TELLURIDE VALLEY FLOOR

Trails and Conceptual Stream Restoration Plan

February 2011

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Town of Telluride

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ERO

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NORDIC GROUP INTERNATIONAL

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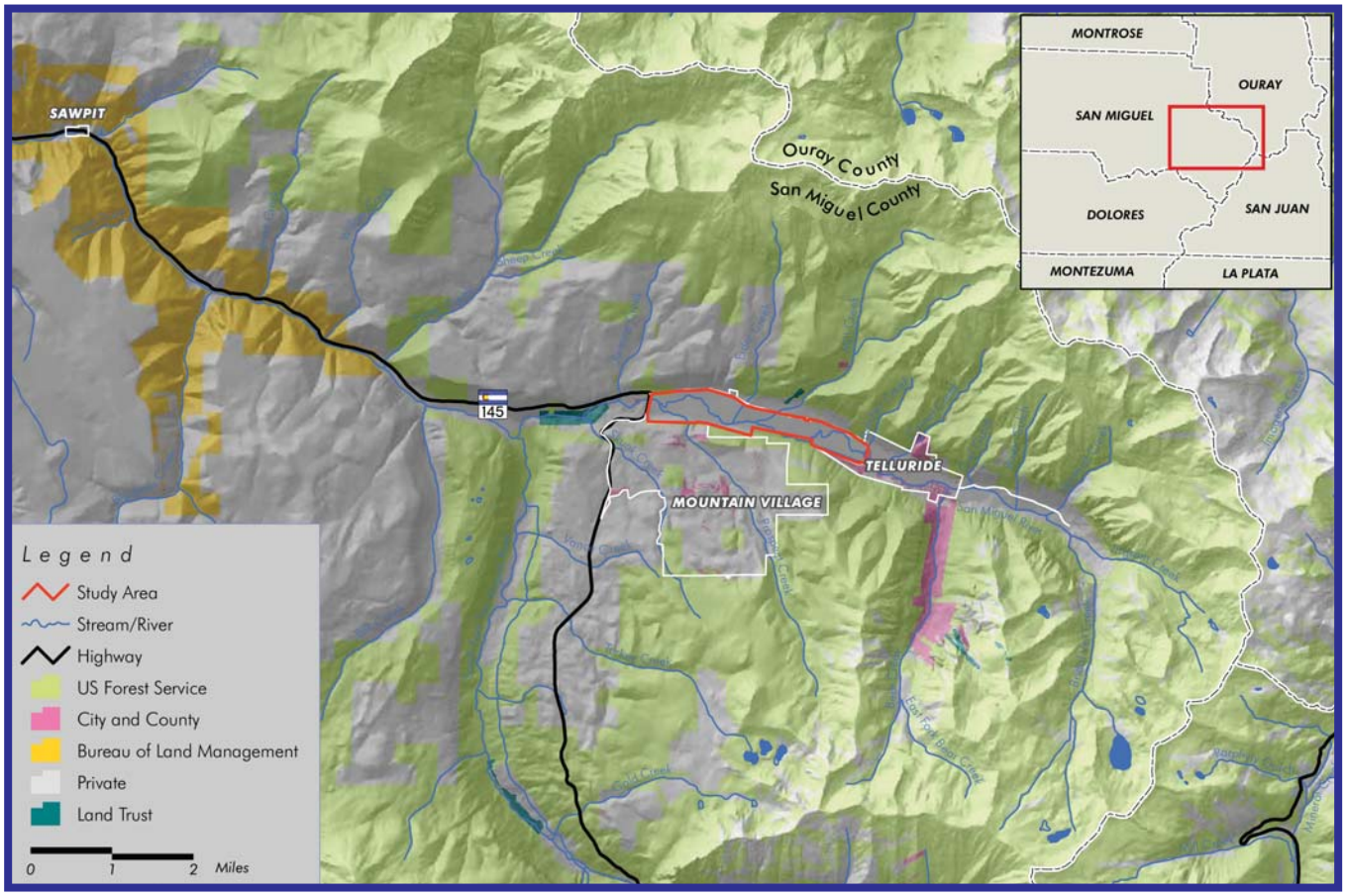
INTRODUCTION

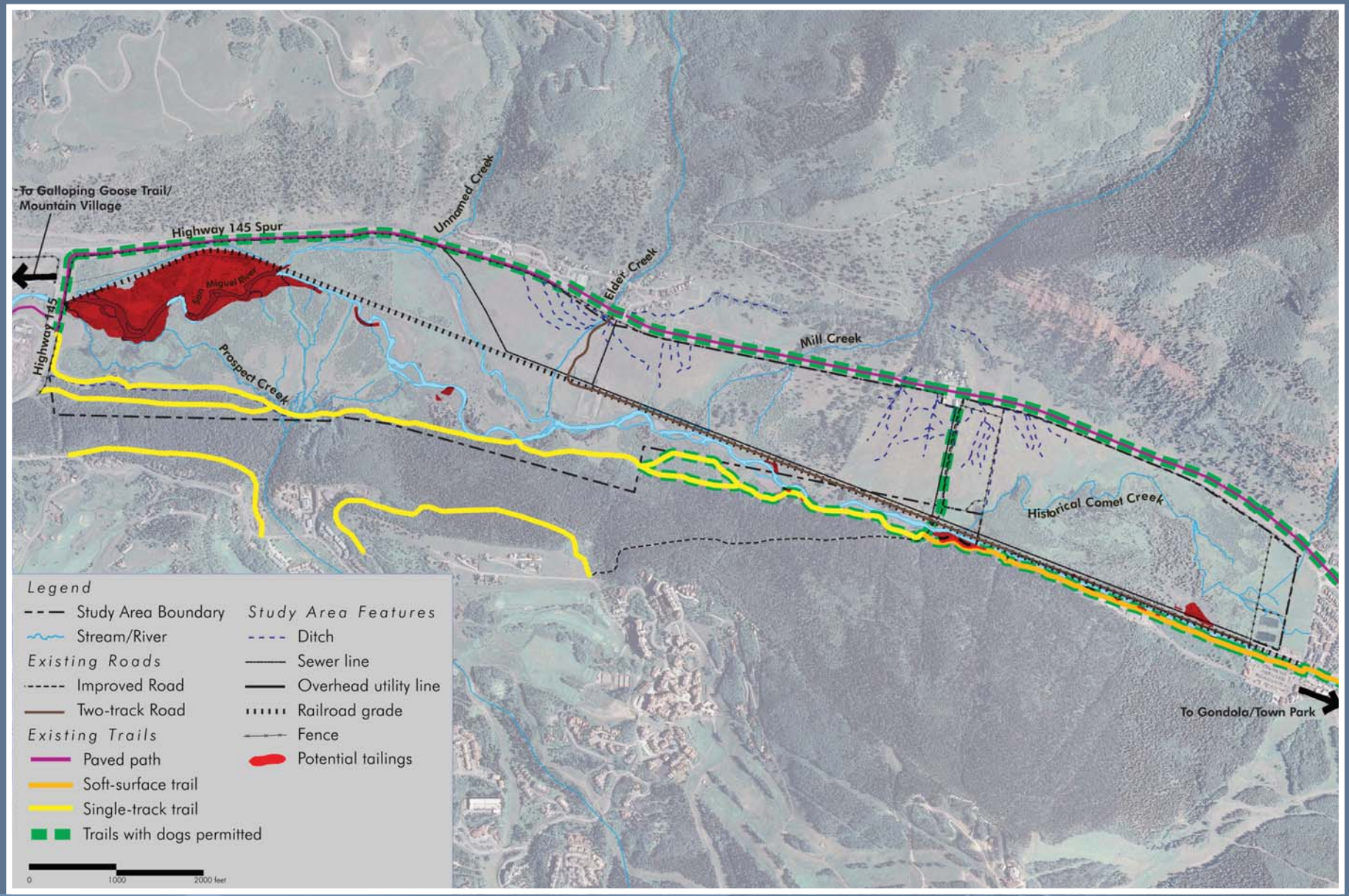
Background

The Valley Floor Property (Property) is a unique natural resource located at the entrance to the Town of Telluride (Town), a National Historic Landmark District. The approximately 560-acre open space parcel is a valued community asset owned and managed by the Town.

In 2008, the Town initiated a detailed ecological and resource evaluation of the Property producing the Valley Floor Environmental Report (Environmental Report) (ERC 2009). The Environmental Report provided a scientifically based assessment of the physical and biological characteristics of the Property in order to guide the Town in future policy decisions regarding management, maintenance and restoration. The Town then built on the information provided in the Environmental Report to produce the Valley Floor Open Space Management Plan (Management Plan) (Town of Telluride 2009). The Management Plan for the Property was a requirement of the Deed of Conservation Easement held by the San Miguel Conservation Foundation, and provides the philosophical and policy guide for the Town's management of natural resources and public recreation on the Property.

A primary recommendation of the management plan was to develop and implement a plan for stream restoration and trails throughout the Property. Ecological Resource Consultants, Inc. (ERC) and ERO Resources Corporation (ERO Corp) were retained by the Town to evaluate stream and trail opportunities and develop a Trails and Conceptual Stream Restoration Plan (Plan). This report, which builds on the information gained from the Environmental Report and Management Plan, provides the framework for proceeding with development of trails and stream restoration on the Property in a manner that is consistent with the Conservation Easement and Management Plan.





PROPERTY FEATURES

Planning Process

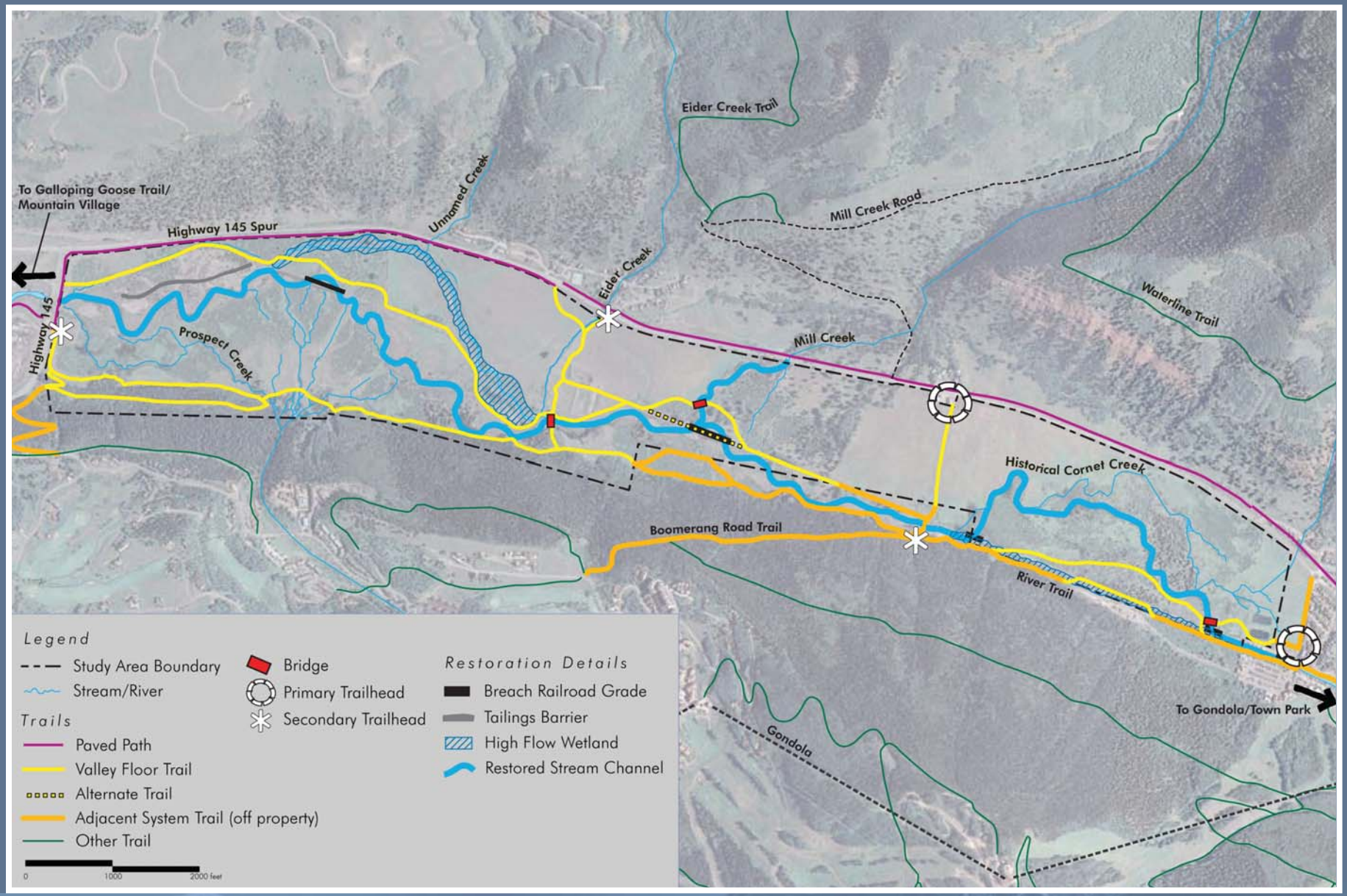
Trail planning and conceptual stream restoration were combined by the Town into a single planning process in keeping with Management Plan recommendations. In many ways, stream restoration and trails are interrelated as plans for potential future trails are dependent on modifications that will occur to the stream.

Public involvement was an important aspect in development of the Plan. Two open public forums were held in which concepts and ideas to be pursued as part of the Plan were presented allowing interested citizens, the Open Space Commission (OSC) and Town staff to provide input. Following the initial meeting the ERC project team convened monthly with the OSC at additional public meetings to discuss project progress and alternatives and obtain input. An initial draft of stream and trail alignments was provided to the OSC and site walks were conducted to obtain on the ground perspectives of the alternatives that were being contemplated. Initial concepts were modified based on input gained from the Town and the OSC and a draft of the preferred alternatives was presented for public input and discussion. Draft plans were altered to incorporate revisions and comments received. Information gained from the ERC team's analysis, citizen and Town input and OSC direction were incorporated into the final Plan.

About the Plan

The Plan is intended to be a living document to help guide the Town as it moves to implement a comprehensive trails and conceptual stream restoration plan for the Property. Trail development is intended to provide active and passive recreation on the Property for summer and winter users in a way that protects the integrity of the Property and is sensitive to on-site resources. The Plan was developed to identify key project components and design elements that will allow the Town to make improvements to the stream system offsetting the past century of impacts.

The Plan and its recommendations are conceptual in nature and do not constitute formal design plans. Ideas and improvements identified in the Plan are, however, intended to provide a "roadmap" the Town can follow as interest and funding allows improvements to be implemented. Though conceptual, the Plan is comprehensive in context and includes both simple, inexpensive improvements and more complex, costly recommendations. Thus, the Plan provides a foundation for moving forward with certain recommendations in the short-term and serves as an approved policy document as the Town seeks funding and partners for large scale restoration or trails projects. Cost estimates and recommendations for logical phasing of improvements are included in the Plan.



VALLEY FLOOR MASTER PLAN

Note: This map represents stream restoration and trails after full implementation

EXISTING CONDITIONS

Stream Reaches

For the purposes of this plan, the San Miguel River was split into six separate reaches based on observed characteristics. Reaches are defined in this report based on areas with similar restoration approaches and include the portion of the San Miguel River that is on US Forest Service property.

Reach 1 is the upstream reach and extends from the eastern Property boundary on the upstream end to the US Forest Service property boundary on the downstream end. This section of stream is approximately 5,800 feet long. It includes the most significantly impacted portion of the stream as a result of channelization effects associated with the railroad grade.

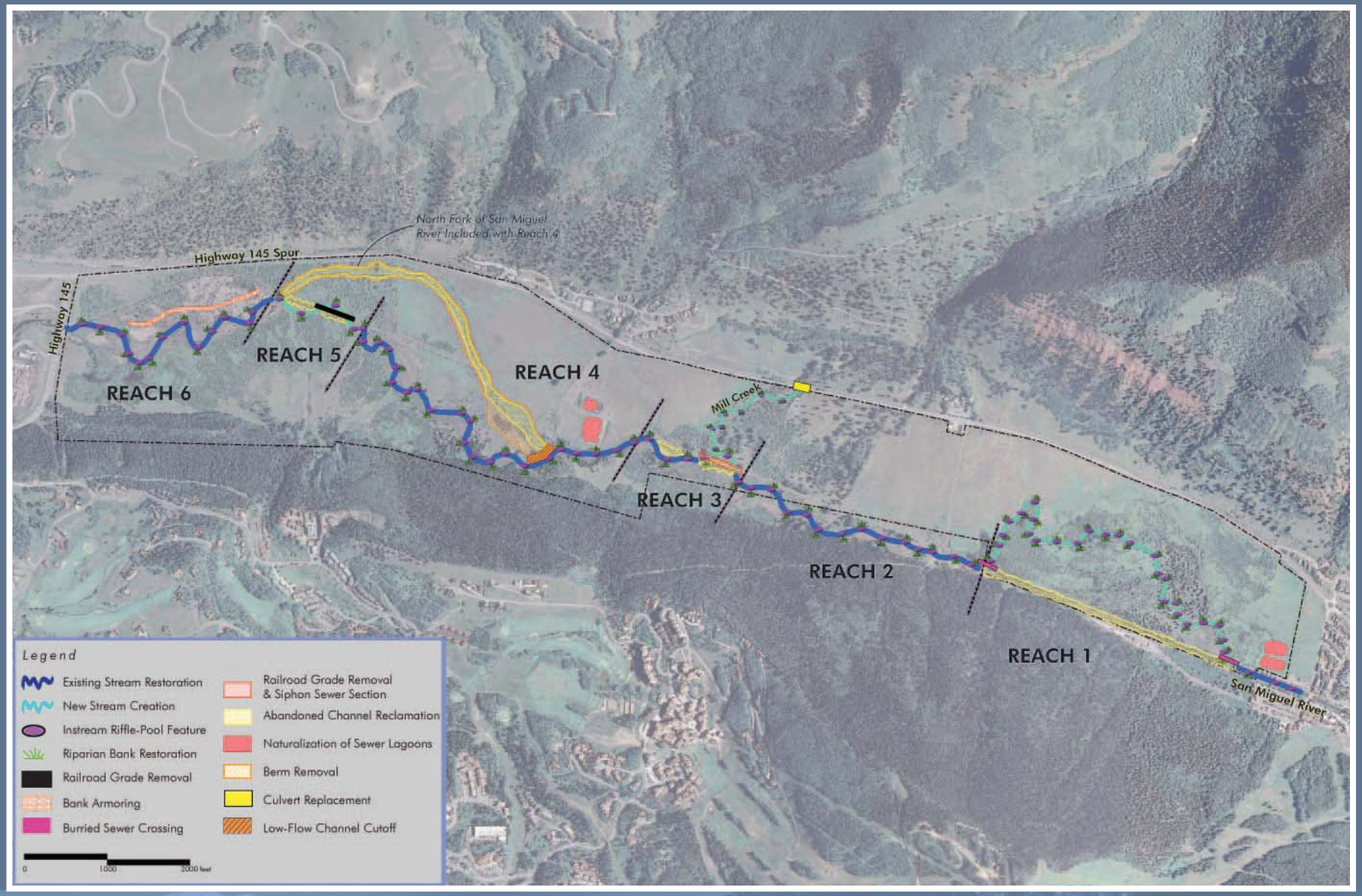
Reach 2 is an area of channel with low amplitude meanders and includes a portion of the stream upstream of Mill Creek and the US Forest Service property. Reach 2 extends approximately 3,200 feet. The railroad grade has lesser impacts to this section of channel, mainly impacting the connectivity between the stream and floodplain in this section.

Reach 3 extends approximately 1,500 feet and includes the confluence with Mill Creek. It extends from the upper end of Reach 4 on the downstream end through the linear portion of the channel upstream of Mill Creek. This reach's defining feature is the railroad grade and its impacts on the confluence of Mill Creek and the San Miguel River.

Reach 4 includes the segment of stream where the channel separates from the railroad grade downstream of Mill Creek at its upstream end to the area where the stream and the railroad grade come back together north of the Prospect Creek drainage on its downstream end. Reach 4 extends approximately 4,650 feet and includes both higher quality meandering channel sections and the channelized north fork branch. The full north fork branch was included with Reach 4.

Reach 5 extends approximately 1,350 feet upstream of Reach 6. This reach's defining feature is the railroad grade, which confines it to the north resulting in a poor quality, channelized section of stream.

Reach 6 extends approximately 3,300 feet at the far downstream end of the Property. Society Turn Tailings Pile #1 is located generally north of the San Miguel River throughout Reach 6.



STREAM RESTORATION PLAN

Aquatic Habitat

Aquatic habitat within the San Miguel River throughout the Property was evaluated extensively as part of the Environmental Report. The Environmental Report selected brook trout (*Salvenlinus fontinalis*) as the primary representative fish species when evaluating aquatic habitat.

Brook trout are not a native fish species, however currently are the most abundant trout species within this section of the stream and have physical habitat requirements similar to other trout species. Using trout as a baseline can provide a quantifiable comparison between existing and proposed conditions. Results of the Environmental Report indicated that aquatic habitat is degraded with most sections of the stream rating from average to poor quality habitat. Channelization of the stream by the railroad grade, which results in a straight channel section that is generally devoid of pool habitat, is the most significant stressor impacting aquatic habitat on the San Miguel River (ERC 2009). The confluence of Mill Creek and the San Miguel River is another significant factor that reduces aquatic habitat quality. Bank erosion, limited quality pools and minimal streamside vegetation are other factors that were found to limit aquatic habitat throughout a majority of areas.

Society Turn Tailings Pile

Society Turn Tailings Pile #1 sits adjacent to the San Miguel River throughout a majority of Reach 6 and encompasses approximately 26 acres of land. Tailings may have been transported to this area as sediment in the stream and deposited behind an impoundment in the area (ERC 2009). The pile is subject to the Idarado Consent Decree and Remedial Action Plan (RAP). State funded remediation is planned for this area.

Sewage Lagoons

Four abandoned sewer lagoons exist along the Property. Two are located in the extreme southeast corner of the Property and the remaining two are located north of the San Miguel River between Eider and Mill Creek. These confined, excavated basins were originally created for sewage storage lagoons in the relatively recent past but were never utilized and eventually abandoned. These abandoned basins have begun to naturalize, however they still retain their "engineered" shape and are not functioning to their full ecologic capability.

Railroad Grade

The historic railroad grade runs in a generally east-west alignment across the Property. It parallels the San Miguel River in Reaches 1 and 5 and parts of Reaches 2 and 3. Construction of the railroad grade impacted the stream by straightening it in areas where the two are adjacent and cutting off connectivity with the stream's floodplain in other locations. While it impacts the stream and its floodplain, the railroad grade has historic significance to the Town and it is desired that it be preserved where appropriate.

The Town's sewer line is contained within the railroad grade throughout a majority of the Property, including areas adjacent to Reaches 1, 2 and 3.

RESTORATION CONSIDERATIONS

Natural Restoration Approach

A natural based restoration approach was taken for all proposed improvements, whenever possible. The guiding principle of our natural restoration approach is that a restored stream system should mimic a natural channel in appearance and function. Recreating the natural form and function within the stream system will allow lost balance to be restored. Like a natural channel, restoration was approached with a design that will allow the stream to migrate in response to flow and sediment loads, but is intended to maintain its basic form without significant aggradation or degradation. This approach, rather than a structural approach to restoration, is of the utmost importance to this project so the restored resources function holistically with existing resources and fit with the overall characteristics of the Property.

Impact Minimization

An important component of the Plan is to maintain the integrity of existing quality resources. This consideration played an integral role in development of potential alternative stream channel alignments. There is no one "correct" alignment for the San Miguel River through the Property, but rather a range of geometric properties that a natural channel in this environment would typically follow. The Plan developed a proposed stream restoration alignment with a channel that falls within the spectrum of typical natural streams in a manner that avoids impacts to important significant resources to the extent possible. The concept of impact minimization is particularly important when considering the hydrologic connection between the San Miguel River and adjacent wetlands in areas where stream realignment is proposed. The Town will need to ensure that construction best management practices (BMPs) are utilized for all restoration and construction activities on the Property to minimize construction related impacts.

A permitting plan should be developed for any work completed within wetlands or waters of the US on the Property. Coordination with the US Army Corps of Engineers – Colorado/Gunnison Basin Regulatory Office to obtain the proper Clean Water Act (Section 404) permit will be required for any restoration, enhancement, or establishment work, relocation of utility lines or construction of recreational features (i.e., bridges) within wetlands or waters of the US.

Railroad Grade and the Town Sewer Line

The most beneficial improvement that can be made to the San Miguel River through the Property is to allow the stream to meander in a natural pattern and reconnect to its floodplain by removing the confining railroad grade. Two significant considerations exist when contemplating removal of local portions of the railroad grade. The first is its historic significance to the valley and Property. For this reason the Town has decided that significant portions of the railroad grade will remain intact to preserve the feel and character of the feature. Removal of no more than approximately 10% of the railroad grade is planned so this historic feature can be preserved in keeping with the

objective of balancing ecological improvements and maintaining the character of the Property as expressed in the Management Plan.

The sewer line buried within the railroad grade creates another constraint. From a cost standpoint, realignment of the sewer line to the perimeter of the Property was estimated to be in the millions of dollars and judged to be cost prohibitive. It would also involve the installation of several mechanical lift stations. Meandering of the channel therefore needed to be accomplished in a manner that impacted minimal portions of the sewer line and did so in a way that maintains gravity flow in the system, if feasible, while minimizing capital and maintenance costs.

Existing Plans for Tailings Remediation

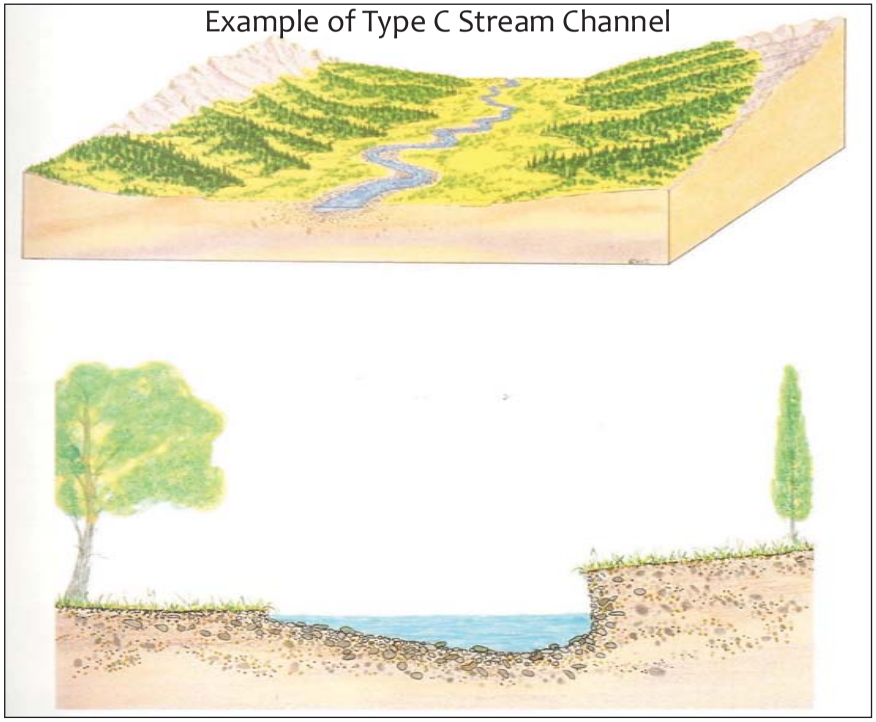
The State of Colorado is planning remediation of the Society Turn Tailings Pile #1. Plans are to cap the tailings material in place with a soil cover and revegetate. The proximity of the tailings pile to the San Miguel River will need to be considered for final remediation of the tailings and restoration of stream Reach 6. Over time it is expected that the San Miguel River will migrate laterally in response to flow and sediment transport. If unrestrained, stream migration is likely to intercept the tailings piles. Such an event would likely result in erosion of the tailings materials, transporting tailings downstream and impacting water quality within the stream system. Stream restoration concepts presented herein include a natural riparian zone to act as a buffer between the San Miguel River and the tailings pile with armored revetment to prevent excessive stream migration and provide diversity into the reclaimed tailings area.

STREAM RESTORATION COMPONENTS

Stream Morphology

The Valley Floor, as the name implies, is characterized by a wide valley that is geologically confined on both sides. Geology on the Property generally consists of Quaternary aged surficial deposits, alluvial, alluvial fan and glacial drift deposits. Alluvium located along the San Miguel River typically consists of a mixture of clay, silt, sand and cobble (ERC 2009). The San Miguel River follows the valley with an average valley slope of approximately 0.54%. Based on the valley configuration, valley slope and observed natural channel patterns, stream restoration design was intended to replicate a natural Type C stream based on the Rosgen Classification System (Rosgen 1996) throughout the Property.

Example of Type C Stream Channel



Source: Rosgen 1996

The proposed channel profile will be created to replicate a natural bend/pool and riffle/pool system. Bend/pool systems are characterized by faster moving riffle sections leading to long pool sections around the apex of stream meanders while riffle/pools are similar but occur in straighter stream sections. Stream restoration proposed in this Plan includes remeandering of portions of the San Miguel River that have been channelized and reshaping the width and profile

of non channelized sections to optimize the ecological health of the stream system. The restored stream is intended to act as a natural channel and like a natural channel, some amount of lateral migration is expected over time. Theoretical geomorphologic values and observed healthy stream characteristics were used as the basis for the desired channel shape. Typical published values for stream sinuosity, slope, meander wavelength and entrenchment for Type C3 and C4 streams are given below.

Category	Criteria
Channel Slope	<2 %
Pool Spacing	5-7 Times Bankfull Width
Width/Depth Ratio	> 12
Entrenchment Ratio	>2.2
Sinuosity	>1.2

Approximate channel widths and depths were estimated based on the standard geomorphologic principles. Width and depth of the active channel were derived based on standard geomorphologic drainage area relationships (Leopold 1994), (Rosgen 1996). The San Miguel River at Society Turn has a total tributary area of approximately 41 square miles (FEMA 1992). Standard regional geomorphologic curves suggest that for this sized basin the active channel should be on the order of 30 - 40 feet wide with a mean depth of approximately 1.5 feet. These general parameters provided the initial guidance on channel geometry and were used to verify the planned alignment in Reaches 1, 3 and 5.

Observations of sections of the stream that are currently properly functioning were also used as a reference to quantify desired channel geometry. The upstream 1,500 feet of Reach 6 were found to provide the best aquatic habitat of any portion of the stream based on results of the Environmental Report (ERC 2009). Channel widths from this section were reviewed and found to range from approximately 30 feet to 45 feet in straighter riffle sections with maximum widths in bend pools ranging from 50 feet to 85 feet. The median channel width in this area is approximately 40 feet. Sinuosity in this reference area is 1.47 and the slope over this 1,500 foot section is 0.32%. The geometry of this reference section is consistent with estimated values derived from geomorphologic principles and those proposed for the realigned Reach 1, 3 and 5 segments.

Geometric characteristics of the six stream reaches are summarized below. Comparison of these values with the typical values estimated from published data, values derived from geomorphologic equations and characteristics observed in reference channel sections confirm that the proposed stream improvements are consistent with a natural channel. It should be noted that with any natural system, variability is desired. Desired values listed below were used as guidelines in the channel restoration design. A majority of areas were intended to fall within these ranges. At times some of the geometric values are outside of these ranges either as the restoration is enhancing an existing feature, is constrained by existing conditions (i.e., existing channel slope or sinuosity) or intentionally to add variety to the character of the stream.

Values defined in the table were generated as part of the restoration conceptual plan. As part of the final restoration design, proposed channel alignments and shapes are expected to require some site specific modifications based on detailed hydraulic and sediment transport modeling.

Instream Features

Instream features are intended to maximize aquatic habitat within the San Miguel River. Instream improvement will start by creating bend/pool features in areas where meanders exist or are planned. Bend/pools consist of a steeper riffle section leading into a long, deeper pool section around the apex of the bend. Cobble bars will be created on the inside of the bends to concentrate flows against the

Reach	Sinuosity	Slope (%)	Riffle Width (ft)	Pool Width (ft)	Entrench Ratio
Reach 1	1.52	0.28%	30 – 40	45 – 75	>2.2
Reach 2	1.10	0.58%	30 – 40	45 – 75	>2.2
Reach 3	1.28	0.53%	30 – 45	50 – 85	>2.2
Reach 4	1.35	0.46%	30 – 45	50 – 85	>2.2
Reach 5	1.27	0.25%	30 – 45	50 – 85	>2.2
Reach 6	1.40	0.34%	30 – 45	50 – 85	>2.2
Entire Property	1.38	0.39%	30 – 45	45 – 85	>2.2

outer bend during low flow conditions while maintaining a stable outer bank. Properly focusing low flows along the outer bank mimics natural stream patterns and benefits aquatic habitat by 1) providing sufficient energy for flows to maintain a scour pool along the outside bend and 2) increasing flow depths during low flow conditions by concentrating flows to one portion of the channel and 3) maintaining naturally occurring and stable outside banks.

Riffle/pool complexes are planned in areas where riffles are expected to form (approximately once every 5-7 bankfull widths) where large meanders are absent. Riffle/pools are similar to bend/pools, however in these instances scour pools are maintained primarily by the velocity of the water without the tangential scour that occurs in a bend pool. Typically, pools in riffle/pool sections are shallower than pools associated with bend/pools. Riffles leading into bend/pool and riffle pool complexes are designed to include gravels for trout spawning habitat and "glide" sections between the sequences.

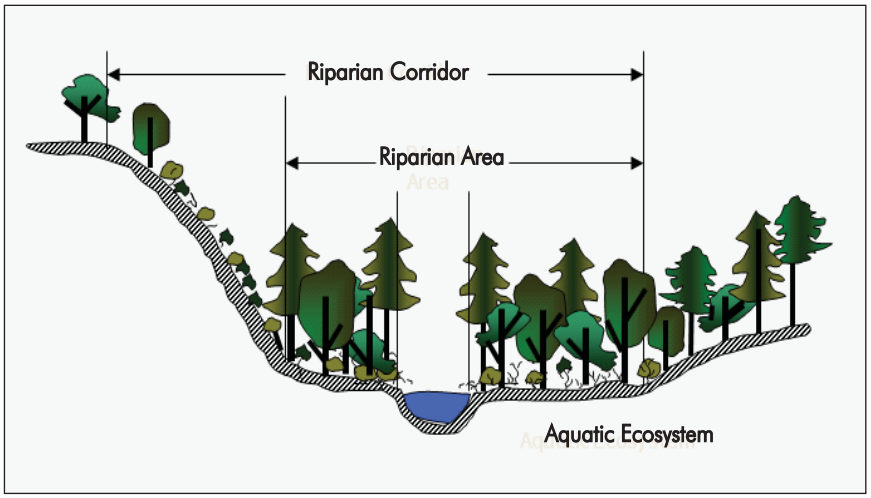
Additional instream cover features included in the channel plan such as larger rock, woody debris and riparian vegetation will be incorporated into the stream. These features will provide increased cover and shade, micro habitat and secondary pools, habitat variety, increased biomass and macroinvertebrate habitat.

Riparian Features

Improvements are intended to extend beyond the stream and include enhancement of the adjacent riparian corridor, where required. A naturally functioning channel regularly interacts with its adjacent riparian floodplain zone. Generally, a stream channel will overtop its banks every 1.5 to 2-years spreading flows out across the riparian zone. Naturally occurring riparian zones of the valley generally include a mix of palustrine scrub-shrub and palustrine emergent vegetation communities characterized by a midstory of 3-12 foot tall shrubs such as Geyer willow (*Salix geyeriana*), strapleaf willow (*Salix ligulifolia*) and park willow (*Salix monticola*) and a dense understory of short to mid-height herbaceous vegetation such as water sedge (*Carex aquatilis*), Northwest Territory sedge (*Carex utriculata*) and Arctic rush (*Juncus arcticus*). Palustrine forested vegetation communities are typically not dominant on the valley, however when present may include species such as Colorado blue spruce (*Picea pungens*) or eastern cottonwood (*Populus deltoids*) intermixed with willow species or herbaceous vegetation. Restoration efforts will replicate these community types where appropriate, ultimately creating a more continuous and naturally functioning stream and riparian ecosystem. Re-establishment of these community types will be accomplished through seeding and planting of species native to the valley and is intended to benefit the stream and all forms of native aquatic life in addition to providing improved habitat for terrestrials.

Different elements of the restoration design are intended to provide a variety of benefits for aquatic and terrestrial life.

- Riffles – Oxygenate the water and provide trout/fish spawning habitat as well as the highest macroinvertebrate production areas.
- Pools – Provide trout/fish refuge and overwintering habitat.
- Glides – Provide transitional areas with aquatic habitat variety.
- Instream Cover Features – Provides trout/macroinvertebrate habitat variety, micro habitat, secondary pools and refuge.
- Riparian Vegetation – Stabilizes banks to improve water quality and provides shade to improve summer water temperatures and overhead cover for aquatic life. Vegetation creates a continuous corridor providing habitat for wildlife adding the benefits of a natural, linked stream and riparian zone.



RECOMMENDED STREAM IMPROVEMENTS BY REACH

A summary of restoration components planned by stream reach is given below.

Reach 1

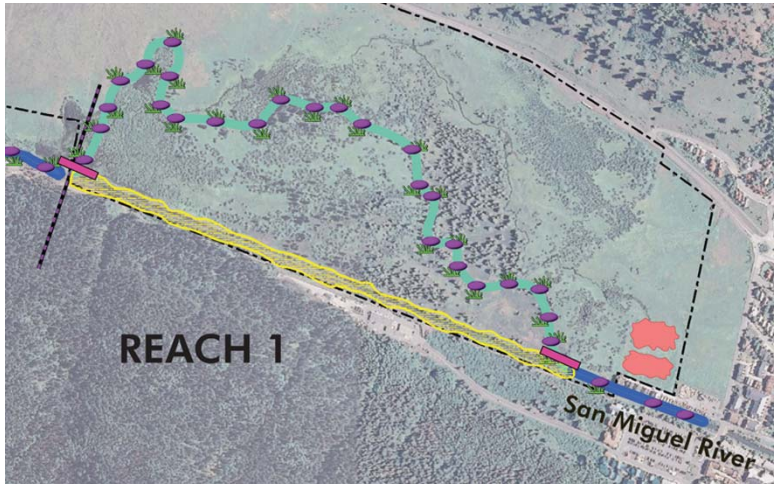
The most extensive and important stream restoration is planned in Reach 1. Restoration of this reach includes realigning the existing straight channel into a meandering alignment north of the railroad grade. The San Miguel River will be returned to a historic stream channel alignment which will be reconstructed to include optimal aquatic habitat. In total approximately 5,800 linear feet of restored stream will be created in Reach 1. Thirty-two bend pool complexes will be constructed within this reach providing significant habitat enhancements. Instream bend/pool features will be created in both the realigned stream section and the portions of Reach 1 that will remain in its existing alignment.

Riparian vegetation will be improved throughout Reach 1 in two manners. First, existing vegetation along the proposed stream alignment will be revegetated with appropriate grass, shrub and tree species. Planting areas will be focused on areas that provide bank stability, fill in voids in the existing vegetation cover and provide stream shading and overhead cover. A total of approximately 6.4 acres of revegetation is planned along the new stream corridor.

Additionally, the existing straight channel section will be graded and converted to a riparian area after the new stream is constructed. This work includes grading approximately 3,700 linear feet of the existing channel and revegetation of approximately 3 acres.

Restoration in Reach 1 requires that the stream cross the existing railroad grade and sewer line in two locations, one at the upstream end of the reach and one downstream. These crossings will be accomplished by locally breaching the railroad grade. In the areas where crossings are planned, the stream elevation is above the sewer line. Sewer line crossings will be made by replacing the existing sewer line with new pipe, encasing the pipe in both steel and concrete and routing the stream over the modified sewer line. Required clearances will need to be maintained between the sewer line and the San Miguel River.

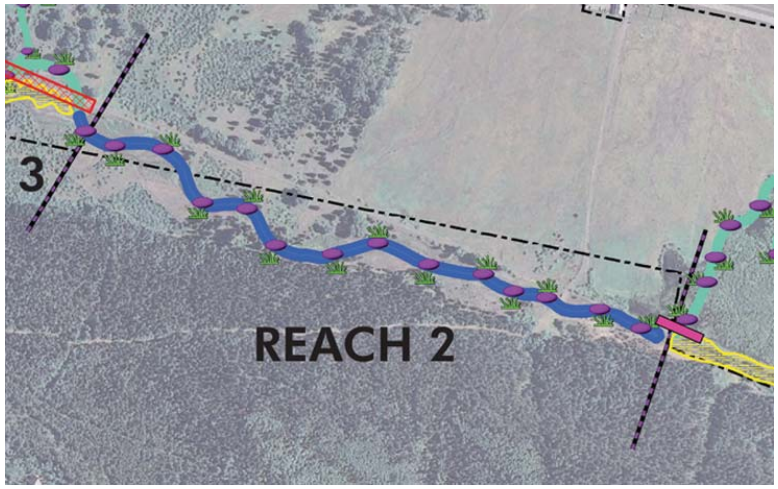
An important consideration for Reach 1 improvements is limiting impacts to existing high quality areas. The proposed stream alignment fits well in the relic channel in terms of the planned stream width and planned stream elevation, both of which minimize required excavation. As part of the final design, location specific modifications will be required when laying out stream banks and tie-ins to minimize the disturbance footprint. Mature vegetation including existing spruce trees should be avoided and protected where practicable.



Reach 2

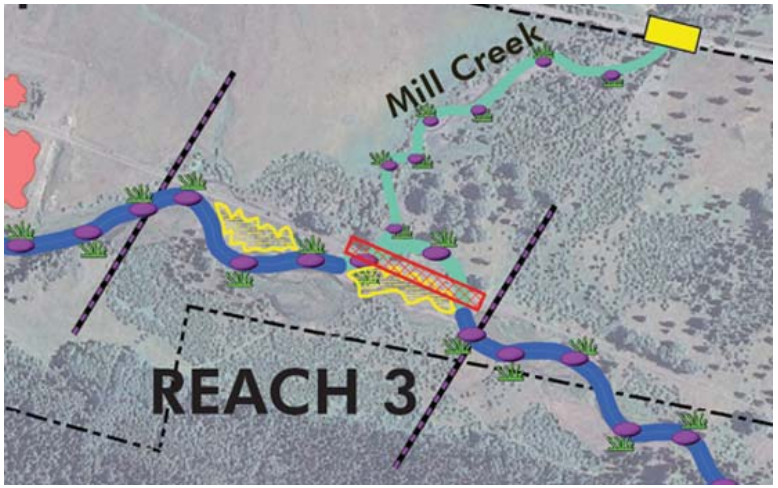
A majority of Reach 2 is located on US Forest Service property. Restoration in Reach 2 includes instream improvements within the existing channel alignment. A total of 12 bend/pool and riffle/pool features are planned in this reach and will increase instream diversity and habitat. Channel banks will be regraded to achieve the desired active channel widths, bankfull flow depths and overflow elevations. These improvements will be made over the entire 3,200 foot reach.

Significant bank stabilization and revegetation is planned along the length of Reach 2. Banks will be reshaped to a stable configuration and vegetation added. Vegetation is intended to aid in stabilizing the earthen banks, provide additional wildlife habitat and create shading and overhead cover for the aquatic environment. A consideration for restoration plans within Reach 2 is that a majority of this section lies within property that is owned by the US Forest Service. The US Forest Service has been involved in the planning process and has expressed support of the overall Plan. Before any improvements can be implemented, however, more thorough review, coordination and approval by the US Forest Service will be required. Restoration of Reach 2 would enhance the overall stream system, however, other improvements are not dependent on work being completed in this area.



Reach 3

Reach 3, while a short segment, is an area where some of the more substantial restoration is planned. The focus of restoration efforts in this reach will be to reconnect the natural confluence of the San Miguel River and Mill Creek. To accomplish this reconnection, the railroad grade, which currently cuts off Mill Creek and impounds water and sediment, will be breached. The San Miguel River will meander through Reach 3 and intercept Mill Creek north of the existing railroad grade. Existing culverts that pass under the railroad grade will be removed and the confluence will be naturalized. The realigned segment of the San Miguel River and the portions of Reach 3 that are downstream of Mill Creek will all be improved to provide quality instream habitat over the entire 1,500 foot area. Approximately three acres of new riparian vegetation is planned along the sections of the railroad grade that will be breached.



Significant grading will be required within Mill Creek to restore the confluence as the elevation of Mill Creek is currently above the San Miguel River. Mill Creek will be lowered to tie into the San Miguel River and restored upstream to the Highway 145 spur as part of these efforts. A naturalized channel with instream habitat and appropriate riparian vegetation will be established to restore the Mill Creek corridor. The Mill Creek culvert under the highway spur is proposed to be replaced to

increase conveyance capacity and allow sediment to pass under the highway. If desired, improvements on Mill Creek can be separated into two distinct projects. The confluence and downstream portions of the Mill Creek restoration would occur concurrent with work on the San Miguel River and the upper portions of Mill Creek, and the highway culvert replacement, completed separately.

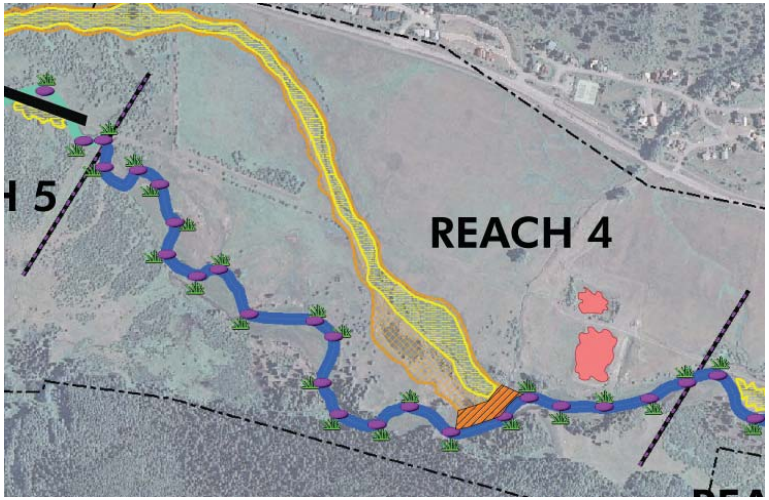
Restoration in Reach 3 requires crossing the sewer line as part of reconnecting the San Miguel River/Mill Creek confluence. In this area the San Miguel River is located well below the sewer line. Three alternatives were considered for the stream and sewer crossing (refer to the alternatives table provided subsequently). Alternative 1 is a siphon crossing where the sewer line would locally drop below the San Miguel River. Alternative 2 is an elevated crossing where the sewer line would pass over the stream, suspended by a bridge or similar structure. Gravity flow would be maintained in both Alternative 1 and 2. Alternative 3 is to pass the sewer line under the stream and include a mechanical lift station. Advantages, disadvantages and relative costs of these three alternatives were compared. Based on input from the OSC, Alternative 1 with the siphon section was selected as the favored alternative for this study and the conceptual restoration plans show this configuration. It is recommended that the pros and cons of each alternative are studied in more detail as the Town moves forward with restoration in this area. For any alternative, it is desired that the railroad grade be removed through this stretch to facilitate enhancement of the riparian corridor.

It should be noted that planned stream restoration and sewer crossings at the confluence with Mill Creek will provide options for trails at this location. Pedestrian bridges could be installed and the trail could follow the existing railroad grade for any of the three sewer alternatives. The trail could, conversely shift and cross Mill Creek north of confluences with any sewer alternative.

Reach 4

The most significant problem that will be address within Reach 4 is the current split flow condition. As part of restoration plans, past channel modifications that created the two separate branches of the stream will be rectified. The southern channel, which is in a relatively natural state, will become the only channel for flows up to the bankfull flow event. A cutoff will be constructed limiting the stream's ability to access the northern fork given lower flows; peak flows will spill over the cutoff and flow through both branches.

Instream improvements will be undertaken to improve aquatic habitat throughout the entire 4,650 foot section of Reach 4. Approximately 24 bend/pool and riffle/pool features will be constructed within the channel to create quality habitat. As part of this channel work, appropriate stream widths and depths will be developed with flooding into the existing north fork planned to occur for flows in excess of the annual flood event. Banks will be stabilized through grading and reestablishment of the riparian corridor. Twenty four riparian planting zones are planned and will improve habitat, stream shading and bank stabilization.

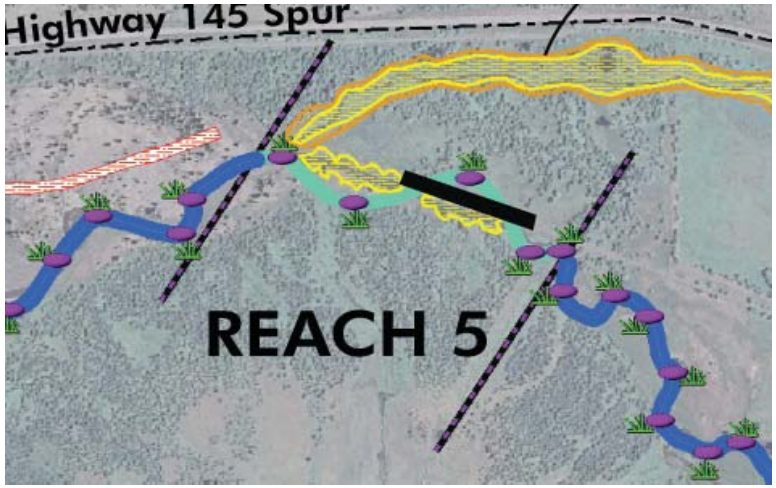


The existing north fork channel will be reclaimed as part of the restoration process. Open water areas will be filled, regraded and planted with native riparian vegetation and banks along the north fork will be graded

and revegetated to reestablish a natural floodplain. A total of approximately 3.4 acres of riparian vegetation is planned for the restored north fork. Detailed design for the north fork should ensure that overall jurisdictional wetland habitat and acreages are maintained or expanded. It may also be possible for this area to serve as a "nursery" to provide plant source material for future projects.

Reach 5

A majority of the improvements in Reach 5 will focus on mitigating stream channelization caused by the railroad grade. Up to approximately 1,000 feet of railroad grade may be removed to open the area for stream realignment and reconnect the floodplain. This is the single largest removal of the railroad grade contemplated on the Property. It is possible that the eastern portion of the railroad grade in this reach will not need to be removed. The final extent of railroad grade removal will be driven by the final stream restoration design.



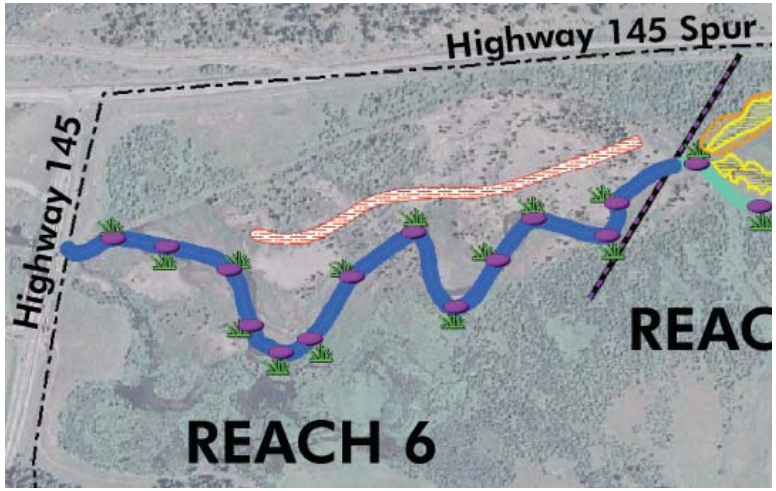
With the railroad grade removed, the stream will be allowed to meander following a natural pattern. A total of approximately 1,325 feet of meandering channel will be created in Reach 5. The channel will be shaped to provide appropriate bend/pool complexes; a total of five are planned for this reach.

Creation of riparian habitat will be important in this reach as the area that is currently railroad grade will provide an opportunity to create new habitat. A total of 1.5 acres of riparian habitat is planned in this area. This revegetation is in addition to five riparian planting areas planned along the new stream channel.

Reach 6

Reach 6 improvements address the condition of the stream, the proximity of the tailings and the overall limited riparian vegetation that exists through this stretch. The existing stream alignment will be maintained throughout this reach; however channel width, connectivity with the floodplain and instream habitat will be improved through a majority of this area. A total of 13 bend/pool and riffle/pool features are planned to improve instream habitat. Bank stabilization will be accomplished by reshaping the channel and lowering banks where higher cut banks exist to reconnect the stream to the floodplain. New vegetation on slopes and adjacent areas that are generally devoid of native plants will improve bank stability and habitat. Thirteen riparian planting areas are included in this reach.

The other major component of restoration in Reach 6 is related to the tailings pile. Restoration plans for this reach include removal of a portion of the tailings pile and creation of a natural riparian buffer between the stream and the tailings. Work in this area will need to be coordinated with the State of Colorado and other relevant parties.



Reach 3 Sewer Line Crossing Alternatives

Alternative	Alternative 1 - Siphon	Alternative 2 – Elevated Sewer Line	Alternative 3 – Lift Station*
Components	Low and high flow lines, steel and concrete encasement	Bridge or other crossing, insulated and heat traced line, flexible, expansion couplings that tolerate movement, power supply	Lift station, pressure rated pipe, power supply
Reliability Issues	Potentially susceptible to clogging. Less reliable than lift station.	Potentially susceptible to line break, freezing or structural concerns. Less reliable than lift station.	Most reliable
Relative Capital Expense	Least expensive	Most expensive	Median expense
O&M Expense	Requires annual cleaning (pumping) of siphon section. Annual costs estimated to be on the order of $10,000	Requires annual electrical expense and minor maintenance. Annual costs assumed to be on the order of $25,000	Requires annual electrical expense and minor maintenance. Annual costs assumed to be on the order of $35,000
Power Requirements	No power required	Power required for heat traced lines. Power required during colder months only.	Power required full time
Advantages	Buried line, maintains gravity flow, no power required	Preserves the current alignment, maintains gravity flow	Buried line, least infrastructure maintenance
Considerations	Siphon will need to be maintained	Pipe break would likely result in direct discharge to the SMR, requires power, exposed line most susceptible to damage/vandalism	Requires building to house lift station, full time power use

**Alternative 3 - Lift Station is considered the least desirable alternative for Reach 3 as it is not consistent with community goals regarding energy conservation.*

ASSOCIATED IMPROVEMENTS

The description of improvements proposed above for the various stream reaches included many features outside of the San Miguel River itself. A detailed description of these features and the planned restoration actions is described below.

Mill Creek (Reach 3)

The confluence of Mill Creek and the San Miguel River will be modified as part of the Plan. The San Miguel River will be realigned north of the railroad grade at the confluence allowing Mill Creek to flow directly into it. Channel hydraulics and sediment transport that are currently cut off by the railroad grade will be restored as part of these improvements. Grading will be required within Mill Creek so the elevations at the confluence match. Alluvial material that has been transported in Mill Creek and deposited north of the railroad grade will be excavated as part of this work. The crossing of Mill Creek and the Highway 145 Spur can also be improved. A larger box culvert is recommended under the highway in order to create additional capacity that will allow flows and sediment transported from the upper reaches of Mill Creek to be transported under the highway, minimizing the accumulation of sediment that currently occurs north of the highway. The functionality of the confluence restoration for the San Miguel River and Mill Creek is not directly dependent on the culvert replacement, therefore the two items can occur independently. If the highway culvert is not completed concurrent with the Mill Creek restoration it is likely that portions of Mill Creek south of the highway will need to be addressed when the culvert is replaced to ensure properly functioning condition with the confluence restoration.

Sewer Line (Reach 1 and Reach 3)

Plans to realign the San Miguel River and restore the confluence with Mill Creek require crossings of the railroad grade and sewer line. Two crossings are intended in Reach 1 one crossing is recommended in Reach 3 as part of the Plan. An initial survey of the sewer line to determine its elevation relative to the stream was performed as part of this work. The sewer line, which is an 18 inch line, was found to have an invert elevation that is generally five feet below the top of the railroad grade. In Reach 1 the sewer line was found to range from approximately four feet above to four feet below the stream bed. Within Reach 3, the bottom of the sewer line was found to be approximately five to seven feet above the current stream bed elevation.

Given the relative elevations of the sewer and the stream, different crossing alternatives were considered. In Reach 1 the sewer line is lower relative to the stream elevation at distinct locations. The concept that is planned for the two crossings in Reach 1 is for the sewer line to be buried below the stream with the crossings located in areas where the stream is at its highest points relative to the sewer line. These points occur downstream of the Mahoney Street bridge and upstream of the Forest Service parcel. Crossings are located at areas where the stream is relatively high in relation to the sewer line for this reason.

Sewer crossings in Reach 1 include replacing the existing 18 inch sewer line with a new ductile iron pipe. This carrier pipe would be encased in a 30 inch steel pipe and the assembly encased in 18 inches of concrete.

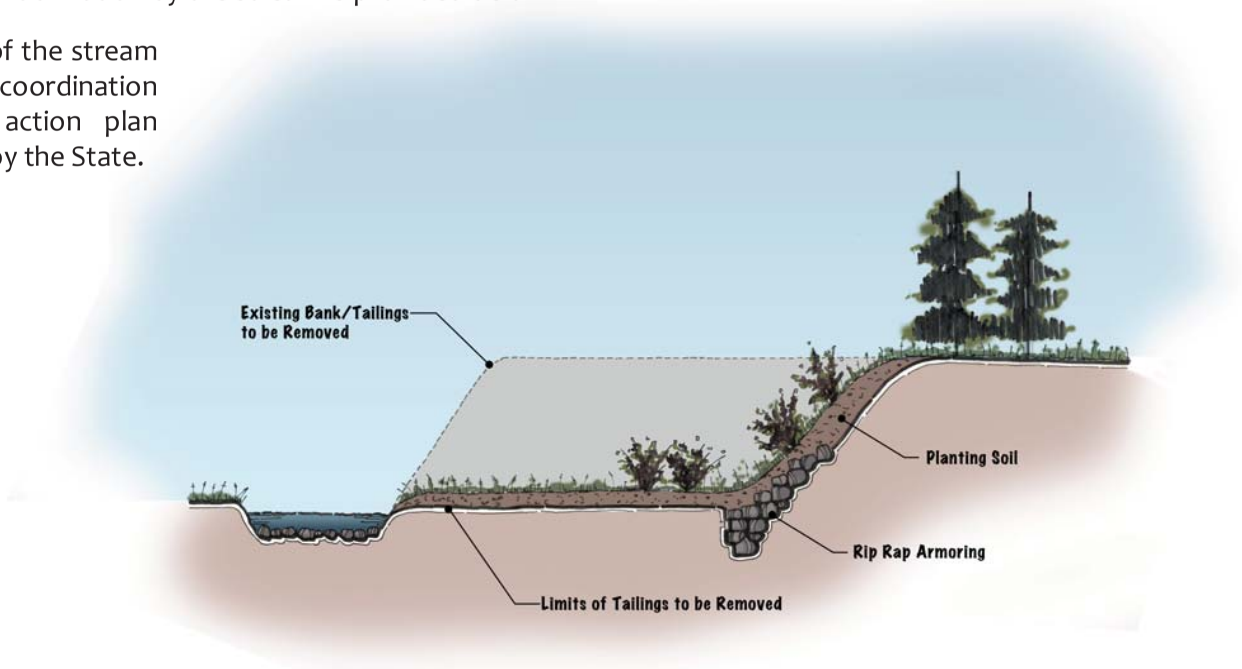
Crossings will be located near planned riffle heads, which will coincide with areas where the stream bed is elevated to maximize the vertical distance between the stream and the sewer line as required for the sewer line to be below the frost line. Localized armoring of the stream bed and banks will be required.

Three alternatives were evaluated for crossing the sewer line in Reach 3 as discussed above. A siphon crossing would likely be accomplished by replacing the existing 18 inch line with an 8 inch line for normal flows and a 12 inch line to carry high flows. Both pipelines would be constructed of ductile iron and encased separately in a 24 inch steel pipeline with both lines set below the frost line and encased in concrete. No power would be required for this alternative. An elevated sewer line crossing would require that a bridge or similar structure be installed to span the San Miguel River. The sewer line would cross the San Miguel River in an insulated, heat traced pipe. Special fittings including flexible, expansion couplings would be required. Permanent power would be required for the heat tracing. The lift station alternative would necessitate lowering and replacing the sewer line locally and adding a lift station. This alternative would require that a utility building be constructed on the Property and permanent power be supplied.

Tailings (Reach 6)

Bank revetment is proposed in the section of the San Miguel River that is adjacent to Society Turn Tailings Pile #1. Ideally, the portion of the tailings pile that is immediately adjacent to the stream would be consolidated with other existing tailings. A 100 foot wide buffer between the stream channel and the tailings pile is recommended. The buffer zone would be restored to create a natural riparian corridor. Elevations of the riparian zone would be set to allow flows from the stream to access the riparian zone at flood events greater than bankfull flow. Bank armoring is proposed at the outer perimeter of the created riparian zone. Armoring, in the form of riprap, would inhibit extreme flood events from eroding into the tailings pile and would allow the stream to be isolated from the reclaimed tailings. A schematic of the proposed configuration for restoring the San Miguel River and preventing tailings remobilization by the stream is provided below.

Work in this section of the stream will obviously require coordination with the remedial action plan being contemplated by the State.



Lagoons

Existing abandoned sewer lagoons will be naturalized as part of the Plan. The lagoons do not have direct surface connections to the stream and therefore could be restored independently of a given stream reach. Restoration activities will include relatively minor grading and native vegetation establishment. Grading will be undertaken to modify the shapes of the ponds so they no longer resemble their current rectangular form. Each pair of ponds will be graded and may form a combined pond. Irregular grading will allow the ponds to take on a natural appearance.

Portions of the ponds and pond edges will be revegetated to expand and enhance waterfowl and other wildlife habitat. Formation of wetland benches will replicate shallow water palustrine emergent wetland communities found in the valley and on the Property.

These communities are typically semi-permanently to permanently flooded and include a mix of short to mid-height sedge and rush species. Considerations will need to be given during the final design process to the sewer line between the ponds near the Eider Creek confluence.

TRAILS PLAN

EXISTING CONDITIONS

Summer Trails

The Valley Floor currently contains about 3.6 miles of trails (some of which coincide with existing service roads and railroad grade). An additional 1.3 miles of trails are located on US Forest Service land.

The existing River Trail is on Town land and follows outside of the southern boundary of the Property. The trail includes 0.9 miles of crusher fine trail between Mahoney Drive and Boomerang Road and another 1.9 miles of natural surface singletrack trail in the western half of the property. (Most of the River Trail is off of the Property). Another 1.3 miles of the River Trail (singletrack) is located on US Forest Service property.

A few existing roads and portions of the existing railroad grade are also used for non-motorized trails, including Boomerang Road (which is not part of the Property), Eider Creek Road, and the railroad grade east of Eider Creek. A paved, multi-use recreation path is located along the entire northern boundary of the Valley Floor between Mahoney Drive and an underpass crossing under Highway 145 near Society Turn.

This trails plan focuses on existing and potential trails and trail opportunities on the Property, considering connections to the larger context of trails on adjacent and surrounding lands.

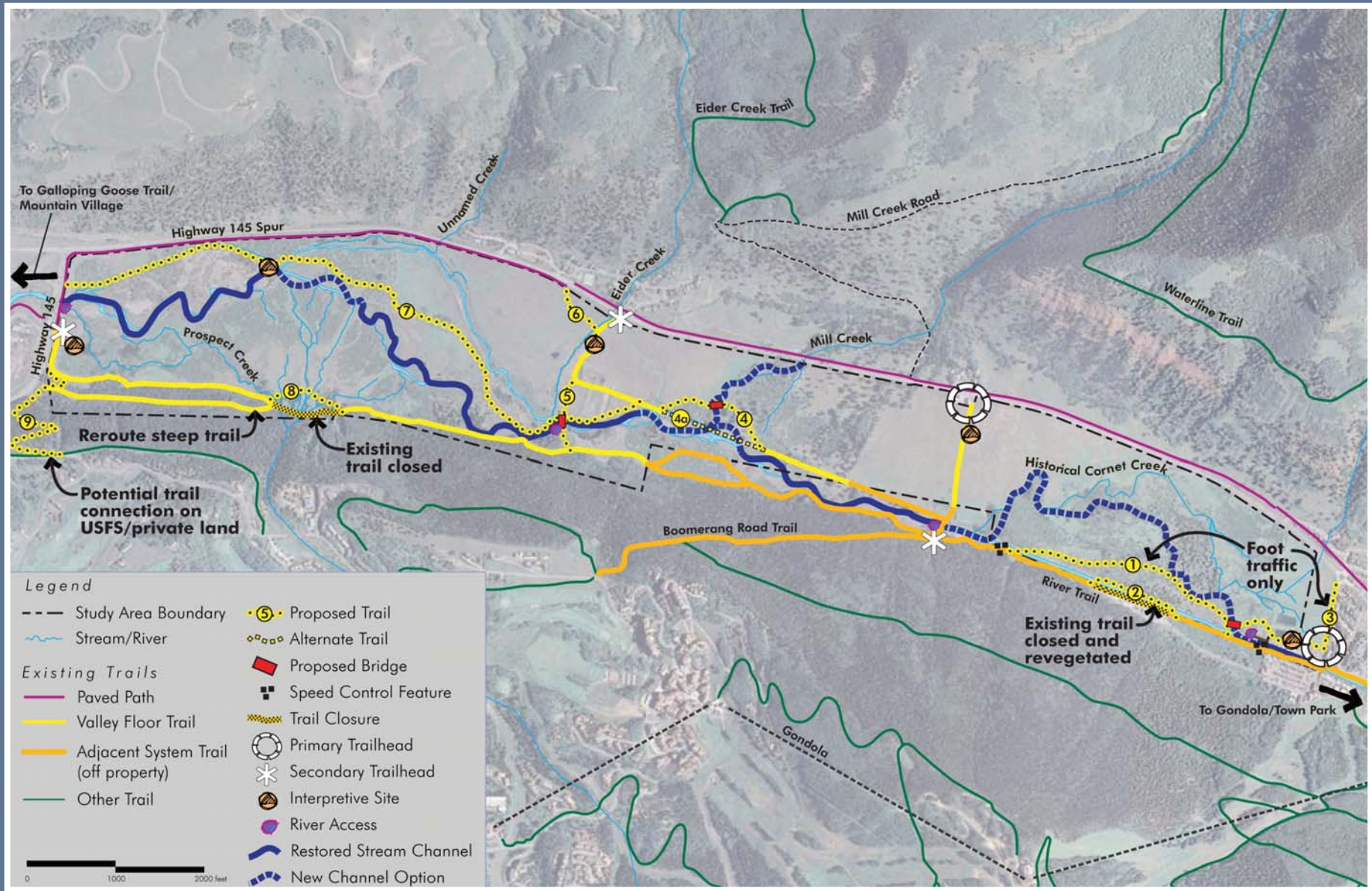
Regional Trail Context

The Valley Floor is located at the nexus of several regional trail networks in the greater Telluride area. For many trail users, the existing network of trails and roads provide access and connections between the Town of Telluride and other regional destinations.

- **Town Trails** – East of the Valley Floor, the River Trail continues through Town providing connections to the gondola terminal, Bear Creek Preserve, Town Park, and the Legacy Trail, which connects to the Bridal Veil Falls area at the head of the valley.
- **Mountain Village Trails** – There are several existing trails associated with the ski area and Mountain Village, including the Ridge Trail, Prospect Trail, and Jurassic Trail. Many summer trail users use the gondola as a jumping-off point. Existing trail connections between Mountain Village and the Valley Floor are not ideal, consisting of Boomerang Road and the Highway 145 right-of-way.
- **Forest Service Trails** – Mill Creek Road, located to the north of the Valley Floor provides access to a vast network of trails on Forest Service lands, including the Eider Creek Trail, Waterline Trail, Deep Creek Trail, and Sneffels Highline Trail.
- **Lawson Hill/Keystone Gorge Trails** – West of the Valley Floor, the existing connection and underpass in the Society Turn/Lawson Hill area provides access to the Galloping Goose Trail and the Keystone Gorge hiking trails. The Galloping Goose Trail extends about 22 miles to Lizard Head Pass.

Winter Trails

All Nordic routes have been established by large motorized grooming equipment to accommodate both skate and classic skiing. Temporary stream crossings are used for winter trails and are removed in the spring. In mid-winter 2009/2010, the Town established groomed snowshoe/walking routes to minimize conflicts between walkers and skiers on a trial basis. The River Trail is also used as a winter route for foot traffic (primarily walking and snowshoe). Winter trail grooming for any use is strictly regulated by the Management Plan and is permitted on a year-to-year basis.


To Galloping Goose Trail/
Mountain Village
Highway 145 Spur
Unnamed Creek
Eider Creek Trail
Mill Creek Road
Eider Creek
Waterline Trail
Highway 145
Prospect Creek
Mill Creek
Reroute steep trail
Existing
trail closed
Potential trail
connection on
USFS/private land
Historical Cornet Creek
Boomerang Road Trail
Foot
traffic
only
River Trail
Existing trail
closed and
revegetated
To Gondola/Town Park
Gondola
Legend
Study Area Boundary
Stream/River
Existing Trails
Paved Path
Valley Floor Trail
Adjacent System Trail
(off property)
Other Trail
Proposed Trail
Alternate Trail
Proposed Bridge
Speed Control Feature
Trail Closure
Primary Trailhead
Secondary Trailhead
Interpretive Site
River Access
Restored Stream Channel
New Channel Option
0
1000
2000 feet

TRAILS PLAN

Planning Objectives

The process to develop the Trails Plan and the proposed trail recommendations integrates the following objectives:

1. Compatibility with existing policies and guidance
2. Improved trail connections and opportunities
3. Habitat protection and enhancement
4. Minimal facility development
5. Compatibility with stream restoration plans
6. Reduced trail user conflict

Existing Policies and Guidance

As described in the Introduction, this plan is built upon a foundation of plans, recommendations, and decisions that include the Conservation Easement, Environmental Report, Management Plan, and subsequent decisions by the Open Space Commission and Town Council. In general, this guidance includes the following key elements:

- Develop and implement a Trails Plan that provides quality recreational access and opportunities in a manner that is compatible with the conservation values of the property and long-term restoration plans.
- Permit compatible winter recreational activities and uses while minimizing impacts to wildlife, sensitive vegetation, and wildlife movement corridors.

Trail Opportunities and Connections

Based upon the existing guidance and conditions on the Property, this trails planning process emphasized opportunities to enhance the overall trails system by:

- Building from existing trails on the Property. The existing trails and roads on the Property provide a strong foundation for future trail development. However, the existing trails and roads are the result of past mixed ownership and ad hoc trail development and lack some key connections that are needed to enhance the overall system.
- Improving connections to adjacent and regional trail systems. The existing trails provide access between the Town and several regional trails and trail systems. The development of a few key connections will enhance the overall connectivity, while also dispersing users on the Property and throughout the regional system.
- Providing high-quality experiences for a variety of users. The Property is a special place that is enjoyed by a variety of users. The range of uses includes walkers, hikers, trail runners, mountain bikers, and others. The development of a variety of trail types and experiences, with varied distances from trailheads, will enhance the experiences for all users.

Habitat Protection and Enhancement

The Property contains a diverse mix of wetland, upland, and forested habitats, and includes several large habitat areas that possess high environmental sensitivity. Based on these intrinsic resources, and many of the existing policies guiding this plan (described above), the protection of sensitive habitat and the potential for habitat enhancement is a central theme in this plan. Some of the key principles that are central to this plan include the following:

- Minimize trails and public use in areas with high environmental sensitivity and focus public use in existing disturbance corridors and areas with lower environmental sensitivity
- Avoid disturbances to wetland areas using special planning consideration for trail development
- Minimize disturbance to wildlife movement corridors and consider a zone of influence of 50 to 100 meters from trails where wildlife may be affected by human presence
- Avoid fragmenting intact blocks of habitat and seek opportunities to improve habitat connections by closing or rerouting unsustainable trails
- Provide reasonable and enjoyable access to desired destinations (e.g., stream banks and viewpoints) to avoid the creation of unwanted social trails
- Use thoughtful and creative planning to provide quality trail experiences while minimizing redundant or unnecessary trails

These and other trail planning principles are described in detail in the Management Plan and the Environmental Report.

Minimal Facility Development

A key concept of this Plan is to improve the function and connectivity of trails, while keeping all facilities minimal in appearance. As directed by the Management Plan, signs and bridges are kept to a minimum and new trails are focused on existing corridors and disturbances (such as the railroad grade).

Compatibility with River Restoration

This plan includes recommendations for both trails and stream restoration on the Property to ensure these two issues are addressed in a comprehensive and proactive manner. The placement of trails is dependent on the future location of the San Miguel River, while the construction and disturbance required to implement restoration projects creates an opportunity to design and construct new trails, bridges, or other facilities with little or no additional disturbance.

User Conflict Reduction

The existing trails on the Property are becoming increasingly popular for a variety of users, resulting in conflicts between hikers and mountain bikers. Most of these conflicts occur along the River Trail east of Boomerang Road and are the result in part of bikers traveling too fast in an area with higher use and limited visibility. One of the objectives of this plan is to develop a trails system on the Property that provides a pleasurable and meaningful experience for all users, disperses trail users away from congested areas and addresses conflict areas through a variety of design and regulatory tools.

TRAILS PLAN RECOMMENDATIONS

Trails Plan Summary

The proposed trails plan includes a combination of new trails, new connections, trail reroutes, bridges, and other facilities that satisfy the objectives described above along with a consensus among the interested public and the OSC. Building from the existing trails on the Property, the proposed trail system will include a passive, hiking-only loop route on the eastern portion of the Property, a new bridge near Eider Creek that closes the loop between the existing railroad grade and San Miguel River, and a new loop route in the western portion of the Property.

Three new connections will improve connectivity to Town, the adjacent paved path, and Mountain Village trails. These and other trails and features are shown in the Trails Plan, and are described in detail below, from east to west.

Once implemented, the proposed trails plan will result in about 7.9 miles of designated trail routes (trails and roads) on the Property, in addition to the 1.3 miles of contiguous trail on Forest Service property. Unless otherwise noted, all trails are multi-use and will have a natural surface tread.

East Area – Mahoney Drive to Boomerang Road

This area is the gateway to the Property for most visitors. Trail recommendations in this area are focused on orienting visitors to the natural themes of the Property, providing passive opportunities for learning about the conservation and enhancement of sensitive resources, minimizing trail conflict in a congested area, and maintaining an important trail corridor for a variety of users. Trail design should consider the environmental sensitivity of the area.

During the public process, many users expressed concerns about biker/walker conflicts in this area. Conflicts are generally due to excessive speeds by bikers and poor visibility along the existing River Trail and are exacerbated by the existing trail design which concentrates all users, in the most heavily used portion of the property, on a single trail. Trail recommendations in this area are specifically designed to disperse users by providing a separate loop route for walkers, reduce speeds through specific design features, and maintain meaningful access and enjoyment for all users.

New Trails

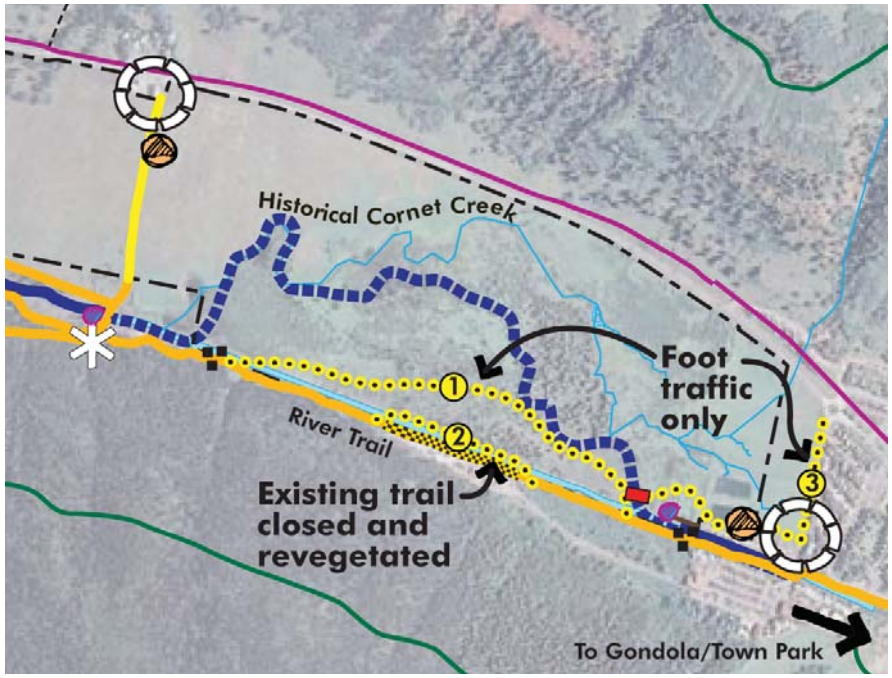
1. *Passive loop trail.* A contemplative route adjacent to the proposed new stream channel and through diverse habitats with greater environmental sensitivity. This trail also provides the best opportunity for casual visitors with limited time or mobility to experience the Property in a 1.5 mile loop. This trail is designated for foot traffic only.

2. *River Trail reroute.* After the San Miguel River is moved from its current channel, the River Trail will be rerouted on to the Property to draw users away from the Town Public Works and snow storage facilities and onto the railroad grade. The existing trail segment will be closed and revegetated.

3. *East access trail.* Provides a trail collector and access from the Town and schools to the trailhead, interpretive sites, and greater trail network. Foot traffic only. (This proposed route is not on the Property, but should be considered, pending wetland issues, on the Pearl property to improve walk-in access and connectivity to schools).

Trail Facilities

- **Primary trailhead** – A trailhead on or near the southeast corner of the Property (on the South Pearl Parking Lot) will be the primary gateway between Town and the Property. This trailhead will include an entry and regulatory sign, trash receptacles, comment boxes, wildlife observation forms, and pet pickups. It may also include off-site restroom facilities and a multi-purpose interior space that can be used for site interpretation and/or winter use, following Management Plan requirements.
- **Interpretive site** – A site adjacent to the ponds provides an opportunity to interpret pond restoration, wetlands, and the ecology of the Property.
- **Regulatory signs** – Small regulatory signs may be installed along the passive loop trail, if negative impacts occur, to remind visitors to remain on the trail through this sensitive habitat area.
- **Bridge** – An approximately 50-foot bridge will be installed across the new San Miguel River channel (concurrent with river restoration efforts).
- **River access** – A designated river access point will be located adjacent to the bridge. This access will be integrated into restoration designs and will also serve as a temporary crossing for groomed winter use.
- **Speed control features** – Appropriate speed control features, such has vegetation clearing or rock barriers, should be installed at or near the junctions with the River Trail to reduce user conflicts.



Central Area – Boomerang Road to Eider Creek

This area is characterized by open meadows, cottonwood forests, and the prominent railroad grade. Trail recommendations in this area are intended to improve connectivity in a manner that is consistent with long-term stream restoration plans.

New Trails

4. *Mill Creek reroute.* Consistent with preferred stream restoration designs for the Mill Creek confluence area, and following the removal of portions of the railroad grade, this new trail will circle the confluence area to the north. The remaining railroad grade, which currently functions as a trail, will be integrated into the system with minor grading and drainage improvements.

4a. *Mill Creek alternate.* In the event alternate sewer crossing designs are pursued as part of the stream restoration efforts, two new bridges would be constructed along the current railroad alignment to accommodate trail use.

5. *Eider Creek bridge connectors.* These three short trail segments provide access between the existing trails and the proposed major bridge over the San Miguel River at Eider Creek.

6. *Bike path connector.* This trail segment provides safe access between the paved path and the Eider Creek Road from the point at which the paved path crosses under the Highway 145 Spur.

Trail Facilities

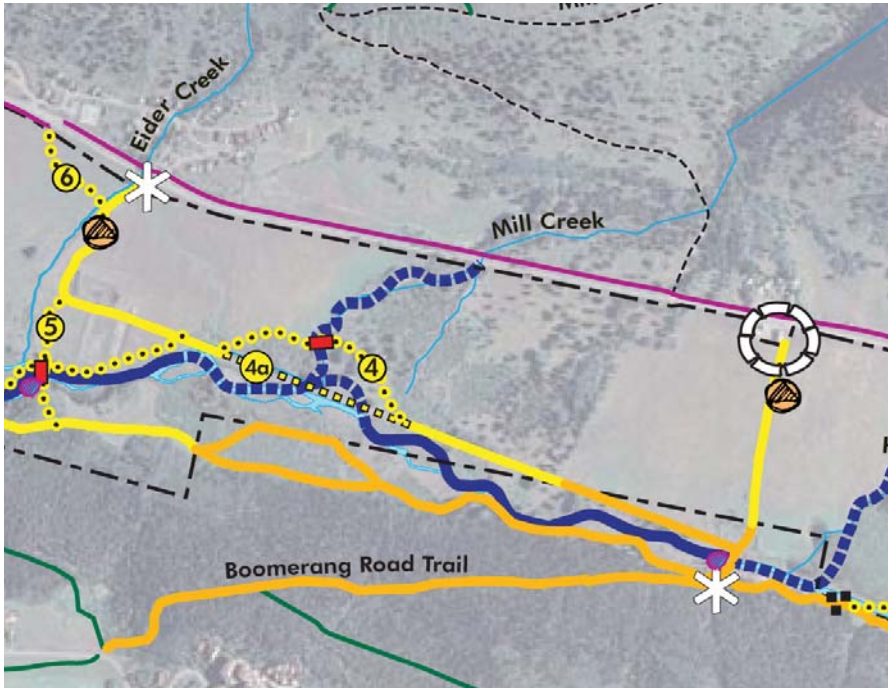
- **Primary trailhead** – A trailhead with limited parking will be located at the north end of Boomerang Road (behind the gas station), and will include an entry and regulatory sign, trash receptacles, comment boxes, wildlife observation forms, and pet pickups.

- **Interpretive sites** – A site along Boomerang Road provides an opportunity to interpret the prairie dog colony and the old San Miguel City, while a site along the Eider Creek Road can interpret the history and restoration of the Vezina Shed and the agricultural history of the Property.

- **Mill Creek bridge** – One bridge (approximately 30 to 50 feet in length) will cross Mill Creek to the north of the restored confluence with the San Miguel River. Bridge design and installation should be integrated into restoration designs and construction timing.

- **Secondary trailheads** – Two secondary trailheads will be located at Boomerang Road south of the river, and at the Eider Creek Road off of the Highway 145 Spur. Both will include a small identification sign, basic regulations, and a simple trail map. The Eider Creek trailhead will also include trash receptacles.

- **Suspension bridge** – A suspension bridge (approximately 100 to 120 feet in length) will be installed across the San Miguel River immediately east of the Eider Creek confluence. This bridge will also serve as an important junction between several trails on the Property. Guidelines for the visual quality of this bridge are found in the subsequent *Trail Design Elements* Section.



West Area – Eider Creek to Society Turn

This area is dominated by the Prospect Creek alluvial fan, a large and inaccessible complex of wetlands, and a long extent of the railroad grade. Trail recommendations in this area are intended to provide an additional trail loop on the Property, improve connectivity to other trail systems, and to improve or abandon unsustainable existing routes.

New Trails

7. *Railroad grade.* This long (1.25-mile) extent of new trail would utilize the existing railroad grade and other disturbed lands to create a loop between the western edge of the Property and the new bridge at Eider Creek.

8. *Prospect Creek reroute.* A new trail will be routed onto the open, lower slopes of the Prospect Creek alluvial fan to create a more sustainable and more manageable trail corridor. This trail will also enhance opportunities to view nearby wetland and wildlife habitat.

The existing patchwork of braided trails and bridges at Prospect Creek will be removed, reclaimed, and where possible, revegetated.

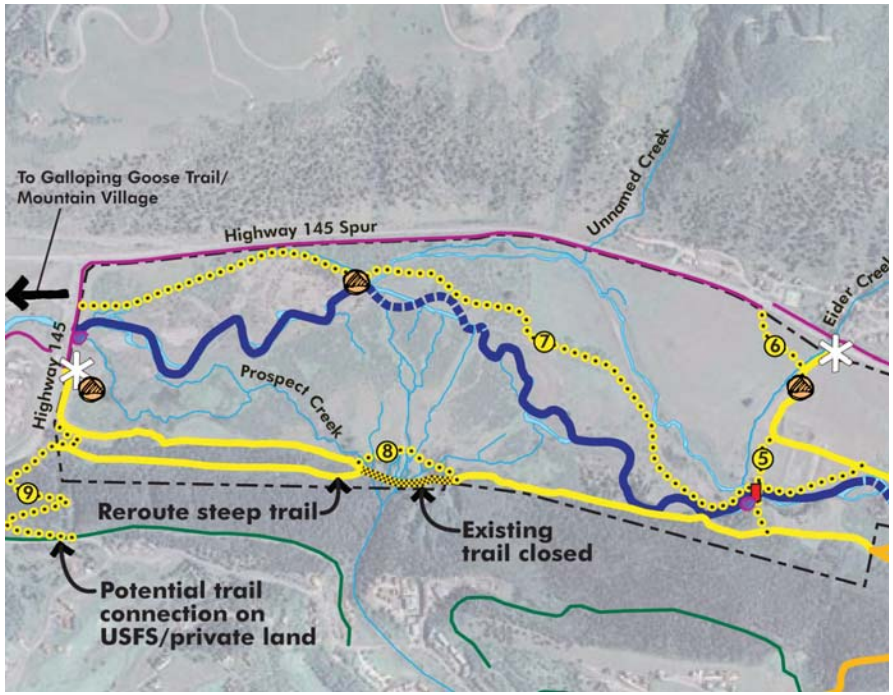
9. *Mountain Village connection.* This conceptual route would climb the hillside to the south of the Property to provide an improved trail connection. This trail would require permission from the Forest Service and private landowners, and would likely require several switchbacks (depending on the specific route) to meet an average grade of no more than 10 percent.

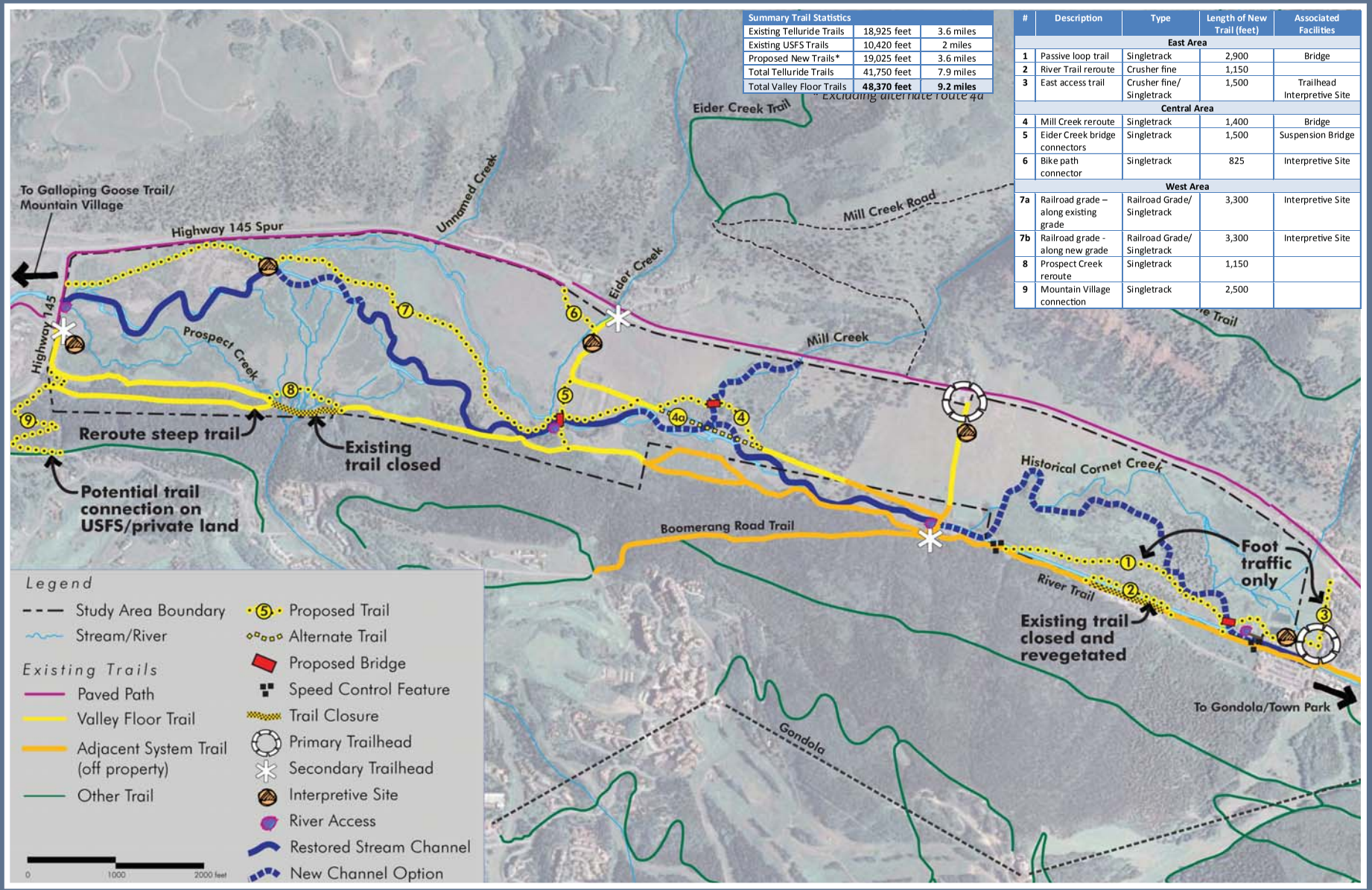
Trail Facilities

- **Secondary trailhead** – A secondary trailhead at the informal west end parking area will include a small identification sign, basic regulations, a simple trail map, trash receptacles, comment boxes, and wildlife observation forms.

- **Interpretive sites** – A site near the western edge of the Property provides an opportunity to interpret wetland ecosystems and Property conservation, while a site near the eastern edge of the tailings pile can interpret the history and restoration of the tailings.

- **Regulatory signs** – Small regulatory signs may be installed along the existing river trail and portions of the railroad grade trail, if needed, to remind visitors to remain on the trail through these sensitive habitat areas.





Summary Trail Statistics		
Existing Telluride Trails	18,925 feet	3.6 miles
Existing USFS Trails	10,420 feet	2 miles
Proposed New Trails*	19,025 feet	3.6 miles
Total Telluride Trails	41,750 feet	7.9 miles
Total Valley Floor Trails	**48,370 feet**	**9.2 miles**

* Excluding alternate route 4a

#	Description	Type	Length of New Trail (feet)	Associated Facilities
East Area				
1	Passive loop trail	Singletrack	2,900	Bridge
2	River Trail reroute	Crusher fine	1,150	
3	East access trail	Crusher fine/ Singletrack	1,500	Trailhead Interpretive Site
Central Area				
4	Mill Creek reroute	Singletrack	1,400	Bridge
5	Eider Creek bridge connectors	Singletrack	1,500	Suspension Bridge
6	Bike path connector	Singletrack	825	Interpretive Site
West Area				
7a	Railroad grade – along existing grade	Railroad Grade/ Singletrack	3,300	Interpretive Site
7b	Railroad grade - along new grade	Railroad Grade/ Singletrack	3,300	Interpretive Site
8	Prospect Creek reroute	Singletrack	1,150	
9	Mountain Village connection	Singletrack	2,500	

OVERALL TRAILS PLAN

WINTER TRAIL RECOMMENDATIONS

The proposed winter use plan for the Property is intended to improve the flow of users, ensure consistency with stream restoration and summer trail facilities, and provide management flexibility for the Town. The plan builds upon the major groomed routes that have been enjoyed in past years, with several new routes and connections to improve the system.

Winter trail recommendations include a groomed Nordic route which will loop to the north around the wetlands in the east portion of the Property, connecting between the Pearl property trailhead and Boomerang Road. A secondary, groomed classic-style route will follow the new summer hiking-only trail through this area. In the center of the Property, a new groomed Nordic and snowshoe route will follow the San Miguel River bank, providing an improved alternative to the current railroad grade route (which is difficult to maintain as a groomed route and will be altered by future stream restoration). Additional connections in the western portion of the Property connect and improve some of the previous routes, while the proposed summer trail connection to Mountain Village would serve as a groomed classic-style ski connection. Most of the open meadows on the Property are designated as "flexible trail routing areas," giving the Town the ability to adjust routes from year to year to adapt to changes or provide varied experiences. Seasonal signage will be used to segregate skiers and walkers and to preserve the groomed tracks and overall user experiences.

The existing practice of installing temporary, seasonal stream crossings will continue and be expanded in suitable locations. New bridges for summer trail use will generally not be designed to accommodate winter grooming equipment. New routes will be located to avoid wetlands and existing riparian vegetation. (Potential impacts of winter grooming on vegetation are discussed in the Environmental Report).

The total length of groomed Nordic routes will be limited to approximately 20 kilometers due to habitat and aesthetic concerns about excessive grooming. The actual length will vary from year to year due to changes in the flexible routing areas. Impacts resulting from Nordic trail maintenance and use will be evaluated and could result in trail modifications, if required.

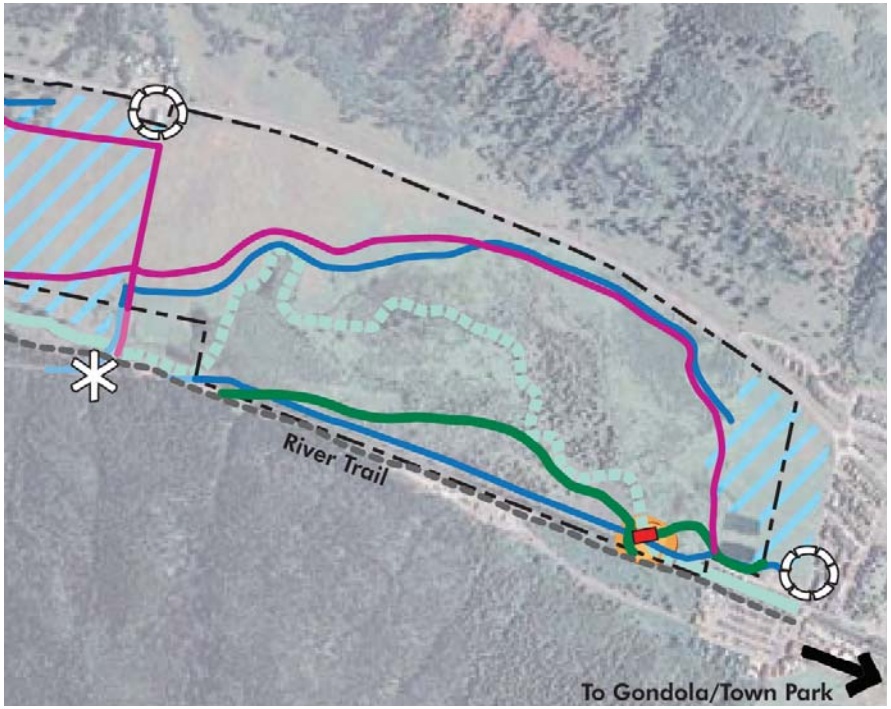
East Area – Mahoney Drive to Boomerang Road

Similar to summer uses, this area is the gateway to the Property for most winter visitors. Winter trail changes are focused on relieving congestion along the railroad grade corridor and enhancing the overall system by providing varied loops and opportunities in this area.

New Routes

A. North loop. This new groomed Nordic skiing route will meander through the willows in this area and then follow the upland bench to reach Boomerang Road, generally skirting to the south portion of the prairie dog colony.

B. Classic route. A groomed, classic-only route will follow the corridor established by the summer route (trail #1). Like the summer route, this is intended to provide a more passive experience and will be groomed using smaller equipment (e.g., snowmobile).



C. Flexible routing area. The open meadows along the eastern boundary of the Property will allow for flexible routing to accommodate a beginner's loop, a through trail, or other system needs.

D. Walking/snowshoe route. A groomed walking/snowshoe route will parallel near the groomed Nordic skiing route in this area.

Winter Facilities

- **Primary trailhead** – The summer trailhead on or near the southeast corner of the Property (on the South Pearl Parking Lot) will be the primary trailhead for the Nordic ski system.
- **New bridge** – The new rigid trail bridge constructed for summer use can also be used, if needed, as the starting point for the classic-only route.
- **Stream crossing** – A temporary, low-flow crossing adjacent to the new bridge will be used for the main groomed Nordic route. As part of the stream restoration, this crossing location should be incorporated into restoration designs.

Central Area – Boomerang Road to Eider Creek

Winter use in this area is dominated by open meadows and the railroad grade/stream corridor. Winter trail recommendations in this area are intended to improve a route along the stream while maintaining flexibility in the meadow areas. As new routes will be implemented over time as part of the Mill Creek restoration efforts, groomed Nordic skiing will be permitted to continue along the railroad grade until new, suitable routes are established. A groomed walking route along the railroad grade would be established only after the skiing route has been relocated.

New Routes

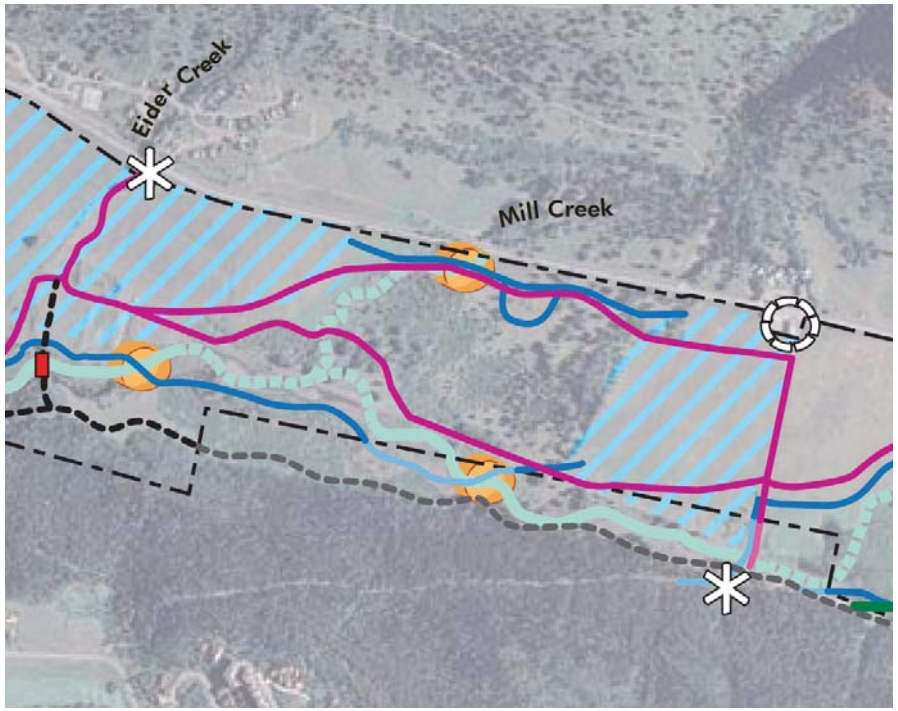
E. Riverbank route. A new groomed Nordic skiing route will be established along the south bank of the San Miguel River. This route is an alternative to the current railroad grade route, which is difficult to maintain for skiing and will be compromised by future stream restoration efforts. This route will require two new temporary low-flow stream crossings.

F. Flexible routing areas. The open meadows west of Boomerang Road and along the Eider Creek alluvial fan will allow for flexible routing.

G. *Walking/snowshoe route.* A new snowshoe/walking route will be established along the current railroad grade. The railroad grade route will be used for a walking route only after the skiing route has been relocated to the riverbank.

Winter Facilities

- **Primary trailhead** – A primary trailhead and parking area will be located at North Boomerang Road.
- **Stream crossings** – Two new temporary, low-flow crossings of the San Miguel River will be established for the new riverbank route. The previous Mill Creek crossing will continue to be used.



West Area – Eider Creek to Society Turn

This area is dominated by wetlands and the railroad grade and winter routes are currently fragmented. Winter trail recommendations in this area are intended to improve overall connectivity while maintaining flexibility in the meadow areas.

New Routes

H. North connection. This short connection can be established as part of the efforts to abandon and naturalize the north stream channel through this area.

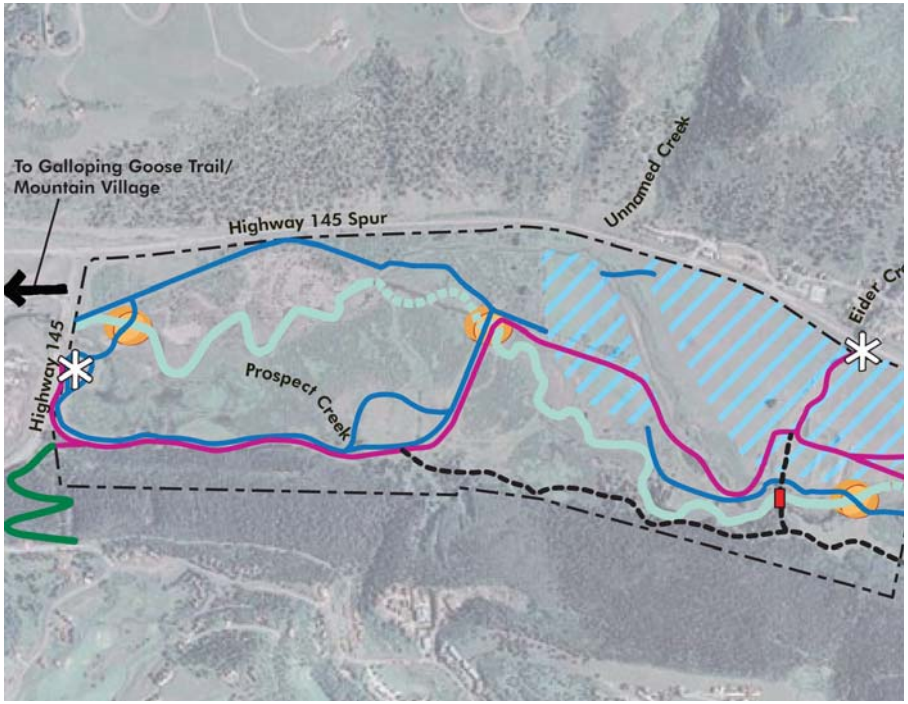
I. West end connection. This short connection, accommodated by a temporary low-flow stream crossing, will improve the overall system by establishing a loop around the west end of the Property.

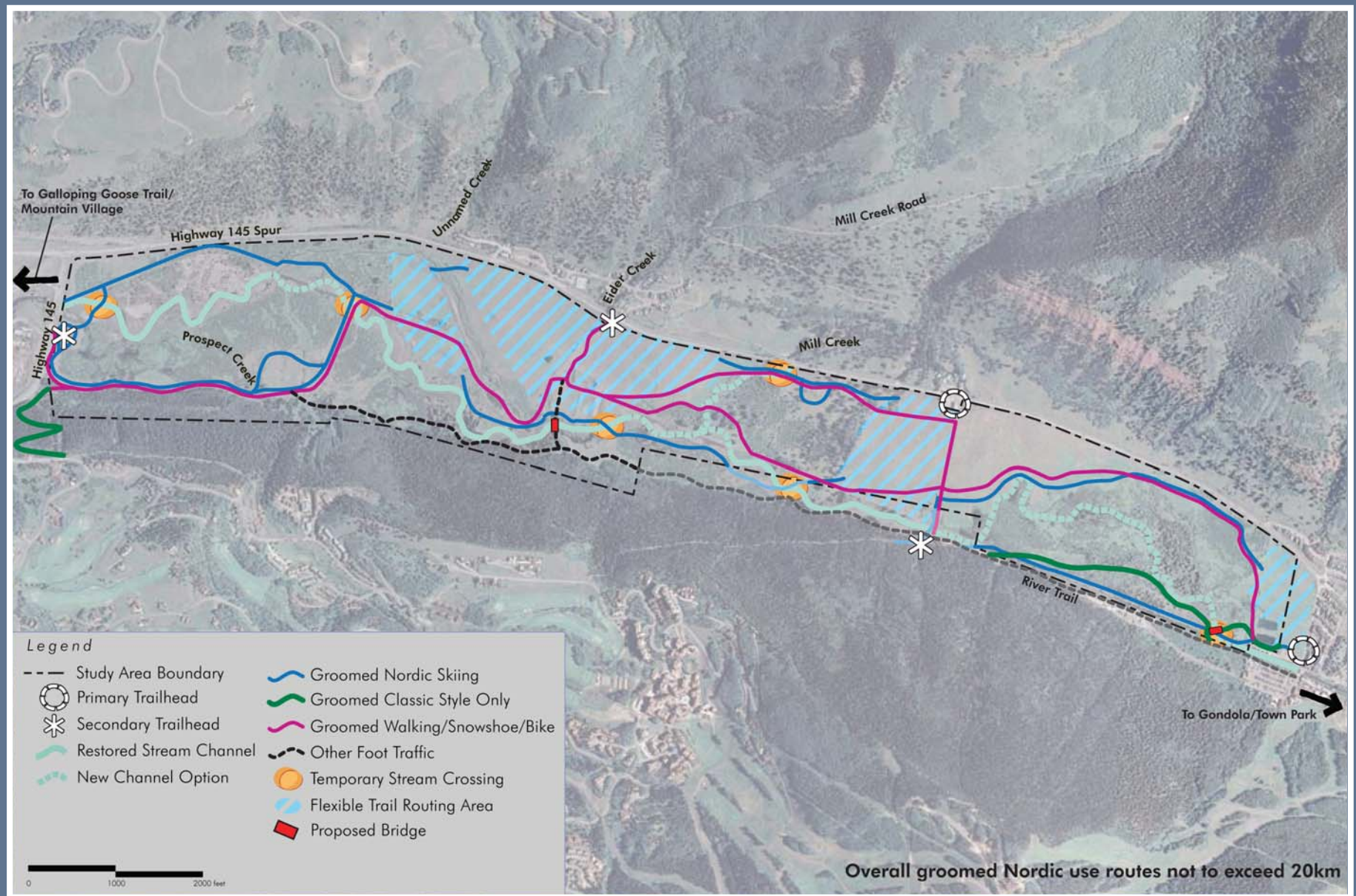
J. Mountain Village connection. A groomed, classic-only route will follow the corridor established by the summer route (trail #9). This route will climb steep grades and will primarily be for advanced skiers, but will establish the connection nonetheless.

K. Walking/snowshoe route. A new groomed walking/snowshoe route will be established along the southern Property boundary and will parallel the groomed Nordic skiing route.

Winter Facilities

- **Secondary trailhead** – Winter trail access will be provided at the west end of the Property.
- **Stream crossings** – One new temporary, low-flow crossing of the San Miguel River will be established near the west end of the Property. The previous crossing in this area will continue to be used.





OVERALL WINTER TRAILS

TRAIL DESIGN ELEMENTS

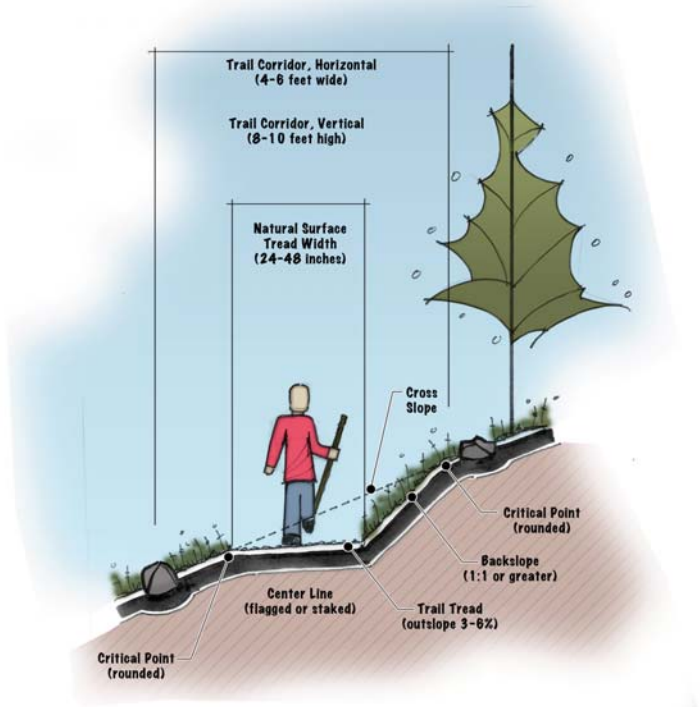
Summer Trail Types

This Plan includes four general trail types, each with its own design and implementation guidelines.

Singletrack Trails (Trails 1, 5, 6, 7, 8 and 9)

Most of the trails on the Property will be natural surface, singletrack trails. The recommended tread width may vary between 24 to 48 inches, depending on location and anticipated traffic. For example, the passive, hiking-only trail in the east area may have a narrower tread while the connector trails in the Eider Creek area should have a wider tread.

Singletrack trails should have a rolling contour design and include small meanders and grade reversals to both shed water frequently and to provide an interesting user experience. This is particularly important on flat terrain where it can be challenging to build and maintain a trail tread that drains appropriately.



New Trails on the Railroad Grade (Trails 2, 4 and 7)

New trails along the railroad grade will be natural surface, with a wider tread (approx 48 inches) to accommodate increased traffic and a wider trail corridor. The length of railroad grade between Eider Creek and Boomerang Road will be more similar in character and construction to other roads on the Property, described below.

New trails constructed along the railroad grade will require frequent meanders between the edges of the railroad grade, as well as grade reversals and other features to ensure proper drainage. Sections of the trail that are straight and flat should be constructed with a crowned trail surface with one or two drainage channels along the trail edge. Several straight and flat sections may be desired to retain the historical character of the railroad grade.

Roads

Several existing roads on the Property will be integrated into the trail system. This includes the Eider Creek Road, Boomerang Road, and the portion of the railroad grade between the two. These roads will also be used for administrative access. No major changes or improvements to these roads is needed or recommended, as they function well in their current state and retain their own character. In some locations, however, minor drainage or structural improvements will be necessary to ensure long-term sustainability.

Crusher Fine Trail (Trails 2 and 3)

Soft surface trails with a crushed stone ("crusher fine") surface provide a durable surface that is appropriate for higher traffic areas along the urban/natural interface. The existing River Trail east of Boomerang Road (which is not on the property), is the only example of this type of trail in the local trail network. The east access trail along Mahoney Drive (also off the Property) and the River Trail reroute, are the only places where new crusher fine trails are recommended. The recommended tread width is 4 to 6 feet.

Soft surface trails should be constructed of crusher fine material about 4 inches thick. Geotextile fabric may be used in areas with soft soils to help stabilize the tread.

Winter Trail Types

The Winter Trails plan includes three general types of trails.

Groomed Nordic

Most of the winter routes on the Property are wide groomed trails (about 12 to 16 feet wide), suitable for skate-skiing, with a parallel track for classic-style skiing. These trails are established and maintained by large, motorized grooming equipment.

Groomed Classic

Classic-only trails are narrower (4 to 6 feet wide), consisting of two parallel ski tracks set and groomed by smaller motorized equipment (snowmobile). Classic trails on the Property are located on summer singletrack routes that are not primarily designed for groomed winter use and therefore may not be uniform in width, grade, or ground surface.

Walking/Snowshoe Trails

Walking/shnowshoe trails generally consist of narrow (4 to 8 foot) groomed trails that are intended to provide a separate surface for foot traffic to protect and maintain groomed ski tracks and to minimize conflicts. Clear signage should be used to segregate skiers and walkers as much as possible.

Specific requirements for winter trail management and operations are established by the Management Plan and by an operations plan, approved annually by the OSC.

Bridges

This plan calls for two new trail bridges across the San Miguel River. One short rigid bridge, and one long suspension bridge. Based on community and OSC input, it is important that the design and fabrication of the bridges are reflective of the character of the Property and the greater Telluride community, and are designed to contribute to the aesthetic value of the Property rather than detract from it. For these reasons, bridge designs that are similar in character and construction to the foot bridges in the Keystone Gorge (2 miles to the west) are recommended for the Property. Implementation of the alternative sewer line designs associated with the Mill Creek confluence restoration would require an additional two bridges, each about 50 feet in length.

The two main types of bridges are described as follows:

- **Rigid steel frame bridges** – One rigid steel frame bridge, about 50 feet in length, is planned on the Property. This bridge is expected to cost approximately $75,000.

- **Suspension bridge** – One long suspension bridge, approximately 100 to 120 feet in length, is planned for the west-central portion of the Property, immediately east of the Eider Creek confluence. This bridge will be at the intersection of four trails, and is expected to be an attractive structure that adds to the aesthetic character of the property. This bridge is expected to cost approximately $145,000.

All new bridges are recommended to have a 5-foot wide deck, which is wide enough to accommodate multiple users or ATVs in the event of an emergency, but narrow enough to retain the natural character of the trails system. The rigid bridge will be associated with a new, restored channel location and can be incorporated into specific channel designs.

The new bridges are not intended to be wide enough to support winter grooming equipment or maintenance vehicles (10 to 12 foot wide deck), as those structures would be disproportionately large for summer uses, and are not in optimal locations for winter uses. If it is deemed necessary to add a rigid steel frame bridge that supports winter grooming, it would add a minimum of 50 percent to the total bridge cost. Smaller bridges, culverts, turnpikes, and other crossings are described below under *Water Crossings.*

Trailheads

Trailhead locations and facilities will be established per the recommendations of the Management Plan. Primary trailheads will be located on or near the South Pearl Parking Lot, and at the North Boomerang Road outlet (behind the gas station). Secondary trailheads will be located at the South Boomerang Road, West End, and Eider Creek Gate.

The South Pearl Trailhead location will be the main gateway between the Property and Town. As mentioned in the Management Plan and based on feedback during this planning process, a multi-purpose facility (environmental education/open space recreation, administration and maintenance) at this location is desired in the future. As such, the following additional facilities should be considered:

- Year-round restroom facilities
- Year-round, multi-purpose structure
- Additional interpretive panels allowed on-site (history of the Property and its preservation)

Any building is not intended, nor permitted, on the Property. If pursued, these additional trailhead facilities should be designed and developed in a thoughtful manner that is consistent with and responsive to the intrinsic values of the Property.

River Access

This trail plan designates four access points to accommodate water-based recreation (primarily kayaking, tubing, and fishing) and to discourage riparian habitat impacts resulting from informal access trails. River access points are designated in the following locations:

- East end, adjacent to the proposed bridge at the beginning of the new stream channel
- Adjacent to Boomerang Road bridge
- Eider Creek confluence, adjacent to the proposed suspension bridge
- West end, adjacent to the paved path and parking area

These access points are anticipated to include the placement of flat rocks or boulders and any other features (rock steps, armoring) necessary to provide safe and reasonable access to the water in a manner that is attractive and consistent with the surrounding character.

Signs

The Property signage program design will need to address a number of informational functions. The goal is to do so in a minimalist way and avoid overuse of signs in such a scenic and pristine natural corridor. With significant use by local residents as well as visitors, the sign information system needs will require, but may not be limited to, the following sign types:

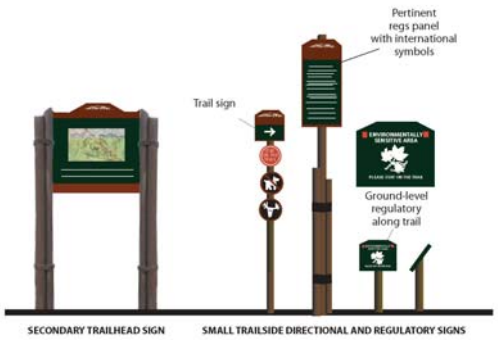
- **Entry /trailhead** – Iconographic sign at primary trailheads, where sign should have a generalized map consistent with the Management Plan, as well as other information. Sign design should allow for trail regulations, notices/closures, comment boxes and pet pick up bag dispensers so as to minimize the quantity of sign posts. Smaller versions to mark secondary trailheads and entry points, similar in design but scaled appropriately, would provide choices based on site-specific needs.
- **Wayfinding/directional** – Simple trail marker signs consistent in character with the overall sign family materials and graphics.
- **Regulatory** – International symbols should be used wherever possible. Larger lists of trail regulations would ideally appear on trailhead signs,while basic regulations would be posted on secondary trailhead and entry locations. Vehicular signs should be limited to trailhead parking.
- **Interpretive** – Located at key waysides where there is a story to be told.

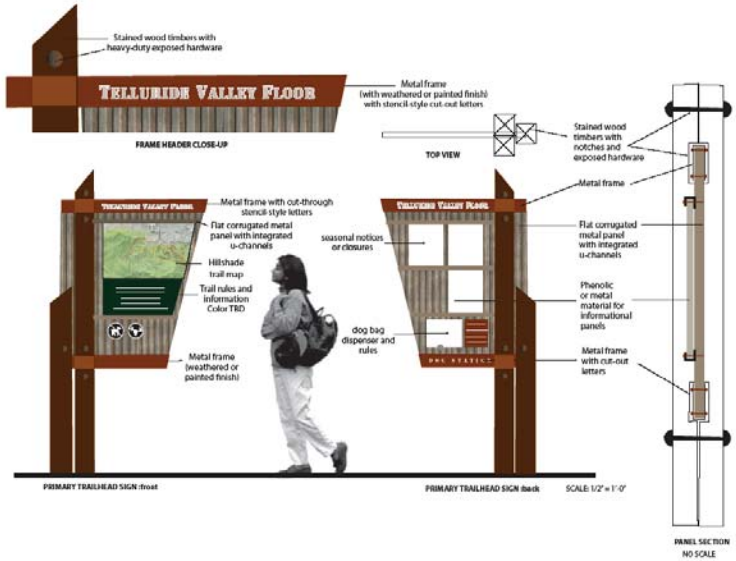
Like other elements of this plan, implementation of the conceptual signage plan will require the development of draft and final designs (with appropriate OSC and Town input), and the development of bid-specific layouts for fabrication.

Conceptual designs for these various sign types are shown. While final designs will vary, the overall style of the signs is intended to be consistent with the historic mining vertacular of the region. Specific guidelines for fabrication are envisioned to include the following:

- **Sign posts** – Double 6" x 6" sign posts, of stained timbers or square metal tubes, sandwiching the metal frame and corrugated metal backdrop, bolted together with oversized exposed hardware.
- **Header and frame** – Top header panel is rusted or "weathered" 1/4" steel, with the trail name in a cut-through stencil letter style. The bottom metal panel is of the same material, and provides a tray for the corrugated metal panel.
- **Sign face backdrop** – Corrugated metal reflects the more contemporary architectural interpretation of the historic mining style. There are multiple profiles and colors or corrugated metal available, but a flat vs. wavy corrugated surface in a galvanized finish is envisioned. The flat profile would allow for the mounting of metal u-channels needed to provide flexible attachment systems for informational signs.
- **Information sign panels** – Sign panels are phenolic resin with embedded graphics, which provide the most durable, fade-proof and graffiti-proof surface available for a high-altitude mountain environment.

Example of sign hierarchy (style indicated for illustrative purposes only):





Trail Design and Implementation Features

This trails plan identifies a recommended trail corridor, recognizing that final adjustments and design changes will be made in the field during implementation. The implementation process will include walking and flagging specific routes along with the identification of specific trail design features that are necessary to ensure long-term sustainability of the trails. Some of these key design features include the following:

- **Grade reversals** – Grade reversals are essential to trail sustainability and will be necessary throughout the trails system. Grade reversals can be in the form of grade dips, water bars, steps, and knicks. A grade reversal collects a flow of water and diverts it off of the trail tread. If trails are constructed without grade reversals, water travels down the trail tread creating erosion channels and destroying long sections of the trail tread. Grade reversals give the trail a rolling effect that is enjoyable to the user.

- **Trail grades** – The recommended practice for constructing sustainable trails is to design the trail with an overall trail grade of less than 10 percent (with a preferred grade of 8 percent). Preferred grades for winter Nordic use are less than 5 percent. This will be an important consideration for the design and construction of the Mountain Village connector trail. Trail grades (for summer use) can exceed 8-10 percent (up to 15 percent) for short segments and when entering and exiting grade reversals. This is a general rule and trail tread conditions can vary, changing the maximum grade for sustainability. Highly erosive soils will decrease the maximum sustainable trail grade and solid rock will increase the maximum sustainable trail grade.

- **The half rule** – The Half Rule is a good design practice. Trail grades should never exceed half of the measured side slope grade. If this occurs, water traveling down the hillside from above will intercept the trail and travel down the trail tread instead of sheeting over the critical edge of the trail. For example, if the side slope of a hillside measures 20 percent, trail grades should be a maximum of 10 percent. A poorly constructed trail tread grade of 15 percent will become the path for water, a trail grade of 8 percent will be sustainable and water will sheet over and down away from the trail tread.

- **Switchback Turn** – The construction of a trail connection between the Property and the Mountain Village trails requires several switch back turns. They are difficult to construct but are a necessary trail feature when trying to keep grades low. The lower leg of a switchback turn is built up with rock and soils created while cutting in the trail tread. The upper leg is insloped and the lower leg is downsloped. Grade reversals are constructed into and out of a switchback turn and water is diverted off the edge of the turning platform. Switchbacks that are constructed properly create a sustainable turning platform and stabilize the trail tread when elevation needs to be gained or lost.

- **Climbing turn** – Climbing turns are constructed on gentler side slopes that do not exceed 7 percent. The radius of the climbing turn is wide – 20 feet or more. A short portion of the climbing turn travels up the fall line for a short distance. Grade reversals are constructed before and after the turn, and both legs of the trail are downsloped.

- **Water crossings** – An addition to the major trail bridges across the San Miguel River, the trail system will require multiple crossings of small water bodies and wetland areas. There are numerous ways to align a trail over a drainage crossing. Final routing and design of trails should always consider ways to avoid unnecessary water and wetland crossings and use the appropriate type of crossing minimizing impacts to sensitive wetlands and habitat.

- **Natural swale crossing** – A natural swale crossing (also referred to as a "ford") descends into and ascends out of the drainage below the contour. This keeps water from flowing along the trail tread when passing over it. Water does not flow up the trail tread; it continues to travel downhill past the trail alignment. A natural swale crossing can be armored to reduce the amount of erosion and regrading required after storm events. The trail tread is armored by placing rock to grade within the trail tread where the main drainage channel crosses over the trail.

- **Simple bridges** – Simple bridges, such as those in the Prospect Creek area, can be constructed from natural materials found locally.

- **Culvert** – Culverts can be used for water crossings with larger flows or perennial flow. Culverts come in a variety of sizes and materials. Install the culvert under the trail tread and armor the inlet and outlet with natural rock. Fill the trail tread up to grade with an appropriate material, wet the material, and compact. This allows water to flow under instead of over the trail. Culverts are drier than natural swales for trail users and cost less than bridges.

- **Boardwalks** – Boardwalks or similar features may be used for short wetland crossings as an alternative to turnpikes or bridges. As a general rule, consistent with the Management Plan, extended boardwalks (or wetland crossings of any kind) are discouraged. There are several designs for boardwalks that are costly to construct and maintain.

- **Turnpikes** – Turnpikes are constructed over seasonably wet terrain and boggy areas. Turnpikes elevate the trail tread while allowing surface and subsurface water flow to continue. A turnpike is constructed by raising the trail tread with natural materials (rocks and/or gravel) between peeled logs. A layer of geotextile fabric should be placed beneath the fill material to prevent subsidence. Turnpikes should not be used in areas where surface water is consistently present.

- **Reroutes and restoration** – In several locations, such as the Prospect Creek area, existing segments of trail are recommended to be abandoned and rerouted to more suitable or sustainable locations. Abandoned segments of trail are to be obliterated (breaking up or burying the existing tread with hand tools or machinery), and revegetated with native species. Ongoing monitoring and weed mitigation will be necessary to ensure restoration success. Erosion control fabric or netting is useful in hiding the abandoned trail location and facilitating revegetation. The selective planting of trees and shrubs, along with the placement of downed vegetation and rocks is also important to naturalize the old trail and ensure that it is no longer used.

The maintenance and improvement of small, isolated sections of trail is an ongoing process. Several sections of existing trail will require the installation of design features to improve or mitigate drainage problems. In some cases, short segments of trail should be rerouted entirely.

Seasonal Trail Closures

Consistent with the direction of the Management Plan, some trails may be subject to seasonal closures to protect wildlife habitat or other environmental values on the property. Examples of conditions that may warrant seasonal closures include elk calving, seasonal movement corridors, or occurrences of rare or sensitive species. Seasonal closures are mostly likely to be necessary along trails that cross through or adjacent to wetland habitat areas, such as trails 1 and 7.

Conflict Management Tools

While the vast majority of trail users will enjoy the Property and other trail systems without experiencing conflicts, conflicts do occur. Trail conflicts are generally the result of mountain bikers traveling too fast and startling other trail users, due to a lack of experience, lack of concern, or a momentary lapse in attentiveness by an otherwise well-meaning rider. These types of conflicts have been reported on the existing trails, particularly along the existing River Trail east of Boomerang Road.

The proposed foot traffic-only trail (trail #1) can help reduce conflicts in this sometimes congested area by dispersing users onto two separate trails and by providing an alternative for walkers and hikers who wish to avoid bikes altogether. While such a specific-use trail is generally not the preferred method to manage user conflicts, it is believed to be appropriate in this case due to its location in a sensitive habitat area. While the ecological impacts between different trail users is minimal, the character and experience of a hiking-only trail is more compatible with the ecologically sensitive area in which this trail is located.

Other conflict management tools to be considered for the Property include the following:

- **Vegetation clearing** – The careful and strategic clearing of vegetation along the trail corridor can reduce conflicts by improving sight-lines. Any clearing should be carefully balanced against the aesthetic and ecological values of the vegetation.

- **Barrier placement** – The placement of medium-sized boulders or other barriers along the trail is an effective way to reduce speeds while retaining the natural feel of the surrounding environment.

- **Signs** – The installation of signs can clearly communicate the need to reduce speeds with messages such as: "Slow – Congested Area", "Two – Way Traffic", or "Expect and Respect Other Trail Users." Considering the direction of the Management Plan to minimize signs on the Property, such regulatory signs should only be used if other methods are not effective.

- **Education and enforcement** – Efforts to educate users about trail etiquette can be effective, along with active enforcement of posted regulations.

COSTS AND PHASING

ITEMIZED COST ESTIMATES

Itemized cost estimates were developed for the individual stream restoration activities and trail plans recommended in this report. Costs have been broken out by stream reach for restoration work and by east, middle and west for trails.

Unit costs were developed for all recommended improvements. Overall costs for restoration and trail work were derived using these unit cost estimates and estimated construction quantities. Unit costs utilized to estimate planned improvements are given below.

Item	Unit	Unit Cost
Create New Meandering Channel	Cubic Yard	$15
Instream Improvements	Linear Foot	$35
Bend Pool, Stabilization and Planting	Each	$10,000
Tailings/River Interface Armoring	Linear Foot	$300
Stabilize and Vegetate New Riparian Corridor	Acre	$16,000
Existing Channel Cutoff	Each	$10,000
Abandoned Channel Grading	Linear Foot	$10
Abandoned Channel Revegetation	Acre	$23,800
Remove Railroad Grade	Linear Foot	$75
New Mill Creek/Hwy 145 Culvert	Each	$156,000
Mill Creek Channel Improvements	Linear Foot	$50
East Pond Grading	Each	$10,000
East Pond Revegetation	Each	$20,000
Sewer Pond Grading	Each	$20,000
Sewer Pond Revegetation	Each	$20,000
Sewer/River Crossing, Standard	Each	$120,000
Sewer/River Siphon, 500 Foot Long	Each	$700,000
Steel Frame Bridge – 50 Foot Length	Each	$75,000
Suspension Bridge – 120 Feet Length	Each	$145,000
Singletrack Trail, 2' – 4' Width, Flat/Rolling Terrain	Linear Foot	$4
Singletrack Trail, 1.5' – 2' Width, Steep Hillside	Linear Foot	$7
Railroad Grade Trail, 2' – 4' Width, Native Surface	Linear Foot	$3.25
Soft Surface Trail, 4' – 6' Width, Crusher Fine Surface	Linear Foot	$14
Switchback Construction	Linear Foot	$5.25
Turnpike Construction, Natural Log and Native Soil	Linear Foot	$75
Trail Removal	Linear Foot	$1.75
Reclamation of Access & Construction Disturbance	Each	$75,000
Contingency	Percent of Construction	15%
Mobilization/Demobilization	Percent of Construction	3%
Final Design/Build Plans	Percent of Construction	5%
Project Permitting	Percent of Construction	1%
Construction Management	Percent of Construction	4%
Monitoring and Maintenance	Per Year	$100,000

Maintenance will be required after the improvements are made and should be included in the Town's financial planning. Major items that are expected to require maintenance and estimated costs are:

- Watering and weed management in newly planted areas - $100,000 per year for 3 years after completion
- Annual cleaning/pumping of siphon lines - $2,000 per year plus routine maintenance
- Minor streambank stabilization - $10,000 per year for 3 years after completion
- Minor trail maintenance - $5,000 per year

PROJECT PHASING

The magnitude of these stream restoration and trail recommendations dictates that improvements will need to be implemented in phases rather than as a single project. From the perspective of stream and associated restoration, phasing would ideally be constructed starting at the upstream end (Reach 1) and proceeding downstream. This progression ensures that once a segment is completed the newly restored area is continuous with other enhancement, eliminating a "checkerboard" approach. Recommendations for phasing the trails plan, if required, include focusing on areas of highest user conflict (speed control features and other improvements on the east end of the Property) and where the existing trail is substandard (Prospect Creek reroute – trail #8 – and localized areas). The new bridge and associated trails at Eider Creek are a high priority, as this short connection would greatly enhance trail flow and use throughout the Property.

In several areas, the planned stream restoration and trails plan are closely linked and improvements should be coordinated. At the east end of the Property the proposed new trail #1 is designed to compliment Reach 1 stream realignment. Similarly the trail alignment (4) as it crosses Mill Creek is linked to the final stream configuration and the southern trail crossing at Eider Creek will be impacted by restoration of the existing split in the San Miguel River at this location.

Total costs for the planned stream and related restoration and trails plan are provided below:

Stream Restoration Costs

	Reach 1				
1	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
1a	Instream Improvements	Linear Foot	$ 35.00	5800	$ 203,000.00
1b	New Meandering Channel Creation (5,800')	Cubic Yard	$ 15.00	16000	$ 240,000.00
1c	Vegetate and Stabilize New Channel Corridor	Acres	$ 16,000.00	6.4	$ 102,400.00
1d	Relocate Sewer Line	Linear Foot	$ 120.00	2500	$ 300,000.00
1e	Bend Pool Grading, Stabilization & Riparian Planting	Each	$ 10,000.00	32	$ 320,000.00
1f	Existing Channel Cutoff	Lump Sum	$ 10,000.00	1	$ 10,000.00
1g	Existing Channel Grading (3,700')	Linear Foot	$ 10.00	3700	$ 37,000.00
1h	Existing Channel Revegetation	Acre	$ 23,800.00	3	$ 71,400.00
	Total - Reach 1				**$ 1,283,800.00**
	Reach 2				
2	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
2a	Instream Improvements (3,200')	Linear Foot	$ 35.00	3200	$ 112,000.00
2b	Bend Pool Grading, Stabilization & Riparian Planting	Each	$ 10,000.00	12	$ 120,000.00
	Total - Reach 2				**$ 232,000.00**
	Reach 3				
3	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
3a	Instream Improvements	Linear Foot	$ 35.00	1500	$ 52,500.00
3b	New Meandering Channel Creation (1,500')	Cubic Yard	$ 15.00	19000	$ 285,000.00
3c	Replace Mill Creek/Hwy 145 Culvert	Each	$ 156,000.00	1	$ 156,000.00
3d	Mill Creek Channel Improvements	Linear Foot	$ 50.00	1700	$ 85,000.00
3e	Sewer Crossing, Siphon Segment	Each	$ 700,000.00	1	$ 700,000.00
3f	Remove Railroad Grade	Linear Foot	$ 75.00	600	$ 45,000.00
3g	Vegetate and Stabilize Corridor	Acres	$ 16,000.00	3	$ 48,000.00
3h	Bend Pool Grading, Stabilization & Riparian Planting	Each	$ 10,000.00	2	$ 20,000.00
	Total - Reach 3				**$ 1,391,500.00**
	Reach 4				
4	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
4a	Instream Improvements (4,650')	Linear Foot	$ 35.00	4650	$ 162,750.00
4b	Bend Pool Grading, Stabilization & Riparian Planting	Each	$ 10,000.00	24	$ 240,000.00
4c	Remove Railroad Grade	Linear Foot	$ 75.00	200	$ 15,000.00
4d	North Channel Cutoff	Lump Sum	$ 10,000.00	1	$ 10,000.00
4e	North Channel Grading	Linear Foot	$ 10.00	5000	$ 50,000.00
4f	North Channel Revegetation	Acre	$ 23,800.00	3.4	$ 80,900.00
	Total - Reach 4				**$ 558,650.00**
	Reach 5				
5	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
5a	New Meandering Channel Creation (1,350')	Cubic Yard	$ 15.00	6000	$ 90,000.00
5b	Instream Habitat	Linear Foot	$ 35.00	1350	$ 47,250.00
5c	Bend Pool Grading, Stabilization & Riparian Planting	Each	$ 10,000.00	5	$ 50,000.00
5d	Remove Railroad Grade	Linear Foot	$ 75.00	1000	$ 75,000.00
5e	Vegetate and Stabilize New Channel Corridor	Acres	$ 16,000.00	1.5	$ 24,000.00
	Total - Reach 5				**$ 286,250.00**
	Reach 6				
6	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
6a	Instream Improvements (3,300')	Linear Foot	$ 35.00	3300	$ 115,500.00
6b	Tailings/River Interface Armoring	Linear Foot	$ 300.00	2800	$ 840,000.00
6c	Bend Pool Grading, Stabilization & Riparian Planting	Each	$ 10,000.00	13	$ 130,000.00
	Total - Reach 6				**$ 1,085,500.00**
	Miscellaneous Items				
7	**Item Description**	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
7a	Eastern Pond (Pearl) Grading	Lump Sum	$ 10,000.00	1	$ 10,000.00
7b	Eastern Pond Revegetation	Lump Sum	$ 20,000.00	1	$ 20,000.00
7c	Sewer Pond Grading	Lump Sum	$ 20,000.00	1	$ 20,000.00
7d	Sewer Pond Revegetation	Lump Sum	$ 20,000.00	1	$ 20,000.00
7e	Access & Construction Disturbance Reclamation	Lump Sum	$ 75,000.00	1	$ 75,000.00
7f	Contingency (10%)	Lump Sum	$ 497,000.00	1	$ 497,000.00
7g	Mobilization/Demobilization (3%)	Lump Sum	$ 149,000.00	1	$ 149,000.00
7h	Final Design/Build Drawings (5%)	Lump Sum	$ 248,000.00	1	$ 248,000.00
7i	Construction Management (4%)	Lump Sum	$ 199,000.00	1	$ 199,000.00
7j	Project Permitting (1%)	Lump Sum	$ 50,000.00	1	$ 50,000.00
7k	Monitoring and Maintenance (per year post project)	Each	$ 100,000.00	3	$ 300,000.00
	Total - Miscellaneous Items				**$ 1,588,000.00**
Total					**$ 6,425,700.00**

Trails Plan Costs

	East Area - Mahoney Drive to Boomerang Road				
	Item Description	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
1	Passive Loop Trail - Singletrack	Linear Foot	$ 4.00	2,900	$ 11,600.00
2	River Trail reroute - Soft surface/crusher fine	Linear Foot	$ 14.00	1,150	$ 16,100.00
3	East access trail - Soft surface/crusher fine	Linear Foot	$ 14.00	1,500	$ 21,000.00
	Rigid steel frame trail bridge (approx. 50')	Each	$ 75,000.00	1	$ 75,000.00
	Existing trail obliteration	Linear Foot	$ 1.75	1,000	$ 1,750.00
	Total - East Area				**$ 125,450.00**
	Central Area - Boomerang Road to Eider Creek				
	Item Description	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
4	Mill Creek reroute	Linear Foot	$ 4.00	1,400	$ 5,600.00
5	Eider Creek bridge connectors - Singletrack	Linear Foot	$ 4.00	1,500	$ 6,000.00
6	Bike Path connector - Singletrack	Linear Foot	$ 4.00	825	$ 3,300.00
	Railroad grade - improvements	Linear Foot	$ 2.00	900	$ 1,800.00
	Suspension bridge (approx. 120')	Each	$ 145,000.00	1	$ 145,000.00
	Rigid steel frame trail bridge (approx. 50')	Each	$ 75,000.00	1	$ 75,000.00
	Total - Central Area				**$ 236,700.00**
	West Area - Eider Creek to Society Turn				
	Item Description	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
7a	Railroad grade - along existing grade	Linear Foot	$ 3.25	3,300	$ 10,725.00
7b	Railroad grade - along new grade	Linear Foot	$ 4.00	3,300	$ 13,200.00
8	Prospect Creek reroute - Singletrack	Linear Foot	$ 4.00	1,150	$ 4,600.00
9	Mountain Village connection - Singletrack	Linear Foot	$ 4.00	2,500	$ 10,000.00
	Existing trail obliteration	Linear Foot	$ 1.75	750	$ 1,300.00
	Total - West Area				**$ 39,825.00**
	Item Description	**Unit**	**Unit Cost**	**Quantity**	**Subtotal**
	Primary trailhead - South Pearl	Each	$ 650,000.00	1	$ 650,000.00
	Primary trailhead - Boomerang	Each	$ 150,000.00	1	$ 150,000.00
	Secondary trailhead	Each	$ 10,000.00	3	$ 30,000.00
	Interpretive site panels	Each	$ 1,000.00	5	$ 5,000.00
	Regulatory signs	Each	$ 500.00	20	$ 10,000.00
	Switchback construction	Linear Foot	$ 5.25	300	$ 1,575.00
	Turnpike construction	Linear Foot	$ 75.00	400	$ 30,000.00
	Total - Miscellaneous Items				**$ 876,575.00**
Total					**$ 1,278,550.00**
Total *- Without Enhanced South Pearl Trailhead Improvements*					***$ 778,550.00***

River work and trail improvements in these three areas should be planned and implemented in a compatible fashion. Several trails and trail connections are independent of stream restoration, and can be implemented at any time. These include the east access trail (trail #1), Eider Creek – bike path connector (trail #6), and the Mountain Village connection (trail #9).

FUNDING

Public and private funding sources may be available to assist with varying aspects of the proposed plans. A listing of potential grant programs and their focus as it relates to this project is provided below.

- USDA Natural Resource Conservation Program – fish, wildlife and natural resource enhancement
- Recreational Trails Program – develop and maintain trails
- EPA 319 Program – watershed and water quality improvements
- CDOW Fishing is Fun – aquatic habitat and angler access
- CDOW Wildlife Conservation – conserve, restore or enhance habitat of threatened, endangered or species of concern
- GOCO/GOCO Legacy – outdoor recreation, wildlife and open space
- Ducks Unlimited – acquisition and restoration of wetlands
- Fish America – aquatic habitat improvements
- Colorado Wildlife Heritage Program – wildlife enhancement projects
- National Fish and Wildlife Foundation – conserve and protect imperiled species
- Native Plant Conservation Initiative – protect, enhance and/or restore native plant communities
- Wildlife Habitat Incentive Program – restore, protect and enhance wildlife habitat and reduce risk of invasive species
- Andrew W. Mellon Foundation – promotes conservation

REFERENCES

(ERC) Ecological Resource Consultants Inc. 2009. Telluride Valley Floor Environmental Report. Prepared by the Town of Telluride with ERC and ERO Resources Corporation. May.

(FEMA) Federal Emergency Management Agency. 1992. Flood Insurance Study – San Miguel County, Colorado and Incorporated Areas. September 30.

Klingeman, Peter C., Beschta, Robert L., Komar, Paul D. and Bradley, Jeffrey B. 2000. Gravel-Bed Rivers in the Environment, Water Resources Publications, LLC, Highlands Ranch, CO.

Leopold, Luna B., Wolman, M. Gordon and Miller, John P. 1992. Fluvial Processes in Geomorphology, Dover Publications, Inc., New York, NY.

Leopold, Luna B. 2004. A View of the River, Harvard University Press, Cambridge, MA.

Rosgen, Dave L. 1996. Applied River Morphology, Wildland Hydrology, Pagosa Springs, CO.

San Miguel Conservation Foundation 2009. Deed of Conservation Easement. Property Name: Telluride Valley Floor Conservation Easement. Town of Telluride, Colorado. August 4.

(TNA) Telluride Nordic Association. 2007. Facilities and Services Assessment. Prepared by Nordic Group International. March.

Town of Telluride. 2009. Telluride Valley Floor Open Space Management Plan. Prepared by the Town of Telluride with ERO Resources Corporation. August.