



United States Department
of Agriculture

Horse Watershed



Hydrologic Unit Code 11020008

Natural Resources
Conservation Service

Rapid Assessment

Lakewood, Colorado

RWA 11020008

July 2007



Satellite Imagery: ArcIMS Server - Geographic Network Services hosted by ESRI

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Introduction

Background Information

The Natural Resources Conservation Service (NRCS) is encouraging the development of rapid watershed assessments in order to increase the speed and efficiency generating information to guide conservation implementation, as well as the speed and efficiency of putting it into the hands of local decision makers.

Rapid watershed assessments provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help landowners and local leaders set priorities and determine the best actions to achieve their goals.

Benefits of these Activities

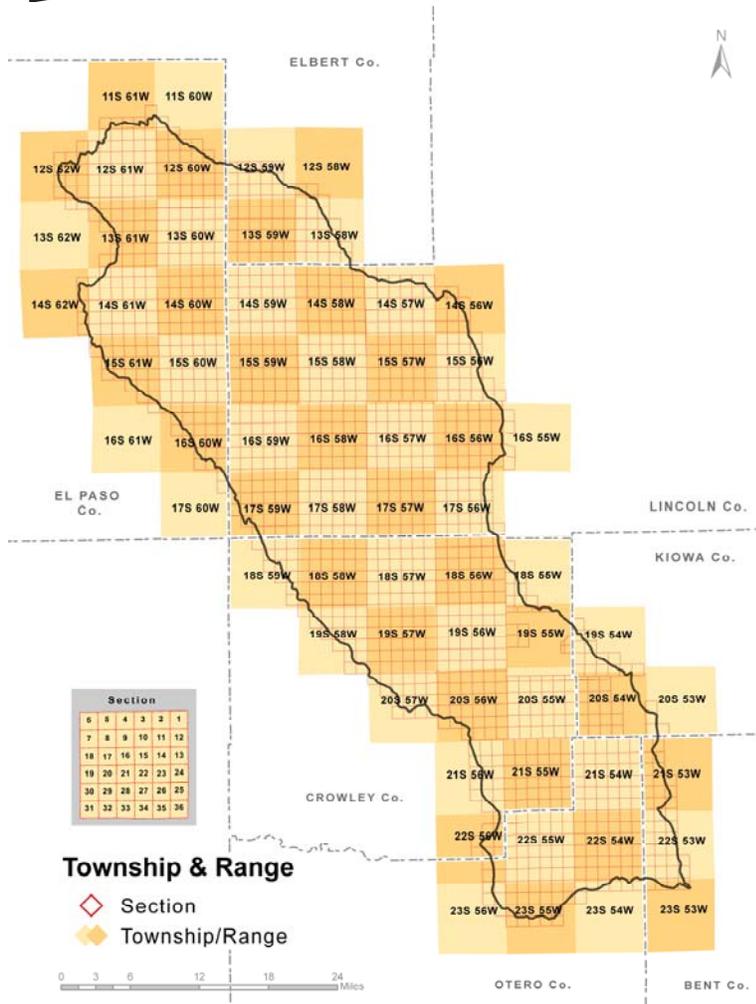
While rapid assessments provide less detail and analysis than full-blown studies and plans, they do provide the benefits of NRCS locally-led planning in less time and at a reduced cost. The benefits include:

- Quick and inexpensive tools for setting priorities and taking action
- Providing a level of detail that is sufficient for identifying actions that can be taken with no further watershed-level studies or analyses
- Actions to be taken may require further Federal or State permits or ESA or NEPA analysis but these activities are part of standard requirements for use of best management practices (BMPs) and conservation systems
- Identifying where further detailed analyses or watershed studies are needed
- Plans address multiple objectives and concerns of landowners and communities
- Plans are based on established partnerships at the local and state levels
- Plans enable landowners and communities to decide on the best mix of NRCS programs that will meet their goals
- Plans include the full array of conservation program tools (i.e. cost-share practices, easements, technical assistance)

Rapid Watershed Assessments provide information that helps land-owners and local leaders set conservation priorities.

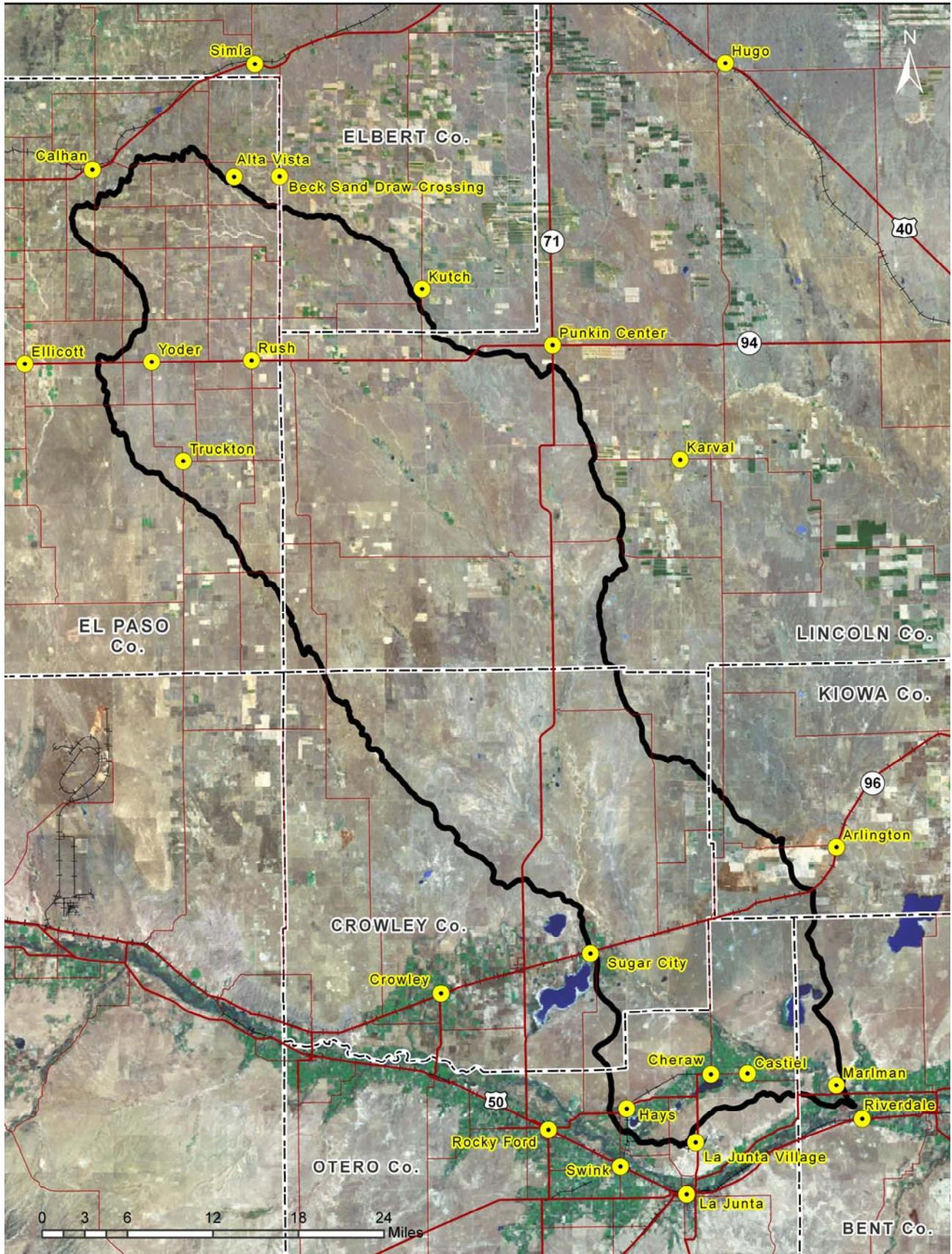
Introduction

The Horse is a highly rural watershed that covers 910,973 acres within the Lower Arkansas River Basin on the eastern plains of Colorado.



	County Acres	County Acres in HORSE Watershed	% of county in the Watershed
Bent	986,170	18,326	1.9%
Crowley	512,067	237,432	46.4%
Elbert	1,183,750	42,770	3.6%
El Paso	1,362,117	179,424	13.2%
Kiowa	1,143,312	25,715	2.2%
Lincoln	1,654,463	321,213	19.4%
Otero	811,808	86,062	10.6%

Horse Watershed - 11020008





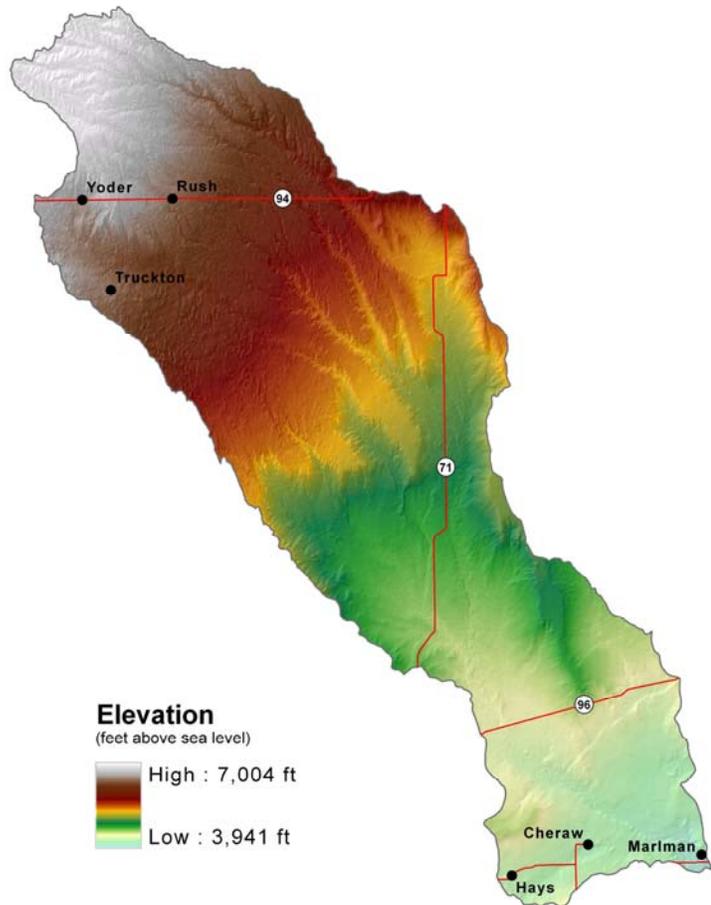
Common Resource Areas (CRA): Geographical areas where resource concerns, problems, and treatment needs are similar. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographical boundaries of the common resource area.

<u>MLRA</u>	<u>CRA</u>	<u>CRA NAME</u>	<u>DESCRIPTION</u>
49	49.1	Southern Rocky Mountain Foothills	This area is generally a transition between the Great Plains and the Southern Rocky Mountains. The temperature regime is mesic or frigid, and moisture regime is ustic. Characteristic native vegetation ranges from grasslands and shrubs to ponderosa pine and Rocky Mountain Douglas fir forest.
69	69.1	Upper Arkansas Valley Rolling Plains	The Upper Arkansas Valley Rolling Plains CRA is broad, undulating to rolling shale plains occurring along the upper tributaries of the Arkansas River. Local relief reaches 200 feet. Soils are shallow to deep and formed in loess, eolian, alluvial and outwash materials. Presettlement vegetation was short grass prairies and pinyon and juniper stands on the stony and rocky soils. Nearly all of this area is in rangeland. Small areas along the floodplains and terraces are irrigated cropland.

Physical Description

This area is characterized by broad, undulating to rolling plains dissected by streams and rivers. The highest elevations are on the northwestern side of the watershed and gently slopes down to the lowest elevation to the southeast.

The vast majority of the Horse Watershed consists of rangeland. Cropland is almost evenly divided between irrigated along the floodplains and dryland crops.



Vegetation

- ◆ No Data
- ◆ Dryland Ag
- ◆ Irrigated Ag
- ◆ Grass Dominated
- ◆ Grass/Forb Mix
- ◆ Sparse Grass (Blowouts)
- ◆ Sagebrush Community
- ◆ Shrub/Grass/Forb Mix
- ◆ Sagebrush/Grass Mix
- ◆ Grass/Misc. Cactus Mix
- ◆ Grass/Yucca Mix
- ◆ Pinon-Juniper
- ◆ Juniper
- ◆ Sparse Juniper/Shrub/Rock Mix
- ◆ Soil/Fallow
- ◆ Riparian
- ◆ Forested Riparian
- ◆ Cottonwood
- ◆ Shrub Riparian
- ◆ Herbaceous Riparian
- ◆ Water



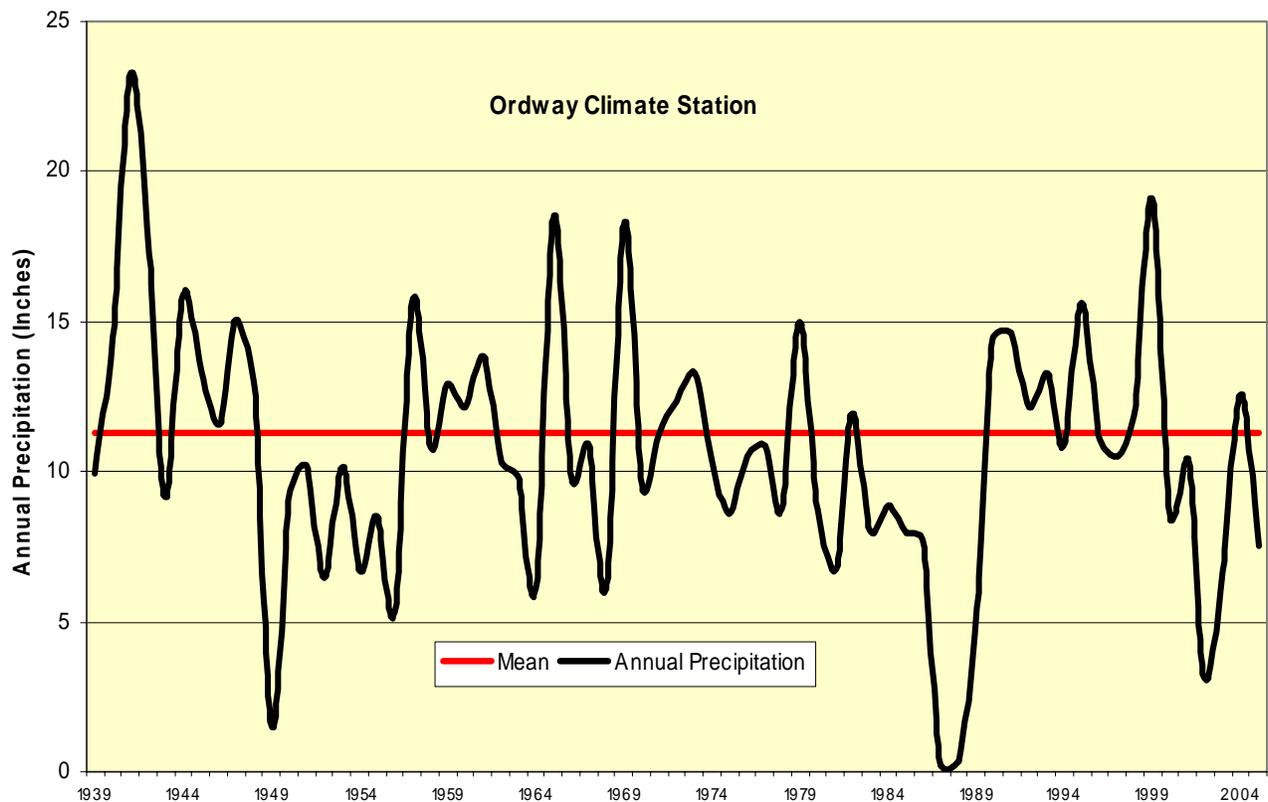
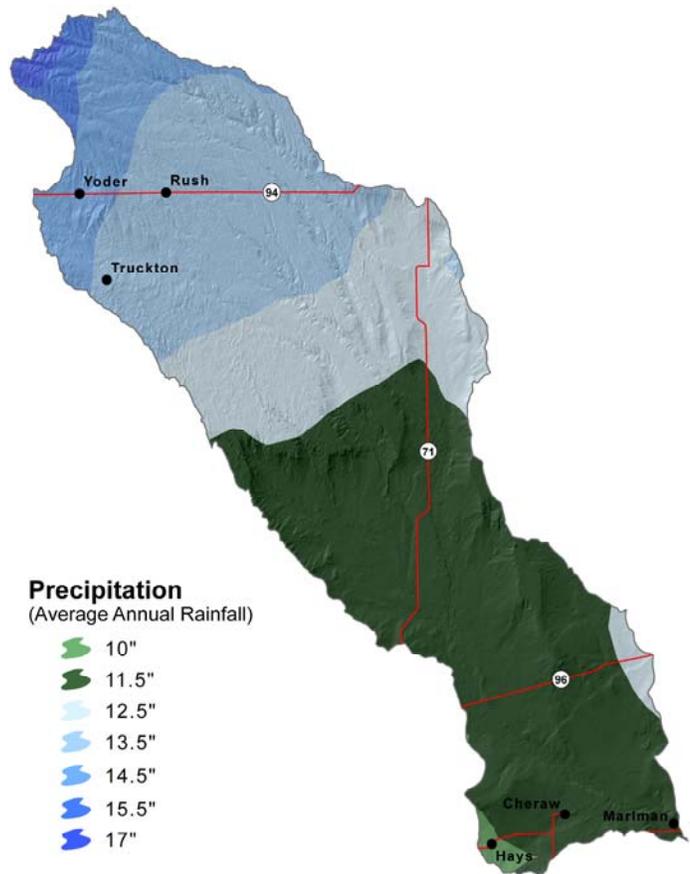
Land Use	Total Acreage	Vegetation	Acreage
Cropland	57,257	Dryland Ag	30,049
		Irrigated Ag	27,208
Rangeland/Grassland	835,569	Grass Dominated	468,324
		Grass/Forb Mix	224,407
		Grass/Misc. Cactus Mix	319
		Grass/Yucca Mix	28,877
		Sagebrush Community	36,711
		Sagebrush/Grass Mix	53,319
		Shrub/Grass/Forb Mix	50
		Soil	7,945
		Sparse Grass (Blowouts)	15,613
		Sparse Juniper/Shrub/Rock Mix	4
Forest	10,625	Cottonwood	10,625
Riparian	5,622	Forested Riparian	93
		Herbaceous Riparian	3,399
		Riparian	2
		Shrub Riparian	2,128
Water	1,881	Water	1,881
Other		No Data	19

Total Watershed Acres

910,973

Precipitation

Droughts are regular visitors to the watershed as with the rest of Colorado. Statewide, in the 1900's alone, four prolonged dry spells occurred. There was one in the 1910s. Another, in the '30s, caused the dust-bowl period. The second worst drought on record in the state occurred in the mid-50s. A series of hot, dry summers following a period of scant mountain snowpack created water shortages. The fourth drought hit parts of Colorado in the late 1970s. In this century, the most severe drought since 1723 hit the state in 2002. Prior to the 1700's, researchers looking at tree ring records have found evidence of even more severe droughts, some lasting many years. Rainfall occurs as frontal storms in the spring and early summer and high intensity, convective thunderstorms in late summer. Maximum precipitation is from mid spring through late autumn. Precipitation in winter is snow. The average annual temperature is from 45 to 55 degrees F. The frost free period averages 162 days but ranges from 133 to 191 days.



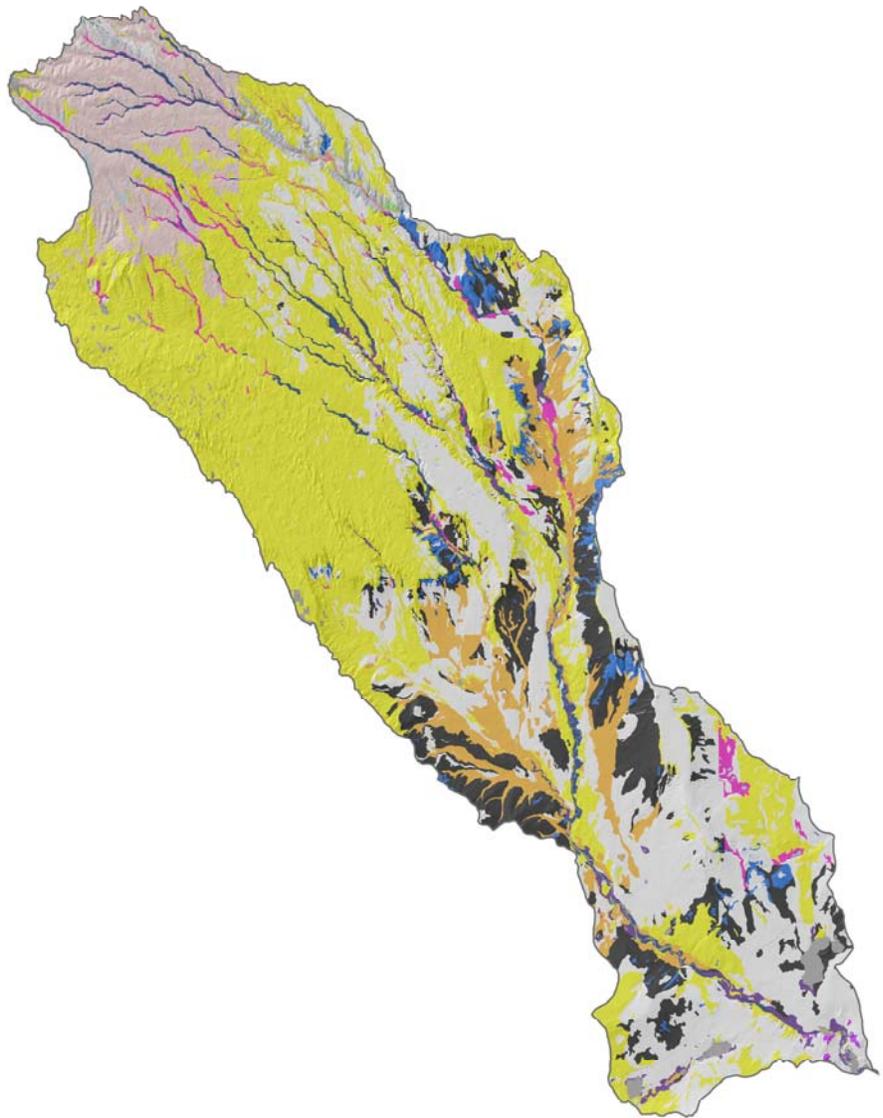
Ecological Sites

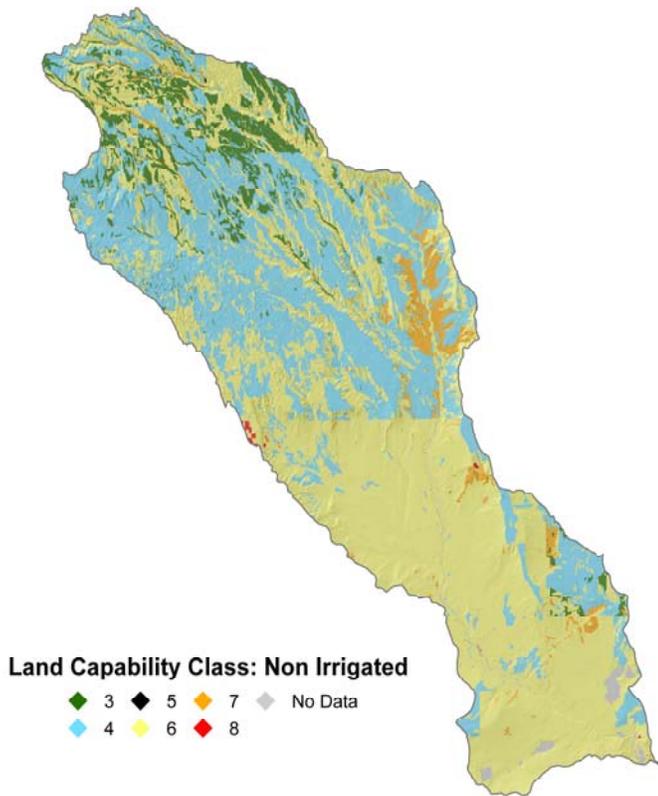
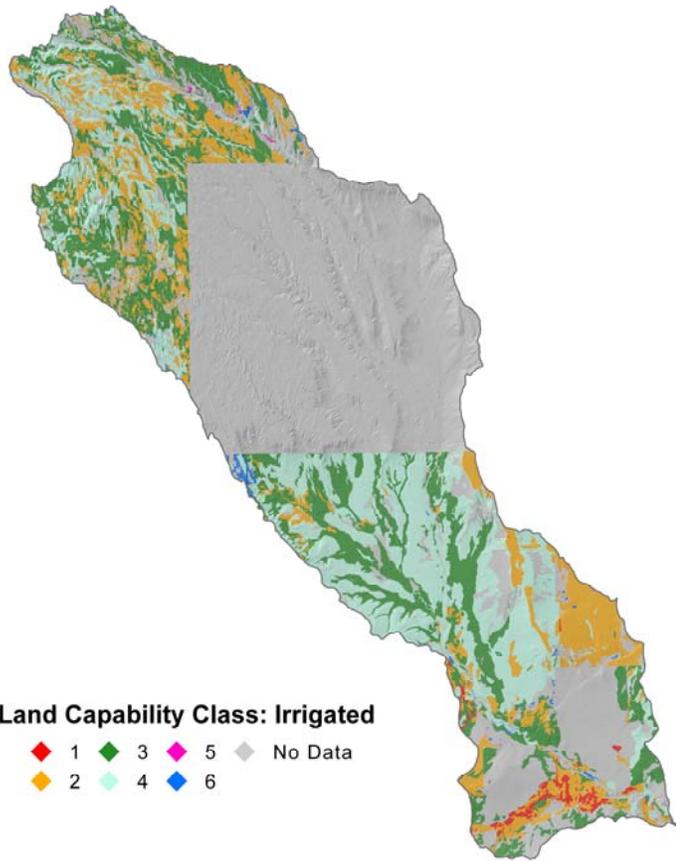
The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production.

Ecological Site maps give an overall indication of the soils plant relationship in the area. More detailed descriptions of ecological sites are provided in the Field Office Technical Guide (FOTG). The FOTG is available in local offices of the Natural Resources Conservation Service (NRCS) and online at <http://www.nrcs.usda.gov/technical/efotg/>.

Soil: Ecological Site Names

- ◆ No Data
- ◆ Alkaline Plains
- ◆ Chippy Sands
- ◆ Clayey
- ◆ Douglas Fir
- ◆ Gravel
- ◆ Gypsum Breaks
- ◆ Limestone Breaks
- ◆ Limy Bench
- ◇ Loamy
- ◆ Mountain Meadow
- ◆ Overflow
- ◆ Plains Swale
- ◆ Rocky Loam
- ◆ Saline Overflow
- ◆ Salt Flat
- ◆ Salt Meadow
- ◆ Sandy
- ◆ Sandstone Breaks
- ◆ Sandy Bottomland
- ◆ Sandy Divide
- ◆ Sandy Foothill
- ◆ Sandy Meadow
- ◆ Sandy Salt Flat
- ◆ Shallow Foothill
- ◆ Shallow Loam
- ◆ Shaly Plains
- ◆ Subalpine Loam
- ◆ Valley Bench
- ◆ Valley Sand





Land Capability Classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations that show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.

Class 1 - soils have few limitations that restrict their use.

Class 2 - soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 - soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 - soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 - soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 - soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

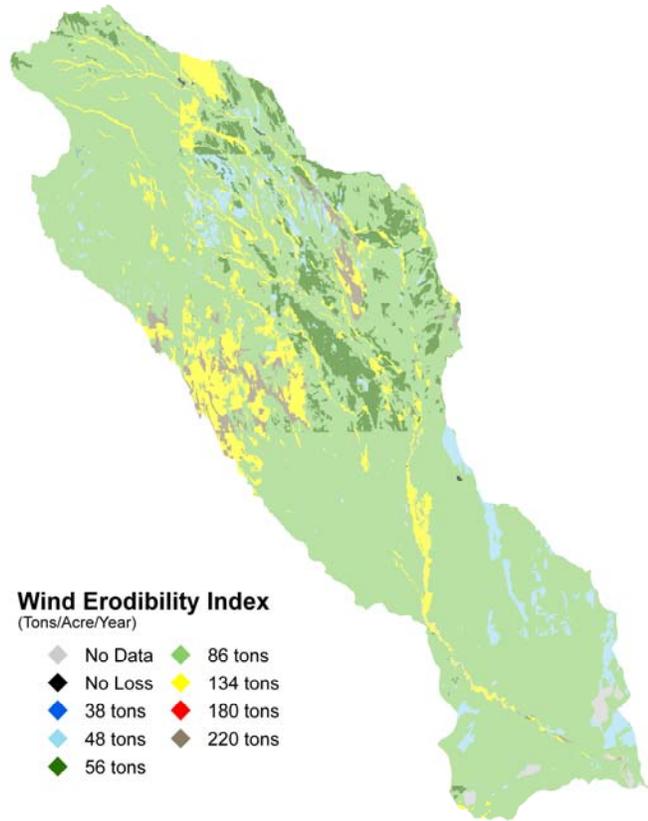
Class 7 - soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 - soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or aesthetic purposes.

The Wind Erodibility Index (WEI), is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion if it is assumed there is no vegetative cover or management.

Soils with an erodibility index equal to or greater than 8 are considered highly erodible.

As shown on the Wind Erodibility Index map below, most soils in the Horse Watershed are considered highly erodible.



This map shows stream locations within the watershed that are listed on the 303d list. Section 303(d) of the Clean Water Act requires states to identify and list all water bodies where state water quality standards are not being met. Thereafter, TMDLs compromising quantitative objectives and strategies have been or will be developed for these impaired waters within the watershed in order to achieve their water quality standards.

Impairment Definition

Selenium: A naturally occurring metal in marine shale that serves as a micronutrient. Excessive amounts impair aquatic life and bioaccumulation up the food chain occurs causing toxicity to birds, mammals, and humans.



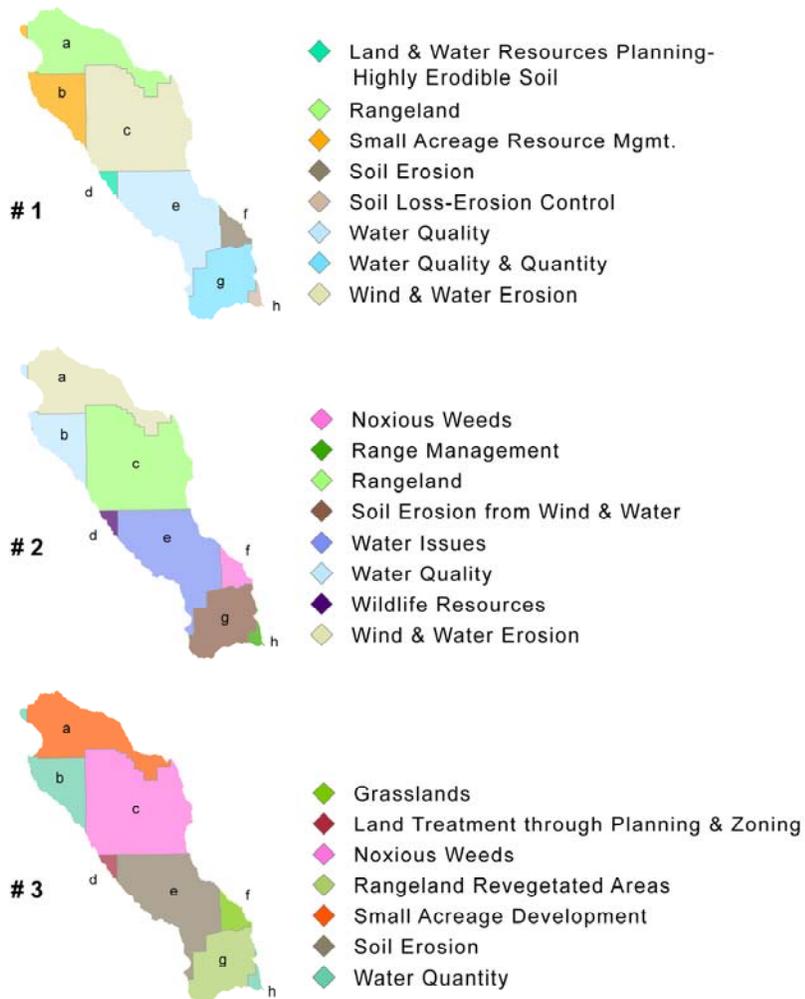
Horse Watershed Natural Resource Concerns

Map Legend—Conservation Districts

- a—Double El
- b—El Paso
- c—Prairie
- d—Olney-Boone
- e—West Otero-Timpas
- f—Kiowa County
- g—East Otero
- h—Bent County

Note: The Colorado Conservation Districts identified and prioritized these resource concerns during facilitated public meetings and are included in their Long Range Plans.

Top Three Concerns within Conservation Districts



1. Ranking of Conservation District's Natural Resource Concerns

	Erosion	Rangeland	Water Quality	Water Quantity	Wildlife	Invasive Species	Development	Flood Control
Double El	4	5			2		3	1
El Paso County			4	3		2	5	
Prairie	5	4			2	3		
Olney-Boone	5				4		3	
West Otero Timpas	3	1	5	4		2		
Kiowa County	5	3			2	4		
East Otero	4	3	5	5	1	2		
Bent County	5	4	3	3	2			
Total Points	31	20	17	15	13	13	11	1

II. Other Identified Resource Concerns

Colorado State University

- On-going research in the Arkansas River has increased awareness of the following trends in agriculture and the environment in the river valley:
 - * Saline High Water Tables
Soil Waterlogging/Salinization
Crop Yield Reduction
 - * Salt and Selenium Dissolution in the aquifer
Substantial return flow of salts and trace metals to the river
 - * High Water Tables Under Fallow Land and Invasive Phreatophytes
Nonbeneficial water consumption

NRCS—Major Land Resource Area Descriptions

- As more agricultural drainage is returned to the rivers, the level of dissolved solids and sediment causes some problems in this watershed.
- Major resource concern in this watershed include wind erosion, soil compaction due to tillage practices, increased salinization of cropland due to irrigation water management practices, and overall degradation of soil quality.

State and Federal Threatened, Endangered, Candidate Species, and Species of Special Concern

Common Name	Scientific Name	Class	State Status/Federal Status	Comments
Arkansas Darter	<i>Etheostoma cragini</i>	Fish	Threatened/Candidate	Occurs in the watershed
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Birds	Threatened/None	May migrate through watershed and may winter near Arkansas River
Black-footed Ferret	<i>Mustela nigripes</i>	Mammals	Endangered/Endangered	No current records of occurrence
Black-tailed Prairie Dog	<i>Cynomys ludovicianus</i>	Mammals	Concern/None	Occurs in the watershed
Burrowing Owl	<i>Athene cunicularia</i>	Birds	Threatened/None	Occurs in the watershed
Couch’s Spadefoot Toad	<i>Scaphiopus couchii</i>	Amphibians	Concern/None	May occur in the watershed
Ferruginous Hawk	<i>Buteo regalis</i>	Birds	Concern/None	Occurs in the watershed
Lesser Prairie Chicken	<i>Tympanuchus pallidicinctus</i>	Birds	Threatened/Candidate	Not currently known in the watershed
Long-Billed Curlew	<i>Numenius americanus</i>	Birds	Concern/None	Occurs in the watershed
Massasauga	<i>Sistrurus catenatus</i>	Reptiles	Concern/None	Occurs in the watershed
Mountain Plover	<i>Charadrius montanus</i>	Birds	Concern/None	Occurs in the watershed
Northern leopard frog	<i>Rana pipiens</i>	Amphibians	Concern/None	Occurs in the watershed
Plains Leopard Frog	<i>Rana blairi</i>	Amphibians	Concern/None	Occurs in the watershed
Swift fox	<i>Vulpes velox</i>	Mammals	Concern/None	Occurs in the watershed
Yellow mud turtle	<i>Kinosternon flavescens</i>	Reptiles	Concern/None	Occurs in the watershed
Suckermouth minnow	<i>Phenacobius mirabilis</i>	Fish	Endangered/None	May occur in the watershed
Flathead chub	<i>Platygobio gracilus</i>	Fish	Concern/None	May occur in the watershed

Shortgrass prairie is the dominant terrestrial habitat type in this watershed. Burrowing owl, mountain plover, black-tailed prairie dog, massasauga, and swift fox are representative species for this habitat. Water is scarce and the native species in this watershed are those that can survive without abundant water supplies. Riparian areas, playa lakes, and the occasional stock pond provide seasonal to intermittent aquatic habitats. Economically important wildlife species that occur in the watershed include black bullhead, sunfish, pronghorn (antelope), mule and white-tailed deer, and scaled quail.

Social Data

County and percentage in watershed	Bent 1.9%	Crowley 46.4	Elbert 3.6	El Paso 13.2	Kiowa 2.2	Lincoln 19.4	Otero 10.6
Demographics (US Census, American Factfinder)							
Total population	5,998	5,518	19,872	550,130	1,622	20,504	20,311
Male	3,379	3,711	9,966	272,922	811	10,834	9,926
Female	2,619	1,807	9,906	277,208	811	9,670	10,385
Median age (years)	37.3	36.6	37.2	33.5	39.7	36.5	37.7
White	4,770	4,577	18,923	444,799	1,559	18,792	16,049
Black or African American	219	389	128	33484	8	420	154
American Indian and Alaska Native	134	143	125	4855	18	131	290
Asian	34	45	74	15516	0	82	142
Native Hawaiian and Other Pacific Islander	0	1	18	1241	1	14	16
Some other race	315	263	255	29575	23	772	3059
Hispanic or Latino (of any race)	1814	1244	766	70312	51	2439	7642
Economic Characteristics (US Census, American Factfinder)							
In labor force (population 16 years and over)	2,303	1,469	11,056	288,867	776	9,771	9,102
Median household income (dollars)	28,125	26,803	62,480	50,714	30,494	32,724	29,738
Median family income (dollars)	34,096	32,162	66,740	61,719	35,536	42,241	35,906
Per capita income (dollars)	13,567	12,836	24,960	25,261	16,382	16,721	15,113
Families below poverty level	231	148	145	x	43	454	778
Individuals below poverty level	988	653	791	x	195	2253	3713
X means that value is not applicable or not available							
County Agricultural Characteristics (Colorado Agricultural Census, county data tables)							
Farms (number)	265	217	1153	1175	357	455	488
Land in farms/ranches (acres)	735,826	375,413	1,068,359	811,931	896,772	1,428,404	546,396
Average size farm/ranch (acres)	2,777	1,730	927	691	2,512	3,139	1,120
Median size farm (acres)	580	540	160	160	1,280	1,497	170
Average age of farmer or rancher	53.9	56.7	52.8	54.1	55.2	55.6	52.3
Net cash return from ag sales (\$1,000)	5,898	5,501	108	2,485	944	4,829	2,935
Cattle and calves (number)	45,000	48,000	36,000	26,000	15,000	40,000	65,000

Selected Conservation Application Data		Horse 11020008				
	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	Total
Total Conservation Systems Planned (Acres)	526,951	432,650	Not Avail.	56,853	30,337	1,046,791
Total Conservation Systems Applied (Acres)	45,364	192,147	Not Avail.	26,942	9,764	274,217
Practices						
Prescribed Grazing	9,762	173,354	33,481	19,372	4,721	240,690
Upland Wildlife Habitat Management	279	2,611	874	8,627	121	12,512
Conservation Cropping System	Not Avail.	Not Avail.	249	543	354	1,146
Mulch Tillage	Not Avail.	Not Avail.	0	0	0	0

Conservation Systems to Address Major Resource Concerns

Primary Resource Concern: Rangeland Health				
Conservation System Description:	Prescribed Grazing—planned management that provides adequate recovery opportunity between grazing events and proper stocking of animals. Estimate 415,100 acres to be treated on a median sized ranch of 4,500 acres.			Based on Conservation System Guide Code: CO 67B.1-GR-01-R-Grazing
Practices	Unit	Quantity	Cost/Unit (\$)	Estimated Cost per Median Sized Ranch (\$)
Prescribed Grazing				
Fence (382)	Ft.	21,120	0.6	12,672
Pest Management (595)	Ac.	300	4,500	4,500
Pipeline (516)	Ft.	15,000	2.40	36,000
Upland Wildlife Habitat Management (645)	Ac.	300	na	0
Watering Facility (614)	No.	2	410	820
Windbreak/Shelterbelt Establishment (380)	Ft.	1,000	.85	850
Costs to apply prescribed grazing per median sized ranch of 4,500 acres	No.	92	54,842	5,045,464
Subtotal Rangeland costs:				\$5,045,464

Conservation Systems to Address Major Resource Concerns (cont'd)

Primary Resource Concern: Soil Erosion By Wind on dryland crops				
Conservation System Description:		Seasonal residue management with Conservation crop rotation, Nutrient and Pest Mgt		Reference Conservation System Guide Code: CO 69.1-CR-Dryland-R-2
Practices	Unit	Quantity	Cost/Unit (\$)	Estimated Cost (\$)
Conservation Crop Rotation (328)	Ac	5,554	10	55,540
Residue Mgmt, Seasonal (344)	Ac	5,554	5	27,770
Nutrient Management (590)	Ac	5,554	5	27,770
Pest Management (595)	Ac	5,554	15	83,310
Subtotal Costs Dryland Crops:				\$194,390
Primary Resource Concern: Water Quality				
Conservation System Description:		Sprinkler irrigation system with IWM, Crop rotation, Mulch-till, Nutrient and Pest Mgt..		Reference Conservation System Guide Code: CO 69.1-CR-Pivot-R-2
Practices	Unit	Quantity	Cost/Unit (\$)	Estimated Cost (\$)
Conservation Crop Rotation (328)	Ac	17,054	10	170,540
Irrigation System, Sprinkler (442)	Ac	9,709	779	7,563,311
Irrigation Water Management (449)	Ac	9,709	5	48,545
Residue Mgmt, Mulch Till (345)	Ac	17,054	5	85,270
Nutrient Management (590)	Ac	9,709	5	48,545
Pest Management (595)	Ac	9,709	15	145,635
Subtotal Irrigated Crops:				\$8,061,846

General Effects, Impacts, and Estimated Costs of Application of Conservation Systems

Landuse	Resource Concern	Measurable Effects	Non-measurable Effects	Estimated Cost (\$)
Rangeland	Plants		Improved plant condition, productivity, health and vigor. Grazing animals have adequate feed, forage, and shelter.	5,045,464
Dryland Crop	Soil	23605 Total Tons/Year saved	Cropland sustainability; air quality	194,390
Irrigated Crop	Water		Nutrients and organics are stored, handled, disposed of, and managed so that surface	8,061,846
Estimated Total Costs to Address Major Resource Concerns:				\$13,301,700

FOOTNOTES/ BIBLIOGRAPHY

303(d) listed streams within Rush Watershed were created using data from Colorado Department of Public Health & Environment's Water Quality & Control Commission. Impaired streams are current as of April 30, 2006. For a list of all Colorado impaired streams, locations and priority ratings, visit <http://www.cdphe.state.co.us/regulations/wqccregs/100293wqlimitedsegmdls.pdf>.

Threatened and Endangered Species information was gathered using data from the Colorado Division of Wildlife (CDOW) Natural Diversity Information Source (NDIS). NDIS GIS data may be downloaded at <http://ndis.nrel.colostate.edu>. For more information on Colorado's Endangered & Threatened Species, as well as Species of Concern, visit <http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/ThreatenedEndangeredList/ListOfThreatenedAndEndangeredSpecies.htm> or <http://mountainprairie.fws.gov/endspp/CountyLists/COLORADO.htm>

Resource Concerns were identified using the Colorado Association of Conservation Districts' (CACD) long range (10 year) plans from the period of 1996-2000. Only the top three environmental resource concerns for each district were used. For more information on Colorado's Conservation Districts, visit <http://www.cacd.us>.

Maps were generated using Soil Survey Geographic Database (SSURGO) tabular and spatial data. SSURGO data was downloaded for the following Colorado surveys:

Bent County (CO011) Published 12/07/2005

Kiowa County (CO061) Published 12/19/2005

Crowley County (CO025) Published 12/20/2005

Lincoln County (CO073) Published 12/19/2005

Elbert County East (CO624) Published 12/16/2005

Otero County (CO089) Published 12/20/2005

El Paso County Area (CO625) Published 12/19/2005

To download SSURGO data, visit <http://soildatamart.nrcs.usda.gov>. The surveys were then loaded into Soil Data Viewer <http://soildataviewer.nrcs.usda.gov> (a tool built as an extension to ArcMAP for quick geospatial analysis of soil data for use in resource assessment) and the subsequent data was exported to a shapefile.

Vegetation data was generated using the Colorado Division of Wildlife's "Colorado Vegetation Classification Project" (CVCP) data. Completed in 2003, the CVCP is a landscape level vegetation dataset created using Landsat TM imagery and then formatted for GIS use. The species identified are an overview of the most common species associated in each cover type, in order of greatest occurrence. For more information on the Colorado Vegetation Classification Project, visit <http://ndis.nrel.colostate.edu/coveg>.

Common Resource Area (CRA), a subdivision of the Major Land Resource Area (MLRA), is a geographical area where resource concerns, problems, or treatment needs are similar. Geographic boundaries of a CRA are determined by landscape conditions, soil, climate, human considerations and other natural resource information. For more information on Common Resource Areas visit <http://soils.usda.gov/survey/geography/cra.html>.

Average Annual Precipitation data was developed through a partnership between the Natural Resources Conservation Service's (NRCS) National Water and Climate Center (NWCC), the National Cartography and Geospatial Center (NCGC), and the PRISM (the Parameter-elevation Regressions on Independent Slopes Model) group at Oregon State University (OSU), developers of PRISM. Mean annual precipitation maps were developed calculating averages of rainfall for the period of 1961-1990. For more information on PRISM data visit <http://www.ncgc.nrcs.usda.gov/products/datasets/climate/docs/fact-sheet.html> or for more information about technical aspects of PRISM, visit the PRISM website at <http://www.ocs.orst.edu/prism>.

Land Ownership (status, 2004 dataset) data was obtained from the Colorado Department of Transportation (CDOT). For more information, visit <http://www.dot.state.co.us>.

Relief & Elevation maps were created using the National Elevation Dataset (NED), 30m Digital Elevation Model (DEM) raster product assembled by the U.S. Geological Survey (USGS). A hillshade grid was created from the 30m DEM to create a 3D effect. For more information about the NED visit <http://ned.usgs.gov>. The data was downloaded from the NRCS Geospatial Data Gateway at <http://datagateway.nrcs.usda.gov>.

Footnotes/Bibliography continued

Conservation Systems to address major resource concerns were extracted from the Conservation Systems Guides (CSG) compiled from local conservationists by the NRCS Ecological Sciences Section at the Lakewood State Office. Contact is Eugene Backhaus, 720-544-2868.

Effects and Impacts of application of conservation systems were extracted from Colorado eFOTG, Section III, Resource Quality Criteria, NRCS, Colorado, March 2005 and CSG.

Cost Estimates to apply conservation systems were developed by estimating costs per median size farm and ranch and calculating costs from the field office cost lists.