PROPOSAL

To Enhance Colorado Water Resources Through Preservation and Restoration of Wetlands and Aquifers in Headwaters Regions

CREATED

March 2019

BY

Colorado Headwaters
A 501(c)(3) nonprofit

COLORADO
HEADWATERS

EXECUTIVE SUMMARY

A stated goal of *Colorado's Water Plan* is "a thriving environment that includes healthy watersheds, rivers, streams and wildlife." To achieve this goal, the plan "supports the development of watershed coalitions and watershed master plans that address the needs of a diverse set of local stakeholders."

Water crises across the West are growing worse in spite of above-average precipitation in the winter of 2018-19. Several years of drought, increased temperatures, aquifer depletion and catastrophic forest fires are challenging elected officials, water managers, farmers, recreation groups and the public to find solutions to this decline of our most important natural resource.

Colorado has had several years of reduced snowpack and reduced flows in rivers as well as declines in groundwater resources. With rising temperatures, Colorado's water future looks bleak. Reports from Western Water Assessment, the Colorado Water Conservation Board and the Rocky Mountain Climate Organization all demonstrate that Colorado is facing critical water and climate issues now and in the coming years.

Potential solutions are varied and challenging. The call for additional water storage faces strong push back. Construction of dams for new reservoirs would require substantial financial investment, lengthy permitting processes and slim chances of regulatory approval. While more likely to succeed, expansion of existing reservoirs would also be time-consuming and costly.

Water conservation efforts have had a positive impact and will remain a key component of water management practices. But conservation without additional storage capacity means that water resources from wet years will not be available during increasingly common drought years. With Colorado's population growth steadily increasing the demand for water, urgent action is needed to ensure the adequacy of the state's water resources.

The focus of this proposal is to promote groundwater recharge as a vital element for increased water storage, primarily through cost-effective, low-tech restoration and preservation of wetlands and riparian ecosystems in headwaters regions.

Headwaters streams are Colorado's lifeblood, yet this South Platte River tributary exemplifies the types of ecological damage that threaten our water supply with excessive evaporation, inadequate aquifer recharge, poor water quality and soil degradation. Colorado Headwaters proposes to address these issues and enhance the state's water resources through wetlands restoration in headwaters regions.

BACKGROUND

Healthy headwaters – wetlands, aquifers, tributary streams, intermittent streams, springs and seeps – are essential to the health of aquatic ecosystems and supply organic matter essential to all ecosystems. Healthy headwaters also help keep sediment and pollutants out of municipal water supplies and the lower reaches of stream systems. Colorado's headwaters regions straddle the Continental Divide, providing clean water for Colorado and downstream states in every direction. Population growth produces steadily increasing demand for this vital resource while a warming climate threatens its sustainability.

Colorado Headwaters, a Colorado 501(c)(3) nonprofit organization, is working to address watershed health issues in the crucial headwaters regions. This proposal presents an overview of these issues along with potential actions to improve the quality and quantity of water in headwaters regions. With Colorado Headwaters' experience in establishing, organizing and implementing

environmental initiatives, we are uniquely positioned to foster development of watershed coalitions and master plans – endorsed by *Colorado's Water Plan* – to protect and enhance this vital resource.

Colorado has lost approximately 50 percent of its historic wetlands, but the actual loss of wetlands is demonstrably worse than indicated by historical records. The problem is that historical records cannot document the extent of wetland loss due to the massive harvest of beavers prior to Euro-American settlement of the region. Estimates of the North American beaver population prior to European settlement vary from 60 million to 400 million. But by 1899, beavers were considered rare, and even after a recent resurgence, beaver populations are estimated at only 6-12 million.

As a foundational species in natural ecosystems stretching from coast to coast and from northern Mexico to the Arctic Circle, beavers created the conditions that fostered species diversity among plants and animals for millennia, primarily by constructing dams that increase wetland acreage, surface water acreage and groundwater recharge. Environmental benefits of beaver activity include more resilient ecosystems and increased biodiversity. For the purposes of this proposal, the most significant benefits of beaver activity are enhanced stream flows, increased groundwater recharge and temperature moderation.

As demonstrated by scientific research showing the diverse benefits provided by the ponds, wetlands and marshy areas created by beavers, restoring even a portion of the beaver-created wetlands that once existed in all headwaters reaches will pay tremendous dividends. Those benefits increase exponentially at the headwaters of the state's river basins, and a commitment to restoring these ecosystems is a practical, cost-effective endeavor that will significantly enhance the state's surface- and ground-water resources.

According to Mary O'Brien, Utah Forests program manager for the Grand Canyon Trust, beaver dams "change everything. Where water was once just passing through the landscape it is suddenly pausing there, recharging aquifers, creating a riparian area and making a place for all kinds of wildlife to live."

The Beaver Restoration Guidebook, jointly produced by the U.S. Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, Portland State University and the U.S. Forest Service, provides a wealth of information about the benefits of restoring beavers to the landscape, including higher water tables, reconnected and expanded floodplains, increased aquifer recharge, higher summer stream flows, expanded wetlands, improved water quality, greater habitat complexity, and greater diversity in the populations of plants, birds, fish, amphibians, reptiles and mammals. Reintroduced beavers have even "transformed some intermittent streams back to perennial streams."

This alpine valley in South Park exemplifies a healthy headwaters environment with wetlands, riparian vegetation and meandering, multi-threaded stream channels. Scientific research clearly shows that healthy headwaters ecosystems are essential to maximizing freshwater resources, and they provide significant benefits in moderating climate change.

The guidebook notes that beaver activity slows water velocities, increases "lateral spreading" and soil saturation, all of which "contribute to increases in both the surface and subsurface water present in a watershed. ... When beaver recolonize stream systems, their impoundments increase base flows, as well as recharge and elevate the water table." The guidebook specifically recommends headwaters beaver impoundments to mitigate the effects of increasingly common drought conditions, reduced snowpack and receding glaciers caused by climate change.

A 2006 study conducted in Rocky Mountain National Park by C. J. Westbrook, D. J. Cooper and B. W. Baker found that the main hydrologic effects of beaver activity occur downstream of beaver dams, underscoring the importance of wetlands restoration in headwaters regions. The researchers also concluded that resulting increases in aquifer recharge and groundwater storage "may be the most important beaver-related factor in mitigating effects from climate change because groundwater is released more gradually than surface water and has no evaporative losses."

PROPOSED ACTIONS

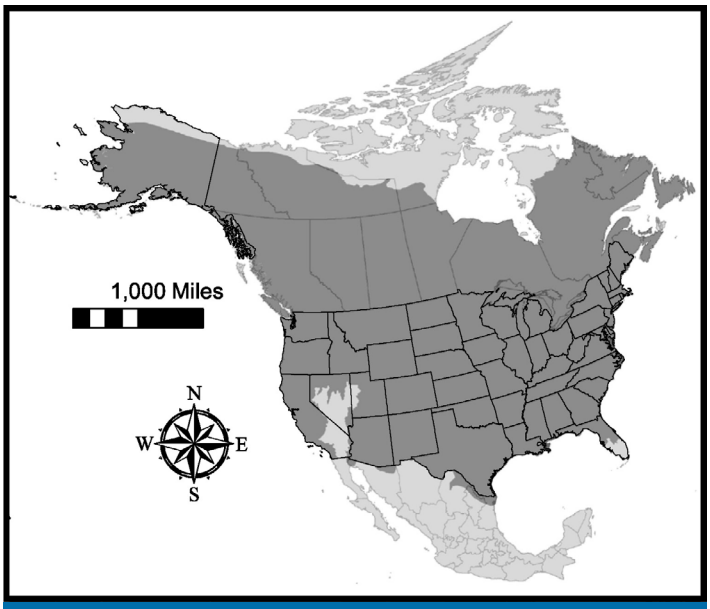
Colorado Headwaters proposes to undertake the actions necessary to re-establish historic wetlands and expand existing wetlands in the Colorado high country. Accomplishing wetlands restoration and expansion will enhance natural underground water storage and safeguard water resources against drought and climate change. Wetlands restoration will also increase surface water acreage, moderate local temperatures, improve water quality and increase biodiversity. These proposed actions are designed to supplement *Colorado's Water Plan*.

Phase 1 proposed actions include:

- Initial research and assessment.
- Prioritizing and targeting initial project locations.
- Construction of beaver dam analogues (BDAs) using naturally available materials to restore riparian and wetland habitat.
- Relocation of nuisance beavers to project sites to maintain and expand upon BDAs, further increasing wetland acreage and groundwater recharge.

Restoration work at Cucumber Gulch Preserve, a headwaters wetland system at about 10,000 feet elevation near the town of Breckenridge, has demonstrated the effectiveness of this approach. A similar project spearheaded by the Colorado Natural Heritage Program has also proven successful in the Gunnison Basin.

The headwaters regions of all the state's river basins are important, but our pilot project will focus on the headwaters of the state's most populous river basin,



The darker shaded area indicates the probable historic range of the North American beaver. As the map demonstrates, beavers most certainly occupied every waterway in Colorado (*Beaver Restoration Guidlines*).

the South Platte, specifically, the Middle and South forks. From there we plan to expand our efforts to the headwaters of the following rivers on National Forest land:

- The South Platte River (Jefferson Creek, Michigan Creek, Deer Creek, Elk Creek, Bear Creek, Clear Creek, South Fork, Middle Fork, North Fork).
- The Arkansas River (Clear Creek, Chalk Creek, Browns Creek, Bear Creek, Hayden Creek, Cottonwood Creek and the South Arkansas River).
- The Colorado River (Blue River, Eagle River).
- The Roaring Fork River (Frying Pan River, Crystal River).
- The Dolores River (San Miguel River).
- The Gunnison River (Taylor River, East River, Slate River, Cimarron River, Uncompahgre River and Lake Fork).
- The Rio Grande River (Conejos River, Piedra River, Florida River, South Fork).
- The San Juan River (Los Pinos River, Animas River, La Plata River and Mancos River).

Protection of healthy headwaters is crucial, and priority consideration for restoration efforts will be dedicated to areas with characteristics that favor maximizing beneficial results. Increasing the quantity and quality of wetlands in these areas will increase groundwater recharge to alluvial aquifers and improve flows in Colorado streams and rivers. Additionally, expanding surface waters and wetlands will help mitigate wildfire risks and prevent catastrophic wildfires, further protecting crucial water supplies.

Expanding existing wetlands and restoring historic wetlands in headwaters regions will pay tremendous dividends by increasing surface water coverage and aquifer recharge, thereby enhancing groundwater resources. Issues resulting in depleted headwaters groundwater resources include:

1. Climate change-induced temperature increases.
2. Increasing drought frequency and severity.
3. Widespread tree mortality from bark beetles.
4. Increased size, frequency and intensity of wildfires.
5. Absence of beavers in headwaters ecosystems.
6. Historic and continuing mineral extraction.
7. Growing population and increasing demand for limited water resources.

The major river basins in Colorado include the following wetlands by percentage of basin land and acreage:

• Rio Grande	6%	283,346 acres
• Colorado	3%	174,999 acres
• Gunnison	3%	143,856 acres
• North Platte	11%	138,102 acres
• South Platte	3%	368,988 acres
• Upper Arkansas	2%	323,647 acres
• Upper Colorado/Dolores	1%	31,287 acres
• Upper San Juan	2%	66,189 acres
• Upper White/Yampa/Green	2%	119,163 acres

These numbers demonstrate ample potential for expanding wetland acreage. Bringing back wetlands is an important, practical and cost-effective endeavor in support of expanding surface-water acreage and rebuilding groundwater resources.

The Hayden Pass Fire burns in the Sangre de Cristo Mountains in July 2016. Colorado wildfires are increasing in frequency, size and intensity as a result of climate change and causing long-term damage to water resources.

The Hayden Pass Fire left the ecosystem incapable of retaining water from ensuing rainfall, which scoured the burn scar, filling streams with sediment. The fire ultimately caused destruction of cutthroat trout habitat in the area, degraded water quality as far downstream as the Arkansas River and impaired groundwater recharge in the region.

Flash flooding following the Hayden Pass Fire caused extensive property damage in the Coaldale community. Actions proposed by Colorado Headwaters would help mitigate the destructive effects of wildfires.

OBJECTIVES

Achieving the following objectives will help ensure the long-term viability of streams, rivers, lakes, wetlands, aquifers and healthy watersheds at the headwaters of Colorado's rivers.

- Develop an economical, low-tech system for constructing BDA-type structures that will reduce water velocity in streams and recharge groundwater at high elevations.
- Expand riparian environments to maintain cooler water temperatures in streams and minimize evaporative water losses from warming to address climate change.
- Restore hydrologic systems on previous wetlands, thereby increasing aquifer recharge.
- Rebuild a sustainable region to restore health of alpine biomes.
- Remediate and contain sources of acid mine drainage.
- Share techniques and resources with other organizations.
- Review and expand successful tools for future projects.

BUDGET

Project funds will be directed to the analysis and inventory of feeder streams at the headwaters of Colorado's rivers. Colorado Headwaters will coordinate with Colorado State University for students to accomplish these initial objectives. Additional funding sources are being sought at this time for the complete budget for 2019-20.

The objective is to identify, prioritize and select high-elevation tributary streams where engineered features can be constructed of naturally available materials to reduce flows, filter acid drainage and recharge groundwater prior to flowing into larger streams. An additional benefit of this initial phase of the project will be public lands management and conservation mentoring.

Research, Inventory and Assessment

State and Federal Mapping	$X,X00.00
Field Data and Mapping	$X,X00.00
Subtotal	$X,X00.00

Project Management (2019-20)

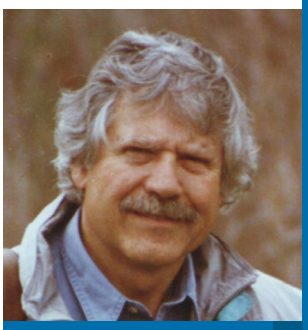
Salaries	$XX,000.00
Travel	$X,X00.00
Lodging	$X00.00
Administration	$X,X00.00
Taxes	$X,000.00
Subtotal	$XX,X00.00

Field Staff (8 persons for 12 weeks)

Salaries	$XX,X00.00
Travel	$XX,000.00
Supplies (including food)	$X,XX0.00
Equipment	$X,XX0.00
Taxes	$X,X00.00
Subtotal	$XX,XX0.00

Total	**$XXX,XX0.00**

PRINCIPALS



Jerry Mallett

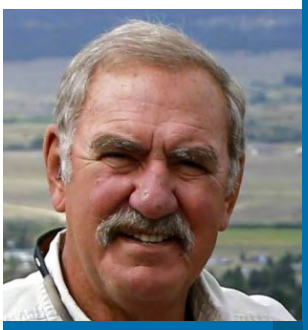
President

For over 50 years Jerry Mallett has worked with local, national and international officials, agencies and citizen groups to achieve solutions to environmental, social and economic issues. As executive director of Western River Guides Association, Jerry developed and secured funding for the association's annual budget. Jerry also served as western field representative for The Wilderness Society and as development director for funding Western U.S. field representatives. He was also a founding member of American Rivers, where he served on the board of directors for 25 years.

Sally Ranney

Vice President

The host for the Colorado Headwaters documentary is Sally Ranney, a passionate environmentalist. Sally has been active in environmental issues for the past 35 years. She serves on a variety of boards, including the Climate Accountability Institute and the Bonobo Conservation Initiative. She is president and co-founder of the American Renewable Energy Institute, Women's Earth and Climate Network and Earth Restoration Alliance. She is the corporate executive officer of Stillwater Preservation, LLC, and president and founder of Rising Wolf International.



Bill Dvorak

Field Organizer

Bill Dvorak has been an avid environmentalist all his life and served as public lands organizer for the National Wildlife Federation from 2006 through 2017. Bill played a key role in the passage of HB-1298, the Wildlife Habitat Protection Act and HB-1341, which designated more diverse and well-rounded representation on the Colorado Oil and Gas Conservation Commission. Bill was also the first licensed river outfitter in Colorado.

Sherri Tippie

Wildlife Ecologist

In 1986 Sherri Tippie founded Wildlife 2000, an organization dedicated to fostering a healthy coexistence between humans and beavers. Sherri is nationally recognized as an expert on beaver ecology in general and beaver live-trapping in particular. She has trapped and relocated more than 1,000 beaverss. Sherri has authored a book, *Working With Beavers*, which highlights Beavers' central role as a keystone species for wilderness ecology.

CONTACT INFORMATION

Colorado Headwaters
6573 Ridge Rd.
Salida, CO 81201
Phone: 719-221-3307
Email: jmallett541@gmail.com

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