Greenhorn Valley
Source Water Protection Plan

Pueblo County, Colorado
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For the Community Water Providers:
Colorado City MD, PWSID# 151200
Town of Rye, PWSID# 151700

Cover photos: Top-left: Town of Rye surface water intake off the Greenhorn Creek; Top-right: Lake Beckwith in Colorado City, Colorado; Bottom-left: Greenhorn Creek Source Water Protection Planning Team; Bottom-right: Hicklin Ditch in Colorado City, Colorado

This Source Water Protection Plan for the water systems, Colorado City MD and the Town of Rye, was developed using the Colorado Rural Water Association's Source Water Protection Plan Template.

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ACRONYMS

BLM	Bureau of Land Management
BMP	Best Management Practice
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
COGCC	Colorado Oil and Gas Conservation Commission
CRWA	Colorado Rural Water Association
EPA	Environmental Protection Agency
GIS	Geographic Information System
MVUM	Motor Vehicle Use Map
NRCS	Natural Resources Conservation Service
PSOC	Potential Source of Contamination
SDWA	Safe Drinking Water Act
SWAA	Source Water Assessment Area
SWAP	Source Water Assessment and Protection
SWPA	Source Water Protection Area
SWPP	Source Water Protection Plan
TOT	Time of Travel
USDA	United States Department of Agriculture
USFS	United States Forest Service

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 implement to decrease 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 Colorado City MD and the Town of Rye (collectively known as the Greenhorn Valley) value a clean, high quality drinking water supply and decided to work collaboratively with each other area stakeholders to develop Source Water Protection Plan. The source water protection planning effort consisted of public planning meetings and individual meetings with water operators, government, and agency representatives during the months of June 2013 to February 2014, at the Colorado City MD office and the Town of Rye community center. During the development of this Plan, a Steering Committee was formed to develop and implement this Source Water Protection Plan. Colorado Rural Water Association was instrumental in this effort by providing technical assistance in the development of this Source Water Protection Plan.

Colorado City MD and the Town of Rye obtain their drinking water from surface water intakes off the Greenhorn Creek. In addition, Colorado City MD has five groundwater wells and one spring. The Source Water Protection Area for these water sources includes the Greenhorn Creek watershed from Colorado City MD's intake off Lake Beckwith and extends upstream approximately twelve miles to the Greenhorn Creek's headwaters on the peak of Greenhorn Mountain. It encompasses both private and public lands including the Town of Rye's town boundaries and US Forest system lands. This Source Water Protection Area is the area that the Greenhorn Valley has chosen to focus its source water protection measures to reduce source water susceptibility to contamination.

The Steering Committee conducted an inventory of potential contaminant sources and identified other issues of concern within the Source Water Protection Area. Through this process, it was determined that the highest priority potential contaminant sources and/or issues of concern are: Wildfires and Flood Events. Other noted water quality threats include: Residential Practices, Septic Systems, Terrorism/Vandalism, Municipal Practices, US Forest Land Use Activities, Prescribed Burns, State and County Road Maintenance, Spills/Accidents on Roadways, and Wildlife Activities.

The Steering Committee developed several best management practices that may help 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 list highlights best management practices which pertain to the highest priority potential contaminant sources and other issues of concern.

- Continue to participate on fire response for the Source Water Protection Area with the Rye Fire Protection District.
- Share a copy of the SWPP with Pueblo County Sheriff's Office, USFS, and Rye Fire Protection District. Encourage collaboration in reviewing fire prevention measures.
- Explore opportunities to work with private landowners for landscape scale fuel reduction and defensible space projects.
- Thin vegetation around drinking water intakes as a defensible space within Zone 1 of the SWPA in conjunction with private landowners.
- Participate in Pueblo County Natural Hazards Mitigation planning process.

The Steering Committee recognizes that the usefulness of this Source Water Protection Plan lies in its implementation and will begin 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 three – five years or if circumstances change resulting in the development of new water sources and source water protection areas, or if new risks are identified.

INTRODUCTION

The Town of Rye and Colorado City MD operate community water supply systems that supplies drinking water to residents located within Pueblo County, Colorado. The Town of Rye obtains their drinking water from one surface water intake off the Greenhorn Creek in the Greenhorn Creek watershed. Colorado City MD obtains their drinking water from six wells, one spring, and one surface water intake off the Greenhorn Creek via the Hicklin Ditch to Lake Beckwith in the Greenhorn Creek watershed. The Town of Rye and Colorado City MD recognize the potential for contamination of the sources of their drinking water, and realize that it is necessary to develop a protection plan to prevent the contamination of this valuable resource. The Colorado City MD and the Town of Rye (collectively known as the Greenhorn Valley) decided to work collaboratively with each other area stakeholders to develop their Source Water Protection Plan. Proactive planning and implementing contamination prevention strategies are essential to protect the long-term integrity of their water supply and to limit their costs and liabilities.[1]

Table 1: Primary Contact Information for water systems within the Greenhorn Valley

PWSID	PWS Name	Name	Title	Address	Phone	Website
CO0151200	Colorado City MD	David Valdez	District Manager	P.O. Box 20229, Colorado City, CO 81019	719-676-3396	http://www.colorado.gov/coloradocitymetro
CO0151700	Town of Rye	Terry Mabrey	Mayor	PO Box 236 Rye, CO 81069	719-489-2011	N/A

Purpose of the Source Water Protection Plan

The Source Water Protection Plan (SWPP) is a tool for the Town of Rye and Colorado City MD 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 management practices to protect and enhance the drinking water supply;

[1] The information contained in this Plan is limited to that available from public records and the Colorado City MD and the Town of Rye 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.

- 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.

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 rural and small communities served by public water systems to reduce or eliminate the potential risks to drinking water supplies through the development of Source Water Protection Plans, and provide assistance for the implementation of prevention measures.

The source water protection planning effort consisted of a series of public planning meetings and individual meetings. Information discussed at the meetings helped the Town of Rye and Colorado City MD develop an understanding of the issues affecting source water protection for the community. The Steering Committee then made recommendations for management approaches 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

Date	Purpose of Meeting
June 13, 2013	First Planning Meeting - Presentation on the process of developing a Source Water Protection Plan for the Greenhorn Valley. Review of the State's Source Water Assessment for Colorado City MD and the Town of Rye.
July 25, 2013	Field tour of Colorado City MD water system. Second Planning Meeting – Review delineation of Source Water Protection Area. Begin discussion of potential sources of contamination and other issues of concern.
August 1, 2013	Field tour of the Town of Rye water system.
August 22, 2013	Third Planning Meeting – Discussion of potential sources of contamination and other issues of concern within the Source Water Protection Area. Presentations from US Forest Service, Pueblo County Public Works Department, and Pueblo City-County Health Department.
September 25, 2013	Fourth Planning Meeting – Develop a priority strategy for potential sources of contamination and other issues of concern within the Source Water Protection Area.
October 16, 2013	Fifth Planning Meeting – Develop Best Management Practices
January 29, 2014	Sixth Planning Meeting – Review and finalize SWPP; develop Action Plan for BMP implementation

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 where local stakeholders have actively participated in the development of their Protection Plan.

The Greenhorn Valley source water protection planning process attracted interest and participation from 32 stakeholders including local citizens and landowners, water operators, local and state governments, and agency representatives. During the months of June 2013 through January 2014, six stakeholder meetings were held in Rye, Colorado and Colorado City, Colorado to encourage local stakeholder participation in the planning process. Stakeholders were notified of meetings via letters, emails, and phone calls. Input from these participants was greatly appreciated.

Steering Committee

During the development of this Plan, a volunteer Steering Committee was formed from the stakeholder group to develop and implement this Source Water Protection Plan. Specifically, the Steering Committee's role in the source water protection planning process was to advise the Greenhorn Valley in the identification and prioritization of potential contaminant sources as well as management approaches that can be voluntarily implemented to reduce the risks of potential contamination of the untreated source water. All members attended at least one Steering Committee meeting and contributed to planning efforts from their areas of experience and expertise. Their representation provided diversity and led to a thorough Source Water Protection Plan. The Greenhorn Valley and the Colorado Rural Water Association are very appreciative of the participation and expert input from the following participants.

Figure 1: Stakeholders touring Colorado City MD's water system

Table 3: Stakeholders and Steering Committee Members

Stakeholder	Title	Affiliation	Steering Committee Member
Terry Mabrey	Rye Town Mayor	Town of Rye	X
Susanna Anderson	Town Clerk	Town of Rye	X
Ralph Atkins	Trustee	Town of Rye	
Bill Clark	Trustee	Town of Rye	X
Ron Cockrell	Trustee	Town of Rye	
Dick Greet	Trustee	Town of Rye	X
Mickey Smith	Trustee	Town of Rye	
David Valdez	District Manager	Colorado City MD	X
Jacque Wachob	Board Member	Colorado City MD	
Greg Bailey	Public Works Director	Colorado City MD	X
Susan Kalman	Board Member	Colorado City MD	
Terry Milsom	Board Member	Colorado City MD	
Gary Golladay	Operator in Responsible Charge	Colorado City MD	
Steve Bennett	Fire Chief	Rye Fire Protection District	
Paul Crespin	San Carlos District Ranger	US Forest Service	
Dave Park	Hydrologist	Us Forest Service	
Karen Ashcraft	Office of Emergency Management Coordinator	Pueblo County	
Pat Coffee	General Services Engineer	Pueblo County Public Works	
Chad Wolgram	Program Manager	Pueblo City-County Health Department	
Danny Golob	Member	Preseren Glee Club	
Rich Hustede	Citizen	Colorado City MD	
Lewis Sadler	Citizen	Colorado City MD	
John Mlinar	Citizen	Colorado City MD	
William Ellis	Citizen	Colorado City MD	
Dave Houghton	Citizen	Colorado City MD	
Leroy Wenzl	Citizen	Colorado City MD	
Theo Kalman	Citizen	Town of Rye	
Elizabeth McGee	Citizen	Town of Rye	
Terry McGee	Citizen	Town of Rye	
Cathy Clark	Property Owner	Greenhorn Valley	
Bob Cook	Property Owner	Greenhorn Valley	

Development and Implementation Grant

Both the Colorado City MD and the Town of Rye have been awarded a $5,000 Development and Implementation Grant from the Colorado Department of Public Health and Environment (CDPHE). 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 Town of Rye was approved for this grant in December, 2012, and it expires on November 30, 2014. Colorado City MD was approved for the grant in July, 2013, and it expires on June 4, 2015. The Greenhorn Valley intends on using the funds to implement management approaches that are identified in this Plan.

WATER SUPPLY SETTING

Location and Description

The Greenhorn Valley consists of the Town of Rye and the Colorado City MD and is located in the southwestern corner of Pueblo County approximately 20 miles south of the City of Pueblo. Primary access to the area is through Colorado State Highway 165 via Interstate 25. The Town of Rye serves approximately 160 residents and two schools with approximately 600 students, and the Colorado City MD serves approximately 2100 residents and one school with approximately 250 students. Future projections by the Greenhorn Valley estimate that growth will increase over the next ten years.

The Town of Rye is a statutory town and was established in 1937. Municipal affairs are governed by the Rye Board of Trustees. Colorado City MD is a special district and municipal affairs are governed by its Board of Directors. Tourism is an important resource for the Greenhorn Valley. Camping and hiking are available in the national forest along Colorado 165, and the area provides access to popular hiking areas such as Bartlett, Camp Crockett and the San Carlos trails. (Greenhorn Valley Chamber of Commerce, 2012).

The majority of Greenhorn Valley's source waters lie within both public and private lands. The private land includes Rye Town Boundaries, the Colorado City District boundaries and unincorporated areas of Pueblo County. The public lands include San Isabel National Forest Lands, managed by the San Carlos Ranger District.

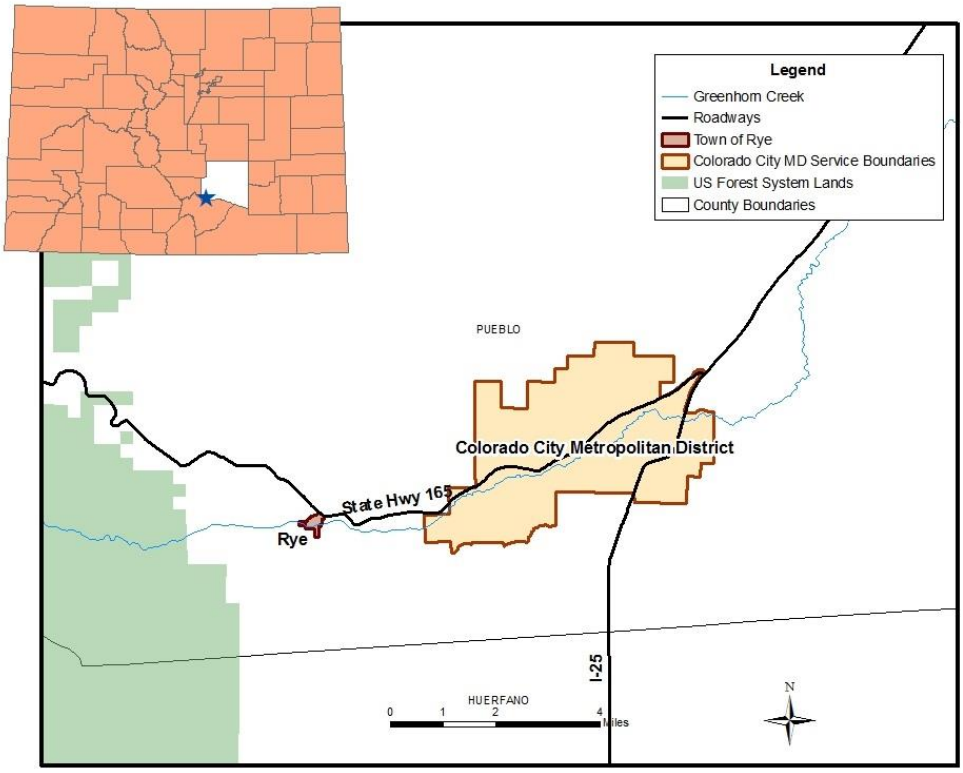

Figure 2: Locations of the Town of Rye and Colorado City MD in Pueblo County, Colorado

Physical Characteristics

The Greenhorn Valley lies in the Southern Rocky Mountain Foothills. The topography of the source water area is mountainous, with elevations ranging from 6,100 to 11,400 feet above sea level. The soil temperature regime of the area ranges from mesic[2] to frigid[3]. Annual precipitation ranges from about 16 inches to 28 inches. Characteristic native vegetation ranges from grasslands and shrubs to ponderosa pine and Rocky Mountain Douglas fir (United States Department of Agriculture, August 2007).

It lies in the very western edge of the Colorado Piedmont section of the Great Plains Physiographic Province that encompasses approximately 40% of the state. The Great Plains are characterized predominantly by sedimentary rocks. Underlying bedrock consists primarily of the Cretaceous age Foxhills Sandstone and Pierre Shale that gently dips to the east (Topper, Spray, Bellis, Hamilton, & Barkmann, 2003).

Soils in the region of the Greenhorn Creek watershed are comprised of Larkson Stony Loam with slopes of five to twenty percent, Pinata-Wetmore Association, Wetmore-Mortenson Association and Merino Family-Rock Outcrop Complex with slopes of forty to 150 percent.

Hydrologic Setting

Greenhorn Creek is the principal source of drinking water for the Greenhorn Valley. The Greenhorn Creek watershed (HUC 1102000208) drains approximately 202 square miles (129,28028,432 acres) and is part of Upper Arkansas River watershed basin (Hydrologic Unit Code (HUC) 11020002), tributary to the Arkansas River. The headwaters of Greenhorn Creek originate approximately 7.5 miles west of the Town of Rye, within U.S. Forest System lands, and receive flow from high mountain snowmelt. Greenhorn Creek flows into the St. Charles River approximately 19 miles northwest of the Greenhorn Valley, which joins the Arkansas River approximately 12 miles farther downstream. The Arkansas River Basin is part of Colorado Water Division Two with the office of the Division Engineer in Pueblo, Colorado.

In addition to the Greenhorn Creek, the Colorado City MD also obtains drinking water from six wells drilled into an unnamed aquifer. Colorado City MD has not petitioned the Water Quality Control Commission for the establishment of a classified ground water area and associated site-specific ground water quality standards for its ground water intakes.

[2] A mesic soil temperature regime is defined as the mean annual soil temperature being eight degrees Celsius or higher but lower than 15degree Celsius, and the difference between mean summer and mean winter soil temperatures being more than six degree Celsius either at a depth of 50 centimeters from the soil surface or at a densic, lithic, or paralithic contact, whichever is shallower.

[3] A frigid soil temperature regime is defined as having mean annual soil temperatures of greater than zero degrees Celsius, but less than eight degrees Celsius, with a difference between mean summer and mean winter soil temperatures greater than five degrees Celsius at 50 centimeters below the surface, and warm summer temperatures.

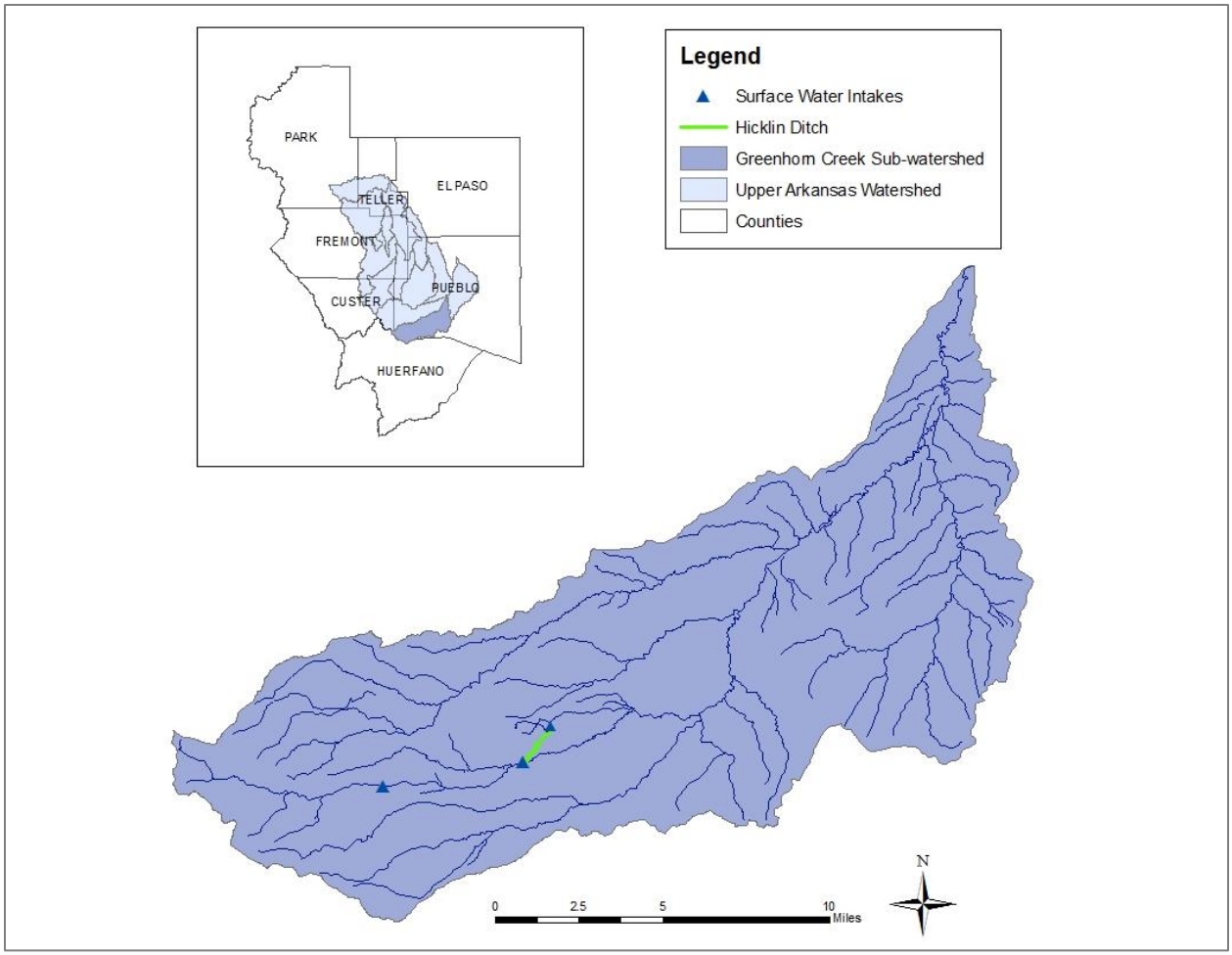

Figure 3: Greenhorn Creek sub-watershed within the Upper Arkansas Watershed

Water Quality Standards

Under the Clean Water Act, every state must adopt water quality standards to protect, maintain and improve the quality of the nation's surface waters. The CDPHE's Water Quality Control Commission 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 (Table 4). Standards are designed to protect the associated classified uses of the streams (Designated Use). Stream classifications can only be downgraded if it can be demonstrated that the existing use classification is not presently being attained and cannot be attained within a twenty year time period (Colorado Department of Public Health and Environment , 2013). A Use Attainability Analysis must be performed to justify the downgrade.

Table 4: Stream segments within the Greenhorn Creek Watershed and their Designated Uses and Impairment Status

Waterbody Name	Waterbody ID	Location	Designated Use	Status
Greenhorn Creek w/ tributaries	COARMA07_2400	HUC: 11020002	Agriculture Aquatic Life Cold Water-Class 1 Domestic Water Source Recreation Primary Contact	Good

Source: (U.S. Environmental Protection Agency, 2013)

Groundwater Protection

Groundwater protection is managed as two separate issues of quantity and quality in Colorado. Quantity issues are managed through the Colorado Division of Water Resources/Office of the State Engineer. The Division of Water Resources administers and enforces all surface and groundwater rights throughout the State of Colorado, issues water well permits, approves construction and repair of dams, and enforces interstate compacts. The Division of Water Resources is also the agency responsible for implementing and enforcing the statutes of the Groundwater Management Act passed by the Legislature as well as implementing applicable rules and policies adopted by the Colorado Groundwater Commission and the State Board of Examiners of Water Well Construction and Pump Installation Contractors.

The CDPHE's Colorado Water Quality Control Commission is responsible for promulgating groundwater and surface water classifications and standards. Colorado's Water Quality Control Commission has established basic standards for groundwater regulations that apply a framework for groundwater classifications and water quality standards for all waters within their jurisdictions. Standards are designed to protect the associated classified uses of water or a designated use. The groundwater classifications are applied to groundwaters within a specified area based upon use, quality and other information as indicated in the CDPHE Water Quality Control Commission's Regulation No. 41, "The Basic Standards for Ground Water." Statewide standards have been adopted for organic chemicals and radionuclides. Significant areas of the state have been classified for site specific use classification and the remainder of the state's groundwater is protected by interim narrative standards.

Classifications and standards are implemented by seven separate state agencies through their rules and regulations for activities that they regulate. Regulated activities include mining and reclamation, oil and gas production, petroleum storage tanks, agriculture, Superfund sites, hazardous waste generation and disposal, solid waste disposal, industrial and domestic wastewater discharges, well construction and pump installation, and water transfers.

Colorado has proactive groundwater protection programs that include monitoring groundwater for agricultural chemicals and pesticides, issuing groundwater discharge permits; voluntary cleanup program, permitting for large hog farm operations, and educational programs. In addition, water wells must have a permit and meet minimum standards of construction and pump installation.

Town of Rye Drinking Water Supply Operations

Town of Rye Water Supply and Infrastructure

The Town of Rye's source water supply comes entirely from the Greenhorn Creek. The Greenhorn Creek intake is located on private property off Heller Lane, approximately a half mile upstream from the Town boundaries.

At the intake, a small settling pond is constructed on the creek, and the overflow spills onto a small gravel pit that acts as a primary filter. A series of perforated pipes then collects the water and diverts it to a four foot deep settling tank approximately 50 feet from the creek. The raw water is then delivered to the water treatment via underground pipeline consisting of four inch cast iron and PVC pipes. There are plans to convert the entire pipeline network to PVC within the next few months. At the treatment plant, chlorine is used for disinfection and chlorine contact time (CT) is calculated each day to ensure that regulations for disinfection are met.

Once the water is treated, it is piped to three different storage tanks before final delivery to the Town of Rye tap holders. Two storage tanks are underground and one is above ground. Each storage tank has the capacity to store 50,000 gallons of water.

Figure 4: (Left to Right) Town of Rye Surface Water Diversion; Settling Tank; and Treatment Facility off the Greenhorn Creek

Town of Rye Water Supply Demand Analysis

The Town of Rye serves an estimated 100 connections and approximately 160 residents and other users in the service area annually. The water system currently has the capacity to produce 75,000 gallons per day. Current estimates by the water system indicate that the average daily demand is approximately 34,000 gallons per day, and that the average peak daily demand is approximately 50,000 gallons per day. Using these estimates, the water system has

a surplus average daily demand capacity of approximately 40,000 gallons per day and a surplus average peak daily demand capacity of 25,000 gallons per day.

Using the surplus estimates above, the Town of Rye has evaluated its ability to meet the average daily demand and the average peak daily demand of its customers in the event the water supply from one or more of its water sources becomes disabled for an extended period of time due to potential contamination. The evaluation indicated that the Town of Rye may not be able to meet the average daily demand of its customers if as few as one water source of the water sources became disabled for an extended period of time. The evaluation also indicated that the Town of Rye may not be able to meet the average peak daily demand of its customers if as few as one water source of the water sources became disabled for an extended period of time. The ability of the Town of Rye 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(s) 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 the Town of Rye the surrounding community can help to reduce the risks posed by potential contamination of its water source(s). Additionally, the Town of Rye has developed an emergency response plan or contingency plan to coordinate rapid and effective response to any emergency incident that threatens or disrupts the community water supply.

Colorado City MD Drinking Water Supply Operations

Colorado City MD Water Supply and Infrastructure

The majority of Colorado City MD's source water supply is from a surface water intake off the Greenhorn Creek via the Hicklin Ditch to Lake Beckwith. In addition, they also have one spring, the Cold Spring, which serves properties that lie upstream from the surface water intake and five groundwater intakes that serve as backup wells. The Hicklin Diversion is located off Beverly Drive. The wells are located above Lake Beckwith, and the Cold Spring is located upstream from the Hicklin Diversion approximately 2319 feet.

Water from the Cold Spring is diverted to the Cold Spring Treatment Plant, which was upgraded in 2009 and treats water via ultraviolet for disinfection. The water treated at the Cold Spring Treatment Plant is then stored in a 3,000,000 gallon above ground storage tank and provides water to properties above the surface water intake.

Raw water diverted from the Greenhorn Creek via the Hicklin Ditch and the groundwater wells is stored in Lake Beckwith, which is operated in conjunction with Colorado City MD and the Colorado Division of Wildlife. Lake Beckwith has a storage capacity of approximately 1033 acre-foot and is used for domestic use as well as non-motorized recreational activity. Raw water is then diverted to their second water treatment plant, where water is treated with chlorine for disinfection. The treatment plant has the capacity to treat 1200 gallons/minute. The treated

water is then stored in three aboveground storage tanks, which have a combined storage capacity of 3,520,000 gallons, prior to distribution.

Colorado City MD Water Supply Demand Analysis

The Colorado City MD serves an estimated 1005 connections and approximately 2500 residents and other users in the service area annually. The water system currently has the capacity to produce 2.304 million gallons per day. Current estimates by the water system indicate that the average daily demand is approximately 307,531 gallons per day, and that the average peak daily demand is approximately 482,824 gallons per day. Using these estimates, the water system has a surplus average daily demand capacity of 1,996,465 gallons per day and a surplus average peak daily demand capacity of 1,821,126 gallons per day.

Using the surplus estimates above, Colorado City MD has evaluated its ability to meet the average daily demand and the average peak daily demand of its customers in the event the water supply from one or more of its water sources becomes disabled for an extended period of time due to potential contamination. The evaluation indicated that Colorado City MD may not be able to meet the average daily demand of its customers if as few as two of the water sources became disabled for an extended period of time. The evaluation also indicated that Colorado City MD may not be able to meet the average peak daily demand of its customers if as few as two of the water sources became disabled for an extended period of time. The ability of Colorado City MD 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(s) becomes disabled.

Colorado City MD recognizes that potential contamination of its ground water source(s) could potentially result in having to treat the ground water and/or abandon the water source if treatment proves to be ineffective or too costly. To understand the potential financial costs associated with such an accident, Colorado City MD evaluated what it might cost to replace one of its water sources (i.e., replacement of the intake structure and the associated infrastructure) if this occurs. The evaluation did not attempt to estimate treatment costs, which can be variable depending on the type of contaminant(s) that need(s) to be treated. The evaluation indicated that it could cost approximately $30,000.00 in today's dollars to replace one of its water sources.


Figure 5: (Left to Right) Colorado City MD's Hicklin Diversion off the Greenhorn Creek; Cold Springs Water Treatment Plant; and Lake Beckwith

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 (CDPHE), assumed the responsibility of developing Colorado's SWAP program. The SWAP program protection plan is integrated with the Colorado Wellhead Protection Program that was established in amendments made to the federal Safe Drinking Water Act in 1996 (EPA Office of Ground Water and Drinking Water, 1996).

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 6, respectively.

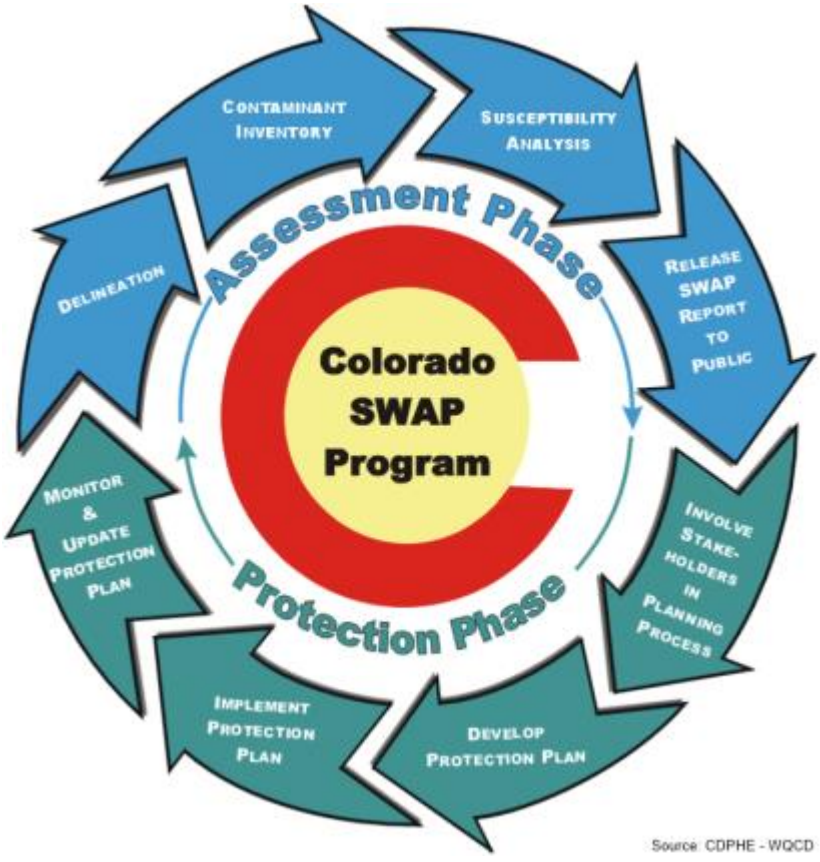

Figure 6: Source Water Assessment and Protection Phases

Source Water Assessment Phase

The Assessment Phase for all public water systems consists 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.

The Assessment Phase involves understanding where the Town of Rye and Colorado City MD's source water comes from, what contaminant sources potentially threaten the water sources, 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. 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 voluntary, 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 6, 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 as indicated in Figure 6. 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.

SOURCE WATER PROTECTION PLAN DEVELOPMENT

Source Water Assessment Report Review

The Town of Rye and Colorado City MD have reviewed the Source Water Assessment Reports along with the Steering Committee. These Assessment results were used as a starting point to guide the development of appropriate management approaches to protect the source waters from potential contamination. A copy of the Source Water Assessment Report for the Town of Rye and Colorado City MD can be obtained by contacting their offices or by downloading a copy from the CDPHE's SWAP program website located at: http://www.colorado.gov/cs/Satellite/CDPHE-WQ/CBON/1251596793639.

Defining the Source Water Protection Area

A source water protection area is the surface and subsurface areas from 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 Town of Rye's and Colorado City MD's Source Water Assessment Reports provide 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 Area for each of the Town of Rye's and Colorado City MD's sources, the Steering Committee chose to accept it as their Greenhorn Valley Source Water Protection Area for this Source Water Protection Plan.

The Greenhorn Valley's Source Water Protection Area is defined as:

1. **Zone 1** is defined as a 1,000 foot wide band on either side of the Greenhorn Creek drainage network.

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

3. **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.

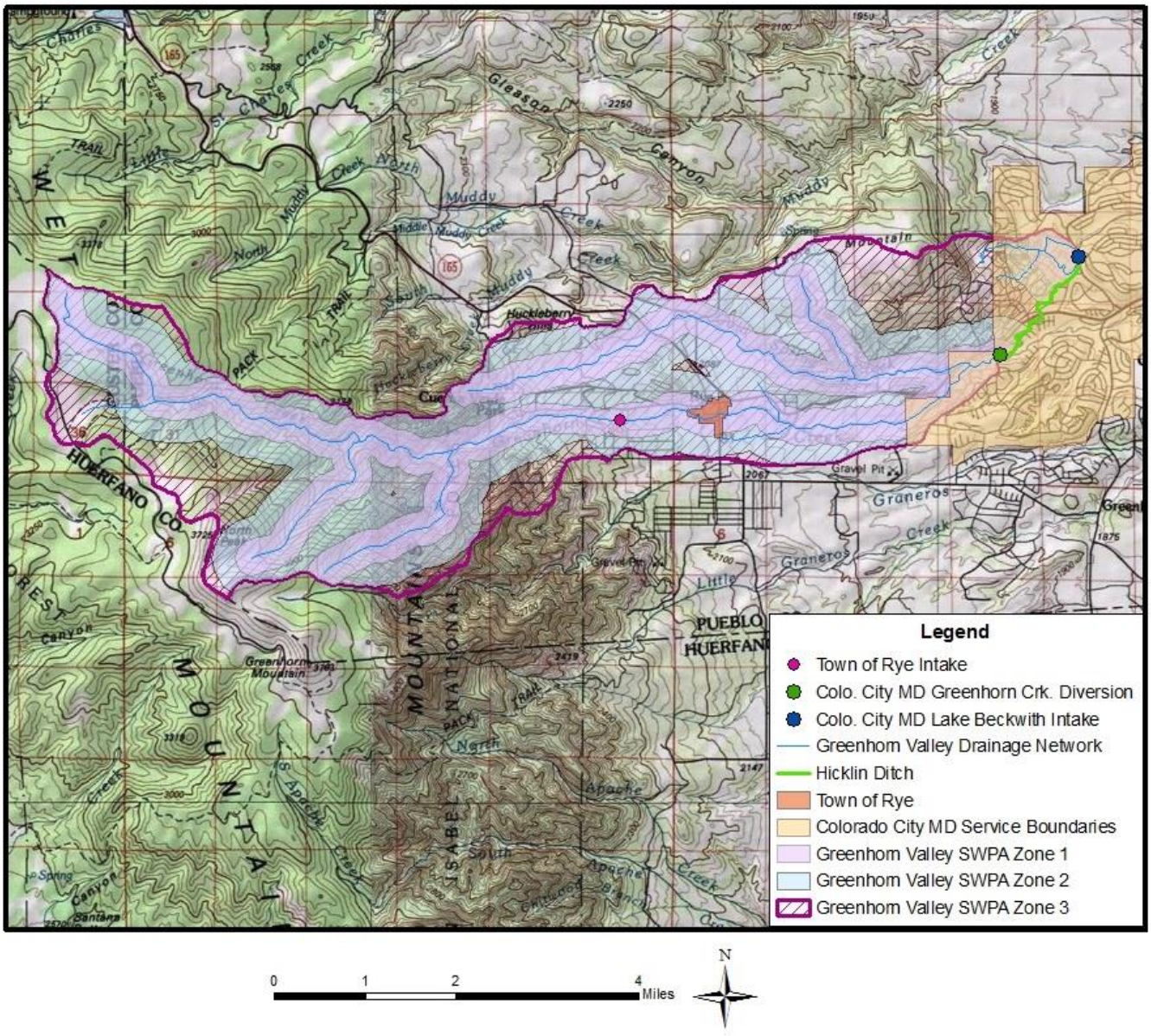

Figure 7: Topographic map of the Greenhorn Creek Source Water Protection Area

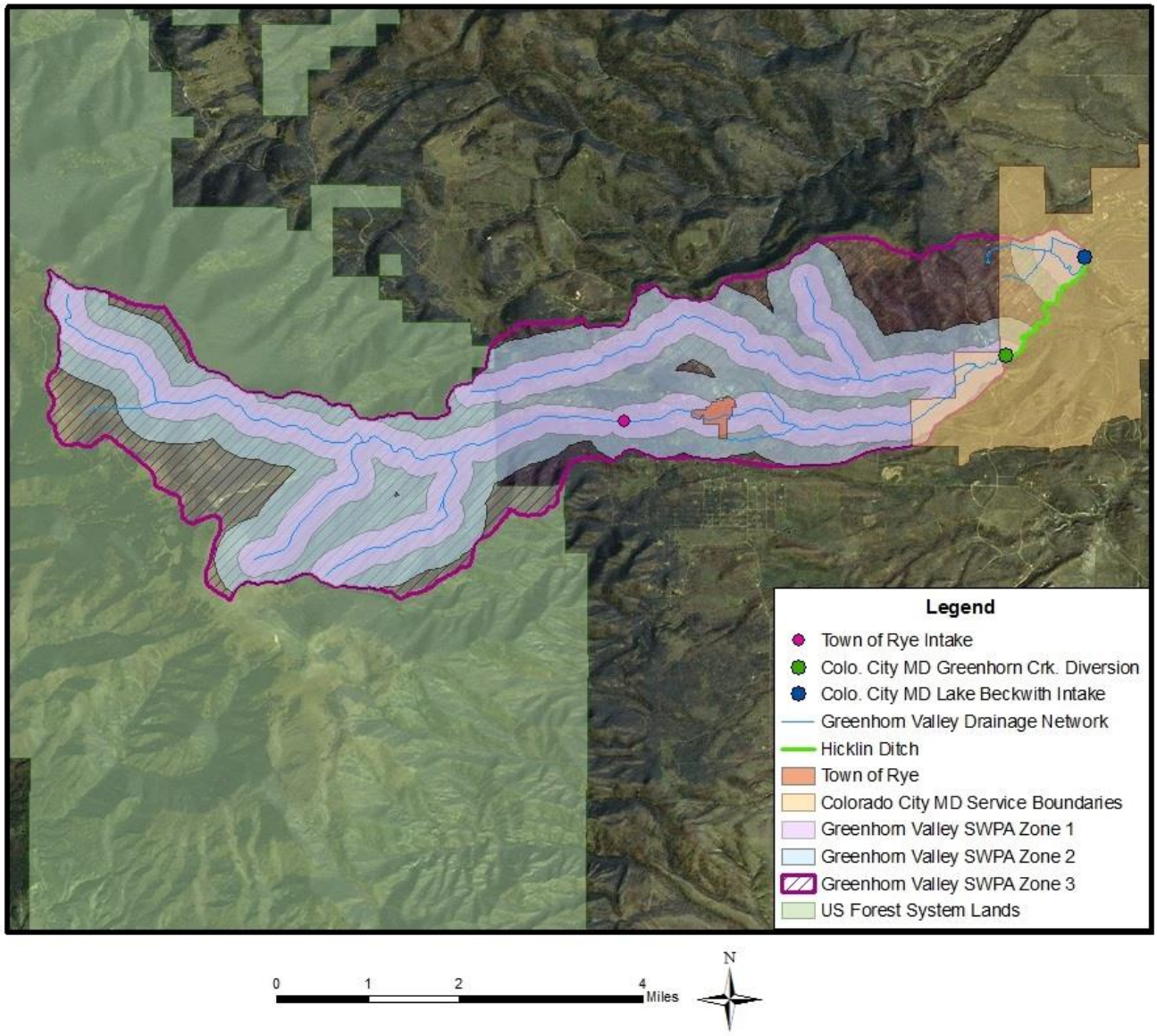

Figure 8: Greenhorn Creek Source Water Protection Area

Potential Contaminant Source Inventory and Other Issues of Concern

Many types of land uses have the potential to contaminate source waters: spills from tanks, trucks, and railcars; leaks from buried containers; failed septic systems, buried or injection of wastes underground, use of fertilizers, pesticides, and herbicides, road salting, as well as urban and agricultural runoff. While catastrophic contaminant spills or releases can wipe out a water resource, groundwater degradation can result from a plethora of small releases of harmful substances. According to the USEPA, nonpoint-source pollution (when water runoff moves over or into the ground picking up pollutants and carrying them into surface and groundwater) is the leading cause of water quality degradation (GWPC, 2008).

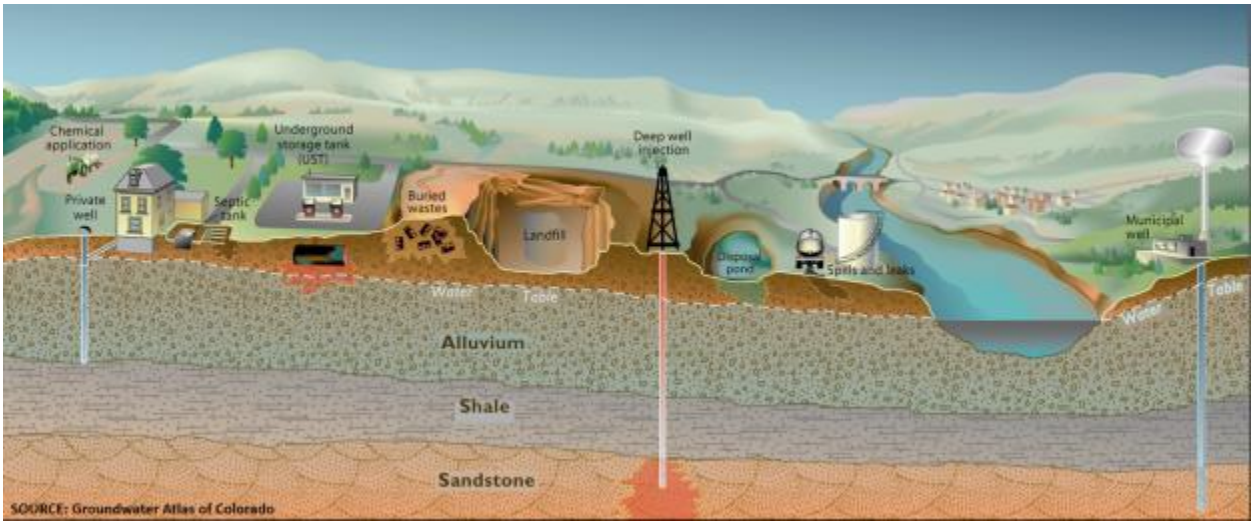

Figure 9: Schematic drawing of the potential source of contamination to surface and groundwater

In 2001 – 2002, as part of the Source Water Assessment Reports, 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[4] contaminant sources were inventoried using selected state and federal regulatory databases including: mining and reclamation, oil and gas production, above and underground petroleum tanks, Superfund sites, hazardous waste generators, solid waste disposal, industrial and domestic wastewater dischargers, and water well permits. Dispersed contaminant sources were inventoried using then recent land use / land cover and transportation maps of Colorado, along with selected state regulatory databases. The contaminant inventory was completed by mapping the potential contaminant sources with the aid of a Geographic Information System (GIS).

The State's contaminant source inventories consisted of draft maps, along with a summary of the discrete and dispersed contaminant sources inventoried within the source water assessment area. The Town of Rye and Colorado City MD were asked, by CDPHE, to review the inventory information, field-verify selected information about existing and new contaminant

[4] The WQCD's assessment process used the terms "discrete" and "dispersed" potential sources of contamination. A discrete source is a facility that can be mapped as a point, while a dispersed source covers a broader area such as a type of land use (crop land, forest, residential, etc.).

sources, and provide feedback on the accuracy of the inventory. Through this Source Water Protection Plan, the Greenhorn Valley is reporting its findings to the CDPHE.

After much consideration, discussion, and input from local stakeholders, the Greenhorn Valley and the Steering Committee have developed a more accurate and current inventory of contaminant sources located within the Source Water Protection Area. Upon completion of this contaminant source inventory, the Town of Rye and the Colorado City MD have decided to adopt it in place of the original contaminant source inventory provided by the CDPHE.

Contaminant Source Inventory (in no particular order):

- Wildfires
- Prescribed Burns
- Flood Events
- U.S. Forest Land Use Activities
    - Timber Harvesting
    - Recreation (Hunting, Camping, ATVs, etc.)
- Residential Practices
- State and County Road Maintenance
- Spills/Accidents on Roadways
- Septic Systems
- Wildlife Activities

In addition to the discrete and dispersed contaminant sources identified in the contaminant source inventory, the Steering Committee has also identified other issues of concern that may impact the Town of Rye's and Colorado City MD's drinking water sources.

Additional Issues of Concern (in no particular order)**:**

- Municipal Practices
    - Maintenance/Operations
    - Sewer Line Failure
- Terrorism/Vandalism

Priority Strategy

After developing a contaminant source inventory and list of issues of concern that is more accurate, complete, and current, the Steering Committee began the task of prioritizing this inventory for the implementation of the Best Management Practices outlined in this Source Water Protection Plan (see Table 7).

The strategy which the Greenhorn Valley and Steering Committee used is based on four criteria.

1. **Direct or Indirect Control**: The Steering Committee first determined whether each potential contaminant and issue of concern was in the group's direct or indirect control or whether they had no control of the issue.

2. **Impact to the Water Source(s)**: Each issue was then given an impact ranking of high, moderate or low to the water source(s). Identifying the impact of a potential contaminant or issue of concern was based on the following criteria:

    a. **Migration Potential or Proximity to the Water Source** - The migration potential generally has the greatest influence on whether a contaminant source could provide contaminants in amounts sufficient for the source water to become contaminated at concentrations that may pose a health concern to consumers of the water. Shorter migration paths and times of travel mean less chance for dilution or degradation of the contaminant before it reaches water sources. The proximity of a potential contaminant source of contamination to Greenhorn Valley's water sources was considered relative to the three sensitivity zones in the Source Water Protection Area (i.e. Zone 1, Zone 2, and Zone 3).

    b. Contaminant Hazard - The contaminant hazard is an indication of the potential human health danger posed by contaminants likely or known to be present at the contaminant source. Using the information tables provided by CDPHE (see Appendices D - G), the Steering Committee considered the following contaminant hazard concerns for each contaminant source:

        - **Acute Health Concerns** - Contaminants with acute health concerns include individual contaminants and categories of constituents that pose the most serious immediate health concerns resulting from short-term exposure to the constituent. Many of these acute health concern contaminants are classified as potential cancer-causing (i.e. carcinogenic) constituents or have a maximum contaminant level goal (MCLG) set at zero (0).

        - **Chronic Health Concerns** - Contaminants with chronic health concerns include categories of constituents that pose potentially serious health concerns due to long-term exposure to the constituent. Most of these

chronic health concern contaminants include the remaining primary drinking water contaminants.

- **Aesthetic Concerns** - Aesthetic contaminants include the secondary drinking water contaminants, which do not pose serious health concerns, but cause aesthetic problems such as odor, taste or appearance

c. Potential Volume - The volume of contaminants at the contaminant source is important in evaluating whether the source water could become contaminated at concentrations that may pose a health concern to consumers of the water in the event these contaminants are released to the source water. Large volumes of contaminants at a specific location pose a greater threat than small volumes.

3. **Probability of Release**: The more likely that a potential source of contamination is to release contaminants, the greater the contaminant threat posed. Each issue was given a ranking of high, moderate, or low based on the probability of the hazard occurring in such a way as to impact the water source(s).

4. **Total Factor**: The Steering Committee then gave a total factor ranking of high, moderate, or low based on the combined rankings of probability and impact.

5. **Priority for Focus**: Finally, the Steering Committee gave each issue a numerical ranking from 1 to 4 in which to focus their Best Management Practices. Those issues that had a higher total factor ranking and/or were in their direct control were given a higher priority ranking.

Based on the above criteria, the Steering Committee has ranked the potential contaminant source inventory and issues of concern as outlined in Table 5.

Table 5: Prioritized Potential Contaminant Sources and Issues of Concern

Issue/Contaminant	In our control? (D, I)	Impact (H, M, L)	Probability (H, M, L)	Total Factor (H, M, L)	Priority for focus
Fires					
• **Wildfires**	**No**	**High**	**High**	**High**	**1**
• Prescribed Burns	Yes – Indirect	Low	Low	Low	3
Flood Events	**No**	**High**	**High**	**High**	**1**
Us Forest Land Use Activities	Yes – Indirect	Low	Low	Low	3
• Timber Harvesting	Yes – Indirect	Low	Low	Low	3
• Recreation (hunting, camping, ATVs, etc.)	Yes – Indirect	Low	Low	Low	3
State and County Roads	Yes – Indirect			Low	4
• Maintenance	Yes – Indirect	Low	Low	Low	4
• Potential Spills/Accidents	No	Moderate	Low	Low	4
Residential Practices	**Yes- Indirect**	**Low**	**Low**	**Low**	**2**
Septic Systems	**Yes- Indirect**	**Moderate**	**Moderate**	**Moderate**	**2**
Wildlife Activities (including livestock grazing & beaver dams)	No	Low	Low	Low	4
Municipal Practices	**Yes – Direct**	**Low**	**Low**	**Low**	**2**
• **Maintenance/Operations**	**Yes – Direct**	**Low**	**Low**	**Low**	**2**
• Sewer Line Failure	Yes – Indirect	Low	Low	Low	4
• **Terrorism/Vandalism**	**Yes – Indirect**	**High**	**Moderate**	**Moderate**	**2**

Susceptibility Analysis of Water Sources

Colorado City MD's and the Town of Rye's Source Water Assessment Reports contained a susceptibility analysis[5] to identify how susceptible an untreated water source could be to contamination from potential sources of contamination inventoried within its source water assessment 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. The CDPHE developed a susceptibility analysis model for surface water sources and ground water sources under the influence of surface water, and another model for groundwater sources. Both models provided

[5] The susceptibility analysis provides a screening level evaluation of the likelihood that a potential contamination problem could occur rather than an indication that a potential contamination problem has or will 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.

an objective analysis based on the best available information at the time of the analysis. The two main components of the CDPHE's susceptibility analysis are:

1. **Physical Setting Vulnerability Rating** – This rating is based on the ability of the surface water and/or groundwater flow to provide a sufficient buffering capacity to mitigate potential contaminant concentrations in the water source.

2. **Total Susceptibility Rating** – This rating is based on two components: the physical setting vulnerability of the water source and the contaminant threat.

Upon review of CDPHE's susceptibility analysis, the Steering Committee determined that both the Physical Setting Vulnerability Ratings and the Total Susceptibility Ratings for each of the Water System's sources are accurate and should remain the same (see table below).

Table 6: Updated Susceptibility Analysis

PWSID #	Public Water System	Source Type	Total Susceptibility Rating	Physical Setting Vulnerability Rating
151200	Colorado City MD	Groundwater	Moderate	Moderate
151200	Colorado City MD	Surface Water	Moderately High	Moderately High
151700	Town of Rye	Surface Water	Moderate	Moderate

DISCUSSION OF 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.

Wildfires/Prescribed Burns

The Greenhorn Valley's Source Water Protection Area has a considerable risk of damage from wildfire. Nationally, wildfires are primarily naturally caused (i.e., lightning), however, a significant percentage of wildfires in Colorado have been human caused. Fire season, traditionally described as May through early July, is now considerably longer, with wildfires occurring state-wide in virtually any month in the calendar. Fire weather and dangerous fuel conditions in the area have historically risen to extreme levels many days per year, with the number of such periods likely to increase along with the longer fire season.

Paul Crespin and Dave Park, with the US Forest Service San Carlos Ranger District, reported that most likely, the biggest threat to the water supply within US Forest System lands is potential wildfire along with the aftermath effects of a catastrophic fire (i.e. downstream flooding due to loss of vegetation, debris and sediment flow, etc.). In 2007, a high wind event blew down several thousands of trees within the Greenhorn watershed (called the Greenhorn Blowdown). In addition, the lack of diversity of vegetation in the area, as well as an increasing number of beetle-killed trees contributes to the vulnerability of wildfire in the area.

A large hot fire in the creek bed and surrounding lands can have an impact on source waters by removing vegetation and decreasing infiltration during rain events. This can result in soil erosion and sediment and ash pollution in drinking water. Large rain events can produce mudslides, and debris flow capable of destroying water infrastructure and altering clarity and pH of the source waters.

The USFS is currently working to decrease the threat of wildfire in the area. This includes the use of mechanical treatments (i.e. physically cutting down stands of trees), potentially prescribing burns and allowing timber sales in the area in an effort to thin out stands of trees to reduce the amount of fuel.

Flood Events

Flooding is a high priority concern for the Greenhorn Valley. Historical flood events occurred in the Greenhorn Creek in the summers of 1947, 1965, and 1975 due to large rains and heavy snow runoff. On July 15, 2013, another historical flood event occurred in which the Town of Rye's diversion was wiped out and their surface water intake was down for approximately 48 hours. The water treatment plant was filled with mud and had to be taken apart to be cleaned. The water system had to rely on stored water in conjunction with conservation measures to ensure water to its customers. According to the Pueblo County Natural Hazards Mitigation

Plan, the estimated probably frequency of flooding for the entire Pueblo County is high[6], and the probable severity is extensive[7] (Pueblo County Sheriff's Office Emergency Serivces Bureau, 2009).

In addition to the large amounts of mud and additional sediment load, flooding is 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 preset 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).

Figure 10: Mud and debris near the Town of Rye's intake due to the July 2013 flood

US Forest Land Use Activities

Just under half of the SWPA for the Greenhorn Valley is located within US Forest Systems lands managed by the San Carlos Ranger District of the San Isabel National Forest within the USFS Rocky Mountain Region. US Forest Service land use management practices have the potential to directly affect the quality of the Greenhorn Valley's source waters. San Carlos District Ranger, Paul Crespin, and Hydrologist, Dave Park, attended a Greenhorn Valley SWPP planning meeting, and their input on US Forest System lands was greatly appreciated.

[6] A high frequency has a recurrence rate of once every ten years according to the Pueblo County Natural Hazards Mitigation Plan.

[7] An extensive probable severity in affected areas means fatalities and severe injury or illness, complete shutdown of critical facilities for 14 days or less, more than 25 percent of the property destroyed or sustaining major damage according to the Pueblo County Natural Hazards Mitigation Plan.

Protecting Water Resources

A principal purpose for which the Forest Reserves (predecessor to the National Forest System) were established was to "secure favorable conditions of water flows". Throughout its history, the Forest Service has had a very diverse and broad mission of multiple use management outlined by the National Forest Management Act, Multiple Use-Sustained Yield Act, Federal Land Policy and Management Act, etc. This means that the agency balances outdoor recreation and preservation of wildlife habitat, air and water, and other scenic and historical values with environmentally responsible commercial development of the land and its resources. The Forest Service's mandate to manage lands for multiple-use requires balancing present and future resource use with domestic water supply needs as well as many other needs. The greater the proportion of National Forest System lands in a source water area, the greater the potential to be directly affected by Forest Service land use and management activities. It is the desired condition of the National Forest System land managers to maintain favorable conditions of flow and sustain supplies of high quality raw water while providing for multiple-use management (USDA Forest Service, January 2000).

One of the long-term management goals of the Rocky Mountain Region is to manage the forest for water resources:

"Protect the resource. Maintain, and where opportunities exist, restore watershed and forest health to ensure full watershed function exhibiting high geomorphic, hydrologic, and biotic integrity. Ensure that forest management activities occur in a manner that adequately protects the integrity of watersheds (USDA Forest Service, 2010)*."*

In October 2009, the Forest Service Rocky Mountain Region and the State of Colorado Department of Public Health and Environment signed a Memorandum of Understanding (MOU) to establish a framework to work together on issues regarding the management and protection of water quality on state defined Source Water Assessment Areas on National Forest System lands in Colorado (see Appendix D). Under this agreement, the Forest Service recognizes a CDPHE-delineated Source Water Area as a "Municipal Supply Watershed" per definition in FSM 2542 (MOU Between CDPHE and USFS Rocky Mountain Region, 2009). The source water protection area for the Greenhorn Valley that lies within these National Forest lands, will be included in future Revised Forest Plans as a municipal supply watershed. In the interim, the Town of Rye and Colorado City MD should be watchful of new and modified activities requesting permitting with the forest and notify the USFS if they are concerned that proposed changes in use could impact the their water supply.

Forest Plan

At the District level, the San Carlos Ranger District adheres to the management directives established under the 1984 Amended Land and Resource Management Plan (1984 Forest Plan) for the Pike and San Isabel National Forests and Comanche and Cimarron National Grasslands.

The current management area prescriptions within the source water protection area include:

- 2B – Management emphasis is for semi-primitive motorized recreation opportunities, such as snowmobiling, four-wheel driving, and motorcycling, both on and off roads and trails. Range resource management provides sustained forage yield.

- 8B – Provides for a primitive recreation opportunity in areas of low use and essentially unmodified natural environment within congressionally designed and proposed wilderness (Wilderness Management Recommendation Only).

- 8C – Provides for the management of heavily used transitional areas near major trailheads and development within congressionally designated and proposed wilderness (Wilderness Management Recommendation Only) (USDA Forest Service, 1984).

Timber Harvesting

Timber harvesting occurs on US Forest System lands within the Greenhorn Valley's SWPA. Timber harvesting can potentially generate several forms of non-point pollution. Disturbance of land surfaces from road construction, log landings, and skid trails are the primary causes of sediment transport into streams from this activity. Other potential impacts include: debris from timber harvesting ending up in the stream, oils and fuels used in machinery washing into streams, and an increase in temperature levels as a result of clearing timber along stream banks.

Recreation

There are many types of recreation occurring in Greenhorn Valley's SWPA including camping, hiking, hunting, fishing, and off-road-vehicle use which may pose threats to forested lands, grasslands, reservoirs and streams. A portion of US Forest System lands within the SWPA contains the Greenhorn Wilderness Area. Within this wilderness area, motorized vehicles are prohibited, and access is via hike-in or horseback only. Extractive uses such as timber harvesting and mining are also prohibited.

Outside the Greenhorn Wilderness Area, recreational activities, such as hunting, camping and fishing are the biggest uses. Road systems within these areas could have an impact on the watershed if improperly designed and/or maintained. Some undesirable impacts include severely eroded soils, user-created unplanned roads, disrupted wetland ecosystems, as well as general habitat destruction and degraded water quality throughout forested lands. To help minimize the impacts, a Motor Vehicle Use Map (MVUM) was developed as a requirement of the 2005 Final Travel Management Rule. The MVUM restricts motorized travel by the public to designated roads and trails. The MVUM also displays allowed uses by vehicle class and seasonal allowances (USDA Forest Service, 2013). In addition, the US Forest Service adheres to the "Leave No Trace" ethics. These ethics include guidelines that visitors should follow such as: keeping campsites at least 100 feet from lakes and streams and outside of meadows; digging toilets at least 100 feet from the nearest water supply; burning or packing out trash; hobbling horses at least 100 feet from lakes and streams; etc. In addition, the US Forest Service is

planning to conduct an analysis of the road systems within this area in an effort to better manage these impacts.

State and County Roads

Within the Greenhorn Valley SWPA, there are several county roads that the Pueblo County Public Works Department is responsible for the maintenance and improvement of. The roads in the SWPA are used primarily for residential and recreational access. Pat Coffee, with the Pueblo County Public Works Department, attended the Greenhorn Valley SWPP planning meetings and her input on roadways was greatly appreciated.

Maintenance

Pueblo County Public Works Department is responsible for the maintenance and improvement of county roads within the Greenhorn Valley SWPA. This includes road grading, patching, reconstruction, snow plowing, etc. Each Public Works employee must have a commercial drivers' license (CDL) and is required to check their equipment before and after each use. In addition, each employee is trained in storm water management.

Dust abatement that contains chemicals such as magnesium chloride may be applied to parts of the roadway within the protection area. Dust suppressants abate dust by changing the physical properties of the road surface by creating a hard, compact surface. 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).

Potential Spills/Accidents

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 source waters. Chemicals from accidental spills are often diluted with water, potentially washing the chemicals into the soil and infiltrating into the groundwater and/or running off into surface waters. Roadways are also frequently used for illegal dumping of hazardous or other potentially harmful wastes. If a small spill occurs alongside the road, each Pueblo County Public Works employee has a clean-up kit onsite. However in the event of a large spill, a Hazardous Response Team must be called to do clean-up.

Residential Practices

The Greenhorn Valley's Source Water Protection Area includes many residential dwellings and potential for future subdivisions over time. Common household practices may cause pollutants to runoff residential property and enter the surface or groundwater as indicated in Figure 11 below. Prevention of surface and groundwater contamination requires education, public involvement, and people motivated to help in the effort. Public education will help people understand the potential threats to their drinking water source and motivate them to participate as responsible citizens to protect their valued resources. Greenhorn Valley will also need to coordinate with Pueblo County since the private lands within the protection area are under county jurisdiction.

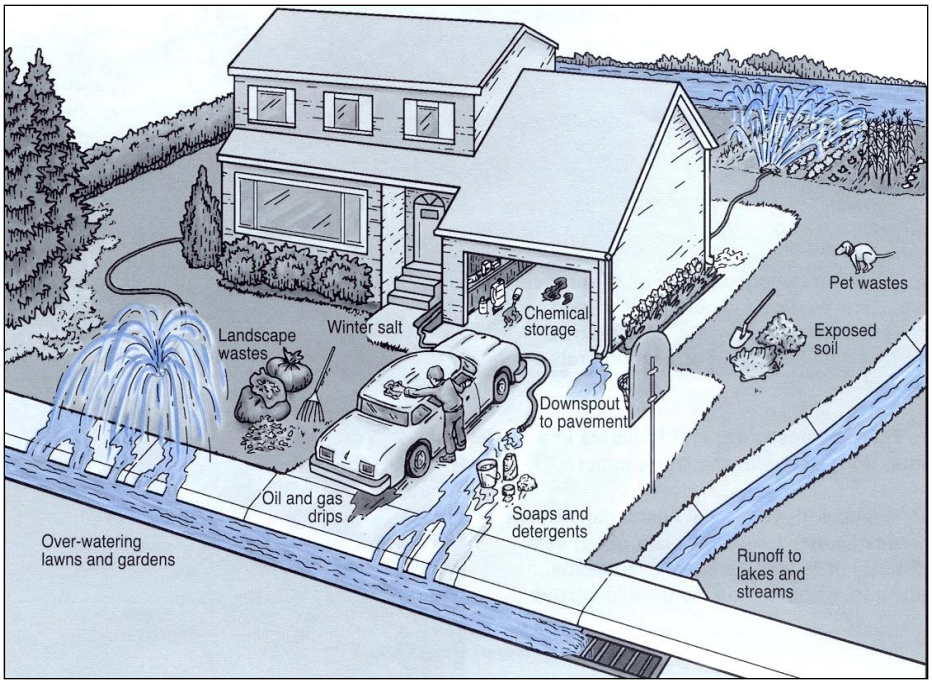

Figure 11: Common residential practices that may be potential sources of contamination to surface or groundwater

Septic Systems

There are many properties within the Greenhorn Valley SWPA that rely on onsite wastewater treatment systems (OWTS) or 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.

When onsite wastewater systems are properly designed, constructed, and maintained, they effectively reduce or eliminate most human health or environmental threats posed by pollutants such as nitrogen, phosphorus, and disease-causing bacteria and viruses in household wastewater. However, they require regular maintenance or they can fail. Unapproved, aging, and failing septic systems have a large impact on the quality and safety of a water supply. The failure to pump solids that accumulate in the septic tank can eventually clog the lines and cause untreated wastewater to back up into the home, to surface on the ground, or to seep into groundwater. If managed improperly, these residential septic systems can contribute excessive nutrients, bacteria, pathogenic organisms, and chemicals to the groundwater. According to the EPA, failing septic systems are the second leading cause of water pollution in the nation, and there are approximately 168,000 reported viral illnesses and 34,000 bacterial illnesses per year from contaminated drinking water (Wolgram, 2013).

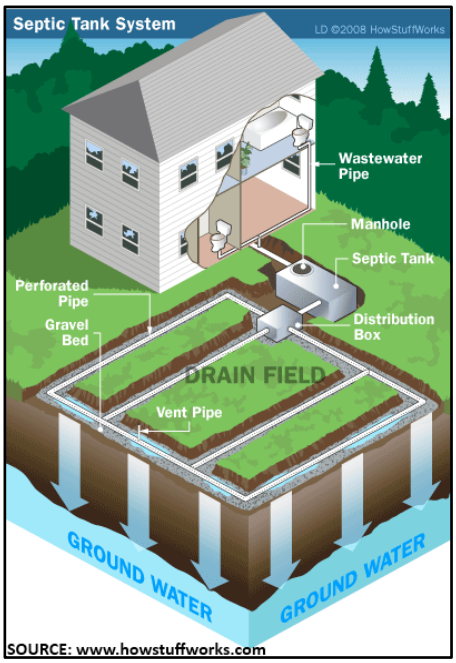

Figure 12: Schematic of a septic system

In Pueblo County, individual sewage disposal systems are permitted by Pueblo City-County Health Department. The Health Department administers and enforces the standards, rules, and regulations outlined in the State of Colorado's Revised Statute 25-10-105. In Pueblo County, permits are required for installation of a new septic system. These permits require the septic tank to be at least 50 feet from wells and 10 feet from potable water lines. Leach fields are required be at least 150 feet from wells, 50 feet from lakes or streams and 25 feet from potable water lines. Failing septic systems are required to be brought up to current code and a permit is required for upgrades. In addition, the sale or transfer or a property requires a septic system inspection and/or a new permit.

Septic systems are a concern for the Greenhorn Valley SWPA as healthy septic systems last approximately 25 – 50 years and there are many homes in the SWPA that were built before 1960 with no record of a septic system permit.

Wildlife Activities

Land within Greenhorn Valley's Source Water Protection Area is home to many wild animals such as deer, elk and bears, who feed upon the land. In addition to wildlife grazing, livestock (cattle) grazing occurs on private and federal lands within the SWPA. On federal lands, livestock operators are authorized to graze on areas called allotments through an approved USFS grazing permit. Within the Greenhorn Valley's Source Water Protection Area, there is cattle grazing activity that occurs in two allotted pastures on the upper watershed within the SWPA. 1200 head of cattle are permitted to graze in these allotments; however, only approximately 300

head currently graze, and only remain in the pastures one to two days per year. These allotments are grazed in an intensive way so as to manage and preserve the watershed.

Wildlife and livestock grazing can impact upland infiltration and erosion, and water quality for groundwater infiltration. The most common wildlife and livestock-caused impacts include fecal/bacterial contamination, sedimentation, and increased water temperatures. Livestock and wildlife grazing activities with the highest potential for direct and indirect impacts to water resources include long-term concentrated grazing in infiltration areas, and trampling/trailing near water sources. The Steering Committee recommends maintaining communication with the San Carolos Ranger District on cattle grazing practices and impacts.

Municipal Practices

Maintenance/Operations

The Town of Rye and Colorado City MD routinely conduct inspections and maintenance activities of their drinking water intakes, treatment plants, reservoirs, and pipelines. If the maintenance work is not conducted properly, there can be short-term or long-term damage to the water supply system. Maintenance activities may include: visual inspections of intake structures, sampling to maintain water quality, repairing or replacing damaged sections of their collection system, distribution system and/or wastewater collection system.

Sewer Line Failure

Colorado City MD is responsible for treated wastewater for both its tap holders as well as the Town of Rye's. The main sewer line runs directly through the Greenhorn Valley SWPA. The depth of the line varies from 5 ½ to 8 ½ feet below the surface. Colorado City MD has a rigid cleaning and maintenance schedule of their pipelines. A break in this line is unlikely, but could have major impacts on the Greenhorn Valley's drinking water intakes.

Terrorism/Vandalism

Although there have been no major acts of terrorism or vandalism to the Town of Rye or Colorado City MD's water supplies, this is still a concern for the Steering Committee. The potential for these acts are low due to the remoteness of the area, however, this is a high priority concern because impacts from a terrorist or vandal could be huge. Water infrastructure could be targeted directly or water can be contaminated through the introduction of poisonous chemicals or disease-causing biological agents (Gleick, 2006). The Steering Committee recommends taking preventative measures by displaying signage around storage tanks and treatment facilities and at the roadways that lead to the watershed that states "Municipal Water Supply: Tampering With This Facility is a Federal Offense and developing outreach material that explains the importance of source water protection.

SOURCE WATER PROTECTION MEASURES

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 focus was on selecting those protection measures that are most likely to work for the community. 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 7, "Source Water Protection Best Management Practices" be considered for implementation by:

- Town of Rye
- Colorado City MD
- Pueblo County
- US Forest Service
- Private Landowners

Evaluating Effectiveness of Best Management Practices

The Greenhorn Valley 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 three – five 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 Greenhorn Valley 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.

Table 7: Source Water Protection Best Management Practices

Issues	Best Management Practices	Implementers
Wildfires/Prescribed Burns/Mechanical Treatment	1. Fuels Reduction Plan - The District Ranger will continue to implement the National Fire Plan to reduce fuels within the areas of National Forest lying within the source water protection area. The Forest Service will provide an opportunity for the public during their NEPA process.	1. US Forest Service
	2. Explore opportunities to work with private landowners for landscape scale fuel reduction and defensible space projects.	2. Rye Fire Protection District, Greenhorn Valley
	3. Fire Prevention – The District Ranger will continue to implement their fire prevention plan which includes public education programs: Fire Wise Program and Project Learning Tree.	3. US Forest Service
	4. Share a copy of the SWPP with Pueblo County Sheriff's Office, USFS, and Rye Fire Protection District. Encourage collaboration in reviewing fire prevention measures.	4. Greenhorn Valley
	5. Continue to participate on fire response for the Source Water Protection Area with the Rye Fire Protection District.	5. Greenhorn Valley
	6. Request Full Suppression designation on Source Water Protection Area with a plan to manage amount of vegetation in the area	6. Greenhorn Valley
	7. Thin vegetation around drinking water intakes as a defensible space within Zone 1 of the SWPA in conjunction with private landowners.	7. Colorado City MD, Town of Rye
	8. Educate homeowners about creating and maintaining defensible space on private lands.	8. Greenhorn Valley
	9. The Greenhorn Valley will request to be notified by USFS a minimum of 90 days prior to a prescribed burn and/or mechanical treatments within the SWPA, in order to ensure protection of quality and quantity of water supply	9. Greenhorn Valley

Flooding	1. Participate in Pueblo County Natural Hazards Mitigation planning process. 2. Upgrade drainage structures in Rye and Colorado City in accordance with the Pueblo County Natural Hazards Mitigation Plan. 3. Explore opportunities for mitigation grant funding.	1. Town of Rye, Colorado City MD 2. Town of Rye, Colorado City MD 3. Town of Rye, Colorado City MD
Residential Practices	1. Conduct public education and outreach programs for SWPA residents to encourage practices that will protect their drinking water source. Topics may include: source water protection, household hazardous waste storage and disposal, fertilizer usage, pet waste cleanup, water conservation, car washing, backflow prevention, and secondary containment for above ground fuel storage tanks. 2. Opportunities for public education include: newspaper articles, poster displays at local utility offices and public buildings, water bill inserts, flyers, creek festivals, public forums, workshops and community events, county fair. 3. Participate in Lower Arkansas Conservation District's annual workshops and provide materials about the Source Water Protection Plan and best management practices to prevent contamination of the source waters. 4. Provide Information concerning the SWPP in the annual Consumer Confidence Report (CCR). Insert an additional letter or paragraph in the CCR about the completed SWPP and information on how they can help prevent pollutants from entering the source waters. 5. Post a copy of the SWPP on Colorado City MD's, Pueblo County's, Pueblo City-County Library District's websites. 6. Develop a youth outreach program to be presented at schools on an annual basis	1. Greenhorn Valley 2. Greenhorn Valley 3. Greenhorn Valley 4. Colorado City MD, Town of Rye 5. Greenhorn Valley 6. Greenhorn Valley

Septic Systems	1. Identify properties within SWPA with septic systems and develop mailing list to educate the property owner on the link between good septic practices and protecting source water. 2. Work with Pueblo City-County Health Department to promote public education for property owners within the SWPA to provide basic information on the Source Water Protection Plan. Public education may include: the proper use and maintenance of their septic systems and how the source of their drinking water can be affected by an inadequately functioning septic system. 3. Explore offering rebates for septic system maintenance and/or upgrades. 4. Explore/encourage residents in critical areas to tie in to wastewater collection system 5. Encourage Pueblo City-County Health Department to work closely with Pueblo County Planning and Zoning Department on subdivision review for septic system uses	1. Greenhorn Valley 2. Greenhorn Valley, Pueblo City-County Health Department 3. Greenhorn Valley 4. Greenhorn Valley 5. Greenhorn Valley
Municipal Practices	1. Perform regular inspection of the surface water intakes, wells and springs. 2. Ensure that the water treatment plant is properly managed, operated and maintained to prevent contamination of the drinking water. 3. Store chemicals properly at the treatment plant. 4. Ensure that all employees are familiar with the Source Water Protection Plan, emergency and contingency plan, and hazardous spill response. 5. Placement of Federal Offense Warning signs at the treatment plant.	1. System Operators 2. System Managers 3. System Managers 4. System Managers 5. System Manager
Sewer Line Failure	1. Continue to inspect watershed and intakes for signs of sewer line failure	1. Colorado City MD
Terrorism, Vandalism, Physical Damage	1. Continue to inspect watershed and intakes for signs of physical damage, such as vandalism.	1. Greenhorn Valley

	2. Display signage that states “tampering with this facility is a federal offense” at roadways leading to the SWPA, intakes and diversions, and on water storages tanks. 3. Develop outreach material that explains the importance of BMDWD’s source water protection.	2. Greenhorn Valley 3. Greenhorn Valley, Colorado Rural Water Association
US Forest Land Use Activities	1. Establish a schedule of regular communication with public land management agencies. 2. Stay involved and provide input in the management plans, policies and proposed actions of public land management agencies. 3. Be an advocate for Town of Rye and Colorado City MD tap-holders.	1. Colorado City MD, Town of Rye 2. Colorado City MD, Town of Rye 3. Colorado City MD, Town of Rye
Timber Harvesting	1. Implement Water Conservation Practices, BMPs, guidelines, and proper design criteria to prevent or reduce sediment delivery to water bodies within the watershed. 2. Work with timber harvesting companies to educate them about fuel spills, lubricants, care when driving trucks that contain fuels, etc.	1. USFS 2. USFS
Recreation	1. Be an advocate for Greenhorn Valley community in minimizing the negative effects of recreational activities within the SWPA and the service area. 2. Display signage in designated areas throughout the SWPA that explains the importance of source water protection. 3. Work with DOW to encourage and educate boaters about the importance of source water protection on Lake Beckwith.	1. Greenhorn Valley 2. Greenhorn Valley 3. Colorado City MD
State and County Roads	1. Meet with the Rye Fire Protection District to discuss their emergency response plans for responding to hazardous and non-hazardous vehicular	1. Greenhorn Valley

	spills within the SWPA. 2. Provide the following information to the local fire departments: a. Importance of the Source Water Protection Plan b. Location of the intakes and Source Water Protection Area c. Overview of the Emergency Contingency Plan d. Personnel to be notified in the event of an emergency 3. Educate the public on how to call "911" to report any spills within the SWPA. 4. Place signage on public roads within the protection areas to educate the public about reporting spills on the roadway. 5. Keep informed on the road maintenance practices and schedules within the Source Water Protection Area (SWPA) including: grading, de-icing, dust abatement and Best Management Practices used. 6. Provide Pueblo County Road and Bridge with a copy of the Source Water Protection Plan and map of the protection area.	2. Greenhorn Valley 3. Greenhorn Valley 4. Greenhorn Valley 5. Greenhorn Valley 6. Greenhorn Valley
Wildlife/Livestock Activity	1. Be an advocate for minimizing the effects of livestock grazing on water sources within the Greenhorn Valley source water protection area. 2. Continue to perform regular inspections of water intakes for unwanted animal activity. 3. Continue conducting required water quality monitoring of intakes as required by the Colorado Department of Public Health and Environment 4. Educate properties owners with livestock about the source water protection plan and that practices such as avoiding having animals in or near reservoir basins, ditches, and streams should be followed.	1. Greenhorn Valley 2. Town of Rye, Colorado City Public Works 3. Town of Rye, Colorado City Public Works 4. Greenhorn Valley

BIBLIOGRAPHY

Colorado Department of Natural Resources. (2011, May 5). *Physiographic Provinces of Colorado.* Retrieved February 26, 2013, from Colorado Geological Survey: http://geosurvey.state.co.us/geology/topography/Pages/Physiographic.aspx

Colorado Department of Public Health and Environment . (2013, 31 January). *Regulation No. 31 The Basic Standards and Methodologies for Surface Water.* Water Quality Control Commission. Denver, CO: Colorado Department of Public Health and Environment.

Delta County Planning and Community Development Dept. (n.d.). *Septic Systems*. Retrieved February 27, 2013, from Delta County, Colorado: http://www.deltacounty.com/index.aspx?nid=279

EPA Office of Ground Water and Drinking Water. (1996, August). *Safe Drinking Water Act Amendments of 1996.* Retrieved from United States Environmental Protection Agency: http://water.epa.gov/lawsregs/guidance/sdwa/summ.cfm#1

Gleick, P. H. (2006, August 14). *Water and Terrorism.* Retrieved 28 March, 2013, from The Pacific Institute: http://www.pacinst.org/reports/water_terrorism.pdf

Greenhorn Valley Chamber of Commerce. (2012). *Greenhorn Valley Information*. Retrieved December 5, 2013, from Greenhorn Valley Chamber of Commerce: http://greenhornchamber.org/visitors.html

Ground Water Protection Council. (2007). *Ground Water Report to the Nation: A Call to Action.* Oklahoma City: Ground Water Protection Council.

Hotchkiss, Paonia, and Crawford Chambers of Commerce. (n.d.). *Heritage and History*. Retrieved February 26, 2013, from North Fork Valley of Colorful Colorado: http://www.northforkvalley.net/

MOU Between CDPHE and USFS Rocky Mountain Region. (2009).

Occupation Safety and Health Administration. (2013). *Fact Sheets on Natural Disaster Recovery: Flood Cleanup*. (U. S. Labor, Editor) Retrieved December 10, 2013, from United States Department of Labor: https://www.osha.gov/OshDoc/floodCleanup.html

Pueblo County Sheriff's Office Emergency Serivces Bureau. (2009). *Natural Hazard Mitigation Plan for Pueblo County, Colorado.* Pueblo County, Colorado.

Rye, Colorado. (n.d.). Retrieved November 21, 2013, from Wikipedia - The Free Encyclopedia: http://en.wikipedia.org/wiki/Rye,_Colorado

State of Colorado. (2013). *List of Incorporated Cities and Towns in Colorado*. Retrieved November 21, 2013, from Colorado State Archives: http://coloradoc2.prod.acquia-sites.com/sites/default/files/List%20of%20Incorporated%20Cities%20and%20Towns%20in%20CO.pdf

Topper, R., Spray, K. L., Bellis, W. H., Hamilton, J. L., & Barkmann, P. E. (2003). Ground Water Atlas of Colorado. Denver, Colorado: Colorado Geological Survey.

U.S. Environmental Protection Agency. (2013, November 19). *2010 Waterbody Report for Greenhorn Creek w/ tributaries*. Retrieved November 19, 2013, from EPA Watershed Assessment, Tracking & Environmental Results: http://ofmpub.epa.gov/tmdl_waters10/attains_waterbody.control?p_au_id=COARMA07_3400&p_cycle=2010&p_state=CO&p_report_type=

United States Department of Agriculture. (August 2007). *Upper Arkansas Watershed HUC 11020002 Rapid Assessment.* Natrual Resources Conservation Service. Lakewood, Colorado: United States Department of Agriculture.

US Environmental Protection Agency. (2002, May). *Potential Environmental Impacts of Dust Suppressants: "Avoiding Another Times Beach".* Retrieved February 28, 2013, from United States Environmental Protection Agency: http://www.epa.gov/esd/cmb/pdf/dust.pdf

USDA Forest Service. (1984). *Land and Resource Management Plan - Pike and San Isabel National Forests; Comanche and Cimarron National Grasslands.* Pueblo, Colorado: USDA Forest Service.

USDA Forest Service. (2010). *Rocky Mountain Region - Water Emphasis.* Golden, CO: USDA Forest Service Rocky Mountian Region.

USDA Forest Service. (2013). *Motor Vehicle Use Maps (MVUM)*. Retrieved December 5, 2013, from USDA Forest Service - Pike and San Isabel National Forests Cimarron and Comanche National Grasslands: http://www.fs.usda.gov/detail/psicc/maps-pubs/?cid=stelprdb5177824

USDA Forest Service. (January 2000). *Water & the Forest Service.* Washington, D.C.: USDA Forest Service.

Williams, C. (2012). *Town of Ridgeway Source Water Protection Plan.* Pueblo, Colorado: Colorado Rural Water Association.

Wolgram, C. (2013). Maintaining Your Septic System. Pueblo, CO: Pueblo City-County Health Department Environmental Health Division.

APPENDICES[8]

A. Colorado City MD Source Water Assessment Report

B. Town of Rye Source Water Assessment Report

C. Town of Rye Source Water Assessment Report Appendices

D. MOU Between CDPHE and U.S. Forest Service Rocky Mountain Region

E. Table A-1 Discrete Contaminant Types

F. Table A-2 Discrete Contaminant Types (SIC Related)

G. Table B-1 Dispersed Contaminant Types

H. Table C-1 Contaminants Associated with Common PSOC's

[8] All appendices are located on the CD version of this SWPP.