Landscape-Scale Assessment for the Upper and Middle Jemez River Watersheds

Final Report

May 9, 2005

Prepared for:

U.S. DEPARTMENT OF AGRICULTURE
SANTA FE NATIONAL FOREST
JEMEZ RANGER DISTRICT

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INTRODUCTION AND FOREST PLAN

1.1 INTRODUCTION

This Landscape Scale Assessment meets the requirements as specified in Tetra Tech's Scope of Services and Work Plan under Contract No. 43-8379-4-2012 with the U.S. Forest Service (USFS), Santa Fe National Forest (SFNF). In addition, this assessment provides a preliminary overview of the environmental conditions within the 5th code boundary of Upper-Middle Jemez River watershed. The focus of this assessment within each resource area is typically limited to National Forest System (NFS) lands within the 5th code watershed; however, where applicable, discussion of surrounding lands (part of the Valles Caldera National Preserve and Jemez Pueblo) have been incorporated.

The information contained in this report, as per the Statement of Work, is a succinct and comprehensive assessment of the existing, current conditions as they relate to the desired, reference conditions. Specific resource areas covered in detail include hydrology, erosion processes, water quality, vegetation, wildlife species and habitat, recreation, heritage resources, and livestock grazing. In addition, recommendations have been supplied in each resource chapter that provide potential corrective measures that could be taken to address specific problems within any given management area.

1.2 SANTA FE NATIONAL FOREST PLAN

The *Santa Fe National Forest Plan, As Amended* (Forest Plan) provides forest-wide goals, standards, and guidelines that apply to the NFS lands within the Upper-Middle Jemez River watershed. In addition to forest-wide direction and goals, the management direction also provides protection and management of wildlife and habitat, water resources, cultural resources, recreation, timber, range, land, and facilities within specific management areas. For specific management direction for NFS lands, refer to the *Santa Fe National Forest Plan, As Amended* (USFS 1987).

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Chapter 2
LOCATION AND SETTING

The Upper and Middle Jemez River watersheds are located in the Jemez mountain range of north central New Mexico (Figure 1). The total acreage of these watersheds are 212,579 acres; USFS lands comprise 93,914 acres in these watersheds. The highest elevation area is Redondo Peak at 11,253 feet (on the Valles Caldera National Preserve). The lowest point is the Jemez River, which exits the Middle Jemez Watershed at the southern boundary at approximately 5,420 feet (Figure 2). The dominant vegetation types in these watersheds include ponderosa pine and piñon/juniper savannas. Vegetative species found at higher elevations include white fir, aspen, blue spruce, Douglas fir, Englemann spruce, subalpine fir, and limber pine. Lower elevations include grasslands, oak woodlands, juniper woodland, and southwestern white pine.

The Forest Plan provides management direction, standards and guidelines to SFNF managers in order to effectively administer NFS lands based on the specific management prescription. The Forest Plan breaks out prescriptions into management areas (Figure 3). There are 10 management areas on USFS lands within the Upper and Middle Jemez River watersheds including Management Areas A, C, E, G, L, M, N, P, R and S. Each of these areas are managed for different objectives based on numerous variables such as: wilderness, research natural areas, threatened and endangered species habitat, developed or dispersed recreation, infrastucture or opportunities, waterbodies, road systems and access, visual resources and viewsheds, wildlife and vegetation, timber production or firewood, and small wood products collection. An overview of the management areas considered in this assessment and their respective management objective are presented in Table 1.

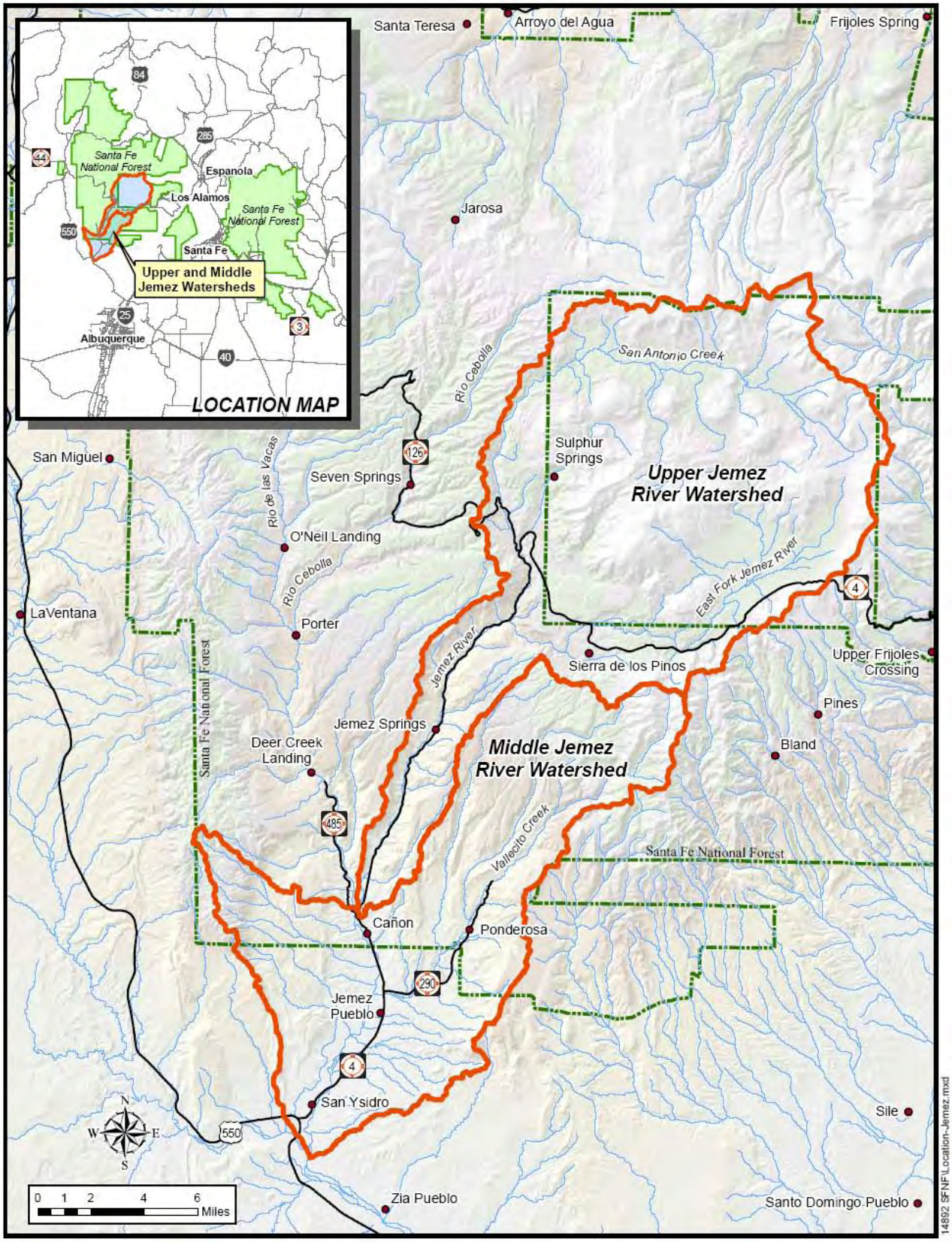

Figure 1. General location of the Upper and Middle Jemez River watersheds.

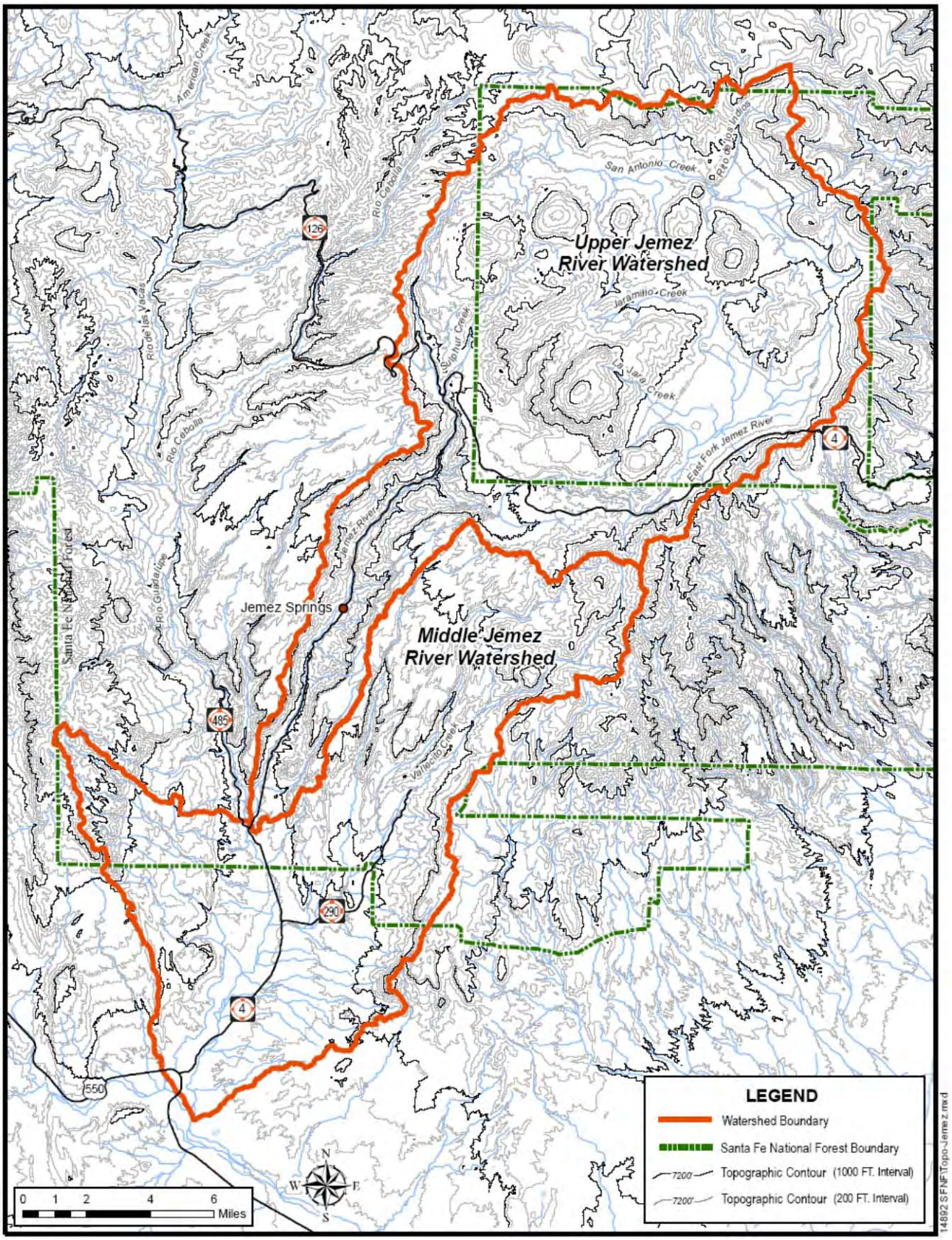

Figure 2. Topographic relief within the Upper and Middle Jemez River watersheds.

Figure 3. USFS Management Areas within the Upper and Middle Jemez River watersheds.

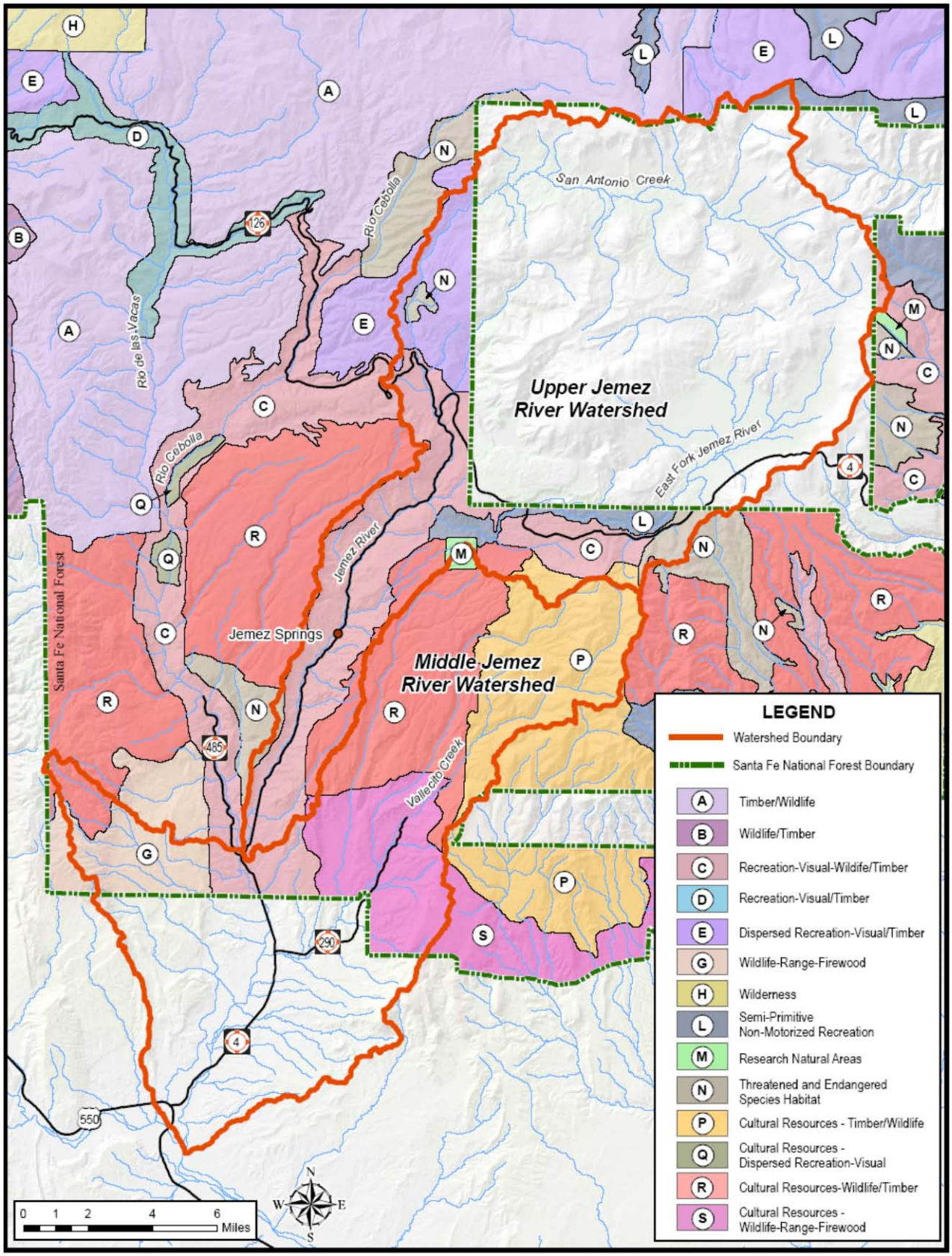
Upper Jemez River Watershed
Middle Jemez River Watershed
San Antonio Creek
East Fork Jemez River
Rio Cebolla
Rio de las Vacas
Jemez River
Jemez Springs
Vallecito Creek
Santa Fe National Forest
126
485
290
4
550
0 1 2 4 6 Miles
N
W
E
S
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
A Timber/Wildlife
B Wildlife/Timber
C Recreation-Visual-Wildlife/Timber
D Recreation-Visual/Timber
E Dispersed Recreation-Visual/Timber
G Wildlife-Range-Firewood
H Wilderness
L Semi-Primitive Non-Motorized Recreation
M Research Natural Areas
N Threatened and Endangered Species Habitat
P Cultural Resources - Timber/Wildlife
Q Cultural Resources - Dispersed Recreation-Visual
R Cultural Resources-Wildlife/Timber
S Cultural Resources - Wildlife-Range-Firewood
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Table 1. Management areas, descriptions, and emphasis for NFS lands within the Upper and Middle Jemez River watersheds.

Management Area	Description	Emphasis
A	Forested areas suitable and capable of growing commercial timber. Also provides primary habitat for wildlife. Areas are located throughout the Forest and contain 40% of the Forest's suitable timber.	Emphasis is on timber production and enhancement of wildlife habitat diversity consistent with other resource integration. Grazing capacity is generally transitory in nature but there are allotments in intermingled grasslands. Roaded dispersed recreation experiences are emphasized. Firewood is provided as a by-product of timber harvest activities.
C	Transportation corridors and areas that provide essential habitat for threatened and endangered species along with opportunities for developed recreation and viewing scenery. Most existing developed recreation sites and fishing recreation use occurs here. Area contains about 6% of the Forest's suitable timber and many of the Forest's large rivers and associated riparian ecosystems.	Enhancement of visual quality and developed recreation opportunities while protecting essential wildlife habitat and riparian zones. Grazing and timber activities occur where they are consistent with the emphasis of this area.
E	Consists of NFS lands that provide a broad range of recreation opportunities and visual quality. Area contains about 15% of the Forest's suitable timber. Provides scenic backdrops from highways or communities and contain important dispersed recreation areas or minor developed sites. Contain a wide array of game, non-game, and fisheries recreational opportunities.	Providing dispersed recreation opportunities, maintaining visual quality, timber and firewood production, and enhancement of wildlife habitat diversity. Grazing activities vary in intensity.
G	Primarily low elevation grasslands, piñon-juniper, oak, and lower ponderosa pine areas with flat to steep terrain. Provide much of Forest's forage and firewood. Contain key wildlife habitat for some woodland and shrub dependent species.	Key wildlife protection, habitat improvement, and forage and firewood production. Dispersed recreation consists of firewood and piñon nut gathering, hunting, and driving.
L	Offer outstanding opportunities for dispersed recreation with moderate to high probability of experiencing isolation in a natural environment. Large percent of area's terrain is rugged and steeply sloped. Primarily unroaded and closed to motorized recreational use. Some cold water fisheries are present.	Providing semi-primitive non-motorized recreation opportunities. Timber harvest and road building are not consistent, but wildlife, range, and fuels management may occur where consistent with emphasis. Will receive priority in dispersed pre-recreation management, trail, and trailhead development, and trail maintenance.
M	This area consists of one existing and two proposed Research Natural Areas (RNA). These areas offer ecosystem representation appropriate to meet needs identified by the Southwestern Region. The existing Monument Canyon RNA is a 640-acre section consisting primarily of Ponderosa Pine.	These areas will be managed to provide opportunities for non-disruptive research and education. This management includes allowing natural processes to occur and the protection of natural features. Use restrictions will be imposed as necessary to keep areas in their natural or unmodified condition. There will be no harvest of timber of firewood, nor will this area be assigned any grazing capacity.
N	These areas of land contain essential habitat for threatened and endangered species. They occur throughout the Forest in a variety of habitat types. For the most part, these are small areas of land isolated from high development areas and are predominantly still in a natural condition.	The emphasis will be on management that protects and enhances essential wildlife habitat. This land area will not be included in the suitable timber base. However, certain timber management activities as well as grazing, firewood, and fire management may occur when consistent with the protection emphasis of this area.

Management Area	Description	Emphasis
P	This management area contains a rich resource of prehistoric and historic cultural resources. It represents about 5% if the Forest's suitable timber. This area also provides primary wildlife habitat.	Cultural resource location, inventory, nomination, and protection are emphasized here. Emphasis is also on timber production and enhancement of wildlife habitat diversity consistent with other resource integration.
R	This management area contains a rich resource of historic and prehistoric sites. It also contains Forest lands that provide essential habitat for threatened and endangered species. Represents about 20% of the Forest's suitable timber.	Cultural resource location, inventory, nomination, and protection are emphasized. The emphasis is also on wildlife habitat improvement and essential habitat protection and enhancement. Grazing and timber harvest activities occur where compatible with the primary emphasis of this area.
S	This management area is rich in historic and prehistoric sites and contains key wildlife habitat for some woodland and shrub dependent species. They are primarily low elevation grasslands, pinyon-juniper, oak, and lower Ponderosa Pine areas with flat to steep terrain and provide a great deal of the Forest's forage and firewood.	Cultural resource site location, inventory, nomination, and protection are emphasized in these areas. Emphasis in this area is also on key wildlife habitat protection, habitat improvement, and forage and firewood production. Recreational opportunities are dispersed and consist primarily of firewood and Christmas tree gathering.

Source: Santa Fe National Forest Plan (USFS 1987)

The following discussion provides an overview of the geology, soils, weather and climate and the various land use characteristics of the Upper and Middle Jemez River watersheds. Although these topics are covered in the following discussion, they are not covered at the same detail as the other major subsections such as hydrology or water quality. The reasoning for this is because major problems or resource conflicts generally do not exist and therefore are not necessary to cover in great detail. However, these subsections do provide additional context for the setting and character of the USFS lands within the watershed, and therefore have been briefly covered below in this section.

Jemez National Recreational Area. On October 12, 1993, the Jemez National Recreational Area (JNRA) was established within the Upper and Middle Jemez Watersheds. Upon establishment, the USFS was directed to develop a management plan for the JNRA as an amendment to the SF National Forest Plan. The JNRA is located on the Jemez Ranger District of the SFNF. The boundary encompasses approx 57,650 acres of land in Sandoval County, within the Jemez Mountain range of north-central NM (USFS 2002a).

Approximately, 48,300 acres (84%) of the JNRA is on lands currently managed by the Forest Service, and the remaining 9,350 acres (16%) is under private ownership. The JNRA covers portions of the Forest Plan management areas A, C, E, G, L, M, N, P, Q and R. The entire JNRA will be one new management area (X) situated in the north central portion of New Mexico. The JNRA is accessed via State Highway 4, a State Scenic and Historic Byway, and State Highway 126. The western boundary of the recreational area includes the Rio Guadalupe corridor, the southeastern portion of the Jemez

River corridor, and San Diego Canyon. Present along the northeast portion of the JNRA is the 3,520 acre congressionally designated *East Fork of the Jemez Wild and Scenic River* (USFS 2002b).

East Fork of the Jemez Wild and Scenic River. The East Fork of the Jemez Wild and Scenic River (WSR) is located in Sandoval County, in the Jemez Mountains of northern New Mexico, approximately 5 miles northeast of Jemez Springs (Figure 1). The WSR corridor lies within the congressionally designated Jemez National Recreation Area, and has been a national wild and scenic river since 1990 (USFS 2002a). The WSR is 11 miles long, flows in a westerly direction, and has a corridor averaging no more than 320 acres per mile, comprising approximately 3,518 acres. The WSR is bounded by the Valles Caldera National Preserve to the north, and the forested NFS lands on the east, south, and west. Also to the south are private lands, and the Sierra Los Pinos Subdivision. Private lands (67 acres) within the designated corridor are outside the jurisdiction of the WSR. The first two-mile segment of the WSR from the Preserve boundary to the second highway crossing of New Mexico State Hwy 4 is designated as the Recreation segment. The next 4 miles extending from second water crossing to the third highway crossing is designated as the wild segment. The wild segment is defined as being free of impoundments and generally inaccessible except by trail, with watersheds and shorelines essentially primitive and waters unpolluted. The last 5 miles ending at the confluence with San Antonio Creek is designated as the scenic segment. This scenic segment includes river segments that are free of impoundments and accessible in places by road with shorelines or watersheds largely primitive and undeveloped.

Geology. The geology of the Upper and Middle Jemez Watersheds are relatively stable but highly variable. In the eastern portions of the watershed, Bandolier tuff, and volcanic ash deposits are dominant. In the central portions, limestone, sandstone and mudstone with shale are interwoven. In the western portions, there are areas of pre-Cambrian granite, sandstone, grading into basalt flows to the north (USFS 2002c).

The geology of the Jemez Mountains provides a variety of dramatic landforms. Over 300 million years ago, a shallow sea covered much of New Mexico. The weight of hundreds of feet of seabed sediments formed the fossil rich Madera Limestone. This limestone can be seen above Jemez Ranger Station just north of the town of Jemez Springs (USFS Region 3). Volcanic eruptions began 1.3 million years ago with 50 cubic miles of pyroclastic ash pouring down the mountain slopes. The ejection of ash caused the roof of the volcano to collapse forming the Toledo crater in what is now the headwaters of Santa Clara Creek. As the 1,000 degree Fahrenheit ash cooled, glass particles welded together to form the lower level of the Bandalier Tuff. The degree of welding resulted in cliffs varying from very hard to very soft tuff. Harder material forms vertical

cliffs, moderately welded materials is softer and is often "pock" marked from wind erosion or breaks down to form benches or ledges (USFS Region 3).

Cataclysmic eruptions rocked the area 1.1 million years ago, another 50 cubic miles of pyroclastic ash was ejected. Hot ash flows traveled at more than 100 miles per hour and buried most of the older caldera, and inundated a 400 square mile area up to 1000 feet deep. More than 200,000 acres of forest were buried. Ash welded together to form the upper Bandalier tuff, which was responsible for the formation of the spectacular mesa tops and plateaus of the Jemez Mountains (USFS Region 3).

Again, ejection of magma caused the volcano to collapse inward and subside, forming the 15 mile diameter, 1,000 ft deep Valles Caldera in the center of the Jemez Mountains. Later, snowmelt filled the caldera with water creating a large lake in the valley floor. Over the next 100,000 years, the magma pushed the center of the caldera (valley) floor, forming the 11,253 Redondo Peak; a dozen or so smaller volcanic domes formed around the three mile wide "moat" of the caldera. The doming eventually raised the lake level causing a three-mile wide breach on the caldera's southwest side. The resulting rush of floodwater is believed to have carved out San Diego Canyon. Other breaches may have carved out San Antonio Creek, the East Fork of the Jemez River, and Santa Clara Creek. These creeks and rivers continue to erode the rim of the volcano and drain the caldera (USFS Region 3).

Around 85,000 years ago, the volcano again roared to life, and the event produced Battleship Rock, a remnant of the small pyroclastic flows, which were produced. During this eruption, pumice was ejected 15 miles into the atmosphere, blanketing 13,000 acres of the East Fork of the Jemez River and areas surrounding Los Griegos, Las Conchas and Cerro Pelado Peaks. Hot springs throughout the Jemez Mountains as well as the existence of steam and gas seeps still exist under the Jemez volcanic pile (USFS Region 3).

The Rio Grande rift zone is the most probable area of New Mexico to have seismic activity. This rift continues to be geologically active, with a considerable number of small, localized earthquakes. The dominant quaternary faults and fault zones that occur within the project area are presented in Table 2 below. The identification numbers in Table 2 can be referenced in Figure 4.

Table 2. Quaternary faults within and/or directly adjacent to the project area.

ID Number	Name of Structure (Fault or Fold)	Most Recent Surface Faulting Event (MRE)	Fault Type, Dip Direction
2029a	Jemez-San Ysidro fault, Jemez section	<1.6 million years ago (Ma)	Normal, East to West

2029b	Jemez-San Ysidro fault, San Ysidro section	<750 thousand years ago (Ka)	Normal, East
2030a	San Felipe fault, Santa Ana section	<1.6 Ma	Normal, East
2030b	San Felipe fault, Algodones Section	<1.6 Ma	Normal, West
2143a	Unnamed faults of the Valles Caldera	<1.6 Ma	Normal
2143b	Unnamed faults of the Toledo Caldera	<1.6 Ma	Normal
2143c	Unnamed faults along the Valles and Toledo caldera walls	<1.6 Ma	Normal
2143d	Unnamed faults related to resurgent Dome of the Valles Caldera	<1.6 Ma	Normal

Source: U.S. Geological Survey Open-File Report 98-0521 (USGS 1998)

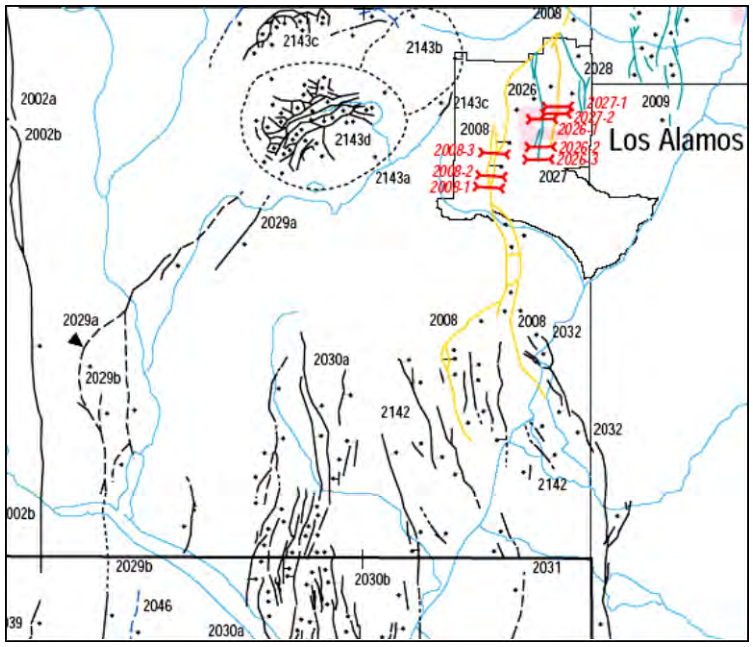

Figure 4. Quaternary faults in the study area.

Soils. A variety of microclimates are present and vary from wet riparian areas to dry mesa tops. Soils in these watersheds are diverse and are dependent upon the parent material. The watersheds are comprised of volcanic (igneous rock) bandalier tuff, associated with the Valles Caldera, as well as sedimentary and metamorphic rocks. Along the Jemez River, the change in geology along the reach transitions from hard rocks to sandstone geology. At high elevations (above the pinon-juniper zone), there is usually enough ground cover to protect soils. Down slope erosion and sediment deposition into streams is usually minimal in these areas (USFS Region 3). In the Middle Jemez watershed, erosion is more common due to steep canyon slopes and a low amount of ground cover. Road maintenance and runoff and the flushing of arroyos after precipitation events create some sedimentation problems in the streams in this watershed. Agricultural practices do occur along these stream reaches, mostly in the form of grazing, removing riparian vegetation. Since soils are highly erosive, some natural inputs of sediment do occur along streambanks. Major soil types in these watersheds are included in Table 3. Upper and Middle Jemez watersheds major soils types.

Table 3. Upper and Middle Jemez watersheds major soils types.

Soil Type*	% in the Watershed	Description
Dystric Eutrochrepts	20%	Coarse loamy or sandy skeletal, mixed frigid soils. Well drained soils. Can be shallow to deep/somewhat excessively drained, on steep to moderately steep slopes with loamy surface. Moderate to severe erosion.
Typic Cryoboralfs	16%	Loamy, skeletal, mixed soils. Formed on old floodplains, well drained, developed from weathered sandstone with limestone inclusions. Erosion hazard is moderate.
Typic Ustorthents	12%	Loamy, skeletal, mixed nonacid mesic soils. Well drained, clayey soils, formed in weathered shale in upland areas.
Pachic Haploborolls	12%	Coarse, loamy soils. This soil is fine, silty, over sand deposits. Formed in level to gently sloping uplands and plains in alluvium, sandstone and shale.
Aridic Argiustolls	11%	Loamy, skeletal mixed mesic soils. Dryer and warmer soils. Formed in moderately deep to deep with loam surfaces.

*** See Figure 5. General Soils within the Upper and Middle Jemez watersheds.**

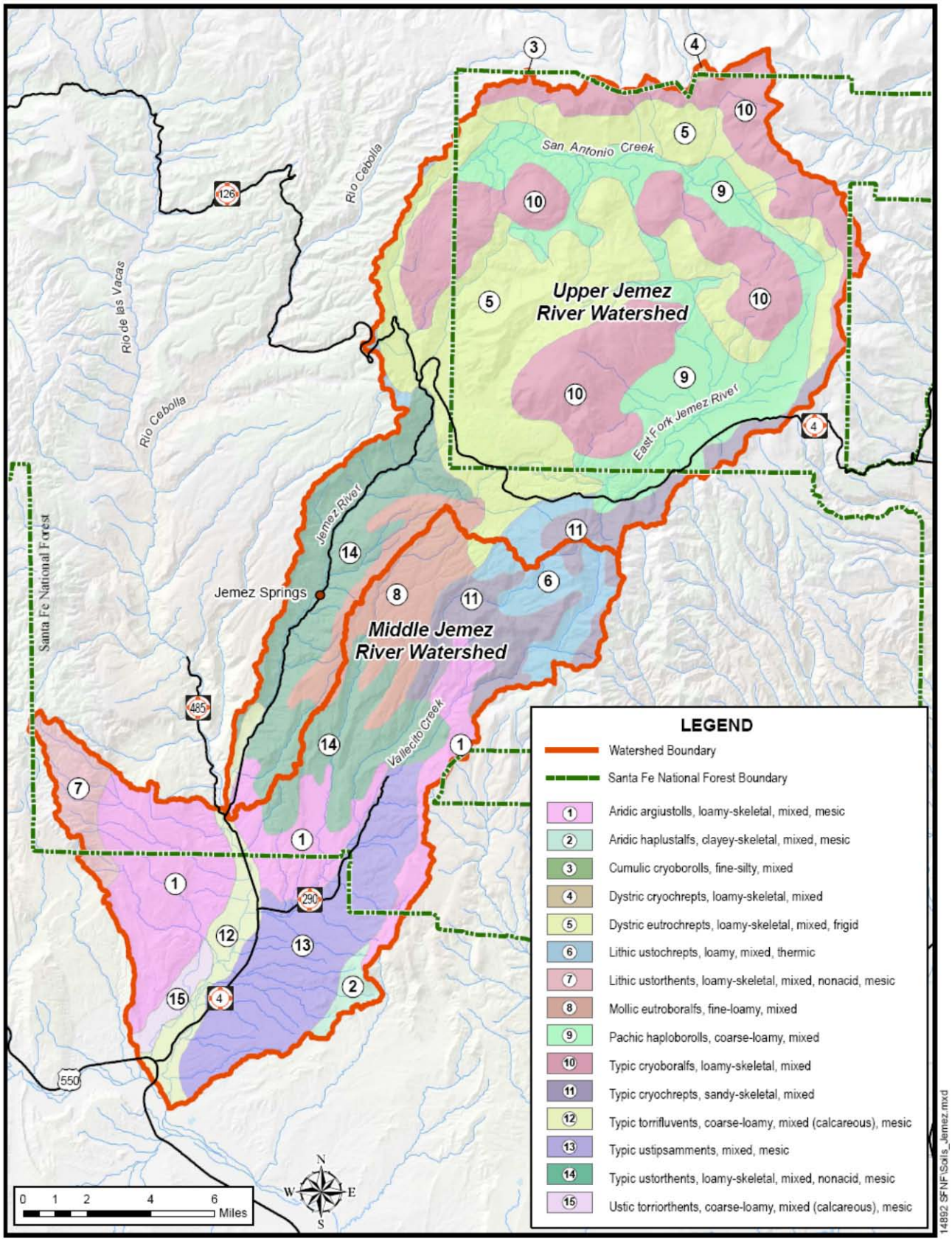

Figure 5. General Soils within the Upper and Middle Jemez watersheds.

Weather and Climate. The Upper and Middle Jemez Watersheds experience all four seasons. There is bimodal distribution of precipitation; one in the winter season between December and March when storms originating in the Pacific Ocean bringing moisture, and the other in the monsoon season between July and September when warm, moist air from the Gulf of Mexico brings late afternoon thunderstorms, in short duration and high intensity rainfall (USFS 2002c). Precipitation ranges (averages) from 16.62 inches at Seven Springs to 19.18 inches at Sulphur Springs to 25 inches at Jemez Springs. Half of the precipitation in these watersheds come during the monsoon season, the remaining half is during the winter. Snow is common from December through February. Average temperatures vary widely in the watershed, depending on elevation. Summer temperatures in the lower elevations normally range from the upper 70's to 80's. May and June represent the warm dry period in the Jemez watershed. Winter temperatures range from lows in the 20's and 30's, to highs in the 50's and 60's (USFS 2002c). High winds (10-20 mph) occur in these watersheds from March through June. Temperatures generally increase quickly in the spring months, slowly in July, and then drop very quickly during late summer. Although extremes may reach 106 degrees Fahrenheit, summer temperatures usually range between 50 and 90 degrees Fahrenheit. Winter lows can be below zero, but on sunny days many areas in the watershed will warm to about 40 degrees (USFS Region 3).

Land Ownership/Land Use. The Upper and Middle Jemez watersheds are mostly managed by the USFS (39%) and the Valles Caldera National Trust (39%). A smaller amount is tribal land (14%), private (5%), State (< 1%) and Bureau of Land Management (< 1%) (Figure 6).

The majority of these watersheds are forested (over 90%); a smaller percentage is rangeland, urbanization and agriculture. Ranching, irrigated and dry land agriculture, silviculture, recreation, mining and some urban development occur in these watersheds. One mine was developed for the extraction of copper ore, but has been abandoned. This mine (the Spanish Queen) is located between Jemez Springs, and the Pueblo of Jemez, and is not known to impact the Jemez River (NMED 2002).

Several open pit pumice mines are located in the Jemez basin; the Las Conchas Mine is closed and is in the process of remediation, and the El Cajete Mine is currently operating at the head of Mistletoe Canyon, an ephemeral tributary to the East Fork Jemez River. There are two permitted point source discharges in these watersheds. These include the Village of Jemez Springs and Jemez Valley Schools Campus (NMED 2002).

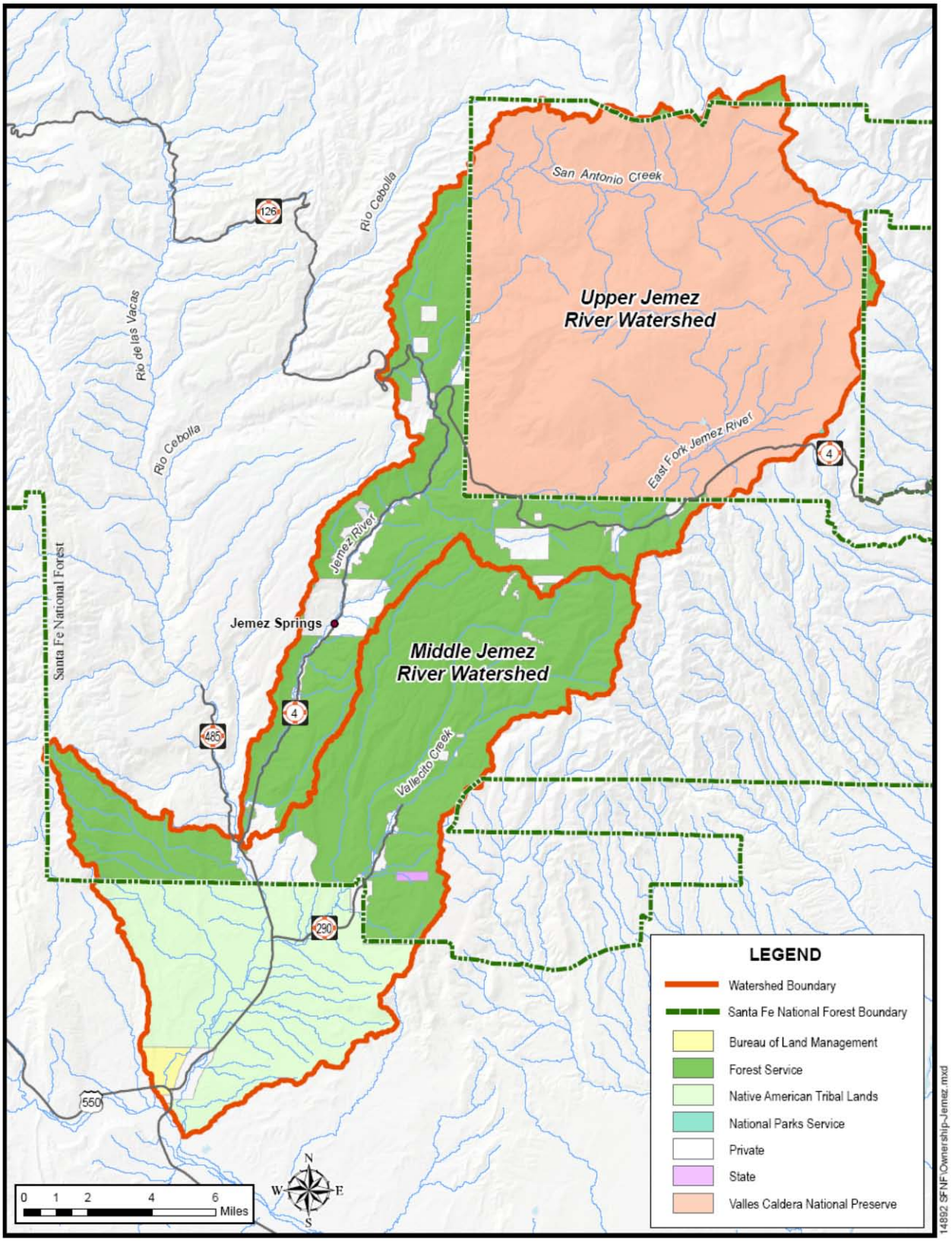

Figure 6. Land Ownership within the Upper and Middle Jemez River watersheds.

Chapter 3
WATERSHED CHARACTERIZATION

Forest Service Manual (FSM) 2500-Watershed and Air Management as amended, Chapter 2520- Watershed Protection and Management requires the Forest Service (FS) to "apply management practices that meet requirements for protecting, maintaining, restoring or improving watershed conditions" (USFS 2004). The objectives of watershed condition assessments are to evaluate the long term influence of integrated land use practices on watershed conditions, changes in watershed capability to produce resources, and to apply a scientific and consistent approach to assess, protect and restore watershed condition (FSM 2521.02 – Objectives).

This Landscape-Scale Assessment of the Upper and Middle Jemez River watersheds, located within the Santa Fe National Forest (SFNF), is organized to follow the steps provided in Part 2 of the Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis-Version 2.2 (USFS 1995). The purpose of this assessment is to describe current watershed conditions in relation to patterns in land use, identify watershed or sub-watersheds in need of treatment and recommended management changes of critical resources to protect or restore watersheds, and assist in setting priorities for ecosystem restoration. The human, aquatic, riparian and terrestrial features, conditions, processes and interactions of the watershed, including condition class, are characterized to provide FS managers with information about specific resource conditions that are not consistent with desired conditions.

This assessment characterizes in general terms the dominant physical, biological and human processes and features of the watershed that regulate ecosystem function. Existing SFNS inventory data has been compiled and synthesized to address seven core topics: Hydrology, Erosion Processes, Water Quality, Vegetation, Species and Habitats, Human Uses, and Livestock Grazing. Each resource is individually assessed in detail using the following criteria:

- **Relevant Issues and Key Issues:** identifies resource concerns and issues that are unique or relevant and discusses them in terms of major and minor issues,
- **Current Conditions:** provides more detailed analyses of current conditions identified from field trips and data collection efforts,
- **Reference Conditions:** provides historic overviews and explains how ecological conditions have changed over time as a result of human influence and natural disturbances,
- **Synthesis and Interpretation:** focuses on comparisons of existing and reference conditions of the watershed element(s), explaining significant differences, similarities or trends and their causes including references to relevant Forest Plans, laws, regulations and policies.

Chapter 4
HYDROLOGY

4.1 RELEVANT ISSUES AND KEY ISSUES

The Jemez River Watershed is a sub-basin of the Rio Grande located in the northcentral region of New Mexico. The principal drainages in the study area are the Jemez River, East Fork of the Jemez River, San Antonio Creek and Vallecito Creek (Figure 1).

Key and relevant issues considered for the hydrology assessment are presented below and discussed in detail in the following sections.

- What are the overall physical properties of the watershed?
- How have the physical properties of the watershed been impacted by anthropogenic activities?
- How do the anthropogenic activities affect the flows, stability, and morphology?
- What are the hydrologic characteristics of the unrestricted streams?
- Where are the sediment sources and most erodable soils in the watershed and how do they affect sediment in the watershed?
- How do fires, grazing, and roads affect the watershed hydrology?
- Where are the important aquatic habitats?

4.2 CURRENT CONDITIONS

The Jemez River Watershed is a relatively steep watershed and river thalweg. The Upper Watershed encompasses the Valles Caldera, a 90,000-acre bowl-shaped volcanic caldera, and the canyons of Jemez River and San Antonio Creek. The Valles Caldera is generally open and meadow-like, whereas the canyons are steep riffle-run systems. The average annual precipitation is 20 inches with over 50% from summer rains, typically monsoons. Snowfall occurs in the upper watershed from December through February. Average

temperatures in the lower watershed rarely drop below freezing during the winter and can become quite warm (90 degrees Fahrenheit) during the summer.

Overall, the riparian areas within the watershed are generally in good "functioning condition" but are also considered fragile ecosystems. Higher elevations typically have good ground cover with minimal erosion. However, lower elevation areas have more erosion and sediment deposition into streams. These ecosystems are currently being disturbed by grazing and recreational use, which in turn cause loss of ground cover, soil compaction, bank instability, and bank erosion. Recreation use within the riparian areas includes camping, hiking, and fishing. Grazing also produces similar disturbances where grazing is allowed within the riparian area.

Jemez River is classified by the State of New Mexico as a high quality coldwater fishery, which also provides irrigation sources, and watering for livestock and wildlife habitat. Today most of the riparian areas are managed in order to reduce impacts from grazing, but local impacts still exist. Riparian standards set for grazing (within the JNRA) allows for some impacts within the riparian corridor including a minimum four inch stubble height, disturbance in riparian areas set at 30% during growing season and 60% during dormant season, and a maximum 10% stream bank instability. The San Diego Range Allotment Permit Issuance EIS, currently under final review, also proposes the continuance of grazing with the addition of fenced restrictions and uplands water source development.

Outside of the riparian corridors there is a dense network of roads for OHV use, which extends through the upper reaches of the study area. Many of these roads follow drainages, and subsequently, the riparian areas contained within those drainages. This extensive network of roads has disturbed a significant portion of the watershed accelerating the naturally erosive processes in unstable, friable soils. This disturbance is contributing to increased sedimentation in waterways.

Mining activities are prohibited except where valid claims existed prior to regulations. Reclamation activities include returning lands to visual and hydrological conditions as close as possible to pre-mining conditions. In general, there is no documentation of significant mining impacts on the hydrology of the watershed.

Fires and subsequent flash flooding cause large influxes of sediment into waterways. This disrupts the cyclic sediment input to the drainage network and overwhelms the waterway with sediment deposition. This causes the waterway to move out of dynamic equilibrium. Currently, fires have not been a major issue in this study area; however, given the recent occurrences of fires in neighboring watersheds, fires in this study area are anticipated.

There are irrigation diversions off of the Jemez but most are downstream of the SFNF boundaries impacting reaches downstream of the SFNF.

Land uses are shown on Figure 7, while topography is shown on Figure 2.

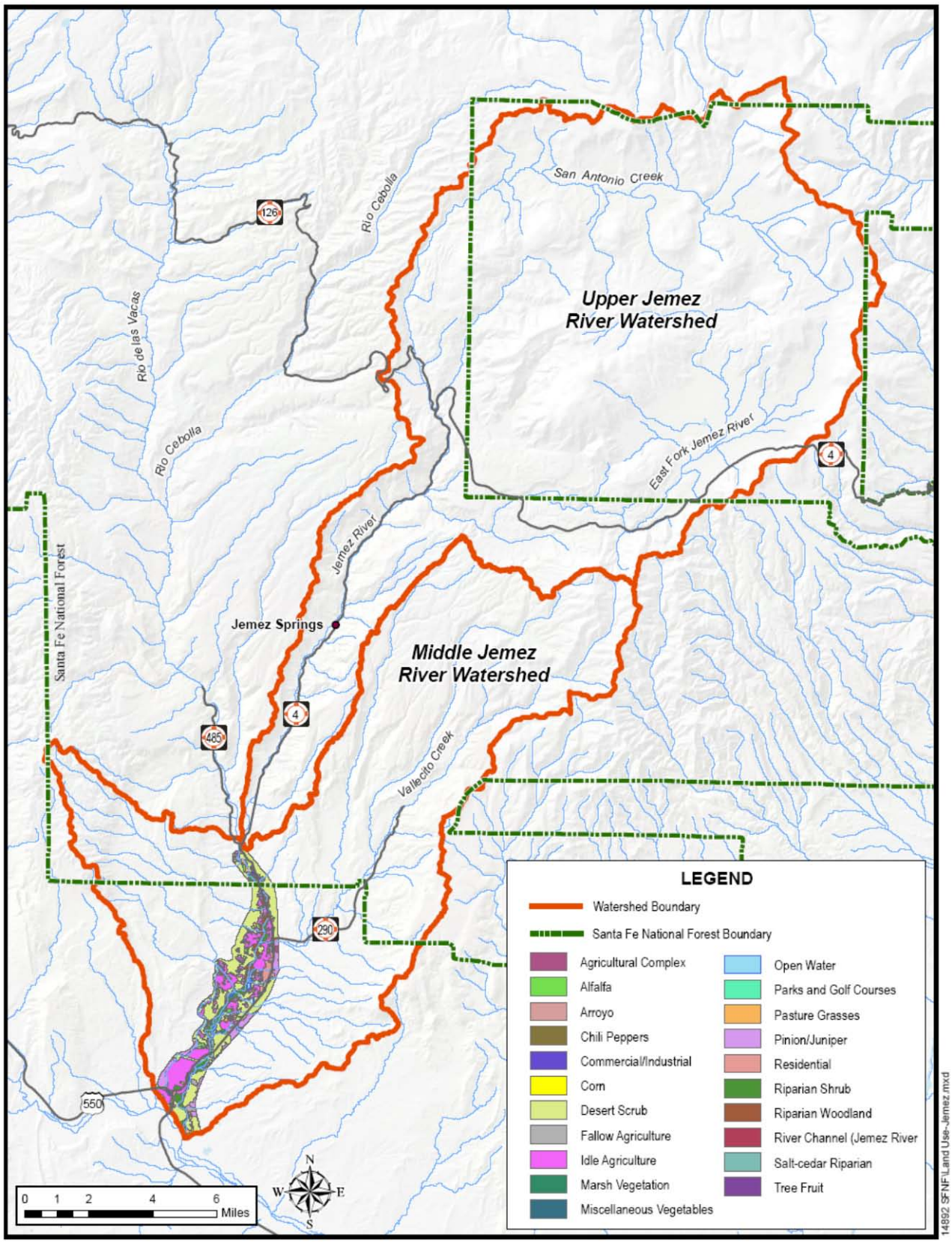

Figure 7. Land Use within the Upper and Middle Jemez River watersheds.

Reach Descriptions

Streams in the Upper Jemez River Watershed originate in volcanic rocks, primarily within the Valles Caldera. As the river segments confluence, they form the Jemez River where it flows onto the Santa Fe National Forest. Here the stream forms San Diego Canyon, a long narrow canyon, as it flows south to its confluence with Rio de las Vacas. Immediately downstream of this confluence the river exits the SFNF on to Tribal and private land. Riparian areas generally follow the stream reaches. Both are shown on Figure 8. The following is a brief description of the major reaches and/or tributaries within the study area.

Jemez River: The southern most downstream point of the Jemez River begins near the SFNF southern boundary, immediately upstream of the Jemez Pueblos and immediately downstream of the confluence with the Rio Guadalupe. From the Rio Guadalupe, the Jemez extends upstream thru San Diego Canyon to the confluence with the east Fork Jemez River at Battleship Rock. Here the river splits into two main tributaries: the East Fork of the Jemez River and the San Antonio River. This reach of Jemez is described as a riffle-pool morphology, averaging between 15 and 30 feet wide and generally 3 feet deep with some of the pools being as deep as 7 feet (Fly Fishing Connection). New Mexico Highway 4 parallels the river so access is generally easy, and as a result the river receives heavy recreational pressures, especially at all the developed recreational sites. From Battleship Rock to Jemez Springs access is limited due to private in-holds.

East Fork of the Jemez River: Originating in the southern regions of the Valles Caldera, the east Fork of the Jemez River contains some of the most dynamic views in New Mexico. Recreation opportunities along this river include fishing, dispersed camping, and hiking. In 1990 eleven miles of the East Fork of the Jemez River were designated recreational, wild, and scenic. The recreation section allows for road access and some development along the shoreline. Four miles is classified as wild because of its undeveloped shoreline, trail-only shoreline, and no highways. Five miles is scenic because of its shoreline, which remains largely undeveloped. The East Fork of the Jemez River from its confluence with San Antonio Creek to its headwaters has a 67.7 square-mile watershed. Overall, the gradient on the East Fork Jemez River is extremely variable, ranging from nearly 0% in the headwaters to over 7% in the lower reaches. The upper reaches are dominated by riffle habitat and there are more riffles than pools in the entire river. The river has only 10.7% pool habitat. There are only 9 pools in the upper 9 miles of river and 36 pools in the last 13.4 miles of stream (SFNF/JRD 2002).

San Antonio Creek: Originating in the northern and western regions of the Valles Caldera, the San Antonio confluences with the main stem of the Jemez

at Battleship Rock. The upper reaches are open meadows within the Valles Caldera. Below, as the river enters SFNF the river narrows and steepens, dropping at several feet per mile, forming waterfalls and deep plunge pools. San Antonio Creek from its confluence with the East Fork of the Jemez River to the headwaters (approximately 23.6 miles) is a 105 square-mile watershed.

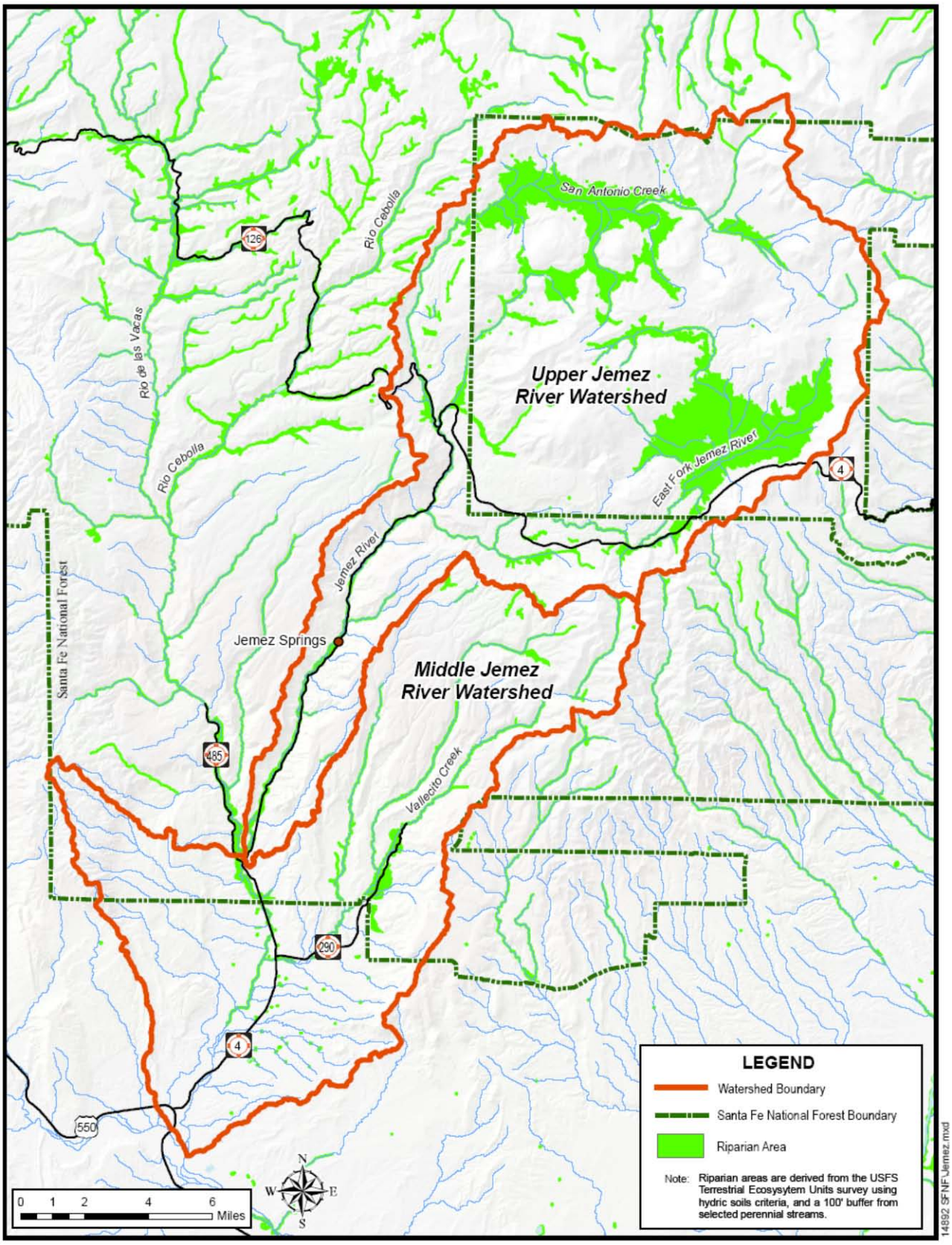

Figure 8. Riparian areas within the Upper and Middle Jemez River watersheds.

Vallecito Creek: This creek drains the Middle Jemez River watershed, joining with the Jemez River south of, and downstream of, the SFNF. Little documentation is found on this creek. No gaging information or water quality testing has been performed. Several campgrounds are located along the creek.

Channel Morphology and Characteristics

USGS gaging station no. 08324000 located near Cañon, New Mexico, has recorded information for the 470 square-mile watershed including all but 7 years since 1936. This gage includes the Rio Guadalupe watershed, as the gage is located immediately downstream of its confluence with the Jemez River. The gage sits at an elevation of 5,622 feet.

Gage records indicate a maximum recorded peak flow of 5,900 cubic feet per second (cfs) on April 21, 1958; a minimum recorded peak flow of 340 cfs on August 15, 1977; and annual mean stream flows ranging from 29.5 cfs in 1977 to 177 cfs in 1985. Typically peak flows occur in April from snowmelt, or in August from thunderstorms and the monsoon season.

The Surface Water Quality Bureau (SWQB) performed an evaluation of the stream morphology using Rosgen Classification and determined that the Jemez River is a C3 (Resources Technology, Inc., 2003). A C3 channel is characterized as a single thread channel slightly entrenched with high sinuosity, moderate to high width to depth ratio, and cobble channel material (Rosgen 1996). The target concentration of fines for a C3 is less than 20%.

A reference site was selected site on San Antonio Creek near Battleship Rock for use in analyzing stream morphology. A reference channel for sedimentation was not identified to determine natural background sediment loads. However, the SWQB concluded that there is some degree of impairment attributable to sediment. The Jemez River currently has a TMDL listing for turbidity, aluminum, and stream bottom deposits. Sedimentation and turbidity is primarily from road maintenance and runoff-flushing of arroyos after runoff events. In addition, sediment is also generated due to poor road maintenance, grazing related disturbances, recreation-compacted soils and disturbed vegetation from fishing, streambank modifications from recreation and grazing, and highly erosive soils typical in this watershed (Resources Technology, Inc. 2003).

4.3 REFERENCE CONDITIONS

The purpose of establishing reference conditions is to attempt to determine the state of the watershed area prior to any development or anthropogenic interference.

Prior to settlement, waterways would have had the ability to meander freely in the floodplain without the effects of artificial bank protection, floodplain encroachment, and channelization. Riparian corridors along the waterways (now interrupted by cattle grazing, recreational uses and motor vehicle use) would have been continuous. Continuous bands of vegetation acted as a filter for sediments washed down through the watershed basin, and provided a more extensive and robust aquatic habitat. Agricultural development, specifically grazing, tends to narrow the riparian corridor and floodplain, and disturb banks impacting downstream and adjacent properties. Thus, under reference conditions the stream systems may have exhibited slightly higher meanders and sinuosity, and fewer disturbances in the riparian corridor.

Historical accounts of the Jemez River indicate that it flooded 'erratically' causing the Santa Ana Pueblo to relocate agricultural fields away from the Jemez and closer to the Rio Grande. The Jemez River was also reportedly alkaline and, when combined with sandy soils, was considered unproductive (Scurlock 1998). Heavy sediment loading is also noted in the downstream reaches of the river, below the SFNF.

Overall the tree cover exceeds reference conditions, primarily as a result of fire management. Fires in the study area prior to settlement would have occurred more frequently and with less intensity. This would have resulted in more frequent rejuvenation of plant species including ground cover. Post-fire erosion would have been more frequent as well as sediment transport and deposition events, but would have been smaller in magnitude than under current conditions.

4.4 SYNTHESIS AND INTERPRETATION

Upland Watershed Restoration

Restore watershed functions for the purpose of improving the water quality from overland surface water runoff.

Rationale

Under current conditions, the overall tree cover is in excess of reference conditions. The predominate tree type is ponderosa pine. These trees are considered high water users and result in a loss of water to springs and creeks. The heavy tree cover also reduces ground cover including grasses and shrubs. The loss of ground cover increases soil erosion and provides poor habitat for natural wildlife as well as for grazing. Soil erosion is also exasperated by unregulated OHV, logging, and grazing. Where OHV use is allowed the road densities are quite high. Approximately 40% of the SFNF allows grazing, and is predominately in the upper, non-riparian areas of the watershed.

Recommendations

- Decrease ponderosa pines and replace with native grasses and shrubs.
- Regulate OHV use and consolidate roads
- Restore areas impacted by grazing. Locate watering sources/facilities in upland areas. Fence and restrict grazing from riparian areas.
- Areas that are notably impacted by road use, grazing, or denuded after a fire should be revegetated and include mechanical measures, to reduce erosion, such as log dams, straw bales or silt catchment fences. Contour felling may also curtail erosion.
- Improve and advance reclamation technology on mine sites to reduce and control sediment laden runoff.
- Maintain dirt roads and associated drainage facilities to minimize sediment, erosion, and associated pollutants.

East Fork of the Jemez Floodplain and Riparian Corridor Restoration

The floodplain and riparian corridor of the East Fork of the Jemez should be protected and restored for the purpose of improving aquatic habitat and stabilizing the floodplain and river overbanks.

Rationale

Current management emphasis is on visual and recreational opportunities. Along the designated Wild and Scenic River corridor five miles is considered scenic due to its undeveloped shoreline, four miles is considered wild due to its trail-only access, and the remaining 2 miles are scenic allowing for some road access and development along the shoreline. However, the entire 11 mile stretch exhibits signs of damage from unregulated dispersed camping including streambank and trail erosion, trash, trampling of vegetation, and soil compaction. There is also some evidence of salt cedar intrusion in the lower Jemez River corridor. The floodplain and riparian corridor of the East Fork of the Jemez has the potential for some of the highest quality habitat of all the areas within the watershed, supporting many of the plant and animal species found in this watershed. For this reason, this area should be considered for environmental restoration.

Recommendations

- Develop designated and regulated camping areas.
- Develop designated and regulated parking areas.
- Formalize social trails. Select primary trails to and from camping areas and regulated river access points. Close secondary trails.

- Revegetate damaged areas with native species.
- Eliminate grazing within the riparian corridor.

Jemez Floodplain and Riparian Corridor Restoration

Restore the floodplain and riparian corridor of Jemez River for the purpose of improving aquatic habitat and stabilizing the floodplain and river overbanks.

Rationale

Most of the public access on this stretch of the Jemez River is found downstream of Jemez Springs. Current management emphasis is on recreational opportunities. This entire river reach receives high traffic volumes and the result is damage from unregulated, dispersed camping and day-use including streambank and trail erosion, trash, trampling of vegetation and soil compaction. There is also evidence of non-native vegetation intrusion (see Figure 14). The floodplain and riparian corridor of the Jemez is capable of supporting many of the plant and animal species found in this watershed. For this reason, this area should be considered for environmental restoration.

Recommendations

- Develop designated and regulated camping and day-use areas.
- Develop designated and regulated parking areas.
- Formalize social trails. Select primary trails to and from camping areas and regulated river access points. Close secondary trails.
- Revegetate damaged areas with native species.
- Remove and replace salt cedar with native vegetation.
- Regulate and restrict two track roads, and OHV use.
- Regulate/minimize grazing along the riparian corridor

Jemez Watershed Tributaries

The floodplain and riparian corridor of the Jemez Watershed Tributaries including San Antonio Creek, Sulphur Creek, Redondo Creek, and Vallecito Creek should be protected for the purpose of maintaining aquatic habitat and stream bank stability.

Rationale

The riparian areas of each reach receive recreational use from camping, day use, fishing and hikers that result in stream bank and trail erosion, trash, trampling of vegetation and soil compaction. These areas should be considered for environmental restoration.

Recommendations

- Develop designated and regulated camping and day-use areas.
- Develop designated and regulated parking areas.
- Formalize social trails. Select primary trails to and from camping areas and regulated river access points. Close secondary trails.
- Revegetate damaged areas with native species.
- Regulate and restrict two track roads, and OHV use.
- Regulate/minimize grazing along the riparian corridor.

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Chapter 5
EROSION PROCESSES

5.1 RELEVANT ISSUES AND KEY ISSUES

Activities related to recreation, commodities, construction, and management can result in the destruction of vegetation within a watershed. Loss of vegetation leaves soils exposed to erosion by water and wind, increasing sediment loads, altering water chemistry, removing topsoil, and creating erosion channels. Key issues related to erosion within the Jemez Watershed identified using information in existing plans and monitoring reports, consultation with SFNF staff, and the experience of resource specialists for vegetation communities located in the watershed include: the loss of vegetation as a result of recreational and commodity based activities, changes in water quality, visual of impacts of vegetation loss.

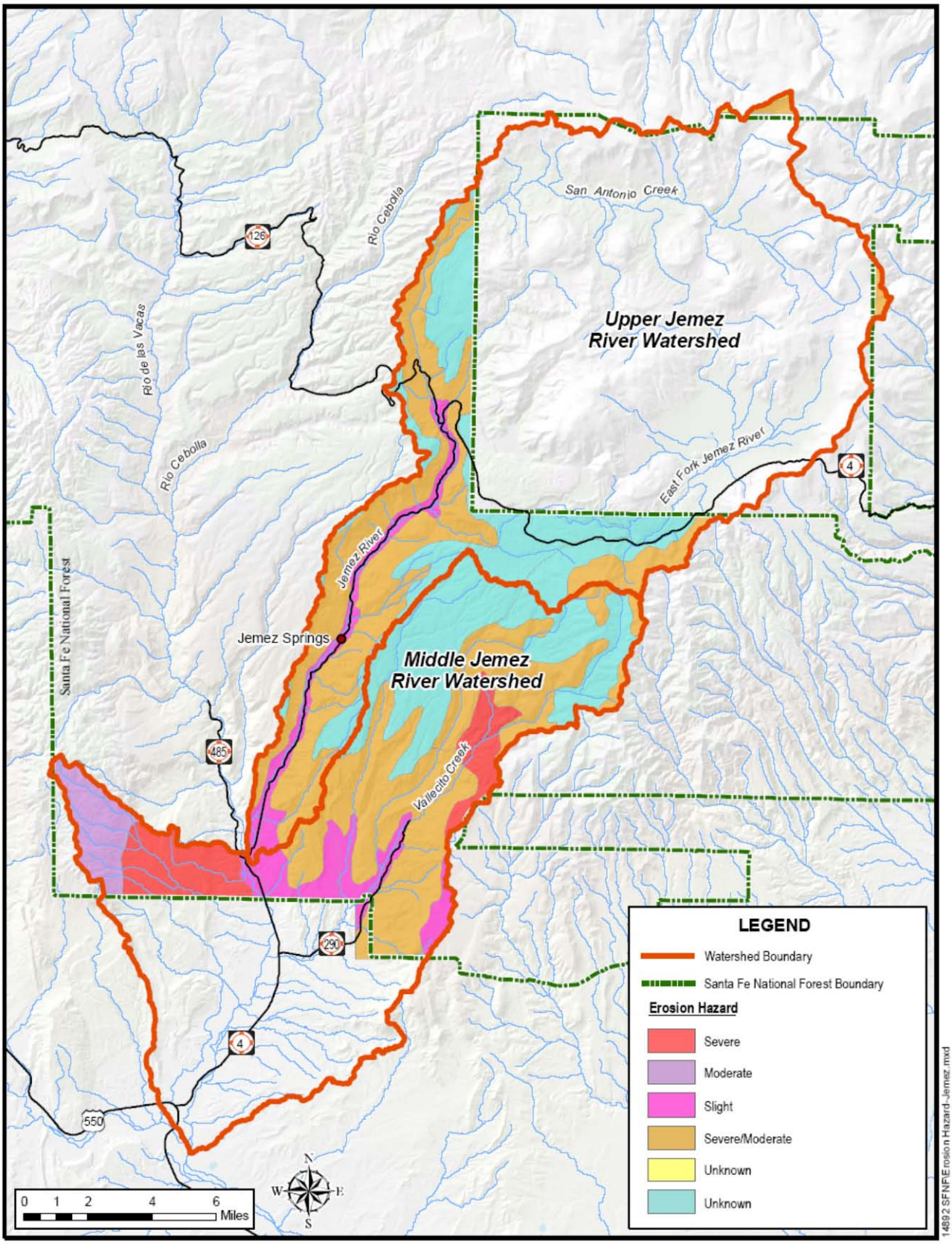
5.2 CURRENT CONDITIONS

Soils that compose the general region of northern New Mexico are primarily dark colored, fine textured silts and clays associated with cooler, moister environments. In some areas of the northern region, older soils that pre-date the last glacial episode can be found. The Jemez watershed is located within the Rocky Mountain Steppe Province of New Mexico. Soils within this region range from soils with thick, dark surface horizons high in organic matter to soils with relatively little organic matter (SFNF 2002). Generally, soils are moderately deep, to deep over shale. Slopes in the area range from 3% in the broad valleys of the Valles Caldera to over 45% in the canyons.

Erosion hazards within the watershed range from slight across the more level terrain and along the rivers to moderate and severe along the steeper declines into the rivers and stream valleys (Figure 9). Soils found in the foothills tend to be poor and shallow with limited humus additions from vegetation. Soils found at the highest elevations within the watershed are generally shallow, moderately fine textured, and contain a high percentage of coarse fragments (SFNF/BLM 2004). Rock outcrops dominate these regions. In mildly sloped areas, soils have high organic content surface-subsurface matter and are subject

to severe erosion if disturbed or abused (Scurlock 1998). Igneous rocks identified within the watershed can be segregated into Tertiary and Quaternary extrusives of the Jemez Mountains (BOR/City of Albuquerque 2002).

Figure 9. Erosion hazards within the Upper and Middle Jemez River watersheds.


Upper Jemez
River Watershed
Middle Jemez
River Watershed
San Antonio Creek
Rio Cebolla
Rio de las Vacas
Rio Cebolla
East Fork Jemez River
Jemez River
Jemez Springs
Vallecito Creek
Santa Fe National Forest
126
4
485
290
4
550
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
Erosion Hazard
Severe
Moderate
Slight
Severe/Moderate
Unknown
Unknown
0 1 2 4 6
Miles
N
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Mining within the Jemez Watershed has shifted from an emphasis on precious metals to pumice. Pumice, an important commodity in today's clothing and building industry, is an igneous rock described as lightweight and porous and has the same chemical make-up as rhyolite. Pumice mining, unlike mining for other minerals, does not require the use of on site chemicals in the extraction process. Pumice mining is a controversial issue for the local community. Concerns have been expressed about the general environmentally disruptive nature of mining including the loss of soil and vegetation. An increase in noise resulting from extraction and hauling and the loss of scenic values is considered undesirable (JNRA 1997). Visual mitigation is required in mining areas by the SFNF. One active pumice mine (El Cajete) exists in the Jemez Watershed. Currently, no permits have been given for new mining activities within the Jemez watershed.

Other recreation and commodity based activities affect vegetation communities within the Jemez Watershed and have the potential to increase erosion rates. The persistent use of creek banks and riparian areas by fisherman and cattle result in the development of trails. In the southern areas of the watershed all vehicle use is permitted (including OHVs and ATVs) and drivers keep widening user-created roads and extend them deeper into the forest. This results in increased erosion and water turbidity, and extends the effects on wildlife. Fires also impact erosion rates, and as human activity has increased in the Jemez Watershed the number of human ignited fires has also increased.

5.3 REFERENCE CONDITIONS

Activities that remove vegetation and increase erosion potentials have been occurring in the Jemez Watershed for centuries. Initially, these activities were primarily commodity based. Overgrazing, timber removal, and the mining of precious metals had detrimental impacts on vegetative communities and increased erosion potentials. In the 1970's, a subtle shift occurred from commodity-based activities to recreational activities. The advent of vehicles with the ability to travel on roads that were not maintained and the desire of users to recreate in remote locations translated into an increase in people visiting national forests, creating trails and roads, and establishing camping areas. Within the Upper and Middle Jemez River watersheds, revegetation potentials are primarily low to moderate with areas along the Jemez River corridor having a high revegetation potential (Figure 10).

Grazing and the timber industry have historic associations with the Jemez Watershed. Grazing has offered a source of food and income since the 1800's. Timber has been removed as a commodity from the Jemez since the early 1900's with extensive timber removal occuring in the 1920's, 30's, and 40's. Evidence that the area was being overgrazed became noticed during the time of

Aldo Leopold. Riparian areas were being destroyed and vegetative communities were being altered. Timber removal resulted in the construction of roads in a web of roads in the Jemez Watershed. As the detrimental impacts of these activities became more prevalent the activities were slowed.

Mining is another commodity-based activity that has historically been conducted on lands within the Jemez Watershed. Early mining focused on the removal of precious metals. Gold and silver were extracted in the Albemarle, Cochiti, and Bland area (east of the JNRA) and copper at the Spanish Queen mine (within the JNRA). These mines are no longer in operation. Federal Mining laws allow mining claim lands to be purchased outright by claim owners. Once purchased, the land becomes private property and the owners may do whatever they wish with the land. The Forest Service examined the 23 remaining minining claims in the Jemez Region and determined that only four and one-half claims are valid. The Bureau of Land Management (BLM) concurred with the Forest Service determination and on January 9, 1997, issued a complaint contesting the validity of 18.5 claims (JNRA 1997). The JNRA Act however, prohibits patenting within the Jemez Area.

When the JNRA Act was passed, the Las Conchas pumice mine (30 acres) was in its final phase of mining and a proposal had been received for the El Cajete pumice mine. The passage of the Act limited the mine operator to mining locatable (larger that 3/4 inch) pumice. The only common variety pumice removed was that which had already been contracted and paid for. The last common variety pumice was removed from the mine by December 31st of 1993. The Las Conchas mine closed in 1996. The west end of the mine was reclaimed in 1993 and is now successfully stabilized and revegetated. The remainder of the mine was reshaped and seeded in the fall of 1996 and planted with tree saplings in the spring of 1997. The 1996-1997 revegetation has been monitored annually for effectiveness.

In December 1996, the Forest Service issued a Record of Decision, which permitted mining at El Cajete (76 acres), pending the approval of a Plan of Operation. The Plan of Operation was accepted and approved by the Forest Service on November 18, 1997, and mining began in 1998. The El Cajete Mine Plan of Operation is considered significantly advanced over those used at the Las Conchas mine. Hydrological impacts were investigated by an intensive drilling program to characterize the sub-surface environment. Two monitoring wells were established and a water sampling and analysis plan was developed to meet water quality standards in cooperation with the State Environmental Department. Mining at El Cajete is expected to end in 2008. Several years of reclamation designed to restore the area to a natural appearing environment will follow the closure (EFJ/WSR EA 1993).

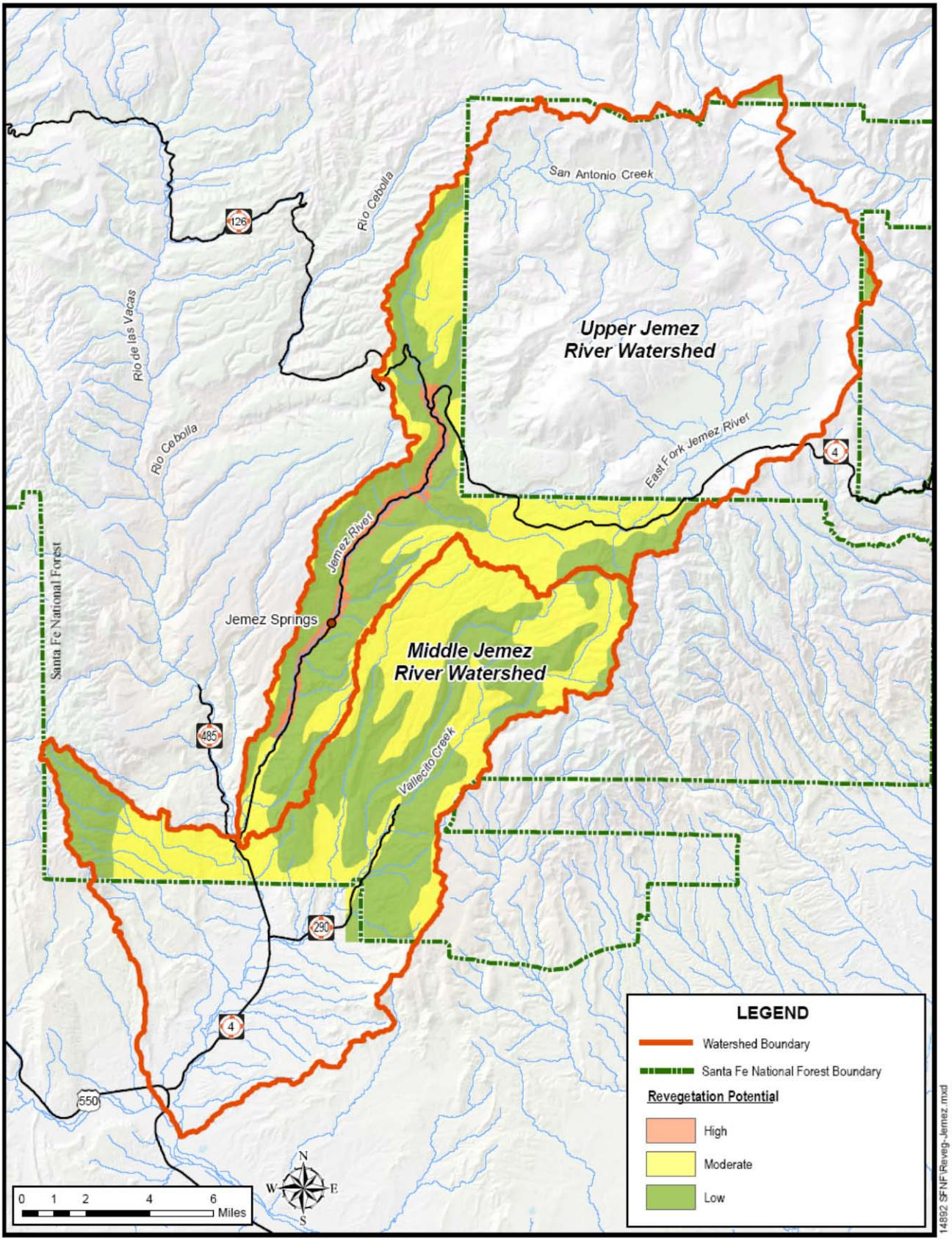
5.4 SYNTHESIS AND INTERPRETATION

The majority of the issues related to erosion are discussed in greater detail in other sections within this document.

Erosion Control

There is a need to prevent further erosion within the watershed and mitigate existing erosion problems.

Figure 10. Revegetation potential within the Upper and Middle Jemez River watersheds.


Upper Jemez
River Watershed
Middle Jemez
River Watershed
San Antonio Creek
Rio Cebolla
Rio de las Vacas
Rio Cebolla
East Fork Jemez River
Jemez River
Jemez Springs
Santa Fe National Forest
Vallecito Creek
126
485
290
4
4
550
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
Revegetation Potential
High
Moderate
Low
0 1 2 4 6
Miles
N
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Rationale

Extensive erosion within a watershed will have detrimental impacts on water quality, wildlife populations, and human activities. Intensified erosion occurs in areas where vegetative stabilization has been impacted or removed by livestock, construction, rock fall, recreation activities, or climatic conditions.

Recommendations

- Incorporate best management practices (BMPs) when considering future construction activities
- Ensure that future construction occurs in areas with low erosion potential and high revegetation potential
- Maintain and manage the health of natural vegetative communities
- Prevent illegal OHV use
- Prevent overgrazing
- Allow heavily impacted areas time to recover
- Minimize activity during times of environmental stress (i.e. drought)
- Develop a road system that is comprised of a main access network with several extensions to key areas
- Education and partnering with local environmental groups to aid with public awareness
- Continue to prohibit new mining claims
- Establish and maintain fences to prevent public abuse and unauthorized livestock use in defined areas (i.e. riparian areas)
- Define areas accessible for recreational fisherman and minimize impacts to riparian with defined trails to fishing areas
- Decrease potential for catastrophic fires
- Identify steep slopes, riparian, and other sensitive areas where OHVs should be limited or prohibited
- Control and minimize the presence of non-native species in riparian areas.
- Restore damaged riparian areas
- Reduce impacts of cattle on riparian areas by providing additional upland water sources.
- Clearly designate where people can recreate and park.
- Invite interested public to participate with the Forest Service in mine planning efforts or in monitoring compliance under approved operating plans

- Enforce stipulations for revegetation and recontouring in mining Plan of Operations

Chapter 6
WATER QUALITY

6.1 RELEVANT ISSUES AND KEY ISSUES

When considering the overall water quality health of a watershed, it is important to first look at the relevant water quality standards applied to the waterbodies. Water quality standards for all assessment units in the Jemez River watershed are set forth in sections 20.6.4.8, 20.6.4.12, 20.6.4.107, 20.6.4.108, 20.6.4.900 of the 2002 New Mexico Standards for Interstate and Intrastate Surface Waters (20.6.4 NMAC). These standards are the most recent version. The specific water quality standards are outlined for the watersheds below.

20.6.4.8 NMAC reads as follows:

Antidegradation Policy and Implementation Plan:

A. Antidegradation Policy: This antidegradation policy applies to all surface waters of the state.

(1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state.

(2) Where the quality of a surface water of the state exceeds levels necessary to support the propagation of fish, shellfish, and wildlife, and recreation in and on the water, that quality shall be maintained and protected unless the commission finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic and social development in the area in which the water is located. In allowing such degradation or lower water quality, the state shall assure water quality adequate to protect existing uses fully. Further, the state shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable BMPs for nonpoint source control. Additionally, the state shall encourage the use of

watershed planning as a further means to protect surface waters of the state.

(3) No degradation shall be allowed in high quality waters designated by the commission as outstanding national resource waters (ONRWs). ONRWs may include, but are not limited to, surface waters of the state within national and state monuments, parks, wildlife refuges, waters of exceptional recreational or ecological significance, and waters identified under the Wild and Scenic Rivers Act.

(4) In those cases where potential water quality impairment associated with a thermal discharge is involved, this antidegradation policy and implementing method shall be consistent with Section 316 of the federal Clean Water Act.

(5) In implementing this section, the commission through the appropriate regional offices of the United States environmental protection agency will keep the administrator advised and provided with such information concerning the surface waters of the state as he or she will need to discharge his or her responsibilities under the federal Clean Water Act.

20.6.4.107 NMAC reads as follows:

RIO GRANDE BASIN - the Jemez River from its confluence with the Rio Guadalupe upstream to State Highway 4 near the town of Jemez Springs and perennial reaches of Vallecito Creek.

A. Designated Uses: coldwater fishery, primary contact, irrigation, livestock watering and wildlife habitat.

B. Standards:

(1) In any single sample: temperature shall not exceed 25°C (77°F), pH shall be within the range of 6.6 to 8.8, and turbidity shall not exceed 25 NTU. The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed 200/100 mL; no single sample shall exceed 400/100 mL (see Subsection B of 20.6.4.13 NMAC).

20.6.4.108 NMAC reads as follows:

RIO GRANDE BASIN - the Jemez River and all its tributaries above State Highway 4 near the town of Jemez Springs and the Guadalupe River and all its tributaries.

A. Designated Uses: domestic water supply, fish culture, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat, and secondary contact.

B. Standards:

(1) In any single sample: conductivity shall not exceed 400 μmhos, pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20°C (68°F), and turbidity shall not exceed 25 NTU. The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed 100/100 mL; no single sample shall exceed 200/100 mL (see Section B of 20.6.4.13 NMAC).

As well, general standards (20.6.4.12. A-L NMAC) are applicable to the above waterbodies. General standards are established to sustain and protect existing or attainable uses of surface waters of the State. These general standards apply to all surface waters of the state at all times, unless a specified standard is provided elsewhere.

In addition, according to New Mexico water quality standards (20.6.4.900.M NMAC), the dissolved aluminum chronic criterion is 87 μg/L, and the dissolved aluminum acute criterion is 750 μg/L for aquatic life uses.

Total Maximum Daily Loads

Total maximum daily loads (TMDLs) can be best described as watershed or basin-wide budgets for pollutant influx to a watercourse. This process necessarily involves State and Federal agencies, local water users and other concerned citizens as well as the public at-large. In reality, a TMDL is a planning document. The New Mexico Environment Department, Surface Water Quality Bureau (SWQB), Monitoring and Assessment Section (MAS) determines the adequacy and significance of water quality and other supporting data. The MAS reviews the effectiveness of existing water quality protection and pollution control measures, evaluates existing management strategies and develops potential new water quality management implementation strategies. The MAS Section interactively uses the full resources of the SWQB to develop and coordinate materials that support the current Clean Water Act (CWA) §§ 303(d) 305(b) Integrated List for the State of New Mexico (From New Mexico Environment Department (NMED) website http://www.nmenv.state.nm.us/swqb/ projects/index.htm).

Identified water quality issues include impaired water quality and potential sources identified for TMDLs on Forest Service (FS) managed lands and

potential impacts on forest health and management. Several TMDL documents and delisting actions have been developed by the SWQB of the New Mexico Environment Department (SWQB/NMED), and approved by the US EPA for waterbodies within the Jemez River watershed (Figure 11).

These TMDLs can be found on the SWQB/NMED website at http://www.nmenv.state.nm.us/swqb/Projects/TMDL/index.html. These documents have identified several Forest Service managed lands as potential contributors of nonpoint source pollutants leading to the impairment of several waterbodies. These TMDLs within the Jemez River watershed were adopted by the NM Water Quality Control Commission and approved by EPA Region 6 in 2003 and 2004.

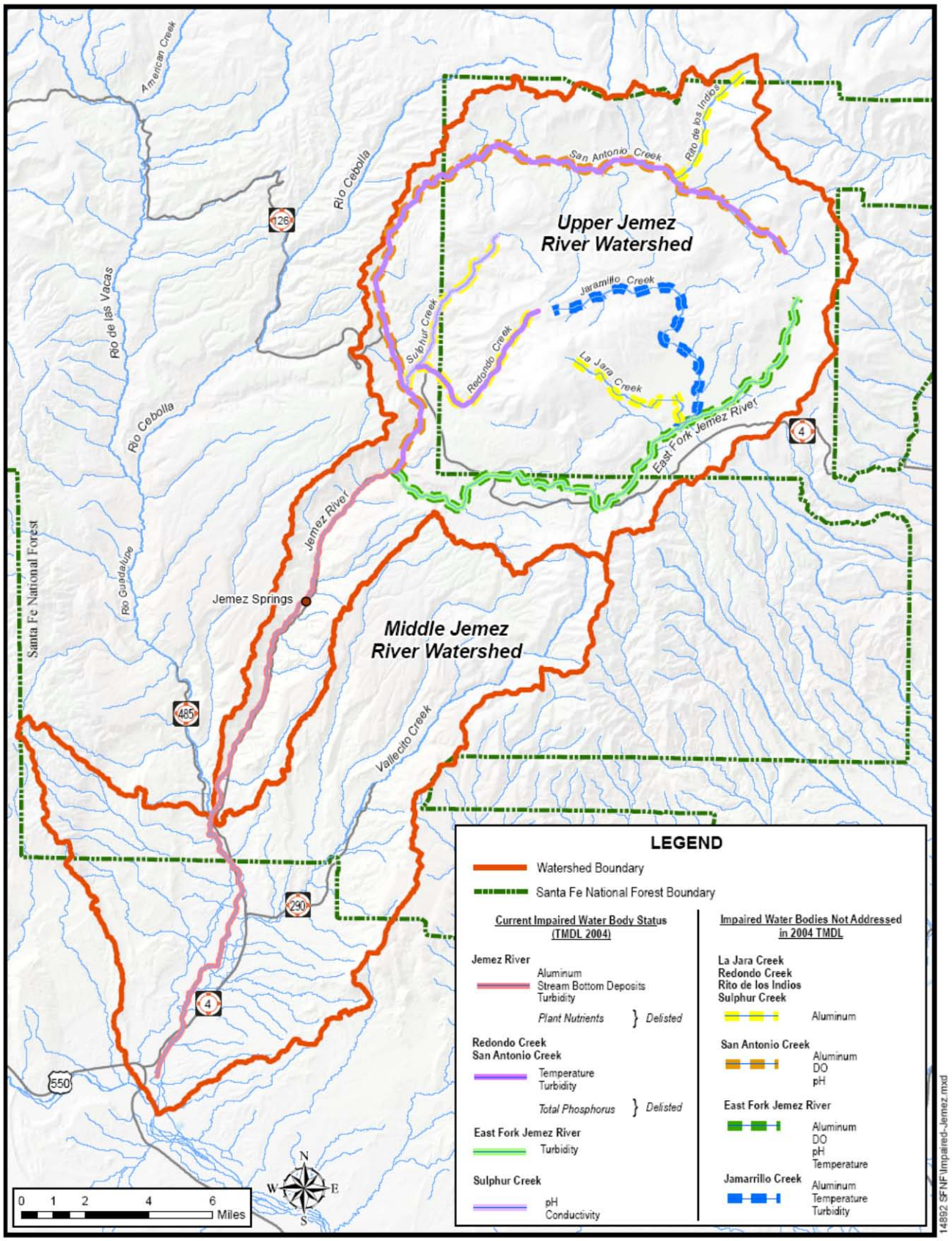


Figure 11. Current impaired waterbody status, Upper and Middle Jemez River

watersheds.

6.2 CURRENT CONDITIONS

Jemez River Watershed TMDL Study

During the period from April 20, 1998, to March 25, 1999, staff of the Surface Water Quality Bureau (SWQB) of the New Mexico Environment Department (NMED) conducted an intensive water quality survey of the Jemez River and its tributaries from the Jemez Pueblo to the headwaters. Sampled tributary streams included the East Fork of the Jemez River, San Antonio Creek, the Rio de las Vacas, the Rito Peñas Negras, the Rio Cebolla, Calaveras Creek, Clear Creek, the Rio Guadalupe, Sulphur Creek, Redondo Creek and Vallecito Creek. This survey was conducted in cooperation with the Pueblo of Jemez and the USGS.

The SWQB will be conducting an intensive water quality survey of the Jemez River and its tributaries in 2005. The study will be comprised of approximately 25 stations in the Jemez watershed, plus visits to 4 hot springs, and a few seasonal stations. Nutrients, ions, total (mercury & selenium), metals, and dissolved metals will be sampled. The survey will cover the entire Jemez watershed and major tributaries from the Jemez Pueblo boundary northward, and will cover high elevation sites if possible.

Surface water quality monitoring stations were established by NMED throughout the basin and were used to characterize the water quality of the stream reaches (Table 4).

Table 4. SWQB/NMED 1998-1999 Jemez River Watershed Sampling Stations.

SWQB Station	STORET Reference	Station Location
1	MRG105.006050	Jemez River downstream from the confluence with Vallecito Creek. Located on Jemez Pueblo Tribal Lands.
2	MRG105.006505	Vallecito Creek upstream from State Highway 4. Located on Jemez Pueblo Tribal Lands.
3	MRG105.009001	Jemez River upstream from confluence with Rio Guadalupe.
4	MRG105.009035	Jemez River downstream from Jemez Springs WWTP effluent discharge.
5	NM0028011	Jemez Springs WWTP effluent discharge.
6	MRG105.009037	Jemez River upstream from Jemez Springs WWTP effluent discharge.
7	URG105.009040	Jemez River downstream from Battleship Rock.
8	MRG106.011001	East Fork of the Jemez River at Battleship Rock.
9	MRG106.010001	San Antonio Creek at Battleship Rock.
10	MRG106.010010	San Antonio Creek upstream from San Antonio Campground at State Highway 4.
11	MRG160.010015	Redondo Creek upstream from confluence with Sulphur Creek at State Highway 4.
12	MRG106.010020	Sulphur Creek upstream from confluence with Redondo Creek at State Highway 4.
13	MRG106.007501	Rio Guadalupe upstream from confluence with Jemez River.
14	MRG106.007502	Rio Guadalupe at Box Canyon.
15	MRG106.008005	Rio Cebolla upstream from confluence with Rio de las Vacas.
16	MRG106.008040	Rio Cebolla downstream from Seven Springs Fish Hatchery.
17	MRG106.008030	Calaveras Creek at Calaveras Campground.
18	MRG106.008505	Rio de las Vacas upstream from confluence with Rio Cebolla.
19	MRG106.008515	Rio de las Vacas upstream from Rancho de Chaparral Girl Scout Camp.

SWQB Station	STORET Reference	Station Location
20	MRG106.008520	Rito Peñas Negras at State Highway 126.
21	MRG106.008521	Rito Peñas Negras at Pipeline Road.
22	MRG106.008525	Clear Creek at State Highway 126.
23	MRG106.008535	Rio de las Vacas at State Highway 126.

In addition, there are stations along various stream reaches that contain historic water quality data. This information is located in the US EPA STORET database. USFS benthic, fisheries and USGS gaging stations as well as the locations with STORET information are shown on Figure 12.

All temperature, chemical/physical, and stream bottom deposits sampling and assessment techniques are detailed in the NMED/SWQB Quality Assurance Project Plan (SWQB/NMED 2004). As a result of this monitoring effort, exceedances of New Mexico water quality standards for several streams were documented. Several TMDL documents were developed in 1999 and 2004 to address each stream or stream reach according to constituent (or pollutant) whose standard(s) has been exceeded (Table 5 and Figure 11). These TMDLs are found on NMED/SWQB website at the following web address at: http://www.nmenv.state.nm.us/swqb/Projects/TMDL/index.html. The SWQB obtained approval for the final draft TMDLs at Water Quality Control Commission meetings. The US EPA approval letters for these TMDLs is dated June 03, 2003 and August 6, 2004. Additional impairments and delistings that were not addressed by the TMDL document are found in Table 6 and Figure 11.

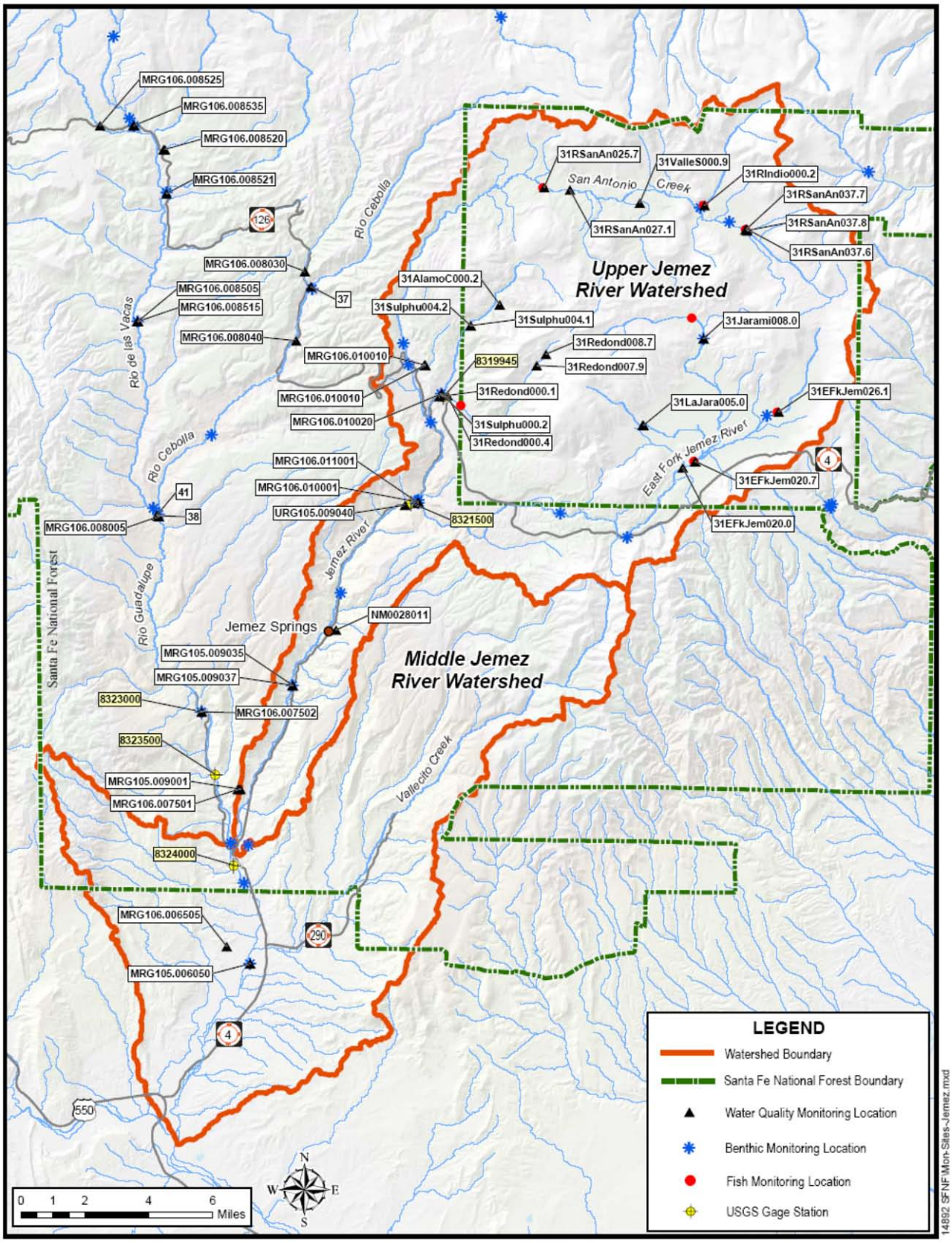
Table 5. Summary of Jemez River Watershed Impairments Addressed in the Total Maximum Daily Load (TMDL) Documents.
(Italicized waterbodies are within the Forest Service designated Jemez River watershed)

Waterbody	Impairments	Delistings Completed*
Clear Creek	Turbidity Total organic carbon	
Jemez River	*Aluminum* *Stream bottom deposits* *Turbidity*	*Plant nutrients*
Redondo Creek	*Temperature* *Turbidity*	*Total phosphorus*
Rio Guadalupe	Chronic aluminum Stream bottom deposits Turbidity	Total phosphorus
San Antonio Creek	*Temperature* *Turbidity*	
Upper Rio Cebolla	Stream bottom deposits Temperature	
East Fork of the Jemez River	*Turbidity*	
Lower Rio Cebolla	Stream bottom deposits	
Rio de las Vacas	Temperature	

	Total organic carbon	
Rito Penas Negras	Stream bottom deposits Temperature Total organic carbon	
Sulphur Creek	*pH* *Conductivity*	

*** The delisting letters are in the SWQB Administrative file, available upon request.**

Figure 12 Monitoring sites, water quality, fish, benthic, Upper and Middle Jemez River watersheds.


MRG106.008525
MRG106.008535
MRG106.008520
MRG106.008521
126
MRG106.008030
MRG106.008505
MRG106.008515
37
MRG106.008040
Rio Cebolla
Rio de las Vacas
Rio Cebolla
41
38
MRG106.008005
Santa Fe National Forest
Rio Guadalupe
31RSanAn025.7
31ValleS000.9
31RIndio000.2
San Antonio Creek
31RSanAn037.7
31RSanAn037.8
31RSanAn037.6
31RSanAn027.1
Upper Jemez River Watershed
31AlamoC000.2
31Sulphu004.2
31Sulphu004.1
31Jarami008.0
31Redond008.7
31Redond007.9
8319945
MRG106.010010
MRG106.010010
31Redond000.1
MRG106.010020
31Sulphu000.2
31Redond000.4
31LaJara005.0
31EFkJem026.1
East Fork Jemez River
4
31EFkJem020.7
31EFkJem020.0
MRG106.011001
MRG106.010001
URG105.009040
8321500
Jemez River
NM0028011
Jemez Springs
MRG105.009035
MRG105.009037
8323000
MRG106.007502
Middle Jemez River Watershed
8323500
MRG105.009001
MRG106.007501
Vallecito Creek
8324000
MRG106.006505
290
MRG105.006050
4
550
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
Water Quality Monitoring Location
Benthic Monitoring Location
Fish Monitoring Location
USGS Gage Station
0 1 2 4 6
Miles
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14892 SFNF\Mon-Sites-Jemez.mxd

Table 6. Summary of Jemez River Watershed Impairments Not Addressed in the Total Maximum Daily Load (TMDL) Document.
(Italicized waterbodies are within the Forest Service designated Jemez River watershed)

Waterbody	Impairments	Delistings Completed
American Creek		Stream bottom deposits Temperature Turbidity
East Fork of the Jemez River	*Aluminum, DO, pH, temperature*	
Jaramillo Creek	*Aluminum, temperature, turbidity*	
La Jara Creek	*Aluminum*	
Rito de los Indios	*Aluminum*	
San Antonio Creek	*Aluminum, DO, pH*	
Sulphur Creek	*Aluminum*	
Redondo Creek	*Aluminum*	

Table 6 shows several reaches within the Jemez watershed that have been identified on the current 2004-2006 CWA §§ 303(d)305(b) Integrated List for the State of New Mexico as having aluminum levels that may naturally exceed chronic water quality standards.

A previous intensive water quality survey of the Jemez River watershed was conducted in 1987 by the SWQB. This report can be found by contacting the SWQB.

United States Geological Survey Water Quality Data

Within the Jemez River Basin, there are six United States Geological Survey (USGS) gaging stations, of which only two are still active. A summary of these stations is listed below in Table 7.

Table 7. United States Geological Survey (USGS) Gage Stations in the Jemez River Watershed.

USGS Gaging Station #	USGS Gage Station Location	From (yyyy-mm-dd)	To (yyyy-mm-dd)
08319945	Redondo Creek near Jemez Springs, NM	1981-11-10	1985-09-30
08321500	Jemez River below East Fork near Jemez Springs, NM	1951-05-14	1990-12-31
08323000	Rio Guadalupe* at Box Canyon near Jemez, NM	1951-05-15	1996-09-30
08323500	Rio Guadalupe* near Jemez Springs, NM	1950-09-30	1950-09-30
08324000	Jemez River near Jemez, NM	1936-10-01	1999-09-30
08329000	Jemez River below Jemez Canyon Dam, NM	1936-04-01	1999-09-30

*** Not within the designated Forest Service Jemez watershed, but it is a major tributary to the Jemez River**

The three USGS gaging stations along the Jemez River have decades of water quality data but are no longer active. These data were for various parameters, such as temperature, suspended sediment, discharge, conductance, total sediment, etc. The data are available on the USGS website (www.nwis.waterdata.usgs.gov). Since the water quality data from these USGS monitoring sites are somewhat historic, they may not provide useful information about the current condition of the waterbody or watershed. The data may be useful for reviewing past conditions or possibly provide information on best management practice effectiveness.

US Forest Service Information

There are two main drainages that drain the southside Jemez Mountains including the Rio Guadalupe and the Jemez River. In cooperation with managers of the Valles Caldera National Preserve and the NM State Game and Fish Department, the USFS is working towards improving fish habitat conditions to meet the designated uses of the river as a high quality coldwater fishery for the East Fork Jemez River (USFS 2002a). The USFS may consider the opportunity for returning the East Fork to a native fishery, including Rio Grande Cutthroat Trout, Rio Grande Chub, Rio Grande Sucker, Longnose Dace, and Fathead Minnow. Monitoring stations will be established in the Valles Caldera National Preserve and in the East Fork Jemez Wild and Scenic River areas to establish baseline conditions and monitor these sites every 3-5 years (USFS 2002b).

According to the Forest Plan Monitoring and Evaluation Report, Santa Fe National Forest, fiscal year 2003, several water quality activities were undertaken both forestwide and in specific resource areas (USFS 2003). Proper functioning condition (PFC) surveys have been done throughout the Santa Fe National Forest. Several water quality and benthic monitoring stations are located within the Jemez River watershed. There appear to be a few US Forest Service fish monitoring stations located within and around the Valles Caldera National Preserve. See Figure 12 for specific monitoring station locations.

6.3 REFERENCE CONDITIONS

The 1998-1999 water quality monitoring completed by the SWQB did not include reference sites, or attempt to establish a reference condition for the Jemez River watershed. Additional studies may provide some reference condition information for the Jemez River watershed. From June 2004 to October 2004, EPA's Wadeable Streams Assessment (WSA) Project studied the ecological condition of small streams throughout the US, including one stream within the Jemez River watershed. The randomly selected sites included two locations on San Antonio Creek (35.958652 latitude/-106.487 longitude and 35.971034 latitude/-106.60439 longitude) located on the Valles Caldera National

Preserve. The EPA will make results from this study available in 2005. More information can be obtained by visiting EPA's website at http://www.epa.gov/owow/monitoring/wsa/index.html

The WSA project was designed like an opinion poll: that is, 500 sites in the US were selected at random to represent the condition of all streams in regions that share similar ecological characteristics. This work is being conducted by State water quality agencies with support from the U.S. EPA using the same types of methods at all sites, to ensure results that can be compared across the country. In addition to providing information on the condition and health of small streams, this project provides funding and expertise that will enhance each State's ability to monitor and assess the quality of its waters in the future. Even if no sites were located on streams within the Jemez River watershed, sites in the same ecoregion may be representative of conditions, or be potential reference reaches for Jemez River waterbodies.

At each WSA sampling site, a small crew of scientists examined biological, chemical, and physical conditions. To check the biological health of the site, the sampling crew collected macroinvertebrates for identification and analysis in a lab. Water samples were taken from the stream and were analyzed in the lab for a set of basic characteristics. The crew also visually assessed the physical condition of the streambed, streambanks, and vegetation surrounding the stream.

The final EPA WSA report to be made available in 2005 will be used to draw regional and national conclusions about the health of small, wadeable streams, and will help water quality agencies understand stream conditions over time.

6.4 SYNTHESES AND INTERPRETATION

TMDL Implications

There is a need to address current and potential nonpoint sources of pollution in and near impaired waterbodies.

Rationale

Several TMDL documents have been developed by the SWQB/NMED and approved by the US EPA for waterbodies within the Jemez River watershed. The Jemez River watershed TMDL documents from 1999 and updated in 2004, identified landowners in the watershed, including the USFS, as potential contributors of nonpoint source pollutants leading to the impairment of these waterbodies.

As an example, the TMDL developed for turbidity in the Jemez River watershed set milestones that will be used to determine whether control actions

are being implemented and state standards ultimately attained. Milestones for turbidity in the Jemez River watershed TMDL include:

- Increases in stabilized streambanks and established riparian vegetation
- Decreases in total organic carbon measurements
- Increases in the miles of properly maintained roads

Recommendations

The TMDLs provide an opportunity to focus resources toward improving water quality on USFS managed lands. These include:

- Focus existing resources on impaired waterbodies
- Partner with other watershed stakeholders for additional resources and on the ground activities that will improve water quality
- Target implementation of best management practices (BMPs)
- Continue and target monitoring efforts where appropriate

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Chapter 7
VEGETATION

7.1 RELEVANT ISSUES AND KEY ISSUES

The Jemez watershed contains a variety of elevations and ecotones, and, as a result, vegetative communities. Flat-topped mesas, lush canyon bottoms, the wide expanse of the Valle Grande, and the domed peak of Redondo (11,254 ft) are all contained within the boundaries of the watershed. Vegetation communities identified within the Jemez watershed include high elevation sub-alpine forests, stands of mixed conifer and aspen, open foothill pine woodlands, high montane grasslands, as well as wetlands and riparian areas (Figure 13). Upwards of 100 plant associations may be found within the Jemez Watershed (veg survey and EA). Plant species common to the watershed include gamble oak (Quercus gambelii), aspen (Populus tremuloides), Rocky Mountain maple (Acer glabrum), cottonwood (Populus angustifolia), willow (Salix spp.), and alder (Alnus spp.). The Jemez Watershed also contains some unique plant species (i.e. giant helleborine [Epipactis gigantean] and bunchberry dogwood [Cornus Canadensis]). These unique species are in danger of being trampled by cattle or recreational users.

Management practices are designed to balance a healthy environment, with the historic cultural use of a region, recreation, and economics. The past 100 years have included management practices that stressed fire suppression, timber harvesting, grazing allowances, as well as hiking and camping. All of these activities can impact the density and composition of vegetation. Information in existing plans and monitoring reports, consultation with SFNF staff, and the experience of resource specialists have been combined to identify issues that have the potential to threaten the health of vegetative communities within the Jemez Watershed. These issues, if not addressed, could result in physical impacts to vegetation, environmental settings, and ecosystem health. Key issues identified for vegetation communities located in the watershed include: an overabundance of trees; detrimental impacts of overgrazing, extensive recreation, and commodity based activities (i.e. timber harvesting); the removal of sensitive plants and plant communities; pest and parasite infestations.

Management practices of the past 100 years included fire suppression. Without natural fire, many stands have become overly dense thickets of very small or pole-sized trees. These dense stands limit the natural growth of understory plants, suppress the growth and development of old large trees, increase the potential for insect and disease infestation, and inhibit the movement of large animals through the forest. These "unhealthy" stands are at risk of catastrophic fire, the effects of which are detrimental to natural resources.

Grazing and recreation activities within the Jemez Watershed can impact vegetation communities in several ways. Plant species composition and densities may change and/or vegetation may be lost as a result of grazing and the creation of trails and roads associated with grazing and recreation. In the course of nearly continuous grazing during the past 100 plus years, native grass species have been slowly replaced by exotic Kentucky bluegrass (Poa pratensis L.) along with several exotic and weedy forbs (veg survey and EA). Road and trail construction can result in erosion and increased sedimentation of water resources, particularly when it occurs within riparian areas (Figure 8). Logging activities, even if restricted to historic logging roads, can result in the fragmentation of vegetation cover.

The Jemez Watershed contains several unique species including giant helleborine and bunchberry dogwood. Sapello Canyon larkspur (Delphinium sapellonis) is the only sensitive plant species recorded within the Jemez Watershed. This is a New Mexico endemic found only at high elevations in the Jemez, Sangre de Cristo, and Sandia Mountains, and is listed by the state of New Mexico as a "Species of Concern." Bog birch (Betula glandulosa), although a somewhat common species at higher latitudes of the U.S. and Canada, is restricted in New Mexico to the Alamo Canyon wetland complex on the west side of the Valles Caldera Natural Preserve. Sensitive species and the habitats that they require need to be protected from the impacts of recreation and commodity related endeavors (i.e. timber and grazing) that occur within the Jemez Watershed.

Poor stand health, brought on by long-term suppression of fire that has allowed stands to increase in density and has promulgated the presence of diseases, parasites, and non-native species within the Jemez Watershed (Figure 14). Western spruce budworm (Choristoneura occidentalis), dwarf mistletoe (Arceuthobium spp.) and possible fir broom rusts (Melampsorella caryophyllacearum) have been documented within the conifer stands found within the watershed. Salt cedar (Tamarix ramosissima), Siberian Elm (Ulmus pumila), Russian olive (Elaeangnus angustifolia L.), bull thistle (Cirsium vulgare), and musk thistle (Carduus nutans) have been documented in riparian areas along the Jemez River (Figure 14). Mortality resulting from these infestations appears to be low at this time. If the infestations persist they have

the potential to substantially increase fuel loads and increase the potential for catastrophic fires.

7.2 CURRENT CONDITIONS

Vegetation within the Jemez Watershed is diverse, offering a multitude of vegetative communities and upwards of 100 plant associations (Muldavin and Tonne 2003). The topographic relief presents a variety of microclimates and creates the potential for numerous ecotones. The watershed contains flat-topped mesas, lush canyon bottoms, the wide expanse of the Valle Grande, and the domed peak of Redondo (11,254 ft). This variation translates into vegetative communities that range from high elevation sub-alpine forests, stands of mixed conifer and aspen, open foothill pine woodlands, high montane grasslands, as well as wetlands and riparian areas (Figure 13).

According to the most recent analysis of vegetation (JNRA 1997), forested regions compose the majority of the vegetation within the Jemez Watershed (greater than 90%). The forested areas can be subdivided according to species. Approximately 51% consists of ponderosa pine (Pinus ponderosa) and dry mixed conifer tree types, 26% consists of woodland tree types (piñon pine [Pinus edululis], one-seed juniper [Juniperus monosperma], Rocky Mountain juniper [Juniperus scopulorum], and Gambel oak), 22% is comprised of wet mixed conifer trees (white fir [Abies concolor], blue spruce [Picea punguns], and limber pine [Pinus flexilis]), 1% consists of aspen, and less than 1% consists of spruce-fir. Aspen and Rocky Mountain maple are generally found in the wetter areas of the mixed conifer forest along with the Douglas fir (Pseudotsuga menziesii), white fir, and spruce. Current stands within the Jemez are very dense (~1,200 trees/acre) as a result of past management strategies.

The understory and meadow areas of the Jemez watershed are composed of grasses, forbs, and shrubs. Species of grass commonly found within the Jemez Mountains include mountain brome (Bromus carinatus), mountain muhly (Muhlenbergia Montana), Arizona fescue (Festuca arizonica), June grass (Koeleria macrantha), blue grama (Bouteloua gracilis), wolf-tail (Lycurus phleoides), pine drop-seed (Blepharoneuron tricholepis), Indian rice grass (Stipa hymenoides), bottle-brush squirrel-tail (Elymus elymoides), orchard grass (Dactylis glomerata), little blue-stem (Schizachyrium scoparium), three awn (Aristada purpurea), Kentucky blue grass, and Nebraska sedge (Carex nebrascensis). Several species of forbe are often found within the watershed: yarrow (Achillea millefolium), sagewort (Artemisia ludoviciana), fleabane (Erigeron Spp.), wild strawberry (Fragaria ovalis), and vetch (Vicia spp.). Shrubs common to the Jemez area include Kinnikinnick (Arctostaphylus uva-ursi), deerbrush (Ceanothus fendleri), mountain mahogany (Cercocarpus montanus), buckwheat (Erigonium umbellatum), Gambel oak, and New Mexico locust (Robinia neomexicana).

Along the Jemez River, and within the wet meadows located within its watershed, riparian vegetation is generally in a healthy condition. This vegetative community composes less than 5% of the vegetation within the watershed. Vegetation within riparian areas is composed of alder, willow, cottonwood, cattail (Typha spp.) and a variety of sedges, reeds, juncus (Juncus spp.) and grasses. The introduction of non-native species in riparian areas has become a concern especially along the Lower Jemez River. Salt cedar, Siberian Elm, Russian olive, bull thistle, and musk thistle have been documented in riparian areas along the Jemez River. Invasive species are not believed to be present in any of the other major canyons in the watershed. Once non-native species are introduced, they tend to out compete native plants and quickly take over an area. Loss of native vegetation can have devastating effects on wildlife species dependent upon specific plants. The non-native species also alter the effects of fire on riparian areas, as they tend to burn at higher intensities. (JNRA 1997).

The presence of pests and parasites expands the issues of forest health within the Jemez Watershed. Western spruce budworm (Choristoneura occidentalis), dwarf mistletoe (Arceuthobium spp.), and possibly fir broom rusts (Melampsorella caryophyllacearum) have been identified within the watershed. There is an ongoing outbreak of spruce budworm that is most prevalent in the mixed conifer zone, but occasionally infestations are recorded within spruce-fir stands. Tree mortality from budworm appears limited at this time. The infestation of dwarf mistletoe and broom rusts is most prevalent in old growth white fir and Douglas-fir forest. The infestations of these species appear to be positively correlated with stand density. Pest and parasite infestations can be indicators of poor stand health; the result of long-term suppression of fire that has allowed stands to increase in density. Currently, the presence of pest and parasite species within the Jemez Watershed is not being addressed.

The Jemez Watershed contains several unique species including giant helleborine and bunchberry dogwood. Sapello Canyon larkspur is the only sensitive plant species recorded within the Jemez Watershed. This is a New Mexico endemic found only at high elevations in the Jemez, Sangre de Cristo, and Sandia Mountains, and is listed by the state of New Mexico as a "Species of Concern." Bog birch, although a somewhat common species at higher latitudes of the U.S. and Canada, is restricted in New Mexico to the Alamo Canyon wetland complex on the west side of the Valles Caldera Natural Preserve.

Sensitive species and the habitats that they require need to be protected from the impacts of recreation and commodity related endeavors (i.e. timber and grazing) that occur within the Jemez Watershed. In order to address some trampling issues the SFNF eliminated grazing in canyon areas and wild and scenic river areas (WSR has a few exceptions). The result is that approximately 60% of the watershed is not grazed. Grazing occurs primarily in upland areas

of the Jemez Watershed. Illegal ATV use and camping continue to have detrimental impacts on riparian areas and sensitive plant species.

The variety in elevation, vegetative communities, and microhabitats found within the Jemez Watershed results in the establishment of several fire regimes. The impact of fire suppression has apparently been minimal in some spruce-fir communities located at high elevations (Bogan et al. 1998; Sherriff et al. 2001), or the fire regime in these areas is just beginning to extend beyond the historical range of variability after 100 years of suppression (Abolt 1997; Kipfmueller and Baker 2000). The long return intervals between fires are primarily a function of increased moisture at high elevations that naturally suppresses fire (Muldavin and Tonne 2003). The accumulation of fuel loads tends to be slow and fuel that tend to be irregular, with large amounts of needle litter accumulating under the narrow crowned trees, in these particular stands. This combination of long-term fuel accumulation and heterogeneous fuel patterns tends to promote highly destructive stand-destroying fires. Once a fire has been started, concentrated, slow-burning fuels usually produce flames high enough to reach the low-growing, lichen-draped branches and start crown fires. High mortality rates can result from either whole-tree crown fires or surface fires because they burn slowly through the fine fuels that collect at the base of mature trees and girdle their thin-barked boles (Bradley et al. 1992).

The potential for highly destructive, catastrophic forest fires has been propagated in drier, low elevation forests by past management practices as well. The past 100 years have included management practices that stressed fire suppression, timber harvesting, grazing allowances, as well as hiking and camping. All of these activities can impact the density and composition of vegetation. An analysis of the age structure stands within the Jemez Watershed indicate that many of the ponderosas were established during the early part of the twentieth century following the last spreading surface fire in 1892. The high degree of recruitment that followed this fire has led to the documented high densities of ponderosa pine, well beyond what would be expected if there had at least been some reoccurring fire in the stand during the last 100 years.

The lack of natural forest fires has also changed the vegetation patterns in the Jemez. Shade created by the thick canopies of fir and spruce has removed aspen from areas where it once existed as a patchwork of small stands over the landscape. In places, there is a lack of snags and large down logs for wildlife habitat. Grassy meadows are being lost to tree invasion. Oak brush and ponderosa pine components are being reduced as spruce and fir species encroach into tree stands. The understory plants are also suffering due to closed canopies. The loss of understory plant cover influences wildlife species and may contribute to changing hydrologic patterns within the watershed. (JNRA 1997) It has been demonstrated that reducing densities from 400 to 1,000 trees per acre to approximately 100 trees per acre has the potential to

dramatically increase grass and forb production. Hence, there is a need for restoration to lower densities to reduce fire hazard, improve stand vigor, and enrich overall biodiversity (Allen et al. 2002). Carefully conducted mechanical thinning or prescribed burns, done in such a way that it does not accelerate erosion, are regularly utilized tools that have the ability to establish a multiple-aged stand structure over time.

Fires within the watershed have the potential to be severe as a result of both the fuel loading and the alignment of the canyons in which they burn. The canyons in the Jemez are aligned so that the predominant winds blow through them, causing flare-ups and potentially increasing the rate at which they are spread. The SFNF has implemented mechanical thinning methods to start thinning trees within the Jemez Watershed. One 7,000-acre area has had two prescribed burns in recent history. These burns have been successful in removing underbrush and saplings, but have not been effective at removing poles or larger saw timber. It takes 5 to 7 prescribed burns for thinning to be effective.

The existence of private in-holdings within the Jemez compounds the problem by increasing use of the forest and the probability of fires. They also increase sensitive areas of wildland-urban interface. There are 11 communities in or adjoining the district, and 6 are at high risk for fire burn over. A fire wise program was established in order to work with communities to use mechanical fuel reduction in areas around communities. Areas within the wildland-urban interface are currently treated by the FS to protect communities, though it is costly to conduct thinnings. Thinning 1,000 to 1,500 acres per year can cost $500K to $1M.

Figure 13. Vegetation within the Upper and Middle Jemez River watersheds.

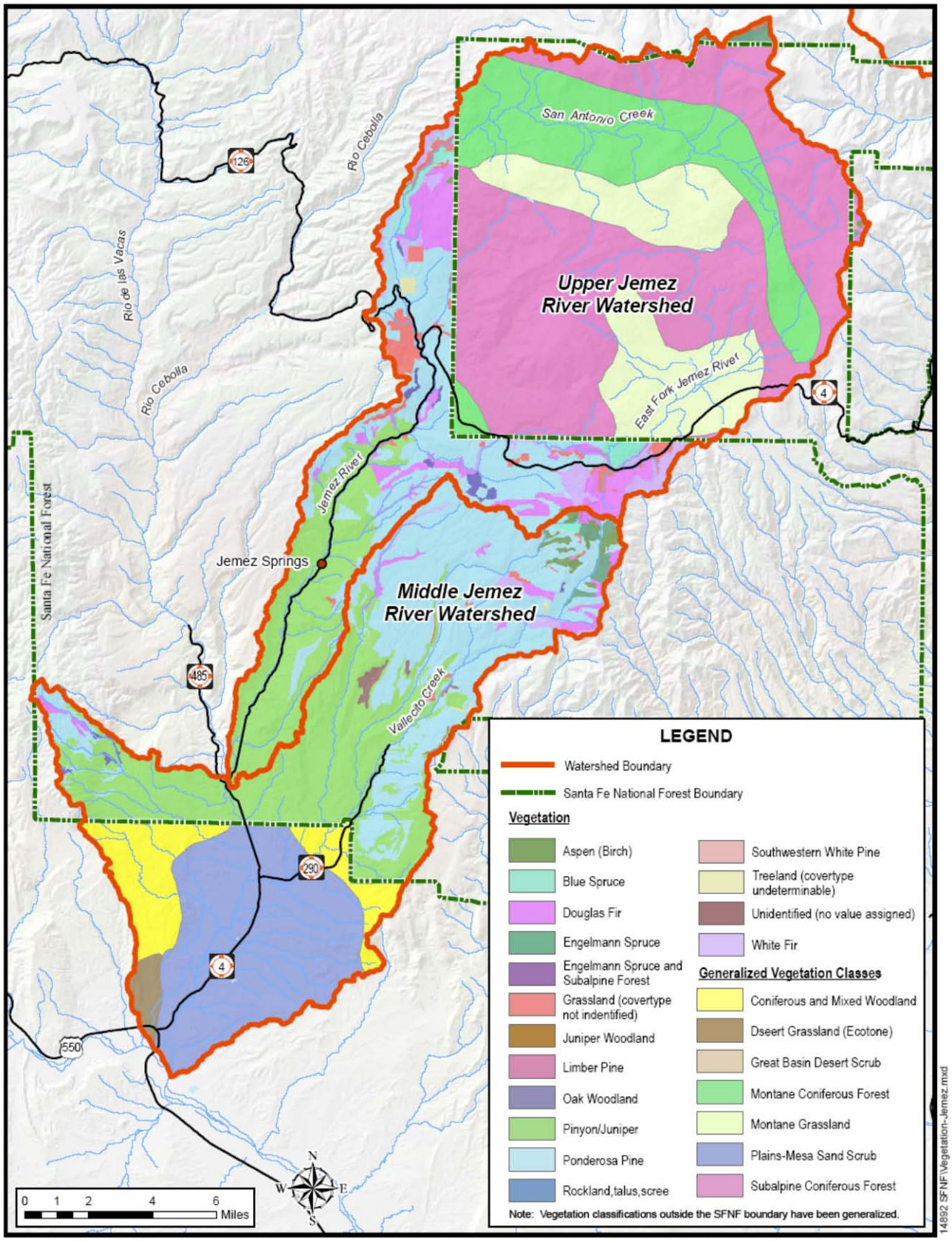
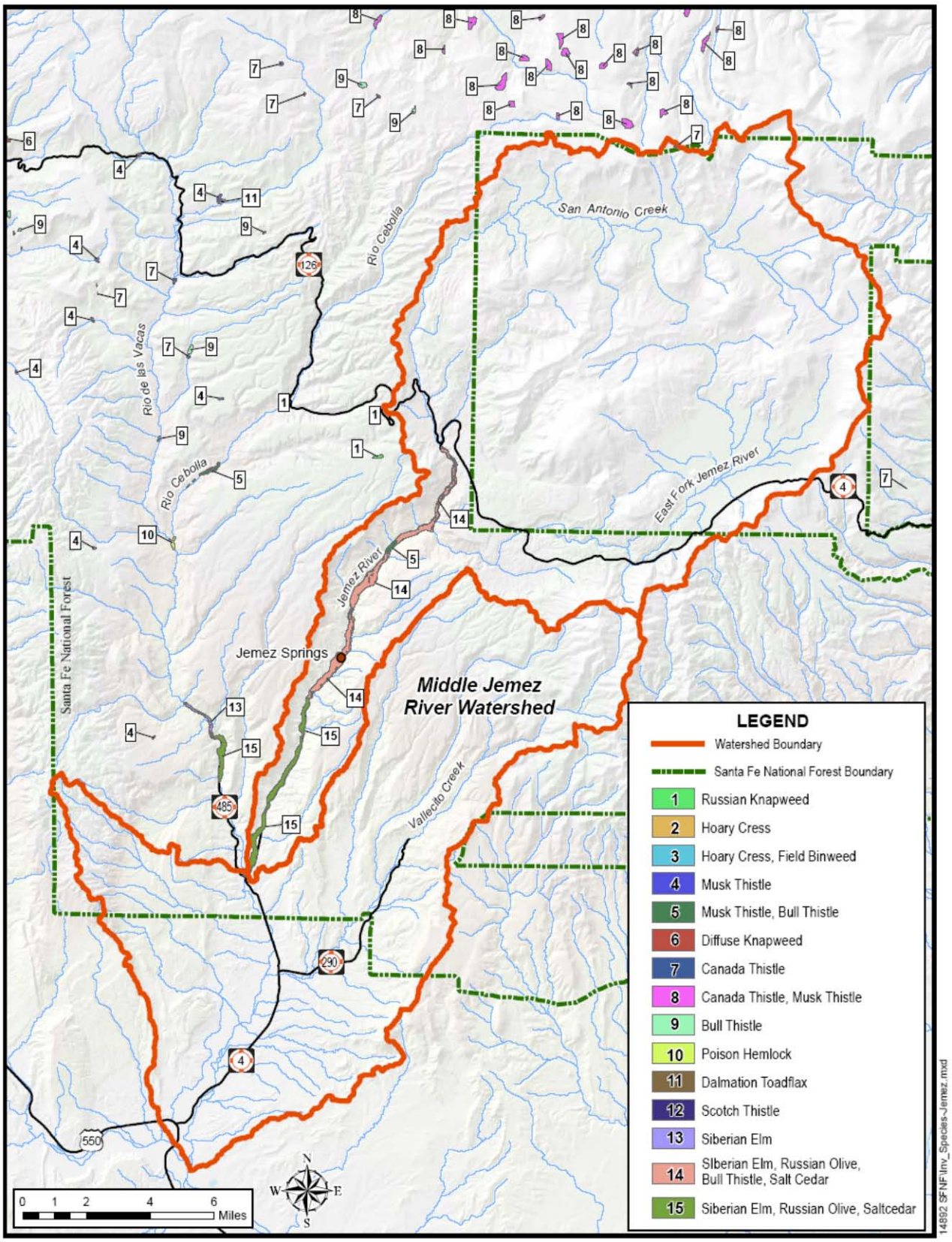

San Antonio Creek
Rio Cebolla
Rio de las Vacas
Rio Cebolla
Upper Jemez River Watershed
East Fork Jemez River
Jemez River
Santa Fe National Forest
Jemez Springs
Middle Jemez River Watershed
Valle cito Creek
126
4
485
290
4
550
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
Vegetation
Aspen (Birch)
Blue Spruce
Douglas Fir
Engelmann Spruce
Engelmann Spruce and Subalpine Forest
Grassland (covertype not indentified)
Juniper Woodland
Limber Pine
Oak Woodland
Pinyon/Juniper
Ponderosa Pine
Rockland,talus,scree
Southwestern White Pine
Treeland (covertype undeterminable)
Unidentified (no value assigned)
White Fir
Generalized Vegetation Classes
Coniferous and Mixed Woodland
Dseert Grassland (Ecotone)
Great Basin Desert Scrub
Montane Coniferous Forest
Montane Grassland
Plains-Mesa Sand Scrub
Subalpine Coniferous Forest
Note: Vegetation classifications outside the SFNF boundary have been generalized.
0 1 2 4 6
Miles
N
W
E
S
14892 SFNF\Vegetation-Jemez.mxd

Figure 14. Weeds & invasive species within the Upper and Middle Jemez River watersheds.


Middle Jemez River Watershed
Jemez Springs
Rio Cebolla
San Antonio Creek
Rio de las Vacas
East Fork Jemez River
Jemez River
Vallecito Creek
Santa Fe National Forest
126
485
290
550
0 1 2 4 6 Miles
N
S
E
W
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
1 Russian Knapweed
2 Hoary Cress
3 Hoary Cress, Field Binweed
4 Musk Thistle
5 Musk Thistle, Bull Thistle
6 Diffuse Knapweed
7 Canada Thistle
8 Canada Thistle, Musk Thistle
9 Bull Thistle
10 Poison Hemlock
11 Dalmation Toadflax
12 Scotch Thistle
13 Siberian Elm
14 SIberian Elm, Russian Olive, Bull Thistle, Salt Cedar
15 Siberian Elm, Russian Olive, Saltcedar
14892 SFNF Inv_Species-Jemez.mxd

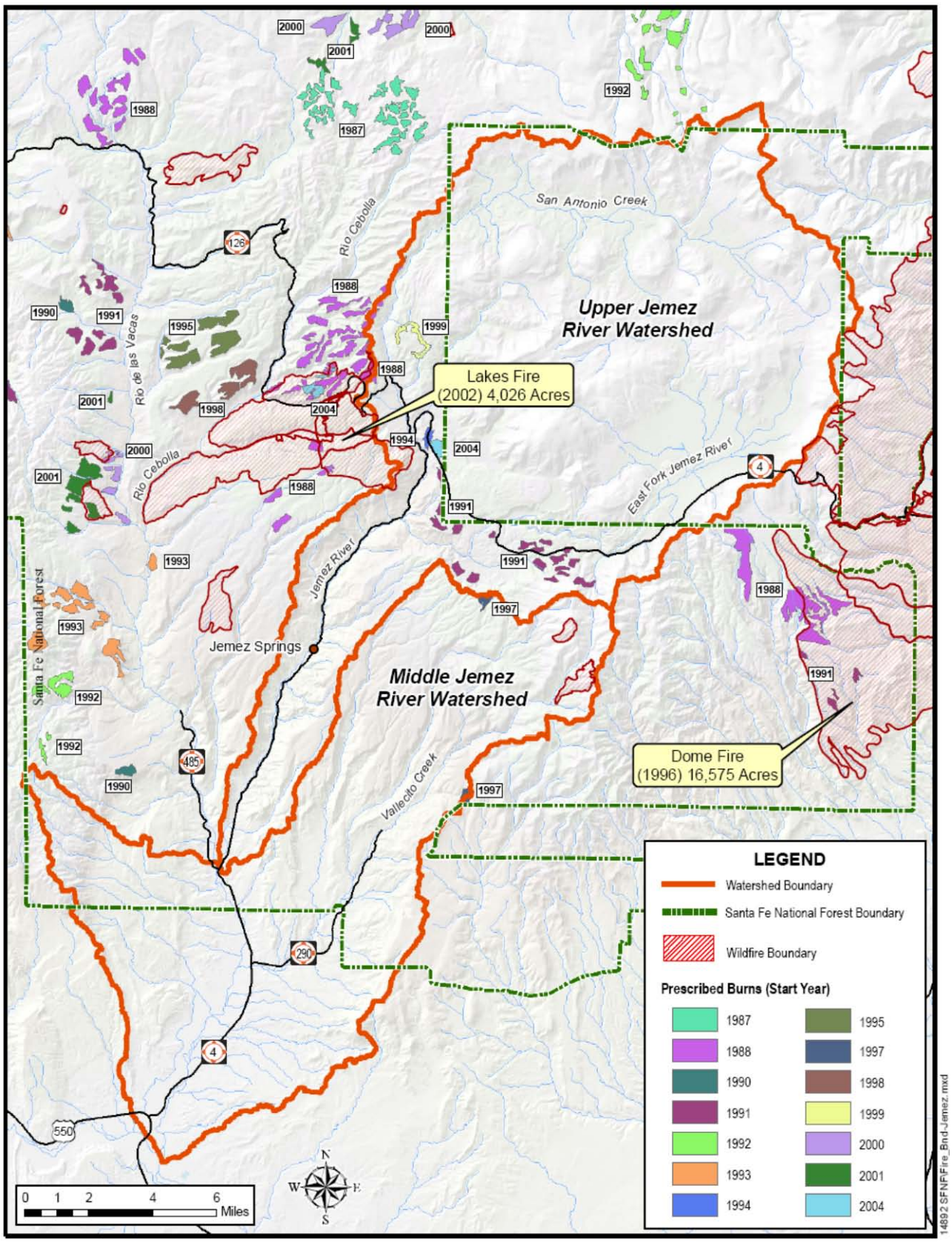


Figure 15. Wild and prescribed fire boundaries within the watershed.

7.3 REFERENCE CONDITIONS

The United States Forest Service acquired a large San Diego land grant area in the mid-60s. On October 12, 1993, the Jemez National Recreation Area (JNRA) was established by the United States Congress to conserve, protect, and restore the recreational, ecological, cultural, religious, and wildlife resource values of the Jemez Mountains (Public Law 103-104). The USFS (1993), in its report on the potential government purchase of the Baca, provided a broad overview of the natural resources as well as the history and the economics of the site. Based on forest inventories from the early 1980's, they estimated that of the 94,812 acres then in the Baca, approximately 25% or 24,000 acres (9,700 ha) were in grassland, 70% or 65,000 acres were in forest (ponderosa pine at 7,700 acres (7,150 ha); spruce-fir at 12,100 acres (4,900 ha); and mixed conifer at 35,700 acres (14,500 ha). Only 1% of the landscape was in aspen. The remaining 5% was ascribed to rock outcrop, rubble fields and scrub. They estimated that nearly 60% of the forestlands had been logged.

By the turn of the century, aggressive fire suppression was a common management policy and suppression practices became more effective as access to forests and fire fighting technology improved. Fire scar studies show that in the late 1800's there was a sharp decline in the frequency and number of fires throughout the southwest. This decline has been attributed to the reduction in the amount of fuel (grasses and ground cover) available to carry fire. This reduction was likely due in part to livestock grazing and the clearing of land for homes and communities (JNRA 1997). As a result, in less than a century, fire was virtually excluded from southwestern ecosystems.

Trees were harvested from almost all suitable areas in the JNRA at least once in the past, with a heavy harvesting period occurring during the 1930s, 40s, and 50s. In 1969, the East Fork Timber Sale covered a majority of the forested acreage in the Jemez River Corridor (EFJ/WSR EA 1993). Between 1991 and 1993, the Banco and Bonito Timber Sales occurred just outside the WSR. The Banco project harvested trees from two units directly on or adjacent to the northwest boundary, and the Bonito project harvested trees from four units on or adjacent to the southern boundary. The treatments involved removing the largest of the overstory trees, leaving the understory trees to grow and re-fill the site. Clear-cutting was not common. The majority of the harvests were partial cuts. An analysis of the age structure of stands within the Jemez Watershed indicates that the young ponderosas that were not harvested became established during the early part of the twentieth century, following the last spreading surface fire in 1892. The high degree of recruitment following clear cutting and fire, and the management policy of fire suppression have led to high tree densities, well beyond what would be expected if there had at least been some reoccurring fire in the stand during the last 100 years. The lack of fire

appears to be responsible for expansion of ponderosa pine into grasslands as well (Allen 1989). The effects of fire suppression are compounded by other management practices. Mast, et al. (1997) found that moderate cattle grazing, combined with fire exclusion, has favored interior ponderosa pine seedling establishment on ponderosa pine/grassland ecotonal communities of the Colorado Front Range. Before fire exclusion, frequent fire likely excluded the majority of ponderosa pine seedlings at the ecotonal boundary (Allen 1989). Within the Jemez Mountains, trees at the back of stands against the hills can be 200 years or older while those at the front may be less than 50 years.

Prior to settlement, the fire regime was likely a mixture of small patch crown fires along with surface fires that were started locally by lightning or that may have swept up from the ponderosa pine belt (Touchan et al. 1996). This led to a heterogeneous forest patch mosaic mediated by differences in local moisture and fuel conditions found in a complex mountain landscape. With fire suppression, forest stands have become more homogenous as they mature and structural differences within stands have been reduced. This increases the potential for large crown fires as fuels build up, which in turn brings further uniformity to the forest in an ever-increasing cycle of departure from normal and a movement away from the small patch mosaic. But unlike ponderosa pine forests, understory densities of reproducing conifers are lower and less of a concern with respect to fuel hazard. However, densities in Douglas fir and white fir stands are probably still higher today than they would be without suppression.

Over the years, the policy of fire suppression has led to the accumulation of heavy ground cover, downed logs, and dense forest conditions in the Jemez Watershed. The changes in forest conditions have resulted in a high fire hazard and have led to the increased number of crown fires in ponderosa (Bogan et al. 1998). As a result, the potential for catastrophic wildfires is present and threatens the ecological resources and recreation area values. There is an especially high risk of crown fires where the dense forest vegetation creates a "ladder" from the forest floor to the tree canopy. Depending on how close the tree crowns are, crown fires can move through the tree canopies and burn vast acreages in a matter of hours. Large crown fires bring further uniformity to the forest in a cycle of departure from normal small patch mosaics. In addition, oak and shrub lands along the southern end of the Jemez River have high fuel hazards and are capable of supporting a fast moving brush fire.

Approximately 70 to 80 fires have occurred within the Jemez Region (an average of three per year), 40% of the total fires recorded within the SFNF. In the Jemez Mountains, several fires have occurred over the past 20 years, including the Cerro Grande (2000), Dome (1996), La Mesa (1977), Porter (1976), and Cebollita (1971). The majority of these wildfires burned outside of

the Jemez Watershed Boundary (Figure 15). In 1994 a wildfire crossed the boundary to burn a small portion within the western boundary of the watershed. Two other small wildfires occurred within the northeastern corner of the Middle Jemez Watershed. Small, patchy prescribed burns were conducted in the Jemez Watershed in 1991, 1994, 1997, 1999, and 2004 (Figure 15).

In the Jemez Region, the number of human ignited fires is increasing. Humans started approximately 76% of the fires that have occurred within the Jemez. Lightning caused the remaining 14%. In addition, an average of 7 abandoned campfires occur each year in the Jemez that are extinguished by Forest Service personnel before they spread. Between 1986 and 1992, the number of human caused fires ranged from 1-10 per year. Between 1993 and 1996, that number ranged from 17 to 49. The most frequent source of human caused wildfires is abandoned campfires. An average of 7 abandoned campfires occur each year that are extinguished by Forest Service personnel before they spread. Other causes include cigarettes, sparks from two-cycle engines and chainsaws, children playing with matches, burning candles, arson, and trash burning. There is often flagrant use of fireworks in the forest during dry seasons. The Dome, La Mesa, Porter, and Cebollita fires were all human caused (Figure 15).

The Forest Service has been shifting from a management regime of fire suppression to fire management, and has been emphasizing the importance of fire's role in certain ecosystems. The Jemez Ranger District has taken an active role in planning and implementing large scale prescribed burns aimed at restoring the forest to conditions that allow natural fire to resume its role in maintaining healthy ecosystems. A 7,000-acre prescribed burn was conducted in 1998. More recently, shaded fuel breaks were created adjacent to Sierra Los Pinos subdivision, just south of WSR boundary, by harvesting approximately 80 to 90% of the trees within a narrow corridor and using prescribed fire to reduce the dead material and slash on the ground. Additional thinning and prescribed burning occurred outside fuel breaks to further reduce live and dead fuel loads in that area. Fire related signs are posted throughout developed sites, in areas of popular use, and on major roads within the Jemez. In times of severe fire danger, restrictions are placed on campfires and some areas are closed to the public.

In addition to the fire and grazing, vegetation within the Jemez watershed faces pressures from recreational users. In 1990, it was noted that heavily used dispersed camp sites are dominated by trampled vegetation, compacted soil, user-created trails, trash and human waste. Some user-created trails have damaged stream banks, and increased erosion and sedimentation impacts. At the cliffs at the west end of Box reach climbers were disturbing cliff vegetation. Mining has had impacts on the resources contained within the Jemez

Watershed. El Cajete pumice mine site was harvested to clear all the trees from the mine site, located approximately 0.25 mile south of the WSR. Trees were left standing along the Highway to screen the mine site from view.

7.4 SYNTHESIS AND INTERPRETATION

Forest Health

There is a need to restore the overall health of forests within the Jemez Watershed.

Rationale

The current high density of trees within the Jemez increases the potential for catastrophic fire, pests and parasites, the loss of diversity and sensitive habitats, as well as the loss of threatened, endangered, and sensitive species. The restoration of a natural canopy composition, diversity, and fire regimes will result in healthier forests.

Recommendations

- Retain and encourage existing groupings of gambel oak and other understory vegetation to promote visual diversity.
- Plant and seed indigenous understory species.
- Manage for natural regeneration of trees and shrubs. If planting is necessary, use conifer seedlings grown from the local seed zone.
- Manage late seral conifer stands for development and maintenance of old-growth characteristics, including large trees, snags and down logs.
- Use management ignitions and natural ignitions (lightning) to enhance and accomplish resource objectives, particularly in fire dependent ecosystems.
- Design management treatments to imitate some of the historic lightning caused fire patterns.
- Inform and educate visitors to the Jemez and residents surrounding the area about fire prevention.
- Increase public awareness of the benefits of prescribed fires.
- Inform publics about occasional short duration reductions in air quality due to smoke from burns or controlled natural fires.
- Identify, prioritize, and protect wildland urban interface areas at risk to wildfires.

- Use thinning and pruning of trees to eliminate ladder fuels and other heavy fuel accumulations.
- Reduce human ignitions by increasing public awareness through fire prevention programs, community outreach, media information, and brochures.
- Increasing the amount of law enforcement and prevention efforts during times of high fire danger in the Jemez, especially around the 4th of July when fireworks are used, may also reduce human caused fires.
- Continue and strengthen partnerships between the Forest Service, the State of New Mexico and the various private landowners. The partnership will provide opportunities for pooling of funds and will involve all parties with planning and implementing projects that cross ownership boundaries.
- Forest health (overstory, understory and meadows) may be promoted and improved through vegetative thinning projects and prescribed burn fire treatments.
- Slowly reintroduce fire to these stands, leading to both within-stand thinning and stand replacement on a small patch scale (as opposed to intensive and costly mechanical thinning with its inherent site impacts from entry).

Trampling/ Damage

There is a need to protect sensitive habitats from trampling related to recreation, grazing, and other commodity based activities (i.e. timber removal).

Rationale

Trampling of sensitive habitats and species can provide in roads for non-native invasive species and pests and parasites, or result in the loss of habitats and species from the watershed.

Recommendations

- Dispose of activity-generated slash in the immediate foreground zone of the river, trail and recreation areas within one year of project completion, with the exception of a maximum of five logs per acre of minimum 12" diameter and 15' length for wildlife.
- Manage land use activities to ensure that soil and vegetative productivity is maintained within the site potential for the area.
- Restore and protect the fragile vegetation growing in sensitive areas (i.e. cliffs and riparian areas).

- Emphasize information and education programs that teach Leave No Trace ethics, the benefits of resource restoration projects, and recreational opportunities outside the corridor or in under-utilized areas within the corridor. Include information regarding the area's outstandingly remarkable values.
- If over-utilization of forage vegetation is occurring due to elk grazing, work in cooperation with New Mexico Department of Game and Fish to evaluate the problem and assist in correcting the situation, such as through a reduction in elk numbers on a localized basis.
- Recreational impacts on understory vegetation may be reduced by closing and fencing off sensitive areas and seeding, spreading slash, and distributing woody debris to bring areas back to a healthy vegetative state.

Threatened, Endangered, and Sensitive species

There is a need to protect sensitive species and the habitats in which they are found.

Rationale

Species are determined to be threatened, endangered, or sensitive based on their prevalence within localities, regions, and nations. If care is not taken to protect areas and habitats that harbor sensitive species numbers dwindle, and the result can be the extirpation of the species.

Recommendations

- Manage areas with sensitive plant communities as Botanical Special Interest Areas.
- Protect sensitive plant species from being trampled, damaged or removed.
- Sensitive plant species may be protected by enhancing forest health through thinning and burning projects, minimizing new road construction, monitoring road use in localized areas, and closing/obliterating non-system roads.
- Conducting treatments to remove non-native plants may retain native riparian vegetation.

Pests, Parasites, and Invasive Species

There is a need to control pest and parasite populations and the presence of invasive species within the Jemez Watershed.

Rationale

Outbreaks of western spruce budworm can have significant effects on white fir and corkbark fir, causing defoliation potentially significant mortality, particularly in the lower elevation portions of the spruce-fir zone (Alexander et al. 1984; Swetnam and Lynch 1993). Invasive species can interrupt habitats that support TES species (i.e. Southwestern willow flycatcher), reduce forest diversity and productivity, reduce soil quality and stability, and have detrimental effects on water quality. Once established, invasive species have the potential to spread at a rate of approximately 5 to 30%a year.

Recommendations

- Promote the health of forest overstory, understory, and meadows.
- Allow prescribed fire, using planned and unplanned ignitions. Forest health (overstory, understory and meadows) may be promoted and improved through vegetative thinning projects and prescribed burn fire treatments.

Chapter 8
SPECIES AND HABITATS

8.1 RELEVANT ISSUES AND KEY ISSUES

The diversity of vegetation and topographical relief provide a wide range of habitats. Coyotes (Canis latrans), kit foxes (Vulpes velox), bobcats (Lynx rufus), raccoons (Procyon lotor), ring-tail cats (Bassariscus astutus), skunks (Mephitis mephitis), migratory birds, rodents, beavers (Castor Canadensis), and rabbits are some of the common species that have been identified within the watershed. Wild turkey (Meleagris gallopavo), mule deer (Odocoileus hemionus), elk (Cervus elaphus), black bear (Ursus americanus), and mountain lion (Felis concolor) are the primary game species in the general area.

Three federally listed species have been documented within the Jemez Watershed. Habitat that supports northern goshawk (Accipiter gentilis), a sensitive species, and American peregrine falcon (Falco peregrinus), a species of concern, is dispersed in patches throughout the watershed. Another sensitive species, the Jemez salamander (Plethodon neomexicanus), is found only within the higher elevations of the Jemez Mountains (Figure 16). The Jemez River has potential habitat for Rio Grande cutthroat trout, a sensitive species, though there currently are no existing populations. The only documented threatened species in the watershed involves the occupancy of Mexican spotted owl (Strix occidentalis). The Jemez Watershed contains habitat that would support foraging activities of this species.

Activities with the potential to interrupt animal species were identified through information in existing plans and monitoring reports, consultation with SFNF staff, and through the experience of the resource specialist. These situations can result in physical impacts to habitat resources and the visual, auditory, or environmental settings necessary to maintain TES species. Two key issues for animal species were identified in the watershed: the loss of habitat and poaching.

Animal populations can be easily disrupted. Grazing, recreation, and commodity related activities fragment habitat, destroy essential cover, and remove essential vegetative communities. These include activities undertaken by the Forest itself, or by others through permitting by the Forest. Natural

processes can also impact plant and animal populations. Wildfire and erosion through often results in direct physical interruption of what may have been healthy populations. Any activity that increases the rates of erosion results in increases in the amount of sediment in rivers and streams, resulting in detrimental impacts on fisheries.

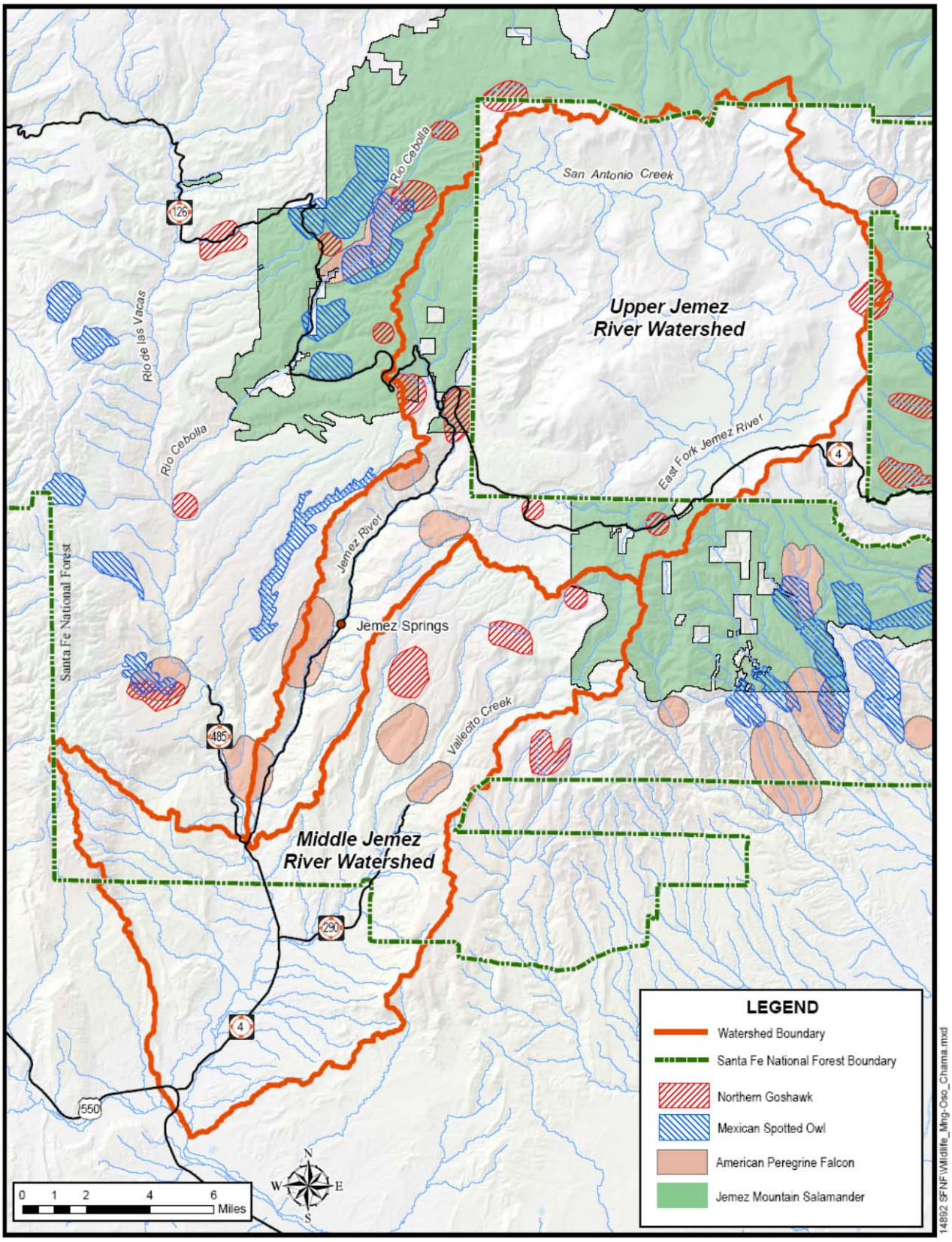


Figure 16. Sensitive wildlife habitats within the watershed.

Despite regular hunting seasons, hunters may take hunt animals illegal, out of season or without paying for appropriate licenses. Hunting seasons and regulations are designed to manage game populations. The results of one hunting season helps determine takes for the following year. Poachers may take more than the allowed number of animals, species that may not have hunting seasons, or animals that are outside of gender and age restrictions.

8.2 CURRENT CONDITIONS

The Jemez Watershed provides habitat for many common species. Coyotes, kit foxes, raccoons, ring-tail cats, skunks, migratory birds, rodents, beavers, and rabbits are present. Over the past five years, beavers have gradually expanded their range within the watershed. The river serves as a passageway for wildlife moving off the Valles Caldera National Preserve during certain times of year. People have seen bear, elk, deer, mountain lion, and bobcat within the Jemez corridor. Non-native fish populations of rainbow trout (Oncorhynchus mykiss) and German brown trout (Salmo trutta) occur in the East Fork of the Jemez River, San Diego Canyon, Lower Jemez River, Rio Cebolla, and Rio Guadalupe creeks.

Several threatened, endangered, and sensitive animal species have been identified within the Jemez Watershed. The range of the Jemez Mountain Salamander, a federally listed sensitive species, is restricted to the Jemez Mountains. This brown backed salamander ranges from 3 3/4-5 5/8" (9.5-14.3 cm) in length and resides in cool, damp north-facing slopes and canyons supporting mixed evergreen forest with Rocky Mountain maple and aspen. Habitat elevations range between 7,200-9,200 feet (2,195-2,804 m). The Jemez Watershed also offers patches of habitat that support the federally listed sensitive species northern goshawk and species of concern American peregrine falcon. In addition, the presence of Mexican spotted owl has been documented within the Jemez Watershed, and the watershed contains the necessary habitat to support this species. Grazing has been eliminated from the area in which the owl was recorded. Bald eagle are known to migrate through the region and some concentrations over-winter in the Caldera.

Two uncommon species, the spotted bat (Euderma maculatum) and black swift (Cypseloides niger), have been found within the Jemez Watershed. These two species could be an indication of the benefit brought by ecotones for enhancing species diversity. There have been scattered records of this bat throughout the western United States dating back to 1891, but it has been taken with any regularity only in California, Arizona, New Mexico, southern Utah, and southern Colorado (http://www.nsrl.ttu.edu/tmot1/eudemacu.htm). The black swift is of particular interest since the colony identified within the Jemez Watershed is the only known colony in the state of New Mexico.

Due to the geology of the area, habitat diversity is dynamic, creating chutes, waterfalls, deep pools, cascades and meandering channels. The Jemez River, fed in part by the East Fork, has a regional reputation for high quality cold-water fishing, a phenomena rare in the arid Southwest. Waters within the Jemez have been designated for primary use as high quality coldwater fisheries by the State of New Mexico (JNRA 1997). Native to the Jemez Mountains is Rio Grande cutthroat trout (Oncorhynchus clarki virginalis), however, this species is no longer present in the JNRA. Currently there are no RGCT within the Jemez River, though, potential habitat has been identified within the river and reintroductions within some of the streams in the watershed have been proposed. German brown trout, rainbow trout, Yellowstone cutthroat trout (Oncorhynchus clarki bouvieri) and other non-natives have replaced RGCT. The Seven Springs fish hatchery provides the Department of Game and Fish with rainbow trout for stocking. Brown trout are currently not being stocked as their population is reproducing on its own. In general, fishing pressure is considered to be relatively high in the Jemez Watershed, partly due to streams being easily accessible.

In the southwest (New Mexico and Arizona), riparian areas account for less than 2% of the land, yet over 65% of southwestern animals depend on riparian habitats for their livelihood. Conflicts between human use of riparian areas and the habitat requirements of animal species occur near developed and dispersed recreation sites. Activities that occur in riparian areas destroy vegetation and increase erosion resulting in loss of habitat and increase sediment loads in waterways. The use of ATVs for hunting and grazing, the establishment of trails for hiking, and the creation of camp areas within riparian areas have detrimental impacts on riparian areas.

Hunting is allowed within the Jemez with restrictions on dates, locations, species, age, and size. There are three designated big game hunting areas located within the watershed (6A: The Jemez Watershed, 6B: Caldera, and 6C: a small area near Las Conchas). One of the main big game species within the Jemez Watershed is the Rocky Mountain elk. Approximately 3,400 adult elk inhabit the Caldera. Black bear and mountain lion are also popular game species. Several outfitters guide hunting trips within the Jemez area. A firearm closure is currently in place in Jemez Canyon. State laws restrict hunting with offroad vehicles, however, ATV use is allowed in association with hunting in small portions of the upper Jemez Watershed portions in the Coyote District. There are violations of ATV use in areas where they have been restricted. Elk hunters create new roads and remove gates within the Jemez Watershed. These issues are compounded by private inholdings that offer access to national forests for unregulated hunting and create a greater possibility of fire within the region.

8.3 REFERENCE CONDITION

People have altered habitats and instituted management practices that have directly and indirectly effected animal populations. From the days of Aldo Leopold, in which the practice was to remove "pest" predator species, to the era of extensive over-grazing, and through the period fragmentation of habitat with the construction of roads, trails, camps, and development of private inholdings, people have affected the composition of animal species in the Jemez River Watershed. Wolves once roamed this area but no longer occur. The Jemez River, once a high quality cold water fishery that supported native fish populations, has been stocked with non-native fish species.

Activities within the watershed may be influencing populations of federally listed species. In 1997 an assessment of the JNRA noted a concern that northern goshawk populations and reproduction rates were declining as a result of past timber harvesting, fire suppression, livestock grazing, and drought. The overly dense stands of small trees may have resulted in the loss of Mexican spotted owl habitat. More could be destroyed by stand-replacing wildfires. (JNRA 1997)

The Jemez River, once hosted the largest populations of RGCT in the Jemez Mountains. Historically, the native fish assemblage throughout the East Fork was comprised of RGCT, Rio Grande chub (Gila pandora), Rio Grande sucker (Pantosteus plebeius), longnose dace (Rhinicthys cataractae), and fathead minnow (Pimephales promelas). The current native fish assemblage excludes RGCT, last found in this drainage in 1950. Since then, German brown trout, rainbow trout, Yellowstone cutthroat trout and other non-natives have replaced RGCT.

Mammals that rely upon riparian habitats have also fluctuated in population. Beaver were once trapped extensively for their fur and their populations saw dramatic declines. Recently beaver populations have begun to recover and they have gradually expanded their range within the Jemez Watershed. Occasionally these expansions have led to conflicts with humans. Beaver dams cause flooding of roads, trails, and grazing areas.

Small game populations have demonstrated changes over time. Gamble quail (Callipepla gambelii) is a desirable game species that no longer occurs in the area. Wild turkey numbers and distribution have declined in the Jemez Mountains over the past two decades. A combination of climate factors and declining habitat diversity are probable causes for the declines in population. Because of the low population, the spring turkey hunt was been suspended between 1995 and 1997. A 1997 assessment of mule deer populations in the JNRA (and entire Jemez Mountains) determined that populations were low, believed to be due to the cumulative effects from poaching, past unlimited

hunting, recreational use, road densities, and habitats becoming denser as a result of fire suppression.

Populations of large game have also changed over time, due in part to changes in land use. Certainly the removal of predators has impacted large game, but so has grazing and the removal of fire from the forest ecosystems. During the late 1800's and early 1900's, the elk population in New Mexico was essentially nonexistent. Attempts were made to reintroduce Rocky Mountain elk to the state and in the 1940's and 1960's a number of elk were transplanted in the Jemez Mountain area. In 1997, it was estimated that approximately 8,000 elk inhabited the Jemez Mountains. A chronic conflict has existed between cattle ranchers and elk, and in the late 1990's ranchers were concerned that the elk population in the Jemez Mountains was too large. A lack of winter range for elk has, on occasion, resulted in the concentration of elk and the overuse of some areas, resulting in competition with mule deer and cattle for forage.

Black bear populations, another popular large game species in the Jemez Mountains, have fluctuated over the past several decades. In addition, mountain lion habitat is present within the JNRA but the species is rarely seen. Extensive statewide hunting of predators in the early 1900's resulted in significant population declines of these species. Hunting restrictions have provided an opportunity for the populations of these species to recover.

8.4 SYNTHESIS AND INTERPRETATION

Habitat Health

There is a need to ensure that habitats that support animal populations are maintained.

Rationale

Every species of animal requires a combination of vegetation types and community compositions to maintain a healthy population. Breeding, feeding and foraging, and cover habitat are essential to all species. Some species require large contiguous areas of undisturbed habitat. The requirements of an animal species may change seasonally, therefore, reasonable access between habitat requirements is essential. Human activity within a natural area often interrupts (fragments) contiguous parcels, or interrupts pathways between habitat requirements.

Recommendations

- Manage recreational facilities located in TES species habitat to protect the habitat
- Enhance habitats to contribute to recovery of T & E species.

- Consider elk migration routes when designing new fencing, and use materials that facilitate elk crossings where appropriate.
- Continue to cooperate with New Mexico Department of Game and Fish, to manage beaver habitat and populations.
- Wildlife management in the river corridor should emphasize late forest seral stage habitat, TES species, and fisheries.
- Wildlife management in the river corridor should emphasize late forest seral stage habitat, TES species, and fisheries.
- Wildlife breeding and wintering areas may be enhanced through projects including prescribed burning and thinning.
- Close roads and limiting access to sensitive habitat areas.
- Plan the location, design, and season of use for new and existing recreation facilities may also further reduce impacts to wildlife habitat.
- Develop upland water sources for elk, deer, and other species. Selective lowland water sources can be designated for wildlife use while other areas remain open for recreational use.
- When planning Forest projects, emphasize/incorporate the needs of TES species and the habitats to the extent possible.
- Maintain and develop breeding and foraging habitats for Mexican Spotted Owl, Northern Goshawk, and other raptors according to the guidelines as specified in the 1996 Forest Plan amendments.
- Increase the amount of winter elk range habitat and calving areas.
- Maintain or improve black bear habitats. Minimize the potential conflicts between black bears and recreationists.
- Where desirable, improve riparian and aspen habitat conditions to encourage beaver colonization.
- Identify and reduce conflicts between recreation use and wildlife access to existing water sources and other key areas.
- Work toward improving fish habitat conditions to meet the designated use as a "high quality cold water fishery"
- Consider the opportunity for returning native fish, including Rio Grande cutthroat trout, Rio Grande chub, Rio Grande sucker, longnose dace and fathead minnow.
- Utilize the latest agency-approved scientific methods to conduct periodic inventories of habitats

Population Health

There is a need to ensure that populations are maintained within a healthy range.

Rationale

Many natural mechanisms of population control have been altered by humans. By extirpating predators people have removed the greatest source of population control. Unregulated hunting has brought populations of some animals (i.e. elk and beaver) to dangerously low levels and has removed some species from the Jemez Watershed completely (i.e. Gamble quail and wild turkey). Conflicts between populations of elk, mule deer, and cattle consistently arise. Populations of deer and elk are increasing as hazards on roads and highways. As humans have interrupted natural population balances, humans have to play a greater role in ensuring that big game populations continue to exist at viable levels without getting too large.

Recommendations

- Forage use by grazing ungulates (cattle, elk, etc) will be maintained at or above a condition that assures recovery and continued existence of TES species.
- Utilize the latest agency-approved scientific methods to conduct periodic inventories of animal populations
- When planning Forest projects, emphasize/incorporate the needs of threatened, endangered, and sensitive species and the habitats to the extent possible.
- Reintroduce Gamble quail to the JNRA.
- Improve mule deer and wild turkey habitats and limit hunting until the population has recovered.
- Increase the amount of winter elk range habitat and calving areas.
- Control beaver numbers and distribution to reduce undesirable impacts to riparian areas, roads, and recreation sites.
- Elk populations may be improved by working with the New Mexico Department of Game and Fish and by identifying and seasonally closing calving and wintering areas to vehicle access.
- Rio Grande cutthroat trout may be re-established by working with the New Mexico Department of Game and Fish to identify possible re-establishment methods such as renovating the Seven Springs fish hatchery; converting it into a hatchery for Rio Grande cutthroat trout.

Chapter 9
HUMAN USES

The human uses chapter of this assessment covers three primary topics, recreation, heritage resources, and livestock grazing. These uses may potentially lead to socially created effects to the watershed, which have real life manifestations. The manifestations can either be reasonably sustainable, or produce slight to significant deterioration of the watershed's physical resources. Under certain circumstances, the effects may be irreversible. This chapter discusses the various problems associated with human uses of the subject landscape, and provides opportunities for correction or appropriate management direction that can adequately address the specific issues for future forest planning.

9.1 RECREATION

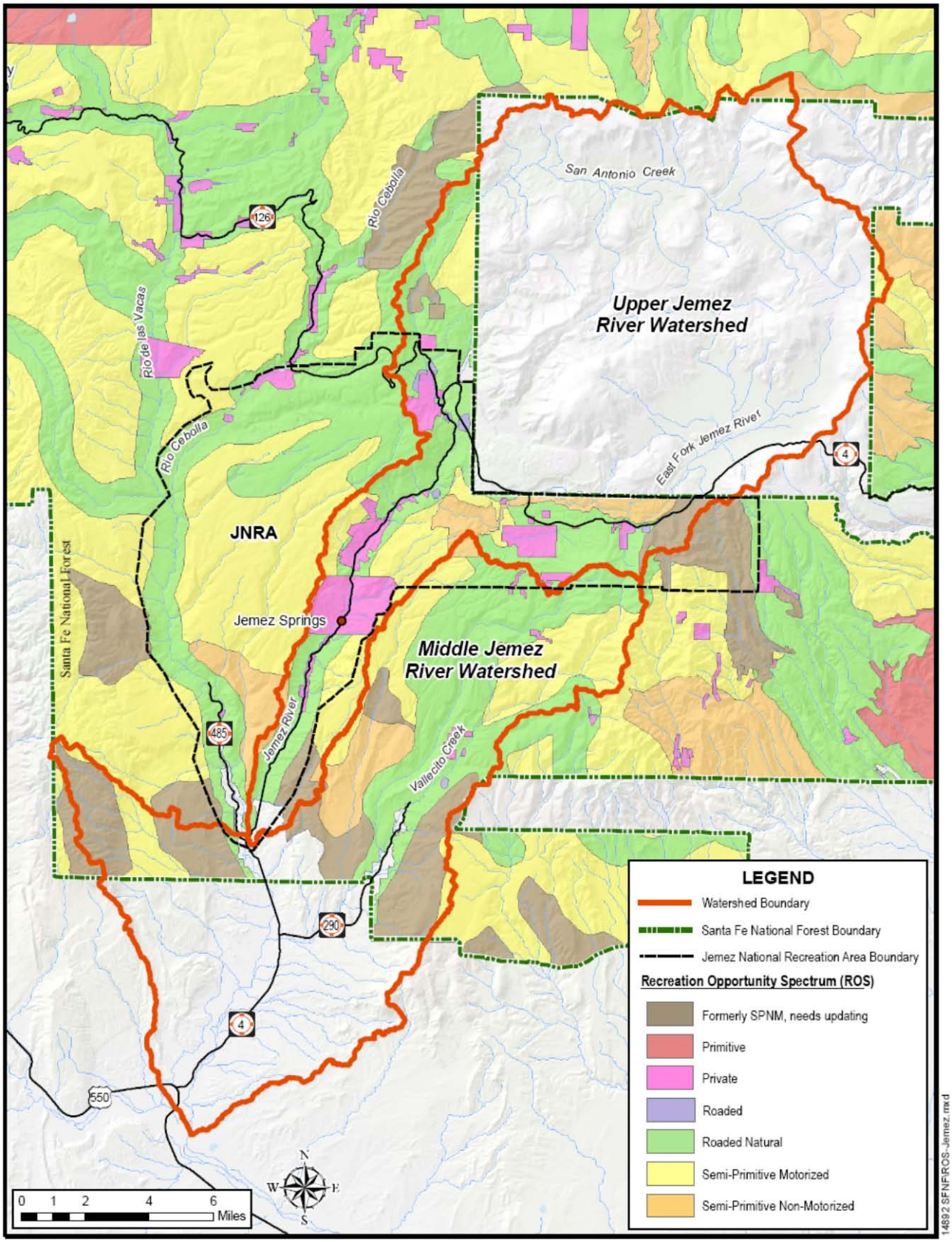
9.1.1 Relevant Issues and Key Issues

The Management Area Prescription allocations on the SFNF are outlined in the Forest Plan (USFS 1987). Within each management area discussion, the Forest Plan provides appropriate management direction to meet various objectives on the various NFS lands. Figure 3 illustrates the different management area boundaries throughout the subject watersheds. The management area prescriptions outline the setting, desired conditions, standards, guidelines, and activities that are to be managed.

The Recreation Opportunity Spectrum (ROS) is a system used by the FS to describe a variety of forest settings provided on NFS lands. There are six major setting categories within the ROS system. These are: Urban, Rural, Roaded Natural, Semi-Primitive Motorized, Semi-Primitive Non-Motorized, and Primitive. A map showing the ROS settings on Upper-Middle Jemez River watershed lands within the project area is presented in Figure 17. The setting categories are constructed to display the range from very developed and convenient (Urban) to very remote and wild (Primitive). There are seven descriptors that are used to differentiate between the various categories and provide agencies with evaluation tools for monitoring the success of management efforts. In addition, agency personnel can use these descriptors to guide decisions on site development proposals. Furthermore, forest visitors can

use the descriptors to evaluate whether a particular part of the forest offers the setting that matches with their expectations. The descriptors are 1. Access; 2. Remoteness; 3. Naturalness; 4. Social Encounters; 5. Visitor Impacts; 6. Visitor Management; and 7. Facilities and Site Management.

Figure 17. Recreation Opportunity Spectrum classifications within the watersheds.


San Antonio Creek
Rio Cebolla
Rio de las Vacas
Upper Jemez
River Watershed
East Fork Jemez River
JNRA
Santa Fe National Forest
Jemez Springs
Middle Jemez
River Watershed
Jemez River
Vallecito Creek
126
485
290
4
550
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
Jemez National Recreation Area Boundary
Recreation Opportunity Spectrum (ROS)
Formerly SPNM, needs updating
Primitive
Private
Roaded
Roaded Natural
Semi-Primitive Motorized
Semi-Primitive Non-Motorized
0 1 2 4 6
Miles
N
W
E
S
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The access descriptor illustrates the type and mode of travel compatible within each setting category. The remoteness descriptor defines the perception of being removed from the sights and sounds of human activities. The naturalness descriptor describes the physical conditions of the setting as compared to a natural environment. This descriptor is primarily a visual evaluation of the surrounding landscape and describes the level of human modifications that has occurred or is proposed. The social encounters descriptor attempts to define the appropriate frequency of meeting others during the course of a day's activities within an area with a particular setting category. The visitor impacts descriptor illustrates the physical change that human use produces in the environment. This descriptor focuses on how much change will be allowed and what tools for control are appropriate, rather than how impacts can be prevented. The visitor management descriptor focuses on the amount of regulation and control, plus the level of information and services, provided to visitors. More developed settings offer sufficient regulation and services to provide a necessary level of security for visitors; whereas, a primitive setting lacks such management, demanding independence and a level of risk taking. The facilities and site management descriptor refers to the level of site development, in that, urban and rural settings provide more convenience and comfort with more developed facilities than primitive settings where facilities are not present.

The current ROS settings for NFS lands within the study area include Private, Roaded Natural (RN), Semi-Primitive Motorized (SPM), Semi-Primitive Non-Motorized (SPNM), and Formerly SPNM, Needs Updating. Because the private property is not part of NFS lands, the ROS setting does not apply. However, these private inholdings are entirely surrounded by NFS lands and therefore, ROS settings must be considered up to the private/NFS boundary. Additionally, the Formerly SPNM, Needs Updating classification indicates areas that used to be effectively controlled for non-motorized use, but in more recent times have seen a proliferation of user-created roads extending onto formerly SPNM lands. Therefore, these tracts of land that typically border SPNM lands need to be updated to reflect the current motorized use taking place there.

9.1.2 Current Conditions

Currently, there are numerous developed NFS recreation infrastructure within the Upper and Middle Jemez River watersheds. A map of the existing picnic areas, campgrounds, fishing access areas, trails, and trailheads is provided in Figure 18. The majority of the developed recreation infrastructure exists within the Upper Jemez watershed within the boundary of the JNRA. However, 2 campgrounds exist along Vallecito Creek in the Middle Jemez watershed. Additionally, numerous opportunities exist for dispersed

recreation. One of the largest drivers for dispersed recreation is access. A map showing the existing road system can be referenced in Figure 19. The majority of the roads that exist on NFS lands in question are Class 4 – unimproved or Class 5 – 4WD roads. However, there are three state highways that provide access to the light duty dirt or gravel roads that continue deeper onto NFS lands and in some cases to private property. These highways are New Mexico Highway 4, New Mexico Highway 126, and New Mexico Highway 290.

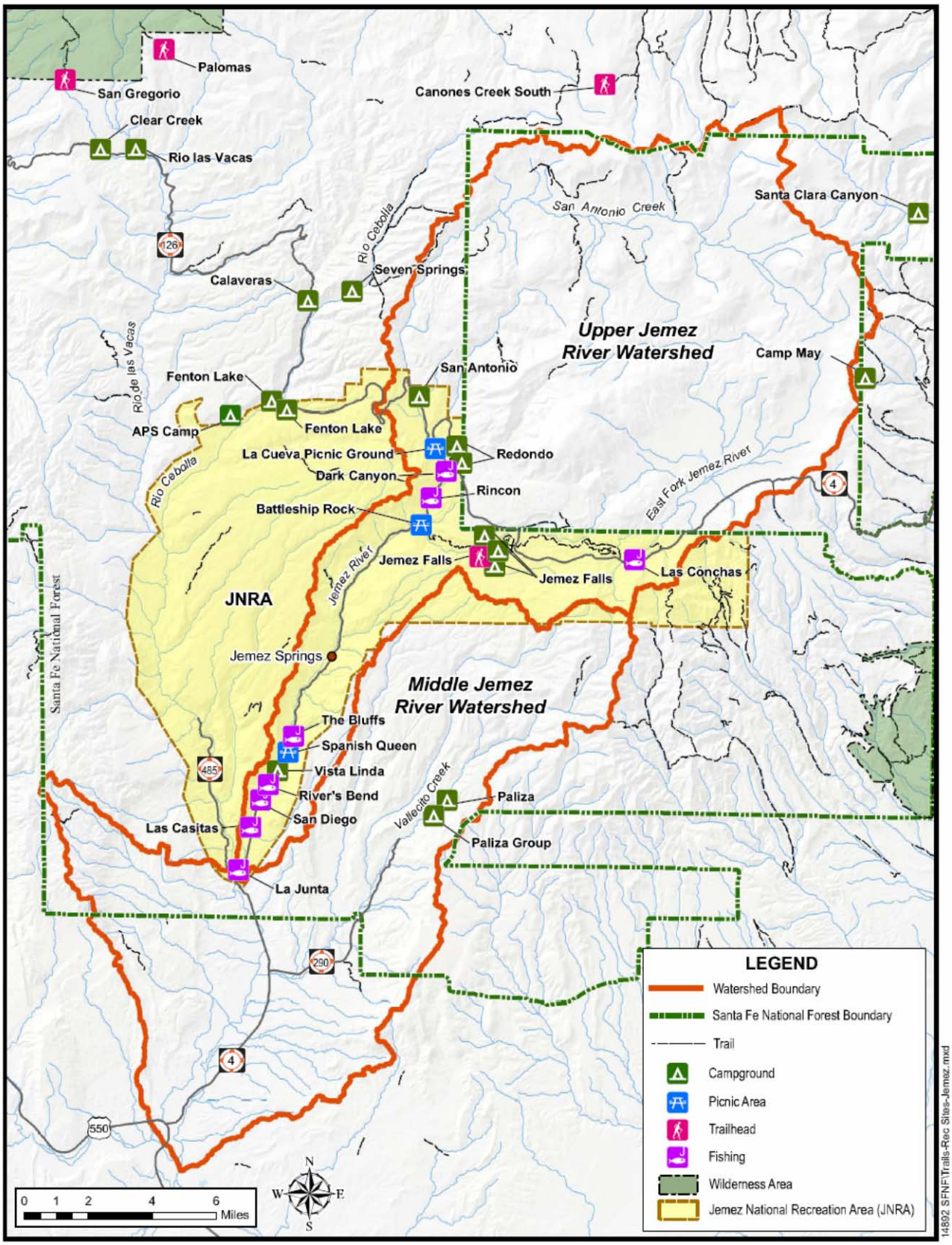
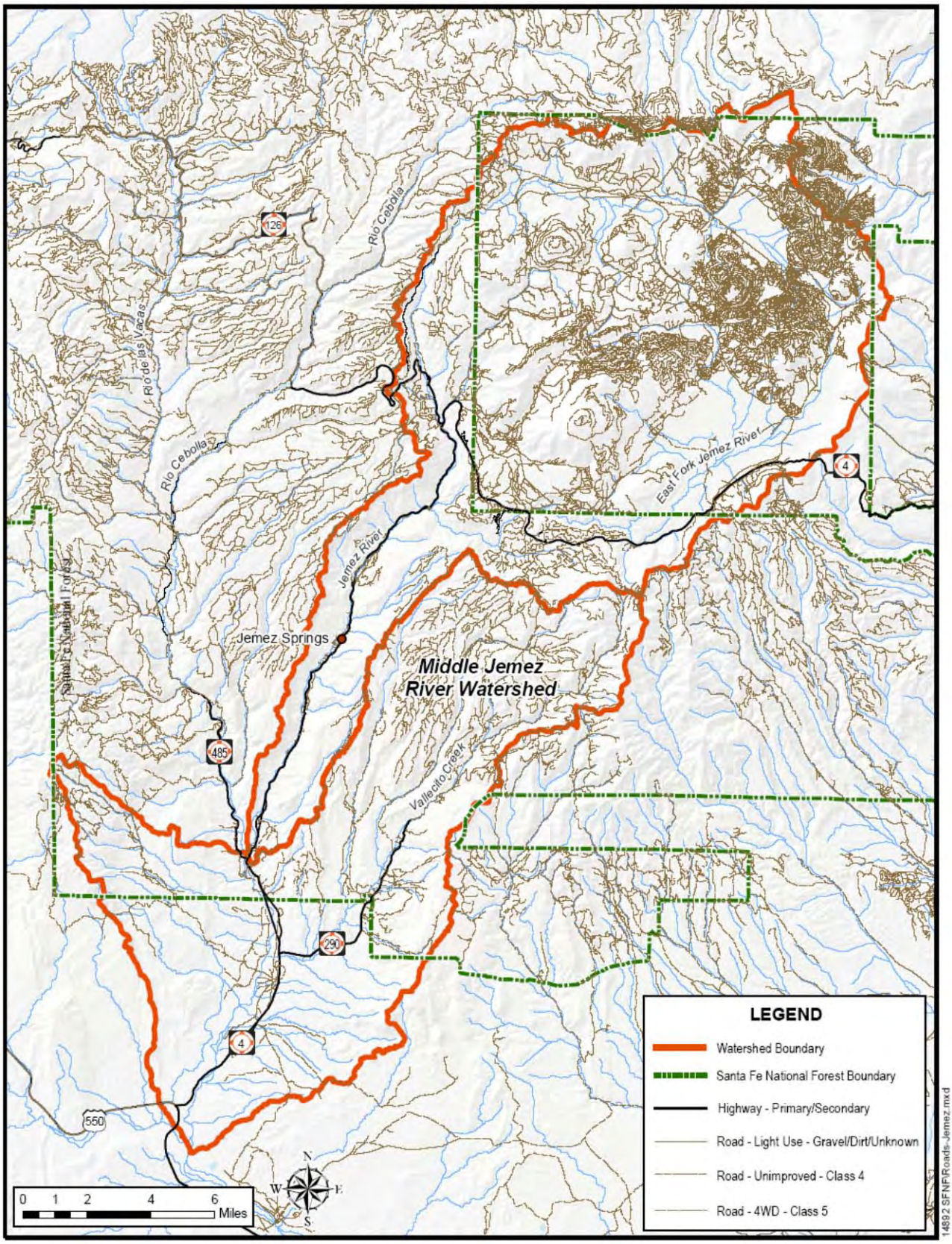

Palomas
San Gregorio
Clear Creek
Rio las Vacas
Canones Creek South
Santa Clara Canyon
San Antonio Creek
Rio Cebolla
Seven Springs
Calaveras
126
Upper Jemez
River Watershed
Camp May
Rio de las Vacas
Fenton Lake
San Antonio
APS Camp
Fenton Lake
La Cueva Picnic Ground
Redondo
Dark Canyon
Rincon
Rio Cebolla
East Fork Jemez River
4
Battleship Rock
Jemez River
Jemez Falls
Jemez Falls
Las Conchas
JNRA
Santa Fe National Forest
Jemez Springs
Middle Jemez
River Watershed
The Bluffs
Spanish Queen
485
Vista Linda
River's Bend
San Diego
Las Casitas
Vallecito Creek
Paliza
Paliza Group
La Junta
290
4
550
N
W
E
S
0 1 2 4 6
Miles
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
Trail
Campground
Picnic Area
Trailhead
Fishing
Wilderness Area
Jemez National Recreation Area (JNRA)
14892 SFNF\Trails-Rec Sites-Jemez.mxd

Figure 18. Trail systems and developed recreation facilities within the watershed.

Figure 19. Existing road system within the Upper and Middle Jemez River watersheds.


Middle Jemez River Watershed
Jemez Springs
Jemez River
East Fork Jemez River
Rio Cebolla
Rio de las Vacas
Vallecito Creek
Santa Fe National Forest
126
485
290
4
550
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
Highway - Primary/Secondary
Road - Light Use - Gravel/Dirt/Unknown
Road - Unimproved - Class 4
Road - 4WD - Class 5
0 1 2 4 6
Miles
N
W
E
S
14892 SFNFRoads_Jemez.mxd

The primary passage through the Upper and Middle Jemez River watersheds is along New Mexico Highway 4. As Figure 17 illustrates, the lands paralleling New Mexico Highway 4 across NFS lands are managed for an ROS setting of RN or Private. The RN buffer was classified to accurately incorporate the major Highway 4 corridor, as well as protect the semi-primitive setting that is provided to recreational users on the SPM and SPNM lands adjacent to the RN corridor. Additionally, within the WSR boundary, the Rural ROS classification only applies within 75-feet of each side of the centerline along Highway 4, and developed recreation sites in the WSR corridor are classified as RN (EFJ/WSR EA 1993). Furthermore, large sections of private land inholdings exist along Highway 4, completely surrounding Jemez Springs, on a large tract just north of Jemez Springs, surrounding Sierra de los Pinos, mostly west of La Cueva, and a narrow strip following Highway 4 south of Jemez Springs for approximately 3.5 miles. For the most part, RN buffers follow major and minor arterial roads and lands that are more secluded or not as readily accessible have an ROS classification of SPM, SPNM, or Formerly SPNM – Needs Updating (Figure 17).

Lands with an ROS classification of SPNM are not permitted for motorized vehicles use including off-highway vehicles (OHV) and all-terrain vehicles (ATV). However currently, portions of the SPNM lands are experiencing an alarming acceleration in the establishment of user-created roads. The resulting proliferation of two-track roads and ATV trails has driven the need to update the boundaries of the SPNM areas to more properly capture the newly emerging and locally enlarging road system created by individual users.

In general, the Jemez Ranger District has fair control over areas with SPNM ROS settings. On May 22, 1996, the SFNF signed Closure Orders No. 10-185 and No. 10-186 for the lower and upper Jemez urban interface areas. Closure Order No. 10-185 limits activities within a corridor along Highway 4 from San Ysidro to Jemez Springs as a day use only area where no fires or OHV/ATV use is permitted. Vista Linda Campground is exempt from the day use only provision of the order. Additionally, discharge of firearms, air rifles, or gas guns within 150 yards of the center of Highway 4 or the Jemez River or developed or occupied sites including Spanish Queen picnic area, and La Junta, Las Casitas, San Diego, River's Bend, and The Bluffs fishing access areas, and Vista Linda Campground is prohibited. Closure Order No. 10-186 limits activities within a corridor along Highway 4 from Jemez Springs to La Cueva as a day use only area where no stoves, fires, or OHV/ATV use is permitted. The use of liquid fueled and LPG fueled stoves, stoves within self-contained camper units and fires within provided fire grates at developed recreation sites at Battleship and La Cueva picnic areas, and Rincon and Dark Canyon fishing access areas are exempt from this provision of the order. Also, it is prohibited to discharge a firearm, air rifle, or gas gun within 150 yards of the center of

Highway 4, Jemez River, San Antonio Creek, or developed or occupied sites including Battleship and La Cueva picnic areas, Rincon and Dark Canyon fishing access areas, Soda Dam and Spence Hot Springs. It is also prohibited to park or leave a vehicle in violation of posted signs on NFS land within both urban interface areas.

On May 7th, the SFNF signed Closure Order No. 10-182 for the La Cueva urban interface area. The order designates corridors along Highway 4, Highway 126, Forest Road 105, and Forest Road 132 where no overnight occupancy is permitted and fires or stoves are prohibited. However, liquid fueled and LPG fueled stoves and stoves within self-contained camper units area exempt from this provision of the order. Additionally, the San Antonio Campground is exempt from this provision of the order as well.

On August 28, 1995, SFNF signed Closure Order No. 10-176 which is a special prohibition road and off road vehicle closure for Upper San Antonio Road # 376. The order prohibits the use of any motorized wheeled or tracked vehicle on Forest Development Road # 376 from the gate near San Antonio Administrative Site (San Antonio Hot Springs) to the gate at the Baca Location No. 1 (Valles Caldera National Preserve boundary). Also, motorized vehicle use is prohibited on Forest Road 106 from the junction with Forest Road 144 to the gate east of San Antonio Creek. However, snowmobiles may be used on the roads when snow conditions warrant. Additionally, it is prohibited to use a motorized vehicle off Forest Roads 376 and 106 in the area bounded by the gate near the San Antonio Administrative Site on the south, and on the northeast by the gate at the Baca Location No. 1 fence. However, snowmobiles may be used in the area when snow conditions warrant.

Currently, Forest Road 376 is open from Highway 126 to the San Antonio Administrative Site (San Antonio Hot Springs). At the hot springs, a gate controls OHV and ATV access to the remainder of Forest Road 376. However, the closed portions of San Antonio Creek does experience violations of the closure order, whereby ATVs gain access to the closed portion from Forest Road 144 through Mushroom Basin. As a result, degradation occurs to the closed lands and there is little opportunity to catch violators due to the difficult and indirect access. Although ATVs are permitted in areas such as Mushroom Basin, OHV use is not permitted. The SFNF may change the use to seasonal prohibition of ATVs if violations continue.

Additionally, Closure Order No. 10-263 was signed by the SFNF on June 4, 2002 prohibiting overnight use of the San Antonio Hot Springs, overnight camping on NFS lands surrounding San Antonio Hot Springs, fires, campfires, or stove fire, except propane or liquid fueled stoves within the San Antonio Hot Springs area, and to park in violation of posted instructions within the San

Antonio Hot Springs area. These orders are the same as those for the Spence Hot Springs area.

Finally, the SFNF has signed a closure order to restrict road and off road vehicle use within the East Fork Jemez WSR area. The order prohibits use of motorized vehicles on Forest Roads 131, 131AB, 131AD, 131C, and 131AH in the WSR area. Furthermore, the order prohibits the use of motorized vehicles on Trail 137 in the WSR area. Currently, Trail 137 is designated as non-motorized; however, there have been some violations.

One important thing to note about any non-motorized lands is that motorized vehicles are permitted within the area under one circumstance. A grazing permitee is authorized to use an OHV or ATV in order to manage or maintain their herds. Furthermore, the grazing permit holders are only allowed to be on motorized vehicles within the SPNM area during the grazing season. Any motorized use during the grazing off season is not permitted by the SFNF and would also be subject to future closure orders.

Elsewhere on the watershed, lands that are classified as SPM, namely along the Rio del Oso, mostly provide access to some private inholdings or to the greater network of roads and trails that occur throughout the Forest (Figure 19). In many cases, the OHV and ATV users have created their own network of roads that continue to be lengthened and widened. In addition, some of the users that cross into grazing allotments leave the gates open, which create conflicts between the motorized users and the grazing permitees. Furthermore, the small portion of SPNM land at the northern extent of the Upper Jemez watershed experiences some ATV use as well. Also, there have been accounts of cultural resource hunting (pot hunting) using ATVs.

Some of the most heavily used developed recreation facilities are campgrounds. There are 5 developed Forest Service campgrounds within the JNRA and Upper Jemez River watershed and another 2 on the Middle Jemez River watershed (JNRA 1997). A list of campgrounds and units available at each is presented in Table 8. Both the Paliza and Paliza Group sites are currently being renovated for reopen during the 2006 season.

Table 8. Campgrounds within the Upper and Middle Jemez River watersheds.

Campground	Watershed	Number of Units
San Antonio	Upper Jemez River	47
Redondo	Upper Jemez River	59
Jemez Falls	Upper Jemez River	52
Vista Linda	Upper Jemez River	13
Paliza	Middle Jemez River	27 (Before renovation)
Paliza Group	Middle Jemez River	2 (Before renovation)

Source: (JNRA 1997; SFNF website)

In addition to the campground facilities, there are also 4 Forest Service picnic areas within the watersheds, all of which fall within the boundary of the JNRA. The list of picnic areas and the number of units available at each is presented in Table 9.

Table 9. Picnic areas within the Upper and Middle Jemez River watersheds.

Picnic Area	Number of Units
Battleship	33
Jemez Falls Group Area	1 (Accommodates 100 people)
La Cueva	12
Spanish Queen	12

Source: (SFNF website)

A major dispersed recreation activity that the watershed provides opportunities for is hunting. Hunting on NFS lands within the watershed is allowed in accordance with state and federal regulations. The watershed is part of Big Game Hunting Unit 6A, 6B, and 6C. Big Game Unit 6A includes the Jemez watershed, Unit 6B includes the Valles Caldera, and Unit 6C includes a small portion near Las Conchas. The hunting unit boundary division for Unit 6C follows Peralta Canyon. The New Mexico Department of Game and Fish (NM Game and Fish) is responsible for issuance of hunting tags for the various big game species within the hunting units. Small game units are also issued by NM Game and Fish; however, these small game tags or stamps are typically issued for statewide use on public or permissible private lands.

Other dispersed recreation activities that are provided within the watershed are hiking, biking, primitive camping, picnicking, photography, rock-houding, fishing, horseback riding, and wildlife viewing. Figure 18 shows the location and extent of the trail system across the watershed. Much of the trails connect developed recreation facilities and points of interest within the JNRA. In some locations, these trails are relatively primitive and are often modified by user-created trails. However, major road and trail degradation by OHV and ATV use in the numerous areas has resulted in a proliferation of user-created trails and roads crossing the historic trail or road system, or overlapping entire sections of historic trails (Figure 19).

Fishing within this watershed occurs on every major stream system. The Jemez River, East Fork Jemez, Vallecito Creek, and San Antonio Creek fisheries are composed of naturally reproducing brown trout, rainbow trout, and a host of other native an non-native species (refer to Species and Habitats section). The FS has developed numerous fishing access points within both the JNRA and the WSR areas. They include La Junta, Las Casitas, San Diego, River's Bend, The Bluffs, Las Conchas, Rincon, and Dark Canyon. However, fishing access is not limited to these developed access sites and fishermen are free to access fishing locations as long as they do so by using NFS lands.

There are no substantial opportunities for private or commercial boating within the watersheds. All of the waterbodies are too small or have large amounts of course woody debris blocking feasible navigation of the channels. However, it is possible for creek boaters to negotiate portions of the watercourse, although doing so is exceptionally dangerous and thus extremely limited.

9.1.3 Reference Conditions

The purpose of establishing reference conditions for recreation is to attempt to determine the state of the watershed area as it relates to recreation opportunities and settings prior to any development or anthropogenic interference. However, the very application of recreation within an area requires at least some level of anthropogenic interference. Therefore, the majority of this discussion is focused on the management direction outlined in the Forest Plan.

In terms of recreation opportunities or settings, the Forest Plan provides specific management direction to adequately manage the lands within the ten management areas on the watersheds. This management direction is applied to specific management areas on top of forest-wide standards. Management Area A has specific management direction for timber production and enhancement of wildlife habitat diversity. In addition, grazing occurs in a limited fashion on intermingled grasslands. Roaded dispersed recreation experiences are emphasized, and firewood is provided as a by-product of timber harvest activities. The only area within the watersheds that is in Management Area A is a small tract at the northern boundary of the Valles Caldera with an ROS setting of RN and SPM (USFS 1987).

Management Area C has specific management direction for developed recreation facilities as well as dispersed use. This area is managed for a ROS setting along roads of RN and Rural surrounding developed sites (USFS 1987). This area is generally open to OHV and ATV traffic and use unless it has been designated closed by the issuance of a closure order prohibiting motorized use. Additionally, motorized use is not permitted if it occurs within developed recreation sites (USFS 1987).

Management Areas E and G are both generally open to OHV and ATV traffic within the Upper and Middle Jemez River watersheds. Each of the areas are managed for a ROS setting of RN and SPM depending on road development standards, maintenance levels, and open road densities. In addition for Management Area G, allotment management planning will minimize the effects of gates and other range structures on recreation travel. Also, a portion of Management Area G land along the western boundary of the Middle Jemez River watershed used to have a ROS setting of SPNM; however, due to more

recent proliferation of user-created roads, the area now requires reclassification to be inline with management objectives in the Forest Plan (USFS 1987).

Although the primary management direction for Management Area L is for a ROS setting of SPNM, there exists specific authorization for the construction of trailheads of less than 2 acres at the edge of this management area if development on adjacent lands or management areas are not possible. In SPNM recreation areas, the normal encounter tolerance is 6-15 parties per day on trails, and this is the management objective for Management Area L. Except for access to parking areas at trailheads, these areas are closed to motorized travel of all types. However, with special use permit, existing use on roads will be permitted until expiration of the permit or a suitable substitute for access is obtained. As with all SPNM areas use of OHV and ATVs is prohibited; however, use of mechanical conveyances such as mountain bikes is permitted (USFS 1987).

Management Area M is designated for the Research Natural Area (RNA). Non-motorized dispersed recreation activities are allowed provided they do not modify the area or threaten or impair the research or educational value of the area. Recreational users must pack out trash, and cross-country vehicular traffic is prohibited. In addition, no open campfires are allowed and no new trail construction will occur (USFS 1987).

Management Area N is designated for TES species habitat. Within the watersheds, the ROS classification is either SPNM in the southwestern portion of the Upper Jemez River watershed between Highway 4 and Highway 485, to Formerly SPNM – Needs Updating just east of the WSR area. Motorized use is allowed on open roads only, and no cross-country travel is allowed unless permitted to do so by special use permit. The Formerly SPNM area has seen proliferation of user-created roads and therefore must be reclassified to meet the management objectives set forth in the Forest Plan (USFS 1987).

Management Areas P, R, and S all are managed to protect and inventory cultural resources, with a lesser emphasis on timber and wildlife, and in some cases firewood. The ROS setting across these management areas vary from RN to SPNM. In general, the recreation direction provided in the Forest Plan focuses on enhancing recreational enjoyment for National Register of Historic Places (NRHP) and other important sites. The Forest Plan also includes direction for signage and interpretive sites that may be developed in an attempt to ultimately protect the vast number of cultural resources existing within these management areas.

9.1.4 Synthesis and Interpretation

User-Created Roads and Trails Proliferation

There is a need to control the proliferation of user created roads within the watershed to mitigate impacts to heritage resources, soil resources, riparian areas, water quality, wildlife, and grazing.

Rationale

Whether it is occurring in the SPNM areas or within management areas that allow for motorized vehicle travel and use, the unchecked generation of user-created roads damages numerous resources. In some areas that were formerly classified as SPNM, the proliferation of user-created roads and trails now requires reclassification of the land to be inline with the management direction provided in the Forest Plan. Increased rates of sedimentation and erosion are directly linked to the number of roads an area has. User-created roads are not maintained and any increase in the rate of erosion can cause overwhelming sedimentation in streams directly affecting water quality. In addition, the heritage resources are driven over or buried by the erosion produced sediment. Likewise, riparian areas, which are inherently fragile, may be severely impacted by the use of OHVs and ATVs to cross or travel longitudinally along them.

Recommendations

- Increase presence of law enforcement to prevent illegal OHV and ATV use within SPNM managed areas
- Issue closure orders for SPNM lands along with highly visible signage indicating the closure and penalty for trespass
- Reclassify the Formerly SPNM settings to be inline with Forest Plan management direction
- Use volunteers to help enforce motorized use regulations
- Educate the public about importance of maintaining various settings on NFS lands to provide opportunities for diverse activities and experiences
- Close, blockade, and post signage on illegal user-created roads to prevent access to restricted areas
- Close, blockade, and rehabilitate riparian areas that have been compromised by OHV/ATV use, especially within the WSR corridor
- Amend Forest Plan to allow OHV/ATV use within specific restricted non-motorized areas that are too difficult to enforce
- Create a designated OHV/ATV use area with unrestricted travel for those who seek this type of opportunity

Grazing Versus Motorized Use

Currently, conflicts exist between OHV/ATV use and grazing. Grazing allotments and pastures on the Forest are fenced. However, these fences are being breached by OHV users who are attempting to gain access to restricted areas. In addition, some OHV/ATV users are leaving pastoral gates open after passing through them which leads to conflicts and bitter feelings among the grazing permitees.

Rationale

The various grazing allotments have been severely affected by degradation of pastures and repeated perimeter breaches and gates left open. The result is conflicts between the motorized OHV/ATV users and grazing permitees.

An important note is that OHV/ATV use is only permitted within the non-motorized areas that allow grazing under special use permit to effectively manage livestock herds that are permitted there. The terms of the special use permits only allow motorized use during the grazing season. However, at times, the grazing permit holders have been known to use the non-motorized areas during the off-season, which is illegal.

Recommendations

- Increase presence of law enforcement to prevent conflicts between grazing and motorized users
- Post highly visible signage indicating the status of the non-motorized lands and penalty for trespass
- Replace gates at key access points with cattleguards to reduce the frequency of perimeter breaches or ability to leave allotment gates open
- Use volunteers to help enforce motorized use regulations
- Close (by Closure Order), blockade (mechanical methods), and post signage on illegal user-created roads to prevent access to restricted areas, and penalties for such trespass
- Amend Forest Plan to allow OHV/ATV use within Formerly SPNM areas
- Place more severe penalties for off-season use of motorized vehicles in non-motorized areas (up to loss of special use permit)

Motorized Vehicle Use in Non-Motorized Areas

Currently, there is an overwhelming problem with OHV/ATV use in non-motorized areas on the watersheds. This use is illegal but problematic to

enforce. In order to solve this runaway problem, several steps need to be taken to bring this use back in line with management area objectives.

Rationale

Motorized use in non-motorized areas within the Upper and Middle Jemez River watershed is a huge problem. Past corrective actions to control motorized users from creating new roads, or using areas that have been formally closed by Closure Order have only been somewhat successful. Now, the FS is faced with a very difficult problem that will be difficult to rectify. Multiple steps need to be taken in tandem to bring the illegal motorized use back into alignment with the management direction and objectives outlined in the Forest Plan. In order to adequately control the OHV use problem on SPNM lands, most of the following opportunities will need to be implemented. In addition, the FS needs to work diligently to prevent additional proliferation of user-created roads from Formerly SPNM lands to other adjacent existing SPNM lands. If action is not taken, the problem will only worsen and the user-created roads will eventually expand onto lands that currently provide SPNM opportunities for recreational users.

Recommendations

- Issue closure orders for SPNM lands (and potentially Formerly SPNM lands as well) along with highly visible signage indicating the closure and penalty for trespass
- Close, blockade, and post signage on illegal user-created roads to prevent access to restricted areas
- Educate the public about importance of maintaining various settings on NFS lands to provide opportunities for diverse activities and experiences
- Increase presence of law enforcement to prevent motorized use within non-motorized areas
- Create a designated OHV/ATV use area with unrestricted travel for those who seek this type of opportunity
- Amend Forest Plan to allow OHV/ATV use within various non-motorized areas
- Use volunteers to help enforce motorized use regulations

9.2 HERITAGE RESOURCES

9.2.1 Relevant Issues and Key Issues

Heritage resources located in the Upper and Middle Jemez River watersheds are diverse, and reflect a variety of human uses of the region since PaleoIndian times, dating back 12,000 years. Resources include archaeological sites and ethnographic resources that are important to present-day communities, termed traditional cultural properties. Heritage resource management in the Santa Fe National Forest includes an active program of identification, evaluation, monitoring, protection, and restoration, as well as interpretation and research. These activities are often conducted by Forest Service personnel. In some instances, these activities are conducted by volunteers, research organizations such as universities, or through agreements with other agencies, always under the oversight of the Forest Service.

Anytime ground disturbing activities take place in the watershed, there is the potential for impacts to heritage resources. These include activities undertaken by the Forest itself, or by others through permitting by the Forest. The National Historic Preservation Act (NHPA)of 1966, as amended, and the Forest Plan address situations where planned activities could potentially affect resources and provide the guidance necessary to identify impacts and provide necessary treatment or mitigations measures. However, in those situations where unplanned activities or processes take place, heritage resources are at risk.

Review of information in existing plans and monitoring reports revealed that the most significant source of impacts to heritage resources in these watersheds is recreational visitors. Increased road and recreational use of the Forest has resulted in higher visibility of resources and accessibility to resources. Use of the Forest by visitors has resulted in physical impacts to heritage resources and impacts to the visual, auditory, or environmental settings of traditional cultural properties. The most common recreational activities causing impacts to heritage resources include: ORV use; formation of user created trails by hikers and bikers; inappropriate activities on resources; and theft and vandalism.

9.2.2 Current Conditions

Heritage resources in the watershed include archaeological sites and ethnographic resources. Archaeological sites consist of the material remains of past human activities, including prehistoric and historic sites. The Forest has a long history of human use. Site types are diverse and include, but are not limited to, artifact scatters, agricultural fields, pit houses, field houses, resource procurement sites, pueblos, historic cabins, logging camps, homesteads, mines, and Civilian Conservation Corps projects.

Ethnographic resources in the watershed include sites and resources considered important to living communities that have traditional ties to the area. The Forest covers traditional lands used by several communities, including Hispanic or land grant communities, pueblos, and other tribal communities. These resources include specific places that figure prominently in religion and tradition, as well as natural resources collected for various uses.

Locations of known heritage resources and densities of those resources somewhat reflect a bias of where field survey has been conducted (see Figure 20). This can be seen especially along paved and major Forest roads where surveys to comply with Section 106 of the NHPA have been conducted prior to undertaking construction and maintenance projects. However, resource densities in these watersheds also reflect expected patterns of land use prehistorically and historically. Resources tend to be located in flat areas, especially on high ridge tops above major drainages, and along the valleys of those waters sources. Resources are found much less frequently along steep slopes or away from major drainages. Within the two watersheds, high densities of resources are located along the Jemez River and the East Fork Jemez River, and on high, relatively flat ridge tops above and to the east of the Jemez River. The high ridge tops located west of Jemez Springs, outside of the watersheds, also exhibit this pattern with a high density of resources. Although some portions of the watersheds currently have no known resources, this is likely due to the fact that much of the watersheds have not undergone 100% pedestrian survey. However, in general, it is expected that as one moves away from water sources or onto steep slopes, the density of resources will decrease.

The generally high density of resources in the watersheds and the importance of protecting those resources are exhibited by the Forest making heritage resources the central management focus for much of these areas. Within the Forest portion of the Middle Jemez River Watershed, 17.5% is designated with heritage resources as the primary concern. Portions of the Upper Jemez River Watershed are also designated with heritage resources as the central concern.

9.2.3 Reference Conditions

ORV use can damage heritage resources by driving over the resources or by increasing erosion on or near resources. ORV traffic usually occurs in areas where access by road is available, and traffic is more likely in areas with gently sloping to flat terrain, as opposed to areas with steep slopes. Unfortunately, gently sloping to flat terrain is where we expect to find high densities of heritage resources. The northern portion of the Middle Jemez River Watershed contains a high density of roads and the terrain is relatively flat, thus ORV traffic is more likely to occur in this area. Correspondingly, this area has a high density of known heritage resources, and more would likely be identified with

further survey. Therefore impacts to heritage resources from ORV traffic in this area are likely significant.

Formation of user created trails by hikers and bikers cause impacts to resources through direct physical impact or by increasing erosion within or near resources. Creation of new trails usually occurs from an established access route such as an existing trail or road. In our study area, the northern portion of the Middle Jemez River Watershed contains a high density of roads, and the area between Battleship Rock and the Las Conchas fishing access contains established trails, thus these are the areas where use created trails are most likely to occur. These areas correspond to the locations of high densities of heritage resources, thus impacts from user created trails likely exist and could be significant.

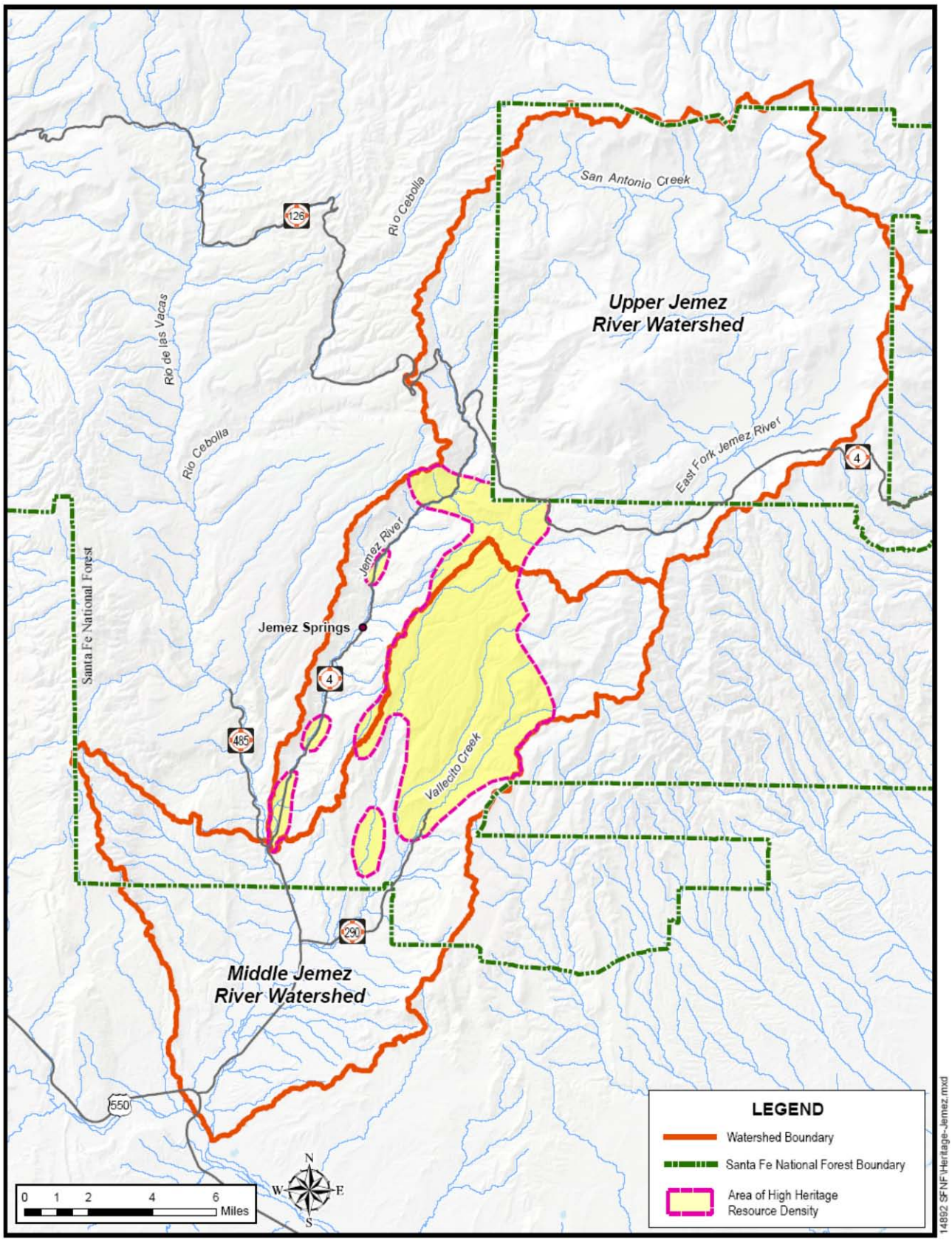
Inappropriate activities by visitors on resources can result in unintentional damage to heritage resources. The damage can occur from camping on resources, sitting or walking on fragile ruins, parking or driving over resources, using rubble from structures for campfire rings, and moving surface artifacts. These impacts occur when visitors have access to the resources, and are more likely to occur where you have the most access through roads and trails and the highest density of heritage resources; again, in the northern portion of the Middle Jemez River Watershed and the area between Battleship Rock and Las Conchas fishing access is where these types of impacts are expected.

Vandalism and theft can occur whenever people come into contact with heritage resources and can exist at different levels of intensity. These illegal activities cause direct physical impacts to the resources by destroying their physical integrity or through removal of artifacts. A causal visitor who comes upon a heritage resource and collects an artifact as a souvenir seems to not be causing much impact. However, if every person who comes across that site does the same thing, the impact to the resource is extensive. The source of this impact would likely come from people using roads, participating in ORV use, hiking, or biking. Thus the areas of impact would be the same, the northern portion of the Middle Jemez River Watershed and the area between Battleship Rock and the Las Conchas fishing access. These areas correspond to the locations of high densities of heritage resources, thus impacts from casual artifact collecting in these areas is likely.

Vandalism, or intentional destruction of a heritage resource, is usually not a planned activity, but tends to occur when a person discovers a resource and takes advantage of the opportunity. Thus the likelihood for occurrence is the same as for the casual artifact collector. Unfortunately, unlike the collection of an artifact, vandalism usually results in extensive impact to the resource from the first occurrence.

Purposeful theft of artifacts, usually for profit, is very destructive to heritage resources. It usually involves excavation of the resource, using tools ranging from hand shovels to bull dozers. Because the use of some vehicle is usually necessary, this level of illegal activity is often carried out at resources located near established roads, though the use of ORVs to access more remote resources is not unheard of. The sites that are targeted for looting activities are usually large, especially villages, which would be located on gentle terrain. Thus the targeted areas would likely be small to large village sites on the flat terrain above the Jemez River in the northern portion of the Middle Jemez River Watershed, where roads are plentiful. Besides the obvious destruction to the resource, this activity also results in increases in erosion, affecting the remaining portion of the resource and other resources nearby. If ORVs or heavy machinery is used, additional impacts would be expected through increased erosion and ground disturbance.

Figure 20. Known heritage resource densities within the watersheds.


Upper Jemez
River Watershed
Middle Jemez
River Watershed
San Antonio Creek
Rio Cebolla
Rio de las Vacas
Rio Cebolla
East Fork Jemez River
Jemez River
Jemez Springs
Vallecito Creek
Santa Fe National Forest
126
4
4
485
290
550
0 1 2 4 6
Miles
N
W
E
S
LEGEND
Watershed Boundary
Santa Fe National Forest Boundary
Area of High Heritage
Resource Density
14892 SFNF Heritage-Jemez.mxd

9.2.4 Synthesis and Interpretation

In the best of situations, Forest personnel would be able to inventory the entire Forest to identify all sites, and then maintain a thorough monitoring system to continually check on the condition of sites and implement stabilization and restoration when necessary. However, because of limitations on Forest personnel and resources, activities to protect and preserve resources must be conducted on a triage basis. To apply the limited Forest resources where they will do the most good, monitoring to identify impact situations must be focused on areas where the likelihood of impacts is greatest.

This discussion focuses on impacts to heritage resources caused by recreational visitors. The activities that have been identified as causing the impacts include ORV use, formation of user created trails by hikers and bikers, inappropriate activities on resources, and theft and vandalism. The conditions necessary that would make it likely that these activities would take place and would impact heritage resources are (1) existing access to remote areas and (2) plentiful heritage resources. For the watersheds in this study, these two conditions overlap in the northern portion of the Middle Jemez River Watershed and the area between Battleship Rock and the Las Conchas fishing access. While the types of impacts discussed above could occur anywhere in the two watersheds, the recommendations provided below should be focused on these two locations to get the most benefit from the limited personnel resources available.

Because all four activities addressed herein derive from recreational visitor use of the Forest, and monitoring is key to dealing with the impacts they cause to heritage resources, certain recommended measures are applicable to dealing with all four causes of impacts. These are presented here.

- Increase the use of volunteers to meet Forest goals and assist with implementation of these recommendations
    - Expand the Site Steward and Passports in Time programs to increase the amount of monitoring and stabilization efforts conducted
    - Establish partnerships with local communities, user groups, and tribes to expand the abilities and effectiveness of the Site Steward program
    - Establish partnerships with universities to conduct training opportunities for their students (field schools) that help meet Forest goals
    - Establish partnerships with universities and organizations to assist with implementation of these recommendations

- Give educational presentations, tours, etc. to local communities and user groups to increase appreciation and respect for heritage resources
- Place interpretive signage at popular heritage resources and at heavily impacted resources to educate visitors about the ethical and legal ramifications of damaging resources, and to increase appreciation and respect for heritage resources
- Include information on heritage resource protection, interpretation, and education in existing brochures and other written materials available at USFS offices, the Walatowa Visitor's Center, and Jemez State Monument
- Conduct surveys of visitors to gauge public sentiment about heritage resource protection and the effectiveness of these recommendations; use information to adjust efforts
- Conduct monitoring of resources to discern patterns in impacts caused to resources and to measure effectiveness of these recommendations; develop standardized monitoring forms and a monitoring database to assist with this; use information to adjust efforts
- Develop alternative resource marking techniques so that paint is no longer used; alternatives should leave less noticeable physical markers that are temporary so that attention is not drawn to resources (use GPS, or biodegradable flagging tape)
- Remove paint from trees in areas where no on-going projects are being conducted
- Monitoring should be prioritized first on resources listed on the National Register of Historic Places (NRHP), then on NRHP-eligible resources, then on other resources
- Prioritize impacted resources for stabilization or repair efforts
- Monitor and document stabilized or repaired resources as a way to evaluate different techniques used; include in the monitoring database; use information to adjust methods used
- Re-route or close roads and trails that run through resources or are causing erosion to resources located nearby
- Apply law enforcement patrols, fencing, signage, and remote sensing devices to high risk resources

OHV Use

Rationale

ORV use causes great impact to heritage resources by driving over the resources and causing increased erosion within and near resources. Efforts needs to be made to prevent ORV impacts to resources and to address impacts already caused. Using information on where ORV traffic is most likely to occur, together with location information on heritage resources, monitoring efforts can be focused on high risk resources.

Recommendations

- Implement use restrictions and road closures in high resource density areas to prevent direct impacts and erosion hazards
- Use information from patrols on where ORV traffic is occurring to adjust the focus of monitoring and restriction efforts

Formation of User-Created Trails

Rationale

These impromptu trails can directly impact resources and cause increased erosion. Using information on where hiker and biker traffic is most dense can help to focus efforts in dealing with these damaging trails.

Recommendations

- Close and rehabilitate user created trails that are located within or near heritage resources
- In areas where many user created trails are located, place signage at important resources along designated trails to educate users
- Use information from patrols on where user created trails are showing up to focus monitoring efforts

Inappropriate Activities on Resources

Rationale

These activities result in unintentional damage to resources, and are usually the result of visitors who have not been educated on appropriate treatment of resources. Education is the most effective way to reduce the occurrence of these impacts.

Recommendations

- Educated the public on the importance of heritage resources and how visitors should treat resources
- Place signage at resources that are repeatedly impacted

Vandalism and Theft

Rationale

Vandalism and illegal artifact collecting result in impacts to resources, both to their integrity and the information they contain. Because these activities are illegal, efforts must be taken to reduce their occurrence. Vandalism of resources and casual collecting of souvenir artifacts are usually not planned activities and are done on an opportunistic basis. Education is usually the best way to prevent these activities. Illegal artifact collecting for profit is a planned activity and usually requires catching the thieves "in the act". In either case, monitoring the impacts of these activities to resources can assist in the prevention of future impacts. These activities can occur at varying levels, and prevention can range anywhere from education through imprisonment.

Recommendations

- Prioritize monitoring to larger resources, such as pithouse and pueblo villages
- Move trails away from important resources
- Re-route or close roads that are located near sites that are vandalized or looted
- For resources that have been repeatedly impacted, fencing of the resource and signs should be employed; some of these resources may be candidates for data recovery excavation or research opportunities

9.3 LIVESTOCK GRAZING

9.3.1 Relevant Issues and Key Issues

Livestock grazing continues to contribute to the economy of local communities and counties located around the Jemez Watershed, however, for most permittees in northern New Mexico, grazing is generally not a commercial venture. It is primarily a means of subsistence. Grazing cattle has been attributed to establishing a sense of personal identity, prestige within the community, pride of life-style, a feeling of self-sufficiency, and a connection with the past (JNRA 1997).

Grazing and activities associated with grazing (i.e. ATV use) can result in the removal of vegetation from a watershed, including vegetation from sensitive habitats (i.e. riparian areas). Even in areas protected by established barriers can be subject to the detrimental impacts of grazing if those barriers are not maintained. Loss of vegetation leaves soils exposed to erosion by water and wind, increasing sediment loads, altering water chemistry, removing topsoil, and creating erosion channels. Key issues related to grazing within the Jemez Watershed identified using information in existing plans and monitoring reports, consultation with SFNF staff, and the experience of resource specialists for vegetation communities located in the watershed include: the loss of vegetation in sensitive areas (i.e. riparian), the loss of grazing grounds to changes in vegetation communities (high density of trees), conflicts between cattle and wildlife (i.e. elk), conflicts between cattle and recreational users, changes in water quality, visual of impacts of vegetation loss.

9.3.2 Current Conditions

Grazing within the Jemez Watershed is a socioeconomic issue. Fifteen allotments are located within, or overlap portions, of the Jemez Watershed (Figure 21). Permitees in the Jemez Mountains are generally families who depend on several sources of income and do not make their sole living from livestock production; however, a good portion of their income may come from livestock production. The average permittee with a 20 cow-calf herd will typically sell 15 yearlings annually for a gross income of about $5,500-6,000. The permittees who graze cattle in the Jemez Watershed typically reside on small ranches (<200 acres) located in the surrounding communities of Jemez Springs, Cañon, Gilman, Ponderosa, San Ysidro, Cuba, Española, Pena Blanca, Bernalillo, Rio Rancho, and Albuquerque.

Of the sixteen allotments located within and overlapping the Jemez Watershed, four comprise the majority of the watershed, making up more than 95% of the grazing area: The San Diego, Cebolla-San Antonio, V-Double Slash, and the Vallecitos (See Figure 21). The remaining percentage of the watershed is composed of several allotments that extend into the watershed boundary: The

Peralta, San Juan, Chicoma, Coyote, Las Conchas, Mesa del Medio, Ponderosa, Pine Springs, and the Youngsville. The following discussion of allotment details will focus primarily on the larger allotments contained within the Jemez Watershed.

The largest allotment, the San Diego Allotment, is grazed by approximately 262 head of cattle for a total of 2235 head months, only twenty percent of the grazing level prior to 1950. Currently, the allotment is managed under a rest rotation grazing system, where grazing duration and time of use in most grazing units are altered annually. Grazing areas in this allotment include Guadalupe Canyon, Cebolla Canyon, Lake Fork Canyon, Lake Fork Mesa, Schoolhouse Mesa, and the south side of the canyon along State Highway 126. The Cebolla-San Antonio is shared with the San Diego Allotment. The San Diego Grazing Association uses the area in the spring and the Cebolla-San Antonio permittees use it in the fall. A total of 311 head of cattle utilize this allotment from June 1 through September 30 under a deferred rotation grazing system. At the end of September, a portion of the cattle are removed from the allotment, leaving 149 head to continue to graze through October 30. The majority of grazeable rangeland within the Jemez portion of this allotment is found within the canyon bottom on the south side of State Highway 126 east of Fenton Lake and near the Horseshoe Springs area.

The V-Double Slash allotment is currently managed under a deferred rotation grazing system, with utilization in the watershed typically occurring between July and September by 148 cattle. This allotment contains a portion of the East Fork of the Jemez Wild and Scenic River and the East Fork Trail, popular fishing, swimming, hiking, dispersed camping, and cross country skiing areas. Because these areas are also accessible to cattle, some conflicts of uses may exist.

The Jemez watershed portion of the Vallecitos Allotment falls within Cat Mesa and the western slopes of Cerro Pelado. The allotment is utilized by 102 head of cattle managed under a four pasture deferred rotation system. Cattle graze the Jemez Watershed portion of the allotment between the months of June and September.

Grazing is restricted from most of the riparian areas in the watershed. The Las Conchas Allotment, which lies north of State Highway 4, is completely contained within the Jemez Watershed. The allotment is utilized from June 1 through September 30 under a deferred rotation grazing system by 25 to 27 head of cattle. The East Fork Jemez Wild and Scenic River flows through the allotment, however, the area from Las Conchas fishing site downstream to where it enters the V Double Slash Allotment is off limits to grazing. The main stem of the Jemez River and nearby slopes to the mesa tops are not grazed. With the exception of a 2 to 3 acre administrative horse pasture in La Cueva, San Antonio Creek is not grazed from San Antonio Campground to the

confluence with the East Fork of the Jemez River. Limited seasonal grazing occurs in the majority of the remaining riparian zones within the Jemez Watershed. Private land development adds additional elements concerning problems related to grazing and riparian areas. Small parcels of private pastureland are grazed along the Jemez River below Jemez Springs and San Antonio Creek, in La Cueva.

Historically, the Jemez Watershed area was heavily grazed. Today, the area is managed differently and grazing occurs at much lower levels. Grazing activities area gradually being shifted from canyons and riparian areas to upland areas. Grazing has been eliminated from 60 % of canyon and wild and scenic river areas (WSR has a few exceptions). The decision to encourage this shift was accelerated by the location of a Mexican spotted owl. Grazing was eliminated from habitat that will support the presence of this species. A section of the watershed is set aside for developed recreation only, and is off limits to grazing (See Figure 21). Due to high recreational demand and riparian vegetation concerns, grazing management in the remaining riparian areas tend to be for short durations (1-3 weeks) during the time of year when recreational use is relatively low (prior to Memorial day and after November 1). Occasionally forest users leave gates open, allowing cattle to access riparian areas during unscheduled grazing periods. This problem is most common in Fogon Canyon where, when gates are left open, cattle are able to access the riparian zone at a time when heavy dispersed camping is occurring. This creates conflicts between users and ranchers and can result in the destruction of riparian vegetation.

9.3.3 Reference Conditions

Livestock grazing has occurred in this area for over 100 years. Most have long family histories of grazing the lands that now make up these grazing "allotments" and continue to have strong ties to the area. Allotments in the Jemez Watershed, historically, have been heavily grazed. Numerous controls on livestock management have been implemented over the past decade and the amount of cattle grazed within the Jemez has diminished.

The San Diego Allotment was established in the mid-1960's when the Forest Service obtained the San Diego Land Grant. Prior to 1950 it was estimated that approximately 7,100 head of sheep, 250 head of cattle, and 100 head of horses grazed the area for a total of 11,000 head months. A 1967 watershed condition survey indicates that the allotment had been "badly abused", and grazing was eliminated from the area from 1967 to 1972. Prior to the 1970's, cattle, sheep and horses grazed the Cebolla-San Antonio Allotment. In the early 1970's the allotment was designated for grazing strictly by cattle.

The V-Double Slash Allotment was formerly the referred to as the Jemez, Paliza, San Jose, and Borrego Allotments. The portion falling within the Jemez

Watershed has been managed for cattle use as early as the 1940's. Throughout the 1970's and 1980's it was managed under a rest rotation system from June 1 through September 30. Since 1996 the permitted licensing the allotment decided voluntarily to not use the North pasture, due to heavy recreational use and associated resource damage in the meadows where the cattle historically grazed. Approximately 15 years, gap fences were installed against natural barriers to prevent the cattle from North pasture from accessing the riparian zone along the river. In 1993, one additional gap was discovered, however, where cattle could access the river through an old roadbed. (EA EFJ/WSR 1993)

The Vallecitos Allotment has been managed for cattle grazing since the 1930's. Initially, the allotment received a high degree of use from sheep and trespass horses (approximately 65 head). Up until 1983, it was managed as one grazing unit with season-long grazing from May 1 to October 31.

Historic grazing issues identified within the Jemez Watershed included the concern that there were not enough water developments to provide for grazing away from all streams or natural water sources. Forage availability was well below the potential of the area due to overly dense forest stands that limit the growth of grasses in the understory. In addition, some closed roads limited permitted access to water wells and their ability to effectively move cattle from pasture to pasture (JNRA 1997).

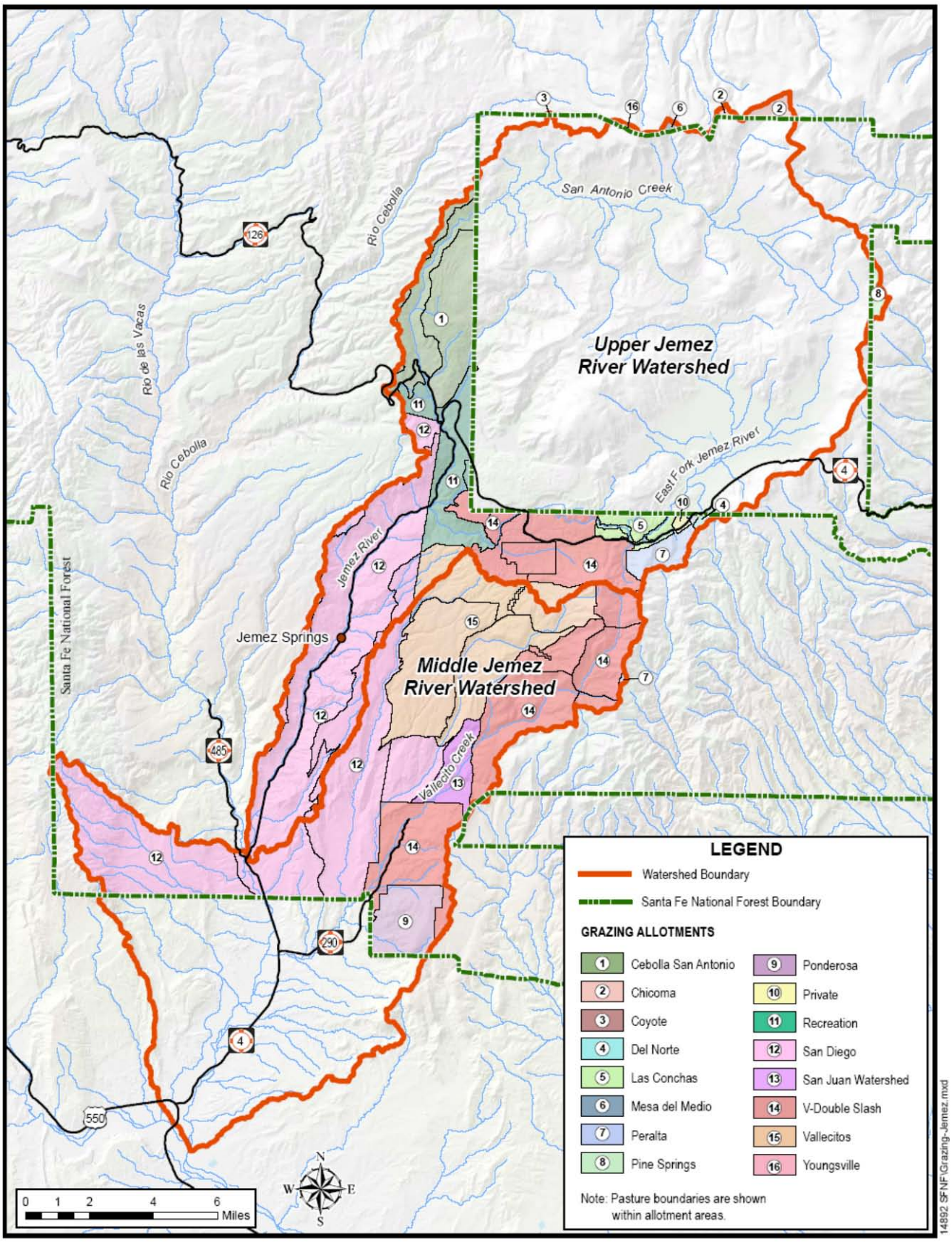


Figure 21. Livestock grazing allotments within the watersheds.

9.3.4 Synthesis and Interpretation

Livestock versus Recreation

There is a need to ensure that conflicts do not occur between recreational users and cattle.

Rationale

The Jemez Watershed is utilized by a variety of user groups, both commodity and recreation based. Occasionally conflicts occur between the different uses. Recreationists feel that their experience is being diminished by the presence of cattle in the forest or along the river. Ranchers feel that they are being forced from pursuing a life style that has been in their family for generations.

Recommendations

- When developing livestock management plans, emphasize reducing conflicts with recreationists.
- Design fences to accommodate recreation use and minimize vandalism to fence lines.
- Work closely with the permitted(s) to avoid adverse impacts or conflicts with recreation activities.
- Conduct utilization studies
- Clearly define parking and recreation areas
- Actively manage established trails and campgrounds

Domestic versus Wild

There is a need to balance the grazing requirements of domestic livestock with the nutrient needs of wild populations (i.e. Rocky Mountain elk).

Rationale

The SFNF states in its 1987 Forest Plan that its management direction should include the management of "habitat to maintain viable populations of wildlife . . . species and improve habitat for selected species" and to "coordinate habitat management with other resource activities". One species determined to be of particular interest by the FS is the Rocky Mountain elk, which competes directly with domestic cattle for browse. Elk were re-introduced into the SFNF in the 1940's and currently the population is healthy. Forage utilization problems have been created on some livestock grazing allotments and have been exacerbated on others as a result of the burgeoning elk population.

Recommendations

- Monitor/measure head of cattle within grazing allotments to ensure there is no overgrazing
- Maintain a controlled hunting program to manage elk populations
- Conduct range analysis and production utilization studies
- Provide a program of range management that emphasizes high quality range forage
- Include game and non-game habitat improvements in sale areas
- Update range analysis and development plans on all allotments
- Integrate wildlife values into all improvement projects
- Ensure that allotment fence management will meet wildlife standards for migration and passage
- Ensure that new and reconstructed livestock water developments include wildlife cover, access, and escape considerations

Erosion

There is a need to prevent erosion and the degradation of riparian areas resulting from grazing activities.

Rationale

Grazing cattle and the maintenance of herds can have detrimental impacts on vegetation in sensitive habitats if not conducted in a responsible manner. Continued cattle traffic through riparian areas, use of ATV's to monitor herds, and the potential for illegal ATV access to grazing allotments can cause significant vegetation loss and erosion. This can have detrimental impacts on streams, rivers, and wildlife populations. Grazing and ATV use in riparian areas, even in moderation, will tend to degrade the sensitive vegetation and associated channel banks.

Recommendations

- Use best management practices (BMPs) with any new construction related to allotments
- Continue to update and revise allotment management plans designed to reduce soil, water, and riparian impacts from grazing
- Attempt to exclude grazing from riparian areas
- Conduct range analysis and production utilization studies

- Monitor sensitive habitats within range allotments
- Work with the permitted to repair or replace damaged upland water developments to minimize the need for the cattle to use the river as a back-up water source.
- Continue to utilize rest-rotation grazing management techniques to protect and enhance WSR values.
- Develop and adjust Allotment Management Plans (AMPs) and Annual Operating Instructions (AOIs) as needed.
- Establish and enforce forage utilization standards for combined use by cattle and elk that maintain vegetation health and vigor, and other ecological conditions
- Enforce regulations when individuals are caught cutting fences.
- Range conditions and forage may be improved by thinning and burning areas to encourage grass and shrub regeneration.

Chapter 10
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