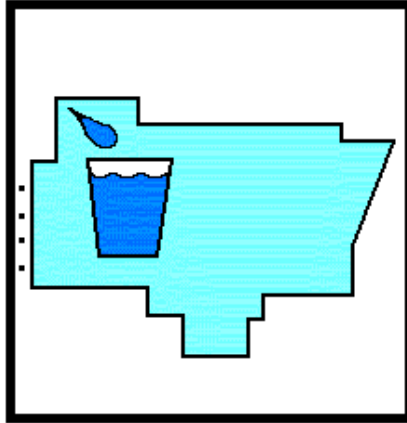


Morgan County Quality Water Source Water Protection Plan



Morgan County, Colorado

September 2009

Written by Colleen Williams
Source Water Specialist
Colorado Rural Water Association

For the community water provider
Morgan County Quality Water: ID # CO0144020

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EXECUTIVE SUMMARY

The Morgan County Quality Water District values a clean, high quality drinking water supply and decided to work collaboratively with area stakeholders to develop a Source Water Protection Plan to protect their water sources: the Hay Gulch, San Arroyo Creek, and Beaver Creek alluvial aquifers. During the months of March 2009 to October 2009, six stakeholder meetings were held in Fort Morgan, Colorado to encourage local public participation. The planning process attracted interest and participation from 24 people including local citizens, water operators, government, industry, and agency representatives. This group comprised the Morgan County Quality Water Planning Team (the Planning Team or Team).

The Planning Team reviewed the Source Water Assessment completed by the Colorado Department of Public Health and Environment; reviewed the delineation of the Specified Areas accepted by the Water Quality Control Commission in 1991 as stated in Regulation 42; identified each drainage basin and underlying aquifer for the well fields; and decided to include these areas within a Drinking Water Supply Protection Area. The Drinking Water Supply Protection Area defines the source water protection area that the community has chosen to implement its protection measures to reduce the risks of potential contaminants to these water sources.

To develop their management approach, the Planning Team focused on the following issues of concern within the Source Water Protection Area: agricultural practices, oil and gas development and operations, septic systems, transportation on roads, land uses, private water wells, residential practices, underground water storage, Clean Harbors hazardous waste disposal site, and Prairie Ponds recharge area.

The Planning Team reviewed and discussed several possible management approaches that could be implemented within the protection area to help reduce the risks of potential contamination to the community's source water. Voluntary implementation of source water management approaches at the local level (i.e. county and municipal) applies an additional level of protection to the drinking water supply by taking preventive measures to protect the source water. The Planning Team established a "common sense" approach in identifying and selecting the most feasible source water management activities to implement locally. These management practices included in this Plan are recommended by the Team to reduce the risks of potential contaminants to the Source Water Protection Area and protect the drinking water source for the Morgan County Quality Water District.

At the completion of this plan, a Steering Committee was formed to oversee its implementation. Representatives from the water district, community, and government agencies who participated on the Planning Team volunteered to serve on the Steering Committee and meet quarterly throughout the year. The first meeting of the Steering Committee is scheduled for November 12, 2009. At this first meeting the Committee will decide which management approaches to implement during 2010.

The Colorado Rural Water Association's Source Water Protection Specialist, Colleen Williams, helped facilitate the source water protection planning process. The goal of the Association'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.

INTRODUCTION

The Morgan County Quality Water is a quasi-government operated "Special District" non-profit water provider that supplies drinking water primarily to 2,500 households throughout rural Morgan County, Colorado. The main source of their water is from 9 groundwater wells located within 3 different well fields within Weld and Morgan County. They realized that in order to protect the source of their drinking water, they needed to work together with area stakeholders to develop a protection plan to prevent possible contamination of this valuable resource. Proactive planning and prevention are essential to both the long-term integrity of their water system and limiting their costs and liabilities.



PHOTO: MARK KOKES

The office of the Morgan County Quality Water District is located at 17586 County Road 20 (Barlow Road exit) in Fort Morgan, Colorado.

Purpose of the Source Water Protection Plan

Source Water Protection is the protection of all present and potential future drinking water sources including ground water protection, wellhead protection, aquifer protection, and watershed protection pertaining to drinking water sources. The Source Water Protection Plan (SWPP) is a tool for the Morgan County community to ensure clean and of 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 water quality within the watershed;
- Encourage education and voluntary solutions to alleviate pollution risks;
- Promote management practices to protect and enhance their drinking water supply;
- Provide for a comprehensive action plan in case of an emergency that threatens or disrupts the community water supply.

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

Public Participation in the Planning Process

Public 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 plan is more likely where local stakeholders have actively participated in the development of their protection plan.

During the months of March 2009 to October 2009, six stakeholders meetings were held at the Morgan County Quality Water office in Fort Morgan, Colorado to encourage local public participation in the planning process. Local stakeholders were sent letters of invitation to participate with follow-up email reminders of meeting dates. The source water protection planning process attracted interest and participation from 24 people including local citizens, water operators, government, industry, and agency representatives. Input from the following list of Planning Team participants was greatly appreciated.

Table 1. Morgan County Quality Water Source Water Protection Plan Participants

Participant	Affiliation
Mark Kokes	Morgan County Quality Water General Manager
Barbara Gorrell	Morgan County Planning Administrator
Tony Carlson	Morgan County Commissioner
Steve Enfante	Morgan County Office of Emergency Management
Karen Schminke	City of Brush Assistant Administrator
Chuck Huntley	Town of Log Lane Village
Chuck Lakotos	Town of Log Lane Village
Don Marymee	City of Brush Water Foreman
Val Loose	Morgan Conservation District
Gabrielle Vergara	Weld County Public Health and Environment
Jeff Canfield	Canfield Drilling Company
Sherri Robbins	Petro-Canada Resources Incorporated
Hal Koemer	Petro-Canada Resources Incorporated
Tim Crumley	Coral Production Corporation
Kenny Strauch	Northeast Chapter Colorado Oil and Gas Association
Dan Barker	Fort Morgan Times
Jesse Chaney	Fort Morgan Times
Paul Hempel	Colorado Rural Water Association
Kimberly Mihelich	Colorado Rural Water Association
Colleen Williams	Colorado Rural Water Association
Steve Treadway	Local farmer
Herman & Arlan Cook	Land owners
Steve Child	Harvey/Child Ranch

Protection Plan Development

The source water protection planning effort consisted of public Planning Team meetings and individual meetings with water operators, government, and agency representatives. Information discussed at the meetings helped the Team develop an understanding of the issues affecting source water protection for the Morgan County Quality Water (MCQW) community. The Team then made recommendations for management approaches to be incorporated into a protection plan. In addition to the Planning Team meetings, data and other information pertaining to source water protection areas was gathered via public documents, internet research, phone calls, emails, and field trips to the protection area. A summary of the meetings is presented below.



PHOTO: JESSE CHANEY

The Planning Team meetings attracted interest and participation from 24 people.

Table 2. Presentations, Tours, and Planning Team Meetings

Date	Purpose of Meeting
3/17/09	First Planning Team meeting with presentation on the process of developing a Source Water Protection Plan for the MCQW community. Review of the State's Source Water Assessment and discussion of the delineation of the source water protection area. MCQW presented information about their well fields.
4/21/09	Second Planning Team meeting with discussion on re-delineating the well field areas and information sharing by Petro-Canada Resources representatives on their natural gas pipeline that transects one of the protection areas.
5/27/09	Third Planning Team meeting with discussion on the 4 types of delineation within the protection area. Discussion of the State's inventory of potential sources of contamination and identification of issues of concern within the three protection areas.
6/23/09	Fourth Planning Team meeting with discussion of the oil well operations within the source water protection areas, prevention and notification of oil well spills, emergency response to a spill event, underground water storage, and aboveground storage tanks.
7/27/09	Fifth Planning Team meeting with information sharing about COGCC's role with oil well spills, underground water storage in the South Platte River Basin, Weld County Land Use, HilCorp Energy, and Colorado Ground Water Commission. Discussed management approaches to include in the Protection Plan.
10/1/09	Sixth Planning Team meeting to review and edit the Draft Plan; appoint a Steering Committee; set the date for the first Steering Committee meeting; and implement one of the action items on the Plan.

Steering Committee Members

At the completion of this plan, a Steering Committee was formed to implement the management approaches of this Source Water Protection Plan. Members of the Planning Team volunteered to serve on the Steering Committee and meet quarterly throughout the year. The first meeting of the Steering Committee is scheduled for November 12, 2009. At this first meeting the Committee will develop an Action Plan for management approaches to implement during 2010.

Table 3. Steering Committee Members

Name	Affiliation
Mark Kokes	Morgan County Quality Water General Manager
Barbara Gorrell	Morgan County Planning Administrator
Tony Carlson	Morgan County Commissioner
Steve Enfante	Morgan County Emergency Management Director
Karen Schminke	City of Brush Assistant Administrator
Chuck Huntley	Town of Log Lane Village
Don Marymee	City of Brush Water Foreman
Val Loose	Morgan Conservation District
Kenny Strauch	Northeast Chapter Colorado Oil and Gas Association
Steve Child	Harvey/Child Ranch
Chuck Lakotos	Town of Log Lane Village
Colleen Williams	Colorado Rural Water Association

WATER SUPPLY SETTING

Location

The Morgan County Quality Water District is located in Morgan County on the high plains of northeastern Colorado. Morgan County measures 36 miles long and 36 miles wide, covering 1,296 square miles of prairies and gently rolling hills. Morgan County is situated in the agriculturally-rich South Platte River valley with many irrigated and dry land farms as well as beef, sheep and dairy ranches. It is accessed via Interstate Highway 76 and U.S. Highway 34 and is approximately 80 miles northeast of Denver and 50 miles east of Greeley. The County seat is located in the City of Fort Morgan in the center of the county at 4,330 feet above sea level.

Location of Morgan County, Colorado

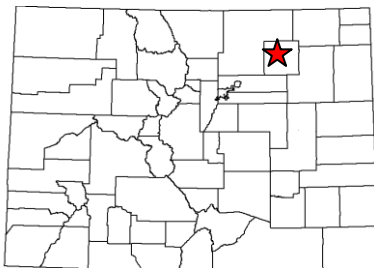
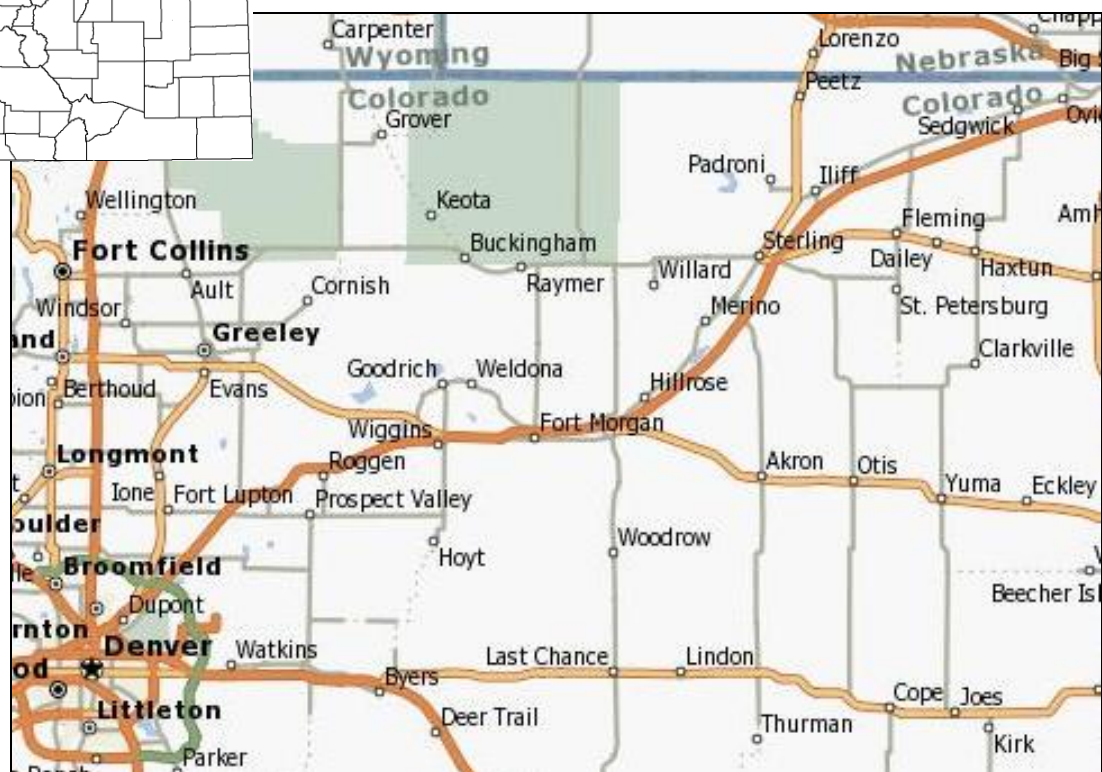


Figure 1. Regional Setting Map



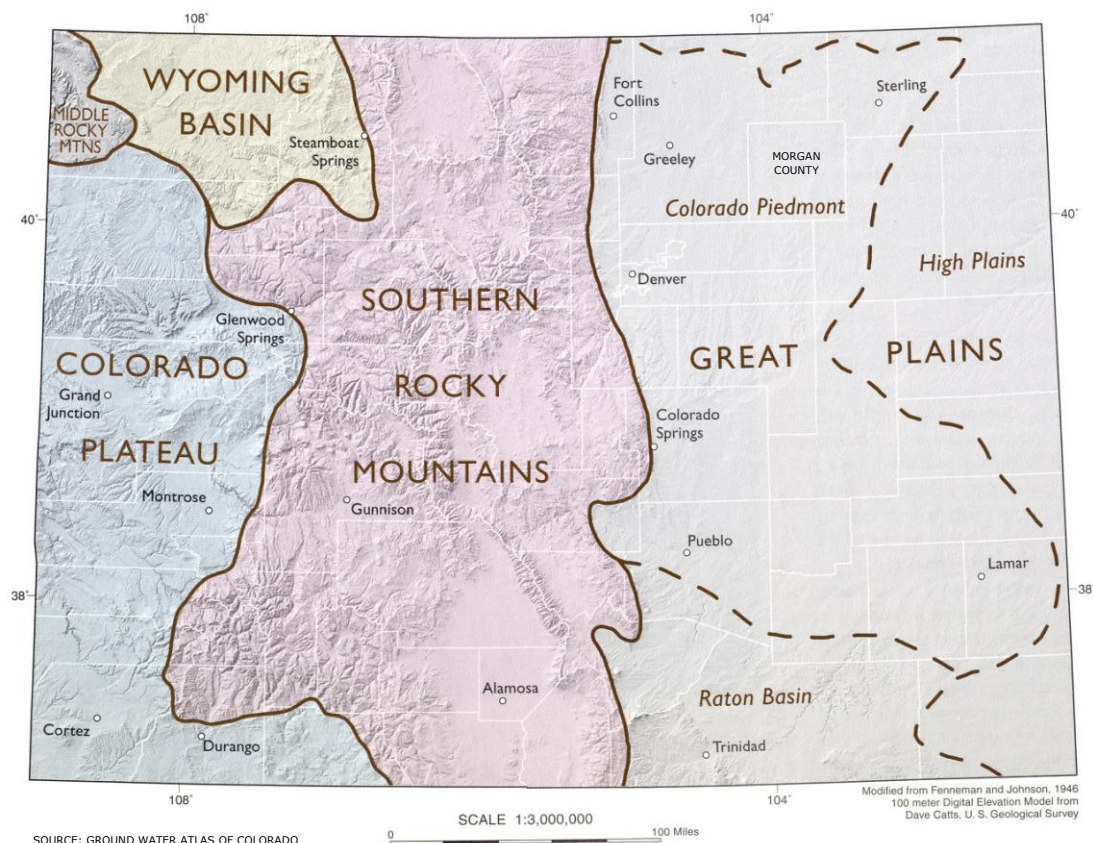
SOURCE: MAPQUEST.COM

Physiography

Morgan County lies within the Colorado Piedmont section of the Great Plains Physiographic Province that encompasses approximately 40% of the state. The terrain is composed of large flat divides of rolling grassland that lie adjacent to the valley of the South Platte River. The Great Plains are characterized by predominantly by sedimentary rocks. Underlying bedrock consists primarily of the Cretaceous age Foxhills Sandstone and Pierre Shale that gently dips to the east (Topper et al, 2003).

Approximately half of the upland areas are covered by windblown deposits in the form of either sheet deposits or stabilized dunes. These areas are often fragile and may result in areas of wind erosion or blowing dust if proper agricultural or development practices are not followed (MCCP, 2004).

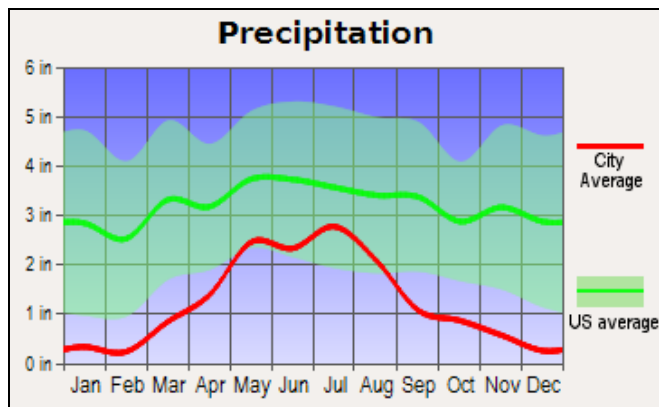
Figure 2. Physiographic Provinces of Colorado



Climate

The Great Plains area generally have abundant sunshine, low relative humidity, large daily temperature variations, high to moderate winds, and little precipitation. Morgan County's average temperatures are relatively mild. While extremes do occur in both the winter and summer, average temperatures in the low 70's are the rule during June through September and decrease to approximately 20 degrees in December and January. Annually they have 330 days of sunshine, 12" of precipitation, and 22" of average snowfall (MCCP, 2004).

Figure 3. Average precipitation in Fort Morgan, Colorado

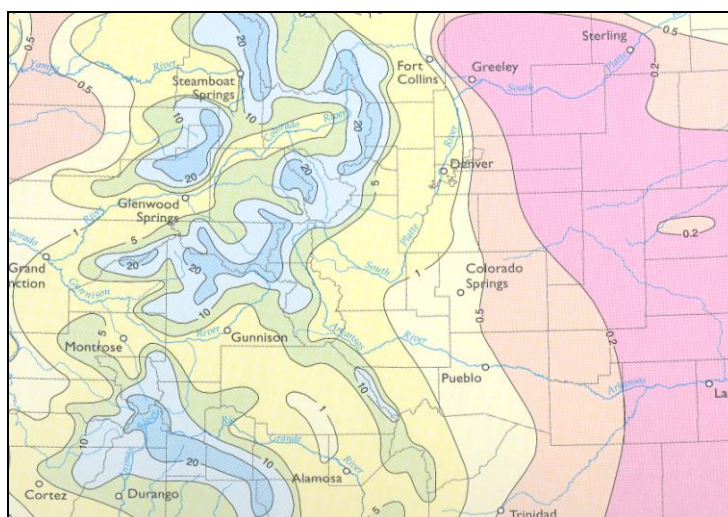


SOURCE: WWW.CITY-DATA.COM

Most of the precipitation that falls on the land surface during storm events flows directly into drainages, streams, and rivers as runoff. The eastern plains of Colorado have an annual runoff of less than one inch (Figure 4). The annual runoff in Morgan County is relatively low (0.2 inches per year).

The precipitation that falls in this area is generally retained as soil moisture because of the relatively flat topography, porous soils and generally low soil moisture content. Some of the water will infiltrate the soil and recharge the underlying aquifer. On average, 81 percent of the precipitation that falls on the land surface throughout Colorado is lost through evapotranspiration, producing a water balance deficit over most of the state (Topper et al, 2003).

Figure 4. Average Annual Water Runoff in Colorado



SOURCE: COLORADO DIVISION OF WATER RESOURCE

Land Ownership and Use

Land Ownership

The MCQW Source Water Protection area lies within unincorporated land of both Morgan and Weld County. Most of the land within Morgan Counties is privately owned, except for the small state owned parcels and the incorporated communities. Incorporated communities within Morgan County include Brush, Fort Morgan, Hillrose, Log Lane Village, and Wiggins. The densest residential concentration in Morgan County is in the City of Fort Morgan.

Land ownership in Weld County is primarily private, except for small state owned parcels, incorporated municipalities, and public land managed by the United States Forest Service. Weld County has 31 incorporated municipalities with the highest residential concentration in the city of Greeley.



PHOTO: COLLEEN WILLIAMS

Most of the land within the source water protection areas is covered with sandy soil or sand dunes.

Land Use

The eastern source water protection areas lie within Morgan County. Land use primarily consists of agriculture, urban and rural development, recreation, and industry. For years, Morgan County has been one of the richest agricultural counties in the State east of the Rockies. More than 88% of the county land area is devoted to farming and raising livestock. It has been ranked in the top 3rd of counties for value of crops and livestock produced. The major crops grown in the county include corn, sugar beets, hay, wheat, potatoes, onions, pinto beans, alfalfa, barley and sunflowers (MCCP, 2004).

The western source water protection area lies within Weld County which is diverse physically, culturally, and in its land use. Spanning an area from northern metropolitan Denver to the Wyoming state line, the County is just less than 4,000 square miles in size -- over twice the size of Delaware. Land use primarily consists of agriculture, urban and rural development, recreation and industry. The County is consistently one of the top ten economically producing agricultural counties in the entire United States. Weld County is Colorado's leading producer of cattle, grain and sugar beets. Two waterways in the County, the Platte and Cache la Poudre Rivers, provide an important sources of water in the otherwise semi-arid western Great Plains. Through a complex system of irrigation canals, water is supplied to the actively farmed portions of western Weld County (WCCP, 2008).

An abundance of water has been important to not only the agricultural community, but also to industrial development. Weld County is the second leading area in Colorado in the production of oil and gas. The county's many abundant resources provide a sound economic base and a secure future for the area (Weld County, 2009).

Administration

Land use decisions for both Morgan and Weld Counties are made by the Board of County Commissioners with recommendations from the Planning Commission and department staff. The County Planning Departments administers, on behalf of the Board of County Commissioners, the County's land use regulatory system. The Departments coordinate issues relating to physical land use and development activities as well as long range planning. The Departments provides information to the public on County land use policies, programs, regulations, and permit requirements.

Planning and Zoning

Morgan County Planning

The Morgan County Comprehensive Plan, adopted in 2004, provides a framework for decision making and serves as a guide to development within the unincorporated Morgan County. The Plan is advisory only and has no regulatory effect. The Plan identifies the following goal, policy, and strategy pertaining to the environmental resources of Morgan County:

- Goal: To preserve the manmade and natural environment in order to enhance the quality of life in Morgan County and to make environment considerations part of the land use decision-making process.
- Policy and Strategies: Ensure that development does not contribute to surface or ground water pollution through either discharge or increased storm water runoff.
- Policy and Strategies: The County shall evaluate development proposals relative to their cumulative impacts and compliance with local and state air and water quality standards (MCCP, 2004).

Weld County Planning

The Weld County Comprehensive Plan, adopted in November 24, 2008, is a document that provides guidance and direction for future and existing land use in Weld County. The Weld County Comprehensive Plan establishes a common vision for what the County will look like over the next 20 years. The Comprehensive Plan includes the following goals and policies that pertain to the environmental resources of Weld County:

- Goal: Strive to address the quality of all water bodies as outlined in the State and Federal Water Quality Standards.
- Policy: Where possible and consistent with existing water rights regulations, stormwater collection and treatment should be considered for all development. The developer should be required to employ best management practices in the design of all stormwater facilities.
- Goal: Strive to address Federal Drinking Water Standards in aquifers that provide drinking water for domestic and public use.
- Policy: Applications for new development not on public wastewater systems should consider the installation and maintenance of managed and advance treatment septic systems to prevent potential groundwater pollution (WCCP, 2008).

Morgan County Zoning

Most of the land in the source water protection area of Morgan County lies within the Agricultural Production Zone (A). Agriculture is considered to be a highly valued resource in Morgan County. Conservation of agricultural resources and land is paramount and such land and resources must be protected from adverse impacts resulting from uncontrolled and undirected business, commercial, industrial and residential uses. The "A" zone is established to maintain and promote agriculture as an essential industry of Morgan County. Morgan County recognizes that non-agriculture uses, such as residences, occur in the Agriculture Zone, but that these uses are subordinate to agricultural uses.

Use-By-Right

Within the Agricultural Zone, the use of land or structures may not require prior review and approval by the Planning and Zoning Commission or the Board of County Commissioners. The use of land without review is called "Use-By-Right" and is the principal use(s) permitted on that land. On parcels larger than 20 acres, the Uses-By-Right include:

1. Farming, ranching, and gardening
2. One single-family residence per parcel
3. Crops cultivation, storage, sale
4. Grazing of livestock
5. Truck and sod farms, nursery stock, greenhouses
6. Sales offices for farms
7. Accessory uses: radio, TV, satellite towers; one additional single-family residence per parcel used for employees or family members; farm buildings; roadside stands; home occupations; fertilizer and chemical storage; seed sales.
8. Major facility of a public utility
9. Water reservoir

Uses-By-Right on parcels 20 acres or smaller include numbers 1, 2, 4, and some accessory uses listed above. To construct a Use-By-Right on a parcel requires a building permit.

Conditional Use

These include normal uses associated with use-by-right upon compliance with certain conditions and after review and approval of a site plan. The Conditional Uses in the Agricultural Zone include:

1. Buildings: group homes, living units (4) per parcel, veterinary clinics, kennels, schools, churches, public recreation facilities, mobile homes, hospitals, fire stations, and meeting places.
2. Resource Operations: oil and gas drilling and facilities; sand, gravel and dirt operations; small wind energy systems; water storage operations; synthetic fuels; and asphalt or concrete plants.
3. Livestock Operations: confinement operations; alternative livestock, animal training
4. Other: golf courses, commercial trucking and heavy equipment parking and maintenance; hunting and fishing perseveres; and cemeteries.

For uses that are not included in the Use-By-Right or Conditional Use category, a Special Use Permit review is required prior to approval. For more information about the uses included in each category refer to the Morgan County Zoning Regulations found online at www.co.morgan.co.us (MCZR, 2003).

Weld County Zoning

Most of the land within the source water protection area of Weld County lies within the A (Agricultural) Zone District. The A (Agricultural) Zone District is intended to provide areas for the conduct of agricultural activities and activities related to agriculture and agricultural production without the interference of other, incompatible land uses. The A (Agricultural) Zone District is also intended to provide areas for the conduct of Uses by Special Review which have been determined to be more intense or to have a potentially greater impact than uses Allowed by Right.

Uses Allowed by Right

Land use by right, without review, within the A (Agricultural) zone District includes the following uses:

1. One single family residence per lot or parcel of land (minimum lot size 80 acres)
2. Farming, ranching and gardening
3. Cultivation, storage and sale of crops, vegetables, plants, flowers and nursery stock raised on the premises and temporary storage not raised and not for sale on premises
4. Grazing and feeding of livestock
5. Oil and gas production facilities
6. Public parks, recreation facilities, schools
7. Facilities: Utility service, police, fire station, animal boarding/ training, alcohol production
8. Temporary: group assemblages, facilities for the sale of fireworks and Christmas trees
9. Mobile homes, manufactured homes, group home, foster care home
10. Borrow pits used temporarily for the completion of a public road improvement project
- Commercial radio towers
11. Disposal of domestic sewage and septic sludge
12. Other accessory uses as identified in the Zoning Code

Use by Special Review

The following land uses are allowed upon approval of a permit with special review:

1. Mineral resource development facilities: oil and gas storage, support, service; mining including open pit mining and materials processing; asphalt and concrete batch plants; and coal gasification facilities.
2. Agricultural service establishments primarily engaged in performing agricultural, animal husbandry or horticultural services on a fee or contract basis
3. Recreational facilities and uses: race tracks, drive-in theatres, golf courses, shooting ranges, guest farms, hunting lodges, fairgrounds, camping areas,
4. Public Utilities facilities including equipment storage or repair, storage tanks
5. Public buildings: churches, schools, administrative offices, airports, junkyards, kennels, solid waste disposal sites, exotic animal facilities,
6. Communication transmission or relay tower over 70 feet in height per lot
7. Multi-family dwelling for persons principally employed or engaged in farming, ranching, or gardening
8. Home business
9. Accessory buildings with gross floor area larger than 4% of total lot area
10. Animal boarding in exceedance of maximum number and/or traffic generated
11. Child care center, bed and breakfast, research laboratory, heavy manufacturing
13. Wind turbines

For more information about the uses included in each category refer to the Weld County Zoning Code found online at www.co.weld.co.us (WCC, 2009).

Population and Growth

Morgan County

From 1930 to 1990, Morgan County experienced small fluctuations in its population, averaging a 0.32% population growth increase. Compared to Colorado, with an average annual population growth rate of 1.96%, the population growth in Morgan County lagged significantly behind. Throughout the 1990s, Morgan County experienced positive population growth. The population growth rate peaked in 1993 at 3.39% and hit its lowest point in 1998 at 0.08%. Morgan County, with an average annual growth rate of 2.43%, had a slightly lower rate than the state average population growth rate of 2.59% during the 1990s (CSU, 2004).

The population growth in the unincorporated areas of the County declined from 50% in the 1950's to 33% in 1990 and has stayed steady at 33% in 2000. Overall, the County experienced a 25% population growth from 1990 to 2000. The following table depicts these population changes and future growth estimates up to 2010 (MCCP, 2004).

Table 4. Projected Growth Rate

Community Area	1985	1990	2000	2010
Morgan County	22,431	21,939	27,171	33,859
Unincorporated Morgan County	7,732	7,371	8,922	10,796
Weld County		131,821	165,805	243,750

The Colorado Department of Local Affairs indicates that the population will increase approximately 2% from 2015 through 2020, with a population of 39,916 in 2020.

Weld County

The Weld County seat and principal city, Greeley, is located in the west central part of the county and contains almost half the county's population. Most of the remaining population resides within a 20 to 30 mile radius of Greeley. The northeastern part of the county is sparsely populated as well as the source water protection area for MCQW located in Weld County.

The county population on July 1, 1999, was 165,805, an increase of 33,984 over the 1990 census. As of 2009, Weld County's population is 243,750 people. Since 2000, it has had a population growth of 30.91 percent.

Both Weld and Morgan County are situated along interstate highway routes, have affordable regional labor pool, and well developed commercial and industrial sites. The local business climate is conducive to growth due to its lower cost of doing business. This has led to a significant population and job growth in recent years.

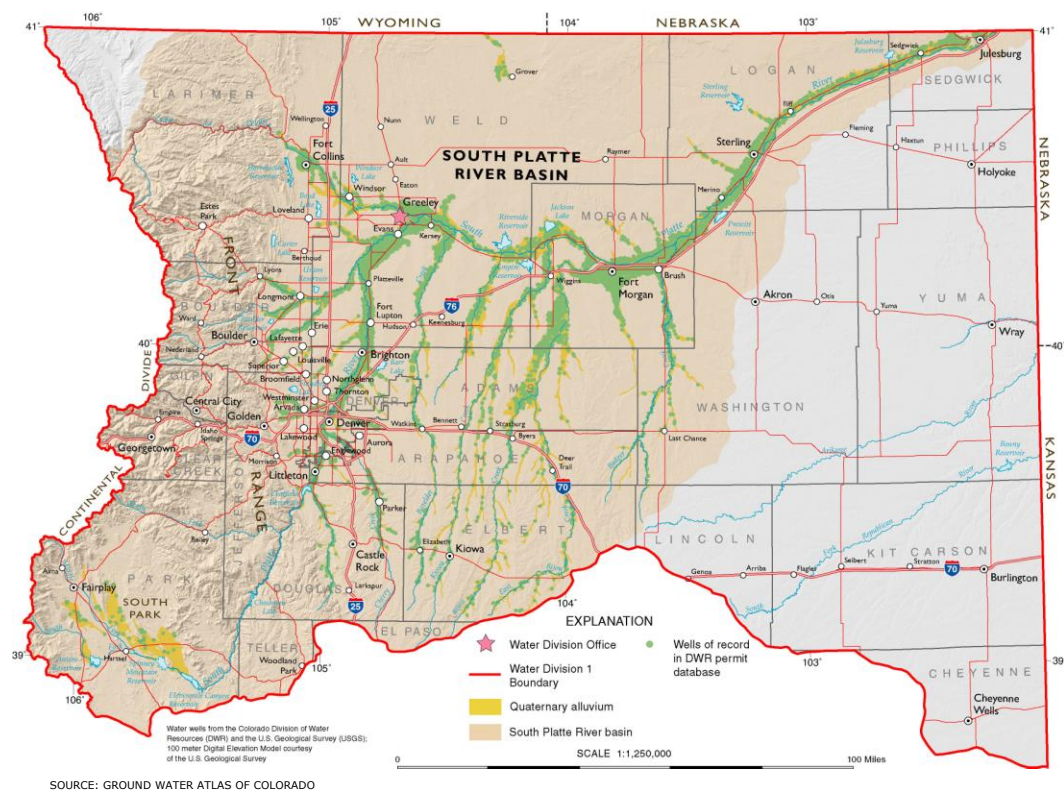
WATER QUALITY SETTING

Hydrology

The main water sources for the Morgan County Quality Water are from three ground water alluvial aquifers located in the subregions of the Lower South Platte River basin; Hydrologic Unit Codes 10190013, 10190012, and 10190003. The South Platte River basin drains an 18,924 square mile area comprising the northeastern quarter of Colorado (Figure 5). Generally, the ground water flows down valley and toward the main channel of the South Platte River. Infiltration from precipitation, irrigation, canal seepage, and pond seepage recharges the alluvial aquifers (Topper, et al).

The alluvial aquifers discussed in this report consist of unconsolidated sand and gravel deposits lying in ancestral channels which were eroded into the underlying bedrock materials. These deposits contain water, derived from precipitation, which is slowly moving down slope towards the South Platte River. Before man's influence on these systems, an equilibrium was established between recharge to and discharge from each aquifer. Man's activities, such as pumping and use of the ground water, importation of surface water, and/or modification of the natural recharge processes change the recharge-discharge balance. If the development of the ground water is too great, an imbalance of discharge exceeding the recharge occurs, resulting in depletion of the water in storage. Situations of this type are often referred to as ground-water mining operations (Bittinger, 1973).

Figure 5. Map of the South Platte River Basin

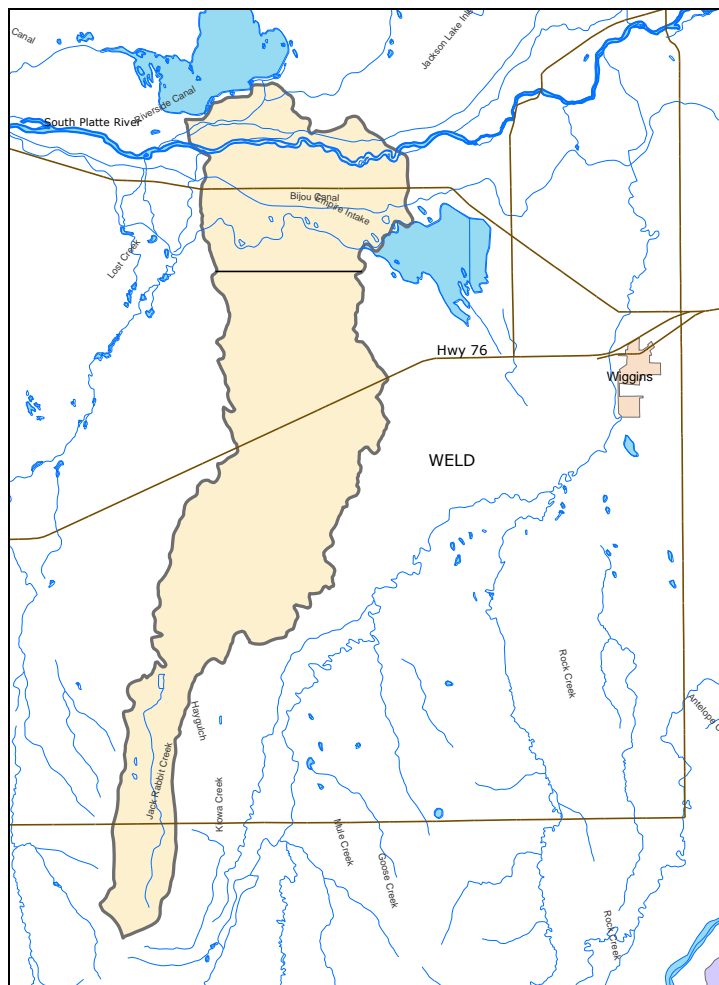


Hay Gulch Alluvium

The Krause well field is the main ground water source for the Morgan County Water Quality District. It is located within the lower Hay Gulch alluvium which heads in T1N, R62W and trends in a northerly direction joining the South Platte River Valley in T4N, R61W, near Dearfield. The entire watershed lies in southeastern Weld County within the Lost Creek Designated Ground Water Basin. Hay Gulch is an intermittent, poorly developed surface stream tributary to the South Platte River.

The underlying bedrock of the Hay Gulch alluvial aquifer consists of the Upper Cretaceous Pierre shale, Fox Hill sandstone and Laramie formation. This aquifer is separated from the Kiowa Creek alluvial aquifer on the east and the Lost Creek alluvial aquifer on the west by bedrock ridges. Recharge to the alluvium occurs through downward percolation of precipitation over the approximately 37 square mile surface drainage watershed. The poorly developed surface drainage system, especially through the lower portion of the basin which is covered with sand dunes, indicates little water flows out of the basin over the surface. The volume of ground water stored within the Hay Gulch alluvium is estimated to be about 60,000 acre feet. A saturated thickness of over 100 feet exists in the center of the channel (Bittinger, 1973).

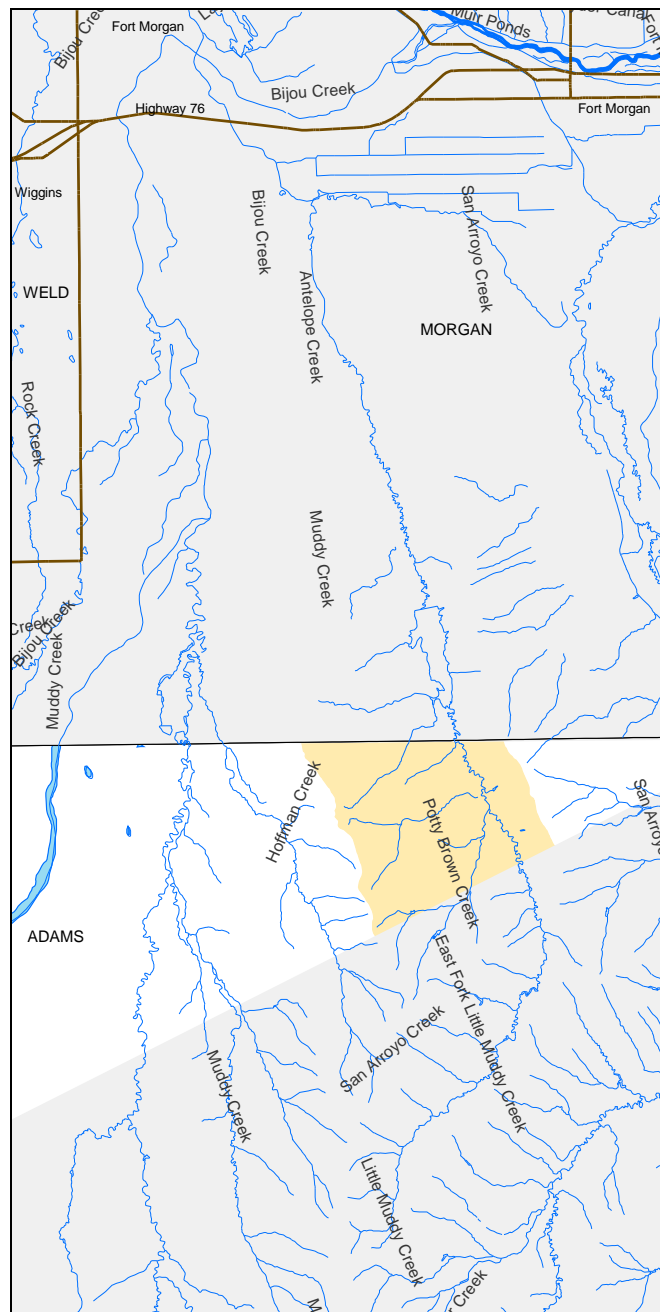
Figure 6. Map of the Hay Gulch alluvial basin



San Arroyo Creek Alluvium

The District's Weingardt well field lies within the upper San Arroyo Creek alluvium. The alluvium heads in T35S, R58W in northern Adams County and trends in a northerly direction joining Bijou Creek in T3N, R59W in Morgan County. Recharge to the alluvium occurs through downward percolation of precipitation over the approximately 122 square mile surface drainage watershed. The District also has an approved infiltration and recovery project in the San Arroyo Creek alluvium. The infiltration water is recovered to supplement the District's ground water supply.

Figure 7. Map of the San Arroyo Creek alluvial basin



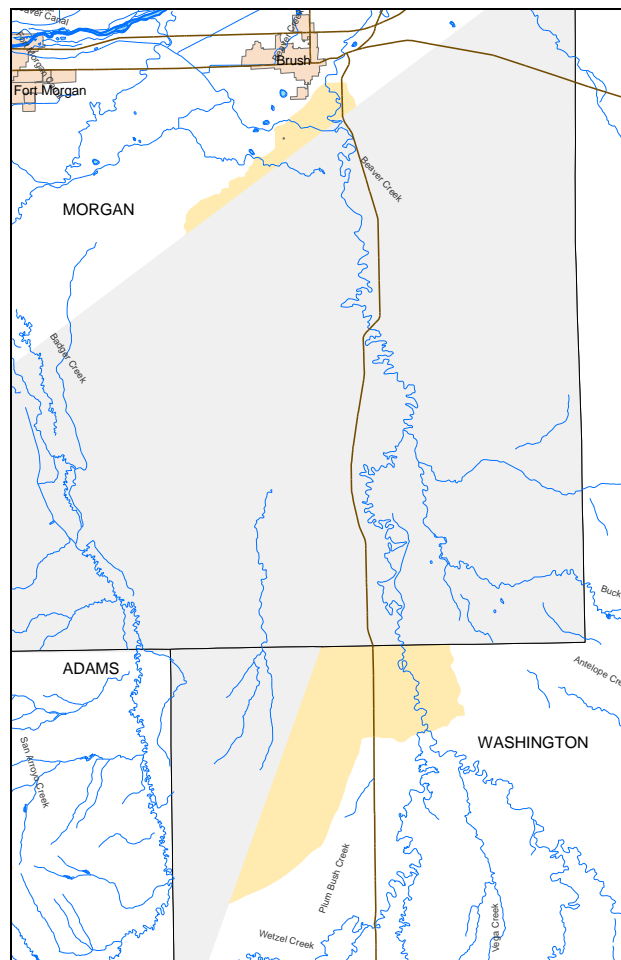
Beaver Creek Aquifer

The District's Smart well field lies within the lower Beaver Creek alluvial aquifer. The Beaver Creek alluvial aquifer consists primarily of saturated, stream-laid deposits of sand and gravel within the broad valley of Beaver Creek. Over much of the area, these alluvial deposits have been covered by wind-deposited sand, so that the present channel of Beaver Creek occupies only the eastern portion of the original alluvial valley. The total depth of dune sand and gravel materials overlying the aquifer is up to 140 feet.

The primary source of natural recharge to the Beaver Creek alluvial aquifer in the well field vicinity is from downward percolation of precipitation within the extensive region of sandhills. The soils in the sandhills have rapid infiltration rates which allows for downward percolation of precipitation even during intense storm events. The general direction of ground-water movement is north / northeast to the South Platte River. The average rate of natural ground-water movement in the aquifer is approximately 0.8 feet per day or about 300 feet per year (HRS, 1990).

The recharge area that contributes to the source of water for the well field extends approximately six miles wide in an east-west direction from the well fields and ten miles to the south totaling 60 square mile area of sandhills. The saturated thickness of the alluvium south of Brush is between 80 to 160 feet (Topper, et al, 2003).

Figure 8. Map of the lower Beaver Creek alluvial basin



Water Quality Standards

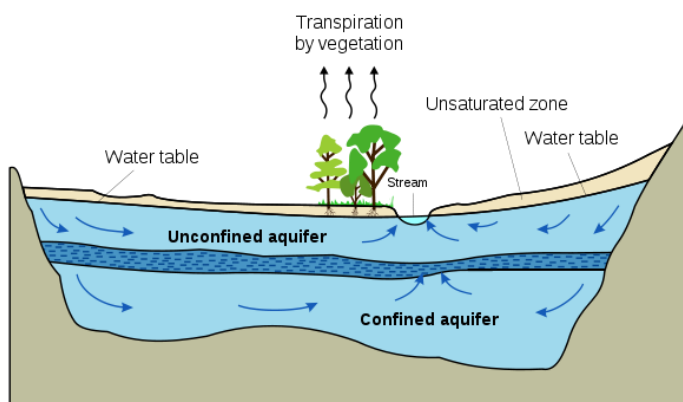
Under the Clean Water Act, every State must adopt water quality standards to protect, maintain, and improve the quality of the Nation's waters. The State of Colorado's Water Quality Control Commission has established basic standards for ground water regulations that apply a framework for ground water classifications and water quality standards for all waters within their jurisdictions. Standards are designed to protect the associated classified uses of the ground water or designated use. The ground water classifications are applied to ground waters within a specified area based upon use, quality and other information as indicated in Regulation No. 41 "The Basic Standards for Ground Water" (CDPHE, 2008).

In 1991 the Water Quality Control Commission adopted Regulation No. 42, "Site Specific Water Quality Classifications and Standards for Ground Water" to apply this framework to specified ground waters in the state. The three Morgan County Quality Water District's well fields were designated Specified Areas that included all unconfined ground waters within the saturated zone underlying that area. The three Specified Areas are listed by the Water Quality Control Commission as:

- Morgan County Quality Water District well field (Krause well field)
- Morgan County Quality Water District well field – San Arroyo Creek Basin (Weingardt well field)
- City of Brush well field (MCQW's Smart well field)

The delineations of these three Specified Areas are included in the maps in the following section of this report.

The Classification or Designated Use for the ground water in these 3 areas is for domestic and agricultural use. The ground water quality standards are assigned to all unconfined ground water in the specified area and are included in Tables 1-4 of "The Basic Standards for Ground Water" Regulation No. 41 (5 CCR 1002-41).



SOURCE: WIKIPEDIA.ORG

Figure 9. Typical aquifer cross-section. Unconfined ground water is ground water that has a free water table; i.e., water not confined under pressure beneath relatively impermeable rocks. The saturated zone is a subsurface zone in which all of the interstices are filled with water under pressure greater than that of the atmosphere. This zone is separated from the zone of aeration by the water table.

Drinking Water Supply Operation

The Morgan County Quality Water District (District) is a quasi-municipal entity created in 1976 to provide drinking water primarily to the rural residents of Morgan County. The District also serves a few customers in Weld, Adams, and Washington Counties. The water system consists of 15 wells, 10 of which are located in 3 well fields: Krause well field in Weld County drilled into the Hay Gulch Creek alluvial aquifer; Weingardt well field in Morgan County drilled into the San Arroyo Creek alluvial aquifer; and the Smart well field in Morgan County drilled into the Beaver Creek alluvial aquifer. The District also has wells in Goodrich, Hillrose, and 1 new Brungardt well north of the Smart well field (Table 5). The wells range from 135 to 161 feet deep.



PHOTO: COLLEEN WILLIAMS

The District stores water from the Krause well field in these two 750,000 tanks prior to distributing water to its 6,500 residents.

Raw water from the Krause well field is piped 2 miles to the two 750,000 gallon tanks. Raw water from the other well fields is piped 12 miles to the 1,250,000 gallon North tank. The total capacity of water storage is 2,750,000 gallons. The water distribution system currently has over 500 miles of water lines and 2,760 taps that provide water to approximately 6,500 residents. The Morgan County Quality Water District is the largest water distribution system relative to land mass in Colorado. The average daily demand is 1.8 million gallons per day. Peak use is in June with 3.7 million gallons per day (Kokes, 2009).

Table 5. List of Morgan County Quality Water's Wells

Well field	Water Source Name	Well Permit Number	Water Source ID	Static Water Level (ft.)	Status
Krause	K1	018338-F	CO0144020-002	52	Active
Krause	K2	015721-F	CO0144020-003	51	Active
Krause	K3	015720-F	CO0144020-004	52	Active
Krause	K4	016644-F	CO0144020-005	62	Active
Krause	K5	23851-F	CO0144020-006		Emergency Use Only
Weingardt	W1	95VE172	CO0144020-011	54	Active
Weingardt	W3	51226-F		66	Active
Weingardt	San Arroyo #1	64487-F			Recovery Well
Smart	S1	043077-F	CO144020-008	58	Active
Smart	S2	038433-F	CO0144020-009	72	Active
Other Wells	W12-Goodrich	5997-F	CO0144020-015		Emergency Use Only
Other Wells	Hillrose	24837-F	CO0144020-014		Emergency use Only
Other Wells	BRUN No. 1E	6260-RF			Leased out
Other Wells	BRUN No. 2W	6259-R			On hold

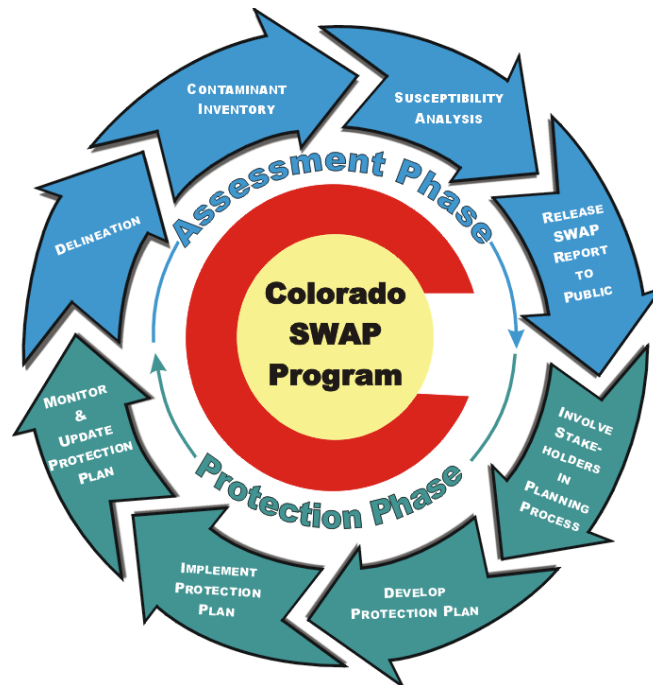
SOURCE: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT AND MORGAN COUNTY QUALITY WATER

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 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 a 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 10, respectively.

Figure 10. Source Water Assessment and Protection Process



Source Water Assessment Phase

As depicted in the upper portion of Figure 10, 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 the Morgan County Quality Water District'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 Morgan County Quality Water District has 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 10, 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 10. 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 ASSESSMENT RESULTS

The Colorado Department of Public Health and Environment assumed the lead role in conducting the source water assessments for public water systems in Colorado. The Morgan County Quality Water District received their source water assessment report in November 2004 and has reviewed the report along with the Source Water Protection Planning Team. These assessment results were used as a starting point to guide the development of appropriate management approaches to protect their source water from potential contamination. A copy of the source water assessment summary report can be obtained by contacting the water system or by downloading a copy from the Colorado Department of Public Health and Environment's SWAP program web site located at: www.cdphe.state.co.us/wq/sw/swaphom.html. The following sections provide a brief summary of the main findings from the three component phases of the assessment.

Source Water Assessment Area Delineation

A source water protection area is the surface and subsurface areas from which contaminants are reasonably likely to reach a 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 purpose of delineating a Source Water Protection Area is to determine the recharge area that supplies water to a public water source. The delineated source water assessment area provides the basis for understanding where the community's source water and potential contaminant threats originate, and where the community has chosen to implement its source water protection measures in an attempt to manage the susceptibility of their source water to potential contamination.

The Colorado Department of Public Health and Environment contracted with EnecoTech to perform delineations of community water system's source water protection areas within the State of Colorado. The delineation included the three sensitivity zones surrounding each of the 10 Morgan County Quality Water District's wells. Since the Assessment report was completed in 1994, the District has added 5 more wells to their system.

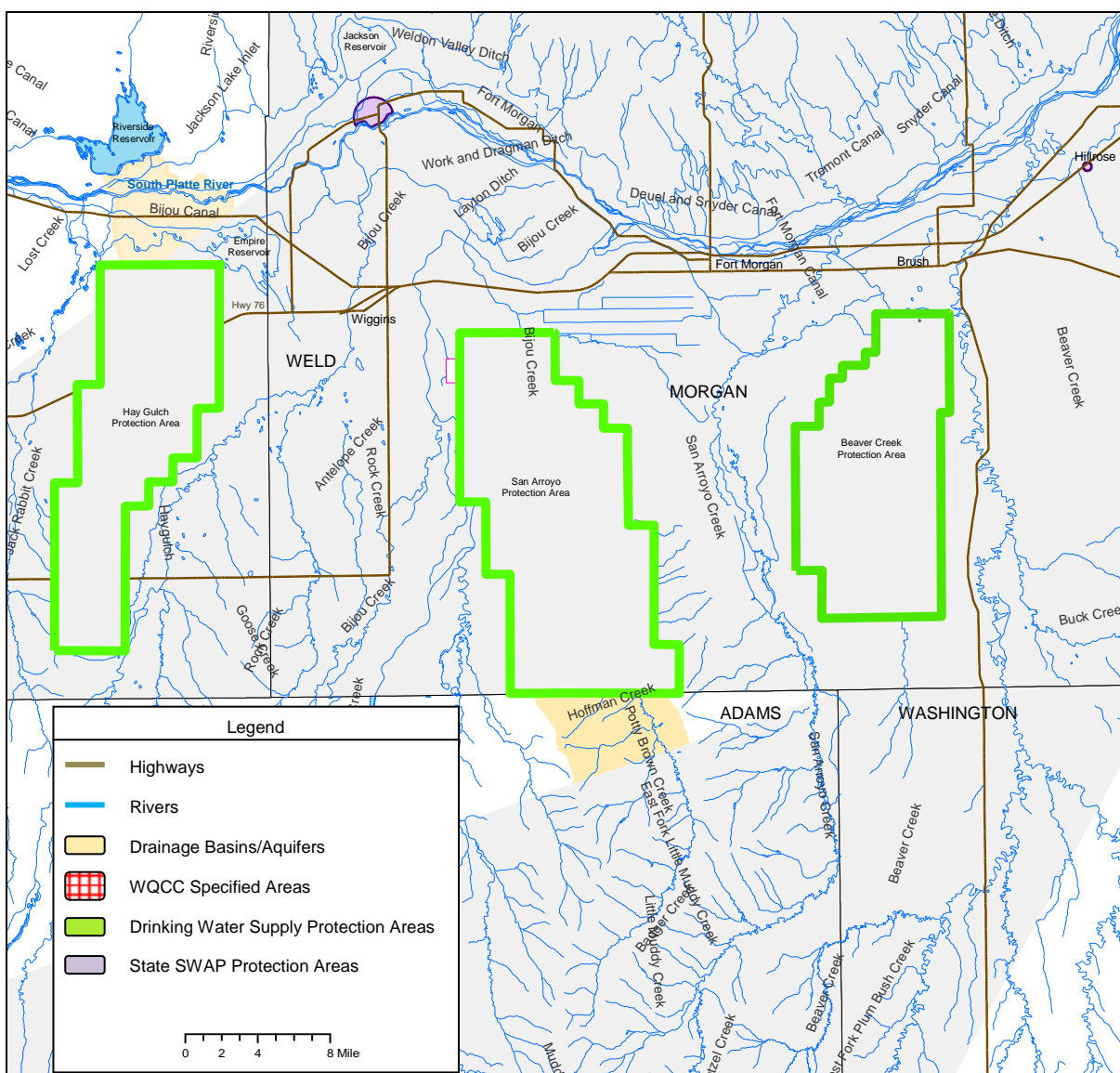
The three "sensitivity zones" surrounding each well include:

- 1) **Zone 1** is a 500-foot radius around the water source intake.
- 2) **Zone 2** is defined by calculating the distance from the water intake source through which a parcel of water travels over a two-year time period.
- 3) **Zone 3** is defined by estimating the distance from the water intake source through which a parcel of water travels over a five-year time period.

Defining the Source Water Protection Area

The Planning Team reviewed the State's assessment and delineation of the source water protection area for each of the wells; reviewed the delineation of the Specified Areas accepted by the Water Quality Control Commission in 1991 as stated in Regulation 42; identified each drainage basin and underlying aquifer for the well fields; and decided to include these areas within a Drinking Water Supply Protection Area. The Drinking Water Supply Protection Area defines the source water protection area that the community has chosen to implement its protection measures to reduce the risks of potential contaminants to these water sources.

Figure 11. Map of the Delineated Source Water Protection Area



SOURCE: COLORADO WATER QUALITY CONTROL DIVISION

Contaminant Source Inventory

In 2001-2002 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 contaminant sources were inventoried using selected state and federal regulatory databases. Dispersed contaminant sources were inventoried using a 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 results were provided to the water systems as part of the source water assessment process. 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.).

Discrete Potential Sources of Contamination

The contaminant source inventory results for the Morgan County Quality Water District's water sources indicate two types of discrete potential source of contamination: 7 tank facilities and 3 Standard Industrial Classification businesses. The inventory identified these facilities within the Goodrich well's protection area. The Planning Team field-proofed all of these sites and found that they were not located in the protection area; therefore, there are no discrete potential sources of contamination in the District's source water protection areas.

Dispersed Potential Sources of Contamination

The contaminant source inventory indicates the following types of dispersed contaminant sources were identified within the source water assessment areas analyzed:

Land uses identified in the State's Assessment:

- Commercial/Industrial/Transportation
- Low Intensity Residential
- Row Crop, Fallow, Small Grain, Pasture/Hay
- Septic Systems
- Oil/Gas Wells
- Road Miles

Notice

The information contained in this "Plan" is limited to that available from public records and the water supplier. 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" should not be interpreted as one that will necessarily cause contamination of the water supply.

Contaminants Health Concerns

The discrete and dispersed sources of contaminants can cause acute and chronic health concerns as indicated below. These categories of contaminants are most likely associated with the most prevalent sources identified in Table 8.

Acute Health Concerns

Acute health concern contaminants 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).

Table 6. Acute Health Concerns

Acute Health Concern	Discrete Contaminants	Dispersed Contaminants
Microorganisms	x	x
Nitrate/Nitrite	x	x
Pesticides	x	x
Semi-volatile organic compounds (SVOCs)	x	
Volatile organic compounds (VOCs)	x	
Lead	x	
Ammonia or nitric acid	x	x

SOURCE: COLORADO WATER QUALITY CONTROL DIVISION

Chronic Health Concerns

Chronic health concern contaminants 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.

Table 7. Chronic Health Concerns

Acute Health Concern	Discrete Contaminants	Dispersed Contaminants
Herbicides	x	x
Pesticides		x
Volatile organic compounds (VOCs)	x	
Non-metal inorganic compounds		
Metals – Primary Drinking Water (other than lead)	x	
Turbidity	x	x
Other inorganic compounds	x	x
Other organic compounds	x	

SOURCE: COLORADO WATER QUALITY CONTROL DIVISION

Susceptibility Analysis

The susceptibility analysis was conducted by the Colorado Department of Public Health and Environment to identify how susceptible an untreated water source could be to contamination from potential sources of contamination inventoried within its source water assessment area. Table 8 summarizes the total susceptibility and physical setting vulnerability results, and the individual susceptibility results for contaminant sources associated the water sources identified in the assessment reports.

Table 8. Table of Susceptibility Results and Contaminant Source Inventory from the SWAP Report

Public Water System: Morgan County Quality Water District	
Public Water System Identification #	CO0144020
Name of the Drinking Water Source	Krause, Weingart, and Smart Well Fields; Hillrose & Goodrich
Source Type	Ground Water Wells
OVERALL SUSCEPTIBILITY RATING	
Total Susceptibility Rating:	8-Moderate & 1-High
PHYSICAL SETTING VULNERABILITY RATING	
Physical Setting Vulnerability Rating:	4-Moderate & 5-Moderately High
DISCRETE SOURCES RATINGS	
Storage Tanks	5-Moderately High & 2-High
Standard Industrial Classification Facilities	2-Moderately High & 1-High
LAND USES SUSCEPTIBILITY RATINGS	
Commercial/Industrial/Transportation	Moderately High
Road Miles	High
Fallow, Small Grain, Pasture/Hay	Moderate /Moderately High
Row Crops	Moderate/Moderately High/High
Oil & Gas Wells	Moderate/Moderately High
Septic Systems	High
Oil/Gas Wells	Moderate/Moderately High

The susceptibility analysis does not reflect the field assessment completed by the Planning Team which found no discrete contaminant sources. Therefore, the Overall Susceptibility Rating needs to be recalculated to reflect this new data.

An explanation of the rating system used in Table 8 includes:

- 1) **Overall Susceptibility Rating** - This rating is based on two components: the physical setting vulnerability of the water source and the contaminant threat.
- 2) **Physical Setting Vulnerability Rating** – This rating is based on the ability of the ground water flow to provide a sufficient buffering capacity to mitigate potential contaminant concentrations in the water source.
- 3) **Land Uses (Dispersed Potential Sources of Contaminants) Susceptibility Ratings** - This summarizes those land uses that the WQCD's assessment considered to represent the highest threats to the waters.

Discussion of Issues of Concern

The Planning Team reviewed the information presented in the State's Assessment, discussed other potential sources of contaminants not included in the assessment, and identified areas of concern within the source water protection areas in which to focus their management approaches.

Issues of concern include:

- Transportation on roads
- Land use: growth and development
- Septic systems
- Agricultural practices
- Private water wells
- Oil/gas development and operations
- Underground water storage
- Prairie Ponds Augmentation Recharge Ponds
- Clean Harbors Hazardous Waste Facility
- Residential practices

Surface and Ground Water Contaminants

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, and polluted urban and agricultural runoff. While catastrophic contaminant spills or releases can wipe out a water resource, ground water 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 ground water) is the leading cause of water quality degradation (GWPC, 2008).

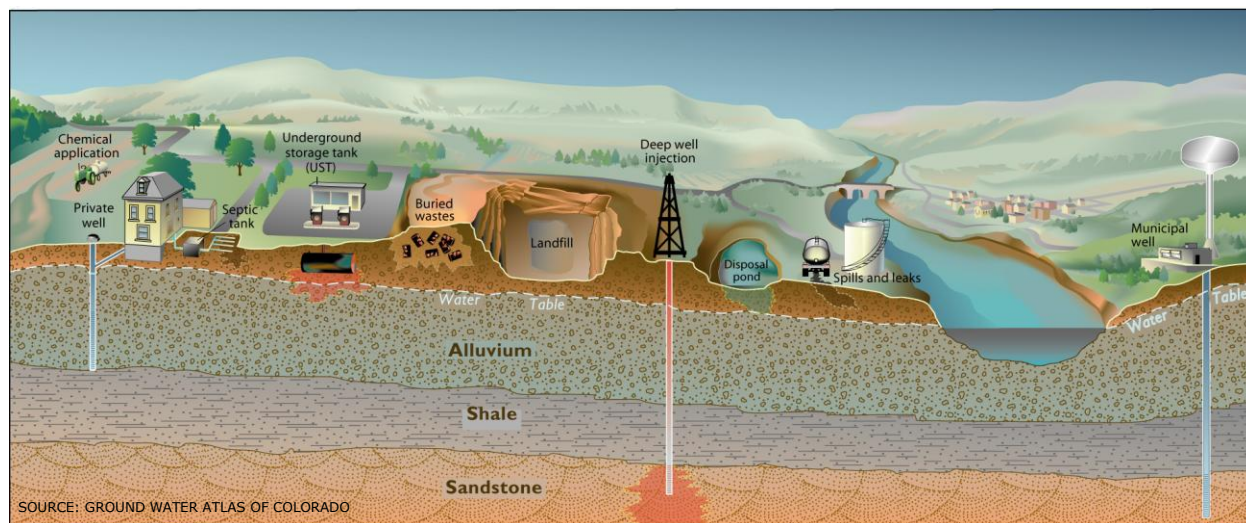
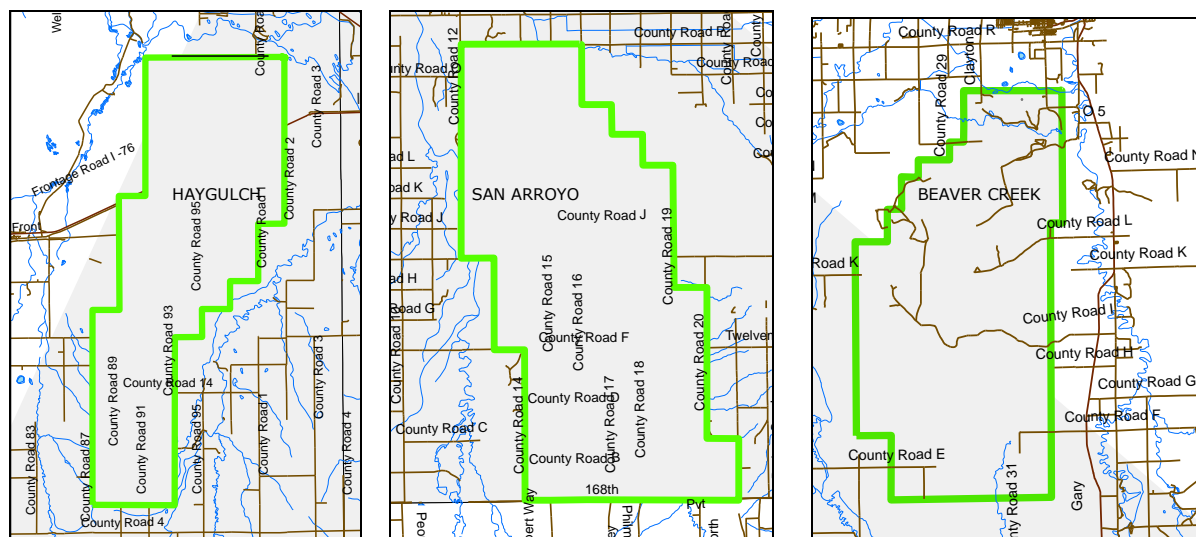


Figure 12. Schematic drawing of the potential sources of contaminants to surface and ground water.

Transportation: Roads and Spills

Figure 13. Road system within the source water protection areas



The Planning Team recommends educating the public on how to respond to a hazardous spill as well as working with local emergency response teams to ensure that any spills within the protection areas be effectively contained and remediated.

Discussion of Issues of Concern

Land Use: Growth and Development

The source water protection areas lie within the unincorporated lands of Weld and Morgan Counties. All of the protection areas are zoned Agricultural and have a list of land uses that are allowed without review by the County. Other land uses within this Agricultural Zone require a special review by County Land Use Departments. Special use permits could be given for land uses within the protection areas including: sand and gravel pits, oil and gas development, confined animal feeding operations, solid waste disposal sites, crop dusting operations, manure storage facilities, cattle truck washing and cleaning, junk yards, slaughter houses, packing plants and rendering plants, and other uses as identified in the County's Zoning Code.

Currently, the State of Colorado law allows the subdivision of property into lots with a minimum of 35 acres without county review. There are large land tracts within the protection area that could be divided into these 35 acre parcels. Future land use and growth within the protection area and the potential for ground water quality impacts from these changes is a concern to the Planning Team. The Team recommends that decision makers within both Weld and Morgan County be encouraged to consider protecting the Hay Gulch, San Arroyo Creek, and Beaver Creek aquifers when they make land use decisions including additional subdivision in this area.

Septic Systems

Currently, there are residences within the Source Water Protection Area with septic systems, also called individual sewage disposal systems (ISDSs). If managed improperly, these residential septic systems can contribute excessive nutrients, bacteria, pathogenic organisms, and chemicals to the groundwater. Septic pollution is the second most cited source of ground water pollution (BCPH, 2008).

The Northeast Colorado Health Department is in charge of permitting septic systems within Morgan County for any occupied building that is not connected to a city sewer system. There are only a few septic systems in the protection areas within Morgan County and they are located at least 100 feet from the wells (Crosthwait, 2008). The Weld County Health Department issues ISDS permits to property owners within Weld County and has participated on the Planning Team.

The Planning Team recommends developing an inventory of owners of septic systems in the protection area and providing public education on proper septic maintenance. The Team also recommends working closely with the County Health Departments to ensure that all of the property owners within the protection area have approved properly functioning septic systems.



PHOTO: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Septic System maintenance is important to the protection of public water supplies.

Discussion of Issues of Concern

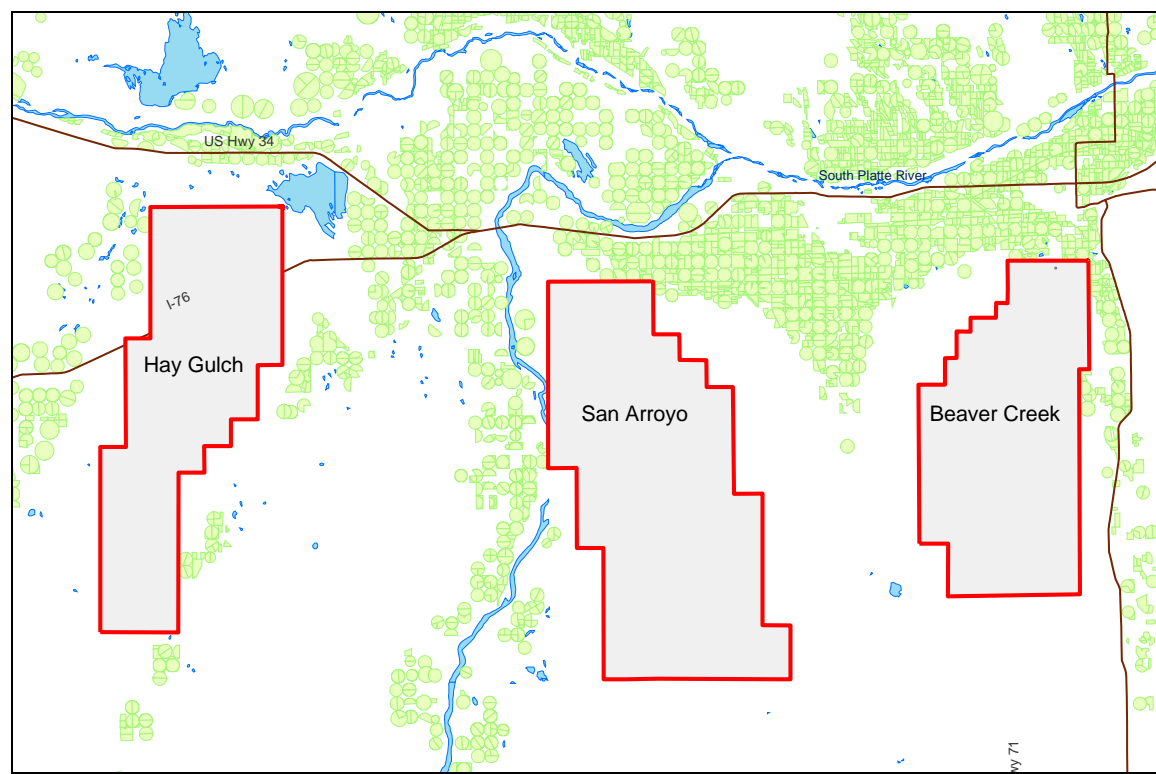
Agricultural Practices

Farming

Most of the irrigated farming is within the South Platte River and Beaver Creek alluviums outside of the protection areas (Figure 14). There are irrigation wells within the source water protection areas most of which is used for growing hay (Figure 16). Dry land farming is practiced in the north and south portions of the county. The protection areas have limited crop farming due to the sandy soil as indicated in Map of Soils in the Protection Area (Figure 15) and irrigation wells. Excess fertilizer use and poor application methods can cause fertilizer movement into ground and surface waters. The two main components of fertilizer that are of greatest concern to source water quality are nitrogen (N) and phosphorus (P).

The Planning Team is concerned with preventing ground and surface water contamination from fertilizers and chemicals used in agricultural practices. They recommend that the land owners use only the types and amounts of nutrients necessary to produce the crop, apply nutrients at the proper times and with proper methods, implement additional farming practices to reduce nutrient losses, and follow proper procedures for fertilizer storage and handling.

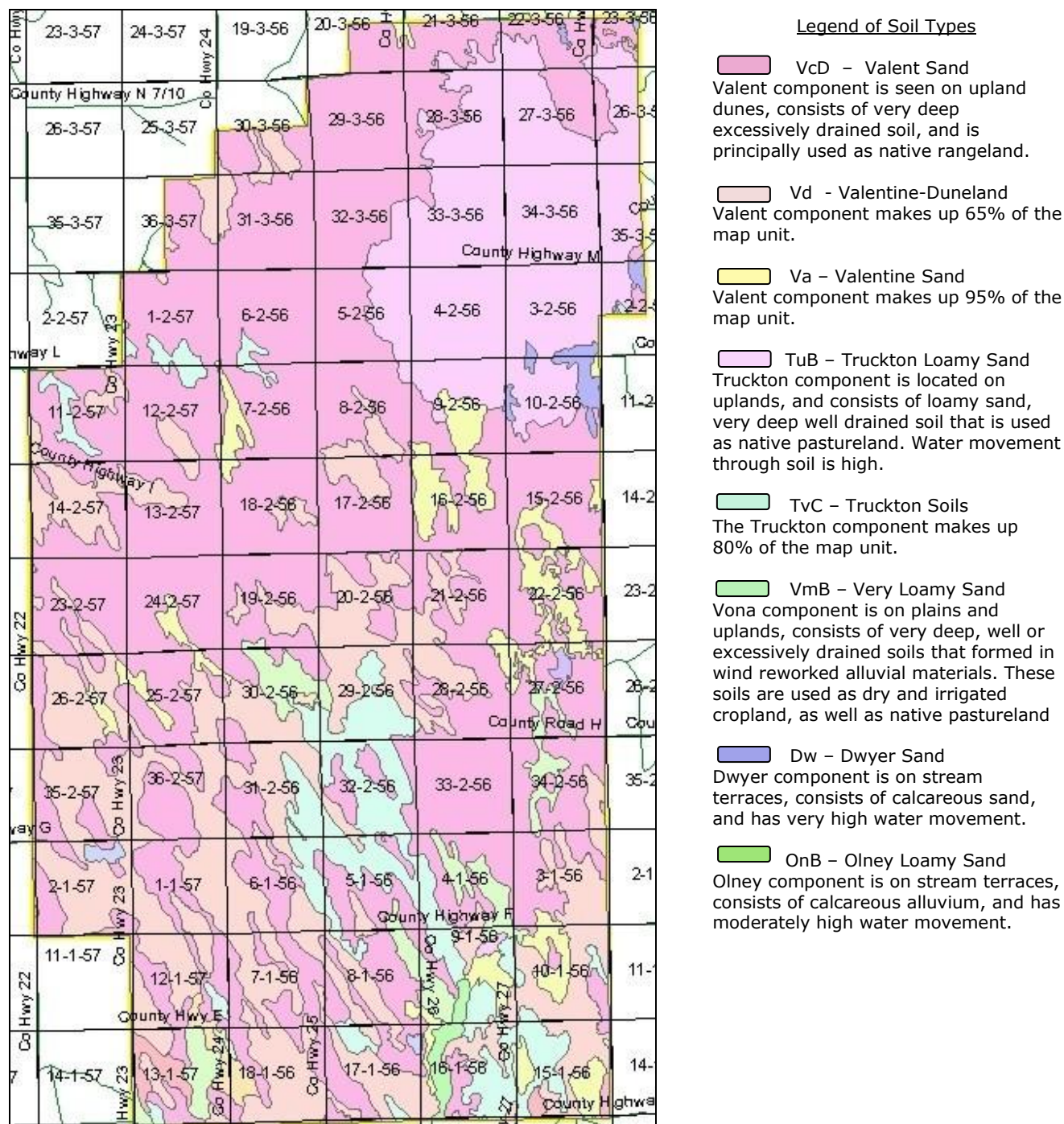
Figure 14. Irrigated Land Map



SOURCE: COLORADO DIVISION OF WATER RESOURCE (2005 DATA)

Discussion of Issues of Concern

Figure 15. Map of the Soils in the Beaver Creek Protection Area



SOURCE: NATURAL RESOURCE CONSERVATION SERVICE

Discussion of Issues of Concern

Livestock Grazing

Most of the land within the Beaver Creek Protection Area is used for livestock grazing on the short grass prairie lands. There are two large ranches, the Huey Ranch and former Kamp Cattle Ranch that was sold in November 2007. The Kamp Cattle Ranch property consists of 8,850+ deeded acres and 640 State leased acres. The Kamp Cattle Ranch lies within the near zone, a 5-mile area from the MCQW Wells. The new owners plan to use this land for winter grazing land for their 400 head of cattle from October to mid June (Harvey, 2008). They have participated on the Planning Team and are committed to range restoration and good stewardship of the land.



PHOTO: COLLEEN WILLIAMS

Nationally, states rank agriculture as the second most prevalent and threatening potential source of contamination for both ground and surface water sources of drinking water. Pathogens that can be carried in animal waste include *E. coli*, salmonella, cryptosporidium, and giardia. To provide for increased protection against microbial pathogens in public water systems that use ground water source, USEPA issued its Ground Water Rule in November 2006. Community water systems will be required to perform additional monitoring for total coliform-positive samples, correct significant deficiencies identified in the system's sanitary survey, and take corrective actions after certain triggers are exceeded. Systems must begin to comply with the new requirements by December 1, 2009. For more information on the Ground Water Rule see: <http://www.epa.gov/safewater/disinfection/grw/index.html>.



PHOTO: COLLEEN WILLIAMS

Animal Feeding Operation is a lot or facility where animals have been, are, or will be stabled or confined and fed for a total of 45 days or more in any 12-month period.



PHOTO: COLLEEN WILLIAMS

Animal waste discharges from a manure storage area can introduce excessive nutrients, organic matter, or pathogens to source waters.

Discussion of Issues of Concern

Private Water Wells

There are many private water wells within the 3 major source water protection areas: Hay Gulch, San Arroyo, and Beaver Creek (Figure 16, Table 9). The Planning Team is concerned about the potential for contaminants to enter the water sources from these wells. Contaminants that infiltrate from the surface are more likely to pollute old, shallow, uncased or abandoned wells than deep wells with properly installed casings.

Figure 16. Water wells located within the source water protection areas

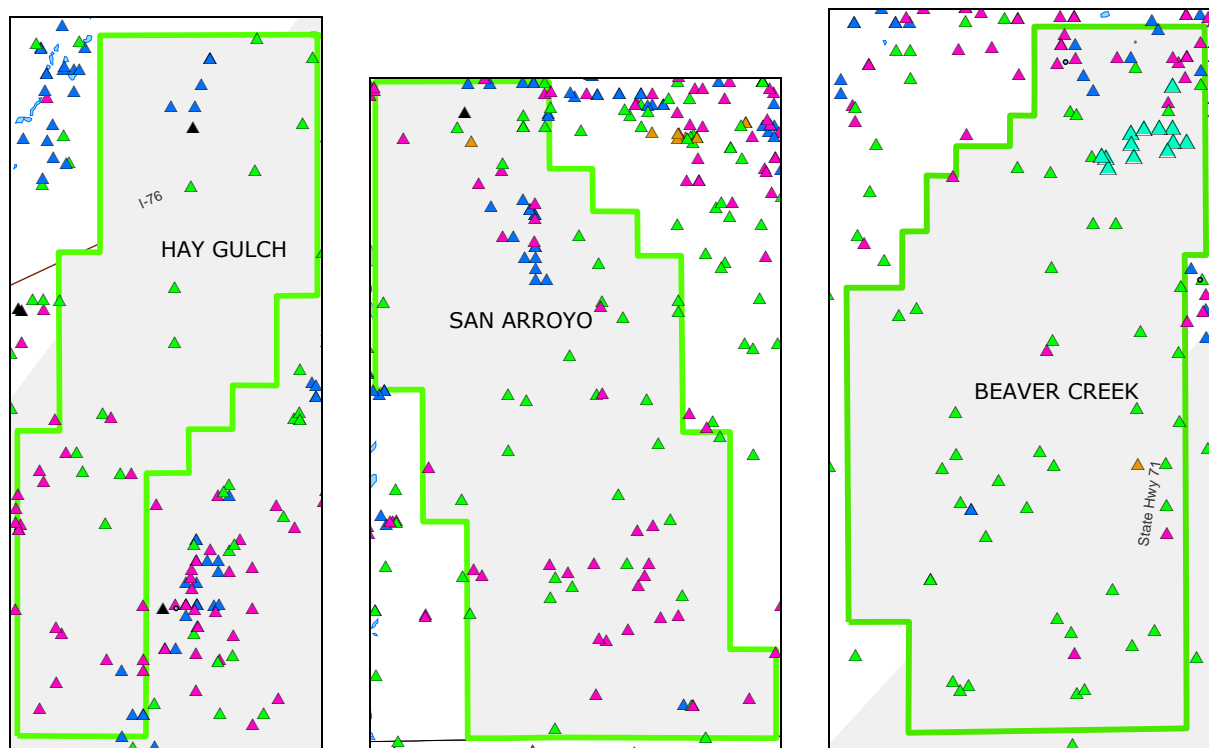


Table 9. Water well types and amounts within the source water protection areas

Legend	Well Type	Hay Gulch	San Arroyo	Beaver Creek
▲	Irrigation	8	18	7
▲	Municipal	0	0	13
▲	Commercial	0	1	1
▲	Domestic	19	35	14
▲	Livestock	12	27	41
▲	Other	1	1	0

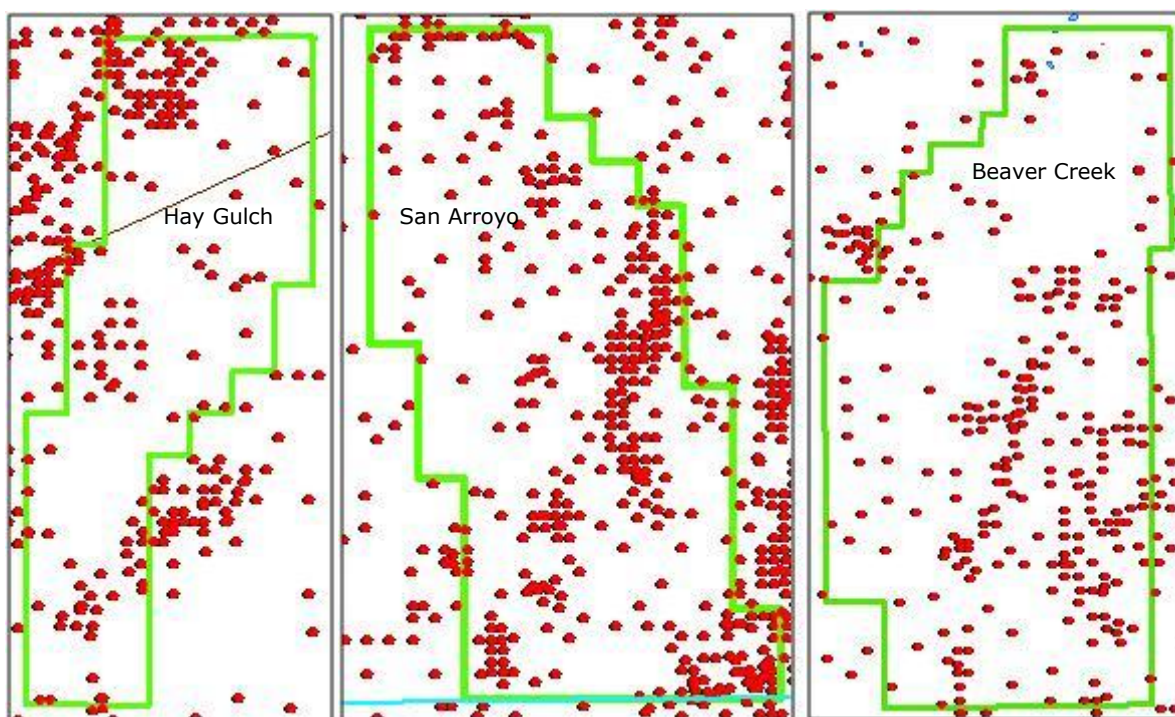
SOURCE: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Discussion of Issues of Concern

Oil and Gas Development and Operation

Morgan County benefits economically from the oil and gas industry through local employment either directly through oil/gas companies or through creation of smaller support businesses that contract with energy developers. In addition to providing jobs, the industry also purchases goods and services promoting economic growth in the community. There are a large number of wells located in Northeastern Colorado that are old and date back to the late 1970's and early 1980's. In Morgan County there were 503 oil and gas wells drilled in the 1980s, 135 drilled in the 1990s and 41 drilled during 2000-2008. The total number of oil and gas wells drilled from 1980 to 2008 is 679 (EWG, 2009). Many of these oil and gas wells lie within the source water protection areas (Figure 17).

Figure 17. Location of oil and gas wells within the source water protection areas



SOURCE: COLORADO OIL AND GAS CONSERVATION COMMISSION 2009 DATA

The Morgan and Weld County Planning Departments are the "Local Designee" to the Colorado Oil and Gas Conservation Commission and the oil and gas industry. The Counties review oil and gas drilling requests and coordinate county interests with the oil and gas companies. The Planning Staff processes permits and also reviews Special and Conditional Use Permit requests for pipelines, compressor stations and processing facilities needed to refine and transport oil and natural gas.

Discussion of Issues of Concern

Hay Gulch Source Water Protection Area

There are 6 producing oil wells within the upper Hay Gulch protection area (Figure 18). All of these producing wells are permitted to the HilCorp Corporation. Two of these producing wells lie within the 500 foot protection area around Morgan County Quality Water District's wells. The close proximity of these oil wells to the MCQW drinking water wells is a concern to the Planning Team.

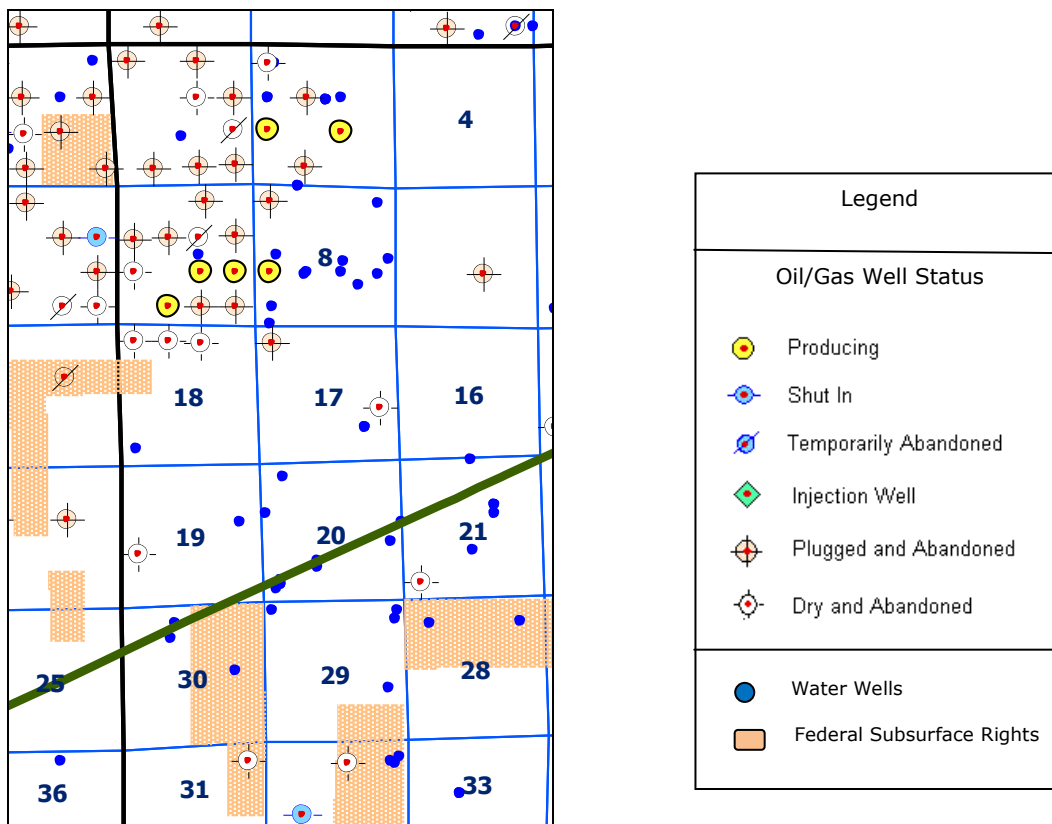
The federal government has subsurface rights on some parcels within the protection areas. Oil and gas development on this subsurface land is managed by the Bureau of Land Management.



PHOTO: COLLEEN WILLIAMS

The oil well in the background is within the 500 foot protection zone surrounding one of Morgan County Quality Water's wells.

Figure 18. Status of oil and gas wells within the upper Hay Gulch Source Water Protection Area



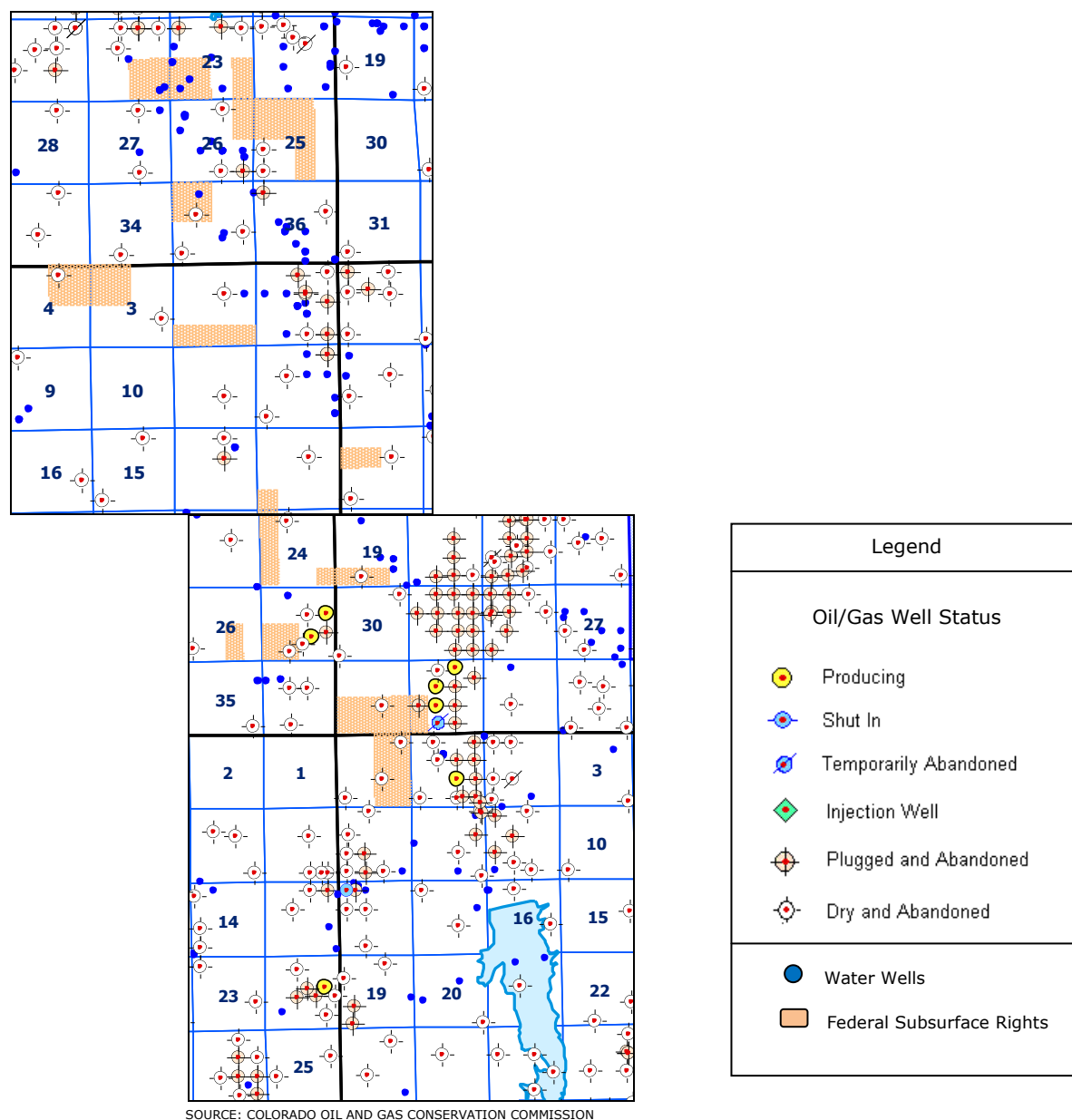
SOURCE: COLORADO OIL AND GAS CONSERVATION COMMISSION

Discussion of Issues of Concern

San Arroyo Source Water Protection Area

There are no producing oil and gas wells within the upper San Arroyo Source Water Protection Area in the vicinity of Morgan County Quality Water's ground water wells. Most of the oil and gas wells are dry and abandoned or plugged (Figure 19). Within the lower San Arroyo Source Water Protection Area are 6 producing wells permitted to Petro-Canada Resources (USA), KP Kauffman Company, and Smith Energy Corporation.

Figure 19. Status of oil and gas wells within the upper and lower San Arroyo Source Water Protection Area

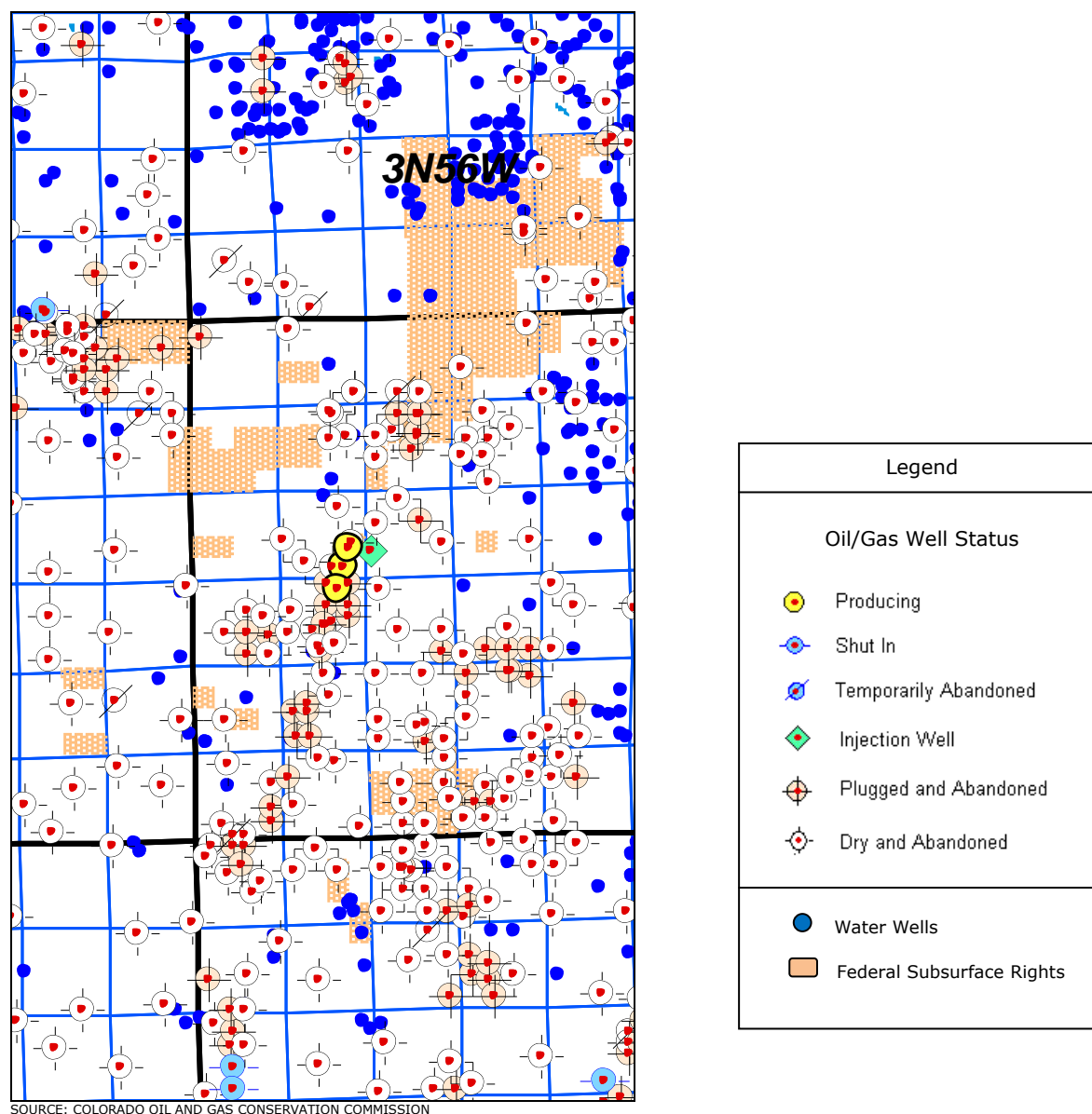


Discussion of Issues of Concern

Beaver Creek Source Water Protection Area

There are three producing wells and one injection well within the Beaver Creek Source Water Protection Area. All of the producing wells are permitted to Coral Productions Incorporated and lie within the central portion of the protection area. The federal government has subsurface rights on some parcels within the protection areas (Figure 20).

Figure 20. Status of oil and gas wells within the Beaver Creek Source Water Protection Area



Discussion of Issues of Concern

Water Quality Concerns

Many different activities related to the oil and gas development may result in ground water contamination. Any activity that involves the storage or transport of crude, natural gas, chemicals or produced water involves the possibility of these substances escaping into the environment. Well drilling and production may result in spill or releases of drilling fluids, fracturing fluids, produced water, hydrocarbons, or other chemicals transported within the source water protection area. During drilling there could be a release of fluids into the underlying aquifers, potentially contaminating the ground water resources.

Groundwater may also be affected by the abandoned oil and gas well that may not be properly plugged. Abandoned oil and gas wells typically result from unsuccessful initial drilling where oil and gas were not found or where it was uneconomical to recover the oil and gas, or wells which were terminated when production was no longer economically justifiable. The Federal Environmental Protection Agency estimates that there are about 1.2 million abandoned oil and gas wells nationwide and that some 200,000 of them may not be properly plugged. Many of the problem wells were drilled before the oil and gas business was regulated. It was not until the mid-1960's that the oil-producing states enacted regulations to protect fresh water supplies by requiring that hundreds of feet of cement be poured into the wells at different levels in the process of closing them properly. If the wells were improperly drilled or cased, or plugged before the rules were in place, then there may be a potential for contamination of the ground water.

Pumping oil and gas out of the ground produces large volumes of water, known as produced water or brine due to its high salinity. Brines can invade drinking water supplies directly, through imperfections in the well casings, or indirectly through nearby wells, such as the large numbers of abandoned wells throughout the state. A casing job in an area of average acidity is estimated to be effective for 20 years after which time it must be tended to and plugged.

Declining production has brought other problems as well. In depleted fields, wells commonly pump more than five barrels of brine for every barrel of oil, and those vast quantities of brine are often forcefully injected back into the ground. The goal is to dispose of the brine and increase pressure in the oil-bearing formation so that more crude can be extracted from a nearby active well. But if an improperly plugged well has penetrated the formation, the added pressure helps push the brine up that shaft and may seep into fresh water aquifers or sometimes reach the surface. Since most groundwater moves sluggishly, contaminants that penetrate our aquifers can linger for hundreds of years.

The Planning Team is concerned about the oil wells within the source water protection area and recommends:

- Working with the Colorado Oil and Gas Conservation Commission to review the status of all oil wells in the protection area in order to identify wells that may increase risk to the ground water if not properly maintained, abandoned, or plugged;
- Working with the current oil well producers in the protection area by encouraging compliance with all regulations, good housekeeping at the well sites, and prompt notification and clean-up of any spill; and
- Encouraging the local community to become actively involved in participating in local and regional oil and gas forums and ongoing communications with the oil and gas industry operating within their source water protection area.

Discussion of Issues of Concern

Colorado Oil and Gas Conservation Commission

The oil and gas industry in Colorado is regulated by the Colorado Oil and Gas Conservation Commission (COGCC). The mission of the COGCC is: To promote responsible development of Colorado's oil and gas natural resources. Responsible development results in:

- The efficient exploration and production of oil and gas resources in a manner consistent with the protection of public health, safety and welfare
- The prevention of waste
- The protection of mineral owners' correlative rights
- The prevention and mitigation of adverse environmental impacts

The COGCC seeks to serve, solicit participation from, and maintain working relationships with all those having an interest in Colorado's oil and gas natural resources (COGCC, 2008). The COGCC's website, www.cogcc.state.co.us, provides updated information on the location and status of oil and gas operations throughout Colorado. The public can also access this website to find out information regarding violations and complaints of well permit holders. Permit holders are required by State law to comply with the rules and regulations of the COGCC.

The Colorado Oil and Gas Association

The Colorado Oil & Gas Association's (COGA) purpose is to foster and promote the beneficial, efficient, responsible and environmentally sound development, production and use of Colorado oil and natural gas. COGA is a nationally recognized trade association that aggressively promotes the expansion of Rocky Mountain natural gas markets, supply and transportation infrastructure through its growing and diverse membership. COGA leads major legal and regulatory efforts in Colorado affecting industry before the Colorado courts, Colorado Oil & Gas Conservation Commission, Colorado Department of Public Health and Environment (air and water quality), as well as federal agencies (COGA, 2008).

COGA chapters provide an expanded statewide grassroots presence for the industry and the Association in their local communities. The chapters also encourage their member companies to improve relations between the industry and its various stakeholders. The local chapter for the project area is the Northeast Colorado Oil and Gas Association.

Table 10. Contact Information

TOPIC	AGENCY	PHONE #
Oil & Gas Regulations in Colorado	Colorado Oil and Gas Conservation Commission	(303) 861-0362
Local Oil and Gas Association	Northeast Colorado Oil and Gas Association	(970) 630-3242
Dig Safely Program	Utility Notification Center of Colorado	1-800-922-1987
Gas Pipelines	Public Utilities Commission	(303) 894-2000
Geological Maps & Publications	Colorado Geological Survey	(303) 866-2611
Oil & Gas Severance Tax	Department of Revenue	(303) 238-7378
Produced Water Discharge Permits	CDPHE/Water Quality Control Division	(303) 692-3524
Service Stations (Inspections, complaints, etc.)	CDLE/Division of Oil & Public Safety	(303) 318-8507
State Oil & Gas Leases/Auctions	State Land Board	(303) 866-3454
Storage Tanks	CDLE/Division of Oil & Public Safety	(303) 318-8507

SOURCE: COLORADO OIL AND GAS CONSERVATION COMMISSION

Discussion of Issues of Concern

Underground Water Storage

The drought of 2002 emphasized the importance of groundwater especially in Northeast Colorado. Water level monitoring by the Colorado Division of Water Resources indicated that the water table is declining in some areas of the Lost Creek Designated Basin. In 2003, the Colorado Department of Natural Resources requested that the Colorado Geological Survey conduct a statewide assessment study of artificial recharge of ground water in Colorado. The study, completed in 2004, identified large aquifer regions for recharge potential. The South Platte River alluvium received the highest ranking of the unconsolidated alluvial aquifers.

In 2006, the Colorado legislature passed Senate bill 06-193 which directed the Colorado Water Conservation Board to conduct a study of potential underground water areas in the South Platte and Arkansas River basins. The two highest scoring subregions in the South Platte River basin were Lower Lost Creek and Upper Lost Creek. The Colorado Geological Survey is currently conducting the, "Lost Creek Basin – Aquifer Recharge and Storage Study." In order to safeguard the quality of this ground water resource, the Morgan County Quality Water District petitioned the Colorado Water Conservation Board to not include the Hay Gulch aquifer in the Lost Creek Basin study.

Water Quantity and Quality Concerns

The Morgan County Quality Water District is concerned that the introduction of surface water from the South Platte River to recharge the aquifers would alter the quality of the ground water. Water quality in the lower South Platte River system, downstream of Denver, is degraded due to a number of factors. As ground water in the lower South Platte River basin aquifer passes through areas of different land use, the quality changes to reflect different contaminant sources.

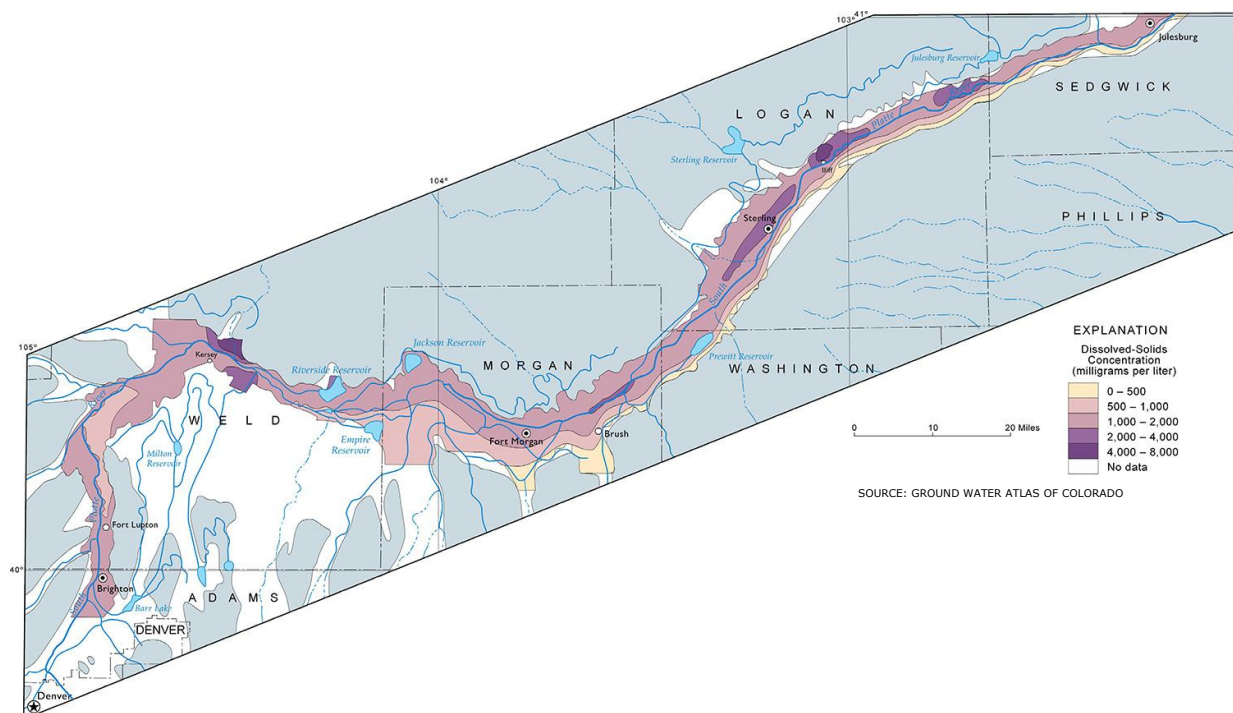


Figure 21. Concentrations of total dissolved solids in the lower South Platte River alluvial aquifer.

Discussion of Issues of Concern

The total dissolved solids (TDS) increases downstream as recharge to the aquifer from irrigation return flows carries with it dissolved fertilizer and other applied agricultural chemicals. The concentration of TDS in the South Platte River alluvial aquifer in Weld and Morgan Counties ranges from 1,000 mg/L to over 4,000 mg/L (Figure 21).

In the historically agricultural areas downstream of the Denver metropolitan area, nitrate concentrations exceeded the drinking water standard of 10 parts per million in about 50 percent of the wells in the alluvial aquifer. The relatively shallow water table makes this aquifer vulnerable to both surface and subsurface contamination.

Volatile organic compounds, such as benzene and methyl-tri-butyl-ether (MTBE) from fuels, enter the ground water in the urban area while nutrients, such as nitrate and phosphate, along with pesticides enter in the agricultural and mixed use areas. Although the alluvial aquifer has historically been used as a source for drinking water, the water in the downstream segments of the lower South Platte River basin is not well suited for this purpose because of its taste, high total dissolved solids (TDS) concentrations, hardness or localized concentrations of iron, nitrate, or sulfate (Topper et al, 2003).

Weingardt Infiltration Project

The Morgan County Quality Water District is not opposed to the concept of ground water recharge, only to the introduction of degraded surface water into the aquifers. The District currently uses Colorado Big Thompson (CBT) water that is piped from Carter Lake by-passing the City of Fort Morgan's water treatment facility and then piped to the Weingardt Infiltration Pond located in the San Arroyo drainage basin. The CBT water in the infiltration pond percolates downward through the sandy soil into the aquifer and supplements the existing groundwater.



PHOTO: COLLEEN WILLIAMS

The Weingardt Infiltration Pond, located in the San Arroyo Source Water Protection Area, receives Colorado Big Thompson water that is piped from Carter Lake.

Discussion of Issues of Concern

Prairie Ponds State Wildlife Area

Within the upper Beaver Creek protection area is a series of three major artificial recharge sites along the Fort Morgan canal, including Prairie Ponds property, the Charlie Henry recharge site, and the Public Service Company recharge pond. Water recharged at these sites is used to offset pumping from ground water wells under augmentation plans. Recharge of Fort Morgan Canal water at Prairie Ponds and the Charles Henry recharge site to the east has the potential to degrade the quality of water at the municipal wells over time. The extent to which this impact takes place is dependent on the degree of mixing and direction of movement of recharge water within the aquifer.

Mixing of ground water sources at the Prairie Ponds may be affected by clay lenses in the alluvial aquifer beneath the dune sands. The direction of ground water flow is determined by the water table gradient. Changes in the amount and location of recharge, along with changes in pumping will affect the direction of ground water flow to the well field. Water table mounding beneath the recharge sites and pumping of the municipal wells can induce a water table gradient back in the direction of the well field.

The City of Brush, owner of the Prairie Ponds property, hired HRS Water Consultants, Inc. in 1994 to develop a comprehensive plan for the management of water resources at the Brush Prairie Ponds property south of Brush. The water management objectives for the property include: ground water recharge for augmentation purposes; protection of water quality at the City's well field; management of water table conditions on the property; management for wetlands and wildlife habitat; and other objectives such as ditch maintenance and revegetation under the Conservation Reserve Program. In order to meet the water management objectives for the property, the plan recommends: 1) management of diversions and ponds on the property; and 2) monitoring of water levels and water quality. The ground water levels and water quality monitoring are key component of the water management plan. Ongoing collection and evaluation of these data will insure that recharge at the property can continue at the same time as water table conditions on the property are managed and water quality at the Brush well field is protected (HRS, 1994).

The Colorado Division of Wildlife leases the Prairie Ponds site from the City of Brush, and manages it primarily for waterfowl production and limited hunting. It is managed for hunting during the fall, and is open for wildlife observation during the rest of the year. These uses, however, are subordinate to water supply purposes (Audubon, 2008).

Figure 22. An aerial photo of Brush Prairie Ponds



Discussion of Issues of Concern

Clean Harbors Hazardous Waste Disposal Site

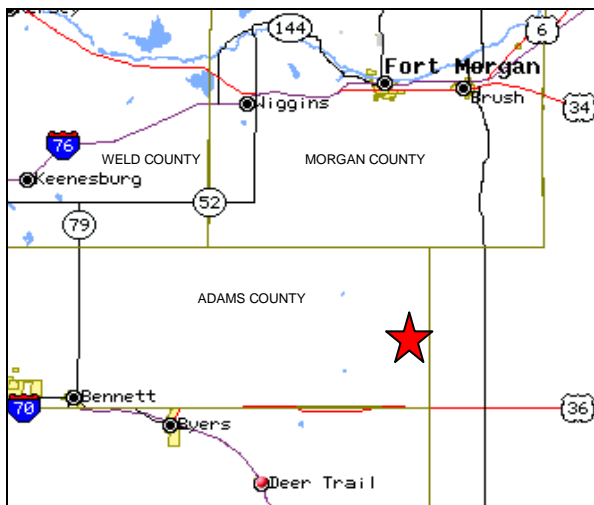
The Clean Harbors facility is the only permitted hazardous waste disposal site in Colorado. It is located north of the community of Deer Trail and west of the community of Last Chance in Adams County in the Beaver Creek watershed area about 30 miles southeast of the city of Brush. The facility was first permitted in April 1987 and began accepting waste in July 1991. As a hazardous waste disposal site, this facility has been specifically designed to accept and dispose of hazardous waste in a manner that will prevent exposure to people who may live near the site and to the environment. Waste is analyzed either at an off-site, or the on-site, laboratory before and after acceptance to determine the type and level of treatment needed before burial in the disposal cells.

On December 21, 2005, the Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division issued the Hazardous Waste Permit Renewal and Radioactive Materials License to the Clean Harbors Deer Trail Facility. The permit renewal authorizes the continued hazardous waste treatment, storage and disposal at the facility for another five years. The radioactive materials license authorizes the receipt, possession, processing and disposal of naturally occurring radioactive material.

The facility's renewed permit continues to require ground water monitoring, management and treatment of storm water, and establishing protocols for disposal of waste only below certain wind speeds to minimize any windblown contamination moving off the site. In addition, other permit and operating requirements are in place to protect workers and comply with all state and federal regulations (HMWMD 2008).

The Planning Team discussed the potential for contamination to the source water protection area from this waste disposal site. Although the State considers this site low risk to the source waters (Natterman, 2008), the Planning Team recommends keeping informed on the results of the monitoring wells in the area downstream from this site. Information about this site can be found online at www.cdphe.state.co.us. A fact sheet regarding this site can be found in the Appendices of this report.

Figure 23. Location of Clean Harbors Site



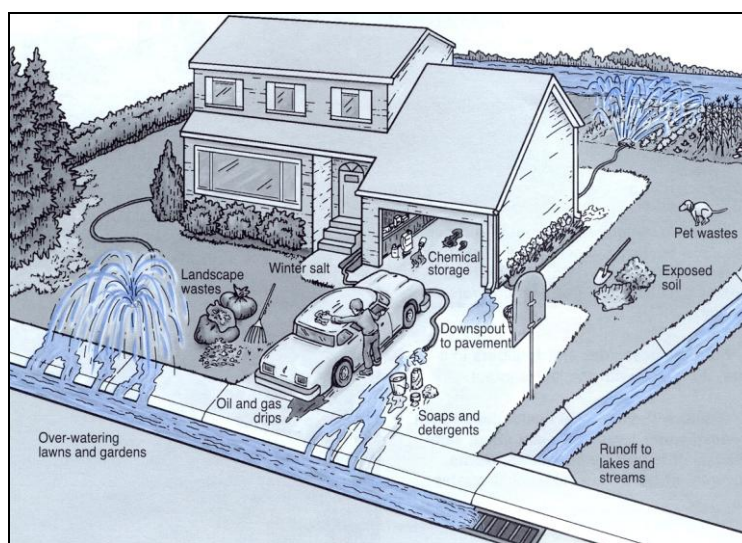
Contact information:

Jeannine Natterman
Public Information Officer
Colorado Department of Public Health and Environment
Hazardous Materials & Waste Management
Phone: (303) 692-3303
Email: comments.hmwmd@state.co.us

Discussion of Issues of Concern

Residential Practices

The MCQW Source Water Protection Area includes rural residential dwellings. Common household practices may cause pollutants to runoff residential property and enter the surface or ground water as indicated in the picture below. Prevention of ground water contamination requires education, public involvement, and people motivated to help in the effort. Educating the community and decision makers is one of the challenges and cornerstone of this protection plan. 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.



SOURCE: COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Figure 24. Common household practices may cause pollutants to runoff residential property and enter the surface or ground water.

Residents within the source water protection area can help protect their drinking water source by:

- **Using Water Wisely** – Use it sparingly. Check for plumbing leaks, use water-saving showerheads and faucets and water lawns mornings or evenings.
- **Properly Dispose of Chemicals** - Properly dispose of household chemicals like cleaning supplies, paints, solvents and lawn and garden chemicals. Call your local Health Department for disposal options. Don't pour waste chemicals onto the ground or into sinks or toilets.
- **Use Fertilizers, Herbicides and Pesticides Properly** - Apply chemicals according to label instructions and avoid runoff. Do not exceed recommended application rates.
- **"Put Used Oil in Its Place"** - If you change your own motor oil place the used oil in a clean, leak proof, reusable container with a tight-fitting cap. Don't mix oil with water, gasoline, antifreeze, solvents, or other substances. Call 1-800-458-0145 for a collection center near you.
- **Don't Use the Drain** - Do not dispose of automotive chemicals (gasoline, antifreeze, waste oil, brake fluid, cleaning solvents, etc.), paints or other pollutants into floor drains, storm drains or onto the ground. Many floor drains and storm drains discharge directly above groundwater. Wastes discharged onto the ground often seep into groundwater.

SOURCE WATER PROTECTION MEASURES

Management Approaches

The Planning Team reviewed and discussed several possible management approaches 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 Planning Team 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 this project.

The Planning Team recommends the management practices listed in Table 11, "Source Water Protection Best Management Practices" be considered for implementation by:

- Morgan County Quality Water District
- Morgan County Government, Land Use, Roads, and Emergency Management
- Northeast Colorado Health Department
- Weld County Government, Land Use, Roads and Health
- Morgan Conservation District
- Town of Log Lane Village
- Colorado Oil and Gas Conservation Commission
- Oil and Gas Industry
- Landowners in the Source Water Protection Area
- Colorado Rural Water Association

Evaluating Effectiveness of Management Approaches

The Morgan County Quality Water District is committed to developing a tracking and reporting system to gauge the effectiveness of the various source water management approaches that have been implemented. The purpose of tracking and reporting the effectiveness of the source water management approaches is to update water system managers, consumers, and other interested entities on whether or not the intended outcomes of the various source water management approaches are being achieved, and if not, what adjustments to the protection plan will be taken in order to achieve the intended outcomes.

The Morgan County Quality Water District is voluntarily committed to applying source water assessment and protection principles to finding and protecting new water sources in the future. This is part of the larger ongoing commitment to providing the highest quality drinking water to their consumers.

The Morgan County Quality Water District is voluntarily committed to assisting 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 11. Source Water Protection Priorities and Best Management Practices

Priority Issue	Management Approach	Implementer
Septic Systems		
Public Education	<p>1. Develop a public education program for property owners within the SWPA to provide basic information on the Source Water Protection Plan. Public education will 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. An educational flier like the one published by the National Small Flows Clearinghouse (NSFC) entitled <i>Groundwater Protection and Your Septic System</i> can be sent to homeowners.</p> <p>2. Develop a mailing list of residents within the SWPA who have septic systems and send them educational materials.</p>	<p>Health Departments Steering Committee</p> <p>Steering Committee</p>
Septic System Inspection Program	<p>1. The County Health Department will continue to implement their optional Septic System Inspection Program upon request of the property owner. The Health Department will use this opportunity to educate the property owner on the link between good septic practices and protecting source water.</p>	Health Departments
Coordinating New Construction and Permits	<p>1. The County Health Department will work be encouraged to work closely with the land use department on subdivision review for septic system uses and with the building department to ensure that whenever a building permit is applied for, the Health Department makes sure that adequate wastewater treatment is planned for.</p> <p>2. The County Health Department will be encouraged to use this opportunity to educate the property owner on the link between good septic practices and protecting source water.</p> <p>3. The County Health Department will be encouraged to provide information to the MCQW or the Steering Committee upon request of any new septic permits issued in the SWPA.</p>	Health Departments

Table 11. Source Water Protection Priorities and Best Management Practices

Priority Issue	Management Approach	Implementer
Roads and Spills		
Road Maintenance	<p>1. 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.</p> <p>2. Provide a copy of the Source Water Protection Plan and map of the protection area to the Morgan and Weld County Road Departments. Encourage them to use road Best Management Practices to prevent road materials from entering the source waters.</p>	<p>Steering Committee</p> <p>Steering Committee Morgan and Weld County Road Department</p>
Vehicular spills	<p>1. Meet with the local fire departments to discuss their emergency response plans for responding to hazardous and non-hazardous vehicular spills within the SWPA. Include this information in the emergency plans for each water system.</p> <p>2. Provide information to the local fire departments:</p> <ul style="list-style-type: none"> • Importance of the Source Water Protection Plan • Location of the intakes and Source Water Protection Area • Overview of the Emergency Contingency Plan • Personnel to be notified in the event of an emergency 	<p>Steering Committee</p> <p>Water Utility</p> <p>Steering Committee</p>
Public Education	<p>1. Cooperate with public agencies to educate the public on how to call "911" to report any spills within the SWPA.</p> <p>2. Educate the public about reporting spills on local roads through the use of area newspapers.</p>	<p>Steering Committee Morgan County Office of Emergency Management</p> <p>Steering Committee</p>

Table 11. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Land Use		
Land Use Planning and Controls	<p>1. County land use planners will be encouraged to overlay the Morgan County Quality Water's SWPAs on their land use map and to refer to it during decisions on land use in the area.</p> <p>2. County Commissioners will be encouraged to consider source water protection of the Hay Gulch, San Arroyo, and Beaver Creek aquifers when making land use decisions or zoning laws. Land use controls may include: subdivision growth controls, zoning, and land use restrictions.</p> <p>3. The MCQW will request to be notified by Morgan and Weld County Planning and Zoning Department officials of land use hearings or meetings regarding land within the SWPA and will have the opportunity to participate in the process.</p> <p>4. Steering Committee will provide the Morgan and Weld County Planning & Zoning Department a copy of the Source Water Protection Plan and mapping GIS data of the protection area.</p>	<p>Morgan and Weld County Planning & Zoning Department</p> <p>Morgan and Weld County Commissioners</p> <p>Morgan County Quality Water Morgan and Weld County Planning & Zoning Department</p> <p>Steering Committee</p>
Land Acquisitions	<p>1. Steering Committee will keep informed of land acquisitions within the SWPA and provide information to new residents on the source water protection area.</p>	Steering Committee
Land Conservation	<p>1. Provide information to landowners within the SWPA to educate them on the opportunities of placing a conservation easement on their land.</p>	Steering Committee

Table 11. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Agricultural Uses		
Public Outreach and Communication	<p>1. Encourage the development of partnerships with the local agricultural community within the source water protection area in order to encourage stewardship of their lands to protect the quality of the ground water.</p> <p>2. Provide land owners with information on agricultural Best Management Practices for grazing management, handling manure, chemical application, and chemical use and storage.</p> <p>3. Education techniques may include: workshops, mailings and community meetings/workshops, and demonstration projects.</p> <p>4. The local NRCS Field Office and the local Conservation District will provide site visits (upon request) to residents with the SWPA to evaluate their agricultural practices and provide educational outreach.</p>	<p>Steering Committee NRCS</p> <p>Steering Committee NRCS</p> <p>NRCS and Farm Organizations</p> <p>NRCS as consultants</p>
Funding Opportunities	<p>1. Explore funding opportunities and provide residents within the SWPA with information on funding opportunities for cost sharing to implement the agricultural BMPs on their land (i.e. EQIP).</p> <p>2. Provide information to agricultural users on the opportunity of conserving their lands under the Conservation Reserve Program.</p>	<p>Steering Committee NRCS Conservation Districts</p> <p>Steering Committee NRCS</p>
Aquifer Recharge		
Communication and Information Sharing	<p>1. Coordinate a meeting between the Morgan and Weld County government officials to discuss concerns regarding aquifer recharge and recovery in the source water protection areas.</p> <p>2. Stay informed and participate in Colorado Ground Water Commission hearings and decisions regarding aquifer recharge in the source water protection areas.</p> <p>3. Network with other community water providers in the Weld and Morgan County areas on concerns over aquifer recharge issues.</p>	<p>Steering Committee</p> <p>Steering Committee</p> <p>MCQW</p>

Table 11. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Oil and Gas Development		
Information Sharing and Public Outreach	<p>1. The Steering Committee will maintain an open dialog with industry representatives and encourage them to share information about their operations within the source water protection areas by participation on the Brush Source Water Protection Steering Committee.</p> <p>2. The Steering Committee will work with Colorado Oil and Gas Conservation Commission to review the status of all oil wells in the protection area in order to identify wells that may increase risk to the ground water if not properly maintained, abandoned, or plugged.</p> <p>3. The Steering Committee will become educated on the Industry's operations by using information available from the State's COGCC website, attending the Northeast Colorado Oil and Gas Forum annual meeting, and meeting with industry representatives.</p> <p>4. The Steering Committee will encourage industry to educate all employees and subcontractors on the location of the source water protection areas, Emergency Response Plans, Storm Water Management Plans, and Spill Response Plans.</p>	<p>Steering Committee Industry Representatives</p> <p>Steering Committee Colorado Oil and Gas Conservation Commission</p> <p>Steering Committee</p> <p>Steering Committee</p>
Oil well maintenance and operations	<p>1. The Steering Committee will encourage the industry to comply with all regulations regarding their oil development operations and implement all best management practices required by the COGCC to prevent contamination of the source water protection areas.</p>	<p>Steering Committee Industry Representatives</p>
Spill Prevention	<p>1. The Steering Committee will encourage the industry to:</p> <ul style="list-style-type: none"> a. Administer a Spill Prevention, Control, and Countermeasures Plan to prevent ground water contamination, b. Immediately notify the water providers of any spills, and c. Use proper equipment & vehicle maintenance BMPs to prevent chemicals from contaminating ground water. 	<p>Steering Committee Industry Representatives</p>

Table 11. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Residential Practices		
Public Education and Outreach	<p>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, and secondary containment for above ground fuel storage tanks.</p> <p>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.</p> <p>3. Participate in local conservation workshops and provide materials about the Source Water Protection Plan and BMPs to prevent contamination of the local aquifer (i.e. NRCS Roundtable).</p>	<p>Steering Committee Water Utility Local Government</p> <p>Steering Committee</p>
Private Wells		
Evaluate condition of wells	<p>1. Gather information on how many wells (private, public, stock) exist within the SWPA. Information may be obtained from the State Department of Water Resources, local residents, or GIS databases.</p> <p>2. Send out a survey to residents within the SWPA to gather information about the location and condition of their wells and the activities around the well that may affect the quality of their drinking water supply or of the public water supply.</p>	<p>Steering Committee</p> <p>Steering Committee</p>
Education and Outreach	<p>1. Provide information to residents within the SWPA on how they can protect both private and public water supplies.</p> <p>2. Secure and cap wells that are temporarily not being used and permanent plugging of wells that are being abandoned.</p>	Steering Committee

Table 11. Source Water Protection Best Management Practices

Priority Issue	Management Approach	Implementer
Water Utility		
Water Supply Intakes	<ol style="list-style-type: none"> 1. Perform regular inspection of the surface water intakes. 2. Protect areas around wells with housing and signage. 	<p>System Operators</p> <p>System Managers</p>
Water Operations	<ol style="list-style-type: none"> 1. Ensure that the water treatment plant is properly managed, operated and maintained to prevent contamination of the drinking water. 2. Ensure that all employees are familiar with the Source Water Protection Plan, emergency and contingency plan, and hazardous spill response. 3. Ensure that the management of diversions and ponds north of the Smart/Brush well field is consistent with protecting the drinking water source, the Beaver Creek alluvial aquifer. 	<p>System Managers</p> <p>System Managers</p> <p>System Managers</p>
Public Education	<ol style="list-style-type: none"> 1. Develop a mailing list of land owners and residents within the protection area. 2. Provide Information concerning the SWPP in the annual Consumer Confidence Report (CCR). Insert an additional letter or paragraph in the CCR of their presence within the protection area and information on how they can help prevent pollutants from entering the source waters. 	<p>Steering Committee</p> <p>Morgan County Quality Water</p>
Water Quality Monitoring	<ol style="list-style-type: none"> 1. Monitor the water levels and water quality of both drinking water and monitoring wells 	System Managers

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APPENDICES

Contingency Plan *

Source Water Assessment Report and Appendices (On CD)

Meetings: Contact List, Attendance Roster, and Minutes (On CD)

Morgan County Zoning Regulations (On CD)

Weld County Comprehensive Plan (On CD)

WQCC Regulations 41 & 42 (On CD)

Funding Sources for Source Water Protection

Citizen's Guides, Handbooks, Maps, and Miscellaneous Reports (On CD)

Glossary (On CD)



*Notice: This public document will only include information that is not deemed sensitive to the safety and operation of the individual community's water plan operation. Appendices marked with a * are only included in the Public Utility's report or kept on file at their office. A CD is included in the back pocket of this report and includes documents that can be reprinted.*