CHAPTER 15 – WATERSHEDS AND SOILS

15.1 RESOURCE OVERVIEW

Watersheds are an important management concept that incorporates several separate resources and takes into consideration the interaction between those resources. The resources that are discussed in this section include groundwater, surface water, and soils. Other resources that are integral to watershed health, such as vegetation, are covered in other sections of the AMS. Each resource is considered independently in this section; for instance, the impact of soil loss on productivity, the availability of surface water, or the quality of groundwater.

However, the interaction of these resources must also be considered, particularly with respect to surface water quality. Almost every management decision involves allowing or restricting surface disturbance on BLM lands. Disturbance and erosion of soils is the primary source of surface water quality degradation; thus impacts to soils from management decisions affects not only in-situ resources, like vegetation, but also resources elsewhere within the watershed.

15.2 WATERSHEDS AND GENERAL TOPOGRAPHY

The Monticello Field Office (FO) planning area lies within portions of nine separate hydrologic subbasins located within the Upper Colorado hydrologic region (Region 14). The majority of the planning area is contained within the San Juan subbasin, though the northern portion of the planning area is largely within the Kane Springs subbasin. Subbasin boundaries are shown on Figure 15-1, and are described in Table 15.1.

Table 15.1. Subbasins within the Monticello FO Planning Area

4th Order HUC	Subbasin Name
14030005	Upper Colorado – Dolores – Kane Springs
14070001	Upper Colorado – Dirty Devil – Upper Lake Powell
14080201	Lower San Juan – Four Corners
14080202	Lower San Juan – McElmo
14080203	Lower San Juan – Montezuma
14080205	Lower San Juan – Lower San Juan

The planning area is also within an administrative area designated by the Utah Division of Water Resources (UDWRe) called the Southeast Colorado River Basin. The boundaries of this area are a mix of political and geographic features, and almost completely overlap the Moab and Monticello planning areas.

The topography of the Monticello FO planning area is defined largely by high mountains, steep escarpments, and incised canyons. The boundaries of the planning area itself are defined by the Colorado border to the east, the San Juan River and Navajo Indian Reservation to the south, and the Colorado River to the west. The northern boundary of the Monticello FO planning area approximately follows the elevational divide along Hatch Point, and the Lower Lisbon Valley. Elevations vary from 3,700 feet

above mean sea level (amsl) in the southwest near Lake Powell, to approximately 7,500 feet amsl near the base of the Abajo Mountains.

The Abajo Mountains themselves lie within the Manti-La Sal National Forest and are the highest topographic features in the planning area. Dry Valley extends north from the Abajo Mountains. The region west of the Abajo Mountains consists of a deeply incised plateau, and includes the Canyonlands National Park. The southern portion of the planning area that extends from the Abajo Mountains to the San Juan River is characterized by similar terrain, though less steep, and an overall loss in elevation to about 4,500 feet amsl at the River.

The three largest cities within the planning area are Monticello, Blanding, and Bluff. Monticello is located in the center of the FO planning area, at an elevation of about 7,100 feet amsl on a high plateau east of the Abajo Mountains near the head of Montezuma Canyon. Blanding is located at an elevation of 6,100 feet amsl twenty-two miles south of Monticello, situated between the Abajo Mountains and the San Juan River. Smaller communities, such as Montezuma Creek, Bluff, and Mexican Hat are situated across the planning area along the San Juan River.

15.3 GEOLOGY

A more detailed description of the geology of the Monticello Field office area can be found in the mineral report (Chapter 9–Minerals and Geology). In brief, the geology of the Monticello FO planning area is characterized primarily by the relatively flat stratigraphic sequence of sedimentary units dating from the Cretaceous, Jurassic, Triassic, and Permian and Pennsylvanian periods. The older Permian and Triassic rocks, which include the Cutler Group and the Moenkopi formation and the Chinle Formation, dominate the area between the Abajo Mountains and the Colorado River. This area is known as the Monument Upwarp, a late Cretaceous uplift that resulted in the erosional removal of the younger strata from the underlying rock. The remainder of the Monticello Field Office is still dominated by younger sedimentary units of Cretaceous and Jurassic age, which includes the Dakota and Morrison Formations and the Glen Canyon Group.

The Abajo Mountains are primarily the result of uplift of sedimentary rocks by Tertiary igneous intrusions, which outcrop in the mountains. Meanwhile Lisbon valley is the result of late Cretaceous collapse of a Paleozoic salt dome. (Utah Geological Survey 2003, Chronic 1990).

Generalized geology of the planning area is shown in Figure 15-2.

15.4 SOILS

Soils are the medium for plant growth, and soils provide nourishment for nearly all terrestrial organisms. Soils in the Monticello FO planning area have developed in residuum, colluvium, alluvium, eolian sands, and loess. They are derived primarily from the sedimentary geologic deposits that occur throughout the Monticello FO planning area. Some soils are derived from igneous parent materials that occur around the Abajo Mountains.

Mean monthly temperatures in the lower valley regions of southeastern Utah, such as at Bluff, reach over 90 degrees Fahrenheit (ºF) in July and less than 20 ºF in January. Mean annual precipitation in the lower valley regions, including most of the southeastern corner of the state, is less than 10 inches. Rainfall increases with elevation to approximately 12 inches through Dry Valley and 15 inches at Monticello. Meanwhile, the higher elevations of the Abajo Mountains can receive over 30 inches of precipitation annually. Precipitation falls all year round, but is generally highest from July to October, during summer

convective storms. Soil temperature regimes vary from mesic (warm) at lower elevations to cryic (cold) at higher elevations. Soil moisture regimes range from aridic (driest) to ustic (some precipitation falls during the growing season) throughout the Monticello FO planning area, with hydric soil (aquic soil moisture regime) occurring in riparian and wetland areas.

15.4.1 Soil Data

Soil mapping for the Monticello FO planning area was prepared using the State Soil Geographic database (STATSGO) for Utah. STATSGO data is useful for regional planning documents (such as this AMS) because it defines broad areas where soil limitations may occur. Additionally, STATSGO data gives the user general soil properties that may be useful for broad-scale planning and management. Higher-resolution Natural Resource Conservation Service (NRCS) soil surveys are available over the entire Monticello FO planning area, and it is highly recommended that land managers use these data for site-specific planning.

NRCS Soil surveys for the Monticello Field Office include:

- San Juan Area 1962
- San Juan County, Central Part 1993
- Canyonlands National Park 1991

15.4.2 Soil Classification

Aridisols (dry soils), Mollisols (soils with a dark surface horizon), Entisols (geologically young soils), and Alfisols (forested soils) comprise the Monticello FO soil orders. A soil order is the broadest soil taxonomic grouping. The next, more refined soil taxonomic level is the soil suborder. There are 7 suborders of soils that occur in the Monticello FO (Figure 15-3). The remaining BLM acreage is composed of rock outcrop. The acreage of soil suborders in the Monticello FO was determined from Utah STATSGO and is summarized in Table 15.2.

Table 15.2. Soil Orders and Suborders, Monticello Field Office

Soil Order Soil Suborder	Acreage	Description
Aridisols		
Argids	292,574 acres	Aridisols with clay accumulation in one or more subsurface horizons.
Orthids	354,966 acres	Aridisols without any exceptional characteristics.
Entisols		
Fluvents	26,170 acres	Entisols formed in a fluvial environment, such as a floodplain.
Orthents	926,129 acres	Entisols are recently developed soils without any exceptional characteristics. Orthents are typically formed in coluvial and aeolian deposits. These soils are the most wide-spread in the Monticello FO planning area.
Mollisols		
Borolls	10,464 acres	Mollisols formed under cooler temperatures.

Table 15.2. Soil Orders and Suborders, Monticello Field Office

Soil Order Soil Suborder	Acreage	Description
Ustolls	18,258 acres	Dry Mollisols (precipitation occurs more frequently than in Xerolls).
Xerolls	29,909 acres	The driest Mollisols (precipitation occurs less frequently than in Ustolls).
Other Lands		
Rock Outcrop/ Rubblelands/ Water	354,966 acres	Includes all of these. No soil development is present on these lands; water makes up a small percentage of this acreage.

BLM 2001b

15.4.3 Sensitive Soils

Soils in the resource area are composed of a wide variety of soil types and characteristics. Sensitive soils are those soils that have one or more limiting characteristics that would make them difficult to reclaim, if they were disturbed. Limiting soil chemical features include sodium, soluble salts, carbonates, and gypsum. Limiting soil physical characteristics include soils that are susceptible to wind and/or water erosion, and soils that are protected by biological soil crusts.

15.4.3.1 Erodible Soils

The erodible soil coverages presented herein assume that no vegetation is present (bare soil).

Wind erodible soils were determined from each mapping unit's wind erodibility group (WEG) which ranges from 1 (highest erodibility) to 8 (lowest erodibility). Soils with a WEG of 1-3 are highly erodible; soils with a WEG of 4-5 are moderately erodible. Wind erosion strips the surface horizon of soil and nutrients necessary for seed germination and plant recruitment. Wind erosion can also result in the formation and expansion of sand dunes. Aeolian deposition can bury and kill biological soil crusts by prohibiting photosynthesis in cyanobacteria, lichens and mosses. In the Monticello FO planning area, moderately and highly wind erodible soils occur over 986,765 acres and 65 acres, respectively (Figure 15-4).

Water erosion causes the formation of rills and gullies, and can contribute to the sedimentation of streams and reservoirs. Two variables were factored into determining a soil's erodibility: the soil's erodibility constant (the "k" factor) and slope. Water erodible soils were divided into four classes: slightly, moderately, highly, and severely erodible. The table below summarizes the erodibilty constants and slope parameters used to determine the level of erodibility.

Erodibility	k Factor		Slope
Slight	<0.43	and	≤10%
Moderate	<0.43	and	>10 to ≤25%
High	≤0.55	and	>10 to ≤25%
Severe	≥0.43	and	>25%

Slightly erodible soils totaled 1,789,629 acres, moderately erodible soils totaled 8,659 acres, highly erodible soils totaled 206,451 acres, and severely erodible soils totaled 8,697 acres (Figure 15-5).

15.4.3.2 Saline and Sodic Soils

Soil salinity can have significant impacts on soil erosion and reclamation potential. Erosion of saline soils can also have significant impacts on the water quality of downstream watersheds. Soil map units with (saline soils) electrical conductivity levels of 8 dS/m or greater are shown in Figure 15-6 (BLM, 2000a). Based on STATSGO data, saline soils do not occur on BLM-administered lands.

Sodic soils are those soils with sodium adsorption ratios (SAR) greater than 13:1. The Monticello FO lands do not contain sodic soils, but they do occur within San Juan County (Figure 15-6).

15.4.3.3 Reclamation-Sensitive Soils

Reclamation sensitive soils are those soils with one or more of the following characteristics that would make them difficult to revegetate if disturbance occurred on them:

- pH $\geq$ 9.0
- SAR $\geq$ 13:1
- Salinity $\geq$ 8 dS/m

As stated above, saline and sodic soils do not occur within the Monticello FO planning area, but there are some strongly alkaline soils present within the planning area. Due to the characteristics listed above, reclamation sensitive soils would be difficult to revegetate, due to their limiting soil chemical properties. The Monticello FO planning area contains 286,736 acres of reclamation-sensitive soils (Figure 15-7).

15.4.3.4 Biological Soil Crusts

Many of the biotic communities found in the Monticello FO planning area have evolved with the presence of biological soil crusts. Biological soil crusts include mats or filaments of cyanobacteria, lichens, and mosses. These crusts play a major role in reducing water and wind erosion and in preventing the establishment of invasive annual grasses (BLM 2001a).

The presence of biological crusts in arid and semi-arid lands have a very significant influence on reducing soil erosion by both wind and water, fixing atmospheric nitrogen, retaining soil moisture, and providing a living organic surface mulch. They can be used as an indicator of rangelands' ecological health. Development of biological crusts is strongly influenced by soil texture, soil chemistry, and successional colonization by crustal organisms. The type and abundance of biological crusts can be used by the land manager to determine the ecological history and condition of a site (BLM 2001a).

Severity, size, frequency, and timing influence the impact of disturbances on biological crusts. Greater impacts and slower recovery result when the disturbance kills or removes the crustal organisms. Hot ground fires often kill the crustal organisms, which results in slower recovery of the surface crust. Fine-textured soils have faster crust recovery rates than coarse-textured soils (BLM 2001a).

Managing for healthy biological crusts requires that impacts occur when the crusts are less susceptible to damage and when conditions are best for recovery. Sandy soils are less susceptible to disturbance when moist or wet, while crusts on fine-textured soils are less susceptible when the soil is dry. Failure to properly manage soils after a disturbance can allow irreversible invasion by annual grasses (e.g.

cheatgrass). Human impacts can be harder to control, since they prefer to walk and drive in open areas that depend on biological crusts for stability (BLM 2001a).

The STATSGO data and NRCS soil surveys do not contain information on the amounts or types of biological crusts that may occur in each soil mapping unit.

15.5 SURFACE WATER SUPPLY AND USE

Surface water supply comes from larger regional rivers (Colorado, San Juan), and those intermittent and perennial streams in the Monticello FO planning area that originate in the Abajo Mountains. Runoff occurs from snowmelt and from brief intense storms that generally occur in late summer. Most of the surface runoff occurs from snowmelt during the months of April, May, and June. Stream segments farther away from the mountains, or with headwaters originating at lower elevations, are less likely to be perennial and more dependent on summer precipitation. Diverted surface water in the FO planning area is used for agricultural, municipal, industrial, and recreational purposes.

Major creeks, rivers, and lakes are summarized in Table 15.3. Average annual streamflows for some of the creeks and rivers are included in Table 15.4.

Table 15.3. Major Waterbodies Within the Monticello Planning Area

Subbasin	Major Waterbodies
Upper Colorado – Dolores – Kane Springs	Colorado River, Indian Creek
Upper Colorado – Dirty Devil – Upper Lake Powell	Colorado River, Lake Powell
Lower San Juan – Four Corners	San Juan River, Butler Wash, Comb Wash, Recapture Creek, Recapture Reservoir, Blanding City Reservoirs
Lower San Juan – Montezuma	Vega Creek, Verdure Creek, Montezuma Creek, Keller Reservoir, Lloyd's Lake
Lower San Juan – Lower San Juan	San Juan River, Lime Creek, Lake Powell

Table 15.4. Annual Mean Streamflow of Selected Waterbodies

Major Waterbodies	Flow Regime	Avg. Annual Streamflow (cfs) [1]	Period of Record
Colorado River	Perennial	12,500	1928-1982
Indian Creek	Perennial	4.2	1950-1990
Montezuma Creek	Intermittent	11.8	1986-1992
Recapture Creek	Intermittent	1.3	1966-2001
San Juan River	Perennial	2,300	1915-2001

[1] Based on published USGS data, www.usgs.gov

The largest use of surface water is for agricultural irrigation for approximately 5,100 acres of land, diverting an average of 17,000 acre-feet annually. Of this diversion, approximately 9,700 acre-feet are depleted through evapotranspiration with the rest returning to the hydrologic system as runoff or infiltration. These numbers are based on data compiled for a region roughly equivalent to the planning area for the year 1996 (UDWRe, 2000). The main irrigated crops in this region are alfalfa, small grain, and pasture plants (San Juan Drought Committee 2000).

Municipal and industrial (M&I) surface water use in San Juan County accounted for diversions of approximately 3,500 acre-feet in 1996 (UDWRe, 2000). Industrial water uses in San Juan County account for approximately 30 percent of the M&I diversions and include mining and mineral processing, lumber processing, construction and rock products, and meat processing.

Intermittent and perennial surface water flow also provides the basis for wet and open areas and supports riparian vegetation. BLM surface water developments include stock ponds, erosion control structures, rainfall catchments, guzzlers for wildlife, and spring developments.

There is no irrigated agriculture associated with BLM lands within the Monticello FO planning area, with the exception of minor acreage being farmed in trespass.

15.6 MUNICIPAL WATERSHEDS

Some municipalities within the planning area rely on surface water as part of their water supply, with some parts of the watershed administered by BLM. Most of the culinary water supplied by Blanding is surface water from Indian, Johnson, and Recapture Creeks, and all of the culinary water supplied by Mexican Hat is surface water from the San Juan River. Culinary or potable water supplied by Bluff, Eastland, Monticello, and the San Juan Special Services District all originates as groundwater derived from springs or wells.

Forty-five parcels within the planning area have been withdrawn by BLM for public water preservation. These lands total approximately 3,800 acres, and are summarized in Table 15.5. These include the following:

Table 15.5. Summary of BLM Public Water Reserve Lands

Parcel	Acres
Alkali Canyon (2)	82.64
	78.75
Arch Canyon	85.64
Cigarette Spring Cave	155.14
Collins Spring (2)	87.35
	103.61
Cottonwood Wash (3)	38.03
	39.28
	35.46

Table 15.5. Summary of BLM Public Water Reserve Lands

Parcel	Acres
Cross Canyon (3)	40.50
	39.31
	40.10
Dark Canyon	41.04
Dry Wash	43.90
East Canyon Wash (2)	35.43
	83.74
Irish Green Spring (3)	120.70
	38.51
	40.15
Lime Creek (4)	72.42
	40.21
	38.59
	40.79
Mike's Canyon (2)	151.45
	243.93
Peter's Canyon	41.30
Picket Fork	159.75
Prehistoric Cave Spring	155.84
Recapture Creek (3)	20.38
	43.70
	37.15
Red House Spring	239.56
Ruin Canyon (2)	73.22
	222.76
San Juan River (2)	41.10
	35.11
Sweet Alice Spring	40.24
Tank Wash	20.27
The Needles	186.10
The Tank	124.09
Turner Water Canyon (2)	156.44
	40.53

Table 15.5. Summary of BLM Public Water Reserve Lands

Parcel	Acres
Wild Cow Point (2)	44.58
	138.61
Woodenshoe Buttes	157.50
Total	**3,794.9**

15.7 GROUNDWATER SUPPLY, QUALITY, AND USE

Groundwater occurs in southeast Utah in both consolidated rock aquifers and shallow alluvial aquifers. The primary consolidated rock aquifer in San Juan County is known as the N aquifer, and it is composed of the Wingate and Navajo sandstones. Water from the N aquifer is generally of good quality and suitable for drinking water. The primary consolidated rock aquifer in San Juan County near Blanding and Monticello is called the D aquifer, which includes the Dakota and Burro Canyon sandstones. Alluvial aquifers in the area occur along existing rivers and streams, generally are limited in extent and less than 200 feet in depth. The largest developed alluvial aquifer in the planning area is the floodplain of the San Juan River near Bluff.

Due to the presence of evaporite deposits in the Paradox formation underlying much of the Monticello FO planning area, there is a significant occurrence of briny groundwater, in which concentrations of total dissolved solids (TDS) can exceed 10,000 milligrams per liter (mg/L). Groundwater quality in the consolidated rocks below the N aquifer is generally saline, including in the Redwall aquifer and Cutler aquifer. Portions of the N aquifer are also saline east of Bluff and along the San Juan River. Groundwater in the D aquifer is generally of low salinity. The alluvial aquifers have the potential for mixing with high saline groundwater, as the presence of the alluvial valleys is a direct result of salt dome collapse.

Aside from saline groundwater, additional areas of concern for groundwater quality include uranium mine tailings at the White Mesa mill site south of Blanding and the Monticello mill site adjacent to the town of Monticello, surface disposal of drilling brine, and leachate from tailings piles.

Groundwater use in the Monticello FO planning area is not fully documented, due to unreported withdrawal from industry and domestic wells. Groundwater is diverted from both springs and wells. The primary uses of groundwater within the planning area are for potable drinking water supply and industrial supply (UDWRe, 2000). In 2002, municipal water suppliers in San Juan County provided approximately 470 acre-feet of groundwater for potable supply (UDWRi 2003b). In 1996, 1,090 acre-feet of water in San Juan County were self-supplied for industrial purposes (UDWRe 2000).

15.8 WATER RIGHTS

Water in Utah is allocated through water rights as established by Utah state law under the doctrine of prior appropriation, or "first in time, first in right". Within the Monticello FO planning area, the BLM has 138 active water right requests filed with the Utah Division of Water Rights (UDWRi). These include surface diversions (from springs, rivers, creeks, and ponds), underground diversions (from wells, drains, and tunnels), and point to point diversions (usually stockwatering, occurring along a length of river rather than at a specific point). Most of these rights (92) have been perfected, which means proof of use has been filed and right has been certificated by UDWRi. The remaining requests (46) have been approved,

but have not yet been fully perfected. Almost all BLM water rights are for stockwatering and/or wildlife, although several are for domestic use and others do not have a specified use.

A summary of BLM water rights on file with UDWRi are given in Table 15.6. The distribution of water rights owned by BLM appears in Figure 15-8.

Table 15.6. Summary of BLM Water Rights on File With UDWRi

Type of Right	Approved	Perfected	Uses
Point to Point	0	9	Stockwatering
Surface	36	37	Stockwatering, Domestic
Underground	10	46	Stockwatering, Domestic
Total:	**46**	**92**	

Source: UDWRi, 2003a.

The drainage basins in the planning area are considered by UDWRi to be either fully appropriated or extremely limited in water supply. New appropriations are limited to small amounts of beneficial use, not to exceed 5.73 acre-feet per year. Temporary and fixed-time appropriations are limited to the amount of water needed to irrigate 60 acres or an equivalent amount for other uses.

Federal reserved water rights are not integrated with state water rights and exist independently of the Utah water rights system. The entire basin is subject to adjudication to determine priority of federal reserve and state water rights. Adjudication of water rights is accomplished by court decree. Recent decrees are based on water right data contained in Proposed Determination Books. A Proposed Determination has not yet been completed for any of the watersheds in the Monticello FO planning area, and no decree for the entire area has been issued. However, seven court decrees exist for individual streams within the planning area, including Indian, Spring, North and South Fork of Montezuma Creek, Verdure, and Montezuma Creeks and Sweet Spring (UDWRi, 2003c).

Under Utah law, water rights for instream flows for the support of fisheries and recreation may be held by the Division of Wildlife Resources or the Division of State Parks and Recreation, provided that the rights are purchased or leased from existing water rights holders. This practice has not been widely used, and only four instream flow rights have been filed in Utah. None of these instream flow rights are located within the Monticello FO planning area (Hadley 2002). However, the Division of Wildlife Resources has purchased conservation pools in Blanding City Reservoirs #3 and #4, Recapture Lake and Loyds' Lake (UDWR 2002).

In addition to instream flow rights, the Utah Division of Water Rights maintains minimum flow requirements on several rivers in Utah. These are not considered water rights; rather they are agreements executed with other rights holders to maintain minimum flows. No minimum flow requirements are located within the Monticello FO planning area.

15.9 SURFACE WATER QUALITY

The U.S. Geological Survey (USGS), BLM, and the Utah Department of Environmental Quality (UDEQ) implement surface water quality sampling programs within the Monticello FO planning area. The USGS

sampling program regularly monitors only the major rivers within the planning area including the Colorado and San Juan Rivers. The USGS monitoring program has been continuously conducted for over sixty years. The UDEQ and BLM sampling programs support state water quality assessments and are more extensive, including many of the smaller creeks, springs, and lakes. The UDEQ sampling program was started in 1997 as the basis for Utah's water quality assessment required under Section 305(b) of the Clean Water Act, and the Section 303(d) list of impaired water bodies.

Impaired water bodies within the Monticello FO planning area were limited to the Kane Springs and Lower San Juan subbasins. Within the Kane Springs subbasin, Indian Creek was identified as impaired with respect to pH. Within the Lower San Juan subbasin, Johnson Creek and North Creek are impaired with respect to pH, and Cottonwood Wash is impaired due to radionucleides (gross alpha) due to historical mining and mine tailings in the area that are currently being worked on. Within the Lower San Juan subbasin, Recapture Reservoir is impaired with respect to dissolved oxygen.

A full list of streams and water bodies located within the Monticello FO planning area and listed on Utah's 303(d) list are included as Table 15.7, and shown in Figure 15-9.

Table 15.7. Waterbodies on Utah's 303(d) List of Impaired Waters

HUC Code	Name	Stressor
14030005	Indian Creek from Newspaper Rock north boundary to headwaters	pH
14080201	Johnson Creek from Recapture Creek to headwaters	pH
14080201	Cottonwood Wash from Westwater to USFS Boundary	Gross alpha
14080201	Cottonwood Wash within USFS Boundary	Gross alpha
14080203	North Creek from Montezuma Creek to headwaters	pH
14080201	Recapture Reservoir	Dissolved Oxygen

Source: UDEQ 2000, UDEQ 2002

Excess salinity is the major surface water quality problem in the planning area, and is of national significance under the Colorado River Basin Salinity Control Act of 1974. Salinity contributions occur from naturally occurring saline springs, from saline groundwater interception by streams, and from erosion of saline soils. During low flow periods, salt contribution comes from seeps, springs, and groundwater flow; during high flow periods, erosion of saline soils becomes a major contributor to salinity problems.

Based on the UDEQ sampling program, problem watersheds within the Monticello FO planning area have been identified and are summarized in Table 15.8. Two parameters can be used to describe salinity impacts from each watershed: total dissolved solids, which are reflective of saline groundwater contribution as well as erosion of saline soils; and total suspended solids, which are an indicator or erosion potential of a watershed. Other stream systems within the Monticello FO planning area may also have problems, but the data is not currently available to make this assessment.

Table 15.8. Watersheds with Potential High Salinity Contributions

Subbasin/Stream System Sampling Locations	Avg. Total Dissolved Solids (mg/L)	Avg. Total Suspended Solids (mg/L)	Percent of Time TDS Limit Exceeded[1]	Percent of Time TSS Limit Exceeded[2]	Approximate Percent of Watershed on BLM Lands
Lower San Juan/ Lime Creek					**90%**
Lime Creek (Mouth)	2,750	20	92	8	
Four Corners/ Comb Wash					**80%**
Comb Wash (Mouth)	1,300	900	44	56	
Comb Wash (Middle)	1,970	190	50	8	
Arch Creek	690	280	0	19	
Fish Creek	1,910	20	69	8	
Four Corners/ Cottonwood Creek					**45%**
Cottonwood Creek (Mouth)	340	3,240	0	60	
Cottonwood Creek (Middle)	330	1,010	0	38	
Cottonwood Creek (Headwaters)	320	560	0	50	
Allen Canyon Creek	340	100	0	17	
Hammond Canyon Creek	310	250	0	25	
Four Corners/ Recapture Creek					**45%**
Recapture Creek (Mouth)	1,440	1,840	45	64	
Bulldog Canyon Creek	410	180	0	15	
Montezuma/ Montezuma Creek					**40%**
Montezuma Creek (Mouth)	1,400	1,750	64	100	
Montezuma Creek (Headwaters)	780	310	0	20	
Kane Springs/ Salt Creek					**25%**
Salt Creek (Mouth)	4,350	10	100	0	
Salt Creek (Middle)	720	30	5	6	
Kane Springs/ Indian Creek					**55%**
Indian Creek (Headwaters)	210	890	0	25	
N Cottonwood Creek	320	140	0	35	

Source: USEPA 2003

[1] Exceedance over 1,200 mg/L

[2] Exceedance over 90 mg/L

15.10 SPECIFIC MANDATES AND AUTHORITY

15.10.1 Federal Laws

- The Economy Act of 1936, as amended, forms the basis for agreements between BLM and the NRCS or USGS concerning soil survey and stream monitoring work.
- The Taylor Grazing Act of 1934, as amended, provides for continued study of erosion and flood control, and provides for any work that may be necessary to protect and rehabilitate public lands to prevent soil deterioration.

- The Appropriations Act of 1952, McCarran Amendment, allows the U.S. to be joined as a defendant in any suit for the general adjudication of water rights.
- The Watershed Protection and Flood Contract Act of 1954, as amended, directs the federal government to cooperate with states and their political subdivisions, soil or water conservation districts, flood prevention or control district, and other local public agencies to prevent erosion or damage from flood waters and sediment.
- The Water Resources Act of 1954, as amended, permits the Secretary of the Interior to give grants to, and cooperate with, federal, state, and local agencies to undertake research into any water problems related to the mission of the Department.
- The Water Resources Planning Act of 1965, as amended, established the Water Resources Council, which is directed to maintain studies of water supplies and water programs. The chairman of any river basin commission can request from an agency, and that agency is authorized to furnish, such information as is necessary to carry out its function.
- The Wild and Scenic Rivers Act of 1968 provides direction, procedures, and standards for management of waters located within the National Wild and Scenic River System.
- The Federal Pollution Control Act, with amendments 1972 and 1977, has the objective of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. The Clean Water Act of 1987 provides additional authorizations.
- The Water Resources Development Act of 1974 directs the Department of the Interior to undertake research and develop demonstration projects to identify methods to improve the water quality of the Colorado River.
- The Colorado River Basin Salinity Control Act of 1974 directs the Department of Interior to undertake research and develop demonstration projects to identify methods to improve water quality obligations with Mexico. The amendment of 1984 directs the Secretary of the Interior to develop a program for minimizing salt contributions to the Colorado River from land administered by the BLM.
- The Federal Land Policy Management Act of 1976 requires that public lands be managed in a manner that will protect scientific, environmental, air and atmospheric, and water resource values. It also requires land use plans to be in compliance with applicable pollution control laws, including state and federal air, water, and other pollution standards.
- The Surface Mining Control and Reclamation Act of 1977 requires federal agencies to gather hydrologic data to ascertain the suitability for mining.
- The Safe Drinking Water Act of 1977 protects all public water systems from pollutants or contaminants that would endanger public health and welfare. Activities on public lands in these watersheds must not cause contaminant levels to exceed promulgated standards.
- The Colorado River Basin Compact states, which includes Utah, have adopted numeric salinity criteria for the basin. Criteria for stations downstream of the Monticello FO planning area include: 723 mg/L salinity below Hoover Dam, 747 mg/L salinity below Parker Dam, and 879 mg/L salinity below Imperial Dam.

15.10.2 Rangeland Health Standards and Guidelines

The Utah BLM has four standards for rangeland health that they implement in their land management program. These guidelines appear in their entirety in Chapter 13–Vegetation. These standards and guidelines are written explicitly, and give the land manager a clear definition of desirable soil conditions.

Of these four standards, Standard 1 refers specifically to the soil resource:

Standard 1. Upland soils exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform. As indicated by:

a. Sufficient cover and litter to protect the soil surface from excessive water and wind erosion, promote infiltration, detain surface flow, and retard soil moisture loss by evaporation.
b. The absence of indicators of excessive erosion such as rills, soil pedestals, and actively eroding gullies.
c. The appropriate amount, type, and distribution of vegetation reflecting the presence of 1) the Desired Plant Community (DPC), where identified in a land use plan conforming to these Standards, or 2) where the DPC is not identified, a community that equally sustains the desired level of productivity and properly functioning ecological conditions.

Guideline 1-a and 1-b of the Utah Rangeland Health Standards and Guidelines also refer to soils:

Guideline 1. Grazing management practices will be implemented that:

a. Maintain sufficient residual vegetation and litter on both upland and riparian sites to protect the soil from wind and water erosion and support ecological functions.
b. Promote attainment of maintenance of proper functioning condition riparian/wetland areas, appropriate stream channel morphology, desired soil permeability and infiltration and appropriate soil conditions and kinds and amounts of plants and animals to support the hydrologic cycle, nutrient cycle and energy flow.

Furthermore, Utah's Rangeland Health Guidelines go on to state the following:

> On rangeland where a Standard is not being met, and conditions are moving toward meeting the Standard, grazing may be allowed to continue. On lands where a Standard is not being met, conditions are not improving toward meeting the Standard or other management objectives, and livestock grazing is deemed responsible, administrative action with regard to livestock will be taken by the Authorized Officer pursuant to CFR 4180.2(c).

This last guideline provides a mechanism by which soil degradation (through wind or water erosion, loss of fertility, decrease in permeability/infiltration) through livestock impacts can be mitigated by administrative action.

15.10.3 Executive Orders

EO 11738 (September 10, 1973) directs each federal agency to enforce the Clean Water Act in the procurement of goods, materials, and services.

EO 11752 (December 17, 1973) mandates that federal agencies shall provide leadership to protect and enhance the quality of air, water, and land resources through compliance with applicable federal, state, interstate, and local pollution standards.

EO 11988 (May 24, 1977) directs each federal agency to take action to avoid the long- and short-term adverse impacts associated with the occupancy and modification of floodplains. Agencies are required to avoid direct or indirect support of floodplain development whenever there is a practicable alternative.

15.10.4 Regulations

The U.S. Water Resource Council published Floodplain Guidelines on February 10, 1978, after being directed to establish guidelines for floodplain management and preservation.

Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management (Federal Register, October 18, 2000).

15.10.5 Applicable Utah State Laws and Regulations

R309-605. Provides for source protection of surface water drinking water sources.

R317-2. Provides standards of quality for waters of the state.

Utah Nonpoint Source Management Plan (October 2000), including amendment for Nonpoint Source Management Plan for Hydrologic Modifications (March 1995) and Nonpoint Source Management Plan for Silviculture Activities (July 1998).

15.10.6 Specific Water Quality Standards

R317-2 of the Utah Administrative Code provides the standards for water quality in the State of Utah. Waters are classified by use (domestic, recreation, wildlife, agriculture), with special reservations made for waters specifically determined by regulation to be High Quality Waters (there are no High Quality Waters designated within the Monticello FO planning area). Use classifications of major water bodies within the planning area and their associate surface water quality standards are summarized in Appendix WS-1.

15.11 CURRENT MANAGEMENT PRACTICES

15.11.1 Water Quantity and Quality

Current management of the watershed is based on two primary existing documents. These include the San Juan RMP (1991) and the Utah Rangeland Health Standards. Decisions are made based on these documents, with mitigation specific to the individual case.

Oil and gas activities have a significant impact on the soil and watershed resources through construction of roads, pads, and other compacted surfaces. Oil and gas permits are issued with stipulations for proper road construction and water control measures. Road construction is a continuing concern in sensitive areas, such as riparian zones and in or near stream channels. Grazing has widespread impact due to the disruption of soil and removal of vegetation near water sources and in riparian areas. Off-Highway Vehicles (OHV) are of concern not only off designated trails, but also because trails tend to follow the same course as drainages with their associated riparian areas.

The San Juan RMP called for maintenance of existing watershed control structures, construction of watershed control structures in specific areas as needed, and management control options such as surface restrictions in critical areas, floodplains and riparian areas. Areas with potential for ACEC designation with respect to watershed issues were identified based on three criteria: areas critical to the protection of Recapture Dam drainage basin, drainage basins with significant downcutting or flooding hazards, and sensitive areas that contribute significant amounts of salt or sediment to the Colorado River system. General areas identified include the following: Recapture Dam drainage basin (to protect municipal

supplies); Montezuma Creek, Butler Wash, Cottonwood Wash, Comb Wash, Indian Creek, and portions of the San Juan River (for downcutting); and portions of Comb Wash, Butler Wash, Cottonwood Wash, Recapture Creek, and Montezuma Creek (for sensitive soil areas contributing salinity).ACEC designations were not made because existing management practices and special management conditions were adequate protection.

The State of Utah has developed a nonpoint source pollution management plan (UDEQ 2000) that includes best management practices (BMPs) for soil stabilization, riparian area management and stabilization, and hydrologic modification, among others. BLM has signed Memoranda of Understanding (MOU) with state agencies for voluntary implementation of BMPs.

BLM is a cooperating agency with respect to implementation of salinity control measures on the Colorado River. Implementation includes two components: point and non-point source controls. Nonpoint source controls have the greater impact to salinity reduction, due to the large amount of land under BLM jurisdiction. Nonpoint source controls cover a wide spectrum of actions, including planning decisions, vegetation management, construction and maintenance of watershed structures, and use authorizations. It is estimated that BLM actions to institute nonpoint source controls has eliminated over 28,000 tons per year of salinity in the Colorado River (again, not just within the Monticello FO planning area) (Colorado River Basin Salinity Control Forum, 1999).

15.11.2 Soils

The Utah Rangeland Health Standards include four separate standards to be met by BLM:

- upland soils that exhibit permeability and infiltration rates that sustain or improve site productivity;
- riparian and wetland areas that are in properly functioning condition, with stream channel morphology and functions appropriate to the soil type, climate, and landform;
- desired species are maintained at appropriate levels; and
- BLM compliance with State of Utah water quality standards, Clean Water Act, and Safe Drinking Water Act, with activities on BLM land supporting the beneficial uses described by the State of Utah Water Quality Standards for surface and groundwater.

Management of the soil resource mainly falls into the hands of rangeland management specialists in the Monticello FO. Range Management Specialists use a variety of proven best management practices (BMPs) to reduce impacts to soils. The BMPs implemented by the BLM for rangeland management are based on developing grazing system practices that influence livestock distribution. Some of these practices include:

- riding/herding;
- strategic placement of salt and protein supplements;
- proper utilization rates to allow for more ground cover; and
- pasture rotation grazing systems.

These BMPs are based on the Utah Rangeland Health Standards. Allotment management plans (AMPs) are a useful resource for rangeland managers to employ in controlling soil erosion when the documents are available. These documents evaluate ways in which impacts to vegetation, soils, and riparian areas can be reduced or eliminated through the use of BMPs; they are allotment-specific. Allotment management plans are available for 2 of the 74 the Monticello FO planning area allotments.

Recreation pressures have increased greatly in the Monticello FO planning area since the writing of the last RMP. Numerous forms of recreation, from rock climbing to OHV use, affect soil resources by accelerating wind and water erosion through surface disturbance. One plan has been authored that describes management opportunities with respect to the soils resource:

- Grand Gulch Plateau Cultural and Recreational Area Management Plan

15.12 RESOURCE DEMAND AND ANALYSIS FORECAST

15.12.1 Water Quantity

The Utah Division of Water Resources expects demand for potable drinking water in the basin to increase to approximately 1,400 acre-feet in 2020, and 1,900 acre-feet in 2050. Based on available culinary supplies of approximately 5,000 acre-feet, drinking water demands are expected to be met throughout the period (UDWR 2002). Industrial water use is projected to increase to approximately 3,500 acre-feet by 2020, and 5,500 acre-feet in 2050.

Water within the basins that make up the planning area is considered by the State Engineer to be fully appropriated, with the exception of *de minimis* uses (less than 5.73 acre-feet per year). Future appropriation of water will require alteration or retirement of existing rights. The BLM has already perfected numerous water rights within the planning area for stockwatering/wildlife and domestic use purposes. There are currently concerns among ranchers that insufficient water supplies exist for livestock, limiting grazing use of some areas. Development of additional water sources will be considered in the future Allotment Management Plan development.

15.12.2 Water Quality

The current demand for maintaining or reducing salinity and sedimentation in the Colorado River system will continue into the future. The need for maintenance of surface water and groundwater quality on public lands to prevent impacts to municipal supplies will continue into the future, as well.

15.12.3 Soils

Current uses that affect soil resources include grazing, recreation, oil and gas exploration and development. The intensity of each of these uses varies over time and space. For example, oil and gas wells cause high-intensity impacts over a relatively small area (well pads typically have a 2-acre footprint), whereas grazing causes relatively lower-intensity impacts over a much larger area.

Some changes in land use have occurred since the formulation of the last RMP, and these affect soils. The intensity of some forms of recreation was not anticipated in the San Juan RMP. For example, mountain biking as a recreational activity was in its infancy when this plan was written and OHV use such as ATVs was considerably less than at present. Every year, greater numbers of people flock to southeastern Utah to experience outdoor recreation in the form of river running, biking, canyoneering, hiking, backpacking, four-wheel driving, OHV use, horseback riding, etc.

With increased recreation pressure, downward trends around trails and roads are likely to occur to soils. OHV areas are especially susceptible to soil degradation because activities allowed under the current RMP are not well regulated. Operation of OHVs can severely impact the native soil surface and biological crusts, especially in areas where erosion control and revegetation are difficult. Soil features that may limit the use of areas for OHV operation are clayey soils, salinity, sodium content, slope, water

erosion, and depth to saturated soils. Loss of biological soil crusts leads to soil erosion by wind and water, loss of soil productivity, and decrease in plant cover and vigor.

Trends observed in oil and gas activities are different because oil and gas operations are well regulated by the BLM, and operators are held accountable for disturbances. Disturbance is limited to the well pads and access roads, pipelines and ROW, etc. Operators are also responsible for reclaiming surface disturbance areas once operations are complete.

Trends for all uses can be evaluated by establishing a series of monitoring programs for each land use. A monitoring program can be as simple as taking photos annually at a set point, or as complicated as setting up a series of transects to monitor rangeland health through a livestock allotment. Currently, the BLM uses methods found in the BLM's Technical Reference (TR) 1734-6: Interpreting Indicators of Rangeland Health and Sampling Vegetation Attributes (Interagency Technical Reference 1996) to evaluate the soils component of rangeland health (BLM 2000).

15.13 CONSISTENCY WITH NON BUREAU PLANS

Watershed activities and plans that involve non-BLM administered property are coordinated with the appropriate private landowners, permittees, and state, federal, or local agencies. BLM has executed Memoranda of Understanding and Agreement with the Bureau of Reclamation and U.S. Forest Service for certain watershed activities and in-kind services. BLM also frequently coordinates with the State of Utah (primarily the Division of Wildlife), the U.S. Forest Service, the Bureau of Reclamation, and the U.S. Geological Survey.

BLM activities should be consistent with the Utah nonpoint source management plan, provided that the BMPs are implemented with respect to hydrologic modifications, grazing practices, soil stabilization, and riparian area management (as per the MOU).

The San Juan County Drought Committee has developed a Drought Hazard Mitigation Plan that includes long-term recommendations for mitigation of drought impacts. This includes recommendations for long-term actions on government lands. These recommendations are: to drill more shallow wells to water cattle on government land, to include water resources in range management on government lands, and to manipulate vegetation to develop better ground cover. The latter two recommendations are indeed part of BLM's management criteria in general. With regard to the first recommendation, BLM's current management policy does not prevent drilling of wells on BLM land, though the wells must meet state and BLM requirements and the water rights must be owned by BLM.

San Juan County has also identified priority projects for drought relief, including some that impact BLM lands. Their highest priority is repair of the Indian Creek tunnel that supplies the City of Blanding. The tunnel is located entirely on U.S. Forest Service land and is not within BLM's jurisdiction. Additional priorities are investigations into reservoir sites in Coal Bed Canyon, Monument Creek, and Clay Draw , which may impact BLM lands (Wright Water Engineers, 2001 and USBR, unknown date).

The Utah State Water Plan identifies several issues of concern for the Monticello FO planning area. Issues include:

- the continued installation of residential septic tanks and drain fields that may pose a threat to local groundwater aquifers;
- the operation of tailings ponds at some local mining operations that may contaminate regional aquifers;

- the need for a long-range groundwater master plan to identify potential contamination problems and establish necessary management criteria; and
- the need to quantify the capability of local aquifers to provide water supply for future demand (UDWRe 2000).

There is little overlap of these issues with BLM management criteria. Few septic tanks and no mine tailings ponds are located on BLM lands, and there is little opportunity for the BLM to collect groundwater data or assist in hydrologic investigations.

In 1992, the Soil Conservation Service (now the NRCS) prepared a River Basin Study Report for the Montezuma Creek river basin to address concerns over soil erosion, sedimentation, flood hazard, and water quality. BLM was involved in preparation of the report and the work groups that preceded it. The report recommends that the Cedar Point watershed be given priority with respect to treatment. Treatment would involve conservation tillage on agricultural lands and land treatment on public lands.

The Manti-LaSal National Forest occupies approximately 310,000 acres surrounded by the planning area. Management of the National Forest is based on the 1986 Forest Land and Resource Management Plan. Specific goals of the Plan with respect to soil and water are as follows. These goals are largely compatible with the management direction of the BLM:

- Maintain satisfactory watershed conditions;
- Provide favorable conditions of water flow (quality, quantity, timing);
- Protect National Forest System lands or resources from unacceptable damage caused by the development of water uses;
- Improve deteriorated watershed conditions where feasible;
- Provide sufficient water for multiple-use management by securing favorable flows of water, which is interpreted to include those flows necessary to maintain stable and efficient stream channels as required by the Organic Act of 1897, and provide for fish and wildlife habitat, recreation, and livestock use as required by the Multiple Use Act of 1960;
- Protect soil and water productivity so that neither will be significantly or permanently impaired; and
- Protect and enhance riparian areas including dependent resources.

15.14 ISSUES AND CONCERNS

15.14.1 Water Quantity

An issue of recent concern is the ongoing drought throughout the Western U.S. The drought has affected watershed health. Decreases in the amount of groundcover and the vigor and diversity of plants have been noted, with a corresponding increase in wind erosion potential.

15.14.2 Water Quality

The primary watershed concern for the planning area as identified in the previous RMP was the prevention and reduction of salinity and sedimentation from public lands. This was to be accomplished through improved management of targeted critical watershed areas.

Based on problem areas previously identified by BLM, and the more recent water quality sampling conducted by the State of Utah, the following specific watersheds currently have issues with nonpoint source pollution. It is not known whether the state of water quality is a product of the natural environment, or due to past and current management practices:

- Comb Wash has frequent exceedances of TDS and TSS standards. Approximately 80% of the watershed is BLM-administered lands.
- Lime Creek consistently exceeds the TDS standards, and almost the entire watershed (90%) consists of BLM-administered lands.
- Cottonwood Creek (South) has frequent exceedances of TSS standards, most severe on the main stem, though the tributaries have frequent exceedances as well. Approximately 45% of the watershed is BLM-administered lands.
- Recapture Creek has frequent exceedances of both TDS and TSS standards, with approximately 45% of the watershed consisting of BLM-administered lands. Portions of this stream form part of the City of Blanding's potable water supply, and flows to Recapture Reservoir for irrigation uses.
- Based on the State of Utah sampling, Montezuma Creek exceeds TSS standards 100% of the time, and frequently exceeds TDS standards as well. Approximately 40% of the watershed consists of BLM-administered land. Detailed study of Montezuma Creek has already been conducted by the (then) Soil Conservation Service in 1992. Estimates of total sediment yield from the Montezuma Creek drainage was over 539,000 tons per year as a result of erosion from cropland (not pertinent to BLM), rangeland, and bank erosion.
- Marginal opportunities exist with Indian Creek and Salt Creek. Indian Creek and Salt Creek (both within the Kane Springs subbasin) have a high percentage of BLM-administered land, but relatively minor water quality problems.

Additional concerns are protection of surface watersheds supplying Blanding (Indian, Johnson, Recapture Creeks) and protection of groundwater used by Bluff, Eastland, Monticello, and the San Juan Special Services District.

The point source discharge of saline groundwater to surface waters is a concern. No uncapped wells or springs have been identified in the planning area requiring attention.

15.14.3 Soils

15.14.3.1 Oil and Gas Exploration and Development

Oil and gas exploration and development activities, and seismic activities can cause temporary disturbance of vegetation resources, and of biological soil crusts. However, the BLM does require that BMPs be implemented to reduce impacts to soil resources.

15.14.3.2 Recreation

Recreation is one of the key issues confronting the Monticello FO planning area with respect to soil degradation. The Monticello FO has identified three Special Recreation Management Areas that are managed to reduce or prevent soil degradation caused by recreational activities:

- San Juan River
- Canyon Basins
- Grand Gulch Plateau

Two recreation plans, the Grand Gulch Plateau Cultural and Recreational Area Management Plan and the Interim Management Plan for the San Juan River, cover potential impacts and mitigation for soil resources, but other Recreation Management Areas need a plan that addresses recreation impacts to soils (the Indian Creek Canyon Recreation Management Plan is currently being written).

15.14.3.3 Grazing

Grazing activities cause impacts to watersheds by impacting soil health and water quality. Impacts caused by grazing may include soil compaction, decreased soil stability, loss of vegetation and biotic soil crusts, accelerated erosion, water quality degradation, and increased salinity contributions. The BMPs implemented by the BLM for rangeland management are based on developing grazing system practices that influence livestock distribution. Some of these practices include:

- riding herding;
- strategic placement of salt and protein supplements; and
- lowering of utilization rates to allow for more ground cover.

15.15 MANAGEMENT OPPORTUNITIES AND LIMITATIONS

15.15.1 Water Quantity

Management Opportunities for Maintenance of Water Supplies for Wildlife and Livestock. Provide additional water supplies for wildlife and livestock. These would primarily be guzzlers fed by impervious catchments, reservoirs, periodic water-hauling, or groundwater (via windmill or other pumping system). These additional water supplies could replace existing water supplies that are located in critical areas, such as riparian zones and areas with unstable soils.

15.15.2 Water Quality

Salinity is the result of several different factors, both point source and non-point source. Point sources for salinity include discharge of saline groundwater from natural springs, seeps, gaining streams (streams that receive groundwater discharge), and the release of saline groundwater during drilling activities. The primary non-point sources of salinity are the diffuse overland runoff from saline soils and erosion and transport of saline soils during flow events.

Management Opportunities for Reduction of Point Source Salinity. Management opportunities could exist for both natural and man-made point sources of salinity. These include:

- Abandonment, plugging, or capping of flowing artesian wells;
- Diversion and disposal of highly saline springs or seeps. Once diverted, water needs to be either deeply injected or evaporated;
- Stipulation in oil and gas leases for deep injection of saline groundwaters.

There are not currently any specific point sources within the Monticello FO planning area that offer any management opportunities.

Management Opportunities for Reduction of Non-Point Source Salinity. Opportunities to reduce non-point source salinity to the Colorado River system from public lands are significant and include: protection of sensitive and saline soils in San Juan County by coordinating with landowners and agencies managing land with saline soils; stabilization of actively downcutting channels; improvement of

watersheds with documented water quality issues; and protection of municipal watersheds, floodplains, and riparian areas.

Specific types of actions to realize these opportunities include the following categories: land treatments, structural controls, and management options.

Land treatment primarily refers to the manipulation of vegetation to meet a specific purpose. In general, conversion of pinyon-juniper or sagebrush to grasses will slow runoff and decrease the potential for erosion. The amount of vegetative cover needed differs depending on the underlying soil type and its risk for erosion. Nonsaline soils should be managed with enough vegetative cover to minimize erosion and channel degradation, but still allow maximum runoff to take place. For moderately saline soils, it is desirable to increase ground cover and litter to improve infiltration and minimize runoff. For highly saline or sensitive soils, both runoff and erosion are to be minimized to the extent possible.

Structural controls are designed to limit sediment movement and slow down water to improve infiltration. These include gully plugs; stock ponds; detention/retention dams; headcut structures; channel stabilization; ripping, pitting, contour furrows, or trenches; cutoff walls to prevent saline groundwater intrusion into gaining stream reaches; and piping water to bypass saline soils.

Management/administrative options include management of grazing, including seasonal rotation and exclusion from critical areas (such as fragile soils with high erosivity, and riparian areas), continuation of stipulations with respect to oil and gas well development and road building, and control of recreation and OHV use.

Management Opportunities for Protection of Municipal Watersheds. As with the overall planning area, the main concern for protection of municipal watersheds is the reduction of salinity from public lands. All municipal watersheds currently feed into reservoirs, thus sedimentation is a long-term economic concern. Opportunities exist to manage public lands to protect municipal water supplies on Recapture Creek (frequent exceedance of salinity and sediment standards).

15.16 WATER RESOURCE MANAGEMENT LIMITATIONS

Inventory and monitoring is a critical component of any management plan. Existing monitoring of water quality and quantity by the Utah Department of Environmental Quality, BLM, and the USGS may be adequate to supply data for BLM management, provided the sampling frequency does not change or increases.

Soils

1. Soil erosion condition and sediment yield trends should be evaluated by establishing permanent monitoring sites at representative locations throughout the resource area.
2. Vegetation type and density should be improved on soils with high erosion potential if evidence of erosion is observed.
3. Continue to improve grazing systems in riparian and wetland areas, and on sensitive soils.
4. The BLM should continue to implement its grazing best management practices in accordance with the Utah Rangeland Health Standards and Guidelines.
5. Manage restoration of disturbed areas on a timely basis to promote recolonization by biological crusts and to minimize invasion of annual grasses and noxious weeds.

6. Identify, revise, and implement watershed plans for critical areas, such as Montezuma Canyon (SCS,1992).
7. Provide better OHV use compliance through interdisciplinary recreation planning in areas identified above.

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