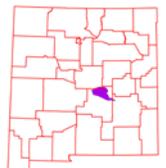
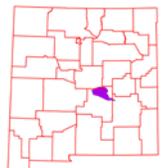


# Rapid Watershed Assessment Gallo Arroyo Watershed



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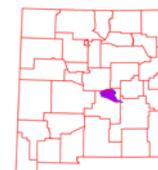
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## Overview

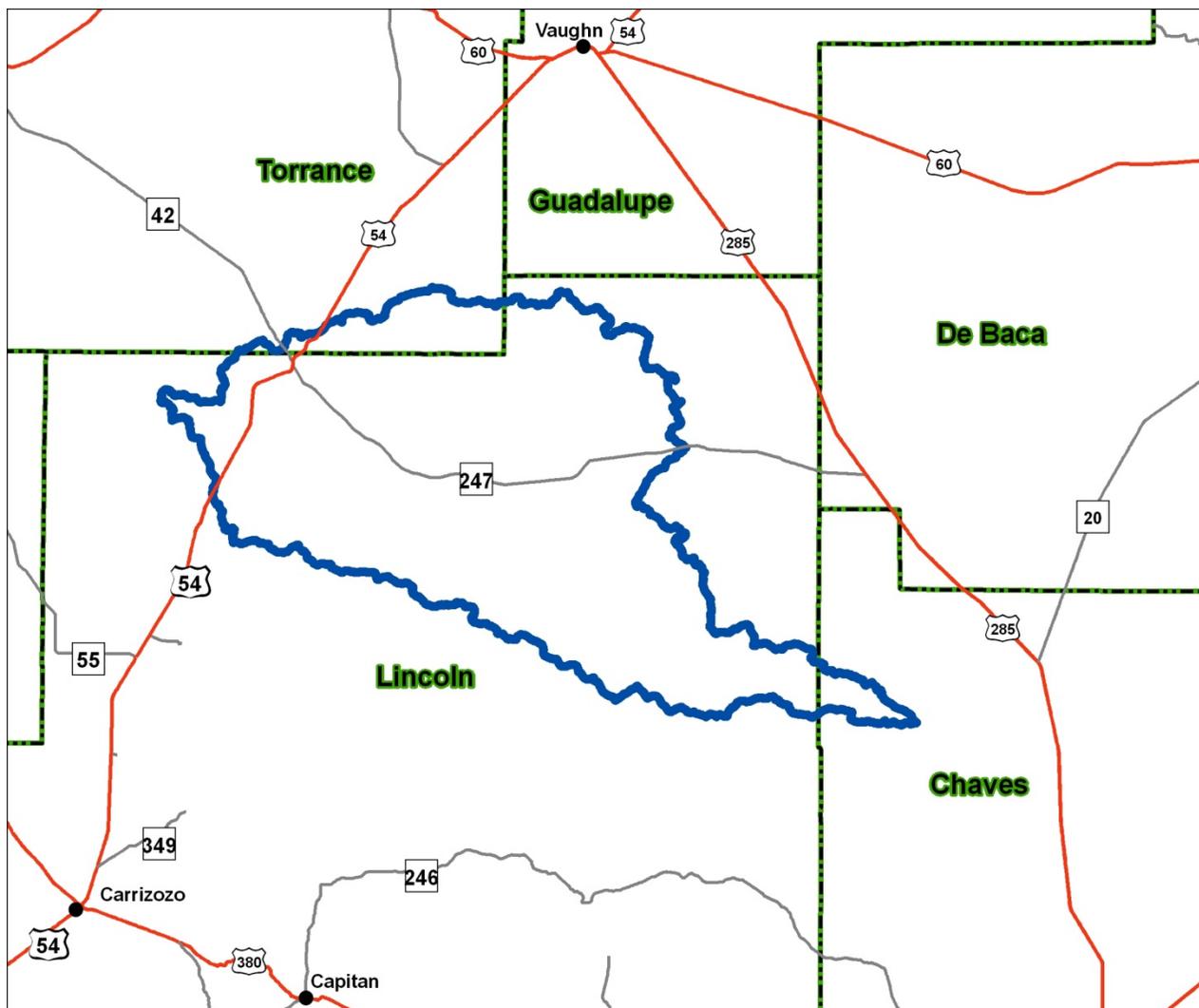
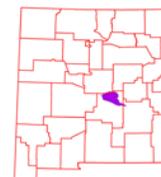


Figure 1. Gallo Arroyo Watershed Overview

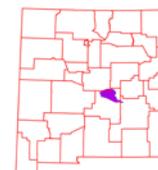


## Overview

The Gallo Arroyo Watershed is located in central New Mexico. It covers 557,570 total acres (2,256 sq. km). Portions of the Gallo Arroyo watershed extend into Torrance, Lincoln, and Chavez counties. Table 1 summarizes the distribution of the Gallo Arroyo watershed.

**Table 1. Gallo Arroyo watershed acreage distribution.**

|                  | County Acres Total | Acres in HUC | % of County in HUC | % of HUC in County |
|------------------|--------------------|--------------|--------------------|--------------------|
| Chavez           | 3,885,365          | 11,099       | <1                 | 2                  |
| Lincoln          | 3,089,795          | 509,294      | 16                 | 91                 |
| Torrance         | 2,139,990          | 37,177       | 2                  | 7                  |
| Sum ( $\Sigma$ ) |                    | 557,570      |                    | 100                |



## **Physical Setting**

### **Geology:**

The HUC has a northwestern boundary at Lackey Peak. The southern boundary passes through Tecolote Peak, between Pipeline Road and Hasperos Canyon, crosses Pipeline Road just SE of the County Road B026 and Pipeline Road intersection, and ends at the confluence of Gallo Arroyo with Arroyo del Macho. The northern boundary passes through Cougar Mountain, Cameleon Hill, crosses State Highway 247 near the intersection with County Road B041, and then to the confluence.

The bedrock is Permian Period limestone, dolomite and sandstone. The limestone is porous and has many sinkholes. Caliche also forms on the ground surface. On the northern edge along the county boundary there are some Quaternary Period eolian deposits.

Resource concerns are high sediment erosion. In addition the lowering of valleys by river incision is a continuing process. 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.

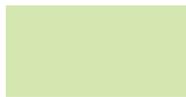
Groundwater quality and quantity is a concern. Depth to groundwater is a concern if the shallow unconfined aquifer does not produce enough water for the resource or increased population demands are 'mining' the water. Groundwater in the limestone is usually along fracture zones which are hard to intercept with water wells. Groundwater quality ranges from good to fair for livestock or crops.

### **Soils:**

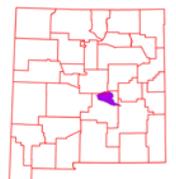
Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms. The soils in the Rio Grande-Albuquerque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

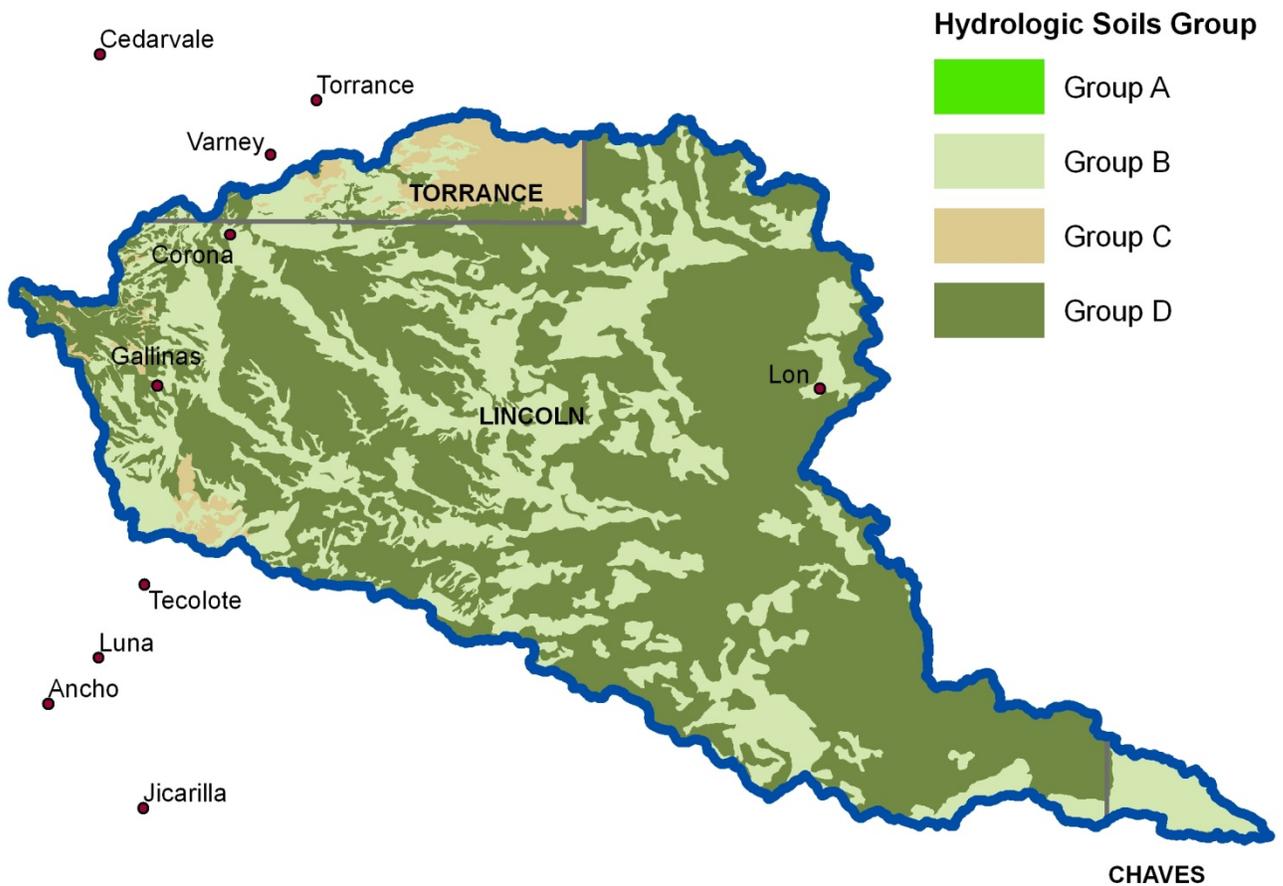
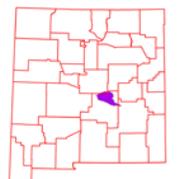


Figure 2. Hydrologic Soils Groups



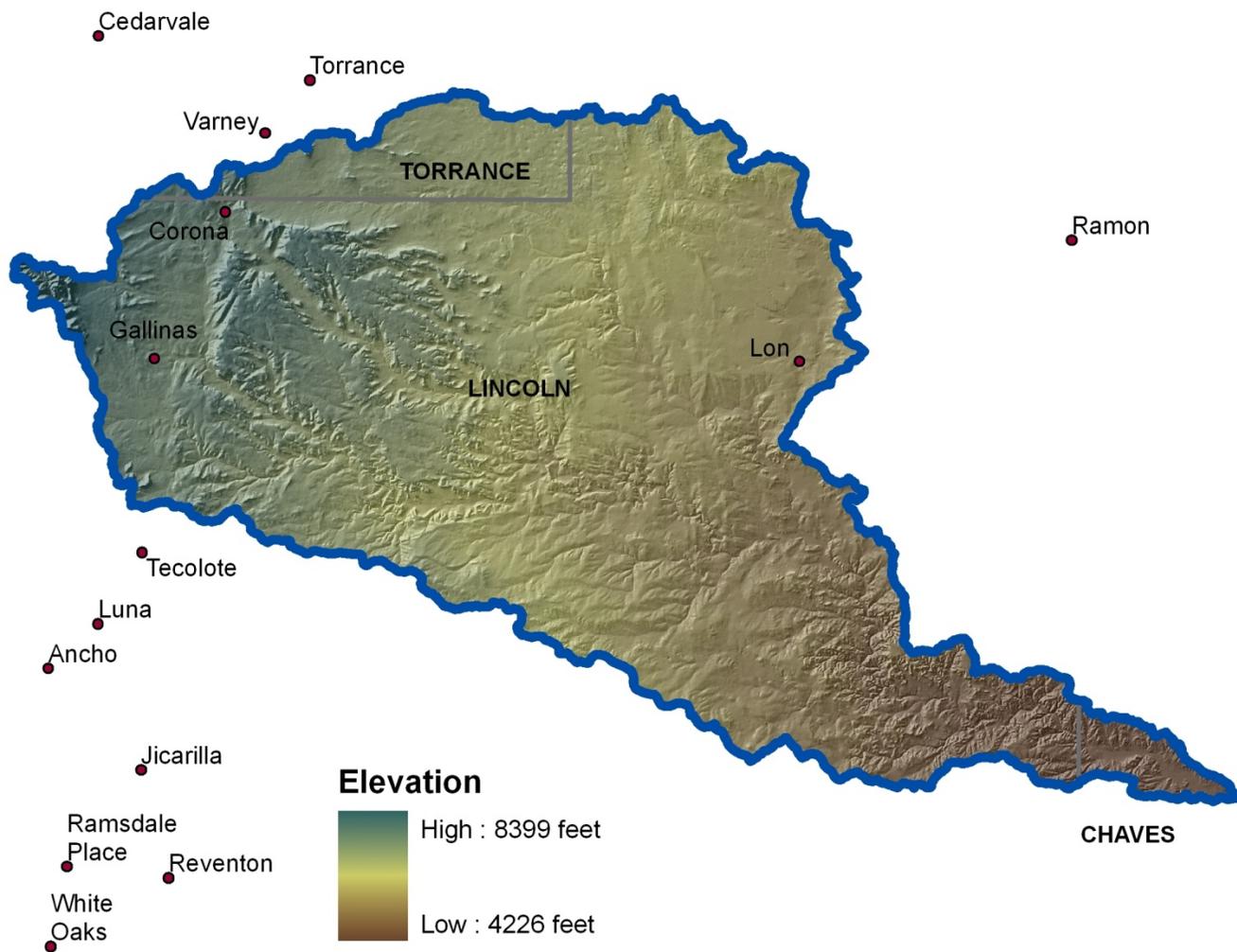
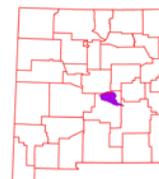


Figure 3. Gallo Arroyo Watershed Shaded Relief



**Precipitation**

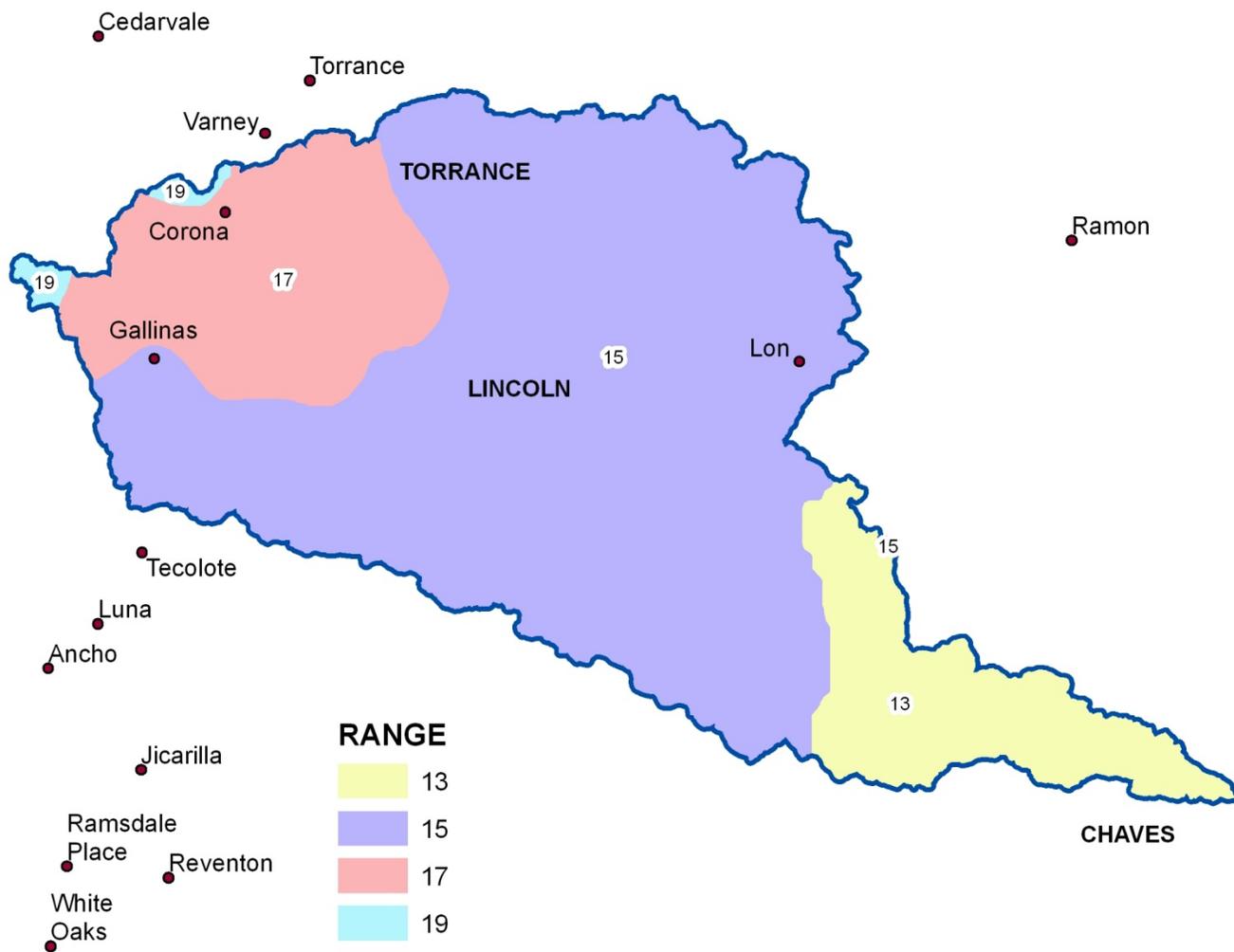
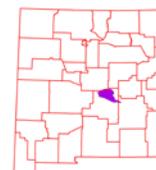
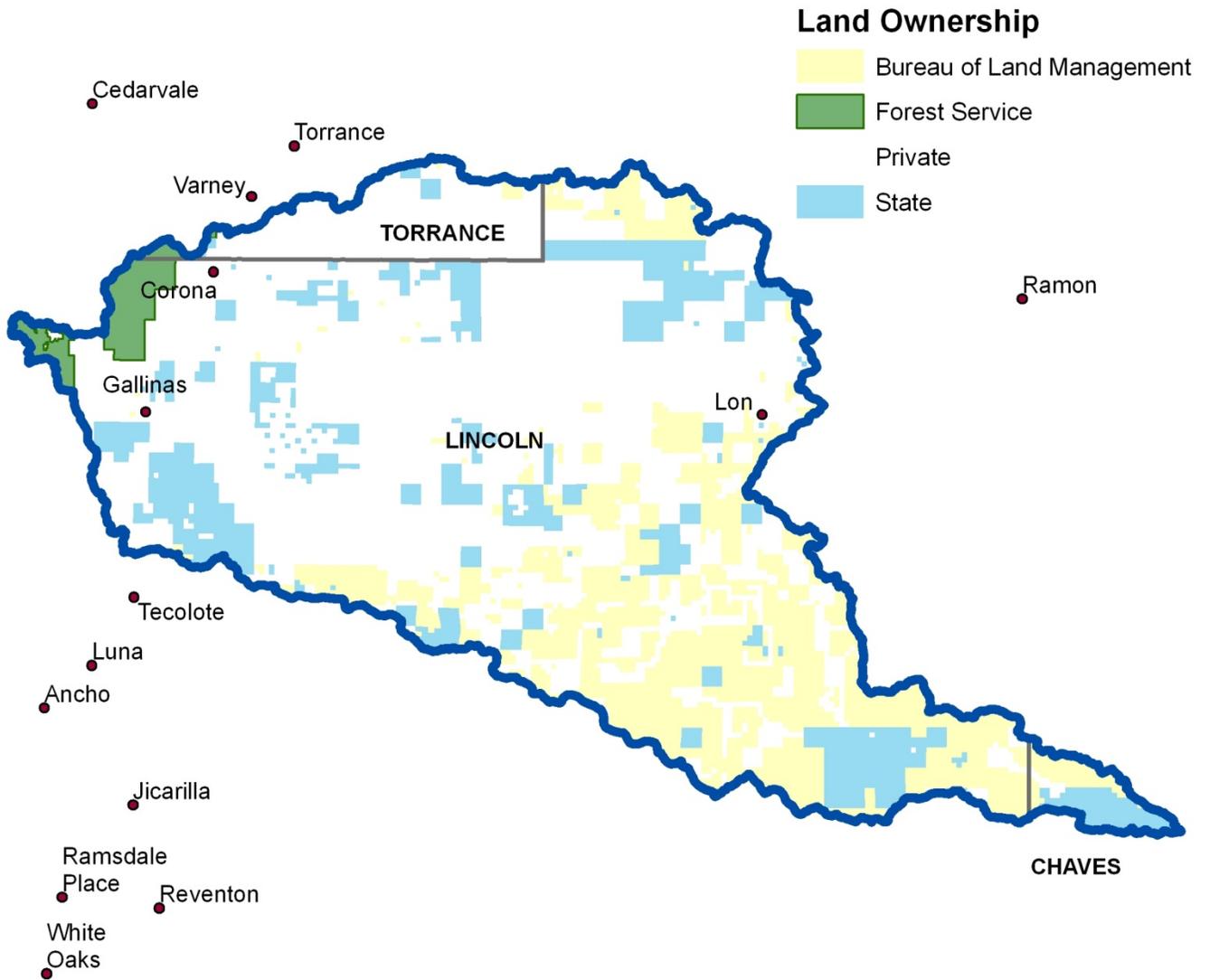


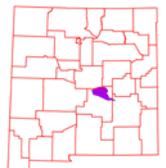
Figure 4. Gallo Arroyo Watershed Annual Precipitation.



**Land Ownership** <sup>2</sup>



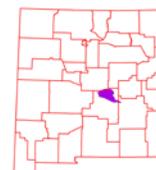
**Figure 5. Gallo Arroyo Watershed Land Ownership.**



### Land Ownership

| <u>COUNTY</u>          | <u>BLM</u> | <u>FS</u> | <u>Private</u> | <u>State</u> |
|------------------------|------------|-----------|----------------|--------------|
| Chavez                 | 4,651      |           | 656            | 5,792        |
| Lincoln                | 128,536    | 10,747    | 291,514        | 78,498       |
| Torrance               | 749        | 1,178     | 33,816         | 1,434        |
| Watershed ( $\Sigma$ ) | 133,936    | 11,925    | 325,986        | 85,724       |
| % Watershed            | 24         | 2         | 58             | 15           |

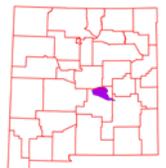
Table 2. Land ownership in the Gallo Arroyo Watershed.



**Land Use / Land Cover** <sup>3, 4</sup>



**Figure 6. The National Land Cover Dataset over the Gallo Arroyo Watershed.**

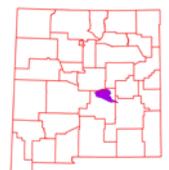


## Land Use / Land Cover

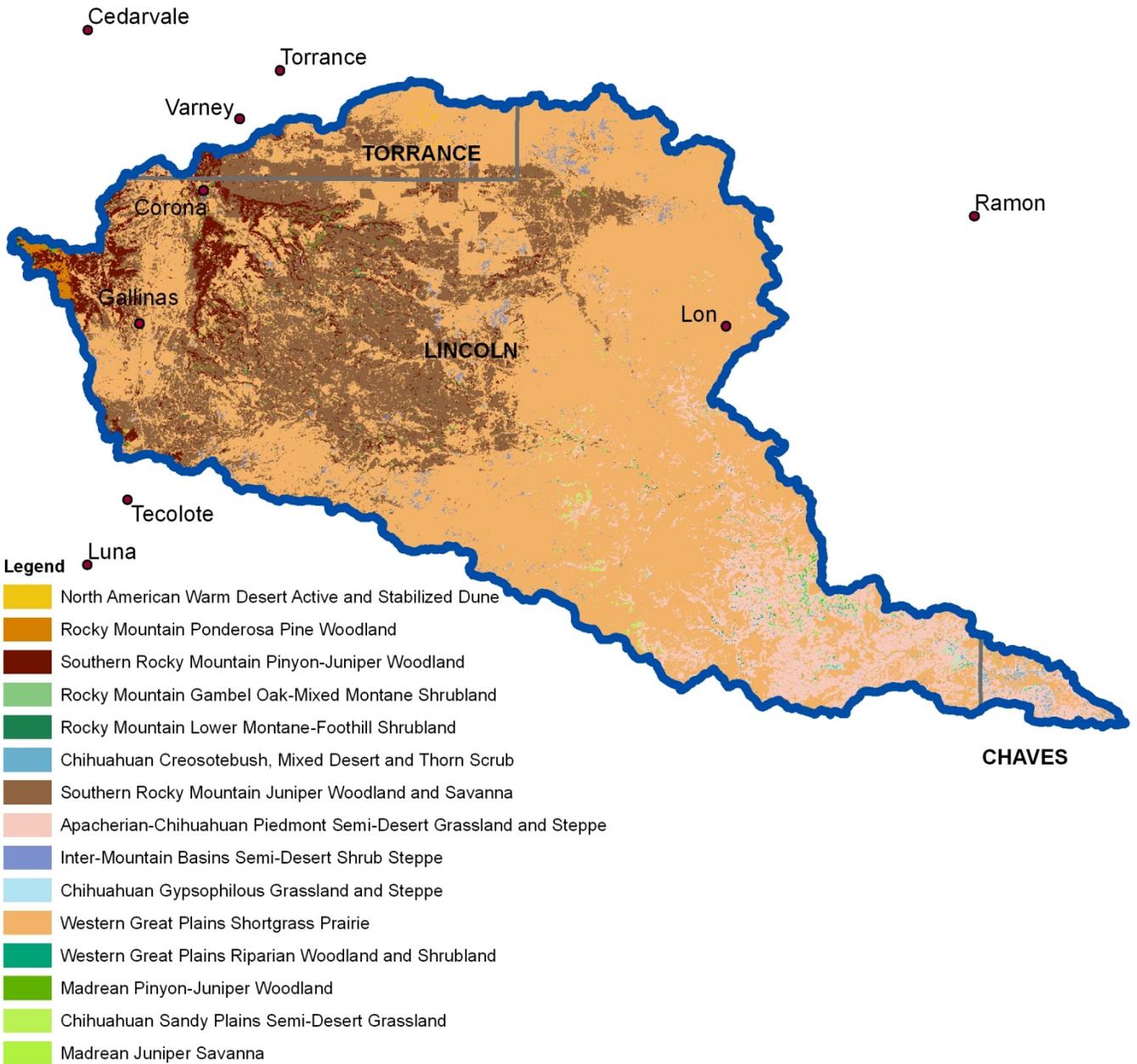
The U.S. Geological Survey (USGS) produced the National Land Cover Dataset (NLCD) as part of a cooperative project between the USGS and the U.S. Environmental Protection Agency (USEPA). The goal of this project was to produce a consistent land cover data layer for the conterminous United States. The 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> |
|--------------------------------------|--------------|-----------------------|
| Grasslands, Herbaceous               | 375,335      | 67                    |
| Shrubland                            | 156,525      | 28                    |
| Evergreen Forest                     | 23,877       | 4                     |
| Low Intensity Residential            | 1,603        | <1                    |
| Bare Rock/Sand/Clay                  | 128          | <1                    |
| Emergent Herbaceous Wetlands         | 54           | <1                    |
| High Intensity Residential           | 20           | <1                    |
| Pasture/Hay                          | 18           | <1                    |
| Commercial/Industrial/Transportation | 4            | <1                    |
| Deciduous Forest                     | 2            | <1                    |

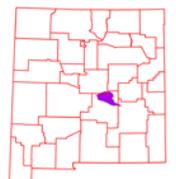
Table 3. Extent of NLCD classes in the Gallo Arroyo watershed.



## Land Use / Land Cover



**Figure 7. Subset of the SWREGAP over the Gallo Arroyo Watershed. The 15 dominant ecosystems are displayed in the legend.**

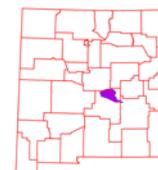


## Land Use / Land Cover

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.

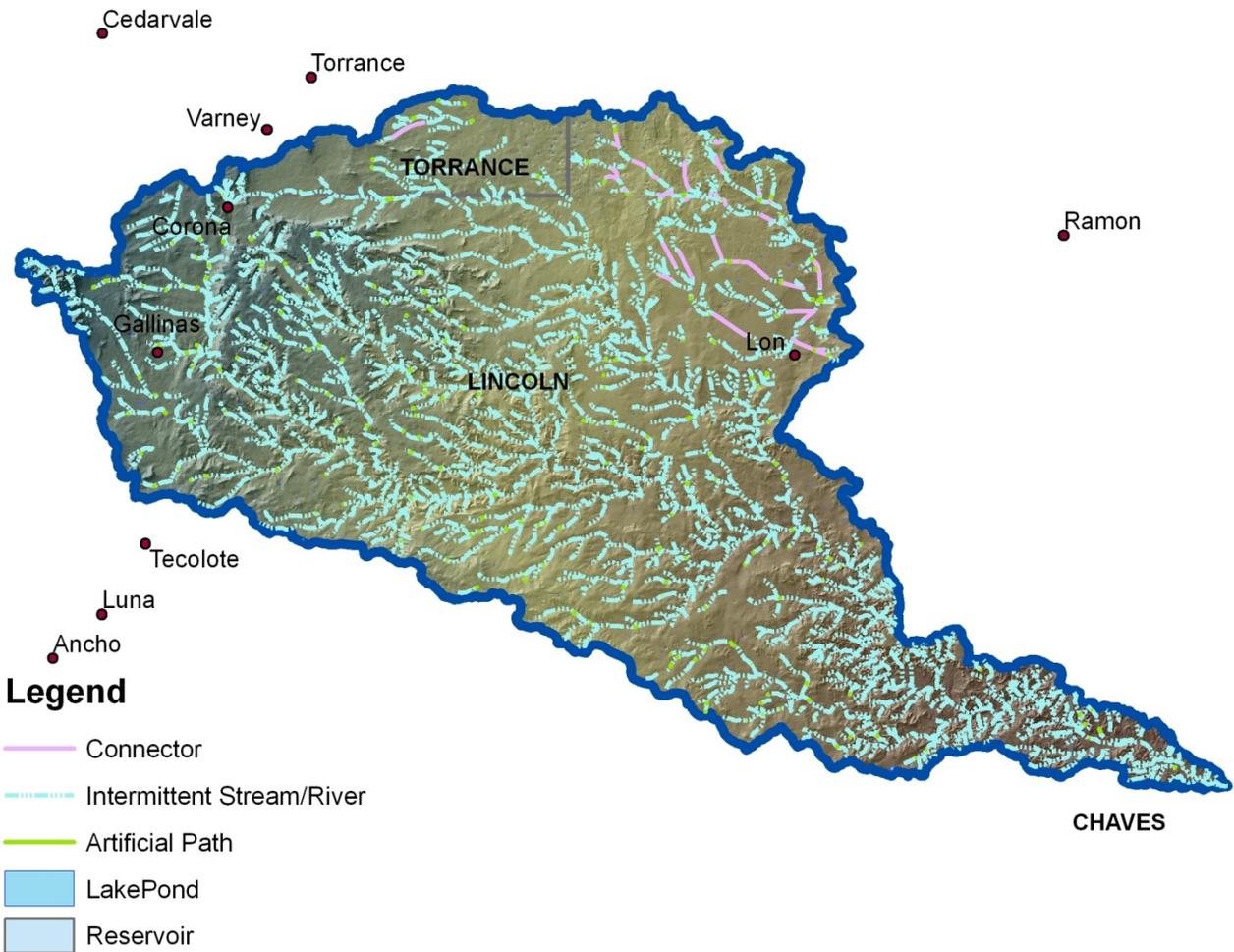
| <u>Ecosystem</u>  | <u>Acres</u> | <u>% of Watershed</u> |
|---|--------------|-----------------------|
| Western Great Plains Shortgrass Prairie                         | 348,843      | 63                    |
| Southern Rocky Mountain Juniper Woodland and Savanna            | 122,244      | 22                    |
| Apacherian-Chihuahuan Piedmont Semi-Desert Grassland and Steppe | 48,860       | 9                     |
| Southern Rocky Mountain Pinyon-Juniper Woodland                 | 22,499       | 4                     |
| Inter-Mountain Basins Semi-Desert Shrub Steppe                  | 4,735        | 1                     |
| Rocky Mountain Ponderosa Pine Woodland                          | 2,375        | < 1                   |
| Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub           | 1,147        | < 1                   |
| Chihuahuan Sandy Plains Semi-Desert Grassland                   | 1,090        | < 1                   |
| Madrean Pinyon-Juniper Woodland                                 | 1,028        | < 1                   |
| Rocky Mountain Lower Montane-Foothill Shrubland                 | 737          | < 1                   |
| Madrean Juniper Savanna   | 577          | < 1                   |
| Rocky Mountain Gambel Oak-Mixed Montane Shrubland               | 575          | < 1                   |
| Chihuahuan Gypsophilous Grassland and Steppe                    | 532          | < 1                   |
| Western Great Plains Riparian Woodland and Shrubland            | 445          | < 1                   |
| North American Warm Desert Active and Stabilized Dune           | 382          | < 1                   |

**Table 4. SW Region Gap analysis ecosystem acreages.**

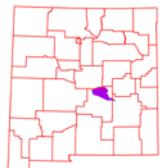


**Hydrology** 5, 6, 7, 8, 9

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 1,233 miles (1,984 km) of water courses in the Gallo Arroyo 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 Gallo Arroyo.**



| Water Course Type           | Miles |
|-----------------------------|-------|
| Artificial path             | 10    |
| Connector                   | 26    |
| Intermittent Stream / River | 1,198 |
| Sum ( $\Sigma$ )            | 1,233 |

**Table 5. NHD Water Course Type and Extents**

There are no dams or water gauging stations in the watershed.

## **Hydrology**

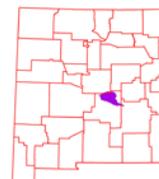
The New Mexico Water Quality Control Commission (NMWQCC) is the issuing agency of water quality standards for interstate and intrastate waters in New Mexico. The NMWQCC has defined the Gallo Arroyo watershed as part of the Rio Grande River Basin.

The Gallo Arroyo watershed has no lakes or reaches designated as impaired.

## **Hydrology - Declared Groundwater Basins**

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 Gallo Arroyo watershed is within one Underground Water Basin: the Roswell Artesian.

| Groundwater Basin | Acres in Basin | Watershed Acres | % of Declared Basin |
|-------------------|----------------|-----------------|---------------------|
| Roswell Artesian  | 6,920,505      | 557,570         | 8                   |



## **Threatened and Endangered Species** <sup>10</sup>

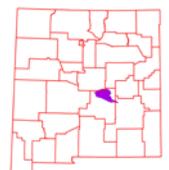
Endangered species are those that are at risk of extinction throughout all or a significant portion of its native range. A threatened species is one that is likely to become endangered in the foreseeable future. The New Mexico Natural Heritage program tracks the status of threatened and endangered species which are listed on both federal and state lists. There are no species which are currently listed and tracked in the Gallo Arroyo River Watershed.

## **Invasive Species** <sup>11</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 Gallo Arroyo watershed, the SWEMP has identified 6 species of invasive plants (Table 6). Each of these species is defined as non-native by the USDA PLANTS database.

| <b><u>Scientific Name</u></b>                   | <b><u>Common Name</u></b>     |
|---|-------------------------------|
| <b><i>Zygophyllaceae</i> (Caltrop Family)</b>   | <b>African Rue</b>            |
| <b><i>Scrophylariaceae</i> (Figwort Family)</b> | <b>Dalmatian Toadflax</b>     |
| <b><i>Brassicaceae</i> (Mustard Family)</b>     | <b>Hoary Cress (Whitetop)</b> |
| <b><i>Asteraceae</i> (Sunflower Family)</b>     | <b>Musk Thistle</b>           |
| <b><i>Asteraceae</i> (Sunflower Family)</b>     | <b>Russian Knapweed</b>       |
| <b><i>Scrophulariaceae</i> (Figwort Family)</b> | <b>Yellow Toadflax</b>        |

**Table 6. Invasive Species Recognized by the SWEMP.**



## Common Resource Areas<sup>12</sup>

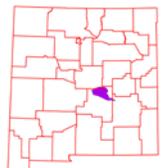
A Common Resource Area (CRA) is defined as a geographical area where resource concerns, problems, or treatment needs are similar. It is considered a subdivision of an existing Major Land Resource Area (MLRA) designation. Landscape conditions, soil, climate, human considerations, and other natural resource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

The entire Gallo Arroyo watershed is in the 70.1 Common Resource Area

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

Tablelands and mesas separated by broad plains and small terraces characterize this area. Elevation is 5,000 to 7,200 feet and precipitation is 12 to 17 inches. The soil moisture regime is aridic to ustic and the soil temperature regime is mesic. Pinyon-juniper savannah and pinyon juniper woodlands at higher elevations, and broad mid- to short-grass prairies and basins at lower elevations dominate the area. Current land use is livestock grazing. The soils formed in Quaternary alluvium, eolian sands, and sedimentary rocks of Permian age. (Old CP-3)



## Conservation <sup>13</sup>

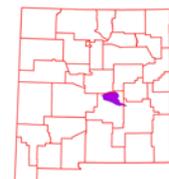
The USDA-Natural Resources Conservation Service (NRCS) focuses on the development and delivery of high quality products and services that enable people to be good stewards of our Nation’s soil, water, and related natural related resources on non-Federal lands. The Natural Resources Conservation Service’s 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        | #         | Acres        | #          | Acres        | #         | Acres       | #          | Acres         |
| Brush Management                   | 6        | 633         | 33        | 3671         | 9         | 1233         | 33         | 2844         | 18        | 1012        | 99         | 9393          |
| Prescribed Grazing                 | 1        | 1408        | 25        | 23406        | 10        | 15186        | 52         | 28337        | 4         | 3860        | 92         | 72197         |
| Upland Wildlife Habitat Management | 1        | 1408        | 28        | 31635        | 10        | 15186        | 49         | 27369        |           |             | 88         | 75598         |
| <b>SUM (Σ)</b>                     | <b>8</b> | <b>3449</b> | <b>86</b> | <b>58712</b> | <b>29</b> | <b>31605</b> | <b>134</b> | <b>58550</b> | <b>22</b> | <b>4872</b> | <b>279</b> | <b>157188</b> |

Table 7. 5 year Trends in Applied Conservation Practices. Reported in Acres.

| Conservation Practice | 2007      |      | 2008      |       | 2009     |      | 2010      |       | 2011     |      | TOTAL     |              |
|-----------------------|-----------|------|-----------|-------|----------|------|-----------|-------|----------|------|-----------|--------------|
|                       | #         | Feet | #         | Feet  | #        | Feet | #         | Feet  | #        | Feet | #         | Feet         |
| Fence                 | 1         | 3030 | 1         | 3900  | 1        | 3900 | 1         | 5265  |          |      | 4         | 16095        |
| Pipeline              | 5         | 8575 | 7         | 31077 | 3        | 6920 | 2         | 13800 | 2        | 5390 | 19        | 65762        |
| Pumping Plant         |           |      | 3         |       |          |      | 2         |       |          |      | 5         |              |
| Water Well            | 2         |      | 1         |       |          |      | 2         |       |          |      | 5         |              |
| Watering Facility     | 10        |      | 13        |       | 3        |      | 9         |       | 5        |      | 40        |              |
| <b>SUM (Σ)</b>        | <b>18</b> |      | <b>25</b> |       | <b>7</b> |      | <b>16</b> |       | <b>7</b> |      | <b>73</b> | <b>81857</b> |

Table 8. 5 Year Trends in Location Specific Applied Conservation Practices. Reported in Feet if Linear (i.e. Fence)



**Soil Resource Inventory** <sup>14</sup>

The Gallo Arroyo Watershed has a number of certified National Cooperative Soil Survey (NCSS) inventories, and is completely covered by soil surveys.

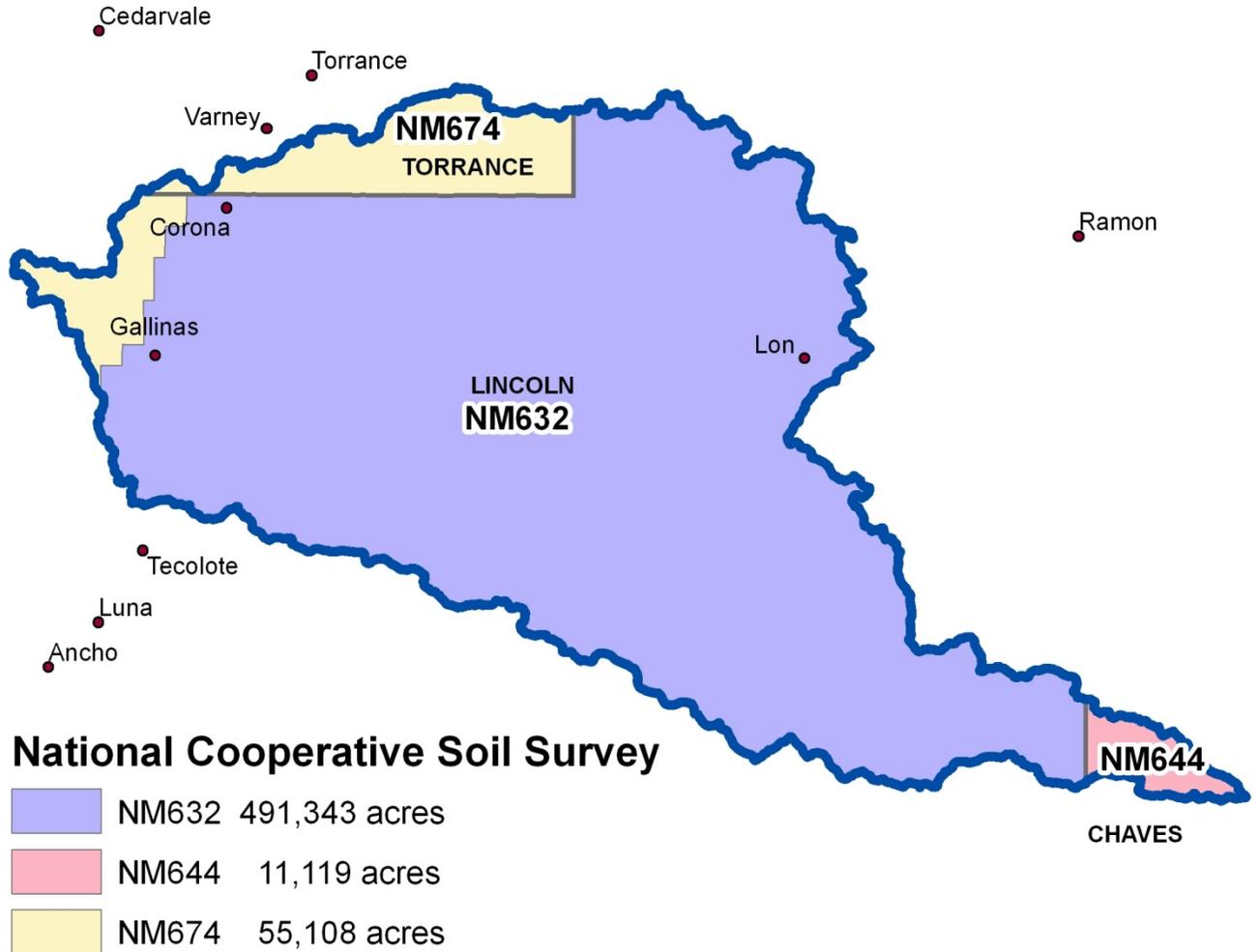
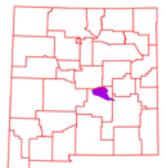


Figure 9. National Cooperative Soil Survey of Gallo Arroyo

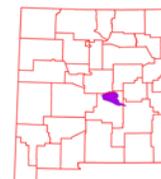


## Soil Resource Inventory

In order to evaluate the susceptibility of erosion within the Gallo Arroyo 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> |
|---|----------------------------|-------------------|
| <b>Saturated Hydraulic Conductivity</b> |                            |                   |
| $\mu\text{m} / \text{s}$                |                            |                   |
| 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                 |
| <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 9. 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.

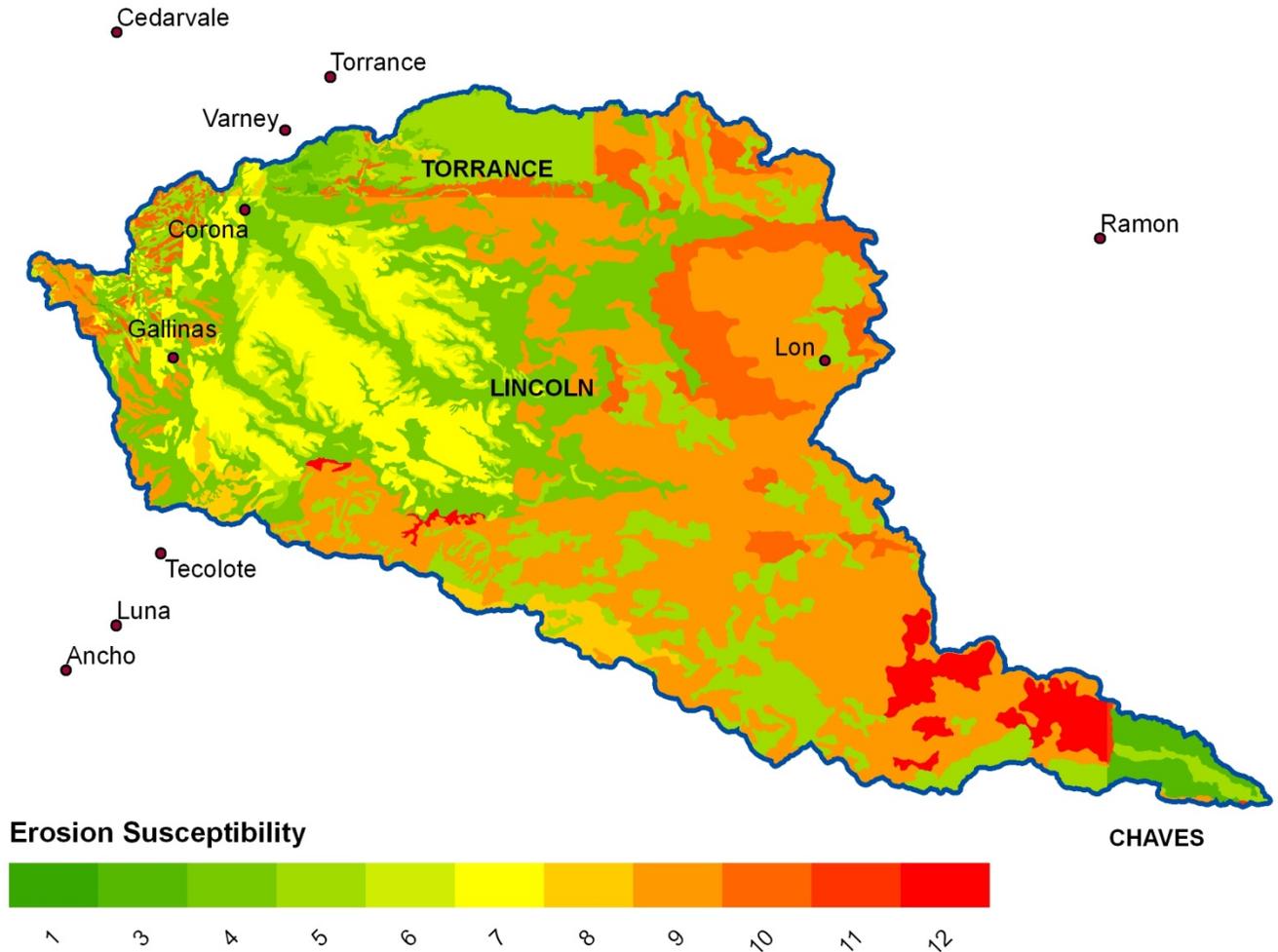
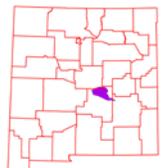


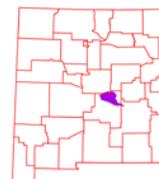
Figure 10. Erosion Potential of the Gallo Arroyo Watershed



## Soil Resource Inventory

| <u>Rank</u>     | <u>Acres</u> |
|-----------------|--------------|
| 1               | 136          |
| 3               | 8,278        |
| 4               | 107,513      |
| 5               | 93,517       |
| 6               | 23,314       |
| 7               | 56,051       |
| 8               | 11,465       |
| 9               | 200,688      |
| 10              | 40,102       |
| 11              | 452          |
| 12              | 16,054       |
| Sum( $\Sigma$ ) | 557,570      |

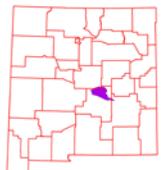
**Table 10. Soil Erosion Potential Model Results. A greater rank indicates greater potential for erosion.**



**Socioeconomic Data** <sup>15</sup>

| 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 (estimate) |
|----------|-------------------------|-------------------------|-------------------------|------------------------|---------------------------|--------------------------------------|-------------------------------|---|---|-------------------------------|--|---|-------------------------------------|---|
| Chavez   | 65,645                  | 47,158                  | 14,224                  | 1,044                  | 13,180                    | 34,139                               | 46,518                        | 1,323   | 814   | 414                           | 52   | 14,399                                  | 2,125                               | \$34,325                                  |
| Lincoln  | 20,497                  | 9,251                   | 10,160                  | 309                    | 9,851                     | 6,110                                | 17,439                        | 96  | 489   | 75                            | 10   | 1,880                                   | 508                                 | NA  |
| Torrance | 16,383                  | 819                     | 16,092                  | 829                    | 15,263                    | 6,399                                | 12,460                        | 219   | 383   | 71                            | 8  | 2,535                                   | 707                                 | NA  |

**Table 11. Socioeconomic Data of the Counties in the Watershed (2010) except for green cells, not available yet from 2010 census so are 2000.**



## References

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