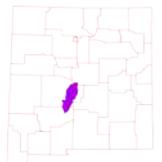


## Rapid Watershed Assessment Jornada Del Muerto Watershed



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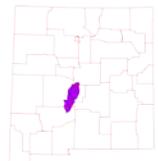


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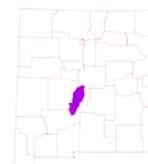
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## Overview

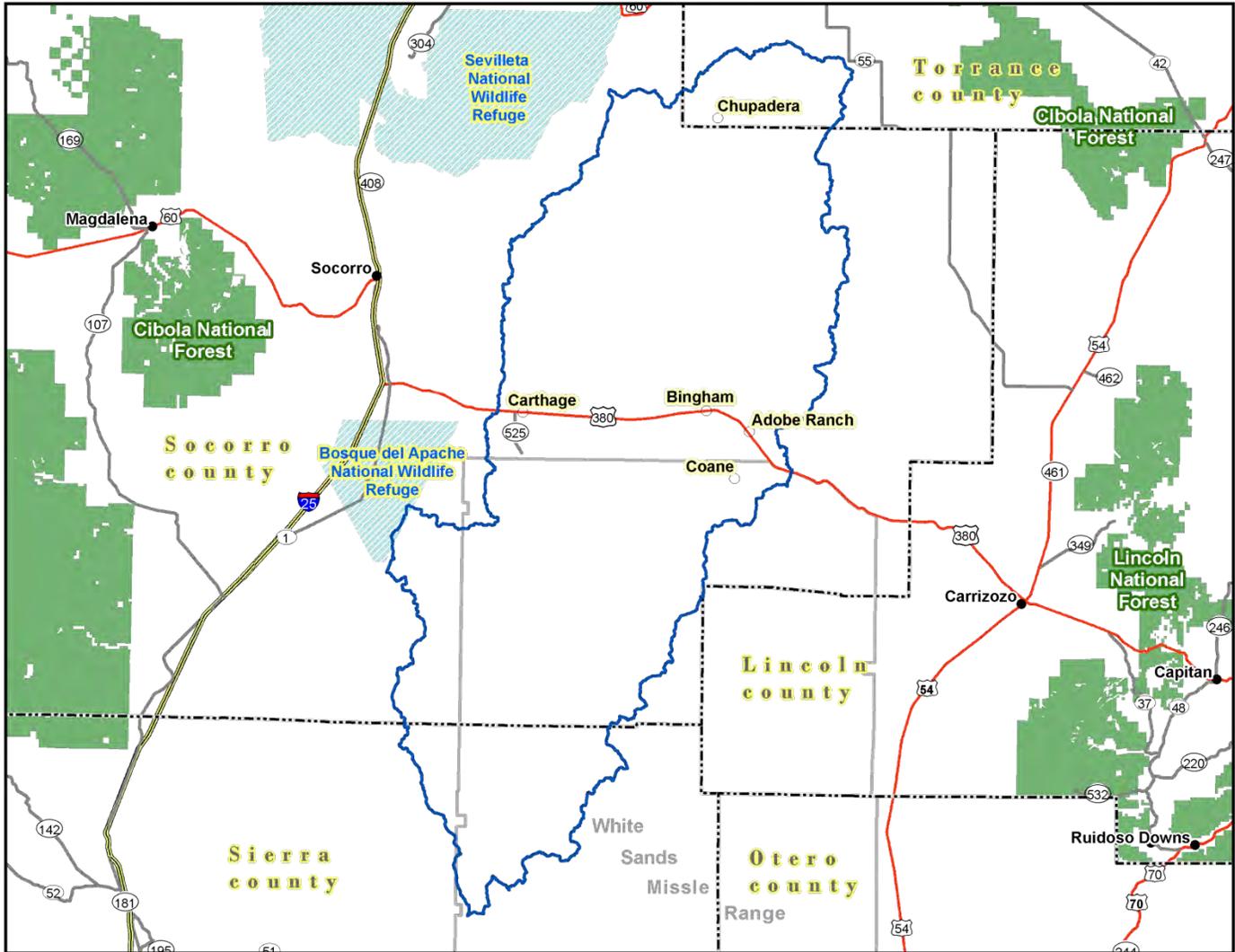


Figure 1 Jornada Del Muerto Watershed Overview

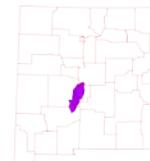


## Overview

The Jornada Del Muerto Watershed is located in central New Mexico and covers 1,094,624 total acres (4,430 sq. km). Portions of the Jornada Del Muerto Watershed are in Lincoln, Sierra, Socorro and Torrance counties. Table 1 summarizes the distribution of the Jornada Del Muerto Watershed.

County	County Acres Total	Acres in HUC	% of HUC in County	% of County in HUC
Lincoln	3,089,787	39	<1%	<1%
Sierra	2,711,883	126,552	12%	5%
Socorro	4,255,295	909,942	83%	21%
Torrance	2,139,978	58,091	5%	3%
Sum ( $\Sigma$ )	--	1,094,624	100	--

Table 1. Jornada Del Muerto Watershed acreage distribution.



## **Physical Setting**

### **Geology: <sup>1</sup>**

The watershed is part of the Rio Grande Rift physiographic province from the Estancia Basin to near Rincon. The rift is a graben with fault block mountains forming the eastern and western boundaries. Mountains to the west are usually volcanic in origin and to the east volcanic or sedimentary.

The mountain ranges consist of Paleoproterozoic Eon aged granitic plutons or quartzite; Tertiary Period aged volcanic (basalt, basaltic-andesite or rhyolite); and Paleoproterozoic Eon aged or earlier volcanic or metamorphic rocks. Pennsylvanian limestone, shale and sandstone occur on the eastern side. The valley floors consist of 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.

The ancestral Rio Grande used to flow through the Jornada Del Muerto in the Late Tertiary Period. Today, it is a closed basin with no flow to the Rio Grande.

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. Wind erosion is a concern especially in the spring. The wind erosion blows away the sands and silts from the natural surfaces and fields.

Groundwater quality and quantity is a concern. Groundwater occurs to a greater or lesser extent in all of these geologic units. The most significant aquifer is the Santa Fe Group, particularly its lower member, the Tesuque Formation. The upper member, the Ancha, is typically more conductive than the Tesuque but occurs above the water table in much of the Santa Fe watershed. Deeper groundwater is nearly continuous in the Tesuque Formation throughout the watershed area, to depths of 2000 feet or greater in some areas. This deep groundwater dates from the Ice Age and is recharged little if at all by present-day rainfall and snowmelt. Volcanics often serve as a “floor” or channel to concentrate percolating groundwater and cause it to emerge as spring flow.

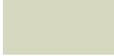
Depth to groundwater is a concern if the shallow unconfined aquifer does not produce enough water for the resource or increased population demands are ‘mining’ the water. Groundwater in the igneous rocks and volcanics is usually along fracture zones which are hard to intercept with water wells. Groundwater 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.

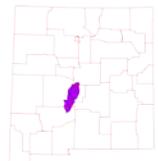
The soils in the Jornada Del Muerto Watershed are assigned to four groups (A, B, C, and D).

 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.



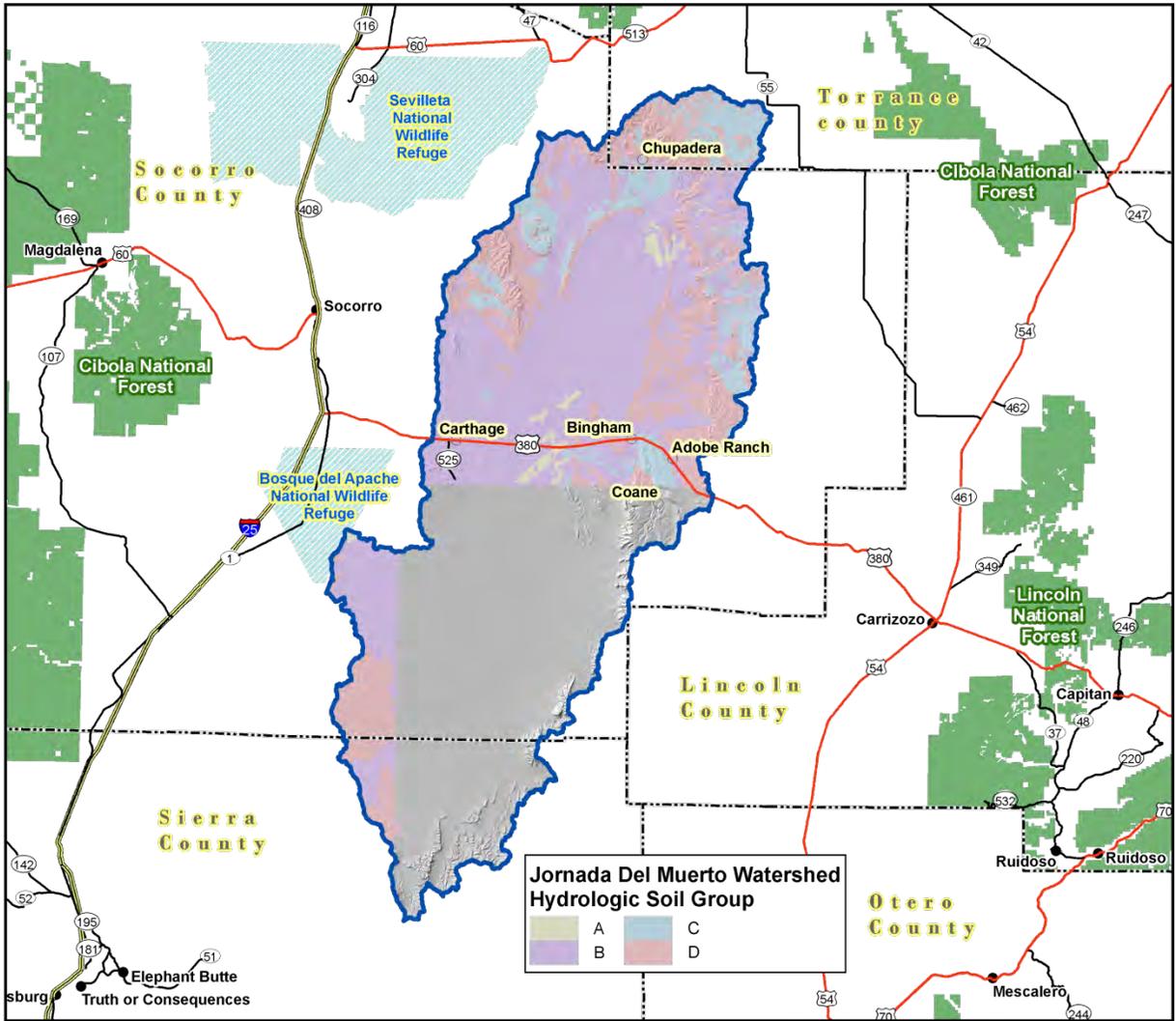
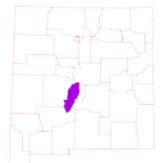


Figure 2. Jornada Del Muerto Watershed Hydrologic Soil Group.



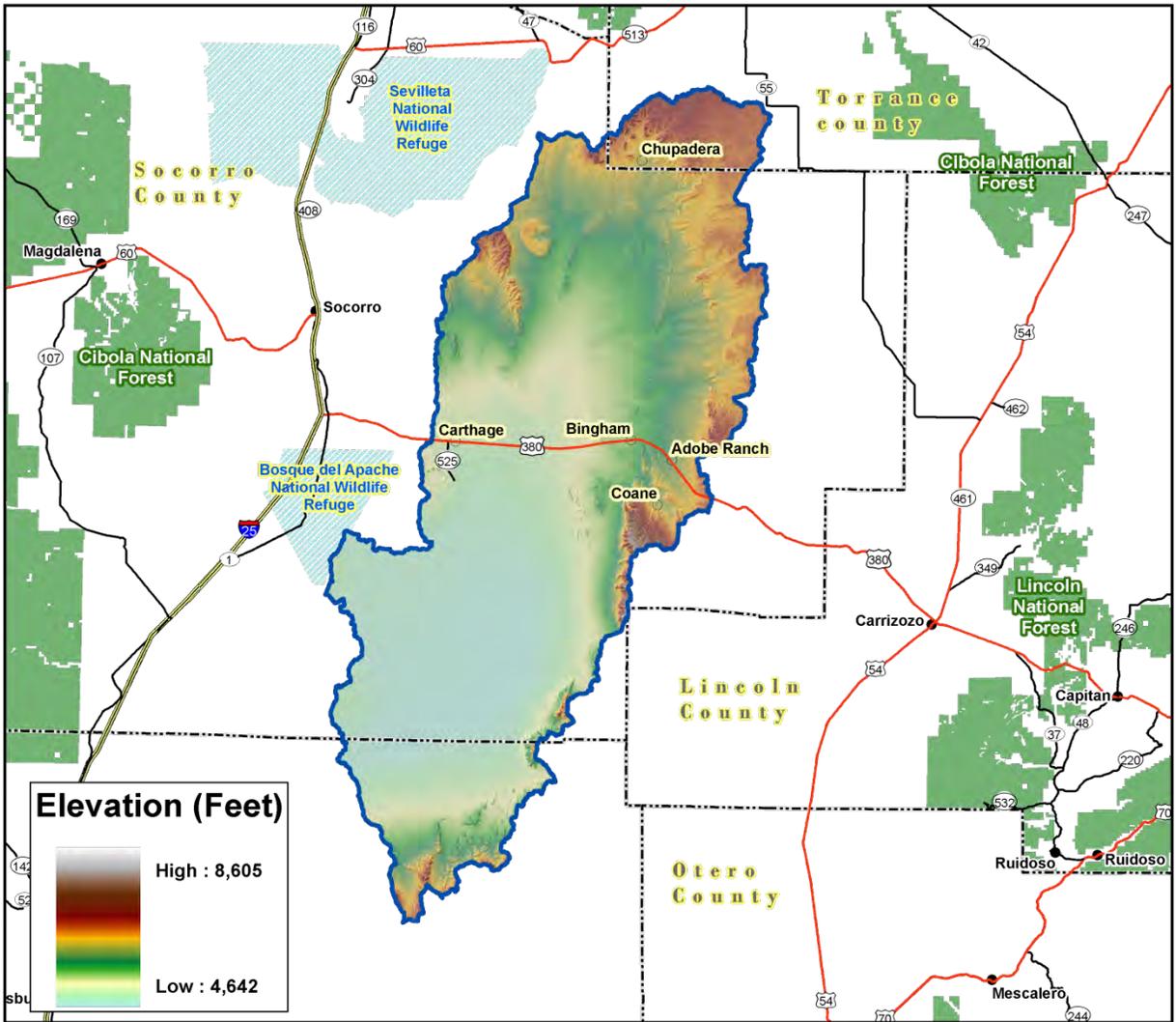
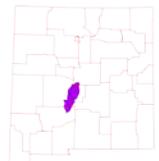


Figure 3. Jornada Del Muerto Watershed Shaded Relief.



## Precipitation <sup>2</sup>

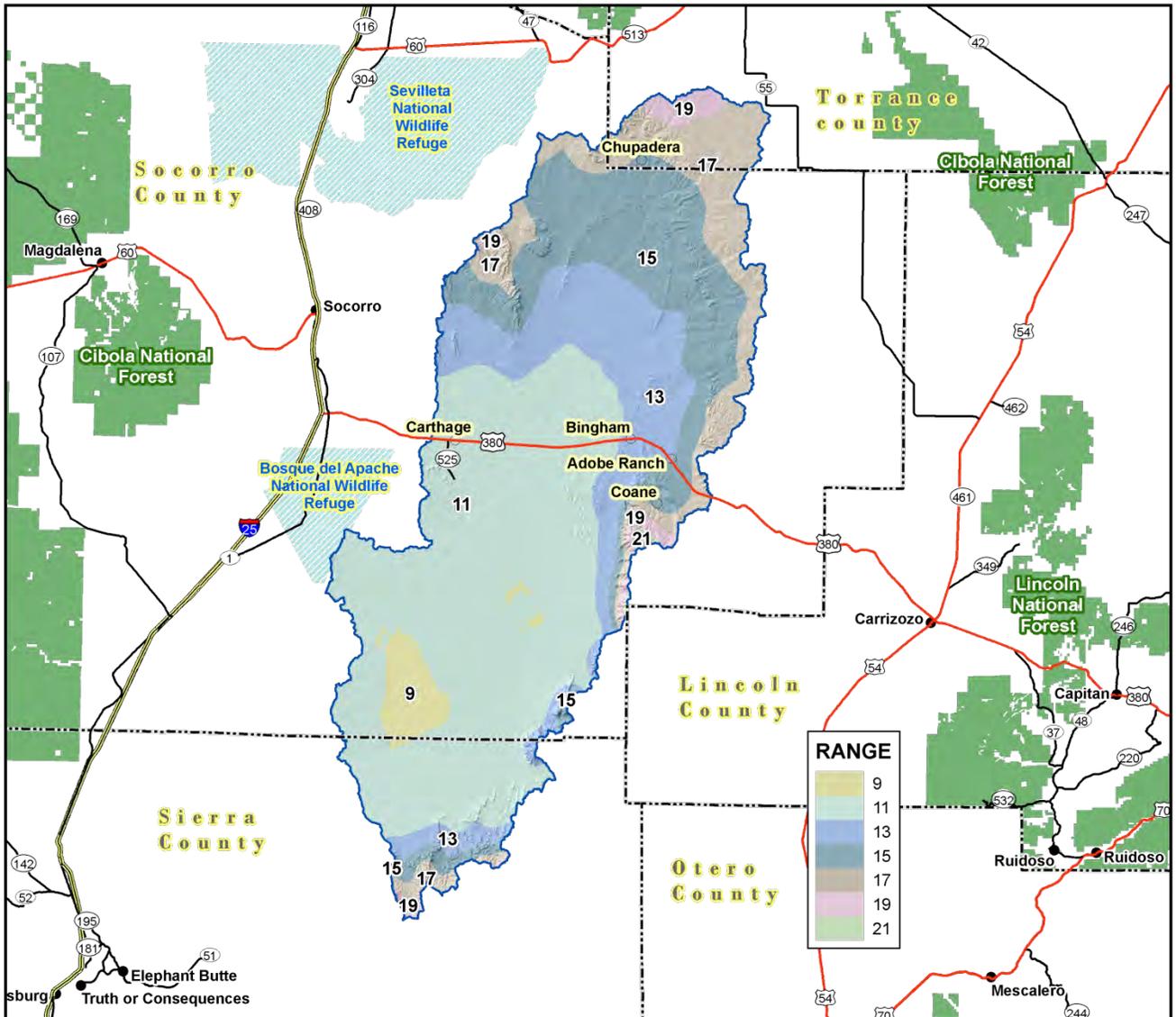
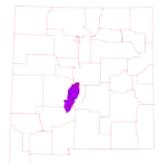


Figure 4. Jornada Del Muerto Watershed Annual Precipitation.



## Land Ownership <sup>3</sup>

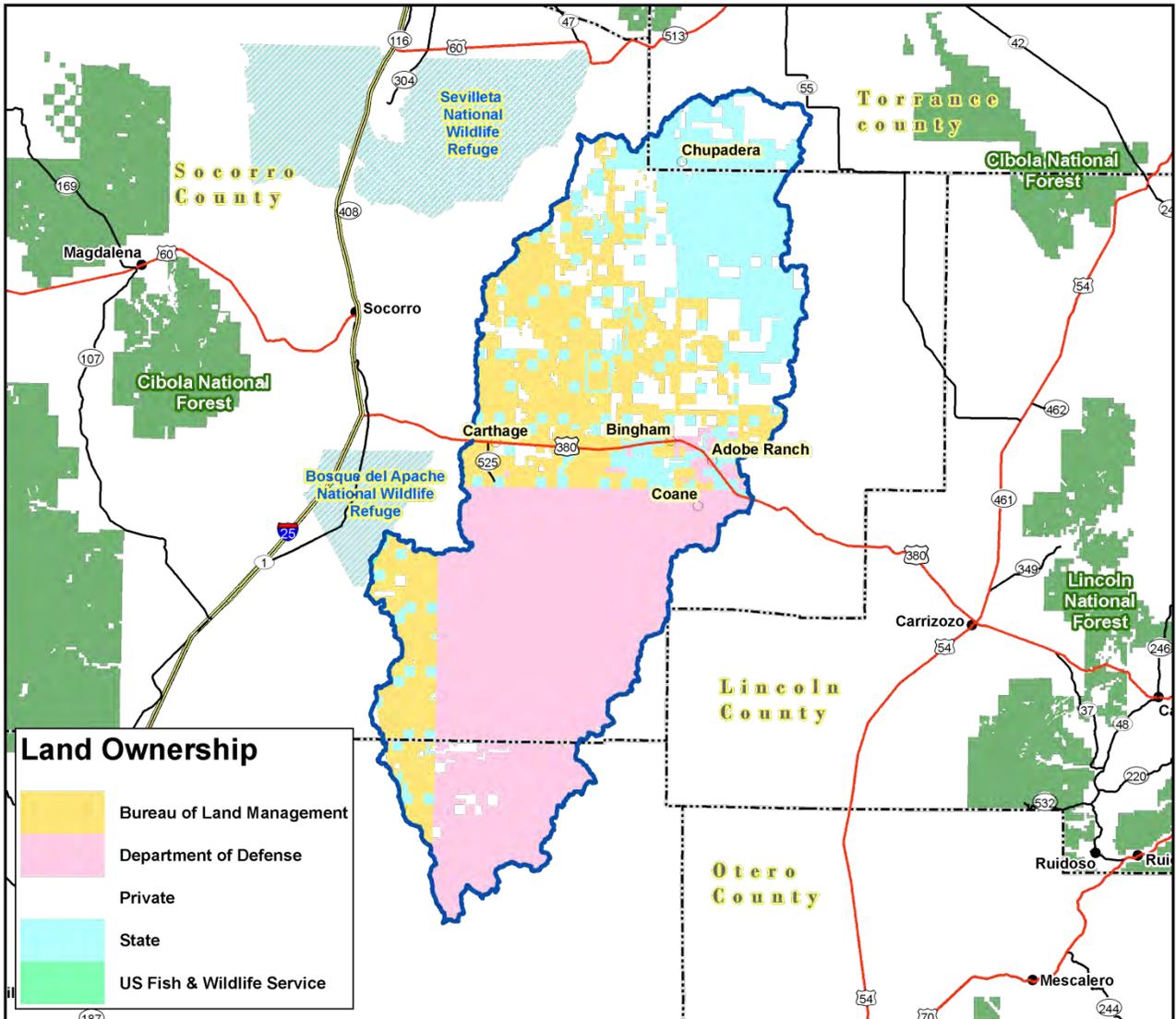
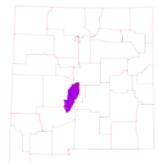


Figure 5. Jornada Del Muerto Watershed Land Ownership.



## Land Ownership

<u>COUNTY</u>	<u>BLM</u>	<u>Department of Defense</u>	<u>U.S. Fishes and Wildlife</u>	<u>Private</u>	<u>State</u>
<b>Lincoln</b>		<b>39</b>			
<b>Sierra</b>	<b>16,938</b>	<b>99,467</b>		<b>7,251</b>	<b>2,922</b>
<b>Socorro</b>	<b>265,720</b>	<b>327,776</b>	<b>762</b>	<b>123,634</b>	<b>192,342</b>
<b>Torrance</b>				<b>21,516</b>	<b>36,602</b>
<b>Watershed (Σ)</b>	<b>282,659</b>	<b>427,283</b>	<b>762</b>	<b>152,400</b>	<b>231,866</b>
<b>% Watershed</b>	<b>26%</b>	<b>39%</b>	<b>&lt;1%</b>	<b>14%</b>	<b>21%</b>

Table 2. Land Ownership in the Jornada Del Muerto Watershed.



**Land Use / Land Cover** <sup>4,5</sup>

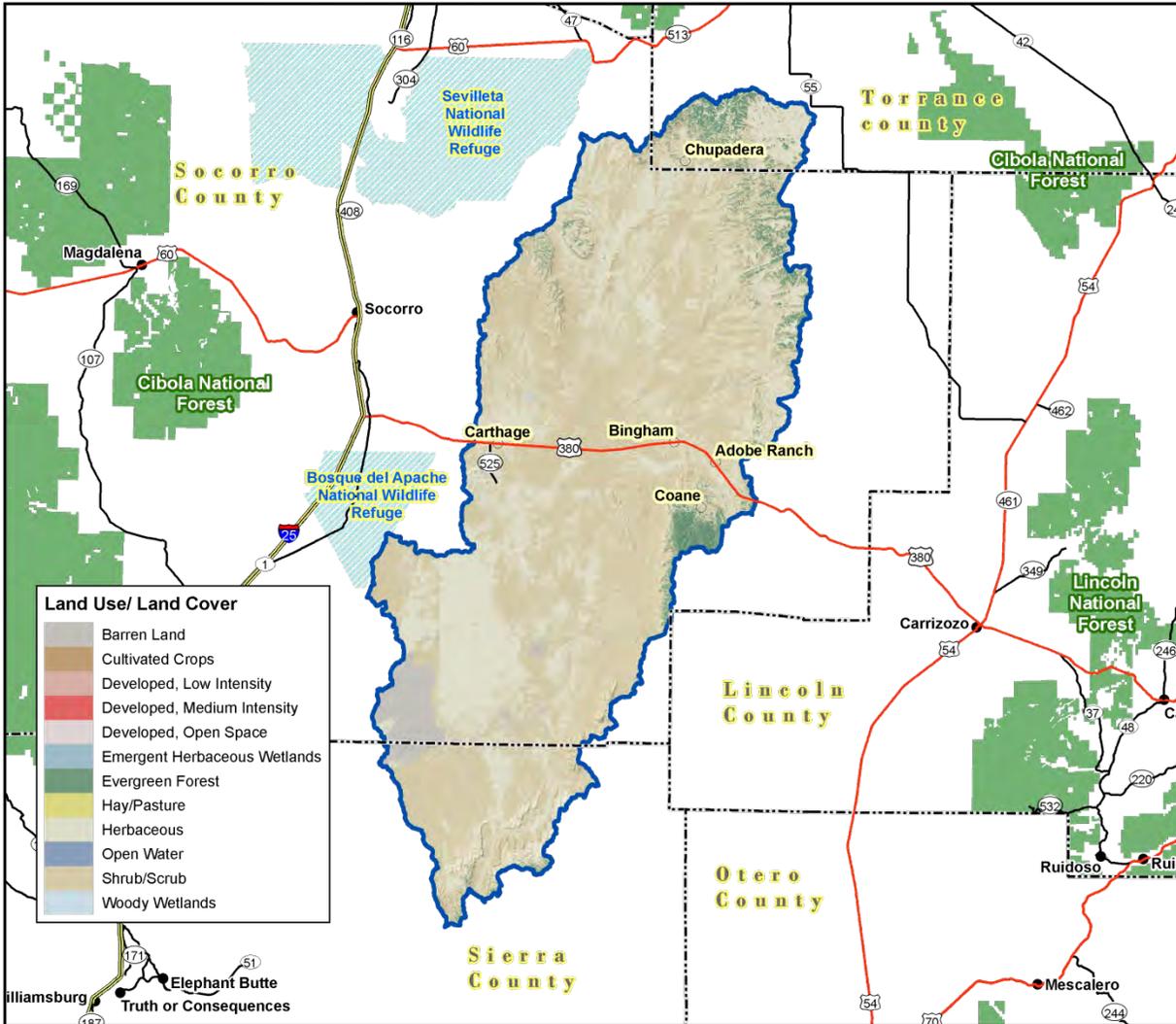
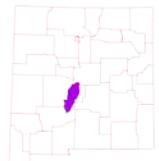


Figure 6. Subset of the National Land Cover Dataset in the Jornada Del Muerto Watershed.

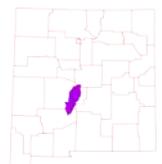


## Land Use / Land Cover

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>
<b>Shrub/Scrub</b>	<b>637,080</b>	<b>58%</b>
<b>Herbaceous</b>	<b>372,757</b>	<b>34%</b>
<b>Evergreen Forest</b>	<b>46,461</b>	<b>4%</b>
<b>Barren Land</b>	<b>35,536</b>	<b>3%</b>
<b>Developed, Open Space</b>	<b>1,330</b>	<b>&lt; 1%</b>
<b>Woody Wetlands</b>	<b>901</b>	<b>&lt; 1%</b>
<b>Emergent Herbaceous Wetlands</b>	<b>306</b>	<b>&lt; 1%</b>
<b>Cultivated Crops</b>	<b>218</b>	<b>&lt; 1%</b>
<b>Hay/Pasture</b>	<b>76</b>	<b>&lt; 1%</b>
<b>Developed, Low Intensity</b>	<b>7</b>	<b>&lt; 1%</b>
<b>Developed, Medium Intensity</b>	<b>3</b>	<b>&lt; 1%</b>
<b>Open Water</b>	<b>2</b>	<b>&lt; 1%</b>

Table 3. Extent of NLCD classes in the Jornada Del Muerto Watershed.



## Land Use / Land Cover

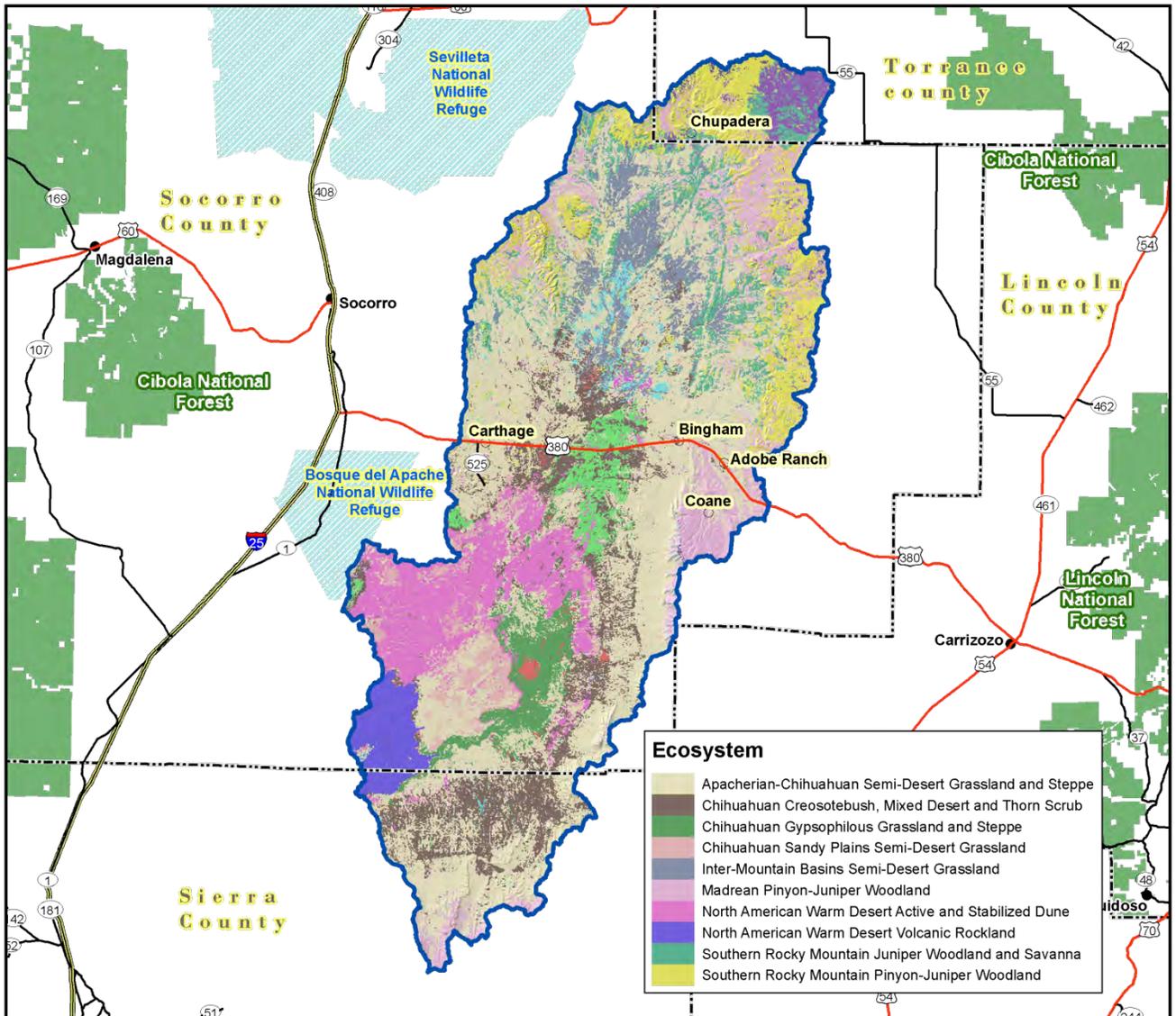
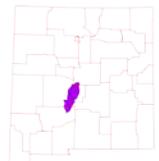


Figure 7. Subset of the SWREGAP over the Jornada Del Muerto Watershed. The 10 dominant ecosystems are displayed in the legend.



## Land Use / Land Cover

The land cover 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.

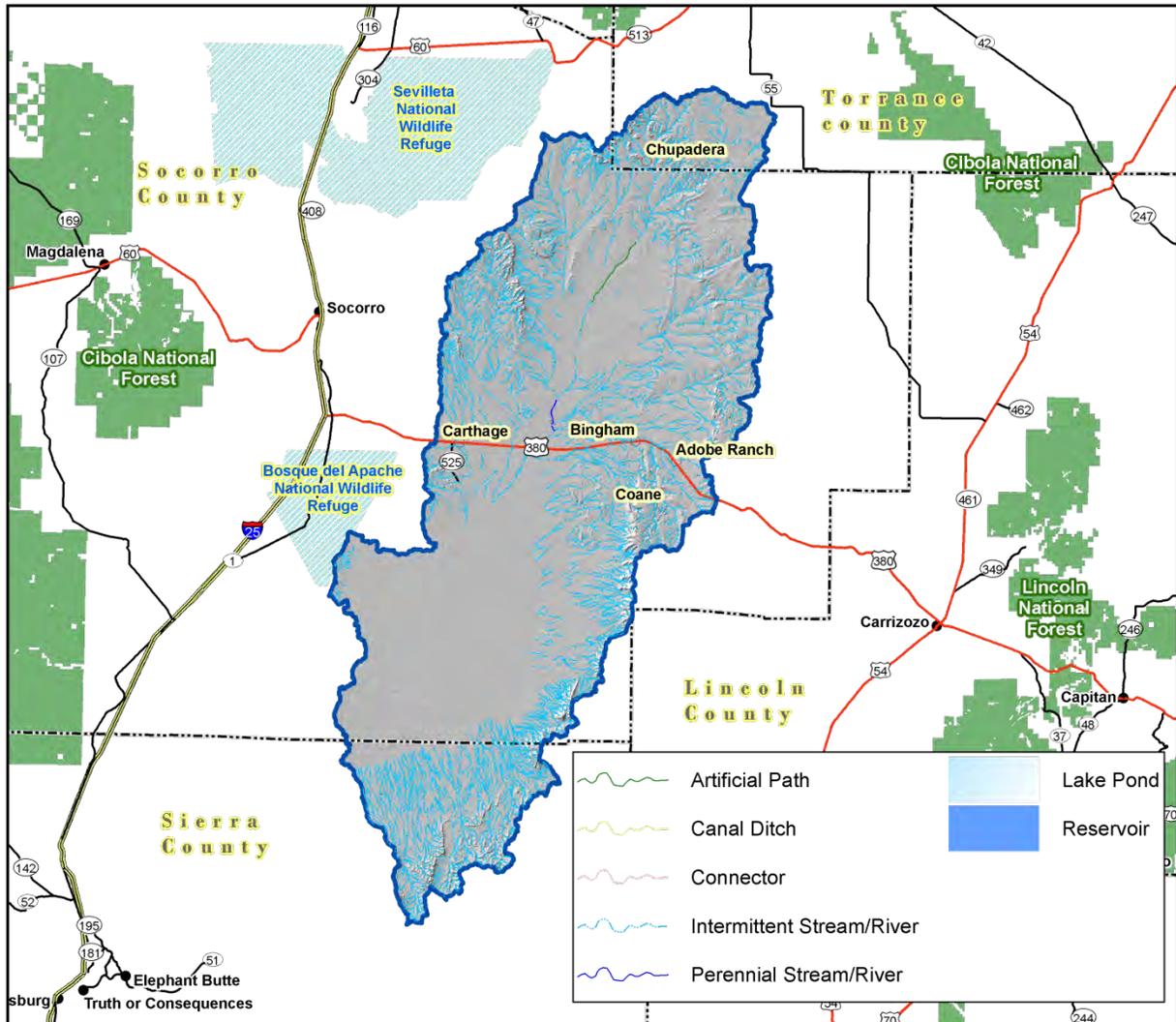
<b>ECOSYSTEM</b>	<b>Acres</b>	<b>% of Watershed</b>
<b>Apacherian-Chihuahuan Semi-Desert Grassland and Steppe</b>	<b>412,888</b>	<b>38%</b>
<b>Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub</b>	<b>106,556</b>	<b>10%</b>
<b>Madrean Pinyon-Juniper Woodland</b>	<b>96,599</b>	<b>9%</b>
<b>Southern Rocky Mountain Pinyon-Juniper Woodland</b>	<b>93,667</b>	<b>9%</b>
<b>North American Warm Desert Active and Stabilized Dune</b>	<b>87,055</b>	<b>8%</b>
<b>Southern Rocky Mountain Juniper Woodland and Savanna</b>	<b>57,239</b>	<b>5%</b>
<b>Inter-Mountain Basins Semi-Desert Grassland</b>	<b>47,203</b>	<b>4%</b>
<b>Chihuahuan Gypsophilous Grassland and Steppe</b>	<b>36,121</b>	<b>3%</b>
<b>Chihuahuan Sandy Plains Semi-Desert Grassland</b>	<b>34,954</b>	<b>3%</b>
<b>North American Warm Desert Volcanic Rockland</b>	<b>28,866</b>	<b>3%</b>

Table 4. SW Region Gap analysis ecosystem acreages.

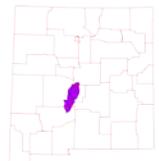


**Hydrology** 6,7,8,9,10

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 2,611 miles (4,202 km) of water courses in the Jornada Del Muerto Watershed. The majority of these courses typically flow intermittently in summer months during periods associated with high intensity convective thunderstorms.



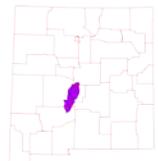
**Figure 8 National Hydrologic Dataset (NHD) of the Jornada Del Muerto Watershed.**



Water Course Type	Miles
Artificial Path	17
Canal / Ditch	1
Intermittent Stream / River	2,590
Perennial Stream / River	3
<b>Sum (<math>\Sigma</math>)</b>	<b>2,611</b>

Table 5. NHD Water Course Type and Extents

## Hydrology



## **Gauging Stations:**

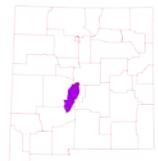
There are no Gauging Stations for this watershed.

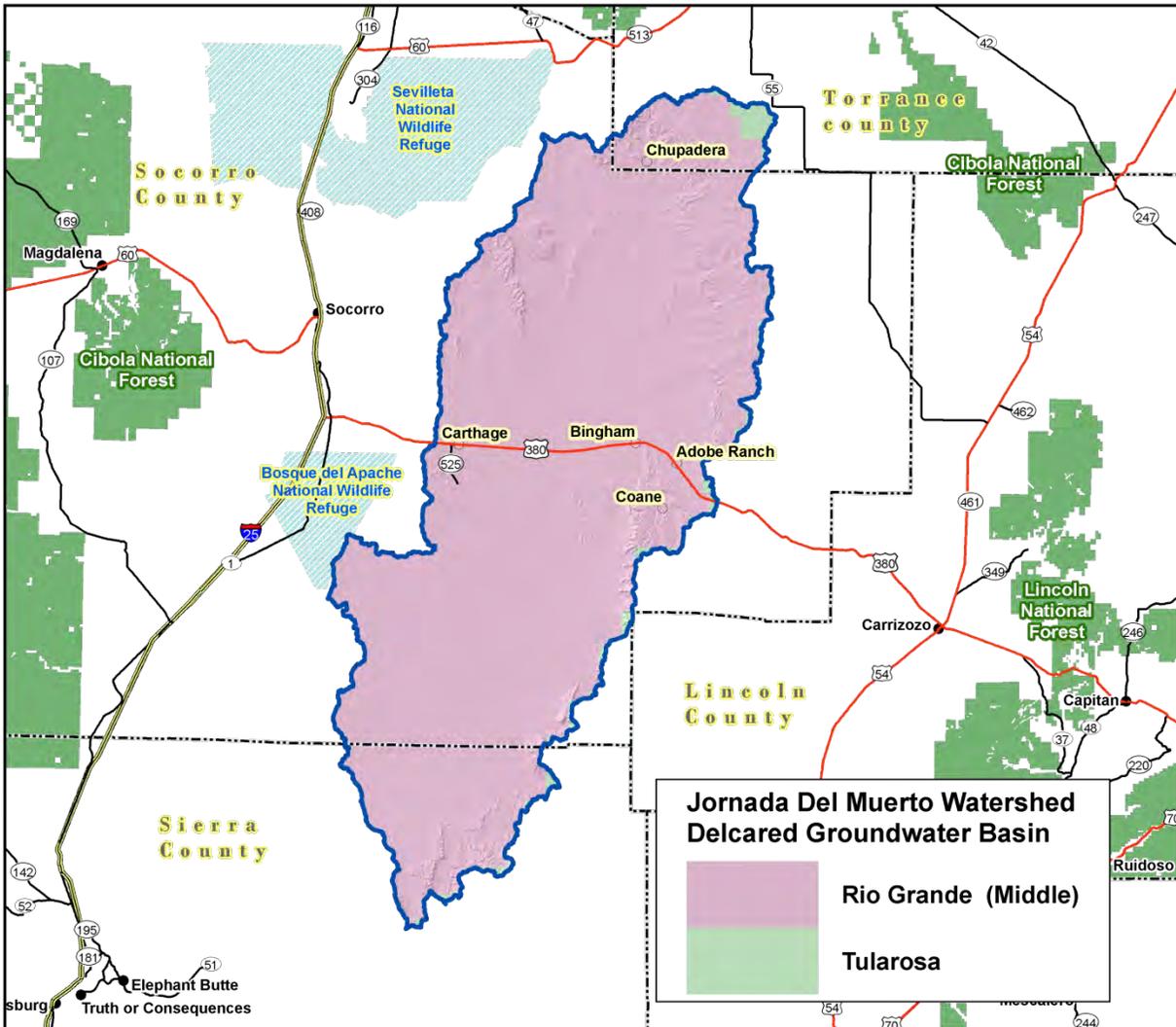
## **New Mexico Water Quality Control Commission (NMWQCC):**

The New Mexico Water Quality Control Commission (NMWQCC) is the issuing agency of water quality standards for interstate and intrastate waters in New Mexico.

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.

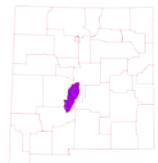
There are no Impaired Waters for this watershed.





**Figure 9. Declared Groundwater Basins of the Jornada Del Muerto.**

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 Jornada Del Muerto Watershed is within the Rio Grande (Middle) and Tularosa Underground Water Basins. The surface watershed in New Mexico covers 1,094,624 of the approximately 29,764,917 million acres of these underground water basin in New Mexico.

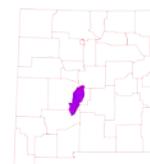


## Threatened and Endangered Species <sup>11</sup>

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 6 lists those species which are currently listed and tracked in the Jornada Del Muerto Watershed.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Tax Class</u>	<u>Family</u>	<u>Federal Status</u>	<u>State Status</u>
Baird's Sparrow	<a href="#"><i>Ammodramus bairdii</i></a>	Aves	Emberizidae		T
Northern Aplomado Falcon	<a href="#"><i>Falco femoralis septentrionalis</i></a>	Aves	Falconidae	LE	E
Gray Vireo	<a href="#"><i>Vireo vicinior</i></a>	Aves	Vireonidae		T
Sand Prickly-pear	<a href="#"><i>Opuntia arenaria</i></a>	Dicotyledoneae	Cactaceae		E
Todsens's Pennyroyal	<a href="#"><i>Hedeoma todsenii</i></a>	Dicotyledoneae	Lamiaceae	LE	E
Organ Mountains Chipmunk	<a href="#"><i>Neotamias quadrivittatus australis</i></a>	Mammalia	Sciuridae		T

Table 6. Threatened and Endangered Plant and Animal Species.



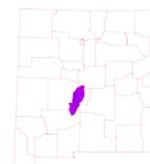
## Invasive Species <sup>12</sup>

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 Jornada Del Muerto 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.

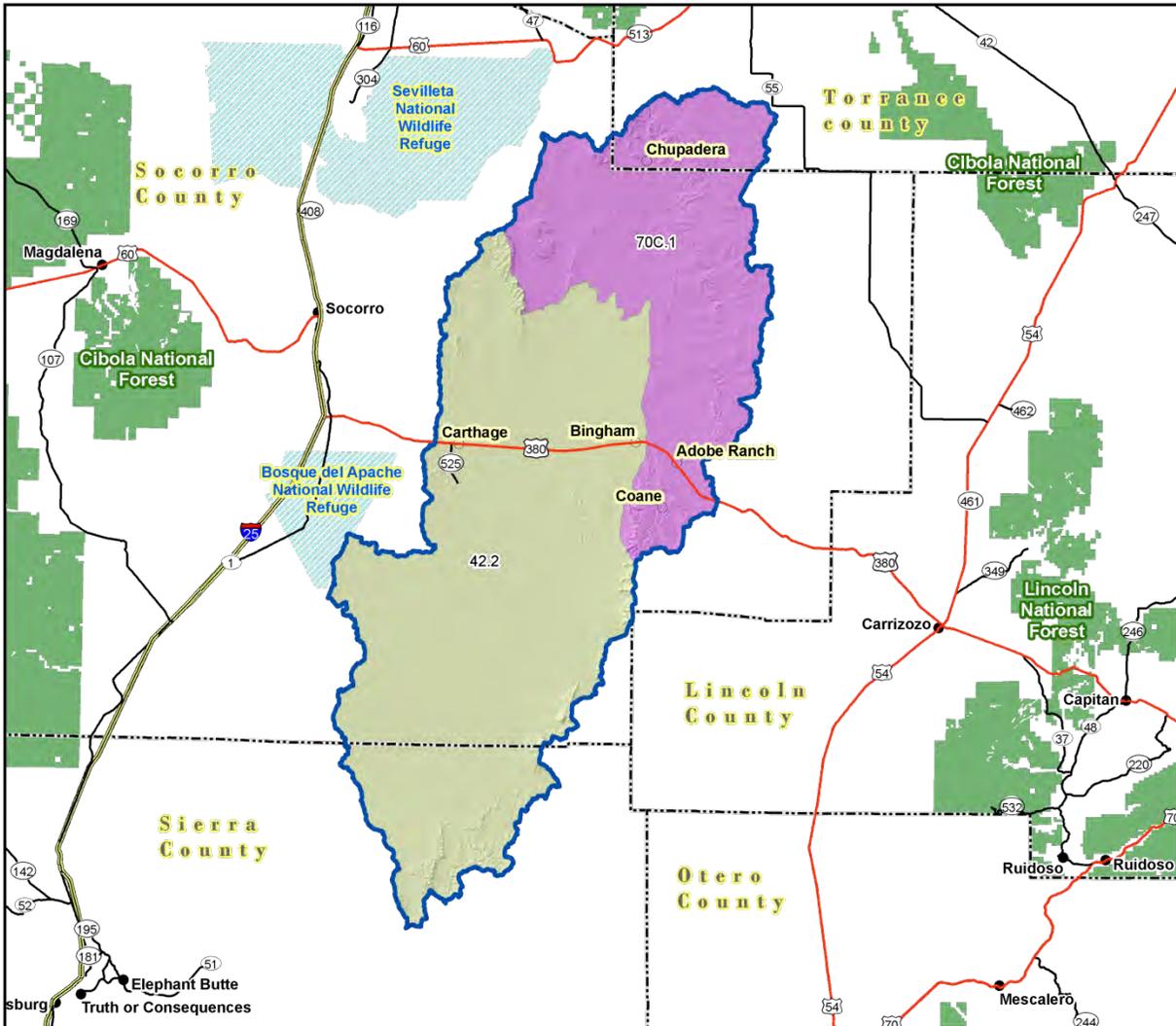
<u>Scientific Name</u>	<u>Common Name</u>
<i>Zygophyllaceae (Caltrop Family)</i>	African Rue
<i>Fabaceae (Pea Family)</i>	Camelthorn
<i>Scrophulariaceae (Figwort Family)</i> Class A Weed	Dalmation Toadflax
<i>Brassicaceae (Mustard Family)</i>	Hoary Cress
<i>Asteraceae (Sunflower Family)</i>	Musk Thistle
<i>Brassicaceae (Mustard Family)</i>	Perennial Pepperweed (Tall Whitetop)
<i>Asteraceae (Sunflower Family)</i>	Russian Knapweed

Table 7. Invasive Species Recognized by the SWEMP.

## Common Resource Areas <sup>13</sup>

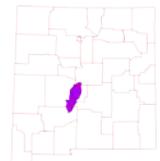


A Common Resource Area (CRA) is defined as a geographical area where resource concerns, problems, or treatment needs are similar. It is considered a subdivision of an existing Major Land Resource Area (MLRA) designation. Landscape conditions, soil, climate, human considerations, and other natural resource 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 10. Common Resource Areas of the Jornada Del Muerto Watershed.**  
**Common Resource Areas**

**42.2 Chihuahuan Desert Shrubs**



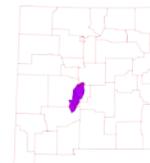
This unit occurs within the Basin and Range Physiographic Province and is characterized by valley plains, alluvial fans, and mountains. Sediments are from fluvial, lacustrine, colluvial and alluvial deposits. Igneous and metamorphic rock dominate the mountain ranges. Elevations range from 3800 to 5200 feet. Precipitation ranges from 8 to 10 inches per year. The soil temperature regime is thermic. The soil moisture regime is typic aridic. Vegetation includes Creosote, tarbush, soap tree yucca, torrey yucca, tobosa, and alkali sacaton.

### **70C.1 Central New Mexico Highlands**

This unit occurs within the Basin and Range Physiographic Province and is characterized by valley plains, alluvial fans, and mountains. Sediments are from fluvial, lacustrine, colluvial and alluvial deposits. Igneous and metamorphic rock dominate the mountain ranges. Elevations range from 3800 to 5200 feet. Precipitation ranges from 8 to 10 inches per year. The soil temperature regime is thermic. The soil moisture regime is typic aridic. Vegetation includes Creosote, tarbush, soap tree yucca, torrey yucca, tobosa, and alkali sacaton.

## **Conservation** <sup>14</sup>

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	2007		2008		2009		2010		2011		TOTAL	
	#	Acres	#	Acres								
<b>Brush Management</b>	2	38,677	2	32,727	1	34,553	1	6,496	1	3,977	7	116,431
Prescribed Grazing	2	6,440	1	10,286			2	20,726	4	38,910	9	76,362
<b>Upland Wildlife Habitat Management</b>	2	43,159	2	23,836	2	29,931	1	9,433	1	2,721	8	109,080
<b>SUM (Σ)</b>	6	88,276	5	66,848	3	64,484	4	36,656	6	45,609	24	301,874

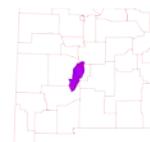
Table 8. 5 year Trends in Applied Conservation Practices. Reported in Acres.

Conservation Practice	2007		2008		2009		2010		2011		TOTAL	
	#	Feet	#	Feet	#	Feet	#	Feet	#	Feet	#	Feet
<b>Fence</b>	1	2,620			1	12,405	2	15,671	1	1,279	5	31,975
Pipeline			1	19,619	1	13,740			1	14,789	3	48,148
<b>SUM (Σ)</b>	1	2,620	1	19,619	2	26,146	2	15,671	2	16,068	8	80,123

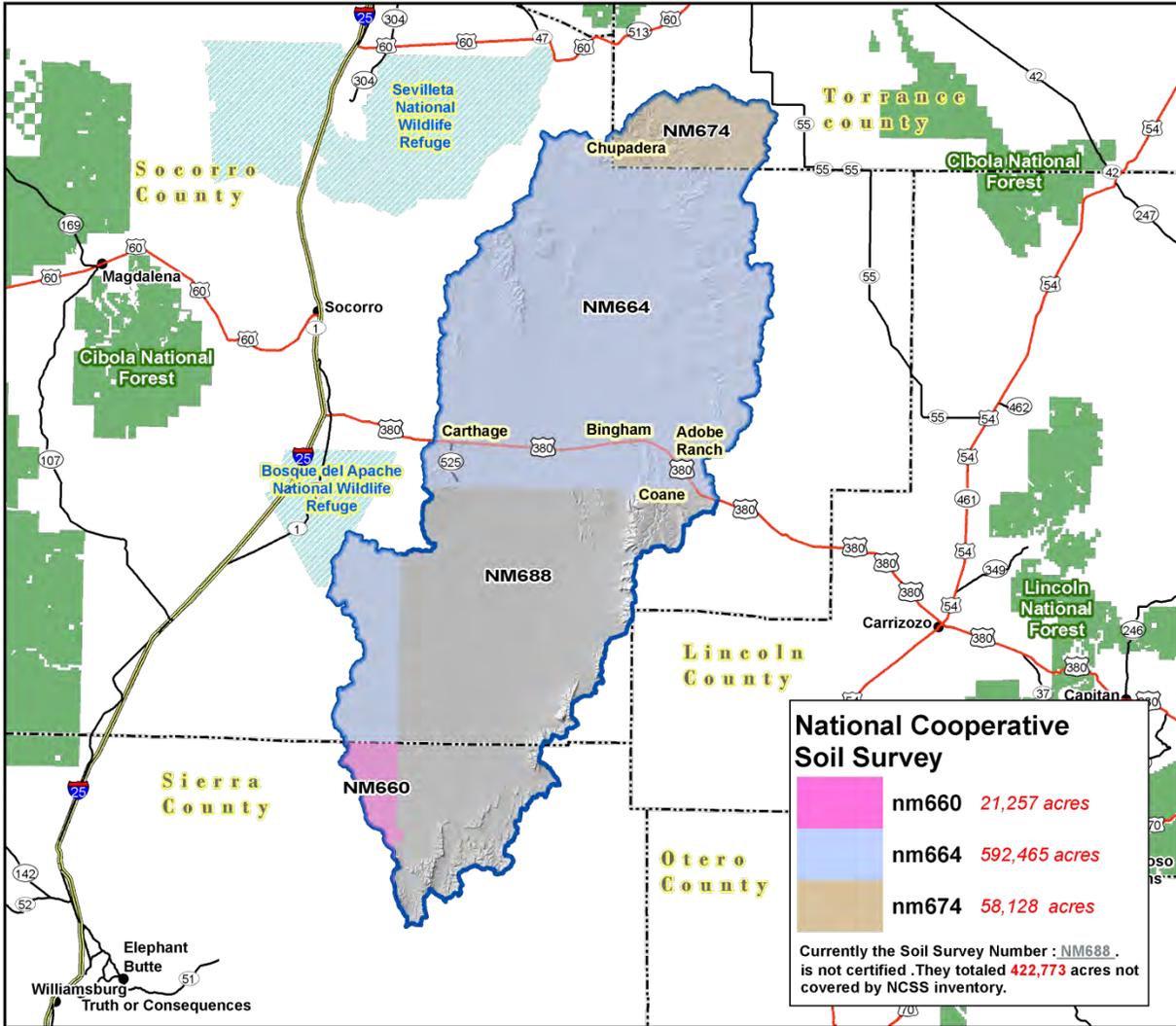
Table 9. 5 Year Trends in Location Specific Applied Conservation Practices. Reported in Feet if Linear (i.e. Fence)

### Soil Resource Inventory <sup>15</sup>

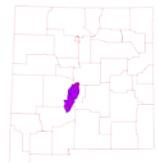
The Jornada Del Muerto Watershed has a number of certified National Cooperative Soil Survey (NCSS) inventories. Soils data is available from the NRCS Soil Data Mart at <http://soildatamart.nrcs.usda.gov/> and/or the NRCS Geospatial Data Gateway at <http://datagateway.nrcs.usda.gov> . Soil Survey NM668 will be available soon.



**National Cooperative Soil Survey:**



**Figure 11. National Cooperative Soil Survey coverage of the Jornada Del Muerto Watershed.**



## Soil Resource Inventory

In order to evaluate the susceptibility of erosion within the Jornada Del Muerto 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 map unit 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 as listed -

<u>SSURGO Value</u>	<u>Nominal Description</u>	<u>Model Rank</u>
<b>Saturated Hydraulic Conductivity</b>		
µm / s		
705.0 - 100.0	Very High	0
99.9 - 10.0	High	1
9.9 - 1.0	Moderately High	2
0.9 - 0.1	Moderately Low	3
0.09 - 0.01	Low	4
<b>Slope %</b>		
0 - 5		0
6 - 10		1
11 - 15		2
16 - 25		3
> 25		4
<b>Soil Loss Tolerance</b>		
5	High Tolerance For loss	0
4	↓	1
3	↓	2
2	↓	3
1	Low Tolerance For Loss	4
<b>Wind Erodibility Group</b>		
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 10. 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. White Sands Missile Range soils are not able to be included in the model at his time.

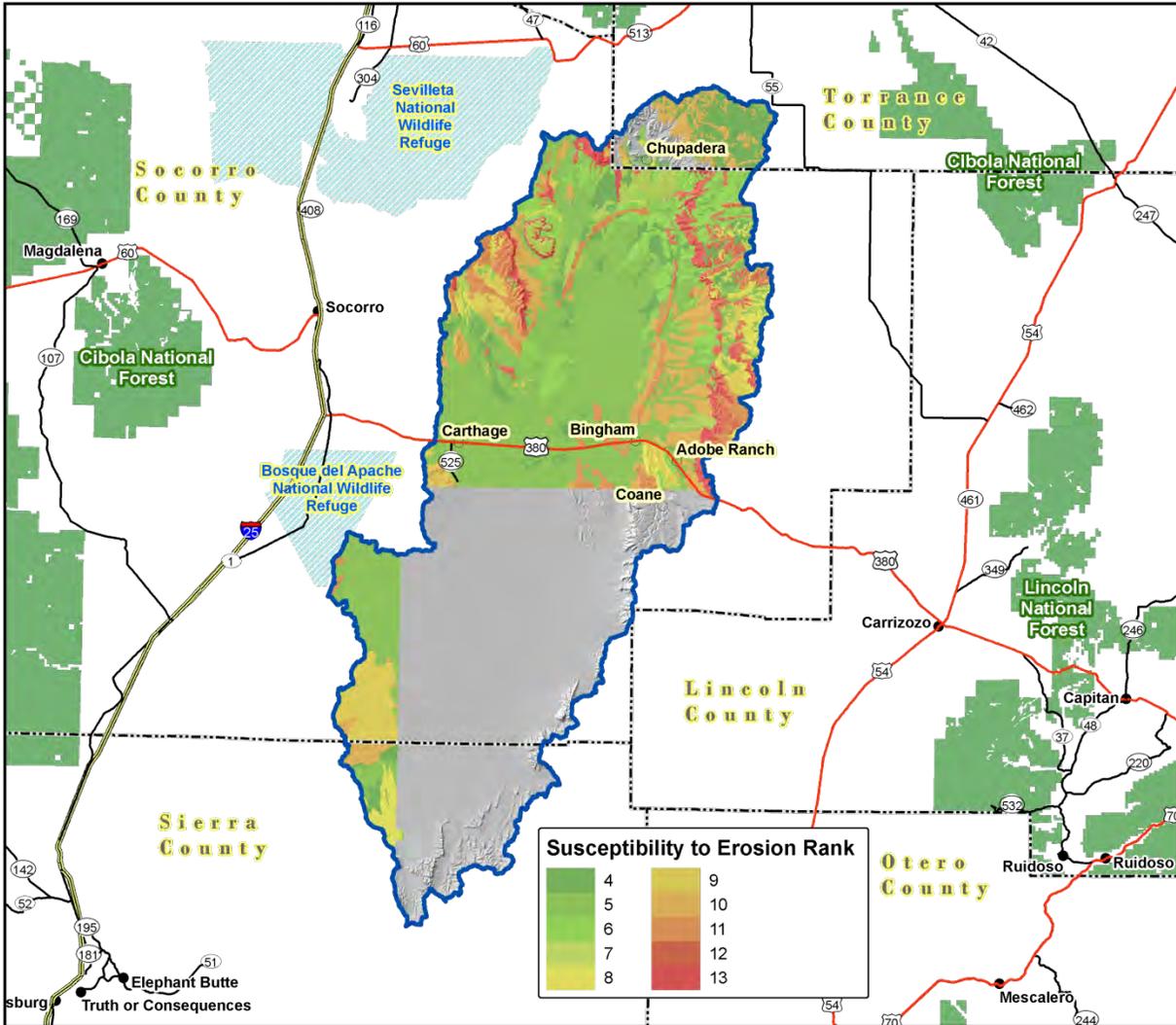
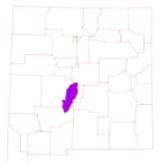


Figure 1.2 Jornada Del Muerto Watershed Erosion Potential.



**Soil Resource Inventory**

<b><u>Rank</u></b>	<b><u>Acres</u></b>
<b>4</b>	<b>59,254</b>
<b>5</b>	<b>295,555</b>
<b>6</b>	<b>55,871</b>
<b>7</b>	<b>21,353</b>
<b>8</b>	<b>29,040</b>
<b>9</b>	<b>39,059</b>
<b>10</b>	<b>70,555</b>
<b>11</b>	<b>36,908</b>
<b>12</b>	<b>24,470</b>
<b>13</b>	<b>23,045</b>
<b>Sum( <math>\Sigma</math> )</b>	<b>655,111</b>

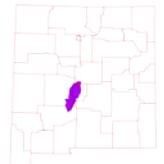
**Table 11. Soil Erosion Potential Model Results. A greater rank indicates greater potential for erosion.**



**Socioeconomic Data 2010** <sup>16</sup>

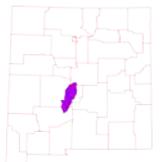
COUNTY	Total population: Total	Total population: Hispanic or Latino	Total population: White alone	Total population: Black or African American alone	Total population: American Indian and Alaska Native alone	Total population: Asian alone	Total population: Native Hawaiian and Other Pacific Islander alone	Total population: Some other race alone	Total population: Two or more races	Families: Median family income adj. 2010
Lincoln	3,725	709	3,344	16	99	7	0	142	117	40,906
Sierra	11,988	3,352	10,265	49	199	49	3	1,032	391	38,641
Socorro	17,866	8,664	13,424	188	2,082	219	8	1,442	503	41,964
Torrance	16,383	6,399	9,173	172	274	61	7	24	273	34,461

**Table 12. Socioeconomic Data of the Counties in the Watershed (2010).**



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15. Natural Resources Conservation Service – Soil Data Mart <http://soildatamart.nrcs.usda.gov/>



16. United States Census Bureau - <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>

