APPENDIX 01 – SOCIAL SURVEY

STAKEHOLDER KNOWLEDGE AND ATTITUDES REGARDING WATER QUALITY IMPROVEMENT PLANNING FOR THE LOWER EMBUDO VALLEY, NEW MEXICO

A Report of Findings and Action Recommendations based on a Social Survey conducted in 2014

By Jan-Willem Jansens (Ecotone Landscape Planning, LLC)

December 16, 2014 – Edited and Updated October 31, 2019

Table of Contents

1. Introduction

Between early 2013 and early 2015, the project ***Clean Water for the Embudo Watershed in the 21st Century (the Proyecto Embudo de Agua Sagrada)*** aims to collect data and develop a detailed action plan for future watershed restoration in the Lower Rio Embudo watershed. This data gathering activity includes a survey of area residents and stakeholders. The survey consists of 3 parts for 3 different stakeholder groups:

1. Institutional Stakeholders: public agency landowners/partners in the Lower Embudo Valley (e.g., BLM, US Forest Service, State Land Office, Rio Arriba County) (coded "INST")
2. Other Stakeholders: living outside the target watershed area (coded "OTHE")
3. Local Private Landowners and Residents: living in the watershed area (coded "PRIV")

Between February and August 2014 the project conducted a survey of institutional partners (INST), stakeholders outside the area (OTHE), and local watershed residents (PRIV) of the Lower Embudo Valley. The survey was conducted in the form of a printed questionnaire. The survey with institutional partners was conducted largely in the form of meetings with agency representatives between April and August 2014. For purposes of methodological rigor and authority needed to meet anticipated EPA-QAPP standards and for purposes of ease in questionnaire administration and analysis, a questionnaire format was chosen based on the Social Indicator Planning & Evaluation System (SIPES) for Non-point Source Management, an EPA-supported methodology developed for watershed resident and stakeholder surveys in the Lake States[1]. The questionnaire was adapted to include issues and wording that are relevant to the Lower Embudo Valley area. The questionnaire was expanded with a question guide for the meetings with institutional partners.

The **purpose of the survey** was to collect base-line information which would be used to develop follow-up surveys that help measure change in land management practices that improve water quality in the Lower Embudo River. A more immediate purpose of the survey was to include local residents, other stakeholders, and institutional land managers in the project planning process and gather information on people's knowledge, opinions, and choices about a variety of aspects concerning water quality improvements in the study area. The information gathered would also be used to formulate recommendations for suggested actions and land use practices for landowners to improve water quality in critical areas throughout the Lower Embudo Valley.

This report documents and analyses the findings of the survey and offers recommendations for future follow-up surveys and for planning aspects and future project implementation techniques to be included for the Watershed-based Plan for the Lower Embudo Valley.

[1] Genskow, Ken and Linda Prokopy (eds.). 2011. *The Social Indicator Planning and Evaluation System (SIPES) for Nonpoint Source Management: A Handbook for Watershed Projects.* 3rd Edition. Great Lakes Regional Water Program. (104 pages).

2. Survey Methodology

2.1. Survey Section INST

Questionnaire Format

The questionnaire for institutional partners (INST) was based on the SIPES format and included only 5 pages, including a cover page with explanations and justifications for the survey and a final page for respondents to offer any additional information in narrative form. The questionnaire included the following sections: Rating of Water Quality, Your Water Resources, Your Opinions, Water Impairments, Sources of Water Pollution, Consequences of Poor Water Quality, and Information Sources. Apart from the SIPES questionnaire, a separate question list was developed as a conversation guide for a sit-down meeting with representatives of each major land management agency (BLM, US Forest Service, State Land Office, and Rio Arriba County) to gather detailed information and insights about the agency's jurisdiction and leverage on others to encourage certain land management practices, and about land use policies, management measures, maintenance costs, regulatory procedures for decision making regarding land and water use, and the format in which the agency could be involved in the process for completing the Watershed-Based Plan for the Lower Embudo Watershed.

The questionnaire cover page stated that "any information you enter in the survey will remain anonymous and is entirely confidential."

Distribution, Sample Size, and Response Rate

The INST questionnaire was distributed by e-mail to key representatives of each agency. Subsequently, follow-up e-mail and phone calls were made to request personal meetings. This led to two meetings with Rio Arriba County representatives on April 2 and 4, 2014, and two meetings with State Land Office (SLO) representatives on April 8 and November 4, 2014. Official letters and follow-up e-mails to the BLM and US Forest Service resulted in meetings with each of these agencies on August 18, 2014.

Most agency representatives felt that the questionnaire was not appropriate for them to complete because the questions elicited responses that would be too subjective, and they felt that they could not speak for the agency in offering responses to the questionnaire. In the first group meeting with Rio Arriba County staff, one questionnaire was completed in an interview format in which all participants offered feedback and the interviewer (Jan-Willem Jansens) completed the questionnaire based on consensus of the group. Additionally, one BLM staff member completed a questionnaire online, and mentioned in an e-mail that the responses were solely her own opinions and not representative of an agency opinion. During the November 4 meeting with SLO also one questionnaire was completed in an interview format in which all participants offered feedback and the interviewer (Jan-Willem Jansens) completed the questionnaire based on consensus of the group.

As a result, sample size and response rate considerations were irrelevant concerning the INST questionnaire. Detailed feedback for each agency is included in appendices to this report.

2.2. Survey Section OTHE

Questionnaire Format

The questionnaire for other stakeholders that live outside the watershed (OTHE) also included 5 pages, including a cover page with explanations and justifications for the survey and a final page for respondents to offer any additional information in narrative form.

The questionnaire was based on the SIPES method and included the following sections: Rating of Water Quality, Your Water Resources, Your Opinions, Water Impairments, Sources of Water Pollution, Consequences of Poor Water Quality, and Information Sources. The web-based SIDMA tool was used to store, analyze and manage the core data collected in the questionnaire.

The questionnaire cover page stated that "any information you enter in the survey will remain anonymous and is entirely confidential. If you have any questions about the survey or the use of the gathered information, please contact Jan-Willem Jansens of Ecotone at jwjansens@gmail.com."

Distribution, Sample Size, and Response Rate

The OTHE questionnaire was distributed in a variety of ways in order to optimize the number of respondents in the face of a diverse target population. The target population for the OTHE category includes residents in the Upper Embudo Watershed (Peñasco and Chamisal areas), residents in the communities of Embudo and Rinconada, immediately outside the watershed, and downstream residents, businesses, and institutions in Velarde and farther downstream, including Espanola and Santa Fe. While no exact data exist about the population numbers for this target group, an estimate would be in the order of 100,000.

Project budget limitations prohibited a comprehensive strategy to reach even a representative sample of this group and to follow the 5-step distribution and follow-up process recommended by the SIPES method. Targeted e-mail/internet distribution was nearly impossible because there are no complete e-mail address lists for the target population. Mail or phone distribution faced similar challenges and also the real chance of high levels of no-response due to the population's expected low level of familiarity with surveys of the kind developed for this project. Instead, distribution has been very limited and informal. As a result, it has proven challenging or impossible to reach this target population and to track distribution precisely in terms of the number of questionnaire copies that were distributed. Distribution methods included:

- Personal distribution to individuals and questionnaire fill-out group meetings (approx. 5 copies distributed)
- E-mail distribution to a selected population on a mailing developed in the past for projects in the Lower Embudo Valley (14 copies distributed)

Additionally, the distribution of the PRIV questionnaire version via the local e-mail list serve (TownCrier) reached approximately 825 addresses, of which perhaps about half are of the target population of "other stakeholders." The PRIV questionnaire is an expanded format of the

OTHE format, and we can therefore assume that about 400 respondents in the "other stakeholders" category received this questionnaire. However, responses from any people who received the questionnaire in this manner have been included in the analysis of the PRIV format (see below).

As a result, the total distribution estimate for questionnaires in the category OTHE was 19 copies.

Only 4 questionnaires of the 19 have been returned, which represents a response rate of 21%. However, the distribution rate and this response rate are too low to draw any representative conclusions from the OTHE questionnaires.

2.3. Survey Section PRIV

Questionnaire Format

The questionnaire for private landowners and residents (PRIV) included 16 pages, including a cover page with explanations and justifications for the survey and a final page for respondents to offer any additional information in narrative form. The questionnaire included a 2-page "Respondent Background Information Section", which was not based on the SIPES methodology and analyzed separately from the Social Indicator Data Management & Analysis (SIDMA) tool of the SIPES method. The "Respondent Background Information Section" was added to gather detailed respondent reference data to analyze survey outcomes in relation to *acequia* communities and terrain types within the Lower Embudo Valley, and to offer respondents a set of questions related to critical *acequia* issues such as maintenance, *repartimiento*, irrigation strategies, and habitat management which *parciantes* and others shared during the 2013 *Celebrando las Acequias* event.

The core questionnaire based on SIPES included 12 pages with the following sections: Rating of Water Quality, Your Water Resources, Your Opinions, Water Impairments, Sources of Water Pollution, Consequences of Poor Water Quality, Practices to Improve Water Quality, Specific Constraints of Practices, Making Decisions for my Property, About Your Farm Operation, About You, and Information Sources.

The questionnaire cover page stated that "any information you enter in the survey will remain anonymous and is entirely confidential. If you have any questions about the survey or the use of the gathered information, please contact Jan-Willem Jansens of Ecotone at jwjansens@gmail.com."

The web-based SIDMA tool was used to store, analyze and manage the core data collected in the 12-page questionnaire. A manual tally was conducted to analyze and manage the 2-page "Respondent Background Information Section" and any additional narrative offered by respondents.

Distribution, Sample Size, and Response Rate

The PRIV questionnaire was distributed in a variety of ways in order to optimize the number of respondents in the face of a diverse target population. Project budget limitations prohibited the

5-step distribution and follow-up process recommended by the SIPES method. Targeted e-mail/internet distribution was nearly impossible because there are no complete e-mail address lists for the target population. Mail or phone distribution faced similar challenges and also the real chance of high levels of no-response due to the complexity and length of the questionnaire and the population's expected low level of familiarity with surveys of the kind developed for this project. Instead, distribution has been limited, but random and informal. As a result, it has proven challenging or impossible to track distribution precisely in terms of the number of questionnaire copies that were distributed. Distribution methods included:

- Distribution via an e-mail list serve (TownCrier) with a reach of approximately 825 addresses, both inside and outside the study area. No data exist on the number of people on this list that live inside the study area. We estimate that this may roughly be 50% of the list (about 400) or more.
- Distribution via a stack of questionnaires that people could pick up at the Dixon Coop Market (50 copies placed; about 40 copies taken).
- Personal distribution to individuals (approx. 10 copies)
- Questionnaire fill-out group meetings (approx. 15 copies distributed).

Total distribution estimate: 465 copies.

No exact data exist about the population numbers for the study area. An estimate based on a study of 2010 Census data for Zip Code areas in the study area has led to a best guess of 1,182 individuals in 550 households. The target population consisted of residents of the study area (the Lower Embudo Valley), which included partially the Zip Code area of Chamisal/Ojo Sarco (87521, we estimate 15%) and Rinconada/Embudo (87531, we estimate 25%), and all of the Zip Code areas of Las Trampas (87576) and Dixon (87527). See Table 1 for a detailed number estimate.

According to Table D2 (p.24) in the SIPES manual[2] which quotes Dillman (2000)[3], the sample size for a population of 550 households would be approximately 220 (217 for 535 people) or 40% of the target population size, and the number of questionnaires to distribute would be equal to the number of the target population due to the relatively small target population (based on a target of 95% confidence and a sample error of +/- 5%).

If there was possibly a 10% overlap in distribution and in people per household that received the questionnaire between the various forms of questionnaire distribution (and we discount any potential population growth or decline between 2009 when Census data were taken and 2014), the effective distribution estimate was 419, which represents 76% of the households in the study area.

[2] Genskow, Ken and Linda Prokopy (eds.). 2011. *The Social Indicator Planning and Evaluation System (SIPES) for Nonpoint Source Management: A Handbook for Watershed Projects.* 3rd Edition. Great Lakes Regional Water Program. (104 pages).

[3] Dillman, D.A.(2000) *Mail and Internet Surveys: The Tailored Design Method.* 2nd Ed. New York, NY: John Wiley and Sons.

Table 1. Target Population for the Study Area[4]

Population Characteristics	Study Area Profile	Respondent Profile	Comparison
Demographics per Zip Code			
87521: Chamisal/Ojo Sarco: Pop: 1003; Househ: 422; Families: 264; Non-fam: 158	Pop: 150; Househ: 64; Families: 40; Non-fam: 24	1 = 1.6% of households	Majority in Chamisal, Ojito and Vallecito; Chamisal and Ojito are outside the study area. Estimate of 15% in study area.
87527: Dixon Pop: 880; Househ: 413; Families: 236; Non-fam: 177	Pop: 880; Househ: 413; Families: 236; Non-fam: 177	11 = 2.7% of households	
87531: Embudo/Rinconada Pop: 368; Househ: 195; Families: 92; Non-fam: 103	Pop: 92; Househ: 49; Families: 23; Non-fam: 26	5 = 5.4% of households	Includes populations outside of the study area (watershed): in Rinconada, el Rincon, la Bolsa, Cienaga, Embudo, Embudo Station, etc. Estimate of 25% on study area
87576: Las Trampas/El Valle Pop: 60; Househ: N/A; Families: N/A; Non-fam: N/A	Pop: 60; Househ: N/A; Families: N/A; Non-fam: N/A	0	
Total Area Pop: 2311 Househ: 1030 (-1055) Families: 592 (-608) Non-fam: 348 (-357)	**Pop: 1182 Househ: 526 (-551) Families: 299 (-315) Non-fam: 227 (-236)**	**17 (+ 1 no answer) = 18 = 1.7% of house-holds**	

Note: "Family households" consist of a householder and one or more other people related to the householder by birth, marriage, or adoption. They do not include same-sex married couples even if the marriage was performed in a state issuing marriage certificates for same-sex couples. Same-sex couple households are included in the family households category if there is at least one additional person related to the householder by birth or adoption. Same-sex couple households with no relatives of the householder present are tabulated in nonfamily households. "Nonfamily households" consist of people living alone and households which do not have any members related to the householder.

The response rate of PRIV questionnaires was 18 copies, which represents a little over 8% of the sample size of 220. As stated above, the SIPES/SIDMA response rate goal is 40%. As a result, the response rate is very low and potentially inadequate to serve as a basis for statistically reliable conclusions. Yet, if the respondent population profile were closely representative of the demographic profile of the target community, the level of reliability of the survey outcomes would be considerably better and useful, with some care, for generalized conclusions.

The respondent profile, however, is biased toward older (60+), well educated, higher-income, males from the Dixon and Embudo area, who nearly all are landowners and *parciantes*. Therefore, the following description of survey outcomes are seriously annotated with contextual information about the respondents based on the "Respondent Background

[4] US Census 2010: http://www.zip-codes.com/zip-code/87527/zip-code-87527-2010-census.asp

Information Section" of the questionnaire in order to render the responses as useful for generalization as is possible and prudent.

The response rate to the questionnaire was low due to (a) insufficient budget to implement broad and repeated questionnaire distribution and follow-up as is recommended by SIPES, and (b) the length and complexity of the questionnaire in relation to the target audience's limited capability for responding to such a survey. While initially designed to be approximately 12 pages long, the questionnaire was increased in size due to the addition of the "Respondent Background Information Section" and a few questions that were added to the core SIPES questions to make the survey more appropriate for the target audience (also because certain core questions that were less appropriate could not be changed). Additionally, it would have perhaps been useful to have a Spanish version of the questionnaire in order to reach the Hispanic segment of the target audience. Finally, budget limitations and the distribution method of the questionnaire largely precluded the possibility to personalize the request to that individuals of the target audience to complete the questionnaire. A more personalized approach would certainly have helped increase the rate of response.

3. Analysis of Survey Reponses

3.1. Response Analysis for the category "Institutional Stakeholders" (INST)

In this section, each institutional stakeholder will be described separately, because they represent separate jurisdictional areas and different management authorities within the watershed. The four main institutional stakeholders include the US Forest Service (USFS), Bureau of Land Management (BLM), New Mexico State Land Office (SLO), and Rio Arriba County (RAC).

US Forest Service: The Embudo Watershed is the area that currently has the highest management priority for the Camino Real Ranger District. The District is completing a NEPA process for about 6,000 acres as part of a 70,000-acre forest area to clear the area for thinning prescriptions that would reduce catastrophic wildfire risk in the area. Annual thinning would cover 300-400 acres/yr for 15-20 years. The NEPA assessment for this area still needs work on the overall NEPA needs regarding trails and trailheads, range, streams, and decommissioning roads. Half (50%) of the fuel wood to be generated by the 6,000 acres would be for the community. The District also issued a travel management decision that identified which roads are appropriate for motorized use. The District is well aware that most roads need maintenance and repair work. Yet, the quantity of this work is unknown. Forest thinning and road work would potentially have significant positive impacts on watershed health.

The USFS is in need of funding to implement the proposed thinning work once the area has cleared the NEPA process. It is hoped that a completed and updated Watershed-based Plan would potentially help the USFS obtain funds for this work. The USFS also needs assistance with water sampling on the national forest lands.

The USFS addresses watershed health issues and the restoration of soil conditions mostly through the BMPs issued in the national Forest Service Handbook. BMPs specify how to implement a forest management activity, such as thinning or burning certain timber stands. Through Operating Plans and annual inspections (e.g., for road maintenance, permittee activities, easements, and contracted work), the USFS collaborates with others and can leverage land use on Forest Lands, adjacent lands, inholdings, easement corridors, etc. While the entire national forest is in principle open to grazing, only specific areas are being grazed. The USFS does not have any specific rules for the protection of waterways or riparian areas; e.g., there are no buffer zone rules, because the agency does not have the capacity to enforce such land management techniques.

BLM: All terrain and natural resource management direction for the area is based on the 2012 Resource Management Plan (RMP) for the Taos Field Office area[5]. The RMP includes various sections that are of importance to formulating recommendations in the Lower Embudo Watershed WBP document in order to best meet BLM standards:

[5] US Department of the Interior. Bureau of Land Management. 2012. Taos Resource Management Plan, May 2012, New Mexico. Taos Field Office. BLM/NM/PL-12-09-1610.

- Goals, Objectives, and General Management Guidance for BLM areas in our study area (particularly the Palacio Management Unit).
- Appendix A: Management Prescriptions for Special Designations (e.g., for the Lower Gorge/Copper Hill Unit Areas of Critical Environmental Concern.
- Appendix C, pp 151-168: summary of BLM Best Management Practices.
- Appendix E, pp 173-187: Overview of the Paso Planning Area Wild and Scenic Rivers Evaluation Report (Ojo Sarco and Rio de las Trampas).

Note: BMP land use standards and BMPs described in the RMP include buffer zones, restrictions to grazing, fencing, road management prescriptions, etc., which all have direct effect on soil and water conservation conditions and all over watershed health.

BLM has few examples of practical land management experience in the area. Areas treated in the last few decades include a thinning are a west of Picuris Pueblo (1,000 acres completed on parcels west of Picuris Pueblo, about 15 years ago), road closures, trash management work, a stream restoration project in the Cañada de Ojo Sarco, and the 2013 arroyo and wetland restoration work done in the Cañoncito area with RERI funds. Agency staff is researching wetlands and riparian areas west of Picuris. Monthly, BLM is collecting data on water quality in the Rio Embudo west of Picuris Pueblo: DO, temp, etc. BLM is ready to share data.

Thinning generated great grass regeneration response, in combination with direct seeding of native grasses and fire (prescribed burn). BLM has maintained piñon-juniper woodlands with a return cycle of 30-40 years. There currently is a need to focus on ponderosa pine forest in the Copper Hill area (west of Picuris); these forests have a response time after thinning of 12-18 months.

BLM collaborates with or seeks cooperation with neighbors for land and resource management activities. Through collaboration and cooperation, the agency has leverage on adjacent lands. BLM has certain resource management authority only on BLM lands. BLM conducts outreach to contact communities in our study area through the TownCrier. Other critical constituencies are the *acequia* communities, (grazing) permittees, tribes (one-on-one), and the NM OHV alliance.

BLM's road closures appear to be very effective (with repeated boulder obstacles – rather than with earthen water bars, like the USFS uses). Besides barring access to OHV/ORVs, the measures have reduced illegal trash dumping. Annually, BLM spends $3,000 annually on boulders to close roads. BLM works with Mark Hildeschein's OHV Education Program of the NM Game & Fish Department.

New Mexico State Land Office: SLO staff have great concern about the water quality in the Lower Embudo River, particularly for irrigation, eating locally caught fish, fish habitat, and scenic beauty. They recognize that irrigation is probably the most important use of water in the area. They have a sense that the SLO would be willing to adapt its resource management approach to improve water quality in the area. The SLO has some leverage to do so by working with its grazing permittees and other partners and neighbors. SLO staff recognize that sediment in the water, including turbidity, and flow alterations are the most important causes of impairments in the Rio Embudo. SLO staff also recognize that the sources of impairment are

multiple. SLO is very interested in collaborating on beaver management on State Trust Lands and on establishing in lieu fee services programs with the US Army Corps to obtain financial opportunity for wetland and riparian restoration on State Trust Lands. SLO staff are very interested in learning from the Watershed-based Planning project to adopt and support newly recommended land management and restoration strategies. SLO is also interested to be part of creative funding and collaboration strategies to participate in collaborative land restoration projects.

Rio Arriba County: RAC only has jurisdiction on unincorporated private lands of the County. RAC would like to do more education work to increase its leverage on Federal and State lands within the County for increased access for residents that fosters multiple use activities. RAC tries through regulations to inform and help individual landowners and residents "meet their self-interest" (esp. regarding public and individual health and safety). RAC has some history of collaboration and ongoing communication with public agencies, such as BLM and USFS.

RAC has no watershed protection measures in place other than its "Yellow Book" (land use code)[6], which addresses zoning and land use regulations. RAC has good regulations on floodplain management and buffer zones, and would like to see more water retention higher up in the watersheds. RAC also has an agriculture protection ordinance to keep farm land undeveloped.
RAC has no information on cost effectiveness and cost-benefit balance of its terrain and road management work.

RAC wants to include indigenous and traditional knowledge and know-how. Recommendations in the Watershed-based Plan should address and accommodate indigenous and traditional knowledge, know-how and land use/stewardship practices. RAC would like the Watershed-based Plan recommendations to encourage collaboration and coordination with public land management agencies for landscape-wide management/stewardship approaches. RAC would like to see better maintenance of utility corridors (for fire protection); but RAC has no leverage on utilities on private or public lands.

RAC suggests that educational notices/letters be sent to private landowners regarding safety (RAC does this occasionally); esp. concerning vegetation management, drainage, roads, flooding, fire, etc. with emphasis on the context of the landscape and its uses, and site specific solutions or mitigation methods. E.g., RAC would typically suggest various options to improve problems with malfunctioning culverts: education of technicians, improved maintenance, or removing them.

RAC suggests that WBP recommendations strike a balance (between science and practicality) so that WBP recommendations are (1) feasible for local people, (2) inclusive of local knowledge and sound science, (3) equitable to the local people and cultures, (4) helping maintain local, viable communities/economies, (5) supporting County regulations, and (6) supporting local health and safety. Furthermore, RAC is concerned about forest fires, water pollution, and solid

[6] Rio Arriba County. 2012. Design and Development Regulation System. Ordinance 2012-001. (Yellow Book). 89 pp. http://www.rio-arriba.org/pdf/departments_and_divisions/planning___zoning_/final_yellow_book.pdf

waste pollution on land and in water ways. RAC wants to encourage forest thinning, water quality improvements (such as planned for the Embudo Valley), and waste management solutions. RAC would like to see economic development opportunities in the Lower Embudo Valley regarding aqua-culture (fish hatcheries). RAC would also like to see more water harvesting and storage in communities (e.g., around buildings and passive water harvesting/ infiltration on the land).

RAC needs to bring more resources to the roads department (e.g., PILT payments), and RAC road maintenance crew people need training (e.g., the Bill Zeedyk road training). RAC is interested in project data on runoff and pollution levels gathered by the WBP project.

3.2. Response Analysis for the category "Other Stakeholders" (OTHE)

The average results of the 4 respondents of the OTHE survey showed greatest concern of water quality for eating local fish and for fish habitat, followed by a concern of water quality for irrigation. Yet, they largely agreed that irrigation was the most important local use of water. The respondents were in full agreement that water quality is not impacting scenic beauty much. However, opinions were mixed about how water quality issues in the Embudo Valley should be addressed.

Respondents seemed to agree that – in decreasing importance – the most serious impairments are the relatively high water temperature, the sediment in the river and cloudiness of the water.

Respondents were also in general agreement that littering and illegal dumping constitute the most problematic sources of water pollution, followed by storm water runoff from roads, soil loss from channels, range grazing, and forest management. Channelization, removal of riparian vegetation, and streambank modification/destabilization were seen as least problematic sources of water pollution.

Respondents also seemed in agreement that loss of desired fish species and siltation of reservoirs, *acequias*, and lakes/ponds constitute the most important consequences of poor water quality. Reduced scenic beauty, increased flood hazard, and damage to property were seen as consequences of lower importance.

Respondents generally placed the highest level of trust in local watershed groups, Soil & Water Conservation District advice, personal observations and experiences, and NRCS staff as sources of information on watershed issues. Public land management agencies, neighbors and friends, and printed or digital media were least trusted as sources of information on watershed issues.

3.3. Response Analysis for the category "Local, Private Landowners and Residents" (PRIV) Respondent Profiles

Comparison of the pool of respondents with census information for the area shows that the respondents are not representative of the area population. However biased, the respondent pool is far from homogeneous and shows a considerable spread regarding social-economic conditions and farming conditions.

The pool of respondents is biased toward older (60+), well educated, higher-income, males from Dixon and Embudo area, who are mostly landowners (no tenants; or perhaps 1), and all of whom are *parciantes*. The age of the respondents is biased to older people (mean age of 63.75 y), while the mean age of the population in the respondent communities is about 15 years younger. The gender of respondents is biased toward males (69.8% vs. around 50%-51% in the general population of the respondent communities). Respondent income levels are also higher than those of the overall population; the respondents' mean annual income is around $40,000; while that in the communities is below $25,000/year.

Respondents are largely in control of home and yard decisions. A few leave decisions to others. All respondents make decisions about farm and property themselves or with close relatives or business partners.

Schooling levels of the respondents (62.4% has completed 4-year college or (post)graduate degrees) are also higher than those in the communities.

Most respondents seem to have a mixed income from farming, off-farm income (29.4% has half-time or more income off farm), and retirement benefits from off-farm jobs (52.9%). Only 29.4% of respondents say to be involved in an agricultural operation, although 75% says that they are not (not even partly) retired from farming. This means that most respondents are still farming, even if it is for subsistence or hobby purposes.

Respondents' production areas are small and variable:

- Tillable acreage: mean 3.88 acre (range 0.5-21 ac; SD 4.96)
- Pasture: mean 1.71 acre (range 0-8 ac; SD 2.6)
- Conservation Set-Aside: mean 0.24 acre (range 0-1.5 ac; SD 0.47)
- Forest/woodland: mean 1.65 acre (range 0-20 ac; SD 4.88)
- Other crops (including alfalfa, hay and orchards): mean 2.35 acre (range 0-21 ac; SD 5).

Respondents have many years of farming experience (mean 32.47 y, range 5-75 y; SD 18.28).

The majority of respondents' farms was not previously owned by relatives (70.6%). However, for those families where relatives owned the farm previously, most farms have been in the family for 3 generation or more (mean 82.5 years; range 60-100 y; SD 20.64). Respondents believe that they can and will reverse the trend to keep most farms in the family; 62.5 % definitely or probably will keep the farm operation going in the family. Many respondents believe that in 5 years things will be largely the same as today, while 29.4% don't know. Some (17.6%) believe that the farm operation will grow; a few (5.9%) believe that it will shrink.

Few respondents' farms include livestock. One farm has about 1000 poultry; a few other farms have 1 cow.

A majority (58.8%) of respondents' farms touches a stream.

Respondents overwhelmingly get their information about soil and water conservation and water quality issues from workshops, demonstrations and meetings; from conversations with others; or from newsletters, brochures, and fact sheets. Roughly 50% (or slightly less) of the respondents also gets information from newsletters, magazines, trades publications, and the internet. Nearly 79% of respondents uses internet and/or e-mail (despite their age and rural living conditions).

Respondent categories that are under-represented are those younger than age 60, lower educated, lower income, tenants, female, from communities such as Ojo Sarco and Las Trampas (forest land areas), and *non-parciantes* / non-farmers (foresters, ranchers, commuters). Populations entirely absent in the respondent pool include young people under age 29, people from Las Trampas, tenants, people who have no farming experience, and people who are not *parciantes*.

Response Findings and Analysis

Knowledge and Opinions:

The average results of the respondents of the PRIV survey show greatest concern of fish habitat, boating, and water quality for eating local fish. Respondents are in full agreement that water quality is not having much impact on scenic beauty. They are also not very concerned about water quality impacts on irrigation. Respondents seem to agree that everyone is personally responsible to maintain or improve water quality. However, people's willingness is low to change their stewardship or management practices or to pay more to improve water quality. People feel that either others have to contribute to change, or that they are already doing a good job despite the problems.

There seems to be near general agreement that sediment is the most important form of water quality impairment. The concepts of flow alteration and high water temperatures as impairments are difficult for people to grasp. Despite respondents concern of fish habitat and eating local fish, water quality for fish seems to have lost its importance in the community, and the cloudiness of water (turbidity) and its impact of fish habitat do not seem to be of much importance for respondents in the PRIV category. This attitude may mean that respondents are not aware of the impacts of turbidity on fish habitat.

While respondents are rather certain in their responses (few indications of "Don't know"), respondents differ strongly in opinion about the degree by which water quality impairment is caused by trash and debris or not, and whether littering and illegal dumping of trash are the most important and most severe sources of pollution. This may be a variation in awareness and opinion or it may be an indication that trash problems only occur in certain neighborhoods.

Respondents are quite certain that important sources of water pollution include stormwater runoff originating from dirt roads, highways and parking lots, followed by (and stated with greater uncertainty) erosion from wildlands, rangelands, and derelict lands. Respondents mention (with high levels of disagreement) that more moderate sources include land

development and re-development, outdoor recreation activities (such as ORVs) (highly controversial), stream channelization (low uncertainty), and soil loss from stream channels. Respondents agree also that other moderate sources include streambank modification/de-stabilization (highest "moderate" score), and removal of riparian vegetation (highest level of agreement: "slight-moderate"). Respondents seem to agree least and also seem to be least certain about various sources of impairment that they deem of lower importance, such as "natural sources" (controversial and uncertain), forest management (controversial), and range grazing (highest level of controversy). Yet, perhaps as to be expected in a traditionally agricultural area, most respondents give low scores to agriculture-related activities as sources of water pollution.

While respondents feel that fish are not important in relation to water quality, they do feel (with a high level of uncertainty; i.e., many who indicated "Don't know") that loss of fish is a serious consequence of water pollution. Respondents also see increased flooding and other public safety hazards due to sediment as an important consequence of water pollution. Respondents highly differ in opinion about the relationship between water quality problems and silt in reservoirs, *acequias*, and on roads, and over the damage to property and property values. Perhaps consistent with varying opinions and perceptions regarding problems with littering and trash dumps, respondents believe that poor water quality in the Lower Embudo Valley does not have any significant consequences for reduced beauty of lakes and streams (scenic beauty) in the area.

Practices:

Respondents have varying experience with a number of practices that could improve water quality conditions in the area. Respondents have most experience with the following practices (in descending order of importance and relevance):

- Applying mulches
- Using fencing to exclude animals from critical areas
- Pruning of trees and shrubs
- Establishing pasture or hay crops
- Managing irrigation to reduce erosion
- Using prescribed burning
- Planting trees to reduce erosion
- Using cover crops for erosion protection and soil improvement
- Using terraces to reduce soil loss
- Using direct seeding/planting to establish trees and/or herbaceous cover
- Establishing permanent vegetation on retired agricultural land to reduce erosion

Respondents are less experience with the following practices, which also score lower as being seen as relevant in the area (in descending order of importance and relevance):

- Restoring native plant communities
- Managing runoff from roofs
- Restoring compacted soils
- Using contour buffer strips to reduce soil loss

Respondents show little experience or indicate very limited relevance for 12 other practices. It is perhaps surprising that respondents reject the following (with observations in italics):

- Planting vegetated riparian buffers *(the survey indicates that barriers are costs, time, lack of know-how, physical health limitations, lack of equipment, and no willingness to change; this may include that people want access to acequias and actually prefer to cut vegetation, and people seem to be poorly informed on how to manage arroyos and stream sides to prevent erosion)*
- Planting vegetation in critical erosion areas *(water may be a limiting factor for this practice, along with limited awareness, knowledge, experience, and funds; the survey lists the following barriers to applying mulches: costs, time, lack of equipment, no willingness to change, insufficient proof of benefits, property features, lack of know-how, and difficulty to use it in the farming operation)*
- Installing sediment basins to collect and store debris and sediment *(space, experience, funds, and required maintenance may be limiting factors)*

Other practices listed in the survey only pertain to specific forms of land use (grazing, forestry), which respondents are not familiar with, but which are relevant for stakeholders that were not included in the survey.

Barriers to change and to adoption of new practices:

Respondents indicate varying circumstances that limit their ability to make changes to management practices. The following are the eight most important barriers to (new) management practices:

1. Personal out-of-pocket expenses
2. No access to equipment
3. Lack of government funding for cost-share
4. Lack of physical ability
5. Confusion on where to get information or assistance
6. Requirements and restrictions of government grants/programs
7. General lack of information about management practices
8. Unwillingness to participate in government programs

There is great variability in opinion about these barriers, except for point #5. Most respondents are in agreement that it's hard to know where to get information and/or assistance. Respondents disagree most about access to equipment: some don't have this problem, while for others it's a great problem.

Lesser barriers include the need to learn new skills or techniques, the lack of being able to see a demo, legal restrictions, concerns for reduced yields, or approval from neighbors. Barriers of lower importance seem to coincide with greater respondent agreement about the barrier, but also with greater uncertainty (more "Don't know" responses) about listed issues as barriers or what the issues entail.

Based on the respondent profiles presented earlier, it should be expected that people with lower education level, fewer years of farming experience, and lower income, will mostly likely have even greater challenges with the listed top-eight barriers, as well as greater agreement about their challenges, but also greater uncertainty what these barriers might mean.

Trust of Information Sources:

Consistent with their indication of where they usually obtain information, respondents in the category Private Landowners (and Residents) (PRIV) indicated that they most trust the following sources of information (in decreasing order of importance):

- Personal observations and experience
- NM Acequia Association
- Local watershed groups and projects
- Local *acequia* associations
- Local community leaders
- Environmental groups
- Neighbors and friends
- The TownCrier (listserve)
- University Extension services
- Magazines and newspapers
- Brochures, pamphlets, and flyers

Respondents indicated limited to no trust in various water and agriculture related government agencies (state and federal), the Internet, consultants and contractors, and Rio Arriba County. Respondents showed particularly little trust in information from the prominent federal land management agencies that manage lands across the Lower Embudo Watershed.

Nearly 80% of the respondents has Internet access and often uses e-mail. Anecdotally, respondents also seem to communicate actively via FaceBook about farm and (*acequia*) irrigation practices, land and water conditions, food uses and marketing, and other farming related topics.

4. Conclusions for Follow-up Surveys

4.1. For data interpretation and extrapolation

As a result of the limited response to the surveys and the skewed demographics of the responders, we are missing data regarding forest and range management, regarding perceptions and attitudes from lower-educated, lower-income people, younger people, females, tenants (people without any long-term ties to the land), and people who are not related to any *acequias* or to the *acequia* culture & community.

The data are therefore only relevant to a subset of the population, and data interpretation should take this into consideration. Extrapolation of data is only tentatively possible and will require certain assumptions based on baseline demographic data of those areas that were poorly represented in the survey. The use of informal reports from community meetings in the area may enrich survey outcomes in this respect.

4.2. For increasing response rates

In so far future funds allow, it would be important to reach more people and a broader representation of the population with future repeat surveys and outreach and education activities. In order to conduct a survey that covers such a broader population, budgets should allow around $10,000 for follow-up survey tasks.

Additional outreach during an implementation phase of the project should focus on the groups missed by the survey. The approach should be conducted in ways that are appropriate to these demographic groups. This might mean that outreach and data collection is done in person, in Spanish, during meetings of these groups or populations, at locations and times appropriate to them, and with the use of wording that is specific to their circumstances.

5. Conclusions and Recommendations for Educational Outreach

5.1. Institutional Stakeholders

Knowledge, opinions, attitudes, perspectives

- **USFS:** Very large knowledge base; knowledge, opinions, attitudes and perspectives are variable and subject to change, based on staff (turnover), leadership, higher-level political conditions, emergencies and high-profile conflict conditions; dependent on NEPA-ready areas and available funding (limited); strong focus on wood/timber resources and their stressors (fire, pathogens, drought, theft, etc.); less on soil and water resources (management for soil and water addressed as/relegated to BMPs for vegetation management treatments or as special treatments in relation to roads, trails and grazing areas). Need for data, information, technical assistance (TA), collaboration on soil and water resource management. Seeks collaboration with other entities to get things done; Makes efforts to listen to and work with residents/users (but somewhat limited by staffing limitations and controversial relationships history).
- **BLM:** Large knowledge base; Knowledge, opinions, attitudes and perspectives are also variable/subject to change, based on staff (turnover), leadership, higher-level political conditions, emergencies and high-profile conflict conditions; dependent on NEPA-ready areas and available funding (very limited); some focus on ORV and road closure activities, woodland and riparian areas and resources and their stressors (grazing impacts, fire, pathogens, drought, erosion, etc.); somewhat on soil and water resources; explicit resource management policies and regulations for buffer zones, grazing regimes, etc. Need for data, information, TA, collaboration on soil and water resource management. Seeks collaboration with other entities to get things done; makes some attempts to work with residents/users (but seriously limited by staffing limitations and controversial relationships history).
- **SLO:** Limited knowledge base (dependent on staff); Knowledge, opinions, attitudes and perspectives are highly variable/subject to change, based on staff (turnover), leadership, higher-level political conditions, and emergencies and high-profile conflict conditions; funds are nearly all dependent leveraging and collaboration; large focus on working with permittees and making money to meet State mandate for supporting infrastructure needs; some focus on management of grazing, woodland and riparian areas); few to no explicit resource management policies and regulations. Great need for data, information, TA, collaboration on soil and water resource management. Highly dependent on collaboration with other entities to get things done; once collaboration is established, the agency can work fast and efficiently (but seriously limited by staffing limitations and politically defined relationships).
- **Rio Arriba County:** Limited knowledge base (dependent on staff); Knowledge, opinions, attitudes and perspectives are highly variable/subject to change, based on staff

(turnover), leadership, higher-level political conditions, and emergencies and high-profile conflict conditions; funding is are nearly all dependent on leveraging and collaboration; large focus on education and regulation enforcement; some focus on floodplain management, trash management, and irrigation planning; some explicit land resource management policies and regulations in the Yellow Book and other ordinances. Great need for data, information, TA, collaboration on runoff/flood control and soil and water resource management. Highly dependent on collaboration with other entities to get things done (seriously limited by staffing limitations and individually and politically defined relationships).

Capacity (policies, funds/costs, regulatory; staff); tools; authorities

- **USFS:** Extensive, detailed policies and regulations for planning and management at national, regional, and national forest levels; update of the Forest Plan will start in 2015; still operating under a 1988 plan with 16 amendments; 2-yr budget cycles for federal funds; also working with (leveraged) grant funding dependent on partnerships (e.g., CFRP); staff capacity dependent on long-term political and budget trends; great experience and many tools and mechanisms, equipment, crews, etc. for implementation; although capacity is limited. Far reaching authorities, but exclusive to national forest lands.
- **BLM:** Extensive, detailed policies and regulations for planning and management at national, regional, and (Taos) field office levels; just completed the 2012 Resource Management Plan (RMP), which includes guidance for management units, including areas in the Lower Embudo watershed; 2-yr budget cycles for federal funds; also working with (leveraged) grant funding dependent on partnerships; staff capacity dependent on long-term political and budget trends; experience embodied in staff; a limited selection of tools and mechanisms, some heavy equipment, and a small crew for implementation. Far reaching local authorities, but exclusive to BLM lands.
- **SLO:** Few policies and regulations. Most land management is delegated to permittees that operate the Trust Lands as if they are private property. Limited budgets; largely dependent on collaboration and (leveraged) grant funding of partners; staff capacity dependent on 4-year election cycles; experience embodied in staff; a limited selection of tools and mechanisms. Limited local authorities related to State Trust Lands.
- **Rio Arriba County:** Policies and regulations mostly described in land use ordinance ("Yellow Book") and other ordinances. Jurisdiction in unincorporated private lands of the County. No direct land or resource management authority other than on County Roads. Limited budgets; largely dependent on annual County budgets. Some collaboration and (leveraged) grant funding of partners. Significant staff capacity; experience embodied in staff; a considerable road management team; although training is needed.

Choices, priorities and priority areas (regarding land use, land management, land restoration, and BMPs)

- **USFS:** Embudo Valley is currently a top priority. 6000-acre NEPA cleared area will be the focus. FS would like to expand this area. The Proposed Action document specifies priorities and choices for locations and actions. Actions focus forest thinning and prescribed burns. BMPs focus on soil and water conservation during and after implementation of thinning and burning treatments.
- **BLM:** The Taos Field Office focuses on specific management areas, due to funded projects and areas with special management designations. Hence, the BLM will probably be able to focus on areas that are NEPA cleared by the CFRP planning project and specific restoration projects of other partners in the area. The 2012 RMP specifies any specific guidelines for restoration and BMPs.
- **SLO:** The SLO is nearly entirely dependent on leveraging activities and priorities in collaboration with other entities. In the short term, the 2014 CFRP will focus SLO activities on thinning and erosion control on a few parcels in the Lower Embudo watershed.
- **Rio Arriba County:** County activities will most likely focus on customary road maintenance (grading) activities and solid waste management. Resident complaints or requests and political preferences are largely setting the schedule of priority locations and activities for the County.

Needs, conditions

- **USFS:** The Carson National Forest can only engage in land restoration and management activities for areas that have been NEPA cleared and if funds and staffing are available to support the proposed initiatives. The Camino Real District is very interested in data sharing.
- **BLM:** The BLM Taos Field Office can only engage in land restoration and management activities for areas that have been NEPA cleared and if funds and staffing are available to support the proposed initiatives. The Taos Field Office is very interested in data sharing.
- **SLO:** The SLO has very limited staff and funds. It can only work if it can leverage these resources and if the Commissioner's political priorities are aligned with the proposed work. The SLO also has to keep in consideration that it needs to generate funds from state trust lands. So, activities that improve the productivity and real estate value and reduce any risk factors of the land are of importance to the agency.
- **Rio Arriba County:** The County Land Use Planning Department is mostly in need of sharing of data and maps, and interested in coordination of educational outreach work. The County Public Works Department might be interested in specific road grading and road management training to improve drainage and soil stability conditions on dirt roads.

Relevant management measures and practices for public land management agencies

Each agency has its own approaches, codes, and policies to determine and/or recommend and promulgate, implement, monitor, and conduct adaptive management regarding management measures and land use and land management and restoration practices. Relevant management measures and practices are summarized and referenced with citations for all jurisdictions stakeholder groups in a table in Appendix 3.

Collaboration

Land management practices and management measures to reduce pollutants in the Rio Embudo by the US Forest Service, BLM, and State Land Office benefit greatly from collaborative efforts. Collaboration helps leverage funding, staff resources, the intermediary role of non-profits and businesses, and outreach to youth, students, and local residents. All agencies are very interested in ongoing collaboration.

5.2. Other Stakeholders

The response rate of the category Other Stakeholders (OTHE) was too low to analyze any specific results and conclusions for this group. If the 4 respondents are any indication, it seems that "Other Stakeholders" are more interested in fish habitat and fishing in relation to water quality concerns and place irrigation at a slightly lower rank. This interest seems logical for stakeholders who are not dependent on local water resources for their livelihoods. However, "Other Stakeholders" seem to recognize that irrigation is locally the most important use of water resources. Survey results seem to indicate that "Other Stakeholders" may be best reached through information targeted specifically at them from local watershed groups, Soil & Water Conservation Districts and/or NRCS, Ag Extension staff, *acequia* organizations, and environmental groups, and through opportunities for personal experiences in the area, such as workshops or special events.

5.3. Private Landowners and Residents

Knowledge, opinions, attitudes, perspectives

The survey revealed that there is a significant divergence in knowledge, opinions, and attitudes about water quality problems, the causes for the perceived problems, the sources of the perceived problems, and the consequences of the perceived problems. While this may mean that some of the problems are localized and not experienced throughout the watershed, it appears also that respondents' knowledge and insights about water quality problems are incomplete.

It is remarkable that most respondents, most of whom are relatively well-educated and well-off older male farmers, indicated that their greatest concerns about water quality problems are fish habitat, boating, and the safety of eating locally caught fish, while they scored the relationship of water quality concerns and irrigation lower. These respondents also indicated a

lack of insight about the relationship between water temperature and stream alterations and the quality of the stream as a fishery. Additionally, the respondents were unclear about the rangelands and wildlands as sources of erosion in the area and also seemed to show some denial about recreational impacts, such as Off-Road Vehicle use in the area. Finally, respondents seemed confused about the consequences of sediment in the water on irrigation and other important uses of water in the area.

Respondents, again despite their education and experience levels and their relative affluence, expressed a low motivation to change their ways and to be willing to pay for changes in farm management.

Based on these findings, it would probably be very useful for watershed restoration efforts to succeed that before management measures and changes in land use are proposed to farmers to offer specific information to them in targeted education campaigns to clarify the reasons for the proposed management measures. Information and education initiatives should target all farmers, *parciantes*, and farm operators, and focus particularly on:

- The impacts of sediment pollution on irrigation systems (including the effectiveness of irrigation), farm soils and crops, and fisheries.
- The impacts of flow alterations (stream channel shape), riparian vegetation removal, water temperature on fisheries, soils, and the availability of water.
- The sources of sediment (and erosion) from wildlands, range and woodlands, roads, arroyos, farm fields, and other areas with poor soil cover, and the impacts of off-road vehicle use.
- The consequences of water pollution on the various uses of land and water in the area, including problems of sediment plugs, flooding, invasive species proliferation, stream biology (algae growth), etc.

Capacity (habits/experience, funds/costs, connections; labor capacity); tools; responsibilities

The capacity of residents to adapt their land use and farm practices and to implement management measures to improve water quality conditions varies across the watershed area and is relatively limited. There are significant demographic differences across the watershed: the population in the higher elevations (Ojo Sarco, Las Trampas, and including Chamisal) is proportionally more numerous, relatively younger, of lower income, with larger families, with relatively more females, and with a greater percentage owning their homes than the populations downstream in Dixon and Embudo. The population in Embudo and Rinconada is proportionally the smallest in number, relatively the oldest, of highest income, with the smallest families, with relatively more males, and with the lowest percentage of people owning their homes.

Income levels vary greatly across the population, and many families live at or below the mean national income level. Income levels in the higher elevation communities and for young families

and households across the watershed is hovering around the poverty level. The low and variable income levels are a great impediment to the potential adoption and implementation of management measures to counter water quality problems. Survey respondents, despite their relative affluence, mentioned costs of practices as the largest barrier to change and adoption of new or better management practices.

In order to overcome the limited financial capacity of many landowners/farmers initiatives to introduce new management measures could:

- Begin with offering rather simple and low cost management measures.
- Identify management measures that lead to savings of time and to high internal (financial) rates of return for farmers, so that further adoption and dissemination of management measures would increase the collective financial and labor capacity of farmer across the watershed; special attention should be given to increasing labor efficiencies for people between 16 and 40 years of age, women, and professional farmers, because these populations are likely to leverage the greatest capacity toward land restoration and water pollution prevention measures. Management measures that may apply in this case are mulching, composting, cover crops, vegetation buffers, fencing, and improvements to *acequias* combined with drip irrigation techniques.
- Accompany the introduction of new management measures with programs for financial aid, including information about and assistance with government grant programs.

Many farmers in the watershed are in the age categories of 41-60 and 61-80 years of age. As a result many respondents indicated that their physical capacity is a limitation to accomplishing innovations that would help reduce water pollution. Related to this, many farmers have limited technical know-how, and have not kept up their equipment or lack appropriate equipment and technology. Financial limitations explained above further limit their capacity for technical innovation.

In order to overcome the limitations of available equipment, technology and/or labor capacity faced by farmers who are willing to introduce new management measures, water quality improvement initiatives could:

- Begin with introducing management measures that are simple and require relatively low levels of equipment, technology and/or labor.
- Organize collaboration among farmers, non-profits, local contractors, and other entities that allows for the sharing of or collective (or grant-funded) investment in equipment for discrete projects.
- Hire local contractors with equipment to be part of the on-farm and off-farm land and watershed restoration work.
- Establish cooperative equipment sharing mechanisms among participants.
- Engage, train and employ young farmers, students, and other youth and young adults in on-farm and off-farm production and land and watershed restoration work.

Information dissemination and educational outreach among residents and private landowners/ farmers would be most effective by using their most customary and trusted sources of information. Because local residents most trust personal observation and experience, appropriate ways of information dissemination include workshops, demonstrations, meetings, and conversations. Important messengers for local residents are the NM Acequia Association, local watershed projects, local *acequia* associations (*mayodomos* and commissioners) and other local community leaders, environmental groups, neighbors and friends, the TownCrier, and the County Extension officer. Printed material is highly preferred and trusted over digital sources.

Much work remains to be done to build trust and productive collaborative relationships between (on one side) the local residents and farmers and (on the other side) the public land management agencies (US Forest Service, BLM, State Land Office, NM DOT) and Rio Arriba County. For the foreseeable future, information flow and coordination of initiatives aimed and land and stream restoration would benefit from the intermediary role of the more trusted messengers listed above. Meanwhile, through collaboration in projects and the development of personal relationships between local residents and agency representatives during public events and workshops, connections between the public management agencies and the local population could gradually be improved.

Choices, priorities and priority areas (regarding land use, farm/land management, land restoration, and practices (BMPs))

Survey respondents seem to favor practices and management measures that relate to their (irrigated) farm lands rather than to upland conditions. This result may be influenced by the skewed demographic of the respondents. However, it may be useful prior to the dissemination of management measures to offer specific targeted education about certain management measures that are not generally used but that may be of relevance to the area in order to reduce water pollution levels. Specific educational outreach and extension work may be useful for:

- Using cover crops for erosion protection and soil improvement
- Using terracing techniques, also in association with contour buffer strip development
- Managing road (and driveway) runoff
- Restoring native plant communities
- Planting and maintaining riparian buffer strips along stream and *acequias*
- Using water and sediment control basins to trap sediment below critical erosion areas
- Prescribed grazing practices in upland forest, woodland and rangeland areas

Relevant management measures and practices on private land

There is a large number of management measures and land use & land management or restoration practices that apply on private lands for the watershed. Private land management measures and practices are summarized and referenced with citations in Appendix 3.

SOCIAL SURVEY APPENDICES

APPENDIX 1 – *Acequia Paciante* and Acreage Information (Estevan Arellano, August 25, 2014)

Regarding your questions:

- Number of *parciantes acequias* on Rio Embudo:

Acequia de la Plaza - 69 parciantes, total of 165 acres under irrigation (87527)

Acequia de la Apodaca - 37 parciantes, 80 acres (87527)

Acequia del Bosque - 36 parciantes, 80 acres (87527)

Acequia del Llano - 122 parciantes, 200 acres (87527)

Acequia del Medio - 42 parciantes, 150 acres (87527)

Acequia Junta y Cienaga - 37 parciantes, 80 acres (87531)

Acequia de los Duranes - 18 parciantes, 40 acres (87527)

Acequia de la Sancochada - 25 parciantes, 40 acres (87527)

Acequia Leonardo Martinez, aka Martinez-Arellano - 30 acres, 7 parciantes (87527)

Acequia el Rincon - 12 acres, 7 parciantes.

Acequias de get their water from the Rio Grande:

Then there's the Acequia de la Rinconada, 150 acres, have no idea how many parciantes (87531).

Acequia de la Bolsa, 30 acres, don't know number of parciantes.

Acequia de Vado, 30 acres, 1 parciantes (Embudo Valley Organics, 87531)

Acequia Bosquecito de los Cordovas, 4 parciantes, 15 acres. (87531)

- Number of parciantes that are irrigating - Impossible to know, varies from year to year.

- Number of parciantes that are irrigating and having an active agricultural operation - Impossible to know, it also varies; the *acequias* with the most fallow land is Acequia de la Plaza and Acequia del Llano.

- Number of all active agricultural operations - Have no idea, first we would have to define "active agricultural operation."

- Total acreage under cultivation - I would venture to say that not more than 50% in total, some more, others far less.

- Average farm size and/or parcel size - this again varies by *acequia*, the biggest farm is Fred Martinez at 25 acres.

Chamisal probably has the most population as Ojo Sarco and Las Trampas are smaller communities. I think Chamisal includes Ojito and Vallecitos. Chamisal is part of the Picuris land grant and I am sure Las Trampas includes El Valle. And yes, they are a lot younger; the lower Embudo is mostly made of recent retires.

APPENDIX 2 – Table of Demographic Background Information and Respondent Profiles

Population Characteristics	Study Area Profile*	Respondent Profile	Comparison
Demographics per Zip Code			
87521: Chamisal/Ojo Sarco	Pop: 1003; Househ: 422; Families: 264; Non-fam: 158	1 = 1.2% of Hh	Majority in Chamisal, Ojito and Vallecito; Chamisal and Ojito are outside the study area.
87527: Dixon	Pop: 880; Househ: 413; Families: 236; Non-fam: 177	11 = 2.7%	
87531: Embudo/Rinconada	Pop: 368; Househ: 195; Families: 92; Non-fam: 103	5 = 2.6%	Includes populations outside of the study area (watershed): in Rinconada, el Rincon, la Bolsa, Cienaga, Embudo , Embudo Station, etc.
87576: Las Trampas	Pop: 60; Househ: N/A; Families: N/A; Non-fam: N/A	0	Includes El Valle
Total Area	Pop: 2311 Househ: 1030 (-1055) Families: 592 (-608) Non-fam: 348 (-357)	17 (+ 1 no answer) = 18 = 1.7% of house-holds	

Population Characteristics	Study Area Profile*	Respondent Profile	Comparison
Social-Economic Indicators			
Commercial farmer, rancher, viticulturist, or orchard owner	N/A	(4) 23.5%	
Subsistence farmer, rancher, viticulturist, or orchard owner	N/A	(10) 58.8%	
No longer working as farmer, rancher, viticulturist, or orchard owner	N/A	(1) 5.9%	
Resident (not a farmer, rancher, viticulturist, or orchard owner)	N/A	(0)	
Parciante (irrigates land)	400 (-X)	(13) 76.5%	
Parciante (do not irrigate any land)	X (N/A)	(1) 5.9%	
Not a parciante (do not irrigate any land)	N/A	(0)	
Not a parciante (but do irrigate land)	N/A	(0)	
An agricultural operation	N/A	29.4%	
Forested land	N/A	0%	
Rural recreational property	N/A	0%	
None of these	N/A	70.6%	

Retired	N/A	6.2%	
Partially retired	N/A	18.8%	
Not retired	N/A	75%	
Owner vs. Renter			
Owners	87521: 85.3 87527: 83.5% 87531: 72.3%	100%	Survey biased to land/homeowners (esp. in Embudo area)
Renters	87521: 14.3 87527: 16.5% 87531: 27.7%	0%	Survey biased to land/homeowners (esp. in Embudo area)
[Income n=15]			
<$24,999	87521: 56% 87527: 53% 87531: N/A	20%	Survey biased to middle-income people (lack of lower income people in respondents pool)
$25K-$49,999	87521: 25% 87527: 26%	46.7%	Survey biased to middle-income people (lack of lower income people in respondents pool)
$50K-$74,999	87521: 12% 87527: 10%	13.3%	
$75K-$99,999	87521: 3% 87527: 6%	6.7%	
>$100,000	87521: 3% 87527: 5%	13.3%	Survey biased to very high-income people (lack of lower income people in respondents pool)
Other Demographics **Gender**			
Male	87521: 49.8 87527: 50% 87531: 51.9%	68.8%	Survey biased to males (esp. lack of young and lower income males and females of all categories).
Female	87521: 50.2 87527: 50% 87531: 48.1%	31.2%	Survey biased to males (esp. lack of females of all categories).
Age 16 and over	Represents 87521: 81% 87527: 84% 87531: 89.4%		Survey biased to people of age 60 and up.
Age 16-40	87521: 243 87527: 212 87531: 67 Total 522/23%	approx. 3 (18%)	(Range: 29 – 83; mean 63.75 y, SD = 13.81; n=16); under-repr of this category
Age 41-65	87521: 405 87527: 248 87531: 156 Total 809/35%	approx. 7 (41%)	Over repr of this category
Age 66-90	87521: 185 87527: 187 87531: 110 Total 482/21%	approx. 6 (35%)	represents in 87521: 18.5% of pop.; 87527: 21.3% of pop. 87531: 29.9% of pop. Strong over-repr of this category (esp. for Ojo Sarco and Dixon area)
Living in EV: (range: 9 – 83; avg: 40.88; mean: 40 = 50% lived 40 y or			

less in the area; 50% lived 41 y or more in the area)			
Lived in EV >50 y (or entire life)	N/A	(5/16)	
Lived in EV >25 y	N/A	(6/16)	
Lived in EV <25 y	N/A	(5/16)	
Does not live in EV	N/A	(0/16)	
Schooling			
High school	N/A	25%	
Some college	N/A	12.5%	
4-y college	N/A	31.5%	
Post graduate degree	N/A	31.5%	

*Sources:

1. US Census 2010: http://www.zip-codes.com/zip-code/87527/zip-code-87527-2010-census.asp

2. Ag Census 2012: Summary by County: http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/New_Mexico/st35_2_001_001.pdf

3. Estevan Arellano.

Note: "Family households" consist of a householder and one or more other people related to the householder by birth, marriage, or adoption. They do not include same-sex married couples even if the marriage was performed in a state issuing marriage certificates for same-sex couples. Same-sex couple households are included in the family households category if there is at least one additional person related to the householder by birth or adoption. Same-sex couple households with no relatives of the householder present are tabulated in nonfamily households. "Nonfamily households" consist of people living alone and households which do not have any members related to the householder.

APPENDIX 3 – Relevant Management Measures and Land Use & Management Practices

Relevant Management Measures and Land Use/Management Practices:

MANAGEMENT MEASURE	US Forest Service	BLM	State Land Office	Rio Arriba County	Private Lands	Citation References
Timber Sales					N/A	
Forest Thinning					N/A	
Fire Wood Harvesting					C	
Prescribed Burning					U	
Pile Burning					U/PL	
Invasive spp/weed management					C	
Road/Trail Closures					U	
Road/Trail Construction					C	
Road Maintenance / Runoff management					C	
Soil Conservation Structures					U	
Mulch, compost, soil cover					C	
Perennial revegetation on retired fields					C	
Restoring compacted soils					U	
Cover crops					C	
Managed irrigation systems & irrigation management planning					C	
Contour buffer strips					U	
Riparian buffers					U	
Sediment basins/traps					U	
Lop & Scatter					U	
Soil amendments/fertilizer					C	
Stream/riparian restoration					PL, PS, PF	
Tree planting					C	
Seeding					C	
Terracing					C, PL	
Water source construction					PL, PS	
Water source removal					C	
Wildlife culling/removal					C	
Wildlife (re)introduction					U	
Fencing/enclosures/exclosures					C	
Managed grazing					U	
Resting (no grazing)					C	
Signage					C	
Interactive Public Education					U	
Area Closure					C	
Use Restrictions/ Regulations					U	
Enforcement (policing)					U	
Land Use Planning/Zoning					PL	
Infrastructure/Incentive Planning					U	

where:
C: Common practice, without procedures;
D: Subject to discretionary review from agency staff and board of commissioners approval;
E: Emergency measures;
P: Requires local (PL) or state (PS) or federal (PF) agency permit;

R: Typically subject to regulatory review (NEPA process, including environmental review (assessment or impact
statement), scoping and inter-agency consultation);
U: Uncommon, unusual;
N/A: Not Applicable

References for Management Measures

US Forest Service

1. US Forest Service Handbook: USDA Forest Service. 2012. FSH 1909.12 - LAND MANAGEMENT PLANNING HANDBOOK. (In revision; Proposed FS1909.12, Version—02/14/2013).
2. Carson Forest Plan 1988 and Amendments: U.S. Dept. of Agriculture, Forest Service, Southwestern Region. 1986. Carson National Forest land and resource management plan. 328 p.: http://babel.hathitrust.org/cgi/pt?id=umn.319510029439491;view=1up;seq=13
3. Carson National Forest, Travel Management Plan for Eastern Ranger Districts: (not yet completed)
4. Rio Trampas CFRP Proposed Action 2014: http://www.forestguild.org/Documents/CFRP/RioTrampasWatershed/20141010_CoverLetter_ProposedAction.pdf
5. Carson National Forest – Specific Operating Plans
6. Evans. A.M., R.G. Everett, S.L. Stephens, and J.A. Youtz. 2011. Comprehensive Fuels Treatment Practices Guide for Mixed Conifer Forests: California, Central and Southern Rockies, and the Southwest. Forest Guild, US Forest Service.

BLM

7. Taos Field Office 2012 Resources Management Plan: US Department of the Interior. Bureau of Land Management. 2012. Taos Resource Management Plan, May 2012, New Mexico. Taos Field Office. BLM/NM/PL-12-09-1610
8. EA for Watershed Restoration 2013: US Department of the Interior. Bureau of Land Management. 2013. Finding of No Significant Impact and Environmental Assessment. Wetland and Arroyo Restoration on the South Side of the Lower Embudo Valley. Taos Field Office. DOI-BLM—F020-2013-0013-0010-EA. February 2013.
9. Travel Management Plan: BLM writes on its website (Note the El Palacio area encompasses the BLM lands west, south and east of Dixon:

Travel Management Planning to Begin Soon for El Palacio and Sombrillo Areas
The Taos Field Office is preparing to initiate a travel management planning process for El Palacio and Sombrillo transportation areas of Rio Arriba and Santa Fe Counties. This area-specific planning process is preceded by the approval of the Taos Resource Management Plan (RMP) in May 2012, which allocated these areas as "limited to designated routes" and established criteria for designating routes. The planning process will be initiated this fall and will include the following basic steps in compliance with the National Environmental Policy Act:

1. Route Inventory Validation (with public input).
2. Scoping (issue and alternative identification by the public and the BLM).
3. Environmental Assessment Preparation (including public review and comment).
4. Approval of a Travel Management Plan by the BLM.
5. Implementation and Enforcement.

To kick off the planning process, the public will soon be provided an opportunity to review data on existing routes and help validate the accuracy of the inventory. The BLM is also hoping the public will provide information on the uses of the routes during this initial step. Stay tuned for more information.

NM State Land Office

10. Internal documents and personal communication
11. Land Use Agreement

Rio Arriba County

12. Land Use Code (Yellow Book): Rio Arriba County. 2012. Design and Development Regulation System. Ordinance 2012-001. (Yellow Book). 89 pp. http://www.rio-arriba.org/pdf/departments_and_divisions/planning___zoning_/final_yellow_book.pdf
13. Flood Ordinance
14. Stormwater Ordinance

Other

15. Clothier V. and B. Zeedyk. 2012. Let the Water do the Work. Quivira Coalition.