

Rapid Watershed Assessment Upper San Juan Watershed



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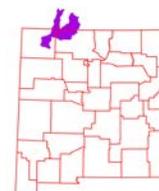
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Overview

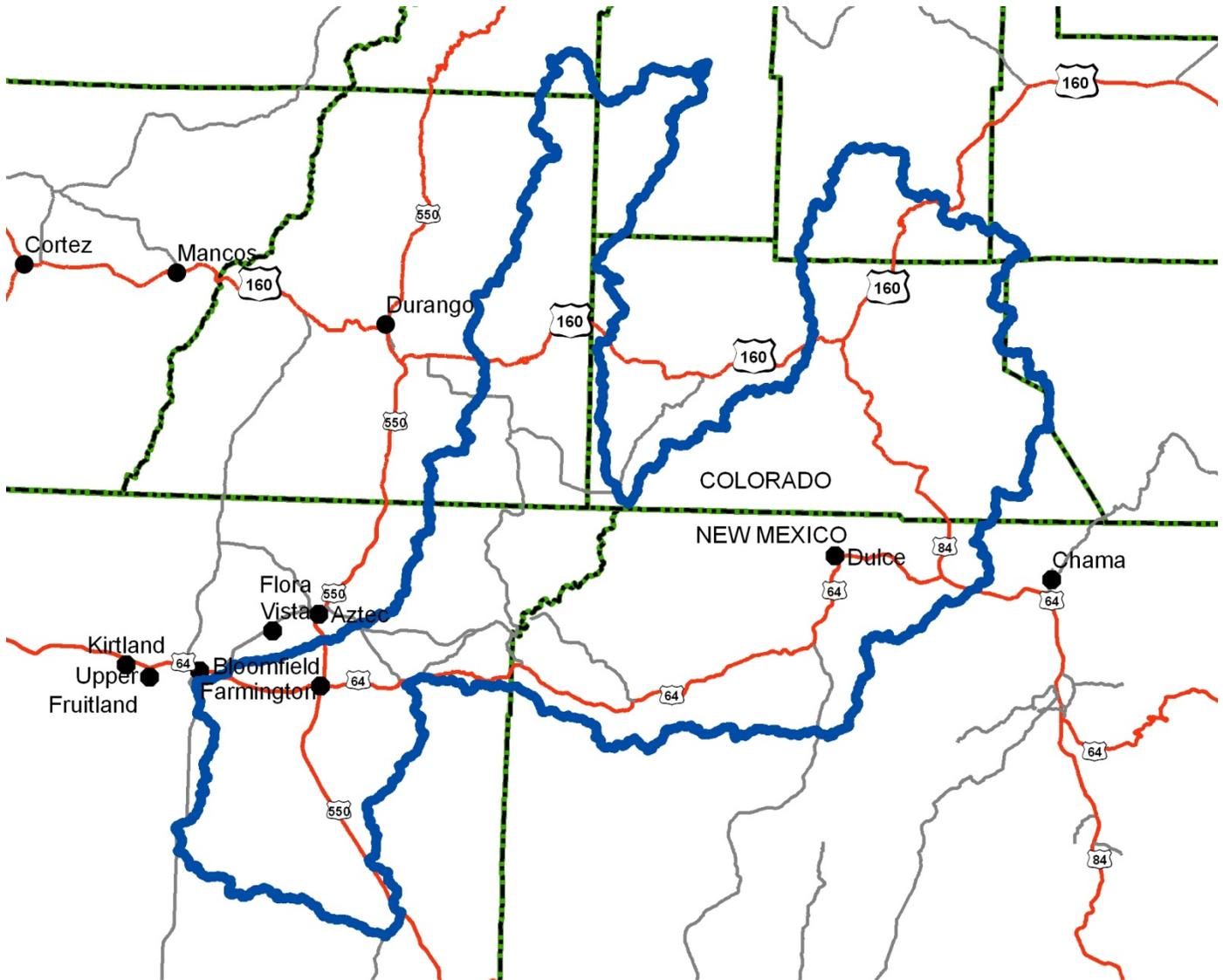


Figure 1. Upper San Juan Watershed Overview



Overview

The Upper San Juan Watershed is located in southwestern Colorado and northwestern New Mexico, east of the Four Corners. It covers 2,196,535 total acres (8,889 sq. km). Table 1 summarizes the distribution of the Upper San Juan watershed.

Table 1. Upper San Juan watershed acreage distribution.

	County Acres Total	Acres in HUC	% of HUC in County	% of County in HUC
Archuleta - CO	866,050	543,986	25	63
Conejos - CO	825,586	6,540	< 1	1
Hinsdale- CO	719,400	75,348	3	10
La Plata- CO	1,087,753	296,503	13	27
Mineral- CO	562,090	100,724	5	18
Rio Grande-CO	584,473	5,607	< 1	1
San Juan- CO	249,417	12,115	1	5
Rio Arriba- NM	3,772,816	586,491	27	16
San Juan- NM	3,549,586	569,185	26	16
Sum (Σ)	--	2,196,535	100	--



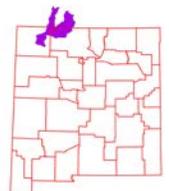
Physical Setting

Geology: ¹

The watershed starts at the western side of the Continental Divide and proceeds westward to the confluence of Cañon Largo and the San Juan River. The San Juan Basin lies on the Colorado Plateau. Several formations of Tertiary and Cretaceous age compose the consolidated geology of the San Juan River basin. The predominant geologic formation in New Mexico is the Nacimiento Formation of Tertiary age which underlies the soils and crops out along nearly all of the reach of the San Juan River valley east of Farmington. The Cretaceous Kirtland and Fruitland Formation and the Mancos Shale layers underlie the soils and crop out west of the Hogback. These two formations underlie tile soils and compose the outcrop in most of the upland area south of the San Juan River. Near Farmington, Cretaceous rocks rise sharply in some areas, forming hogback ridges. All of the shales of Cretaceous age consist at least in part of gray arid black shale. The San Juan River valley is composed in part of Quaternary unconsolidated sand, gravel, silt, clay, and terrace gravel and boulder deposits. Valley soils typically are derived from sandstone, shale, siltstone, and mudstone and range in permeability from moderately rapid to moderately slow.

Resource concerns are high sediment erosion and water runoff. In addition the lowering of valleys by river incision is a continuing process. Many valleys are flanked by terraces. Rivers respond by aggrading during climates that promote large sediment yield and large, stable discharges; and incise during climates that produce flashy flows and reduce the sediment supply. This can be exasperated by the mining of sand and gravel from the river channels.

Groundwater quality and quantity is a concern. Groundwater occurs to a greater or lesser extent in all of these geologic units. Depth to groundwater is a concern if the shallow unconfined aquifer does not produce enough water for the resource or increased population demands are 'mining' the water. Groundwater in the igneous rocks and volcanics is usually along fracture zones which are hard to intercept with water wells. Groundwater quality ranges from good to poor for livestock or crops.



Soils:

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the Upper San Juan are assigned to four groups (A, B, C, and D). Some National Forest soils are not in the National Cooperative Soil Survey at this time.



Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.



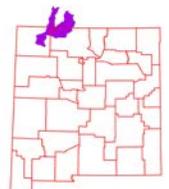
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.



Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.



Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.



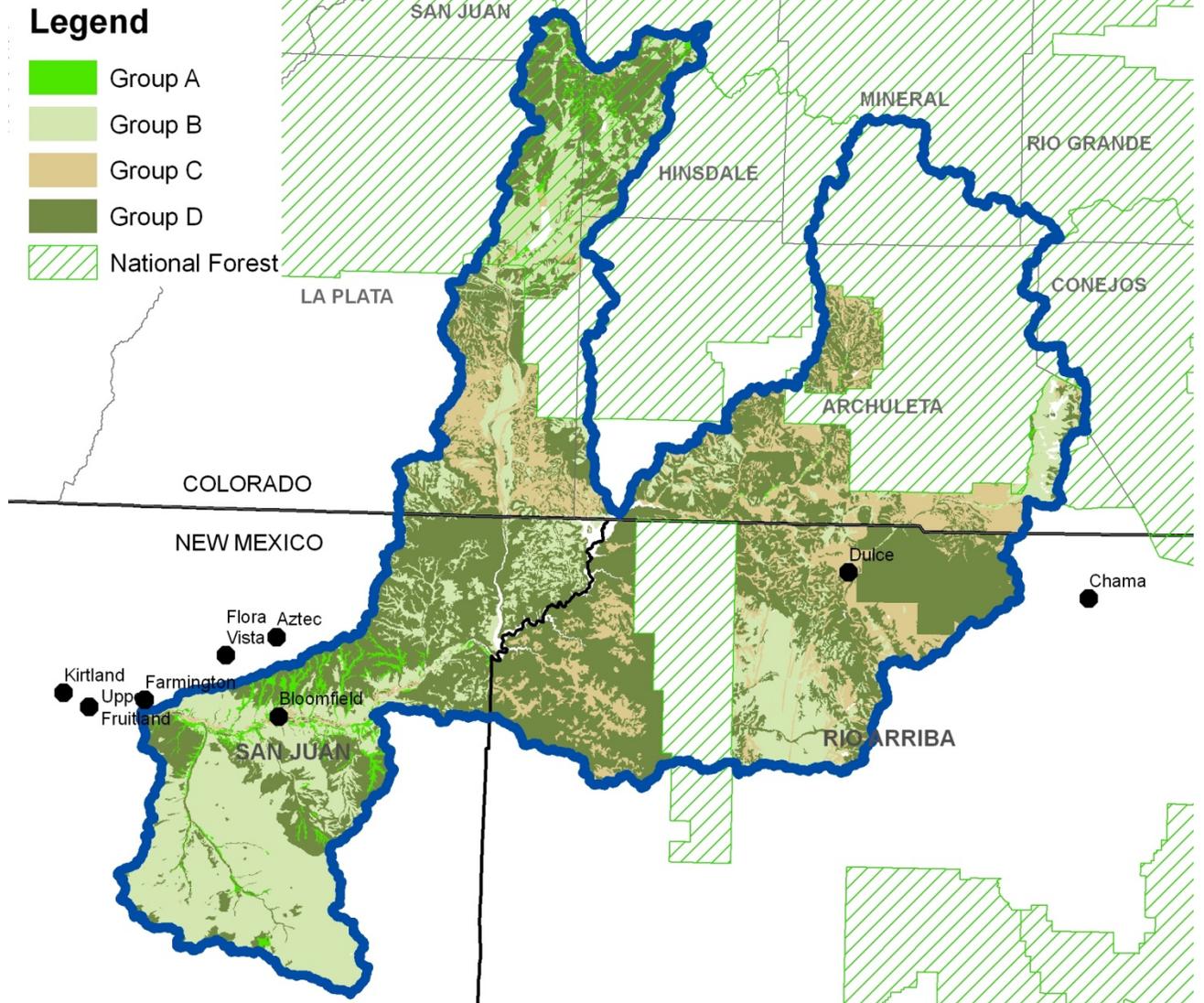
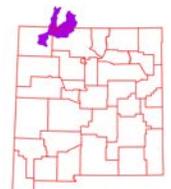


Figure 2. Hydrologic Soil Groups



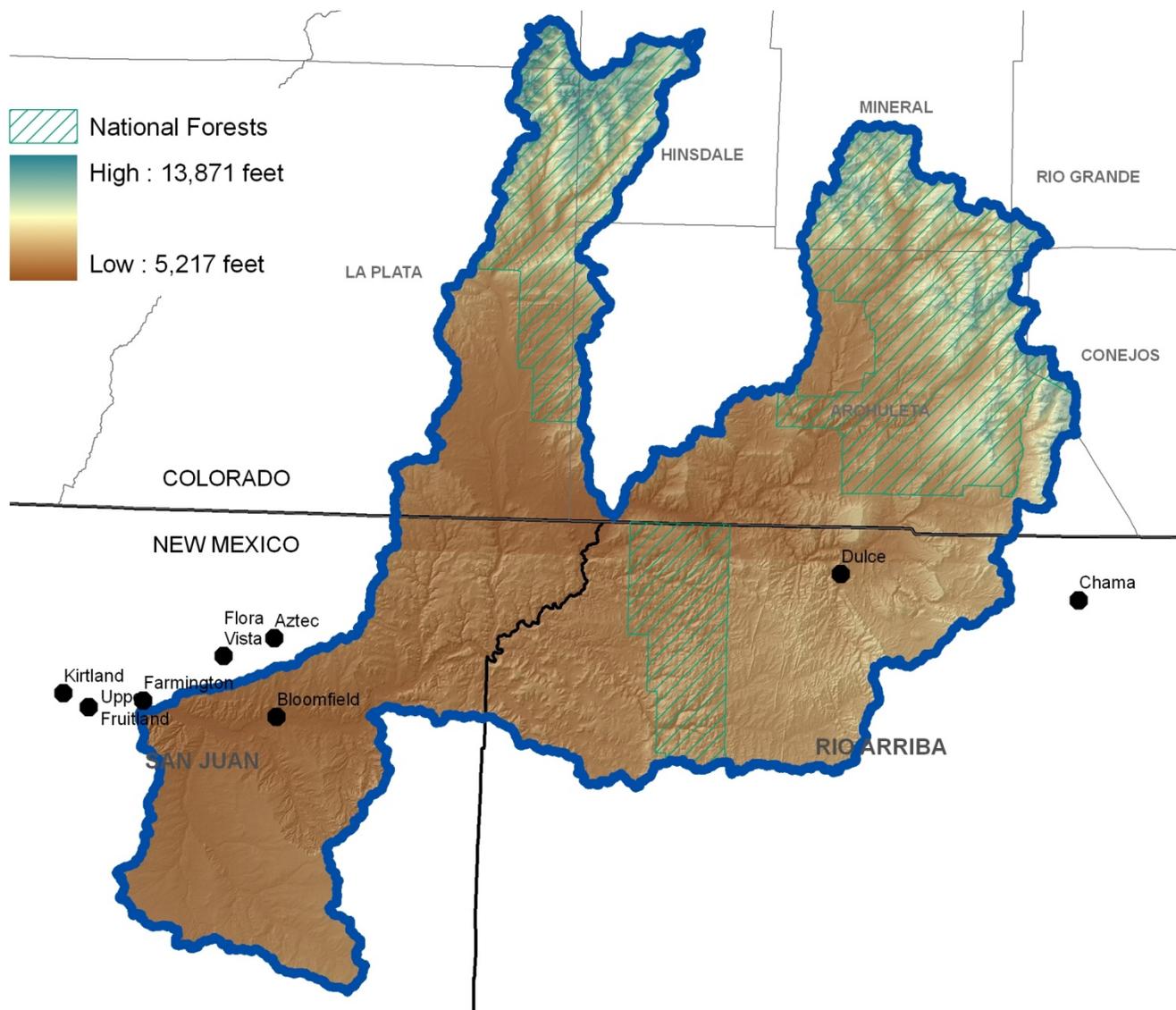


Figure 3. Upper San Juan Watershed Shaded Relief



Precipitation ²

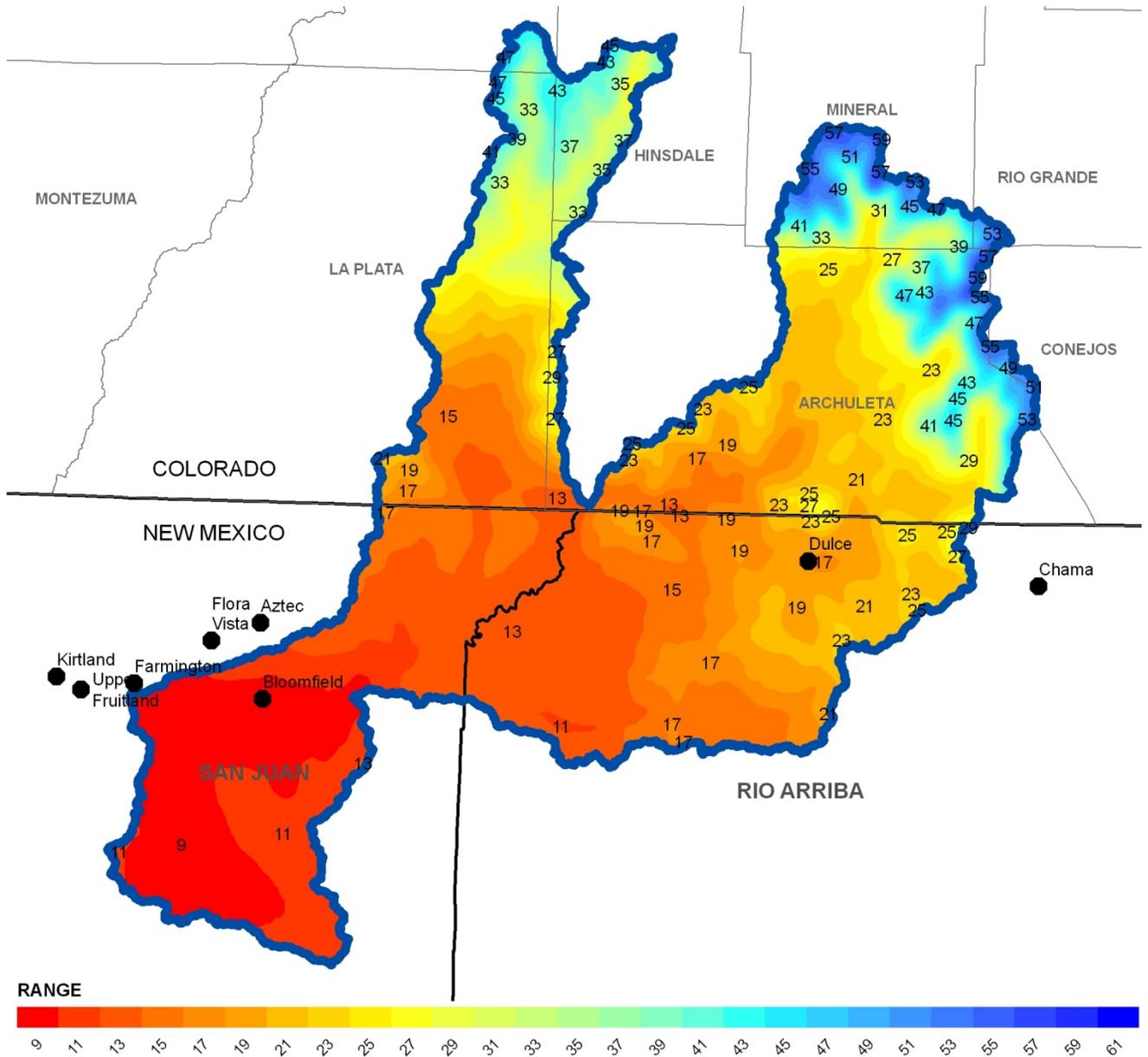
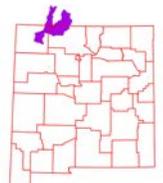


Figure 4. Upper San Juan Watershed Annual Precipitation.



Land Ownership ³

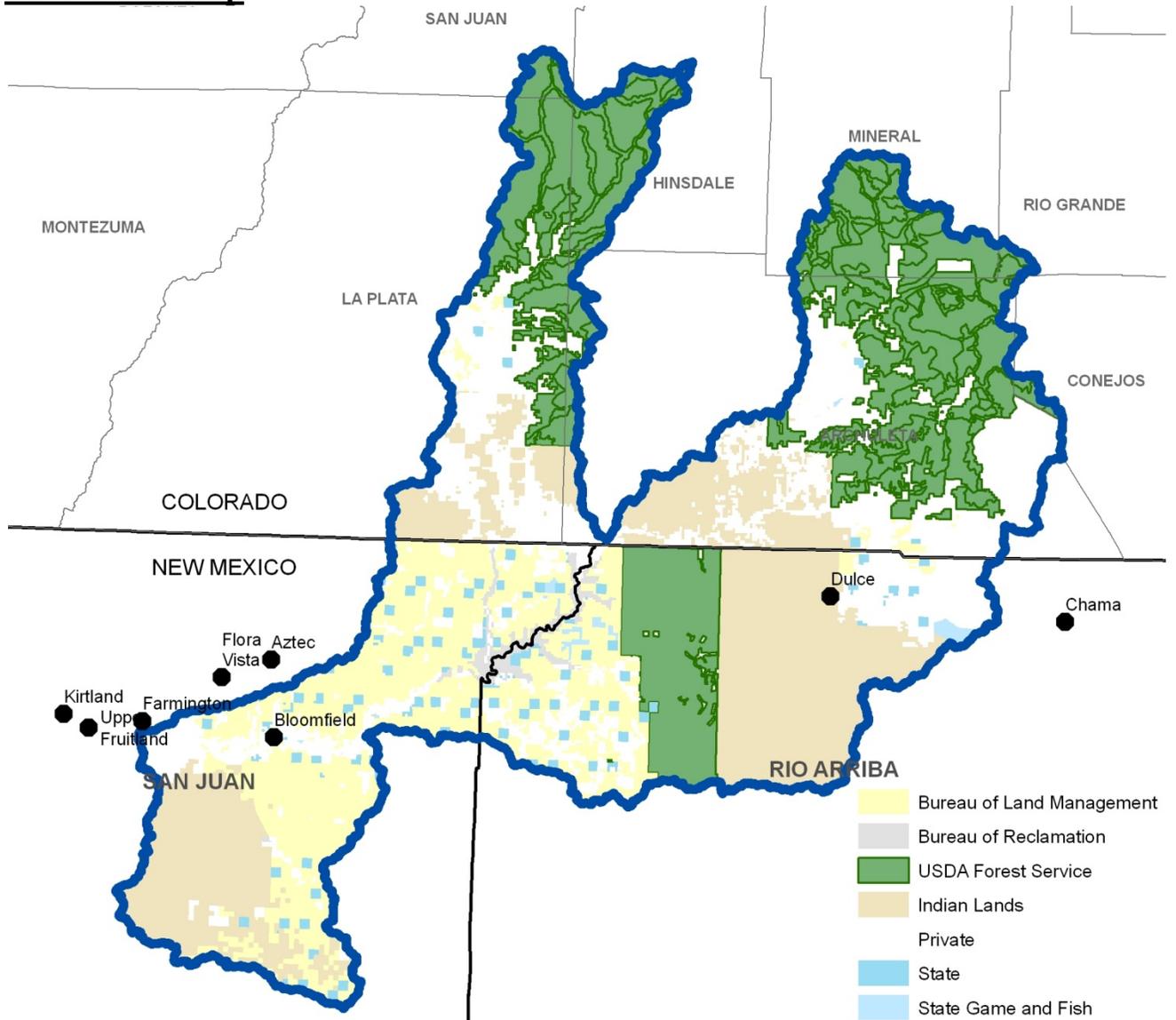


Figure 5. Upper San Juan Watershed Land Ownership



Land Ownership

<u>COUNTY</u>	<u>BLM</u>	<u>BoR</u>	<u>FS</u>	<u>Indian Lands</u>	<u>Private</u>	<u>State</u>	<u>State G&F</u>
Archuleta - CO	4,517		224,048	92,132	221,447	1,470	212
Conejos - CO			6,535		5		
Hinsdale- CO			75,106		242		
La Plata- CO	4,635		104,866	57,966	127,081	1,938	
Mineral- CO			94,852		5,872		
Rio Grande-CO			5,566		41		
San Juan-CO			12,115				
Rio Arriba-NM	96,091	12,428	120,033	224,698	106,913	19,048	7,274
San Juan-NM	290,181	13,092		144,678	88,840	31,154	1,222
Watershed (Σ)	395,424	25,520	643,121	519,474	550,441	53,610	8,708
% Watershed	18	1	29	24	25	2	< 1

Table 2. Land ownership in the Upper San Juan watershed.



Land Use / Land Cover ^{4.5}

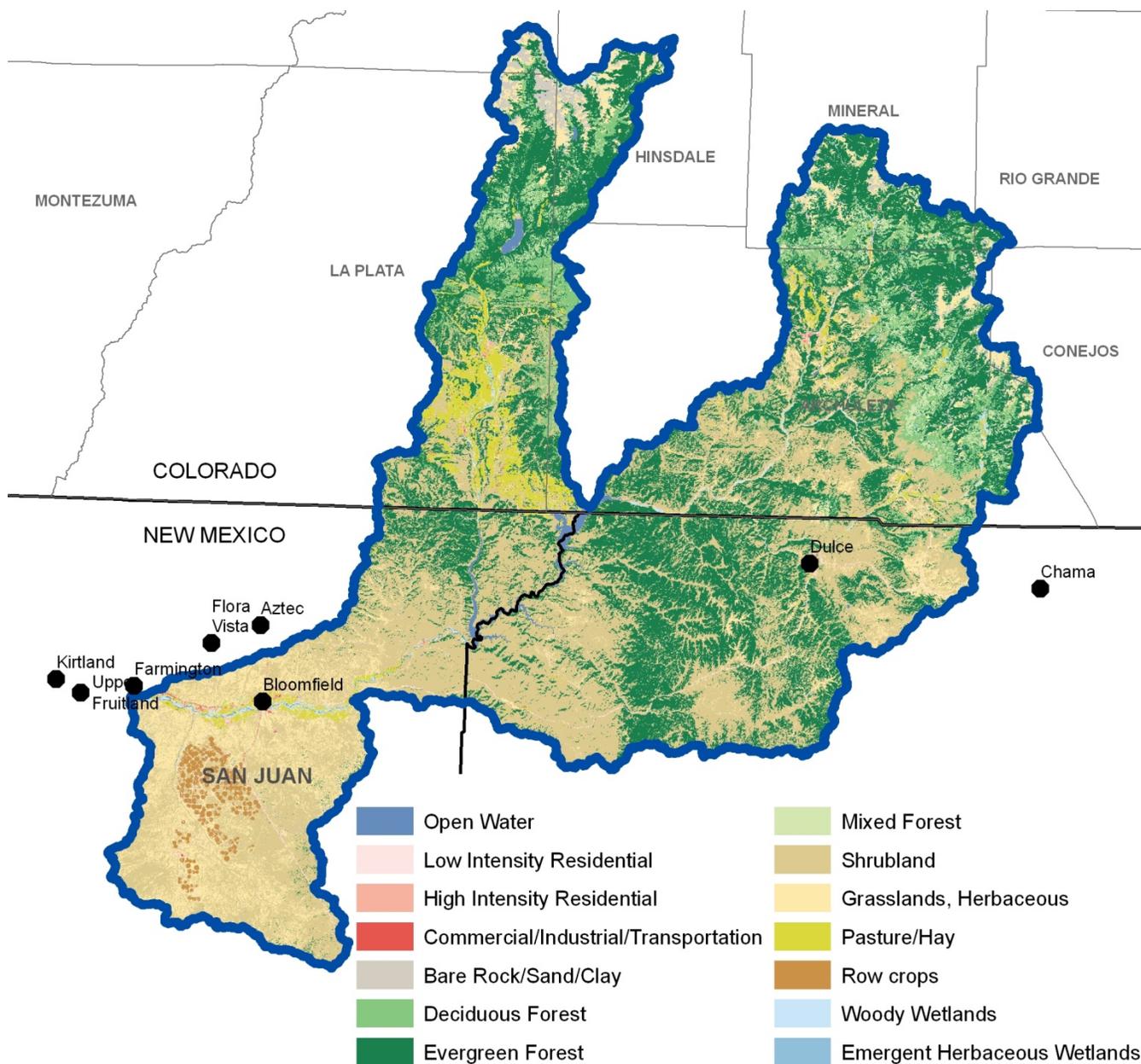


Figure 6. National Land Cover Dataset over the Upper San Juan Watershed.



Land Use / Land Cover

The U.S. Geological Survey (USGS) produced the National Land Cover Dataset (NLCD) as part of a cooperative project between the USGS and the U.S. Environmental Protection Agency (USEPA). The goal of this project was to produce a consistent land cover data layer for the conterminous United States. The Multiresolution Land Characterization (MRLC) Consortium collected the data used to compile the NLCD. The MRLC Consortium is a partnership of Federal agencies that produce or use land cover data; partners include the UNITED STATES GEOLOGICAL SURVEY (National Mapping, Biological Resources, and Water Resources Divisions), USEPA, the U.S. Forest Service, and the National Oceanic and Atmospheric Administration.

<u>Land use / Land cover</u>	<u>Acres</u>	<u>% of Watershed</u>
Shrubland	859,722	39
Evergreen Forest	712,107	32
Grasslands, Herbaceous	256,902	12
Deciduous Forest	120,966	6
Pasture/Hay	70,814	3
Mixed Forest	49,170	2
Bare Rock/Sand/Clay	34,458	2
Woody Wetlands	31,171	1
Row crops	20,522	1
Low Intensity Residential	19,042	1
Open Water	18,180	1
High Intensity Residential	7,417	< 1

Table 3. Extent of NLCD classes in the Upper San Juan watershed.



Land Use / Land Cover

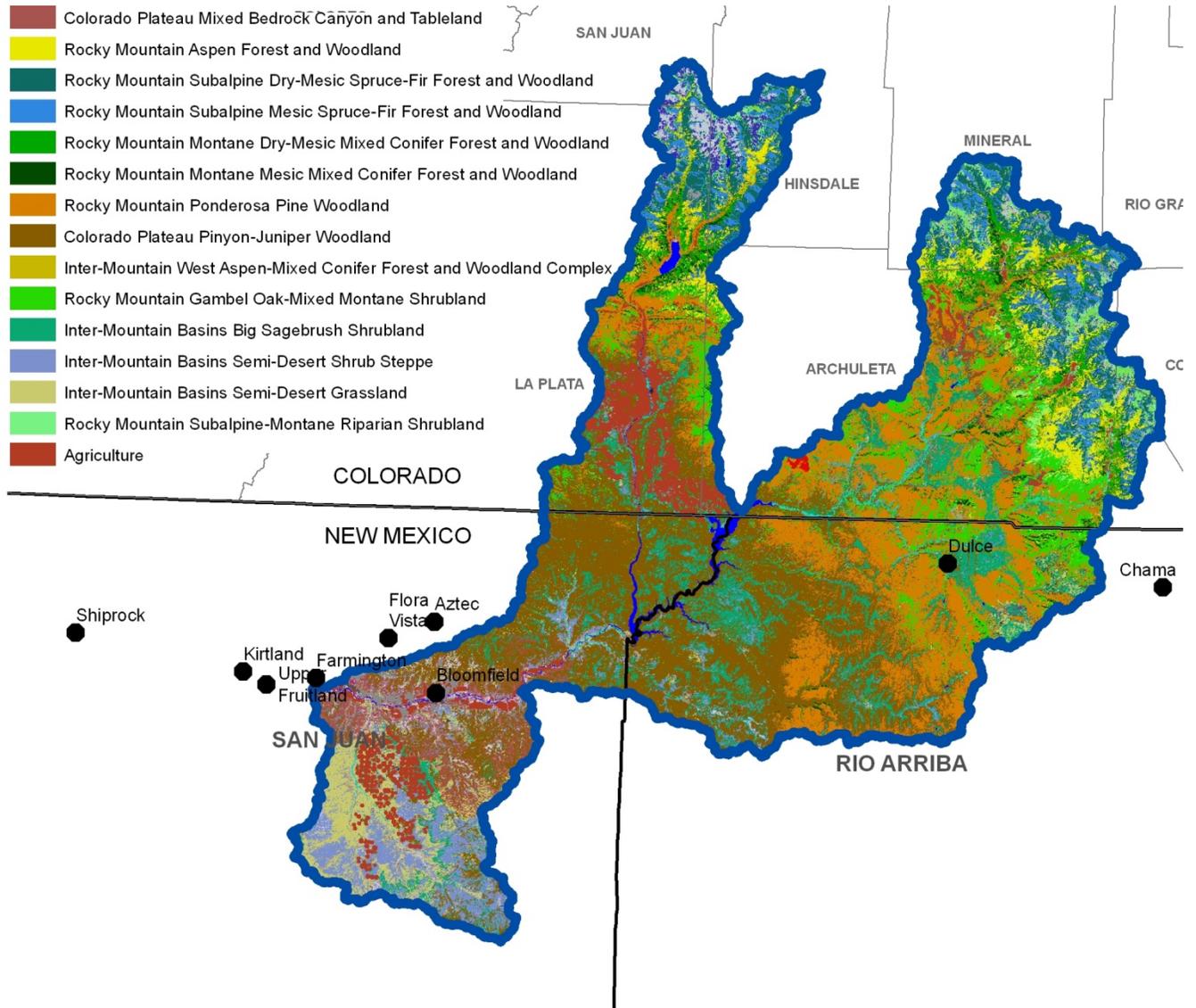
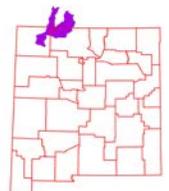


Figure 7. Subset of the SWREGAP over the Upper San Juan Watershed. The 15 dominant ecosystems are displayed in the legend.



Land Use / Land Cover

The landcover mapping effort for the Southwest Region Gap Analysis Project was a coordinated multi-institution endeavor. This dataset was created for regional terrestrial biodiversity assessment. Additional objectives were to establish a coordinated mapping approach to create detailed, seamless maps of land cover, all native terrestrial vertebrate species, land stewardship, and management status, and to analyze this information to identify those biotic elements that are underrepresented on lands managed for their long term conservation.

<u>Ecosystem</u>	<u>Acres</u>	<u>% of Watershed</u>
Colorado Plateau Pinyon-Juniper Woodland	547,658	25
Rocky Mountain Ponderosa Pine Woodland	365,654	17
Inter-Mountain Basins Big Sagebrush Shrubland	178,250	8
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	138,723	6
Agriculture	114,693	5
Inter-Mountain Basins Semi-Desert Shrub Steppe	113,065	5
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	106,591	5
Inter-Mountain Basins Semi-Desert Grassland	78,994	4
Rocky Mountain Aspen Forest and Woodland	65,953	3
Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland	65,289	3
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	64,905	3
Colorado Plateau Mixed Bedrock Canyon and Tableland	51,997	2
Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland	31,747	1
Inter-Mountain West Aspen-Mixed Conifer Forest and Woodland Complex	31,536	1
Rocky Mountain Subalpine-Montane Riparian Shrubland	29,660	1

Table 4. SW Region Gap analysis ecosystem acreages.



Hydrology 6, 7, 8, 9, 10

The National Hydrography Dataset (NHD) is a comprehensive set of data that encodes information about naturally occurring and constructed bodies of water, paths through which water flows, and related entities. The NHD identifies 11,404 miles (18,353 km) of water courses in the Upper San Juan River Watershed. The majority of these courses typically flow intermittently in summer months during periods associated with high intensity convective thunderstorms.

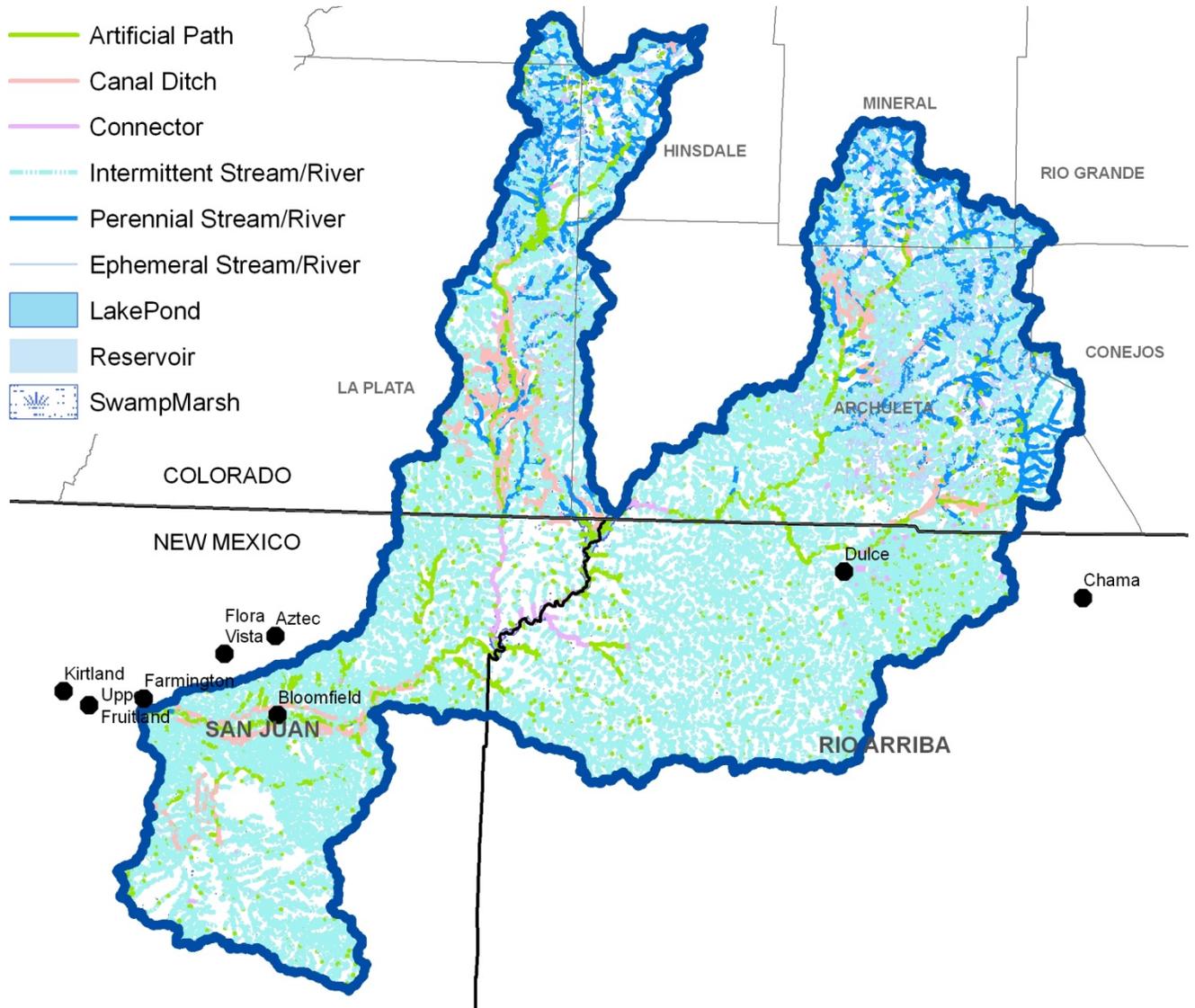
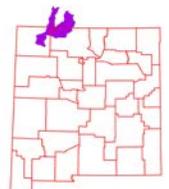


Figure 8. National Hydrologic Dataset (NHD) of the Upper San Juan.



Water Course Type	Miles
Artificial path	476
Connector	480
Canal / Ditch	91
Ephemeral Stream / River	1,669
Intermittent Stream / River	7,765
Perennial Stream / River	923
Sum (Σ)	11,404

Table 5. NHD Water Course Type and Extents



There are 32 water gauging stations in the watershed. USGS Site 09355500 is near the middle of the watershed on the San Juan River near Archuleta, NM. During the period 1963 – 2011, this site has had mean annual discharge of 1090 cubic feet per second ranging from 280.1 (1963) to 2,686 (1987) cubic feet per second.

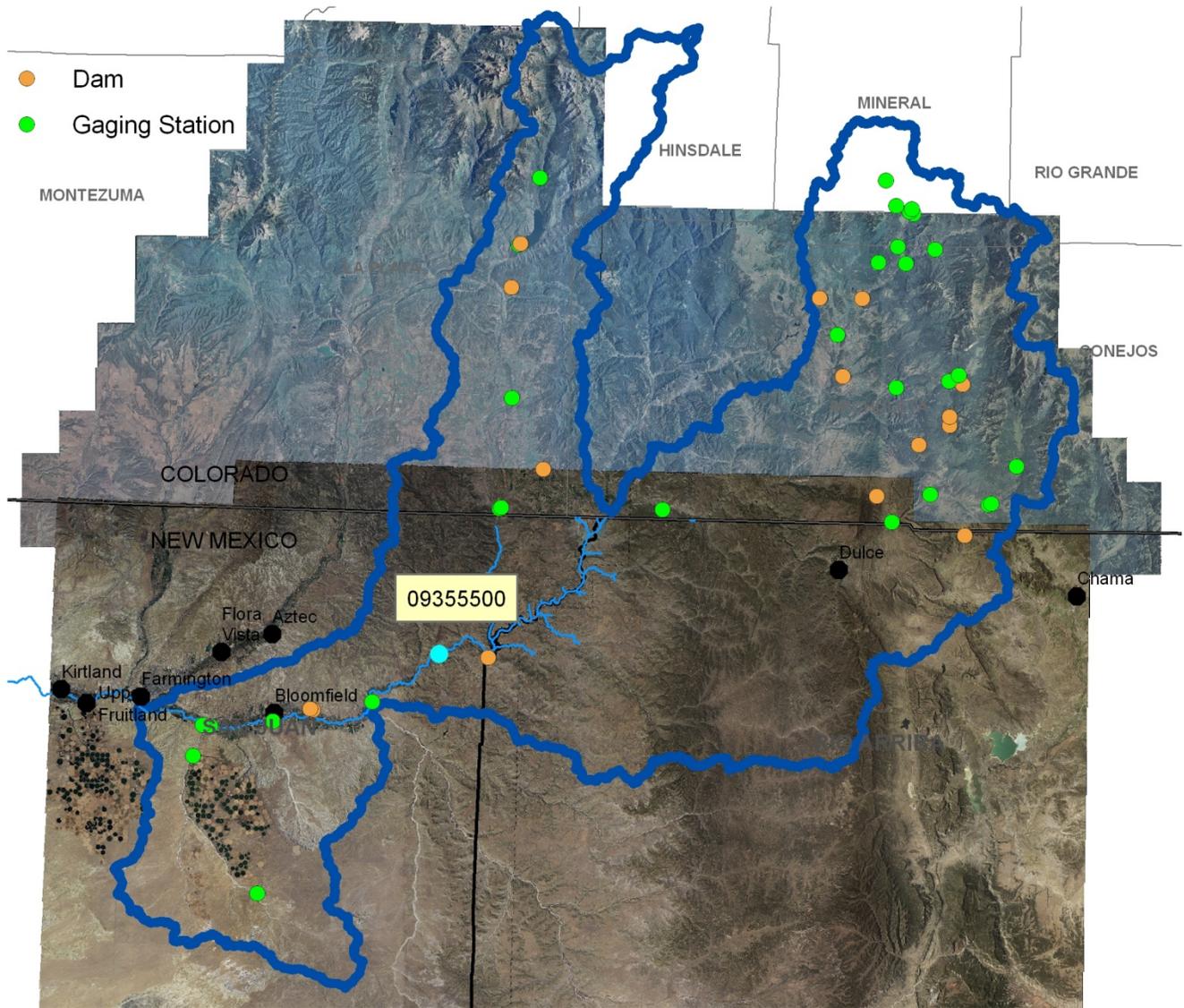
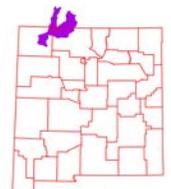


Figure 9. Gauging Stations in the Upper San Juan Watershed



Hydrology

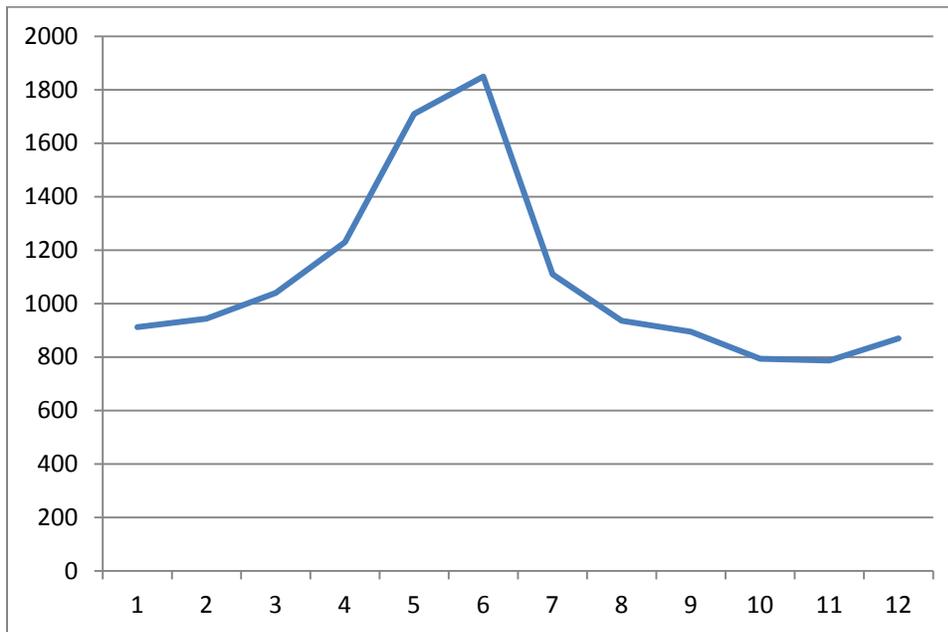
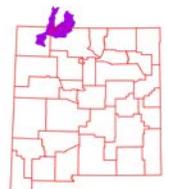


Figure 10. Monthly Average of Mean Daily Flow on the San Juan River near Archuleta, NM. Period of observation: 1954-2011.



The New Mexico Water Quality Control Commission (NMWQCC) is the issuing agency of water quality standards for interstate and intrastate waters in New Mexico. The NMWQCC has defined the Upper San Juan watershed as part of the San Juan River Basin. This report will only cover the New Mexico portion of the watershed.

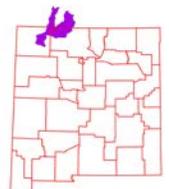
The Upper San Juan watershed has the following water bodies/reaches listed as 303 (d) Impaired Surface Waters:

1. Navajo Reservoir
2. Navajo River (Jicarilla Apache Nation to CO border)
3. San Juan River (Animas River to Canon Largo)

The designated uses for these reaches have been listed in Table 6.

<u>Use</u>	1	2	3
Coldwater aquatic life	NS	NS	NS
Industrial Water Supply	NA		NA
Irrigation/irrigation storage	X	X	X
Public water supply	NA	NA	NA
Livestock watering	X	X	X
Wildlife habitat	X	X	X
Warmwater aquatic life	X		X
Primary contact	X	X	X

Table 6. Listed Uses. NS = Not Supporting, NA = not assessed, x = Fully Supporting



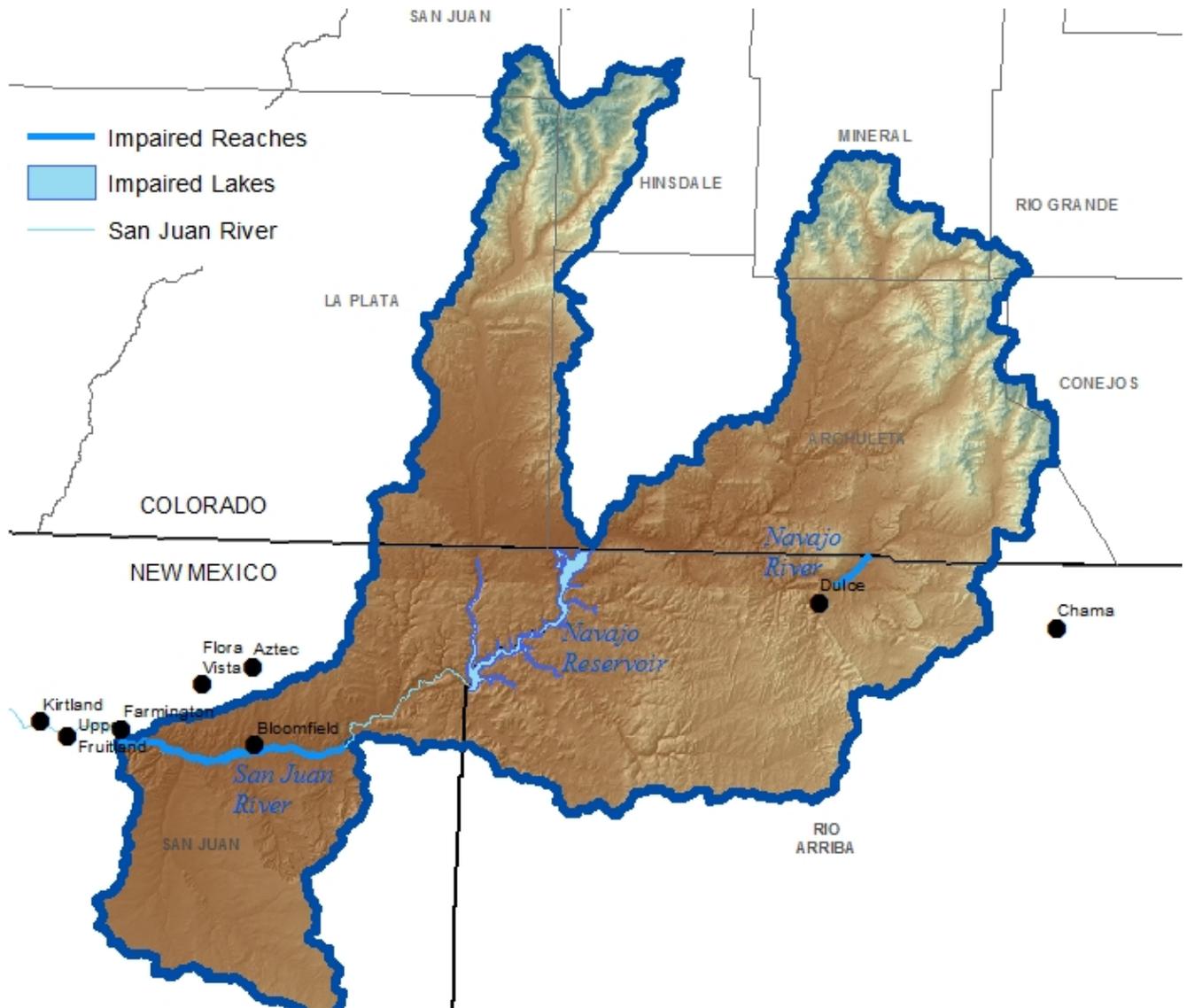


Figure 11. 303(d) Impaired Waters



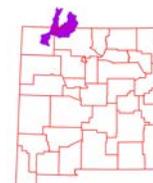
Hydrology

Under section 303(d) of the Clean Water Act, states, territories, and authorized tribes, are required to develop lists of impaired waters. These are waters for which technology-based regulations and other required controls are not stringent enough to meet the water quality standards set by states. The law requires that states establish priority rankings for waters on the lists and develop Total Maximum Daily Loads (TMDLs), for these waters. A TMDL is a calculation of the maximum amount of a pollutant a water body can receive and still safely meet water quality standards.

The river and stream reaches total 28.04 miles (45.13 km). Navajo Reservoir covers 13,151 acres.

Probable Causes of Impairment	1	2	3
Aluminum			
Benthic-Macroinvertebrate Bioassessments			
Copper			
Dissolved Oxygen			
Total Fecal and Coliform			
Gross Alpha - Adjusted			
Mercury	X		
Nutrient/Eutrophication			
PCB's			
Sedimentation/Siltation			X
Specific Conductance			
Temperature	X	X	
Turbidity			X
Zinc			

Table 7. Possible Causes of Impairment



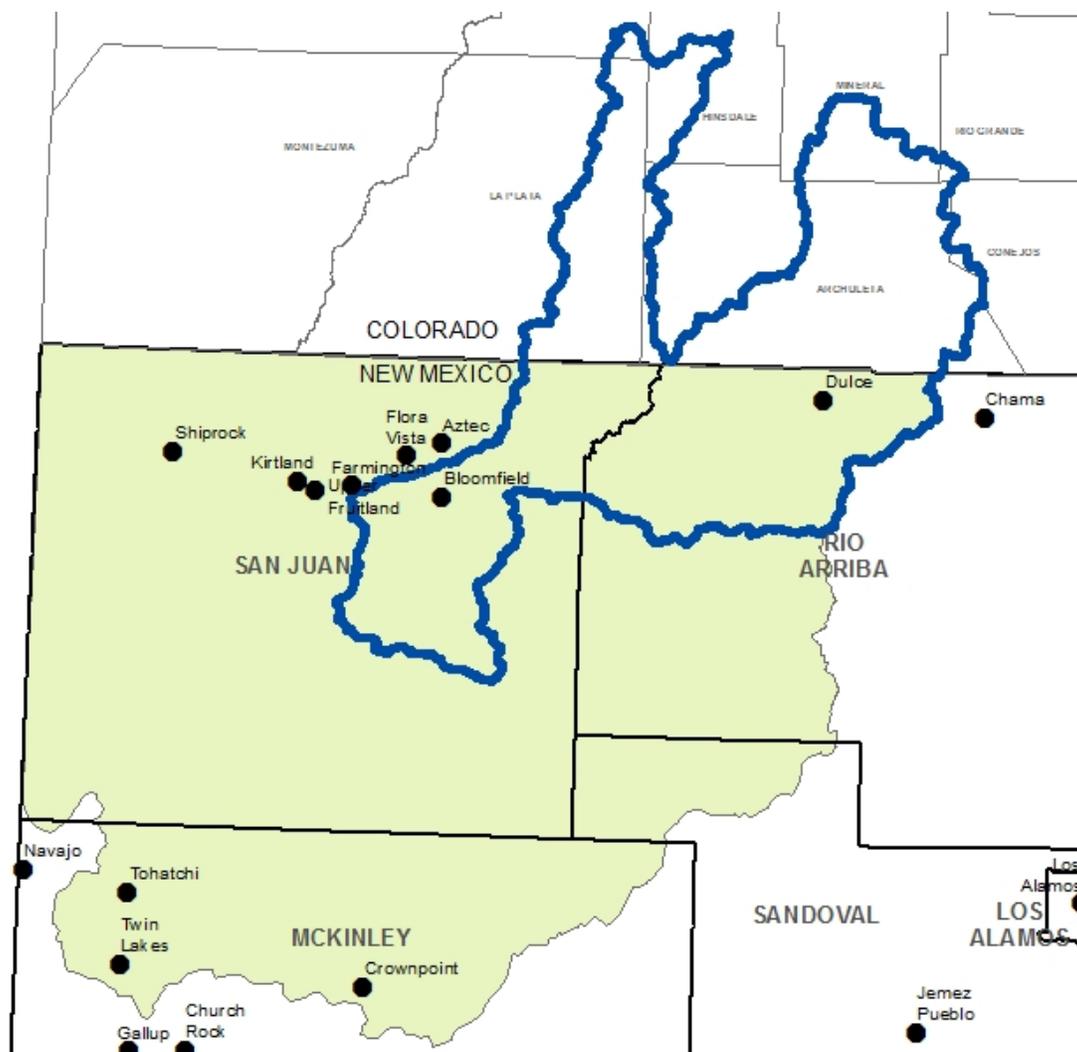


Figure 12. Declared Groundwater Basins of the Upper San Juan.

A declared groundwater basin is an area of the state proclaimed by the State Engineer to be underlain by a groundwater source having reasonably ascertainable boundaries. By such proclamation the State Engineer assumes jurisdiction over the appropriation and use of groundwater from the source. The New Mexico portion of the Upper San Juan watershed is completely within the San Juan Underground Water Basin. The surface watershed in NM covers 1,150,430 of the approximately 6.25 million acres of the underground water basin in NM.

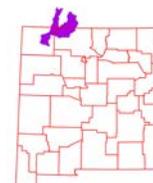


Threatened and Endangered Species ¹¹

Endangered species are those that are at risk of extinction throughout all or a significant portion of its native range. A threatened species is one that is likely to become endangered in the foreseeable future. The New Mexico Natural Heritage program tracks the status of threatened and endangered species which are listed on both federal and state lists. Table 7 lists those species which are currently listed and tracked in the Upper San Juan River Watershed.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Tax.Class</u>	<u>Family</u>	<u>Fed Status</u>	<u>State Status</u>
<u>Mexican Tetra</u>	<u><i>Astyanax mexicanus</i></u>	Actinopterygii	Characidae		T
<u>Bonytail</u>	<u><i>Gila elegans</i></u>	Actinopterygii	Cyprinidae	LE	
<u>Colorado Pikeminnow</u>	<u><i>Ptychocheilus lucius</i></u>	Actinopterygii	Cyprinidae	LE	E
<u>Roundtail Chub</u>	<u><i>Gila robusta</i></u>	Actinopterygii	Cyprinidae		E
<u>Gray Vireo</u>	<u><i>Vireo vicinior</i></u>	Aves	Vireonidae		T
<u>Mexican Spotted Owl</u>	<u><i>Strix occidentalis lucida</i></u>	Aves	Strigidae	LT	
	<u><i>Sclerocactus cloveriae</i> <i>ssp. brackii</i></u>	Dicotyledoneae	Cactaceae		E
<u>Knowlton's Cactus</u>	<u><i>Pediocactus knowltonii</i></u>	Dicotyledoneae	Cactaceae	LE	E
<u>Aztec Gilia</u>	<u><i>Gilia formosa</i></u>	Dicotyledoneae	Polemoniaceae		E

Table 7. Threatened and Endangered Plant and Animal Species.

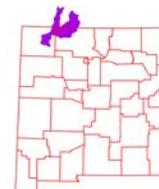


Invasive Species ¹²

Invasive species are those which have been introduced into a region or ecosystem and have the ability to out-compete native species for resources (i.e. water, nutrients, sunlight, etc.) The Southwest Exotic Plant Mapping Program (SWEMP) is a collaborative effort between the United States Geological Survey and federal, tribal, state, county and non-government organization partners in the southwest which maintains ongoing efforts to compile and distribute regional data on the occurrence of non-native invasive plants in the southwestern United States. Within the Upper San Juan watershed, the SWEMP has identified 10 species of invasive plants (Table 8). Each of these species is defined as non-native by the USDA PLANTS database.

<u>Scientific Name</u>	<u>Common Name</u>
<i>Zygophyllaceae</i> (Caltrop Family)	African Rue
<i>Scrophylariaceae</i> (Figwort Family)	Dalmatian Toadflax
<i>Brassicaceae</i> (Mustard Family)	Hoary Cress (Whitetop)
<i>Euphorbiaceae</i> (Spurge Family)	Leafy Spurge
<i>Asteraceae</i> (Sunflower Family)	Musk Thistle
<i>Brassicaceae</i> (Mustard Family)	Perennial Pepperweed (Tall Whitetop)
<i>Asteraceae</i> (Sunflower Family)	Russian Knapweed
<i>Asteraceae</i> (Sunflower Family)	Spotted Knapweed
<i>Asteraceae</i> (Sunflower Family)	Yellow Starthistle
<i>Scrophylariaceae</i> (Figwort Family)	Yellow Toadflax

Table 8. Invasive Species Recognized by the SWEMP.



Common Resource Areas¹³

A Common Resource Area (CRA) is defined as a geographical area where resource concerns, problems, or treatment needs are similar. It is considered a subdivision of an existing Major Land Resource Area (MLRA) designation. Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographic boundaries of a Common Resource Area.

Each Common Resource Area will have multiple Conservation System Guides associated with it. A Conservation System Guide associates, for a given CRA and land use, different components of Resource Management Systems and their individual effect on conserving soil and water resources.

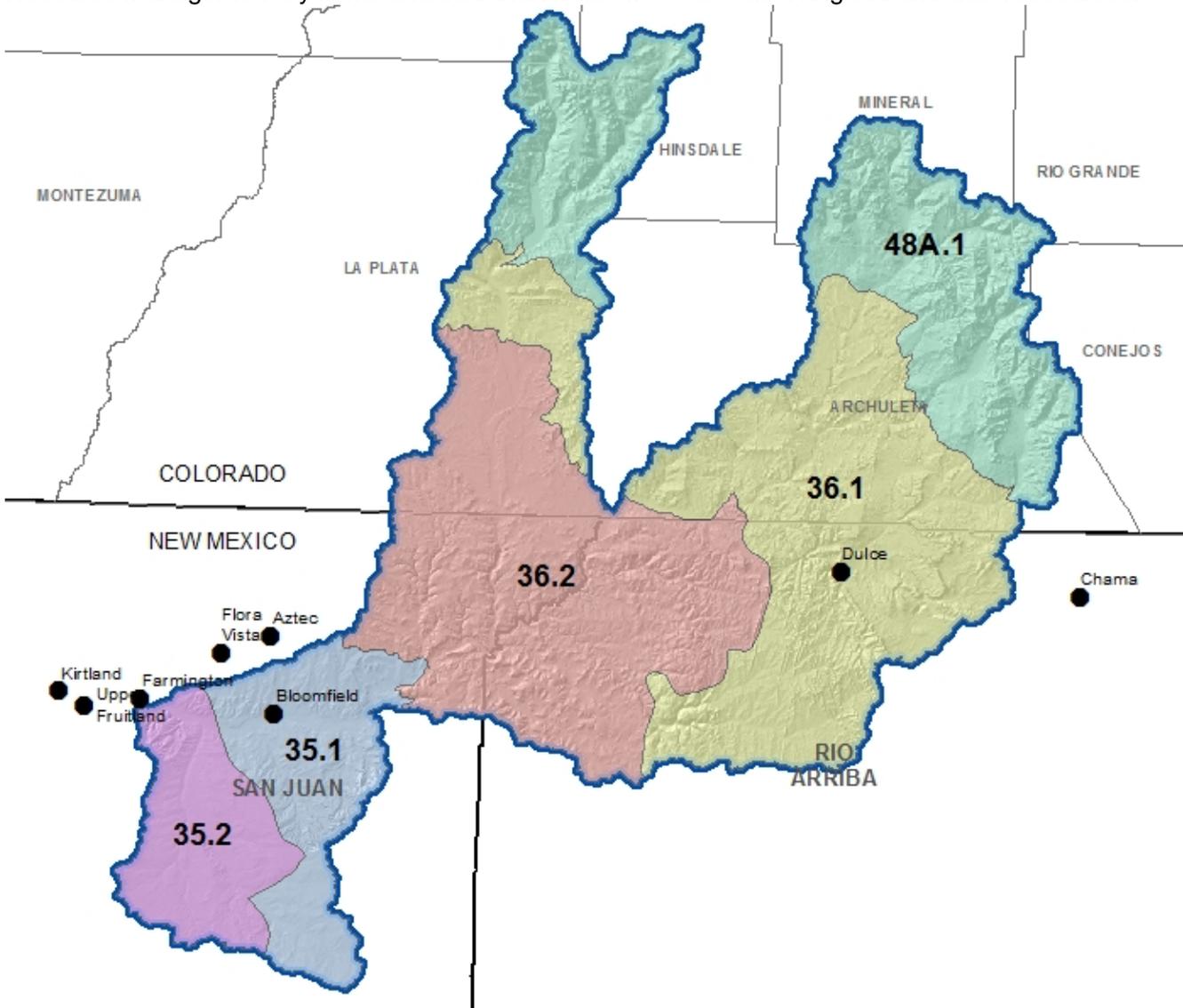
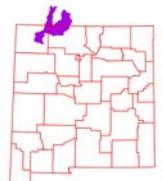


Figure 13. Common Resource Areas of the Upper San Juan.



Common Resource Areas

35.1 - Colorado Plateau Mixed Grass Plains

This unit occurs within the Colorado Plateau Physiographic Province and is characterized by flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Volcanic fields occur in places. Elevations range from 5100 to 6000 feet. Precipitation averages 10 to 14 inches per year. The soil temperature regime is mesic. The soil moisture regime is ustic aridic. Vegetation includes Stipa, Indian ricegrass, galleta, blue grama, fourwing saltbush, and scattered juniper.

35.2 - Colorado Plateau Shrub – Grasslands

This unit occurs within the Colorado Plateau Physiographic Province and is characterized by gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Volcanic fields occur in places. Elevations range from 3500 to 5500 feet. Precipitation averages 6 to 10 inches per year. The soil temperature regime is mesic and the soil moisture regime is typic aridic. Vegetation includes shadscale, fourwing saltbush, mormon tea, Indian ricegrass, galleta, and blue and black grama.

36.1 - Southwestern Plateaus, Mesas, and Foothills - Cool Subhumid Mesas and Foothills

This area encompasses the higher elevation mesas and foothills that represent a transition to the Southern Rocky Mountains. The temperature regime is frigid, and the moisture regime is ustic. The typical vegetation is big sagebrush, Gambel oak, and ponderosa pine. Land use is mainly forest and grazing land.

36.2 – Southwest Plateaus, Mesas, and Foothills – Warm Semiarid Mesas and Plateaus

This area encompasses the lower elevation mesas and plateaus. The temperature regime is mesic and the moisture regime is transitional from ustic to aridic. Vegetation is typically twoneedle pinyon, Utah juniper, and big sagebrush. Cropland is a significant land use in parts of this area, particularly on soils formed in thick deposits of eolian material. Precipitation ranges from 10 to about 16 inches. Elevations range from about 6,000 to 7,000 feet.

48.1 – 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 sagebrush-grass at low elevations, and with increasing elevation ranges from coniferous forest to alpine tundra. Elevations range from 6,500 to 14,400 feet.



Conservation ¹⁴

The USDA-Natural Resources Conservation Service (NRCS) focuses on the development and delivery of high quality products and services that enable people to be good stewards of our Nation's soil, water, and related natural related resources on non-Federal lands. The Natural Resources Conservation Service's conservation programs aid agricultural producers in their efforts to reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. Public benefits include enhanced natural resources that help sustain agricultural productivity and environmental quality while supporting continued economic development, recreation, and scenic beauty. These figures cover both Colorado and New Mexico.

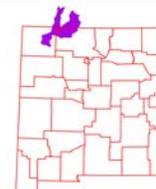
Conservation Practice	2007		2008		2009		2010		2011		TOTAL	
	#	Acres	#	Acres								
Access Control	15	580							9	74	24	654
Brush Management	11	719	13	698	17	8934	9	1053	9	145	59	11549
Conservation Crop Rotation	2	4	20	1913							22	1917
Cover Crop							2	59			2	59
Critical Area Planting							2	13			2	13
Forage and Biomass Planting	27	696	15	197	11	166	6	65	12	132	71	1256
Forage Harvest Management	116	3101	100	2446	29	1091	38	1088	40	1502	323	9228
Forest Stand Improvement	13	98	18	92	11	76	21	547	14	164	77	977
Herbaceous Weed Control									2	108	2	108
Integrated Pest Management	5	97	33	1971	2	206	1	20			41	2294
Irrigation System, Sprinkler	13	215	36	4092	14	370	32	538	15	162	110	5377
Irrigation System, Surface and Subsurface	3	122					5	45	11	64	19	231
Irrigation Water Management	236	14664	60	1367	49	1386	36	1021	46	1406	427	19844
Land Smoothing			1	2	5	38	1	3			7	43
Nutrient Management			37	2058							37	2058
Prescribed Burning									1	1142	1	1142
Prescribed Grazing	44	10862	32	19477	29	25182	53	31925	53	23865	211	111311
Range Planting	7	62	3	605	3	21	6	65	9	75	28	828



Residue Management, Mulch Till			17	1900							17	1900
Residue Management, Seasonal	2	4	3	13							5	17
Riparian Forest Buffer			1	7							1	7
Stream Habitat Improvement and Management			3	8	4	80	1	12	3	263	11	363
Tree/Shrub Establishment	1	5			1	3	1	2	3	61	6	71
Upland Wildlife Habitat Management	20	5510	14	2618	19	18680	44	12530	16	33125	113	72463
Wetland Creation			1	1							1	1
Wetland Restoration					1	3					1	3
Wetland Wildlife Habitat Management	1	25	1	9	5	75					7	109
SUM (Σ)	516	36764	408	39474	200	56311	258	48986	243	62288	1625	243823

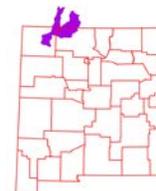
Table 9. 5 year Trends in Applied Conservation Practices. Reported in Acres.

Conservation Practice	2007		2008		2009		2010		2011		TOTAL	
	#	Feet	#	Feet								
Above-Ground, Multi-Outlet Pipeline			30	27972	47	40028	25	20470	15	16220	117	104690
Conservation Completion Incentive First Year	5		1								6	
Conservation Completion Incentive Second Year					1						1	
Dam, Diversion							1				1	
Fence	2	2651	4	21513	13	36902	9	15042	18	37649	46	113757
Irrigation Pipeline									3	2597	3	2597
Irrigation Regulating Reservoir	1										1	
Irrigation Water Conveyance, Anionic Polycrylamide Ditch and Canal Treatment	2	7012									2	7012
Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic	29	35334	29	40628	32	40219	33	35107	27	26547	150	177835
Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic	5	2297	3	990	2	2150	1	200			11	5637



Irrigation Water Conveyance, Pipeline, Rigid Gated Pipeline	51	50419	22	27400	18	20804	10	4218	3	2520	104	105361
Irrigation Water Conveyance, Pipeline, Steel	4	280	2	74	3	80	5	130			14	564
Pipeline			1	2176	3	2969	4	12137			8	17282
Pond	3		1		4		6		3		17	
Pond Sealing or Lining, Flexible Membrane					1		2				3	
Pond Sealing or Lining, Soil Dispersant	1				3						4	
Pumping Plant	11		4		8		5		9		37	
Sediment Basin	1										1	
Spring Development					2		1				3	
Streambank and Shoreline Protection	1	4450	1	4400			1	5000	4	9562	7	23412
Structure for Water Control	25		36		40		37		22		160	
TA Application					6		5		5		16	
TA Check-Out					6		7		4		17	
TA Design					4		2		3		9	
Water Well	7		2		3		1		1		14	
Watering Facility	13		7		7		5		1		33	
Wildlife Watering Facility					1						1	
Windbreak/Shelterbelt Establishment			1	457	3	1300			1	500	5	2257
SUM (Σ)	161		144		207		160		119		791	560404

Table 10. 5 Year Trends in Location Specific Applied Conservation Practices. Reported in Feet if Linear (i.e. Fence)



Soil Resource Inventory ¹⁵

The Upper San Juan Watershed has a number of certified National Cooperative Soil Survey (NCSS) inventories. Soils data is available from the NRCS Soil Data Mart at <http://soildatamart.nrcs.usda.gov/> and/or the NRCS Geospatial Data Gateway at <http://datagateway.nrcs.usda.gov/>. The National Forests in New Mexico are not covered, but have soils information available through their Terrestrial Ecosystem Unit Inventories. These will be integrated with the National Cooperative Soil Survey (NCSS) inventories in the next few years.

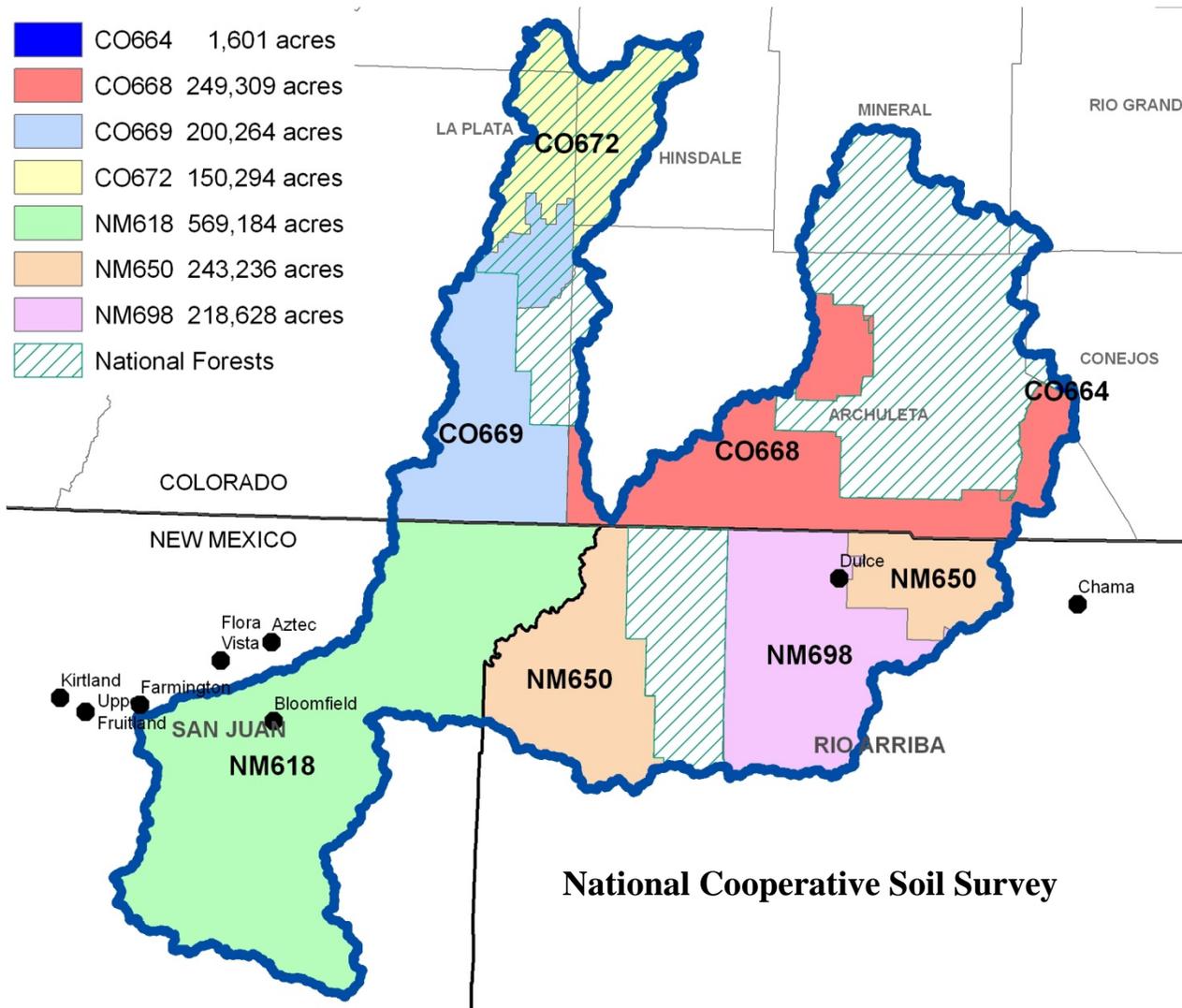


Figure 14. National Cooperative Soil Survey coverage of the Upper San Juan Watershed.

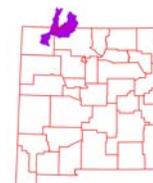


Soil Resource Inventory

In order to evaluate the susceptibility of erosion within the Upper San Juan watershed, a model was developed using Soil Survey Geographic Database (SSURGO) information. The soil properties saturated hydraulic conductivity, soil loss tolerance, and wind erodibility group were used in conjunction with slope to assess soil mapunit potential for erosion. Saturated hydraulic conductivity and slope are reported in SSURGO databases as interval/ratio data whereas wind erodibility and soil loss tolerance are ordinal data. Data transformations for the model are listed -

<u>SSURGO Value</u>	<u>Nominal Description</u>	<u>Model Rank</u>
Saturated Hydraulic Conductivity		
µm / s		
705.0 - 100.0	Very High	0
100.0 - 10.0	High	1
10.0 - 1.0	Moderately High	2
1.0 - 0.1	Moderately Low	3
0.1 - 0.01	Low	4
Slope %		
0 - 5		0
6 - 10		1
11 - 15		2
16 - 25		3
> 25		4
Soil Loss Tolerance		
5	High Tolerance For loss	0
4	↓	1
3	↓	2
2	↓	3
1	Low Tolerance For Loss	4
Wind Erodibility Group		
1	Very High	4
2	Very High	4
3	High	3
4	High	3
4L	High	3
5	Moderate	2
6	Moderate	2
7	Moderate	1
8	Slight	0

Table 11. Criteria Used for Soil Erosion Susceptibility Model.



Soil Resource Inventory

For each soil map unit (discrete delineation), the soil properties (named above) of the dominant soil type was used as the condition to be evaluated in the susceptibility to erosion model. Miscellaneous areas such as gravel pits, water, riverwash, etc. were excluded from evaluation. Possible range of values for each map unit are 0 – 16. Increasing values represent a higher susceptibility to soil erosion. Forest Service Soils are not able to be included in the model at this time.

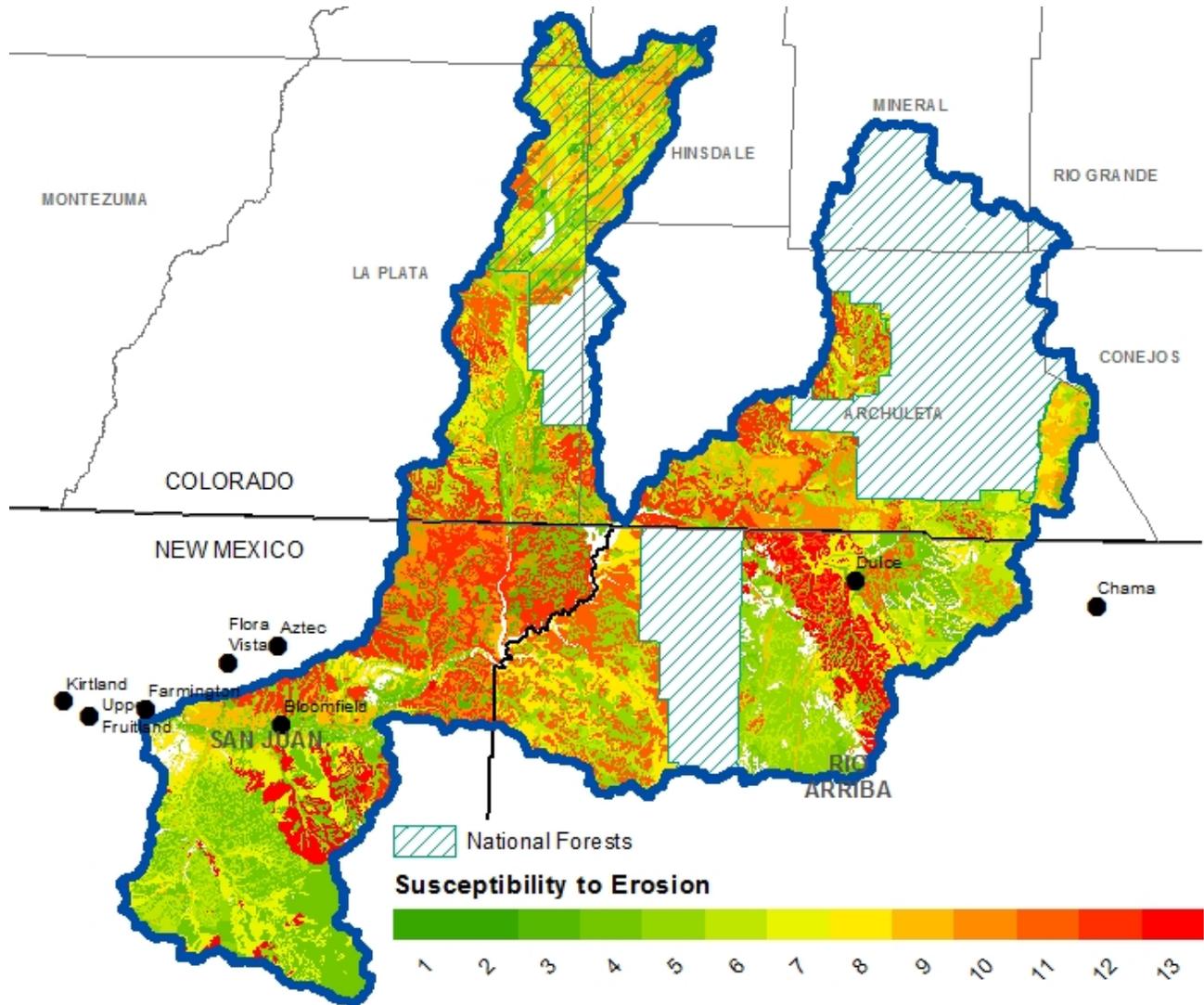


Figure 15. Upper San Juan Watershed Erosion Potential.



Soil Resource Inventory

Rank	Acres
1	2,619
2	185
3	29,704
4	220,587
5	267,724
6	171,232
7	181,594
8	105,056
9	126,886
10	96,971
11	110,606
12	184,946
13	76,720
Sum(Σ)	1,574,830

Table 12. Soil Erosion Potential Model Results. A greater rank indicates greater potential for erosion.



Socioeconomic Data ¹⁶

COUNTY	Total population: Total	Total population: Hispanic or Latino	Total population: White alone	Total population: Black or African American alone	Total population: American Indian and Alaska Native alone	Total population: Asian alone	Total population: Native Hawaiian and Other Pacific Islander alone	Total population: Some other race alone	Total population: Two or more races	Families: Median family income 2010 ACS
Archuleta - CO	12,084	2,148	10,436	37	227	89	6	948	341	\$56,068
Conejos - CO	8,256	4,620	6,293	27	182	23	4	1,390	337	\$33,627
Hinsdale - CO	843	24	802	3	9	3	0	11	15	\$74,659
La Plata - CO	51,334	6,056	44,546	204	2,987	286	31	1,680	1,600	\$56,422
Mineral - CO	712	21	693	2	4	1	0	2	10	\$53,438
Rio Grande - CO	11,982	5,086	9,379	43	220	42	2	1,908	388	\$39,871
San Juan - CO	699	84	647	0	2	8	0	26	16	\$43,783
Rio Arriba - NM	40,246	28,703	20,778	204	6,447	170	13	11,288	1,346	\$40,737
San Juan - NM	130,044	24,776	67,048	756	47,640	484	74	9,501	4,541	\$47,019

Table 13. Socioeconomic Data of the Counties in the Watershed (2010).



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