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The Cerro Grande Fire, Los Alamos, New Mexico

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Abstract

The Cerro Grande Fire of 2000 was the largest, most destructive wildfire that New Mexico has ever known. The fire swept across 47,000 forested acres in Bandelier National Monument, the Santa Fe National Forest, Los Alamos National Laboratory, Los Alamos County, and the Santa Clara and San Ildefonso Indian Reservations, causing about $1 billion in property damage. Over 400 families were left homeless, and over 100 Laboratory structures burned. However, the destruction would have been greater if the community had not learned from past wildfires and planned and carried out actions that lessened the eventual damage.

Introduction

In May 2000 about one-quarter of the community of Los Alamos and thousands of acres of surrounding forest were consumed by the most devastating wildfire ever recorded in the state of New Mexico. The Cerro Grande Fire occurred in a heavily forested, relatively remote, area of New Mexico. First set as a controlled burn by the National Park Service, unprecedented winds soon whipped the fire out of control. Although wildfire is a naturally occurring event in this region, several factors contributed to the situation leading to the Cerro Grande Fire. These include overgrown forests, drought conditions, communities built without regard to the wildland-urban interface, and the complex physical and political landscape. The area had a wake-up call five years earlier when a smaller fire threatened the community. The actions taken in response to that earlier wildfire served to protect the community and Los Alamos National Laboratory from greater damage during the Cerro Grande fire.

Setting the Stage

Los Alamos is situated in Northern New Mexico, a relatively remote part of the country. While New Mexico is the fifth-largest state in the country, it is sparsely populated, with over half of the population living in Albuquerque 100 miles to the south. The area around Los Alamos is known for its scenic beauty, archaeological ruins, rugged terrain, and infrequent roads. The landscape is complex, both in terms of terrain and in terms of land ownership. The complex geography and the complex topography both play a significant role in the management of wildfire in the Los Alamos area.

Los Alamos is by far the smallest county in the state, comprising only 108 sq. mi. The two residential areas in Los Alamos County are the communities of Los Alamos and White Rock with populations of about 12,000 and 6,000 respectively. To the south of Los Alamos and to the west of White Rock lies Los Alamos National Laboratory. The 43 sq.mi. Laboratory is operated by the University of California under contract with the U.S. Department of Energy, and is considered to be one of the nation's preeminent science and technology laboratories. The Laboratory has an annual operating budget of over $1billion, has over 2,000 structures ranging from very large buildings to small utility sheds, and employs about 12,000 people. Primarily known as a nuclear weapons laboratory, its mission includes research in many aspects of science relating to physics, nuclear materials, energy, and biosciences. The Laboratory buildings house many hazardous materials and volatile chemicals and about half of the Laboratory acreage is devoted to tests that use high explosives.

Adjoining Los Alamos National Laboratory on the south is Bandelier National Monument, administered by the National Park Service, U.S. Department of the Interior. To the west and north of the Laboratory and townsite is Santa Fe National Forest, administered by the U.S. Forest Service of the U.S. Department of Agriculture. To the north of the forest is the Santa Clara Indian Reservation, and to the east of the Laboratory and the townsite is the San Ildefonso Indian Reservation. Administered by sovereign American Indian tribes, the reservation land is held in trust by the Bureau of Indian Affairs of the U.S. Department of Interior. Adjoining Santa Clara Reservation, Santa Fe National Forest, and Bandelier National Monument on the west is the recently-created Valles Caldera National Preserve, administered by a board of trustees appointed by the President. Originally a Spanish land grant and more recently a cattle ranch and hunting reserve, in the summer of 2000 the 110 sq. mi. tract was purchased by the federal government from its private landowner to bring its vast natural resources under public ownership.

Los Alamos National Laboratory sprawls across the center of Los Alamos County. When the Laboratory was formed in 1943 Los Alamos County was scooped out of the holdings of the three adjacent counties. Los Alamos County is administered by a combined county-municipal government and has jurisdiction over parkland and open space within the townsite and White Rock. In addition to the county governments, the State of New Mexico has jurisdiction over certain natural resources in the area including forestry and wild game. In an area about fifteen miles square, then, the land and its resources are administered by three federal agencies, a federal board of trustees, two American Indian tribes, four counties, the state, and a few thousand private landowners.

Topographically the land pattern is just as complex. Place names here reflect the Spanish and Indian heritage of the region. From west to east, the topography falls sharply along the eastern flanks of the Jemez Mountains (*jemez* is the Spanish spelling of a Towa Indian word that refers to a specific *pueblo* or community). The Valles Caldera National Preserve is named after the valleys (*valles* in Spanish) formed by a collapsed crater, or *caldera*, from a quiescent volcano. The caldera is rimmed by the Jemez Mountains, which rise slightly over 10,000 feet at their highest point above Los Alamos (*los alamos*

means "the cottonwoods"). The flanks of the mountains drop sharply to the Pajarito Plateau (*pajarito* means "little bird") situated at about 7,500 to 6,500 feet. Los Alamos, both the townsite and the Laboratory, sit on the fingerlike mesas of the Pajarito Plateau; the lobes of the mesa are dissected by steep canyons dropping hundreds to thousands of feet to the Rio Grande below, at about 5,000 feet. In a span of slightly more than ten miles, the land drops over a mile in elevation.

Fire Ecology

Wildfire is a part of the western ecology, and has shaped, and is shaped by, the lands and forests of the Jemez Mountains. Three things are needed for a wildfire: 1) an ignition source, often lighting, but sometimes human-caused (intentionally or by accident); 2) sufficient fuels to carry a fire, such as trees, shrubs, dry grass, or structures; and 3) certain ambient weather or climatic conditions, in particular hot, dry weather with high winds. The stories of past fires on the Pajarito Plateau are captured in the tree trunks of the ponderosas, marked by fire scars where the wood rings have healed over burned wood. For a thousand years frequent, low-intensity ground fires would sweep through the mountains, started by lighting in the dry season of early summer, or by people. These cleansing fires served to clear out accumulations of undergrowth and small trees leaving a park-like savannah punctuated by the fire-resistant cinnamon trunks of large ponderosa pine trees. However, if pushed by abundant understory fuels, steep slopes, or high winds, a low-intensity wildfire can jump up into the tops of the trees and become a high-intensity, devastating crown fire, leaping from tree to tree with the speed of the wind.

In the late 1800's, changes in land use on the Pajarito Plateau brought a change in how people in the area managed fires. In the 1890's the railroad came through Northern New Mexico, bringing new industries and more people. Livestock grazing became important and the animals consumed the grasses and forbs that had carried the low-intensity ground fires. To protect new homesteads, cattle and sheep ranges, logging areas, and other new improvements, settlers on the plateau began to suppress the natural fires. As a result of this change in managing vegetation and fire ignition the cleansing action of the low-intensity wildfires was delayed. Small densely-spaced trees and thickets of underbrush became established in the formerly open ponderosa parks.

An even greater change in land use on the Pajarito Plateau came about during World War II when the federal government established a secret laboratory at Los Alamos. Almost overnight the tiny community grew to a thousand people, then ten thousand, as scientists, engineers, machinists, maintenance works and their families were brought in to invent, design, engineer, and build the world's first nuclear weapons. Pasturelands were converted to acres of houses, and bean fields to top secret Laboratory buildings. Frame construction and cedar shingles of the new houses added to the fuel loads of the forests and the forests were allowed to grow into the center of the community.

To some extent, the community learned to live with the threat of fire. Wildfire on the Pajarito Plateau is influenced by many things, but large fires tend to occur at intervals of approximately 20 years. This presents a dilemma for community planners: how to plan

for and manage an event that is relatively certain, but occurs at an interval beyond human memory. The wildfires in 1896, the 1920's, and 1946 are remembered by few, if any, still living in the Los Alamos area. Those Los Alamos citizens who are now nearing retirement age remember the wildfire of 1954 as a childhood event; those same people remember the large fire of 1977 as an event early in their professional careers.

The community, of course, rallied to fight wildfires but paid little attention to actions needed to plan for catastrophic fires. The Laboratory and community did do some things for a short period after the 1954 and 1977 fires, such as building fire roads to improve access for fire fighters, establishing fuel breaks to slow the progress of a wildfire, and thinning trees to reduce fuel loads, but these improvements were soon forgotten. This same twenty-year period was when most of the houses in Los Alamos were constructed as well as most of the buildings on the Laboratory. Because most people find forests attractive, and because the forests had grown up to the edge of the town, many of these new structures were built in forested areas.

A Wake-up Call

The 1977 fire mentioned above was called the La Mesa Fire, named for a prominent geographic feature (as are all wildfires). The La Mesa Fire, started by a catalytic converter on a vehicle, swept across 15,000 acres of Bandelier and the southern part of the Laboratory in June of 1977 leaving a fire scar that is still clearly visible today. Based on the nominal wildfire frequency of twenty years, foresters expected that fuels build-up in the Jemez Mountains would be sufficient to sustain a large fire in the 1990's – and that prediction was carried out. In April 1996 a campfire in the Santa Fe National Forest served as the ignition source for a wildfire that spread over the Dome Wilderness of Bandelier National Monument and came up to the southern edge of the Laboratory. In nine days, over 16,500 acres were burned. From the Laboratory, fascinated Los Alamos residents watched 200-foot flames engulf 80-foot trees in a matter of seconds; fireballs formed by the explosive gasses of the burning trees exploded 400 feet into the night sky. At one time it was feared that the fire would take over the southern part of the Laboratory. Hot Shot crews and professional fire fighters from the Interagency Fire Center in Boise, Idaho, fought furiously to bring the fire under control, and finally, aided by a change in the weather, the fire died down. The community and the Laboratory were left to wonder what the outcome would have been if the winds had shifted to the north and brought the fire closer to the town.

The Dome Fire pointed out very clearly the problems of passivity and neglect. There was no comprehensive consideration of how to fight wildfires on the Pajarito Plateau. Although the community had cut fire roads, fire breaks and fuel breaks after the 1977 La Mesa Fire, these infrastructure tools had not been maintained. During the Dome Fire emergency it was difficult to find maps of where these had been constructed, and in the field most were impassable or unrecognizable due to the new trees filling in the fuel breaks and washouts in the fire roads from twenty years of erosion. Different federal and local agencies must respond to different sets of missions, laws, politics and points of view, and during the Dome Fire there were disagreements and miscommunications

among agency fire fighters and resource managers on how to attack the fire and how to protect natural and cultural resources from damage during the fire fighting operations.

The reaction to the situation created by the Dome Fire was immediate. Within weeks after the fire was brought under control, the Laboratory, Los Alamos County, Bandelier National Monument, Santa Fe National Forest, and state and Pueblo agencies formed a new Interagency Wildfire Management Team. Started as an *ad hoc* exercise to plan for and execute tasks in the wake of the Dome Fire, the team soon recognized the value in continuing to coordinate wildfire fighting and mitigation management within and around Los Alamos County. The Interagency Team has met every two weeks since April 1996. This Team provided the first comprehensive look at regional wildfire issues. They prioritized wildfire management actions and determined what was needed to protect life, property, agency mission, and the resource base. They located, mapped, and reestablished basic fire fighting tools such as fire roads and fuel breaks. They assessed fuels loading within different sections of the Pajarito forests, and employed computer models to estimate probable fire behavior. Working together, the agencies found funds to thin the overgrown forests around the perimeter of the Laboratory and the community, trained resource management personnel in wildfire fighting techniques, purchased forestry equipment such as large chippers that could reduce forest litter to useable mulch, and established a helicopter base and fire supply cache in a central location on the southern edge of the Laboratory. The Team put into place administrative controls, such as limits on the use of outdoor grills or fireworks, in order to control the possibility of igniting a wildfire. The Team raised community awareness by meeting with homeowners regarding forest interface issues on specific properties, and jointly sponsored public meetings to raise community awareness of the wildfire threat to homes and lives. The people in charge of the different political jurisdictions of the area came to realize the value of knowing more about each other's plans, methods, and policies and learned to work together to solve fire management issues in the community while respecting each other's points of view. The Interagency Team is widely recognized as being instrumental in raising community awareness, improving response, and instilling the first notion of proactively managing the forests surrounding the community.

However, the Interagency Team could not control the weather. A few years of relatively high precipitation in the mid-1990's led to a flush of growth of grasses and new wood within the overgrown thickets of trees. The next couple of years, though, had scant rainfall or snowpack, and the grasses and twigs across the sweep of the Jemez Mountains dried to a fine tinder.

The wildfires did not wait. Even though the experts had projected twenty-year fire intervals the community experienced four significant fires in five years. Following the 1996 Dome Fire, Los Alamos watched the 1997 Lummis Fire, Bandelier National Monument, started by lighting; the 1998 Oso Fire, Santa Clara Pueblo, started by people, and the 2000 Guaje Canyon Fire, Santa Fe National Forest, also started by people. Curiously, the fact that these intense fires occurred so close together served to cement the relationships within the Interagency Team. The groundwork laid by the Interagency Team during these five years was instrumental in the community's ability to effectively

fight all of these fires, specifically through improved communication, coordination, and most importantly, trust.

The Cerro Grande Fire

In May 2000 came the largest wildfire ever recorded in New Mexico – the Cerro Grande Fire. The Cerro Grande Fire was widely reported on national news media, and many people are aware of the basic facts surrounding this event. They may have also read about or seen pictures of the massive destruction left behind – about $1 billion in property damage.

In the evening of Thursday, May 4, 2000, the fire crew of Bandelier National Monument lit a long-planned prescribed burn on the "big hill," or Cerro Grande, the highest and northernmost point of the monument. The purposed of the controlled burn was to clear out trees and undergrowth in order to reestablish an Alpine meadow ecosystem. Although the weather in Los Alamos had been hot and dry, the 10,000 foot peak had snow cover until late in the spring and park personnel felt that in March and April the meadow was too moist to sustain a fire prescription. The first week of May was about the end of their window of opportunity, and as the townsite suffered through unseasonable heat, the fuels on the high slopes of the Cerro Grande were thought to be finally dry enough to sustain the fire prescription. The burn was lit in the late afternoon, and the first evening of the fire was relatively uneventful.

For whatever reason, during the early morning hours the fire slipped out of the control of the fire crews, and on Friday, May 5 the official status of the fire changed from a prescribed burn to a wildland fire. Aerial slurry drops were made on the fire in an attempt to rein it in. The national fire center in Boise, Idaho, mobilized Hot Shot crews from around the west and directed them to head for Los Alamos. Throughout the next day firefighters and townspeople alike watched the situation nervously. On Sunday the winds began to pick up, and burning brands and embers were carried onto the forest service lands above the Laboratory starting small spot fires that were extinguished. That afternoon the Laboratory's Emergency Operations Center was activated, and that evening, amid thick smoke and blowing ash, part of the townsite of Los Alamos was evacuated.

On Monday, May 8, in the face of an impending natural disaster, the Laboratory made the unprecedented decision to shut down at a cost of about $3 million per day in lost time. It would prove to be the right decision. Burning embers and flaming branches, carried off the mountain by the hot dry wind, landed up to a mile from the main fire and quickly ignited the thick layers of dry pine needles, twigs, and grasses at the lower, drier, elevations. The small spot fires took hold and spread quickly across the steep face of the Jemez Mountains, sweeping first north, then south, as the winds drove the face of the fire up slopes, down canyons, and into the crowns of the trees. Hundreds of firefighters began to pour into Los Alamos to augment the federal wildfire fighters and the town's small fire department. On Wednesday morning, May 10, it seemed for a brief period that the firelines, backburns, aerial slurry and water drops, and firefighters on the line with

shovels and Pulaskis, would be successful in keeping the fire west of the Laboratory and south of the deep V-shaped Los Alamos Canyon that divides the townsite from the technical areas. However, the optimism was short-lived.

A wildfire makes its own weather. The hot dry winds of early summer were amplified by the movement of air to feed the rising flames. By mid-day on May 10 the winds began to gust to an unprecedented 60 and 70 miles per hour. If the fire jumped Los Alamos Canyon, it was decided, then the entire town of Los Alamos would have to be evacuated. A few months earlier the county's emergency management office had put together an evacuation plan for the nascent Y2K emergency that never materialized, but now the county officials turned to the untried plan. Shortly after noon the fire jumped Los Alamos Canyon, which was the last natural barrier before the townsite, and at 1:15 p.m. the County emergency personnel broadcast the directive for all of the people of Los Alamos to evacuate their homes immediately. Although some projections had indicated that it would take up to 12 hours to get all 12,000 residents of Los Alamos out the single road down the mountain, amazingly the entire town, including people, dogs, cats, parrots, horses and a few goats, left within four hours, directed by the small police force standing against the orange sky.

And they left not a moment too soon. On that day, May 10, the fire burned over 15,500 acres in nine hours – in other words, the Cerro Grande Fire consumed in nine hours the same amount of acreage that the 1996 Dome Fire consumed in nine days. By late afternoon the wind-whipped 200-foot wall of flame reached the western edge of town, and by 6:00 p.m. the first reports of loss of houses came in to the Emergency Operations Center. Just as we had watched the superheated trees explode during the Dome Fire, four years before, now we watched the superheated gases make burning homes explode. Throughout the night, the TV helicopters played live footage of house after house going up in flames, often consumed in just seconds.

But nothing could prepare the firefighters, emergency workers, or the TV audiences for the scene of devastation slowly revealed the next morning by the dawn's first light. House after house, row after row, block after block of homes, garages, cars, swing sets, toys, gardens, and bicycles were incinerated to a fine gray ash punctuated by the black skeletons of trees and power poles. Under the intense heat of the wildfire the houses burned down to their foundations. Nothing was left standing except a few chimneys or an occasional odd clutter of household piping.

Within Los Alamos that night, 239 residential structures were lost, and 429 families were burned out. However, it could have been much worse. At one time firefighters projected that up to 60% of the town could be lost. Fire suppression operations directly saved 1,245 homes, and indirectly saved over 4,600 homes.

The fire was far from over. On Thursday, May 11, spot fires from the still-burning slopes of Cerro Grande jumped almost a mile within the Laboratory boundaries, and crown fires raced both up and down the canyons crossing the Laboratory land. By Friday night about 7,500 acres, or about one-quarter, of the Laboratory had burned and 112 Laboratory

structure were lost. All of the buildings that burned were minor, such as trailer offices used by graduate students or storage sheds. No buildings containing nuclear materials or high explosives were burned although in some cases the fire came very close. There were some substantial losses on the Laboratory: loss of research materials, loss of experimental equipment, and damage from smoke and ash. A nationally-significant historic site – an old frame building where the world's first nuclear device was assembled, the birthplace of the atomic age – was totally destroyed, and there were significant losses to wildlife habitat and wetlands.

The fire continued to burn across the uninhabited areas to the north of Los Alamos. The plume of smoke could clearly be seen in satellite photos and crossed a four-state area into western Kansas. By late Thursday, May 11, the fire reached the Santa Clara Canyon in the center of the Santa Clara Indian Reservation. Although no one lived in the canyon, it represents the spiritual center of the reservation lands, and the tribal members felt great anguish as it burned.

All told, the Cerro Grande Fire burned for several weeks over a 47,00 acre area. It was considered contained on June 6, a month after it started, and was not declared extinguished until July 20, two and a half months after it started.

What did we learn?

So what were the successes of the Cerro Grande Fire? In the face of such widespread destruction "success" has to be viewed on a relative scale. But there were successes, because the damage from the fire could have been much worse. No lives were lost. No injuries were incurred during the evacuation of Los Alamos on the afternoon of May 10 and the 1:00 a.m. evacuation of White Rock that night, on May 11. Only three firefighters out of 1,500 sustained injuries, and none of those were life-threatening.

The work of the Interagency Wildfire Management Team was also a success. The tree-thinning program along the western perimeter of the Laboratory was instrumental in holding the fire off of Laboratory property for several days; the fire never did cross the fuel break, although it eventually jumped the break and burned back from within the Laboratory. Importantly, the selective tree thinning that was done around Laboratory facilities of greatest risk served its intended purpose. The tree thinning that had been done in the community of Los Alamos was also effective and in some cases helped to damp the fire. The interagency training program was also a success. During the fire, Laboratory resources specialists such as archaeologists who had been trained in fire fighting techniques were allowed to walk beside the fire crew bulldozers as they bladed fire lines, helping avoid damage to archaeological sites. The fire cache and helipad were heavily used during the fire, and the 1,200 wildfire fighters set up a tent city next to the cache at an area that had been planned for such use. After the fire, the County and the Forest Service worked together to establish and implement an Urban-Wildland Interface code to cover housing design and construction.

Conclusion

It has been almost a year since the Cerro Grande Fire. The debris of the burned houses has been cleared away and the County has installed new, better-designed sewer and water systems. The first of the new houses in the burned western area of town has been completed, and the framework for several more units is taking shape. A bronze statue of children climbing a tree has been placed before the municipal building to memorialize the fire. It will take the forest 100 years to grow back, and in the meantime the town will look to a ten-mile-long burn scar that will slowly soften as it fills in with shrubs and aspen, then pine, to cover the glazed slopes.

The planning lesson for the community is "never forget." We have seen first-hand what happens when the community loses its collective memory of fire and becomes complacent. But we have also seen first-hand what extraordinary good can happen when agencies learn to plan together to manage and mitigate for the inevitable next fire.

Timetable for the Cerro Grande Fire

- May 4 – prescription burn started on Cerro Grande, Bandelier National Monument, by Park Service staff
- May 5 – fire declared a wildland fire
- May 7 – spot fire spread, part of the Los Alamos townsite evacuated, Laboratory closes
- May 10 – the town of Los Alamos evacuated; over 230 homes burn, over 400 families left homeless
- May 11 – the community of White Rock evacuated; fire spreads across Los Alamos National Laboratory and over 100 minor buildings burn
- May 15 – evacuation order lifted
- May 22 – Laboratory partially reopened
- June 6 – fire fully contained
- July 20 – fire declared out

Spread of the Cerro Grande Fire

- May 4 – prescription burn lit on Cerro Grande within Bandelier National Monument to clear 200 to 300 acres
- May 8 – 1,900 acres on Bandelier National Monument and Santa Fe National Forest
- May 9 – 4,300 acres; fire spreads to Valles Caldera National Preserve
- May 10 – 19,500 acres; fire spreads to Laboratory, crosses western edge of Los Alamos townsite, and burns to the northeast
- May 11 – 32,900 acres; fire crosses Los Alamos National Laboratory and reaches Santa Clara Indian Reservation and San Ildefonso Pueblo Sacred Area
- May 13 – 36,100 acres
- May 14 – 42,200 acres
- May 15 – 47,600 acres
- May 20 – 48,300 acres

(Note: acreages are rounded, and represent the boundaries of the burned area; not all land within these boundaries burned during the fire.)