

Beavers Building Habitat
A project sponsored by
the New Mexico Department of Game and Fish
FINAL REPORT
for 2008 - 2009 Contract Year



Submitted by



for



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Introduction

Beavers Building Habitat builds community support for wetland stewardship by cultivating young adult stewards of wetlands. Young adults conduct beaver habitat monitoring and stewardship activities such as assessing beaver habitat conditions and identifying potential areas for new beaver colonies. This report summarizes of the progress of the development of *Beavers Building Habitat* as managed, staffed, and evaluated by River Source during the 2008-2009 contract year.

The vision for ***Beavers Building Habitat*** is to build widespread community support for wetland stewardship and restoration so that keystone wetland species such as beavers increase their habitat. This community support will provide fertile ground for increase in beaver ponds in the valleys and floodplains in the foothills of New Mexico watersheds. Beavers will move into new locations found for beaver ponds which, when developed, help create habitat conditions, connectivity and size necessary to sustain meadow jumping mouse populations. Many past beaver/human conflicts will get resolved and in fifteen years the jumping mouse, a Species of Greatest Conservation Need, may have a population increase that leads to delisting the endangered status.

River Source staff worked with sub-contractors (such as Citizen Watershed Monitoring Team – CWMT) to prepare curriculum and outreach materials regarding the importance of beaver habitat. We piloted instruction with the materials with four different groups of students in several watersheds, created a data sharing tool and assessed student learning. River Source set up service learning work multiple schools for two-municipal watersheds, Santa Fe and Las Vegas, and with the Santa Clara Pueblo Department of Natural Resources and the Biophilia Foundation in two restricted-access properties. River Source worked with partners and students to create maps of specific survey reaches.

Curriculum & beaver survey methods development for citizen science

River Source developed in-class and outdoor activities with lesson plans and led classroom and outdoor activities for over 270 youth and adults (teachers are parent volunteers) during 186 direct contact hours with participants. ***Beavers Building Habitat*** reached out to people with diverse backgrounds in 4 significant watersheds:

1. Cimarron watershed with New Mexico State Parks, Cimarron Watershed Alliance, Cimarron Schools, and Skip Lisle of Beaver Deceivers International
2. Sapello watersheds near San Ignacio with the Biophilia Foundation/Pritzlaff Ranch, Citizen Watershed Monitoring Team and Memorial Middle School
3. Gallinas watershed on municipal watershed land with the City of Las Vegas and Rio Gallinas Charter School, United World College and summer ecology program for Memorial Middle School
4. Santa Clara Canyon with the Santa Clara Pueblo and Eight Northern Pueblo's Office of Environmental Technical Assistance and the Summer Youth Environmental Training Camp.
5. Santa Fe watershed with the City of Santa Fe and Santa Fe High School's Environmental Science students

Curriculum Development and Practice

The following is a summary of education and research work done in each watershed. In attachment 1 we present lesson plans and handouts for classroom and outdoor experiences that we developed and subsequently adapted based on our pilot project experiences.

1. Cimarron watershed

River Source worked in partnership with several groups to do beaver survey work on New Mexico Department of Game and Fish land (Horseshoe Parking Lot) and on a NM State Parks property. The field experience included installing a “beaver deceiver” to prevent flooding of the Horseshoe Parking Lot while allowing the beaver to persist near the property.



Cimarron youth build a “beaver deceiver” to allow water to pass downstream with little noise and at a lower elevation to prevent flooding from beaver habitat development on a Game and Fish parking lot in Cimarron Canyon. Skip Lisle designed the structure for NM Parks and Cimarron Watershed Alliance

2. Sapello watershed

River Source and CWMT worked together to introduce ***Beavers Building Habitat*** to students and teachers from Memorial Middle School (MMS). Dr. Peter Skelton, NMSU employee, working at MMS, coordinated our activities at MMS with the help of Science teacher, Roberta Montañó. We conducted 55-minute classroom training and a full day of field activities with 75 seventh graders. Classroom work was done with five different classes over the course of a day. It covered an introduction on beaver ecology, natural history, the role beavers play in maintaining watershed health, identification of beaver sign, and an introduction of the beaver survey method that will be used in the field. The field day took place at the Pritzlaff Ranch in Sapello with help from Sterling Grogan, Ranch Manager. It consisted of rotating students through three stations of activities; beaver survey, water quality testing, forest restoration. Dr. Kent Reid of the New Mexico Forest & Watershed Restoration Institute conducted the forest restoration station. The beaver survey involved small groups of students searching for beaver

sign along a predetermined stretch of river. The GIS staff for the Institute created a map with the data gathered during the field day (please see maps for this and other survey reaches in Attachment 2).

3. Gallinas watershed

In the fall of 2008, the CWMT collaborated with the United World College (UWC) to complete a beaver survey of the Gallinas Watershed. With assistance from Bill Zeedyk and David Blagg, we conducted a workshop on beaver ecology, natural history, the recognition of beaver sign, and field survey methods for a group of ten UWC students and their two teachers (Jeff Gregory and Mandy Lane) that would assist with the survey. Following this workshop, we surveyed a substantial portion of the Gallinas Watershed (approximately 15 miles) including the Gallinas River, Trout Springs, Gallinas Creek and El Porvenir Creek. UWC students assisted with conducting the survey on approximately 2 miles of this area, while CWMT volunteers completed the remaining distance. Four active beaver locations were found in the survey area. One of these active sites then became the location of further investigation by Rio Gallinas Charter School students.

A similar program to that done with MMS was conducted with a group of 43 5th, 6th, and 7th graders from Rio Gallinas Charter School in Las Vegas in May 2009. Classroom activities spanned a 1 ½ hour period and field activities were a full school day. Fieldwork was done in the City of Las Vegas Municipal watershed at a previously found beaver area. The field day included three stations: beaver site exploration and documentation, water quality testing above and below the beaver area, artistic rendition of the beaver area.

CWMT worked with a group of approximately 15 students participating in a summer program at MMS during the final week of June 2009 in the Las Vegas Municipal Watershed. This summer program focuses on watershed health, as indicated by water quality testing throughout the watershed. CWMT trained students in recognizing the role of beaver in restoring and maintaining watershed health, particularly water quality, as well as beaver sign identification and beaver site mapping techniques over a three-day period.

4. Santa Clara Canyon

River Source raised funds from the McCune Foundation and Eight Northern Pueblo's OETA to pay for three staff to work two stations at the annual event that trains 30 high school and college participants plus some of their teachers about riparian ecology, benthic macroinvertebrates and beaver habitat restoration. The Pueblo has students planting high elevation willow species, Dogwood, and Box Elder to re-colonize the floodplain with the foundation of the beaver economy. Plant survival appeared high in many of the low terraces where old beaver dams could be observed. The two Native American interns that River Source is recruiting for late July will be encouraged to help advance this project with their tribes.

5. Santa Fe watershed

River Source worked with the City of Santa Fe and Marcia Barton of Santa Fe High School and her students to map the location of beaver dams, lodges, slides and other features such as scat. David Blagg volunteered with technical assistance during the entire field day plus in dialogue with project staff. We discovered that most of the available habitat between Nichols and McClure Reservoir were occupied and that the stream reach is likely "exporting" adolescent

beavers each year. River Source worked with 2 student interns to complete the survey on a Sunday morning in April. Please see the map in Attachment 2.

Beaver Survey Methods Development & Data Gathering

River Source worked with Lea Knutson of the CWMT to shape a “road-map” for citizen scientists to assess beaver habitat conditions and future potential. The method that emerged from multiple pilot experiences includes:

1. Ground Survey – phased approach of habitat weighted towards indicators of habitat potential in phase 2.
2. In-depth diagramming, mapping, photographing and geo-referencing data.
3. Landowner/Manager Survey
4. Sharing your beaver habitat story with data sharing tools

These methods are described in attachment 3 – Beaver Survey and include field forms and collection methodologies for citizen scientists at multiple levels of entry from beginner to advanced. We found that our methods evolved during the pilot process towards assessing habitat to help predict the likelihood of beaver relocation or the opportunities for reducing beaver – human conflicts.

The GPS data collected as part of this project are shown in the table in attachment 4.

Relationships with Collaborators and Lessons Learned

Through collaborative work on Beavers Building Habitat, important relationships were formed that will not only broaden the understanding and appreciation of beavers, but also enable future work on beaver and other environmental education efforts in the Las Vegas area.

1. City of Las Vegas. The City of Las Vegas manages the Las Vegas Municipal Watershed as a protected area to supply clean drinking water to Las Vegas. The City cooperated with CWMT to allow our beaver survey to occur in this protected area in the fall of 2008. Once an active beaver family was located, the City allowed us to conduct more in-depth study of this area with both Rio Gallinas Charter School and Memorial Middle School students. This is a new, collaborative relationship between the City and CWMT, which we plan to foster in the future. We plan to present findings from the students’ work to the City to help educate them on the role of beaver in watershed health. This budding relationship began and will hopefully stay on a very positive, cooperative basis with CWMT helping to provide the City with information they need on the condition of the watershed while they provide us with an outdoor classroom.

2. United World College (UWC) - The beaver survey with UWC students consisted of a day of field training and five days of field survey work (in two hour sessions). This project was part of the UWC Community-Action-Service (CAS) work. CAS projects usually span a semester and in our case, occur once every two weeks for two-hour sessions. Within this time limitation, it was somewhat difficult to cover much area in each field sessions. Because of this, it was difficult for students to get a bigger picture perspective of beaver use in the watershed. Adequate time was also not available to include students in data analysis and presentation of results. This time would also have helped round out students understanding of the survey results. This survey provided us with good feedback on our beaver survey methods especially the survey

data form and what was possible to accomplish in a short period of time. In the future we will pursue alternative means of working with UWC outside of the CAS format.

The relationship with UWC was fostered and refined by this project. We are pursuing two potential collaborative efforts for this next year. One is to conduct another beaver survey (possibly in the Sapello Watershed), consisting of a more concentrated effort of a day of training, followed by a concentrated day of field survey. The other is to work closely with the Environmental Systems instructor to do an in-depth ecological condition study of the Las Vegas Municipal Watershed. This study will span a semester and include beaver survey, Rapid Stream-Riparian Assessment, water quality testing, and other topics to be determined.

3. Memorial Middle School - The two experiences with Memorial Middle School provided a good testing ground for Beavers Building Habitat educational efforts. Working within the confines of public school schedules, resources, and the quantity of students involved, our team met with students in class prior to a ½ day field trip. Our team observed that we needed time at the end of the field day to summarize observations, clarify data recording questions, and discuss findings.

The classroom work went very well and provided good background and introduction to fieldwork. Our fieldwork guided students through three stations: beaver survey, water quality, and forest restoration. We needed to accommodate 75 students and nearly half had to leave in the middle of the event for a sports activity.

In the short time with students in the field it was extremely difficult to expect a beaver survey to be completed along a stretch of river and data forms to be completed. Perhaps if the entire day were devoted to beaver (see recommendations below) this could have been more effectively covered.

At the end of June and early July 2009, CWMT will work with a group of 15 MMS students in a summer program. The June work has occurred very recently and went well. In sum, CWMT will have four hours of class time and eight hours of field time, broken up between three days. The combination of fewer students and greater class and field time works very well and enables much more in-depth experiences.

4. Rio Gallinas Charter School - Compared to MMS, work with Rio Gallinas Charter School involved fewer students (45 rather than 75) but the time frame was similar (one class period and one field day). Class work was similar to that done with MMS, but again, should have included more time to provide specifics of what was to be done in the field the following day (e.g. a mock up of some activities). In the field we had three stations: 1. water quality testing, 2. beaver area diagramming, GPS mapping, and photographing (students split into 3 smaller groups), and 3. painting and drawing of the area to foster an artistic appreciation.

The second station (focusing on beaver), was not a beaver presence/absence survey as with MMS, it instead was an in-depth study of a previously found beaver area. We hoped to develop a description of this beaver area to include a diagram with measurements; a list of beaver features (how many beaver signs were present, e.g. dams, lodges, cuttings) a GPS map and a photo collection. All three groups of 3-4 students ended up spending much of their time

exploring the area and finding beaver (and other animal) sign before they were ready to produce diagrams, photographs and GPS data. We learned that it is important to allow some time for students to explore an area before expecting them to do more in-depth work (e.g. data collection). This exploration is vital for them to begin to recognize natural signs, work through their curiosities of an area, and build a connection to natural areas. This exploration can take the form of group walks to find and identify all wildlife signs and can culminate in a list of signs found as well as questions posed.

5. Private Landowners - The Pritzlaff Ranch, north of Las Vegas and along the Sapello River, offered an excellent outdoor classroom. The ranch includes past and present beaver use areas and river reaches of various conditions. The ranch is easily accessible and the managers are very helpful in creating a practical and beneficial learning environment. To our knowledge, the use of the Pritzlaff Ranch is available for future beaver and environmental education efforts. Opportunities exist for educational projects to in turn provide data to the ranch for use in developing their land management priorities.

6. Municipal Watershed Managers - We developed constructive relationships with watershed managers for Santa Fe and Las Vegas, two cities highly dependent on surface water diversions and effected by the over-allocations of water rights in their respective basins. Staff at both agencies expressed interest in the data results and a growing awareness of the water storage and habitat value of beavers in their watersheds.

7. Santa Clara Pueblo and Eight Northern Pueblo's OETA - The Office of Environmental Technical Assistance of Eight Northern hired River Source to provide instruction for advanced middle schools students in a math, science and engineering honor's program. We exposed youth, teachers and university students to 11 contact hours with three of our staff at multiple stations focusing on beaver habitat indicators.

Program Evaluation

Student Pre- and Post-Test Results

The *Beavers Building Habitat* curriculum includes a pre- and post-test. Pre and Post testing was conducted using a 10 point short answer test on basic beaver knowledge. This showed significant learning gains in the two core schools in the program. Testing at Santa Fe High School showed a doubling in test scores, or 200% increase, and Memorial Middle School had a 160% increase, from 5 out of 10 correct to 8 out of 10 correct answers.

School	Average Pre-Test Score	Average Post-Test Score	Percent Improvement
SFHS	4/10	8/10	200%
MMS	5/10	8/10	160%

Highlights of student learning/perception:

- Students named a number of animals that could benefit from beaver dams.
- About half the students thought the dams helped fish (provided ponds to swim in) and half thought they hurt fish (took water away from fish, trapped fish).
- They were mostly puzzled by the question about beavers living near their home or school, because they didn't think there were any, even in the post test, perhaps because they didn't think the beavers were "near" enough.
- Many students thought beavers "clean the forest" by picking up twigs and branches, and that people will like this.
- There was a lot of focus on giardia. Many students thought the beavers made the water dirtier because of that.
- Some students have a perception of beaver dams like a human dam, that it can totally stop the water. They need to learn that beaver dams do not significantly reduce downstream flow or dry up a river.
- No one mentioned aquifer recharge as a benefit of having beavers.

Teacher & Parent Comments

Parents of students at MMS have commented that students were excited to show parents locations of beaver lodges, dams and cuttings and want other people to know how recognize beaver use areas. Teachers and students commented that more time needs to be devoted to helping students understand exactly what data they will collect in the field and to provide better instruction on completing the data forms.

General Results & Recommendations

Curriculum approaches. On a first visit to a survey area, students are often reluctant to jump right into a formal field survey. Initial exploration time of the site is important to begin understanding beaver, and other wildlife signs within the field context. Most students do not have a basis for reading the land and wildlife signs. After initial, guided exploration, embarking on a beaver survey can be more productive. Adequate time must be devoted to introduce and practice filling out data forms, identifying beaver sign, using GPS technology and digital cameras, and developing diagrams of the area before the formal survey begins. Otherwise, the survey will be the first introduction to the students and data collected may be incomplete or questionable. One classroom day and one field day offers an excellent start for a class and its teacher to get to know a stream segment that they will return to periodically to track change.

A focus on beaver work in the field might occur as follows: three sequential stations would cover different facets of a beaver survey, they could be: 1. general exploration and recognition of beaver and other wildlife sign; 2. gathering and recording data pertinent to a beaver survey; 3. mapping and describing a beaver area.

Survey completeness. We found that in several cases a classroom visit (approximately one hour) and 1 to 1 ½ hours in the field with a group of students is not adequate time to expect that an actual beaver survey could occur. An additional third trip is needed to survey forms are completed properly, that beaver sign is accurately identified, and photopoints and GPS data is collected properly. It may be possible to train a group of *beaver observation assistants*, probably volunteers due budget constraints, to accompany each student group to observe and record beaver sign. Having such volunteers will help engage students in smaller groups, improve data quality, and improve youth-community member relations locally. We need to keep in mind that training and retaining volunteers can be difficult but may be possible if incentives are set up to keep them involved.

Survey focus. A survey method that focuses on “doability” by volunteers, evaluating beaver habitat suitability, investing in community education emerged from the project as part of the learning process we went through this year. We think that linking citizen inquiry toward habitat suitability and mitigation of human-beaver conflict will help keep existing beavers in place and provide identification of sites where relocations can occur with higher likelihood of success.

Acknowledgments

River Source would like to acknowledge and thank Lea Knutson of the Citizen Watershed Monitoring Team, Joe Zebrowski of the New Mexico Forest and Watershed Restoration Institute, David Blagg, Bill Zeedyk, Sterling Grogan and Anne Watkins of the Biophilia Foundation for their support above and beyond the call of duty to advance the values our hard-working fellow-mammal of New Mexico creeks and rivers.

Report Attachments

1. Lesson plans for classroom and outdoor activities
 - Plans for MMS
 - 2 page handout
 - classroom PowerPoint slide show

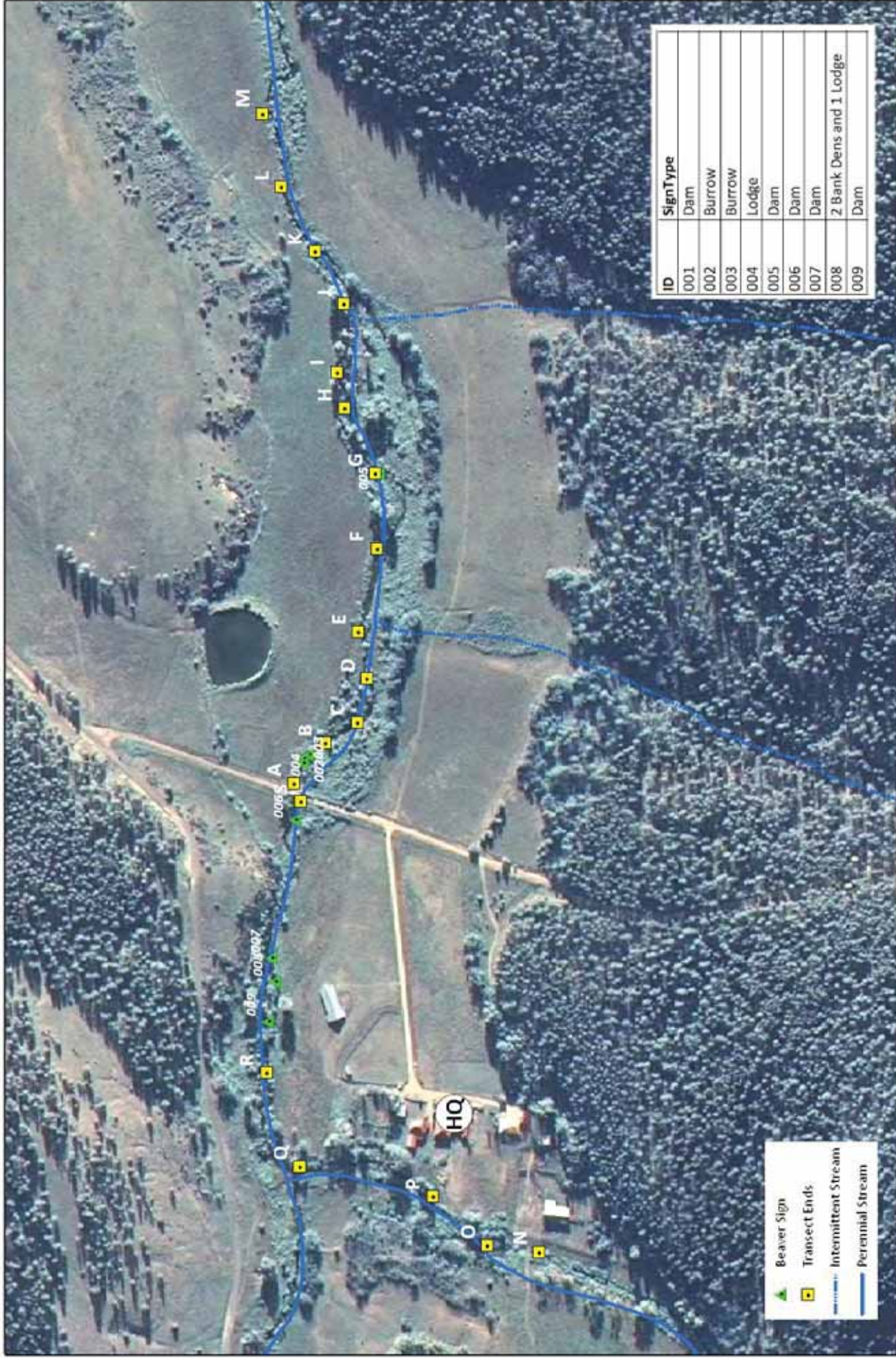
2. Maps from survey results
 - Pritzlaff Ranch
 - Santa Fe Municipal watershed
 - Map of Gallinas Canyon Municipal watershed

3. Beaver Survey methods plus field forms.

4. GPS coordinates in NAD 83, UTM (Zone 12 or 13)

5. Photos of students doing work.

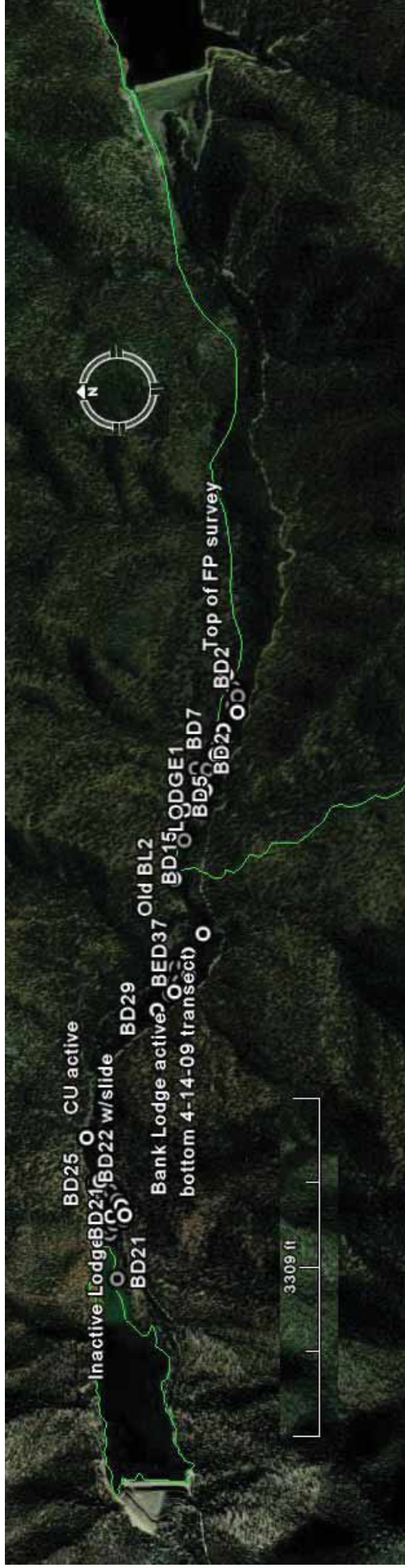
Pritzlaff Ranch, NM Beaver Survey, April 8, 2009



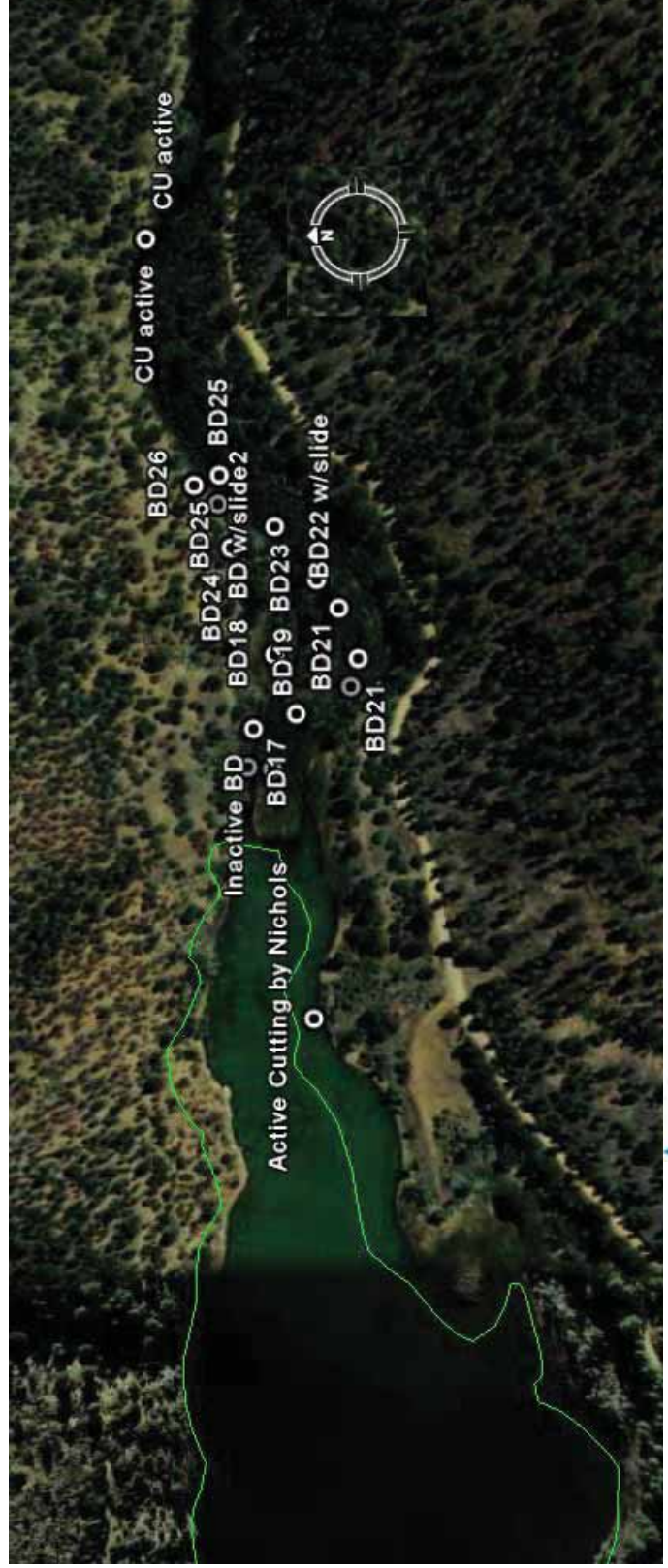
Source: Beaver data: Memorial Middle School students, Apr 8, 2009
 Image: HM BGIS DOQQ, Date: Jul 2005.
 Stream: USGS NHD, downloaded 2008.



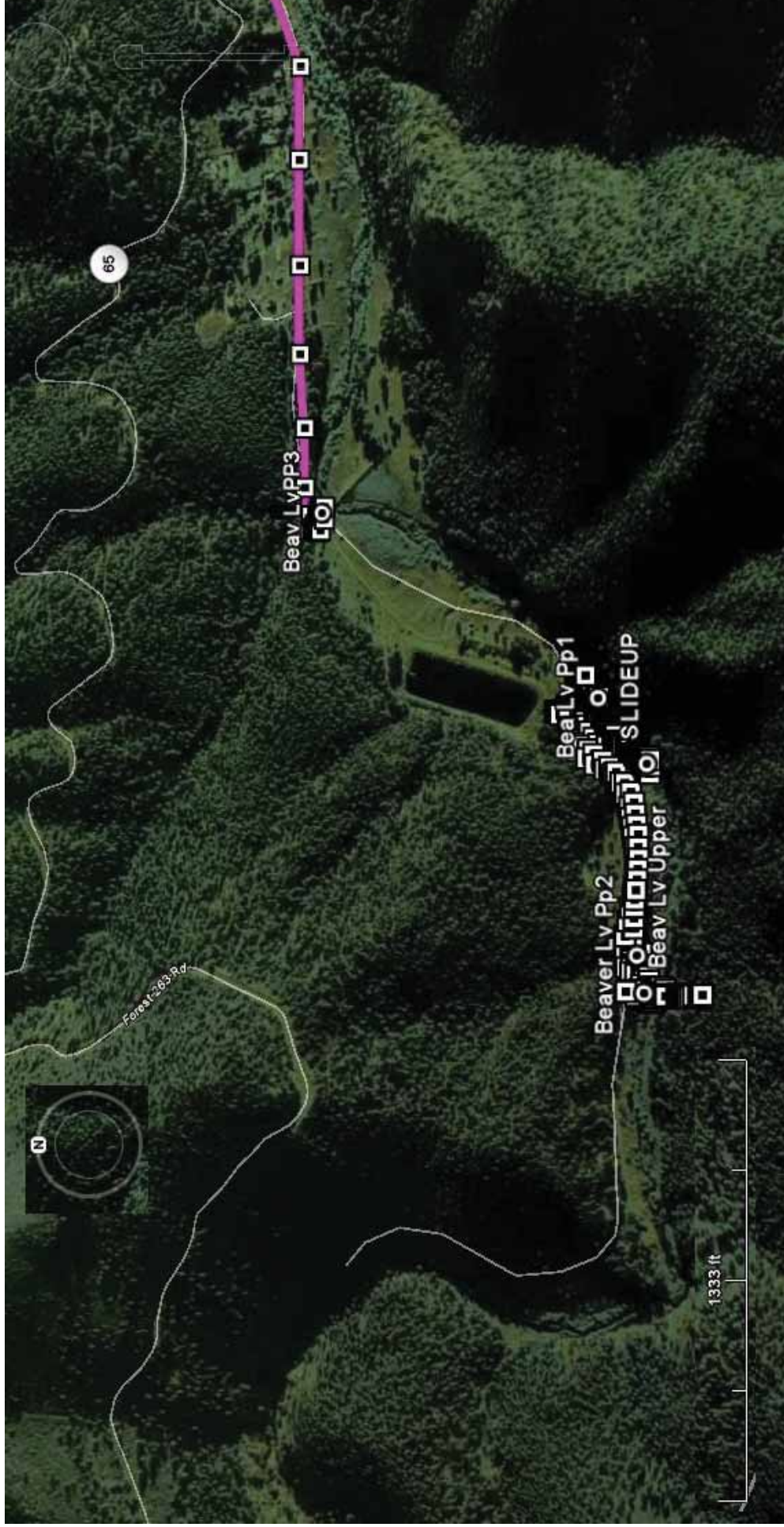
Santa Fe Municipal Watershed - Overview of Beaver Study Area between Nichols and McClure Reservoir - April 2009



Dams at the headwater of Nichols Reservoir



Las Vegas Municipal Watershed on Gallinas River- Overview of Beaver Study Area May 2009



Beavers Building Habitat – Activities in Spring 2009



Rich Schrader teaching at Memorial Middle School (above) on April 7, 2009
Ryan Bolton teaching on Pritzlaff Ranch on April 8, 2009





Top left: Rich Schrader teaching at Santa Fe High School on April 13, 2009.
Above: Santa Fe High students demonstrate the pin flags to mark beaver sign on April 14
Below: Santa Fe High student enjoys the experience by a beaver pond





Above: David Blagg (volunteer) and Ryan Bolton discuss beaver ecology and dams with Santa Fe High students on April 14
Below: Victor Castagna talks about the impacts on beavers wildlife habitat and water quality





Above: Dominic and Yuki of Santa Fe High check out a recently-active beaver lodge with Ada Schrader on April 19 in the upper Santa Fe watershed at the mouth of Nichol's Reservoir.
Below: Dominic and Yuki stand on deposited sediment upstream of an old beaver dam



May 2009 - Gallinas Watershed with Rio Gallinas School

To the left: Rio Gallinas student studies beaver-cuttings

Below: Rio Gallinas students with Citizen Watershed Monitoring Team volunteer look for beaver sign



June 2009 - Santa Clara Canyon with young tribal adults from all over the southwest U.S. and Pueblo of Santa Clara and Eight Northern Pueblos

To the left: Measuring stream flow with a measuring tape on re-covering streambank

To the right: Victor Castagna, River Source staff, describes fluvial geomorphology patterns in a flood plain prior to meau

