

Rapid Watershed Assessment Middle San Juan Watershed



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Overview

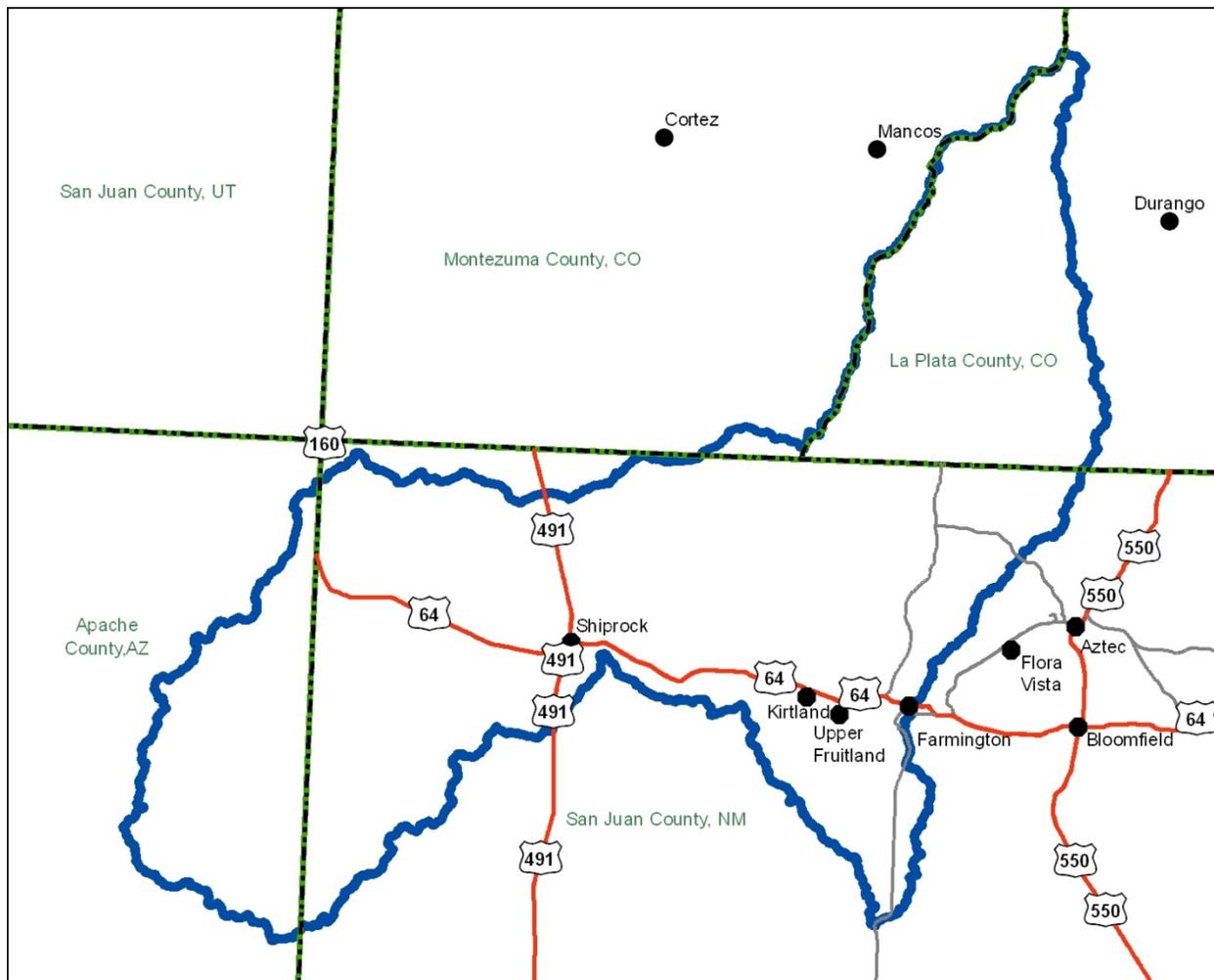
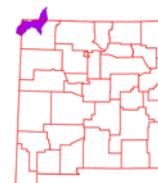


Figure 1. Middle San Juan Watershed Overview

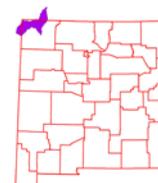


Overview

The Middle San Juan Watershed is located in southwestern Colorado, northwestern New Mexico, and northeastern Arizona, in the Four Corners region. It covers 1,246,923 total acres (5,046 sq. km). The Colorado counties in the watershed are La Plata and Montezuma counties, Apache county in Arizona, and San Juan county in New Mexico. Table 1 summarizes the distribution of the Middle San Juan watershed.

Table 1. Middle San Juan watershed acreage distribution.

	County Acres Total	Acres in HUC	% of HUC in County	% of County in HUC
Apache - AZ	7,817,894	181,883	15	2
La Plata - CO	1,090,940	267,282	21	25
Montezuma CO	1,309,061	10,460	1	1
San Juan	3,659,354	787,299	63	22
Sum (Σ)	--	1,246,923	100	--



Physical Setting

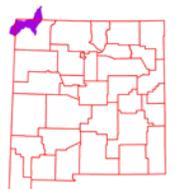
Geology: ¹

The Middle San Juan River HUC includes the watershed from upstream of the confluence with the Mancos River upstream to near the confluence with and including the La Plata River. It is located in the Colorado Plateau physiographic province and most of it is also in the San Juan Basin. The downstream portion includes Red Rock Valley which is bounded by the Lukachukai, Carrizo, and northern portion of the Chuska Mountains in Arizona.

The Carrizo Mountains are the remnants of Tertiary Period laccoliths. The Lukachukai and Chuska Mountains along with most of the watershed are formed by Cretaceous and Tertiary period sandstones, coal, mudstone, and shales.

Resource concerns are high sediment erosion by wind or water. 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 quality ranges from good to poor for livestock or crops. Mercury and selenium concentrations in sections of the watershed are also a concern.



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 Middle San Juan 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.



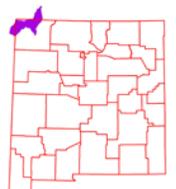
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.



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.



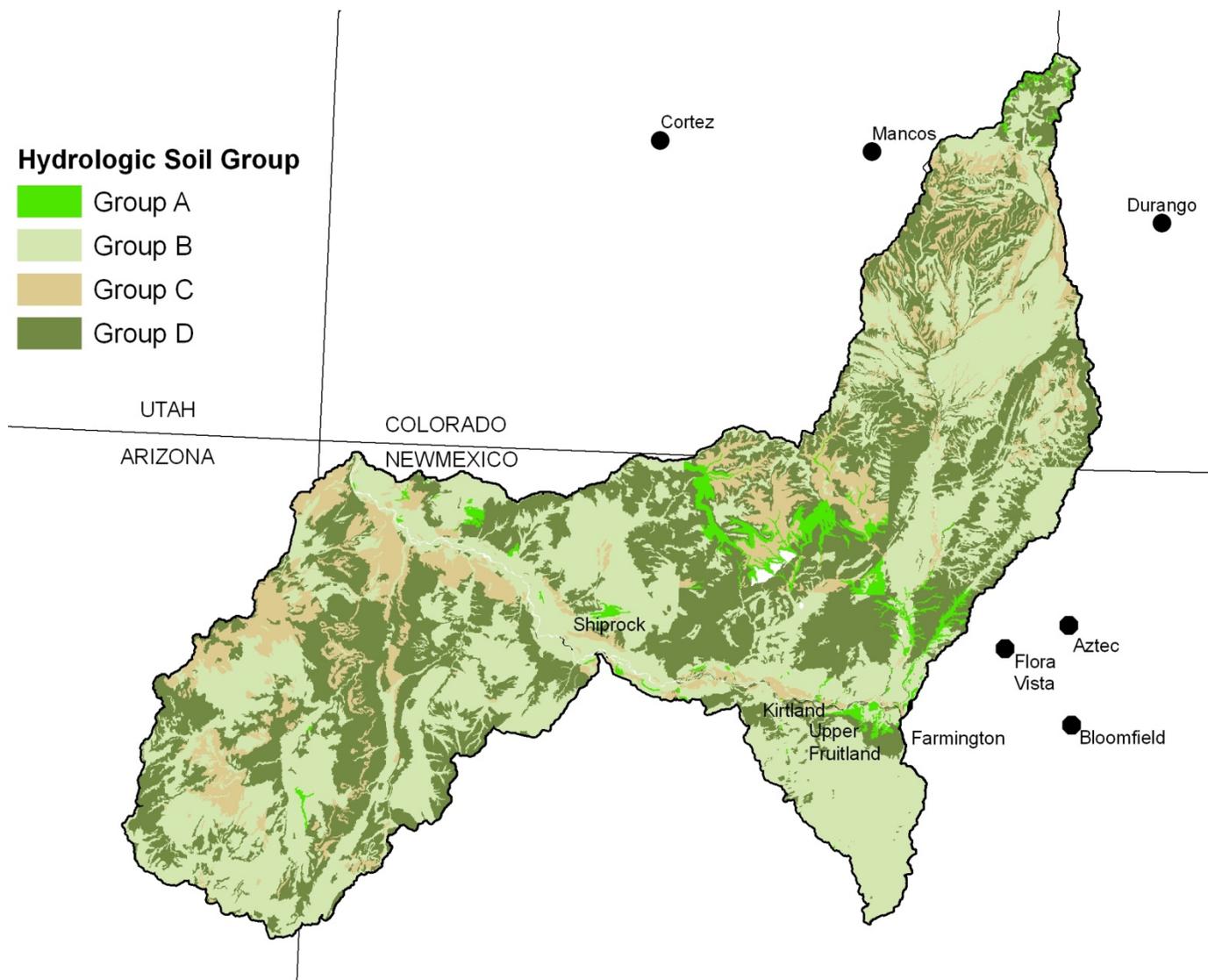
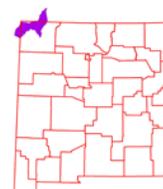


Figure 2. Hydrologic Soil Groups



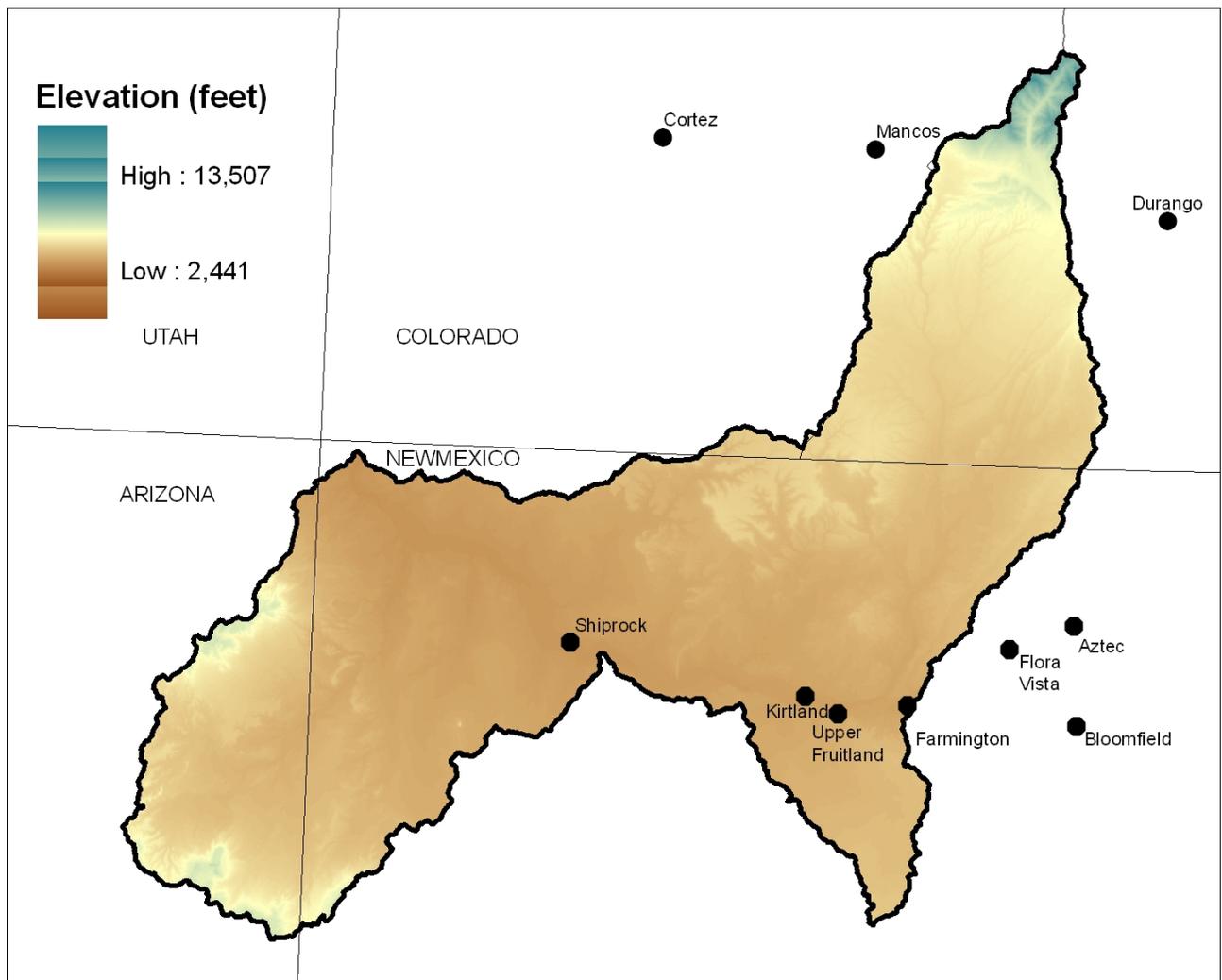


Figure 3. Middle San Juan Watershed Shaded Relief



Precipitation ²

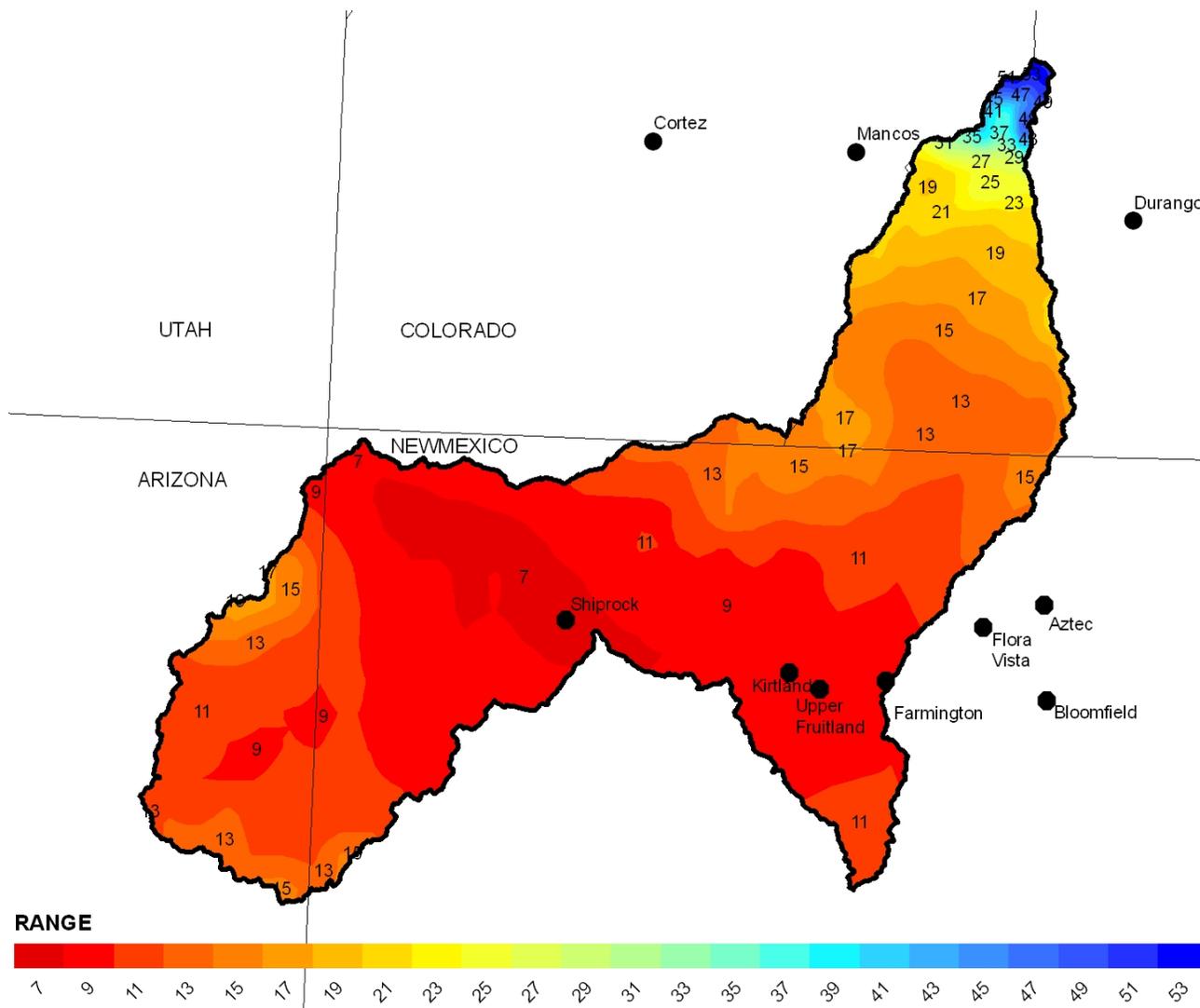
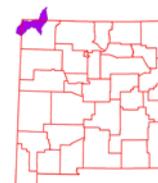


Figure 4. Middle San Juan Watershed Annual Precipitation.



Land Ownership ³

Land Ownership

- Bureau of Land Management
- Bureau of Reclamation
- USDA Forest Service
- Indian Lands
- Private
- State
- State Game and Fish

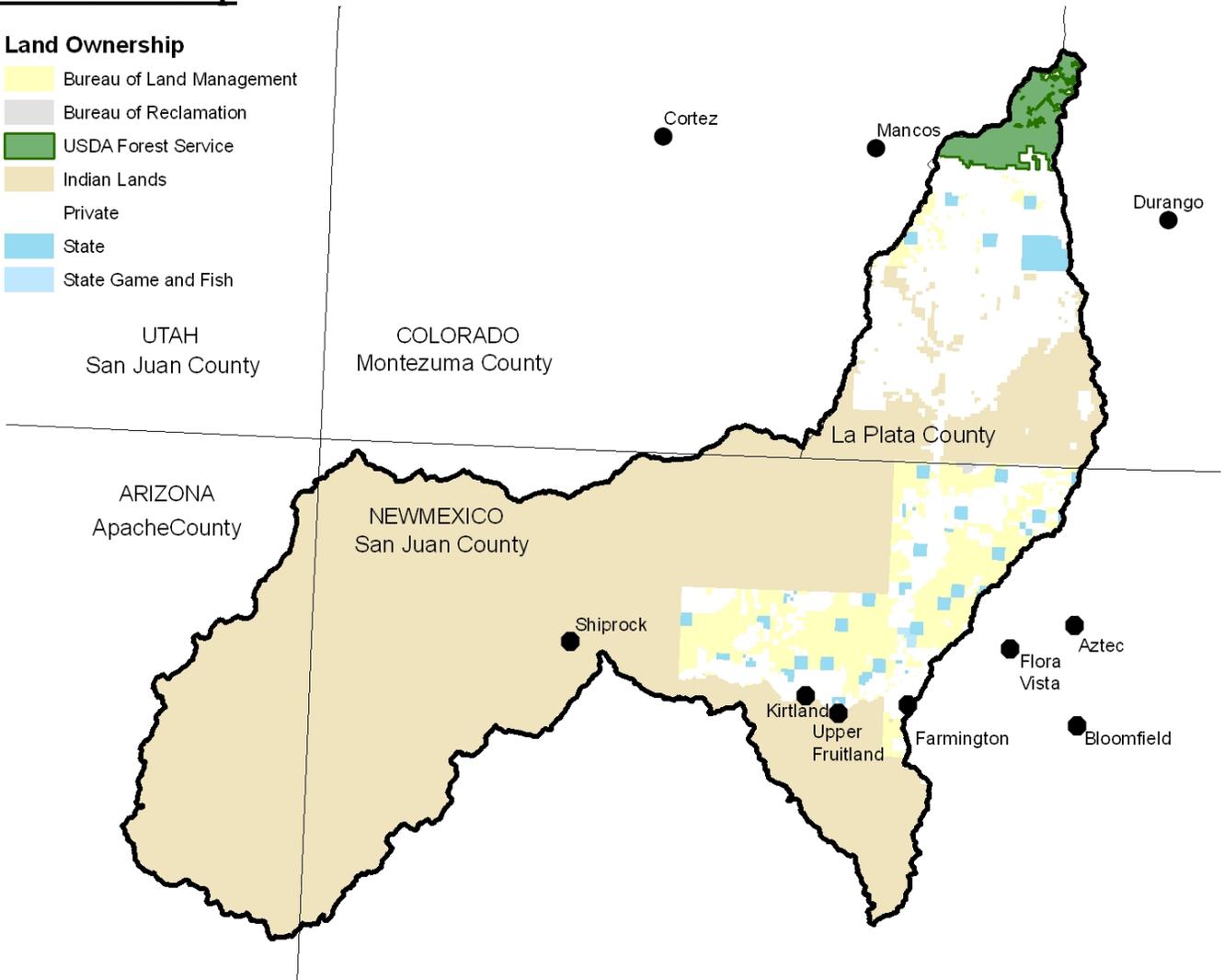


Figure 5. Middle San Juan Watershed Land Ownership



Land Ownership

<u>COUNTY</u>	<u>BLM</u>	<u>BoR</u>	<u>FS</u>	<u>Indian Lands</u>	<u>Private</u>	<u>State</u>	<u>State G&F</u>
Apache - AZ				181,883			
La Plata - CO	5,629		25,100	86,014	140,274	8,477	
Montzuma - CO	633		1,036	8,091	304	13	
San Juan - NM	90,824	609		603,938	78,219	14,286	832
Watershed (Σ)	97,086	609	26,136	897,926	218,797	22,776	832
% Watershed	8	<1	2	71	18	2	<1

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



Land Use / Land Cover ^{4,5}

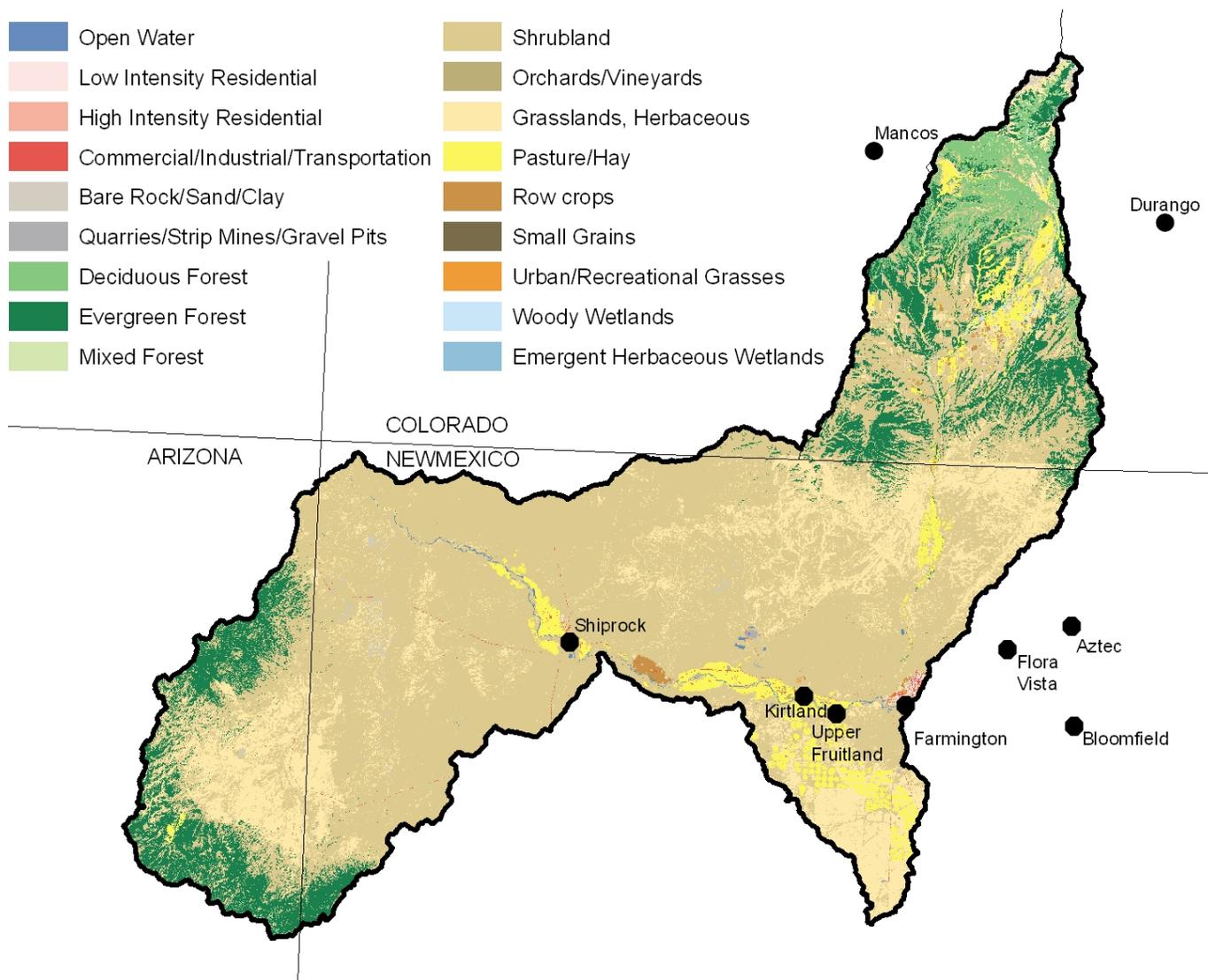
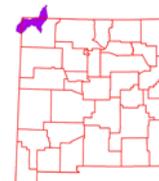


Figure 6. Subset of the National Land Cover Dataset over the Middle San Juan Watershed.

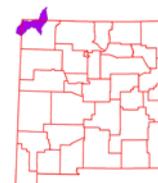


Land Use / Land Cover

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

<u>Land use / Land cover</u>	<u>Acres</u>	<u>% of Watershed</u>
Shrubland	754,785	61%
Grasslands, Herbaceous	226,079	18%
Evergreen Forest	151,377	12%
Pasture/Hay	54,566	4%
Deciduous Forest	39,278	3%
Bare Rock/Sand/Clay	6,703	1%
Row crops	4,720	< 1%
Low Intensity Residential	4,165	< 1%
Mixed Forest	2,699	< 1%
Open Water	2,553	< 1%
Woody Wetlands	2,474	< 1%
Commercial/Industrial/Transportation	2,395	< 1%

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



Land Use / Land Cover

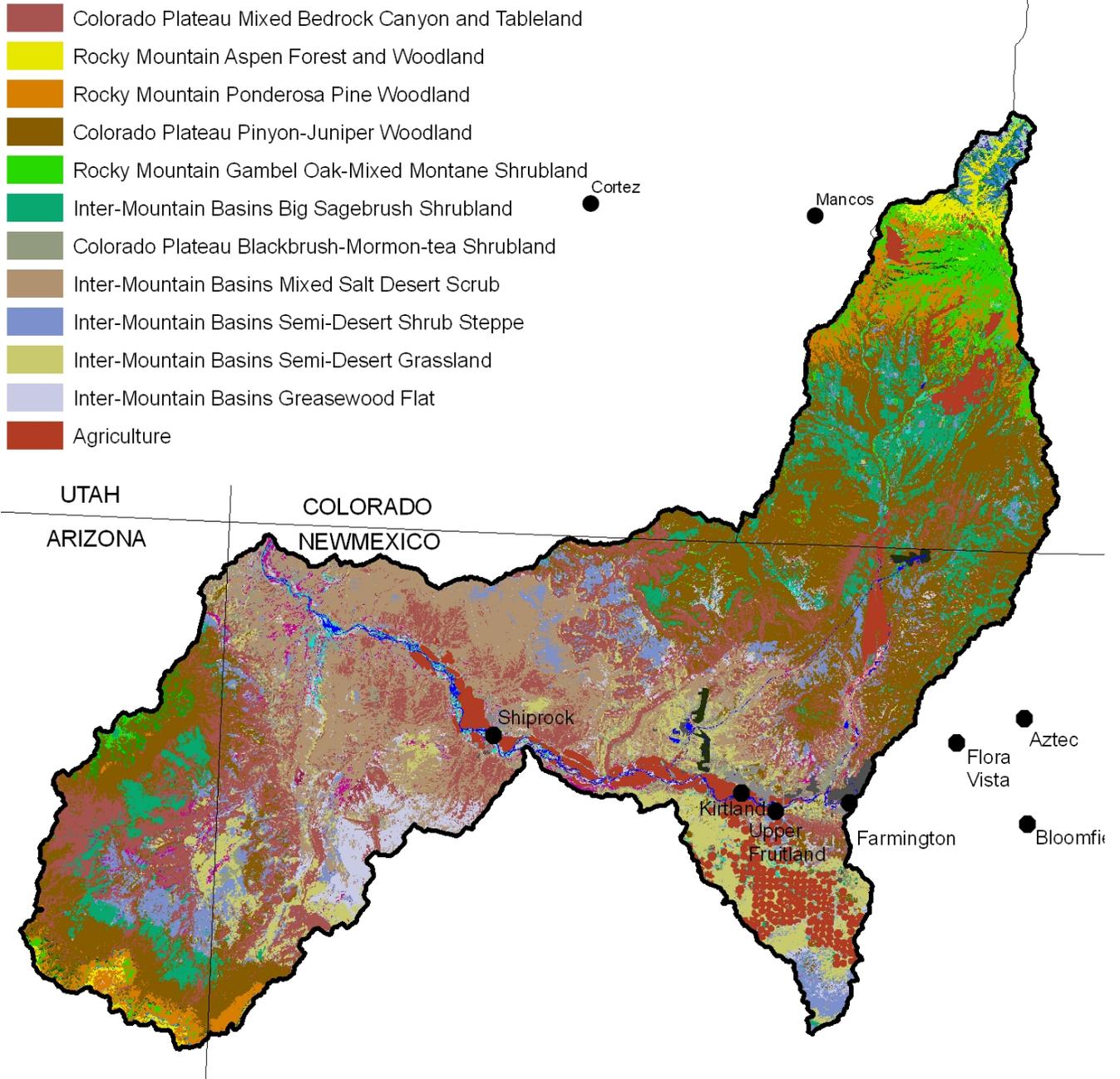
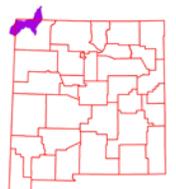


Figure 7. Subset of the SWREGAP over the Middle San Juan Watershed. The 12 dominant ecosystems are displayed in the legend.

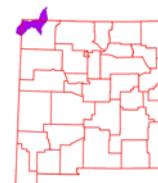


Land Use / Land Cover

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.

<u>Ecosystem</u>	<u>Acres</u>	<u>% of Watershed</u>
Colorado Plateau Pinyon-Juniper Woodland	311488	25
Colorado Plateau Mixed Bedrock Canyon and Tableland	196741	16
Inter-Mountain Basins Mixed Salt Desert Scrub	185808	15
Inter-Mountain Basins Big Sagebrush Shrubland	85918	7
Inter-Mountain Basins Semi-Desert Grassland	81446	7
Inter-Mountain Basins Semi-Desert Shrub Steppe	77372	6
Agriculture	62651	5
Rocky Mountain Ponderosa Pine Woodland	44669	4
Inter-Mountain Basins Greasewood Flat	40434	3
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	37468	3
Colorado Plateau Blackbrush-Mormon-tea Shrubland	27435	2
Rocky Mountain Aspen Forest and Woodland	13036	1
Southern Colorado Plateau Sand Shrubland	11758	1
Inter-Mountain Basins Shale Badland	11080	1
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	8348	1
Open Water	6240	1
Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland	5286	<1

Table 4. SW Region Gap analysis ecosystem acreages.



Hydrology 6, 7, 8, 9, 10

The National Hydrography Dataset (NHD) is a comprehensive set of data that encodes information about naturally occurring and constructed bodies of water, paths through which water flows, and related entities. The NHD identifies 5,596 miles (9,006 km) of water courses in the Middle San Juan River Watershed. The majority of these courses typically flow intermittently in summer months during periods associated with high intensity convective thunderstorms.

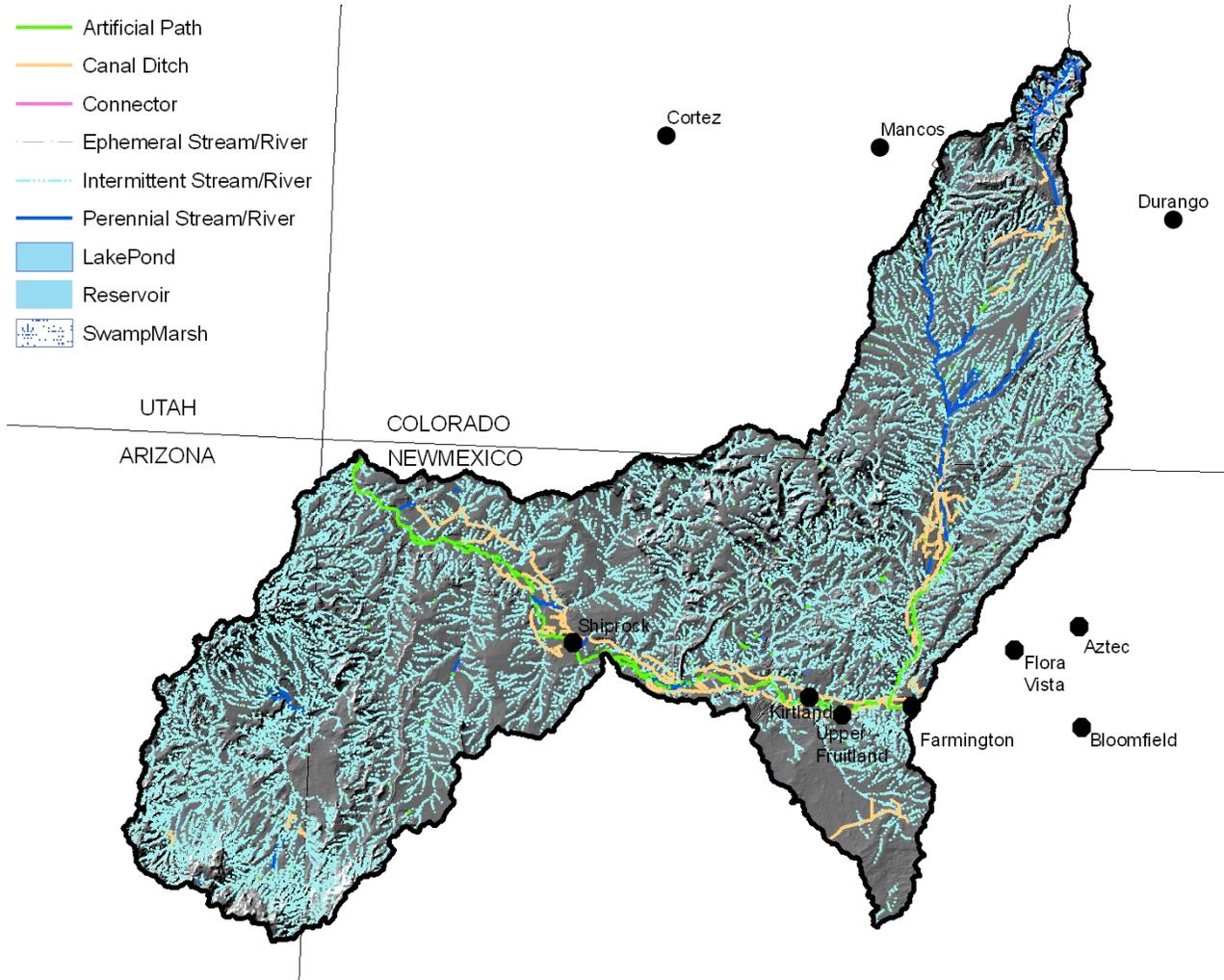
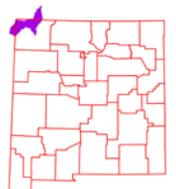


Figure 8. National Hydrologic Dataset (NHD) of the Middle San Juan.



Water Course Type	Miles
Artificial path	135
Connector	1
Canal / Ditch	222
Ephemeral Stream / River	114
Intermittent Stream / River	5,008
Perennial Stream / River	116
Sum (Σ)	5,596

Table 5. NHD Water Course Type and Extents



There are 12 water gauging stations in the watershed. USGS Site 08313000 is near the southeast corner of the watershed on the San Juan River at Farmington, NM. During the period 1931 – 2010, this site has had mean annual discharge of 862 cubic feet per second ranging from 728 (1963) to 5,054 (1941) cubic feet per second.

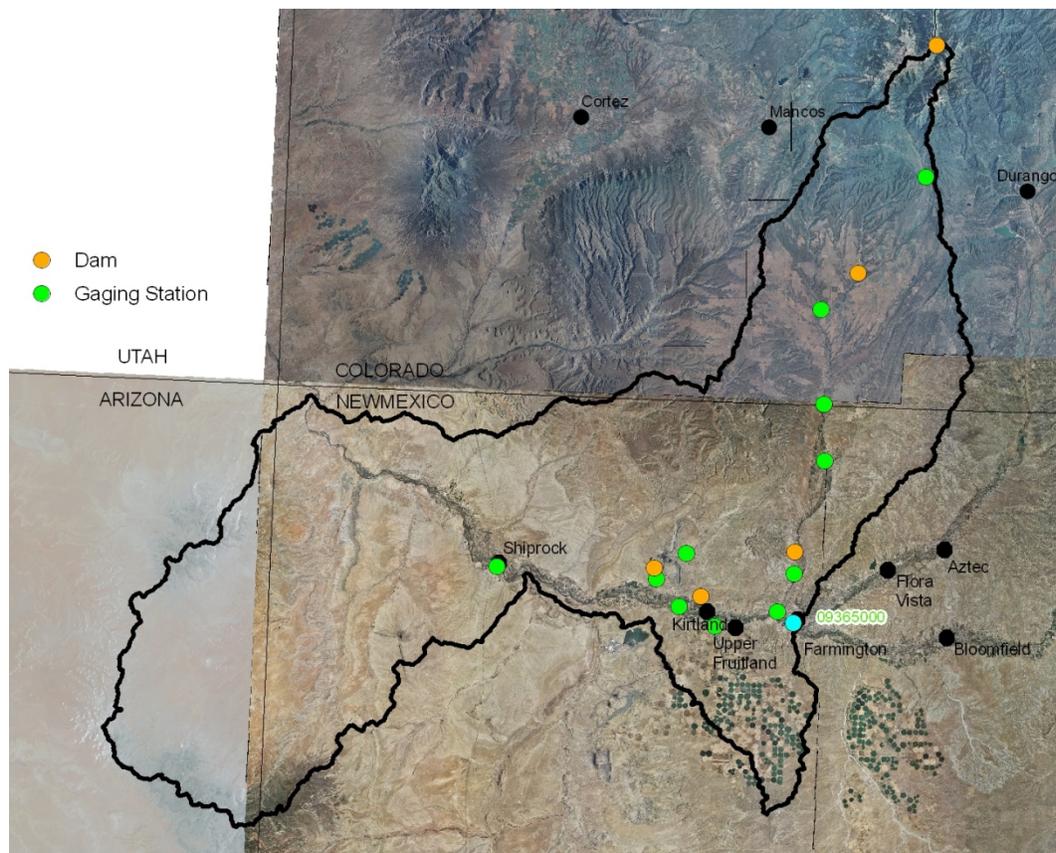
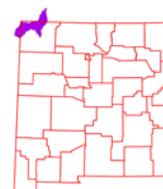


Figure 9. Gauging Stations in the Middle San Juan Watershed



Hydrology

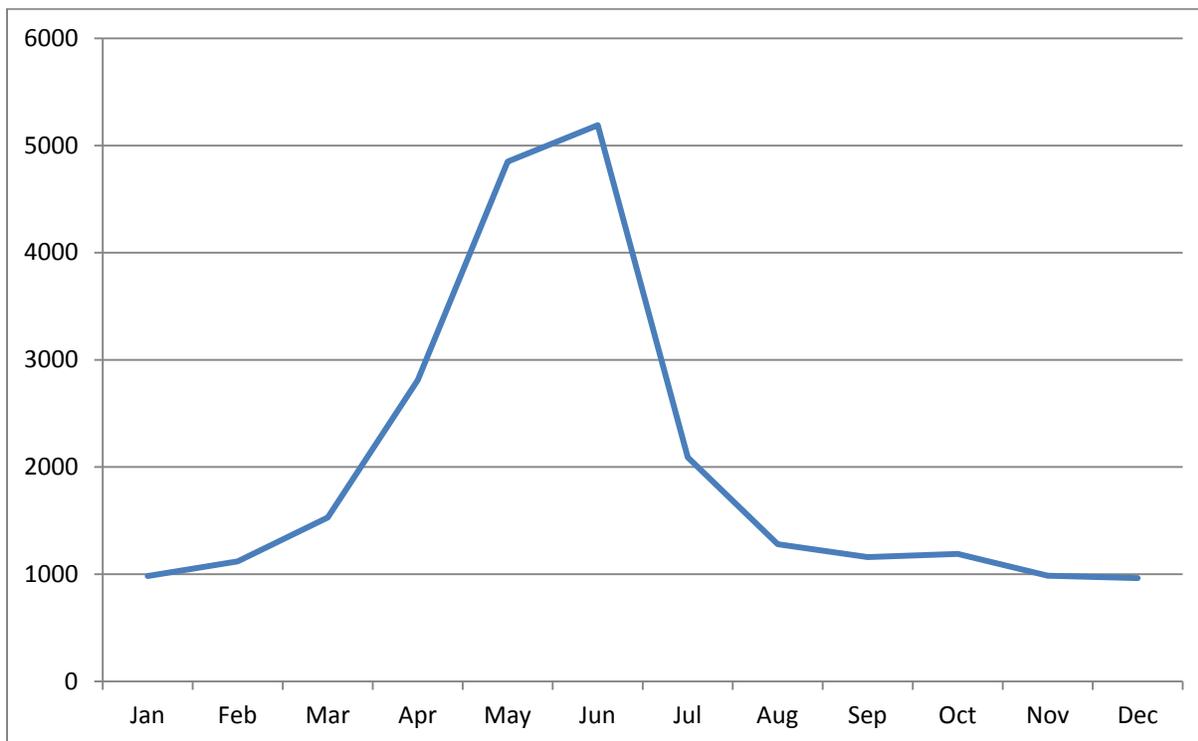
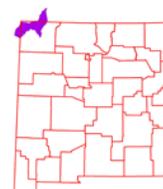


Figure 10. Monthly Average of Mean Daily Flow on the San Juan River at Farmington, NM. Period of observation: 1931-2010.



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 Middle San Juan watershed as part of the San Juan River Basin.

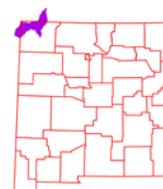
The Middle San Juan watershed has the following reaches listed as 303 (d) Impaired Surface Waters:

1. La Plata River (McDermott Arroyo to CO border)
2. La Plata River (San Juan River to McDermott Arroyo)

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

Use	La Plata River (McDermott Arroyo to CO border)	La Plata River (San Juan River to McDermott Arroyo)
high quality coldwater aquatic life		
marginal coldwater aquatic life	NS	NS
Irrigation/irrigation storage	x	x
domestic water supply		
livestock watering	x	x
wildlife habitat	x	x
marginal warmwater aquatic life	NS	x
Primary contact		
secondary contact	NS	x
Fish culture		
Limited Aquatic Life		

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



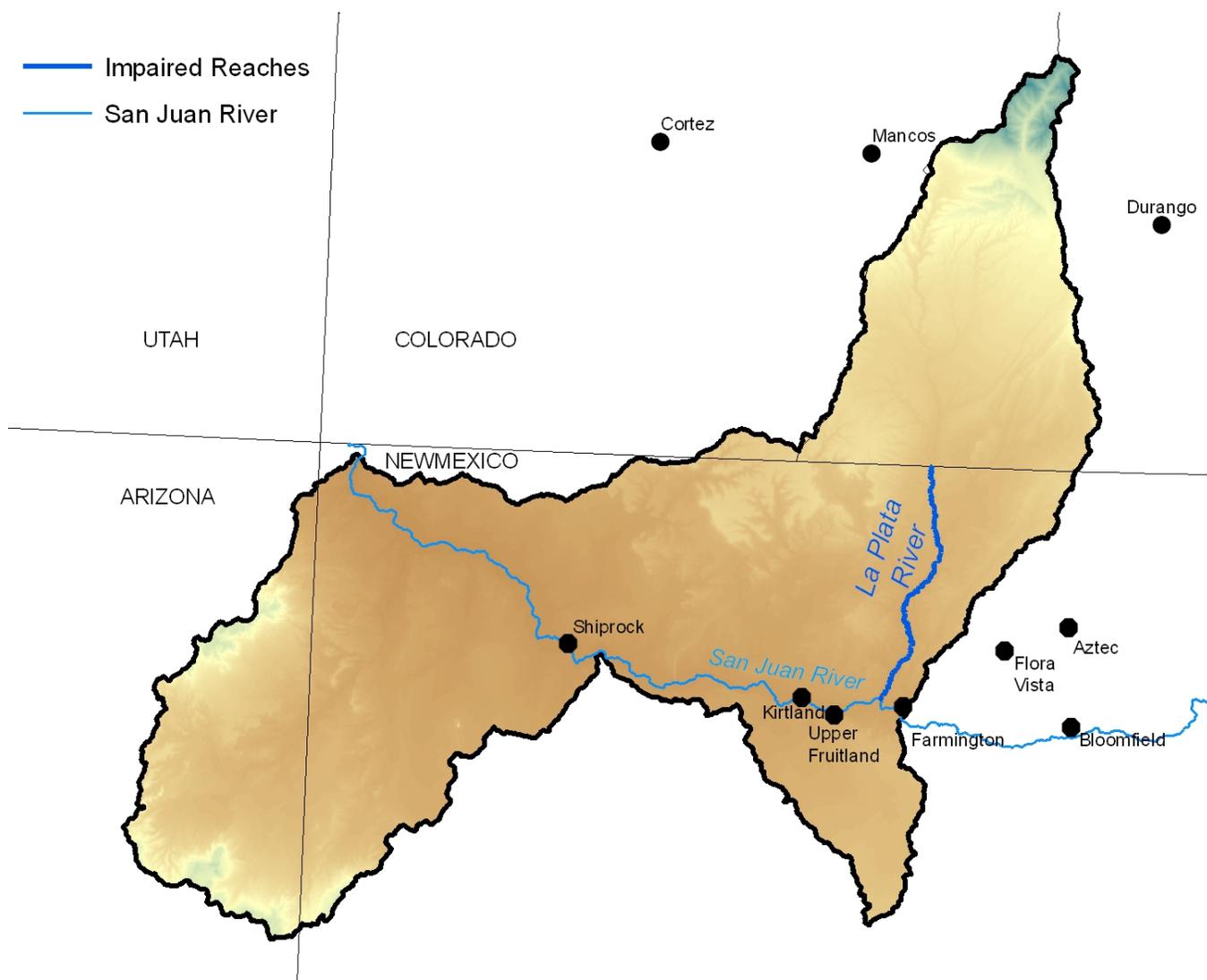
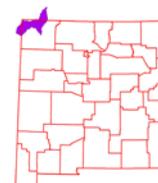


Figure 11. 303(d) Impaired Waters



Hydrology

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

The river and stream reaches total 24.8 miles (39.9 km) .

<u>Probable Causes of Impairment</u>	La Plata River (McDermott Arroyo to CO border)	La Plata River (San Juan River to McDermott Arroyo)
Aluminum		
Benthic-Macroinvertebrate Bioassessments	x	
Copper		
Dissolved Oxygen	x	x
Total Fecal and Coliform		
Gross Alpha - Adjusted		
Mercury		
Nutrient/Eutrophication		
PCB's		
Sedimentation/Siltation		x
Specific Conductance		
Temperature		
Turbidity		
Zinc		

Table 7. Possible Causes of Impairment



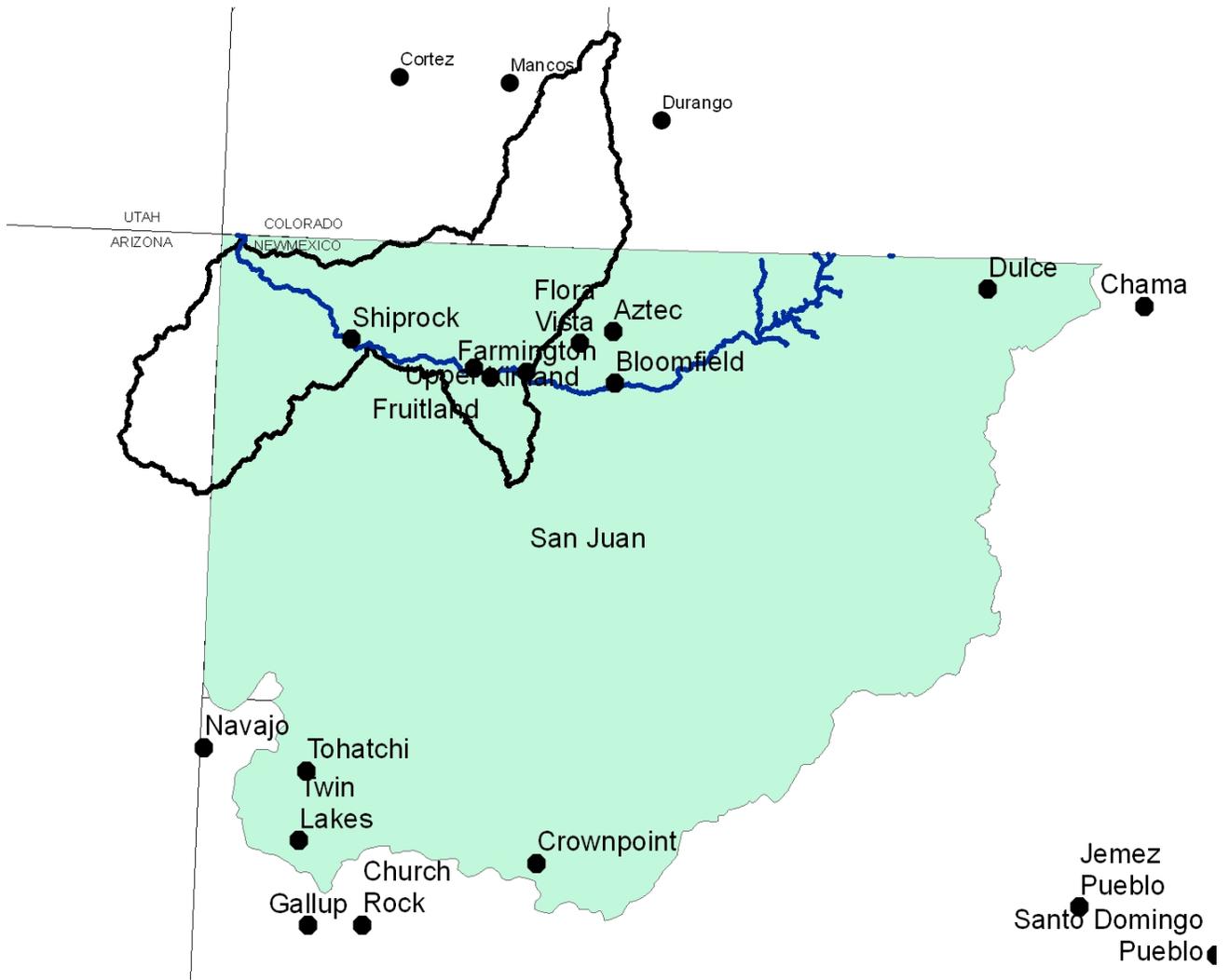
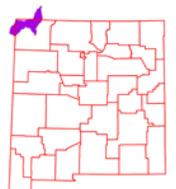


Figure 12. Declared Groundwater Basins of the Middle San Juan.

A declared groundwater basin is an area of the state proclaimed by the State Engineer to be underlain by a groundwater source having reasonably ascertainable boundaries. By such proclamation the State Engineer assumes jurisdiction over the appropriation and use of groundwater from the source. The New Mexico portion of the Middle San Juan watershed is completely within the San Juan Underground Water Basin. The surface watershed in NM covers 786,857 of the approximately 6.25 million acres of the underground water basin in NM.

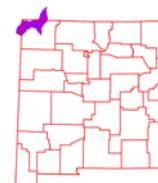


Threatened and Endangered Species ¹¹

Endangered species are those that are at risk of extinction throughout all or a significant portion of its native range. A threatened species is one that is likely to become endangered in the foreseeable future. The New Mexico Natural Heritage program tracks the status of threatened and endangered species which are listed on both federal and state lists. Table 8 lists those species which are currently listed and tracked in the Middle San Juan River Watershed.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Tax.Class</u>	<u>Family</u>	<u>Fed Status</u>	<u>State Status</u>
<u>Razorback Sucker</u>	<u><i>Xyrauchen texanus</i></u>	Actinopterygii	Catostomidae	LE	
<u>Mexican Tetra</u>	<u><i>Astyanax mexicanus</i></u>	Actinopterygii	Characidae		T
<u>Colorado Pikeminnow</u>	<u><i>Ptychocheilus lucius</i></u>	Actinopterygii	Cyprinidae	LE	E
<u>Roundtail Chub</u>	<u><i>Gila robusta</i></u>	Actinopterygii	Cyprinidae		E
<u>Gray Vireo</u>	<u><i>Vireo vicinior</i></u>	Aves	Vireonidae		T
<u>Bald Eagle</u>	<u><i>Haliaeetus leucocephalus</i></u>	Aves	Accipitridae		T
<u>Southwestern Willow Flycatcher</u>	<u><i>Empidonax traillii extimus</i></u>	Aves	Tyrannidae	LE	E
<u>Mesa Verde Cactus</u>	<u><i>Sclerocactus mesae-verdae</i></u>	Dicotyledoneae	Cactaceae	LT	E
<u>Aztec Gilia</u>	<u><i>Gilia formosa</i></u>	Dicotyledoneae	Polemoniaceae		E
<u>Mancos Milk-vetch</u>	<u><i>Astragalus humillimus</i></u>	Dicotyledoneae	Fabaceae	LE	E
<u>Parish's Alkali Grass</u>	<u><i>Puccinellia parishii</i></u>	Monocotyledoneae	Poaceae		E

Table 7. Threatened and Endangered Plant and Animal Species.



Invasive Species ¹²

Invasive species are those which have been introduced into a region or ecosystem and have the ability to out-compete native species for resources (i.e. water, nutrients, sunlight, etc.) The Southwest Exotic Plant Mapping Program (SWEMP) is a collaborative effort between the United States Geological Survey and federal, tribal, state, county and non-government organization partners in the southwest which maintains ongoing efforts to compile and distribute regional data on the occurrence of non-native invasive plants in the southwestern United States. Within the Middle San Juan 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</i> (Caltrop Family)	African Rue
<i>Fabaceae</i> (Pea Family)	Camelthorn
<i>Scrophylariaceae</i> (Figwort Family)	Dalmatian Toadflax
<i>Brassicaceae</i> (Mustard Family)	Hoary Cress (Whitetop)
<i>Euphorbiaceae</i> (Spurge Family)	Leafy Spurge
<i>Asteraceae</i> (Sunflower Family)	Musk Thistle
<i>Asteraceae</i> (Sunflower Family)	Russian Knapweed
<i>Asteraceae</i> (Sunflower Family)	Spotted Knapweed
<i>Asteraceae</i> (Sunflower Family)	Yellow Starthistle

Table 8. Invasive Species Recognized by the SWEMP.



Common Resource Areas¹³

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

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

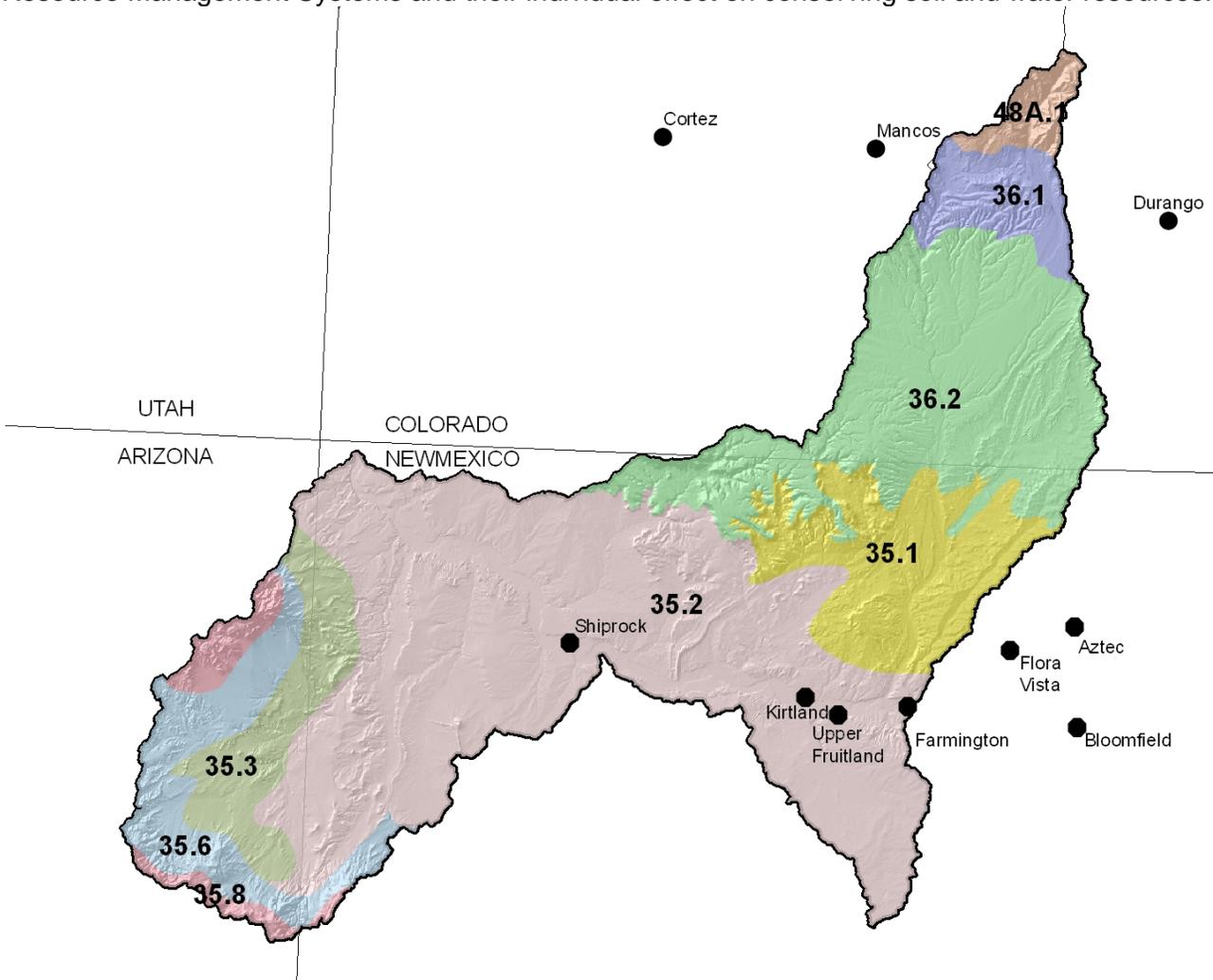


Figure 13. Common Resource Areas of the Middle San Juan.



Common Resource Areas

35.1 - Colorado Plateau Mixed Grass Plains

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

35.2 - Colorado Plateau Shrub – Grasslands

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

35.3 - Colorado Plateau Sagebrush – Grasslands

This unit occurs within the Colorado Plateau Physiographic Province and is characterized by gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Volcanic fields occur in places. Elevations range from 4500 to 6000 feet. Precipitation averages 10 to 14 inches per year. The soil temperature regime is mesic. The soil moisture regime is ustic aridic. Vegetation includes Wyoming big sagebrush, Utah juniper, cliffrose, Indian ricegrass, needle and thread, and blue grama.

35.6 - Colorado Plateau Pinyon-Juniper-Sagebrush

This unit occurs within the Colorado Plateau Physiographic Province and is characterized by gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Volcanic fields occur in places. Elevations range from 5500 to 7000 feet. Precipitation averages 13 to 17 inches per year. The soil temperature regime is mesic. The soil moisture regime is aridic ustic. Vegetation includes pinyon, juniper, big sagebrush, muttongrass, prairie junegrass, western wheatgrass, and blue grama.

35.8 - Colorado Plateau Ponderosa Pine Forests

This unit occurs within the Colorado Plateau Physiographic Province and is characterized by gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Volcanic fields occur in places. Elevations range from 6800 to 8500 feet. Precipitation averages 17 to 25 inches per year. The soil temperature regime ranges from mesic to frigid. The soil moisture regime is typic ustic. Vegetation includes ponderosa pine, white fir, aspen, pinyon, juniper, Gambel oak, and big sagebrush.



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

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

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

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

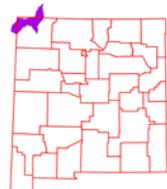
48.1 – Southern Rocky Mountains – High Mountains and Valleys

This area is best characterized by steep, high mountain ranges and associated mountain valleys. The temperature regimes are mostly frigid and cryic; moisture regimes are mainly ustic and udic. Vegetation is sagebrush-grass at low elevations, and with increasing elevation ranges from coniferous forest to alpine tundra. Elevations range from 6,500 to 14,400 feet.



Conservation ¹⁴

The USDA-Natural Resources Conservation Service (NRCS) focuses on the development and delivery of high quality products and services that enable people to be good stewards of our Nation's soil, water, and related natural related resources on non-Federal lands. The Natural Resources Conservation Service's conservation programs aid agricultural producers in their efforts to reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. Public benefits include enhanced natural resources that help sustain agricultural productivity and environmental quality while supporting continued economic development, recreation, and scenic beauty. These figures cover Colorado and New Mexico, not Arizona.



Conservation Practice	2006		2007		2008		2009		2010		TOTAL	
	#	Acres	#	Acres	#	Acres	#	Acres	#	Acres	#	Acres
Access Control	1	120	21	1090							22	1210
Brush Management	6	794	14	134	5	281	9	117	8	78	42	1404
Conservation Cover	4	184							1	52	5	236
Conservation Crop Rotation	124	10922	4	23	5	83					133	11028
Contour Buffer Strips			1	75							1	75
Cover Crop			9	259							9	259
Forage and Biomass Planting	3	85	29	1226	4	74	1	65			37	1450
Forage Harvest Management	23	818	31	866	7	216	1	11	7	418	69	2329
Forest Stand Improvement	1	10									1	10
Grassed Waterway	1	149									1	149
Grazing Land Mechanical Treatment			4	186							4	186
Integrated Pest Management	116	13360	15	1452	36	598	2	213			169	15623
Irrigation System, Sprinkler	3	81			25	25			2	50	30	156
Irrigation System, Surface and Subsurface	9	493					1	1	1	6	11	500
Irrigation Water Management	152	11697	119	9787	42	939	4	50	20	1780	337	24253
Land Smoothing					1	16	1	26			2	42
Nutrient Management	124	13403	9	1248	36	598	1	11			170	15260
Prescribed Burning			1	53							1	53
Prescribed Grazing	19	34955	29	48042					4	340	52	83337
Range Planting	1	100	4	181							5	281
Residue Management	112	10660									112	10660
Residue Management, Seasonal	13	2768	2	1170	10	314					25	4252
Tree/Shrub Establishment			1	68			1	15			2	83
Upland Wildlife Habitat Management	21	3365	9	340	9	876			8	21406	47	25987
Wetland Enhancement					1	6					1	6
SUM (Σ)	733	103964	302	66200	181	4026	21	509	51	24130	1288	198829

Table 9. 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	1920			1	2	2	1922
Conservation Completion Incentive First Year			1								1	
Fence	1	1875			1	2952	4	6339	5	5761	11	16927
Grazing Management Plan, written									6		6	
Irrigation Reservoir							1				1	
Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic	8	12294	2	2726	6	10372	5	4604	4	1964	25	31960
Irrigation Water Conveyance, Pipeline, Low-Pressure, Underground, Plastic	14	9828	6	6996	4	3002					24	19826
Irrigation Water Conveyance, Pipeline, Rigid Gated Pipeline	10	8302	5	5271	13	11762	1	1020			29	26355
Irrigation Water Conveyance, Pipeline, Steel					7	138	1	44			8	182
Pond			1								1	
Pond Sealing or Lining	1										1	
Pumping Plant	1				2		5		1		9	
Structure for Water Control	14		4		11		7		2		38	
Water Well					2						2	
Watering Facility			1		22				2		25	
Wildlife Watering Facility	2										2	
SUM (Σ)	51		20		69		24		21		185	97172

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



Soil Resource Inventory ¹⁵

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

National Cooperative Soil Survey

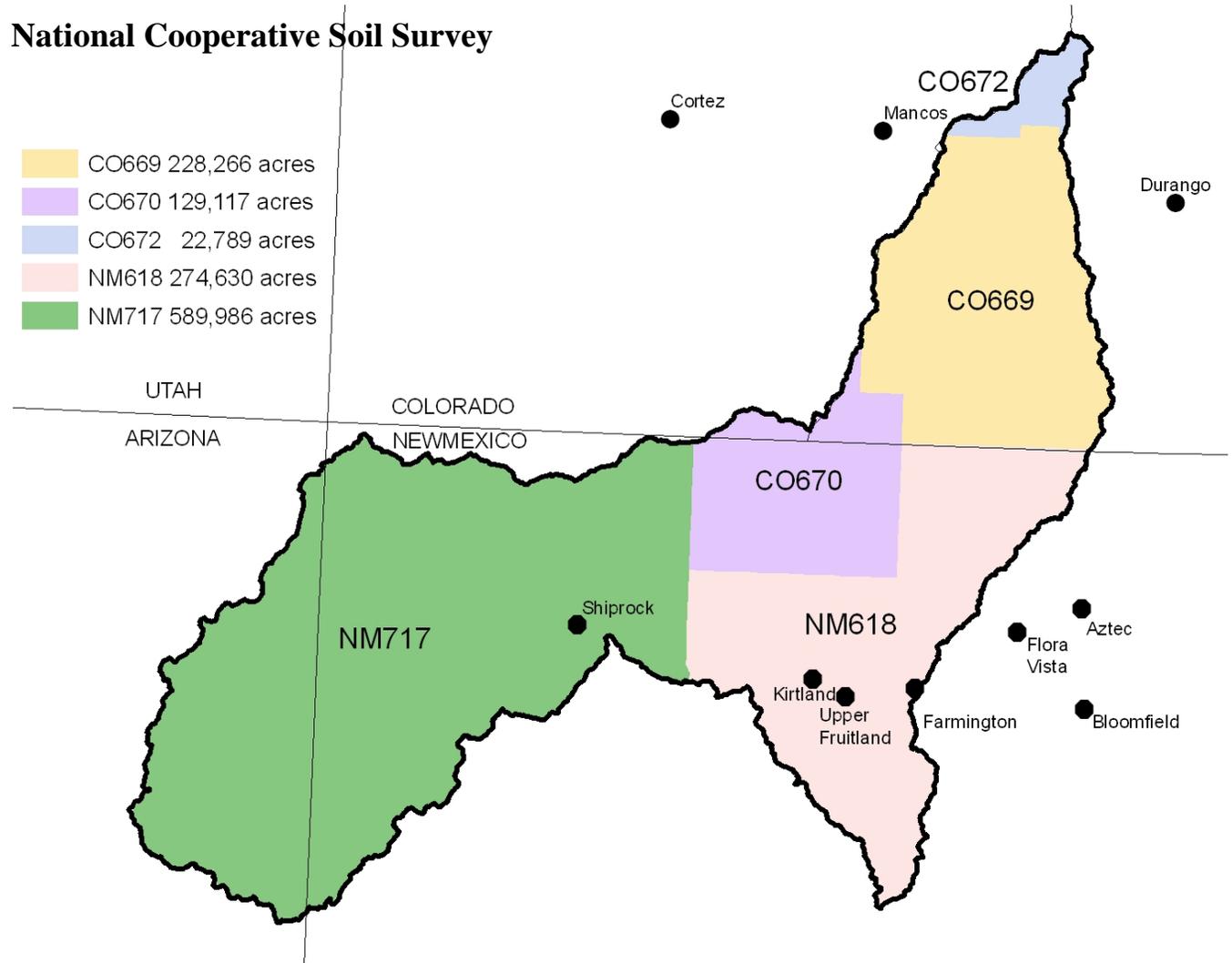


Figure 14. National Cooperative Soil Survey coverage of the Middle San Juan Watershed.

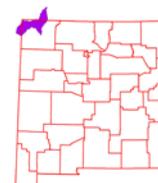


Soil Resource Inventory

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

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

Table 11. Criteria Used for Soil Erosion Susceptibility Model.



Soil Resource Inventory

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

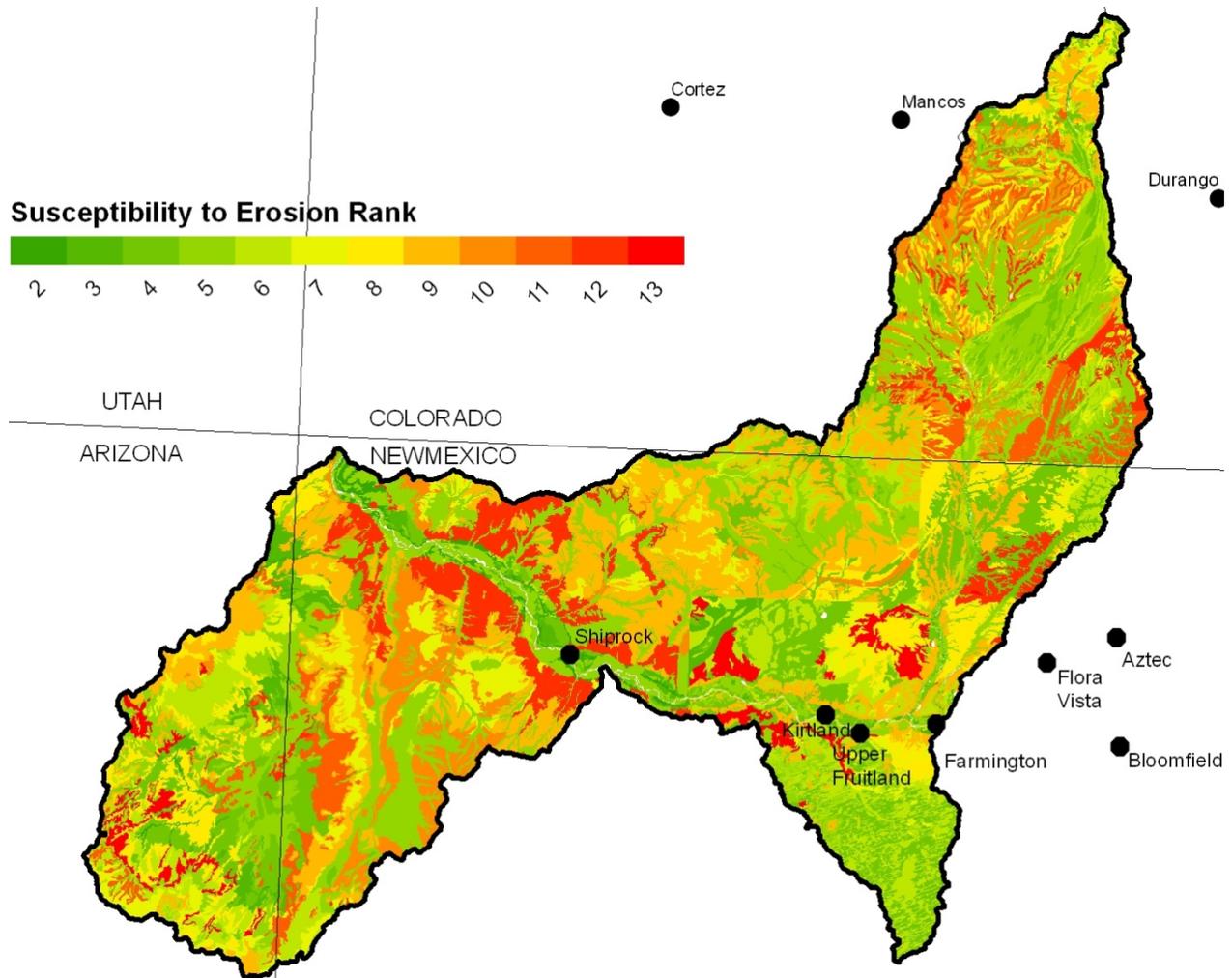


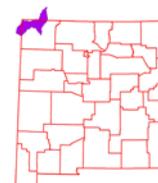
Figure 15. Middle San Juan Watershed Erosion Potential.



Soil Resource Inventory

Rank	Acres
2	8,788
3	28,337
4	163,609
5	276,806
6	138,513
7	91,676
8	86,391
9	204,242
10	76,202
11	53,724
12	85,541
13	27,477
Sum(Σ)	1,241,306

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



Socioeconomic Data ¹⁶

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
Apache (AZ)	69,728	16,606	52,817	433	52,384	4,072	16,296	221	51,461	88	19	1,019	624	\$36,773
Montezuma (CO)	23,830	8,012	15,818	482	3,150	2,263	19,474	33	2,676	48	15	1,016	568	\$55,453
La Plata (CO)	49,594	15,493	28,448	1,401	27,047	5,345	42,985	240	3,214	317	10	1,490	1,338	\$71,501
San Juan (NM)	122,120	67,413	46,338	1,069	45,319	21,330	67,905	1,259	44,485	665	0	5,150	2,656	\$52,564

Table 13. Socioeconomic Data of the Counties in the Watershed (2000).



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