



**The American beaver may be Colorado's most effective tool to improve watershed health and regulate the state's water supply.**

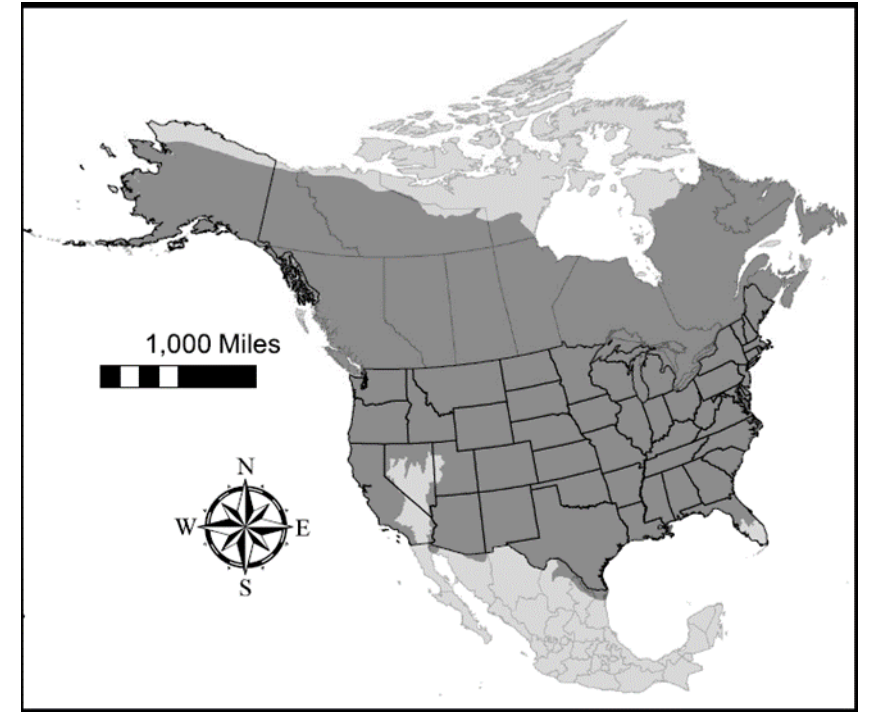
# **THE BEAVER SOLUTION**

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## **HISTORICAL ABUNDANCE AND DISTRIBUTION OF BEAVER IN COLORADO**

- **Historically >125 million beaver inhabited ~15 million km<sup>2</sup> North America, changing the ecological workings of countless streams and rivers.**
- **As settlers moved West, they hunted and trapped them to near extinction.**

**Trapping quickly became so intense that most of the beavers were trapped within two decades. John Charles Fremont rarely saw an active beaver lodge during his journey through the Front Range in 1842-43, but he wrote of many abandoned beaver dams falling into disrepair**



- **Currently 6-12 million beaver in North America**
- **Now there are efforts — to boost their number**



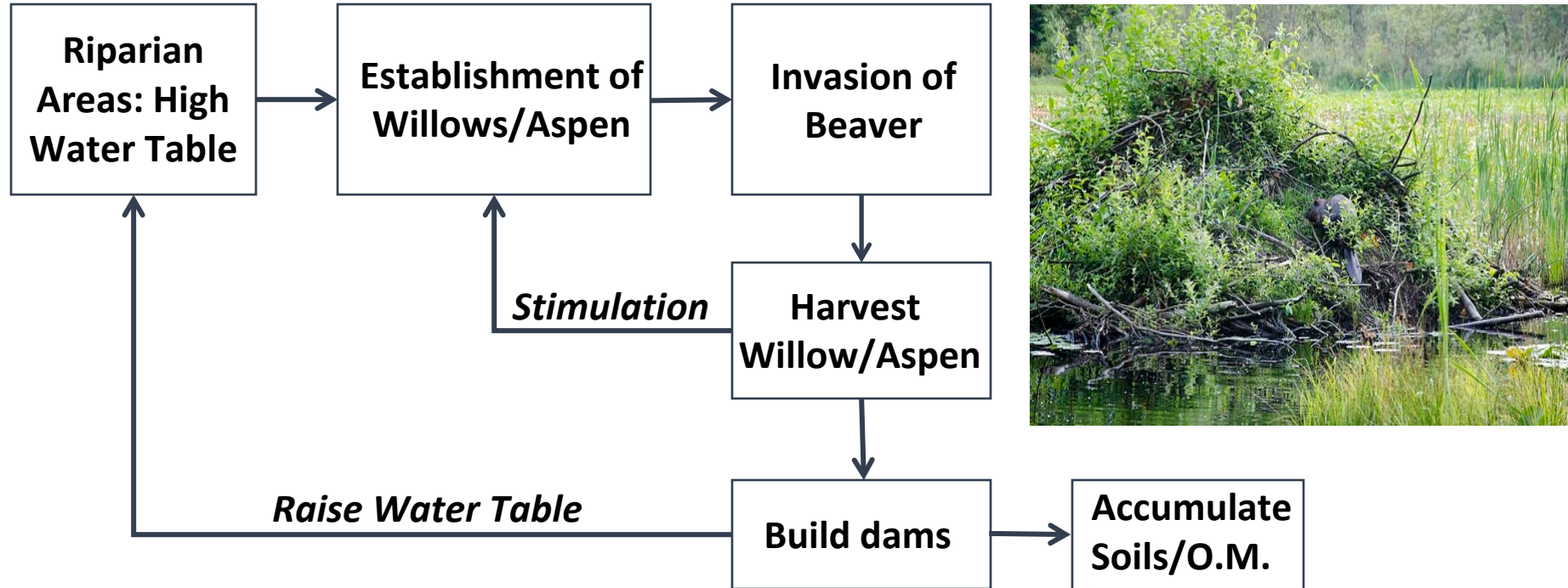
**INCREASED WATER STORAGE**

**INCREASED BIODIVERSITY**

**IMPROVED ENVIRONMENTAL QUALITY**



# The Importance of Beaver as a Keystone Species



- **Beaver produce long- and short-term impacts on the landscape.**
- **The presence of dams and accumulated sediments raises valley bottoms and increases soil moisture, and promotes colonization by willows.**
- **Biological and landscape diversity is increased by a mosaic of shrubs, ponds, wet meadows, and aspen along the edge of the floodplain.**

## **EFFECTS OF BEAVER DAMS ON PHYSICAL AND BIOLOGICAL PROCESSES**

- **Overbank floods**
- **Sediment storage**
- **High water table**
- **Nutrient storage**
- **Multiple channels**
- **Biotic diversity**



**Greater diversity of instream and floodplain habitats associated with beaver activity promotes greater biomass and biodiversity than valley segments not inhabited by beaver as well as greater standing stocks and longer retention of nutrients.**

- **By reducing longitudinal river connectivity and enhancing lateral and vertical river connectivity, beaver fundamentally alter river networks and create alternative stable states.**

**1. Water storage: Beavers dam streams which build wetlands that function as significant pieces of the life cycle for most forest creatures thereby beaver act to increase biological diversity**

- **These wetlands hold and distribute water more evenly through drought and rainy seasons, sequester carbon, filter toxins, and mitigate flood and fire events.**
- ***The Lands Council (Spokane, WA; 2010), estimates that 10 acre-feet (ca. 3.26 million gallons) of water storage can be attributed to a single beaver family due to its dam-building prowess.***
- ***Restoring and protecting the beaver population is consistent with the intent of the Colorado Water Plan – store water, conserve aquatic resources, and close the approaching water supply gap –***

**2. increased biological diversity by creating more heterogenous habitat in time and space**

**3. Improved environmental quality and resiliency**

**Substantial sink for watershed N and P**

**Store sediment: Beaver dams obstruct flow, creating backwater areas that store sediment.**

**Trap and store carbon**

**Surface and groundwater storage**

**Prevent fire – wet valley bottoms buffer fire**

**[https://www.youtube.com/watch?time\\_continue=5&v=IAM94B73bzE](https://www.youtube.com/watch?time_continue=5&v=IAM94B73bzE)**



# **UPPER MORAINE PARK... HISTORIC BEAVER MEADOW ECOSYSTEM SEVERELY OVER-BROWSED BY ELK.**

- **Loss of beaver**
- **Lowered water table and drying of soils**
- **Death of numerous shrubs**
- **Erosion of stream banks**
- **Invasion of non-native species**



# WILLOW ARE RECOVERING





**NEOTROPICAL MIGRANT SONGBIRDS ARE RETURNING**

A circular frame with a torn-paper edge contains a photograph of a beaver in a pond. The beaver is standing on a log in the water, surrounded by green grass and trees in the background. The text is overlaid in the center of the image.

**REVISIONING THE WEST:  
REWATERING THE WEST:  
RETHINKING BEAVER.**

- **State laws across the West (and Colorado) classify beavers as a nuisance that causes problems like dammed culverts and downed trees.**
- **Trapping beaver isn't regulated like other game species - if a beaver is up to no good on your property you can kill it, no questions asked.**
- **Wild Services ...” In FY03 the Colorado WS Program entered into a Cooperative agreement with the Colorado Department of Transportation to provide assistance in controlling beaver damage statewide. WS routinely uses explosives to remove beaver dams that are flooding property. “**
- **Beaver and Wolves together create a thriving partnership...**
  - **Beaver increase water storage**
  - **Wolves eat beaver and so help control their populations:**
  - **in Voyageurs National Park beaver comprise up to 50% of the wolf's summer diet.**
  - **Wolves benefit beaver by preying on elk and keeping them on the move –**
  - **which prevents elk from over-browsing the willow and aspen that beaver depend on**



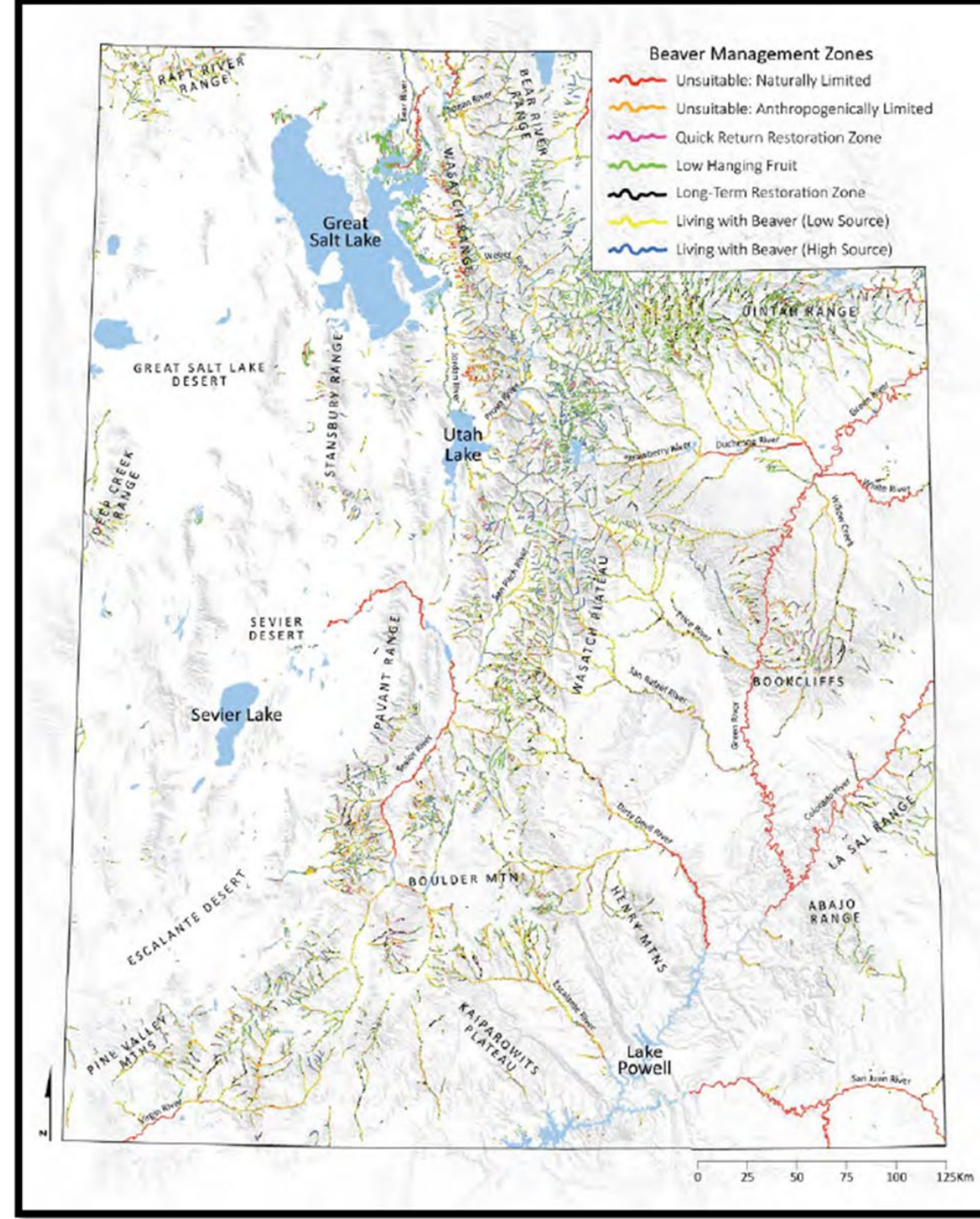
## **BEAVER RESTORATION: PLANNING, RESTORATION AND MANAGEMENT**

## PLANNING AND IMPLEMENTATION

1. The Beaver Restoration Assessment Tool (BRAT) assesses the potential for beaver as a stream conservation and restoration agent

- Capacity model: habitat to support dam building activity
- Conflict model: potential interaction between dam building and anthropogenic land use

2. Beaver Dam Viability Matrix -assess the likelihood that a beaver dam will persist over at least two seasons—the time needed for a mating pair of beaver to successfully rear their offspring



## BEAVER RESTORATION

- **Passive actions: trapping restrictions or changes in grazing regimes**
- **Active habitat manipulation to entice beaver to build dams and establish colonies**
- **Actively relocating beaver to areas with the intent that they will establish colonies**

## RELOCATING BEAVER

- **In Wyoming beaver were successfully established at 13 of 14 sites**
- **In the Yakima Valley the USFS relocated 130 beaver to Forest Service lands in the high-elevation headwaters of the Yakima River.**
- **In the Methow Valley in north-central Washington, an ongoing beaver restoration project has relocated 240 beaver to 51 sites**



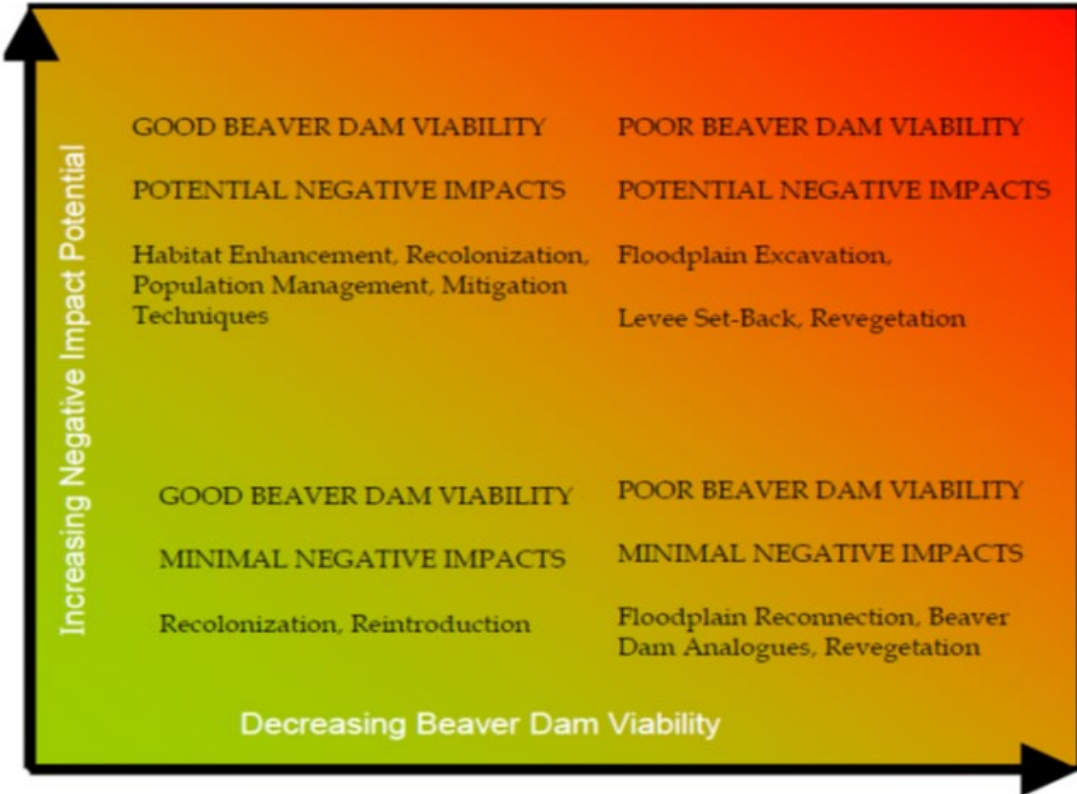
## MANAGING HABITAT FOR BEAVER: NON-LETHAL OPTIONS FOR MITIGATING UNWANTED EFFECTS OF BEAVER.



- Tree caging
- Pond levelers – 87% success
- Beaver deceivers – 60% success
- Lethal removal – 16%



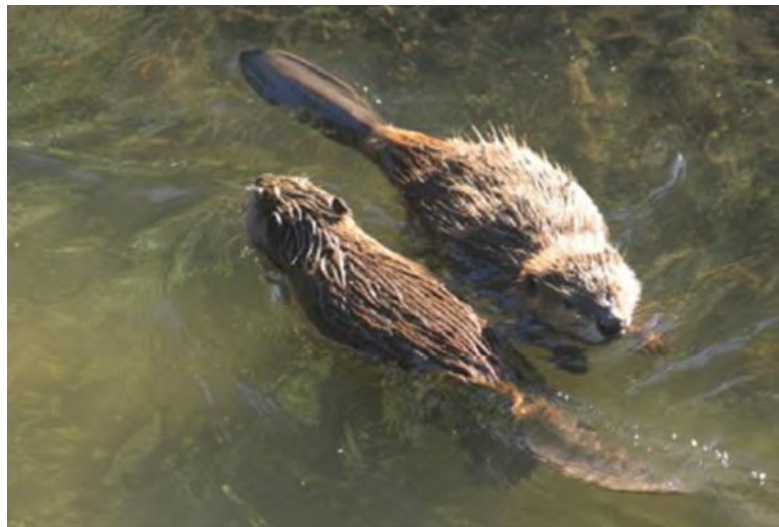
<b>Planning Context</b>	<b>Coordinated Watershed Plan</b>	<b>Stand-alone Project</b>
<b>Scale</b>	<b>Multi-Reach Scale</b>	<b>Scale</b>
<b>Adjacent Land Use</b>	<b>Open Space Agricultural</b>	<b>Urban/Industrial</b>
<b>Infrastructure</b>	<b>None</b>	<b>Intakes/Outlets</b>
<b>Monitoring Plan</b>	<b>Adaptive Management</b>	<b>Monitoring only</b>
	<b>Rural/Suburban</b>	<b>None</b>
	<b>Culverts</b>	
	<b>Reach Scale</b>	<b>Site</b>



<b><u>Stream Slope</u></b>	<1%	>>	1 - 3%	>>	> 3%
<b><u>Valley Form</u></b>	Wide floodplain >>	Narrow floodplain >>	Confined channel		
<b><u>Channel Incision</u></b>	Yearly out-of-bank flow >>	Occasional out-of-bank flow >>	No out-of-bank flow		
<b><u>Riparian Corridor</u></b>	Continuous/Wide	Semi-continuous/Wide	Discontinuous/Narrow	Urbanized/Leveed	
<b><u>Beaver Presence</u></b>	Thriving Colony >>	Evidence of Past Occupation >>	No Evidence of Past Occupation		
<b><u>Dominant Hydrologic Regime</u></b>	Spring-fed	Snowmelt	Rain	Rain-on-snow	Convective Thunderstorm

## **GOALS. RESTORE BEAVER BY REESTABLISHING POPULATIONS OF BEAVERS ON PUBLIC LAND.**

- **Vast swathes of the West seem primed for a beaver comeback, but they're not showing up.**
- **Relocate beavers to suitable habitat.**
  - **Compare and contrast forest conditions before and after beaver reintroduction and study the effects of beaver dams and lodges on forest hydrology.**
  - **Work with CMC students and Agencies and Private citizens to restore beaver and mitigate the effects of human-beaver conflicts**
- **Increase high elevation water storage**
- **Reduce conflicts:**
  - **Competition - cattle**
  - **Predation – human trapping: adopt land management policies that provide protection for beaver**





[http://methowsalmon.org/mbp\\_about.html](http://methowsalmon.org/mbp_about.html)