Living With Beaver: Importance of Managing the Human-Beaver Interface in Mountain Watersheds

TOMV Town Council Presentation
March 20, 2025

Rory Cowie, PhD
Alpine Water Resources

www.alpinewaterresources.com Rory@alpinewaterresources.com

Experience

- PhD in mountain hydrology and water resource Management
- Over 20 years working on beaver management and monitoring in the San Juan Mountains
- TelSki: Environmental Sustainability team, Prospect Basin Fen Research
- TOT Beaver Monitor: water level controls, vegetation management, community education, water quality monitoring
- Trained by Skip Lisle, inventor of the beaver deceiver flow devices used across the US
- Extensive beaver specific collaborative connections with academic researchers, local and state governments, and non-profit organizations
- Founding member of the Colorado Beaver Working Group
- Owner of Alpine Water Resources Silverton, CO

- https://www.rmpbs.org/blogs/rocky-mountain-pbs/colorado-abandoned-mines-beavers-environment

Castor Canadensis Ecology

- 100-400 million beaver in N. America before European arrival
- Nearly every stream was trapped from CO to CA between 1820-1840
- Only ~ 100,00 beaver at start of 20th century
- Around 15 million today
- Found in every watershed in Western US
- Up to 52 beaver dams per km of stream in Wyoming
- Shaped entire landscapes (from arroyos to valleys)

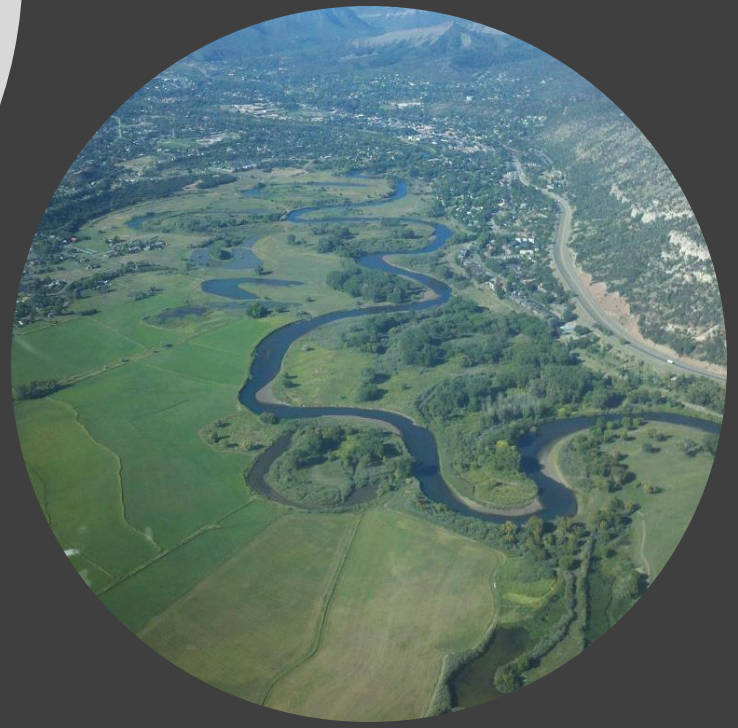
Castor Canadensis Ecological Benefits

- Wetlands are 2% land in Western US but support 80% biodiversity
- Improve water quality
- Reduce sediment and turbidity
- Slow release of snowmelt for downstream agriculture and domestic uses
- Reduce spread of wildfires
- Mitigate flooding
- ***Regulate mine discharges and remove metals**
- ***Increased Resiliency to changing climate**

Beavers are not just an animal, the are an ecosystem!

Habitat diversity
Leads to
species biodiversity

Slide Credit: Torrey Ritter
Montana Dept Fish & wildlife



"Before the emigrant's wagon ever rolled a mile, before the miner found his first color, before the government authorized a single road or trail, this inhospitable land had been traversed and mapped." –Ross Tolle, 1959

"it was the persistent search for beaver that familiarized the white man with the western wilds, and eased the way for official explorers and settlers". (LeRoy Hafen, 1933)

We went from coexistence to commodification about 200 years ago!

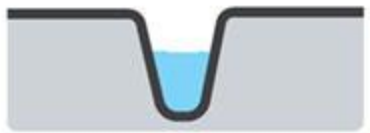
Credit:
Joe Wheaton, USU

Beavers and Landscape Ecology: Grazing

Two sections of Sevenmile Creek, Utah — where beavers have been active (left) and where heavy grazing is allowed [photo credit: Stacy Passmore]

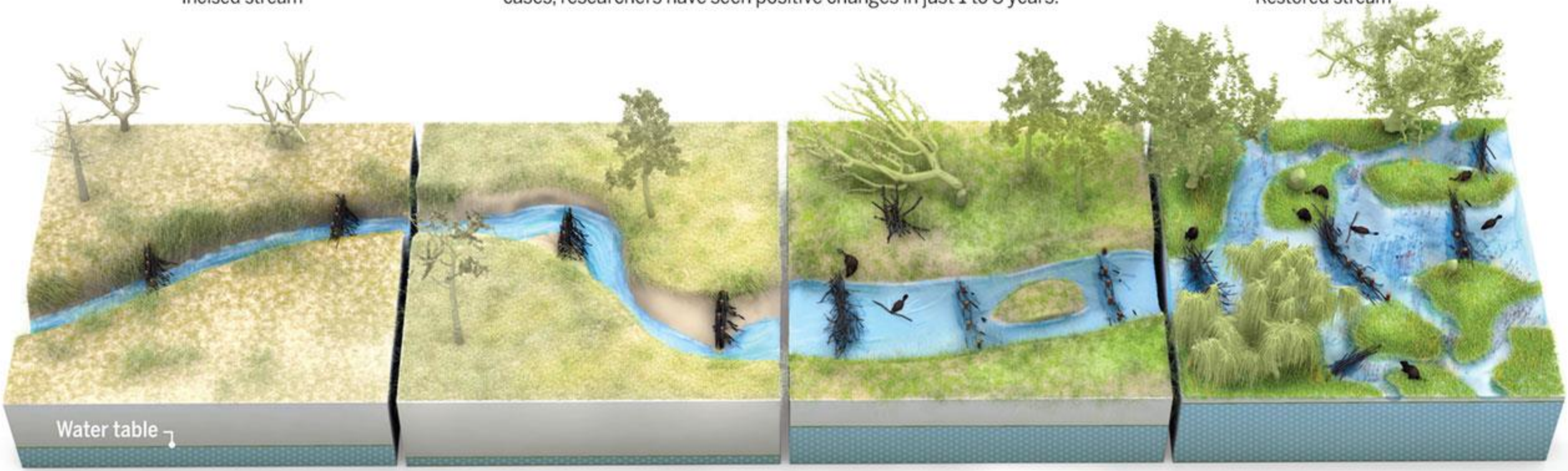
A stream comes back to life

Across the U.S. West, scientists and land managers are using beaver dam analogs (BDAs) to heal damaged streams, re-establish beaver populations, and aid wildlife. In some cases, researchers have seen positive changes in just 1 to 3 years.



Incised stream

Restored stream



Adding dams
Beaver trapping and overgrazing have caused countless creeks to cut deep trenches and water tables to drop, drying floodplains. Installing BDAs can help.

Widening the trench
BDAs divert flows, causing streams to cut into banks, widening the incised channel, and creating a supply of sediment that helps raise the stream bed.

Beavers return
As BDAs trap sediment, the stream bed rebuilds and forces water onto the floodplain, recharging groundwater. Slower flows allow beavers to recolonize.

A complex haven
Re-established beavers raise water tables, irrigate new stands of willow and alder, and create a maze of pools and side channels for fish and wildlife.

Goldfarb, 2018 Science

Co-Existence in Mountain Watersheds

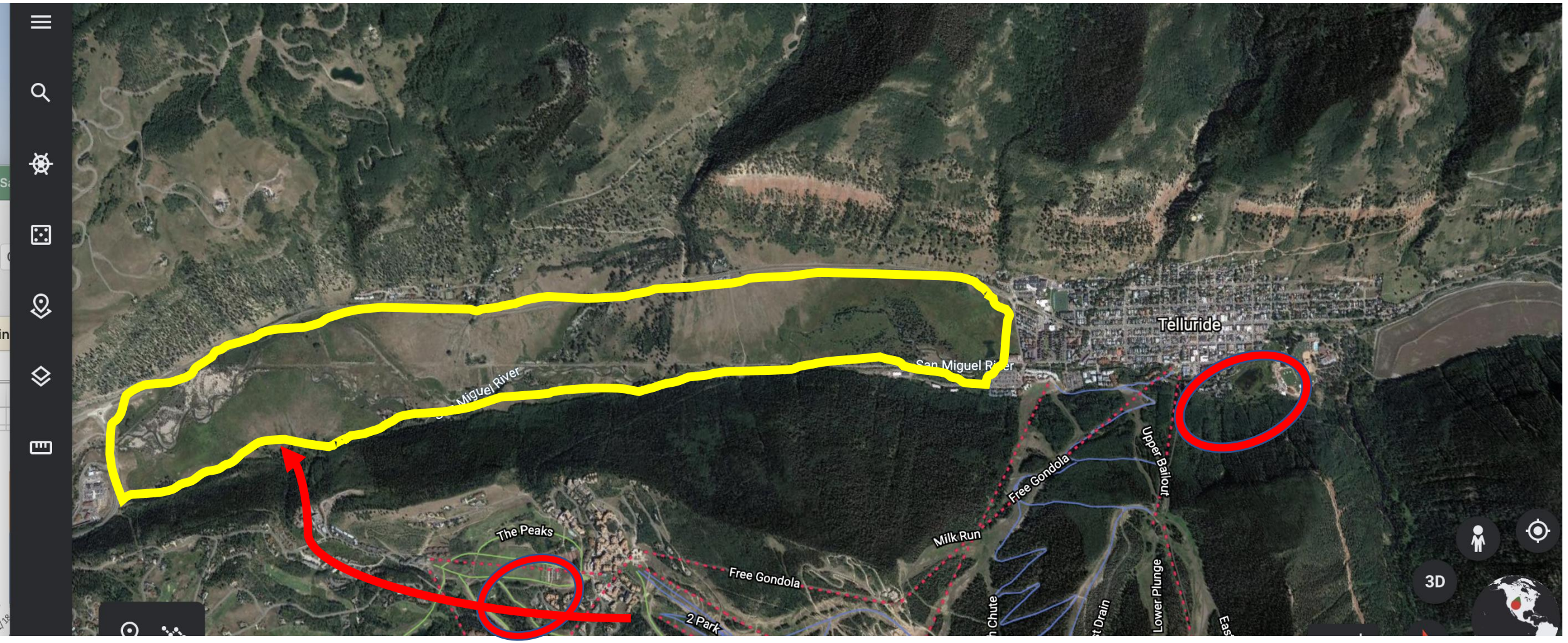
- Beaver habitat preservation and management

a) Beaver deceivers
b) Flow devices
c) Exclusion fences and infrastructure protection

- Beaver habitat expansion and enhancement

a) Low-Tech Process Based Restoration (PBR)
b) Beaver Dam Analogs (BDAs)

Beavers in the Upper San Miguel River watershed



Glacial retreat 10,000 yrs ago; lake and then flood plains in U-shaped valley. Beavers move in ~5,000 years ago, removed by 1830's; mining 1870-1920; grazing 1950-2008; Ski area 1970-present; Valley floor purchased by TOT in 2008 for preservation.

Prospect Creek

WETLANDS MANAGEMENT PLAN FOR THE TELLURIDE MOUNTAIN VILLAGE

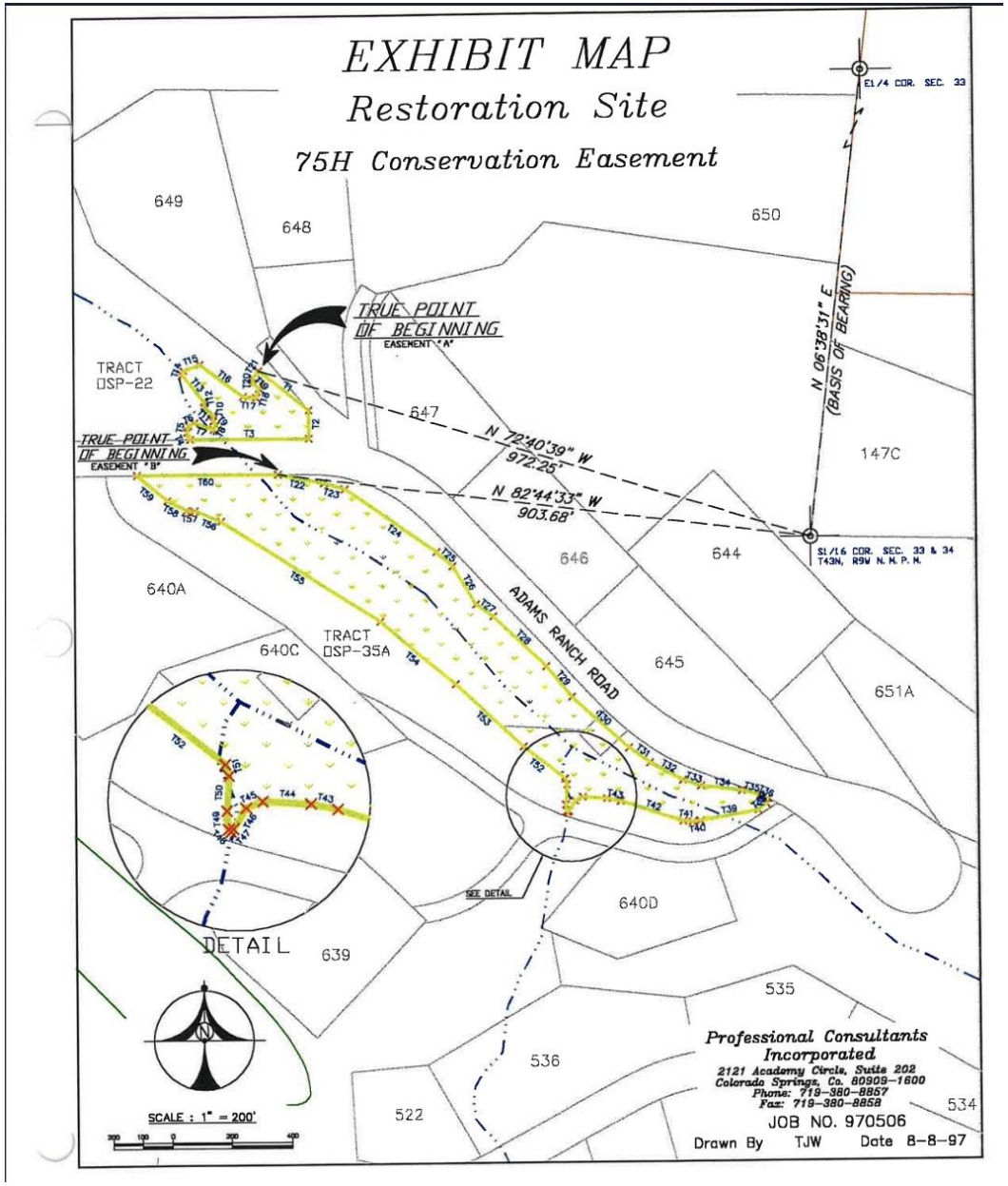
OCTOBER 1996

1.0 INTRODUCTION

1.1 Applicability and Purpose of the Management Plan

Wetlands form an important part of the ecological setting within the Telluride Mountain Village and surrounding area. All of the wetlands in the project area benefit not only the Telluride Mountain Village, but the broader community of San Miguel County as well. Their unique ecological setting predisposes these features to impacts that may result from development and recreational activities. These pressures have influenced wetlands within the boundaries of the Telluride Mountain Village and the surrounding areas. As wetlands provide a variety of functions that support aesthetic, ecological, and physical needs within the landscape, their protection from further degradation, as well as a framework for their maintenance and enhancement is necessary to maintain the ecological integrity of the area. Management decisions for wetlands within the region can not be effectively undertaken without an understanding of the wetland systems currently within the project area. Such an understanding requires a knowledge of their origins, the functions they provide and the relative value of these functions and, the natural and human-produced conditions that have influenced wetlands in the area to this point.

This Management Plan is applicable to the activities of and binding upon Telluride Ski & Golf Company, The Telluride Company, Mountain Village Inc. (dba Telluride Mountain Village, Inc.), and their business entities, affiliates, contractors, sub-contractors, employees, servants and



- An inventory of all known existing wetlands, other regulated waters of the United States, and wetland mitigation sites within the Project Area (collectively, "wetlands");

- An identification of certain wetlands that Telski will preserve through the recording of a conservation easement;

- Specific measures that Telski will implement in connection with its future application of fertilizers, pesticides, herbicides, fungicides, and insecticides within the Project Area for the purpose of preventing the introduction of

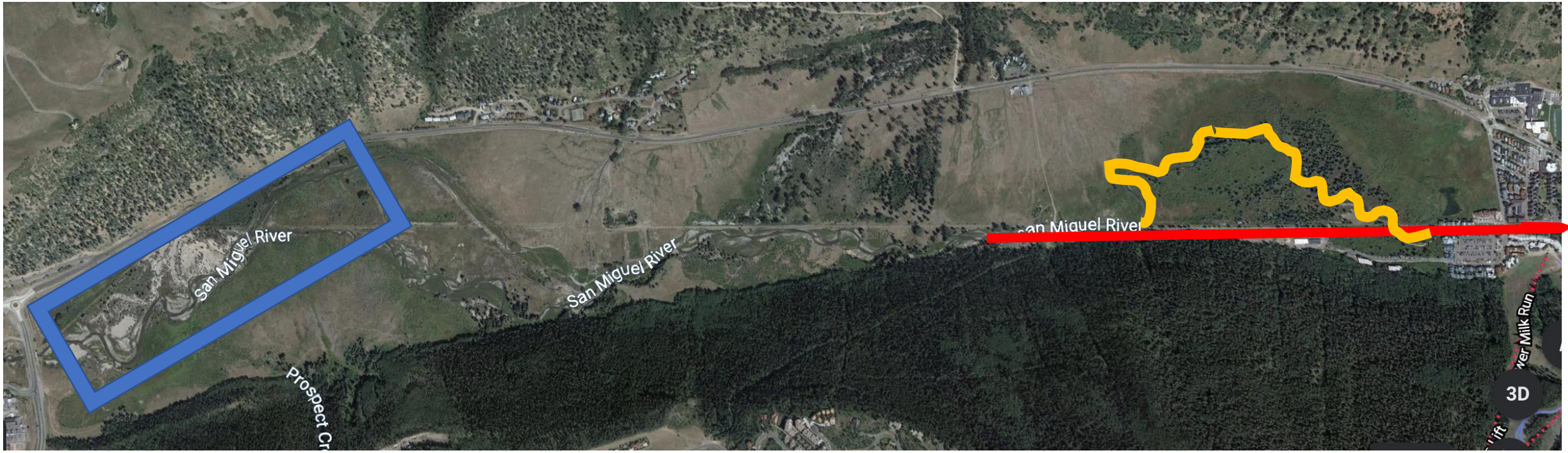
- Specific measures that Telski will imp their obligations under this Management Plan; and

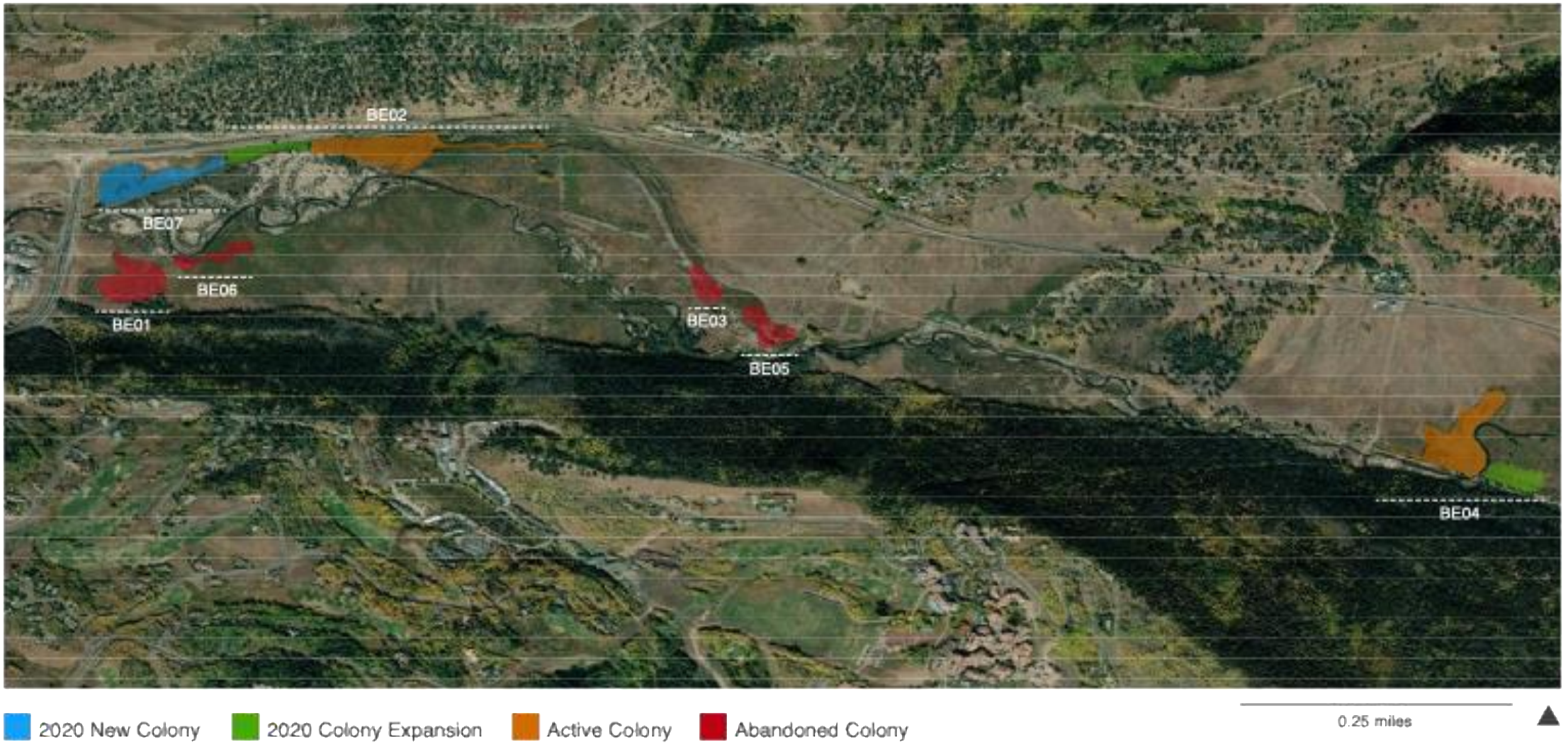
Most of the area within the Telluride Mountain Village lies within the Silver Mountain landslide, one of the largest landslide features in North America (GEOS, 1980). This geologic feature produces an uneven topography that supports numerous groundwater discharge points in the form of springs and seeps. Although the Prospect Creek and Skunk Creek drainages are well-defined, drainage patterns both within and outside these drainages are irregular. Analyses of the site also refer to the Adams Creek basin; however, a creek only occurs at the bottom of the basin (GEOS, 1980; Cooper, 1995). These three drainages form the backbone of wetland features within the project area.

The type of wetlands in an area are typically defined by the geologic and climatic setting. As in other areas, wetlands in and adjacent to Mountain Village have also been influenced by other factors. Specifically, wetlands in the region have been influenced on a historic basis by the activity of beavers as well as diversions into and out of the drainages that supported agricultural land uses; within the upper portions of the Prospect Creek drainage historic mining disturbances persist. Wetlands in the area have also been directly and indirectly impacted through the development of the Telluride Ski Area; the golf course; residential and commercial construction; and the supporting infrastructure.

Exhibit MP-1 constitutes a mapped inventory of all known existing wetlands within the Project Area, whether or not they are currently owned by Telski. The wetland resources of the project area are generally described in Section 3.2 below.

Telluride Valley Floor: River restoration and beaver habitat expansion





Map of Telluride Valley Floor Beaver Colonies 2020

Telluride Valley Floor, beaver habitat 2020

The Telluride Watch — Tuesday, June 15, 2004 — 7

TOWN OF TELLURIDE

Town Officials Seek to Work Around Beaver Dams

By Kelly Hearn

A beaver deceiver!

Governments have historically dabbled in deception, but Telluride public works officials may turn to a benevolent brand of trickery to help humans live alongside nature's busiest water engineer.

Telluride's most recent beaver problem began when several beavers put the final touches on a dam across a section of the San Miguel River, at a spot north of the River Trail, between Shandoka and the Telluride Public Works building.

The dammed water flowed over the banks, which, for the beaver, was a good thing. It meant access to more food like bark, leaves and twigs. It also meant they could swim south to get to, gnaw through and transport their favorite snack – the tasty aspen tree – from the south side of Black Bear Road, to facilitate building even more dams.

For humans, however, the spreading water was a bad thing. It covered the River Trail. It crossed Black Bear Road, the only access road to the Public Works facility. Worse, it threatened to run across a sewer line that snakes across nearby property owned by the San Miguel Valley Corporation.

"It was a big problem, but we wanted to use the latest technology to deal with it," said Karen Guglielmone, projects manager for the Telluride Public Works Department. "We wanted to find a way to live alongside them."

THE CASTOR MASTER - Telluride Public Works Department hopes this device (named after the beaver's scientific name Castor Canadensis) will help solve the beaver dam problem near their facility on the River Trail, west of town. (Photo by Brett Schreckengost)

"It was a big problem, but we wanted to use the latest technology to deal with it."

– Karen Guglielmone

seering designs, Lisle hopes to avoid more traditional and less friendly human responses to beavers, which have often included dynamite, traps or rifles.

Like many animals, the beaver population has fluctuated in response to the whimsical nature of human fashion. Back when beaver pelts were in demand, beaver populations were decimated. Today beavers are being recognized for their engineering skills – everything from raising water tables to maintaining wetland systems to slowing storm water runoff – and there has been a burst of beaver management techniques.

Beavers are not only hard workers; they are loyal, monogamous partners as well. Adults usually mate in February, resulting in two to four kits four months later. Family units typically consist of five to six members who team up to build lodges and dams and bring home meals.

Beavers have been problematic for some Telluride residents for years, particularly for those residents living near the Drew-Hyggood wetlands at the end of Spruce and Willow streets. Several homes have been built near the wetlands and when beavers dam things up, the water spreads to threaten nearby property.

To control the beavers near Black Bear Road, Public Works used machinery to clear a section of the dam (although Guglielmone said she typically prefers to remove dams by hand instead of machines, which tend to disrupt the river). They also installed one of Lisle's devices, known as a Castor Master (the beaver's scientific name is *Castor canadensis*).

The device is simply a culvert that helps water sidestep the beaver dam and keep flowing downstream instead of backing up and tipping over riverbanks, and causing problems. The trick, Guglielmone explained, is to keep the beavers from damming the culvert, a favorite beaver activity that often strains relations with humans wanting to manage water their own way.

"The key is to keep beavers away from the sound of the water running through the pipe," said Guglielmone.

To the nocturnal, monogamous beaver, the sound of running water is a call to obsessive action.

Lisle's Castor Master keeps the beaver at tooth's length from the culvert, with a fully enclosed cage of wire, made of six by six inch square holes. The holes are large enough to let water and river debris pass through the culvert's entrance and keep a downstream course. But they are too small to let a beaver – with its webbed hind feet, a broad, flat tail and a potential weight of 60 pounds – pass thorough and clog things up.

Guglielmone hopes the castor truly can master the beaver. If not, Lisle has yet another trick up his sleeve to keep the toothsome rodent at bay: The Beaver Deceiver, a trapezoidal fence that narrows at the culvert and extends upstream, widening as it goes.

Guglielmone and other beaver experts are fast to point out that beavers are a so-called keystone player, meaning other species are helped out as a consequence of their lifestyle. When beavers build dams with sticks and mud, the backup water forms deepwater ponds that support other mammals, birds, fish and amphibians. So while beaver relocation can be successful, it is often more beneficial to find a way to maintain the animal's habitat.

TOWN OF TELLURIDE

Public Works Department
P.O. Box 397
Telluride, CO 81435

970-728-2177 Phone
970-728-0548 Fax

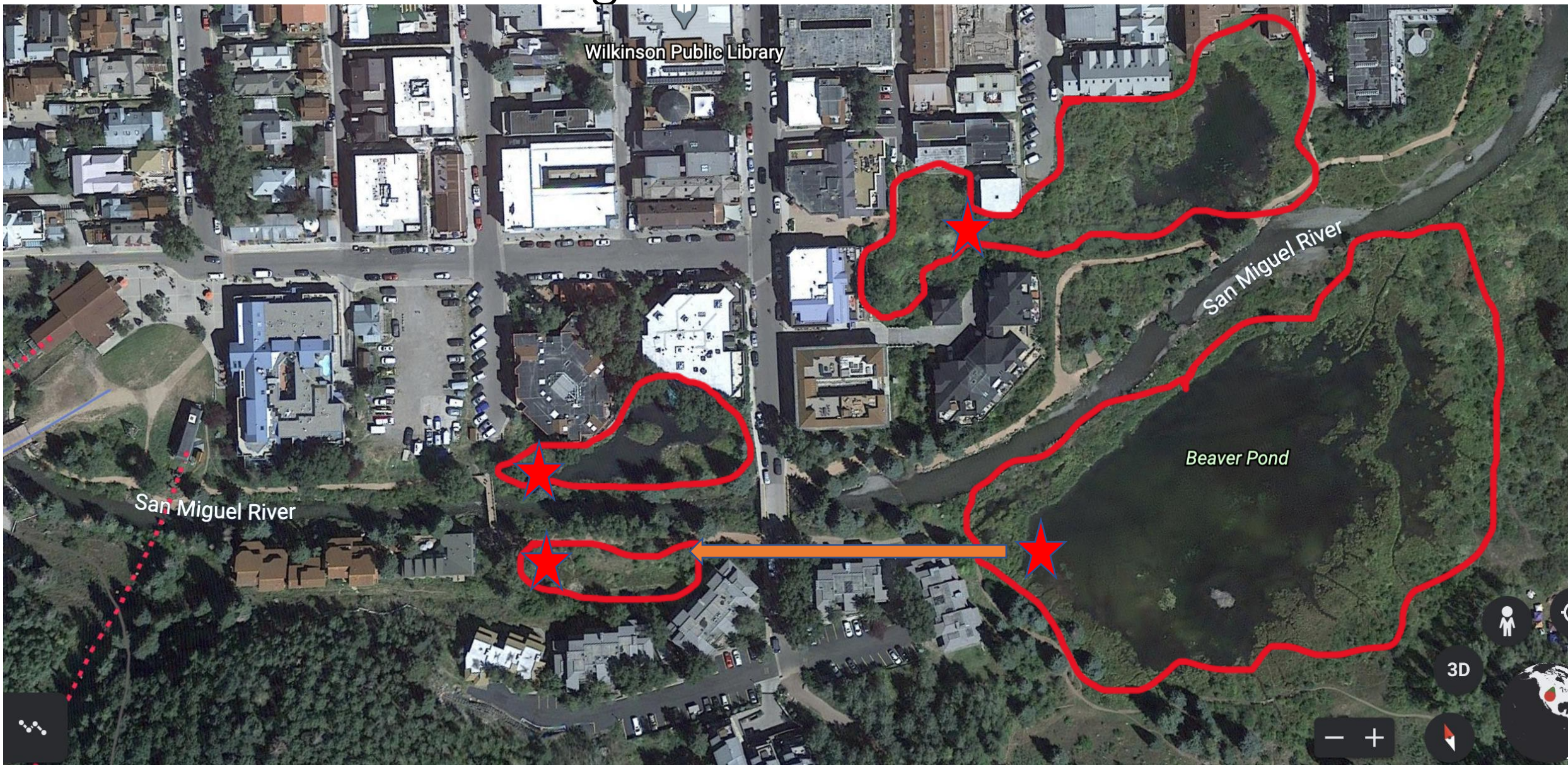
MEMORANDUM

TO: Jay Harrington, Town Manager
FROM: Karen Guglielmone, Public Works Project Manager
DATE: October 31, 2005
SUBJECT: Update on new approach to beaver management

In early October 2005, Skip Lyles, a renowned beaver management expert came to assist Public Works staff in building "beaver deceivers" to decrease the amount of man-hours spent working to break down beaver dams when these dams threaten public or private infrastructure. Four beaver deceivers were installed: two in the Hobgood-Drew Wetlands, one in the Pine Street Wetlands, and one in the beaver pond. To date, these systems are working well and the beavers really are "deceived"—meaning that they have not figured out how to stop the water from flowing through their dams. A minimum of 120 hours has been spent battling the beaver over the last five years every field season (June through October). If the beaver deceivers continue to function into the future as well as they do now, these valuable labor hours can instead be spent pulling invasive weeds, planting riparian vegetation, monitoring water quality, measuring groundwater levels, restoring adversely impacted areas of the riparian corridor or wetlands, or a myriad of other necessary tasks. It will mean our staff has worked smarter!

2005: Beaver issues to be addressed by Public Works Department

Beaver habitat adjacent to infrastructure and location of flow devices to manage water levels



Hobgood-Drew wetland

Hobgood-Drew Wetland above the beaver dam that is behind 299 South Spruce Street, a building whose foundation is continuously threatened when beavers back up water levels too high. Man-hours required to lower this dam each day is 1 hour. If the beaver deceiver continues to work as it has for over 1 month now, approximately 150 hours of labor can be used doing other important tasks during the busy field season. (10/11/05)

5 months after install

- No activity around the inflow fence
- Some activity over the dam section but no damming of outflow

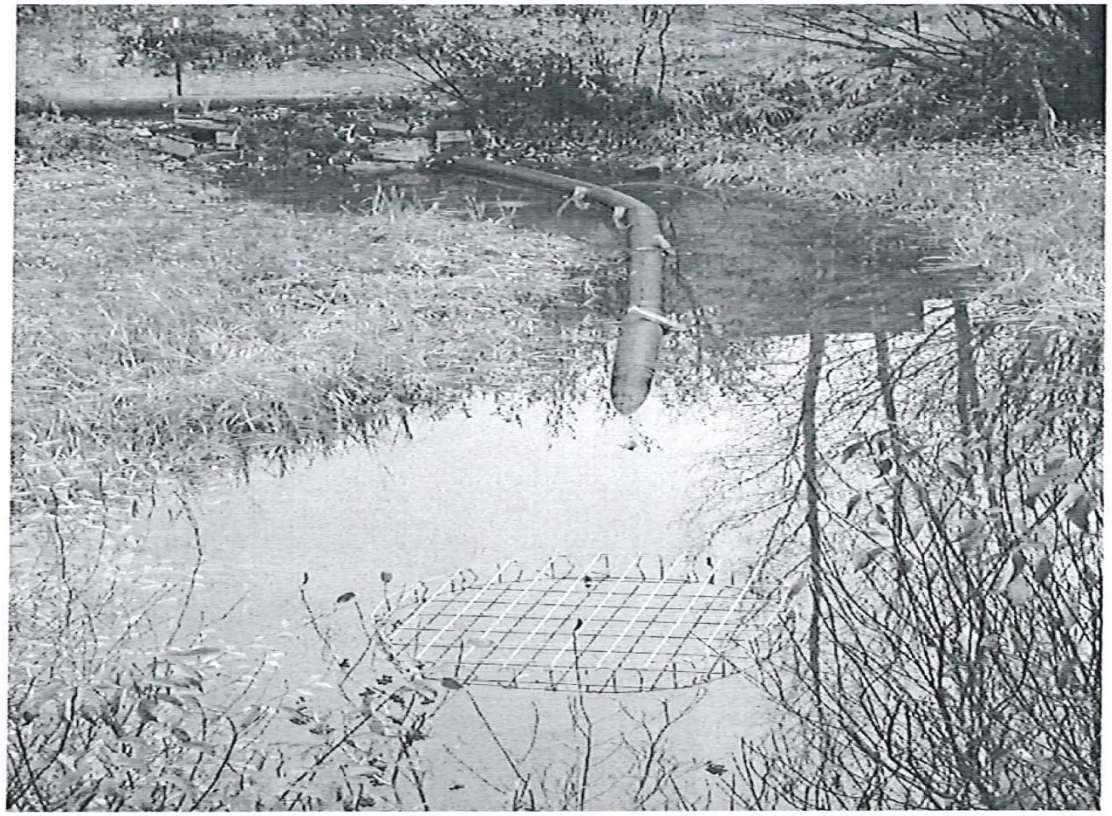
19 years after install

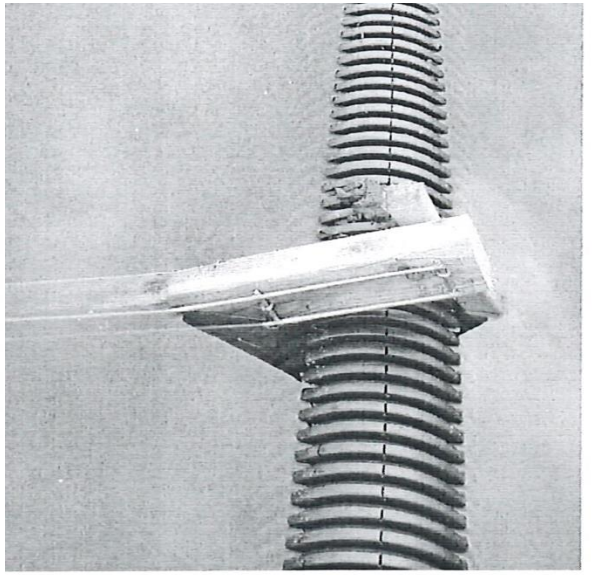
Outfllow pipe

- Minimal maintenance
- 150 hrs per year x 17 years = 2,550 hours of labor saved

Beaver Deceiver system example

- Beavers had routinely clogged the outflow culvert and created a stagnant pond.
- Pipe and round fence installed. Beavers unable to access end of pipe to stuff debris and clog.
- Highest point in the pipe can be adjusted to set the desired water level in the pond. Good for variable/seasonal inflow locations
- Inflow located in deepest area, supports greater water circulation in small wetland





"Castor Master"
-Skip Lyles

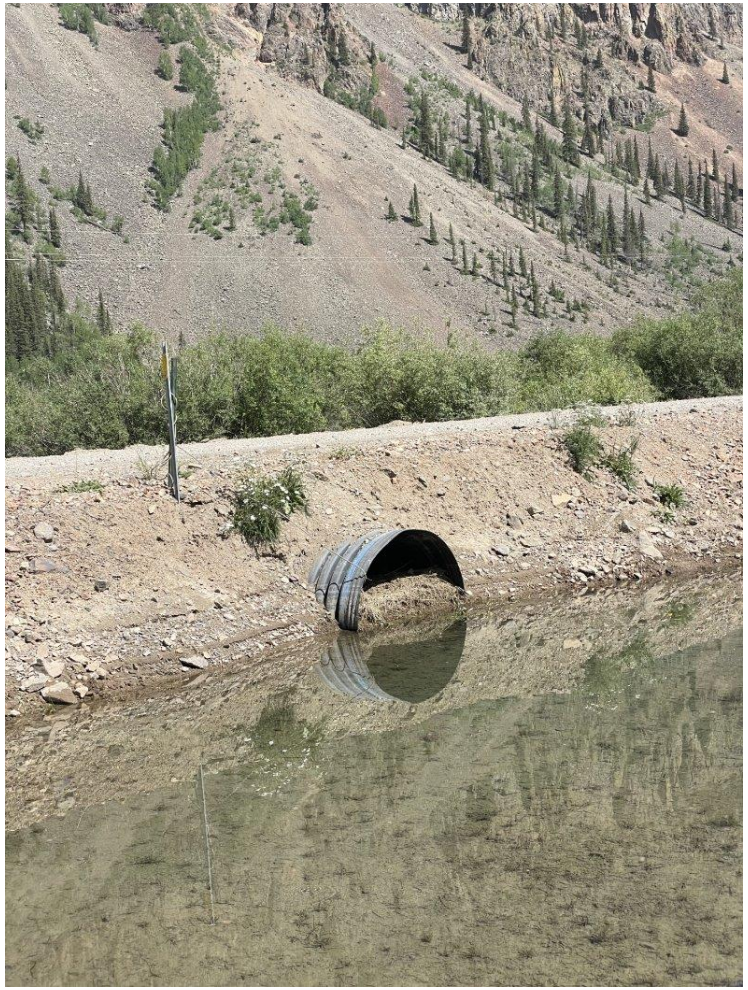
Ice House wetlands: outlet flow device

Protecting valuable trees

Infrastructure Impacts: Hwy 550 Red Mountain Pass


35D

Road Culvert Exclusion Fencing



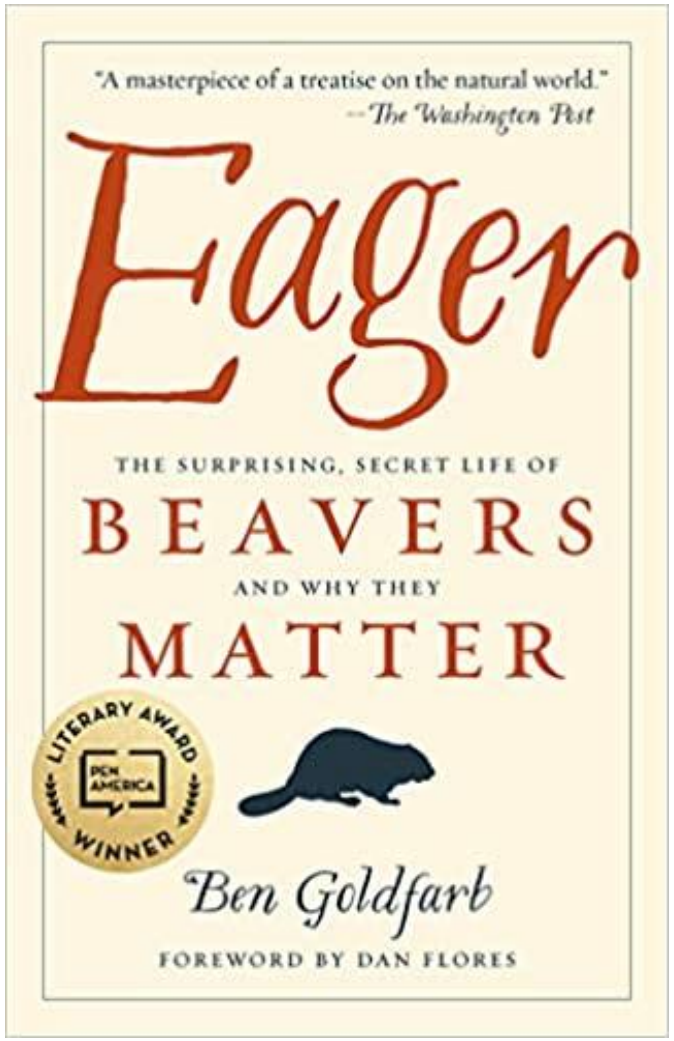
Thank you
for your time

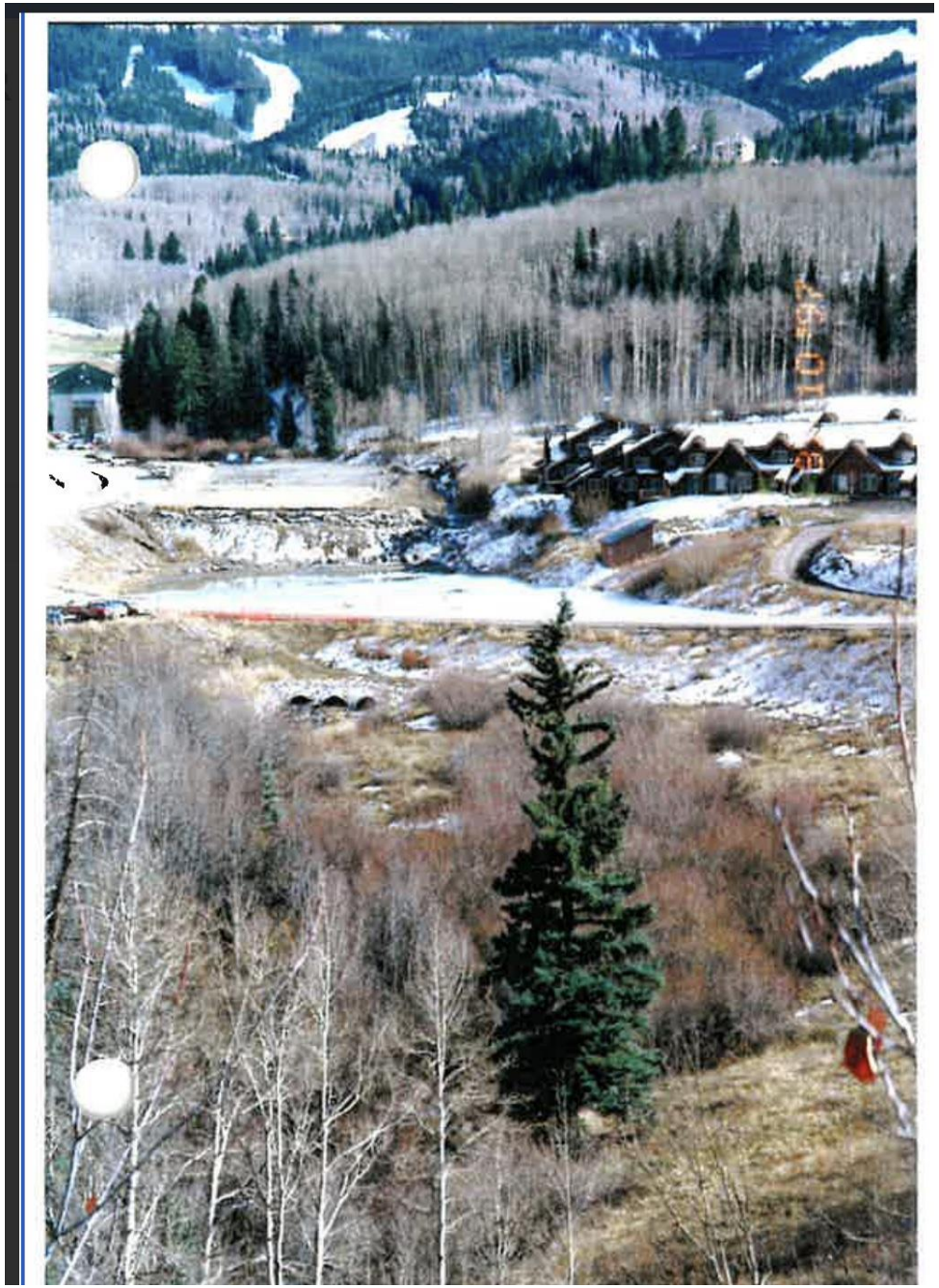
Questions?

Photo: Michael Mowery

Rory@alpinewaterresources.com

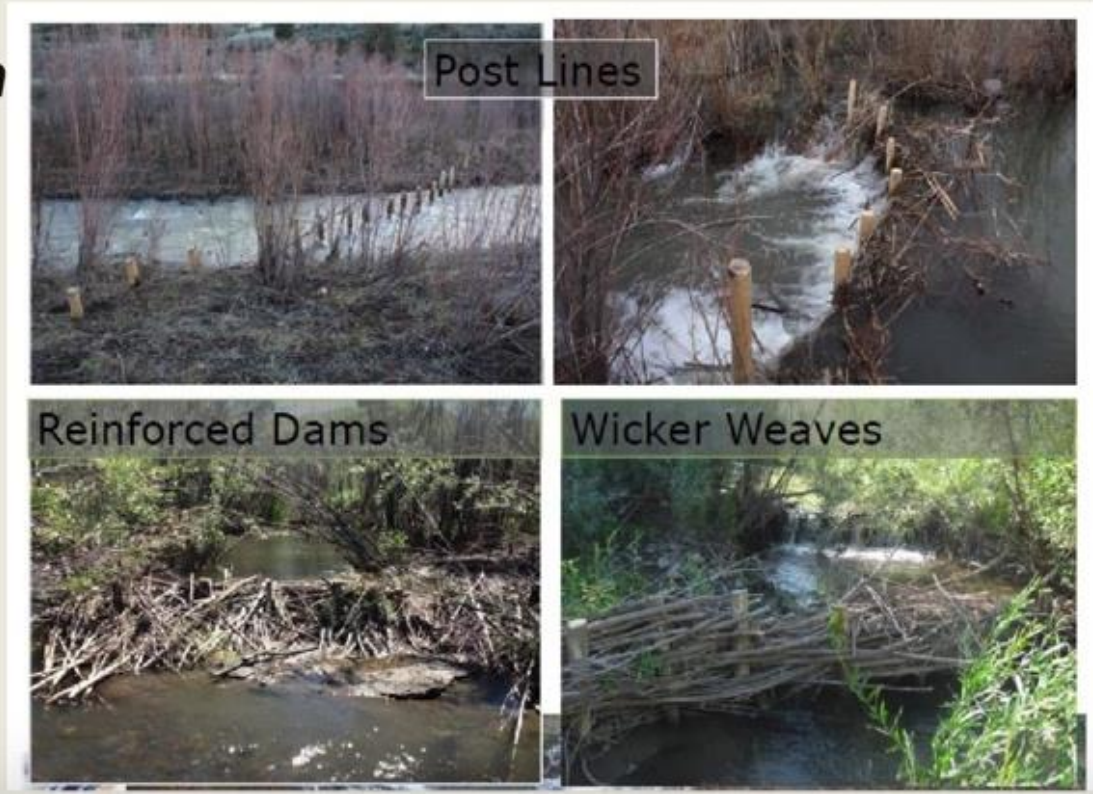
www.alpinewaterresources.com


"A masterpiece of a treatise on the natural world."
—The Washington Post
Eager
THE SURPRISING, SECRET LIFE OF
BEAVERS
AND WHY THEY
MATTER
LITERARY AWARD
PEN AMERICA
WINNER
Ben Goldfarb
FOREWORD BY DAN FLORES



What are Beaver Dam Analogs?

- "Structures completely or partially built by humans that mimic many of the functions of natural beaver dams"
  - *Characteristics reduce velocities*
  - *Reduce bedload and washload tran*
  - *Disperse flow*
  - *Create ponds, pools and wetlands*
  - *Create riparian habitat*
  - *Passable to fish*
  - *100% Organic*
  - *Ephemeral, Dynamic, and Porous*
  - *Often used by beaver*



Credit: Sue Niezgoda, Gonzaga University

Low-Tech Restoration: Beaver Dam Analogs, Post-Assisted Log Structures

https://www.anabranchsolutions.com/