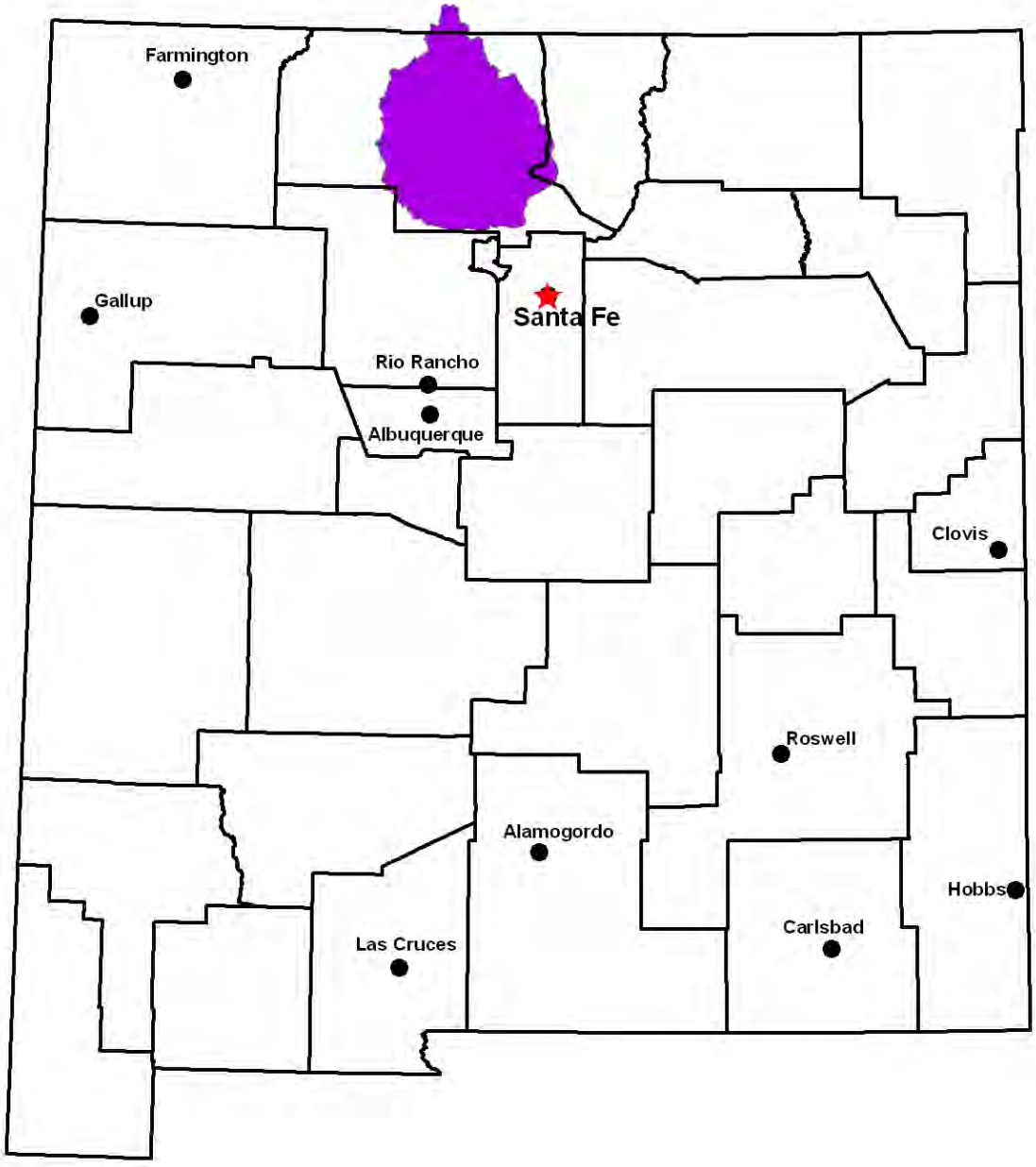
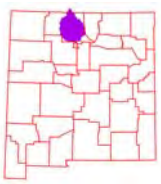
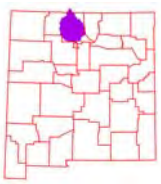


Rapid **W**atershed **A**ssessment
Rio Chama Watershed





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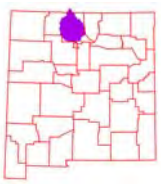

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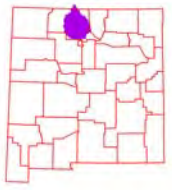


Overview

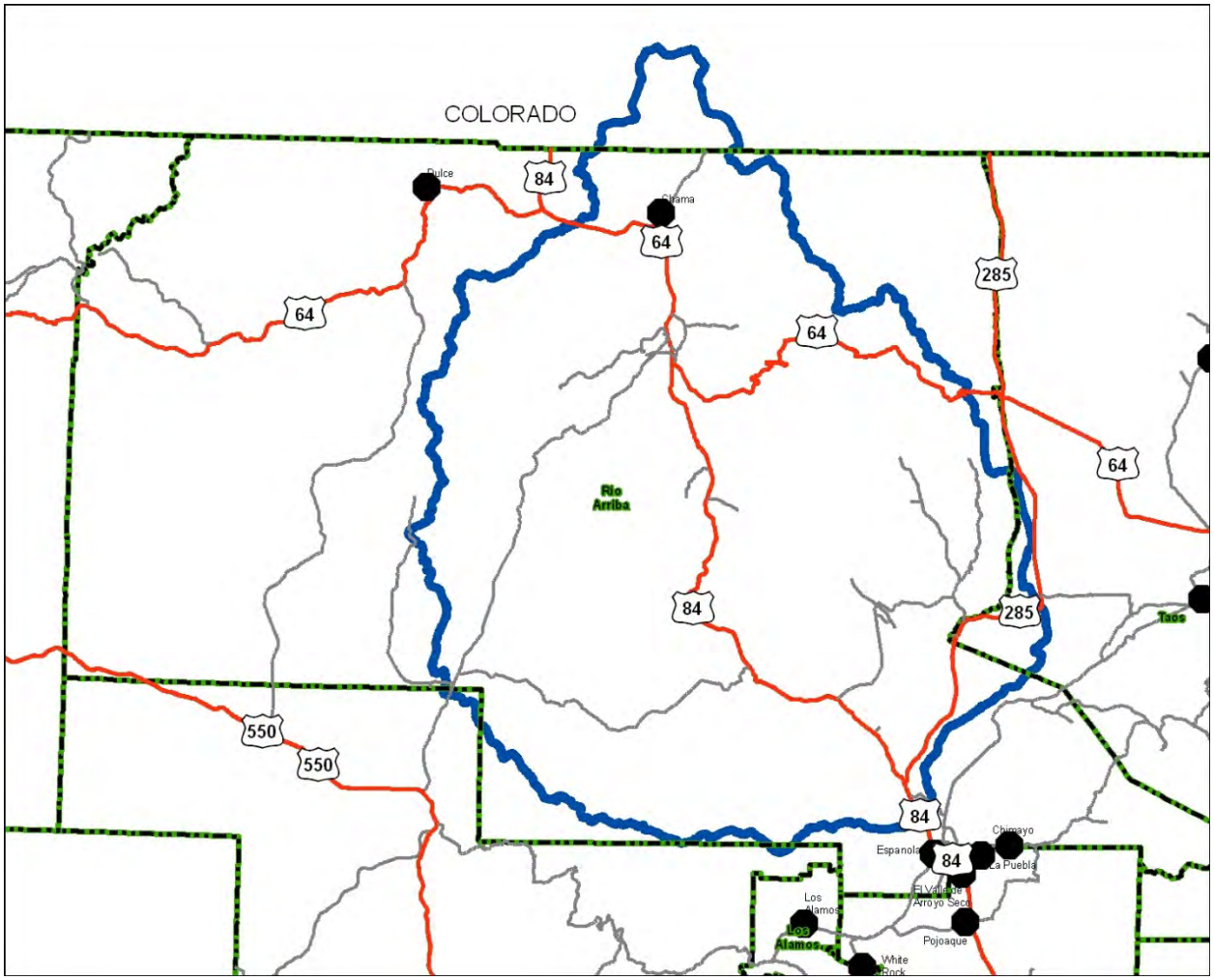
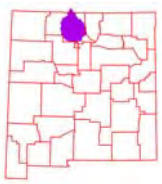


Figure 1. Rio Chama Watershed Overview

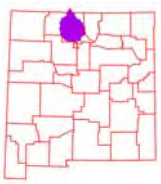


Overview

The Rio Chama Watershed is located in southern Colorado and north central New Mexico. It covers 2,020,419 total acres (8,176 sq. km). Portions of the Rio Chama watershed extend into southern Colorado (Archuleta and Conejos counties), and Rio Arriba, Sandoval, and Taos counties. Table 1 summarizes the distribution of the Rio Chama watershed.

Table 1. Rio Chama watershed acreage distribution.

	County Acres Total	Acres in HUC	% of HUC in County	% of County in HUC
Rio Arriba	3,772,816	1,925,465	95	51
Sandoval	2,377,011	4,142	<1	<1
Taos	1,409,948	38,345	2	3
CO-Archuleta	866,050	40,835	2	5
CO-Conejos	825,586	11,466	<1	1
Sum (∑)	--	2,020,419	100	--

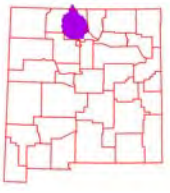


Land Grant History: [1]

The majority of the Upper Rio Chama watershed is within the Tierra Amarilla land grant boundary. The Tierra Amarilla land grant was the largest and most controversial land grant in northwestern New Mexico (Quintana 1991). The first application for the Tierra Amarilla land grant was made by seventy-two Hispanic settlers of the lower Rio Chama valley in 1814 to start a tract of agricultural land primarily to raise sheep. Two other unsuccessful petitions were submitted in 1820 and 1824. In 1832, Manuel Martinez submitted a grant petition on behalf of himself and his family, requesting that access to pastures, roads, and watering places be limited to grantees in an attempt to acquire a private vs. communal grant. The Committee of the Territorial Deputation rejected the request for limited access and made the Tierra Amarilla grant a community grant (Quintana 1991).

There were no permanently inhabited Hispanic settlements in the area until 1860. In the same year, Congress changed the grant from a communal grant to a private grant for Martinez and his descendants. Although deeds supported settlers' claims to their rights on common lands, the grant was signed over to Thomas Benton Catron in 1881, one of the richest landowners in the country (Quintana 1991). In 1901, Catron received patent on the entire grant with small exceptions of the lands allotted to settlers. By 1904, the area between the Village of Chama and Tierra Amarilla was cleared of ponderosa pine by the Southwestern Lumber and Railway Company, leading to subsequent gully erosion and siltation of downstream surface waters (Quintana 1991). The first fences were installed in 1912, depriving settlers of their open range rights. The Alianza was launched in Northern New Mexico in 1966, believing that colonialism had denied them access to the resources of their ancestral lands and had destroyed their communities. They appealed for a Congressional investigation into the circumstances that had led to this alienation of original land grantees. In 1967, the Alianza attempted a citizen's arrest of a district attorney at the Tierra Amarilla Courthouse. The incident erupted into a shootout, leading to a manhunt for Alianza leader Reies Lopez Tijerina. The episode at the courthouse led to inquiries by the Civil Liberties Union and to a resurrected sense of pride and identity with the land and associated culture (Quintana 1991).

Although the Alianza in now defunct, the issue of land ownership and management in the Tierra Amarilla land grant issue remains alive (Quintana 1991). The Upper Rio Chama watershed is currently dominated by private land with some US Forest Service and state wildlife land (Figure 5).



Physical Setting

Geology: [2, 3]

The Rio Chama originates in the Jemez, Conejos and San Juan Mountains of New Mexico and southwest Colorado in the Colorado Plateau physiographic province. It is the largest tributary to the Rio Grande and enters the Rio Grande Rift at its confluence. The mountain ranges consist of Paleoproterozoic Eon aged granitic plutons or quartzite; Tertiary Period aged volcanic (basalt, basaltic-andesite or rhyolite) and pyroclastic flow breccias from the Valles Caldera; and Paleoproterozoic Eon aged or earlier volcanic or metamorphic rocks. The valley floors consist of Cretaceous Period Mancos shale, Dakota sandstone or Mesa Verde group (mudstones, shales, sandstones and coal) until just upstream of Abiquiu Reservoir. Through the reservoir to just downstream, the river passes through the sandstones of the Jurassic Period San Rafael group and the Tertiary Period Chinle group (red sandstones and siltstones). Downstream to the confluence with the Rio Grande, the bedrock is the Tertiary Period partly compacted sands and gravels of the Santa Fe group or Quaternary Period alluvium. The Santa Fe Group consists of alluvial fans, river channel deposits and inter-bedded volcanic rocks preserved in a complex of depressed fault blocks within the Rio Grande depression.

Above El Vado Lake, the Rio Chama is a Class IV to Class IV+ whitewater rafting river. Between El Vado Lake and Abiquiu Reservoir the Rio Chama is a Class II to Class III whitewater rafting river for this 70 mile stretch. Thirty-one of these miles pass through the Chama Canyon with spectacular geologic features and up to 1,500 feet walls.

Resource concerns are high sedimentation rates caused by landslides in the Mancos shale; or high sediment erosion and water runoff as the result of forest fires. 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.

Groundwater quality and quantity is a concern. 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 Mancos shale, an aquiclude, has a low yield and usually is fair to poor quality for livestock or crops. Groundwater in the igneous rocks and volcanics is usually along fracture zones which are hard to intercept with water wells.

Soils:

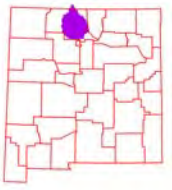
Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.
The soils in the Rio Chama Watershed are assigned to four groups (A, B, C, and D).

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.



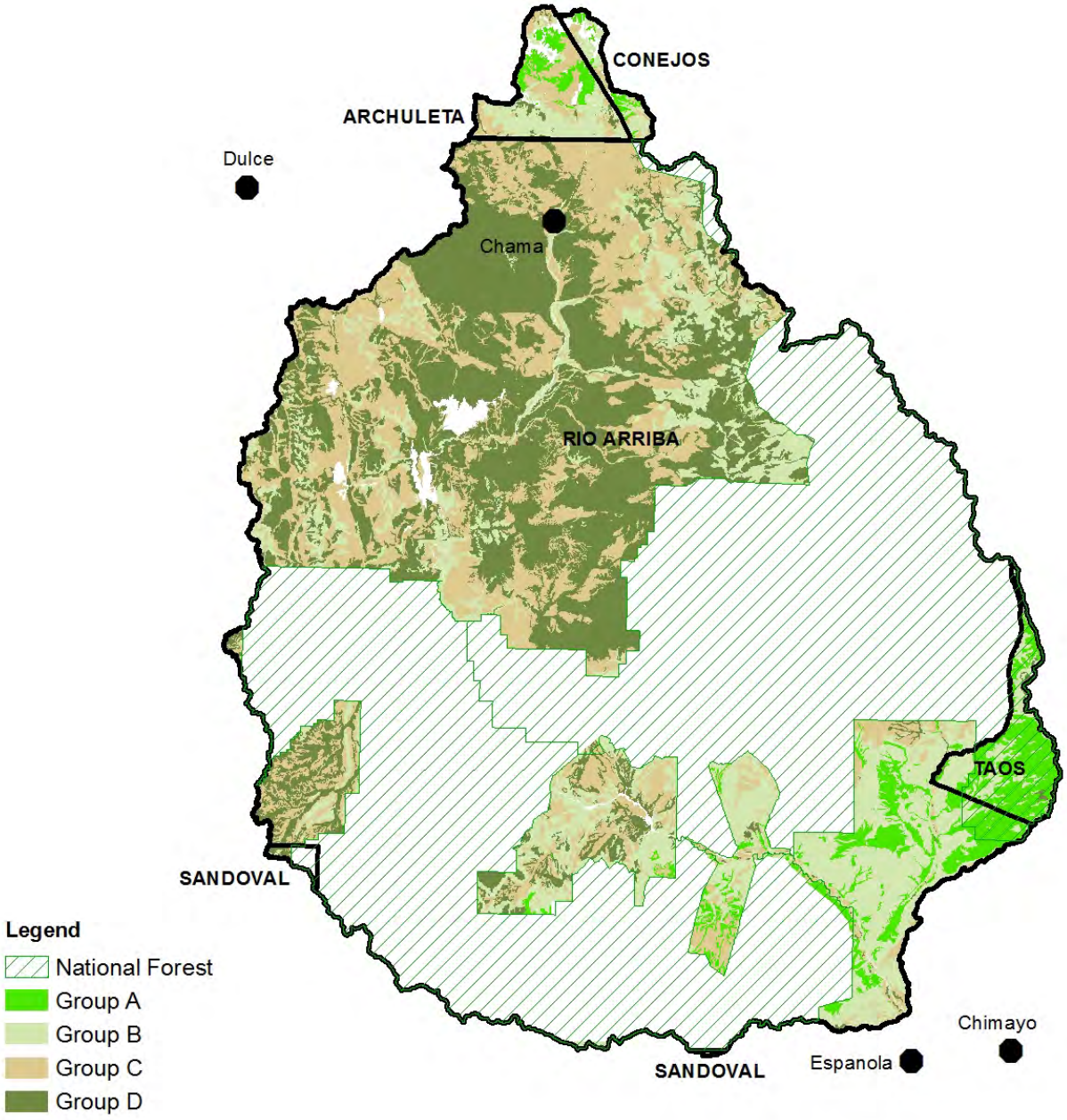
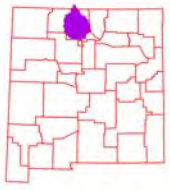


Figure 2. Hydrologic Soil Groups



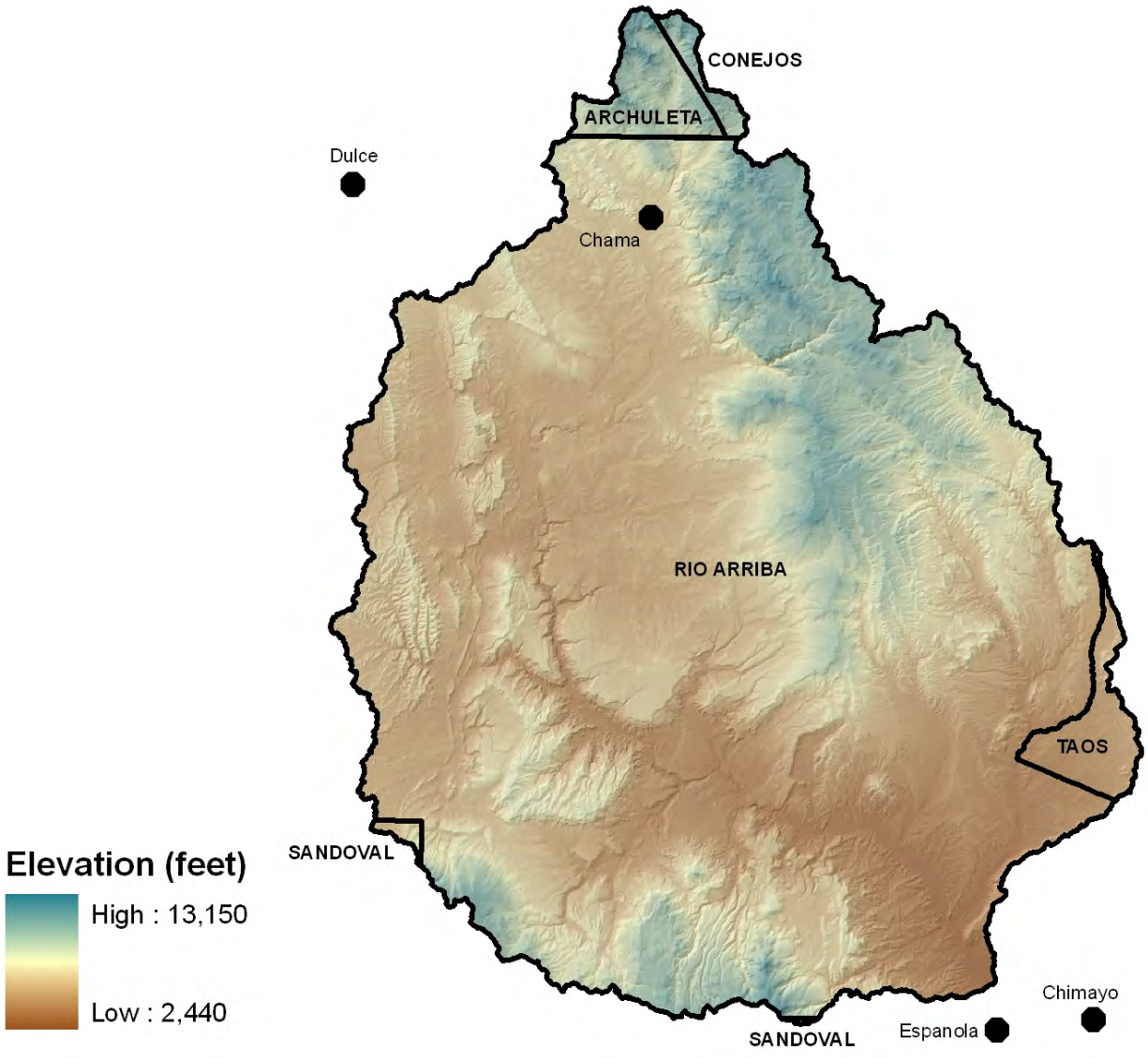
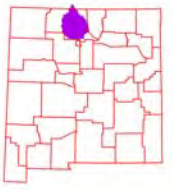


Figure 3. Rio Chama Watershed Shaded Relief



Precipitation [4]

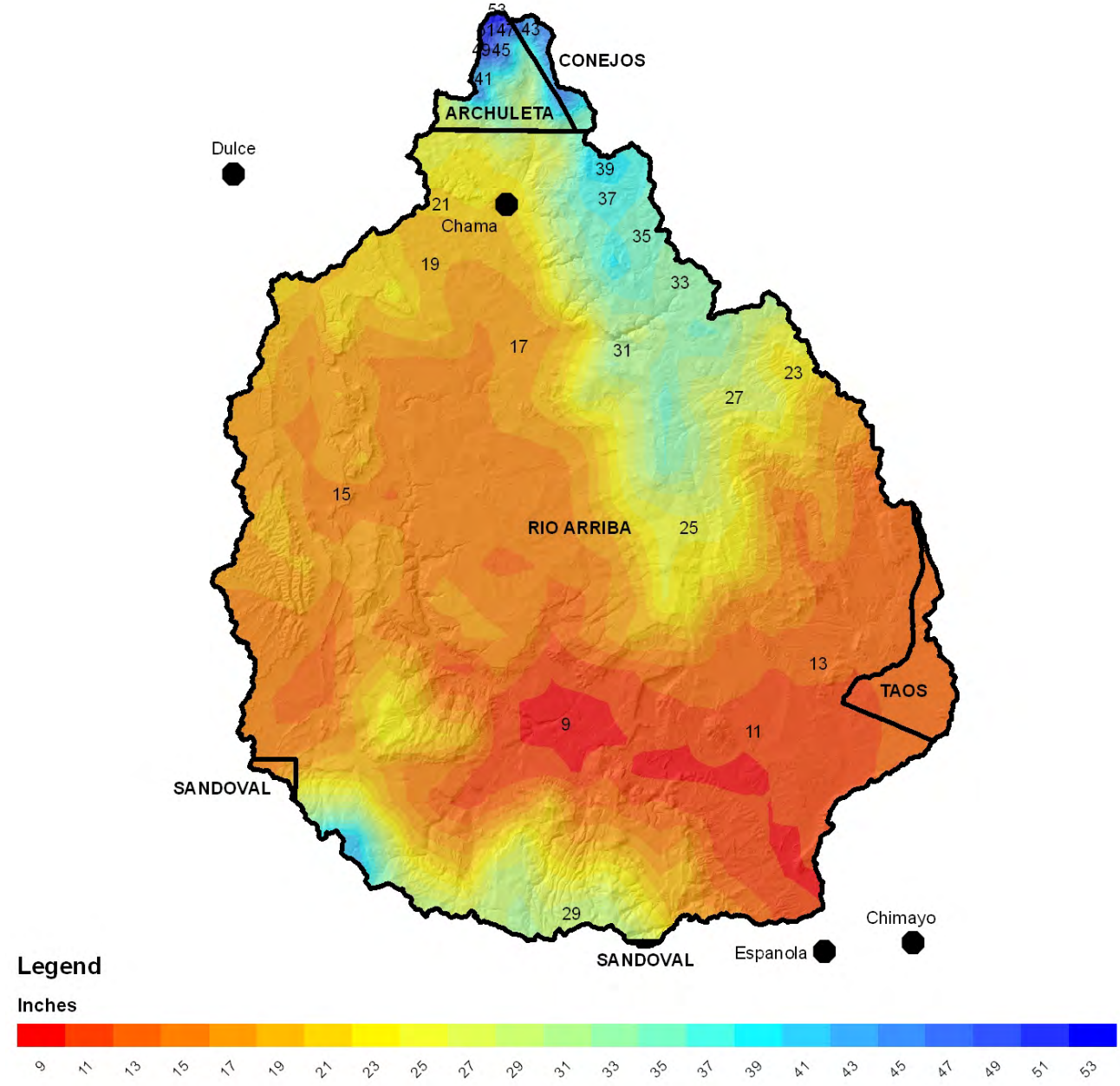
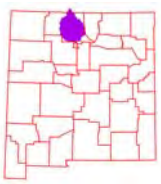


Figure 4. Rio Chama Watershed Annual Precipitation.



Land Ownership [5,6]

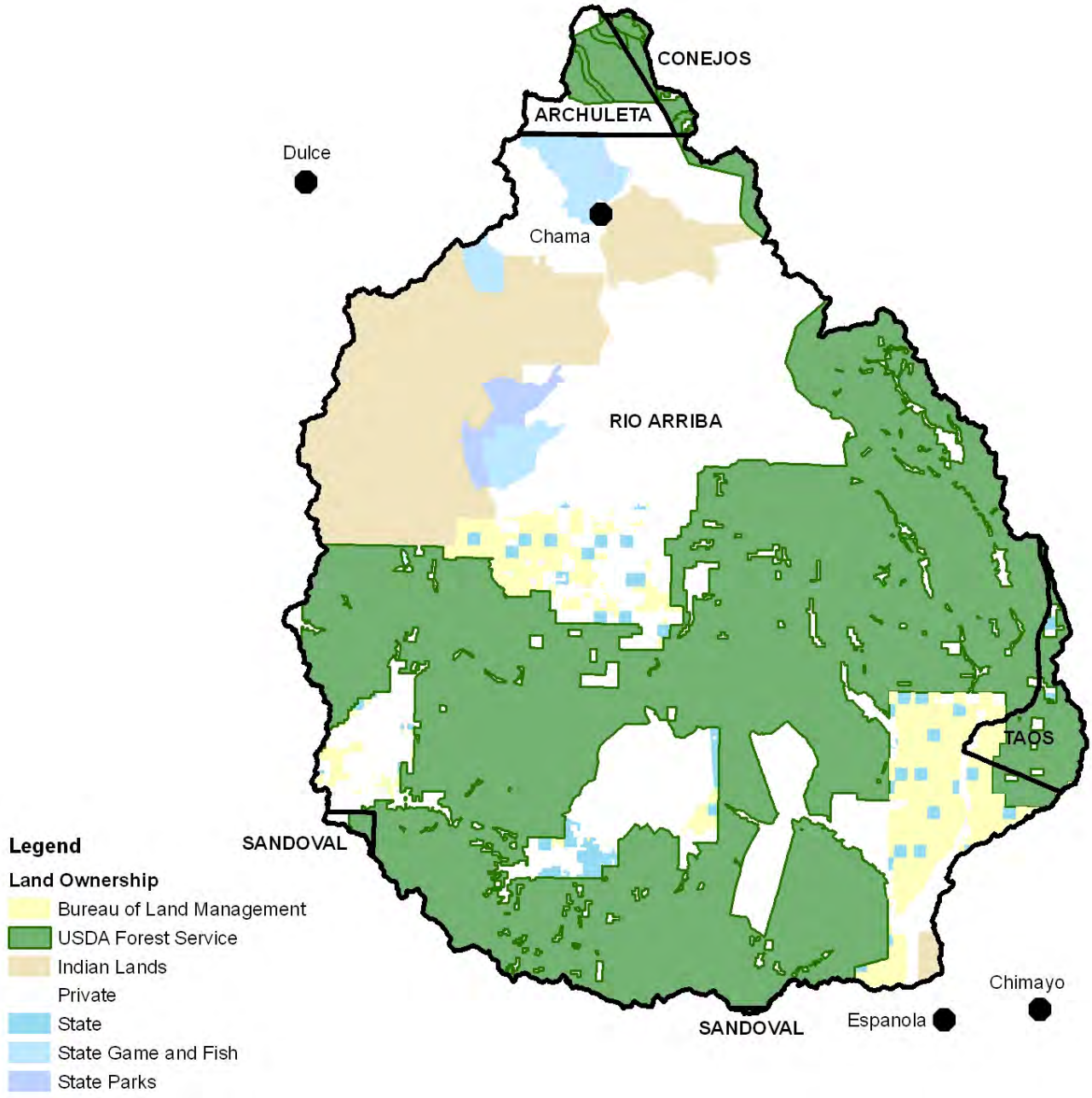
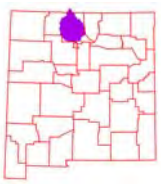


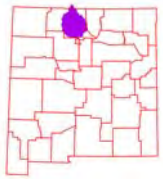
Figure 5. Rio Chama Watershed Land Ownership.



Land Ownership

COUNTY	BLM	DoD	FS	Indian Lands	Private	State	State Game and Fish	State Parks
Rio Arriba	109,600	2,900	944,000	247,300	539,200	27,300	40,000	15,200
Sandoval	100	--	2,500	400	1,000	--	--	--
Taos	3,700	--	30,300	--	3,400	1,000	--	--
Archuleta (CO)	--	--	19,600	--	21,200	--	--	--
Conejos (CO)	--	--	10,700	--	800	--	--	--
Watershed (∑)	113,400	2,900	1,007,100	247,700	565,600	28,300	40,000	15,200
% Watershed	6	<1	50	12	28	1	2	1

Table 2. Land ownership in the Rio Chama watershed. Reported to the nearest hundred acres.



Las Conchas Fire [7]

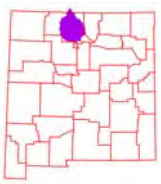
Date Started: June 26, 2011

Cause: Human

Size: 156,593 acres total, 10,059 in the Rio Chama watershed
Residences: 63 destroyed
Outbuildings: 49 destroyed; **2** damaged
Location: On Santa Fe National Forest in Sandoval, Los Alamos, and Rio Arriba Counties; Santa Clara Pueblo; Jemez Pueblo; Cochiti Pueblo; Santo Domingo Pueblo; Bandelier National Monument; Valles Caldera National Preserve; and state and private in-holdings.

Safety and Health: Flash floods on and near burn scars can be life threatening. Monitor forecasts and prepare to take action or evacuate should flash flood warnings be issued. Thunderstorms can form, and subsequently produce lightning and heavy rainfall within 30 minutes.

Figure 6: Las Conchas Fire, Summer 2011



Land Use / Land Cover [8,9]

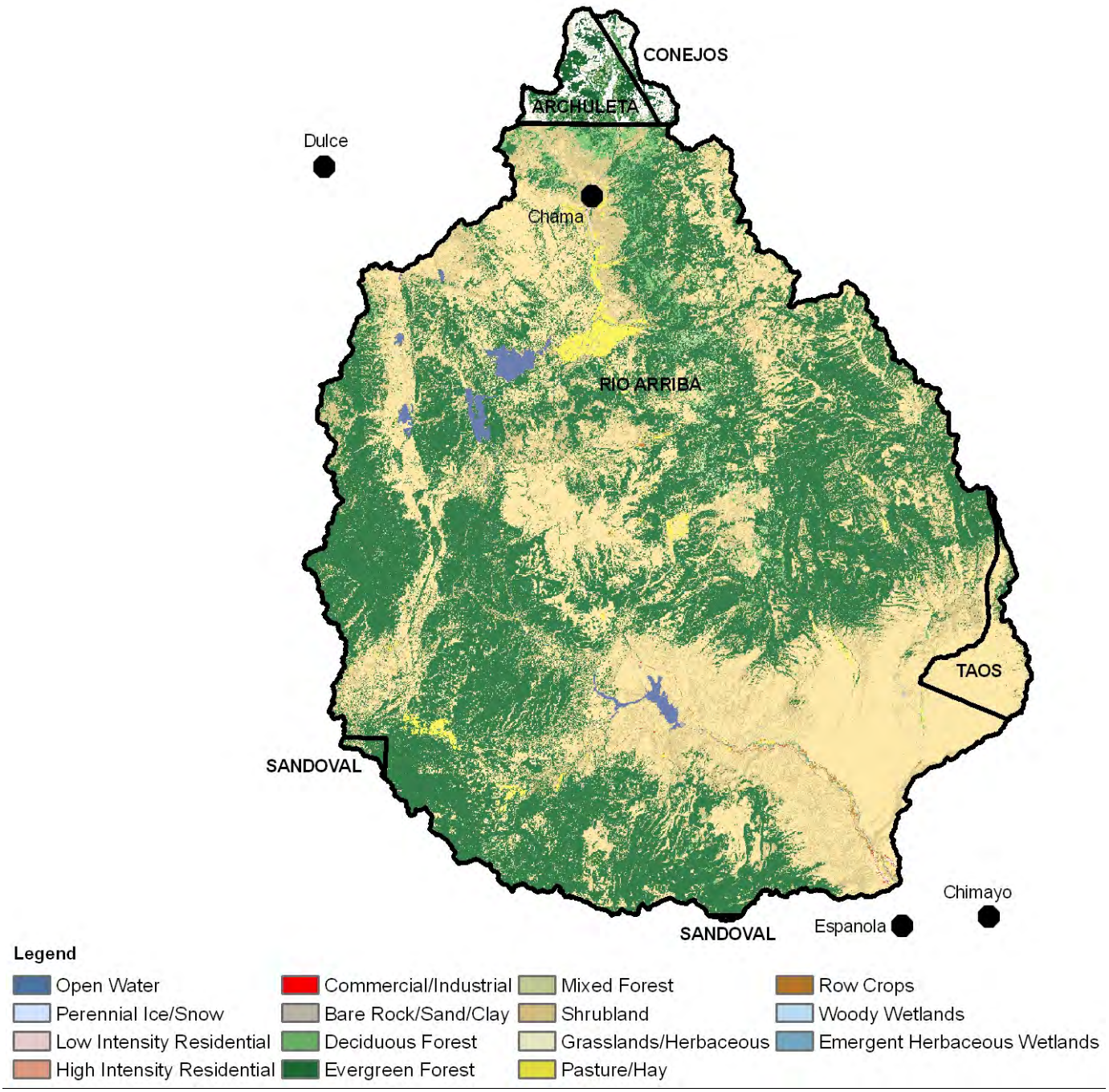
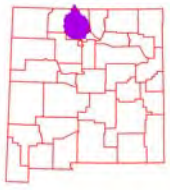


Figure 7. Subset of the National Land Cover Dataset over the Rio Chama Watershed.

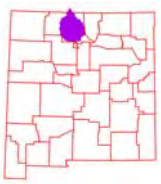


Land Use / Land Cover

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.

Land use / Land cover	Acres	% of Watershed
evergreen forest	936,394	46%
grasslands, herbaceous	663,140	32%
shrubland	319,073	16%
Deciduous forest	39,748	2%
Pasture/hay	20,563	1%
Open water	16,241	1%
Mixed Forest	14,660	1%
Bare rock/sand/clay	2,609	< 1%
Row crops	2,478	< 1%

Table 3. Extent of NLCD classes in the Rio Chama watershed.



Land Use / Land Cover

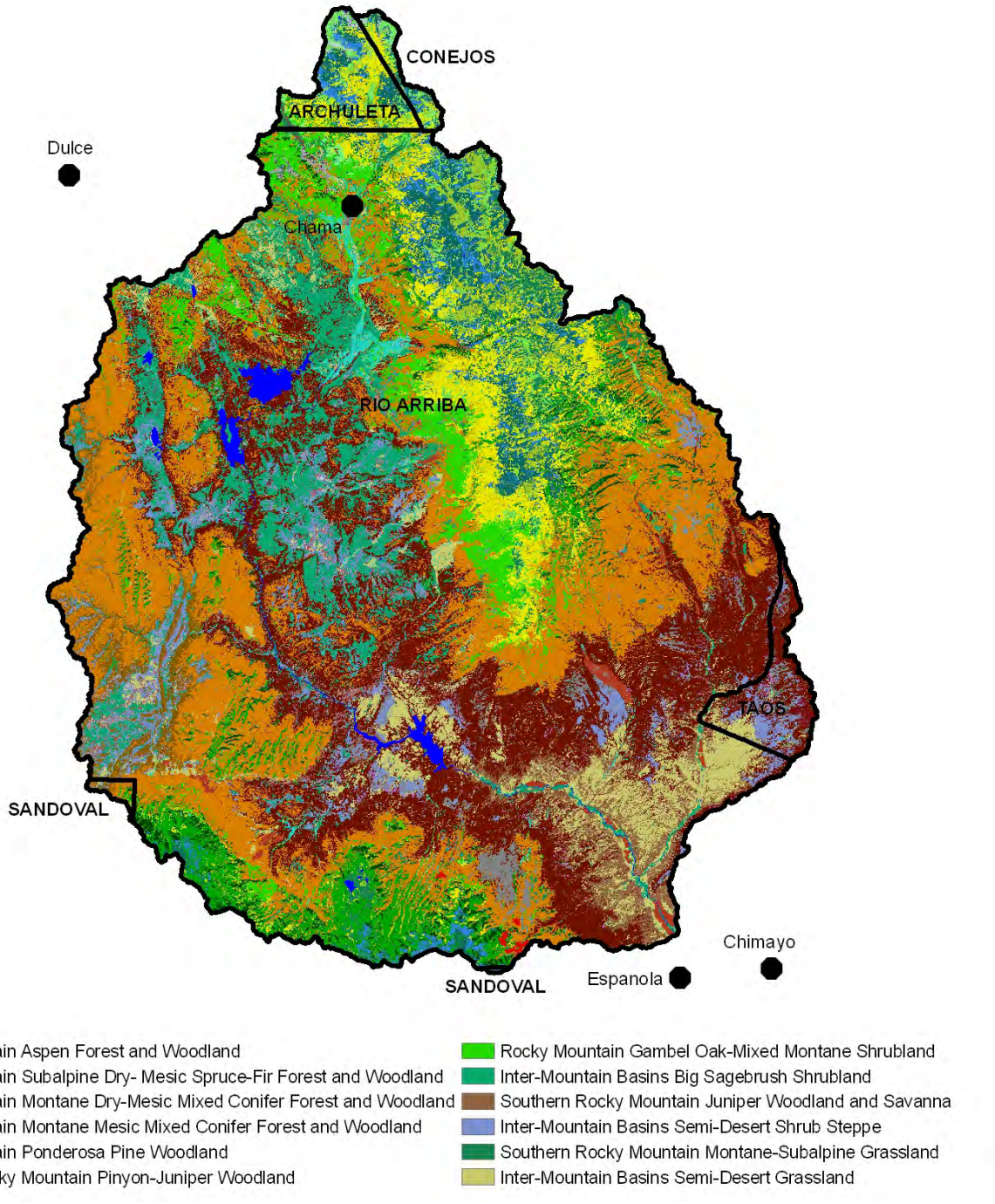
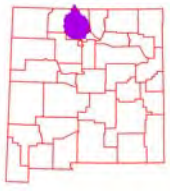


Figure 8. Subset of the SWREGAP over the Rio Chama Watershed. The 12 dominant ecosystems are displayed in the legend.

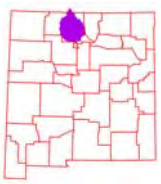


Land Use / Land Cover

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.

Ecosystem	Acres	% of Watershed
Rocky Mountain Ponderosa Pine Woodland	488,800	24
Southern Rocky Mountain Pinyon-Juniper Woodland	420,300	21
Inter-Mountain Basins Big Sagebrush Shrubland	157,200	8
Inter-Mountain Basins Semi-Desert Grassland	100,100	5
Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland	93,600	5
Rocky Mountain Aspen Forest and Woodland	91,000	5
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	88,400	4
Inter-Mountain Basins Semi-Desert Shrub Steppe	88,000	4
Southern Rocky Mountain Juniper Woodland and Savanna	51,800	3
Rocky Mountain Subalpine Dry- Mesic Spruce-Fir Forest and Woodland	47,300	2
Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland	45,200	2
Southern Rocky Mountain Montane-Subalpine Grassland	44,800	2
Colorado Plateau Pinyon-Juniper Woodland	34,500	2
Western Great Plains Foothill and Piedmont Grassland	25,600	1
Rocky Mountain Subalpine Mesic Meadow	23,900	1
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	21,400	1
Inter-Mountain West Aspen-Mixed Conifer Forest and Woodland	20,300	1
Open Water	17,500	1
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	15,900	1
Rocky Mountain Alpine-Montane Wet Meadow	15,300	1
Colorado Plateau Mixed Bedrock Canyon and Tableland	14,400	1
Rocky Mountain Cliff and Canyon	13,500	1
Agriculture	12,400	1
Western Great Plains Riparian Woodland and Shrubland	7,500	< 1

Table 4. SW Region Gap analysis ecosystem acreages. Reported to the nearest hundred acres



Hydrology[10,11,12,13,14,15,16]

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 9,539 miles (15,348 km) of water courses in the Rio Chama River Watershed. The majority of these courses typically flow intermittently in summer months during periods associated with high intensity convective thunderstorms.

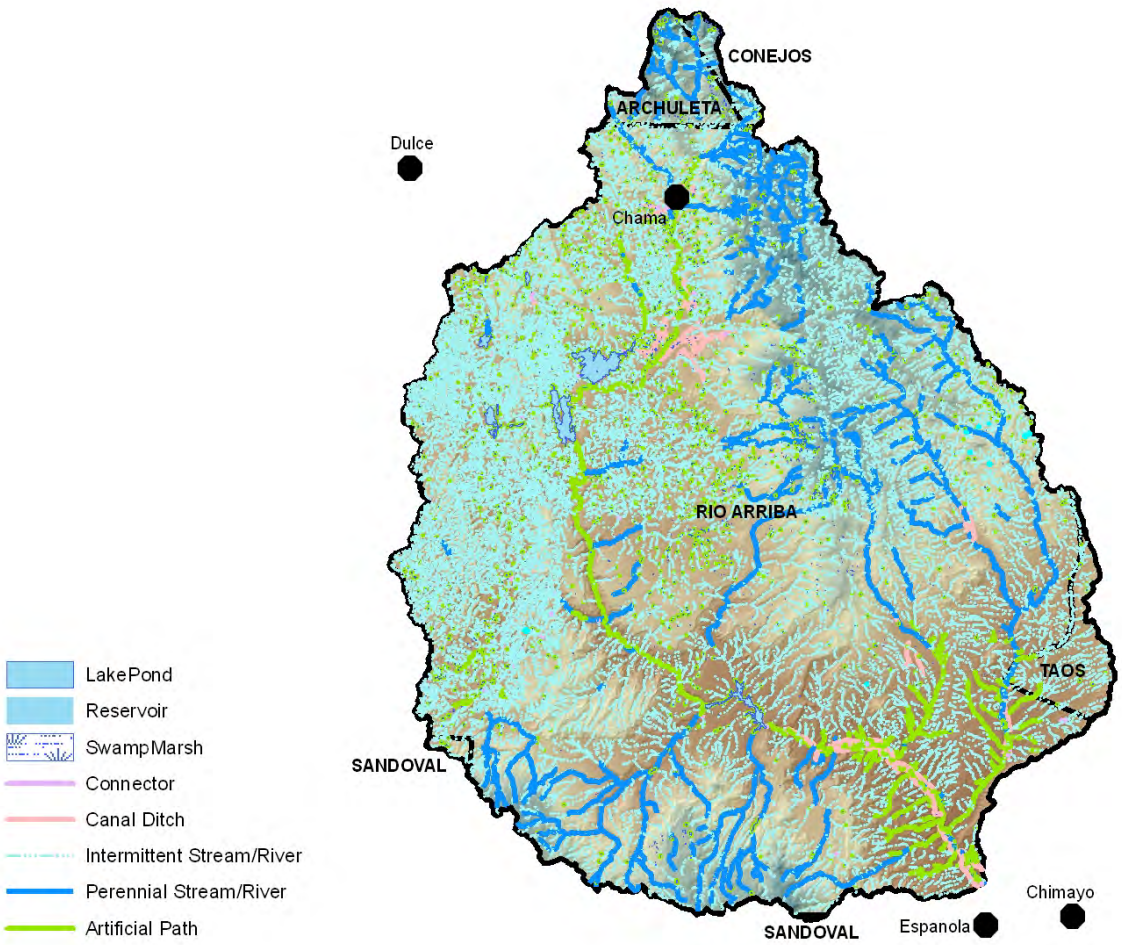
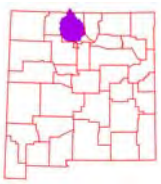
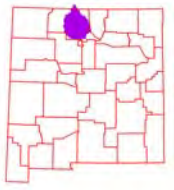


Figure 9. National Hydrologic Dataset (NHD) of the Rio Chama.



Water Course Type	Miles
Artificial path	445
Connector	4
Canal / Ditch	134
Intermittent Stream / River	8,150
Perennial Stream / River	806
Sum (∑)	9,539

Table 5. NHD Water Course Type and Extents



There are 15 water gauging stations in the watershed. USGS Site 08290000 is near the SE corner of the watershed on the Rio Chama near Chamita, NM. During the period 1971 – 2009, this site has had mean annual discharge of 570.8 cubic feet per second ranging from 234 (1972) to 922.6 (1987) cubic feet per second.

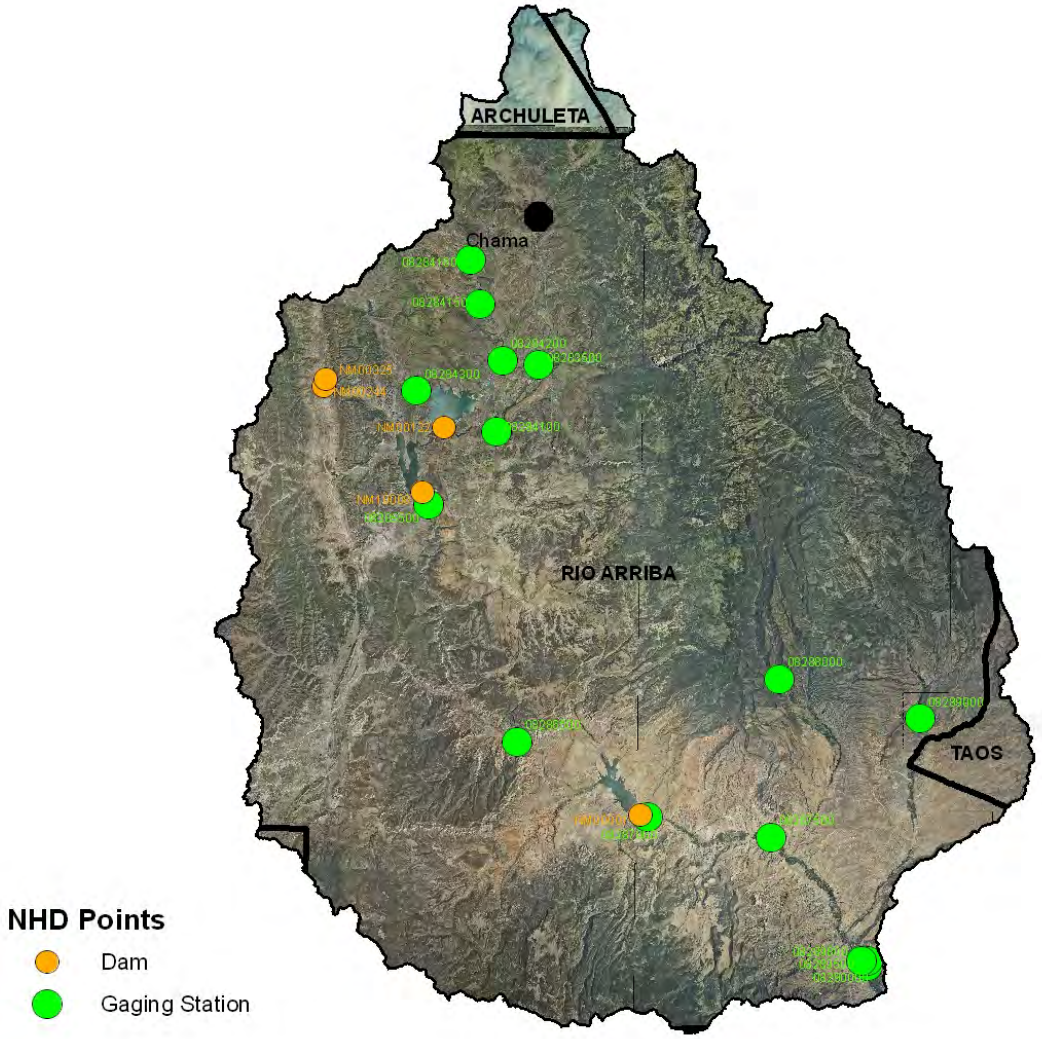
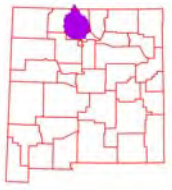


Figure 10. Gauging Stations in the Rio Chama Watershed



Hydrology

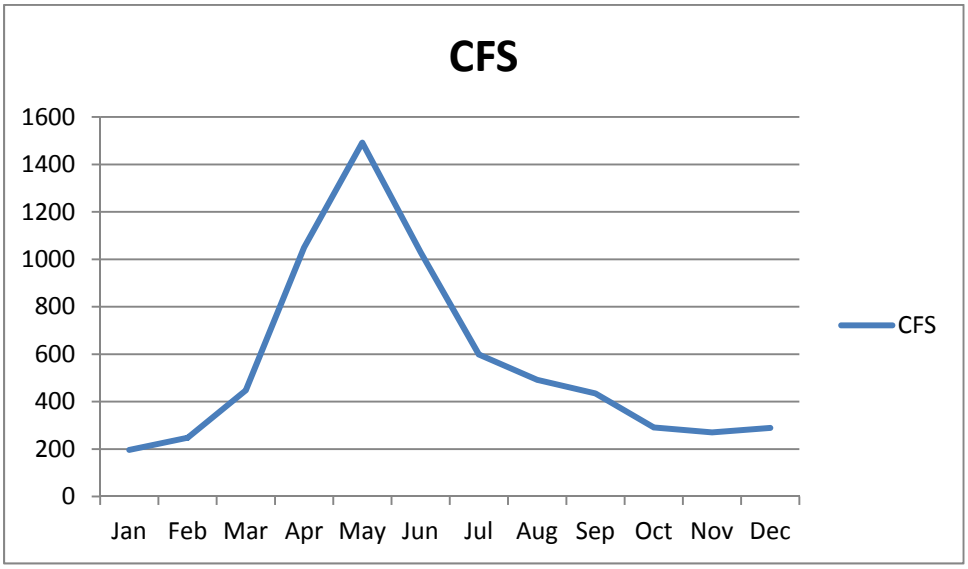
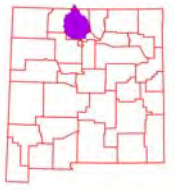


Figure 11. Monthly Average of Mean Daily Flow on the Rio Chama near Chamita, NM. Period of observation: 1970-2009.

The Rio Chama watershed was identified as a priority participant for the Office of the State Engineer's Active Water Resource Management (AWRM) plan. The AWRM initiative was launched in January 2004 in response to continued drought conditions in New Mexico. Active Water Resource Management refers to the essential tools and elements needed to enable the State Engineer to actively manage the state's limited water resources. In New Mexico, the state constitution makes priority of right the basis for water administration. However, recent drought years have compelled the State Engineer to realize that, should it become necessary to conduct priority administration, the tools necessary to do so are not yet in place. The tools for AWRM include: measuring and metering, rules and regulations, creation of water districts and appointment of water masters, and development of water master manuals.

In the Rio Chama Basin, the State Engineer currently administers the release and delivery of the San Juan-Chama Project water. The entire Rio Chama watershed is targeted for Active Water Resource Management. A Water Master was hired for the Rio Chama.



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 Rio Chama watershed as part of the Rio Grande River Basin.

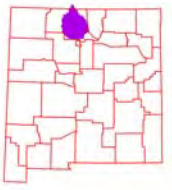
The Rio Chama watershed has the following reaches listed as 303 (d) Impaired Surface Waters:

1. Abiquiu Reservoir
2. Canjilon Creek (perennial portions Abiquiu Reservoir to headwaters)
3. El Vado Reservoir
4. Hopewell Lake
5. Polvadera Creek (Canones Creek to headwaters)
6. Rio Capulin (Rio Gallina to headwaters)
7. Rio Chama (El Vado Reservoir to Rio Brazos)
8. Rio Chama (Little Willow Creek to CO border)
9. Rio Chama (Rio Brazos to Little Willow Creek)
10. Rio Chamita (Rio Chama to CO border
11. Rio Puerco de Chama (Abiquiu Reservoir to headwaters)
12. Rio Tusas (Rio Vallecitos to headwaters)
13. Rito Resumidero (Rio Puerco de Chama to headwaters)

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

Use	1	2	3	4	5	6	7	8	9	10	11	12	13
high quality coldwater aquatic life		ns		ns	ns	x	ns	ns	ns	ns	x		ns
coldwater aquatic life	ns		ns								ns	ns	
Irrigation/irrigation storage	x	x	x	x	x	x	x	x	x	x	x	x	x
domestic water supply		x		x	x	x	x	x	x	x	x		x
livestock watering	x	x	x	x	na	x	x	x	x	x	x	x	x
wildlife habitat	x	x	x	x	x	x	x	x	x	x	x	x	x
Warmwater aquatic life	ns										ns	ns	
Primary contact	x		x										
secondary contact		na		x	na	ns	ns	ns	ns	ns	x	x	x
Fish culture		x			x	x	x	x	x	x	x		x

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



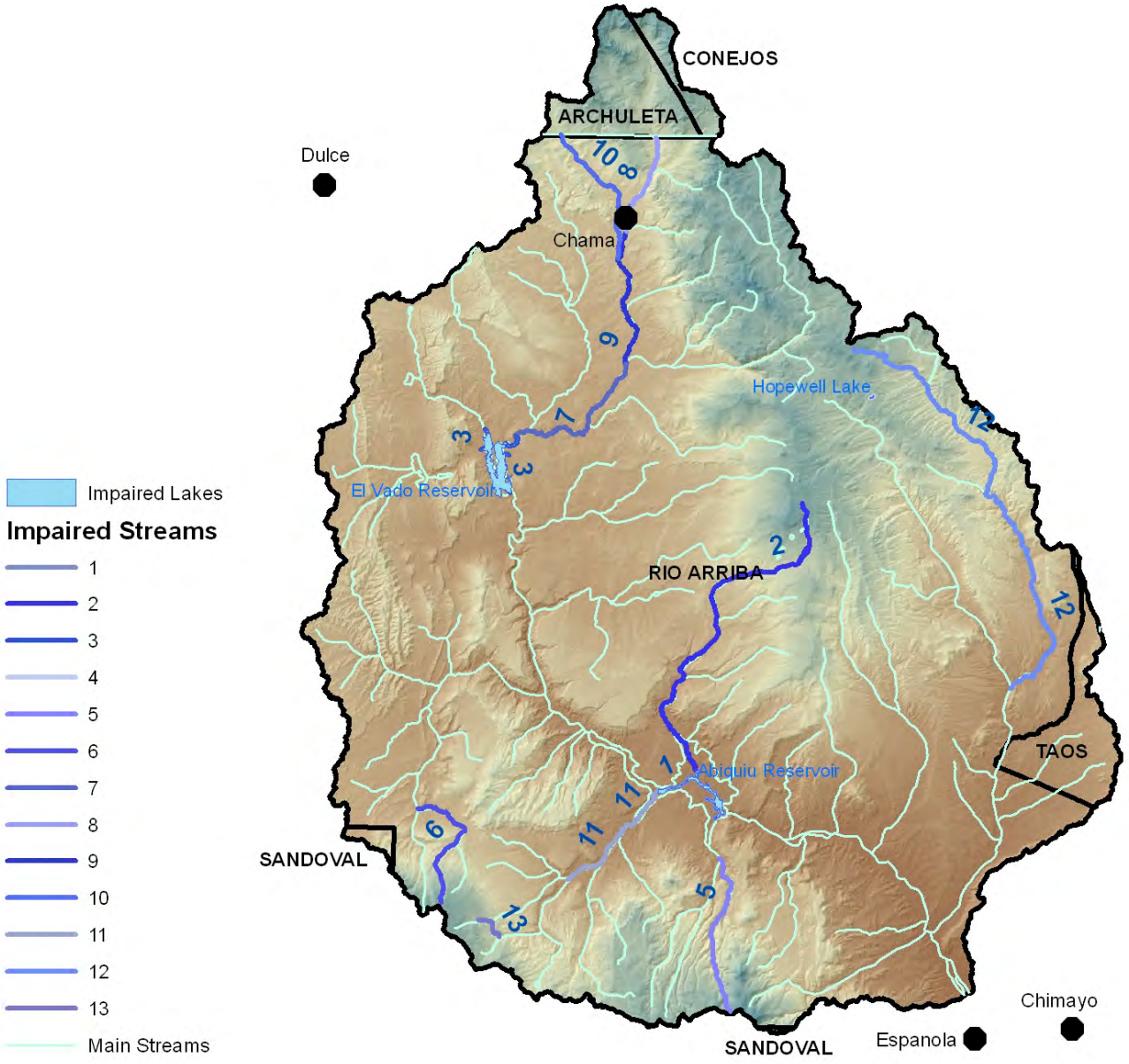
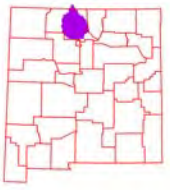


Figure 12. 303(d) Impaired Waters. (numbers reference Table 6 stream reaches).



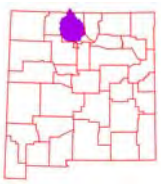
Hydrology

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. Within the Rio Chama Watershed, there are several bodies of water that are listed as impaired as of the 2010-12 listing cycle.

The river and stream reaches total 173.6 miles (279.38 km) and the listed water bodies cover 10,048 ac (40.66 sq. km).

	Impairment								
	Dissolved Oxygen	Temp-erature	Nutrient/ Eutrophi-cation	Total Fecal and Coliform	Mercury Or aluminum	Turbidity	PCB's	Specific Conductance	Sedi-menta-tion
1	x				X (Hg)		x		
2		x	x			x		x	
3	x								
4			x						
5		x							x
6				x					
7		x	x	x	x(Al)	x			
8		x		x	x(Al)				
9		x	x	x	x(Al)	x			
10		x	x	x	x(Al)	x			
11		x	x	x	x(Al)				
12			x						
13									

Table 7. Possible Causes of Impairment



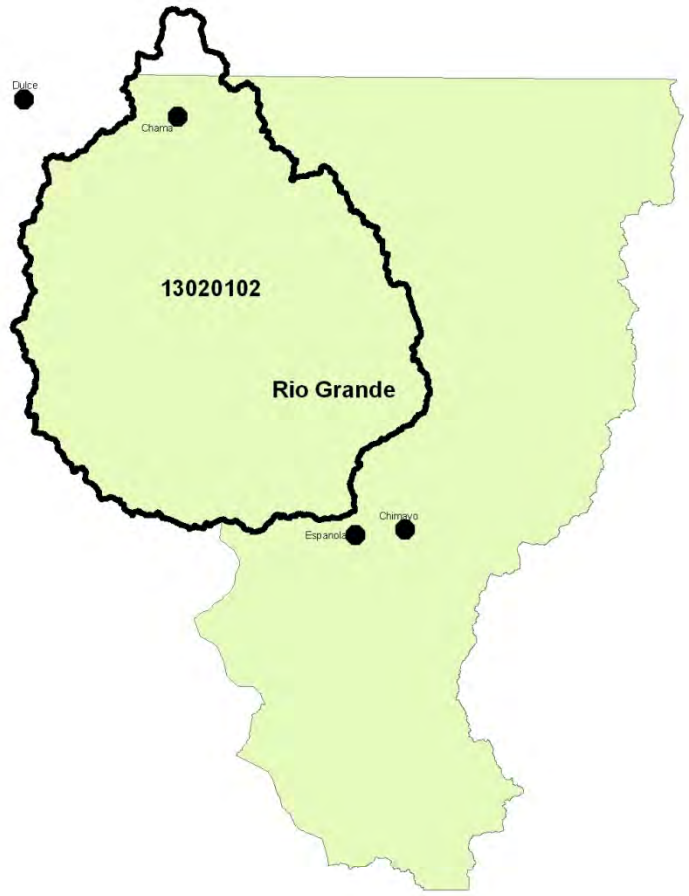
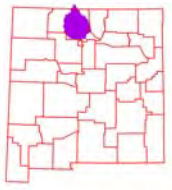


Figure 13. Declared Groundwater Basins of the Rio Chama.

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 Rio Chama watershed is completely within the Northern Rio Grande Underground Water Basin. The surface watershed in NM covers 1,967,952 of the approximately 4.97 million acres of the underground water basin in NM.

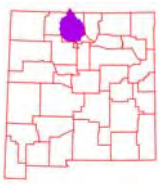


Threatened and Endangered Species [17]

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 8 lists those species which are currently listed and tracked in the Rio Chama River Watershed.

Common Name	Scientific Name	Tax.Class	Family	Fed Status	State Status
Rio Grande silvery minnow	*Hybognathus amarus*	Actinopterygii	Cyprinidae	LE	E
Boreal Toad	*Bufo boreas boreas*	Amphibia	Bufonidae		E
Jemez Mountains Salamander	*Plethodon neomexicanus*	Amphibia	Plethodontidae		E
American Peregrine Falcon	*Falco peregrinus anatum*	Aves	Falconidae		T
Boreal Owl	*Aegolius funereus*	Aves	Strigidae		T
Mexican spotted owl	*Strix occidentalis lucida*	Aves	Strigidae	LT	
SW Willow Flycatcher	*Empidonax trailii extimus*	Aves	Tyranni	LE	E
New Mexican Jumping Mouse	*Zapus hudsonius luteus*	Mammalia	Dipodidae		E
American Marten	*Martes americana*	Mammalia	Mustelidae		T

Table 8. Threatened and Endangered Plant and Animal Species.

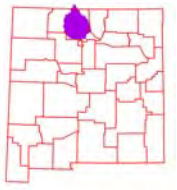


Invasive Species [18]

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 Rio Chama watershed, the SWEMP has identified 7 species of invasive plants (Table 9). Each of these species is defined as non-native by the USDA PLANTS database.

Scientific Name	Common Name
Scrophylariaceae **(Figwort Family)**	**Dalmatian Toadflax**
Brassicaceae (**Mustard Family)**	**Hoary Cress (Whitetop)**
Euphorbiaceae **(Spurge Family)**	**Leafy Spurge**
Asteraceae **(Sunflower Family)**	**Musk Thistle**
Brassicaceae (**Mustard Family)**	**Perennial Pepperweed (Tall Whitetop)**
Asteraceae **(Sunflower Family)**	**Russian Knapweed**
Asteraceae **(Sunflower Family)**	**Spotted Knapweed**

Table 9. Invasive Species Recognized by the SWEMP.



Common Resource Areas[19]

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.

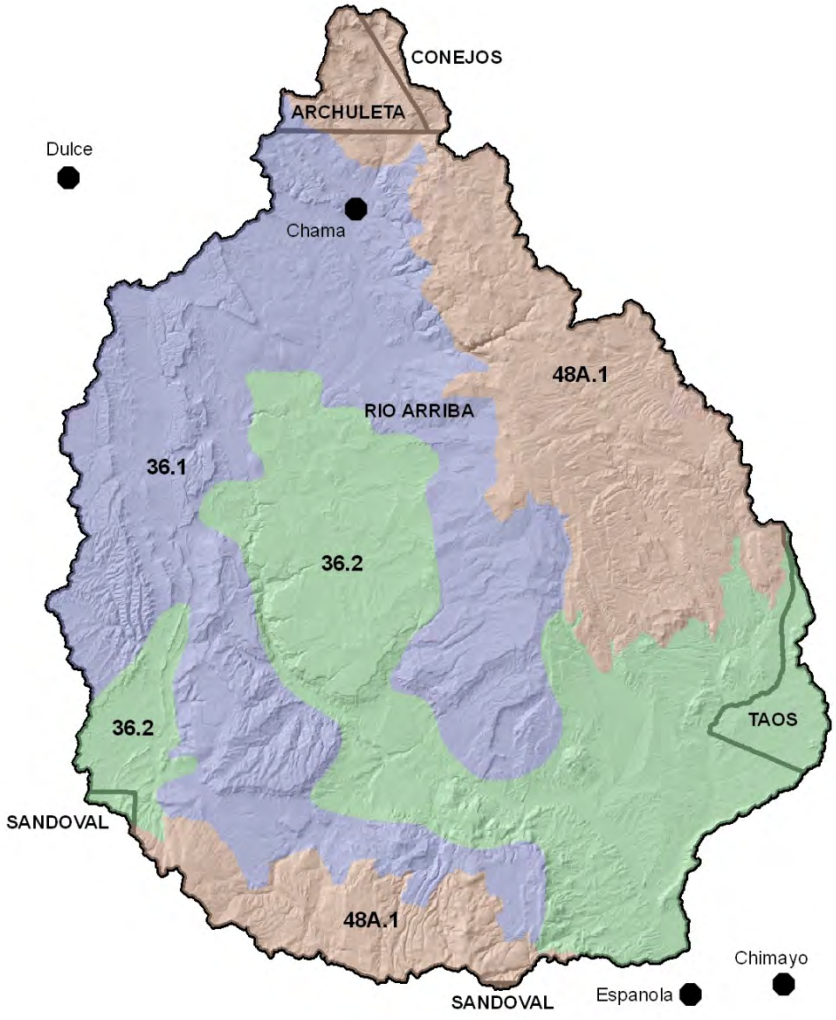
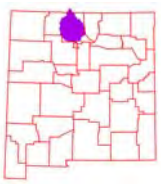


Figure 14. Common Resource Areas of the Rio Chama.



Common Resource Areas

36.1 – Southwest Plateaus, Mesas, and Foothills – Cool Subhumid Mesas and Foothills

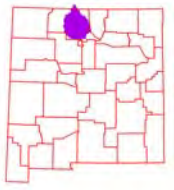
This area encompasses the higher elevation mesas and foothills that represent a transition to the Southern Rocky Mountains. The temperature regime is frigid, and the moisture regime is ustic. The typical vegetation is big sagebrush, Gambel oak, and ponderosa pine. Land use is mainly forest and grazing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

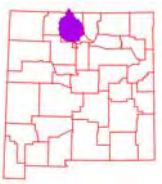
48.1 – Southern Rocky Mountains – High Mountains and Valleys

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.



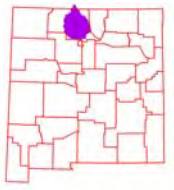
Conservation [20]

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.



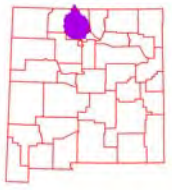
Conservation Practice	2006		2007		2008		2009		2010		TOTAL	
	#	Acres	#	Acres	#	Acres	#	Acres	#	Acres	#	Acres
Access Control									1	1	1	1
Brush Management	6	631	1	4	16	1,375	9	71	11	281	43	2,362
Conservation Crop Rotation					2	4					2	4
Cover Crop							1	3	1	3	2	6
Early Successional Habitat Dev/Mgmt	1	40									1	40
Forage and Biomass Planting	10	533	16	240	15	136	10	68	9	58	60	1,035
Forage Harvest Management	10	139	11	89	9	104	6	100	6	47	42	479
Forest Slash Treatment									2	50	2	50
Forest Stand Improvement	1	50	1	40	1	32	1	7	6	87	10	216
Grazing Land Mechanical Treatment							1	1			1	1
Integrated Pest Management	3	30	3	40	5	28	6	49	8	60	25	207
Irrigation Land Leveling							2	20	3	35	5	55
Irrigation System, Sprinkler	7	834	3	13	10	21	2	13	4	20	26	901
Irrigation Water Management	8	47	10	374	12	150	5	42	10	1,363	45	1,976
Land Smoothing	2	16	5	30	5	39	1	11	7	54	20	150
Nutrient Management	3	30	7	36	6	34	4	37	5	6	25	143
Prescribed Grazing	9	3,981	1	491	9	11,188	5	16,028	6	3,226	30	34,914
Range Planting	1	20	1	4	2	245	4	51	3	67	11	387
Residue Management					4	6					4	6
Residue Mgmt, Seasonal	1	1			2	4					3	5
Stream Habitat Imp and Mgmt									1	1	1	1
Tree/Shrub Establishment			1	4	2	362	7	72	1	1	11	439
Upland Wildlife Habitat Mgmt	12	2,792	5	19,374	14	13,375	4	19,303	4	891	39	55,735
SUM (∑)	74	9,144	65	20,739	114	27,103	68	35,876	88	6,251	409	99,113

Table 10. 5 Year Trends in Applied Conservation Practices. Reported in Acres.



Conservation Practice	2006		2007		2008		2009		2010		TOTAL	
	#	Feet	#	Feet	#	Feet	#	Feet	#	Feet	#	Feet
Above-Ground, Multi-Outlet Pipeline							1	300	2	2,580	3	2880
Conservation Completion Incentive First Year			2		1						3	
Diversion	1	100			2	4,000			1	950	4	5050
Fence	10	25,612	6	10,464	12	80,888	7	14,837	5	55,449	40	187250
Firebreak							1	300			1	300
Grade Stabilization Structure	1						7		14		22	
Irrigation Field Ditch			7	8,096	8	11,466	2	5,321	2	2,308	19	27191
Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic	4	1,573	4	1,485	6	3,052	4	5,292	4	4,543	22	15945
Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic	3	4,755	6	6,223	1	2,363	2	725			12	14066
Irrigation Water Conveyance, Pipeline, Steel	8	303			2	711	7	321	9	246	26	1581
Irrigation Water Conveyance, Pipeline, Rigid Gated Pipeline	1	60	4	2,180	1	780					6	3020
Pipeline	1	1			3	5,100	3	13,264	1	2,675	8	21040
Pond	9		1		4		4		5		23	
Pumping Plant	6		3		7		4		3		23	
Surface Drain, Main or Lateral	1	10									1	10
Structure for Water Control	25		9		17		20		17		88	
Water Well							1		2		3	
Watering Facility	8		5		1		2		1		17	
Windbreak/Shelterbelt Establishment									2	1,391	2	1391
SUM (∑)	78	NA	47	NA	65	NA	65	NA	68	NA	323	279724

Table 11. 5 Year Trends in Location Specific Applied Conservation Practices. Reported in Feet if Linear (i.e. fence)



Soil Resource Inventory [21]

The Rio Chama Watershed has a number of certified National Cooperative Soil Survey (NCSS) inventories. 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.

National Cooperative Soil Survey

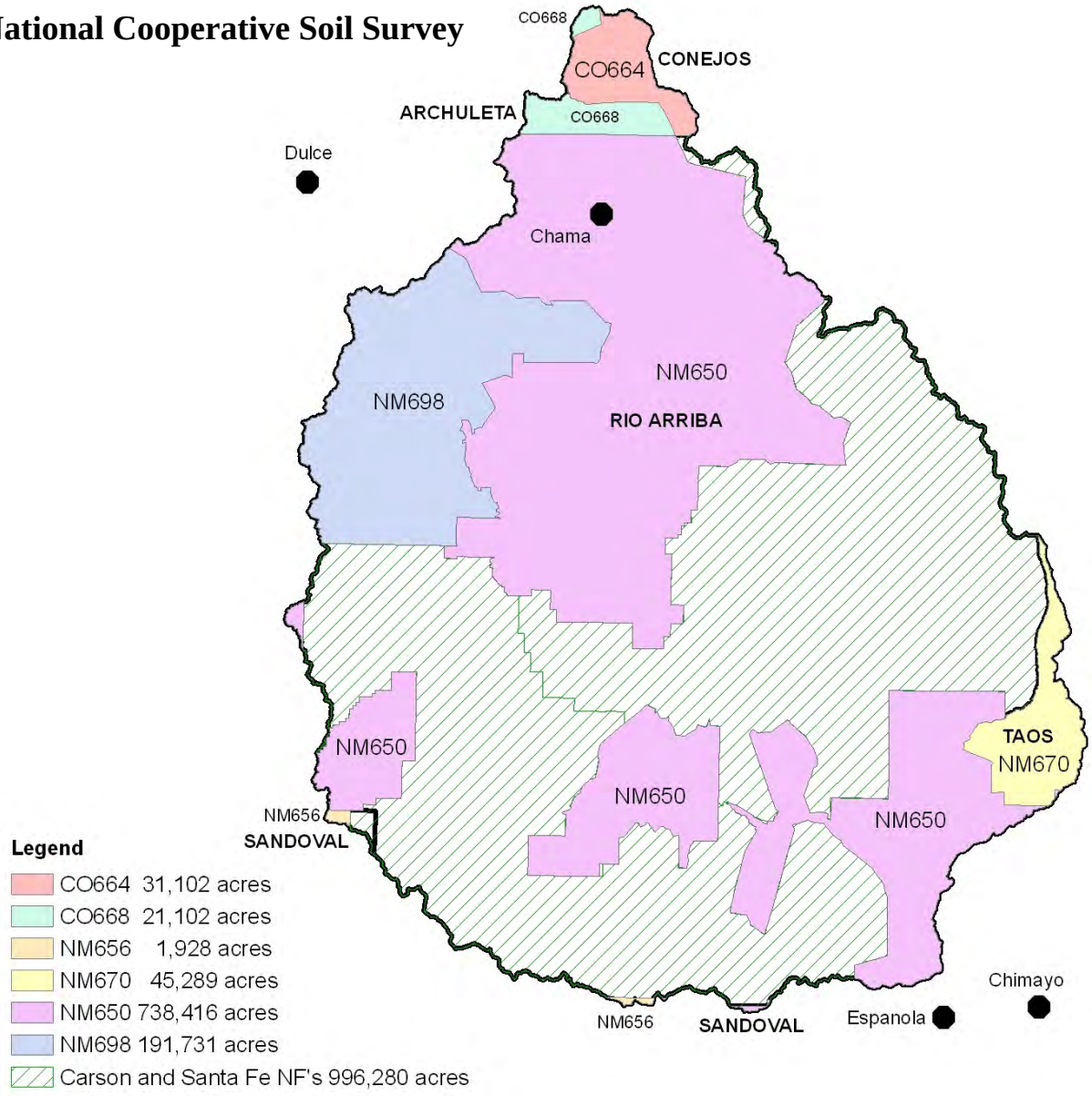
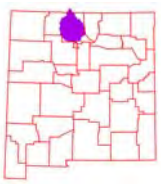


Figure 15. National Cooperative Soil Survey coverage of the Rio Chama Watershed.

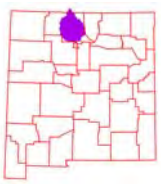


Soil Resource Inventory

In order to evaluate the susceptibility of erosion within the Rio Chama 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 -

SSURGO Value	Nominal Description	Model Rank
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
5 - 10		1
10 - 15		2
15 - 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 12. 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.

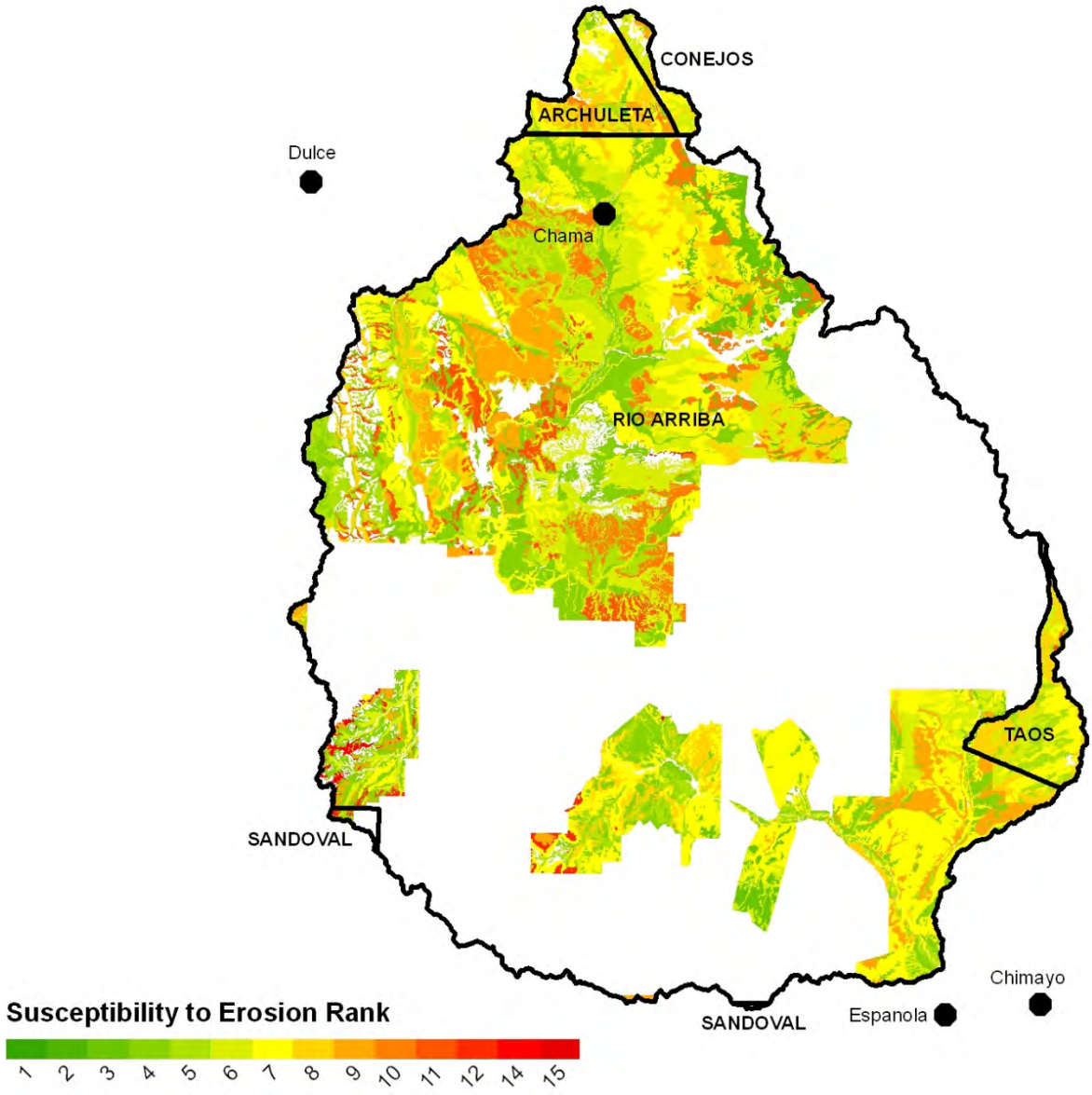
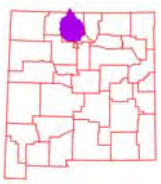


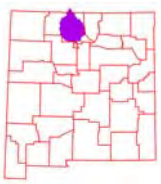
Figure 16. Rio Chama Watershed Erosion Potential.



Soil Resource Inventory

Rank	Acres
1	836
2	86
3	34,009
4	140,617
5	886,504
6	194,264
7	253,267
8	91,166
9	65,999
10	57,242
11	26,187
12	3,480
13	39,426
14	3,298
15	41
Sum(∑)	1,796,422

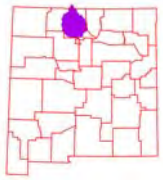
Table 13. Soil Erosion Potential Model Results. A greater rank indicates greater potential for erosion.



Socioeconomic Data [22]

COUNTY	Total population: Total	Total population: Urban	Total population: Rural	Total Pop,: Rural Farm	Total Pop.: Rural Nonfarm	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 adj. 2008
Rio Arriba	41,190	17,678	23,512	544	22,968	30,025	23,320	143	5,717	56	47	10,554	1,353	$41,387
Sandoval	89,908	68,906	21,002	161	20,841	26,437	58,512	1,535	14,634	894	98	11,118	3,117	$56,479
Taos	29,979	12,171	17,808	291	17,517	17,370	19,118	105	1,975	114	35	7,447	1,185	$37,778
Archuleta (CO)	9,898	3,644	6,254	238	6,016	1,659	8,743	35	139	31	3	690	257	$43,259
Conejos (CO)	8,400	0	8,400	547	7,853	4,949	6,112	18	142	13	6	1,806	303	$29,066

Table 14. Socioeconomic Data of the Counties in the Watershed (2000).



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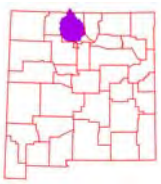

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