



United States Department  
of Agriculture

# Purgatoire Watershed



Hydrologic Unit Code 11020010

Natural Resources  
Conservation Service

Lakewood, Colorado

## Rapid Assessment

RWA 11020010

September 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

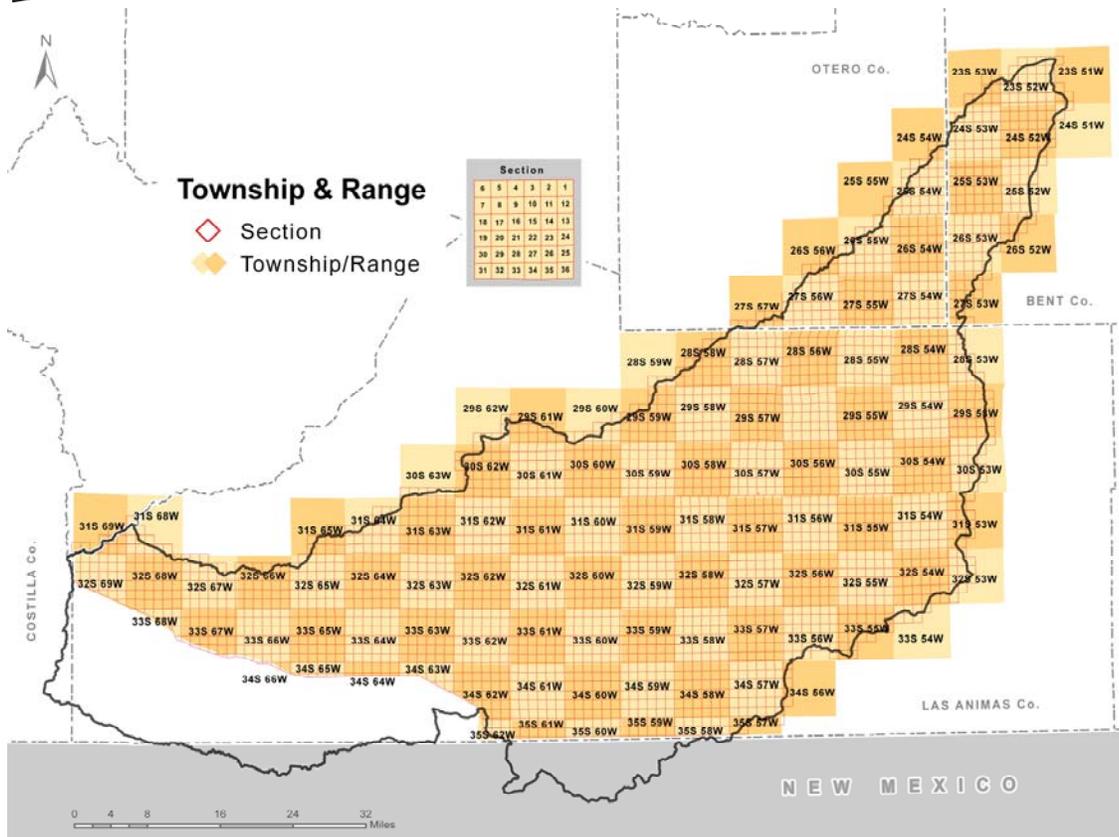
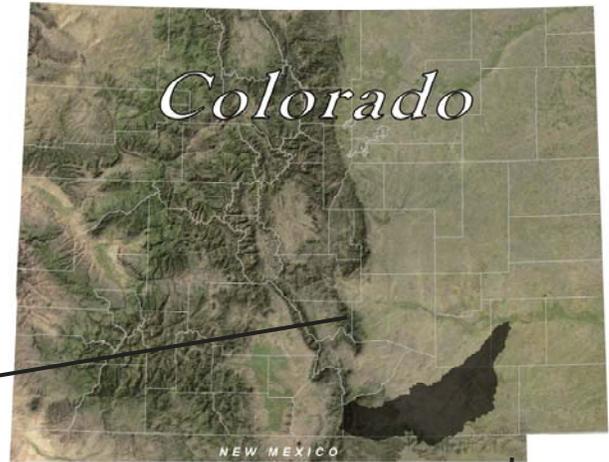
While rapid assessments provide less detail and analysis than full-blown studies and plans, they do provide the benefits of NRCS locally-led planning in less time and at a reduced cost. The benefits include:

- 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)

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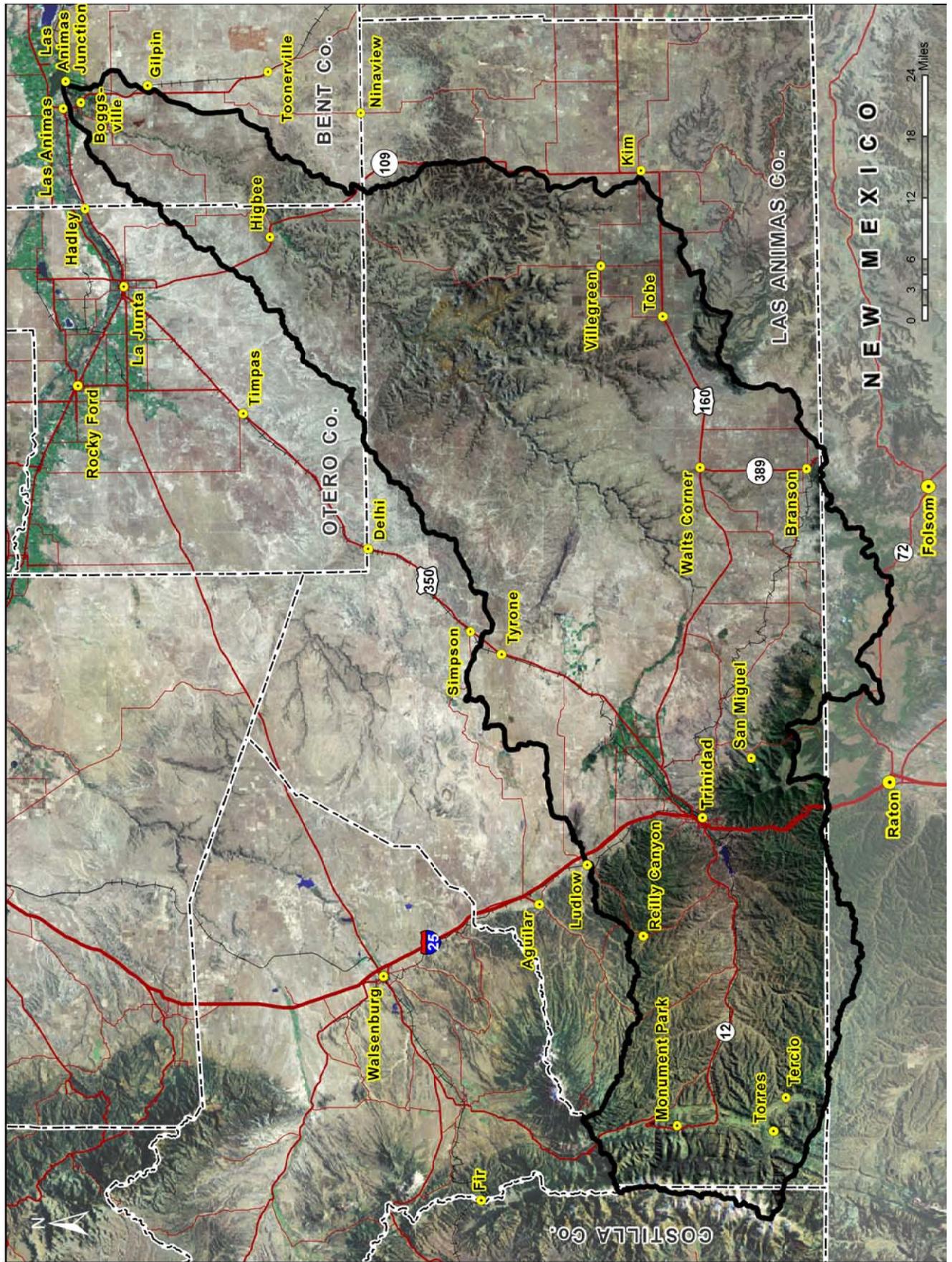
Rapid Watershed Assessments provide information that helps land-owners and local leaders set conservation priorities.

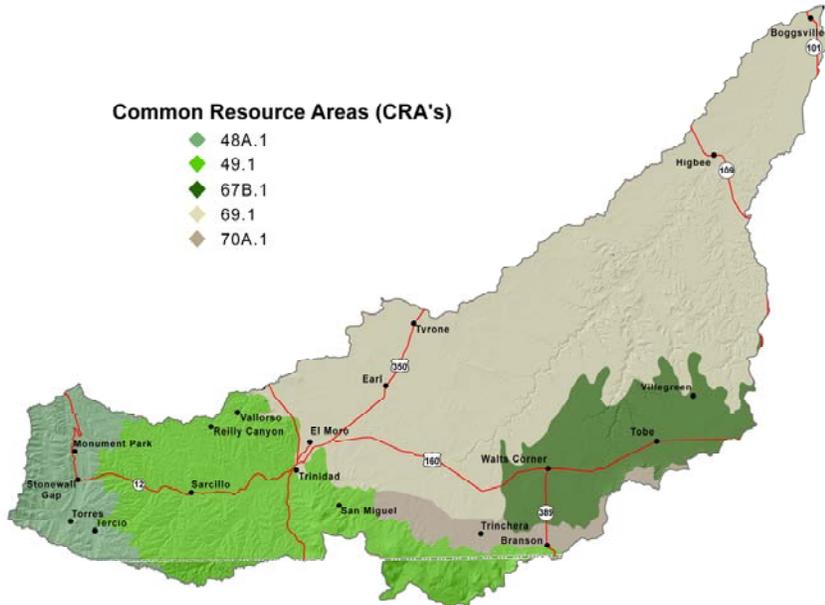
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	County Acres	County Acres In Purgatoire Watershed	% of county in the Watershed
Bent	986,170	129,926	13.2%
Costilla	787,109	10,291	1.3%
Las Animas	3,054,954	1,854,720	60.7%
Otero	811,808	127,383	15.7%

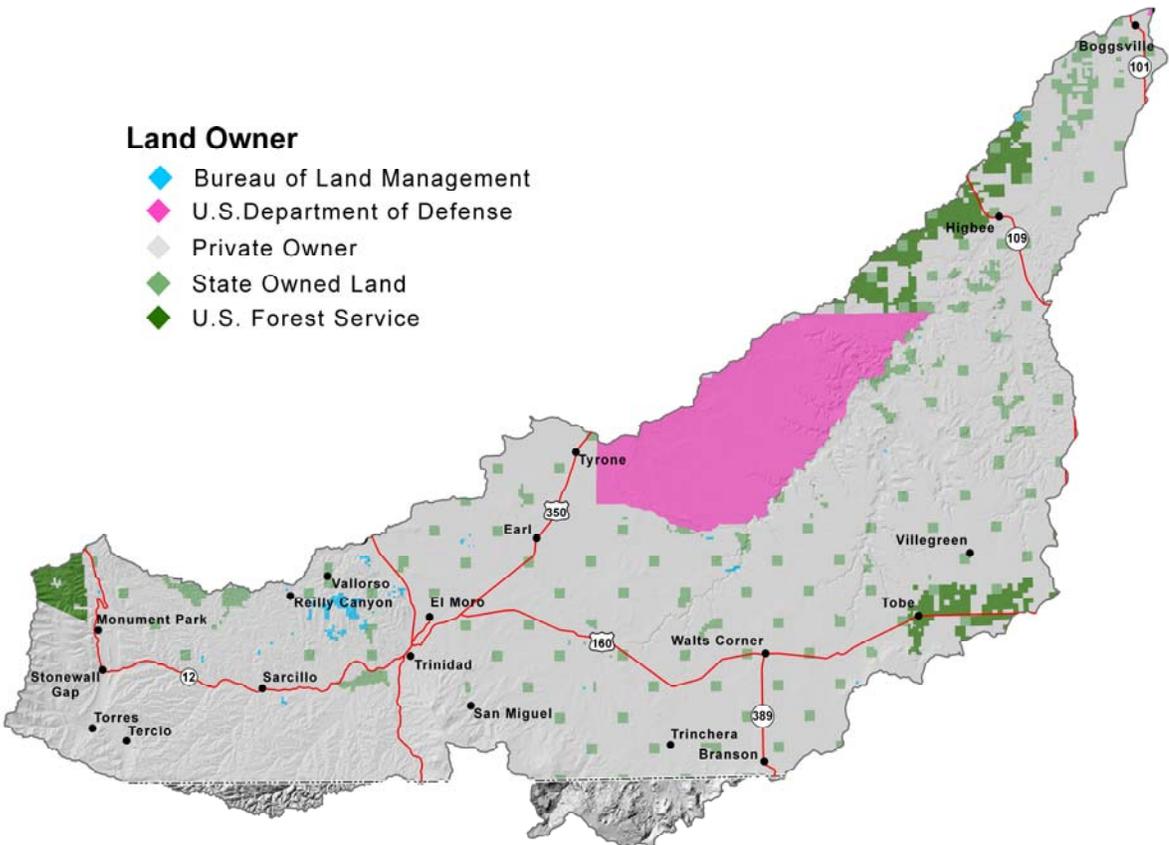
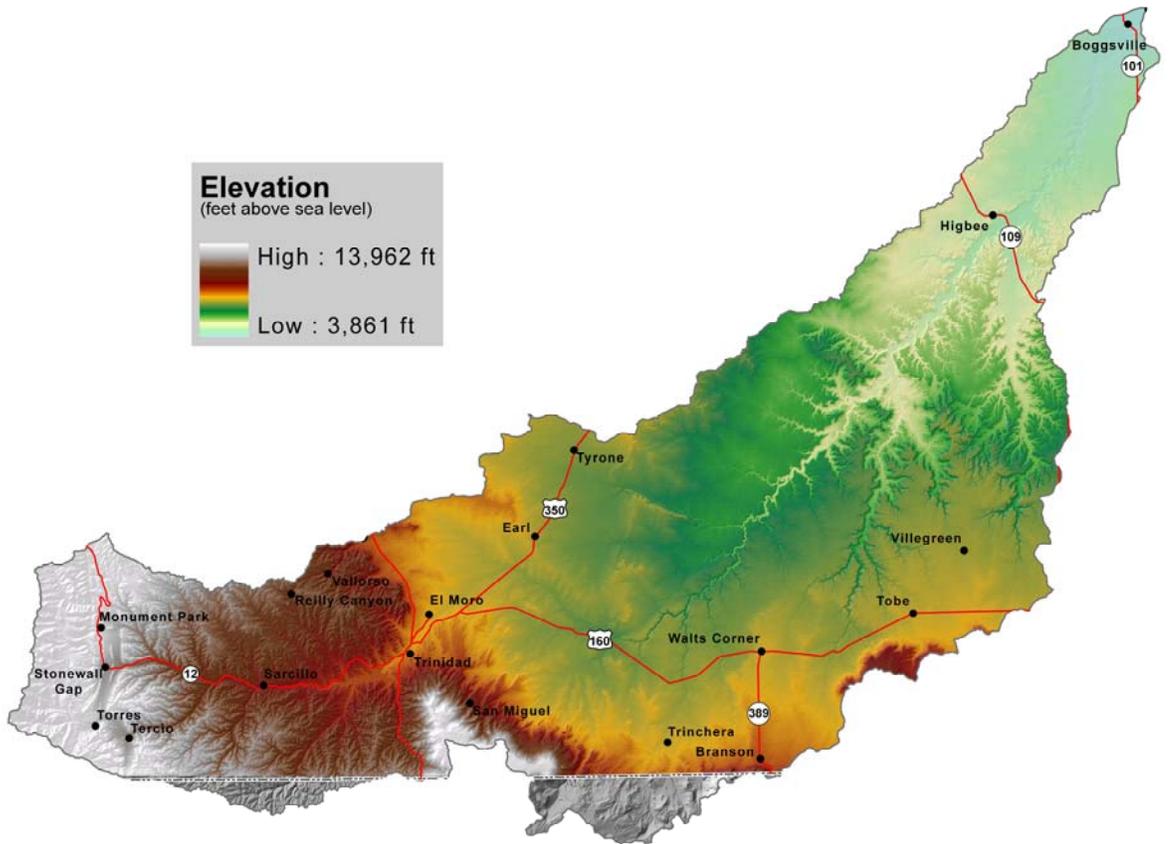
Purgatoire Watershed - 11020010





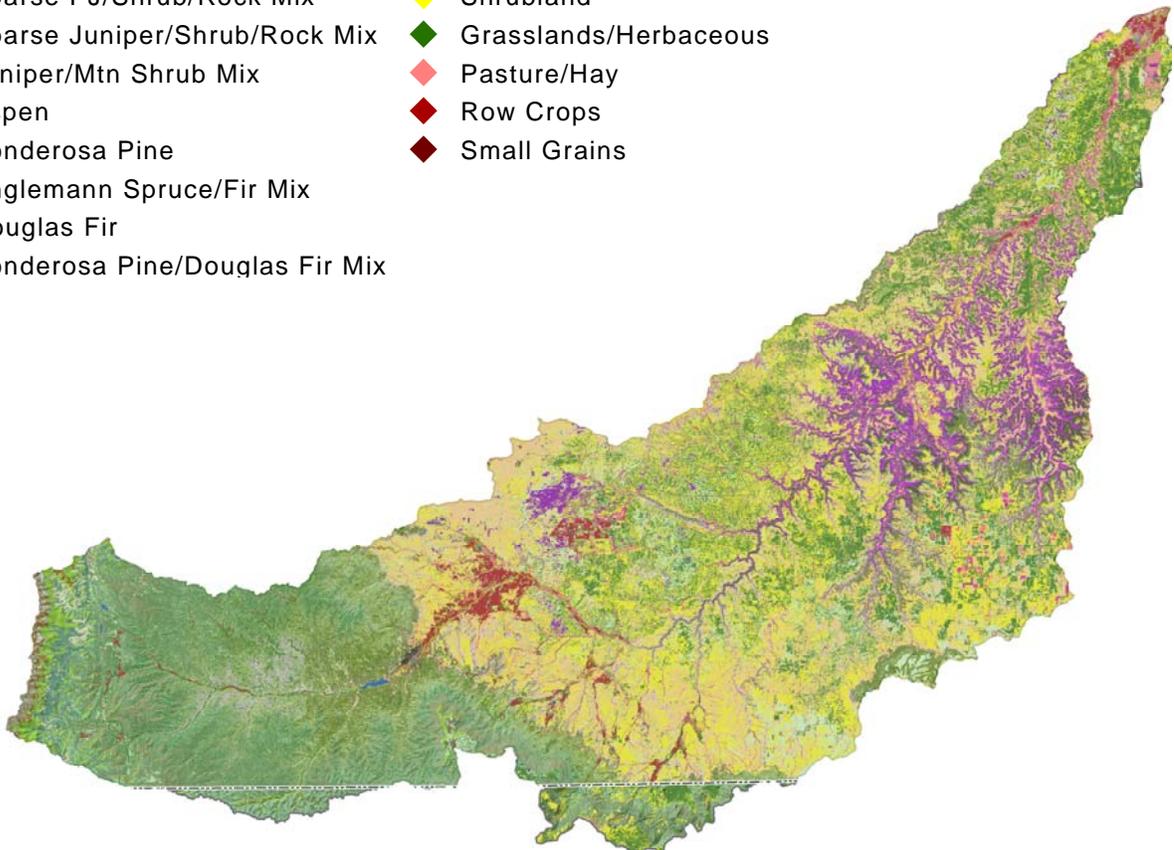
**Common Resource Areas (CRA):** Geographical areas where resource concerns, problems, and treatment needs are similar. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographical boundaries of the common resource area.

CRA	CRA Name	Description
48A.1	Southern Rocky Mountains High Mountains and Valleys	This area is best characterized by steep, high mountain ranges and associated mountain valleys. The temperature regimes are mostly frigid and cryic; moisture regimes are mainly ustic and udic. Vegetation is sage brush-grass at low elevations, and coniferous forest to alpine tundra as elevation increases.
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.
67B.1	Central Great Plains, Southern Part	The Central High Plains, Southern Part CRA is broad, undulating to rolling plains dissected by streams and rivers. Local relief is measured in tens of feet on the plains. Soils are deep and formed in eolian and alluvial materials. Presettlement vegetation was short grass prairies. Nearly all of this area in fallow cropland rotations or rangeland. Some cropland areas are irrigated.
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 of irrigated cropland occur along the floodplains and terraces.
70A.1	Northern New Mexico Highlands	This unit is characterized by broad, rolling plains broken by closed basins and drainageways that have smooth-shaped valley floors. Rugged breaks are common in the northern part of the area. Native vegetation is mid- to short-grass prairie species in the lowlands, with pinyon and juniper in the higher elevations and on the breaks. The soils are formed in weathered sedimentary rocks of Cretaceous age and igneous rocks of Tertiary and Quaternary age.



## Vegetation

- |                                  |                            |
|----------------------------------|----------------------------|
| ◇ No Data                        | ◆ Spruce/Fir/Aspen Mix     |
| ◆ Residential                    | ◆ P.Pine/Gamble Oak Mix    |
| ◆ Commercial                     | ◆ Douglas Fir/Aspen Mix    |
| ◆ Dry Agland                     | ◆ Barren Land              |
| ◆ Irrigated Ag                   | ◆ Rock                     |
| ◆ Grass Dominated                | ◆ Soil/Fallow              |
| ◆ Grass/Forb Mix                 | ◆ Alpine Grass Dominated   |
| ◆ Sparse Grass (Blowouts)        | ◆ Alpine Grass/Forb Mix    |
| ◆ Sagebrush Community            | ◆ Subalpine Grass/Forb Mix |
| ◆ Greasewood                     | ◆ Riparian                 |
| ◆ Shrub/Grass/Forb Mix           | ◆ Cottonwood               |
| ◆ Sagebrush/Grass Mix            | ◆ Shrub Riparian           |
| ◆ Grass/Misc. Cactus Mix         | ◆ Herbaceous Riparian      |
| ◆ Pinon-Juniper                  | ◆ Water                    |
| ◆ Juniper                        | <b>New Mexico</b>          |
| ◆ Gambel Oak                     | ◆ No Data                  |
| ◆ Mesic Mountain Shrub Mix       | ◆ Water                    |
| ◆ Upland Willow/Shrub Mix        | ◆ Deciduous Forest         |
| ◆ PJ-Oak Mix                     | ◆ Evergreen Forest         |
| ◆ PJ-Mtn Shrub Mix               | ◆ Mixed Forest             |
| ◆ Sparse PJ/Shrub/Rock Mix       | ◆ Shrubland                |
| ◆ Sparse Juniper/Shrub/Rock Mix  | ◆ Grasslands/Herbaceous    |
| ◆ Juniper/Mtn Shrub Mix          | ◆ Pasture/Hay              |
| ◆ Aspen                          | ◆ Row Crops                |
| ◆ Ponderosa Pine                 | ◆ Small Grains             |
| ◆ Englemann Spruce/Fir Mix       |                            |
| ◆ Douglas Fir                    |                            |
| ◆ Ponderosa Pine/Douglas Fir Mix |                            |

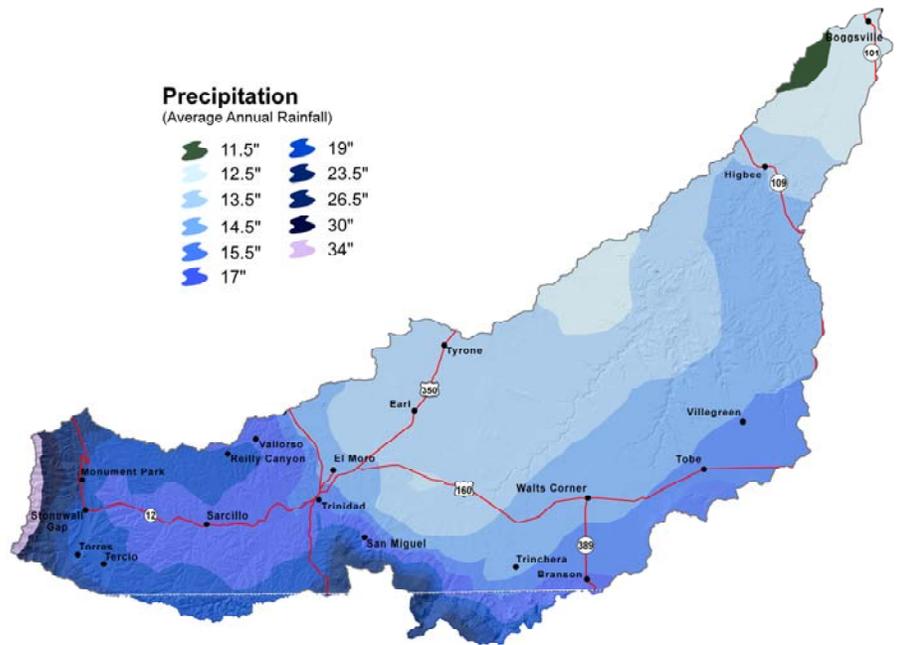


Purgatoire Land Use	Total Acreage	Vegetation in Colorado	Acreage
Cropland	39,342	Dryland Ag	9,039
		Irrigated Ag	30,303
Rangeland/Grassland	1,885,935	Alpine Grass Dominated	3,541
		Alpine Grass/Forb Mix	1,688
		Gambel Oak	75,466
		Grass Dominated	167,530
		Grass/Forb Mix	335,540
		Grass/Misc. Cactus Mix	271,166
		Greasewood	52,030
		Juniper	43,217
		Juniper/Mtn Shrub Mix	3
		Mesic Mtn Shrub Mix	1
		Pinon-Juniper	131,038
		Pinon Pine/Gambel Oak Mix	60,418
		PJ-Mtn Shrub Mix	34
		PJ-Oak Mix	89,803
		Sagebrush Community	1,382
		Sagebrush/Grass Mix	5
		Shrub/Grass/Forb Mix	458,538
		Soil	3
		Sparse Grass (Blowouts)	18,531
		Sparse Juniper/Shrub/Rock Mix	88,638
Sparse PJ/Shrub/Rock Mix	85,136		
Subalpine Grass/Forb Mix	741		
Upland Willow/Shrub Mix	1,486		
Forest	185,343	Aspen	8,812
		Cottonwood	16,065
		Douglas Fir	25,633
		Douglas Fir/Aspen Mix	3,865
		Engleman Spruce/Fir Mix	22,600
		Ponderosa Pine	51,367
		Ponderosa Pine/Douglas Fir Mix	29,730
		Spruce/Fir/Aspen Mix	27,271
Riparian	790	Herbaceous Riparian	11
		Riparian	3
		Shrub Riparian	776
Water	2,051	Water	2,051
Other	6,321	Barren Land	16
		Commercial	528
		Residential	827
		Rock	4,950

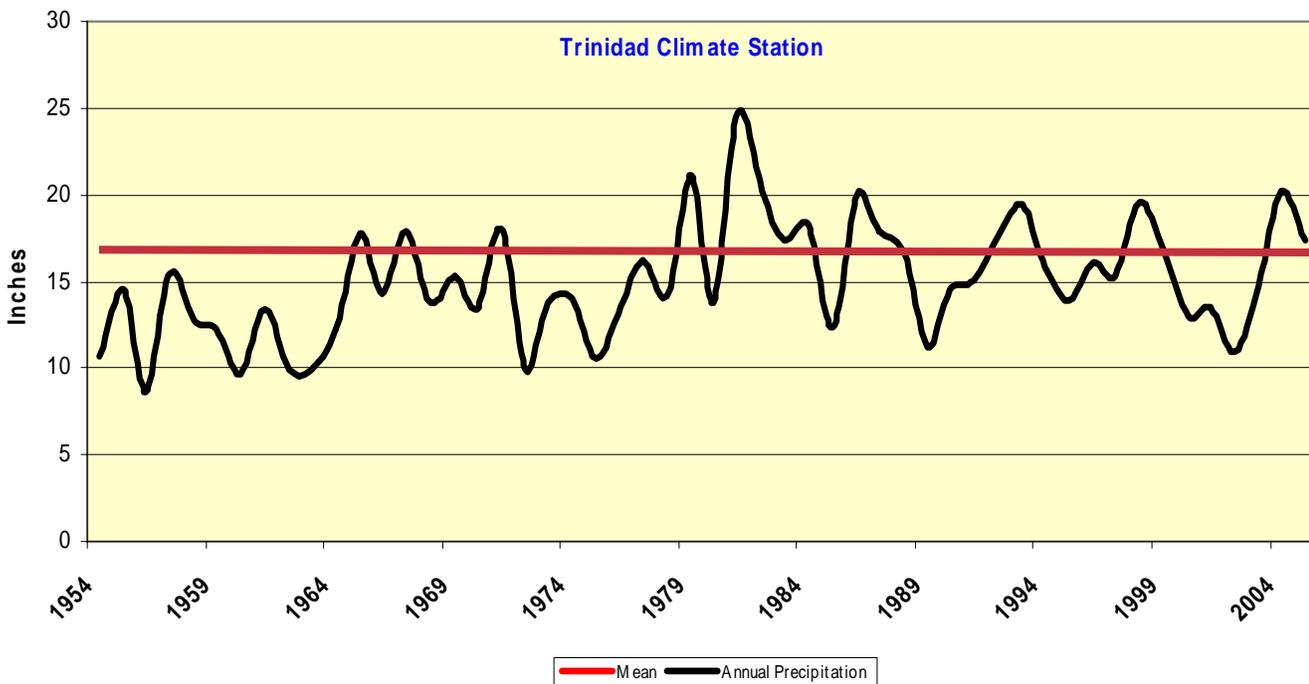
**Total Watershed Acres in Colorado 2,119,782**

## 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.



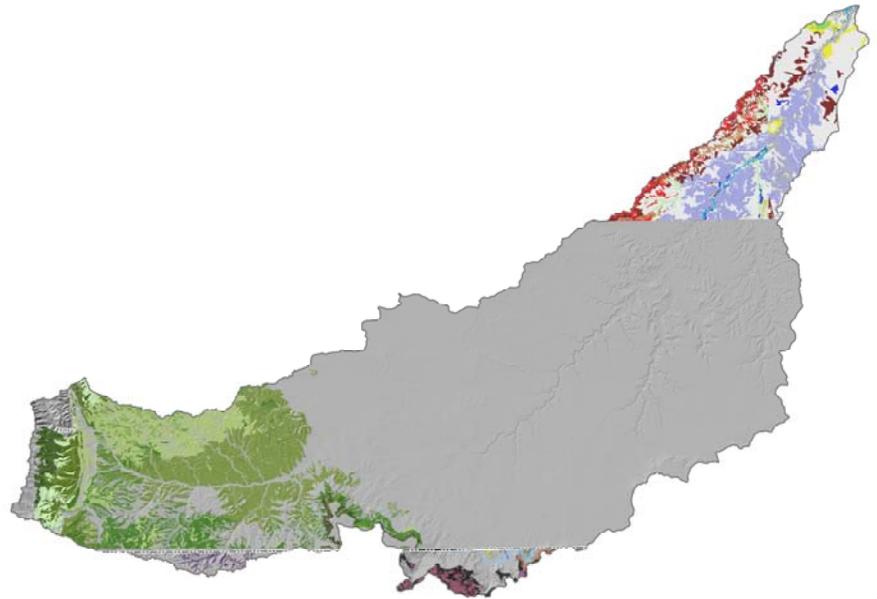
## Purgatoire Watershed Historic Precipitation



## 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/>.

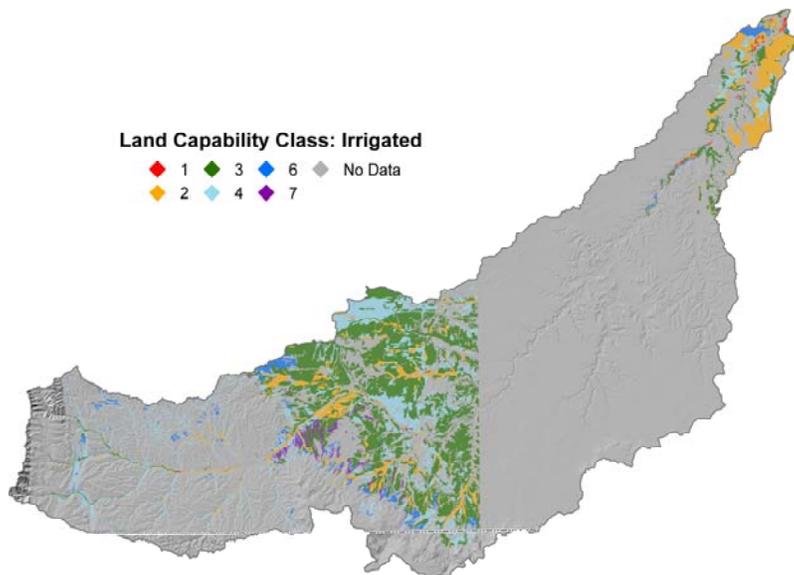


### Soil: Ecological Site Names

- |  |  |
|--|--|
| ◆ No Data  | ◆ Rocky Mountain Douglas fir/white fir |
| ◆ Alkaline Plains  | ◆ Salt Flats                           |
| ◆ Bottomland   | ◆ Sandstone Breaks                     |
| ◆ Breaks north exposure                                    | ◆ Sandy Loam                           |
| ◆ Clay Loam  | ◆ Sandy Plains                         |
| ◆ Clayey Upland  | ◆ Shale Hills                          |
| ◆ Choppy Sands   | ◆ Shallow Sandstone                    |
| ◆ Cinder   | ◆ Shallow Shale                        |
| ◆ Clay Loam  | ◆ Shallow Upland                       |
| ◆ Clayey Foothill  | ◆ Subalpine Grassland                  |
| ◆ Clayey Upland  | ◆ Swales                               |
| ◆ Cobbly Foothill  | ◆ Saline Overflow                      |
| ◆ Douglas fir  | ◆ Salt Flat                            |
| ◆ Douglas fir/white fir                                    | ◆ Salt Meadow                          |
| ◆ Engelmann's spruce-Subalpine fir                         | ◆ Sand Hills                           |
| ◆ Gravelly   | ◆ Sands                                |
| ◆ Gravel Breaks  | ◆ Sandstone Breaks                     |
| ◆ Gypsum Breaks  | ◆ Sandy                                |
| ◆ High Lime  | ◆ Sandy Bottomland                     |
| ◆ Loamy Upland   | ◆ Sandy Foothill                       |
| ◆ Limestone Breaks   | ◆ Sandy Loam                           |
| ◆ Limy Bench   | ◆ Sandy Plains                         |
| ◆ Loamy  | ◆ Shallow Foothill                     |
| ◆ Loamy Foothill   | ◆ Shallow Loam                         |
| ◆ Loamy Park   | ◆ Shallow Sandstone                    |
| ◆ Loamy Plains   | ◆ Shallow Upland                       |
| ◆ Loamy Upland   | ◆ Shaly Plains                         |
| ◆ Malpais Upland   | ◆ Subalpine Loam                       |
| ◆ Mountain Grassland                                       | ◆ Swale                                |
| ◆ Mountain Malpais   | ◆ Very Shallow                         |
| ◆ Mountain Meadow  | ◆ Valley Bench                         |
| ◆ Mountain Shale   | ◆ Valley Sand                          |
| ◆ Mountain Valley  | ◆ White fir/Douglas fir                |
| ◆ Malpais Upland   | ◆ Ponderosa pine/mountain muhly        |
| ◆ Mountain Loam  |  |
| ◆ Pinyon/juniper   |  |
| ◆ Ponderosa pine/Gambel's oak                              |  |
| ◆ Rocky Mountain Douglas fir/ponderosa pine/mountain muhly |  |

**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.

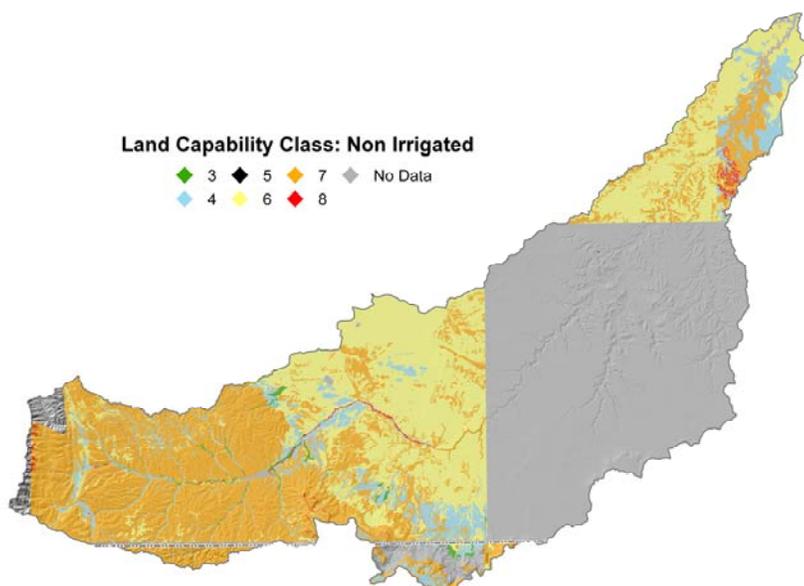
**Class 4** - soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

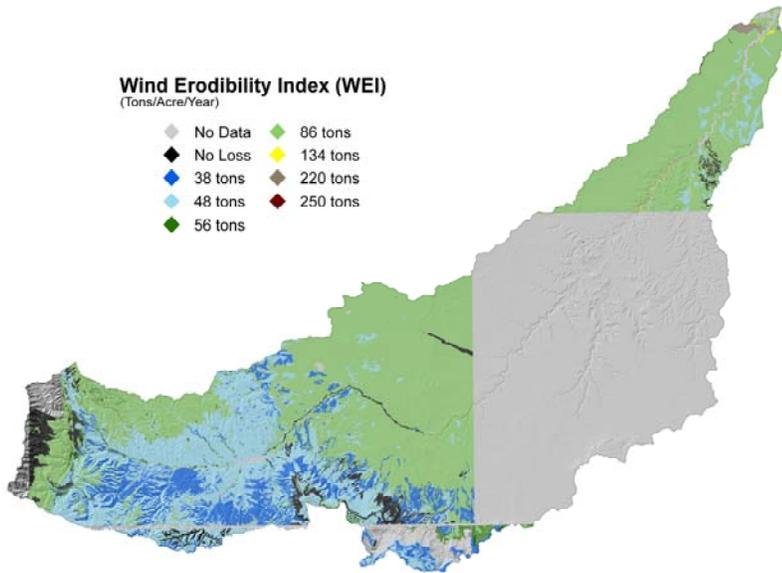
**Class 5** - soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

**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.

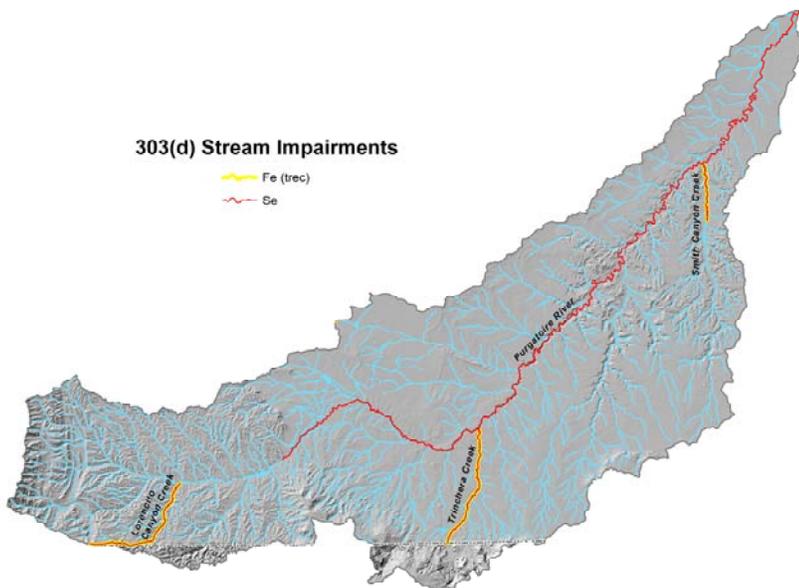




The Wind Erodibility Index (WEI), is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion if it is assumed there is no vegetative cover or management.

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 this watershed are highly erodible.



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 (Se):** 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.

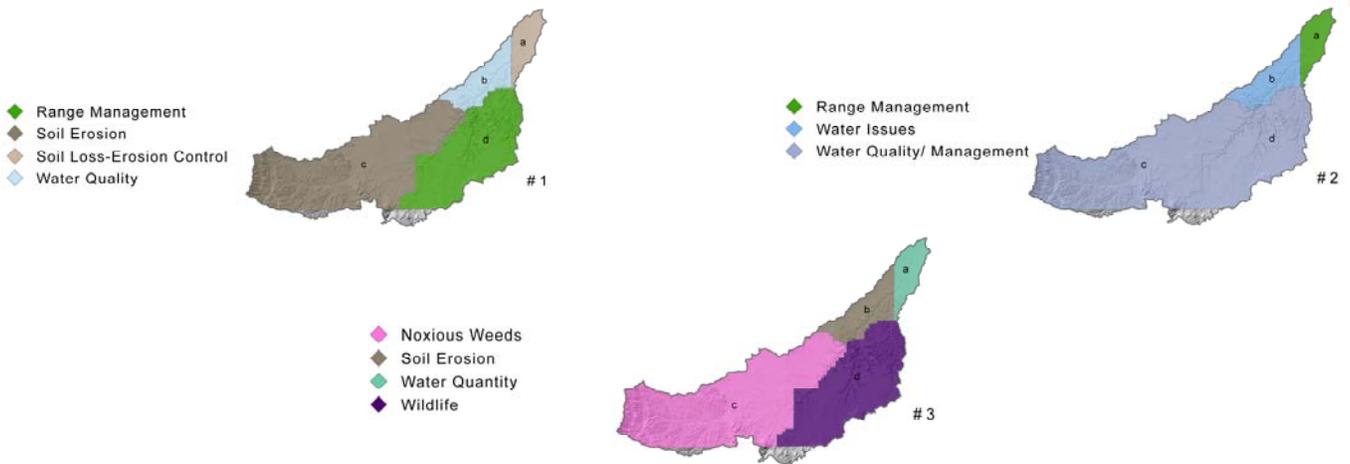
**Iron (Fe):** Iron is the fourth most abundant, by weight, of the elements that make up the earth's crust . The ferrous, orbivalent (Fe<sup>++</sup>), and the Ferric, or trivalent (Fe<sup>+++</sup>) irons are the primary forms of concern in the aquatic environment. Fe<sup>++</sup> can persist in waters void of dissolved oxygen and originate from groundwaters or mines when these are pumped or drained.

## Purgatoire Watershed Natural Resource Concerns

### I. Conservation District Rankings of Natural Resource Concerns

Conservation District Map Legend	Water Quantity & Quality	Wind and Water Erosion	Range -land	Noxious Weed Control	Wildlife Habitat	Urban Rural Issues	Forestry	Note: The Colorado Conservation Districts identified and prioritized these resource concerns during facilitated public meetings and are included in their Long Range Plans.
a Bent County	3	5	4		1	2		
b West Otero-Timpas	5	4	2	3				
c Spanish Peaks-Purgatoire	4	5	2	3			1	
d Branson-Trinchera	4	1	5	2	3			
<b>TOTALS</b>	<b>16</b>	<b>15</b>	<b>13</b>	<b>8</b>	<b>4</b>	<b>2</b>	<b>1</b>	

Conservation Districts Top Three Natural Resource Concerns



### 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.

## Wildlife Information

The diverse terrestrial habitat types in this watershed range from shortgrass prairie to foothills shrublands to coniferous forest. Wildlife species found in this watershed are equally diverse. Species such as mountain plover, black-tailed prairie dog, and swift fox are adapted to the scarce water found on shortgrass prairie. Seasonal streams with associated riparian areas and stock ponds provide limited aquatic habitats in the shortgrass. Higher in the watershed, in the shrub and forest habitats, species such as elk, Canada lynx, and Mexican spotted owl may be found. Economically important wildlife species that occur in the watershed include black bullhead, sunfish, pronghorn (antelope), mule and white-tailed deer, elk, wild turkey, pheasant (limited area), mourning dove, and scaled quail.

State and Federal Threatened, Endangered, and Candidate Species and Species of Special Concern in Purgatoire Watershed				
Common Name	Scientific Name	Class	State Status/Federal Status	Comments
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	Birds	Concern/None	Occurs in the watershed
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Birds	Threatened/None	May migrate through watershed
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
Canada Lynx	<i>Lynx canadensis</i>	Mammals	Endangered/Threatened	May occur in the watershed
Common Kingsnake	<i>Lampropeltis getula</i>	Reptiles	Concern/None	May occur 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
Flathead Chub	<i>Platygobio gracilis</i>	Fish	Concern/None	Occurs in the watershed
Great Plains narrowmouth toad	<i>Gastrophryne olivacea</i>	Amphibians	Concern/None	May occur in the watershed
Least Tern	<i>Sterna antillarum</i>	Birds	Endangered/Endangered	Not currently known in the watershed. Occurs near lower end of 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
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	Birds	Threatened/Threatened	May occur 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	May occur in the watershed
Piping Plover	<i>Charadrius melodus circumcinctus</i>	Birds	Threatened/Threatened	Not currently known in the watershed. Occurs near lower end of watershed.
Plains Leopard Frog	<i>Rana blairi</i>	Amphibians	Concern/None	Occurs in the watershed
Suckermouth Minnow	<i>Phenacobius mirabilis</i>	Fish	Endangered/None	Occurs in the watershed
Swift Fox	<i>Vulpes velox</i>	Mammals	Concern/None	Occurs in the watershed
Texas blind snake	<i>Leptotyphlops dulcis</i>	Reptiles	Concern/None	May occur in the watershed
Texas Horned Lizard	<i>Phrynosoma cornutum</i>	Reptiles	Concern/None	Occurs in the watershed
Townsend's big-eared bat (pale ssp)	<i>Corynorhinus townsendii pallascens</i>	Mammals	Concern/None	May occur in the watershed
Triploid checkered whiptail	<i>Cnemidophorus neotesselatus</i>	Reptiles	Concern/None	Occurs in the watershed
Yellow Mud Turtle	<i>Kinosternon flavescens</i>	Reptiles	Concern/None	May occur in the watershed

<b>Social and Economic Data</b>	<b>Bent County</b>	<b>Las Animas County</b>	<b>Otero County</b>
<b>Demographics</b>			
Total population	5,998	15,207	20,311
Male	3,379	7,441	9,926
Female	2,619	7,766	10,385
Median age (years)	37.3	40.9	37.7
White	4,770	12,566	16,049
Black or African American	219	60	154
American Indian and Alaska Native	134	387	290
Asian	34	57	142
Native Hawaiian and Other Pacific Islander	0	30	16
Some other race	315	1525	3059
Hispanic or Latino (of any race)	1814	14816	7642
<b>Economic Characteristics</b>			
In labor force (population 16 years and over)	2,303	6,558	9,102
Median household income (dollars)	28,125	28,273	29,738
Median family income (dollars)	34,096	34,072	35,906
Per capita income (dollars)	13,567	16,829	15,113
Families below poverty level	231	572	778
Individuals below poverty level	988	2573	3713
<b>County Agricultural Characteristics</b>			
Farms (number)	265	567	488
Land in farms/ranches (acres)	735,826	2,304,766	546,396
Average size farm/ranch (acres)	2,777	4,065	1,120
Median size farm (acres)	580	1,000	170
Average age of farmer or rancher	53.9	57.6	52.3
Net cash return from ag sales (\$1,000)	5,898	1,798	2,935
Cattle and calves (number)	45,000	47,000	65,000

Selected Conservation Application Data Purgatoire Watershed						
	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	Total
Total Conservation Systems Planned (Acres)	543,527	474,386	Not Avail.	94,438	80,243	1,192,594
Total Conservation Systems Applied (Acres)	96,158	182,548	Not Avail.	88,521	51,246	418,473
<b>Practices</b>						
Prescribed Grazing	28,559	155,421	68,893	67,213	26,728	346,814
Conservation Cropping System	na	na	0	33	215	248
Irrigation Water Management	1,249	3,262	108	710	268	5,597

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 695,500 acres to be treated on median sized ranches 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.	155	54,842	\$8,500,510
Subtotal Rangeland costs:				\$8,500,510

## 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	8,750	10	87,500
Residue Mgmt, Seasonal (344)	Ac	8,750	5	43,750
Nutrient Management (590)	Ac	8,750	5	43,750
Pest Management (595)	Ac	8,750	15	131,250
<b>Subtotal Costs Dryland Crops:</b>				<b>\$306,250</b>
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 (\$)
Irrigation System, Sprinkler (442)	Ac	3,975	779	3,096,525
Irrigation Water Management (449)	Ac	3,975	5	19,875
Pest Management (595)	Ac	3,975	15	59,625
<b>Subtotal Irrigated Crops:</b>				<b>\$3,176,025</b>

## 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.	8,500,510
Dryland Crop	Soil	37,188 Total Tons/Year saved	Cropland sustainability, air quality	306,250
Irrigated Crop	Water		Nutrients and organics are stored, handled, disposed of, and managed so that surface water uses are not adversely affected.	\$3,176,025
<b>Estimated Total Costs to Address Major Resource Concerns:</b>				<b>\$11,982,785</b>

## FOOTNOTES/ BIBLIOGRAPHY

**303(d)** listed streams within Rush Watershed were created using data from Colorado Department of Public Health & Environments' 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/100293wqlimitedsegtdls.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
- Costilla County Area (CO023) Published 01/20/2006
- Las Animas County Area (CO628) Published 05/01/2006
- Otero County (CO089) Published 12/20/2005

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>. New Mexico vegetation generated from the National Land Cover Database (NLCD 2001). For more information, visit [http://www.mrlc.gov/mrlc2k\\_nlcd.asp](http://www.mrlc.gov/mrlc2k_nlcd.asp)

**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.

