

# Zuni Mountain Collaborative Forest Landscape Restoration



Funded by the Collaborative Forest Landscape Restoration Program (CFLRP) of the USDA Forest Service

## Multiparty Monitoring Data Gap Assessment March 22, 2013

### Introduction

In July 2012, there were a series of Zuni Mountain CFLR kick-off meetings in Albuquerque, Grants, and Gallup. The Albuquerque meeting reconvened the multiparty monitoring group that engaged on the proposal. The meeting notes from that meeting identified four ecological and two socioeconomic recommendations. These six recommendations led to five next step actions. The third ecological recommendation was to conduct, *“a gap analysis to identify where current monitoring efforts can be used by the CFLR to avoid duplicated efforts and responsibly use project funding.”*

This report was developed to specifically address the multiparty monitoring team’s recommendation. What follows is a discussion of how the report was developed, the findings, and finally the recommendations.

Since the 2012 meetings there has been meaningful steps taken towards and “endangered” listing the Zuni bluehead sucker under the Endangered Species Act in 2013. The Endangered Species Listing Package for the Zuni bluehead sucker (Federal Register p. 5369 January 25, 2013) identifies the project specifically in a discussion on sedimentation,

“For example, in 2012, the Forest Service funded the Zuni Mountain Collaborative Forest Landscape Restoration project, which will increase logging to reduce fire risk in the Rio Puerco and Rio Nutria watersheds over the next 10 years (Forest Service 2012, pp. 1–2). Ultimately, the reduction in fire risk in these watersheds is likely to benefit the Zuni bluehead sucker; however, the short-term increase in logging is likely to increase sedimentation in these watersheds.”

Sedimentation is an important issue since the fish requires a gravelly substrate for its habitat. The short-term sedimentation concern would apply to all areas of habitat with proposed Forest Service treatments in surrounding uplands.

Finally, the forthcoming New Mexico Department of Game and Fish (NMGF) 2011 – 2012 ZBS report<sup>1</sup> is expected to mention the ZML CFLR as well as the National Wild Turkey Federation’s (NWTF) 2011 CFRP and indicates NMGF support for forest restoration and wildfire risk reduction while also indicating their concerns regarding the need for erosion and sedimentation mitigation.

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<sup>1</sup> The 2010 report is available here, <http://www.wildlife.state.nm.us/conservation/documents/ZuniBlueheadSucker2010AnnualReport.pdf>.

Combined, the ZML CFLR, the NWTf planning effort, the FWS listing package, and the forthcoming 2011-12 NMGF ZBS report necessitate cooperation and collaboration in management and monitoring west of the continental divide.

### **Approach and Existing Monitoring**

This document summarizes current and planned monitoring in the ZML CFLR project area by category.

The categories are:

1. *NFF Outcomes and Indicators*

- a. These include ten ecological, wildfire cost reduction (RCAT model outputs), jobs and economics (TREAT model outputs), leveraged fund tracking, and collaboration indicators. The Cibola National Forest (CNF) and the Forest Guild will lead these. The Forest Guild is currently developing a leverage fund tracking worksheet to document leveraged funds by the agency and partners.

2. *Hydrology and Climate*

- a. Forest Guild contacted four non-USFS members of the multiparty monitoring team who have previously commented on other planned or actual monitoring efforts. They were contacted and asked to elaborate on existing or planned efforts as well as the indicators, methods, and scale of these efforts. They are Mike Matush from the New Mexico Environment Department (NMED), Eliza Gilbert from the New Mexico Department of Game and Fish (NMGF), Robert Findling with the New Mexico Chapter of the Nature Conservancy (TNC), Kirk Bemis and Nelson Luna with Zuni Pueblo Environment Department, and Melissa Mata with the Fish and Wildlife Service (FWS).

Mike Matush and NMED conduct monitoring of the Bluewater watershed about once every eight years (2002 and 2010) during the growing season, since it was listed as an impaired watershed for nutrients and temperature. The listing developed Total Maximum Daily Loads for the watershed. NMED is using a SSTemp model via thermographs in bank and stream sites on state land just north of the CNF boundary. His findings indicate that summer storm discharges negatively affect stream temperature<sup>2</sup>.

The USGS Bluewater Lake installation<sup>3</sup> measures reservoir storage (acre/feet) and reservoir height (elevation above NGVD 1929). The USGS Bluewater C B Bluewater Dam installation measured discharge below the dam from 1951 – 2001.

NOAA from the National Weather Service identifies three NOAA stations in the ZML, a volunteer station in McGaffey, a station in Milan, and a station at El Morro National Monument. NOAA also identifies Remote Automatic Weather

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<sup>2</sup> 2007 TMDL Report for the Rio Puerco, [http://www.epa.gov/waters/tmdl/docs/33268\\_RioPuercoTMDL-Part2.pdf](http://www.epa.gov/waters/tmdl/docs/33268_RioPuercoTMDL-Part2.pdf); 2004 Watershed Assessment for Bluewater Creek, [http://ofmpub.epa.gov/tmdl/attains\\_waterbody.control?p\\_list\\_id=NM-2107.A\\_01&p\\_cycle=2004&p\\_report\\_type=](http://ofmpub.epa.gov/tmdl/attains_waterbody.control?p_list_id=NM-2107.A_01&p_cycle=2004&p_report_type=); and the 2007 TMDL Report for Bluewater Creek from the reservoir to the headwaters, [http://ofmpub.epa.gov/tmdl/attains\\_impaired\\_waters.tmdl\\_report?p\\_tmdl\\_id=33268&p\\_tribe=&p\\_report\\_type=](http://ofmpub.epa.gov/tmdl/attains_impaired_waters.tmdl_report?p_tmdl_id=33268&p_tribe=&p_report_type=)

<sup>3</sup> [http://waterdata.usgs.gov/usa/nwis/nwisman/?site\\_no=08341400&agency\\_cd=USGS](http://waterdata.usgs.gov/usa/nwis/nwisman/?site_no=08341400&agency_cd=USGS)

Stations (RAWS)<sup>4</sup> at Bluewater Ridge north of Post Office Flats<sup>5</sup>, Grants, and Zuni Buttes (~35+ miles west of ZML area). These stations measure temperature, dew point, relative humidity, wind speed, wind gust, solar radiation. The Bluewater Ridge station also measures fuel temperature and 10 hr fuel moisture.

3. *Vegetation*

- a. This includes changes in forest structure and composition as well as monitoring operator compliance with prescription specifications. The Mt. Taylor Ranger District will continue to monitor operator compliance. The Cibola National Forest (CNF) and the Forest Guild are developing a vegetation monitoring design in spring 2013. It will incorporate existing monitoring such as the ERI macro plots and NMFWRP plots in the R3 Showcase. The monitoring design plan will connect monitoring with soil type and evaluate sampling intensity. In general it will collect post thinning and post burn data prioritized to where there is pre-treatment data (from the Bluewater EIS or other efforts). Tree pests and pathogens will also be evaluated by the Common Stand Exam protocol.

4. *Fish and Wildlife Habitat*

- a. This includes using existing large and small mammal monitoring (changes in population distribution and habitat quality assessments) already occurring with NMGF (Craig Sanchez) and CNF staff (Bev DeGrouyter and Consuelo Zamora). NMGF is flying deer and elk population surveys in the Bluewater watershed (every other year) but not in the Puerco project area since the forests are too thick there for detection. Additionally there is planned aquatic (stream rapid assessments) and terrestrial (pit fall traps) invertebrate monitoring proposed with Cottonwood Gulch youth and Forest Guild. A goal is to have pre- and post-treatment monitoring.
5. *Wildfire Effects* – The CNF and the Forest Guild are planning on monitoring this indicator.
  6. *Wood Utilization* – The CNF and the Forest Guild are planning on monitoring this indicator.
  7. *Wildfire Suppression Cost Savings* – The CNF and the Forest Guild are planning on monitoring this indicator.
  8. *Livestock Grazing* – The CNF and the Forest Guild are planning on monitoring this indicator in coordination with grazing permittees. There is emerging interest from the Rio Grande Chapter of the Great Old Broads for Wilderness to be training in grazing monitoring, perhaps through permanent photo points or ground coverage data.
  9. *Cultural Resource Protection* – The CNF and the Forest Guild are planning on monitoring this indicator.
  10. *Restoration Business Stabilization* – The CNF and the Forest Guild are planning on monitoring this indicator.
  11. *Job Sustainability* – The CNF and the Forest Guild are planning on monitoring this indicator.
  12. *Training and Outreach* – The CNF and the Forest Guild are planning on monitoring this indicator.

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<sup>4</sup> <http://raws.wrh.noaa.gov/rawsobs.html>

<sup>5</sup> [http://raws.wrh.noaa.gov/cgi-bin/roman/meso\\_base.cgi?stn=BLWN5](http://raws.wrh.noaa.gov/cgi-bin/roman/meso_base.cgi?stn=BLWN5)

13. *Ecosystem Services, Recreation and Tourism* – The CNF and the Forest Guild are planning on monitoring this indicator in partnership with recreation and tourism businesses in Cibola and McKinley Counties as well as the CNF visitation tracking efforts.

### **Discussion**

Forest Guild contacted four non-USFS members of the multiparty monitoring team who have previously commented on other planned or actual monitoring efforts. They were contacted and asked to elaborate on existing or planned efforts as well as the indicators, methods, and scale of these efforts. They are Mike Matush from the New Mexico Environment Department, Eliza Gilbert from the New Mexico Department of Game and Fish, Robert Findling with the New Mexico Chapter of the Nature Conservancy, and Melissa Mata with the Fish and Wildlife Service.

This discussion will need to be paired with existing and planned monitoring activities administered by CNF staff in terms of climate, hydrology, and wildlife (large and small mammal, aquatic, and avian) monitoring.

#### *New Mexico Environment Department (NMED)*

Mike Matush mentioned that the NMED does snapshot monitoring of the Bluewater watershed once every 8 years to determine how in-stream water quality is meeting the NMED developed total maximum daily load standard (for temperature and nutrient loading; nitrogen and phosphorus) He made extensive recommendations building on his earlier suggestions. These focus on expanding current monitoring in the Bluewater Watershed to the Puerco project area. Mike suggested monitoring water quality (temperature) and stream height (as a surrogate for actual water quantity) paired with rain gauges and groundwater piezometers installed in upland sites. He suggested a weather station for the Puerco project area but that the SNOTEL site in the Bluewater Watershed would suffice for the whole project area.

The SNOTEL and weather stations would give context on how water is moving through the project area while the rain gauges and ground water piezometers would describe precipitation in the uplands while in-stream transducers and piezometers with gauge meters would provide water temperature (surrogate for water quality) and flow volume. He recommended placing in-stream monitoring beneath the FR - 178 bridge north of the R3 Showcase and up from the Nutria Reservoir.

#### *New Mexico Chapter of the Nature Conservancy (TNC)*

Bob Findling discussed the TNC focus in the Puerco project area due to their biodiversity concerns regarding the Zuni bluehead Sucker (ZBS) and their parcel of fee-owned land with critical habitat. Bob conducts annual observational monitoring of that parcel of land that assesses changes in land condition (similar to conservation easement monitoring). Bob deferred to monitoring efforts (and indicators and metrics) conducted by NM Department of Game and Fish (NMGF) lead by Eliza Gilbert and any existing or planned monitoring by the US Fish and Wildlife Service (FWS). Bob emphasized that sediment movement into the isolated habitat pools, whether due to natural background erosion, beaver activity, road and vehicle use, or forest

restoration activities that impede the gravely, cobbly, or bedrock substrates needed by the ZBS should be avoided or mitigated. This may be particularly important to incorporate into the Puerco CFRP planning effort.

#### *New Mexico Department of Game and Fish (NMGF)*

Eliza Gilbert focused her discussion on the Puerco project area due to her lead role with the Zuni bluehead sucker (ZBS) protection team (including Pueblo of Zuni, and the US Fish and Wildlife Service). Eliza leads the ZBS team in quantitative annual population monitoring of ZBS occupied sites. These findings can be found on her annual reports<sup>6</sup>. This annual monitoring measures catch rates (electro fishing) and which are used to calculate the ZBS population for the occupied sites. There are 2 pool/spring sites (1 on USFS, 1 on private) and one long site that spans a 2-5 mile stretch of the Rio Nutria on a combination of TNC and Zuni Pueblo land. This monitoring takes about 4 days.

Eliza is focused on the west side of the Continental Divide and has an interest in seeing how much thinning is proposed for the southern Nutria watershed on CNF lands. While she welcomes thinning to diversify forest structure and reduce uncharacteristic wildfire risk, she is concerned that forest restoration activities will, in the short term, increase sedimentation into the pools and stream sites. She recommends measuring pool sedimentation, and enhanced BMP measures such as one-rock-dams, Zuni bowls, and wood chip waddling to keep sediment from reaching ZBS habitat.

She discussed how the project might monitor changes in ground water (to meet previous CNF commitments) and sedimentation in pools and streams that would address sedimentation concerns identified in the Listing Package. In addition to sedimentation and ground water monitoring, she welcomed the installation of weather, precipitation, and stream flow equipment to better characterize how water moves through these watersheds. Eliza discussed that these monitoring measures would benefit expected Endangered Species Act section 7 consultation.

#### *Zuni Pueblo*

Zuni Pueblo Environment Department Director Kirk Bemis and ZBS lead Nelson Luna discussed their current monitoring capacity. At the mouth of the Rio Nutria canyon at the Upper Nutria Dam there are two stream gauges, a USGS gauge at the dam and an extra gauge (part of the dam safety warning system). These gauges measure discharge (CFS) and gauge height. Kirk mentioned that they capture high flow well, but are not well suited for low flows. Kirk and Nelson also discussed the local beaver population that periodically impeded the lower gauge. They said they work regularly to mitigate this issue. Zuni Pueblo also has a ground water well monitoring site in the upper Nutria watershed. They also annually conduct observational monitoring of stream conditions and also maintain a rain gauge tipping bucket. There were a series of temperature HOBO gauges in the Nutria watershed on Zuni Pueblo and TNC land. Unfortunately, these units appear to not be functioning at this time. The bucket doesn't accurately measure winter precipitation and Kirk mentioned he feels the SNOTEL site in the Rice Park is too far east to be representative of the western portion of the mountains. Zuni Pueblo currently tracks data from the McGaffey NOAA Cooperative station which is the longest term climate data west of the continental divide. It is increasingly becoming spotty and they are

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<sup>6</sup> <http://www.wildlife.state.nm.us/conservation/documents/ZuniBlueheadSucker2010AnnualReport.pdf>

concerned that the volunteer is aging and that this data may end. Kirk and Nelson are interested in a RAWS or other automated weather station and in working as a team to determine ideal and representative instrument installation locations, brands and types instrumentation specified. He emphasized that these would be critical for sustainability for the ZBS team.

### *Fish and Wildlife Service*

A discussion with Melissa Mata, FWS author of the ZBS listing package indicated that there is a desire by FWS to dovetail monitoring efforts between the ZBS recovery team and the CFLR project. She indicated that monitoring sediment is implied by the listing package language and noted that currently, fine sediment in pools and streams and grazing are current risks to ZBS habitat. She also expressed interest in monitoring spring output and recharge. Melissa offered specific concern areas such as the TNC parcel which exhibits substantial nitrogen input, from upper part of watershed that contribute to algal mats and blooms. Melissa noted that it is unclear if this condition from current grazing or historic activates. Melissa was interested in better tracking of winter precipitation and suggested working with NOAA and NRCS to investigate the potential to secure a SNOTEL site for west of the continental divide. Melissa and I discussed a potential protocol to measure water height and depth of pool (paired with substrate identification) by setting up a fixed height point near ZBS habitat to characterize the potential habitat displacement caused by sedimentation.

### **Recommendations**

The following recommendations are presented by monitoring category:

1. *NFF Outcomes and Indicators* - Continue as planned.
2. *Hydrology and Climate* – These monitoring categories are currently trending due to the reference in the ZBS listing package and the forthcoming NMGF 2011-12 ZBS report. It seems that the ZML CFLR may be able to proactively engage with the ZBS team to collaboratively pursue monitoring investments that meet multiple partner needs. The outreach of this report focused on these monitoring categories.
  - a. The outreach recommended for the Bluewater project area:
    - i. Install piezometer and gauge height device underneath the bridge north of Post Office Flats.
    - ii. Purchase and install a small array (3-5) of rain gauge tipping buckets in treatment and non-treatment areas.
    - iii. Purchase and install a couple ground water piezometers to determine relative rate of flow.
    - iv. Use existing gauges and ground water piezometers north of CNF on SLO lands
    - v. Use existing RAWS and SNOTEL stations in the Bluewater Watershed.
  - b. The outreach effort recommended for the Puerco project area:
    - i. Use existing USGS gauge at Nutria dam to measure flow in the Rio Nutria watershed.
    - ii. Purchase and install a small array (3-5) of rain gauge tipping buckets in treatment and non-treatment areas.
    - iii. Purchase and install a couple ground water piezometers to determine relative rate of flow.
    - iv. TNC was amenable to installing ZML CFLR equipment on their parcel.

- v. Purchase and install a RAWS type automated weather station.
  - vi. Work collaboratively as a team to select equipment and determine optimal installation locations.
  - vii. Discuss with Zuni Pueblo the potential to augment this data point with their second gauge above the dam and to share well monitoring data.
  - viii. Work with the ZBS team to develop sedimentation tracking measurement for use in streams and at pool habitat sites.
  - ix. Incorporate erosion and sedimentation mitigation into Puerco area project treatments for areas that flow to ZBS pool and stream habitat sites that might use an array of techniques ranging from limited skidding, limiting work during wet periods, installation of temporary wood-chip waddles along treatment roads and at landings, installation of wood-chip waddles, one-rock dams, or Zuni bowls features above pool sites to slow the movement of sediment and water.
3. *Vegetation* – NMED recommended collecting pre- and post-treatment (thinning and prescribed fire) data in treatment areas with a small amount of data in non-treatment data collected less frequently. NMED recommended incorporating soil type into the sampling design so that sampling occurs in all major soil types present. Mike felt this would be an important feature of the sampling design that would help with data interpretation and analysis.
4. *Fish and Wildlife Habitat* – Continue as planned, however it would be useful to collect existing data to date to develop a baseline condition, at least for the Puerco project area. Eytan will be meeting with Cottonwood Gulch 3/26 to check on their interest in the proposed aquatic (stream rapid assessments) and terrestrial (pit fall traps) invertebrate monitoring.
5. *Wildfire Effects* – The CNF and the Forest Guild are planning on monitoring this indicator.
6. *Wood Utilization* – Continue as planned.
7. *Wildfire Suppression Cost Savings* – Continue as planned.
8. *Livestock Grazing* – Continue as planned. However there is emerging interest from the Rio Grande Chapter of the Great Old Broads for Wilderness to be training in grazing monitoring, perhaps through permanent photo points or ground coverage data. They are an emerging interest group that has an interest in volunteer opportunities that could be directed towards monitoring.
9. *Cultural Resource Protection* – Continue as planned.
10. *Restoration Business Stabilization* – Continue as planned.
11. *Job Sustainability* – Continue as planned.
12. *Training and Outreach* – Continue as planned.
13. *Ecosystem Services, Recreation and Tourism* – The CNF and the Forest Guild are planning on monitoring this indicator in partnership with recreation and tourism businesses in Cibola and McKinley Counties as well as the CNF visitation tracking efforts and game tag tracking.

## Appendix

### Example of stream and groundwater monitoring installation on SLO lands:

#### Bluewater Temperature Reduction and Riparian Restoration Project

In March 2009, The WildEarth Guardians were awarded EPA funding to mitigate high surface water temperatures at Bluewater Creek, Cibola County, by providing needed shade. The New Mexico State Land Office recently installed a piezometer at Bluewater Creek in an effort to measure groundwater fluctuations in and around the mass planting of cottonwood and willow. An important step in evaluating riparian plantings is to perform regular groundwater observations so that overall health and rate of growth can be linked to the ability of the watershed to provide suitable growing conditions. Substrate composition (e.g., clay, sand, gravel) strongly influences the rate of groundwater movement and potential capillary action, both important determinants of plant survival. Long term groundwater measurements can therefore also provide important information for future expansion of riparian enhancements. Instrumentation used to measure groundwater levels also records water temperature. This information may be used to model changes in riparian temperature at the planting site. Additional surface water and bank temperatures are being measured approximately 2 miles upstream and at the planting site to help understand temperatures of the inflow versus those at the planting site. In addition to the increased tree canopy, the plantings added habitat and recreational value to New Mexico State Trust lands adjacent and upstream from Bluewater Reservoir.

The traditional approach to measuring groundwater levels is to construct a borehole designed to measure groundwater conditions at a single point within the alluvial (streamside) aquifer. In this case, a well point and series of galvanized steel pipes were used to construct a *piezometer*; all were ordered from one tool company. A pressure transducer/water level logger was installed in the pipe to collect water level data at defined timed intervals and store the data digitally into long-term memory. By operating in a continuous 24/7 monitoring mode, the logger allows users to accurately observe changes in groundwater levels and responses to floods, droughts and possibly plant use. The level loggers are programmed using a field laptop computer and an optical reader. The selected level logger can record groundwater levels and water temperature every .5 seconds to once every 99 hours or to an event based option. The instrument is synchronized to the laptop clock and the battery life is estimated to run 10 years. Since barometric pressure affects water levels in pipe, a second level logger (Barologger) was mounted above ground to measure barometric pressure. Those data are used to compensate pressure gradients inside the borehole pipe so true groundwater level readings are achieved. Barologgers also measure ambient air temperature to be compared to bank temperature, surface and groundwater temperature and the added increments of additional shading as the willow and cottonwood matures.

Once the well point and pipe are assembled, the pipe is pounded into the ground with a simple post pounder. The well point must be sufficiently deep so that groundwater fluctuations do not go below the well point and transducer so that no groundwater levels can be measured. A fitted galvanized cap on a short pipe extension with coupler is used with the post pounder to drive the

piezometer pipe into the ground. As the pipe is driven into the ground, additional pipe extensions can be attached for the desired depth of the piezometer. After installation, the transducer is suspended from a threaded cap by a coated wire cable to the bottom of the well point. An oversized cap was used in this particular case and a lock was attached for security. Occasionally clay fines from long-term groundwater movement will infiltrate into a piezometer or well. A simple inertial hand pump can remedy this problem; please see link below.

The same materials can be used to construct a stage gauge, if mounted properly in the stream. The transducer will then continuously monitor and record the depth of the stream at the selected time interval. This information can be compared to groundwater fluctuations, which is important if the field specialist is determining the hydraulic conductivity of the alluvium (soil, gravel, cobble adjacent to the stream). It helps determine the degree of permeability and if there is a real connection from surface water to groundwater in the vicinity of riparian plantings. A stage gauge can also take the guess work out of determining bankfull stream width.

The transducer software allows immediate viewing of the data in graph or chart form, or simple downloading for future examination. It also allows easy export into a spreadsheet or database for further processing.

In an effort to help the readers understand and see the needed equipment for a simple piezometer, these links are provided.

Wellpoint:

<http://www.grainger.com/Grainger/wwg/search.shtml?searchQuery=5YM69&op=search&Ntt=5YM69&N=0&sst=All>

Pipe couplers:

<http://www.grainger.com/Grainger/wwg/search.shtml?searchQuery=5YM76&op=search&Ntt=5YM76&N=0&sst=All>

Pipe:

<http://www.grainger.com/Grainger/wwg/search.shtml?searchQuery=6P911&op=search&Ntt=6P911&N=0&sst=All>

Pipe cap:

<http://www.grainger.com/Grainger/items/6JK15?Pid=search>

Transducer:

<http://www.solinst.com/Prod/3001/3001.html>

Transducer guide:

<http://www.solinst.com/Prod/3001/LevelloggerInstructions.html>

Inertial pump:

<http://www.solinst.com/Prod/404/404d2.html>



Bluewater Creek Restoration Project  
Groundwater Level and Temperature

