

Montezuma Creek
&
Lower San Juan-Four Corners
Watershed
Coordinated Resource Management
Plan



Sponsored by the
San Juan Conservation District

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1.0 Introduction

1.1 Purpose

This watershed plan was developed using the Coordinate Resource Management Planning (CRMP) process that included local landowners, communities, watershed organizations, and agencies operating within the Montezuma Creek Lower San Juan-Four Corners Watersheds. This plan will be referred to as the SJWP. The CRMP process allows for local input into the planning and future improvement of the rangeland, farmland and water quality within the targeted watersheds.

The SJWP covers the majority of the Montezuma Creek watershed (14080203), excluding the area east of the Colorado/Utah state line. It also encompasses the Lower San Juan-Four Corners Watershed (14080201) excluding the area west of Butler Wash sub watershed (1040802010708) and the area south of the San Juan River.

The area covered under this plan is large in scale but projects are based on a smaller sub-watershed scale (12 digit Hydrologic Unit code or HUC). Developing and implementing the SJWP is an interactive process and is managed as such. In the initial phase of development, the plan only focuses on a few sub-watersheds; however as other sub-watersheds become priorities, this plan will be updated to include them.

This SJWP was developed using a combination of the Natural Resources Conservation Services (NRCS) assessment of the soil, water, air, plant, animal, energy & human resources and the Environmental Protection Agency (EPA)'s watershed planning method.

The SJWP resources were quantified and assessed by a group of technical experts who served as the CRMP technical committee. Concerns with the resource conditions were surfaced by local stakeholders. A steering committee directed the work of the technical committee and moved the process to completion.

Best management practices (BMP) and projects were proposed to address the resource concerns and as a result provide healthier rangelands, less soil erosion and flooding, protection of cultural resources, improvement in the quality of existing water and the quantity of water available for agriculture and other beneficial uses.

A major intent in producing this plan is to address all of the significant sources of pollution that are causing rangeland, farmland and water quality impairment in the watershed and identify sound practices that will restore and maintain water quality in the watershed once implemented. Pollutant sources are categorized as: Point source – pollution loads originate from a specific point of origin and Non-point sources requiring a broader view at the watershed scale.

EPA requires that each State utilizing Clean Water Act (CWA) section 319 funds to develop watershed plans that include nine key elements:

1. Identification of causes of impairment & pollutant sources that need to be controlled to achieve needed load reductions and any other goals identified in the plan.
2. An estimate of the load reductions expected from management measures (i.e. projects).

3. A description of the nonpoint source management measures (i.e. projects) that will need to be implemented to achieve load reductions listed above, and a description of the critical areas in which those measures will be needed to implement this plan.
4. Schedule for implementing the nonpoint source management measures (projects) identified in this plan that is reasonably expeditious.
5. Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.
6. An information and education (I&E) component used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.
7. A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.
8. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.
9. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item 8 immediately above.

These elements can be found in more detail at:

<http://www.epa.gov/region9/water/nonpoint/9elements-WtrshdPlan-EpaHndbk.pdf>. EPA must approve watershed plans prior to using 319 funds to address non-point source pollution and plans must include stakeholder and public input during their development.

1.2 Mission

The mission of the SJWP is to establish and implement socially, environmentally, and economically sustainable watershed management standards and practices that will provide good water quality, healthy & productive rangeland, soil condition, and cultural resource protection for the watershed area.

The goals of this plan are to develop a set of recommendations that will reduce soil erosion, improve rangeland health, improve stream habitat, improve recreational opportunities, and help local stakeholders achieve water quantity & quality objectives in the watershed area. Implementation of these recommendations will help foster activities that create a balance between the local community and its ecosystems.

The San Juan Conservation District hosted public meetings to explain what a watershed plan is and the benefits derived from them. A group of stakeholders were in attendance and a steering committee was organized to gather information, formulate and write the plan. A technical committee was selected to provide their expertise to the steering committee.

Organizations represented include:

TABLE 1 - 1.2 PARTNERS IN PLAN DEVELOPMENT

Electric Utilities/Power Companies	San Juan Conservation District (SJCD)
San Juan County	Natural Resources Conservation Service (NRCS)
Trout Unlimited (TU)	San Juan CWMA
Manti-LaSal (USFS)	Utah Association of Conservation Districts (UACD)
Utah Department of Agriculture and Food (UDAF)	Utah Division of Water Quality (UDWQ)
Utah Division of Wildlife Resources (UDWR)	Utah Farm Bureau Federation (UFBF)
Utah State University (USU) Extension	San Juan Water Conservancy District/Norman Johnson
Montezuma Creek/Aneth Chapter Navajo Nation	Utah State University Extension
Regional Conservation Coordinating Council	Utah Division of Water Rights
Bureau of Land Management (BLM)	Department of Oil, Gas and Mining (DOG M)
Railroad, Mining, Oil and Gas Industries	Ranchers/Grazers (sheep & cattle)
Private Land Owners	Forestry, Fire and State Lands (FFSL)
Sportsmen for Fish and Wildlife	US Fish and Wildlife Service
Irrigation Companies	
Water Users	Utah State Parks and Recreation
Utah Dept of Transportation (UDOT)	Army Corps of Engineers (ACOE)
Blanding City	Monticello City
White Mesa Ute Tribe	Bluff Area Residents/Homeowners
Utah Division of Water Rights	State Institutional Trust Lands (SITLA)

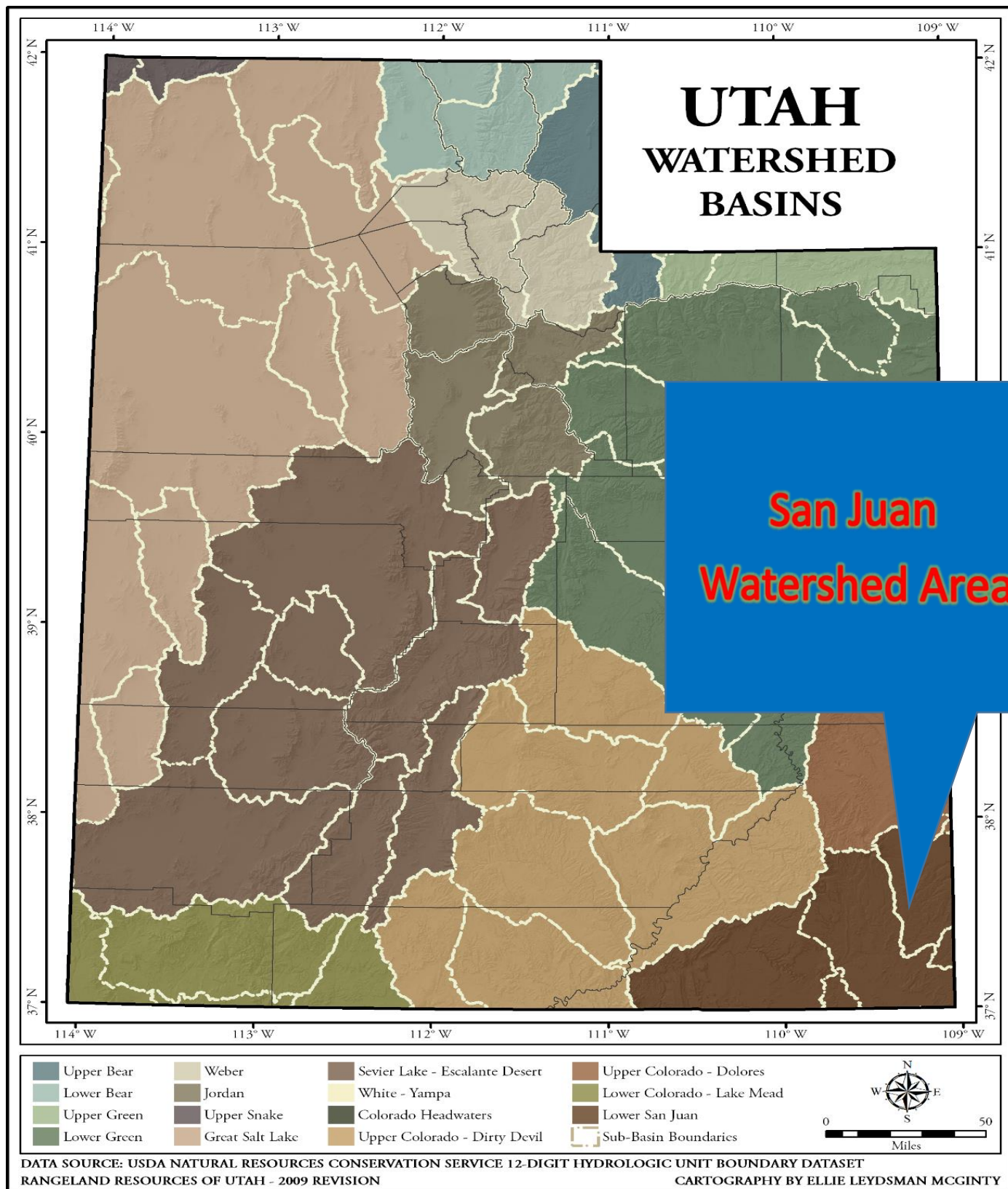


FIGURE 1 SAN JUAN WATERSHED AREA

2.0 Watershed Characteristics

2.1 Watershed Boundaries

San Juan Area Watershed Location Map

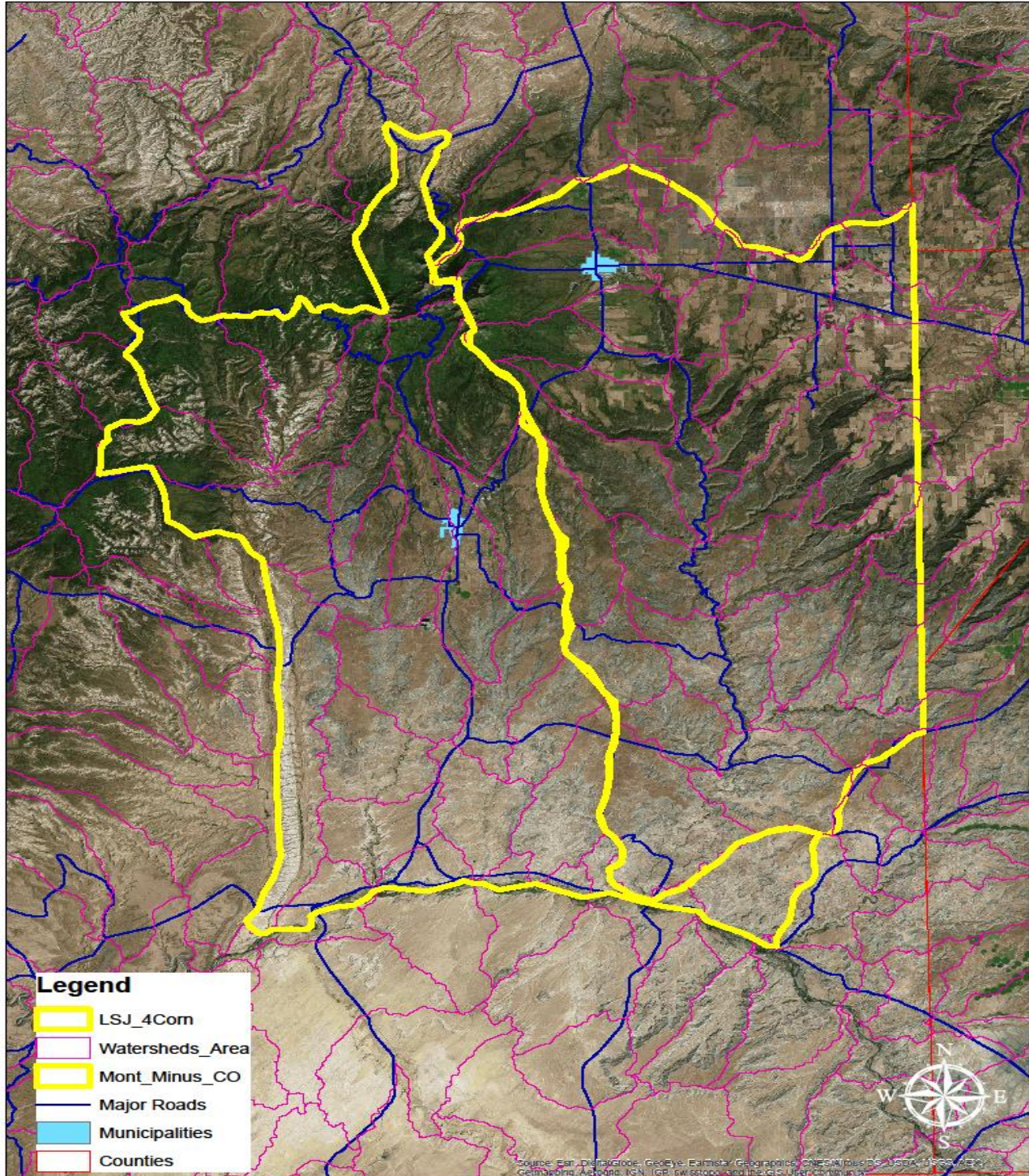


FIGURE 2 - 2.1 WATERSHED BOUNDARY

2.2 Hydrology of the San Juan Watershed Planning Area

The San Juan Watershed Planning area includes multiple watersheds as defined by the U.S. Geological Survey (USGS). Figure 2 – 2.1 shows the watershed boundaries within the planning area.

2.3 Climate and Precipitation

The annual precipitation in this area ranges from 8 inches in the low elevation areas to 31 inches in the high elevation areas of the forest areas. Much of the rainfall occurs as convective storms in late summer; about

20 to 35 percent of the total precipitation falls in July and August. This proportion increases from north to south within the area. About 15 to 25 percent of the precipitation is snow. Snow packs are generally light and not persistent throughout the winter, except at the higher elevations. The average annual temperature ranges from

37 to 56 degrees F. The frost-free period averages 160 days and ranges from 105 to 210 days.

The shortest frost-free periods occur in the northern part of the area and at high elevations.

2.4 Surface Water Resources

Surface water resources in the targeted watershed area include rivers, wetlands, springs, seeps and lakes. Water falling as rain and snow in the upper reaches of the planning area drain through a series of streams, reservoirs, irrigation canals and wetlands. The southern planning area boundary is the San Juan River, which drains into Lake Powell and then into the Colorado River.

There are several smaller streams in the planning area with intermittent or perennial stream flow. Intermittent streams flow continuously at least 30 days each year, and perennial streams flow year round. These streams are spring fed, and flows can fluctuate seasonally (low flows in summer) and annually based on climate conditions. Most of the stream flows range from less than 1 cfs in the summer to 5 cfs - 10 cfs with spring snowmelt conditions.

Flowing streams and stream segments within the planning area include Cross Canyon Creek, Indian Creek, Montezuma Creek, Recapture Creek, South Cottonwood Creek, Spring Creek, Verdure Creek and Westwater Creek. These streams eventually flow into the San Juan River.

2.4.1 Surface Water Uses

Many of the streams in the planning area are diverted for municipal and irrigation uses. Major water managers in the drainage include private irrigation companies and ditches such as Blue Mountain Irrigation Company, The Carlisle Group, Pioneer Irrigation, and Blanding Irrigation Company. These irrigation companies provide water to water stock holders within the watershed. Other users consist of Blanding City, Monticello City, Bluff Service Area, San Juan County and the Department of Energy.

Water is "Imported" from the Indian Creek Drainage to the Johnson Creek Drainage via a tunnel running north to south through the Jackson Ridge sitting roughly 10,000 feet in elevation.

Blanding City can take the first 2.0 cfs through this tunnel under water right numbers 05-2948, 2949, 2946. The remaining water stays in the Indian Creek for downstream water rights, mainly at the Dugout Ranch. The only water "exported" naturally drains to the San Juan River.

The map below shows locations of water use along with the ditches/canals.

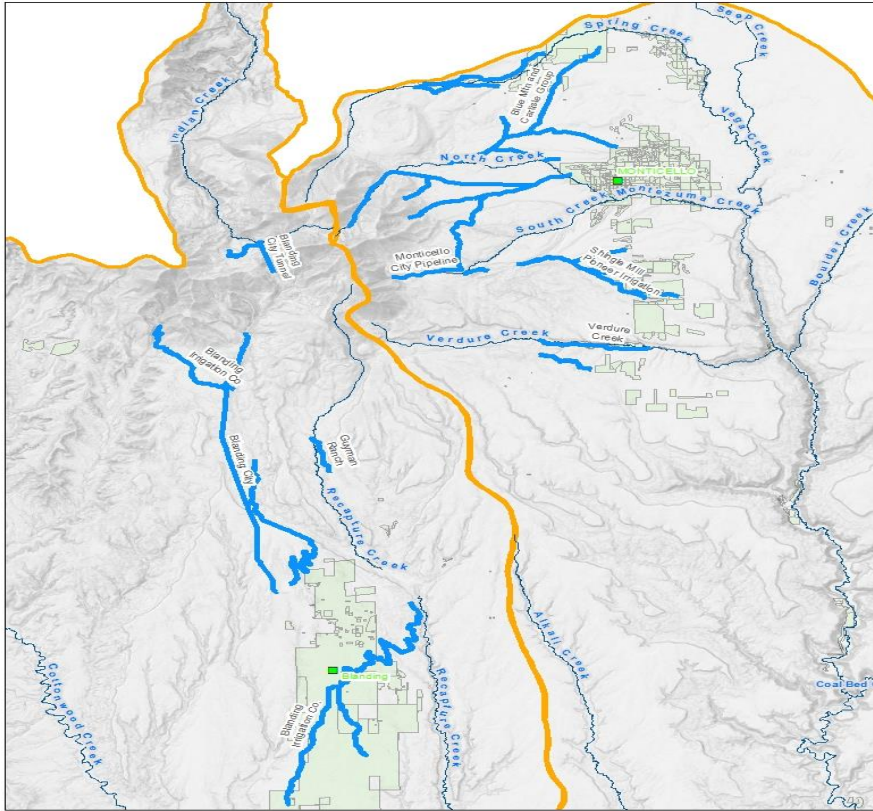


FIGURE 3 - 2.4 WATER USE WITH DITCHES & CANALS

The following is a list of average annual water use per user

Monticello City Pipeline (mountain)	494 acre feet (acft)
Pioneer Irrigation	65 acft
Shingle Mill Draw	74 acft

The following is a list of industrial/municipal water users in the watershed boundary on record with the Division of Water rights from 2000-2015

Blanding City	673 acft
Bluff Service Area	69 acft
Eastland Special Service District	11.6 acft
Mexican Hat SSD	21.1
Monticello City	778 acft

2.4.2 USGS Streamflow Data

There are currently three USGS water measurement stations located in the watershed boundary that are active. Average annual acre-foot volumes are as follows:

There are currently three active USGS stream gauges located in the planning area. Average annual acre-foot volumes at these sites are as follows:

- South Creek Above Reservoir near Monticello 1049 acft
- Recapture Creek Near Blanding 789 acft

San Juan River Near Bluff 1.54 Million acft

There were four additional USGS stream gauges in the planning area which have been discontinued and are not currently active. Average annual acre-foot volumes at these sites are as follows:

Spring Creek Near Monticello (2002-2008) 644 acft

Indian Creek Tunnel (1958-1980) 1100 acft

Indian Creek Near Monticello (1950-1957) 2085 acft

Recapture Creek Below Johnson Creek (1976-1994) 6255 acft

2.4.3 Reservoirs

There are ten large reservoirs and many smaller stock ponds located within the planning area. The larger reservoirs provide water for municipal water and irrigation. The smaller stock ponds provide water for livestock and wildlife, and are especially important in areas with no other surface water such as streams or springs. See section 4.1 for stock pond locations and current conditions.

Reservoir Storage in the Watershed are as follows:

TABLE 2 - 2.4.1 RESERVOIRS

Name	Elevation (MSL)	Storage (AF)	Owned	Operated	Type	Use
Monticello Lake	8600	27	Wildlife Res.	Wildlife Res.	Earth	Recreation
Lloyds Lake	7163	3500	San Juan WCD	San Juan WCD	Earth	Irrigation
Gordon Reservoir	7400	179	Carlisle Water	Carlisle Water	Earth	Irrigation
Keller Reservoir	6880	206	Grayson Redd	Grayson Redd	Earth	Irrigation
Blanding #3	5960	133	Blanding City	Blanding City	Earth	Municipal
Blanding #4	6480	76.3	Blanding City	Blanding City	Earth	Municipal
Starvation	6540	500	Blanding City	Blanding City	Earth	Municipal
Recapture	6070	8820	San Juan WCD	San Juan WCD	Earth	Irrigation
Dry Wash #2	7741	518	San Juan WCD	San Juan WCD	Earth	Irrigation
Camp Jackson	9098	49	Blanding City	Blanding City	Earth	Municipal

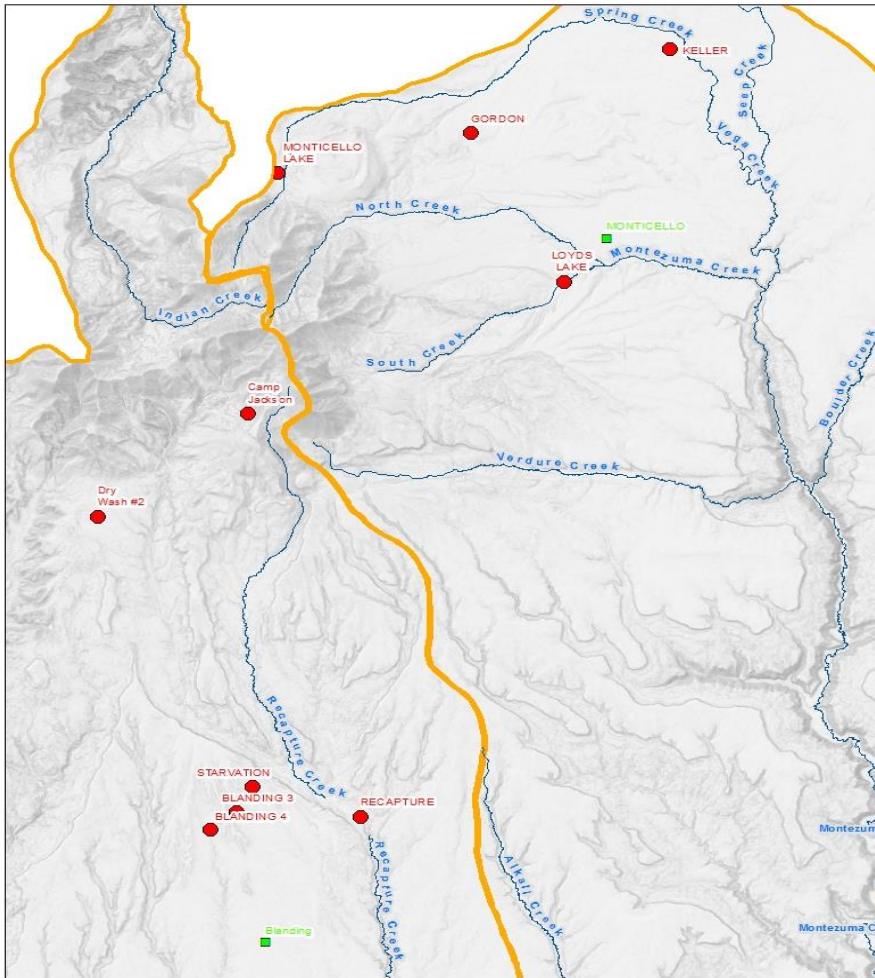


FIGURE 4 - 2.4.1 RESERVOIR LOCATIONS

2.4.2 Groundwater

Groundwater is an important source of water in the planning area. Groundwater resources include springs, seeps and water wells. These springs and seeps provide water to all the flowing streams in the planning area, which otherwise only flow with rainfall or snowmelt events.

Good quality groundwater is often found in the Entrada Sandstone and the Navajo Sandstone Geologic Formations. Poor quality groundwater can be found in the Dakota Sandstone, Cedar Mesa Sandstone and the Leadville Limestone Geologic Formations.

Water wells provide water for domestic and irrigation uses on private and state lands. The Division of Water Rights currently has on record 779 well logs for the area. The average depth to ground water in these wells is 98 feet from the surface. The City of Blanding has some deep wells that extend between 700 and 1800 feet deep. There are a few wells in the Bluff area that are flowing artesian wells. The map below shows where wells with water rights are located and their respective depth ranges.

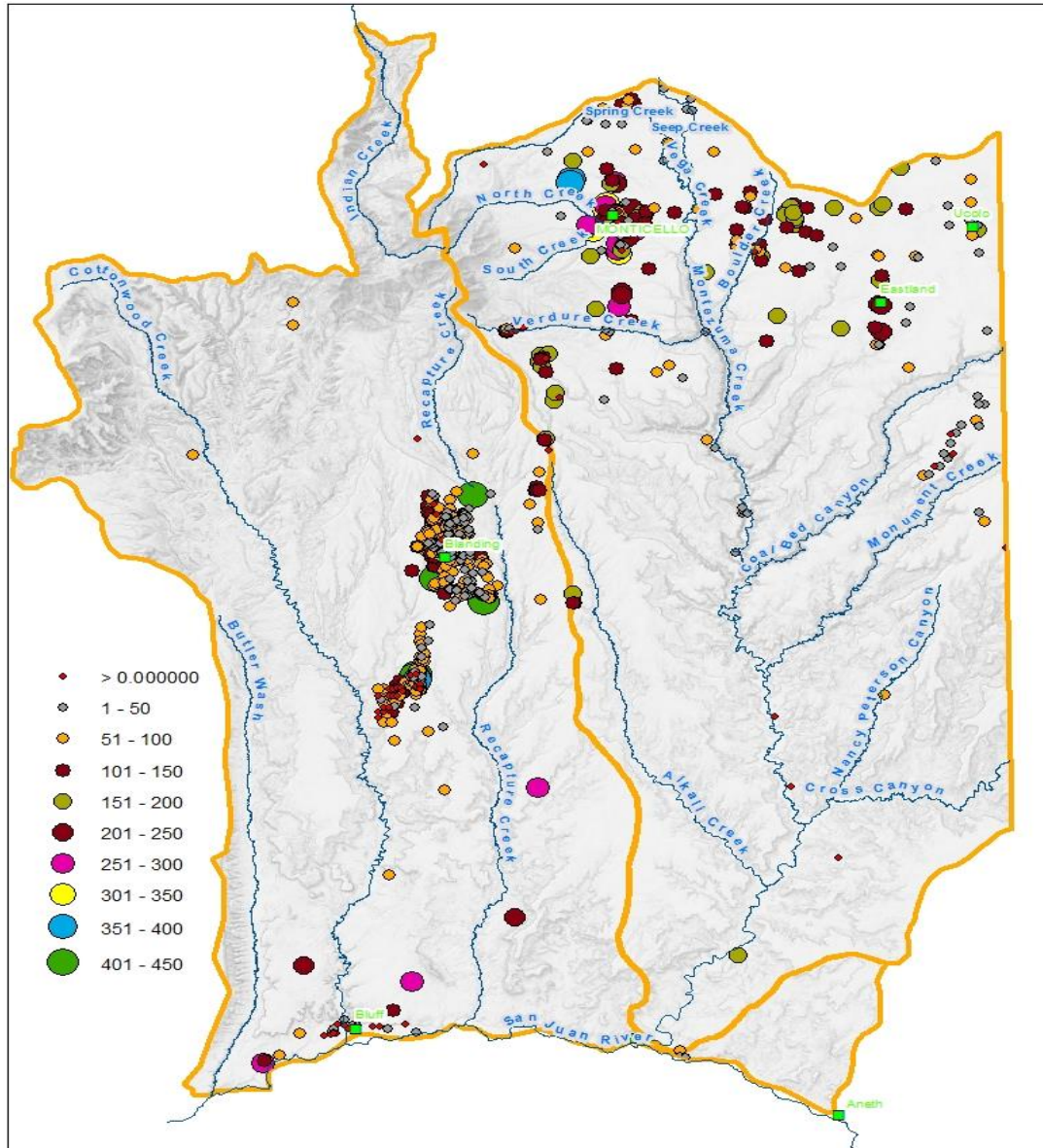


FIGURE 5 - 2.4.2 WELL LOCATIONS

2.5 Soils

Natural Resources Conservation Service (NRCS) has broken the landscape of Utah into Major Land Resource Areas (MLRA). These MLRAs are geographically associated land resource units. They were delineated to group lands that have similar soils, ecology and uses. They are also the basic units for State land resource maps. MLRA divisions help guide finer-scale soil maps and ecological site descriptions.

There are 3 major MLRA's in the San Juan watershed area. The Colorado and Green River Plateaus-MLRA 35, which is mostly in the southern end of the watershed but also includes a small area at the extreme northern end. This MLRA is located in the SE portion of Utah and the major portion of it extends further into Arizona and New Mexico.

The Southern Rocky Mountains-MLRA 48A, is at the NW part of the watershed area and the major part of this MLRA is in central Colorado with small amounts in central-eastern and southeastern Utah. The Southwestern Plateaus, Mesa and Foothills-MLRA D36, makes up the

majority of the watershed area. This MLRA extends from SE Utah through SW Colorado and into northern New Mexico. These three MLRAs have differing soils, geology and vegetation (USDA-NRCS, 2006.).

2.5.1 San Juan Watershed Major Land Resource Areas

Colorado and Green River Plateau-MLRA 35

The soils in this MLRA are generally very shallow to very deep, well drained or somewhat excessively drained, and loamy or clayey. These soils form in arid or semi-arid conditions (Aridisols), are young soils with little development (Entisols). In higher elevations of the MLRA within the watershed, the soils may be more well-developed and fertile soils (Mollisols).

The soil moisture regime is Ustic Aridic, meaning that generally there is plant-available moisture during the growing season, but severe periods of drought may occur. This means that these soils have to be irrigated, either naturally or artificially, to be used for agriculture. Winters are relatively moist and cool, and summers are relatively hot and dry.

The dominant soil temperature regime is mesic, meaning the mean annual soil temperature is above 46°F and less than 59°F.

Southern Rocky Mountains-MLRA 48A

The soils in this MLRA are generally moderately deep, stony or very stony, and medium textured and mixed mineralogy.

The soil moisture regime is udic, meaning soil moisture is sufficiently high year-round in most years to meet plant requirements.

The soil temperature regime in the mountain area is frigid, meaning the mean annual soil temperature is above 32° and less than 46°. In the high mountain area the soil temperature regime is cryic, meaning the mean annual soil temperature is less than 46° and colder than a frigid soil regime in the summer.

Southwestern Plateaus, Mesa and Foothills-MLRA D36

The soil moisture regime is ustic, meaning Soil moisture is intermediate between Udic and Aridic regimes; generally, plant-available moisture during the growing season, but severe periods of drought may occur.

The soil temperature regime is mesic, meaning the mean annual soil temperature is above 46°F and less than 59°F, or frigid, meaning the mean annual soil temperature is above 32° F and less than 46°.

Following are the various kinds of land use in this MLRA:

Cropland—private, 3%

Grassland—private, 41%; Federal, 39%

Forest—private, 7%; Federal, 5%

Urban development—private, 2%

Other—private, 3%

Nearly all of this area supports natural vegetation and is used as grazing land or forestland. Cropland also is a significant land use. Where irrigation water is available, irrigated crops, such as wheat, barley, beans, oats, alfalfa, and hay, are grown.

2.5.2 San Juan Watershed Ecological Sites

NRCS further defines lands as ecological sites. An ecological site is defined as a distinctive kind of land with specific soil and physical characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation and its ability to respond similarly to management actions and natural disturbances.

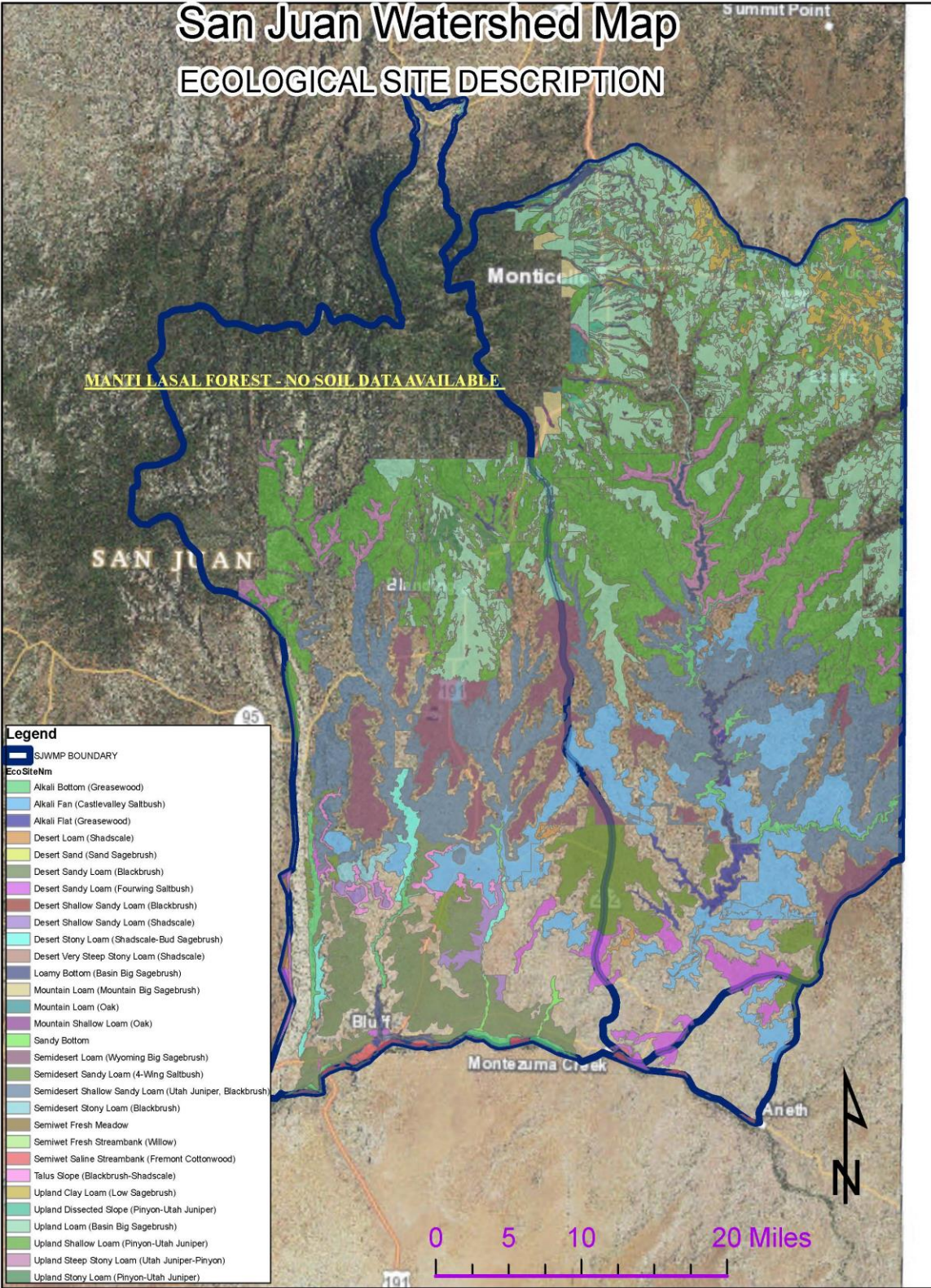


FIGURE 6 - 2.5.2 ECOLOGICAL SITE DESCRIPTION

2.6 Geology

2.6.1 Physiography and General Geology

The San Juan Watershed Area is situated in the west central part of the Pennsylvanian Paradox sedimentary basin (Figure 2.a). The Paradox sedimentary basin encompasses a somewhat smaller area referred to as the Paradox evaporate basin (Kelly, 1958). The Paradox evaporate basin is an oval shaped area roughly 110 miles wide, a northeasterly direction and 180 miles long in a northwesterly direction which is underlain by a thick Pennsylvanian sequence distinctive by the presence of evaporate rocks such as salt, gypsum and anhydrite.

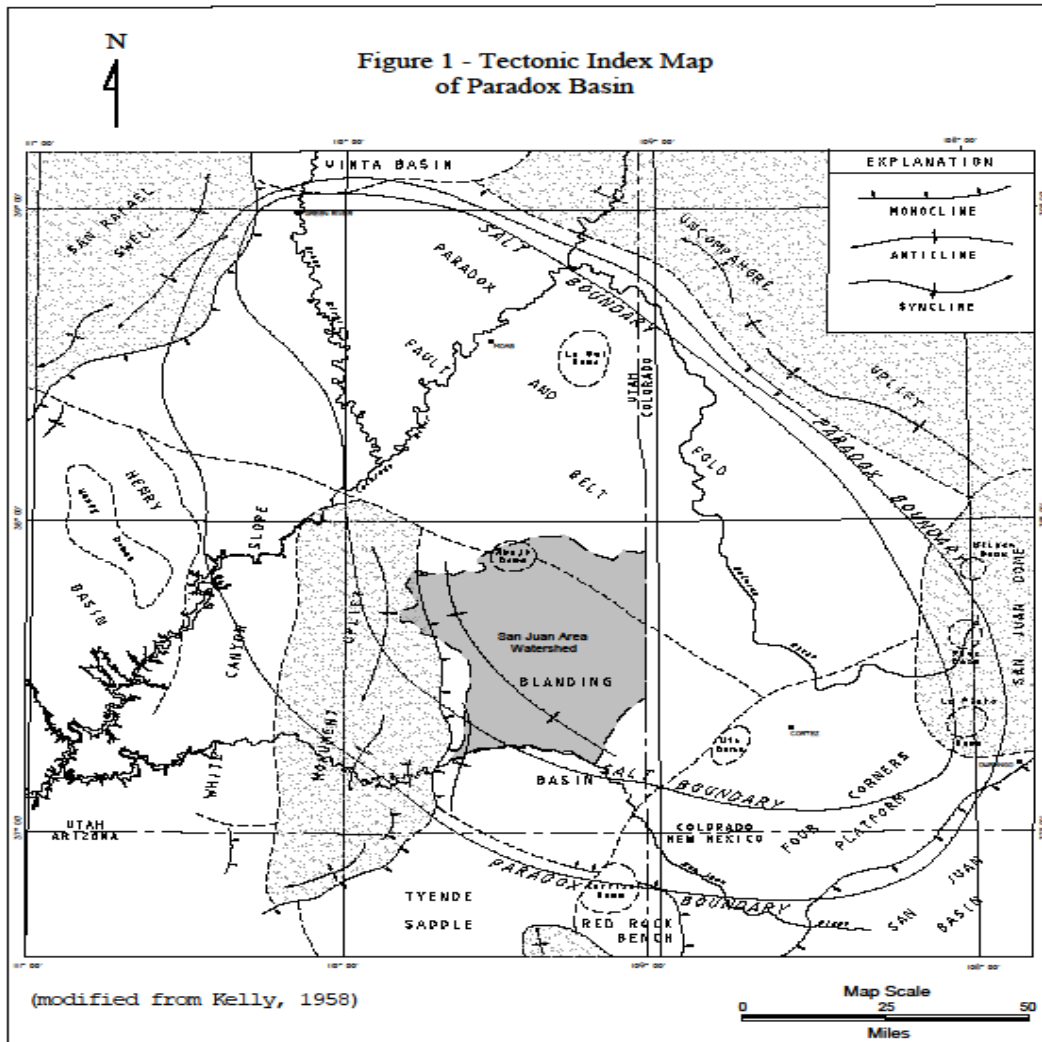


FIGURE 7 - 2.5.6 TECTONIC INDEX MAP

The San Juan Watershed Area is located in the southeast corner of Utah near the Four Corners which is roughly at the center of the Colorado Plateau physiographic province (Stokes, 1986). The watershed area involves portions of four sub-provinces or sections of the Colorado Plateau. These sub-provinces are: the Abajo or Blue Mountains, the Monument Upwarp, the Great Sage Plains, and the Blanding Basin.

The highest point in the watershed area is Abajo Peak in the Abajo Mountains section at an elevation of 11,345 feet. The Abajo Mountains are the result of igneous rock being intruded upward through conduits

in sedimentary rock. The surrounding sedimentary strata are domed upward on the flanks of these Tertiary age laccolithic intrusions. The western part of project area in upper Comb Wash and Elk Ridge is situated along the east flank of the Monument Upwarp. The Monument Upwarp is one of the major structural features of the Colorado Plateau. It is a broad asymmetric anticlinal structure resulting from horizontal crustal compression during the Laramide orogeny (Woodward-Clyde Consultants, 1982). The Comb Monocline forms the steeply dipping eastern margin of the Monument Upwarp. The upper reaches of Montezuma Canyon and its northern tributaries are the result of headward erosion of sedimentary strata in the Great Sage Plains sub-province. The Great Sage Plains extend from the base of the Abajo Mountains many miles east into Colorado. It is a level region that has been stripped by erosion of overlying softer rock units and conforms to the top of a relatively resistant flat-laying sedimentary rock layer.

The majority of the San Juan Watershed Area is within the Blanding Basin sub-province. The Blanding Basin is a roughly equidimensional shallow structural basin 40 to 50 miles across. The Blanding Basin includes the bulk of the Montezuma Creek Watershed and the other primary drainages in the project area including, Recapture Creek, Cottonwood Wash and Butler Wash. The Blanding Basin is an area of low mesas, buttes, and finger-like points between the primary drainages and their tributaries.

2.6.2 Stratigraphy

In general, sedimentary strata in the San Juan Watershed Area dip gently into the axis of the Blanding Basin which trends southeastward in the vicinity of Bluff, Utah. However, on the north and east margins of the project area, sedimentary rock layers are tilted moderately to steeply upward on the flanks of the Monument Upwarp and the Abajo intrusive complex. The oldest sedimentary rocks exposed in the project area coincide with these areas of greatest tectonic uplift and erosion. These comprise the Permian Cutler Group and the Triassic Moenkopi and Chinle Formations. For the most part, Mesozoic strata of Jurassic and Cretaceous age are exposed throughout the project area. Intrusive igneous rocks of Tertiary age comprise the Abajo Mountains.

Figure 2.b provides a general stratigraphic section of the area. The formations exposed in the project area are, in ascending order, the: Cedar Mesa Sandstone, Organ Rock Shale, Moenkopi Formation, Chinle Formation, Wingate Sandstone, Kayenta Formation, Navajo Sandstone, Carmel Formation, Entrada Sandstone, Curtis Formation, Summerville Formation, Bluff Sandstone, Morrison Formation, Burro Canyon Formation, Dakota Sandstone, and igneous rocks of the Abajo Laccolithic Complex.

The Cedar Mesa Sandstone and Organ Rock Shale are part of the Permian Cutler Group. The Cedar Mesa Sandstone is comprised of fine-grained, white to pale-reddish-brown, cross-stratified, near-shore sandstones. The Organ Rock Shale contains red, thin-bedded sandstones and shales. Stratigraphic Column Permian and Triassic age formations are exposed in the north and northwestern part of the project area on the flanks of the Abajo Mountains and in upper Comb Wash and Elk Ridge. The Triassic-age sediments in the project area are characterized by thick, red, clastic sequences that were deposited in a range of near-shore and fluvial environments. The Moenkopi Formation consists of chocolate-colored, fluvial, deltaic, and coastal deposits that include silty, micaceous shales interbedded with sandstones. The Chinle Formation is comprised

of red, brown, and gray sandstone; conglomerate; and red, purple, and green-gray mudstone.

The Jurassic Glen Canyon Group includes the Wingate Sandstone, Kayenta Formation, and Navajo Sandstone. The Wingate and Navajo Sandstones consist primarily of massive, white and gray-orange to red-brown, cross-bedded, eolian sandstones and the Kayenta Formation is a very fine to fine-grained, irregularly bedded, locally conglomeratic, fluvial sandstone, siltstone, and shale.

The Jurassic San Rafael Group includes the Carmel Formation, Entrada Sandstone, Curtis Formation and Summerville Formation. This Group consists of non-marine, cross-stratified sandstone and siltstone and transitory marine thin-bedded red mudstone and gray and yellow sandstone, marine glauconitic sandstone. The Jurassic Morrison Formation is exposed extensively in the Blanding Basin and consists of

brown and lenticular sandstone and conglomeratic sandstone and red-green bentonitic mudstone of fluvial origin. The Cretaceous Burro Canyon Formation and Dakota Sandstone caps the mesas in the Blanding Basin and the Greater Sage Plains **Figure 2.b** Stratigraphic Column

sub-provinces. The Cretaceous sediments represent a marine transgression. Conglomerate, sandstone, mudstone, and coal were deposited in transitional regimes, while carbonaceous shale and minor limestone reflect deposition in marine environments.

The youngest rocks in the project area are the Tertiary age igneous intrusive rocks in the Abajo Mountains comprised of diorite and quartz-diorite.

Figure 2 - Generalized Stratigraphic Column

Erathem	System	Rock Unit
CENOZOIC	Quaternary	Alluvial, Colluvial and Eolian Deposits
	Tertiary	Igneous Rock
MESOZOIC	Cretaceous	Mesaverda Group
		Mancos Shale
		Dakota Sandstone
		Cedar Mt. Formation and Burro Canyon Formation
	Jurassic	Morrison Formation
		Bluff Sandstone
		Summerville Formation ?
		Curtis Formation ?
		Entrada Sandstone
		Carmel Formation
Glen Canyon Group	Navajo Sandstone	
	Kayenta Formation and Wingate Sandstone	
Triassic	Chinle Formation	
	Moenkopi Formation	
PALEOZOIC	Permian	White Rim (De Chelly) Sandstone
		Organ Rock Shale
		Cedar Mesa Sandstone
		Elephant Canyon Formation
		Halgaito Shale
	Hermosa Group	Honaker Trail Formation
		Paradox Formation
		Pinkerton Trail Formation
	Molas Formation	
	Mississippian	Leadville Limestone (Redwall equivalent)
		Ouray Limestone
	Devonian	Elbert Formation
		Upper Elbert Member
		McCracken Sandstone Member
Cambrian	Aneth Formation	
	Lynch Dolomite ?	
	Muav Limestone	
	Bright Angel Shale	
Pre-Cambrian	Ignacio Formation (quartzite)	
	Basement Complex of Igneous and Metamorphic Rock	

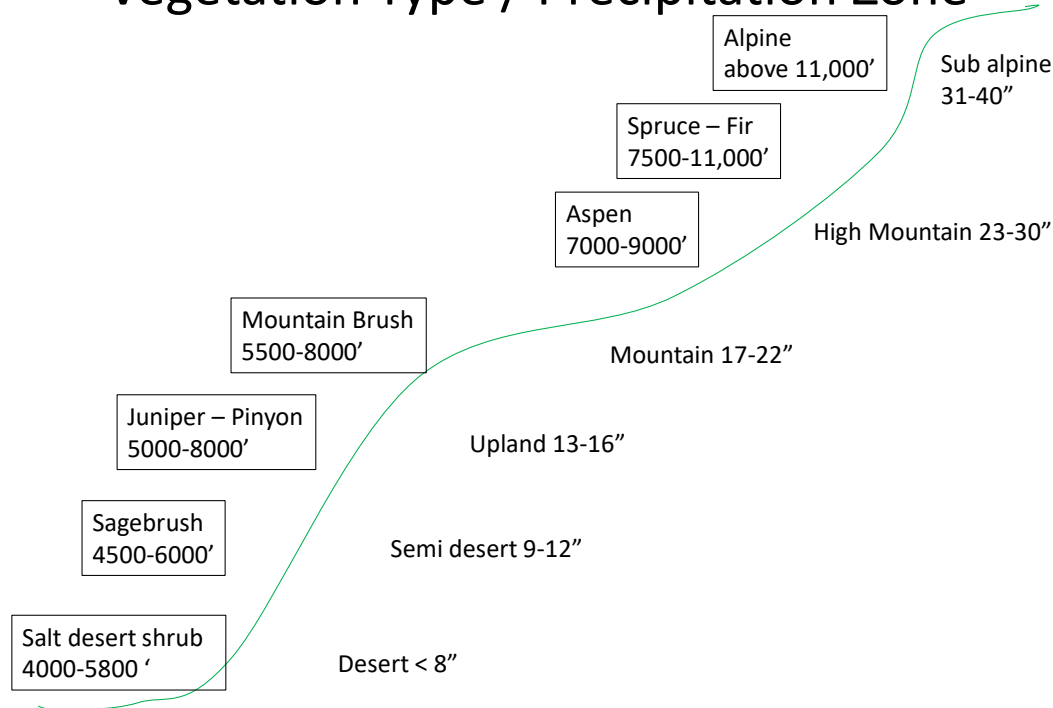
(modified from Wood-Clyde Consultants, 1982)

FIGURE 8 - 2.6.2 STRATIGRAPHIC COLUMN

2.7 Vegetation

The plant communities of the San Juan Watershed are determined in large part by elevation, precipitation and by the soils on which they grow.

Vegetation Type / Precipitation Zone



2.8 Noxious and Invasive Plant species

San Juan County contains 19 of the noxious plant species identified by the state. Russian Knapweed, Scotch Thistle, Canada Thistle, Field Bindweed, Hoary Cress, Musk Thistle, Camelthorn, Tamarisk/ Saltcedar, and Russian Olive are most prevalent. In 2015 Jointed Goat Grass and Goat head were added to the state list. The County identified an additional three noxious weeds in 2003: Silverleaf Nightshade, Buffalobur, and Whorled milkweed . Cheatgrass and Halogeton are also weeds of concern. These weeds compete with crops for moisture, nutrients, sunlight, and space, resulting in significant crop loss.

The San Juan County weed department works to appropriately manage existing and invasive weeds through education and research, mapping and monitoring, prevention, early detection and rapid response, control methods (i.e. chemical, mechanical, biological), integrated weed management, restoration, regulation and enforcement of state weed laws. They seek funding outside of local taxes for their efforts (i.e. Utah Department of Agriculture and Food grants).

3.0 Population Characteristics

3.1 Communities Within The Watershed

The population in the San Juan watershed area is located mainly in 2 cities, Blanding and Monticello. As of July 1, 2016 the population of Blanding was 5,386 the median household income was \$51,747. The racial makeup of Blanding is 73.3% White, 16.4% American Indian, and 6.5% Hispanic. In 2014 the population of Monticello was 2,069, the median household income was \$47,500. The ethnic makeup of Monticello is 76.6% White, 14.3% Hispanic, and 7.6% American Indian. The small, unincorporated area of Bluff had 402 residents.

www.utah-demographics.com

utah.hometownlocator.com/zip-codes/data,zipcode,84511.cfm

utah.hometownlocator.com/zip-codes/data,zipcode,84535.cfm

Other communities within the watershed include:

Bluff – 401 residents; White 89.3%, Two or more races 4.2% and Hispanic 3.7%;

median household income \$47,857 (2014)

Montezuma Creek – 385 residents; American Indian 88.8%, Asian 7.8% and White 3.4%; median household income \$18,750 (2014)

White Mesa – 337 residents; American Indian 87.8%, Hispanic 9.5% and Two or more races 1.5%; median household income is \$27,361 (2014)

Eastland - < 100 residents; other data not available

Data from utah.hometownlocator.com and utahscanyoncountry.com

BLANDING POPULATION

Total Population	5,386
Population in Households	5,196
Population in Families	4,670
Population in Group Qtrs.	190
Population Density ¹	5
Diversity Index ²	47

BLANDING HOUSEHOLDS

Total Households	1,584
Average Household Size	3.28
Family Households	1,225
Average Family Size	4

BLANDING HOUSING

Total Housing Units	1,871 (100%)
Owner Occupied HU	1107 (59.2%)
Renter Occupied HU	477 (25.5%)
Vacant Housing Units	287 (15.3%)
Median Home Value	\$159,742
Average Home Value	\$186,698

BLANDING INCOME

Median Household Income	\$51,747
Average Household Income	\$59,434
Per Capita Income	\$17,919

BLANDING INCOME

Median Household Income	\$51,747
Average Household Income	\$59,434
Per Capita Income	\$17,919

(Compound Annual Growth Rates)

BLANDING GROWTH RATES

	2010-2015	2015-2020
Population	1.38%	1.06%
Households	1.0%	0.92%
Families	1.17%	0.87%
Median Household Income		1.37%
Per Capita Income		1.49%

MONTICELLO POPULATION

Total Population	2,658
Population in Households	2,524
Population in Families	2,248
Population in Group Qtrs.	134
Population Density ¹	3
Diversity Index ²	38

MONTICELLO HOUSEHOLDS

Total Households	843
Average Household Size	2.99
Family Households	642
Average Family Size	4

MONTICELLO HOUSING

Total Housing Units	1,098 (100%)
Owner Occupied HU	637 (58%)
Renter Occupied HU	206 (18.8%)
Vacant Housing Units	255 (23.2%)
Median Home Value	\$160,139
Average Home Value	\$179,984

MONTICELLO INCOME

Median Household Income	\$53,858
Average Household Income	\$65,274
Per Capita Income	\$21,330

(Compound Annual Growth Rates)

MONTICELLO GROWTH RATES

	2010-2015	2015-2020
Population	0.63%	0.48%
Households	0.29%	0.4%
Families	0.23%	0.34%
Median Household Income		1.9%
Per Capita Income		1.75%

1) Population Density = Total Population per square mile.

2) The Diversity Index is a scale of 0 to 100 that represents the likelihood that two persons, chosen at random from the same area, belong to different race or ethnic groups. If an area's entire population belongs to one race AND one ethnic group, then the area has zero diversity. An area's diversity index increases to 100 when the population is evenly divided into two or more race/ethnic groups.

Based on Census 2010 counts, the Diversity Index for the United States was 60.6 and it is expected to increase to 64.8 by July 1, 2018.

4.0 Historic and Current Land Use

The prehistory and history of Blue Mountain revolve around the use of resources. While archaeological work at the higher elevations is scanty, reports indicate that the Anasazi used the mountain most intensely during the 800s (Pueblo-I period) by building seasonal structures in the foothills at approximately the 7,000-foot level.

During historic times, the Weeminuche Utes, along with some members of the amorphous San Juan Band Paiutes, laid claim to this region. Traditional camping areas nearby, such as a Paiute Springs, Allen Canyon, and Montezuma Canyon, had sufficient water and forage to allow Native Americans to live close to a convenient variety of hunting and gathering resources. Navajos also used the area, collecting a variety of coniferous, deciduous, and herbal plant products for medicinal purposes. Blue Mountain is called "Furry Mountain" by the Navajos, who say it has a male spiritual inner form whose female counterpart is the LaSals. Hunting traditions tell of how Black God placed elk upon it during the creative period, while other teachings say that the horse-head figure formed by trees on its east slope is a sign that a good breed of horses comes from this area.

Although the Old Spanish Trail passed close to the base of Blue Mountain during the first half of the nineteenth century, it was not until the 1880s that cattle companies like those of Edmund and Harold Carlisle or of I.W. Lacy started to monopolize its resources. Their outfits ranged cattle on the slopes of Blue Mountain, Elk Ridge, and the LaSals in the summer, then moved the herds to the canyons and foothills during the winter. Friction erupted as Native Americans watched their natural larder disappear into the mouths and under the hooves of thousands of cattle that overgrazed the grass and changed the face of the mountains through erosion. Conflicts shifted when the large cattle companies sold out to individual ranchers or to Mormon groups such as the Bluff Livestock Pool.

Monticello, founded in 1887, and Blanding (in 1905) gave increasing permanence in the area not only to the livestock industry but also to farming, lumbering, and limited mining interests. Water for these communities came from the mountain, which in some instances required herculean tunneling efforts to get, as one passerby claimed, "the water to flow uphill" to Blanding. By 1907 President Theodore Roosevelt had created the Monticello Forest Reserve comprised of 214,270 acres on Blue Mountain and Elk Ridge. Two years later the government officially changed the name to the La Sal National Forest and combined these holdings with those in the LaSals, in order to better supervise the use of the resources. Today, Blue Mountain is important not only for its colorful history but also its multiple-use resources administered by the Forest Service. Water, lumber, hiking trails, game animals, campgrounds, and dramatic scenery add an interesting contrast to the sandstone canyonlands below. To many local people, it represents not only a triumph over challenges in the past, but also the means by which people can continue to survive in an otherwise harsh environment.

See: Charles S. Peterson, *Look to the Mountain* (1975); Robert S. McPherson, *Sacred Land, Sacred View* (1991); Allan Kent Powell, *San Juan County, Utah* (1983).

4.1 Grazing

The watershed area is grazed by livestock, big game species, and small mammals.

Anglo livestock grazing consisted of cattle grazing first, then sheep then a combination of the two and finally back to cattle. Early cattle ranchers in the 1870s were small ranchers who ran small herds on the north and east slopes of the Blue Mountains (San Juan: *A Hundred Years of Cattle, Sheep, and Dry Farms* – Charles S. Peterson from San Juan County, Utah – *People, Resources, and History* – Allan Kent Powell).

Between 1882 and 1887, large cattle outfits with headquarters outside the county came into the area. One such outfit was the LC or Lacey Company from Texas that grazed an estimated 17,000 head in the Montezuma, Recapture and South Cottonwood Creek drainages. (A History of San Juan County – In The Palm of Time – Robert S. McPherson) In that same time period Mormon settlers began to increase their cattle herds grazing on the public domain.

Such large stock numbers led to overgrazing of forage, loss of ground cover and subsequent soil erosion. The Forest Service and Bureau of Land Management began to restrict stock numbers based on forage carrying capacity on public and national forest lands in the 1940s and 1950s and to implement sound grazing management practices as the science of range management developed. Some of these practices included chaining native pinyon and juniper and sagebrush sites and seeding to forage species along with deferred and rotational grazing systems. Beginning in the 1960s many sheepmen began to change to cow/calf operations due to poor market conditions for sheep and predation on sheep herds. By the end of the 1990s there were no longer any sheep operators in the area.

The major areas currently grazed are located on Bureau of Land Management (BLM) and Manti-LaSal National Forest (FS) managed land. Smaller areas are located on State Institutional Trust Lands (SITLA) and some private land.

Domestic livestock graze the mountain pastures in the summer and the lower elevations in the spring, fall and winter.

The following table shows the grazing allotments on FS land:

TABLE 3 - 4.1 FS GRAZING ALLOTMENTS

Allotment	Total Acres	Acres in SJWP area	Number Livestock	Season of Use
Babylon	41269	24882	210	6/1 to 10/15
Blue Creek	30542	12095	244	6/21 to 10/15
Bulldog	3950	3950	40	between 6/15 and 10/15
Camp Jackson	17721	17721	301	6/16 to 10/15
Chippean	6873	6873	Closed Allotment	No grazing
Cottonwood	62448	4134	581	6/16 to 9/15
Gooseberry	28213	19803	204	6/1 to 10/15
Harts Draw	18872	6908	271	5/16 to 10/15
Lakes/South Peak	15728	15728	367	7/1 to 10/15
Long Canyon	2145	2145	60	6/16 to 9/23
North Creek	7333	7333	203	7/1 to 9/30
Verdure	1154	1154	25	6/21 to 9/13
West Mountain	26506	25246	192	6/26 to 10/11

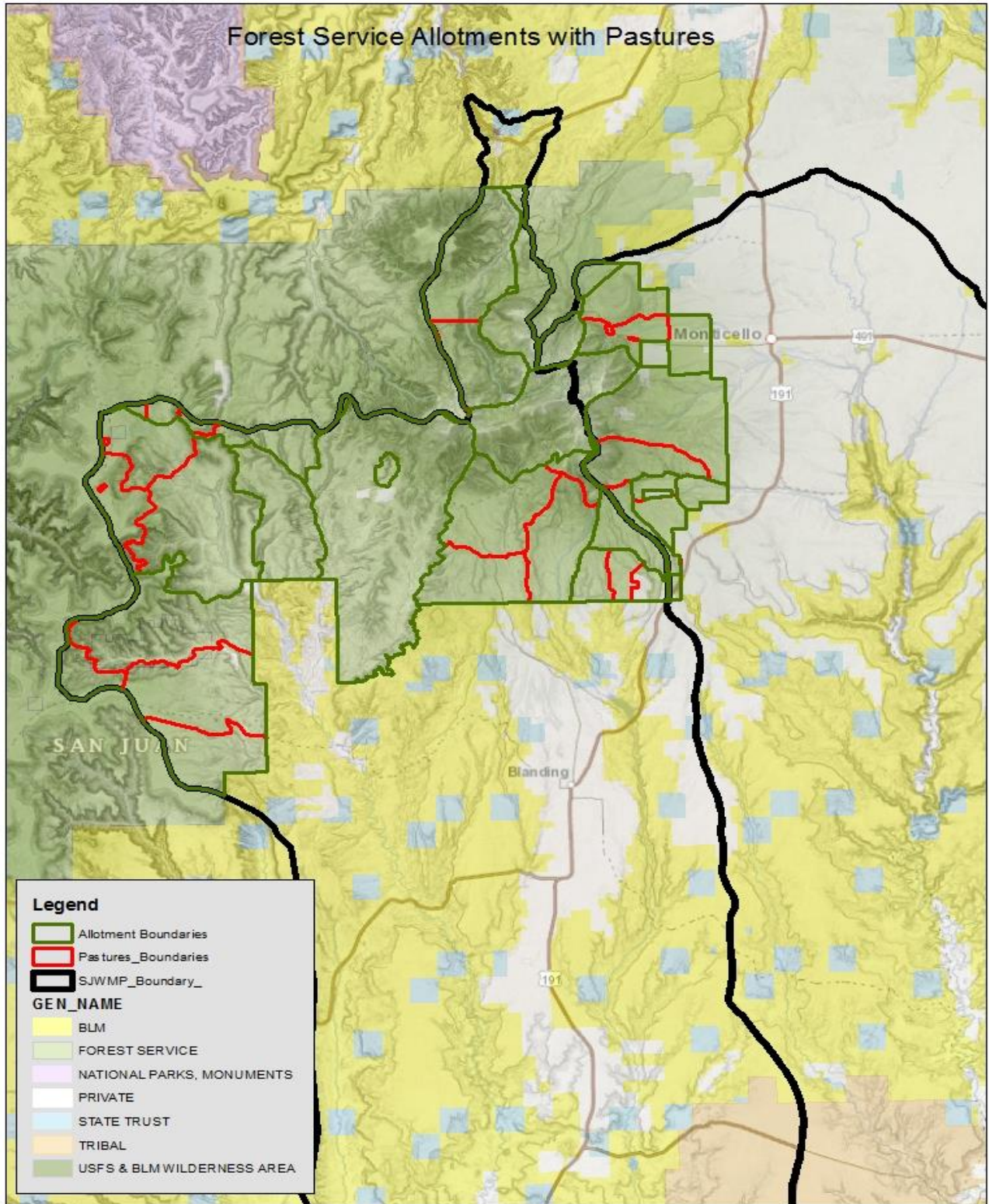


FIGURE 9 - 4.1A FOREST SERVICE ALLOTMENTS WITH PASTURES

San Juan Watershed Plan BLM Grazing Allotments and Pastures

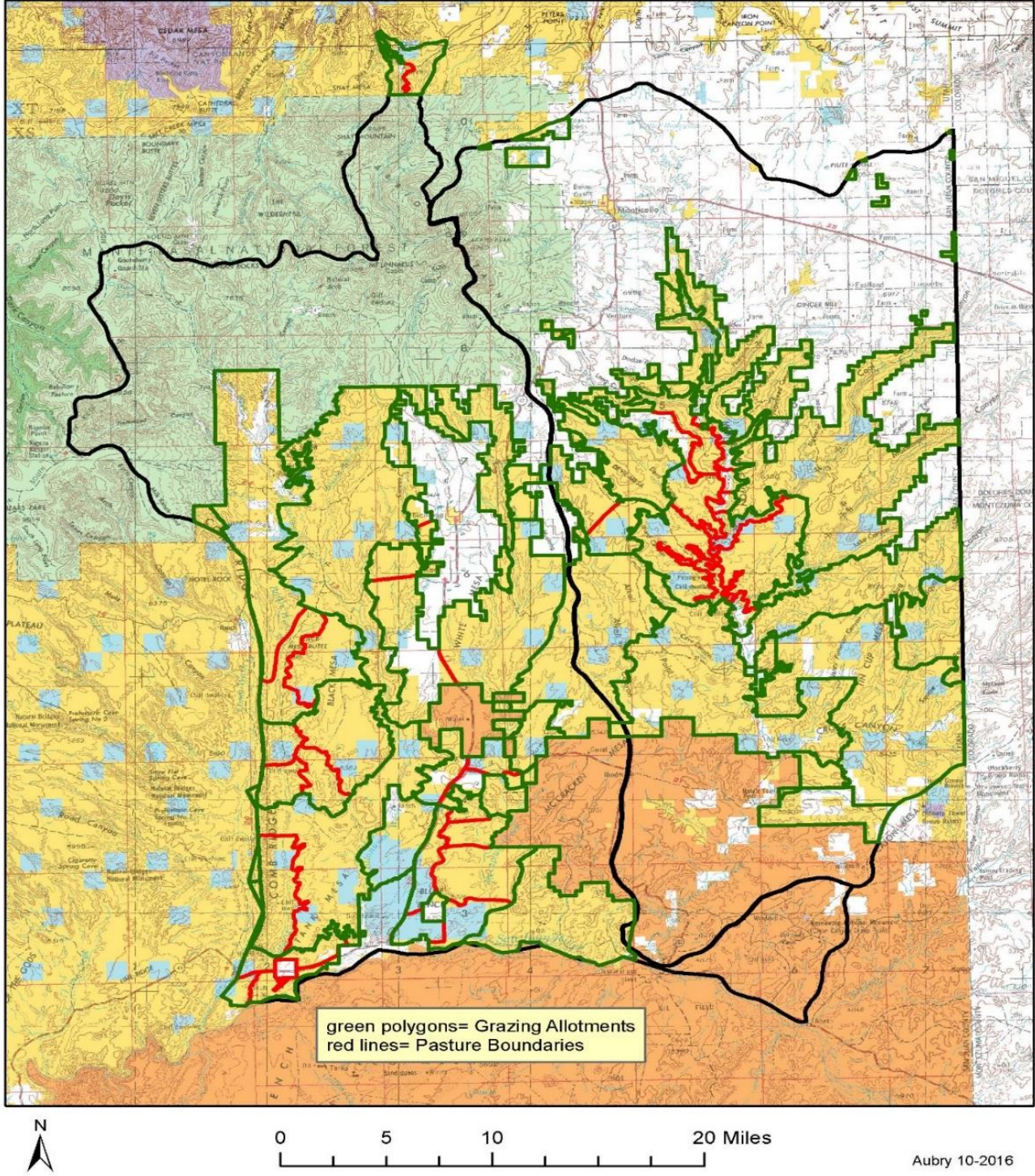


FIGURE 10 - 4.1B BLM GRAZING ALLOTMENTS AND PASTURES

The map below shows the condition of reservoirs on BLM land within the watershed area:

San Juan Reservoir Conditions

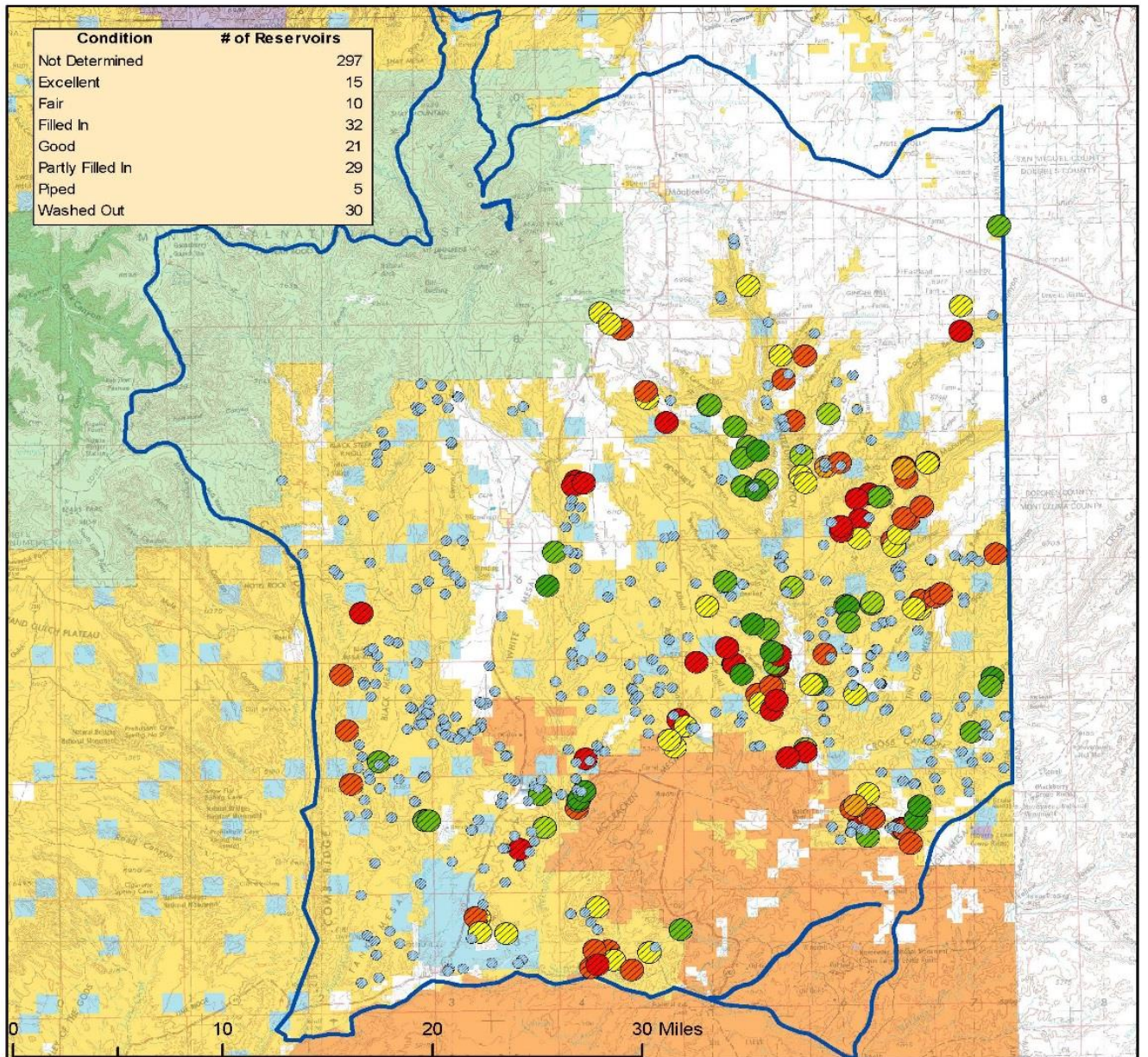
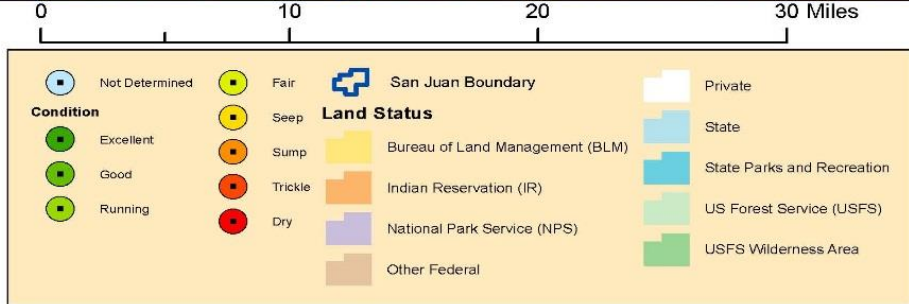
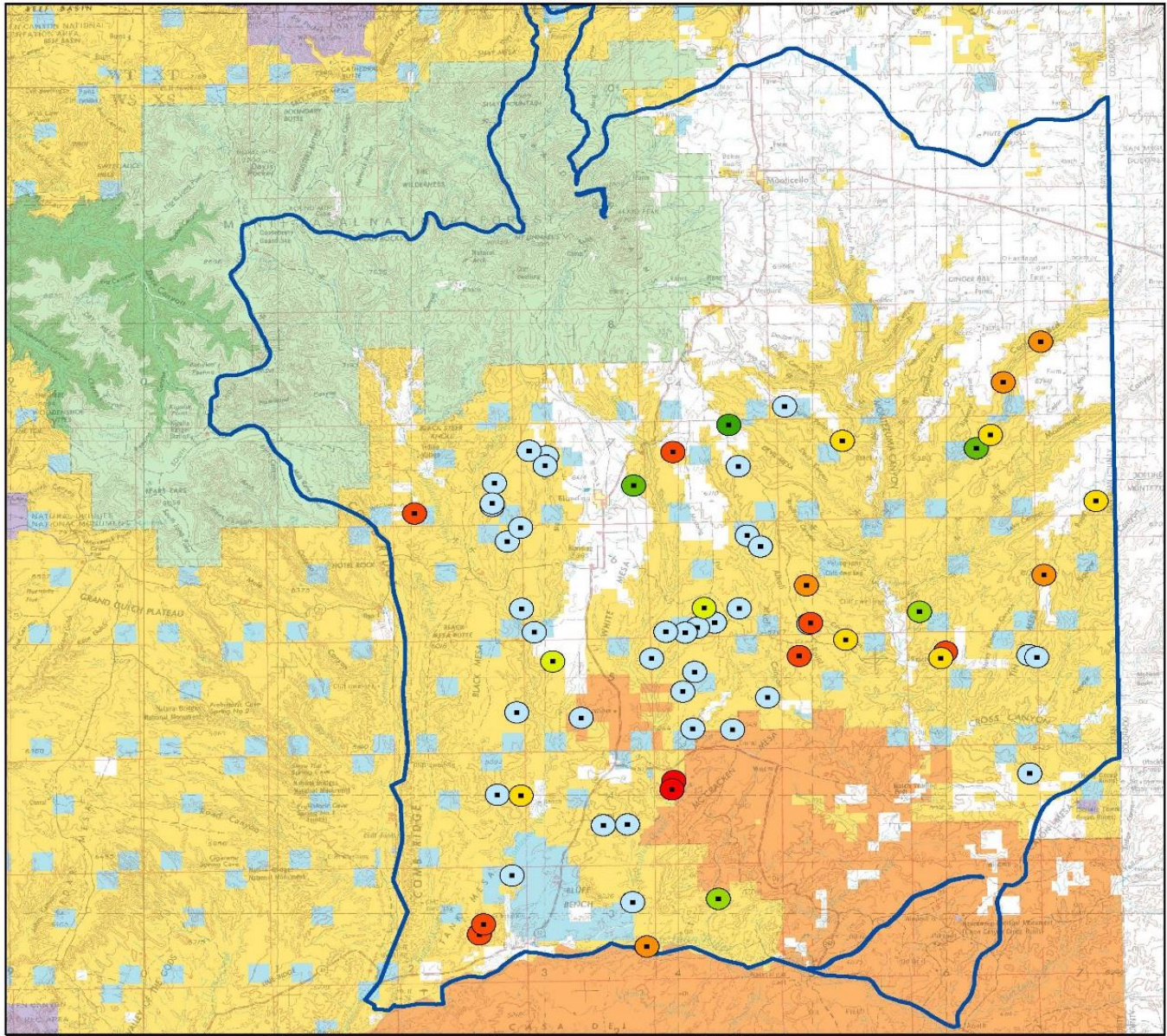


FIGURE 11 - 4.1C SAN JUAN RESERVOIR CONDITIONS

The map below shows the spring conditions on BLM land within the watershed area.

San Juan Spring Conditions



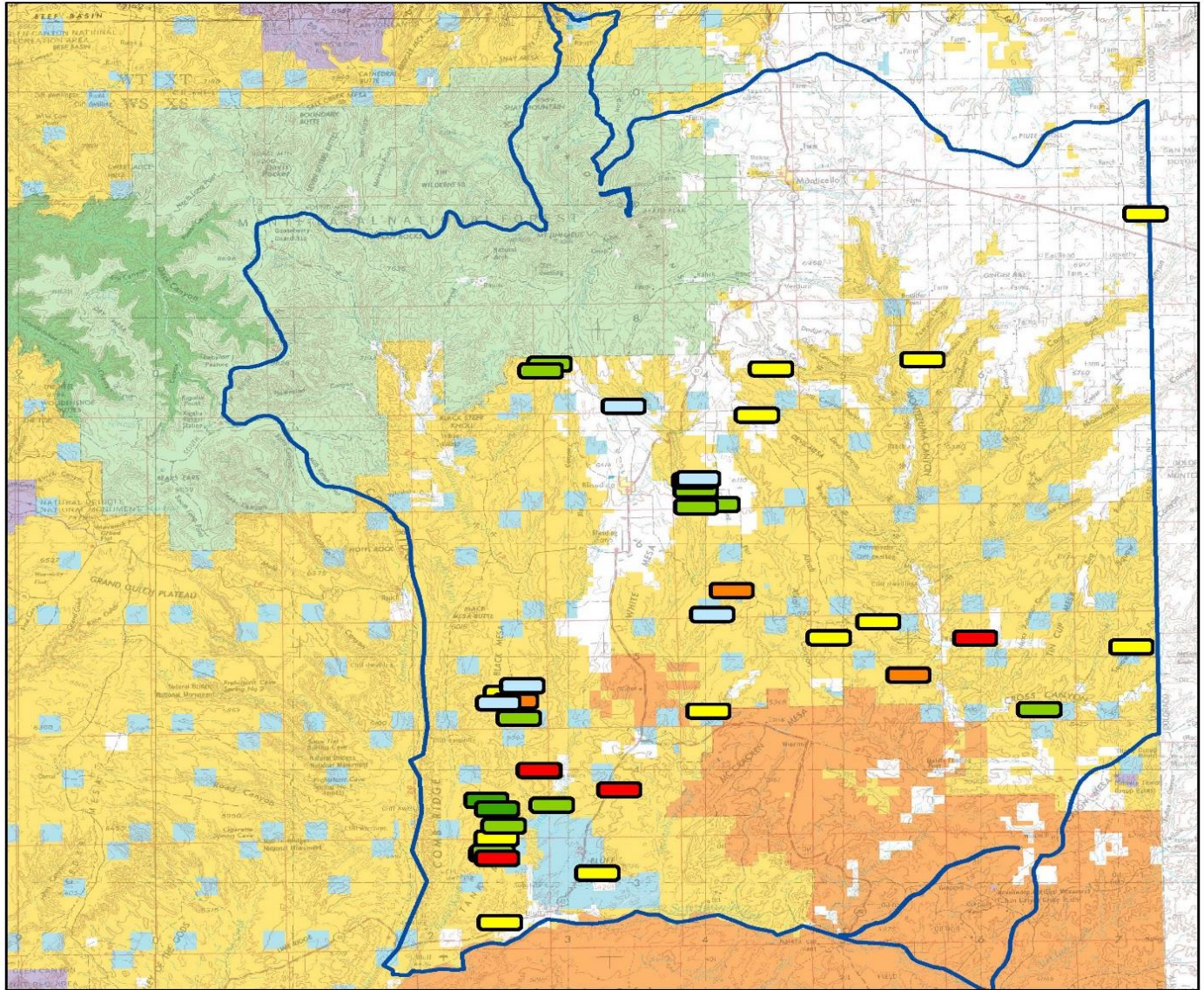
Condition	# of Springs
Not Determined	11
Dry	2
Excellent	1
Fair	2
Good	2
Running	2
Seep	6

Hohensee 11-2016

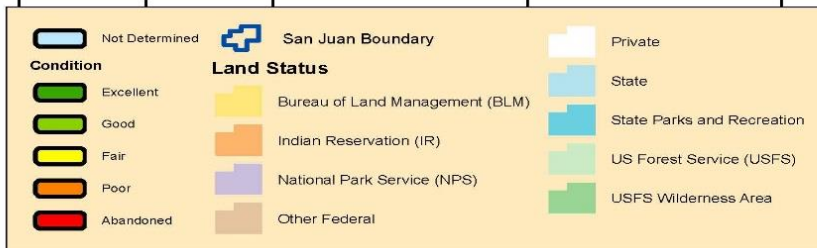
FIGURE 12 - 4.1D SAN JUAN SPRING CONDITIONS

The map below shows the water trough conditions on BLM land or grazing land administered by BLM in the watershed area.

San Juan Water Trough Conditions



0 10 20 30 Miles



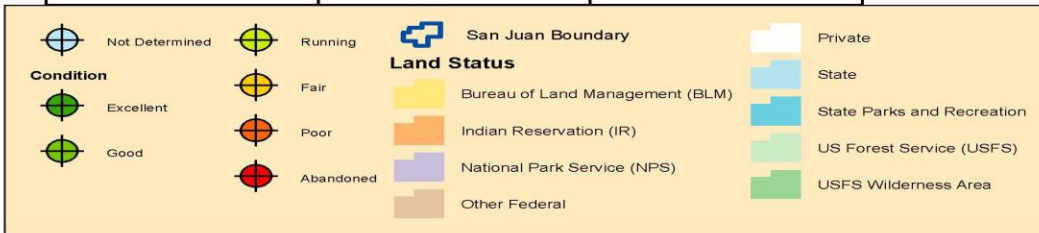
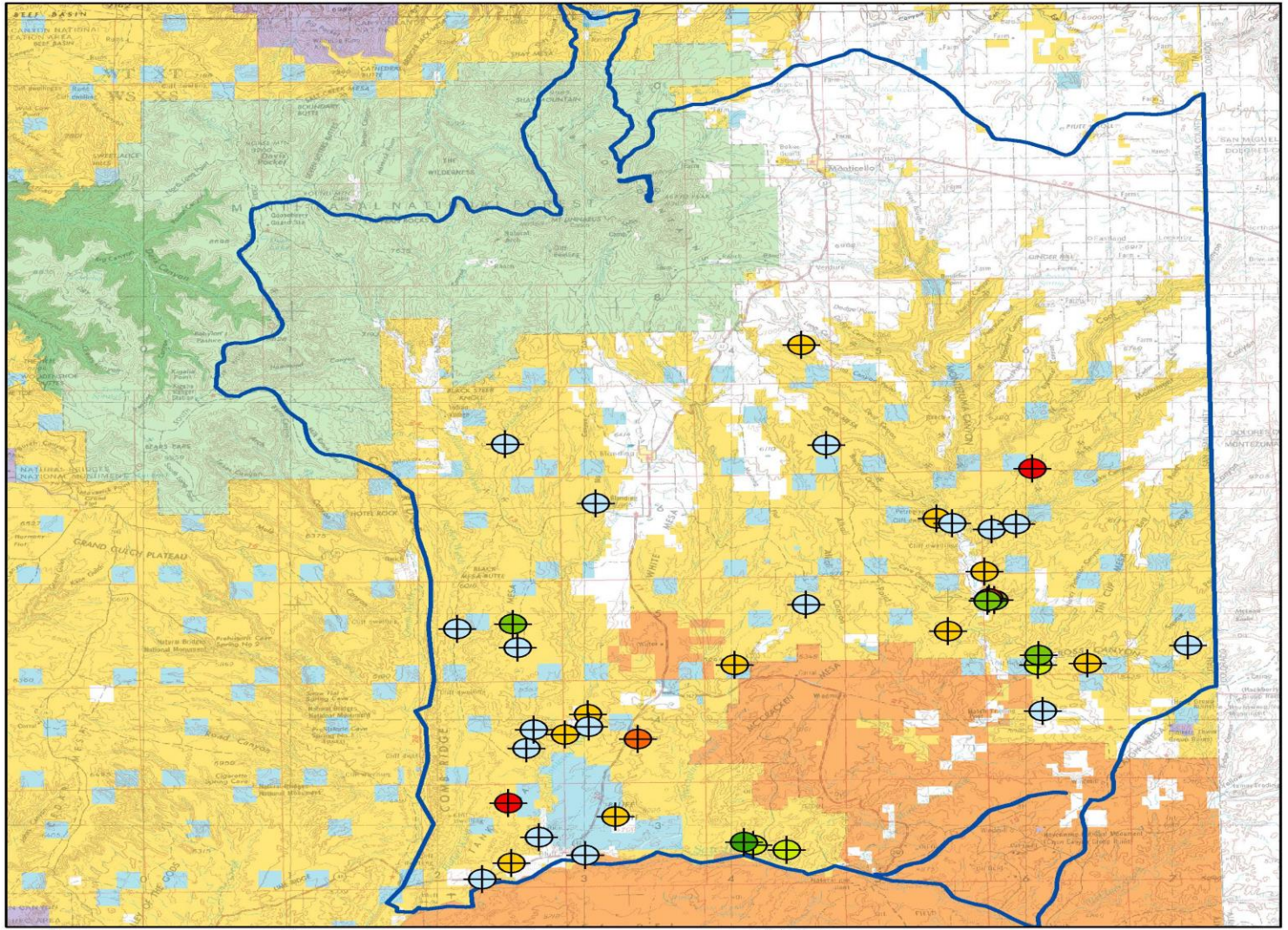
Condition	# of Water Troughs
Not Determined	5
Abandoned	5
Excellent	2
Fair	13
Good	11
Poor	3

Hohensee 11-2016

FIGURE 13 - 4.1E SAN JUAN WATER TROUGH CONDITIONS

The map below shows the well conditions on land in the watershed area.

San Juan Watershed Area Well Conditions



Condition	# of Wells
Not Determined	13
Abandoned	3
Excellent	1
Fair	10
Good	5
Poor	1
Running	3

Hohensee 11-2016

FIGURE 14 - 4.1F SAN JUAN WELL CONDITIONS

State lands within the watershed area are made up primarily of scattered sections interspersed within BLM grazing allotments. The exception is the Bluff Block that was acquired through a land exchange with the BLM. The number of AUMs on those lands are approximately 5,040 SITLA AUMs. These are spread over multiple grazing permits held by multiple permittees.

4.2 Fuels

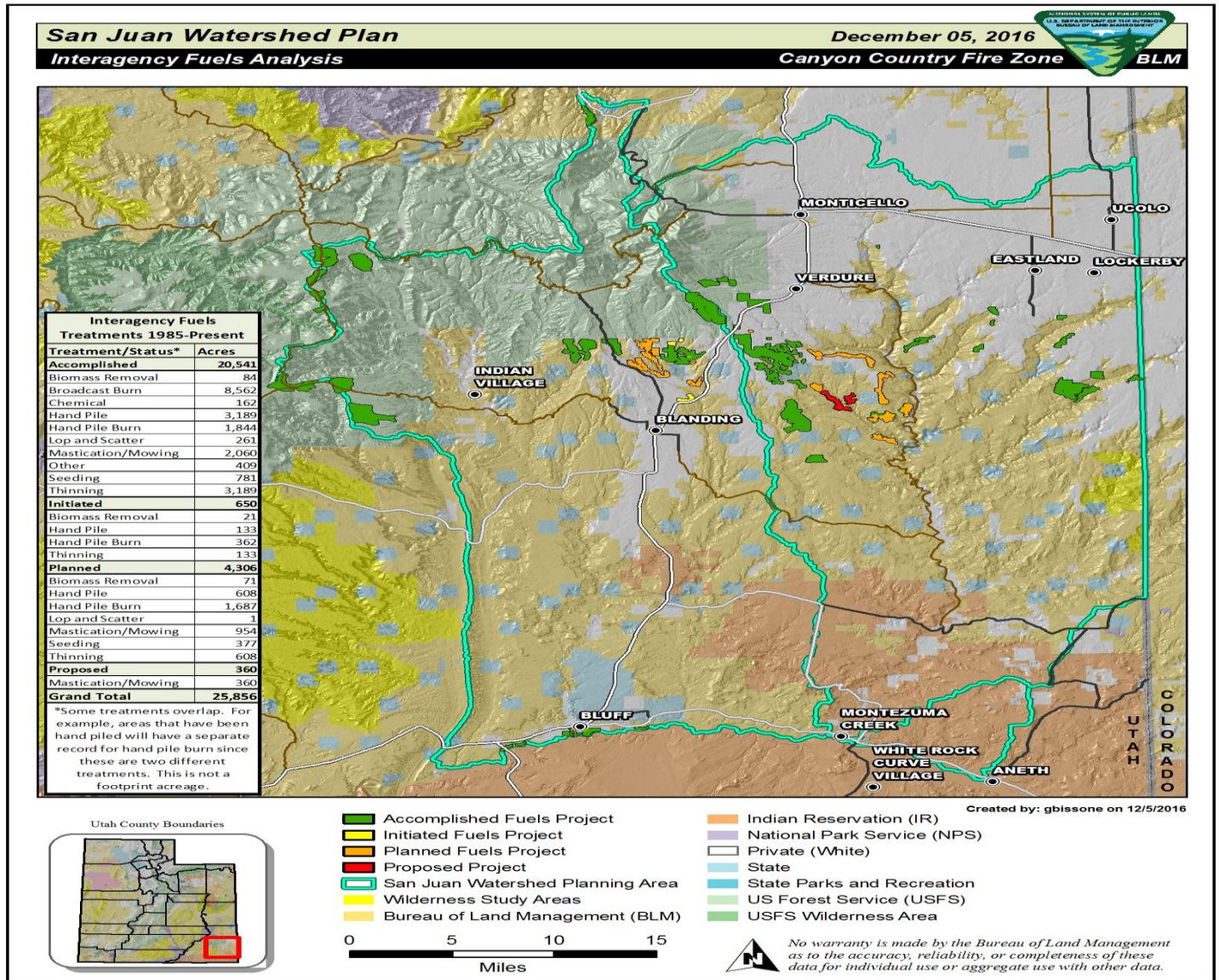


Figure 15 - 4.2 BLM Watershed Area Fuels

4.3 Recreation

Although the major tourist attractions in the County (such as Canyonlands National Park, Lake Powell and Grand Gulch) are outside the watershed area, cultural resources, scenic vistas, varied terrain and a network of developed and primitive roads offer a multitude of opportunities for recreation in the area.

Recreation opportunities include dispersed camping, hiking, hunting, four-wheeling, ATV and mountain bike riding and exploring ancient Indian ruins. Developed campgrounds include Nizhoni, Dalton Springs and Buckboard Flat on Forest Service lands.

Visitors to the area enjoy the Native American culture as well as cowboy and Mormon history. Edge of the Cedars State Park and Museum in Blanding highlights the Ancestral Puebloan (Anasazi) culture with a large display of artifacts. The Bluff Fort Historic Site commemorates the original pioneer settlement founded by Mormon pioneers and includes recreated log cabins and Native American dwellings.

The area includes the Comb Ridge Recreation Management Zone managed by BLM for heritage tourism and traditional cultural values. It is popular with visitors for the density of significant cultural ruins and rock art. Montezuma Canyon and tributary drainages and adjacent bench land also abound with ancient Indian ruins popular for self-guided exploring.

Recapture Lake is popular for fishing and boating activities. Mountain lakes (Monticello, Foy and Lloyd's), Blanding Reservoirs and Indian Creek offer fishing opportunities. The San Juan River is popular for river rafting especially from Sand Island below Bluff to points downriver.

4.4 Industry (Mining, oil & gas)

Uranium

The primary mining interests in the area have been for uranium. Uranium/vanadium deposits occur in the Salt Wash Member of the Jurassic Morrison Formation in the watershed. Mining Districts include the South Cottonwood Wash Area, Montezuma Canyon Area and Bluff-Butler Wash Area. Uranium deposits have been mined in the area off and on for almost 100 years (Chenoweth 1996 Monticello RMP), first for their radium content, then for their vanadium co-product and then primarily for uranium during the "Uranium Boom" beginning in the late 1940s. A declining national and international demand and prices began in the 1980s so that there are no currently active mines in the area today.

Even though there are no active uranium mines in the area, the area has the only active uranium processing mill in the United States. This is the White Mesa Mill located on the northern end of White Mesa. This mill processes uranium ore from sources outside the area as well as radioactive waste from other parts of the country.

The Cottonwood Wash Abandoned Mine Land Project was a federally funded project begun in 1998. The objective of the project was to improve water quality, protect health and safety of the community, and reclaim former mines and mining areas while preserving the local mining history. Project work included closing mine openings, removal and reclamation of mining waste piles and roads, plugging drill holes and reseeding disturbed areas. The project area included 143,000 acres of BLM and FS lands in the South Cottonwood Wash drainage including Hammond Canyon, Allen Canyon and Brushy Basin Wash drainages. (Abandoned Mine Lands: A Decade of Progress Reclaiming Hardrock Mines, September 2007, FS Publication No. FS-891, BLM Publication No. BLM-WO-GI-07-013-3720).

Sand and Gravel

Sand and gravel deposits are scattered over much of the area with important deposits along the San Juan River, surrounding the Abajo Mountains and in the vicinity of Blanding. (RMP). Most production of these materials has occurred in close proximity to road infrastructure, communities and specific points of use in order to minimize transportation costs. Approximately 15 to 20 material pits are currently authorized on BLM or SITLA lands for use primarily by San Juan County Road Department and a few for use by Utah Department of Transportation. A few pits are operated on private lands. Some of the gravel deposits in the Bluff area are of a higher quality which are used by local contractors as aggregate in concrete.

Oil and Gas

Most of the watershed area is within the Blanding sub-basin region of the Paradox Basin which is rated as high potential for the occurrence of oil and gas. (Monticello RMP Mineral Report 2005). Oil and gas were first discovered in the area at Boundary Butte in 1948. Subsequent discoveries were made in 1956 in the Greater Aneth Field, Bluff Field and Recapture Field. There are a host of other reservoirs in the basin including Bug, Cave Canyon, Cherokee, Deadman, Kachina, Ismay, Kiva, Mustang Flat and Tin Cup fields. As of 2016 there were 387 producing wells in the Greater Aneth Field (Resolute Energy Corporation) ranking it one of the top 100 oil fields in the United States (Utah Division of Oil, Gas and Mining).

4.5 Farming

Beginning in the late 1870s early white settlers farmed small acreages where irrigation water was available from the San Juan River or creeks flowing from the slopes of the Blue Mountains. Between 1910 and the early 1920s an increase in homesteading in the upper parts of the Montezuma Creek Watershed led to more land being used for dryland farming to produce crops such as wheat and pinto beans. (*A History of San Juan County – In The Palm of Time – Robert S. McPherson*).

Early farming practices exposed more lands to the effects of wind and water erosion leading to soil loss. The Soil Conservation Service (today known as the Natural Resources Conservation

Service) began to work with landowners in the 1940s to implement better farming practices less susceptible to erosion.

Most of the land farmed in the targeted watershed is not irrigated. Dryland crops grown are wheat, safflower, and dry beans. The irrigated farmland is mostly pastureland used for forage by cattle. Alfalfa hay is also grown on the irrigated farmland.

4.6 Cultural Resources

Human occupation of San Juan County goes back at least 10,000-years and has continued up to the present. This occupation has included Paleoindians, Archaic, Basketmaker Anasazi, Pueblo I-III Anasazi, Navajo (Dine'), Ute, Paiute, and most recently Euroamericans. The long human occupation, and especially the intensity of the Anasazi use of the area, has left an important cultural mark on the landscape. Evidence of prehistoric occupation is abundant in nearly all environmental settings within the county but is densest on the mesas and deeply incised canyons that empty into the San Juan River.

The richness of antiquities in the area attracted several early artifact-collecting expeditions between the 1890s and 1920s (Blackburn and Williamson 1997). The excellent preservation conditions of the arid Southwest resulted in the ability to recover collections of perishable objects for museums in the East including the Smithsonian and Peabody museums. The area has long been known for the quality of its archaeological sites and antiquities. The number of recorded archaeological sites within the county surpasses most other counties in Utah by far, and not just due to sampling bias. Currently, more than 30,000 recorded sites are listed with the Utah Division of State History for San Juan County alone, and many more sites have yet to be documented. It is hard to go anywhere in the county without encountering flaked stone artifact and debris scatters; rock rubble from collapsed and ruined Anasazi unit pueblos, great houses, or cliff dwellings; and rock art panels.

The importance of cultural resources in San Juan County to the collective heritage of the nation and also to the tourism industry in Utah cannot be overstated. In fact, several national parks occur within the greater area that include Mesa Verde, Hovenweep, Natural Bridges, Canyonlands, and the newly created Bear's Ears monument. The protection of cultural resource sites (e.g., ruins and rock art) coupled with the scenic beauty of the area has been a major factor in the creation of these national parks and monuments. What is more, a significant number of cultural resources sites occur in areas outside of the national parks on both public and private lands.

National historic preservation law requires that federally funded projects or projects that occur on public lands must take into consideration effects on historic properties (archaeological sites). Proposed work within the watershed and especially work that involves ground disturbing will have to avoid or mitigate impacts to cultural resources sites. This will be especially challenging in San Juan County due to the density of significant cultural resources sites.

4.7 Roads

The watershed area is one of the more densely roaded areas of San Juan County (see map 4.7). Roads are vital to the economic and cultural well-being of the County providing access for commercial and recreational uses of the lands in the County. The road network consists of federal and state highways, County Class B and D roads and BIA roads. San Juan County provides an active maintenance program for all Class B roads, a small percentage of which are paved, a larger percentage gravel surface and the majority natural surface. Rainfall and flood events can cause considerable damage to roads which requires emergency maintenance actions in addition to regularly scheduled maintenance. For example, emergency maintenance for flood damage only on the Montezuma Canyon Road, a 34 mile section from US191 to the junction of the Perkins Road in the lower third of the canyon, cost the County over \$123,000 for the period 2005 through 2015. Improved watershed cover, land use practices and better runoff retention could help minimize such damage. Class D roads are not regularly maintained.

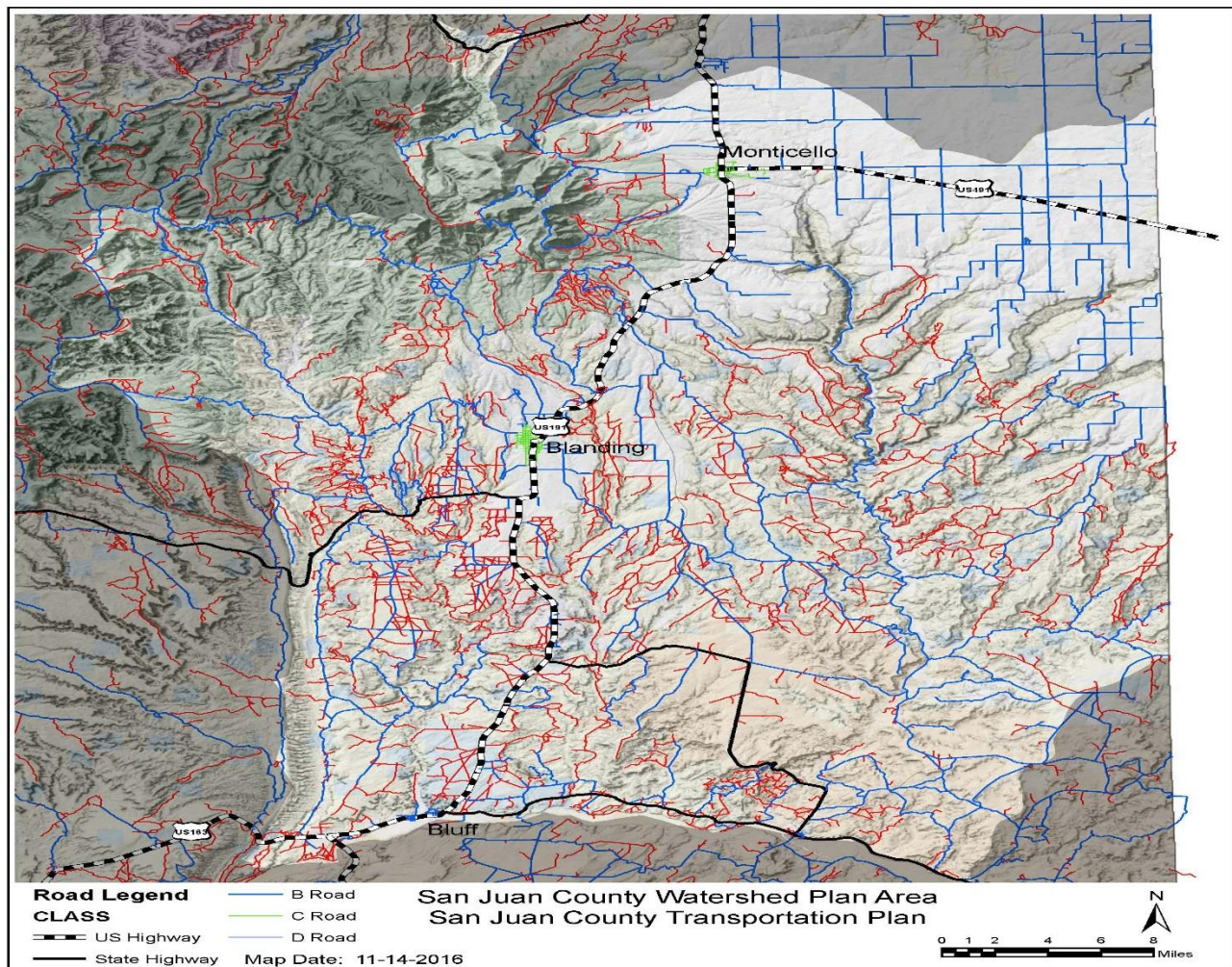


FIGURE 16 - 4.6 ROADS

5.0 Biology of Watershed

5.1 Wildlife

The San Juan watershed has several game and nongame wildlife species that are socially, economically, and biologically important. Native big game species include: mule deer and Rocky Mountain elk. Other harvestable species include: black bear, cougar, bobcat, coyote, red fox, gray fox, wild turkey, dusky grouse, band-tailed pigeon, mourning dove, chukar, cottontail rabbit, and several species of waterfowl.

Mule deer and Rocky Mountain elk both have summer and winter habitat within the San Juan Watershed. The long-term mule deer population objective is 20,500 deer (13,500 on the Abajos and 7,000 on Elk Ridge). Poor range conditions have recently led to a reduction in objective for the Elk Ridge deer herd to 5,600, which in 2014 was only 9 percent of the long-term objective. In 2014, the Abajo deer herd was at 73 percent of objective (Utah Deer Herd Unit Management Plan, October 2015). Threats to the deer herd include disease, habitat conditions, and highway mortality. Elk are currently just below their population objective of 1,300 on in this Unit (Utah Elk Herd Unit Management Plan, August, 2016). The elk population is summer limited, meaning annual precipitation on the mountain range is important to the population. Other threats include drought, habitat loss and fragmentation, and competition. Several habitat projects have been completed since 2004 to improve habitat quality primarily in the winter and transitional habitats (Utah's Watershed Restoration Initiative 2016).

A wide variety of nongame birds occur within this drainage with the greatest diversity of birds occurring in riparian zones near permanent water. Migratory bird species of conservation concern common to the area include bald eagle, golden eagle, burrowing owl, prairie falcon, peregrine falcon, ferruginous hawk, cassin's finch, loggerhead shrike, pinyon jay, sage thrasher, Virginia's warbler, and willow flycatcher. .

Non-game mammals important to the watershed include the Gunnison's prairie dog, common in deeper-soiled lowlands, which serve as prey for many species and dig burrows that create habitat for other birds, mammals, and reptiles. Bat species diversity is fairly high, particularly in Montezuma Canyon where habitat occurs for roosting, hibernation, and rearing of young. Common bat species in the watershed include: pallid bat, big brown bat, silver-haired bat, California myotis, long-eared myotis, little brown bat, long-legged myotis, Western pipistrelle, and Townsend's big-eared bat. The silky pocket mouse, a Utah sensitive species, is also common in the watershed.

Lizards and snakes are common, such as collared lizard, long-nosed leopard lizard, short-horned lizard, sagebrush lizard, eastern fence lizard, tree lizard, side-blotched lizard, western whiptail, night snake, striped whipsnake, pine snake, western terrestrial garden snake, and western rattlesnake (Prairie, Hopi, and Midget-faded subspecies). Records for smooth greensnake, a Utah sensitive species, occur in the area. Amphibians are limited to a few species in areas

where open water is at least seasonably available and include: tiger salamander, Great Basin spadefoot, Great Plains toad, red-spotted toad, canyon treefrog, striped chorus frog, and northern leopard frog.

TABLE 4 - 5.1 WILDLIFE SPECIES

Category	Common Name	Scientific Name
Native Big Game	Mule deer	<i>Odocoileus hemionus</i>
	Rocky Mountain elk	<i>Cervus canadensis</i>
Native Upland Game	Band-tailed pigeon	<i>Patagioenas fasciata</i>
	Dusky Grouse	<i>Dendragapus obscurus</i>
	Mourning Dove	<i>Zenaida macroura</i>
	Wild Turkey	<i>Meleagris gallopavo</i>
Nonnative Upland Game	Chukar Partridge	<i>Alectoris chukar</i>
Small Game	Black-tailed Jackrabbit	<i>Lepus californicus</i>
	Cottontail rabbit	<i>Sylvilagus audubonii</i>
	Gunnison's prairie dog	<i>Cynomys gunnisoni</i>
Native Furbearers	Badger	<i>Taxidea taxus</i>
	Beaver	<i>Castor canadensis</i>
	Bobcat	<i>Lynx rufus</i>
	Coyote	<i>Canis latrans</i>
		<i>Urocyon</i>
	Gray Fox	<i>cinereoargenteus</i>
	Kit Fox	<i>Vulpes macrotis</i>
	Long-tailed weasel	<i>Mustela frenata</i>
	Muskrat	<i>Ondatra zibethicus</i>
	Ring-tailed cat	<i>Bassariscus astutus</i>
	Spotted Skunk	<i>Spilogale gracilis</i>
	Striped Skunk	<i>Mephitis mephitis</i>
Nonnative Furbearers	Red Fox	<i>Vulpes vulpes</i>
	Raccoon	<i>Procyon lotor</i>
Native Predators	Black Bear	<i>Ursus americanus</i>
	Cougar	<i>Puma concolor</i>

5.2 Fisheries

The San Juan River watershed contains a short stretch of the San Juan River. Several species of native and nonnative fish inhabit the San Juan River (Table 5.2). There are no native sport fish species in this portion of the San Juan River. Several nonnative sport fish are present and include channel catfish, striped bass, largemouth bass, walleye, and smallmouth bass. The only

species that is commonly caught and sought by anglers is the channel catfish. Several State Conservation species can be found in the San Juan River and its tributaries; the flannelmouth sucker, the roundtail chub, and the bluehead sucker. Four species of Federally Endangered fish are found in this watershed. The Colorado pikeminnow, the humpback chub, the razorback sucker, and the bonytail all utilize this stretch of river at one or more times during their life cycle.

Additionally, the watershed contains several reservoirs and a few cold water streams. Recapture Reservoir contains a population of northern pike, largemouth bass, black bullhead, and bluegill. This reservoir is large enough for motorized boats and is a locally popular warm water fishery. Several other cold water lakes contain populations of stocked rainbow and tiger trout. These lakes include Blanding #3 reservoir, Blanding #4 reservoir, and Dry Wash Reservoir. Two cold water streams are home to populations of cutthroat trout and brook trout. These streams are Indian Creek and Johnson Creek.

TABLE 5 - 5.2 FISH SPECIES

Category	Common Name	Scientific Name
Native Game Fish	Colorado River cutthroat trout	<i>Oncorhynchus clarkii pleuriticus</i>
Nonnative Game Fish	Black bullhead	<i>Ameiurus melas</i>
	Bluegill	<i>Lepomis macrochirus</i>
	Brook trout	<i>Salvelinus fontinalis</i>
	Channel catfish	<i>Ictalurus punctatus</i>
	Largemouth bass	<i>Micropterus salmoides</i>
	Northern pike	<i>Esox lucius</i>
	Rainbow trout	<i>Oncorhynchus mykiss</i>
	Smallmouth bass	<i>Micropterus dolomieu</i>
	Striped bass	<i>Morone saxatilis</i>
	Tiger trout	<i>Salmo trutta X Salvelinus fontinalis</i>
Walleye	<i>Sander vitreus</i>	
Native Nongame Fish	Bluehead sucker	<i>Catostomus discobolus</i>
	Bonytail	<i>Gila elegans</i>
	Colorado pikeminnow	<i>Ptychocheilus lucius</i>
	Flannelmouth sucker	<i>Catostomus latipinnis</i>
	Humpback chub	<i>Gila cypha</i>
	Mountain sucker	<i>Catostomus platyrhynchus</i>
	Razorback sucker	<i>Xyrauchen texanus</i>
Roundtail chub	<i>Gila atraria</i>	
Nonnative NonGame Fish	Common carp	<i>Cyprinus carpio</i>
	Redside Shiner	<i>Richardsonius balteatus</i>
	Speckled Dace	<i>Rhinichthys osculus</i>
	Utah chub	<i>Gila atraria</i>

Fisheries Data

The main stem of the San Juan River provides an important role in the recovery of endangered fish. First, it provides seasonal and yearlong habitat and presumably beneficial foraging opportunities (based on the high percentage of native species) for juvenile and adult Colorado pikeminnow (i.e. a direct role in recovery) as well as the other three species of endangered fish. Secondly, the San Juan River provides year round habitat for all life stages of four native species of Colorado River fish (flannelmouth sucker, bluehead sucker, roundtail chub, and speckled dace). Since these species provide a forage base for the Colorado pikeminnow, the San Juan River also provides an indirect role in recovery. Flannelmouth sucker, bluehead sucker, and roundtail chub are themselves the subject of a Range-wide Conservation Agreement for the Three Species. Therefore, the San Juan River, and its tributaries, also provides a direct role in the conservation of these native species. Additionally, current research is being conducted with stationary PIT (Passive Integrated Transponder) tag readers to further determine use in the San Juan River from various fish species and to help understand movement and connectivity with its tributaries.

5.3 Protected Species

The San Juan watershed is home to numerous species of wildlife that are protected under the Endangered Species Act (ESA). According to the United States Fish and Wildlife Service IPaC (information for planning and conservation), the following wildlife species potentially occur in the watershed: California condor, Gunnison sage-grouse, Mexican spotted owl, Southwestern willow flycatcher, yellow-billed cuckoo, bonytail chub, Colorado pikeminnow, greenback cutthroat trout, humpback chub, razorback sucker, New Mexico meadow jumping mouse, and North American wolverine. Critical habitat for Colorado pikeminnow, razorback sucker, Southwestern willow flycatcher, and yellow-billed cuckoo occurs along the San Juan River. Critical habitat for Gunnison-sage grouse also occurs in the watershed.

Records for Colorado pikeminnow, razorback sucker, southwestern willow flycatcher, yellow-billed cuckoo, Gunnison sage-grouse, and Mexican spotted owl are documented in Utah's Natural Heritage Program data.

TABLE 6 - 5.3 FEDERALLY PROTECTED SPECIES

Federal Status	Common Name	Scientific Name
Endangered	Bonytail	<i>Gila elegans</i>
	Colorado pikeminnow	<i>Ptychocheilus lucius</i>
	Humpback chub	<i>Gila cypha</i>
	Razorback sucker	<i>Xyrauchen texanus</i>
	Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>
Threatened	Mexican spotted owl	<i>Strix occidentalis lucida</i>
	Yellow-billed cuckoo	<i>Coccyzus americanus</i>
	Greenback cutthroat trout	<i>Oncorhynchus clarki stomias</i>
	Gunnison sage-grouse	<i>Centrocercus minimus</i>
Proposed	North American wolverine	<i>Gulo gulo luscus</i>
Experimental Population	California Condor	<i>Gymnogyps californianus</i>

Only two non-commensal mammals are established in Utah that could be considered invasive, the raccoon and the red fox. Both these species greatly increased their distribution and abundance in the state during the late 20th century. Changes in habitat plus suppression of populations of larger predators, such as coyotes and cougars, may have played a role in this expansion. Very rarely, fox squirrels and opossums are reported, but there is no evidence they are established.

The most significant non-native birds are the Eurasian Collared Dove, English Sparrow, and European Starling. These are abundant enough to compete significantly with native birds. Chukars are also established, but not abundant enough to be considered invasive. Brown-headed cowbirds may not have been present in the area as breeders before the introduction of cattle. They are currently abundant and have significant negative impacts on native breeding birds.

There are several species of aquatic life that can be considered invasive species in the San Juan River watershed. The common snapping turtle is not native to Utah and has documented occurrences extending from Green River, Utah south to Lake Powell, and the San Juan River arm. Dreissenid mussels (i.e., quagga mussels) are currently found in Lake Powell and also in headwater lakes of the Colorado and Green Rivers in the State of Colorado. These species have not been found in the San Juan River watershed, but are a species of concern. Several species of nonnative game and nongame fish occur in the San Juan River and are considered invasive species. Common carp, gizzard shad, channel catfish, largemouth bass, and northern pike have been documented in the Lake Powell and the San Juan River arm. These species directly compete with and predate on native species.

6.0 Watershed Water Quality Condition

6.1 Water Quality Summary

Water quality refers to the physical, chemical and biological characteristics of water. Water quality information can be used to assess the ability of surface water to meet requirements for a variety of beneficial uses ranging from drinking water, contact recreation, and aquatic wildlife habitat requirements. Water quality is often framed in context of measureable concentrations of contaminants. (See Section 6.2 for more information on beneficial uses). Water quality is evaluated and affected by a complex web of chemical, physical and biological processes. A diverse variety of human activities can affect water quality in ways that aren't always obvious. The impacts to water quality from human activities are dependent on the type of activity, its timing, location, duration and intensity. All activities within the watershed have the potential to affect water quality and contribute wide-ranging pollutants to the stream system. Pollutant concentrations can vary by season, by day, and sometimes from hour to hour making it difficult to measure water quality. This makes it critical to build a data set over time in order to assess water quality under varied conditions.

6.2 Water Quality Regulations

Utah is the second driest state in the nation making water a highly valued and sought after resource. As a public resource, it is the responsibility of the State to evaluate and maintain water quality. Public Law 92-500, the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act), enacted by Congress in 1972 and amended in 1977 and 1981, provides a national framework for water quality protection. The Clean Water Act recognizes that it is the primary responsibility of the States to prevent, reduce and eliminate water pollution; to determine appropriate uses for their waters and to set water quality criteria to protect those uses. Section 303(d) of the Clean Water Act requires that each state reviews and, if necessary, revises its Water Quality Standards at least once every three years. This serves to ensure that the requirements of State and Federal law are met and that water quality criteria are adequate to protect designated water uses. A list of water quality standards and pollutant criteria can be found in Rule R317-2 of the Utah Administrative Code.

6.3 Beneficial Use

The Division of Water Quality is responsible for assessing all streams, rivers, lakes and reservoirs in the state and categorizing them according to their beneficial use. Water quality standards are directly associated with these uses and therefore limitations for pollutants are created according to each waterbody's beneficial use.

Each waterbody in the San Juan Watershed Management Plan area has Use Designations depending upon their beneficial uses defined in State Statute (Standards of Quality for Waters of the State §R317-2, UAC). Therefore the various use designations for water bodies in this plan are too numerous to list here and will be discussed below with each assessment unit. A full description of all beneficial

uses is provided below in Table 6.1.

TABLE 7 - 6.3 WATER QUALITY DESIGNATIONS

Table 6.3 Use designations for the State of Utah and their definitions	
Use Designation	Definition of Uses
Class 1	Protected for use as a raw water source for domestic water systems
Class 1C	Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water
Class 2	Protected for recreational use and aesthetics.
Class 2A	Protected for frequent primary contact recreation where there is a high likelihood of ingestion of water or a high degree of bodily contact with the water. Examples include, but are not limited to, swimming, rafting, kayaking, diving, and water skiing.
Class 2B	Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.
Class 3	Protected for use by aquatic wildlife.
Class 3A	Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
Class 3B	Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
Class 3C	Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.
Class 3D	Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.
Class 3E	Severely habitat-limited waters. Narrative standards will be applied to protect these waters for aquatic wildlife.
Class 4	Protected for agricultural uses including irrigation of crops and stock watering.

6.3.1 Water Quality Standards

Utah water quality standards (State of Utah, 2000, UAC R317-2) and the 303(d) listing criteria provide the criteria to make an initial assessment of water quality conditions.

Utah's Standards of Quality for Waters of the State (§R317-2, UAC) establishes numeric criteria for beneficial use. Additional criteria are used to determine the degree of beneficial use support. Utah's 303d List provides guidance on how to apply the numeric water quality criteria for determining the degree of beneficial use support. These criteria are used to evaluate the listing and delisting of a water body. The 303(d) criterion for assessing the degree of support for beneficial use Classes is provided in Table 6.2

TABLE 8 - 6.3B CRITERIA FOR ASSESSING BENEFICIAL USE

Table 6.2 Criteria for Assessing Beneficial Use Support	
Degree of Use Support	Conventional Parameters
Full Support	For any one pollutant, no more than one exceedance of a criterion or criterion exceeded in <10% of the samples, if there were two or more exceedances.
Non-Support	For any one pollutant, criterion was exceeded two times, and criterion was exceeded in more than 10% of the samples.

6.4 Known and Potential Pollutants

There are seventeen assessment units in this plans area. All of the individual units listed below are part of the DWQ Colorado River Southeast watershed management unit. The individual units are listed below in Table 6.3 with their use designation 2016 draft assessment.

Table 6.3 2016 Draft Assessment of Watershed Units in San Juan Watershed Management Plan

Unit Description	Unit ID	Beneficial Use Classes	2016 Draft Assessment	Cause of Impairment	Impaired Beneficial Use	TMDL Status	Perennial Stream Miles
Butler Wash and tributaries from confluence with San Juan River to headwaters	UT!4080201-00 1	IC, 2A, 3B, 4	Assessment Category 3 = No assessment (more data required)				7.7
Cottonwood Wash and tributaries from confluence with San Juan River to Westwater Creek confluence	UT14080201-002	IC, 2A, 3B, 4	Assessment Category 2 = Not impaired				0.0
Cottonwood Wash from Westwater confluence to USFS boundary	UT14080201-006	IC, 2A, 3B, 4	Assessment Category 5 = Impaired: TMDL required (303d list)	Dissolved Oxygen and Radium	3B, unknown	None	5.8
Cottonwood Wash and tributaries within USFS boundary	UT14080201-007	IC, 2A, 3B, 4	Assessment Category 5 = Impaired: TMDL required (303d list)	Gross Alpha and Radium	IC, 4, unknown	????	17.2
Johnson Creek and tributaries from confluence with Recapture Creek to headwaters	UT14080201-004	IC, 2B, 3A, 4	Assessment Category 5 = Impaired: TMDL required (303d list)	Dissolved Oxygen and Temperature	3A	None	4.2
Montezuma Creek from San Juan River confluence to Verdure Creek confluence	UT!4080203-007	IC, 2A, 3B, 4	Assessment Category 5 = Impaired: TMDL required (303d list)	Selenium, Dissolved	3B	None	10.0
Montezuma Creek and tributaries from Verdure Creek confluence to U.S. 191	UT14080203-003	IC, 2B, 3B, 4	Assessment Category 2 = Not impaired				12.0
Montezuma Creek and all other tributaries not defined, from U.S. 191 to headwaters	UT14080203-005	IC, 2A, 3A, 4	Assessment Category 2 = Not impaired				.2
North Creek and tributaries from confluence with Montezuma Creek to headwaters	UT14080203-008	IC, 2B, 3A, 4	Assessment Category 1 = Not Impaired				4.5
Recapture Creek and tributaries from confluence with San Juan River to USFS boundary, except Johnson Creek	UT!4080201-005	IC, 2B, 3B, 4	Assessment Category 3 = No assessment (more data required)				1.6

Recapture Creek and tributaries from USFS boundary to headwaters	UT!4080201-003	IC, 2A, 3B, 4	Assessment Category 3 = No assessment (more data required)				4.0
South Creek and tributaries from confluence with Montezuma creek to headwaters	UT!4080203-004	IC, 2B, 3A, 4	Assessment Category 1 = Not Impaired				0
Spring Creek and tributaries from confluence with Vega Creek to headwaters	UT!4080203-006	2B, 3A, 4	Assessment Category 3 = No assessment (more data required)				6.1
Westwater Creek and tributaries from confluence with Cottonwood Wash to headwaters	UT!4080201-008	IC, 2A, 3B, 4	Assessment Category 5 = Impaired: TMDL required (303d list)	Selenium and Dissolved Oxygen	3B	None	5.7
Undefined Waterbodies	UT!4080201	IC, 2A, 3B, 4	Assessment Category 3 = No assessment (more data required)				?
Verdure Creek and tributaries from confluence with Montezuma Creek to U.S.191	UT!4080203-00 I	IC, 2A, 3B, 4	Assessment Category 3 = No assessment (more data required)				5.3
Verdure Creek and tributaries from U.S. 191 to headwaters	UT!4080203-002	2B, 3A, 4	Assessment Category 2 = Not impaired				11.0

TABLE 9 - 6.4A DRAFT ASSESSMENT OF WATERSHED UNITS

TABLE 10 - 6.4B DRAFT ASSESSMENT OF LAKES

Unit Description	Unit ID	Beneficial Use	2016 Draft Assessment	Cause of Impairme	Impaired Beneficial	TMDL Status	Lake Acres
Blanding City Reservoir	UT-L-14080201-002	IC, 2B, 3A, 4	Assessment Category 5 = Impaired: TMDL required (303d list)	Temperature	3A	None	92
Lloyds Reservoir	UT-L-14080203-009	IC, 2B, 3A, 4	Assessment Category 2 = Not impaired				90
Monticello Lake	UT-L-14080203-002	2B, 3A, 4	Assessment Category 5 = Impaired: TMDL required (303d list)	Temperature and Dissolved Oxygen	3A	None	5
Recapture Reservoir	UT-L-14080201-007	2B, 3A, 4	Assessment Category 3 = No assessment (more data required) Exceedances	Mercury in Fish Tissue	3A	None	221

In addition to the main drainages in the seventeen watershed units, there are several lakes within this plans area. The individual lakes are listed below in Table 6.4 with their use designation 2016 draft assessment.

6.5 Current Water Quality Monitoring

6.5.1 Fish Tissue Sampling

Fish tissue from some of the Environmental Assessment Programs (EMAP, NRSA, and UCASE) sampling was analyzed for mercury. The results for mercury in fish are summarized in Table 6.5. The Black Bullhead catfish and Largemouth Bass collected at Recapture Reservoir contained levels of mercury above the EPA significant value of .3ug/g. The State of Utah Department of Health in cooperation with UDWQ issued a fish advisory for Recapture Reservoir in August of 2013.

TABLE 11 - 6.5 FISH TISSUE DATA

Table 6.5 Fish tissue data summary				
STORET	Site Description	Year Sampled	Mean ug/g	Species
4953463	Johnson Ck ab CNFL/ Red Bluff Ck	2004	0.019	Brook trout
5958010	Recapture Reservoir	2009	0.471	Black Bullhead
5958010	Recapture Reservoir	2009/2012	0.498	Largemouth Bass

*Information on water quality monitoring programs and environmental monitoring assessment programs can be referenced in Appendix A

6.6 Conclusion

The relative dearth of water quality data in this watershed management plan is directly related to the amount of perennial streams in the area. Perennial streams in the watershed are few in number. Water is scarce in this area which makes the water that is there more valuable. Water quality and quantity are important resources that are respected and used wisely. There appears to be a small number of problem constituents that are impairing the watershed. There are opportunities to improve both the quality and quantity with resource conservation projects. The relationship between these constituents and other factors will be analyzed in Section 7, Watershed Implementation Strategy.

7.0 Watershed Implementation Strategy

Specific resource concerns were identified by the stakeholders and steering committee. These resource concerns were categorized by Soil, Water, Air, Plant, Animal, Human and Energy Concerns. Objectives and recommended practices for each of the resource concerns were identified. For each resource concern, project areas were recommended that would meet the objective recognized and assist in obtaining the goal of treating and/or reducing the concern.

The Steering committee met on several occasions to solicit suggestions for any potential projects to include that are within the targeted watershed. The technical committee met before and after the steering committee to review their project ideas, recommend best management practices (BMP) for the projects. Though many of those suggested projects have not been fleshed out at this point in time, they are mentioned in this plan in the following table. Those that are highlighted are the ones detailed later in the implementation plan. If/when the others

become a priority for the stakeholders, this document can be revised to include the specifics of those projects including the 9 elements that EPA requires related to watershed planning work.

The ultimate goal of the SJWP Steering committee is to address each of the resource concerns identified, but this will be a phased approach and currently there are 4 specific projects that are spelled out in detail in Section 7.1

7.1 Resource Concerns

TABLE 12 - 7.1 RESOURCE CONCERNS

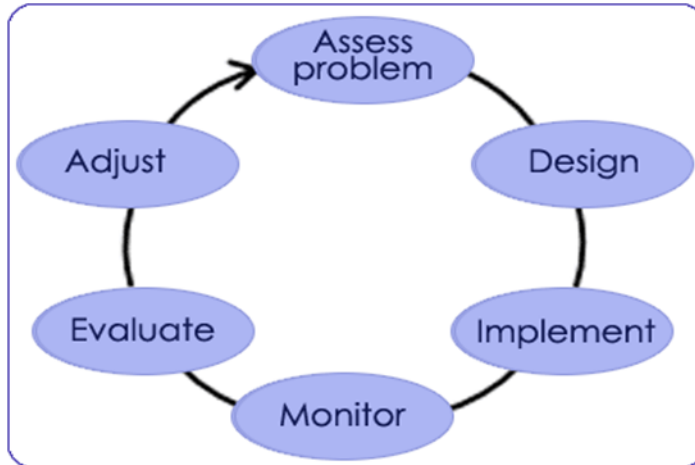
<u>Resource</u>	<u>Concerns</u>	<u>Best Practices</u>	<u>Project Recommendations</u>
Soil:	1. Soil Erosion from Wind & Water on Agriculture and Grazing lands. (Shingle Mill, BLM area N & W of Monticello, Montezuma Creek)	<ol style="list-style-type: none"> Thin Pinyon/Juniper and reseed with grasses and/or forbs depending upon the area using mastication, lope and scatter and/or fire. Terracing and Re-terracing areas prone to erosion Reseeding areas where soil disturbance has/is occurring. 	<ol style="list-style-type: none"> Thin Pinyon & Juniper (PJ) and re-seed the BLM area W of the airport (N of Monticello) Shingle Mill soil stabilization project Other drainages/areas of concern that need a PJ removal project include but are not limited to the following: Boulder area, Dodge point, Pearson, Horse Head, and Long Canyon. Johnson Creek is in need of re-terracing.
	2. Road Dust control	<ol style="list-style-type: none"> Chemical treatment to stabilize dirt road surfaces. Planting/reseeding more grasses along road side. 	
	3. Roadside wind and water erosion.	<ol style="list-style-type: none"> Seed roadsides with drought tolerant plants (i.e. crested wheatgrass) 	
	4. Soil Health	<ol style="list-style-type: none"> Increase species diversity. Proper grazing management. 	
Water:	1. Inadequate water storage/supply	<ol style="list-style-type: none"> Increase supply by assuring allocated water is appropriately diverted. Increase supply by increasing water storage facilities. Increase supply by adding and maintaining irrigation ditches. 	<ol style="list-style-type: none"> Install measuring devices on the Indian Creek drainage. Pipe ditch from Dry Wash Canyon Create reservoir in Clay Draw Increase capacity/raise dam on Gordon Reservoir
	2. Large flows during heavy rains causing erosion	<ol style="list-style-type: none"> Seeding grasses in uplands. Install flow reduction structures or engineered erosion control measures. Increase Beaver population where appropriate. Appropriately engineered check dams. Assignment of water facility (i.e. pond, spring) maintenance to grazing permit holder. 	<ol style="list-style-type: none"> Projects and areas listed above for soils will help with this. Montezuma stream bank stabilization project Cottonwood and Willow revegetation projects including but not limited to the following drainages: Devils Canyon, Coal Bed, Monument and Bradford.

	3. Water quality on Montezuma Creek	1. Reduce erosion of Mancos Shale and other soils during heavy rains by using BMP's stated in cells above.	1. Projects listed above for soils and flow reduction will help with this. 2.
	4. Groundwater at White Mesa	1. Continued regulation by UDWQ Groundwater Section	
	5. Groundwater/springs in management plan area	1. Spring development with headworks, off spring water troughs and spring enclosures	1. There are numerous springs that could use development on private and public lands
	6. Water Quality in Cottonwood Creek	1. Closure of Mine Adits and continued implementation of Cottonwood Creek TMDL.	1. Work with Utah DOGM, UDWQ, BLM and USFS on TMDL implementation
Air:	1. Wind-blown soil	1. Tree planting and grass seeding including tall grasses will reduce wind erosion.	1. Projects listed above for soils will help with this. 2.
	2. Blanding/White Mesa Air pollution (Radon) causing health issues	1. Continue regulation of Air Quality by UDAQ.	
Plants:	1. Lack of vegetation to reduce wind-blown sand and stop soil erosion	1. Tree planting and grass seeding to reduce wind erosion	1. Projects listed above for soils will help with this.
	2. Noxious weed presence	1. Information and Educational programs to inform populace about opportunities and obligations they have to control noxious weeds. 2. Chemical weed control. 3. Control of infestations with fire. 4. Reseeding areas of soil disturbance, areas where weed control is occurring and road right of ways.	1. Continue the San Juan County Weed Control program. 2. Develop an education pamphlet for citizens.
	3. Aspen forest	1. Harvesting of aspen and conifer ingrowth to stimulate sprouting. In most conifer-choked stands prescribed fire may be effective.	1. Aspen regeneration projects.
	4. High elevation conifer forests	1. Restore young stands, including aspen through cutting and/or prescribed fire.	
	5. Invasive Pinyon-Juniper	1. Mastication, thinning, grass and forb seeding	1. Projects listed above for soils will help with this. 2.

	6. Invasive Woody Plants	<ol style="list-style-type: none"> 1. Clearing and restoration. Replanting of native cottonwoods and willows as well as upland species. 2. Reduce serviceberry and gambel oak through biological control, herbicide treatment and/or other methods. 	<ol style="list-style-type: none"> 1. Projects listed above for decreasing large flows during heavy rains would help with this.
	7. Grazing management Impacts	<ol style="list-style-type: none"> 1. Spring, well and stock pond development to improve grazing distribution 	<ol style="list-style-type: none"> 1. Projects listed above for spring development will help with this.
	8. Fuels Management	<ol style="list-style-type: none"> 1. Prescribed Fire 2. Plan for live tree harvest with Manti-LaSal forest feller/buncher tool. 3. Promote firewood Collection 	<ol style="list-style-type: none"> 1. Continue permit program for collection of fuel and fire wood. 2. Utilize Forest Service equipment to harvest live trees for fuelwood on Abajo mountains. 3. Utilize Forest Service temporary access roads to harvest dead trees to reduce fuel load.
Animals:	1. Low Beaver population	<ol style="list-style-type: none"> 1. Increase Beaver population where appropriate. 	
	2. Lack of Beaver Habitat	<ol style="list-style-type: none"> 1. Utilize construction of beaver amalgam structures to simulate beaver activity and lure beaver into appropriate areas. 	
	3. Elk Depredation	<ol style="list-style-type: none"> 1. Manage populations through hunting permits. 2. Remove elk from areas where depredation is occurring. 	<ol style="list-style-type: none"> 1. Continue UDWR herd management through hunting permits.
Energy:	1. Access to Fuelwood	<ol style="list-style-type: none"> 1. A permit program for collection of fuelwood. 2. Incorporate fuel wood collection into Pinyon/Juniper and Aspen thinning projects. 	<ol style="list-style-type: none"> 1. Continue permit program for collection of fuelwood. 2. Add Fuel wood collection to projects listed above that would thin trees.
	2. Windmill Development	<ol style="list-style-type: none"> 1. Reseed and revegetate areas where soil disturbance has occurred. 2. Manage windmills to protect animals. 	
Human:	1. Access to posts, poles, and rails for fencing	<ol style="list-style-type: none"> 1. A permit program for collection of posts, poles and rails. 2. Incorporate fuel wood collection into Pinyon/Juniper and Aspen thinning projects 	<ol style="list-style-type: none"> 1. Continue permit program to collect posts, poles, and rails for fencing. 2. Add collection of fencing materials to projects listed above that would thin trees.

7.2 Adaptive Watershed Planning

The SJWP represents the CRMP group’s consensus on concerns and priorities at this point in time. There will undoubtedly be changes in watershed condition that will need to be noted in this document, and there will be new projects identified by stakeholders that will need to be incorporated. Adaptive management of this plan will allow for flexibility and adaptation based on any new information obtained. It’s an ongoing cycle, as illustrated below. This document was the Committee’s first attempt to assess the problems and design a solution. Implementation, monitoring, evaluation and adjustments will be made as time goes on.



Monitoring efforts will continue in the future. The Utah Division of Water Quality will include SJWP watershed sampling locations on the Colorado River basin intensive monitoring run that will be conducted every six years. The most recent monitoring was conducted in 2012-13. The next round will take place in 2018-19. That monitoring is done to assess current condition of stream and reservoir sites and those results will be used to

determine the next areas to focus on.

In addition to the intensive basin sampling, individual sampling and analysis plans will be developed and implemented for monitoring any best management practices that are implemented. These sampling and analysis plans will outline project goals and expected pollutant load reductions and define the steps that will be taken to determine actual pollutant load reductions post implementation.

The Committee will keep a record of changes that need to be made to this plan and incorporate those changes after each round of intensive monitoring is complete. The next revision will be done 5 years from now in 2022. At that point stakeholders will hopefully have recognized the benefits of having this document in place and will be helpful in offering suggested changes or additions to it.

7.3 Implementation Plan

The implementation strategy for this watershed plan will first be to address projects that are ready to be implemented now. Other projects will be added to this document as they come forward. This plan will address, in a general manner, all anticipated aspects of the watershed. Specific projects will be added to this document once approved by the Steering Committee. The following 5 projects will be actively coordinating efforts, building partnerships and seeking funding for implementation as quickly as possible:

- 1) Remove Pinyon & Juniper trees from 5,930 acres of mainly BLM land located North and West of Monticello. **Estimated Cost \$1,927,250**
- 2) Remove Pinyon & Juniper trees from 188,464 acres of mainly BLM land located South and East of Monticello. **Estimated Cost \$61,250,800**
- 3) Pipe canal from Indian Creek Diversion to Dry Wash. **Estimated Cost \$690,000 (Bureau of Reclamation Grant seeking \$300,000 funds has been submitted by San Juan Water Conservancy District, as of February 2017 no award has been made. A Resource Conservation Partnership Program (RCP) Application was also submitted in April 2017 to help fund this project).**
- 4) Install Measuring & Monitoring Station at Indian Creek Diversion and pond on Dugout Ranch. **Estimated Cost \$5,520 (A Water Conservation Grant was submitted by USU Extension to fund this project in March 2017)**
- 5) Implement Shingle Mill restoration project. 10,680 Acres total. Treatments to reduce gullying and erosion with grade control structures and also upland vegetation treatment and seeding. **No Estimated Cost Amount currently available due to NEPA Process limitation.**

7.4 Project Descriptions

7.4.1 Spring Creek Pinyon Juniper Removal Project

This project would remove Pinyon & Juniper trees from 5,930 acres of mainly BLM land located North and West of Monticello.

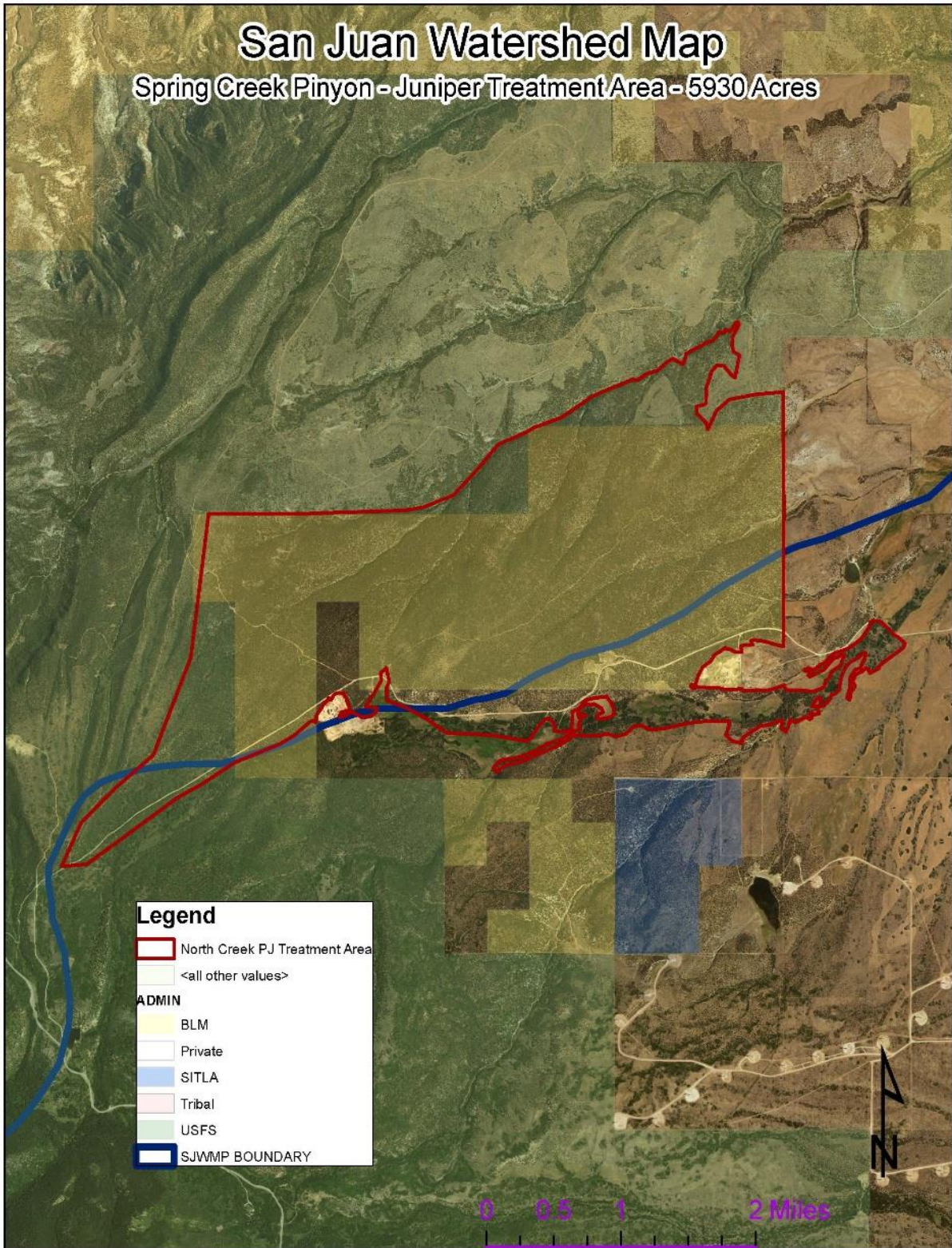


FIGURE 16 7.4.1 SPRING CREEK TREATMENT AREA

Spring Creek PJ Treatment Project; Masticate 5,930 Acres of Pinyon & Juniper Trees

Cost Estimate

Item:	Quantity	Unit	Unit Cost	Cost
Mastication	5,930	Acre	\$325	\$1,927,250
TOTAL COST:				\$1,927,250

Spring Creek PJ Treatment Project; Cut/Pile/Burn 5,930 Acres of Pinyon & Juniper Trees

Cost Estimate

Item:	Quantity	Unit	Unit Cost	Cost
Cut/Pile/Burn	5,930	Acre	\$700	\$4,151,000
TOTAL COST:				\$4,151,000

Spring Creek PJ Treatment Project; Chain 5,930 Acres of Pinyon & Juniper Trees

Cost Estimate

Item:	Quantity	Unit	Unit Cost	Cost
Chain	5,930	Acre	\$150	\$889,500
TOTAL COST:				\$889,500

7.4.2 Montezuma Bench Pinyon Juniper Removal Project

This project would remove Pinyon & Juniper trees from 188,464 acres of mainly BLM land located South and East of Monticello.

Montezuma Bench PJ Treatment Project; Masticate 188,464 Acres of Pinyon & Juniper Trees

Cost Estimate

Item:	Quantity	Unit	Unit Cost	Cost
Mastication	188,464	Acre	\$325	\$61,250,800
TOTAL COST:				\$61,250,800

Montezuma Bench PJ Treatment Project; Cut/Pile/Burn 188,464 Acres of Pinyon & Juniper Trees

Cost Estimate

Item:	Quantity	Unit	Unit Cost	Cost
Cut/Pile/Burn	188,464	Acre	\$700	\$131,924,800
TOTAL COST:				\$131,924,800

Montezuma PJ Treatment Project; Chain 188,464 Acres of Pinyon & Juniper Trees

Cost Estimate

Item:	Quantity	Unit	Unit Cost	Cost
Chain	188,464	Acre	\$150	\$28,269,800
TOTAL COST:				\$28,269,800

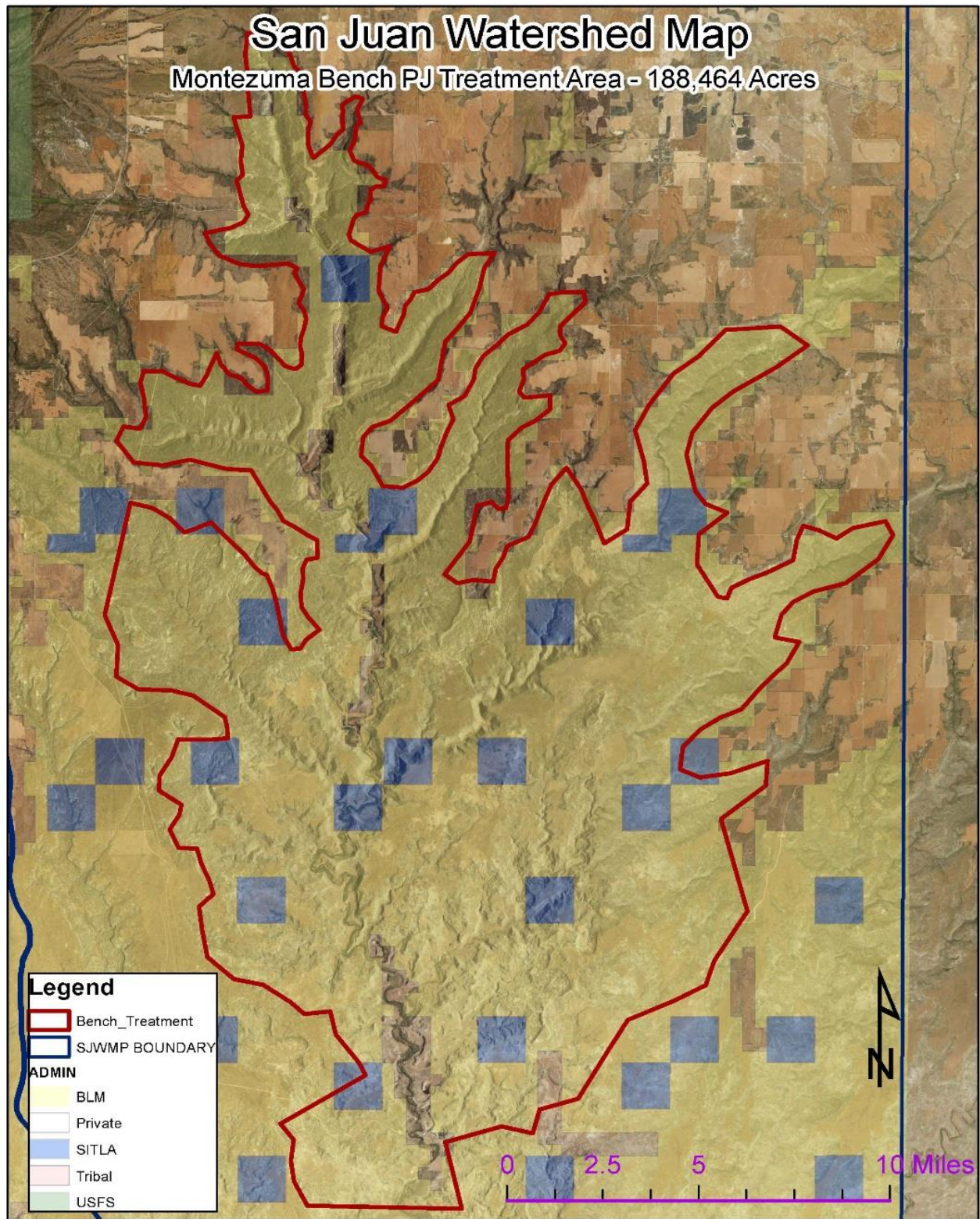


FIGURE 17.4.2 MONTEZUMA BENCH TREATMENT AREA

7.4.3 Indian Creek Diversion Measuring & Monitoring Station

Indian Creek Diversion Measuring and Monitoring System

Cost Estimate

Item:	Quantity	Unit	Unit Cost	Cost
Base Station (Data logger, solar panel, battery, antenna, lightning arrestor)	2 (One at the diversion, one at Pond on Dugout ranch)	System – CR 300 w/radio link	\$1,200	\$2,400
Water Level Sensor	2	System – CS 451	\$800	\$1,600
Satellite	1	1 System	\$1400	\$1,400
*Short Burst data plan	1	Data plan	\$360 (yearly cost, \$30/month)	\$120
TOTAL COST:				\$5,520

*"Short burst" data plan converts raw data to something understandable to read



7.4.4 Manti LaSal Forest Shingle Mill Watershed Restoration Project

Manti LaSal Forest Shingle Mill Watershed Restoration Project

1215 Acre Aspen Unit understory thinning and regeneration protection treatments. 3945 Acre Mechanical treatment. 3490 Acre thin and prescribed burn in Ponderosa Pine. 2034 Acre watershed treatment with gully plugs and vegetation manipulation.

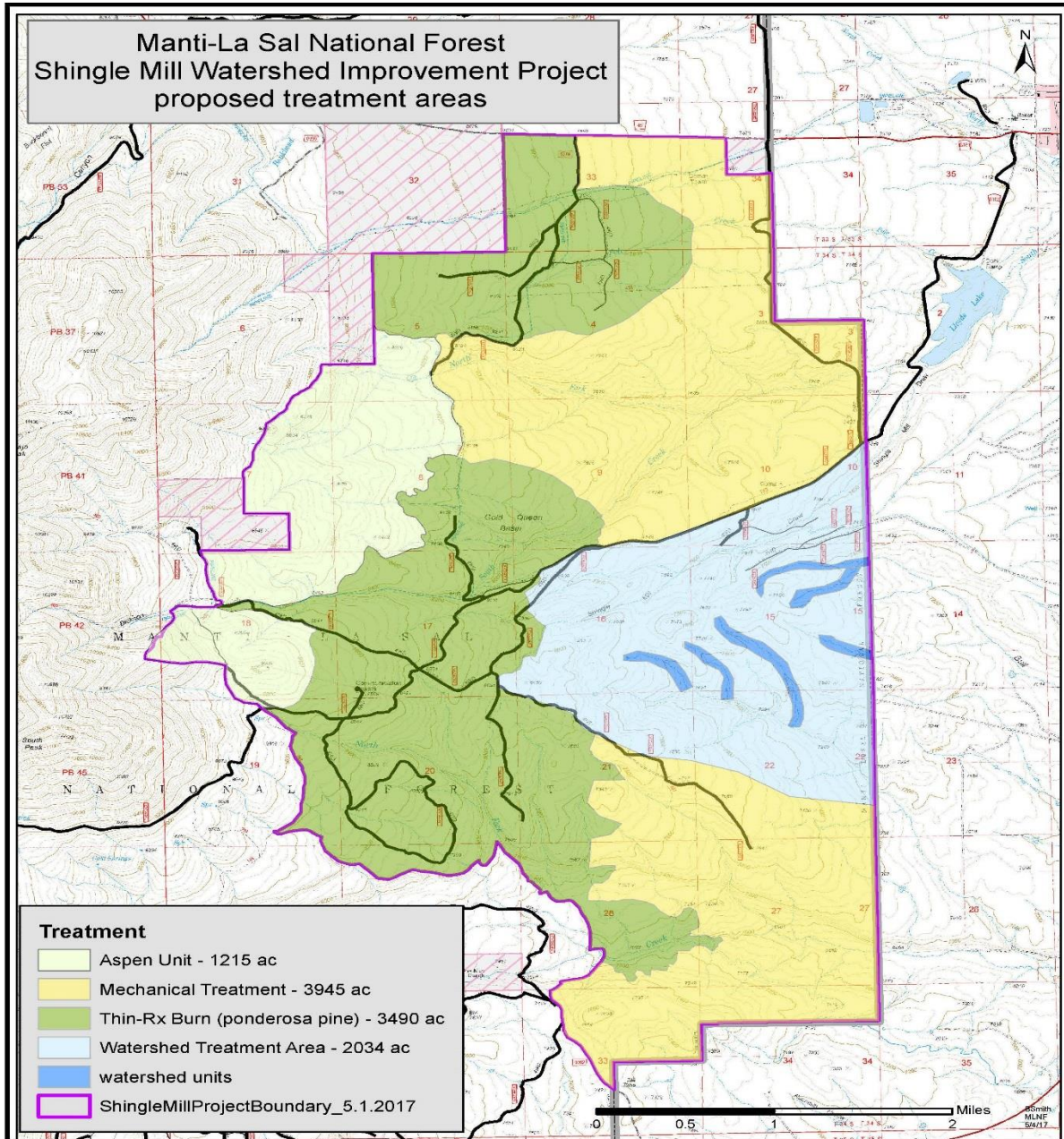


FIGURE 18 7.4.4 MANTI LASAL FOREST SHINGLE MILL WATERSHED IMPROVEMENT PROJECT

TOTAL PROJECT COST ESTIMATES:

Project	Quantity	Unit	Unit Cost	Total Cost
Spring Creek Pinyon Juniper Treatment	5,930	Acres	\$325 (Mastication)	\$1,927,250
Montezuma Bench Pinyon Juniper Treatment	188,464	Acres	\$325 (Mastication)	\$61,250,800
Dry Wash Canal Piping				\$697,000
Indian Creek Measuring & Monitoring Station				\$5250
Shingle Mill Forest Project				N/A
TOTAL PROJECTS	5			\$63,880.300

APPENDIX:

A. Water Quality Monitoring Programs and Environmental Assessment Programs

Intensive Monitoring Program

The State of Utah Division of Water Quality conducts targeted intensive chemical and physical ambient water monitoring in the State's five major watersheds. The program rotates annually between the five basins sampling each basin October through September every five years. The Southeast or Colorado River Basin was sampled intensively in 1997 -1998, 2002 – 2003, 2007 – 2008, and 2012 - 2013. Mill Creek and Castle Creek watersheds were included in those sampling efforts. The sites are sampled monthly for field parameters, flow, nutrients anions, cations, and standard water characteristics. Metals are sampled for quarterly. Sites varied over the years as data needs and issues varied. The sites that have been sampled and the periods they were sampled are shown in Table 3.8. A summary of the results for all sampling periods through 2008 is presented in Appendix A. The results from the 2012-2013 sampling period are not available at this time.

Station Id #	Station Description	1997-1998	2002-2003	2007-2008	2012-2013
4953420	Recapture Ck at U163 Xing	X	X	X	
4953560	Montezuma Ck at U163 Xing	X	X	X	X
4953460	Johnson Ck ab Recapture Reservoir	X	X	X	X
4953610	Montezuma Ck bl Cnfl/ Verdure Ck	X	X	X	
5958280	South Fork Ck ab Lloyd's Reservoir	X	X	X	
4953790	North Ck ab Lloyd's Reservoir	X	X	X	X
5952140	Stream ab Blanding City Reservoir #4			X	
4953510	Bulldog Canyon Ck ab Recapture Res				X
4955790	Indian CK ½ mile S of Newspaper Rock	X	X	X	X
4953650	Verdure Ck at US191 Xing	X			

Lake Monitoring Program

UDWQ samples lakes as part of their clean lakes program. Lakes are generally sampled bi-annually. During the years a lake is sampled it is sampled twice, once in the late spring and again in late summer. Depending on the size of the lake there can be more than one sample station and the lake inflows are sampled with the lake. The lakes that are part of the clean lakes program and in this watershed plans area are listed in.

Station Id #	Station Description
5952090	Blanding City Res No. 4 001 ab Dam

5952140	Stream ab Blanding City Reservoir #4
5952210	Monticello Lake 01
5952220	Spring Ck ab Monticello Lake
5958010	Recapture Res 001 ab Dam
5958020	Recapture Res 002 ¼ way up Res
5958030	Recapture Res 003 ½ way up Res
4953510	Bulldog Canyon Ck ab Recapture Res
4953460	Johnson Ck ab Recapture Reservoir and ab Diversion
5958250	Lloyds Res 001 ab Dam
4953790	North Ck ab Lloyd's Reservoir
5958280	South Fork Ck in Canal ab Lloyd's Res

Cooperative Monitoring Program

UDWQ and the Bureau of Land Management (BLM) have cooperatively monitored streams, springs and lakes since the early 1980's. The Bureau of Land Management provides personnel time and monitoring equipment to collect the water quality samples and UDWQ provides the sample analyses, data storage, and assessment software. The sites that have been monitored cooperatively in this Watershed Plan area are listed in Table 3.10

Station Id #	Station Description	Years Sampled
4953240	BUTLER WASH @ U95	1999-2001
4953560	WESTWATER CK AT U95 XING	2003-2004
4953290	COTTONWOOD CK AB MILL SITE	1998-1999
4953300	COTTONWOOD CK AT U163 XING	1997-1998
4953310	HAMMOND CANYON CK AB COTTONWOOD CK	1998-1999
4953320	COTTONWOOD CK AT U95 XING	1997-1999,2001,2003-2004,2015
4953330	DRY WASH AB COTTONWOOD CK	1998
4953340	ALLEN CANYON CK AB COTTONWOOD CK	1998-1999
4953360	COTTONWOOD CK @ USFS BNDY	1998-1999
4953370	KING EDWARD MINE PORTAL SOUTH	1998-1999
4953380	KING EDWARD MINE PORTAL NORTH	1998-1999
4953390	COTTONWOOD CK AB MINE SITE	1998-1999
4953440	RECAPTURE CK AT U262 XING	1997,2000
4953495	RECAPTURE CK 6.5MI BL RECAPTURE RES	2007-2008
4953520	BUCKET CANYON LOWER SPRING	2001,2003-2004
4953530	BUCKET CANYON SPRINGS BC#1	2003,2004
4953570	BUCKET CANYON AT MOUTH	1999-2001

4953640	Montezuma Ck AB Navajo Reservation	2007
4953670	Montezuma Ck AB CNFL/ Horsehead Canyon	2001,2007
4953694	Spring Ck bl USFS/BLM BNDY	2004-2005
4953810	COALBED CANYON CK AB MONTEZUMA CK	2000-2001
4953830	North ck ab Harts Draw rd	2001
4955890	INDIAN CK BL EXCLOSURE NR NEWSPAPER ROCK	1997-2000
4955900	INDIAN CK AB EXCLOSURE NR NEWSPAPER ROCK	1997-2001

UDWQ and the Manti-La Sal have also cooperatively monitored streams, springs and lakes since the early 1980's. The sites that have been monitored cooperatively in this Watershed Plan area are listed in Table 3.11

Station Id #	Station Description	Years Sampled
4955800	INDIAN CREEK AT SHAY RIDGE ROAD CROSSING (MIDDLE SITE)	2003-2005
4955840	INDIAN CREEK ABOVE BLANDING DIVERSION	2001,2004-2005

Environmental Monitoring Assessment programs

There are several other monitoring programs that have sampled sites in San Juan County. They include the EPA sponsored Environmental Monitoring and Assessment Program (EMAP) began sampling in 2001. The EMAP program involved several western states and the document "An Ecological Assessment of Western Streams and Rivers" can be found at: http://www.epa.gov/region8/water/emap/EMAP_West_Assessment_100305.pdf. The EMAP monitoring protocol consists of sampling water for chemical and physical parameters, macroinvertebrate sampling, algal sampling, coliform sampling, fish counts and tissue sampling, and physical habitat sampling. The EMAP program was a demonstration project and was replaced by the National River and Stream Assessment program.

The National River and Stream Assessment program was initiated by the EPA and modeled after the EMAP program. The program samples the same constituents as the EMAP program and uses the same protocols for monitoring. The EPA is the caretaker for the data for both programs. The EPA uses the data from these programs to assess water quality on a regional basis. The data is not used to assess individual waterbodies. Both EMAP and NRSA have probabilistic monitoring strategies that pick sites randomly as opposed to the targeted sampling strategies.

The Utah Classification and Stream Assessment program (UCASE) is modeled after the EMAP and NRSA program. The sampling strategy is probabilistic and similar constituents are monitored. The DWQ is the caretaker for that data and uses it to assess waterbodies in the State.

Currently the macroinvertebrate community is compared to “reference sites” that have similar climate and geographic characteristics and have not been subjected to anthropogenic disturbance. Monitoring locations associated with these sampling programs are listed in Table 3.12

SITE ID	Site Description	Date Sampled	Program	Comments
4953463	Johnson Ck above conf with Red Bluff Ck	10-2-2004	EMAP	
4953565	MONTEZUMA CK AB HWY 162 XING UT09ST-222	04-28-2010	UCASE	
4953635	VERDURE CK ~ .6 MI AB CNFL/ MONTEZUMA CK (UT09ST-230)	06-02-2010	UCASE	
4953655	VERDURE CK ~ 1.8 MI BL COLD SPRINGS SOURCE UT09ST-214	06-03-2010	UCASE	
4955800	INDIAN CREEK AT SHAY RIDGE ROAD CROSSING (MIDDLE SITE)	10-03-2004	EMAP	
4955840	INDIAN CREEK ABOVE BLANDING DIVERSION	10-02-2004	EMAP	

B. Literature Cited

Greater Sage-Grouse Working Group. 2013. Utah’s Conservation Plan for Greater Sage Grouse. http://wildlife.utah.gov/uplandgame/sage-grouse/pdf/greater_sage_grouse_plan.pdf

Utah Division of Wildlife Resources. 2009. Utah Pronghorn Statewide Management Plan. http://wildlife.utah.gov/hunting/biggame/pdf/Statewide_prong_mgmt_2009.pdf

Utah Division of Wildlife Resources. 2009. Utah Moose Statewide Management Plan. http://wildlife.utah.gov/hunting/biggame/pdf/moose_plan.pdf

Utah Division of Wildlife Resources. 2009. Utah Greater Sage-Grouse Management Plan. http://wildlife.utah.gov/uplandgame/sage-grouse/pdf/management_plan_2009.pdf

Utah Division of Wildlife Resources. 2010. Utah Elk Statewide Management Plan. <http://wildlife.utah.gov/hunting/biggame/pdf/bighorn-plan.pdf>

Utah Division of Wildlife Resources. 2011. Utah Black Bear Management Plan. http://wildlife.utah.gov/bear/pdf/2011_bear_plan.pdf

Utah Division of Wildlife Resources. 2011. Utah Big Game Annual Report.
http://wildlife.utah.gov/hunting/biggame/pdf/annual_reports/11_bg_report.pdf

Utah Division of Wildlife Resources. 2015. Deer Herd Unit Management Plan Deer Herd Unit # 14 San Juan. https://wildlife.utah.gov/hunting/plans/deer_14.pdf

Utah Division of Wildlife Resources. 2016. Elk Herd Unit Management Plan Elk Herd Unit # 14 San Juan.
https://wildlife.utah.gov/public_meetings/rac/2016_elk_plans/unit14_san_juan.pdf

Utah's Watershed Restoration Initiative. 2016. <https://watershed.utah.gov/>