

## 2013-2014 Bren School Group Project Proposal

Project Title: Beaver Impact on Flow Volume and Timing: Implications for Climate Change Adaptation

Proposers:

WildEarth Guardians

[www.wildearthguardians.org](http://www.wildearthguardians.org)

John Horning, Executive Director

[jhorning@wildearthguardians.org](mailto:jhorning@wildearthguardians.org)

505-988-9126 x 1153

Hannah Riseley-White, UCSB Bren Student,  
MESM 2014 Candidate

[hriseley-white@bren.ucsb.edu](mailto:hriseley-white@bren.ucsb.edu)

917-528-8647

Bryan Bird, Wild Places Program Director

[bbird@wildearthguardians.org](mailto:bbird@wildearthguardians.org)

505-819-5922

Problem Statement: The Jemez Mountains, located in central northern New Mexico, have been identified by the Nature Conservancy as one of the two places in the state measurably experiencing the hydrological effects of climate change<sup>1</sup>. Modeling scenarios for beaver reestablishment, and the implications of reestablishment on stream flow and timing, will enable us to evaluate the effectiveness of this low-cost, simple option as a climate change adaptation strategy.

The implications of this study for both species preservation and regional water resources management are significant. Although the study will focus on a specific watershed area within the Jemez, the potential applicability over a larger geographic area could lead to a real win-win for both watershed management and municipalities that depend on stream systems for consumptive use.

Project Objectives:

Southwestern water planners are facing mounting pressure on resources that are increasingly limited by overuse, drought and the uncertainties of climate change<sup>2</sup>. Natural resource managers and scientists are working to identify tools that may be available to help increase ecosystem adaptation and resilience in the face of climate change<sup>1</sup>. Due to their unique dam-building behavior and the habitats they create, the reestablishment of the American beaver, *Castor canadensis*, has been suggested as a climate change adaptation strategy<sup>3</sup>.

This project will:

1) Assess the potential affects of beaver reestablishment on stream flow and timing

Using multiple data sources and the GIS beaver habitat model currently being developed by WildEarth Guardians (GW), Group Project (GP) members will create an estimate of the potential effects on stream flow and timing, as well as groundwater recharge, for a specific watershed area within the Jemez Mountains. Beaver dam effects on flows associated with flood events and seasonal base flows, as well as sediment capture will also be evaluated.

Based on this analysis, GP members can create an assessment of the additional ecosystem services provided by beavers. The potential to develop payment for ecosystem services-based plans in western watersheds could also be explored.

2) Conduct an analysis of the viability of beaver reestablishment

GP members will research the economic and political implications of beaver reestablishment and a potential timeline for action in collaboration with federal land managers, especially the US Forest Service and state wildlife and water management agencies.

3) Initiate a western states information network for beaver reestablishment projects

Research needs to be shared between private organizations and public agencies working on adaptation and resilience with regard to climate change and more specifically beaver reestablishment. GP members will research current efforts being undertaken and invite active groups to participate in an information-sharing network.

4) Assist WG in their assessment of current and potential habitat areas

Assist in determining which streams in the Jemez Mountains are currently occupied by beavers, which areas are currently unoccupied but suitable for reestablishment, and which are potential habitat with some degree of vegetation restoration. Evaluate degree and cost of restoration and possible threats to successful reestablishment due to cattle and elk grazing pressure or other factors. Create plans for the mitigation of such potential threats.

5) Visit and document habitat points in the Jemez Mountains

Through summer internship(s), GP members will assist in validating the beaver habitat model developed by WG. Interns will also assist in developing a geo-referenced database of photo points for long-term monitoring of stream conditions in the Jemez Mountains.

Project Significance:

Approximately 1 of 5 Americans depends on a national forest for drinking water<sup>3</sup>. Changes in western snowpack and timing of runoff are already being felt and expected to increase in the coming decades. The National Research Council has concluded that runoff in the Rio Grande Basin (including the Jemez Mountains), will decrease by 12% for every one degree of temperature rise, the greatest reduction projected for any stream basin in the U.S.<sup>3</sup>.

Beaver dams are known to slow snowmelt runoff, which both extends summertime stream flow and can restore perennial flow to some stream systems<sup>3</sup>. Beaver dams create ponds, which maintain and create wetlands, provide nurseries for salmonids and other native fish, provide critically-needed amphibian habitat, increase habitat for small mammals and cavity-nesting birds, contribute to establishment of deep-rooted native plants and grasses establishing riparian vegetation, improve downstream water quality by trapping and storing sediment, and create wet meadows behind abandoned dams that have silted in<sup>3</sup>.

Background Information:

Though beaver populations have increased in places in the American West over the last two decades, their numbers are significantly depressed from their peak in the late 1800's due to intentional and widespread eradication and the degradation of their habitat caused mostly by grazing practices<sup>4</sup>.

WG has been awarded a grant from the EPA to produce a GIS model of beaver habitat in New Mexico and the potential for wetlands augmentation that could result. A systematic and thorough assessment of potential and suitable habitats, as well as identification of impediments to successful recovery, is

being undertaken with multiple state and federal collaborators. Modeling of habitat statewide will ensure efficient use of funds and viable wetlands restoration plans and projects. The overall goal is to identify all potential, suitable, and occupied, beaver habitat on federal public lands in New Mexico.

#### Stakeholders:

Beyond the countless species that depend on mountain stream systems for survival, stakeholders also include New Mexico state residents, and potentially the state of Texas through water delivery through the Rio Grande Compact.

#### Possible approaches and available data:

Data required for projections of flow and timing are available from WG and the US Geological Survey. WG is currently modeling suitable and potential beaver habitat and the results, including GIS mapping of topography and habitat, will be available to GP members by June of 2013. Data on stream flow volumes and timing is currently available from the US Geological Survey. Climate data and projection models will be the responsibility of GP members. Additionally, WG will provide an existing georeferenced photo-point database.

Multiple studies will serve as springboards for research into the impacts of beaver populations on hydrological processes and species habitat<sup>3,5,6</sup>. The US Forest Service and New Mexico state agencies are already coordinating with WG and can assist in a logistical assessment of reestablishment within New Mexico's state and federal regulations.

Guardians Wild Places Program Director, Bryan Bird, and GIS contractor, Bird's Eye View GIS, will be available throughout the time of the GP to direct and consult with team members. Over the summer of 2013 WG staff will train intern(s) for fieldwork in the Jemez Mountains.

#### Deliverables:

- 1) Projection of flow timing changes associated with reestablishment of beaver populations in the Jemez River watershed on federal lands in the Jemez Mountains of New Mexico
- 2) Establish and revisit habitat photo points across the Jemez mountains, ground truth model for beaver habitat being developed by WG
- 3) Inventory streams for beaver presence and draft report

#### Client:

Founded as Forest Guardians in 1989, the original mission of the grassroots effort was to fight a logging project on northern New Mexico's Elk Mountain. As the evidence of environmental threats continued, the efforts of the Guardians expanded. WG's current mission is to protect and restore wildlife, wild rivers, and wild places in the American West. Headquartered in Santa Fe, NM, they have offices in Denver and Boulder, CO and Tucson, AZ that work on four programs focusing on wildlife, wild places, wild rivers, and climate & energy.

#### Anticipated financial needs and additional support:

There are no additional financial needs necessary to conduct this project as described here.

#### Internship Opportunities:

WG is offering \$2,500 for a paid summer internship in 2013. (See attached letter of support.) WG can accommodate additional interns if GP members are able to acquire additional funding. Intern(s) paid

by WG will be required to assist in revisiting photo points throughout the summer and ground truthing the beaver habitat model developed by WG in the winter of 2012-13.

References:

1. The Nature Conservancy (2012) **New Mexico, Climate Change: Acting Now for Future Generations**  
<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newmexico/new-mexico-climate-change.xml>
2. Western Water Policy Review Advisory Commission (1998) **Water in the West: Challenge for the Next Century**, June 1998, Denise D. Fort, Chair
3. Bird, B., O'Brien, M., Petersen, M. (2011) **Beaver and Climate Change Adaptation in North America: A Simple, Cost-Effective Strategy** WildEarth Guardians, Grand Canyon Trust, The Lands Council  
[http://www.wildearthguardians.org/site/DocServer/Beaver\\_and\\_Climate\\_Change\\_Final.pdf?docID=3482](http://www.wildearthguardians.org/site/DocServer/Beaver_and_Climate_Change_Final.pdf?docID=3482)
4. WildEarth Guardians (2012) **Beavers: Climate Heroes**  
[http://www.wildearthguardians.org/site/PageServer?pagename=priorities\\_wild\\_places\\_jemez\\_mountains\\_beavers](http://www.wildearthguardians.org/site/PageServer?pagename=priorities_wild_places_jemez_mountains_beavers)
5. Lowry, M (1993) **Groundwater Elevations and Temperatures Adjacent to a Beaver Pond in Central Oregon**
6. Ringer, G. (1994) **Sedimentation of Beaver Ponds in an Oregon Coast Range Stream**