United States Department of Agriculture

Big Sandy Watershed

Hydrologic Unit Code 11020011

Natural Resources Conservation Service

Rapid Assessment

Lakewood, Colorado

RWA 11020011

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.

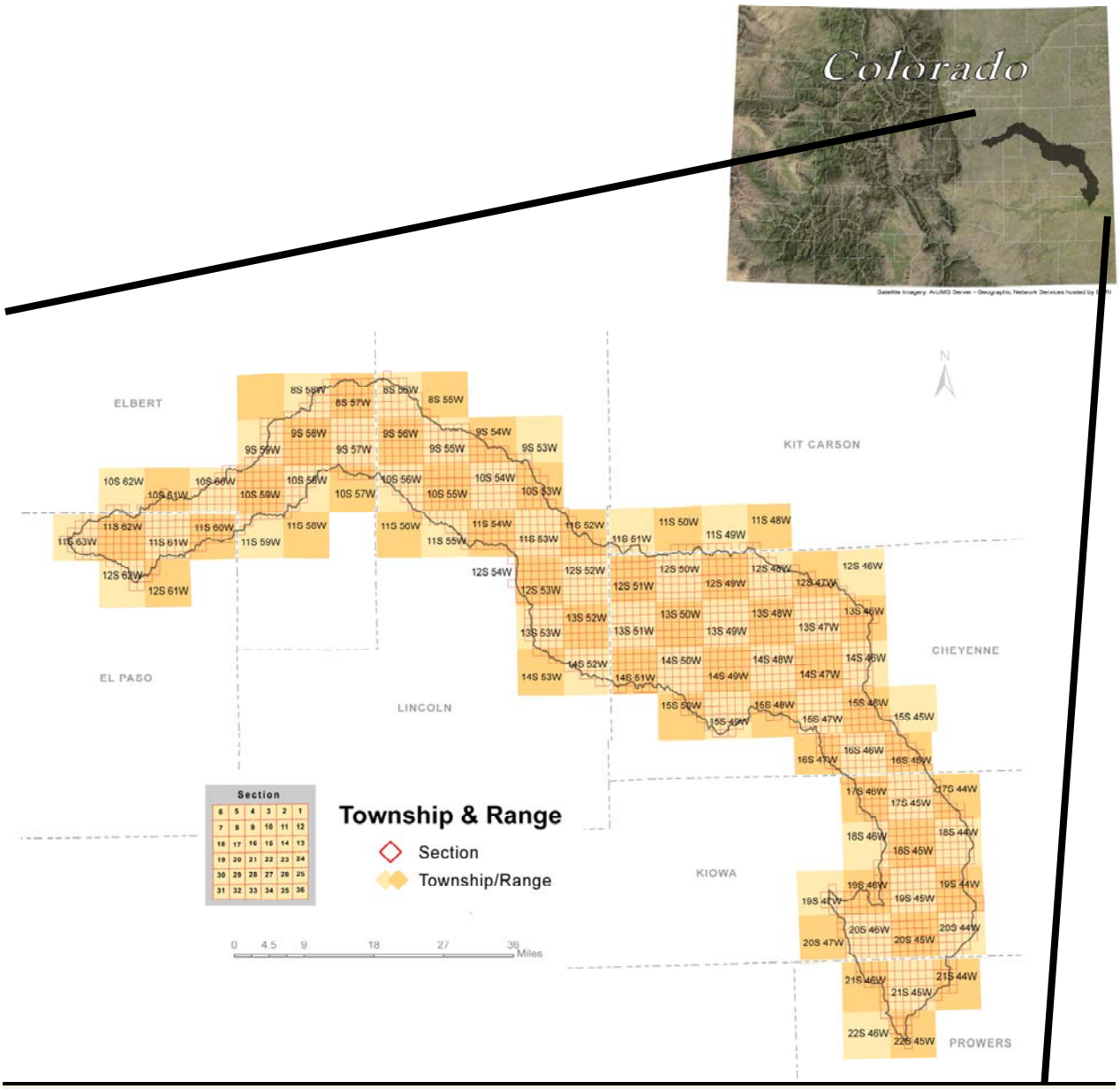
Rapid watershed assessments provide initial estimates of where conservation investments would best address the concerns of landowners, conservation districts, and other community organizations and stakeholders. These assessments help land-owners and local leaders set priorities and determine the best 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:

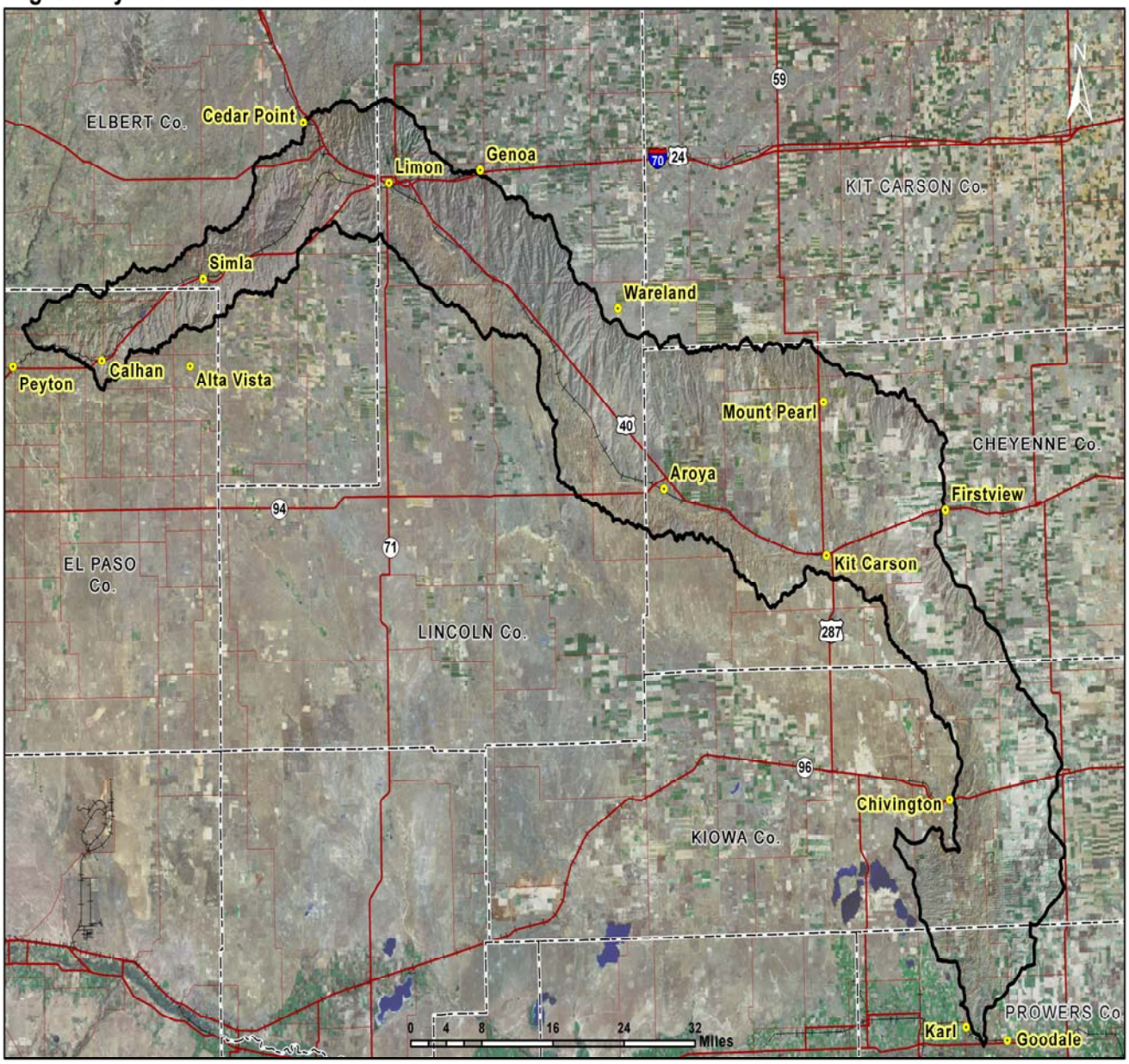
- Quick and inexpensive tools for setting priorities and taking action
- Providing a level of detail that is sufficient for identifying actions that can be taken with no further watershed-level studies or analyses
- Actions to be taken may require further Federal or State permits or ESA or NEPA analysis 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.



County	County Acres	County Acres in BIG SANDY Watershed	% of County in the Watershed	% of Watershed in the County
Cheyenne	1,140,362	452,214	40%	38%
Elbert	1,183,750	141,938	12%	12%
El Paso	1,362,117	70,935	5%	6%
Kiowa	1,143,313	195,086	17%	17%
Kit Carson	1,383,890	3,105	<1%	<1%
Lincoln	1,654,464	292,559	18%	24%
Prowers	1,052,815	40,460	4%	3%

Big Sandy Watershed - 11020011



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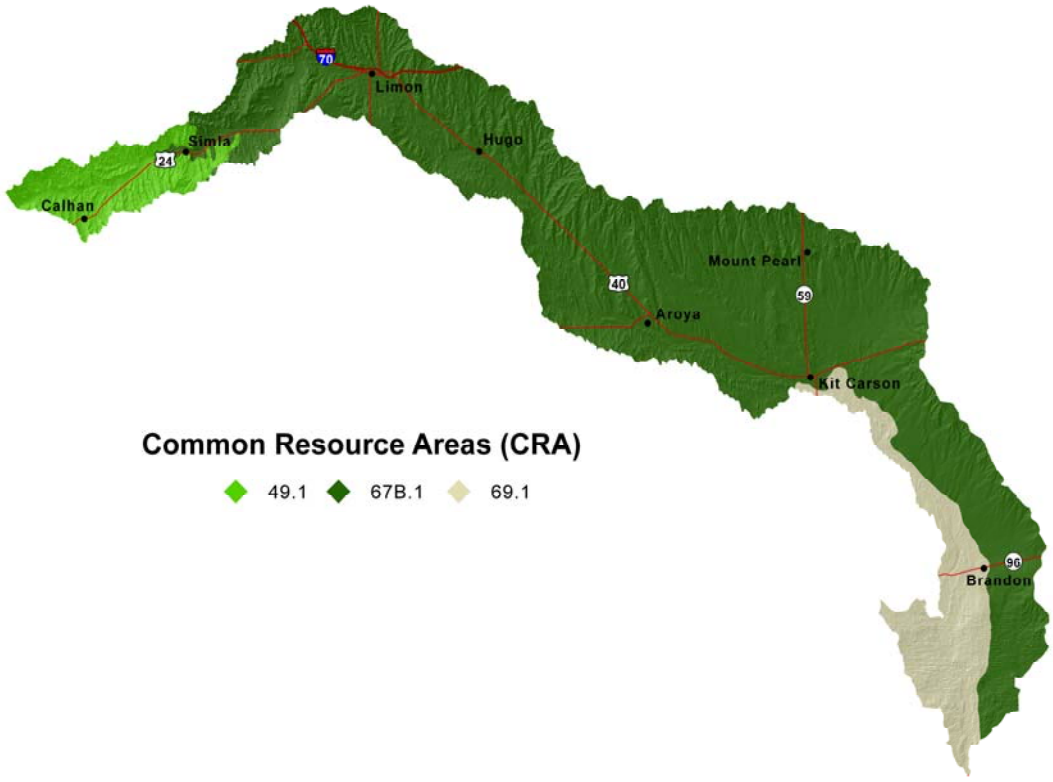


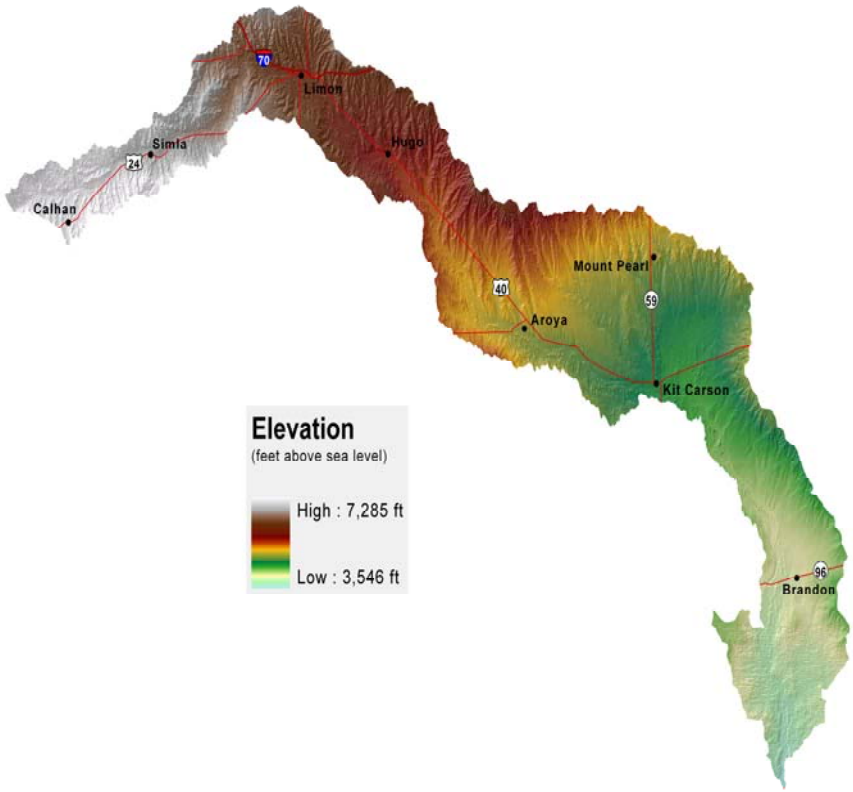
Common Resource Areas (CRA): Geographical areas where resource concerns, problems, and treatment needs are similar. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographical boundaries of the common resource area.

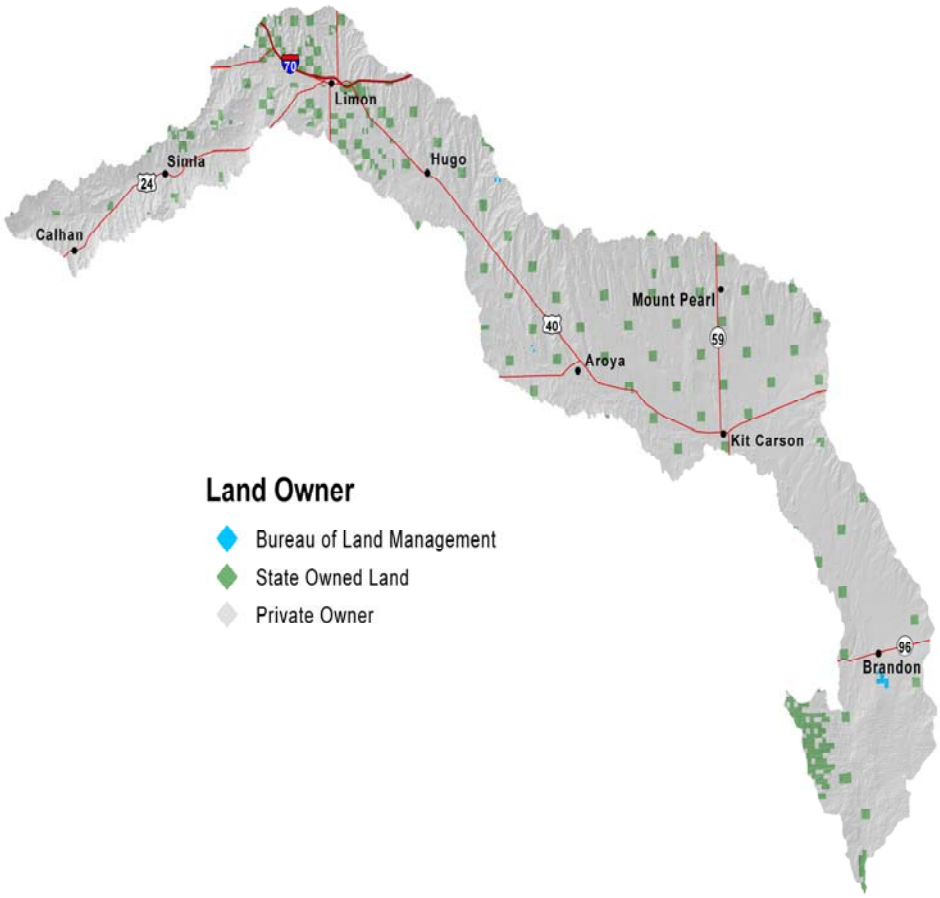
MLRA	CRA	CRA NAME	CRA DESCRIPTION
49	**49.1**	Southern Rocky Mountain Foothills	This area is generally a transition between the Great Plains and the Southern Rocky Mountains. The temperature regime is mesic or frigid, and moisture regime is ustic. Characteristic native vegetation ranges from grasslands and shrubs to ponderosa pine and Rocky Mountain Douglas fir forest.
67B	**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 aeolian and alluvial materials. Pre-settlement vegetation was short grass prairies. Nearly all of this area in fallow cropland rotations or rangeland. Some cropland areas are irrigated.
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, aeolian, alluvial and outwash materials. Pre-settlement 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.

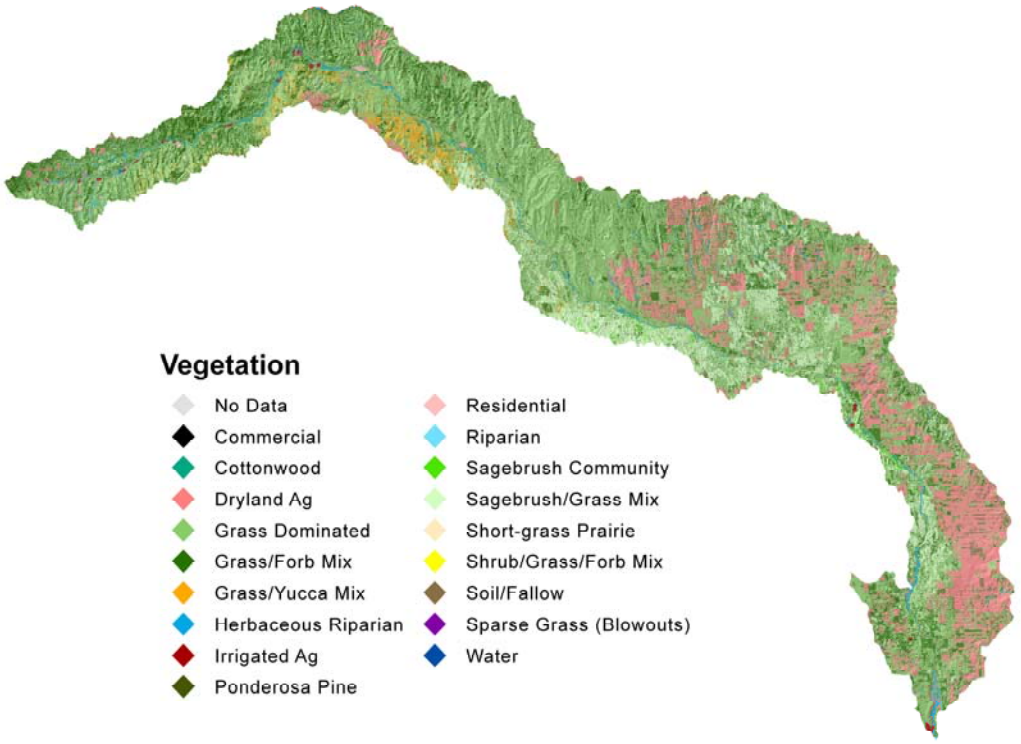
Physical Description

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 Big Sandy Watershed consists of rangeland. Cropland is dominated by dryland crops in the eastern portion of the watershed.

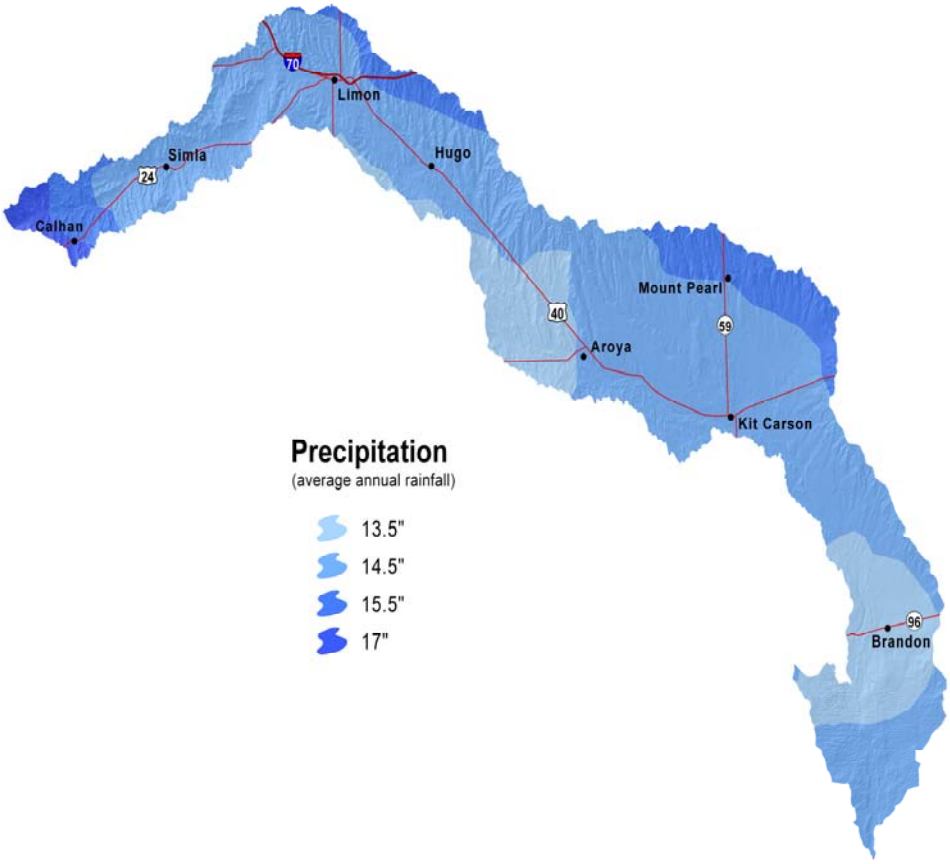






BIG SANDY Land Use	Total Acreage	Vegetation	Acreage
Cropland	193,730	Dryland Ag	191,244
		Irrigated Ag	2,486
Rangeland/Grassland	977,974	Grass Dominated	526,937
		Grass/Forb Mix	261,882
		Grass/Yucca Mix	22,106
		Sagebrush/Grass Mix	139,095
		Sagebrush Community	7,844
		Short-grass Prairie	170
		Shrub/Grass/Forb Mix	250
		Soil	19,859
		Sparse Grass (Blowouts)	81
Forest	6,805	Cottonwood	6,455
		Ponderosa Pine	350
Riparian	15,445	Herbaceous Riparian	15,373
		Riparian	72
Water	757	Water	757
Other	1,244	Commercial	2
		Residential	1,240
		No Data	2
Total Watershed Acres			1,195,955

Precipitation

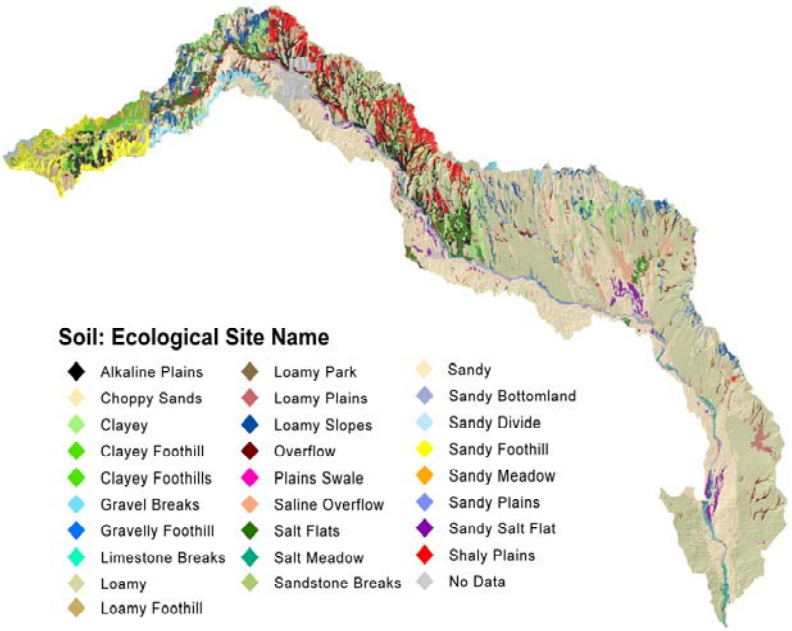


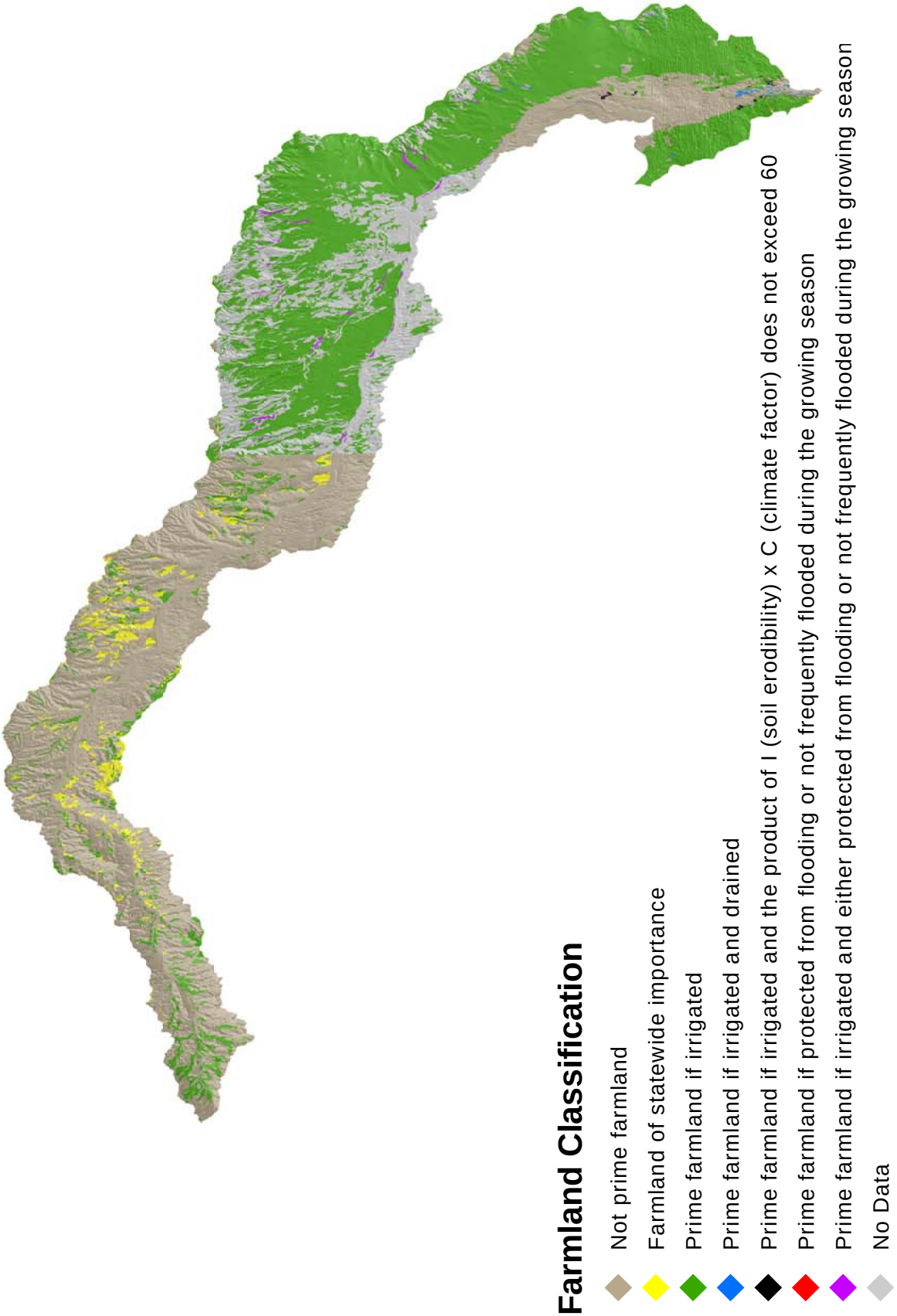
Droughts are regular visitors to the watershed as with the rest of Colorado. Statewide in the 1900's alone, four prolonged dry spells occurred. There was one in the 1910s. Another, in the '30s, caused the dust-bowl period. The second worst drought on record in the state occurred in the mid-50s. A series 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

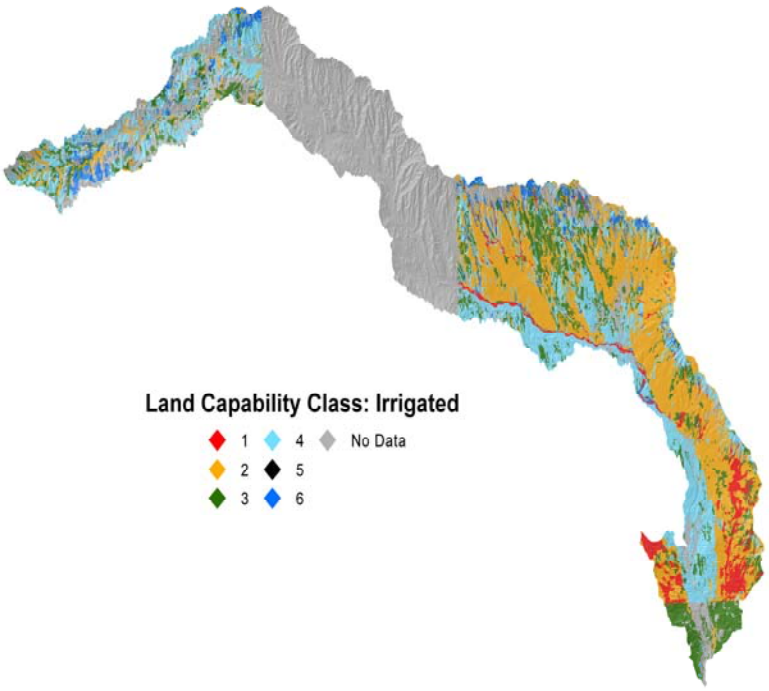
Ecological Sites

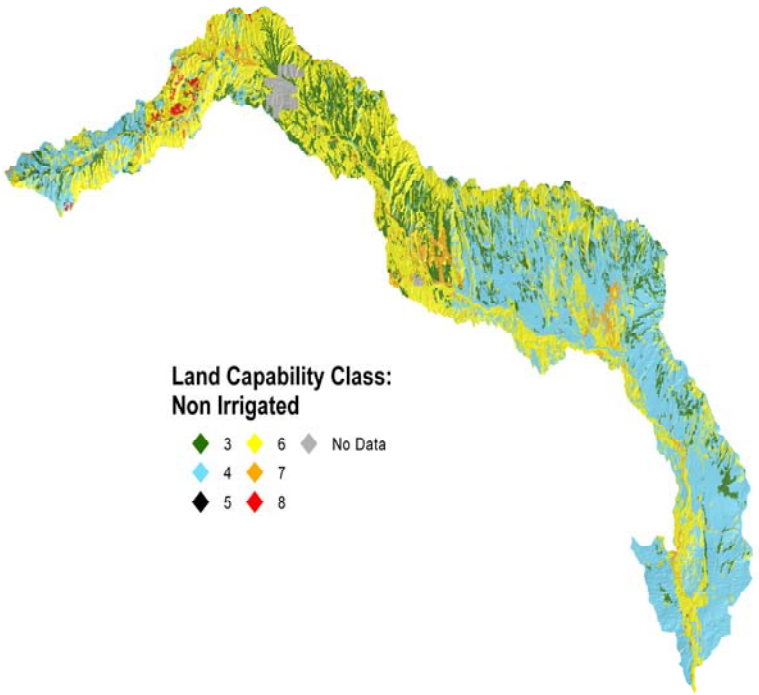
The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production.

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/.




Farmland Classification
Not prime farmland
Farmland of statewide importance
Prime farmland if irrigated
Prime farmland if irrigated and drained
Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
Prime farmland if protected from flooding or not frequently flooded during the growing season
Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
No Data





Land Capability Classes

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.

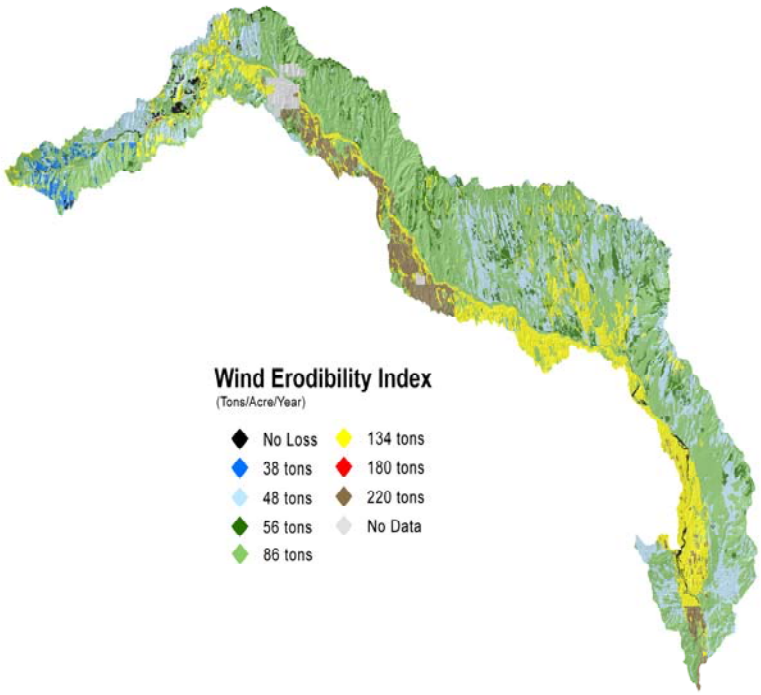
Class 7 - soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

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): 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 cropland soils in the Big Sandy Watershed are considered highly erodible.



Stream Impairments

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.

State and Federal Threatened, Endangered, and Candidate Species and Species of Special Concern in Big Sandy Watershed

Common Name	Scientific Name	Class	State Status/ Federal Status	Comments
Arkansas Darter	*Etheostoma cragini*	Fish	Threatened/ Candidate	Occurs in the watershed
Bald Eagle	*Haliaeetus leucocephalus*	Birds	Threatened/None	May migrate through watershed
Black-footed Ferret	*Mustela nigripes*	Mammals	Endangered/ Endangered	No current records of occurrence
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Mammals	Concern/None	Occurs in the watershed
Burrowing Owl	*Athene cunicularia*	Birds	Threatened/None	Occurs in the watershed
Ferruginous Hawk	*Buteo regalis*	Birds	Concern/None	Occurs in the watershed
Lesser Prairie Chicken	*Tympanuchus pallidicinctus*	Birds	Threatened/ Candidate	Occurs in the watershed
Long-Billed Curlew	*Numenius americanus*	Birds	Concern/None	Occurs in the watershed
Massasauga	*Sistrurus catenatus*	Reptiles	Concern/None	Occurs in the watershed
Mountain Plover	*Charadrius montanus*	Birds	Concern/None	Occurs in the watershed
Northern leopard frog	*Rana pipiens*	Amphibians	Concern/None	Occurs in the watershed
Plains Leopard Frog	*Rana blairi*	Amphibians	Concern/None	Occurs in the watershed
Suckermouth Minnow	*Phenacobius mirabilis*	Fish	Endangered/None	May occur in the watershed
Swift fox	*Vulpes velox*	Mammals	Concern/None	Occurs in the watershed
Yellow mud turtle	*Kinosternon flavescens*	Reptiles	Concern/None	Occurs in the watershed

Shortgrass prairie and sandsage-mixed grass rangeland are the dominant terrestrial habitat type in this watershed. Burrowing owl, mountain plover, black-tailed prairie dog, massasauga, and swift fox are representative species for the shortgrass habitat. Lesser prairie chickens occur in a limited area of the watershed in Kiowa County in sand sage-mixed grass rangeland habitats. 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 green sunfish, pronghorn (antelope), mule and white-tailed deer, mourning dove, and scaled quail. Wild turkey (Rio Grande) occur in the Big Sandy Creek riparian area.

Social Data

County	Cheyenne	Elbert	ElPaso	Kiowa	Kit Carson	Lincoln	Prowers
Demographics (US Census, American Factfinder)							
Total population	2,231	19,872	550,130	1,622	8,011	20,504	14,483
Male	1,119	9,966	272,922	811	4,236	10,834	7,278
Female	1,112	9,906	277,208	811	3,775	9,670	7,205
Median age (years)	37.9	37.2	33.5	39.7	37.4	36.5	32.4
White	2,072	18,923	444,799	1,559	6,992	18,792	11,379
Black or African American	11	128	33484	8	139	420	43
American Indian and Alaska Native	17	125	4855	18	41	131	177
Asian	3	74	15516	0	26	82	54
Native Hawaiian and Other Pacific Islander	0	18	1241	1	3	14	4
Some other race	114	255	29575	23	737	772	2487
Hispanic or Latino (of any race)	181	766	70312	51	1095	2439	4766
Economic Characteristics (US Census, American Factfinder)							
In labor force (population 16 years and over)	1,066	11,056	288,867	776	3,746	9,771	6,976
Median household income (dollars)	37,054	62,480	50,714	30,494	33,152	32,724	29,935
Median family income (dollars)	44,394	66,740	61,719	35,536	41,867	42,241	34,202
Per capita income (dollars)	17,850	24,960	25,261	16,382	16,964	16,721	14,150
Families below poverty level	53	145	x	43	198	454	546
Individuals below poverty level	244	791	x	195	908	2253	2755
X: value is not applicale or not availiable							
County Agricultural Characteristics (Colorado Agricultural Census, county data tables)							
Farms (number)	283	1153	1175	357	678	455	531
Land in farms/ranches (acres)	740,486	1,068,359	811,931	896,772	1,247,181	1,428,404	861,778
Average size farm/ranch (acres)	2,617	927	691	2,512	1,840	3,139	1,623
Median size farm (acres)	1,528	160	160	1,280	11,112	1,497	640
Average age of farmer or rancher	57.2	52.8	54.1	55.2	54.3	55.6	53.3
Net cash return from ag sales ($1,000)	1,829	108	2,485	944	3,392	4,829	8,467
Cattle and calves (number)	20,000	36,000	26,000	15,000	148,000	40,000	110,000

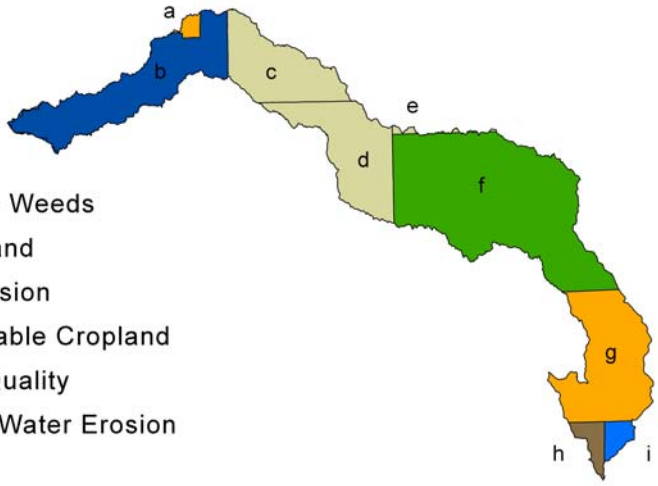
Big Sandy Watershed Natural Resource Concerns

Top Three Concerns within Conservation Districts

 # 1

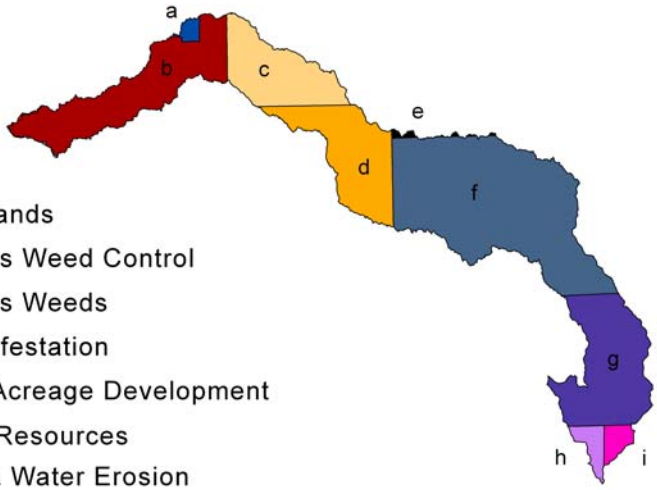
- Grazing Management
- Irrigation Water Management
- Rangeland
- Soil Erosion
- Water Quality & Quantity
- Wind & Water Erosion

 # 2



- Noxious Weeds
- Rangeland
- Soil Erosion
- Sustainable Cropland
- Water Quality
- Wind & Water Erosion

 # 3



- None
- Grasslands
- Noxious Weed Control
- Noxious Weeds
- Pest Infestation
- Small Acreage Development
- Water Resources
- Wind & Water Erosion

Legend

Letter	Conservation District
a	Agate
b	Double El
c	High Plains
d	Prairie
e	Flagler
f	Cheyenne
g	Kiowa
h	Prowers
i	Northeast Prowers

Resource Concerns Identified by Conservation Districts (continued)

Resource Concern By Priority	Agate	Double El	High Plains	Prairie	Cheyenne	Kiowa County	Prowers	NE Prowers	Totals
Rangeland/ Grazingland Health and Productivity	5	5	4	4	5	3			26
Soil Erosion	3	4	5	5		5	4		27
Plants-Invasive Species	4		3	3	1	4	2	3	20
Wildlife Habitat		2	2	2		2	3		11
Sustainable Cropland					4				4
Water Quality/ Quantity	2				3		5	5	15
Small Acreage Development	1	3						2	6
Trees					2				2
Salinity							1		1
Flood Control		1							1

Notes:

The Conservation Districts identified and prioritized these resource concerns during facilitated public meetings held between 1998 and 2000 and are part of the Conservation District's Long Range Plans.

Higher scores indicate higher priority

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.

Selected Conservation Application Data	Big Sandy 11020011						
	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	Total
Total Conservation Systems Planned (Acres)	148,764	26,339	Not Avail.	53,960	53,681	58,495	341,239
Total Conservation Systems Applied (Acres)	71,638	41,751	Not Avail.	44,547	27,845	51,995	237,776
Practices							
Prescribed Grazing	598	20,580	2,080	33,611	12,228	27,865	69,097
Upland Wildlife Habitat Management	11,554	742	2,146	6,657	871	3,173	21,970
Conservation Cropping System	Not Avail.	Not Avail.	249	1,619	47	0	1666
Residue Management	Not Avail.	Not Avail.	160	1,619	163	1,706	3,648

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 870,000 acres need to be treated on median sized ranches of 5,000 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 5,000 acres	No.	174	54,842	9,542,508
			Subtotal Rangeland costs:	**$9,542,508**

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 67B.1-CR-Dryland-R-2
Practices	**Unit**	**Quantity**	**Cost/Unit ($)**	**Estimated Cost ($)**
Residue Mgmt, Seasonal (344)	Ac	81,800	5	27,770
Nutrient Management (590)	Ac	81,800	5	409,000
Pest Management (595)	Ac	81,800	15	1,227,000
			Subtotal Costs Dryland Crops:	**$2,045,000**

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. Wildlife habitat is sustained or improved.	**9,542,508**
Dryland Crop	Soil	409,000 Total Tons/Year saved	Cropland sustainability	**2,045,000**
			Estimated Total Costs to Address Major Resource Concerns:	**$11,587,508**

References Not Cited in Document

303(d) listed streams within Big Sandy 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/100293wqlimitedsegtmdls.pdf.

Threatened and Endangered Species information was gathered using data from the Colorado Division of Wildlife (CDOW) Natural Diversity Information Source (NDIS).

Resource Concerns were identified using the Colorado Association of Conservation Districts' (CACD) long range (10 year) plans from the period of 1996-2000. 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:

Cheyenne County (CO017) Published 12/19/2005

Kiowa County (CO061) Published 12/19/2005

Lincoln County (CO073) Published 12/19/2005

Prowers County (CO099) Published 12/20/2005

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

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

Vegetation data was generated using the Colorado Division of Wildlife's "Colorado Vegetation Classification Project" (CVCP) data. 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. 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 visit http://www.ncgc.nrcs.usda.gov/products/datasets/climate/docs/fact-sheet.html or 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). The data was downloaded from the NRCS Geospatial Data Gateway at http://datagateway.nrcs.usda.gov.

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.

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