

## Jemez Mountains Field Trip Handout – From Tom Swetnam, February 27, 2012



Tree-Ring fire scar study sites are shown above (with 3 letter codes), and perimeters of large wildfires since about 1970 are visible as red lines (the 2011 Las Conchas Fire is not shown).

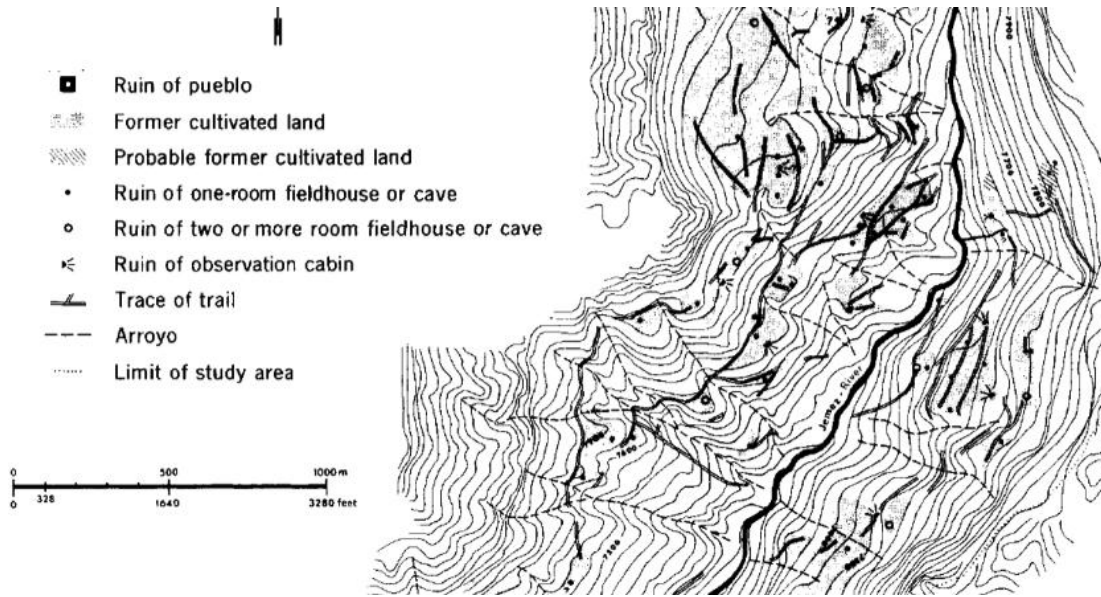
This is a very rich physical, ecological and cultural landscape. I grew up in Jemez Springs (1964 to 1973), attending the elementary and high schools at Cañon, NM. Since then I have worked with students and colleagues in this landscape on various fire, insect outbreak, climate, and human history studies.

Our newest study is aimed at learning how people, fire and ponderosa pine forests co-existed in these mountains over many centuries. The opportunity is great, because there are archaeological, historical, cultural, tree ring, and sedimentary sources that we can learn from. The need to learn is also great because of the increasing risk of forest cultural resource loss. I include the public abstract for this National Science Foundation funded project at the end of this handout.

A key learning opportunity is the fact that the Jemez people lived within ponderosa pine forests here for many centuries prior to the Spanish settlement period (circa 1610-1700).

A number of large, multi-story villages with more than 1,000 rooms each were occupied when the Spanish first arrived. The population density on the southern flanks of the mountain is not known with certainty, but a conservative estimate would be about 28 people/km<sup>2</sup>. The modern definition of the Wildland Urban Interface is 25 people/km<sup>2</sup>.

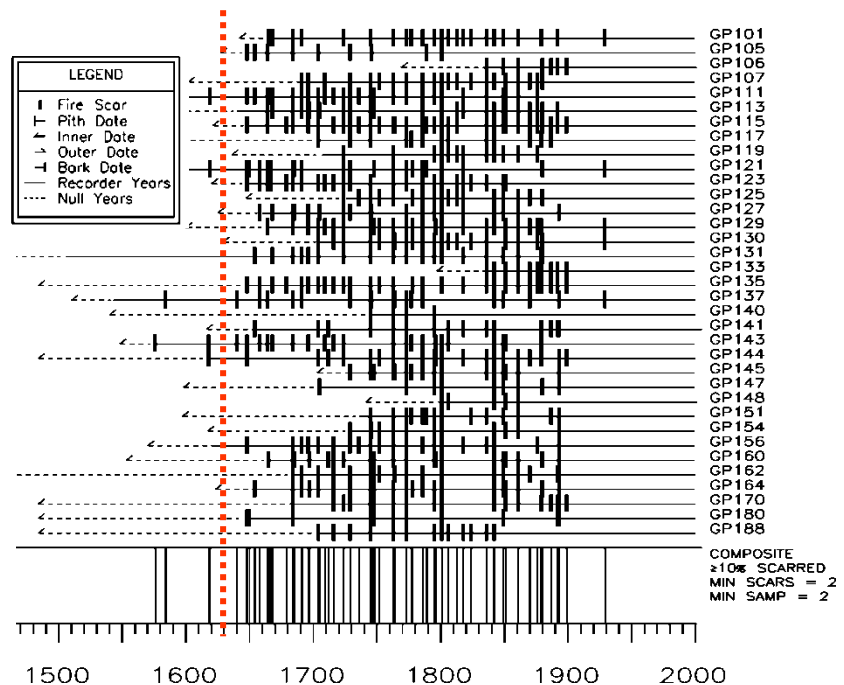




These ponderosa pine and mixed-conifer forests were extensively occupied and utilized for living space, agriculture, hunting, and other purposes. Dryland farming was practiced on mesa tops, in shallow drainages, and along canyon bottoms. The long-term human use of this landscape is hard to fully appreciate today. Diterich Fliedner's mapping of a small area near Battleship Rock (above) exemplifies the remarkable number and distribution of agricultural, water control, travel and living features in this landscape (Annals of Assoc. Amer. Geog. 65(3), 1975).

*What effect did such long-term, intensive human occupation and use of this landscape have on forests and fire regimes? What effect did wild and managed fires have upon the Jemez people? How did past climate variability and its effects on fire and agricultural systems affect the people and the forests? What insights and lessons can we learn for understanding and managing these systems today and in the future?*

Our fire history studies from fire scarred trees in the Jemez Mountains show typical Southwestern ponderosa pine patterns: frequent, widespread surface fires prior to circa 1900, and a sharp reduction of burning after that time. Don Falk's dissertation research in the 640 acre Monument Canyon Research Natural Area (about 3 miles northeast of the Fliedner map above), suggests that widespread fires may have been less frequent during the intensive occupation period of these forests before circa 1630.

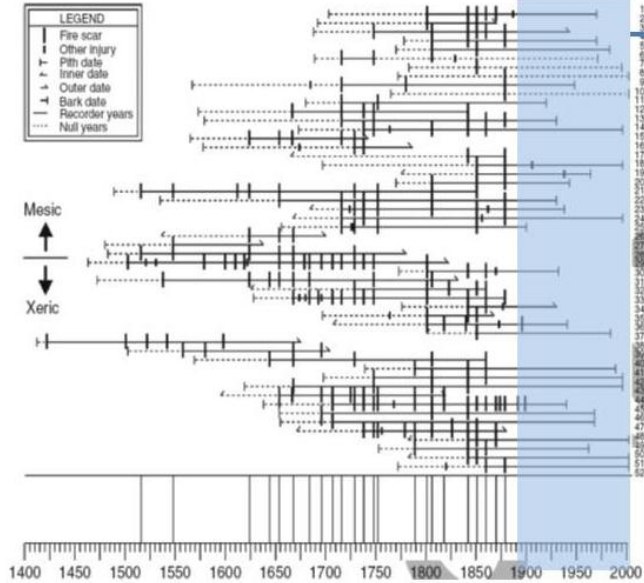




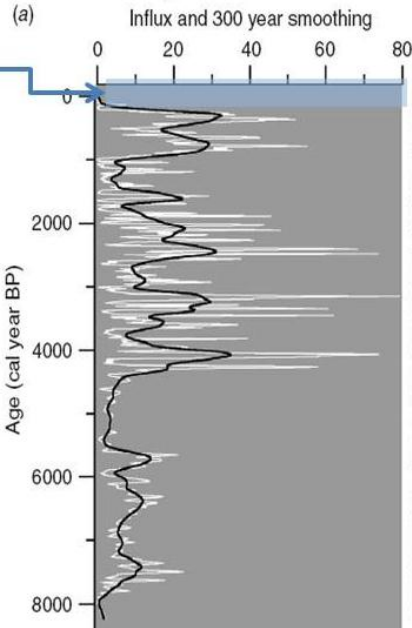
Forest changes after 1900 in Monument Canyon and elsewhere are evident from historical photos, early aerial photography (1935-36), tree age structure data, and other evidence. Don Falk measured some post-1900 tree thickets at Monument Canyon that exceeded 10,000 stems per acre! Recent restoration work at Monument Canyon RNA has been carried out by the Forest Service and in partnership with the Pueblo of Jemez (before: above left, and after: right).

We have studied fire history at multiple elevations, in different forest types in the Jemez, and in a few studies we have also looked at very long-term fire history patterns. A combined study of both charcoal in sediments from Alamo Bog and fire scarred trees on surrounding slopes illustrates the somewhat longer intervals between surface fires that occurred in mixed conifer forests before 1900 (below, Allen et al., *Int. J. Wildland Fire* 17(1), 2008). Charcoal was abundant throughout the sediment core going back nearly 8,000 years, except during the uppermost portion corresponding to the past century. The 20<sup>th</sup> century fire suppression period is the most anomalous hiatus in fire occurrence in the entire record.

**Fire scar chronology from mixed conifer slopes in watersheds above Alamo Bog, Valles Caldera National Preserve:**



**Charcoal particle abundance in sediment core from Alamo Bog:**



## **FHiRE: Fire & Humans in Resilient Ecosystems**

**Tom Swetnam, University of Arizona; Chris Roos, Southern Methodist University, Matt Leibmann, Harvard University; TJ Ferguson, University of Arizona; Rachel Loehman, US Forest Service; Bob Keane, US Forest Service; John Welch, Simon Fraser University; Sara Chavarria, University of Arizona; Chris Baisan, University of Arizona, Chris Toya, Pueblo of Jemez, and other collaborators**

**Long-term vulnerability and resilience of coupled human-natural ecosystems to fire regime and climate changes at an ancient Wildland Urban Interface (National Science Foundation Proposal #1114898)**

As global climates change, large wildfires have become regular features of national and international news. These fires are newsworthy because they affect the lives and livelihoods of thousands of people and because the *types of fire* are so different than in the recent history of these places. Certain types of fire are necessary to sustain key structures and functions of many environments around the world. Both people and climate can alter the types of fire that these environments experience through their effects on fire ignitions and on vegetation (fuels). In various circumstances these alterations may either increase or decrease the risk for types of fires that *will not* sustain those environments or the human societies dependent upon them. Although the physical and ecological responses of fire and vegetation to weather/climate are relatively well known, the interplay between human activities and fire are poorly understood, especially over time scales of 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.

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. 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. The study area is 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 1,000 years. 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.

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. Information from the project will be provided directly to manager-partners who are engaged in landscape-scale fire and forest management initiatives on federal and tribal lands. Participatory research with American Indian tribes whose ancestors lived in these ponderosa pine forests will contextualize the fire and forest histories and human responses to environmental changes. 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. An educational program will establish a legacy of learning by developing and implementing K-12 lesson plans that integrate fire-society issues in science and history classrooms in the region. The involvement of undergraduate and graduate students, participation of American Indian research partners and underrepresented K-12 students, and the linkages to contemporary managers provide a broad capacity to disseminate project results in meaningful, applicable, and lasting ways.

# The Albuquerque Tribune

LOCAL FORECAST: Partly cloudy and warm today and tomorrow with scattered afternoon and evening showers or thunderstorms.

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A letter from the editor

## A visit to a tragic scene — Where a forest died

**EDITOR'S NOTE**—This Editor's Letter was originally written for publication last Monday. The rioting in Albuquerque delayed its publication.

DEAR TRIBUNE READERS:

It is a terrible thing to see a forest fire while it is burning.

I'll never forget driving home on Highway 44 west of Bernalillo on a summer night four years ago. And suddenly seeing in front of us great clouds of smoke and then an evil, irregular rectangle of red up and down the west face of the Sandias above Juan Tabo picnic grounds.



Carmack

But there's something sadder than seeing a burning forest fire.

With a fire there's hope—the wind will change, the rain will come, the firefighters will soon conquer it.

A great forest fire that has burned itself out is a far sadder thing.

The trees have gone. And all the living things of the forest—even the perky chipmunks—have fled the forest or died in the flames.

There is no hope. The flame-swept area of the forest is dead—and a long time dead. Forty years after a great fire, such as the one in the

Jemez, it will still be possible to tell where the boundaries of the stricken area were.

FRIDAY AFTERNOON BONNIE and I went to the site of the Jemez fire.

We spent almost four hours traveling over the area. With us was a group of Forest Service men who could not only give us a step-by-step account of the heroic battle, but also tell us what the destruction meant.

In the group were Morgan Smith of the Regional Office, Santa Fe Forest Supervisor John M. Hall, Jemez Ranger Fred R. Swetnam and Robert G. Steinhoff.

SADNESS WAS WITH US as we drove and walked where the forest had been.

No one who sees such a scene could ever again be careless with a match or a cigaret or a campfire.

MOST EERIE ARE THE great eyeless sockets scattered everywhere in the fire's path.

Sometimes a tree—but usually a dry stump—not only burns above the ground but the fire burns down its roots.

Here would be the center hole of the stump itself and then leading off from it down into the

ground are the round, narrowing tunnels where the roots burned.

None we saw were this large and no longer this hot—but Mr. Steinhoff reported he was on a firefight where a man was killed when the ground caved in and he fell into one of these deep burn-outs.

WE STOPPED OUR TRUCKS and walked out to where a small blaze and considerable smoke were coming from a fallen tree.

Mr. Hall pointed out there were rabbit tracks—those of a snowshoe rabbit, he was sure—coming out through the ashes to the foot of this tree. The rabbit had made two sets of these tracks.

In some manner the rabbit had lived through the fire and had come back here twice after it was over.

Mr. Hall is sure that it had a nest in the roots of the tree before the fire.

What pull brought that rabbit back after this holocaust?

TODAY—NINE DAYS SINCE the fire broke out and six days since it was contained—there are probably a thousand fires still burning.

As you stand in the peaceful mountain

see A VISIT, page A-6



Forest Supervisor John M. Hall  
"I saw flames 1000 feet high."

le hot from them.  
We would scratch down through the ashes and generally they were from two to three inches deep.

And how sad when a gust of wind would stir up the ashes out in front of us.

☆ ☆ ☆ ☆  
I WAS IN TOKYO AT the end of World War II. They were not talking about the A-bombs but about the great fire bomb attacks — particularly one night in March 1945 when the “fires of Hell” burned in Tokyo.

They talked about the great “fire storm” that swept the city.

Ranger Swetnam says that at its height, this great Jemez fire reached such fierce heat that it created a “fire storm.”

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“IT WAS LIKE A MONSTROUS serpent writhing and twisting in the air,” he said. “Imagine several giant whirlwinds of fire whirling at great speed and also moving forward.

“The roar was like a big train.  
“Flames would race along the ground and suddenly be sucked up to the top of a tall tree.”

☆ ☆ ☆ ☆  
MR. HALL BELIEVES that he saw flames that were 1,000 feet high.

One thing caught our eye — aspen trees whose tops had not been completely consumed but had fallen to the ground.

We soon found out why.  
Hollow trees acted as chimneys causing the flames to roar up through them burning the tree from inside out.

About 30 feet above the ground the flame would get so intense that it would burn the tree so thin that the draft created by the fire would topple it over.

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I ASKED MR. HALL how old he thought the oldest tree burned by the fire might have been.

“I honestly believe there may have been a few trees 1,000 years old,” Mr. Hall said.

We say one giant log—old, old, old—still burning that must have been close to that age.

For it would have taken hundreds and hundreds of years for this giant to reach this size in land that gets no more rain than New Mexico gets.

And it plainly had lived its span, stood lifeless for decades and fallen many years before this fire finally ended its millennium on earth.

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THE REAL TRAGEDY DOES not lie in trees that have reached their prime, though several million dollars worth of timber was burned.

All photographs used with this Jemez fire article are by Bonnie Carmack.

The tragedy lies in the young trees. I pointed to a great grove of small trees blackened and dead. There were hundreds of them.

“How old were those trees? How many years has it taken them to reach that size?” I asked.

“Those trees were about 60 years old,” Mr. Hall said.  
The real loss — in every sense of the word — lies in the



J. Morgan Smith

“Flames so hot they burned even roots of this tree.”

millions on top of millions of trees in various stages of growth.

☆ ☆ ☆ ☆  
IT WAS PLAIN FROM THE first this was going to be a big fire.

Frank Gonzales in the lonely fire lower atop Cerro Pelado, six and half miles to the southwest, spotted it first at 1:20, Saturday, June 5. He sounded the alarm.

Red Top Lookout — nine miles off to the west — then caught the smoke.

And that gave them the “triangle” and pin-pointed the fire — near one of the small canyons that run into Virgin Canyon. It is not too many miles west and slightly north of Battleship Rock.



Ranger Fred R. Swetnam

“From first glance, I knew it was a bad one.”

THEY WERE TWO GUARDS in the area and they were at the scene of the fire almost instantly.

So linked up is the radio system that 20 men were on the fire in half an hour.

Tall, lanky young Jim O'Rourke, a range management man, was one of their there.

He had Ranger Swetnam on the radio and warned him: “Fred, be careful with the men — it's already in the tops of the trees.”

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RANGER SWETNAM WAS PUSHING his truck hard to get to the scene when he caught his first glimpse of the smoke from a high turnout on the road.

A glance told him how bad it was and right there he ordered a slurry plane to come from Santa Fe.

Not only fire crews but local people started coming in and volunteering to help despite the danger. Ranger Swetnam over and over talks of their bravery.

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FOREST SUPERVISOR HALL WAS SOON on the scene. More and more firefighters kept coming in — and more and more slurry bombers were ordered.

At 6 p.m. four more professional crews of firefighters were ordered. At 8 p.m. eight more were asked for — and then at midnight, 16 additional crews were asked for the emergency.

At the height of the fight, there were 1100 men trying to stop it. Infra-red aerial cameras kept track of their progress.

There were seven B-17 and two B-25 bombers dropping load after load of slurry. What drama lies in those raspberry soda-like streaks that still stripe some of the hillsides.

☆ ☆ ☆ ☆  
BACK OF EVERY ARMY ARE the support troops — and feeding those 1,100 firefighters took some doing.

Ted Garoutte and his wife, Pat, run the Post o' Call catering service at Grants.

They were in Albuquerque getting set up to handle the concessions stands at the drag races, when the Forest Service got the word to them to get moving.

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THEY SWEEP ALL THE SOFT DRINKS, popcorn and other stuff out of their big kitchen truck and set out for the firefighters central camp in the La Cueva area above Jemez Springs.

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