Preventing melt

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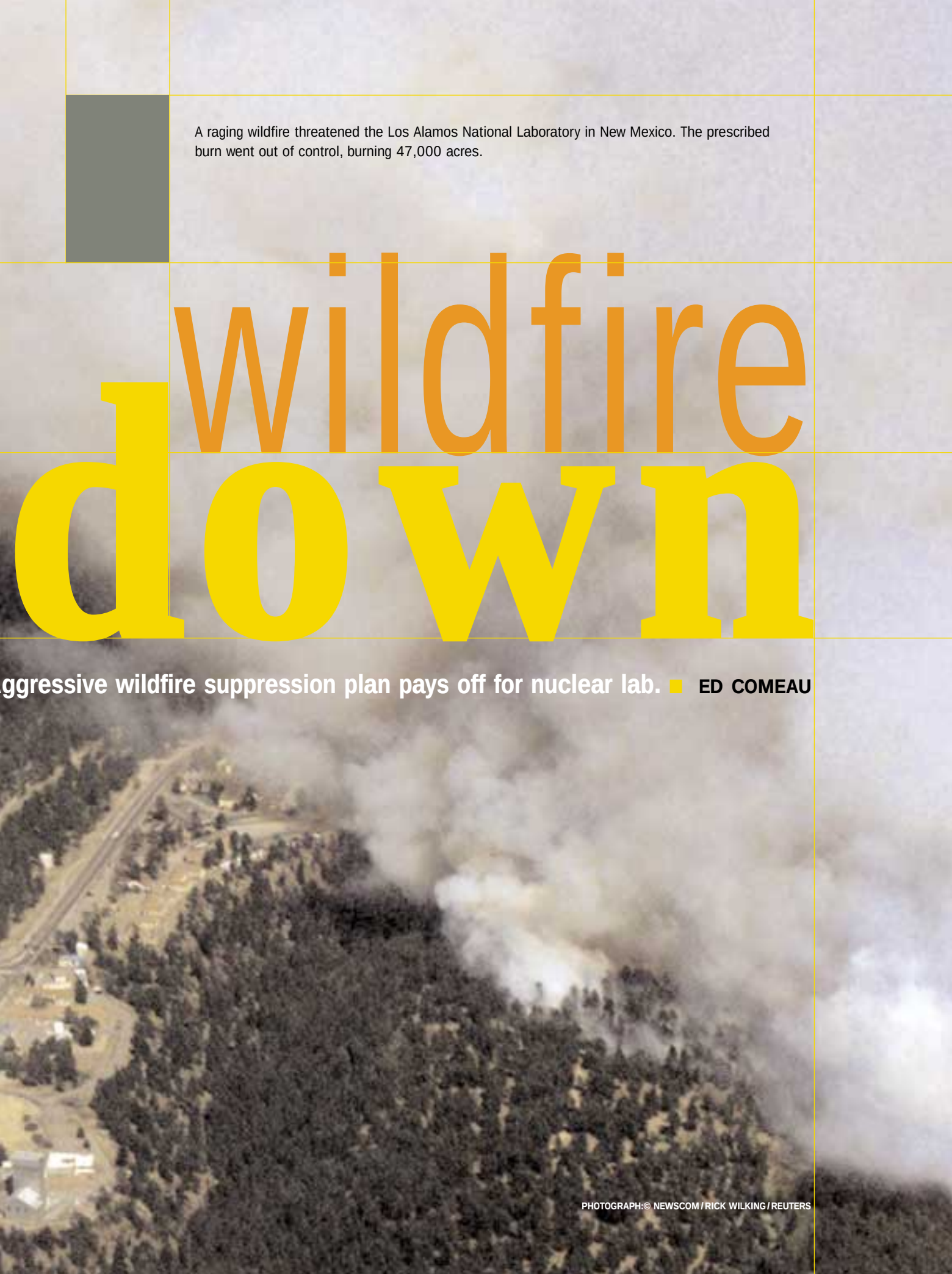

A raging wildfire threatened the Los Alamos National Laboratory in New Mexico. The prescribed burn went out of control, burning 47,000 acres.

wildfire down

ggressive wildfire suppression plan pays off for nuclear lab. ■ **ED COMEAU**

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On May 4, 2000, a prescribed fire was set in the Bandelier National Monument in New Mexico to reduce the fuel load in the region and help mitigate any damage that might occur during a wildland fire. Unfortunately, the strategy backfired, and the fire soon raged out of control, burning 47,000 acres (19,020 hectares) and destroying or damaging 400 structures and 37 million trees.

This blaze, which became known as the Cerro Grande fire, was one of the most significant wildland fires in recent history, requiring an extensive deployment of personnel and equipment. But there was one factor that made it significantly different from other wildland fires: It directly threatened the Los Alamos National Laboratory (LANL).

Established in 1943 as part of the Manhattan Project to develop the atomic bomb, LANL is now run by the University of California for the U.S. Department of Energy, using "the core technical competencies developed for defense and civilian programs to carry out both our national security responsibilities and our broadly based programs in energy, nuclear safeguards, biomedical science, environmental protection and cleanup, computational science, materials science, and other basic sciences."

The complex, which comprises between 1,100 and 2,000 separate facilities covering 6 million square feet (557,418 square meters), is spread over 43 square miles (111 square kilometers) on a series of mesas separated by canyons 400 feet (122 meters) deep. Some of these facilities are built down into the canyons, which are filled with combustible vegetation that can create severe fire conditions, providing a variety of fire protection challenges. Between full-time staff, seasonal employees, and contractors, about 10,000 people work at LANL daily.

FOR MORE INFORMATION ON NFPA'S WILDLAND/URBAN INTERFACE PROGRAMS, GO TO WWW.NFPA.ORG.

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History repeats itself

The Cerro Grande fire wasn't the first wildland fire to endanger LANL. In fact, four major fires have encroached upon the complex. In 1954, the Water Canyon fire broke out, followed in 1977 by the La Mesa fire, in 1996 by the Dome fire, and in 1998 by the Oso fire.

After the La Mesa fire, says Deputy Chief Doug Tucker of the Los Alamos, New Mexico, Fire Department (LAFD), the facility made an effort to protect itself from wildland fires.

"The La Mesa fire reached the borders [of the lab] and burned up two of the high-explosive buildings," he says. "After that fire, they took great lengths to install fire roads and fuel breaks."

Unfortunately, the roads and fuel breaks weren't maintained in the 20 years following the La Mesa fire.

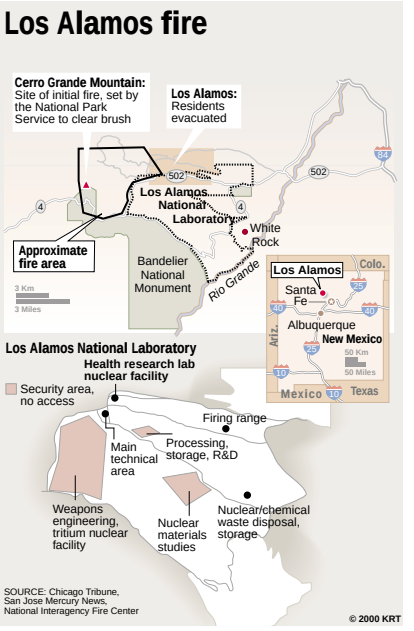
When the Dome fire broke out southwest of LANL in 1996, it threatened a tritium facility.

"Officials realized that they had to readdress the idea of fuel breaks and fire breaks around the buildings," says Tucker.

An interagency wildfire management team was formed that included representatives of LAFD, LANL, the U.S. Forest Service, the National Park Service, Los Alamos County, several Native American tribes, the state of New Mexico, and the U.S. Department of Energy (DOE).

"The whole intent was to have a community-wide defensive plan that looked at mitigation and forest health," says Tucker. "Using the scientific background of the biologists at the lab, they were able to come up with a prescription that looked at the forest and the buildings at LANL."

Part of the problem was that the forests surrounding LANL had changed. In the past, small fires periodically cleared the



land of smaller trees, downed limbs, and other fuel loads that are inevitable in a forest with large, fire-tolerant trees that has no significant amount of continuous fuel at the ground level. However, changes in U.S. Forest Service policy dictated that such fires were to be extinguished, rather than left to burn. As a result, fuel loads accumulated, presenting an ever-growing threat of conflagration.

In addition, logging operations around LANL resulted in the removal of the larger, fire-tolerant trees, leaving behind smaller, more fire-intolerant species. According to a report published by the DOE, the forest stands became overgrown with unhealthy trees, including large amounts of standing and fallen deadwood that created a significant fire hazard.

Following the 1996 Dome fire, LAFD convinced LANL that one of the biggest dangers to the lab wasn't a fire in one of the buildings, but a fire outside them.

"We became aggressive in 1996 in terms of defensible space and determining how LANL could protect those spaces and still allow for endangered species in the area," says Tucker.

"About a year before the fire, we changed the inspection program," says James R. Gourdoux, Laboratory Fire Marshal at LANL. "It includes the exte-

ILLUSTRATION: ©KRT

The Los Alamos National Laboratory.

rior of the building. The inspectors used industry standards to recommend clearing and cutting. The facility managers would then prioritize the projects based on funding and other priorities."

Tucker pointed to the example of five explosives-testing areas. Following the Dome fire, the sites were cleared of trees, which provided a visual barrier for the buildings and lab operations, to eliminate the continuous fuel load, and the grass was mowed to reduce the amount of combustible material present. In addition, employees were forbidden to use the areas for barbecues, and designated smoking areas were instituted.

"They went from a lax attitude to heightened awareness," Tucker says.

Mark Ghilarducci, the federal coordinating officer for the Federal Emergency Management Agency during the Cerro Grande fire, agrees.

"Los Alamos has an aggressive fire suppression plan," he says. "They'd done a tremendous amount of mitigation work before the fire season, when they cleared out the slash and wooded area where the fire would be minimized." This reduced the impact of the Cerro Grande fire by reducing the fuel load.

The burn

The success of these mitigation efforts was demonstrated during the Cerro Grande fire.

When the fire burned out of control on May 5, 2000, bulldozers were immediately sent to increase the defensible space around some key endangered buildings. Although the facility eventually lost 50 buildings, Tucker notes that they were all unprotected, portable buildings and work sheds. A number of hardened bunkers were overrun, but none sustained significant damage.

At the height of the fire, all facility employees were evacuated, except for core security personnel and firefighters, who used compressed air foam to protect buildings.

One of the difficult factors in fighting this fire was coordinating the different agencies involved in the incident, a responsibility that fell to Ghilarducci.

"I don't tell them how to fight the fire," he says. "I ensure that all of the agencies come under one coordinating umbrella and develop priorities with the governor's office to work effectively in a unified way to mitigate the emergency."

Because of the national security issues surrounding this fire, Ghilarducci was in regular contact with the White House.

"During an incident like this, the White House Situation Room moves to the highest level of alert," he says. "The National Security Council is advised, and decisions affecting national security are made at the White House."

Because the release of airborne radiation was a particular concern, the New Mexico Environment Department, the U.S. Environmental Protection Agency, the U.S. DOE, and LANL all monitored the air during the fire. According to Ghilarducci and to a report published by LANL, no abnormal radiation levels were detected at any of the 75 air monitoring stations during the fire, which was finally contained on June 6.

The aftermath

Following the Cerro Grande fire, the U.S. government made hundreds of millions of dollars available to beef up the mitigation efforts that were already underway when the fire broke out.

Another nuclear facility, another fire beaten back

Shortly after the Cerro Grande fire that threatened Los Alamos, another fire broke out in the area surrounding the Hanford Site, a nuclear waste-processing facility in eastern Washington state. This fire demonstrated the importance of planning and preparation in protecting such facilities.

The blaze started on June 27, 2000, when a motor vehicle accident on a nearby highway ignited brush on both sides of the roadway. By the time the fire was brought under control four days later, thousands of acres had burned.

"It spread incredibly fast," says Fire Chief Don Good of the Hanford, Washington, Fire Department, "moving across 20 miles (32 kilometers) in 90 minutes." Helping the fire along was the steep terrain, which ranged from 400 to 3,600 feet (122 to 1,097 meters).

Despite the size of the fire and the speed with which it moved, the fire department successfully protected the buildings at Hanford.

"We follow NFPA guidelines, such as NFPA 299, *Protection of Life and property From Wildfire*, Chapter 8, for defensible spaces, and we're pretty aggressive about enforcing them," says Good.

In addition, the roofs of many of Hanford's 500 buildings are noncombustible, which reduced their ignition potential.

The type of fuels that burned at Hanford were different than at Los Alamos, too.

"We don't have the tree problem they have at LANL," says Good. "Our fuel loads are primarily grasses and sagebrush, what's known as Type I and Type II fuels."

PHOTOGRAPH:© NEWSCOM/PAUL BUCK

The main objective of the plan was—and is—to reduce the number of trees on 10,000 acres (4,047 hectares) surrounding the facility from 400 to 800 trees per acre to 50 to 150 trees per acre.

"There should be clearances around the buildings," says Jim Smalley, NFPA's senior fire service specialist, who's responsible for coordinating NFPA's wildland/urban interface efforts. "There should be a minimum of 30 feet (9 meters) or more, depending on the slope."

"Mitigation efforts are really about taking out trees where they shouldn't be," adds Gourdoux. "This is done with the ecology staff at LANL, who pick out the diseased and weakened trees." Those that can't be sold or given away are burned in special units that generate low quantities of smoke and debris.

At the time the fire erupted, the mitigation program had managed to address only 800 acres (324 hectares). Fortunately, these were primarily around buildings that had been given a high priority during the vulnerability study that preceded the introduction of the mitigation plan.

"We didn't lose any building that met the criteria for highly protected risk (HPR) protection," says Gourdoux, since they had been built using strong construction because of their function.

"The mode of construction isn't necessarily based on nuclear operations but on the total dollar value at risk," says Gourdoux. "Anything valued at more than $1 million is built to HPR criteria."

At least one of the buildings at LANL featuring this type of construction has concrete exterior walls 36 inches (91 centimeters) thick. To make sure the doors of its loading dock can't be breached, they are protected by a deflecting structure designed to withstand a force equivalent to a large pine tree rammed into it at 100 miles (161 kilometers) per hour. Trucks have to negotiate the structure to deliver their loads.

The only LANL building that was significantly damaged during the Cerro Grande fire contained an ultra-clean room, and it was the victim of smoke, not flames.

"The fire never reached it," says Gourdoux, "But the smoke was so thick that when the power and ventilation went out, they couldn't keep the positive pressure up, and the smoke seeped in." The facility sustained $8 million in damage.

The building ventilation systems drew in outside air across the filters, which had to be replaced after the fire, resulting in a significant expense.

"One area where we could've saved a lot of money was by shutting down the ventilation," says Gourdoux. Smoke intrusion was one hazard that isn't being adequately addressed according to a DOE *Joint Review of Wildland Fire Safety*, which was issued last December after fires at Los Alamos and other DOE sites.

The review also noted that although the analytical tools are in place, all the wildland fire hazards at a particular DOE site may not have been cataloged, and therefore mitigation and response plans may not be adequate. Since the number of response vehicles and equipment is based on previous incidents, not potential hazard threat, there's no way of knowing if DOE sites have adequate resources.

Additional steps in any wildland fire mitigation project should include maintaining adequate water supplies and making sure there's a reliable means of getting the water to the fire. Access routes must be developed and maintained so that other responding agencies can access the site easily, and the personnel responsible for providing fire protection should be trained in all aspects of firefighting, including wildland firefighting. Solid contingency planning is a must, as are cooperative agreements with other agencies that can provide whatever help is needed in the event of a major conflagration.

Wildland fires used to be just that: fires that occurred in the wild and threatened only forests. With the increase in the wildland/urban interface, however, they've become issues of more widespread concern. Because facilities are now being built in areas that present a serious potential for external fire danger, it's critical that the proper steps be taken to minimize the danger. Detailed pre-incident planning, along with sound engineering, can play a major role in reducing the loss to nuclear facilities.

DOE report cites failure to apply NFPA standards

In the wake of wildland fires last year that threatened the Hanford Site, Los Alamos National Laboratory, and the Idaho National Engineering and Environmental Laboratory, the Department of Energy (DOE) conducted a joint review of fire safety programs with the Offices of Independent Oversight and Performance Assurance, Security and Emergency Operations, and Environment, Safety and Health.

The *Joint Review of Wildland Fire Safety* at DOE sites found that although the wildland fire prevention and response programs cover the basics to protect facilities, they need to be comprehensive and beefed up in certain areas in order to provide more efficient and effective protection to fully protect the assets of the lab sites.

The report recommended establishing clear expectations for creating wildland fire management programs. A lack of guidance at the Department level has led to a lack of clarity about wildland fire prevention and response programs at DOE field offices, leaving most DOE sites without a comprehensive program. NFPA was the only organization named specifically as having formal requirements to provide such identification. The report stated that DOE *Work Smart Standards* had not applied NFPA 299, *Protection of Life and Property from Wildfire*; NFPA 295, *Wildfire Control*; and NFPA 1051, *Wildland Fire Fighter Professional Requirements*.