Innovation Working Group
Natural and Human Dynamics of *Acequia* Systems
Activity Lead: Dr. Alexander Fernald

Problem statement

Arid and semi-arid region river valleys with traditional irrigated agriculture may represent a vitally important ecosystem worldwide that is threatened by mounting pressures to convert agricultural land and water resources to other perceived higher value uses. *Acequia* irrigation systems may ameliorate impacts of expected earlier and more rapid spring runoff by diverting water from streams, storing it underground, and releasing it to streams. Centuries of adaptation to climate variability have created *acequia* traditions that support resilience and adaptation to water scarcity. Beyond these hydrologic and cultural aspects, *acequia* systems appear to support an entire suite of ecosystem functions such as: water cooling for improved aquatic habitat health, riparian vegetation for biodiversity preservation, contiguous corridors for short- and long-term migration, and stream-floodplain connections for increased habitat complexity. These natural ecosystem functions rely on the human socio-cultural structures developed to manage water.

IWG

This Innovation Working Group (IWG) was designed to bring together a group of local, national, and international experts to explore the interactions between ecosystem functions and human cultures of traditional *acequia* irrigation systems. The IWG was convened to address the following questions:

1) what are the hydrologic and ecosystem functions of *acequia*-irrigated valleys?
2) how are these functions dependent on socio-cultural traditions of these systems; and
3) how can understanding of these natural and human elements be integrated into a single multispatial and multitemporal analysis of response to climate change?

The operational objective was initial preparation of a grant proposal to the National Science Foundation (NSF) Dynamics of Coupled Natural and Human Systems (CNH) program. The workshop built on the activities of the socioeconomics and *acequia* hydrology team of the current New Mexico EPSCoR project, “Climate Change Impacts on New Mexico’s Mountain Sources of Water”. This interdisciplinary team is effectively working together to understand climate change impacts on hydrology of *acequia* irrigated valleys and community resilience to change based on *acequia* culture and tradition. The topic is excellently suited for the NSF CNH program with intrinsic links between natural and human systems, and meets an anticipated function of EPSCoR by using EPSCoR infrastructure to advance groundbreaking research.

The IWG was held from September 15-17, 2009 at Ghost Ranch in Northern New Mexico; participant names and affiliations are listed below.

Alexander (Sam)	Fernald	NM State University
Daniel	Guerara	NM Environment Dept
Carlos	Ochoa	NM State University
Andres	Cibils	NM State University
Kenneth	Boykin	NM Environment Dept
Jose Luis	Arumi	Univ. of Concepcion
Sylvia	Rodriguez	University of NM
Amanda	White	NM Tech
Vince	Tidwell	Sandia National Labs
Ken	Bencala	USGS
José	Rivera	University of New Mexico

The IWG enabled this team to synthesize complex intersecting topics. In addition to other productive conceptual outputs, the IWG helped formulate the **central hypothesis** that *traditional acequias create and sustain intrinsic linkages between human and natural systems that increase community and ecosystem resilience to climatic and socioeconomic stresses*. This hypothesis was the core of a clearly formulated and competitive CNH proposal submitted on November 17, 2009. The proposal built directly on the IWG, addressing better understanding of climate change effects on physical, ecological, and social functions of acequia-irrigated systems.