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New Mexico Monitoring Meeting, August 20-21, 2007 at the Sevilleta Field Station, USFWS conference room

Greetings once again to all the attendees of the monitoring meeting hosted by the Forest and Watershed Restoration Institute and the Forest and Watershed Health Office. Details about the agenda, lodging, and meals are found below.

The meeting objective

Multiple statewide meetings were held over the past two years that were designed to develop key recommendations and work objectives for the NMFWRI and State Forestry's Office of Forest and Watershed Health. For both of these organizations, there was a call to organize a series of meetings to bring monitoring practitioners together to discuss which protocols were most effective in New Mexico's watersheds. In addition, the state's stakeholders requested that each of these organizations become a clearinghouse for monitoring information, and that they develop a publicly accessible list of practitioners, a web-based library of case studies, and a statewide database where monitoring data could be warehoused.

For this initial meeting, we are attempting to target individuals who we know to be actively involved in the monitoring of watersheds around the state. Due to space limitations, we will only invite approximately 40 people to this meeting, but if you know of someone that should be at this meeting and that we inadvertently left off the list, please contact Ken Smith of the NMFWRI. If you plan to attend this meeting, you should also contact Ken Smith about your desire to participate.

Speakers and topics

I have asked each speaker to give the audience a feel for their work, to give their opinions about what we may be missing in our monitoring efforts, and what (if any) protocols should be followed across the state. The second day (August 21) will end before noon and will be dominated by a discussion of a statewide monitoring database.

August 20

8:45 – 9 am
Ken Smith (NMFWRI) – Introductions and an update on the activities of the NMFWRI

9 - 9:15
Susan Rich (FWHO) – An update on the activities of the Office of Forest and Watershed Health

9:20- 9:45
Chris Allison (NMSU) – A Recent History and Overview of Monitoring Natural Resources in New Mexico

Break 9:45-10

10- 10:15
Melissa Savage (Four Corners Institute) – What the CFRP Taught Me about Community Monitoring

10:20- 10:35
Justin Dean (BLM) – PJ monitoring on BLM Lands in the Taos Region

10: 40 – 10:55
Glenn Harper (Pueblo of Santa Ana) – Juniper woodland monitoring at the Pueblo of Santa Ana

Break 11- 11:20

11:20 – 11:35
Sam Fernald (NMSU) – PJ monitoring at the Corona Ranch and mixed conifer monitoring in Mora County

11:40 – 11:55
David Lightfoot (SWCA Environmental Consultants) – Estancia Basin Watershed Health, Restoration and Monitoring Project

12- 1pm lunch

1- 1:15
Chris Cudia (NMED) - Surface Water Quality Bureau Watershed Protection and Monitoring Efforts in NE New Mexico

1:20 – 1:35
Gina Dello Russo (USFWS) - Activities at the Bosque del Apache NWR and the San Acacia Reach of the Rio Grande: restoration project and overall ecosystem monitoring

1:40 – 1:55
Sam Smallidge (NMSU) – The Canadian River Riparian Restoration Project

2- 2:20 break

2:20 – 2:35
Red Baker (NMSU) - Mixed Conifer Forests in New Mexico: Research and Monitoring

2:40 – 2:55
Ellen Soles (NAU) – Store in a Cool, Wet Place: Monitoring long-term effects on alluvial groundwater levels and stream baseflow for watershed remediation projects

3:00 – 3:15
Steven Yanoff (TNC) - A summary of TNC/BLM's New Mexico Rangeland Ecological Assessment (REA)

3:20 – 3:30 break

3:30 - 4
Terry Booth (USDA ARS) - Image-Based Resource Monitoring: Acquisition, Analysis, Utility, and Relative Cost

4:05 - 4:30
Rich Schrader (River Source) – Citizen-volunteer monitoring and the development of a statewide database

4:35 – 5pm
Chris Frazier (Natural Heritage, UNM) – A strategic statewide IT plan and monitoring database

6 pm dinner served

Tuesday, August 21

7:00 breakfast served

8:30 – 10:30

All attendees - 2 hour discussion of monitoring projects not highlighted in this meeting, the statewide database, and a future agenda for the state's monitoring community

Current Attendees/Invitees

Ken Smith, NMFWRI
Kent Reid, NMFWRI
Ron Ortega, NMFWRI
Susan Rich, NMFWHO
Jeremy Kruger, NMFWHO
Terrell Treat, NMFWHO

Melissa Savage, Four Corners Institute
Rich Schrader, River Source
Will Barnes, Quivira Coalition
Craig Conley, Quivira Coalition
Mark Meyers, State Land Office
Brian Bader, Pueblo of Santa Ana
Glenn Harper, Pueblo of Santa Ana
Adam Ringia, Hawks Aloft
Travis Dotson, FUTA
Eytan Krasilovsky, Forest Guild
Dan Shaw, BEMP/Bosque School
Carl White, UNM
Craig Allen, USGS
Chris Cudia, NMED/SWQB
Anne Bradley, TNC
Steven Yanoff, TNC
Ellen Soles, NAU
Anne Moote, ERI
Jan-Willem Jansens, Earth Works Institute
Michael Bain, Cimarron Watershed Alliance, Inc
Gina Dello Russo, Bosque del Apache NWR
Todd Caplan, Parametrix
Kirk McDaniel, NMSU
Sam Fernald, NMSU
Red Baker, NMSU
Andrés Cibils, NMSU
John Boren, NMSU
Chris Allison, NMSU
Terry Booth, USDA ARS
Chris Frazier, Natural Heritage New Mexico
David Lightfoot, SWCA
Leif Bang, SWCA
Roy Jemison, USFS
Yasmeen Najmi, MRGCD
Justin Dean, BLM
Dave Borland, BLM
Mike Matush, NMED
Stephen Monroe, NPS
Carolyn Koury, USFS
Cliff Crawford, UNM, BEMP
Kim Eichhorst, BEMP
Greg Miller, USFS

Carol Van Dorn, USFS
Zig Napkora, USFS
Donald Auer, NM Game and Fish
Dan Binkley, CFRI
Wally Covington, ERI
Diane Vosick, ERI
Toby Gass, CSU, CFRI
Edward Martinez, NMHU
Sam Smallidge, NMSU
Nick Smokovich, NM State Forestry

The following is a summary of the presentations given at the August 2007 meeting held at Sevilleta. Please contact the individual speakers for further information about each presentation.

General Concepts and Community Based Monitoring

Melissa Savage –
What the CFRP taught me about Community Monitoring
Rich Schrader –
Volunteer Monitoring in New Mexico Trends & Future Possibilities
Chris Frazier, Esteban Muldavin, and Rayo McCollough -
The Development of a Statewide Monitoring Database
Steven Yanoff,
A summary of TNC/BLM's New Mexico Rangeland Ecological Assessment (REA)

Clarity of purpose is key.

The many reasons to monitor include:

- mutual learning
- conflict avoidance
- adaptive management
- involving the community
- project tracking
- tracking ecological and social change

Reliable results are critical for tracking changes. "Reliable" results are not science or research, but are accurate information.

Reliable results come from:

- specific, standardized methods
- careful sampling

• understanding the meaning of data

Three standards of monitoring are proposed:

• scientific - hypothesis testing - must be very reliable
• agency - information for adaptive management - must be very reliable
• community - useful for the collaborative process - may not be reliable

We need to know enough so that:

- we don't repeat the past
- the world isn't made in our own image
- natural processes return

From the conclusions of the *National River Restoration Science Synthesis:* "Rather than attempt to recreate unachievable or even *unknown* historical conditions, the restoration goal should be to move towards the least degraded and most ecologically dynamic [resilient] state possible"

Quantifying restoration practice results for Ecological and Economic Effectiveness (E^3)

What are challenges to landscape-scale assessment, restoration & monitoring?
Ownership, administrative jurisdiction, management, populations and infrastructure, and scale

What landscape scale, if any, should we work at?
Landscape is a spatial and temporal unit adequate in extent to include the necessary parts to tackle an ecological problem.

Monitoring by community volunteers
Why do volunteers get involved?

- Want to learn more about the resource
- Want to monitor as a steward of the area
- Want to share information with other people so that the community is informed and engaged (effectiveness of restoration, mitigation, and results of stewardship practices)

Big challenge: Turning data into information
Current trends in turning data to information in New Mexico

- **State-wide partnerships forming** –
  ~ New Mexico State Forestry (Forest and Watershed Health Office),
  ~ non-profit groups (Cimarron Watershed Alliance),
  ~ university-based (NM Forest and Watershed Restoration Institute)
- **National and regional efforts & support**
  River Network & Rocky Mountain (Geoff Dates)
  Watershed Network (Barb Horn of Colorado Div. of Wildlife & others)
- **Tremendous Innovation in Technology**
  (XML programming for the new EPA WQX database, open source software, Google Map)

The Development of a statewide monitoring database.
Initial NMFWRI focus will be on forest monitoring and gathering metadata for ongoing or recent projects within New Mexico. NMFWRI should explore ways to collaborate with existing DSS development efforts, reducing duplication of effort. One potentially fruitful avenue for NMFWRI is to emphasize the development and collection of high quality data that can be used to give DSS and other tools a more sound foundation.

How can we use regional information about ownership, condition, and restoration options to help prioritize and inform assessment, restoration, and monitoring at the landscape-scale?
What baseline resources are available and appropriate?
For vegetation: ReGAP, NLCD, LANDFIRE
For soils: STATSGO and SSURGO, both from the NRCS
For reference conditions: Donart, Kuchler PV; LANDFIRE BpS; NRCS ecological sites
For departure from reference conditions: LANDFIRE FRCC, FS TES, NRCS ecological sites
For restoration opportunities: LANDFIRE FRCC?, FS TES?, NRCS ecological sites
For monitoring: Plots, Remote Sensing, Mapping new Baselines

Some Landscape-Scale Spatial Data Resources
General (ownership, administrative, management):
http://rgis.unm.edu/
ReGAP: http://fws-nmcfwru.nmsu.edu/swregap/
LANDFIRE: http://www.landfire.gov/index.php
USFS Terrestrial Ecosystem System Survey:
http://www.fs.fed.us/r3/gis/datasets.shtml
NRCS soils & ecological site descriptions:
http://www.nm.nrcs.usda.gov/technical/fotg/section-2/esd.html
Jornada Experimental Range State Mapping:
http://usda-ars.nmsu.edu/presentations/steeleCaiti.pdf (doesn't work)
NM Rangeland Ecological Assessment (REA):
http://nmconservation.org/reapublic/REA_Website1_intro_msg.htm

Examples of web-based community databases:
www.imrivers.com/riversource
http://www.columbiawatertrail.org/watertrail
http://mddnr.chesapeakebay.net/mbss/streamwaders.cfm
http://savebuzzardsbay.org/baywatchers/
https://fp.auburn.edu/icaae/index.aspx
http://www.imrivers.com/cahaba
For more information go to: http://riversource.net/content/view/18/119

The New Mexico Rangeland Ecological Assessment

- Map ecological sites (NRCS soil survey)
- Map ecological states (remote sensing, experts)
- Validate maps (field data)
- Attribute map (reference/non-reference conditions, ecological dynamics, restoration opportunity, management options)

What is a Landscape?

Landscape = a spatial & temporal unit adequate in extent to include the necessary parts to tackle a problem

Challenges to Working at Landscape Scale
(at what scale *do* we assess, restore & monitor?)

Resources for Working at Landscape Scale
(at what scale *can* we assess, restore & monitor?)

Mixed conifer

Red Baker –
Mixed Conifer Forests in NM: Research & Monitoring

Red Baker and co-authors from NMSU described several completed and ongoing projects which are monitoring various ecological parameters in mixed conifer in the Lincoln National Forest. Monitoring objectives are in italics, followed by the measured variables.

Several projects, completed and on-going, which monitor in mixed conifer in the Lincoln National Forest.
Vegetative response under different frequencies and intensities of silvicultural treatment

Response Variables:	Overstory	Midstory	Understory
	species richness	species richness	species richness
	DBH	size class	cover by species
	basal area	cover	ground cover
	stem density		
	canopy bulk density		

Mechanical fuel treatment effects on fuel loads and indices of crown fire potential
Response Variables: Dead & downed (1, 10, 100, 1000-hr) Fuels, Fine Fuels

Soil genesis, classification, and morphology

- Soil properties related to mixed conifer vs. ponderosa pine and mountain meadow systems
- Soil signatures relative to historic meadow extent & how they differ from adjacent uplands.

Large Ungulate Response to Silviculture Treatments

Monitoring distributions of deer, elk, and cattle across treatments and study areas with the Pellet Group Plot method. Response Variables: habitat use, distributional overlap, seasonal patterns, trend over time, response to treatment

Small Mammal Response to Silviculture Treatments:

10 small mammal live-trapping grids were established on each of the treatment areas plus a control area, for a total effort of 27,440 trap-nights

Ponderosa pine

David Lightfoot, Leif Bang, Chris Garrett, and Victoria Williams -
Estancia Basin Watershed and Forest Health Experimental Monitoring Project

Purpose: To determine over time the effects of forest thinning practices on hydrology, soils, vegetation, and native animals.

Research Approach on two ponderosa pine sites:

- assess existing forest
- stratify landscape by topography, soils, vegetation
- replicate in different sub-watersheds
- paired treatment and control study plots
- determine pre-treatment conditions for soils, hydrology, vegetation and animals
- impose forest thinning treatments
- monitor responses of soils, hydrology, vegetation and animals over time

Sources for physical layout, transects with plots, and plot diagrams:

- USDA-ARS rangeland monitoring protocols; soils, non-tree vegetation. Integrates various soils, hydrology and vegetation measures with monitoring.
  http://usda-ars.nmsu.edu/JER/Monit_Assess/monitoring.php
- USDA Forest Service Inventory and Analysis (version 3) protocols; tree density and canopy structure.
  http://www.fia.fs.fed.us/library/field-guides-methods-proc/

Piñon-Juniper

Justin Dean and Leslie A. Boby –
Monitoring Protocol For Hazardous Fuels Reduction, Prescribed Fire, and Forest / Range Restoration Activities

Glenn Harper –
Restoration of One-seed Juniper Savannah on the Pueblo of Santa Ana, Sandoval County, New Mexico

Sam Fernald –
Effects of tree thinning on surface cover, infiltration, runoff, sediment yield and soil moisture in variably wooded catchments
Steven Yanoff,
A summary of TNC/BLM's New Mexico Rangeland Ecological Assessment (REA)

Monitoring protocols were established in the BLM Taos Field Office Fire Management Program to mandate a minimum level of monitoring and documentation of management effects, to insure that monitoring methods will be repeatable and consistent over time, and to establish a documentation program to ensure that information is organized, available, and protected.
A monitoring database was created in Microsoft Access for all treatment types throughout the Taos Field Office BLM, including all PJ Treatment monitoring data.
This database has been queried to prepare reports on treatment objectives for a variety of resource disciplines with interests in PJ Woodland management.

Santa Ana Pueblo is restoring one-seed juniper savannah across 3,073 acres to a 1935 reference point. Project goals include: reduce the threat of catastrophic wildfire; reinstate a natural fire regime; increase perennial herbaceous cover; enhance wildlife habitat
General monitoring principles:

- High potential for re-monitoring
- Photo points
- Include ground cover (e.g., basal vegetation, bare ground, litter) and vegetation cover and composition at multiple levels (e.g., forb, grass, shrub, tree)
- Include wildlife, soils, and precipitation components
- Target monitoring to sensitive species or guilds (e.g., Gray Vireo, wintering grasslands birds)

Specific Project Monitoring:

- Vegetation (qualitative and quantitative)
- Pellet counts (2 x 25-m plots)
- Fuels reduction
- Seasonal (breeding and winter) avian monitoring (point counts)

At what level do we thin P-J forests for increased forage, infiltration, and water yield (or aquifer recharge) along with reduced surface runoff and sediment yield? To answer this question, we need to do at least the following:

- Vegetative Sampling: Transect-Based Measurements of cover (grass, forb, and litter) and production (clipping of grass and forb)
- Rainfall Simulations: One-hour Simulations applied Precipitation and examined runoff, sediment, and soil moisture.
- Photo-points over time

The New Mexico Rangeland Ecological Assessment
PJ Case study
Using land ownership, fire condition class, and restoration options to prioritize and inform assessment, restoration, and monitoring at the landscape scale.

Bosque

Gina Dello Russo
Monitoring in the San Acacia Reach of the Rio Grande Socorro Valley, NM

Monitoring Objective: Identify and reduce high fire danger areas and improve bosque condition
Monitoring Focus Areas

- Ignition Sources
- Resource Response
- Wildfire affects and effectiveness of treatments
- Baseline vegetation and fuel load types and conditions
- Balance biological diversity and fire resistance

Monitoring Categories: Riparian, Wetland, and Upland Programs
Example: Monitoring on a River-Reach Scale, focused Fire Danger and Fire Protection.

- Fire Effects on Past Wildfires (untreated areas)
- Fire Effects on Treated Areas (by any means besides fire)
- Areas Treated by Prescribed Fires

Grassland

Chris Allison -
History of Resource Monitoring
S.T. Smallidge, T.T. Baker. And C.D. Allison -
Canadian River Riparian Restoration Project Monitoring Program
Terry Booth –
Image-Based Resource Monitoring: Acquisition, Analysis, Utility, and Relative Cost

A History of Resource Monitoring from the perspective of producers.
BLM – the Taylor Grazing Act established allotments. It also began the Soil-Vegetation Inventory Method (SVIM), implemented throughout the West, and inventoried everything. BLM inventory is good in NM, and one of the best in the West.
Forest Service – biased toward measuring trees, not grass, and has used the intensive Parker 3-Step Methodology to measure "clusters". This method is time-consuming, but has to be kept for continuity.
NRCS – had a system based on state transition models and thresholds, but it has been abandoned conceptually and in practice.

Often, decisions are based on ocular estimations, e.g. “That’s the way it’s supposed to look this time of year.”

Methods: *Monitoring Rangelands in NM: Range, Riparian, Water Quality, and Wildlife,* Report 53: A general introduction to monitoring range resources, which follows an approach of three levels of increasing thoroughness.
Rapid Assessment Methodology (RAM), Report 58: Developed by NMSU to rapidly assess forage availability on USFS allotments following years drought, to determine if enough forage is available to allow for livestock grazing through September while maintaining the sustainability of the resource.
Both Reports are available at http://cahe.nmsu.edu/pubs/_ritf/
General Methods and Contents:

- Selection of Key Areas
- Soil Moisture Depth
- Photo Points
- Step-Point Intercept: cover, plant species composition, and herbaceous stubble height
- Available or Residual Biomass: Clipping 6”x24” frames
- Pellet Transect: Index Cow, Deer, Elk
- General Observations

Monitoring specific to invasive salt cedar on the Canadian River: Before-After-Control-Impact (BACI)

- Permanent Photo Point: landscape and ground-level
- Vegetation: canopy cover, herbicide effectiveness, composition, ground cover, and herbaceous biomass
- Soil: moisture, salinity, fertility
- Wildlife: large herbivore use and bird surveys
- Riparian: community classification and channel profile

Image-Based Resource Monitoring using Ultra-light Aircraft
Nine different federal laws say we need to monitor natural resources.
Conventional rangeland monitoring:

- Subject to technician bias and stress
- Risk of error in paper handling
- Time critical (phenol. & comparative sampling)
- High variability and/or low repeatability make data validation difficult or impossible
- Travel time = inefficient use of trained personnel
- Expen$ive
- Statistical analysis is not easy

Digital Images:

- capture background details
- create a permanent record that allows data verification.

Advantages of Digital Data Storage and Analysis

- Low-cost storage: 500 GB (500 billion bytes) ~$250.
- Computers and software make it easy to analyze thousands of images.
- Automatic data entry (no paper).

NMSU Corona Ranch Project Objectives

- General rangeland survey: ground cover assessment

Assessment of PJ: Recruitment, Biomass, Control efforts

Water

Chris Cudia -
Special Monitoring Activities in Northeastern New Mexico
Ellen Soles –
Store in a Cool, Wet Place: Monitoring long-term remediation effects on alluvial groundwater capture

Monitoring long-term remediation effects on alluvial groundwater capture: An "over-bank event" is desired at peak discharge. Water will seep into the surrounding valley, and increase base flow steadiness. Monitoring is done by local volunteers using simple instruments and/or wells.

Special Monitoring Activities:
Gallinas Watershed Forest Management/BMP Effectiveness & Temperature Sample Parameters:

- Chemistry: Suspended Solids, Dissolved Solids, N, and P
- Biology/Habitat: Detailed stream mapping; Nutrient Survey; Quantitative evaluation of instream insect community; water or air temperature; DO, pH, Temp, Conductance and Turbidity.

Moreno Valley Temperature Research Goals

- Studies to investigate the degree to which riparian areas buffer water temperature.
- Compare the difference between instantaneous peak air and water temperature
- Compare the lag time between a peak in air temp and a corresponding peak in water temperature

Day 2 Summary (email from Ken Smith to participants)

To all the monitoring meeting attendees,

Thanks again for such a great level of participation. If you are interested in obtaining further information about any particular project, I would suggest that you contact the speaker of interest.

On Tuesday, a smaller group of about 20 met for 2 hours over coffee and green chile cheese enchiladas, and we discussed several topics which I will summarize below.

Kim Eichhorst informed us of the latest activities of BEMP and their desire to be included in any statewide monitoring collaboration. They have over 3800 K-12 students participating in their monitoring efforts, and they collect information on a wide range of variables. Impressive to say the least.

Adam Ringia was pleased to see the inclusion of wildlife/bird protocols in several of the projects. He asked if most projects/land managers thought that watershed health included high quality habitat for birds. Good question.

Much of the discussion on Tuesday was focused on the issues of a statewide monitoring database and how we can organize New Mexico's monitoring community to change decision making at all levels (field, office, Santa Fe, Wash., D.C.).

The Forest and Watershed Health Office is currently working on building a map that will have point data for forest and watershed projects (restoration, hazardous fuel reduction, WUI, etc.) around the state. They are in the process of approaching the land management agencies to obtain locations and metadata for these projects. Once the first edition of this map gets posted on their website this fall, we will be able to see where the gaps/needs are and we can move forward from there. It is clear that some agencies have this information in an accessible format, others don't. Contact Susan Rich for further information.

The development of a statewide monitoring database was met with a cool reception, although there was general agreement that there is a need to synthesize monitoring information collected across the state. Possible approaches include a meta-analysis (across a broad array of projects)or to closely examine individual case studies and each individual outcome.

The idea of forming a New Mexico Monitoring Council was discussed, and the potential agenda for this council included the following:

- promote the use of a small subset of standard protocols by all monitoring projects
- to understand and overcome the barriers in extracting meaning from monitoring
- to help address political barriers, how to encourage monitoring across all agencies
- to create an interface with policy makers, to create a group that can deliver an answer when asked if watershed "X" is improving in health or declining in health
- define the big unanswered questions, e.g., what does the successful restoration of a mixed conifer forest look like
- to get monitoring results in the hands of land managers, to promote adaptive management

We will likely organize another monitoring meeting sometime after the release of the statewide watershed restoration project map and before the spring New Mexico Watershed Forum, which is scheduled for the 1st week in May. I envision a one day affair, to discuss the map, the potential Monitoring Council, and to hear from a couple of ongoing projects that were not highlighted at Sevilleta.

Please feel free to contact me or Susan Rich at any time with your thoughts and comments, regards, Ken