

**The Jemez FHiRE Project (2012-2014)**  
**University of Arizona Laboratory of Tree-Ring Research**

Through a historical case study, this project tests alternative hypotheses of how human activities at the Wildland Urban Interface affect the response of fire-adapted pine forests to climate change and conversely, how humans respond to these changes over multiple centuries. Improved understanding of these interactions is needed for managing these forests today, and for anticipating future social and environmental vulnerabilities where high-density human settlements have developed -- also known as the Wildland-Urban Interface.

### Goals

**Primary:** The understanding of long-term, landscape-scale dynamics of human societies, forests, and climate generated by this project will be necessary for sustainable management of similar forests at the Wildland Urban Interface across the American West and elsewhere.

**Secondary:** Participation in both research and education will strengthen the relationships between scientists, managers, and community members, facilitating the use of scientific information in management decisions aimed at establishing resilient, sustainable forests.

**Study area:** An ancient Wildland Urban Interface in northern New Mexico where large communities of Native American farmers lived within ponderosa pine forests through varying climate episodes over the last 700 years.

### Why should we be concerned now?

In the past half-century many thousands of homes have been built within North American forests dominated by ponderosa pine (*Pinus ponderosa*) trees. These forests and communities are now extremely vulnerable to large, severe fires during droughts as a consequence of fire exclusion and other land use practices.

### Research methods

**Archaeology and paleoecology** will be combined to build multi-century fire and forest histories across gradients of human population sizes, ranging from large towns to relatively unoccupied areas.

**Dynamic computer models** will be developed, and using paleoclimatic data as input they will simulate fire and forest histories across the landscape and through time. Tested against the local fire histories, these simulations will be varied in the magnitude and location of human impacts to identify tipping points in the sustainability of these forests and human communities.

### Who benefits from this research?

**Land managers** who are engaged in landscape-scale fire and forest management initiatives on federal and tribal lands.

**American Indian tribes** whose ancestors lived in these ponderosa pine forests will contextualize the fire and forest histories and human responses to environmental changes through participatory action research.

**K-12 teachers** will develop and implement lesson plans/activities that integrate fire-society issues in science and history classrooms in the region.

### Outreach Questions to explore:

- How do people and climate alter the types of fire that these environments experience?
  - What role has climate played in fire regimes of the area in the last 500 years?
  - What influence did people in that environment have on climate relationship or fire regimes?
  - How were people able to live in fire-adapted ecosystems/forests for such a long period of time?
- Why are wildfires so large now? Is this typical?
  - How do these fires affect lives of people living close to them?
  - Were *fires always of this type* in these regions?
  - What role do ground fuel types have?
  - What is the connection between fuels and fire ignition responses?
- Forests were managed landscapes (by humans) for hundreds of years. There are valuable lessons from this. What are those lessons?
- How do we live on this landscape sustainably?

## Project Researchers and Scope of Work

Researcher	Focus area	Year 1 (2012)	Year 2 (2013)	Year 3 (2014)
<b>Chris Roos</b>	<b>Sedimentary paleo-ecological research</b>	Field - 6 weeks of research at two localities -Fall- laboratory analysis of sediment samples	Field -6 weeks of research at two localities -Fall- laboratory analysis of sediment samples	Spring -major analyses of sediment samples -Field- 6 weeks of geo-archaeological fieldwork to collect sediments from the remaining two localities
<b>Rachel Loehman</b>	<b>Ecosystem modeling</b>	Field - 4 week season to generate basic data on the Jemez area forests to calibrate the initial run of FireBGC -Fall- adapt FireBGC for Southwestern ponderosa pine forest and fire dynamics	Field - 4 weeks of fieldwork for any additional data necessary to refine the modeling input -Fall- first round of model revisions	Evaluating model performance with the first two seasons of paleo-ecological data leading to final round of model revisions.
<b>Matthew Liebman</b>	<b>Archaeology</b>	Field - 8 week season of archaeological mapping and ceramic analysis	Field - 8 week season of archaeological mapping and ceramic analysis	Field - 8 students from Jemez Pueblo in archaeological fieldwork at the final two ancestral Jemez villages
<b>Tom Swetnam</b>	<b>Tree-ring research</b>	Field -4 week season of sample collection at two localities -Fall- preparation and analysis of samples by the LTRR	Field - 4 week season of sample collection at two localities -Fall- analysis of collected samples will continue	Spring - Major analyses of tree-ring samples - Field - 4 weeks of dendro-ecological fieldwork at the final two localities
<b>John Welch &amp; TJ Ferguson</b>	<b>Ethnographic fieldwork</b>	Field - 4 week ethnoecology field season: 1-week each with the four participating tribes -Fall- transcribing interviews and annotating field photos	Field - 4 week ethnoecology field season: 1-week each with the four participating tribes -Fall- synthesizing results from the two full seasons of ethnoecology research	Field -2 days with each group of tribal collaborators - presenting preliminary results; solicit feedback/interpretation from participating members of the Cultural Advisory Committees -Fall- synthesize feedback from the follow-up meetings addressing paleoecology, archaeology, and modeling projects
<b>Sara Chavarria</b>	<b>Outreach (Audience: Teachers)</b>	Field – 1-2 weeks in Jemez and 2 wks in Tucson working with 6 teachers: exposure to research project; design classroom lessons/activities; design summer teacher workshop. - Fall-use the designed lesson plans in class and provide feedback through the website	Field - 6 Lead teachers plan and deliver teacher workshop at Biosphere 2? Financially support 10 teachers from native tribes to attend the workshop. -Fall-16 secondary teachers deliver lesson units in their classroom; collect pre-post survey of knowledge and college plans	Spring – review feedback from the initial use of learning units in secondary school classrooms -Field - 6 Lead teachers plan and deliver teacher workshop at Biosphere 2. Financially support 10 new teachers from native tribes to attend the workshop. -Fall-20 secondary teachers deliver lesson units in their classroom; collect pre-post survey of knowledge and college plans