

Mine Scarred Lands to Open Space

(Restoring Vital Public Resources from “Holey Crap”)

Brian Lorch: Director

Jason Lederer: Senior Resource Specialist
Summit County Open Space and Trails



Open Space Acquisition Program Highlights

15,480+ acres protected;
8,808 ac in fee simple

5,810 acre Shadow Creek
Ranch Conservation Easement
is largest protected property

~ **\$1,250,000/year** allocated
to land acquisition

~ **\$28,369,418** spent to date
on **274** acquisitions

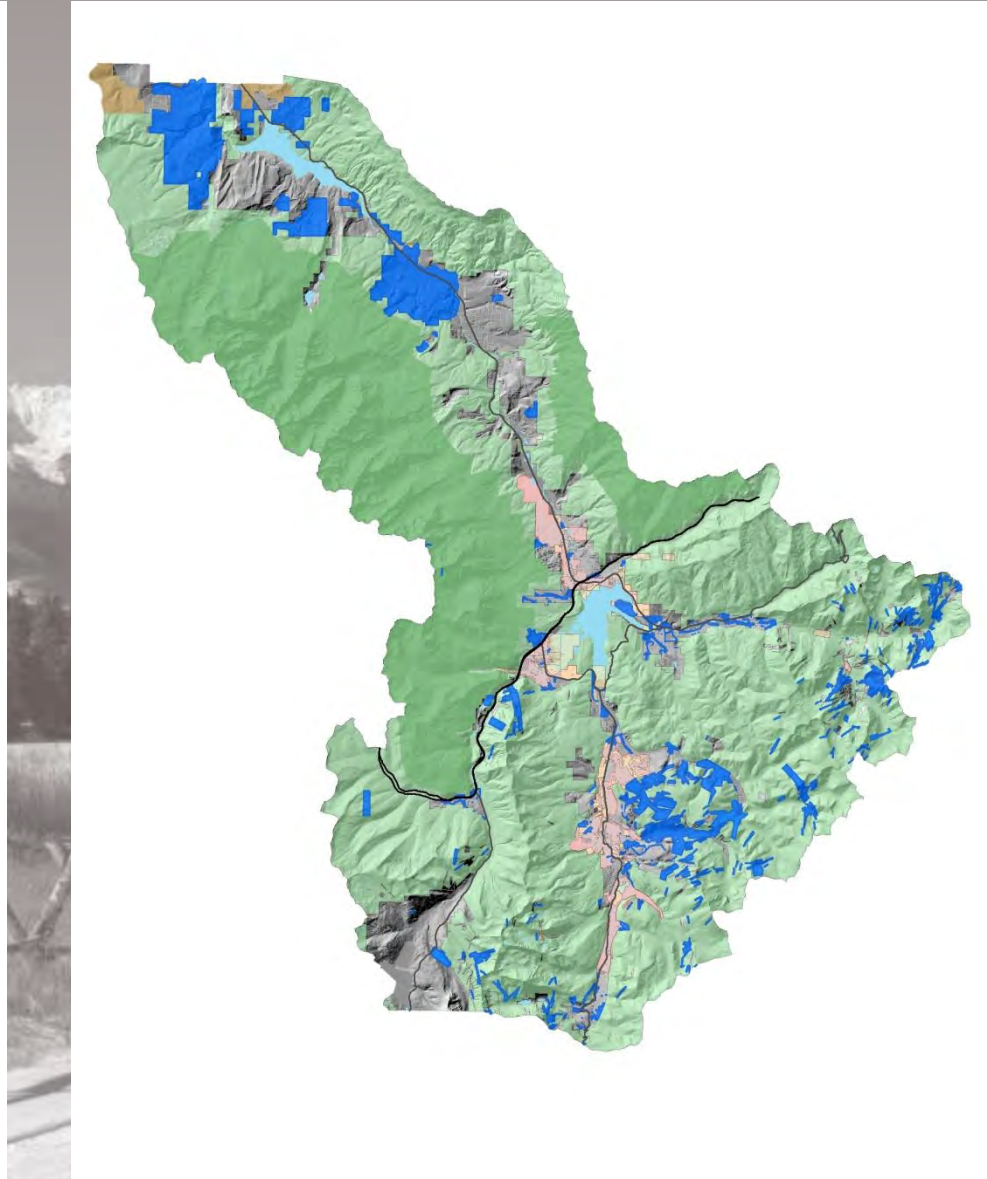
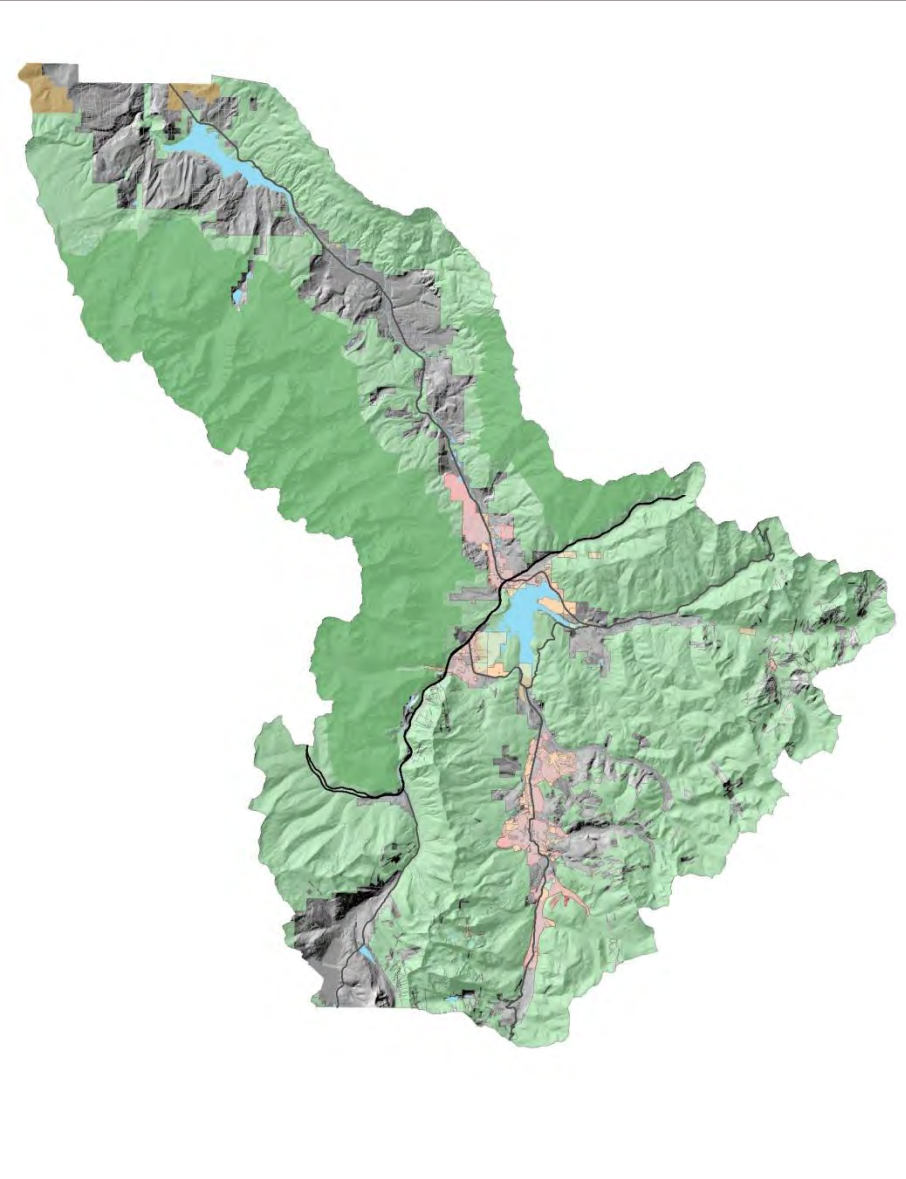
2010 - most recent mil levy
approved by Summit County
voters. Expires 2022.

Lands protect recreational
access, backcountry character,
scenery, historic and natural
resources (including wildlife),
agricultural heritage, buffers
between communities, and
extensions of public lands



Mission: To identify, protect and manage open spaces, trails and trailheads to preserve and maintain Summit County's rural mountain character, unique natural areas and high quality of life for residents and visitors.

Protected Lands Overview ~ 1995-2015



Abandoned Mine Cleanup Efforts

- Peru Creek Brownfields Assessment
 - Reviewed properties for environmental liabilities and cleanup potential (\$200,000 EPA Grant)
- B&B Mines Purchase and Cleanups
- Cleanup Projects Undertaken
 - Wellington Oro, Jessie and Royal Tiger
 - Pennsylvania Mine, Shoe Basin Mine, Sts John Mill, Brittle Silver Mill, Silver Spoon, Cinnamon Gulch, Delaware Mine (EPA – 319)
 - Jumbo Mine, Illinois Gulch and four others under review
- Restoration of dredged reaches of Blue River and Swan River

Acid Rock Drainage Chemistry

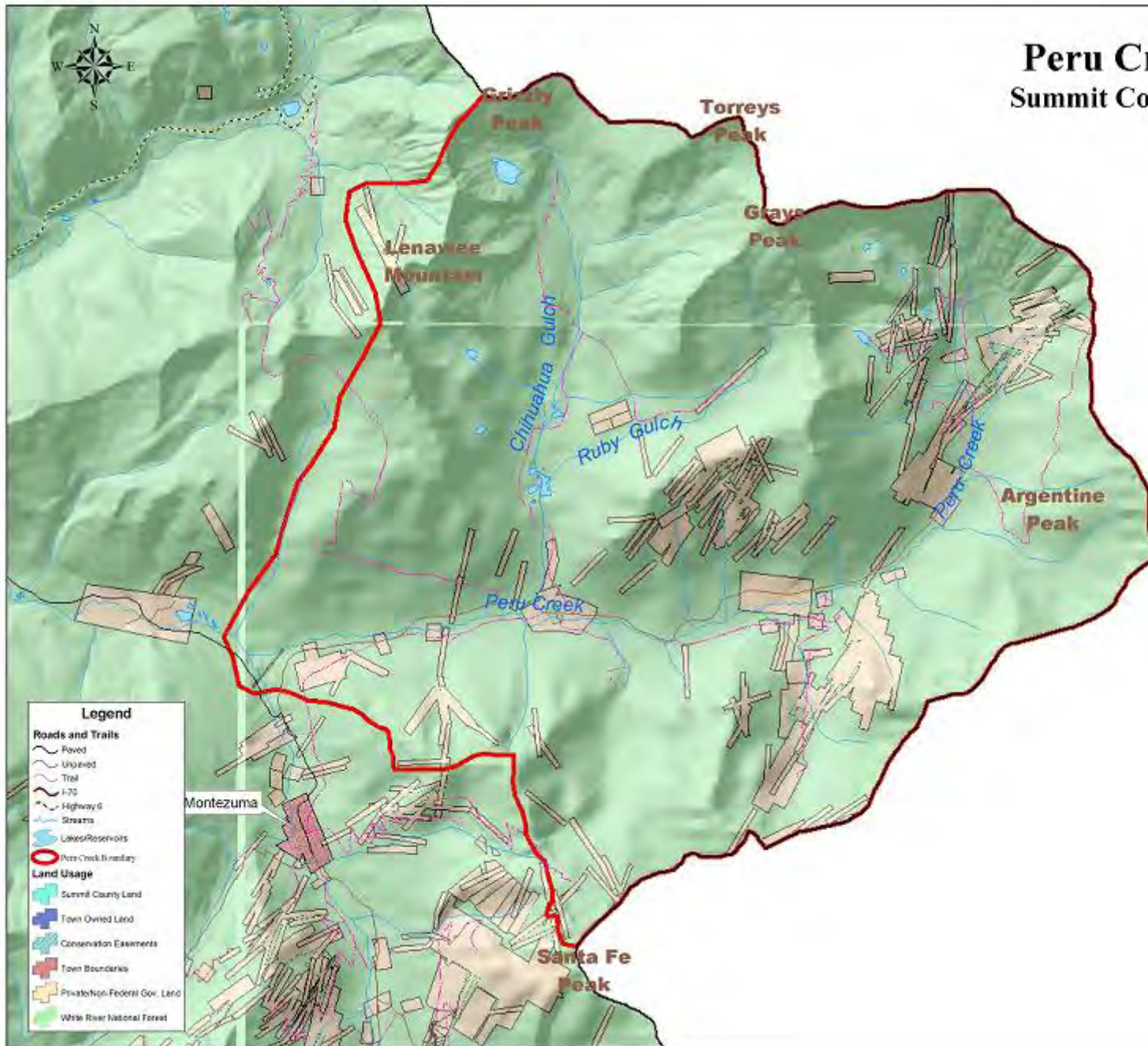
Iron Pyrite (Fools Gold) is oxidized when exposed to air and water



Peru Creek Basin

Summit County, Colorado

Basin Map



Legend

Roads and Trails

- Paved
- Unpaved
- Trail
- I-70
- Highway 6
- Streams

Lakes/Reservoirs

- Lakes/Reservoirs

Peru Creek Boundary

- Peru Creek Boundary

Land Usage

- Summit County Land
- Town Owned Land
- Conservation Easements
- Town Boundaries
- Private/Non-Federal Gov. Land
- White River National Forest



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Peru Creek Brownfields Assessment

- The first EPA Grant to address Mine Scarred Lands with goal of preserving natural areas (\$250,000 Grant awarded in 2004)
- Primary Project Components
 - Liability Analysis
 - Review of existing and potential liability associated with ownership and cleanup of mine scarred properties
 - Environmental Assessment
 - Phase 1 Site Investigations of approximately 15.5 square miles (252 patented mining claims and surrounding National Forest)
 - All sites categorized according to “environmental concern”
- Outcomes:
 - Acquisition or protection of over 100 mining claims (~500 acres) as open space and model for thousands more acres.
 - Colorado DRMS closed over 15 dangerous mine openings
 - Conceptual reclamation plans for 4 priority sites

Pennsylvania Mine

Has been spewing ~12,700 grams of zinc per day into Peru Creek (250 mg/liter is considered toxic to fish)

- Pilot passive treatment system installed by state in early 1990's (never commissioned)
- Liability Concerns
 - Clean Water Act (no Good Samaritan Legislation)
 - Potential EPA Superfund Designation
- Snake River Watershed Task Force (started 1999)
 - Keystone Center – USFS, USEPA, USGS, USFWS, CDPHE, CDRMS, Summit County, and others.
 - Summit County Open Space negotiated restrictive covenant and TDR to provide access and institutional controls
 - EPA 319 funded reclamation of several small mine sites

Pennsylvania Mine 2016

- EPA funding approximately \$4.3 M cleanup by Colorado DRMS, including installing 3 bulkheads to reduce water contamination
- Flows dropped from > 100 gpm to < 5 gpm (approximately 85 vertical feet of water has backed up in mine)

Colorado Division
of Reclamation,
Mining & Safety

Project Summary

Project Name: Pennsylvania Mine, continued...

Since access into the underground workings was restricted by collapsed portals, initial investigations were conducted on surface and through wells. Surface sampling was completed at various locations to better pinpoint loading associated with the mine workings, and colored dyes were also injected at various location within the watershed to better understand groundwater flowpaths.

It was determined that continued collection of surface data would not provide enough information for full evaluation of source control options, so a decision was made to explore the potential for portal rehab and underground investigations. During the summer of 2011 drilling was conducted to better understand portal rehab options and help define the construction scope.

In 2012 a portal rehab project was undertaken that involved excavation of the collapsed portals at both Level C and F, followed by installation of large diameter culvert to provide safe access. Once safe access was establish, initial underground investigations were conducted on both levels to better inform next steps and remedial options.

Results

Underground investigations provided a better understanding of underground hydrology and the potential for installation of bulkheads (hydrologic seals) as a source control remedy. Construction of bulkheads within Level F could results in a number of potential improvements including: significantly reduced flow out the portal; diffusion of flow into the groundwater system; elimination of surge events; reduction of oxidation and acid production through mine flooding.

Conclusion

The current path forward for 2013 will involve additional underground rehab on Levels C and F to facilitate further investigations and eventual bulkhead installation. It is anticipated that at least one and possibly two bulkheads will be constructed to reduce and regulate flow from the Pennsylvania Mine workings. Additional work will also be directed at implementing surface controls to reduce infiltration of rainfall and snowmelt into the Penn Mine system.



Figure #3: Installation of large diameter culvert at Level F following portal excavation.



Figure #4: View looking up Level F access. Photo shows timber supports and significant iron hydroxide build up.

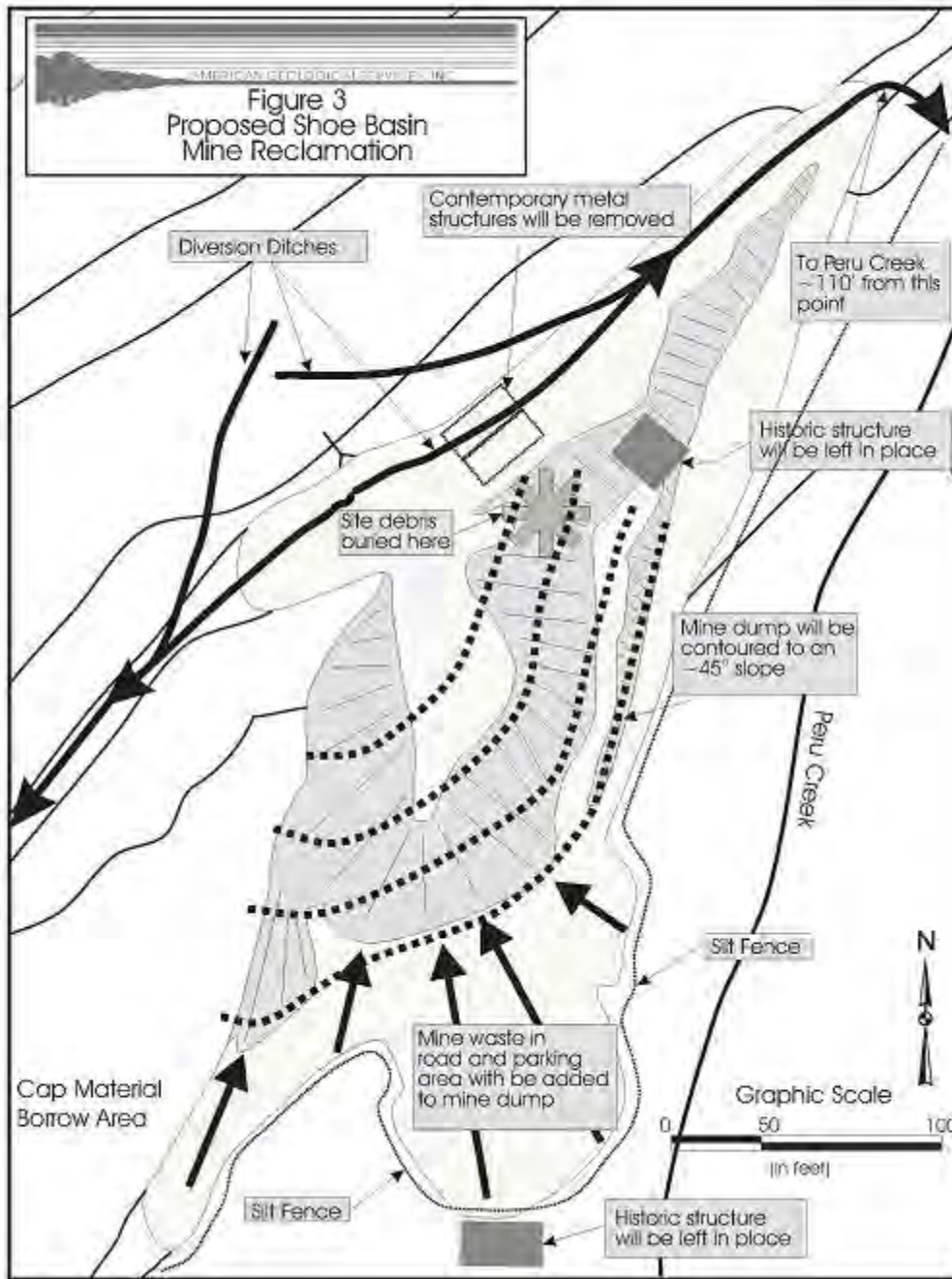
CDRMS Office Locations

Douglas
303-866-2567

Grand Junction
970-241-9330

Shoe Basin Mine





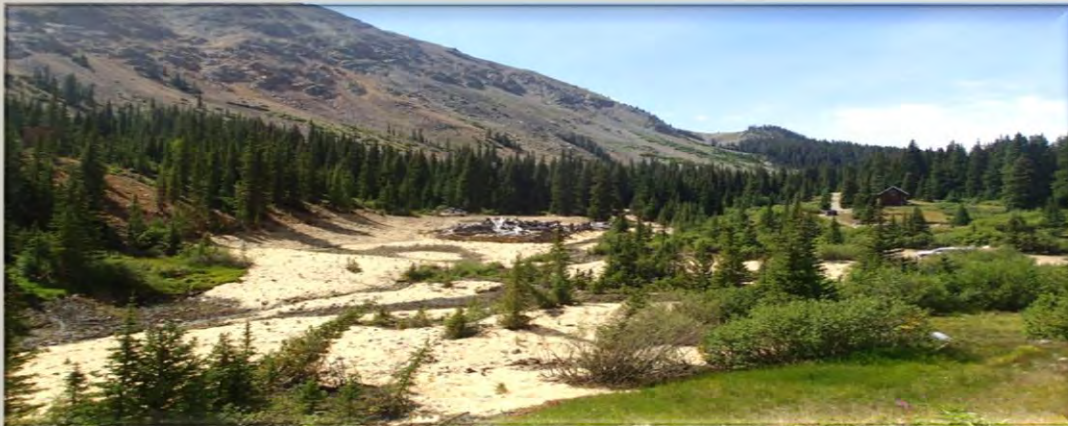


Shoe Basin Mine,
after reclamation

Saints John Wetlands Revegetation Project



Project Site Prior to Reclamation



Project Site Following Reclamation

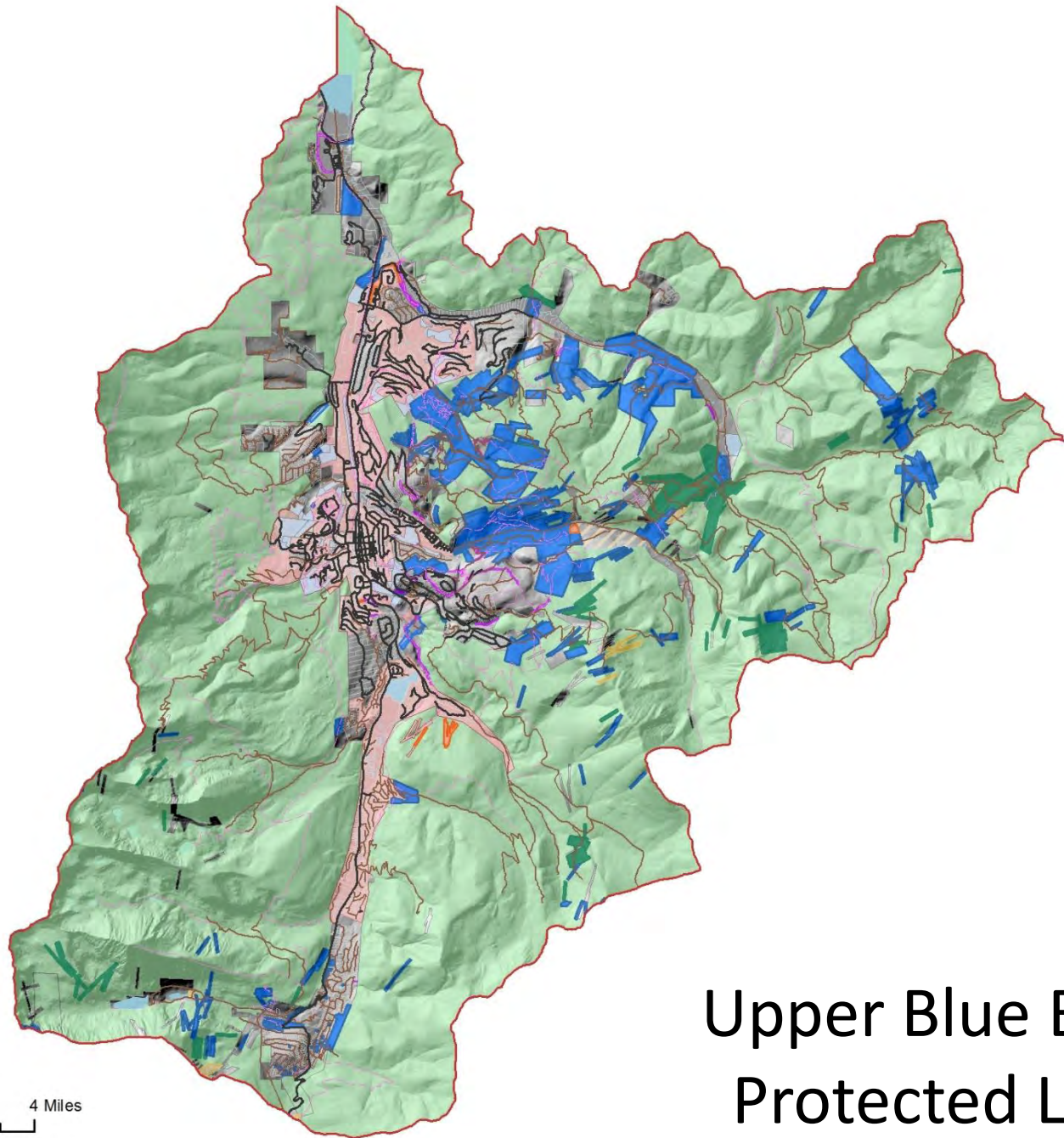


Saints John Town Site

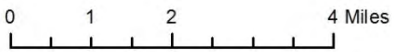
Upper Blue Program Highlights

- TOB partnership
 - 82 acquisitions/ 3,910ac
 - ~80% all UB acquisitions
- Public access, trails, recreation
- River Restoration (Fourmile, Swan)
- Historic preservation (B&B Mines)
- Mine reclamation (B&B Mines)
- Wetland protection
- View corridors and Buffers





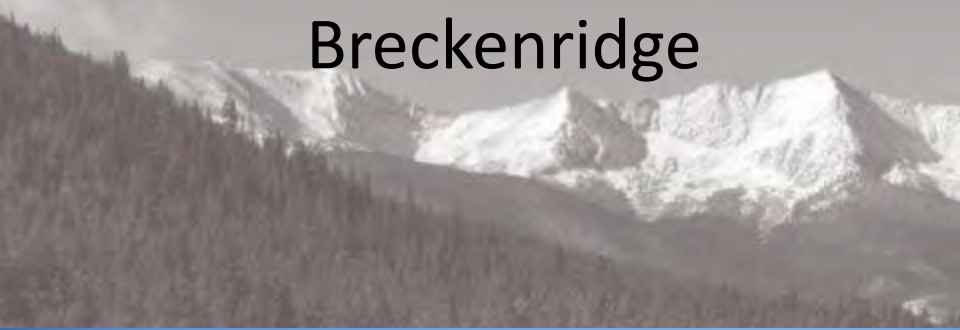
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Upper Blue Basin Protected Lands

B&B Mines Property

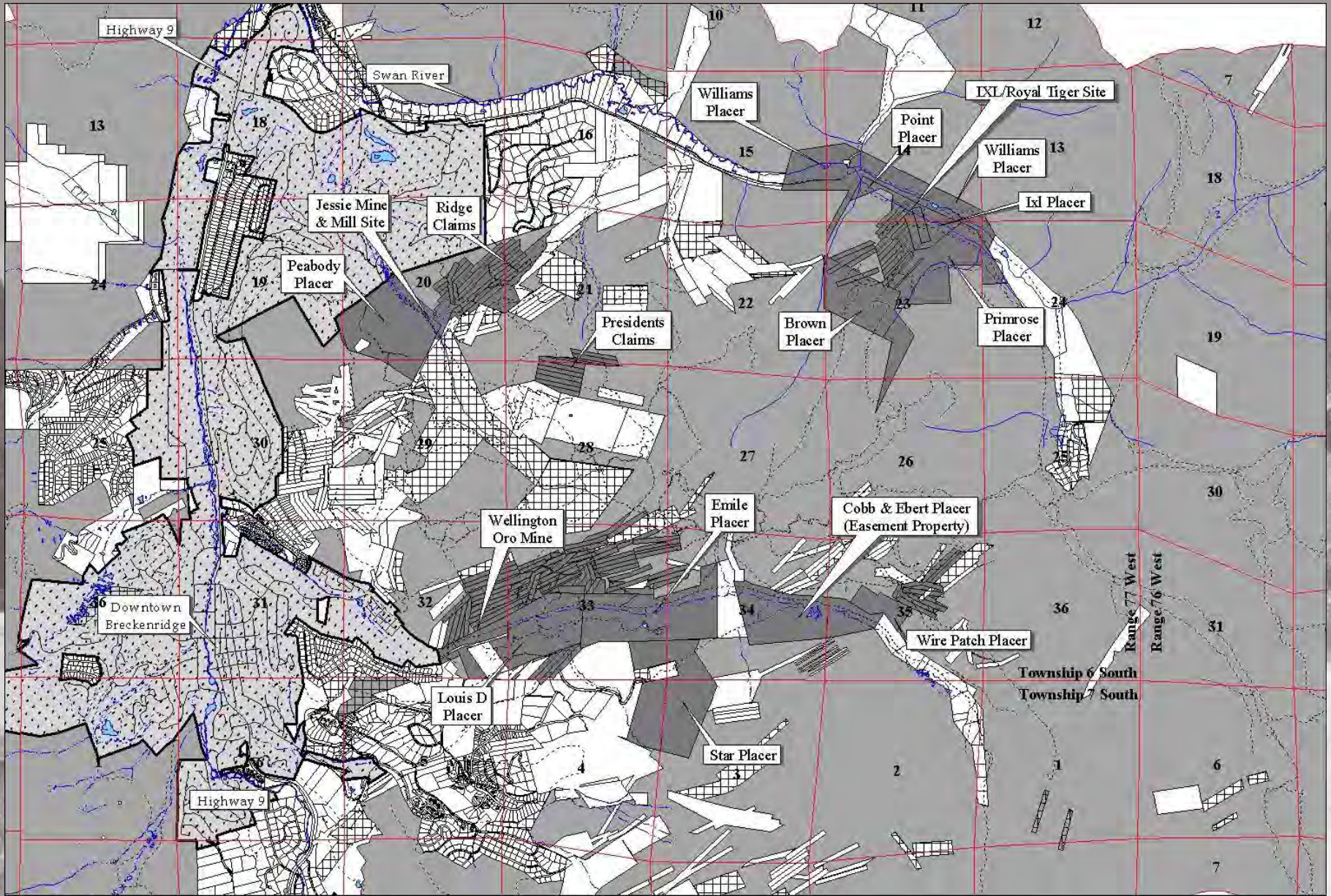
1840 Acres near
Breckenridge



Open Space Opportunities

Vs

Environmental Concerns



B&B Mines Property, Golden Horseshoe

Upper Blue Basin, Summit County, Colorado

B&B Mines - Dark Gray; Private - White; USFS - light gray

Summit County/Breckenridge Open Space - cross hatch; Breckenridge Town limits - dotted

Map printed 4/11/2005

Copyright Summit County Government

2083 0 2083 4166 Feet



1:50000



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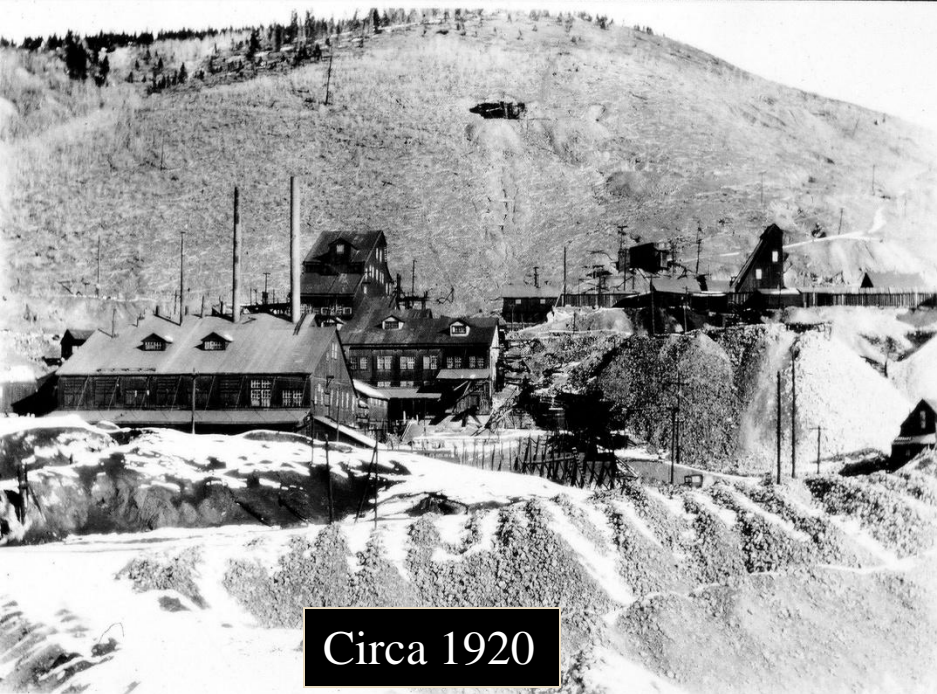
B&B Mines Property

- Ecological Risk Analysis
- Engineering Evaluation/ Cost Analysis
- Use Attainability Analysis
- French Gulch Remediation Opportunities Group (FROG)
- EPA Cleanup Remedy
- Surface Reclamation
- EPA and B&B Mines reach legal impasse



CONSENT DECREE

Agreement between Summit County, Town of Breckenridge, State and Federal Gov't.



Circa 1920

Wellington / Oro Mine



Identified for potential EPA Superfund designation due to Zinc and Cadmium levels toxic to fisheries

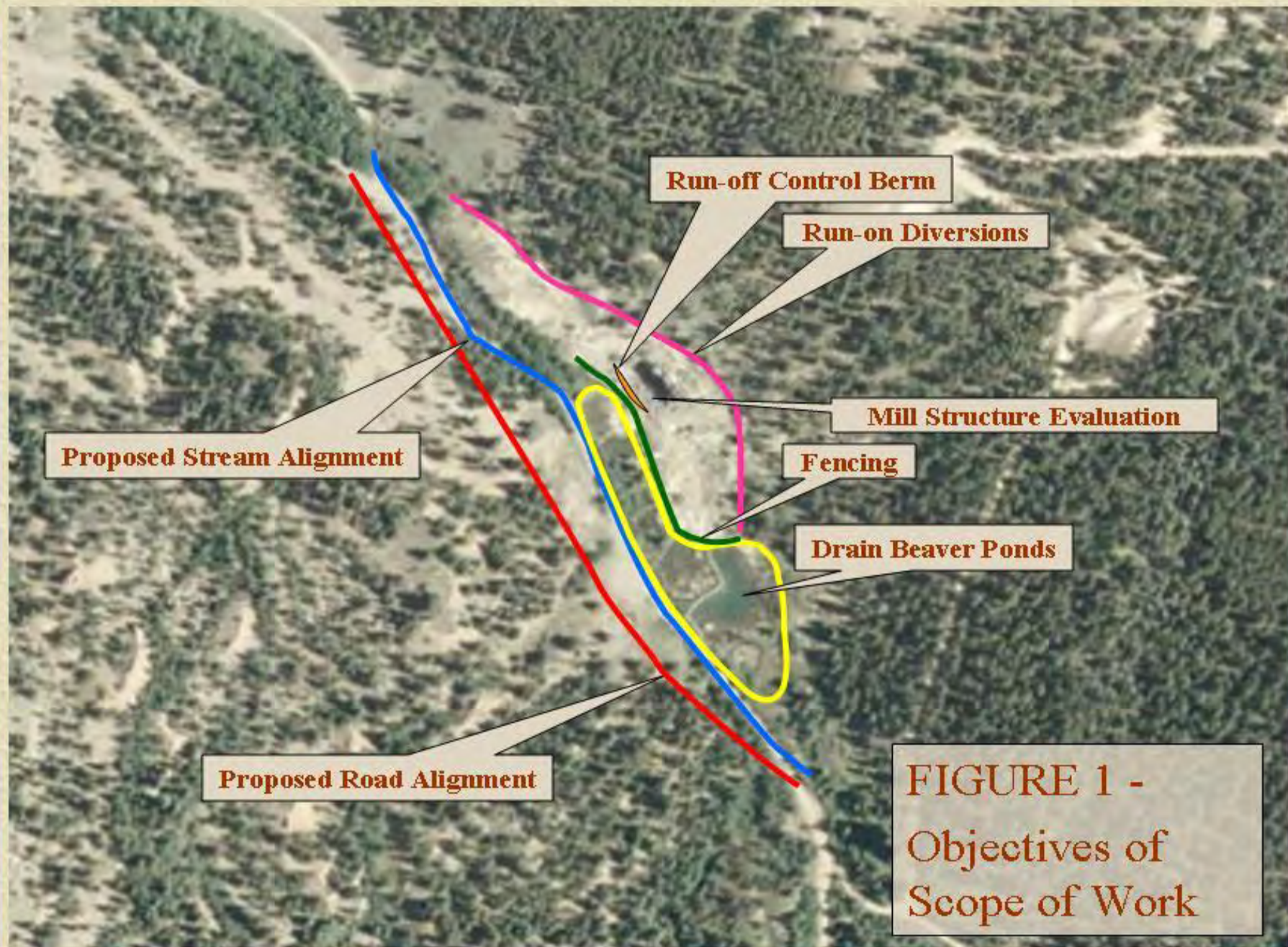


Wellington /Oro Water Treatment Plant

- Joint venture between Summit County and Town of Breckenridge
- Approximately \$4 Million to construct and \$150,000 per year to operate
- Removes Zinc and Cadmium to surpass EPA stream water standards
- Sulphide precipitation process produces a “zinc ore” suitable for refining / recycling
- Commissioned December, 2008

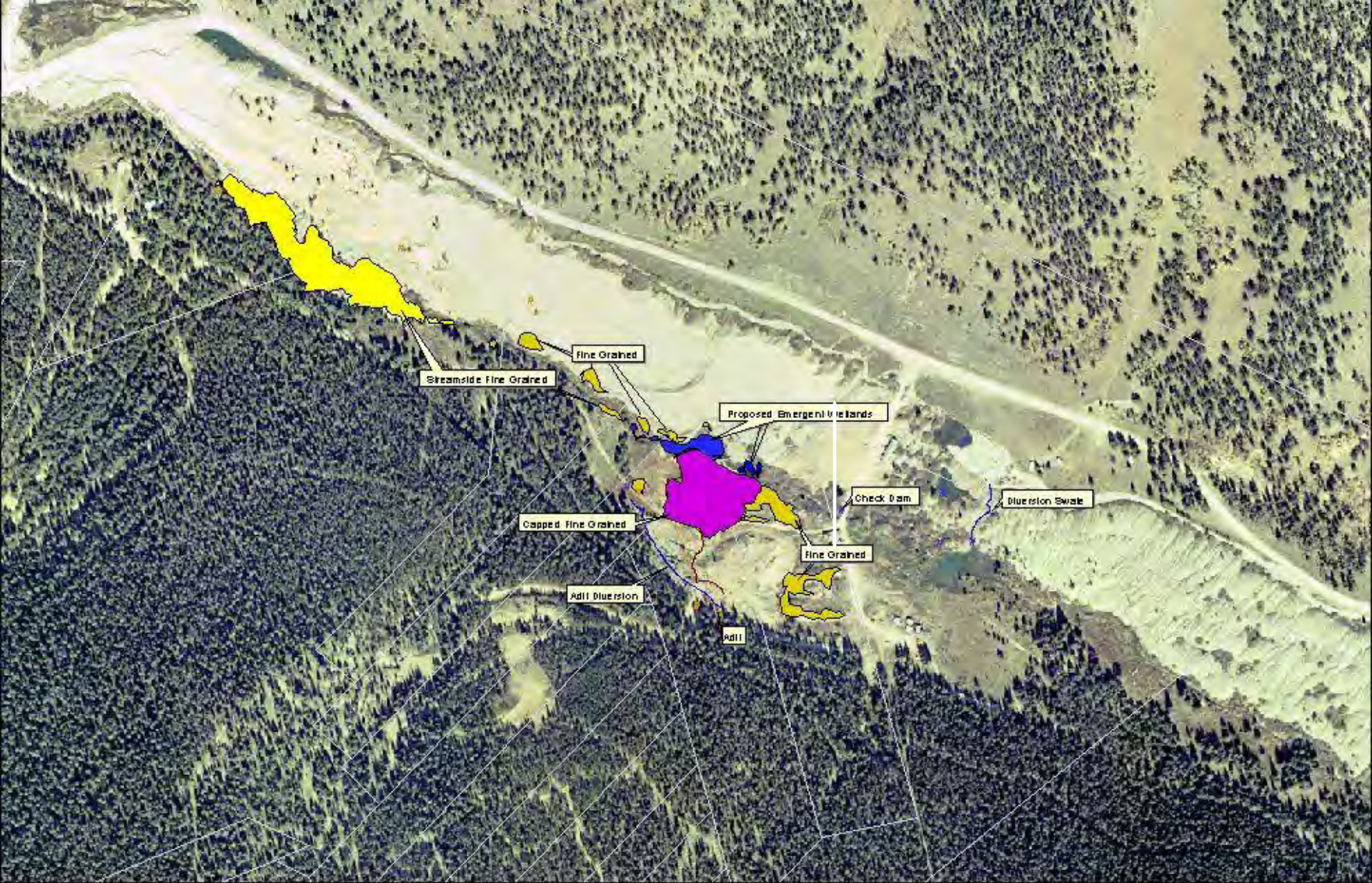
Jessie Mine & Millsite





Royal Tiger/IXL mine





Royal Tiger / IXL Mine Site
Conceptual Reclamation Plan

Map printed 7/14/2004
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200 0 200 400 Feet



1:4800



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Which Legacy



Do
We
Leave?



Blue River Restoration at Fourmile Bridge Open Space



After (2007)



Before (2004)

Example of
“Natural Stream
Design”



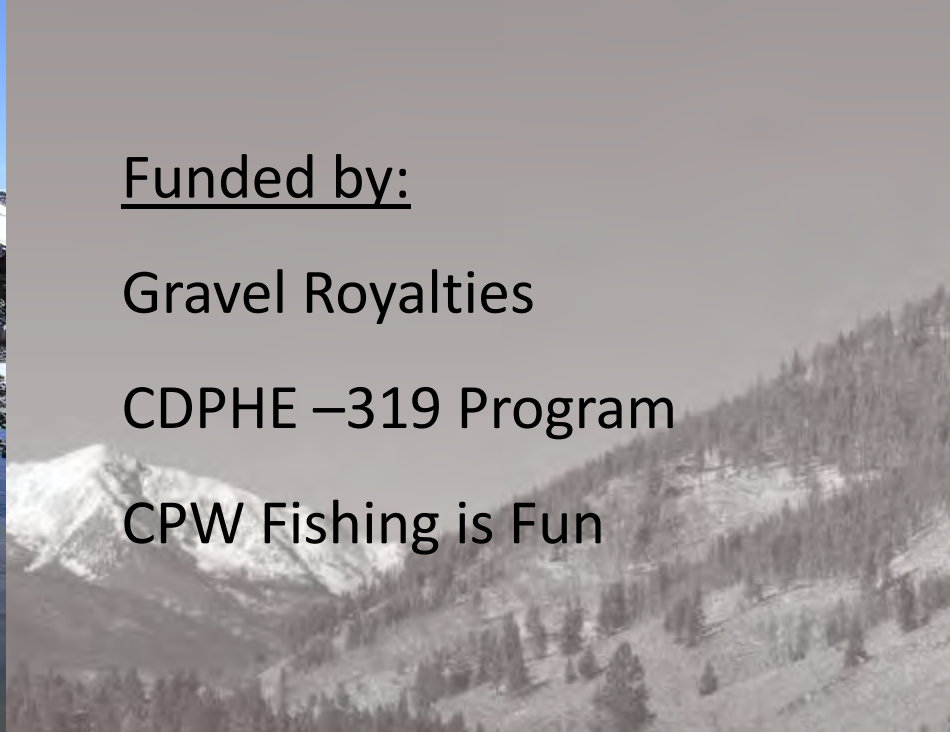


Funded by:

Gravel Royalties

CDPHE –319 Program

CPW Fishing is Fun



Primary Goals:

Enhance Fisheries, Riparian, and
Wetland Habitat

Restore Floodplain Functions

Provide Recreational
Opportunities



Successes:

- Stable stream channel
- Fishing Access
- Improved Water Quality
- Created Wetlands



- “Gold Medal Trout Fishery – most productive stretch of Blue River”
- Natural reproduction of Kokanee Salmon



The Swan River

Then...



SWAN RIVER RESTORATION

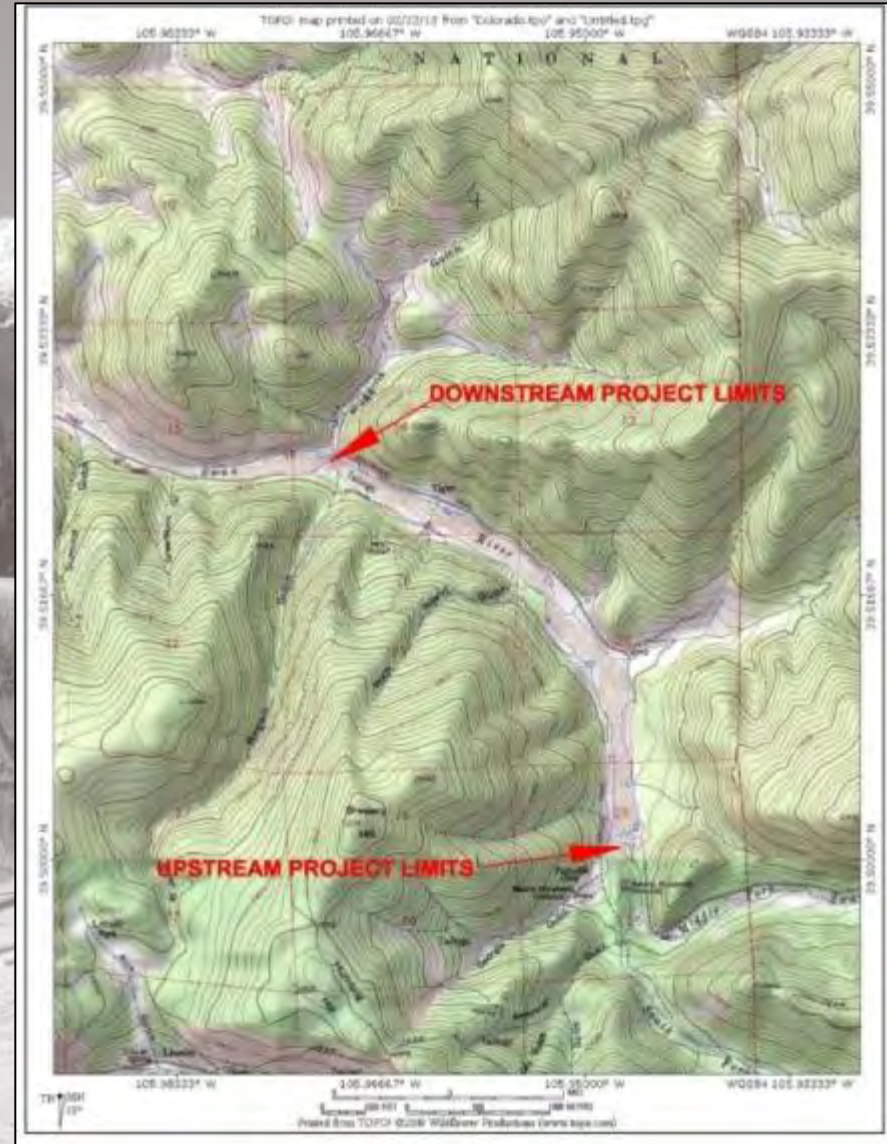


6

Rock Island Rd

Project Location

Swan River Valley
Unincorporated Summit County



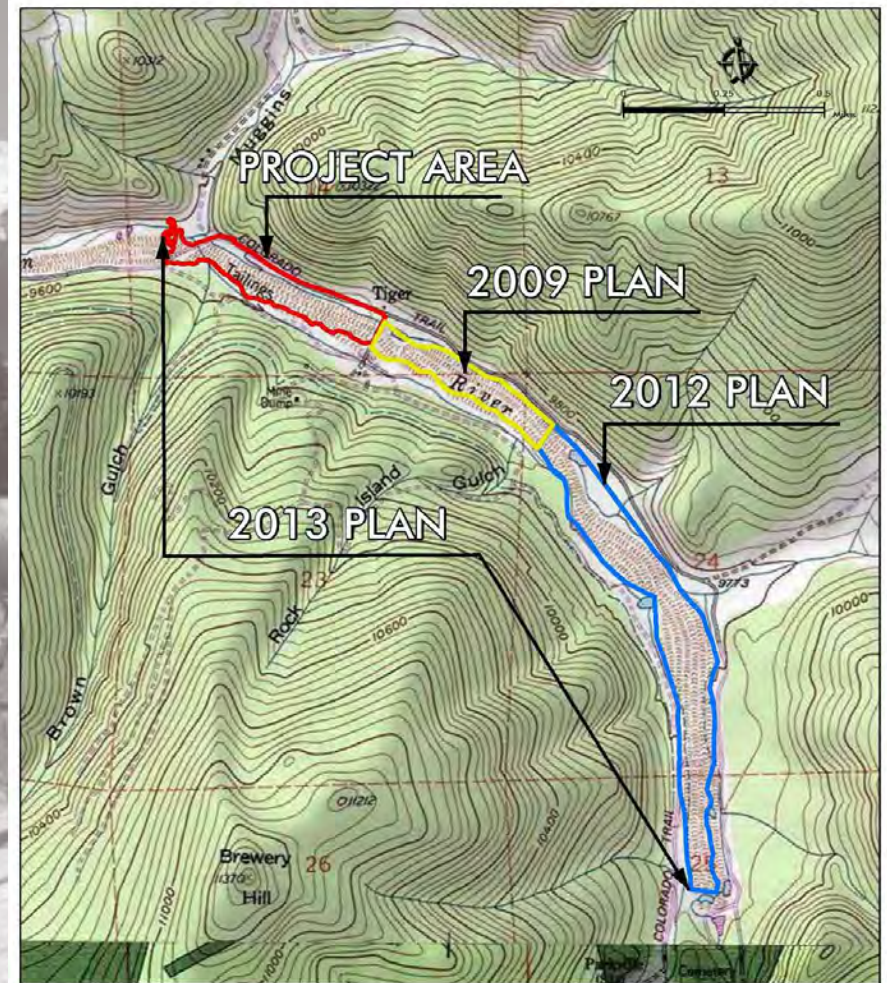


Vs



Project Planning

- CEC, 2009 Swan River Restoration Plan (Summit County)
- ERC, 2012 Upper Swan River Restoration Plan (BRWG)
- ERC, 2013 Swan River Restoration Preliminary Design Report (BRWG)



Project Partners and Supporters

Public Agency

- US Forest Service
- Town of Breckenridge
- Colorado Basin Roundtable & Colorado Water Conservation Board
- Colorado Parks and Wildlife
- US Fish and Wildlife Service
- US Environmental Protection Agency
- Colorado Division of Water Quality
- Colorado Division of Minerals and Geology
- US Army Corps of Engineers

Non-profit and Private

- Blue River Watershed Group
- Friends of Dillon Ranger District
- Trout Unlimited
- National Forest Foundation
- Everest Materials
- Adjacent private landowners

Project Overview & Goals

- ❑ Create a natural, stable channel.
- ❑ Improve water quality and water conservation.
- ❑ Protecting and enhance existing wetlands.
- ❑ Restore, stream, riparian, and floodplain function and habitat.
- ❑ Natural treatment of surface water and groundwater.
- ❑ In-stream aquatic habitat for metapopulation of Colorado River cutthroat trout and diverse macroinvertebrates populations.

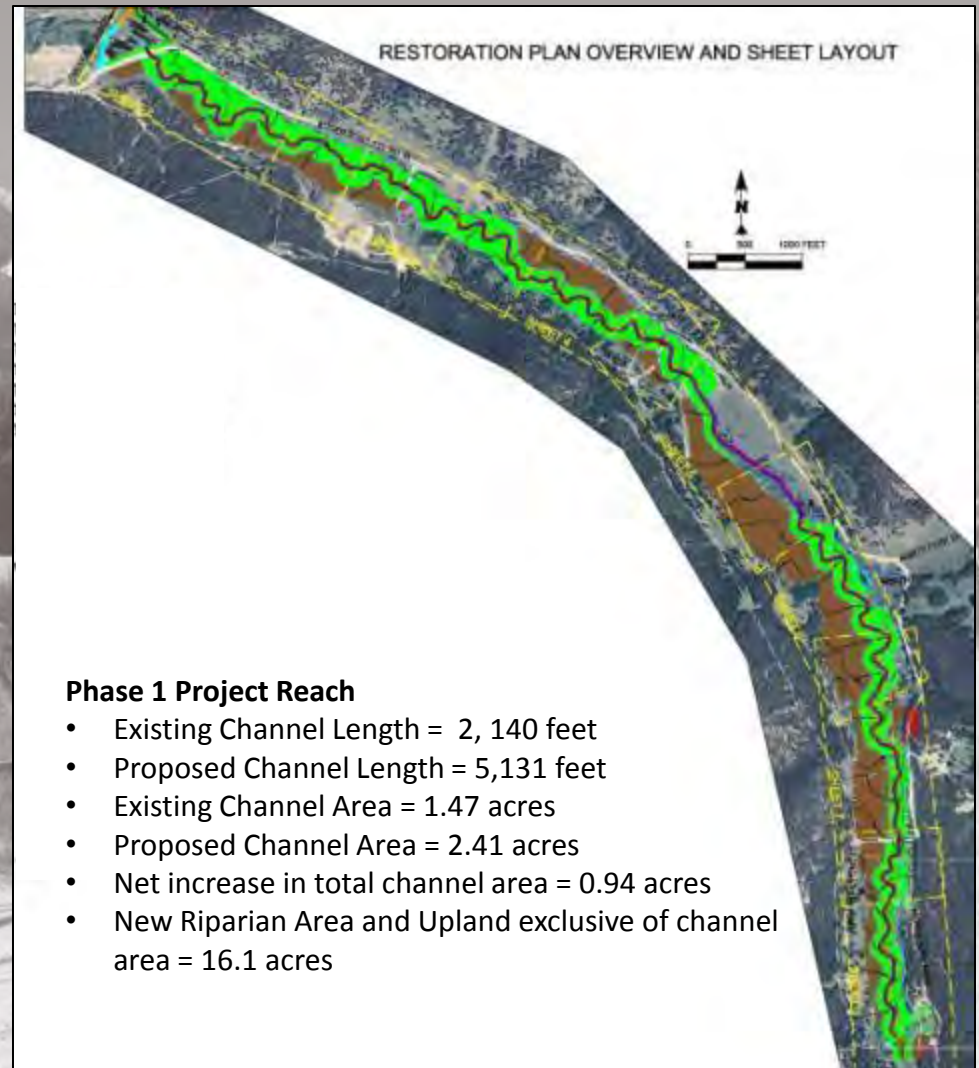
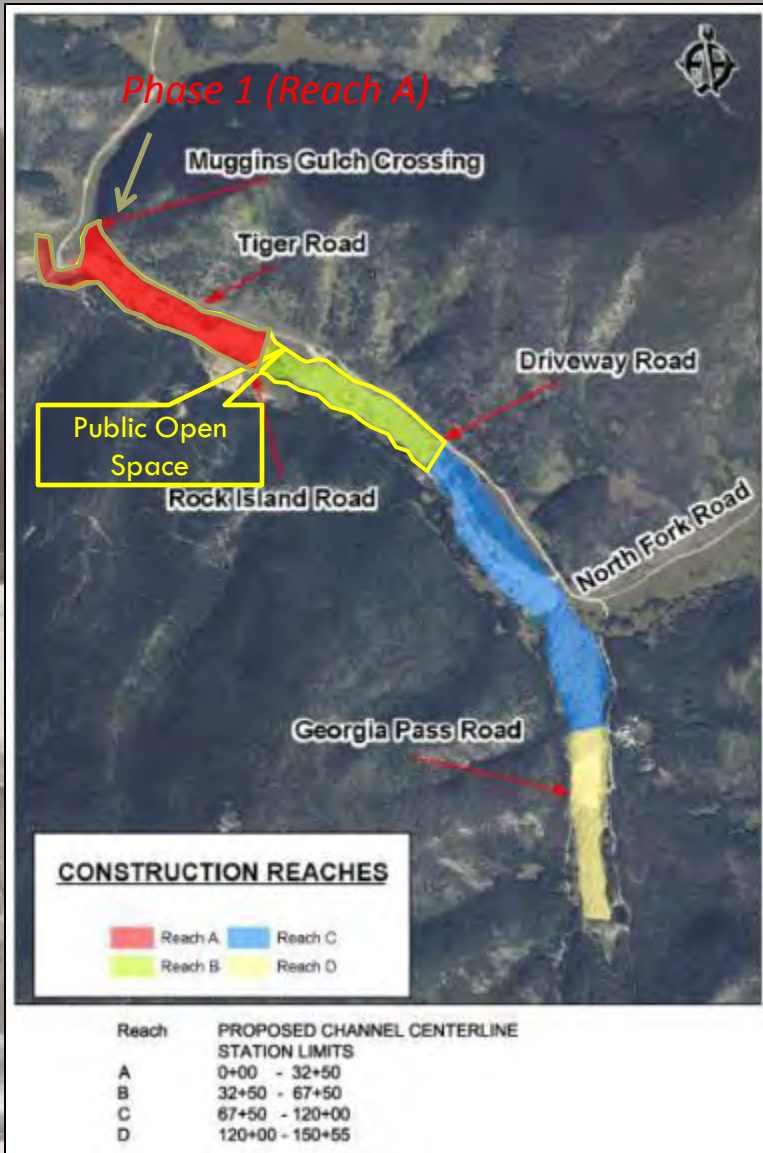


Project Overview & Goals

- ❑ Enhance local economy by creating public open space and opportunities for water-based recreation activities.
- ❑ Educational opportunities demonstrating stream restoration techniques for other reaches degraded by historic dredge mining.
- ❑ Benefit multiple stakeholder groups and objectives.



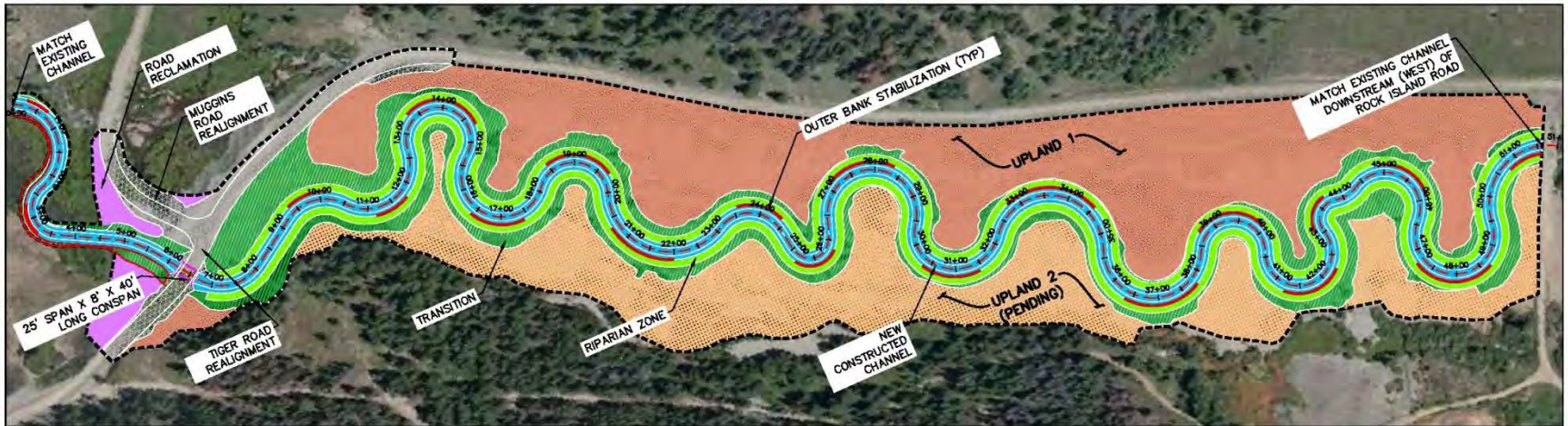
Project Details



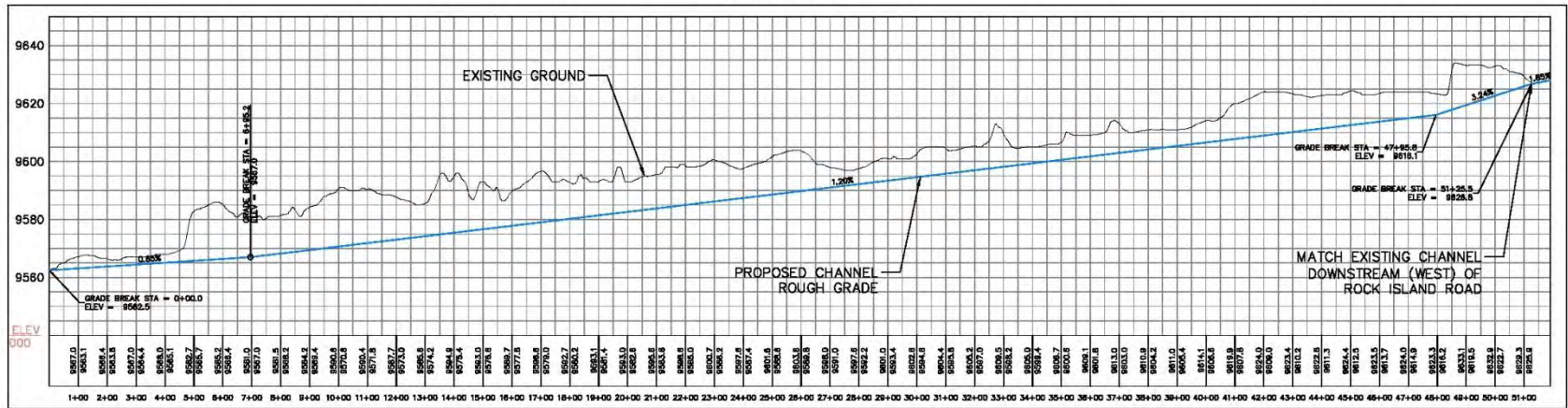
Project Funding and Support

Organization	Type	Value (\$)
Summit County	Cash	568,055
US Fish and Wildlife Service	Cash	150,000
U.S. Forest Service	Cash	110,000
Colorado Parks and Wildlife (Fishing is Fun)	Cash	130,000
Colorado Parks and Wildlife (Wetlands and Riparian)	Cash	59,000
Town of Breckenridge	Cash	368,055
National Forest Foundation	Cash	100,000
Colorado Water Conservation Board	Cash	975,000
Summit County	In-Kind	11,000
Friends of Dillon Ranger District	In-Kind	10,500
Blue River Watershed Group	In-Kind	5,250
Trout Unlimited	In-Kind	5,000
Total		2,491,860

Restoration Plan



① RIVER REALIGNMENT PLANVIEW



② RIVER REALIGNMENT STRAIGHT PROFILE

1001 HORIZONTAL TO VERTICAL SCALE



REV	DATE	DESCRIPTION
B	02/28/24	ISSUED FOR PERMITS
A	01/30/24	ISSUED FOR CLERK REVIEW



PREPARED BY
ECOLOGICAL RESOURCES CONSULTANTS, INC.
 35715 US HIGHWAY 40, SUITE D204
 EVERGREEN, CO 80439

CLIENT
SUMMIT COUNTY OPEN SPACE AND TRAILS

PROJECT
SWAN RIVER RESTORATION PROJECT

TITLE
OVERALL RIVER PLAN AND PROFILE

SHEET NO
03

Reach A Project Milestones

- Colorado Basin Roundtable votes to approve grant funding in January 2015
- Summit County hires Ecological Resource Consultants/Tezak Heavy Equipment design-build team June 2015
- CWCB Water Supply Reserve Account Grant of \$975,000– Executed August 2015
- Design and permitting June 2015 – May 2016
- Construction May 2016 – November 2016
- Final Reach A restoration planting completed August 2017

Project Challenges

- Design & Permitting
- Conditional Use Permit to crush dredge rock and the public process...

“We love the project, but we don’t like trucks on our road...”

May 2016



Crushing vs. No Crushing

Swan River Restoration - Phase 1/Reach A

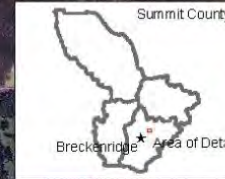
Activity/Description	Scenario 1: Crushing	Scenario 2: No Crushing
Excavation Quantity (CY)	149,000	149,000
Imported Soil Material Required (CY)	1,300	8,000
Onsite Storage of Excavated Material (CY)	87,000	87,000
Excess Excavation Hauled from Site for Use at Offsite Locations (CY)	63,300	70,000
Number of truckloads for Export (Assume 15 CY Trucks)	4,220	4,667
Number of truckloads for Import, e.g., organic material (Assume 15 CY Trucks)	87	533
Net Project Savings from Purchase of Excess Export Materials by Others (\$)	\$108,000	\$0
Export Net Cost to the Project for Removal of Excess Material (\$ +/-)	(\$108,000)	\$392,000
Import Cost to the Project (\$ +/-)	\$26,000	\$160,000
Total Truckloads	4,307	5,200
Total Net Cost to the Project	(\$82,000)	\$552,000

Assumptions:

- *\$5.60 per cubic yard for hauling excess material from the project site to McCain Property
- *Soils material based on approximately 8,000 cubic yards of soil that is required for riparian and upland planting; excludes the 5,000 cubic yards of material required for the low permeability layer.
- *\$20 per cubic yard for import of compost and/or planting soils
- *Net project savings assumes excess materials exported from the project site purchased by others (e.g., Road & Bridge, CDOT, etc.)



Traffic Management Plan



Swan River Stream Restoration (Phase 1/ Reach A)

Truck Haul Route Plan

- Permissible Haul Route
- Paved Road
- Unpaved Road
- Trail



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This predefined truck haul route for truck traffic associated with the Swan River Restoration Project (Phase 1 - Reach A) and associated Construction Phase Traffic Control Plan is developed to help mitigate the effects of truck traffic on residents and recreationalists along and adjacent to the Tiger Road (SCR 6) haul route. This plan is specific to Phase 1 (Reach A) of the project only.

Drivers shall adhere to the following:

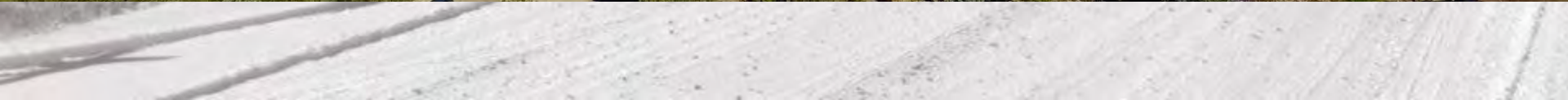
- Follow all applicable traffic rules, laws, and signage
- Follow all posted speed limits
- The use compression release engine brakes ('Jake' brakes) is strictly prohibited
- Yield to bicycle, pedestrian, and other recreational traffic sharing the roadway

Questions can be directed to the Open Space & Trails Department at 970-668-4213.

Construction



Reach A Transformed



Project Challenges

Unanticipated mine wastes in stream alignment



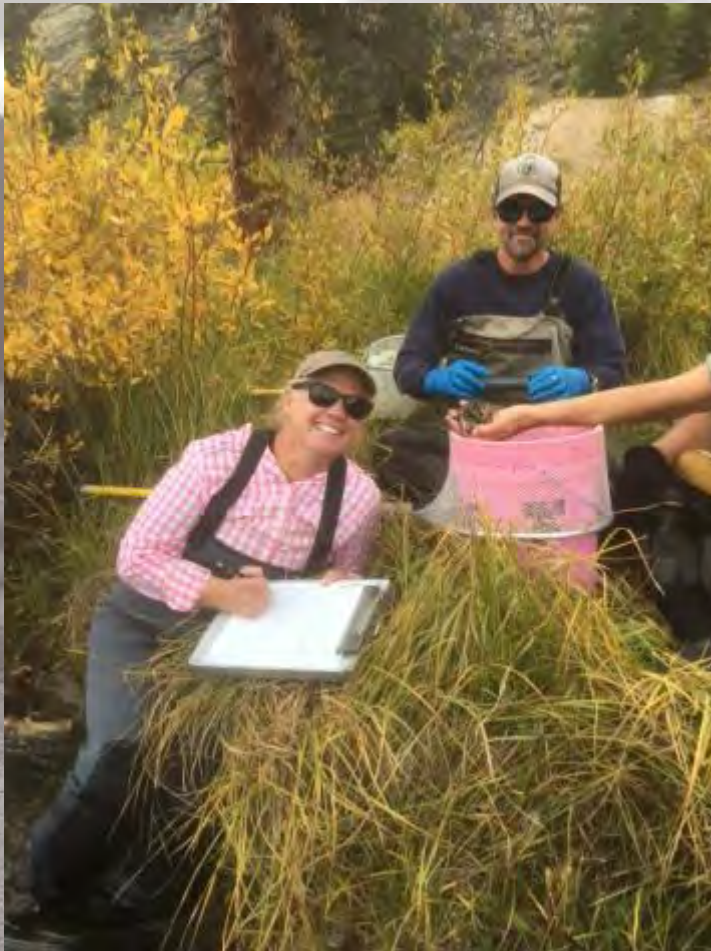
- Excellent Support from Project Partners
 - CDPHE
 - DRMS
 - US EPA
 - CPW
 - USFS
 - CWCB
 - Design-Build Team

Project Challenges

- Strange hydrology
 - Existing stream flowing subsurface through dredge



Fishery Survey



Swan River at Muggins Gulch

Fishery Survey Report

Jon Ewert, Aquatic Biologist, Colorado Parks and Wildlife

March 2017

On September 28, 2016, CPW Aquatics staff, along with Summit County personnel, conducted a fish population survey on a section of the Swan River downstream of the Muggins Gulch road crossing (right).

The purpose of the survey was to quantify the fish population in an area immediately downstream of the Swan River Restoration Project being undertaken on Summit County Open Space property. This information will help inform reasonable expectations for the biological potential of the stream reach within the restoration project. Also, since in the year the construction had



Location of Swan River survey reach.

created a large amount of turbidity downstream of the project, to the extent that there were questions as to whether or not the ecology of the stream was being impacted at that area. This survey found no evidence of such impacts.

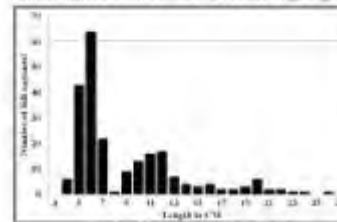
The reach that we surveyed was 404 feet in length and averaged 15.8 feet in stream width. This was a five-flooding section bounded on both ends by beaver pond complexes. The upstream section of the reach was a beaver dam. We used two backpack electrofishers to conduct a two-pass depletion estimate of the total fish population within that reach. All fish were anesthetized. A subset of the fish were weighed, and all fish were returned to the water immediately upon completion of data collection.

We captured 229 brook trout and 332 mottled sculpin in the survey reach. The brook trout ranged from 45 mm (1.8") to 265 mm (10.6") in length, and averaged 94 mm (3.7"). The size distribution of the brook trout is depicted in the figure below. The reason for the small average size is apparent in the graph—the size distribution of the fish in the reach was heavily skewed toward juvenile fish. The group of fish in the 1-6 cm range are Age-0 fish, born in 2016, while the rest size group, averaging 11-12 cm, are Age-1 fish, born in 2015. Because this reach was in the middle of a beaver pond complex, it is likely that if it were possible to accurately sample the fish within the nearby beaver ponds, one would find a greater representation of adult fish. However, it is extremely difficult to accurately survey the fish population in a beaver pond.

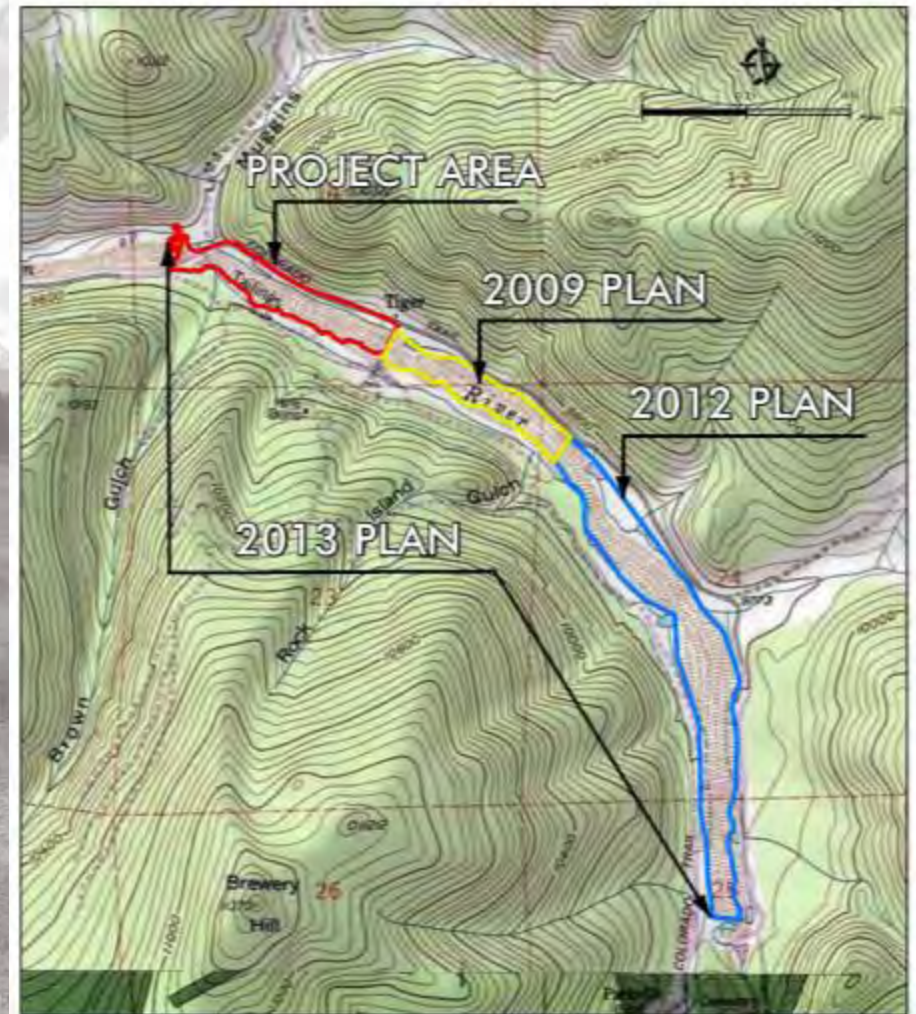
Body condition of the brook trout that were weighed was good, averaging a relative weight (a measure of "plumpness") of $W^2.4$. This indicates that the population has ample prey items to support it.

Mottled sculpin are a small native fish species and are an important indicator of stream health. Their range is now from 15 mm (0.6") to 134 mm (5.3"), with an average length of 30 mm (1.2"). This was actually the highest density mottled sculpin population that we have found to date anywhere upstream of Dillon Reservoir. In comparison, neighboring French Gulch has no mottled sculpin. Interestingly, there are also no mottled sculpin in the Swan River being upstream of the stream habitat restoration site. It will be fascinating to observe whether the stream reach will allow them to expand their range upstream in the coming years.

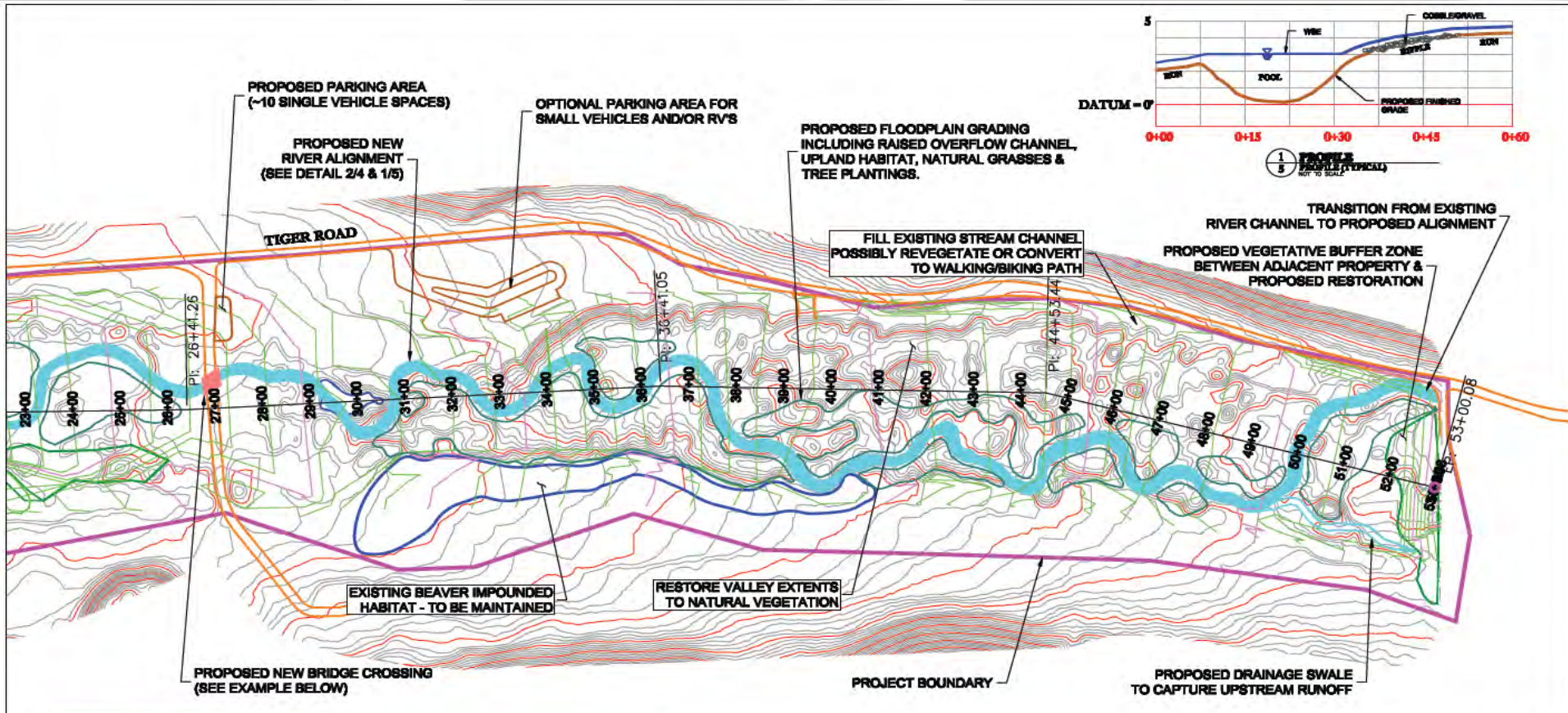
Our catch rates produced population estimates of 242 total brook trout in the reach, or 2.740 fish per mile, and 189 mottled sculpin, or 2.154 fish per mile. While this is not a trophy fishery by any means, it is clearly a prolific and healthy one. In the future, we will continue to monitor this site, as well as additional sites within the habitat improvement reach after construction is complete.



Reach B Project Planning



Reach B Channel Design



EXAMPLE OF BRIDGE CROSSING



Legend

Project Edgents	Proposed Swan River Channel
Existing Edge of Gravel	Proposed Vegetative Buffer Zone
Existing Water Surface/Channel	Proposed Floodplain Grading Transition Area
Existing Contour Major (10' Interval)	Proposed Bridge Crossing
Existing Contour Minor (2' Interval)	Proposed Parking Areas
	Proposed Contour Major (10' Interval)
	Proposed Contour Minor (2' Interval)

Swan River Restoration Project

Proposed Conditions - Upper Reach



1 Inch = 500 feet

LIDAR Existing Contours Provided by Summit County

Datum: NAD 1983 Colorado State Plane, National Foot CO 83CF

MAY 2009

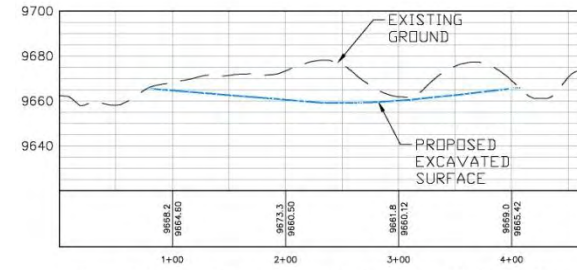
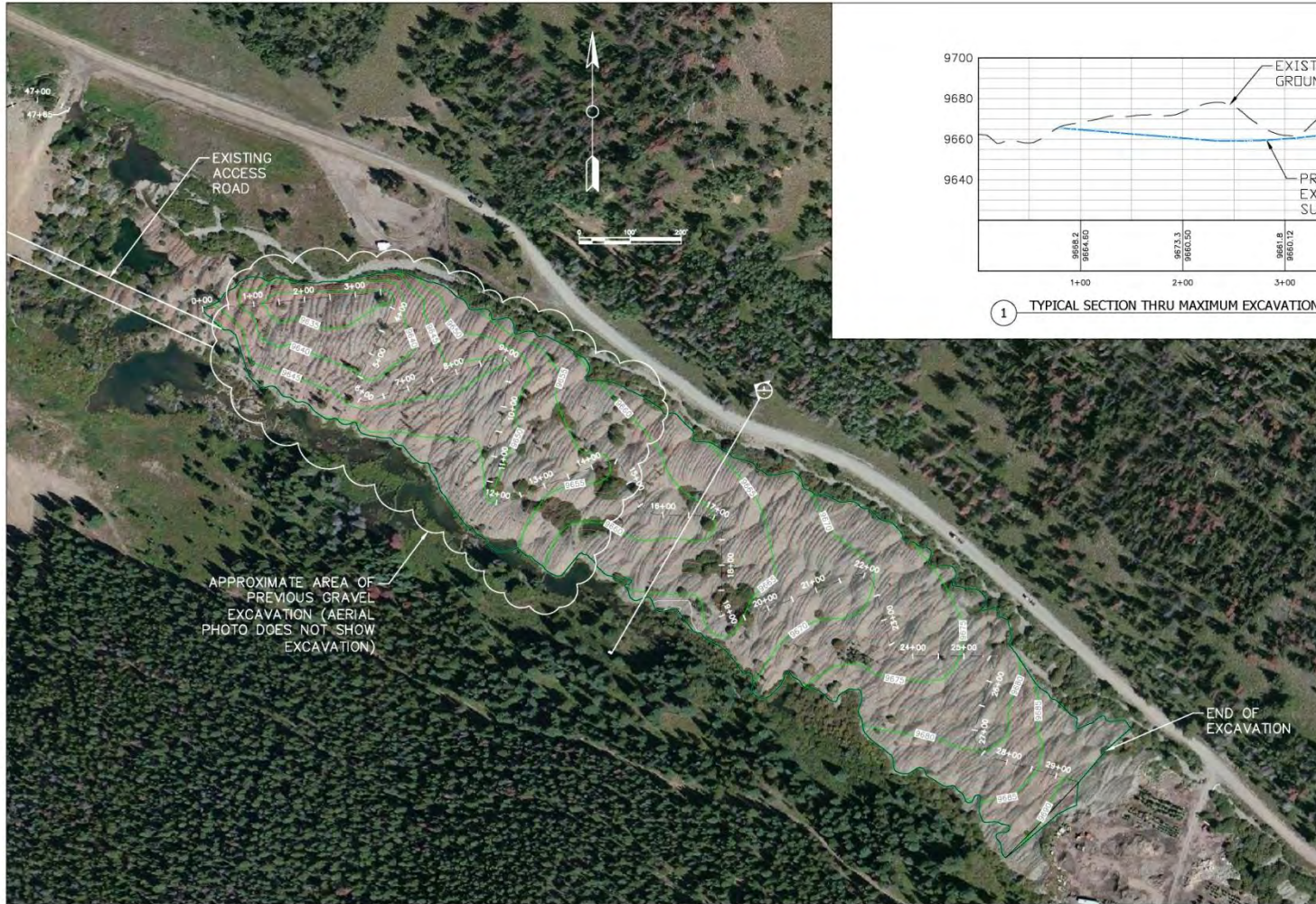
Clelley Ecological Consulting, Inc.

Figure 5

Reach B Implementation

- Gravel removal work on Reach B (above/upstream from the recently completed Reach A restoration site)
 - Summit County and the Town of Breckenridge will collect royalty payments on all material leaving the site, which will be dedicated towards the restoration of public Open Space in the Swan River Valley (Reach B)
 - rough grade the future stream channel, riparian, and upland areas
 - produce material required for constructing the future stream channel
 - import and place suitable soil for the riparian and upland restoration areas
- Summit County and the Town of Breckenridge able to purchase manufactured materials (e.g.,) road base at a reduced cost compared to the open market
- The lease agreement also requires the contractor to:
 - complete all gravel milling activities by May 3, 2020 (expiration date of the CUP)
 - complete all gravel removal operations by May 3, 2021

Reach B Implementation



1 TYPICAL SECTION THRU MAXIMUM EXCAVATION CONFIGURATION

EXCAVATION =
195,000 CY

REV	DATE	DESCRIPTION
A	04/27/17	ISSUED FOR BID



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35715 US HIGHWAY 40, SUITE D204
EVERGREEN, CO 80439

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SUMMIT COUNTY OPEN
SPACE AND TRAILS

PROJECT
SWAN RIVER
RESTORATION PROJECT

TITLE
PHASE 2 - MASS EXCAVATION
MAXIMUM CUT CONFIGURATION
WITH AERIAL PHOTO

SHEET NO
1A

Reach B Implementation



Mines to Open Space

Learn more at:

- SummitCountyCO.gov/SwanRiverBlog
- RestoreTheSwanRiver.com

