UPPER RIO GRANDE WATERSHED ASSESSMENT

PREPARED FOR

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

RioGrande Watershed RWEACT Emergency Action Coordination Team

COLORADO
Department of Public Health & Environment

San Luis Valley Water Conservancy District

Rio Grande Headwaters Restoration Project

COLORADO TROUT UNLIMITED

RIO GRANDE HEADWATERS LAND TRUST

COLORADO PARKS • WILDLIFE

FOREST SERVICE DEPARTMENT OF AGRICULTURE

HEADWATERS ALLIANCE

PREPARED BY

lōtic hydrological

SGM

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Acronyms

Assessment	Upper Rio Grande Watershed Assessment Project
Basin	Rio Grande Basin
BIP	Rio Grande Basin Implementation Plan
CDPHE	Colorado Department of Public Health and Environment
CDPS	Colorado Discharge Permit System
CDSS	Colorado Decision Support System
CDWR	Colorado Division of Water Resources
CGS	Colorado Geologic Society
CNHP	Colorado Natural Heritage Program
CPW	Colorado Parks and Wildlife
CWCB	Colorado Water Conservation Board
DEM	Digital Elevation Model
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
GIS	Geographic Information Systems
HA	Headwaters Alliance
HUC	Hydrologic Unit Code
M&E	Monitoring and Evaluation List
M&I	Municipal and Industrial
NAIP	National Agricultural Imagery Program
NLCD	National Land Cover Database
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
RGBRT	Rio Grande Basin Roundtable
RGHRP	Rio Grande Headwaters Restoration Project
RGNF	Rio Grande National Forest
RWEACT	Rio Grande Watershed Emergency Action Coordination Team
TAT	Technical Advisory Team
TMDL	Total Maximum Daily Load
TU	Trout Unlimited
USDA	United State Department of Agriculture
USDOI	United States Department of Interior
USFS	United States Forest Service
USGS	United States Geological Survey
WWTF	Wastewater Treatment Facility
Watershed	Upper Rio Grande Watershed

1.0 Executive Summary

The Upper Rio Grande Watershed Assessment (Assessment) was a stakeholder-driven watershed process, which encompassed the upper Rio Grande Basin (Basin) from the headwaters to the town of South Fork (**Figure 1-1**). The Assessment was conducted by the SGM, Inc. and Lotic Hydrologic Consulting Team under the guidance of the Rio Grande Headwaters Restoration Project (RGHRP) and the Upper Rio Grande Watershed Assessment Technical Advisory Team (TAT). Input and guidance from the TAT was critical to the success of the Assessment. Funding for the Assessment was provided by the Colorado Water Conservation Board (CWCB), the Rio Grande Watershed Emergency Action Coordination Team (RWEACT), and the Colorado Department of Public Health and Environment (CDPHE).

The 2001 Study, titled the Rio Grande Headwaters Restoration Project (MWH, *et. al*., 2001), evaluated the channel capacity, floodplain function, riparian habitat condition, diversion access, and channel stability for the Rio Grande from the upstream corporate limit of the Town of South Fork, Colorado to the Alamosa-Conejos County line and developed a rating criteria and overall river condition assessment by subreach. The results of this Assessment will further support the structural and non-structural measures identified in that study which aimed to fulfill the:

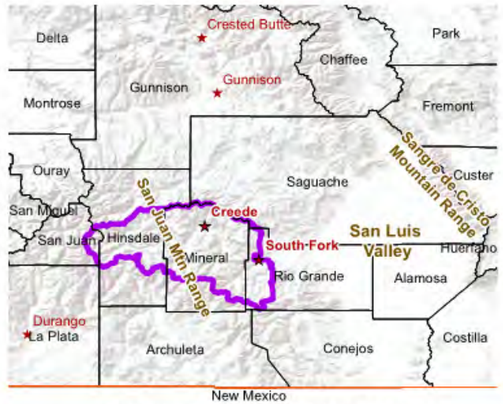
- Maintenance of channel capacity and overbank capacity;
- Protection of channel and floodplain from damage by flooding;
- Maintenance of riparian habitat;
- Delivery of Rio Grande Compact commitments; and
- Access to river for water diversion.

The Assessment, through an interactive approach with the Consulting Team and the TAT:

- Evaluated the ecological condition of the Rio Grande mainstem in the Basin, major tributaries, and upland ecosystems;
- Identified causes of concern;
- Developed a list of prioritized projects that will improve the function of uplands, aquatic, and riparian ecosystems; and
- Identified projects that involve infrastructure improvements to support recreational, environmental, agricultural, and municipal/industrial needs in the upper Rio Grande Basin.

The Consulting Team, together with the TAT, evaluated the following natural and water resources to meet the project objectives:

- **Adjacent uplands** - Adjacent uplands (associated with the riparian areas) were assessed using GIS tools and data, Google Earth images, and limited fieldwork. The upland impacts assessed included: dispersed recreation, roads, grazing and livestock trails, fire impacts, beetle kill impacts, noxious weed concentrations, residential development, mining operations, and material stockpiles. The amount and length of impact was ranked among the river segments.
- **Riparian habitat** - Riparian areas are defined as those transitional areas between upland and aquatic ecosystems. The objective of the riparian habitat assessment was to evaluate the condition of riparian habitat throughout the watershed, including its functioning condition and existing impacts. The riparian habitat was assessed using GIS tools and data and limited fieldwork.
- **Geomorphology** - Stream channel morphology and evolution were characterized through analysis of local topography, land use, land cover, patterns of hillslope erosion, wildlife or stock browsing in riparian areas, precipitation regimes, water management, and patterns of peak and low-flow discharges. The structure of the stream channel and the way that it changes through time mediate the function of many ecosystem attributes such as riparian health conditions and plays an important feedback role in controlling and maintaining channel stability over time. Development of a process-based conceptual model helped to identify locations on the landscape considered at risk for degradation. **Figure 1-2** provides a longitudinal profile along the Rio Grande mainstem depicting the various features of this analysis.
- **Infrastructure** - The objective of the infrastructure assessment was to identify significant impact points within the Rio Grande Basin, specifically impacts to aquatic and riparian conditions as well as impacts to river recreation. Watershed infrastructure was characterized using existing georeferenced datasets such as road alignments, historical and active mines, permitted water discharge locations, reservoirs, and river diversions.
- **Recreation** - A variety of recreational activities were assessed within the Basin to identify high-use areas and the associated impacts. The primary focus was river-based activities along the Rio Grande. The evaluation included development of a list of priorities based on capacity and use of facility, disturbed area within riparian zone, disturbed area outside riparian zone, facility importance, facility management practices, water quality impacts, and relevance to goals identified in the 2015 Rio Grande Basin Implementation Plan.
- **Water quality** - The objective of the water quality assessment was to collect data that will provide a baseline of conditions in the assessment boundaries. Comprehensive long term understanding of water quality in the upper Rio Grande Basin is deficient. The collection of water quality data within this assessment served as a snapshot of the Basin but was built on data collected before and after the West Fork Fire Complex in 2013. Fifteen water quality monitoring sites were established in the study area. Results from these monitoring sites indicate further data is needed to understand shifts in water quality at periods of time outside of high and low flows, as well as to understand the difference between anthropogenic and naturally occurring concentrations of heavy metals. Findings in the water quality assessment identify immediate needs at Willow Creek, near Wagon Wheel Gap, and at Elk Creek, but consistent elevated metals exist along the entire assessment area, necessitating further understanding of the system.
- **Hydrology** - The hydrology in the study area was characterized as a snowmelt-driven system, where wintertime precipitation is captured and stored in the snowpack of the San Juan Mountains and delivered via surface runoff during spring melt. The Rio Grande in Colorado is a working river that is used primarily by farmers and ranchers for irrigation. By the early 1900s, the available water supply was spoken for or fully appropriated.
  Data from the Colorado Division of Water Resources (CDWR) that documented the storage yields of the three biggest on-channel reservoirs within the study area were used for the



Southwest Colorado Vicinity Map

Figure 1-1. Project Overview and Priority Streams

hydrology analysis. Data beginning in 2004-2005 and ending in 2016 represented wet and dry years and recent hydrology in the Basin. This data was used to determine the amount of water and the flow rates being stored and, therefore, the realized departure from the natural hydrograph.

- **Aquatic habitat** - Aquatic habitat represents the interrelationship between the physical environment, the chemical processes of a watershed, and the biological communities that live there. The aquatic habitat and fisheries assessment characterized the dominant fish species of steams in the study area and identified priority streams for Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*). The fisheries on both the South Fork and the mainstem Rio Grande are in excellent condition with self-sustaining populations of wild brown trout, reflecting high quality aquatic habitat.

The TAT and project partners developed a list of priority recommendations based on the results of the resource evaluations. These recommended actions are anticipated to protect or enhance the values associated with river and watershed health. The list of priority recommendations that resulted from the assessment process follows:

1. Implement riparian restoration and streambank protection projects in areas of the watershed with local channel instabilities and degraded riparian areas.
2. Protect and restore areas of overuse from dispersed recreation through riparian restoration projects, educational campaigns and signage, management of dispersed camping sites, and the closure of unauthorized trails.
3. Enhance river recreation infrastructure and access on public land through boat ramp improvements and signage.
4. Continue channel restoration projects on Willow Creek downstream of the town of Creede and develop plans for floodplain restoration on Willow Creek upstream of the town of Creede.
5. Establish a long-term monitoring program to document changes in water quality and develop projects to address identified non-point source impacts.
6. Work with reservoir operators and stakeholders to continue existing efforts and further develop projects to enhance flows to improve downstream fisheries
7. Identify and implement projects to facilitate the reintroduction of Rio Grande cutthroat trout in streams prioritized by Colorado Parks and Wildlife.

Figure 1-2 depicts the compilation of the resource evaluations along the mainstem of the Rio Grande, specifically:

- Percent vegetation removed;
- GIS and field-verified mining, utility corridor, agriculture, dispersed recreation, road encroachment, and road crossing impacts;
- Land management in fire- and insect-impacted areas;
- Land ownership; and
- River Style

A prioritization matrix with an adjustable scoring system will assist managers in prioritizing streams for the re-introduction of Rio Grande cutthroat trout. The matrix also identifies the key sub-watersheds that scored well for potential reintroduction.

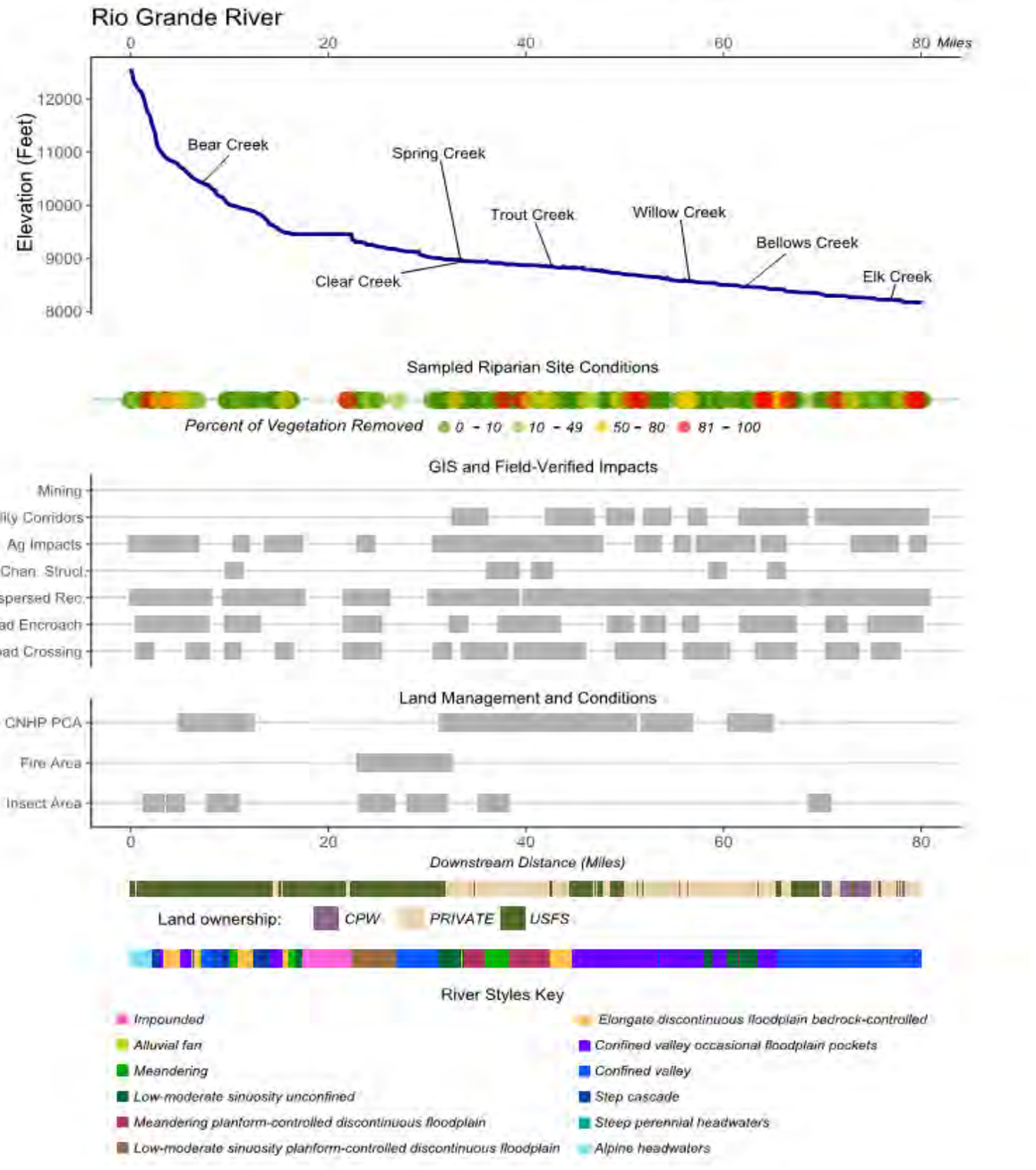


Figure 1-2. Longitudinal Profile of the Rio Grande Mainstem

2.0 Project Background and Approach

2.1 Project Background

The upper Rio Grande watershed encompasses forests, rangelands, wetlands, riparian areas, and farmlands. Currently, these ecosystems are threatened by water scarcity, erosion, insect outbreaks, wildfire and ensuing floods, decreased biodiversity, and drought. There is strong recognition by the watershed stakeholders that opportunities exist to protect and enhance the health of the watershed through projects that target improving forest resiliency, safeguarding water supplies, and protecting public safety by altering forest stand structure to include multi-aged trees and building fuel breaks to reduce fire risk. To develop, secure funding for, and implement collaborative, multi-benefit projects that address needs facing the watershed, stakeholders recognized the need to complete a comprehensive assessment.

The assessment focused on the upper Rio Grande Basin (Basin) from the headwaters to the town of South Fork (**Figure 1-1**). The Project Partners have invested, and continue to devote, countless hours and dollars into the Rio Grande Basin and are instrumental in working towards the goal of protecting and restoring the valuable resources of the watershed. This assessment built upon the knowledge of the Technical Advisory Team (TAT) and project partner groups, in addition to the past watershed studies and available Geographic Information Systems (GIS) spatial datasets' locating data and information to evaluate land use, riparian habitats and vegetation, critical habitats, stream crossings, sediment and geomorphic conditions, hydrology and stream flows, and water quality conditions.

2.1.1 Foundational Documents and Watershed Studies

The need for the assessment was recognized in the Colorado Water Plan (CWP) and the Rio Grande Basin Implementation Plan (BIP). The BIP identified critical water issues facing the Basin and proposed ways in which those issues could be addressed. As one of the top projects in the BIP, this assessment supports the following BIP goals through the evaluation of the Basin's vital natural and water resources. The protection of these resources is critical to sustaining the agricultural, municipal and industrial (M&I), environmental and recreational, and water administration in the Basin:

- ✓ Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watersheds by focusing on the watershed health and ecosystem function ***(Basin Goal #1)***.
- ✓ Operate, maintain, rehabilitate, and create necessary infrastructure to meet the Basin's long-term water needs, including storage ***(Basin Goal #4)***.
- ✓ Support the development of projects and methods that have multiple benefits for agriculture, municipal and industrial, and environmental and recreational water needs ***(Basin Goal #6)***.
- ✓ Meet new demands for water, to the extent practicable, without impacting water rights and compact obligations ***(Basin Goal #7)***.
- ✓ Make progress toward meeting applicable water quality standards throughout the Basin ***(Basin Goal #9)***.
- ✓ Promote water management and administration practices that are adaptive, flexible, and responsive to optimize multiple benefits ***(Basin Goal #10)***.
- ✓ Protect, preserve, and enhance terrestrial and aquatic wildlife habitats throughout the Basin ***(Basin Goal #11)***.
- ✓ Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats within the context of existing water rights and compact obligations (***Basin Goal #13***).
- ✓ Maintain and enhance water-dependent recreational activities (***Basin Goal #14***).

Although the existing conditions are not well documented throughout the watershed, numerous studies served as the basis for this project including, but not limited to:

- Rio Grande Basin Implementation Plan (BIP) (Rio Grande Basin Roundtable (RGBRT) & DiNatale Water Consultants, 2015)
- Rio Grande Headwaters Restoration Project Report (MWH, *et. al*, 2001)
- Rio Grande Natural Area River Condition Assessment (Riverbend Engineering, 2016)
- A Classification of Riparian Plant Associations of the Rio Grande and Closed Basin Watersheds, Colorado (Kittel, *et. al.*, 1999)
- USDA. Forest Service. Final Environmental Impact Statement for the Revised Land and Resource Management Plan, Rio Grande National Forest
- USDA. Forest Service. Update to the Biological Assessment and Biological Evaluation of the 1996 Rio Grande National Forest Revised Land and Resource Management Plan in Support of the Proposed Environmental Assessment to Add MIS. Rio Grande National Forest. April 2003
- USDA Forest Service. The Rio Grande National Forest Plan: Proposed Action (USFS, 2016)
- A Framework for a Restoration Vision for the Rio Grande (Tetra Tech, 2003)

Additional key references used in the analysis are also listed in each resource section.

2.1.2 Technical Advisory Team

The Assessment was prompted and organized by the TAT, which included partners from state and federal agencies, water user groups, and local non-profit organizations. The TAT aided in the development of the resource evaluations by providing guidance and review of the work. Input from the TAT was critical to the success of the assessment. The assessment project team members are listed in **Table 2-1**.

2.2 Project Assessments and Resource Evaluations

Six resources were evaluated as part of this assessment that supported the prioritization of future protection and rehabilitation needs for the watershed and the BIP goals:

- Riparian habitat and adjacent uplands
- Geomorphology
- Recreation
- Infrastructure
- Aquatic habitat
- Water quality
- Hydrology

Table 2-1. Project Team Members

Name	Project Role
SGM and Lotic Hydrological Consulting Team	
❖ Cindy Adams	❖ Riparian Habitat and Adjacent Uplands
❖ Angie Fowler	❖ Project Manager
❖ Kelly Haun	❖ Riparian Habitat, Adjacent Uplands, Recreation, Infrastructure
❖ Steve Kirk	❖ GIS Coordination
❖ Brendon Langenhuizen	❖ Recreation and Infrastructure
❖ Seth Mason	❖ Geomorphology/Asst. Project Manager/Riparian Habitat and Adjacent Uplands
❖ Dave Mehan	❖ Riparian Habitat and Adjacent Uplands
Technical Advisory Team	
❖ Andréa Bachman	❖ Rio Grande Headwaters Restoration Project
❖ Rick Basagoitia	❖ Colorado Parks and Wildlife
❖ Kristine Borchers	❖ Rio Grande Watershed Emergency Action Coord. Team
❖ Dan Dallas	❖ U.S. Forest Service
❖ Heather Dutton	❖ San Luis Valley Water Conservancy District
❖ Jeremy Gallegos	❖ Colorado Parks and Wildlife
❖ Ivan Geroy	❖ U.S. Forest Service
❖ Guinevere Nelson Freer	❖ Headwaters Alliance
❖ Allen Law	❖ Rio Grande Headwaters Land Trust
❖ Diana McGinn	❖ U.S. Forest Service
❖ Judi Perez	❖ U.S. Forest Service
❖ Emma Reesor	❖ Rio Grande Headwaters Restoration Project
❖ Steve Russell	❖ Rio Grande Headwaters Restoration Project
❖ Kevin Terry	❖ Trout Unlimited
❖ Vaughn Thacker	❖ U.S. Forest Service
❖ Estevan Vigil	❖ Colorado Parks and Wildlife
❖ Martha Williamson	❖ U.S. Forest Service
❖ Brent Woodward	❖ Colorado Parks and Wildlife

2.3 Priority Streams

The stream reaches included in the assessment were identified by the TAT and project partners at the beginning of the assessment process. These “priority streams” generally represent significant tributaries within the upper Rio Grande watershed. Additionally, stream reaches were selected based on the level of human related impacts coupled with the managerial ability to improve stream condition. These priority streams are shown in **Figure 1-1**.

2.4 Rio Grande Watershed

The upper Rio Grande Basin is in south central Colorado and encompasses roughly 7.2% of the state’s land (approximately 7,500 square miles). Its borders are defined by the Colorado–New Mexico state line to the south, the La Garita range to the north, the San Juan Mountains and Continental Divide to the west, and the Sangre de Cristo and the Culebra Mountains to the east. Snowmelt runoff and summer storms provide a majority of the water supply to the headwaters in the surrounding mountains. Streams and rivers deliver water from the mountains to the San Luis Valley (the Valley). The average elevation of the Valley floor is around 7,500 feet and receives an average annual precipitation of less than eight inches. The land ownership within the watershed is a mix of public and private land with most of the headwaters streams in the Rio Grande National Forest (RGNF). In contrast, much of the land on the Valley floor is privately owned and supports a productive agricultural economy.

2.5 Upper Rio Grande Watershed Assessment Area (Study Area)

The study area for the assessment included the upper Rio Grande watershed from the headwaters of the Rio Grande to the town of South Fork. The Assessment area is approximately 1,126 square miles (720,573 acres). The town of Creede is the only other town located in the study area. The study area is in portions of five counties: San Juan, Saguache, Hinsdale, Mineral, and Rio Grande. The study area encompassed approximately 680,927 square miles (1,064 acres) of United States Forest Service (USFS) lands and approximately 304 square miles (194,486 acres) of wilderness within the USFS lands. Portions of La Garita Wilderness and Weminuche Wilderness are also located in the study area. Private lands within the assessment area mainly occur along portions of the Rio Grande, South Clear Creek, (West) Trout Creek, South Fork of the Rio Grande, and West Willow Creek as well as around the towns of Creede and South Fork. Much of the private lands are used for agriculture, livestock grazing, or mining.

Much of the study area has been recently affected by forest fires, namely the Million Fire of 2002, Stream Lake Fire of 2013, and the West Fork Fire Complex of 2013. The West Fork Fire Complex includes both the Papoose Fire and the West Fork Fire. Throughout this document, any references to pre- or post-fire refer to these fires. A map of these fires can be found in **Figure 3-3**.

2.6 Concerns and Values at Risk

The TAT identified the following values at risk during the project kickoff meeting. These values were considered in the prioritization of the recommended projects presented in the assessment and recommendations sections.

- Watershed health
- Water quality
- Recreation
- Wetlands
- Water quantity/available flows

The approach and data considered for each resource evaluation are discussed in individual sections of this report.

3.0 Adjacent Uplands Assessment

3.1 Objective

The adjacent uplands assessment evaluated the upland conditions in the watershed and identified land use activities, ecological conditions, and disturbances that have an impact on these areas.

3.2 Approach and Methodology

Upland areas were evaluated using a combination of methodologies including: 1) review existing data; 2) conduct desktop analysis; and 3) perform fieldwork (limited). The RGNF data depicting the present riparian communities, slope, aspect, other site factors, and land use/impacts; GIS spatial databases; and US Geological Survey (USGS) topography were also used to identify existing vegetation and ecotypes, the presence of beetle kill and burn areas, slope, aspect, land use activities, ecological condition, livestock grazing, and infrastructure features (outfalls, roadways, and development). The adjacent uplands assessment results are described by the potential impacts to riparian communities due to insect kill and fire impacts, presence of weeds, soil types and soil erosivity potential. **Table 3-1** lists the key literature and datasets used for the uplands assessment.

Areas of significant upland disturbance were prioritized, and additional factors were considered to identify upland areas with a high risk for hazards and inform the other resources evaluated as part of this assessment.

Table 3-1. Key Literature and Datasets Used for the Upland Areas

Existing Datasets	*New and Derived Data*	*Reports*

❖ US Geological Survey (USGS) topography
❖ NRCS Web Soil Survey (2016)
❖ Google Earth
❖ USFS
  ❖ Roads
  ❖ USFS Boundaries
  ❖ Wilderness Boundaries
  ❖ Fire Complex Burn Areas
  ❖ Grazing Allotments
  ❖ Slope/Aspect
  ❖ Noxious Weed Mapping
  ❖ Vegetation Communities
	❖ Number of upland impacts by priority stream
	❖ Percent of vegetation communities impacts by fire and insect kill
	❖ Soil Erosion Potential in watershed based on NRCS soil data
	❖ Fire severity-based sediment risk in the watershed
	  ❖ At Risk Infrastructure Values based on Upland Conditions in the watershed
	  ❖ At-Risk Ecological Values from Upland Conditions based on relative fire-based sediment risk
		❖ USDA NRCS Web Soil Survey Soil Map Unit Descriptions

3.2.1 Vegetation Community Description

The USFS maps and data served as the primary sources of information for the upland vegetation communities and uplands assessment. **Figure 3-1** depicts the fifteen general upland vegetation communities in the watershed. **Table 3-2** lists these vegetation communities and provides information on the area, average elevation, and average slope of each type within the watershed. **Table 3-3** lists the dominant plant species within these communities. The US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) vegetation code, scientific name, common name, native status, and lifeforms are also listed in this table.

3.2.1.1 Vegetation Communities

The most common plant communities within the watershed include mountain grassland, spruce-fir forest, alpine vegetation, and aspen forest/aspen forest with <100% hardwood vegetation communities. These communities comprise 68% of the upland communities in the watershed and 65% of the total watershed area. Below is a summary of the various vegetation types and their dominant species within the communities and listed from largest area to smallest area. See also **Table 3-2** and **Table 3-3** for more details.

- The mountain grassland community is dominated by Carex species (sedges), Deschampsia cespitosa (tufted hairgrass), Festuca arizonica (Arizona fescue), and Bromus marginatus (mountain brome).
- The spruce-fir forest is dominated by Abies lasiocarpa (subalpine fir), Picea engelmannii (Engelmann spruce), Populous tremuloides (quaking aspen), and Pinus aristata (bristlecone pine).
- The aspen forest and aspen forest with <100% hardwood vegetation communities are dominated by quaking aspen, Engelmann spruce, subalpine fir, Abies concolor (white fir), and bristlecone pine.
- The dominant species in the alpine vegetation community include sedges, tufted hairgrass, Festuca thurberi (Thurber's fescue), and willows.
- The dominant species in the mixed conifer forest–cool moist and mixed conifer forest warm-dry vegetation communities include Pinus contorta (lodgepole pine), Pseudotsuga menziesii (Douglas fir), and quaking aspen. Both communities have been heavily impacted by beetle kill, and to a lesser extent, by forest fires.
- The dominant species in the bristlecone pine/limber pine forest vegetation community include bristlecone pine, Pinus flexilis (limber pine), Douglas fir, and quaking aspen.
- The dominant species in the ponderosa pine forest vegetation community include Pinus ponderosa (ponderosa pine) and Douglas fir.
- The dominant species in the mountain shrubland vegetation community includes Amelanchier (service berry), Symphoricarpos albus (common snowberry), and Lonicera involucrate (twinberry honeysuckle) with an understory like the mountain grassland community.
- The dominant species in the non-riparian willow vegetation community includes Salix spp. (willow), plainleaf willow, and shortfruit willow.
- The dominant species in the sagebrush shrubland vegetation community includes Artemisia tridentata (big sagebrush) and shortfruit willow.
- The dominant species in the lodgepole pine forest vegetation community includes lodgepole pine and quaking aspen.
- The dominant species in the ponderosa pine forest vegetation community include Pinus ponderosa (ponderosa pine) and Douglas fir.

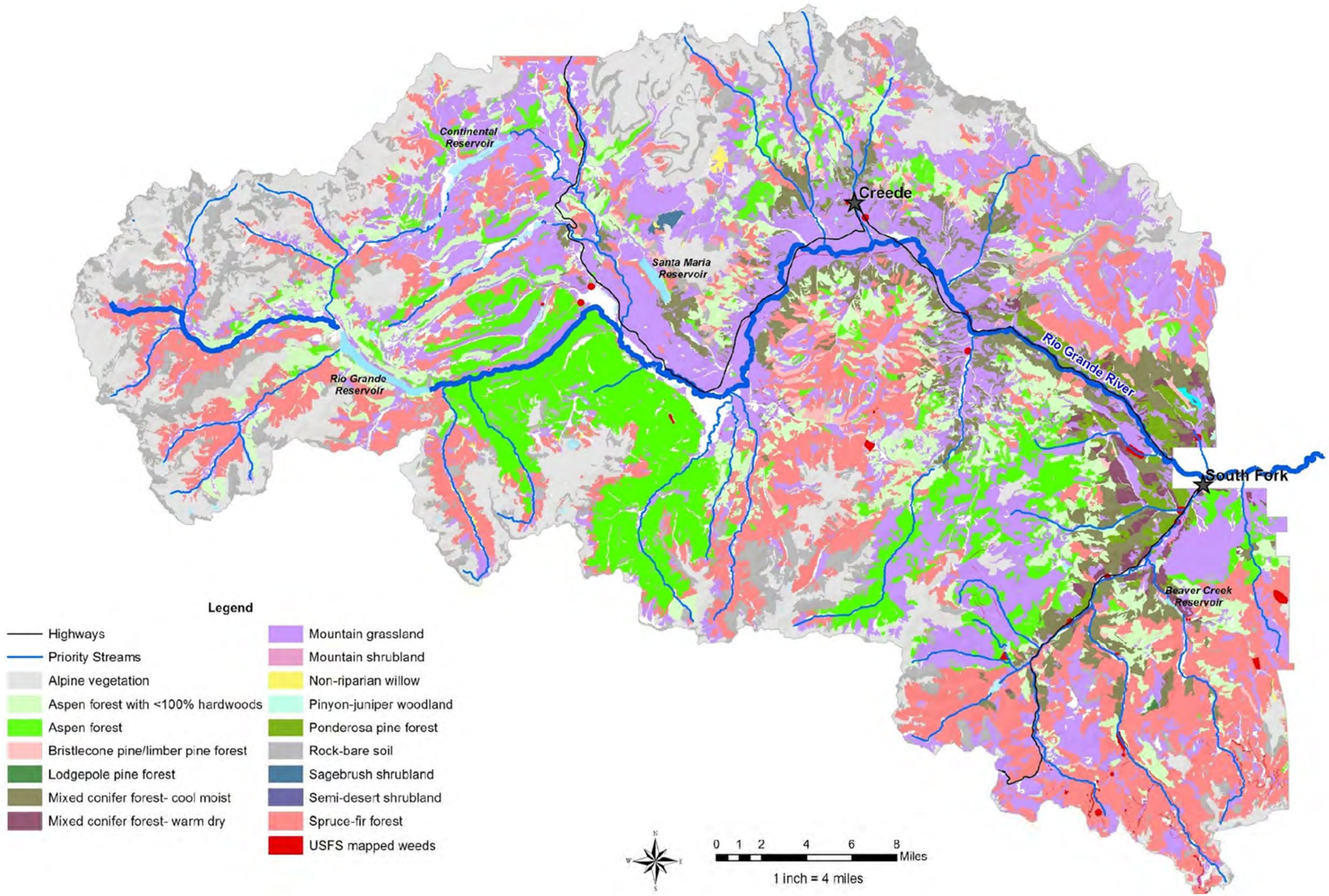


Figure 3-1. Upland Vegetation Communities in Watershed

Table 3-2. Upland Vegetation Communities in Watershed

USFS Local Type Code	Vegetation Community	Number of Acres in Watershed Pre-fires	Number of Acres in Watershed Post-fires*	Percent of Vegetation Community in Watershed	Average Elevation (Feet Above Sea Level)	Average Slope (%)
TSF	Spruce-fir forest	183,129	146,379	19.4%	10,707	32
MTGRA	Mountain grassland	181,524	181,524	24.1%	10,327	26
ALP	Alpine vegetation	120,050	120,050	15.9%	11,949	25
TAA-SW	Aspen forest with < 100% hardwoods (softwoods present)	89,776	70,809	9.4%	10,278	33
NRS	Rock-bare soil	59,950	59,950	8.0%	11,274	45
TMC-CM	Mixed conifer forest -- cool-moist	37,476	36,862	4.9%	9,408	38
TAA	Aspen forest	18,548	76,080	10.1%	10,384	34
TBC-LI	Bristlecone pine/limber pine forest	7,646	7,597	1.0%	10,502	52
TPP-PP	Ponderosa pine forest	8,001	7,445	1.0%	8,914	37
TMC-WD	Mixed conifer forest -- warm-dry	6,357	5,761	0.8%	9,005	34
MTSHR	Mountain shrubland	1,061	1,061	0.1%	10,622	28
UP-SWI	Non-riparian willow	983	983	0.1%	11,115	18
SSA	Sagebrush shrubland	461	461	0.1%	11,484	6
TLP	Lodgepole pine forest	108	108	0.01%	10,114	19
DS_GRA	Semi-desert grassland	96	96	0.01%	9098	37
TPJ	Pinyon-juniper woodland	118	118	0.02%	9051	41

*Vegetation Communities- TSF, TAA-SW, MTC-CM, TBC-LI, TPP-PP, TMC-WD post fire are now Aspen Forest.

Table 3-3. Dominant Vegetation Community Species List

NRCS Plants Symbol	Scientific Name	Common Name	Native Status	Lifeform
ARTR2	*Artemisia tridentata*	Big sagebrush	Native	Perennial
DECA18 DECE	*Deschampsia caespitosa*	Tufted hairgrass	Native	Perennial
FETH	*Festuca thurberi*	Thurber's fescue	Native	Perennial
KOMY	*Kobresia myosuroides*	Bellardi bog sedge	Native	Perennial
Salix	*Salix spp.*	Willow	Native	Perennial
SAPL2	*Salix planifolia*	Diamondleaf willow	Native	Perennial
FEAR2	*Festuca arizonica*	Arizona fescue	Native	Perennial
BROMU	*Bromus inermis*	Brome grass	Introduced	Annual
POTR5	*Populus tremuloides*	Quaking aspen	Native	Perennial
PIEN	*Picea engelmannii*	Engelmann spruce	Native	Perennial
ABLA	*Abies lasiocarpa*	Subalpine fir	Native	Perennial
PIAR	*Pinus aristata*	Bristlecone pine	Native	Perennial
ABCO	*Abies concolor*	White fir	Native	Perennial
PSME	*Pseudotsuga menziesii*	Douglas fir	Native	Perennial
PIFL2	*Pinus flexilis*	Limber pine	Native	Perennial
PICO	*Pinus contorta*	Lodgepole pine	Native	Perennial
PIPO	*Pinus ponderosa*	Ponderosa pine	Native	Perennial
PIPU	*Picea pungens*	Blue spruce	Native	Perennial
SABR	*Salix brachycarpa*	Shortfruit willow	Native	Perennial

3.2.2 Soils

Data and maps from the USDA NRCS -- Conejos, Hinsdale, Mineral, Rio Grande, Saguache, and San Juan Counties Soil Survey Area supported the characterization of the existing soils in the watershed and includes 58 soil map units (**Table 3-4**). The top 10 soil map units by percent area comprise 62% of the study area and include:

- Frisco-Agneston association, 5 to 50% slopes
- Cryoboralfs-Rock outcrop complex, 35 to 75% slopes
- Seitz cobbly loam, 15 to 60% slopes
- Cryumbrepts-Rock outcrop-Rubble land complex, 20 to 80% slopes
- Leighcan-Frisco association, 5 to 60% slopes
- Rock outcrop and Rubble land
- Leighcan-Endlich association, 2 to 50% slopes
- Endlich-Hechtman association, 5-60% slopes
- Frisco-Scout association, 15 to 60% slopes
- Mirror-Teewinot association, 8 to 45% slopes

There are 12 hydric soil map units in the watershed and a list of the dominant hydric soil map units near the streams include:

- Cryaquolls-Cryoborolls association, 0 to 20% slopes
- Cryochrepts-Rock outcrop association, 5 to 70% slopes
- Cryohemists-Cryaquolls association, 0 to 12% slopes
- Bross, moist-Mirror association, 10 to 50% slopes

These soils are generally located in the uplands areas and not along the priority streams. The soil texture in the upper 9 – 12 inches of the soil profile is characterized as cobbly loam to cobbly silt or sandy loam. Note the soil profile is made up of soil horizon which typically differ in color, texture, structure and thickness.

3.2.2.1 Soil Erosivity

Many factors drive soil erosivity, including internal factors like texture and clay content, as well as external factors such as slope angle, vegetative cover, and the general rockiness of terrain. Various state and federal programs have inventoried soil conditions throughout Colorado, describing texture and composition, as well derived values such as the k-factor. A soil's k-factor is its erodibility factor; higher k-factors indicate relatively higher propensity for erosion. Soil erosivity due to water is measured in two ways: how susceptible the soil is to sheet and rill erosion (k-factor) and the estimated maximum average annual rate of soil loss in tons per acre that can occur without affecting crop productivity (T factor). K-factors range from 0.02 for the least erodible soils to 0.64 for the most erodible soils (NRCS). Most soils in the study area have a moderate to low soil erodibility based on the k-factor. All the dominant soil map units have a k-factor less than 0.25. The T factor ranges from 1 ton/year for the most fragile soils to 5 tons/year for soils that can sustain erosion without significant loss of productive potential. Most of the soils in the study area have a T factor of 4 or greater, meaning the soils can sustain more erosion without losing significant productive potential. Approximately twenty percent of the soil map units, both in number of soil map units and acres in watershed, are more susceptible to losing productive soil material by erosion, with a T factor of 1 or 2. These soils are highlighted in green in **Table 3-4**.

Table 3-4. Soil Map Units within the Watershed

NRCS Soil Map Unit Symbol	*# of Acres in Watershed*	*% of Watershed*	*NRCS Soil Map Unit Name*
140	92,708	12.3%	Frisco-Agneston association, 5 to 50% slopes
125	68,566	9.1%	Cryoboralfs-Rock outcrop complex, 35 to 75% slopes
165	57,157	7.6%	Seitz cobbly loam, 15 to 60% slopes
129	41,957	5.6%	Cryumbrepts-Rock outcrop-Rubble land complex, 20 to 80% slopes
150	40,301	5.4%	Leighcan-Frisco association, 5 to 60% slopes
162	39,581	5.3%	Rock outcrop and Rubble land
149	33,275	4.4%	Leighcan-Endlich association, 2 to 50% slopes
137	32,487	4.3%	Endlich-Hechtman association, 5 to 60% slopes
142	31,992	4.3%	Frisco-Scout association, 15 to 60% slopes
154	28,348	3.8%	Mirror-Teewinot association, 8 to 45% slopes
*127	25,347	3.4%	Cryochrepts-Rock outcrop association, 5 to 70% slopes
*124	23,913	3.2%	Cryaquolls-Cryoborolls association, 0 to 20% slopes
*111	21,702	2.9%	Bross, moist-Mirror association, 10 to 50% slopes
155	17,799	2.4%	Pergrin-Agneston-Hechtman association, 15 to 60% slopes
153	17,397	2.3%	Mirror-Bross association, 8 to 35% slopes
168	14,688	2.0%	Seitz-Winz association, 8 to 60% slopes
*128	13,700	1.8%	Cryohemists-Cryaquolls association, 0 to 12% slopes
159	12,081	1.6%	Quander-Bowen association, 15 to 60% slopes
126	11,347	1.5%	Cryoborolls-Cryochrepts-Rock outcrop complex, 15 to 80% slopes
157	11,020	1.5%	Quander stony loam, 5 to 60% slopes
113	9,784	1.3%	Bushvalley-Rock outcrop complex, 10 to 90% slopes
106	9,711	1.3%	Bachelor-Lymanson complex, 8 to 50% slopes
174	9,016	1.2%	Youga-Gateview complex, 3 to 25% slopes
166	8,722	1.2%	Seitz cobbly loam, dry, 15 to 60% slopes
160	7,784	1.0%	Quander-Bushvalley association, 15 to 60% slopes
115	6,054	0.8%	Cabin fine sandy loam, 5 to 15% slopes
152	5,982	0.8%	Leighcan-Frisco complex, 5 to 35% slopes, very bouldery
141	5,619	0.7%	Frisco-Mulgon association, 2 to 35% slopes
112	5,419	0.7%	Bushvalley-Bowen association, 20 to 60% slopes
169	5,346	0.7%	Tellura-Gothic association, 2 to 45% slopes
108	5,045	0.7%	Bowen, cool-Agneston association, 15 to 50% slopes
117	5,004	0.7%	Cirqueland
W	4,549	0.6%	Water
138	4,037	0.5%	Frisco very stony loam, 5 to 35% slopes
*116	4,035	0.5%	Cabin-Silas association, 0 to 15% slopes
134	3,571	0.5%	Embargo-Tellura association, 12 to 50% slopes
*139	3,108	0.4%	Frisco very stony loam, slumped slopes, 5 to 60% slopes
*123	2,614	0.3%	Cryaquepts, 0 to 6% slopes
*161	2,057	0.3%	Quander-Cryaquolls-Cryohemists association, 1 to 30% slopes
114	1,744	0.2%	Bushvalley-Rogert complex, 12 to 50% slopes
*105	1,269	0.2%	Aquic Cryofluvents, 0 to 5% slopes

NRCS Soil Map Unit Symbol	# of Acres in Watershed	% of Watershed	NRCS Soil Map Unit Name
122	1,017	0.1%	Cowdrey-Gothic, cool association, 2 to 35% slopes
171	920	0.1%	Youga-Gateview complex, 3 to 25% slopes
170	851	0.1%	Tellura, moist-Seitz association, 15 to 60% slopes
167	758	0.1%	Seitz, cool-Embargo, cool-Tellura association, 15 to 60% slopes
158	543	0.1%	Quander stony loam, cool, 15 to 50% slopes
102	468	0.1%	Alamaditas-Posant association, 15 to 60% slopes
143	411	0.1%	Gelkie fine sandy loam, 2 to 7% slopes
*135	341	0.0%	Embargo-Tellura association, moist, 5 to 45% slopes
110	269	0.0%	Bowen-Winnemucca association, 5 to 45% slopes
109	266	0.0%	Bowen, cool-Bushvalley association, 35 to 60% slopes
107	155	0.0%	Booneville-Clayburn association, 5 to 40% slopes
131	99	0.0%	Curecanti-Delson association, 2 to 35% slopes
148	98	0.0%	Jodero loam, 2 to 12% slopes, gullied
133	82	0.0%	Dumps, mine
144	38	0.0%	Gothic-Bowen complex, 5 to 60% slopes
136	18	0.0%	Empedrado-Curecanti association, 2 to 25% slopes
*145	17	0.0%	Gothic-Cryaquepts association, 3 to 30% slopes
*147	8	0.0%	Haploborolls-Haplaquolls association, 1 to 8% slopes

*Hydric soil

Hydric soils that have the largest surface area by streams

T-factor of 2 or less = fragile soil

Susceptible to wind erosion

Another measure of soil erosion potential is susceptibility to wind erosion, as measured by the "wind erodibility group". Most of the soil map units are not very susceptible to wind erosion. A value of 1 is for soils that are more susceptible, and of 8 or higher is for soils that are least susceptible to wind erosion. There are three soil map units that are more susceptible to wind erosion, and those include Cabin fine sandy loam, 5-15% slopes, Gelkie fine sandy loam, 2-7% slopes, and Cabin-Silas association, 0-15% slopes. These soils are highlighted in blue in **Table 3-4** and had a wind erodibility group number of 3. Approximately 1% of soils, measured by number of acres, are more susceptible to wind erosion. The slope data and information for the Study Area are depicted in **Figure 3-2**. The soil map units that are more susceptible to wind, water, or soil loss are shown in **Figure 3-3** and highlighted in blue and green in **Table 3-4**. Overall, approximately 21% of the soil map units in the study area are more susceptible to erosion.

3.3 Adjacent Uplands Assessment Results

The upland areas near the identified priority streams and mainstem of the Rio Grande were evaluated as part of the preliminary riparian area desktop analysis and fieldwork. Twenty-seven of the 35 priority streams were identified as having upland impacts. **Table 3-7** shows the priority stream segment, number of upland impacts, and description of identified impacts documented during the fieldwork. Dispersed recreation, roads, and livestock trails constitute most of the upland impacts near the riparian corridors. Other upland impacts include residential development, junk piles, abandoned railroad cars, mining operations, and material stockpiles. The Rio Grande, North Clear Creek, and Miners Creek drainages had the most upland impacts. It should be noted that vegetation removed and/or fragmented associated with each impact varies.

The USFS mapped areas of beetle kill, forest fires (**Figure 3-5**), noxious weeds, and limits of the upland vegetation communities were overlain to estimate the percent of the communities impacted by insects, forest fires, and weeds. The results are provided in **Table 3-5**. The combined information considered as part of this assessment also provided data for an evaluation of the fire severity within the watershed.

3.3.1.1 Insect Kill Impacts

All the vegetation communities in the study area are affected by insect kill to a relatively high degree. Spruce-fir forest, mixed conifer forest (warm dry), ponderosa pine forest, bristlecone pine/limber pine forest, aspen forest with less than 100% hardwoods, and non-riparian willow communities have greater than 90% of the mapped community within the insect kill boundary. **Figure 3-5** depicts the areas of insect or disease impacts.

3.3.1.2 Fire Impacts

Aspen forest with less than 100% hardwoods, spruce-fir forests, mountain grasslands, and mixed conifer forest (warm dry) had 20% or more of the vegetation community impacted by fire. **Figure 3-5** depicts the areas fire impacts.

3.3.1.3 Weed Impacts

The USFS mapped 2,217.7 acres of noxious weeds and concluded that there are 25 weed species present within the watershed. These noxious weeds are present in all vegetation communities except non-riparian wetland and sagebrush shrubland. **Table 3-6** shows the noxious weed types and number of mapped occurrences within the watershed. Broadleaved pepperweed, Canada thistle, hardhead/Russian knapweed, whitetop, field bindweed, and black henbane are the most common weeds and all have over 1,000 mapped occurrences.

3.3.1.4 Fire Severity-Based Sediment Risk

Fire severity-based sediment risk is influenced by the vegetation condition class of the landscape, general soil type cohesion, and a combined measure of hillslopes steepness and length. Areas dominated by vegetation that is prone to uncharacteristic wildfire, extensive steep slopes, and erosive soil types are considered to have a higher relative fire/sediment production risk.

Broad-scale alterations of historical fire regimes and vegetation dynamics have occurred in many landscapes in the U.S. through the combined influence of land management practices, fire exclusion, ungulate herbivory, insect and disease outbreaks, climate change, and invasion of non-native plant species. Vegetation Condition Class (VCC) provides an indication of the amount of departure between current and historic vegetation cover type and successional stage. This is a useful metric because it indicates where vegetation succession class distribution does not match that expected under historic disturbance regimes. In ecosystems that rely on wildfire as their primary disturbance process, a highly departed VCC frequently indicates that stands are uncharacteristically dense and these are therefore susceptible to higher intensity and severity fires than would be expected under historic conditions. Ecosystems that evolved with long disturbance return intervals, high elevation spruce-fir for example, generally show less departure. This means that wildfires in these systems are expected to have characteristic intensity, severity and post-fire effects. Areas with higher departure scores may be candidates for vegetation treatments aimed at restoring vegetation composition and structure in order to mitigate the potential for uncharacteristic fire effects. Although a low departure score is not synonymous with anticipating low-intensity wildfire, it does mean that vegetation treatments in these areas should focus on mitigating wildfire impacts to specific values at risk rather than on broad-scale restoration. **Figure 3-6** shows the VCC for the study area. The majority of the watershed is in VCC II.A, low to moderate departure, with portions of II.B and I.A.

Soil erosivity is complex and driven by texture, clay content, slope angle, and cover. See Section 3.2.2.1 for an overall discussion of soil erosivity. In addition to erosion propensity (the ease by which individual soil particles detach), slope steepness and slope length also play a large roll. A combined slope angle-slope length index was created using GIS terrain models. **Figure 3-4** overlays the moderate to high soil erosion potential with moderate to high slopes in the study area, highlighting areas of higher risk for sediment production during fire.

These three factors—vegetation condition class, soil erosivity, and slope angle-length—were aggregated across the study area, to help understand fire/sediment production risk for the Basin. In general, the analysis identified that the mid-to-high elevation subwatersheds in the southern and central portions of the upper Rio Grande assessment area are at a higher fire/sediment production risk. Empirical knowledge of the region supports this, as these areas tend to have long steep slopes, more erosive soil types, and a tendency for thick forest cover from mixed conifer and ponderosa pine in the lower elevations and spruce/fir in upper elevations. Middle and lower elevation sub-basins near the Rio Grande mainstem and on the eastern end of the assessment area feature large areas of steppe-like and scrub/shrub terrain and shorter or less steep slopes. While these vegetation types are not immune to wildfire impacts, smaller frequent fires that burned prior to anglo-settlement were unlikely to reach stand-replacement severities. The analysis emphasizes the relationship between upland watershed conditions and their potential impacts to ecological and human values of concern at various locations. As the watershed remains largely undeveloped, upland forest and range conditions are often the primary driver of potential aquatic stressors. Combining vegetation condition class, soil erosivity, and slope highlights areas of the study area that require further research on fire potential and potential associated risks from fire. In 2019, the USFS plans to begin a more thorough fire risk modeling effort, which will provide a detailed analysis of fire risk across the study area.

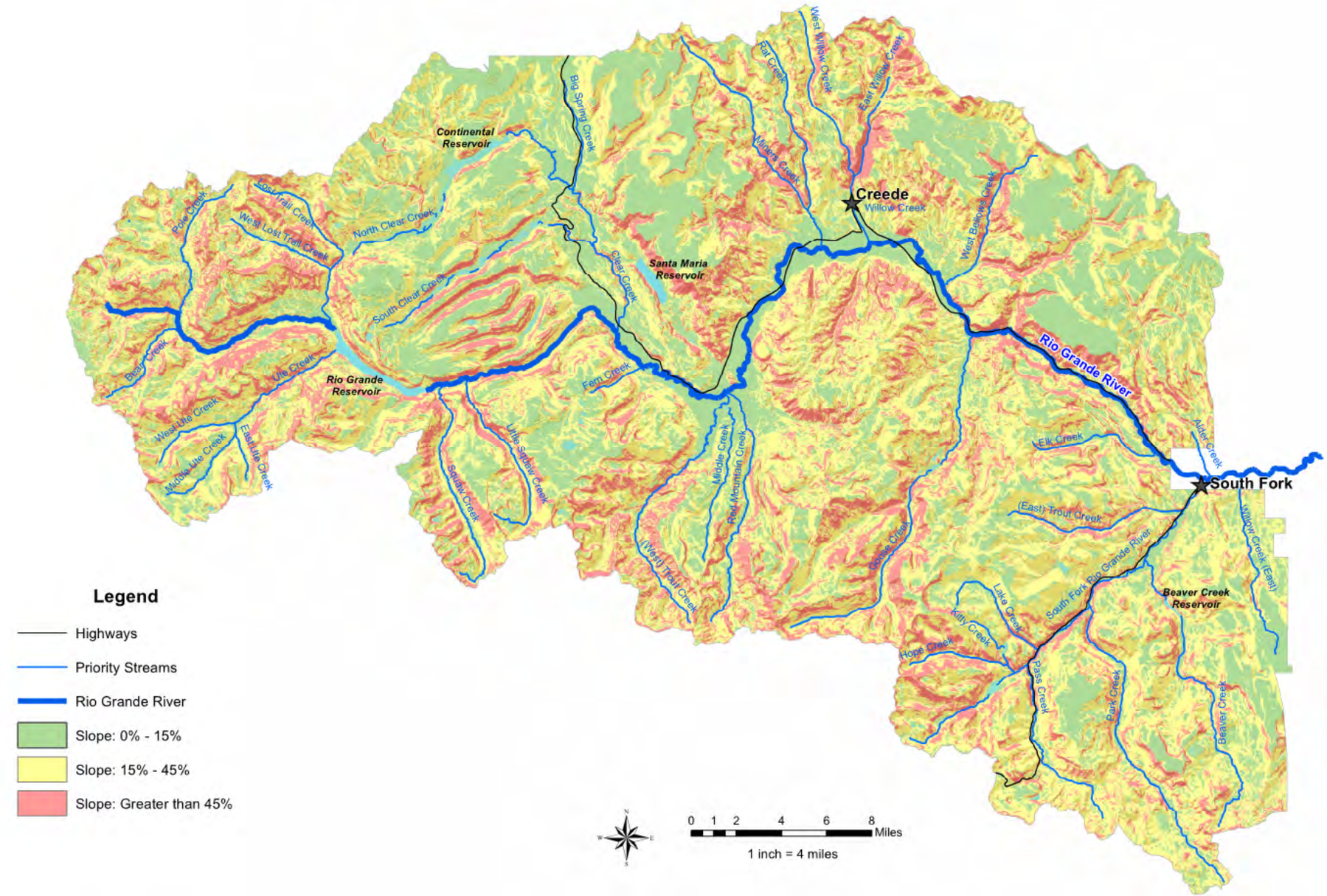


Figure 3-2. Slope Variability within Watershed

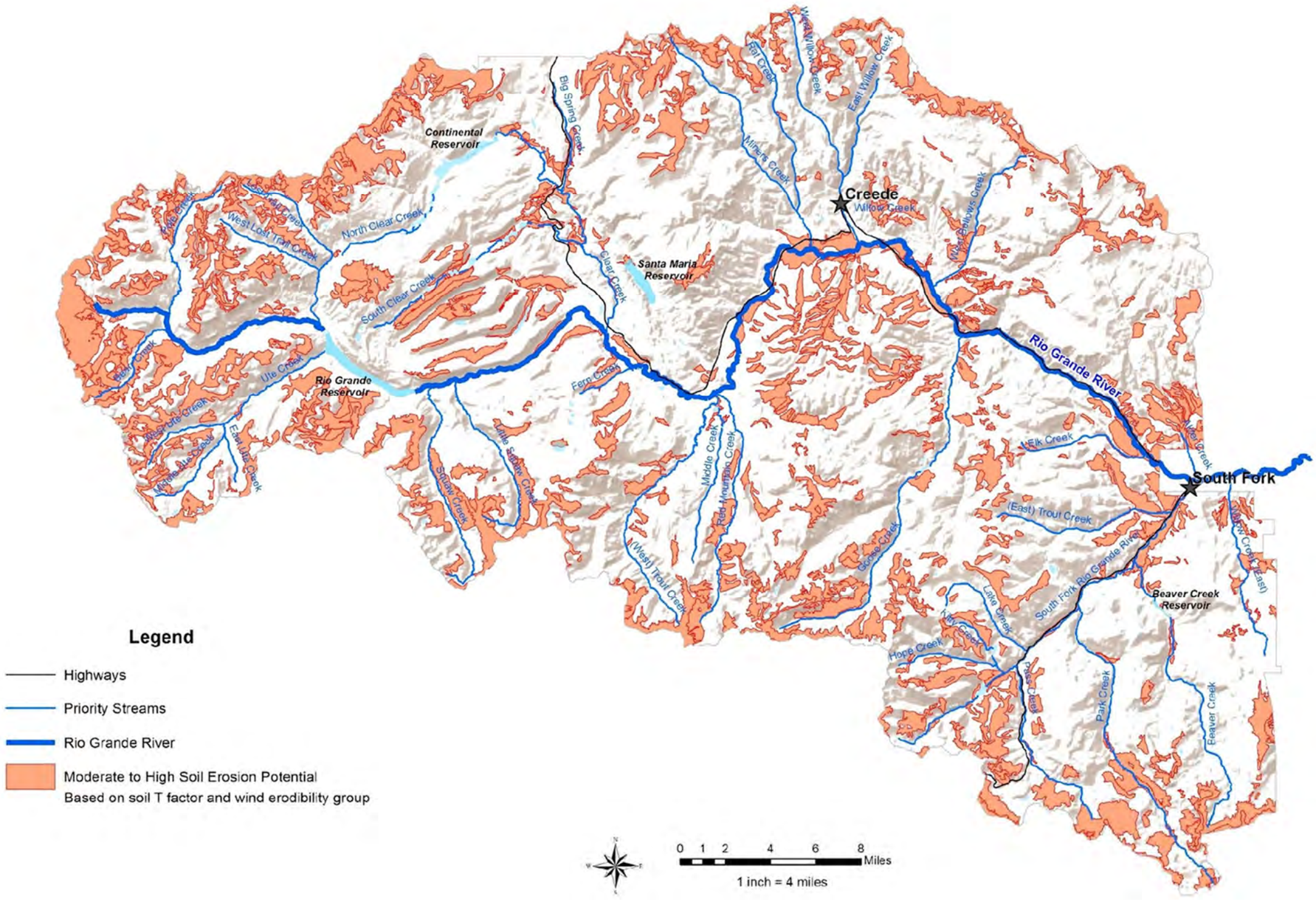


Figure 3-3. Soil Erosion Potential

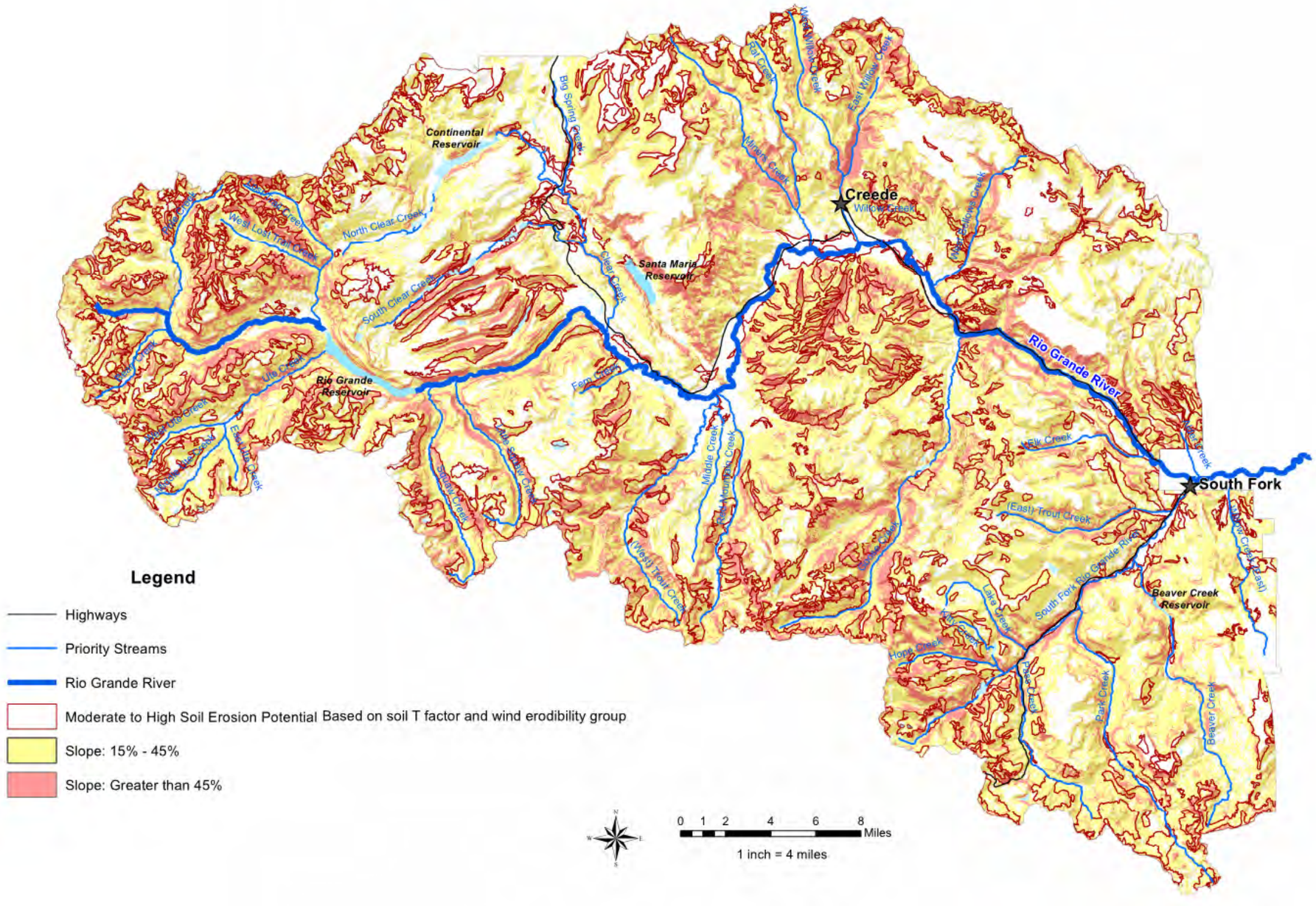


Figure 3-4. Moderate to High Soil Erosion Potential Overlaid with with Moderate to High Slopes

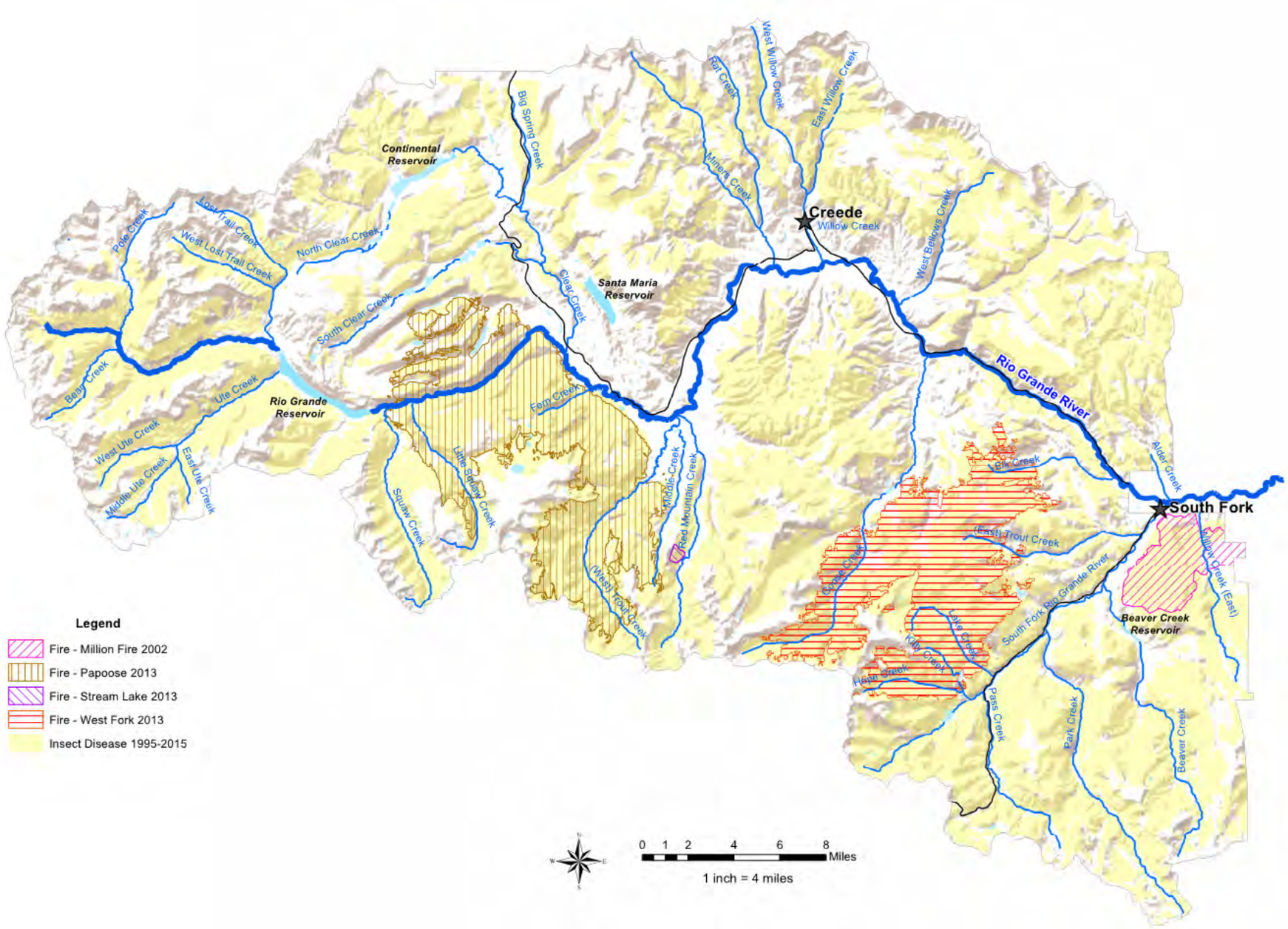


Figure 3-5. Insect and Fire Impacts in the Watershed

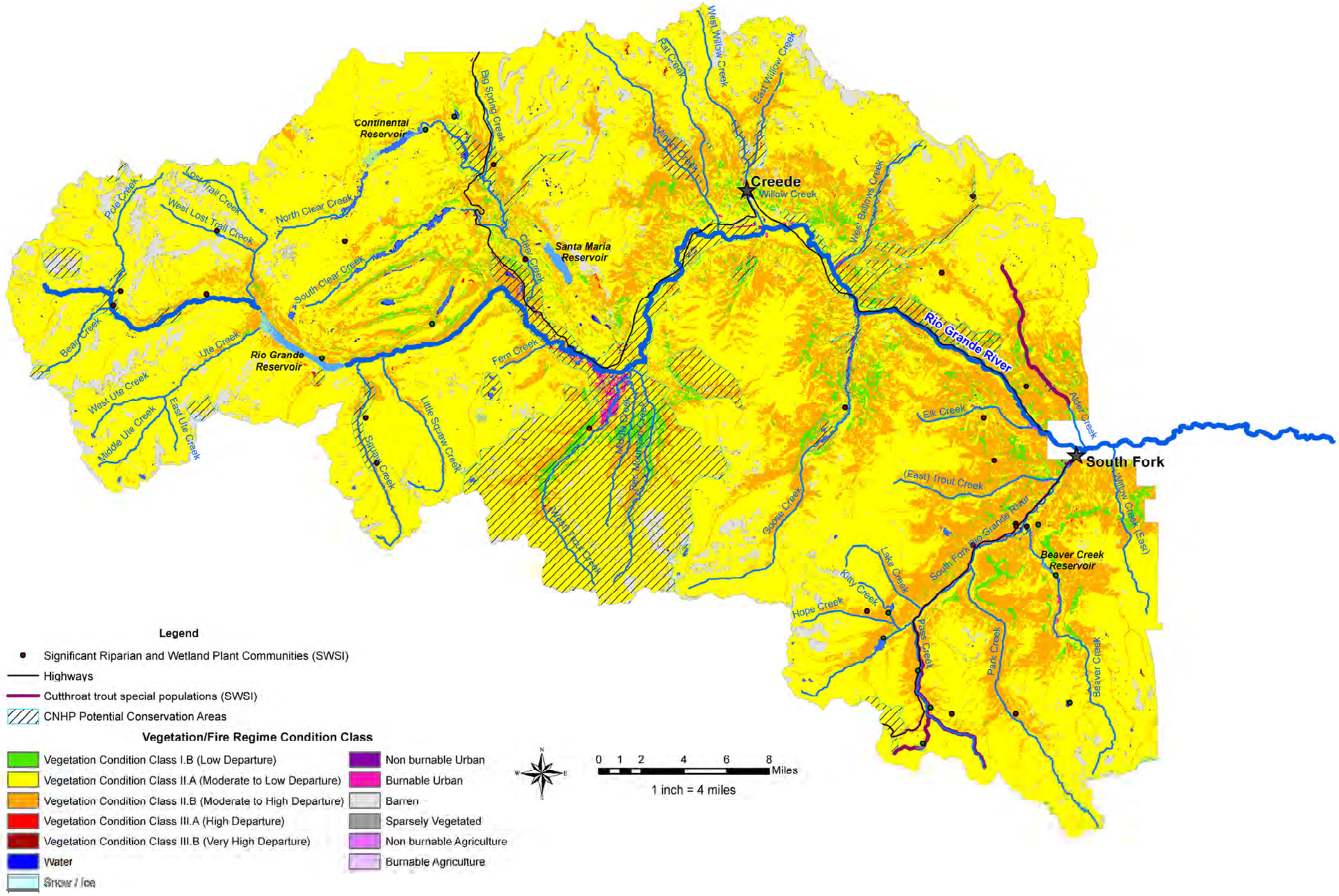


Figure 3-6. Vegetation/Fire Regime Condition Class

Table 3-5. Insect and Fire Impacts by Upland Vegetation Community

Vegetation Community	*Acres in Watershed pre-fire*	*Percent in Insect Boundary(1)*	*Percent in Fire Boundary(1)*	*Acres in Weed Mapped Area(2)*
Spruce-fir forest	183,129	98%	25%	608
Mountain grassland	181,524	83%	20%	767
Alpine vegetation	120,050	71%	7%	17
Aspen forest with <100% hardwoods (softwoods present)	89,776	93%	30%	81
Rock-bare soil	59,950	83%	9%	27
Mixed conifer forest -- cool-moist	37,476	82%	4%	111
Aspen forest	18,548	89%	15%	38
Bristlecone pine/limber pine forest	7,646	93%	1%	<0
Ponderosa pine forest	8,001	95%	12%	19
Mixed conifer forest -- warm-dry	5,081	94%	20%	44
Mountain shrubland	6,357	88%	10%	4
Non-riparian willow	1,061	93%	5%	0
Sagebrush shrubland	983	100%	0%	0
Lodgepole pine forest	461	100%	0%	<0
Semi-desert grassland	108	100%	1%	0
Pinyon-juniper woodland	96	79%	2%	0

1) Upland impacts by Vegetation Community calculated using the amount of pre-fire acres

2) The USFS has mapped weed concentration areas in the watershed and this column identifies the number of acres per vegetation community

Table 3-6. Noxious Weed Types in Watershed

Colorado List Type	Symbol	Scientific Name	Common Name	No. of Mapped Occurrence Areas (USFS)*
List B	LELA2	*Lepidium latifolium*	Broadleaved pepperweed	8,528
List B	CIAR4	*Cirsium arvense*	Canada thistle	6,498
List B	ACRE3	*Acroptilon repens*	Hardheads / Russian knapweed	5,009
List B	CADR	*Cardaria draba*	Hoary cress / Whitetop	2,323
List C	COAR4	*Convolvulus arvensis*	Field bindweed	1,134
List B	HYNI	*Hyoscyamus niger*	Black henbane	1,007
List B	LIVU2	*Linaria vulgaris*	Butter and eggs	191
List C	BRTE	*Bromus tectorum*	Cheatgrass	148
List B	ELAN	*Elaeagnus angustifolia*	Russian olive	108
List B	LEVU	*Leucanthemum vulgare*	Oxeye daisy	75
List B	CANU4	*Carduus nutans*	Nodding plumeless thistle	42
List B	CIVU	*Cirsium vulgare*	Bull thistle	25
List B	ONAC	*Onopordum acanthium*	Scotch cottonthistle	16
List B	TARA	*Tamarix ramosissima*	Saltcedar	14
List B	EUES	*Euphorbia esula*	Leafy spurge	9
List A	HIAU	*Hieracium aurantiacum*	Orange hawkweed	4
List A	ALMA12	*Alhagi maurorum*	Camelthorn	2
List B	CIRSI	*Cirsium*	Thistle	2
List B	ANAR6	*Anthemis arvensis*	Corn chamomile	2
List C	VETH	*Verbascum thapsus*	Common mullein	2
Not listed	BASC5	*Bassia scoparia*	Burningbush	2
List B	CESTM	*Centaurea stoebe ssp. micranthos*	Spotted knapweed	1
List B	CENTA	*Centaurea*	Knapweed	1
List B	LIDA	*Linaria dalmatica*	Dalmatian toadflax	1

*Number of Mapped Occurrence Areas are based on data obtained from the USFS
List A species are weed species that must be eradicated whenever detected
List B species are species that have state noxious weed management plans designed to stop the continued spread of these species
List C species are weed species that are managed on a local level
Invasive weed species that are of local concern are not listed

Table 3-7. Upland Impacts along Priority Streams (upstream to downstream)

Priority Stream	*No. of Upland Impacts*	*Summary of Impacts*
Rio Grande Mainstem Tributaries		
Bear Creek	10	Beetle kill and fire impacts exist in the uplands.
Pole Creek	4	Beetle kill and fire impacts exist in the uplands.
Lost Trail Creek	3	Livestock and hiking trails are present.
West Lost Trail Creek	16	Grazing and many livestock trails are present along the riparian corridor. Recreation is present with pull-out/camping areas and braided single-track trails.
East Ute Creek	1	Trails run through the uplands and along riparian areas.
Ute Creek	1	Trails run along the riparian corridor.
Squaw Creek	7	Outbuildings and dispersed recreation, including trails, are present.
Little Squaw Creek	6	High fire impacts in the uplands are present, including landslides present. Recreational trails are also present.
North Clear Creek	52	Dispersed recreation and agricultural impacts including two-track trails, hiking trails, livestock trails, and grazing are present. Some development in the uplands and evidence of beetle kill are also present.
Big Spring Creek	6	Livestock trails and pull-out/camping areas along creek are present. There is some erosion in the uplands from the culvert under the highway.
South Clear Creek	15	Livestock trails, hiking trails, two track trails, camping, and upland erosion are all present.
Clear Creek	9	Dispersed recreation impact including trails, two track trails, and camping, as well as livestock trails, are present. There is a housing development on the banks of the creek.
Middle Creek	1	Livestock and hiking trails are present.
Red Mountain Creek	2	Livestock trails and upland erosion are present.
Rat Creek	12	Mining is present, including outbuildings, mine tailings, and mining areas. Dispersed recreation is present, including pull-out/camping areas, two track roads, and hiking trails.
Miners Creek	25	Agricultural impacts including livestock trails, over-grazing, and outbuildings are present. There is development in the uplands, including housing, utility corridors, camping, hiking trails, and mine tailings. Areas of high beetle kill impact are present.
West Willow Creek	12	Mining is present, including outbuildings and operations. Dispersed recreation is present, including pull-out/camping areas, two-track roads, and hiking.
East Willow Creek	5	Road and trail impacts on upland banks. Abandoned mine with outbuildings and several settling ponds.
Willow Creek	9	Grazing and livestock trails are present. Several outbuildings including junk yard, power plant facility, and water treatment buildings are present.
West Bellows Creek	9	Evidence of beetle kill is present along portions of the uplands. Dispersed recreation is also present, including roads, trails, and camping.
Bellows Creek	2	New construction is occurring near the creek, resulting in barren ground. Livestock trails are also present.
Goose Creek	2	Strong burn and beetle kill evidence in uplands.
Rio Grande	101	Livestock trails, dispersed recreation including trails, camping, and roads, and outbuildings and housing are present.
South Fork of the Rio Grande Tributaries		
Hope Creek	3	High fire impacts exist in the uplands and there is erosion on upland slopes.
Kitty Creek	1	High fire impacts exist in the uplands.
Pass Creek	4	Evidence of beetle kill is present. Dispersed recreation including camping is also present.
Lake Creek	4	Evidence of beetle kill and fire exists in the uplands and there are lots of downed trees.
Park Creek	1	Evidence of beetle kill is present.
Beaver Creek	5	Dispersed recreation impacts and livestock trails are present.
(East) Trout Creek	1	A landslide into the creek from upland fire erosion has occurred.

4.0 Riparian Habitat Assessment

4.1 Objective

Riparian areas are defined as those transitional areas between upland and aquatic ecosystems. These areas support important ecological functions within the watershed and act as a buffer to provide water quality and aquatic life protection, which in turn support a myriad of other uses. Hence, fully functioning riparian areas are essential for supporting a healthy watershed.

The objective of the riparian habitat assessment was to evaluate the condition of riparian habitat throughout the watershed, including its functioning condition and existing impacts that supported the list of priority projects. Areas assessed include the priority streams identified by the TAT and the mainstem of the Rio Grande.

4.2 Approach and Methodology

Riparian areas were evaluated using a combination of methodologies including: 1) existing data review; 2) desktop analysis of impacts; 3) targeted field data collection; and 4) extrapolation on a watershed-wide basis. The condition of riparian areas was assessed by estimating the percent of vegetative cover along streambanks and evaluating impacts.

4.2.1 Existing Data Sources

Table 4-1 identifies the datasets used for the riparian area evaluation based upon input from the TAT and existing data review.

Table 4-1. Key Literature and Datasets Used for the Riparian Assessment

Existing Datasets	*New and Derived Data*	*Reports*
❖ CPW riparian and wetland mapping ❖ National Wetlands Inventory (NWI) wetland mapping ❖ USFS vegetation layer ❖ USFS riparian mapping ❖ USFS Trails ❖ USFS Fire Dataset ❖ USFS Insect Dataset ❖ Wilderness Area ❖ Ordered Streams ❖ Google Earth Imagery 2017 ❖ Google Earth Historical Imagery to 1998 ❖ USFS Grazing Allotments ❖ USFS Noxious Weed Mapping ❖ USGS National Land Cover Database (NLCD)	**Collected** ❖ Riparian photo points **Created** ❖ Riparian impact points based on aerial photography ❖ Riparian degradation ranking by priority stream segment	❖ A Classification of the Riparian Wetland Plant Associations of Colorado, Colorado Natural Heritage Program (CNHP) and others, September 1, 1999. ❖ A Classification of the Riparian Plant Associations of the Rio Grande and Closed Basin Watersheds, Colorado, CNHP, March 1999.

4.2.2 Desktop Analysis

Riparian impacts on all priority streams (provided by TAT) were identified using ArcGIS. Google Earth and ESRI aerial imagery were also used to inform this assessment. Historical Google Earth aerial imagery dating back to 1998 was used to inform riparian impacts before the fires and insect kill events. Points were marked on the aerials to document occurrence(s) of identified riparian impacts and the following impacts were documented at each point by recognizing the presence of the impact (i.e., “Yes” to the type(s) of impact present):

- road crossing
- road encroachment
- dispersed recreation impact(s)
- on channel waterbodies
- grazing and livestock trails
- outbuilding (including homes, pump houses, sheds, etc.)
- utility corridor
- burn evidence
- beetle (insect) kill evidence
- instream habitat structure
- mining impact
- other impacts including landslides, low water (ford) road crossings, and upland erosion into riparian area

In addition, the percentage of vegetation removed or fragmented was estimated at each impact point in the riparian area based on aerial imagery. The percent vegetation removal ranges used for the assessment included 0-10%, 11-49%, 50-80%, and 81-100%. These ranges are based on the classification system in the Colorado National Heritage Program (CNHP) 1999 report, as modified for this assessment.

Based on the CNHP 1999 information, riparian areas less than 50% disturbed along their length are considered in “good condition”; those with 50-80% of their length disturbed are in “fair” condition; and those with >80% disturbance are considered “poor” condition. An additional range of 0-10% disturbance was used in this assessment to define areas in “excellent” condition. Based on the range of impacts, this equates to less than two impacts per mile of stream, which is minimal and appropriate for this rating. The resulting percentage ranges and associated ratings emphasize that fully functioning and intact riparian areas have little vegetation removed and few impacts.

4.2.2.1 Development of Riparian Area Condition Scoring

The condition of the riparian areas in each of the priority stream watersheds was ranked based on a scale from 1 to 4, with 1=excellent; 2=good; 3=fair; and 4=poor. A composite index was developed that considered both the extent of vegetation removed and the intensity of riparian areas impacts, as follows:

- The number of riparian impacts per stream-mile was calculated for each priority stream. The values were ranked from lowest to highest (least to most impacts). A score was then assigned to each stream using percentage ranges described above with the streams with the lowest 10% of the impacts/mile assigned a score of 1; the next 11-49% of streams a score of 2; the next 50-80% a score of 3; and the top 80-100% of streams in terms of

impacts assigned a score of 4. Therefore, the riparian area condition was assigned a score based on the average intensity of impacts.

- The extent of vegetation removal for each impact area was assigned a score of 1, 2, 3 or 4 using the percentage ranges, and an average score was calculated for each stream.
- A composite riparian area condition score was calculated for each priority stream as the average of the above two scores.

4.2.3 Field Verification

Riparian and upland field data collection locations were chosen from the desktop analysis and CNHP 1999 report. A table of reference riparian areas for the Rio Grande watershed is provided in the CNHP 1999 report, and thirteen of these areas occur within the upper watershed. Three of these sites were visited as part of this analysis and were used as reference sites to assist with the impact assessment. For example, each site was ranked by CNHP based on their condition for overall riparian health including, but not limited to, amount of disturbance, grazing impacts, and presence of non-native plant species, from A-rank (highest) to D-rank (poorest). The three CNHP reference sites visited were ranked as an A-, B-, and C-rank from highest condition to generally poor condition.

Seventeen additional sites were identified for field verification based on the desktop analysis. These sites were identified as having either 50-80% or 81-100% vegetation removed. The intent was to confirm the results from the desktop analysis with regards to existing conditions of the riparian and upland areas at the seventeen sites.

SGM staff and volunteers conducted the field analysis at the 20 total sites to assess the characteristics of the areas, including the extent of any existing impacts. A standardized field form for these observations was developed (See **Appendix A**). Fieldwork was completed on July 24, 2017 and included completion of the field form and photographic documentation.

4.2.4 Stream Prioritization Methods

SGM prepared an initial list of factors for determining the priority riparian improvement projects for the December 2016 TAT meeting. The list was modified per input from the TAT during this meeting resulting in a final list of factors that considered the extent and nature of riparian impacts, in addition to the proximity of these areas to public water supplies, recreation uses, and land ownership, as shown in **Table 4-2**.

Table 4-2. Prioritization Factors for Riparian Area Improvement Projects

Factors
❖ Proximity to public water supplies
❖ Proximity to areas of high recreation use
❖ Proximity to high use fishing areas
❖ Unique riparian community
❖ Nature and degree of impacts/degradation
❖ Land ownership
❖ Potential for measurable success
❖ Teaming opportunities

4.2.5 Riparian Area Description

Figure 4-1 depicts the general extent of riparian areas within the watershed based on existing mapping by the USFS, NWI, and CPW. Diverse riparian communities occur throughout the watershed along major creeks and the Rio Grande, and a riparian area exists to some extent along all the priority streams and the Rio Grande. The USFS mapped riparian areas to a width of 80 feet and at least two acres in size and found 23,208 acres of riparian vegetation in the watershed, which comprises four percent of the entire area. The largest contiguous riparian areas occur along the mainstem of the Rio Grande, particularly between Crooked and Lime Creeks. However, it should be noted that some of the wetlands may be caused by agricultural irrigation.

CNHP 1999 report found 70 riparian plant associations in the Rio Grande and Closed Basin watersheds. It is estimated that around nine of these associations occur within the upper Rio Grande watershed. Most of the riparian areas in the watershed include some shrub or tree component. In higher elevation reaches, dominant species typically include sub-alpine fir, willow, and spruce. Lower elevation riparian areas typically have an overstory of willows, narrowleaf cottonwoods and alders. Understory species also vary by elevation and generally include grasses, grass-like species, and forbs. **Table 4-3** lists the main riparian plant associations within the watershed based on CNHP.

Table 4-3. Summary of Riparian Area Plant Associations in the Watershed

Scientific Name	*Common Name*
Abies lasiocarpa-Picea engelmannii/Anlus incana var. Tenuifolia	Subalpine fir, Englemann spruce, thinleaf alder
Abies lasiocarpa-Picea engelmannii/Salix drummondiana	Subalpine fir, Englemann spruce, willow
Abies lasiocarpa-Picea englemannii/Ribes spp.	Subalpine fir, Englemann spruce
Alnus incana var. tenuifolia/Mesic Forbs	Englemann spruce
Alnus incana var. tenuifolia/Salix drummondiana	Thinleaf alder, willow
Carex aquatilis	Sedge
Picea pungens	Blue spruce
Populus angustifolia-Picea pungens/Alnus incana var. tenifolia	Narrowleaf cottonwood, blue spruce, thinleaf alder
Salix geyeriana/Calamagrostis canadensis	Willow, Bluejoint

Per the USFS mapping and CNHP, dominant species in the riparian vegetation communities include sedges, Engelmann spruce, subalpine fir, blue spruce, thinleaf alder, quaking aspen, narrowleaf cottonwood, willow, plainleaf willow, shortfruit willow, and bluejoint. The dominant species in the riparian vegetation community post-fire have shifted to aspens and mixtures of grasses and forbs.

4.3 Riparian Habitat Assessment Results

The extent of impacts to riparian areas within the watershed depends greatly on the location of the riparian area and the proximity to roads and existing infrastructure. Much of the watershed is USFS land and designated wilderness, both of which have restrictions on the use of the areas that generally reduce the potential for impacts, especially for wilderness areas.

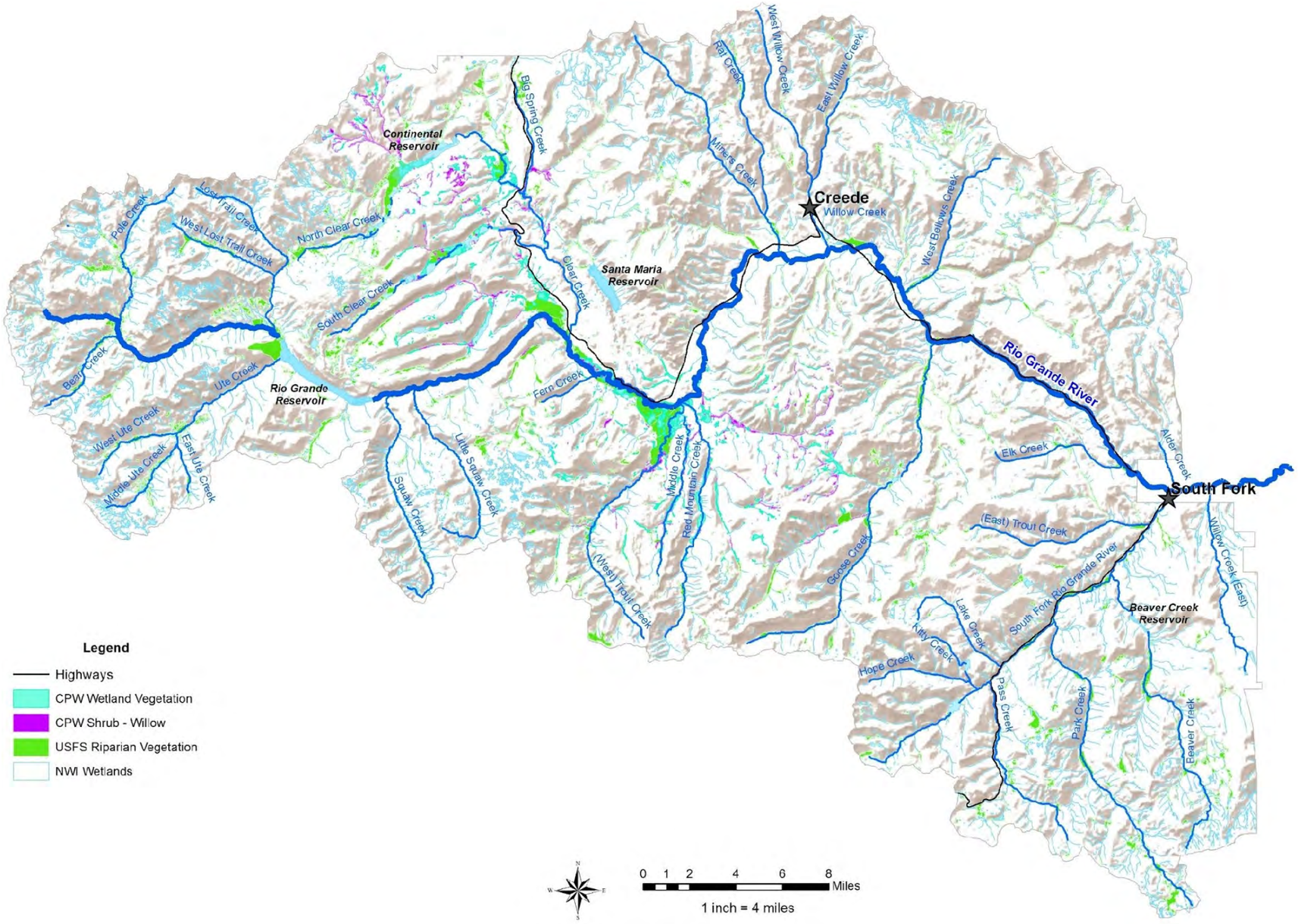


Figure 4-1. Riparian Areas

4.3.1 Desktop Analysis

Figure 4-2 depicts the results of the riparian area desktop impact analysis. **Table 4-4** summarizes the riparian impacts for the priority streams and shows the types and number of impacts per mile by priority stream. **Appendix A** includes details on all the riparian impacts identified in the desktop analysis.

Beetle kill and fire have impacted the watershed and much of the riparian areas. Approximately 72% of the riparian vegetation is within insect (beetle) kill area, and 9% is within historic fire boundaries. There are 474 acres of weedy areas mapped within the riparian vegetation. However, field observations found significant re-growth of herbaceous plants in burn areas (see Photos 13-17 in **Appendix A**) which has reduced the potential for erosion and sedimentation.

All the identified types of impacts were found in the watershed to some extent. The main riparian impacts include dispersed recreation, beetle kill, fire, road crossings, outbuildings, and other impacts (which include trails, downed trees, landslides, railroad, etc.). The intensity of actual effects on the riparian area varies depending on the type of impact. For example, effects from recreation use tend to be less intense and more dispersed. Impacts from mining are not as widespread but are more intense and concentrated, mostly near Creede. **Figure 4-2** shows streams with the most significant riparian area impacts. This figure indicates that riparian area impacts are most concentrated in the following priority streams/areas:

- West Willow Creek: due to mining
- Willow Creek, East Willow Creek, Miners Creek: due to mining and development in the Town of Creede, multiple road crossings, dispersed recreation impacts, outbuildings
- Rio Grande: dispersed recreation impacts, grazing and livestock impacts, road encroachment, trails, and beetle kill evidence
- North Clear Creek: high beetle kill evidence, grazing and livestock impacts, and multiple road crossings
- South Clear Creek: dispersed recreation impacts and beetle kill evidence
- West Trout Creek: road encroachment and grazing and livestock impacts
- Middle Creek: grazing and livestock impacts, road crossings, and road encroachment
- Kitty Creek: fire and beetle kill evidence, dispersed recreation impacts, upland erosion
- Hope Creek: fire and beetle kill evidence
- Bellows Creek: bank stabilization/instream structures, bridge crossings, and grazing and livestock impacts

Since streams tended to have more impacts the longer their length, impacts were determined per stream mile, and the results of this analysis are shown in **Table 4-5**. The bottom of this table shows the average number of impacts per stream mile for each type of impact. The most impacts per mile occur from dispersed recreation, road crossing, beetle kill, and other. This latter category includes impacts from factors such as landslides and soil erosion.

The streams with the greatest number of impacts per mile (>13) are Willow Creek, Alder Creek, North Clear Creek, Bellows Creek, Rio Grande, West Willow Creek, and South Clear Creek.

4.3.2 Fieldwork

Table 4-6 summarizes the riparian and adjacent upland fieldwork for the 20 sites. Field data sheets and photographs are included in **Appendix A**. SGM and four volunteers from the Rio Grande Headwaters Restoration Project conducted ocular observations of 20 sites within the watershed to document the current conditions in the riparian areas. The volunteers took photographs and GPS locations of each area, provided a general description of vegetation community, described the effects of impacts due to fire, beetle kill, grazing and livestock, and dispersed recreation.

The results of the fieldwork were used to verify the findings from the assessment of existing data and the desktop analysis. The impact site observations were generally consistent with the results of the desktop analysis. Some differences may be attributed to not being able to locate the exact point in the field due to accuracy of GPS coordinates and/or restricted access due to private property. The CNHP site locations were also difficult to locate due to the loosely documented latitude and longitude coordinates. Additionally, CNHP Site No. 7 (Hope Creek) baseline observations were pre-West Fork Fire Complex.

It is important to note that the summary of field observations in **Table 4-6** shows the percent area affected where the volunteers were able to estimate the percent of vegetation removed or fragmented at each site. These are general observations and intended to document what the primary impacts are at each site. The percent should not be totaled to reach 100% because the observations were for the upland and riparian areas and there is overlap of impacts. For example, the Clear Creek site observed beetle kill in the uplands being approximately 50-80% impacted and there is likely overlap with the grazing and dispersed recreation impacts in the riparian area. It is also important to note that most sites that were identified as having 81-100% impacted by both fire and beetle were in fact impacted by beetle prior to fire. For example, based on interviews the Hope Creek sites were impacted by beetle kill prior to fire which explains the percent affected in the summary table. The Rio Grande site located at the 30-mile bridge showed 80-100% affected by beetle in the uplands, and of that, 50-80% was impacted by fire. Again, there is overlap with the recreation and road encroachment impacts.

4.3.3 Riparian Stream Ranking and Priority Projects

An integrated ranking system was developed for riparian areas along priority streams. This ranking assessed both the number of impacts per river mile and the amount of vegetation removed/fragmented in the riparian area. These two factors complement each other and are critical towards assessing the health of riparian areas. One rank was developed for each priority stream riparian area by ranking the number of impacts per mile and the percent of vegetation removal for the area, and then averaging the rankings. The riparian area was then determined to be in poor, fair, good, or excellent condition based on value. The results of this analysis are shown in **Table 4-7**.

Table 4-7 shows that most of the riparian areas along the priority streams are assessed to be in fair to good condition. Riparian areas considered to be in poor condition occur along Alder and West Willow Creeks. Other streams with fair to poor rankings (ranking of 2.8) include: East Trout Creek, Middle Creek, and Willow Creek. Streams with riparian areas in excellent condition only include Ute and Middle Ute Creeks. The paucity of riparian areas in excellent condition is due to the wide spread extent of impacts, especially from beetle kill and fires, in the watershed.

The riparian analysis identified several priority projects in the watershed. The projects were identified by integrating the results of the riparian area assessment with the factors listed in **Table 4-2**. The overall factor for prioritization was the extent of impacts. For example, Willow Creek north of Creede has mining, water quality, riparian degradation, insect kill, and private land development impacts. Consideration was also given to the proximity of existing projects, and teaming opportunities with the Headwaters Alliance (HA), Trout Unlimited (TU), Rio Grande Headwaters

Restoration Project (RGHRP), USFS, and others. Furthermore, it is desirable to encompass a range of projects within the watershed in terms of both geography and resources.

It was also determined that it will be difficult to complete large scale restoration of areas affected by beetle kill and fires due to the extent of potential impacts. For example, Hope and Kitty Creeks have extensive burn areas next to riparian areas. However, the fieldwork indicates that there has been good growth of herbaceous vegetation in these watersheds, which is lessening potential impacts on their riparian areas. (See photos in **Appendix A** showing relatively intact riparian areas with new growth—both aspen trees and herbaceous growth stabilizing banks). Additionally, in certain areas, restoration is unnecessary as both beetle kill and forest fires are natural phenomena. If these events have minimal impact to infrastructure and resources, then there is no need to mitigate them.

The following passages detail the recommended riparian priority projects:

- **Ongoing Willow Creek Restoration Projects by HA.** HA has several ongoing projects in the Willow Creek watershed focused on mine cleanup efforts. Projects include the Nelson Tunnel/Commodore Waste Rock Pile and Solomon Mine. Per the HA, the Nelson Tunnel contributes an estimated 50% of the metals loading to the Willow Creek watershed (tributary to the upper Rio Grande watershed) and is located upstream of the water supply for the town of Creede. The HA has ongoing projects to clean up this tunnel and area. It is recommended that Assessment stakeholders work with HA on restoration of riparian areas and revegetation projects as part of their mine reclamation cleanup efforts.
- **Work with private landowners on bank stabilization work and revegetation projects.** Many impacts to streambanks occur on private land, where agencies cannot implement projects without landowner support. Previous projects have included stabilization, revegetation, and instream habitat structures on the mainstem of the Rio Grande as well as on Bellows and Miners Creeks. Additional opportunities may exist to assist private landowners with revegetation and restoration projects within the upper Rio Grande watershed.
- **Work with USFS and others to protect and restore overused areas from dispersed recreation.** Many riparian areas were identified during the recreation evaluation that are impacted by camping and the creation of unauthorized trails. For example, Pass and Park Creeks have been affected by these impacts. Opportunities exist for both direct participation in restoration projects and use of education (e.g., additional signage) to limit impacts. This work will require coordination with the USFS.
- **Work with CPW and USFS on areas affected by overuse at designated use areas**. Riparian areas are impacted by overuse at boat ramps, fishing access areas, and campgrounds. A combination of direct participation in restoration projects and further education opportunities exist. Most of these areas are located along the mainstem of the Rio Grande and Beaver Creek Reservoir.
- **Work with the agriculture community to protect and restore riparian areas**. Impacts associated with agriculture were observed in the desktop analysis and fieldwork. Specific impacts include overgrazing and road crossings on both private and public lands. In addition, impacts could be occurring from irrigation and haying activities close to riparian areas. Areas where these impacts were identified include North Clear Creek, Middle Creek, and (west) Trout Creek. The RGHRP could work with the USFS, conservation districts, and individual ranchers to educate them about the importance of protecting and restoring riparian areas.

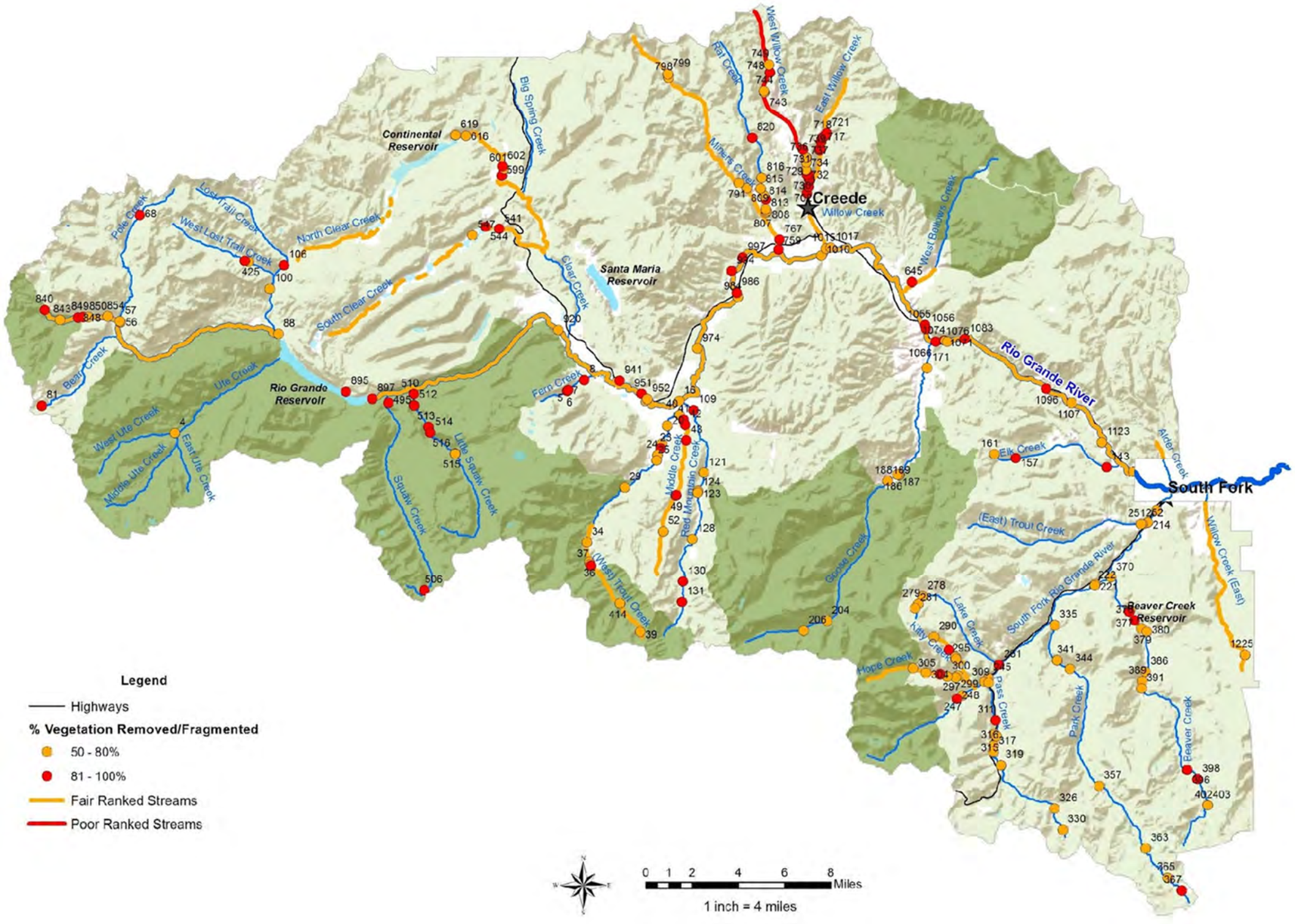


Figure 4-2. Riparian Impacts

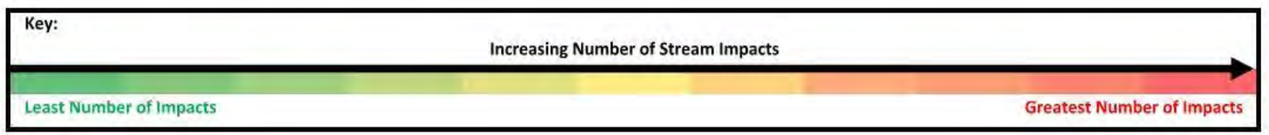
Table 4-4. Summary of Riparian Impacts for Priority Streams (upstream to downstream)

Stream Name	*Impacts*
Rio Grande Mainstem Tributaries	
Bear Creek	Most impacts are at ford crossings where vehicles make multiple routes causing damage to riparian areas.
Pole Creek	Most impacts are at ford crossings where vehicles make multiple routes causing damage to riparian areas. There are dispersed camping impacts at the mouth near the Rio Grande confluence.
Lost Trail Creek	Most impacts are due to grazing but hard to tell the extent of fragmented vegetation. There are visual trails from livestock and dispersed camping impacts.
West Lost Trail Creek	Most impacts are from livestock. There is beetle kill evidence in approximately 70% of trees along entire reach of creek.
East Ute Creek	Minimal impacts.
Middle Ute Creek	Minimal impacts at trail crossings.
West Ute Creek	Minimal impacts at trail crossings.
Ute Creek	Minimal impacts.
Squaw Creek	Most impacts are at the mouth of Squaw Creek at the developed campground. Otherwise there are minimal impacts. There is one location of potential acid drainage from a mining prospect far upstream -- approx. 0.01 acres.
Little Squaw Creek	Most impacts are from loss of vegetation from the Papoose fire; there are 2 landslides located approximately 3 miles upstream from mouth.
North Clear Creek	Most impacts are in the SW section of Continental Reservoir from 4wd drive roads in and along riparian and upland areas. There are dispersed outbuildings from the housing development at all lakes. There are grazing and livestock impacts in the E and SE section of Continental Reservoir. There are some dispersed camping and hiking trails impacts. There are several instream structures near Bristol Head viewing area.
Big Spring Creek	Most impacts are from livestock trails in the upland and riparian areas, mostly along the east side of channel. There are some dispersed camping and recreation impacts.
South Clear Creek	Most impacts are from livestock trails. There are some dispersed camping sites along road. There is a large section of private land with instream waterbodies. There is beetle kill evidence in approximately 50-70% of trees along entire reach of the creek upstream of the Clear Creek confluence.
Clear Creek	There are dispersed recreation impacts at the housing development near the mouth. Most impacts are from grazing and livestock to the confluence of South Clear Creek.
Fern Creek	Road crossings and fire/beetle kill impacts.
(West) Trout Creek	Road crossings, grazing and livestock impacts, and some instream habitat structures.
Middle Creek	Road crossings, grazing and livestock, dispersed recreation impacts, and evidence of beetle kill and fire.
Red Mountain Creek	Most impacts are from grazing for much of the creek. There is evidence of beetle kill and impacts from road crossings.
Rat Creek	Most impacts are from dispersed recreation and mining impacts.
Miners Creek	Most impacts are from dispersed recreation and ag impacts. There are numerous instream and bank stabilization structures from the confluence of Rat Creek to the confluence of the Rio Grande. There are some mining impacts.
West Willow Creek	Most impacts are from mining; this section is considered the Mining District of Creede. There is no riparian vegetation and minimal upland vegetation along much of the creek until Bachelor Loop Road, then one large mine upstream. Other impacts are from dispersed recreation.
East Willow Creek	Most impacts are from mining. Due to the narrow canyon, there are road encroachment impacts. Much of the beetle kill is observed in upland areas, but there is some in the riparian areas in the upstream end of the reach.
Willow Creek	Located in Creede; Willow Creek runs through the center of town in a concrete flume. Dispersed outbuilding impacts due to it being densely populated on edge of the riparian area; very minimal riparian vegetation along reach.
West Bellows Creek	Most impacts are from dispersed recreation. The lower reach of the creek has evidence of grazing and livestock impacts. There is beetle kill evidence (approximately 50-70% impact) in the upper reach of the creek in the riparian and upland areas.
Bellows Creek	Most impacts are on private land upstream of the confluence to the Rio Grande. There is evidence of new construction with bare soils; evidence of revegetation in the riparian areas. There are several instream waterbodies and numerous instream habitat and bank stabilization structures where vegetation was removed (approximately 20-50% impact to riparian area).
Goose Creek	Grazing and livestock impacts are nearer to the Rio Grande, beetle kill evidence and fire evidence in the riparian area on the upstream portion of the creek, some dispersed recreation, bridge crossings, and road encroachments.
Elk Creek	Large fire impact for about 1 mile downstream from start of creek. There are irrigation, grazing and livestock, and residential impacts, bridge and road crossings, road encroachment, and on-channel water bodies.
Alder Creek	Most impacts are from the golf course and private property. There are some grazing and livestock impacts.
Willow Creek East	Most impacts are dispersed recreation from private land and grazing and livestock at the bottom half (north) of the creek and grazing impacts upstream to the headwaters. There are a significant number of downed trees in and along the riparian and upland areas from the Million Fire in 2002.

Stream Name	Impacts
Rio Grande	Majority of impacts are from dispersed recreation and ag. Residential impacts are isolated mostly near Creede and South Fork. There are numerous instream habitat, bank stabilization, and diversion structures. Utilities begin to impact riparian areas near Creede all the way to South Fork.
South Fork of the Rio Grande Tributaries	
Hope Creek	Hope Creek is within the insect and fire boundary and has impacts from both throughout the entire reach of the creek; there is evidence of more than 50% vegetation fragmentation. Other impacts are from dispersed recreation with trails on either side of creek.
Kitty Creek	Located within the fire boundary. There are downed trees with impacts of 50-80% in the upland areas; the riparian areas appear to have some herbaceous vegetation growth but no woody growth. Other impacts include: beetle kill, road crossings, dispersed recreation, and road encroachment.
Pass Creek	The average impacts are from the mouth to South Fork of about 50-80% in riparian areas, while upstream to the start of creek has on average 10-49% of impact. There are 3 road crossings and several dispersed recreation impacts (campgrounds and hiking trails). There are ag impacts within the first 20% of the stream (headed downstream). 70% of the stream has evidence of beetle kill.
Lake Creek	Majority of creek is impacted by fire (10-49% or 50-80% vegetation removed), some areas have dispersed recreation, ag, and road crossing impacts.
Park Creek	The amount of vegetation removed/fragmented is on average 10-49% in and along the creek. Much of the creek has beetle kill present in the uplands and riparian edges. 36% of the points have dispersed recreation impacts present. These points mainly occurred in the large valley areas. Livestock impacts are also high in these large valley areas. In addition, there were some areas of natural erosion landslides along the creek.
Beaver Creek	Impacts on Beaver Creek range between 0-10% to 81-100% vegetation removed. The 81-100% vegetation removed occurs along road crossings and on-channel waterbodies. Most vegetation removed is between 0-10% and 10-49%. Major impacts include: dispersed recreation, ag impact (livestock grazing), and beetle kill evidence.
(East) Trout Creek	East Trout Creek is within the insect (beetle kill) and fire boundary. Impacts from beetle kill and fire have removed/fragmented approximately 50-80% vegetation. There are 3 road crossings, some ag impacts. There is minimal dispersed recreation impact.
South Fork of Rio Grande	Most impacts are from South Fork to the reservoir; upstream of the reservoir had minimal impacts. Impacts included: bridge crossings, road encroachments, ag, residential, camping, and recreation impacts.

Table 4-5. Type and Number of Riparian Impacts per Stream Mile (upstream to downstream)

Name of Creek	Length (miles), excludes onstream reservoirs	Road Crossing	Road Encroach-ment	Dispersed Recreation	On Channel Waterbodies	Agricultural Impacts	Out Buildings	Utility Corridor	Burn Evidence	Beetle Kill Evidence	Instream Structures	Mining	Other	Number of Impacts per mile	Percentile	Rank
	Rio Grande River Mainstem Tributaries															
Bear Creek	5.50	0.55	0.18	0.91	-	-	0.18	-	-	1.09	-	0.18	-	3.09	22%	30
Pole Creek	10.91	0.83	0.18	0.46	-	-	-	-	-	0.09	-	-	0.09	1.65	8%	35
Lost Trail Creek	9.51	0.53	0.11	0.63	-	1.05	0.21	-	0.32	0.53	-	-	0.11	3.47	27%	28
West Lost Trail Creek	5.30	-	-	0.57	-	3.59	-	-	0.19	4.53	-	-	0.94	9.82	73%	11
East Ute Creek	2.28	-	-	1.32	-	-	0.44	-	0.44	0.44	-	-	-	2.63	14%	33
Middle Ute Creek	5.22	0.38	-	-	-	-	-	-	-	-	0.19	-	-	0.57	0%	38
West Ute Creek	4.45	0.67	-	0.22	-	-	-	-	0.22	0.67	-	-	0.22	2.02	11%	34
Ute Creek	5.95	-	-	0.50	-	-	-	-	-	0.50	-	-	-	1.01	3%	37
Squaw Creek	11.38	0.18	-	0.44	0.35	-	0.18	-	0.09	1.58	-	0.09	0.97	3.87	35%	25
Little Squaw Creek	9.64	0.10	-	0.21	0.10	-	0.10	-	0.83	0.83	-	-	0.83	3.01	19%	31
North Clear Creek	14.47	1.93	0.90	4.91	0.62	3.59	0.69	-	-	4.97	0.21	-	3.39	21.21	95%	3
Big Spring Creek	5.33	0.38	0.19	1.31	-	0.94	-	-	-	0.56	-	-	1.13	4.50	43%	22
South Clear Creek	8.60	1.63	0.12	3.72	0.70	1.28	0.12	-	-	4.07	-	-	1.63	13.26	84%	7
Clear Creek	4.84	0.62	-	1.65	0.21	0.21	0.21	-	-	0.21	-	-	2.07	5.17	49%	20
Fern Creek	2.66	0.38	-	-	-	-	0.38	-	1.13	1.51	-	-	0.75	4.14	38%	24
(West) Trout Creek	9.14	0.77	0.22	0.11	-	0.11	-	-	-	0.11	-	0.11	-	1.42	5%	36
Middle Creek	7.37	0.81	0.81	0.68	0.27	1.36	0.14	0.27	0.41	0.54	-	-	0.14	5.43	51%	19
Red Mountain Creek	12.30	0.41	0.41	0.16	-	1.63	0.08	-	-	0.24	0.08	-	0.41	3.41	24%	29
Rat Creek	8.32	1.08	-	2.52	0.24	-	0.84	-	-	1.68	0.12	0.84	1.68	9.01	68%	13
Miners Creek	12.40	1.45	0.16	2.82	0.08	1.21	0.89	0.24	-	1.13	0.24	0.40	2.10	10.73	78%	9
West Willow Creek	8.39	1.79	1.67	2.98	0.24	-	1.07	0.60	-	2.27	-	1.43	1.67	13.71	86%	6
East Willow Creek	5.37	1.30	0.74	1.68	-	-	1.12	-	-	1.12	-	1.49	2.23	9.68	70%	12
Willow Creek	2.63	6.08	1.14	7.98	1.14	0.76	9.88	1.90	-	-	1.14	-	11.78	41.80	100%	1
West Bellows Creek	6.19	0.65	-	1.78	-	0.48	0.32	-	-	0.65	-	-	1.61	5.49	54%	18
Bellows Creek	1.92	3.12	-	2.08	0.52	1.56	1.04	-	-	-	1.56	-	6.77	16.66	92%	4
Goose Creek	18.14	0.22	0.55	0.39	0.11	0.72	0.22	-	0.66	0.22	-	0.06	0.39	3.53	30%	27
Elk Creek	6.37	1.26	1.41	0.47	0.63	0.63	0.16	-	0.79	0.16	0.16	-	0.47	6.13	59%	16
Alder Creek	2.55	3.53	7.45	14.12	-	0.78	2.35	-	-	-	0.78	-	1.96	30.98	97%	2
Willow Creek East	9.31	1.83	0.43	1.83	0.11	2.15	1.18	-	0.32	1.40	0.21	-	1.29	10.74	81%	8
Rio Grande	66.16	0.83	0.86	3.40	0.15	1.69	1.42	0.79	0.15	1.22	0.11	-	3.79	14.42	89%	5
	South Fork of Rio Grande River Tributaries															
Hope Creek	4.66	0.21	0.21	1.72	-	-	-	-	2.15	2.36	-	-	0.43	7.09	62%	15
Kitty Creek	3.15	1.27	1.27	1.59	0.32	0.32	-	-	2.86	1.27	-	-	-	8.88	65%	14
Pass Creek	9.22	0.33	0.43	1.52	-	0.43	-	-	-	1.84	-	-	0.22	4.77	46%	21
Lake Creek	5.96	0.50	0.17	1.01	-	0.34	-	-	1.84	1.34	-	-	0.34	5.53	57%	17
Park Creek	15.92	0.50	0.44	0.88	-	0.44	0.13	-	-	1.07	-	-	0.19	3.64	32%	26
Beaver Creek	14.52	0.28	0.41	1.45	0.14	0.69	0.14	-	-	0.90	-	-	0.21	4.20	41%	23
(East) Trout Creek	6.00	1.33	2.33	0.83	-	2.50	-	-	1.83	0.67	0.33	-	0.50	10.34	76%	10
South Fork of Rio Grande	19.15	0.84	0.78	0.52	0.10	0.10	0.42	-	-	0.10	0.05	-	0.05	2.98	16%	32
Average # of Impacts per Mile		**1.01**	**0.62**	**1.83**	**0.16**	**0.75**	**0.63**	**0.10**	**0.37**	**1.10**	**0.14**	**0.12**	**1.32**	**8.16**		



Note: Grazing and livestock impacts are collectively addressed within the general “Agricultural Impacts” column.

Table 4-6. Summary of Riparian & Upland Fieldwork Conducted in July 2017 (up-to-downstream)

Map Label[1]	Name	CNHP Site or Impact Site[2]	Baseline Observations[3],[4]	Field Observations	Field Description					
				Dominant Species	% of Area Affected[5]					Field Description
					Fire	Beetle kill	Grazing	Dispersed Recreation	Other	
Rio Grande Mainstem Tributaries										
A4	Squaw Creek	Impact site	Steep barren slope on east bank; on perimeter of West Fork Fire Complex boundary.[3]	Spruce, willow shrubs, mixture of grasses and forbs	10-49%	81-100%	0%	0-10%	0-10%	Fire and beetle kill impacts; dispersed rec impacts from campsite nearby. Other impacts due to outbuildings.
7	Little Squaw Creek	Impact site	Impacts located at the mouth of the creek. Evidence of vegetation loss in upland areas from fire.[3]	willow shrubs, mixture of grasses and forbs	81-100%	0%	0%	10-49%	50-80%	Area burned in West Fork Fire Complex; standing burned trees-hydro ax/hazard tree removal; some trees removed after fire.
14	North Clear Creek	Impact site	Staging area for construction crews, dispersed recreation and camping, road crossing.[3]	Spruce, willow, mixture of grasses and forbs	0%	81-100%	10-49%	0%	10-49%	Spruce and aspen in uplands; willow, grasses and forbs in riparian area. High beetle kill in uplands; some grazing up- and downstream of reservoir; other impacts from road encroachment and on-channel water bodies.
6	South Clear Creek	Impact site	Dispersed recreation impacts.[3]	Willow, mixture of grasses and forbs	0%	81-100%	0%	50-80%	81-100%	Dispersed recreation impacts; on-channel waterbody; beetle kill in uplands.
3	Clear Creek	CNHP 1 & 2	Subalpine fir, Englemann spruce, blue spruce, thinleaf alder[4]	Mixture of grasses and forbs	0%	50-80%	50-80%	10-49%	0%	CNHP reference site identified as C - ranked site (generally poor condition); Abundant non-native plant species present and/or the area is highly fragmented, and/or the area is very small. Beetle kill impacts in uplands. Grazing and dispersed recreation impacts in riparian area.
A1	Fern Creek	Impact site	Road crossing, culverts.[3]	Spruce, aspen, willow	0%	10-49%	0%	0%	0-10%	Impacts from road crossing and culvert; dense vegetation.
A6	Rat Creek	Impact site	Natural land disturbance from point approximately 350 ft on west bank; hillside encroachment on channel; no visible riparian vegetation; very minimal upland elevation—vegetated steep slope.[3]	Spruce, aspen, willow, mixture of grasses and forbs	0%	50-80%	0%	0%	0%	Culvert plugged; road washed out-impassable; bank erosion.

1) Map Labels refer to the Field Map for Volunteers in **Appendix A**.
2) CNHP = Colorado National Heritage Program. Impact site = identified from riparian and upland desktop analysis.
3) Baseline conditions taken from desktop analysis by SGM.
4) Baseline conditions and dominant species within specific vegetation community types: 1) Spruce/Fir forest, 2) Cottonwood/Blue spruce forest, 3) Willow, and 4) Herbaceous.
5) Percent area effected: 1-10%, 10-49%, 50-80%, and 81-100% determined from desktop analysis.

Map Label[1]	Name	CNHP Site or Impact Site[2]	Baseline Observations[3],[4]	Field Observations	Field Description					
				Dominant Species	% of Area Affected[5]					Field Description
					Fire	Beetle kill	Grazing	Dispersed Recreation	Other	
A5	Miners Creek	Impact site	Mine approx. 100 ft of tailings in upland and on edge of riparian area; then trail goes upstream to a 60 ft area prospected-tailings in riparian and upland.[3]	Spruce, willow, mixture of grasses and forbs	0%	0-10%	0%	0%	0-10%	Dispersed recreation from trailhead. May be tailings in riparian area.
10	West Willow Creek	Impact site	No riparian veg from point upstream approx. 0.5 miles on both sides of creek.[3]	Minimal spruce, fir, willow	0%	0%	0%	0%	50-80%	Tailings in stream.
9	East Willow Creek	Impact site	Tailings sloughed down hillside from mine above creek approx. 500 ft. to road. Abandoned mine w/collapsed outbuildings; tailings are approx. 80 ft. x 530 ft. along west side of creek; approx. 100 ft. along riparian area >80% veg loss; 100% no veg in upland.[3]	Spruce, willow	0%	0-10%	0%	0%	10-49%	Stream confined by road.
8	Willow Creek	Impact site	Multiple in-channel water bodies with grade control structures, no riparian vegetation on both sides of the creek from point all the way to confluence of East and West Willow Creeks.[3]	Minimal grasses and spruce	0%	0%	0%	0%	81-100%	Powerlines; mining structure; forebay.
2	Bellows Creek	Impact site	Located on private land off La Garita Ranch Drive at the confluence of the Rio Grande. No riparian vegetation from channel and bank stabilization work and new construction for approx. 1.5 miles upstream.[3]	Spruce, aspen, mixture of grasses and forbs	0%	0-10%	10-49%	0-10%	0%	Stable hillsides; unable to see bank stabilization work due to private property.
1	Alder Creek	Impact site	Dispersed recreation impacts from golf course.[3]	Willow shrubs, mixture of grasses and forbs	0%	20%	0%	10-49%	0-10%	Approximately 20% beetle kill in upland area; dispersed recreation impacts 10-49% from golf course; other impacts are road encroachment 0-10%.
A7	Rio Grande	Impact site	Compacted soils approx. 0.35 acres; very little vegetation.[3]	Spruce, pine, cottonwood	0%	0-10%	0%	0-10%	0%	Stable banks.
A9	Rio Grande	Impact site	Located at 30 mile bridge. Site in coordination with water quality site.[3]	Spruce, willow shrubs, mixture of grasses and forbs	50-80%	81-100%	0%	50-80%	10-49%	Uplands impacted by fire and beetle kill. Dispersed recreation and road encroachment impacts.
A12	Rio Grande	Impact site	Pull-out/camping area	Spruce, aspen	0%	50-80%	0%	0%	0-10%	Observed riparian from hillside. Dispersed rec in uplands from pull-out.
South Fork of the Rio Grande Tributaries										
4	Hope Creek	CNHP 7	Subalpine fir, Englemann spruce, willow[4]	Mixture of grasses and forbs. 40% aspen.	81-100%	81-100%	0%	0-10%	0%	Small aspens growing throughout drainage; mostly grasses and forbs; slopes appear stable; no evidence of erosion. Dispersed recreation is from hiking trail.

1) Map Labels refer to the Field Map for Volunteers in **Appendix A**.
2) CNHP = Colorado National Heritage Program. Impact site = identified from riparian and upland desktop analysis.
3) Baseline conditions taken from desktop analysis by SGM.
4) Baseline conditions and dominant species within specific vegetation community types: 1) Spruce/Fir forest, 2) Cottonwood/Blue spruce forest, 3) Willow, and 4) Herbaceous.
5) Percent area effected: 1-10%, 10-49%, 50-80%, and 81-100% determined from desktop analysis.

Map Label[1]	Name	CNHP Site or Impact Site[2]	Baseline Observations[3],[4]	Field Observations	Field Description					
				Dominant Species	% of Area Affected[5]					Field Description
					Fire	Beetle kill	Grazing	Dispersed Recreation	Other	
5	Hope Creek	Impact site	Located approximately 1.4 miles at the second switchback on USFS Rd 430 past Big Meadows Reservoir. Impact site is located approximately 0.6 miles upstream on the north hillslope. Upland erosion from lack of vegetation on upland hillslope into riparian area. Heavy sediment deposition for about 100' downstream of gully. Trail to north of river.[3]	Mixture of grasses and forbs.	81-100%	81-100%	0%	0-10%	0%	Upland impacts from fire. Large erosion cut from north tributary; vegetation is approximately 40% cover; large rocks in gully slowing runoff.
A3	Pass Creek	Impact site	Highway 160 over creek.[3]	Willow shrubs; mixture of grasses and forbs	0%	10-49%	0%	0%	0%	Highway 160 over creek; embankment is stable with approximately 100% vegetation cover.
13	Beaver Creek	CNHP 11 & 12	Narrowleaf cottonwood, blue spruce, thinleaf alder, willow[4]	Spruce, cottonwood, willow, mixture of grasses and forbs	0%	50-80%	0-10%	0%	0%	Ranked as B; dominant species include narrowleaf cottonwood, blue spruce, thinleaf alder, and willow. Cattle grazing across valley; minimal impacts.

1) Map Labels refer to the Field Map for Volunteers in **Appendix A**.
2) CNHP = Colorado National Heritage Program. Impact site = identified from riparian and upland desktop analysis.
3) Baseline conditions taken from desktop analysis by SGM.
4) Baseline conditions and dominant species within specific vegetation community types: 1) Spruce/Fir forest, 2) Cottonwood/Blue spruce forest, 3) Willow, and 4) Herbaceous.
5) Percent area effected: 1-10%, 10-49%, 50-80%, and 81-100% determined from desktop analysis.

Table 4-7. Summary of Riparian Area Rankings (organized from upstream to downstream)

Stream Name	Length of Stream (miles), Excludes On-stream Reservoirs	Average Rank of % Vegetation Removed/Fragmented[1]	Average No. of Impacts per mile	Ranking of No. of Impacts per Mile[2]	Total Rank[3]	Riparian Condition[4]
	(1)	(2)	(3)	(4)	(5)	(6)
Rio Grande Mainstem Tributaries						
Bear Creek	5.5	1.7	3.1	2.0	**1.9**	Good
Pole Creek	10.9	1.9	1.7	1.0	**1.4**	Good
Lost Trail Creek	9.5	1.3	3.5	2.0	**1.7**	Good
West Lost Trail Creek	5.3	1.2	9.8	3.0	**2.1**	Fair
East Ute Creek	2.3	1.0	2.6	2.0	**1.5**	Good
Middle Ute Creek	5.2	1.0	0.6	1.0	**0.8**	Excellent
West Ute Creek	4.5	2.0	2.0	2.0	**2.0**	Good
Ute Creek	6.0	1.0	1.0	1.0	**1.0**	Excellent
Squaw Creek	11.4	1.4	3.9	2.0	**1.7**	Good
Little Squaw Creek	9.6	2.9	3.0	2.0	**2.4**	Fair
North Clear Creek	14.5	1.3	21.2	4.0	**2.6**	Fair
Big Spring Creek	5.3	1.2	4.5	2.0	**1.6**	Good
South Clear Creek	8.6	1.2	13.3	4.0	**2.6**	Fair
Clear Creek	4.8	1.0	5.2	2.0	**1.5**	Good
Fern Creek	2.7	2.9	4.1	2.0	**2.4**	Fair
(West) Trout Creek	9.1	2.0	1.4	1.0	**1.5**	Good
Middle Creek	7.4	2.5	5.4	3.0	**2.8**	Fair
Red Mountain Creek	12.3	2.1	3.4	2.0	**2.1**	Fair
Rat Creek	8.3	1.7	9.0	3.0	**2.4**	Fair
Miners Creek	12.4	1.5	10.7	3.0	**2.2**	Fair
West Willow Creek	8.4	2.4	13.7	4.0	**3.2**	Poor
East Willow Creek	5.4	2.2	9.7	3.0	**2.6**	Fair
Willow Creek	2.6	1.5	41.0	4.0	**2.8**	Fair
West Bellows Creek	6.2	1.2	5.5	3.0	**2.1**	Fair
Bellows Creek	1.9	1.4	16.7	4.0	**2.7**	Fair
Goose Creek	18.1	2.0	3.5	2.0	**2.0**	Good
Elk Creek	6.4	1.6	6.1	3.0	**2.3**	Fair
Alder Creek	2.6	2	31	4.0	**3.0**	Poor
Willow Creek East	8.4	1.3	10.7	4.0	**2.7**	Fair
Rio Grande	66.2	1.5	14.4	4.0	**2.7**	Fair
South Fork of Rio Grande Tributaries						
Hope Creek	4.7	2.5	7.1	3.0	**2.7**	Fair
Kitty Creek	3.2	2.2	8.9	3.0	**2.6**	Fair
Pass Creek	9.2	2.1	4.8	2.0	**2.1**	Fair
Lake Creek	6.0	1.6	5.5	3.0	**2.3**	Fair
Park Creek	15.9	2.0	3.6	2.0	**2.0**	Good
Beaver Creek	14.5	2.0	4.2	2.0	**2.0**	Good
East Trout Creek	6.0	2.5	10.3	3.0	**2.8**	Fair
South Fork of Rio Grande	19.2	1.9	3.0	2.0	**2.0**	Good

1) Ranking is based off the CNHP rank of percent vegetation removed or fragmented: 1 = 0-10%; 2 = 10-49%; 3 = 50-80% and; 4 = 81-100%.
2) Ranking is based from stream data set rank and percentile function in excel for number of impacts per mile: 1 = 0-2; 2 = 2-4.9; 3 = 5-10.3 and; 4 = 10.4+.
3) Total rank equals (Column 2 + Column 4) divided by 2.
4) Riparian Condition Rank equals ≤1=excellent; 1.1-2=good; 2.1-2.9=fair and; ≥3=poor

5.0 Geomorphology Assessment

5.1 Objective

Stream channel morphology and evolution tend to reflect the dominant boundary conditions present in each landscape. Channels respond in varying degrees to regional and local bio-physical conditions and characteristics, including: local topography, patterns of hillslope erosion, wildlife or stock browsing in riparian areas, precipitation regimes, and patterns of peak and low-flow discharges. In many areas, local channel dynamics reflect changes in land use/land cover or water management across short, medium, and long timescales. Importantly, the structure of the stream channel and the way that it changes through time mediates the functioning of many ecosystem attributes. For example, channel form and processes mediate riparian health conditions, as streambank vegetation both responds to channel changes and plays an important feedback role in controlling and maintaining channel stability over time. The development of process-based conceptual models of system behavior is therefore useful for identification of locations on the landscape at elevated risk for degradation of high-value environmental attributes.

5.2 Approach and Methodology

Fluvial geomorphological processes and conditions throughout the study area were initially characterized by cataloging existing information on existing channel form and processes, historic physical characteristics, rates of sediment transport, and riparian conditions. Stream channel classification helped to organize available information and provided an opportunity to define conceptual models of channel behavior and the evolutionary trajectories that are both possible and likely. Spatially inventorying land use information including road networks, burn areas, and storage/diversion infrastructure allowed for the identification of important relationships between land conditions and stream conditions. Hydraulic and sediment transport modeling was used to understand channel dynamics along alluvial reaches within the study area, particularly in reaches downstream from large burn areas.

- Channel classification *characterized the dominant geomorphological processes* at work on different stream reaches in the Rio Grande watershed.
- Hydraulic and sediment transport models *illuminated reaches with potential sediment transport disequilibrium* contributing to channel instabilities.
- Pairing insights on channel processes with land conditions *highlighted linkages between undesirable stream conditions, land use, land cover, and water use.*
- Geomorphic conditional assessments identified the need for *additional analysis or fieldwork* and targeted *potential rehabilitation or protection sites.*
- Consideration of natural recovery potential *identified stream reaches likely to respond positively to active intervention*.
- Stream reaches in *poor condition with low natural recovery potential were identified as candidates for management projects*.

5.2.1 Existing Studies and Data Sources

Table 5-1 summarizes key literature and datasets relevant to fluvial geomorphology. To augment available data, project staff and volunteers collected additional stream cross sections and particle size distributions at key locations to enable assessments of sediment transport and channel stability. **Table 5-2** indicates how various available and derived data and information was used in the application of various assessment methodologies.

5.2.2 Desktop Analysis

Classifying river channel types provides a useful framework to understand the dominant physical processes at a position in the stream network. This process-based understanding of channel form is useful for contextualizing historical impacts to riverine ecosystem function and for anticipating future shifts in ecosystem function following some altered condition. In this way, river classification not only simplifies communication about the ways that dynamic physical processes manifest themselves across the landscape, but also aids in natural resource use decision-making.

Table 5-1. Key Literature and Datasets Relevant to Geomorphology

Existing Datasets	*New and Derived Data*	*Reports/Interviews*
❖ USGS 10 meter Digital Elevation Models (DEM) ❖ USGS NHD Flowlines ❖ CPW R2Cross Cross-sections ❖ Colorado Division of Water Resources (CDWR) Structure Locations ❖ CDWR Diversion Records ❖ USGS Surficial Geology ❖ USGS NLCD ❖ National Agricultural Imagery Program (NAIP) Aerial Imagery ❖ USGS Streamflow Records	**Collected** ❖ Cross-section surveys ❖ Wolman pebble counts **Created** ❖ Estimated daily streamflows on mainstem and tributaries ❖ River Styles channel classification ❖ Longitudinal profiles of hydraulic characteristics ❖ 1D hydraulic models and At-a-Station hydraulic geometry models ❖ 1D sediment transport models	❖ Upper Willow Creek Watershed – Flood Control and Stream Stability Study (Agro Engineering, 2002) ❖ A Framework for a Restoration Vision for the Rio Grande (Tetra Tech, 2003) ❖ Regional Bankfull Characteristics for the Lower Willow Creek Steam Restoration (NRCS, 2003) ❖ Don Prichard, *et. al*, BLM

Table 5-2. Assessment Methodology Inputs/Outputs

Data Inputs	*Output or Model*
❖ USGS 10 meter DEM ❖ UGS NHD Flowlines ❖ CDWR Structures ❖ Derived GIS data (valley width, power index, etc.)	❖ Longitudinal profiles
❖ USGS 10 meter DEM ❖ UGS NHD Flowlines ❖ USGS Surficial Geology ❖ USGS NLCD ❖ Aerial imagery ❖ Longitudinal profiles	❖ River Styles channel classification
❖ GS/CDWR streamflow records ❖ CDWR diversion history ❖ USGS 10 meter DEM	❖ Estimated daily streamflow on mainstem and tributaries
❖ Cross-section surveys ❖ CPW R2Cross cross-sections ❖ Estimated daily streamflows	❖ 1D hydraulic models
❖ 1D hydraulic models ❖ Wolman pebble counts	❖ 1D sediment transport models

The River Styles framework was selected as an appropriate approach for channel classification in the study area, as it encourages process level understanding of channel forms. This approach uses cross-sectional geometry, planform geometry, and geomorphic features of the floodplain to classify stream reaches in terms of channel behavior, not just current physical character. The root of the framework is a hierarchical classification tree. The hierarchy begins broadly with valley characteristics and increases in specificity with floodplain geomorphic features, instream geomorphic features, and substrate types (**Figure 5-1**; **Table 5-3**). Rio Grande watershed streams were classified down to the level of floodplain and instream geomorphic features whenever possible but stopped short of using substrate data for further style type delineation due to project constraints and paucity of existing data on tributaries. Most assessments were carried out through examination of aerial photographs and GIS analyses of landform characteristics. Field visits conducted in late 2016 and early 2017 were used for ground-truth channel classifications on several streams.

Channel classification in the Rio Grande watershed yields insight into the anticipated physical responses of different stream reaches to existing management practices or anticipated flow regime or land use changes (**Figure 5-2**). For example, steep, confined, bedrock streams are less prone to geomorphic change than low-gradient streams following hydrologic regime changes. Headwater streams are, however, more tightly coupled to changes in hillslope land use or land cover changes than low gradient streams. Conversely, meandering unconfined streams are more vulnerable to rapid shifts in channel form and ecosystem function following changes to the flow regime, sediment regime, or riparian integrity. These streams are more resilient to changes in hillslope land use or land cover, as they are significantly less connected to patterns of surface water, debris, or sediment transport processes occurring on hillslopes. Changes in land use or water management, therefore, produce unique local responses, which are mediated by the local biophysical setting and the dominant geomorphological processes at work on a given stream reach. In this way, anticipating the degree to which land or water management may affect channel form and evolution is directly supported by process-based classifications.

The upper Rio Grande watershed exhibits a high diversity of channel types. Tributary streams originating in alpine and subalpine headwaters in the Rio Grande watershed feature confined channels: steep profiles, narrow riparian bands, and variable substrates. These channels are somewhat resilient to changes in hydrology (e.g. alteration of runoff timing, reduced peak flows, or altered baseflows) and such changes are unlikely to initiate large shifts in channel geometry. However, major land use changes on hillslopes (e.g. timber harvest, fire, road development, increased impervious area, or climate-induced shifts in vegetation communities) can increase sediment inputs, alter the frequency and magnitude of shallow landslides, or disrupt the supply of woody debris to the stream. Mid-elevation tributaries, such as South Clear Creek, North Clear Creek, and the reaches of the Rio Grande mainstem below Rio Grande Reservoir, exhibit partially or fully unconfined morphologies where they flow across wide alluvial pockets (frequently known as ‘parks’ in the southern Rockies). Planform-controlled channel geometries and active meandering are also present. These channel forms are responsive to changes in flow regime, sediment regime, and riparian condition, increasing their sensitivity to human and natural disturbance. Legacy effects from grazing in the riparian zone, road building, and reservoir construction can push these reaches out of balance with their natural biophysical setting. Increased sediment loads from fire-affected tributaries may also cause local or regional channel instability. Where riparian zone degradation is observed along these reaches, streambank vegetation preservation or rehabilitation may prove beneficial. From the middle of the watershed to its terminus at South Fork, the Rio Grande mainstem alternates between partly confined and confined channel morphologies. Although the valley bottom itself consists of wide, flat alluvial deposits, most of these features are terraces that exist at an elevation above the river channel too great for regular flood inundation. The Rio Grande flows through a relatively small floodplain in the bottom of a shallow entrenchment (1 to > 10 meters deep) into these terraces. The result is a predominantly confined morphology with little active floodplain. Where the river can access the floodplain, localized segments are sensitive to disturbance and alteration in flow regime, riparian condition, and floodplain fragmentation due to transportation infrastructure development.

5.3 Assessing Geomorphic Condition

Consideration of the concepts of connectivity, capacity, and complexity are useful for evaluating channel dynamics within the context of a process-based channel classification scheme. Interplay between these critical components of the physical system govern a stream’s resilience to perturbation:

- Connectivity refers to the linkages between hillslopes, floodplains, and the river. The presence or absence of these linkages provide primary controls on sediment and nutrient inputs, energy dissipation, and biological exchange at the reach scale and throughout greater channel network. Connectivity between hillslopes and stream channels is largely mediated by land cover. Road networks, forest fires, and other occurrences that alter land cover may increase connections between patterns of hillslope erosion and sediment loading to downstream channels. Forestry or removal of riparian vegetation may reduce connections between hillslopes and channels and decouple important fluvial geomorphic processes governed by woody debris inputs to streams. In alluvial streams, longitudinal connectivity throughout the stream network and lateral connections between a channel and its floodplain are often more important than connections between the channel and adjacent hillslopes. Dams, water diversions, dikes, and other infrastructure alter hydrologic connections between adjacent stream channels and/or floodplains in a way that may alter the balance between sediment supply and transport or impact important feedbacks between the hydrologic regime and riparian health.
- Capacity describes a channel segment’s ability to effectively convey water and sediment and is largely controlled by sediment supply, local channel geometry, and the hydrologic regime. Where capacity for sediment transport is reduced, channel aggradation may occur, and rapid channel change may follow. Where capacity for sediment or water transport is increased, excessive bed sediment transport may produce down-cutting or other undesirable changes.
- Complexity encompasses the scales of physical variability in channel planform or bedforms and the magnitude of hydrological and hydraulic variability experienced at a location across time. Complexity is driven by physical processes and, in turn, drives local energy dynamics, habitat quality, and habitat availability for aquatic life. Complexity may be reduced where historical mining operations, development of towns, or other infrastructure resulted in the straightening or channelization of streams. Construction of in-channel features, other types of hardened engineering for recreation, or habitat enhancement can also alter sediment transport and erosion processes that shift channel forms either locally or in downstream areas.

Figure 5-1. River Styles Classification Workflow

Table 5-3. Modified River Styles Classification Descriptions, as applied to the Watershed

Landscape Characteristics	Classification	Key features
Confined valley setting. High energy streams closely coupled to hillslopes. Narrow riparian zones. Very sensitive to upland land use activities.	Alpine headwaters	High gradient, low-order streams exhibiting waterfalls, cascades, no floodplain, and substrate ranging from bedrock and boulders to sand and gravel; interspersed with small zones of alluvium and valley fills.
	Steep perennial headwaters	High gradient, low-order streams exhibiting cascades, extensive wood debris/log jams, no floodplain, and substrate consisting of colluvium, boulders, and gravel.
	Step cascade	High gradient, predominantly step cascades and occasional steep runs and waterfalls. Increasing amounts of cobble and gravel deposits with partially recognizable reoccurring step structure and frequency. Substrate includes bedrock, boulders and colluvium.
	Confined valley	Confined channel geometry with very little or no floodplain present throughout reach. Instream features derive from lower gradients than step cascades reaches; with plane bed and riffle-run sequences dominant rather than cascades and step pools, although the latter may still occur. Planform remains fully margin-controlled.
	Confined valley occasional floodplain pockets	Small and discontinuous floodplain pockets, controlled largely by margin structures. Riffles, runs and rapids with occasional larger wood-generated or step pools. Median substrate decreasing in size compared to headwaters; fewer boulders and more sands and gravels. Occasional but irregular instream bar formations.
Partially confined valley setting. Moderate energy streams exhibiting some floodplain development and weak connections to hillslopes. Variable riparian zone widths. Somewhat sensitive to both land and water use activities.	Elongated discontinuous floodplain, bedrock confined	Low to moderate sinuosity reaches in partially confined valleys; channel bed in predominately alluvial materials; various bar types, run and pool complexes, well-developed floodplain typically on one side of river; lateral channel movements occur but are largely confined by valley margins for a majority but not all of linear channel distance. Confining margins variously include bedrock, terraces, alluvial fans, and extensive colluvium stretches.
	Low-moderate sinuosity planform-controlled discontinuous floodplain	Similar to elongated discontinuous floodplain but with slightly increased sinuosity and tendency to exhibit active meandering activity and channel features in planform. Channel still abuts confining valley margins frequently. Increased presence of meander-related geomorphic floodplain and channel features including paleo channels, meander cutoffs, cutbanks; multiple instream bar types. Substrate can range from cobbles to silt.
	Meandering planform-controlled discontinuous floodplain	Active channel abuts confining margins for a minority of linear valley distance but is not fully unconfined. Floodplain and instream geomorphic features characteristic of meandering and lateral migration including multiple bar forms, especially point bars, cutoffs, and cutbanks. Substrate can range from cobble to silt.

Landscape Characteristics	Classification	Key features
Laterally unconfined valley setting. Low energy alluvial streams exhibiting well-developed floodplains. Very weak connections to hillslopes and strong interactions with overbank areas. Well-developed riparian zones. Sensitive to land use changes in floodplains, changes in sediment supply, and water use activities that alter the timing and/or magnitude of peak flows.	Low-moderate sinuosity unconfined	Unconfined, planform-controlled channel with low-moderate sinuosity, almost to straight in some instances. Poorly developed meandering and associated geomorphic forms.
	Meandering	Unconfined, planform-controlled channel with moderate to high sinuosity, well-developed meandering and associated channel and floodplain geomorphic forms. Range of bar types, floodplain features and floodplain textures; substrate sizes tending towards gravels and sand; substrate variability depends on habitat-scale geomorphic features such as location in bend, pool, or riffle.
	Intact valley-fill	Low-order stream form in very low-gradient headwaters reaches and rare instances of structural fill pockets at mid-elevations, typically related to landscape-scale structural elements that promote high-elevation valley fills; may alternate with steep headwaters styles. Slow water runs and overflow channels, potential for multiple small flow paths; typically feature fine textured sediments.
	Alluvial fan	Unconfined, distributary channel form with potential for multiple channels, lateral migration, and frequent location shift. Typically occurs only for short distances at the mouths of steep, lower-order tributaries. Where developed by humans, channel location may be artificially confined and no longer shift laterally. Active formation processes may be evident at mouths of burned tributaries in the Rio Grande area.

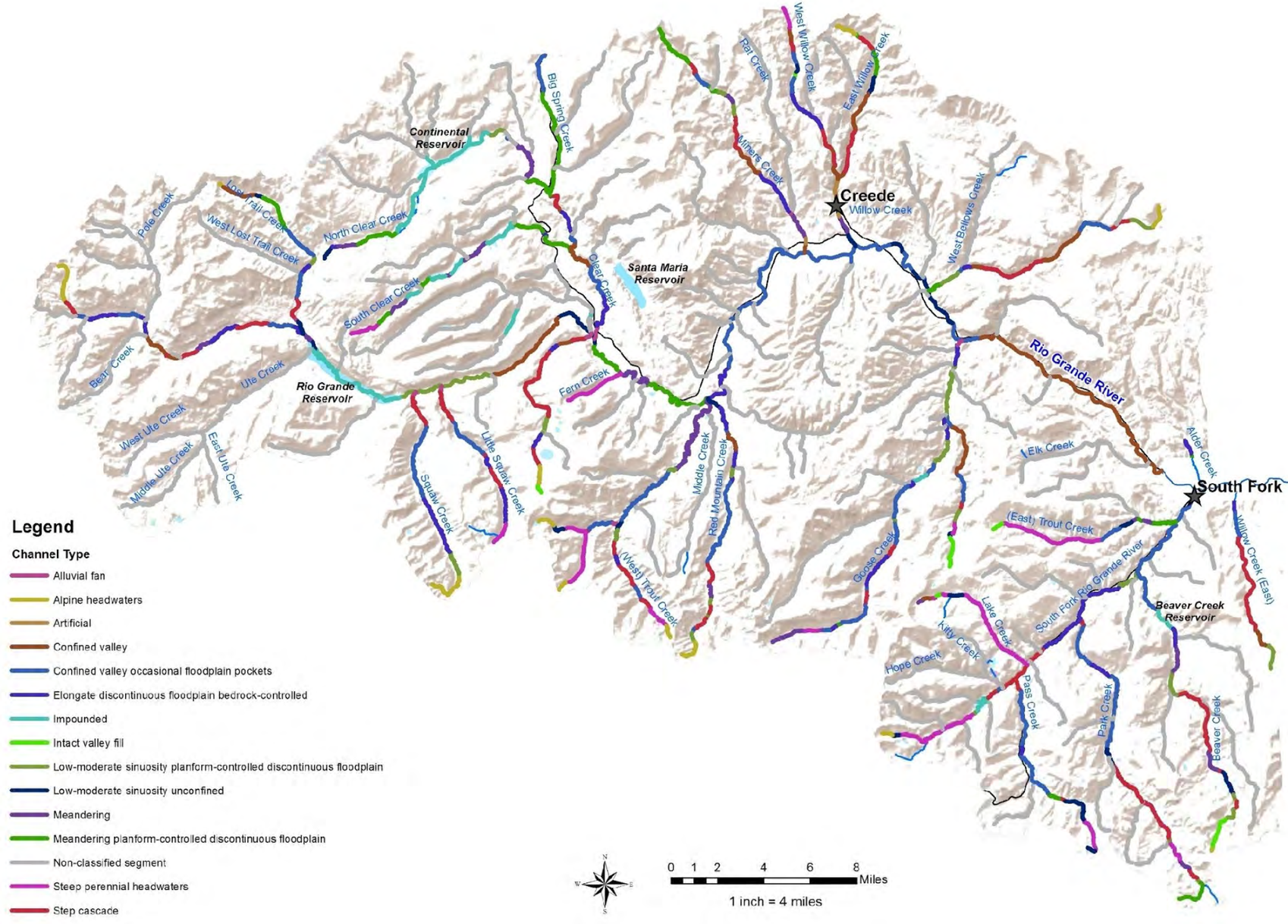


Figure 5-2. Process-based Channel Classifications

There are no ideal targets for the degree to which a stream reach is connected to adjacent hillslopes or floodplains, or its capacity of moving water, sediment, and woody debris, or complexity in longitudinal and planform channel structures. Rather, the manifestation of connectivity, capacity, and complexity play out on stream reaches differently depending on landscape position, climate, hydrology, etc. Considerations of these geomorphological conditions are useful for understanding and anticipating natural or management-induced changes to one of the three concepts that may trigger rapid or dramatic changes to channel form and function. Where such changes result in different—and, potentially, undesirable—fluvial geomorphic states, restoration action may be desirable.

The geomorphic conditional assessment initially relied on desktop analysis. Aerial photographs and other geospatial data were overlaid on classification results to identify locations where local degradation of riparian vegetation, forest fire activity, impoundment of water, or fragmentation of floodplains altered expected conditions for connectivity, capacity, or complexity. Initial assessment results were refined following review by stakeholders and ground-truthing during field visits. To respond to expectations of increased connectivity between the mainstem Rio Grande and burned hillslope areas, this assessment effort also employed a coarse-scale sediment transport analysis on the mainstem Rio Grande (**Appendix B**). Cross sectional surveys, Wolman Pebble counts, and observed and simulated streamflow were used to calculate effective discharge—the streamflow responsible for mobilization of most of bed sediment—at several locations. Divergence between the effective discharge and the high-frequency (2-4-year recurrence interval) flood flow in areas downstream from burn areas was expected to be observed. This result would have indicated a decrease in channel competency and an increased propensity for aggradation or lateral channel movement near tributary confluences carrying increased sediment loads from recently burned sub-watersheds. Our results did not indicate any reduction in the ability for high frequency flood events to mobilize sediments in these channels.

Qualitative ranking of connectivity, capacity, and complexity as *Good (Score=3), Moderate (Score=2)*, or *Poor* (*Score=1*) on streams reaches throughout the Rio Grande—given their existing condition and expectations for the dominant processes governing local channel form—highlights areas that may require special land or water management consideration (**Table 5-5**, **Figure 5-3**).

The following list details the management issues of concern identified by the assessment of geomorphological conditions on streams and rivers in the upper Rio Grande watershed:

1. **Monitor ongoing Willow Creek Restoration projects.** Monitor recent restoration efforts above the confluence with the Rio Grande. Local parties are actively addressing channel form and process issues with ongoing channel reconstruction projects below Willow Creek. Careful monitoring of any channel response to restoration actions is required. The section of Willow Creek below Creede receives flow and sediment from the straightened and diked portion of the creek. The high sediment conveyance and hydraulic energy of this upstream segment may produce unexpected downstream outcomes in the restoration area.
2. **Develop Plans for Floodplain Restoration on West Willow Creek.** In the area near Nelson Creek, geomorphological recovery from mining is likely to proceed slowly at best without significant intervention. In these areas, develop restoration plans for removal of mine waste from the historical floodplain, stabilization of mine waste on hillsides, and revegetation of riparian zones.
3. **Promote and protect beaver activity.** Altered hydrologic and sediment regimes due to reservoirs on South Clear Creek appear to be mitigated by beaver activity downstream of reservoirs. Passive management of ecosystem function through promotion or protection of beaver activity in these and other areas below reservoirs is recommended.
4. **Develop hazard or zoning overlays.** Channel processes in some reaches on valley floors may benefit from county and city hazard overlay and zoning overlays that restrict development in floodplains and riparian areas. Work with local governments to develop and adopt these overlays. Where these overlays exist, work with planning commissions to develop policies that work to promote removal of historical structures from floodplains during redevelopment approval processes.
5. **Work with landowners to protect riparian areas**. Develop partnerships with local landowners in the watershed to implement riparian restoration and streambank protection projects, including utilizing grazing best management practices. Focus efforts in areas of the watershed with local channel instabilities or denuded riparian areas.

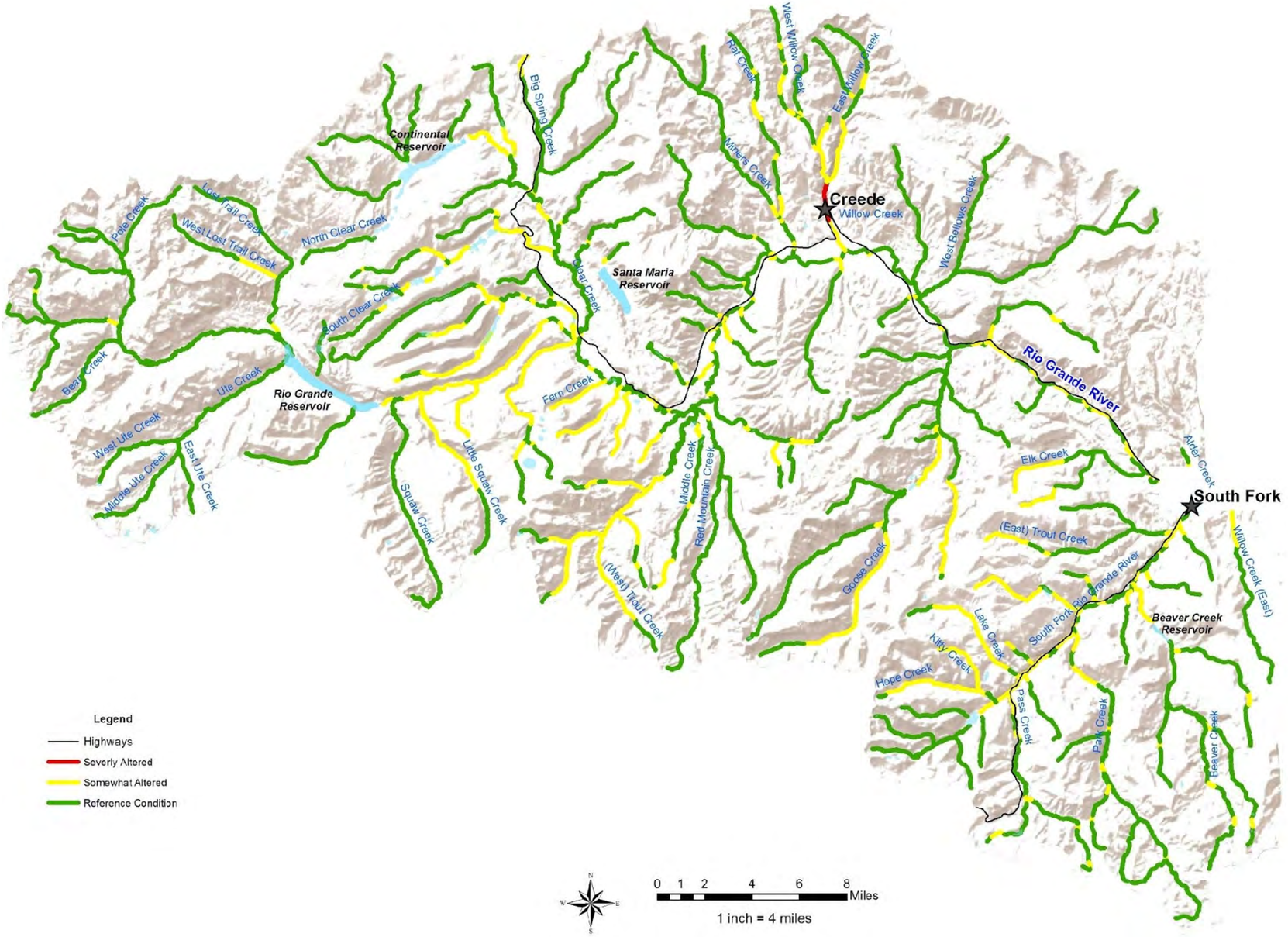


Figure 5-3. Geomorphic Condition Assessment Results from across the Watershed

Table 5-4. Geomorphic Condition Assessment (GCA) and Natural Recovery Potential Evaluation Results (up-to-downstream)

Stream	Connectivity	Capacity	Complexity	GCA	Observations and Comments	Natural Recovery Potential and Management Recommendation
	Rio Grande Mainstem Tributaries					
Bear Creek	3	3	3	3.0	Bear Creek watershed lies high on the headwaters of the Rio Grande. It contains little development and features an intact hydrologic regime and presumably undisturbed sediment regime. CR 506 stretches high to the alpine zone to access abandoned mine features at Kite Lake, but the road predominantly traverses hillslopes, avoiding the stream and floodplains.	To the extent that hydrologic regime and channel form remain unaltered, Bear Creek should maintain high functional values.
Pole Creek	3	3	3	3.0	Pole Creek watershed lies high on the headwaters of the Rio Grande. It contains little development and features an intact hydrologic regime and presumably undisturbed sediment regime.	To the extent that hydrologic regime and channel form remain unaltered, Pole Creek should maintain high functional values.
Lost Trail Creek	3	3	3	3.0	Lost Trail Creek features an intact hydrologic regime and undisturbed channels. Impacts from the high-altitude Carson Mining District including increased sediment from road networks and mine refuse appear limited by lack of direct connectivity to the creek. Unconfined channel types in the upper watershed exhibit intact riparian vegetation and planform-controlled geometries that appear balanced and functional. Higher gradient reaches in the confined lower watershed are resilient to physical changes and road crossings utilize bridges rather than culverts, maintaining longitudinal connectivity to greater watershed.	To the extent that hydrologic regime and channel form remain unaltered, Lost Trail Creek should maintain high functional values.
West Lost Trail Creek	2	2	3	2.3	West Lost Trail Creek experienced a large landslide known as Sturzstrom in 1991, damming the valley to form a lake. The stream now moves through the area in a percolating and distributed channel network for several hundred meters. The hydrologic regime is intact but sediment regime and channel form are progressing towards a new dynamic equilibrium downstream of the slide.	West Lost Trail Creek downstream of the landslide will experience a shifting sediment regime for decades as the valley adjusts to its new configuration. Monitor these conditions for evidence of downstream alteration in channel form or process, especially between CR 520 and the Rio Grande on Lost Trail Creek. Where geomorphological change is evident, consider secondary impacts to infrastructure and develop mitigation plans that adjust infrastructure location rather than attempt to "fix" local channel forms to resemble the historical condition, as this approach is unlikely to succeed in areas near the Rio Grande confluence.
East Ute Creek	3	3	3	3.0	East Ute Creek lies wholly within designated Weminuche Wilderness and features an intact hydrologic regime and undisturbed sediment regime.	To the extent that hydrology regime and channel form remain unaltered, East Ute Creek should maintain high functional values.
Middle Ute Creek	3	3	3	3.0	Middle Ute Creek lies wholly within designated Weminuche Wilderness and features an intact hydrologic regime and undisturbed sediment regime.	To the extent that hydrology regime and channel form remain unaltered, Middle Ute Creek should maintain high functional values.
West Ute Creek	3	3	3	3.0	West Ute Creek lies wholly within designated Weminuche Wilderness and features an intact hydrologic regime and undisturbed sediment regime.	To the extent that hydrology and channel form remain unaltered, West Ute Creek should maintain high functional values.
Ute Creek	3	3	3	3.0	Ute Creek lies wholly within designated Weminuche Wilderness and features an intact hydrologic regime and undisturbed sediment regime.	To the extent that hydrologic regime and channel form remain unaltered, Ute Creek should maintain high functional values.
Squaw Creek	3	3	3	3.0	Squaw Creek features undisturbed hydrology and sediment regimes in the upper watershed, largely escaping the significant fire impacts of neighboring Little Squaw Creek. Wilderness designation shields the Basin from anthropogenic impacts, while remaining vulnerable to shifting climate and natural disturbances like wildfire.	To the extent that hydrologic regime and channel form remain consistent, Squaw Creek should maintain high functional values.

Stream	Connectivity	Capacity	Complexity	GCA	Observations and Comments	Natural Recovery Potential and Management Recommendation
Little Squaw Creek	2	2	3	2.3	Little Squaw Creek features largely undisturbed hydrology but sediment balance and channel forms may be disturbed from catastrophic fires in 2013. Fire impacts can increase lateral hillslope connectivity and increase sediment loads.	Medium-long-term recovery potential is good. Little Squaw Creek is likely to experience unbalanced sediment characteristics in the short-medium-term (years-decades) from fire impacts. Post-fire recovery should progress without significant intervention if natural hydrologic processes remain intact.
North Clear Creek	1	2	3	2.0	North Clear Creek's headwaters display few hydrologic or hydraulic impacts. The lower half of the watershed is comprised of a series of impoundments that disrupt longitudinal habitat connectivity while significantly altering flow regimes and sediment transport.	Lower North Clear Creek is likely to remain at suboptimal ecological stream function to the extent that other social water values are maximized, and existing water management regimes continue. Investigate opportunities for stream management planning with local stakeholders to identify opportunities to support existing uses and alter existing infrastructure to better support sediment and water conveyance and reduce the number and severity of longitudinal discontinuities.
Big Spring Creek	3	3	3	3.0	Spring Creek features an undisturbed hydrologic regime and largely unaltered channel form. CO 149 lies adjacent to the creek but seldom encroaches the floodplain. CR 18 crosses Spring Creek near its mouth via an unimproved ford, unlikely to impair network connectivity.	To the extent that hydrologic regime and channel form remain unaltered, Spring Creek should maintain high functional values.
South Clear Creek	1	2	3	2.0	The South Clear Creek headwaters display few hydrologic or hydraulic impacts, while the lower reaches are home to a series of impoundments that disrupt longitudinal hydrological connectivity sediment transport regimes.	Lower South Clear Creek is likely to remain at suboptimal ecological stream function to the extent that other social water values are maximized. Altered hydrological and sediment regimes appear to be mitigated by beaver activity downstream of reservoirs. Passive management of ecosystem function through promotion or protection of beaver activity in these areas is recommended.
Clear Creek	3	3	3	3.0	Clear Creek below the confluence of the N and S forks flows in a small canyon, largely removed from road and housing impacts. Channel form is robust to changes in floodplain conditions or hydrologic condition in most areas. Reservoir operations on the N and S forks alter flow and sediment inputs, but largely intact tributaries to the N and W may attenuate overall impacts from upstream flow alteration.	Future expansion of upstream reservoirs or reoperation of the existing reservoirs may alter hydrologic and sediment regime significantly enough to observe changes in channel form and processes near the confluence with the Rio Grande.
Fern Creek	2	2	3	2.3	Fern Creek is a small, low-elevation tributary with largely undisturbed hydrologic regime and channel form. It may not have perennial flow in all years. Catastrophic fires during 2013 likely increased hillslope connectivity and sediment delivery. The current water/sediment regime is potentially unbalanced and likely to impact channel form including substrate characteristics (capacity). Higher gradients, predominantly in confined channel form, and the persistence of natural hydrologic regimes likely make Fern Creek resilient to long-term impacts.	Medium-long-term recovery potential is good. Fern Creek is likely to experience unbalanced sediment characteristics in the short-medium-term (years-decades) from fire impacts. Post-fire recovery should progress without significant intervention.
(West) Trout Creek	2	2	3	2.3	Trout Creek features largely undisturbed hydrology. Catastrophic fires in the subwatershed during 2013 likely have increased hillslope connectivity and sediment delivery to Trout Creek, with the current water/sediment regime remaining unbalanced and likely to impact channel form including substrate characteristics (capacity) and local habitat quality (complexity).	Medium- to long-term recovery potential is good. Trout Creek is likely to experience unbalanced sediment characteristics in the short-medium-term (years-decades) from fire impacts. However, with intact hydrologic regimes, confined valley types, and higher gradients, Trout Creek should experience a natural recovery to pre-fire states without significant intervention. The low-gradient, meandering lower reaches in Antelope Park may have trouble accommodating the change in sediment load and flashy hydrology in the short-medium-term, reducing habitat complexity and potentially altering planform. Monitoring is recommended in this area. Where rapid aggradation, incision, or lateral movement of stream channels is observed, work with resource management agencies to develop riparian and/or hillslope revegetation projects in upstream areas.
Middle Creek	2	2	2	2.0	Middle Creek features largely undisturbed hydrology. Catastrophic fires in the subwatershed during 2013 likely have increased hillslope connectivity and sediment delivery. The current water/sediment regime is potentially unbalanced and likely to impact channel form including substrate characteristics (capacity). Higher gradients, a mix of confined and partly confined valley forms, and the persistence of natural hydrologic regimes likely make Middle Creek resilient to long-term fire impacts.	Medium-long-term recovery potential is good. Middle Creek is likely to experience unbalanced sediment characteristics in the short-medium-term (years-decades) from fire impacts. However, with intact hydrologic regimes, confined valley types, and higher gradients, Middle Creek should experience a natural recovery to pre-fire states without significant intervention.

Stream	Connectivity	Capacity	Complexity	GCA	Observations and Comments	Natural Recovery Potential and Management Recommendation
Red Mountain Creek	3	2	3	2.7	Red Mountain Creek exhibits a diverse array of channel morphologies, an intact hydrologic regime, and good longitudinal connectivity. Riparian conditions and channel habitat appear somewhat impacted in middle reaches, possibly by legacy grazing effects. A large number of artificial drop structures have been implemented upstream of Leopard Creek. Headwaters reaches exhibit few impacts.	To the extent that hydrologic regime and channel form remain unaltered, Red Mountain Creek should maintain high functional values.
Rat Creek	3	3	3	3.0	Rat Creek and its upper forks feature largely undisturbed hydrology and channel form. Although headwaters have experienced timber harvesting and distributed range management activities, few impacts are evident from a high-level view.	To the extent that hydrologic regime and channel form remain unaltered, Rat Creek should maintain high functional values.
Miners Creek	2	3	3	2.7	Miners Creek features a largely undisturbed hydrologic regime and channel condition. Timber harvest and range use likely impacted the upper watershed, but major legacy impacts are not currently apparent. Road encroachment in the last few miles, culvert crossing at CO 149 and CR 508, and limited pond construction near the mouth may somewhat inhibit longitudinal and floodplain connectivity.	To the extent that hydrologic regime and channel form remain unaltered, Miners Creek should maintain high functional values. Replacing culverts at road crossings with bridges or alternate crossing types that help improve longitudinal sediment movement may additionally aid in fish passage.
West Willow Creek	1	3	3	2.3	West Willow Creek features largely undisturbed hydrology and channel form in its headwaters and middle reaches. A series of multiple culverted road crossing at CR 503 reduces longitudinal network connectivity in upper reaches. Mining impacts increase in frequency and severity towards the Nelson Tunnel confluence. Downstream, legacy mining impacts provide ongoing physical limitations to stream condition. Road building, mine refuse piles, widespread soil disturbances, and significant historical vegetation alteration or removal promote instability on hillslopes and localized channel segments, increased sediment load, and reduced natural complexity. The intact hydrologic setting and high-gradient channel make West Willow Creek relatively resilient to physical disturbances; however, the extent of mining-related disturbances may overcome this resiliency for short reach lengths in the lower watershed.	To the extent that hydrologic regime and channel form remain unaltered, upper West Willow Creek should maintain high functional values with the exception of road impacts to connectivity. In the lower watershed, especially in the area near Nelson Tunnel, geomorphological recovery from mining uses is likely to proceed slowly, at best, without significant continued intervention. In these areas, develop restoration plans for removal of mine waste from the historical floodplain, stabilization of mine waste on hillsides, and revegetation of riparian zones.
East Willow Creek	2	3	2	2.3	East Willow Creek features largely undisturbed hydrology and channel form above the CR 502 crossing at 9700'. Below this landmark, legacy mining impacts provide ongoing physical limitations to stream condition. Road building, mine refuse piles, widespread soil disturbances, and significant historical vegetation alteration or removal promote instability on hillslopes and localized channel segments, increased sediment load, and reduced natural complexity. The intact hydrologic setting and high-gradient channel make East Willow Creek relatively resilient to physical disturbances; however, the extent of mining-related disturbances in the lowest reaches may overcome this resiliency.	To the extent that hydrologic regime and channel form remain unaltered, upper East Willow Creek should maintain high functional values. In the lower watershed, geomorphological recovery from mining uses likely to proceed slowly, at best, without intervention.
Willow Creek	1	2	2	1.7	Willow Creek features a relatively unaltered hydrologic regime but has been extensively impacted and modified by hardrock mining activities in the last century. The short reach from the confluence of the E and W forks through the mining district and downtown Creede has been straightened, armored, disconnected from hillslopes, and is subject to increased sediment input from mining refuse piles, roads, and disturbed soils. Sediment balance is likely highly unbalanced; however, due to the reach's confined valley and steep gradient, transport capacity probably remains functional. Below Creede, Willow Creek's sediment balance remained strongly non-functional until recent efforts to reestablish a natural planform on the alluvial floodplain.	To the extent that hydrologic regime and channel form remain unaltered, upper East Willow Creek should maintain high functional values. Lower Willow Creek was and is unlikely to recover on a suitable time frame on its own. Local parties are actively addressing channel form and process issues with ongoing channel reconstruction projects below Creede. Careful monitoring of any channel response to restoration actions is required. Monitor recent restoration efforts above the confluence with the Rio Grande. The section of Willow Creek below Creede receives flow and sediment from the straightened and diked portion of the creek. The high sediment conveyance and hydraulic energy of this upstream segment may produce unexpected downstream outcomes in the restoration area.
West Bellows Creek	3	3	3	3.0	West Bellows Creek and its upper forks feature largely undisturbed hydrology and channel form. Although headwaters have experienced timber harvesting and distributed range management activities, few impacts are evident from a high-level view.	To the extent that hydrologic regime and channel form remain unaltered, West Bellows Creek should maintain high functional values.

Stream	Connectivity	Capacity	Complexity	GCA	Observations and Comments	Natural Recovery Potential and Management Recommendation
Bellows Creek	3	3	3	3.0	Bellows Creek and its upper forks feature largely undisturbed hydrology and channel form. Headwaters show little impact from legacy timber harvesting. Distributed range management activities are the primary current impact, but stakeholders have not noted any particular excessive impacts from grazing. Localized floodplain alteration occurs due to pond building near the La Garita Ranch facilities, but the mainstem of the creek is not obstructed.	Consider working with local landowner(s) to implement grazing best management practices or fencing and grazing enclosures around streams and riparian areas.
Goose Creek	2	3	3	2.7	Goose Creek experienced upper watershed fire impacts in 2013 that may increase hillslope connectivity and result in unbalanced sediment loads. Lake Humphreys disrupts longitudinal connectivity in the watershed, and flow management can result in a sediment-starved reach downstream. However, confined valleys and steep gradients above Leopard Creek may keep Goose Creek largely insensitive to flow and sediment imbalances. Below Leopard Creek, Goose Creek exhibits a partly confined valley setting and occasionally planform-controlled geomorphology that may be more sensitive to changes in discharge and sediment load. Limited floodplain encroachments from roads and pond construction exist in these reaches.	Goose Creek is likely to experience unbalanced sediment characteristics in the short- to mid-term timeframe (years to decades) from fire impacts. Post-fire recovery should progress without significant intervention.
Elk Creek	2	3	3	2.7	Elk Creek is a small, low elevation tributary with largely undisturbed hydrologic regime and channel form. Elk Creek experienced partial impacts from 2013 fires, likely increasing hillslope connectivity and sediment delivery, with the current water/sediment regime potentially unbalanced. Higher gradients, partly-confined channel forms, and the persistence of natural hydrologic regimes likely make Elk Creek resilient to long-term impacts.	Elk Creek is likely to experience unbalanced sediment characteristics in the short-medium-term (years-decades) from fire impacts. Post-fire recovery should progress without significant intervention.
Alder Creek	2	3	3	2.7	Alder Creek features an intact hydrologic and sediment regime. Golf course and home development create minor floodplain incursions and hillslope connectivity disturbances.	Development impacts are unlikely to reverse but are not significantly impacting channel form or processes.
Rio Grande	2	3	3	2.7	The Rio Grande mainstem spans a diverse array of channel forms and hydrologic/hydraulic disturbance regimes. Because the only major impoundment occurs near the watershed top, alteration to natural flow and sediment regimes are increasingly attenuated from upstream to downstream by the numerous tributary subwatersheds. The valley floor includes some grazing and irrigated pasture. Even in wider portions of the valley, the river frequently travels in a semi-confined channel between low terraces. Localized impacts from recreation, development, and ranching exist, but the effects of these disturbances remain very localized and do not appear to significantly alter channel processes.	The mainstem Rio Grande appears to maintain consistent geomorphic function on most reaches under current conditions. Institute a program to monitor geomorphological change in stream reaches between Creede and South Fork where fish habitat structures alter patterns of sediment deposition, scour, and erosion. Where these structures are correlated with relatively rapid local or downstream changes in bed or bank forms, consider removal or redesign.
Hope Creek	2	2	3	2.3	Hope Creek is a small low elevation tributary with a largely undisturbed hydrologic regime and channel form. It may not have perennial flow in all years. Catastrophic fires during 2013 likely increased hillslope connectivity and sediment delivery, with the current water/sediment regime potentially unbalanced. Higher gradients, predominately in confined channel form, and the persistence of natural hydrologic regimes increase resiliency to long-term impacts.	Hope Creek is likely to experience unbalanced sediment characteristics in the short-medium-term (years-decades) from fire impacts. Post-fire recovery should progress without significant intervention.
Kitty Creek	2	2	3	2.3	Kitty Creek is a small low elevation tributary with a largely undisturbed hydrologic regime and channel form. It may not have perennial flow in all years. Catastrophic fires during 2013 likely increased hillslope connectivity and sediment delivery, with the current water/sediment regime potentially unbalanced. Higher gradients, predominately in confined channel form, and the persistence of natural hydrologic regimes increase resiliency to long-term impacts.	Kitty Creek is likely to evidence unbalanced sediment characteristics in the short-medium-term (years-decades) from fire impacts. Post-fire recovery should progress without significant intervention.

Stream	Connectivity	Capacity	Complexity	GCA	Observations and Comments	Natural Recovery Potential and Management Recommendation
Pass Creek	2	3	3	2.7	Hwy 160 and several local roads, ski area development, recreational road access, and timber harvesting near Pass Creek at the headwaters likely increases fine sediment load, largely due to increased road network density. Numerous road crossings also interrupt longitudinal connectivity. However, its steep gradient and confined geometry are likely to maintain a resiliency to major geomorphic alteration.	Although Pass Creek features resilient morphology and hydrologic regimes, road impacts from Hwy 160 are unlikely to be mitigated due to the state and national significance of the travel corridor.
Lake Creek	2	3	3	2.7	Lake Creek features largely undisturbed hydrology, but sediment balance and channel forms may be disturbed from catastrophic fires in 2013. Fire impacts may increase lateral hillslope connectivity and increase sediment loads. Confined valley types and steep gradients help maintain resiliency to long-term channel impacts from fires.	Medium-long-term recovery potential is good. Lake Creek will likely experience unbalanced sediment characteristics in the short-medium-term(years-decades) from fire impacts. However, with intact hydrologic regimes, confined valley types, and higher gradients, Lake Fork should experience a post-fire recovery without significant intervention.
Park Creek	3	3	3	3.0	Park Creek features a largely intact hydrologic regime and low levels of channel disturbances. Timber harvesting has occurred over time on higher hillslopes but appears buffered from the mainstem. Short segments feature elevated hillslope connectivity due to road encroachment by CR 380 and 21. Extensive USFS and logging road networks may also increase sediment flux over time. Multiple road crossings on the mainstem are bridged rather than culverts, minimizing longitudinal connectivity impacts.	To the extent that hydrologic regime and channel form remain unaltered, Park Creek appears to maintain high functional values. Potential impacts from road networks may be mitigated by erosion abatement projects on road shoulders and cut and fill slopes that feature active rilling or shallow landslide activity.
Beaver Creek	1	2	3	2.0	Headwater reaches of Beaver Creek feature largely undisturbed hydrology and channel form, although timber harvest has occurred in the recent past. The reservoir eliminates longitudinal connectivity for aquatic life to the greater system and interrupts sediment transport to the lower creek.	Headwaters in Beaver Creek are in functional condition. Due to reservoir controls on hydrology, lower Beaver Creek is managed for consumptive water uses locally, which are unlikely to shift in the short-medium-term.
(East) Trout Creek	2	3	3	2.7	Trout Creek (South Fork watershed) features a largely undisturbed hydrologic regime but has some fire impacts in its highest reaches. Fires in 2013 have likely increased hillslope connectivity and sediment delivery. Higher gradients, a mix of confined and partly confined valley forms, and the persistence of natural hydrologic regimes likely make Trout Creek resilient to long-term impacts.	Short-medium-term good. Trout Creek may experience unbalanced sediment characteristics in the short-medium-term (years-decades) from fire impacts in the upper watershed. However, the majority of the watershed experienced little fire, and with intact hydrologic regimes, confined valley types, and higher gradients, Trout Creek watershed should recover naturally.
South Fork Rio Grande	2	3	3	2.7	The South Fork exhibits a wide variety of channel forms from headwater to mouth. It features an intact hydrologic regime but numerous road encroachments throughout and a limited amount of floodplain development in the lower watershed. The South Fork's generally steep gradients in the headwaters and confinement within low terraces in the lower watershed make the channel largely insensitive to changes in hydrology and sediment load. A short reach of unconfined channel near the Fun Valley Family Resort exhibits significant floodplain encroachment. Highway 160 over Wolf Creek Pass disrupts hillslope-channel connectivity of the South Fork on numerous occasions, but the high gradient step-cascades and heavily armored streambeds do not appear significantly impacted by the road corridor.	The South Fork Rio Grande features resilient morphology to changes in hydrologic regime. Where road impacts from Hwy 160 occur, they are unlikely to be mitigated due to the state and national significance of the travel corridor. Connectivity impacts to headwater tributaries resulting from local and forest service roads may warrant exploration and mitigation, but specific issues were not observed in this assessment. Channel processes in the lower reaches may benefit from county and city hazard overlay and zoning overlays that restrict development in floodplains.

5.4 Geomorphology Assessment Results

Expert evaluation of the processes affecting channel structure and dynamics helped anticipate the natural recovery potential (or lack thereof) on stream reaches affected by some stressor (**Table 5-5**). Where conditions appeared degraded and where natural recovery potential was assessed as low, management intervention is an appropriate consideration. The coarse-scale examination of stream and river conditions across the Rio Grande watershed indicated the greatest potential geomorphological sensitivities result from changes in hydrology and sediment loading in the recently burned areas, from historical mining activities near Creede, from development of transportation corridors in floodplains and adjacent hillslopes, and from development and operation of reservoirs. Although burned areas face significant impacts to channel processes, the lack of permanent human alteration to channel hydraulics and the intact-nature of the affected streams' hydrologic regimes make it likely that recovery will occur in a year-to-decades timeframe. Conversely, some locations facing geomorphology impacts from dams, roads, mining, or other major anthropogenic channel alterations are less likely to move towards recovery without active restoration or management efforts. Critically, while geomorphological processes appear functional on many streams in the study area, it is important to recognize the potential for secondary effects of watershed management and restoration strategies aimed at resolving other issues or concerns. Careful consideration and planning will help avoid a situation where restoration of one riverine attribute inadvertently degrades geomorphological processes (**Table 5-5**).

Table 5-5. Management/Restoration Project Types that Affect Geomorphological Processes

Hydrologic Regime Projects	*Sediment Regime Projects*	*Riparian and Bank Stability Projects*
❖ Alternative storage and release scenario planning at reservoirs ❖ Instream flow and conservation leasing with water users ❖ Dry year non-diversion agreements with water users	❖ Fuels reduction/treatments on fire-prone hillslopes ❖ Levee or dam removal ❖ Culvert and bridge replacement projects ❖ Range management projects. ❖ Transportation corridor restoration projects	❖ Riparian vegetation restoration and enhancement ❖ Recreational access projects

The type and magnitude of geomorphic disturbances in the upper Rio Grande relate directly to stream channel resiliency and recovery likelihood. In burned reaches, connectivity between hillslopes and channels has been increased by the alteration or destruction of over-story and riparian vegetation communities. This increased connectivity results in increased loading of fine and coarse sediments to streams and a flashier hydrological response to precipitation events. Elevated peak flows following rainstorms, increased fine sediment delivery from hillslope rilling, and large colluvial inputs due to an increased frequency of landslides and debris flows can cause significant alteration in local channel form. Importantly these headwaters feature steeper confined valleys, exhibit high stream power, and are likely to transport an increased fine sediment load with little difficulty. Colluvial inputs and coarse sediment supply may not be easily transported by these streams in the short run, but they are also unlikely to significantly impact downstream reaches. In tributary reaches featuring partly confined or unconfined morphologies, the increased sediment load could generate unpredictable sediment storage or transport and corresponding lateral or vertical channel shifts. During field visits, personnel were unable to locate areas where altered sediment inputs produced aggrading channel forms on tributary streams. The natural recovery potential of most streams in burn areas appears to be moderate or high. However, the propensity for change in these areas is elevated against background or reference conditions and these reaches were assigned a reduced scoring accordingly.

Increased hillslope-stream connectivity from extensive road network development present a lesser, but widely distributed impact to small tributary streams in mountainous zones, where roads frequently parallel valley bottoms. Where roads dissect floodplains and riparian areas, they interrupt lateral connectivity between channels and hillslopes or floodplains. Subsequent disruption of sediment transport, woody debris delivery, and in-channel energy dynamics may produce effects on channel geomorphology ranging from moderate to significant. In general, road impacts occur throughout the watershed, but most impacts are limited to short stream reaches near secondary or forest roads. Highway 149 and Highway 160 tend to create larger scale impacts on hillslope-channel connectivity. However, the channel response to these impacts is muted.

On both small and large streams, reservoirs and small impoundments impact fluvial processes by disrupting the downstream flow of sediment, nutrients, and woody debris. Larger reservoirs with the capacity to capture sediment and significantly alter hydrologic regimes downstream may also drive changes in channel morphology below their outlets. Dam-released waters are often 'sediment starved', which can lead to streambed armoring or bank erosion as well as downstream shifts in channel planform as streams 'mine' sediment from the channel bed or streambanks. Impoundments also disrupt network connectivity, preventing longitudinal movements of woody debris, detritus, or migrating aquatic fauna (e.g. fish or macroinvertebrates). This may contribute to genetic bottlenecks, the inability to recover from stochastic events (such as wildfire and landslides in disconnected tributaries), or the inability to access preferable habitat under changing temperature or flow regimes related to climate change. Numerous small-to-medium sized reservoirs in the upper watershed interrupt network connectivity and alter downstream sediment transport regimes. However, changes in sediment and hydrological connectivity do not manifest in altered downstream channel dynamics. It is likely that beaver activity in these areas mediates the impacts commonly associated with altered connectivity.

Mining activity on the streams near Creede disturbed channel form and process by increasing sediment inputs, altering hillslope connectivity, and reducing channel complexity. Ongoing and recent channel realignment and riparian restoration efforts respond to this historical degradation. The middle reaches of Willow Creek also face significant degradation from road development, channelization, and urbanization of the floodplain. The complex interactions and synergies created by this suite of stressors on channel morphology makes the recovery of Willow Creek especially challenging. Significant effort will be required to remove mine waste from floodplains on West Willow Creek, and it is unlikely that the channel will ever be released from the flume that carries the entire stream through Creede. Despite these difficulties, the magnitude of the impacts, the proximity of human habitation, and the uses of Willow Creek and its tributaries make it a high priority for management.

6.0 Infrastructure Assessment

6.1 Objective

Development of infrastructure, particularly in the watershed, is necessary to allow the public access to the bountiful natural resources and wilderness. Infrastructure impacts to river health are found from the development of hard construction such as roads, bridges, reservoirs, mines, and towns that impact natural developed channels. Extensive mining in the Basin created disturbances through tailings piles and, in some cases, mine drainage consisting of heavy metals. With mines came roads, railroads, and bridge crossings up the Rio Grande valley. The post-mining era brought water development and installation of river diversions and construction of reservoirs along the Rio Grande and its tributaries to support active mining operations and a growing agricultural industry further down in the Rio Grande Basin. Today, the Rio Grande continues to be impacted not as much by those in search of silver and lead, but instead by those seeking the thrills of driving off road vehicles in the mountains, adventuring in the wilderness, and rafting and fishing the prized upper Rio Grande. River users have modified the riverbanks to access the river with rafts, kayaks, and dories and, in a few places, the main river channel to improve sport fishing habitat.

The objective of the infrastructure assessment was to identify significant impact points along the Rio Grande, specifically those impacts to aquatic and riparian conditions as well as impacts to river recreation. Characterization of the existing infrastructure was based on existing datasets provided by the State Engineer's Office, CPW, USFS, and Colorado's Decision Support System (CDSS). Interviews were also conducted with the USFS, CPW, and others familiar with recreation activity within the watershed. Coordination with the TAT occurred throughout the infrastructure assessment.

6.2 Approach and Methodology

Watershed infrastructure was characterized using existing georeferenced datasets such as road alignments, historical and active mines, permitted water discharge locations, reservoirs, and river diversions. Datasets developed as part of this assessment were based on aerial reviews and input from individuals familiar with the watershed and with datasets characterizing the locations of bridges, boat ramps, and in-channel structures. Interviews were conducted with staff at the RGNF, CPW, TU, Rio Grande Angler, and Ramble House Creede Guide and Outfitters to characterize the watershed infrastructure and priority impacts. **Table 6-1** lists the infrastructure assessment datasets used for the analysis. **Figure 6-1** depicts this information graphically and provides an overview of the location of this information in the watershed. This figure also identifies potential water quality impacts from mine drainage, sedimentation from gravel roads, discharge permits, and the locations of large reservoirs located on federal lands. **Appendix C** (MAPBOOK) includes a map set of the Rio Grande corridor identifying the bridges, boat ramps, land ownership, and instream structures.

Table 6-1. Key Literature and Datasets Relevant to Infrastructure

Existing Datasets	*New and Derived Data*	*Reports/Personal Interviews*
❖ Colorado Department of Public Health and Environment (CDPHE) ❖❖ Individual and industrial discharge permits ❖❖ Municipal discharge permits ❖❖ 303(d) reaches ❖ CDSS ❖❖ Diversion structures ❖❖ Reservoirs ❖❖ Flow gage locations ❖ Colorado Geological Society (CGS) ❖❖ Historical Mines ❖❖ Active Mines ❖ USFS ❖❖ Roads ❖❖ USFS Boundaries ❖❖ Wilderness Boundaries ❖❖ Fire Complex Burn Areas ❖❖ Grazing Allotments ❖❖ Activity Locations ❖ ESRI ❖❖ Aerial imagery ❖ San Luis Valley Rural Electric Cooperative ❖❖ Electric line locations	❖ Boat ramps on Rio Grande (TU, Rio Grande Angler, Ramble House Creede Guide and Outfitters) ❖ Bridges (TU, Rio Grande Angler) ❖ In-channel structures (Wason Ranch)	❖ USFS ❖❖ Jody Fairchild (Dist. Recreation Staff Officer) ❖❖ Steve Brigham (Natural Resource Specialist/Snow Ranger) ❖❖ Ivan Geroy (Forest Hydrologist) ❖❖ Devon Catsamire (Social Scientist) ❖❖ Burned Area Report (USDA, 2013) ❖ CPW ❖❖ Estevan Vigil (Fishery Biologist) ❖❖ Brent Woodward (Dist. Wildlife Manager) ❖❖ Jeremy Gallegos (Dist. Wildlife Manager) ❖❖ Rick Basagoitia (Area Wildlife Manager) ❖ TU ❖❖ Kevin Terry (Project Coordinator, Rio Grande Basin) ❖ Wolf Creek Ski Resort ❖❖ Davey Pitcher (owner)

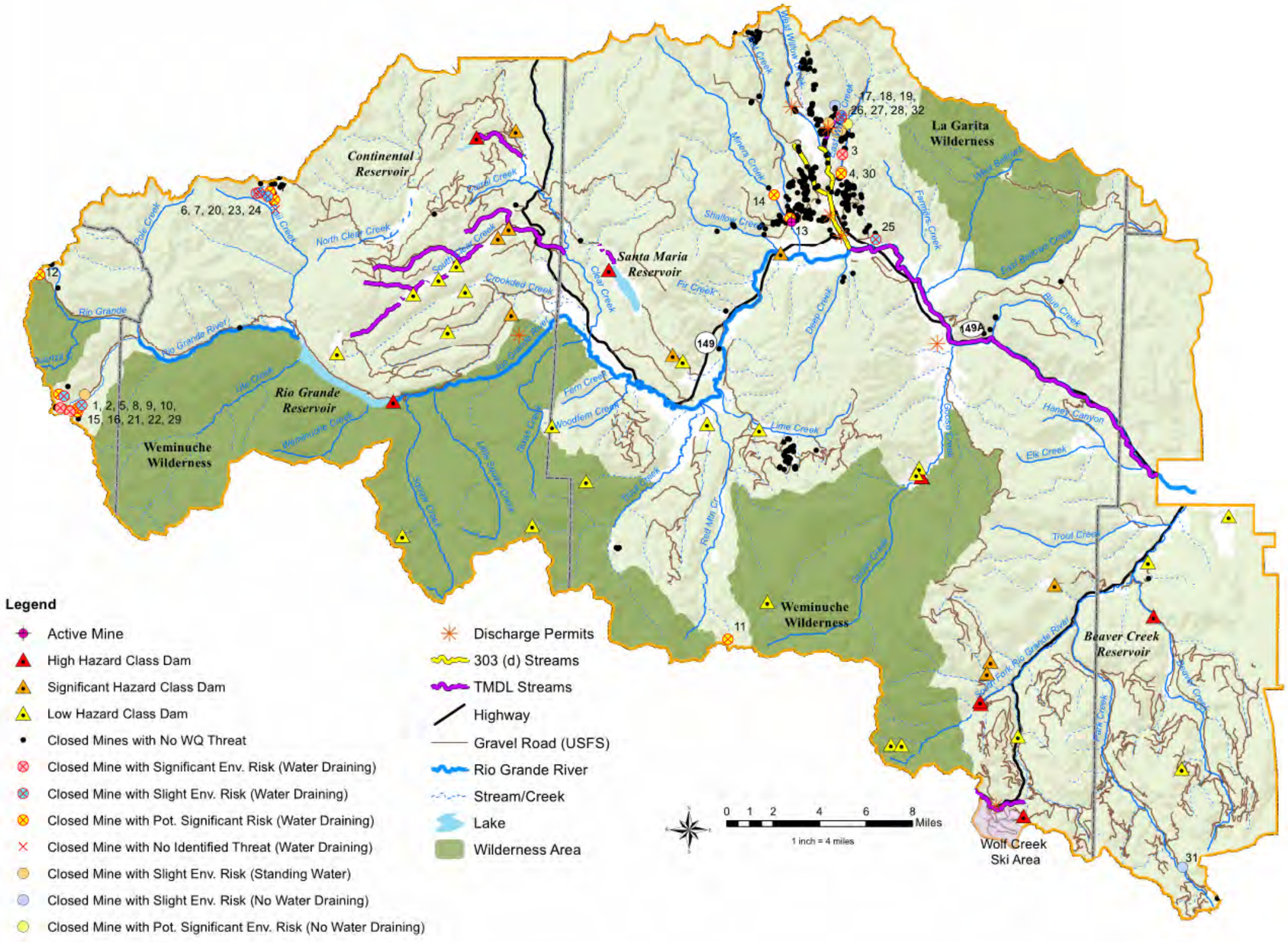


Figure 6-1. Overview of Infrastructure in Watershed (Labels Cross-Reference Table 6-4)

6.2.1 Roads and Communities

Mountainous regions dictate roads and communities be developed in the valley bottoms and such is the case in the watershed. Three main communities, South Fork, Creede, and Wagon Wheel Gap, all are located along or near the Rio Grande. Highway 149 connects each of the towns and runs along the Rio Grande from South Fork on the east to the top of Spring Creek Pass in the northwest portion of the watershed. Highway 160 diverges off 149 in the Town of South Fork and heads south, up the South Fork Rio Grande Basin to the top of Wolf Creek Pass near where the ski resort is located. Historical railroad tracks exist from Creede to South Fork, although the only trains regularly operating within the Basin today are scenic tourist trains that run periodically during the summer. Geographical limitations forced multiple railroad and highway bridge crossings of the Rio Grande and tributaries as they developed up into the Basin. Approximately 27 vehicular, pedestrian, and railroad bridges can be found crossing the Rio Grande within the watershed (**Table 6-2**).

6.2.2 Rio Grande National Forest

Most of the watershed is in the RGNF, which is owned and managed by the USFS. Sections of two wilderness areas are also located within the watershed, including 168,282 acres of the Weminuche Wilderness and 25,203 acres of the La Garita Wilderness. The USFS manages over 18 campgrounds, numerous dispersed camping areas, and trails for multiple purposes, including hiking, horseback riding, OHVs, and single track uses. For water recreation, the USFS manages 17 lake boating and fishing activity areas and several river boat ramps (**Appendix C**). The USFS also permits grazing allotments and timber harvesting within the watershed. In addition, the USFS manages over 729 miles of identified gravel roads.

From June 5, 2013 through January 1, 2014 the West Fork/Papoose Fire Complex burned a total of 88,724 acres of the RGNF, mainly in the southwest portion of the watershed. The fire was started by lightning strikes in an area vastly impacted by the spruce beetle outbreak. Land managers with the USFS and CPW have indicated that the burn areas have stabilized, and regrowth is occurring, which was confirmed by field verification during the riparian and upland assessment (see photos in **Appendix A**). As noted in the Riparian Assessment section, the post fire dominant species in the riparian vegetation communities have shifted to aspens and mixtures of grasses and forbs.

6.2.3 Reservoirs

As early as 1895, large reservoirs were being constructed to supply water for irrigation and mining operations throughout the Rio Grande Basin. In response to the need for capturing spring snowmelt and delivering larger water quantities late in the irrigation season, three large reservoirs were constructed in the early 1900's: Rio Grande Reservoir, Santa Maria Reservoir, and Continental Reservoir. **Table 6-3** shows the reservoirs located in the watershed that are classified as High Hazard or Significant Hazard due to the impacts level of damage expected if the dams failed.

Particularly, the Santa Maria and Road Canyon Reservoirs are notable due to their old age, hazard class, and dam heights. Humphrey's Reservoir and hydropower plant on Goose Creek is another important structure, as it is the only Federal Energy Regulatory Commission-licensed hydropower operation in the Basin, and the dam is classified as a high hazard potential.

A unique aspect of the reservoirs located in the watershed is the number and size of reservoirs located within designated wilderness or roadless areas. The lands these reservoirs are located on were designated with these special protections after the construction of the reservoirs but add to complexity and difficulty maintaining and improving these structures. Reservoirs located in these areas are of concern for strict monitoring and prompt response to recommended upgrades due to the coordination involved and permissions needed to access the dams with any sort of machinery.

6.2.4 Mining

Historical mining occurred throughout the watershed with most of the mines located in Willow Creek and Miners Creek drainages near the town of Creede. Additional pockets of mines are in Lost Trail Creek, Lime Creek, and Bear Creek drainages. The Colorado Geological Society (CGS) identified 455 mapped historical mine locations, 32 of which were identified with slight, potentially significant, or significant environmental risks (**Table 6-4**). Rio Grande Silver, LLC is the owner of the only CGS identified active mine in the watershed at the Bulldog Mine and is currently undergoing research and exploration for lead and silver.

6.2.5 CDPHE Datasets

Colorado Department of Public Health and Environment (CDPHE) is the state agency responsible for enforcing the Clean Water Act and protecting water quality of rivers and streams. CDPHE manages the 303(d) List of Water-Quality-Limited Segments requiring Total Maximum Daily Loads (TMDLs) and Colorado's Monitoring and Evaluation (M&E) List. In addition, CDPHE oversees review and issuance of discharge permits aimed to protect receiving waters from degrading impacts. Within the watershed there are listed 303(d) segments for pH/acidity/caustic conditions along the mainstem of Willow Creek and up branches of East and West Willow Creek (**Table 6-6**). TMDLs have been established on 43 river segments within the watershed as documented on the M&E list including a segment on the main stem of the Rio Grande from Creede to South Fork. Water quality parameters of concern listed in the M&E include six commercial & industrial discharge permits in the watershed. The Bulldog Mine exploration discharge permit and two inactive mining discharge permits are included in the list. Three public & private discharge permits are issued in the watershed: the Creede's Wastewater Treatment Facility (WWTF), Wolf Creek Ski Area's WWTF, and the 4UR Ranch Inc. for groundwater discharges. **Table 6-5** lists CDPHE discharge permits issued within the watershed.

6.2.6 Rio Grande Corridor Features

Uses of the Rio Grande in the Assessment area have changed in recent history from industrial and domestic use during the mining boom to include recreational resources visitors seek today. The river channel has been modified over time. Diversion structures were constructed in and along the Rio Grande, mainly between Creede and South Fork, to direct flow towards mining operations and irrigation uses. More recently, drop structures were constructed along 3.5 miles of the Rio Grande east of Creede near the Wason Ranch to increase sport fishing habitat. Based on interviews with local fisherman and guides, there are mixed reviews as to whether the fishing was significantly improved, but the boulder drop structures create white water waves for recreational boaters to enjoy. According to the Wason Ranch manager, the fishery has improved, and the river banks are more stable. Significant streambank restoration improvements were made along a four-mile reach of the Rio Grande just west of the Rio Oxbow Ranch, approximately 29 miles west of Creede.

6.3 Infrastructure Impact Assessment

Infrastructure was assessed and evaluated by considering three impact categories: 1) recreation use on the Rio Grande, 2) vulnerability to flooding or fire events, and 3) water quality threats. The assessment review began with a course-scale review of the assembled datasets and interview inputs. Connectivity between features was evaluated with GIS-based maps displaying the existing and created datasets shown in **Figure 6-1** and **Appendix C**. The initial qualitative assessment also considered input from the TAT and resulted in the identification of specific sites that were impacted

Table 6-2. Bridge Assessment

Name	Type	Private or Public	Owner	Recreational Assessment
Thirty Mile Campground Bridge	Vehicular	Public	USFS	
Little Squaw Resort Bridge	Vehicular	Private	Little Squaw Resort	
Box Canyon Bridge	Vehicular	Public	USFS/County	This bridge is rarely passable by river and rafters that float the canyon need to take out on river left just upstream. There are no formal boat ramps on either side of bridge.
Fern Creek Rd Bridge	Vehicular	Public	County	
Rio Oxbow Ranch Bridge	Vehicular	Private	Rio Oxbow Ranch	Starts to be dangerous at flows above 1,200 cfs at the thirty-mile gauge. There may be future issues when the outlet gates at Rio Grande Reservoir are repaired and the new gates allow larger releases.
USFS 772 Bridge	Vehicular	Public	USFS	
Kansas Club Bridge	Pedestrian	Private	Kansas Club	At high flows, boats must stay river left and be aware of hanging ropes and cables. This bridge needs maintenance and a possible lift and tightening.
Historical Marshall Park Bridge	Vehicular	Public		
Hwy 149 Bridge at Marshall Park	Vehicular	Public	CDOT	
Antlers Resort Bridge	Pedestrian	Private	Antlers Resort	Bridge is extremely dangerous during high flows (above 2,600 cfs) and hinders recreational use more than any other bridge. Bridge needs to be raised.
Broadacres Ranch Bridge	Vehicular	Private	Broadacres Ranch Resort	This bridge is passable on river left at all flows and river right most of the time.
HWY 149 Bridge at Broadacres Ranch	Vehicular	Public	CDOT	
County Road 507C Bridge	Vehicular	Private	County	
County Road 806 Bridge	Vehicular	Public	County	
Hwy 149 Bridge at Wason Ranch	Vehicular	Public	CDOT	
Wason Railroad Bridge	Railroad	Private		Hazardous at times due to debris accumulation on the pilings
Hwy 149 Bridge near Wagon Wheel Gap	Vehicular	Public	CDOT	
Wagon Wheel Trestle Bridge	Railroad	Private		Most dangerous bridge to navigate due to accumulated debris and angle of bridge footers to river flow. At high flows (above 4,000 cfs) boats must be roped through the bridge or portaged.
Goose Creek Rd Bridge (4UR Ranch)	Vehicular			
Lower Terrace Drive Bridge	Vehicular			
Railroad Bridge at Upper Coller	Railroad	Private		
USFS 430A Bridge at Upper Coller	Vehicular	Public	USFS	
Pedestrian Bridge	Pedestrian	Private		
USFS 430 Bridge at Middle Coller	Vehicular	Public	USFS	
Superintendent Dr. Bridge	Vehicular	Public	County	
Elk Creek Bridge	Vehicular	Private		A relatively new bridge that was built too low. Boats are not able to float under bridge at flows above 2,500 cfs.
HWY 149 Bridge at South Fork	Vehicular	Public	CDOT	
County Road 19 Bridge	Vehicular	Public	County	Below Study Area
County Road 18 Bridge	Vehicular	Public	County	Below Study Area
County Road 17 Bridge	Vehicular	Public	County	Below Study Area
Flying W Bridge	Vehicular			Below Study Area
Rio Grande Canal Diversions	Diversion	Private		Below Study Area
HWY 112 Bridge (Del Norte)	Vehicular			Below Study Area

Table 6-3. Dams with High, Significant, or Low Hazard Classifications

DAMID	Dam Name	Stream	Year Completed	Year of Rehabilitation	Located on Federal Land	Located in Wilderness or Roadless Land	Dam Height (feet)	Normal Storage (acre-feet)	Outlet Inspection	Hazard Class	EAP	EAP Inundation Map	Last Inspection Date	Overall Conditions	Current Restrictions
200204	SANTA MARIA*	BOULDER CREEK	1911		Y	N	102	43,826	10/10/2013	High	Yes	Yes	9/5/2018	Satisfactory	No
200102	BEAVER PARK	BEAVER CREEK	1912	2016	Y	N	114	4,746		High	Yes	Yes	6/6/2018	Conditionally Satisfactory	No
200137	RIO GRANDE	RIO GRANDE RIVER	1914	2013-2016	Y	N	111	54,082	7/17/2012	High	Yes	Yes	12/6/2018	Conditionally Satisfactory	No
200121	HUMPHREYS - MAIN DAM	GOOSE CREEK	1926	1988	Y	N	81	842	1/1/1988	High	Yes	Yes	7/25/2018	Satisfactory	No
200233	HUMPHREYS - SPILLWAY DAM	GOOSE CREEK	1926		Y	N	26	842	5/11/2011	High	Yes	Yes	7/25/2018	Satisfactory	No
200110	CONTINENTAL	NORTH CLEAR CREEK	1927	2016	Y	N	92	22,679	9/22/2015	High	Yes	Yes	9/5/2018	Conditionally Satisfactory	YES
200114	FUCHS	E. FORK PINOS CREEK	1930		Y	N	25.5	237	10/3/2007	High	Yes	Yes	9/21/2018	Satisfactory	No
200101	ALBERTA PARK	PASS CREEK	1953	2018-planned	Y	N	32	598	7/1/2017	High	Yes	Yes	6/6/2018	Conditionally Satisfactory	No
200103	BIG MEADOWS - MAIN DAM	S FORK RIO GRANDE	1968		Y	N	61	2,436	10/6/2014	High	Yes	Yes	6/6/2018	Satisfactory	No
200230	BIG MEADOWS - NORTH DIKE	S. FORK RIO GRANDE	1968		Y	N	14.5	2,436		High	Yes	Yes	6/6/2018	Satisfactory	No
200205	SHAW - NORTH DAM	KITTY CREEK	1895		Y	N	25	681	10/18/2017	Significant	Yes	No		Conditionally Satisfactory	No
200231	SHAW - SOUTH DAM	KITTY CREEK	1895		Y	N	19	681	No Outlet	Significant	Yes	No	9/12/2017	Conditionally Satisfactory	No
200133	METROZ PARK, LOWER	DECKER CREEK	1907		Y	N	35	395	7/29/2011	Significant	Yes	No	9/4/2018	Satisfactory	No
200202	ROAD CANYON #1	ROAD CANYON CREEK	1908		Y	N	26	1,367	10/7/2014	Significant	Yes	Yes	6/5/2018	Conditionally Satisfactory	No
200219	TROUTVALE #1 (UPPER BROWNS LAKE)	SOUTH CLEAR CREEK	1911		Y	N	12.3	297	8/20/2002	Significant	Yes	Yes	6/5/2018	Conditionally Satisfactory	No
200106	BRISTOL HEAD #2 (UPPER BRISTOL HEAD)	SEEPAGE CREEK	1928		Y	N	29.5	305	8/14/2001	Significant	Yes	No	11/9/2018	Conditionally Satisfactory	No
200220	TROUTVALE #2 (LOWER BROWNS LAKE)	SOUTH CLEAR CREEK	1940		Y	N	15.3	257	8/20/2002	Significant	Yes	Yes	6/5/2018	Satisfactory	No

DAMID	Dam Name	Stream	Year Completed	Year of Rehabilitation	Located on Federal Land	Located in Wilderness or Roadless Land	Dam Height (feet)	Normal Storage (acre-feet)	Outlet Inspection	Hazard Class	EAP	EAP Inundation Map	Last Inspection Date	Overall Conditions	Current Restrictions
200138	RITO HONDO	RITO HONDO	1956	2019-planned	Y	N	44	561	10/7/2014	Significant	Yes	Yes	6/5/2018	Conditionally Satisfactory	No
200117	HERMIT #1	SOUTH CLEAR CREEK	1889		N	N	13	423		Low	Not Required	No	10/29/2014	Conditionally Satisfactory	No
200118	HERMIT #2	SOUTH CLEAR CREEK	1889		N	N	10	361		Low	Not Required	No	10/29/2014	Conditionally Satisfactory	No
200227	HOME LAKE	RIO GRANDE	1896		N	N	14	400		Low	Not Required	No	11/2/2015		No
200135	POAGE	BEAVER CREEK	1906		Y	N	22	370		Low	Not Required	No	7/18/2017	Satisfactory	No
200136	REGAN	HOUSE CANYON CREEK	1906		Y	N	17	717		Low	Not Required	No	10/28/2014	Conditionally Satisfactory	No
200127	LOST LAKE #1	LOST LAKE CREEK	1907		N	N	22	917	9/11/2002	Low	Not Required	No	8/23/2016	Satisfactory	No
200225	SPAR CITY, LOWER	LIME CREEK	1917		N	N	23	36		Low	Not Required	No	8/21/2009	Conditionally Satisfactory	No
200210	SOWARD #3	MIDDLE CREEK	1920		N	N	13	8		Low	Not Required	No	9/22/2015	Satisfactory	No
200105	BRISTOL HEAD #1	SEEPAGE CREEK	1921		Y	N	14.5	121		Low	Not Required	No	11/9/2018	Unsatisfactory	No
200116	HAY PRESS PARK - DAM #1	GOOSE CREEK	1922		N	N	27	200		Low	Not Required	No	7/20/2017	Conditionally Satisfactory	No
200234	HAY PRESS PARK - DAM #2	GOOSE CREEK	1922		N	N	8	200		Low	Not Required	No	7/20/2017	Satisfactory	No
200213	SPRUCE LAKE #1 (UPPER)	S FK RIO GRANDE	1926		Y	Y	18.5	111	7/13/2000	Low	Not Required	No	9/7/2018	Conditionally Satisfactory	No
200214	SPRUCE LAKE #2 (LOWER)	S FK RIO GRANDE	1926		Y	Y	18.5	105	7/13/2000	Low	Not Required	No	9/7/2018	Conditionally Satisfactory	No
200218	TROUT LAKE	WEST TROUT CREEK	1931		Y	Y	15	198		Low	Not Required	No	9/25/2008	Conditionally Satisfactory	No
200115	GOOSE LAKE	FISHER CREEK	1933		Y	Y	10.8	223		Low	Not Required	No	8/18/2004	Conditionally Satisfactory	No
200124	S. LAZY U	CROOKED CREEK	1933		N	N	11	149		Low	Not Required	No	7/30/2015	Conditionally Satisfactory	No
200221	WEE RUBY	TEXAS CREEK	1934		Y	N	12.5	186		Low	Not Required	No	9/30/2011	Satisfactory	No
200215	SQUAW LAKE	SQUAW CREEK	1937		Y	Y	10.7	131		Low	Not Required	No	7/17/1998	Conditionally Satisfactory	No
200123	JUMPER CREEK	JUMPER CREEK	1940		Y	Y	16.7	38		Low	Not Required	No	9/19/1996		No

DAMID	Dam Name	Stream	Year Completed	Year of Rehabilitation	Located on Federal Land	Located in Wilderness or Roadless Land	Dam Height (feet)	Normal Storage (acre-feet)	Outlet Inspection	Hazard Class	EAP	EAP Inundation Map	Last Inspection Date	Overall Conditions	Current Restrictions
200223	HERMIT #4	SOUTH CLEAR CREEK	1947		N	N	10	185	8/14/2001	Low	Not Required	No	10/29/2014	Satisfactory	No
200134	MILL CREEK	MILL CREEK	1953		N	N	25	43		Low	Yes	Yes	9/3/2008	Satisfactory	No
200229	WILLOW PARK	WILLOW CREEK	1970		N	N	19	13		Low	Not Required	No	10/6/2015	Conditionally Satisfactory	No
200232	LA GUNITA	PASS CREEK			N	N	17.4	50		Low	Not Required	No			No

* These reservoirs are off - channel

Definitions

- Year of Rehabilitation: From presentation by Bill McCormick, P.E., Chief Dam Safety Engineer, on March 14, 2017 at the Rio Grande Basin Roundtable meeting.

Hazard Classification:

- High - A dam for which loss of human life is expected to result from failure of the dam. Designated recreational sites located downstream within the bounds of possible inundation should also be evaluated for potential loss of human life.
- Significant - A dam for which significant damage is expected to occur, but no loss of human life is expected from failure of the dam. Significant damage is defined as damage to structures where people generally live, work, or recreate, or public or private facilities.
- Low - A dam for which loss of human life is not expected, and significant damage to structures and public facilities as defined for a "Significant Hazard" dam is not expected to result from failure of the dam.

EAP: Emergency Action Plan

NR – Not Required

NA – Not Applicable

Overall Condition

- Satisfactory - The safety inspection indicates no conditions that appear to threaten the safety of the dam, and the dam is expected to perform satisfactorily under all design loading conditions. Most of the required monitoring is being done.
- Conditionally Satisfactory - The safety inspection indicates symptoms of structural distress (seepage, evidence of minor displacements, etc.), which, if conditions worsen, could lead to the failure of the dam. Essential monitoring, inspection, and maintenance must be performed as a requirement for continued full storage in the reservoir.

Table 6-4. Historical Mines with Identified Environmental Risk

Map Label	Type	Drainage	Environmental Rating	Hazard Rating	Condition	Comments
1	adit	water draining	significant	no significant hazard	filled or collapsed	Looks possibly like a collapsed adit with a dump below, but it should be further investigated. It discharges about 15 gpm of water which leaves a heavy stain & precipitate on dump & rock. Small dump, very likely has limited workings, if it is indeed.
2	adit	water draining	significant	no significant hazard	filled or collapsed	Collapsed shut but drains water straight into the lake. Difficult to tell ownership.
3	adit	water draining	significant	no significant hazard	intact	Has been safeguarded with a bulkhead seal with a locking grate. Probably on private land. A layer of crushed limestone was installed inside of 100 for buffering purposes. Water draining from opening is treated in a passive mine drainage treatment system.
4	adit	water draining	potentially significant	no significant hazard	filled or collapsed	Mammoth Tunnel is collapsed shut, but water flowing from the tunnel used to be collected & carried by pipeline to the old public water supply, where it was used to keep the shutoff valve from freezing.
5	prospect hole	water draining	potentially significant	no significant hazard	filled or collapsed	Slight amount of drainage- just a seep. Not possible to collect adequate water for pH/cond. test.
6	adit	water draining	potentially significant	no significant hazard	filled or collapsed	Water is pouring out of the collapsed adit & then flows over the dump.
7	adit	water draining	potentially significant	no significant hazard	filled or collapsed	This adit drains water. It is collapsed shut just inside the portal.
8	adit	water draining	potentially significant	no significant hazard	filled or collapsed	Collapsed shut but drains water. Per Floyd Getz this is the Kankakee Mine.
9	adit	water draining	potentially significant	potential danger	partially collapsed or filled	On patented land. Has partially collapsed & is water flooded.
10	adit	water draining	potentially significant	potential danger	partially collapsed or filled	Has timber & debris collapsed across portal leaving a 3' x 3' entrance into a water filled tunnel. Has short crosscut running to west just outside of collapsed debris. .
11	adit	water draining	potentially significant	potential danger	partially collapsed or filled	Adit faces directly onto creek. Its dump has mostly been eroded away.
12	adit	water draining	potentially significant	dangerous	partially collapsed or filled	Portal is caving but is still wide open. Snow over portal; discharges water. Given a 2 because of proximity to the popular Stony Pass 4wd road and its very unstable portal.
13	adit	water draining	potentially significant	potential danger	intact	Big Six Mine, unpatented claimant recently installed door with lock. Closure consists of steel pipe & 4' x 4' reinforcing wire. Somewhat effective.
14	adit	water draining	potentially significant	no significant hazard	intact	Closed with a bulkhead with door by Colorado Mined Land Reclamation Division (CMLRD) during Creede Project.
15	other	not available	potentially significant	no significant hazard	not available	A series of springs which issue about 5 gpm combined. These also form a lesser tufa mound but found no indication that these are from mining.
16	other	no water draining	potentially significant	no significant hazard	partially collapsed or filled	
17	other	no water draining	potentially significant	potential danger	partially collapsed or filled	A concrete & wooden vault associated with the outlet works for second opening. The area around the structure is unstable & hazardous.
18	adit	water draining	slight	no significant hazard	filled or collapsed	
19	adit	water draining	slight	no significant hazard	filled or collapsed	Check periodically because collapsed debris does not look stable. Settlement could allow for reopening to occur.
20	adit	water draining	slight	no significant hazard	filled or collapsed	Is on NFS land. It appears to have been covered/filled when the dozer bench was put in.
21	adit	water draining	slight	no significant hazard	filled or collapsed	Has collapsed shut but drains water.
22	prospect hole	water draining	slight	no significant hazard	filled or collapsed	
23	adit	water draining	slight	no significant hazard	filled or collapsed	Bearing from 100 to peak 13,581 is S55W.100 & 101 appear to be on private land. The dozer benches appear to postdate aerial photos.
24	adit	water draining	slight	no significant hazard	filled or collapsed	Collapsed shut but a tiny seepage drains out of the collapsed debris. Flow is too small to measure and infiltrates into the dump 10 ft. from the old portal face.
25	adit	water draining	slight	no significant hazard	intact	Safeguarded by MLRD, feature ID 08-176 #50, bulkhead with door, lock #3480. Shown as "cave" on topo. Not enough drainage to test.
26	vertical shaft	standing water only	slight	dangerous	partially collapsed or filled	A dangerous shaft with an unstable collar. It has cratered out to 25'x 35' at the surface. It necks down to a 4'x 6' wood-lined shaft. It has standing water at 29 ft. deep. The tape would not go below 35 ft. depth.
27	vertical shaft	standing water only	slight	potential danger	partially collapsed or filled	Has standing water about 10 ft. below ground level, unable to sample or test. Probed depth with a dead aspen. Apparent bottom only about 5 ft. below water level. Two small prospect pits east of 100 about 100 ft.
28	prospect hole	standing water only	slight	no significant hazard	intact	Looks like a very recently dug prospect pit. Was not here in 1991.
29	adit	standing water only	slight	potential danger	partially collapsed or filled	Standing water inside adit dammed by collapsed debris. Adit is about 150 ft. uphill from road. Noted another dump on air photos uphill from 100 but did not locate it during my brief recon, which was discouraged by an intense electrical storm.
30	adit	standing water only	slight	no significant hazard	Intact	Safeguarded by CMLRD using a steel grate with a locking door. Called Office of Surface Mining (OSM) 08-176 #25. A faint trail to the adit starts between old concrete diversion box, for old public water supply intake, and culvert on road. Concrete footer is deteriorating.

31	open pit	no water draining	slight	dangerous	partially collapsed or filled	Open pit face w/ 3-30’ bench faces, catch benches less than 5’ wide and mostly filled with rockfall, central to southern part of pit face has raveled and filled catch benches.
32	open pit	no water draining	slight	no significant hazard	intact	This looks like an area where there used to be mine openings, but someone brought in heavy equipment and cut an exploration pit through the area. There might also be some landslides in the area.

Table 6-6. CDPHE Colorado Discharge Permit System (CDPS) Permits

Permit Category	Permit Type	Permit ID	Permittee	Facility Name	Facility Address	Immediate Water	Receiving Water	Stream Segment	Activity Description
Commerce & Industry	COR040000-Metal mining stormwater	COR040085	Creede Resources Inc.	Emperius Mill		Nelson Creek	West Willow Creek	CORGRG07	Inactive flotation mill.
	COR040000-Metal mining stormwater	COR040087	Creede Resources Inc.	Phoenix Claim		Nelson Creek	West Willow Creek	CORGR07	Inactive underground metal mine.
	COR040000-Metal mining stormwater	COR040291	Rio Grande Silver Inc.	Equity Exploration Project	CR 503 and CR 503A	West Willow Creek	Willow Creek	CORGRG05	Activities involve a continuation of geologic exploration activities
	COR340000 - Sand and Gravel Stormwater only	COR341540	CDOT	Forest Service Pit Spring Creek	SH 149 and Antelope Mtn.	Ingalls Gulch	Crooked Creek	CORGRG02	Dry open pit. Sand and gravel mining and crushing operation, 12 months per year on an as needed basis.
Utilities – Public & Private	CO-Individual permit	CO0040533	Town of Creede	Creede WWTF	2223 N Main St.	Willow Creek	Rio Grande	CORGRG07	
	CO-Individual permit	CO0041785	Wolf Creek Ski Corp.	Wolf Creek Ski Corp WWTF	Hwy 160, 1 mile east of Wolf Creek Pass		Pass Creek	CORGRG09	
	COX-Individual permit	COX048904	4UR Ranch Inc.	4UR Ranch			Groundwater		

Table 6-5. 2018 303(d) and Monitoring and Evaluation Listings

Water Body	Cycle	WBID	AUID	Cat	AsT	Bugs	CdD	CuD	DO	FeD	FeTrec	MnD	PbD	pH	Sediment	ZnD
East Willow Creek	2018	CORGRG06	CORGRG06_B	3b			M&E						M&E			M&E
Embargo Creek and West Alder Creeks	2018	CORGRG05	CORGRG05_C	5	303(d)											
Hope Creek	2018	CORGRG09	CORGRG09_C	5											303(d)	
Nelson Creek	2018	CORGRG05	CORGRG05_B	3b	M&E		M&E	M&E				M&E	M&E	M&E		M&E
North Branch of Pass Creek	2018	CORGRG09	CORGRG09_B	5	303(d)			M&E								303(d)
Rio Grande	2018	CORGRG02	CORGRG02_A	5	303(d)											
Rio Grande	2018	CORGRG04a	CORGRG04a_A	5			TMDL						303(d)			TMDL
Seepage Creek	2018	CORGRG03	CORGRG03_A	3b							M&E					
South Clear Creek	2018	CORGRG02	CORGRG02_B	5	303(d)				M&E	303(d)	303(d)	303(d)				
West Willow Creek	2018	CORGRG07	CORGRG07_A	3b		M&E		M&E					M&E			M&E

by the three categories. Considerations for prioritizing the top features for each of the impact categories are described in the following sections.

6.3.1 Rio Grande Recreation Use Impact

Recreational uses on the Rio Grande have been increasing in recent years with the growing popularity of rafting and guided fishing trips. As these relatively new uses are developing, limitations caused by existing bridges, lack of river access, and development of in-channel structures are causing impacts. The analysis evaluated the restrictions that existing infrastructure has on recreational uses of the river. Characteristics of recreational impacts evaluated included:

- Dangerous conditions
- Boater flow restrictions
- Available river access points
- Required boat portages

6.3.2 Flood and Fire Vulnerability Impacts

Natural disasters such as forest fires, flooding events, or dam breaks from large reservoirs have the potential to significantly damage the infrastructure assets in the Basin. Impacts from recent forest fires can still be observed and are a constant reminder of the remaining threat. Beetle kill continues to propagate throughout the Basin. Floodplain mapping was researched for this project but, due to the undeveloped nature of the Basin, a very small percentage of the Basin has been mapped by the Federal Emergency Management Agency. Electric utility alignments were provided throughout the Basin and evaluated for vulnerability and impacts to the power grid system from forest fires. Characteristics evaluated for the vulnerability of a natural flooding or fire event included:

- Dam hazard classification, condition rating, age, recent repairs, and access
- Road and bridges potentially impacted by flood conditions
- Fire threats

6.3.3 Water Quality Impacts

Water quality in the watershed has been well monitored by CDPHE due to the high impacts from mining operations. Water quality has also been evaluated throughout the Basin to understand the connectivity between the different site impacts. Sediment flowing into the creeks and streams from bare ground, gravel roads, or barren mine sites contribute to heavy sediment loading events observed in Basin streams. In-depth discussion of water quality conditions within the watershed can be found in Section 8.0. Characteristics evaluated for water quality impacts included:

- Discharge permit types and locations
- Concentration of impacts to receiving streams
- Current condition of impacted stream
- Historical and current operations
- Gravel road and exposed soils near water bodies

6.4 Infrastructure Assessment Results

Table 6-7 identifies the prioritized infrastructure impacts in the watershed. Several bridges were found to be especially impacting recreational uses on the Rio Grande including the Box Canyon, Wason, and Wagon Wheel bridges as being the most dangerous obstacles. The Antlers Resort pedestrian bridge was also a concern because it is impassable at flows greater than 2,600 cfs; however, the owners allow boaters to portage on the property during the higher flows.

The lack of enough parking and restroom facilities at the Wagon Wheel Gap boat ramp and Marshall Park boat ramp were also considered in this evaluation. These two sites are congested and used beyond capacity on weekends from Memorial Day weekend through July from private and commercial boaters. The overuse is due to CPW's regulation that commercial guides and outfitters are restricted from using any CPW boat ramps in the Coller State Wildlife Area during that time. The purpose for this regulation is to allow private boaters and fisherman easier access to the river. However, private boaters are not aware of this regulation and not fully utilizing the "reserved" CPW ramps during this timeframe. Additionally, the Wagon Wheel Gap boat ramp parking is also used as an overflow parking area for the adjacent Pool Table Road, which is an access point for Pool Table Mountain, a popular OHV area. Currently, there are no signs along the river corridor that identify the different boat launch sites to direct rafters to the different put-ins and take-outs.

The Box Canyon bridge is impassable to rafters at all flows and there is no easy or identified portage as the boat ramp is located on the downstream side of the bridge. There are no upstream signs to warn rafters of the impending hazard and that they must portage the bridge. Improvements of all the prioritized bridge hazards are recommended and at the very minimum signage should be installed to warn river users of upcoming hazards and safe passages/portages.

The electric grid in the Basin consists of mostly overhead power lines with some underground lines installed along recent road improvements, residential areas, and along Goose Creek below the Lake Humphreys hydropower facility. A significant portion of the grid lies within the valley floor near existing roads where there is easy access to maintain, protect, and rebuild infrastructure if necessary. However, an overhead line runs through a dense forest in upper Pass Creek Basin which supplies power to the ski resort and other electric users and is at risk to forest fire. Power is also supplied into the upper Pass Creek Basin from the west side of the pass which can be used as an alternative source of power if needed. Another identified utility risk is the Lake Humphreys hydropower facility, which is located adjacent to the Weminuche Wilderness and is also at risk to forest fire. The 2013 West Fork Fire Complex burned very close to the facility but was fortunately spared as this facility is a source of renewable energy for the Creede area. Furthermore, as the facility is reliant on the Lake Humphreys Dam, there is a vulnerability to flooding and loss of supply water if the dam breaks.

Prioritized water quality impacts to the watershed were found along Bear Creek (mining) and South Fork (high concentration of gravel roads) and Willow Creek (high concentration of mining and gravel roads). Section 8.0 discusses the water quality analysis in more detail. Headwaters Alliance, which is a local effort established to improve water quality in the Willow Creek drainage, has made significant efforts in identifying and tackling prioritized projects in the Basin including multiple mine, tunnel, and tailing restoration projects. Also, the town of Creede is currently under contract to re-line Willow Creek through the town, which will help to stabilize the stream bank and prevent additional erosion and sediment loading.

Table 6-7. Prioritized Infrastructure Impacts (upstream to downstream)

Site	Impact Type	Location	Comments
Mine Drainage in Bear Creek Watershed	Water Quality	Bear Creek	High concentration of mining with identified significant environmental risks from mine drainage.
Reservoirs in Weminuche Wilderness	Dam Safety/Flood	Weminuche Wilderness (Squaw Creek, Little Squaw Creek, Goose Creek, and South Fork)	Dams are generally classified as low hazard but due to access issues from being in wilderness maintenance and improvement are more complex and add to the threat of impact on the watershed.
Box Canyon Ramp and Bridge	Recreation	Rio Grande (below Little Squaw Creek)	The bridge is impassable to boaters and requires a portage. The ramp needs signage to warn boaters as well as a formal egress above the bridge. Located above popular floating reaches.
Kansas Club Bridge	Recreation	Rio Grande (below Red Mountain Creek)	Dangerous bridge has cables and debris hanging into the river.
Antlers Resort Pedestrian Bridge	Recreation	Rio Grande (below Red Mountain Creek)	Largest impact to recreational activity when flows are above 2,600 cfs as it's located too close to the river water surface.
Mine Drainage in Willow Creek Watershed	Water Quality	Willow Creek Basin	Significant concentration of historical mine activity. One identified mine drainage treatment system in Basin. TMDL's located on Willow Creek and tributaries due to mining activities.
Sediment Transportation in Willow Creek Watershed	Water Quality	Willow Creek Basin	Large concentration of gravel roads and exposed soils from mining activities lead to higher potential for sediment transport into receiving streams.
Wason Railroad Bridge	Recreation	Rio Grande (below Willow Creek)	Hazardous, at times, to boaters due to debris accumulation on the pilings.
Wagon Wheel Boat Ramp	Recreation	Rio Grande (below Willow Creek)	High use area requiring improved parking and river access.
Wagon Wheel Trestle Bridge	Recreation	Rio Grande (below Willow Creek)	Dangerous bridge requires portage at high flows and caution at all other flows.
Lake Humphreys Hydropower Facility	Utility	Goose Creek	Power supply for Creede is located adjacent to Weminuche Wilderness.
Elk Creek Bridge	Recreation	Rio Grande (below Goose Creek)	Hinders recreational activity when flows are above 2,500 cfs
Upper Pass Creek Overhead Power Lines	Utility	Upper Pass Creek tributary to South Fork of Rio Grande	Overhead electric lines located on hillside in dense forest increasing vulnerability to fire.
Sediment Transportation in South Fork Watershed	Water Quality	South Fork of Rio Grande (Park Creek & Beaver Creek)	Large concentration of USFS gravel and logging roads leading to higher potential for sediment transport into receiving streams.

7.0 Recreation Assessment

7.1 Objective

The objective of this task was to assess the environmental impacts of river focused recreation in the study area and develop a prioritized ranking of recreational-focused projects in the watershed.

7.2 Approach and Methodology

Recreational areas were documented using GIS spatial databases and interviews. **Table 7-1** lists the local recreational authorities and resources within the watershed used to identify high use and associated impacted areas. Recreational use data was also sought from the RGNF and CPW, who are the two major landowners and have the most river access points within the watershed. Interviews were conducted with staff from TU, Rio Grande Anglers, and the Ramble House Creede Guide and Outfitters. A preliminary desktop evaluation reviewed the recreational areas identified during the interviews, including consideration of historical aerial photography. Input received from the TAT and feedback from the interviewers directed the assessment to focus on the Rio Grande boating impacts and dispersed recreation.

Table 7-1. Key Literature and Datasets Relevant to Recreation

Existing Datasets	*New and Derived Data*	*Reports*
❖ CDSS ❖ Diversion structures ❖ Reservoirs ❖ Flow gauge locations ❖ USFS ❖ Roads ❖ USFS Boundaries ❖ Wilderness Boundaries ❖ Fire Complex Burn Areas ❖ Grazing Allotments ❖ Activity Locations	❖ Boat ramps on Rio Grande (TU, Rio Grande Angler, Ramble House Creede Guide and Outfitter) ❖ Bridges (TU, Rio Grande Angler, Ramble House and Creede Guide & Outfitter) ❖ In-channel structures (Wason Ranch) ❖ Field verification	❖ USFS ❖ Jody Fairchild (Dist. Recreation Staff Officer) ❖ Steve Brigham (Natural Resource Specialist/Snow Ranger) ❖ Ivan Geroy (Forest Hydrologist) ❖ Devon Catsamire (Recreation Specialist) ❖ CPW ❖ Estevan Vigil (Fishery Biologist)

An evaluation matrix was developed to highlight primary areas for further investigation. The matrix was developed with input from the TAT into priority ranking categories including: capacity and use of facility, disturbed area within riparian zone, disturbed area outside riparian zone, facility importance, facility management practices, water quality impacts, and relevance to goals identified in the 2015 BIP. Aerial photography and feedback from the interviews were used to complete the initial matrices and identify top facilities for field verification. A total of 20 sites were field verified on July 25-26, 2017 to further evaluate the matrix criteria for a final ranking of the top existing recreational-based impacts to the river corridors in the watershed.

7.2.1 Regional Analysis

Figure 7-1 maps the general high use recreational areas identified for consideration in the assessment. Many more recreational uses occur in the watershed; however, the map focuses on Rio Grande river access points and motorized boating.

7.2.2 Rio Grande Recreational Use

Recreational use of the Rio Grande within the watershed has been growing in recent years. Sport fishing, guided float fishing tours, guided rafting trips, and private boaters are among the top river recreation uses. Primary river segments used for fishing and rafting are located downstream of Box Canyon, with only thrill-seeking, private whitewater boaters floating the Class III-IV rapid section below the Rio Grande Reservoir through Box Canyon. The Rio Grande below Box Canyon is generally tame with a few bridges and in-channel structures creating hazards. Typical hazards include bridges constructed too low to the water surface hindering boaters from safely passing underneath or bridge piers that collect debris and are difficult to maneuver around. Many of the hazards are discussed in the infrastructure discussion

Recreational use in the Rio Grande can be limited to the available flow in the river, particularly for guided floating trips that start below Box Canyon where the season is limited to the spring run-off and typically is over by early July. Further discussion on efforts to coordinate reservoir releases to return the streams to a more natural hydrological cycle to increase aquatic habitat and subsequently boater days on this section of river can be found in Section 9.0. Below Rio Grande Campground/Fisherman's Boat Ramp flows generally support boating activities throughout the summer and into the fall and winter months although, not many boaters recreate on the water outside of the summer months.

Fifteen boat ramps have been identified along the Rio Grande including formal and informal ramps as shown in **Table 7-2**. Three of the ramps are located downstream of South Fork but were included due to the importance they have for boaters within the watershed. Land managers have been making efforts to improve the formal boat ramps; however, informal ramps have been created and are an ongoing recognized issue. Development of new ramps and river access points may be from the lack of collaboration to coordinate existing river access points through a created river access map or developed plan. In 2018, land managers for the Palisade boat ramp completed upgrades such as grading and maintenance work in the channel to help to sustain the ramp.

Guided fishing trips start at the Box Canyon Boat Ramp and continue past South Fork. Guided rafting trips generally start their float near Creede at the Deep Creek Ramp or Fish Hatchery Ramp and continue down to the Highway 149 Ramp. CPW has restricted all commercial guides and outfitters from using their ramps in the Coller State Park from Memorial Day weekend through July. Therefore, the Wagon Wheel Gap Boat Ramp and Marshall Park Boat Ramp are heavily used during this time. These two ramps do not have toilet facilities to accommodate the increased use, and parking is an issue. Parking is particularly an issue at the Wagon Wheel Gap Boat Ramp, as it is also used as an overflow parking from the Pool Table Road for off-road vehicles to access Pool Table Mountain. The Wagon Wheel Gap Boat Ramp ranked second highest in the list of priority recreation sites based on site observations and the matrix criteria (**Appendix D**). The congestion of boaters, particularly fishermen between Rio Grande Campground Boat Ramp and Wagon Wheel Boat Ramp, are causing some concern of overly disturbing fish habitat and constantly stressing the fish. Additionally, new boaters to the area are unaware of the regulation and don't know to use the "reserved" CPW boat launch sites, causing further over-use at Marshall Park and Wagon Wheel Gap Boat Ramps.

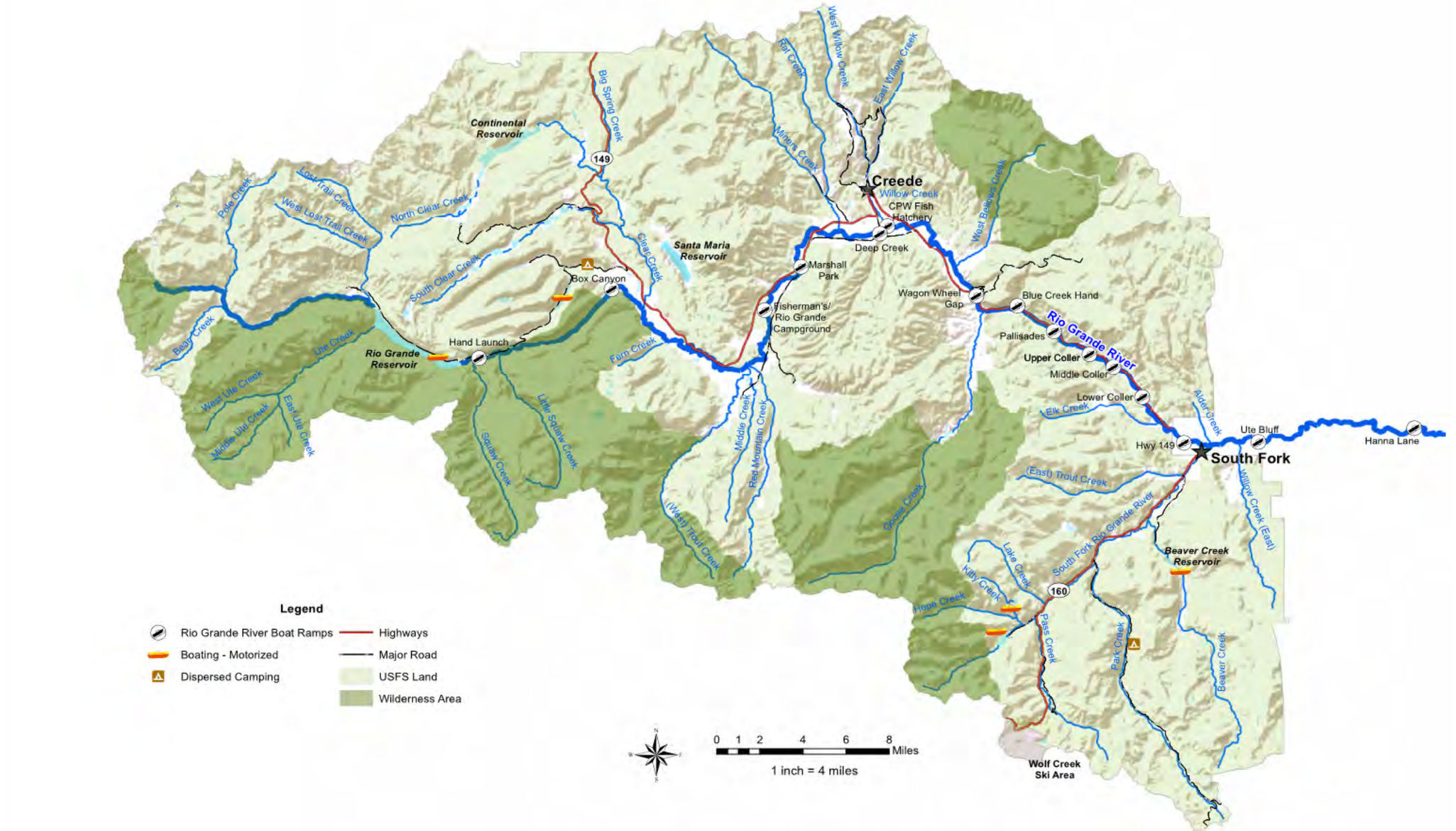


Figure 7-1. Recreation Assessment

Table 7-2. Summary and Ranking of Boat Ramps along the Rio Grande

Name	Entity/Owner Responsible for Maintenance	Ranking(1)	Comments
Rio Grande Reservoir Area Hand Launch	USFS	Poor	There are several undesignated hand launch locations with potential trailer access below the reservoir; used mostly by private individuals, not permitted for commercial rafting. Thirty Mile Campground or River Hill Campground are also used as access to the river.
Box Canyon Ramp	USFS	Fair	This a primitive (not maintained) site located on USFS land downstream of the Box Canyon bridge. The bridge is impassable and hazardous during all flows, and rafters must take-out upstream of site. The installation of an egress sign upstream is recommended to inform rafters of the hazard. Scheduled for improvements.
Rio Grande Campground/Fisherman's Ramp	USFS	Fair	This is a primitive hand launch and trailer access site located in the Rio Grande Campground. Scheduled for improvements.
Marshall Park Ramp	USFS	Fair	This is a high use ramp. This site is not maintained but has trailer access and parking. It is located near the USFS Marshall Park Campground. Maintenance to improve access to the river is recommended.
Deep Creek Ramp	CPW	Good	This is a CPW Ramp and the only ramp that has been "engineered", so to speak.
CPW Fish Hatchery Ramp	CPW	Fair	This site is used as an auxiliary ramp to Deep Creek; mostly used by commercial rafting companies.
Wagon Wheel Gap Ramp	USFS	Poor	High use ramp with sprawling access to river occurring. Efforts underway to widen river access ramp and restrict sprawling use in riparian area. Toilet facility in this high use area is recommended.
Blue Creek Hand Launch	None	Fair	This is a primitive hand launch site where parking is on the shoulder along the highway. With higher use of the area and limited to no oversight, impacts to riparian and upland areas could potentially increase.
Palisade Ramp	USFS	Poor	In 2018, land managers for the Palisade boat ramp completed upgrades such as grading and maintenance work in the channel to help to sustain the ramp.
Upper Coller Ramp	CPW	Fair	Located within the Coller State Wildlife area. Ramp is on a cut-bank with cobble and large rock that shifts with high flows. Maintenance such as grading and installation of a deflector upstream is recommended to sustain the site. A designated parking area was installed and is contained with large boulders.
Middle Coller Ramp	CPW	Fair	This river access site is managed by CPW with boulders to limit sprawled impacts from parking and river access points. Area is recovering from shoreline impacts prior to CPW efforts.
Lower Coller Ramp	CPW	Fair	Ramp with limited use at the lower end of the Coller State Wildlife Area. Sprawled use is contained with large boulders along access road and within turn-around area.
Hwy 149/Main Bridge Ramp	CPW	Poor	CPW acquired in 2015 and work performed in 2016. Ramp has signs of erosion. Installation of designated parking signs is recommended.
Ute Bluff/CR-19 Ramp(2)	None	Poor	Not within the study area but an important feature for recreation. This is a primitive ramp that is not maintained. It is a steep bank and erosive.
CR-17/Hanna Lane/State Bridge Ramp(2)	CPW	Good	Not within the study area but an important feature for recreation. It is located near the Rio Grande at Del Norte gauging station and upstream of the Rio Grande Canal Diversion.

Footnotes
1) Ranking is defined: >20=poor; 10-19=fair; 0-10=good; ranking is based off the Recreation Feature Matrix Evaluation.
2) Ramp is not located within the study area and not shown on the recreation map.

Lack of boat ramp signage and coordinated management of the ramps was discovered through the assessment. The only signs that were observed were informing fishermen of the fishing regulations. Educating private boaters of the recommended boat launch sites would reduce overcrowding at the existing boat ramps, prevent further erosion along the embankments, and disperse the fishermen along different reaches of the Rio Grande to allow the fish to recover.

7.2.2.1 USFS and CPW Recreational Management

Boat ramps are primarily located on USFS and CPW property. CPW has been leading the effort to upgrade their boat ramps with recent improvements made to the Deep Creek Ramp, including a cleared and contained parking area, new bathroom facility, and concrete trailer ramp to the river at Highway 149. Field verification confirmed that Middle Coller Boat Ramp was improved with new additional parking near the toilet facility. The USFS is considering improvements at the Rio Grande Campground/Fisherman's Ramp and Box Canyon Ramp to better manage the high use of this area and contain the sprawl of impacts. According to interviews, the required permits have been procured to perform improvements to the Wagon Wheel Gap Boat Ramp. Proposed improvements are being planned with local stakeholder input.

The 1996 Rio Grande National Forest Final Environmental Impact Statement (FEIS) for the Revised Forest Land and Resource Management Plan identified river user capacity to help manage impact to the river and preserve the experience. Two stream segments were evaluated including the Upper Stretch starting at the Texas Creek Summer Home Group, located below Box Canyon near 520 Road, to the Wagon Wheel Gap and the Lower Stretch from Wagon Wheel Gap downstream to the Coller State Wildlife Area. The 1996 FEIS established a capacity for the Upper and Lower Stretches at 2,730 user-days and 1,700 user-days respectively. Of the identified capacity, 65% of the use was allocated to commercial guides and outfitters along with a recommendation that all commercial use in and through the stretches be permitted. In 2016, the USFS identified 39% of the commercial capacity was utilized in the Upper Stretch and 59% in the Lower Stretch, see **Table 7-3**. The stretch of river through the Coller State Wildlife Area and below does not have an identified use capacity.

CPW administers a permitting process for commercial use of their ramps in the Coller State Park. In 2016, 13 commercial outfitters applied for a CPW commercial permit; however, it is unknown how many user days there were.

7.2.3 Other Identified Recreational Impacts

Recreational use is found throughout the watershed beyond the shores of the Rio Grande. Analysis of additional recreational uses was performed as they related to impacts on stream health. A broad overview of the recreational facilities overseen by the USFS within the watershed is shown in **Table 7-4**. An assessment of current impacts to stream health from these facilities is discussed below.

Table 7-3. River Use Permits and User Days (USDA, 1996)

Rio Grande Commercial River Use Permitted Segments	*Identified User-Day Capacity*	*Commercial User-Day Capacity*	*Public User-Day Capacity*	*2016 Commercial Service Days*	*2016 Commercial Capacity Utilized*
Upper Stretch (Below Box Canyon to Wagon Wheel Gap)	2,730	1,775 (65%)	955 (35%)	1,057 (6 permits issued)	39%
Lower Stretch (Wagon Wheel Gap to Coller State Park)	1,700	1,000 (65%)	700 (35%)	1,330 (6 permits issued)	59%
Coller State Park	Not Identified	Not Identified	Not Identified	Not available (13 permits issued)	-

Table 7-4. Capacity of Developed Recreation Sites Located in the Rio Grande National Forest

Developed Site Type	*Total number of Sites*	*Capacity (persons at one time*)*	*Comments*
Boating Site	7	338	6 within study area; all associated with reservoirs/lakes
Campground	40	2,647	16 within study area; all along waterways
Dispersed Camping Area	2	105	1 within study area
Fishing Site	10	455	7 within study area
Group Picnic Site	4	110	
Interpretive Site	11	289	6 within study area
Lookout/Cabin	11	512	
Observation Site	2	55	2 within study area
Picnic Site	10	464	5 within study area
Trailhead	59	6,394	23 within study area
Total	**156**	**11,369**	

*Persons-At-One-Time: a measure of social carrying capacity. National conventions include 5 people per family picnic/camp unit, 3.5 people per parking lot stall at a trailhead or visitor center, 1.5 people per motorcycle parking stall and 40 people per tour bus parking stall (Powell, 2014).

7.2.3.1 Lake Recreational Use (no identified concerns)

Lake fishing, boating, and general recreation are top activities within the watershed, with popular locations including Beaver Creek Reservoir, Shaw Lake, Big Meadows Reservoir, Road Canyon Reservoir, and Rio Grande Reservoir. Land managers and TAT members did not identify any significant environmental impacts from these reservoirs when asked about impacts to riparian areas, water quality degradation, or facility overuse.

7.2.3.2 Dispersed Camping

The USFS allows dispersed camping within the RGNF and has identified the increase in demand for this type of camping, which is having impacts to the riparian corridor in addition to having water quality impacts from lack of proper handling of human waste near these water bodies. The USFS is addressing this issue by promoting the "Leave No Trace" principles, including posting signage and

implementing sprawl mitigation techniques such as closing areas for rehabilitation. Two dispersed recreation areas were identified as being particularly impacted near Park Creek and the Ute Creek Trailhead. These areas were evaluated within the Riparian Assessment. A dispersed camping management plan was recommended by USFS staff as a more formal and comprehensive approach to addressing these growing impacts.

7.2.3.3 **Ski Resort (no real identified concerns)**

Wolf Creek Ski Area is the only ski area located within the watershed. The ski area is located within the RGNF south of Highway 160 near Wolf Creek Pass and has 1,600 skiable acres. During the 2015 ski season, approximately 179,000 skier days were reported by the USFS. No environmental impacts to nearby water bodies were identified regarding the ski area.

7.2.3.4 **Trail and Road Stream Crossings (some impacts but overall minor)**

Hiking and motorized trail stream crossings may impact the riparian corridor or the water quality of the water body. Overall, these impacts were identified by the TAT and land managers as minor and difficult to evaluate as part of this assessment. Riparian impacts due to trail crossings were included in the riparian conditions assessment.

7.3 Recreation Assessment Results

Table 7-5 lists the top priority recreation sites. **Appendix D** includes a summary of the desktop analysis and interviews of the priorities matrices used to evaluate the top river recreation impacts. The summary also includes the rating for each site and project evaluated. A site visit was performed for the top priority recreation sites on July 25-26, 2017. Each of the “poor”-rated facilities were observed to note any recent improvements and to refine any of the assumptions left unclear from the initial assessment. **Appendix D** includes the revised versions of the site evaluations and lists the final prioritized recreation projects to be addressed in the watershed. These sites and projects were identified as having the largest recreational impacts on the watershed and the Rio Grande.

Field verification and follow-up interviews confirmed that dispersed recreation is a top priority of concern in the Park Creek area. In many places, campers and RVs were parked along the creek banks adjacent to the riparian area, thereby compacting the soils and causing degradation to the area. The USFS Leave No Trace campaign includes one sign at the turn off from the highway; there was no other signage observed farther up the valley. It is recommended more signs be installed, particularly in heavily impacted areas, to educate the public about “Leave No Trace” principles and management of dispersed campsites. Dispersed camping management ranked highest on the list of top priority recreation sites after the observations of the areas were made and assessed using the matrix criteria.

Table 7-5. List of Top Priority Recreation Sites (upstream to downstream)

Name	Facility Type	Entity/Owner Responsible for Maintenance	Comments	Matrix Ranking	Reason	Location
Dispersed Camping Management	Coordination Project	USFS	Recommended installation of signs identifying importance of "Leave No Trace" principles and management of dispersed camping sites.	26.6	Overuse of Area	Basin-wide
Boat Ramp Signage Project	Coordination Project	USFS/CPW	Recommended installation of identified boat ramp use signs and river etiquette within valley. Efforts to be coordinated with CPW, USFS, and recreational guides & outfitters.	23.6	Overuse of Area	Basin-wide
Ute Creek Trailhead(1)	Dispersed Camping	USFS	Located west of Rio Grande Reservoir. Impacts from dispersed recreation in riparian and upland areas (50-80% vegetation removed/fragmented near toilet facility).	19.5	Overuse of Area	Rio Grande (below Ute Creek)
Rio Grande Reservoir Area Hand Launch	Boat Ramp & Dispersed Camping	USFS	There are several undesignated hand launch locations with potential trailer access below the reservoir; used mostly by private individuals, not permitted for commercial rafting. Located near Thirty-mile Campground. Sprawling use and dispersed camping in the area. Stock unloading is also adding to sprawl and riparian impacts	20.4	Environmental Concerns	Rio Grande (below Squaw)
Box Canyon Ramp	Boat Ramp	USFS	This a primitive site at the Box Canyon Bridge. The bridge is impassable and hazardous during all flows, and rafters must take-out upstream of site. The installation of an egress sign upstream is recommended to inform rafters of the hazard. Scheduled for improvements include trailer boat ramp.	17.4	Safety Concerns	Rio Grande (below Little Squaw Creek)
Rio Grande Campground/Fisherman's Ramp	Boat Ramp	USFS	This primitive site is used by commercial fishing guides and private boaters. With increased use, sprawling has occurred for parking and along river access points. USFS looking to improve the ramp and parking facilities. Toilet facilities currently underserve demand and efforts underway to address concerns.	17.4	Overuse of Area	Rio Grande (below Red Mountain Creek)
Marshall Park Ramp	Boat Ramp	USFS	This site is not maintained but has trailer access and parking. It is located near the USFS Marshall Park Campground. Use of site is contained and impacts to riparian area are limited.	13.4	Environmental Concerns	Rio Grande (below Red Mountain Creek)
Deep Creek Ramp	Boat Ramp	CPW	This ramp was recently improved by CPW to include toilet facilities, a designated parking area, and a formal boat ramp for sustainable trailer access.	8.4	High Use Area	Rio Grande (below Miners Creek)
CPW Fish Hatchery Boat Ramp	Boat Ramp	CPW	This ramp is used by commercial rafting companies and is overseen by CPW. Facilities appear stable although the high use of the area have caused impacts to the shoreline outside the access point.	12.4	High Use Area	Rio Grande (below Willow Creek)
Wagon Wheel Gap Ramp	Boat Ramp	USFS	High use ramp with sprawling access to river occurring. Efforts underway to widen river access ramp and restrict sprawling use in riparian area. Toilet facility in this high use area is recommended.	25.4	Overuse of Area	Rio Grande (below Bellow Creek)

Name	Facility Type	Entity/Owner Responsible for Maintenance	Comments	Matrix Ranking	Reason	Location
Blue Creek Hand Launch	Boat Ramp	None	This is a primitive hand launch site where parking is on the shoulder along the highway. With higher use of area and limited to no oversight, impacts to riparian and upland areas could potentially increase.	13.4	Environmental Concerns	Rio Grande (below Goose Creek)
Palisade Ramp	Boat Ramp & Dispersed Camping	USFS	This used to be a hand launch ramp located in the Palisade Campground; rocks were removed to allow for trailer access. Limited oversight of facility has led to increased parking sprawl along Highway 160 and difficult access to river. In 2018, improvements were made the facility including regrading to mitigate erosion.	20.4	Environmental Concerns	Rio Grande (below Goose Creek)
Upper Coller Ramp	Boat Ramp	CPW	Located within the Coller State Wildlife area. Ramp is on a cut-bank with cobble and large rock that shifts with high flows. Maintenance such as grading and installation of a deflector upstream is recommended to sustain the site. A designated parking area was installed and is contained with large boulders.	13.4	Environmental Concerns	Rio Grande (below Goose Creek)
Middle Coller Ramp	Boat Ramp	CPW	This river access site is managed by CPW through the use of boulders to limit sprawled impacts from parking and river access points. Area is recovering from shoreline impacts prior to CPW efforts.	11.4	High Use Area	Rio Grande (below Goose Creek)
Lower Coller Ramp	Boat Ramp	CPW	Ramp with limited use at the lower end of the Coller State Wildlife Area. Sprawled use is contained with large boulders along access road and within turn-around area.	14.4	Environmental Concerns	Rio Grande (below Goose Creek)
Tucker Ponds	Reservoir Fishing	USFS	High use fishing area with no boat access. Vehicular parking is sprawling outside of designated areas. Nearby trails are expanding to encroach on the reservoir.	16.5	Overuse of Area	Pass Creek
Park Creek Dispersed Camping[(1)]	Dispersed Camping	USFS	Located approximately 2.5 miles and 11.5 miles up Park Creek Road from Hwy 160. Impacts from dispersed recreation in and along riparian area (10-49% and 50-80% vegetation removed and fragmented respectively) exist.	21.5	Overuse of Area	Park Creek
Beaver Creek Reservoir[(1)]	Reservoir Fishing & Dispersed Camping	USFS	Reservoir is most popular fishing reservoir in watershed with over 9,000 user-days. Impacts around the reservoir are restricted due to the steep banks and limited riparian area. Dispersed recreation impacts at the south end of the reservoir to the private land boundary (0-10% vegetation removed/fragmented) exist.	10.4	High Use Area	Beaver Creek
Big Meadows Reservoir[(1)]	Reservoir Fishing	USFS	Reservoir is a top fishing site for both boat and shoreline fishing. Impacts are primarily due to pedestrian access to the reservoir within the riparian area.	11.6	High Use Area	South Fork of Rio Grande

Name	Facility Type	Entity/Owner Responsible for Maintenance	Comments	Matrix Ranking	Reason	Location
Hwy 149 @ South Fork Ramp	Boat Ramp	CPW	High use boat ramp with limited designated parking. Boat ramp has signs of erosion.	23.4	Environmental Concerns	Rio Grande (below South Fork)
Outside of Study Area						
CR-19/ Ute Bluff Ramp	Boat Ramp	None	Not within the study area but an important feature for recreation. This is a primitive (not maintained) ramp. It is a steep bank and erosive.	22.4	Environmental Concerns	Rio Grande (below South Fork)
CR-17/ Hanna Lane Ramp	Boat Ramp	CPW (leased)	This CPW managed ramp is located on private land. The ramp and parking areas are constricted to designated areas and impacts are minimal. A toilet facility is available.	7.4	Overuse of area	Rio Grande (below South Fork)

Footnote
1) Recreation sites identified by USFS staff from interview on December 6, 2016.
2) See **Appendix D** for matrix ranking on each recreational site.
3) Shading indicates top priority projects.

8.0 Water Quality Assessment

8.1 Objective

The objective of the water quality assessment was to collect data to provide a summary of the current and historic water quality conditions in the Assessment boundaries. The water quality data will be useful as baseline information to monitor changes in the watershed and guide the development of reclamation and restoration objectives in the future. The water quality data are a snapshot of the conditions within the river during high flows in the spring following runoff and low flows in late summer. The data reveal some areas in the watershed with elevated heavy metal concentrations, which merit further monitoring and investigation. Nutrient data do not reveal any notable sources of nitrogen or phosphorus and hover near the detection limit for all samples.

8.2 Approach and Methodology

Water quality data were collected along the mainstem of the Rio Grande from the headwaters of the Rio Grande above Rio Grande Reservoir down to the Colorado Division of Water Resources stream flow gauge at Hannah Lane near Del Norte (**Figure 8-1)**. The water quality assessment incorporated on-site measurements of physical water conditions (pH, temperature and specific conductivity) as well as laboratory analysis of chemical constituents in grab samples to evaluate the concentration of dissolved heavy metals (Ag, Al, As, Ca, Cd, Cr, Cu, Fe, Pb, Mg, Mn, Hg, Ni, Se, Zn) and total nitrogen and phosphorus. Water quality data were collected specifically for this assessment by the Headwaters Alliance from August 2017 through October 2018. Additionally, the water quality assessment includes data compiled from historic metal sampling by Rio Grande Silver, the Willow Creek Reclamation Committee, RWEACT, and the Colorado School of Mines. Hence this water quality assessment encompasses the water quality in the Rio Grande from 2013 through 2018.

On-site water quality analysis was conducted using standard methodology, by means of calibrated probes which measure pH, temperature, and conductivity. Dissolved metals samples were collected using a triple-rinsed syringe and filtered through a 0.45 µM glass fiber filter. Filtered samples were preserved with 1M nitric acid to a pH below 3 and kept refrigerated until analyzed by inductively coupled plasma mass spectrometry (ICP MS, Water-Mira 032713U method) in a lab at the Colorado School of Mines. Duplicate field samples were collected for every ten samples and were analyzed with deionized water (blank) samples for quality assurance and quality control. High and low flow water samples collected by other entities in the same sampling locations followed the same methods.

Nutrient samples were analyzed by Sangre de Cristo Laboratory in Alamosa. Total nitrogen was analyzed using HACH 10208 method and total phosphorus was analyzed using US Environmental Protection Agency (EPA) method 365.3. Samples were acidified with H2SO4 to lower the pH to below 2. **Table 8-1** lists the key literature and datasets used for the Water Quality Assessment.

Table 8-1. Key Literature and Datasets Used for Water Quality Assessment

Existing Datasets	*New and Derived Data*	*Reports*
❖ Water Quality Sampling Points	❖ Health of priority streams based on water quality	❖ CDPHE's Water Quality Control Division ❖ RWEACT's West Fork Fire Complex monitoring research ❖ US EPA reports ❖ CPW Reports ❖ HA Reports

8.2.1 Graphical Analysis

Box and whisker plots were created to illustrate differences in dissolved metal concentrations among water quality sampling sites along the upper Rio Grande. A box and whisker plot shows the median, 25th, and 75th percentile concentration values for each dissolved metal of interest from each site. Where only two or three sampling events occurred, at sites selected only for this assessment which lack historic data, a median value is still identified, but there is not enough data to calculate percentile values. Each individual water quality sample result is illustrated in the box and whisker plots as a dot to further highlight the distribution of sampling results.

Since nitrogen and phosphorus regulations are set for discharges and not for surface water, a simple histogram with results is provided and no further analysis was completed (**Figure 8-11**).

8.2.2 Statistical Analysis

A non-parametric multiple comparison test, the Kruskal-Wallis test, was conducted to compare the medians of physical and chemical water quality values among all sites, and an approximate p-value for the sample was calculated. The null hypothesis of the Kruskal-Wallis test states that all the medians among groups are identical (Helsel and Hirsch 1992; Tamhane and Dunlop, 2000); i.e., that the water quality is the same throughout the river. When significant differences were detected, when the p-value was less than the alpha value ($\alpha = 0.05$), an additional non-parametric test, the Dunn's test for pairwise comparisons, was utilized to identify which sites were significantly different from one another.

8.3 Results

Physical parameters, such as pH, temperature, and specific conductivity, were all within normal ranges for a cold-water river and were within state water quality standards (Regulation 36, CDPHE). While most of the dissolved heavy metal concentrations measured from 2013 through 2018 were below state water quality standards (Regulation 36, CDPHE), a few dissolved metals were above chronic and acute value thresholds. Many samples were below the limit of detection for certain metals. The ICP instrument used to analyze the heavy metal concentrations has a specific detection limit for each metal evaluated; in general, limits of detection range from 0.01 mg/L to 0.2 µg/L. These results are summarized in **Table 8-2** and **Figures 8-2 through 8-12**.

The concentration of dissolved aluminum exceeded state chronic standards at least once from 2013-2018 at all but three sites (**Table 8-2, Figure 8-2**). The three sites where aluminum did not

exceed chronic standards were sites measured only for this assessment, so they had the fewest data points and only the most recent data. The dissolved cadmium concentration exceeded both the chronic and acute standards sporadically throughout the study area from 2013-2018 (**Figures 8-4**). However, more often, the measured cadmium concentration values were below the ICP instrument's detection limits, meaning the concentrations were negligible (**Table 8-2, Figures 8-4 and 8-5**). The dissolved metal that exceeded chronic and acute standard concentrations most frequently was zinc (**Table 8-2, Figures 8-6, 8-7, and 8-8**). All measured concentrations of dissolved manganese were well below chronic and acute standards (**Table 8-2, Figure 8-9).** Arsenic exceeded the state chronic standards at all sites but did not exceed the acute standard (**Table 8-2; Figure 8-10 and 8-11**).

The working hypothesis employed for this study stated that the water quality was the same along the studied stretch of the Rio Grande. The Kruskal-Wallis test was applied to test this hypothesis and identify differences in distribution. The Kruskal-Wallis test failed to reject the null hypothesis for all dissolved heavy metals except for zinc, whose median concentrations were significantly different (p-value = 0.00, d.f. = 10). After determining the samples came from different distributions and the medians were significantly different, the Dunn's test was performed and revealed that the median concentration of zinc is significantly different in the Rio Grande below Marshall Park through the confluence of Elk Creek (p-value <0.05).

When stream flow data were available, it was possible to calculate the loading rate of dissolved zinc (**Table 8-2**). This loading rate is reported in kilograms per year of zinc entering the Rio Grande. The calculated median zinc loading rate in the Rio Grande at Marshall Park was over 10,000 kg (10 metric tons) per year (**Table 8-2**). Similarly, the calculated median loading rate of zinc in the Rio Grande at Wagon Wheel Gap was greater than 37,000 kg (37 metric tons) per year (**Table 8-2**). The South Fork of the Rio Grande also carries a zinc load, with a loading rate of 2,179 kg (2 metric tons) per year. Here again, the loading rate was much higher from the Rio Grande at Marshall Park through the Wagon Wheel Gap stretch.

Total nitrogen was collected at high and low flows in the study section as part of a comprehensive snapshot. During the low flow event (August 2017), total nitrogen ranged from 0.3 mg/L to 1 mg/L. In the high flow event (June 2018), concentrations were lower, ranging from 'None Detected' to 0.7 mg/L. During the low flow event, Box Canyon (Sample Point BC) had the highest concentration of nitrogen at 1.1 mg/L. Thirty Mile Campground (Sample Point TM) had the highest concentration of nitrogen during the high flow event at 0.7 mg/L (**Figure 8-12**). The detection limit for nitrogen at Sangre de Cristo Labs was 0.1 mg/L.

Total phosphorus ranged from below the limit of detection (0.02 mg/L) to 0.05 mg/L during the low flow event and from none detected to 0.05 mg/L during the high flow event. During the low flow event, sample point UT had the highest concentration, at 0.05 mg/L, but during the high flow event, sample point SF had the highest concentration of phosphorus at 0.06 mg/L (**Figure 8-12**).

8.4 Discussion and Conclusion

Overall, the water quality of the upper Rio Grande appears healthy. The physical measures of the water quality are within normal ranges and the aquatic life supported throughout this segment are evidence of a healthy river. However, data collected from this assessment and prior data collection efforts revealed high concentrations of four heavy metals: aluminum (Al), arsenic (As), cadmium (Cd), and zinc (Zn). There were elevated concentrations of dissolved aluminum, above chronic water quality standards, sporadically throughout the entire study reach. Aluminum, cadmium, and zinc can be mobilized as dissolved metals under lower pH conditions, where there is acid mine drainage from exposed mine tailings and other exposed rock with naturally high levels of sulfur oxides. Dissolved cadmium demonstrated a similar pattern to aluminum, where concentrations were periodically elevated above chronic and acute standards at all sample sites. However, more often, the dissolved cadmium concentrations were below detection limits and considered to be negligible.

Dissolved arsenic was consistently above the chronic water quality standard (0.02 µg/L; Regulation 36, CDPHE) throughout the Basin. The arsenic concentrations measured in the Basin were far below the acute standard (340 µg/L), but always exceeded the exceptionally low chronic standard. Almost any value of detectable arsenic would exceed the chronic standard of 0.02 µg/L. Given that the chronic arsenic standard was exceeded even in the headwaters of the Rio Grande, above the Rio Grande Reservoir, which is presumably pristine and free of anthropogenic influence, it is likely that the source of arsenic lies in the local geology and is an ambient condition. Near the Beartown area in the Kite Lake segment, there is a known abandoned mine with tailings in direct contact with the lake. This area could also be a source of acid mine drainage and dissolved metals loading. This scenario either represents a water quality issue of concern, with a possible anthropogenic source that could be remedied, or, alternatively, a water quality standard (As chronic = 0.02 µg/L) that is unattainable given ambient conditions and the geology of the Basin. It would be worth conducting higher spatial resolution water quality monitoring for dissolved metals in the headwaters region of the Rio Grande, above the Rio Grande Reservoir. If the source of metals cannot be identified or remedied, it would be worth reviewing and adjusting the chronic standard for these segments of the upper Rio Grande.

The dissolved zinc concentrations are a greater concern and were significantly higher in the Rio Grande from the Marshall Park area downstream through the confluence of Elk Creek. The dissolved zinc could originate from a region or sub-watershed above Marshall Park and the Wagon Wheel Gap area, as the calculated loading rate at Wagon Wheel Gap is higher than that at Marshall Park.

All elevated dissolved metals may be entering the river as particulates mobilized during erosion events. With dirt roads and recreational paths throughout the Rio Grande National Forest, sediment is transported downhill during precipitation events, commonly during the summer monsoon season. Fewer recreational roads and improved protection of the river's riparian area would reduce the amount of sediments and particulate metals that enter the stream. Additionally, maintaining a healthy riparian buffer would intercept dissolved metals that may be entering the river with surface runoff.

Dissolved concentrations of aluminum, cadmium, and zinc are frequently above chronic water quality standards, and dissolved arsenic is consistently above the chronic water quality standard. In addition, many of the segments with the highest heavy metal concentrations are listed on the 303(d) List of Impaired Waters and Monitoring and Evaluation List (March 2018, CDPHE Regulation #93) for these same dissolved metals (Al, As, Cd, and Zn). More frequent, monthly or bi-monthly monitoring at the same water quality sampling sites would reveal how regular these exceedances are. Additional sampling within the stretch from Marshall Park to the confluence with Elk Creek and its tributaries would help to further identify the location of any naturally exposed geological source

or anthropogenic source. Addressing this concern requires further monitoring, standards evaluation, and potential calculation of TMDL limits.

The sources of nutrients in the watershed appear to be minimal. Concentrations of these nutrients do not appear to be elevated above discharge permit levels into receiving streams, however no nutrient standards for surface waters have been set by the WQCC. Current standards for permitted discharges range from 7 mg/L-15 mg/L for the annual median concentration of nitrogen and 0.7 mg/L to 1.1 mg/L for the annual median concentration of phosphorus. No data from this assessment reveals an exceedance of nutrients based on those parameters.

The highest nitrogen levels were measured far upstream in the watershed, at UT and BC sample points during low flows and at TM sample point during high flows. Phosphorus followed similar trends, with the highest concentration for low flows at sample point UT. No discharge permits were found in this region, but potential sources of nutrients in this segment of river include grazing, vault toilets at campgrounds, and septic sources at vacation ranches in the area.

Overall, the river appears healthy, though elevated heavy metal concentrations are cause for concern. Higher temporal frequency and refined spatial sampling would expose the consistency, severity and potential for remedy of the elevated dissolved metals problem and assist in providing more accurate trends for nutrients and their sources. Erosion mitigation and a healthy riparian zone will help reduce the loading of sediment and metals into the river.

8.5 Recommendations

The purpose of this water quality task was to provide a baseline of information for the assessment region. Data reveals inconsistent findings of the water quality in the assessment area and drives the overarching recommendation to increase monitoring of both metals and nutrients. More specific recommendations are described below:

1. Develop monitoring plan to identify anthropogenic vs naturally occurring water quality impairments above and below samples sites MP, WC, and WW.
2. Expand temporal and spatial datasets for increased understanding of water chemistry in the Upper Rio Grande Assessment area.
3. Mitigate erosion from recreation, grazing, and naturally occurring changes within the assessment area to reduce heavy metal loading.
4. Conduct monitoring to identify impairments of segments listed in CDPHE's 303(d) list and Monitoring and Evaluation List (Regulation #93). Impaired segments:
    a. South Clear Creek
    b. Seepage Creek
    c. North Clear Creek
    d. North Branch of Pass Creek
    e. Hope Creek
    f. Embargo Creek
    g. West Alder Creek
    h. Big Meadows Reservoir
    i. Alberta Park Reservoir
5. Increase monitoring of nutrients at sample sites UT, TM, and BC to determine if nutrient trends are consistent with this assessment or anomalous.
6. Investigate the source of cadmium loading at sample sites WW (Wagon Wheel Gap) and DN (Del Norte).
7. Investigate the impact of Kite Lake on the Rio Grande.
8. Investigate the impact of Santa Maria Reservoir and Continental Reservoir on segments listed in Regulation 93.
9. Work with CDPHE to provide more data on tributaries and lakes/reservoirs "not assessed" for more accurate standards within the Basin.

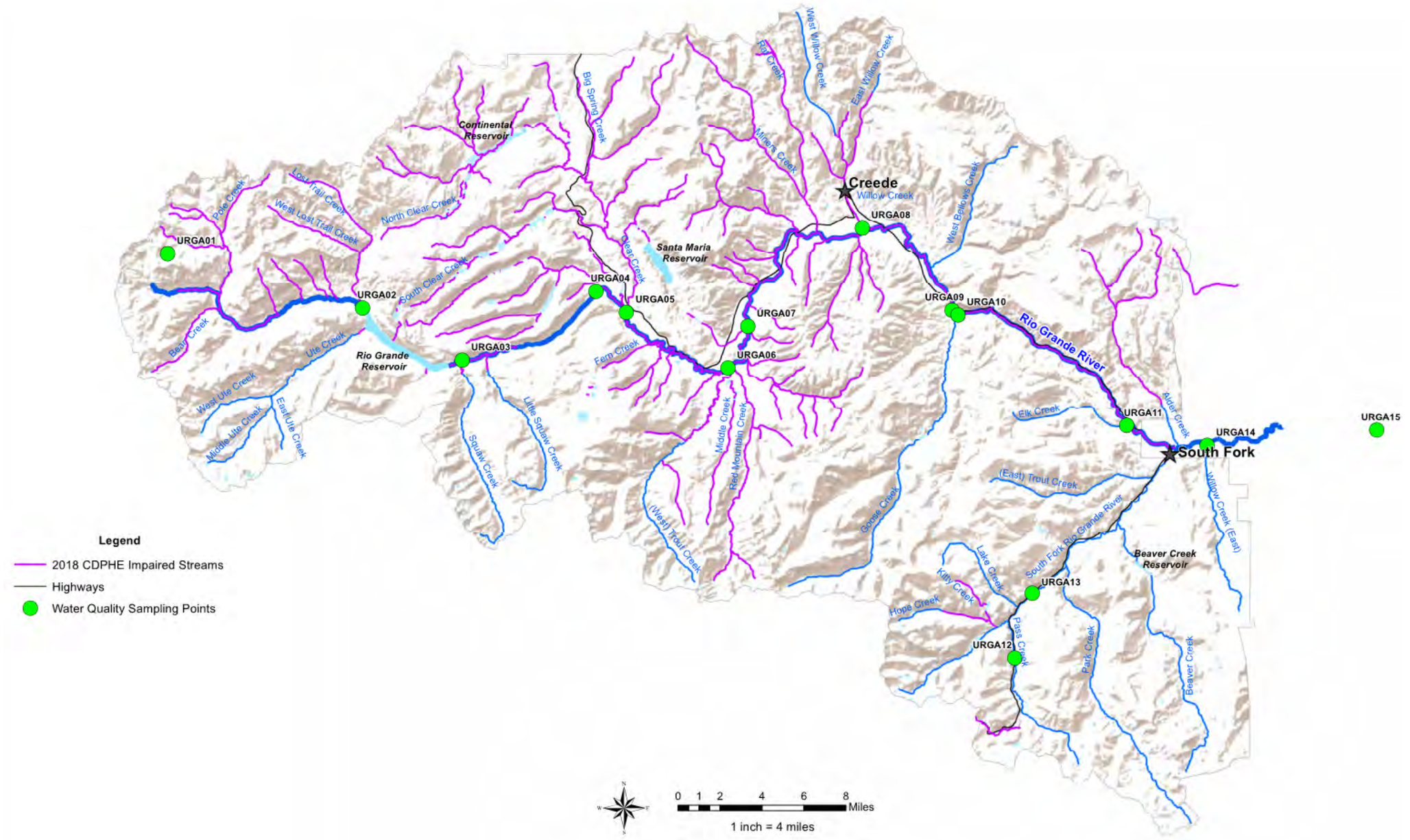


Figure 8-1. Water Quality Sampling Locations with 2018 Impaired Stream Segments

Table 8-2. Summary of Dissolved Metals Results for 2018 (upstream to downstream)

URGA Site ID	Abbreviation	Median As (µg/L)	Median Al (µg/L)	Median Cd (µg/L)	Median Mn (µg/L)	Median Pb (µg/L)	Median Zn (µg/L)	Number of Acute As Exceedances	Number of Chronic As Exceedances	Number of Acute Zn Exceedances	Number of Chronic Zn Exceedances	Median Zn Loading Rate (kg/year)
URGA 02	UT	12.99	17.33	0.00	7.55	BDL	6.30	0	1	0	0	
URGA 03	TM	7.65	67.11	0.56	43.25	1.91	8.10	1	2	0	0	708
URGA 04	BC	8.99	167.31	0.73	10.16	BDL	4.09	1	3	0	1	638
URGA 06			31.98	BDL	BDL	BDL	8.62	0	1	0	0	
URGA 07	MP	7.58	44.91	0.68	12.90	2.79	18.10	2	3	2	0	10,443
URGA 08	WC	15.47	17.20	1.06	50.92	BDL	31.90	0	1	1	0	
URGA 09	WW	5.07	56.31	0.73	17.24	1.41	54.83	1	2	3	4	37,234
URGA 10				BDL	35.79	BDL	5.64	0	1	0	0	
URGA 11	EC	8.54	20.20	BDL	14.80	BDL	23.60	0	1	0	1	
URGA 12	PC	13.08	26.21	BDL	8.97	BDL	31.20	0	1	0	0	
URGA 13	SF	12.80	27.93	0.84	3.63	2.92	7.47	1	3	1	1	2,179
URGA 14			10.71	BDL	27.00	BDL	17.40	0	1	0	0	
URGA 15	DN	8.91	148.24	1.20	10.61	1.95	22.22	1	2	0	1	8,245

CO Reg. 36 Segment Codes

RGRG02	RGRG08	RGRG04b
RGRG04a	RGRG09	

Above chronic standard
Above acute standard

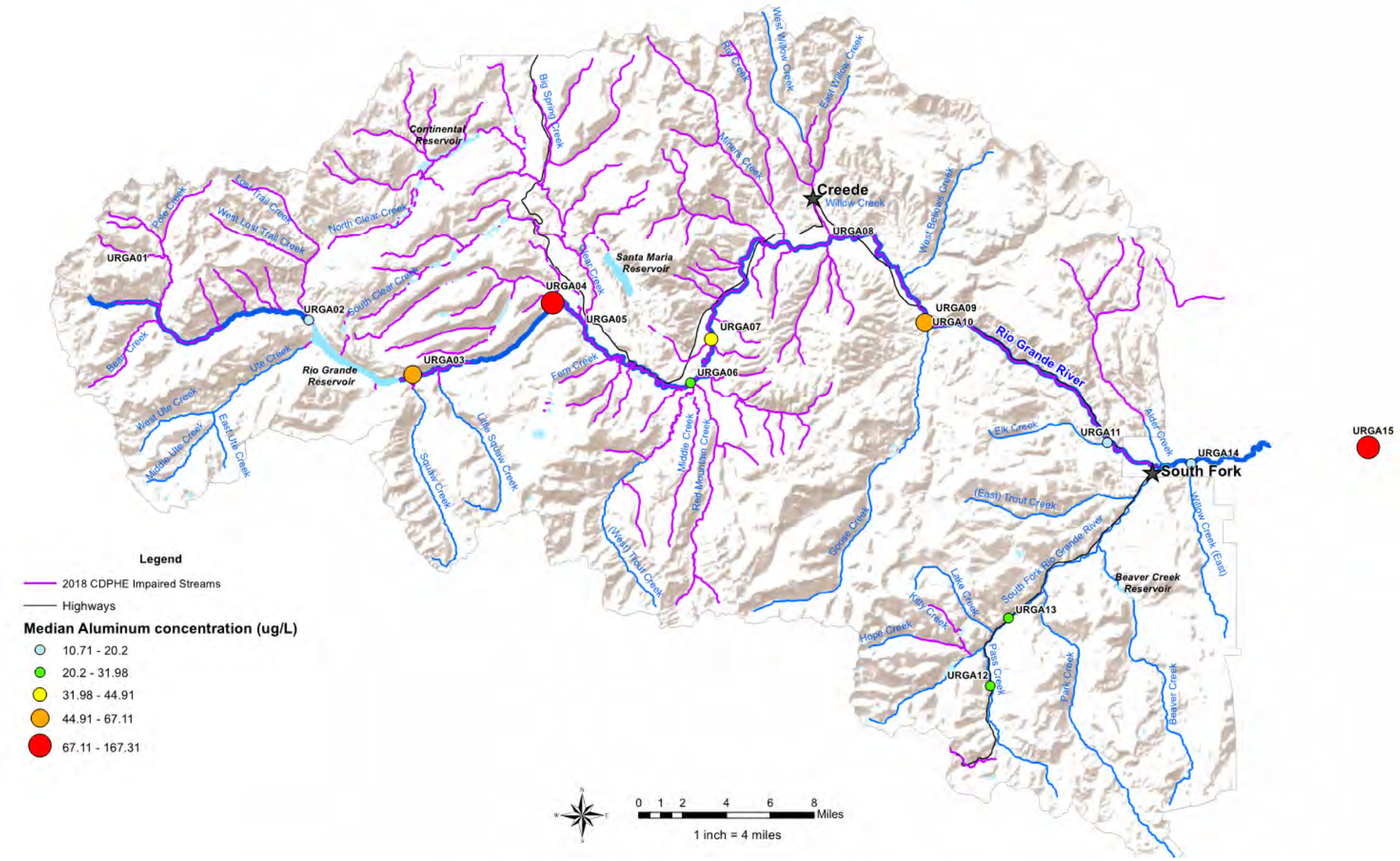


Figure 8-2. Median Aluminum Concentrations at Sampling Locations

UT: Rio Grande above Rio Grande Reservoir at Ute Creek, URGA 02
TM: Rio Grande at Thirty Mile and confluence with Squaw Creek, URGA03
BC: Rio Grande at Box Canyon, URGA04
CF: Rio Grande at confluence with Clear Creek, URGA 05
MP: Rio Grande at Marshall Park, URGA07
WC: Rio Grande at confluence with Willow Creek, URGA08
WW: Rio Grande at Wagon Wheel Gap, URGA09
EC: Rio Grande at confluence with Elk Creek, URGA11
PC: Rio Grande at confluence with Pass Creek, URGA12
SF: South Fork of Rio Grande at Lake Creek, URGA13
DN: Rio Grande at Del Norte Hannah Lane, URGA15

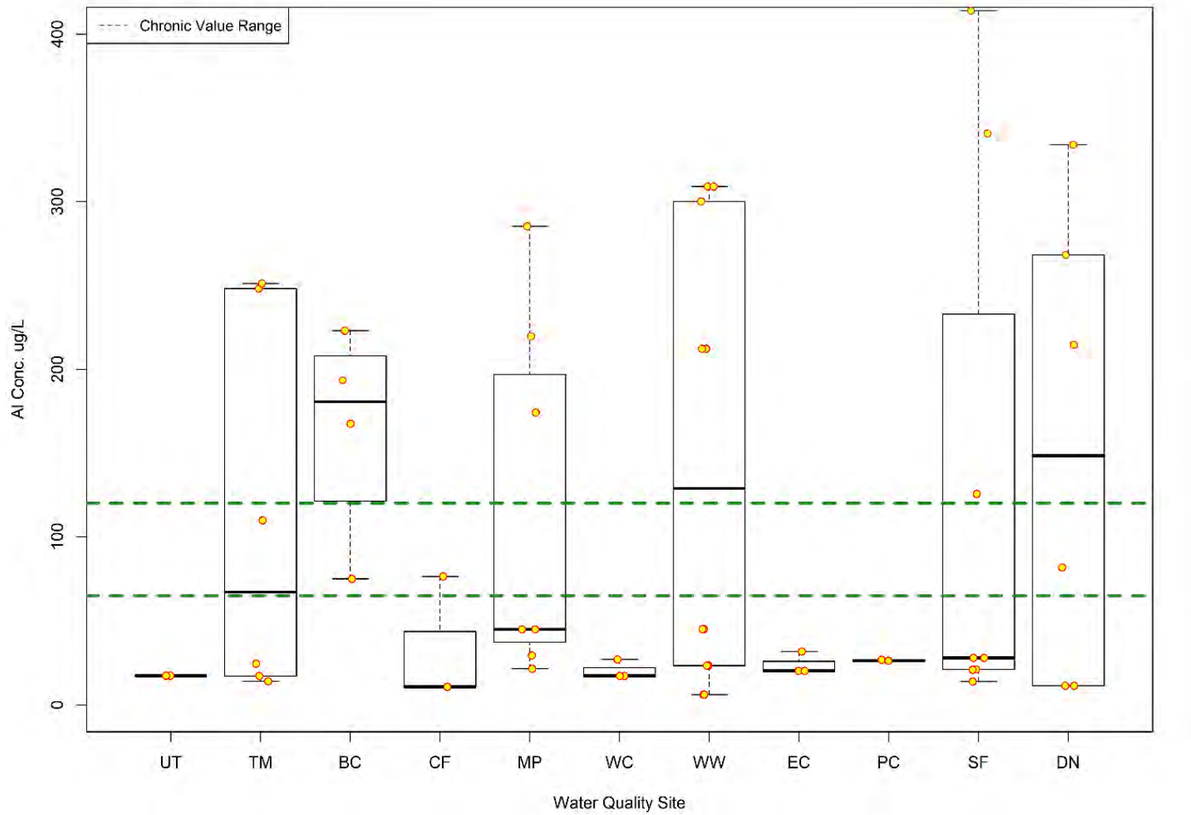


Figure 8-3. Box and Whisker Plot of Measured Aluminium Concentrations (upstream to downstream)
The dotted green lines represent the range of chronic standards using measured hardness values. The yellow dots represent individual results.

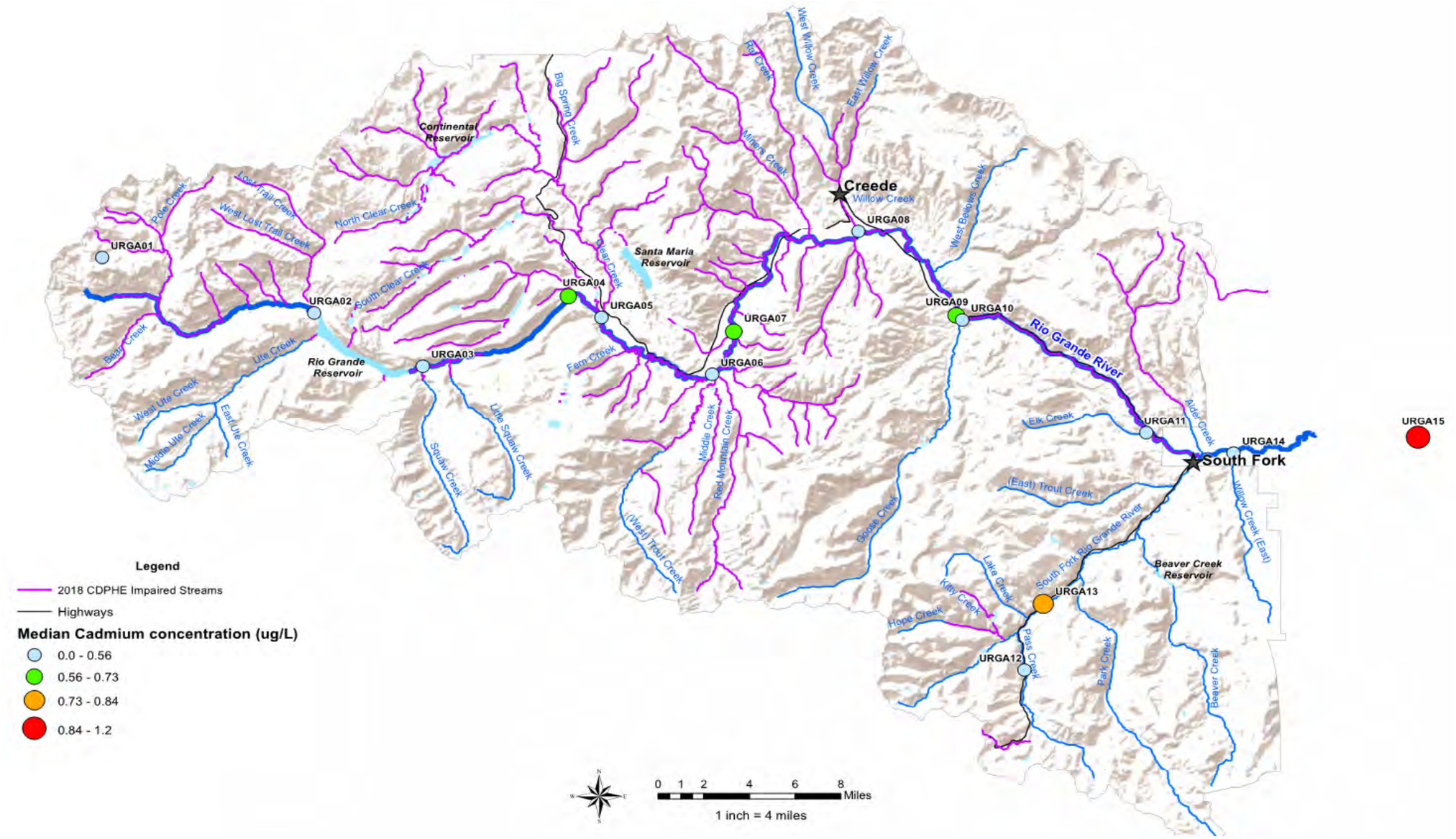


Figure 8-4. Median Cadmium Concentrations at the Sampling Locations

UT: Rio Grande above Rio Grande Reservoir at Ute Creek, URGA 02
TM: Rio Grande at Thirty Mile and confluence with Squaw Creek, URGA03
BC: Rio Grande at Box Canyon, URGA04
CF: Rio Grande at confluence with Clear Creek, URGA 05
MP: Rio Grande at Marshall Park, URGA07
WC: Rio Grande at confluence with Willow Creek, URGA08
WW: Rio Grande at Wagon Wheel Gap, URGA09
EC: Rio Grande at confluence with Elk Creek, URGA11
PC: Rio Grande at confluence with Pass Creek, URGA12
SF: South Fork of Rio Grande at Lake Creek, URGA13
DN: Rio Grande at Del Norte Hannah Lane, URGA15

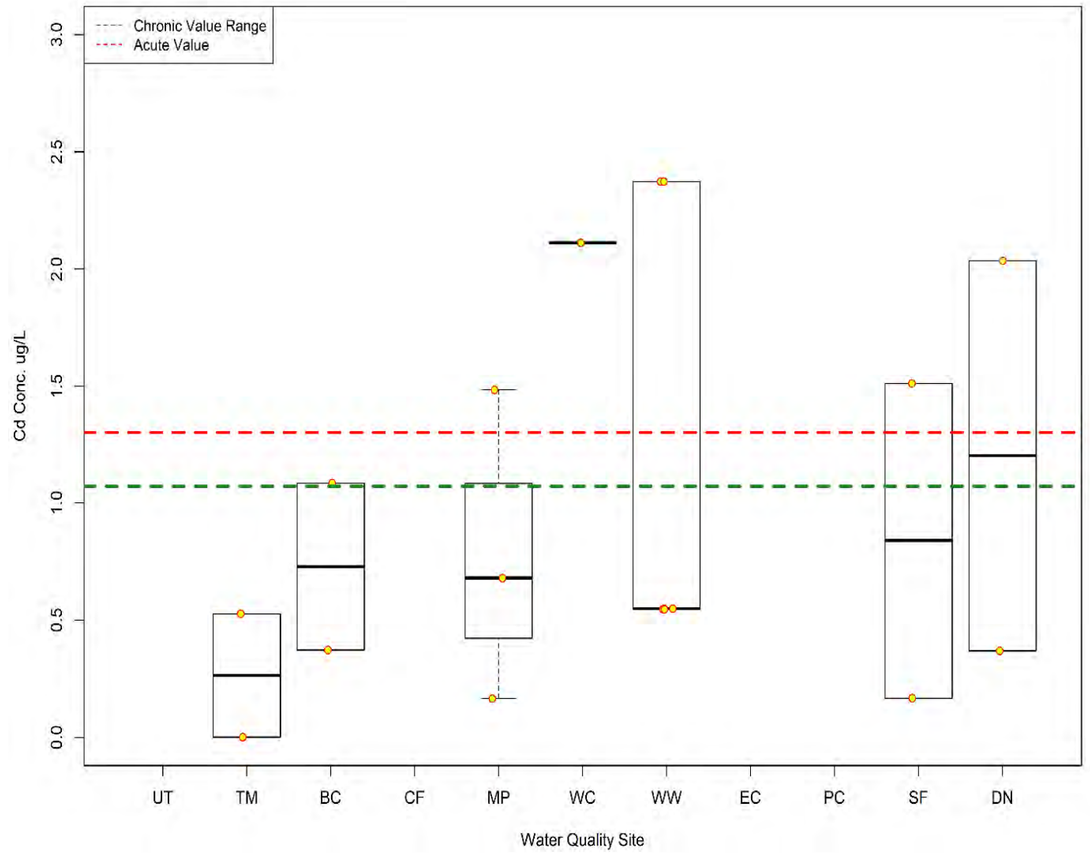


Figure 8-5. Box and Whisker Plot of Measured Cadmium Concentrations (upstream to downstream)
The dotted green line indicates the chronic standard range and the red line indicates acute standard range; both are calculated using hardness values. The yellow dots represent individual results.

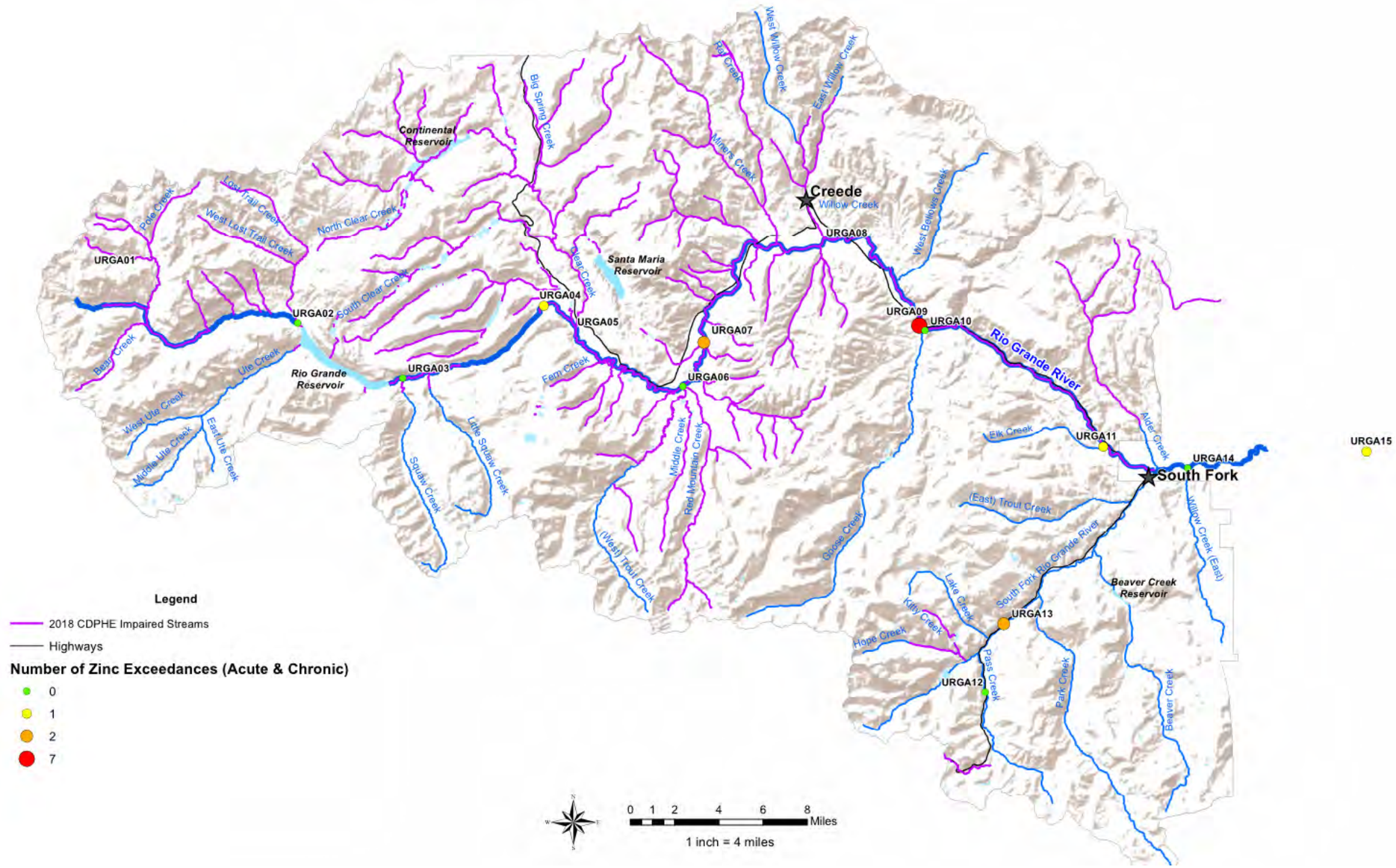


Figure 8-6. Number of Zinc Exceedances at the Sampling Locations

UT: Rio Grande above Rio Grande Reservoir at Ute Creek, URGA 02
TM: Rio Grande at Thirty Mile and confluence with Squaw Creek, URGA03
BC: Rio Grande at Box Canyon, URGA04
CF: Rio Grande at confluence with Clear Creek, URGA 05
MP: Rio Grande at Marshall Park, URGA07
WC: Rio Grande at confluence with Willow Creek, URGA08
WW: Rio Grande at Wagon Wheel Gap, URGA09
EC: Rio Grande at confluence with Elk Creek, URGA11
PC: Rio Grande at confluence with Pass Creek, URGA12
SF: South Fork of Rio Grande at Lake Creek, URGA13
DN: Rio Grande at Del Norte Hannah Lane, URGA15

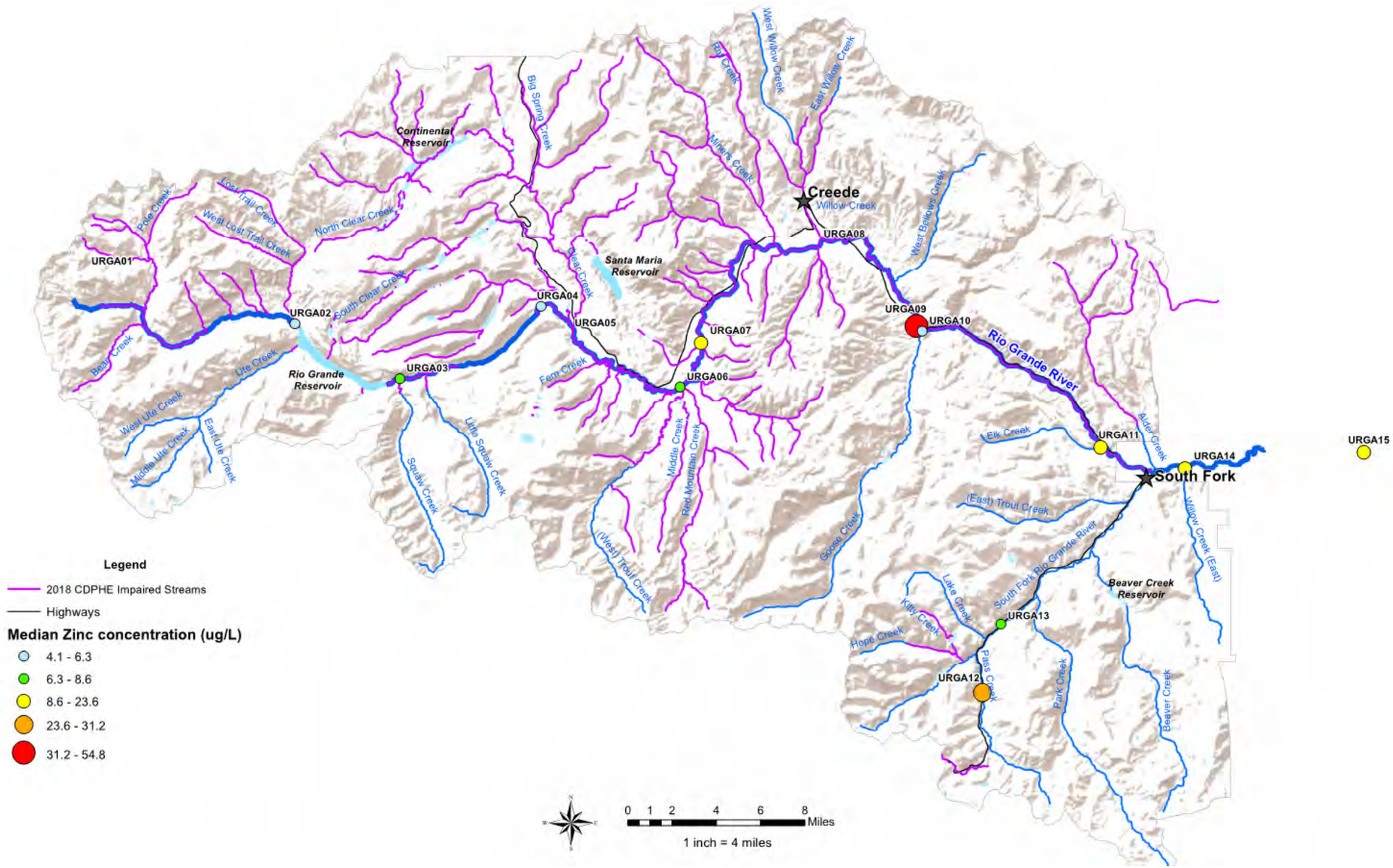


Figure 8-7. Median Zinc Concentrations at the Sampling Locations

UT: Rio Grande above Rio Grande Reservoir at Ute Creek, URGA 02
TM: Rio Grande at Thirty Mile and confluence with Squaw Creek, URGA03
BC: Rio Grande at Box Canyon, URGA04
CF: Rio Grande at confluence with Clear Creek, URGA 05
MP: Rio Grande at Marshall Park, URGA07
WC: Rio Grande at confluence with Willow Creek, URGA08
WW: Rio Grande at Wagon Wheel Gap, URGA09
EC: Rio Grande at confluence with Elk Creek, URGA11
PC: Rio Grande at confluence with Pass Creek, URGA12
SF: South Fork of Rio Grande at Lake Creek, URGA13
DN: Rio Grande at Del Norte Hannah Lane, URGA15

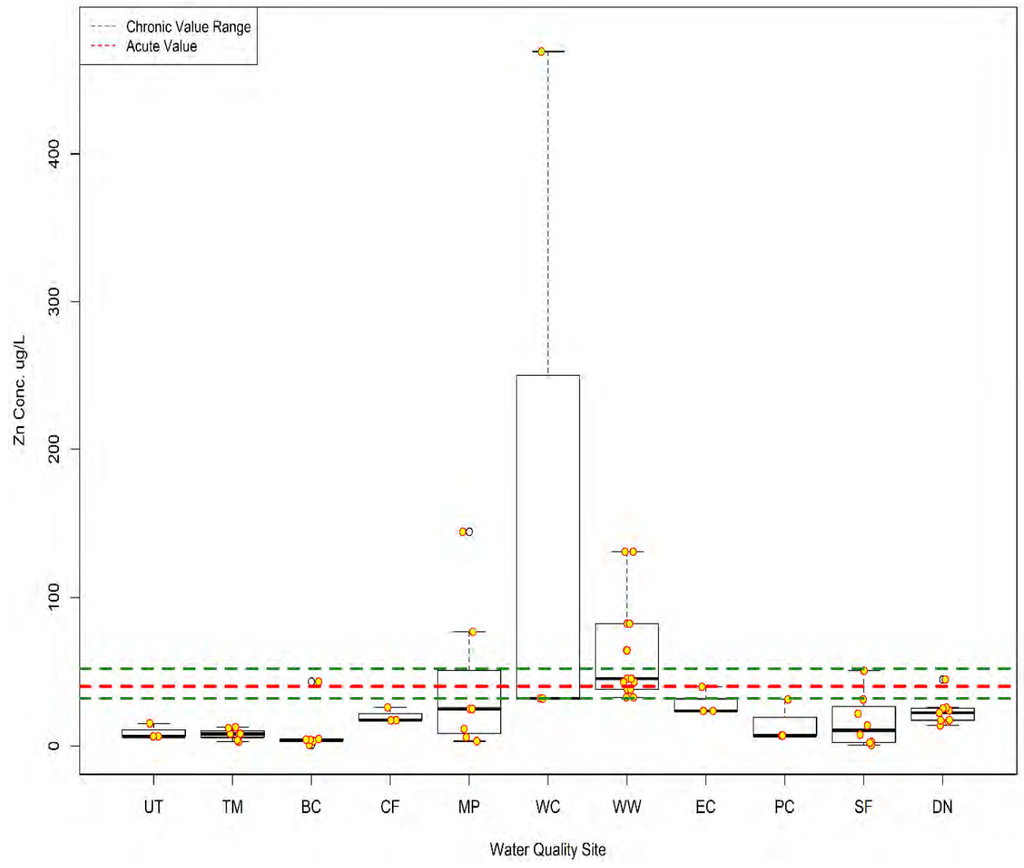


Figure 8-8. Box and Whisker Plot of Measured Zinc Concentrations (upstream to downstream)
The dotted green line indicates the chronic standard range and the red line indicates acute standard range; both are calculated using hardness values.

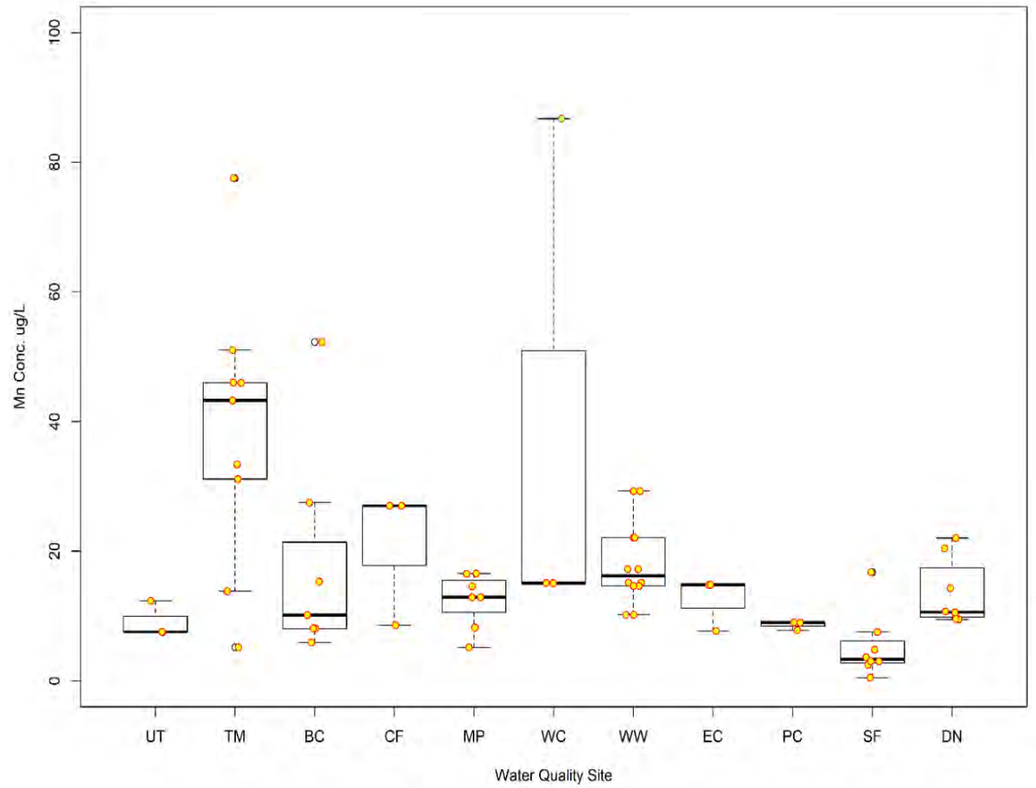


Figure 8-9. Box and whisker plot of Measured Manganese Concentrations (upstream to downstream) Yellow dots represent individual sample results

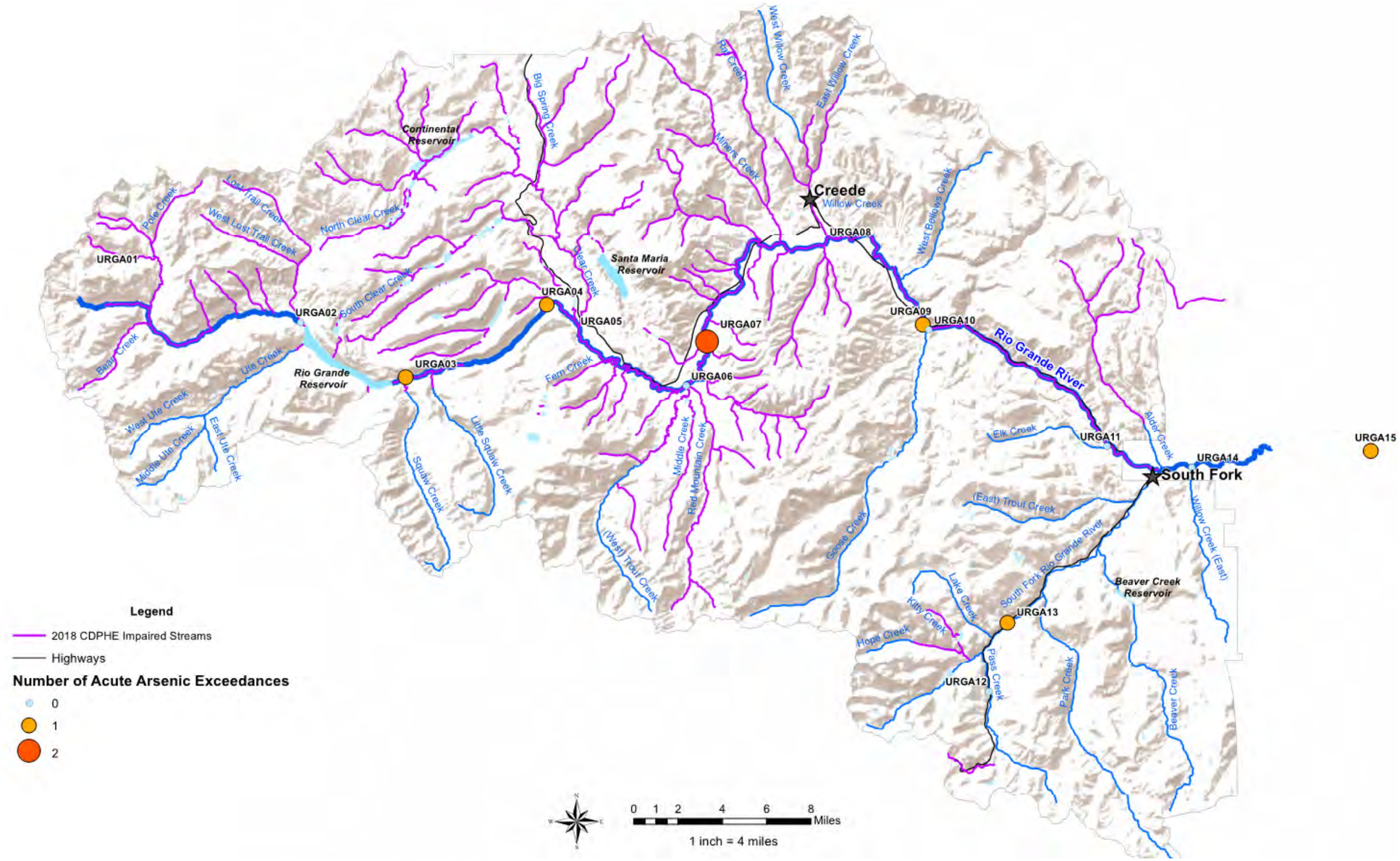


Figure 8-10. Number of Acute Arsenic Exceedances at Sampling Locations

UT: Rio Grande above Rio Grande Reservoir at Ute Creek, URGA 02
TM: Rio Grande at Thirty Mile and confluence with Squaw Creek, URGA03
BC: Rio Grande at Box Canyon, URGA04
CF: Rio Grande at confluence with Clear Creek, URGA 05
MP: Rio Grande at Marshall Park, URGA07
WC: Rio Grande at confluence with Willow Creek, URGA08
WW: Rio Grande at Wagon Wheel Gap, URGA09
EC: Rio Grande at confluence with Elk Creek, URGA11
PC: Rio Grande at confluence with Pass Creek, URGA12
SF: South Fork of Rio Grande at Lake Creek, URGA13
DN: Rio Grande at Del Norte Hannah Lane, URGA15

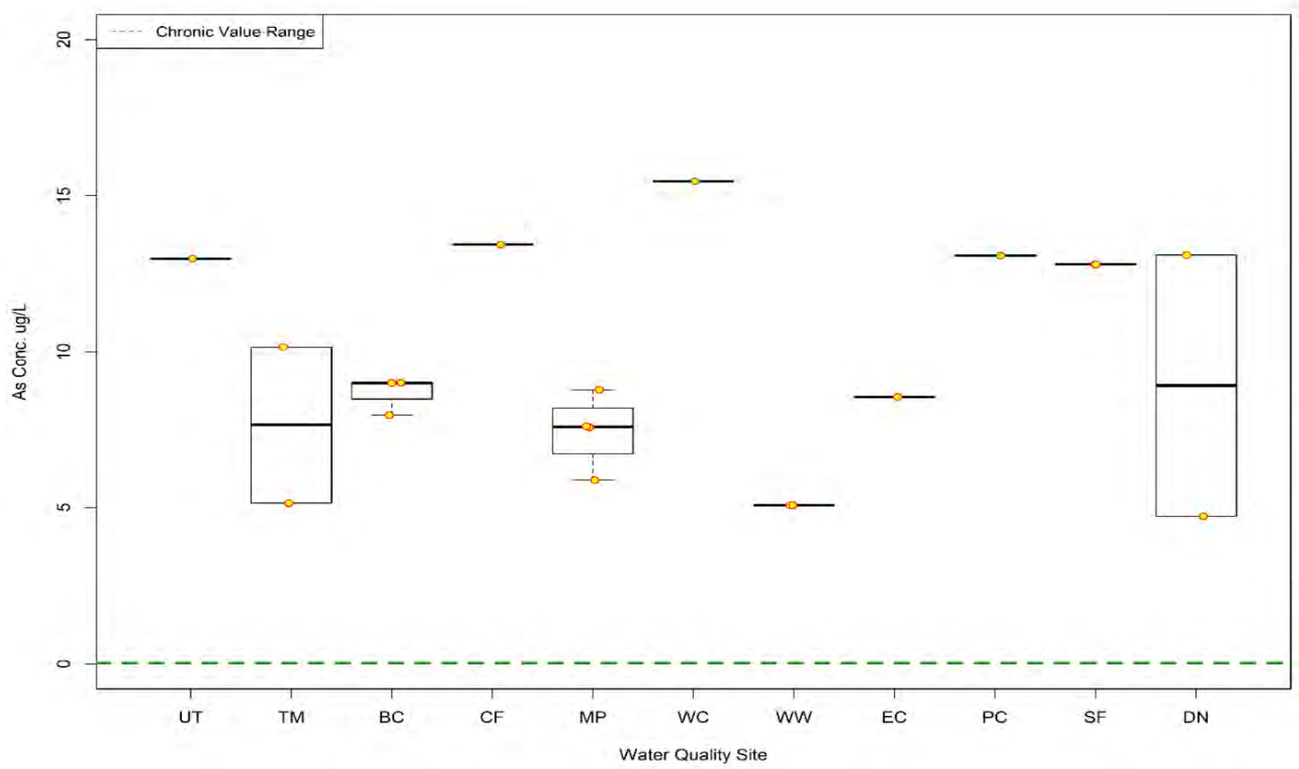


Figure 8-11. Box and Whisker Plot of Measured Arsenic Concentrations (upstream to downstream)
The dotted green line represents the range of chronic standards using measured hardness values.
The yellow dots represent individual results.

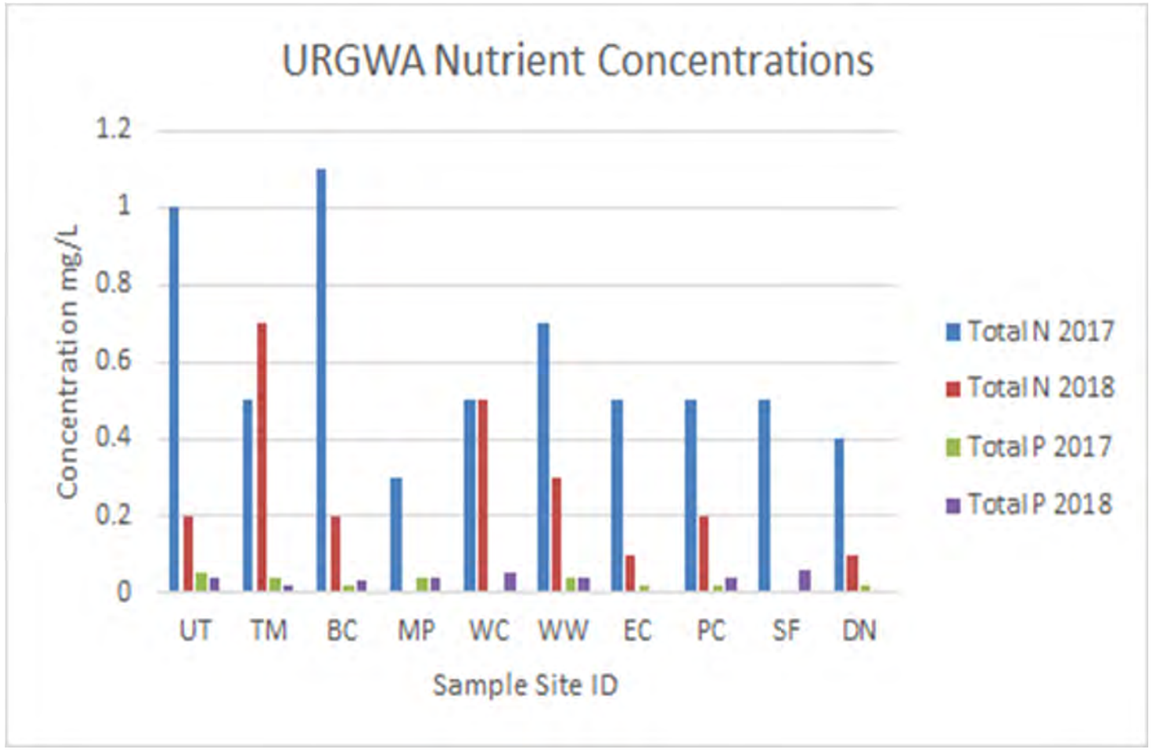


Figure 8-12. Histogram of Concentrations across the Assessment Area

Concentrations that were below detection limits (<0.1 mg/L for N and < 0.02 mg/L for P) or none detected were given a value of zero for this graph.

9.0 Flow Regimes Assessment

9.1 Flow Regimes Assessment Objective

The objective of the flow regimes assessment is to analyze the departure from natural hydrology in the study area as influenced by water administration and storage of water rights. The study did not attempt to identify changes in hydrology caused by climatic factors such as climate change and drought.

The Rio Grande Basin Project Manager for Trout Unlimited's Western Water Project was contracted to complete the assessment of flow regimes, provide recommendations for potential flow improvement projects, and compile Chapter 9.

The hydrology of the Rio Grande in Colorado and within the study area is characterized as a snowmelt-driven system where wintertime precipitation is captured and stored in the snowpack of the San Juan Mountains and delivered via surface runoff during spring melt. The duration and volume of the peak flows are directly related to the amount of annual snowpack and the rate that it melts. Following runoff in late summer through the fall months, surface water flows in rivers and streams are maintained by groundwater inputs, return flows, and rain-based precipitation events. In wintertime, the rivers flow at baseflow levels maintained by groundwater and alluvial flows.
The Rio Grande in Colorado is a working river that is used primarily by farmers and ranchers for irrigation. The first European immigrants started diverting surface water in the lower reaches of the river on the valley floor beginning in the mid 1800's. By the early 1900's, the available water supply was spoken for or fully appropriated under the doctrine of prior appropriation, which is the foundation of Colorado water law. Any further development of surface water resources was restricted to the times of year that existing water rights holders did not need to divert water directly from rivers and streams. This resulted in the construction of dams and reservoirs to store water during the winter or non-irrigation season. The stored water is delivered to irrigated lands when primary supplies of water are depleted and supplementary, stored water is needed.

The chronology of water development in the San Luis Valley influences the realized hydrology in the study area. Because the oldest appropriated water rights on the Rio Grande are downstream, a relatively natural hydrograph exists in the Rio Grande above South Fork.

During the irrigation season, which is typically April 1st to November 1st, the upstream reservoirs in the study area are required to pass through the water that flows into them in order to deliver water to downstream senior water rights holders. Therefore, natural flow levels are maintained for the most part throughout the study area during the irrigation season. The greatest noticeable hydrological departures during the irrigation season are the releases of stored water and the physical limitation of the outlet works at Rio Grande Reservoir to pass the highest flows. However, the reservoir companies and the CDWR work to minimize this constraint through combined operations and limited short-term storage.

The winter months are commonly called the storage season; the typical storage season begins November 1st and ends on March 31st. Variation in dates are subject to the discretion of the Division Engineer for Colorado Water Division 3, who has the authority to decide the irrigation season dates. Variation from the schedule is typically limited to a week or two. During the storage season, depending on decrees, the reservoirs have the right to store the entire river or a substantial portion of the flows. Therefore, the storage season is where the Rio Grande system has the largest departure from a natural hydrograph.

In recent years, there has been a cooperative effort to identify opportunities to deliver water during the storage season for various beneficial uses downstream and to achieve secondary environmental or non-consumptive benefits from increased flows below reservoirs during winter months. This chapter focuses on quantifying the divergence from natural hydrology as a result of reservoir storage to inform future projects, including winter flow program efforts.

9.2 Approach and Methodology

9.2.1 Existing Datasets and Baseline Reservoir Information

The CDWR is the state agency responsible for managing and administering the water resources of Colorado. The study area falls into Water Division 3, the Rio Grande Basin. Administering water in Colorado is a data-intensive effort using stream gauges and other equipment to track environmental and atmospheric conditions. This analysis utilized CDWR storage data from the three biggest on-channel reservoirs within the study area, Rio Grande Reservoir, Continental Reservoir, and Beaver Reservoir. Theses reservoirs, along with the other significant working reservoirs in the study area are shown on **Figure 9-1**. The period of study began in 2004-2005 and ended in 2016. This period includes wet and dry years and recent trends in hydrology in the Basin.

9.2.1.1 Rio Grande Reservoir

Rio Grande Reservoir is on-channel on the Rio Grande southwest of Creede near the headwaters. The reservoir was built in 1912 with a capacity of 54,000 AF. The reservoir is owned and operated by the San Luis Valley Irrigation District. The reservoir was recently repaired as part of the Rio Grande Cooperative Project to address seepage and dam safety concerns. Prior to the repair, seepage was significant. The reservoir is currently under construction as part of the second phase of the repair project to update the outlet tunnel and add new valves to the outlet works, which will allow the reservoir to pass high flows and eliminate leakage from the outlet. The storage data reflect what was captured and stored rather than what the watershed produced.

9.2.1.2 Continental Reservoir

Continental Reservoir is on-channel on North Clear Creek west of Creede near the Continental Divide. The reservoir was built in 1928 with a capacity of 27,000 AF. The reservoir is owned and operated by the Santa Maria Reservoir Company. The reservoir was repaired in 2015-2016 to address dam seepage and spillway issues. Continental Reservoir has been operated at times to release water during the winter on a voluntary basis. These operations are not part of a formal plan or schedule. The data analyzed reflect the water that was stored, not what the watershed produced.

9.2.1.3 Beaver Reservoir (AKA Beaver Park Reservoir)

Beaver Reservoir is on-channel on Beaver Creek, a tributary to the South Fork of the Rio Grande south of the town of South Fork. The reservoir is owned and operated by CPW. The reservoir was built in 1914 with a capacity of 4,500 AF. The reservoir was recently repaired as part of the Rio Grande Cooperative Project to address seepage and to replace outlet works. CPW voluntarily releases water during the storage season to increase flows to a target rate of approximately 5 cfs in Beaver Creek. The data analyzed represent the stored component and not what the watershed produced.

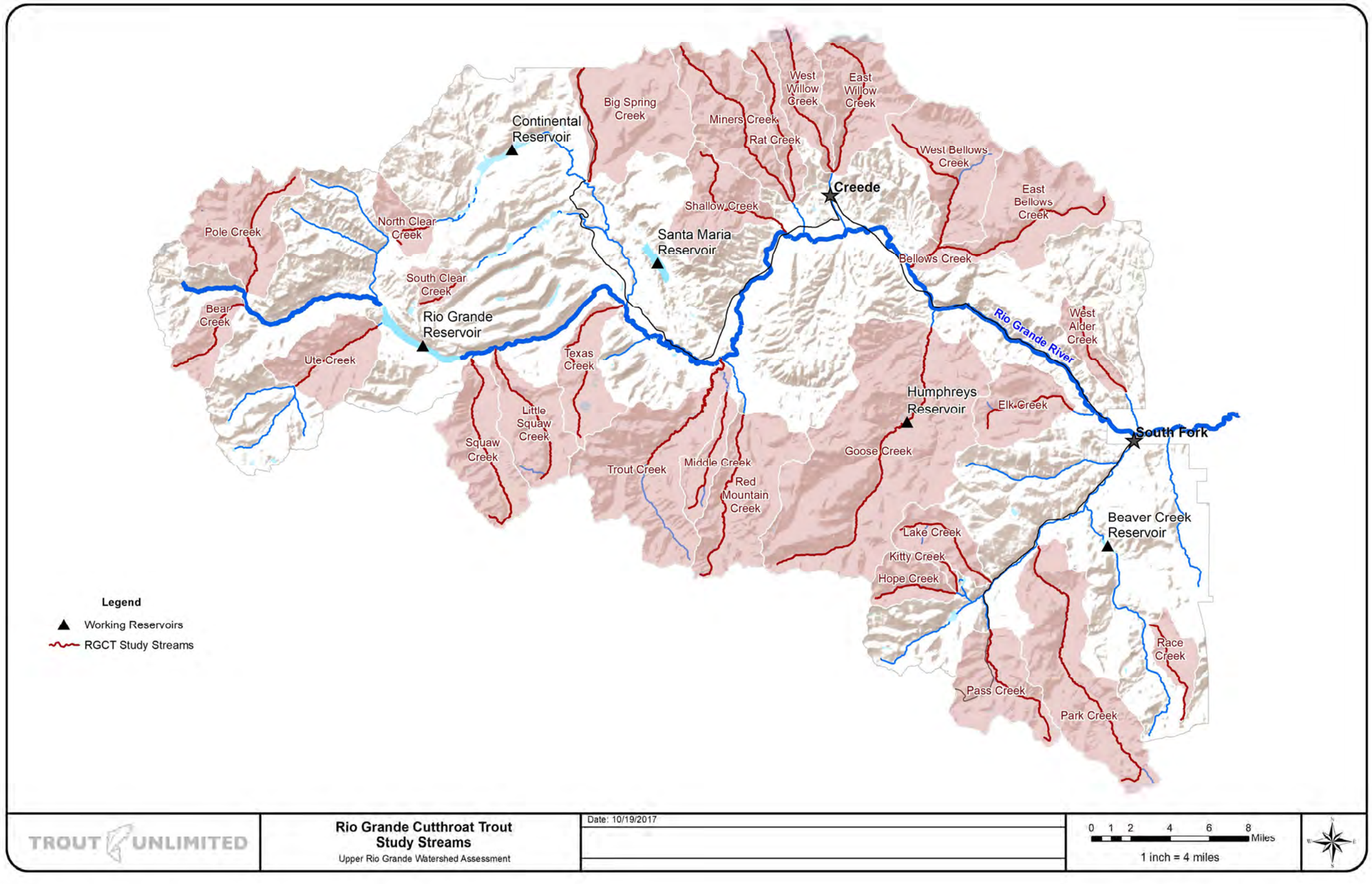


Figure 9-1. Major Reservoirs and Rio Grande Cutthroat Trout Streams in the Watershed

Table 9-1. Key Literature and Datasets Used for Flow Regime Assessment

Existing Datasets	*New and Derived Data*	*Reports*
❖ CDWR data from 2004/2005 to 2016 for Rio Grande Reservoir ❖ CDWR data from 2004/2005-2016 for Continental Reservoir ❖ CDWR data from 2005/2006-2016 for Beaver Creek Reservoir (minus 2009-2010)	❖ none	❖ none

9.2.2 Hydrology and Flow Regimes Assessment Methodology

Beginning in 2005, reservoir storage datasets were evaluated to identify the amount of water stored in each of the three large on-channel reservoirs within the study area. The data was broken down to identify the annual yield during the storage season (November 1st – March 31st) and monthly yield.

9.3 Hydrology and Flow Regimes Assessment Results

The figures below identify the amount of water stored in the three largest on-channel reservoirs within the study area during the storage seasons from 2004-2005 to 2015-2016.

Not surprisingly, the annual storage yields generally follow the trend in total annual flow for the Rio Grande. **Figure 9-2** is the long-term hydrograph for the Rio Grande, which is measured at the Del Norte gauge. The annual flow of the Rio Grande is dependent on the winter snowpack and can be highly influenced by strong summer monsoons.

Figures 9-3, **9-5**, and **9-7** show the annual storage for Rio Grande, Continental, and Beaver Reservoirs, respectively. The storage records for Beaver Reservoir do not include the 2004-2005 or 2009-2010 storage seasons, as the data sets were deemed inaccurate.

The month wherein the highest proportion of storage occurred varied for the three reservoirs. Late season rains and snowstorms provide a jumpstart for reservoir storage and the start of spring snowmelt provides significant increases in storage before the irrigation season begins. **Figure 9-4** shows the monthly storage for Rio Grande Reservoir. In all but three years of the study period, the greatest proportion of storage in Rio Grande Reservoir occurred in November. However, the monthly of storage yield in Continental Reservoir, compiled in **Figure 9-6**, varies from year to year. The storage records for Beaver Reservoir show that the monthly yield for five out of eight years was highest in November and December, compiled in **Figure 9-8**.

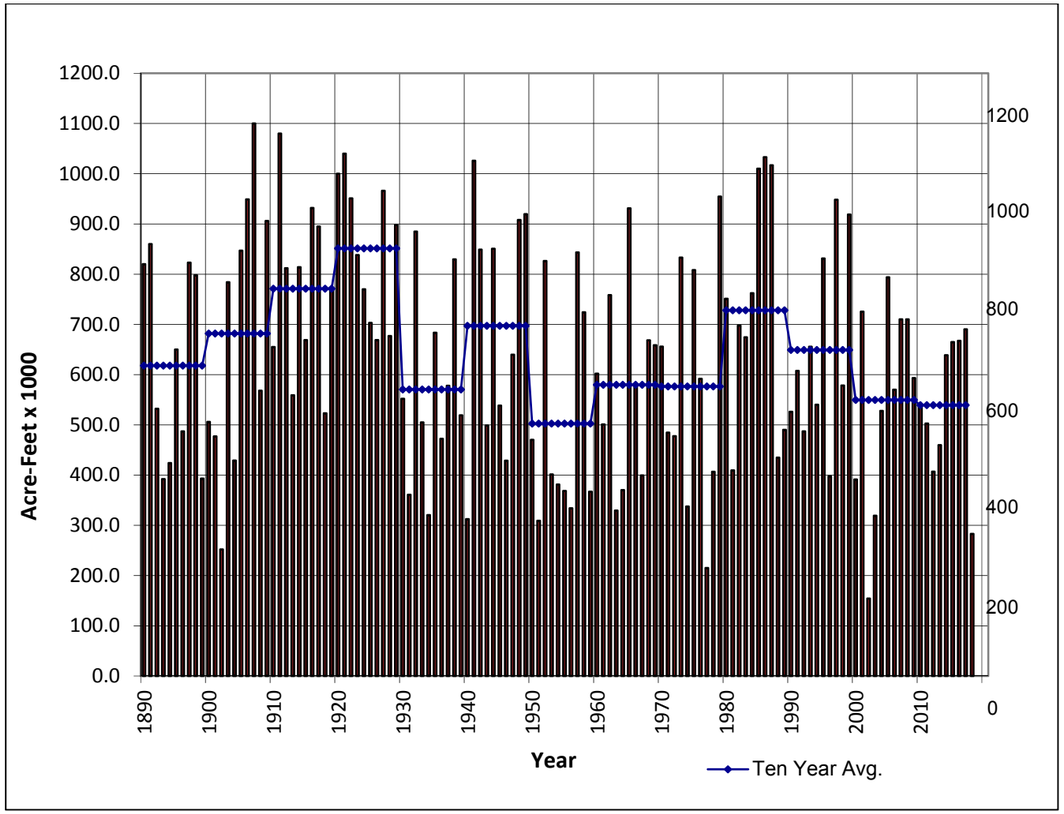


Figure 9-2. Annual Calendar Year Flows at the Rio Grande Near Del Norte (1890-2018)

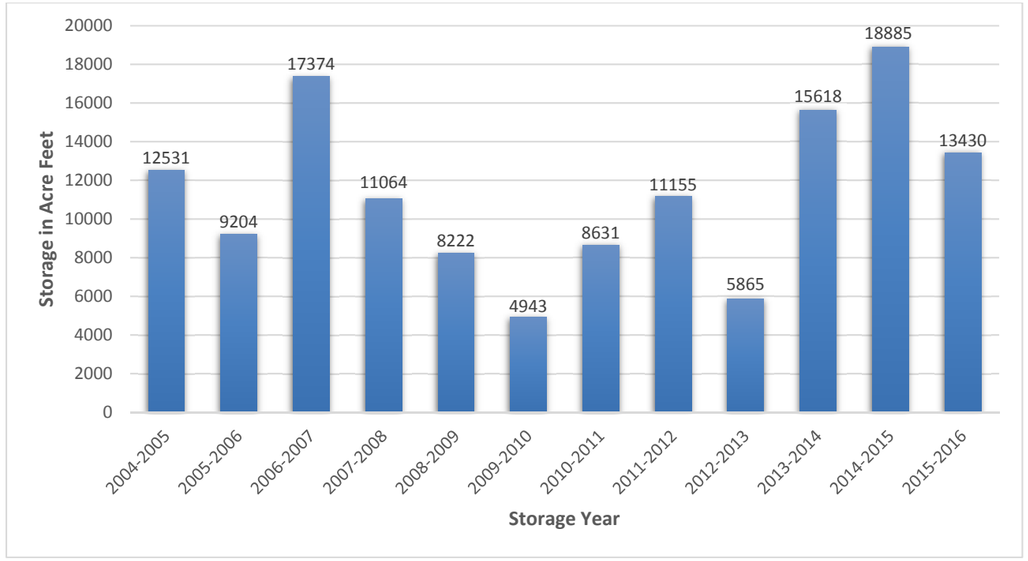


Figure 9-3. Rio Grande Reservoir Annual Storage (AF)

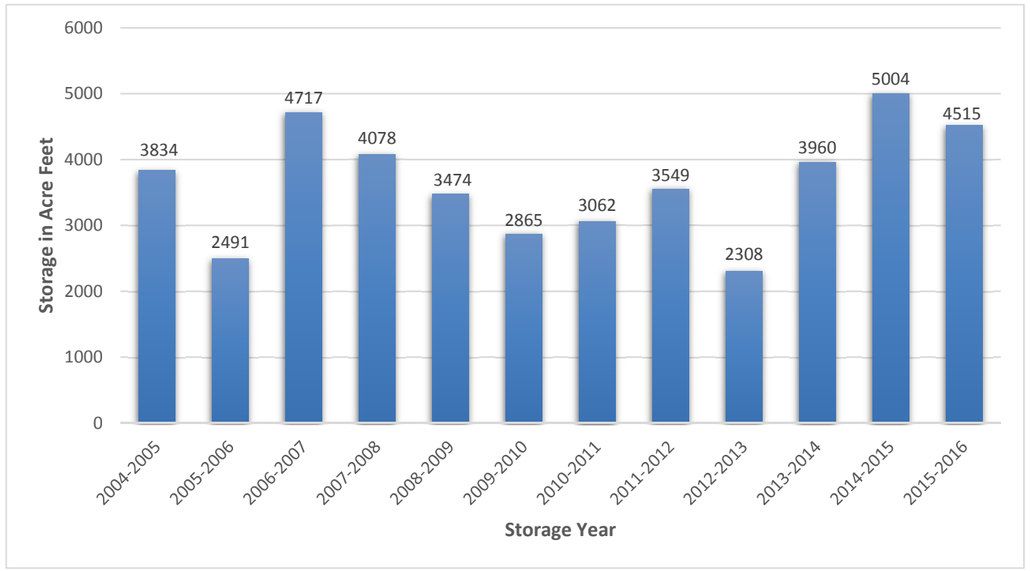


Figure 9-5. Continental Reservoir Annual Storage (AF)

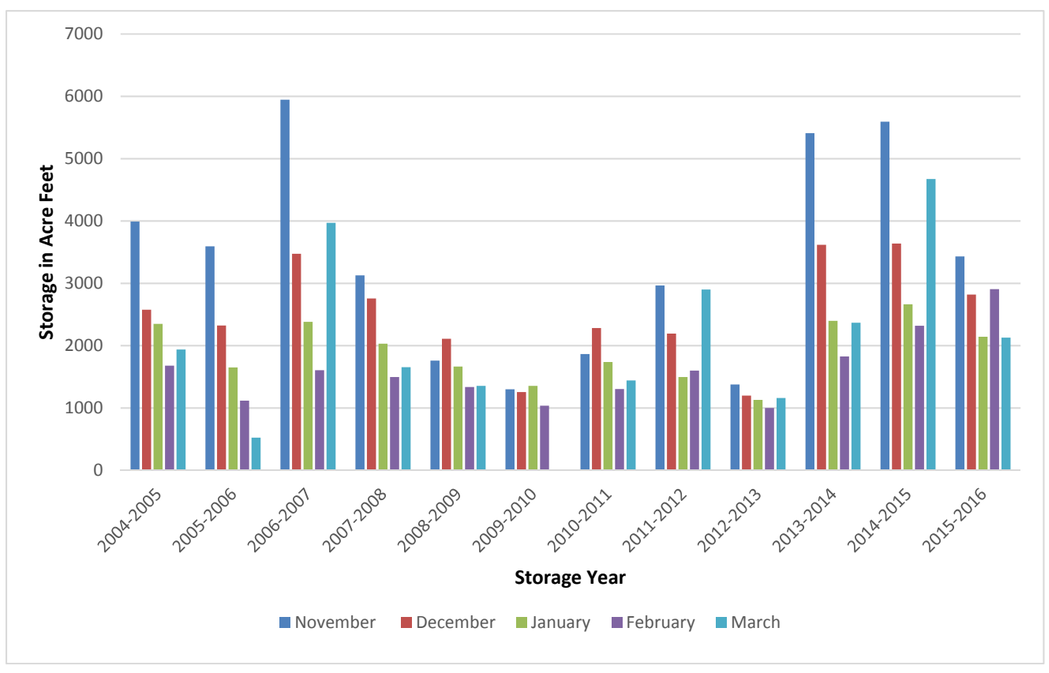


Figure 9-4. Rio Grande Reservoir Monthly Storage (AF)

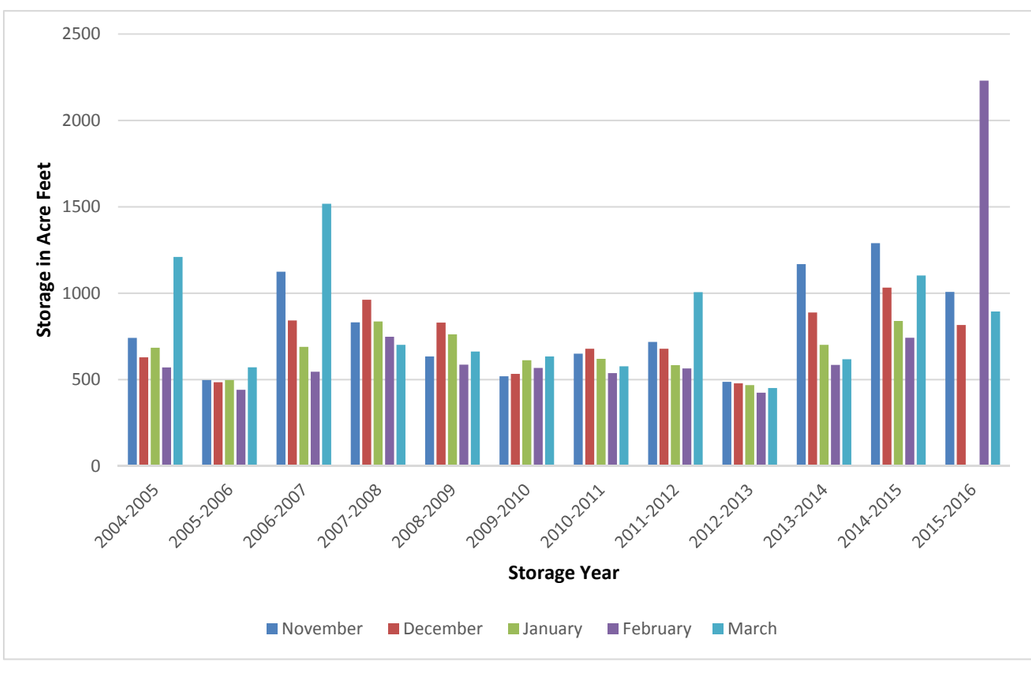


Figure 9-6. Continental Reservoir Monthly Storage (AF)

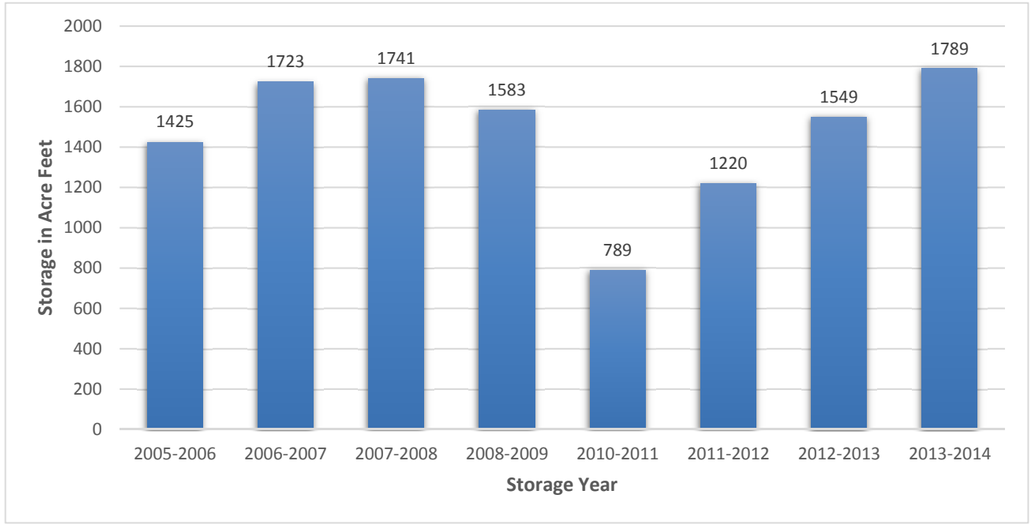


Figure 9-7. Beaver Reservoir Annual Storage (AF)

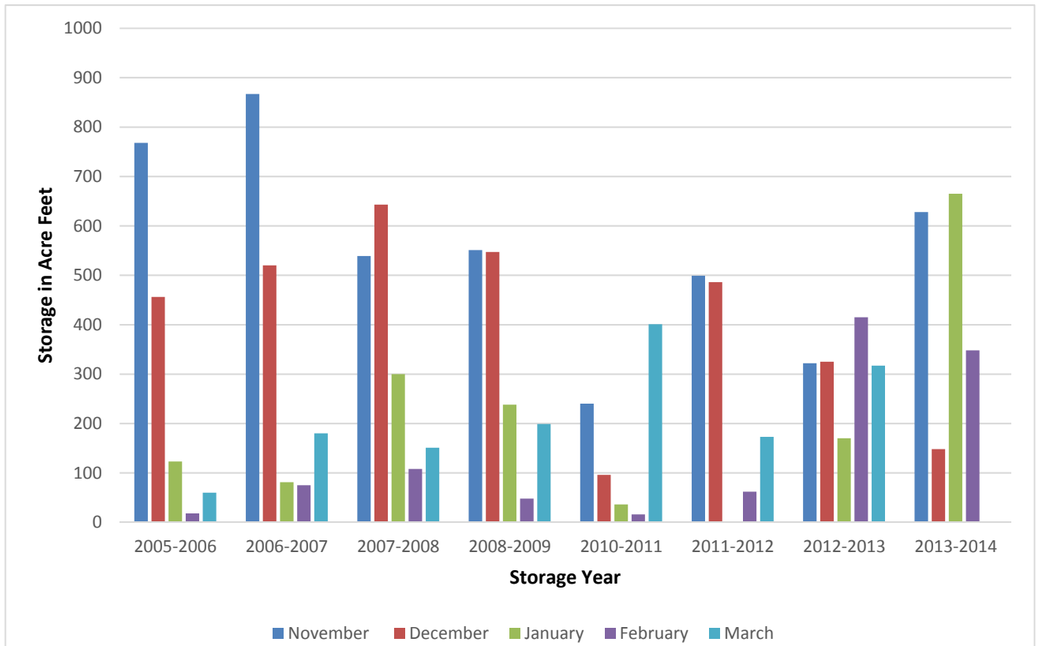


Figure 9-8. Beaver Reservoir Monthly Storage (AF)

9.4 Hydrology and Flow Regime Assessment Priority Projects

The hydrology of the study area is a snowmelt-driven system with high flows in spring and low flows in late summer and fall. The hydrology of the tributaries is almost completely natural with a few small diversions, flow-through impoundments, and protections for in-stream flows that preclude future development of water. The flow regime of the mainstem of the Rio Grande in the study area is relatively natural except for the winter storage season, when many reservoirs store water for the subsequent irrigation season. The storage information summarized in this chapter can be referenced by reservoir operators and stakeholder partners during the consideration of projects to enhance winter flows.

Partners identified the following priorities for altering the flow regime:

- Avoid a “hard shut off” by ramping down flows from the end of the irrigation season. This action will allow the rivers below the dams to recede gradually as the reservoirs enter storage season and will encourage fish to find deeper water for the winter.
- Take steps to avoid pulses and maintain a steady flow during spawning. This will help fish find gravel beds that are likely to stay wet throughout the winter. Late season pulses may lead to temporary wetting of gravel beds that are likely to be out of the water during the low flows of winter.
- Work to maintain a steady release in the winter months from reservoirs with a goal of providing enough water to reduce crowding, stress, and disease in fish, which often bunch in deep holes during low flows. Efforts have been made to time augmentation releases and CPW exchanges to maintain flows during the lowest months. The project partners recommend continuation of these and similar efforts.

Project partners identified the need for additional data collection to better understand potential projects to enhance summer flows. The RGHRP is leading the effort to develop Stream Management Plans in the Rio Grande Basin. Through this work, the RGHRP and American Whitewater are working with recreational boaters and fishermen to quantify the ranges of flows that are suitable for different water crafts, skill levels, and recreation experiences on popular reaches of the Rio Grande and Conejos River. The RGHRP is also working to assess current riparian and aquatic habitat conditions and is partnering with CPW to explore methods of determining recommendations for flows to support the fisheries in the project area. Partners will determine how often the environment and recreation flows exist under low, average, and high flow conditions.

10.0 Aquatic Habitat/Fisheries Assessment

10.1 Aquatic Habitat and Fisheries Assessment Objective

The objective of the aquatic habitat and fisheries assessment is to characterize the fish species occurring in steams in the study area and identify priority streams for Rio Grande cutthroat trout reintroduction. The Rio Grande Basin Project Manager for Trout Unlimited's Western Water Project was contracted to develop the Rio Grande cutthroat trout prioritization matrix and compile information for Section 10.

The upper Rio Grande Basin is home to world-class aquatic resources and renowned fisheries. The snowmelt-driven system and the clean, cold water it provides sustain fisheries in the Basin that are incredible ecological resources, largely self-sustaining wild populations, and a primary driver of tourism. Most rivers and streams within the study area are located on public land, which allows for locals and visitors to enjoy the fisheries.

Aquatic habitat is the interrelationship between the physical environment, the chemical processes of a watershed, and the biological communities that live there. The quality of aquatic habitat and the presence or absence of aquatic organisms can predict ecological function and health of a watershed. Differences in the physical environment from both natural and anthropogenic causes can provide information about the capacity of aquatic habitat to support and sustain biological communities.

The TAT identified the need to summarize the fisheries in the study area streams in order to understand the health of the aquatic habitat, current management objectives, and opportunities for native trout reintroduction. The Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) is the only native trout in the upper Rio Grande Basin. Once prevalent across the entire Basin, the Rio Grande cutthroat trout currently occupy only 10-12% of its historic range. Threats Rio Grande cutthroat trout include competition with nonnative trout, habitat degradation, and climate change. Habitat degradation can occur from sediment loading, mining impacts, and loss of riparian cover. Climate change also has the potential to impact habitat because of increased drought and fire severity and warmer water temperatures. Nonnative trout will outcompete and hybridize with Rio Grande cutthroat trout; in order to protect viable populations, native trout often need separation from nonnative trout with physical barriers.

CPW manages over 80 recreational populations of Rio Grande cutthroat trout in Colorado. Established in the high mountain lakes and streams of the Rio Grande Basin, these populations are stocked by plane, pack animals, and vehicles. Rio Grande cutthroat trout habitat is consistent with that of typical cutthroat trout habitat. Optimal cutthroat trout habitat is characterized by clear, cold water, silt free rocky substrate in riffle-run areas, well-vegetated stream banks, and relatively stable water flow and temperature regimes.

A Conservation Strategy for Rio Grande cutthroat trout was developed by the Rio Grande Cutthroat Trout Conservation Team, a working group of agency representatives charged with the management and protection of the Rio Grande cutthroat trout. The Conservation Strategy identified actions for assuring the long-term persistence of the subspecies within its historic range: fish population inventory (surveys and analysis including genetics); restoration projects (non-native removal, reintroduction, supplemental stocking, spawn-taking, maintaining broodstock); habitat manipulation (barrier placement or removal, in-stream structures, flows, increasing connectivity); regulatory actions (fishing regulations, water use, land management); developing educational and outreach efforts.

10.2 Fisheries Assessment Approach and Methodology

To characterize the fisheries in the study area, survey and stocking data from CPW was obtained and compiled. **Table 10-2** shows the streams in the study area, the most recent year of sampling, the fish species present, and any available stocking information. The Rio Grande in the study area is broken into three management reaches by CPW, as shown in **Figure 10-1**. **Figure 10-1** also shows the Rio Grande Cutthroat trout study reaches, which are being considered by CPW for Rio Grande Cuttroat trout reintroduction.

10.3 Fisheries Assessment Results

The results of the data analysis provide a reference of fisheries management activities in the study area and confirm the well-known fact that the steams in the study area contain many healthy, self-sustaining populations of wild fish. Particularly, the fisheries on both the South Fork and the mainstem of the Rio Grande are in excellent condition with self-sustaining populations of wild brown trout, reflecting high quality aquatic habitat. The results of the analysis also show that CPW has made a shift toward stocking cutthroat trout that are native to the Rio Grande in recent decades and hybrid trout that are resistant to whirling disease. **Table 10-2** highlights areas where sampling has not occurred and may be warranted as part of the development of future fisheries projects. The results of the surveys can provide reference information for entities planning work in those streams.

10.4 Aquatic Habitat Assessment Approach and Methodology

The goal of the aquatic habitat assessment was to prioritize streams for the reintroduction of native Rio Grande cutthroat trout. The habitat assessment involved organizing existing information into a single dataset. As this part of the assessment is fisheries-based, the primary dataset was provided by the CPW. The dataset maintained by CPW encompasses the entire study area and includes information provided by USFS and other federal agencies. Information about the physical environment was developed using the USGS StreamStats 4.0 program, a web-based GIS application that provides users with access to analytical tools. These tools are useful for a variety of water resources planning and management activities and for project design purposes. With the program, users can select a location along a stream and obtain the drainage basin boundary, basin characteristics, and estimates of streamflow statistics for the location.

The Climate Shield model was utilized to provide stream-specific probability-based predictions about the occurrence of cutthroat trout in association with different scenarios for climate change (Isaak, et. al. 2017).

Figure 10-2 shows the probability of Rio Grande Cutthroat Trout occurrence in 2080 with 50% brook trout invasion. Under this scenario, many of the Rio Grande Cutthroat Trout Study Streams maintain a probability of 80-100% percent occurrence.

Figure 10-3 shows the probability of Rio Grande Cutthroat Trout occurrence in 2080 with 100% brook trout invasion. Under this scenario, the probability of cutthroat occurrence is greatly reduced across the majority of Rio Grande Cutthroat Trout Study Streams. Notably, the headwaters of Pole Creek, East Willow Creek, and West Bellows Creek maintain high probability of cutthroat occurrence in both scenarios.

Data from the CWCB instream flow program was used as the metric for expected and protected flows in tributaries. The location used to study the flows was selected as a starting point for watershed evaluation in StreamStats.

The data was used to inform the prioritization matrix, which was developed and guided by studies that evaluated the habitat requirements for re-establishing cutthroat trout populations (Harig and Fausch. 2002) (Kruse, Hubert, and Rahel. 1997).

10.5 Aquatic Habitat Assessment Results

The Rio Grande cutthroat trout prioritization matrix and climate shield models highlight streams that are suitable for further investigation of reintroduction efforts. The suitable habitat characteristics for reintroduction and sustainability of Rio Grande cutthroat trout populations were listed, scored, and summarized in **Table 10-3**, the Prioritization Matrix. The cumulative score provides a relative index of suitability, with the highest scores attributed to the streams with the greatest potential for successful reintroduction.

The total possible score is 25. The top six highest scoring streams are as follows:

- Park Creek: 20
- East Bellows Creek: 20
- Trout Creek: 19
- Red Mountain Creek: 19
- Miners Creek: 19
- Squaw Creek: 19

The prioritization matrix will assist land and wildlife managers in identifying projects to facilitate the reintroduction of Rio Grande cutthroat trout. Projects may include fieldwork to assess the current fishery composition and inform projects to remove non-natives to restock the stream with native trout. The matrix may also be used to identify physical projects such as installation of barriers or riparian vegetation improvement to provide necessary Rio Grande cutthroat trout habitat.

Table 10-1. Key Literature and Datasets Used for the Aquatic Habiat/Fisheries Assessment

Existing Datasets	*New and Derived Data*	*Reports*
❖ CPW Dataset ❖ CWCB Instream Flow Program (2016)	❖ USGS StreamStats 4.0 program information from priority streams ❖ Climate change scenarios	❖ Isaak, D., M. Young, D. Nagel, D. Horan, M. Groce, and S. Parkes. 2017. ❖ Harig, Amy L. and Kurt D. Fausch. 2002. ❖ Kruse, Carter G., Wayne A. Hubert, and Frank J. Rahel. 1997.

Table 10-2. Aquatic Species Survey and Stocking Data for the Study Reaches

Stream Name	Most Recent Survey Date	Fish Species Present						Survey Notes	Stocking Record
		Cutthroat Trout	German Brown Trout	Brook Trout	Rainbow Trout	White Sucker	Longnose Dace		
Rio Grande Mainstem and Tributaries									
Bear Creek	2012	X						Two survey stations; cutthroat at each.	Stocked in 1985 with Pikes Peak cutthroat.
Pole Creek	2012	X						Two survey stations; cutthroat at each.	
Lost Trail Creek	1980			X					Stocked in 2009, 2011, and 2013 with Rio Grande native cutthroat.
West Lost Trail Creek	1994	X		X					Stocked since 1996 with Rio Grande native cutthroat.
East Ute Creek	N/A							Creek not sampled.	
Middle Ute Creek	N/A							Creek not sampled.	
West Ute Creek	N/A							Creek not sampled.	
Ute Creek	N/A							Creek not sampled. West Ute Lake sampled 1978: Snake River and Yellowstone cutthroat. Middle Ute Lake sampled 1985: cutthroat.	Stocked since 2001 with Rio Grande native cutthroat.
Squaw Creek	1980		X		X				Stocked since 2001 with Rio Grande native cutthroat.
Little Squaw Creek	2003	X						Last sampled in 2003; Rio Grande native present, genetics show CO cutthroat.	Stocked in 1974 with Pikes Peak cutthroat.
North Clear Creek	1995		X		X				Stocked in 1994 with rainbow trout.
Big Spring Creek	2004			X					Stocked in 1977 with brook trout.
South Clear Creek	1980			X	X	X			Stocked in 2013 with Hofer Colorado rainbow trout
Clear Creek	N/A							Creek not sampled.	
Fern Creek	1980							No fish found.	Stocked in 1973 and 1974 with Pikes Peak cutthroat.
(West) Trout Creek	1980		X					Two survey stations; brown at each.	Stocked in 1977 with Pikes Peak cutthroat, 1982 with rainbow trout, and 1985 with Pikes Peak cutthroat.
Middle Creek	2009							No fish found.	
Red Mountain Creek	2000	X	X	X				Snake River cutthroat trout surveyed.	Stocked since 2006 with Rio Grande native cutthroat.
Rat Creek	2008		X	X					Stocked in 1975 with rainbow trout and 1977 with brook trout.
Miners Creek	1983			X					Stocked in 1974 with Pikes Peak cutthroat, 2002 with Snake River cutthroat, and 2006 with Rio Grande native cutthroat.
West Willow Creek	2008			X					
East Willow Creek	2008			X					
Willow Creek	N/A							Creek not sampled.	
West Bellows Creek	N/A							Creek not sampled.	
Bellows Creek	1980		X	X	X			Fisherman survey (creel survey)	
Goose Creek	2013		X		X				Stocked in 1974 with Pikes Peak cutthroat and 1977 with brook trout.
Elk Creek	1980		X	X					
Alder Creek	2005		X					West Alder Creek also sampled in 2005: brook trout and Rio Grande cutthroat.	Stocked in 1973 with brook trout.
Willow Creek East	1980				X				Stocked in 1973 with brook trout.
Rio Grande Section #3[1]	2014		X		X	X	X		Stocked in 2016 with cut bow, rainbow trout, and hofer Tasmanian cross.
Rio Grande Section #4[2]	1996	X	X	X	X				Stocked in 2016 with cut bow; rainbow trout had been stocked before
Rio Grande Section #5[3]	2012	X							Stocked since 2008 with Rio Grande native cutthroat and in 2007 with rainbow trout.
South Fork of the Rio Grande Tributaries									
Hope Creek	1983			X					
Kitty Creek	N/A							Creek not sampled.	
Pass Creek	2013			X					Stocked since 2002 with Rio Grande native cutthroat.
Lake Creek	1993			X					Stocked in 1980 with Pikes Peak cutthroat and 1989 with brook trout.
Park Creek	2014		X	X					Stocked in 2002 with Snake River cutthroat.
Beaver Creek	2008		X		X			Upper Beaver sampled 2000: brook trout, brown trout, and rainbow trout.	Stocked in 2010 with rainbow trout.
(East) Trout Creek	1993		X						
South Fork of the Rio Grande	2015		X						Stocked since 2006 with Hofer Colorado rainbow trout.

1) Rio Grande section #3 - Confluence of Red Mountain Creek to South Fork
2) Rio Grande section #4 - Rio Grande Reservoir to the Confluence of Red Mountain Creek
3) Rio Grande section #5 - Rio Grande above Rio Grande Reservoir

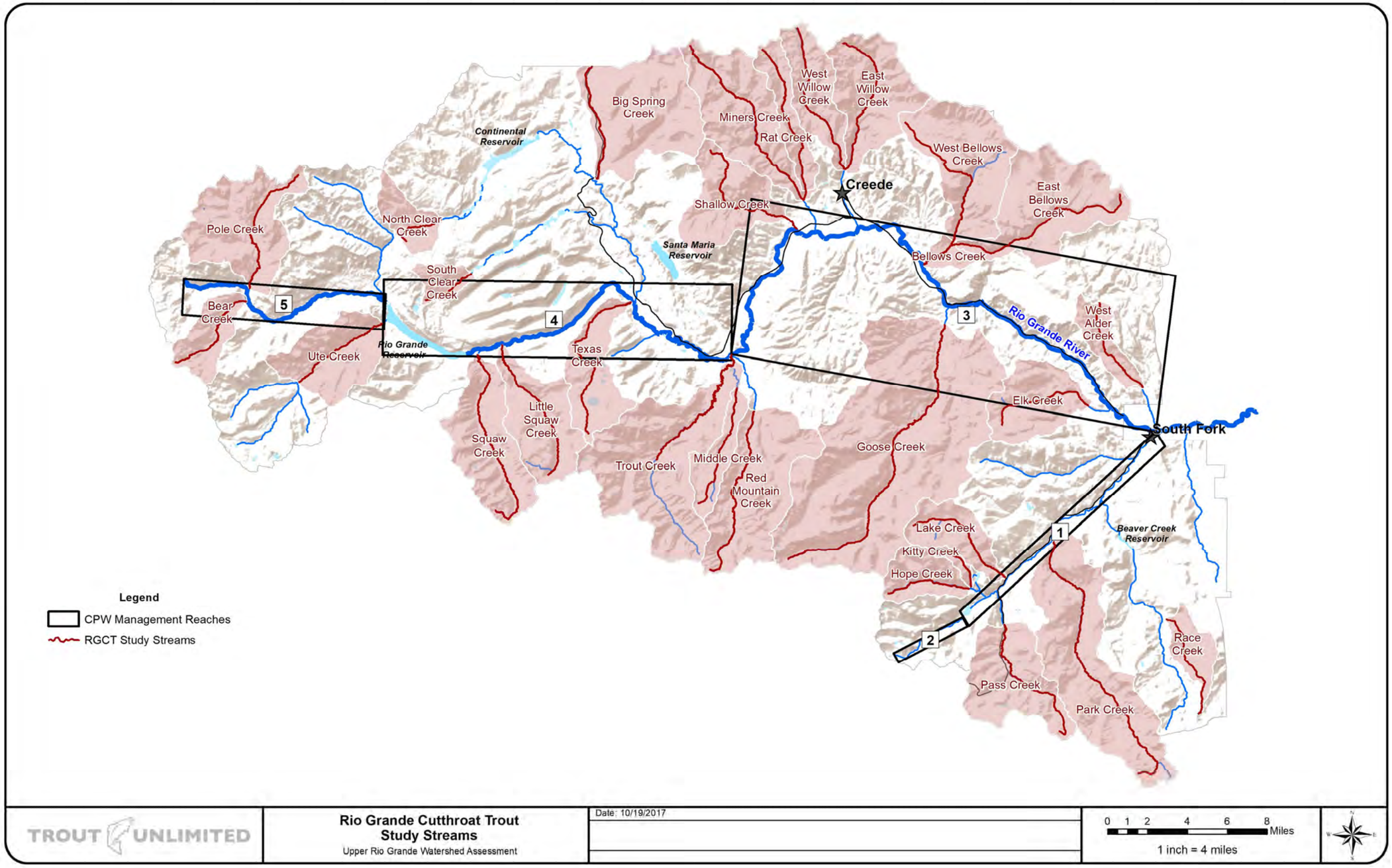


Figure 10-1. CPW Management Reaches and Rio Grande Cutthroat Trout Study Streams

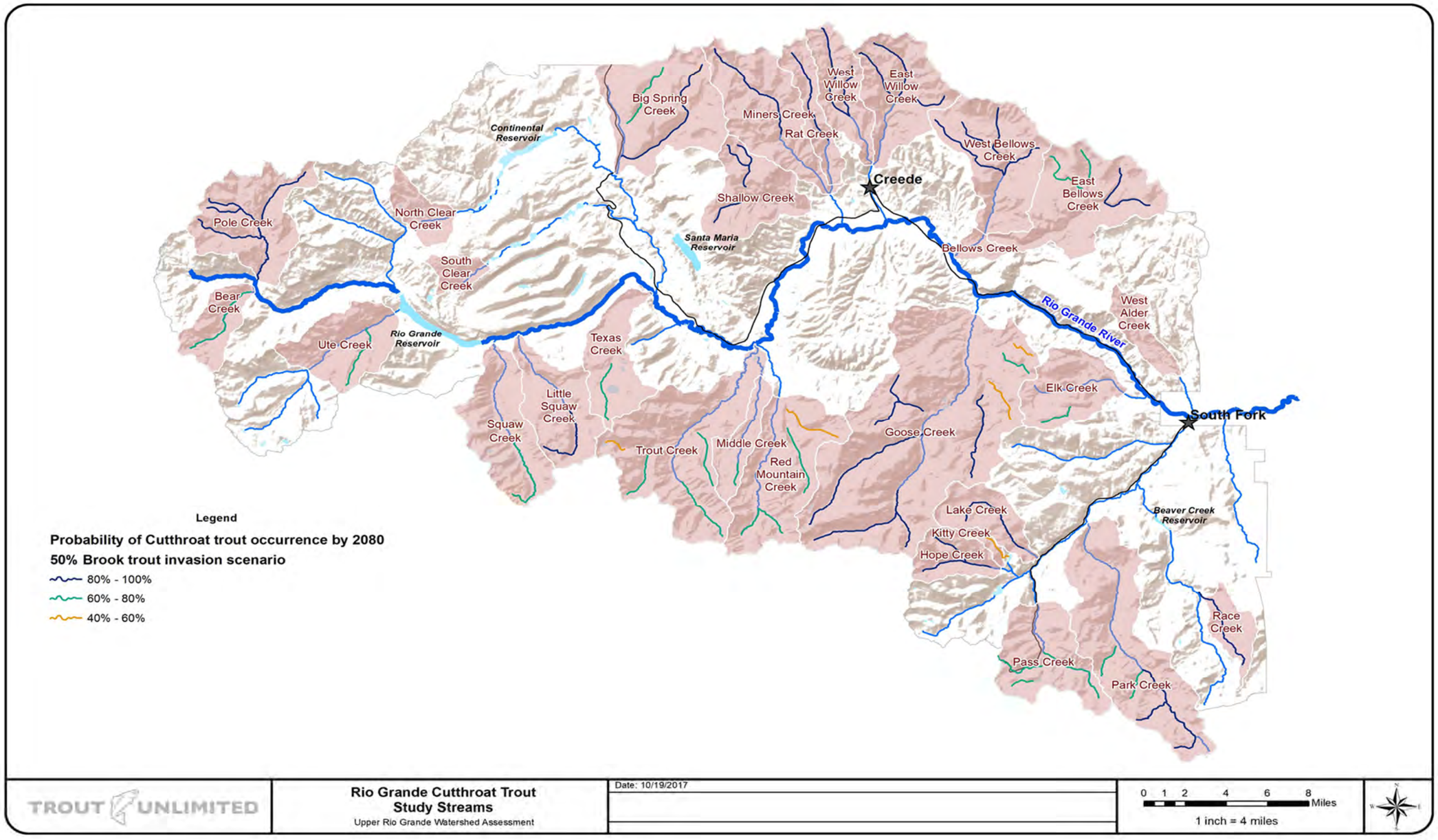


Figure 10-2. Climate Shield Analysis for a 50% Brook Trout Invastion Scenario

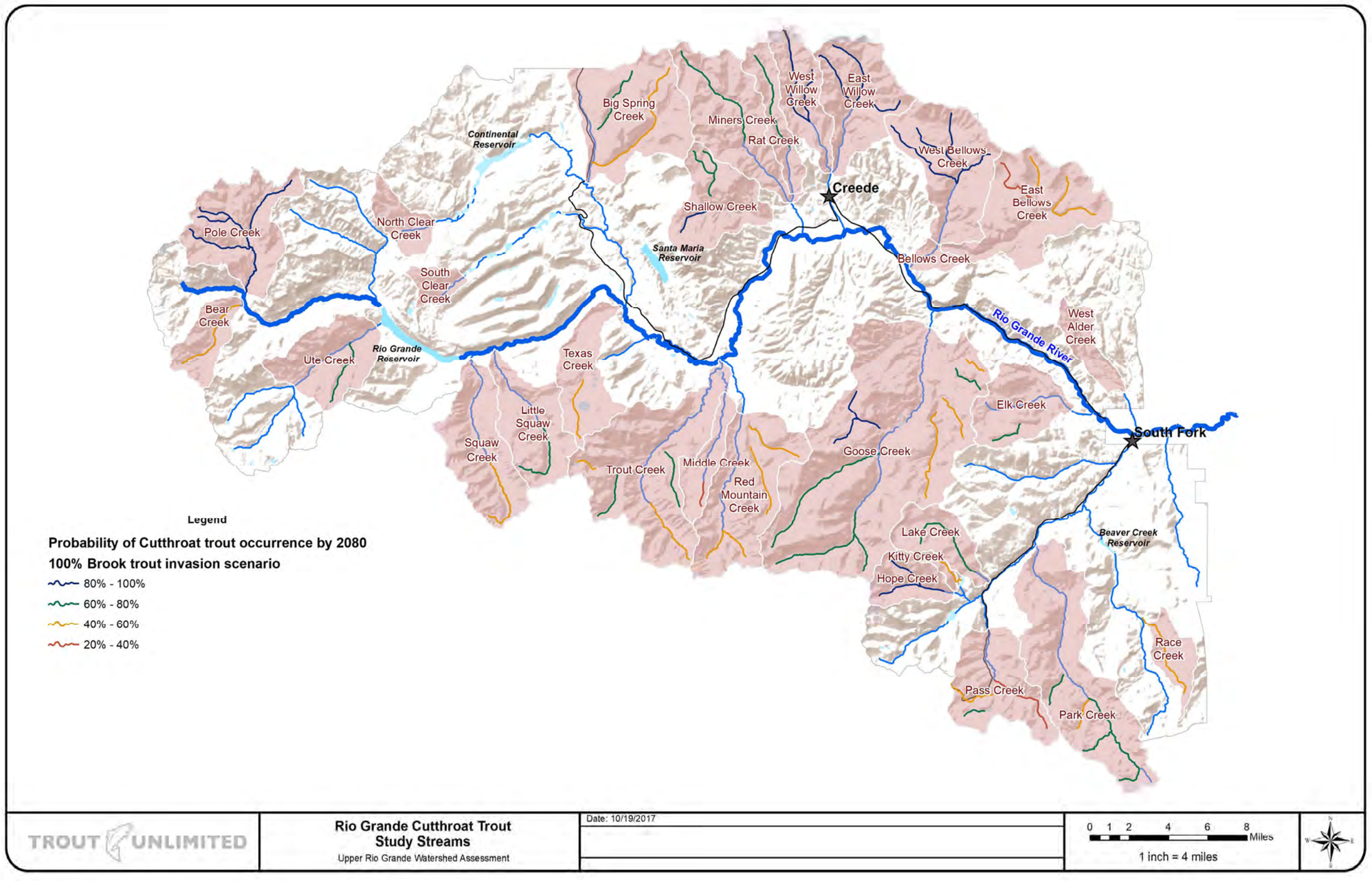


Figure 10-3. Climate Shield Analysis for a 100% Brook Trout Invastion Scenario

Table 10-3. Rio Grande Cutthroat Trout Prioritization Matrix

Stream	Watershed Area in Acres	Watershed Area Score(1)	Stream Miles (calculated)	Stream Miles Score(2)	Mean Predicted Annual Flow (cfs)	Mean Predicated Annual Flow Score(3)	Strahler Stream Order	Strahler Stream Order Score(4)	Mean Slope (%)	Mean Slope Score(5)	% Public Land	% Public Land Score(6)	Mean August Temp (°C)	Mean August Temperature Score(7)	Total Score
Kitty Creek	987	1	2.86	1	13.03	3	2	2	23.61	1	100.00	3	7.67	1	12
Hope Creek	5534	2	4.77	1	13.03	3	2	2	15.80	1	100.00	3	7.67	1	13
Pass Creek	12,769	3	8.67	3	26.65	3	2	2	13.58	1	97.65	3	9.50	2	17
Park Creek	26,139	3	16.74	5	47.13	3	3	3	12.38	1	99.78	3	9.46	2	20
Race Creek	4,396	1	6.23	3	9.34	2	1	1	12.89	1	100.00	3	9.02	2	13
Trout Creek	30,758	3	10.17	5	45.14	3	2	2	7.15	2	93.44	1	10.31	3	19
Lake Creek	6,800	2	6.78	3	13.05	2	1	1	17.21	1	100.00	3	8.62	2	14
Goose Creek	58,268	3	18.68	5	65.53	3	3	3	10.33	1	94.62	1	9.83	2	18
Red Mountain Creek	18,443	3	10.43	5	34.04	3	2	2	10.54	1	97.37	3	9.34	2	19
Middle Creek	4,933	1	6.93	3	6.69	2	1	1	11.09	1	99.47	3	10.29	3	14
Bear Creek	5,754	2	6.05	3	10.89	3	1	1	13.34	1	97.91	3	8.85	2	15
Bellows Creek	1,863	1	2.08	1	31.85	3	3	3	6.17	2	52.33	1	13.40	3	14
Big Spring Creek	18,813	3	6.92	3	25.66	3	2	2	6.69	2	100.00	3	9.17	2	18
East Bellows Creek	17,976	3	10.92	5	18.08	3	3	3	18.37	1	99.80	3	9.50	2	20
East Willow Creek	13,308	3	8.67	3	14.00	3	2	2	18.26	1	96.20	3	8.90	2	17
Elk Creek	9,767	2	5.88	3	8.56	2	2	2	14.11	1	92.73	1	10.98	3	14
Little Squaw Creek	11,343	3	8.72	3	17.11	3	2	2	13.94	1	100.00	3	9.36	2	17
Miners Creek	21,132	3	11.89	5	24.08	3	2	2	15.04	1	97.86	3	9.62	2	19
Pole Creek	14,934	3	7.97	3	28.45	3	2	2	14.34	1	99.97	3	7.94	1	16
Rat Creek	5,711	2	9.33	3	5.82	2	2	2	15.09	1	95.97	3	9.36	2	15
Shallow Creek	11,015	3	8.36	3	10.91	3	2	2	16.26	1	99.79	3	9.82	2	17
Squaw Creek	13,900	3	11.52	5	22.06	3	2	2	11.03	1	100.00	3	9.82	2	19
Texas Creek	9,297	2	9.90	3	13.04	3	2	2	15.19	1	99.77	3	10.01	3	17
Ute Creek	11,046	3	5.83	3	44.29	3	3	3	18.47	1	100.00	3	8.98	2	18
West Bellows Creek	16,354	3	9.07	3	13.54	3	2	2	15.00	1	99.15	3	9.50	2	17
West Willow Creek	8,434	2	9.00	3	9.74	2	2	2	17.55	1	79.82	1	9.12	2	13
West Alder Creek	4,391	1	5.60	3	15.64	3	2	2	18.11	1	100.00	3	10.94	3	16
South Clear Creek	2,706	1	3.04	1	3.23	1	1	1	12.49	1	96.49	3	10.32	3	11
North Clear Creek	4,479	1	2.88	1	10.64	3	1	1	10.56	1	100.00	3	9.67	2	12

Scoring Criteria:

1) Scoring based on thousands of acres: 0-5k=1, 5k-10k=2, >10k=3
2) Scoring based on stream miles: 0-5=1, 5-10=3, >10=5
3) Scoring based on Mean Predicated Annual Flow (cfs)- <5 =1, 5-10=3, >10=5
4) Scoring-based on Strahler Stream Order 1=1,2=2,3=3
5) Scoring based on % slope: >10%=1, 5%-10%=2, <5%=3
6) Scoring based on % of public lands along the creek:-0-95%=1, 95-100%=3
7) Scoring based on mean August temperature (°C) <8=1, 8-10=2,>10=3

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Appendix A

Riparian Habitat Data

Appendix A. Identified Riparian and Upland Points and Associated Impacts in the Upper Rio Grande Watershed

Object ID	Name	Stream Order	Within Fire Boundary	Within Insect Boundary	Vegetation Removed and/or Fragmented	Road Crossing	Road Encroachment	Dispersed Recreation Impact	On-Channel Waterbodies	Ag Impacts	Out Buildings	Utility Corridor	Burn Evidence	Beetle Kill Evidence	Instream Habitat Structure	Mining	Other	Comment
1	Middle Ute Creek	1			0 - 10	Yes												
2	Middle Ute Creek	1			0 - 10			Yes									Yes	Pedestrian bridge crossing
3	West Ute Creek	1			0 - 10	Yes												
4	West Ute Creek	1			50 - 80								Yes	Yes			Yes	Natural Land disturbances near point
82	West Ute Creek	1		Yes	0 - 10	Yes								Yes				Trail crossing
83	West Ute Creek	1		Yes	0 - 10	Yes								Yes				Trail crossing
84	West Ute Creek	1		Yes	0 - 10			Yes										Several trails along shoreline of West Ute Lake; minimal impacts otherwise
5	Fern Creek	1	Yes	Yes	50 - 80								Yes	Yes			Yes	Landslide near point
6	Fern Creek	1	Yes	Yes	50 - 80								Yes	Yes				Burn and beetle kill evidence, woody veg by creek is burned
7	Fern Creek	1	Yes	Yes	81 - 100								Yes	Yes				Burn and beetle kill evidence, woody veg by creek is burned
8	Fern Creek	1	Yes	Yes	81 - 100	Yes												Road crossing, culverts
9	Fern Creek	1		Yes	0 - 10						Yes			Yes				Out buildings, beetle kill evidence
10	Fern Creek	1		Yes	0 - 10												Yes	
11	Trout Creek	2			10 - 49					Yes								Diversion structure
12	Trout Creek	2			10 - 49		Yes	Yes		Yes								Livestock grazing, trail on N and S of creek
13	Trout Creek	2			0 - 10										Yes			Habitat structures along the bends in the creek in this section
14	Trout Creek	2			0 - 10										Yes			Habitat structures along the bends in the creek in this section
15	Trout Creek	2			10 - 49	Yes												Bridge across river with limited riparian vegetation on west side of creek
16	Trout Creek	2			50 - 80		Yes	Yes										Two track trail leading to river's edge, dispersed recreation
17	Trout Creek	2			10 - 49					Yes							Yes	Riparian is not present on the west side of the creek
18	Trout Creek	2			10 - 49		Yes			Yes							Yes	Upland grasslands on the north and west side of the creek, no riparian
19	Trout Creek	2			10 - 49					Yes								Riparian back on west bank, livestock grazing, berm?
20	Trout Creek	2			50 - 80					Yes								0.70 miles of Upland grassland grazing on west side
21	Trout Creek	2			0 - 10		Yes			Yes								Livestock grazing
22	Trout Creek	2			50 - 80	Yes	Yes			Yes								Impacts run upstream to next point
23	Trout Creek	2			81 - 100	Yes	Yes			Yes							Yes	Habitat structures; bridge and ford
24	Trout Creek	2			50 - 80		Yes			Yes								Habitat structures between this point and the next point downstream
25	Trout Creek	2			50 - 80		Yes			Yes								Livestock grazing, primarily on west side
26	Trout Creek	2			0 - 10	Yes	Yes											Bridge crosses the creek
27	Trout Creek	2	Yes		0 - 10		Yes						Yes					End of burn evidence in riparian area; road on edge encroachment in riparian area
28	Trout Creek	2	Yes		10 - 49					Yes								Livestock grazing, two track trail north of creek
29	Trout Creek	2	Yes		50 - 80			Yes					Yes					Burn evidence and two track trail on east side of creek
30	Trout Creek	2	Yes		0 - 10			Yes										End of fire impact, dis rec with trails to the north of creek
31	Trout Creek	2	Yes		10 - 49	Yes	Yes			Yes			Yes					Road ford creek crossing, livestock grazing
32	Trout Creek	2	Yes		10 - 49													Talus, rock fall/floodplain disturbance
33	East Trout Creek	2	Yes	Yes	10 - 49	Yes	Yes											Trail encroachment
34	East Trout Creek	2	Yes	Yes	50 - 80								Yes					Burn evidence along the creek and either side of the drainage for about 0.9 miles upstream
35	East Trout Creek	2	Yes	Yes	10 - 49	Yes	Yes			Yes			Yes					Road crossing, dis. rec (hiking trails), livestock trails in valley.
36	East Trout Creek	2	Yes	Yes	50 - 80	Yes	Yes			Yes			Yes					Dis rec, road crossing/livestock trail crossing
37	East Trout Creek	2	Yes	Yes	50 - 80								Yes					Begin intense burn evidence on either side of creek and near creek. some herbaceous vegetation growing back, still no woody species
38	East Trout Creek	2	Yes	Yes	10 - 49								Yes					Burn evidence but less intense as the area opens to a small valley
39	East Trout Creek	2		Yes	50 - 80									Yes				Beetle kill evidence present, lots of fallen trees, snow still present
40	Middle Creek	1			50 - 80		Yes		Yes	Yes								On channel water body and ag impact
41	Middle Creek	1			81 - 100		Yes			Yes								Ag from this out to further upstream
42	Middle Creek	2			81 - 100	Yes	Yes			Yes	Yes	Yes						More ag impacts
43	Middle Creek	1			81 - 100	Yes	Yes			Yes								Livestock trails, road parallel to creek
44	Middle Creek	2			0 - 10													
45	Middle Creek	1			0 - 10	Yes	Yes											Ford road crossing through creek
46	Middle Creek	1		Yes	10 - 49			Yes		Yes								Livestock grazing and hiking trail to the north of the creek
47	Middle Creek	1			10 - 49									Yes				Beetle kill evidence and fallen trees
48	Middle Creek	1			0 - 10					Yes								Livestock trails in area
49	Middle Creek	1			50 - 80	Yes		Yes	Yes									On channel water body with lots of trails/roads around the reservoir. There is a bridge across creek near the reservoir
50	Middle Creek	1			10 - 49			Yes		Yes				Yes				Livestock trails, hiking trails, and beetle kill evidence in uplands
51	Middle Creek	1			10 - 49			Yes		Yes							Yes	Livestock trails and hiking trails, floodplain
52	Middle Creek	1			50 - 80					Yes			Yes	Yes				Livestock trails and beetle kill evidence
53	Middle Creek	1			10 - 49	Yes	Yes	Yes		Yes			Yes					Livestock trails, hiking trail to west of creek, road crossing with culverts, beetle kill and fire evidence to east of creek
54	Middle Creek	1			10 - 49	Yes							Yes	Yes				Road crossing
55	Pole Creek	1		Yes	10 - 49	Yes								Yes				Rd crossing approx 84 ft across channel; entry/exit pts much wider than road
56	Pole Creek	1		Yes	50 - 80			Yes										Multiple dispersed camping along east side; compacted soils
57	Pole Creek	1		Yes	50 - 80			Yes										Multiple dispersed camping sites along west bank; compacted soils
58	Pole Creek	1		Yes	10 - 49			Yes										Trail along channel; dispersed camp sites
59	Pole Creek	1			0 - 10			Yes										Trail along west bank to access fishing; could be some dispersed camping sites
60	Pole Creek	1			0 - 10	Yes												
61	Pole Creek	1			0 - 10	Yes												
62	Pole Creek	1			0 - 10	Yes												
63	Pole Creek	1			0 - 10	Yes												
64	Pole Creek	1			0 - 10		Yes											
65	Pole Creek	1			10 - 49		Yes											Areas of erosion from road into riparian area; could be pull-out/camping
66	Pole Creek	1			10 - 49			Yes										
67	Pole Creek	1			10 - 49	Yes												Rd crossings on both NW tributaries
68	Pole Creek	1			81 - 100												Yes	No riparian on east bank; avalanche path
69	Pole Creek	1			10 - 49	Yes												Multiple split roads/trails into riparian area across trib
70	Pole Creek	1			10 - 49	Yes												
71	Pole Creek	1			10 - 49	Yes												Several split rds on east side to creek/steep
72	Bear Creek	1		Yes	10 - 49			Yes						Yes				Pull out from road; trails leading up and downstream along channel
73	Bear Creek	1		Yes	0 - 10			Yes						Yes				
74	Bear Creek	1		Yes	0 - 10			Yes						Yes				
75	Bear Creek	1		Yes	10 - 49	Yes								Yes				

Object ID	Name	Stream Order	Within Fire Boundary	Within Insect Boundary	Vegetation Removed and/or Fragmented	Road Crossing	Road Encroachment	Dispersed Recreation Impact	On-Channel Waterbodies	Ag Impacts	Out Buildings	Utility Corridor	Burn Evidence	Beetle Kill Evidence	Instream Habitat Structure	Mining	Other	Comment
76	Bear Creek	1		Yes	10 - 49			Yes						Yes				Multiple camping spots along S SE side of creek
77	Bear Creek	1		Yes	10 - 49	Yes								Yes				Road widens at crossing on both sides; split channel from northern trib
78	Bear Creek	1		Yes	0 - 10	Yes	Yes											River jumps out of banks at crossing and travels on rd approx 500 ft
79	Bear Creek	1		Yes	0 - 10			Yes										Pull-out and camping - minimal impact
80	Bear Creek	1		Yes	0 - 10						Yes							Old structure 50 ft from waters edge
81	Bear Creek	1		Yes	81 - 100											Yes		Mine tailings at source-approx .4 surface acres
85	Middle Ute Creek	1		Yes	0 - 10	Yes												Trail crossing; there are multiple trails that intersect at this point
86	Lost Trail Creek	1			0 - 10	Yes												Concrete road crossing located above the mouth at the confluence of Rio Grande
87	Lost Trail Creek	1			0 - 10						Yes							Pit toilet located approx 420 ft from east bank
88	Lost Trail Creek	1			50 - 80			Yes		Yes								Parking and camping surrounding pit toilet approx 4 acres of impact; within grazing allotment-impacts could be ag impacts
89	Lost Trail Creek	1			0 - 10					Yes								Several livestock trails formed in west upland area
90	Lost Trail Creek	1			0 - 10			Yes										Several livestock trails formed along east bank and uplands
91	Lost Trail Creek	1			0 - 10					Yes								Livestock trails on west upland
92	Lost Trail Creek	1			0 - 10	Yes												Bridge crossing
93	Lost Trail Creek	1			0 - 10					Yes								Livestock trails on east bank
94	Lost Trail Creek	1			0 - 10					Yes								Livestock trails on west bank
95	Lost Trail Creek	1			0 - 10						Yes						Yes	Developed campground-Lost Trail Campground
96	Lost Trail Creek	1		Yes	0 - 10	Yes												Bridge crossing
97	Lost Trail Creek	1			0 - 10					Yes								
98	Lost Trail Creek	1		Yes	0 - 10					Yes								
99	Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				
100	Lost Trail Creek	1		Yes	50 - 80			Yes						Yes				
101	Lost Trail Creek	1		Yes	0 - 10	Yes								Yes				
102	Lost Trail Creek	1		Yes	0 - 10			Yes						Yes				
103	Lost Trail Creek	1		Yes	0 - 10			Yes										Trail access to creek
104	Lost Trail Creek	1		Yes	0 - 10					Yes								Livestock trails
105	Lost Trail Creek	1		Yes	0 - 10					Yes								Livestock trails
106	Lost Trail Creek	1		Yes	81 - 100		Yes						Yes					Upland erosion (landslide), fire impact on riparian, appears to have been burned
107	Lost Trail Creek	1		Yes	0 - 10	Yes							Yes	Yes				Road crossing, riparian area is brown and appears to have been burned
108	Lost Trail Creek	1		Yes	10 - 49			Yes					Yes					Dis rec impact with trails near the creek and running parallel, area burned
109	Red Mountain Creek	1			81 - 100	Yes	Yes	Yes										Recreation impact off the main road, bridge crossing, limited vegetation east of the bridge
110	Red Mountain Creek	1			10 - 49					Yes								Grazing impacts on west side of river, house nearby
111	Red Mountain Creek	1			10 - 49					Yes								Grazing impacts on east side of creek
112	Red Mountain Creek	1			0 - 10					Yes								Grazing impact, cow trail through riparian on either side of creek
113	Red Mountain Creek	1			10 - 49					Yes								Grazing impact
114	Red Mountain Creek	1			0 - 10					Yes								Grazing impact more on west side of creek
115	Red Mountain Creek	1			10 - 49		Yes			Yes								Grazing impact
116	Red Mountain Creek	1			0 - 10					Yes								Livestock trails
117	Red Mountain Creek	1			10 - 49					Yes								Livestock trails
118	Red Mountain Creek	1			0 - 10					Yes								Grazing
119	Red Mountain Creek	1			0 - 10		Yes			Yes								Livestock trails and erosion from uplands
120	Red Mountain Creek	1			10 - 49	Yes												Bridge across the creek
121	Red Mountain Creek	1			50 - 80					Yes								Grazing trails
122	Red Mountain Creek	1			0 - 10	Yes												Bridge crossing
123	Red Mountain Creek	1			50 - 80	Yes	Yes			Yes							Yes	Ford crossing, ag impacts, diversion structures in this length of stream
124	Red Mountain Creek	1			50 - 80					Yes					Yes			In-stream structures and bank disturbances in this area
125	Red Mountain Creek	1			10 - 49					Yes								Grazing and in stream structures
126	Red Mountain Creek	1			10 - 49			Yes		Yes								Creek near reservoir with dispersed recreation impacts and grazing
127	Red Mountain Creek	1			10 - 49												Yes	Upland erosion
128	Red Mountain Creek	1			50 - 80	Yes	Yes			Yes	Yes							Grazing, downed trees near creek, houses near creek
129	Red Mountain Creek	1			10 - 49												Yes	Upland erosion
130	Red Mountain Creek	1			81 - 100					Yes							Yes	A closed grazing license (per USFS grazing allotment info) from this point to the next.
131	Red Mountain Creek	1			81 - 100												Yes	Limited natural vegetation cover and upland erosion
132	Red Mountain Creek	1			10 - 49									Yes				Back to vegetation cover and evidence of beetle kill
133	Red Mountain Creek	1		Yes	10 - 49					Yes								Grazing
134	Red Mountain Creek	1		Yes	10 - 49					Yes				Yes				Grazing and beetle kill evidence with downed trees
135	Red Mountain Creek	1		Yes	10 - 49									Yes				Downed trees
136	Red Mountain Creek	1		Yes	10 - 49					Yes								Grazing on west/north side of creek, limited vegetation growth
137	Elk Creek	1			0 - 10	Yes	Yes				Yes							Residential house on NW side by the mouth of Elk Creek to Rio Grande. Bridge crossing, riparian area around bridge impacted.
138	Elk Creek	1			0 - 10	Yes	Yes											Bridge/Road crossing, road/trail on either side of creek
139	Elk Creek	1			10 - 49		Yes			Yes								Limited riparian vegetation due to road impact and ag (irrigation impact) for about 0.02 miles downstream towards bridge
140	Elk Creek	1			0 - 10												Yes	Railroad bridge crossing
141	Elk Creek	1			0 - 10	Yes												Road crossing
142	Elk Creek	1			0 - 10													Bridge crossing and entry into an on creek waterbody
143	Elk Creek	1			81 - 100		Yes	Yes	Yes									On channel waterbody present with limited riparian vegetation, dispersed recreation impact
144	Elk Creek	1			0 - 10	Yes		Yes										Bridge crossing
145	Elk Creek	1			0 - 10			Yes										Dispersed recreation impact
146	Elk Creek	1			0 - 10										Yes			Boulders across river, four structures spanning approx. 0.06 miles upstream of point
147	Elk Creek	1			0 - 10				Yes								Yes	Dam for small reservoir
148	Elk Creek	1			10 - 49	Yes	Yes		Yes									Road crossing between reservoirs, limited vegetation on the north and south side of the reservoirs
149	Elk Creek	1			10 - 49				Yes	Yes								On channel water body (reservoir), ag impacts to the NW of point
150	Elk Creek	1			0 - 10												Yes	Sedimentation from river slowing due to reservoirs.
151	Elk Creek	1			10 - 49					Yes								Ag impacts on SW side of creek
152	Elk Creek	1			0 - 10	Yes												Road crossing to houses on East side of Creek
153	Elk Creek	1			0 - 10	Yes												Road crossing to house and access road on north side of creek heading upstream
154	Elk Creek	1			0 - 10		Yes											Est. two track road encroachment, irrigated fields to south of creek
155	Elk Creek	1			10 - 49					Yes								Ag impacts (irrigated fields) for about 0.08miles upstream from point. Irrigation ditch 0.02 miles upstream and heading south, appears to have riparian veg present.

Object ID	Name	Stream Order	Within Fire Boundary	Within Insect Boundary	Vegetation Removed and/or Fragmented	Road Crossing	Road Encroachment	Dispersed Recreation Impact	On-Channel Waterbodies	Ag Impacts	Out Buildings	Utility Corridor	Burn Evidence	Beetle Kill Evidence	Instream Habitat Structure	Mining	Other	Comment
156	Elk Creek	1			0 - 10	Yes												Two track road crossing, ag fields on either side of creek
157	Elk Creek	1			81 - 100								Yes					Fire burned through this area, start of downed trees and limited vegetation herbaceous vegetation.
158	Elk Creek	1	Yes		10 - 49								Yes					Likely herbaceous vegetation regrowth is present along riparian zone
159	Elk Creek	1	Yes		10 - 49		Yes						Yes					Road encroachment for 0.04 miles upstream of point on north side of creek. Likely herbaceous veg in riparian area only
160	Elk Creek	1	Yes		10 - 49		Yes						Yes	Yes				Difficult to see the creek through the trees, trees are burned and riparian is likely impacted for approximately 0.6 miles upstream of point.
161	Elk Creek	1	Yes		50 - 80		Yes						Yes					Road encroachment erosion, burned area, limited herbaceous growth.
162	Goose Creek	1			0 - 10		Yes	Yes										0.04 miles upstream is the impact. Road/trail impact and parking area
163	Goose Creek	1			0 - 10													Upland trail
164	Goose Creek	1			0 - 10					Yes								Ag and livestock impact on west side of river for about 0.35 miles
165	Goose Creek	1			10 - 49					Yes								Ag impact (grazing) for about 0.06 miles upstream. access road runs near the creek to the west and trail to the east
166	Goose Creek	1			0 - 10					Yes	Yes							Ag impact, irrigation diversion and outbuildings west of the creek.
167	Goose Creek	1			10 - 49		Yes	Yes		Yes								Ag impact, several river diversion structures for about 0.5 miles upstream, road encroachment, and disperse recreation on east side and
168	Goose Creek	1			10 - 49		Yes										Yes	Residential impact (backyards) for about 0.04 miles downstream and upstream. Road encroachment on east side of creek (noted dead riparian shrubs/trees)
169	Goose Creek	1			10 - 49		Yes	Yes									Yes	Upland erosion (landslide), road encroachment and dispersed recreation on east side of creek
170	Goose Creek	1			0 - 10	Yes												Bridge crossing
171	Goose Creek	1			50 - 80						Yes					Yes	Yes	Upland disturbance (no vegetation cover) may be due to mining east of the river, about 0.01 miles downstream and 0.02 miles upstream
172	Goose Creek	1			10 - 49					Yes								Irrigation impacts for 0.03 miles upstream of point
173	Goose Creek	1			10 - 49		Yes											Road on edge of creek on east side
174	Goose Creek	1			10 - 49					Yes								Livestock grazing on both sides of creek for approximately 0.5 miles
175	Goose Creek	1			0 - 10		Yes		Yes	Yes								On channel waterbody and road encroachment
176	Goose Creek	1			10 - 49					Yes								Livestock trails for about 0.07 miles upstream with limited vegetation present.
177	Goose Creek	1			0 - 10					Yes								Livestock trails for about 0.05 miles upstream
178	Goose Creek	1			10 - 49					Yes								Ag impact for about 0.1 miles upstream
179	Goose Creek	1			10 - 49					Yes								Stock pond on west side of creek and some riparian disturbance on west side for about 0.08 miles
180	Goose Creek	1			10 - 49					Yes								Grazing impacts on west and east side of creek for about 0.5 miles in various degrees
181	Goose Creek	1			0 - 10	Yes												Road crossing (likely to have a bridge)
182	Goose Creek	1			10 - 49		Yes				Yes							Building by creek and adjacent road encroachment on creek
183	Goose Creek	1			0 - 10	Yes												Bridge crossing
184	Goose Creek	1			0 - 10					Yes	Yes							Pump house and outfall
185	Goose Creek	1			50 - 80			Yes										Dispersed rec impact, waterfall
186	Goose Creek	1			50 - 80												Yes	Dam
187	Goose Creek	1			50 - 80		Yes	Yes	Yes									Recreation area and roads on the N side of the reservoir, 2 large open space sections on the south side of reservoir
188	Goose Creek	1			81 - 100		Yes	Yes										Road encroachment and recreation impact
189	Goose Creek	1			50 - 80	Yes												Bridge crossing
190	Goose Creek	1			10 - 49									Yes				Beetle kill evidence
191	Goose Creek	1			10 - 49									Yes				Beetle kill evidence on south/east side of river of various intensity for about 0.4 miles upstream and 0.25 miles downstream
192	Goose Creek	1			10 - 49									Yes				Continued beetle kill evidence and on the uplands looks severe
193	Goose Creek	1			0 - 10									Yes				End of beetle kill evidence around creek
194	Goose Creek	1			10 - 49								Yes					Evidence of burned trees and limited veg cover in the riparian zone upstream 0.75 miles
195	Goose Creek	1			10 - 49								Yes					Evidence of burned trees and limited veg cover in the riparian zone
196	Goose Creek	1			10 - 49		Yes											Trail impacts to north side of creek
197	Goose Creek	1			10 - 49												Yes	Upland erosion into creek, impact is 0.1 miles
198	Goose Creek	1			10 - 49								Yes					Fire impact
199	Goose Creek	1			10 - 49								Yes					Fire impact on riparian zone
200	Goose Creek	1			10 - 49								Yes					Fire impact on riparian zone, strong burn evidence in the uplands (the next 0.2 miles the riparian looks good, however there was a large rock outcrop on the uplands.
201	Goose Creek	1			10 - 49								Yes					Fire impact on riparian zone for about 0.85 miles upstream
202	Goose Creek	1			10 - 49								Yes					Fire impact on riparian zone
203	Goose Creek	1			10 - 49								Yes					Fire impact on riparian zone
204	Goose Creek	1			50 - 80								Yes				Yes	Upland erosion into creek and fire impact on riparian zone
205	Goose Creek	1			10 - 49			Yes					Yes					Dispersed recreation and fire impact on riparian zone
206	Goose Creek	1			50 - 80								Yes				Yes	Upland erosion into riparian zone and burn evidence
207	Goose Creek	1			10 - 49								Yes					Burn evidence for about 0.1 miles upstream
208	South Fork of Rio Grande	1			0 - 10	Yes												Railroad bridge
209	South Fork of Rio Grande	1			10 - 49	Yes												Highway crossing and road encroachment
210	South Fork of Rio Grande	1			0 - 10						Yes							Outbuilding (house) on NW side of river
211	South Fork of Rio Grande	1			0 - 10						Yes							Backyard of house and outbuilding disturbance for about 1.5 miles upstream
212	South Fork of Rio Grande	1			10 - 49			Yes										Dispersed recreation on east side of river
213	South Fork of Rio Grande	1			50 - 80	Yes												Bridge crossing
214	South Fork of Rio Grande	1			50 - 80													Road encroachment on NW side of river for about 0.1 mi upstream
215	South Fork of Rio Grande	1			10 - 49													Bridge crossing
216	South Fork of Rio Grande	1			0 - 10			Yes										Recreation and trails on west side of river
217	South Fork of Rio Grande	1			10 - 49		Yes			Yes	Yes							Ag impacts, outbuildings (houses by river) on east side of river and road encroachment and ag impacts on west side for about 1 mi upstream
218	South Fork of Rio Grande	1			10 - 49		Yes											Road encroachment for about 0.2 miles upstream
219	South Fork of Rio Grande	1			10 - 49			Yes										Appears to be a boat ramp and camp ground on north side of river and dispersed hiking for 0.25 miles upstream
220	South Fork of Rio Grande	1			10 - 49			Yes										Dispersed recreation on east side of river for about 150' upstream
221	South Fork of Rio Grande	1			50 - 80		Yes	Yes			Yes							Water treatment site, a mobile home park, and camping on north side of river for about 1mi as well as road encroachment
222	South Fork of Rio Grande	1			50 - 80	Yes												Bridge crossing
223	South Fork of Rio Grande	1			10 - 49			Yes			Yes							Campgrounds on south side of river for about 0.75 miles

Object ID	Name	Stream Order	Within Fire Boundary	Within Insect Boundary	Vegetation Removed and/or Fragmented	Road Crossing	Road Encroachment	Dispersed Recreation Impact	On-Channel Waterbodies	Ag Impacts	Out Buildings	Utility Corridor	Burn Evidence	Beetle Kill Evidence	Instream Habitat Structure	Mining	Other	Comment
224	South Fork of Rio Grande	1			10 - 49		Yes											Bridge crossing
225	South Fork of Rio Grande	1			10 - 49	Yes												Bridge crossing
226	South Fork of Rio Grande	1			10 - 49	Yes												Bridge crossing
227	South Fork of Rio Grande	1			10 - 49	Yes												Bridge crossing
228	South Fork of Rio Grande	1			0 - 10	Yes												Bridge crossing
229	South Fork of Rio Grande	1			10 - 49		Yes											Road encroachment from highway to north and dirt road on south side of river for about 0.2 mi
230	South Fork of Rio Grande	1			10 - 49		Yes											Road encroachment from highway
231	South Fork of Rio Grande	1			10 - 49	Yes	Yes	Yes										Bridge crossing and dispersed rec on south side of river downstream for about 0.1 miles and dis rec and road encroachment upstream for about 0.1 mi
232	South Fork of Rio Grande	1			10 - 49										Yes			8 instream habitat structures upstream from point
233	South Fork of Rio Grande	1			0 - 10			Yes										Campground on west side of river for 0.25 miles upstream
234	South Fork of Rio Grande	1			10 - 49		Yes											Road encroachment for 0.1 mi
235	South Fork of Rio Grande	1			0 - 10	Yes												Bridge crossing
236	South Fork of Rio Grande	1			10 - 49		Yes											Road encroachment for 0.25 mi
237	South Fork of Rio Grande	1			0 - 10						Yes							Out buildings
238	South Fork of Rio Grande	1			0 - 10	Yes												Bridge and ag/residential impact on west side, however there is a fence protecting some of the riparian area
239	South Fork of Rio Grande	1			10 - 49			Yes		Yes	Yes							Ag and residential impact on west/north side of river for about 0.6 miles
240	South Fork of Rio Grande	1			0 - 10	Yes					Yes							Bridge crossing and residential on both sides of river
241	South Fork of Rio Grande	1			0 - 10	Yes												A couple of water bodies north of the river for about 0.1 miles
242	South Fork of Rio Grande	1			10 - 49				Yes									Bridge crossing
243	South Fork of Rio Grande	1			10 - 49		Yes											Road encroachments for about 0.3 miles upstream
244	South Fork of Rio Grande	1			10 - 49		Yes											Road encroachment for about 1.2 miles upstream by highway
245	South Fork of Rio Grande	1			50 - 80	Yes												Road crossing of highway
246	South Fork of Rio Grande	1			50 - 80	Yes	Yes											Road crossing and road encroachment/recreation for about 0.15 miles
247	South Fork of Rio Grande	1			50 - 80	Yes	Yes											Road crossing and road encroachment
248	South Fork of Rio Grande	1			81 - 100		Yes	Yes	Yes									Dispersed recreation, road encroachment, and instream water body
249	South Fork of Rio Grande	1			0 - 10		Yes							Yes				Road encroachment and beetle kill evidence from reservoir to beyond this point upstream
250	South Fork of Rio Grande	1			10 - 49									Yes			Yes	Floodplain and beetle kill for about 0.25 miles
251	Trout Creek	2			50 - 80	Yes												Bridge, two track road
252	Trout Creek	2			50 - 80		Yes									Yes		Gravel mining and adjacent disturbance
253	Trout Creek	2			10 - 49	Yes												Bridge
254	Trout Creek	2			10 - 49	Yes												Bridge
255	Trout Creek	2			10 - 49					Yes								Ag impacts and dispersed outbuildings for about 0.15 miles
256	Trout Creek	2			0 - 10	Yes												Ag bridge
257	Trout Creek	2			0 - 10	Yes												Ag bridge
258	Trout Creek	2			10 - 49	Yes												Bridge with road encroachment
259	Trout Creek	2			10 - 49	Yes	Yes	Yes										Bridge and some road encroachment upstream on the north side of creek. Rec impact on N side of creek for about 0.2 miles
260	Trout Creek	2			0 - 10									Yes				Some beetle kill evidence on various sections of riparian area
261	Lake Creek	2		Yes	81 - 100	Yes	Yes											Highway crossing and road encroachment ROW for 0.03 miles to the west.
262	Lake Creek	2		Yes	0 - 10			Yes										Trail running on north side of river
263	Lake Creek	2		Yes	0 - 10									Yes			Yes	Downed tree in river and another one about 85' downstream. Beetle kill evidence in uplands
264	Lake Creek	2		Yes	0 - 10			Yes						Yes				Dispersed recreation with trail along the north side of creek
265	Lake Creek	2	Yes	Yes	10 - 49	Yes		Yes						Yes				Ped bridge crossing, but trail maintains on N side of creek as well. Some beetle kill evidence on uplands but riparian looks good
266	Lake Creek	2	Yes	Yes	0 - 10			Yes					Yes	Yes				Burn evidence and fallen trees in riparian area for about 0.25 miles, path still on N side of creek
267	Lake Creek	2	Yes	Yes	10 - 49			Yes					Yes	Yes			Yes	Erosion from wash on west side of creek, fallen trees, burn evidence, and dis. rec. trail on east side of creek
268	Lake Creek	2	Yes		10 - 49								Yes					Erosion from wash on west side of creek, fallen trees, burn evidence, and dis. rec. trail on east side of creek
269	Lake Creek	2	Yes		0 - 10								Yes					End of lots of downed trees in riparian zone, however the burn is still evident in the uplands
270	Lake Creek	2	Yes		10 - 49								Yes					Fallen trees, burn evidence
271	Lake Creek	2	Yes		0 - 10								Yes					Burn evidence is not as severe
272	Lake Creek	2	Yes		0 - 10			Yes		Yes			Yes					Either a ped trail or livestock trail on north side of creek, some burn evidence in uplands and near the creek
273	Lake Creek	2	Yes		10 - 49								Yes					Burn evidence on south side of creek in the riparian zone for about 0.2 miles
274	Lake Creek	2	Yes		10 - 49								Yes					Burn evidence in riparian zone, between this and the other point has 0-10% of riparian dist.
275	Lake Creek	2	Yes	Yes	10 - 49								Yes	Yes				Burn evidence in riparian zone and downed trees for about 0.25 miles
276	Lake Creek	2	Yes	Yes	0 - 10					Yes			Yes	Yes				Livestock trails
277	Lake Creek	2	Yes	Yes	0 - 10	Yes							No					Road crossing and about 0/3 miles upstream and 0.2 miles downstream as the crow flies has no riparian impact
278	Lake Creek Trib	2	Yes	Yes	50 - 80								Yes	Yes				Burn / beetle kill evidence from this point to where the stream ends. Also this looks to be a tributary of Lake Creek and not the main stem.
279	Lake Creek Trib	2	Yes	Yes	50 - 80			Yes					Yes	Yes				Burn / beetle kill evidence, low veg cover in riparian area, near an road for rec access
280	Lake Creek Trib	2	Yes	Yes	0 - 10								Yes	Yes				Opens to a large meadow with limited burn and beetle kill evidence for about 0.15 miles
281	Lake Creek Trib	2	Yes	Yes	50 - 80								Yes	Yes				Burn / beetle kill evidence from this point to where the stream ends
282	Lake Creek Trib	2	Yes		10 - 49	Yes							Yes	Yes				Burn / beetle kill evidence from this point to where the stream ends, road crossing for about 0.05 miles on either side is not as heavily burned
283	Lake Creek	2		Yes	10 - 49									Yes				Beetle kill evidence less severe till end of river
284	Kitty Creek	3		Yes	0 - 10			Yes		Yes								Dispersed recreation and livestock grazing. Road/trail runs on south side of creek about 70' S
285	Hope Creek	2	Yes	Yes	10 - 49								Yes	Yes				This point is the start of downed trees and evidence of fire with impact to riparian area. The extent is nearly to the end of the creek.
286	Hope Creek	2		Yes	0 - 10									Yes				From previous point to the next one there was some beetle kill evidence
287	Kitty Creek	3	Yes		0 - 10		Yes											Road encroachment from turnaround
288	Kitty Creek	3	Yes		10 - 49	Yes	Yes	Yes	Yes									Dis. rec., road crossing, boat ramps, instream water body with recreation

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289	Kitty Creek	3	Yes		10 - 49								Yes					Downed trees and fire evidence from the start of the creek downstream for the entire length of the stream. there appears to be herbaceous vegetation in the riparian zone, the fire was from 2013
290	Kitty Creek	3	Yes	Yes	50 - 80	Yes		Yes					Yes					Road crossing, dis. rec., and fire impacts. the entire area is 50-80%, while there is still herbaceous veg in the riparian area, there is a lack of shrubs and the uplands have fire scarring
291	Kitty Creek	3	Yes	Yes	10 - 49								Yes					Large riparian meadow area that was likely burned but is green in the photo. length along creek is ~.15 mi downstream
292	Kitty Creek	3	Yes	Yes	10 - 49								Yes					Another large riparian meadow area that extends 0.13 mi downstream as the crow flies. burn evidence on either side of rip zone
293	Kitty Creek	3	Yes	Yes	81 - 100	Yes		Yes					Yes	Yes				Missing culvert in road, disturbance around road crossing (81-100%) and the remaining channel still at 10-49%, potential of rec impacts
294	Kitty Creek	3	Yes	Yes	50 - 80			Yes					Yes	Yes				Dis. rec. with trail north of creek, heavy fire evidence
295	Kitty Creek	3	Yes	Yes	50 - 80		Yes						Yes	Yes				Landslide area north of creek for about 133 ft, heavy fire evidence
296	Kitty Creek	3	Yes	Yes	0 - 10									Yes				Area not burned and stream is under tree cover
297	Kitty Creek	3	Yes		50 - 80	Yes	Yes						Yes					Road impact for 120' downstream , minimal fire impact
298	Kitty Creek	3	Yes		10 - 49								Yes					Fire impact at 10-49%, stream channel narrow.
299	Hope Creek	2	Yes	Yes	50 - 80	Yes	Yes	Yes					Yes	Yes				Road crossing (80-100%) trail N of stream, upstream of road into fire boundary the riparian impact in 50-80%, while there appears to be herb veg, there is no woody veg and no woody veg in the uplands
300	Hope Creek	2	Yes	Yes	50 - 80			Yes					Yes	Yes				Erosion from fire in the uplands down to riparian area for about 45 feet. Trail is still on N side of creek
301	Hope Creek	2	Yes	Yes	81 - 100			Yes					Yes	Yes			Yes	Upland erosion from lack of veg on upland hillslope into riparian area. Heavy sediment deposition for about 100' downstream of gully. Trail to N of river.
302	Hope Creek	2	Yes	Yes	10 - 49			Yes					Yes	Yes				Brief lower impact from fire at 10-49% for about 165', with remaining channel at 50-80% impact.
303	Hope Creek	2	Yes	Yes	10 - 49			Yes					Yes	Yes				Some shrubs appear to still be intact. wetland/rip area extends about 3.3 acres N of creek. area of impact extends 0.15 mi upstream of point
304	Hope Creek	2	Yes	Yes	50 - 80			Yes					Yes	Yes				Better riparian habitat for 0.5 miles upstream. Trail still to the N of creek
305	Hope Creek	2	Yes	Yes	50 - 80			Yes					Yes	Yes			Yes	Upland erosion (gully) into creek; dis rec with trail N of creek.
306	Hope Creek	2	Yes	Yes	10 - 49			Yes					Yes	Yes				Less fire damage upstream with wetlands extending on either side of the creek N or S.
307	Hope Creek	2	Yes	Yes	10 - 49								Yes	Yes				End dis. rec., fire impact still present
308	Pass Creek	2			10 - 49			Yes										Parking area to the east and a trail to the river
309	Pass Creek	2			50 - 80		Yes											Road encroachment on east side of creek for about 0.6 miles upstream
310	Pass Creek	2			0 - 10									Yes				Some beetle kill evidence present along east side of creek for 0.17 miles
311	Pass Creek	2			81 - 100	Yes												Highway 160 over creek
312	Pass Creek	2			0 - 10		Yes	Yes										Dispersed rec and road encroachment from hwy390
313	Pass Creek	2			10 - 49													Dispersed rec on east side of river with 2 track roads present and camping for 0.15 miles upstream
314	Pass Creek Lake	2			50 - 80			Yes						Yes				Pass Creek Lake- may have a PEM fringe but west side looks like dis. recreation. Beetle kill evidence in uplands
315	Pass Creek	2			50 - 80									Yes			Yes	Natural area of no riparian veg on west side of creek for 0.04 miles
316	Pass Creek	2			50 - 80			Yes										1 acre of erosive soils and dis. rec on east side of creek
317	Pass Creek	2			50 - 80		Yes	Yes						Yes				Dis. rec, beetle kill, and road encroachment on hillside to the west of creek for 0.15 miles upstream
318	Pass Creek	2			10 - 49			Yes						Yes				Dis. rec. camping
319	Pass Creel	2		Yes	50 - 80			Yes						Yes				Dis rec. camping and erosion from cleared trees from beetle kill impact
320	Pass Creek	2		Yes	10 - 49			Yes						Yes				Trail to the N and E of creek and natural erosion into riparian area has less riparian growth on N and E side of creek for ~0.25 miles
321	Pass Creek- off channel res	2		Yes	0 - 10			Yes										Off channel reservoir E of creek has dis. rec/camping and road impacts. May have some effect on rip in creek
322	Pass Creek	2		Yes	10 - 49			Yes						Yes				Dis rec, camping and hiking on E side of creek for ~0.05 miles
323	Pass Creek	2		Yes	10 - 49	Yes		Yes						Yes				Road crossing and in a grazing allotment, beetle kill evidence on upland areas (good spot to verify riparian)
324	Pass Creek	2		Yes	0 - 10					Yes				Yes				Beetle kill evidence. livestock trails present on E side of creek (active grazing lease)
325	Pass Creek	2			10 - 49			Yes		Yes				Yes				Dis. rec. camping and may have impacts to large open meadow with meandering creek. Grazing impacts to meadow
326	Pass Creek	2			50 - 80	Yes								Yes				Road crossing
327	Pass Creek	2			10 - 49			Yes		Yes				Yes				Livestock trails on west side of creek and road/two tracks on west/east side of creek for about 0.25miles, some beetle kill evidence
328	Pass Creek	2			0 - 10			Yes						Yes				Camping in upland areas
329	Pass Creek	2			10 - 49		Yes	Yes						Yes				Road erosion from the N, dis. rec., and beetle kill in uplands for about 0.1 miles upstream
330	Pass Creek	2			50 - 80									Yes			Yes	Upland landslide that has been present since 1998
331	Pass Creek	2			0 - 10			Yes						Yes				Dis rec and beetle kill evidence (lots of downed trees). Access road to the NE of creek and has been following the creek
332	Pass Creek	2			0 - 10					Yes				Yes				Hiking and livestock trails in area for about 0.1 miles downstream and 0.05 miles upstream, beetle kill evidence
333	Park Creek	2			0 - 10		Yes											Road encroachment
334	Park Creek	2			10 - 49		Yes											Road encroachment for 0.03 miles upstream on the east side of creek.
335	Park Creek	2			50 - 80	Yes	Yes							Yes				Bridge crossing, beetle kill on uplands, road encroachment on west side of creek for about 0.2 miles
336	Park Creek	2			10 - 49		Yes											Road encroachment on west side of creek for about 0.1 miles
337	Park Creek	2			10 - 49		Yes											Road encroachment on west side of creek for about 0.1 miles
338	Park Creek	2			10 - 49		Yes											Road encroachment on west side of creek for about 0.1 miles
339	Park Creek	2			10 - 49			Yes										Dis. rec. impact - parking for 0.12 acres on west bank
340	Park Creek	2			10 - 49			Yes										Dis. rec. impact -camping for 0.3 acres on west bank
341	Park Creek	2			50 - 80			Yes										Dis. rec. impact - camping for 0.8 acres on west bank
342	Park Creek	2			10 - 49	Yes												Road crossing
343	Park Creek	2			10 - 49		Yes	Yes										Dis. rec. impact- parking/hiking
344	Park Creek	2			50 - 80	Yes												Bridge crossing
345	Park Creek	2			10 - 49			Yes		Yes								Dis. rec. impact- camping, on NE side of creek and livestock grazing on either side of creek for about 0.7 miles
346	Park Creek	2			0 - 10						Yes							Outbuildings

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347	Park Creek	2		Yes	10 - 49			Yes		Yes								Two track near creek on east side and camping along creek for about 0.3 miles
348	Park Creek	2		Yes	0 - 10									Yes				Beetle kill evidence in riparian area
349	Park Creek	2		Yes	0 - 10									Yes			Yes	Beetle kill evidence and off channel pond on east side of creek
350	Park Creek	2		Yes	10 - 49			Yes										Dis. rec. impact- camping on E side of creek for 0.2 miles. in open valley
351	Park Creek	2		Yes	0 - 10									Yes				Beetle kill evidence present upstream from here
352	Park Creek	2			10 - 49			Yes		Yes				Yes				Dis. rec. impact, open valley with roads on both sides. livestock grazing as well, impact of 10-49% for about 1.2 miles
353	Park Creek	2			10 - 49	Yes								Yes				Road crossing through river, no bridge
354	Park Creek	2			10 - 49			Yes						Yes				Camping
355	Park Creek	2			10 - 49			Yes			Yes			Yes				Outbuilding or camping
356	Park Creek	2			10 - 49												Yes	Natural landslide that has been present for many years
357	Park Creek	2			50 - 80					Yes				Yes				Ag impacts livestock trails near creek and crosses creek at point
358	Park Creek	2		Yes	10 - 49									Yes				Landslide present since 2011
359	Park Creek	2		Yes	10 - 49									Yes				Heavy beetle kill area even on trees near or in riparian area
360	Park Creek	2		Yes	10 - 49	Yes		Yes						Yes				Road crossing fjord (no bridge), camping near the river, and beetle kill evidence. camping for about 0.1miles upstream
361	Park Creek	2		Yes	10 - 49									Yes			Yes	Sparse vegetation on old landslide (pre 1998) for 0.1 miles on west side of creek
362	Park Creek	2			10 - 49	Yes		Yes		Yes				Yes				Dis. rec. hiking and livestock trails about 0.25 miles downstream and 0.1 miles upstream from ford road crossing (no bridge)
363	Park Creek	2		Yes	50 - 80			Yes						Yes				Dis rec trails on west side of creek leading to erosion in rip area for about 0.25 miles upstream
364	Park Creek	2			0 - 10					Yes				Yes				Livestock grazing trails present in the valley for 0.7 miles upstream as the crow flies
365	Park Creek	2			50 - 80	Yes		Yes										Bridge road crossing, dis. rec. about 0.02 miles upstream
366	Park Creek	2			0 - 10					Yes								Cattle grazing in the valley with most impacts of 0-10% and some areas appear more heavily grazed and are at 10-49%.
367	Park Creek	2		Yes	81 - 100	Yes								Yes				Bridge crossing and beetle kill evidence
368	Beaver Creek	2			0 - 10			Yes										Dis. rec.- lots of two tracks trails on uplands around creek
369	Beaver Creek	2			10 - 49			Yes										Dis. rec- road near creek, two track trails, camping for about 0.15miles upstream
370	Beaver Creek	2			50 - 80	Yes												Road crossing- bridge
371	Beaver Creek	2			0 - 10			Yes			Yes							Resort near the creek with several outbuildings and dis. rec. impact on both sides of creek (resort and camping) for 0.06 mi downstream and 0.25 miles upstream
372	Beaver Creek	2			10 - 49			Yes										Road encroachment on east side of creek for 0.05 mi upstream
373	Beaver Creek	2			0 - 10			Yes										Dis. rec- camp grounds on east side of creek for about 0.25 miles
374	Beaver Creek	2			0 - 10			Yes										Dis. rec- upland trail on east side
375	Beaver Creek	2			10 - 49		Yes											Road encroachment on N side for 0.05 miles upstream
376	Beaver Creek	2			50 - 80		Yes											Road encroachment on N side for 0.1 miles upstream
377	Beaver Creek	2			81 - 100				Yes								Yes	Dam in creek with 100% disturbance for about 0.07 miles upstream to reservoir
378	Beaver Creek	2			81 - 100			Yes	Yes									Dis. rec around Beaver Creek Reservoir, reservoir was low in 2017 photo
379	Beaver Creek	2			50 - 80			Yes									Yes	Dis. rec. and floodplain. limited veg cover as Beaver Creek enters the reservoir for about 0.7 miles upstream
380	Beaver Creek	2			50 - 80			Yes										Boat ramp and parking area
381	Beaver Creek	2			10 - 49			Yes										Dis. rec- pedestrian bridge and hiking trails
382	Beaver Creek	2			10 - 49		Yes	Yes										Dis. rec.- two track trail and road impact to riparian
383	Beaver Creek	2			0 - 10			Yes										Dis. rec. trails into rip area
384	Beaver Creek	2			10 - 49			Yes										Dis. rec. trails into rip area
385	Beaver Creek	2			10 - 49			Yes										Dis. rec. trails into rip area
386	Beaver Creek	2			50 - 80			Yes		Yes								Dis. rec. trails into rip area, appears to be an ag field and ditches running on east side of creek for about 0.3 miles
387	Beaver Creek	2			10 - 49					Yes	Yes							Outbuildings- farmers house and pump house
388	Beaver Creek	2			0 - 10					Yes								In-stream structures- may be diversion structures for ag
389	Beaver Creek	2			50 - 80					Yes								Two track trail running on east side of creek from ag field to house and past house to pond along creek for 0.3 mi
390	Beaver Creek	2			0 - 10													Off channel pond and pump house, appears to pipe water from creek about 0.04 mi away
391	Beaver Creek Trib	2			50 - 80													Ag fields on either side of tributary to Beave Creek for about 0.25 miles
392	Beaver Creek	2			0 - 10									Yes				Begin beetle kill evidence upstream
393	Beaver Creek	2			0 - 10									Yes			Yes	Natural landslide since 1998, does not appear to have grown much
394	Beaver Creek	2			0 - 10			Yes										Dis. rec.- camping
395	Beaver Creek	2			10 - 49					Yes								Livestock trails present in upland and around riparian area for about 0.5 miles upstream
396	Beaver Creek	2			81 - 100	Yes												Bridge crossing
397	Beaver Creek	2			0 - 10			Yes										Dis. rec. impact of hiking trail along the creek for about 0.25 miles upstream, beetle kill evidence present
398	Beaver Creek	2			81 - 100	Yes	Yes											Road crossing and parking area impact on S side
399	Beaver Creek	2		Yes	10 - 49					Yes				Yes				Livestock grazing in the valley and high beetle kill evidence on uplands
400	Beaver Creek	2		Yes	0 - 10			Yes										Two track trail parallels the creek
401	Beaver Creek	2		Yes	10 - 49									Yes				High beetle kill evidence for 0.2 miles upstream
402	Beaver Creek	2		Yes	81 - 100	Yes	Yes							Yes				Road crossing and road encroachment. Appears to have a culvert under the road.
403	Beaver Creek	2		Yes	50 - 80									Yes				High beetle kill evidence for 0.2 miles upstream
404	Beaver Creek	2		Yes	10 - 49									Yes				High beetle kill evidence for 0.1 miles upstream
405	Beaver Creek	2		Yes	0 - 10									Yes				Rock outcrop, minimal veg cover
406	Beaver Creek	2		Yes	0 - 10					Yes				Yes				Pond, livestock trails present near creek
407	Beaver Creek	2		Yes	0 - 10					Yes				Yes				3 ponds near road, appear to be connected to the creek; livestock trails in area.
408	Beaver Creek	2		Yes	0 - 10									Yes				Road crossing and several roads in the area
409	Beaver Creek	2		Yes	0 - 10			Yes		Yes				Yes				Livestock or hiking trail near the upper portion of the valley. the valley had great riparian veg present
410	Beaver Creek	2		Yes	0 - 10		Yes	Yes						Yes				Road encroachment, 4-wheel drive access road
411	Beaver Creek	2		Yes	0 - 10			Yes		Yes								Livestock grazing or hiking trail in valley for about 0.15 miles, beetle kill evidence on uplands
412	East Trout Creek	2	Yes	Yes	0 - 10			Yes						Yes				Dis. rec. impact and beetle kill evidence. road runs along stream downstream of this point for 0.2 miles
413	East Trout Creek	2	Yes	Yes	81 - 100								Yes					Landslide into creek from upland fire erosion
414	East Trout Creek	2		Yes	50 - 80								Yes	Yes				End fire boundary with high riparian impacts, opens to valley
415	East Trout Creek	2		Yes	10 - 49									Yes				Begin beetle kill evidence along creek with many fallen trees
416	Middle Creek	1			81 - 100							Yes						Looks like a utility disturbance from the reservoir to the road
417	Fern Creek	1	Yes	Yes	81 - 100													

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418	Trout Creek	2	Yes		10 - 49								Yes					
419	West Lost Trail Creek	1		Yes	0 - 10									Yes			Yes	Multiple roads paralleling main road in upland area
420	West Lost Trail Creek	1		Yes	0 - 10			Yes						Yes				Pull-out/camping in adjacent upland area
421	West Lost Trail Creek	1		Yes	0 - 10									Yes				Downed tree in channel from beetle kill from 2013
422	West Lost Trail Creek	1		Yes	10 - 49			Yes						Yes				Pull-out/camping in adjacent upland area
423	West Lost Trail Creek	1		Yes	0 - 10			Yes		Yes				Yes				Livestock trails in adjacent upland area; may be some dispersed camping
424	West Lost Creek Trail	1		Yes	50 - 80									Yes			Yes	Lots of downed dead trees in riparian area for approx 200 ft
425	West Lost Trail Creek	1		Yes	81 - 100								Yes				Yes	Channel within avalanche path/debris field for approx .5 mile from this point upstream; channel goes under debris-no clear open channel, ponds\pools; no riparian veg
426	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Several livestock trails along SW riparian and upland areas-approx 6 acre area
427	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas-approx 1.6 acres
428	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails
429	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails from this point upstream approx 1500 ft in riparian and upland areas
430	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
431	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes			Yes	Livestock trails in riparian and upland areas
432	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
433	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
434	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian area
435	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian area
436	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
437	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian area
438	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in upland area
439	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian area
440	West Lost Trial Creek	1		Yes	0 - 10					Yes				Yes			Yes	Livestock trail crossing the creek
441	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
442	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
443	West Lost Trail Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
444	North Clear Creek	2		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
445	North Clear Creek	2		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
446	North Clear Creek	2		Yes	0 - 10					Yes				Yes				Livestock trails in riparian area along channel
447	North Clear Creek	2		Yes	0 - 10					Yes				Yes				Livestock trails in riparian area along channel
448	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Road has multiple tracks in riparian area; two-tracker and single tracks; livestock trails?
449	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Road splits and goes to upland area in multiple tracks as well as in riparian area; two-tracker and single tracks; livestock trails?
450	North Clear Creek	2		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
451	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Multiple 4-wheel drive roads in upland area; single track; livestock trails?
452	North Clear Creek	2		Yes	0 - 10	Yes								Yes				Ford crossing NE across trib; multiple tracks
453	North Clear Creek	2		Yes	0 - 10	Yes								Yes				Ford crossing across NW trib; multiple tracks
454	North Clear Creek	2		Yes	0 - 10			Yes						Yes				Road splits, multiple two tracker and single tracks in upland area along north side for approx 1-mile east upstream
455	North Clear Creek	2		Yes	0 - 10					Yes				Yes				Livestock trails in riparian area
456	North Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				Ford/trail crossing
457	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Two-tracker and single track trails in riparian area; livestock trails?
458	North Clear Creek	2		Yes	0 - 10	Yes		Yes		Yes				Yes				Ford/trail crossing; livestock trail?
459	North Clear Creek	2		Yes	0 - 10	Yes		Yes		Yes				Yes				Ford/trail crossing; livestock trail?
460	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple two-tracker and single track trails in riparian and upland areas
461	North Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				Ford/trail crossing
462	North Clear Creek	2		Yes	0 - 10			Yes						Yes				Multiple roads and trails in upland and riparian area to access channel
463	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple roads and trails in riparian and upland areas to access creek; livestock trails?
464	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Trails along north west channel; livestock trails?
465	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple two-track and single tracks in upland area
466	North Clear Creek	2		Yes	0 - 10	Yes								Yes				
467	North Clear Creek	2		Yes	10 - 49			Yes						Yes				Multiple roads; pull-out/camping
468	North Clear Creek	2		Yes	0 - 10	Yes		Yes		Yes				Yes				Ford crossing at SW trib; road splits on SW side; multiple trails-two-track and single track; livestock trails?
469	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple two-track and single track trails in upland areas
470	North Clear Creek	2		Yes	0 - 10					Yes				Yes				Livestock trails in upland area
471	North Clear Creek	2		Yes	0 - 10			Yes						Yes				Numerous two-track and single track trails and roads in upland area off main road to access channel - upstream and downstream of point; upstream all the way to development-4800ft
472	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple two-track and single track trails in upland area; livestock?
473	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple two-track and single track trails and roads in upland area to access creek
474	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Trail crossing; livestock?
475	North Clear Creek	2		Yes	10 - 49		Yes	Yes						Yes				Road in riparian area to access creek
476	North Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				
477	North Clear Creek	2		Yes	0 - 10		Yes	Yes	Yes		Yes			Yes			Yes	Dispersed out-buildings in upland and riparian areas surrounding lake
478	North Clear Creek	2		Yes	0 - 10		Yes	Yes	Yes		Yes			Yes			Yes	Dispersed out-buildings in upland and riparian areas surrounding lake
479	North Clear Creek	2		Yes	10 - 49		Yes	Yes			Yes			Yes			Yes	Dispersed out-buildings for approx 1.8 miles upstream of point along SW side of creek in upland and riparian areas
480	North Clear Creek	2		Yes	0 - 10		Yes	Yes	Yes		Yes			Yes			Yes	Dispersed out-buildings surrounding lake
481	North Clear Creek	2		Yes	10 - 49	Yes	Yes	Yes	Yes					Yes			Yes	Pearl Lakes; road surrounds lake; dispersed camping/vehicle pull-outs; road crossing at two point at upstream point of lake
482	North Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				
483	North Clear Creek	2		Yes	0 - 10	Yes	Yes	Yes	Yes					Yes			Yes	SW section of Castle Rock Lake; road crossing on west side; roads and trails surround lake to access in riparian and upland areas
484	North Clear Creek	2		Yes	10 - 49	Yes	Yes	Yes	Yes					Yes			Yes	Castle Rock Lake; roads and trails surround lake and in riparian and upland areas; parking and pull-outs along all sides of lake
485	North Clear Creek	2		Yes	10 - 49	Yes	Yes	Yes	Yes					Yes			Yes	Road and trails surround lake in upland and riparian areas
486	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Trails in riparian area to access channel
487	North Clear Creek	2		Yes	10 - 49	Yes	Yes	Yes	Yes	Yes				Yes			Yes	Road and trails surround lake in upland and riparian areas; 2 gravel boat launch sites on SW bank; parking area approx .45 acres; rd encroachment on N and W bank; rd crossing at N end of lake
488	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Two-track and single track trails for next 1/4 mile upstream to access channel' livestock trails?

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489	North Clear Creek	2		Yes	0 - 10			Yes						Yes				Multiple roads run next to channel for next 1/4 mile in riparian and upland
490	North Clear Creek	2		Yes	0 - 10	Yes		Yes	Yes					Yes			Yes	Castle No. 4 Reservoir; several trails and roads surround lake; 1 boat launch site on NW bank; parking and pull-outs; road crossing at N end of lake
491	Squaw Creek	1		Yes	10 - 49			Yes			Yes			Yes			Yes	Thirty Mile Campground-approx 21 acres to the S & SW from point in upland and riparian areas; several pit toilets
492	Squaw Creek	1		Yes	10 - 49			Yes			Yes			Yes			Yes	Thirty Mile Resort; dispersed out-buildings approx 7.5 acres in upland and riparian areas
493	Squaw Creek	1		Yes	0 - 10	Yes								Yes				Bridge across creek to access out-building
494	Squaw Creek	1		Yes	0 - 10			Yes						Yes			Yes	Squaw Creek Trail access along west bank
495	Squaw Creek	1	Yes	Yes	81 - 100								Yes	Yes				Steep barren slope on east bank; on perimeter of Papoose Fire boundary
496	Squaw Creek	1		Yes	0 - 10	Yes		Yes						Yes			Yes	Bridge/trail crossing above creek
497	Squaw Creek	1		Yes	0 - 10									Yes			Yes	Trail runs along east bank in riparian area for approx .5 mile upstream
498	Squaw Creek	1		Yes	0 - 10				Yes					Yes				Ponds along both sides of creek for approx .45 miles upstream from point
499	Squaw Creek	1		Yes	0 - 10									Yes			Yes	Trail crossing on east upland trib
500	Squaw Creek	1		Yes	0 - 10				Yes					Yes				Dispersed ponds from this point upstream for approx .9 miles
501	Squaw Creek	1		Yes	0 - 10									Yes			Yes	Bridge/trail crossing; trail runs along both sides of creek in upland and riparian areas upstream from this point
502	Squaw Creek	1		Yes	0 - 10									Yes			Yes	Multiple trails in riparian area; could be from hiking trail navigating wetlands
503	Squaw Creek	1		Yes	0 - 10				Yes					Yes				Ponds in riparian area from this point upstream approx .17 miles
504	Squaw Creek	1		Yes	0 - 10			Yes						Yes			Yes	Multiple trails off main trail from upland area to channel
505	Squaw Creek	1		Yes	0 - 10									Yes			Yes	Trail crossing on east trib upland area
506	Squaw Creek	1		Yes	81 - 100									Yes		Yes		Could be a small mine prospecting site-approx .01 acres in upland; no vegetation
507	Squaw Creek	1		Yes	0 - 10				Yes					Yes				A series of lakes and ponds from this point upstream approx .6 miles
508	Squaw Creek	1		Yes	0 - 10									Yes			Yes	Trail crossing
509	Little Squaw Creek	1	Yes	Yes	10 - 49			Yes			Yes		Yes	Yes			Yes	Dispersed out-buildings-approx 25 acres-River Hill Resort?; impact from Papoose fire in riparian and upland areas
510	Little Squaw Creek	1	Yes	Yes	81 - 100								Yes	Yes				Evidence of veg loss in upland areas from fire; potential ground truth site
511	Little Squaw Creek	1	Yes	Yes	0 - 10	Yes		Yes					Yes	Yes			Yes	Bridge crossing to trail that runs the extent of creek on east bank upland areas
512	Little Squaw Creek	1	Yes	Yes	81 - 100								Yes	Yes			Yes	Natural land disturbance-rock slide encroachment in channel-steep barren slope on west side of channel; no veg
513	Little Squaw Creek	1	Yes	Yes	81 - 100								Yes	Yes			Yes	Mud slide on east bank from cliff above-approx 829 ft; debris encroachment in channel ; fan at base approx 35 ft wide- .02 surface acres- could be impact from Papoose fire
514	Little Squaw Creek	1	Yes	Yes	81 - 100								Yes	Yes			Yes	Land slide on east bank from cliff above-approx 895 ft; debris in upland area; fan at base of slide approx 80 ft wide - .02 surface acres- could be impact from Papoose fire
515	Little Squaw Creek	1	Yes	Yes	50 - 80								Yes	Yes			Yes	Approx .3 acre surface area on east bank riparian and upland area of minimal to no veg due to fire
516	Little Squaw Creek	1	Yes	Yes	50 - 80								Yes	Yes			Yes	Evidence of veg loss in upland area from fire; approx .4 miles upstream from this point on west side of channel
517	Little Squaw Creek	1			0 - 10				Yes								Yes	Series of ponds from this point upstream approx 1 mile to source; no visual impacts
518	Clear Creek	1			0 - 10			Yes			Yes						Yes	Dispersed out-buildings (housing development) on both sides of channel in upland areas for approx .7 miles upstream; trails along creek in riparian and upland areas for same length .7 miles
519	Clear Creek	1			0 - 10	Yes											Yes	Hwy bridge crossing
520	Clear Creek	1			0 - 10	Yes		Yes									Yes	Trail crossing; split trails on west bank creating 15 ft fan at top narrowing to 3 ft at bridge; 4 ft wide trail on east bank
521	Clear Creek	1			0 - 10												Yes	Numerous abandoned vehicles in upland area
522	Clear Creek	1			0 - 10			Yes									Yes	Pull-out/small parking area to access channel; visible trails along riparian and upland area upstream of point approx 600 ft-west bank
523	Clear Creek	1			0 - 10			Yes	Yes								Yes	Trails in riparian and upland area SW, and W bank of pond
524	Clear Creek	1			0 - 10												Yes	Multiple two-track road leading to pond in upland area
525	Clear Creek	1			0 - 10	Yes											Yes	Bridge
526	Clear Creek	1			0 - 10			Yes									Yes	Trails along both sides of channel in riparian and upland areas for approx .4 miles upstream of this point
527	Clear Creek	1			0 - 10			Yes										Road accessing channel; camping in upland area
528	Clear Creek	1			0 - 10			Yes		Yes							Yes	Numerous livestock/hiking trails on both sides of channel in riparian and upland areas from this point upstream for approx 2.25 miles
529	Clear Creek	1		Yes	0 - 10			Yes						Yes				Pull-out/camping to access Clear Creek Falls in upland area
530	South Clear Creek	2		Yes	0 - 10					Yes				Yes				Livestock trails in upland area
531	South Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple trails/livestock trails on south side of channel for approx .8 miles upstream from point; mostly in upland but some in riparian
532	South Clear Creek	2		Yes	0 - 10			Yes		Yes								Multiple trails/livestock trails for approx .8 miles upstream from point on north side of channel in riparian and upland areas
533	South Clear Creek	2		Yes	0 - 10	Yes								Yes				
534	South Clear Creek	2		Yes	0 - 10			Yes						Yes				Road follows creek for approx .2 miles upstream from point in upland area on north side; several pull-out/camping sites; trails to access creek in riparian area
535	South Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple trails in upland and riparian areas
536	South Clear Creek	2		Yes	0 - 10			Yes						Yes			Yes	Campground/picnic area; compacted soils; pit toilet, trails to access creek in riparian and upland areas
537	South Clear Creek	2		Yes	0 - 10	Yes								Yes				
538	South Clear Creek	2		Yes	0 - 10			Yes						Yes			Yes	Road into riparian area to access creek; pull-out/camping site
539	South Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple trails/livestock trails in upland and riparian areas
540	South Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Multiple livestock trails along riparian and upland areas from this point upstream to Brown Lakes
541	South Clear Creek	2		Yes	81 - 100									Yes			Yes	Erosion from culvert crossing into upland area
542	South Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Multiple trails/livestock trails in riparian and upland areas from this point to Brown Lakes
543	South Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes			Yes	Pedestrian bridge crossing
544	South Clear Creek	2		Yes	81 - 100			Yes						Yes			Yes	Parking area; boat launch site
545	South Clear Creek	2		Yes	0 - 10			Yes	Yes					Yes			Yes	Brown Lakes; trail surrounds lake for access
546	South Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes			Yes	Pedestrian bridge crossing
547	South Clear Creek	2		Yes	50 - 80			Yes						Yes			Yes	Parking area; boat launch site; trail surrounds lake; road runs along NW shoreline
548	South Clear Creek	2		Yes	0 - 10			Yes	Yes									
549	South Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Numerous trails/livestock trails on both sides of channel in riparian and upland areas from this point to the next lake-Hermit No. 1
550	South Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				

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551	South Clear Creek	2		Yes	0 - 10			Yes	Yes					Yes				
552	South Clear Creek	2		Yes	10 - 49			Yes			Yes			Yes			Yes	Dispersed out-buildings (housing development) from this point upstream for approx 2 miles in upland areas
553	South Clear Creek	2		Yes	0 - 10	Yes								Yes				
554	South Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				
555	South Clear Creek	2		Yes	0 - 10			Yes	Yes					Yes				
556	South Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				Pedestrian bridge crossing
557	South Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				
558	South Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				
559	South Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes			Yes	Pedestrian bridge crossing
560	South Clear Creek	2		Yes	0 - 10			Yes						Yes				Numerous two-track and single track trails from upland to riparian to access channel
561	South Clear Creek	2		Yes	0 - 10	Yes	Yes	Yes						Yes			Yes	There are 3 road crossings on the dam
562	South Clear Creek	2		Yes	0 - 10			Yes	Yes					Yes			Yes	There are multiple trails surrounding lake; road on NW and SE side of lake for access
563	South Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				
564	South Clear Creek	2		Yes	0 - 10			Yes	Yes								Yes	Multiple trails and roads surrounding lake for access in riparian and upland areas
565	South Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Two-track and single track trails; livestock trails; in riparian area from this point upstream for approx .7 miles
566	South Clear Creek	2		Yes	0 - 10	Yes				Yes				Yes				
567	South Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Livestock trails in riparian and upland areas from this point upstream to source; some dispersed rec impacts
568	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				
569	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Several livestock trails in upland area
570	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Livestock trails in upland area
571	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Trails; livestock trails in riparian area; dispersed camping in upland area
572	North Clear Creek	2		Yes	0 - 10			Yes						Yes				Dispersed camping in upland area
573	North Clear Creek	2		Yes	0 - 10	Yes								Yes				Bridge crossing
574	North Clear Creek	2		Yes	0 - 10			Yes			Yes			Yes			Yes	Dispersed out-buildings in upland areas (housing development) from this point upstream approx .75 miles along both sides of channel
575	North Clear Creek	2		Yes	0 - 10			Yes						Yes			Yes	May be dispersed rv/camping site within development
576	North Clear Creek	2		Yes	10 - 49			Yes						Yes			Yes	Pull-out/camping in upland area
577	North Clear Creek	2		Yes	0 - 10	Yes								Yes				Bridge crossing
578	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes				Trails to access creek; livestock trails in upland area
579	North Clear Creek	2		Yes	0 - 10			Yes						Yes			Yes	Pull-out/dispersed camping from this point upstream approx .16 miles along road
580	North Clear Creek	2		Yes	0 - 10						Yes			Yes			Yes	Out building; some sort of diversion structure? and/or pump house? Hydro-electric?
581	North Clear Creek	2			0 - 10	Yes											Yes	Pipe crossing and some sort of pedestrian crossing
582	North Clear Creek	2		Yes	0 - 10			Yes			Yes			Yes			Yes	North Clear Creek Falls Observatory; parking area, pit toilet; trails in upland and riparian areas to view falls
583	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Road and trails to view falls; ag impacts
584	North Clear Creek	2		Yes	0 - 10					Yes				Yes				Livestock trails along riparian and in upland areas
585	North Clear Creek	2		Yes	0 - 10					Yes								Livestock trails in riparian and upland areas
586	North Clear Creek	2			0 - 10	Yes												Bridge crossing
587	North Clear Creek	2			0 - 10			Yes									Yes	Pull-out/parking area in upland
588	North Clear Creek	2			0 - 10										Yes		Yes	According to Google Earth imagery dated 10/13/2015 at very low flows there is a manmade structure in the channel; other images not as clear
589	North Clear Creek	2			0 - 10			Yes		Yes								Numerous trails in upland and riparian areas along SW side of channel from point upstream approx 1.8 miles; livestock and hiking trails
590	North Clear Creek	2			0 - 10			Yes									Yes	Trails from upland to riparian and along creek
591	North Clear Creek	2			0 - 10			Yes		Yes							Yes	Two-track roads in upland area to access channel
592	North Clear Creek	2			0 - 10			Yes		Yes								Numerous trails/livestock trails along riparian and upland areas from point upstream on NE side of channel for approx 1.6 miles
593	North Clear Creek	2			0 - 10			Yes							Yes		Yes	Looks like some sort of man-made structure in channel; habitat structure?
594	North Clear Creek	2			0 - 10			Yes							Yes			Looks like a man-made in channel structure?
595	North Clear Creek	2			10 - 49	Yes		Yes		Yes							Yes	Trail crossing; approx 500 square feet of no veg on N bank; approx 90sq ft no veg on S bank
596	North Clear Creek	2			0 - 10					Yes								Heavily used livestock trails in riparian areas
597	North Clear Creek	2			0 - 10			Yes									Yes	Two-track road in upland to access channel
598	North Clear Creek	2			0 - 10			Yes									Yes	Two-track road in upland to access channel
599	North Clear Creek	2			81 - 100					Yes							Yes	Approx 2165 sq ft of compacted/trampled ground in upland area-salt lick area? for livestock
600	North Clear Creek	2			0 - 10					Yes								Heavily used livestock trails from upland to riparian to access channel
601	North Clear Creek	2			50 - 80	Yes				Yes							Yes	Multiple trails leading to channel crossing; loss of veg on both banks; 300 sq ft area on W bank; 250 sq ft area on E bank
602	North Clear Creek	2			81 - 100					Yes							Yes	Approx 500 sq ft area in upland no veg; compacted/trampled soils-salt lick location-livestock impact; multiple trails from site to channel
603	North Clear Creek	2			0 - 10					Yes							Yes	Multiple livestock trails in upland and riparian along both sides of channel
604	North Clear Creek	2			0 - 10			Yes		Yes	Yes						Yes	Dispersed out-building (housing development)-approx 22.5 acres in upland area to Pointer Lake
605	North Clear Creek	2			0 - 10	Yes		Yes		Yes							Yes	Pedestrian bridge; corral in N upland-50-80% veg loss
606	North Clear Creek	2			0 - 10	Yes												Bridge across creek
607	North Clear Creek	2			0 - 10			Yes		Yes							Yes	Trails in riparian along creek on NE side of channel
608	North Clear Creek	2			0 - 10			Yes		Yes							Yes	Numerous trails/livestock trails along both side of channel in riparian and upland areas from point upstream approx .76 miles
609	North Clear Creek	2			10 - 49	Yes	Yes	Yes		Yes								Ford/trail crossing
610	North Clear Creek	2			0 - 10			Yes		Yes							Yes	Road and trails from upland to access channel; trails in riparian upstream and downstream
611	North Clear Creek	2			0 - 10	Yes	Yes	Yes		Yes							Yes	Road access to channel; heavily used trails along both sides; trail crossing; dispersed camping; multiple two-track trails in upland and riparian areas
612	North Clear Creek	2		Yes	0 - 10			Yes		Yes				Yes			Yes	Heavily used trails/livestock trails along both sides of channel in riparian and upland areas from point upstream approx 1 mile
613	North Clear Creek	2		Yes	10 - 49			Yes						Yes			Yes	Split road in upland to avoid water crossing/swale
614	North Clear Creek	2		Yes	10 - 49			Yes						Yes			Yes	Pull-out/camping area in upland; trails to access channel in riparian
615	North Clear Creek	2		Yes	0 - 10					Yes				Yes				
616	North Clear Creek	2		Yes	50 - 80			Yes						Yes			Yes	Staging area for construction crew; dispersed camping and rec; road to access channel
617	North Clear Creek	2		Yes	0 - 10	Yes		Yes						Yes				Bridge crossing; pull-outs on both sides
618	North Clear Creek	2		Yes	0 - 10						Yes			Yes			Yes	In-stream grade control structure and out building

Object ID	Name	Stream Order	Within Fire Boundary	Within Insect Boundary	Vegetation Removed and/or Fragmented	Road Crossing	Road Encroachment	Dispersed Recreation Impact	On-Channel Waterbodies	Ag Impacts	Out Buildings	Utility Corridor	Burn Evidence	Beetle Kill Evidence	Instream Habitat Structure	Mining	Other	Comment
619	North Clear Creek	2		Yes	50 - 80		Yes				Yes			Yes			Yes	Continental Reservoir dam impacts for approx .1 mile downstream
620	North Clear Creek	2		Yes	10 - 49	Yes								Yes				
621	Big Spring Creek	2			0 - 10	Yes		Yes									Yes	Ford crossing; pull-outs on both sides
622	Big Spring Creek	2			0 - 10			Yes		Yes							Yes	Numerous heavily used livestock trails from this point upstream approx .6 miles in E side of creek in upland areas; trails along creek in riparian area
623	Big Spring Creek	2			10 - 49		Yes	Yes									Yes	Two-track road off highway to access creek; splits and parallels creek in riparian area for approx 164 ft downstream; dispersed camping sites
624	Big Spring Creek	2			0 - 10			Yes										Pull-out/camping area in upland; access to creek; trials in riparian area
625	Big Spring Creek	2			0 - 10	Yes		Yes		Yes							Yes	Trail crossing/livestock crossing?
626	Big Spring Creek	2			0 - 10					Yes								Livestock trails in upland area; trails to access creek
627	Big Spring Creek	2		Yes	0 - 10			Yes						Yes			Yes	Numerous trails from pull-outs off highway accessing creek from this point upstream for approx .2 miles
628	Big Spring Creek	2		Yes	0 - 10					Yes				Yes				Numerous livestock trails along both sides of channel in upland and riparian areas from this point upstream for approx .8 miles
629	Big Spring Creek	2		Yes	10 - 49												Yes	Erosion in upland from culvert under highway
630	Big Spring Creek	2		Yes	0 - 10			Yes		Yes				Yes				Mostly impacted from livestock trails in upland and riparian areas from point upstream approx 2.8 miles on both sides of creek
631	Bellows Creek	1			0 - 10					Yes	Yes						Yes	Ag impacts from point upstream approx .5 miles on both sides of creek
632	Bellows Creek	1			0 - 10	Yes												
633	Bellows Creek	1			0 - 10			Yes							Yes		Yes	Several instream habitat structures and bank stabilization structures for next .9 miles upstream from point
634	Bellows Creek	1			10 - 49												Yes	No riparian veg visible-from channel and bank stabilization work
635	Bellows Creek	1			10 - 49												Yes	Loss of riparian veg from channel and bank stabilization work from this point upstream on both sides from approx .17 miles
636	Bellows Creek	1			10 - 49												Yes	Loss of riparian veg from channel and bank stabilization work for approx .13 miles upstream on both sides from this point.
637	Bellows Creek	1			0 - 10	Yes												Bridge across channel
638	Bellows Creek	1			0 - 10												Yes	Irrigation ditch outlet from upstream in-channel waterbody
639	Bellows Creek	1			0 - 10												Yes	Irrigation ditch outlet from upstream in-channel waterbody
640	Bellows Creek	1			0 - 10	Yes												Bridge crossing
641	Bellows Creek	1			0 - 10	Yes												Bridge crossing
642	Bellows Creek	1			10 - 49	Yes												Bridge crossing
643	Bellows Creek	1			10 - 49												Yes	Diversion structure
644	Bellows Creek	1			0 - 10				Yes									Series of in-channel waterbodies from point for next .45 miles upstream
645	Bellows Creek	1			81 - 100			Yes			Yes						Yes	Dispersed out-buildings; looks like new construction of several buildings; visible re-veg project in riparian and upland areas; barren ground for approx .35 miles from point upstream in upland
646	Bellows Creek	1			0 - 10												Yes	Diversion structure
647	Bellows Creek	1			10 - 49			Yes							Yes		Yes	In-stream habitat structures and bank stabilization structures from this point upstream approx .15 miles
648	Bellows Creek	1			0 - 10	Yes												Bridge crossing
649	Bellows Creek	1			0 - 10					Yes								Livestock trials in upland area from point for approx 1.2 miles
650	Bellows Creek	1			0 - 10					Yes							Yes	Diversion structure
651	Bellows Creek	1			0 - 10			Yes							Yes		Yes	In-stream habitat and bank stabilization structures from this point upstream for approx .5 miles
652	West Bellows Creek	1			0 - 10	Yes												Bridge crossing
653	West Bellows Creek	1			10 - 49			Yes									Yes	Pull-out/camping site; road parallels channel on east side
654	West Bellows Creek	1			10 - 49	Yes		Yes									Yes	Parking area across bridge; road on both sides to assess channel work
655	West Bellows Creek	1			0 - 10					Yes								Livestock trails in upland on both sides of channel
656	West Bellows Creek	1			0 - 10			Yes			Yes						Yes	Abandoned/collapsed building in upland area
657	West Bellows Creek	1			0 - 10			Yes		Yes							Yes	Road dead ends; pull-out/turn-around/camping; livestock trails on both sides of creek in uplands
658	West Bellows Creek	1			0 - 10			Yes		Yes							Yes	Well used trail on east upland from this point upstream; a few spur livestock trails
659	West Bellows Creek	1			0 - 10			Yes									Yes	trail crosses creek a few times along this section for approx .3 miles-minimal impact
660	West Bellows Creek	1		Yes	0 - 10			Yes						Yes				Beetle kill approx 50-70% along this section of creek that reaches riparian area; downed trees in and along channel; trail continues along channel in upland and riparian
661	West Bellows Creek	1		Yes	0 - 10	Yes		Yes									Yes	Multiple roads/trails intersect on west upland to road crossing
662	West Bellows Creek	1		Yes	10 - 49			Yes						Yes			Yes	Camping area; multiple roads/trails from compacted area leading upstream in riparian and upland areas
663	West Bellows Creek	1		Yes	0 - 10	Yes		Yes						Yes			Yes	Multiple roads intersecting in west upland to road crossing
664	West Bellows Creek	1		Yes	0 - 10			Yes			Yes			Yes			Yes	Wheeler Geologic Area Forest Shelter out building; heavily used trails along upland west side of creek
665	Willow Creek	1			0 - 10	Yes												Bridge crossing
666	Willow Creek	1			10 - 49			Yes			Yes						Yes	Dispersed out-buildings (housing/rv development) along first 300 feet from confluence upstream; minimal riparian veg due to bank stabilization work before bridge
667	Willow Creek	1			0 - 10			Yes			Yes						Yes	Multiple roads in riparian and upland; stockpile of materials in upland area
668	Willow Creek	1			0 - 10					Yes								Ag impact in upland area
669	Willow Creek	1			10 - 49			Yes		Yes	Yes						Yes	Ag impact; several corrals in upland; dispersed out-buildings in uplands
670	Willow Creek	1			0 - 10												Yes	Railroad crossing on east split channel
671	Willow Creek	1			0 - 10												Yes	Railroad crossing on east split channel
672	Willow Creek	1			0 - 10												Yes	Several diversion structures on east split channel
673	Willow Creek	1			0 - 10				Yes		Yes						Yes	3 water treatment ponds on west upland; dispersed out-buildings
674	Willow Creek	1			0 - 10										Yes		Yes	Numerous in-stream grade control structures from point upstream for approx 1 mile which is part of the Willow Creek Restoration Project
675	Willow Creek	1			0 - 10							Yes						Utility corridor runs east-west across floodplain
676	Willow Creek	1			10 - 49												Yes	Some sort of stockpile area (berm) approx .28 acres in riparian area
677	Willow Creek	1			10 - 49						Yes						Yes	Abandoned railroad car; stockpile of material in floodplain; road from east upland into riparian area
678	Willow Creek	1			10 - 49												Yes	Road parallels west side of channel in riparian and upland areas; stockpile areas in upland
679	Willow Creek	1			10 - 49						Yes	Yes					Yes	Power plant facility; looks like junk yard in proximity to the east in upland area
680	Willow Creek	1			0 - 10	Yes	Yes	Yes			Yes						Yes	Bridge across channel; densely dispersed out-buildings; beginning of concrete lined channel for approx 1 mile upstream from point (through town of Creede)

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681	Willow Creek	1			10 - 49						Yes						Yes	Junk yard?; abandoned vehicles; scrap metals; other materials stockpiled along upland for approx .1 mile upstream and downstream of point
682	Willow Creek	1			10 - 49			Yes			Yes						Yes	Baseball field
683	Willow Creek	1			10 - 49						Yes						Yes	Dispersed out-buildings; numerous vehicles; stockpiles of materials in upland
684	Willow Creek	1			10 - 49						Yes						Yes	Some sort of construction business; stockpiles of materials and gravel; dispersed out-buildings, vehicles, and heavy equipment
685	Willow Creek	1			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
686	Willow Creek	1			0 - 10	Yes		Yes			Yes							
687	Willow Creek	1			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
688	Willow Creek	1			0 - 10	Yes		Yes			Yes							
689	Willow Creek	1			0 - 10							Yes						
690	Willow Creek	1			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
691	Willow Creek	1			0 - 10	Yes		Yes			Yes							
692	Willow Creek	1			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
693	Willow Creek	1			0 - 10							Yes						
694	Willow Creek	1			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
695	Willow Creek	1			0 - 10	Yes		Yes			Yes	Yes						
696	Willow Creek	1			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
697	Willow Creek	1			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
698	Willow Creek	1			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
699	Willow Creek	1			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
700	Willow Creek	1			81 - 100			Yes	Yes		Yes				Yes		Yes	Multiple in-channel water bodies with grade control structures; no riparian veg on both sides of creek from point all the way to confluence of East and West Willow Creek
701	Willow Creek	2			0 - 10			Yes	Yes		Yes				Yes		Yes	Several in-stream waterbodies (settling ponds); several in-stream grade control structures
702	Willow Creek	2			50 - 80		Yes	Yes									Yes	Road parallels west side of creek upstream to confluence of West Willow Creek in riparian and upland area
703	Willow Creek	2			50 - 80	Yes											Yes	Bridge across creek; no visible riparian veg from point downstream to city limits
704	Willow Creek	2			81 - 100		Yes										Yes	Both sides of channel banks have been armored with rocks from point upstream to confluence of West Willow Creek; no visible riparian veg
705	East Willow Creek	2			10 - 49	Yes		Yes			Yes						Yes	Dispersed out-buildings for approx .2 miles upstream; north bank is armored with rocks at crossing; mining?
706	East Willow Creek	2			0 - 10	Yes		Yes									Yes	Pedestrian bridge crossing; pull-out/parking area; mining?
707	East Willow Creek	2			0 - 10	Yes		Yes										
708	East Willow Creek	2			10 - 49		Yes	Yes									Yes	Narrow canyon; road encroaches channel is several places ; pull-outs along road in upland
709	East Willow Creek	2			10 - 49			Yes									Yes	Pull-out/camping area
710	East Willow Creek	2			0 - 10	Yes		Yes										
711	East Willow Creek	2			10 - 49											Yes	Yes	Several settling ponds for mining site approx 50 ft from channel in uplands
712	East Willow Creek	2			10 - 49		Yes											
713	East Willow Creek	2			0 - 10	Yes					Yes					Yes	Yes	Bridge for mining operation housing; dispersed out-buildings on east side of creek
714	East Willow Creek	2			81 - 100						Yes					Yes		
715	East Willow Creek	2			81 - 100		Yes									Yes		
716	East Willow Creek	2			81 - 100											Yes	Yes	Mine tailings from mine approx .23 miles above creek; tailings have sluffed down hillside to the road; hard to see the creek
717	East Willow Creek	2			81 - 100											Yes	Yes	Tailings sluffed down hillside from mine above creek approx 500 ft to road
718	East Willow Creek	2		Yes	81 - 100						Yes			Yes		Yes	Yes	Abandoned mine w/collapsed out-buildings; tailing are approx 80 ft x 530 ft along west side of creek; approx 100 ft along riparian area >80%veg loss; 100% no veg in upland
719	East Willow Creek	2		Yes	0 - 10	Yes								Yes				
720	East Willow Creek	2		Yes	10 - 49			Yes						Yes			Yes	Pull-out/parking area in upland on east side of creek
721	East Willow Creek	2		Yes	81 - 100		Yes							Yes			Yes	No riparian veg where road switchbacks up to old mine site
722	East Willow Creek	2		Yes	0 - 10						Yes			Yes				
723	East Willow Creek	2		Yes	0 - 10	Yes								Yes				
724	East Willow Creek	2		Yes	10 - 49			Yes									Yes	Pull-out/parking area; trails in upland and riparian
725	East Willow Creek	2		Yes	10 - 49			Yes			Yes					Yes		Upland area
726	West Willow Creek	2			81 - 100		Yes	Yes								Yes	Yes	No riparian veg from point upstream approx .5 miles on both sides of creek
727	West Willow Creek	2			81 - 100			Yes								Yes		Beginning of mining district
728	West Willow Creek	2			81 - 100	Yes	Yes	Yes			Yes					Yes		Parking area; fill/culvert crossing of creek
729	West Willow Creek	2			81 - 100		Yes	Yes			Yes					Yes	Yes	Series of several mines along both sides of creek for approx .3 miles from point upstream; no riparian veg;
730	West Willow Creek	2			81 - 100	Yes	Yes	Yes	Yes		Yes					Yes		Fill encroachment from road
731	West Willow Creek	2			81 - 100	Yes	Yes	Yes			Yes					Yes		
732	West Willow Creek	2			50 - 80		Yes	Yes			Yes					Yes		Impacts to riparian and upland areas
733	West Willow Creek	2			0 - 10							Yes				Yes		Hard to tell if utility corridor runs along entire reach of creek
734	West Willow Creek	2			50 - 80		Yes										Yes	Road encroachment along most of the road in upland areas; several places in riparian impacted
735	West Willow Creek	2		Yes	10 - 49	Yes	Yes	Yes				Yes		Yes				
736	West Willow Creek	2		Yes	50 - 80	Yes	Yes	Yes				Yes		Yes				
737	West Willow Creek	2		Yes	50 - 80		Yes	Yes			Yes	Yes		Yes		Yes	Yes	Mine tailings from point upstream on west upland and riparian for approx 1.3 miles
738	West Willow Creek	2			0 - 10	Yes												
739	West Willow Creek	2		Yes	81 - 100	Yes	Yes	Yes			Yes	Yes		Yes		Yes	Yes	Very large abandoned mining operation ""Last Chance Mine"";90-100% veg removal in riparian & upland; abandoned out-buildings in riparian & creek; tailings on both sides of creek in riparian & upland
740	West Willow Creek	2		Yes	0 - 10			Yes			Yes			Yes			Yes	Private land from point upstream for approx .67 miles on both sides of creek; beetle kill mostly in upland but has reached the riparian areas in some places; road fill encroachment
741	West Willow Creek	2		Yes	0 - 10	Yes		Yes						Yes				Road crossing with parking area
742	West Willow Creek	2		Yes	10 - 49			Yes						Yes				Pull-out/parking/camping; road/trial access to creek; impacts mostly in upland-minimal in riparian; fill encroachment from road
743	West Willow Creek	2		Yes	50 - 80	Yes	Yes	Yes						Yes				
744	West Willow Creek	2		Yes	50 - 80		Yes							Yes				Road encroachment on west bank approx 100 ft in riparian and upland from to road
745	West Willow Creek	2		Yes	10 - 49			Yes						Yes			Yes	Parking/pull-out/camping; trails in riparian
746	West Willow Creek	2		Yes	10 - 49			Yes									Yes	Pull-out in upland; trail from road for creek access; trails on both sides of creek in riparian
747	West Willow Creek	2		Yes	0 - 10	Yes		Yes						Yes			Yes	Ford crossing; several roads on west upland to access creek;

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748	West Willow Creek	2		Yes	81 - 100									Yes			Yes	Steep rock slope on east side on creek for approx .25 miles from point; 80-100% no riparian veg
749	West Willow Creek	2		Yes	50 - 80	Yes	Yes	Yes	Yes		Yes			Yes		Yes	Yes	Large mining operation; impacts mostly on east bank upland but encroaches into riparian
750	West Willow Creek	2		Yes	0 - 10	Yes		Yes						Yes				Bridge
751	West Willow Creek	2		Yes	0 - 10	Yes		Yes						Yes			Yes	Pull-out/camping on both sides of creek at crossing
752	West Willow Creek	2		Yes	0 - 10									Yes		Yes		May be old mine tailings from above creek approx .25 miles on west side
753	West Willow Creek	2		Yes	10 - 49			Yes									Yes	Camping/pull-out; trails to access creek
754	West Willow Creek	2		Yes	0 - 10	Yes		Yes						Yes				
755	West Willow Creek	2		Yes	0 - 10	Yes		Yes						Yes				
756	West Willow Creek	2		Yes	0 - 10			Yes						Yes			Yes	Heavily used trail on east upland for remainder of reach upstream
757	Miners Creek	1			0 - 10			Yes									Yes	Several two-track trails/roads in upland area
758	Miners Creek	1			0 - 10							Yes						Utility corridor runs east-west across channel
759	Miners Creek	1			81 - 100											Yes	Yes	Approx 3 acres of mining area disturbed in upland; no evidence of tailings in riparian area
760	Miners Creek	1			0 - 10			Yes		Yes	Yes							Ag impacts in upland and riparian
761	Miners Creek	1			10 - 49			Yes		Yes	Yes	Yes						Private land on both sides of creek; numerous out-buildings; ag impacts mostly in upland areas
762	Miners Creek	1			0 - 10	Yes												Bridge
763	Miners Creek	1			0 - 10					Yes								Livestock trails in upland and riparian
764	Miners Creek	1			0 - 10					Yes								Numerous livestock trails in upland and riparian areas
765	Miners Creek	1			0 - 10					Yes							Yes	Diversion structure
766	Miners Creek	1			0 - 10			Yes		Yes					Yes		Yes	Numerous instream habitat and bank stabilization structures from point upstream for approx. 1.25 miles
767	Miners Creek	1			81 - 100					Yes							Yes	Ag impacts; salt-lick area trampled/compacted approx .05 acres in upland
768	Miners Creek	1			0 - 10	Yes		Yes		Yes							Yes	Pedestrian bridge; livestock trails/trails in both sides riparian and upland areas
769	Miners Creek	1			0 - 10	Yes		Yes		Yes	Yes						Yes	Pedestrian bridge; dispersed out-buildings (housing development); trails along both sides of creek in riparian and uplands areas
770	Miners Creek	1			10 - 49	Yes	Yes	Yes	Yes								Yes	4 in-stream waterbodies; trails and roads surrounding each one; impacts in riparian and upland areas
771	Miners Creek	1			0 - 10	Yes		Yes		Yes	Yes						Yes	Looks like there is an in-channel road crossing next to bridge; livestock trails on both sides of creek in riparian and upland areas
772	Miners Creek	1			0 - 10	Yes											Yes	Pedestrian bridge
773	Miners Creek	1			0 - 10						Yes							Abandoned building in upland
774	Miners Creek	1			0 - 10	Yes												
775	Miners Creek	1			0 - 10			Yes		Yes	Yes	Yes						Utility crosses creek to house; dispersed out-building impacts; livestock trails on both sides of creek uplands
776	Miners Creek	1			10 - 49			Yes			Yes							Upland area; trial along east bank riparian
777	Miners Creek	1			10 - 49	Yes		Yes			Yes							
778	Miners Creek	1			0 - 10			Yes							Yes			
779	Miners Creek	1			0 - 10			Yes							Yes			
780	Miners Creek	1			10 - 49			Yes									Yes	Dispersed rec; parking/pull-out/camping
781	Miners Creek	1			10 - 49			Yes									Yes	Pull-out/camping along section of creek; impacts to riparian and upland
782	Miners Creek	1			10 - 49			Yes									Yes	Heavily used parking/pull-out/camping area; impacts to riparian and upland areas
783	Miners Creek	1			10 - 49			Yes									Yes	Camping/pull-out/parking area; impacts to riparian and upland areas
784	Miners Creek	1			10 - 49						Yes					Yes		Small mining site; tailings limits to upland on east side of road
785	Miners Creek	1			0 - 10			Yes									Yes	Camping/parking; impacts to riparian and upland areas
786	Miners Creek	1			50 - 80			Yes			Yes					Yes		Mine approx 100 ft of tailings in upland and on edge of riparian; then trail goes upstream to a 60ft area prospected-tailings in riparian and upland
787	Miners Creek	1			10 - 49			Yes			Yes					Yes	Yes	Dispersed out-buildings; may be several small prospecting tailing mounds around house in uplands
788	Miners Creek	1			0 - 10	Yes		Yes								Yes		
789	Miners Creek	1			0 - 10			Yes										Road parallels creek on west side upland; dispersed camping
790	Miners Creek	1			0 - 10	Yes		Yes									Yes	May be a pedestrian bridge next to road crossing
791	Miners Creek	1			50 - 80		Yes	Yes										No visible riparian veg; narrow road along east creek
792	Miners Creek	1		Yes	0 - 10			Yes						Yes				Dispersed camping in upland and riparian
793	Miners Creek	1		Yes	0 - 10	Yes		Yes						Yes			Yes	Trails in riparian
794	Miners Creek	1		Yes	0 - 10	Yes		Yes						Yes				Pedestrian bridge
795	Miners Creek	1		Yes	0 - 10					Yes				Yes				Livestock trails in riparian area
796	Miners Creek	1		Yes	0 - 10	Yes		Yes		Yes				Yes			Yes	Trail crossing; livestock trails
797	Miners Creek	1		Yes	0 - 10	Yes		Yes		Yes				Yes			Yes	Trail crossing; livestock trails
798	Miners Creek	1		Yes	50 - 80									Yes			Yes	Steep slope encroaches from approx .1 mile into channel; minimal riparian veg along this section-east bank
799	Miners Creek	1		Yes	50 - 80									Yes				Steep slope encroaches in channel for approx .12 miles; minimal riparian veg on east bank
800	Miners Creek	1		Yes	0 - 10	Yes		Yes						Yes			Yes	Road/trail crossing; beetle kill approx 70% in upland areas
801	Miners Creek	1		Yes	0 - 10			Yes						Yes			Yes	Two-track road parallels channel on east bank in uplands
802	Miners Creek	1		Yes	0 - 10	Yes		Yes						Yes				Road crosses creek-impact to riparian area
803	Miners Creek	1		Yes	0 - 10	Yes		Yes						Yes			Yes	Multiple two-track roads into riparian area; ford crossing
804	Miners Creek	1		Yes	0 - 10	Yes		Yes						Yes			Yes	Multiple two-track roads leading to ford crossing on both sides of creek; impacts to riparian and upland areas
805	Miners Creek	1		Yes	0 - 10			Yes		Yes				Yes			Yes	Trail crossing; livestock trails
806	Rat Creek	1			0 - 10			Yes									Yes	Road/pull-out/camping area in upland
807	Rat Creek	1			50 - 80			Yes			Yes					Yes		Mine approx .2 acres impacted-upland
808	Rat Creek	1			50 - 80			Yes			Yes					Yes		Mine approx .45 acres impacted-upland
809	Rat Creek	1			50 - 80			Yes			Yes					Yes	Yes	Mine approx .23 acres impact; tailing in riparian area-east bank; pull-out on west bank; dispersed rec impact
810	Rat Creek	1			0 - 10	Yes		Yes			Yes						Yes	Bridge to access dispersed out-buildings
811	Rat Creek	1			0 - 10	Yes		Yes			Yes						Yes	Bridge to access dispersed out-buildings
812	Rat Creek	1			0 - 10	Yes		Yes			Yes						Yes	Bridge to access out-buildings
813	Rat Creek	1			81 - 100			Yes								Yes		mine approx .13 acres impact in upland
814	Rat Creek	1			50 - 80	Yes		Yes			Yes					Yes		small mine on west bank; cannot tell extent of impacts
815	Rat Creek	1			50 - 80											Yes		Mine tailings approx .1 acre impacted in upland area
816	Rat Creek	1			50 - 80											Yes		Mine approx .32 acres impact in upland and riparian areas
817	Rat Creek	1			10 - 49												Yes	Steep slope encroaching into channel for approx 100 ft on west bank

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818	Rat Creek	1		Yes	0 - 10	Yes		Yes	Yes					Yes				Dispersed rec around lake upstream of point
819	Rat Creek	1		Yes	0 - 10			Yes						Yes			Yes	Dispersed camping; trails in riparian area
820	Rat Creek	1		Yes	81 - 100									Yes			Yes	Natural land disturbance from point approx 350 ft on west bank; hillside encroachment on channel; no visible riparian veg; very minimal upland veg-steep slope
821	Rat Creek	1		Yes	0 - 10			Yes						Yes				Road dead ends in riparian; impacts in upland; trails in riparian
822	Rat Creek	1		Yes	0 - 10			Yes										Pull-out/camping area in upland; trail in riparian to access creek
823	Rat Creek	1		Yes	0 - 10	Yes								Yes				
824	Rat Creek	1		Yes	0 - 10			Yes						Yes			Yes	Pull-out/camping in upland; trails in riparian
825	Rat Creek	1		Yes	10 - 49									Yes			Yes	Natural land disturbance-erosion from steep slope encroaching in riparian area approx .03 acres
826	Rat Creek	1		Yes	0 - 10			Yes						Yes				Trails in riparian from dispersed rec impacts
827	Rat Creek	1		Yes	0 - 10			Yes						Yes			Yes	Several two-track roads in upland areas to access creek; trails in riparian
828	Rat Creek	1		Yes	0 - 10	Yes		Yes						Yes			Yes	Split roads into riparian area; road crossing in west trib; trails in and along riparian area
829	Rat Creek	1		Yes	0 - 10	Yes		Yes						Yes				
830	Rat Creek	1		Yes	0 - 10	Yes		Yes						Yes			Yes	Several split/spur roads in upland area along west side of creek; roads cut into riparian; road crossing on west trib
831	Rat Creek	1		Yes	0 - 10			Yes						Yes				
832	Rat Creek	1		Yes	0 - 10			Yes	Yes					Yes			Yes	Several spur roads into riparian areas to access series of in channel waterbodies for approx .6 miles upstream from point
833	Rio Grande	3			0 - 10					Yes							Yes	Multiple livestock trails in riparian and upland area; several livestock trails crossing river
834	Rio Grande	3			0 - 10			Yes		Yes								Heavily used hiking trail (Colorado Trail) and livestock trails in upland and riparian areas
835	Rio Grande	3			10 - 49			Yes		Yes								Pull-out/camping; multiple trails/livestock trails in riparian area
836	Rio Grande	3			10 - 49	Yes	Yes	Yes										Culvert crossing; pull-outs on either side; road encroachment in riparian area
837	Rio Grande	3			10 - 49		Yes										Yes	Pull-out; road encroachment in riparian
838	Rio Grande	3			10 - 49		Yes										Yes	Erosion from road into riparian area
839	Rio Grande	3			0 - 10					Yes								Livestock trails in upland area
840	Rio Grande	3		Yes	81 - 100									Yes			Yes	Natural land disturbance; erosion from steep banks into riparian area; no riparian vegetation
841	Rio Grande	3		Yes	0 - 10			Yes		Yes								Trail/livestock trails in upland and riparian areas
842	Rio Grande	3		Yes	0 - 10			Yes		Yes				Yes			Yes	Trail/livestock trail crossing; trails on both uplands and in riparian areas
843	Rio Grande	3		Yes	50 - 80		Yes							Yes				Natural land disturbance in riparian area (approx. 06 acres)
844	Rio Grande	3		Yes	0 - 10					Yes				Yes				Livestock trails in upland and riparian areas
845	Rio Grande	3		Yes	0 - 10					Yes				Yes				Numerous livestock trails in riparian area on both side of river
846	Rio Grande	3		Yes	0 - 10			Yes		Yes				Yes				Heavily used trail in upland and along riparian; hiking and livestock
847	Rio Grande	3		Yes	0 - 10			Yes		Yes				Yes				Several trails/livestock trails in upland and in and along riparian area
848	Rio Grande	3		Yes	81 - 100									Yes			Yes	Natural land disturbance; sedimentation deposit from south tributary
849	Rio Grande	3		Yes	81 - 100		Yes	Yes						Yes			Yes	Pull-out on road; road encroachment; erosion into riparian area
850	Rio Grande	3		Yes	50 - 80		Yes										Yes	Sediment deposition in riparian area from north tributary crossing road
851	Rio Grande	3		Yes	0 - 10			Yes		Yes				Yes				Trails/livestock trails in riparian area
852	Rio Grande	3		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
853	Rio Grande	3		Yes	10 - 49			Yes									Yes	Pull-out/camping; multiple trails into riparian area to access river
854	Rio Grande	3		Yes	50 - 80		Yes	Yes						Yes				Road encroachment; pull-out on road creating more surface area to erode into riparian
855	Rio Grande	3		Yes	0 - 10			Yes		Yes				Yes				Trails; livestock trails in riparian and upland areas
856	Rio Grande	3		Yes	0 - 10			Yes						Yes			Yes	Pull-out/camping area; trails in and along riparian
857	Rio Grande	3		Yes	10 - 49		Yes	Yes						Yes			Yes	Pull-out/camping area
858	Rio Grande	3		Yes	0 - 10			Yes						Yes				Two-track road in upland into riparian to access river
859	Rio Grande	3		Yes	0 - 10			Yes						Yes				Trails in upland and riparian areas on both side of river
860	Rio Grande	3		Yes	0 - 10			Yes						Yes				Pull-out/camping area in upland
861	Rio Grande	3		Yes	10 - 49	Yes	Yes	Yes						Yes			Yes	Several dispersed camping sites on both sides of river; ford crossing; numerous two-track roads in riparian and upland areas
862	Rio Grande	3		Yes	0 - 10			Yes						Yes			Yes	Several two-track roads in riparian; dispersed camping; trails in riparian area
863	Rio Grande	3		Yes	10 - 49			Yes						Yes			Yes	Several dispersed camping sites; two-track road parallels NW bank
864	Rio Grande	3		Yes	0 - 10	Yes	Yes	Yes						Yes			Yes	Ford crossing; multiple crossings in riparian
865	Rio Grande	3		Yes	0 - 10		Yes	Yes	Yes					Yes			Yes	Road runs along NW side of pond
866	Rio Grande	3		Yes	0 - 10			Yes						Yes			Yes	Several dispersed camping sites; trails in riparian area to access river
867	Rio Grande	3		Yes	0 - 10			Yes						Yes				Dispersed camping in upland; trails to riparian
868	Rio Grande	3		Yes	0 - 10			Yes						Yes			Yes	Dispersed camping; several two-track roads in upland and riparian areas
869	Rio Grande	3		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
870	Rio Grande	3		Yes	0 - 10			Yes						Yes				Pull-out/camping areas
871	Rio Grande	3		Yes	10 - 49			Yes						Yes			Yes	Several dispersed camping areas in riparian and upland areas in this area; multiple two-track/trails
872	Rio Grande	3		Yes	0 - 10			Yes						Yes			Yes	Several dispersed camping sites; two-track roads into riparian area
873	Rio Grande	3		Yes	0 - 10					Yes				Yes				Livestock trails in riparian and upland areas
874	Rio Grande	3		Yes	10 - 49			Yes						Yes			Yes	Road parallels river; multiple split roads in riparian area
875	Rio Grande	3		Yes	0 - 10			Yes						Yes				Split two-track roads in riparian
876	Rio Grande	3		Yes	10 - 49		Yes	Yes						Yes			Yes	Multiple two-track/split roads in riparian area; dispersed camping
877	Rio Grande	3		Yes	0 - 10			Yes						Yes			Yes	Pull-out/camping area; several two-track roads in upland and riparian areas
878	Rio Grande	3		Yes	0 - 10			Yes						Yes			Yes	Numerous dispersed camping sites along this section; two-track roads/trails in riparian and upland areas
879	Rio Grande	3		Yes	0 - 10			Yes						Yes			Yes	Pull-out/camping area in upland; trails to access riparian
880	Rio Grande	3		Yes	0 - 10			Yes		Yes	Yes			Yes			Yes	Dispersed out-buildings (housing development) from this point downstream for approx 1 mile
881	Rio Grande	3		Yes	0 - 10			Yes						Yes				Pull-out/camping areas in riparian and upland areas
882	Rio Grande	3		Yes	0 - 10	Yes		Yes						Yes				Bridge crossing
883	Rio Grande	3		Yes	0 - 10			Yes			Yes			Yes				
884	Rio Grande	3		Yes	0 - 10									Yes			Yes	Materials stockpiled in riparian area
885	Rio Grande	3		Yes	0 - 10	Yes		Yes						Yes			Yes	Pedestrian bridge crossing; heavily used trails on both sides of the river
886	Rio Grande	3		Yes	0 - 10			Yes		Yes				Yes				Trails/livestock trails in upland and riparian areas
887	Rio Grande	3		Yes	0 - 10	Yes		Yes						Yes			Yes	Ford crossing
888	Rio Grande	3		Yes	0 - 10			Yes		Yes				Yes			Yes	Several roads/trails intersect in uplands and along riparian
889	Rio Grande	3		Yes	0 - 10			Yes		Yes				Yes				Trails/livestock trails in riparian and upland areas
890	Rio Grande	3			0 - 10			Yes		Yes				Yes				Several two-track roads/trails from upland to riparian to access river
891	Rio Grande	3			0 - 10			Yes		Yes								Numerous trails/livestock trails in riparian area on both sides of river
892	Rio Grande	3			0 - 10			Yes									Yes	Pull-out area; trails in riparian and upland areas

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893	Rio Grande	3			0 - 10			Yes		Yes								Heavily used trails/livestock trails on west side of river in riparian area
894	Rio Grande	3			10 - 49		Yes	Yes	Yes								Yes	Rio Grande Reservoir; road encroachment on east side; trails mostly on N and S side of reservoir
895	Rio Grande	3			81 - 100		Yes	Yes			Yes						Yes	Gravel boat ramp; parking area; pit toilet
896	Rio Grande	3			10 - 49			Yes									Yes	Pull-out/camping area; compacted soils
897	Rio Grande	3			81 - 100	Yes	Yes	Yes			Yes						Yes	Rio Grande Reservoir earthen dam
898	Rio Grande	3			10 - 49						Yes							Reservoir operations maintenance buildings
899	Rio Grande	3		Yes	0 - 10			Yes						Yes				Road parallels river along south side to access Thirty Mile Resort
900	Rio Grande	3		Yes	10 - 49			Yes			Yes			Yes			Yes	Thirty Mile Campground - approx 21 acres impacts; pit toilets; compacted sites; trails in riparian
901	Rio Grande	3		Yes	0 - 10	Yes	Yes	Yes						Yes				Bridge to access campground
902	Rio Grande	3		Yes	10 - 49			Yes						Yes			Yes	Pull-out/parking/camping area - approx 2.25 acres
903	Rio Grande	3		Yes	0 - 10	Yes	Yes	Yes		Yes				Yes			Yes	Ford crossing on side channel
904	Rio Grande	3		Yes	10 - 49			Yes		Yes				Yes			Yes	Pull-out/parking/camping area (approx 7.5 acres); some ag impact - corrals
905	Rio Grande	3		Yes	0 - 10	Yes	Yes	Yes		Yes				Yes			Yes	Ford crossing; roads in riparian areas
906	Rio Grande	3	Yes	Yes	0 - 10	Yes	Yes	Yes					Yes	Yes			Yes	Bridge; pull-out on both sides
907	Rio Grande	3	Yes	Yes	10 - 49			Yes			Yes		Yes	Yes			Yes	River Hill Campground from point downstream approx .5 miles; pit toilets; trails in riparian areas; compacted soils
908	Rio Grande	3	Yes	Yes	10 - 49			Yes			Yes		Yes	Yes				Dispersed out-buildings in upland; trails to access river; may be part of campground
909	Rio Grande	3	Yes	Yes	10 - 49								Yes	Yes				Papoose fire reached S side of channel; riparian veg along waters edge but minimal from riparian to upland
910	Rio Grande	3	Yes	Yes	0 - 10			Yes						Yes				Heavily used trail in north upland and along riparian for approx 1 mile from point downstream
911	Rio Grande	3	Yes	Yes	10 - 49								Yes	Yes				Papoose Fire jumped the creek along this area; hard to tell the extent of riparian damage; dead standing trees approx 80%
912	Rio Grande	3	Yes	Yes	0 - 10			Yes					Yes	Yes				Several two-track roads in upland area
913	Rio Grande	3	Yes	Yes	10 - 49			Yes			Yes		Yes	Yes			Yes	Dispersed out-buildings (private land next 2 miles downstream) on both sides of river in upland and riparian areas
914	Rio Grande	3	Yes	Yes	0 - 10					Yes			Yes	Yes			Yes	Diversion structure
915	Rio Grande	3	Yes	Yes	0 - 10	Yes		Yes					Yes	Yes			Yes	Bridge; pull-out/parking on both sides of bridge; trails in riparian upstream and downstream of point on both sides of river
916	Rio Grande	3	Yes	Yes	0 - 10			Yes			Yes		Yes	Yes			Yes	Two-track road in upland to access river
917	Rio Grande	3			0 - 10			Yes		Yes							Yes	Numerous two-track roads in uplands and along riparian area
919	Rio Grande	3			0 - 10					Yes	Yes						Yes	Abandoned/collapsed out-building
920	Rio Grande	3			0 - 10			Yes		Yes							Yes	Numerous roads/trails intersect in riparian and upland areas
921	Rio Grande	3			50 - 80		Yes			Yes							Yes	Material stockpile area in riparian and upland area
922	Rio Grande	3			0 - 10					Yes								Livestock trails in riparian and upland areas
923	Rio Grande	3			0 - 10			Yes			Yes	Yes					Yes	Dispersed out-buildings (housing development) along east side from point downstream to confluence of Clear Creek (approx .3 miles)
924	Rio Grande	3			0 - 10			Yes										Two-track road along east bank of creek; trails in riparian areas
925	Rio Grande	3			0 - 10					Yes							Yes	Two track roads in upland and riparian; livestock trails in upland and riparian - both sides of river
926	Rio Grande	3			0 - 10					Yes					Yes		Yes	Oct 2015 Google Earth images shows a rock deflector (wing) in channel
927	Rio Grande	3			0 - 10					Yes							Yes	Numerous livestock trails in riparian and upland areas
928	Rio Grande	3			0 - 10	Yes				Yes							Yes	Looks like some sort of bridge or dam
929	Rio Grande	3			10 - 49					Yes							Yes	Heavily used livestock trails to riparian; trail crossing; 370 sq ft area no riparian veg on north bank
930	Rio Grande	3			0 - 10					Yes							Yes	Numerous livestock trails on both sides of river in riparian and uplands from point downstream approx .6 miles
931	Rio Grande	3			0 - 10	Yes												Bridge
932	Rio Grande	3			0 - 10			Yes			Yes	Yes						Dispersed out-buildings (housing development) for approx 1 mile downstream on both sides of river
933	Rio Grande	3			0 - 10			Yes							Yes		Yes	Dispersed in-stream habitat and bank stabilization structures from point downstream for approx 3.3 miles
934	Rio Grande	3			0 - 10					Yes								Livestock trails in upland and riparian areas; corrals; several two-track roads
935	Rio Grande	3			0 - 10	Yes				Yes								Bridge
936	Rio Grande	3			0 - 10					Yes							Yes	Material stockpile area
937	Rio Grande	3			10 - 49	Yes		Yes	Yes	Yes	Yes						Yes	Numerous roads in riparian; livestock trails; bridges
938	Rio Grande	3			0 - 10	Yes		Yes		Yes								Bridge
939	Rio Grande	3			0 - 10	Yes		Yes		Yes								Culvert crossing
940	Rio Grande	3		Yes	0 - 10					Yes				Yes				Grazing impacts in riparian area
946	Rio Grande	3		Yes	0 - 10					Yes				Yes			Yes	Irrigation diversion turn-out
951	Rio Grande	3			81 - 100		Yes											Road encroachment from Hwy approx 430 ft; no riparian veg
952	Rio Grande	3		Yes	0 - 10					Yes								
955	Rio Grande	3			0 - 10					Yes							Yes	Multiple roads in and along riparian area
956	Rio Grande	3		Yes	0 - 10			Yes	Yes	Yes	Yes						Yes	Off-channel water body approx 23 acres
957	Rio Grande	3			0 - 10					Yes							Yes	Irrigation diversion turn-out
958	Rio Grande	3		Yes	0 - 10			Yes	Yes	Yes				Yes			Yes	Off-channel water body approx .5 acres
960	Rio Grande	3		Yes	0 - 10					Yes				Yes			Yes	Diversion structure
961	Rio Grande	3		Yes	0 - 10					Yes				Yes			Yes	Diversion structure
963	Rio Grande	3			0 - 10	Yes												Bridge
965	Rio Grande	3			0 - 10					Yes							Yes	Numerous roads and irrigation ditches along this section in riparian area
966	Rio Grande	3			81 - 100		Yes											Road encroachment from Hwy approx 615 ft; no riparian veg
972	Rio Grande	3			50 - 80		Yes	Yes									Yes	Road encroachment from Hwy; pull-out/parking area
973	Rio Grande	3			0 - 10					Yes								
975	Rio Grande	3			0 - 10					Yes							Yes	Livestock corrals in upland area
976	Rio Grande	3			0 - 10	Yes												Bridge
978	Rio Grande	3			0 - 10	Yes	Yes	Yes	Yes	Yes							Yes	Diversion turn-outs at both ends of pond
979	Rio Grande	3			10 - 49	Yes	Yes	Yes	Yes	Yes							Yes	Road and ford crossing; road runs along pong; several turn-outs
980	Rio Grande	3			10 - 49			Yes		Yes	Yes						Yes	Dispersed out-buildings; several pedestrian crossings over irrigation ditches; ag impacts
981	Rio Grande	3			0 - 10	Yes		Yes		Yes								Bridge crossing on side channel
983	Rio Grande	3			10 - 49			Yes		Yes							Yes	Livestock corrals in upland; parking area
984	Rio Grande	3			0 - 10					Yes								Grazing impacts
985	Rio Grande	3			0 - 10			Yes										Several two-track roads in upland to access river

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986	Rio Grande	3			0 - 10							Yes					Yes	Utility road in upland
987	Rio Grande	3			0 - 10					Yes		Yes					Yes	Utility road in upland; livestock trails in upland and riparian area
988	Rio Grande	3			10 - 49			Yes		Yes	Yes						Yes	Dispersed out-buildings on both sides of river (housing development); trails in riparian and upland areas
989	Rio Grande	3			0 - 10	Yes		Yes									Yes	Pedestrian bridge crossing; two-track roads on both sides of bridge in riparian and upland areas
990	Rio Grande	3			0 - 10			Yes									Yes	Several two-track roads follow west side of river in and along riparian for approx .8 miles from point downstream
991	Rio Grande	3			0 - 10							Yes						Utility road/corridor runs north/south along east side of river
992	Rio Grande	3			0 - 10			Yes									Yes	Two-track roads along east bank in riparian and uplands from point downstream approx .8 miles
993	Rio Grande	3			0 - 10	Yes		Yes		Yes							Yes	Several ford crossings in channel ; livestock trails; two-track roads
994	Rio Grande	3			0 - 10			Yes		Yes	Yes						Yes	Dispersed out-buildings (housing development on west side); livestock trails in riparian and upland areas; two-tracks road in upland areas
995	Rio Grande	3			0 - 10					Yes							Yes	Irrigation/ditch outlet
996	Rio Grande	3			0 - 10			Yes		Yes		Yes					Yes	Livestock trails; trails and two track roads along riparian and upland areas
997	Rio Grande	3			50 - 80												Yes	Some sort of gravel pit in upland area; roads parallel west side of river
998	Rio Grande	3			0 - 10			Yes			Yes						Yes	Rio Grande Campground; pit toilets; trails in riparian area; compacted soils
999	Rio Grande	3			0 - 10			Yes										Trails in and along riparian area
1000	Rio Grande	3			10 - 49			Yes		Yes	Yes						Yes	Dispersed out-buildings on both sides of river (housing development) from point downstream for approx 2 miles
1001	Rio Grande	3			0 - 10			Yes									Yes	Two-track road from Hwy to access river; pull-outs/camping areas in riparian and upland
1002	Rio Grande	3			0 - 10												Yes	Bank stabilization work on west bank for approx 80 ft
1003	Rio Grande	3			0 - 10			Yes									Yes	Two-track road from Hwy to access river
1004	Rio Grande	3			0 - 10							Yes						
1005	Rio Grande	3			0 - 10		Yes	Yes									Yes	Road parallels river from point for approx .7 miles; some encroachment in riparian
1006	Rio Grande	3			10 - 49			Yes			Yes						Yes	Seven Mile Campground; pit toilets; compacted soils; trails in riparian
1007	Rio Grande	3			50 - 80		Yes										Yes	Road encroachment .16 miles; minimal riparian veg
1008	Rio Grande	3			10 - 49	Yes	Yes	Yes										Bridge crossing; pull-outs on both sides
1009	Rio Grande	3			81 - 100			Yes									Yes	Boat launch site; parking area
1010	Rio Grande	3			0 - 10	Yes	Yes											Hwy bridge crossing
1011	Rio Grande	3			10 - 49	Yes	Yes	Yes									Yes	Old bridge abutments and road in riparian and upland areas
1012	Rio Grande	3			0 - 10							Yes						Utility corridor runs north south along reach of river
1013	Rio Grande	3			0 - 10			Yes									Yes	Two-track roads in upland to access river
1014	Rio Grande	3			0 - 10			Yes									Yes	Two-track roads and trails in upland and riparian areas along this section; old grazing field?
1015	Rio Grande	3			0 - 10					Yes							Yes	Old diversion structure?
1016	Rio Grande	3			0 - 10			Yes			Yes						Yes	Dispersed out-buildings (housing development); two-track roads and trails in riparian and upland areas
1017	Rio Grande	3			81 - 100												Yes	Natural land disturbance; no riparian veg
1018	Rio Grande	3			10 - 49			Yes			Yes						Yes	Private land from point downstream approx 6.4 miles on both sides of river; dispersed out-buildings impacts; trails in riparian
1019	Rio Grande	3			0 - 10	Yes		Yes			Yes							Bridge crossing
1020	Rio Grande	3			81 - 100												Yes	Natural land disturbance; no riparian veg
1021	Rio Grande	3			0 - 10			Yes		Yes	Yes						Yes	Livestock trails; corrals; two-track roads in upland and riparian
1022	Rio Grande	3			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge
1023	Rio Grande	3			0 - 10			Yes			Yes				Yes			In-stream habitat structures from point for approx 1.2 miles downstream
1024	Rio Grande	3			10 - 49	Yes	Yes	Yes			Yes						Yes	Bridge crossing; two-track roads on both sides in upland and along riparian areas
1025	Rio Grande	3			10 - 49	Yes	Yes											Hwy bridge crossing
1026	Rio Grande	3			10 - 49			Yes		Yes	Yes	Yes						Ag impacts
1027	Rio Grande	3			0 - 10			Yes			Yes							Heavily used trails in riparian from housing development
1028	Rio Grande	3			0 - 10	Yes	Yes	Yes									Yes	Bridge crossing; pull-out /parking on north side; trails and two-track roads in riparian on both sides upstream and downstream
1029	Rio Grande	3			0 - 10			Yes			Yes						Yes	Trails in riparian from housing development
1030	Rio Grande	3			0 - 10			Yes			Yes						Yes	Several two-track roads in upland to access river
1031	Rio Grande	3			0 - 10			Yes		Yes	Yes							
1032	Rio Grande	3			10 - 49	Yes	Yes	Yes			Yes						Yes	Bridge crossing
1033	Rio Grande	3			50 - 80			Yes			Yes						Yes	Airport Rd boat launch; parking area; pit toilet
1034	Rio Grande	3			0 - 10			Yes									Yes	Several two-track roads in upland area; trails in riparian
1035	Rio Grande	3			10 - 49			Yes			Yes						Yes	Material stockpile area for large RV park; two-track road along riparian
1036	Rio Grande	3			0 - 10			Yes		Yes	Yes	Yes						Livestock trails in upland and riparian areas
1037	Rio Grande	3			10 - 49			Yes			Yes						Yes	Off-channel water body; pond?; treatment facility? for RV park?
1038	Rio Grande	3			50 - 80			Yes			Yes						Yes	Densely populated RV park approx 33 acres
1039	Rio Grande	3			10 - 49		Yes	Yes									Yes	Google Earth Imagery 2015 shows parking area and gravel boat ramp
1040	Rio Grande	3			50 - 80			Yes			Yes						Yes	Pull-out/parking area; trails in riparian
1041	Rio Grande	3			0 - 10			Yes							Yes		Yes	In-stream habitat and bank stabilization structures from this point downstream for approx 3.6 miles
1042	Rio Grande	3			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
1043	Rio Grande	3			0 - 10			Yes				Yes					Yes	Two-track roads and trails in riparian and upland areas along this reach from the downstream housing development
1044	Rio Grande	3			0 - 10			Yes				Yes					Yes	Two-tracks roads and trails in upland to access river; utility roads
1045	Rio Grande	3			0 - 10						Yes							Ag impacts in upland; livestock trails in riparian
1046	Rio Grande	3			0 - 10	Yes		Yes									Yes	Hwy bridge crossing; pull-out on east side; trails to riparian to access river
1047	Rio Grande	3			0 - 10	Yes											Yes	Railroad bridge crossing
1048	Rio Grande	3			0 - 10					Yes	Yes						Yes	Ag impacts in uplands; multiple two-track roads parallel north side of river in upland and along riparian
1049	Rio Grande	3			0 - 10					Yes								Grazing impacts in upland
1050	Rio Grande	3			0 - 10			Yes									Yes	Multiple two-track roads in upland and riparian areas to access river
1051	Rio Grande	3			0 - 10			Yes									Yes	Two-track roads in upland and along riparian; trails in riparian to access river
1053	Rio Grande	3			0 - 10			Yes									Yes	Diversion structure
1054	Rio Grande	3			0 - 10	Yes		Yes									Yes	Pedestrian bridge crossing; two track road on south west side in riparian and upland area
1055	Rio Grande	3			0 - 10	Yes	Yes	Yes									Yes	Ford crossing in ditch
1056	Rio Grande	3			0 - 10	Yes		Yes	Yes								Yes	Pedestrian crossing at head of series of in-stream water bodies

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1057	Rio Grande	3			10 - 49			Yes									Yes	parking/turn around for pond
1058	Rio Grande	3			0 - 10	Yes		Yes									Yes	Culvert crossing in riparian
1059	Rio Grande	3			0 - 10	Yes		Yes									Yes	Culvert crossing in riparian
1060	Rio Grande	3			0 - 10			Yes									Yes	Outflow from in-channel water bodies
1061	Rio Grande	3			0 - 10			Yes									Yes	Two-track road along riparian area to access river
1062	Rio Grande	3			0 - 10					Yes							Yes	Grazing impacts; livestock trails; roads in upland and riparian area
1063	Rio Grande	3			10 - 49			Yes									Yes	Parking area for access to river; trails in riparian
1064	Rio Grande	3			0 - 10			Yes									Yes	Two-track road and trails in upland and riparian area to access river
1065	Rio Grande	3			0 - 10			Yes		Yes	Yes						Yes	Livestock/trails and two track roads in upland and riparian area
1066	Rio Grande	3			0 - 10					Yes								
1067	Rio Grande	3			0 - 10							Yes						Utility corridor road runs along channel in uplands and along riparian
1068	Rio Grande	3			10 - 49		Yes											Road encroachment for .2 miles
1069	Rio Grande	3			10 - 49												Yes	Material stockpile area in upland and along riparian approx .08 acres
1070	Rio Grande	3			0 - 10							Yes						
1071	Rio Grande	3			0 - 10												Yes	Railroad tracks run along the west bank of the river
1072	Rio Grande	3			0 - 10			Yes									Yes	Multiple two-track roads off main road in upland to access river and stockpile area
1073	Rio Grande	3			10 - 49		Yes											
1074	Rio Grande	3			0 - 10			Yes				Yes						Two-track road runs parallel on west side of river along riparian
1075	Rio Grande	3			0 - 10	Yes												Hwy bridge crossing
1076	Rio Grande	3			0 - 10			Yes									Yes	Pull-out/parking areas on both sides of bridge to access river; two-track road on south side upland
1077	Rio Grande	3			10 - 49		Yes										Yes	Railroad encroachment in west side of river; hard to tell extent of impact to riparian veg loss
1078	Rio Grande	3			10 - 49			Yes									Yes	Wagon Wheel Gap boat launch site and parking area
1079	Rio Grande	3			81 - 100		Yes											Encroachment from Hwy from point approx .2 miles downstream; minimal riparian veg
1080	Rio Grande	3			81 - 100	Yes	Yes	Yes				Yes					Yes	Railroad bridge crossing; pull-out/parking area on east side upland; bare soils on west upland approx .4 acres
1081	Rio Grande	3			10 - 49			Yes									Yes	Heavily used two-track road/trail from upland to riparian to access river; heavily used trail from point downstream to bridge
1082	Rio Grande	3			10 - 49	Yes	Yes	Yes									Yes	Bridge crossing; pull-out/parking area on west side; trails leading upstream and downstream of parking area in upland and riparian areas
1083	Rio Grande	3			0 - 10			Yes				Yes					Yes	Multiple two-track roads under utility lines
1084	Rio Grande	3			10 - 49						Yes						Yes	Abandoned railroad car; materials stockpile area in upland
1085	Rio Grande	3			10 - 49					Yes							Yes	Livestock corral
1086	Rio Grande	3			0 - 10			Yes									Yes	Two-track road in upland to access river; trails in riparian
1087	Rio Grande	3			10 - 49			Yes									Yes	Dispersed camping sites; road runs parallel to river; trails in riparian
1088	Rio Grande	3			0 - 10	Yes											Yes	Outlet channel from off-stream pond from Goose Creek; culvert crossing just upstream of point
1089	Rio Grande	3			10 - 49			Yes			Yes						Yes	Dispersed out-building impacts from point downstream approx .5 miles; trails in riparian
1090	Rio Grande	3			81 - 100			Yes			Yes						Yes	Compacted soils approx .35 acres; very little veg
1091	Rio Grande	3			10 - 49			Yes			Yes				Yes		Yes	2 off-channel ponds; compacted soils surrounding both; minimal riparian veg along downstream pond
1092	Rio Grande	3			0 - 10				Yes		Yes						Yes	4 water treatment ponds
1093	Rio Grande	3			10 - 49			Yes			Yes						Yes	Livestock corrals
1094	Rio Grande	3			10 - 49												Yes	Material stockpile area in and along riparian area
1095	Rio Grande	3			81 - 100			Yes				Yes					Yes	No riparian veg in .19 acre area adjacent to utility pole
1096	Rio Grande	3			10 - 49	Yes		Yes	Yes	Yes							Yes	Diversion structure for 2 in-stream waterbodies; road in riparian on riverside of ponds; pedestrian crossing between ponds
1097	Rio Grande	3			10 - 49			Yes		Yes	Yes						Yes	Out-building impacts (ranch); livestock corral; numerous two-track roads and trails/livestock trails in upland and riparian
1098	Rio Grande	3			50 - 80			Yes									Yes	Minimal riparian veg on bank between river and ponds, approx .25 mile
1099	Rio Grande	3			0 - 10			Yes				Yes					Yes	Two-track road below utility corridor in upland
1100	Rio Grande	3			50 - 80			Yes									Yes	Parking area in upland
1101	Rio Grande	3			10 - 49		Yes										Yes	Railroad encroachment for approx 5 miles from point downstream in and along riparian areas; sections where no riparian veg exists
1102	Rio Grande	3			0 - 10		Yes	Yes									Yes	FS road runs parallel to river for approx .8 miles from point downstream; hard to tell extent of impact
1103	Rio Grande	3			10 - 49			Yes			Yes						Yes	Dispersed out-buildings (housing development) on both sides of river for approx .9 miles
1104	Rio Grande	3			10 - 49	Yes	Yes	Yes			Yes							Bridge crossing
1105	Rio Grande	3			0 - 10							Yes						
1106	Rio Grande	3			0 - 10							Yes						
1107	Rio Grande	3			81 - 100			Yes			Yes						Yes	No riparian veg from point downstream for approx .1 mile
1108	Rio Grande	3			10 - 49			Yes			Yes						Yes	Houses are approx 30 to 50 ft from river for approx .2 miles; minimal riparian veg-may be bank stabilization (hard to see extent); some houses have lawns to waters edge
1109	Rio Grande	3			0 - 10							Yes						
1110	Rio Grande	3			0 - 10			Yes				Yes						Two-track road follows utility corridor in upland downstream and into housing development
1111	Rio Grande	3			0 - 10							Yes						Utilities cross from river left to river right
1112	Rio Grande	3			10 - 49			Yes			Yes						Yes	Palisade Campground; compacted soils; pit toilets; boat launch site; parking area; abandoned railroad car
1113	Rio Grande	3			0 - 10			Yes									Yes	Two-track roads off Hwy upstream and downstream in uplands areas to access river; several pull-outs and parking areas; trails in riparian
1114	Rio Grande	3			0 - 10							Yes						Split two-track road off highway to access river
1115	Rio Grande	3			10 - 49	Yes	Yes										Yes	Railroad bridge crossing
1116	Rio Grande	3			0 - 10			Yes			Yes	Yes					Yes	Utility road and FS road runs along west bank of river
1117	Rio Grande	3			0 - 10			Yes									Yes	Parking area for dispersed rec to access river
1118	Rio Grande	3			0 - 10							Yes						
1119	Rio Grande	3			0 - 10	Yes		Yes										Bridge crossing
1120	Rio Grande	3			81 - 100			Yes				Yes					Yes	Upper Coller boat launch; cut bank drop; parking area
1121	Rio Grande	3			10 - 49		Yes										Yes	Railroad runs along riparian for approx .2 miles
1122	Rio Grande	3			0 - 10							Yes						
1123	Rio Grande	3			10 - 49			Yes			Yes						Yes	Dispersed out-building impacts (housing development) for approx .7 miles downstream of point; houses mostly in upland but few along riparian
1124	Rio Grande	3			0 - 10							Yes						

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1125	Rio Grande	3			0 - 10			Yes			Yes	Yes					Yes	Utility crosses to west side of river; dispersed out-buildings (residential); two-track roads in upland and riparian
1126	Rio Grande	3			0 - 10	Yes		Yes			Yes						Yes	Pedestrian bridge crossing
1127	Rio Grande	3			10 - 49			Yes			Yes						Yes	Residential; two-track road in upland; trails in riparian
1128	Rio Grande	3			10 - 49												Yes	Material stockpile area in upland
1129	Rio Grande	3			10 - 49			Yes			Yes	Yes					Yes	Dispersed out-buildings (residential); utility corridor; FS road runs parallel to river in upland
1130	Rio Grande	3			0 - 10	Yes		Yes									Yes	Bridge crossing; parking areas on both sides; trails in riparian
1131	Rio Grande	3			50 - 80			Yes									Yes	Middle Coller boat launch; parking area; trails in riparian
1132	Rio Grande	3			0 - 10							Yes						Utility corridor runs along west upland along railroad and FS road
1133	Rio Grande	3			0 - 10			Yes			Yes						Yes	Diversion structure; pump house; two track road to access in upland and riparian; trails in riparian
1134	Rio Grande	3			0 - 10					Yes								Irrigated field in and along riparian; two-road along ditch; culvert crossings over ditch
1135	Rio Grande	3			10 - 49			Yes									Yes	Material stockpile area; road from Hwy to access river; pull-around and parking area along riparian
1136	Rio Grande	3			0 - 10			Yes										Multiple two-track roads from Hwy to access river; trails in and along riparian
1137	Rio Grande	3			10 - 49			Yes									Yes	Parking area; dispersed rec impacts; two-track road along riparian from Hwy to access river
1138	Rio Grande	3			10 - 49			Yes									Yes	Two-track roads in upland to parking area; dispersed rec impacts; trails in riparian
1139	Rio Grande	3			0 - 10					Yes							Yes	Some sort of pipe/old irrigation ditch? that runs along west bank
1140	Rio Grande	3			0 - 10			Yes							Yes			Series of in-stream habitat structures from point downstream for approx 3.5 miles
1141	Rio Grande	3			0 - 10			Yes				Yes					Yes	Two-track road under utility; road used to access riparian from Hwy
1142	Rio Grande	3			0 - 10			Yes										Two-track road in and along riparian to access river; trails in riparian
1143	Rio Grande	3			10 - 49			Yes									Yes	Lower Coller boat launch; parking area, two-track road from Hwy to access river along riparian; trails in riparian
1144	Rio Grande	3			10 - 49			Yes									Yes	Two-track road along riparian; turn around/parking area to access river
1145	Rio Grande	3			0 - 10							Yes						
1146	Rio Grande	3			0 - 10			Yes			Yes	Yes					Yes	Utility crosses from west to east side of river; beginning of dispersed out-building impacts-private property on both sides of river from point downstream through South Fork approx 4 miles
1147	Rio Grande	3			50 - 80		Yes										Yes	Railroad encroachment from point downstream approx 490 ft
1148	Rio Grande	3			10 - 49		Yes	Yes			Yes							Two-track road runs from subdivision to riparian for access to river
1149	Rio Grande	3			0 - 10			Yes			Yes						Yes	Residential lawns in and along riparian areas
1150	Rio Grande	3			0 - 10			Yes			Yes	Yes						
1151	Rio Grande	3			10 - 49	Yes	Yes	Yes			Yes	Yes						Bridge crossing; utilities cross just downstream of bridge
1152	Rio Grande	3			0 - 10					Yes	Yes	Yes					Yes	Irrigated fields
1153	Rio Grande	3			0 - 10						Yes							Material stockpile area in upland
1154	Rio Grande	3			10 - 49			Yes				Yes					Yes	Pull-out/parking area off Hwy
1155	Rio Grande	3			0 - 10			Yes			Yes						Yes	Two-track road in upland; trails in riparian
1156	Rio Grande	3			10 - 49		Yes										Yes	Railroad encroachment from point downstream approx .1 mile
1157	Rio Grande	3			0 - 10							Yes						
1158	Rio Grande	3			0 - 10					Yes								Ag impacts
1159	Rio Grande	3			0 - 10	Yes												Bridge crossing
1160	Rio Grande	3			10 - 49		Yes	Yes			Yes						Yes	Pull-out/parking to access river; unofficial boat ramp; 10-12 ft swath cut out of riparian
1161	Rio Grande	3			10 - 49		Yes	Yes		Yes	Yes						Yes	Two-track road accessing river; 10 ft swath cut out of riparian
1162	Rio Grande	3			0 - 10			Yes		Yes	Yes						Yes	Approx 60 acres irrigated fields in upland and riparian
1163	Rio Grande	3			0 - 10							Yes						
1164	Rio Grande	3			0 - 10			Yes			Yes	Yes						
1165	Rio Grande	3			0 - 10			Yes			Yes	Yes						
1166	Rio Grande	3			0 - 10												Yes	Material stockpile area in riparian
1167	Rio Grande	3			10 - 49		Yes										Yes	Railroad encroachment from point downstream approx 400 ft
1168	Rio Grande	3			0 - 10			Yes			Yes	Yes						
1169	Rio Grande	3			0 - 10			Yes			Yes						Yes	Residential lawns along section of river
1170	Rio Grande	3			10 - 49			Yes			Yes						Yes	Material stockpile area in and along riparian
1171	Rio Grande	3			0 - 10			Yes			Yes	Yes						
1172	Rio Grande	3			50 - 80		Yes	Yes										Hwy encroachment from point downstream approx .2 miles; pull-out/parking along Hwy
1173	Rio Grande	3			0 - 10			Yes									Yes	Two-track roads/trails in upland and riparian to access river
1174	Rio Grande	3			0 - 10												Yes	Stormwater gully/outlet from pavement in subdivision
1175	Rio Grande	3			0 - 10												Yes	Stormwater gully/outlet from pavement in subdivision
1176	Rio Grande	3			10 - 49			Yes			Yes						Yes	Two in-stream habitat/deflector structures
1177	Rio Grande	3			0 - 10			Yes			Yes						Yes	Evidence of run-off from pavement; trails in riparian
1178	Rio Grande	3			0 - 10							Yes						
1179	Rio Grande	3			0 - 10							Yes					Yes	Utility road follows corridor
1180	Rio Grande	3			10 - 49		Yes	Yes				Yes					Yes	Main Street Hwy 149 Bridge boat launch; parking area
1181	Rio Grande	3			0 - 10	Yes											Yes	Hwy bridge crossing
1182	Rio Grande	3			10 - 49			Yes			Yes	Yes					Yes	Two-track road to access river
1183	Rio Grande	3			0 - 10												Yes	Evidence of run-off from pavement
1184	Rio Grande	3			0 - 10			Yes			Yes						Yes	Two-track road/turn around/parking to access river; trails in riparian
1185	Rio Grande	3			81 - 100			Yes			Yes						Yes	Bank stabilization - residential impacts
1186	Rio Grande	3			10 - 49			Yes			Yes						Yes	Several residential homes have lawns in and along riparian
1187	Rio Grande	3			0 - 10			Yes			Yes						Yes	Golf course
1188	Rio Grande	3			10 - 49		Yes											Road encroachment
1189	Rio Grande	3			0 - 10			Yes		Yes	Yes							Ag impacts
1190	Rio Grande	3			0 - 10			Yes			Yes				Yes		Yes	In-stream habitat/deflector structure
1191	Rio Grande	3			81 - 100						Yes	Yes					Yes	Utility plant in upland
1192	Rio Grande	3			81 - 100			Yes		Yes	Yes						Yes	Rodeo/Fairgrounds
1193	Rio Grande	3			0 - 10			Yes			Yes						Yes	Golf course
1194	Rio Grande	3			10 - 49			Yes			Yes						Yes	Dispersed rec; pit toilet; trails in riparian; some evidence of run-off from pavement to river
1195	Rio Grande	3			0 - 10						Yes	Yes					Yes	Abandoned railroad cars
1196	East Ute Creek	1		Yes	0 - 10			Yes			Yes							Trails runs along upland and along riparian areas
1197	East Ute Creek	1		Yes	0 - 10			Yes					Yes					Heavily used trail in upland and along riparian areas
1198	East Ute Creek	1		Yes	0 - 10			Yes						Yes				Trail runs along east side of creek in and along riparian areas
1199	Ute Creek	1		Yes	0 - 10			Yes						Yes				Trail runs in and along riparian area
1200	Ute Creek	1		Yes	0 - 10			Yes						Yes				Ute Creek Trail runs along west side of creek in and along riparian area

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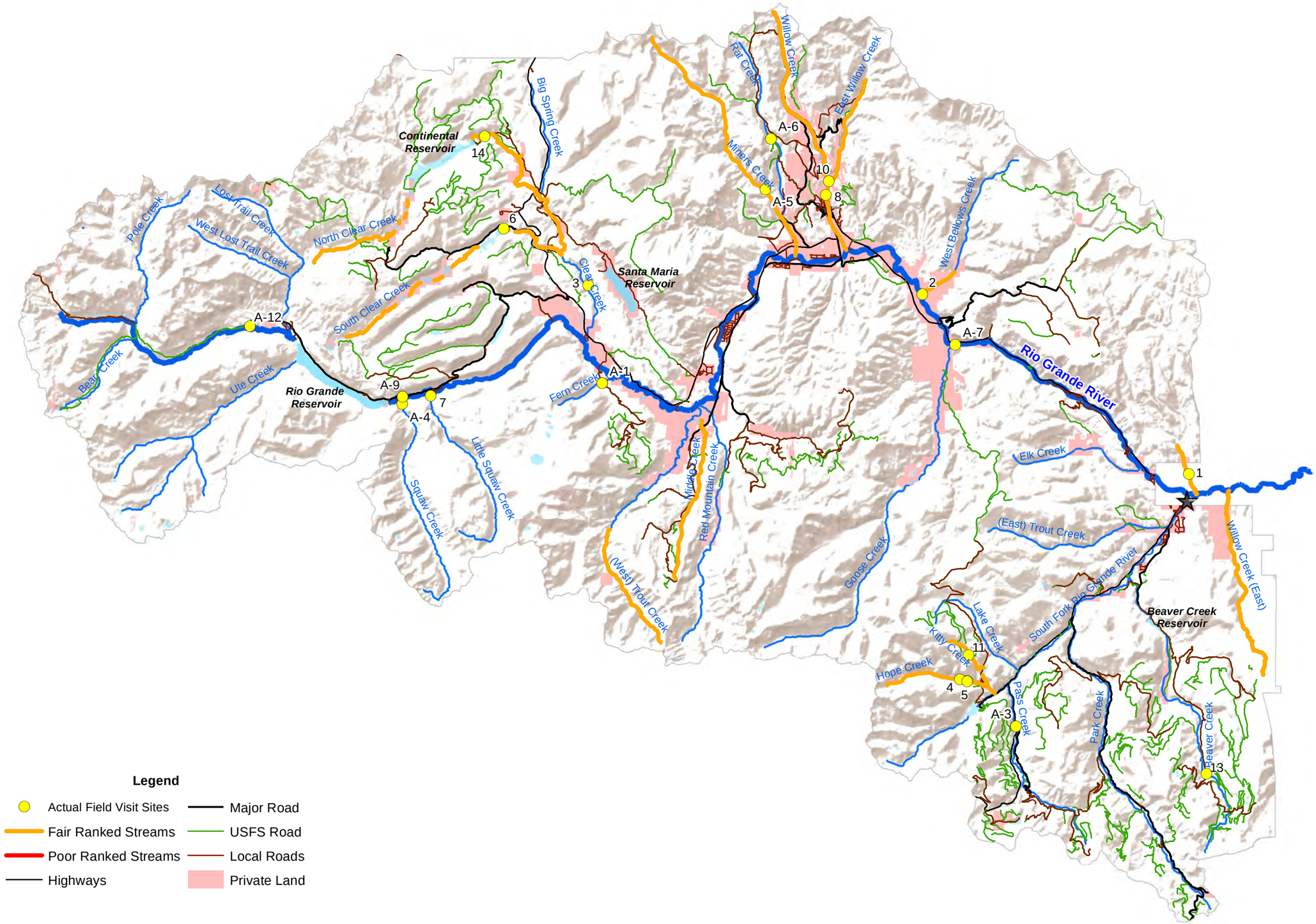
1201	Ute Creek	1		Yes	0 - 10			Yes						Yes				Trails run in upland and riparian areas
1202	Willow Creek East	1			0 - 10	Yes											Yes	Railroad bridge crossing
1203	Willow Creek East	1			0 - 10	Yes												Hwy bridge crossing
1204	Willow Creek East	1			0 - 10					Yes							Yes	Irrigation ditch; cannot see headgate due to trees next to creek
1205	Willow Creek East	1			0 - 10					Yes	Yes							Ag/grazing impacts in upland - approximately 15 acres
1206	Willow Creek East	1			0 - 10					Yes	Yes							Livestock corral in upland; ag impacts
1207	Willow Creek East	1			0 - 10	Yes												Bridge crossing
1208	Willow Creek East	1			0 - 10					Yes								Ag/grazing impacts in upland
1209	Willow Creek East	1			0 - 10					Yes								Ag impacts in upland
1210	Willow Creek East	1			0 - 10	Yes												Road crossing but hard to tell if it is a bridge or ford due to trees
1211	Willow Creek East	1			0 - 10					Yes							Yes	Irrigation ditch runs along east side of creek in uplands and into riparian for approx .21 miles upstream from point
1212	Willow Creek East	1			0 - 10					Yes	Yes							Irrigation ditch runs in and along riparian and upland from point approx .78 miles upstream west of creek
1213	Willow Creek East	1			10 - 49			Yes			Yes							Out building impacts (private land)
1214	Willow Creek East	1			0 - 10			Yes			Yes						Yes	Dispersed rec impacts; trails in riparian; two pedestrian bridges over ditch
1215	Willow Creek East	1			0 - 10					Yes								Livestock trails in upland
1216	Willow Creek East	1			0 - 10					Yes								Livestock trails in riparian and upland
1217	Willow Creek East	1			0 - 10	Yes												Bridge crossing
1218	Willow Creek East	1			10 - 49			Yes		Yes	Yes							Dispersed out building impacts (housing development on both sides of creek from point upstream approx 1.13 miles)
1219	Willow Creek East	1			0 - 10			Yes		Yes	Yes							Ag impacts; irrigation ditches present; culvert crossings over ditch; debris stockpile areas in upland
1220	Willow Creek East	1			0 - 10					Yes								Livestock trails in riparian
1221	Willow Creek East	1			10 - 49					Yes								Livestock corral in upland
1222	Willow Creek East	1			0 - 10			Yes	Yes		Yes							Road runs along NE boundary of pond in riparian
1223	Willow Creek East	1			0 - 10	Yes											Yes	Pedestrian bridge crossing
1224	Willow Creek East	1			0 - 10	Yes												Bridge crossing
1225	Willow Creek East	1			0 - 10					Yes								Livestock trails in riparian and upland
1226	Willow Creek East	1			10 - 49			Yes			Yes				Yes		Yes	House built within 15 feet of creek; 100 ft bank stabilization structure on west side of creek
1227	Willow Creek East	1			10 - 49			Yes							Yes		Yes	Series of instream habitat and bank stabilization structures from point upstream approx .22 miles
1228	Willow Creek East	1			0 - 10	Yes												Bridge crossing
1229	Willow Creek East	1			0 - 10			Yes										Two-track road from upland to riparian to access creek
1230	Willow Creek East	1	Yes		10 - 49			Yes			Yes						Yes	Landscaping pond in riparian area
1231	Willow Creek East	1	Yes		0 - 10	Yes												Ford crossing
1232	Willow Creek East	1	Yes		0 - 10	Yes					Yes							Bridge crossing
1233	Willow Creek East	1	Yes		0 - 10												Yes	Numerous downed trees from Million Fire in upland and riparian areas
1234	Willow Creek East	1	Yes		10 - 49	Yes		Yes					Yes					Bridge crossing to access east bank; two-track road in riparian and upland on east side
1235	Willow Creek East	1	Yes		10 - 49								Yes					Burn evidence in upland and in riparian; downed trees on both sides of creek
1236	Willow Creek East	1	Yes		0 - 10	Yes							Yes					Ford crossing
1237	Willow Creek East	1	Yes	Yes	0 - 10	Yes	Yes							Yes				Culvert crossing
1238	Willow Creek East	1		Yes	10 - 49												Yes	Natural land disturbance; debris path in upland into riparian
1239	Willow Creek East	1		Yes	10 - 49									Yes			Yes	Old logging site in upland
1240	Willow Creek East	1		Yes	0 - 10	Yes								Yes				Culvert crossing
1241	Willow Creek East	1		Yes	10 - 49		Yes							Yes				
1242	Willow Creek East	1		Yes	10 - 49		Yes											
1244	Willow Creek East	1		Yes	0 - 10			Yes						Yes				Dispersed camping; two-track roads in upland; road parallels west side of creek
1245	Willow Creek East	1		Yes	0 - 10	Yes		Yes						Yes				Ford crossing
1246	Willow Creek East	1		Yes	10 - 49	Yes	Yes	Yes						Yes			Yes	Pull out and parking area on west side of bridge; additional road runs parallel in riparian on west bank
1247	Willow Creek East	1		Yes	0 - 10			Yes		Yes				Yes				Heavily used trail on west riparian
1248	Willow Creek East	1		Yes	0 - 10			Yes										Two-track road runs along east bank upland
1249	Willow Creek East	1		Yes	0 - 10			Yes		Yes				Yes				Trails/livestock trails in upland and riparian
1250	Willow Creek East	1		Yes	50 - 80					Yes				Yes				Area of compacted soils approx .11 acres - cattle trough; numerous livestock trails in upland and riparian
1251	Willow Creek East	1		Yes	0 - 10	Yes												Ford crossing
1252	Willow Creek East	1		Yes	0 - 10			Yes		Yes				Yes				Heavily used trial/livestock trail in and along west riparian
1253	Willow Creek East	1		Yes	0 - 10					Yes				Yes				Livestock trails in upland
1254	Willow Creek East	1		Yes	0 - 10					Yes				Yes				Cattle trough?; livestock trails in riparian and upland
1255	Alder Creek	1			0 - 10			Yes										Golf course on both sides of creek approx 400 ft from point upstream; upland impacts
1256	Alder Creek	1			0 - 10	Yes		Yes										Golf course bridge crossing
1258	Alder Creek	1			0 - 10												Yes	Material stockpile area in upland
1259	Alder Creek	1			10 - 49			Yes			Yes				Yes		Yes	Bank stabilization structures from point upstream .35 miles on both sides of creek; dispersed out building impacts (private land)
1260	Alder Creek	1			10 - 49			Yes			Yes							Evidence of new housing lots along riparian area on west bank
1261	Alder Creek	1			0 - 10		Yes											Two-track access road along east riparian and upland for bank work
1262	Alder Creek	1			10 - 49		Yes											Two-track road along east upland
1263	Alder Creek	1			0 - 10	Yes												Bridge crossing
1264	Alder Creek	1			10 - 49			Yes			Yes							Stockpile area for golf course; maintenance building
1265	Alder Creek	1			0 - 10	Yes												Bridge crossing
1266	Alder Creek	1			0 - 10			Yes			Yes							Golf course in upland
1267	Alder Creek	1			0 - 10	Yes	Yes	Yes										Bridge and road that runs parallel on east bank in and along riparian and upland areas
1268	Alder Creek	1			0 - 10			Yes			Yes				Yes		Yes	From point upstream 1.12 miles: dispersed out building impacts (private land on west side); golf course impacts in upland and riparian; bank stabilization structures
1269	Alder Creek	1			0 - 10	Yes		Yes										Golf course bridge crossing
1270	Alder Creek	1			0 - 10	Yes		Yes									Yes	Pedestrian bridge crossing
1271	Alder Creek	1			10 - 49		Yes	Yes										
1272	Alder Creek	1			10 - 49		Yes	Yes										
1273	Alder Creek	1			10 - 49		Yes	Yes										
1274	Alder Creek	1			10 - 49		Yes	Yes										
1275	Alder Creek	1			10 - 49		Yes	Yes										
1276	Alder Creek	1			10 - 49		Yes	Yes										

Object ID	Name	Stream Order	Within Fire Boundary	Within Insect Boundary	Vegetation Removed and/or Fragmented	Road Crossing	Road Encroachment	Dispersed Recreation Impact	On-Channel Waterbodies	Ag Impacts	Out Buildings	Utility Corridor	Burn Evidence	Beetle Kill Evidence	Instream Habitat Structure	Mining	Other	Comment
1277	Alder Creek	1			10 - 49		Yes	Yes										
1278	Alder Creek	1			0 - 10	Yes		Yes										Golf course bridge crossing
1279	Alder Creek	1			50 - 80		Yes	Yes										
1280	Alder Creek	1			10 - 49		Yes	Yes										
1281	Alder Creek	1			10 - 49		Yes	Yes										
1282	Alder Creek	1			10 - 49		Yes	Yes										
1283	Alder Creek	1			10 - 49		Yes	Yes										
1284	Alder Creek	1			10 - 49		Yes	Yes										
1285	Alder Creek	1			50 - 80			Yes									Yes	.23 acre area of minimal vegetation in riparian and upland
1286	Alder Creek	1			10 - 49		Yes	Yes										
1287	Alder Creek	1			10 - 49		Yes	Yes										
1288	Alder Creek	1			0 - 10	Yes		Yes										Golf course bridge
1289	Alder Creek	1			10 - 49		Yes	Yes										
1290	Alder Creek	1			10 - 49		Yes	Yes										
1291	Alder Creek	1			0 - 10	Yes		Yes										Golf course bridge crossing
1292	Alder Creek	1			0 - 10			Yes										Two-track roads and trails in upland and along riparian on both side of creek
1293	Alder Creek	1			10 - 49			Yes										Pull-out/parking area; trails to access creek
1294	Alder Creek	1			0 - 10			Yes										Two-track road in uplands along riparian
1295	Alder Creek	1			0 - 10			Yes										Pull-out/parking area for access to creek
1296	Alder Creek	1			0 - 10			Yes		Yes	Yes							Dispersed out-building impacts (private home); ag impacts
1297	Alder Creek	1			0 - 10			Yes		Yes								Grazing impacts

Notes:
Data taken from Google Earth imagery during ArcGIS desktop analysis by Cindy Adams and Kelly Haun.



Legend

- Actual Field Visit Sites
- Fair Ranked Streams
- Poor Ranked Streams
- Highways
- Major Road
- USFS Road
- Local Roads
- Private Land

SGM
118 W. Sixth St., Suite 200
Glenwood Springs, CO 81601
970.945.1004
www.sgm-inc.com

lotic hydrological

Field Map for Volunteers

Upper Rio Grande Watershed Assessment

Date: 09/20/2017

Data Sources: USFS, USGS, ESRI, CWCB

File: I:\2016\2016-372-UpperRioGrande\001-WatershedAsmnt\H-Dwgs\GIS\MXDs\Riparian_Field_map2017.mxd

0 1 2 4 6 8 Miles

1 inch = 4 miles

N W E S

Photo 1. Impact Site No. 1, Alder Creek. Dispersed recreation impacts from trail along creek.

Photo 2. Photo taken within the vicinity of the site. Dispersed recreation impacts from golf course.

Photo 3. Impacts from road encroachment along trail.

Photo 4. CNHP Site Nos. 11 and 12, Beaver Creek..

Photo 5. Beetle kill impacts in the upland areas.

Photo 6. Some grazing impacts.

Photo 7. Impact Site No. 2, Bellows Creek. Photos taken within the vicinity of the site.

Photo 8.Unable to access site on Bellows Creek due to private land.

Photo 9. CNHP Site No. 3, Clear Creek. Impact from beetle kill in uplands.

Photo 10. Dispersed recreation and grazing impacts along Clear Creek.

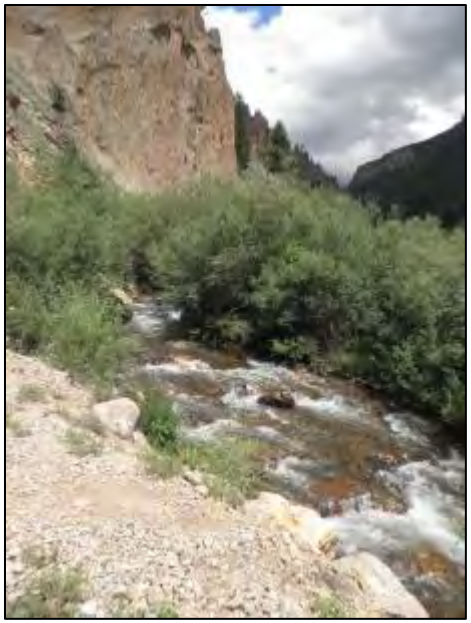


Photo 11. Impact Site No. 9, East Willow Creek. Impacts from road encroachment – looking upstream.

Photo 12. Impacts from road encroachment – looking downstream.

Photo 13. CNHP Site No. 37, Hope Creek. Impacted by West Fork Complex Fire in 2013.

Photo 14. Dominant species after fire are mixture of grasses and forbs with aspen becoming more established.

Photo 15. Impact Site No. 5, Hope Creek. Impacts from fire.

Photo 16. Evidence of erosion from fire; however, vegetation is established in gully to slow velocity and sediment to Hope Creek.

Photo 17. Impact Site No. 7, Little Squaw Creek. Impacted by West Fork Complex Fire in 2013.

Photo 18. Trees were removed for safety concerns after fire. Note soils still effected by evidence of bare ground.

Photo 19. Impact Site No. 14, North Clear Creek.

Photo 20. Impacts include beetle kill, grazing, and road encroachment.

Photo 21. Impact Site No. 6, South Clear Creek.

Photo 22. Dispersed recreation and beetle kill impacts.

Photo 23. Impact Site No. 10, West Willow Creek.

Photo 24. West Willow Creek is highly impacted from mining.

Photo 25. Impact Site No. A1, Fern Creek.

Photo 26. Impacts from road crossing and culvert.

Photo 27. Impact Site No. A3, Pass Creek.

Photo 28. Road crossing at Pass Creek.

Photo 29. Impact Site No. A4, Squaw Creek.

Photo 30. Impacts from out-buildings.

Photo 31. Impact Site No. A5, Miners Creek. Impacts from mining.

Photo 32. Dispersed recreation impacts.

Photo 33. Impact Site No. A6, Rat Creek. Erosion impacts from culvert and road encroachment.

Photo 34. Impacts from beetle kill in uplands.

Photo 35. Impact Site No. A7, Rio Grande River.

Photo 36. Photos taken within vicinity of site.

Photo 37. Impact Site No. A9, Rio Grande River. Site in coordination with water quality location.

Photo 38. Impacts from road crossing and dispersed recreation.

Photo 39. Impact Site No. A12, Rio Grande River, above Rio Grande Reservoir.

Photo 40. Photos taken within vicinity of site. Beetle kill impacts in the uplands.

Photo 41. Impacts from dispersed recreation.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Kelly Haun
Date	7/24/17
CNHP Plot No.	#1
Name of GPS Point Location (Last name and point number, for example: Adams1)	Haun 1
Specify type of GPS used and to what accuracy	Trimble Geo 7x - 3-5'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
2 photos	Riparian area - Willow dominated - well vegetated
2 photos	Upland - beetle kill impact
gps Haun 1-a 4 photos	- trail along channel, stable vegetation, no evidence of erosion
gps Haun 1-b 4 photos	→ Bank Stabilization/road encroachment impact - 0-10%

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce		Some pinon
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	yes ✓	Mixed Alder maybe some smaller cottonwoods
Herbaceous	Mixture of grasses and forbs (flowers)	✓	~~90~~ 100% grass cover
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%	X	X in upland area	X		road encroachment
10-49%				X	
50-80%					
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: Upland area to North 20% impacted by beetle kill

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Kelly Haun
Date	#7/24/17
CNHP Plot No.	(Map ID 4)
Name of GPS Point Location (Last name and point number, for example: Adams1)	Haun 4 - CNHP site #7
Specify type of GPS used and to what accuracy	Trimble Geo 7x - 3-5'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
5-6 photos	All photos taken of vegetation community in riparian and upland areas. - mostly grasses & forbs - lots of small aspen ≈ 40%

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce		
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs		
Herbaceous	Mixture of grasses and forbs (flowers)	✓	grasses & forbs ≈ 90% coverage
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%				X - trail along channel	
10-49%					
50-80%					
81-100%	X	? X			

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: small aspens growing on Northern slope / Actually throughout drainage. Slopes appear stable from vegetation & aspens. No evidence of erosion

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Kelly Haun
Date	7/24/17
CNHP Plot No.	Impact Site - Haun-5
Name of GPS Point Location (Last name and point number, for example: Adams1)	#5
Specify type of GPS used and to what accuracy	Trimble Geo 7x - 3-5'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
total 8 photos	Upland impacts from fire. Large erosion cut from North tributary. Vegetation is approx 60 cover; large rocks in gully slowing run-off.
1 photo	vegetation laid down from surface flow - fairly stable.

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce		
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs		
Herbaceous	Mixture of grasses and forbs (flowers)	✓	grasses are established; some bare ground.
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%				✓ trail	
10-49%					
50-80%					
81-100%	X	?	—		

*Other impacts include: road crossing (bridge of ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: Some areas between Point 4 & 5 that are bare -

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Kelly Haun
Date	7/20/17
CNHP Plot No.	A3
Name of GPS Point Location (Last name and point number, for example: Adams1)	Haun-A3 - impact site
Specify type of GPS used and to what accuracy	Trimble Geo 7x' - 3-5'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
4 photos	photos above culvert across Hwy 160 & Pass Creek Established vegetation on banks. No evidence of erosion

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce		
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	X	willow & Alder
Herbaceous	Mixture of grasses and forbs (flowers)	X	100% cover stable
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%					
10-49%		X			
50-80%					
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: Alternate site - may have had previous impacts from culvert installation but as of today no obvious impacts. Embankments are stable & approx 100% vegetation cover

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Kelly Haun
Date	7/24/17
CNHP Plot No.	#13 – CNHP sites 11 & 12
Name of GPS Point Location (Last name and point number, for example: Adams1)	haun-13 – ≈ 1300' SE of original site
Specify type of GPS used and to what accuracy	Trimble Geo 7x - 3-5'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
7 photos	Looking SE across Beaver Creek
	Cattle grazing in the distance. – Cannot tell level of impact
	Photos of vegetation community

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	
Cottonwood Forest	Cottonwood	✓	
Willow	Willow shrubs	✓	
Herbaceous	Mixture of grasses and forbs (flowers)	✓	
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%			X ?		
10-49%					
50-80%		X			
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: Could get to original site; however, on opposite side of valley. – similar vegetation community as outlined in CNHP – B-Rank reference site

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	SMERCH/MOORE
Date	7/24/17
CNHP Plot No.	A-7 ~~NO FLOWER.~~
Name of GPS Point Location (Last name and point number, for example: Adams1)	
Specify type of GPS used and to what accuracy	GARMIN OR. 450 10'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
35	U/S
36	U/S
37	S. HILLSIDE/ACROSS RIVER
38/39	LAT/LONG

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce		
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs		
Herbaceous	Mixture of grasses and forbs (flowers)		
Other	SPRUCE/P. PINE/COTTONWOOD	YES	

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%		✓		✓	
10-49%					
50-80%					
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: STABLE BANKS/ NEXT TO 4WR FENCE
JUST D/S OF ELK CR. / U/S FROM RESORT

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	SMERCH/MOORE
Date	7/24/17
CNHP Plot No.	IMPACT SITE
Name of GPS Point Location (Last name and point number, for example: Adams1)	BELLOWS CR.
Specify type of GPS used and to what accuracy	

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#40/41	U/S FROM RD
#42	DS FROM RD
#43	HILLSIDE ACROSS RIVER

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce / ASPEN	✓	
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs		
Herbaceous	Mixture of grasses and forbs (flowers)	✓	
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%		✓ ACROSS RIVER		✓ GOOD HEAVILY USED	
10-49%			✓ ACROSS RIVER		
50-80%					
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: STABLE HILLSIDES / DID NOT SEE STREAM OR NEW CONSTRUCTION WORK

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	SMERCH/MOORE
Date	7/24/17
CNHP Plot No.	IMPACT SITE #10
Name of GPS Point Location (Last name and point number, for example: Adams1)	W. WILLOW CR.
Specify type of GPS used and to what accuracy	GARMIN OR. 450 17'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#44	U/S TOWARD 503
45	D/S " CREEK
46	CLIFF W/ MINING
47	HILLSIDE ABOVE U/S
48	GPS

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce		
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs		
Herbaceous	Mixture of grasses and forbs (flowers)		
Other	SMALL COMM. OF SPRUCE/FIR/WILLOW	✓	MOSTLY CLIFF + TAILINGS

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other* OLD MINING
0-10%					
10-49%					✓
50-80%					
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: TAILINGS IN ST REAM

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	SMERCH / MOORE
Date	7/24/17
CNHP Plot No.	8
Name of GPS Point Location (Last name and point number, for example: Adams1)	WILLOW CREEK
Specify type of GPS used and to what accuracy	GARMIN OR. 450

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#50	D/S @ FOREBAY
51	U/S @ "
52/53	GPS

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce		
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs		
Herbaceous	Mixture of grasses and forbs (flowers)		MINOR GRASSES/SPRUCE
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%					
10-49%					
50-80%					
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: POWER LINES / MINING STRUCTURE / FOREBAY

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	SMERCH/MOORE
Date	7/24/17
CNHP Plot No.	9
Name of GPS Point Location (Last name and point number, for example: Adams1)	E. WILLOW CR.
Specify type of GPS used and to what accuracy	GARMIN OR 450 ~~30'~~ 15'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#54	U/S E. WILLOW CR
#55	D/S " " "
#56	N. SLOPES
#57	E. SLOPE

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	
Herbaceous	Mixture of grasses and forbs (flowers)		
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%		✓			
10-49%					
50-80%					
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: STREAM CONFINED BY ROAD

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	SMERUK/MOORE
Date	7/24/17
CNHP Plot No.	A-6
Name of GPS Point Location (Last name and point number, for example: Adams1)	RAT CREEK
Specify type of GPS used and to what accuracy	GARMIN OR. 450 10'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#61	U/S OF WASHOUT
62	D/S " "
63	U/S
64	D/S BEETLE KILL
65	PLUGGED CULVERT
66	GPS

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	
Herbaceous	Mixture of grasses and forbs (flowers)	✓	
Other	ASPEN	✓	

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%					
10-49%		✓			
50-80%		✓			
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: CULVERT PLUGGED/ROAD WASHOUT/IMPASSABLE

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	SMERCH/MOORE
Date	7/24/17
CNHP Plot No.	A5
Name of GPS Point Location (Last name and point number, for example: Adams1)	MINERS CR.
Specify type of GPS used and to what accuracy	GARMIN OR 450 12'

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
67	U/S
68	D/S
69	~~MEADOW~~ FLAT NEXT TO CR.
70	BEAVER DAM
71	BANK COLLAPSE

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	
Herbaceous	Mixture of grasses and forbs (flowers)	✓	
Other ~~ASPEN~~			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%		✓			
10-49%					
50-80%					
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: NOT SURE ABOUT TAILINGS.. COULD BE BANK COLLAPSE? (IF SEEN IN AERIALS)
POINT @ MINERS CR. TRAILHEAD

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Reesor Bachman Team
Date	7-24-2018
CNHP Plot No.	
Name of GPS Point Location (Last name and point number, for example: Adams1)	Reesor 8 - below A12 - windshield assessment
Specify type of GPS used and to what accuracy	Awiza

Location 37.76618, -107.37780

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#1	looking upstream into canyon from hill
#2	looking downstream from hill
#3	looking upstream - beetle kill
#4	picture of adjacent upland - aspen + beetle kill

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs		
Herbaceous	Mixture of grasses and forbs (flowers)		
Other	Aspen	✓	

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%					
10-49%					
50-80%		✓			
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: observed river from hill - couldn't get close to observe all veg. types

Use additional sheets if necessary.

Z:\2016\2016-372-UpperRioGrande\001-WatershedAsmnt\B-Calcs and Task Documentation\Task 1 Riparian\Riparian area burn assessment job description-2017-07-20.docx

photos → last 4 photos in folder are for this site.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Reesor - Bachman Team
Date	7-24-2017
CNHP Plot No.	n/a Location: 37.73598, -107.10009
Name of GPS Point Location (Last name and point number, for example: Adams1)	Reesor 1 (Fern Creek, A1)
Specify type of GPS used and to what accuracy	Avenza Maps App

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
1 Picture #1	road crossing
1 picture #2	looking upstream from road
1 pic #3	culvert
#4	Upland condition - beetle kill spruce
#5	down hill looking at culvert

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	Spruce + aspen mixed
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	
Herbaceous	Mixture of grasses and forbs (flowers)		
Other	Aspen		

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%					
10-49%		✓			
50-80%					
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: dense vegetation - mix of aspen, spruce, willow, + herbacious
impacts from road crossing and culvert - shown in photos

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Reesor - Bachman Team
Date	7-24-2017
CNHP Plot No.	#1 + 2
Name of GPS Point Location (Last name and point number, for example: Adams1)	Reesor 2
Specify type of GPS used and to what accuracy	Avenza maps

Location - 37.79671, -107.11274

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#1	Clear creek from hill - view of bristol head
#2	fly fisherman on Clear creek
#3	path to creek - grazing impacts / dispersed rec.
#4	clear creek looking upstream
#5	grazing impacts next to creek / riparian area
#6	view downstream
#7	adjacent uplands - beetle kill impact
#8	trail to clear creek looking uphill

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	limited / very little present
Herbaceous	Mixture of grasses and forbs (flowers)	✓	dominant
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply. * beetle kill primarily in uplands

Percent Effected	Fire	Beetle*	Grazing	Dispersed Recreation	Other*
0-10%					
10-49%				✓	
50-80%		✓	✓		
81-100%					

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: Beetle kill impacts in uplands, not surrounding creek
significant grazing impacts and some dispersed rec.
Beetle kill in uplands

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Reesor Bachman Team
Date	7-24-2017
CNHP Plot No.	Impacted site #6. South Clear Creek/Brown lake
Name of GPS Point Location (Last name and point number, for example: Adams1)	Reesor 3
Specify type of GPS used and to what accuracy	Avenza Maps

Location: 37.83095, -107.18043

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#1	dam, reservoir, foot bridge, beetle kill in background
#2	so. clear creek, looking downstream of dam
#3	down stream ~~bank erosion/lack of riparian veg at site~~
#4	south clear creek willows/riparian area
~~#5~~	from road directly downstream of Brown Lakes
~~#6~~	
~~#7~~	

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce		
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	dominant
Herbaceous	Mixture of grasses and forbs (flowers)	✓	
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%					
10-49%					
50-80%				✓	
81-100%		✓			✓

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: downstream of dam making Brown Lakes SWA significant recreation + beetle kill in uplands

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Reesor Bachman Team
Date	7-24-2017
CNHP Plot No.	Impact Site #14 - N. Clear Creek
Name of GPS Point Location (Last name and point number, for example: Adams1)	Reesor 4
Specify type of GPS used and to what accuracy	Avenza Maps

Location: 37.88808, -107.19710

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#1	looking downstream - looking down from hill, riparian veg (willows, grass, wetlands. Aspen in background, grazing in foreground
#2	looking upstream, beetle kill in uplands + grazing in foreground
#3	looking upstream
#4	downstream
#5	construction staging site next to creek

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	Spruce + aspen in uplands
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	riparian area
Herbaceous	Mixture of grasses and forbs (flowers)	✓	riparian area
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%					
10-49%			✓		✓
50-80%					
81-100%		✓			

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

* down stream of continental reservoir
*near road/parallels road

Other Notes: high beetle kill in uplands, some grazing downstream of continental reservoir upstream of "Continental Ranch" - recreation cabins + grazing

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	
Date	7-24-2017
CNHP Plot No.	Impacted Site # 7, Little Squaw
Name of GPS Point Location (Last name and point number, for example: Adams1)	Reesor 5
Specify type of GPS used and to what accuracy	Avenza

Location: 37.72557, -107.23457

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#1	Looking downstream, towards Little Squaw resort
#2	Looking upstream, willows, Fire impacts
#3	Looking up Little Squaw canyon, fire impacts
#4 foot	bridge to resort

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce		
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	
Herbaceous	Mixture of grasses and forbs (flowers)	✓	
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%					
10-49%				✓	
50-80%					✓
81-100%	✓				

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

*hydro ax / hazard tree removal

Other Notes: Upstream of Little Squaw resort, downstream of canyon
Area burned in West Fork Complex Fire. ~~standing~~ burned trees were removed w/ hydro ax following fire

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Reesor Bachman Team
Date	7-24-2017
CNHP Plot No.	Impacted site A-9 Rio Grande
Name of GPS Point Location (Last name and point number, for example: Adams1)	Reesor 6
Specify type of GPS used and to what accuracy	Auenza

Location: 37.72474, -107.25649

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#1	looking downstream at 30-mile Bridge
#2	looking upstream - fly fisherman
#3	looking across river - road, aspen
#4	uplands, beetle kill impacts, campground
#5	uplands, fire impacts

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	
Herbaceous	Mixture of grasses and forbs (flowers)	✓	
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other* Road encroachment + crossing
0-10%					
10-49%					✓
50-80%	✓			✓	
81-100%		✓			

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: Site parallels road, next to 30 mile campground & bridge
Uplands impacted by both Fire and beetle kill
high recreation

Use additional sheets if necessary.

Riparian and Upland Area Assessment Field Datasheet

Name of Observer	Reesor Baumman Team
Date	7-24-17
CNHP Plot No.	Impacted site A-4 : Squaw Creek
Name of GPS Point Location (Last name and point number, for example: Adams1)	Reesor 7
Specify type of GPS used and to what accuracy	Avenza Maps

Location: 37.72030, -107.25661

Photographs:

1. Take a picture of the GPS screen with the GPS point label showing.
2. Take landscape photos of the area. Photographs should include items like: general landscape, vegetation (woody and non-woody), extent of any burn area, beetle kill, areas of erosion (bare areas, gullies, rills)
3. In the following table, describe what you took photos of:

Photo Number	Description
#1	downstream of pin, steep rock bank on east bank
#2	adjacent uplands - beetle kill impacts
#3	old building/out building - generator
#4	old ditch/concrete near creek
#5	looking upstream w/ beetle kill spruce and steep cliff/rock + willows
#6	looking down stream - willows, beetle kill spruce, steep rocks
#7	old headgate off of creek into ditch
#	pic of area closure, FS sign, just downstream/North of pin

Vegetation Type Present: choose from a vegetation community described below, if multiple communities are present, list them all.

Vegetation Community Type	Dominant Species	Community Presence - Yes (check mark), No (leave blank)	Additional Notes
Spruce Forest	Spruce	✓	
Cottonwood Forest	Cottonwood		
Willow	Willow shrubs	✓	
Herbaceous	Mixture of grasses and forbs (flowers)	✓	
Other			

Effects from impacts. Check yes where appropriate, leave blank if No. Mark all that apply.

Percent Effected	Fire	Beetle	Grazing	Dispersed Recreation	Other*
0-10%				✓ campsite nearby	✓ out buildings
10-49%	✓				
50-80%					
81-100%		✓			

*Other impacts include: road crossing (bridge or ford); road encroachment; on-channel waterbodies; instream-habitat structures; out-buildings; utility corridor; and/or mining.

Other Notes: beetle kill impacts, steep rock cliffs, fire impacts near by dead spruce right near creek - down trees over creek appears to be an old ~~pow~~ hydro power facility diverting water off squaw creek (see pictures)

Use additional sheets if necessary.

Appendix B

Geomorphology Data

Longitudinal Sediment Transport Patterns

Local channel hydraulics and sediment size distributions control two dominant phases of sediment transport.[1] These phases are responsible for mobilizing small and large particle size fractions along the streambed (Figure 1). Phase I transport typically includes sand and fine gravel. This phase of transport is often supply limited in gravel bedded mountain streams. Phase II transport mobilizes gravel and larger substrate sizes. This phase of transport is typically transport limited. Channel maintenance work is expected to occur between the discharge where the majority of sediment transport work begins ($Q_{trigger}$) and the peak flow observed in the system (Q_{cap}). Optimal rates of sediment occur near the effective discharge ($Q_{effective}$)—an intermediate flow rate with a higher probability of occurrence than Q_{cap}.

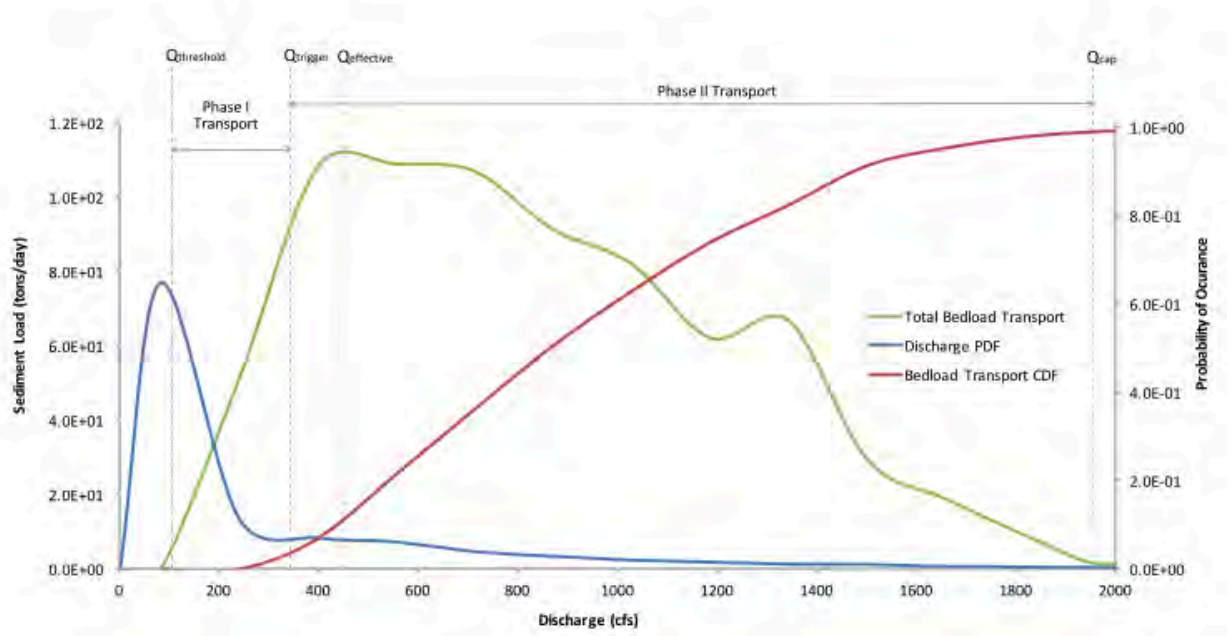


Figure 1: Flow recommendations for a particular reach correspond to the range of flows that occur between the trigger discharge ($Q_{trigger}$) and the effective discharge ($Q_{effective}$), as these flows may be more directly impacted by human management activities than extremely large flood events.

Simulated hydrological time series and one-dimensional sediment transport models constructed using cross-sectional channel geometry and particle size distributions evaluated the recurrence interval of flow events important for sediment transport on alluvial sections of the Rio Grande River (Figure 2). Sites were selected to provide an understanding in longitudinal changes in effective discharge related to land use changes or segments receiving sediment and water inputs from burn areas. Sediment transport dynamics on tributaries were not characterized here due to the dearth of data to inform such analysis and the presence of geomorphological channel types that do not lend themselves to effective discharge assessments.

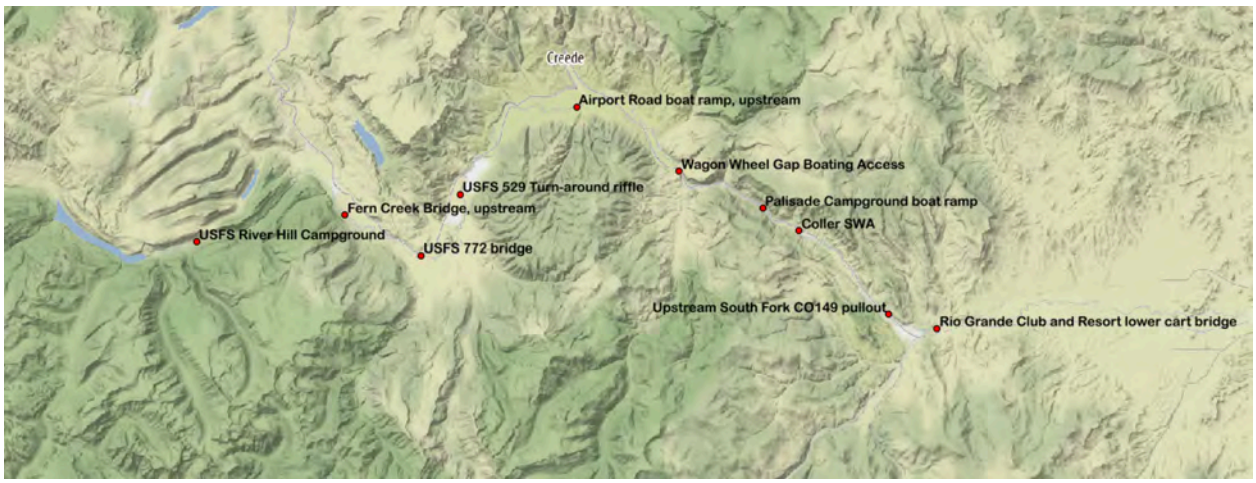


Figure 2. Data collection locations along the mainstem Rio Grande River.

Particle size distribution data was collected at each site using the Wolman Pebble Count method[2] (Table 1). Cross sectional elevation and slope information was additionally collected at each site to enable development of simple 1D hydraulic and sediment transport models (see proceeding section) in HEC-RAS. The Meyer-Peter Muller sediment transport equation was used to calculate critical shear stress and estimate effective discharge. Stream discharge records at several Colorado Division of Water Resources and USGS gauging sites were aggregated and used to estimate daily inflows at ungagued tributary locations using the drainage area ratio approach (Table 2). These estimated tributary inflows were added to observed flows on the mainstem to estimate flows on the mainstem Rio Grande upstream and downstream of existing gauging locations. Daily observed and estimated streamflow over a thirty-year period was used to calculate the recurrence interval of various flood magnitudes. These recurrence intervals were used to assess the frequency at which the effective discharge at each observation location was exceeded. At all locations, the effective discharge was approximated between bankfull conditions and the 4-year flood, well within the expected range for channels efficiently conveying sediment inputs without substantial risk for aggradation or degradation of streambed elevations.

Table 1. Particle size distributions collected at sampling locations

Grain Size Statistics	River Hill Campground	Fern Creek	Park Corral	Rio Grande Campground	Airport Road	Palisade Boat Ramp	Coller SWA	Upstream South Fork
Geometric mean (mm)	140.43	60.97	59.22	37.03	71.87	97.65	84.49	97.79
Geometric standard deviation (mm)	2.26	2.37	2.52	6.60	3.44	2.36	3.28	2.56
D10 (mm)	45.25	19.50	19.80	0.91	8.00	28.98	16.65	36.13
D16 (mm)	67.45	26.25	27.27	5.82	22.63	40.32	30.88	62.03
D25 (mm)	85.40	37.74	36.76	14.99	39.74	61.11	46.19	75.89
D50 (mm)	157.05	73.58	65.38	67.50	103.62	112.87	112.61	128.00
D65 (mm)	202.16	94.05	90.00	96.78	141.10	150.56	159.45	155.87
D75 (mm)	238.63	117.21	109.45	141.23	165.97	177.10	194.49	177.74
D84 (mm)	303.54	140.01	131.16	179.25	206.91	266.35	233.10	215.93
D90 (mm)	374.15	155.93	151.79	241.42	255.00	345.93	282.21	247.35

Stream Type	Range of median bed material particle size (mm)
Sand-bed stream	0.063 - 2
Gravel-bed stream	2 - 64
Cobble-bed stream	64 - 256
Boulder-bed stream	256 - 4096

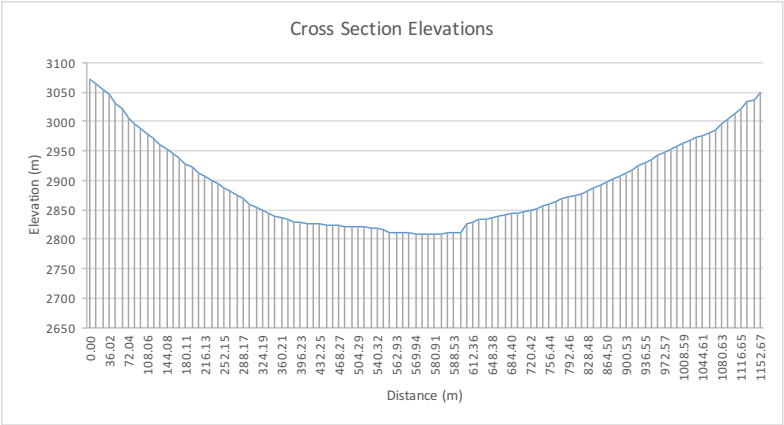
Table 2. Drainage area ratios used to estimate streamflows in ungauged tributaries.

Stream	Drianage Area (sq miles)	Ratio
Rio Grande at Thirty Mile Bridge	163	
Rio Grande at Wagon Wheel Gap	780	
Clear Creek	148	0.91
Trout Creek and Red Mountain Creek, Combined	79.8	0.49
Trout Creek	40.2	0.25
Red Mountain Creek	39.6	0.24
Trout, Red Mountain, Miners Creeks, Combined	115.6	0.71
Miners Creek	35.8	0.22
Note: Drainage area ratio method most apprpriat if ratio is between 0.5 and 1.5.		

Data Collection Site Information

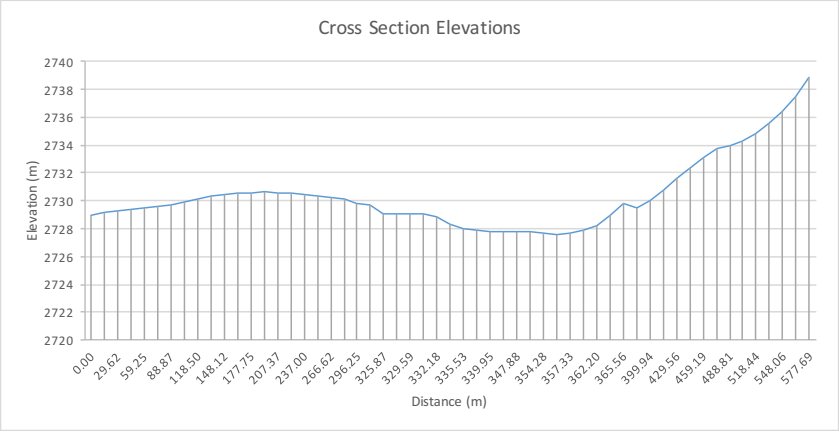
1. USFS River Hill Campground

Flow Regime Statistics	
Qmean annual (cfs)	2.0E+02
Q effective (cfs)	1.2E+03
Q1_5 (cfs)	1.2E+03
Q2 (cfs)	1.3E+03
Q1_5 / Qma	6.0E+00
Q1_5 / Q_e	1.0E+00
Q2 / Qma	6.4E+00
Q2 / Q_e	1.1E+00
Mean Discharge (cfs)	2.0E+02
Mean Discharge Exceedance Time	2.2E-01
CV annual maximums	2.8E-01
coefficient of skewness	2.2E+00
Sediment Transport (tons/year)	3.0E+07



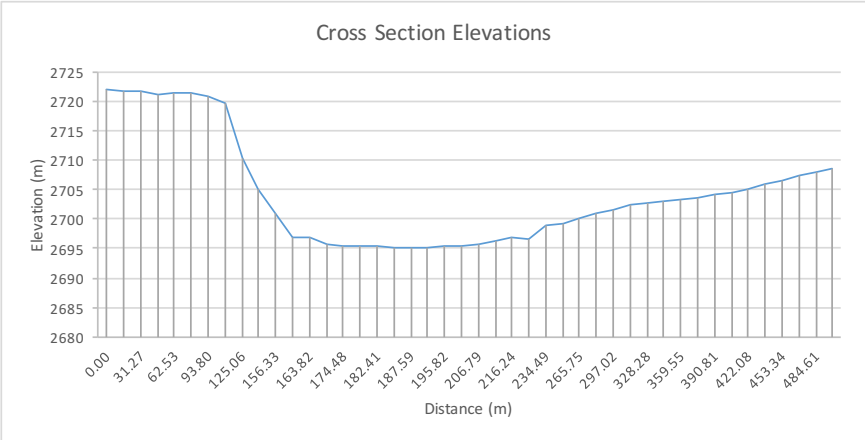
2. Fern Creek Bridge, upstream

Flow Regime Statistics	
Qmean annual (cfs)	3.9E+02
Q effective (cfs)	2.2E+03
Q1_5 (cfs)	2.3E+03
Q2 (cfs)	2.5E+03
Q1_5 / Qma	6.0E+00
Q1_5 / Q_e	1.0E+00
Q2 / Qma	6.4E+00
Q2 / Q_e	1.1E+00
Mean Discharge (cfs)	3.9E+02
Mean Discharge Exceedance Time	2.2E-01
CV annual maximums	2.8E-01
coefficient of skewness	2.2E+00
Sediment Transport (tons/year)	1.7E+07



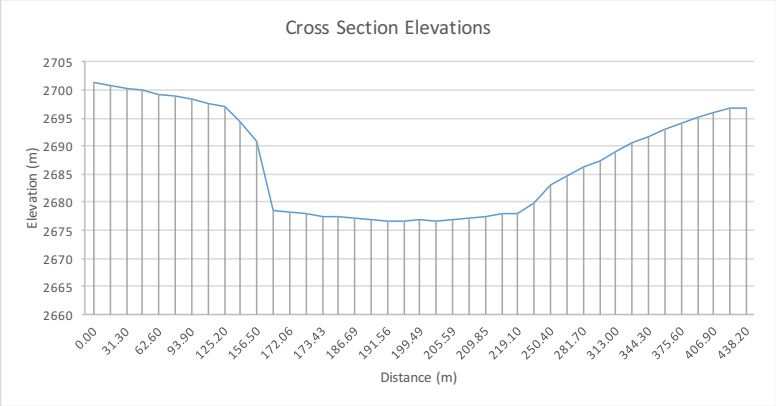
3. Park Corral, USFS 772 Bridge, upstream of bridge

Flow Regime Statistics	
Qmean annual (cfs)	4.9E+02
Q effective (cfs)	2.8E+03
Q1_5 (cfs)	2.9E+03
Q2 (cfs)	3.1E+03
Q1_5 / Qma	6.0E+00
Q1_5 / Q_e	1.0E+00
Q2 / Qma	6.4E+00
Q2 / Q_e	1.1E+00
Mean Discharge (cfs)	4.9E+02
Mean Discharge Exceedance Time	2.2E-01
CV annual maximums	2.8E-01
coefficient of skewness	2.2E+00
Sediment Transport (tons/year)	2.0E+07



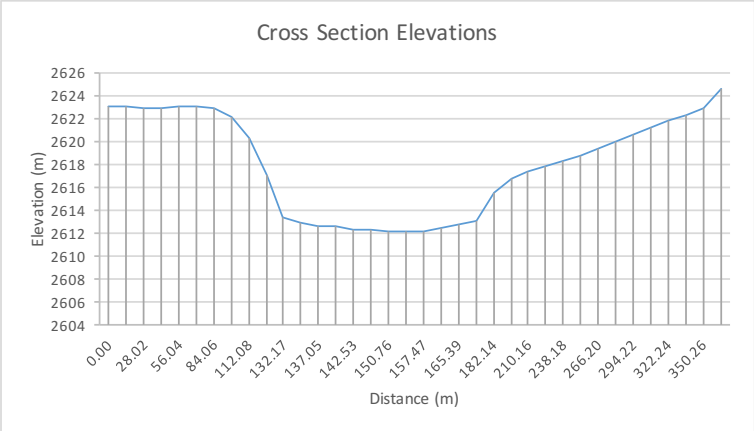
4. Rio Grande Campground, USFS 529 Turn-around

Flow Regime Statistics	
Qmean annual (cfs)	4.9E+02
Q effective (cfs)	2.8E+03
Q1_5 (cfs)	2.9E+03
Q2 (cfs)	3.1E+03
Q1_5 / Qma	6.0E+00
Q1_5 / Q_e	1.0E+00
Q2 / Qma	6.4E+00
Q2 / Q_e	1.1E+00
Mean Discharge (cfs)	4.9E+02
Mean Discharge Exceedance Time	2.2E-01
CV annual maximums	2.8E-01
coefficient of skewness	2.2E+00
Sediment Transport (tons/year)	2.9E+07



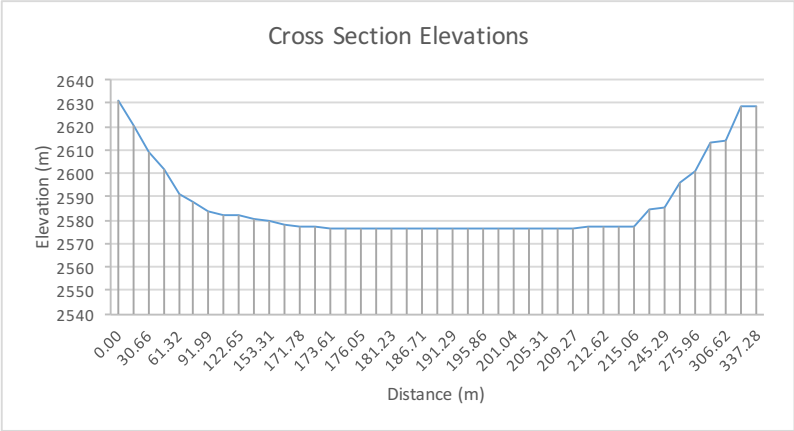
5. Airport Road boatramp, upstream riffle

Flow Regime Statistics	
Qmean annual (cfs)	5.3E+02
Q effective (cfs)	3.0E+03
Q1_5 (cfs)	3.2E+03
Q2 (cfs)	3.4E+03
Q1_5 / Qma	6.0E+00
Q1_5 / Q_e	1.0E+00
Q2 / Qma	6.4E+00
Q2 / Q_e	1.1E+00
Mean Discharge (cfs)	5.3E+02
Mean Discharge Exceedance Time	2.2E-01
CV annual maximums	2.8E-01
coefficient of skewness	2.2E+00
Sediment Transport (tons/year)	5.5E+05



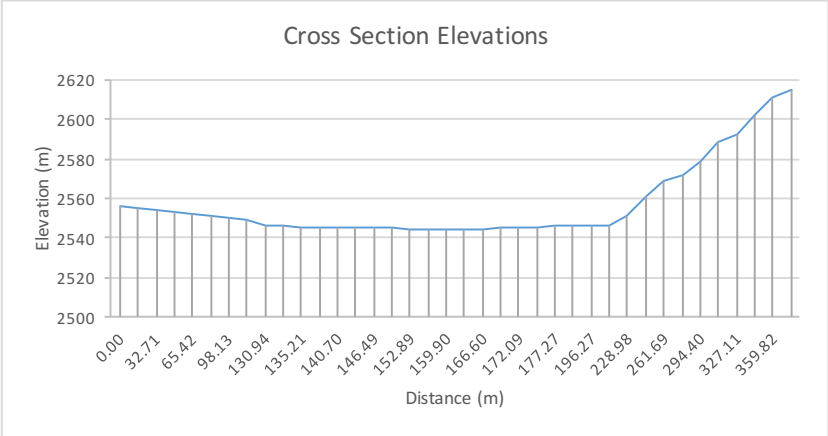
6. Wagon Wheel Gap boat ramp, upstream of ramp access

Flow Regime Statistics	
Qmean annual (cfs)	5.5E+02
Q effective (cfs)	2.1E+03
Q1_5 (cfs)	2.7E+03
Q2 (cfs)	2.9E+03
Q1_5 / Qma	4.8E+00
Q1_5 / Q_e	1.3E+00
Q2 / Qma	5.3E+00
Q2 / Q_e	1.4E+00
Mean Discharge (cfs)	5.6E+02
Mean Discharge Exceedance Time	2.4E-01
CV annual maximums	2.9E-01
coefficient of skewness	2.1E+00
Sediment Transport (tons/year)	4.8E+06



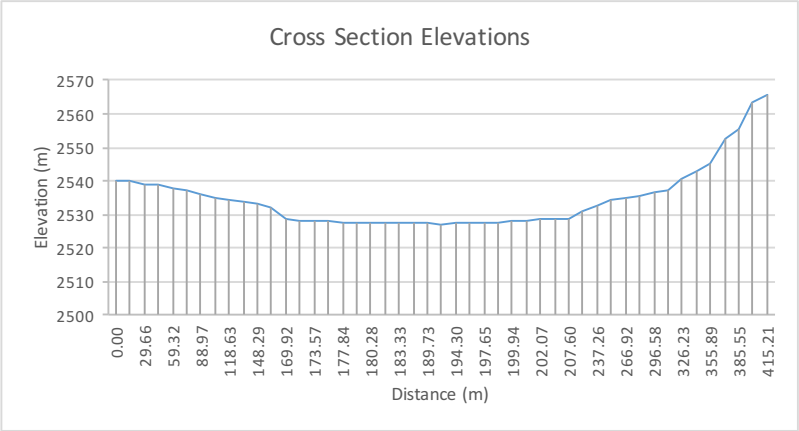
7. Palisade Campground boat ramp

Flow Regime Statistics	
Qmean annual (cfs)	6.2E+02
Q effective (cfs)	3.1E+03
Q1_5 (cfs)	3.0E+03
Q2 (cfs)	3.4E+03
Q1_5 / Qma	4.8E+00
Q1_5 / Q_e	9.5E-01
Q2 / Qma	5.5E+00
Q2 / Q_e	1.1E+00
Mean Discharge (cfs)	6.2E+02
Mean Discharge Exceedance Time	2.4E-01
CV annual maximums	2.2E-01
coefficient of skewness	2.1E+00
Sediment Transport (tons/year)	1.8E+05



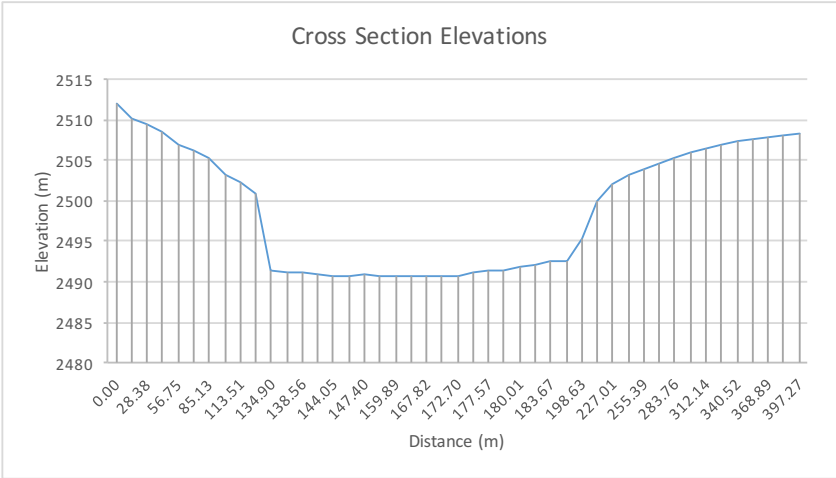
8. Coller State Wildlife Area

Flow Regime Statistics	
Qmean annual (cfs)	6.2E+02
Q effective (cfs)	3.8E+02
Q1_5 (cfs)	3.0E+03
Q2 (cfs)	3.4E+03
Q1_5 / Qma	4.8E+00
Q1_5 / Q_e	7.8E+00
Q2 / Qma	5.5E+00
Q2 / Q_e	8.9E+00
Mean Discharge (cfs)	6.2E+02
Mean Discharge Exceedance Time	2.4E-01
CV annual maximums	2.2E-01
coefficient of skewness	2.1E+00
Sediment Transport (tons/year)	2.4E+06



9.Upstream of South Fork, CO 149 pullout

Flow Regime Statistics	
Qmean annual (cfs)	6.2E+02
Q effective (cfs)	2.6E+03
Q1_5 (cfs)	3.0E+03
Q2 (cfs)	3.4E+03
Q1_5 / Qma	4.8E+00
Q1_5 / Q_e	1.1E+00
Q2 / Qma	5.5E+00
Q2 / Q_e	1.3E+00
Mean Discharge (cfs)	6.2E+02
Mean Discharge Exceedance Time	2.5E-01
CV annual maximums	2.2E-01
coefficient of skewness	2.1E+00
Sediment Transport (tons/year)	2.0E+06

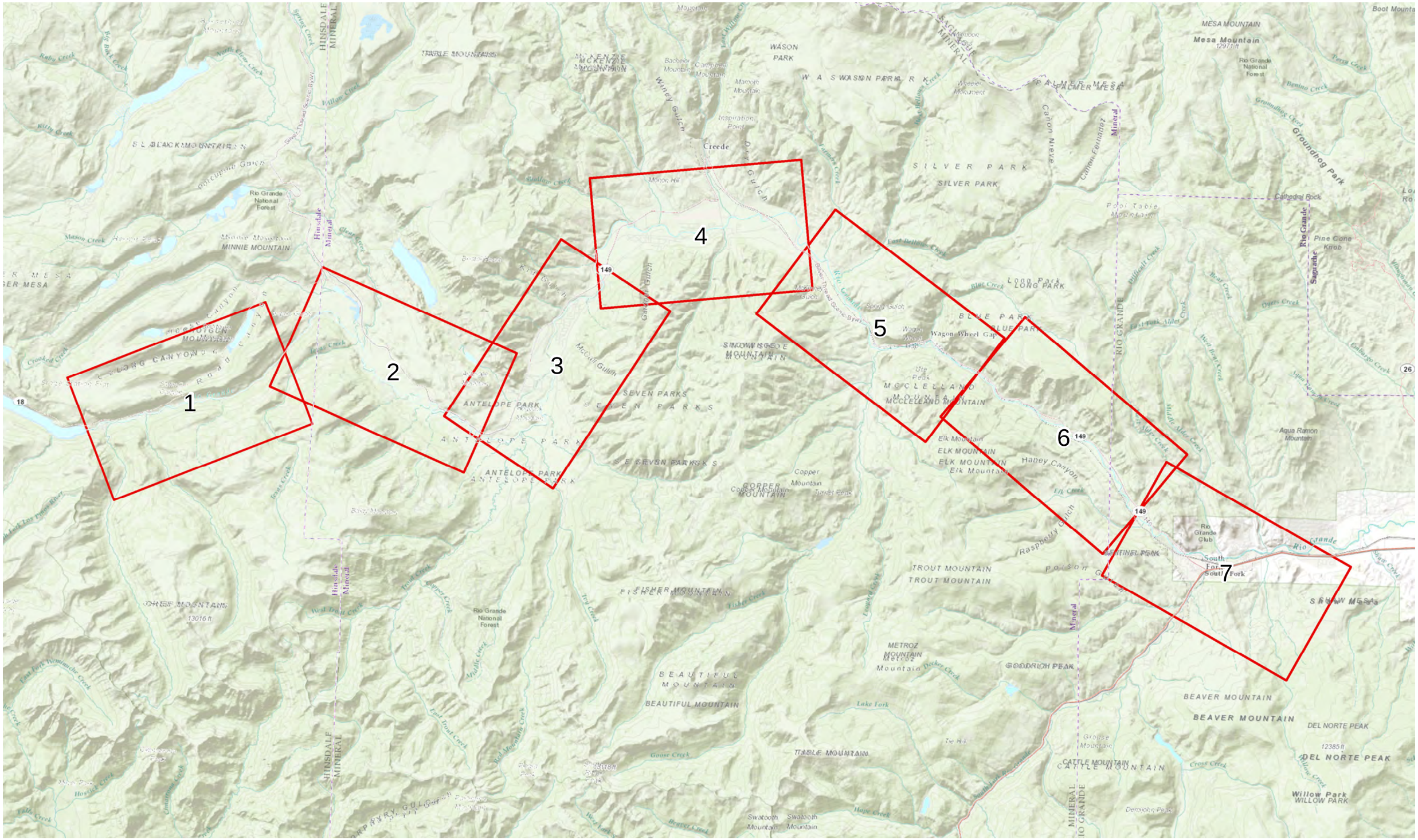


References

1. Schmidt, L. J., & Potyondy, J. P. (2004). *Quantifying channel maintenance instream flows: An approach for gravel-bed streams in the western United States* (General Technical Report No. RMRS-GTR-128) (p. 33). Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.
2. Wolman, G. M. (1954). *A method of sampling coarse river-bed material.* Transactions American Geophysical Union, 35 , 951-956.

Appendix C

Infrastructure Data



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Rio Grande River Corridor Map Set

Upper Rio Grande Watershed Assessment

Date: 06/01/17

Data Sources: USFS, USGS, ESRI, CWCB, Trout Unlimited

File: I:\2016\2016-372-UpperRioGrande\001-WatershedAsmnt\H-Dwgs\GIS\MXDs\Maps_for_Reports\Rio_Grande_River_Corridor_Map_Set_Overview.mxd

The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.

0 0.75 1.5 3 4.5 6 Miles

1 inch = 3 miles

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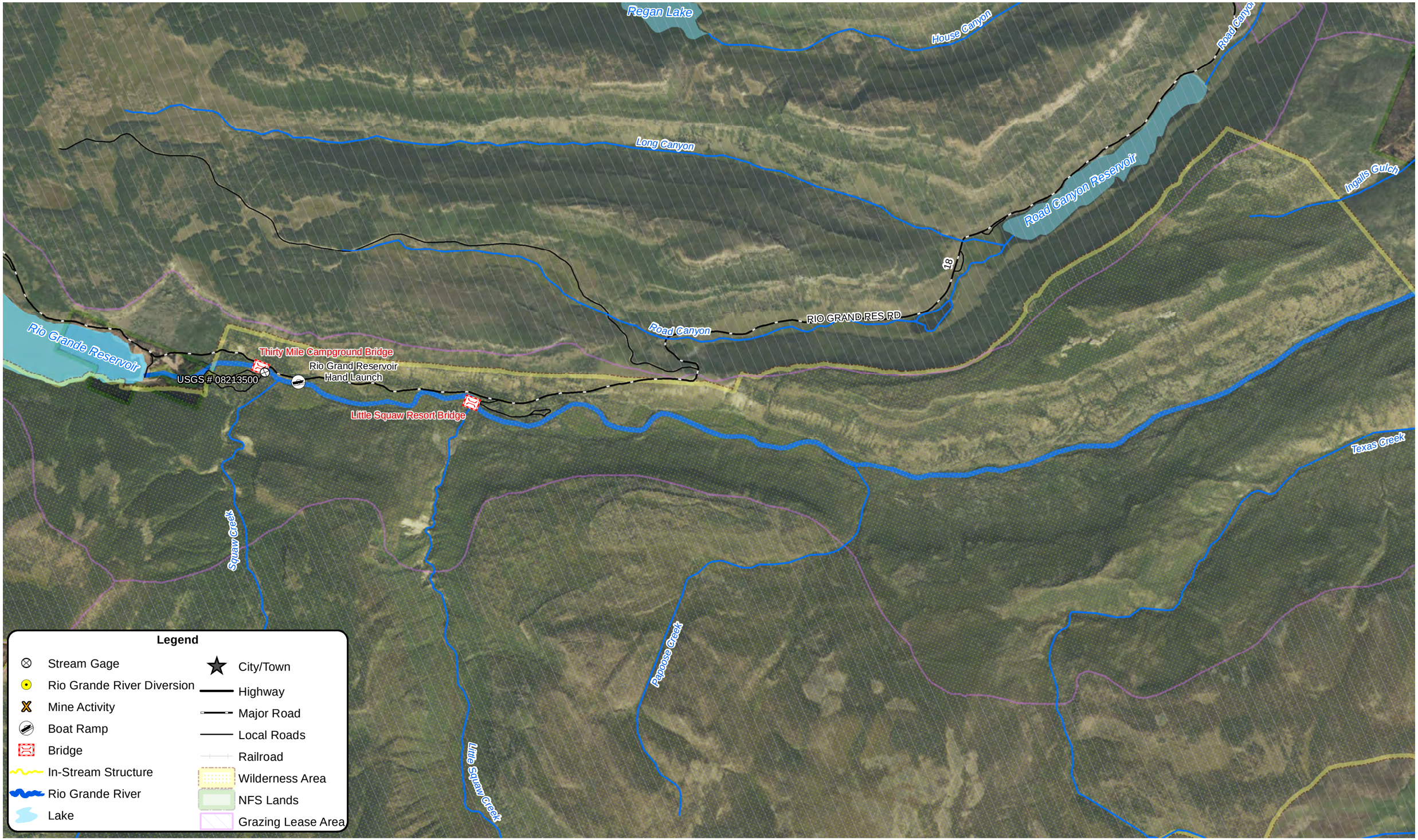

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Rio Grande River Corridor Map Set

Upper Rio Grande Watershed Assessment

Date: 06/12/17

Data Sources: USFS, USGS, ESRI, CWCB, Trout Unlimited

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1 inch = 0.5 miles

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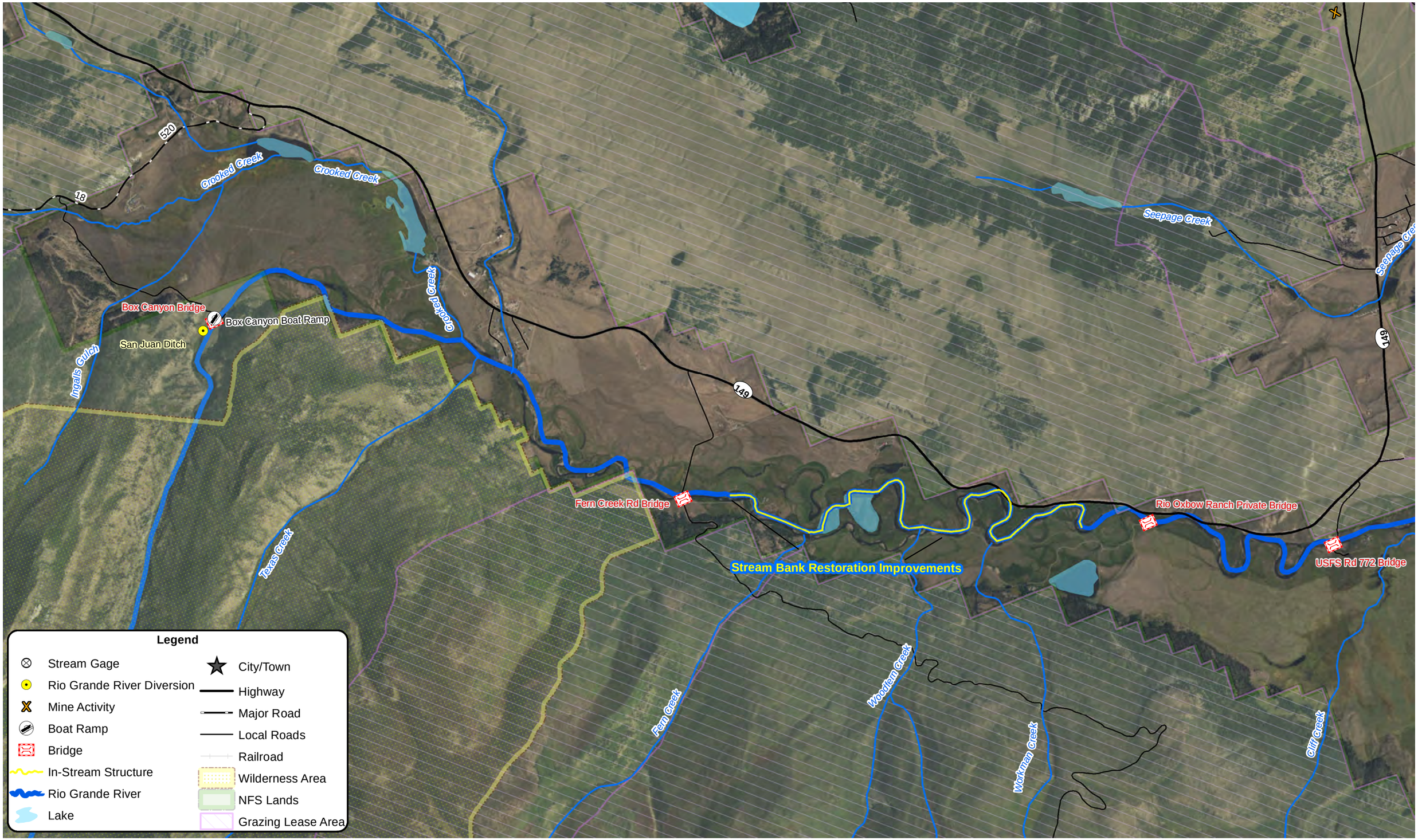

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1 inch = 0.5 miles

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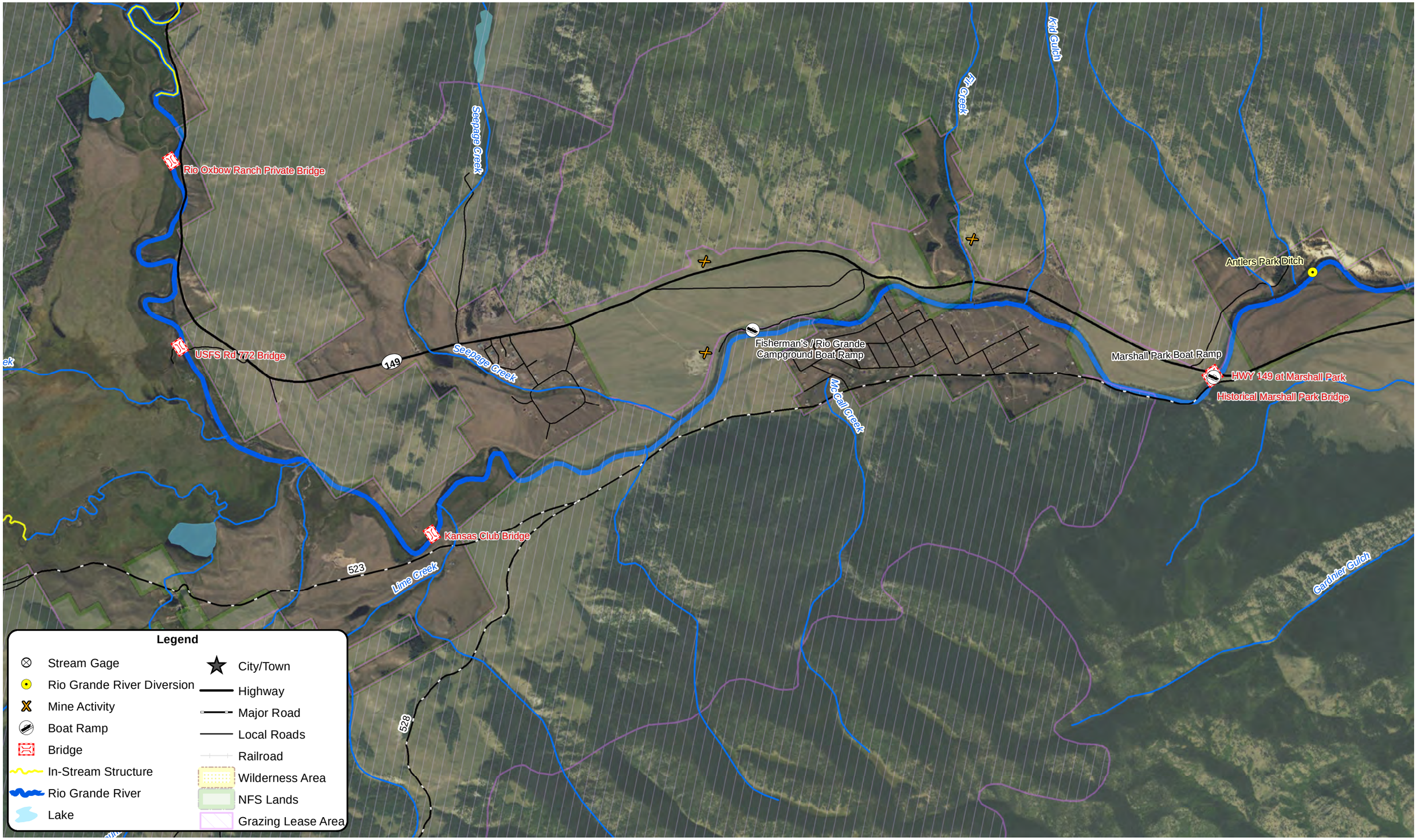

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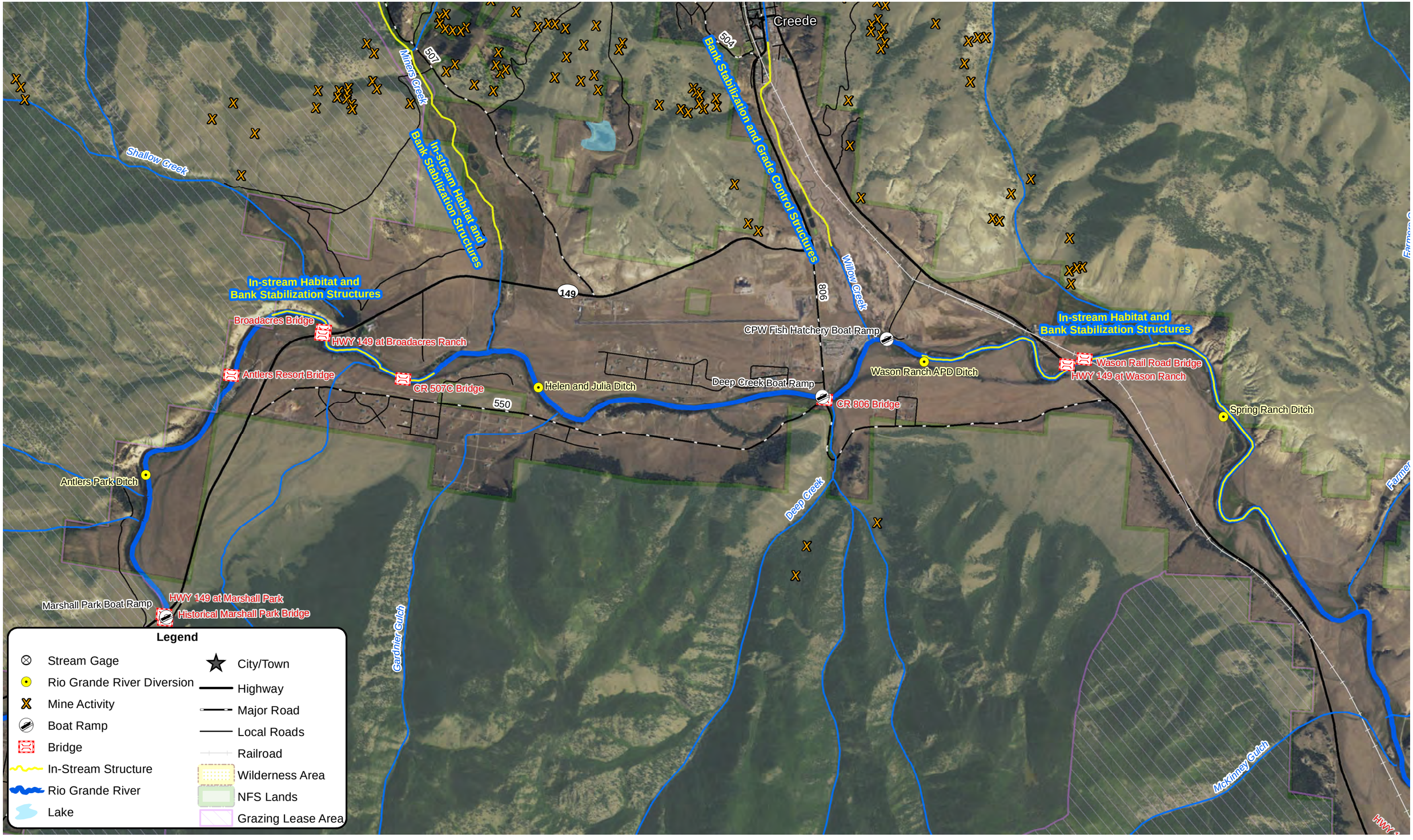
1 inch = 0.5 miles



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Upper Rio Grande Watershed Assessment

Date: 06/12/17

Data Sources: USFS, USGS, ESRI, CWCB, Trout Unlimited

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1 inch = 0.5 miles

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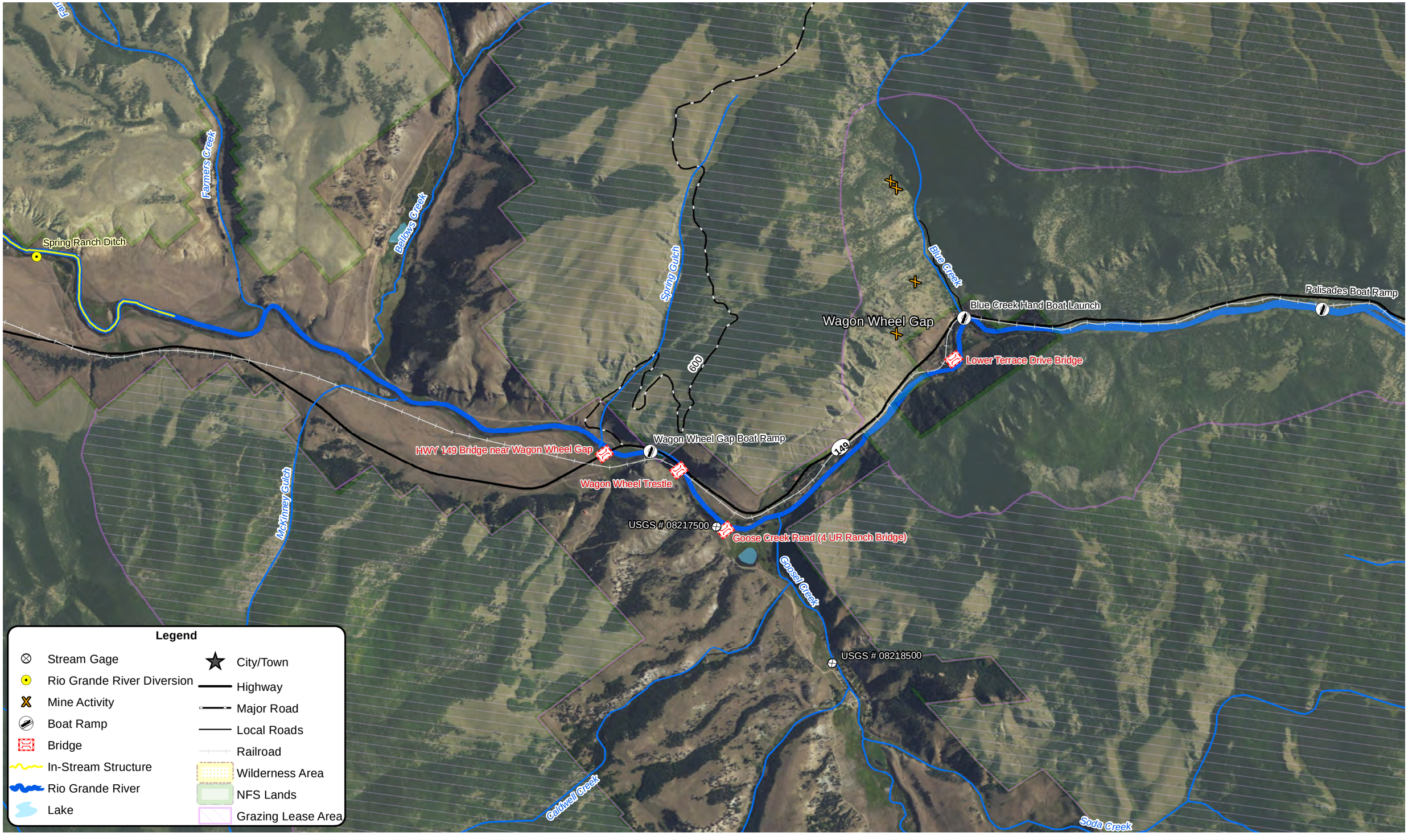

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Upper Rio Grande Watershed Assessment

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Data Sources: USFS, USGS, ESRI, CWCB, Trout Unlimited

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1 inch = 0.5 miles

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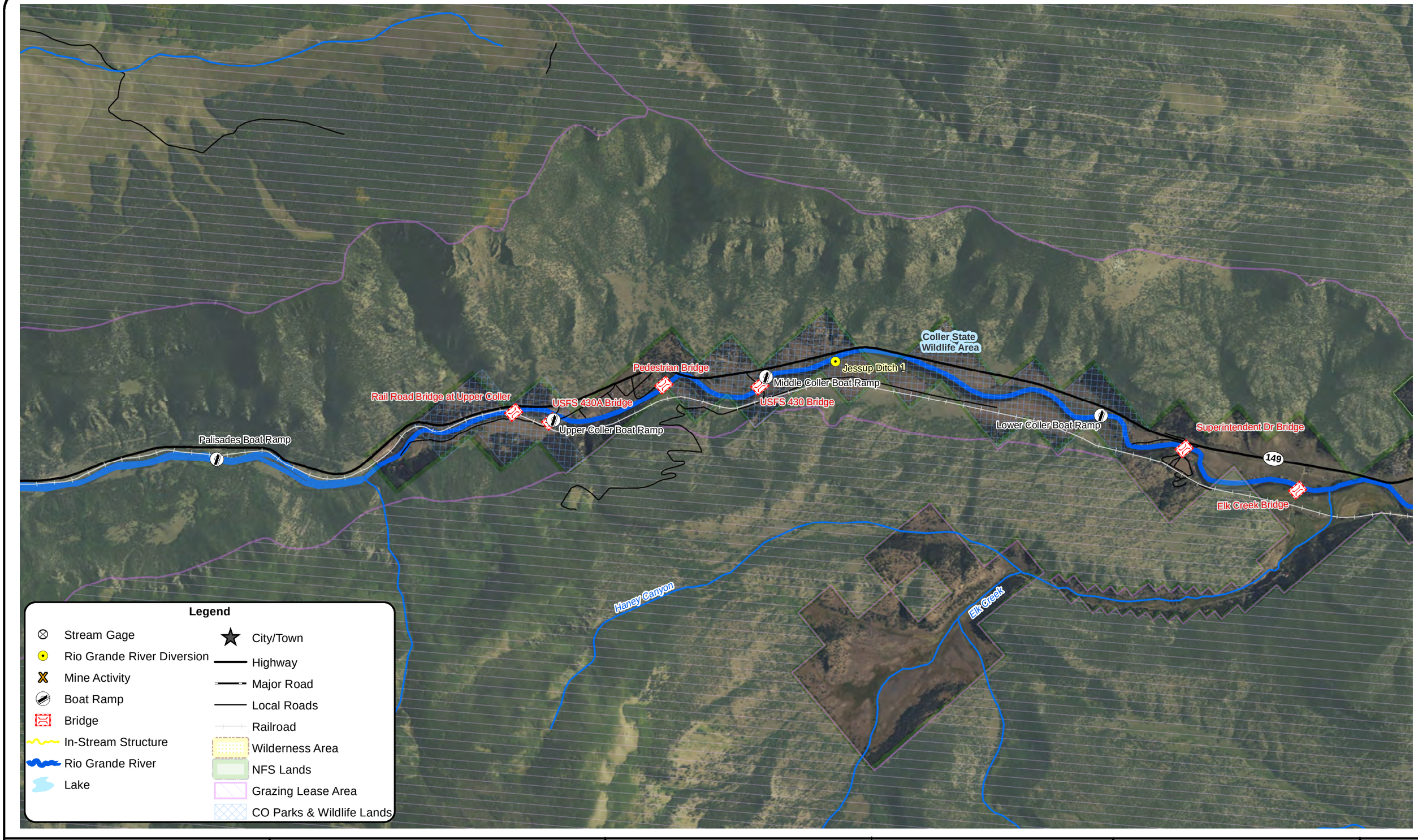

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1 inch = 0.5 miles

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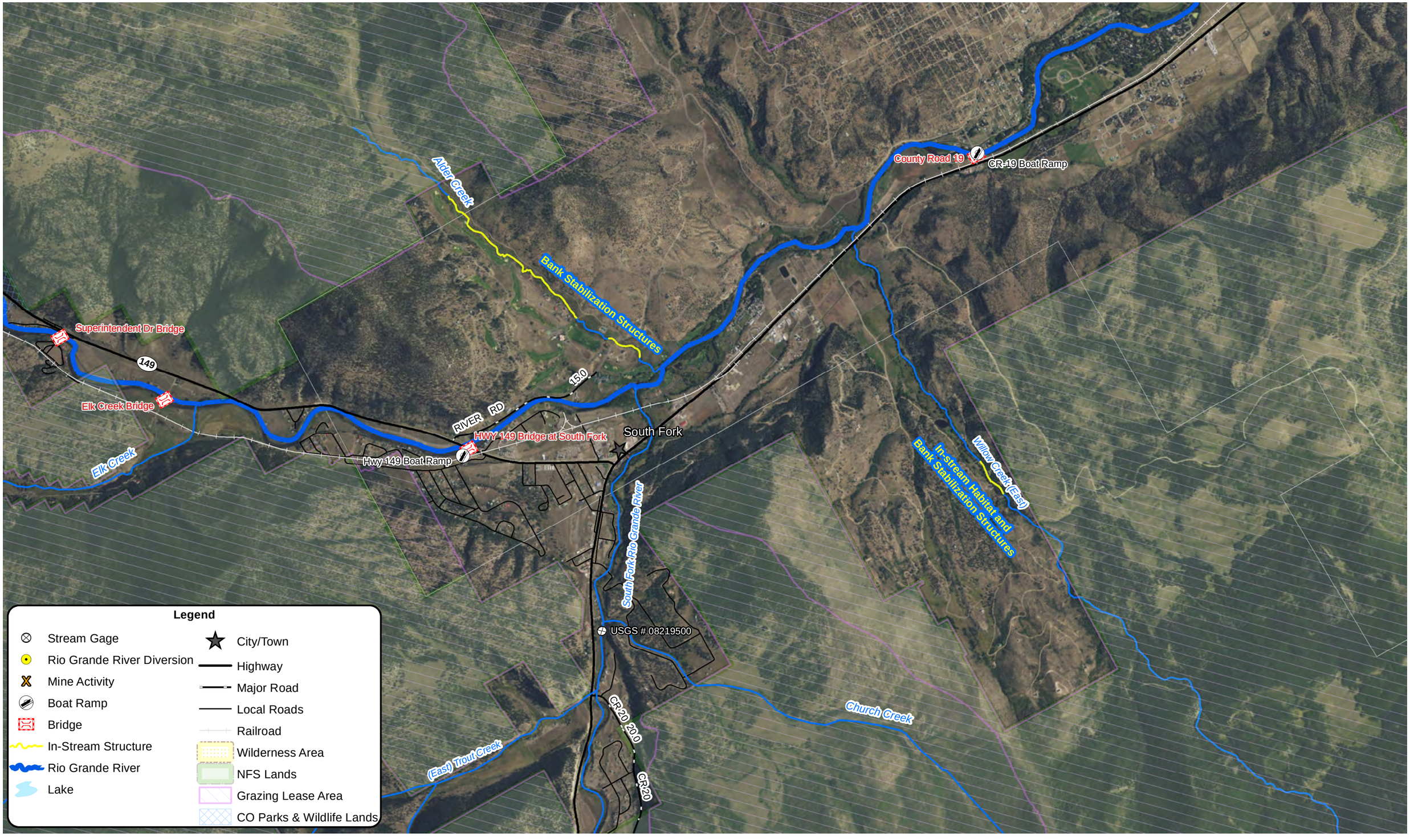

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0 0.25 0.5 0.75 1 Miles

1 inch = 0.5 miles

Appendix D

Recreation Data

Recreational Feature Priority Matrix Evaluation

Facility/ Rio Grande Reservoir Area Hand Launch

Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	1	3	1	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	1	3	1	
	Toilet facilities	1	3	1	
			Subtotal	**3**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank	Yes	5	5	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.		1	0	
			Subtotal	**5**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of	Yes	5	5	5
	0.06-0.09 acres		3	0	
	<0.05 acres		1	0	
			Subtotal	**5**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	3	5	3	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner	Yes	3	3	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	3	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	**1**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**20.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Box Canyon
Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	0	3	0	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	3	3	3	
	Toilet facilities	3	3	3	
			Subtotal	**6**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	Yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres	Yes	3	3	
	<0.05 acres		1	0	
			Subtotal	**3**	
4	**Facility/Area Importance to Activity**	4	5	4	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner	Yes	3	3	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	3	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**17.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Fisherman's Ramp
Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	2	3	2	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	2	3	2	
	Toilet facilities	2	3	2	
			Subtotal	**6**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	Yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres	Yes	3	3	
	<0.05 acres		1	0	
			Subtotal	**3**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	4	5	4	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner	Yes	3	3	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	3	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**17.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Marshall Park
Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	1	3	1	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	3	3	3	
	Toilet facilities	1	3	1	
			Subtotal	**5**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	Yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity**	4	5	4	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**13.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Deep Creek
Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	0	3	0	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	0	3	0	
	Toilet facilities	1	3	1	
			Subtotal	**0**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	Yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management	Yes	1	1	
			Subtotal	1	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**8.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Fish Hatchery
Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	0	3	0	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	0	3	0	
	Toilet facilities	3	3	3	
			Subtotal	**3**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management	Yes	1	1	
			Subtotal	1	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	1	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**12.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Wagon Wheel Gap
Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	3	3	3	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	3	3	3	
	Toilet facilities	3	3	3	
			Subtotal	**9**	
2	**Area of Unintended Riparian Disturbances**				
	>50LF of river bank	Yes	5	5	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.		1	0	
			Subtotal	**5**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres	Yes	3	3	
	<0.05 acres		1	0	
			Subtotal	**3**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	Yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	1	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**25.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Blue Creek
Facility Hand boat launch site

Criteria		Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	2	3	2	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	3	3	3	
	Toilet facilities (if available)	0	3	0	
			Subtotal	**5**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	Yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres	Yes	3	3	
	<0.05 acres		1	0	
			Subtotal	**3**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	1	5	1	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner	Yes	3	3	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	3	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**13.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Palisade

Facility Boat Ramp and Campground

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				9
	Parking	2	3	2	
	Access to activity (Boat Ramp, Stream Crossing, etc.)	2	3	2	
	Toilet facilities (if available)	2	3	2	
			Subtotal	**6**	
2	**Area of Unintended Riparian Disturbances**				5
	>50 LF of river bank		5	0	
	26-49 LF of river bank.	Yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				5
	>0.1 acres of disturbed native vegetation outside of	Yes	5	5	
	0.06-0.09 acres		3	0	
	<0.05 acres		1	0	
			Subtotal	**5**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	4	5	4	5
5	**Facility Oversight**				3
	Facility is unrecognized and is not maintained by land owner		3	0	
	Facility is recognized by land owner but not maintained	Yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurance**				2
	High potential for erosion and sediment transport off of site		2	0	
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				2
	High potential for water quality impacts to nearby stream		2	0	
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				0.7
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**20.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Upper Coller
Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	0	3	0	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	0	3	0	
	Toilet facilities	3	3	3	
			Subtotal	**3**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	Yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	4	5	4	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	Yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurance**				
	High potential for erosion and sediment transport off of site	Yes	2	2	2
	Medium Potential		1	0	
	Low Potential		0	0	
			Subtotal	2	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**13.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Middle Coller/Green Bridge

Facility Boat launch

Criteria		Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	0	3	0	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	0	3	0	
	Toilet facilities	1	3	1	
			Subtotal	**1**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.	yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	<0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management	Yes	1	1	
			Subtotal	1	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**11.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Lower Coller

Facility Boat launch

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	1	3	1	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	1	3	1	
	Toilet facilities	3	3	3	
			Subtotal	**5**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	Yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity**	3	5	3	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	Yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)		0.1	0	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.	Yes	0.1	0.1	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**12.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Lower Coller

Facility Boat launch

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	0	3	0	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	1	3	1	
	Toilet facilities	3	3	3	
			Subtotal	**4**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.	Yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity**	4	5	4	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	Yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)		0.1	0	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.	Yes	0.1	0.1	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**14.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Hwy 149/Main Bridge
Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	2	3	2	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	2	3	2	
	Toilet facilities	3	3	3	
			Subtotal	**7**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.	Yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of	Yes	5	5	5
	0.06-0.09 acres		3	0	
	<0.05 acres		1	0	
			Subtotal	**5**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	1	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**23.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Ute Bluff/CR-19 Ramp

Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	3	3	3	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	0	3	0	
	Toilet facilities	3	3	3	
			Subtotal	**6**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.	Yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of	Yes	5	5	5
	0.06-0.09 acres		3	0	
	<0.05 acres		1	0	
			Subtotal	**5**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	3	5	3	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner	Yes	3	3	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	3	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site	Yes	2	2	2
	Medium Potential		1	0	
	Low Potential		0	0	
			Subtotal	2	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**22.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Hana Lane/State Bridge/ CR-17 Ramp

Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	1	3	1	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	0	3	0	
	Toilet facilities	0	3	0	
			Subtotal	**1**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	Yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	3	5	3	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management	Yes	1	1	
			Subtotal	1	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**7.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Del Norte
Facility Boat Ramp

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	2	3	2	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	1	3	1	
	Toilet facilities	3	3	3	
			Subtotal	**6**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank	Yes	5	5	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.		1	0	
			Subtotal	**5**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acres of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	2	5	0	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner	Yes	3	3	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	3	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	1	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	**1**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.		0.1	0	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**17.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Big Meadows Reservoir

Facility Reservoir/fishing/dispersed recreation

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	1	3	1	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	0	3	0	
	Toilet facilities	0	3	0	
			Subtotal	**1**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.	Yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acre of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management	Yes	1	1	
			Subtotal	1	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.	Yes	0.1	0.1	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.	Yes	0.1	0.1	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.6**	
			Total	**11.6**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Beaver Creek Reservoir from the south end to the private property boundary

Facility Reservoir/fishing/hiking/dispersed recreation/private land

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				9
	Parking	0	3	0	
	Access to activity (Boat Ramp, Stream Crossing, etc.)	0	3	0	
	Toilet facilities	0	3	0	
			Subtotal	**0**	
2	**Area of Unintended Riparian Disturbances**				5
	>50 LF of river bank		5	0	
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.	Yes	1	1	
			Subtotal	**1**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				5
	>0.1 acre of disturbed native vegetation outside of		5	0	
	0.06-0.09 acres		3	0	
	<0.05 acres	Yes	1	1	
			Subtotal	**1**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	5	5	5	5
5	**Facility Oversight**				3
	Facility is unrecognized and is not maintained by land owner		3	0	
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management	Yes	1	1	
			Subtotal	1	
6	**Sedimentation Occurrence**				2
	High potential for erosion and sediment transport off of site		2	0	
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	1	
7	**Water Quality Impacts (excluding sediment)**				2
	High potential for water quality impacts to nearby stream		2	0	
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	**1**	
8	**Meets Basin's Goals (From 2015 BIP)**				0.7
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin		0.1	0	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.	Yes	0.1	0.1	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.		0.1	0	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.4**	
			Total	**10.4**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Tucker Ponds
Facility Fishing access on reservoir

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	3	3	3	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	1	3	1	
	Toilet facilities	0	3	0	
			Subtotal	**4**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.	yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acre of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres	yes	3	3	
	<0.05 acres		1	0	
			Subtotal	**3**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained		2	0	
	Facility/Area has effective oversight and management	Yes	1	1	
			Subtotal	1	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	Yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin	Yes	0.1	0.1	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.	Yes	0.1	0.1	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities		0.1	0	
			Subtotal	**0.5**	
			Total	**16.5**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Park Creek-2 approximately 11.5 miles up Park Creek Rd from Hwy 160

Facility Dispersed recreation/undesignated camping areas

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	0	3	0	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	1	3	1	
	Toilet facilities	3	3	3	
			Subtotal	**4**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank	Yes	5	5	5
	26-49 LF of river bank.		3	0	
	<25 LF of river bank.		1	0	
			Subtotal	**5**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acre of disturbed native vegetation outside of	Yes	5	5	5
	0.06-0.09 acres		3	0	
	<0.05 acres		1	0	
			Subtotal	**5**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	3	5	3	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	Yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential	YES	1	1	
	Low Potential		0	0	
			Subtotal	1	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	**1**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin	Yes	0.1	0.1	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.	Yes	0.1	0.1	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities		0.1	0	
			Subtotal	**0.5**	
			Total	**21.5**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Ute Creek Trailhead west of Rio Grande Reservoir
Facility Dispersed recreation/undesignated camping areas/fishing/hiking

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	2	3	2	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	1	3	1	
	Toilet facilities (if available)	1	3	1	
			Subtotal	**4**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.	yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acre of disturbed native vegetation outside of	Yes	5	5	5
	0.06-0.09 acres		3	0	
	>0.5 acres		1	0	
			Subtotal	**5**	
4	**Facility/Area Importance to Activity**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	Yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential		1	0	
	Low Potential	yrs	0	0	
			Subtotal	0	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential		1	0	
	Low Potential	yes	0	0	
			Subtotal	**0**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin	Yes	0.1	0.1	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.	Yes	0.1	0.1	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities		0.1	0	
			Subtotal	**0.5**	
			Total	**19.5**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/Area Name: Boat Ramp Signage Project
Facility Type: Coordination Project

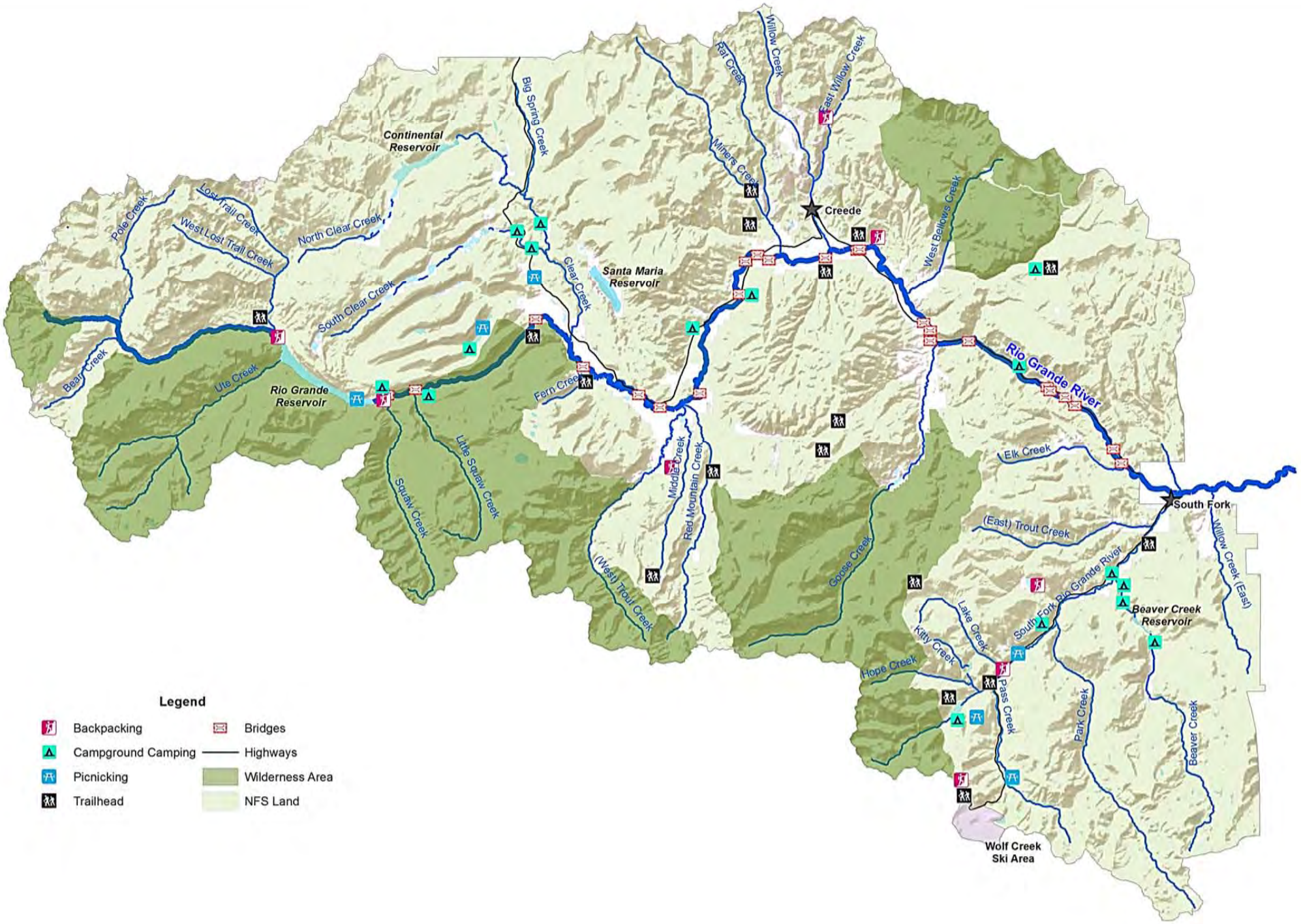
Criteria		Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	3	3	3	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	3	3	3	
	Toilet facilities	2	3	2	
			Subtotal	**8**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.	Yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acre of disturbed native vegetation outside of		5	0	5
	0.06-0.09 acres	Yes	3	3	
	>0.5 acres		1	0	
			Subtotal	**3**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	Yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	1	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	**1**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin	Yes	0.1	0.1	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.	Yes	0.1	0.1	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.6**	
			Total	**23.6**	31.7

Recreational Feature Priority Matrix Evaluation

Facility/ Despersed Camping Management Project

Facility Coordination Project

	Criteria	Meets?	Weight	Score	Possible Score by Category
1	**Use of Recreational Feature (3 = Exceeds Capacity, 0 = Under Utilized)**				
	Parking	3	3	3	9
	Access to activity (Boat Ramp, Stream Crossing, etc.)	3	3	3	
	Toilet facilities	3	3	3	
			Subtotal	**9**	
2	**Area of Unintended Riparian Disturbances**				
	>50 LF of river bank		5	0	5
	26-49 LF of river bank.	Yes	3	3	
	<25 LF of river bank.		1	0	
			Subtotal	**3**	
3	**Area of Unintended Upland Disturbances (outside floodplain corridor)**				
	>0.1 acre of disturbed native vegetation outside of	Yes	5	5	5
	0.06-0.09 acres		3	0	
	>0.5 acres		1	0	
			Subtotal	**5**	
4	**Facility/Area Importance to Activity (5 is high 0 is low)**	5	5	5	5
5	**Facility Oversight**				
	Facility is unrecognized and is not maintained by land owner		3	0	3
	Facility is recognized by land owner but not maintained	Yes	2	2	
	Facility/Area has effective oversight and management		1	0	
			Subtotal	2	
6	**Sedimentation Occurrence**				
	High potential for erosion and sediment transport off of site		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	1	
7	**Water Quality Impacts (excluding sediment)**				
	High potential for water quality impacts to nearby stream		2	0	2
	Medium Potential	Yes	1	1	
	Low Potential		0	0	
			Subtotal	**1**	
8	**Meets Basin's Goals (From 2015 BIP)**				
	Goal #1: Protect, preserve, and/or restore the sustainability of the Rio Grande Basin watershed.	Yes	0.1	0.1	0.7
	Goal #6: Support multi-party benefit projects. (recreation, environmental, Municipal, Agricultural)	Yes	0.1	0.1	
	Goal #9: Meet Water quality standards throughout the Basin	Yes	0.1	0.1	
	Goal #11: Protect, preserve and enhance terrestrial and aquatic wildlife habitats throughout the Basin.	Yes	0.1	0.1	
	Goal #12: Conserve, restore and maintain wetlands and riparian areas for the benefit of a healthy watershed.	Yes	0.1	0.1	
	Goal #13: Work to sustain active river flows throughout the year in cooperation with water users and administrators to restore and sustain ecological function of the rivers and floodplain habitats.		0.1	0	
	Goal #14: Maintain and enhance water-dependent recreational activities	Yes	0.1	0.1	
			Subtotal	**0.6**	
			Total	**26.6**	31.7



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USFS Activity Map

Upper Rio Grande Watershed Assessment

Date: 05/18/17

Data Sources: USFS, USGS, ESRI, CWCB

File: I:\2016\2016-372-UpperRioGrande\001-WatershedAsmnt\H-Dwgs\GIS\MXDs\Maps_for_Reports\USFS_Activity_Map.mxd

The information displayed above is intended for general planning purposes. Refer to legal documentation/data sources for descriptions/locations.

0 1 2 4 6 8 Miles

1 inch = 4 miles