

# City of Fort Collins Source Water Protection Plan

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Cover photo: City of Fort Collins Drinking Water Treatment Facility.

This Source Water Protection Plan is a planning document and there is no legal requirement to implement the recommendations herein. Actions on public lands will be subject to federal, state, and county policies and procedures. Action on private land may require compliance with county land use codes, building codes, local covenants, and permission from the landowner. This SWPP for the City of Fort Collins was developed using a modified version 15.04.27 of the Colorado Rural Water Association's Source Water Protection Plan Template.

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## COMMON ACRONYMS

BMP	Best Management Practice
BTEX	Benzene, Toluene ethylbenzene, and xylenes
CDPHE	Colorado Department of Public Health and Environment
CECs	Contaminants of Emerging Concern
CLP	Cache la Poudre
CPRW	Coalition for the Poudre River Watershed
CRWA	Colorado Rural Water Association
DRMS	Division of Reclamation, Mining, and Safety
FCWTF	Fort Collins Water Treatment Facility
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
GIS	Geographic Information System
LUST	Leaking Underground Storage Tank
MGD	Million Gallons per Day
PPCPs	Pharmaceuticals and Personal Care Products
PSOC	Potential Source of Contamination
MTBE	Methyl tert-butyl ether
NRCS	Natural Resources Conservation Service (USDA)
SWAA	Source Water Assessment Area
SWAP	Source Water Assessment and Protection
SWPA	Source Water Protection Area
SWPP	Source Water Protection Plan
TEPCS	threatened, endangered, proposed, candidate, or sensitive areas
USDA	United States Department of Agriculture
US EPA	United States Environmental Protection Agency
USFS	United States Forest Service

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## EXECUTIVE SUMMARY

There is a growing effort in Colorado to protect community drinking water sources from potential contamination. Many communities are taking a proactive approach to preventing the pollution of their drinking water sources by developing a source water protection plan. A source water protection plan identifies a source water protection area, lists potential contaminant sources and outlines best management practices to reduce risks to the water source. Implementation of a source water protection plan provides an additional layer of protection at the local level beyond drinking water regulations.

The City of Fort Collins values a clean, high quality drinking water supply and decided to work collaboratively with area stakeholders to develop a Source Water Protection Plan. The source water protection planning effort consisted of public planning meetings with stakeholders including local citizens and landowners, private businesses, water operators, local and state governments, and agency representatives during the months of June 2015 to April 2016, at Fort Collins Water Treatment Facility. Colorado Rural Water Association was instrumental in this effort by providing technical assistance in the development of this Source Water Protection Plan.

The City of Fort Collins obtains its drinking water from two surface water intakes on the Upper Cache La Poudre River and the Horsetooth Reservoir, a terminal reservoir on the Colorado-Big Thompson System. The Source Water Protection Areas for these water sources include the watershed boundaries of each source. These Source Water Protection Areas are the areas that the City of Fort Collins has chosen to focus its source water protection measures to reduce source water susceptibility to contamination. The Steering Committee, described herein, conducted an inventory of potential contaminant sources and identified other issues of concern within the Source Water Protection Area.

The Steering Committee developed several best management practices to reduce the risks from the potential contaminant sources and other issues of concern. The best management practices are centered on the themes of building partnerships with community members, businesses, and local decision makers; raising awareness of the value of protecting community drinking water supplies; and empowering local communities to become stewards of their drinking water supplies by taking actions to protect their water sources.

The following is an abbreviated list that highlights the highest priority potential contaminant sources and/or issues of concern and their associated best management practices.

- *Forest Health: Wildfires (high)*
  1. Continue to work with the Coalition for the Poudre River Watershed (CPRW) to complete two priority wildfire-related tasks:
    - a. Identify remaining priority areas for restoration that were burned in the 2012 Hewlett Gulch and High Park Wildfires, and
    - b. Complete the Poudre River Watershed Resiliency Plan to identify priority areas for targeted forest fuels treatment based on the wildfire hazards and other values at risk within sub-drainages in the Upper Poudre Watershed.

2. Continue to assess and mitigate, as needed, the wildfire hazards that threaten the City of Fort Collins' critical facilities through forest fuels treatments and other BMPs.
  3. Ensure that source watersheds are identified and managed as a critical asset for the Fort Collins Water Treatment Facility (FCWTF) in major planning efforts such as the FCWTF Wildfire Response Plan, FCWTF Vulnerability Assessment and Regional Hazard Mitigation Plans.
  4. Share copies of the City of Fort Collins' SWPP and GIS shapefiles/maps of the SWPAs with stakeholders.
  5. Continue to maintain early-warning water quality alert system to signal significant changes in water quality.
  6. Participate in regional efforts to advance practices around mitigating the risks of wildfire to water supplies (e.g. Front Range Watershed Wildfire Protection Group, Carpe Diem West's Healthy Headwaters Initiative).
  7. Update internal City policies, as needed, to support the best management practices that provide protection of source water supplies.
- *Historical and Active Mines(Moderate)*
    1. Develop a Mine Action Plan by referencing existing studies such as the USFS Hazard Abandoned Mine Land Inventory Project and DRMS inventories to help determine which abandoned mines and tailings piles are impaired and a threat to the source waters.
    2. Share data from Mine Action Plan with interested parties.

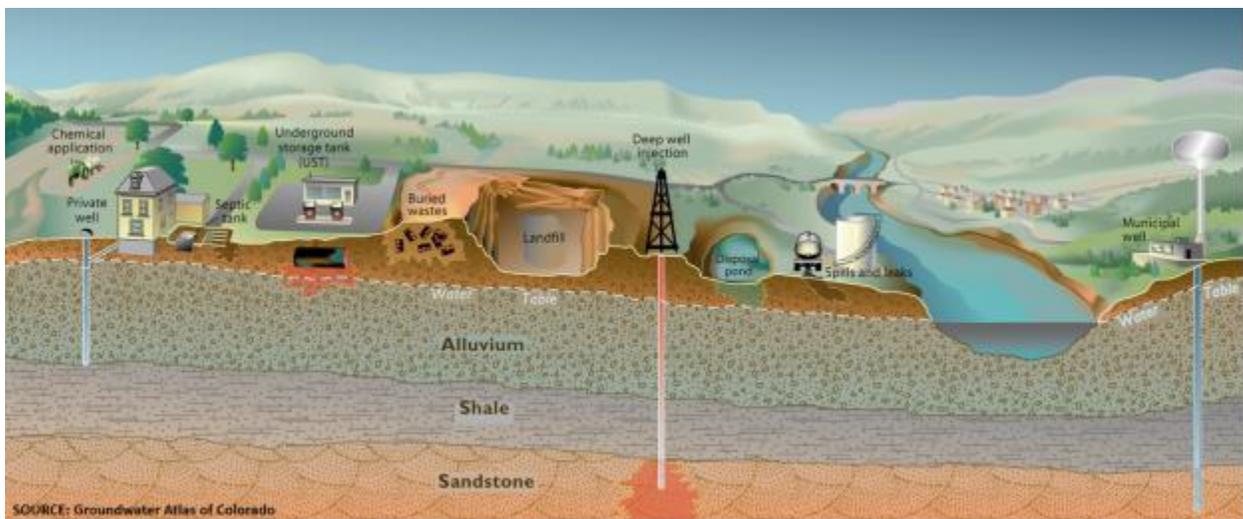
The Steering Committee recognizes that the usefulness of this Source Water Protection Plan lies in its implementation and will begin and/or continue to execute these best management practices upon completion of this Plan.

This Plan is a living document that is meant to be updated to address any changes that will inevitably come. The Steering Committee will review this Plan at a frequency of once every 3-5 years or if circumstances change resulting in the development of new water sources and source water protection areas, or if new risks are identified.

## 1.0 INTRODUCTION

Source water protection is a proactive approach to preventing the pollution of lakes, rivers, streams, and groundwater that serve as sources of drinking water. For generations water quality was taken for granted, and still today many people assume that their water is naturally protected. However, as water moves through and over the ground, contaminants may be picked up and carried to a drinking water supply.

While a single catastrophic event could potentially wipe out a drinking water source, the cumulative impact of minor contaminant releases over time can also result in the degradation of a drinking water source. Contamination can occur via discrete (point source) and dispersed (nonpoint source) sources. A discrete source contaminant originates from a single point, while a dispersed source contaminant originates from diffuse sources over a broader area. According to the US Environmental Protection Agency, nonpoint source pollution is the leading cause of water quality degradation (GWPC, 2008).



**Figure 1. Schematic drawing of the potential source of contamination to surface and groundwater**

The City of Fort Collins Drinking Water Quality Policy (Resolution 93-144, 1993) specifies that the City shall provide “water services that meet or exceed customer expectations”.

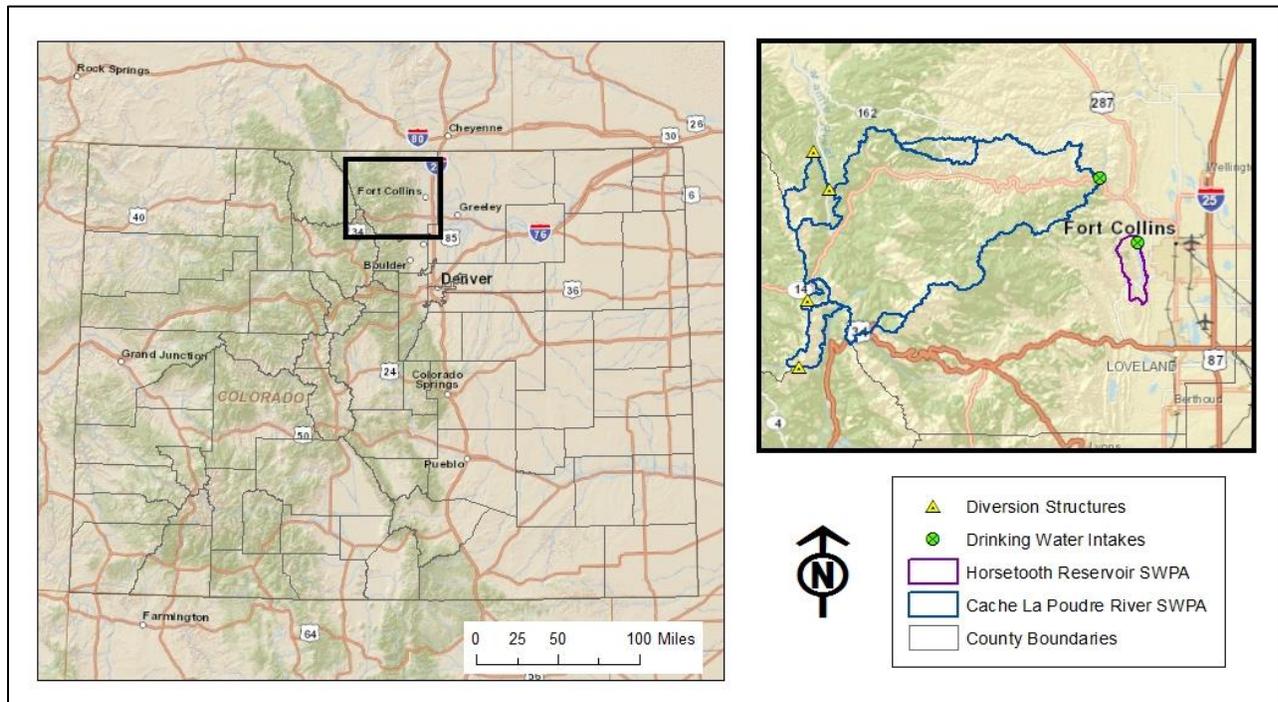
Specifically, pertaining to water supply protection, the policy states:

*“The City will protect raw water sources from contamination or any other activities that would diminish the quality of water provided to customers, or that would result in increased treatment costs.”*

Additionally, the Colorado Water Plan (2015), Section 7, identifies natural hazards and watershed health as key influences on water supplies and encourages the development of stakeholder groups and watershed planning efforts to protect the quality of these water supplies. Specifically, the plan recommends identifying potential impacts to public water supplies from abandoned mines and other threats through processes similar to this Source Water Protection Plan (SWPP) development, and implementing strategies to address these impacts.

<https://www.colorado.gov/pacific/cowaterplan/colorados-water-plan-final-2015>

In both policy and practice, the City of Fort Collins recognizes the potential for contamination of their drinking water sources, and realizes that the development of this SWPP is an important step in protecting these valuable resources. Proactive planning is essential to protect the long-term integrity of the drinking water supply and to limit costs and liabilities. This SWPP demonstrates the City of Fort Collins' commitment to reducing risks to their drinking water supply.



**Figure 2. Location of Fort Collins, CO in Larimer County**

### 1.1 Purpose of the Source Water Protection Plan

The Source Water Protection Plan (SWPP) is a tool for the City of Fort Collins to ensure clean and high quality drinking water sources for current and future generations. This Source Water Protection Plan is designed to:

- Create an awareness of the community's drinking water sources and the potential risks to surface water and/or groundwater quality within the watershed;
- Encourage education and voluntary solutions to alleviate pollution risks;
- Promote best management practices to protect and enhance the drinking water supply;
- Provide for a comprehensive action plan in case of an emergency that threatens or disrupts the community water supply.

Developing and implementing source water protection measures at the local level (i.e. county and municipal) will complement existing regulatory protection measures implemented at the state and federal governmental levels by filling protection gaps that can only be addressed at the local level.

## 1.2 Background of Colorado's SWAP Program

Source water assessment and protection came into existence in 1996 as a result of Congressional reauthorization and amendment of the Safe Drinking Water Act. These amendments required each state to develop a source water assessment and protection (SWAP) program. The Water Quality Control Division, an agency of the Colorado Department of Public Health and Environment (CDPHE), assumed the responsibility of developing Colorado's SWAP program and integrated it with the Colorado Wellhead Protection Program.

Colorado's SWAP program is an iterative, two-phased process designed to assist public water systems in preventing potential contamination of their untreated drinking water supplies. The two phases include the Assessment Phase and the Protection Phase as depicted in the upper and lower portions of Figure 3, respectively.



Figure 3. Source Water Assessment and Protection Phases

### Source Water Assessment Phase

The Assessment Phase for all public water systems was completed in 2004 and consisted of four primary elements:

1. Delineating the source water assessment area for each of the drinking water sources;
2. Conducting a contaminant source inventory to identify potential sources of contamination within each of the source water assessment areas;

3. Conducting a susceptibility analysis to determine the potential susceptibility of each public drinking water source to the different sources of contamination;
4. Reporting the results of the source water assessment to the public water systems and the general public.

A Source Water Assessment Report was provided to each public water system in Colorado in 2004 that outlines the results of this Assessment Phase.

#### Source Water Protection Phase

The Protection Phase is a non-regulatory, ongoing process in which all public water systems have been encouraged to voluntarily employ preventative measures to protect their water supply from the potential sources of contamination to which it may be most susceptible. The Protection Phase can be used to take action to avoid unnecessary treatment or replacement costs associated with potential contamination of the untreated water supply. Source water protection begins when local decision makers use the source water assessment results and other pertinent information as a starting point to develop a protection plan. As depicted in the lower portion of Figure 3, the source water protection phase for all public water systems consists of four primary elements:

1. Involving local stakeholders in the planning process;
2. Developing a comprehensive protection plan for all of their drinking water sources;
3. Implementing the protection plan on a continuous basis to reduce the risk of potential contamination of the drinking water sources; and
4. Monitoring the effectiveness of the protection plan and updating it accordingly as future assessment results indicate.

The water system and the community recognize that the Safe Drinking Water Act grants no statutory authority to the Colorado Department of Public Health and Environment or to any other state or federal agency to force the adoption or implementation of source water protection measures. This authority rests solely with local communities and local governments.

The source water protection phase is an ongoing process. The evolution of the SWAP program is to incorporate any new assessment information provided by the public water supply systems and update the protection plan accordingly.

## 2.0 SOURCE WATER SETTING

The City of Fort Collins obtains its drinking water from two surface water intakes on the Upper Cache La Poudre River and the Horsetooth Reservoir, a terminal reservoir on the Colorado-Big Thompson System.

The City of Fort Collins' source waters lie within both public and private lands. The private land is within the unincorporated areas of Larimer County, and the public lands include Arapaho-Roosevelt National Forest Lands, managed by the Canyon Lakes Ranger District, and Rocky Mountain National Park, managed by the National Park Service. Land use on private land consists of agricultural and rural residential development.

### 2.1 Cache la Poudre River

The Cache la Poudre (Poudre) watershed is a sub-watershed of the South Platte River Basin. The South Platte River Basin is part of Colorado Water Division One with the office of the Division Engineer in Greeley.

The headwaters of the Cache la Poudre River watershed (Hydrologic Unit Code (HUC) 10190007) lie within Rocky Mountain National Park. From here, the Mainstem Poudre travels approximately 65 miles through the Poudre Canyon, descending approximately 5,500 feet from its starting elevation of 10,800 feet. It then flows through the City of Fort Collins, and meets the South Platte River on the agricultural plains, near Greeley, Colorado. The City of Fort Collins raw Poudre River water intake facility is located on the Mainstem of the Poudre River above the confluence with the North Fork Poudre approximately 5 miles upstream from the mouth of the Poudre Canyon.



**Figure 4. Upper Cache la Poudre River during Spring snowmelt runoff.**

The upper Poudre watershed (above the canyon mouth) encompasses approximately 565 square miles of mountain terrain, dominated by coniferous forest with less than 4 square miles of developed land. Within this upper basin, there are a total of 30 miles of river designated under the Wild and Scenic Rivers Act (1968) as "wild" and another 46 miles with a "recreational" designation. These designations underscore the pristine conditions of these river segments and protect against any activity that threatens the water quality or the outstanding natural, cultural, and recreational values on these segments (Oropeza et al, 2011). The City of Fort Collins does not own any of the lands upstream from the Poudre water supply intake, which means all watershed management and water supply protection efforts must be addressed through collaboration with other land owners and land/water management agencies. The primary tributaries of the Mainstem Poudre are the Little South Fork Poudre and Joe Wright Creek. Within the upper watershed, there are nine water supply reservoirs and five trans-basin

diversions that deliver water from the Colorado River, Michigan River and Laramie River basins; however, the Mainstem Poudre remains free of impoundments. As such, the water quality at the City’s Poudre Supply Intake, reflects the cumulative contributions of these sources in addition to the land use activities within the watershed.

In 2012, a major wildfire, the High Park Fire, burned approximately 135 square miles of the Upper Poudre Watershed, the majority of which drains into the Mainstem Poudre River, above the City’s Poudre Supply Intake. Within the burn area, burned hillslopes have regained significant vegetative cover since 2012, which has significantly reduced the magnitude of peak storm flows and delivery of sediment to the Poudre River. However, the channel structure and hydrologic function of several tributary streams were damaged by the highly erosive flash floods in the first two years following the High Park Fire. These impacted stream channels continue to act as sources of eroded sediment and nutrients to the River, particularly during significant rainfall events, and will be targets for restoration by the Coalition for the Poudre River Watershed (CPRW).

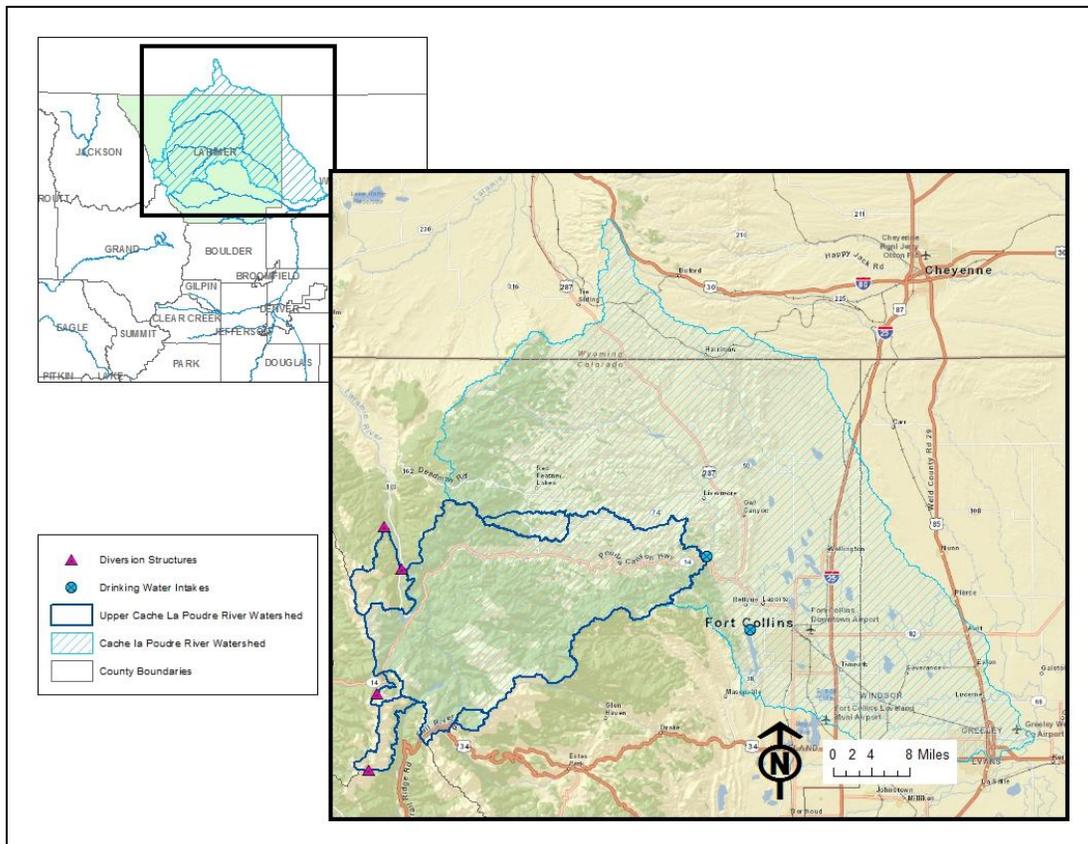


Figure 5. Upper Cache la Poudre River Sub-watershed within the Poudre River Watershed

## 2.2 Horsetooth Reservoir

The City of Fort Collins also obtains drinking water from Horsetooth Reservoir via the Hansen Feeder Canal system. Horsetooth Reservoir is located in the foothills west of the Fort Collins’ city boundaries in Larimer County, Colorado. Horsetooth Reservoir has a storage capacity of 156,735 acre feet. It is situated north to south along the foothills with a length of approximately 6.7 miles and a relatively

narrow, maximum width of 0.9 miles. The residence time of water stored in Horsetooth Reservoir is approximately 8.4 months to 1 year.

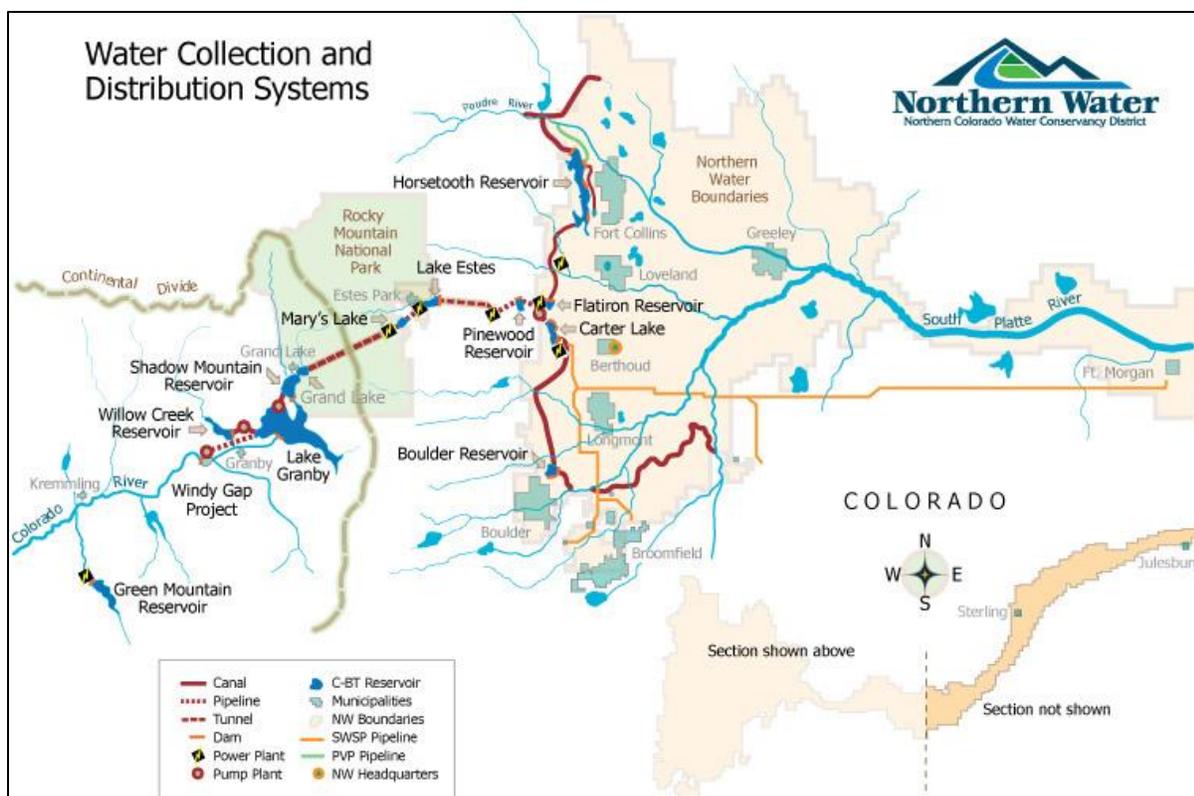
Horsetooth Reservoir is a terminal reservoir of the Colorado-Big Thompson Project (C-BT) operated by the Bureau of Reclamation and the Northern Colorado Water Conservancy District. The Colorado-Big Thompson Project is the largest trans-mountain water diversion project in Colorado. West of the Continental Divide, runoff from the headwaters of the Colorado River is collected in Granby Reservoir, Shadow Mountain Reservoir and Grand Lake. Granby Reservoir also receives water pumped from Willow Creek Reservoir and Windy Gap Reservoir. When East Slope delivery requirements are greater than the direct runoff to Grand Lake, water is pumped from Granby Reservoir to Shadow Mountain Reservoir where it flows by gravity into Grand Lake. From there, the Alva B. Adams Tunnel, a 13 mile tunnel, transports the water under the divide to the East Slope.

Once the water reaches the East Slope, it is used to generate electricity as it falls almost half a mile through five power plants on its way to Colorado's Front Range. Carter Lake, Horsetooth Reservoir and Boulder Reservoir store C-BT water (Figure 7). The C-BT Project provides water for agricultural, municipal and industrial uses (Northern Colorado Water Conservancy District, n.d.).

The C-BT system includes over 1,000 square miles of watershed area, which is comprised of primarily forested, mountain terrain as well as some developed areas around the Towns of Grand Lake and Estes Park. In comparison, the direct, local watershed of Horsetooth Reservoir is small, approximately 17 square miles. There are several small intermittent streams that feed into the Reservoir, primarily during spring snowmelt runoff and significant rain events. Similar to the Poudre River watershed, the City of Fort Collins does not own any of the lands upstream from the reservoir, which means all watershed management and water supply protection efforts must be addressed through collaboration with other land owners and land/water management agencies.



**Figure 6. Horsetooth Reservoir, a terminal reservoir in the C-BT system.**



**Figure 7. Colorado-Big Thompson Project Water Collection and Distribution Systems (Northern Colorado Water Conservancy District, n.d.)**

### 2.3 Clean Water Act Water Quality Standards

Under the EPA Clean Water Act, every state must adopt water quality standards to protect, maintain and improve the quality of the nation’s surface waters. Section 305(b) of the Clean Water Act requires all states to assess and report to Congress on the quality of waters within their state. The State of Colorado’s Water Quality Control Commission (WQCC) has established water quality standards that define the goals and limits for all waters within their jurisdictions. Colorado streams are divided into individual stream segments for classification and standards identification purposes. Colorado’s Section 303d List of Impaired Waters and Monitoring and Evaluation List (Regulation #93) identifies the stream segments that do not meet the attainment of those standards for designated uses.

In 2015, all tributaries to the Mainstem of the Upper Cache la Poudre River from the headwaters to the canyon mouth were added to the 303d list of impaired waters due to non-attainment of the Aquatic Life standards (provisional) based on a multimetric index (MMI) for aquatic macroinvertebrates and for total arsenic (As) concentrations (COSPCP02a ). The lower segment between the Munroe Tunnel and the canyon mouth (COSPCP10a), is also 303d listed for temperature. Horsetooth Reservoir (COSPCP14) is on the 303d list for mercury (Hg) concentrations in fish tissue and total arsenic (As) exceedances.

These 303d designations do not affect the suitability of the Poudre River or Horsetooth Reservoir as high quality drinking water sources.

### **3.0 SOURCE WATER MONITORING PROGRAMS**

#### **3.1 Upper Cache la Poudre (CLP) Collaborative Water Quality Monitoring Program**

The Upper Cache la Poudre (CLP) Collaborative Water Quality Monitoring Program (“Upper CLP Program”) was initiated in 2008 as a cooperative approach to monitoring source waters for the City of Fort Collins, City of Greeley and the Tri-Districts. This collaborative program incorporates historical monitoring programs on the Poudre River from City of Greeley and City of Fort Collins. As such, it eliminates redundancies in sampling efforts, improves cost-effectiveness and monitoring capabilities for all partner entities. The majority of samples are analyzed by the City of Fort Collins Water Quality Laboratory. The data collected are used to track water quality trends and watershed issues of concern over time on the Poudre River. The information from this program allows treatment facility operations to readily anticipate any needed changes in treatment processes and plan accordingly.

In total, 19 sites on the Mainstem and North Fork of the Poudre River are monitored 11 times per year, for up to 30 water quality constituents that reflect the physical, chemical, microbiological and aesthetic characteristics of the water source. The sites are situated above and below major tributaries, reservoirs, inflow diversion points and at water treatment intake facilities. The data are analyzed and reported in annual and five-year summary reports. All water quality reports can be found at <http://www.fcgov.com/utilities/what-we-do/water/water-quality/source-water-monitoring/water-quality-reports>.

#### **3.2 Horsetooth Reservoir Water Quality Monitoring Program**

The City of Fort Collins conducted water quality monitoring on Horsetooth Reservoir from the mid-1980’s until 2014. In 2015 the City entered into a cost-share agreement with Northern Water for the cooperative monitoring of Horsetooth Reservoir. A review of historical data and a program comparison indicates that this shared monitoring effort will eliminate redundancy in sampling efforts, maintain a consistent, high quality data record and offer cost savings to both parties. The current monitoring program evaluates reservoir dynamics by tracking physical depth profile characteristics throughout the year at three key locations at the top and bottom of the reservoir and data from this program are used to monitor long-term and seasonal trends in water quality. Information from this program is used to inform water treatment operations. Horsetooth Reservoir Water Quality Reports can be found at the City’s website, <http://www.fcgov.com/utilities/what-we-do/water/water-quality/source-water-monitoring/water-quality-reports> and on Northern Water’s website, <http://www.northernwater.org/WaterQuality/WaterQualityReports1.aspx>.

#### **3.3 Contaminants of Emerging Concern**

The City of Fort Collins participates in Northern Water’s Cooperative Emerging Contaminant Monitoring Program along with other Front Range municipalities. This program samples from a number of source water supplies three times per year for the presence of a large suite of Contaminants of Emerging Concern (CECs). The compounds of interest include pharmaceuticals and personal care products (PPCPs), herbicides, pesticides and hormones.

A link to the description of this program and the monitoring results can be found at the City of Fort Collins Utilities - Source Water Monitoring web page: <http://www.fcgov.com/utilities/what-we-do/water/water-quality/source-water-monitoring/special-studies/emerging-contaminants>, and at Northern Water's Website: <https://www.northernwater.org/WaterQuality/WaterQualityReports1.aspx>.

To date, observed concentrations of emerging contaminants have been extremely low, often near the method detection limit and orders of magnitude below typical consumptive or therapeutic doses and consistently well below EPA numerical water quality standards, when applicable. However, the purpose of this cooperative monitoring effort is to establish a baseline for these types of compounds in surface water supplies and to track them over time. In some areas of the country, concentrations of certain compounds have been shown to cause adverse impacts on aquatic life, and it is important for EPA to be able to evaluate the potential impact of CECs and PPCPs on aquatic life and have an approach for determining protective levels for aquatic organisms (US Environmental Protection Agency, 2015).

### **3.4 Harmful Algal Blooms**

The City of Fort Collins assessed the vulnerability of its source waters to harmful algal blooms and cyanotoxin production. Cyanotoxins are produced by several widely-occurring species of cyanobacteria known as blue-green algae. The production of cyanotoxins is complex and very difficult to predict; however, rapid cyanobacteria growth, or "blooms", are generally favored by slow moving, warm, nutrient-enriched waters with exposure to ample sunlight. These compounds can be difficult to remove in drinking water treatment process, and so avoidance is, by far, the best protection strategy. People and animals who come into contact with contaminated waters can experience serious health effects or even death. Under the Safe Drinking Water Act, the U.S. EPA is required to develop and publish a list of unregulated contaminants that are known or expected to occur in public water systems and that pose concern for public health. Accordingly, the EPA has included 10 cyanotoxins in the fourth Unregulated Contaminants Monitoring Rule (UCMR4), which requires public drinking water systems to analyze samples from their drinking water distribution systems during the period of March 2018 through November 2020. The City of Fort Collins will monitor the drinking water distribution system accordingly.

To evaluate the level of risk of Fort Collins water supplies face from potential cyanotoxin production, City staff evaluated the prevalence of environmental factors that favor cyanotoxin production and analyzed historical water quality data. It was determined that the Cache la Poudre River source water supply is at low risk for cyanotoxin production. Horsetooth Reservoir is also of low risk for harmful algal blooms based on long-term historical data; however, future changes in climate or reservoir dynamics may support environmental conditions favorable to harmful algal blooms and potential cyanotoxin release. Therefore, the City of Fort Collins has developed a cyanotoxin monitoring protocol and early warning action plan in the event that conditions favor harmful algal blooms in Horsetooth Reservoir. Due to the low risk of occurrence of cyanotoxins in Horsetooth Reservoir and the high cost of quantifying cyanotoxins, the goal of this monitoring plan is not to monitor specifically for cyanotoxins, but to outline a method to assess water quality indicators that can inform decisions about when to monitor cyanotoxins in raw and finished water.

## **4.0 DRINKING WATER SUPPLY OPERATIONS**

### **4.1 Water Supply and Infrastructure**

The City of Fort Collins operates a community water supply system that supplies drinking water to 129,300 residents located within Larimer County, Colorado.

On an annual basis, the FCWTF treats approximately half of its water from each of two primary sources - Horsetooth Reservoir and the Poudre River. Horsetooth Reservoir is a terminal reservoir in the Colorado-Big Thompson (C-BT) system and is managed by the Northern Colorado Water Conservancy District (Northern Water). Horsetooth Reservoir is a deep, narrow reservoir, oriented north to south along the foothills west of Fort Collins. At capacity, it holds approximately 156,735 acre feet of water and has a residence time between 8.4 months to 1 year. The reservoir outlet is located at the north end, near the bottom of the Soldier Canyon Dam and delivers water to the City of Fort Collins, Tri-Districts Soldier Canyon Filter Plant and Colorado State University's (CSU) Engineering Research Center. In addition to the outlet at Soldier Canyon Dam, there is an outlet at Horsetooth Dam that delivers water to the Hansen Supply Canal which flows approximately 5 miles north and discharges to the Poudre River downstream of the City's Poudre River intake.

The City's Poudre supply is direct flow to the FCWTF from the Cache la Poudre River via two 13-mile long pipelines. A third pipeline, the Pleasant Valley Pipeline, diverts water from the North Poudre Irrigation Company (NPIC) channel at the mouth of Poudre Canyon. NPIC, in turn, diverts this water from the Mainstem of the Poudre River approximately one mile above the Fort Collins diversion. The Poudre pipelines can deliver a total of 20 million gallons per day (MGD) to the treatment facility. The Pleasant Valley Pipeline can deliver an additional 60 MGD to the FCWTF.

Water from all three Poudre pipelines and the Horsetooth pipeline enters a blending basin at the Water Treatment Facility. The Flowblend basin is baffled to provide sufficient mixing of the water from all three pipelines to create one homogenous source of water for treatment.

### **4.2 Water Treatment Process**

Chlorine dioxide is added as a pre-oxidant to the incoming raw water in order to minimize taste and odor causing compounds. Chlorine dioxide is typically added to the Horsetooth source prior to the flow blending basin. Sufficient residual remains in the Flowblend basin for treatment of Poudre Water. Capacity exists to feed chlorine dioxide directly to Poudre water, should the need arise. The water is coagulated by addition of aluminum sulfate and flocculated with the aid of a cationic polymer. Solids are removed in sedimentation basins using the aid of lamella plates or settling tubes. The supernatant from the sedimentation basins is filtered through dual media constant rate filters. The filtrate is disinfected using gaseous chlorine. For corrosion control, the alkalinity is increased to between 36 and 40 mg/L by the addition of hydrated lime, and the pH is adjusted to 7.8 – 8.0 by the addition of carbon dioxide. The finished water is also fluoridated using hydrofluosilic acid. Currently, a portion of the on-site reservoirs are reserved for disinfectant contact time. A contact basin is currently under construction, which will provide all necessary disinfectant contact time prior to the storage reservoirs.

The treatment facility consists of four independent treatment trains and 23 filters. Each treatment train has a maximum sustainable treatment capacity of between 20 MGD and 22 MGD, depending on the train, for a total sustainable treatment capacity of 87 MGD. The hydraulic maximum rate of the plant is 92 MGD.

### 4.3 Finished Water Storage

Two finished water storage reservoirs are located on the plant grounds, with a capacity of 15 million gallons each. Two off site reservoirs help maintain pressure in parts of our system – Foothills Reservoir serves customers on the western edge of Fort Collins, including CSU’s Foothills Campus. It can store 4 million gallons and can be isolated into two hydraulically independent chambers of 2 million gallons each. The Goat Hill Reservoir has a capacity of 1.5 million gallons, and serves customers in the town of LaPorte, northwest of Fort Collins.

**Table 1. Surface Water Supply Information**

Water System Facility Name	Water System Facility Number	Surface Water Source	Constructed Date
Poudre River Intake / Pleasant Valley Pipeline	SS002	Cache la Poudre River	1979
Horsetooth Reservoir Outlet	SS001	Horsetooth Reservoir	1951 (filled)

### 4.4 Water Supply Demand Analysis

The City of Fort Collins serves an estimated 129,300 residents and other users in the service area annually. In addition to residents, Fort Collins sells treated water to business customers as well as CSU, and SFCF.

The water system has the current capacity to produce 87 million gallons per day. Current estimates indicate that the average daily demand is approximately 21.2 million gallons per day, and that the average peak daily demand is approximately 44.5 million gallons per day. Using these estimates, the water system has a surplus average daily demand capacity of 65.8 million gallons per day and a surplus average peak daily demand capacity of 42.5 million gallons per day.

If either water source becomes disabled for an extended period of time due to contamination, the City of Fort Collins is able to meet its average and peak daily demand by using water from the other source. However, if both water sources become disabled, the City of Fort Collins will not be able to meet the average or peak daily demand of its customers. The ability of City of Fort Collins to meet either of these demands for an extended period of time is also affected by the amount of treated water the water system has in storage at the time a water source becomes disabled.

The potential financial and water supply risks related to the long-term disablement of one or more of the community’s water sources are a concern to the Steering Committee. As a result, the Steering Committee believes the development and implementation of a source water protection plan for City of Fort Collins can help to reduce the risks posed by potential contamination of its water sources. Additionally, the City of Fort Collins has developed an emergency response plan which is maintained at the Water Treatment Facility to coordinate rapid and effective response to any emergency incident that threatens or disrupts the community water supply.

## 5.0 SOURCE WATER PROTECTION PLAN DEVELOPMENT

The Colorado Rural Water Association’s (CRWA) Source Water Protection Specialist, Kimberly Mihelich, helped facilitate the source water protection planning process. The goal of the CRWA’s Source Water Protection Program is to assist public water systems in minimizing or eliminating potential risks to drinking water supplies through the development and implementation of Source Water Protection Plans.

The source water protection planning effort consisted of individual planning meetings with the water provider and a series of stakeholder meetings. Information discussed at the meetings helped the City of Fort Collins develop an understanding of the issues affecting source water protection for the community. The Steering Committee for the SWPP development included the City’s Watershed Specialist, Watershed Technician and Water Production Manager and CRWA’s Water Protection Specialist. Based on recommendations from stakeholder groups and water treatment staff, the Steering Committee made recommendations for best management practices to be incorporated into the Source Water Protection Plan. In addition to the planning meetings, data and other information pertaining to Source Water Protection Area was gathered via public documents, internet research, phone calls, emails, and field trips to the protection area. A summary of the meetings is represented below.

**Table 2. Planning Meetings and SWPP development timeline**

Date	Purpose of Meeting
June 23, 2015	First Planning Meeting - Review stakeholder list; review of the State’s Source Water Assessment for City of Fort Collins.
July 30, 2015	Second Planning Meeting - Review drinking water supply operations for the City of Fort Collins; define Source Water Protection Areas.
September 17, 2015	Third Planning Meeting - Review Source Water Protection Areas; identify and develop potential source of contaminant inventory.
October 21, 2015	Fourth Planning Meeting - Review inventory of potential sources of contaminants and assess risk; begin development of best management practices.
November 24, 2015	Fifth Planning Meeting - Review risk assessment of potential sources of contamination; continue development of best management practices.
December 2, 2015	Conference call - Finalize best management practices; prioritize potential sources of contamination.
April 21, 2016	Present draft Source Water Protection Plan to stakeholder group
May 13, 2016	Stakeholder comment period ends
June 13, 2016	Final SWPP published

### 5.1 Development of the Poudre River Watershed Resiliency Plan

The Coalition for the Poudre River Watershed (CPRW) is a 501c3 nonprofit organization, established in 2013, that works to improve and maintain the ecological health of the Poudre River watershed through community collaboration. The City of Fort Collins is a founding member of CPRW and holds a reserved seat on the Board of Directors. CPRW is currently engaged with a variety of stakeholders (e.g. natural resource professionals, scientists, residents, government agency representatives, etc.) to develop a

community-driven Watershed Resiliency Plan that will identify priority areas at risk from wildfires and among other issues, and that will recommend mitigation / treatment options for prioritized areas and values at risk. The Watershed Resiliency Plan will provide opportunity for outreach to residents about watershed health, and will guide implementation of restoration activities within the upper Poudre River watershed. It is intended that this Source Water Protection Plan will complement CPRW's Watershed Resiliency Plan, as the quality and consistency of the City's water supplies depend on healthy, functioning watersheds and likewise, are vulnerable to similar risks.

## **5.2 Stakeholder Participation in the Planning Process**

Local stakeholder participation is vitally important to the overall success of Colorado's Source Water Assessment and Protection (SWAP) program. Source water protection was founded on the concept that informed citizens, equipped with fundamental knowledge about their drinking water source and the threats to it, will be the most effective advocates for protecting this valuable resource. Local support and acceptance of the Source Water Protection Plan is more likely when local stakeholders have actively participated in its development.

The planning process took place during the months of June 2015 through April 2016. Because the development of the Fort Collins Source Water Protection Plan and the CPRW Poudre River Watershed Resiliency Plan were largely concurrent efforts, the City decided to utilize the existing CPRW stakeholder meetings for SWPP updates in to maximize the benefit of stakeholder involvement. The City of Fort Collins held internal planning meetings prior to the development of a final SWPP. Local stakeholders and internal City staff were notified initially of the planning process and email and updates were provided to the group. The draft SWPP was shared at a CPRW Stakeholders and internal City staff via email on April 21, 2016 and a notice was posted to the City's Source Water Monitoring webpage (<http://www.fcgov.com/utilities/what-we-do/water/water-quality/source-water-monitoring>) to provide an opportunity for comments on the Fort Collins SWPP. The City of Fort Collins and the Colorado Rural Water Association are very appreciative of the participation and expert input from the following stakeholders.

A list of participating stakeholders in the City of Fort Collins SWPP development is provided in Appendix A.

## **5.3 Development and Implementation Grant**

The City of Fort Collins has been awarded a \$5,000 Development and Implementation Grant from the Colorado Department of Public Health and Environment. This funding is available to public water systems and representative stakeholders committed to developing and implementing a source water protection plan. A one to one financial match (cash or in-kind) is required. The City of Fort Collins was approved for this grant in February 2015, and it expires on January 31, 2017. The City of Fort Collins intends on using the funds to implement management approaches that are identified in this Plan.

## **5.4 Source Water Assessment Report Review**

The Steering Committee has reviewed the Fort Collins Source Water Assessment Report (2004). The Assessment results were used as a starting point to guide the development of appropriate management approaches to protect the source water(s) of City of Fort Collins from potential contamination. A copy of the Source Water Assessment Report for City of Fort Collins can be obtained by contacting the City of

Fort Collins or by downloading a copy from the CDPHE's SWAP program website located at: <http://www.colorado.gov/cs/Satellite/CDPHE-WQ/CBON/1251596793639>.

## 5.5 Defining the Source Water Protection Area

A source water protection area is the surface and subsurface areas within which contaminants are reasonably likely to reach a water source. The purpose of delineating a source water protection area is to determine the recharge area that supplies water to a public water source. Delineation is the process used to identify and map the area around a pumping well that supplies water to the well or spring, or to identify and map the drainage basin that supplies water to a surface water intake. The size and shape of the area depends on the characteristics of the aquifer and the well, or the watershed. The source water assessment areas that were delineated as part of the City of Fort Collins' Source Water Assessment Report provides the basis for understanding where the community's source water and potential contaminant threats originate, and where the community has chosen to implement its source water protection measures in an attempt to manage the susceptibility of their source water to potential contamination.

After carefully reviewing their Source Water Assessment Report and the CDPHE's delineation of the Source Water Assessment Areas for each of the City of Fort Collins' sources, the Steering Committee chose to modify it before accepting it as their Source Water Protection Area for this Source Water Protection Plan. The original Source Water Assessment Report included two distinct SWAAs for both of their water sources (Appendix B). The SWAA for the Upper Cache la Poudre River intake included the entire Upper Cache la Poudre River Watershed, and the SWAA for the Horsetooth Reservoir intake included the drainage into Horsetooth Reservoir and expanded up to the entire Colorado River and Little Thompson watersheds. In an effort to reduce the scope of this project, the City of Fort Collins narrowed the Horsetooth Reservoir SWAA to include only the drainage into the reservoir.

The City of Fort Collins' Source Water Protection Areas are defined as:

**Zone 1** is defined as a 1,000 foot wide band on either side of the streams.

**Zone 2** extends 1/4 mile beyond each side of the boundaries of zone 1 (2,320 feet from the stream).

**Zone 3** is made up by the remainder of the SWAA area up to the watershed boundary.

The Source Water Protection Area is illustrated in the following maps.

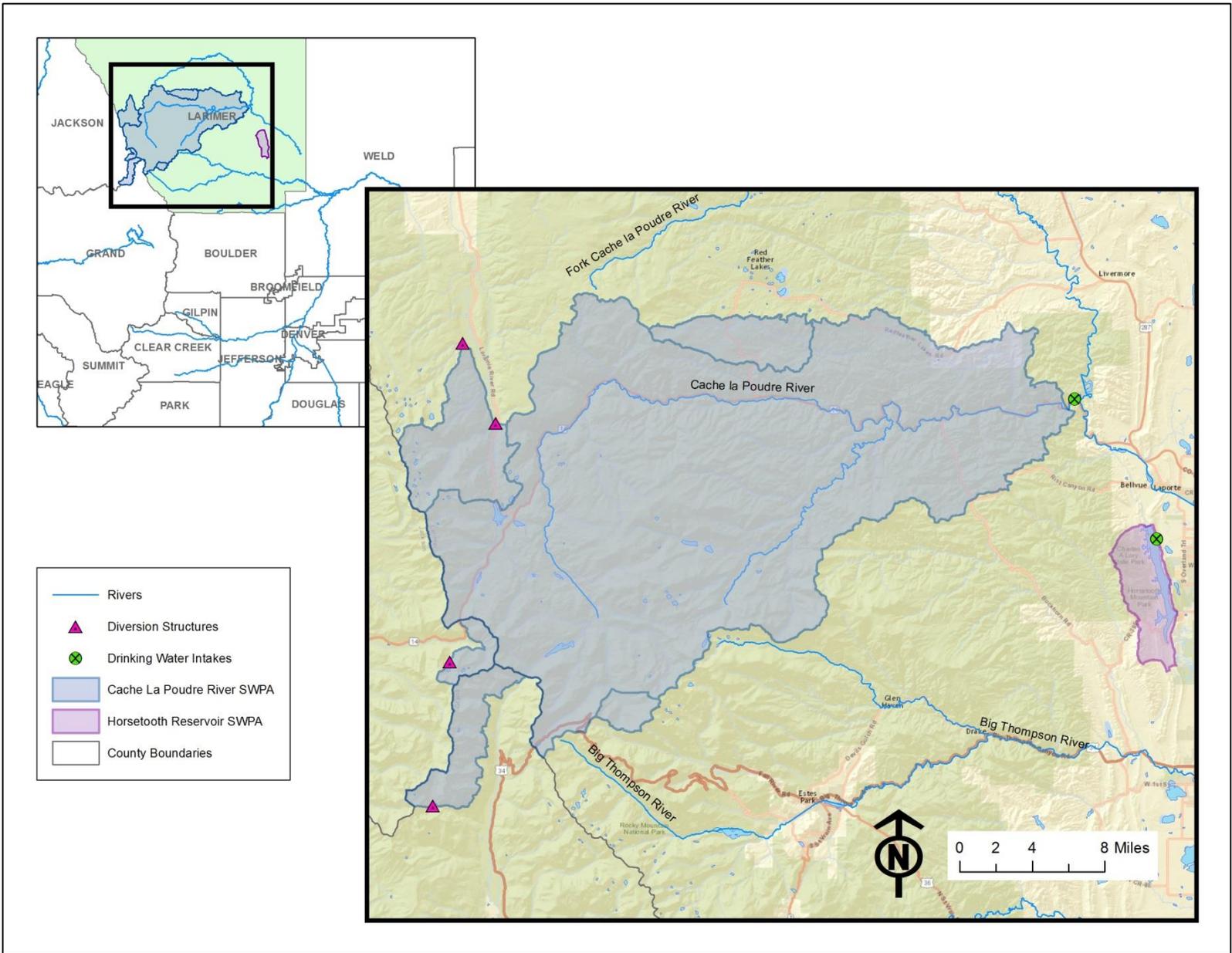


Figure 8. Overview of City of Fort Collins' SWPAs.

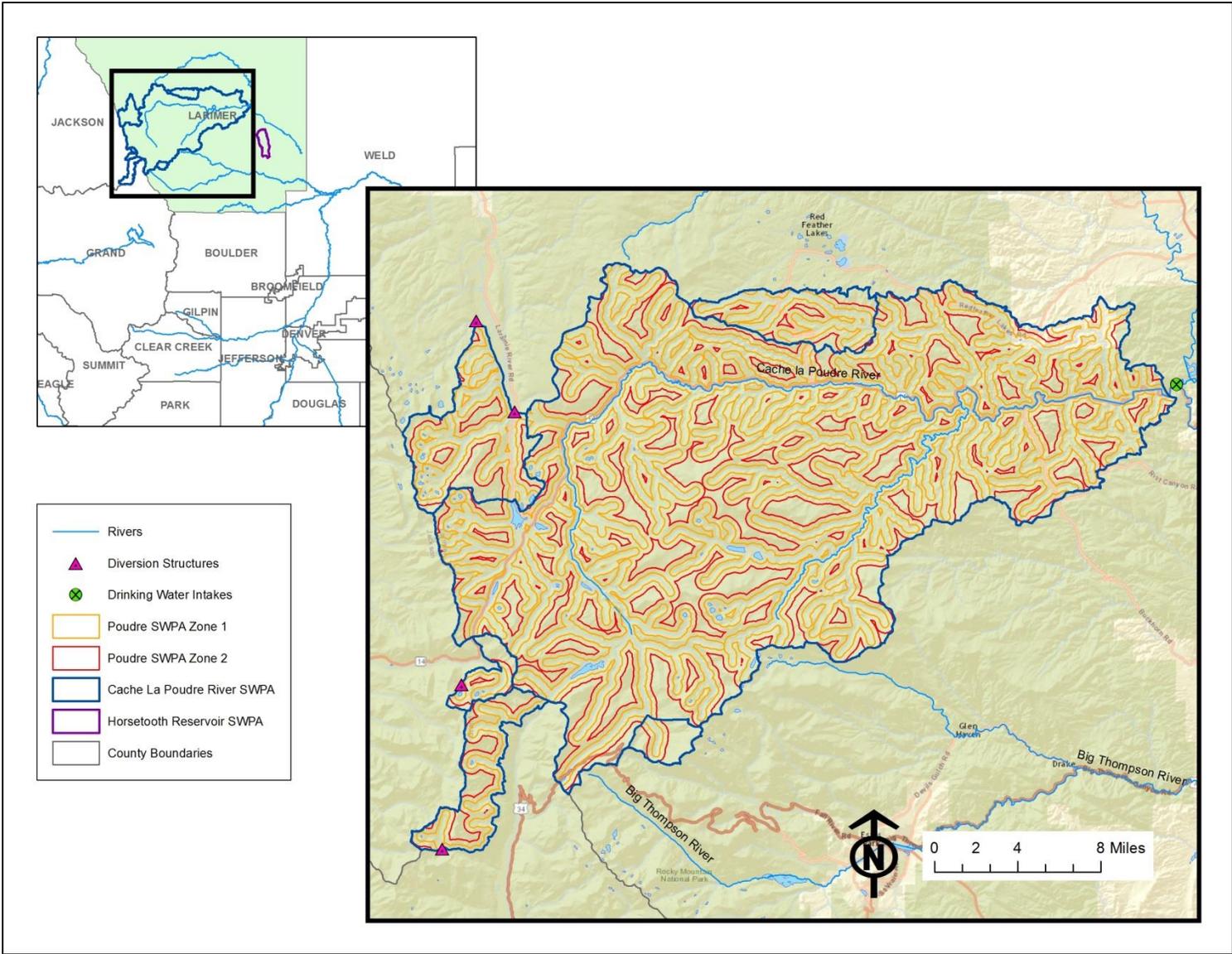


Figure 9. City of Fort Collins' Cache la Poudre River SWPA

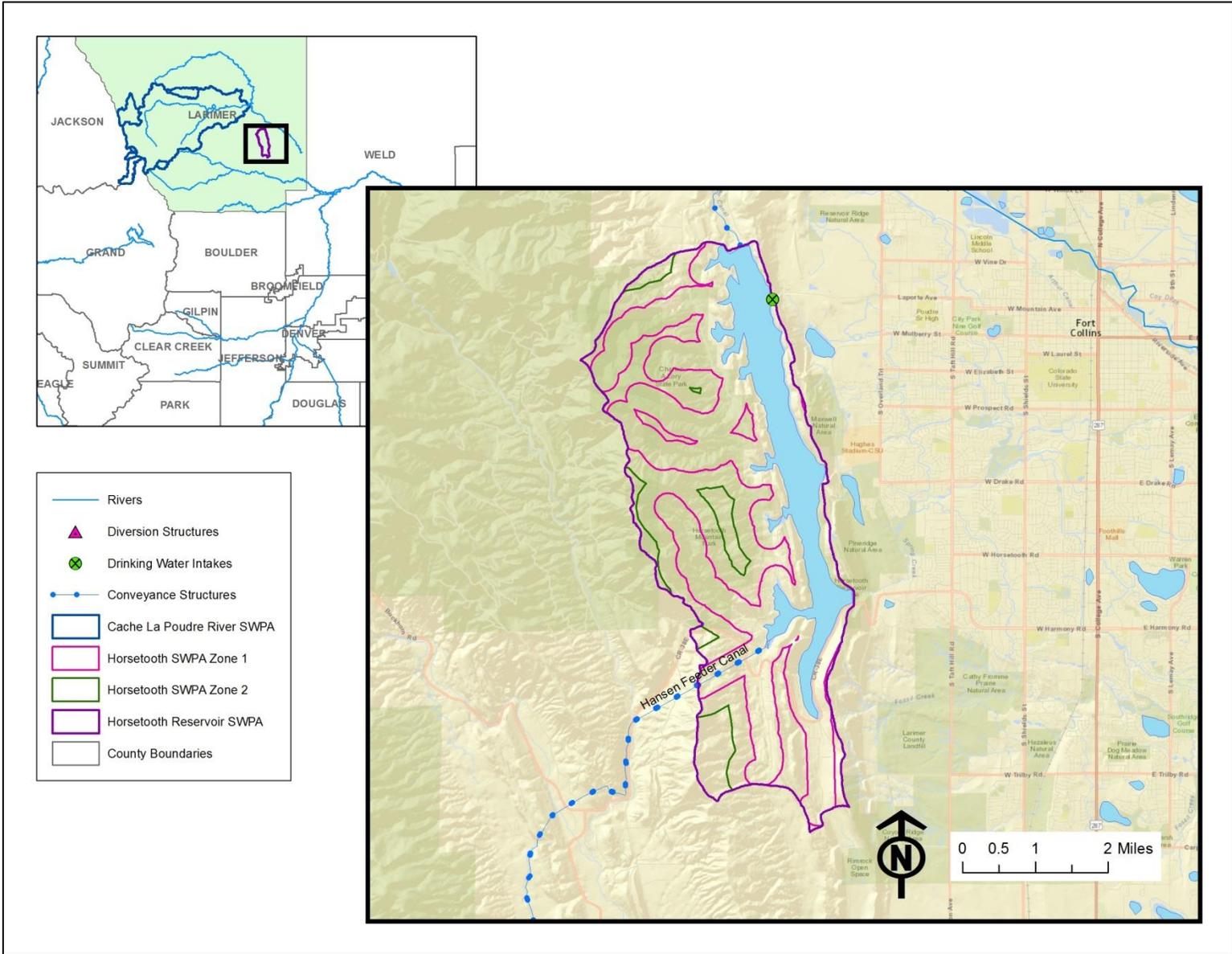


Figure 10. City of Fort Collins' Horsetooth Reservoir SWPA

## 5.6 Inventory of Potential Contaminant Sources and Other Issues of Concern

In 2001 – 2002, as part of the Source Water Assessment Report, a contaminant source inventory was conducted by the Colorado Department of Public Health and Environment to identify selected potential sources of contamination that might be present within the source water assessment areas. Discrete and dispersed contaminant sources were inventoried using selected state and federal regulatory databases, land use / land cover and transportation maps of Colorado. The contaminant inventory was completed by mapping the potential contaminant sources with the aid of a Geographic Information System (GIS).

The City of Fort Collins was asked, by CDPHE, to review the inventory information, field-verify selected information about existing and new contaminant sources, and provide feedback on the accuracy of the inventory. Through this Source Water Protection Plan, the City of Fort Collins is reporting its findings to the CDPHE.

After much consideration, discussion, and input from local stakeholders, the City of Fort Collins has developed a more accurate and current inventory of contaminant sources located within the Source Water Protection Area and other issues of concern that may impact the City of Fort Collins’s drinking water sources.<sup>1</sup> In addition to the discrete and dispersed contaminant sources identified in the contaminant source inventory, the City of Fort Collins has also identified other issues of concern that may impact their drinking water sources (see Table 4. Potential Sources of Contamination and Issues of Concern Prioritization Table, page 47). Upon completion of this contaminant source inventory, the City of Fort Collins has decided to adopt it in place of the original contaminant source inventory provided by the CDPHE.

## 5.7 Priority Strategy of Potential Contaminant Sources and Other Issues of Concern

After developing a contaminant source inventory and list of issues of concern that is more accurate, complete, and current, the City of Fort Collins prioritized each item to guide the implementation of the Best Management Practices outlined in this Source Water Protection Plan (see Table 6: Source Water Protection Best Management Practices). The prioritization ranking of each potential contaminant source or other issue of concern factored in the following criteria (as described below): the level of risk, the water system control, and the Best Management Practices associated with each item.

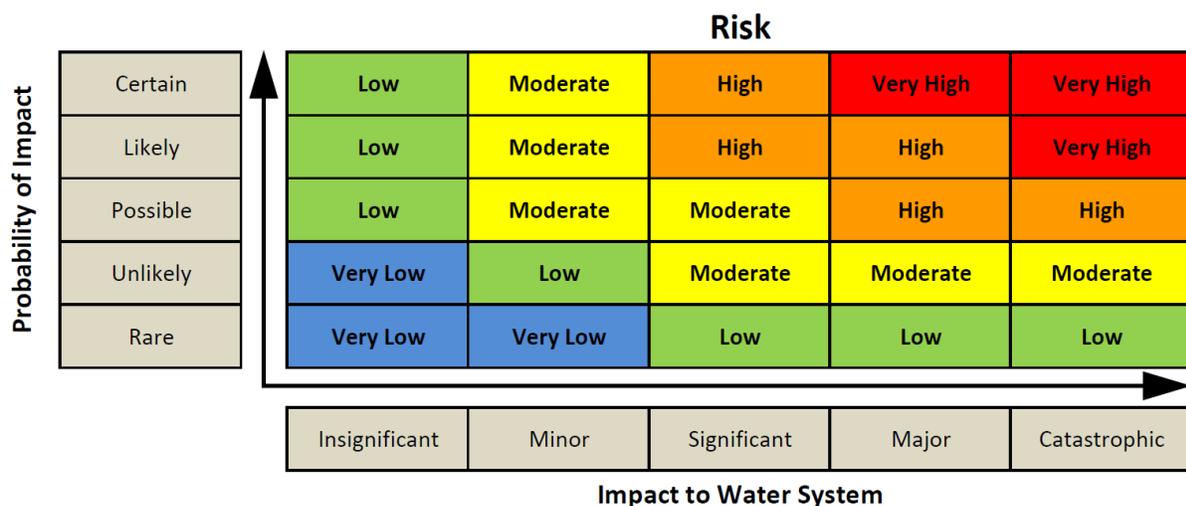
1. **Risk** – The level of risk for each contaminant source is a measure of the water source’s potential exposure to contamination. The City of Fort Collins utilized CRWA’s *SWAP Risk Assessment Matrix* (Appendix C), which calculates the level of risk by estimating the following:
  - **Impact to the Public Water System** – The risk to the source waters increases as the impact to the water system increases. The impact is determined by evaluating the human health concerns and potential volume of the contaminant source. CDPHE developed information tables to assist with this evaluation (Appendices D-G). The following descriptions provide a framework to estimate the impact to the public water system.

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<sup>1</sup> The information contained in this Plan is limited to that available from public records and the City of Fort Collins at the time that the Plan was written. Other potential contaminant sites or threats to the water supply may exist in the Source Water Protection Area that are not identified in this Plan. Furthermore, identification of a site as a “potential contaminant site” should not be interpreted as one that will necessarily cause contamination of the water supply.

- **Catastrophic (very high)** - irreversible damage to the water source(s). This could include the need for new treatment technologies and/or the replacement of existing water source(s).
  - **Major (high)** - substantial damage to the water source(s). This could include a loss of use for an extended period of time and/or the need for new treatment technologies.
  - **Significant (moderate)**- moderate damage to the water source(s). This could include a loss of use for an extended period of time and/or the need for increased monitoring and/or maintenance activities.
  - **Minor (low)** - minor damage resulting in minimal, recoverable, or localized efforts. This could include temporarily shutting off an intake or well and/or the issuance of a boil order.
  - **Insignificant (very low)** - damage that may be too small or unimportant to be worth consideration, but may need to be observed for worsening conditions. This could include the development of administrative procedures to maintain awareness of changing conditions.
- **Probability of Impact** – The risk to the source waters increases as the relative probability of damage or loss increases. The probability of impact is determined by evaluating the number of contaminant sources, the migration potential or proximity to the water source, and the historical data. The following descriptions provide a framework to estimate the relative probability that damage or loss would occur within one to ten years.
    - **Certain:** >95% probability of impact
    - **Likely:** >70% to <95% probability of impact
    - **Possible:** >30% to <70% probability of impact
    - **Unlikely:** >5% to <30% probability of impact
    - **Rare:** <5% probability of impact

Figure 11. CRWA's SWAP Risk Assessment Matrix



2. **Degree of Influence** – The degree of water system influence describes the ability of the water system to take measures to prevent contamination or minimize impact. A potential contaminant source that falls within a water system’s jurisdiction (i.e. direct control), may be of higher priority since they can take direct measures to prevent contamination or minimize the impact.
  - **High** – The water system can take direct measures to prevent.
  - **Medium** – The water system cannot directly control the issue, but can work with another person or entity to take measures to prevent.
  - **Low** – The PSOC or issue of concern is outside the control of the public water system and other entities.
  
3. **Best Management Practices** – BMPs are the actions that can be taken within the Source Water Protection Area to help reduce the potential risks of contamination to the community’s source waters. The prioritization of the potential contaminant sources or issues of concern may be affected by the feasibility of implementing the BMPs that the City of Fort Collins developed (Table 5. Source Water Protection Best Management Practices).

City of Fort Collins’ approach for ranking potential contaminant source inventory and issues of concern is presented in Table 3.

**Table 3: Potential Sources of Contamination and Issues of Concern Prioritization Table**

Potential Contaminant Source or Issue of Concern	Proximity (SWPA Zone)	Impact to Water System (Insignificant, Minor, Significant, Major, Catastrophic)	Probability of Impact (Rare, Unlikely, Possible, Likely, Certain)	Risk (Very Low, Low, Intermediate, High, Very High)	Control (Direct-High, Indirect-Medium, None-Low)	BMPs <sup>2</sup>	Priority Ranking
Forest Health: Wildfires	1, 2, 3	Major	Likely	High	Low		High
Historical & Active Mines	1, 2, 3	Significant	Possible	Moderate	Low		High
Flooding	N/A	Major	Unlikely	Moderate	Low		Moderate
State Highways	1	Significant	Likely	High	Medium		Moderate
County & Forest Roads <sup>2</sup>	1, 2, 3	Minor	Rare	Very Low	Low		Moderate
Septic Systems		Significant	Possible	Moderate	Medium		Moderate
Forest Health: Insect Mortality /Disease	1, 2, 3	Minor	Unlikely	Low	Low		Low
Recreation	1, 2, 3	Minor	Rare	Very Low	Low		Low
Grazing/Agriculture	1, 2, 3	Minor	Unlikely	Low	Low		Low
Storage Tanks	1	Significant	Unlikely	Moderate	Medium		Low
Water Wells	1, 2, 3	Insignificant	Rare	Very Low	Low		Low

<sup>2</sup>The Priority Ranking of the potential contaminant sources or issues of concern may be affected by the feasibility of implementing the identified BMPs. See Table 6: Source Water Protection Best Management Practices for details.

## **6.0 POTENTIAL CONTAMINANT SOURCES AND ISSUES OF CONCERN**

The following section provides a brief description of potential contaminant sources and issues of concern that have been identified in this plan, describes the way in which they threaten the water source(s) and outlines best management practices.

### **6.1 Forest Health: Wildfires**

(Priority Ranking: High)

The forests throughout Colorado are dense with fuel build-up from a century of fire suppression and thus more vulnerable to high-intensity fires than historically. The years 2012 and 2013 were among the worst for wildfires in Colorado due to drought conditions throughout the State. The previous winters were extremely dry and summer temperatures exceeded or approached 100°F. The High Park Fire occurred near Fort Collins in the summer of 2012, and was the largest and most destructive fire in the history of Larimer County, burning over 87,200 acres of land (CDOT, Larimer County, NRCS, and USFS, 2012) within both the Horsetooth Reservoir and Cache La Poudre River SWPAs (Figure 12). The Coalition for the CPRW, discussed previously, is currently spearheading restoration activities within the 2012 High Park Fire burn areas. The Upper Cache la Poudre River Watershed Resiliency Plan that is in development will include additional watershed activities to reduce the risk of future catastrophic wildfires and address other watershed risks (Coalition for the Poudre River Watershed, 2014).

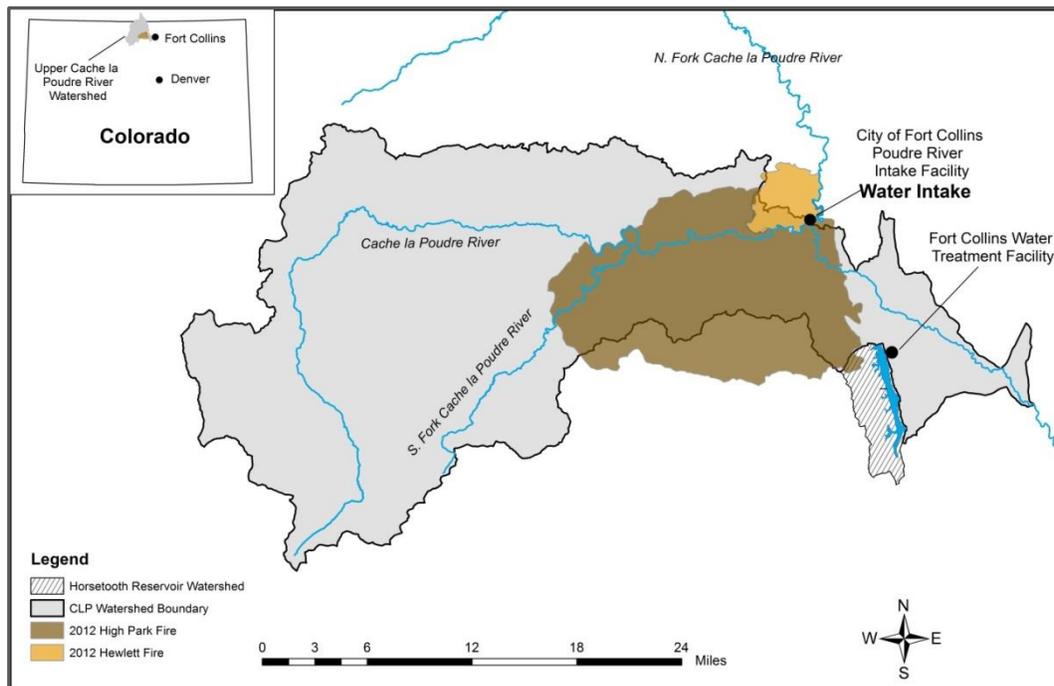
Wildfires can have an impact on source waters by altering land cover and watershed hydrology. This can result in soil erosion and sediment and ash pollution in source water supplies, which present challenges to water treatment operations. Large rain events can produce mudslides, and debris flows capable of destroying water infrastructure and impacting water quality (Figure 13). Chemicals used in fire retardants may also have a negative impact on drinking water sources. On December 31, 2011, the US Forest Service signed a new direction to approve the use of aerially applied fire retardant and implement an adaptive management approach that protects resources and improves the documentation of retardant effects through reporting, monitoring and application coordination. Aerial retardant drops are not allowed in mapped avoidance areas for certain threatened, endangered, proposed, candidate, or sensitive (TEPCS) species or waterways. All waterways were given at least a 300 foot buffer avoidance area. A waterway is defined as a body of water including lakes, rivers, streams and ponds whether or not they contain aquatic life (US Department of Agriculture, 2013).

#### Wildfire Best Management Practices Recommendations

1. Continue to work with the Coalition for the Poudre River Watershed to complete two priority wildfire-related tasks:
  - a. Identify remaining priority areas for restoration that were burned in the 2012 Hewlett Gulch and High Park Wildfires, and
  - b. Complete the Poudre River Watershed Resiliency Plan to identify priority areas for targeted forest fuels treatment based on the wildfire hazards and other values at risk within sub-drainages in the Upper Poudre Watershed.
2. Engage with CPRW and other stakeholders and partners to implement fuels treatments identified in the Resiliency Plan and other planning efforts.
3. Continue to assess and mitigate, as needed, the wildfire hazards that threaten the City of Fort Collins' critical facilities through forest fuels treatments and other BMPs.

4. Ensure that source watersheds are identified and managed as a critical asset for the Fort Collins Water Treatment Facility in major planning efforts such as the FCWTF Wildfire Response Plan, FCWTF Vulnerability Assessment, Master Plan, and Regional Hazard Mitigation Plans.
5. Share copies of the City of Fort Collins' SWPP and GIS shapefiles/maps of the SWPAs with stakeholders.
  - a. Gather contact information & create mailing list for distribution;
  - b. Utilize CRWA's "SWPP Distribution Letter" template to develop a cover letter for SWPP distribution;
  - c. Print hard/CD copies of SWPP; print CDs with SWPA GIS shapefiles;
  - d. Mail SWPP Distribution Cover Letter along with copy of City of Fort Collins' SWPP and SWPA GIS shapefiles.
6. Maintain early-warning water quality alert system to signal significant changes in water quality.
7. Participate and partner in local and regional efforts to advance practices around mitigating the risks of wildfire to water supplies (e.g. Front Range Watershed Wildfire Protection Group, Carpe Diem West's Healthy Headwaters Initiative, Colorado Big Thompson Headwaters Partnership, Colorado Conservation Exchange)
8. Update internal City policies, as needed, to support the best management practices that provide protection of source water supplies.

Note that implementation of projects identified in Tasks 1.a and 1.b will be completed in cooperation with a broad-reaching group of stakeholders, which may include Federal, State, and Local government agencies, non-profit organizations as well as businesses, private landowners and local natural resource practitioners.



**Figure 12.** Location of the High Park and Hewlett Gulch Wildfires in relation to the City of Fort Collins Source Watersheds for the Poudre River and Horsetooth Reservoir.



**Figure 13. Example of a large debris flow within the High Park Fire burn scar (July 2013) following an afternoon thunderstorm (above) and the subsequent water quality impairment that occurred in the Poudre River (right).**

## 6.2 Historical and Active Mines

(Priority Ranking: Moderate)

The City of Fort Collins’ Upper Cache la Poudre River Source Water Protection Area includes several historic mine sites as well as a few permitted mining operations. The Colorado Division of Reclamation, Mining, and Safety (DRMS) regulates mining and prospecting operations in the state of Colorado under the auspices of the Colorado Mined Land Reclamation Act and the Hard Rock/Metal Mining Rules and Regulations of the Mined Land Reclamation Board. The Division is responsible for mineral and energy development, policy, and regulation and planning. One of their primary objectives is to review mining permit applications and to inspect mining operations to make sure that regulations are being followed.

### Permitted Mines

The State of Colorado began requiring mines to be permitted in 1973. Mine permits are administered by the Colorado Division of Reclamation, Mining and Safety (DRMS). According to the DRMS database, there are currently eight permitted mining operations within the City of Fort Collins’ Upper Cache la Poudre River SWPA and none in the Horsetooth Reservoir SWPA. The status of each permitted mine is shown in Table 5 below, but the majority of them have been terminated.

**Table 4. Permitted mines within the City of Fort Collins’ Upper Cache la Poudre River SWPA**

Site Name	Permittee	ID Number	Commodities Mined	Status
Forest Service Pit	(Colorado Division of Highways)	M1978254	Sand & Gravel	Terminated
Carrol Sorelle Pit	(Siegrist Construction Company)	M1990099	Borrow Material for Construction	Terminated
Roaring Creek Pit	(Colorado Division of Highways)	M1980181	Borrow Material for Construction	Terminated
Sagert Storage	(Alan Sagert)	M1999159	Chlorine	Not Mining
Red Feather Lakes	(Elkhorn Excavating)	M2000141	Sand & Gravel	Not Mining
The Polemic Lode	(The Polemic Lode)	M1988049	Gold	Application Withdrawn
Glacier View Meadows	(Donald B. Weixelman)	M1980031	Sand & Gravel	Terminated
Boy Scout Turnoff Red Feather Lakes	(Longs Peak Council – Boy Scouts of America)	M1998042	Borrow Material for Construction	Not Mining

(Source: DRMS, <http://mining.state.co.us/Reports/Pages/default.aspx>, September 24, 2015)

## Abandoned Mine Land

Historical mining practices allowed mine owners to simply abandon mines without consideration of the impact on streams, water quality, slope stability and safety. Many old mining properties contain abandoned mine workings, mine waste and/or mill tailings. Active and inactive mining operations have a potential to contaminate drinking water supplies from either point source discharges (i.e. mine drainage tunnels or flowing adits) or nonpoint source discharges from run-off over waste rock or tailing piles. Acidic, metal-laden water from inactive mines and waste rock piles has a potential to impair aquatic life in the Upper Cache la Poudre River Watershed upstream from the Fort Collins' drinking water intake, and to a lesser degree threaten drinking water supplies. Historical mining activity in the Horsetooth Reservoir watershed includes sandstone quarries. Information from the United States Geologic Survey Mineral Resources Program indicates that the Horsetooth Reservoir watershed contains three mine occurrences, two of which are currently located under the reservoir near Solider Canyon and Spring Canyon Dams. These mines were previous fire clay refractories. The third mine is located near the headwaters of an intermittent drainage that flows into Inlet Bay, and was also mined for stone.

During the years 1991 through 1999, the Colorado Geologic Survey (CGS) completed an inventory of abandoned mine lands on National Forest System lands within Colorado to assess environmental degradation (Colorado Geologic Survey, n.d.). The Estes-Poudre Ranger District was inventoried in 1993 and included mapping of features, environmental information, environmental safety ratings, and water and waste water samples from selected sites. The highest environmental degradation rating given within this ranger district was 4 ("slight") based on a 1 through 5 scale with 1 being "extreme" and 5 being "none." Seven out of 40 inventoried areas within the Upper CLP were identified as having a "slight" impact to the environment (Heath, 2016).

A total of 26 tailings piles and 71 openings were identified within the 40 mine inventory areas in the Upper CLP basin. Field visits verified that no draining water was exiting any of the 26 tailing piles, however, three locations exhibited signs of erosion. Standing water was identified at mine openings located in the historic Manhattan Mine District in the Sevenmile Creek sub-basin, which was given a "slight" environmental hazard rating (Figures 14 & 15).

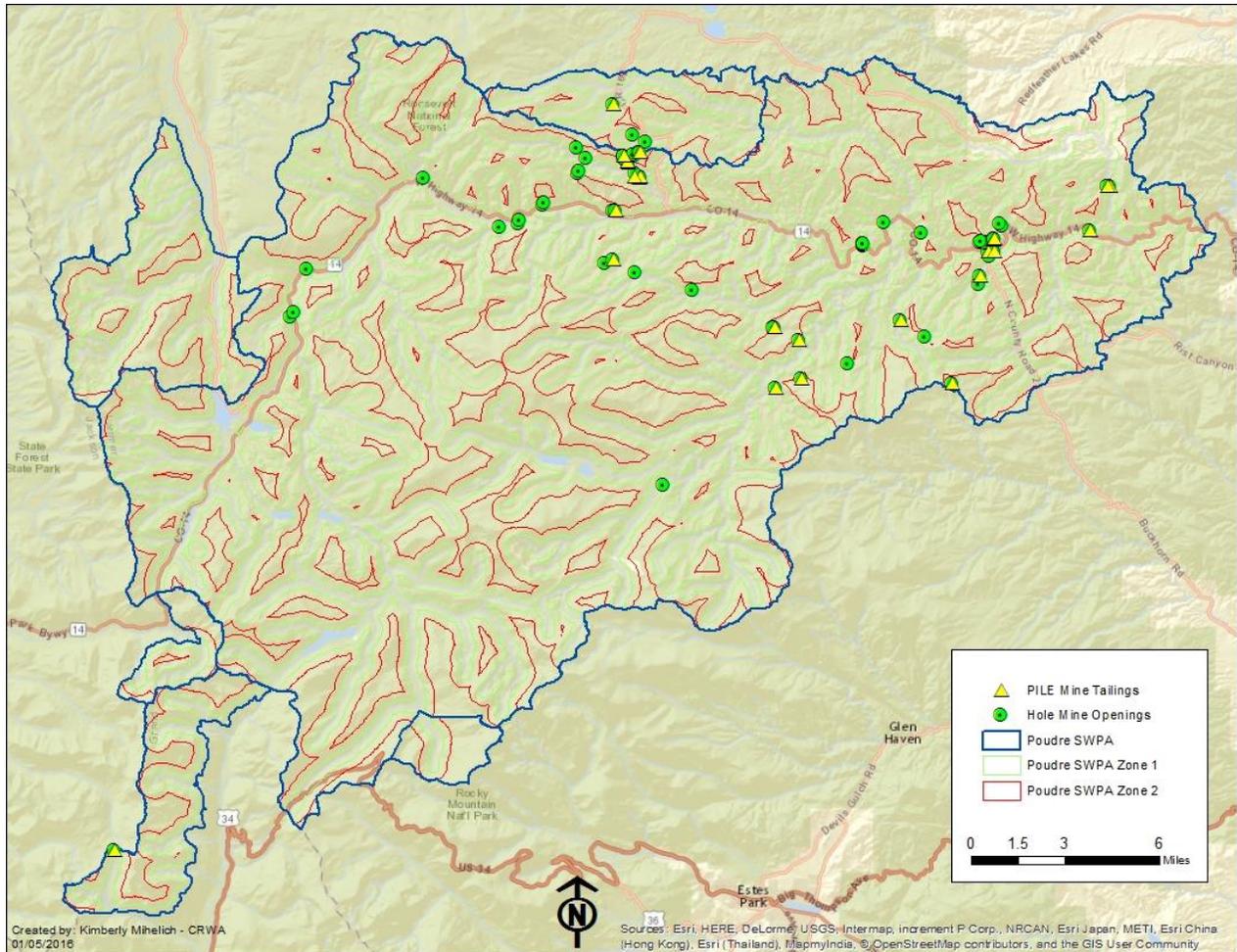
The City of Fort Collins is not currently aware of any mining impacts to their drinking water sources, but has developed a Mine Assessment and Action Plan for the Upper Cache la Poudre River

Watershed (Appendix H). The goal of the Mine Assessment and Action Plan is to inventory existing and historical mining activity within the City's Source Water Protection Areas and to evaluate potential water quality impacts of historical and active mines. The assessment included a research review of relevant historical background information, relevant data, and past abandoned mine inventories and



**Figure 14. Abandoned mine along Sevenmile Creek in the Upper Poudre River Watershed.**

assessments associated with mining activities and impacts within the watershed, and then identified sites with potential or confirmed environmental degradation. A water quality monitoring plan was developed and will be implemented in Fall 2016 to catalog water quality of perennial streams draining mine impacted sub-basins that flow to the Poudre River.



**Figure 15. Historical mine openings and tailing piles within Fort Collins' Upper Cache la Poudre River SWPA**

### Historical and Active Mines Best Management Practices Recommendations

1. Develop a Mine Action Plan by referencing existing studies such as the USFS Hazard Abandoned Mine Land Inventory Project and DRMS inventories to help determine which abandoned mines and tailings piles are impaired and a threat to the source waters.
  - a. Conduct water quality analyses at high priority sites.
  - b. Develop notification procedures with organizations that might first notice the problems (e.g. Larimer County, Fire Department, USGS, USFS, and/or Private Landowners).
  - c. Develop and maintain an effective contact list to report and collaborate on any issues that may arise.
  - d. Report any issues or threats that arise to the appropriate agencies.
2. Share data from Mine Action Plan with interested parties.

### **6.3 Flooding**

(Priority Ranking: Moderate)

Flooding is a moderate priority concern for the City of Fort Collins. In September 2013, Larimer County, along with several other counties in Colorado's Front Range, experienced a substantial flood event. In addition to the large amounts of mud and additional sediment load caused by flood events, this could be a concern to drinking water providers because it can cause the disruption of water purification and sewage disposal systems, overflowing of toxic waste sites, and dislodgement of chemicals previously stored above ground. Floodwaters also pose as a potential health risk because they may contain infectious organisms such as *E. coli*, *Salmonella* and *Shigella*. Floodwaters may also be contaminated by agricultural or industrial chemicals or by hazardous agents present at flooded hazardous waste sites. Pools of standing or stagnant water in the aftermath of floods can become breeding ground for mosquitoes, increasing the risk of West Nile Virus or other mosquito-borne diseases (Occupation Safety and Health Administration, 2013).

#### Flooding Best Management Practices Recommendations

1. Continue to maintain the City of Fort Collins flood alert system.
2. Share copies of the City of Fort Collins' SWPP and GIS shapefiles/maps of the SWPAs with stakeholders.
  - a. Gather contact information & create mailing list for distribution;
  - b. Utilize CRWA's "SWPP Distribution Letter" template to develop a cover letter for SWPP distribution;
  - c. Print hard/CD copies of SWPP; print CDs with SWPA GIS shapefiles;
  - d. Mail SWPP Distribution Cover Letter along with copy of City of Fort Collins' SWPP and SWPA GIS shapefiles.

### **6.4 Roadways (State Highways, County Roads, Forested Roads)**

(Priority Ranking: Moderate)

The City of Fort Collins' Source Water Protection Areas are served by a large network of roads and lie within a variety of jurisdictions. Within the Upper Cache la Poudre River SWPA, there are about 8 miles of county roads maintained by Larimer County and some paved and unpaved forested roads maintained by the US Forest Service. Colorado State Highway 14 also runs through the Poudre River SWPA and is maintained by CDOT. The Horsetooth Reservoir SWPA includes county roads maintained by Larimer County. In addition, there are several private roadways that are owned and maintained by the corresponding landowners within the SWPAs.

#### Sediment Erosion along Unpaved Roads

Several studies have concluded that forest roads are a major source of sediment in forested watersheds and sediment delivered to streams from forest roads can carry undesirable pollutants into source waters potentially impacting drinking water treatment (Elliot, 2003).

### Accidents & Spills on Roadways

Motor vehicles, roads, and parking facilities are a major source of water pollution to both surface and groundwater. An estimated 46% of US vehicles leak hazardous fluids, including crankcase oil, transmission, hydraulic, and brake fluid, and antifreeze, as indicated by oil spots on roads and parking lots, and rainbow sheens of oil in puddles and roadside drainage ditches. An estimated 30-40% of the 1.4 billion gallons of lubricating oils used in automobiles are either burned in the engine or lost in drips and leaks, and another 180 million gallons are disposed of improperly onto the ground or into sewers. Runoff from roads and parking lots has a high concentration of toxic metals, suspended solids, and hydrocarbons, which originate largely from automobiles (Gowler & Sage, 2006). Storm water runoff over these roads can deliver contaminants from the road surface into the nearby groundwater.

Vehicular spills may occur along the transportation route within the Source Water Protection Areas from trucks that transport fuels, waste, and other chemicals that have a potential for contaminating the groundwater. Furthermore, boating activity on Horsetooth Reservoir presents the opportunity for fuel/oil spills directly into the water. Chemicals from accidental spills are often diluted with water, potentially washing the chemicals into the soil and infiltrating into the groundwater. Roadways are also frequently used for illegal dumping of hazardous or other potentially harmful wastes.

### Chemical Applications to Roadways

**De-Icers.** During the winter season, CDOT may apply a salt-sand mixture and de-icer (magnesium chloride, M1000, or Ice Slice r) to State Highway 14 along routes within the Upper Cache la Poudre River Source Water Protection Area. Water quality problems resulting from the use of road de-icers can cause concern among federal, state, and local governments.

Salt from the highway is introduced into the surface water and groundwater through multiple pathways. When runoff occurs from highways, flows are sometimes carried to ditches and unlined channels through which the water infiltrates into the soil and eventually into the groundwater. Also, when snow is plowed together with the salt, the snow pile that is accumulated on the roadside melts during warmer weather. The water that results contains high dissolved salt which can also infiltrate. Plowing and splashing of salt causes the salt to deposit along the pavement, especially near the shoulders where it melts causing runoff to enter drainage ways and then the groundwater system.

Salt contributes to increased chloride levels in groundwater through infiltration of runoff from roadways. Unlike other contaminants, such as heavy metals or hydrocarbons, chloride is not naturally removed from water as it travels through soil and sediments and moves towards the water table. Once in the groundwater, it may remain for a long time if groundwater velocity is slow and it is not flushed away. Chloride may also be discharged from groundwater into surface water and can account for elevated levels of chloride throughout the year, not just in winter. Thus, regardless of the path that the runoff takes, salt poses a water quality problem.

The Upper CLP Collaborative Water Quality Monitoring Program, managed by the City of Fort Collins tracks ion concentrations that serve as potential indicators of various salts, including chloride (Cl<sup>-</sup>), Magnesium (Mg<sup>+2</sup>), and Calcium (Ca<sup>+2</sup>).

**Dust Abatement.** Dust abatement containing magnesium chloride may be applied to unpaved county roads within the Source Water Protection Areas. Dust suppressants abate dust by changing the physical

properties of the road surface by creating a hard, compact surface that resists potholing, rutting, and loss of aggregate. The use of chemical dust suppressants prevents road particulates from becoming airborne.

Magnesium chloride, used in dust abatement, is highly soluble in water and has the potential to move through the soil with water. The movement is dependent on the rate and frequency of rainfall, the drainage characteristics, and soil type. If the soil surface is not bound together well or if the rain event is extreme, dust suppressant treated soil particles can be carried by overland flow into streams, rivers, and ditches. Potential water quality impacts include elevated chloride concentrations in streams downstream of application areas and shallow groundwater contamination (US Environmental Protection Agency, 2002).

**Weed Management.** During spring and summer months the Larimer County Weed District and CDOT spray herbicides, which is a type of pesticide, along county- and state-maintained roadsides, respectively, in an effort to control noxious weeds. Pesticides can be harmful to both aquatic life and human health should they be allowed to enter the water supply.

On county roads, the Larimer County Weed District complies with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) that regulates the distribution, sale, and use of all pesticides, including herbicides. Before EPA may register a pesticide under FIFRA, the applicant must show that using the pesticide according to specifications will not generally cause unreasonable adverse effect on the environment (US Environmental Protection Agency, 2016).

In addition to FIFRA, the Weed District must also have and comply with a National Pollutant Discharge Elimination System (NPDES) Pesticide General Permit, which is regulated at the state and federal level. The Pesticide General Permit requires operators to minimize discharge of pesticides, protect water quality, visually monitor for adverse effects, report incidents, and document and maintain details of pest control activities (US Environmental Agency). In addition operators of a Pesticide General Permit are required to create a Spill Management Plan and calibrate equipment frequently so as to ensure they are not spraying more pesticides than necessary.

Along State Highway 14, CDOT is the main weed manager. Weed management along that route is strictly mechanical and is considered a mow-only site due to environmental concerns. Chemical treatment along the route has not been performed for over three years, and when pesticides were applied, they were spot-sprayed by hand with the pesticide, Milestone.

#### State Highway Best Management Practices Recommendations

1. Continue to implement elements of the Fort Collins Water Treatment Facility - Emergency Response Plan pertaining to vehicular spills, accidents, and maintenance/construction of roadways, for both Poudre River and Horsetooth Reservoir.
2. Identify compounds used for weed management and the State's Herbicide Application BMPs
3. Maintain City's participation in Northern Water's Cooperative Emerging Contaminant Monitoring Program and update compound list annually to reflect compounds in current use for weed management, when possible.
4. Share copies of the City of Fort Collins' SWPP and GIS shapefiles/maps of the SWPAs with stakeholders.

- a. Gather contact information & create mailing list for distribution;
- b. Utilize CRWA's "SWPP Distribution Letter" template to develop a cover letter for SWPP distribution;
- c. Print hard/CD copies of SWPP; print CDs with SWPA GIS shapefiles;
- d. Mail SWPP Distribution Cover Letter along with copy of City of Fort Collins' SWPP and SWPA GIS shapefiles.

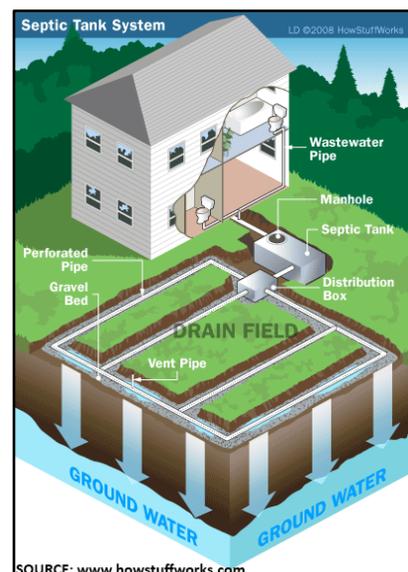
### County, Private, and Forest Roads Best Management Practices Recommendations

1. Share copies of the City of Fort Collins' SWPP and GIS shapefiles/maps of the SWPAs with USFS; Larimer County Road & Bridge; Larimer County Sheriff's Dept.; Colorado State Patrol; Larimer County Hazardous Material Unit, and other emergency responders and/or stakeholders.
  - a. Gather contact information & create mailing list for distribution;
  - b. Utilize CRWA's "SWPP Distribution Letter" template to develop a cover letter for SWPP distribution;
  - c. Print hard/CD copies of SWPP; print CDs with SWPA GIS shapefiles;
  - d. Mail SWPP Distribution Cover Letter along with copy of City of Fort Collins' SWPP and SWPA GIS shapefiles.
2. Inventory USFS roads in proximity to perennial streams.
  - a. For roads that are determined to be impacting water quality, including those identified in the CPRW Watershed Resiliency Plan, work with USFS to develop BMPs for remediation.
3. Identify compounds used for weed management and the County Herbicide Application BMPs
4. Maintain City's participation Northern Water's Cooperative Emerging Contaminant Monitoring Program and update compound list annually to reflect compounds in current use for weed management, when possible.
5. For known risks to water quality on private property, communicate SWPP importance of source water protection with private landowners and encourage use of BMPs for construction of new roadways.

## **6.5 Septic Systems & Treated Waste Water Effluent** (Priority Ranking: Moderate)

Within the source water protection areas there are properties that rely on septic systems to dispose of their sewage. A septic system is a type of onsite wastewater system consisting of a septic tank that collects all the sewage and a leach field that disperses the liquid effluent onto a leach field for final treatment by the soil (Figure 16).

Septic systems are the second most frequently cited source of groundwater contamination in our country. Unapproved, aging, and failing septic systems have a large impact on the quality and safety of the water supply. The failure to pump solids that accumulate in the septic tank will also eventually clog the lines and cause untreated wastewater to back up into the home, on the ground



**Figure 16. Schematic of a septic system.**

surface, or to seep into groundwater. If managed improperly, these residential septic systems can contribute excessive nutrients, bacteria, pathogenic organisms, and chemicals to the groundwater.

In Larimer County, individual sewage disposal systems are permitted by their Larimer County Health Department. The County administers and enforces the minimum standards, rules, and regulations outlined in the state of Colorado's Revised Statutes (CRS 25-10-105). It is unknown at this time the number or age of approved and unapproved septic systems within the City of Fort Collins' SWPAs.

### Septic Systems Best Management Practices Recommendations

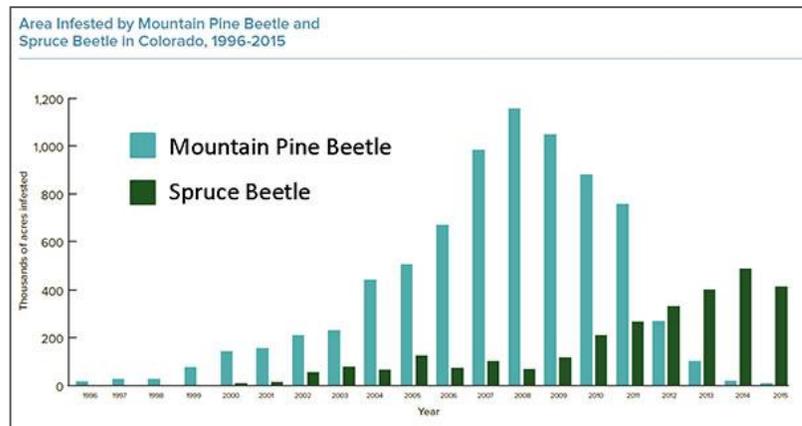
1. Develop a public education campaign for septic system owners within City of Fort Collins' SWPAs.
  - a. Continue participation in Northern Water's cooperative Emerging Contaminants Monitoring program to track presence of compounds indicative of both treated and untreated wastewater effluent over time.
  - b. Gather contact information & create mailing list of septic system owners within SWPAs (work w/ Larimer County Health Department for list of owners)
  - c. Gather or develop outreach material about Source Water Protection as it relates to improper septic system maintenance practices (work w/ CRWA or Larimer County Health Department to find/create material)
  - d. Mail outreach material to septic system owners identified in SWPAs

## **6.6 Forest Health: Insect Mortality & Disease**

(Priority Ranking: Low)

The overly dense forests throughout the Rocky Mountains are concentrated with older age classes of trees that lack diversity in age and size. This lack of diversity, along with intense competition for resources has left many forest stands vulnerable to insect and disease attacks and widespread damage. The US Forest Service Rocky Mountain Region 2 has conducted aerial and ground surveys annually over western conifer and aspen forest to detect damage caused by defoliating insects (USDA Forest Service , 2014).

According to the 2014 Forest Health Conditions Report and the Colorado State Forest Service's 2015 Report on the Health of Colorado's Forests for the Arapaho-Roosevelt National Forest Report, the 2014 and 2015 Aerial Detection Surveys indicated that spruce beetle activity has increased while mountain pine beetle activity decreased (Figure 17). Western balsam bark beetle or subalpine fir decline activity also occurred (USDA Forest Service , 2014).



**Figure 17. Area Infested by Mountain Pine Beetle and Spruce Beetle in Colorado, 1996-2015.** Source: 2015 Report on the Health of Colorado's Forests, Colorado State Forest Service.

<http://csfs.colostate.edu/media/sites/22/2016/02/ForestHealthReport-2015.pdf>

The US Department of Agriculture (USDA) Strategic Plan for FY 2010–2015 targeted the restoration of watershed and forest health as a core management objective of the national forests and grasslands. To achieve this goal, the USFS, agency of USDA, was directed to restore degraded watersheds. The Watershed Condition Framework was developed as a comprehensive approach for classifying watershed conditions, proactively implementing integrated restoration in priority watersheds on national forests and grasslands, and tracking and monitoring outcome-based program accomplishments for performance accountability. Thirty-three sub-watersheds within the City of Fort Collins Source Water Protection Area were evaluated using the Watershed Condition Framework (Figure 18). Of those sub-watersheds, 22 were classified as “Functioning at Risk” while the remaining 11 were classified as “Functioning Properly”. Watershed conditions were classified based on a 12-indicator model, which identified the following factors: (1) Water Quality, (2) Water Quantity, (3) Aquatic Habitat, (4) Aquatic Biota, (5) Riparian/Wetlands Vegetation, (6) Roads & Trails, (7) Soils, (8) Fire Regime or Wildfire, (9) Forest Cover, (10) Rangeland Vegetation, (11) Terrestrial Invasive Species, and (12) Forest Health (USDA Forest Service, May 2011).

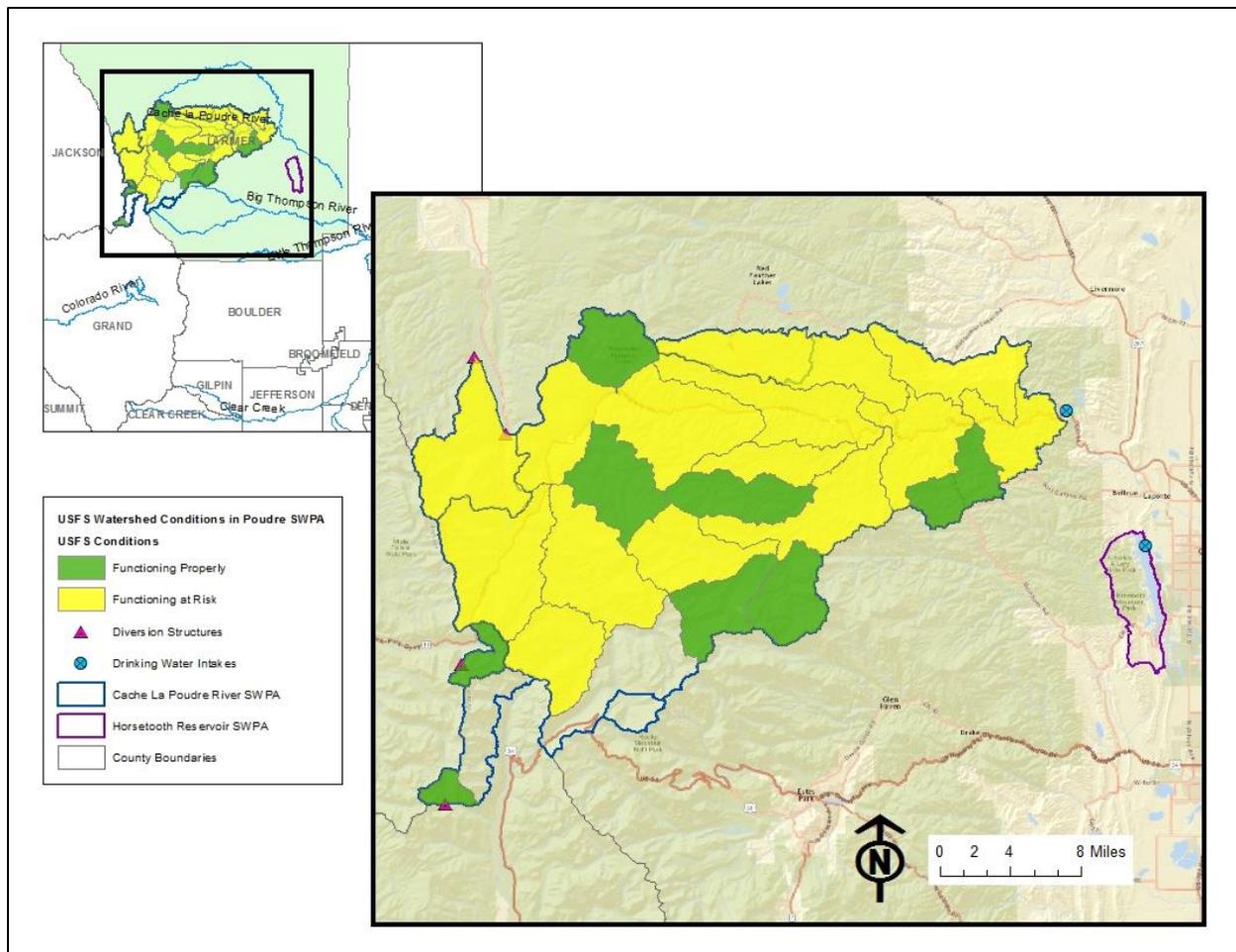


Figure 18. Watershed conditions within the City of Fort Collins's Cache La Poudre SWPA.

## Forest Health: Insect Mortality & Disease Best Management Practices Recommendations

1. Continue Source Water Quality Monitoring Program.
2. Continue to routinely evaluate the extent and severity of insect mortality in the source watersheds.

### **6.7 Recreation**

(Priority Ranking: Low)

There are many types of recreation that occurs in Fort Collins' SWPAs including camping, hiking, horseback riding, bicycling, and off-road-vehicle use where legal, on system roads and trails. These activities can pose threats to forested lands and streams. Some undesirable impacts include eroded soils, user-created unplanned roads, disrupted wetland ecosystems, as well as general habitat destruction and degraded water quality throughout forested lands.

Northern Water's annual Emerging Contaminants reports indicate that compounds indicative of recreational activity are detected at very low levels in the Poudre River and Horsetooth Reservoir and include caffeine, sucralose and diethyltoluamide (DEET), and triclosan.

(<http://www.northernwater.org/WaterQuality/WaterQualityReports1.aspx>)

#### Recreation Best Management Practices Recommendations

1. Continue monitoring for emerging contaminants.
2. Work with USFS, City Natural Areas and State Wildlife Areas to install signage or post information about source water protection and emerging contaminants at recreational sites in SWPA.

### **6.8 Improper Agricultural Practices (Farming & Livestock Grazing)**

(Priority Ranking: Low)

Agriculture is a significant land use throughout Larimer County and is present within the City of Fort Collins' SWPAs. While many of the operations are relatively small, their cumulative impact can be a threat to water supplies.

#### Farming (Irrigated Fields)

Agricultural crop and hay production is limited within the City of Fort Collins' SWPAs. In general, excess use and poor application methods for these operations can cause fertilizer movement into surface and groundwater. If the land is over-irrigated, this can lead to excess runoff of fertilizers as well. Fertilizers usually consist of nitrogen and phosphorus, the two compounds which are of greatest concern to drinking water supplies. The increased nutrient loads in water from these fertilizers can lead to changes in dissolved oxygen content and cause algal blooms to grow around intakes.

Likewise, pesticide application to crops can be a potential source of contamination, which can lead to surface and groundwater impacts if mismanaged. Synthetic organic chemicals in pesticides have been linked to serious health problems, including cancer, liver and kidney damage, reproductive difficulties, and nervous system effects.

The City of Fort Collins tracks the occurrence of herbicides and pesticides in source water supplies through the Northern Water Cooperative Emerging Contaminant Program. Source water monitoring efforts on the Cache la Poudre and Horsetooth Reservoir routinely track nutrient concentrations and would identify a potential increase in loads associated with excessive fertilizer application.

### Livestock Grazing

Livestock grazing occurs within private and federal lands within the City of Fort Collins' SWPAs. On US Forest System lands, livestock operators are authorized to graze on areas called allotments through an approved USFS grazing permit.

If not well managed, livestock grazing can impact riparian health, stream-channel conditions and water quality. The most common water quality impacts include pathogen contamination, sedimentation, and increased water temperatures from loss of vegetative stream coverage. Grazing activities with the highest potential for direct and indirect impacts to water resources include long-term concentrated grazing in riparian areas, and trampling/trailing near water sources. Direct bank damage may add large amounts of sediment directly into streams, especially in wet meadow streams or erosive topography that is prone to gully formation. In addition, animal waste can also have an impact on source waters. In particular, animal waste contains many pollutants and pathogens that can impact human health. Nitrates found in animal waste can contaminate surface and groundwater as well (US Environmental Protection Agency, 2001).

### Improper Agricultural Practices Best Management Practices Recommendations

1. Share outreach material with private land owners that explains the importance of source water protection.
  - a. Identify private landowners and areas in US Forest System lands within the SWPAs where grazing and/or agricultural practices occur.
  - b. Gather/develop outreach material as it pertains to livestock grazing/agricultural material.
  - c. Mail outreach material.
2. Continue Source water quality monitoring programs on the Upper Poudre River and Horsetooth Reservoir.
3. Continue participation in the Northern Water Emerging Contaminants Program

## **6.9 Storage Tanks**

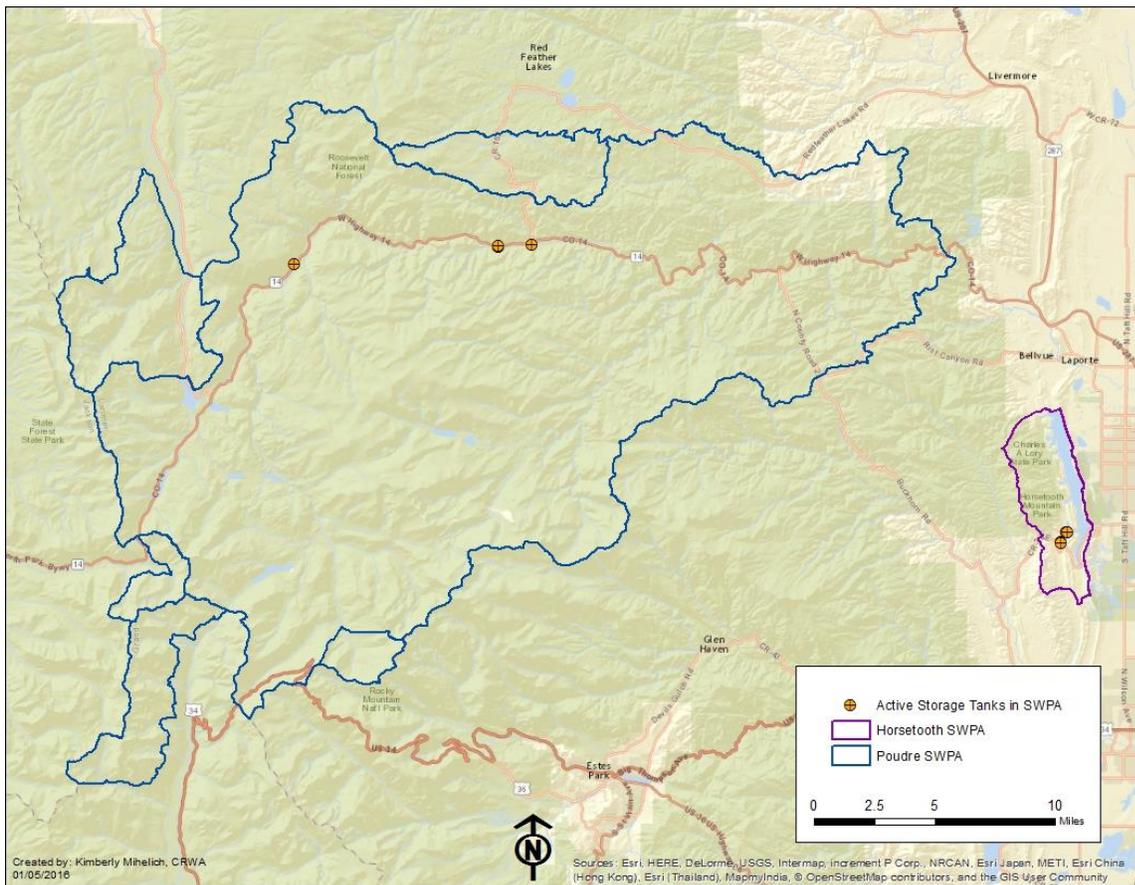
(Priority Ranking: Low)

There are five locations within the City of Fort Collins' Source Water Protection Areas that have permitted storage tanks onsite (Figure 19). Each location has between one and four above ground or underground storage tanks onsite containing petroleum products (gasoline, diesel). In addition, there are several other sites within the SWPAs that contain permanently closed storage tanks.

## Storage Tank Spills

Storage tanks can become leaky due to corrosion, failure of the piping systems, spills, and overfills, as well as equipment failure and human operational error. Even a small spill can have a serious impact. A single pint of oil released into the water can cover one acre of water surface area and can seriously damage an aquatic habitat. A spill of one gallon can contaminate a million gallons of water (US Environmental Protection Agency, 2001).

The owner/operator of a storage tank must report a suspected release within 24 hours and investigate suspected releases within seven days. After confirming a release and conducting the initial response and abatement, the owner/operator must continue further source investigation, site assessment, characterization and corrective actions.



**Figure 19. Storage Tank Sites within the City of Fort Collins' Source Water Protection Areas**

The leaky underground storage tank releases gasoline or "liquid phase hydrocarbon." The gasoline descends through the unsaturated soil zone to float on the water table (gasoline is lighter than water). The gasoline releases compounds like benzene, toluene, ethylbenzene, and xylenes (BTEX) and methyl tert-butyl ether (MTBE) to the groundwater and they are carried in the direction of groundwater flow. The extent of contamination is defined by the concentration of benzene (from 10 to 10,000 parts per billion) in the groundwater.

Spills from leaking underground storage tanks (LUST) sites can contaminate the groundwater and also present other hazards (Figure 20). Because gasoline is lighter than water, gasoline floats on the water table and remains relatively close to the land surface. The most hazardous compounds in groundwater (the BTEX compounds) are quite volatile and carcinogenic. Besides the potential for being consumed in drinking water, volatile compounds can enter nearby buildings. In poorly ventilated buildings, the compounds can accumulate and present a health risk through inhalation. In buildings, the volatile compounds can also present an explosion hazard (Ryan, 2006).

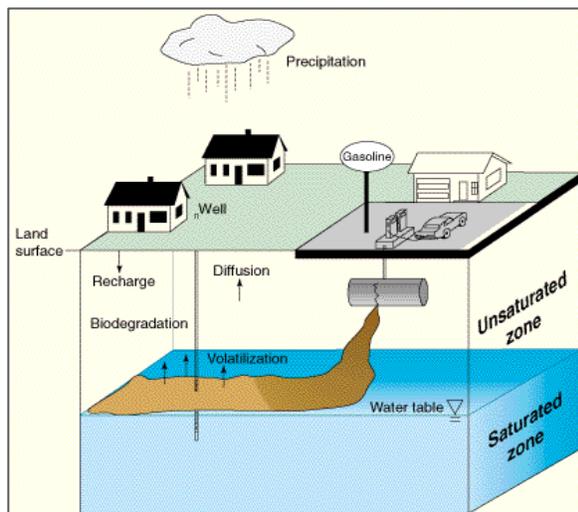


Figure 20. Schematic of a LUST spill site.

### Storage Tank Best Management Practices Recommendations

1. Develop a public education campaign for storage tank owners within the Upper Cache la Poudre River and Horsetooth Reservoir SWPAs.
  - a. Gather contact information & create mailing list of storage tank owners within SWPAs
  - b. Gather or develop outreach material about Source Water Protection as it relates to storage tanks (work with CRWA to find/create material)
  - c. Mail outreach material to storage tank owners identified in SWPAs
2. Work with owners of aboveground storage tanks within SWPAs Zone 1 to install secondary containment.

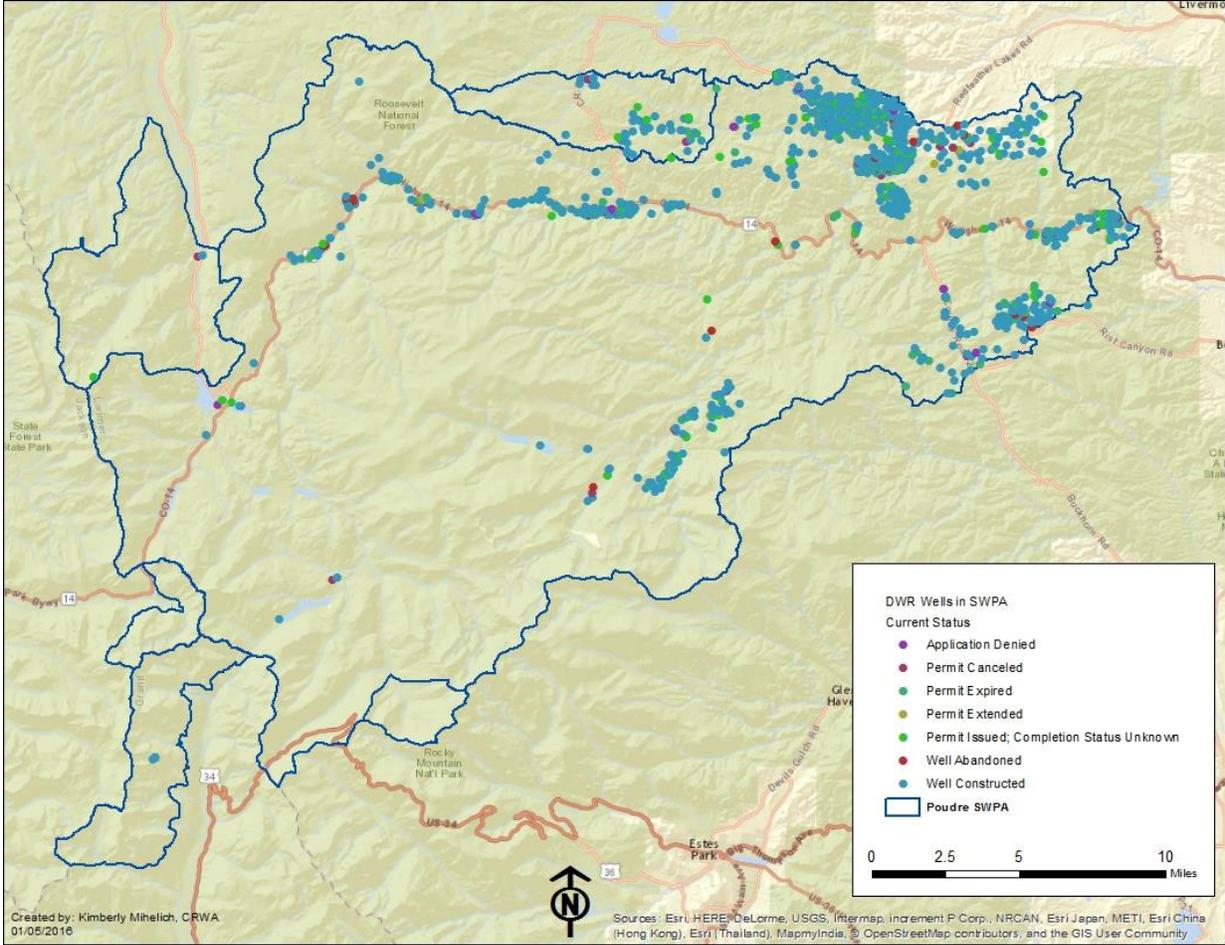
### **6.10 Water Wells**

(Priority Ranking: Low)

There are over 1,650 private water well permits located within the City of Fort Collins' Upper Cache la Poudre River SWPA as shown in Figure 21, below. Of those well permits, approximately 1214 have constructed wells onsite and 131 permits have been issued, but completion status of the well is unknown. There are no water well permits within the Horsetooth Reservoir SWPA. Private water wells can be a direct route for contaminants to enter the groundwater if not properly cased and maintained. Contaminants that infiltrate from the surface are more likely to pollute wells that are old, shallow, uncased, or improperly abandoned.

### Private Wells Best Management Practices Recommendations

1. Share outreach material with private well owners that explains the importance of source water protection.
  - a. Identify private wells within the SWPAs utilizing the DWR's database.
  - b. Gather/develop outreach material as it pertains to private wells.
  - c. Mail outreach material.



**Figure 21. Well permit applications within the City of Fort Collins' Upper Cache la Poudre River SWPA (Colorado Division of Water Resources, 2015)**

## **7.0 SOURCE WATER BEST MANAGEMENT PRACTICES**

The Steering Committee reviewed and discussed several possible best management practices that could be implemented within the Source Water Protection Area to help reduce the potential risks of contamination to the community's source water. The Steering Committee established a "common sense" approach in identifying and selecting the most feasible source water management activities to implement locally. The best management practices were obtained from multiple sources including: Environmental Protection Agency, Colorado Department of Public Health and Environment, Natural Resources Conservation Service, and other source water protection plans.

The Steering Committee recommends the best management practices listed in Table 6 be considered for implementation.

**Table 5: Source Water Protection Best Management Practices**

Issues	Best Management Practices	Partners
<p><b>Forest Health: Wildfires</b> Priority Ranking: High</p>	<ol style="list-style-type: none"> <li>1. Continue to work with the Coalition for the Poudre River Watershed to complete two priority wildfire-related tasks:               <ol style="list-style-type: none"> <li>a. Identify remaining priority areas for restoration that were burned in the 2012 Hewlett Gulch and High Park Wildfires, and</li> <li>b. Complete the Poudre River Watershed Resiliency Plan to identify priority areas for targeted forest fuels treatment based on the wildfire hazards and other values at risk within sub-drainages in the Upper Poudre Watershed.</li> </ol> </li> <li>2. Support CPRW and other stakeholders in implementation of fuels treatments identified in the Resiliency Plan and other planning efforts.</li> <li>3. Continue to assess and mitigate, as needed, the wildfire hazards that threaten the City of Fort Collins’ critical facilities through forest fuels treatments and other BMPs.</li> <li>4. Ensure that source watersheds are identified and managed as a critical asset for the Fort Collins Water Treatment Facility in major planning efforts such as the FCWTF Wildfire Response Plan, FCWTF Vulnerability Assessment, Master Plan, and Regional Hazard Mitigation Plans.</li> <li>5. Share copies of the City of Fort Collins’ SWPP and GIS shapefiles/maps of the SWPAs with stakeholders.               <ol style="list-style-type: none"> <li>a. Gather contact information &amp; create mailing list for distribution;</li> <li>b. Utilize CRWA’s “SWPP Distribution Letter” template to develop a cover letter for SWPP distribution;</li> <li>c. Print hard/CD copies of SWPP; print CDs with SWPA GIS shapefiles;</li> <li>d. Mail SWPP Distribution Cover Letter along with copy of City of Fort Collins’ SWPP and SWPA GIS shapefiles.</li> </ol> </li> <li>6. Maintain early-warning water quality alert system to signal significant changes in water quality.</li> <li>7. Participate and partner in local and regional efforts to advance practices around mitigating the risks of wildfire to water supplies (e.g. Front Range Watershed Wildfire Protection Group, Carpe Diem West’s Healthy Headwaters Initiative, Colorado Big Thompson Headwaters Partnership, Colorado Conservation Exchange)</li> <li>8. Update internal City policies, as needed, to support the best management practices that provide protection of source water supplies.</li> </ol>	<p>City of Fort Collins; USFS; Poudre Fire Authority; CDOT; Larimer County</p>

<p>Abandoned Mines / Mine Tailings <b>Priority Ranking: High</b></p>	<ol style="list-style-type: none"> <li>1. Develop a Mine Action Plan by referencing existing studies such as the USFS Hazard Abandoned Mine Land Inventory Project and DRMS inventories to help determine which abandoned mines and tailings piles are impaired and a threat to the source waters. <ol style="list-style-type: none"> <li>a. Conduct water quality analyses at high priority sites.</li> <li>b. Develop notification procedures with organizations that might first notice the problems (e.g. Larimer County, Fire Department, USGS, USFS, and/or Private Landowners).</li> <li>c. Develop and maintain an effective contact list to report and collaborate on any issues that may arise.</li> <li>d. Report any issues or threats that arise to the appropriate agencies.</li> </ol> </li> <li>2. Share data from Mine Action Plan with interested parties.</li> </ol>	<p>City of Fort Collins</p>
<p><b>Flooding/Runoff</b> Priority Ranking: Moderate</p>	<ol style="list-style-type: none"> <li>1. Continue to maintain the City of Fort Collins flood alert system.</li> <li>2. Share copies of the City of Fort Collins' SWPP and GIS shapefiles/maps of the SWPAs with stakeholders. <ol style="list-style-type: none"> <li>a. Gather contact information &amp; create mailing list for distribution;</li> <li>b. Utilize CRWA's "SWPP Distribution Letter" template to develop a cover letter for SWPP distribution;</li> <li>c. Print hard/CD copies of SWPP; print CDs with SWPA GIS shapefiles;</li> <li>d. Mail SWPP Distribution Cover Letter along with copy of City of Fort Collins' SWPP and SWPA GIS shapefiles.</li> </ol> </li> <li>3. Implement projects that decrease flood risk as identified in the CPRW Watershed Resiliency Plan.</li> </ol>	<p>City of Fort Collins; Larimer County; CDOT; emergency responders; Colorado State Patrol</p>
<p><b>State Highways</b> Priority Ranking: Moderate</p>	<ol style="list-style-type: none"> <li>1. Continue to implement elements of the Emergency Response Plan pertaining to vehicular spills, accidents, and maintenance/construction of roadways.</li> <li>2. Identify compounds used for weed management and the State's Herbicide Application BMPs</li> <li>3. Maintain City's participation in Northern Water's Cooperative Emerging Contaminant Monitoring Program and update compound list annually to reflect compounds in current use for weed management, when possible.</li> <li>4. Share copies of the City of Fort Collins' SWPP and GIS shapefiles/maps of the SWPAs with stakeholders. <ol style="list-style-type: none"> <li>a. Gather contact information &amp; create mailing list for distribution;</li> <li>b. Utilize CRWA's "SWPP Distribution Letter" template to develop a cover</li> </ol> </li> </ol>	<p>City of Fort Collins; CDOT; Larimer County Sheriff's Dept.; Colorado State Patrol; Larimer County Hazardous Material Unit; emergency responders; CRWA</p>

	<p>letter for SWPP distribution;</p> <p>c. Print hard/CD copies of SWPP; print CDs with SWPA GIS shapefiles;</p> <p>5. Mail SWPP Distribution Cover Letter and Fort Collins' SWPP and SWPA GIS shapefiles.</p>	
<p><b>County, Private, and Forest Roads</b> Priority Ranking: Moderate</p>	<ol style="list-style-type: none"> <li>1. Share copies of the City of Fort Collins' SWPP and GIS shapefiles/maps of the SWPAs with USFS; Larimer County Road &amp; Bridge; Larimer County Sheriff's Dept.; Colorado State Patrol; Larimer County Hazardous Material Unit, and other emergency responders and/or stakeholders. <ol style="list-style-type: none"> <li>a. Gather contact information &amp; create mailing list for distribution;</li> <li>b. Utilize CRWA's "SWPP Distribution Letter" template to develop a cover letter for SWPP distribution;</li> <li>c. Print hard/CD copies of SWPP; print CDs with SWPA GIS shapefiles;</li> <li>d. Mail SWPP Distribution Cover Letter along with copy of City of Fort Collins' SWPP and SWPA GIS shapefiles.</li> </ol> </li> <li>2. Inventory USFS roads in proximity to perennial streams. <ol style="list-style-type: none"> <li>a. For roads that are determined to be impacting water quality, including those identified in the CPRW Watershed Resiliency Plan, work with USFS to develop BMPs for remediation.</li> </ol> </li> <li>3. Identify compounds used for weed management and the County Herbicide Application BMPs.</li> <li>4. Maintain City's participation Northern Water's Cooperative Emerging Contaminant Monitoring Program and update compound list annually to reflect compounds in current use for weed management, when possible.</li> <li>5. For known risks to water quality on private property, communicate SWPP importance of source water protection with private landowners and encourage use of BMPs for construction of new roadways.</li> </ol>	<p>City of Fort Collins; USFS; Larimer County Road &amp; Bridge; Larimer Sheriff's Dept.; Colorado State Patrol; Larimer County Hazardous Material Unit, and other emergency responders; private landowners; CRWA</p>
<p><b>Septic Systems</b> Priority Ranking: Moderate</p>	<ol style="list-style-type: none"> <li>1. Develop a public education campaign for septic system owners within City of Fort Collins' SWPAs. <ol style="list-style-type: none"> <li>a. Gather contact information &amp; create mailing list of septic system owners within SWPAs (work w/ Larimer County Health Department for list of owners).</li> <li>b. Gather or develop outreach material about Source Water Protection as it relates to improper septic system maintenance practices (work w/ CRWA or Larimer County Health Department to find/create material).</li> </ol> </li> </ol>	<p>City of Fort Collins; Larimer County Health Department; CRWA; septic system owners</p>

	2. Mail outreach material to septic system owners identified in SWPAs.	
<b>Forest Health (insect disease/mortality)</b> Priority Ranking: Low	<ol style="list-style-type: none"> <li>1. Continue Source Water Quality Monitoring Program.</li> <li>2. Continue to routinely evaluate the extent and severity of insect mortality in the source watersheds.</li> </ol>	City of Fort Collins; Coalition for the Poudre River Watershed; USFS
<b>Recreation</b> Priority Ranking: Low	<ol style="list-style-type: none"> <li>1. Continue monitoring for emerging contaminants.</li> <li>2. Work with USFS to install signage or post information about source water protection and emerging contaminants at recreational sites in SWPA.</li> </ol>	City of Fort Collins; USFS
<b>Livestock Grazing / Agricultural Practices</b> Priority Ranking: Low	<ol style="list-style-type: none"> <li>1. Share outreach material with private land owners that explains the importance of source water protection. <ol style="list-style-type: none"> <li>a. Identify private landowners and areas in US Forest System lands within the SWPAs where grazing and/or agricultural practices occur.</li> <li>b. Gather/develop outreach material as it pertains to livestock grazing/agricultural material.</li> </ol> </li> <li>2. Mail outreach material.</li> </ol>	Town of Fowler; Larimer County; CRWA; Private Land Owners
<b>Aboveground / Underground Fuel Storage Tanks</b> Priority Ranking: Low	<ol style="list-style-type: none"> <li>1. Develop a public education campaign for storage tank owners within the Cache la Poudre River and Horsetooth Reservoir SWPAs. <ol style="list-style-type: none"> <li>a. Gather contact information &amp; create mailing list of storage tank owners within SWPAs.</li> <li>b. Gather or develop outreach material about Source Water Protection as it relates to storage tanks (work with CRWA to find/create material).</li> <li>c. Mail outreach material to storage tank owners identified in SWPAs.</li> </ol> </li> <li>2. Work with owners of aboveground storage tanks within SWPAs Zone 1 to install secondary containment.</li> </ol>	City of Fort Collins; Storage Tanks owners
<b>Private Wells</b> Priority Ranking: Low	<ol style="list-style-type: none"> <li>1. Share outreach material with private well owners that explains the importance of source water protection. <ol style="list-style-type: none"> <li>a. Identify private wells within the SWPAs utilizing the DWR's database.</li> <li>b. Gather/develop outreach material as it pertains to private wells.</li> </ol> </li> <li>2. Mail outreach material.</li> </ol>	City of Fort Collins; CRWA; CO Division of Water Resources; Private Well Owners
<b>Regional Agreements to enhance SWPP efforts</b> Priority Ranking: N/A	<ol style="list-style-type: none"> <li>1. Work with Larimer County, other water providers, and land management agencies to develop MOUs for this SWPP effort to increase collaboration and gain partnerships that strengthen the management and sustainability of the SWPP.</li> </ol>	City of Fort Collins; Larimer CO, Tri-Districts, City of Greeley, Northern Water, US Forest Service, Colorado State Forest Service



## **8.0 EVALUATING EFFECTIVENESS OF SOURCE WATER PROTECTION PLAN**

The City of Fort Collins is committed to developing a tracking and reporting system to gauge the effectiveness of the various source water best management practices that have been implemented. The purpose of tracking and reporting the effectiveness of the source water best management practices is to update water system managers, consumers, and other interested entities on whether or not the intended outcomes of the various source water best management practices are being achieved, and if not, what adjustments to the Source Water Protection Plan will be taken in order to achieve the intended outcomes. It is further recommended that this Plan be reviewed at a frequency of once every 5 years or if circumstances change resulting in the development of new water sources and source water protection areas, or if new risks are identified.

The City of Fort Collins is committed to a mutually beneficial partnership with the Colorado Department of Public Health and Environment in making future refinements to their source water assessment and to revise the Source Water Protection Plan accordingly based on any major refinements.



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## 10. APPENDICES<sup>3</sup>

- A. SWPP Stakeholder List
- B. Fort Collins Source Water Assessment Report
- C. CRWA's SWAP Risk Assessment Matrix
- D. Table A-1 Discrete Contaminant Types
- E. Table A-2 Discrete Contaminant Types (SIC Related)
- F. Table B-1 Dispersed Contaminant Types
- G. Table C-1 Contaminants Associated with Common PSOC's
- H. Fort Collins Mine Action Plan
- I. MOU Between CDPHE and U.S. Forest Service Rocky Mountain Region

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<sup>3</sup> All appendices are located on the CD version of this SWPP.