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Draft Supplemental Environmental Assessment for the Wildfire Hazard Reduction and Forest Health Improvement Program at Los Alamos National Laboratory, Los Alamos, New Mexico

Predecisional Draft

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EXECUTIVE SUMMARY

Wildland fires threaten LANL's mission to promote and protect national security through the design, qualification, certification, and assessment of nuclear weapons. Strategies for addressing this threat were previously analyzed in the *2000 Environmental Assessment for the Wildfire Hazard Reduction and Forest Health Improvement Program at Los Alamos National Laboratory, Los Alamos, New Mexico* (2000 EA). Conditions have changed at LANL since the 2000 EA was issued, so updated actions are proposed. These conditions include, but are not limited to longer fire seasons, changes in vegetation, and global climate change.

To address the current conditions, LANL proposes new strategies in the 2019 *Wildland Fire Mitigation and Forest Health Plan* (The Plan). This 2019 Supplemental Environmental Assessment to the 2000 EA analyzes potential impact from the Proposed Action and the No Action Alternative as described below:

- **Proposed Action** – Implementation of The Plan with the objective of reducing wildland fire risk while also promoting healthy forests
- **No Action Alternative** – The wildland fire program continues as currently implemented and as analyzed in the 2000 EA

In the Proposed Action, wildland fire risk reduction and forest health objectives would be accomplished through treatments for forest thinning, life safety actions, open space forest health, and the implementation of new treatment practices.

The assessment presented in this document did not identify any significant impacts to resource areas after the implementation of measures to mitigate potential adverse effects.

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ACRONYMS AND TERMS

CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CRMP	Cultural Resources Management Plan
DBH	Diameter at breast height
DOE	U.S. Department of Energy
EA	Environmental Assessment
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
LANL	Los Alamos National Laboratory
NEPA	*National Environmental Policy Act of 1969*
NNSA	National Nuclear Security Administration
SEA	Supplemental Environmental Assessment
SWEIS	Site-Wide Environmental Impact Statement
TA	Technical Area
U.S.	United States

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1.0 INTRODUCTION

The United States (U.S.) Department of Energy (DOE) National Nuclear Security Administration (NNSA) Los Alamos National Laboratory (LANL) Field Office located in Los Alamos, New Mexico, has prepared this supplemental environmental assessment (SEA) to the 2000 *Environmental Assessment for the Wildfire Hazard Reduction and Forest Health Improvement Program at Los Alamos National Laboratory, Los Alamos, New Mexico* (2000 EA) (DOE 2000c). This 2019 SEA augments the 2000 EA by evaluating potential impacts associated with the implementation of new strategies for forest health and wildland fire risk reduction at LANL, changes to the affected environment, and potential impacts associated with global climate change.

LANL is a multipurpose research institution with a primary mission of promoting and protecting national security through the design, qualification, certification, and assessment of nuclear weapons. Additionally, LANL, as one of the largest science and technology institutes in the world, conducts multidisciplinary research in fields such as space exploration, renewable energy, medicine, nanotechnology, and supercomputing (DOE 2018a).

LANL employs approximately 12,000 people and is located in north-central New Mexico about 60 miles north-northeast of Albuquerque. LANL covers approximately 40 square miles of the Pajarito Plateau with developed infrastructure to support mission operations interspersed within forested canyons and mesa tops. LANL contains habitat for numerous plants and animals including habitat for three threatened and endangered animal species, approximately 2,000 archeological sites (cultural resources), and approximately 2,000 structures totaling approximately eight million square feet with an estimated replacement value of $14.2 billion dollars (LANL 2019b). LANL is surrounded by lands owned by the U.S. Forest Service, Bandelier National Monument, Los Alamos and Santa Fe Counties, and the Pueblo de San Ildefonso Indian Reservation (Figure 1-1). The two primary residential areas contiguous with LANL are the Los Alamos town site and the White Rock community. These two residential areas are home to approximately 19,000 people.

Wildland fire is a risk to LANL mission operations as identified in accident scenarios involving wildland fire in both the 1999 and 2008 Site-Wide Environmental Impact Statement (SWEIS) for LANL (DOE 1999, 2008a). Current actions to mitigate wildland fire risk include forest thinning for fuels[1] reduction by the LANL wildland fire management program. The current actions do not fully address conditions that have changed at LANL since the 2000 EA was issued. These conditions include, but are not limited to longer fire seasons, increased severity of wildland

[1] All combustible materials within the wildland/urban interface or intermix, including, but not limited to, vegetation and structures (NFPA 2013).

fires, changes in vegetation, and global climate change (Garfin et al. 2013, Jolly et al. 2015, Margolis et al. 2017, Allen et al. 2010, Jain et al. 2017).

These are all potential vulnerabilities for LANL (LANL 2018a). Global climate change model predictions have indicated that the southwestern U.S. is likely to experience increased annual temperatures of 2.0°F to 4.0°F higher than historical norms (Garfin et al. 2014). Stresses of severe heat and changes in precipitation are projected to cause snowpack declines that reduce infiltration of surface water in mountain watersheds (Garfin et al. 2014, Seager and Vecchi 2010). These stresses within forested lands perpetuate an increase of pest and disease outbreaks, which reduces resiliency to wildland fire (IPCC 2014, Garfin et al. 2014, Kent 2015). Climate change is also likely to exacerbate the direct climate impacts such as tree mortality, and the indirect impacts of these disturbances such as post fire flash flooding (Joyce et al. 2014).

Two wildland fires, the 2000 Cerro Grande Fire and the 2011 Las Conchas Fire, have negatively impacted the Laboratory. The Cerro Grande Fire burned 7,403 acres at LANL with estimated costs of $33.5 Million for suppression, and over $1.1 Billion total (Morton et al. 2003). Due in part to fuels reduction efforts, there were no infrastructure losses from the 2011 Las Conchas Fire, but suppression costs were $48.4 Million (IDS 2013).

To respond to continued wildland fire risk, DOE is focused on mitigating the adverse effects of wildland fire through fuels reduction treatments, training, additional personnel and equipment and through collaborative partnerships with surrounding land management agencies.

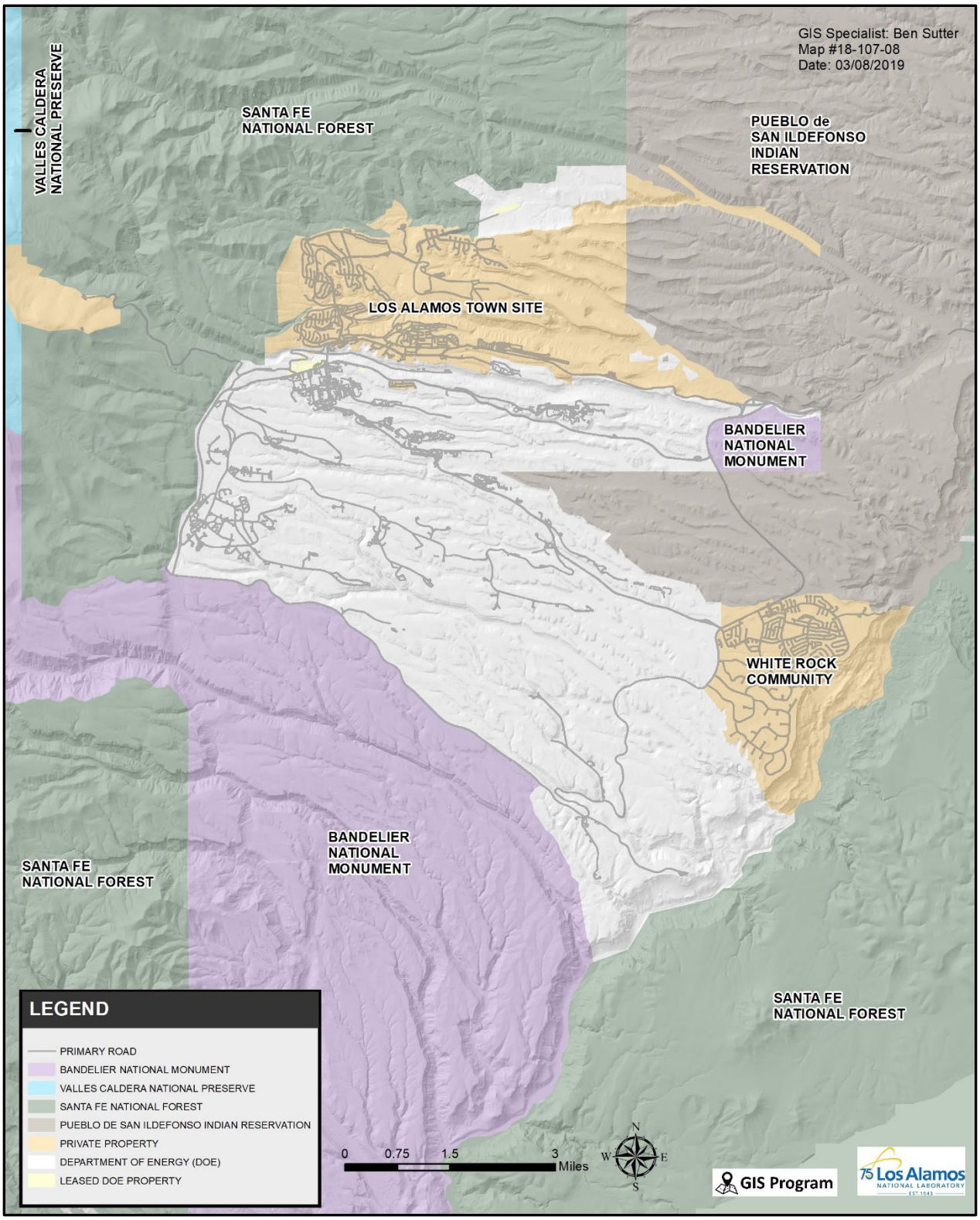

Figure 1-1. Los Alamos National Laboratory and neighboring landowners

1.1 Purpose and Need for Agency Action

Forest conditions have changed since the publication of the 2000 EA, and wildland fire continues to pose a significant risk to LANL mission operations. NNSA needs to address and reduce wildland fire risk for the protection of LANL operations, natural resources, and the safety of LANL workers and nearby residents.

1.2 Supplemental Environmental Assessment (SEA) Scope

The scope of this document is to identify the environmental factors that have changed since issuance of the 2000 EA and analyze the potential environmental impacts that could result from implementation of the Proposed Action.

Factors analyzed in the 2000 EA that have not substantially changed or in which the original analysis is still valid are summarized below and are not discussed further in this SEA:

- Accident analyses included in the 2000 EA and 2008 SWEIS (DOE 2008a, 2000c). These accident scenarios were reviewed and determined to be current, appropriate, and remain bounding.
- Prescribed burning of forest slash[2] in piles or with air curtain destructors (Limited Burn Alternative) and burning understory vegetation as an alternative to mechanical treatment (Burn Alternative) were analyzed in the 2000 EA and selected in decision documents (DOE 2001, 2004). Prescribed burning remains a potential strategy that could be used at LANL for reducing the risk of wildland fire and there is no change to the strategy from the actions in the 2000 EA.

1.3 National Environmental Policy Act and Related Procedures

DOE/NNSA evaluates environmental assessments to determine the following: (a) whether the existing analysis remains adequate or if a supplement assessment is needed, (b) prepare a new Environmental Assessment or Environmental Impacts Statement, or (c) a revised decision document is required. The final determination and supporting analysis is made available in the appropriate DOE public reading room(s) or in other appropriate location(s) for a reasonable time.

DOE/NNSA prepared this Supplemental Environmental Assessment to the 2000 EA in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 United States Code [USC] 4321), the President's Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508) and DOE's implementing procedures for compliance with NEPA (10 CFR 1021). This statute and the implementing regulations require that DOE/NNSA, as a federal agency perform the following:

[2] Debris resulting from natural events such as wind, fire, snow, or ice breakage; or from human activities such as building or road construction, logging, pruning, thinning, or brush cutting.

- Assess the environmental impacts of the Proposed Action
- Identify any adverse environmental effects that cannot be avoided, should the Proposed Action be implemented
- Evaluate alternatives to the Proposed Action, including a No Action Alternative
- Describe the cumulative impacts of the Proposed Action together with other past, present, and reasonably foreseeable future action

The draft SEA will be made available for a 14-day public review and comment period. All comments on the draft EA, provided within the 14-day comment period, will begin on the date of the public notice of availability, and will be considered by NNSA during preparation of the final SEA.

1.4 Summary of Changes to the Affected Environment

Several events have caused landscape level changes to LANL forests since 2000. A major piñon tree dieback event occurred between 2002 and 2004 due to a bark beetle outbreak and drought (Allen 2007). The loss of grassy understory and vegetation mortality contributed to increased erosion and sediment runoff (Allen 2007). In 2011, the Las Conchas Fire burned the upper watersheds surrounding LANL, resulting in increased flooding and soil erosion.

These events have resulted in significant landcover changes since. Juniper woodlands[3] have increased with the death of mature piñons (Hansen et al. 2018). Woodlands with little vegetative cover are prone to high erosion rates (Munson et al. 2011, Davenport et al. 1998), which can threaten archeological sites (cultural resources) and increase sediment transport that could affect water quality (Allen 2007, LANL 2017c, 2014).

Areas affected by the Cerro Grande and the Las Conchas fires have regrown into shrublands. Where fire and thinning have not occurred, dense forests remain. These forests are more vulnerable to disturbances such as high-severity fire, drought, and insect outbreaks (Allen et al. 2002, Bottero et al. 2017, Reynolds et al. 2013, Schoennagel et al. 2004).

Regional and local projected climate change and related tree mortality research studies predict increase loss of forest cover, an increase in the amount of fuel, continued high risks of severe wildland fire, and higher soil erosion rates in the southwestern U.S. (LANL 2014, Garfin et al. 2014). These tree mortality projections were supported by a study conducted at LANL. As a result of global climate change most piñon-juniper woodlands in the southwest U.S. will experience high tree mortality by 2050 (McDowell et al. 2016). Additionally, climate modeling indicates that northern New Mexico will experience continual increasing temperatures without

[3] Woodlands are defined in the LANL landcover map as having between 10 and 50 percent tree canopy cover. No woodland areas identified had more than 10 percent tree canopy cover of piñon trees, so all were classified as Juniper Woodlands.

concurrent increase in precipitation, thereby adversely affecting piñon juniper woodlands by rising temperatures and increased periods of extreme drought (Kent 2015).

1.5 Related NEPA Documents that are Incorporated by Reference

Decisions analyzed in the below NEPA documents describe activities and decisions directly, indirectly, or similar to activities discussed in the Proposed Action. These documents are incorporated by reference and/or tiered for potential impacts from the Proposed Action for this evaluation, where applicable.

1.5.1 2000 Environmental Assessment for the Wildfire Hazard Reduction and Forest Health Improvement Program (DOE-EA-1329)

The Wildland Fire Risk Reduction and Forest Health Improvement Program was analyzed in an environmental assessment (2000 EA) (DOE 2000c). Three Findings of No Significant Impact (FONSIs) were issued to implement each of the three alternatives analyzed in the environmental assessment (DOE 2000b, 2001, 2004). These alternatives are the Proposed Action or the no burn alternative, the limited burn alternative, and the burn alternative. There were mitigations associated with the first FONSI that were subsequently rolled into the SWEIS Mitigation Action Plan. All analyses in the 2000 EA were evaluated and determined to remain valid. This 2019 SEA supplements the 2000 EA by analyzing proposed actions that are beyond what was identified in the 2000 EA. The SWEIS Mitigation Action Plan requires that LANL prepare a Wildland Fire Management Plan, and annual activities related to wildland fire are reported in the annual Mitigation Action Plan Annual Report (DOE 2008b).

1.5.2 2000 Special Environmental Analysis, Actions taken in response to the Cerro Grande Fire (DOE/SEA-03)

Following the Cerro Grande Fire, immediate response was needed to reduce the transport of contaminates from LANL land during heavy precipitation events. These emergency actions were implemented prior to NEPA analysis. A special environmental analysis of the impacts associated with post-fire actions was completed in 2000. The 2000 Special Environmental Analysis is used for evaluating impacts directly to cultural resources from fire suppression and mitigation activities as they relate to the Proposed Action.

1.5.3 2008 Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EIS-0380) and Records Of Decision (ROD)

The 2008 SWEIS analyzes LANL's potential environmental impacts of ongoing and future operations and activities, superseding the 1999 SWEIS. Three alternatives were analyzed in the 2008 SWEIS: (1) No Action Alternative, (2) Reduced Operations Alternative, and (3) Expanded Operations Alternative. The initial record of decision (ROD) DOE/NNSA selected was the No Action Alternative to continue operation at LANL as described in the 1999 SWEIS with some elements from the Expanded Operations Alternative (DOE 2008c). The 2008 SWEIS provides the accident scenarios for wildland fire at LANL. The Mitigation Action Plan requires LANL to

have a Wildland Fire Plan, and report on annual wildland fire risk reduction activities in the Mitigation Action Plan Annual Report.

1.5.4 Supplement Analysis of the 2008 Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory, (DOE/EIS-0380-SA-05), April 2018

The 2018 Supplement Analysis was to provide a basis for understanding if there were significant changes to LANL's mission, operations, or information relevant to environmental affects that might not be bounded by the 2008 SWEIS analysis. It was determined that the 2008 SWEIS provides a bounding NEPA analysis. Under the 2018 Supplement Analysis, it was determined that continued risks of severe wildland fire and higher soil erosion rates require the need for a continued active Wildland Fire and Forest Health Program (DOE 2018b).

2.0 DESCRIPTION OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVE

The Wildland Fire Mitigation[4] Working Group was established to develop a cohesive strategy to reduce wildland fire risk to LANL mission operations and promote better forest health within LANL boundaries (LANL 2018b). The resulting integrated *Wildland Fire Mitigation and Forest Health Plan* (The Plan) describes strategies and actions for fire risk reduction efforts (LANL 2019a). Strategies and actions for wildland fire mitigation efforts are based on previous management plans for wildfire management (LANL 2016b) and forest health (LANL 2014), while accounting for changes to the landscape. The Plan is intended to be a living document that will have periodic updates to account for changing environmental conditions, new fire mitigation techniques and technologies, and wildland fire management.

The Proposed Action is to implement The Plan. The No Action Alternative is the continuation of activities currently performed by the Wildland Fire Management Program. These are described in more detail below.

2.1 Proposed Action

DOE/NNSA proposes to implement The Plan's strategies and actions to manage wildland fire risks to LANL operations. The strategies and actions are described as forest management treatments that mitigate potential wildland fire and promote forest health. The Plan also defines strategies and actions to ensure the desired final forest conditions for LANL's open spaces.

The Proposed Action in this SEA differs from the 2000 EA by more aggressively thinning trees to achieve a lower final tree density, and to encourage an overall mosaic of forested areas that includes groups of trees of various sizes and ages, and grassy open spaces. The Plan is applicable to anywhere on the LANL land, which is a change from the limit of 10,000 acres analyzed in the 2000 EA. Additionally, there is an increased emphasis on soil stability by promoting more ground cover vegetation in open space.

2.1.1 Proposed Forest Management Treatments

The Proposed Action is to implement forest management treatments as described in The Plan, which include vegetation removal by tree thinning or limbing. The removed trees and woody

[4] As used by the Working Group, mitigation refers to "Modifying the environment or human behavior to reduce potential adverse impacts of from a natural hazard." We do not use the term in this document to avoid confusion with mitigation measures associated with a NEPA Mitigation Action Plan.

plants (biomass) may be masticated in place. Mowing and targeted herbicide treatments may also be used to reduce wildland fire risk and to improve forest health.

The following sub-sections describe the types of treatments included in The Plan.

Wildland Fire Risk-Reduction and Life Safety Actions

General types of treatments and their definitions are provided in the list below. Table 2-1 follows with a comparison of treatments identified in The Plan (Proposed Action) and current treatments (No Action Alternative).

- **Evacuation routes and primary arterial roads** - Reduce fuel loads surrounding evacuation routes and primary arterial roads using mechanical means (mowing and tree removal for life safety)
- **Defensible space** - Create and maintain defensible space around buildings and structures.[5]
    - The area around a structure where material capable of causing a fire to spread has been treated, cleared, reduced or changed to act as a barrier between an advancing wildland fire and the structure.
- **Utility infrastructure** - Evaluate and manage vegetation in right-of-ways for overhead power lines to reduce risks of wildland fire ignitions, and around exposed gas lines, lift stations, water tanks, and other utilities to protect equipment vulnerable to wildland fire.
- **Fire roads** - Evaluate and maintain fire roads passable for firefighters and heavy equipment to facilitate wildland fire response and ensure responder safety
    - Fire roads are rural roadways identified specifically for the purpose of access for fire management activities. Fire roads are used to ensure responders and fire personnel have safe ingress and egress routes during wildland fire responses.
- **Firebreaks** - Construct and maintain firebreaks to updated specifications
    - A firebreak is an area where fuels are reduced to slow the spread of fire or provide a fire suppression anchor point. Firebreaks are strategically located either to prevent fire spread in heavy fuel areas or to protect sensitive resources.

[5] Defensible space around Firing Site facilities will be further defined and analyzed in an upcoming Supplement Analysis for High Explosives Operations sites.

Table 2-1. Comparison of wildland fire risk reduction treatment specifications between the No Action Alternative and the Proposed Action

Treatment	No Action Alternative	Proposed Action

Evacuation Routes	Thinning and other 'good housekeeping' activities within 100 feet of roadways	***Within 60 feet of the roadway on designated evacuation routes (LANL 2016b):***
		• Maintain free of smaller trees and brush with the exception of:
		  o areas where the slope is greater than 30 percent
		  o areas designated to protect cultural and biological resources (threatened/endangered habitat, and archeological sites)
		  o areas where solid waste management units (SWMU) are present
		• Grasses and shrubs mowed to 4-6 inches during wildland fire season
		• Masticate tree stumps, logs, and branches

Treatment	No Action Alternative	Proposed Action
Primary Arterial Roads	Not addressed, but see evacuation routes	***Roadside to 10 feet:*** • Maintain free of trees and shrubs, mow grass as needed ***10 feet from roadside to 60 feet or the fence line:*** • Retain all trees larger than 20 inches diameter breast height (DBH), unless their removal is specifically approved by subject matter experts (SME) in the Integrated Review Tool[6] • Remove stressed, diseased, dead, or dying trees and shrubs • Cut or masticate non-native or invasive species trees (Chinese Elm, Russian Olive, and Salt Cedar) • Thin remaining larger trees and shrubs so there is 10-25 feet between crowns of individual trees or 40 feet between clusters of trees • Remove ladder fuels that would allow fire to move from the ground to tree crowns within the area as follows: o For mature/tall trees, remove branches (limb) to a height of 8 feet o For shorter trees, limb from the ground up to a height that does not exceed one-third of the tree's overall height • Remove dead branches from trees and limit the number of dead trees (snags) retained in the area to one or two per acre • Masticate or remove from the area tree stumps, logs, and branches

[6] The Integrated Review Tool is the primary mechanism by which subject matter experts representing all environmental, safety, and health, and security requirements provide compliance feedback to project managers and other users.

Treatment	No Action Alternative	Proposed Action
Defensible Space	Maintain 25 feet crown spacing within 50 feet of buildings	***Maintain defensible space within 100 feet of structure or a group of structures with the following guidelines:*** • Retain trees larger than 20 inches DBH, unless their removal is specifically approved by the SMEs in the Integrated Review Tool • Remove woody non-native invasive species regardless of size (i.e. Chinese Elm, Russian Olive, and Salt Cedar) • Remove brush and shrubs (other than landscaping shrubs)Thin remaining trees to less than 125 trees per acre o Thinning would follow open space treatment standards for the dominant vegetation type (i.e. ponderosa or juniper woodlands) • Remove ladder fuels that would allow fire to move from the ground to tree crowns within the area as follows: o For mature/tall trees, remove branches (limb) to a height of 8 feet o For shorter trees, limb from the ground up to a height that does not exceed one-third of the tree's overall height • Mow herbaceous vegetation (other than landscaping shrubs) to 4-6 inches or less as needed prior to fire season • Mulch or chip biomass in place or remove it from the area (LANL 2017a).

Treatment	No Action Alternative	Proposed Action
Utility Infrastructure	Not discussed	***For overhead 115 kV transmission lines:*** • Maintain 20 feet either side of overhead electric center lines clear of vegetation taller than two feet • From 20-50 feet either side of the center line, remove all piñon, juniper and such fuel-rich shrubs and trees • Trees outside of the 100 foot right of way may also be removed if they are tall enough to pose a danger to the line, as described in the LANL Engineering Standards (DOE 2019) ***For overhead 15kV class distribution lines:*** • Maintain clear of vegetation as described for 115kV lines in a smaller, 25 foot on either side of a center line right-of-way, and for trees outside of this right-of-way that pose a danger to the line, as described in the LANL Engineering Standards (DOE 2019) For other ***vulnerable utility infrastructure:*** • Clear all vegetation, trees, and shrubs at least 10 feet from exposed gas lines, lift stations, water tanks, and other utility infrastructure vulnerable to wildfire • Mow grass to 4-6 inches inside and outside of security fencing prior to a severe wildland fire season

Treatment	No Action Alternative	Proposed Action
Fire Roads	• 16 feet wide • Constructed on grades of less than 10 percent with bar ditches and turnouts, as appropriate.	***Minimum width of 10 feet:*** • Minimum road width of 10 feet, with an additional 2 feet on each side, clear of vegetation and other obstructions • Unobstructed vertical clearance from trees, power lines, etc., up to 15 feet • Maximum grade of 25% and maximum difference in shoulder to shoulder elevation of 10% • Clear of obstacles and passable driving conditions for vehicles during wildland fire seasons • 20 ton maximum weight capacity • Maintain vegetation on the roadway less than 6 inches in height • Cut and fill slopes shall be prepared and maintained to control erosion of the roadway and surrounding terrain • Within applicable LANL standards adopted as a mitigation to this document (see Section 6.0 Mitigations) • Must have appropriate signage
Firebreaks	Specifications not defined	***Maximum width of 60 feet (LANL 2016b):*** • Maintain barriers free of trees and shrubs • Under severe conditions, as designated by LANL Emergency Management, firebreaks may be stripped to bare mineral soil • Established firebreaks are maintained to prevent erosion and potential damage from water run off (Section 4.0 Mitigation Measures)

Open Space Treatments

Open space areas are those undeveloped areas that do not fall under the treatments in Section 2.11 and are intended to improve forest health and reduce fire risk. Thinning and mechanical treatments in open space include the removal of shrubs and trees to reduce density and to provide a more natural age and size class structure and spacing diversity. Table 2-2 follows

with a comparison of design criteria for open space identified in The Plan (Proposed Action) and current treatments (No Action Alternative).

Table 2-2. Comparison of Differences in Design Criteria for the Open Space Treatments.

Design Criteria	No Action Alternative	Proposed Action
Largest tree diameter that can be cut	16 inches	20 inches [7]
Treatments differ by landcover type	Little differentiation between treatments in different landcover types	Identifies specific desired final conditions for juniper woodlands, and ponderosa pine forest and woodlands
Landscape heterogeneity	No heterogeneity of tree spacing or open (treeless) areas	Open areas in drier sites can be up to 3 acres to promote understory growth to achieve heterogeneity in forest stand density
Desired final tree density	Final tree density (50–100 trees per acre in all cover types)	Treatments result in a more variable final tree density (10–125 trees per acre) with up to three acre open spaces
Desired final canopy cover	Final canopy cover (50–60% cover)	• Final canopy cover for juniper woodlands approximately 10% for any 5-acre area[8] • Ponderosa landcover types standard does not specify a final canopy cover
Desired final understory and species preferences	No species preferences	• *Ponderosa:* Retain understory shrubs (minimum of 25-50 percent) and retain representation of piñons and junipers in understory • *Juniper woodlands:* No understory condition specifics
Snags and downed wood	Preferentially remove dead and diseased trees	Retain standing dead trees as much as practical, consistent with project objectives (if removing snags, select the ones most recently dead)
Mulch/slash and ground fuels for soil erosion control	No lower limit for mulch retention	• Retain slash/mulch on bare soils in open space treatments • Masticated material not to exceed 4.5 inches depth • Apply other soil erosion best management practices on disturbed areas as needed

[7] Cutting trees larger than 20 inches would only be performed after review and approval through the Integrated Review Tool.

[8] Note: Juniper woodland treatments would be applied only in areas with signs of erosion to provide soil cover and promote vegetation grown to stabilize soil.

New Implementation Practices

Implementation practices that are currently used but were not analyzed in the 2000 EA and are now included in the Proposed Action include: (a) biomass retention or disposition procedures, (b) extent of masticator use, (c) the targeted application of herbicides, and (d) an increase in the size of tree that can be removed.

Forest thinning treatments can result in excess biomass on the ground. On a project-by-project basis, biomass would be left onsite, chipped or masticated in place. Cut biomass would be used for soil stabilization, transported to the landfill for composting or burned. Transported biomass would be analyzed for possible contamination following a defined procedure (LANL 2017a).

The masticator has become an important tool for reducing fuel loading at LANL. A masticator is a vehicle equipped with a chipper that can be used to convert standing vegetation into mulch (Figure 2-1). It is used to thin vegetation within road right-of-ways and in other areas with slopes less than 30% more efficiently than could be done by hand. The masticator cuts and mulches vegetation to a height of 6 inches off the ground.

Figure 2-1 Masticators used to chip biomass in place

Targeted herbicide treatments are also a tool for reducing wildland fire risk in areas that are difficult to treat mechanically. The application of herbicides can be used on tree stumps for invasive species after cutting to prevent their regrowth. Guidelines for the removal and management of invasive species will be developed into a new management plan (Section 4.0 Mitigation Measures).

The new plan allows removal of larger diameter trees (20 inches as opposed to 16 inches) to achieve greater tree thinning objectives.

2.1.2 Individual Project Planning Measures

Potential projects would be identified through a hazard analysis process, and prioritized in an Annual Operating Plan as described in The Plan. Forest health and wildland fire risk reduction objectives are achieved through identifying areas at higher risk of fire or erosion and treating these areas (e.g., implement a tree thinning project). Proposed projects are included in the Annual Operating Plan. Prior to implementation, all projects are reviewed through LANL's Integrated Review Tool which is the primary mechanism by which subject matter experts representing all environmental, safety, and health, and security requirements provide compliance feedback to project managers and other users. The Integrated Review Tool has a series of initial screening questions that informs a project requester how to further engage subject matter experts to identify necessary permits and other requirements.

2.2 No Action Alternative

The No Action Alternative for this SEA is a continuation of the wildland fire program as currently implemented. Table 2-1 and Table 2-2 provide a comparison of differences between the Proposed Action and the No Action Alternative.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Resource Areas Screened for Changes and Impacts

Resource areas were screened for relevant changes since the issuance of the 2000 EA, and for potential impacts to the resource area associated with the Proposed Action in this SEA. Resource areas identified to have negligible or no changes or impacts are summarized in Table 3-1. Resource areas that were further analyzed for potential impacts from the Proposed Action and the No Action alternative include: water and soil, ecological resources, and cultural resources.

Table 3-1. Summary of resource areas that were screened out from further analysis

Resource Area	Changes to the Affected Environment Since the 2000 EA	Potential Impacts to Resource from Proposed Action
Land Use	**Negligible changes.** The same categories of land use are still in use. Vegetation, such as trees, is used at LANL to enhance buffer areas for operational and security purposes. The percentage of developed land has decreased slightly because structures have been removed since the year 2000 (DOE 2018b).	**No anticipated impacts.** Proposed Action focuses on treatments of fuels located throughout LANL, and does not change the designated land use.
Visual Resources	**Negligible changes**. Some tree mortality and thinning have occurred. These changes are negligible because tree mortality and thinning were limited to small areas throughout LANL and are not considered a significant change from the current condition.	**Negligible impacts.** New thinning project areas are more interior to LANL and further from the most common viewsheds. The most visible areas (e.g., evacuation routes) are already thinned and masticated.
Geology	**Negligible changes**	**No anticipated impacts.** Proposed Action does not harm the geology or create any geologic hazards.
Air Quality	**Negligible changes**. LANL operates under a Title V Operating Permit (NMED 2018). Notification to the New Mexico Environmental Department (NMED) and public is required prior to any prescribed burning.	**Negligible impacts**. There would be local, short term and minor air emissions from operation of heavy machinery and dust generation.
Noise	**No changes**	**Negligible impacts**. Machinery and chain-saw use would have minor short-term noise impacts.
Transportation	**Not applicable**	**Not applicable**

Resource Area	Changes to the Affected Environment Since the 2000 EA	Potential Impacts to Resource from Proposed Action
Utilities and Infrastructure	**Negligible**. Ongoing maintenance of power line corridors includes thinning and clearing of low-lying vegetation and the topping of tall trees	**No anticipated impacts**. The Proposed Action would not directly impact any utilities or infrastructure, but would enhance defensible space.
Socioeconomic	**Negligible changes.** Jobs at LANL have decreased since 2000 (~ 600 fewer) (LANL 2019c)	**Negligible impacts.** The Proposed Action will not directly impact socioeconomics because the overall employment will not change.
Human Health	**No changes.** The degree of risk to human health, as described and analyzed in the 2000 EA, is still representative of the current condition.	**No changes.** Impacts evaluated in the 2000 EA are still valid and accurate. There are no new types of health hazards from the Proposed Action that were not previously analyzed.
Environmental Justice	**No changes.** Minority and low-income populations would not be impacted.	**No disproportionate impacts.** Minority and low-income populations would not be impacted. The Plan would be protective of all populations and land owners.
Waste Management	**No changes**. LANL's Waste Management Program meets DOE Order (o) 435.1 to ensure proper characterization and disposal pathways of generated waste (DOE 2011).	**Negligible impacts**. Tree thinning operations would generate additional waste. Trees and vegetation would be evaluated for contamination prior to offsite disposal through updated procedures (LANL 2017a).
Greenhouse Gases	**No changes.** A 2009 EPA rule (40 CFR Part 98) requires reporting DOE greenhouse gas emissions. Executive Order 13693 confirms the federal government's continued commitment to reduce greenhouse gas emissions.	**Negligible impacts.** An increase in carbon dioxide equivalent total emissions from heavy equipment. Emissions would be bounded within the current emissions of approximately 91,475 metric tons (operations) and 58,628 metric tons (commuting) (LANL 2018c).

3.2 Affected Environment and Potential Impacts

To compare and to evaluate the environmental impacts of the Proposed Action with the No Action Alternative, each resource area was analyzed for impacts, then a sliding-scale analysis was performed which analyzed impacts in proportion to their significance. Resource areas analyzed include: water and soil, ecological resources, and cultural resources. Resources screened out from further analysis are listed in Table 3-1. Changes to the affected environment since 2000 were considered most carefully when analyzing and a potential impacts to resources.

Cumulative impacts are addressed at the end of each resource area's sub-section by collectively analyzing impacts from other LANL projects and projects conducted by other agencies in the region of influence. Appendix A includes descriptions of other agencies' projects and other LANL projects considered for cumulative impacts from the Proposed Action and No Action Alternatives.

3.2.1 Water and Soil

Surface Water

LANL contains all or parts of seven primary watersheds that drain into the Rio Grande. Listed north to south, the major canyons for these watersheds are Los Alamos, Sandia, Mortandad, Pajarito, Water, Ancho and Chaquehui Canyons. Stream flow within LANL occurs either in the canyons as ephemeral flow associated with monsoonal rainfall lasting a few hours to days, or as intermittent flow associated with snow melt lasting a few days to weeks. Of the 85 miles of stream channel within LANL, approximately two miles contain naturally occurring perennial flow and approximately three miles are supplemental discharge flows. The canyons are tributaries to the Rio Grande and will occasionally deliver surface flow from heavy rains or sustained snowmelt to the river.

Soil

Soil types located on LANL are typically poorly developed medium-textured loamy soils. Soils on top of mesas are generally well-drained and thin (zero to 40 inches). Canyons often consist of steep rock outcrops and patches of shallow, undeveloped, loose, well-drained soils at various depths. South-facing canyon walls are steep and usually have little or no soil material or vegetation. In contrast, north-facing canyon walls generally have areas of shallow, dark-colored soils that are more heavily vegetated.

Soil erosion rates are dependent on the following: (a) topography, (b) annual precipitation, (c) soil erodibility, and (d) ground cover. Throughout LANL, soil erosion rates are typically higher in drainage channels and areas of steep slopes and the lowest rates occur on gently sloping portions of the mesa tops away from channels (LANL 1993, Copeland et al. 2019) and in dense juniper stands (LANL 2014). Large wildland fires like the Cerro Grande and Las Conchas fires, can result in areas with diminished ground cover that are more susceptible to flash flooding that may scour stream channels and move sediments (Reneau et al. 2007).

Additionally, areas where runoff is concentrated by roads and other structures are especially prone to high erosion rates. Figure 3-1 shows the proximity of fire roads, firebreaks, and evacuation routes to drainages.

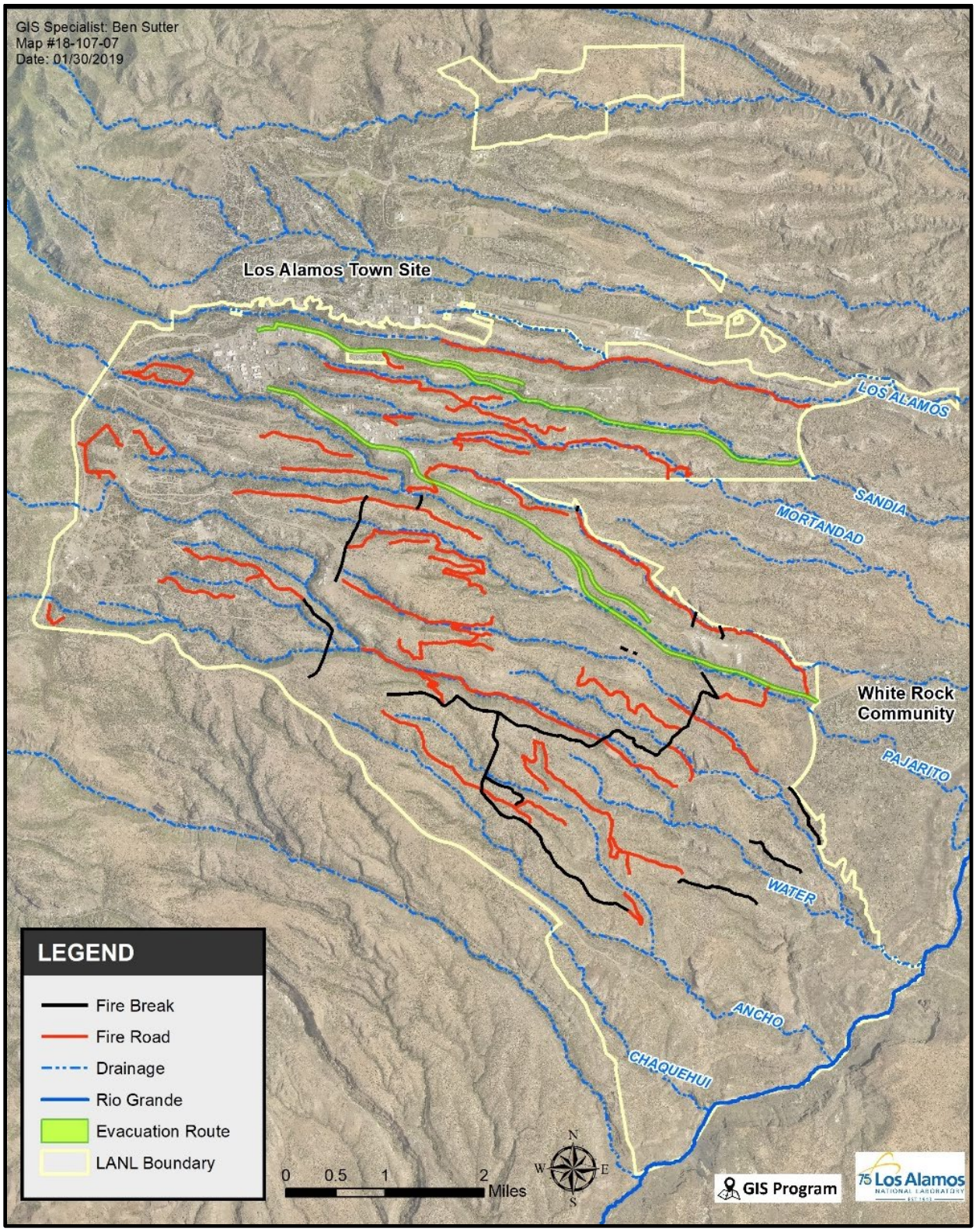

Figure 3-1. Location of fire roads, firebreaks, and evacuations routes at LANL and major drainages.

Environmental Consequences of the Proposed Action

Overall, the Proposed Action would potentially improve ground cover, which would lessen soil erosion across LANL (Jones 2019). Implementation of the Proposed Action would reduce the amount of erosion from storm water runoff and enhance deposition of sediments within the canyons by maintaining and improving ground cover in open spaces, increasing stormwater infiltration rates, decreasing surface water runoff, and soil erosion (Stednick 2010). The impact of high-intensity storm water flow events and soil disturbance would be limited because of the maintained ground cover. The Proposed Action includes treatments that leave slash and chipped biomass (limbs needles, leaves, and other woody material) that would likely reduce water flow and minimize sediment and debris movement. These controls would protect downstream floodplains and wetlands from sediment deposition.

Use of mechanical thinning could impact soils and water quality in the short-term because of a reduction in ground cover, which could cause minor soil erosion (Stednick 2010). However, these impacts would be reduced by avoiding steep slopes (greater than 35 percent), scattering biomass (which would reduce immediate soil erosion) and the use of best management practices (e.g., wattles, silt fence) (Stednick 2010).

The long-term impacts of the Proposed Action would be increased ground cover. Application of biomass, especially to highly eroded areas in juniper woodlands, provides soil cover and promotes vegetation growth (Page-Dumroese et al. 2010). Increased ground cover in thinned forests slows water flow, decreases erosion, and increases water infiltration, which reduces peak storm water flow and transport of sediments and contaminants (Page-Dumroese et al. 2010).

Under the Proposed Action, herbicide use that is targeted would be used to remove vegetation in areas where mechanical or hand thinning is difficult. Herbicides could potentially impact water quality, however herbicide application is not allowed into waters of the U.S. (LANL 2016a).

Potential minor impacts to soil and surface water from fire roads and firebreaks exist because of erosion from drainage crossings (Figure 3-1). These impacts would be minimized by the mitigation requirement to develop and and implement a fire road and firebreak sustainability plan (see Section 5.0 Mitigation Measures). A fire road and firebreak sustainability plan would include a monitoring plan and actions taken to limit stormwater runoff and soil erosion. Roads that have limited use would be closed and rehabilitated through the revegetation of ground cover to reduce potential erosion.

Mechanical thinning could potentially increase soil erosion, however with the use of best management practices, rehabilitating soil, and revegetation actions these potential impacts would be short-term (Page-Dumroese et al. 2010, Labelle and Jaeger 2011).

Environmental Consequences of the No Action Alternative

Requirements for best management practices for current treatments and revegetation would continue, however additional sustainability improvements to fire roads would not occur.

Cumulative Impacts

There are no anticipated adverse cumulative impacts to water and soil by the Proposed Action and other past, present or projects in the forseeable future within the region of influence (Appendix A). Potential impacts would be mitigated by project requirements for best management practices that contribute to long-term soil stabilization, and short-term temporary erosion. Other construction projects are not adjacent to each other geographically and would install best management practices for erosion control, so would not contribute additional risk of erosion. The watershed enhancement projects on LANL are designed to improve watershed conditions, reduce erosion, and improve water quality. The Proposed Action is not likely to diminish the positive impacts of the watershed enhancement projects.

3.2.2 Ecological Resources

The biological diversity in the Los Alamos region is due partly to the pronounced 5,000-foot elevation gradient from the Rio Grande River to the Jemez Mountains and partly to the many canyons that cut across the region. Major vegetative cover types on LANL land include low-elevation grasslands and juniper woodlands, shrublands, ponderosa pine forest and woodlands, mixed conifer forests and woodlands (Hansen et al. 2018). Additionally, wetlands and riparian areas are also present. Figure 3-2 shows the two landcover types with open space treatment standards, and Figure 3-3 shows the locations of these landcover types at LANL. Much of LANL lands function as a refuge for wildlife, because of restricted public access, lack of permitted hunting, and adjacent lands managed for natural biological systems by Bandelier National Monument and the Santa Fe National Forest Service.

Several LANL documents for managing impacts to biological resources have been updated since the 2000 EA. These include the Biological Resources Management Plan (LANL 2007), the Threatened and Endangered Species Habitat Management Plan (HMP) (LANL 2017b) the Sensitive Species Best Management Practices Source Document (Hathcock et al. 2015), and the Migratory Bird Best Management Practices Source Document (LANL 2011a).

Figure 3-2. Landcover Types—juniper woodland (left), and ponderosa pine woodlands (right).

Table 3-2 illustrates three federally listed threatened and endangered species present within LANL land, including the Jemez Mountains Salamander listed after the 2000 EA in 2013 (DOI 2013). The HMP identifies suitable habitat for these species at LANL, and these areas have specific management requirements that have been approved by the U.S. Fish and Wildlife Service (USFWS). There is USFWS designated critical habitat for Mexican Spotted Owl and Jemez Mountains Salamander on Bandelier National Monument and U.S. Forest Service property adjacent to LANL land.

Table 3-2. Federal Threatened or Endangered Species at LANL

Common Name	Scientific Name	Status*	Habitat	Occurrence of Suitable Habitat at LANL
Mexican Spotted Owl	Strix occidentalis lucida	FT	Ponderosa pine and mixed conifer forests; Uneven-aged, multistoried forests with closed canopies	High
Southwestern Willow Flycatcher	Empidonax traillii extimus	FE	Nests in riparian areas with willows and cottonwoods	Moderate
Jemez Mountains Salamander	Plethodon neomexicanus	FE	Moist conifer woodlands and wet understory at higher elevations in Jemez Mountains	High

* FT = Federally listed as threatened, FE = Federally listed as endangered

The Cerro Grande Fire burned some areas managed as Mexican Spotted Owl suitable habitat. A Biological Assessment in 2001 (LANL 2001a) evaluated the 2001 Wildfire Hazard Reduction Project Plan (LANL 2001b) and determined that wildfire abatement projects are strongly supported and do not jeopardize the continued existence of the Mexican Spotted Owl (USFWS 2001). A Biological Assessment in 2005 updated the suitable habitat using a more fine-scale habitat model and accounting for burned areas (LANL 2005). This consultation between DOE/NNSA and the USFWS resulted in a reduced size of managed suitable habitat areas at LANL (LANL 2005).

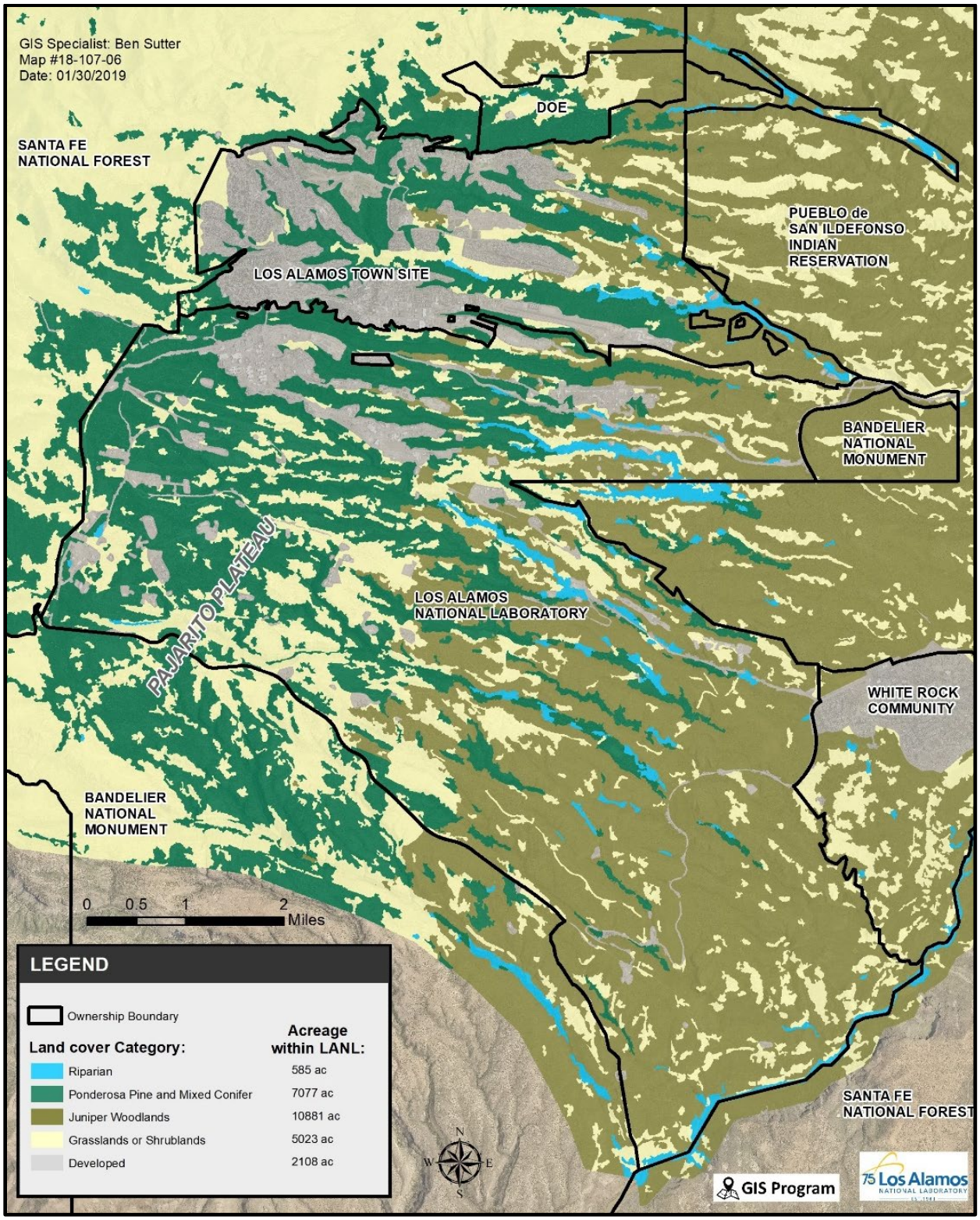

Figure 3-3. Landcover types in the vicinity of LANL land, based on 2016 landcover map (Hansen et al. 2018)

The Jemez Mountains Salamander was listed as endangered in 2013 (USFWS 2013). This species and the Mexican Spotted Owl have specific forest management requirements with regards to fuel treatments. These requirements were reviewed through DOE/NNSA consultations with the USFWS and are detailed in the LANL Habitat Management Plan (LANL 2017b). Migratory birds are protected under the Migratory Bird Treaty Act (LANL 2011a), which requires project review by LANL biologists and avoiding vegetation removal during migratory bird breeding season.

Environmental Consequences of the Proposed Action

Threatened and endangered species habitat would be protected by following the HMP guidelines for each species. The Plan is in compliance with the HMP by limiting the tree size that can be cut, and limiting noise and other disturbances during owl breeding season within suitable habitat areas. Potential impacts to the Jemez Mountains salamander from herbicide use would be avoided because the HMP limits herbicide use in suitable habitat areas.

Impacts to migratory birds protected under the Migratory Bird Treaty Act would be minimized by following best management practices such as clearing trees and shrubs outside of migratory bird breeding season (LANL 2011a).

For wildland fire risk-reduction treatments along arterial roads, evacuation routes, and defensible space, there would be long-term habitat alteration from forest thinning and vegetation removal. These treatments would affect a small amount of the total habitat available at LANL, and are not expected to affect overall wildlife populations. For these thinned areas, it is anticipated that more mobile wildlife species such as, deer, elk, and birds would occupy adjacent undisturbed areas. A recent LANL study documented declines in bird populations at LANL since 2003, and fewer birds were observed in areas with mechanical tree thinning These effects were dominated by extensive juniper removal and piñon tree mortality (Fair et al. 2018).

Open space treatments designed for forest health would incur short-term impacts but are expected to improve habitat in the long-term. These treatments would create conditions consistent with historic ecological conditions, improved health and increased ecological diversity of wildlife habitats (Kaufmann et al. 2007). The use of a masticator is better for erosion than an alternative treatment method called chaining (Jones 2019), but it is known to increase the presence of non-native or invasive species. An invasive species best management practices or Invasive Species Management Plan would be developed as a mitigation for this SEA (Section 5.0 Mitigation Measures).

Removal of larger trees up to 20 inches diameter of breast height may be needed to achieve goals of stand age diversity, and a mosaic of groups of trees, grassy open spaces, and trees of various sizes and ages. Cutting larger trees as a restoration practice is supported by evidence that is less likely to result in even-age forests, and contributes to the overall forest biodiversity and resiliency of the landscape (Abella et al. 2006, Triepke et al. 2011). Under the Proposed Action, cutting trees larger than 20 inches would only be performed after review and approval through the Integrated Review Tool. Impacts to ecological resources would be limited, because other large trees would remain in any given project area.

Environmental Consequences of the No Action Alternative

Under the No Action Alternative, the existing treatments would continue as currently implemented. Requirements for best management practices for these treatments and revegetation would continue.

Cumulative Impacts

There are no anticipated adverse cumulative impacts to ecological resources by the Proposed Action and other past, present or projects in the forseeable future within the region of influence (Appendix A). Impacts to threatened and endangered species and migratory bird habitat by mechanical thinning are anticipated to be temporary and minor as the agencies conducting projects at LANL, the Valles Caldera National Preserve, the Santa Fe National Forest, and Los Alamos County would all adhere to requirements under the Threatened and Endangered Species Act and the Migratory Bird Treaty Act (FEMA 2018, USDA 2015, 2018). These projects are isolated from each other, leaving adjacent undisturbed habitat at any given time, so no adverse impact to habitats are expected across the landscape.

3.2.3 Cultural Resources

Cultural resources within LANL include sites and structures that date to the prehistoric and historic periods and have importance for American Indians, Hispanic, and American histories and folk life traditions (LANL 2017c).

Since 2000, there are changes to cultural resources management at LANL. A new Cultural Resources Management Plan (CRMP) (LANL 2017c) and a Programmatic Agreement (DOE 2017) between LANL, the New Mexico State Historic Preservation Office, and the Advisory Council on Historic Preservation were adopted for managing cultural resources at LANL. Both the percentage of LANL surveyed for cultural resources and the number of identified cultural resource sites has increased since the issuance of the 2000 EA. There have also been cultural resources monitoring projects related to the Cerro Grande Fire, wildland fire management activities, and the Las Conchas Fire. Another major change to cultural resources at LANL was the 2015 establishment of the Manhattan Project National Historical Park.

Following the Cerro Grande Fire in May 2000, DOE/NNSA and LANL cultural resources staff assessed impacts from the fire to cultural resources (both archaeological sites and historic buildings) as required by the Special Environmental Analysis of actions taken in response to the Cerro Grande Fire (DOE 2000a). Adverse impacts included four significant buildings at the V-Site Manhattan Project era historical site which were destroyed by the fire. Almost 500 cultural resources were assessed and impacts to cultural resources included smoke damage, impacts from suppression activities, and natural erosion (LANL 2002). The Special Environmental Analysis required a Mitigation Action Plan for rehabilitation and monitoring of cultural resources (DOE 2000a). These actions were conducted for ten years, until hydrologic conditions were stabilized in 2013. The results were reported in the annual SWEIS Mitigation Action Plan Annual Report (DOE 2014).

Following fire road and firebreak maintenance in 2006 and in 2008, LANL's cultural resources staff evaluated archaeological sites in technical areas (TA) 5, -15, -36, -39, -49, -54, -60, and -68 to identify potential impacts to cultural resources located within or adjacent to fire roads and firebreaks. Minor impacts range from minimal displacement of surface artifacts from natural erosion, to occasional exposure of subsurface deposits from blading and maintenance. These sites had previously been impacted from cumulative maintenance activities during the past six decades (LANL 2006, DOE 2012). This determination helped classify these existing (i.e. historical) fire roads and fire breaks as undertakings not requiring further National Historic Preservation Act review in the current LANL Programmatic Agreement (DOE 2017).

During the Las Conchas Fire, fuels reduction and new firebreaks were implemented using machine and hand thinning. Since there was a CRMP in place for the Las Conchas Fire (but not the Cerro Grande Fire), LANL cultural resources staff supported fire suppression during the closure by marking archaeological sites for avoidance (LANL 2011b).

Environmental Consequences of the Proposed Action

Archaeological sites are sensitive to soil disturbance activities, fuel removal, and natural erosion (LANL 2002, DOE 2000a, USDA 2012, DOE 2012). The risk of impacts to archaeological sites in developed areas such as, evacuation routes, defensible space corridors, and primary arterial roads is low, because there are not previously undisturbed resources in these areas. Cultural resources on LANL land are currently managed through the implementation of the CRMP and the Programmatic Agreement (DOE 2017) by means of the Integrated Review Tool. Archaeological sites along fire roads, firebreaks, and open spaces are potentially susceptible to erosion from fuel removal and would be avoided by using site marking and/or monitoring during wildland fire management activities. Best management practices include fencing vulnerable sites located within treatment areas, installation of erosion controls around sites, improving drainage, and long term sustainability of fire roads and breaks. The effectiveness of these efforts would be monitored and adapted as needed (Section 4.0). If potential impacts to archaeological sites are identified, DOE/NNSA will initiate consultation with the State Historic Preservation Office, Tribal Historic Preservation Office and any other required parties to mitigate any potential impacts under requirements of the National Historic Preservation Act and the LANL Programmatic Agreement (DOE 2017).

Potential impacts to historic buildings, including those associated with the Manhattan Project National Historical Park, are negligible under the Proposed Action. Implementing the Proposed Action would reduce risks of high severity fire, which could damage historic buildings. Soil disturbance, fuels reduction, and erosion are all potential impacts that are evaluated and monitored under the CRMP (LANL 2017c).

Environmental Consequences of the No Action Alternative

Potential impacts to cultural resources (archaeological sites and historic buildings) from the No Action Alternative are similar to the Proposed Action. Project undertakings would continue to be reviewed using the Integrated Review Tool. Improved forest health and increased ground

cover that reduces erosion and potential impacts to cultural resources in open spaces would not occur.

Cumulative Impacts

There are no anticipated adverse cumulative impacts to cultural resources at LANL by the Proposed Action and other past, present or projects in the forseeable future within the region of influence (Appendix A). The ongoing implementation of the CRMP (LANL 2017c) ensures that projects with the potential to impact cultural resources are evaluated, and best management practices are used to avoid impacts to cultural resources. The improvement of forest health and fuels reduction in areas surrounding the park locations would enhance the setting and visitor experience (DOE 2018b).

4.0 MITIGATION MEASURES

Mitigations are required to minimize potential impacts from the Proposed Action. Individual projects would be reviewed using LANL's Integrated Review Tool to identify specific requirements to reduce or to avoid impacts described in Section 2. Specific mitigations for implementation of the Proposed Action include:

- Develop or adopt LANL standards for sustainable gravel or other unpaved roads.
- Develop and implement a program to routinely inspect the condition of fire road and firebreaks. Program would develop plans for drainage improvements to reduce erosion, and closures or replacements of fire roads.
- Develop and implement a monitoring program for cultural resources that are adjacent to fire roads and firebreaks.
- Develop and implement annual fuels and forest health management plans.
- Review and update the LANL Pesticide Discharge Management Plan to ensure that herbicides are not used in salamander habitat areas and floodplains.
- Develop or adopt a LANL invasive species best management practices document or an invasive species management plan.

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APPENDIX A - PROJECTS CONSIDERED FOR CUMULATIVE IMPACTS IN THE REGION OF INFLUENCE

The Council of Environmental Quality (CEQ) NEPA implementing regulations define cumulative impacts as the impact on the environment which results from the incremental impact of an action that is added to or interact with effects from other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR § 1508.7). The concept of cumulative impacts takes into account all disturbances that result in the compounding of the effects over time. Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource (EPA 1999).

The region of influence for considering cumulative impacts to environmental factors in this SEA is defined as the eastern plateau of the Jemez Mountains, also referred to as the Pajarito Plateau (DOE 2008a). The Pajarito Plateau encompasses several federal, state, tribal, and city jurisdictions that include the DOE/NNSA, the Forest Service, the National Park Service, the Pueblo de San Ildefonso, and the towns of Los Alamos and White Rock (Figure 1-1). Table A-1 lists projects in the region of influence evaluated for potential cumulative impacts. Projects were included in this list if they are similar in nature to the Proposed Action, in that they address forest health, have tree removal, or address erosion.

Table A-1. Projects Considered within the Region of Influence of the Proposed Action and No Action Alternative

Project	Agency/Owner	Purpose
Landscape Restoration and Stewardship Plan (USDA 2015)	Valles Caldera National Preserve	10-year stewardship plan for managing and restoring natural systems of the Valles Caldera.
Invasive Plant Control Project (USDA 2018)	Forest Service	Controlling or eradicating weed infestations on the Carson and Santa Fe National Forests to maintain or improve the diversity, function and sustainability of desired native plant communities in the forests.
Los Alamos County Wildfire Mitigation and Public Education Project (FEMA 2018)	Los Alamos County	Reduce wildland fire hazard that puts the lives of citizens and fire fighters at risk and that threaten residential structures, schools, and critical facilities of national importance (i.e., Los Alamos National Laboratory).
Supplemental Environmental Projects	DOE/NNSA	Watershed enhancement supplemental environmental projects conducted by the DOE/NNSA.