TRUCKEE RIVER WATERSHED COUNCIL

PO Box 8568
Truckee, CA 96162
530-550-8760
www.truckeeriverwc.org

Addendum No. 1

Date: May 21, 2018

RE: Coldstream Canyon Restoration and Project Design – Phase 1

TO: Prospective Bidders

This addendum modifies the original Request for Bid dated May 3, 2018.

Reference pages 6 - 11 of the original bid document.

Summary of amendments to original bid package

1. Complete 25%, 60%, and 90% design plans for each of these three projects: road maintenance and decommissioning, ponds restoration/rehabilitation, and large woody debris placement.

2. Remove completion of 100% design plans and necessity to obtain stamped engineered plans.

3. Clarification on structure of proposal budget.

4. Clarification on two optional tasks: Completion of CEQA documents and completion of permit applications.

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Request for Bid

Coldstream Canyon Restoration & Project Design – Phase 1

The Truckee River Watershed Council (TRWC) along with project partner California Department of State Parks (CDPR) seek to hire a consultant to complete restoration design plans for projects in Coldstream Canyon. The goal of the restoration is to reduce flooding, reduce erosion, and protect and enhance riparian habitat.

Lead: Truckee River Watershed Council
Mailing address:
P.O. Box 8568
Truckee, CA 96162

Physical address
10418 Donner Pass Rd (enter from High Street)
Truckee, CA

530-550-8760
Eben Swain
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Partner:
California Department of Parks & Recreation – State Parks
P.O. Box 266
Tahoma, CA 96142-0266

530 525-7232
Cyndie Walck

Original: May 3, 2018

Amended: May 21, 2018

In 2018, TRWC will release several Requests For Proposals (RFP) and Requests For Bids (RFB) for restoration design, construction, environmental compliance, permit assistance, and other work tasks. We appreciate that some firms may wish to respond to multiple RFPs & RFBs. To help with proposal and bid preparation, we offer the following:

1. **Responding to Multiple RFPs/RFBs.** Firms may respond to multiple RFPs and RFBs. In the vast majority of our projects, a firm will not be prevented from bidding on future work if they participate in current work. In the rare case where this prohibition exists, we will state the prohibition in the current RFP/RFB.

2. **Lead Firm vs. Subcontracted Firm**. We understand and accept a given firm may be the lead in one response and a subcontractor in another response.

3. **Respond Uniquely to Each RFP/RFB.** Each of our projects has a unique combination of partners, stakeholders, funders, constraints, opportunities, and timelines. Due to the characteristics of each project, we purposely release separate RFPs/RFBs. Firms must submit a response to each RFP or RFB to be considered. While we appreciate that a firm might be able to offer efficiencies if we combined projects, the unique blend of characteristics of each project prevent us from combining projects more than has already been done.

4. **Repeating Information Across Multiple Responses**. We understand and accept that information about the firm, its staff, past work, references and work approach may be repeated, perhaps even word for word, across multiple responses.

Proposal Deadline

Proposals are due on June 4th, 2018 by 5 PM.

Proposal Submission

Submit proposals in electronic form to TRWC. Electronic copies should be sent to:
Eben Swain eswain@truckeeriverwc.org

Section 1. Introduction and Background information

1.1 Project Overview

Location. Coldstream Canyon, located in the Truckee River watershed, drains multiple tributaries including Cold Creek into Donner Creek and the Truckee River. There has been some 150 years of significant anthropogenic disturbance to the canyon, which has affected hydrologic and geomorphic function of the watershed.

Disturbance. A watershed assessment was completed in 2006 TRWC. (River Run Consulting and Hydro Science - 2007) The Coldstream Canyon Watershed Assessment (CCWA) described the geomorphic setting, pre-disturbance function, disturbance history and response, and described restoration opportunities for several locations within the canyon. The CCWA report describes multiple restoration opportunities within the canyon related to roads improvement, floodplain and alluvial fan restoration, streambank stabilization, restoration of gravel mining ponds and modifications to the Union Pacific Railroad (UPR) culverts.

Development of an extensive road network and UPR infrastructure has significantly confined the Cold Creek channel and disrupted historic floodplain interaction. Hydraulic forces caused by the confinement have resulted in severe channel erosion and degradation of both upstream and downstream channel as well as adjacent floodplain areas.

Opportunities. Restoration opportunities identified within in the CCWA report were analyzed with respect to several factors:

- Geomorphic function and channel stability
- Water quality improvement
- Habitat improvement
- Construction feasibility

Complete restoration of pre-disturbance geomorphic function is not possible within the Coldstream watershed, however TRWC and CA State Parks recognize that specific actions implemented will significantly reduce erosion potential, improve channel stability and floodplain interaction and enhance habitat availability and ecosystem functionality.

Previous Work. Based on restoration opportunities identified in the CCWA, TRWC and California State Parks completed a pilot project in 2008 to rehabilitate the gravel mining ponds. Work for this pilot project consisted of enhancing wetland areas, regrading of pond banks and revegetation. In 2012, TRWC also completed a streambank stabilization and floodplain restoration project in the lower portion of Coldstream Canyon. This project helped to restore over 1,500 feet of severely incised channel in Cold Creek. Additional work performed by CA State Parks includes maintenance work on a number of dirt roadways identified as erosion hotspots, particularly within the lower portion of the canyon.

Project. The CCWA has identified multiple opportunities in Coldstream Canyon where restoration actions can be implemented. This next phase of restoration in Coldstream Canyon will address the following project components:

a) roads maintenance and decommissioning;

b) conducting a feasibility study to determine restoration opportunities for the Union Pacific Railroad (UPR) culvert;
c) additional pond rehabilitation and wetland enhancement;
d) large woody debris placement to stabilize degraded stream channel

1.2 Site Description

Cold Creek drains a 12.5 square mile watershed (Coldstream Canyon) that extends from the crest of the Sierra Nevada to Donner Creek just west of the Town of Truckee. Cold Creek flows through a rugged subalpine landscape that was sculpted by glacial processes and has been highly affected by land use since construction of the Transcontinental Railroad in the 1860s. Lower Cold Creek flows out from a narrow canyon onto a side valley alluvial fan that extends northward into the Donner Lake Valley. Near the terminus of the alluvial fan, Cold Creek flows into Donner Creek.

Human disturbance within the watershed includes channelization of lower Cold and Donner Creek below the confluence; mining and fill of the historic Cold and Donner Creek floodplains; channel confinement through mining and development on the floodplain, hardened stream banks, and a narrow culvert crossing Cold Creek on UPR properties. Analysis of geomorphic responses to human disturbance in the CCWA showed that substantial portions of the watershed are in a state of deterioration with existing channel banks eroding in response to incision and channelization, drainage capture, and degraded habitat.

1.3 Project Need

Road Network. The extensive road network that has been established in the Coldstream Canyon watershed has been poorly designed, often crossing topographic contours and resulting in steep confined areas that concentrate water, form rills, and cause significant erosion issues. Road restoration within the watershed may consist of improving drainage to reconnect hydrologic flow, re-routing of existing road spurs and complete decommissioning and revegetation. Roads that intersect stream crossings will need to be assessed and potentially reconstructed to reduce constricted flows and to accommodate heavy storm and rain on snow events.

Railroad Culvert. The construction of railroad grades and culverts has been identified as the primary factor responsible for destabilization of the Upper Valley and downstream impacts. High velocity flows through the constricted culvert have resulted in severely incised stream channels both upstream and downstream of the culvert causing significant erosion in over 3,500 linear feet of stream channel and degradation of adjacent floodplains. Additional assessment will need to be conducted to explore opportunities to reduce hydraulic constriction, enhance floodplain interaction and stabilize incised stream channels.

Ponds. In the early 1960's gravel mining occurred in the lower valley along the mainstem of Cold Creek and ponds were constructed on glacial outwash terraces. The construction of the ponds and the main Coldstream Canyon road has altered drainage patterns and made the adjoining hillslopes more susceptible to erosion, especially during larger rain-on-snow events. After mining operations ended, a minimal effort was made to restore soils and vegetation around the mining pits. What was once a vibrant and functional wetland system now consists of highly compacted soils and denuded areas, or complete lack of, vegetation. Restoring and improving soil restoring infiltration in compacted areas and increasing wetland vegetation around the ponds will increase stormwater infiltration, decrease sediment transfer and improve habitat conditions.

Large Woody Debris. Channel incision has occurred as a result of significant headcuts, causing excess erosion and disconnecting the stream channel from historic floodplains. Restoration actions will help to minimize the potential for erosion, alleviate flood damage and allow for greater resiliency in a watershed where a changing climate and increased uncertainty of erratic storm events will likely cause greater damage in an environment that is already severely degraded.

1.4 Existing Data

A watershed assessment for the entire Coldstream Canyon watershed was completed in 2006 by TRWC. A watershed assessment was also conducted for the Donner Basin (TRWC 2016) that describes restoration opportunities for a portion of Coldstream Canyon. Both these reports are available electronically on the TRWC website. https://www.truckeeriverwc.org/library/

Section 2. Project Work Plan

The consultant shall perform all professional and technical services necessary to accomplish the work, including all labor, materials, equipment as required. The work to be performed shall consist of approximately the following scope:

2.1 Scope of Work to be performed

Task 1. Meetings

At the onset of the project, a meeting will be held with CDPR and TRWC, to finalize the scope of work and a work plan.

Review meetings will be held at the 25%, 6~~5~~0%, 90%, and 100% design plan phases with a stakeholder group, or Technical Advisory Committee. Likely participants are CDPR, TRWC, Sierra Nevada Conservancy, Union Pacific Railroad and Lahontan Regional Water Quality Control Board.

A community meeting will be held at the 90% design plan phase to present the proposed project to the public.

Task 2. Data Review and Collection

Consultant will review existing data and determine additional data requirements. They will conduct all additional research and field data collection to support project design. This includes a thorough site inspection of the project area, review of existing data, and collection of additional data as needed to determine specific erosion hotspots along roads proposed for inclusion in design development. Identification of erosion hotspots will be conducted in coordination with TRWC and CDPR.

Task 3. Union Pacific Railroad Culvert Feasibility Report.

Consultant will conduct a thorough investigation of the feasibility of implementing specific action items described in the 2007 Coldstream Canyon watershed assessment. Based on the investigation conducted, a conceptual design will be developed that details specific restoration actions that may be implemented to modify the culvert to relieve flow constriction, restore floodplain interaction and address stream channel incision both upstream and downstream of the existing culvert. Feasibility studies, and conceptual design will address both the constraints and opportunities of the selected restoration actions and will provide technical support and reasoning for the actions delineated in the concept design.

Concept Plans will include (but are not limited to) technical feasibility studies, major project features, proposed restoration actions, typical sections and descriptions/typicals of important treatment considerations. Concept plans will also need to detail a rough construction cost estimate. Due to the anticipated high cost of implementing restoration actions, it is expected that this project will be phased over multiple years. Conceptual plans should adequately describe a phased approach to restoring the entire area impacted by the Union Pacific Railroad. Multiple treatment options may be proposed through conceptual design development, but a preferred alternative will be selected based on determined feasibility and stakeholder/public input. Consultant will also draft a strategy memo that details information that will need to be compiled and field studies that will need to be conducted to fulfill expected environmental requirements including, but not limited to, CEQA/NEPA.

Task 4. Roads, Ponds, Instream - 25%, 65%, 90% Design Plans

CDPR and TRWC have received funding to complete design plans and specifications for three project components identified in the CCWA. The three projects that have been selected to move through 100% design completion include:

4.1 Road maintenance and decommissioning. The majority of roadwork to be performed will take place in the upper watershed. The information collected in task two will be used to inform specific actions to reduce erosion and restore hydrologic connectivity within the extensive road network located on CDPR properties. Design considerations will need to detail specific site location of proposed treatments and identify restoration actions that will meet project objectives. Roadwork may include, but is not limited to:

- improvement of existing rolling dips and installation of rock outfalls
- installing new rolling dips or other drainage improvements;
- removal of fill material and regrading;
- decommissioning and revegetation of road spurs no longer in use; and
- development of low-water crossings where existing roads intersect with local waterways.

4.2 Ponds restoration/rehabilitation. As noted in section 1.3, a series of gravel ponds have been constructed on glacial terraces and have disrupted wetland habitat and ecological processes. Design considerations will focus on habitat rehabilitation and ecological restoration. Soil testing will need to occur to inform design development, revegetation specifications and quality of existing soils to support wetland/riparian habitat. Based on the results of soil analysis, design development and recommended actions may include:

- restoring and improving soil composition
- rehabilitation of compacted soils to improve infiltration
- reactivation of floodplain areas and increasing wetland/riparian vegetation
- topographic modification of pond margins to expand wetland habitat
- staging areas and anticipated construction impacts will be identified and noted in plan documents

4.3 Large woody debris placement. Woody debris placement within stream channels play an important role in storing sediment and helping to stabilize the channel and surrounding floodplain. Woody debris placement will occur in the upper valley of Coldstream Canyon in an effort to reduce erosion, promote sediment deposition and restore geomorphic function. Select stream reaches will be identified by the project team where woody debris placement would be deemed beneficial in restoring ecological processes. Consultant will need to consider the following components in design development:

- appropriate slope and gradation of channel banks to support woody debris placement (may need to reduce steepness of streambanks)
- bio-technical engineering techniques to stabilize stream banks and reduce erosion – specific sizing and quantity of materials will need to be noted in the plan set and technical specifications will need to be developed to ensure placement of woody debris is secure
- revegetation plans and planting palates appropriate for site selection
- staging areas and anticipated construction impacts will be identified and noted in plan documents

Task 5. Construction Cost Estimate

The consultant will develop construction cost estimates for the project components noted in Tasks 3 and 4.

Task 6. Coordination and Reporting

Consultant will coordinate with TRWC and CDPR staff regarding the status of the project, as well as design issues.

Copies of all survey or other data collected and analyses are to be provided to TRWC in electronic form (Word, Excel and/or Arc GIS).

Task 7. Support Documentation for Environmental Compliance and Permitting

Conduct necessary surveys (wildlife, veg, arch, aquatic, etc) and compile information needed to prepare CEQA documents for roads work, pond rehabilitation and large woody debris placement.

Optional if budget allows: prepare and compile full CEQA documentation for review and approval by CDPR.

Develop strategy memo detailing information needed for environmental compliance and permits for the UPR culvert restoration.

Optional if budget allows: prepare permit packages for California Department of Fish and Game, Army Corps of Engineers, and Lahontan Regional Water Quality Control Board.

2.2 Deliverables

- Participation in stakeholder/TAC meetings – kickoff, 25% review, 60% and 90%, reviews
- Draft feasibility study for culvert restoration
- Final feasibility study for culvert restoration
- 25%, 60%, 90% design plans for road maintenance and decommissioning
- 25%, 60%, 90% design plans for ponds restoration/rehabilitation
- 25%, 60%, 90% design plans for large woody debris placement
- Public presentation of final project plan
- Digital copies of all data collected and analyses performed
- Completed surveys and detailed information to allow for preparation of CEQA documentation for Task #4. Strategy memo detailing approach for obtaining environmental compliance and permits for the UPR culvert.
- Optional task: prepare permits for ACOE, CDFG and LRWQCB
- Optional task: prepare and compile CEQA documentation.

2.3 Schedule

Contract negotiations for this project will include scope and time constraints. Anticipated proposed project schedule is as follows:

Activity	**Completion Date**
Proposals due	June 4, 2018
Interviews with top applicants	June 11, 2018
Scope of work and contract finalized	June 18, 2018
Kickoff Stakeholder meeting	July 10, 2018
25% design development and review	August 27 2018
60% design development and review	October 5 2018
90% design development and review	November 16 2018
Public presentation	November 2018
Surveys for CEQA	December 2018

Quarterly progress reports March 25, June 25, September 25, and December 25 annually

2.4 Desired Qualifications

- Experience in geomorphology and hydrology
- Experience with restoration project design
- Experience with developing construction plans for similar projects
- Licensed engineer, landscape architect (construction plans must be stamped)
- A minimum of three constructed projects with similar objectives

Section 3. Proposal Format

3.1 Detailed work plan

Scope: Define specifically the scope of services to be provided to perform the completion of construction design described above for the Coldstream Restoration Project. The contractor may elect to suggest modifications to the scope above or include optional tasks to be considered or negotiated. Include estimated time schedule of the major tasks to be accomplished.

Objectives: Identify and discuss briefly the specific objectives you will achieve through the conduct of the services within the project, as defined and specified above.

Detailed work approach: Discuss in detail each of the activities you will conduct to achieve the scope and objectives defined and identified above. List personnel that will be available to work on project. Please specifically address work components outlined in the “Proposed Project” section above, and elaborate as needed. Please specifically address what further studies will be conducted and what information will need to be compiled to take the existing conceptual design plan to construction plans. Modifications to the components listed in the work statement can be included. Technical merit, details of work, and experience of team proposed will be heavily weighted in proposal evaluation.

There is no page limit, but concise writing and graphics are greatly appreciated.

3.2 Background and References

- List current and previous experience in geomorphic assessment and restoration design.
- Include a duty statement and resume of each key person to be assigned to the project, by name and title, with experience in pertinent fields. Include a breakdown of personnel assigned to each subtask and estimated hours.
- If subcontractors may be used, a description of those persons or firms including a description of their qualifications. Identify portions of the work to be performed by subcontractors
- Provide a minimum of three references for similar projects, with name and phone number.

3.3 Project Cost

The maximum budget available is $125,000. Cost effectiveness will be considered during proposal evaluation.

Prospective bidders should structure the budget by task per the above section “2.1 Scope of Work to be performed.” In Task 4. Roads, Ponds, Woody debris - 25%, 65%, 90% Design Plans, please structure the budget by subtasks 4.1, 4.2, and 4.3.

Please separate the budget for the two option items: CEQA document preparation and permit document preparation.

Once a contractor is selected, TRWC will attempt to negotiate a satisfactory contract and reasonable fee for the services needed. In the event a satisfactory agreement cannot be negotiated with the top ranked qualified firm, the negotiations shall be terminated with the firm and the negotiations continued with the remaining qualified firms in order of their ranking.

Section 4. Contract Terms and Agreements (TRWC)

This contract will cover feasibility studies for culvert restoration, and 25%, 60%, and 90% plans for the roads work, ponds restoration, and large woody debris placement and will also encompass preparation for CEQA permitting and documentation. If budget allows, a contract amendment will be negotiated at a later date for additional permit support.

4.1 Payments

Contractor may invoice on a quarterly basis following acceptance and approval of progress reports and associated deliverables. It is expected TRWC can pay the Contractor within 60 days of invoice(s) submittal. All efforts will be made by TRWC to expedite payment; however, no interest will be paid on overdue payments.

4.2 Changes in Personnel

Contractor's key personnel as indicated in contractor's response to the RFP may not be substituted without the written consent of the TRWC Project Manager. This will be monitored and enforced by the TRWC.

4.3 Termination for Convenience

The TRWC may, at its option, terminate the contract at any time upon thirty (30) day written notice to contractor. Contractor may submit written request to terminate only if TRWC should substantially fail to perform its responsibilities as provided in the contract. If terminated, contractor will be compensated for costs incurred up to the time of the termination notice. In no event shall payment of such costs exceed the contract price.

4.4 Liability Insurance

Contractor must furnish a performance bond in favor of TRWC in the following amounts: faithful performance (100%) of contract value; labor and materials (100%) of contract value for any contract over $25,000 (Civ. Code, § 3247 et seq.; Pub. Contract Code, § 7103.).

Contractor must provide insurance certificates covering $2 Million Per Each Occurrence and no less than $4 Million Aggregate showing the Truckee River Watershed Council and California State Parks as special endorsement to be added to the insurance policy.

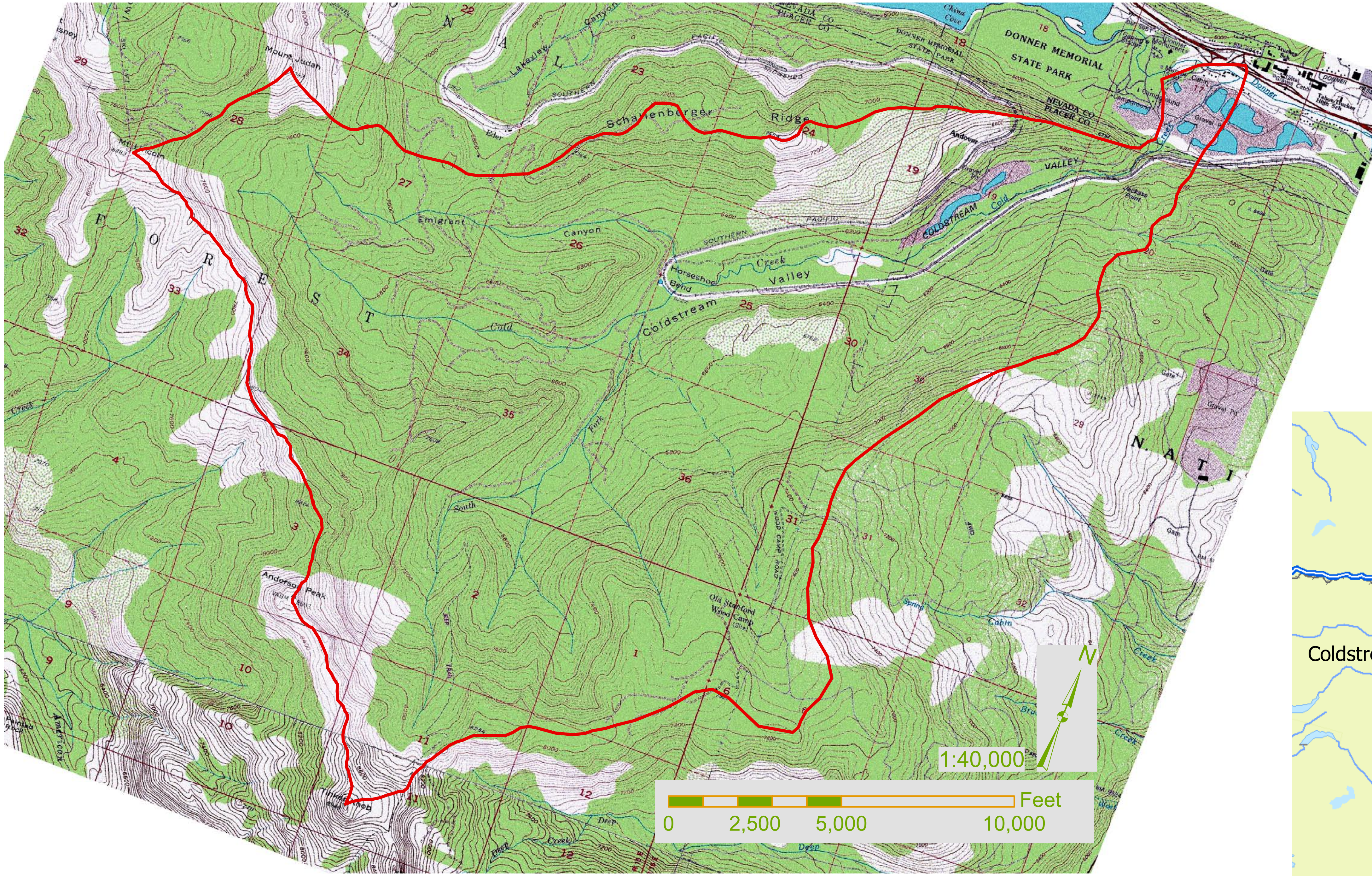
4.5 Progress Reports

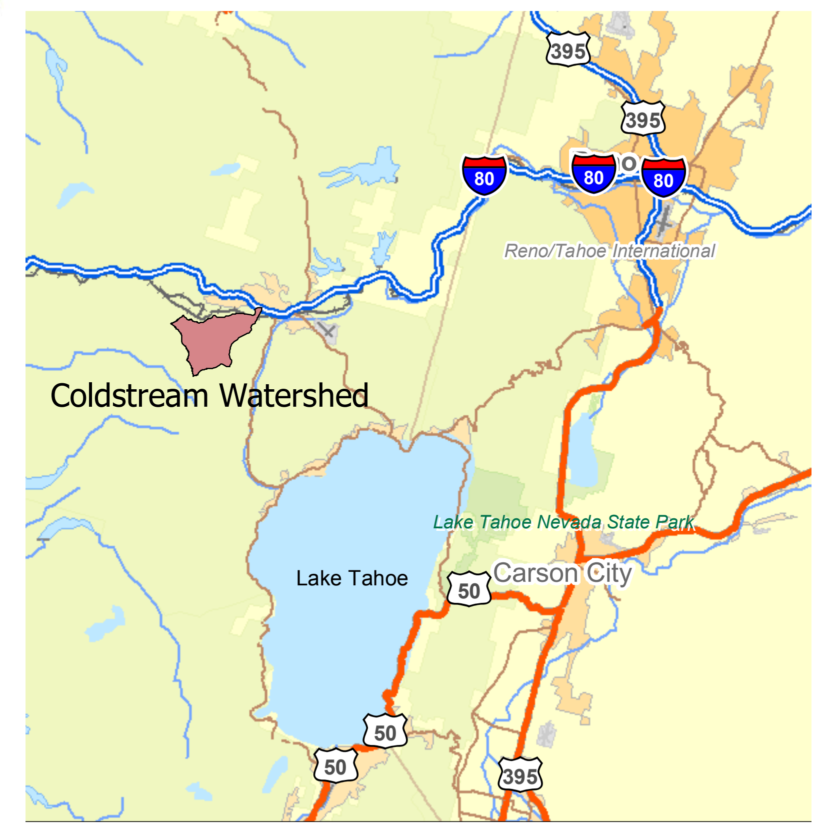
Contractor to provide quarterly progress reports and meet with TRWC representatives upon reasonable notice to allow TRWC to determine if the contract is on the right track, whether the project is on schedule, provide communication of interim findings, and afford occasions for airing difficulties or special problems encountered so that remedies can be developed. All reports will be in Microsoft Word format. If GIS shapefiles, layers and associated data are developed, all data will be projected to NAD 83 Zone 10N.

Attachments:

1. Watershed Location and Map
2. Restoration Opportunities – Donner Basin Watershed Assessment
3. Restoration Opportunities – Coldstream Canyon Watershed Assessment

Watershed Map and Site Location





RIVER RUN consulting
P.O. Box 562 Cedarville, CA 96104
530 279 2400
rrkiesse@ hughes.net

Coldstream Canyon Watershed Assessment

Final Report, March 2007
Prepared for:
Truckee River Watershed Council
Truckee, CA

Topographic map and watershed location.
Topographic map from USGS 7.5 minute series mapping. Data for location map from ESRI.

Figure 2-1

Excerpt from Donner Basin Watershed Assessment

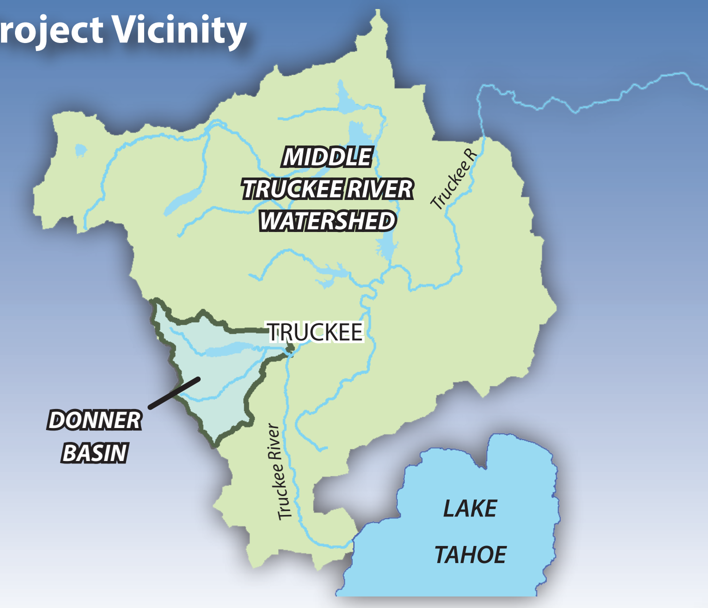
Click Here to access the full report

Donner Basin
Unpaved Road Stabilization and Erosion Treatment

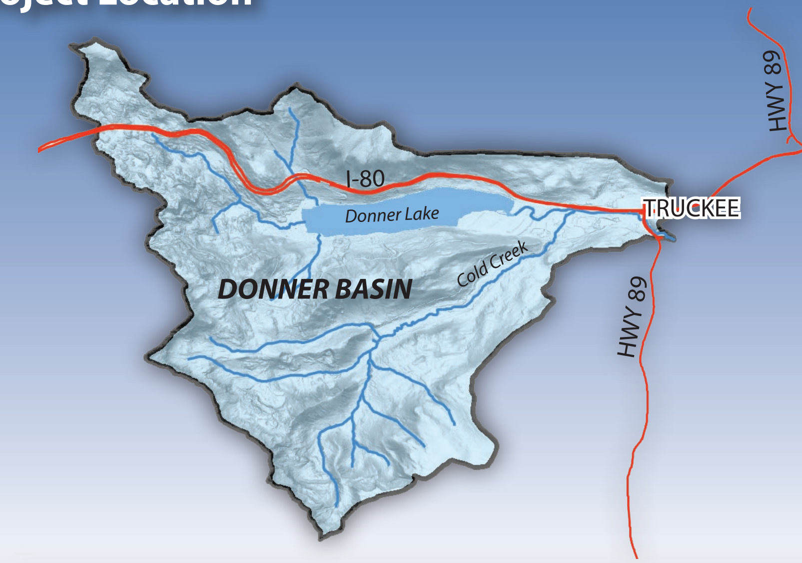
truckeeriverwc.org

Sediment accumulated behind fallen log downhill from an eroding backcountry road. Photo by Jai Singh, cbec (2015).

Project Vicinity



Project Location



Location: Numerous sites throughout the Donner Basin, most of which are located in backcountry areas.

Project Description

Unpaved roads in the Donner Basin that exhibit erosion issues should be decommissioned or improved to reduce or eliminate local erosion problems. Projects may consist of full hillslope recontouring, addressing drainage problems, reducing road width, and other maintenance and stabilization actions. The scale of unpaved road maintenance and / or decommissioning will depend on severity of erosion, funding and coordination with land managers. Preliminary site identification should draw on the Erosion Hazard Analysis and the preliminary road prioritization based on slope and soil erodibility (see figure on reverse side of page). Sites should then be further evaluated and prioritized through field studies and existing land manager knowledge.

Problem

Numerous unpaved roads, particularly in backcountry areas, exhibit significant erosion problems today and contribute large volumes of fine sediment to the watershed. Many of these roads were created for logging purposes and are no longer actively used or maintained. Due to steep slopes and unstable soils, many areas continue to suffer from unabated erosion issues.

Benefits

The stabilization of eroding unpaved roads will reduce fine sediment yields to the watershed and help improve water quality. Projects may also lessen historic hydrologic impacts associated with logging and road construction. Upland forest and meadow habitat will be improved directly, and may improve indirectly from reduced backcountry off-road vehicle traffic.

Constraints

The scale and coverage of projects will depend significantly on funding. Further site prioritization will be necessary and will likely require additional field efforts. Coordination with land managers will be required, especially where roads provide access (e.g., to the railroad). The ability to revegetate steep hillslopes successfully may be challenging due to harsh climatic conditions.

Cost Estimate: $100,000 to > $1M

Timeline: 0.5 to 10+ years

Project concept assumes support of all land owners, land managers, and stakeholders.

Gully erosion on backcountry road. Photo by Jai Singh, cbec (2015).

Backcountry road showing signs of sheet erosion. Photo by Jai Singh, cbec (2015).

Project Benefits

Benefit	Comments
Geomorphic / Physical Processes	These projects will reduce hillslope erosion from rilling and gullying, thus lessening excessive fine sediment loading and associated impacts to sediment dynamics in receiving streams.
Hydrology	Decommissioning and improving roads will lessen historic impacts to the basin's hydrology by lessening the concentration of runoff along artificial flow paths. This in turn will promote infiltration and reduce peak flows in receiving streams.
Water Quality	These projects will improve water quality by reducing fine sediment loading to receiving streams and Donner Lake.
Fine Sediment Reduction	These projects will stabilize eroding roads and hillslopes, thus addressing one of the largest human-induced sources of fine sediment to the basin.
Habitat	Decommissioning roads will provide local improvements to forest and meadow habitat. It may also provide indirect benefits by reducing off-road vehicle traffic and creating more contiguous habitat areas. The stabilization of unpaved roads will alleviate active erosion and likely reduce fine sediment loads to Donner Lake tributaries, thereby improving aquatic habitat quality.

cbec eco engineering, H.T. Harvey & Associates, Susan Lindstrom. 2016. Donner Basin Watershed Assessment. Prepared for Truckee River Watershed Council. January 2016.

For more information about this project, please visit truckeeriverwc.org

Donner Basin
Railroad Grade Hillslope Erosion Stabilization

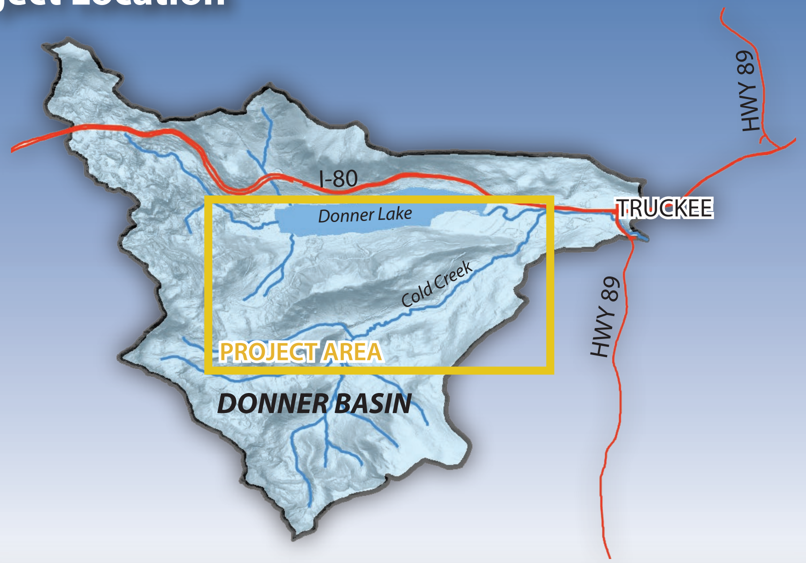
Truckee River Watershed Council
Collaborative solutions to protect, enhance and restore the Truckee River Watershed

truckeeriverwc.org

Erosion along retired railroad grade. Photo by Jai Singh, cbec (2015).

Project Vicinity

Project Location



Location
Various locations along railroad corridor.

Project Description
Eroding hillslopes along the railroad grade should be stabilized using a combination of various materials including large wood or logs, soil amendments, natural fabrics (such as coir or jute) and revegetation with native, drought-tolerant grasses and sedges. In some cases, more intensive geotechnical stabilization efforts may be necessary.

Problem
Grading for the railroad tracks created steep, bare hillslopes in many areas along the railroad line. Particularly where these steep hillslope coincide with easily erodible soils, the erosion caused by grading has failed to stabilize. Ongoing hillslope erosion transports significant volumes of fine sediment to Summit Creek, Lakeview Canyon and Donner Lake.

Benefits
The stabilization of eroding hillslopes will reduce fine sediment yields to the watershed and help improve water quality. Projects may also lessen historic hydrologic impacts associated with the railroad's construction. Upland forest and meadow habitat may improve.

Constraints
Coordination with the railroad will be required. The scale and coverage of erosion stabilization projects will depend significantly on funding. Further site prioritization will be necessary and will likely require additional field efforts. The ability to revegetate steep hillslopes successfully may be challenging due to harsh climatic conditions. Soil erodibility and slope stability may also pose challenges in some areas.

Cost Estimate: $100,000 to > $1M

Timeline: 1 to 10+ years

Project concept assumes support of all land owners, land managers, and stakeholders.

Severely eroding gully along railroad grade. Photo by Jai Singh, cbec (2015).

Hillslope erosion along retired railroad grade. Photo by Jai Singh, cbec (2015).

Project Benefits

Benefit	Comments
Geomorphic / Physical Processes	These projects will reduce hillslope erosion, thus lessening excessive fine sediment loading and associated impacts to sediment dynamics in receiving streams.
Hydrology	Stabilizing hillslopes along the railroad grade will lessen historic impacts to the basin's hydrology by reducing the concentration of runoff along artificial flow paths. This in turn will promote infiltration and reduce peak flows in receiving streams.
Water Quality	These projects will improve water quality by reducing fine sediment loading to receiving streams and Donner Lake.
Fine Sediment Reduction	These projects will stabilize eroding hillslopes, thus addressing a very significant human-induced source of fine sediment to the to Donner Lake and the basin's stream network
Habitat	Hillslope stabilization will alleviate active erosion and likely reduce sediment loads into Lakeview Canyon, Summit Creek, and Donner Lake, thereby improving aquatic habitat quality in these systems. It will also provide local improvements to forest and meadow habitat.

cbec eco engineering, H.T. Harvey & Associates, Susan Lindstrom. 2016. Donner Basin Watershed Assessment. Prepared for Truckee River Watershed Council. January 2016.

For more information about this project, please visit truckeeriverwc.org

cbec

H.T. HARVEY & ASSOCIATES
Ecological Consultants

Excerpt from Coldstream Canyon

Watershed Assessment

Click Here to access the full report

4. RESTORATION OPPORTUNITIES AND CONSTRAINTS

The previous section identified four areas in the watershed where human disturbance has impacted function and restoration opportunities exist: upland areas, the Forks Alluvial Fan and the Upper Valley, Lower Valley gravel ponds, and the Lower Alluvial Fan. In this section, restoration opportunities and constraints for these three areas are briefly explored. The primary objective of the restoration opportunities developed is to restore, to the extent feasible, natural rates of erosion, sediment yield, and channel stability.

Restoration opportunities were analyzed with respect to several factors:

- Geomorphic function and channel stability;
- Water quality improvement,
- Habitat improvement; and
- Construction feasibility.

In general, no significant constraints to restoration practices were identified in terms of special status plants and animals (see Appendices A and B). The various restoration opportunities and their constraints are described in following sections.

4.1 Upland Areas

Because this assessment occurred less than one year after a large storm on December 31, 2005, road and drainage concerns were readily apparent. We visually surveyed roads in most of the watershed to which we had access. Virtually all of the erosion problems in the upper watershed caused by human disturbance are related to roads. Many of the older skid trails from timber harvest are vegetated, stable and no longer a concern for erosion (Figure 4-1), although some may divert or concentrate flow in some areas. However, most of the roads that are recently or currently in use showed some evidence of localized flow diversion and erosion during the extreme 2005 event (Figure 4-1). These roads are often fairly steep and have berms that divert and disrupt natural flow patterns. They concentrate water, form rills, and fine sediment is eroded from their surfaces.

Disconnecting roads and other human features from the drainage network given the hydrology of Coldstream Canyon is a difficult problem. Many roads are poorly laid out and cross topographic contours, resulting in steep, confined areas that may require reconstruction to reduce erosion. Much of the erosion occurs after road construction or maintenance, when fine materials are removed from the surface. Most of the road network functions reasonably well during average annual conditions such as typical rainstorms or snowmelt. However, the rain-on-snow hydrology of the watershed assures the occurrence of far larger storms on decadal-time scales. Because these storms are so much larger, they present an entirely different set of design challenges. Most of the active roads in Coldstream captured drainage during the extreme December 31, 2005 storm (Figure 4-2). The resulting concentrated flows caused significant erosion. Drainage through the railroad embankment suffers similar problems during large storms; culverts clog and diverted flow often creates erosion (L. Hahn, personal communication).

There are several opportunities for dealing with the problems associated with roads and other drainage in the watershed:

- Road removal, topographic restoration and revegetation, if feasible candidates can be identified
- Upgrades of existing roads, including re-routing into more favorable topography, and improving drainage
- More regular road maintenance to remove berms and maintain and improve drainage.

The use of any of these measures at any particular location is a highly site-specific decision; all roads function differently depending on their topographic position. Regular maintenance of drainage dips may be adequate in low-relief locations, while re-design may be required where road alignment is across topographic relief. As noted by Gucinski et al. (2001), developing plans for improving road networks is an extremely complicated task that must consider social concerns as well as technical hydrologic issues. Such an analysis is beyond the scope of this assessment, but is recommended for the Cold Creek watershed, and should incorporate the following basic principles(from Gucinski et al. 2001):

- Locate roads to minimize effects; conduct careful geologic examination of all proposed road locations.
- Design roads to minimize interception, concentration, and diversion potential, including measures to reintroduce intercepted water back into slow (subsurface) pathways by using outsloping and drainage structures rather than attempting to concentrate and move water directly to channels.
- Evaluate and eliminate diversion potential at stream crossings.
- Design road-stream crossings to pass all likely watershed products, including woody debris, sediment, and fish—not just water. Regular inspection and clearing of crossings is necessary.
- Consider landscape location, hillslope sensitivity, and orientation of roads when designing, redesigning, or removing roads.
- Design with failure in mind. Anticipate and explicitly acknowledge the risk from existing roads and from building any new roads, including the probability of road failure and the damage to local and downstream resources that would result. Decisions about the acceptable probability and especially consequences of failures should be informed through explicit risk assessments. The many tradeoffs among road building techniques to meet various objectives must be acknowledged. For example, full bench road construction may result in lower risk of fill slope failure, but it also may increase the potential for groundwater interception; outsloping of the road tread may reduce runoff concentration on the road surface but also increase driving hazard during icy or slippery conditions.

4.2 The Forks Alluvial Fan and the Upper Valley

Restoration opportunities for these landforms are considered together as geomorphic processes are strongly linked. As described in previous sections, construction of the railroad culvert, with some influence from other watershed impacts, has resulted in incision of the channel in the lower

Forks Alluvial Fan. Though the channel in this area is currently relatively stable, it has been disconnected from the surrounding floodplain, and now effectively transports sediment from the upper portion of the watershed to the Upper Valley landform downstream. This sediment, and the sediment created when the channel in the lower portion of the Forks Alluvial Fan incised, has caused massive channel instability in the upper portion of the Upper Valley landform.

Stream and floodplain improvements in the Upper Valley landform are of high priority due to the extensive instability and high rates of erosion, and should have the objective of stabilizing the channel and reducing sediment production within the reach. Achieving these objectives would not only improve water quality and aquatic habitat but would help protect downstream reaches from becoming more unstable due to inputs of coarse sediment transported downstream from this area.

Ideally, restoration of the channel within the Forks Alluvial Fan would include removing the confinement of the railroad culvert and reestablishing the relationship of the incised channel downstream with the adjacent floodplain. This would have important geomorphic and ecosystem benefits. However, realizing these objectives in this complicated geomorphic environment will be difficult. Complete restoration of pre-disturbance function, considered below, may not be technically feasible, and would certainly be very costly and highly uncertain in outcome. Therefore, opportunities for more limited restoration of some of the pre-disturbance function are also described below; the last three alternatives focus on problems within the destabilized portion of the Upper Valley.

4.2.1 Complete Channel and Floodplain Geomorphic Restoration

Complete restoration of pre-disturbance geomorphic function would have several components. First, the current crossing would have to be replaced with a structure that allowed for not only flood access to the adjacent floodplain, but a substantial amount of channel dynamics, as the stream was historically fairly active. Second, the incised channel downstream would have to be reconstructed, for a distance of about 1,500 ft., with a raised bed. Finally, at least 2,000 ft of highly unstable channel in the upper portion of the Upper Valley would have to be reconstructed; as with the incised channel upstream, the streambed elevation would have to be raised. These measures, if successful, would restore historic channel and floodplain geomorphic function.

However, there are significant constraints to this approach. The first is cost. Construction of a railroad bridge or other structure capable of crossing the floodplain, several hundred feet wide, without impeding flow, would be very expensive. Reconstruction of the incised channel downstream of the culvert and in the destabilized portion of the Upper Valley would be very costly also; based on our experience with projects of similar scale in the area, design and construction costs would likely be in the range of at least $500 per lineal foot.

The second major constraint to complete geomorphic restoration is the technical feasibility of channel reconstruction. For the incised reach, which was historically in a depositional area, the technical challenge is to construct a channel that provides initial stability but is capable of storing sediment, with resulting dynamic function. While higher gradient, step-pool channels that transport all sediment supplied to them have been successfully constructed, the authors are aware of no successful complete restoration of a channel designed to mimic the sediment storage function of an alluvial fan.

Reconstruction of the disturbed channel in the upper portion of the Upper Valley also presents substantial technical challenges. The scale of destabilization in this range is dramatic (Figure 3-11, lower right). Again, we are not aware of a complete channel reconstruction project which successfully restored geomorphic and ecosystem processes in a similarly-disturbed environment. Among the technical obstacles to successful reconstruction are: bank stabilization, given the droughty setting, and the inevitable occurrence of a large rain-on-snow flood within five years of project completion; streambed stability, given the high energy environment and the potential for large-scale coarse bedload transport; and maintenance of water quality during and following construction, given the extent of grading and floodplain disturbance. These factors strongly suggest the complete restoration would be not only very costly, but a realistic appraisal of success would have to conclude that there is a very high level of uncertainty.

Because channel reconstruction is costly and risky, replacing the current culvert with a longer crossing to allow for floodplain function, but allowing the rest of the channel to adjust on its own, is a potential alternative for complete restoration. This will be a relatively slow process that will take at least decades to restore the historic channel characteristics. It is important to recognize that extensive erosion will take place, far in excess of current erosion rates. When the grade control of the current structure is removed, a head cut, between five and ten feet in depth, will make its way upstream for at least several hundred feet. Coarse sediment generated by this erosion may help fill the incised channel downstream, but this process will likely occur in unpredictable ways with substantial lateral erosion and instability. Much of the coarse sediment generated during this process will also be transported further downstream, further contributing to instability in the Upper Valley. Substantial erosion will also occur because the channel downstream of the culvert has incised well below the surrounding floodplain. Opening up the floodplain at the railroad crossing and allowing flood flows onto the floodplain will result in erosion where these flows reenter the incised channel over steep, unvegetated streambanks. Thus, while this alternative would restore channel and floodplain function over time, it would require significant short-term erosion and instability.

Finally, it is important to note that, although the narrow railroad culvert is the primary factor responsible for destabilization of the Upper Valley reach downstream, modifications of the culvert area alone are unlikely to result in any short-term improvements in the Upper Valley. As noted previously, this channel has already enlarged substantially, and has abundant sources of additional sediment, such that it will continue to erode unless stabilization measures are applied to the channel within the destabilized area.

4.2.2 Culvert Modifications

Alternatives for modifying rather than replacing the current railroad culvert, with more limited objectives, can be developed. Generally, there would be two primary objectives of culvert modification: reduce hydraulic constriction and allow flood access to the floodplain; and allow for fish passage through the culvert. Specific designs to meet the hydraulic objectives would include widening the culvert and installing floodplain culverts through the embankment to provide for floodplain flow. Improving fish passage would require baffles or extensive modification of the culvert interior, along with extensive channel modification downstream, such as the construction of step-pool channel, to allow fish to access the culvert.

Widening of the culvert, or allowing for flood flow through floodplain culverts, would reduce flood velocity in the culvert and directly downstream. This would help promote stability of the culvert itself, and would lessen erosive stress on the downstream channel. As noted previously, however, continuing erosion is not a substantial problem in the downstream channel, which has already incised and is highly armored. The hydraulic changes resulting from widening or floodplain flows are unlikely to promote significant improvements in the incised channel downstream.

Floodplain culverts should not be considered without either reconstructing or stabilizing the banks of the channel downstream. Without these measures, water flowing through the culverts would likely cause substantial erosion where it enters the incised channel downstream, resulting in headcuts with the potential to destabilize the railroad embankment. The benefits of floodplain culverts, in the absence of other measures, would be limited. For example, the incised channel downstream effectively drains local groundwater, so floodplain culverts alone would not have a significant benefit for floodplain vegetation in the incised reach.

Floodplain culverts could be considered in conjunction with a widened culvert, and reconstruction of the incised channel downstream into a step-pool configuration for fish passage, with extensive side-slope stabilization to protect against erosion during floods. While this alternative would be expensive, it is technically feasible and is reasonably certain of success, based on our experience with similar projects. This alternative would restore fish passage, would increase channel stability, and could restore a limited portion of the historic alluvial fan function. However, it is unlikely to have substantial benefits for the Upper Valley destabilized reach.

It is important to note reconstruction of the culvert for fish passage could conflict with informal local access. Rather than modifying the existing culvert, a shorter bridge may be required to address this concern. A short bridge would also improve the function of the area with respect to hydraulics. Such an alternative probably represents the most feasible project associated with modification of the current railroad crossing.

4.2.3 Upper Valley Streambank Stabilization

This alternative would stabilize eroding streambanks within the destabilized portion of the Upper Valley landform, a significant source of sediment. Streambanks would be stabilized with rip-rap and/or biotechnical techniques. There are substantial constraints to this approach, which include the following;

- Widespread disturbance of adjoining areas would be required;
- Revegetation would be difficult due to the drier conditions created by incision;
- Rip-rap stabilization would be very expensive.

The success of stabilization would also be highly uncertain in this reach. As demonstrated in the previous section, this area is unstable both laterally and vertically. Streambank stabilization is very vulnerable to vertical scour, which causes structure failure by undermining. While it may be possible to engineer stable streambanks in such an environment, design and construction costs would be extremely high. Given the substantial constraints and uncertainty associated with this alternative, we do not consider it feasible.

4.2.4 Upper Valley Floodplain Excavation

Given the constraints and uncertainty associated with stabilization of the existing channel form within the Upper Valley, this alternative was developed to meet the limited objective of reducing fine sediment yield by excavating adjacent floodplain soils rather than attempting to stabilize the streambanks. Upper floodplain soils would be removed in a band along both streambanks. These bands would be at least 10-20 feet wide to assure that any additional erosion would not create additional fine sediment recruitment. This alternative also has numerous constraints:

- Excavation would cause enormous floodplain disturbance;
- The lowered streambanks would be very difficult and expensive to stabilize—erosion of the lower banks would provide additional coarse sediment to lower reaches, causing additional channel instability;
- Disposal of excavated material would be difficult and expensive.

Given the limited benefits and substantial constraints, we do not consider this alternative feasible.

4.2.5 Upper Valley Woody Debris Placement

As described previously, woody debris functions in mountainous environments to store sediment and help stabilize the channel and floodplain (see Section 2.5.4). Under this alternative, woody debris jams would be constructed within the unstable portion of the Upper Valley to promote geomorphic processes that would reduce erosion, promote sediment deposition, and begin to rebuild the channel and adjacent floodplain. It should be noted that this alternative does not constitute restoration in the strictest sense of the word; there is no evidence that woody debris was an important geomorphic component of this area prior to human disturbance. However, given the enormous constraints and uncertainty involved with other stabilization techniques, woody debris offers a potentially more feasible opportunity to restore geomorphic function.

Woody debris jams would be placed throughout the unstable reach. The objectives of jams would be to reduce flood velocity, encourage sediment deposition and protect streambanks from erosion. It must be recognized that this approach would rely on geomorphic processes to reconstruct the channel and floodplain over time, especially the processes of sediment transport during larger floods. As such, benefits would be realized slowly, relying on the geomorphic work performed by the channel itself during larger floods. If successful, this alternative would reduce sediment yield from within this reach, promote the deposition of sediment from upstream sources, and thus protect downstream reaches from further destabilization. Significant constraints to this approach include.

- Reestablishment of riparian plant communities would be a slow process due to the disruption of the groundwater table resulting from incision (see Appendix A);
- Sources of woody debris may be difficult to find, although surrounding second-growth forest would likely benefit ecologically from thinning that would provide ample woody debris;

- The processes of erosion and deposition are complex in this reach, and designing woody debris jams that will achieve the objectives carry a relatively high degree of uncertainty.

Although there is some uncertainty regarding the design approach, it should also be noted that this alternative has little risk of causing additional damage. The reach is already highly unstable; woody debris placement is very unlikely to make the channel more erosional. Project construction disturbance could be minimized through careful consideration of access and construction techniques. This alternative is also relatively inexpensive, and uncertainty associated with this approach could be managed by phasing implementation, using smaller demonstration projects to study the effects and function of woody debris jams. With these caveats, we consider this alternative feasible at some level, and it represents the best opportunity to restore geomorphic function to the Upper Valley and help protect downstream reaches from additional instability.

4.3 Lower Valley Gravel Ponds

Gravel ponds were constructed in this area on glacial outwash terraces. The terraces were well above the modern floodplain topographically and mining had only limited impacts on the stream and floodplain. Gravel mining and construction of the main Coldstream Canyon road, however, altered drainage patterns and made the hillslopes far more susceptible to erosion. Rills and gullies have developed throughout the mined hillslopes and continue to erode; erosion is especially high during larger rain-on-snow storms.

Drainage from the eroding hillslopes enters the ponds, where turbid water is stored and sediment slowly settles. The ponds therefore reduce the impact of gravel mining and road construction on the adjacent hillslopes. Typically, outflow from the ponds is relatively clear when inflow to the ponds is low, as during snowmelt runoff. During larger storms, when discharge to the ponds and its sediment concentration is high, outflow from the ponds is turbid and sediment is delivered to the adjacent Cold Creek floodplain.

Upon cessation of mining, only limited effort was made to restore soils and vegetation around the pits. Restoration efforts probably consisted primarily of limited grading and revegetation primarily focused on erosion control. There is no evidence that an effort was made to restore soils; the highly compacted, gravelly sediment comprising the bottom of the pits following mining was not amended. Over time, fine sediment entering the pits from adjacent hillslopes, and decomposed organic material from vegetation, have begun to rebuild soils. This is a very slow process, however; the current soils around the ponds are very gravelly and shallow, and support sparse, discontinuous wetland and riparian vegetation.

Restoring and improving soil, restoring infiltration in compacted areas, and increasing wetland vegetation around the ponds would increase infiltration of stormwater, decrease runoff and store fine sediment before it gets into the Cold Creek floodplain. Several different techniques are available to improve water infiltration and sediment storage around the ponds: importing or amending soils; reducing compaction by removing roads or other access areas; topographic modification of the pond margins to expand wetlands; and revegetation. All of these techniques are feasible in this location, and are likely to be successful in reducing fine sediment yield to the Cold Creek floodplain, especially during larger storms.

4.4 Lower Alluvial Fan

Human disturbance of the Lower Alluvial Fan includes channelization of lower Cold Creek and Donner Creek below the confluence; fill of the historic Cold and Donner Creek floodplains; channel confinement through development on the floodplain, rip-rap, and a narrow bridge. Analysis of channel response to human disturbance in previous sections showed that substantial portions of the Lower Alluvial Fan continue to erode, widening to recreate a floodplain similar to that which existed prior to human disturbance. As a result, this landform now exports sediment, whereas it tended to store sediment prior to human disturbance. The following restoration opportunities were developed to promote channel stability and reduce erosion and sediment yield.

4.4.1 Streambank Stabilization

Under this alternative, eroding streambanks would be stabilized in place throughout the landform. Most of the instability is in the upper portions of this landform, so most of the work would occur here. Due to the very high energy of this reach, effective stabilization would require large rip-rap. Some stabilization of the upper portion of streambanks could utilize revegetation, but substantial channel incision has created a difficult, dry environment for establishing plants.

If successful, this alternative would substantially decrease both fine and coarse sediment yield from this landform. As the analysis in previous sections showed, coarse sediment derived from erosion is at least partly responsible for continued channel dynamics both within this landform and downstream. Reducing the coarse sediment supply would help promote channel stability, and reducing the fine sediment supply would improve water quality both here and in downstream waters.

This alternative would not recreate the historic depositional function of this landform, however. Incision created by human disturbance and subsequent channel response has resulted in a very deep, highly confined channel with a steep gradient that has a high transport capacity. The bridge, which is narrow and enforces confinement, would not be widened. Stabilization of the streambanks will likely enhance sediment transport capacity, with the effect that much of the sediment supplied from the upper watershed will be efficiently transported below this landform. Sediment supply to the lower reaches of Cold Creek and the upper portions of Donner Creek may result in significant channel instability.

Note that streambank stabilization, especially in the upper portions of the landform, would be a fairly substantial and expensive project. Eroding streambanks are extremely high in many areas (Figure 3-14). Nonetheless, streambank stabilization is feasible, although the potential risks of continued destabilization of areas downstream should be carefully considered.

4.4.2 Floodplain Restoration

This alternative was developed with the recognition that geomorphic trends throughout this reach are to widen to create a floodplain like that which existed historically. It would basically mimic the anticipated geomorphic evolution of the channel by excavating floodplain on either or both sides of the channel. By actively creating the floodplain, the amount of fine sediment introduced to the creek during streambank erosion can be significantly reduced, and the process of riparian vegetation and floodplain development can be significantly accelerated. The project would have both water quality and habitat benefits.

Constructed floodplain width would be based on several factors: cost, benefits, development constraints, etc. Because the 1939 channel configuration was relatively stable, the constructed floodplain should be designed to accommodate the approximate geometry of the channel in 1939, to the extent feasible. To avoid instability, the bridge would likely have to be widened to allow for continuity of flow and sediment transport.

Riparian vegetation has rapidly colonized most of the bars constructed by the river since channelization. This suggests that revegetation of the constructed floodplain will take place naturally, and extensive revegetation will not be required, though low-cost biotechnical approaches such as willow staking and wattling would be very effective. Measures to protect water quality could include constructing the floodplain of screened material with a low proportion of fine sediment.

The active stream channel would not be modified under this conceptual design. Existing riparian vegetation would be protected. Rather than the channel constraints imposed by rip-rap stabilization, under this alternative the stream channel would be allowed to slowly evolve over time, likely increasing length and sinuosity. To avoid extensive erosion of slopes connecting the new floodplain to higher adjacent surfaces, groups of larger rock (barbs) could be placed at the toe of the slope to direct the channel to the floodplain. Given that much of the energy during large floods would be dissipated on the constructed floodplain, and that the source of much of the coarse sediment forming large bars would be eliminated, it is likely that the channel would evolve by slow migration of meanders over time rather than by episodic avulsion. Widening the existing bridge to some extent would likely provide benefits in terms of sediment transport continuity.

An additional water quality improvement opportunity may exist. New floodplain next to the ponds could likely be constructed to allow the stream to overflow into one or more of the adjacent ponds, at least during the largest floods when the greatest quantity of fine sediment is in transport. The ponds would act as settling basins, trapping fine sediment that otherwise would be transported to the Truckee River.

It is important to note that the channel would be widened considerably with the construction of floodplain, significantly reducing sediment transport capacity and encouraging sediment deposition. This alternative would thus restore much of the historic depositional function of the Lower Alluvial Fan prior to human disturbance, storing sediment supplied to the fan from upstream portions of the watershed. Given that coarse sediment supply from within the landform would also be eliminated, this alternative would promote stabilization of downstream reaches.

In summary, this restoration opportunity would address past human disturbance of Coldstream Creek. It is designed to work with natural processes that have been occurring since the stream was channelized in the 1960's. The creek would be stabilized; several acres of high quality riparian habitat would be created; and fine sediment yield would be substantially reduced. We believe this alternative is feasible and is the recommended approach to restoring the Lower Alluvial Fan.