Telluride Valley Floor

Environmental Report

May 2009

TOWN OF TELLURIDE

Ecological Resource Consultants, Inc.

ERC

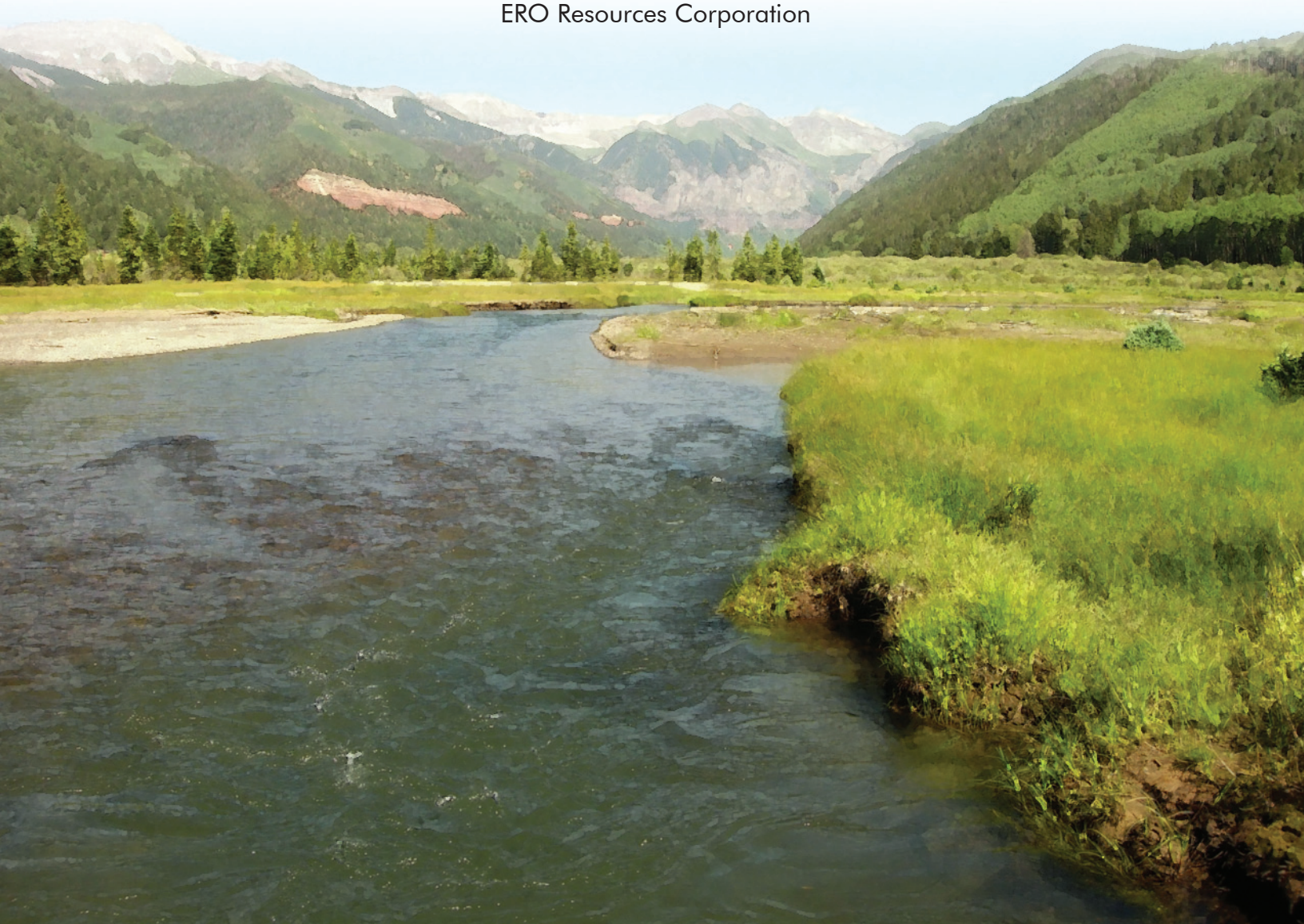
Telluride Valley Floor

Environmental Report

May 2009

Prepared for:
Town of Telluride

Prepared by:
Ecological Resource Consultants, Inc.
ERO Resources Corporation



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AC	alternating current
AMSL	above mean sea level
BGEPA	Bald and Golden Eagle Protection Act
BMI	benthic macroinvertebrate
CDOW	Colorado Division of Wildlife
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
cfs	cubic feet per second
CHS	Colorado Historical Society
CNHP	Colorado Natural Heritage Program
CWA	Clean Water Act
dbh	diameter at breast height
EPA	Environmental Protection Agency
ERC	Ecological Resource Consultants, Inc.
ERO	ERO Resources Corporation
ESA	Endangered Species Act
FEMA	Flood Emergency Management Agency
GIS	Geographic Information Systems
GPS	Global Positioning System
H.B.	House Bill
HBI	Hilsenhoff Biotic Index
MBTA	Migratory Bird Treaty Act
NHPA	National Historic Preservation Act
NAD83	North American Datum of 1983
NRHP	National Register of Historic Places
OAHP	Office of Archaeology and Historic Preservation
OHWM	ordinary high water mark
PEM	palustrine emergent
POW	palustrine open water
POR	period of record
ppt	parts per thousand
PFO	palustrine forested
PSS	palustrine scrub-shrub
RAP	Remedial Action Plan
SCP	Species Conservation Program
SMA	Sheep Mountain Alliance
SMVC	San Miguel Valley Corporation
Study Area	Town of Telluride Valley Floor Property
Supplement	Interim Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Western Mountains, Valleys, and Coast Region
Town	Town of Telluride - a Colorado Home Rule Municipality
TRPAC	Telluride Regional Planning Advisory Committee
US	United States
USACE	US Army Corps of Engineers
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
USNVC	US National Vegetation Classification System
WSS	Web Soil Survey

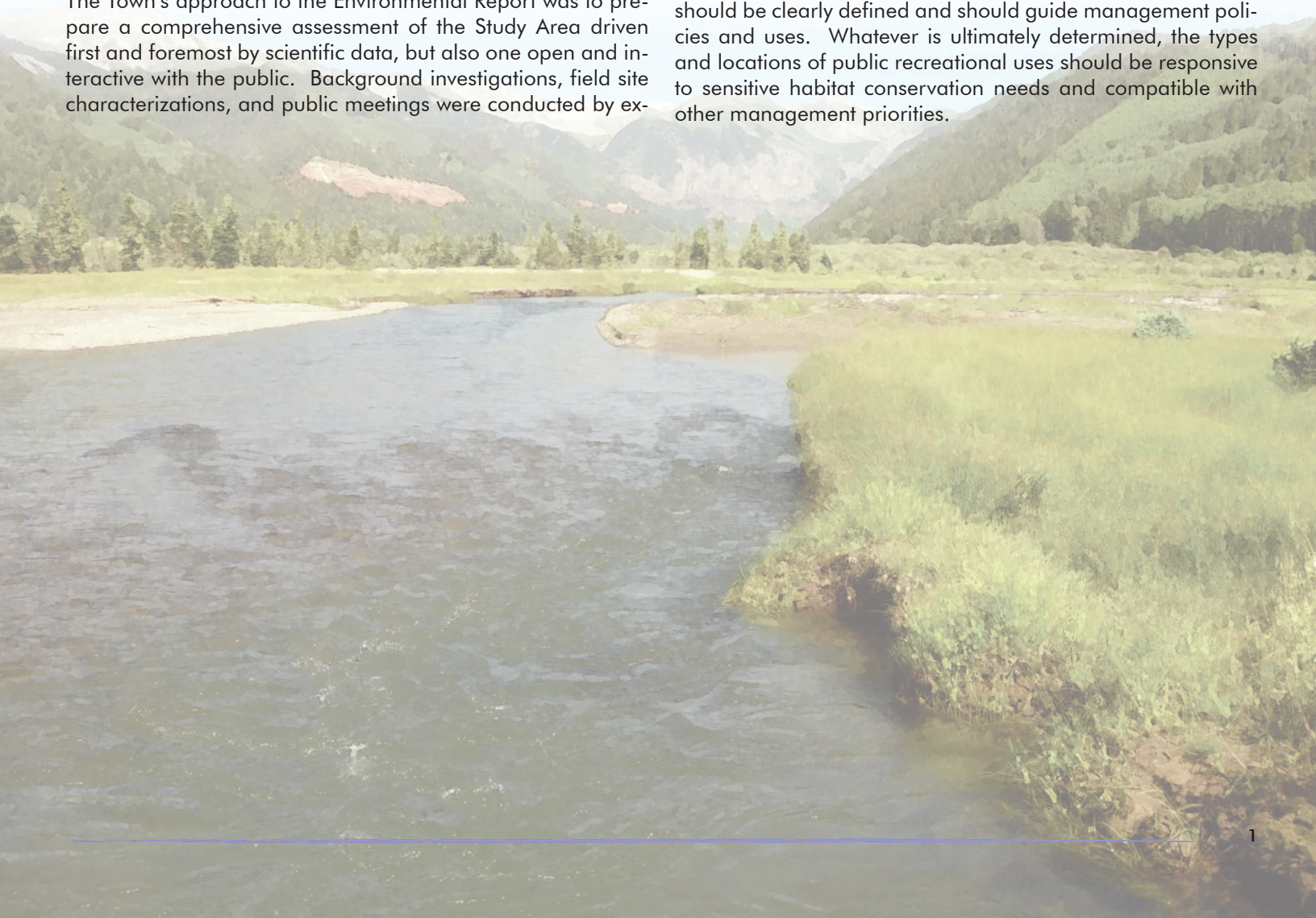
EXECUTIVE SUMMARY

The Telluride Valley Floor Property (herein referred to as the "Study Area") is a unique natural resource located at the entrance to the Town of Telluride (Town). The Study Area comprises diverse vegetation communities, supports a range of wildlife species, contains cultural resources, and includes nearly 3 miles of the San Miguel River and hundreds of acres of wetlands and other natural habitat. The Study Area also serves as a visual gateway to Town and provides many recreational opportunities.

The Study Area has a long and storied past, dating back to the early days of mining and agricultural uses through its current Town ownership and open space status. In 2008, through great effort and citizen fund raising, the Town officially acquired the Study Area. Town representatives and local residents realize the uniqueness and importance of this gateway property to the community. The Town will be implementing a conservation easement to ensure the long-term preservation and protection of the Study Area. Additionally, the Town is developing a Valley Floor Management Plan for the long-term management and conservation of the Study Area. As a predecessor to the future Valley Floor Management Plan, the Town commissioned this Environmental Report.

The Town's approach to the Environmental Report was to prepare a comprehensive assessment of the Study Area driven first and foremost by scientific data, but also one open and interactive with the public. Background investigations, field site characterizations, and public meetings were conducted by experienced scientists from Ecological Resource Consultants, Inc. (ERC) in collaboration with experts from ERO Resources Corporation (ERO) on behalf of the Town during the summer and fall of 2008. Long-term management of the Study Area will be directed by the Management Plan, which will be prepared by the Town based on the comprehensive scientific findings and recommendations provided in this Environmental Report.

Results of the environmental investigation show the Study Area contains resources with a wide range of environmental sensitivity as well as ecological functions and values. In the most environmentally sensitive areas, long-term management should emphasize conservation and preservation to maintain and protect the ecological integrity of the Study Area. The types of public uses allowed on the Study Area will be determined by the forthcoming conservation easement and Management Plan. Management of the Study Area should strike a balance between public recreational use and the protection of environmentally sensitive areas. As part of the Management Plan process, the Town should define management zones that emphasize the conservation of the most environmentally sensitive resources and unique features within the Study Area as well as provide appropriate levels of public use within the context of the conservation easement. These management zones should be clearly defined and should guide management policies and uses. Whatever is ultimately determined, the types and locations of public recreational uses should be responsive to sensitive habitat conservation needs and compatible with other management priorities.



1.0 Introduction

1.0 INTRODUCTION

The Telluride Valley Floor Environmental Report (Environmental Report) is being prepared to provide a comprehensive understanding of the existing conditions, structure and function of the Study Area's ecosystem. This Environmental Report is intended to provide a scientific assessment of the Study Area that can be used by the Town in future policy decisions regarding management, maintenance and restoration. The basis for the Environmental Report was provided following resolution of the case of *Town of Telluride v. San Miguel Valley Corp*. Following the favorable verdict on behalf of the Town, the decision to protect the open space values by way of a conservation easement required the evaluation of the natural resource issues associated with the Study Area. The scope of this Environmental Report includes an assessment of the Study Area acquired by the Town and covers a broad array of natural resources and watershed functions and values. The result is a multi-disciplinary ecological approach that provides the foundation for management of the Study Area.

Photo 1

1.1 OVERVIEW

This section provides a regional context, defines the Study Area, presents general background information, and describes the legal history of the Valley Floor.

1.1.1 Location

The Study Area is located immediately west of the town of Telluride in San Miguel County, on the western slope of Colorado. The Study Area is in Sections 33, 34, 35, Township 43 North, Range 9 West, and the center coordinates for the Study Area are: Latitude 37°56'43.745" North, Longitude 107°50'47.975" West). The Town is a Colorado Home Rule Municipality. **Figure 1-1** shows a map of the general vicinity of Telluride. Telluride is located in the San Juan Mountain Range, which covers over 12,000 square miles of southwestern Colorado (about one-eighth of the state) **(Photo 1)**. Geologically, the mountains are relatively new, and rank among the highest and most rugged in North America. About 70% of San Miguel County is administered by the United States Department of the Interior, Bureau of Land Management (BLM), and the US Forest Service (USFS). The state of Colorado administers 1.5% of the land area (USDA-NRCS 2001). The Town **(Photo 2)** is situated in the Uncompahgre National Forest. This National Forest has four peaks over 14,000 feet and approximately 100 peaks over 13,000 feet in elevation.

Photo 2

1.1.2 Study Area

The Study Area **(Photo 3)** encompasses approximately 560 acres extending 2.75 miles east from Society Turn to Town. The Study Area is bordered to the east by an undeveloped Town-owned property (the Pearl Property), to the south by USFS land, to the west by State Highway 145/Society Turn, and to the north by the former State Highway 145 Spur, which was purchased by the Town 1994 and is currently known as the "Spur" **(Figure 1-2)**. The Spur turns into Colorado Avenue in Town. The 560-acre Study Area is a portion of the Town property legally described in **Appendix A**.

Topography of the Study Area is relatively flat, sloping from an elevation of 8,750 feet above mean sea level (AMSL) on the east side of the Study Area to 8,643 feet AMSL on the west side of the Study Area near Society Turn. Portions of the southwest side of the Study Area and a small segment along the far southeast side of the Study Area incorporate areas of forested mountain reaching elevations of approximately 8,850 feet AMSL.

Photo 3

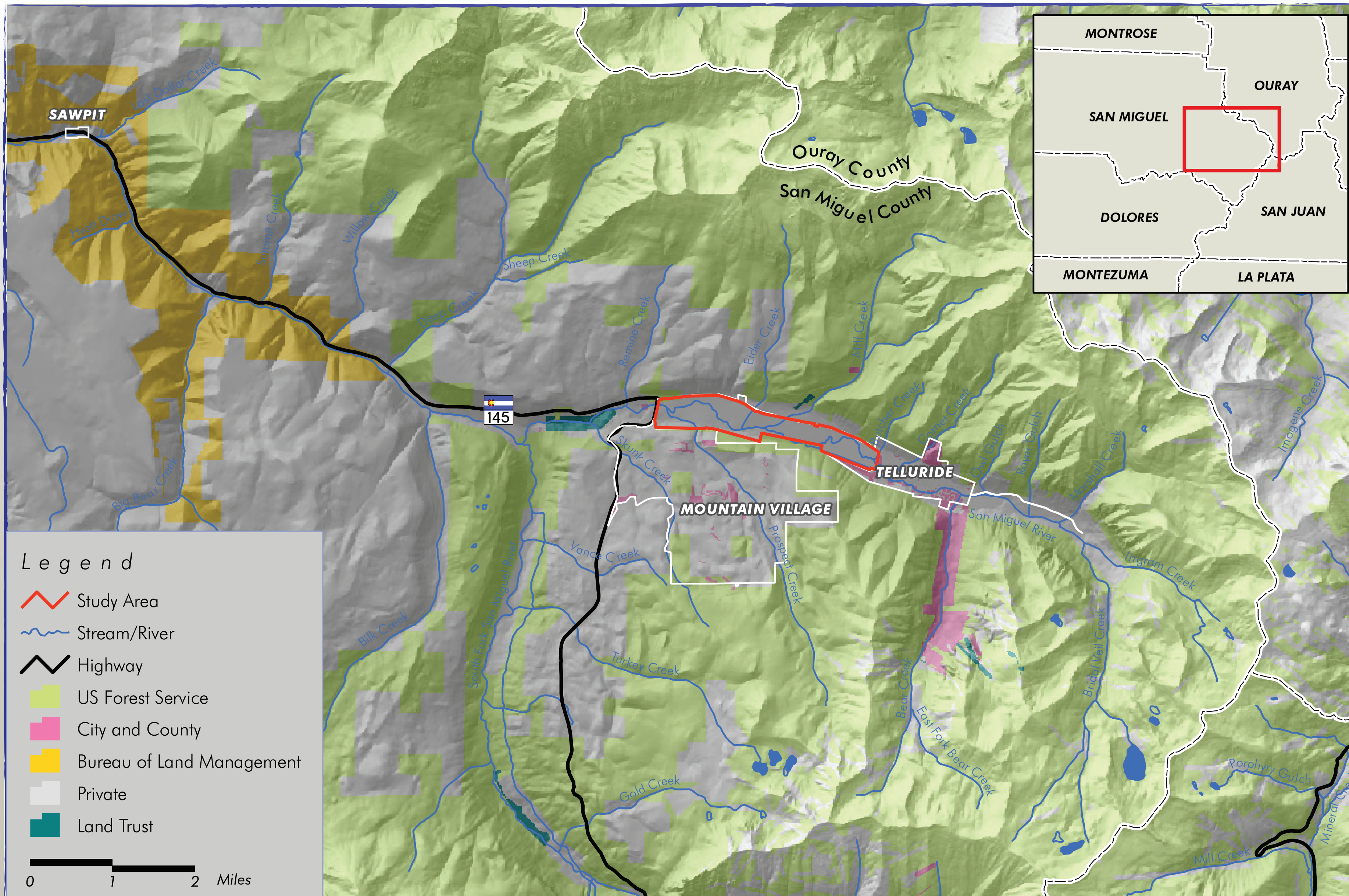


Figure 1-1

General Vicinity Map

Telluride Valley Floor

Environmental Report

Town of Telluride

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ERO

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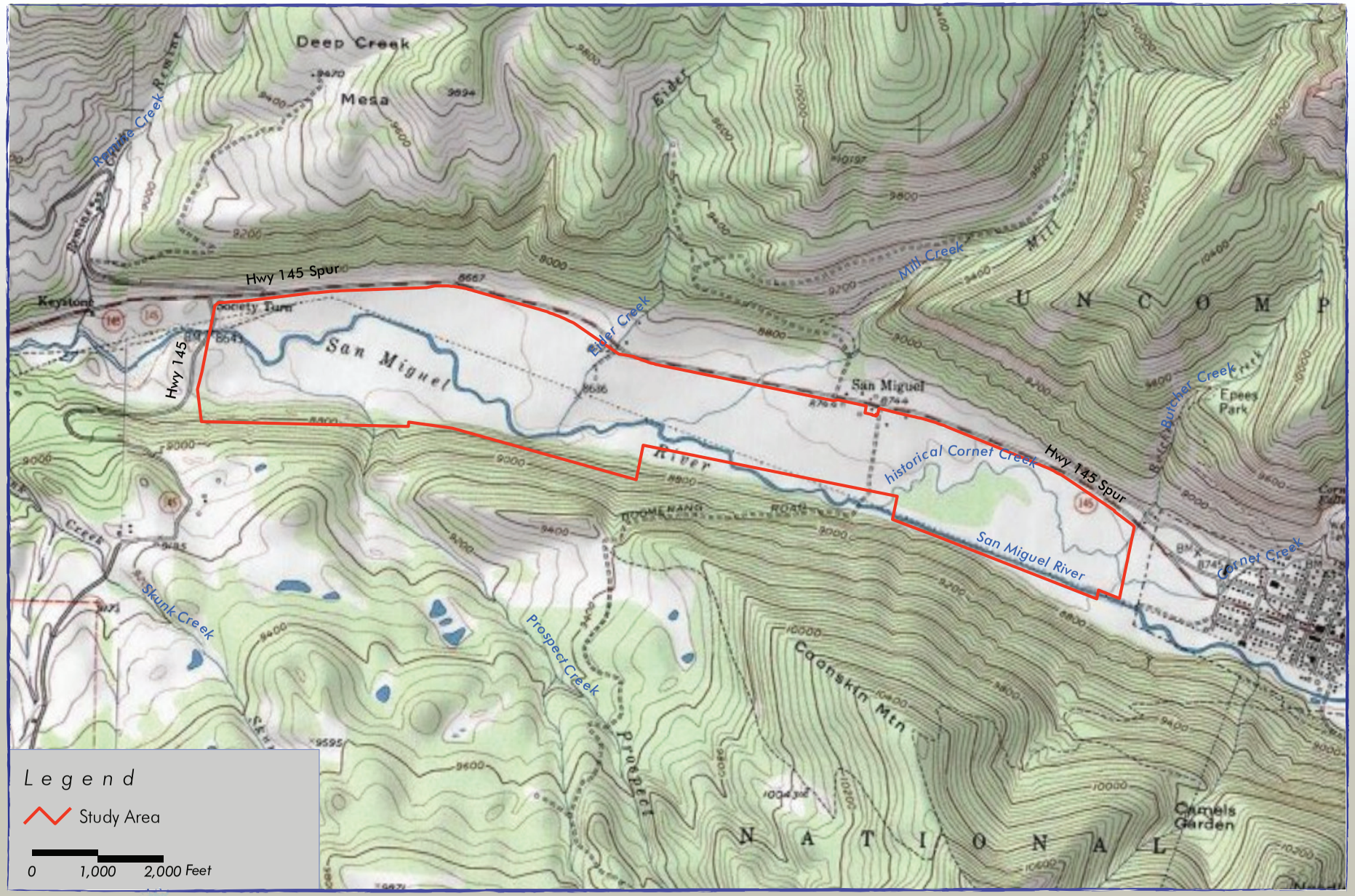

Figure 1-2

Study Area Location

Telluride Valley Floor

Environmental Report

March 2009

Ecological Resource Consultants, Inc.

Photo 4

Telluride from Society Turn (Courtesy, La Plata Historical Society)

Photo 5

Photo 6

1.1.3 General Setting

The climate in San Miguel County is variable, ranging from warm desert in Disappointment Valley (approximately 75 miles west of Telluride) to cool and sub-humid on the mesas and mountains within the Uncompahgre National Forest. In Telluride, the average annual total rainfall precipitation is approximately 23.19 inches (HPRCC 2008). Snowmelt from the San Juan Mountains and the Uncompahgre Plateau yields the major flow for the rivers and creeks in the Study Area. The average annual snowfall in Telluride is approximately 194 inches. The average growing season is only 50 to 80 days long, and typically extends from late June/early July to late August/early September, depending on seasonal variability (USDA-NRCS 2008, USDA-NRCS 2002).

The San Miguel River is one of the few remaining undammed rivers in the State; however, its biological and physical integrity have been affected by an assortment of historical land uses within its watershed – including mining, railroads, agriculture, regional development, recreation and resort tourism. Traversing the Study Area along a wide (approximately 1,000 foot) alluvial fan composed of sand and gravel deposited by the last glaciation, the San Miguel River flows along the length of the Study Area, from east to west, through several reaches that vary in sinuosity, size of substrate, and water velocity. The 90 mile long San Miguel River is a tributary of the Dolores River and represents the principal source of surface water in the County, draining the San Juan Mountains and flowing northwest from its headwaters **(Photo 4)** approximately 7 miles upstream from the Study Area. Downstream of the Study Area, the San Miguel River flows along the southern slope of the Uncompahgre Plateau, to the Dolores River in western Montrose County, approximately 15 miles east of the state line with Utah. From its confluence with the Dolores, the San Miguel River flows approximately 50 miles to its confluence with the Colorado River. Six perennial tributaries feed the San Miguel River within the Study Area.

1.1.4 Study Area Background

1.1.4.1 Historical Land Use

Modern land use in the area began in 1876, when parts of the Study Area, called San Miguel City, were settled and utilized for placer mining. During the late 1880s, the naturally meandering San Miguel River was channelized and straightened to accommodate the Rio Grande Southern Railroad. The historic railroad grade **(Photo 5)** bisects the Study Area, confining and redirecting the San Miguel River channel to the south, disconnecting the river from much of its natural floodplain **(Photo 6)**. The Town's sewage line currently underlies sections of the historic railroad grade. Mining and dairy farming continued within the Study Area through the end of the Second World War. By 1950, the railroad was no longer running. **Figures 1-3 and 1-4** depict Study Area features such as the historic railroad grade, sewage line, trails, fences, streams and rivers.

The Idarado Mine Superfund Site is located between the Town and Ouray in San Miguel and Ouray counties. The western portal of the mine is about 2 miles east of the Town. Reports indicate this historic mine deposited over 50,000-75,000 tons of tailing materials along the stream banks of the San Miguel throughout the Study Area (SEI 2002, State of Colorado v. Idarado Mining Company *et al.* 1992). The San Miguel River through the Study Area **(Photo 7)** is currently listed as a 303(d) impaired waterbody under the Clean Water Act (CWA) for excessive levels of zinc (EPA 2008a). The river banks in the tailings areas are significantly eroded due to the lack of vegetation and the unconsolidated composition of the mine tailings. These uses, in addition to increased population growth in surrounding areas, have affected the Study Area. Agricultural practices within the Study Area also have contributed to impacts.

Numerous ditches line the upland agricultural fields diverting water from natural tributaries altering and re-directing flow affecting local vegetation, wildlife, and the amount of water flowing to the San Miguel River **(Photo 8)**.

Mining and agriculture aside, other land uses also impact the Study Area. Residential development currently lines the north side of the Spur leading to the Town, although the south remains open space. Resort tourism brings thousands of people into Town on an annual basis, resulting in impacts from vehicle trips on the Spur and pressuring the area's recreational resources. Currently, the Study Area is open to the public for a variety of recreational uses. Discussed further in **Section 3.2 Resource Management Recommendations**, a multiuse trail circles the upland perimeter of the Study Area **(Photo 9)** providing access to the Study Area from the east and the west. The multiple uses of the trail, including mountain biking and hiking, bring a variety of additional impacts to the Study Area.

Consolidation of the San Miguel River Valley Floor to single ownership began in the 1930s when Joe Oberto began buying many small properties. Throughout the 1940s, land use on the Valley Floor reflected Telluride's mining industry, with portions of the property used as mine tailing storage sites. After the Rio Grande Southern Railroad closed in 1951, the Telluride mining industry began to decline. In 1967, Joe Oberto sold the property to Newmont Mining, the owner of Idarado, a local mine. Idarado intended to use the area to store additional mine tailings on the land. Although additional excavations and other site disturbances occurred, the Town was largely successful at preventing such use and by 1971, Idarado's Telluride mine closed.

1.1.4.2 Recent Land Use and Ownership

The Study Area was formerly a portion of the larger San Miguel Valley Corporation (SMVC) property, which occupied approximately 714 acres. In 1983, 860 acres, including the 714 acres composing the property, were sold to the Cordillera Corporation, the parent company of the SMVC. Of the 714 acres located adjacent to Town, 560 acres were located to the south of the Spur, 121 acres were located to the north of the Spur, and 20 acres were located at Society Turn (the northwest corner formed by the intersection of Highway 145 and the Spur). These parcels are commonly referred to as "the South Side," "the North Side," and "the Society Turn Parcel."

Meanwhile, while the property changed hands, the San Miguel Board of County Commissioners and the Town Council began to change as well. The San Miguel County Commissioners and the Town Council established the Telluride Regional Planning Advisory Committee (TRPAC) in 1979. TRPAC recommended methods to bring regional zoning in line with the County Master Plan, specifically density guidelines within each sub-region of the Telluride region. This approach, known as the PUD-R zoning designation, allocated to the property a collective density of 1,770 people, two-thirds of which were designated for the South Side. The South Side was allocated two high-density development pods, one for 200 lodge units on a 10-acre site and another for 600 lodge units on a 5-acre site. On January 29, 1982, the San Miguel County Board of Commissioners adopted the PUD-R zone district recommendation.

In April 1986, negotiations between Cordillera and the Town related the location of a sewer plant at Society Turn collapsed. For the first time in the property's history, the Town initiated procedures to condemn a new sewer treatment plant site on the Society Turn parcel using its power of eminent domain. Ultimately, the Town agreed to a Society Turn Sewer Treatment Plant Agreement as an alternative to condemnation. Under the terms of the Agreement, Cordillera conveyed the Sewer Treatment Plant Site to the Town along with certain other property and easements. In turn, the Town conveyed the old sewer lagoon site

Photo 7

Photo 8

Photo 9

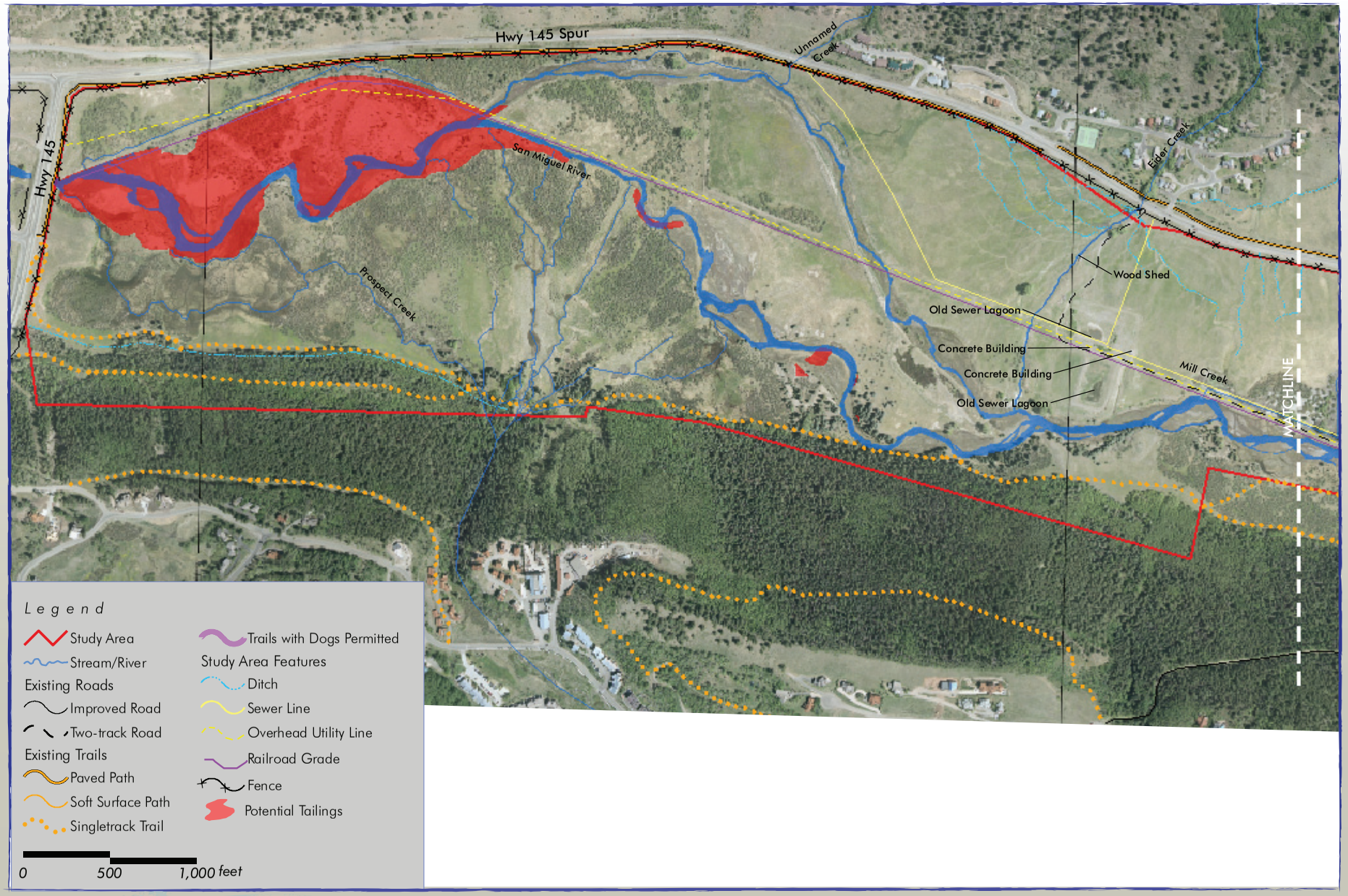

Figure 1-3

Study Area Features (West)

July 2009

N W E S

Telluride Valley Floor

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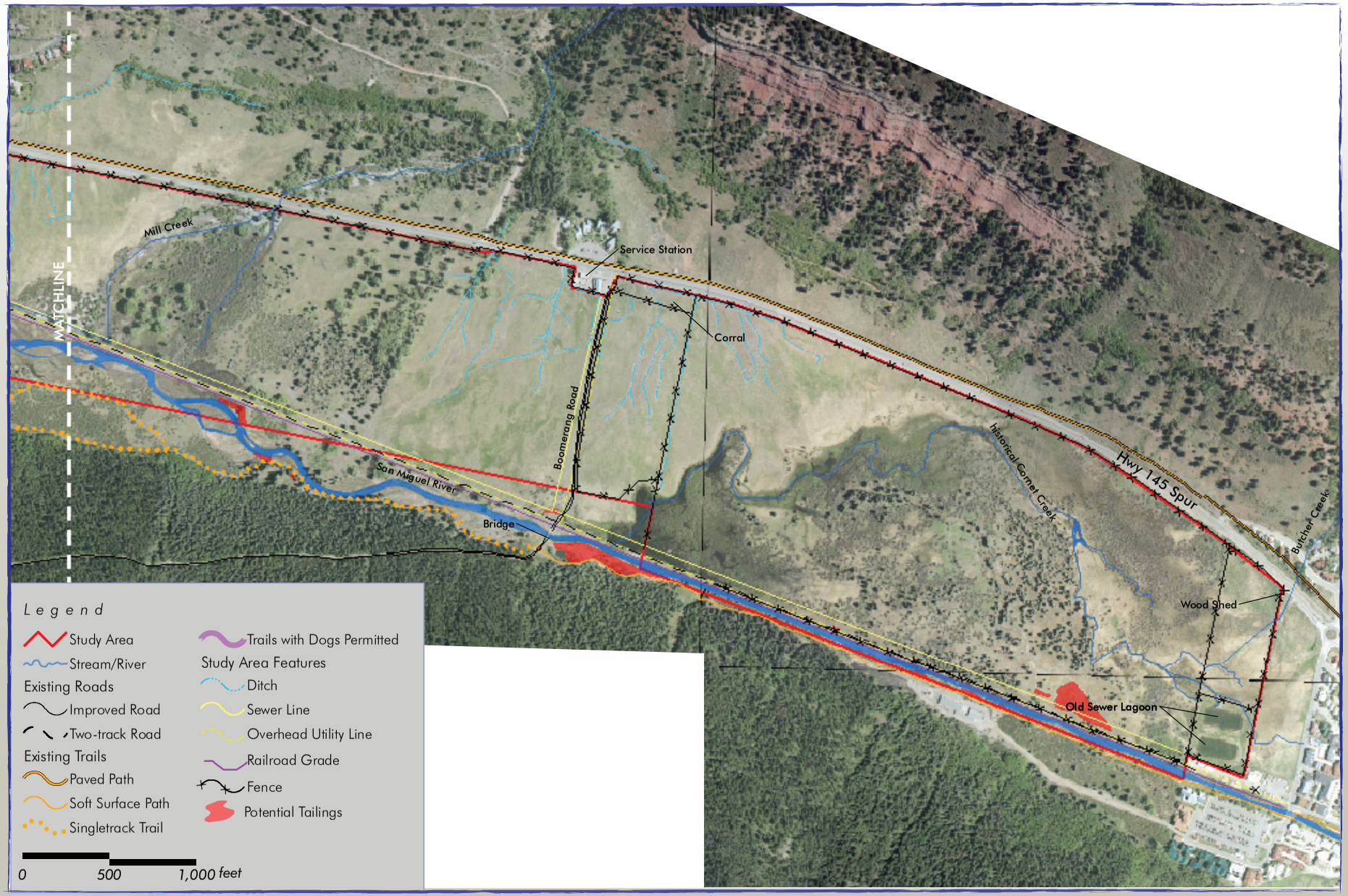

Figure 1-4

Study Area Features (East)

July 2009

N W E S

Telluride Valley Floor

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Town of Telluride

Ecological Resource Consultants, Inc.

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(located in the middle of the South Side) to Cordillera.

In 1993, the Town citizens (electorate) voted to implement the "20 Percent Solution" to create public funds for open space preservation. The vote was a public declaration that the Town was prepared to appropriate funds for the cause of open space preservation in the Telluride area.

In June 2000, SMVC representatives made a presentation to the Mountain Village Town Council concerning annexing the property into nearby Mountain Village. Within two weeks, the Town Council voted unanimously to begin immediate work on appraisals, legal descriptions and boundary surveys of the property, with the express purpose of condemning it. On April 10, 2001, the Town Council passed Resolution No. 3, authorizing counsel to proceed with a condemnation action toward acquiring 714.14 acres of the property. Resolution No. 3 was revoked in October 2001 and replaced with Ordinance 1157, which also authorized counsel to exercise the power of eminent domain on behalf of the Town.

In 2002, the Sheep Mountain Alliance (SMA) filed an initiated condemnation ordinance with the Town. On June 25, 2002, the Town voted 605 to 389 to acquire the South Side of the property through condemnation. The vote would initiate 6 years of litigation between the Town and the SMVC.

In January 2004, the Town Council voted unanimously to file a legal action condemning the property. On March 14, 2004, the Petition for Condemnation was officially filed in District Court.

On June 4, 2004, Colorado Governor Bill Owens signed House Bill (H.B.) 1203, containing the so-called "Telluride Amendment." The bill purported to outlaw Home Rule Municipalities from condemning property outside their borders for parks, recreation, and open space preservation. On the same day, the SMVC filed an Answer and Counter Claim asking the court to dismiss the Condemnation Petition based on the new legislation. The Town subsequently filed a Motion to Dismiss the Counterclaim stating that H.B. 1203 was inapplicable, unenforceable, unlawful, and unconstitutional. On October 6, 2004, Judge Charles Greenacre ruled H.B. 1203 unconstitutional, essentially nullifying the position of the SMVC that the Town could not pursue condemnation. Judge Greenacre would preside over a valuation trial scheduled to occur in 2006 and ordered the Town and SMVC into mediation, to be completed by the end of 2005.

The trial to determine the value of the 560-acre property concluded with a jury verdict on February 16, 2007. The total award for the property was deposited with the court, by the Town, on May 9, 2007.

On March 27, 2007, the SMVC filed a Notice of Appeal with the Colorado Supreme Court to dismiss the October 6, 2004 Order denying SMVC's Motion to Dismiss and granting the Town's Motion to Dismiss Counterclaim, which held that H.B. 1203 was unconstitutional, and that the Town had the right to proceed with condemnation. The Colorado Supreme Court agreed to hear oral arguments to determine if the Town had the constitutional power of eminent domain to acquire the property.

On June 2, 2008, the Colorado Supreme Court rendered its decision 6 to 1 in favor of the Town, stating that the Town's condemnation of the property was lawful, "…because the General Assembly cannot deny Home Rule Municipalities the eminent domain power conferred to them in the constitution." When Judge Greenacre issued the final Rule and Order for the Condemnation Case on June 20, 2008, possession of the approximately 560 acre Study Area officially transferred to the Town.

1.2 PURPOSE

Although the issuance of the final Rule and Order effectively ended the legal battle for ownership of the Study Area, it ushered in a new era of Town management. On June 24, 2008, the Town authorized Ordinance No. 1289 to formally extend municipal jurisdiction to the Study Area and immediately establish a set of interim land use regulations for the Study Area. Town Ordinance No. 1289 reaffirms the Town's commitment to preserve and protect the Study Area for the purpose of public open space **(Appendix B)**. To accomplish that goal, Ordinance No. 1289 authorized immediate restrictions on public use of the Study Area until the completion of the Environmental Report, described as "a comprehensive assessment of the existing natural conditions on the Valley Floor…a key element that must be completed before the imposition of the Valley Floor conservation easement and management plan" **(Appendix C)**.

Ordinance No. 1289 is a temporary measure to assert short-term management over the Study Area. Long-term management of the Study Area will occur under the authority of a Management Plan prepared based in part on this Environmental Report. Future guarantees that the open space values of the Study Area will be protected will be ensured through a conservation easement **(Appendix C)**. A conservation easement is similar to other easements in that it transfers usage rights, creating a legally enforceable agreement between a land owner and another party. In the case of the Study Area, the agreement involves restrictions on the use of the Study Area to protect its open space values.

This Environmental Report provides a comprehensive assessment of the existing natural and physical conditions of the Study Area, with the intent of providing a scientific foundation for the long-term management of the Study Area within the constraints of the conservation easement.

1.3 PROJECT APPROACH

1.3.1 Project Phases

The approach to the project was driven first and foremost by scientific methodologies, but was also an open and interactive process with the public. The project consisted of a four-phased approach: Phase I—Project Scoping; Phase II—Data Collection; Phase III—Public Presentations; and Phase IV—Report Preparation and Recommendations.

Phase I – Project Scoping

The first phase set the project schedule for data collection, public meetings, and report preparation. The key study elements were defined as was the appropriate level of investigation needed to produce a sound technical environmental evaluation of the Study Area. Specific natural resources of importance, target indicator species, water resources, water rights and historic/cultural resources were defined to ensure appropriate data were obtained for use in determining management and restoration guidelines. Project scoping activities included:

- Establishing project schedules and available budget;
- Identifying key natural resources and physical characteristics to investigate;
- Defining data collection and review methods; and
- Developing public meeting schedule.

Phase II – Data Collection

The second phase included completion of a comprehensive environmental

evaluation and analysis of the Study Area's ecologic and environmental resources. The second phase included initial investigation, field data collection, analysis and interpretation of scientific data related specifically to the characteristics of the Study Area. Data collection activities included:

- Investigating available data sources (literature/reference review, interviews with local experts or agencies); and
- Characterizing in the field the following resources:
    - Wetlands
    - Upland vegetation
    - Aquatic resources
    - Threatened, endangered and species of concern
    - Wildlife
    - Tailings
    - Soils and geology
    - Hydrology, floodplains and irrigation facilities
    - Historic, cultural and archaeological resources.

Phase III – Public Presentations

The third phase communicated the scientific data to the public and incorporated public input within the limits of the hard science. The third phase provided an open and extensive public informational forum to keep the Town, citizens and other interested parties updated on findings and progress. Public presentation activities included:

- Providing news and information to the public on the Town's website;
- Presenting data in public workshops and educational forums; and
- Incorporating information obtained from the public.

Phase IV – Report Preparation and Recommendations

The fourth and final phase included preparation of a Draft Environmental Report for review and comment by the Town and public. After the consideration of comments, the Environmental Report was finalized. The fourth and final phase presented the scientific data accompanied with management and restoration recommendations to provide the Town with the foundation to achieve intelligent restoration and management of the Study Area. Report preparation and recommendation activities included:

- Preparing the Draft Environmental Report;
- Finalizing the Environmental Report; and
- Presenting resource management recommendations, restoration opportunities, guidelines for public use management, adaptive management strategy, and future monitoring measures.

1.4 INITIAL INVESTIGATION

1.4.1 Literature Review

Extensive research has been conducted previously in the region as well as within the Study Area itself. This information helped with understanding existing data and identifying data gaps. It also provided insight into existing opportunities, problems, and constraints of the Study Area.

The data were used along with input from outside resources discussed in the *Interviews* section to define the amount of additional background work that needed to be done for this Environmental Report. Information gained through

the literature review was critical to defining a well developed project scope as defined in the *Project Phases* section.

Literature and background data review activities included:

- Reviewing existing studies and data;
- Determining current data gaps; and
- Understanding the need for additional data collection.

The list of literature reviewed included the following:

- Aquatic and Wetland Company, Wetland Map of the Cordillera Property, 1994.
- Banks and Gesso, Mineral Report, 2002.
- Colorado Division of Wildlife, Aquatic Inventory, San Miguel Project, (part of San Miguel County – Telluride Region Master Plan).
- Colorado Mined Land Reclamation Board, Study of Wetlands Picking up Heavy (Metals), (part of San Miguel County – Telluride Region Master Plan).
- Department of the Army, Corps of Engineers, Jurisdictional Determination Modifications, 1998.
- HOH Associates, Site Analysis, Development Suitability and Preliminary Planning Concepts, Telluride Colorado, 1994.
- Institute of Arctic and Alpine Research, Natural Hazards of San Miguel County, University of Colorado, 1997 (part of San Miguel County – Telluride Region Master Plan).
- National Valuation Consultants, Inc., History of Mineral Rights, 2005.
- San Miguel County, Master Plan Mapping – Elk Activity, Mule Deer Activity, Flood Boundary & Floodway of San Miguel River, Trails and Geological Hazards.
- San Miguel County, Open Lands Plan.
- Sustainable Ecosystems Institute, SEI Report, 2002.
- Telluride Ski and Golf Company, Mitigation Site, Book 570, Page 6788.
- Town of Telluride, Telluride Open Lands Plan.
- Town of Telluride, Draft Conservation Easement, 2007.
- US District Court for the District of Colorado Civil Action No. 83-C2385, Consent Decree and Remedial Action Plan, 1992.
- Water Rights (to be acquired) documentation.
- Baseline Documentation Report, prepared by BIO-Logic, Inc., 2008.
- Preliminary Design Report for the Court Ordered Remediation Plan at the Idarado Mine Facility, prepared by Rocky Mountain Consultants, Inc. (RMC), 1989.
- Evaluation of High Flow and Low Flow Sampling and Historical Data – Society Turn Tailings Piles ST-1, ST-2, and ST-3 along the San Miguel River, San Miguel County, Colorado, 2001.

1.4.2 Interviews

For some issues, the most efficient approach to gathering information was to incorporate additional resource-specific experience on a topic. Experts with

specific qualifications on topics that were key to the community, such as the interaction of dogs in natural areas or beaver and prairie dog management, were consulted to supplement ERC and ERO's technical knowledge and provide input at topic-specific educational forum meetings. Local entities and governmental agencies with relevant expertise were interviewed in person and via telephone and e-mail communication. Relevant information was incorporated into this Environmental Report and is documented in appropriate sections. **Table 1-1** is a summary table identifying the entities interviewed.

1.5 PUBLIC INVOLVEMENT

An education-based, interactive public forum was important throughout all phases of this project to keep the Town, citizens and other interested parties updated on findings and progress and to obtain input and feedback. The public process included a kick-off meeting with Town staff, data presentation in the form of public meetings, and report presentation.

Two types of public meetings were held as part of the process, general public workshops and targeted topic-specific educational forums. Public meetings were held at Rebekah Hall (113 W. Columbia Ave., Telluride, Colorado) and consisted of presentations in an open house format.

Project Initiation

A kick-off meeting was conducted with Town staff on June 25, 2008. In addition, an initial public workshop was held on July 24, 2008 (Public Meeting #1). This first public workshop introduced the ERC/ERO project team to the community, and provided an overview of the Conservation Easement, and an explanation of the Environmental Report purpose, process and general methods used to collect resource data.

Data Presentation

Phase II of the public involvement process included the presentation of the initial scientific findings and general characteristics. This meeting was a 1-day public workshop held on September 25, 2008.

Public Meeting #2 – September 25, 2008 (Presentation of Findings)

- Wetland Assessment
- Vegetative Communities
- Threatened/Endangered & Species of Concern
- Tailings Characterization
- Wildlife
- Aquatic Resources
- Soils/Geology/Hydrology
- Historic, Cultural & Archaeological Resources
- Summary of Work to be Completed
- Project and Public Process Schedule

In addition to the general data presentation workshop, three educational forums were held for the community on October 2, 2008, December 8, 2008, and December 9, 2008. The purpose of these forum meetings was to discuss topics of community interest as part of the scientific findings. The forums included the following topics:

Table 1-1. Summary of Individuals and Entities Interviewed.

Organization	Expertise	Contact Name
Montana Department of Transportation	Wetland Functional Assessment	Lawrence J. Urban Wetland Mitigation Specialist
Bio-Logic	Conservation Easement Baseline Report	Steve Boyle Senior Biologist
Boulder County Parks and Open Space	Dog Management	Mark Brennan Wildlife Specialist
Bureau of Land Management	San Miguel River	Dennis Murphy Hydrologist
City of Boulder Open Space and Mountain Parks	Dog Management	Steve Armstead Visitor Master Plan Implementation Coordinator
Colorado Department of Public Health and Environment	Idarado Mining Complex; Water Quality	Camille Price State Project Manager Hazardous Materials and Waste Management Division
Colorado Division of Wildlife	San Miguel River	Dan Kowalski Aquatic Biologist
Colorado Division of Wildlife	San Miguel River	Barb Horn River Watch Coordinator
Colorado Division of Wildlife	Wildlife; Threatened & Endangered Species	Mark Caddy District Wildlife Manager
Colorado Division of Wildlife	Gunnison's Prairie Dogs	Amy Seglund Regional Habitat Biologist
Misc	Rare Plants	Bill Schiffbauer Local Citizen
Oikographica	Prospect Creek Wetland Mitigation Site	Edward Gage Ecologist
PBS&J	Wetland Functional Assessment	Rich McEldowney
Pitkin County	Dog Management	Gary Tennenbaum Land Steward
San Juan Fen Partnership	Fens	Deanna Belch Environmental Program Manager Telluride Ski & Golf Resort
San Miguel Conservation Foundation	Conservation Easement	Gary Hickcox
San Miguel County	Weed Management	Shiela Grother Weed Control Program Manager
San Miguel County Environmental Health Department	Environmental Health	Dave Schneck County Environmental Health Director
San Miguel Watershed Coalition	Water Quality	Leigh Sullivan Watershed Coalition River Ranger
Telluride Ski & Golf Resort	Prospect Creek Wetland Mitigation Site	Chris Hazen Former Field Monitoring & Mitigation Site Maintenance Manager
Town of Breckenridge	Dog Management	Heide Andersen Open Space and Trails Planner
US Army Corps of Engineers	Wetlands	Sue Moyer Project Manager Grand Junction Regulatory Office
US Environmental Protection Agency	Biological Monitoring	Jill Minter
US Environmental Protection Agency	Prospect Creek Wetland Mitigation Site	Kenneth Champagne Section 404 Enforcement Program
US Fish and Wildlife Service	Threatened & Endangered Species	Al Pfister Western Colorado Project Leader
US Forest Service	Wildlife	Unknown
Valley Floor Preservation Partners	Valley Floor History	Information obtained online
Western Aquatic Entomology	Aquatic Insects	Joe Kotynek

Photo 10

Educational Forum #1 – October 2, 2008 (Study Area Characteristics) **(Photo 10)**

- Wetlands
- Vegetation Communities
- Wildlife
- Aquatic Assessment

Educational Forum #2 – December 8, 2008 (Management Concerns)

- Sensitive Areas
- Cultural/Historic Resources Discussion
- Panel Discussion – Tailings
- Panel Discussion – Prairie Dogs

Educational Forum #3 – December 9, 2008 (Management Concerns)

- Study Area Restoration and Monitoring
- Recreation within the Study Area
- Panel Discussion – Dogs

Report Presentation

The Draft Environmental Report was presented on February 3, 2009 at a public workshop meeting (Public Meeting #3). The information presented included how the findings (science) and preliminary recommendations relate to management, suggested monitoring measures and restoration opportunities in the Study Area.

A final meeting was held on March 23, 2009 (Public Meeting #4) to present the Final Environmental Report to the Town. This workshop was intended to accommodate questions specific to scientific findings and recommendations.

2.0 Field Site Characterization

2.0 FIELD SITE CHARACTERIZATION

A comprehensive field assessment was essential as part of this project to scientifically determine the physical attributes and ecological integrity of the Study Area. This assessment and subsequent data evaluation provides a scientific foundation to guide future management. As part of this Environmental Report, site characteristics and resources were selected to be evaluated that best provide an overview or representative perspective of physical and ecological conditions of the Study Area.

Site characteristics and resources selected for evaluation included:

- Wetlands
- Upland vegetation
- Aquatic resource
- Threatened, endangered and species of concern
- Wildlife
- Tailings
- Soils and geology
- Hydrology, floodplains and irrigation facilities
- Historical, cultural and archaeological resources

For each of the above characteristics or resources, a methodology was devised, field or office research was performed and results were compiled and analyzed. Results presented in this Environmental Report have been peer reviewed by staff at ERC and ERO, Town staff, and the public through the public comment process as part of the Draft and Final Environmental Report.

Project base mapping was provided by the Town, and produced by Foley Associates, Inc. Project base mapping included color orthorectified digital aerial photography with 0.5 foot pixel size. Aerial photography was taken in July of 2008. Two foot contour interval topography was produced. All mapping was established in the Colorado State Plane-South coordinate system and the North American Datum of 1983 (NAD83). Base mapping was compiled and incorporated into ArcMap Geographic Systems (GIS) (Version 9.2) for spatial analysis and mapping.

Site characteristics and resources were evaluated using a combination of aerial photo interpretation and field verification as appropriate. During field evaluations, positional information for selected site characteristics and resources were recorded using a handheld Trimble GeoHX Global Positioning System (GPS) unit. Coordinates were recorded in feet using the Colorado State Plane-South coordinate system, NAD83. The resulting GPS data were post-processed using Trimble Pathfinder Office 3.10 software. Post-processing differential correction provided an average horizontal mapping accuracy of +/- 3 feet. Post-processed GPS data were imported into GIS and overlain on the project base mapping.

All project base mapping utilized for the production of figures in this Environmental Report has been compiled and forwarded to the Town in GIS format.

2.1 WETLANDS

Wetlands are transitional zones between terrestrial and aquatic habitats. They are valuable biological resources that perform many functions including groundwater recharge, flood flow attenuation, erosion control, and water quality improvement. They also provide habitat for many plants and animals. The

Photo 11


Photo 12


Photo 13

US Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA) jointly define wetlands as, "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." Waters of the US are defined as areas that "include essentially all surface waters such as rivers, streams and their tributaries, all wetlands adjacent to these waters, and all ponds, lakes and reservoirs."

Through their administration of Section 404 of the CWA, the USACE has jurisdiction over all waters of the US, which includes wetlands adjacent to waters of the US. The protection of these areas is critical for maintaining the physical, chemical and biological integrity of waters of the US. A wetland delineation was conducted to identify all wetland and waters of the US habitat, determine jurisdiction and regulatory status under the CWA, as well as to classify habitat types within the Study Area. The wetland delineation will be submitted to the USACE by the Town in order to receive official verification of the wetland delineation. Results of the wetland delineation served as the basis for the habitat classification used to further describe the existing conditions of the wetland resources found in the Study Area. The primary objective of this classification was to define general community type boundaries for the purposes of inventory, evaluation, and management.

2.1.1 Methodology

Study Area wetlands and waterways were evaluated in the summer of 2008.

The objectives of the wetland evaluation were to:

- Delineate wetland and waters of the US boundaries and obtain a jurisdictional determination from the USACE; and
- Classify wetland habitat types.

2.1.1.1 Wetland Delineation

A formal wetland delineation was completed to identify specific locations of wetlands and waters of the US that may be considered jurisdictional and regulated by the USACE under Section 404 of the CWA. Wetland delineation field work was conducted on July 15-19 and 21-25, 2008 to identify and document the presence and extent of wetlands and waters of the US within the Study Area. The delineation was completed using the routine (on-site) methodology and criteria specified in the *2008 Interim Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Western Mountains, Valleys, and Coast Region* (Environmental Laboratory 2008) (herein referred to as "Supplement"). As of February 12, 2008, the Supplement was made mandatory for any data collection for wetland delineations by the USACE Sacramento District of which the Study Area is part. The development of regional supplements is part of a nationwide effort to address regional wetland characteristics and improve the accuracy and efficiency of wetland delineation procedures (Environmental Laboratory 2008). The Supplement was designed as an update to the *1987 USACE Wetland Delineation Manual* (Environmental Laboratory 1987).

Based on the Supplement, wetlands are identified by three general diagnostic characteristics:

- Hydrophytic vegetation **(Photo 11)**;
- Hydric soils **(Photo 12)**; and
- Wetland hydrology **(Photo 13)**.

In addition to the delineation of wetlands, waters of the US were delineated in the field according to the ordinary high water mark (OHWM). The OHWM is characterized as "the line on the shores established by the fluctuations of water and indicated by physical characteristics such as: a clear natural line impressed on the bank, shelving, changes in the character of the soil, wetland vegetation, the presence of litter and debris, and other appropriate means that consider the characteristics of the surrounding areas" **(Photo 14)** (33 CFR Section 329.11(e)). Areas that do not meet any one of the wetland parameters (hydrophytic vegetation, hydric soils and/or wetland hydrology) were classified as upland and mapped as such. These definitions are the basis of the wetland delineation.

Photo 14

Based on the field observations, a wetland determination was made, the limits of plant community types delineated, and a wetland/upland boundary field flagged. Each wetland boundary determination point was recorded in the field using a GPS receiver. Where no wetlands were present, potential waters of the US were delineated using either the OHWM of the channel, or the channel centerline. The resulting GPS data were overlain on project base mapping for spatial analysis and mapping.

Results of delineation were summarized in a report per the "Minimum Standards for Acceptance of Preliminary Wetland Delineations" by the USACE Sacremento District.

2.1.1.2 Habitat Classification

During field surveys, wetlands and waters of the US were classified using the Cowardin *et al.* (1979) Classification of Wetland and Deepwater Habitats of the United States. Wetlands and waters of the US were classified into two systems: Palustrine and Riverine. The term System refers to "a complex of wetlands and deepwater habitats that share the influence of similar hydrologic, geomorphic, chemical, or biological factors" (Cowardin *et al.* 1979).

Photo 15

Palustrine Systems are all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens and all such tidal wetlands where ocean derived salinities are below 0.5 parts per thousand (ppt). The Palustrine System encompasses wetlands traditionally called by such names as marsh, swamp, bog, fen, and prairie **(Photo 15)**. This category also includes wetlands lacking such hydric vegetation but with all of the following characteristics: (1) area is less than 20 acres, (2) area is lacking an active wave formed or bedrock boundary, (3) water depth in the deepest part of the basin is less than 6.6 feet at low water, and (4) ocean derived salinities are less than 0.5 ppt (Cowardin *et al.* 1979). Wetlands within the Palustrine System were classified into five Subsystems: Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS), Palustrine Forested (PFO), Palustrine Open Water (POW), and Palustrine Unconsolidated Bottom/Shore (PUB/PUS).

Waters of the US were classified into the Riverine System and consisted of two Subsystems: Riverine Lower Perennial (R2) and Riverine Upper Perennial (R3). The Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5%. The Riverine System is bounded on the landward side by upland, by the channel bank (including natural and manmade levees), or by vegetated wetlands **(Photo 16)**.

Photo 16

A description of the wetland types present (as defined by the Cowardin *et al.* (1979) wetland classification system) and the extent to which they occur within the Study Area is presented in the *Results* section.

Photo 17

2.1.2 Results

2.1.2.1 Wetland Delineation

Within the Study Area, 312 acres of wetlands and waters of the US were identified and delineated. In total, 290 acres (51% of the Study Area) were classified as [Palustrine] wetland, 22 acres (4% of the Study Area) were classified as waters of the US [Riverine wetland], and 261 acres (46%) were classified as upland. Of the total 290 acres delineated as wetland, 6 acres were found to be hydrologically isolated.

Results of the wetland delineation (ERC 2008) will be submitted to the USACE (Grand Junction Regulatory Office) to request verification of the delineation and jurisdictional determination for wetlands and waters of the US within the Study Area. The wetland delineation and USACE verification establishes a line that separates and identifies wetland areas from non-wetland (upland) areas. The jurisdictional determination establishes regulatory status (jurisdictional wetlands versus non-jurisdictional wetlands) under the CWA and provides important information for planning purposes or carrying out certain activities on a given parcel of land.

A detailed description of the characteristics of wetlands and waters of the US delineated within the Study Area is included in the *Habitat Classification* section.

2.1.2.2 Habitat Classification

Palustrine Wetland Habitats

Of the 290 acres of Palustrine wetland within the Study Area, five wetland habitat types were classified and mapped. A summary discussion of the characteristics of the overall wetland complexes within the Study Area is provided below.

Palustrine Emergent (PEM) (108 acres)

PEM wetlands are characterized by erect, rooted, herbaceous hydrophytes including mosses and lichens. This type of vegetation is present for the majority of the growing season in most years. PEM wetlands are often dominated by perennial plants **(Photo 17)**.

PEM wetlands are found throughout the Study Area. The largest complexes are associated with beaver dams, which are abundant along Prospect Creek and historical Cornet Creek. A detailed discussion of historical Cornet Creek through the Study Area is included in the *Riverine Wetland Habitats* section.

Large PEM wetland complexes are found in the floodplain areas bordering the San Miguel River and its tributaries. A combination of the perennial streams and rivers that feed these habitats, in addition to a groundwater table that is at or near the surface throughout most of the Study Area, results in a water regime that is semi-permanently to permanently flooded throughout most of the growing season. The dominant vegetation occurring in these wetlands is hydrophytic plant species including Northwest Territory sedge (*Carex utriculata*), water sedge (*Carex aquatilis*), smallwing sedge (*Carex microptera*), and blister sedge (*Carex vesicaria*). Soils in the permanently flooded areas contain organic layers underlain by clay-textured mineral soils. The semi-permanently flooded areas are generally clay textured, mixed with varying degrees of sand/cobble/gravel.

Other (dryer) PEM wetland habitats within the Study Area occur on higher stream terraces or confined by berms. These wetlands have saturated to seasonally flooded water regimes. Vegetation in these wetlands is dominated by

clustered field sedge (*Carex praegracilis*) and smallwing sedge, interspersed with arctic rush (*Juncus arcticus*). Soils have thin organic layers of 0-2 inches and are generally clay loam above underlain by cobble/gravel substrate.

Palustrine Scrub-Shrub (PSS) (119 acres)

PSS wetlands are dominated by woody vegetation less than 20 feet tall. Typical species include shrubs, young trees and trees or shrubs that are small or stunted because of environmental conditions **(Photo 18)**.

PSS wetlands are the predominant habitat type within the Study Area. Most PSS wetlands occur in areas confined by berms, on elevated stream terraces, or areas with higher topographic relief. Hydrology is typically a combination of overland flow, groundwater, and precipitation/snowmelt. Water regimes vary from the drier temporarily flooded or saturated areas (confined by berms or with higher geomorphic setting) to the seasonally flooded areas (adjacent to streams). PSS habitat in these areas is characterized by a midstory dominated by Geyer willow (*Salix geyeriana*) most commonly, and to a lesser extent strapleaf willow (*Salix ligulifolia*) and park willow (*Salix monticola*), with an understory of water sedge, Northwest Territory sedge, and Arctic rush. Soil textures are loamy silt to sandy loam.

Other PSS wetlands within the Study Area include complexes associated with beaver dams along Prospect Creek and historical Cornet Creek. Due to the constant inflow of groundwater and surface water throughout the growing season, these wetlands have permanently flooded to semi-permanently flooded hydrologic regimes. The dominant vegetation occurring in these wetlands is hydrophytic plant species including Geyer willow, with a thick understory of water sedge, Northwest Territory sedge, and Nebraska sedge (*Carex nebrascensis*).

Palustrine Forested (PFO) (51 acres)

PFO wetlands are typically dominated by woody vegetation 20 feet or taller, and possess a canopy of trees, an understory of young trees or shrubs and an herbaceous layer **(Photo 19)**.

PFO wetlands within the Study Area occur along high stream terraces of the San Miguel River, along Prospect Creek, and in a large complex associated with historical Cornet Creek. These wetland areas have saturated to seasonally flooded hydrologic regimes. The dominant vegetation occurring in these wetlands is hydrophytic plant species including combinations of Engelmann spruce (*Picea engelmanii*), blue spruce (*Picea pungens*), subalpine fir (*Abies bifolia [lasiocarpa]*), and to a lesser extent trembling aspen (*Populus tremuloides*). PFO understories are typically sparse with some Geyer willow and herbaceous mixes of water sedge, and Arctic rush. Soil textures in these wetland areas are generally silty clay to sand.

Palustrine Open Water (POW) (8 acres)

POW wetlands are typically dominated by open water and are permanently flooded. They include unvegetated areas less than 20 acres in size with water depths in the deepest part under 6.6 feet at low water **(Photo 20)**.

Two types of POW wetlands occur within the Study Area, those areas associated with man-made excavation activities such as former lagoons and inundated areas forming the center of the beaver complexes. Four POW areas occur within the Study Area: two ponds on the far east side of the Study Area, which were historically excavated and intended to be used as sewage lagoons; one natural groundwater fed POW area in the center of the Study Area within a PEM complex; an isolated (former sewage lagoon) POW area near Eider

Photo 18

Photo 19

Photo 20

Photo 21

Creek; and a POW area associated with a beaver pond on the east side of the Study Area, which is interspersed with a large PSS/PEM complex.

Palustrine Unconsolidated Bottom (PUB) / Palustrine Unconsolidated Shore (PUS) (4 acres)

PUB/PUS wetland areas typically have at least 25% cover of particles smaller than stones (PUB) or unconsolidated substrates with less than 75% aerial cover of stones, boulders or bedrock (PUS), and a vegetative cover less than 30%. These areas are characterized by the lack of large stable surfaces for plant and animal attachment **(Photo 21)**.

Within the Study Area, these areas are commonly cobble-gravel with sparse vegetation. They are found along the braided meanders of the San Miguel River and along Mill Creek, which receives large amounts of cobble/gravel during high spring runoff flows.

Riverine Wetland Habitats

Areas delineated as waters of the US were classified as Riverine wetland habitat. Of the 22 acres of Riverine wetlands, two habitat types were classified and mapped (R2 and R3). A summary of Riverine wetlands within the Study Area by wetland classification is presented below.

Riverine Lower Perennial (R2) (18 acres)

In these Riverine wetland habitats, the gradient is low and water velocity is slow. The substrate mainly consists of sand and mud. The gradient is lower than R3 and the floodplain is well developed. Within the Study Area, the San Miguel River is classified as R2 wetland habitat **(Photo 22)**.

The San Miguel River traverses the Study Area along a wide (approximately 1,000 foot) alluvial fan composed of sand and gravel deposited by the last glaciation. The San Miguel River flows along the length of the Study Area from east to west in several reaches that vary in sinuosity, size of substrate, and water velocity.

On the far eastern side of the Study Area, the San Miguel River is highly channelized, approximately 40 feet wide, and underlain with cobble/gravel substrate. The velocity of the San Miguel River is higher due its channelization. PSS wetlands border the San Miguel River along the south, however the historic railroad grade and Town sewage line run along the north side confining the San Miguel River, preventing the development of natural floodplain wetlands.

Photo 22

Through the center of the Study Area, the floodplain of the San Miguel River widens as the railroad grade runs north, allowing more room between the San Miguel River and the mountains to the south. The channel widens to approximately 50-60 feet and begins to meander creating natural gravel bars and PEM floodplain wetlands along the south side of the San Miguel River banks. The historic railroad grade continues to confine the channel to the north, where the banks are unvegetated and severely undercut. Approximately ½ mile of the San Miguel River flows through USFS property along this stretch.

Along the western portion of the Study Area, the San Miguel River splits. This split was likely a man-made diversion intended to separate the San Miguel River from the railroad grade. The southern section of the San Miguel River meanders and is approximately 50 feet wide with gravel bars and natural PEM/PSS wetlands along the floodplain. This section exhibits more sinuosity and a lower gradient. It is underlain by moderately sized cobble/gravel substrate.

The north fork channel is approximately 25 feet wide and confined to the north and south by steep berms. The velocity of the San Miguel River is moderate in

this section as the channel is lined with PEM wetlands and beaver dams along the western segment. The substrate of the San Miguel River is predominantly sand/mud throughout this reach.

Riverine Upper Perennial (R3) (4 acres)

In these Riverine wetland habitats, the gradient is high and water velocity is fast. The substrate consists of rock, cobbles, or gravel with occasional patches of sand. The gradient is high compared to the gradient of R2 and there is very little floodplain development **(Photo 23)**.

Photo 23

Within the Study Area, six tributaries (classified as R3) feed the San Miguel River: (on the eastern side) Butcher Creek, historical Cornet Creek, Mill Creek; (on the west side) Eider Creek, Prospect Creek, and an unnamed creek. The headwater segments of these tributaries, outside of the Study Area, are steepest upstream where they erode and drain the surrounding mountains. As these streams enter Study Area, the gradient drops and the streams deposit large amounts of cobble/gravel material.

Within the Study Area, Butcher Creek and the historical Cornet Creek are low gradient streams flowing from east to west, underlain by mud and lined with numerous beaver dams as they flow through large PEM/PSS wetland complexes. In the 1960s, two ponds were built on the historical Cornet Creek channel. The ponds were intended to be used as sewage lagoons but were never used reportedly due to the high groundwater in this area.

Cornet Creek has been responsible for the majority of the Town's historical flooding problems. The two most well know and destructive events occurred on July 27, 1914, and August 1, 1969. These events caused deposits of mud and rock throughout Town with depths ranging from 2 feet to as much as 6 feet in localized areas ([Mears *et al.* 1974] in MEI 2008).

Following the 1969 flood event, the USACE modified the apex of the Cornet Creek alluvial fan by creating a small stilling basin and a berm/dike structure to divert the flow into the realigned channel (MEI 2008). The historical alignment of Cornet Creek downstream from approximately Colorado Avenue has also been modified to flow directly south into the San Miguel River (MEI 2008) (near South Davis Street, approximately 1,500 feet upstream of the Study Area) rather than flowing west along the Study Area. This realignment likely occurred after the 1969 flood event as well; however, the exact date is not known.

The current alignment of historical Cornet Creek is within the Study Area, approximately 60 feet north of two historical ponds, on the far eastern side of the Study Area. A small drainage from the northwest corner of the northern most pond flows into historical Cornet Creek. Because the main channel of Cornet Creek has been realigned to flow into the San Miguel River in Town, hydrology for historical Cornet Creek is likely influenced by high groundwater in addition to stormwater that flows west into the Study Area from an adjacent property to the east (the Pearl Property).

The southern pond does not contain an outlet (Groeneveld 1995; ERC 2008). Historical Cornet Creek and Butcher Creek merge within the wetland complex forming one channel that flows into the San Miguel River near the USFS property boundary.

Mill Creek flows south into the Study Area through four culverts under the Spur. A recent debris flow event deposited extensive quantities of cobble and gravel throughout the Study Area, essentially eliminating any defined stream channel. Within the Study Area, the approximately 115 foot wide cobble/gravel flow path is lined with PEM, PSS, and PFO wetlands that run south along the stream

to the railroad grade. The stream follows a topographic gradient to the southwest along the berm into two 4-foot diameter culverts, and continues to flow under the railroad grade and into the San Miguel River. Because Mill Creek lacks a defined stream channel, during high stream flows, the adjacent uplands receive large amounts of flood flow. Although surface water is present, these areas are dominated by narrowleaf cottonwood (*Populus angustifolia*) with an understory of brome and do not exhibit indicators of hydric soils, thus were mapped as upland pockets in the Mill Creek wetland complex.

Eider Creek flows south into the Study Area through three culverts under the Spur. The channel is approximately 10 feet wide with a cobble/gravel substrate. The banks of the stream are moderately high and channelized; no wetlands are located adjacent to this stream. No water was observed to be flowing into the San Miguel River from Eider Creek as irrigation ditches, which are used seasonally, divert flow to agricultural fields throughout the growing season.

Prospect Creek flows north into the Study Area through USFS property. This high gradient perennial stream exhibits natural flows through predominantly upland forested habitat. The streambed is lined with boulders in its upstream reaches, and cobble/gravel in its lower reaches. The main channel of Prospect Creek flows northwest through the Study Area feeding the PEM/PSS beaver pond wetland complexes near Society Turn before its confluence with the San Miguel River. As the stream enters the Study Area, it is split into five channels. As the mountain gradient decreases, these channels are lined with PFO, PSS, and PEM wetlands. These channels finger out into a wetland mitigation area flowing north and northeast into the San Miguel River. The channels appear to have been constructed to provide hydrology to the wetland mitigation area. A detailed discussion of this area is provided in **Section 2.1.2.4 Wetland Mitigation Site**.

An unnamed creek flows southwest into the Study Area through a culvert under the Spur. This is a small stream, not mapped on the US Geological Survey (USGS) Topographic Map of Telluride; however, it still appears to provide constant flows to the Study Area. The unnamed creek appears to be man-made within the Study Area. It is approximately 6 feet wide with cobble/gravel substrate and lined with a thin, possibly man-made, PEM wetland fringe. This stream splits in its lower reaches; a segment flows south into the San Miguel River, while one segment runs west into the PEM/PSS wetland adjacent to the San Miguel River. This narrow segment is vegetated with sedges and drains into the river approximately 1,500 feet to the west.

Palustrine and Riverine wetland habitat types delineated within the Study Area are presented in **Figures 2-1 and 2-2**, Wetland Habitat Maps (West), and (East), respectively.

2.1.2.3 Isolated Wetlands

Isolated wetlands are those areas that lack a significant nexus to a navigable waterway (EPA 2007). They have no readily identifiable surface connection to other waters and do not meet the significant nexus criteria. For purposes of the wetland delineation; wetlands within the Study Area were determined to be isolated if they did not contain an obvious surface connection to a relatively permanent tributary, waters of the US, or an adjacent wetland.

Isolated wetlands within the Study Area are depressional wetlands (man-made and natural) influenced by a high groundwater table in conjunction with rainfall precipitation/snowmelt. These areas have developed wetland characteristics; however, they are not likely federally regulated under the CWA. The classification of wetland habitat types includes all wetland areas regardless of regulatory status; thus, isolated wetland areas are included in **Figures 2-1 and 2-2**.

2.1.2.4 Wetland Mitigation Site

Since the early 1980's, the Telluride Ski and Golf Company (Telski), (formerly the Telluride Company), had been associated with EPA CWA violations for filling wetlands during the development of parts of the Telluride ski resort. The development included wetland impacts associated with new ski slopes and the installation of new access roads, ski lifts and water lines for snow making. In 1997, the US District Court in Denver signed a Consent Decree to approve a wetlands settlement presented between the EPA and Telski.

Per the EPA Consent Decree, Telski was required to complete portions of the mitigation work along the Prospect Creek alluvial fan, within Study Area, because these wetlands had been altered over many years. The original Prospect Creek alluvial fan wetlands were historically drained in the late 1960's as a result of mining activities. In the 1970's, the Idarado mining company cut three trenches with the intent of disposing additional mine tailings. More recently, wetlands on the Prospect Creek alluvial fan had been affected by cattle grazing and weed proliferation (Belch 1999).

The mitigation plan incorporated a combination of wetland restoration within the town of Mountain Village (south of the Study Area); in addition to the restoration of hydrological and ecological functions of approximately 20 acres of wetlands on the Prospect Creek alluvial fan within the Study Area. Ultimately, the goal of wetland mitigation work on the Prospect Creek alluvial fan was successful restoration of hydrology, which included the excavation and reconnection of numerous channels associated with Prospect Creek within the Study Area **(Photo 24)**. Prior to the commencement of restoration/mitigation work in 2001, Telski acquired an easement on 20.8 acres of land within the Study Area to allow for restoration as part of its wetlands mitigation plan (SMWC 2001). The historical trenches excavated by Idarado mining company were filled in 2001. The mitigation site was revegetated, infiltration ponds were developed and annual groundwater monitoring was conducted until the EPA determined that the site had been hydrologically restored. To date, all wetland mitigation work has been completed within the Study Area as required by the EPA.

Photo 24

2.1.2.5 Histosols

Histosols are defined as organic soils that contain 16 inches or more of organic soil material within the upper 32 inches of a soil profile (USDA-NRCS 2006). Organic soil material must have an organic carbon content (by weight) of 12-18% or more, depending on the clay content of the soil **(Photo 25)**. One PSS willow-sedge wetland complex located adjacent to Butcher Creek in the eastern section of the Study Area contains histosol soils. This PSS wetland complex is dominated by Geyer willow midstory with a thick water sedge understory. The vegetation root matting is substantial with deep sedge tussocks interspersed beneath the willow. The water regime is semi-permanently flooded with the water table present approximately one inch below the ground surface. The soil material in this wetland complex is classified as peat (i.e., undecomposed plant material) due to the fibric organic content of the soil. The organic content was visually assessed with no lab analysis. Soil cores were dug throughout this wetland complex to define the boundaries. The limits of the histosol are generally within the PSS wetland complex, and extend slightly into the adjacent PEM wetland complex (see WA19 in the *Summary of Assessment Area Characteristics* section).

Soil cores dug throughout the Study Area did not identify any other soils that meet the criteria for histosols. However, only a limited number of soil cores were dug across the Study Area as part of the wetland delineation. The delineation did not include detailed mapping or evaluation of histosols. A more comprehensive histosol evaluation and laboratory soil analysis may be appro-

Photo 25

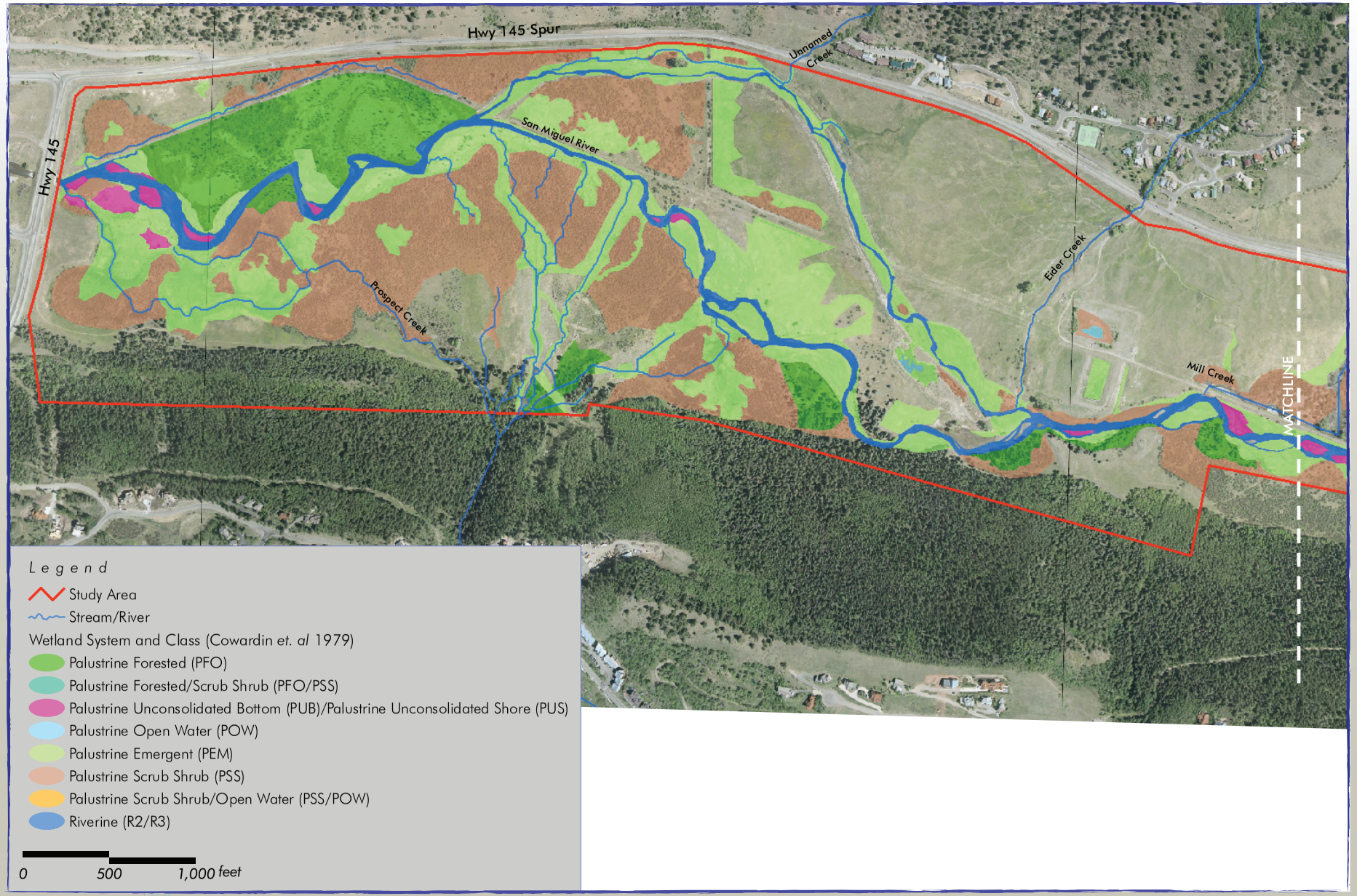

Figure 2-1

Wetland Habitat (West)

March 2009

N W E S

Telluride Valley Floor

Environmental Report

TOWN OF TELLURIDE

Ecological Resource Consultants, Inc.

ERC

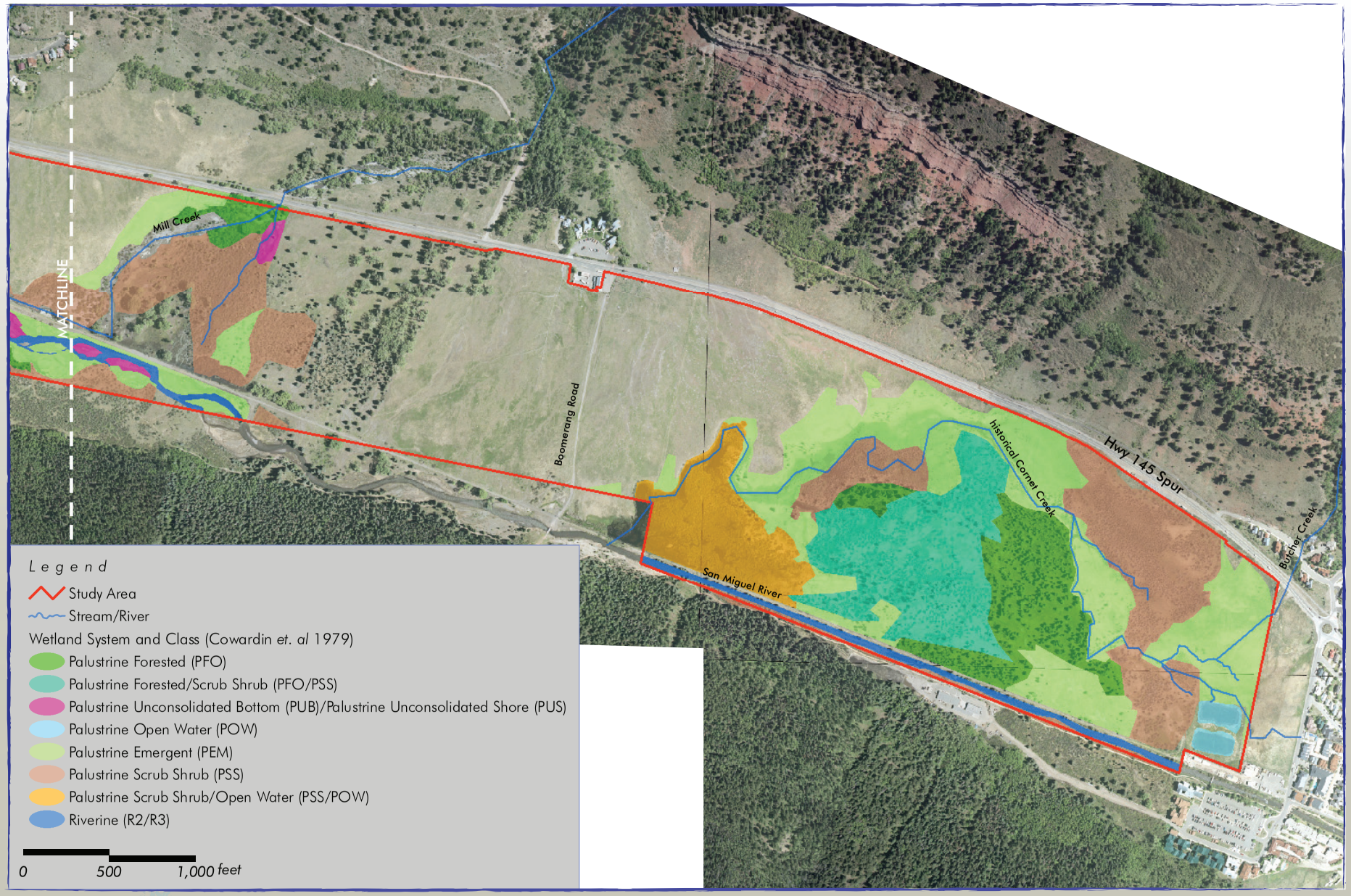

Figure 2-2

Wetland Habitat (East)

March 2009

N W E S

Telluride Valley Floor

Environmental Report

TOWN OF TELLURIDE

Ecological Resource Consultants, Inc.

ERC

priate prior to any disturbance in wetland areas.

Generally, groundwater fed wetlands containing histosols are rare in the Western US because they form in ecosystems where the rate of organic matter decomposition is slower than the rate of organic matter production, taking up to 10,000 years to form naturally (EPA 2008b; Cooper and Wolf 2006, Chimner *et al.* 2006). They provide important benefits in a watershed, including preventing or reducing the risk of floods, improving water quality, and providing habitat for unique plant and animal communities (EPA 2008b).

Wetlands containing histosols are regulated under Section 404 of the CWA. Because histosols are considered "difficult-to-replace resources," they require special consideration for permitting, and will generally not be permitted due to the unique process in their development that makes them virtually irreplaceable. The USACE recognizes their extremely high value and rarity, thus avoidance and minimization of impacts to these areas is strongly recommended.

In accordance with the Fish and Wildlife Coordination Act, the USACE gives full consideration to the views of the US Fish and Wildlife Service (USFWS) on fish and wildlife matters in deciding on the issuance, denial, or conditioning of permits. The USFWS has issued regulatory policies to protect and conserve these valuable wetland ecosystems. The *USFWS, "Mitigation Policy"* published in the Federal Register, Vol. 46, No. 15, January 23, 1981 (subsequent Federal Register guidance dated February 4, 1981 and February 24, 1993), designates these wetland habitats as Resource Category 1, which is defined as habitat that "… is of high value for evaluation species and is unique and irreplaceable on a national basis or in the ecoregion section." The mitigation goal for habitat in Resource Category 1 is "no loss of existing habitat value." Moreover, the USFWS recommends that all losses of these unique habitats be prevented, as they cannot be replaced. Minor changes that do not result in adverse impacts on habitat value may be acceptable provided they will have no significant cumulative impact.

2.1.3 Conclusion

Formal wetland delineation was conducted within the Study Area in July of 2008 identifying and delineating 312 acres of jurisdictional and non jurisdictional wetlands and waters of the US within the approximately 560 acre Study Area. In total, 290 acres or 51% of the Study Area were delineated as Palustrine wetlands. Of the total wetlands delineated, 284 acres were found to be jurisdictional. Additionally, 22 acres or 7% of the Study Area were delineated as jurisdictional waters of the US or Riverine wetlands.

Wetland habitats were classified using the Cowardin *et al.* (1979) classification system and included: PEM, PSS, PFO, POW, PUB/PUS, R2, and R3 wetlands. **Table 2-1** provides a summary of the acreage and proportional extent of wetland habitats within the Study Area according to Cowardin wetland Subsystem.

The USACE formally classifies delineated wetlands into two categories: jurisdictional wetlands and non-jurisdictional wetlands. The USACE makes the final determination on the jurisdiction of wetlands and waters of the US, which are then regulated under the CWA.

Within the Study Area, 284 acres of jurisdictional wetlands, and 22 acres of jurisdictional waters of the US were delineated. Additionally, 6 acres of isolated wetland were delineated; these areas will likely be considered non jurisdictional by the USACE because they lack a surface connection to a waters of the US or adjacent wetland or any significant nexus. The USACE in response to the request for jurisdictional determination will make the final decision on jurisdiction of isolated areas.

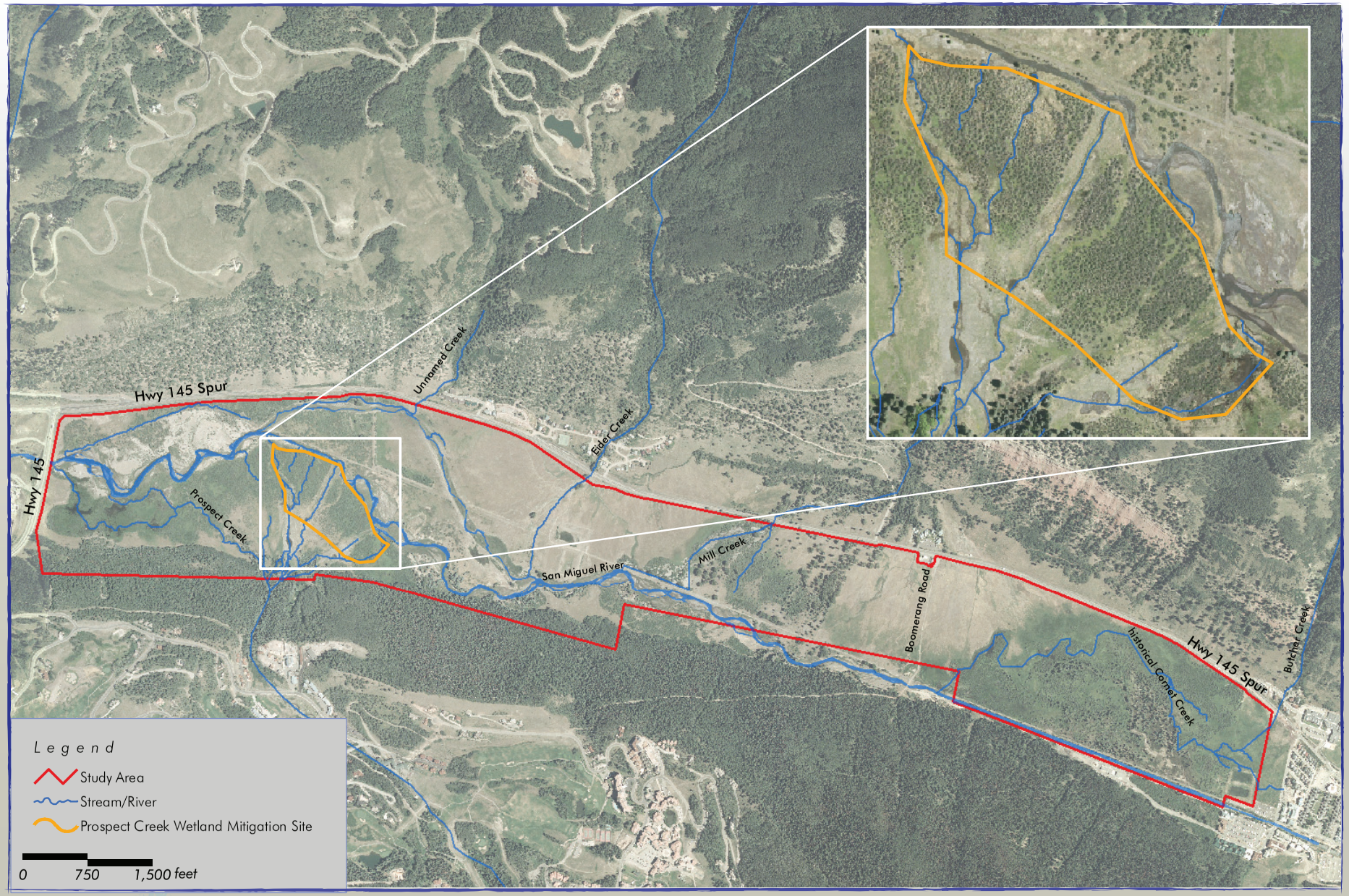

Figure 2-3

Prospect Creek Wetland Mitigation Site

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Table 2-1. Acreage and Proportional Extent of Wetland Habitats within the Study Area.

Wetland Habitat Type	Acreage*	% of Wetlands
Palustrine Wetlands (290 acres; 93%)		
Palustrine Emergent (PEM)	108	35%
Palustrine Forested (PFO)	51	16%
Palustrine Open Water (POW)	8	3%
Palustrine Scrub-Shrub (PSS)	119	38%
Palustrine Unconsolidated Shore / Palustrine Unconsolidated Bottom (PUS/PUB)	4	1%
Riverine Wetlands (22 acres; 7%)		
Riverine Lower Perennial (R2)	18	6%
Riverine Upper Perennial (R3)	4	1%
Total Wetlands	**312**	**100%**

* Rounded to the nearest acre

Jurisdictional determination will be requested from the USACE (Grand Junction Regulatory Office) to obtain concurrence with the wetlands and waters of the US delineation presented in the wetland delineation report. Upland areas and isolated wetlands not determined by the USACE to contain a significant nexus to waters of the US will not be considered jurisdictional, thus not regulated by the USACE. Section 404 of the CWA requires a permit from the USACE for discharge of dredged or fill material into any jurisdictional wetland or waters of the US; so prior to any disturbance of wetlands, all appropriate regulatory agencies should be contacted to obtain appropriate approvals and permits.

2.2 UPLAND VEGETATION

Upland vegetation refers to the dominant vegetation communities present in the Study Area that are not classified as wetlands or waters of the US. Upland vegetation communities within the Study Area were classified during field sessions in July of 2008 as part of the wetland delineation and field site characterization. The vegetation communities were later refined using project base mapping as well as field verified on September 9-11, 2008. Vegetation classification was completed using the US National Vegetation Classification System (USNVC), based on approaches detailed in *International Classification of Ecological Communities: Terrestrial Vegetation of the United States* (Grossman *et al.* 1998).

2.2.1 Methodology

Study Area upland habitats were evaluated in the summer of 2008. The objectives of the upland vegetation evaluation were to delineate and classify upland habitat types for inventory, evaluation, and management guidelines.

2.2.1.1 Habitat Classification

The method used to delineate, characterize and classify upland vegetation types in the Study Area included the following three-step approach to delineating, characterizing and analyzing vegetation communities:

- Existing Data Review/Aerial Photograph Interpretation;
- Field Data Collection; and
- Data Analysis/Final Classification.

Vegetation communities were initially delineated on project base mapping. Prior to field verification, preliminary habitat types were delineated around upland vegetation complexes based on visual signature.

Field verification of preliminary habitat types began during field sessions in July of 2008 as part of the wetland delineation and field site characterization. Vegetation communities were identified in the field, upland data points were established and vegetation samples were obtained for third-party verification by the University of Colorado Museum of Natural History (**Appendix D**). Areas not observable from aerial photography (i.e., herbaceous layers under a forested cover) were inspected and verified in the field. Results from the July 2008 sampling effort were reviewed in the office and preliminary habitat types were refined to include more detailed vegetation community groupings based on dominant plant species. Refined habitat types were re-inspected during field verification sessions conducted September 9-11, 2008.

Data analysis of vegetation communities occurred throughout the classification process. Final classification of vegetation communities within the Study Area was based on the USNVC System (Grossman *et al.* 1998). The system is based on evaluation of existing natural vegetation and uses a combined physiognomic floristic hierarchy providing a systematic approach to classifying vegetation communities.

The USNVC System, developed by NatureServe, Natural Heritage member programs, and the Nature Conservancy, is a systematic way of describing and assessing ecological diversity. The USNVC System allows for classification at a scale fine enough to be used to understand, manage, and protect natural resources on a site-by-site basis, and provides a systematic approach to classifying terrestrial vegetation communities. The Study Area was evaluated based on the Formation and Association classes, respectively. These classes are the most coarse and fine levels of the USNVC System's physiognomic floristic hierarchy for terrestrial vegetation.

Formation Class

Physiognomy refers to the structure (height and spacing) and growth form (morphology and aspect) of predominant vegetation species. The basic unit of many physiognomic classifications is the Formation, a "community type defined by dominance of a given growth form in the upper-most stratum (or the upper-most closed stratum) of the community, or by a combination of dominant growth forms" (Whittaker [1962] in Grossman *et al.* 1998). These features provide a fast and efficient method to categorize vegetation. Simply, formation classes are based on the structure of vegetation and are determined by the relative percentage of cover and the height of the dominant, uppermost life forms. The formation level includes the following seven mutually exclusive classes:

- Forest – Trees with their crowns overlapping (generally forming 60-100% cover) **(Photo 26)**.
- Woodland – Open stands of trees with crowns not usually touching (generally forming 25-60% cover). Canopy tree cover may be less than 25% in cases where it exceeds shrub, dwarf-shrub, herbaceous, and nonvascular cover, respectively **(Photo 27)**.
- Shrubland – Shrubs generally greater than 1.6 feet tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 25% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herbaceous, and nonvascular cover, respectively. Vegetation dominated by woody vines is generally

Photo 26

Photo 27

Photo 28

Photo 29

Photo 30

Photo 31

Photo 32

Photo 33

treated in this class **(Photo 28)**.

- Dwarf-Shrubland – Low-growing shrubs usually under 1.6 feet tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 25% cover). Dwarf-shrub cover may be less than 25% where it exceeds tree, shrub, herbaceous, and nonvascular cover, respectively **(Photo 29)**.
- Herbaceous – Herbaceous vegetation (graminoids, forbs, and ferns) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 25% cover). Herbaceous cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively **(Photo 30)**.
- Nonvascular – Nonvascular cover (bryophytes, non-crustose lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and herbaceous cover, respectively **(Photo 31)**.
- Sparse Vegetation – Abiotic substrate features dominant. Vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources (total vegetation cover is typically less than 25% and greater than 0%). Sparse Vegetation types are primarily based on substrate features, rather than vegetation **(Photo 32)**.

Association Class

In addition to classifying vegetation based on physiognomic level, the USNVC System also requires assessment based on floristic levels. Floristic classification utilizes species composition or species groups, rather than physiognomic patterns, to define vegetation types. The basic floristic unit, called the Association, is defined as "a plant community type of definite floristic composition, uniform habitat conditions and uniform physiognomy" (Flauault and Shroter [1910] in Moravec 1992 and Grossman *et al*. 1998). The lowest, and finest, level of the hierarchy, the Association Class is the basic unit for vegetation classification in North America.

The names of dominant and diagnostic species are the foundation of the Association Class. Species occurring in the same stratum are separated by a hyphen (–); those occurring in different strata are separated by a slash (/). Species occurring in the uppermost strata are listed first, followed successively by those in lower strata. Within the same stratum, the order of species names generally reflects decreasing levels of dominance, constancy, or indicator value.

2.2.2 Results

2.2.2.1 Habitat Classification

Results from the upland vegetation classification and field verification sessions identified 261 acres of upland habitat within the Study Area. Within the upland areas, the following five vegetation Formation Classes were identified: Herbaceous, Shrubland, Forest, Dwarf Shrubland, and Sparse Vegetation. Within each of these Formation Classes, vegetation is grouped according to Association Class.

Herbaceous

Herbaceous vegetation formations are the most dominant vegetation within the Study Area uplands, accounting for 181 acres, and over 69% of the total Study Area uplands **(Photo 33)**. Of this, Mixed Grass (*Poa spp.*) is the exclusive vegetation association.

Shrubland

Shrubland vegetation formations account for 9 acres, or 3% of the Study Area uplands **(Photo 34)**. Of this, the Geyer Willow/Mixed Grass complex is the exclusive vegetation association.

Forest

Forested vegetation formations account for 56 acres, or 22% of the Study Area uplands. Of this, the Spruce (*Picea spp.*)– Fir (*Abies spp.*) – Aspen complex is the most dominant vegetation association, accounting for 37 acres (14% of the upland area) **(Photo 35)**. The Cottonwood complex accounts for 12 acres (5% of the upland area), followed by the Spruce complex, accounting for 5 acres (2% of the upland area), and the Spruce–Fir complex, accounting for 2 acres (1% of the upland area).

Dwarf Shrubland

Dwarf shrubland formations account for 13 acres, or 5% of the Study Area uplands **(Photo 36)**. Of this, the silver sagebrush (*Artemisia cana)*/Mixed Grass–Dwarf Shrubland complex is the exclusive vegetation association.

Sparse Vegetation

The remainder of the Study Area uplands are composed of the Cobble–Gravel association, accounting for 2 acres (1% of upland area) **(Photo 37)**.

Upland vegetation communities within the Study Area are presented in **Figures 2-4 and 2-5** Upland Habitat Map (West), and (East), respectively.

2.2.3 Conclusion

2.2.3.1 Habitat Classification

Upland vegetation communities were classified and evaluated in July and September of 2008 identifying and delineating 261 acres of upland habitat within

Table 2-2. Acreage and Proportional Extent of Upland Habitats within the Study Area.

Upland Habitat Type	Acreage*	% of Uplands
Herbaceous (181 acres, 69%)		
Mixed Grass	181	69%
Shrubland (9 acres, 3%)		
Geyer Willow/Mixed Grass	9	3%
Forest (56 acres, 22%)		
Spruce–Fir–Aspen	37	14%
Cottonwood	12	5%
Spruce	5	2%
Spruce–Fir	2	1%
Dwarf Shrubland (13 acres, 5%)		
Silver Sagebrush/Mixed Grass	13	5%
Sparse Vegetation (2 acres, 1%)		
Cobble–Gravel	2	1%
Total	**261 acres**	**100%**

*Rounded to the nearest acre

Photo 34

Photo 35

Photo 36

Photo 37

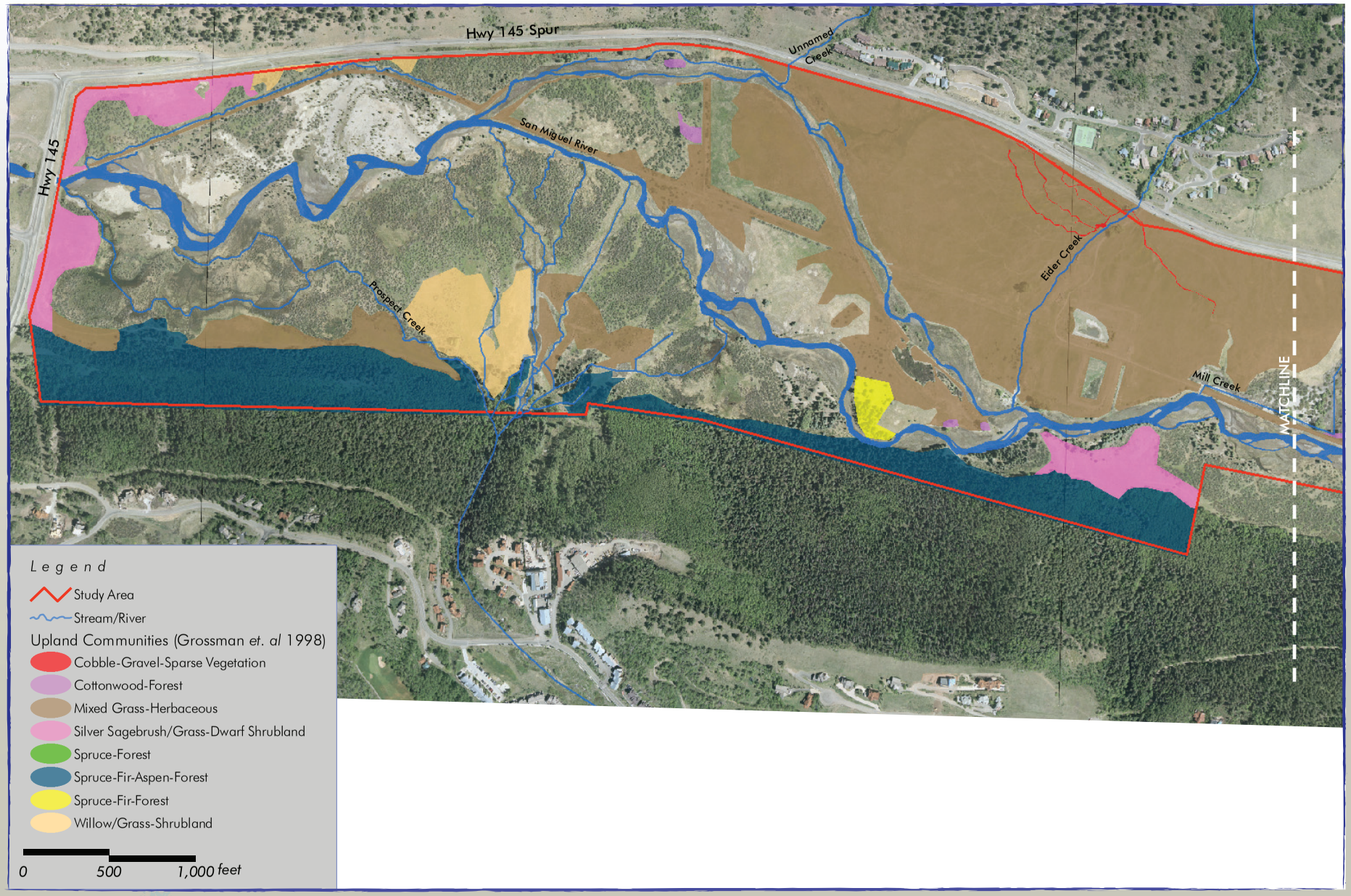

Figure 2-4

Upland Habitat (West)

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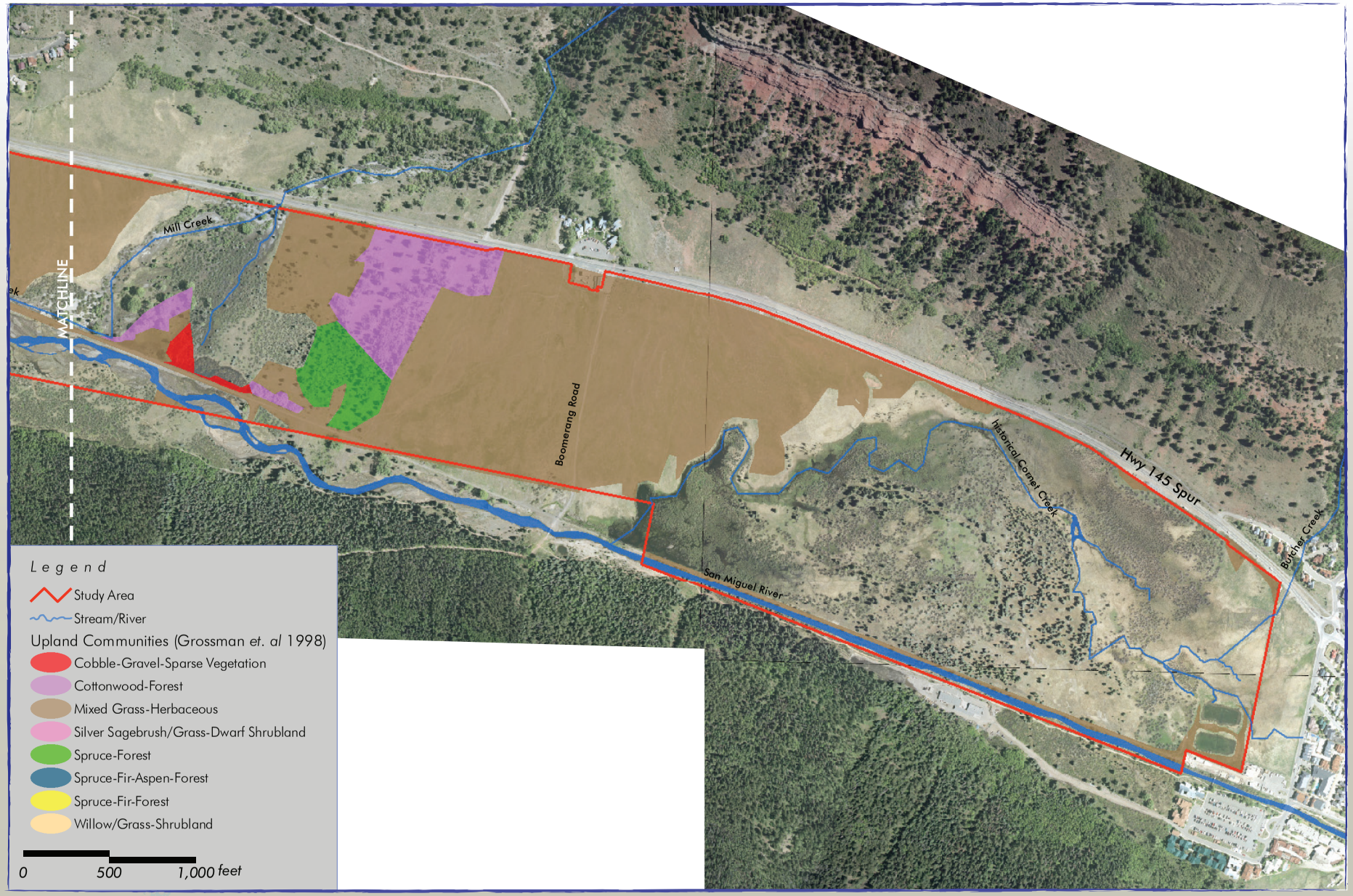

Figure 2-5

Upland Habitat (East)

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the Study Area. Within the upland areas, eight habitat types were classified and mapped using the USNVC System: Mixed Grass-Herbaceous; Geyer Willow/Mixed Grass-Shrubland; Spruce-Fir-Aspen-Forest; Cottonwood Forest; Spruce Forest; Spruce-Fir Forest; Silver Sagebrush/Mixed Grass Dwarf Shrubland; and Cobble-Gravel-Sparse Vegetation. **Table 2-2** provides a summary of the acreage and proportional extent of upland habitats within the Study Area according to the USNVC System.

2.3 AQUATIC RESOURCES

An assessment of aquatic resources within the Study Area was completed utilizing available data, field investigations and standard scientific practices. The purpose of this assessment was to quantify the health of existing aquatic resources and establish current conditions for evaluating potential future changes and restoration opportunities.

2.3.1 Methodology

Bioassessment using benthic macroinvertebrate (BMI) assemblages is an established method of assessing aquatic resources. Based on the health of the BMI, characteristics detailing the health and quality of the stream system can be assessed beginning, literally, with the base of the aquatic food chain. BMI assemblages and Habitat Suitability evaluations provide insight to the following factors influencing stream ecosystems:

- **Nutrient Cycle:** BMI assemblages play a crucial role in the stream nutrient cycle. If BMI populations are suffering it will affect the whole ecosystem.
- **Pollution Tolerance:** Some insects are tolerant of pollution, whereas others are not. The presence or absence of tolerant and intolerant types can indicate the condition of the stream. For example, the order Plecoptera, or Stoneflies, are very sensitive to pollution, so their absence in a stream can signal a higher pollution levels.
- **Population Fluctuations:** Because many bug life cycles are short (sometimes one season in length), we can detect population fluctuations in a short period of time. Population fluctuations might indicate that a change (positive or negative) may have occurred in the stream.
- **Habitat Suitability:** Calculation of trout habitat suitability provides insight as to the health of the stream system and its ability to support higher level aquatic life. The Habitat Suitability Index (HSI) as established by the USFWS provides a means of quantifying existing habitat by life cycle.

BMI and HSI sampling and assessment in the San Miguel River was completed with three objectives:

- To define the existing health of the aquatic resources using quantifiable methods.
- To compare the health of sections of the San Miguel River in the Study Area to each other, and gain perspective on how, for example, the channelized upstream section compares to the meandering downstream section.
- To establish a set of baseline conditions for long-term monitoring and/or restoration.

2.3.1.1 Habitat Suitability Index

The USFWS developed the HSI method to quantify habitat quality (Raleigh 1982). This method, which includes consideration of physical habitat, channel hydrology and water quality, to the quality of trout habitat was used to assess the San Miguel River through the Study Area. Brook Trout (*Salvelinus fontinalis*)

were selected as the representative specie when evaluating aquatic habitat as part of this evaluation as they are the predominate trout species in the Study Area. Although the specific habitat requirements for trout are not the only component of aquatic habitat, they are considered a good indicator of overall aquatic habitat quality. Generally, if specific trout habitat requirements are present, the overall aquatic habitat can be considered of higher quality.

To assess stream health using the brook trout HSI, the condition of instream habitat is evaluated by visual inspection, measurement, and documentation of the stream. Qualitative observations of overall instream habitat quality and aquatic life utilizing the different river features are also incorporated into the evaluation.

An HSI evaluation for brook trout was completed as part of the 2008 field program. The Equal Components HSI Method was utilized for the evaluation. This method gives equal weight to habitat considerations for all lifeforms (adult, juvenile, fry and embryo) following procedures established by the US-FWS (Raleigh 1982).

A field assessment following HSI protocol was conducted on July 25, 2008. At the time of the evaluation peak runoff had receded and flows were typical of late summer. The water was clear allowing for an unobscured view of the channel and its substrate.

For the field assessment, the San Miguel River was split into seven separate reaches based on observed channel characteristics denoted as Reach 1a, Reach 1b, Reach 2, Reach 3, Reach 4, Reach 5 and Reach 6:

- Reach 1a extends from the upstream (eastern) edge of the Study Area downstream to the Town Public Works facility.
- Reach 1b extends from the Public Works facility downstream to the USFS property boundary.
- Reach 2 extends from the where the San Miguel River re-enters the Study Area off of USFS land downstream to confluence with Mill Creek.
- Reach 3 extends from the confluence with Mill Creek downstream to the point where the stream is again confined by the railroad grade.
- Reach 4 includes the section near the western end of the Study Area where the stream is confined by the railroad grade.
- Reach 5 extends from the location where the stream is no longer confined by the railroad grade downstream for a distance of approximately 1,500 feet.
- Reach 6 encompasses approximately 1,500 feet at the far downstream end of the Study Area.

The delineation of the different stream reaches as defined for the HSI evaluation is shown on **Figure 2-6**.

The HSI methodology determines habitat quality for brook trout based on various life stages (adult, juvenile, fry and embryo) and other physical, hydrological and water quality parameters that span multiple life-cycles. Fourteen different physical habitat variables and seven different water quality and flow regime variables were quantified for each reach **(Table 2-3)**. Each variable represents a species habitat requirement/preference and each variable is scaled in the model to produce a numeric index between 0 (unsuitable) and 1 (optimal (Raleigh 1982)).

A summary of the variables considered in the model along with optimal conditions is presented below.

- **Variable:** Average maximum water temperature during the warmest time of the year
  Optimal Condition: 10 °C - 16 °C
- **Variable:** Average maximum water temperature during embryo development
  Optimal Condition: 4 °C - 12 °C
- **Variable:** Average minimum dissolved oxygen during late growing season and embryo development
  Optimal Condition: < 6.5 mg/l
- **Variable:** Average thalweg depth during the late growing season
  Optimal Condition: > 42 cm
- **Variable:** Average velocity over spawning area during embryo development
  Optimal Condition: 30 cm/s – 60 cm/s
- **Variable:** Percent instream cover during the late growing season
  Optimal Condition: > 14% for juvenile trout, > 23% for adult trout
- **Variable:** Average size of substrate between 0.3 – 8 cm in spawning areas
  Optimal Condition: 2.5 – 6 cm
- **Variable:** Percent substrate in 10 – 40 cm size class
  Optimal Condition: > 8%
- **Variable:** Dominant substrate type in riffle-run areas
  Optimal: rubble or small boulders or aquatic vegetation with limited amounts of gravel, large boulders or bedrock
- **Variable:** Percent pools during late growing season
  Optimal: 35% - 65%
- **Variable:** Average percent vegetation along the streambank during summer including scores for various levels (shrubs, trees and grasses)
  Optimal: > 135% (scaled for % cover by vegetation type)
- **Variable:** Average percent rooted vegetation and stable rocky ground cover
  Optimal: > 75%
- **Variable:** pH range
  Optimal: 6.5 – 8
- **Variable:** Average annual base flow during late summer/winter as a percentage of average annual daily flow
  Optimal: > 50%
- **Variable:** Pool class rating during low flow period
  Optimal: > 30% of the area is comprised of large, deep pools sufficient to provide holding water for several adult trout with > 30% of the pool bottom obscured, or pools > 2 meters deep
- **Variable:** Percent fines in riffle-run areas spawning areas
  Optimal: < 12% in riffle-run areas, < 6% in spawning areas
- **Variable:** Percent of stream area shaded between 10:00 and 2:00
  Optimal: 50% - 77%

All of the values for physical parameters were determined based on channel observations and measurements. Water quality values were determined based on water quality monitoring data taken from a water quality sampling site established by the Town at the upstream end of the Study Area near the Mahoney

Street Bridge between 1993 and 2002. The average low flow base flow as a percent of the average annual daily flow was approximated by the flow exceeded 90% of the time as a percent of the mean annual flow (AWC/MEI 1998).

Estimates were made for two of the water quality/flow parameters where either

Table 2-3. Physical Habitat Variables Evaluated for HSI Field Assessment in the San Miguel River.

Physical Parameter	Water Quality and Flow Parameters
Thalweg Depth	Average Maximum Water Temperature (°C)
% Cover Deep Areas	Average Maximum Water Temperature During Embryo Development (°F)
Average Substrate Size (0.1 inches – 3 inches)	Average Minimum Dissolved Oxygen During Low Water Period (milligrams/liter)
% Substrate 4 inches – 16 inches	Average Velocity Over Spawning Area During Embryo Development (feet/second)
Dominant Substrate Type (A-C)	Average Maximum pH
% Late Season Pools	Average Minimum pH
% Vegetation on Banks	Average Low Flow Base Flow as a % of Average Annual Daily Flow (90% of time/mean annual)
% Stable Banks	
% Fines in Non Pools	
% Fines Spawning Areas	
% Shade 10:00 am – 2:00 pm	
% Pools	
Pool Class	
% Instream Cover	

no data was available or the time of the monitoring did not correspond to the time of year when the data would need to be collected. Assumed parameters included the average minimum dissolved oxygen during the low water period and the average velocity over the spawning area during embryo development. Minimum dissolved oxygen was assumed to be 5 milligrams/liter, which we believe to be a conservative estimate based on the characteristics of the channel and the amount of aeration observed. Average velocity over spawning areas during embryo development was assumed to be 1.5 feet per second. This was judged to be a reasonable assumption as the predominant spawning areas are upstream of the riffles in areas where lower velocities are anticipated.

The Equal Component HSI Method was used to calculate the overall HSI value for each of the stream segments by determining a habitat coefficient for the adult, juvenile, fry and embryo life stages along with the suitability index other factors that affect brook trout in all life stages. Individual components affecting the various life-cycle stages in the HSI model are listed below.

- **Adult Stage:** Percent instream cover, percent pools, pool class and thalweg depth
- **Juvenile Stage:** Percent pools and percent instream cover
- **Fry Stage:** Percent pools, percent of substrate between 4" and 6" and percent fines in riffle/run areas
- **Embryo Stage:** Water temperature, average substrate size between 0.1" and 3", percent fines in spawning areas, minimum dissolved oxygen and velocity over spawning beds
- **"Others":** Percent shade, dominant substrate size, percent fines in riffle/runs, average maximum water temperature, minimum dissolved oxygen, percent bank vegetation, percent stable banks, minimum pH, maximum pH and baseflows as a percentage of average annual flows.

Photo 38

Photo 39

Photo 40

Photo 41

Net scores were determined based on established HSI calculation methods. A composite HSI value was also determined by taking the average individual parameter score for each of the stream segments.

2.3.1.2 Macroinvertebrate Assessment

Field Methods

Field methods to collect BMI samples are consistent with those described in the EPA *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers* (Barbour *et al.* 1999). Quantitative samples were collected using a standard kick-net (1.0 m^2) with a 500-micron mesh screen **(Photo 38)**. Samples were collected by disturbing the 1.0 m^2 area immediately upstream from the net at representative locations within 100-meter reaches of the San Miguel River **(Photo 39)**. Locations were selected based on available habitat types within each reach. Specific habitat types identified for sampling include: (1) cobble; (2) snags; (3) vegetated banks; (4) submerged macrophytes; and (5) sand (and other fine sediments). All habitat types within each 100-meter reach were sampled. All samples were combined to create one large composite sample for each reach. Individual substrate particles within each sampling area were scrubbed and inspected in the field, then preserved in 75% Ethanol and forwarded for laboratory identification.

Sample Location Descriptions

Four sample locations were selected along the San Miguel River with the intention of sampling a range of available macroinvertebrate habitat types **(Figure 2-6)**. The following is a brief description of each sampling area. Descriptions refer to the locations of the sampling points within the reach of the San Miguel River encompassed by the Study Area.

Sample Location

Sample 1 is located along the eastern section of the San Miguel River near the USFS boundary **(Photo 40)**. This section of the channel is linear, with no discernable meanders or bends. This section is heavily channelized by the historic railroad grade to the north. Water depths were approximately one foot deep. The bottom is primarily cobble substrate. The banks of this reach are vegetated with conifers and willows.

Sample Location 2

Sample 2 is located along the southern channel after the San Miguel River splits **(Photo 41)**. Located along a bend, this location is characterized by a mixture of 1-2 foot deep riffles and three pools ranging in depth from 3-5 feet. The bottom is primarily cobble substrate, with accumulated sediment within the pools. The banks of this reach are vegetated with coniferss and assorted grasses.

Sample Location 3

Sample 3 is located along the northern channel after the San Miguel River splits **(Photo 42)**. Moderately channelized, the area is just upstream from a spring fed intermittent stream. Substrate is composed of cobble and silt. Water depths range from 3-6 inches in cobble areas to approximately 3 feet within the lone pool observed in this reach. The banks of this reach are eroded along the mild bends and vegetated with assorted sedges and rushes.

Sample Location 4

Sample 4 is located along the western section of the San Miguel River after the northern and southern channels merge **(Photo 43)**. The sampled reach encompassed an area downstream and upstream of two bends and included

two cobble/gravel riffles and a 50 foot run. Water depths range from approximately 0.5 to 2 feet. The banks of this reach are composed of sedges and rushes located on top of old mine tailings. The sampling effort at this location was larger than sampling efforts at other locations.

Laboratory Methods

General procedures for processing invertebrate samples were similar to those recommended by the USGS (Cuffney *et al.* 1993) and are described in greater detail and rationalized in Vinson and Hawkins (1996). Samples were sub-sampled if the sample appeared to contain more than 600 organisms. Sub-samples were obtained by pouring the sample into a 500 micron sieve, floating this material by placing the sieve within an enamel pan partially filled with water and leveling the material within the sieve. The sieve was then removed from the water pan and the material within the sieve was divided into equal parts. One side of the sieve was then randomly chosen to be processed and the other side was set aside. The sieve was then placed back in the enamel pan and the material in the sieve again leveled and split in half. This process was repeated until approximately 600 organisms remained in one-half of the sieve. This material was then placed into a Petri dish and all organisms were removed under a dissecting microscope at 10-30 power. Additional sub-samples were taken until at least 600 organisms were removed. All organisms within a sub-sample were removed.

During the sorting process organisms were separated into Orders. When the sorting of the sub-samples was completed, the entire sample was spread throughout a large white enamel pan and searched for 10 minutes to remove any taxa that might not have been picked up during the initial sample sorting process. The objective of this "big/rare" search was to provide a more complete taxa list by finding rarer taxa that may have been excluded during the sub-sampling process. These rarer bugs were placed into a separate vial and the data entered separately from the bugs removed during the sub-sampling process. All the organisms removed during the sorting process were then identified using appropriate identification keys (see literature cited list for list of taxonomic resources used). Once the data had been entered into a computer and checked, the unsorted portion of the sample was discarded.

The identified portion of the sample was placed in a 20 milliliter glass scintillation vial with polypropylene lids in 70% ethanol, given a catalog number, and retained **(Photo 44)**. In this report, metrics were calculated using data from the sub-sampled and big/rare portions of the sample. Abundance data are presented as the estimated number of individuals per square meter for quantitative samples and the estimated number per sample for qualitative samples.

Photo 42

Photo 43

Photo 44

2.3.2 Results

2.3.2.1 Habitat Suitability Index

A summary table showing HSI results by life cycle is provided in **Table 2-4**. Values for each of the individual parameters within each of the seven reaches are shown in **Appendix E**.

Final values for the different reaches range from 0.27 in Reach 1a to 0.86 in Reach 5 as indicated in the right hand column in **Table 2-4**. Reach 5 is the only area that received a relatively high score indicating that it is the only section of the river where the existing aquatic habitat is of high quality. Reaches 1a and 1b, which have been channelized and are currently constrained on both banks scored the lowest.

Review of the scores for the individual life cycle stages for the various reaches

provides insight as to the main factors influencing habitat conditions. Reaches where adult and juvenile habitat is the limiting factor (Reaches 1a, 1b, 2 and 4) all correspond to locations where the stream is channelized by the railroad grade. Channelization results in poor quality pool habitat, which drives these life cycle scores lower. The same four reaches also have the lowest scores for fry habitat. Again, the lack of pools is the limiting factor. All reaches have the same, relatively high score for embryo habitat. Throughout all reaches the scores for embryo habitat are controlled by dissolved oxygen levels; with other parameters affecting embryo habitat scoring high for all reaches. The score for the "other" category is the lowest of any of the individual life cycle scores for the three highest ranking reaches (Reach 3, 5 and 6). The low scores for this category are controlled by lack of vegetation, stream shading and baseflows.

Results derived from the individual life cycle scores and the final scores provide insight into the overall health of the stream. Conclusions that can be drawn from the results of the HSI evaluation include:

- Channelized reaches of the San Miguel provide the lowest quality habitat.
- Pool habitat is a limiting factor and affects adult, juvenile and fry.
- Bank stabilization and vegetation along the channel could increase the overall habitat of all reaches.
- Reach 5, which scored the highest for adult, juvenile and fry among all reaches can be used as a reference or model if stream restoration occurs.
- Based on the high overall score achieved within Reach 5 it is likely that with appropriate restoration work, the entire reach could achieve similarly high habitat scores.

2.3.2.2 Macroinvertebrate Assessment

Benthic Macroinvertebrate Metrics

A number of metrics, or ecological summaries, can be calculated from an aquatic invertebrate sample. In this report, the following metrics were calculated for each sample: abundance, richness, evenness, Hilsenhoff Biotic Index (HBI), and Shannon Diversity Index. Sampling data collected at each of the four sampling locations have been compared to each other to determine similarities and differences between each sampling location. Summary results of the four primary samples processed are presented in **Table 2-5**. Individual taxa lists for all four samples processed are presented in **Table 2-6**.

Abundance

The abundance, density, or number of aquatic macroinvertebrates per unit area is an indicator of habitat availability and fish food abundance. Abundance may be reduced or increased depending on the type of impact or pollutant. Increased organic enrichment typically causes large increases in abundance of pollution tolerant taxa. High flows, increases in fine sediment, or the presence of toxic substances normally cause a decrease in invertebrate abundance. Increased sampling effort at a given location can bias abundance as a "stand alone" metric.

Sampling efforts at each of the sampling locations was consistent with the exception of Sample 4. At Sample 4, the sampling team collected a substantially larger sample in an effort to obtain a sample with as many individuals as possible. Due to this, the abundance (total number of individuals) was substantially higher at Sample 4 than at any of the other sampling locations. Given this inconsistency, although abundance has been used to calculate other metrics (i.e., Shannon Diversity Index); it has not been considered as a "stand-alone"

Table 2-4. Summary of HSI Results by Life Cycle and Composite Value.

Reach	Ca (Adult)	Cj (Juvenile)	Cf (Fry)	Ce (embryo)	Co (others)	Composite HSI	Rank
Reach 1a	0.27	0.50	0.65	0.8	0.47	0.27	Very Low
Reach 1b	0.57	0.50	0.65	0.8	0.49	0.57	Low
Reach 2	0.62	0.61	0.75	0.8	0.46	0.62	Intermediate/Low
Reach 3	0.75	0.78	0.79	0.8	0.53	0.75	Intermediate
Reach 4	0.61	0.56	0.65	0.8	0.59	0.61	Intermediate/Low
Reach 5	0.86	0.93	0.91	0.8	0.40	0.86	High
Reach 6	0.67	0.74	0.81	0.8	0.53	0.67	Intermediate

metric of stream health in this assessment.

Taxa richness

Richness is a component and estimate of community structure and stream health based on the number of distinct taxa (Genus). Although taxa richness normally decreases with decreasing water quality, in some situations, organic enrichment can cause an increase in the number of pollution tolerant taxa. Taxa richness was calculated for the number of unique genera identified at each sample location. All individuals within all samples were generally identified similarly, so that comparisons in taxonomic richness among samples within this dataset are appropriate. Comparisons to other datasets should be made at the genera or family level.

Assessment of this metric used individuals identified to the Genus taxonomic level. Mean operational taxa units among the four sample locations was 19 units. This number is somewhat higher because of the inclusion of Sample 4, which included 30 operational taxa units. The higher values associated with Sample 4 are probably a result of the increased sampling effort at this location, as evidenced by the elevated abundance metric (792 individuals). Regardless, the number of operational taxa units at each of the sampling locations is relatively consistent among Study Area locations.

Evenness

Evenness is a measure of the distribution of taxa within a community. The evenness index used in this report was calculated following Ludwig and Reynolds (1988). Value ranges are from 0-1 and values approach zero as a single taxa becomes more dominant. Values approaching zero or one are not desirable.

Evenness among the four sample locations ranged from 0.67 to 0.72. This value is a strong measurement for distribution of taxa within a community. There was very little variation in evenness values among sampling locations, suggesting that taxa are well distributed throughout the community. The range of values observed suggest that there is no dominant taxa in any given sample location, and that a variety of taxonomic categories are present in each sample.

Table 2-5. San Miguel River Benthic Macroinvertebrate Results.

Sample	Abundance (total individuals)	Richness (individual taxa)	Evenness	Hilsenhoff Biotic Index	Shannon Diversity Index
1	189	19	0.67	3.08	1.97
2	92	12	0.72	2.99	1.80
3	98	14	0.79	2.54	2.09
4	792	30	0.71	2.30	2.43
MEAN	-----	19	0.73	2.73	2.07

Hilsenhoff Biotic Index

HBI summarizes the overall pollution tolerances of the taxa collected. This index has been used to detect nutrient enrichment, high sediment loads, low dissolved oxygen, and thermal impacts. It is best at detecting organic pollution. Families were assigned an index value from 0 (taxa normally found only in high quality unpolluted water), to 10 (taxa found only in severely polluted waters). Family level values were taken from Hilsenhoff (1987, 1988) and a family level HBI was calculated for each sampling location for which there were a sufficient number of individuals and taxa collected to perform the calculations. Sampling locations with HBI values of 0-2 are considered clean, 2-4 slightly enriched, 4-7 enriched, and 7-10 polluted. Rather than using mean HBI values for a sample, taxon HBI values can also be used to determine the number of pollution intolerant and tolerant taxa occurring at a site. In this report, taxa with HBI values $\leq$1 were considered intolerant clean water taxa and taxa with HBI values $\geq$9 were considered pollution tolerant taxa. The number of tolerant and intolerant taxa and the abundances of tolerant and intolerant taxa were calculated for each sampling location.

Cumulative results from each of the four sampling locations fall between 2-4, suggesting slight organic enrichment. These values are slightly higher than might be expected, given the sampling locations are high in the watershed. However, these results are likely influenced by their location downstream from the Town.

Among individual taxa, none of the sampled individuals are considered pollution tolerant. The highest value (6) was observed in only four of the taxa identified. However, one family (*Chironomidae*) was the most abundant taxon observed. Conversely, among those individuals considered pollution intolerant, 13 separate taxa were identified. The most abundant family of intolerant taxa, (*Pteronarcyidae*), is the second most abundant taxon identified. These results indicate that among the taxa identified throughout the sampling locations, the majority of individuals present are not tolerant of polluted water.

Shannon Diversity Index

Ecological diversity is a measure of community structure defined by the relationship between the number of distinct taxa and their relative abundances. The Shannon Diversity Index was calculated for each sampling location for which there were a sufficient number of individuals and taxa collected to perform the calculations. The calculations were made following Ludwig and Reynolds (1988).

Comparison of Shannon Diversity Index results at each sampling location shows that results range from 1.80 to 2.43 with a mean of 2.07. Sample 4 varies from this mean the most, by 0.36, approximately 17%. Based on these numbers, ecological diversity is relatively consistent across the Study Area sampling locations.

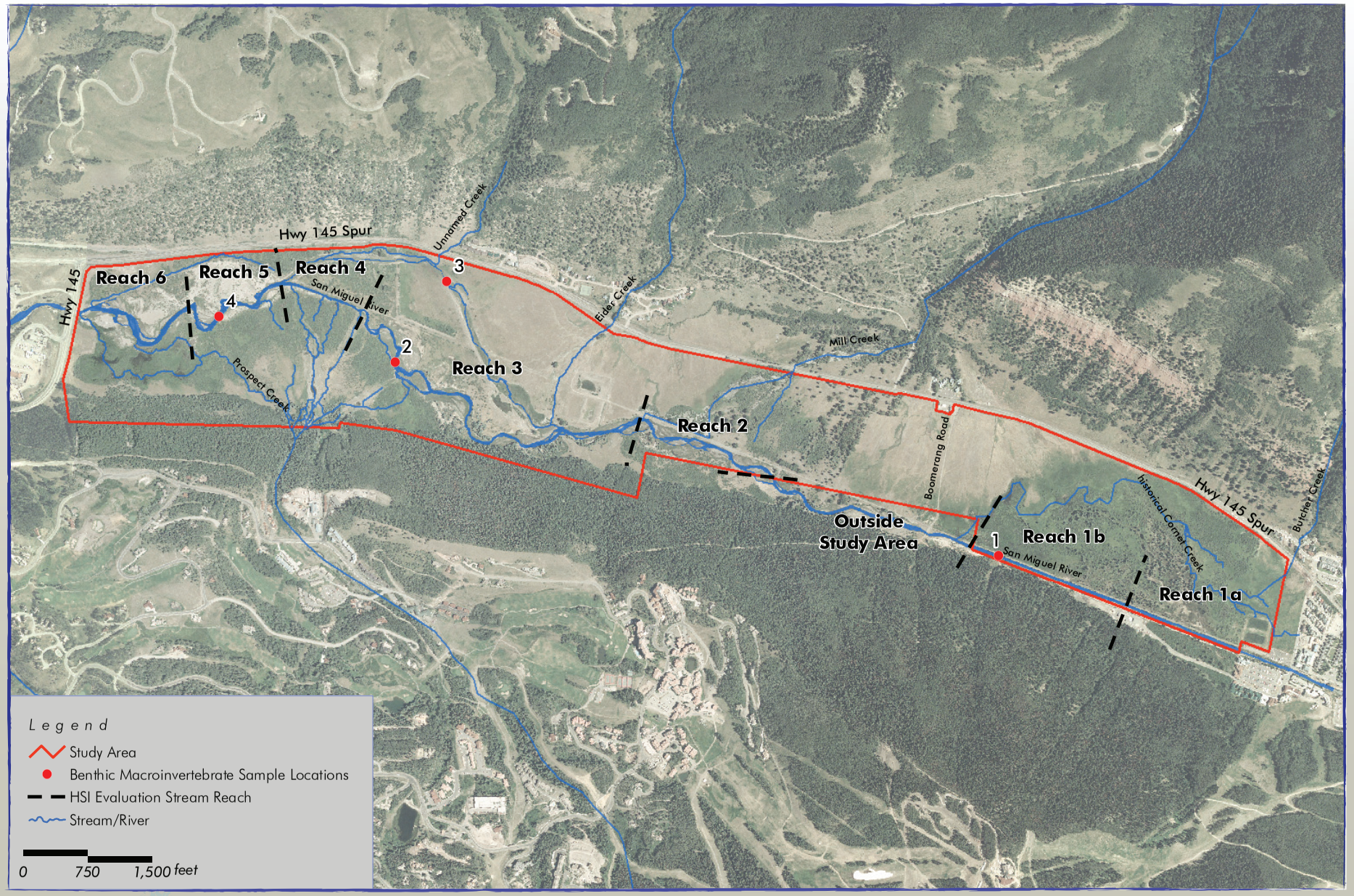

Figure 2-6

Aquatic Resources

Telluride Valley Floor

Environmental Report

Ecological Resource Consultants, Inc.

ERO

March 2009

Table 2-6. Taxanomic Lists for Processed Samples.

				Sample#	1	2	3	4
Order	Family	Genus species	Life Stage	Tolerance Value	# of Individuals			
Coleoptera	Elmidae	*Narpus concolor*	Adult	4				1
Coleoptera	Unknown	Unknown	Adult	*			1	
Diptera	Ceratopogonidae	*Probezzia*	Larvae	6				1
Diptera	Chironomidae	Chironominae (subfamily)	Larvae	6	1			1
Diptera	Chironomidae	Orthocladiinae (subfamily)	Larvae	6	72	22	24	121
Diptera	Chironomidae	Unknown	Pupae	6	1			2
Diptera	Empididae	Unknown	Pupae	6				1
Diptera	Simuliidae	*Simulium*	Larvae	6	1		1	38
Diptera	Simuliidae	*Simulium*	Pupae	6			5	
Diptera	Tipulidae	*Tipula*	Larvae	4	2	21		
Ephemeroptera	Ameletidae	*Ameletus*	Larvae	0	1			
Ephemeroptera	Baetidae	*Baetis*	Larvae	4	14	2	3	80
Ephemeroptera	Ephemerellidae	*Acentrella*	Larvae	3				2
Ephemeroptera	Ephemerellidae	*Drunella doddsii*	Larvae	0	2		3	28
Ephemeroptera	Ephemerellidae	*Drunella grandis*	Larvae	0				1
Ephemeroptera	Heptageniidae	*Epeorus*	Larvae	1.5	13		1	31
Ephemeroptera	Heptageniidae	*Rhithrogena*	Larvae	0				1
Plecoptera	Capniidae	Unknown	Larvae	1				2
Plecoptera	Chloroperlidae	*Suwallia*	Larvae	1	5	1	2	8
Plecoptera	Chloroperlidae	*Sweltsa*	Larvae	1	6	1	5	163
Plecoptera	Chloroperlidae	Unknown	Larvae	1	5			
Plecoptera	Nemouridae	*Zapada oregonensis* group	Larvae	2	3	1		6
Plecoptera	Perlodidae	*Isogenoides*	Larvae	2		2	4	17
Plecoptera	Perlodidae	*Megarcys signata*	Larvae	2	7	18	14	49
Plecoptera	Pteronarcyidae	*Pteronarcella badia*	Larvae	0	48	21	26	118
Plecoptera	Taenipterygidae	Unknown	Larvae	2		1		1
Trichoptera	Brachycentridae	*Brachycentrus americanus*	Larvae	1		1	8	81
Trichoptera	Glossosomatidae	*Glossosoma*	Larvae	0				8
Trichoptera	Hydropsychidae	*Arctopsyche grandis*	Larvae	2	1		1	14
Trichoptera	Hydropsychidae	*Parapsyche*	Larvae	1				4
Trichoptera	Hydropsychidae	Unknown	Larvae	4	1			
Trichoptera	Limnephilidae	*Dicosmoecus*	Larvae	1	1			
Trichoptera	Limnephilidae	*Hesperophylax*	Larvae	5				3
Trichoptera	Limnephilidae	*Psycoglypha*	Larvae	2				1
Trichoptera	Limnephilidae	Unknown	Larvae	4		1		
Trichoptera	Rhyacophilidae	*Rhyacophila brunnea/vemna* groups	Larvae	1	5			5
Trichoptera	Rhyacophilidae	*Rhyacophila hyalinata* group	Larvae	1				1
Trombidiformes	Lebertiidae	Lebertia	Adult	*				3

Note that "Unknown" represents unidentifiable life stages for certain taxonomic groups – i.e., Simulium larvae often necessitate the use of chromosomes for species identification.
Taxa with a tolerance value of * indicates that there is was no established tolerance value available, and these taxa were not included in the Hilsenhoff Biotic Index calculations (shown in Table 2-5).

2.3.3 Conclusion

2.3.3.1 HSI

HSI results for the seven different channel reaches ranged from a low of 0.27 to a high of 0.86 on a scale of 0 to 1.0. Reach 5 had the highest score of any of the reaches. Habitat variety and quality pool habitat were notably greater here than in other sections of the San Miguel River throughout the Study Area. Channelization obviously impacts the health of the stream in terms of aquatic habitat. The three reaches that received the highest scores (reaches 3, 5 and 6) are all sections of stream that are currently not channelized and flood flows can access the floodplain. These areas are also more sinuous (meandering), which increases flow and habitat diversity. Channelized sections tended to have lower scores relating to bank stability, presumably a function of straight, steeper gradients that result from channelization.

2.3.3.2 Macroinvertebrate

Results from BMI sampling data indicate little significant variation among the four sampling locations in the Study Area. Samples showed limited variation in metrics such as richness, evenness, the HBI, and the Shannon Diversity Index. Evaluations of the HBI and Shannon Diversity Index, which allow ecologists to consider overall pollution tolerances of identified taxa and community structure of these taxa, suggest that BMI assemblages within the Study Area are balanced and composed of species that do not tolerate pollution.

Although these metrics provide a snapshot of BMI assemblages within the Study Area as of September 2008, they do not provide a complete picture. Although these results do provide a baseline for subsequent monitoring of the area, only by comparing BMI assemblages over time can definitive statements be made regarding stream health as it relates to BMIs.

2.4 THREATENED, ENDANGERED & SPECIES OF CONCERN

The Study Area was evaluated for the potential existence of, or use by threatened, endangered and species of concern. This evaluation was intended as a rapid screening method to determine if such special status species have the potential to exist or utilize habitat within the Study Area. Detailed species-specific population surveys or inventories were not conducted as part of this Environmental Report. The screening considered species regulated or indicator species from the USFWS, USFS, BLM and Colorado Division of Wildlife (CDOW).

2.4.1 Methodology

Although there are a substantial number of species in Colorado that warrant protection under either federal or state law, a much smaller number have life history requirements consistent with the habitat available within the Study Area. Life history requirements of special status plant and wildlife species were compared to habitat available within the Study Area and classified into three categories:

- Known Special Status Species;
- Potential Special Status Species; and
- Unlikely Special Status Species

Special status species potentially occurring within the region were identified and critical life history requirements were evaluated to determine the potential for each species to occur or utilize habitat within the Study Area. Known spe-

cial status species are those that have been documented within the Study Area and for which suitable habitat clearly exists. Potential special status species are those that have not been documented within the Study Area but for which suitable habitat is, or is likely to be, available. Unlikely special status species are those that, although they may occur regionally, there is no evidence of the species occurring within the Study Area and for which there is little or no available habitat available. Species determined to have no potential to occur within the Study Area, either because they are completely out of their established range or because crucial life history elements are completely absent, were discarded and are not addressed within the context of this report.

Special status species were cross-referenced with previously completed studies addressing the Study Area (BioLogic 2008, SEI 2007) and with records provided by the Colorado Natural Heritage Program (CNHP) and the University of Colorado Museum of Natural History to identify those species positively identified as occurring within San Miguel County.

2.4.1.1 Regulatory Classifications

Endangered Species Act—USFWS

The Endangered Species Act (ESA) of 1973 was enacted to conserve endangered and threatened species and the ecosystems on which they depend. Under the ESA, species may be listed as either "endangered" or "threatened"; both designations are protected. The ESA is administered by the USFWS. The USFWS also identifies "candidate species." A candidate species is "any species being considered for listing as an endangered or a threatened species, but is not yet the subject of a proposed rule." Such a designation does not confer any procedural or substantive protections of the ESA on the candidate species. A copy of the USFWS List of Endangered, Threatened and Candidate Species for San Miguel County is included in **Appendix F**. Under provisions of section 7(a)(2) of the Endangered Species Act, a federal agency that carries out, permits, licenses, funds, or otherwise authorizes activities that may affect a listed species must consult with the USFWS to ensure that its actions are not likely to jeopardize the continued existence of any listed species. If a federal agency's action (i.e., the issuance of a Section 404 permit) is likely to adversely affect listed species, then the agency must request initiation of a formal Section 7 consultation.

Migratory Bird Treaty Act—USFWS

Migratory birds are protected by the USFWS under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 730-712). The MBTA makes it illegal for anyone to *take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter any migratory bird, or the parts, nests, or eggs of such a bird* except under the terms of a valid permit issued pursuant to federal regulations. In Colorado, all birds except for the European starling (*Sturna vulgaris*), house sparrow (*Passer domesticus*) and rock dove (*Columba livia*) are protected under the MBTA. A total of 523 migratory bird species are known to occur in the USFWS Mountain-Prairie Region (Montana, Wyoming, Utah, North Dakota, South Dakota, Nebraska, Kansas and Colorado) (USFWS 2008); 264 of the 523 migratory bird species are known to breed in Colorado (Kingery 1998) **(Appendix G)**. If migratory bird nests are encountered in the future in areas where ground-disturbing activities are planned, notification for examination should be made to the USFWS, Non-game Migratory Bird Coordinator. Future coordinators of land use activities should be aware that occupied nests require a Nest Depredation Permit, issued by the USFWS, before removing, disturbing or destroying any occupied nest within the Study Area.

Species Conservation Program—USFS

An important part of the mission of the USFS is to maintain the diversity of plant and animal species on National Forest System lands. The Species Conservation Program (SCP) provides leadership to promote and coordinate positive actions that contribute to recovery of threatened and endangered species, and conservation of sensitive species and their habitats. Emphasis is given to conservation of these species through conservation planning, habitat improvement, inventory and monitoring, coordination with other resource programs, visitor information and education, and other management actions (USFS 2007).

To provide a sound scientific foundation for management, the USFS Rocky Mountain Region has produced species conservation assessments for more than 200 featured plants and animals, as well as ecological assessments for terrestrial and aquatic/riparian/wetland ecosystems **(Appendix H).** Although the Study Area does not include any USFS property, USFS SCP species potentially occurring within the Study Area were considered in this assessment. USFS SCP species were considered in this Environmental Report to help assess the full ecological value of the Study Area. Potential actions within the Study Area are not subject to any additional federal regulatory requirements or permits as a result of the presence of these species, however future management decision should consider these species.

Sensitive Species List—BLM

BLM lands in Colorado are managed for ESA listed endangered, threatened and candidate plant species. In addition to managing for listed plant species, BLM policy allows the State Director to designate sensitive species for those rare species found on BLM lands, and for BLM to consider these species when making management decisions that actions may affect these species. In May of 2000 BLM Colorado updated its Sensitive Species List **(Appendix I)**. According to BLM policy, sensitive species are considered in management actions to ensure that actions do not cause these species to need to be listed in the future. Although the Study Area does not include any BLM property, BLM sensitive species potentially occurring within the Study Area were considered in this assessment. BLM sensitive species were considered in this Environmental Report to help assess the full ecological value of the Study Area. Potential actions within the Study Area are not subject to any additional federal regulatory requirements or permits as a result of the presence of these species.

State Endangered and Threatened Species—CDOW

Species identified by the State of Colorado as endangered or threatened are protected by the CDOW under Colorado Statute Title 33. State regulations prohibit "*any person to take, possess, transport, export, process, sell or offer for sale, or ship and for any common or contract carrier to knowingly transport or receive for shipment*" any species or subspecies listed as State endangered or threatened. Actions or individuals responsible for the illegal taking of species listed by the State of Colorado as threatened or endangered are subject to legal penalties. The CDOW also has identified species of special concern, which are species or subspecies of native wildlife currently vulnerable in their Colorado range and with the potential to become threatened or endangered. Species of special concern are not protected under state regulations but the 'take' of individuals and disturbance of their habitat is strongly discouraged. A list of State Endangered, Threatened and Special Concern Species is included in **Appendix J.**

Table 2-7. Special Status Species in San Miguel County.

Common Name	Scientific Name	Regulatory Status
Status on the Study Area - KNOWN		
Canada lynx	*Lynx canadensis*	Federal Threatened, State Endangered
Gunnison's prairie dog	*Cynomys gunnisoni*	USFS Sensitive
Black swift	*Cypseloides niger*	USFS Sensitive
Status on the Study Area - POTENTIAL		
Bald eagle	*Haliaeetus leucocephalus*	State Threatened, USFS Sensitive
Golden eagle	*Aquila chrysaetos*	USFS Special Interest
Prairie falcon	*Falco mexicanus*	USFS Special Interest
Northern goshawk	*Accipiter gentilis*	USFS Sensitive, BLM Sensitive
Boreal toad	*Bufo boreas boreas*	USFS Sensitive, State Endangered
Northern leopard frog	*Rana pipiens*	USFS Sensitive, BLM Sensitive, State Special Concern
Red-naped sapsucker	*Sphyrapicus nuchalis*	USFS Special Interest
Purple martin	*Progne subis*	USFS Sensitive
Nokomis silverspot fritillary butterfly	*Speyeria nokomis nokomis*	USFS Sensitive, BLM Sensitive
Slender cotton-grass	*Eriophorum gracile*	USFS Sensitive, BLM Sensitive
Status on the Study Area - UNLIKELY		
Southwestern willow flycatcher	*Empidonax traillii extimus*	Federal Endangered, State Endangered
Peregrine falcon	*Falco peregrinus*	USFS Sensitive, State Special Concern
American marten	*Martes americana*	USFS Sensitive
Western burrowing owl	*Athene cunicularia hypugea*	State Threatened, USFS Sensitive
Mexican spotted owl	*Strix occidentalis lucida*	Federal Threatened, State Threatened
Boreal owl	*Aegolius funereus*	USFS Sensitive
Northern harrier	*Circus cyaneus*	USFS Special Interest
River otter	*Lontra canadensis*	State Threatened, USFS Sensitive
Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*	USFS Sensitive, BLM Sensitive, State Special Concern
Colorado pikeminnow	*Ptychocheilus lucius*	Federal Endangered, State Threatened
Slender rock-brake	*Cryptogramma stelleri*	BLM Sensitive
Hamilton milkvetch	*Astragalus lonchocarpus var. hamiltonii*	BLM Sensitive
Naturita milkvetch	*Astragalus naturitensis*	BLM Sensitive
Cushion bladderpod	*Physaria pulvinata*	USFS Sensitive

2.4.2 Results

Table 2-7 provides a summary of special status species known to occur in the Study Area, those that potentially could occur in the Study Area, as well as those unlikely to occur within the Study Area.

2.4.2.1 Known Special Status Species

Canada Lynx *(Lynx canadensis)*

Regulatory Status Canada lynx **(Photo 45)** is listed as a threatened species by the USFWS, and as an endangered species by the State of Colorado.

Species Background The Canada lynx is a secretive forest-dwelling cat historically found throughout much of Canada, the forests of northern tier states, and subalpine forests of the central and southern Rocky Mountains (Fitzgerald *et al.* 1994). In 1999, the CDOW began a re-establishment program by releasing lynx captured in Canada into the San Juan Mountains of southern Colorado. Additional releases were made in 2000 and lynx appear to be dispersing throughout Colorado's southern and central mountains.

In the southern Rockies, primary lynx habitat is found in the subalpine and upper montane forests between 8,000 and 12,000 feet AMSL (Ruggiero *et al.* 2000). Subalpine forest habitat is dominated by subalpine fir and Engelmann spruce, while the upper montane forest supports lodgepole pine (*Pinus contorta*) and aspen. Lower elevation montane forests of ponderosa pine *(Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), and riparian corridors provide connective habitat that may facilitate dispersal and movement between primary habitats and provide additional foraging opportunities (Ruggiero *et al.* 2000). Lynx habitat in Colorado is fragmented naturally by elevation and vegetation gradients, as well as human developments that affect landscape connectivity and access to primary lynx habitat (McKelvey *et al.* 2000, Lynx Biology Team 2000).

Foraging habitat in the southern Rocky Mountains includes all of the primary lynx habitat vegetation types, as well as other habitats where snowshoe hare, lynx principal prey, is abundant. Hares prefer mixed stands of conifer forest for cover with openings of shrubby hardwoods for feeding (Quinn and Parker 1987). Dense regenerating forest stands are thought to produce the highest densities of snowshoe hares, but other studies have indicated hares also prefer higher elevation mature to late-successional spruce-fir forests (Beauvais 1997). Forests of mixed conifer and aspen with dense regeneration and/or a shrub and woody understory may also provide important habitat for snowshoe hare and other prey (Ruggiero *et al.* 2000). Lynx also may prey on grouse, jackrabbits, and small mammal species, but snowshoe hares are typically the main prey in the winter (Aubry *et al.* 2000). Within the Study Area, they may also prey on prairie dogs.

The average home range in southern boreal forest is 58 square miles for male lynx and 28 square miles for females (Aubry *et al.* 2000). The large home ranges are probably in response to the low density of snowshoe hare populations and the fragmentation of habitat. Travel corridors are thought to be an important factor in lynx habitat because of their large home ranges (Brittell 1989). The mosaic of natural and artificial barriers to lynx movement in Colorado indicates the need to maintain undisturbed corridors to link primary lynx habitat. Landscape connectivity for lynx movement may include forested mountain ridges, wooded riparian drainages, and lower elevation forests and shrub habitat (Koehler 1990). Travel corridors are usually forested and include contiguous vegetation cover over 2 meters (6 feet) in height (Brittell 1989). Lynx travel along the edges of meadows, but generally do not cross openings wider

Photo 45

Photo 46

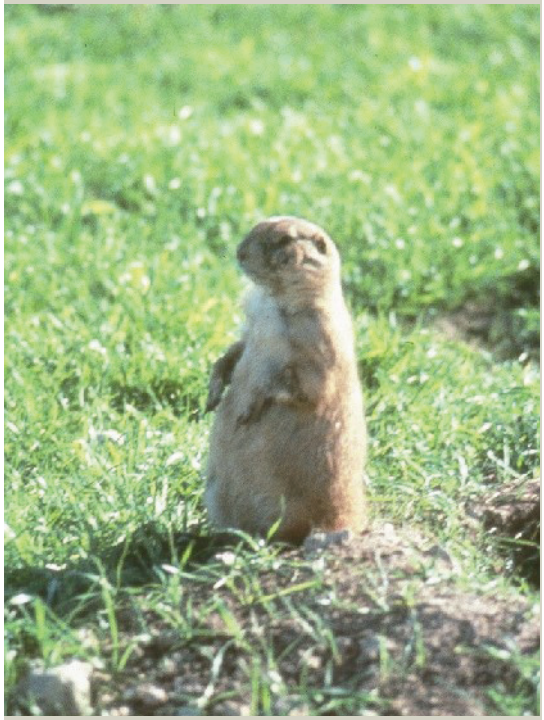

Photo 47

Photo 48

than 100 meters (approximately 300 feet); however, there are records of lynx using open habitat and riparian areas surrounded by open habitat in Idaho (Terra-Berns *et al.* 1998).

Local Habitat and Occurrence While Canada lynx are known to occur in forested habitats in the Telluride area, the Study Area does not provide primary habitat for the species; however, the Study Area is considered a potential migratory/travel corridor. The CDOW has documented high lynx densities in the mountains surrounding Telluride, particularly to the south and east. Lynx habitat mapping conducted by the USFS (based on vegetation types) has documented lynx denning habitat on the steep hillside south of the Study Area, and winter foraging habitat in the areas dominated by willows (USFS 2008) **(Figure 2-7)**.

Gunnison's Prairie Dog *(Cynomys gunnisoni)*

Regulatory Status Gunnison's prairie dogs **(Photos 46, 47, 48)** are a USFS sensitive species.

Species Background Gunnison's prairie dog (*Cynomys gunnisoni*) inhabits grasslands and semiarid desert and montane shrublands in the Four Corners region, including southwestern Colorado. They range in elevation from 6,000 to 12,000 feet AMSL. Gunnison's prairie dogs are the smallest species of prairie dogs in Colorado, and are typically less social than black-tailed prairie dogs with less complex burrow systems.

In favorable habitat, colony densities range from about 5 to 60 animals per hectare (12 to 148 per acre) (Fitzgerald *et al.* 1994). Colony density between years and among habitats is likely driven by local factors such as disease, climate, and vegetation quantity and quality. High densities of prairie dogs in limited areas may result in the prairie dogs striping vegetation, ultimately resulting in lower prairie dog reproductive output. Overgrazing by prairie dogs can lead to the invasion of non-native annuals, such as cheat grass (CDOW 2008).

Gunnison's prairie dogs are primarily herbivorous, but at times will consume insects. Grasses comprise the bulk of the diet and prairie dogs will switch among plant species as they become available in the growing season. Rayor (1985) found that in Gunnison's prairie dog colonies located in habitats with higher quality vegetation had greater mass, accelerated sexual maturity, and earlier dispersal than prairie dogs in colonies located in lower quality vegetation sites.

On February 23, 2004, the USFWS was petitioned to list the Gunnison's prairie dog under the ESA. The USFWS concluded on February 5, 2008 that the species is not threatened or endangered throughout all of its range, but that the portion of the species current range located in central and south-central Colorado and north-central New Mexico (the northeastern portion of the range) represents a significant portion of the range where the Gunnison's prairie dog is warranted for listing under the ESA. Currently, listing is precluded by higher priority actions (73 FR 6660) and the species within the northeastern part of the range is considered a "candidate" species for listing. According to the USFWS (Pfister pers. comm. 2008) the prairie dogs within the Study Area are not within the northeastern part of the range and are currently not considered a candidate species. The Gunnison's prairie dog is not listed as a state endangered, threatened, or species of concern in Colorado.

Gunnison's prairie dogs use burrows for protection, rearing young, sleeping and winter hibernation and require well drained, deep soils for burrow construction (Wagner and Drickamer 2003). Because they hibernate and many colonies occur at high elevations, these burrowing animals rely on placement

of a portion of their burrow (hibernacula) below the frost line. They generally inhabit flat areas, but sometimes occupy areas with steeper slopes if the slopes are also long (Wagner and Drickamer 2003). Above-ground activity is curtailed during periods when cold weather and environmental conditions requires more energy than can be obtained by foraging (Pizzimenti 1976, Michener 1977, Bakko and Nahorniak 1986, Harlow and Menkens 1986, Rayor *et al.* 1987). Environmental conditions, including lack of precipitation, extreme daily temperatures and/or lack of forage and water, appear to be the ultimate factors that initiate hibernation. Gunnison's prairie dogs generally hibernate for 4-5 months during the winter, and may aestivate during mid- to late summer (Tileston and Lechleitner 1966, Bakko and Brown 1967, Harlow and Menkens 1986).

Local Habitat and Occurrence An active Gunnison's prairie dog colony is located in the eastern half of the Study Area, in the meadow immediately east of Boomerang Road (see **Figure 2-7** in the *Wildlife* section for approximate colony location). This colony encompasses about 23 acres, and appears to be a healthy viable population with a relatively high density of burrows. Vegetation cover and structure within the colony is slightly reduced from the surrounding area, primarily as a result of prairie dog grazing activity to maintain clear sight lines. Vegetation cover may also be impacted by underlying soil disturbance associated with the San Miguel City site. While the vegetation cover is slightly reduced the species composition and vegetation quality appears similar to surrounding un-grazed areas. This colony may have originated on the grassy slopes to the north of the Study Area, across the Spur, and still extends into that area (Pera, pers. comm. 2008).

This colony is currently being studied by the CDOW as part of a southern regional study (Southwestern IPA) to provide information to be incorporated into the state-wide conservation plan. The goal of the state-wide plan is to implement conservation strategies to facilitate long-term viability and preclude the need for protection under the ESA.

Black Swift *(Cypseloides niger)*

Regulatory Status Black swifts **(Photo 49)** are USFS sensitive species.

Species Background The life history requirements of black swifts are not clearly understood. The factors thought to be most important for black swift reproductive success are colony and nest site availability and the abundance and dispersion of food. Black swifts nest on precipitous cliffs or vertical rock faces near or behind high waterfalls **(Photo 50)**. Nesting sites are typically surrounded by coniferous, mixed conifer or spruce-fir forests, but this varies depending on elevation and aspect, and nest sites may include mountain shrub, aspen, or even alpine components (Kingery 1998, Wiggins 2004). Knorr (1961, 1993) listed six features strongly associated with black swift nest sites: 1) falling or dripping water, 2) high relief, 3) inaccessibility to ground predators, 4) unobstructed flyways in the immediate nest vicinity, 5) shade during a major portion of the day, and 6) the presence of suitable nest niches.

Black swifts are colonial birds. Females produce one egg with no seasonal or geographical variation. Their primary breeding habitat constraint appears to be their requirements of steep rock faces with waterfalls. Their preference for damp cliffs (i.e., near waterfalls) in montane areas (inland populations) as nesting sites has led to a patchy breeding distribution within North America. Nest and colony sites in western Colorado are used over long periods, suggesting that black swifts show extremely high site fidelity (Marín 1997). Therefore, they may be susceptible to local extinction through lack of population connectivity. Predation on adult black swifts has rarely been recorded (Marín 1997). Black

Photo 49

Photo 50

Photo 51

Photo 52

Photo 53

swift feeding requirements appear to range widely and inhabit a variety of landscapes. Foraging habitat appears to be closely associated with blooms of available aerial insects (Lowther and Collins 2002). The factors affecting the abundance of the primary food resource, flying ants and other swarming insects, are not well understood, but the temporal and spatial patterns of local water flow are likely correlated with the pattern of insect abundance. Late summer flow rates at waterfalls may also directly influence nest site quality for black swifts.

Black swifts migrate to an unknown South American location in the winter.

Local Habitat and Occurrence Black swift habitat is available upstream and downstream from the Study Area and individuals have been observed within the Study Area (CNHP 2008). Black swifts are confirmed to occur within San Miguel County (Kingery 1998) and all surrounding counties. A black swift colony is known to exist behind Bridal Veil Falls east of Telluride.

2.4.2.2 Potential Special Status Species

Bald Eagle *(Haliaeetus leucocephalus)*

Regulatory Status Bald Eagles **(Photo 51)** are a State of Colorado threatened species and a USFS sensitive species. On August 8, 2007, the bald eagle was removed from the list of threatened and endangered species protected under the ESA (72 FR 37346). Although the bald eagle is no longer protected under the ESA, in addition to Colorado state law, bald eagles are also still protected by two other major federal laws: the Bald and Golden Eagle Protection Act (BGEPA) and the MBTA.

Species Background The bald eagle **(Photo 52)** is a large North American raptor with a historical distribution throughout most of the US. Eagles feed primarily on fish and waterbirds but also feed on small mammals **(Photo 53)**, mammal carcasses, and prey stolen from other raptors (Buehler 2000). Typical bald eagle nesting habitat consists of forests or wooded areas that contain many tall, aged, dying, and dead trees (Martell 1992). Bald eagles are migratory and are primarily winter residents in Colorado, but can be found year-round in southwestern Colorado.

Local Habitat and Occurrence The CDOW considers the lower elevations of the San Miguel River corridor to the west of the Study Area to be winter range for bald eagle (CDOW 2008b). Bald eagles have been sighted during the winter months in the Telluride area (SEI 2002), but are not considered a regular visitor.

The Study Area provides suitable habitat for bald eagle. The mature cottonwoods and spruce trees provide potential perching, roosting or nesting habitat, while small mammals (including Gunnison's prairie dog) provide an abundant source of prey.

Golden Eagle *(Aquila chrysaetos)*

Regulatory Status Golden eagles **(Photo 54)** are a USFS special interest species.

Species Background Golden eagles occur throughout Colorado, concentrating in the western two-thirds of the state (Kingery 1998). Golden eagles breed in open and semi-open habitat from sea level to nearly 12,000 feet AMSL (Kochert *et al.* 2002), and usually nest on cliffs and large trees in a variety of ecotypes, including tundra, shrublands, grasslands, conifer woodlands and riparian areas. Golden eagles avoid heavily forested areas (Kochert *et al.* 2002). Nesting cliffs are typically tall (> 100 feet) and located midway or

above cliff faces. Golden eagles typically forage over vast areas of grasslands, open areas and shrub steppe vegetation in search of prey that includes small rodents, rabbits, hares and carrion, particularly in winter (Kochert *et al*. 2002, Kingery 1998).

Local Habitat and Occurrence Golden eagles have not been documented in the upper San Miguel River watershed (Kingery 1998) and are not likely to be present in the Study Area; however, the Study Area provides suitable foraging habitat for the species, while nest sites could be found on the cliffs high above the Study Area to the north.

Prairie Falcon *(Falco mexicanus)*

Regulatory Status Prairie falcons **(Photo 55)** are a USFS special interest species.

Species Background In Colorado, prairie falcons typically nest on cliff faces in open country below 10,000 feet AMSL (Enderson 1964). Major nesting clusters in Colorado occur in the southeast corner of the state and along the Front Range (Kingery 1998), although one breeding pair has been confirmed in south-central San Miguel County. Prairie falcons prefer cliff faces associated with nearby grassland foraging habitat to facilitate foraging on birds and small mammals (Kingery 1998). Their low-level style of hunting necessitates an absence of tall vegetation (Enderson 1964).

Local Habitat and Occurrence Prairie falcon have not been documented in the Study Area; however, the cliff faces overlooking the Study Area provide perching and potential breeding habitat. Although the foraging habitat available within the Study Area is marginal compared to that found along the Front Range, the presence of birds and small mammals suggests that this species could occur within the Study Area.

Northern Goshawk *(Accipiter gentilis)*

Regulatory Status Northern goshawks **(Photo 56)** are a USFS sensitive species and BLM sensitive species.

Species background In Colorado, goshawks occur in mature stands of aspen, lodgepole pine, and spruce-fir forests at elevations ranging from 7,500 to 11,000 feet AMSL (USFS 1997). Nests are usually in dense coniferous forest, often on north- or east-facing slopes (Shuster 1980; Bailey and Niedrach 1965). Northern goshawks show a high fidelity to a specific nesting territory, although alternate nest sites within a nesting territory may be used from year to year (Herron et al. 1985; Kennedy 2003, Woodbridge and Hargis 2006).

Goshawks forage for small mammals and birds from tree perches in the lower forest canopy (Kingery 1998). Foraging habitat appears to include a variety of habitats as long as suitable prey is present. Known foraging areas include woodlands with mature trees, meadows, streams, aspen stands and forest openings (Kingery 1998).

Local Habitat and Occurrence No northern goshawks have been observed or documented within the Study Area. While the forested slopes immediately adjacent to the south side of the Study Area provide potential habitat for the goshawk, the Study Area itself provides only marginal habitat, because of its almost exclusive use of interior forest habitats for nesting and foraging.

Photo 54

Photo 55

Photo 56

Photo 57

Photo 58

Photo 59

Boreal Toad (*Bufo boreas boreas*)

Regulatory Status Boreal toads **(Photos 57 and 58)** are a State of Colorado endangered species and a USFS sensitive species.

Species Background The boreal toad is a fairly large toad known to inhabit mountain areas in Colorado between 8,500 and 11,500 feet AMSL. Boreal toad habitat includes wetland areas, beaver ponds, slow-moving creeks and streams, kettles, and wet meadows (Hammerson 1999). In recent years, boreal toad numbers have decreased significantly in the southern Rocky Mountain region. Recent estimates have indicated that the boreal toad population in Colorado has decreased by 90% since the 1970s. This has prompted the CDOW to list the toad as endangered. Surface water and water quality are particularly important to amphibians, including boreal toads, which require water to breed (SEI 2002).

Boreal toads are also sensitive to water acidification. When pH levels drop below 6.0, changes in algal communities that would affect the growth and development of boreal toad tadpoles can occur (Corn and Vertucci 1992). Acidification of aquatic habitats and deposition of heavy metals from mine tailings may make historical breeding sites inhospitable for boreal toads (Corn and Vertucci 1992, Vertucci and Corn 1996, Keinath and McGee 2005).

Local Habitat and Occurrence No boreal toads have been observed or documented within the Study Area. While the ponds and wetlands of the Study Area provide suitable habitat for boreal toad, as of 2006, the most recent cycle of 303(d) testing, the San Miguel River in the vicinity of Telluride continued to result in impaired ratings for zinc (EPA 2008a), suggesting that water quality in the area may not be sufficient for sustainable local populations.

Northern Leopard Frog (*Rana pipiens*)

Regulatory Status Northern leopard frogs **(Photo 59)** are State of Colorado species of special concern and a USFS and BLM sensitive species.

Species Background The northern leopard frog is a species of cooler climates, with a range that encompasses most of the northern US and stretches far north into Canada. The species ranges southward only in the western United States where they have been found up to 11,000 feet AMSL in the mountains of southern Colorado (Hammerson 1999). Northern leopard frogs have become scarce at many sites in Colorado (Hammerson 1999). Corn and Fogleman (1984) documented extinctions at nine high elevation sites in Colorado, and this species has also gone extinct or become severely reduced at low elevation sites in the state (Hammerson 1982, Cousineau and Rogers 1991, Smith and Keinath 2007). Northern leopard frogs require a broad range of habitats in close proximity due to their complicated life histories. Merrell and Rodell (1968) categorized three major habitat types: winter habitat (overwintering in lakes, streams, and ponds), summer habitat (feeding by adults in upland areas), and tadpole habitat (up to three months spent as tadpoles in shallow breeding ponds).

Local Habitat and Occurrence No northern leopard frogs have been confirmed within the Study Area. The broad range and habitat requirements, as well as the high upper elevation limits of this species, suggest that the ponds and wetlands of the Study Area could provide suitable habitat for northern leopard frogs.

Red-naped Sapsucker *(Sphyrapicus nuchalis)*

Regulatory Status Red-naped sapsuckers **(Photo 60)** are a USFS special interest species.

Species Background Red-naped sapsuckers are a common sapsucker in deciduous and streamside forests, especially around aspen, cottonwood, and willow stands. They also breed in mixed coniferous forests and will use open- and closed-canopy forests, burns, and clear-cuts, if there are some remaining standing trees. They typically nest in healthy aspen trees or dead conifers. Nest trees are sometimes reused, but a new nest cavity is excavated most years. Red-naped sapsuckers are considered a keystone species (a species that plays a critical role in maintaining the structure of an ecological community and whose impact on the community is greater than would be expected based on its relative abundance or total biomass), as many other species feed at the sap wells they drill (Kingery 1998).

Local Habitat and Occurrence No red-naped sapsuckers were observed on the Study Area during field sessions in the summer of 2008. However, red-naped sapsuckers are a relatively common species that potentially could utilize the extensive willow stands located in the Study Area or the aspen stands located on the forested slopes immediately south of the Study Area.

Photo 60

Purple Martin *(Progne subis)*

Regulatory Status Purple martins **(Photo 61)** are a USFS sensitive species.

Species Background The preferred habitat of purple martins in the Rocky Mountains is mature aspen forest with nearby meadows and open water. In the Rocky Mountains, the *arboricola* subspecies breeds in mid-elevation (6,600 to 9,900 feet AMSL) forest edges, typically near areas of open water (Gillihan and Levad 2002, Reynolds *et al.* 2002, Wiggins 2005). Reynolds *et al.* (2002) made a detailed study of the nesting habitat of purple martins in west-central Colorado and characterized martin nesting habitat as mature (>60 years old) aspen stands on gentle slopes adjacent to large forest openings. The majority of nests were also within 300 meters (approximately 1,000 feet) of water (i.e., streams, ponds). As summarized in the Colorado Partners in Flight Landbird Conservation program (CPIF 2000), key habitat elements for purple martins in Colorado include:

- live aspen trees with a diameter at breast height (dbh) of at least 14 inches;
- nest trees located within 175 feet of open parks/meadows;
- nest trees located within 1000 feet of standing water.

Local Habitat and Occurrence Although no individuals were observed within the Study Area during field sessions conducted in the summer of 2008, the size, age and location of nearby aspens and the increase in slope to the south suggests that the Study Area could potentially support this species.


Photo 61

Nokomis Silverspot Fritillary Butterfly *(Speyeria nokomis nokomis)*

Regulatory Status The Nokomis silverspot fritillary butterfly (Nokomis fritillary) **(Photo 62)** is a USFS sensitive species and a BLM sensitive species.

Species Background The Nokomis fritillary is associated with the Upper Sonoran (pinyon-juniper, various shrubs) and Canadian (fir-spruce-tamarack, some pine, aspen-maple-birch-alder-hemlock) Life Zones of the southwestern US and northern Mexico (Hammond 1974, Scott 1986, Selby 2007). Habitats are generally described as permanent spring-fed meadows, seeps, marshes,

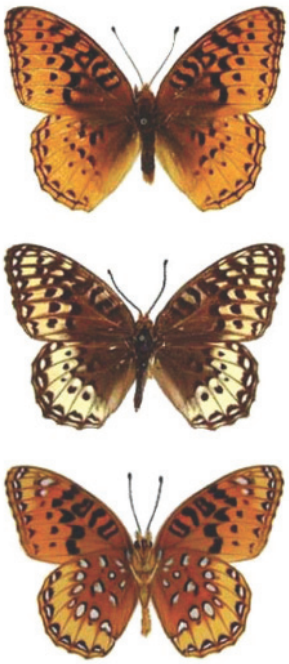

Photo 62

Photo 63

and boggy streamside meadows associated with flowing water in arid country (Hammond 1974, Scott 1986, Tilden and Smith 1986, Opler and Wright 1999, Brock and Kaufman 2003). The presence of an adequate supply of the larval food plant (i.e., bog violet [*Viola nephrophylla*]) is a critical habitat component (NatureServe 2006). Microhabitat conditions for the bog violet include soggy soil and shade, often under shrubs such as willows (Baird 1942). Nokomis fritillaries utilize a variety of species, including native and introduced thistles (i.e., *Cirsium*, *Carduus*, and *Onopordon* species), horsemint (*Agastache*), and joe pye weed (*Eupatorium maculatum*) (NatureServe 2006).

Local Habitat and Occurrence The potential for the presence of the Nokomis fritillary in the Study Area has been discussed at length in a previous research effort by the Sustainable Ecosystems Institute (SEI 2002). To quote the SEI report, "Colorado State University biologist Aaron Ellingson is of the opinion that the [Study Area] is a prime locality suitable for the species" (SEI 2002). Field visits in 2000 by international butterfly expert Dr. Steven Courtney confirmed that the Study Area has high violet densities and is a suitable locality for the Nokomis fritillary. Although invertebrate surveys conducted by the SEI did not reveal any Nokomis fritillary specimens. Less detailed field characterization efforts as part of this Environmental Report also did not verify the Nokomis fritillary's presence. The Study Area provides habitat consistent with that required by the Nokomis fritillary and could potentially provide habitat for this species.

Slender Cotton Grass (*Eriophorum gracile*)

Regulatory Status Slender cotton grass **(Photo 63)** is a USFS and BLM sensitive species and a State of Colorado species of special concern.

Species Background Slender cotton grass is a member of the sedge family (*Cyperaceae*) and often forms large uniform stands recognizable from a distance because of reddish leaf tips (Decker *et al.* 2006). Commonly found in fens, wet meadows and along pond edges, the elevation range for this species is between 8,100 and 12,000 feet AMSL.

Local Habitat and Occurrence A specimen of this species has been found along the Prospect Creek drainage approximately 2 miles south of the Town (University of Colorado 2008). The presence of wet meadows and fen-like ecosystems within the Study Area, and nearby known populations suggest that this species potentially could occur within the Study Area.

2.4.2.3 Unlikely Special Status Species

Southwestern Willow Flycatcher *(Empidonax traillii extimus)*

Regulatory Status The southwestern willow flycatcher **(Photo 64)** is designated as an endangered species by the USFWS and the State of Colorado.

Species Background The southwestern willow flycatcher is a small, migratory species that breeds in the southwestern US and winters in southern Mexico and Central America. The flycatcher breeds in different types of patchy to dense riparian habitats, near or adjacent to surface water and wetlands (Durst *et al.* 2005). Common nesting habitat includes willows, cottonwood, and salt cedar (USFWS 2002).

Local Habitat and Occurrence The flycatcher was listed as endangered in 1995 and in 2005 the USFWS issued its final Critical Habitat designation. No Critical Habitat is designated in Colorado. In Colorado, the flycatcher has been documented in the San Luis Valley, and is believed to occur in San Juan River tributaries near the New Mexico border (Durst et al. 2005).

The southwestern willow flycatcher (*E.t. extimus*) is not believed to occur at elevations above about 8,500 feet, or in areas north of the Dolores River. Flycatchers beyond these limits are believed to be a separate subspecies (*E.t. adastrus*), which is not federally listed (USFWS 2002). For these reasons, the southwestern willow flycatcher is not likely to occur in the Study Area, and any flycatchers found are likely to be a separate subspecies. While the conservation of riparian habitat for *E.t. adastrus* and other migratory birds is important, no federal ESA requirements would influence their conservation and management.

Photo 64

Peregrine Falcon *(Falco peregrinus)*

Regulatory Status Peregrine falcon is a State of Colorado species of special concern and a USFS sensitive species.

Species Background Peregrine falcon **(Photo 65)** are found from the tundra to the tropics on every continent except Antarctica, inhabiting mountains, deserts, maritime islands, continental forests and urban skyscrapers (White *et al.* 2002). Peregrines use a variety of different habitats for nesting, hunting, migration, and wintering but prefer nest sites on rugged, remote cliffs 100 to 300 feet in height usually overlooking water or marshy areas where prey is abundant (USFWS 1984, Craig and Enderson 2004). Nests can be found in the Rocky Mountains at elevations up to 11,811 feet AMSL (White *et al.* 2002).

Peregrines' primary diet includes medium-size birds such as jays, doves, flickers, shorebirds, and songbirds. Preferred hunting areas include cropland, meadows, river bottoms, marshes, and lakes that attract abundant bird life. In Colorado, some of the highest concentrations are in the river valleys and canyons of the Western Slope, including the Dolores and Colorado River canyons (Kingery 1998).

Photo 65

Local Habitat and Occurrence Peregrine falcon are known to occur throughout southwestern Colorado (Kingery 1998), though none have been documented in the upper San Miguel River basin. The Study Area provides some potential foraging habitat for the species; however, no nesting habitat (i.e., remote cliffs) exists within the Study Area. Based on the limited availability of suitable nesting sites, it is unlikely the peregrine falcons utilize the Study Area.

American Marten *(Martes americana)*

Regulatory Status American marten **(Photo 66)** are designated USFS sensitive species.

Species Background American martens are found in climax coniferous and mixed forests. They require dense and contiguous canopy (>30%) and sufficient understory cover for hiding and denning. American martens inhabit high elevation basins in spruce-subalpine fir or mountain hemlock forests in the West. Mature lodgepole pine stands that include spruce or subalpine fir will also support American marten. Although American martens are usually found at high elevations, they will use forests at lower elevations with high precipitation, such as cedar-grand fir. Mesic sites that support dense, succulent understory vegetation for American marten prey species are considered the best habitat (Koehler *et al.* 1977). During the summer, American martens may hunt for food in open meadows bordering dense forests if hiding cover is present (Allen 1984, Koehler *et a*l. 1977).

Photo 66

Local Habitat and Occurrence American marten have not been documented within the Study Area. Although American marten may occur on the slopes and within the extensive coniferous forests in the Telluride area, the open areas and relative lack of dense contiguous coniferous tree canopy suggests that the Study Area is unlikely to provide habitat to this species.

Photo 67

Photo 68

Photo 69

Western Burrowing Owl *(Athene cunicularia hypugea)*

Regulatory Status The Western burrowing owl **(Photo 67)** is listed as a threatened species by the State of Colorado and is a USFS sensitive species.

Species Background Western burrowing owls are ground-dwelling owls known for using habitat in open areas with mammal burrows. They use a wide variety of arid and semi-arid environments, with well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground (Haug *et al.* 1993, Dechant *et al.* 1999, Dechant *et al.* 2003, Klute *et al.* 2003). Burrowing owls require a mammal burrow or natural cavity surrounded by sparse vegetation. Burrow availability is often limiting in areas lacking colonial burrowing rodents (Desmond and Savidge 1998). Burrowing owls frequently use burrows of black-tailed prairie dogs. They nest less commonly in the burrows of Douglas' ground squirrels, whitetailed prairie dogs, Gunnison's prairie dogs, yellowbellied marmots, woodchucks, skunks, foxes, coyotes, and nine-banded armadillos (Dechant *et al.* 1999). Where mammal burrows are scarce, burrowing owls have been found nesting in natural rock and lava cavities (Gleason 1978, Gleason and Johnson 1985, Rich 1986).

Local Habitat or Occurrence Burrowing owls have not been documented in the Study Area. The presence of prairie dog colonies within the Study Area suggests some potential for nesting habitat, but their preference for black-tailed prairie dogs, as opposed to the resident Gunnison's prairie dogs, as well as the burrowing owls limited distribution in southwestern Colorado, suggests that this species is not likely to occur within the Study Area.

Mexican Spotted Owl *(Strix occidentalis lucida)*

Regulatory Status The Mexican spotted owl **(Photos 68 and 69)** is considered a threatened species by the USFWS and the State of Colorado.

Species Background Spotted owls are residents of old-growth or mature forests that possess complex structural components (uneven aged stands, high canopy closure, multi-storied levels, high tree density). Canyons with riparian or conifer communities are also important components. In southern Arizona and New Mexico, the mixed conifer, Madrean pine-oak, Arizona cypress, encinal oak woodlands, and associate riparian forests provide habitat in the small mountain ranges (Sky Islands) distributed across the landscape (Brown *et al.* 1980). Owls feed on small mammals, particularly mice, voles, and woodrats; and will also take birds, bats, reptiles and arthropods. This owl is a "perch and pounce" predator, using elevated perches to find prey items using sight and sound. They can take prey on the wing, particularly birds. Most hunting occurs at night, however, there are some reports of diurnal foraging. Mated pairs are territorial. The breeding season activity centers tend to be smaller than the non-breeding season activity area, with considerable overlap between the two. Adults may or may not leave the territory during the winter. Most adults remain on the same territory year after year. Juveniles leave their natal territory in September, and while they are capable of moving long distances, many successfully establish themselves nearby. Elevation ranges for Mexican spotted owls varies from 1,249 to 9,000 feet AMSL (USFWS 1995).

Local Habitat and Occurrence There is no critical habitat designated in San Miguel County. While the forested slopes immediately adjacent to the south side of the Study Area may provide potential habitat for the Mexican spotted owl, the disparity between preferred and existing vegetation communities and the borderline elevation of the area suggests that the Study Area is not likely to support the species (USFWS 2005).

Boreal Owl *(Aegolius funereus)*

Regulatory Status Boreal owls are a USFS sensitive species.

Species Background The boreal owl **(Photos 70 and 71)** inhabits northern coniferous and mixed deciduous boreal and subalpine forests of North America. In Colorado, they have been found to occur between 9,100 and 10,400 feet AMSL with the highest densities located above 9,800 feet AMSL in mature spruce-fir forests where there were numerous subalpine meadows and high populations of red-backed voles (Corn *et al*. 1989). Boreal owls are an obligate secondary cavity nester dependent on old forest and old growth stands to provide previously inhabited cavities for shelter. Roosting sites are typically found in thick, homogeneous stands of lowland conifers including black spruce and balsam fir (Hayward and Hayward 1993).

Local Habitat and Occurrence While the forested slopes immediately adjacent to the south side of the Study Area may provide potential habitat for the boreal owl, the disparities between preferred and existing vegetation coupled with the 8,700 AMSL elevation, suggests that the Study Area is not likely to support the species.

Northern Harrier *(Circus cyaneus)*

Regulatory Status Northern harriers are a USFS special interest species.

Species Background The northern harrier **(Photos 72 and 73)** occupies a wide range of open wetland and upland habitats during the breeding season, including fresh to alkali wetlands, wet or dry grasslands, lightly grazed agricultural pastures, old fields, brushy areas, and cold desert shrub-steppe (Duebbert and Lokemoen 1977, Evans 1982, Kantrud and Higgins 1992, Prescott *et al*. 1995, Prescott 1997). Nests are built on the ground or over water on platforms of vegetation and are typically well concealed by tall, dense grasses, forbs or low shrubs (Hecht 1951, Duebbert and Lokemoen 1977, Hamerstrom and Kopeny 1981, Kantrud and Higgins 1992, Herkert *et al*. 1999). Whether nesting in dry upland or wetland habitats, harriers appear to be associated with large tracts of undisturbed habitat (MacWhirter and Bildstein 1996). Northern harriers reside throughout most of Colorado but are usually more abundant during migration than during the breeding season (Andrews and Righter 1992). Northern harriers generally avoid high elevations in the Rocky Mountains and dry areas in the southeast (Carter 1998).

Local Habitat and Occurrence Although potential habitat may occur within the Study Area, the generally high elevation and limited amount of undisturbed land in the immediate vicinity suggests that the Study Area is unlikely to support this species.

River Otter (*Lontra canadensis*)

Regulatory Status River otters **(Photo 74)** are a USFS sensitive species and a State of Colorado threatened species.

Species Background The primary habitat requirement for river otters is permanent water with abundant fish or crustacean prey and relatively high water quality (Boyle 2006). In western Colorado, river otters often inhabit stream-associated habitats (Boyle 2006, Melquist and Hornocker 1983, Mack 1985, Bradley 1986). Lakes, reservoirs, beaver ponds, and floodplain wetlands also occur frequently within seasonal home ranges. Otter habitat within these aquatic systems is enhanced by vegetation along shorelines, which stabilizes banks, contributes nutrients and invertebrates to aquatic systems, provides shade for fish habitat, and encourages beaver activity (Boyle 2006). Fish represent the vast majority of river otter diets rangewide, and the presence of fish

Photo 70

Photo 71

Photo 72

Photo 73

Photo 74

Photo 75

Photo 76

in suitable quantity typically constitutes an essential habitat component. Because river otters are top predators in the aquatic food chain, they are highly vulnerable to pollution (Boyle 2006). Residues of petroleum products, mercury and other heavy metals, organochlorine compounds, polychlorinated biphenyls, and other toxic compounds have been found in river otter tissues (Kimber and Kollias 2000, Ben-David *et al.* 2001a, Ben-David *et al.* 2001b, Bowyer *et al.* 2003, a review by Melquist *et al.* 2003 [in Boyle 2006]). Bioaccumulation of polychlorinated biphenyls was considered the likely cause of river otter declines in Oregon (Henny *et al.* 1981 [in Boyle 2006]) and New York (Foley *et al.* 1988 [in Boyle 2006]). O'Conner and Nielsen (1981) reported that methyl mercury at dietary levels of 2 ppm was lethal to river otters, and they noted that even after pollution abatement, mercury persisting in sediments continues to move through aquatic food chains.

Local Habitat and Occurrence No river otter were observed or have been documented within the Study Area. Given historical and existing water quality issues associated with mining in the Study Area and the limited number of fish available within this stretch of the San Miguel River, it is unlikely that this species would occur within the Study Area.

Colorado River Cutthroat Trout *(Oncorhynchus clarkii pleuriticus)*

Regulatory Status Colorado River cutthroat trout **(Photo 75)** are a USFS sensitive species, a State of Colorado species of special concern, and a BLM sensitive species.

Species Background Colorado River cutthroat trout **(Photo 76)** historically have occupied relatively steep, coldwater streams and rivers and accessible high-mountain lakes in the Colorado River basin at elevations ranging between 5,500 to 12,000 feet AMSL. In general, cutthroat trout appear to occupy higher-gradient sites than other trout species in many Rocky Mountain streams (Fausch 1989, Bozek and Hubert 1992), and it has been suggested that these represent the most suitable reaches for cutthroat trout (Griffith 1988).

Their habitat use resembles that of other salmonid fishes in mountain environments. Colorado River cutthroat trout disproportionately use pools relative to riffles during summer observations due to decreased energy expenditures associated with remaining within the pool structure. Cutthroat trout spawn in lotic environments. They generally choose small, perennial streams (Clancy 1988, Magee *et al.* 1996, Hirsch *et al.* 2006), alluvial side channels of main-stem rivers (Henderson *et al.* 2000, De Rito 2004), or intermittent channels that remain flowing until fry have emerged (Gresswell *et al.* 1997). Spawning may begin as early as April and conclude as late as July in response to elevational gradients in flow and temperature (Young 2008). This species tends to spawn during or after snowmelt-driven peaks in discharge (Young 2008). Locations with suitable velocity, depth, and substrate for spawning can be found in channels of many different configurations and created by a variety of channel features and lithologies (Magee *et al.* 1996). Many Colorado River cutthroat trout redds in small streams are associated with the shallow tails of pools where channel shape favors downwelling and deposition of appropriate sized substrate.

Cover is thought to represent one of the most fundamental habitat needs of salmonids in streams (Young 2008). Its primary role seems to be as a sanctuary from predators, although it may also offer shelter from high flows. Yet because many habitat elements can serve as cover—large wood, overhanging or submerged vegetation, roots of bankside trees and shrubs, beaver dams, rubble and boulders, deep or turbulent water, or undercut banks—it may rarely be limiting in unaltered streams. More critical may be the hydraulic and physical complexity of channels that generates an array of microsites. Channel

complexity has been related to the density of Colorado River cutthroat trout (Kershner *et al.* 1997). Although a number of geomorphic elements can influence complexity, large wood (also known as coarse woody debris) plays a dominant role in many montane streams where Colorado River cutthroat trout persist (Young 2008). Deposition of large wood affects sediment scour and deposition, energy dissipation, and channel form (Montgomery *et al.* 2003), and creates pools, stores spawning gravels, affords overhead cover, and provides refuge during high flows (Dolloff and Warren 2003). For Colorado River cutthroat trout in a Wyoming stream, pools formed by large wood were disproportionately occupied relative to other pool types (Young *et al.* 1996). Removals or additions of large wood have caused declines or increases in local salmonid abundance (Dolloff 1986, Bisson *et al.* 2003).

Local Habitat and Occurrence The CNHP notes that a Colorado River cutthroat trout was observed in the vicinity of the Study Area (TWP4 N, R10W) in 1996. Although potential habitat may occur in the Study Area, the channelization of the San Miguel River, the absence of extensive pool habitat, the relatively low gradient reach of the San Miguel River throughout the Study Area and the absence of woody debris/cover area negatively affect important habitat components of potential Colorado River cutthroat trout populations. Furthermore, Colorado River cutthroat trout rely heavily on cold water, unimpaired, high gradient mountain streams. Historical and existing water quality issues potentially limit the ability of Colorado River cutthroat trout to utilize the Study Area as habitat.

In addition to poor habitat conditions, the threat posed by competition from non-native trout species has been documented in many native inland cutthroat trout assessments (James and Speas 2005; CRCT Task Force 2001; Gresswell 1995; Kershner 1995; McIntyre and Reiman 1995; Rinne 1995; Young 1995;). Non-native brook trout out-compete and totally replace Colorado River cutthroat trout in many stream systems. Rainbow trout readily hybridize with Colorado River cutthroat trout. Populations of brook trout and rainbow trout were observed both in the Study Area and upstream from the Study Area during field sessions in 2008. The presence of these species further reduces the likelihood of populations of Colorado River cutthroat in the Study Area. Based on the lack of habitat, the presence of non-native trout species and poor water quality, the Colorado River cutthroat trout is unlikely to occur within the Study Area

Colorado Pikeminnow *(Ptychocheilus lucius)*

Regulatory Status The Colorado pikeminnow **(Photos 77 and 78)** is a USFWS endangered species and a State of Colorado threatened species.

Species Background The Colorado pikeminnow is believed to be historically restricted to large rivers of the Colorado River basin, formerly in the mainstream Colorado River and major tributaries (Gunnison, White, Yampa, Dolores, San Juan, Uncompahgre, Animas, and Green rivers) (USFWS 1993). However, present distribution is drastically reduced from the original. Young pikeminnow prefer small, quiet backwaters. Adults prefer medium to large rivers and use various habitats, including deep turbid strongly flowing water, eddies, runs, flooded bottoms, or backwaters (especially during high flow). Lowlands inundated during spring high flow appear to be important habitats. Reproductively active adults seek white-water canyons that receive freshwater input of groundwater from sandstone/limestone seeps (Tyus 1991). In some areas, adults spawn where large, deep pools and eddies (resting and feeding areas) are intermingled with riffles and runs and cobble bars of gravel, cobble, and boulder substrates (Tyus and Karp 1989, Tyus 1991).

Photo 77

Photo 78

Photo 79

Photo 80

Photo 81

Local Habitat and Occurrence No evidence that Colorado pikeminnow have historically inhabited or currently inhabit the San Miguel River in the vicinity of Town has been observed. The relatively shallow water depths, the steep incline from the deeper and wider San Miguel and Dolores Rivers downstream and the relative lack of deep pools and eddies the upper San Miguel River suggests that the Study Area is unlikely to support this species.

Slender Rock-brake *(Cryptogramma stelleri)*

Regulatory Status The slender rock-brake **(Photo 79)** is a BLM sensitive species.

Species Background Slender rock-brake are found in central Alaska, south through the Yukon and British Columbia, to northeastern Washington and northwestern Montana. It is also found in the east from Ontario to Newfoundland, south to Minnesota, Iowa, Illinois, Michigan, New York, Pennsylvania, and New Jersey. Isolated populations exist in Wyoming and Colorado. This species grows on moist, shaded limestone cliffs and ledges at middle and upper altitudes in the mountains (Spackman *et al.* 1997).

Local Habitat and Occurrence The CNHP (2008) identifies at least one known sighting of slender rock-brake in the vicinity of Town. The University of Colorado Herbarium (2008) notes that this sighting occurred approximately ¾ mile above Town along the south canyon in 1989. The absence of limestone cliffs within the study area suggests that this species is not present in the Study Area.

Hamilton milkvetch *(Astragalus lonchocarpus var. hamiltonii)*

Regulatory Status The Hamilton milkvetch **(Photo 80)** is a BLM sensitive species.

Species Background Typically found in gullied bluffs and ridges, in desert shrub or juniper communities, this species is found in a relatively limited elevational range of 5,240 to 5,800 feet AMSL (Spackman *et al.* 1997).

Local Habitat and Occurrence Although observed on five occasions within San Miguel County, the elevational ranges and specific habitat requirements suggest that this species does not occur in the Study Area.

Naturita milkvetch *(Astragalus naturitensis)*

Regulatory Status The Naturita milkvetch **(Photo 81)** is a BLM sensitive species.

Species Background Typically found on sandstone mesas, ledges, crevices and slopes of pinyon-juniper woodlands, this species is found only between 5,000 and 7,000 feet AMSL (Spackman *et al.* 1997).

Local Habitat and Occurrence Although observed in San Miguel County, the elevational ranges and specific habitat requirements of this species suggest that it does not occur in the Study Area.

Cushion Bladderpod (Physaria pulvinata)

Regulatory Status The cushion bladderpod is a USFS sensitive species.

Species Background Relatively little is known about this species. Though endemic to Colorado, populations are confined to shale outcrops widely used for road gravel (Spackman et al. 1997, Cronquist 2003).

Local Habitat and Occurrence Although observations of this species have occurred within San Miguel County, the absence of shale outcrops in the Study Area indicates that this species is not likely to occur within the Study Area.

2.4.3 Conclusion

This screening is intended as a rapid assessment to determine the potential presence or absence of habitat for special status plant or wildlife individuals or populations. Based on a review of existing records and an evaluation of habitat characteristics within the Study Area, three special status species known to utilize the Study Area for some aspect of their life histories have been identified (Canada lynx, Gunnison's prairie dog, and black swift). Of these three, only the Canada lynx is protected by the USFWS under the ESA.

The Study Area is a known travel corridor for Canada lynx, a species designated as threatened under the ESA. Although the Study Area does not provide extensive lynx habitat, it does provide some migratory and secondary foraging habitat for the species, and anecdotal evidence suggests that this species has been observed in the past. The regulatory implications of lynx habitat are discussed in detail in the *Canada Lynx Conservation* section. The remaining two species (Gunnison's prairie dog and black swift), designated sensitive by the USFS, do not receive any additional protection on non-federal lands such as the Study Area. Gunnison's prairie dogs currently occur in a confirmed colony located in the northeastern portion of the Study Area. Black swifts are known to breed in Bridal Veil Falls, upstream of the Study Area, and have been observed utilizing the Study Area.

Ten special status species (bald eagle, golden eagle, prairie falcon, northern goshawk, boreal toad, northern leopard frog, red-naped sapsucker, purple martin, nokomis silverspot butterfly, and slender cotton grass) have been identified as having the potential to exist within the Study Area, although no confirmed sightings have occurred. Of these species, none are protected by the USFWS under the ESA and two (bald eagle and boreal toad) are considered threatened or endangered in Colorado.

The Study Area provides potential habitat for bald eagles, a Colorado threatened species. Bald eagles have been sighted in the Telluride area and the Study Area provides some suitable perching and foraging habitat. Some suitable habitat also exists for boreal toads, a Colorado endangered species. However, based on a review of existing water quality issues and specific habitat requirements of the species, there is little evidence to suggest that boreal toads currently use, or have used the Study Area as habitat. The remaining special status species potentially occurring within the Study Area (golden eagle, prairie falcon, northern goshawk, northern leopard frog, red-naped sapsucker, purple martin, nokomis silverspot butterfly and slender cotton grass), while designated sensitive or special interest species by the USFS, or species of special concern by the State of Colorado, do not receive any additional regulatory protection; however, the intent of these designations is not to provide the same kind of protection as a threatened or endangered designation under the ESA. Instead, these designations are intended to alert resource managers to the potential presence of these species during regional management planning, with the goal of preventing the need to formally designate these species as threatened or endangered.

A variety of migratory birds could potentially utilize the Study Area. Of the 264 birds known to breed in Colorado that are protected under the MBTA, approximately 148 are known or are likely to breed in San Miguel County **(Appendix G)**. Killing or possession of these birds, parts of these birds or their nests is prohibited under the MBTA. Future land use changes could potentially alter species composition and diversity. Should land use alterations occur during the breeding season (roughly April through August), a breeding bird survey should be completed prior to any vegetation removal.

2.5 WILDLIFE

This study of wildlife habitat and use of the Study Area was completed with information from a variety of sources, including field surveys, existing data and reports, and consultations with agencies and individuals familiar with the Study Area. This study is not intended to be a census or comprehensive inventory of all wildlife species that occur in the Study Area. Instead, this study describes the wildlife species and communities that are known in the Study Area or have the potential to use the Study Area, the known or potential sensitive species that require special protection and management, and wildlife habitat conditions that warrant special attention due to their implications for long-term management and stewardship of the Study Area.

2.5.1 Methodology

Evaluation of overall wildlife habitat and use was completed through examination of existing data, reports and scientific literature, field surveys, and consultations with agencies and individuals familiar with the Study Area. Each of these data sources are described as follows.

- Draft Baseline Report, Telluride Valley Floor Conservation Easement, prepared by BIO-Logic, Inc. 2008;
- The San Miguel Headwaters – Valley Floor Scientific Analysis, Synthesis, and Recommendations, prepared by SEI, 2002;
- A Natural Heritage Assessment, San Miguel and Western Montrose counties, Colorado, prepared by the Colorado Natural Heritage Program, 2000;
- Grand Mesa, Uncompahgre, and Gunnison National Forest Plan Revision, Proposed Land Management Plan, USFS, 2007;
- Natural Diversity Information Source GIS Data, CDOW, 2008b; and
- Telluride Natural Areas Inventory, Prepared by ERO, 1998.

This study incorporated current scientific literature and technical reports relevant to the Study Area and the wildlife management issues that are anticipated to occur there. In general, scientific literature and technical reports were explored for the following topics:

- Elk habitat and management;
- Prairie dog habitat and management;
- Recreation/wildlife interactions; and
- Dog/wildlife interactions.

Field reviews were conducted from July 29 through August 1, 2008. A wildlife biologist, ecologist, and natural resource planner walked the extent of the Study Area multiple times and at different times of the day. The following wildlife data was recorded:

- Wildlife species observed;
- Existing and potential habitat conditions;
- Location and conditions for significant species and;
- Regional context and potential movement corridors.

Considering the short time period (four days) and time of year (mid to late summer), these field reviews may not be consistent with the life cycles or migratory patterns of some species. Instead, the field reviews provide a "snapshot"

of wildlife activity within the Study Area, and are supplemented by other data sources described in this Environmental Report.

2.5.2 Results

The Study Area is dominated by a mosaic of wetlands, wet meadows, and upland pasture areas. Most of the wetland areas support dense patches of willows, while the San Miguel River corridor and the Mill Creek alluvial fan support mature stands of narrowleaf cottonwood and blue spruce. The steep mountainside along the southern boundary of the Study Area supports a dense forest dominated by blue spruce, Engelmann spruce, and aspen. Vegetation communities within the Study Area are described in greater detail in the *Wetlands* and *Upland Vegetation* sections.

From a regional perspective, the Study Area plays an important role in maintaining the function and viability of many broad-ranging species. The wetlands of the Study Area help sustain water flows along the San Miguel River, which in turn supports important wetland and riparian habitat for a variety of wildlife species throughout the watershed.

As one of the largest sub-alpine wetland areas in the region, the Study Area provides a unique habitat opportunity for a variety of migratory bird species. Locally, the Study Area provides an important north-south movement corridor for broad-ranging species such as elk, mule deer, black bear, bobcat, and Canada lynx. Use and corridors for these species are described in further detail below **(Figure 2-7)**.

2.5.2.1 Mammals

The Study Area is known to support habitat for a host of large and small mammal species that are typical of the region. The most common and noticeable mammals in the Study Area include elk, mule deer, Gunnison's prairie dog and marmots.

Elk

To the casual observer, the most noticeable wildlife within the Study Area is the "semi-resident" herd of elk **(Photos 82 and 83)**. Elk are considered generalist feeders, grazers and browsers, foraging on a variety of grasses, forbs, and shrubs throughout the year. Grasses usually make up most of their diet, while woody shrubs are also important (particularly in the winter when less grass is available). While elk forage primarily in open areas, they rely on nearby forested areas or shrublands for cover. Elk generally do not move more than about 1 km (0.62 mile) during their daily activities, and typically favor relatively steep slopes (15 to 30%) for bedding grounds (Fitzgerald *et al.* 1994, NPS 2007).

Most elk herds migrate between summer and winter ranges, with winter ranges typically occurring at lower elevations, however, some herds are relatively sedentary (Fitzgerald *et al.* 1994). As shown in **Figure 2-8**, the south-facing slopes north of the Study Area have long been considered winter range for elk, while the high alpine ridges and drainages to the north of the San Miguel River Valley are known to support summer concentration and calving areas (CDOW 2008b). The timing of migration between summer and winter ranges typically depends on weather and snow depth, which influences the availability of forage on summer ranges (NPS 2007).

In recent years, a small herd of elk has been spending the summer within the Study Area. It is believed that the elk moved in after livestock was removed from the Study Area in 2005 (Pera pers. comm. 2008). During the field reviews for this study, a herd of about 40 to 50 individuals was seen in various locations in the Study Area, generally spending the days in dense willow thickets before emerging to graze in the open meadows in the evening.

Photo 82

Photo 83

Photo 84

In the absence of hunting or other disturbances in the Study Area, this semi-resident elk herd is expected to continue to grow over time (Caddy pers. comm. 2008), which could result in management issues related to over-grazing and habitat degradation, increased vehicle collisions, and potential conflicts with recreational use and dogs. These and other issues related to elk management are explored further under *Management Recommendations*.

Mule Deer

Mule deer **(Photo 84)** are common throughout the region in all types of ecosystems from grasslands to alpine tundra, though some of the highest densities are found in rough, broken terrain that provides abundant browse and cover. In Colorado, mule deer herds tend to be migratory. Movements occur from summer range at higher elevations to winter range at lower elevations triggered by snowfall, and a decrease in quantity and quality of forage (Fitzgerald *et al.* 1994).

While mule deer are known to use the Study Area, they are not particularly concentrated. Based on CDOW mapping, the San Miguel River Canyon to the west of the Study Area is known to provide winter range for mule deer, while the entire region is considered to be overall range (CDOW 2008b). Three individual mule deer (one doe with two fawns) were seen in the Study Area during the field reviews.

Black Bear

Black bear **(Photo 85)** are known to occur throughout the region, and have been observed within the Study Area. Black bears are secretive animals that usually stay close to rough topography and dense forest cover for concealment, escape, and travel. They are most common in montane shrublands and forests and subalpine forests that support well-developed stands of Gambel oak (*Quercus gambelii*) or berry-producing shrubs such as serviceberry (*Amelanchier spp.*) and chokecherry (*Prunus virginiana*). Rock cavities or excavations under shrubs and trees are used for den sites (Fitzgerald *et al.* 1994). The entire Telluride/Mountain Village area is considered by CDOW to be a Human Conflict Area for black bear, because of the high potential for and incidence of conflict between foraging bears and homes and businesses (CDOW 2008b).

While the Study Area is known to support foraging habitat and a movement corridor for black bear, it is not considered to be prime habitat for the species. In June, 2008, a black bear was seen taking an elk calf before escaping up the hillside to the north (Pera pers. comm. 2008). During the field reviews, bear tracks were observed along the San Miguel River, while bear claw marks are evident in some of the aspen trees near the Study Area's southwestern boundary.

Photo 85

Other Carnivore Species

The Study Area provides habitat for several other carnivore species, including mountain lion, weasels, ermine, coyote, bobcat, and red fox. While most of these species are habitat generalists or prefer forested habitat, all of these species are likely to use the Study Area for movement, foraging, and in some cases, denning. Canada lynx, a federally-listed threatened species, is known to occur within the Study Area and is discussed in greater detail under **Section 2.4, Threatened, Endangered, and Species of Concern**. During the field review, a weasel was observed along the River Trail near the eastern end of the Study Area.

Small Mammals

The wetlands and meadows of the Study Area provides habitat for numerous small mammals, including mice, voles, shrews, squirrels, and rabbits. All of

these types of species were observed within the Study Area during the field reviews. A significant colony of Gunnison's prairie dog is located in the east-central portion of the Study Area, and is discussed in greater detail under **Section 2.4, Threatened, Endangered and Species of Concern**.

A moderate to large colony of marmots **(Photo 86)** dominates the natural and man-made rock piles, berms, and fill areas in and around the old dog pound/sewage lagoon area in the center of the Study Area. While marmots are typically associated with more alpine settings, they are known to occur in areas as low as 5,400 feet AMSL if suitable habitat exists. Marmots eat a variety of forbs and flowers, and prefer to dig burrows close to rock outcrops or burrows that provide sites for sunning and observation (Fitzgerald *et al.* 1994).

Photo 86

The streams and wetlands of the Study Area support, and are in turn sustained by, beavers. Beavers **(Photo 87)** are found throughout North America around open water, and are common in Colorado in areas with abundant aspen, cottonwood, or willow – especially in broad glacial valleys with low stream gradients (like the Study Area). Beavers eat a wide variety of plants, but prefer bark, buds, leaves and twigs of aspen, willow, and cottonwood. With their complex network of dams, canals, and lodges **(Photo 88)**, beavers manage watersheds by slowing runoff and raising the water table, which favors the development of woody riparian and wetland communities. Beaver can also be a nuisance for irrigation and drainage structures, plugging culverts and interfering with irrigation diversions (Fitzgerald *et al.* 1994). Several beaver dams and lodges were observed during the field reviews **(Figure 2-7)** and in previous evaluations (BIO-Logic 2008). The ecological values, habitat interactions, and management recommendations pertaining to beavers are discussed in greater detail in the *Resource Management Recommendations* section.

Photo 87

2.5.2.2 Birds

The mosaic of grasslands, wetlands, riparian species, and open water within the Study Area provides habitat for a variety of bird species, including songbirds, waterfowl, and raptor species. Local volunteers have documented about 50 different bird species within the Study Area within the past year.

Common bird species observed within the Study Area include spotted sandpiper, Northern flicker, black-billed magpie, mountain chickadee, mountain bluebird, American robin, yellow warbler, song sparrow, dark-eyed junco, red-winged blackbird, pine siskin, and house sparrow. Several species of ducks and geese are commonly found in open water areas during the summer months, including Canada goose, mallard, cinnamon teal, and green-winged teal (TOSC 2008).

Raptors

While the Study Area provides suitable habitat for a variety of raptor species, few have been documented within the Study Area. During the site visits and local bird counts, a red-tailed hawk was observed in the west-central portion of the Study Area near Eider Creek and the old sewer lagoons. (This hawk is believed to have a nest on the densely vegetated slopes to the south of the Study Area). Sharp-shinned hawk, a small forest accipiter, has also been observed within the Study Area. Bald eagles have been observed wintering along the San Miguel River to the west of the Study Area, but are rarely seen on the Study Area itself.

The mature cottonwood and spruce trees (suitable for nests and hunting perches), combined with the diversity of foraging areas, provide habitat conditions favored by many raptor species. However, few raptors have been documented in the Study Area, leaving a habitat niche that appears to be underutilized. The

Photo 88

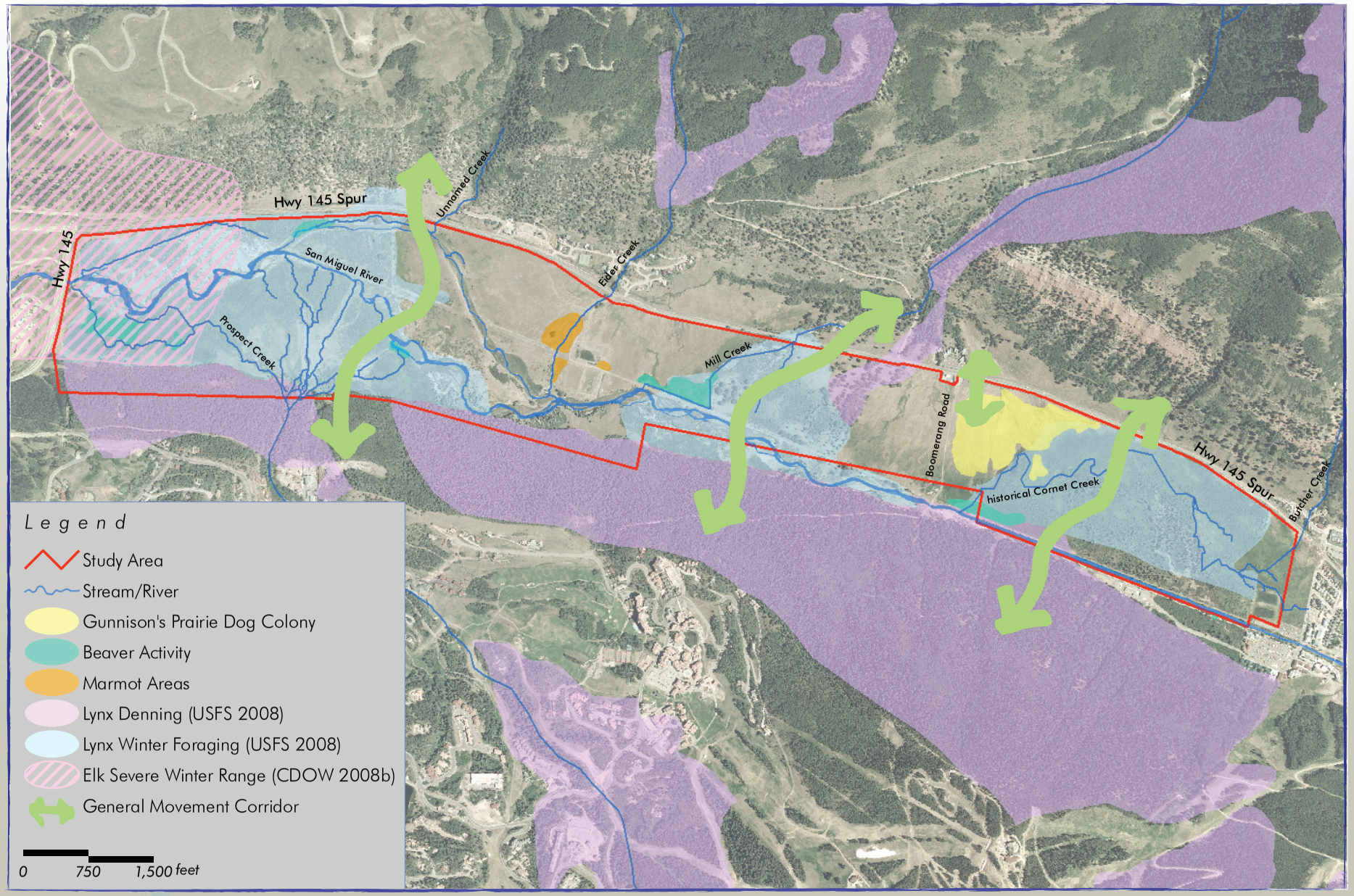

Figure 2-7

Wildlife

N W E S

Telluride Valley Floor

Environmental Report

TOWN OF TELLURIDE

Ecological Resource Consultants, Inc.

ERC

March 2009

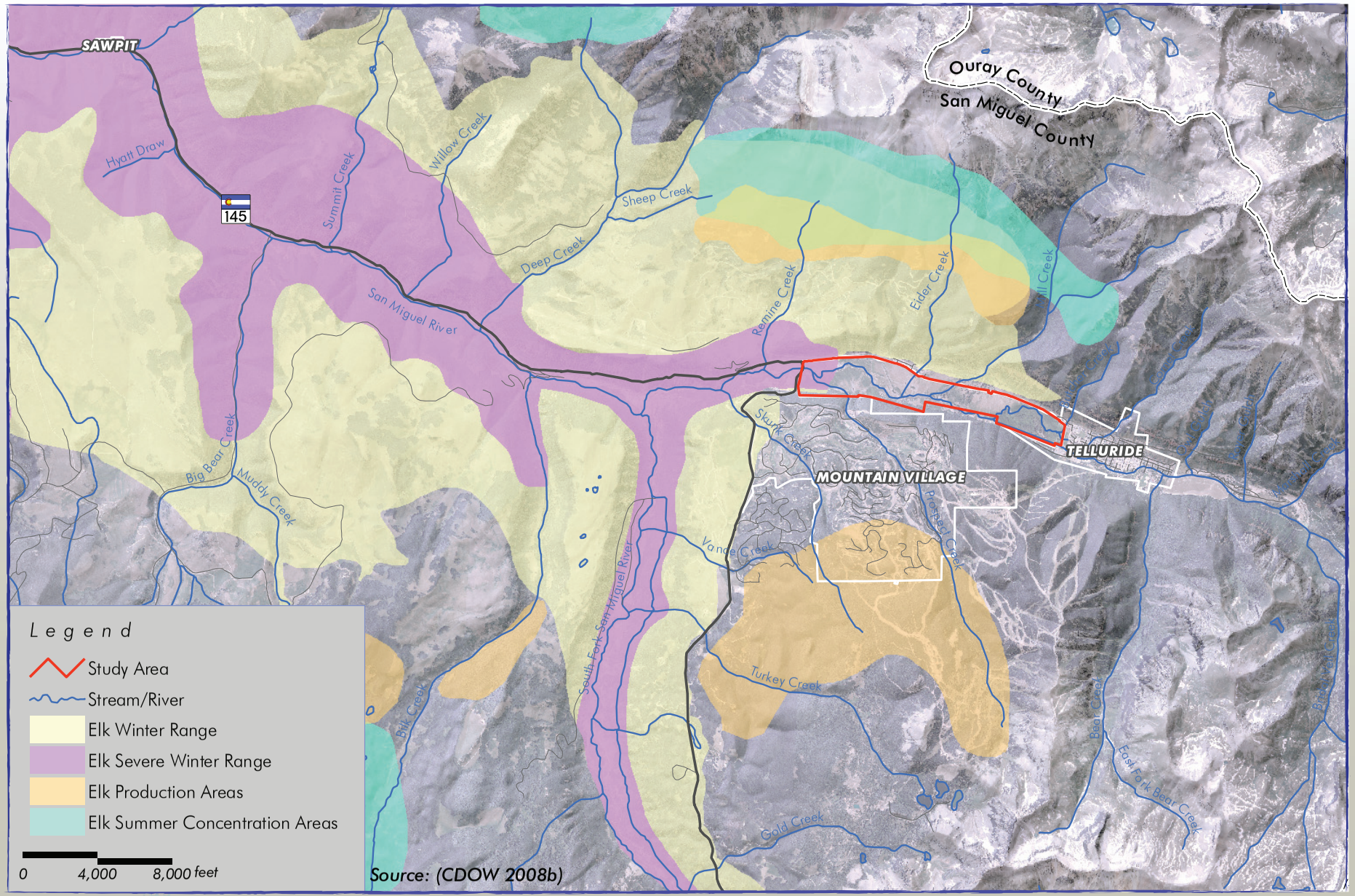

Figure 2-8

Regional Elk Habitat

March 2009

Telluride Valley Floor

Environmental Report

TOWN OF TELLURIDE

Ecological Resource Consultants, Inc.

ERO

Photo 89

reasons for this relative absence of raptors within the Study Area may include its high elevation, short growing season, and isolation from similar habitat types (which could hinder dispersal into the area), or a lack of available prey.

The cliffs above the Study Area to the north have the potential to support cliff-nesting raptors that could potentially forage on the Study Area. In addition to the factors described above, additional reasons for a lack of cliff-nesting raptor use is that the cliffs are generally smaller in height and have more south-facing exposure than what is generally preferred.

2.5.2.3 Invertebrates

The Study Area ecosystem supports, and is sustained by, a host of insects and invertebrate species. The 2002 SEI report documented the function and importance of invertebrates within the Study Area (2002). The San Miguel River is a breeding ground for insects such as mayflies **(Photo 89)**, caddisflies, and aquatic true bugs, while the wetland areas provide habitat for dragonflies, beetles, mosquitoes, and flies. Terrestrial invertebrates include beetles, butterflies, moths, weevils, true bugs, grasshoppers, and crickets (SEI 2002). Results of benthic macroinvertebrate sampling are discussed in **Section 2.3.2.2**.

2.5.2.4 Amphibians

The extensive wetlands and ponds within the Study Area provide a large amount of habitat for amphibians, including chorus frog, northern leopard frog, bullfrog, and tiger salamander **(Photo 90)**. However, considering the extensive habitat that exists, amphibians were noticeably absent from the Study Area during the site visits. While some community members have reported hearing chorus frogs or possibly bullfrogs in June, no amphibians of any kind were observed during the wetland and wildlife studies conducted in July.

The absence of amphibians within the Study Area may be the result of any (or a combination) of the following factors: 1) degraded water quality, which can be toxic to amphibians; 2) higher elevation, which can limit the survival of some species; 3) hydrological fluctuations; or 4) isolation from other populations, which can limit dispersal and colonization from other sites.

As described under **Section 2.4, Threatened, Endangered, and Species of Concern**, the Study Area also provides suitable habitat for the boreal toad. This species is not likely to occur and has not been recorded anywhere in the Telluride region.

Photo 90

2.5.3 Conclusion

The Study Area supports a range of wildlife species, from large mammals and carnivores to insects and amphibians that are typical of sub-alpine habitats in the Rocky Mountain region. While most of the necessary ecological dynamics are in place, a relative lack of predators (both avian and terrestrial) within the Study Area was noted. This observation may have more to do with the geographic location of the Study Area, rather than any particular habitat or management deficiencies. Although it supports important wetland and upland habitats, the Study Area functions as a small part of a much larger ecosystem, and future management of wildlife and habitat should be considered within that greater regional context.

2.6 TAILINGS CHARACTERIZATION

The purpose of this evaluation is to summarize the current and relevant information about the tailings in a manner that enables the Town to make more informed decisions on future investigations, potential remediation plans, restoration, and long-term management of the Study Area. This evaluation is based on existing information and did not include any additional soil or water analysis.

2.6.1 Methodology

This evaluation of existing and potential mine tailings within the Study Area was completed with information from a variety of sources, including field mapping, review of existing relevant data and reports, and consultations with agencies and individuals familiar with the location and legal status of tailings within the Study Area. Each of these data sources is described as follows.

Existing Data and Reports

Information pertaining specifically to the tailings within the Study Area was obtained and reviewed. Most of the documentation reviewed is related to the court ordered cleanup and remediation of the Idarado Mine facility on the east side of Town. This remediation was the subject of a lengthy legal process and Consent Decree, resulting in thousands of pages of documents, most of which are not relevant to tailings within the Study Area. For this reason, Camille Price, the project manager for the Colorado Department of Public Health and Environment (CDPHE) was contacted to obtain relevant documents for the Study Area. These documents include the following:

- Preliminary Design Report for the Court Ordered Remediation Plan at the Idarado Mine Facility, prepared by Rocky Mountain Consultants, Inc. (RMC), 1989.
- Evaluation of High Flow and Low Flow Sampling and Historical Data – Society Turn Tailings Piles ST-1, ST-2, and ST-3 along the San Miguel River, San Miguel County, Colorado, 2001.

Field Reviews

Field reviews and mapping of existing and potential tailings piles was conducted on three occasions: July 28, August 21, and September 26, 2008. The purpose of the field reviews was to map the current extent of known tailings piles and identify other potential tailings areas within the Study Area.

Individual Consultations

As mentioned above, the primary contact for this evaluation was Camille Price with the CDPHE. Anecdotal information from Town staff and community members was also used to identify other potential tailings areas within the Study Area.

2.6.2 Results

History and Source of Tailings

Most of the tailings piles within the Study Area originated from the Idarado Mine facility on the east side of Town **(Photos 91 and 92)**. According to Camille Price with the CDPHE, most of the tailings were transported as sediment in the San Miguel River, and were then deposited alluvially behind an impoundment located near Society Turn. A placer mining operation at Keystone, located immediately west of Society Turn and the Study Area, was reportedly mining the alluvial deposits in the valley for gold in the late 1800s.

Photo 91

Photo 92

Photo 93

Other theories contend that the tailings were transported to the Study Area by rail car and dumped, or deposited after a large flood event. The actual history of the tailings piles likely includes a combination of these and possibly other theories, and the deposition of various tailings piles within the Study Area may have been the result of several events over a long period of time. Ultimately, what is important for future management of the Study Area is an understanding of current tailings piles.

Tailings Types

For the purposes of this evaluation, three types of tailings within the Study Area are mapped and described:

1. Idarado Consent Decree Tailings
2. Miscellaneous Tailings
3. Other Potential Tailings

Based on documents provided by the CDPHE, our current knowledge of the extent and characterization of tailings within the Study Area is summarized in **Table 2-8**, and are shown in **Figures 2-9 and 2-10**.

Idarado Consent Decree Tailings

In 1989, RMC identified and mapped various tailings piles along the San Miguel River **(Photos 93 and 94)**, both on and off of the Study Area. The largest of these piles is the Society Turn Tailings Pile #1. This pile is subject to the Idarado Consent Decree and Remedial Action Plan (RAP), encompasses the legal extent of Idarado tailings within the Study Area, and is likely to represent the extent of State-funded remediation activity. Idarado Consent Decree Tailings encompass approximately 26 acres of the Study Area.

Photo 94

Table 2-8. Tailings within the Study Area.

Tailings Pile	Size (acres)	Notes
Idarado Consent Decree Tailings		
Society Turn Tailings Pile #1	26.34	Area mapped in 1989.
Miscellaneous Tailings		
MT-1	0.36	Oxbow area partially inundated by current river channel.
MT-2	0.23	Small area along river channel.
MT-3	0.07	Small area along river channel.
MT-4	0.01	Small area along river channel.
MT-5	0.01	Small area along river channel.
MT-6	0.2	Very shallow, mixed with river gravels.
MT-11	0.04	Small portion of "East Tailings" below.
Total Miscellaneous Tailings	0.92	
Other Potential Tailings		
Society Turn Tailings	25.15	Current estimated extent of main tailings pile, mapped in 2008.
Public Works Tailings	1.0	Along banks of San Miguel River on east end of the Study Area.
East Tailings	0.9	Area north of RR grade on east end of the Study Area.

Miscellaneous Tailings

Eight smaller piles were also identified by the State as "miscellaneous tailings", located intermittently within the Study Area. These tailings were mapped in 1987 and are *not* included for remediation under the Idarado Consent Decree and RAP.

Other Potential Tailings

These areas represent the current estimated extent of potential tailings within the Study Area, based on field investigations and community input. These areas include both discernable piles and other areas where non-native surface soils appear to be intermixed with native soils. Besides the Society Turn tailings pile, these areas encompass about 2 acres of the Study Area.

Society Turn Tailings Pile #1 Characterization

On June 10, 1987, RMC collected sediment samples from Society Turn Tailings Pile #1, as well as other piles in the area. According to the results of the investigation, the Society Turn Tailings are high in lead, cadmium, copper, and zinc, and the pH of tailings is about neutral. A leachability test indicated that the tailings within Society Turn Pile #1 have the potential for leaching lead and cadmium into the surrounding soil and the river. A hazardous waste evaluation suggests that the tailings contained in Society Turn Pile #1 may be a hazardous waste due to the lead and cadmium concentrations. It is advised that the public not be allowed to access the tailings piles to minimize disruption and potential erosion.

Potential Tailings Influence on Water Quality

In 2000, RMC collected stream sediment and water quality data from the San Miguel River during both high (June) and low (October) stream flows **(Photos 95 and 96)**. Sampling locations in 2000 were established to bracket individual tailings piles (to better identify their influence on water quality). The two sampling locations that are relevant to the Study Area include:

- SMST – 3: Located at Highway 145 near Society Turn (downstream of the Study Area)
- SMST – 4: Located at the former railroad crossing (upstream of the Society Turn Tailings Pile).

Results of the water quality sampling from the San Miguel River are summarized in **Table 2-9**. The table shows that there were aquatic life water quality exceedances for dissolved zinc at both SMST-3 and SMST-4 in June 2000 and at SMST-4 in October 2000. During both sampling events, dissolved and total zinc concentrations were higher at SMST-4, the site located upstream of the Society Turn Tailings Pile, than at SMST-3, located downstream of the tailings pile. The only other water quality exceedances occurred in June 2000 for total aluminum. The exceedances of the aquatic life chronic total aluminum standard occurred at both sampling sites. There were no exceedances of human health standards.

River sediment sampling data from 2000 showed that, except for nickel, sediment metals concentrations increased from upstream of Pile #1 to downstream of Pile #3. RMC concluded that the tailings appear to be eroding into the San Miguel River from the Society Turn Tailings Piles (RMC 2001). It is not possible to make conclusions on the present state of the sediment or stream water quality of the San Miguel River in the vicinity of the tailings piles based on two sampling events that occurred in 2000. For example, it is unclear why zinc concentrations could be higher upstream rather than downstream of the tailings pile. A more robust sampling program would be required, including

Photo 95

Photo 96

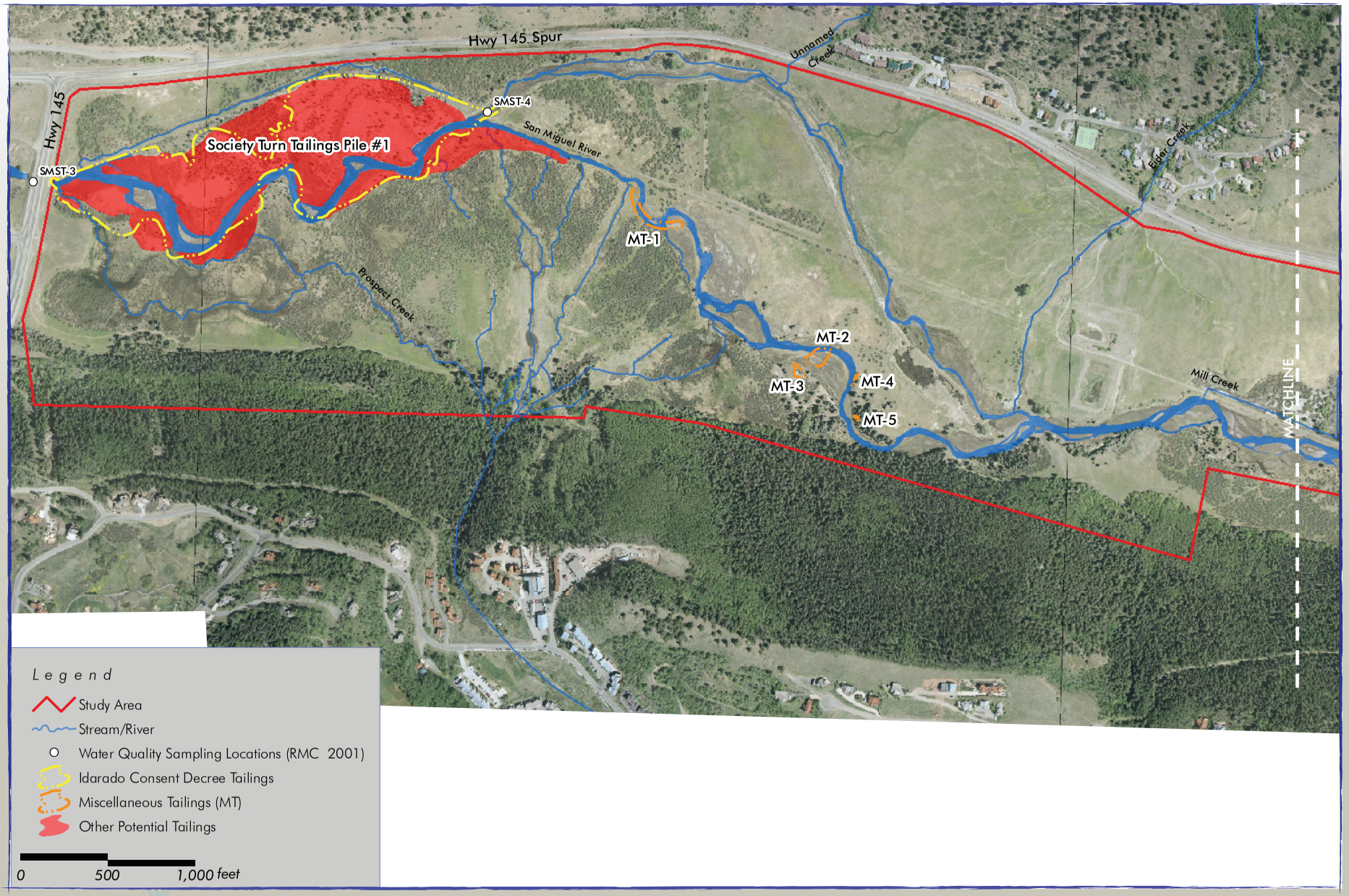

Figure 2-9

Tailings (West)

March 2009

N W E S

Telluride Valley Floor

Environmental Report

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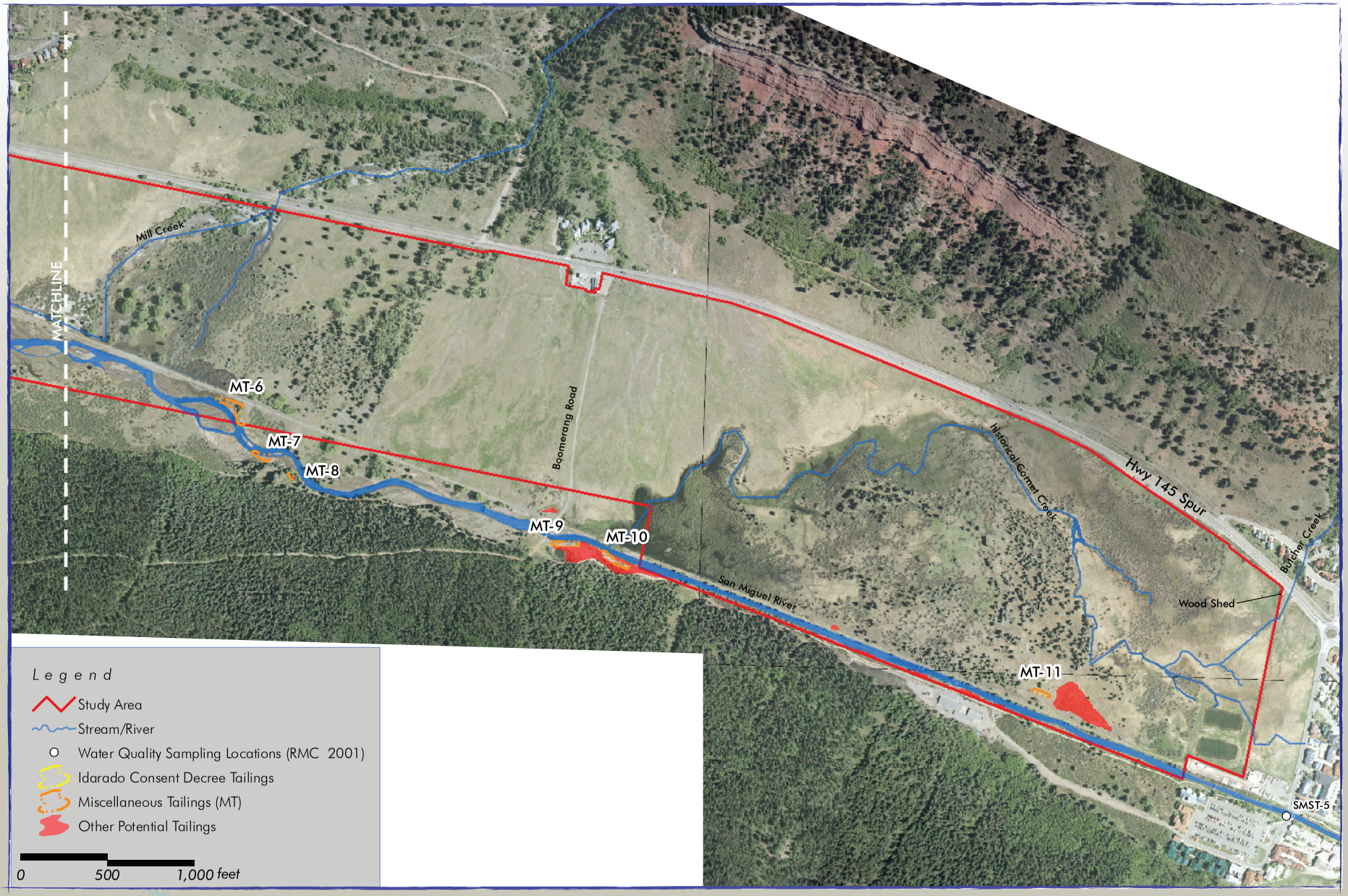

Figure 2-10

Tailings (East)

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Table 2-9. Selected Metals Concentrations, pH, Hardness and Streamflows for 2000 Sampling Events in the San Miguel River Near Tailings Pile #1.

Water Quality Parameter		High Flow (June 2000)		Aquatic Life Standard[1] (acute/chronic)	Low Flow (October 2000)		Aquatic Life Standard[1] (acute/chronic)	Human Health Standard[2]
		SMST-4	SMST-3	June 2000 High Flow (based on hardness=75 mg/L)	SMST-4	SMST-3	October 2000 Low Flow (based on hardness=150 mg/L)	
Zinc (µg/L)	Dissolved	220	200	112/198[3]	240	100	201/198[3]	--
	Total	220	210	--	250	230	--	3,000
Cadmium (µg/L)	Dissolved	0.7	0.7	1.3/0.73	0.7	0.6	2.4/0.73	--
	Total	0.5	0.6	--	0.7	0.7	--	5
Manganese (µg/L)	Dissolved	48	53	2,713/1,499	136	164	3,417/1,888	--
	Total	61	65	--	139	170	--	200
Silver (µg/L)	Dissolved	<0.1	<0.1	1.2/0.05	<0.05	<0.05	4.1/0.15	--
	Total	<0.1	<0.1	--	0.07	0.3	--	20
Lead (µg/L)	Dissolved	0.4	1.3	47/1.8	0.3	0.5	100/3.9	--
	Total	5.7	6.2	--	2.3	2.9	--	50
Copper (µg/L)	Dissolved	3	4	10/7.0	1.6	1.4	20/13	--
	Total	3	4	--	2.6	2	--	200
Iron (µg/L)	Dissolved	NA	NA	--	NA	NA	--	300[4]
	Total	200	190	--/1,000	100	180	--/1,000	--
Aluminum (µg/L)	Dissolved	<30	<30	--	<30	<30	--	--
	Total	220	230	750/87	50	60	750/87	--
Streamflow (cfs)		199.6	179.3	29.06	--	30.44	--	--
pH		7.3	7.6	7.95	6.5 - 9	8.08	6.5 - 9	5 - 9
Hardness (mg/L)		69	69	153	--	154	--	--

Source: (RMC 2001). CDPHE Water Quality Control Commission, 5 CCR 1002-35, Reg. No. 35, Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins.
[1] Dissolved metals standards for aquatic life and are hardness dependent (metals are less toxic to aquatic life when hardness is higher).
[2] Total metals standards are for either drinking water supply or agricultural use.
[3] Cadmium and zinc chronic dissolved standards are temporary modifications with an expiration date of 12/31/2011.
[4] Iron human health standard is for dissolved iron.
µg/L=micrograms per liter; cfs=cubic feet per second; mg/L=milligrams per liter

additional monthly streamflow measurements, water quality and stream sediment samples, to truly understand the relationship of tailings on water quality in the San Miguel River.

Current Remediation Plans

According to a 2003 Agreement between Idarado and the State, and pursuant to the contingency plan specified in the RAP dated May 21, 1992, the preferred method of remediation or reclamation is to cover Society Turn Tailings Pile #1 with one foot of soil and revegetate with grasses and forbs. Annual vegetation monitoring will be conducted for three years following planting to assess the total cover achieved by the revegetation. Anything less than 50% cover will be deemed a failure, requiring the responsible party to submit to the State an analysis and proposal to be implemented to remedy the situation. The remediation plan consists of analyzing the soil conditions for organic content, nutrients, and pH, and amending the cover soils with manure, limestone, and fertilizer as necessary based on the results of the soils analysis. According to CDPHE, the Idarado Mining Company will begin revegetation efforts for Society Turn Tailings Pile #1 once access agreements and work schedules can be negotiated with the Town.

As the Study Area owner, the Town will work with CDPHE and Idarado to develop a remediation plan that meets the requirements of the existing RAP and is compatible with management of the Study Area.

2.6.3 Conclusion

The Society Turn Tailings Pile #1, encompassing about 26 acres along the San Miguel River on the west end of the Study Area, is the subject of a RAP that will be administered by the State. Soil investigations indicate that these tailings are high in lead, cadmium, copper, and zinc. Other known and potential tailings within the Study Area (about 3 acres) are not subject to the RAP, and have not been characterized. More detailed evaluation of these areas is recommended to delineate exact extents, determine characteristics, and develop a remediation plan.

Photo 97

2.7 SOILS AND GEOLOGY

This evaluation is intended to provide a brief overview of general soil characteristics and underlying geology within the Study Area. Soil characteristics are important to consider during management and restoration planning and decision-making.

2.7.1 Methodology

The methodology for the analysis of the soils within the Study Area consisted of extracting data from the USDA Web Soil Survey (WSS). The WSS is an interactive website that provides soil data and information produced by the National Cooperative Soil Survey. The methodology for the analysis of the geology within the Study Area consisted of a review and interpretation of the USGS Geologic Map of the Telluride Quadrangle.

2.7.2 Results

The soils within the Study Area consist of silty loam at the top and gradually transitions to a very gravely clay at the bottom and typically ranges from 4 to 5.5 feet thick. There are also portions of the Cryaquolls-Borohemists Complex that contain peat layers up to 2 feet thick overlying sandy loam. The Cryoborolls-Cryaquolls Association comprises most of the Study Area **(Figure 2-11)**. The Cryoborolls-Cryaquolls Association contains primarily sandy, clayey loam. In areas the loam will take on a more silty nature. Gravel content within the Cryoborolls-Cryaquolls Association varies from slightly gravelly at the surface to very gravelly at the bottom of the unit. In some areas gravelly clay may replace the loam in the lower portions of the unit. The Washboard Rock Outcrop Complex **(Photo 97)** is also present in some minor area along the southern boundary of the Study Area. The Washboard Rock Outcrop Complex is composed of a mixture of very gravelly/stony loam and unweathered bedrock.

The geology within the Study Area generally consists of Quaternary age surficial deposits overlying Permian age mudstone and sandstone. There are 3 types of Quaternary deposits present at the surface within the Study Area, alluvium, alluvial fan deposits, and glacial drift deposits **(Figure 2-12)**. The alluvium is typically located toward the center of the Study Area, adjacent to the San Miguel River. The alluvium consists of a mixture of clay, silt, sand, and cobble that was deposited by the San Miguel River. The alluvial fan deposits are located at the mouths of tributary drainages and spread out into a fan shape as they enter the Study Area. They consist of poorly sorted silt to boulder size material. Within the Study Area, glacial drift deposits are typically located under alluvium and alluvial fan deposits. The glacial drift deposits are generally at the surface on the edges of the valley and at the base of steeper slopes on the valley sides. Exposed glacial drift deposits within the Study Area are limited to small areas on the edges of the Study Area boundary. The glacial drift deposits consist of poorly sorted, unconsolidated, clay to boulder size material that was deposited by glacial processes.

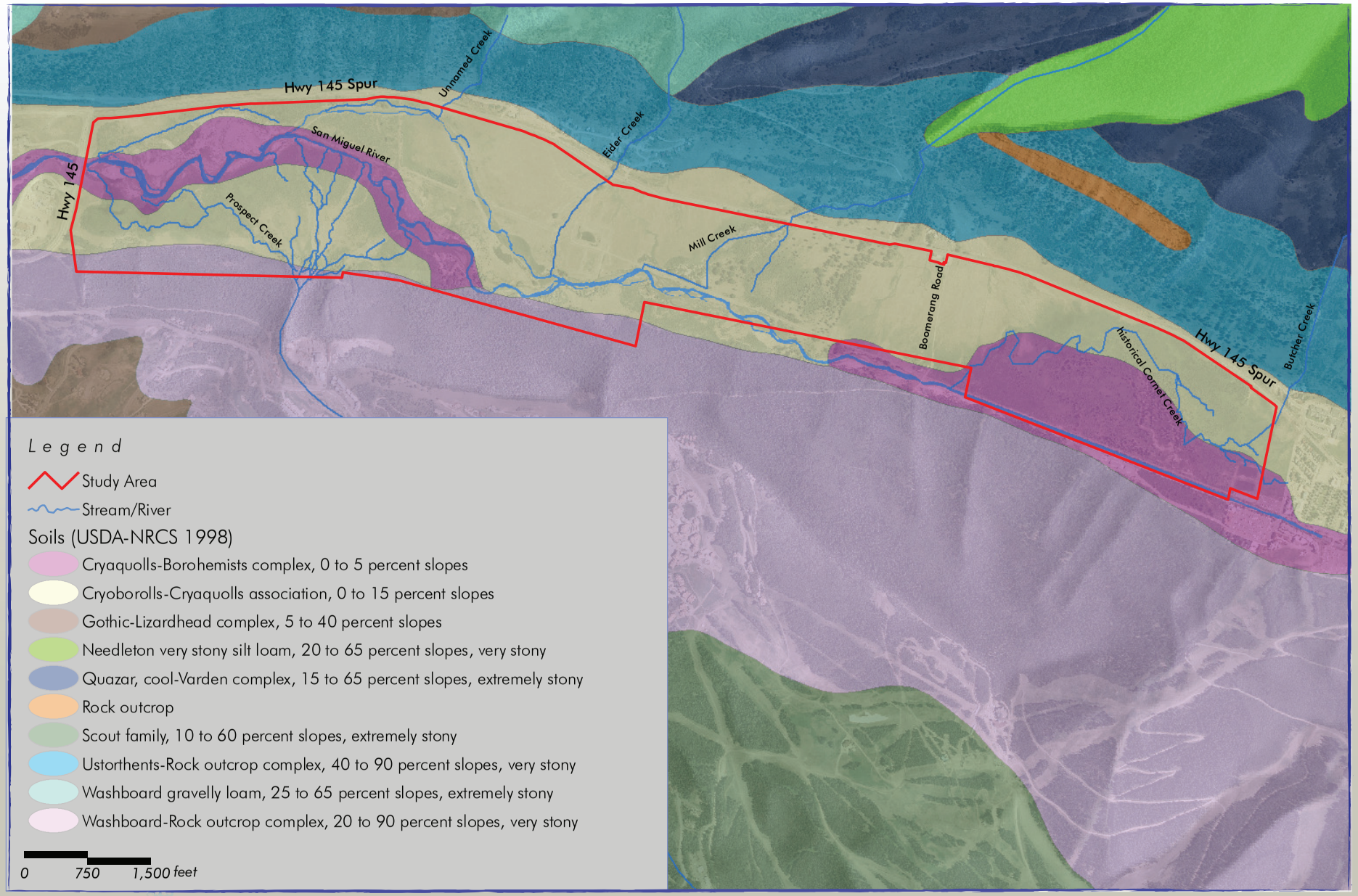

Figure 2-11

Soils

Telluride Valley Floor

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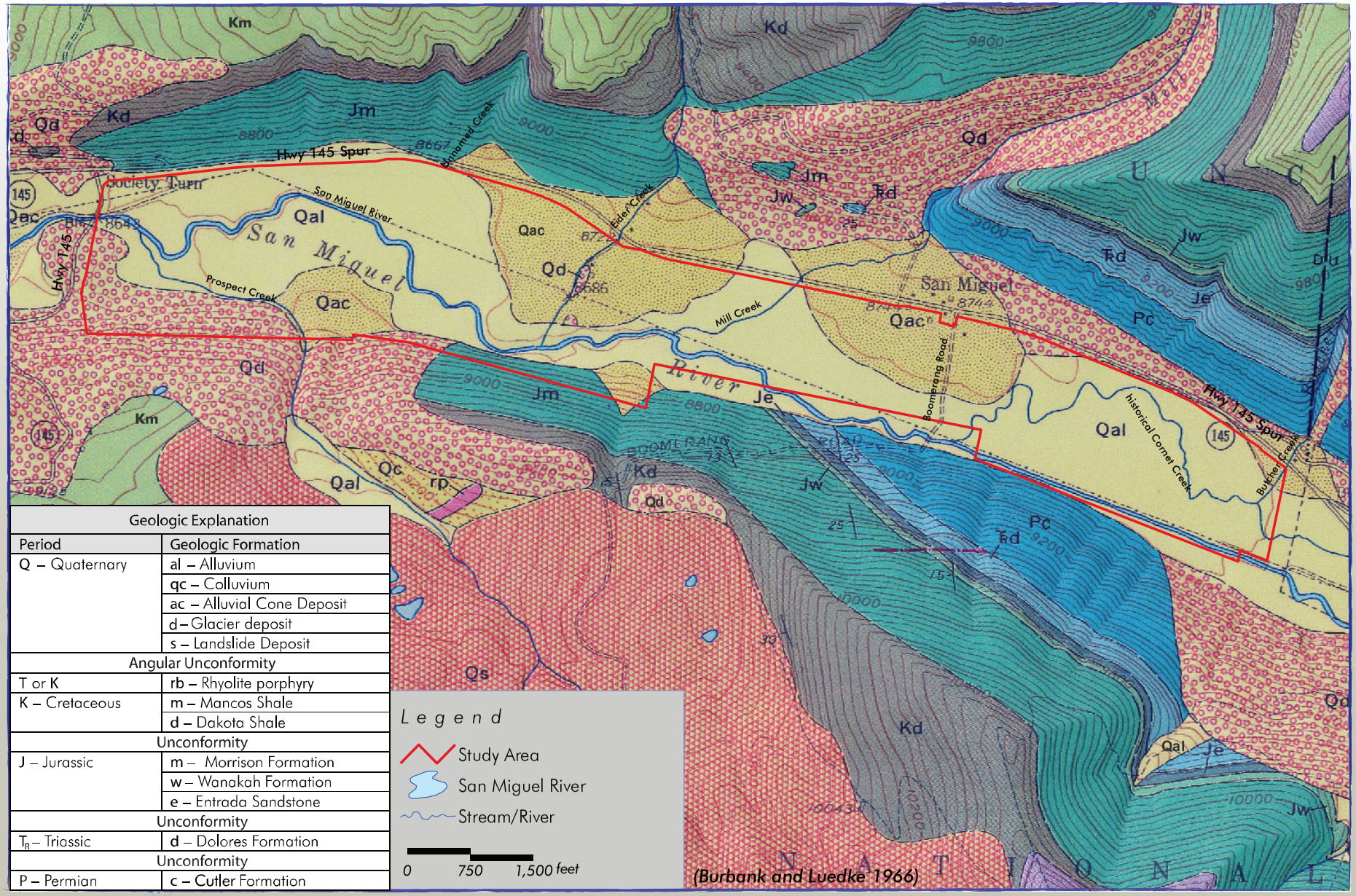

Geologic Explanation	
Period	Geologic Formation
Q – Quaternary	al – Alluvium
	qc – Colluvium
	ac – Alluvial Cone Deposit
	d – Glacier deposit
	s – Landslide Deposit
Angular Unconformity	
T or K	rb – Rhyolite porphyry
K – Cretaceous	m – Mancos Shale
	d – Dakota Shale
Unconformity	
J – Jurassic	m – Morrison Formation
	w – Wanakah Formation
	e – Entrada Sandstone
Unconformity	
T_R – Triassic	d – Dolores Formation
Unconformity	
P – Permian	c – Cutler Formation

Figure 2-12

Geology

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Telluride Valley Floor

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The Quaternary age surficial deposits are typically underlain by the Permian age Cutler Formation. Locally, the Cutler Formation is composed of Reddish Brown micaceous shale and arkosic sandstone and conglomerate. In the San Juan region the Cutler Formation ranges in thickness from 0 to 500 feet thick. Topographically, the Cutler Formation is located on the valley sides above the alluvium or glacial drift, east of the confluence of Mill Creek and the San Miguel River. Within the Study Area, the Cutler Formation is exposed at the surface in a small area in the southeast corner. There is also a small exposure of the Morrison Formation on the southern of the Study Area. In the San Juan area the Morrison Formation ranges from 0 to 100 feet thick and is composed of interbedded buff sandstone and gray to green variegated mudstone. Mudstone is dominant in the upper portion of the formation and sandstone is dominant in the lower portion of the formation. The Cutler Formation is exposed on the valley sides above the alluvium or glacial drift, west of the confluence of Mill Creek and the San Miguel River. It is exposed higher on the valley walls farther east in the valley. Sedimentary rocks in the area generally have a 15 to 25 degree dip to the west.

2.7.3 Conclusion

In general, the Cryaquolls-Borohemists Complex and the Cryoborolls-Cryaquolls Association are the two main soil types within the Study Area. The Cryaquolls-Borohemists Complex is located in close proximity to the San Miguel River and the Cryoborolls-Cryaquolls Association covers the majority of the Study Area and is typically located in areas away from the San Miguel River. The geology within the Study Area is dominated by Quaternary age alluvium and alluvial fan deposits underlain by Quaternary age glacial drift deposits. There are small outcroppings of the Cutler and Morrison Formations near the southern edge of the Study Area.

2.8 HYDROLOGY, FLOODPLAINS AND IRRIGATION FACILITIES

The evaluation of hydrology, floodplains and water rights within and associated with the Study Area was completed based on available data, published reports and consultation with individuals with knowledge of the Town's water rights.

This purpose of this assessment was to compile and summarize available information relating to these water resources that could potentially affect decisions relating to management and future restoration of the Study Area.

2.8.1 Methodology

This evaluation was completed using existing data and reports, and consultations with individuals familiar with the water resources within the Study Area. Each of these data sources is described as follows.

Existing Data and Reports

Data used to develop our understanding of the water resources on and relating to the Study Area includes:

- Federal Emergency Management Agency, Flood Insurance Rate Map – San Miguel County, Colorado and Incorporated Areas, Parcel 286 of 400, Revised September 30, 1992.
- Federal Emergency Management Agency, Flood Insurance Rate Map – San Miguel County, Colorado and Incorporated Areas, Parcel 287 of 400, Revised September 30, 1992.
- Federal Emergency Management Agency, Flood Insurance Study – San Miguel County, Colorado and Incorporated Areas, September 30, 1992.

- USGS Streamflow Data Station 09172500, San Miguel River near Placerville
- USGS Streamflow Data Station 09171200, San Miguel River near Telluride

Individual Consultations

Information pertaining to water rights associated with the Study Area was also obtained in consultation with Cindy Chapin, legal assistant from the Town. Ms. Chapin provided insight on specific water rights associated with the Study Area as part of the condemnation.

2.8.2 Results

2.8.2.1 Daily Streamflows

Daily streamflow data were collected from two gages operated by the USGS. These gages were selected as they provided the most reliable year-round data with extended periods of record (POR). The two gages evaluated were Station 09172500, San Miguel River near Placerville and Station 09171200, San Miguel River near Telluride. The POR for the Placerville Station is 1911 – 2007 while the POR for the station near Telluride is 1960 – 1965. At Placerville the tributary drainage area is approximately 289.6 square miles while the tributary basin for the Telluride site is reported to be 42.8 square miles. The Telluride site was located at Society Turn and is representative of daily flows in the San Miguel River at the lower end of the Study Area. Minimum, mean and maximum daily flows for each site are presented in **Figure 2-13**.

Data indicate that on average flows in the San Miguel River through the Study Area are lowest in late winter when they reach average levels of approximately 15 cubic feet per second (cfs). Runoff starts with early snowmelt in late March and stream flows in the San Miguel River through the Study Area typically peak sometime from late May to late June. For the 6 years of record at the Society Turn gage, peak daily flow rates ranged from 228 cfs in 1963 to 457 cfs in 1965. Over this short period of record the average peak annual flow rate was 372 cfs. A more detailed analysis of gage records would be required prior to any stream restoration design, but based on this data the bankfull flow in the San Miguel River at the downstream of the Study Area is expected to be on the order of 400 cfs. Tributary flows from Butcher, Mill, Eider and Prospect Creeks impact flows along the length of the Study Area and as a result the bankfull flow at the upstream end of the Study Area will likely be considerably less than 400 cfs.

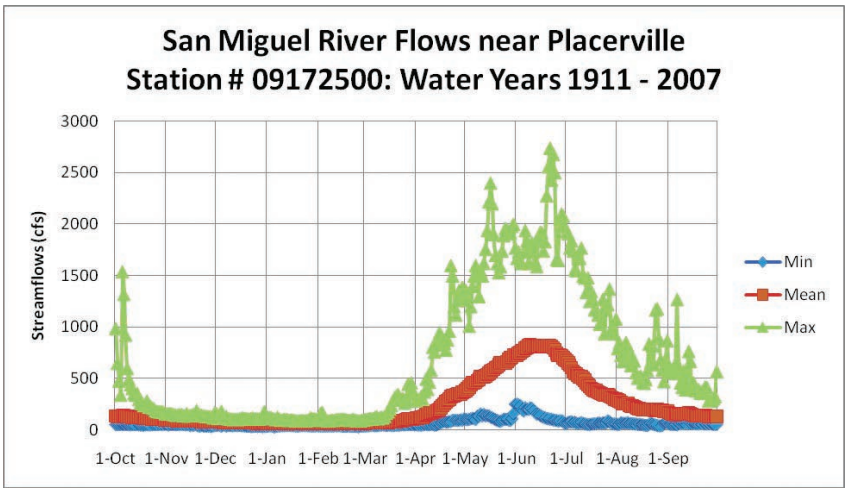
2.8.2.2 Flood Flows

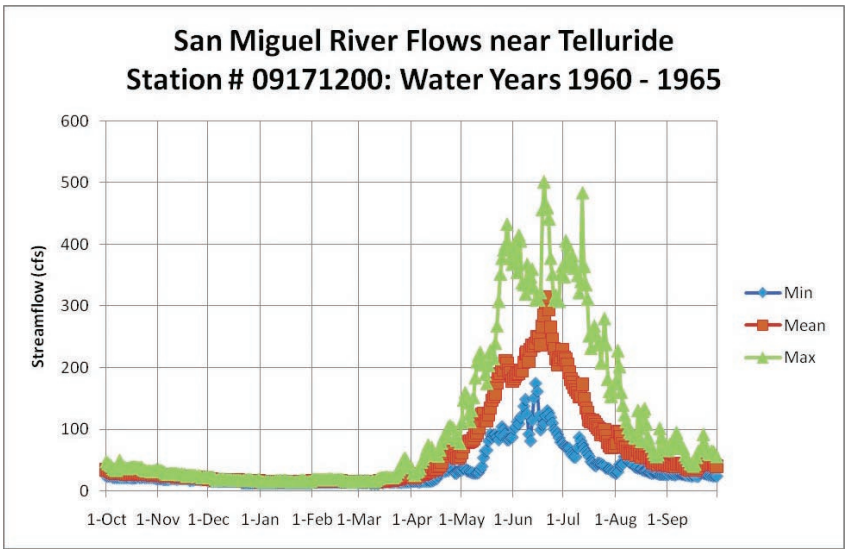
Flood flows were calculated for the San Miguel River as part of the Flood Insurance Study completed by the Federal Emergency Management Agency (FEMA) in 1992. Anticipated flows were quantified at various locations along the San Miguel River, including at the Confluence with Cornet Creek, near the upstream end of the Study Area and at Highway 145, the downstream end of the Study Area. Peak flood flows were determined for the 10-, 50-, 100- and 500-year flood events and results summarized on **Table 2-10** and shown in the graph on **Figure 2-13**.

Across the Study Area, the drainage basin area tributary to the San Miguel River increases by nearly 70%. Peak anticipated flood flows change similarly with the increase from the upstream to the downstream end of the Study Area ranging from 35% for the 500-year flow to 46% for the 10-year flow.

2.8.2.3 Regulatory Floodplain

The regulatory (100-year) floodplain for the San Miguel River across the Study Area was mapped by FEMA in 1992. The approximate boundaries of the





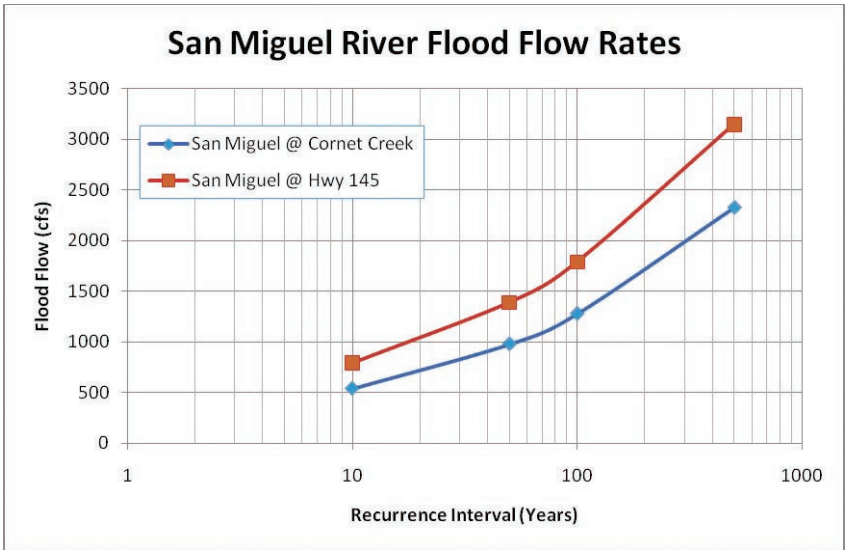


Figure 2-13

San Miguel River USGS Gage Data

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Telluride Valley Floor

Environmental Report

Town of Telluride

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Table 2-10. FEMA Peak Flood Flows for the San Miguel River.

Flood Event	San Miguel at Cornet Creek (cfs)	San Miguel at Hwy 145 (cfs)
10-Year	540	790
50-Year	980	1390
100-Year	1280	1790
500-Year	2330	3150
Drainage Basin Area (mi2)	*25.25*	*42.8*

Source: (FEMA 1992)

current regulatory floodplain are given on **Figure 2-14**. The presence of a regulatory floodplain throughout the Study Area is not expected to result in significant impacts relating to the management and maintenance of the area. Floodplain regulations impact development and associated earthworks that alter the floodplain. Structures are not allowed on the Study Area pursuant to the Draft Conservation Easement. Floodplain issues would need to be addressed as part of any planned restoration work; however as the Town is the owner of the parcel and restoration can be accomplished in a manner that does not affect outside properties, this is not expected to be a hindrance to potential stream restoration.

2.8.2.4 Groundwater

Information on groundwater levels throughout the Study Area is limited to sparse piezometer data and known elevations at locations where open water or wetlands exists. Additional groundwater data collection is recommended as part of the planning process for any major stream realignment work or restoration efforts.

2.8.2.5 Water Rights

The following information was provided by the Town regarding water rights acquired in connection with the Study Area. Water rights acquired by the Town are summarized in **Table 2-11** and described in the following section. An independent evaluation of water rights ownership has not been conducted.

Water rights acquired include the water rights themselves as well as related interests in the ditches, headgates, pipelines and ancillary structures. The water rights are historical irrigation water rights.

- The Town acquired 0.569 cfs of Priority No. 106 and 1.365 cfs of Priority No. 252 in the Ohio and Kokomo Flood and Waste Ditch. The Ohio and Kokomo Flood and Waste Ditch diverts from Mill Creek, which is a tributary of the San Miguel River. In addition, the Town acquired the right to the continuation of any return flow and surplus water from the remaining interest in those rights to the extent they contributed to the supply of irrigation water to the Study Area.
- The Town acquired 1.061 cfs of Priority No. 107 in the House Flood and Waste Ditch. The House Flood and Waste Ditch diverts from Mill Creek, which is a tributary of the San Miguel River. In addition, the Town acquired the right to the continuation of any return flow and surplus water from the remaining interest in that right to the extent it contributed to the supply of irrigation water to the Study Area.
- The Town acquired 1.061 cfs of Priority No. 219 in Mill Creek Ditch No. 1, 1.274 cfs of Priority No. 228 in Mill Creek Ditch No. 1 Enlargement and 0.426 cfs of Priority No. 247 in Mill Creek Ditch No. 1, Boyer Enlarge-

Table 2-11. Town Water Rights Associated with the Study Area.

Water Right Name	Water Source	Priority	Decreed Amount (cfs)	Pro-Rata Amount Acquired by Town (cfs)	Appropriation Date	Adjudication Date
Ohio & Kokomo Flood & Waste Ditch	Mill Creek	106	1.25	0.569	6/1/1903	6/3/1911
Ohio & Kolomo Flood & Waste Ditch	Mill Creek	252	3	1.365	6/2/1903	10/22/1926
House Flood & Waste Ditch	Mill Creek	107	1.25	1.061	6/1/1903	6/3/1911
Mill Creek Ditch No. 1	Mill Creek	219	1.25	1.061	7/1/1889	10/22/1926
Mill Creek Ditch No. 1 Enlargement	Mill Creek	228	1.5	1.274	7/2/1894	10/22/1926
Mill Creek Ditch No. 1 Boyer Enlargement	Mill Creek	247	0.5	0.426	6/15/1901	10/22/1926
Missouri Ditch	Prospect Creek	220	1.25	1.25	7/1/1889	10/22/1926
Prospect Ditch	Prospect Creek	221	1.25	1.25	7/1/1889	10/22/1926
Eider Creek	Eider Creek	226	3.0	3.0	7/1/1891	10/22/1926

Source: (Town of Telluride)

ment. Mill Creek Ditch No. 1, Mill Creek Ditch No. 1 Enlargement and Mill Creek Ditch No. 1, Boyer Enlargement divert from Mill Creek, which is a tributary of the San Miguel River. In addition, the Town acquired the right to the continuation of any return flow and surplus water from the remaining interest in those rights to the extent they contributed to the supply of irrigation water to the Study Area.

- The Town acquired 1.25 cfs from the Missouri Ditch under Priority No. 220. The Missouri Ditch diverts from Prospect Creek, which is a tributary to the San Miguel River.
- The Town acquired 1.25 cfs from Prospect Ditch No. 2 under Priority No. 221. Prospect Ditch No. 2 diverts from Prospect Creek, which is a tributary to the San Miguel River.
- The Town acquired 3.0 cfs from the Eder Creek Ditch under Priority No. 226. The Eder Creek Ditch diverts from Prospect Creek, a tributary to the San Miguel River.

A historical use analysis of these water rights was conducted in 1996 for the SMVC. The analysis (based on practices at the time) determined irrigated acreages and net consumptive use associated with the water rights. This analysis concluded that these water rights typically had sufficient water supply to meet crop demands. The estimated average annual consumptive use of these water rights is approximately 105 acre-feet and approximately 127 acres were historically irrigated by these water rights.

2.8.3 Conclusion

Hydrology and water rights are significant resources associated with the Study Area. Surface flows from the San Miguel River along with tributary flows from Butcher, Mill, Eider, and historical Cornet and Prospect Creek help shape the landscape and are the lifeblood of much of the vegetation and habitat that ex-

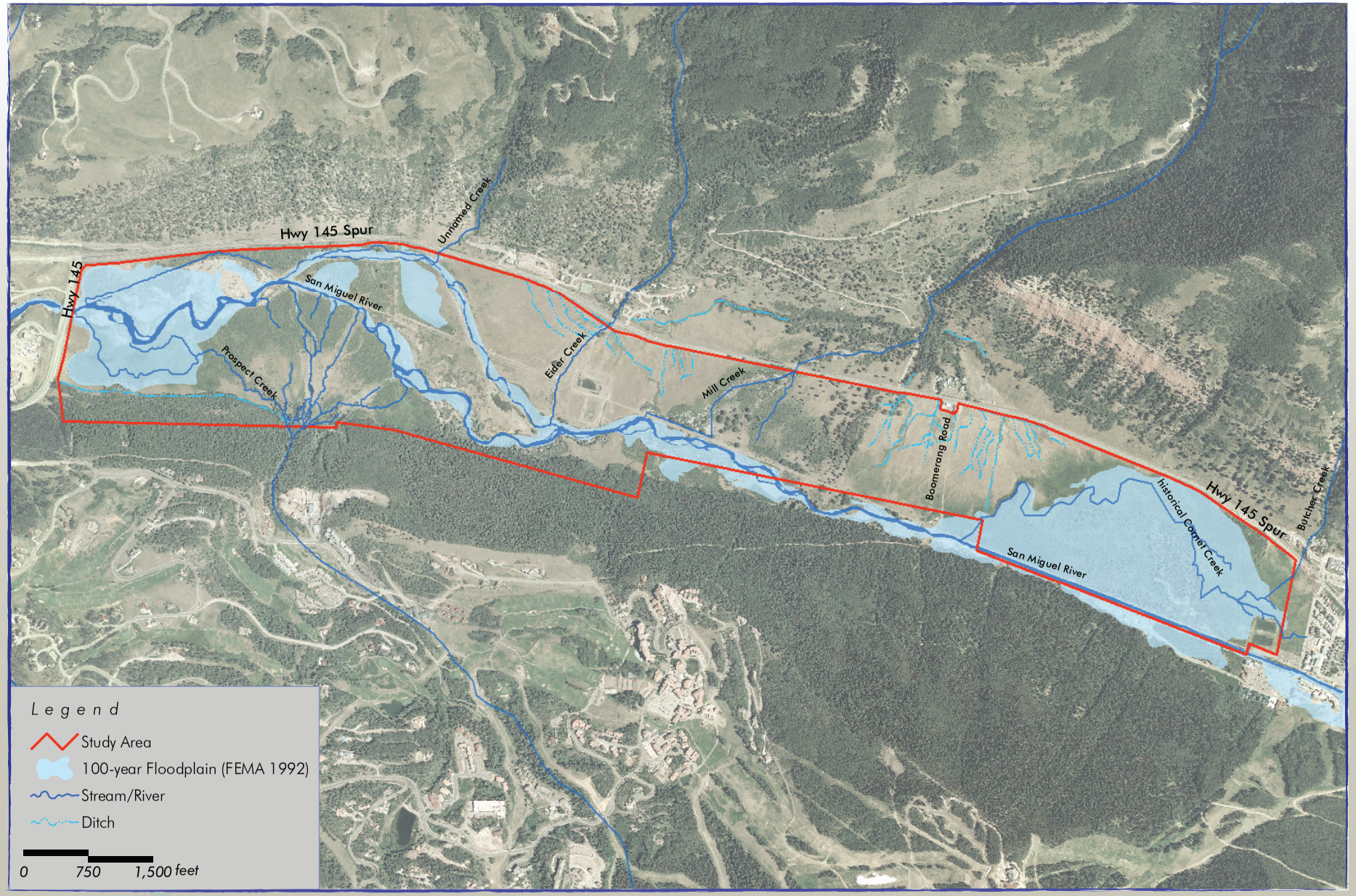

Figure 2-14

Floodplains and Irrigation Facilities

Telluride Valley Floor

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Ecological Resource Consultants, Inc.

Photo 98

ists across the Study Area. A large portion of the Study Area is located within the existing regulatory floodplain. As development and structures are not allowed by the Draft Conservation Easement, being located within a regulatory floodplain is not expected to impact the area. Floodplain issues would, however, need to be addressed as part of any stream restoration work. Groundwater is less well defined, but also plays a major role as it feeds open water and wetland areas.

The Study Area resources also include significant senior water rights. In total the pro-rata water rights acquired by the Town sum to 11.256 cfs with priorities ranging from 106 to 252. The estimated consumptive use of this water is approximately 105 acre-feet and it was used to historically irrigate approximately 127 acres. The water rights associated with the Study Area have significant value. Legal review of the rights is recommended to ensure the rights are maintained and are put to beneficial use.

2.9 HISTORIC, CULTURAL AND ARCHAEOLOGICAL RESOURCES

This evaluation of cultural and historical resources within the Study Area was completed with information from a variety of sources, including field surveys, review of existing data and reports, and consultations with agencies and individuals familiar with the history and significance of the Study Area.

2.9.1 Methodology

A Class I cultural resources reconnaissance survey (consisting of a review and synthesis of all existing literature and records, and a "walkover" survey of the Study Area) was conducted July 29-31, 2008 within the Study Area **(Photo 98)**. The survey was conducted by walking unsystematic transects across the Study Area in areas of likely cultural resources. These areas included tracts of land not currently inundated with water or areas of perennial wetlands. Discovered cultural resources were located using GPS, photographed, and incorporated into project base mapping. Observed cultural resources, their significance, and overall sensitivity rating are listed on **Table 2-12**. Specific locations of cultural resources described in the following section can be found in **Figures 2-15 and 2-16**.

Existing Data and Reports

The following documents were obtained and reviewed as part of the evaluation of cultural and historical resources on the Study Area:

- Historical photographs of the Study Area - Telluride Historical Society
- Colorado Council of Professional Archaeologists Publications – Northern Colorado River Basin Prehistoric Context and Colorado Historic Context
- Technical reports provided by the Colorado Office of Archaeology and Historic Preservation
- Written interview with Mr. Don Oberto

Individual Consultations

As part of this study, archaeologists contacted several individuals, both in person and over the phone, who are knowledgeable about the history of the Study Area or its significance as a cultural resource. Individuals contacted include:

- Lauren Bloemsma and Kathy Rohrer – Telluride Historical Society
- Mr. William "Senior" Mahoney – local Telluride resident

Table 2-12. Cultural Resource Findings.

Site Number	Cultural Resource	NRHP Significance Statement	Sensitivity
5SM.2030	Rio Grande Southern Railroad – Telluride Spur	**Significant** – local level. Segments may be both significant and non-significant depending on physical integrity. The resource contributes to the overall historic setting of the Study Area.	High
5SM.2881	Idarado Mine Tailings	Non-significant – the tailings have been dumped in the Study Area since the 1930s	N/A
TVF-01	Historic Features	Non-significant. Artificial landform and features probably related to highway construction and transmission line.	N/A
TVF-02	Historic Powerline and telegraph poles	Non-significant. Located adjacent to railroad grade; poles have either been sawn off or have fallen over and therefore have no physical integrity and do not contribute to the historic setting.	Low
TVF-03	Abandoned Road Grade	Non-significant. Possibly associated with the sewer line.	N/A
TVF-04	Historic Structure and Features	Needs Research. Vitrified brick features, milled lumber, and seven depressions. Research to date indicates brick dump or possible habitation.	N/A
TVF-05	Ranch gate	**Significant** – local level. Normally would be documented as an isolated find. Contributes to overall historic setting.	Low
TVF-06	Missouri Ditch	**Significant** – local and state levels. Historic ditches are typically considered significant – contributes to overall historic setting.	Moderate
TVF-07	Prospect Pits	Non-significant. These features are ubiquitous within the state and by themselves do not contribute to the historic setting.	N/A
TVF-08	Dike/Access Road and former pond	Non-significant. A relatively ephemeral feature that does not contribute to the overall historic setting.	N/A
TVF-09	Two-track road	Non-significant. Does not contribute to the overall historic setting.	N/A
TVF-10	Stock Pond	Non-significant. Does not contribute to the overall historic setting.	N/A
TVF-11	Historic Trash Scatter	**Significant** – local level. Contributes to the overall historic setting and could contribute additional information through excavation.	Moderate
TVF-12	Two-track road	Non-significant. Does not contribute to the overall historic setting.	N/A
TVF-13	Historic Feature	Non-significant. Does not contribute to the overall historic setting.	N/A
TVF-14	Fenceline	Non-significant. Does not contribute to the overall historic setting.	N/A
TVF-15	Historic Structure and trash scatter	**Significant** – local level. The structure contributes to the overall historic setting and is related to a significant Study Area family (Vezina).	Moderate
TVF-16	Corral	**Significant** – local level. Contributes to the overall historic setting.	Low
TVF-17	Racetrack Berm	**Significant** – local level. Resource is related to a reoccurring significant event of the Study Area.	Low
TVF-19	Fenceline	**Significant** – local level. Related to the original partition (mining claim) of the Study Area and contributes to the overall historic setting.	N/A
TVF-20	Fenceline	**Significant** – local level. Related to the original partition (mining claim) of the Study Area and contributes to the overall historic setting.	Moderate
TVF-21	Boomerang Road	**Significant** – local and state levels. Contributes to the early transportation/ settlement themes of Colorado and contributes to the overall historic setting.	High
TVF-22	San Miguel City	**Significant** – local, state, federal levels. Contributes to the Victorian settlement theme and has the potential to provide additional information important to history.	High
TVF-23	Fenceline	**Significant** – local level. Contributes to the overall historic setting.	Moderate
TVF-24	Llama Shed	**Significant** – local level. Contributes to the Town's Historic District and to the overall historic setting.	Low
TVF-25	Irrigation Ditches	Non-significant. Does not contribute to the overall historic setting.	N/A
TVF-26	Fenceline	**Significant** – local level. Related to the original partition (mining claim) of the Study Area and contributes to the overall historic setting.	Moderate

Source: Significance evaluated based on criteria outlined under 36 CFR 60.4 of the National Historic Preservation Act (NHPA 1966, as amended).
Sensitivity Ranking:
High sensitivity = Significant at all three levels; potential future impact
Moderate sensitivity = Significant at the local and state levels; potential impact
Low sensitivity = Significant at the local level; no known impact
Not Applicable/No value (N/A) = Non-significant at all three levels; loss of physical integrity

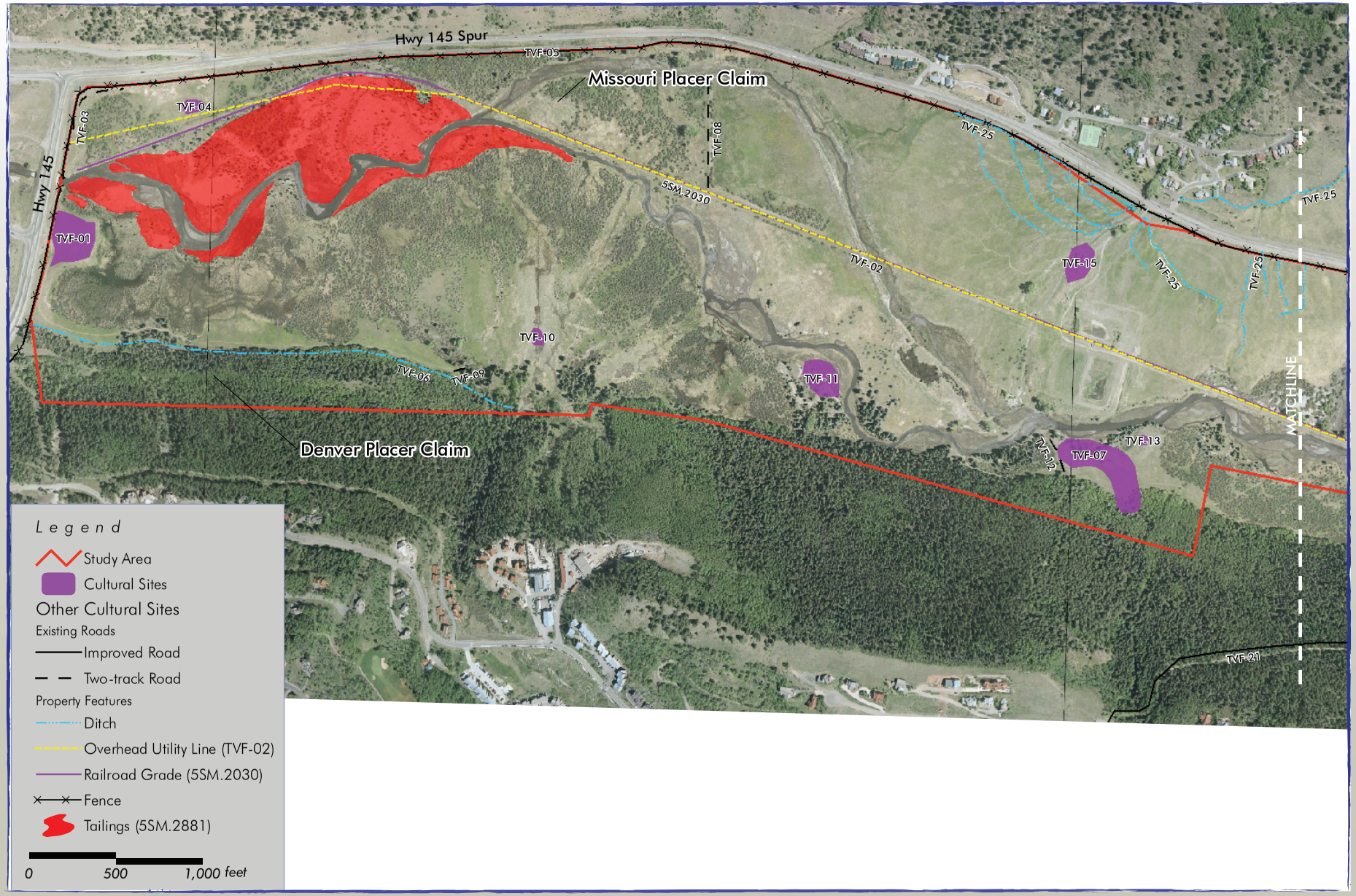

Figure 2-15

Cultural Resources (West)

March 2009

N W E S

Telluride Valley Floor

Environmental Report

TOWN OF TELLURIDE

Ecological Resource Consultants, Inc.

ERO

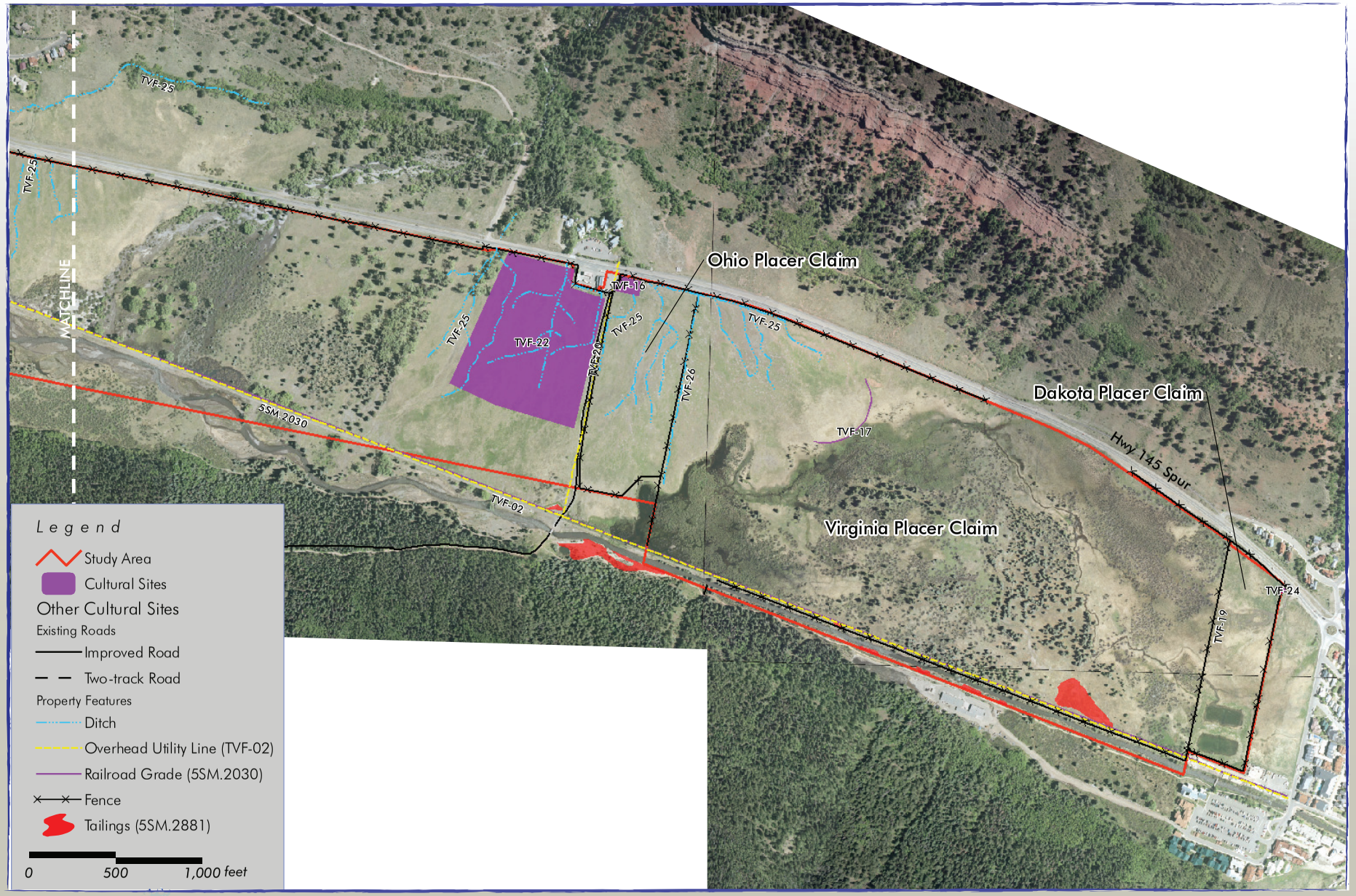

Figure 2-16

Cultural Resources (East)

March 2009

N W E S

Telluride Valley Floor

Environmental Report

TOWN OF TELLURIDE

Ecological Resource Consultants, Inc.

ERC

Photo 99

2.9.2 Results

2.9.2.1 History of the Study Area

In order to understand the Study Area cultural resources, it is necessary to reconstruct the history of land use within the Study Area. To do so, a brief annotated history is provided to place the Study Area in historical context. The Study Area is indelibly linked to the Town, which was listed as a National Historic Landmark in 1961. A National Register of Historic Places (NRHP) nomination form was completed in 1987 (Front Range Research Associates 1987). The Study Area's cultural resources are undoubtedly related to the events and character that contribute to the Landmark designation and should be considered in a similar context **(Photo 99)**.

The northwestern edge of the San Juan Mountains was probably first reached by trappers and mountain men during the years 1820 – late 1830s, but it wasn't until the Hayden Survey that the Study Area was first surveyed in 1874. Prior to this venture, though, the area had been a seasonal home to Native Americans for 10,000 years. West of the valley along the San Miguel River and on top of the Uncompahgre Plateau are thousands of archaeological sites that date from the Paleoindian, Archaic, Formative, and Protohistoric periods. The ruggedness and climate of the San Juan Mountains precluded year-long occupation, but the broad valleys to the west, such as Paradox, Disappointment, and Dry Valleys were home to hunters and gatherers who moved seasonally between high mountain valleys in the summer and the lower valleys in the winter. The area around the modern towns of Nucla and Naturita saw a brief occupation of groups who built substantial dwellings and practiced horticulture around A.D. 1000. These groups remain enigmatic and have been compared with the Ancestral Puebloan groups of the Southwest and the Fremont of west-central Colorado and Utah (Reed and Metcalf 1999).

Historically, the Ute occupied much of Colorado and intensively throughout western Colorado in particular (Baker *et al.* 1999a). The band best associated with the San Miguel Valley was the Uncompahgre. Although the Ute signed a treaty in 1868 granting them one-quarter of western Colorado, mining interests increased to such a magnitude that they eventually ceded 4 million acres as part of the Brunot Treaty. By 1881 most had left Colorado for the Uintah Reservation in northeastern Utah, but many returned periodically to hunt in their traditional territory. Early settler accounts confirm that the Ute's used the valley for hunting and favorable summer camping. One of the earliest settlers to the valley, Linnard Remine, illegally prospected while the area was still Ute land, yet was unmolested in his activities.

The Victorian period (1865-1918) is well represented in the Study Area (Baker *et al.* 1999b). The principal historic feature of the valley was the town of San Miguel City, first settled in 1876 by Frank Brown and several others (Buys 2003). The first mining claims were filed in the valley in 1874 (Neely and Archimede 2004) and from the earliest settlement logging and small-scale lumber mills were already in operation (Mahoney pers. comm. 2008). Brown and others started a mining camp along Mill Creek and north of the present Spur. San Miguel City was surveyed in 1877, platted in 1885, but never incorporated. San Miguel City was, as platted, at least 40 blocks square (Mahoney pers. comm. 2008). By the mid 1870s, at least 300 men were placer mining along the San Miguel River and by 1877 hydraulic mining began in earnest, forever changing the local landscape. The Keystone Company extracted $3,500 in gold from placer mining west of San Miguel City along the north side of the valley (Baker 1987). Although San Miguel City provided the first school in the valley, by 1885 Telluride had become the population nexus due to closer and more productive mines and San Miguel City dropped to 175 people. Gold

King Road (now Boomerang) appears to have been built in 1880 to provide better access from the south **(Photo 100)**.

The Rio Grande Southern Railroad (RGSR) was completed by Otto Mears from Ridgway to Telluride in 1890-91 **(Photo 101)**. The railroad facilitated the transportation of ore to smelters and led in large part to the Telluride Boom. A telegraph line paralleled the railroad line (Mahoney pers. comm. 2008). Long sections of the San Miguel River were channelized and straightened by the narrow gauge railroad grade. By the 1940s the railroad was being used for tourism and sightseeing and officially folded in 1951 (Buys 2003); shortly afterward the tracks and ties were removed from the Study Area section (Collman and McCoy 1991; Oberto n.d.) **(Photo 102)**. The other technological endeavor that contributed significantly to the rise of Telluride was Lucien Nunn's alternating current (AC) generating station at Ames, the first such technology developed in the world. The route of the first AC powerline went east from Ames and up to the Gold King Mine in 1891. The original transmission line followed the Spur and the current powerline that follows the railroad grade was established by Western Colorado Power (Mahoney pers. comm. 2008).

Frank Brown became one of the first dairy farmers in the valley, switching from mining to farming in 1879. Thus began the valley's gradual transition from its brief placer and hydraulic mining emphasis to farming and ranching, which would be the primary land use for the next 80 years. The valley supported between 70-80 milk cows and was intensively cultivated for hay (Buys 2003). Small-scale dairy farm operations continued to work the valley through the 1920s before Joe Oberto acquired about 800 acres of the Valley Floor. His son Silvio (Dutch) Oberto continued the operation after Joe's death in the 1940s.

The Vezina ranch was acquired in the 1950s located near the present-day sewer lagoons and included a two-story house and barn with corrals (Mahoney pers. comm. 2008) **(Photo 103)**. Tilman Beam leased the ranch from Silvio Oberto beginning in the early 1950s and ranched the property throughout the 1950s and early 1960s. Beam built the corrals that still stand east of the Shell gas station. Don Oberto relates that the three or four remaining structures from old San Miguel City were burned by him and Beam, probably in the late 1950s (Oberto n.d.). The Telluride USGS 7.5 minute topographic quadrangle dated 1955 shows five structures on the south side of the Spur. Presumably these structures were burned by Beam shortly after the USGS quadrangle was produced. Don Oberto also relates that the old school house foundation was located in the grove of cottonwood trees to the west and south of San Miguel City (no evidence was found of this structure). Beam was also responsible for a network of irrigation ditches that diverted water from either side of Mill and Eider Creeks. Holstein cows were introduced to the valley in the 1950s as well, but the altitude culled about 10% of the herd in the first year and the remaining cows were sold within a few short years. This appears to have been the last significant dairy effort in the valley, despite an oral interview with Carlie McKnight who asserted that that the Hughes ran the last dairy operation (Neely and Archimedes 2004).

Chet Waggoner leased the property beginning in the early 1960s and by 1967 Silvio Oberto sold the ranch to Art Bishop who, unbeknownst to Oberto, was acting on behalf of the Idarado/Newmont mining company. Idarado intended to use the Valley Floor to store mine tailings. Idarado bought the Telluride Mine operations in 1953 and after refurbishing, reopened the mine workings in 1955 (Mahoney pers. comm. 2008; Mehls and Tyberg 2001).

During the 1970s, the Study Area was largely left alone. Idarado used the far western portion of the Study Area near Society Turn to store mine tailings,

Photo 100

Photo 101

Photo 102

Photo 103

Photo 104

Photo 105

Photo 106

which eventually amounted to 206,000 cubic yards (Rocky Mountain Consultants 1989). This area is located south of the abandoned railroad grade and the river. Conversations with Senior Mahoney (Mahoney pers. comm. 2008) indicate that the tailings were not actually disposed of in the Study Area, but were dumped in the river, upstream of the Study Area, and were naturally transported down river to their current location during high flows.

2.9.2.2 Preliminary Cultural Resource Findings

The file and literature review conducted with the Colorado Historical Society (CHS), Office of Archaeology and Historic Preservation (OAHP), used both GIS shapefiles and a review of their online Compass database. Results of the review found that two previous cultural resource inventories have been conducted within the Study Area. These include a linear survey along the western portion of the abandoned railroad grade (SM.FS.R67) (Nickens 1984) and a Colorado Department of Transportation (CDOT) survey along the right-of-way of Highway 145 between Society Turn and Town (SM.CH.NR2 (Angulski 1989). Highway 145 in this area (locally known as the Spur) is now owned and maintained by the town of Telluride.

It was noted in the Nickens report that the railroad grade had been previously recorded as 5SM.1024 and was recommended not eligible for listing on the National Register of Historic Places (NRHP) **(Photo 104)**. A 2007 notation in the report by OAHP staff noted that the designation 5SM.1024 had been changed to 5SM.2030.19 and that the documented boundaries of the Telluride Spur through the valley remain unknown. Additional research suggests that the railroad grade within the valley located within the Study Area has not been formally documented except for that portion that falls on USFS property. This segment, 5SM.2030.19, was documented during the Telluride Ski Area Expansion project (SM.FS.R71) in 1983 (Eininger and Gaunt 1984). The segment was determined officially not eligible due to a loss of physical integrity – all railroad ties have been removed and a modern sewer line has been placed within portions of the grade.

The other cultural resource to have been previously documented within the Study Area is 5SM.2881, a concentration of Idarado mine tailings (OAHP Site Form completed by Rocky Mountain Consultants 1989). The GIS shapefile of the site location provided by OAHP is incorrect; the site is principally located near Society Turn in the northwest corner of the Study Area; smaller concentrations are located along the length of the San Miguel River in the Study Area. Documentation of the mine tailings is incomplete and no determination of eligibility was provided on the site form.

Newly Identified Cultural Resources

Table 2-12, below, presents the known cultural resources identified to date. This list is not exhaustive since only a reconnaissance level inventory has taken place in high potential areas. A close interval intensive cultural resource inventory would likely discover additional cultural resources.

Sensitivity rankings are established for each cultural resource. The ranking is based on the resources' significance at the federal, state, and local levels. Significance is evaluated based on the criteria outlined under 36 CFR 60.4 of the National Historic Preservation Act (NHPA, 1966, as amended).

Overall, the 26 potential cultural resources are not overly significant in terms of their eligibility to be listed on the NRHP (that is, at the federal level). However, the emphasis here is on the significance of cultural resources at the local level. The exception to this is the Southern Rio Grande Railroad (Telluride Spur) (5SM.2030), the location of San Miguel City (TVF-22), and Boomerang Road

(TVF-21). Strict NRHP eligibility criteria is not necessarily *sine qua non* and that local consideration of setting and feeling should also be taken into account when assessing significance.

Fencelines (TVF-19, 20, and 26)

Preliminary assessment of the existing fencelines within the Study Area indicates that physically (i.e., their construction and/or materials), the fencelines are not significant. However, some of these fencelines originally demarcated mining patent claims (Ohio, Virginia, and Dakota placer claims), and it is likely that they most recently demarcate grazing or hay cultivation allotments and/or boundaries dating prior to the 1950s **(Photos 105 and 106)**. The original fencelines would have been removed during the period of hay cultivation and replaced when the Study Area reverted to cattle grazing. Our initial assessment is that the fencelines are not significant at the federal or state levels. Those fencelines extending east-west do not demarcate significant boundaries and can be removed to enhance wildlife corridors (i.e., the fenceline extending parallel to the railroad grade); but that the north-south fencelines should be retained as they contribute to the overall historic setting of the valley. The perimeter fence (TVF-23) was probably constructed from several events, including during cattle grazing and perhaps when ownership of much of the Study Area reverted to the Idarado mining company.

The Southern Rio Grande Railroad - Telluride Spur (5SM.2030)

The Telluride Spur would likely be considered not eligible for listing on the NRHP due to the loss of physical integrity from the removal of its associated elements and from the placement of a sewer line within the grade. Although the rails and ties have been removed, the very visible grade still evokes the feeling of historic setting and may be eligible at the local and state levels **(Photos 107 and 108)**. However, in the case of the railroad, there is a need to balance the restoration of the San Miguel River to a natural course with the preservation of a significant historic resource. It is our suggestion that those portions of the railroad grade that channelize the river be removed after formal documentation and that those segments that do not affect the San Miguel River's course be left in place and undisturbed in order to retain historic setting. Associated with the railroad grade are the remains of power poles (associated with the original Telluride Power Company line) and telegraph poles. These poles have either been sawn off or intentionally removed and left in place. None of the telegraph and original power line poles are still standing and therefore no longer retain physical integrity. As such, they are not considered significant at any level.

San Miguel City (TVF-22)

San Miguel City is considered a significant historic resource at all three levels **(Photo 109)**. Although no physical remains exist south of Highway 145, the area is defined by its plat and through historic photographs. San Miguel City would contribute to the Victorian and early mining settlement theme defined in Colorado (Church *et al.* 2007) and undoubtedly retains buried cultural deposits in the form of cellars and outhouses. It therefore has the potential to contribute significant additional information through excavation. Ground disturbing activities should be avoided in this area. Geophysical investigations have the potential to define the limits of San Miguel City.

Boomerang Road (TVF-21)

The road is considered significant for its association with early transportation development and settlement in the region (first engineered road into the valley). Significant modification does not appear to have taken place thereby

Photo 107

Photo 108

Photo 109

Photo 110

preserving its physical characteristics; it also contributes to the overall historic setting of the Study Area. No improvements should be made to the road and careful consideration should take place before any maintenance activities.

Tillman Beam Corral (TVF-16) / Ranch Gate (TVF-5)

The corral and ranch gates are considered significant at the local level for their association with historical ranching in the valley and their association with a locally significant person **(Photos 110 and 111)**. Preservation initiatives could include evaluating the corral for stabilization measures, if necessary. The "llama shed" located on the Pearl property in the northeast corner of the study area was added to the historic district in 1994; it was recommended not eligible (Barbour 1994). However, both structures are recommended significant at the local level for their association with historic persons and for maintaining the historic setting of the valley.

Missouri Ditch (TVF-06)

The irrigation ditch that extends from Prospect Creek to the Study Area's southwest corner, paralleling the base of the south slope, is the Missouri Ditch which may have been associated with or improved upon by Ed Vezina (Mahoney pers. comm. 2008). Historic irrigation ditches tend to be considered significant by the State Historic Preservation Office; in this case, the ditch is named and is related to the mining development and overall historic setting of the Study Area.

Historic Trash Scatter (TVF-11)

The historic trash scatter located on the south side of the San Miguel River is most likely the remains of a placer mining camp; no physical integrity remains, however, and the site would not be significant at the state or federal levels. Its location along the floodplain also calls into question the potential to provide additional information through excavation.

Racetrack Berm (TVF-17)

A low mounded berm east of Boomerang Road is the last remaining physical evidence of the horse racetrack that existed in the early 20th century. Historical photographs provided by Mahoney confirm its location. As such, the berm is considered significant at the local level for its association with a significant, reoccurring event in the Study Area. Photographs and interviews (Mahoney pers. comm. 2008) indicate that the viewing grandstand was located where the Tillman Beam corral now stands; the horsetrack extended from the edge of Boomerang Road east and covered much of the area that has been colonized by the prairie dogs.

Photo 111

Other Structures and Features

The remains of brick and depressions near the northwest corner of the Study Area and north of the mine tailings (TVF-4) is believed to have been deposited by the Telluride brick foundry (Mahoney pers. comm. 2008) and would therefore be non-significant; additional research is needed to confirm this hypothesis. East of TVF-4 is the location of a north-south dike/access road and the former location of a pond that was used to store logs before loading onto the railroad (TVF-8). A windlass was located adjacent to the railroad and was used to lift the logs into the train (Mahoney pers. comm. 2008). The location is not considered significant due to a loss of physical integrity and it no longer contributes to the overall historic setting (not directly visible).

Isolated features such as the concrete blocks and prospect pits are, by themselves, not considered significant. Features such as these are ubiquitous in a

historic mining landscape and do not contribute to the interpretation of this era, nor contribute to the overall historic setting of the Study Area. Modern elements of the Study Area, including the dog pound structure and sewer lagoons, do not meet the age criteria for historic significance; regardless, they do not contribute to the significant history of the Study Area.

2.9.2.3 Potential Future Investigations

The following additional investigations would provide a more detailed accounting of the Study Area's cultural resources.

- Conduct geophysical investigations in the area of San Miguel City to help delineate the historic boundaries and determine whether significant subsurface structural features are present.
- Conduct a formal Class III, intensive, cultural resource inventory in areas of high potential (i.e., would exclude areas of excessive slope and wetlands). This inventory would conform to OAHP standards and would identify any remaining potential cultural resources not readily visible during the reconnaissance inventory. Prehistoric resources would still be unlikely due to the significant ground disturbance that has taken place.
- Use historic photographs to recreate the historic setting of the Study Area akin to what was accomplished for Colorado (i.e., Fielder project), albeit at a much smaller scale. Sanborn maps, GLO records, and County records could be used to recreate land ownership within the Study Area and identify areas of potential subsurface cultural deposits.
- Evaluate the structural stability of the Vezina shed (TVF-15), the llama shed (TVF-24), and the Tillman Beam corral (TVF-16). The llama shed was recently stabilized by the Town.

2.9.3 Conclusion

Results of a reconnaissance-level inventory indicate that the Study Area contains significant cultural resources. It should be noted that documentation of the 27 identified cultural resources was conducted at a cursory level and involved locating the resource with GPS technology and photography. At this time, there is no federal involvement that would trigger historic preservation laws.

Particularly significant cultural resources include old San Miguel City, Boomerang Road, and the Southern Rio Grande Railroad (grade). These resources would likely be considered significant at the state level and be eligible for inclusion in the NRHP – pending further evaluation and consultation. All three of these cultural resources are significant for their association with the Early Settlement and Victorian periods of the Study Area. Resources significant at the local level include standing structures such as the Vezina Ranch shed, the Tillman Beam corral, and the llama shed; segments of fence lines that delineate named mining claims; and the remaining feature of the racetrack. Although, these resources would not be eligible for individual listing on the NRHP, they may be eligible for Telluride's National Register District if the district were to be expanded to include the Study Area.

3.0 Environmental Sensitivity and Resource Management Recommendations

3.0 ENVIRONMENTAL SENSITIVITY AND RESOURCE MANAGEMENT RECOMMENDATIONS

3.1 ENVIRONMENTALLY SENSITIVE AREAS

3.1.1 Ecological Value Analysis

In order to provide recommendations on future use, management and restoration potential within the Study Area, the ecological value of specific ecosystems must first be determined. Ecological value is a complex way of evaluating to what degree a pre-determined function performs within an ecosystem. Ecosystem functions are self-sustaining properties that exist in the absence of human impacts. Functions result from both living and non-living components. Values are benefits derived from either one or more functions and the physical characteristics associated with an ecosystem. The value of a particular ecosystem function (or combination of functions) is based on human judgment of its worth, merit, quality, or importance attributed to those functions (USACE 1995). Once the functional value is determined for specific ecosystems, the overall sensitivity can be determined, which then can provide insight into management considerations.

The determination of ecological value and ultimately environmental sensitivity is a process of environmental science that provides a definitive procedure for identifying, characterizing or measuring functions and/or social benefits of a particular natural resource. A wide array of functional assessment procedures have been developed and are accepted in the scientific community. For the Telluride region, however, no one single assessment procedure has been specifically developed that provides the necessary information to determine management considerations across a wide spectrum of habitat types that occur in the Study Area.

For the purpose of this report, a modified version of the Montana Wetland Assessment Method (MWAM) (Berglund and McEldowney 2008) was determined the most appropriate and comprehensive tool to evaluate ecological function in the Study Area. The method is scientifically based and was developed from existing literature on ecological functions and their assessment in the Rocky Mountain Region. Because Telluride is located in the heart of the Rocky Mountains, the subalpine environment provides a mixture of climate, landscape and plant life that is comparable to the Northern Rocky Mountain Region in Montana. Thus the MWAM is applicable and appropriate for use throughout the Telluride Region (McEldowney pers. comm. 2008).

The MWAM has several advantages for use in assessing ecological value for the Study Area. It minimizes subjectivity and variability between evaluators, it allows for comparison of various ecosystem types, and it provides a means of quantifying ecosystem functions and values.

To provide a brief overview of the process and intended goal, the entire Study Area was first delineated into specific ecosystems or Assessment Areas based on physical characteristics identified during Field Site Characterization efforts. Second, the Assessment Areas were scored and rated into categories based on functional values. The categories (I-IV) were then classified into Sensitivity Values. In general, areas of high ecological value are considered the most sensitive areas and preservation of existing ecological integrity should be the first priority. Conversely, areas of low ecological value are considered the least sensitive and the ecological integrity is considered at risk or highly disturbed.

Results of the evaluation provide an insight as to the overall environmental sensitivity of an area, specific attributes of importance, and attributes that are limiting the ecological value. The determination of ecological value and environmental sensitivity is not intended to preclude any public use or management activity. Instead, the environmental sensitivity of an area can be used to guide management decisions on the appropriate level of public use, preservation and restoration opportunities. A detailed explanation of the methodology follows.

3.1.1.1 Methodology

The MWAM was implemented to assess the functional value of specific ecosystems throughout the entire Study Area. Functional assessments were completed using a combination of field and office data collection. After completion of the Wetland Delineation/Classification and Upland Habitat Classification within the Study Area, individual Assessment Areas were determined. To provide consistency when comparing functions and values between upland and wetland areas, this method was modified to provide a foundation for quantifying upland habitats within the Study Area. As a modification of the MWAM, functions deemed unlikely to occur within upland areas (i.e., General Fish Habitat, Flood Attenuation, Short- and Long-Term Surface Water Storage, Sediment/Nutrient/Toxicant Removal, and Sediment/Shoreline Stabilization) were not assessed. Assessment Areas were identified on hydrologic/biological interaction (i.e., points of significant hydrologic change, man-made constrictions, points where the gradient changes rapidly, points of significant inflow, places where other factors limit hydrologic interaction, or limits/termination of wetland) and/or significant changes in vegetation community. Additionally, Assessment Areas that were not contiguous hydrologically were grouped together and assessed as one when the areas exhibited similar ecological characteristics (i.e., tailings areas, isolated lagoons).

The MWAM evaluates up to 12 functions that are considered ecologically significant and scientifically measurable. The functions evaluated in relation to the ecosystem type are summarized in **Table 3-1**. Functional Assessment forms are provided in **Appendix K**.

Applicable functions and values were assessed and rated on a scale of 0 (lowest) to 1.0 (highest) "Functional Points." Functions that do not apply to the given Assessment Area were assigned a rank of "Not Applicable" and are not included in the possible point totals and thus do not affect the calcu-

Table 3-1. Comparison of Wetland and Upland Functions Evaluated.

Ecosystem Function	Ecosystem Type	
	Wetland	Upland
Listed/Proposed T&E Species Habitat	X	X
Colorado Natural Heritage Program Species Habitat	X	X
General Wildlife Habitat	X	X
General Fish Habitat	X	
Flood Attenuation	X	
Short and Long Term Surface Water Storage	X	
Sediment/Nutrient/Toxicant Removal	X	X
Sediment/Shoreline Stabilization	X	
Production Export/Food Chain Support	X	X
Groundwater Discharge/Recharge	X	X
Uniqueness	X	X
Recreation/Education Potential	X	X
Total Number of Functions Evaluated	*12*	*8*

lated percentage of the possible total points. The percentage was then used in conjunction with other criteria to provide an overall ranking into one of four categories: Category I is the highest overall ranking, followed by Category II, Category III, and the lowest, Category IV. An explanation and definition of each Category follows.

Category I

Areas are of exceptionally high quality and are generally rare to uncommon or are important from a regulatory standpoint. Category I areas can: provide primary habitat for federally listed or proposed threatened or endangered species; represent a high quality example of a rare habitat type (i.e., wetlands containing histosols); provide irreplaceable ecological functions (i.e., are not replaceable within a human lifetime, if at all); exhibit exceptionally high flood attenuation capability; or are assigned high ratings for most of the assessed functions and values. To be ranked as Category I, the Assessment Area must satisfy one of the following criteria, (if does not meet at least one criterion, go to Category II):

- Score of 1 functional point or "High" (1H) for Listed/Proposed Threatened or Endangered Species; or
- Score of 1 functional point or "High" (1H) for Uniqueness; or
- Score of 1 functional point or "High" (1H) for Flood Attenuation and man-made features that may be significantly damaged by floods are located within 0.5 mile downstream; or
- Total actual functional points > 80% of total possible functional points.

Category II

Areas are more common than Category I areas, and are those that provide habitat for sensitive plants or animals, function at very high levels for wildlife or fish habitat, are unique in a given region, or are assigned high ratings for many of the assessed functions and values. To be ranked as Category II, criteria for Category I are not satisfied and the Assessment Area meets any one of the following criteria; (if not satisfied, go to Category IV):

- Score of 1 functional point for Species Rated S1, S2, or S3 by the Colorado Natural Heritage Program; or
- Score .9 or 1 functional point or "High" (.9H or 1H) for General Wildlife Habitat; or
- Score .9 or 1 functional point or "High" (.9H or 1H) for General Fish/Aquatic Habitat; or
- "High" (.9H) to "Exceptional" (1E) ratings for both General Wildlife Habitat and General Fish/Aquatic Habitat; or
- Score .9 functional point or "High" (.9H) for Uniqueness; or
- Total Actual Functional Points > 65% of total possible functional points.

Category III

Areas are more common and generally less diverse than Category I and II areas. They can provide many functions and values, although they may not be assigned high ratings for as many parameters as are Category I and II areas. To be ranked as Category III, criteria for Categories I, II or IV are not satisfied and:

- Total Actual Functional Points >35% and <65% of total possible functional points.

Photo 112

Photo 113

Photo 114

Photo 115

Category IV

Areas are generally small, isolated, and lack vegetative diversity. These sites provide little in the way of wildlife habitat, and are often directly or indirectly disturbed. To be ranked as Category IV, criteria for Categories I or II are not satisfied and two of the following criteria are met; (if does not satisfy criteria go to Category III):

- "Low" rating for Uniqueness; or
- Vegetated component < 1 acre; or
- Total actual functional points <35% of total possible functional points.

3.1.1.2 Functional Assessment Results

The entire Study Area was divided into 34 total Assessment Areas: 26 wetland areas (WA1 through WA26) and eight upland areas (UA27 through UA 34). Each Assessment Area was evaluated using the MWAM for its functions and values. One Assessment Area was ranked as Category I (1% of the Study Area), nine were ranked as Category II (31% of the Study Area), 15 were ranked as Category III (30% of the Study Area), and nine were ranked as Category IV (38% of the Study Area). Refer to **Figures 3-1 and 3-2** for location of the Assessment Areas. A comprehensive summary showing the results is presented in **Table 3-2**.

Category I

Only one Assessment Area (WA19) was ranked as Category I. This wetland complex contains pockets of histosol soils, which are rare in the state and are important from a regulatory standpoint (refer to Section 2.1.2.5 *Histosols*). None of the UAs observed are ranked as Category I uplands.

Category II

Nine Assessment Areas (WA1, WA4, WA13, WA20, WA21, WA24, UA29, UA30 and UA31) were ranked as Category II. These areas function at very high levels for wildlife or fish habitat, are relatively unique in the region, and were assigned "High" ratings for many of the assessed functions and values, particularly General Wildlife Habitat.

Category III

Fifteen Assessment Areas (WA3, WA5, WA7, WA8, WA9, WA10, WA12, WA14, WA17, WA18, WA23, WA25, WA26, UA28 and UA34) were ranked as Category III. These areas provide many important functions and values, although they were not assigned "High" ratings for as many parameters as are Category I and II wetlands and uplands. All Assessment Areas ranked as Category III received total functional point scores between 35% and 65%.

Category IV

Category IV areas occupied the highest acreage within the Study Area. Nine Assessment Areas (WA2, WA6, WA11, WA15, WA16, WA22, UA27, UA32 and UA33) were ranked as Category IV. Some wetland areas ranked as Category IV are small (less than 1 acre in size) and are hydrologically isolated; all areas lack vegetative diversity. These areas were highly disturbed, and provide little in the way of wildlife habitat.

3.1.1.3 Summary of Assessment Area Characteristics

A brief summary of each Assessment Area follows along with each area's Category ranking and rationale.

Table 3-2. Summary of Functional Assessment Results.

Assessment Area	Functional Assessment Category	Percent of Possible Score	Sensitivity Value	Environmental Sensitivity
WA19	I	75%	High-1	
WA20	II	71%	High-1	
WA21	II	67%	High-1	
WA1	II	63%	High-2	
WA24	II	59%	High-2	
UA31	II	57%	High-2	**High**
WA13	II	55%	High-2	
WA4	II	51%	High-2	
UA29	II	47%	High-2	
UA30	II	43%	High-2	
WA7	III	59%	Medium-1	
WA8	III	58%	Medium-1	
WA26	III	58%	Medium-1	
WA12	III	54%	Medium-1	
WA17	III	52%	Medium-1	
WA18	III	52%	Medium-1	
WA9	III	47%	Medium-2	
WA3	III	46%	Medium-2	**Medium**
WA23	III	45%	Medium-2	
WA14	III	43%	Medium-2	
WA25	III	41%	Medium-2	
WA5	III	36%	Medium-3	
WA10	III	36%	Medium-3	
UA28	III	33%	Medium-3	
UA34	III	33%	Medium-3	
WA11	IV	49%	Low-1	
WA15	IV	41%	Low-1	
WA22	IV	41%	Low-1	
UA27	IV	32%	Low-2	
WA6	IV	30%	Low-2	**Low**
WA2	IV	27%	Low-2	
UA32	IV	27%	Low-2	
UA33	IV	22%	Low-3	
WA16	IV	17%	Low-3	

WA1 (Category II)

WA1 is a permanently flooded PEM/PSS wetland complex associated with a large beaver dam on Prospect Creek **(Photo 112)**. Because of the permanently flooded water regime and low level of disturbance, 7 of 12 functions evaluated received "High" scores for this WA including a score of .9H for General Wildlife Habitat. Thus, WA1 meets the criteria for Category II ranking.

Photo 116

Photo 117

Photo 118

Photo 119

Photo 120

Photo 121

Photo 122

Photo 123

WA2 (Category IV)

WA2 consists of temporarily flooded/seasonally flooded mine tailing areas **(Photo 113)**. Because the wetlands are small with a vegetated component <1 acre in size, and highly disturbed, this WA received "Low" scores for 8 of 11 functions evaluated resulting in a percentage of possible points below 35%. Thus, WA2 meets the criteria for Category IV ranking.

WA3 (Category III)

WA3 consists of the San Miguel River channel (R2 wetland habitat), permanently flooded PEM and PSS floodplain wetlands, and PUS/PUB gravel bars within the river channel **(Photo 114)**. This complex has moderate structural diversity and moderate disturbance therefore the WA received "Low" to "Moderate" scores for 9 of 12 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus WA3 meets the criteria for Category III ranking.

WA4 (Category II)

WA4 is a temporarily flooded PEM/PSS wetland complex associated with Prospect Creek **(Photo 115)**. Central portions of the WA are permanently flooded; northern portions of the WA are adjacent to the San Miguel River. These ecological characteristics in combination with low levels of disturbance provide a "High" score for General Wildlife Habitat (.9H). Thus, WA4 meets the criteria for Category II ranking.

WA5 (Category III)

WA5 consists of temporarily flooded PSS wetland habitat (with small portions consisting of seasonally flooded PEM habitat) **(Photo 116)**. A railroad grade separates this wetland complex almost entirely from the San Miguel River altering its natural flooding regime. Due to the high level of disturbance, this wetland complex received "Low" to "Moderate" scores for 7 of 9 functions evaluated, resulting in a percentage of possible points >35% and <65%. Thus, WA5 meets the criteria for Category III ranking.

WA6 (Category IV)

WA6 consists of a large seasonally flooded PFO mine tailings area **(Photo 117)**. Because the wetland complex is sparsely vegetated, only seasonally flooded, and highly disturbed, 7 of 11 functions evaluated received "Low" scores for this wetland complex resulting in a percentage of possible points <35%. Thus, WA6 meets the criteria for Category IV ranking.

WA7 (Category III)

WA7 consists of permanently flooded PEM habitat and seasonally flooded PSS habitat **(Photo 118)**. The area is adjacent to the bike path and is confined by a berm to the south. Because portions of the wetland complex are cut off from the natural flooding of the San Miguel River, this WA received "Low" to "Moderate" scores for 6 of 11 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA7 meets the criteria for Category III ranking.

WA8 (Category III)

WA8 consists of the north fork of the San Miguel River (R2 wetland habitat) and abutting PSS/PEM seasonally flooded wetlands **(Photo 119)**. The river is confined by high berms on either side, which limits the abutting wetlands. Due to this high level of disturbance, this WA received "Low" to "Moderate" scores for 7 of 12 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA8 meets the criteria for Category III ranking.

WA9 (Category III)

WA9 consists of PEM/PSS habitat that is temporarily flooded **(Photo 120)**. This complex is located on an "island" between the north and south forks of the San Miguel River, confined by berms on all sides. This wetland complex received "Low" to "Moderate" scores for 7of 8 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA9 meets the criteria for Category III ranking.

WA10 (Category III)

WA10 consists of temporarily flooded/seasonally flooded PEM habitat located on a terrace in a former oxbow, between the north and south forks of the San Miguel River **(Photo 121)**. The area is located on an "island" with relatively low levels of disturbance associated with the nearby berms and the railroad grade. The WA sits atop a terrace only receiving floodwaters temporarily or seasonally during the growing season, therefore the area received "Low" to "Moderate" scores for 7 of 8 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA10 meets the criteria for Category III ranking.

WA11 (Category IV)

WA11 consists of seasonally flooded PEM/PSS habitat, and permanently flooded POW habitat located adjacent to the north fork of the San Miguel River, on an "island" **(Photo 122)**. The area assessed consists of three wetland pockets, adjacent to the river, but surrounded by berms. Because of the moderate disturbance from the berms, the small size of the WA (<1 acre), and a "Low" score for Uniqueness, WA11 meets the criteria for Category IV ranking.

WA12 (Category III)

WA12 consists of R2 wetland habitat associated with the south fork of the San Miguel River, permanently flooded/seasonally flooded PEM and PSS floodplain wetlands, and PUB gravel bars within the river channel **(Photo 123)**. This complex has moderate structural diversity and moderate disturbance from the river confinement (by the railroad grade). The wetland complex received "Low" to "Moderate" scores for 8 of 12 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA12 meets the criteria for Category III ranking.

WA13 (Category II)

WA13 consists of seasonally flooded PFO habitat, seasonally flooded/permanently flooded PEM habitat, and R3 habitat associated with Prospect Creek **(Photo 124)**. This forested wetland complex received "High" scores for structural diversity and "High" scores for Uniqueness (.9H) (because it is a rare habitat type within the Study Area (e.g., mature forested wetland)). Thus, WA13 meets the criteria for Category II ranking.

WA14 (Category III)

WA14 consists of temporarily flooded PFO habitat and temporarily flooded/seasonally flooded PSS habitat on the south side of the San Miguel River **(Photo 125)**. The wetland complex has moderate disturbance from the surrounding berms and receives only temporary/seasonal flooding from the San Miguel River, thus the WA received "Low" to "Moderate" scores for 8 of 11 functions evaluated resulting in a percentage of possible points >35% and <65%. WA14 meets the criteria for Category III ranking.

Photo 124

Photo 125

Photo 126

Photo 127

Photo 128

Photo 129

Photo 130

Photo 131

WA15 (Category IV)

WA15 consists of seasonally flooded POW, PEM, and PSS habitat associated with two man-made historical sewage lagoons **(Photo 126)**. Because the wetland complex received a "Low" score for Uniqueness and the vegetative component of the lagoons is <1 acre, WA15 meets the criteria for Category IV ranking.

WA16 (Category IV)

WA16 consists of R3 habitat associated with Eider Creek. The area is highly disturbed as a result of the lack of water in the channel (due to irrigation diversions) **(Photo 127)**. The wetland complex is sparsely vegetated along the banks of the creek (the vegetated component is <1 acre), and it received "Low" scores for 10 of 12 functions evaluated, including Uniqueness. Thus, WA16 meets the criteria for Category IV ranking.

WA17 (Category III)

WA17 consists of permanently flooded R2 habitat associated with the San Miguel River, seasonally flooded PEM and PSS floodplain wetlands, and PUB gravel bars within the river channel **(Photo 128)**. T his area receives moderate disturbance as the natural flooding regime is altered by the historic railroad grade that runs parallel to the wetland complex, confining the river and the abutting wetlands on the north side. The wetland complex received "Low" to "Moderate" scores for 9 of 12 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA17 meets the criteria for Category III ranking.

WA18 (Category III)

WA18 consists of permanently flooded/temporarily flooded PEM habitat, seasonally flooded PSS habitat, temporarily flooded PUS habitat, seasonally flooded PFO habitat, and seasonally flooded R3 habitat associated with Mill Creek **(Photo 129)**. The wetland complex is highly disturbed due to the hydrologic alteration of Mill Creek from a recent flood event, in addition to seasonal water diversion for irrigation. The wetland complex received "Moderate" scores for 8 of 12 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA18 meets the criteria for Category III ranking.

WA19 (Category I)

WA19 consists of semipermanently flooded PEM/PSS wetland habitat associated with a high groundwater table **(Photo 130)**. This is a rare wetland type underlain by deep histosol soils with low disturbance, thus WA19 scored "High" (1H) for Uniqueness, which meets the criteria for Category I ranking.

WA20 (Category II)

WA20 consists of seasonally flooded/permanently flooded PFO habitat, seasonally flooded PEM habitat, and permanently flooded PSS habitat, bordering Cornet Creek along the north side of the complex **(Photo 131)**. This large wetland complex has low levels of disturbance, high structural diversity, and a permanently flooded water regime; therefore, the wetland complex received "High" scores for 7 of 9 functions evaluated, including a "High" score (.9H) for General Wildlife Habitat. Thus, WA20 meets the criteria for Category II ranking.

WA21 (Category II)

WA21 consists of seasonally, temporarily, and permanently flooded PEM habitat, seasonally flooded and permanently flooded PSS habitat, and POW habitat associated with numerous beaver dams on Cornet Creek/Butcher Creek **(Photo 132)**. This large wetland complex has low disturbance and moderate

structural diversity. WA21 received "High" to "Moderate" scores for 8 of 10 functions evaluated including a "High" score (.9H) for General Wildlife Habitat. Thus, WA21 meets the criteria for Category II ranking.

WA22 (Category IV)

WA22 consists of POW habitat associated with two man-made ponds (historically excavated and intended to be used as sewage lagoons) **(Photo 133)**. The complex is highly disturbed due to its artificial nature, contains low structural diversity as the vegetative component is <1 acre, and scored "Low" for Uniqueness. Thus, WA22 meets the criteria for Category IV ranking.

WA23 (Category III)

WA23 consists of permanently flooded R2 habitat associated with the San Miguel River and adjacent seasonally flooded PSS habitat along the south side of the channel **(Photo 134)**. The complex is highly disturbed due to the extreme channelization of the San Miguel River as a result of the historic railroad grade that borders the north side. WA23 received "Low" to "Moderate" scores for 10 of 12 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA23 meets the criteria for Category III ranking.

WA24 (Category II)

WA24 consists of seasonally flooded/temporarily flooded PSS habitat and permanently flooded PEM habitat **(Photo 135)**. Because the wetland complex has low levels of disturbance, moderate structural diversity, and a permanently flooded water regime within a substantial portion of the complex, the WA scored "High" to "Moderate" for 9 of 11 functions evaluated, including a "High" score (.9H) for General Wildlife Habitat. Thus, WA24 meets the criteria for Category II ranking.

WA25 (Category III)

WA25 consists of temporarily flooded PSS habitat, and temporarily flooded, seasonally flooded, and permanently flooded PEM habitat (portions of which include a wetland mitigation area) **(Photo 136)**. Because of the significant hydrologic alteration due to the induced hydrology within this wetland complex and the temporarily flooded water regime throughout most of the wetland complex, WA25 received "Low" to "Moderate" scores for 8 of 10 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA25 meets the criteria for Category III ranking.

WA26 (Category III)

WA26 consists of permanently flooded PEM habitat on the far eastern side of the Study Area, associated with historical Cornet Creek and Butcher Creek **(Photo 137)**. This wetland complex has moderate disturbance from the historical hydrologic alteration of Cornet Creek, and moderate structural diversity. WA26 received "Moderate" to "High" scores for 7 of 10 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, WA26 meets the criteria for Category III ranking.

UA27 (Category IV)

UA27 consists of two Willow/Mixed Grass Shrubland complexes **(Photo 138)**. One large area is located adjacent to the wetland mitigation site; the second is located on the north side of the Study Area, adjacent to the bike path. These areas have moderate disturbance and moderate structural diversity, therefore 4 of 7 functions evaluated score "Low" for this UA resulting in a percentage of possible points below 35% and a "Low" score for Uniqueness. Thus, UA27 meets the criteria for Category IV ranking.

Photo 132

Photo 133

Photo 134

Photo 135

Photo 136

Photo 137

Photo 138

Photo 139

UA28 (Category III)

UA28 consists of Spruce-Fir Forest habitat located on a high terrace "island" adjacent to the north fork of the San Miguel River **(Photo 139)**. The area has moderate disturbance from some weeds and berms that alter the adjacent river's hydrologic flow. UA28 received "Low" to "Moderate" scores for 6 of 7 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, UA28 meets the criteria for Category III ranking.

UA29 (Category II)

UA29 consists of Spruce-Fir-Aspen Forest habitat located along the south side of the Study Area, bordering the USFS property **(Photo 140)**. This complex has high structural diversity and low disturbance, which results in a "High" score (.9H) for General Wildlife Habitat. Thus, UA29 meets the criteria for Category II ranking.

UA30 (Category II)

UA30 consists of Spruce Forest habitat located adjacent to an agricultural field, west of Boomerang Road **(Photo 141)**. This complex has high structural diversity and moderate disturbance, which results in a "High" score (.9H) for General Wildlife Habitat. Thus, UA30 meets the criteria for Category II ranking.

UA31 (Category II)

UA31 consists of Cottonwood Forest habitat located between Mill Creek and an agricultural field west of Boomerang Road **(Photo 142)**. This complex has high structural diversity and moderate disturbance, which results in "High" scores (.9H) for General Wildlife Habitat and Uniqueness. Thus UA31 meets the criteria for Category II ranking.

UA32 (Category IV)

UA32 consists of Mixed Grass Herbaceous habitat located throughout the Study Area in agricultural fields, on berms, and along the historic railroad grade **(Photo 143)**. This complex has high disturbance from historical grazing, current agricultural practices (i.e., irrigation), and weeds along the berms, which results in "Low" to "Moderate" scores for 6 of 7 functions evaluated, including a "Low" score for Uniqueness. Additionally, the percentage of possible points for these areas is <35%. Thus, UA32 meets the criteria for Category IV ranking.

UA33 (Category IV)

UA33 consists of Cobble-Gravel-Sparse Vegetation habitat located along the irrigation ditches and near Mill Creek **(Photo 144)**. These areas have moderate disturbance and low structural diversity (with a vegetative component <1 acre), thus, 5 of 7 functions evaluated received "Low" scores for this UA resulting a percentage of possible points <35%. Thus, UA33 meets the criteria for Category IV ranking.

UA34 (Category III)

UA34 consists of Silver Sagebrush/Mixed Grass Dwarf Shrubland habitat located on the west side of the Study Area, near Society Turn, and in the center of the Study Area, near the USFS property boundary This complex has moderate disturbance and moderate structural diversity. UA34 received "Low" to "Moderate" scores for 6 of 7 functions evaluated resulting in a percentage of possible points >35% and <65%. Thus, UA34 meets the criteria for Category III ranking.

3.1.2 Environmental Sensitivity Findings

3.1.2.1 Sensitivity Values

Once the ecological value of an area was determined for each Assessment Area, the Total Functional Rating and Percent of Possible Score were compiled into a range of Sensitivity Values. The Sensitivity Value range was determined based on the Category rating (I-IV) in combination with the Percent of Possible Score, as discussed in the *Ecological Value* section. The Sensitivity Values range includes High, Medium and Low with further gradation from 1 to 3. High 1 is the highest Sensitivity Value while at the opposite end of the spectrum, Low 3 is the lowest possible Sensitivity Value. In general, areas of high ecological value are most sensitive and warrant the greatest consideration for maintaining ecological integrity through conservation and preservation. Areas of high environmental sensitivity (1 to 2) have unique physical characteristics and provide significant functions to the ecosystem. Areas of medium (1 to 3) environmental sensitivity are more common and are less sensitive to potential disturbances. Areas of low environmental sensitivity (1 to 3) typically are highly disturbed or altered areas and are not sensitive to potential disturbances.

Figures 3-1 and 3-2 provide a graphic representation of environmentally sensitive areas (Assessment Areas) and associated Sensitivity Value.

3.1.2.2 Summary of Characteristics and Recommended Considerations

High 1-(WA19, WA20, WA21 Eastern Study Area Limits)

The area of highest environmental sensitivity is a large complex of high quality wetlands located along the eastern Study Area. The area is characterized by a variety of vegetation community types dominated by willow and sedge interspersed with mature spruce stands. Vegetation development is mature and diverse providing significant edge effect and structural diversity for wildlife habitat. The area has seen minimal physical disturbance in recent history. The historical Cornet Creek flows through the area in a relatively undefined channel with a wide variety of surface depths and soil saturation. Additionally, historical Cornet Creek is a consistent water source for wildlife. Several beaver dams in the area provide an additional open water component to the vegetative diversity and wildlife habitat of the wetland complex. The larger size and characteristics of the area provide significant flood attenuation and pollution/sediment removal. Pockets of histosols are present.

Considerations:

- Preserve overall existing ecological integrity and functional value
- Preserve well-developed vegetation communities and species diversity
- Minimize human disturbance and activity
- Minimize habitat fragmentation
- Restoration potential is minimal

High 2-(UA 29, UA 30, UA31 Mature Forest Stands)

The areas of high environmental sensitivity are the large mature forest complexes consisting of mature cottonwood galleries and the mature spruce-fir-aspen stands along the south boundary. Cottonwood trees are relatively unique in the Study Area and because of the San Miguel River channelization and water diversion, the cottonwood stands do not easily recolonize. Mature cottonwood galleries provide significant wildlife habitat from structural diversity, nesting, foraging and shelter. The mature spruce-fir-aspen forest stand (UA29) in

Photo 140

Photo 141

Photo 142

Photo 143

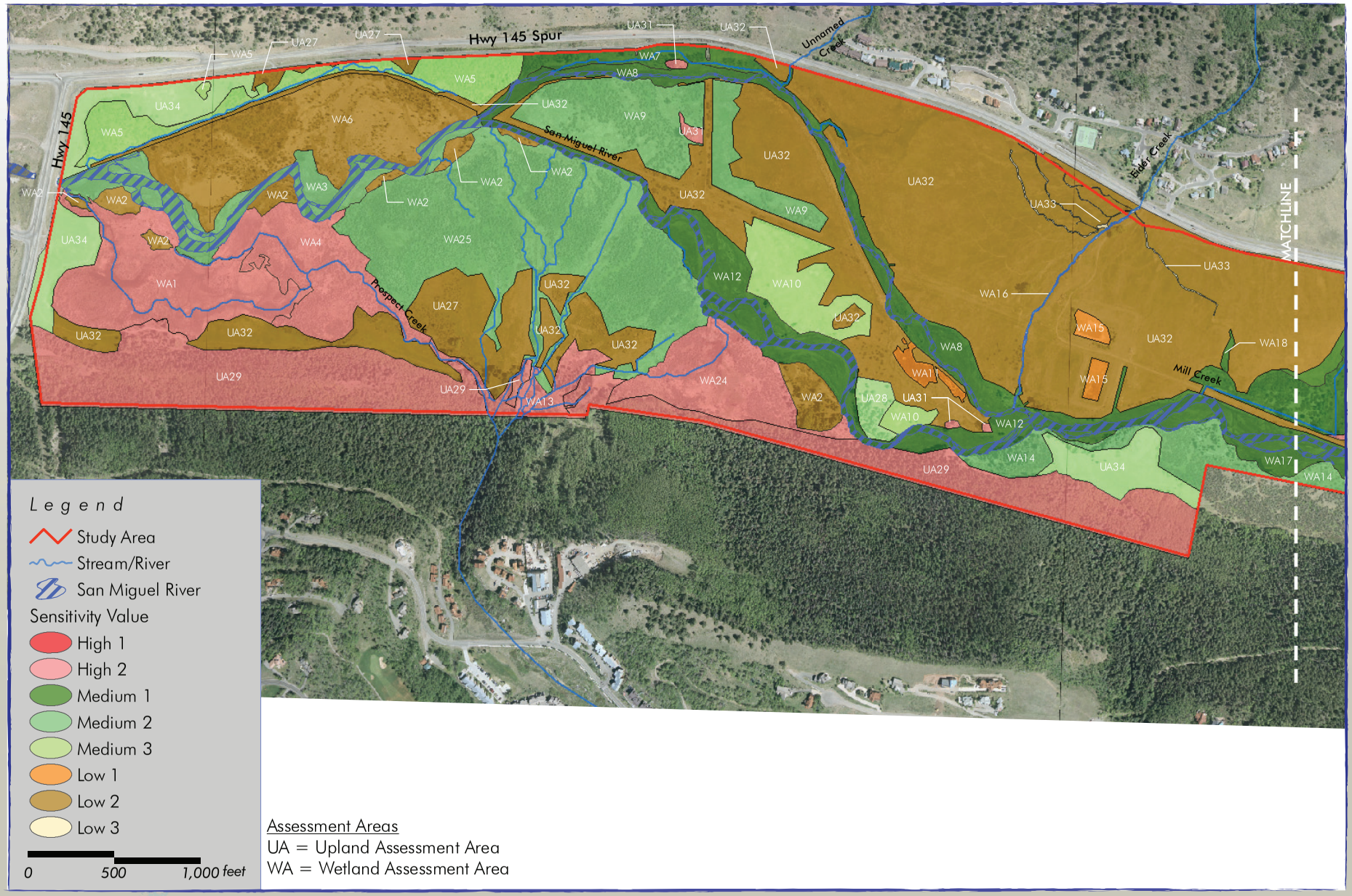

Figure 3-1

Environmental Sensitivity (West)

March 2009

Telluride Valley Floor
Environmental Report

Town of Telluride

Ecological Resource Consultants, Inc.

ERO

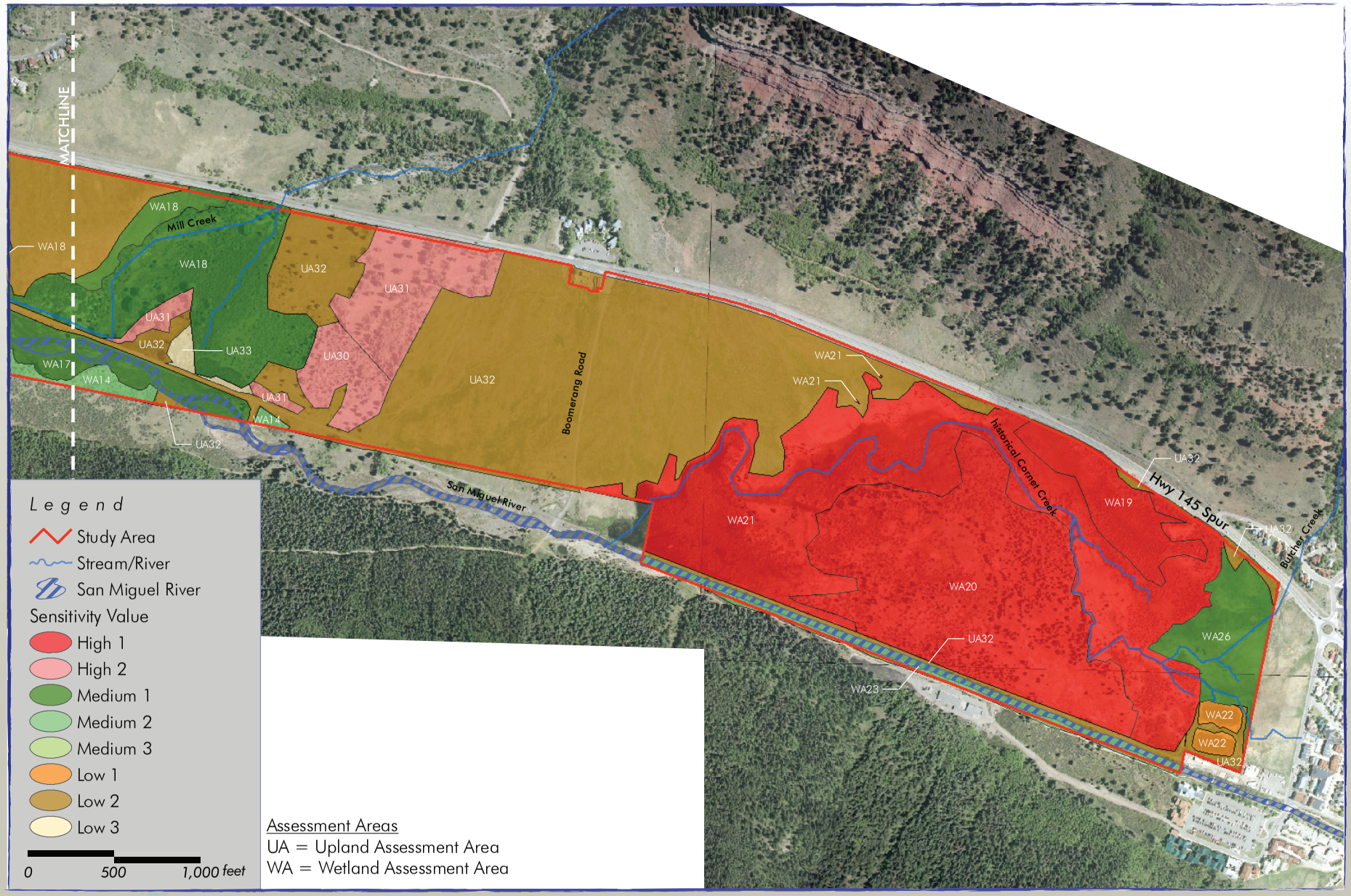

Figure 3-2

Environmental Sensitivity (East)

March 2009

N W E S

Telluride Valley Floor

Environmental Report

TOWN OF TELLURIDE

Ecological Resource Consultants, Inc.

ERC

Photo 144

itself is not relatively unique to the region. However, the unfragmented corridor created by the forest community, the edge effect onto the Study Area and the adjacency of the forest to the river and wetland complexes provide significant wildlife value.

High 2-(WA1, WA4, WA13, WA24)

The area is of high environmental sensitively consisting of a mature forested wetland complex that abuts the upper reaches of Prospect Creek in addition to a diverse permanently flooded wetland complex associated with beaver activity downstream on Prospect Creek. A wide array of inundated/saturated conditions in combination with a wide range of vegetation communities, species diversity and structural complexity provides significant nesting, foraging and shelter for many wildlife species.

Considerations:

- Preserve overall existing ecological integrity and functional value
- Preserve existing forest community and individual mature tree specimens
- Minimize human disturbance and activity
- Minimize habitat fragmentation
- Restoration potential is minimal

Medium1-(WA7, WA8, WA12, WA17, WA18, WA26); Medium 2-(WA7, WA8, WA12, WA17, WA18, WA26); and Medium 3-(WA5, WA10, UA28, UA34)

Areas of Medium 1 and 2 environmental sensitivity contain the most common vegetation communities found throughout the region. These areas are relatively stable, not-at risk, with at least two vegetation strata (typically shrub

Table 3-3. Sensitivity Value Summary Chart.

Sensitivity Value	Ecological Value Category Rating	Range of % Possible Score	General Description of Characteristics
High 1	I/II	65-100	-Histosol Soils -Forested wetland/beaver pond complex with highest Category II percent
High 2	II	40-64	-Mature Spruce and Spruce-Fir-Aspen forest -Cottonwood gallery -Beaver pond wetlands -Forested wetland -Excellent wildlife habitat due to permanently flooded wetlands or high overall vegetative diversity
Medium 1	III	50-60	-High Category III percent -Permanently flooded PEM/PSS wetlands -Higher functional value river reaches -Areas with higher plant diversity and structural diversity
Medium 2	III	40-49	-Lower functional value river reaches -Dryer (temporarily or seasonally flooded) wetland habitats
Medium 3	III	30-39	-Moderate disturbance from railroad grade -Oxbow areas -Areas associated with “islands” formed by berms
Low 1	IV	40-50	-Small wetland areas isolated by berm -Historic lagoons / ponds
Low 2	IV	25-40	-Disturbed uplands -Sparsely vegetated tailings
Low 3	IV	0-24	-Disturbed non vegetated areas

mid-story and herbaceous understory). The areas provide adequate wildlife habitat. Moderate levels of existing disturbance exist, which limits functional values. Of the areas ranked of medium environmental sensitivity, the San Miguel River is the most significant natural resource. The river corridor ranked Medium 1 where it exhibited greater sinuosity and was connected to a natural floodplain and Medium 2 environmental sensitivity in areas confined by berms that altered the natural flooding regime. Additionally, the river corridor, which is in contact with a large mine tailings complex in the western portion of the Study Area, ranked Medium 2 as a result of the overall degraded river condition and unstable banks. This resource should be considered of high priority for maintaining and improving ecological integrity. Areas of Medium 3 environmental sensitivity were disconnected from the river's floodplain due to the railroad grade, were isolated as a result of berms, or exhibited limited structural diversity. Restoration or enhancement could significantly improve the ecological function and value of these areas.

Considerations:

- Allow appropriate levels of human activity and disturbance activity
- Minimize additional habitat fragmentation
- Restoration/enhancement opportunities exist

Low 1-(WA11, WA15, WA22); Low 2(WA6, WA2, UA27, UA32); and Low 3 (WA16, UA33)

Areas of low environmental sensitivity consist of highly altered (man-made land alterations) or highly disturbed areas. These areas mostly consist of remnant tailings piles and agricultural fields. Generally these areas are devoid of significant natural vegetation communities, contain non-native or weed species, have only one-vegetation strata and limited species diversity or structural diversity. Natural hydrological function has been altered.

Considerations:

- Target areas for human activity and disturbance
- Consider issues related to human interaction with tailings areas
- Restoration/enhancement potential is highest and appropriate

3.2 RESOURCE MANAGEMENT RECOMMENDATIONS

This section provides an overview of management issues, options, and recommendations for some of the key resources within the Study Area other than environmentally sensitive areas described in **Section 3.1**. These key resources have been specifically identified because of their environmental sensitivity, their importance, or because their management has implications that cut across many other resources. The following discussions and recommendations are based on the science behind the resources, experiences from other areas, and the professional experience of the consultants.

The recommendations in this section do not attempt to emphasize one resource over another, or reflect the values and preferences of the community. Those value-based decisions will need to be made as part of the forthcoming Management Plan.

3.2.1 Management Zone Designation

As described in the previous *Environmentally Sensitive Areas* discussion, The Study Area has a range of ecological functions, values, and characteristics. The levels of environmental sensitivity are shown on **Figures 3-1 and 3-2**. In the most environmentally sensitive areas, long-term management should emphasize conservation and preservation to maintain and protect their ecological integrity.

Management zones are useful in open space and natural areas planning to define a management emphasis for particular areas, and guide management policies and uses. The number and types of potential management zones varies depending on the resource, management capacity, complexity, and community values. Examples of potential management zone types (and names) include:

- Low sensitivity/high recreation suitability – Passive Recreation Area
- Medium sensitivity/recreation suitability – Natural Area; Conservation Area
- High sensitivity/low recreation suitability – Habitat Protection Area; Wildlife Preserve
- Other management emphasis – Restoration Area; Agricultural Management Area; Facility Disturbance Area; Multiple-Objective Area

The boundaries of management zones should be thoughtful and defensible, and the management direction for each zone should be clearly defined and articulated.

Recommendation: As part of the Management Plan process, the Town should designate management zones that integrate the resource values and public use priorities in the Study Area. These management zones should be clearly defined based on the following attributes:

- Environmental Sensitivity Values **(Figures 3-1 and 3-2)**;
- Known wildlife populations and locations (i.e., prairie dog colony and beaver areas);
- Wildlife movement corridors **(Figures 2-7 and 2-8)**;
- Cultural or historical resources **(Figures 2-15 and 2-16)**;
- Separation from public use or other disturbances; and
- Seasonal uses or closures.

While the range and number of management zones will need to be determined by the Town as part of the Management Plan, it should at least include a zone that covers areas with high sensitivity and low recreation suitability. Such a "Habitat Protection Area" is described below as an illustrative example.

Habitat Protection Areas in the Study Area should include core areas of contiguous habitat with High Environmental Sensitivity **(Figures 3-1 and 3-2)**. In addition, it should also include the existing Gunnison's prairie dog colony, Canada lynx habitat, and major vegetated habitat corridors **(Figure 2-8)**. The boundaries of this zone do not need to include all of the above attributes, but should instead include distinct core habitat units, connections, and corridors.

From a policy and management standpoint, Habitat Protection Areas should receive the highest degree of protection from public use and other disturbances. These disturbances should be minimized to the greatest extent possible. However, this does not mean that specific disturbances (such as trails or res-

toration efforts) should be absolutely prohibited. Instead, any disturbances in this zone must be carefully planned and managed to minimize short and long-term impacts to the specific ecological values and functions that make those areas important.

Conceptual Habitat Protection Areas are shown on **Figures 3-3 and 3-4**. Other management zones should be determined as part of the Management Plan process.

3.2.2 Gunnison's Prairie Dog Management

The Study Area is home to a 23-acre colony of Gunnison's prairie dog. Prairie dog management is often controversial, and can complicate land management efforts. Some people see prairie dogs as pests and their colonies as degraded wastelands, while others value prairie dogs as a "keystone species" and believe that they should have access to any available suitable habitat areas. Management of prairie dogs usually requires a balance between grassland management goals, wildlife management goals, and public perceptions of both **(Photo 145)**.

Photo 145

From a regulatory standpoint, Gunnison's prairie dogs are generally classified into two general geographical groupings: higher elevations in the northeast part of the range ("montane") and lower elevations elsewhere. In February 2008, the USFWS listed the Gunnison's prairie dog in the northeastern/montane portions of its range as a candidate for listing, finding that "the species is not threatened or endangered throughout all of its range, but that the portion of the current range of the species located in central and south-central Colorado and north central New Mexico (the northeastern portion of the range) represents a significant portion of the range where the Gunnison's prairie dog is warranted for listing under the Act" (73 FR 6661).

According to the USFWS (Pfister pers. comm. 2008), prairie dogs within the Study Area are not within the northeastern part of the range and are currently not considered a candidate species. The CDOW is conducting studies of Gunnison's prairie dogs throughout the region, including the Study Area population, to determine the genetic makeup and confirm their listing status. These studies will continue to take place over several years (Seglund 2008).

As the Town moves forward with management of the Study Area, it will need to consider the following:

- The current population is believed to be healthy, but has colonized most of the available habitat east of Boomerang Road.
- If left unchecked by human management or natural controls, the prairie dog population could expand to the west, colonizing another approximately 40 acres of available grassland habitat on the Study Area.
- While its potential regulatory status (candidate species) does not preclude any management, including extermination, ecological value should be considered.

Given these considerations, the Town should pursue a balanced approach that allows some expansion of the colony while preventing dispersal into unoccupied habitat areas. This balanced approach should consider other open space conservation goals, including habitat needs for other wildlife species, vegetation and weed management, aesthetics, public recreation, and public sentiment.

Long-term management decisions about the Gunnison's prairie dog should consider the following factors:

- **Regulatory context –** This species may become listed under the ESA, which could change management priorities and introduce additional regulatory requirements. It may also be listed as a species of concern by the State of Colorado.
- **Agency coordination –** The CDOW is working to study this population, along with several others, to learn about the genetic and population dynamics of the species and to develop range-wide conservation strategies.
- **Colony isolation –** The Study Area population is isolated from other active colonies. This isolation could hamper the ability of this population to recover from natural or human-caused impacts, since dispersal from other colonies is highly unlikely.
- **Habitat degradation –** Prairie dogs have a tendency, in human-altered environments, to reach high population densities that adversely impact the composition and quality of vegetation in the immediate vicinity of the colony.

Several distinct approaches present themselves for management of Gunnison's prairie dog on the Study Area. These are:

- **Facilitated expansion –** Manage other resources to facilitate and encourage the dispersal and expansion of prairie dogs into other suitable habitat areas. This would include curtailing irrigation of the meadow to the west of Boomerang Road, and limiting recreational use in that area to the existing road corridor.
- **Natural dispersal –** Minimize disturbances to the existing colony, while allowing natural dispersal in other areas. Emphasize prairie dog conservation within the existing colony. Do not actively facilitate dispersal by changing or curtailing other management activities or uses (such as irrigation or recreational use). If prairie dogs naturally disperse into other areas, do not compromise other management priorities to specifically accommodate prairie dogs. Continue to monitor colony size, expansion, and responses to other uses and adaptively manage it over time.
- **Containment –** Implement management actions to contain the prairie dog colony to its existing location, minimizing dispersal into other areas. These management actions may include barrier fencing along Boomerang Road, strategic flood irrigation to the west of Boomerang Road, and other management techniques/emphases to discourage prairie dog dispersal to the west.
- **Active population management –** Utilize active measures, including sterilization, relocation, and extermination to reduce or eliminate all or portions of the prairie dog colony from areas that pose management conflicts.

Recommendation: A *natural dispersal* approach is recommended (see description above). This approach would emphasize the conservation of the existing colony, while balancing other resource values if prairie dogs disperse to other parts of the Study Area. While conflicts with other resources and values are likely to arise in the future, the Town will be able to adaptively respond to those issues on an individual basis using knowledge and information gained from ongoing monitoring.

Desired outcomes, such as population size and density, vegetation condition, and level of compatibility with other management and uses should be determined by the Management Plan. Once the desired outcomes for prairie dogs and prairie dog dispersal are determined, ongoing monitoring of population and habitat conditions should be used to make future management decisions, using an adaptive management approach.

The Town should continue to work with the CDOW and USFWS to learn about Gunnison's prairie dog management and conservation, and to allow the Study Area population to benefit the conservation of the entire species.

3.2.3 Beaver Conservation

The Study Area is home to several families of beaver. The dam-building, canal-building, and foraging activities of beaver can have profound effects on ecosystem structure and function (Baker and Hill 2003). This is certainly the case in the Study Area where many of the wetland and open water habitats are sustained by beaver activity. Beaver dams raise the groundwater table and promote the establishment and growth of wetland and riparian vegetation, including willow and cottonwood, as well as alter vegetation species composition and aquatic habitat condition **(Photos 146 and 147)**.

Photo 146

In many areas, a symbiotic relationship exists between beaver and willows. While willows are a primary source of food for beaver and material for dams and lodges, the elevated groundwater table created by beaver dams favors the establishment of new willows. In addition, the cutting of willows by beavers stimulates vigorous resprouting and increased stem production (Baker and Hill 2003).

The relationship of beaver and willow results in other ecosystem benefits:

- Improved water quality through sediment filtering.
- Improved habitat for invertebrates, fish, and amphibians.
- Habitat for songbirds that favor willows and other riparian shrubs.
- Improved foraging habitat for various predators.
- Contribution to overall ecosystem diversity and function.

Beaver can also have a negative effect on surrounding ecosystem:

- Alter vegetation community type.
- Herbivory removal of large riparian trees.
- Increase sediment accumulation within stream systems eliminating spawning habitat and minimizing BMI.
- Increase aquatic nuisance species habitat (i.e., whirling disease).
- Increase flooding potential causing property damage.

In areas where elk, livestock, or other large mammals are heavily concentrated, the relationship between beaver and willows can be disrupted. A recent study of beaver, willow, and elk interactions in Rocky Mountain National Park found this to be the case, where intense congregation and overpopulation of elk occurs due to a lack of natural predators (Baker *et al.* 2005). In this study, Baker *et al.* offered the following predictions about the interaction of beaver cutting and intense elk browsing:

- When beaver cut willow in a heavily browsed environment, they can change a tall willow community into one consisting of short, hedged plants that are less likely to mature and produce seed.
- Elk will outcompete and exclude beaver by decreasing the suitability of willow as beaver food, leading to declines in beaver populations.
- When beaver populations decline, wetlands will lose key willow establishment and survival processes such as elevated groundwater tables and sediment deposition.

Photo 147

Photo 148

Baker *et al.* also noted that a beaver-willow community is likely to remain *stable* if ungulate or livestock utilization of willow is absent or limited to the perimeter of the willow community and the interior stems are mostly full height. Likewise, a community is *declining* if herbivory has penetrated the interior of the community and suppressed regrowth of beaver-cut stems.

Long-term management and conservation of beaver on the Study Area does not present distinct options or scenarios. Instead, several management approaches are possible, ranging from an absolute protection of existing beaver areas from any disturbances, to active control or removal of beavers from areas that may be incompatible for other management purposes, or a blend of approaches. Future river and habitat restoration activities in the Study Area have the potential to disrupt the existing beaver population and habitat due to changes in stream channels and hydrology, construction activity, and possibly the physical removal of beaver dams and lodges.

Recommendation: The streams and wetland habitats of the Study Area are a dynamic system that will continue to change in response to shifts in hydrology, vegetation, climate, and management. Beaver are a dynamic and important component of the overall ecological function of the Study Area. As long as other important components of the system, including hydrology, water quality, and native vegetation communities continue to function in a dynamic fashion, the Study Area will continue to provide plenty of habitat to allow beaver populations to thrive.

An "ecosystem approach" to beaver management is recommended for the Study Area. This approach assumes that as long as enough suitable habitat exists, beaver will find and exploit those areas and beaver populations will persist over the long term. This will occur despite short-term or localized human intervention (such as river restoration or removal of individual beavers from problem areas). While some individuals may be adversely affected by human intervention or disturbance, the population as a whole will continue to thrive and adapt to changing conditions.

3.2.4 Canada Lynx Conservation

With home ranges of between 30 and 60 square miles, Canada lynx are a broad ranging species that depend on undisturbed habitat corridors for travel and foraging. While the Study Area does not provide primary lynx habitat (higher elevation mature to late-successional spruce-fir forests) it does provide secondary foraging habitat and key movement corridors through the Telluride valley. Several individuals have been observed in the Telluride area in recent years **(Photo 148)**.

The lynx is listed as threatened under the ESA, and is considered endangered by the State of Colorado. From 1999 through 2006, 218 lynx from Alaska and Canada were reintroduced to the San Juan Mountains. Now, the CDOW estimates that 106 of the reintroduced animals are still alive. Of the 112 confirmed mortalities, most have either been shot (15), have been hit by a vehicle (14), or have died from starvation (11) (CDOW 2008c). Successful reproduction was confirmed in 2003 through 2006, with a total of 116 kittens found.

The CDOW has documented high lynx densities in the mountains surrounding Telluride, particularly to the south and east. Lynx habitat mapping conducted by the USFS (based on vegetation types) has documented lynx denning habitat on the steep hillside on the south side of the Study Area, and winter foraging habitat in the areas dominated by willows. This mapping is shown on **Figure 2-7**.

The most important contribution to the viability of Canada lynx on the Study Area is the long-term conservation of the Study Area, which has already been

achieved. Large-scale development of the Study Area would have diminished its value as a movement corridor for lynx. Looking forward, future management decisions are not likely to significantly impact (or benefit) lynx use on the Study Area, provided that no major facility development occurs. However, the placement and management of public use should be cognizant of and minimize impacts to lynx use areas and corridors.

Any activity on the Study Area that would require federal wetlands permitting (ranging from the installation of a pedestrian bridge to large-scale restoration) will likely require consultation with the USFWS. Ongoing conservation of lynx habitat and movement corridors will minimize impacts to the species and will potentially reduce future regulatory requirements under the ESA.

Recommendation: In general, an "ecosystem approach" to lynx habitat conservation should be followed on the Study Area (the conservation of habitat will sustain the species that depend on it). This general principle should also be bolstered by the designation Habitat Protection Areas or similar management zones that protect lynx foraging and movement habitat on the Study Area. From a regulatory standpoint, the establishment of these protection areas could reduce future regulatory requirements by demonstrating the Town's commitment to habitat conservation and possibly serving as mitigation for localized impacts on the Study Area.

Photo 149

3.2.5 Elk Management

The Study Area has been utilized as summer range and winter range for a small "semi-resident" elk herd in recent years. During the summer of 2008, this herd consisted of about 50 animals, primarily cows and calves. By the end of September, they had moved to more traditional winter ranges. This pattern of summer use began within the past few years after livestock were removed from the Study Area. Now, the elk herd has become an icon for the Study Area that is valued by many residents and visitors **(Photo 149)**.

As described above, over-population of elk in willow-riparian habitats (such as the Study Area) can disrupt the relationship between beaver and willow, which can degrade willow habitat and ultimately affect habitat for other species, including migratory songbirds (Anderson 2007). This problem has been well documented in other places, including Rocky Mountain National Park, Yellowstone National Park, and the National Elk Refuge (NPS 2007; Zeigenfuss and Singer 2003; Ripple and Beschta 2004), but also occurs at a smaller scale in many other localized areas **(Photo 150)**.

It is important to note that the current levels of use of the Study Area by elk has not resulted in major habitat impacts, and does not constitute an immediate management concern. However, if elk numbers increase over the course of several years, impacts to willow-riparian habitat could increase, along with other management challenges (including recreation/dog conflicts and increased vehicle collisions).

In general, elk herds in the Telluride area have traditionally been known to spend summers at higher elevations, concentrating on the ski area and on the upper ridges to the north of the valley. Winter range for local elk herds usually consists of the lower-elevation slopes and mesas above the San Miguel River to the west of the Study Area. During severe winters, elk typically move farther west and closer to the river bottom, where more forage is available. The south-facing slopes above the Study Area to the north also serve as winter range (CDOW 2008b).

Photo 150

Typically, calving activity in the Telluride area take place in higher elevation areas, including the ski area. This past year, much of the calving occurred on

Photo 151

Photo 152

Photo 153

the Study Area. This may set up a new use pattern as elk that were born on the Study Area return to that location to calve. If this new pattern does occur, the CDOW is concerned about habitat impacts, recreation conflicts, and traffic accidents due to an overabundance of elk on the Study Area during the summer (Caddy pers. comm. 2008).

The San Miguel County Land Use Code prohibits recreational uses *requiring County review* within severe winter ranges for elk, and any dogs within ½ mile of severe winter ranges, as mapped by the CDOW. The prohibition on recreational uses occurs between December 1 and April 15; no seasonal guidelines are set for dog prohibitions. Based on current CDOW mapping **Figure 2-8**, the general prohibition includes the western most portion of the Study Area near Society Turn, while the dog prohibition includes areas west of Prospect Creek **(Figures 3-3 and 3-4)**.

Most of the research on elk impacts to riparian habitats is focused on winter ranges, where the impacts of over-browsing are more apparent due to the lack of available grass forage. In contrast, on summer ranges such as the Study Area, grass is the most important forage type for elk, usually making up more than 85% of their diet. Forbs and browse (including willow) are also used during the summer, depending on availability (Olliff *et al*. 1999). These facts would indicate that the congregation of elk on the Study Area during the summer is not a cause for concern. However, in other places where elk are considered to be overpopulated, impacts to willows and riparian habitats have been observed on summer ranges. This includes the Kawuneeche Valley in the Colorado River drainage on the west side of Rocky Mountain National Park – an area with similar elevation and vegetation (wet meadows and riparian shrubs) as the Study Area – where primary summer range willow cover is declining (NPS 2007).

Over the next 2 to 5 years, there does not appear to be an immediate need to implement any active management of elk on the Study Area. Any long-term patterns of elk use could change over time, particularly in response to the introduction of public use, habitat management (including irrigation and haying), or restoration. However, monitoring elk use patterns, conflicts, and impacts should begin immediately to better guide future management decisions.

Over the long term, if elk use of the Study Area becomes a management issue (primarily due to habitat degradation or public safety concerns), some of the following active management tools can be considered:

- **Exclosure fencing –** Construction of strategically located fencing to discourage use of environmentally sensitive areas. All fencing should conform with the conservation easement **(Photo 151)**.
- **Hazing –** Deliberate harassment of elk by trained and supervised professionals to encourage the herd to move on to traditional summer ranges.
- **Traffic infrastructure –** Installation of warning signs and traffic calming measures to reduce elk/vehicle collisions.
- **Fencing –** Construction of fencing along the Spur to limit elk crossing and steer individuals toward designated crossings or underpasses. All fencing should conform with the conservation easement.
- **Hunting –** Implementation of a special elk hunt on the Study Area to reduce populations and sedentary behavior. Such a hunt could be controlled and limited by the Town (including number of hunters, days, locations), and could be limited to short-range weapons (such as archery or crossbow), only in accordance with applicable Town regulations and within the conservation easement.

Recommendation: A monitoring and adaptive management approach is recommended for elk on the Study Area. At this point, little is known about long-term dynamics of elk on the Study Area. The semi-resident herd has only been there for a few summers, and is still small to moderate in size. As stated previously, elk are currently not a management problem but are instead generally considered an asset for the community. It has yet to be determined if the Study Area summer elk population will: 1) continue to grow every year; 2) stabilize at a sustainable size; or 3) move on to other summer ranges after a few years. Scenarios 1 or 2 are the most likely, but 3 is also possible. The lack of understanding of trends at this time provides an opportunity for the Town to begin monitoring and recording the following:

- Increased willow utilization on both the periphery and interior of willow patches.
- Differences in willow utilization and growth within constructed exclosure fences.
- Seasonal behavior or movements to or from the Study Area.
- Population size and changes through the seasons.
- Mating or calving activity.
- Incidences of or changes in elk conflicts with visitors to the Study Area.
- Incidences of or changes in elk/vehicle collisions along the Spur.

These data, if collected over a period of 5 to 10 years, combined with ongoing coordination with CDOW, will allow the Town to better understand trends, impacts and management issues related to elk. If management issues become apparent over time, the Town should work with CDOW to develop management strategies that are compatible with Study Area resources, the community's values, and CDOW's regional management objectives.

3.2.6 Recreational Use

Management of the Study Area will need to balance public recreational use with the protection of areas with high environmental sensitivity. This balance is reflected in the Draft Conservation Easement for the Study Area, which states that:

> "It is further the specific purpose of this Easement to ensure recreational and educational uses such as nature walks, trails and areas for hiking, bicycling, running, cross country skiing, hang/para glider and hot air balloon landing; temporary associated uses of a major festival held within the Town… such as public sanitation facilities, parking (except for recreational vehicles) and tent camping, and other park purposes not requiring improvement of the land or placement of permanent structures, and that such uses are accessible to the public and do not significantly impair or interfere with the conservation values."

Under the current management direction, the Study Area can provide a variety of public uses. The existing trails and roads are currently used for hiking, mountain biking, nature viewing, and trail running **(Photos 152 and 153)**. The open meadows near Boomerang Road are periodically used for hang-gliding, paragliding, and hot air balloon landing **(Photos 154, 155, 156)**. Winter uses include a groomed Nordic skiing track, as well as skiing and snowshoeing along ungroomed routes. The San Miguel River is used for fishing, and is occasionally used for recreational boating and tubing through the Study Area. The Draft Conservation Easement specifically allows many of the above uses, as well as other uses related to in-town festivals.

Outdoor recreational uses provide a broad range of community and individual

Photo 154

Photo 155

Photo 156

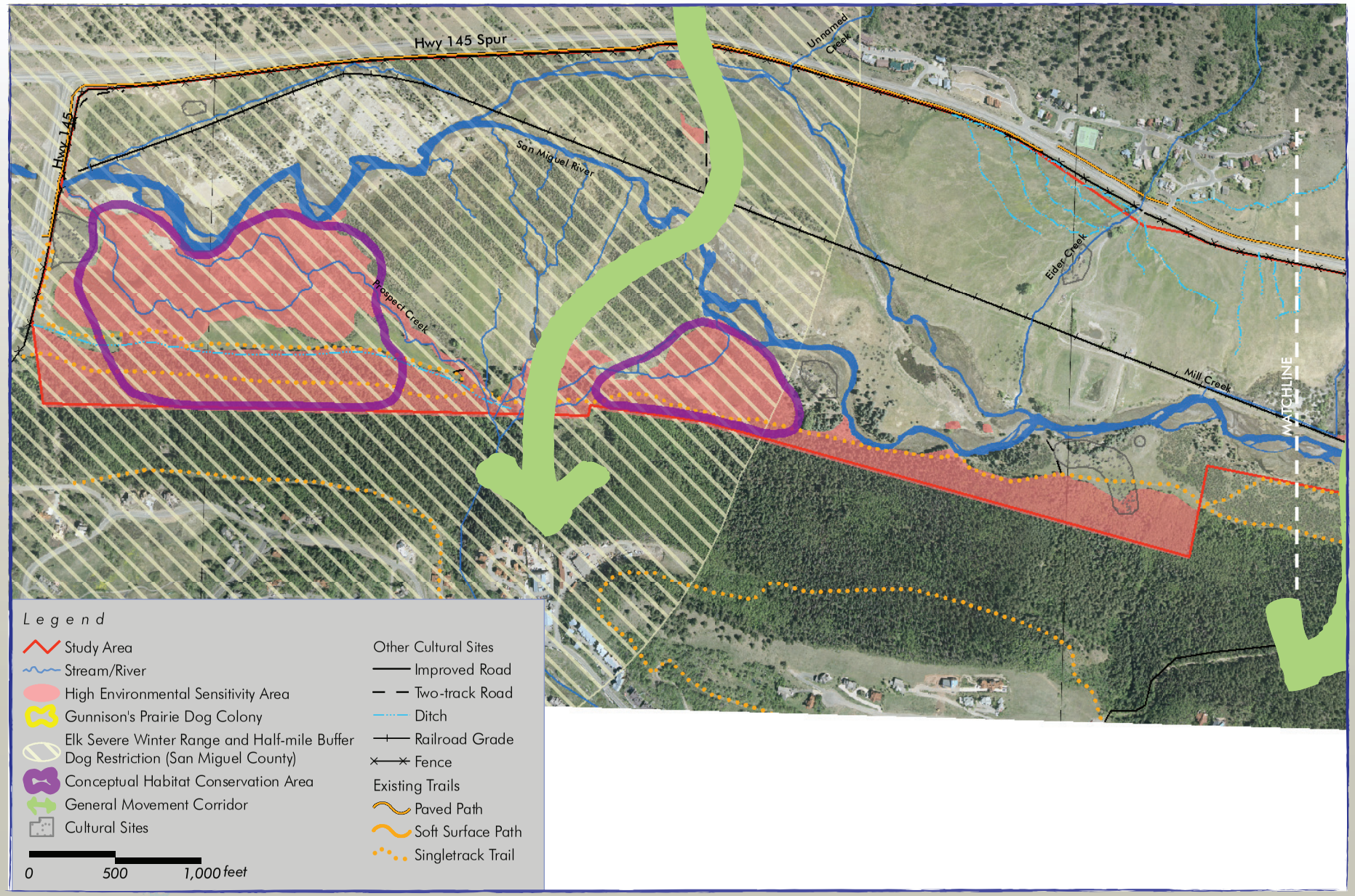

Figure 3-3

Management Considerations (West)

July 2009

N W E S

Telluride Valley Floor

Environmental Report

TOWN OF TELLURIDE

Ecological Resource Consultants, Inc.

ERC

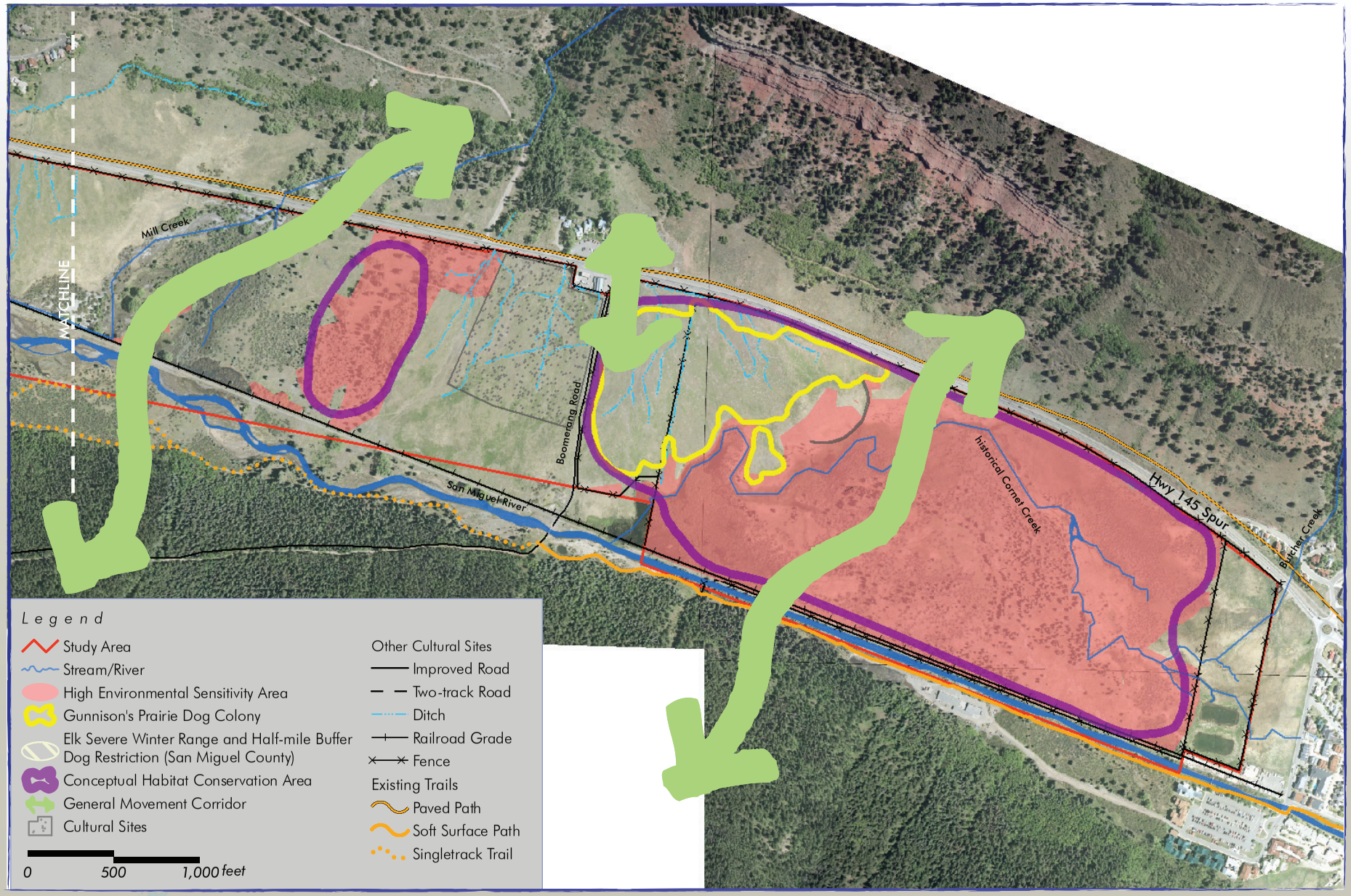

Figure 3-4

Management Considerations (East)

July 2009

N W E S

Telluride Valley Floor

Environmental Report

Town of Telluride

Ecological Resource Consultants, Inc.

ERC

benefits that are gained by interacting with the natural world. These benefits include solitude, natural quiet, opportunities to learn, opportunities to observe wildlife, exercise, social activity, and many others. However, all forms of public use, recreation, and trails in the natural environment inherently result in localized impacts to wildlife and habitat due to habitat fragmentation, startling or flushing of some species, and the introduction of conduits for non-native species and predators. Careful planning and management of those uses and facilities can minimize their impacts while maximizing the public benefits of recreation.

The San Miguel County Land Use Code prohibits recreational uses *requiring County review* within elk severe winter ranges, as mapped by the CDOW, from December 1 through April 15. Based on current mapping **(Figure 3-3)**, this prohibition includes the western most portion of the Study Area near Society Turn. It is not clear if any existing or proposed recreational uses in the Study Area would require County review.

General Impacts of Recreation to Wildlife

The impact of outdoor recreation and trails on wildlife is an emerging science, and wildlife responses to recreation vary by location, species, and individual animal. However, the existing scientific literature on this subject is sufficient to draw general guidelines for outdoor recreation and trails planning. These include:

- Wildlife sensitivity to recreation vary by species, terrain, and individual animal.
- Recreation and trails in a natural area can reduce habitat value for some species, while others are not affected.
- In some cases, long-term behavioral changes can result from new recreational use, such as abandonment of preferred nesting, denning, or foraging areas.
- The zone of influence for deer and elk is generally about 100 meters (328 feet) on either side of a trail, and about 75 meters (246 feet) for some bird species.
- The zone of influence is generally greater in open terrain than in wooded areas.
- Off-trail use results in a greater impact than on-trail use.
- Wildlife in close proximity to frequent human use can habituate to predictable and recurrent use of recreational trails.
- Habituated wildlife with frequent interaction with humans may not be influenced by any additional human activity.
- Wildlife protection efforts should focus on reducing population impacts to rare or sensitive species; individual impacts to generalist species are less of a concern.
- There is little difference in wildlife response between hikers and mountain bikers.

These findings are described in greater detail in **Appendix L.** The impacts of specific types of recreational activities on wildlife and habitat are described below.

Trails and Trail Use

Several existing trails and roads provide recreational access onto and through

the Study Area. Existing trails and trail routes on or adjacent to the Study Area include the following **(Photos 152 and 153)**:

- River Trail (crusher-fine trail extending from Town to Boomerang Road)
- River Trail Extension (natural surface single track trail extending along the southern boundary to Society Turn)
- Boomerang Road (county road serving as a recreational access route)
- Railroad Grade (de facto trail route along existing grade)
- Bike Path (paved path along north boundary and the Spur)
- Two-track road along Eider Creek near the old sewer lagoon
- A groomed Nordic ski track is established and maintained in the winter

Future management of the Study Area presents opportunities to establish new trails and reconfigure existing ones to improve recreational opportunities, minimize environmental disturbances, and optimize future conditions **(Photo 157)**.

Photo 157

In addition to the wildlife impacts described above, the introduction of trails and visitors will also have localized impacts on soils, vegetation and water quality **(Photo 158)**. These impacts are described in detail in **Appendix L.**

The planning and implementation of trails on the Study Area must also consider potential changes that would result from major river restoration projects. For example, a major reconfiguration of the San Miguel River channel on the eastern half of the Study Area could change the overall habitat dynamics of the area, which could then change where trails could or should be located. Those changes could provide an opportunity to move the existing River Trail to a location that is more suitable from an ecological perspective. For this reason, trails planning on the Study Area should be coordinated with river restoration planning, and should consider both short-term and long-term options that are adaptable to changing conditions.

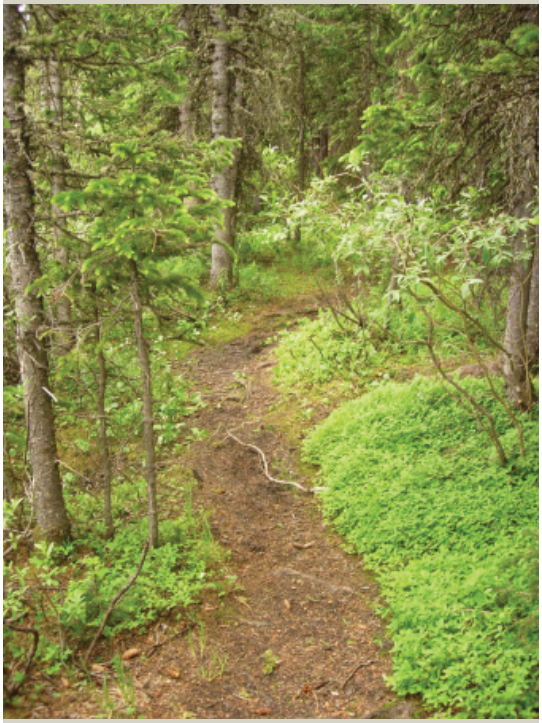

Photo 158

Winter Activities

Winter recreational activities, including Nordic skiing and snowshoeing on both groomed and ungroomed trails, can impact wildlife due to snow compaction and wildlife disturbance. The level of impact varies depending on the extent and intensity of activities. In addition to the wildlife disturbance considerations described above, larger mammals are vulnerable to increased stress during the winter (Olliff *et al.* 1999, Knight and Cole 1995b).

Snow compaction occurs from both mechanized grooming equipment and individual tracks over undisturbed snow, and can alter soil temperature and plant development in the immediate vicinity. Besides the direct impacts on vegetation due to broken twigs or soil disturbance, snow compaction has been found to increase frost penetration into roots, delay spring thaw and subsequent plant growth and seed germination. These effects can result in localized changes in plant composition and diversity, and are generally reduced as snowpack depths increase (Fahey and Wardle 1998, Olliff *et al.* 1999). Wildlife species that are most directly affected by snow compaction are the small animals that live under the snow during the winter ("subnivean fauna"). These small mammals are important prey species for raptors and mid-sized carnivores (Olliff *et al.* 1999).

Impacts to vegetation and subnivean fauna due to snow compaction are a greater concern for groomed Nordic ski tracks than for ungroomed uses (such as hiking, snowshoeing, and cross-country skiing along ungroomed trails). This is because the area of impact is much smaller and typically occurs along existing road or trail corridors.

Water-based Uses

Improved access to the San Miguel River as it flows through the Study Area will likely result in an increase in water-based recreational uses including boating (primarily kayak and light rafts), tubing, and fishing. Fishing activity is also expected to increase over the long term as ecological conditions and the fishery improves. There are generally three types of impacts from these uses – wildlife disturbance, social trails and trampling, and disturbances to aquatic resources.

Wildlife disturbances from additional human presence on the Study Area are similar to those described above. All water-based recreational uses can result in a proliferation of braided or redundant social trails to provide fishing access or stream bank access for floaters. Besides the considerable impacts to riparian habitat due to trampling and fragmentation, these social trails can also increase stream bank erosion and sedimentation. Floating access, particularly during low flow conditions, can also adversely impact aquatic insects and fish, while overfishing can deplete the fishery.

Hot Air Balloon/Paraglider Use

Portions of the Study Area, particularly the open meadows adjacent to Boomerang Road, have historically been used for paraglider landing and hot air balloon take-off and landing **(Photos 154 and 155)**. The potential impacts on these areas are generally limited to vegetation trampling and general wildlife disturbance. Considering the disturbed nature and low ecological sensitivity of these areas, such impacts would have a negligible overall impact on the ecology of the Study Area.

Any public uses to the east of Boomerang Road, however, could adversely impact the Gunnison's prairie dog colony in that area. While impacts due to occasional human disturbances within the prairie dog colony are minor (the prairie dogs will avoid humans by seeking refuge in their burrows), the additional stress and vigilance can have an incremental impact on the population in the fall (when individuals are gaining weight for winter) or if it already stressed by other factors (such as disease) (Seglund 2008).

Concentrated Uses

Recreational activities that are concentrated in a particular area (such as festival uses, special events, camping, or field sports) are likely to result in localized vegetation trampling and general impacts to wildlife. A single concentrated event can potentially denude an area of vegetation, and provide a foothold for noxious weed infestations, resulting in impacts that are very difficult to restore. The impacts of occasional concentrated uses on most wildlife species are minor – the animals simply leave the area until the disturbance ends. However, repeated disturbances in an area can result in abandonment of nearby habitat by some species.

Other Dispersed Uses

Off-trail recreational uses such as disc golf, geocaching, and dispersed hiking can result in localized vegetation impacts due to trampling. As described above and detailed in **Appendix L**, any off-trail dispersed use can have a greater impact on wildlife because it is less predictable. The overall impact

of such dispersed activity on wildlife largely depends on the frequency of the activity and the location. For example, frequent incursions into areas with high ecological sensitivity are more likely to result in long-term impacts, while occasional wanderings into areas of moderate to low sensitivity are less likely to impact wildlife populations.

Recommendation: As part of the Management Plan process, the Town should develop specific strategies for recreational access and trails in the Study Area that considers environmental sensitivity values, designated management zones, varied recreational opportunities, restoration and remediation plans, and long-term management and maintenance. Public use strategies should incorporate winter and summer uses, internal and external trail connections, trail closures and reroutes, and interpretive opportunities. Guidelines and recommendations for accommodating public use in the Study Area are described below by type of use.

General Guidelines

- Focus public use in existing disturbance corridors and areas with lower environmental sensitivity.
- Minimize public use in areas with higher environmental sensitivity.
- Consider a zone of influence of 50 to 100 meters (164 to 328 feet) from public use areas where wildlife may be affected.
- Minimize disturbances to movement corridors for broad-ranging species such as elk, black bear, and Canada lynx.
- Minimize disturbance and fragmentation to known wildlife populations.
- Retain a variety of undisturbed habitat types to provide a refuge for a variety of species.
- Consider seasonal closures to protect specific wildlife or habitats (such as elk calving areas or raptor nests).

Trail Design and Management

- Provide reasonable and enjoyable trail access to key features (i.e., view points, river banks) to avoid the proliferation of social trails to those areas.
- Use thoughtful and creative planning to provide quality trail experiences while minimizing redundant or unnecessary trails.
- Maintain visual or physical barriers (i.e., trees, water bodies, ridges) between trail corridors and sensitive areas.
- Where appropriate, incorporate trail designs or reroutes into major restoration efforts.
- Consider dog management and impacts when designing and implementing trails.
- Construct new trails using modern trail-building techniques to reduce long-term maintenance and conflict.
- Minimize wetland crossings and boardwalks, which are costly to install and maintain, and are disruptive to wildlife habitat.
- Utilize portions of the existing railroad grade, and interpret its historical significance.
- Establish, maintain, or improve multi-use connections to other nearby trails.
- Consider multi-use and single use trails.

Photo 159

- Establish an interpretive overlook in the eastern portion of the Study Area that highlights key resources, provides an education opportunity, and manages access in close proximity to Town.
- Consider various types of trail uses, experiences, and destinations to maximize use enjoyment and to reduce conflict.

Winter Activities

- Consider separate seasonal trails for snowshoeing and Nordic skiing.
- Locate winter trails and routes to avoid areas with sensitive vegetation or movement corridors for carnivores, including Canada lynx.
- Avoid trail grooming through wetlands, particularly willow-dominated wetlands, histosols, or other areas with high sensitivity characteristics.
- Avoid trail grooming through the core of the prairie dog colony – consider Nordic trail location as part of an overall prairie dog management strategy.
- While periodic trail crossings (groomed or ungroomed) of sensitive habitats *may* be appropriate, such crossings should be kept to a minimum.
- Avoid early- and late-season grooming when low snow depths result in direct contact with the ground/vegetation.
- Monitor changes in vegetation along groomed trail routes to evaluate actual impacts and improve long-term conservation and management.

Fishing and Boating

- Establish suitable fishing and boating access points as part of the overall trail system.
- Minimize the proliferation of social trails through education, signs, and if necessary, attractive wildlife-friendly fencing.
- Consider seasonal restrictions on boating and tubing during late summer low flow conditions to minimize stress on aquatic resources.
- Work with the CDOW to establish fishing regulations that are appropriate for the Study Area.
- Consider designated areas for specific water based activities (fly-fishing only, no boating/tubing area, full use areas).

Other Public Uses

Other recreational uses, such as hot air balloon use, paraglider landing, disc golf, and geocaching should be allowed only in habitat areas with low sensitivity (such as agricultural fields). These activities and their impacts should be considered as part of overall public use and agricultural management strategies, and should be compatible with management zone designations and policies. Public access to and use within the prairie dog colony should be considered as part of an overall management strategy for prairie dogs and public use.

3.2.7 Dog Management

The management of domestic dogs in natural areas is becoming increasingly problematic for land managers. For many dog owners, recreating with their dog is an integral part of the experience, offering opportunities for exercise, training, socialization, companionship, and another way to enjoy the natural environment. However, for some users of trails and natural areas, dogs are considered a nuisance and threat to the intrinsic values of the area. As more and more people and dogs use trails and natural areas, these issues and po-

tential conflicts become more severe, particularly in areas near population centers **(Photo 159)**.

Note: While domestic dog use is a recreational use of the Study Area, dog management has been separated into its own category because of its complexity, level of interest and controversy, and its applicability to most of the other recreational uses discuss above (since most of the other potential recreational uses can be conducted with a companion dog). This separate discussion does not mean to imply that dog management and access is any more or less important than other forms of recreation.

The primary issues related to dog management in natural areas include:

- Failure to pick-up and dispose of dog waste
- Dogs disturbing/harassing other visitors
- Dogs disturbing/harassing wildlife

Issues related to dog waste are primarily related to concerns about aesthetics, water quality, disease prevention, and weed prevention. Harassment of others by off-leash dogs is a visitor management issue. Both of these are ongoing problems for managers, and can be addressed with a combination of facilities (for dog waste), education, and enforcement.

In terms of impacts of dogs on wildlife, key findings of recent scientific studies include:

- Many species (particularly mammals and amphibians) perceive dogs as predators and avoid areas where they could be chased.
- While actual chases of wildlife are rare, they can pose significant hazards to both the wildlife under chase and the dog.
- Most dogs will remain within 5 meters (16 feet) of a trail, although some will wander up to 85 meters (279 feet).
- The presence of dogs may greatly expand the area of influence of a trail.
- Off-leash dogs expand the area of influence more than on-leash dogs.
- Off-leash dogs are likely to disturb prairie dogs in close proximity and can adversely influence prairie dog behavior.

These findings are described in greater detail in **Appendix L.**

The Town is known to be a dog-friendly community, and Town residents have become accustomed to walking and hiking with their dogs throughout the area. Off-leash dogs are common throughout downtown Telluride and the Bear Creek Preserve allows visitors to hike with their dogs off-leash (under voice and sight command). Under the current management direction, dogs are prohibited within the Study Area.

The introduction of domestic dogs into areas with high environmental sensitivity does have an impact. These impacts include habitat degradation in concentrated use areas, contamination from feces, and the disturbance of wildlife that perceive dogs to be a threat. These impacts should be considered in balance with the positive benefits of allowing people to recreate with their dogs.

Dog management on the Study Area is a topic that will need to be addressed in the Management Plan. The Town will need to develop policy that is compatible with existing land use regulations, sensitive to ecological resources, respectful of public preferences and values, and pragmatic when it comes to implementation and enforcement **(Photo 160)**.

Photo 160

The San Miguel County Land Use Code prohibits dogs within ½ mile of elk severe winter ranges, as mapped by the CDOW. Based on current mapping **(Figure 2-8)**, this prohibition includes portions of the Study Area west of Prospect Creek **(Figure 3-2)**. While the land use code does not specify seasonal variances for dogs, a seasonal closure (December 1 through April 15) would likely satisfy the intent of the regulation.

The case studies presented in **Appendix M** illustrate the variety of approaches used in different communities to manage recreational dog use. Management approaches are typically based on environmental sensitivity, community values and priorities, management objectives, and management capacity. The range of dog management regulations generally includes:

- Prohibition of all dogs
- Seasonal trail closures to dogs
- Dogs allowed on-leash
- Voice and sight command (off-leash) permitted
- Combination of approaches by area or trail
- No regulations or restrictions

Regardless of the management approach or combination of approaches used to manage dog use, most open space managers agree on the following guidelines:

- Regulations should be simple, practical, and easily understood by the public.
- Distinctions in regulations between two areas should be clearly defined by physical boundaries (such as a water body, tree line, fence line, ridge, road, or trail).
- Areas should not be opened up to any new use on a "trial" basis – once a use is established it is very difficult to retract.
- Regulations should be enforceable and enforced.
- A combination of education and enforcement, including the presence of rangers, is the most effective approach to ensure compliance.

Recommendation: The type and location of dog access on the Study Area will be determined by the Management Plan. Any dog management policy will need to balance environmental sensitivity, public recreation desires, community values, and enforcement capacity. Possible dog management policies that should be considered include:

- Dogs permitted under voice and sight command along designated trail corridors. Dogs are prohibited in areas outside of trail corridors, including wetlands, prairie dog colonies, and selected management zones.
- Dogs permitted on-leash along designated trail corridors.
- Dogs permitted, under voice and sight command, along designated trails and Boomerang Road, and are prohibited from interior trails, and selected management zones.
- Any of the above scenarios with seasonal dog closures for portions or all of the Study Area.

Each approach has its advantages and disadvantages. The advantages of more restrictions are increased assurances that sensitive habitats will be protected. Less restrictive approaches have the advantage of a higher quality

experience for people who enjoy recreating with their dogs, as well as opportunities for dog training and socialization. Conversely, an excessively restrictive approach could result in backlash within the community, a "free-for-all" attitude among some dog users, and ongoing enforcement problems. An approach that is not restrictive enough could result in higher levels of impact if certain areas become a destination for off-leash dogs (de-facto dog park). A blended approach, if not structured well, could result in a lack of compliance due to a lack of awareness or understanding of the policies.

Dog management policies should be closely considered in the planning and implementation of trails. The location of trails may be the single greatest factor influencing the potential for dog impacts, based on the following assumptions:

- Most visitors will follow designated trail corridors (with or without dog);
- Most dogs will remain close to their owner/guardian;
- Many visitors with dogs will follow trails with their dog off-leash regardless of the dog regulations.

Given these assumptions, the most effective way to protect sensitive habitat from dog impacts is to keep trails away from those areas.

3.2.8 Wetland Mitigation Site

To facilitate the restoration of wetlands on the Prospect Creek alluvial fan, as discussed in **Section 2.1.2.4 Wetland Mitigation Site,** in 1996, SMVC entered into a "Wetlands Easement Agreement" (the Agreement) with The Telluride Company for the 20.8 acre mitigation site on the Study Area **(Photos 161 and 162)**. Under the terms of the Agreement, the Telluride Company was authorized to access the site for the purpose of "restoring, creating, monitoring and maintaining a wetlands area" as it related to Civil Action No. 93-K-2181 (EPA vs. The Telluride Company). The terms of the agreement were valid until:

- The settlement or resolution of the litigation if such settlement or resolution does not require the Telluride Company to use the mitigation site for creation, restoration, monitoring and maintenance of the wetlands area; or
- Seven years from the date of the easement (October 2, 1996), if the Telluride Company has not begun using the mitigation site for creation, restoration, monitoring and maintenance of the wetlands area as part of the settlement or resolution of the litigation; or
- If the easement does not terminate pursuant to either of the above provisions, then the easement shall continue in effect as long as it is being used for creation, restoration, monitoring and maintenance of the wetlands area pursuant to a settlement or resolution.

The easement does not appear to contain any legal restrictions regarding allowable activity within the wetland mitigation site. Further investigation is recommended for any deed restriction or similar legal documents that may have been created with the EPA as part of the mitigation efforts. Regardless of legal restrictions, the original intent of the mitigation efforts should be considered during future management considerations.

Recommendations:

- Maintain hydrologic flow and connections through the area
- Minimize weed infestation
- Increase vegetation diversity

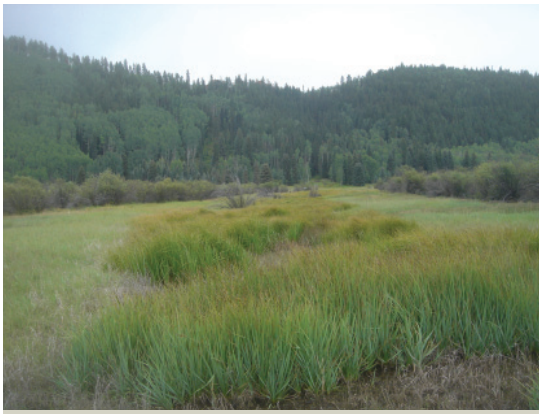

Photo 161

Photo 162

Photo 163


Photo 164


Photo 165


Photo 166

3.2.9 Other Management Considerations

3.2.9.1 Roads and Access

Several existing roads and trails provide administrative and recreational access to the Study Area **(Photo 163)**. General recommendations include:

- Establish roads and routes for administrative access that minimize resource impacts and use existing roads and disturbances to the greatest extent possible. Allow other roads to revegetate over time.
- Consider reasonable access to existing utilities on the Study Area when establishing access roads and routes.
- Designate temporary access roads for large-scale projects (i.e., restoration or tailings remediation) that minimize impacts to higher environmentally sensitive areas and public uses. Actively close and revegetate temporary roads after project completion.
- Establish designated recreational access points, considering types of uses, parking, and environmental sensitivity.

3.2.9.2 Fencing

Existing fencing on the Study Area ranges from recently constructed perimeter fences, to historical fences and fence alignments that cross the Study Area **(Photo 164)**. General recommendations include:

- Retrofit fencing on north and west boundaries to meet specifications that allow wildlife passage. These fences are important to demarcate the boundary and to discourage inappropriate vehicle access and uses.
- All fencing should conform with wildlife-friendly fencing guidelines developed by the CDOW.
- All fencing should conform with the conservation easement.
- Consultation with CDOW on new fencing is recommended to ensure appropriate movement corridors are maintained and/or eliminated.
- Work with the USFS to remove the southern boundary fence to the greatest extent possible, retaining signs and corner posts to demarcate boundaries.
- Maintain historical fence alignments on the Study Area, albeit altered to allow safe wildlife passage.
- Allow periodic use of attractive/natural fencing (i.e., buck and rail or pole fences) to manage public uses and protect sensitive habitat per the conservation easement.
- Modify the Final Conservation Easement to allow fencing options that are necessary for resource conservation and management.

3.2.9.3 Utilities

Several existing utility lines cross the Study Area, including an overhead electrical line, a sewer line, and a natural gas line **(Photos 165 and 166)**. General recommendations include:

- For utility maintenance, allow reasonable access that minimizes impacts to selected management zones.
- Consider opportunities to relocate or reconfigure utilities to improve habitat or aesthetic conditions. Potential benefits should be weighed against the impacts and costs of such projects.
- Utility work should consider construction impact mitigation.

3.2.9.4 Cultural and Historic Resources

The Study Area contains several sites and resources that have significance to the history of Telluride and the surrounding region. Key resources include the railroad grade, the San Miguel City site, historical fence lines, and the corral **(Photos 167 and 168)**. General recommendations include:

- Preserve the visual integrity of the historical fence alignments; however, the barbed wire itself is not historic and can be removed if needed.
- Preserve and interpret portions of the railroad grade while allowing some sections to be removed as needed (after formal documentation) to facilitate habitat or river restoration.
- Conduct geophysical investigations of the San Miguel City site to potentially identify subsurface structures or features.
- Evaluate the structural integrity of historic structures on the Study Area and consider restoration or stabilization.
- Incorporate community values and preferences before removing or restoring structures or features (such as the old dog pound); if removed, consider documenting the history and significance of those features.
- Consider the recreational and educational value of historic features when locating trails and interpretive sites and consider potential archaeological resources prior to ground-disturbing activities.
- Consider conducting a formal Class III intensive cultural resource inventory and providing the Colorado State Historic Preservation Officer a copy of the report and site documentation forms.
- Irrigation ditch historic significance.

Photo 167


Photo 168

3.2.9.5 Irrigation

An existing network of ditches and laterals supply irrigation water to the meadows on the Study Area. These networks are used for irrigated pastures **(Photos 169, 170, 171)**. General recommendations include:

- Continue irrigating most areas on the Study Area to retain stable (albeit non-native) vegetation communities until natural restoration is completed.
- Develop and implement an irrigation strategy that is compatible with management objectives for other resources, including vegetation management, noxious weed control, prairie dog management, recreational use, and cultural and historic resources, or
- Identify and preserve an alternative "beneficial use" for these water rights.
- Regardless of specific plan, continue to exercise these water rights to preserve their historic use and value.


Photo 169


Photo 170

3.2.9.6 Noxious Weeds

The Study Area currently has few issues related to noxious weeds. However, future changes in management, uses, and ground-disturbing activities (i.e., restoration, trail installation) may provide a foothold for noxious weed infestations **(Photos 172 and 173)**. General recommendations include:

- Work closely with the San Miguel County Weed Control Program or other appropriate organizations to develop weed management strategies and to implement control techniques.

Photo 171

Photo 172

Photo 173

- Develop an integrated weed management strategy that includes a combination of mapping, mechanical, cultural, biological, and chemical techniques.
- Consider test plots for different and alternative weed control methods.
- Consider adverse impacts on non-target native vegetation and wildlife species before applying any weed control action.
- Map, on an annual basis, distinct patches or infestations of noxious weeds.
- Emphasize proactive monitoring and prevention to identify and control weeds before they become major infestations.
- Incorporate weed monitoring and control into restoration plans following ground-disturbing activities.

3.2.9.7 Administration

The Town and its management partners will need to determine a framework for management, maintenance, and stewardship of the Study Area **(Photo 174)**. General recommendations include:

- Develop prioritized strategies and milestones for management plan implementation.
- Develop a monitoring plan with specific tasks, schedules, and milestones.
- Determine and dedicate sufficient staffing for law enforcement, resource protection, monitoring, visitor outreach, maintenance, and resource management.
- Where appropriate, utilize organized volunteers for appropriate tasks, including monitoring, visitor outreach, and resource management.
- Develop a management and administration framework that is consistent with other Town open space properties.
- Develop and maintain relationships with key management partners and community stakeholders, including the San Miguel Conservation Foundation, Telluride Historical Museum, and others.
- Develop and maintain relationships with other regulatory and management entities, including the San Miguel County Weed Control Program, CDOW, USFWS, and the Grand Mesa, Uncompahgre, and Gunnison National Forests.

3.3 RESTORATION RECOMMENDATIONS

The evaluation of the ecology and resources contained within the Study Area identified many locations and specific features that are functioning well from an environmental standpoint. In other areas, impacts resulting from past land practices have degraded resources. In some cases there is an opportunity to improve existing conditions through physical restoration. Thirteen areas or items were identified where restoration efforts could increase ecological functions and values of the overall ecosystem.

Restoration ecology is the process of renewing a degraded, damaged or destroyed ecosystem through human intervention. True "restoration" is the process of manipulating an ecosystem in a manner that transforms it to a pre-human impact state. Given the human impacts within and adjoining the Study Area, improvements to the area are more accurately ecological rehabilitation; however, the term "restoration" is used in this Environmental Report.

Thirteen areas/specific items have been identified where restoration would most improve ecological functions and values. These areas are:

1. Tailings Remediation
2. San Miguel River Restoration
3. Mill Creek Restoration
4. Railroad Grade
5. Historical Cornet Creek Sewage Lagoons
6. Boomerang Road Agricultural Field
7. Eider Creek Agricultural Field
8. Eider Creek Restoration
9. Abandoned Sewer Ponds – Eider Creek Area
10. Historical Cornet Creek Confluence
11. Wetland Hydrology Restoration
12. Debris Piles
13. Abandoned Pond Area

The section below lists problems identified and restoration concepts and considerations for each of these thirteen potential restoration activities. Refer to **Figures 3-5 and 3-6** for approximate location of restoration opportunities. The concepts presented herein are ideas based on field observation and suggestions for improving the ecological functions and values of a specific area as well as the overall ecosystem of the Study Area. Potential sources of public funding for restoration activities are included in this section.

Restoration of these areas/items should be undertaken only with an understanding of the system as a whole and will require detailed planning. It is recommended that the Town develop a detailed restoration plan prior to undertaking any restoration activities. Restoration activities also should consider construction impact mitigation. A recommended approach to restoration including logical prioritization of improvements is included.

Photo 174


Photo 175


Photo 176

3.3.1 Restoration Opportunities

Thirteen specific locations/concepts for restoring ecologic value to the Study Area have been identified. Problems identified, potential restoration concepts, and considerations when undertaking restoration are provided below.

3.3.1.1 Tailings Remediation

Problems Identified

Tailings piles identified on the Study Area are generally locations of poor vegetation, unstable slopes, and potential health hazards **(Photos 175, 176, 177, 178)**.

Restoration Concepts

Restoration plans for the Society Turn Tailings Pile #1 have been approved as part of Idarado's Consent Decree agreement with the EPA. The current plan for these areas is to cap the tailings with 1 foot of soil and revegetate the surface with forbs.

The remaining tailings piles are not included in Idarado's Consent Decree and therefore do not have a current tailings reclamation plan. Multiple options exist for reclaiming the other piles including:

Photo 177

Photo 178

Photo 179

Photo 180

- Active revegetation of tailings
- Grading, stabilization and revegetation of tailings
- Grading, stabilization, capping and revegetation of tailings
- Potential in-situ treatment of tailings
- Consolidation of tailings piles
- Removal of tailings pile (to off site location or to Tailings Pile #1)

It is likely that the most effective plan of action may be a combination of the items above with each pile addressed individually based on site specific opportunities and constraints.

Considerations

Remediation of the Society Turn Tailings Pile #1 will require close coordination with the State and Idarado because an agreement and funding is in place for this work. A special consideration for this planned work is the pile's close proximity to the San Miguel River. Likely long-term lateral migration of the stream could encroach on tailings stabilization and potentially negatively affect in place restoration of these tailings.

- Remediation of other tailings piles will require coordination with other restoration activities and potential recreation on the Study Area. Any removal or grading should be done in a manner that minimizes damage to surrounding areas.
- Remediation of tailings piles through capping typically results in a very uniform and monotypic habitat development. Consideration should be given to the end goal of habitat development and appropriate vegetation community type for each remediation area.
- Seek opportunities to refine the remediation plan to ensure compatibility with San Miguel River restoration, habitat conservation, and other management activities on the Study Area.
- Minor remaining tailings piles also should be delineated and characterized in order to develop a remediation plan. Provide visual access to the large tailings area (following remediation) to interpret the history of the tailings and the long-term remediation process.

3.3.1.2 San Miguel River Restoration

Problems Identified

The health of the San Miguel River itself and the ecological benefits it provides have been significantly impacted. Impacts include channelization, loss of connectivity to its floodplain, eroding banks, lack of riparian vegetation, poor in-stream habitat, and confinement **(Photos 179, 180, 181)**.

Restoration Concepts

Channel restoration should focus on returning the San Miguel River channel to a planform and profile typical of a natural channel. Restoring the form of the San Miguel River would enhance the function of the stream system. Using the Rosgen Classification System, the San Miguel River through the Study Area would naturally be a Type C stream. A Type C stream is generally a meandering low gradient channel. Riffles/pool sequences and point bars are typical of this stream type. A Type C channel system has a broad, well defined floodplain that the channel accesses during high flow events.

Because a river is a dynamic system, there is no "correct" channel alignment that should be the goal of restoration. Appropriate "reference reaches" exist that should be mimicked when developing channel meander patterns, width/depth ratios and localized slopes. For a Type C stream in this setting, the restored channel would likely take on these general geometric characteristics:

- Slope < 1%
- Sinuosity > 1.4
- Width/Depth Ration> 20
- Entrenchment Ratio > 5

Restoration concepts may include full realignment of the channel or realignment of the most heavily impacted areas coupled with in-place enhancement of other non-channelized sections.

Considerations

Obtaining the desired channel shape and function will require major realignment of at least portions of the San Miguel River. The railroad grade would need to be removed or at least locally breached and a new channel alignment cut through areas that are currently not part of the river system. This would impact the existing sewer line.

Some potential direct and indirect impacts could result from moving the San Miguel River. For example, several potential channel realignments could cut through high quality non-Riverine habitat causing a direct impact to these areas. Conversely, moving the stream from its current location may result in decreased hydrologic connection to areas adjacent to the channel in its present state. This indirect impact could change existing quality systems.

Additionally, major channel restoration activities that include realignment of the channel likely will affect the regulatory floodplain. This should be considered when contemplating any structures or facilities on the Study Area.

Given the important role that the San Miguel River plays in the character and ecological value of the Study Area, it is advisable to address restoration of this resource as one of the first restoration activities that the Town may undertake.

3.3.1.3 Mill Creek Restoration

Problems Identified

The Mill Creek drainage has been disrupted by the undersized culverts under the Spur and by the culverts under the railroad grade, near its confluence with the San Miguel River. Both crossings fragment the natural riparian system and cause disconnectivity of resources. The crossings also negatively impact the flow regime and sediment transport. Between these two crossings the channel has been impacted and improvements are recommended **(Photos 182, 183, 184, 185)**.

Restoration Concepts

The most important piece of restoring Mill Creek is to address the crossings. Widening the highway crossing and eliminating the railroad grade (or portion of the grade) at the confluence with the San Miguel River would improve the hydraulics of the drainage and potentially reconnect the riparian system along Mill Creek, re-establishing an appropriate channel shape and function.

From where Mill Creek enters the Study Area to the confluence with the San Miguel River, instream improvements including habitat work, bank stabilization, and revegetation would enhance the system. Similar to the San Miguel

Photo 181

Photo 182

Photo 183

Photo 184

Photo 185

Photo 186

Photo 187

Photo 188

River itself, the stream would be restored to mimic a more natural channel geometry and riparian system. Removal of the railroad grade would provide the opportunity to realign the channel, particularly nearest the confluence, and re-establish a stream system with a more natural floodplain.

Considerations

Enlargement of the culverts under the Spur would impact the road. It also could alter the sediment regime in this area, which currently is a significant maintenance issue. Replacement of these culverts should be done with a good understanding of current sediment and debris flow concerns. Removal of the railroad grade (or portion of the grade) and enhancing the connection to the San Miguel River would require that the sewer line be modified or moved.

3.3.1.4 Railroad Grade

Problems Identified

The railroad grade causes significant impacts on the ecology of the Study Area. In some areas, the grade restricts surface water flows; in other areas, it fragments habitat. It eliminates the San Miguel River's ability to migrate laterally and access its floodplain. The presence of the railroad grade impacts nearly all resources on the Study Area, either directly, indirectly, or both **(Photos 186, 187, 188)**.

Restoration Concepts

Restoration would entail removal of a strategic section of the grade or potentially the entire grade. For historical purposes it may be desired to retain portions of the grade. The most appropriate portions of the railroad grade to retain are those in upland areas that are not confining the river nor cutting off surface flows.

Considerations

The Town's sewer line is buried within portions of the railroad grade. Removal of the railroad grade will require that the sewer line be rerouted, either within the Study Area or potentially in a completely new alignment.

Removing the railroad grade will have significant indirect effects on the Study Area. Boundaries of many micro habitats and the hydrology that affects them are defined as a result of the railroad grade. Removal of this feature will change many of these systems and reshape some of the makeup of the Study Area.

Full or partial removal of the railroad grade in locations where it currently confines the San Miguel River will impact the regulatory floodplain across the Study Area. This should be considered relative to the floodplain's effects on any planned activities.

3.3.1.5 Historical Cornet Creek Sewage Lagoons

Problems Identified

Sewage lagoons were excavated at the far eastern end of the Study Area. Groundwater was intercepted during the construction of these ponds and as a result they were not used as designed. The ponds affect the hydrology of the local wetland community **(Photo 189)**.

Restoration Concepts

The ponds currently provide habitat variety, but could be reconfigured to restore function to the broader wetland complex. This reconfiguration would likely include grading to re-establish hydrologic connection to the surrounding areas and wetland plantings.

Considerations

Work on this project would need to be done in a manner that does not degrade some of the high quality areas that exist. Naturalization of this area could create a high quality unique habitat feature directly adjacent to Town.

3.3.1.6 Boomerang Road Agricultural Field

Problems Identified

The upland fields adjacent to Boomerang Road have been impacted as a result of agricultural land practices and currently do not function as a native upland meadow. The meadow has been irrigated and diversion laterals exist throughout the area. Agricultural practices have resulted in altered hydrology and disturbed soils, and weeds and non-native vegetation have been introduced to the area **(Photo 190)**. Restoring such an area to a more natural condition would require removal of the irrigation practice.

Restoration Concepts

The area could be returned to a native upland meadow. Restoration would likely entail removal of the irrigation laterals, eradication of weed and other non-native vegetation, re-contouring, adding soil amendments, and seeding and planting using native upland material.

Considerations

Restoration of this area to a native upland meadow would need to consider potential impacts on the prairie dog colony. Modification of the landscape could change the quality and extent of the colony. A portion of the meadow also includes the historic San Miguel City. Ground-disturbing activities in this area should consider historical significance and any impacts grading may have on potential buried or surface cultural resources. In addition, removal or change in use of irrigation water rights must be considered.

3.3.1.7 Eider Creek Agricultural Field

Problems Identified

The upland agricultural fields adjacent to Eider Creek have been impacted as a result of agricultural land practices and currently do not function as a native upland meadow. The meadow has been irrigated and diversion laterals exist throughout the area. Agricultural practices have resulted in altered hydrology and disturbed soils, and weeds and non-native vegetation has established in the area **(Photos 191 and 192)**. Restoring such an area to a more natural condition would require removal of the irrigation practice.

Restoration Concepts

The area could be returned to a native upland meadow. Restoration would likely entail removal of the irrigation laterals, eradication of weed and other non-native vegetation, re-contouring, adding soil amendments, and revegetation using native upland material.

Considerations

Conversion of this area to a native upland meadow likely would be done in conjunction with restoration of Eider Creek. Potential restoration of Eider Creek would most likely impact irrigation practices that may alter the hydrology of the area. In addition, removal or change in use of irrigation water rights must be considered.

Photo 189

Photo 190

Photo 191

Photo 192

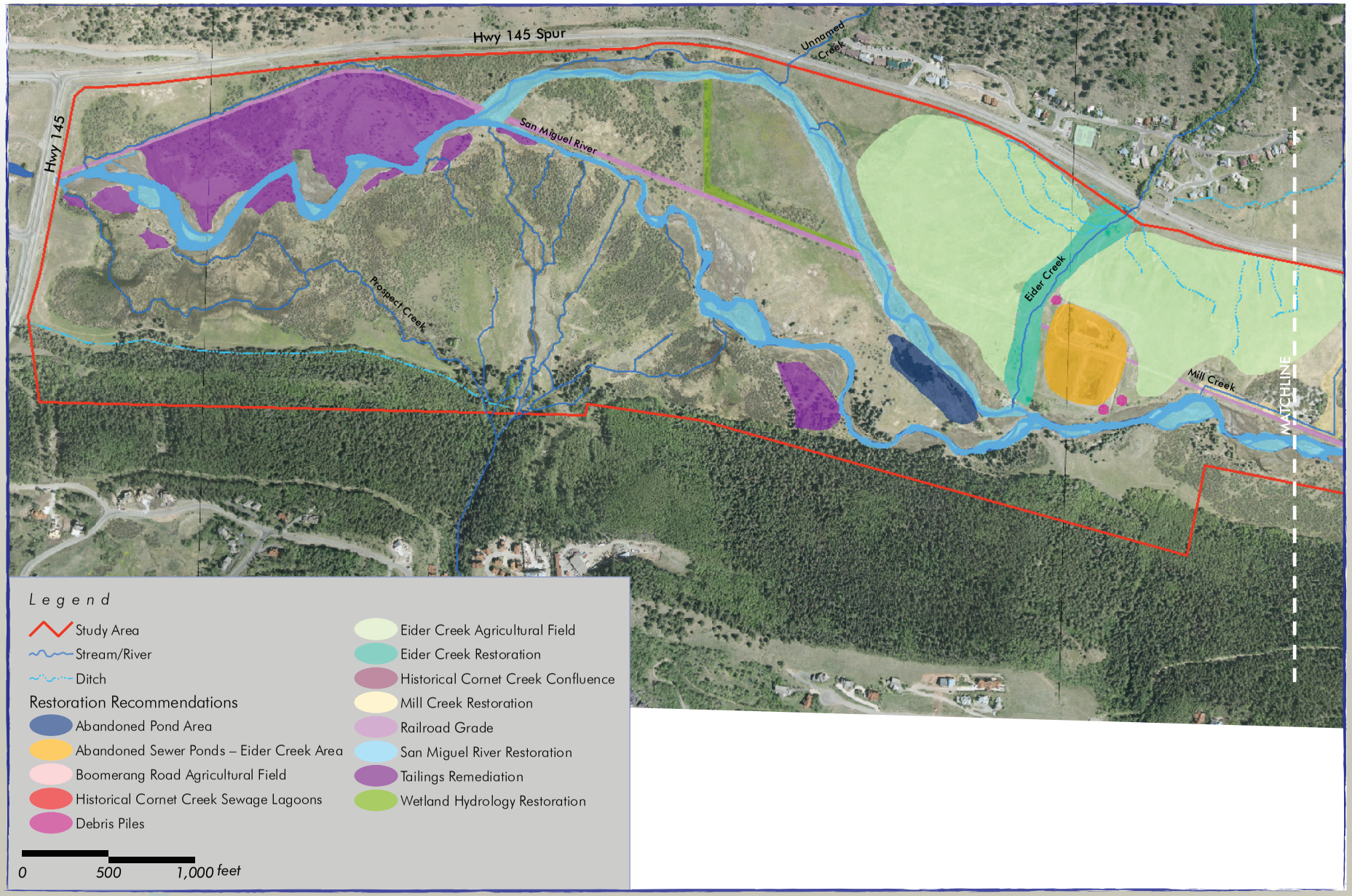

Figure 3-5

Restoration Recommendation Areas (West)

March 2009

N W E S

Telluride Valley Floor

Environmental Report

Town of Telluride

Ecological Resource Consultants, Inc.

ERC

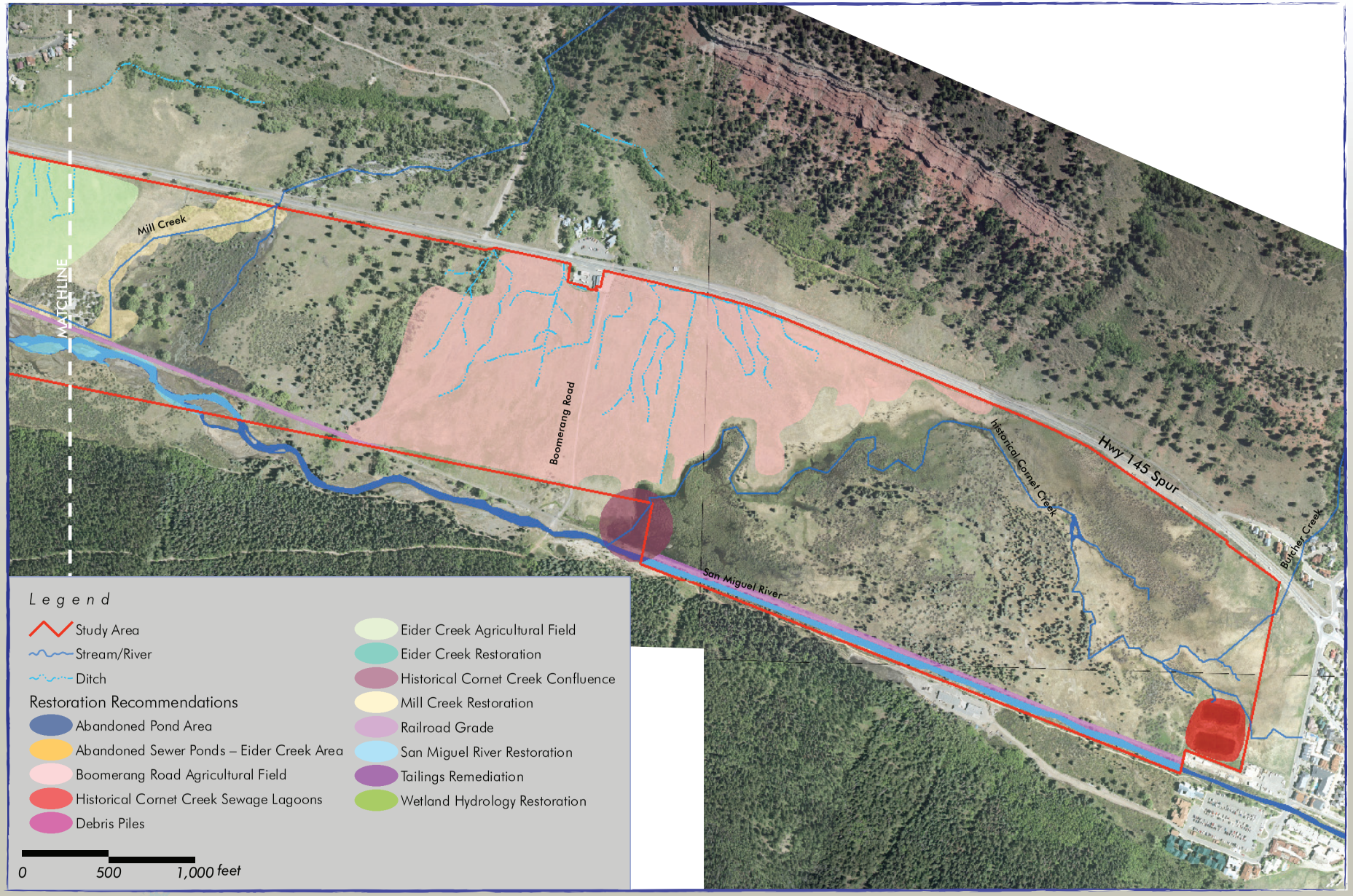

Figure 3-6

Restoration Recommendation Areas (East)

March 2009

Telluride Valley Floor
Environmental Report

Town of Telluride

Ecological Resource Consultants, Inc.

ERC

Photo 193

Photo 194

Photo 195

Photo 196

3.3.1.8 Eider Creek Restoration

Problems Identified

Agricultural diversions as well as the Spur culverts have altered the Eider Creek drainage as it enters the Study Area. The Spur culverts fragment the natural riparian system and cause disconnectivity of the resource. Eider Creek water is used to irrigate the adjacent fields as it flows south toward the San Miguel River. In its current state the creek is not functioning in a natural condition and has been managed more for irrigation than as a natural stream system. As such the Eider Creek drainage provides few of the benefits associated with a natural riparian system **(Photos 193 and 194)**. Irrigation practices are not a natural occurrence. Therefore, to restore such an area to a more natural condition would require removal of the irrigation practice.

Restoration Concepts

Widening the highway crossing would improve the hydraulics of the drainage and potentially reconnect the riparian system along Eider Creek. Eider Creek, from where it enters the Study Area to the confluence with the San Miguel River, could be restored to a natural stream system. This improvement could include realigning the stream to a natural meandering channel, adding instream aquatic habitat components, developing a riparian system by grading the adjacent areas, and introducing appropriate native vegetation.

Considerations

Naturalizing Eider Creek to enhance its ecological functions and values likely would reduce its irrigation function. Realigning the stream to include meanders, coupled with creating a riparian system, also would decrease the acreage available for agricultural production. In addition, removal or change in use of irrigation water rights must be considered.

3.3.1.9 Abandoned Sewer Ponds – Eider Creek Area

Problems Identified

An abandoned sewer pond system exists east of Eider Creek and north of the San Miguel River. Two separate ponds currently exist, one north and one south of the railroad grade. In addition, topographic depressions and unnatural grading exists in the area. The excavated ponds and surrounding area is engineered in character, likely disrupting local hydrology, and providing habitat that is below the area's potential **(Photos 195 and 196)**.

Restoration Concepts

The pond area could be restored to add complexity to the system and reconnect the area to the surrounding environment. Restoration likely would entail breaching or removing the railroad grade that currently separates the two ponds, contouring/grading the area between the ponds and adjacent to the ponds and increasing vegetation diversity. Restoration of the pond area also could be linked to restoration of Eider Creek and the connection to the riparian system of Eider Creek resulting in less habitat fragmentation.

Considerations

Restoration work in this area likely will require removal of at least a section of the railroad grade and modification to the sewer line.

3.3.1.10 Historical Cornet Creek Confluence

Problems Identified

The confluence of the historical Cornet Creek drainage and the San Miguel River has been disrupted as a result of the railroad grade. Hydrology and continuity of the riparian system are cut off by the berm **(Photos 197 and 198)**.

Restoration Concepts

Removal of the railroad grade in this area would restore the hydrologic function of the channel at the confluence. Creation of a riparian system by grading and planting appropriate native vegetation would defragment lost habitat.

Considerations

Work on the confluence of the historical Cornet Creek channel is dependent on removal of the railroad grade. Removal of the railroad grade also likely would require removal of or modification to the sewer line. This restoration activity likely would be impacted by potential restoration of the San Miguel River, which would likely shift from its current location.

Photo 197

Photo 198

3.3.1.11 Wetland Hydrology Restoration

Problems Identified

In several locations in the Study Area, berms have been constructed, either intentionally to confine surface water or other features or unintentionally as the result of excavation for other purposes. These berms currently disrupt surface and groundwater flow patterns, fragment habitat, and cut off the natural floodplain in areas **(Photos 199 and 200)**.

Restoration Concepts

Berms should be breached and contoured to match surrounding areas so that they do not inhibit water conveyance. Areas should be planted with native vegetation suitable for the surrounding hydrologic regime.

Considerations

Breaching these berms will alter the hydrology; vegetation and habitats on both sides of the berms will likely readjust to the altered hydrology.

Photo 199

3.3.1.12 Debris Piles

Problems Identified

Debris piles are present in several locations around the Study Area. The piles decrease the aesthetic appeal of the area **(Photos 201 and 202)**.

Restoration Concepts

Debris piles could be removed. After removal, the areas should be graded and planted with native vegetation consistent with the hydrologic regime of the area.

Considerations

When removing debris, care should be taken to minimize impacts to surrounding areas and ingress/egress paths. The cultural significance of debris should be verified prior to removal.

Photo 200

Photo 201

Photo 202

Photo 203

Photo 204

3.3.1.13 Abandoned Pond Area

Problems Identified

An abandoned pond system exists between the main stem and the north fork of the San Miguel River just west of the confluence of Eider Creek. The excavated pond is engineered in character, likely disrupting local hydrology and providing habitat that is below the area's potential **(Photos 203 and 204)**.

Restoration Concepts

The pond area could be restored to add complexity to the system and reconnect the area to the surrounding environment. Grading would likely be necessary to reconnect this area to adjacent areas, potentially connecting it with the existing north fork of the San Miguel River. This would result in less fragmentation and increase vegetation diversity and habitat in the area.

Considerations

Restoration of the abandoned pond area likely will be dependent on whether the restoration of the San Miguel River occurs.

3.3.2 Restoration Plan and Prioritization

The thirteen categories presented above include improvements that would restore large portions of the Study Area by mitigating past human impacts. Proposed restoration includes work that would improve vegetation, habitat, connectivity and aesthetic values.

A recommended approach for restoring the Study Area has been developed and is presented below. This approach breaks the thirteen identified categories down into four major restoration actions. Each of the four actions is prioritized based on known time constraints and a logical progression for improvements. The prioritized list consists of:

1. Society Turn Tailings Pile #1
2. River Restoration
3. Agricultural Fields
4. Miscellaneous Areas

Each group is discussed in more detail below.

Priority #1, Society Turn Tailings Pile #1

Remediation of Tailings Pile #1 should be the initial priority for improvements within the Study Area. This work is listed as the highest priority for several reasons: 1) it is logical to complete this task (or at least have a firm understanding of specific plans) prior to completing any river restoration in this area, 2) preliminary plans exist and money is available for this work, and 3) restoration work will need to be considered when the Town establishes near-term and long-term management and any recreation in this location.

The current restoration plan as agreed to in the Consent Decree calls for the tailings to be capped in place with 1 foot of topsoil and planted with forbs. The work and Idarado's responsibility for the remediation will be completed after 3 years assuming percent cover performance criteria are met. Taken out of the geographic context of the Study Area, the current plan as it exists may be an adequate remedy; however, given the proximity of the tailings to the San Miguel River, the current plan may not adequately address potential stream migration.

Lateral stream migration of the San Miguel River is an on-going natural process that should be expected to continue into the future. If left alone over time, the course of the San Miguel River will most likely take on a different alignment and cut into the restored tailings piles. This stream migration will likely erode the reclaimed slopes and re-expose the tailings. As part of the Town's role in the approval/permitting of the tailings remediation work, it is recommend that efforts be made to provide a stable, naturalized riparian buffer zone between the San Miguel River and the remediated tailings.

For the San Miguel River to be able to function as a natural stream system, an active channel and a vegetated flood overbank should exist. To accommodate this, the tailings piles should be pulled away from the active channel as far as possible, with a recommended minimum for the vegetated overbank of two times the bankfull width. Given a bankfull flow of approximately 400 cfs **(Section 2.8)**, the bankfull width of the active channel is expected to be approximately 35 feet resulting in a minimum recommended vegetated overbank width of 70 feet on each side of the active channel.

Additional protection should be added between the overbanks and the tailings piles to prevent migration during infrequent flood events. Armoring, such as a buried riprap slope, is an effective means of arresting lateral migration. Buried armoring that extends along the length of the tailings piles, placed adjacent to the San Miguel River deep enough to prevent scour, would effectively isolate the reclaimed tailings from the San Miguel River. In the event of a major flood flow, this armoring should limit the lateral extent of any migration and keep the tailings piles isolated from the San Miguel River.

The recommendations listed above are likely to cost significantly more than the current remediation plan. One of the major costs associated with the remediation plan as defined by the Consent Decree is sure to be the addition of topsoil, which will be used to cap the tailings piles. It is possible that if this work were done in conjunction with all or a part of river restoration (priority #2), topsoil may be available from that project to help offset some of the costs, making the tailings restoration improvements more economically feasible.

Priority #2, San Miguel River Restoration

Restoration of the San Miguel River should be the second priority for improvements within the Study Area. This work is listed as the second highest priority because: 1) the San Miguel River is one of the most significantly impacted resources within the Study Area, 2) physical restoration would greatly enhance this resource, and 3) modifications to the stream channel may have an impact on and directly and indirectly improve other resources and habitat.

Restoration of the San Miguel River will affect a significant portion of the Study Area. A holistic approach to this task would logically include several of the other recommended restoration items. An overall stream restoration plan should incorporate improvements to Mill Creek, Eider Creek, the historical Cornet Creek, the railroad grade, and disconnected wetland hydrology. All of these improvements have therefore been combined into this second restoration priority.

There is no single correct approach to restoring the San Miguel River. Over recent geologic time the stream has undoubtedly taken various forms and shapes through the Study Area. Because the restored channel could take the form of any of these past conditions or follow a completely new route, the opportunity exists to locate the channel in an alignment that minimizes impacts to higher environmentally sensitive areas yet maximizes aquatic and other direct and indirect benefits.

The straight, channelized sections of the San Miguel River near the upstream (east) end of the Study Area are the most damaged, least healthy existing segments of the stream. Realigning the upper end of the channel should be one of the first objectives of the stream restoration plan. Given the constraints imposed by the hillside to the south of the existing channel alignment and the highly sensitive area immediately north of the railroad grade, a logical alignment for this upper portion of the channel is to enter and follow the historical Cornet Creek drainage. Immediately after the San Miguel River passes downstream (west) of the existing development, the railroad grade could be breached and a new channel cut to the northwest, intercepting the smaller tributary channel. Connecting the San Miguel River to the historical Cornet Creek channel will require lowering the ground within Cornet Creek near the east end of the Study Area; however, from a reconnaissance level evaluation, it appears the elevations work reasonably well to allow this. The sewer line and existing railroad grade could be lowered with materials from the railroad grade used to fill the existing San Miguel River channel, which could then be revegetated. The railroad grade likely would be breached again near the existing confluence of the San Miguel River and the historical Cornet Creek drainage. Pending cooperation with the USFS, restoration could continue with a meandering planform through the USFS property.

Moving downstream the channel likely would benefit from another breach of the railroad grade, allowing the San Miguel River to intersect with Mill Creek north of the existing railroad grade. Improvements to the Mill Creek drainage could be included in this plan and would result in reconnection of these riparian systems. After recapturing Mill Creek, existing topography suggests that the most feasible alignment would meander back to the south, once again crossing the railroad grade, rejoining the existing alignment. Eider Creek would be intercepted in this area and improvements to this tributary will need to be consistent with the overall San Miguel River restoration, therefore Eider Creek's restoration plan should be completed concurrently.

In the vicinity of the Eider Creek confluence, the existing San Miguel River splits to the main stem and a north fork. Likely the restoration plan would recommend removing the split and having a single thread channel. From a topographical standpoint, the restored channel could follow either of these general paths. Regardless of the path ultimately chosen, existing berms and/or the railroad grade likely would be removed and additional meanders added to generate a more natural, stable planform.

Given the relative quality of some of the downstream portions of the San Miguel River west of where the two forks join back together, and the constraints surrounding the Society Turn Tailings Pile #1 through Reach 6, the overall shape of the San Miguel River from this point to the downstream end of the Study Area at Society Turn likely will remain in its existing alignment.

As part of the recommended stream work, restoration should also re-establish and/or enhance the riparian system. Similar to the recommendations for segments of the San Miguel River adjacent to the tailings piles, restored reaches should include an active channel as well as vegetated flood terraces. These riparian terraces improve the quality of the aquatic habitat but also will re-establish the natural dynamics of a valley stream system. Water quality, shading, habitat, flood retention, nutrient transport and groundwater storage/recharge benefits will result. River restoration, selective breaching of the railroad and other berms that channelize surface flows and restoring tributaries and their confluences with the San Miguel River will result in remedying some of the most significant human impacts to the Study Area.

The first step needed prior to the Town undertaking this work is to develop an overall river and riparian system restoration plan. The restoration plan should identify approximate locations for all improvements, quantify major cost items, and establish the guiding vision for future related restoration work. Given the magnitude and anticipated expense associated with a stream restoration project, careful planning is a necessity. Detailed knowledge of the existing environment, particularly areas of high environmental sensitivity, will help ensure that unintended negative impacts do not occur as the result of restoration activities. A logical stream alignment designed using the fundamentals of geomorphology is the key to the long-term sustainability of the design. From a practical standpoint, the restoration will need to be engineered to balance these geomorphologic requirements with a design that minimizes excavation, cost and impacts to the surrounding ecosystem.

Stream restoration of the magnitude required to undo the physical human impacts and optimize the affected resources will be an expensive, multi-million dollar undertaking. As is presented in **Section 3.3.3**, many grant opportunities exist for projects that enhance Riverine and riparian systems. The Town is mostly likely eligible for many of these funding sources. The recommended restoration plan, complete with construction cost estimates along with the justification for this restoration as presented in this Environmental Report, should provide the basic tools needed by the Town to apply for and secure outside funding.

Priority #3, Agricultural Fields

Restoration of fields converted from a native upland area for agricultural uses is recommended as the third priority of the Study Area. Ecological benefits from converting these areas would include removal of weeds and conversion of the altered, non-native pasture lands to native uplands. Fields adjacent to Boomerang Road and Eider Creek would benefit as a result. This work could be done as an independent project or in conjunction with other improvements.

Currently these lands have been altered by historical land practices. The area has been leveled, soils have been disturbed, lands have been irrigated, and non-native upland species have been introduced. Restoring these areas to a native upland will likely require the following steps:

- Eradicate all existing vegetation and seeds;
- Strip and stockpile all topsoil;
- Regrade the subsurface soils to remove irrigation laterals and restore a more natural, less uniform rolling topography;
- Spread stockpiled topsoil;
- Add amendments to the soil;
- Determine appropriate local/native vegetation species for revegetation;
- Reseed the entire area to establish a base vegetation;
- Create diverse test plots with native shrub and grass diversity;
- Install exclusionary fencing around test plot areas; and
- Monitor and maintain the restored upland areas.

The Town should address two major considerations prior to any restoration work on the agricultural fields. First, restoration work should be compatible with the Town's management plans for the Study Area. Second, the Town's existing water rights need to be carefully considered and should be preserved.

Table 3-4. Potential Valley Floor Restoration Funding Sources.

Source	Contact	Description
Federal Funding		
Environmental Finance Program	www.epa.gov/efinpage	Assists public and private sector in search for funding of environmental projects.
Five Star Restoration Program	www.epa.gov/owow/wetlands/restore/5star/	Small grants for education and training through wetland and stream restoration projects.
National Fish & Wildlife Foundation - Keystone Initiative Grants	www.nfwf.org/Content/NavigationMenu/Grants/GrantGuidelines/default.htm	Matching grants priorities - bird conservation, fish conservation, wildlife and habitat conservation.
National Fish & Wildlife Foundation - Special Grant Programs	http://www.nfwf.org/AM/Template.cfm?Section=Browse_All_Programs	Fifty different special grant programs - many region or project specific.
USDA-NRCS Wetland Reserve program	www.nrcs.usda.gov/programs/wrp/	Long-term conservation and wildlife practices and protection.
USDA-NRCS Wildlife Habitat Incentive program (WHIP)	www.nrcs.usda.gov/programs/whip/	Up to 75% cost sharing to establish and improve fish and wildlife habitat - various programs.
USFWS - North American Wetlands Conservation Act	www.fws.gov/birdhabitat/grants/nawca/index.shtm	Matching grants for wetland conservation projects for the benefit of wetland-associated migratory birds and other wildlife.
Recreational Trails Program	www.fhwa.dot.gov/tea21	Grants to develop and maintain motorized and non-motorized trails.
Transportation Enhancement Program	http://www.fhwa.dot.gov/tea21/factsheets/te.htm	Grants for trails, environment and/or cultural resource improvements.
State Funding		
CDOW wildlife conservation grant	http://wildlife.state.co.us/LandWater/PrivateLandProgram/CWCG/	Grants for projects that conserve, restore or enhance habitat of threatened, endangered or wildlife of concern.
Colorado State Parks (with GOCO)	http://parks.state.co.us/Trails/Grants/	Grants for public trails.
GOCO Legacy	www.goco.org	Multi-million $$ multi-year grants for outdoor recreation, wildlife and open space.
Fishing is Fun	http://wildlife.state.co.us/Fishing/ResourcesTips/FishingIsFunProgram/	Grants for projects that increase angling opportunities in Colorado.
Local Funding		
Telluride Foundation Land Conservation Fund	www.telluridefoundation.org	Provides grants for land conservation projects.
Private Funding		
Ducks Unlimited	www.ducks.org	Funding for acquisition and restoration of wetlands.
Fish America	www.fishamerica.org/grants/	Small grants for habitat improvements.
Trout Unlimited Embrace a Stream (EAS)	www.tu.org/eas	Small grants for cold water restoration and habitat improvements.
Colorado Wildlife Heritage Foundation	http://wildlife.state.co.us/CWHF/Apply/	Foundation that acquires funding for wildlife enhancement projects.
National Fish and Wildlife Foundation	www.nfwf.org	Keystone grant - grant ranges from 50k-300k and is for projects that conserve and protect populations of imperiled species.
Native Plant Conservation Initiative	www.nfwf.org	Supports projects that protect, enhance, and/or restore native plant communities on public and private lands.
Freshwater Fish Conservation Initiative	www.nfwf.org	Provides funding for projects that increase populations of flagship freshwater, anadromous and diadromous fish species and other aquatic species.
Wildlife Forever Challenge Grant	http://www.wildlifeforever.org/grants/overview.aspx	Offers grants for all wildlife projects by nonprofit conservation organizations and government agencies and small conservation projects in local communities.
Wildlife Habitat Incentives Program	http://www.nrcs.usda.gov/programs/whip/	Provides funding for projects that restore declining or important native wildlife habitats; protect, restore, develop or enhance wildlife habitat of at-risk species; reduce the impacts of invasive species on wildlife habitats; protect, restore, develop or enhance declining or important aquatic wildlife species' habitats.
Mule Deer Foundation	http://www.muledeer.org	Funds a variety of conservation projects including habitat enhancement.
Rocky Mountain Elk Foundation	http://www.rmef.org/	Funds a variety of projects that improve or conserve elk habitat.
Andrew W. Mellon Foundation	www.mellon.org	Funds projects that promote conservation.

The Town's ultimate management plan for the Study Area may include areas where more intensive recreational activities (i.e., festival uses, special events, camping) are allowed. Given that the current agricultural fields are less environmentally sensitive than many other parts of the Study Area, it is feasible that any such uses would occur at these locations. The concentrations of people associated with these activities could adversely affect the ecological health of the area due to trampling and weed infestation. This should be considered prior to implementing a restoration plan.

Water rights are another important consideration that needs to be properly evaluated prior to any restoration of the fields. Colorado water law dictates that water rights need to be used to be maintained. The continued use of all irrigation water in some beneficial form should, therefore, be a prerequisite to any restoration work. In the short term, it is recommended that current irrigation practices be continued. A detailed water rights evaluation should be completed and a plan for use of the Town's water rights that is compatible with existing management of the Study Area and any potential restoration be developed.

An evaluation of the water rights may conclude that the Town has many options for continued beneficial use of the water. Some potential options that may be available to the Town are:

- Continue to use the water for irrigation;
- Sell the water rights;
- Use the water to support the hydrology for new wetland/habitat areas within the Study Area;
- Use the water to develop a formal wetland mitigation bank within the Study Area;
- Transfer the water right from irrigation to an instream flow water right; or
- Use the water right for municipal needs.

Regardless of the path chosen, a detailed water rights analysis including legal advice is recommended.

Priority #4, Miscellaneous Areas

This category of restoration includes the generally smaller, isolated areas identified as potential restoration opportunities. Projects within this category include:

- Historical Cornet Creek Sewage Lagoons
- Sewage Ponds in the Eider Creek Area
- Debris Piles
- Isolated Tailings Piles

These projects are considered the fourth priority because, unlike the first three categories, there is either not the time constraint to complete the project (Tailings Pile #1) or because the benefits received would be more localized. In general, items grouped together under the fourth priority are 1) isolated in nature and/or 2) improvements where the existing system could be optimized, but are currently not detrimental to the overall ecology of the Study Area. Each of these projects could be addressed as a stand-alone activity or incorporated into a larger overall restoration plan. The Town also may conclude that while these projects are not the highest priority, the planning, timing, and costs to address these issues are comparatively minor and the Town may decide to undertake one or more of these restoration activities in the near term.

The scattered debris piles and isolated tailings piles fit into the first category. While these areas are localized problems detrimental to the overall condition of the Study Area, their impacts are believed to be isolated. Restoration should focus on removal of the debris and either removal or in situ stabilization of the tailings. In both cases, localized grading and revegetation should be completed after the tailings and debris are removed or stabilized.

The sewage lagoons are areas currently not detrimental to the overall health of the Study Area. The old lagoons are now functioning in a manner where they are providing ecological benefits; though the areas have been altered by human activities and are not functioning as natural systems. While restoration of these areas is not critical to the health of the Study Area, these areas should be addressed if the Town desires to restore the Study Area to a natural condition. Restoration would require grading work to eliminate the unnatural topography and the pond systems could be converted to more natural wetland and open water complexes.

3.3.3 Restoration Funding Opportunities

Opportunities for funding assistance with planning, design, and implementation of restoration are available. Federal, state, local and private funding opportunities were researched as part of this evaluation. A list of grant opportunities, their websites and a brief description of the types of projects that the particular grants typically fund is provided in **Table 3-4**.

3.4 LONG TERM MONITORING OPPORTUNITIES

This Environmental Report provides a snapshot of the health, function and condition of resources associated with the Study Area. Natural resources and physical characteristics of a parcel are ever-changing and influenced by human interaction (i.e., trails, recreational use, water diversion) and natural forces (i.e., drought, wildfire, floods, disease). Many opportunities exist for long-term, ongoing monitoring of the natural resources in the Study Area. Long-term monitoring that builds on data collected for this Environmental Report will provide the Town with valuable information on trends occurring in the Study Area and how certain activities influence physical characteristics. Long-term monitoring is also valuable information for better understanding specific Town interests, filling in data gaps, assisting in future restoration efforts, and quantifying changes in current condition.

3.4.1 Adaptive Management

An adaptive management program is recommended to identify potential issues and determine corrective measures as needed. Adaptive management is an incremental approach to managing a property that emphasizes monitoring, evaluation, and feedback. Knowledge of a resource, gained by monitoring management actions, is evaluated and incorporated into future management actions and decisions. This feedback loop facilitates effective management that remains connected to the changing resources on the Study Area. Key steps in the adaptive management process include:

- Establishing a clear set of goals and management objectives;
- Implementing management actions to address specific objectives;
- Monitoring to measure the effectiveness/consequences of management actions; and
- Evaluating to incorporate knowledge gained from monitoring and revising management actions accordingly.

Adaptive management will require that the Town periodically plan, re-plan, refine management objectives, and adapt resource management actions based on a growing understanding of the resources being managed, and how those resources respond to changes on the Study Area.

3.4.2 Monitoring Topics

The following provides numerous topics for additional monitoring opportunities the Town may wish to pursue. The monitoring protocols and resource topics should be specifically selected to ensure accurate, supportable data is obtained which will be beneficial for future use.

- **Wildlife surveys –** Because of the variable habits of some wildlife species and the reclusive nature of others, monitoring and observations of wildlife populations over time are important to understand wildlife use and trends. Several different types of wildlife monitoring could be used to gain this long-term perspective. Snow track count surveys are useful in identifying the presence of rare or reclusive species (such as carnivores), key movement corridors, and the variety of terrestrial species that are found in the area. Specific monitoring of elk behavior (including population size, movements to/from the Study Area, grazing behavior/impacts, mating or calving activity, or conflicts with visitors or vehicles) would be useful in identifying long-term trends and formulating necessary elk management approaches. The use of staff or volunteers to record general wildlife observations (i.e., species observed, movements, habitat use, interactions or conflicts with humans) is also very informative if collected on a consistent basis. Finally, ongoing bird counts are also valuable in developing a census of species that use the Study Area, and identifying changes that may indicate management issues or opportunities.
- **Groundwater data –** Groundwater monitoring wells (peizometers) could be installed across the entire Study Area to gain a better understanding of the groundwater elevations, fluctuations and flow patterns. The number and location layout of peizometers should be established by an appropriate expert in order to ensure sufficient data can be collected and should consider existing surface water features and potential restoration planning. Data should be collected on a routine basis to ensure seasonal groundwater fluctuations are observed as well as over multiple years. This data would be extremely useful for future restoration efforts to identify overall groundwater elevations, vegetation establishment, stream channel re-configuration and wetland creation/enhancement.
- **Soil characterization –** An understanding of the fundamental soil characteristics such as texture, chemistry and structure is extremely important for any restoration, revegetation or reclamation effort. Soil is the basic growth medium for all plant life and is made up of minerals, dead organic matter and living organisms. The characteristics of soil will influence the specific species of plants, community types and potential need for amendments in future restoration efforts. The Town could initiate a soil analysis project to collect soil samples throughout the Study Area and obtain laboratory results of soil characteristics.
- **Tailings piles stability –** Changes in the size, shape, and stability of the larger tailings piles could be monitored over time, particularly in areas where the San Miguel River directly abuts the piles. This information is important in understanding the rate of erosion and sloughing into the San Miguel River, potential deposition in other areas, and other changes that may have implications for tailings remediation plans, water quality protection, and aquatic habitat restoration. Simple monitoring methods in-

clude mapping the extent of tailings piles using GPS and/or aerial photos, repeat ground photo documentation from fixed points, and staff observations of river/tailings dynamics during high runoff periods.

- **Tailings revegetation –** A more detailed study of the specific vegetation species that have naturally established on the existing tailings could provide important information for future tailing remediation efforts. Based on the Field Site Characteristics efforts of this Environmental Report, areas of the existing tailings piles have started to revegetate. The plant species that voluntarily established in these areas have naturally adapted to the chemical characteristics of the tailings and could be considered prime candidate species for future revegetation or remediation efforts. Vegetation transects or plot sampling monitoring could be established and plant species evaluated over multiple years. Monitoring efforts should include an evaluation of the successes and failures of past tailings revegetation efforts completed by Idarado.
- **Prairie dog colony –** The size, population, and condition of the Gunnison's prairie dog colony could be monitored on at least an annual basis to identify changes or management issues. The areal extent of the colony could be mapped, using either a GPS unit or aerial photography on an annual basis, along with a count of the number of burrows in the area. Population monitoring could also be conducted on an annual basis (for the first several years) to track the number of individual prairie dogs that inhabit the colonies. Population surveys should be conducted in May, and should follow established protocols set forth by the CDOW. Vegetation composition (including species present, percent cover, and noxious weeds) could also be monitored within the colony to identify signs of stress, overpopulation, or indicators of other management issues.
- **Recreational impacts –** A variety of methods could be used to monitor the long-term impacts and trends resulting from various types of recreation. Social trails could be mapped (using GPS or hand-drawn on aerial photography) on an annual basis. Multiple photo documentation points could be established along existing and future trails to track trail widening, braiding, downcutting, erosion, drainage problems, or other impacts to trails. Repeat photos would be taken at least once annually. Hand measurements (with a tape measure) of trail width and depth at several key points are also useful in identifying trail wear, widening, and related impacts. Specific photo points could be established along groomed Nordic ski routes to document changes in vegetation over time. Specific measurements of vegetation composition may also be useful along Nordic ski routes to identify impacts from grooming. Finally, anecdotal or qualitative observations of impacts (by staff or the public) could be recorded in a spreadsheet or database that can be useful in identifying recurrent issues, problem areas, or trends.
- **Recreational use and conflicts –** Recreational use and conflicts should be monitored with both qualitative and quantitative measures. The installation of trail counters at key access points or along major trails is useful in identifying the number of users and use patterns (i.e., time of day, day of week). Also, rangers and staff could record basic information about their observations (i.e., general number of users, types and locations of users) in a spreadsheet or database following each visit to the Study Area. User conflicts, including observed conflicts, reported conflicts, and complaints, could also be recorded along with the day, time, and specific location of the problem. Over time, a continuous log of observations and conflicts can be useful in identifying recurrent issues, problem areas, or trends – information that is critical in managing or rectifying the issue.

- **Vegetation community composition –** Changes in vegetation community composition (i.e., weed establishment, species decline/disease) can be a useful indicator in determining land use impacts. As the Study Area becomes open to more public use, impacts are inevitable. In order to assess potential land use impacts, one evaluation method could be used to evaluate changes in vegetation community composition. Weed establishment is a common impact associated with land use changes. The Town could establish a weed mapping program in order to identify and monitor the potential weed patterns on the Study Area and implement appropriate adaptive management programs. Other vegetation monitoring could include establishing test plots to evaluate community changes and/or identify stressed or dying trees as well as new tree recruitment.
- **Histosol evaluation –** Wetlands containing histosols are rare and difficult to replace resources. Histosols, which are discussed in detail in Section 2.1.2.5, are defined as organic soils which contain 16 inches or more of organic soil material within the upper 32 inches of a soil profile with an organic carbon content (by weight) of 12-18% (USDA-NRCS 2006). The wetland assessment completed for this Environmental Report included a limited number of soil cores through key wetland communities but did not include a detailed mapping of *all* potential areas containing histosols. Therefore, a comprehensive histosol evaluation should be completed for all wetlands in the Study Area. Detailed mapping of histosols would provide important information for future management or restoration associated with these areas. The sampling methodology should include systematically digging soil cores along pre-defined transect lines through all wetland areas. Soils which appear meet the characteristics of a histosol in the field should be laboratory analyzed for percent organic carbon content for accurate histosol identification.
- **Fish Surveys –** The Town could work with the CDOW to establish fish population surveys. Fish population surveys can provide valuable information regarding aquatic health of the San Miguel River system as well as population trends of the fishery. Typical fish surveys are conducted by either creel surveys or electro-shocking. A creel survey is a technique used to obtain information on a fishery. Creel surveys involve interviewing anglers to collect details about; their catch (i.e., species, length, weight), time spent fishing, type of fishing (i.e., boat or shore) and the distance they have travelled to go fishing. Interviews are recorded throughout the day, typically when angling activity is highest and several times per season. The data collected can provide useful information on the use of the fishery as well as populations patterns. Electro-shocking is a process of fish population survey typically done by the CDOW in conjunction with local volunteers. Typically the CDOW establishes a sample location and then conducts yearly fish population inventories. The general public is often encouraged to assist with data collection.
- **Benthic macroinvertebrate sampling –** Continuation of the BMI sampling protocol established in **Section 2.3.1.2** could provide useful data on aquatic health patterns over time within the San Miguel River. The sampling protocol should be followed similarly to ensure consistent data comparison. Samplings could occur on a routine basis throughout the year to evaluate seasonal change and lifecycles. The Town could establish a routine sampling effort and submit samples to a qualified laboratory. Laboratory results could then be compared to evaluate changes or trends in aquatic health patterns.

4.0 References

4.0 REFERENCES

1. Allen, Arthur W. 1984. Habitat Suitability Index Models: Marten. FWS/OBS-82/10.11 (Revised). Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service. 13 p. [11714].

2. Anderson, Eric. 2007. Changes in Bird Communities and Willow Habitats Associated with Fed Elk. *Wilson Journal of Ornithology* 119(3):400–409, 2007.

3. Andrews, R. and R. Righter. 1992. *Colorado Birds: A Reference to their Distribution and Habitat*. pp. 69. Denver Museum of Natural History. Denver, CO.

4. Angulski, Debra. 1989. Archaeological Resource Survey of a Stretch of Highway West of Telluride, San Miguel County, Colorado. Colorado Department of Highways Project SR 0145(14), Telluride Spur.

5. Aubry, K.B., G. Koehler, and J. R. Squires. 2000. Ecology of Canada Lynx in Southern Boreal Forests. Chapter 13. In Ruggerio, L.F. et al. eds. Ecology and conservation of lynx in the United States. University Press of Colorado. Boulder, CO.

6. Bailey, A.M. and R.J. Niedrach. 1965. *Birds of Colorado*. Denver Museum of Natural History.

7. Baird, V.B. 1942. *Wild Violets of North America*. University of California Press, Berkeley, CA.

8. Baker, B.W., and E.P. Hill. 2003. Beaver (*Castor canadensis*). Pages 288-310 in G. A. Feldhamer, B. C. Thompson, and J. A. Chapman, editors. *Wild Mammals of North America: Biology, Management, and Conservation*. Second Edition. The Johns Hopkins University Press, Baltimore, Maryland, USA.

9. Baker, Steven G. 1987. Cultural Resource Inventory for the San Miguel Hydroelectric Project, San Miguel County, Colorado. Prepared for CH2M Hill, Rocky Mountain Office. Copies available from the Colorado Office of Archaeology and Historic Preservation, Denver.

10. Baker, Steven G., Richard F. Carrillo, and Carl D. Spath. 1999a. Chapter 2. Protohistoric and Historic Native Americans. *In Colorado History: A Context for Historical Archaeology*, edited by E. Steve Cassells, pp. 153-176. Colorado Council of Professional Archaeologists, Denver.

11. Baker, Steven G., Duane Smith, and Martha Sullenberger-Fry. 1999b. Chapter 4. Victorian Mining Settlements. *In Colorado History: A Context for Historical Archaeology*, edited by E. Steve Cassells, pp. 29-106. Colorado Council of Professional Archaeologists, Denver.

12. Baker, B.W., H.C. Ducharme, D.C.S. Mitchell, T.R. Stanley, and H.R. Peinetti. 2005. Interaction of Beaver and Elk Herbivory Reduces Standing Crop of Willow. *Ecological Applications*, 15(1), 2005, 110-118.

13. Bakko, E. B., and J. Nahorniak. 1986. Torpor Patterns in Captive White-tailed Prairie Dogs (*Cynomys leucurus*). *Journal of Mammalogy* 67:576-578.

14. Bakko, E. B., and L. N. Brown. 1967. Breeding Biology of the White-tailed Prairie Dog, (*Cynomys leucurus*), in Wyoming. *Journal of Mammalogy* 48:100-112.

15. Barbour, Elizabeth. 1994. Colorado Cultural Resource Survey Form dated 9/93-4/94 for the 1993-1994 Telluride Secondary Structure Survey.

16. Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

17. Baumann, R.W., A.R. Gaufin, and R.F. Surdick. 1977. The Stoneflies (Plecoptera) of the Rocky Mountains. Memoirs of the American Entomological Society Number 31.

18. Beauvais. G.P. 1997. Mammals in Fragmented Forests in the Rocky Mountains: Community Structure, Habitat Selection, and Individual Fitness. Ph.D. Dissertation, Univ. Wyoming, Laramie, WY.

19. Ben-David, M., L.K. Duffy, G.M. Blundell, and R.T. Bowyer. 2001a. Exposure of Coastal River Otters to Mercury: Relation to Age, Diet, and Survival. *Environmental Toxicology and Chemistry* 20:1986-1992.

20. Ben-David, M., L.K. Duffy, and R.T. Bowyer. 2001b. Biomarker Responses in River Otters Experimentally Exposed to Oil Contamination. *Journal of Wildlife Diseases* 37:489-508.

21. Berglund, J. and R. McEldowney. 2008. MDT Montana Wetland Assessment Method. Prepared for: Montana Department of Transportation. Post, Buckley, Schuh & Jernigan. Helena, Montana. 42 p.

22. BIO-Logic. 2008. Town of Telluride Valley Floor Conservation Easement: Baseline Documentation Report. Prepared by BIO-Logic, Inc., Montrose, CO.

23. Bisson, P.A., S.M. Wondzell, G.H. Reeves, and S.V. Gregory. 2003. Trends in American Rivers. *American Fisheries Society Symposium* 37:391-406.

24. (BLM) Bureau of Land Management. 2008. Aquatic Invertebrate Report for Samples Collected by Montrose Field Office in the San Miguel Basin in 2007. 28 April 2008.

25. Bowyer, R.T., G.M. Blundell, M. Ben-David, S.C. Jewett, Thomas A. Dean, and L.K. Duffy. 2003. Effects of the Exxon Valdez Oil Spill on River Otters: Injury and Recovery of a Sentinel Species. Wildlife Monographs No. 153.

26. Boyle, S. 2006. North American River Otter (*Lontra canadensis*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/northamericanriverotter.pdf [November 30, 2008]. , September 2, 2006.

27. Bozek, M.A. and W.A. Hubert. 1992. Segregation of Resident Trout in Streams as Predicted by Three Habitat Dimensions. *Canadian Journal of Zoology* 70:886-890.

28. Bradley, P.V. 1986. Ecology of River Otters in Nevada. M.S. Thesis, University of Nevada, Reno, NV.

29. Brittell, J. D. 1989. Native Cats of Washington - Section III: Lynx. Washington State Department of Wildlife. Olympia, WA.

30. Brock, J.P. and K. Kaufman. 2003. *Butterflies of North America*. Houghton Mifflin, New York, NY. 383 pp.

31. Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). In *The Birds of North America*, No. 506 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

32. Buys, Christian J. 2003. *A Brief History of Telluride*. Western Reflections Publishing Company, Montrose, Colorado.

33. Caddy, Mark. 2008. District Wildlife Manager. Personal communication with Bill Mangle, Natural Resource Planner, ERO Resources Corporation. July 27 and December 23, 2008.

34. (CDOW) Colorado Division of Wildlife. 2008a. Colorado Gunnison's and White-tailed Prairie Dog Conservation Plan; Draft Statewide Conservation Plan. September. Available at http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/Mammals/GunnisonsWhitetailPrairieDogConsPlan.htm.

35. _____. 2008b. Natural Diversity Information Source GIS Database.

36. _____. 2008c. Lynx Update. Prepared by Tanya Shenk. August 27, 2008.

37. Chimner, R.A, D.J. Cooper, K. Northcott and J. Lemly. 2006. Final Report: Regional Assessment of Fen Distribution, Condition, and Restoration Needs, San Juan Mountains.

38. Clancy, C.G. 1988. Effects of Dewatering on Spawning by Yellowstone Cutthroat Trout in Tributaries to the Yellowstone River, Montana. *American Fisheries Society Symposium* 4:37-41.

39. (CNHP) Colorado Natural Heritage and Endangered Species Program. 2008. List of Species in San Miguel County.

40. Colorado River Fishes Recovery Team. 1978. Colorado squawfish recovery plan. U.S. Fish and Wildlife Service.

41. Collman, Russ and Dell A. McCoy. 1991. *The R.G.S. Story: Volume II – Telluride, Pandora, and the mines above*. Sundance Publications, Ltd., Denver.

42. Cooper, D. J. and E.C. Wolf. 2006. The Influence of Ground Water Pumping on Wetlands in Crane Flat, Yosemite National Park, California. March 2006.

43. Corn, P.S. and F.A. Vertucci. 1992. Descriptive Risk Assessment of the Effects of Acidic Deposition on Rocky Mountain Amphibians. *Journal of Herpetology* 26:361-369.

44. Corn, P.S., W. Stolzenburg, and R.B. Bury. 1989. Acid Precipitation Studies in Colorado and Wyoming: Interim Report of Surveys of Montane Amphibians and Water Chemistry. USDI Fish and Wildlife Service Biological Report 80(40.26).

45. Cowardin, L.M., V. Carter, F.C. Golet, & E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States (FWS/OBS-79/31). Office of Biological Services, Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C.

46. Craig, G.R. and J.H. Enderson. 2004. Peregrine Falcon Biology and Management in Colorado, 1973-2001. Tech. Publ. no. 43, Colorado Div. of Wildlife. Ft. Collins, CO. 80 pp.

47. Cronquist, Arthur. *Intermountain Flora: Vascular Plants of the Intermountain West, U.S.A.* Volume 6. New York Botanical Garden. 1977.

48. CRCT Task Force. 2001. Conservation Agreement and Strategy for Colorado River Cutthroat Trout (*Oncorhynchus clarki pleuriticus*) in the States of Colorado, Utah, and Wyoming. Colorado Division of Wildlife, Fort Collins, Colorado.

49. De Rito, J.N., Jr. 2004. Assessment of Reproductive Isolation between Yellowstone Cutthroat Trout and Rainbow Trout in the Yellowstone River, Montana. Master's thesis, Montana State University, Bozeman, Montana.

50. Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, P.A. Rabie, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Burrowing Owl. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Available online at http://www.npwrc.usgs.gov/resource/literatr/grasbird/buow/buow.htm

51. Decker, K., D.R. Culver, and D.G. Anderson. 2006. *Eriophorum gracile* (slender cottongrass): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available online at http://www.fs.fed.us/r2/projects/scp/assessments/eriophorumgracile.pdf [12/18/2008].

52. Desmond, M.J. and J.A. Savidge. 1998. Burrowing Owl Conservation in the Great Plains. Page 9 in Abstracts of the Second International Burrowing Owl Symposium, Ogden, Utah.

53. Dolloff, C.A. 1986. Effects of Stream Cleaning on Juvenile Coho Salmon and Dolly Varden in Southeast Alaska. *Transactions of the American Fisheries Society* 115:743-755.

54. Dolloff, C.A. and J.L. Warren, Jr. 2003. Fish relationships with large wood in small streams. *American Fisheries Society Symposium* 37:179-193.

55. Duebbert, H. F. and J. T. Lokemoen. 1977. Upland Nesting of American Bitterns, Marsh Hawks, and Short-eared Owls. *Prairie Naturalist* 9(3/4):33-40.

56. Durst, S.L., M.K. Sogge, A.B. Smith, S.O. Williams III, B.E. Kus, S.J. Sferra. 2005. Southwestern willow flycatcher breeding site and territory summary – 2003. U.S. Geological Survey, Southwest Biological Science Center, Colorado Plateau Research Station, Flagstaff, AZ.

57. Eininger, S and J.K. Gaunt. 1984. Cultural Resource Survey of the Telluride Ski Area Expansion, San Miguel County, Colorado. Copies available from the Colorado Office of Archaeology and Historic Preservation, Denver.

58. Edmunds, G. F., Jr., S. L. Jensen and L. Berner. 1976. *The Mayflies of North and Central America*. North Central Publishing Co., St. Paul, Minnesota.

59. Enderson, James H. 1964. Prairie Falcon in the Rocky Mountain Region. *The Auk*, Vol. 81, No. 3, (Jul., 1964), pp. 332-352.

60. Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, U.S. Army Corps of Engineer Waterways Experiment Station. Vicksburg, MS.

61. _____. 2008. Interim Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Western Mountains, Valleys, and Coast Region Supplement. ERDC/EL TR-08-13. U.S. Army Engineer Research and Development Center. Vicksburg, MS. April.

62. (EPA) U. S. Environmental Protection Agency. 2008a. Section 303(d) List Fact Sheet for Watershed – San Miguel County; San Miguel River – Marshall Creek to S. Fork San Miguel River. Available online at: http://oaspub.epa.gov/tmdl/huc_rept.control?p_huc=14030003&p_huc_desc=SAN%20MIGUEL&p_cycle=2004

63. _____. 2007b. Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States. June 2007.

64. (ERC) Ecological Resource Consultants, Inc. 2008. Wetland and Waters of the US Delineation and Ecological Assessment. ERC Staff: David Blauch, V.P., Senior Ecologist; Diane Krzysztof, Ecologist; Aaron Eilers, Staff Ecologist. July 2008.

65. Fausch, K.D. 1989. Do Gradient and Temperature Affect Distributions of, and Interactions Between, Brook Carr (Salvelinus fontinalis) and Other Resident Salmonids in Streams. Physiology and Ecology Japan, Special Volume 1:303-322.

66. (FEMA) Federal Emergency Management Agency. 1992. San Miguel County Colorado and Incorporated Areas Flood Insurance Study. September 30, 1992.

67. Finch, D.M. and S.H. Stoleson, Eds. 1999. Status, ecology, and conservation of the southwestern willow flycatcher. US Forest Service Rocky Mountain Research Station, Albuquerque, NM.

68. Fitzgerald, J.P., C.A. Meaney, and D.M. Armstrong. 1994. *Mammals of Colorado*. Denver Museum of Natural History and University Press of Colorado, Boulder, Colorado.

69. Foley, R.E., S.J. Jackling, R.J. Sloan, and M.K. Brown. 1988. Organochlorine and Mercury Residues in Wild Mink and Otter: Comparison with Fish. *Environmental Toxicology and Chemistry* 7:363-37.

70. Front Range Research Associates, Inc. 1987. National Register of Historic Places Nomination Form for the Telluride National Historic Landmark District.

71. Gleason, R. S. 1978. Aspects of the breeding biology of burrowing owls in southeastern Idaho. M.S. Thesis, University of Idaho, Moscow, Idaho, USA.

72. Gleason, R.S. and D.R. Johnson, 1985, Factors influencing nesting success of burrowing owls in southeastern Idaho. *Great Basin Naturalist* 45: 81-84.

73. Gresswell, R.E., W.J. Liss, G.L. Larson, and P.J. Bartlein. 1997. Influence of basin-scale physical variables on life history characteristics of cutthroat trout in Yellowstone Lake. *North American Journal of Fisheries Management* 17:1046-1064.

74. Groeneveld, David P., Ph.D. 1995. A Conceptual Design: West Telluride Wetland Rehabilitation. For an Amended Mitigation Plan Permit #9557. For Foley Associates on behalf of the Town of Telluride. May.

75. Gresswell, R.E. 1995. Yellowstone cutthroat trout. In Conservation Assessment for Inland Cutthroat Trout. General Tech. Report RM-GTR-256. USDA Forest Service. February 1995.

76. Hamerstrom, F. and M. Kopeny. 1981. Harrier nest-site vegetation. *Raptor Research* 15:86-88.

77. Hammerson, G.A. 1999. Amphibians and Reptiles in Colorado, Second edition. University Press of Colorado, Colorado Division of Wildlife. xxvi + 484 pp.

78. Hammond, P.C. 1974. An ecological survey of the nymphalid butterfly genus Speyeria. M.S. Thesis, University of Nebraska, Lincoln, NE.

79. Harlow, H. J., and G. E. Menkens, Jr. 1986. A comparison of hibernation in the black tailed prairie dog, white-tailed prairie dog, and Wyoming ground squirrel. *Canadian Journal of Zoology* 64: 793-796.

80. Haug, E.A., B.A Millsap, and M.S. Martell. 1993. Burrowing Owl (*Speotuyo Cunicularia*) In the Birds of North America, No. 149. The Academy of Natural Sciences, Philadelphia PA, and American Ornithologists Union, Washington, D.C. 20pp.

81. Hayward, G. D. and P. H. Hayward. 1993. Boreal Owl (*Aegolius funereus*). In The Birds of North America, No. 63 (A. Poole, and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

82. Hecht, W.R. 1951. Nesting of the Marsh Hawk at Delta, Manitoba. *Wilson Bulletin* 63:167-176.

83. Henderson, R.C., J.L. Kershner, and C.A. Toline. 2000. Timing and location of spawning of non-native wild rainbow trout and native cutthroat trout in the South Fork Snake River, Idaho, with implications for hybridization. North American Journal of Fisheries Management 20:584-596.

84. Henny, C.J., L.J. Blus, S.V. Gregory, and C.J. Stafford. 1981. PCB's and organochlorine pesticides in wild mink and river otters form Oregon. Proceedings of the Worldwide Furbearer Conference 3:1763-1780.

85. Herkert, J.R., S.A. Simpson, R.L. Westemeier, T.L. Esker, and J.W. Walk. 1999. Response of Northern Harriers and Short-eared Owls to grassland management in Illinois. *Journal of Wildlife Management* 63:517-523.

86. Herron, G.B., C.A. Mortimore, and M.S. Tawlings. 1985. Nevada raptors, their biology and management. Nevada Department of Wildlife, Biological Bulletin No. 8. Reno, NV.

87. (HPRCC) High Plains Regional Climate Center. Accessed January 5, 2008. http://www.hprcc.unl.edu/data/historical/index.php?state=co&action=select_state&submit=Select+State

88. Hilsenhoff, W. L. 1988. Rapid field assessment of organic pollution with a family level biotic index. The *Journal of the North American Benthological Society*. 7:65-68.

89. Hilsenhoff, W.L. 1987. An improved index of organic stream pollution. *The Great Lakes Entomologist*. 20:31-39.

90. Hirsch, C. L., S. E. Albeke, and T. P. Nesler. 2006. Range-wide status of Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*):2005. Colorado River Cutthroat Trout Conservation Team Report. Colorado Division of Wildlife, Fort Collins, Colorado.

91. Keinath, D. and M. McGee. 2005. Boreal Toad (*Bufo boreas boreas*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. May 25, 2005. Available online at http://www.fs.fed.us/r2/projects/scp/assessments/borealtoad.pdf [Accessed August 29, 2008].

92. Kennedy, P.L. 2003. Northern Goshawk (*Accipiter gentiles atricapillus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available online at: http://www.fs.fed.us/r2/projects/scp/assessments/northerngoshawk.pdf [Accessed September 12, 2008]. January 2, 2003.

93. Kershner, J.L. 1995. Bonneville cutthroat trout. In Conservation Assessment for Inland Cutthroat Trout. General Tech. Report RM-GTR-256. USDA Forest Service. February 1995.

94. Kershner, J.L., C.M. Bischoff, and D.L. Horan. 1997. Population, habitat, and genetic characteristics of Colorado River cutthroat trout in wilderness and nonwilderness stream sections in the Uinta Mountains of Utah and Wyoming. *North American Journal of Fisheries Management* 17:1134-1143.

95. Kimber, K.R. and G.V. Kollias. 2000. Infectious and parasitic diseases and contaminant-related problems of North American river otters (*Lontra canadensis*): A review. *Journal of Zoo and Wildlife Medicine* 31:452-472.

96. Kingery, H.E. (ed). 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado, USA.

97. Klute, D.S., L.W. Ayers, M.T. Green, W.H. Howe, S.L. Jones, J.A. Shaffer, S.R. Sheffield, and T.S. Zimmerman. 2003. Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States. U.S. Department of Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003, Washington, D.C.

98. Kochert, M.N., K. Steenhof, C.L. McIntyre and E.H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). (A. Poole, Ed.) Ithaca: Cornell Lab of Ornithology: Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/684. 07 August 2008.

99. Koehler, Gary M.; Hornocker, Maurice G. 1977. Fire effects on Marten Habitat in the Selway-Bitterrroot Wilderness. Journal of Wildlife Management. 41(2): 500-505. [7637].

100. Koehler, G.M. 1990. Population and habitat characteristics of lynx and snowshoe hares in north central Washington. Can. J. Zool. 68:845-851. In: Washington Department of Wildlife 1993. Status of North American lynx in Washington. Draft unpubl. Report. Olympia, WA.

101. Lee, D. S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister, and J. R. Stauffer, Jr. 1980. Atlas of North American Freshwater Fishes. North Carolina State Museum of Natural History. 867 pp.

102. Ludwig, J.A. and J.F. Reynolds. 1988. Statistical ecology: a primer on methods and computing. John Wiley and Sons. New York.

103. Lynx Biology Team. 2000. Canada lynx conservation assessment and strategy. Bill Ruediger, team leader, USDA Forest Service. Other participants from the Bureau of Land Management, U.S. Fish and Wildlife Service, and National Park Service.

104. Mack, C.M. 1985. River otter restoration in Grand County, Colorado. M.S. Thesis, Colorado State University, Fort Collins, CO.

105. MacWhirter, R.B. and K.L. Bildstein.1996. Northern Harrier (Circus cyaneus) in A. Poole and F. Gill, editors. The Birds of North America, 210. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C. 31 pages.

106. Magee, J.P., T.E. McMahon, and R.F. Thurow. 1996. Spatial variation in spawning habitat of cutthroat trout in a sediment-rich stream basin. Transactions of the American Fisheries Society 125:768-779.

107. Mahoney, William "Senior". 2008. Interview conducted on December 9, 2008 regarding the historic cultural resources in the Valley Floor.

108. Martell, M. 1992. Bald Eagle Winter Management Guidelines. USFWS, Region 3. The Raptor Center, University of Minnesota, St. Paul, MN Minneapolis, MN.

109. McCafferty, W. P. 1981. Aquatic Entomology. Jones and Bartlett Publishers, Inc., Boston.

110. McIntyre J.D. and B.E. Rieman. 1995. Westslope cutthroat trout. In Conservation Assessment for Inland Cutthroat Trout. General Tech. Report RM-GTR-256. USDA Forest Service. February 1995.

111. McKelvey, K.S., K. B. Aubry, and Y. K. Ortega. 2000. History and distribution of lynx in the contiguous United States. Pages 207-264 *in* Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, G.M. Koehler, C. J. Krebs, K. S. McKelvey, and J. R. Squires. (Tech. Eds.) Ecology and conservation of lynx in the United States. University Press of Colorado. Boulder, CO. 480 pp.

112. Mehls, Steven F. and Joel Tyberg. 2001. *Historical Cultural Resources Study of the Idarado Mining Company Property in the Vicinity of Telluride, Colorado*. Prepared for Design Workshop and the Idarado Mining Company. Copies available from the Colorado Office of Archaeology and Historic Preservation, Denver.

113. (MEI) Mussetter Engineering, Inc. 2008. Cornet Creek Drainage Maintenance and Flood Mitigation Study, Colorado. Prepared for Town of Telluride Department of Public Works. March 11, 2008.

114. Melquist, W.E. and M.G. Hornocker. 1983. Ecology of river otters in west central Idaho. *Wildlife Monographs* 83.

115. Merritt, R.W. K.W. Cummins, and M. B. Berg, editors. 2008. An introduction to the aquatic insects of North America. Kendall/Hunt Publishing Company, Dubuque, Iowa. 4th Edition.

116. Montgomery, D.R., B.D. Collins, J.M. Buffington, and T.B. Abbe. 2003. Geomorphic effects of wood in rivers. *American Fisheries Society Symposium* 37:21-47.

117. NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.7. NatureServe, Arlington, VA. Available online at: http://www.natureserve.org/explorer [Accessed on September 1, 2008].

118. Neely, Ronald J. Burr and Gianfranco Archimede. 2004. *Cultural Resource Inventory of Select Historic Sites in San Miguel County, Colorado*. Prepared for San Miguel County. Copies available from the Colorado Office of Archaeology and Historic Preservation, Denver.

119. Nickens, Paul R. 1984. *Cultural Resource Inventory for the Telluride Regional Sewer Plant Site and Interceptor Route Alternatives*. Prepared for Arix Engineering and the Forest Service. Copies available from the Colorado Office of Archaeology and Historic Preservation, Denver.

120. (NPS) National Park Service. 2007. Elk and Vegetation Management Plan. Final Environmental Impact Statement. Rocky Mountain National Park, Colorado.

121. O'Conner, D.J. and S.W. Nielsen. 1981. Environmental survey of methylmercury levels in wild mink (*Mustela vison*) and otter (*Lutra canadensis*) from the northeastern United States and experimental pathology of methylmercurialism in the otter. Pages 1728-1745 *in* J.A. Chapman and D. Pursley, editors. Proceedings of the Worldwide Furbearer Conference, Frostburg, MD.

122. Oberto, Don. n.d. Written interview. Copied provided by the Telluride Historical Society.

123. Pera, Jack. 2008. Personal communication with Bill Mangle, ERO Resources Corporation. July, 2008.

124. Opler, P.A. and A.B Wright. 1999. *Peterson Field Guide to Western Butterflies*. Revised edition. Houghton Mifflin Co., Boston, MA. 540 pp.

125. Pfister, Al. 2008. Personal communication. - Presentation to Telluride community December, 8, 2008.

126. Pizzimenti, J. J. 1976. Genetic divergence and morphological convergence in the prairie dogs, *Cynomys gunnisoni* and *Cynomys leucurus*. I. Morphological and ecological analyses. *Evolution* 30:345-366.

127. Prescott, D.R.C., A.J. Murphy, and E. Ewaschuk. 1995. An avian community approach to determining biodiversity values of NAWMP habitats in the aspen parkland of Alberta. NAWMP-012. Alberta NAWMP Centre, Edmonton, Alberta. 58 pages.

128. Quinn, N.W.S. and G. Parker. 1987. Lynx. In: M. Novak, J.A. Baker, M.E. Obbard and B. Malloch (eds.). Wild furbearer management and conservation in North America. Ministry of Natural Resources, Ontario.

129. Raleigh, Robert. 1982. Habitat Suitability Index Models: Brook Trout. United States Fish and Wildlife Service.

130. Rayor, L.S. 1985. Dynamics of a plague outbreak in Gunnison's prairie dog. *Journal of Mammalogy* 66(1):194-196.

131. Reed, Alan D. and Michael D. Metcalf. 1999. *Colorado Prehistory: A Context for the Northern Colorado River Basin*. Colorado Council of Professional Archaeologists, Denver.

132. Rich, T. 1986. Habitat and nest-site selection by Burrowing Owls in the sagebrush steppe of Idaho. *Journal of Wildlife Management* 50(4):548-555.

133. Rinne, J.R. 1995. Rio Grande cutthroat trout. In Conservation Assessment for Inland Cutthroat Trout. General Tech. Report RM-GTR-256. USDA Forest Service. February 1995.

134. Ripple, W.J., and R.L. Beschta. 2004. Wolves, elk, willows, and trophic cascades in the upper Gallatin Range of Southwestern Montana, USA. *Forest Ecology and Management* 200 (2004) 161–181.

135. Rocky Mountain Consultants. 1989. *Supplement to Preliminary Design Report for the Court Ordered Remediation Plan at the Idarado Mine Facility.* Prepared for the Colorado Department of Law, CERCLA Litigation Section, Denver.

136. Ruggiero, L.F., K.B. Aubry, S.W. Buskirk (and others). 2000. Ecology and Conservation of Lynx in the United States. University Press of Colorado, Boulder, CO. 480 p.

137. Seglund, Amy. 2008. Regional Habitat Biologist, Colorado Division of Wildlife. Personal communication with Bill Mangle and Ron Beane, ERO Resources Corp. August – December, 2008.

138. (SEI) Sustainable Ecosystems Institute. 2002. The San Miguel Headwaters – Valley Floor: Scientific Analysis, Synthesis, and Recommendations. Portland, OR.

139. Selby, G. 2007. Great Basin Silverspot Butterfly (Speyeria nokomis nokomis [W.H. Edwards]): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available online at: http://www.fs.fed.us/r2/projects/scp/assessments/greatbasinsilverspotbutterfly.pdf [Accessed on August 20, 2008].

140. Shuster, W.C. 1980. Northern goshawk nest site requirements in the Colorado Rockies. *Western Birds*. 11:89-96.

141. Smith, B.E. and D.A. Keinath. (2007). Northern Leopard Frog (Rana pipiens): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/northernleopardfrog.pdf [January 2, 2009].

142. Spackman, S., B. Jennings, J. Coles, C. Dawson, M. Minton, A. Kratz and C. Spurrier. 1997. Colorado Rare Plant Field Guide. Prepared for the Bureau of Land Management, the U.S. Forest Service and the U.S. Fish and Wildlife Service by the Colorado Natural Heritage Program.

143. State of Colorado vs. Idarado Mining Company *et al*. 1992. Overview of Proposed Consent Decree and Remedial Action Plan. Civil Action No. 83-C2385. The United States District Court for the State of Colorado.

144. Terra-Berns *et al*. 1998. Canada lynx in Idaho. DRAFT. A cooperative effort of the Bureau of Land Management, Idaho Department of Game and Fish, U.S. Fish and Wildlife Service, U.S. Forest Service, and Idaho Parks and Recreation.

145. Tilden, J.W. and A.C. Smith. 1986. *A Field Guide to Western Butterflies*. Houghton-Mifflin Co., Boston, MA. 370 pp. 23 color plates.

146. Tileston, J.V. and R.R. Lechleitner. 1966. Some comparisons of the black-tailed and whitetailed prairie dogs in north-central Colorado. *The American Midland Naturalist* 75(2):292-316.

147. (TOSC) Telluride Open Space Commission. 2008. Bird Count Summary – December 31, 2007, May 22, 2008, and May 28, 2008.

148. Tyus, H. M. 1985. Homing behavior noted for Colorado squawfish. *Copeia* 1985:213-215.

149. Tyus, H. M. 1986. Life history strategies in the evolution of the Colorado squawfish (Ptychocheilus lucius). *Great Basin Naturalist* 46:656-661.

150. Tyus, H. M. 1991. Ecology and management of the Colorado squawfish. Pages 379-402 in W. L. Minckley and J. E. Deacon, editors. Battle against extinction: native fish management in the American West. Univ. Arizona Press, Tucson.

151. Tyus, H. M., and C. A. Karp. 1989. Habitat use and streamflow needs of rare and endangered fishes, Yampa River, Colorado. U.S. Fish Wildlife Service, Biological Report 89(14). 27 pp.

152. Tyus, H. M., and C. W. McAda. 1984. Migration, movements and habitat preferences of Colorado squawfish, (Ptychocheilus lucius), in the Green, White, and Yampa rivers, Colorado and Utah. *Southwestern Naturalist* 29:289-99.

153. Tyus, H. M., and W. L. Minckley. 1988. Migrating Mormon crickets, Anabrus simplex, (Orthoptera: Tettigoniidae), as food for stream fishes. *Great Basin Naturalist* 48:25-30.

154. Tyus, H.M. 1991. Ecology and management of Colorado Squawfish. In: battle against extinction: native fish management in the American west. W.L. Minckley and J.E. Deacon eds. University of Arizona press, Tucson. 517pp.

155. Tyus, H.M. and C.A. Karp. 1989. Habitat use and streamflow needs of rare and endangered fishes, Yampa River, Colorado. U.S. Fish and Wildlife Service, Biological Report 89(14), Washington, DC. 27 p.

156. University of Colorado. 2008. University of Colorado Museum of Natural History Herbarium. Personal Communication between Nancy Lederer (Botanist) and Aaron Eilers, Ecological Resource Consultants, Inc. Boulder, Colorado. August 2008.

157. (USACE) US Army Corps of Engineers. 1995. The highway methodology workbook supplement: wetland functions and values – a descriptive approach. US Army Corps of Engineers New England Division.

158. _____ 2007. Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States. June.

159. (USDA-NRCS) US Department of Agriculture-Natural Resources Conservation Service. 2001. Soil Survey of the San Miguel Area, Parts of Dolores, Montrose, and San Miguel Counties. USDA Natural Resources Conservation Service, Denver, Colo.

160. _____. 2004. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Natural Resources Conservation Service. Baton Rouge, LA 70874-4490 USA.

161. _____. 2006. Natural Resources Conservation Service. 2006. Field Indicators of Hydric Soils in the United States. G.W. Hurt, Whited, P.M., and Pringle, R.F. (eds.). USDA, NRCS, Ft. Worth, Tex.

162. _____. 2008. Soil Survey Geographic (SSURGO) Database for San Miguel County, Colorado. Available on internet at: http://soildatamart.nrcs.usda.gov/.

163. (USFS) U.S. Forest Service. 1997. Final environmental impact statement for Arapaho and Roosevelt National Forests and Pawnee National Grasslands. Fort Collins, CO.

164. _____. 2007. Grand Mesa, Uncompahgre and Gunnison National Forests Proposed Land Management Plan. March 2007.

165. _____. 2008. Iron Mountain Lynx Analysis Area - Lynx Habitat. GIS Data. Provided by Carol Howe, Resource Information Specialist, Grand Mesa, Uncompahgre and Gunnison National Forests.

166. (USFWS) US Fish and Wildlife Service. 1984. American peregrine falcon recovery plan (Rocky Mountain/Southwest population). Prepared in cooperation with the American Peregrine Falcon Recovery Team. U.S. Fish and Wildlife Service, Denver, CO. 105 pp.

167. _____. 2002. Final Recovery Plan: Southwestern Willow Flycatcher. Region 2, U.S. Fish and Wildlife Service, Albuquerque, NM.

168. Valley Floor Preservation Partners. 2008. Background Statement. The Telluride Valley Floor: A Campaign for Preservation. Available online at: http://www.valleyfloor.org/backgroundstatement.html.

169. Vinson, M.R. and C.P. Hawkins. 1996. Effects of sampling area and subsampling procedures on comparisons of taxa richness among streams. Journal of the North American Benthological Society 15:393-400.

170. Wagner, D.M. and L.C. Drickamer. 2003. Distribution, habitat use, and plague in Gunnison's prairie dogs in Arizona. Arizona Game and Fish Department. Unpublished Report.

171. White, C., N. Clum, T. Cade, W. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*). *The Birds of North America*, 660. Accessed March 24, 2006 at http://bna.birds.cornell.edu/BNA/account/Peregrine_Falcon/.

172. Wiggins, D. (2004, January 26). Black Swift (Cypseloides niger): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available online at: http://www.fs.fed.us/r2/projects/scp/assessments/blackswift.pdf [10/05/2008].

173. Wiggins, D. 2005. Purple Martin (Progne subis): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available:

174. Woodbridge, B.; Hargis, C.D. 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

175. Young, M. K., tech. ed. 1995. Conservation assessment for inland cutthroat trout. General Technical Report RM-256. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 pp.

176. Young, Michael K. 2008. Colorado River cutthroat trout: a technical conservation assessment. [Online]. Gen. Tech. Rep. RMRS-GTR-207-WWW. Fort Collins, CO: USDA Forest Service, Rocky Mountain Station. 123 p. Available: http://www.fs.fed.us/rm/pubs/rmrs_GTR-207-WWW.pdf 207-WWW.pdf [March 2008].

177. Zeigenfuss, L.C., and F.J. Singer. 2003. Ecology of Native Ungulates in the Jackson Valley: Habitat selection, interactions with domestic livestock, and effects of herbivory on grassland and willow communities. Final Report on Natural Resources Preservation Program Project #00-03, FY00-03, and Interagency Agreement Nos. 1460-6-0013 and 1460-01-005 between Grand Teton National Park and the U.S. Geological Survey.

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Telluride Valley Floor

Environmental Report