LA-UR-02-4921

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Title

Progress Report on Los Alamos National Laboratory Cerro Grande Fire Rehabilitation Activities One Year After Burned Area Rehabilitation

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LA-UR-02-4921

Issued: August 2002

PROGRESS REPORT ON LOS ALAMOS NATIONAL LABORATORY CERRO GRANDE FIRE REHABILITATION ACTIVITIES ONE YEAR AFTER BURNED AREA REHABILITATION

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BAER	Burned Area Emergency Rehabilitation
BART	Burned Area Rehabilitation Tracking
CGRP	Cerro Grande Rehabilitation Project
dbh	diameter at breast height
DOE	Department of Energy
ERP	Emergency Rehabilitation Project
GIS	Geographic Information System
GPS	Global Positioning System
LANL	Los Alamos National Laboratory
PRS	Potential Release Site
RRES-ECO	Risk Reduction and Environmental Stewardship Division - Ecology Group
RRES-WQH	Risk Reduction and Environmental Stewardship Division - Water Quality and Hydrology Group

ABSTRACT

The Cerro Grande Fire of 2000 had an enormous adverse impact on forests on and around Los Alamos National Laboratory (LANL). Immediately there were concerns about increased erosion and flooding and the potential impacts on contaminated soil and sediment. Seventy-seven contaminant potential release sites (PRSs) and two nuclear facilities at LANL that contain hazardous and radioactively contaminated soils and materials are located within floodplain areas. Without Department of Energy (DOE) action, these PRSs and nuclear facilities could potentially release contaminants and materials downstream during rainfall events. Numerous cultural resource sites and traditional cultural properties are located in canyons or along drainage areas. These sites are now at increased risk of flood damage.

An Emergency Rehabilitation Plan was created to evaluate and estimate the impacts of the Cerro Grande Fire on LANL property, design appropriate mitigation methods for erosion and increased runoff, and implement these measures to prevent further damage to people, property, and the environment.

The Laboratory conducted assessments and implemented all on-the-ground rehabilitation efforts. Under the DOE Special Environmental Analysis, the Laboratory was to conduct mitigation measures and monitor annually the condition of the burned area. In all, LANL treated over 1,800 acres (728 ha) with techniques similar to those used by the Burned Area Emergency Rehabilitation team. The project was successful; increasing vegetative cover on the severely burned units from around 0% to almost 45%. Most of the straw wattles that were installed have held sediment on site and allowed vegetation to grow. Out of 40 rehabilitation units only five require additional work in FY 2002.

This work was funded through emergency funds provided to DOE and LANL to remediate damage and address demonstrated vulnerabilities associated with the Cerro Grande Fire. This work has been conducted by LANL using two initiatives: the Emergency Rehabilitation Team to address emergency and urgent actions to recover from the fire and the Cerro Grande Rehabilitation Project (CGRP) to address near- and long-term activities required for LANL to fully recover from the Cerro Grande Fire. This work was conducted as part of the erosion control task of the CGRP.

1.0 INTRODUCTION

This report details the treatments and first year results of the Emergency Rehabilitation Team and the Cerro Grande Rehabilitation Project (CGRP). The Laboratory has been directed by the Department of Energy (DOE) through the Special Environmental Analysis (DOE 2000) to conduct assessments, implement mitigation measures, and monitor annually the condition of the burned area. Once on-the-ground rehabilitation prescriptions were in place, the Burned Area Rehabilitation Tracking (BART) system was developed. BART is a Geographic Information System (GIS)-based tracking and monitoring system designed to identify and generate reports of additional work needed in the treatment units based on field assessments. Two BART assessments have been conducted; with additional assessments to be conducted in the future.

1.1 Regional Setting

Los Alamos National Laboratory (LANL) and the associated residential areas of Los Alamos and White Rock are located in Los Alamos County, north-central New Mexico, approximately 60 miles (100 km) north-northeast of Albuquerque and 25 miles (40 km) northwest of Santa Fe (Fig. 1).

The 28,654-acre (11,596-ha) LANL site is situated on the Pajarito Plateau. This plateau is a series of finger-like mesas separated by deep east-to-west-oriented canyons that are cut by intermittent streams. Mesa tops range in elevation from approximately 7,800 ft (2,400 m) on the eastern flanks of the Jemez Mountains to about 6,200 ft (1,900 m) at their eastern termination above the Rio Grande.

Most of the finger-like mesas in the Los Alamos area are formed from Bandelier Tuff, which is composed of ash fall, ash-fall pumice, and rhyolite tuff. The tuff, ranging from nonwelded to welded, is more than 1,000 ft (300 m) thick in the western part of the plateau and thins to about 260 ft (80 m) eastward above the Rio Grande. Major eruptions in the volcanic center of the Jemez Mountains deposited the tuff about 1.2 to 1.6 million years ago.

On the western part of the Pajarito Plateau, the Bandelier Tuff overlaps onto the Tschicoma Formation, which consists of older volcanic materials that form the Jemez Mountains. The conglomerate of the Puye Formation underlies the tuff in the central plateau and near the Rio Grande. Chino Mesa basalts inter-finger with the conglomerate along the river. These formations overlay the sediments of the Santa Fe Group, which extend across the Rio Grande Valley and are more than 3,300 ft (1,000 m) thick. LANL is bordered on the east by the Rio Grande and is within the Rio Grande rift. Because the rift is slowly widening, the area experiences frequent minor seismic disturbances.

Los Alamos has a temperate, semiarid mountain climate. However, elevation strongly influences the climate, and the topography causes large temperature and precipitation differences in the area. The average annual precipitation in Los Alamos is 18.73 inches (47.57 cm). The summer rainy season accounts for 48% of the annual precipitation. During the July–September period, thunderstorms form when moist air from the Gulf of Mexico and the Pacific Ocean moves up the sides of the Jemez Mountains. These thunderstorms can bring large downpours, but sometimes they only cause strong winds and lightning. Hail frequently occurs from these rainy-season thunderstorms.

Surface water in the Los Alamos area occurs primarily as short-lived or intermittent reaches of streams. Perennial springs on the flanks of the Jemez Mountains supply base flow into upper reaches of some canyons, but the volume is insufficient to maintain surface flows across the LANL site before evaporation, transpiration, and infiltration deplete the springs. In previous years, runoff from heavy thunderstorms or heavy snowmelt reaches the Rio Grande several times a year in some drainage areas. Effluents from sanitary sewage, industrial waste-treatment plants, and cooling-tower blow-down enter some canyons at rates sufficient to maintain surface flows for varying distances.

The Pajarito Plateau, including the Los Alamos area, is biologically diverse. This diversity of ecosystems is partly caused by the dramatic 5,000-ft (1,500-m) elevation gradient from the Rio Grande on the east to the Jemez Mountains 12 miles (20 km) to the west and partly by the many steep canyons that dissect the area. Five major types of vegetative cover are in Los Alamos

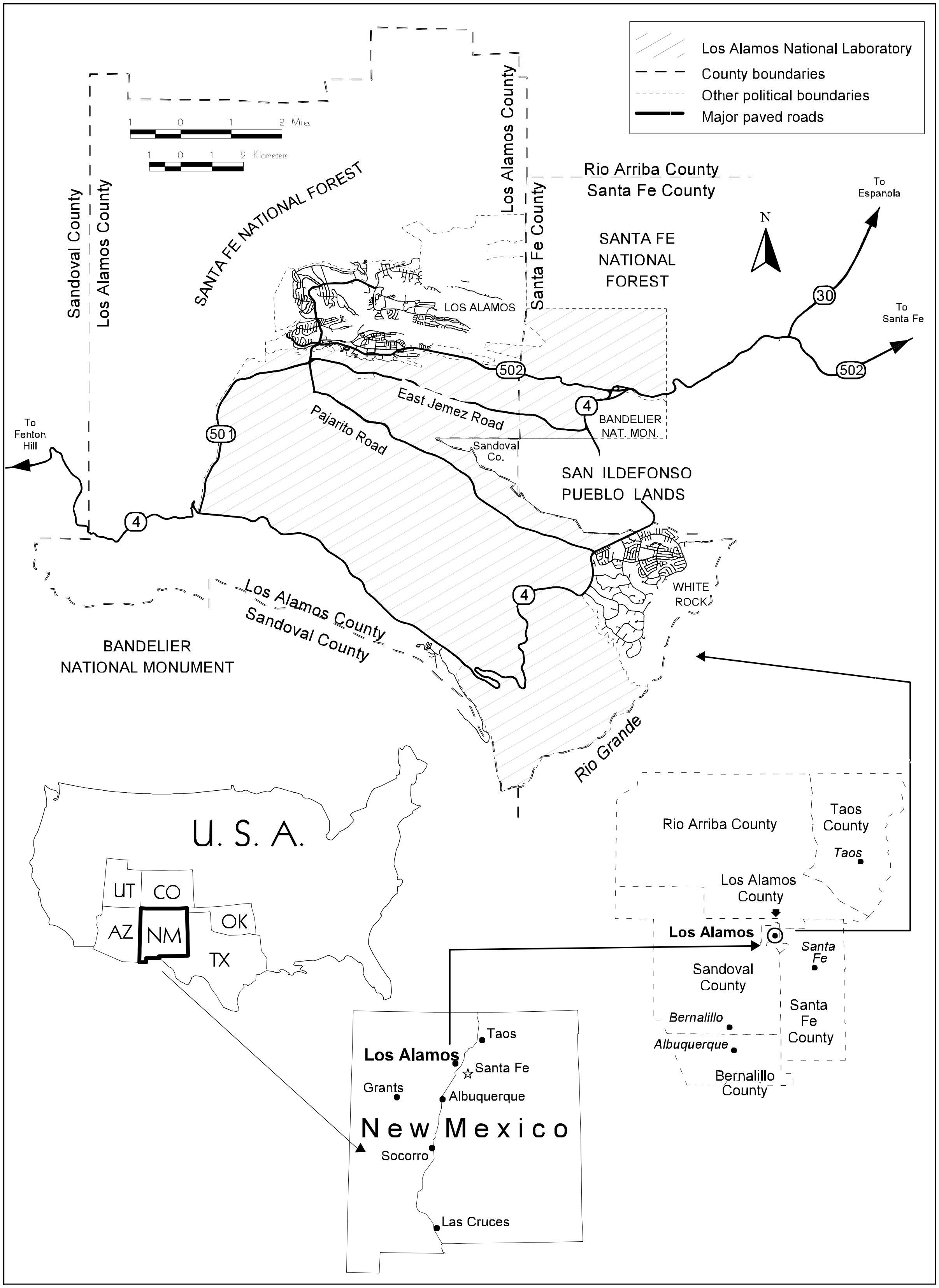

Figure 1. Location of LANL.

County: juniper (*Juniperus monosperma* Englem.)-savanna, piñon (*Pinus edulis* Engelm.)-juniper woodland, ponderosa pine (*Pinus ponderosa* P.& C. Lawson) forest, mixed conifer forest, which includes Douglas fir (*Pseudotsuga menziesii* [Mirbel] Franco), white fire (*Abies concolor* [Gord. & Glend.] Lindl. ex Hildebr.), and ponderosa pine, and spruce-fir forest which includes Engelmann spruce (*Picea engelmannii* Perry ex Engelm.), subalpine fir (*Abies lasiocarpa* [Hook.] Nutt. var. *lasiocarpa*), and corkbark fir (*Abies lasiocarpa* [Hook.] Nutt. var. *arizonica* [Merriam] Lemmon).

Two cover types dominate LANL

- The piñon-juniper woodland cover type, generally in the 6,200- to 6,900-ft (1,900- to 2,100-m) elevation range, covers large portions of the mesa tops and north-facing slopes at the lower elevations.
- Ponderosa pine forest is in the western portion of the plateau in the 6,900- to 7,500-ft (2,100- to 2,300-m) elevation range.

The mixed-conifer cover type, at an elevation of 7,500 to 9,500 ft (2,300 to 2,900 m), overlaps the ponderosa pine community in the deeper canyons and on north-facing slopes and extends from the higher mesas onto the slopes of the Jemez Mountains. Subalpine grassland and spruce-fir forest are at higher elevations of 9,500 to 10,500 ft (2,900 to 3,200 m). Twenty-seven wetlands and several riparian areas enrich the diversity of flora and fauna on LANL lands.

1.2 Cerro Grande Fire Impacts

1.2.1 Impacts on Vegetation

The Cerro Grande Fire (Fig. 2) burned approximately 43,000 ac (17,400 ha) and significantly altered the soils, vegetation, and surface hydrology throughout the region. An assessment of fire-induced vegetation mortality was made by the Burned Area Emergency Rehabilitation (BAER) team methodology. The vegetation mortality classification generally corresponds to the burn-severity ratings (Fig. 3). Areas of high-burn severity have experienced 70%–100% vegetation mortality. Moderate-burn severity corresponds to 10%–40% mortality and low-burn severity to less than 10% mortality. Areas with a mosaic of high- and moderate-burn severity have experienced 40%–70% mortality. LANL had approximately 6,376 acres (2,580 ha) of low-burn severity, 825 ac (334 ha) of moderate-burn severity, and 203 ac (82 ha) of high-burn severity.

The fire also indirectly affected vegetation in the following ways:

- High- and moderate-severity fires often consume seed reserves, thus inhibiting recovery of native vegetation.
- It is generally assumed by professional foresters that trees with 30% live, or green, canopy will survive. However, the Cerro Grande area had experienced two years of winter drought conditions before the fire and the vegetation would have been under more stress than usual. Precipitation following the fire was above average the first year but well below average in the second year. At this point in time we do not know how the interaction of the fire and weather will affect the vegetation.
- Bark beetles and wood-boring insects attracted to trees damaged or killed in a fire can also attack and kill living trees.
- Invasive exotic species may be introduced or expanded by
  - use of contaminated seed for rehabilitation purposes,

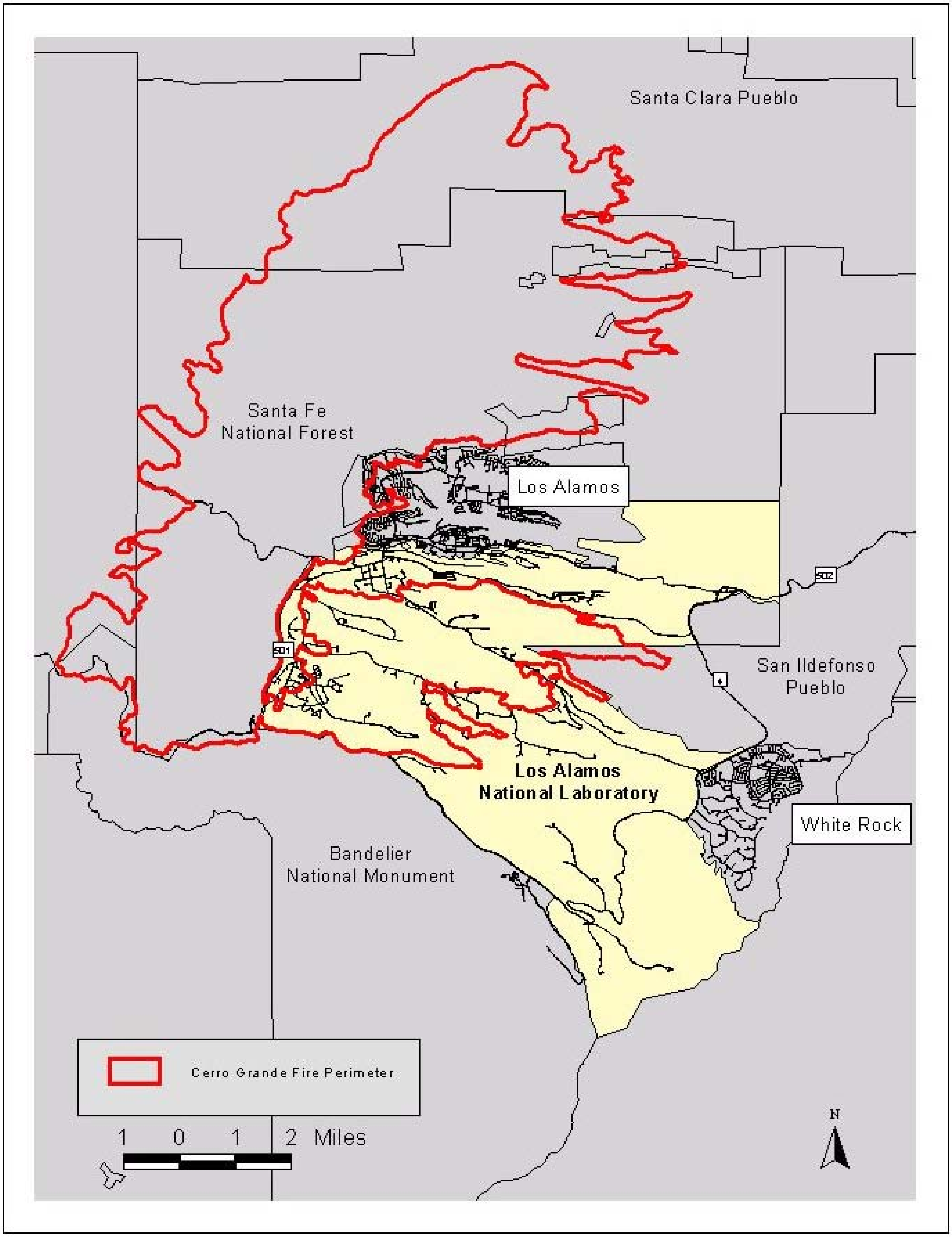

Figure 2. Cerro Grande Fire perimeter.

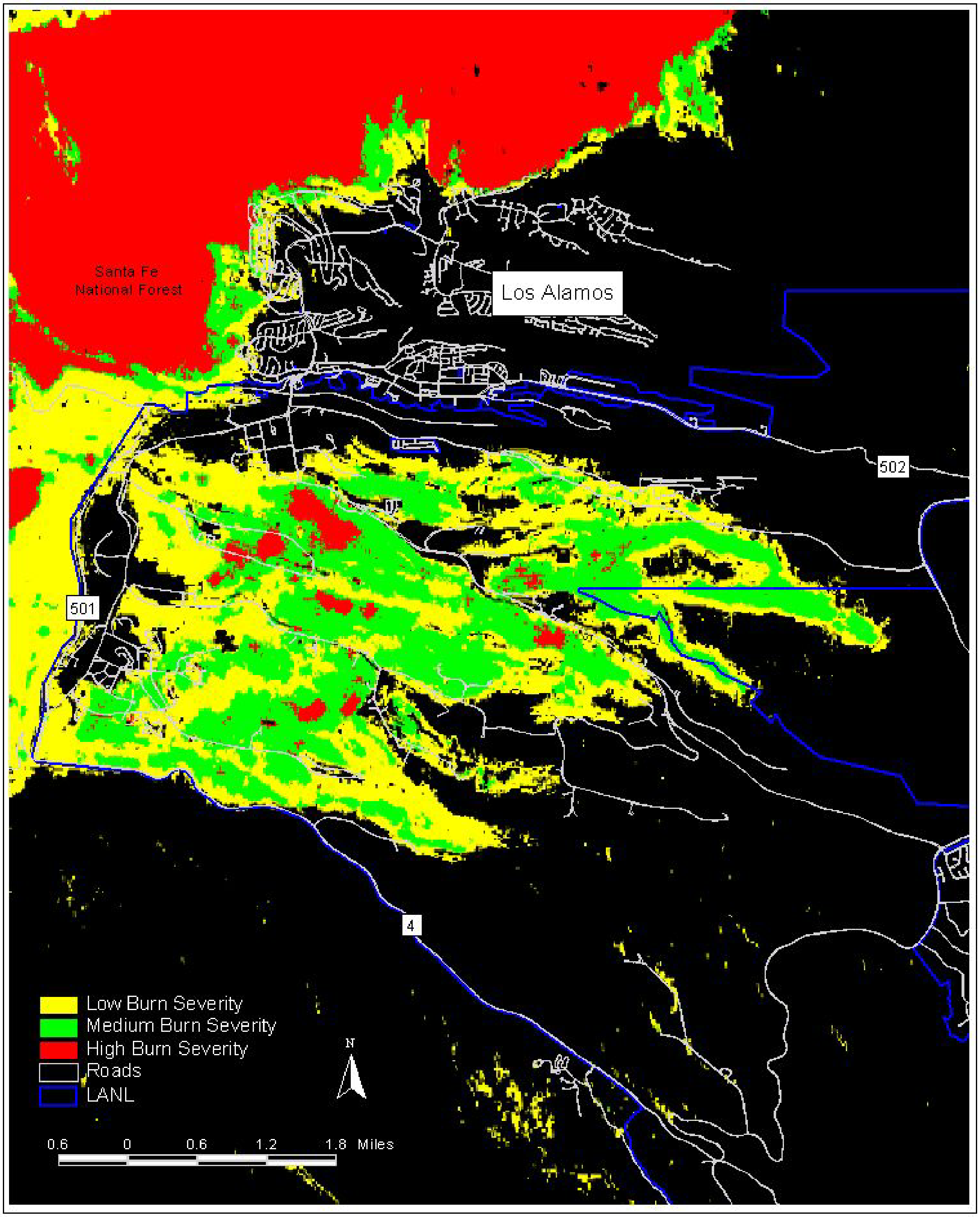

Figure 3. Burn severity at LANL based on GENIE[1] technology.

[1] Brumby, Steven P., Neal R. Harvey, Jeffrey J. Bloch, James Theiler, Simon Perkins, A. Cody Young, and John J. Szymanski. 2001. Evolving forest fire burn severity classification algorithms for multi-spectral imagery. Proc. SPIE vol. 4381, pp. 236–245.

- transporting of plants from other regions by fire-suppression equipment and personnel, and
- expansion in the post-fire environment of already existing small isolated populations of plants, resulting in serious consequences to native plant and animal populations.

The ultimate effects of the fire on vegetation mortality may not be known for many years.

1.2.2 Impacts on Soils and Hydrology

Fire also alters surface soil properties in the following ways:

- Intense heat (high-burn severity) can break down soil structure and create a hydrophobic layer that resists water infiltration.
- The loss of effective ground cover (vegetation and litter) can lead to a significant increase in soil erosion and runoff during storms.
- Areas with moderate- and low-severity burns can experience increased rates of soil erosion primarily caused by loss of effective ground cover.

Postfire conditions along the hills and ridges at elevations higher than that of LANL, as well as such features within LANL, pose a very high risk for erosion and flood damage at the LANL facilities and to nearby residential communities situated downstream all the way to the Rio Grande. This high risk for flooding also exists for portions of the Los Alamos town site located north of LANL, as well as for pueblo lands and residences located downstream of the town site.

Seventy-seven contaminant potential release sites (PRSs) and two nuclear facilities at LANL that contain hazardous and radioactively contaminated soils and materials are located within floodplain areas. Without DOE action, these PRSs and nuclear facilities could potentially release contaminants and materials downstream. Numerous cultural resource sites and traditional cultural properties are located in canyons or along drainage areas. These sites are now at increased risk of flood damage.

Flooding could also affect area canyons that provide potential habitat for federally listed threatened and endangered species. Before the fire, canyon storm-water-discharge flow measurements for a 6-h storm with a 1 in 100-year return rate at LANL typically were in the range of about 35 to 590 ft^3/s (1.05 to 17.7 m^3/s). Modeling for the same canyons estimated postfire discharge flows (before rehabilitation work) to be in the range of 90 to 3,276 ft^3/s (2.7 to 98.3 m^3/s) for storms of the same duration. Some canyons are expected to have even greater flow amounts over some areas because of location-specific site conditions after the fire. The potential for flooding onto and across LANL property will exist for the next several years, decades in some locations, until enough vegetation covers hillsides and canyons to sufficiently deter soil erosion and threat of flooding.

2.0 EMERGENCY POSTFIRE RESTORATION AND REHABILITATION EFFORTS

One of the goals of LANL's Emergency Rehabilitation Team and the CGRP was to address potential impacts of increased runoff that could result from the Cerro Grande Fire and to look at potential long-term issues that could result from the fire. Assessment of PRSs began May 16, 2000, and general field rehabilitation began on June 9, 2000.

The Laboratory performed the following operations:

- conducted on-the-ground evaluations of burned areas to ground-truth burned-area maps and determine areas for and types of needed restoration activities;
- instructed professional forestry and subcontractor crews on proper rehabilitation techniques and locations for work;
- coordinated procurement of materials, escorts, and access for work on LANL property; and
- worked seven days a week to complete initial land rehabilitation treatments before heavy summer rains that could cause erosion and flooding.

The goal of the LANL rehab efforts was to reduce the risk of contaminant movement and potential flooding from LANL property. Treatments were designed to stabilize ash and soil, reduce runoff, improve infiltration, and replace fire-consumed litter. Rehabilitation efforts on LANL property lasted for approximately 10 weeks. During this time the hand crews treated 1,800 ac (728 ha). Completed land treatments follow the BAER specifications for the Cerro Grande Fire. Rehabilitation treatments such as felling of trees, raking, placing of wattles, and building of log structures and rock check-dams are all done on the contour to decrease erosion caused by water runoff. The following pages summarize the actions taken. Table 1 shows approximate areas for each treatment and Figure 4 illustrates each action.

Table 1. Approximate Treatment Acreages

Treatment	Total Acres	Treatment Rate (lbs/acre)	Total Materials Used
Aerial seeding	**650**	36	13,000 lb
Air hydromulch	**145**	NA	NA
Truck hydromulch	**125**	NA	NA
Hydromulch		2000	250,000 lb
Tackifier		240	30,000 lb
Seed		35	4,375 lb
Rehabilitation by hand	**950***		
Hand seeding	700	35	
Wattles	736	NA	7,550 wattles
Contour felling	886	NA	NA
Raking	736	NA	NA
Straw mulch	736	540	5,000 bales

*Note: The acreage listed is per unit treated. Several units required a combination of treatments.

Aerial Seeding. Crop-duster-type aircraft performed aerial seeding at a rate of 35 lb/ac. Workers used the BAER-recommended seed mixture for aerial and hand seeding. This mixture included both annual and perennial seed (30% annual rye grass [*Lolium perenne* L. ssp. *multiflorum* (Lam.) Husnot], 30% mountain brome [*Bromus marginatus* Nees ex Steud.], 30% slender wheatgrass [*Elymus trachycaulus* (Link) Gould ex Shinners], and 10% cereal barley [*Hordeum vulgare* L.]).

Aerial Seeding/Aerial Hydromulching

Truck Hydromulching

Contour Tree Felling

Hand Seeding

Log Erosion Barrier with Wattle

Straw Mulching

Figure 4. Treatment actions taken after the Cerro Grande Fire.

Hydromulching (aerial and truck). Crews performed hydromulching by air along specified canyon walls in Pajarito and Water Canyons and on areas that were steep and inaccessible by road. Land hydromulching took place on ground that was steep but had road access. The hydromulching application included the Cerro Grande BAER seed mix, hydromulch, water, and tackifier.

Hand seeding. Rehabilitation crews used seeders set at a rate of 35 lb/ac to hand seed the Cerro Grande BAER mix.

Contour raking. Crews used heavy rakes to break up the soil surface. They raked on contours to slow overland runoff and to increase precipitation infiltration rates on hydrophobic soils.

Straw mulching. Crews spread straw mulch where preburn ground cover had been consumed by the fire and the expected overland runoff would threaten high values at risk, such as buildings in valley bottoms, archeological sites, or anything that could be damaged due to fire related flooding.

Straw wattles. Straw wattles are 9-in. by 25-ft rolls of rice straw placed by hand crews on slopes. These wattles act as terraces to prevent slope erosion and to facilitate revegetation. Straw wattles also act as grade-control structures in stream channels with flatter gradients, finer streambed materials, or uneven bottoms.

Log structures and rock check-dams. Crews built these structures to control flow in stream channels. Reducing water velocity lowers the in-channel erosive force to prevent down cutting and to capture sediment of the flowing stream.

Contour tree felling. Crews felled trees on contours of two slope types:

- Situation 1—Moderately sloping-to-steep slopes that had hydrophobic soil conditions (moderate-/high-burn severity), and few downed trees or surface rocks to protect soil surface. The sites also needed to have at least 30–40 standing trees/acre that were 6–14 in. in diameter at breast height (dbh), or trees were felled; and
- Situation 2—Steep-to-very-steep slopes where existed erodible soils, few downed trees, more than 30–40 standing trees of 6–14 in. dbh, and danger for the minimum number of personnel to work on the slope.

3.0 REHABILITATION MONITORING

As stated earlier, approximately 1,800 burned acres (728 ha) were treated on LANL property to minimize soil loss. Almost all of the treatments applied to LANL property are short-term best management practices that help to stabilize soils on site until the native vegetation can re-establish. Due to this fact, regular monitoring of the rehabilitation sites is required before additional rehabilitation efforts can be implemented. Follow-up inspections and assessments will be completed each spring, summer (during the monsoon season), and fall of all treated areas over the next two years.

3.1 Burned Area Rehabilitation Tracking (BART) System

To determine the success of the treatments applied at LANL. BART was developed as a GIS-based tracking and monitoring system designed to store and readily provide information and to identify and generate reports of additional work needed in the treatment units based on field assessments.

A Global Positioning System (GPS) unit was used to document and map the burned area boundaries and the associated treatments. Treatment areas were broken into units and the boundaries were mapped (Fig. 5). Additional information was collected on the treatment types, amounts of materials used, and crew identification.

A field form was developed to standardize the type of information collected when monitoring and assessing the treatment units (Fig. 6). Some of the information collected includes condition of treatment unit, estimated percent of ground cover, additional work required, maintenance requirements, etc. Completed monitoring forms were entered into a database, and maintenance reports were generated based on the type of repair or additional treatment needed in the rehabilitation area. In addition, photo points (Fig. 7) were established within each treatment unit to document the dominant landscape vegetation. Digital photos will be taken during each assessment. Comparison of photos of the same site over time will provide visual evidence of vegetation changes and site recovery.

Areas needing treatment that were not treated last year were identified and the locations recorded with GPS. Based on the findings of the BART surveys, areas needing additional work will be prioritized and rehabilitation work will be completed.

4.0 BART SUMMARY REPORT

4.1 Field Assessment

Two rounds of field assessments, implementing the BART field forms, were conducted in 2001. The first inspections began in May of 2001 and were completed by June 10, 2001. The field forms were filled out and photo points established at each burn area rehabilitation unit. The information collected was entered into the BART database. The second assessment occurred in December, conditions were not ideal for observations due to snow in some units.

4.2 Field Conditions

In general, the rehabilitation units are in good to excellent condition. In most of the units the seeded vegetation is established and providing ground cover. Very few wattles were damaged. Most damage was due to poor installation, animals/rodents tearing apart the wattles to get to the straw, and wash outs in some of the channel placements. Field assessments indicated that a high percentage of the wattles filled with sediment; however, due to excellent ground cover and vegetative growth, no further installation and maintenance is warranted for these locations at this time. There was very little evidence of down cutting below wattles or rill erosion on the slopes. Most of the mulch has been incorporated with the vegetation; however, in some areas the mulch has been blown away by spring winds. There are some small areas within the rehab units that could be re-seeded and mulched, but are not of immediate concern. In general the exposed soil in the rehab units has been stabilized by the rehabilitation treatments.

No additional moderately burned areas were identified as needing rehabilitation work at this time. Field surveys of moderately burned areas to monitor needle cast, native vegetation, tree response, and field erosion will be scheduled for late fall 2001.

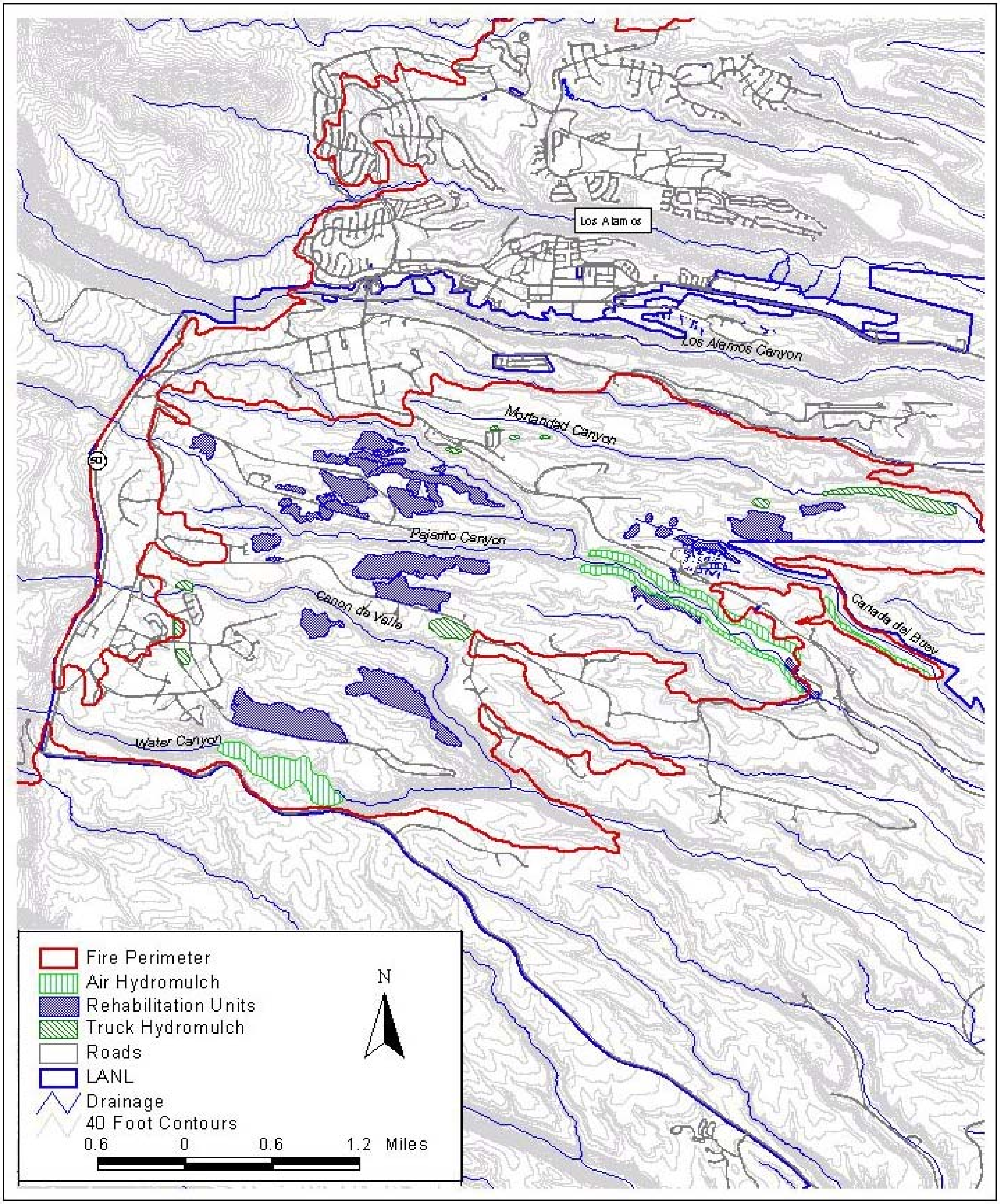

Figure 5. Treatment areas at LANL.

Burn Area Rehabilitation Tracking System

Unit
TA#

FORM ID#

PRS Status:

Field Information

Estimated % of wattles filled with sediment? ------------ ______%
Estimated % of wattles failed or damaged? ------------- ______%
Down-cutting / erosion present below wattles? ------------ ☐
Potential for wattles behind contour logs? ------------------ ☐
Estimated % of unit covered with straw mulch? -------- ______%
Estimated % of unit covered with vegetation? ---------- ______%
Are run-outs from road(s) draining into rehab unit? ------- ☐
Evidence of recent Bark Beetle activity? --------------------- ☐

Required Work

For every YES answer in this section please note specifics in the Maintenance Required area below.

Are additional wattles needed? -- ☐
Is additional straw mulch needed? --- ☐
Is additional reseeding needed? -- ☐
Does this unit require other additional rehab. efforts? -------------------- ☐
Are there areas near this unit that require additional rehab. efforts? -- ☐
GPS file collected for additional rehab areas: (GPS file number)

Maintenance Required - Please specify exact amount and type of additional work needed (256 char. max.)

Photo Pt. ID ______

Photo Pt. ID ______

Photo Pt. ID ______

Photo Pt. ID ______

Revisit Schedule

Does this site need to be revisited this year? --------- ☐ Date: ______ M / Y
Do needed repairs make this a high priority site?--- ☐

Data Collection

Photos taken? ☐ Next available photo point number: ____________________

Photo Point#	Number of photos taken	New photo point established?	GPS file collected for new photo point

General Comments (256 char. max.)

MERRICK

Figure 6. BART field form.

Rehabilitation Unit 15, June 2000

Rehabilitation Unit 15, June 2001

Rehabilitation Unit 11, May 2001

Rehabilitation Unit 11, December 2001

Figure 7. Rehabilitation photo points.

The Laboratory will be or has conducting detailed Wildfire Assessment surveys in a few of the rehab units. These surveys should determine the success of the seeding and the potential for native vegetation species to return.

5.0 FINDINGS

Restoration activities conducted last year were successful in establishing ground cover on areas burned by the Cerro Grande Fire. Figure 8 shows summary data for effective ground cover and vegetative cover. Table 2 details the results of the BART survey. Conditions, with regards to vegetative cover, improved from June to December. The monsoon season was relatively short lived and did not produce significant storms over the burn units on LANL. Effective ground

Field conditions one year after treatment. Area in foreground was not treated, area in background was.

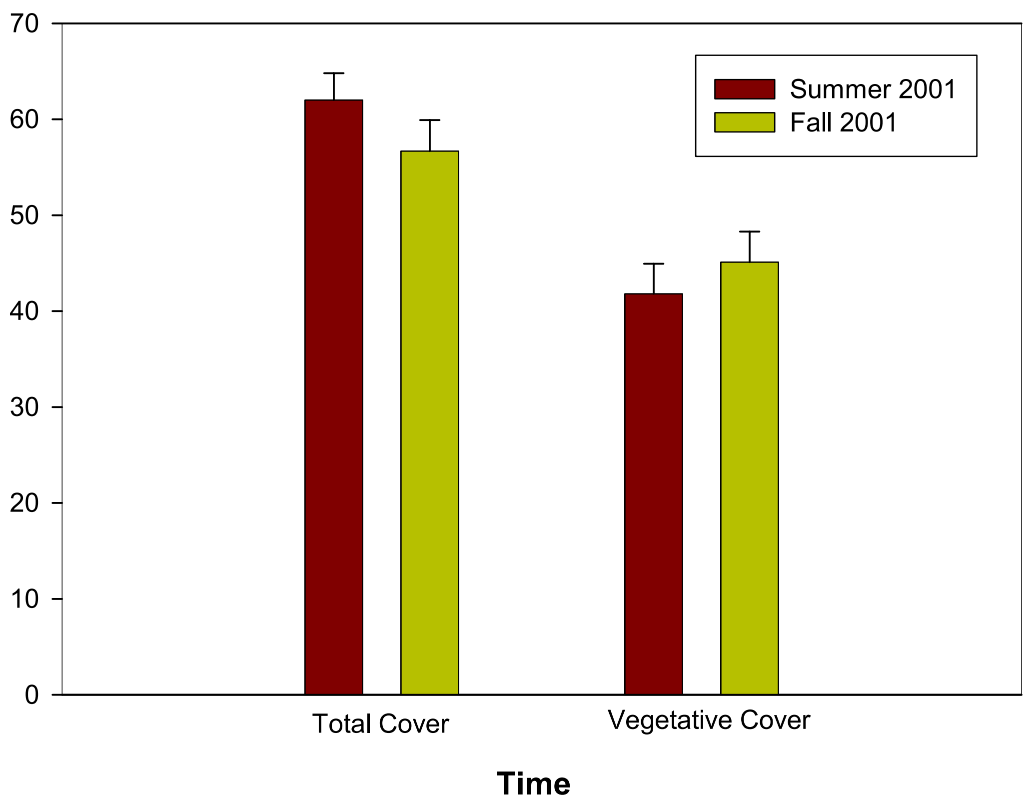

Figure 8. Change in cover on LANL rehab units.

Table 2. BART Survey Results

Unit ID	Estimated Percent Ground Cover		Estimated Percent Vegetative Cover	
	Summer 2001	***Fall 2001***	***Summer 2001***	***Fall 2001***
1	75.00%	40.00%	50.00%	40.00%
2	60.00%	70.00%	45.00%	60.00%
3	5.00%	10.00%	2.00%	5.00%
4	65.00%	60.00%	60.00%	55.00%
5	65.00%	70.00%	45.00%	60.00%
6	40.00%	50.00%	15.00%	40.00%
7	40.00%	snow	15.00%	snow
8	50.00%	50.00%	25.00%	40.00%
9	50.00%	75.00%	25.00%	50.00%
10	50.00%	snow	25.00%	snow
11	75.00%	80.00%	60.00%	70.00%
12	60.00%	40.00%	15.00%	50.00%
13	40.00%	snow	13.00%	snow
14	50.00%	70.00%	30.00%	60.00%
15	50.00%	snow	30.00%	snow
16	70.00%	40.00%	40.00%	35.00%
17	70.00%	snow	40.00%	snow
18	40.00%	40.00%	20.00%	30.00%
19	60.00%	45.00%	40.00%	30.00%
20	50.00%	snow	40.00%	snow
21	95.00%	snow	75.00%	snow
22	45.00%	snow	20.00%	snow
23	50.00%	40.00%	30.00%	30.00%
24	30.00%	30.00%	10.00%	20.00%
26	80.00%	75.00%	70.00%	65.00%
27	70.00%	60.00%	60.00%	50.00%
28	75.00%	70.00%	60.00%	65.00%
29	75.00%	snow	60.00%	snow
30	75.00%	60.00%	60.00%	50.00%
31	75.00%	65.00%	50.00%	60.00%
32	75.00%	65.00%	60.00%	50.00%
33	75.00%	60.00%	70.00%	50.00%
34	80.00%	40.00%	70.00%	25.00%
35	80.00%	30.00%	70.00%	20.00%
36	60.00%	75.00%	40.00%	60.00%
37	75.00%	70.00%	65.00%	60.00%
38	70.00%	65.00%	30.00%	55.00%
39	80.00%	70.00%	40.00%	55.00%
40	80.00%	85.00%	50.00%	40.00%
41	70.00%	snow	50.00%	snow

cover decreased from June to December; however, snow and late-season conditions may have influenced observer’s estimations. None of the observed changes were statistically significant.

5.1 BART Maintenance Reports

Overall the rehabilitation units are in good to excellent condition; however, five units were identified as needing additional work before the summer monsoon season. Maintenance requirements include additional seeding, wattles, and mulch. One unit will require additional contour felling of trees in small drainages with wattles placed behind the logs. Maintenance should occur on these units in the Spring of 2002.

6.0 CONCLUSIONS

The Cerro Grande Fire had an enormous adverse impact on LANL, burning almost 7,600 acres (2,833 ha) of DOE property and 112 Laboratory buildings. Immediately there were concerns from the public about the potential for contaminated soil to be washed off of LANL onto public and private land and ultimately into the Rio Grande. An Emergency Rehabilitation Team and CGRP were created to evaluate and estimate the impacts of the Cerro Grande Fire on LANL property, design appropriate mitigation methods for erosion and increased runoff, and implement these measures to prevent further damage to people, property, and the environment. In all, LANL crews treated over 1,800 acres (728 ha) with techniques similar to those used by the BAER team. The project was successful; we have increased vegetative cover on the severely burned units from around 0% to almost 45%. Most of the straw wattles we installed have held sediment on site and allowed vegetation to grow. Out of 40 rehabilitation units only five require additional work.

The Laboratory will continue to use the BART system to track the recovery of the rehabilitation units. The system works well and allows us to document the recovery of the units and identify areas needing additional attention.

7.0 ACKNOWLEDGMENTS

This work was funded through emergency funds provided to DOE and LANL to remediate damage and address demonstrated vulnerabilities associated with the Cerro Grande Fire. This work has been conducted by LANL using two initiatives: the Emergency Rehabilitation Team to address emergency and urgent actions to recover from the fire and the CGRP to address near- and long-term activities required for LANL to fully recover from the Cerro Grande Fire. This work was conducted as part of the erosion control task of the CGRP.

The authors would like to thank the following individuals and entities for their assistance with this project: Mike Alexander (RRES-WQH), Randy Balice (RRES-ECO), Harvey Decker (DX-DO), Debbie Apodaca and Betsy Cata (RRES-WQH), Allen Bollschweiler (Merrick Co.), Mindy Wheeler and Eric Petterson (WP Natural Resource Consulting, Inc.), Steven Brumby (NIS-2), Steven Mee (FWO-CGRP), and Victoria George (FWO-CGRP),

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