

Source Water Protection Plan for Upper Clear Creek Watershed and Standley Lake

Completed under a CDPHE Source Water Protection Planning Grant
awarded to the Standley Lake Cities:

WESTMINSTER CITY OF
Public Water System ID:
CO0101170
WESTMINSTER, CO
ADAMS County

NORTHGLENN CITY OF
Public Water System ID:
CO0101115
NORTHGLENN, CO
ADAMS County

THORNTON CITY OF
Public Water System ID:
CO0101150
THORNTON, CO
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Surface Water Source Adams County, Colorado

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TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	4
INTRODUCTION.....	6
Protection Plan Process Guidance.....	6
Public Participation and Steering Committee Establishment.....	6
Steering Committee and Other Participants.....	7
Protection Plan Development Process.....	8
Purpose of Source Water Protection Plan Development.....	9
OVERVIEW OF COLORADO’S SWAP PROGRAM.....	10
Source Water Assessment Phase.....	11
Source Water Protection Phase.....	11
WATER SUPPLY SETTING.....	12
Hydrogeographic Setting.....	12
Historical Water Quality Protection Efforts.....	12
Site Specific Chlorophyll Standard.....	20
Drinking Water Treatment.....	21
Drinking Water Supply Operation.....	22
Raw Water.....	22
Water Treatment.....	22
Water Supply Demands/Analysis.....	23
SOURCE WATER ASSESSMENT RESULTS.....	25
Source Water Assessment Area Delineation.....	25
Categories of Contaminants.....	27
Discrete Nutrient Sources.....	27
Dispersed Nutrient Sources.....	27
Prioritization Strategy and Susceptibility Analysis.....	28
Water Source Prioritization.....	28
Prioritizing Contaminant Sources.....	29
Susceptibility Analysis.....	32
SOURCE WATER PROTECTION MEASURES.....	32
Source Water Protection Area Delineation.....	32
Management Strategies.....	34
Source Water Protection Area.....	34
Nutrient-Related Contaminant Sources.....	34
Source Water Protection Priorities.....	35
Organizational Strategies.....	36
Pending Issues.....	37

TABLE OF CONTENTS (continued)

EXHIBITS

- Exhibit 1: City of Westminster's Source Water Assessment Area
- Exhibit 2: City of Northglenn's Source Water Assessment Area
- Exhibit 3: City of Thornton's Source Water Assessment Area
- Exhibit 4: Standley Lake Source Water Assessment Area
- Exhibit 5: Standley/Clear Creek Source Water Protection Area
- Exhibit 6: Contaminant Types Associated with Regulated Discrete Contaminant Sources - Standley/Clear Creek Source Water Protection Plan
- Exhibit 7: Contaminant Types Associated with Dispersed Contaminant Sources - Standley/Clear Creek Source Water Protection Plan
- Exhibit 8: Best Management Practices - Standley/Clear Creek Source Water Protection Plan
- Exhibit 9: Best Management Practice #1 – Call-Down System Enhancements

EXECUTIVE SUMMARY

The Standley Lake Cities of Westminster, Northglenn and Thornton have been actively involved in protecting water quality in Clear Creek and Standley Lake for many years. This source water protection plan represents one of the more recent collaborative projects involving stakeholders throughout the Upper Clear Creek Watershed and other areas that affect the quality of Standley Lake's source water. By inviting all stakeholders to participate in the planning process, this planning process allows participants to express their interests and needs with regard to water quality and provides the opportunity to address all interests by incorporating appropriate protection efforts into the Plan.

The financial and water supply risks related to the potential contamination of one or more of Standley Lake's water sources are a concern to the Standley Lake/Clear Creek Watershed Steering Committee (Steering Committee). As a result, the Steering Committee believes the development and implementation of a source water protection plan for the Upper Clear Creek Watershed and Standley Lake can help to reduce the risks posed by potential nutrient contamination of its water source. This Source Water Protection Plan (the Plan) was developed to prioritize source water protection concerns and to identify local source water protection activities that can be implemented to protect Standley Lake's source water.

The Steering Committee recommends adopting a Source Water Protection Area that is similar to the source water assessment areas defined by CDPHE. The Standley Lake/Clear Creek Source Water Protection Area (SWP Area) defines the region where the stakeholders in the Upper Clear Creek Watershed and Standley Lake Cities have chosen to implement source water protection activities in an attempt to manage the susceptibility of their source water to potential nutrient-related contamination.

The Steering Committee adopted CDPHE's two-step strategy for prioritizing the water sources and potential contaminant sources using the results contained in the source water assessment reports as a starting point, then supplementing the results with local knowledge.

The first step in this strategy is to prioritize water sources based on the highest total susceptibility and/or physical setting vulnerability ratings. CDPHE recommends prioritizing water sources using the total susceptibility and physical setting vulnerability results contained in Appendix A of the source water assessment reports. The second step of CDPHE's strategy allows the option of prioritizing potential contaminant sources based on those that are (1) most prevalent, (2) most concerning, or (3) most prevalent and concerning.

Having followed the recommended two-step strategy recommended by CDPHE, the Steering Committee recommends focusing source water protection measures on the Standley Lake SWP Area, and plans to address the most concerning *discrete* nutrient-related contaminant sources and the most prevalent *dispersed* nutrient-related contaminant sources identified in this area.

The Steering Committee reviewed and discussed a number of source water protection activities that could be implemented within the Standley Lake/Clear Creek SWP Area. These protection activities may help reduce the risks of potential contamination from nutrient-related contaminant sources. The purpose of voluntarily implementing source water protection activities is to apply an additional level of protection to the drinking water supply by taking preventive measures at the local level.

The Steering Committee established feasibility criteria as part of identifying and selecting source water protection activities (i.e., Best Management Practices, or BMPs). The Steering Committee recommends implementing the following list of BMPs where applicable in the Standley Lake/Clear Creek SWP Area:

- Call-Down System Enhancement
- Standley/Clear Creek Source Water Protection Plan - Workplan
- Wastewater Treatment Plant Optimization
- Participate in annual Clear Creek Watershed Festival
- Participate in annual Household Chemical / Hazardous Materials Clean-Up Day
- Conduct Watershed Assessments for Prioritizing Fire Risk
- Implement regular inspection and pumping program for Onsite Wastewater Systems
- Implement a community education/outreach campaign on the effects of nutrient enrichment
- Install runoff and sediment controls
- Reduce levels of Phosphorus in consumer and industrial products

The Steering Committee recommends updating the Clear Creek Watershed Management Agreement to include the source water protection activities described in this Plan. Funding to cover the necessary investment in time and materials is expected to come from the Plan's annual budget, grants, state revolving funds, utility fees, and stakeholder contributions.

Implementation of these BMPs is expected to begin in February, 2010 and will be ongoing following the establishment of a sustainable organizational structure that includes as many of the existing Steering Committee members as possible.

INTRODUCTION

Protection Plan Process Guidance

The Water Quality Control Division (WQCD) of Colorado’s Department of Public Health and Environment (CDPHE) is responsible for managing the state’s Source Water Assessment and Protection (SWAP) program according to the requirements of the federal Safe Drinking Water Act. The SWAP program encourages community-based protection and preventive management strategies to ensure that all public drinking water resources are kept safe from future contamination. The long-term program goal is voluntary development and implementation of local source water protection statewide. The following table is provided by the state as a reference for effectively planning and developing a source water protection plan for public water supply (PWS) systems.

Table 1. Process Steps for Source Water Protection Planning

Task	Output	Responsible Party
Review SWAP assessment results	Report of findings & recommendations	PWS, Staff, Citizens
Report findings to decision makers	Formal presentation to decision makers	PWS, Staff, Citizens
Advocate for developing protection plan	Formal endorsement of decision makers	PWS, Staff, Citizens
Explore feasibility of partnering with other PWSs in watershed (if applicable)	Determination of partnering with other PWSs	Staff, Citizens
Appoint citizen steering committee to advise	Citizen Steering Committee	Staff, Decision Makers
Decide on process to follow	Planning Process	Steering Committee, Staff
Develop schedule for planning process	Planning Schedule	Steering Committee, Staff
Decide on public involvement & notice process	Public involvement & notice process	Steering Committee, Staff
Produce and distribute plan	Source Water Protection Plan	Steering Committee, Staff

Public Participation and Steering Committee Establishment

From its inception, public participation has been important to the overall success of Colorado’s 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. The state worked successfully with voluntary citizen advisory groups in the development of both the wellhead protection and SWAP program plans.

The state recommends that public water suppliers or other well-suited local interest groups take the lead in organizing public participation in the local source water protection planning effort. Effective public participation requires a well-organized effort to raise public awareness, to identify groups and individuals interested in helping, and to define and implement the necessary planning tasks. The Standley Lake/Clear Creek Watershed

Steering Committee (Steering Committee) has adopted this public participation principle and is encouraging the involvement of all types of stakeholders – individuals, groups, organizations and local decision-makers affected by or concerned with the community’s drinking water – in the local source water protection planning and implementation effort. The Steering Committee believes that local support and acceptance is more likely where local stakeholders have been actively recruited and encouraged to participate in the development and implementation of a source water protection plan.

Steering Committee and Other Participants

The Cities of Westminster, Northglenn, and Thornton (Standley Lake Cities) facilitated the appointment of a Steering Committee to provide input on the design and development of the SWPP for Standley Lake, which serves as their primary water supply. The members of the Standley Lake/Clear Creek Watershed Steering Committee that was established to create and implement the Standley Lake/Clear Creek Watershed SWPP are listed below.

Steering Committee

Management Team:

Rob Buirgy - Standley Lake/Clear Creek SWPP Coordinator
Mary Fabisiak - City of Westminster
Shelley Stanley - City of Northglenn
Vic Lucero - City of Thornton

Steering Committee:

Kevin Bayer - Arapaho-Roosevelt National Forest
Anne Beierle - City of Golden
Chris Brownell - City of Idaho Springs
Carl Chambers - Arapaho-Roosevelt National Forest
John Duggan - CDPHE SWAP Program
Katie Fendel - Black Hawk/Central City Sanitation District
Rick Fendel - Gilpin County
Jim Ford - City of Black Hawk
David Holm - Clear Creek Watershed Foundation
William Katz - Henderson Mine
Dale Lauer - City of Black Hawk
Roy Laws - Jefferson County
Fred Lyssy - Upper Clear Creek Watershed Association
Jim McCarthy - City of Arvada
Ben Moline - Molson Coors Brewing Company
Manuel Montoya - Farmers Reservoir & Irrigation Company
Ray Reling - City of Northglenn
Peggy Stokstad - Clear Creek County Economic Development Corp.
Tracy Volkman - Clear Creek County Public Health
Bert Weaver - Clear Creek County Community Development

Active involvement of the Steering Committee from the earliest stages of the planning process was important to the success of this plan. The role of the Steering Committee was to guide the working group in preparing the plan, report back to their respective organizations, and to assist with distribution of the plan document to stakeholders and other interested parties. The wide representation of upper- and lower-basin stakeholders on the Steering Committee was beneficial in promoting collaboration and maintaining a working relationship throughout the plan development process, and contributed significantly to the level of investment in the final product.

Other Participants

The source water protection planning process attracted interest and participation from a few other key entities. Input by these entities was greatly appreciated and was instrumental in developing the Standley Lake/Clear Creek Source Water Protection Plan (the Plan). These participants included:

- Colleen Williams – Colorado Rural Water Association
- Jean Mackenzie - EPA Region VIII
- Jeannette Hillary – Colorado AWARE
- Jeff Crane – Colorado Watershed Assembly

Protection Plan Development Process

The source water protection planning effort consisted of a structured process of work group meetings followed by public meetings. The Steering Committee’s recommendations were developed from these work group meetings that were convened to establish the goals and objectives of the protection plan, evaluate the source water assessment results and establish protection priorities, and evaluate source water management approaches. Ultimately, the Steering Committee’s recommendations were incorporated into a draft Plan which was presented at four public meetings for comment and discussion. A list of these public meetings is presented below.

Table 2. Public Meetings

Date	Location	Purpose / Description	Audience
9/23/2008	Consolidated Mutual Water District	Meeting to discuss SWP planning process and recruit Steering Committee members	16
2/19/2009	Consolidated Mutual Water District	Meeting to discuss SWP planning process	23
4/28/2009	Clear Creek High School, Evergreen	Meeting to discuss SWP planning process and elements	16
7/30/2009	West View Rec Center, Westminster	Meeting to discuss draft SWP plan and BMP’s	38

The general public was notified of the public meeting schedule via local newspapers, listservs, community web page and fliers posted in public venues prior to each meeting.

An invitation to attend and participate in these public meetings was extended to the entire community served by the Upper Clear Creek Watershed and the Standley Lake Cities or potentially affected by this Plan. Meetings were announced through regular mailings by Upper Clear Creek Watershed Association, at meetings of other water quality-related organizations, through print and broadcast media, and in flyers posted in public venues.

Purpose of Source Water Protection Plan Development

The stakeholders in the Upper Clear Creek Watershed and Standley Lake Cities recognize the potential financial, public health, and water supply risks related to contamination of one or more of the community's water sources. In an effort to address the potential problems that could affect their untreated source water, the Standley Lake Cities applied for and received a pilot grant from the Colorado Water Quality Control Division (CWQCD) to identify nutrient sources and other potential sources of contamination and to develop best management practices to limit nutrient loadings and other impacts to Standley Lake and the Upper Clear Creek Watershed. In order to accomplish the goals set forth in the pilot grant guidelines, the stakeholders in the Upper Clear Creek Watershed and Standley Lake Cities established the Standley Lake/Clear Creek Watershed SWPP Steering Committee and an associated website (www.standleyswp.com) for distribution of SWPP-related information. The Steering Committee advised the stakeholders in the Upper Clear Creek Watershed and Standley Lake Cities regarding voluntary source water protection measures to reduce the risks of nutrient contamination of untreated source water.

The primary reason for developing and implementing source water protection measures is to provide an additional level of protection for the drinking water supply. While this first phase of the protection plan is focused on nutrient-related sources of contamination, the protection measures will be expanded in time to include all potential sources of contamination. Voluntary protective measures developed and implemented at the local level (e.g., county and municipal level) are expected to aid in protection of the community's source water. These local protective measures are intended to complement regulatory measures implemented at the state and federal governmental levels.

This SWPP identifies the source water protection area(s) where the stakeholders in the Upper Clear Creek Watershed and Standley Lake Cities have chosen to implement source water protection measures. In addition, this Plan establishes a strategy for prioritizing the source waterbodies and potential contaminant sources to which the source water protection measures will be applied. The strategy is based on the source water assessment results for the Standley Lake Cities as a starting point from which these priorities were identified. The Plan also identifies the source water protection measures and associated tasks that will be implemented within the source water protection area.

Finally, as a companion to this SWPP, an emergency response plan is being developed by the stakeholders in the Upper Clear Creek Watershed and Standley Lake Cities that will

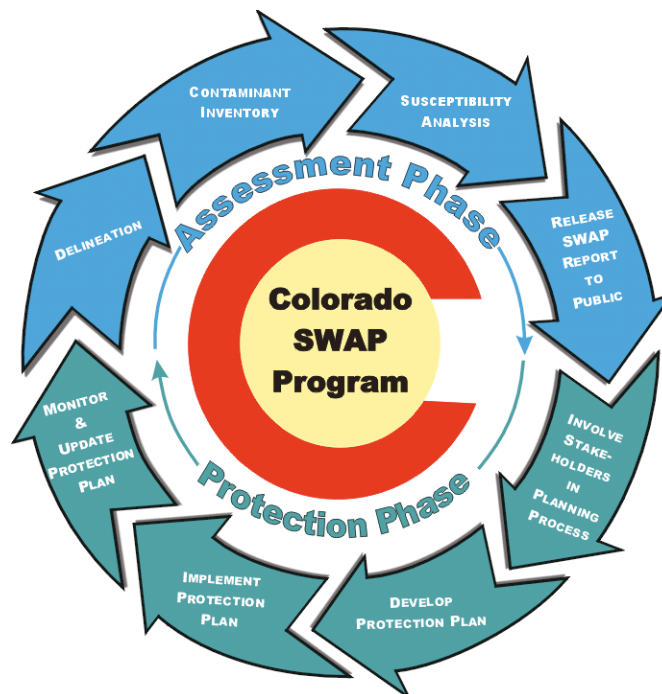
enhance the existing Clear Creek Call Down System. The enhancements planned for the Call Down System will improve upon the existing protocols for responding rapidly, effectively, and efficiently to any emergency incident that threatens or disrupts the water supply to many stakeholders in the basin. As one of the Best Management Practices (BMPs) recommended in this Plan, the Steering Committee intends to enhance the Call Down System to better deal with nutrients and other contaminants. Details on these improvements are described elsewhere in this document.

OVERVIEW 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. The 1996 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, assumed the responsibility of developing Colorado’s SWAP program. The SWAP program protection plan will be integrated with the existing Colorado Wellhead Protection Program that was established in amendments made to the federal Safe Drinking Water Act (SDWA, Section 1428) in 1986. Wellhead protection is a preventative concept that aims to protect public groundwater wells from contamination. The Wellhead Protection Program and the SWAP program have similar goals and will combine protection efforts in one merged program plan.

Colorado’s SWAP program is an iterative, two-phased process (Figure 1) 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 1, respectively.

Figure 1. Source Water Assessment and Protection Process.



Source Water Assessment Phase

As depicted in the upper portion of Figure 1, the Assessment Phase for all public water systems consists of four primary elements.

1. Delineating the source water assessment area for each drinking water source;
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 and;
4. Reporting the results of the source water assessment to the public water systems and the general public.

The Assessment Phase involves understanding where Standley Lake's source water comes from, what contaminant sources potentially threaten the water source(s), and how susceptible each water source is to potential contamination. The susceptibility of an individual water source is analyzed by examining the properties of its physical setting and potential contaminant source threats. The resulting analysis calculations are used to report an estimate of how susceptible each water source is to potential contamination.

Source Water Protection Phase

The Protection Phase is a voluntary, ongoing process in which stakeholders in the Upper Clear Creek Watershed and Standley Lake Cities have been encouraged to voluntarily employ preventive 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 1, 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 systems 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 governments. The source water protection phase is an iterative process as indicated in Figure 1. The evolution of the SWAP program is intended to incorporate any new assessment information provided by the public water supply systems and update the protection plan accordingly.

WATER SUPPLY SETTING

Hydrogeographic Setting

The Clear Creek Watershed is located due west of Denver, Colorado, spanning 575 square miles from Clear Creek's headwaters near the Continental Divide (14,000 feet in elevation) to its confluence with the South Platte River in the northern metropolitan Denver area (5,000 feet in elevation). The watershed includes five counties, several towns and cities, and a considerable rural/mountain population. The historic Mineral Belt bisects the Clear Creek Watershed and, while the mining and milling boom was an economic benefit to our State, it left a legacy of negatively impacted water quality throughout the watershed. More recently, water quality in the watershed has been negatively impacted by other factors, including transportation, increasing population, and vegetative changes in forested areas.

Clear Creek is a hard working creek. It supplies water to approximately 350,000 people in the watershed, supports numerous industries, including those focused on recreation and farming, and provides habitat for some of the best fisheries close to an urban setting in Colorado. Standley Lake is the largest reservoir that is filled with water from upper Clear Creek. Constructed in the early 1900's, Standley Lake is an approximately 43,000 acre feet reservoir located in Jefferson County, Colorado, in the Big Dry Creek drainage. The majority of the water stored in Standley Lake is derived from Clear Creek. Water is conveyed to Standley Lake via several large canals including the Croke Canal, the Farmers High Line Canal and the Church Ditch. Standley Lake holds one of the more senior water storage rights on Clear Creek. Accordingly, it generally diverts and stores the majority of the Clear Creek flow during the months of November through March. A significant amount of water is diverted into the reservoir during the summer months as well.

Historical Water Quality Protection Efforts

Stakeholders in the Upper Clear Creek Watershed and the Standley Lake Cities have worked for many years to protect the water quality in Clear Creek, participating in water quality rulemakings before the Water Quality Control Commission and engaging in litigation in Colorado's Water Court. Several stakeholders have also provided both financial and in-kind support for water quality monitoring and improvement programs in the Clear Creek basin. In addition, the Standley Lake Cities (Cities) have undertaken significant steps to monitor and improve the water quality within the Big Dry Creek basin, which is tributary to Standley Lake.

Standley Lake Cities

Water providers have a responsibility on behalf of the public to deliver safe and clean water to citizens. Recognizing this responsibility, the Cities have consistently worked to establish programs for the protection of the water quality in Standley Lake. In the 1980's the Cities launched a joint monitoring program for Standley Lake. This effort was formalized June 28, 1989, when the cities of Northglenn, Thornton, and Westminster signed an intergovernmental agreement (IGA). The IGA established cost sharing percentages and division of in-kind services. Further, a number of taste and odor events caused by blue-green algal blooms during the 1980's led to additional protection efforts, as citizens were upset by the quality of their drinking water, and expressed a loss of faith in the ability of their municipalities to deliver safe drinking water. This response emphasized the importance of maintaining effective programs to protect water quality both in Standley Lake and its watershed.

In the 1980's the effluent discharge location from the Coors and the City of Golden WWTF's was moved to below the diversion points for supply canals to Standley Lake. This effort resulted in the so-called "Cosmic Agreement" on Clear Creek, which settled numerous pending lawsuits and administrative actions involving the Cities and Coors and Golden. The relocation of these outfalls avoided significant loadings of nutrients into Standley Lake. In order to address other water quality risks during this period, the Cities continued in their efforts before the WQCC to obtain additional standards for the protection of water quality in Standley Lake.

In the 1990's, the Cities successfully completed the Standley Lake Protection Project, which severed the hydrologic connection between Standley Lake and the former Rocky Flats Environmental Technology Site located in the Big Dry Creek basin upstream of Standley Lake. Also in the 1990's the Cities first sought nutrient standards for the protection of Standley Lake. This proposal was contentious, but interested parties ultimately entered into the Clear Creek/Standley Lake Watershed Agreement (the "Agreement"), which resulted in the adoption of a narrative standard for Standley Lake. The Agreement also led to the formation of the Upper Clear Creek Watershed Association and increased cooperation among stakeholders in the Upper Clear Creek Watershed and the Cities. Although the relationship has not been without tension over the years, it has resulted in increased monitoring, voluntary wastewater treatment plant improvements, and the implementation of voluntary BMPs and stormwater permitting efforts in both the upper reaches of Clear Creek and within the tributary basin of Standley Lake itself.

In the current decade, stakeholders in the Upper Clear Creek Watershed and the Cities have continued their efforts to protect the water quality in Standley Lake. In early 2000, the Cities finalized an agreement with Black Hawk and Central City that resulted in improved nutrient removal from the Black Hawk/Central City Sanitation District wastewater treatment plant in the upper reaches of the Clear Creek basin. Through a joint effort that involved significant funding from Black Hawk and Central City, as well as from the Cities and other stakeholders, a new advanced wastewater treatment plant was

constructed on North Clear Creek, designed to significantly reduce nutrient levels in the treated effluent discharges.

Also in the current decade, the Cities worked with the City of Arvada to reduce stormwater run-off into the feeder canals to Standley Lake. Collectively, the Cities and Arvada have implemented a number of projects that reduce stormwater runoff into the canals themselves. This has the effect of reducing the nutrient loading to Standley Lake from the basins that are tributary to the feeder canals.

Finally, in 2007, the Cities completed the Church Ditch Water Quality Protection Project, which significantly reduces stormwater impacts to Standley Lake from development activities within the Big Dry Creek drainage basin. Currently, Westminster is working with other upstream entities in water rights proceedings in an effort to protect Standley Lake water quality. All of these efforts have resulted in increased protections for Standley Lake.

Nonpoint source control efforts such as these play an important role in improving water quality. The majority of governmental entities in both the upper and tributary basins have adopted and are implementing nonpoint source control regulations. In 2003, the lower basin cities of Arvada, Northglenn, Thornton, Westminster and Golden received Phase II stormwater permits as required by the Clean Water Act. The cities have successfully completed program goals for each year since 2003. Additionally, all of the lower basin cities have adopted regulations providing for erosion control during construction, permanent BMP maintenance and prohibition of illicit discharges.

Upper Basin Stakeholders

In response to the request by the Standley Lake Cities (SLC) for a Rulemaking Hearing to establish water quality standards and resulting nutrient control regulations for Standley Lake, 23 entities developed and agreed to the Clear Creek Watershed Management Agreement (Agreement). This Agreement, adopted in December 1993, sought to address certain water quality issues and concerns within the Clear Creek Basin, focusing on issues that could affect water quality in Standley Lake. The parties (Parties) to this Agreement are governmental agencies and private corporations having land use, water supply, and/or wastewater treatment responsibilities within the Clear Creek Basin.

The Agreement requires the Parties to develop a report on an annual basis and submit it to the WQCC. Many of the Parties are engaged in water quality protection activities that directly or indirectly result in better management of nutrient sources in the Upper Clear Creek Watershed. The following information from the 2007 Annual Report provides examples of the broad scope of nutrient-related activities conducted by the Parties.

Upper Clear Creek Watershed Association

The Upper Clear Creek Watershed Association is the management agency for the Upper Clear Creek watershed. A memorandum of understanding provides a framework and opportunity for joint participation in the association. Eligible members include the cities

of Black Hawk, Idaho Springs, Golden and Central City, the towns of Empire, Georgetown, and Silver Plume, Central Clear Creek Sanitation District, Black Hawk/Central City Sanitation District, St. Mary's Glacier Water and Sanitation District, Clear Creek, Gilpin, and Jefferson Counties, Clear Creek Skiing Corporation, Climax Molybdenum, Coors and Shwayder Camp.

The Upper Clear Creek Watershed Association (UCCWA) focused on two main areas in 2007. The first project was the formation of the Clear Creek Wastewater Study Group as a subcommittee of the Upper Clear Creek Watershed Association, with Clear Creek County administering the contract. The Study Group accumulated \$143,000 in funding from UCCWA members and the Colorado Department of Local Affairs (\$50,000) in order to do a Countywide Wastewater Utility Plan, an analysis of regionalization and consolidation alternatives, and individual Wastewater Utility Plans for each of the ten dischargers in Clear Creek County. As of December 31, 2007, the regionalization/consolidation alternatives analysis was completed and accepted and most of the Wastewater Utility Plans were completed and were in the process of gaining approval from each of the dischargers, UCCWA, and DRCOG. The Wastewater Utility Plans and regionalization/cooperation efforts are important for improving wastewater plant performance and effluent quality, which over time will reduce nutrient levels in Clear Creek.

Black Hawk/Central City Sanitation District

The Black Hawk/Central City Sanitation District plant incorporates full scale Biological Nutrient Removal (BNR) and filtration. During 2007 the plant experienced phosphorus levels well below 0.3 mg/l. The biosolids from this facility are being shipped to Leadville for a mined land reclamation project.

Central City

Central City continued the erosion control measures in 2007 on the Central City Parkway, including further rip rap work replacing hay bales and rock mitigation work. Erosion control measures were applied throughout the City, including cleaning out storm drainage facilities. Central City is working cooperatively with Black Hawk on the addition of drainage detention ponds at Russell Park. The City cooperated with CDPHE on the construction of storm drainage mitigation for Quartz Hill.

Central Clear Creek Sanitation District

AAA Operations tests monthly for BOD, TSS, FC, ammonia, flow and % capacity and reports that no effluent violations occurred during 2007. The District continues alum addition and controls sludge age to achieve biological nutrient removal.

City of Arvada

- *Public Education.* Arvada personnel worked with elementary students to place curb inlet markers that say "No Dumping, Drains To Creek". The students also distributed door hangers informing the residents of the storm inlet markers and of the importance of proper disposal of waste on storm water and streams. Career

days, festivals, the Cities “Nature Center”, water bill inserts, and other venues were used to distribute the non-point education message.

- *Erosion Control During Construction.* Since 1993 Arvada has had regulations concerning erosion and sediment control during construction. In 2007, the program was strengthened with the establishment of a Site Development Permit system for construction activities. The new program requires that any construction that disturbs more than 10,000 square feet of earth must apply for a Site Development Permit.
- *Permanent Stormwater Quality Control for New Development or Significant Redevelopment.* Arvada continues to enforce the requirements that the owner or developer of a new development or a significant redevelopment must provide and maintain reasonable structural best management practices for permanent stormwater quality control within the development.
- *Hazardous Substance Spills.* In 2007, Arvada responded to 40 calls reporting illicit discharges with two of these incidents within areas that drain to the Standley Lake tributaries. These incidents resulted in no impact on nearby waterways.
- *Public Education Activities.* Arvada continues to educate the public on illicit discharge prevention through presentations given to schools and other groups.
- *Household Hazardous Waste Disposal and Recycling.* Arvada is an active member of the Rooney Road Recycling Center, which provides a very effective program for recycling trees and shrubs and a safe disposal site for household hazardous wastes, including pesticides, herbicides, automotive products and electronic waste.

City of Black Hawk

In 2007, the City of Black Hawk completed the design for the Dory Hill Historic Tank and Vortex Separator Unit Project. Construction of the proposed project in early 2008 will enable raw water cleanup to levels suitable for treatment plant use during periods of turbid water conditions. The City also acquired water storage rights in Georgetown Lake and began improvements to the outlet works in liaison with the Town of Georgetown. When the improvements are completed, more wet water will be available to downstream water users.

City of Golden

- *Water Quality.* The sanitary sewer Inflow and Infiltration (I&I) mitigation program repaired or replaced 3900 linear feet of sewer line in Tucker Gulch. The Pretreatment Program established a general permitting program for mobile power washers. These permits will allow wastewater from washing operations that are prohibited by the stormwater program to be discharged to the sanitary sewer.

- *Stormwater Program.* The Stormwater Program continues its public education campaign by distributing educational materials and attending public events. The Maintenance Program installed sumped manholes at strategic locations to contain sand and sediments where they can be efficiently removed. It is estimated that this simple and low cost approach will prevent an additional 3,000 cubic yards of sediment and debris from entering Clear Creek each year.
- *Watershed /Other Activities.* The City's permanent monitoring and sampling site at CC-59, located above the City intake and the Church Ditch, successfully sampled nine storm events that occurred in the Clear Creek watershed during 2007. The CC-59 monitoring site is part of the cooperative monitoring program between upper and lower basin water users.

Clear Creek County

- The *Clear Creek Wastewater Study Group* met throughout 2007 in a continuing effort to facilitate the work of Richard P. Arber and Associates of Lakewood, Colorado in evaluating regional wastewater treatment options in the Upper Clear Creek Basin area of Clear Creek County.
- In December 2007, the Wastewater Alternatives Evaluation Report drafted by Arber and Associates was completed and approved by the Wastewater Study Group and the contracting entity, Clear Creek County. The report was distributed to over 25 cooperating partners. In addition, ten Wastewater Utility Plans (WUP) were drafted for wastewater dischargers located in the Upper Clear Creek Basin area. These WUPs were presented to their respective wastewater district boards for review and public hearing. Once approved by their wastewater district, each WUP will be reviewed by the Upper Clear Creek Watershed Association and transmitted to the Denver Regional Council of Governments (DRCOG) for adoption. The first of these ten WUPs, the Georgetown/Silver Plume Wastewater Utility Plan, was approved by DRCOG in December, 2007.
- In order to notify down-stream users of water from Clear Creek of any potential contamination from an upstream source, Clear Creek County maintains an *emergency call-down system* using the Emergency Preparedness Network. The Clear Creek County Office of Emergency Management Director continues to update and maintain the database for the call lists. This system applies to incidents/spills into Clear Creek and tributaries leading into Clear Creek.

Clear Creek High School

The high school uses a Zenon (MBR) membrane filtration plant that came on line in 2004. Alum continues to be added for nutrient removal. Alum addition and control of the sludge age continue to improve nutrient removal.

Clear Creek Watershed Foundation

In 2007, the Clear Creek Watershed Foundation (CCWF) focused primarily on research activities funded by their EPA Watershed Sustainability Grant. More than a year's worth

of research culminated in the final project report entitled “2007 Clear Creek Watershed Report: Exploring Watershed Sustainability”. This report establishes the existing conditions of the Clear Creek Watershed in terms of its physical, biological, and human dimensions; threats to cleaner water; opportunities for sustainable management of natural resources; and descriptions of more sustainable conditions. This report also examines the applicability of multi-attribute utility analyses, cost-benefit analyses, and discourse-based valuations to impact decision making in the realm of sustainable watershed management. A discourse-based evaluation by watershed stakeholders was then conducted to quantify overall threats and opportunities in the watershed. Those results were then applied specifically to 80 new projects in order to better define partnerships, funding, and implementation strategies. Subsequently, research/work was conducted by CCWF in the project areas of Alternative Energy & Transportation, Wastewater Treatment Alternatives, Custom Milling, the Clear Creek County Community Wildfire Protection Plan, and the 150th Anniversary of the Colorado Gold Rush.

The CCWF’s outreach/education efforts continued throughout 2007. In March the CCWF organized and hosted the Clear Creek Watershed Forum 2007: Leading the Way to Watershed Sustainability. At this forum, CCWF’s new website was unveiled.

Climax Molybdenum Company

In 2007, Henderson Mine upgraded their Storm Water Management Plan and new BMPs were installed. BMPs included sediment basins, rock silt fences, concrete barricades to control traffic flow, and new snow plowing procedures. The new BMPs have minimized the amount of road sand leaving the property. At the Urad Mine site, upgraded stormwater diversions around the upper and lower tailings impoundments in the Urad Valley greatly diminished the amount of clean snow melt entering the URAD water treatment plant. The diversions were installed in 2005 and 2006.

Colorado Department of Transportation

In 2007, the Colorado Department of Transportation (CDOT) continued its Highway Stormwater Monitoring project along I-70. This includes data on snowmelt and runoff events. CDOT is working with stakeholders on the I-70 Corridor PEIS, using the Collaborative Effort (CE) approach. Water quality impacts are among those being evaluated; mitigation will be identified in the PEIS for all significant impacts.

In late 2007, CDOT initiated a study of the water treatment plant at the Eisenhower-Johnson Memorial Tunnel. This effort will track water quality and quantity at the inflow and outflow areas. Although the WWTP at the tunnel treats a much smaller amount of waste since the Homeland Security closed the restrooms to the public, flow levels indicate a large influx of groundwater to the wastewater treatment area. In lieu of keeping the tunnel restrooms open to the public, CDOT supports such facilities at the Georgetown and Silverthorne Visitor Center.

Coors Brewing Company

In addition to continued stormwater efforts, water quality monitoring and habitat restoration funding, Coors Brewing Company completed construction of a floodplain control project to address the proposed, new 100 year flood plain mapping.

Georgetown

2007 saw the completion of a new Wastewater Utility Plan (WUP) for Georgetown's wastewater system. The WUP was completed as part of the Clear Creek Countywide Wastewater Utility Plan project wherein Arber Associates completed a regionalization and consolidation alternatives study and an individual WUP for each of the ten dischargers in Clear Creek County.

Gilpin County

Gilpin County continues programs requiring best management practices for erosion control, and enhanced individual sewage disposal systems in sensitive areas and areas with higher densities.

Idaho Springs

Idaho Springs' wastewater treatment plant continues to improve its effluent quality. 2007 marks the second year where there were no effluent discharge violations. Plant operations staff has elevated their certification levels through education and hands-on training and have been recognized for their efforts from the Colorado Rural Water Association. Ongoing preventative maintenance and process optimization has increased removal for ammonia, phosphorus and nitrate while reducing power consumption. Over the next two years the City will be completing capital improvement projects to the wastewater treatment plant.

Jefferson County

In 2007 Jefferson County continued its existing stormwater programs and initiated the post construction inspection program. This program allows the County to ensure long-term function and maintenance of permanent stormwater quality structures. A Notice of Intent (NOI) is required for land disturbance activities that disturb less than one acre. Applicants must submit a NOI detailing the erosion and sediment control BMPs for a small construction site. The plan is reviewed by Jefferson County staff followed by an inspection by a field inspector who is trained in erosion and sediment control.

Jefferson County also maintains an erosion and sediment control program as part of their MS4 permit. The county maintains a small-site erosion control manual that explains the basic principles of erosion control and illustrates techniques to control sediment from small development sites.

Shwayder Camp

Shwayder Camp enlisted the services of AquaWorks DBO to engineer a new wastewater treatment system and has chosen to install a Fluidyne SBR system that will be operated by AAA Operations. The new SBR treatment system was completed in 2007 and put

online. 2008 will be the first full year of operations of the new SBR treatment plant. Initial operations in 2007 showed very positive results.

Silver Plume

The Town of Silver Plume performed road improvements to reduce dust and sediment during the past year. Over 500 tons of gravel was laid on the street surfaces, significantly reducing exposure of the fine materials.

Superfund (CDPHE/EPA) Remediation Projects

CDPHE and EPA constructed the first phase of sediment control measures for the Nevada and Russell Gulches areas. This included construction of two sediment dams and erosion protection measures at five mine waste piles. Design for a second phase that would address a number of mine piles continued in 2007 with a summer 2008 construction target. CDPHE, EPA and the Black Hawk Central City Sanitation District teamed on constructing a mitigation wetland that is twice the size that the Sanitation District would have otherwise implemented. The wetland has been in place since July 2007 and a portion of North Clear Creek is routed through the wetland cells.

Tributary Basin Area

Tributary entities continue to work with ditch companies to prevent stormwater flows into the Standley Lake supply ditches. At the end of 2007, approximately 13,300 acres or 64% of the total Tributary Basin were separated and therefore no longer drain into canals and subsequently into Standley Lake.

The largest diversion effort was initiated on October 26, 2006 when the Cities of Arvada, Northglenn, Thornton, and Westminster signed an intergovernmental agreement with the Church Ditch Water Authority to divert storm water flows around Standley Lake. When completed, this effort will prevent 1,392 acres from draining into the Church Ditch, as well as diverting runoff from 2,604 acres that currently drain directly into Standley Lake. Construction of a new Church Ditch inlet structure began in 2007.

Site Specific Chlorophyll Standard

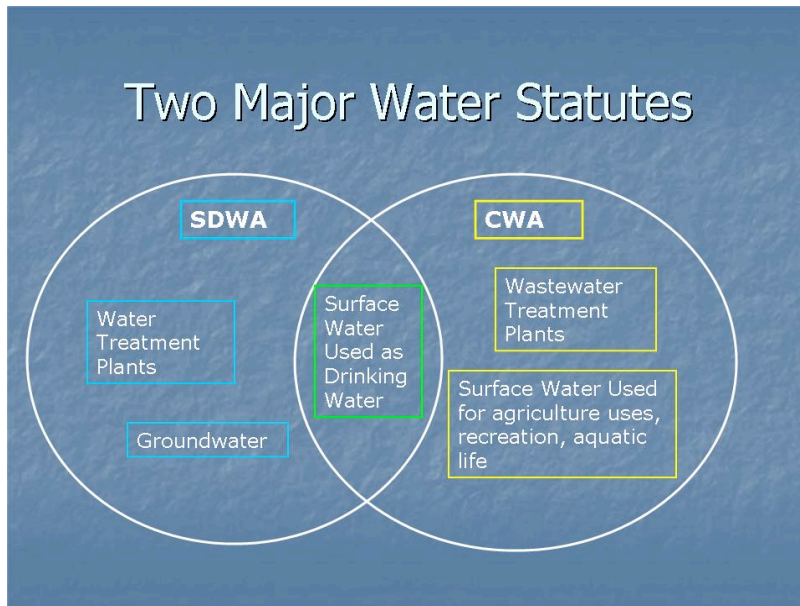
The Cities submitted a proposal in May of 2009 to the Water Quality Control Commission (WQCC) for a chlorophyll standard to protect the water quality of Standley Lake. The WQCC ruled on the proposal at the June, 2009 South Platte Basin Standards Rule Making Hearing and approved a chlorophyll standard of 4.0 ug/L with a permissible exceedance of an assessment threshold of 4.4 ug/L once every five years. The standard is based on the most recent 14 years of chlorophyll data collected by the Cities. Chlorophyll was selected as the control of choice due to uncertainties surrounding the direct response of algae to nutrients (phosphorus and nitrogen) and other factors that may affect this relationship. The Cities will continue to work on the relationship between chlorophyll and nutrients in an effort to dovetail with the state's Nutrient Standards Development effort.

The intent of the chlorophyll standard is to protect the current classified uses and status quo of the water quality in Standley Lake, in support of the lake's role as a direct drinking water supply, and in recognition of the significant efforts that have already been undertaken to protect water quality in the upper reaches of Clear Creek, in the basins that are tributary to the feeder canals, and in the tributary areas adjacent to Standley Lake.

Drinking Water Treatment

Extensive changes in drinking water regulations have occurred over the past 20 years. These changes make compliance with the requirements of the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA) much more difficult. Protection of source water quality is becoming increasingly critical in order to protect public health, avoid increased treatment costs, prevent aesthetic water quality problems such as taste and odor events, and to meet new regulatory standards.

Figure 2. Drinking Water Supplies and Federal Water Statutes



Disinfection of potable water supplies is critical in preventing waterborne disease. Unfortunately, when water is disinfected, undesirable disinfection byproducts are formed. A number of these compounds are known carcinogens, so it is imperative that these compounds are kept at low levels. Since higher concentrations of nutrients and algae in lakes and reservoirs can lead to higher levels of disinfection byproduct precursors in source water, improving control of pollution sources on a watershed basis is important to assure compliance with the new regulations.

High concentrations of algae can also create taste and odor compounds that are not readily treated or controlled with conventional water treatment. The resulting taste and odor problems are very apparent, often causing the public to question the quality and general safety of their drinking water.

It is axiomatic that clean and dependable water supplies are critical to providing safe, clean drinking water, and it is well known that treatment is not a substitute for good source water. The American Water Works Association (AWWA) strongly supports securing drinking water from the highest-quality sources available and protecting those sources to the maximum degree possible. Consequently, protecting water quality in reservoirs that are direct sources for drinking water should be a priority.

Drinking Water Supply Operation

Raw Water

Two intakes in Standley Lake deliver water to the Standley Lake Outlet Works. Water is delivered from the Outlet Works to the Cities' water treatment plants via several pipelines:

The City of Westminster procures water from the Outlet Works via 3 pipelines:

- a 42-inch steel pipeline to Westminster's Semper Water Treatment Facility (WTF), which was completed in 1985;
- a 36-inch prestressed concrete cylinder pipe (PCCP) pipeline to the Semper WTF, completed in 1973; and
- a 36-inch ductile iron (DIP) pipeline to the Northwest WTF, completed in 2002.

The Standley Lake Pump Station has two 125-horsepower pumps that can increase the water delivery through the 36-inch PCCP pipeline when water levels in Standley Lake are low.

The City of Northglenn's Standley Lake water flows by gravity through a 48 inch pipeline from the Outlet Works to a terminal raw water reservoir with a storage capacity of 40 million gallons. The terminal reservoir is located at the Northglenn WTF.

The City of Thornton's Standley Lake water flows through the 48 inch pipeline shared with the City of Northglenn, which bifurcates down to a 36" line and flows by gravity to the Thornton WTF.

Water Treatment

Each of the Cities operates one or more drinking water treatment facilities, with a total combined treatment capacity of 145 million gallons per day (MGD). The Cities' water treatment facilities are described below:

City of Westminster: The City of Westminster owns and operates two water treatment facilities, which provide a total maximum treatment capacity of 59 MGD.

- The Semper WTF was built in 1970 with the initial capacity to process 6 MGD of Standley Lake water. Facility upgrades in the 1970's and 1990's increased the processing capacity to 44 MGD. The Semper WTF is a conventional treatment

plant that uses layers of gravel, sand, and anthracite coal to filter the water before disinfection and distribution.

- The Northwest WTF was built in 2002 to add another 15 MGD of treatment capacity. The Northwest WTF is a membrane treatment plant. Micro-membrane fibers are used to filter the water before disinfection and distribution.

City of Northglenn: The City of Northglenn owns and operates one water treatment facility, built in 1980, which provides a maximum treatment capacity of 16 MGD of Standley Lake water. The Northglenn WTF is a conventional treatment plant, using layers of gravel, sand, and anthracite coal to filter the water before disinfection and distribution.

City of Thornton: The City of Thornton owns and operates two water treatment facilities, which provide a total maximum treatment capacity of 70 MGD.

- The Thornton WTF was built in the early 1950's and has a 20 MGD capacity. The City of Thornton treats an average of 8,000 to 10,000 acre feet of Standley Lake water per year at the Thornton WTF, which provides approximately 40% of the City's drinking water supply. This facility is typically utilized as a peaking plant in the summer months and provides 100% of Thornton's drinking water supply from November to April. The Thornton WTF is a conventional treatment plant, using layers of gravel, sand, and anthracite coal to filter the water, which is treated with ultraviolet disinfection before distribution.
- The Wes Brown WTF, which was opened in 1973 and completely refurbished in 1995, has a 50 MGD capacity. Approximately 3,000 to 4,000 acre feet of water are diverted annually from lower Clear Creek below the City of Golden and stored in the West Gravel Lakes for treatment at the Wes Brown WTF. The Wes Brown WTF is an ultra-filtration membrane plant. Micro-membrane fibers are used to filter the water, which is treated with ultraviolet disinfection before distribution.

Water Supply Demands/Analysis

The following demand estimates do not reflect non-potable demands supplied by the reclaimed water system, or by any other non-potable water system.

Westminster's current water demand is approximately 24,000 acre-feet per year. The City's water system can currently supply almost 30,000 acre-feet and additional supply will need to be developed to meet the future water demand of the City at build-out. Westminster's current and projected water demands were determined for a master planning study conducted by URS in 2006.

Northglenn's current water demand is approximately 5,400 acre-feet per year. The City's water system can currently supply almost 5,200 acre-feet and additional supply will need to be developed to meet the future water demand of the City at build-out. Northglenn's current and projected water demands were determined for a master planning study conducted by Camp Dresser and McKee Inc (CDM) in 2007.

Thornton’s current water demand is approximately 22,000 acre-feet per year. The City’s water system can currently supply about 28,000 acre-feet and additional supply will need to be developed to meet the future water demand of 44,000 acre-feet at build-out. Thornton has acquired nearly 60,000 acre-feet of water rights in northern Colorado but currently does not have the infrastructure to deliver that water to Thornton.

Table 3. Current and Future Water Demands for the Standley Lake Cities

Current and Future Water Demands (MGD) for the City of Westminster

Conditions	Minimum Day Demand	Average Day Demand (ADD)	Maximum Day Demand (MDD)	Maximum Hour Demand (MHD)
Current (2006)	9.86	16.96	39.66	61.47
Future (Build Out)	14.67	25.18	62.94	97.55

Current and Future Water Demands (MGD) for the City of Northglenn

Conditions	Minimum Day Demand	Average Day Demand (ADD)	Maximum Day Demand (MDD)	Maximum Hour Demand (MHD)
Current	2.5	4.6	12	20
Future (Build Out)	*	6.6	21.0	*

* Northglenn is essentially built out and is experiencing decreases in demand due, in part, to the City's water conservation efforts.

Current and Future Water Demands (MGD) for the City of Thornton

Conditions	Minimum Day Demand	Average Day Demand (ADD)	Maximum Day Demand (MDD)	Maximum Hour Demand (MHD)
Current	13	20	44	55
Future (Build Out)	24	40	87	157

The Standley Lake Cities recognize that accidental contamination of Standley Lake could potentially result in having to treat the contamination or abandon the water source if treatment proves to be ineffective or too costly. To understand the potential financial costs associated with such contamination, the City of Westminster evaluated what it might cost to replace Standley Lake, which is essentially the City’s only source of raw water. The evaluation did not attempt to estimate treatment costs, which can vary depending on the type of contaminants that need to be treated. A recent asset valuation report presented estimates of the current replacement value of Westminster’s water

system. The total value was approximately \$480,000,000. It is important to note that Standley Lake is also the only source of drinking water for the City of Northglenn and comprises a significant portion of the City of Thornton's supply. In the event of disruption of this supply, the Cities have developed contingency plans that are not included as part of this report.

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 Standley Lake/Clear Creek Watershed Steering Committee. As a result, the Steering Committee believes the development and implementation of a source water protection plan for Standley Lake and the Clear Creek Watershed will help to reduce the risks posed by potential contamination of this critically important water source.

SOURCE WATER ASSESSMENT RESULTS

The Colorado Department of Public Health and Environment (CDPHE) assumed the lead role in conducting the source water assessments for public water systems in Colorado. The Standley Lake Cities (the Cities) received their source water assessment reports in November, 2004 and they have reviewed the reports along with the Standley Lake/Clear Creek Watershed Steering Committee (the Steering Committee). The Cities and the Steering Committee have used these assessment results as a starting point to guide the development of appropriate protection measures to protect their source water from potential nutrient contamination.

Copies of the source water assessment summary reports for the Cities can be obtained by contacting the respective cities or by downloading a copy from CDPHE's SWAP program web site. The following sections provide a brief summary of the main findings from the three phases of the assessments.

Source Water Assessment Area Delineation

Surface Water Systems: The source water assessment (SWA) area for Standley Lake's surface water source is comprised of three distinct sub-basins: an approximately 525 square mile area draining the Upper Clear Creek Watershed; an area of approximately 6.5 square miles that contributes runoff to the Standley Lake feeder canals; and the relatively small area immediately surrounding Standley Lake. In order to test the validity of this SWA area delineation, CDPHE provided the Standley Lake Cities with draft maps of their SWA areas and asked them to voluntarily review and comment on their accuracy. The final SWA area delineations were provided to the Cities in November, 2004 as part of their individual Source Water Assessment Reports.

The Cities of Westminster and Northglenn rely on Standley Lake for 100% of their water supply year-round. Consequently, as illustrated in Exhibits 1 and 2, CDPHE established identical SWA areas for Westminster and Northglenn.

The City of Thornton relies on Standley Lake for 100% of its water supply from November to April each year, and to meet peak demands during the summer months. As

shown in Exhibit 3, the City of Thornton's SWA area originally delineated by CDPHE encompasses the areas contributing water to both of these sources.

After reviewing the SWA areas for each of the Cities, the Steering Committee has determined that the source water assessment area for Standley Lake (the Standley Lake SWA area) will be defined as all portions of the Westminster/Northglenn/Idaho Springs SWA areas that are located east of the Continental Divide. This area is illustrated in Exhibit 4.

Contaminant Source Inventory: In order to prepare the original SWA assessments, CDPHE conducted a contaminant source inventory to identify the presence or absence of potential sources of contamination within a given SWA area. CDPHE inventoried "discrete contaminant sources" in the SWA area using selected state and federal regulatory databases. Additionally, "dispersed contaminant sources" were inventoried using a limited selection of state regulatory databases and the most current land use/land cover and transportation maps available at the time of the assessment. CDPHE completed the contaminant inventories by mapping both discrete and dispersed potential contaminant sources with the aid of a Geographic Information System (GIS).

CDPHE provided each of the Standley Lake cities with a draft map of their SWA area and a summary of the potential contaminant sources within their SWA area. The Standley Lake Cities were asked to voluntarily review the inventory information, verify selected information about discrete contaminant sources, and to provide feedback on the accuracy of the inventory.

***Notice:** The information contained in this Plan is limited to that available from public records. Other potential contaminant sites or threats to the water supply may exist in the source water assessment area that are not identified in this Plan. Identification of a site as a potential contaminant site does not indicate that site will necessarily cause contamination of the water supply.*

As described in the Introduction to this report, this phase of Source Water Protection planning for the Standley Lake/Upper Clear Creek Watershed is focused on nutrient-related potential contaminant sources. The Steering Committee agrees that this focus is consistent with the scope of the Source Water Protection Planning Grant awarded to the Standley Lake Cities, which served as the impetus for initiating source water protection planning at this time. The Steering Committee recognizes that there are other potential sources of contamination identified within their SWA areas, some of which are highly concerning to stakeholders in the Upper Clear Creek Watershed and the Standley Lake Cities. Future efforts to address non-nutrient sources of contamination will be considered by the Steering Committee as resources become available. Consequently, the following analysis of contaminant source inventory results for the Standley Lake SWA is concerned primarily with nutrient-related sources of contamination, as defined by the Steering Committee.

Categories of Contaminants

Discrete Nutrient Sources

The contaminant source inventory results for the Standley Lake SWA area identified the following types of discrete contaminant sources (*italicized entries indicate nutrient-related contaminant sources*):

- *EPA Superfund Sites*
- *EPA Abandoned Contaminated Sites*
- EPA Hazardous Waste Generators
- EPA Chemical Inventory/Storage Sites
- EPA Toxic Release Inventory Sites
- *Permitted Wastewater Discharge Sites*
- Aboveground, Underground and Leaking Storage Tank Sites
- *Solid Waste Sites*
- *Existing/Abandoned Mine Sites*
- *Other Facilities*

Dispersed Nutrient Sources

The contaminant source inventory results for the Standley Lake SWA area identified the following types of dispersed contaminant sources (*the Steering Committee has determined that each of these sources may result in some degree of nutrient-related impacts*):

Land Use / Land Cover Types:

- *Commercial / Industrial / Transportation*
- *High Intensity Residential*
- *Low Intensity Residential*
- *Urban Recreational Grasses*
- *Quarries / Strip Mines / Gravel Pits*
- *Row Crops*
- *Fallow*
- *Pasture / Hay*
- *Deciduous Forest*
- *Evergreen Forest*
- *Mixed Forest*

Other Types:

- *Septic Systems*
- *Oil / Gas Wells*
- *Road Miles*

Prioritization Strategy and Susceptibility Analysis

The objective of this subsection is to describe the strategies used to identify the water sources and potential contaminant sources to which the community will apply source water protection measures under this Plan. Defining a strategy will help the Steering Committee focus their protection efforts on those water sources and potential contaminant sources with the greatest susceptibility concerns. CDPHE recommends a two-step strategy that prioritizes the water sources and potential contaminant sources using the results contained in the source water assessment (SWA) reports as a starting point, then supplementing the results with local knowledge.

The first step in this strategy is to prioritize water sources based on the highest total susceptibility and/or physical setting vulnerability ratings. CDPHE recommends prioritizing water sources using the total susceptibility and physical setting vulnerability results contained in Appendix A of the source water assessment reports.

The second step of CDPHE's strategy allows the option of prioritizing potential contaminant sources based on those that are (1) most prevalent, (2) most threatening*, or (3) most prevalent and threatening*. According to CDPHE's recommendations, contaminant sources should be prioritized using the individual susceptibility results contained in Appendix C of the source water assessment report. The following discussion describes the results achieved by applying this two step strategy to the Standley Lake SWA area.

*(*In order to better reflect the local perspective, the most "threatening" contaminant sources will be referred to as the most "concerning" contaminant sources throughout this report.)*

Water Source Prioritization

After reviewing the source water assessment results for the Standley Lake SWA area, the Steering Committee conducted the two-step process recommended by CDPHE to prioritize the water sources and the potential nutrient sources that will be addressed through voluntary source water protection measures.

The first step in the process calls for the prioritization of water sources with "total susceptibility" ratings or "physical setting vulnerability" ratings of Moderately High or High. A Moderately High or High total susceptibility rating indicates that the water source is more susceptible to potential contamination when compared to other similar water sources around the state. Higher total susceptibility ratings typically occur for water sources with highly vulnerable physical settings and a SWA area containing several potential contaminant sources.

A Moderately High or High "physical setting vulnerability" rating indicates that, when compared to other similar water sources in Colorado, the physical setting of the SWA area is less able to buffer contaminant concentrations in the source water and therefore the source water is more vulnerable to potential contamination. Even in cases where few potential contaminant sources are currently present, a water source with a highly

vulnerable physical setting may be highly susceptible to contamination by newly introduced contaminants in the future.

Table 4: Physical Setting Vulnerability and Total Susceptibility Scores and Ratings for Standley Lake

Water Source ID	CO0101170-003
Water Source Name	STANDLEY LAKE
Source Type	Surface Water
Physical Setting Score	44
Physical Setting Rating	Moderately Low
Total Susceptibility Score	82.3
Total Susceptibility Rating	High

As described earlier in this report, Standley Lake is the sole water source year-round for the Cities of Westminster and Northglenn, and the sole source for the City of Thornton during six months of the year. The disruption of this water source due to contamination would prevent these water systems from meeting their daily water demands, as described in the earlier subsection titled Water Supply Demands. For this reason, the stakeholders in the Upper Clear Creek Watershed and Standley Lake Cities are committed to establishing voluntary, sustainable protection measures that will maintain the water quality in Standley Lake over the long term.

Prioritizing Contaminant Sources

The second step of CDPHE’s prioritization process involves selecting one of three options for prioritizing discrete and dispersed potential contaminant sources that occur in the source water protection area. These three options would guide the prioritization of source water protection measures as follows:

1. Most prevalent contaminant sources. Under this option, protection measures would be focused on the discrete and dispersed contaminant sources that occur most frequently, regardless of the individual susceptibility ratings they may have received.
2. Most threatening contaminant sources. Under this option, protection measures would be focused on the individual discrete and dispersed contaminant sources to which the water source is most susceptible. The most threatening contaminant sources are defined as any potential contaminant source receiving a Moderately High or High individual susceptibility rating.

3. Most prevalent and threatening contaminant sources. Under this option, protection measures would be focused on the most frequently occurring discrete and dispersed contaminant sources that received a Moderately High or High individual susceptibility rating.

Having followed the recommended two-step strategy recommended by CDPHE, the Steering Committee recommends focusing source water protection measures on the Standley Lake source water assessment area, and plans to address the most concerning discrete nutrient-related contaminant sources and the most prevalent dispersed nutrient-related contaminant sources identified in this area. Potential contaminant sources were prioritized using the individual susceptibility results contained in Appendix C of the Standley Lake Cities' source water assessment reports. The Steering Committee provided local knowledge regarding the nutrient-related nature of each potential contaminant source, and appropriate source water protection measures were developed. The resulting management strategies are described in the following section titled *Source Water Protection Measures*.

Table 5 summarizes the relevant prioritization information for Standley Lake, and lists the potential nutrient-related contaminant sources according to the adopted priority strategy. It is the intent of the Steering Committee to further clarify the exact locations and the degree of risk associated with each of the contaminant sources listed as part of the ongoing implementation of this Plan.

Table 5. Source Water Protection Priority Strategy and Susceptibility Results*

SOURCE ID	CO0101170-003
Source Name	STANDLEY LAKE
Source Type	Surface Water
Total Susceptibility Rating	High
Physical Setting Vulnerability Rating	Moderately Low

MOST CONCERNING DISCRETE CONTAMINANT SOURCES

<i>EPA Superfund Sites</i>	2
<i>EPA Abandoned Contaminated Sites</i>	6
EPA Hazardous Waste Generators	21
EPA Chemical Inventory/Storage Sites	13
EPA Toxic Release Inventory Sites	9
<i>Permitted Wastewater Discharge Sites</i>	9
Aboveground, Underground and Leaking Storage Tank Sites	99
<i>Solid Waste Sites</i>	4
<i>Existing/Abandoned Mine Sites</i>	353
Confined Animal Feeding Operations	0
<i>Other Facilities</i>	48
TOTAL	564

MOST PREVALENT DISPERSED CONTAMINANT SOURCES

LAND USES	
<i>Commercial/Industrial/Transportation</i>	X
<i>High Intensity Residential</i>	X
<i>Low Intensity Residential</i>	X
<i>Urban Recreational Grasses</i>	X
<i>Quarries/Strip Mines/Gravel Pits</i>	X
<i>Row Crops</i>	X
<i>Fallow</i>	X
Small Grains	
<i>Pasture/Hay</i>	X
Orchards/Vineyards/Other	
<i>Deciduous Forest</i>	X
<i>Evergreen Forest</i>	X
<i>Mixed Forest</i>	X
OTHER TYPES	
<i>Septic Systems</i>	X
<i>Oil/Gas Wells</i>	X
<i>Road Miles</i>	X
TOTAL	14

(*italicized entries indicate nutrient-related contaminant sources)

Susceptibility Analysis

Notice: *The susceptibility analysis provides a screening-level evaluation of the likelihood that a potential contamination problem could occur. The analysis is not a reflection of the current quality of the untreated source water, nor is it a reflection of the quality of the treated drinking water that is supplied to the public.*

The susceptibility analysis summarized in the source water assessment reports was conducted by CDPHE to identify the susceptibility of an untreated water source to contamination from potential sources of contamination inventoried within its SWA area. The analysis looked at the susceptibility posed by individual potential contaminant sources and the collective or total susceptibility posed by all of the potential contaminant sources in the source water assessment area. CDPHE developed a susceptibility analysis model for surface water sources which provided an objective analysis based on the best available information at the time. CDPHE provided the results of this analysis and supporting information to the Standley Lake cities as part of their final SWA reports.

Table 5 presents the priority strategy and the susceptibility analysis results for Standley Lake. The table summarizes the total susceptibility and physical setting vulnerability results, and the individual susceptibility results for the discrete and dispersed contaminant sources associated with Standley Lake. As a starting point, Standley Lake has been prioritized based on the source water protection priority strategy recommended by the Steering Committee. The priority strategy was discussed previously in the section titled *Source Water Protection Priority Strategy and Susceptibility*.

The Steering Committee has determined that, while the susceptibility analysis model developed by CDPHE provided a reasonable broad-brush view of potential contaminant sources identified in the Standley Lake SWA area, there is clearly a need to further refine the analysis. The Steering Committee intends to develop the necessary refinements and incorporate the improved analysis results as part of the ongoing implementation of this Plan.

SOURCE WATER PROTECTION MEASURES

Source Water Protection Area Delineation

The “Standley Lake/Upper Clear Creek Source Water Protection Area” (Standley/Clear Creek SWP Area), is the area selected by the Standley Lake/Clear Creek Watershed Steering Committee (Steering Committee) for implementation of the voluntary source water protection measures described in this Plan.

In defining the Standley/Clear Creek SWP Area, the Steering Committee chose to adopt the “Standley Lake Source Water Assessment Area” described in the *Source Water Assessment Area Delineation* section of this report. The Steering Committee has defined the “Standley Lake Source Water Assessment Area” as all portions of the Westminster/Northglenn source water assessment area that are located east of the Continental Divide. This area is illustrated in Exhibit 4.

There are two distinct reasons for delineating the Standley/Clear Creek SWP Area in this fashion. First, the Standley Lake Source Water Assessment Area correlates directly with the Source Water Assessment Reports prepared by the Colorado Department of Public Health and Environment (CDPHE). This correlation provides a clear historical context for understanding the origins of the Standley Lake Cities' (the Cities') source water and potential sources of nutrient-related contamination. Second, this area encompasses the drainage basins and waterways that have been the focus of water quality protection efforts by the stakeholders in the Upper Clear Creek Watershed and the Cities since the 1980's. As a result, there is a wealth of data and information currently available, with additional sources of data and new reports becoming available on a regular basis. The Steering Committee is confident that these data gathering and reporting activities will continue, thanks in part to the robust cooperative and individual monitoring programs, the modeling efforts for Clear Creek Watershed and Standley Lake, and the strong commitments to programs such as the Call-Down System.

As shown in Exhibit 5, the Standley/Clear Creek SWP Area is comprised of three distinct sub-basins:

Upper Clear Creek Watershed: an area of approximately 525 square miles (336,000 acres) that drains the Upper Clear Creek Watershed;

Canal Basin: an area of approximately 6.5 square miles (4,200 acres), portions of which contribute runoff to the Standley Lake feeder canals; and

Standley Lake Basin: the relatively small area immediately surrounding Standley Lake.

It is important to address CDPHE's recommendation that water systems "at least consider an area 5 miles upstream of their intake as their source water protection area." As CDPHE points out in their source water protection guidance documents, this minimal area is consistent with the protection area allowed for municipalities in state statute [C.R.S §31-15-707(1)(b)]. Early on, the Steering Committee agreed that the Plan should take a watershed approach, which means that areas beyond this recommendation are included.

The Steering Committee also unanimously agreed that the Plan will rely entirely on voluntary, cooperative measures and that any regulatory efforts to enforce the measures described in this Plan are beyond the purview of the Steering Committee. It is important to note that the stakeholders in the Upper Clear Creek Watershed and the Cities have a long history of cooperation dating back to the signing of the 1993 Watershed Management Agreement. Based on this history, the Steering Committee fully expects stakeholders to continue working cooperatively to protect water quality by crafting the best possible blend of regulatory and voluntary approaches.

It is further recognized that planning is an iterative process and that future updates to the Plan will require continued commitment and ongoing participation in the process.

Management Strategies

The 2004 Source Water Assessment by CDPHE identified a number of discrete and dispersed contaminant sources that may exist in the Standley/Clear Creek SWP Area. Each of these sources of potential contamination is commonly associated with one or more “categories of contaminants”. For example, “Aboveground, Underground and Leaking Storage Tank Sites” are commonly associated with the presence of “Volatile Organic Compounds”. CDPHE can provide a detailed list of contaminants in each category and their sources. This Plan is concerned primarily with identifying and managing the effects of nutrient-related sources of contamination, as defined in Table 5. Efforts to address non-nutrient sources of contamination may be considered by the Steering Committee in the future as resources become available.

Source Water Protection Area

The Steering Committee intends to apply the following voluntary management strategies within the “Standley Lake/Upper Clear Creek Source Water Protection Area” (Standley/Clear Creek SWP Area). This area is illustrated in Exhibit 5.

Nutrient-Related Contaminant Sources

The Steering Committee chose a public health-based approach to categorizing the contaminants identified in the Standley/Clear Creek SWP Area. While this approach was driven mostly by the Cities’ concerns with secondary drinking water contaminants, the presence of “nutrient-related contaminants” can also prompt concerns about the possibility of acute and chronic health effects. These effects are categorized as follows:

Contaminants of acute health concern include individual contaminants and categories of constituents that pose the most serious, immediate health concerns resulting from short-term exposure to the constituent. This list includes several primary drinking water contaminants as set forth in the Safe Drinking Water Act (SDWA), many of which are classified as potential cancer-causing constituents or have a Maximum Contaminant Level Goal (MCLG) set at zero*.

Contaminants of chronic health concern include categories of constituents that pose potentially serious health concerns due to long-term exposure to the constituent. This list also includes several contaminants that are listed as primary drinking water contaminants.

Contaminants of aesthetic concern include the secondary drinking water contaminants, which do not usually pose serious health concerns in raw water supplies. These contaminants can cause taste and odor problems in treated drinking water and may serve as precursors to disinfection by-products, which are classified as potential cancer-causing constituents. Taste and odor events cause citizens to question the quality of their water and result in a lack of confidence in their public water supply.

(*These lists are periodically updated with the resultant addition of constituents and/or concentration adjustments.)

According to the information provided by CDPHE, which is tabulated in Exhibits 6 and 7, the following categories of contaminants are likely to be associated with the discrete and dispersed nutrient-related contaminant sources identified in Table 5.

Contaminants of Acute Health Concern:

- Microorganisms
- Nitrate/Nitrite
- Pesticides
- Semi-volatile organic compounds
- Volatile organic compounds
- Lead
- Ammonia or nitric acid

Contaminants of Chronic Health Concern:

- Herbicides
- Pesticides
- Volatile organic compounds
- Non-metal inorganic compounds
- Metals – Primary Drinking Water (other than lead)
- Radionuclides
- Turbidity
- Other inorganic compounds
- Other organic compounds

Contaminants of Aesthetic Concern:

- Secondary drinking water contaminants

Source Water Protection Priorities

The Steering Committee reviewed and discussed several voluntary protection measures (i.e., Best Management Practices, or BMPs) that could be implemented within the Standley/Clear Creek SWP Area to help reduce the risks associated with nutrient-related contamination of Standley Lake and the Upper Clear Creek Watershed. The Steering Committee is confident that cooperatively identifying and implementing these BMPs is a cost-effective and common sense approach. This is a strong ‘first step’ in minimizing the risks associated with all of the concerns listed above.

The Steering Committee established the following criteria for identifying and selecting the most feasible BMPs at the time of this report:

- preference for voluntary, non-regulatory approaches
- ability to reduce or prevent threats posed by a specific nutrient-related contaminant source
- likelihood of increased public awareness and participation
- resources needed for implementation
- potential for one or more stakeholders to take the lead

These criteria are influenced by a host of factors, including economic conditions, policy developments, environmental/climate conditions, and regulatory changes. Changes in any of these factors can improve the feasibility of some BMPs, while diminishing others.

The Steering Committee considered the BMPs listed in Exhibit 8 for possible implementation in the Standley/Clear Creek SWP Area and selected the “Call-Down System Enhancement” project as the most feasible project at this time. This project is scheduled for implementation during 2010 in accordance with the scope of work included as Exhibit 9.

With the exception of the “Call-Down System Enhancement” project, the order of BMPs listed in Exhibit 8 is not an indicator of priority or preference. The Steering Committee plans to update this list and review the feasibility of each project on an annual basis. Projects that meet a majority of the feasibility criteria during the annual update/review cycle will be considered for implementation.

Organizational Strategies

The Steering Committee recognizes that long-term viability of this Plan requires the ability to meet on a regular basis, conduct the activities described in this Plan and follow through on implementation of BMPs. In an effort to identify a viable organizational structure, the Steering Committee considered various entities already engaged in broad-scale water quality management in the Standley/Clear Creek SWP area. Among all the organizational structures discussed, the Clear Creek Watershed Management Agreement (Agreement) exhibits the strongest overlap with the features of this Plan.

As described in the *Water Supply Setting* section of this report, the 1993 Agreement resulted in adoption of a narrative standard for Standley Lake, formation of the Upper Clear Creek Watershed Association and increased cooperation among stakeholders in the Upper Clear Creek Watershed and the Cities. During the ensuing 17 years, the Agreement has resulted in increased water monitoring, voluntary wastewater treatment plant improvements, and the implementation of voluntary BMPs and stormwater permitting efforts in both the upper reaches of Clear Creek and within the Canal Basin.

With the adoption of a new site-specific chlorophyll standard for Standley Lake in 2009, the Steering Committee feels it is appropriate to update the Clear Creek Watershed Management Agreement to include the source water protection activities described in this Plan. By incorporating this Plan as part of an updated Agreement, participants can establish realistic criteria and expectations for source water protection activities and secure additional resources through the ongoing participation of the Steering Committee.

Once an ongoing organizational structure is established, the Steering Committee will prepare an annual report on the status of the Plan and the effectiveness of the BMPs in operation at the time of the report. The annual report will serve to update water system managers, consumers, and other interested parties on the effectiveness of the various BMPs and will describe any refinements necessary to achieve the intended outcomes. Copies of the annual report will be provided to all interested parties, and electronic

versions of the report will be available for download from the Plan's website (www.standleyswp.com) and from CDPHE's source water protection website (www.cdphe.state.co.us/wq/sw/swaphom.html).

The Steering Committee supports CDPHE's efforts to refine Colorado's Source Water Assessment and Protection (SWAP) program. More accurate spatial information, updated contaminant source inventories and more sensitive susceptibility analyses would all be welcome improvements. Refinements to these or other aspects of Colorado's SWAP program will be incorporated into the Plan at the discretion of the Steering Committee.

Pending Issues

The Steering Committee recognizes that source water protection is a dynamic process, with broad swings in the communities' readiness to address source water protection and in the feasibility of specific BMPs to address sources of potential contamination. As noted in the *Management Strategies* section of this report, the feasibility of addressing individual sources of contamination at any given time is affected by economic conditions, policy developments, environmental/climate conditions, and regulatory changes.

Recognizing the need for a Plan that is responsive to these factors, the Steering Committee has identified the following list of "pending issues". While these activities were beyond the scope of this initial planning process, they are vital to the success of the Plan.

The Steering Committee recommends addressing these issues in a work-plan format with clearly identified tasks, coupled with a sustainable funding strategy. This approach is meant to lay the groundwork for an effective process that becomes a vital component of land and water management activities in the Standley/Clear Creek Source Water Protection Area.

The Steering Committee recommends prioritizing the following tasks and implementing them in priority order during the initial phases of the work plan.

- Update the Clear Creek Watershed Management Agreement.
- Update past studies and initiate additional studies (e.g., Watershed Assessment, Regional Wastewater Treatment Study).
- Refine the Watershed Analysis Risk Management Framework (WARMF) and Standley Lake models. (e.g., improve understanding of nutrient dynamics in the Canal Basin, ground-truth assumptions for the Upper Clear Creek Watershed).
- Improve management of and access to water quality data managed by various entities.
- Participate in CDPHE's process to establish nutrient criteria for the South Platte Basin.

- Refine CDPHE's susceptibility analysis model for better applicability to the Standley/Clear Creek SWP Area. (e.g., overlay proximity zones onto WARMF sub-watersheds and re-evaluate assumptions).
- Clarify the exact locations and the degree of risk associated with each of the *nutrient-related* contaminant sources identified by CDPHE in the Standley/Clear Creek SWP Area.
- Distribute the Plan document and maps of the area to governments, agencies and interested stakeholders.