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Award Number: 1010516
Award Title: CNH: Acequia Water Systems Linking Culture and Nature: Integrated Analysis of Community Resilience to Climate and Land-Use Changes
PI/Co-PI Name: Alexander Fernald

Awards with Annual/Final/Project Outcomes Report Requirements:

What do "NSF Report Status" and "My Submission Status" mean?

Please Note - *Only Principal Investigators (PIs) and Co-PIs may prepare and submit a Project Outcomes Report for the General Public. At this time, preparation and submission of these reports cannot be delegated to an Other Authorized User.*

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6 reporting periods found, displaying 1 to 6 **1**

Report Requirement	Report Period Start Date	Report Period End Date	Report Due Date	Report Overdue Date	NSF Report Status	My Submission Status	Last Submission Date	Action
Annual	09/15/2010	08/31/2011	06/02/2011	09/01/2011	Approved	Submitted	07/28/2011	View PDF
Annual	09/01/2011	08/31/2012	06/02/2012	09/01/2012	Approved	Submitted	07/30/2012	View PDF
Annual	09/01/2012	08/31/2013	06/02/2013	09/01/2013	Not Yet Due	Not Submitted	--	Create/Edit
Annual	09/01/2013	08/31/2014	06/02/2014	09/01/2014	Not Yet Due	Not Submitted	--	Create/Edit
Final	09/01/2014	02/28/2015	03/01/2015	05/30/2015	Not Yet Due	Not Submitted	--	Create/Edit
POR	09/01/2014	02/28/2015	03/01/2015	05/30/2015	Not Yet Due	Not Submitted	--	Create/Edit

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POR	09/01/2014	02/28/2015	03/01/2015	05/30/2015	Not Yet Due	Not Submitted	--	Create/Edit

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Annual Report for Period: 09/2011 - 08/2012
Submitted on: 07/30/2012
Principal Investigator: Fernald, Alexander G.
Award ID: 1010516
Organization: New Mexico St University
Submitted By:
Fernald, Alexander - Principal Investigator
Title:
CNH: Acequia Water Systems Linking Culture and Nature: Integrated Analysis of Community Resilience to Climate and Land-Use Changes

Project Participants

Senior Personnel

Name: Fernald, Alexander
Worked for more than 160 Hours: Yes
Contribution to Project:
PI and overseer of CNH Acequia Project and Team Members. Coordinating Instructor for the RGSC 618 Interdisciplinary Modeling: Water Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012.

Name: Wilson, John
Worked for more than 160 Hours: No
Contribution to Project:
Hydrologic data and model construction; also supported by NM EPSCoR. Guest Lecturer for the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012

Name: Rivera, Jose
Worked for more than 160 Hours: Yes
Contribution to Project:
Served as Co-PI of NSF grant to NMSU and as the PI of a subaward from NMSU to UNM at $50,188 for Year One. Supervised work of two graduate students as RAs: GIS mapping and environmental history research. Completed a major review of social science literature and archival sources to include historical maps of the region. Support Source is the Center for Regional Studies at UNM with no NSF grant funding for Rivera. Guest lecturer for the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012

Name: Tidwell, Vincent
Worked for more than 160 Hours: Yes
Contribution to Project:
Leading Integrated Modeling Effort. Travel and support of Post-Doc.
Because of employement at Sandia, funding for participation is limited. Guest lecturer for RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate held at NMSU, June 4th-15th, 2012

Name: Arumi, Jose
Worked for more than 160 Hours: No
Contribution to Project:
Dr. Jose Luis Arumi is currently starting the project 'Water availability in a stressed Andean watershed in Central Chile: Vulnerability under climate variability', funded by the Chilean Sciences Council (Fondecyt) that can be used as a parallel Chilean research project.

The creation of a new Water Center will provide the basis of future collaboration between the Acequia Team, the Chilean partners and the Chilean canal users.

Name: Guldan, Steve
Worked for more than 160 Hours: Yes
Contribution to Project:
Takes lead on AES and CES outreach publications. Coordinates assistance of Alcalde staff on some aspects of field work. Presents project objectives and results as needed at meetings and when giving tours at the Alcalde Science Center.

Name: Boykin, Kenneth

Worked for more than 160 Hours: Yes

Contribution to Project:

Lead personeel overseeing graduate student and participating in project scoping and modeling. Co-Instructor for the RGSC 618 Interdisciplinary Modeling: Water Related Issues and Changing Climate, June 4th-15th, 2012

Name: Cibils, Andres

Worked for more than 160 Hours: Yes

Contribution to Project:

Participated in three organizing meetings (Socorro, Albuquerque, and Alcalde) including a visit to El Rito and Alcalde acequias which involved conversations with farmers. Recruited a graduate student (Stephanie Lopez) to conduct interviews and gather background information on the relevance of livestock grazing. Recruited an external collaborator (Dr. Lee Hamilton) to provide necessary expertise in conducting interviews. Completed IRB certification. Collaborated on the preparation of a manuscript that will be submitted for publication to Sustainable Development. Attended a research rally meeting organized by NMSU's VPR office.

Name: Hurd, Brian

Worked for more than 160 Hours: Yes

Contribution to Project:

Lead personnel regarding Socio-Economic Assessment and Analysis.

Name: Ortiz, Marquita

Worked for more than 160 Hours: No

Contribution to Project:

Provides acequia expert input and survey involvement with Dr. Hurd and Dr. Rivera. Collaborating on coordination of Socio-Cultural focus group. Guest lecturer for the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012.

Name: Rodriguez, Sylvia

Worked for more than 160 Hours: No

Contribution to Project:

Consultant with UNM. Lead coordinator for Global Perspective Symposium and Workshop to be held in Las Cruces, NM March 4th & 5th, 2013. Lead coordinator for Acequia exhibit to be showcased at Maxwell Museum in 2014 and traveling exhibit.

Name: Link, Timothy

Worked for more than 160 Hours: Yes

Contribution to Project:

Coordinating Instructor for the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course that was held at NMSU June 4th-15th, 2012.

Name: Saito, Laurel

Worked for more than 160 Hours: Yes

Contribution to Project:

Coordinating Instructor for the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course that was held at NMSU, June 4th-15, 2012.

Name: Rango, Al

Worked for more than 160 Hours: No

Contribution to Project:

Related through EPSCoR Project.

Name: Michener, William

Worked for more than 160 Hours: No

Contribution to Project:

Related through EPSCoR Project.

Name: Klein, Kathryn

Worked for more than 160 Hours: No

Contribution to Project:

Curator of Ethnology, Maxwell Museum at UNM. Left position with museum in 2011.

Name: Fleming, William

Worked for more than 160 Hours: No

Contribution to Project:

Faculty Mentor, Community and Regional Planning Program, University of New Mexico.

Name: Pullin, Michael

Worked for more than 160 Hours: No

Contribution to Project:

Project Participant-UROP Coordinator.

Name: White, Amanda

Worked for more than 160 Hours: No

Contribution to Project:

Collaborator-left project in 2011.

Name: Garcia, Paula

Worked for more than 160 Hours: No

Contribution to Project:

Related through New Mexico Acequia Association.

Name: Shukla, Manoj

Worked for more than 160 Hours: No

Contribution to Project:

Worked with Dr. Ochoa in creating publications, poster, and conference presentations that relate to the CNH Acequia grant.

Name: Gonzales, Moises

Worked for more than 160 Hours: No

Contribution to Project:

Faculty Mentor, Center for Raza Planning, School of Architecture and Planning, University of New Mexico. Guest lecturer for RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012.

Post-doc

Name: Steele, Caitriana

Worked for more than 160 Hours: Yes

Contribution to Project:

Spatial data creation, compilation and GIS support. Co-Instructor for RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012.

Name: Ochoa, Carlos

Worked for more than 160 Hours: Yes

Contribution to Project:

Collects and provides research information dealing with New Mexico Acequias. Assisted with the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012.

Name: Frisbee, Marty

Worked for more than 160 Hours: No

Contribution to Project:

Post-Doc on the NM EPSCoR Project.

Graduate Student

Name: Mayagoitia, Laura

Worked for more than 160 Hours: Yes

Contribution to Project:

Assistance with survey design and implementation.

Name: Samson, Elizabeth

Worked for more than 160 Hours: Yes

Contribution to Project:

Graduate Student focusing thesis and GRA time on wildlife and ecosystems. Attended RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012

Name: Garcia, Jarrett

Worked for more than 160 Hours: Yes

Contribution to Project:

Lead responsibility for the creation of GIS maps for the Rio Chama Basin in Rio Arriba County of New Mexico under the supervision of Faculty Mentor, Moises Gonzales. Received NSF/RA salary of $1800 monthly for approximately ten months.

Name: Markwell, Sam

Worked for more than 160 Hours: Yes

Contribution to Project:

Co-author responsibility for environmental history research, Rio Chama Basin under the supervision of Faculty Mentor, Jose Rivera. Received NSF/RA salary of $1800 for approximately ten months.

Name: Lopez, Stephanie

Worked for more than 160 Hours: Yes

Contribution to Project:

Conducted a literature review and a guided study on Rural Sociology in preparation for survey design. Worked on the design of interview questions for planned focus group sessions.

Name: Cozzens, Brian

Worked for more than 160 Hours: No

Contribution to Project:

Hydrologic data and model construction; also supported by NM EPSCoR.

Name: Harding, Jevon

Worked for more than 160 Hours: No

Contribution to Project:

NMT Student and RA. Hydrologic data and model construction; also supported by NM EPSCoR.

Name: Tsinnajinnie, Lani

Worked for more than 160 Hours: No

Contribution to Project:

NMT MS Student and RA conducting monthly field sampling in El Rito collecting snow, snowmelt, and installing field equipment. Attended RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th 2012.

Name: Tolley, Douglas

Worked for more than 160 Hours: No

Contribution to Project:

NMT MS Student and RA collecting stream and spring samples and installing field equipment in Rio Hondo. Attended RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate held at NMSU, June 4th-15th 2012

Name: Gutierrez, Karina

Worked for more than 160 Hours: Yes

Contribution to Project:

Assisting Dr. Fernald with data research in Northern New Mexico for CNH project and graduate work. Attended RGSC 618

Interdisciplinary Modeling: Water Related Issues and Changing Climate course held at NMSU, June 4th-15th 2012

Name: Esquibel, David

Worked for more than 160 Hours: No

Contribution to Project:

Assisting Dr. Fernald with data research in Northern New Mexico for summer 2012

Name: Miller, Amy

Worked for more than 160 Hours: No

Contribution to Project:

Member of NSF EPSCoR and CNH projects. UNM student who works with Dr. Rivera with community and regional planning/water resources programs.

Name: Roybal, Marcos

Worked for more than 160 Hours: No

Contribution to Project:

Member of NSF EPSCoR and CNH projects. UNM student who works with Dr. Rivera with community and regional planning/water resources programs.

Undergraduate Student

Name: Lopez, Alejandro

Worked for more than 160 Hours: No

Contribution to Project:

Assisting Dr. Fernald and Dr. Ochoa with data research in Northern New Mexico. Assisted as a student helper with the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012.

Name: Hughes, Jimmie

Worked for more than 160 Hours: No

Contribution to Project:

Assisting Dr. Fernald and Dr. Ochoa with data research in Northern New Mexico. Left the group Spring 2012.

Name: Jones, Amy

Worked for more than 160 Hours: No

Contribution to Project:

UNM undergraduate, BA in Environmental Planning and Design working with Dr. Rivera.

Name: Blom, Lucas

Worked for more than 160 Hours: No

Contribution to Project:

NMT Undergraduate on the NM EPSCoR Project

Name: Tysor, Elizabeth

Worked for more than 160 Hours: No

Contribution to Project:

NMT Undergraduate on the NM EPSCoR Project.

Technician, Programmer

Name: Fossberg, Bobbie Jo

Worked for more than 160 Hours: Yes

Contribution to Project:

Program Coordinator-provides project support for CNH Acequia Team Members. Assisted with coordination of RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate held at NMSU, June 4th-15th, 2012.

Name: Haas, Laua

Worked for more than 160 Hours: No

Contribution to Project:
Assisted with research-OSI.

Name: Rad, Hamid
Worked for more than 160 Hours: No
Contribution to Project:
Assisted with research-OSI.

Name: Murthy, Sudha
Worked for more than 160 Hours: No
Contribution to Project:
Assisted with research-OSI

Name: Courtney, Mark
Worked for more than 160 Hours: No
Contribution to Project:
Part of review team that evaluated draft proposal.

Name: Richards, Beth
Worked for more than 160 Hours: No
Contribution to Project:
Part of review team that evaluated draft proposal.

Name: Bencala, Kenneth
Worked for more than 160 Hours: No
Contribution to Project:
Associated with IWG at USGS.

Name: Parra, Rita
Worked for more than 160 Hours: No
Contribution to Project:
Provided proposal accounting assistance.

Name: Villa, Alma
Worked for more than 160 Hours: No
Contribution to Project:
Provided proposal accounting assistance.

Name: Haynes, Misty
Worked for more than 160 Hours: No
Contribution to Project:
Provided proposal accounting assistance.

Name: Blackburn, Anne
Worked for more than 160 Hours: No
Contribution to Project:
Provided proposal accounting assistance.

Name: Smith, Amy
Worked for more than 160 Hours: No
Contribution to Project:
Edited original grant proposal

Name: Rapp, Dustin
Worked for more than 160 Hours: No
Contribution to Project:
Assisted with proposal editing and data gathering. Left NMSU in 2011

Other Participant

Name: Dunlap, Robbie

Worked for more than 160 Hours: Yes

Contribution to Project:

Works on-site in Northern New Mexico gathering data and assisting graduate students.

Name: Villalobos, Vanessa

Worked for more than 160 Hours: No

Contribution to Project:

Assisted as a student helper with the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012.

Research Experience for Undergraduates

Organizational Partners

University of New Mexico

Sandia National Laboratories

New Mexico Institute of Mining and Technology

Universidad de Concepcion

New Mexico Acequia Association

Rivera - Marquita Ortiz assisted with input to the Acequia Socio-Economic Survey headed by NMSU Professor, Brian Hurd.

University of Idaho

Assisting with an interdisciplinary modeling course that will be held in 2012.

University of Nevada, Reno

Assisting with an interdisciplinary modeling course that will be held in 2012.

Long Term Ecological Research Network

US Geological Survey

New Mexico EPSCoR

Extreme integration with infrastructure from NM EPSCoR. Provided additional funding for the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU in Las Cruces, NM June 4th-15th, 2012.

Taos Valley Acequia Association

Ochoa - Palemon Martinez allowed us to install a weather station on his property.

Rivera - Palemon Martinez convened a meeting of the Rio Hondo Valley Acequia Association to discuss the Flow Sharing Agreement with presentation by NMSU Carlos Ochoa.

Acequia de los Prandos

Ochoa - Sandra Varos and Nora Olst collaborated with acequia flow measurement.

Acequia de la Atalaya

Ochoa - Solomon Kaplan and Allen Kaplan collaborated on acequia flow measurement and allowed installation of a water level monitoring device on Allen Kaplan's domestic well.

Acequia de la Plaza

Ochoa - Peter Merscher collaborated on acequia flow measurement.

Acequia de Des Montes

Ochoa - Herbert Martinez, Ernie Martinez and Jim Sanborn collaborated on acequia flow measurement, allowed installation of a water level monitoring device on Ernie Martinez's domestic well, and discussed project activities to be performed.

Acequia Madre del Llano

Ochoa - Allen Kaplan and Moises Lacombe allowed installation of a water level monitoring device on Allen Kaplan's domestic well and discussed project activities to be performed.

APSensing

Ochoa - Greg McElyea and Doug Yates ran distributed temperature sensing (DTS) trial in a 300 m transect of the Rio Hondo.

Canoncitos North Ditch

Ochoa - Collaborated with Herbert Garcia to install a new flume in the Canoncitos ditch.

Canoncitos South Ditch

Ochoa - Collaborated with Cloro Garcia on discussion of project activities to be performed.

Acequia de San Antonio

Ochoa - Collaborated with Elias Espinoza on discussions for project activities to be performed.

Valdez, NM

Ochoa - Collaborated with Eric Patterson on data collection from installed water level monitoring device on his domestic well.

Alcalde, NM

Ochoa - Collaborated with Horace Valdez on data collection from installed water level monitoring device on his domestic well.

Velarde, NM

Ochoa - Collaborated with Richard Garcia, Mike Martinez, Gene Lopez, Joe Garcia, Archie Velarde, and Mel Medina on data collection from installed water level monitoring device on each of their domestic wells.

El Guique, NM

Ochoa - Collaborated with Benito Chavez on data collection from installed water level monitoring device on his domestic well.

UNM Maxwell Museum

Dr. Rodriquez will work with UNM Maxwell Museum staff to curate the Acequia exhibit, utilizing materials, such as museum historical photographs.

Environmental Protection Agency

Provides collaboration on Biodiversity Metrics and Urban Growout Scenarios.

UNM Resource Center for Raza Planning

Rivera - Moises Gonzales served as a faculty mentor for the GIS mapping, Rio Chama Basin in Rio Arriba County.

UNM Community & Regional Planning Prgm.

Rivera - William Flemming served as faculty mentor for the Natural Resources Inventory.

El Rito Acequia Association

Alcalde Acequia Association

Rio Hondo Acequias

Tri-State EPSCoR (NM, NV, ID)
Tri-State EPSCoR of NM, NV, and ID provided additional funding for the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU in Las Cruces, NM June 4th-15th, 2012

Other Collaborators or Contacts

Amanda Beth White from New Mexico Institute of Mining and Technology left the project during the first year.

Lee Hamilton from NMSU-Sociology is collaborating in training a graduate student (Stephanie Lopez) to conduct field interviews. He is participating in formulating the questionaire for the focus group sessions, and will help lead the focus group sessions.

The following Faculty members participated in the RGSC 618 Interdisciplinary Modeling: Water-Related Issues and Changing Climate course held at NMSU, June 4th-15th, 2012:
*Darko Koracin (Div. of Atmospheric Sciences (DAS), Desert Research Institute (DRI); weather and climate modeling)
*Venkataramana Sridhar (Dept. of Civil Engineering, Boise State Univ.; water systems modeling)
*Sajjad Ahmad (Dept. of Civil and Environmental Engineering, Univ. of Nevada Las Vegas (UNLV); water resources systems modeling)
*Franco Biondi (Dept. of Geography, UNR; why the past matters)
*Carter Borden (DHI Water and Environment; integrated modeling)
*Kelly Cobourn (Boise State University; economics modeling)
*Levan Elbakidze (Dept. of Agricultural Economics and Rural Sociology, UI; economics modeling)
*I?igo Garcia-Bryce (Dept. of History; NMSU; historical perspective)
*Robert Heinse (Dept. of Plant, Soil, and Entomological Sciences, UI; vadose zone modeling)
*Phillip King (Dept. of Civil and Geological Engineering, NMSU; groundwater modeling)
*David Kreamer (Dept. of Geology, UNLV; thermal stratification modeling)
*John Mejia (DAS, DRI; dynamical downscaling)
*Anna Panorska (Dept. of Mathematics and Statistics, UNR; statistical modeling)
*Scott Peckham (Inst. of Arctic and Alpine Research, Univ. of CO; computer science)
*Mark Stone (Dept. of Civil and Environmental Engineering, Univ. of New Mexico (UNM); water resources modeling)
*Aleksey Telyakovskiy (Dept. of Mathematics and Statistics, UNR;
mathematical modeling)
*John Tracy (ID Water Resources Research Institute; UI; systems dynamics modeling)
*J.D. Wulfhorst (Dept. of Ag. Economics & Rural Sociology; UI; rural sociology)

William Kepner from EPA provided collaboration on Biodiversity Metrics in Year 2.

David Bradford from EPA provided collaboration on Biodiversity Metrics in Year 2.

Britta Bierwagen from EPA has provided collaboration on Urban Growout Scenarios in Year 2.

Ursula Smedly collaborated with Dr. Andres Cibils for Ad hoc interviews with community leaders.

Pilar Trujillo of NMAA is a collaborator with Dr. Rivera and Quita Ortiz.

Activities and Findings

Research and Education Activities: (See PDF version submitted by PI at the end of the report)

Year 1
Ochoa - Training Apr-11 on Acequia Flow Measurement as a Community Education Event at the Rio Hondo site for 2-4 hours to 1-25 local stakeholders/specific resource users. Purpose was to train acequia water masters (mayordomos) on how to measure acequia flow.

Ochoa with Fernald, Guldan, and Tidwell - Training May-11 on Acequia Hydrology as a Research Event for 1-25 regional students.

Ochoa - Training June-11 on Well Installation as a Research Event at the Alcalde site for 8 hours to 1-25 local student to provide content knowledge.

Hurd - Ongoing training on Socio-economic Survey Sample and Survey Design as a Research Event for a 2 year duration to provide content knowledge.

Rodriguez - Ongoing preparation and collaboration with the Acequia and EPSCoR teams, New Mexico Acequia Association, and the UNM Maxwell Museum to establish an Acequia exhibit and assist in the coordination and hosting of the Global Communities Workshop.

Guldan - Guided tours June-11 of Alcalde Science Center as a Community Education Event at ACS Alcalde to 1-25 UNM and Northern NM College faculty and students.

Rivera - Rio Hondo Meeting Apr-11 at the Community Center at Arroyo Seco as a 2 hour community event for content knowledge. Given to 22 officers and members of acequia associations in the Rio Hondo Valley for local farmers who irrigate from the Rio Hondo Stream.

Rivera - El Rito Meeting Apr-11 at the La Clinica del Norte at El Rito as a 2 hour community event for content knowledge. Given to 38 officers and members of acequia associations in the El Rito Valley for local farmers who irrigate from the El Rito Stream.

Cibils - Organizational Meetings Aug-10, Oct-10, and Dec-10 in Socorro, Albuquerque, and Alcalde full day for the purpose to plan project execution strategies and refine overall conceptual model.

Arumi - Project startup 'Water availability in a stressed Andean watershed in Central Chile: Vulnerability under climate variability'

Arumi - Creation of a new Water Center by the Chilean partners, which is inspirited in the research and extension centers that exist in the USA, like Alcalde. The center has the participation of the Irrigation Water Organization of Central Chile.

Steele - The three Geo-databases containing relevant spatial data for acequia study sites have been created. Although nearly complete, the data is of variable quality and require topological and accuracy checking. The data also requires metadata to be complete. Dr. Steele is coordinating with Dr. Ochoa and the current undergraduate student employee to create a 'master' copy of the data and to make corrections where necessary.

Steele - Maps of acequia valleys have been created, but will need to be updated as data is corrected.

Steele - Maps of the snowmelt dominated basins above the acequias are underway.

Year 2

Fernald
Conducted reseach study in Costa Rica and Chile.

Steele
Coordinated a NM EPSCoR funded Inovative Working Group (IWG) at Synergia Ranch in Santa Fe, NM involving participants, students, and Stakeholders related to the CNH project. February 3rd-5th, 2012(pdf attached)

Cibils
1. Ad hoc interviews with community leaders to gain insights into northern NM livestock production systems were conducted with:
a. Palemon Martinez
b. Patrick Torres
c. Tony Valdez
d. Edmund Gomez
e. Ursula Smedly
2. Compilation of the following county and state-wide statistics on livestock inventories, elk populations, rainfall and PDSI data:

a. Livestock inventory data for Rio Arriba and Taos Counties (1975-2011; source: NASS)
b. Hay production data for Rio Arriba and Taos Counties (1975-2011; source: NASS)
c. Livestock inventory data for NM USFS lands (1909-97; source: USFS Region III)
d. Elk inventory estimates for the Carson National Forest (1999-2006; source: USFS)
e. Elk population estimates for NM (1875-1999; Source USFS)
f. PSDI (1900-2003; source NOAA) and rainfall (1975-2011; source: NASS)
3. Exploratory analysis of data described above was conducted to:
a. Identify abrupt changes in the data series that could indicate system tipping points
b. Assess statistical relationships among livestock inventory, climate, and hay production
4. Compilation of the following allotment ?level statistics for upland areas surrounding each of our three study sites(1) :
a. Maps of allotments surrounding each of our three study sites
b. USDI-BLM: A chronology of livestock permitted, actual use, kind of livestock, dates of use, permit transfers for 23 allotments surrounding the Alcalde study area for the 1960-2012 period were retrieved for analysis.
c. USDA-FS : A chronology of livestock permitted, actual use, kind of livestock, dates of use, permit transfers for 21 allotments surrounding the El Rito and Valdez/Rio Hondo study sites for the 1929-1970 period were retrieved. Retrieval of 1970-2011 data for these allotments is in progress
d. USDA-FS: A chronology of estimated elk population numbers in the Carson National Forest for the 1984-2003 period were retrieved for analysis.
(1)Data were retrieved from the USDI-BLM and USDA FS offices in Taos, NM. Compilation of this data is ongoing and involved reviewing written records in allotment files archived by each of the mentioned land management agency.

Hurd
A survey was conducted of acequia members during autumn of 2011, resulting in 60 completed observations.

Data collection efforts continued in order to provide support and analysis for the system dynamics modeling component.

Guldan
Guest Lecture, NMSU International Agriculture Class with 25 participants, September 30, 2011.

Ochoa
Met with officials (mayordomos and commissioners) of the acequias of the Rio Hondo, presented an update in project ongoing activities (i.e. acequia and river flow data) ? April 27th 2012

Attended and displayed posters about ongoing research activities at the Annual Meeting of the Taos Valley Acequia Association ? April 28th 2012

Have extended the network of collaboration at the Rio Hondo study site and have installed sensors for monitoring groundwater level fluctuations at new collaborators' wells.

Installed flow measuring devices and soil moisture equipment at one collaborator's farm in Valdez, NM

Rodriguez
Continuing preparation and collaboration with the Acequia and EPSCoR teams, New Mexico Acequia Association, and the UNM Maxwell Museum to establish an Acequia exhibit in 2014 and lead in the coordination and hosting of the Global Communities Workshop to be held in Las Cruces, NM March 5 & 6, 2013.

Ortiz
Assisting with coordination and planning of Socio-cultural focus groups. Traveled to Alcalde and El Rito study site to facilitate socio-cultural foucus groups.

Rivera
Guest Lecturer at four UNM classes: Landscape Architecture (fall semester 2011); Water Resources (fall semester 2011); geography (spring semester 2012; economics (spring 2012).

Co-presenter, Brian Hurd and Jose Rivera, 'Connecting Communities: Acequia Responses to Changes in Climate, Economy and Population,' CNH Retreat, Synergia Ranch, Madrid, New Mexico, February 3, 2012

Conducted Focus Group Sessions on Sociocultural Component of CNH Acequia Systems Dynamics Model at Alcalde research site with acequia members (June 19, 2012), El Rito site (July 12, 2012), upper Rio Hondo site at Valdez (August 1, 2012), and Arroyo Hondo site (August 2, 2012), facilitated by the New Mexico Acequia Association and UNM. Finding from these sessions will be presented at the March 2013 International Acequia Symposium.

Wilson
RESEARCH ACCOMPLISHMENTS
In collaboration with the NM EPSCoR Project we continued the development of the watershed model for the Rio Hondo using the GS Flow approach and computer code (http://water.usgs.gov/nrp/gwsoftware/gsflow/gsflow.html), that was developed by the US Geological Survey. We also began model development for the El Rito watershed. Most watershed models give little attention to groundwater, treating it simply if at all. The GS Flow approach combines PRMS, a surface water and land surface model, together with MODFLOW, a groundwater model, to develop an integrated model of the entire system. With our emphasis on the role of groundwater in mountain hydrology such an approach is essential, and GS Flow approach provides software and partners (at the U.S. Geology Survey in Carson City, NV, and collaborators in the Nevada EPSCoR project at the University of Nevada and Desert Research Institute) to pursue this with minimal new software development. Spatial and temporal data sets for the Rio Hondo and El Rito have been assembled to provide the input information needed by GSFlow. Isotopic and aqueous geochemical samples from precipitation, streamflow, springs and wells have been taken. They are being assembled and analyzed to help diagnosis flow paths and residence times. Manuscripts on this later topic are in preparation. In May 2012 graduate student Jevon Harding successfully defended her MS thesis with a focus on the Rio Hondo studies, and graduated. This work, and similar work for El Rito, was presented at the 2012 EPSCoR Tri-State Meeting, and will be presented at future meetings of the Geological Society of America and the American Geophysical Union.

BROADENING PARTICIPATION
We employed two EPSCoR supported REU students (from underrepresented groups) last summer and one this summer (2012) to help support the field work in the Rio Hondo and El Rito. The students received experience using DTS (distributed temperature sensing), measuring water chemistry and isotopes in streams and precipitation isotope collectors, installing weather stations, surveying springs, and interpreting data. Each student had a particular project that they presented at the end of summer. A new PhD student entered the Hydrolog Project in the fall of 2011 with a research focus on the El Rito watershed. Lani Tsinnajinnie is from the Navajo Nation in northwestern New Mexico. She is interested in furthering her education and knowledge of hydrology, and bringing her developing expertise in hydrology to bear on issues of importance to her Nation. During her first months on the project she wrote a successful proposal for an EPA STAR Fellowship to study the mountain sources of water on the Navajo Nation, which will be awarded in the fall of 2012. She is currently working on the project's El Rito watershed. Should her Fellowship be funded, and feedback from EPA is very encouraging, she will shift her focus to that study, and bring in another student to focus on El Rito.

Findings: (See PDF version submitted by PI at the end of the report)
Year 1
Ochoa - Collaboration with community.

Ochoa - Collaboration with regional student community.

Ochoa - Driven-point well installation.

Hurd - Collaboration with community.

Rodriguez - Acequia exhibit will be based on results from the integrated analysis accomplished by the project. The Global Communities Workshop will be an international participatory workshop designed to put study findings from NM and Chile into a comparative global perspective with respect to community irrigation systems located in semi-arid settings.

Guldan - Tours covered ASC-Alcalde Research including acequia hydrology and new phases.

Rivera - Irrigators concluded that they need to implement a water sharing agreement and evaluate the headgates and flumes to better measure the flows.

Rivera - Irrigators provided information regarding crop patterns, dryland agricultural practices historically, water conservation, water allocation in dry years, and other key points.

Arumi - The research project focus is on obtaining answers for the river stakeholders. They need to improve their understanding of the

hydrological process with potential to assist the decision-making process regarding the water management of the Diguillin watershed and assess the vulnerability of the river water resources against the land use change at the headwater and/or climate change.

Arumi - The Water Center will provide the basis of future collaboration between the Acequia Team, the Chilean partners and the Chilean canal users.

Year 2

Cibils
Qualitative information obtained in ad hoc interviews and quantitative analysis of livestock data retrieved from different sources are being used to:
a. Reconstruct the history of grazing use of the watersheds that lie above each of the three research sites
b. Inform the development of survey instrument which will be sent out in fall 2012

Hurd
Data was analyzed and finding reported in the MS Thesis for Laura Mayagoitia and in the journal publication. Findings were presented at the stakeholder workshop (Madrid, NM, Jan 2012) and at the annual conference of the Universities Council on Water Resources (Santa Fe, NM, July 2012).

Ortiz
Socio-cultural Focus Group, NOTES, Acequia de Alcalde, Alcalde Community Center, June 19, 2012 (pdf attached)

Training and Development:

Year 1
Ochoa - Provided basic training on how to read/collect acequia flow data.

Ochoa - Provided research knowledge on Acequia Hydrology.

Ochoa - Hands on experience on installing monitoring wells.

Hurd - During the coming year, expectations are that the socio-economic survey will begin to be implemented and data assembled.

Rodriguez - The exhibit will show the interconnected futures of upstream and downstream rural and urban populations as linked by acequias. It will also draw on the global communities' workshop perspectives.

Guldan - Tours provided understanding of ASC-Alcalde Research including acequia hydrology and new phases.

Rivera - Took notes to document the meeting for use later at Focus Group Sessions.

Rivera - Took notes to document the meeting for use later at Focus Group Sessions.

Arumi - Will provide answers and future collaborations between the Acequia Team, the Chilean partners, and the Chilean canal users.

Steele - Outline and introductory content in place for an article describing object-based image processing approach for mapping forest cover in snowmelt dominated basins.

Fernald - Outline and introductory content in place regarding a paper on sustainability.

Year 2

Fernald
WSC Workshops, September 16 and October 18, 2011

Coordinating Instructor for RGSC 618 Interdisciplinary Modeling; Water-Related Issues and Changing Climate course, June 4th-15th, 2012, NMSU. The two week course included 25 Graduate Students and 30 Instructors from three states and eight universities. The final student project consisted of 5 groups presenting on data obtained from the CNH grant. (pdf attached)

Hurd
Summary and methods information was presented at the summer course: 'Interdisciplinary Modeling: Water-Related Issues and Changing Climate' RGSC 618 (Las Cruces, NM, June 2012)

Ochoa
Ochoa, C.G. and V.C. Tidwell. 2012. Acequia-community based agriculture systems in northern New Mexico: A systems approach. 2012. RGSC 618 Interdisciplinary modeling course. June 4?15, Las Cruces, NM. Guest speaker.

Assisted and provided a 'hands on' training on installing flumes and soil moisture sensors to graduate student (Karina Gutierrez) and recently hired technician (Robert Dunlap)

Alcalde Field Day - August 15, 2012, Training on Acequia Irrigation, Groundwater, and River Connections with Graduate Student, Karina Gutierrez Juardo

Attended a Global Sustainability summer school for twwo week training, Potsdam, Germany, July 8th-21st, 2012.

Boykin
Co-Instructor for RGSC 618 Interdisciplinary Modeling; Water-Related Issues and Changing Climate course, June 4th-15th, 2012, NMSU.

Kepner, W.G., E.A. Samson, A.K. Leimer, R.K. Guy, K.G. Boykin, B.G. Bierwagen, and D.F. Bradford. 2011. Evaluating Biodiversity Response to Forecasted Land-use Change: A Case Study in the South Platte River, CO. Automated Geospatial Watershed Assessment (AGWA) Tool Software Demonstration, Training Workshop, South Platte Spatial Database and Biodiversity Metrics Overview, 27-28 October 2011, Denver, CO.

Guldan
February 17, 2012, Presented acequia hydrology research at New Mexico Organic Farming Conference; Albuquerque

March 26, 2012, U.S. State Department's International Visitor Leadership program group. Gave presentation and tour at Alcalde.

April 2, 2012, Northern New Mexico College student group. Gave tour at Alcalde. U.S. State Department's Council on International Relations Water group; Gave presentation in Santa Fe.

May 11, 2012, Presented acequia hydrology research at the annual meeting of the East Rio Arriba Soil & Water Conservation District; Abiquiu, NM

August 15, 2012, Alcalde Field Day Program, Alcalde, NM

Rivera
Co-presented an acequia case study with Moises Gonzales at the Tri-State EPSCoR Interdisciplinary Modeling Course, June 2012, NMSU campus, for use by graduate students from Idaho, Nevada, and New Mexico: 'The Rio Chama Basin: Land, Water, and Community' Rivera

Steele
Co-Instructor for RGSC 618 Interdisciplinary Modeling; Water-Related Issues and Changing Climate course, June 4th-15th, 2012, NMSU.

Outreach Activities:
Year 1
Ochoa with Fernald, Guldan, and Tidwell - Invited talk Apr-11 titled 'Acequia Hydrology Research in the Rio Hondo' given to the local general public with 1-25 participants.

Ochoa with Fernald, Guldan, and Tidwell - Invited talk May-11 titled 'Acequia Hydrology: Surface Water and Groundwater Interactions' given to the Local General Public with 51-100 participants.

Rodriguez - The materials from the exhibit will be available for various venues and educational programs located at the museum. Additionally, a smaller, traveling component of the exhibit will be developed by the museum for display in venues in northern and southern parts of New

Mexico.

Guldan - Guided tour June-11 of Alcalde Science Center as a Community Event at the Alcalde site for three NMSU Media Personnel/Reporters.

Guldan with Fernald, Tidwell, and Ochoa - Invited talk: Lecture and Powerpoint June-11 titled 'Hydrologic Connection between Traditional Acequia Communities and their Watersheds: Three Cases from Northern New Mexcio' given to irrigators, college students, university faculty, and a general audience with 50-100 total participants. Given at 4th Annual Celebrando las Acequias - Water and Resilience.

Rivera - Invited talk: Lecture and Powerpoint Jun-11 titled 'The Culture of Ayuda Mutua in the Rio Arriba' given to local, regional, and national researchers, students, government employees, and the general public with 80 total participants. Given at 4th Annual Celebrando las Acequias - Water and Resilience.

Fernald - Invited talk Jan-11 titled 'Climate Changes and Forest Management for Water' given to staff of Carson and Santa Fe National Forests with 50 total participants. Given in Abiquiu, NM during a Forest Service Meeting.

Fernald with NMSU Researchers - Informational meeting and answer session Jan-11 titled 'Acequia Water Systems Linking Culture and Nature' given to NMSU Administrators (VPR, Provost, President), students, faculty and staff as well as New Mexico legislators, local government officials, the general public and the media. Held at NMSU's Second Research Rally.

Year 2
Guldan
August 11, 2011, Provided youuth group tour.

September 9, 2011, Led seed producer tour group of 40 participants.

September 30, 2011, Guest Lecture, NMSU International Agriculture Class.

October 5, 2011, Hosted two academic visitors.

March 2, 2012, Rio Grande Community Farm group. Gave tour at Alcalde.

March 29, 2012, Three visitors from the New Mexico Department of Agriculture. Gave tour at Alcalde.

April 13, 2012, One college and two high school students. Gave tour at Alcalde.

July 9, 2012, Tour and discussion with academic visitor at Alcalde.

July 16, 2012, UCOWR pre-conference tour group. Tour at Alcalde.

July 19, 2012, New Mexico State Land Office group. Tour at Alcalde.

July 24, 2012, Presentation to Los Alamos Rotary Club. Los Alamos, NM.

August 3, 2012, NMSU administrators and faculty tour group. Tour at Alcalde. Scheduled

August 8, 2012, Western Sustainable Agriculture Research and Education tour group. Tour at Alcalde. Scheduled

Rivera
Invited Speaker, 'Acequia Culture International: From al-Andalus to the Americas,' La Resolana Series at the National Hispanic Cultural Center, September 24, 2011

Invited Speaker, 'Acequias International: Comparative Irrigation Systems Around the World,'Earth Science Seminar, Hydrology Program Lecture, Earth and Environmental Science Department, New Mexico Institute of Mining and Technology, Socorro, NM, November 28, 2011

Invited Speaker, Amigos Bravos 'Water Matters' Lecture Series, presentation to members of Amigos Bravos and general public at the Randall Davey Audubon Center, Santa Fe, New Mexico, July 17, 2012

Hurd
'Estimates of the Economic Impact of Changes in Climate and Water Availability,' Jan. 27-28, 2011

Journal Publications

Alexander Fernald1*, Vincent Tidwell2, Jose Rivera3, Sylvia Rodriguez4, Steven Guldan5, Caitriana Steele1, Carlos Ochoa1, Brian Hurd1, Marquita Ortiz6, Kenneth Boykin1 and Andres Cibils1, "A multiperspective model for sustainability of water, environment, livelihood, and culture in traditional irrigation communities and their linked watersheds (pdf attached)", Sustainability-Open Access Journal, p. , vol. 4, (2012). Published, 10.3390/su40x000x

Ochoa C.G., A.G. Fernald, S.J. Guldan, and V.C. Tidwell, "Shallow aquifer recharge from irrigation in a semi-arid irrigated Valley in New Mexico, USA", Journal of Hydrologic Engineering, p. , vol. , (2012). Submitted,

Ochoa, C.G., A.G. Fernald, and S.J. Guldan, "Caracterizacion del balance hidrico y la recarga por retorno de riego en un valle agricola de una region semiarida de los Estados Unidos de America (Characterization of the water balance and aquifer recharge from irrigation in an agricultural valley of a", Estudios en la Zona no Saturada del Suelo, p. , vol. , (2011). Published, 10:337-340

Hurd, Brian, and Mani Rouhi-Rad, "Estimating Economic Impacts of Changes in Climate and Water Availability", Climatic Change, p. , vol. , (2011). Submitted,

Mayagoitia, L., B. Hurd, J. Rivera, S. Guldan, "Rural Community Perspectives on Preparedness and Adaptation to Climate-Change and Demographic Pressure", Journal of Contemporary Water Research and Education, p. , vol. 147, (2012). Published,

Books or Other One-time Publications

Hurd, Brian; Rivera, Jose; Mayagoitia, Laura, "Adapting Water, Economy, and Values in Small Community Irrigation (Acequia) Systems to the Challenges of Regional Economic Growth and Climate Change", (2011). Conference, Published
Bibliography: Universities Council on Water Resources, PLANNING FOR TOMORROW'S WATER: SNOW PACK, AQUIFERS, AND RESERVOIRS. Boulder, CO. July 11-14, 2011

Samson, Elizabeth; Boykin, Kenneth, "Coupled Natural and Human Systems: Changes In Biodiversity Metrics Based On Climate And Land Use Changes At Watershed And Basin Landscape Scales", (2011). Conference and Paper, Published
Bibliography: Universities Council on Water Resources, PLANNING FOR TOMORROW'S WATER: SNOW PACK, AQUIFERS, AND RESERVOIRS. Boulder, CO. July 11-14, 2011

Boykin, Kenneth, "Research within the Center for Applied Spatial Ecology", (2011). Paper, Published
Bibliography: Boykin, Kenneth. April 2011

Rivera, Jose; Garcia, Jarrett RA, "Acequia Systems Linking Culture and Nature: The Rio Chama Basin Case Study", (2011). Conference, Invited Speaker
Bibliography: EPSCoR Western Consortium Tri-State Meeting. Santa Ana Pueblo, NM. April 8, 2011

Guldan, Steven; Fernald, Alexander; Ochoa, Carlos, "Acequia Water Systems Linking Culture and Nature: Integrated Analysis of Community Resilience to Climate and Land Use Changes", (2011). Conference, Published
Bibliography: Universities Council on Water Resources, PLANNING FOR TOMORROW'S WATER: SNOW PACK, AQUIFERS, AND RESERVOIRS. Boulder, CO. July 11-14, 2011

Tidwell, Vince; Ochoa, Carlos; Mayagoitia, Laura, "Modeling the Physical/Social/Cultural Dynamics of Small Scale Community Irrigation Systems (Acequias)", (2011). Conference, Published
Bibliography: Universities Council on Water Resources, PLANNING FOR TOMORROW'S WATER: SNOW PACK, AQUIFERS, AND RESERVOIRS. Boulder, CO. July 11-14, 2011

Fernald, Alexander, "Treating Juniper with Herbicide: Where Does the Water Go?", (2011). Convention, Published
Bibliography: IX International Rangeland Congress-IRC 2011, "Diverse Rangelands for a Sustainable Society" , Rosario, Argentina - April 2nd to April 8th, 2011

Ochoa, C. and V.C. Tidwell, "Looking At The Human And Environmental Interactions Of Acequia-community Based Agriculture Systems In New
Mexico: A System Dynamics Modeling Approach", (2012). Conference, Invited Speaker
Bibliography: UCOWR/NIWR Annual Conference, July 17-19, 2012, Santa Fe, NM.

Ochoa C.G., A.G. Fernald, S.J. Guldan, M.K. Shukla, and V.C. Tidwell, "Characterizing water table fluctuations and shallow aquifer recharge from irrigation in a semi-arid irrigated valley", (2011). Conference, Oral Presentation
Bibliography: Proceedings of the 47th Annual Conference for the American Water Resources Association. Session # 62-3. November 7?10, Albuquerque, NM.

Ochoa, C.G., A.G. Fernald, and S.J. Guldan, "Caracterizacion del balance hidrico y la recarga por retorno de riego en un valle agricola de una region semiarida de los Estados Unidos de America.", (2011). Conference, Oral Presentation
Bibliography: Jornadas de Investigacion en la Zona no Saturada del Suelo. October 19-21, Salamanca, Spain

Ochoa C.G., A.G. Fernald, S.J. Guldan, and V.C. Tidwell, "Understanding potential climate change effects on watersheds of northern New Mexico: An integrated nature and human research approach", (2011). Conference, Oral Presentation
Bibliography: Reunion Conjunta de Produccion Animal y Manejo de Pastizales. September 6-10, Chihuahua, Mexico

Samson, E.A., K.G. Boykin, W.G. Kepner,D.F. Bradford, and A.K.K. Leimer, "Evaluating biodiversity metrics in response to forecasted land-use change in the American Southwest", (2011). Conference, Oral Presentation
Bibliography: The Wildlife Society 18th Annual Conference. Waikaloa, HI, Nov 5-10 2011

Samson, E.A., K.G. Boykin, W.G. Kepner,D.F. Bradford, and A.K.K. Leimer, "Evaluating biodiversity metrics in response to forecasted land-use change in the American Southwest", (2011). Conference, Oral Presentation
Bibliography: 1st One Day Chapter Conference and Habitat Connectivity Workshop, New Mexico Chapter of The Wildlife Society. 18 October 2011, Albuquerque, NM

Kepner, W.G., E.A. Samson, A.K. Leimer, R.K. Guy, K.G. Boykin, B.G. Bierwagen, and D.F. Bradford, "Evaluating Biodiversity Response to Forecasted Land-use Change: A Case Study in the South Platte River, CO", (2011). Conference, Oral Presentation
Bibliography: The Fourth Interagency Conference on Research in the Watersheds, 26-30 September 2011, Fairbanks, AK

Samson, E.A., and K.G. Boykin, "Coupled Natural And Human Systems: Changes In Biodiversity Metrics Based On Climate And Land Use Changes At Watershed And Basin Landscape Scales", (2011). Conference, Oral Presentation
Bibliography: 2011 UCOWR/NIWR Conference July 11-14, 2011 Boulder, Colorado

McCarl, Bruce A., Brian H. Hurd, Siyi J. Feng, Amy D. Hagerman, Jian H. Mu, and Wei W. Wang, "Climate Change and Its Impact on Agriculture: Challenges for the 21st Century", (2011). Book, Published
Bibliography: Chapter 1 in (ed.) Cossia, Juliann M., Global Warming in the 21st Century, ISBN 978-1-61728-980-4, Nova Science Publishers, Inc. pp: 1-40

Mayagoitia, L., "Adapting Water, Economy, and Values in Small Community Irrigation (Acequia) Systems to the Challenges of Regional Growth and Climate Change", (2012). Thesis, Thesis for the Master's of Science Degree in Agricultural Economics
Bibliography: New Mexico State University

Hurd, Brian H. and Laura Mayagoitia, "Adapting Water Resources along the Upper Rio Grande and its Acequia Communities to the Challenges of Climate Change", (2011). Conference, Invited Presentation
Bibliography: Expo-Agro, Internacional, Cuarto Foro de Agua, Ciudad Chihuahua, Mexico. Aug 11, 2011

Rouhi-Rad, Mani and Brian H. Hurd, "Assessing Climate Change Impacts on Agricultural Diversity and Water Use in the Upper Rio Grande Using a Hydro-economic Model", (2011). Conference, Oral Presentation

Bibliography: the Annual meeting of the New Mexico EPSCoR, Climate Change Impacts on New Mexico's Mountain Sources of Water, Albuquerque, NM. Sept 30, 2011

Quita Ortiz, "Strengthening the Resilience of New Mexico Acequias through Community Engagement, New Mexico Acequia Association, Santa Fe, NM, 2012", (2012). Conference, Invited Speaker
Bibliography: UCOWR/NIWR Annual Conference, July 17-19, 2012, Santa Fe, NM.

Steve Guldan, "Multiperspective Analysis of Community Resillience to Changing Water Supplies for Traditional Irrigation Systems in Northern New Mexico, Alcalde Sustainable Agriculture Science Center, Alcalde, NM", (2012). Conference, Invited Speaker
Bibliography: UCOWR/NIWR Annual Conference, July 17-19, 2012, Santa Fe, NM.

Albert Rango, Alexandder Fernald, Caitriana Steele, and Brian Hurd, "Acequias and the Effects of Climate Change", (2012). Conference, Invited Speaker
Bibliography: UCOWR/NIWR Annual Conference, July 17-19, 2012, Santa Fe, NM.

Kenneth Boykin, "Biodiversity Response to Forecasted Land-Use Change in the Rio Grande Basin, NM", (2012). Conference, Invited Speaker
Bibliography: UCOWR/NIWR Annual Conference, July 17-19, 2012, Santa Fe, NM.

Mani Rouhi-Rad, and Brian Hurd, "The Role Adaptation in Agricultural Irrigation in Assessing the Hydro-Economic Impacts of Climate Change in the Upper Rio Grande", (2012). Conference, Invited Speaker
Bibliography: 2012 UCOWR/NIWR Annual Conference, July 17-19, 2012, Santa Fe, NM

Hurd, Brian, "Estimates of the Economic Impact of Changes in Climate and Water Availability", (2011). Invited presentation,
Bibliography: Workshop on Improving the Assessment and Valuation of Climate Change Impacts for Policy and Regulatory Analysis, Session on Research on Climate Change Impacts and Associated Econom

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Jose A. Rivera, "The Historical Role of Acequias and Agriculture in New Mexico", (2012). Book, Published
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Bibliography: Earth Science Seminar, Hydrology Program Lecture, Earth and Environmental Science Department, New Mexico Institute of Mining and Technology, Socorro, NM, November 28, 2011

Bill Fleming, Jose Rivera, and Amy Miller, "Ecological Services of New Mexico Acequias", (2012). Conference, Presenter
Bibliography: 4th Annual NSF EPSCoR Western Consortium Tri-State Meeting, Sun Valley, Idaho, April 4, 2012.

Jose Rivera, "Globally Relevant: Acequia Culture & Sustainable Land Use in the 21st Century", (2012). Conference, Invited Presenter
Bibliography: World Heritage Symposium, Sponsored by the International Business Student Group, Anderson School of Management, UNM, April 28, 2012

Sam Markwell, "Climate Realities: Eco-Cultural Development on the Rio Chama, 1200-2012", (2012). Conference, Presentation
Bibliography: Sevilleta LTER Summer Seminar, July 10, 2012

Ochoa, C.G., A.G. Fernald, and S.J. Guldan, "Deep percolation from surface irrigation: Measurement and modeling using the RZWQM.", (2011). Book, Published
Bibliography: . p. 231?252. In M.K. Shukla (Ed.), Soil Hydrology, Land Use and Agriculture: Measurement and Modeling. CABI, Wallingford, UK.

Ochoa, C.G., A.G. Fernald, S.J. Guldan, and V.C. Tidwell, "Monitoring and modeling the hydrologic connectivity between headwaters and their snow-melt driven irrigated valleys", (2011). Conference, Abstract
Bibliography: Annual New Mexico Water Conference. Water Resources Research Institute. Abstract # 4. December 13?14, Alamogordo, NM.

Web/Internet Site

URL(s):

https://sites.google.com/site/cnhacequia/
http://aces.nmsu.edu/cnhacequia/

Description:

An internal website for the project.
An external website housed within the New Mexico State University website.

Other Specific Products

Product Type:

Poster

Product Description:

Poster Presentation-Year 1

Sharing Information:

Fernald with Arumi, Boykin, Cibils, Guldan, Hurd, Klein, Link, Ochoa, Ortiz, Pullin, Rivera, Rodriguez, Saito, Steele, Tidwell, White, and Wilson - Visual presentation to a large widespread audience representing "Acequia Water Systems Linking Culture and Nature: Integrated Analysis of Community Resilience to Climate and Land Use Changes". (PDF Attached)

Ochoa with Fernald, Guldan, and Tidwell - Visual presentation for an audience of more than 100 International Researchers representing "Temporal and Spatial Variability of Surface Water and Ground Water Interactions in a Semi-Arid Agricultural Valley". (PDF Attached)

Ochoa with Fernald, Guldan, and Shukla - Visual presentation for an audience of more than 100 International Researchers representing "Field Studies and Modeling of Water Movement through the Shallow Vadose Zone in a Floodplain Irrigated Valley. (PDF Attached)

Product Type:

Powerpoint

Product Description:

Powerpoint Presentation-Year 1

Sharing Information:

Guldan - Powerpoint demonstration to accompany presentation titled "Hydrologic Connections between Traditional Acequia Communities and their Watersheds: Three cases from Northern New Mexico".

Rivera - Powerpoint demonstration to accompany presentation titled "The Culture of Ayuda Mutua in the Rio Arriba".

Product Type:

Map

Product Description:

Study Area Boundary Map-Year 1

Sharing Information:

Boykin - Mapping showing regional study area boundary shared through internal website: http://sites.google.com/site/cnhacequia/

Boykin - Mapping showing three fine scaled study area boundaries shared through internal website: http://sites.google.com/site/cnhacequia/

Product Type:

Table

Product Description:

Land Cover Table-Year 1

Sharing Information:

Boykin - Tables of land cover for region and 3 sites shared through internal website: https://sites.google.com/site/cnhacequia/

Product Type:

Model

Product Description:

Integrated Decision Model-Year 1

Sharing Information:

Tidwell - Model will evaluate stress and mitigation options for acequia operation and will be available from website on completion.

Product Type:

Data or databases

Product Description:

CNH Dropbox, FTP Site, Acequia Manual-Year 2

Sharing Information:

CNH Acequia Drop Box
This is a secured web-based external repository that allows invited project participants efficient access to all data and information relevant to the CNH project.

CNH Acequi FTP Site
This FTP site houses large amounts of raw data or items with a higher level of security than is available with the CNH Acequia Dropbox.

Acequia Manual
This manual contains pictures, maps, site descriptions, and contact information for the El Rito and Rio Hondo Valleys. It is located in the CNH Acequia Dropbox and is available to all invited participants.

Product Type:

Newsletter

Product Description:

CNH Acequia Newsletter-Year 2

Sharing Information:

Quarterly newsletter that showcases all project activities and is located on the CNH Acequia website.

Product Type:

Poster

Product Description:

Poster Presentation-Year 2

Sharing Information:

Abstracts for poster presentations reporting preliminary data documenting grazing history of watersheds surrounding acequia communities included in this study will be submitted to the 66th Annual Meeting of the Society for Range Management and the 45th Annual Fall Meeting of the American Geophysical Union.

Monitoring Streamflow In Irrigated Valleys of Northern New Mexico: Undergraduate Research. Alejandro Lopez, Jimmie Hughes, Sam Fernald, and Carlos Ochoa, New Mexico State University, Las Cruces, NM. Annual NM EPSCoR All Hands meeting, September 2011, Albuquerque, NM (pdf attached)

Implementation of Hydro-Meteorological Network in Northern New Mexico - Dustin Rapp, New Mexico State University, Las Cruces, NM (co-authors: Carlos Ochoa, Sam Fernald) AWRA, 2011 Annual Water Resources Conference, Albuquerque, NM Nov. 7-10, 2011 (pdf attached)

"Acequia Water Systems Linking Culture and Nature: Integrated Analysis of Community Resilience to Climate and Land Use Changes", NMAA Annual Congresso, Santa Fe, NM Nov. 12th, 2011 (pdf attached)

Characterizing Water Level Fluctuations and Shallow Aquifer Recharge From Irrigation in a Semi-Arid Irrigated Valley -Carlos G. Ochoa, NMSU, Las Cruces, NM (co-authors: Alexander G. Fernald, Steven J. Guldan, Manoj K. Shukla, Vincent C. Tidwell)

"Assessing Climate Change Impacts on Agricultural Diversity and Water Use in the Upper Rio Grande Using a Hydro-economic Model," Presented at the Annual meeting of the New Mexico EPSCoR, Climate Change Impacts on New Mexico's Mountain Sources of Water, Albuquerque, NM. Sept 30, 2011

"EPSCoR Acequia and Climate Change Project, Year 4 Research", NMAA Annual Congresso, Santa Fe, NM Nov. 12th, 2011 (pdf attached)

Jarrett Garcia and Sam Markwell, "Land, Water, and Community on the Rio Chama, 1200-2010", NMAA Annual Congresso, Santa Fe, NM Nov. 12th, 2011 (pdf attached)

Product Type:

Audio or video products

Product Description:

YouTube Video-Year 2

Sharing Information:

http://www.youtube.com/watch?v=3HIHJ3elW98&feature=channel_video_title.
The story will be on KRWG TV (channel 22 in Las Cruces) on August 18th at 7:00p.m. It will also run as a 5 part series on KRWG FM 90.7 from August 15 - 19 in the morning and afternoon and will be posted to the KRWG.org website by August 15th

Product Type:

Photo

Product Description:

Photos-Year 2

Sharing Information:

CNH Project photos will be documented on the CNH Acequia website and used by CNH participants to help illustrate their project work. (pdf attached)

Product Type:

Power Point Presentation

Product Description:

Power Point Presentation-Year 2

Sharing Information:

Jose Rivera, Moises Gonzales, Jarrett Garcia, Sam Markwell, "The Rio Chama Basin: Water-Related Issues and Changing Climate," Powerpoint presented at Tri-State EPSCoR Interdisciplinary Modeling Course, June 2012 at NMSU campus

B. Hurd1, A. Fernald, V. Tidwell, J. Rivera, K. Boykin, A. Cibils, S. Guldan, C. Ochoa, J. Wilson, M. Ortiz, S. Rodriguez, C. Steele, J.L.

Arumi, "Acequia Communities and Small-Tract Irrigation: Linking Culture and Nature through an Integrated Analysis of Resilience to Climate and Land Use Changes" Acequia Communities

Vince Tidwell, Carlos Ochoa, Laura Mayagoitia, "Modeling the Physical/Social/Cultural Dynamics of Small Scale Community Irrigation Systems(Acequias)", Annual UCOWR Meeting, Boulder, CO July 13, 2011.

Carlos Ochoa, Vince Tidwell, "Looking at the Human and Environmental Interactions of Acequia-Community Based Agriculture Systems in New Mexico: A System Dynamics Modeling Approach", Annual UCOWR Meeting, Santa Fe, NM July 17, 2012.

B. Hurd1, A. Fernald, V. Tidwell, J. Rivera, K. Boykin, A. Cibils, S. Guldan, C. Ochoa, J. Wilson, M. Ortiz, S. Rodriguez, C. Steele, J.L. Arumi, "Acequia Communities and Small-Tract Irrigation: Linking Culture and Nature through an Integrated Analysis of Resilience to Climate and Land Use Changes" Overview

Product Type:

Maps

Product Description:

Landcover Maps-Year 2

Sharing Information:

Garcia
Completed the Final Landcover Maps (17 with legends) and Final Water Maps (17 with legends) of the Rio Chama Basin in Rio Arriba County.

Product Type:

Teaching aids

Product Description:

Environmental History of the Rio Chama Basin-Year 2

Sharing Information:

Markwell
Completed first three chapters of environmental history of the Rio Chama Basin and a working bibliography.

Contributions

Contributions within Discipline:

Year 2

Hurd
Hurd, Brian H. (Mar, 2012). 'Assessing and Adapting Water Resource Systems to Climate Variability and Change, What Have We Learned and Where are We Going?' Seminar given to the Water Science and Policy Center, UC Riverside, March 22, 2012. Invited.

Rivera
Discussant for twelve papers presented at Mesa I: Gesti?n tradicional del Agua, a session of the Segundo Congreso de la Red de Investigadores Sociales Sobre Agua (Red-ISSA), Chapala, Jalisco, Mexico, March 21-23, 2012.

Contributions to Other Disciplines:

Year 2

Hurd, Brian H. (Aug, 2012). 'Finding a Balance Between Agricultural and Urban Water Uses,' Seminar given to the Santa Fe County Extension and the Western Region Sustainable Agriculture and Education Program (WSARE), Water: The Foundation of Agricultural Sustainability Conference, Aug 7, 2012. Invited.

Contributions to Human Resource Development:

Contributions to Resources for Research and Education:

Contributions Beyond Science and Engineering:

Conference Proceedings

Special Requirements

Special reporting requirements: None
Change in Objectives or Scope: None
Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Contributions: To Any Human Resource Development
Contributions: To Any Resources for Research and Education
Contributions: To Any Beyond Science and Engineering
Any Conference