APPENDIX B

VEGETATION MANAGEMENT PLAN

IMPLEMENTATION PLAN

for the Stanford Wedge Property Development Vegetation Management Plan

August 2020

Introduction

Stanford University (Stanford) has proposed a subdivision of 39 residential units on a 75.4-acre parcel located at 3530 Alpine Road in the Town of Portola Valley (Town). Approximately 6 acres of the project site would be developed for residential units and the remainder of the 75.4-acre parcel would be undeveloped (the Undeveloped Area).

The Woodside Fire Protection District (WFPD), in review of the application and site plans, required preparation of a Vegetation Management Plan (VMP) to address existing fire hazards across the parcel through fire behavior modeling and to define mitigations to reduce the hazards identified during modeling.

This Implementation Plan has been prepared to identify the methods and approaches to the initial treatment of vegetation described in the VMP. Chapter 6 of the VMP addresses vegetation treatment methods that will be used; treatment activities or "prescriptions;" logistics associated with the work including access, material collection, and removal; and environmental protection measures.

The VMP identifies the need for a new, permanent access road to be constructed in order to haul out cut vegetative material from the Undeveloped Area. While the VMP assumes that initial treatments would commence after completion of a new, permanent access road so that all materials can be removed, it is not necessary for this permanent road to be constructed to perform initial work. This Implementation Plan identifies the activities that can be undertaken,

and the general prioritization of initial treatments that can occur, prior to construction of the permanent access road and other ground-disturbing activities.

The prescriptions presented in Chapter 6.2 of the VMP identify activities to be carried out by vegetation cover type and in many cases, note that material can either be removed or rearranged (masticated) on site. Both scenarios (where vegetation is removed versus where it is masticated and left onsite) are identified as acceptable methods in Chapter 6.2.8 of the VMP. Prior to construction of the permanent access road, initial treatments remain feasible and would commence, provided certain conditions defined in this Implementation Plan are met to avoid impacts to any sensitive environmental resources such as special-status plants that may be present in the Undeveloped Area.

Phasing of Initial Treatments

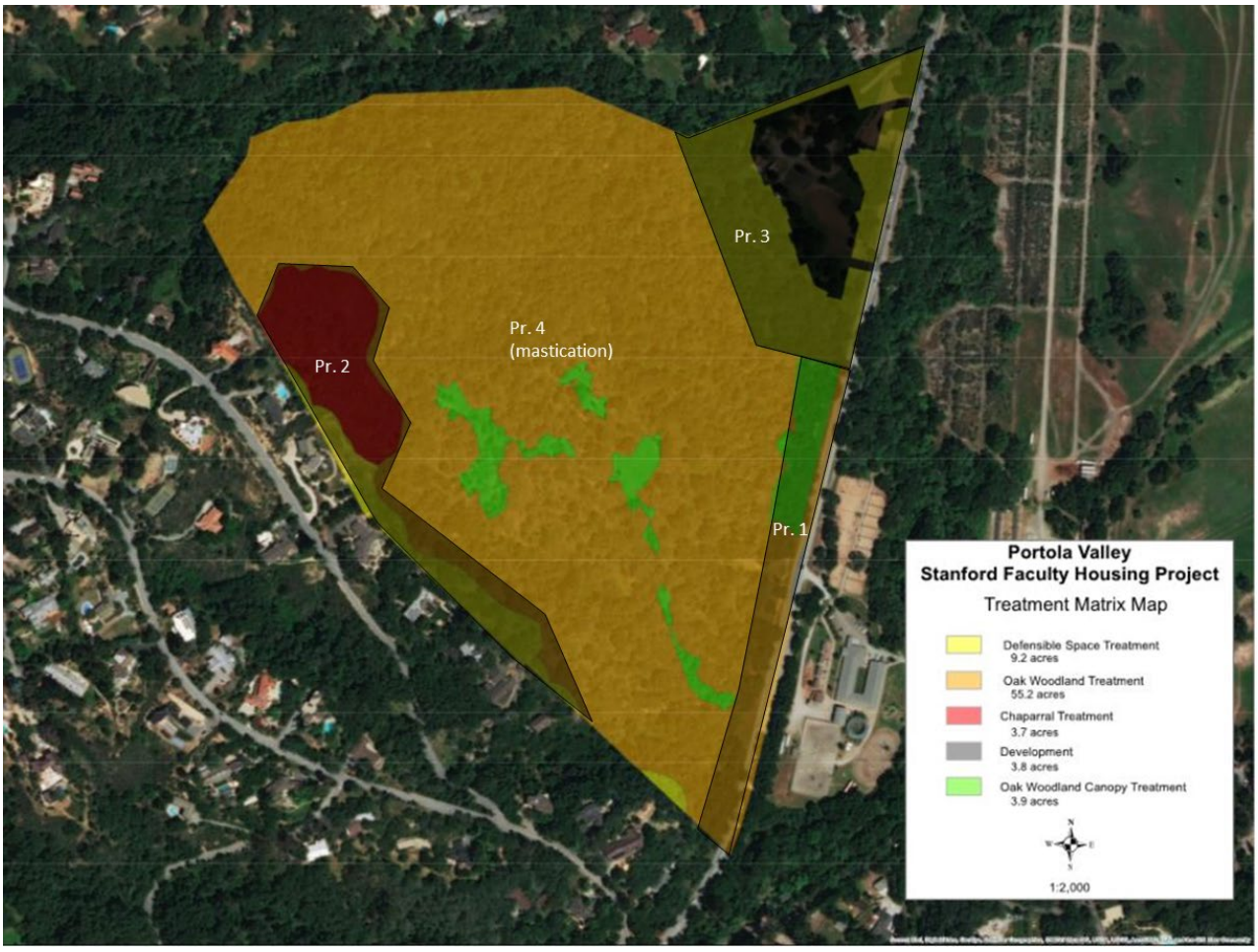
Priorities

The initial treatment described in the VMP can commence prior to construction of the permanent access road. The prioritization and focus of initial treatments prior to construction of the road would be as follows:

1. Oak woodland canopy and oak woodlands vegetation treatments within approximately 200 feet of Alpine Road, where access and material removal are easily accomplished. This work would help to protect the parcel from potential ignitions from the existing overhead transmission line and road.
2. Creation of defensible space and chaparral treatments along the western boundary of the parcel with removal of material, provided access via Minoca Road is provided by adjacent landowners. These treatments would add a layer of protection between the parcel and the closest homes and structures.
3. Creation of defensible space around the existing stables and the area of future housing development, including removal of cut vegetative materials. Defensible space treatments would protect the existing stables and future housing from the spread of fire emanating from the southwest or mitigate the spread of a fire that originated at the stables, the future housing, or Alpine Road.
4. Treatments throughout the remainder of the parcel (and Priority 2 areas if access by adjacent landowners is not provided) by rearranging cut materials on the surface through mastication and/or chipping. These treatments should still reduce flame lengths, if a wildfire occurs during 97th percentile weather, to an acceptable level that would allow for direct attack of the fire.

These priority areas are shown in Figure 1. Initial treatments in priority areas 1 through 3 can be completed optimally, without the installation of the permanent access road. All initial treatments can meet the treatment objectives defined in Section 6.2 of the VMP.

Figure 1 Priority Treatment Areas for Initial Treatments Commencing Prior to Construction of the Permanent Access Road



Conditions to Limit Impacts of Initial Treatments that are Implemented Prior to Construction of the Permanent Access Road

To limit impacts of initial treatments that commence prior to the construction of the permanent access road, the following additional conditions would need to be implemented:

- Tree removal would occur through hand methods (leaving cut stumps at about 6 inches in height so as not to disturb the ground surface). Material would be carried when possible and when dragging could not be avoided, dragging lengths would be less than 250 feet. Removed trees would be under 11 inches in diameter unless considered a hazard to workers or infrastructure.
- Heavy equipment use, including a chipper or masticator, would minimize soil disturbance through limiting machine configurations to PSI's that do not exceed pressures of 10 pounds per square inch (psi) on the ground, a treatment design that reduces rutting from machine turns. Maximum soil moisture thresholds would be enforced to moderate any compaction.

- Material masticated or chipped and spread on the surface would not exceed 1 inch in depth so as not to hinder growth or establishment of sensitive plants. Removal or further manual spreading would be required to ensure that this standard is met.

Treatments after Completion of the Permanent Access Road

Once the permanent access road is completed, any initial treatments that were not completed would be accomplished using the "removal" method for cut material described for each prescription in the VMP. The removal of vegetation would optimize fire hazard reduction as compared with mastication or chipping which rearranges material on site.

On-going maintenance would utilize the permanent access road to remove cut vegetative materials, further improving the effectiveness of the treatments as the work continues. As stated in Section 6.2.6 of the VMP, each area of the undeveloped parcel will be treated approximately every 5 years with work staged such that 1/5 of the site is treated each year.

Conclusion

This Implementation Plan allows for initiation of the initial treatments defined in the VMP prior to construction of the permanent access road described in the VMP. The VMP fully supports this approach through allowing for mastication or removal of cut vegetative material. While less effective than full removal of all material cut, the VMP demonstrated through modeling that mastication of materials still resulted in an acceptable reduction of fire hazards across the site.

The VMP implementation will be a continuous process. Any work performed will serve to improve upon existing conditions and hazards. Continuous maintenance ensures that the objectives of the VMP will be met on a long-term basis.

Stanford University

Stanford Wedge Property Development Vegetation Management Plan

May 2020

SIG

PANORAMA ENVIRONMENTAL, INC.

Stanford University

Stanford Wedge Property Development Vegetation Management Plan

May 2020

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1.1 Background

Stanford University (Stanford) has proposed a subdivision of 39 residential units on a 75.4-acre parcel located at 3530 Alpine Road in the Town of Portola Valley (Town), as shown in Figure 1. Approximately 6 acres of the project site would be developed for residential units and the remainder of the 75.4-acre parcel would be undeveloped.

The Woodside Fire Protection District (WFPD), in review of the application and site plans, required preparation of a Vegetation Management Plan (VMP or plan) to address existing fire hazards across the parcel through fire behavior modeling and to define mitigations to reduce the hazards identified during modeling.

1.2 Existing Conditions of the Site

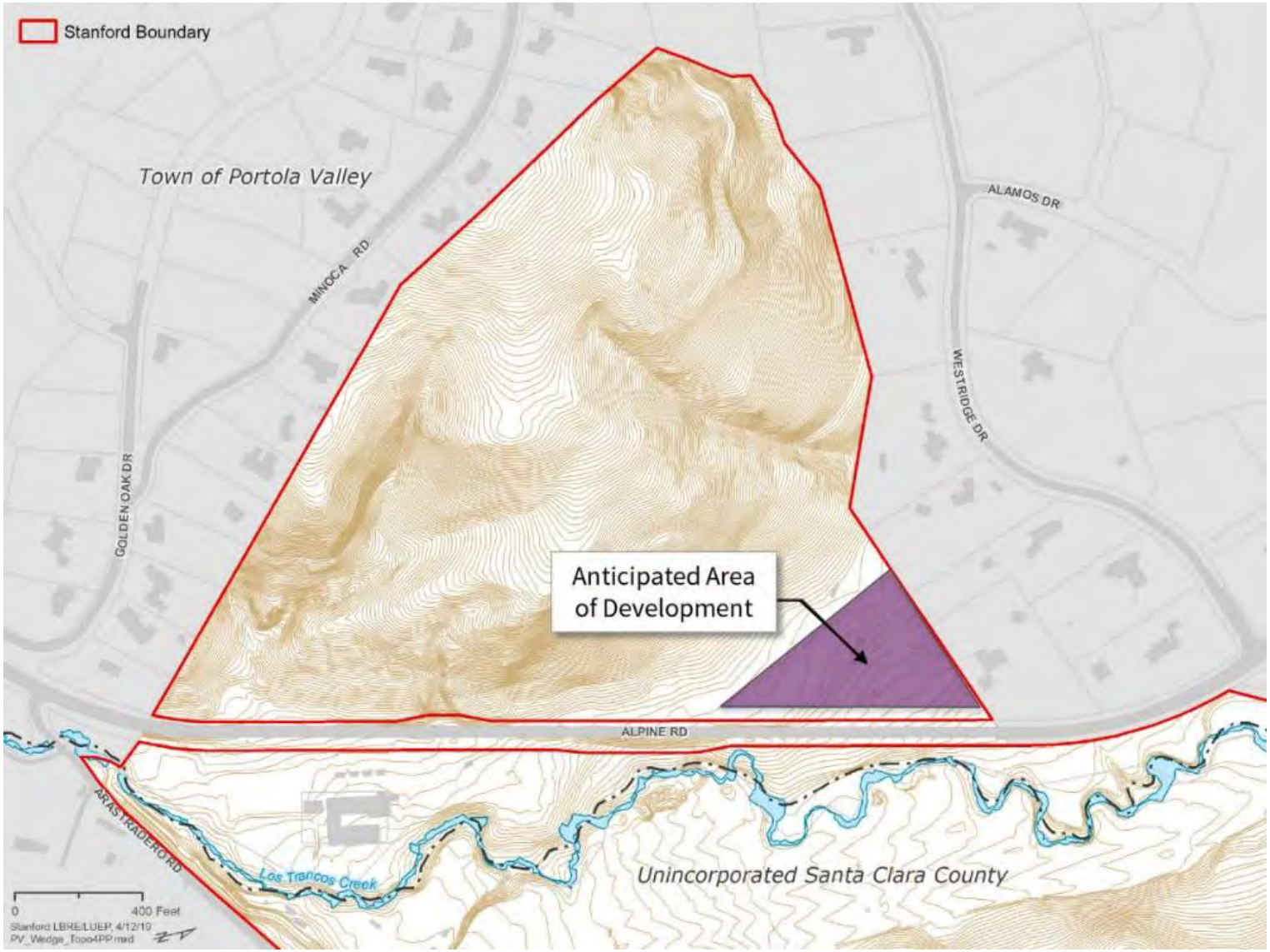
The site is currently largely undeveloped with some disturbance and development at Alpine Road in the area of the proposed housing development, where horse stables are currently located. The project parcel is surrounded by single family residential development to the north, west, and south. Elevations within the project site range from approximately 323 feet to 678 feet above sea level. The area of proposed development is on the flattest portion of the site encompassing approximately 6 acres. This flat area is surrounded by steep hillsides of up to an over 30 percent slope in some places. The slope has a northeast aspect. The dominant vegetation types across the larger property include chaparral and oak woodland. Dense understory is found through much of the parcel.

1.3 Fire Behavior Modeling

1.3.1 Overview of Modeling

Wildfire modeling is a field of computational science that uses numerical simulations to predict fire behavior. Wildfire modeling attempts to reproduce fire behavior characteristics like how quickly a fire can spread, in which directions it may spread, and how much heat it may generate given the conditions of the fuels, land, and predicted weather. Fire behavior modeling also looks at whether a fire would transition from the ground surface to tree crowns, which is

Figure 1 Site Location



much more dangerous. Once fire behavior is estimated through modeling, an assessment of fire hazards to surrounding life and property can be made and modifications can be made to the vegetation to reduce the exposure of important human values to that hazard, known as vegetation treatments or prescriptions.

The factors that influence fire behavior serve as the key inputs in modeling efforts. These factors include:

- **Landscape:** Topography factors influence wildfires. Orientation toward the sun, which influences the amount of energy received from the sun, and the slope (fire spreads faster uphill) influence fire behavior. Fire can accelerate in narrow canyons and it can be slowed down or stopped by barriers such as creeks and roads
- **Fuels**: Fuels include anything that can burn. In wildland areas, fuels are primarily comprised of vegetation. Dead trees with low moisture ignite more easily and burn faster than live trees with higher moisture. Leaf litter and dried twigs and branches also ignite easier and burn faster.
- **Weather:** Weather influences fire through wind and moisture. Wind can increase the spread of fire in the direction of the wind, wind speed can accelerate spread, and higher temperatures can result in a fire burning faster, as can low humidity and low precipitation.

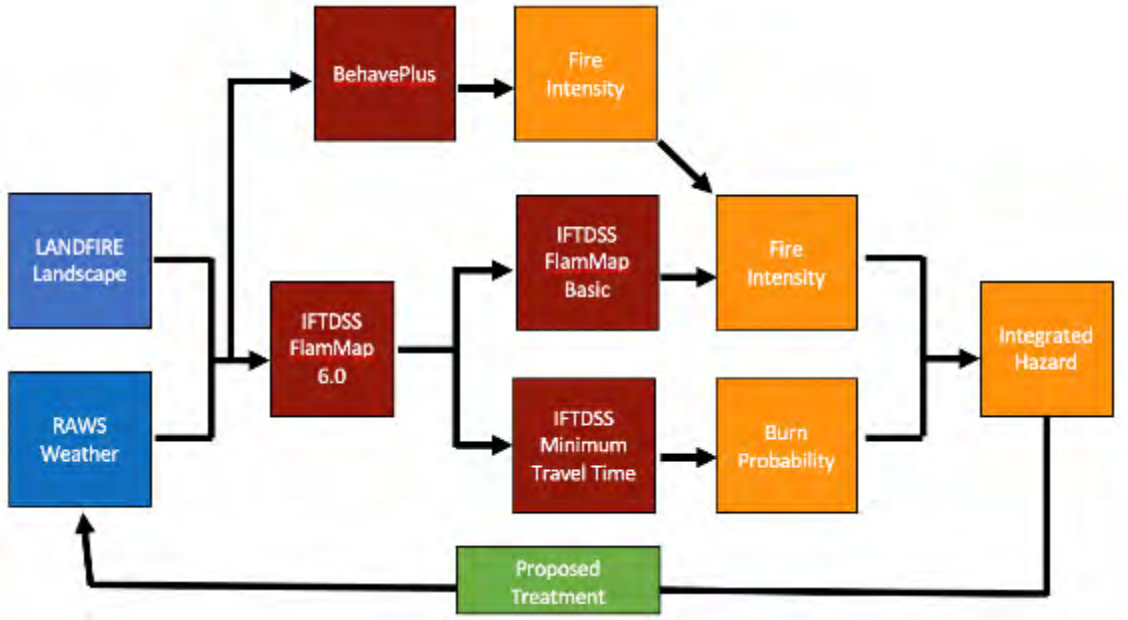
Outputs of fire behavior modeling can include different parameters, but this exercise focused on burn probability and fire intensity. Burn probability is the likelihood that a wildfire will burn a given point or area over a specified period. Flame length can be used as a proxy for fire intensity, where flame length is the height of the flames, with taller flame lengths indicating a higher intensity fire. Generally, if flame lengths are less than 4 feet, then fire can be effectively controlled with professional suppression resources. Flame lengths between 4 and 8 feet require multiple, more specific types and numbers of professionally trained firefighting resources and suppression success goes down. Flame lengths greater than 8 feet generally prevent firefighters and resources from directly attacking the fire front because the fire is too intense. Many times, this scenario results in more land being burned and unfortunate effects on property and even life. Vegetation treatments should be identified to reduce undesirable fire intensities when flame lengths exceed 4 feet, so that fire fighters have the highest probability of safely controlling a wildland fire under most weather conditions.

1.3.2 Models Used for VMP Analysis

Protocol

A wildland fire behavior modeling protocol was developed for this effort and was presented to WFPD Fire Marshal, Don Bullard. The modeling protocol that was used is shown in Figure 2 and explained in the following sections.

Figure 2 Fire Behavior Modeling Protocol



Models Used

Two fire behavior modeling programs were used to understand the existing fire hazard on the project parcel and to compare or cross check the results. Each model is described below:

- **Interagency Fuel Treatment Decision Support System (IFTDSS)** utilizes two imbedded models, FlamMap and Minimum Travel Time. IFTDSS is a web-based application designed to make fuels treatment planning and analysis more efficient and effective. IFTDSS provides access to data and models through one simple user interface.
- **BehavePlus** is composed of a collection of mathematical models that describe fire behavior and the fire environment. The modeling program simulates flame length, rate of fire spread, spotting distance, scorch height, tree mortality, fuel moisture, as well as other variables; so, it is used to predict fire behavior in multiple situations.

1.3.3 Model Inputs

The Landscape Fire and Resource Management Planning Tools (**LANDFIRE**) was used for the inputs for landscape and fuels, that is, topography and vegetation cover types. LANDFIRE is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service (USFS) and U.S. Department of the Interior. The datasets in LANDFIRE for topography and vegetation are based on remote sensing data, which have varied accuracies and must be assessed further. Therefore, field visits to the project parcel were conducted to verify and augment the LANDFIRE remotely sensed datasets through professional judgement and photo interpretation to ensure the existing conditions were being appropriately represented within the model inputs.

The Remote Automatic Weather Stations (RAWS) provided the inputs for weather. The Remote Automatic Weather Stations (RAWS) system is a network of automated weather stations run by the USFS and Bureau of Land Management (BLM) and monitored by the National Interagency Fire Center (NIFC), mainly to observe potential wildfire conditions. The 97th percentile weather conditions were utilized. Percentiles are based on a scale of 0-100 and are used to sort and rank a collection of data collected over a period. For wildfire, when values at the upper end of the scale occur, complex fires are expected, where initial attack may often fail. The 97th percentile is often termed "the most likely worst-case scenario." These are the days where weather conditions are greatest for wildfire ignition and spread.

1.3.4 Current Condition Modeling Results/Outputs

Overview

The results of the fire behavior modeling programs indicated that nearly all areas in the project parcel will require some form of vegetation treatment to reduce fire hazard.

Flame Length

IFTDSS (with FlamMap)

Approximately 52 percent of the project parcel exhibited flame lengths greater than 4 feet and the entire parcel has a modeled average flame length of 4.8 feet. Under current conditions, as modeled, the project parcel would likely exhibit high intensity fire and put the surrounding homes and infrastructure at risk because suppression resources would have trouble safely directly attacking the fire and, thus, direct suppression effectiveness might be limited.

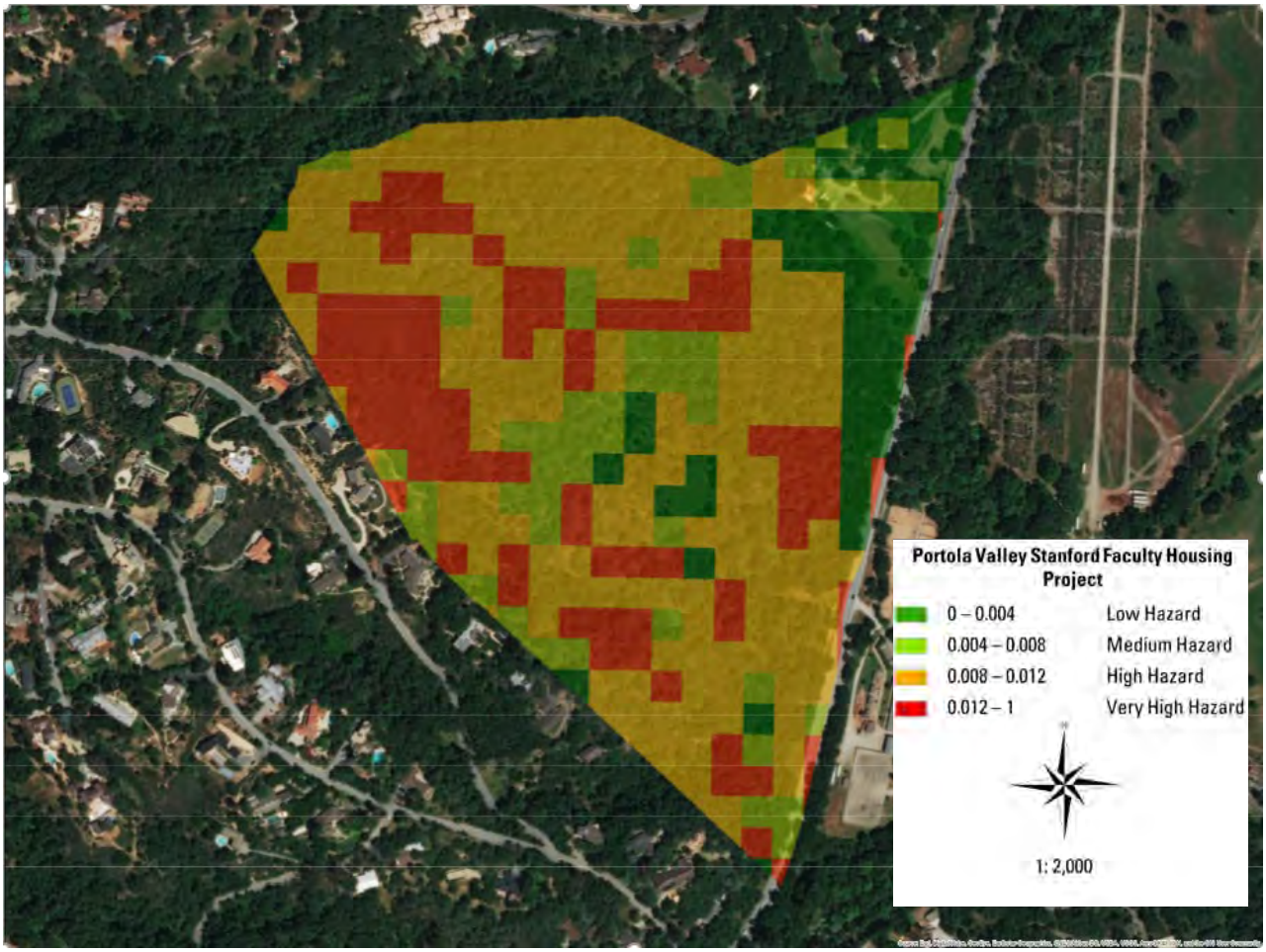
BehavePlus

Flame lengths were comparable using the BehavePlus model as found with FlamMap (in IFTDSS), with some variations in patterns based on underlying differences in how the models work. The fire intensity measured by flame length modeled by FlamMap was confirmed with the Behave simulation.

1.3.5 Integrated Hazard

The integrated hazard combines intensity (determined by proxy with flame length) and burn probability. Burn probabilities were calculated using Minimum Travel Time in IFTDSS. Figure 3 highlights areas where there is a high fire intensity that overlaps with a high fire probability and thus, a high integrated hazard. Although some areas are considered low hazard, much of the project parcel has an elevated hazard.

Figure 3 Modeled Integrated Hazard for the Project Parcel under Existing Conditions



*The integrated hazard is a scale from 0 to 1 where 0 represents low burn probability and small flame length and 1 is the combination highest burn probability and large flame length. The scaling allows for comparisons before and after treatment.

1.4 Vegetation Management Plan

1.4.1 Types of Vegetation Management Treatments or Prescriptions

Areas with high fire hazard are mitigated through modifications to the live vegetation and removal of dead fuels onsite to reduce the risks. Fuels is the parameter for which the landowner has control since neither weather nor topography can be altered. The modification of vegetation to reduce a fire's potential is called a "treatment" or "prescription." Several treatments or prescriptions are available in vegetation management practice. Table 1 summarizes the treatment types available for the project parcel.

Table 1 Typical Vegetation Treatments

Treatment Activity	Description	Method of Application
Steep Slope Mechanical Treatment with Manual Support	Use of specialized self-leveling motorized equipment to cut, uproot, crush/compact, or chop existing vegetation. On inaccessible terrain: manual cutting and removal of vegetation to machine for comprehensive treatment Used on slopes from 30 to 70 percent only (self-leveling machines up to 50%).	Mastication, chipping, brush raking, tilling, mowing, roller chopping, chaining, skidding and removal, piling; often combined with pile burning (if allowed)
Mechanical Treatment	Use of motorized equipment to cut, uproot, crush/compact, or chop existing vegetation Used on slopes from 0 to 30 percent only.	Mastication, chipping, brush raking, tilling, mowing, roller chopping, chaining, skidding and removal, piling; often combined with pile burning (if allowed)
Manual Treatment	Use of hand tools and hand-operated power tools to cut, clear, or prune herbaceous or woody species	Hand pull and grub, thin, prune, hand pile, hand plant; often combined with pile burning (if allowed)
Prescribed Herbivory	Use of domestic livestock to reduce a target plant population thereby reducing fire fuels or competition of desired plant species	Grazing or browsing goats

1.4.2 Treatment Areas by Cover Type

The type of treatments to be utilized within the project parcel depend on the vegetation type, cover, and location. The VMP identifies two types of vegetation cover on the project site that can exhibit extreme fire behavior, which are chaparral and oak woodland. Given the existing condition of the vegetation on-site, three treatment areas were developed in the VMP, including 1) defensible space areas around structures, 2) oak woodland, and 3) chaparral. These areas are shown in Figure 4.

1.4.3 Treatments

Table 2 presents the vegetation management objectives and the types of treatments that would be implemented by treatment area. A new permanent road will be constructed from Alpine Road up through to the middle of the property to allow for access and material removal from the higher elevations of the parcel. Temporary roads will be constructed from there to collect and haul as much material as possible to the access road and off the site. Not all material can be hauled off-site. Some material will be rearranged (masticated) and left on-site for decomposition. The access road will allow for Class III or greater fire engine access as well as staging for regular maintenance of the parcel.

Environmental protections are also incorporated into the VMP, including for significant tree removal, nesting birds, protection of San Francisco dusky-footed woodrats, California red-legged frogs, and archaeological resources.

Figure 4 Vegetation Treatment Areas by Cover Type

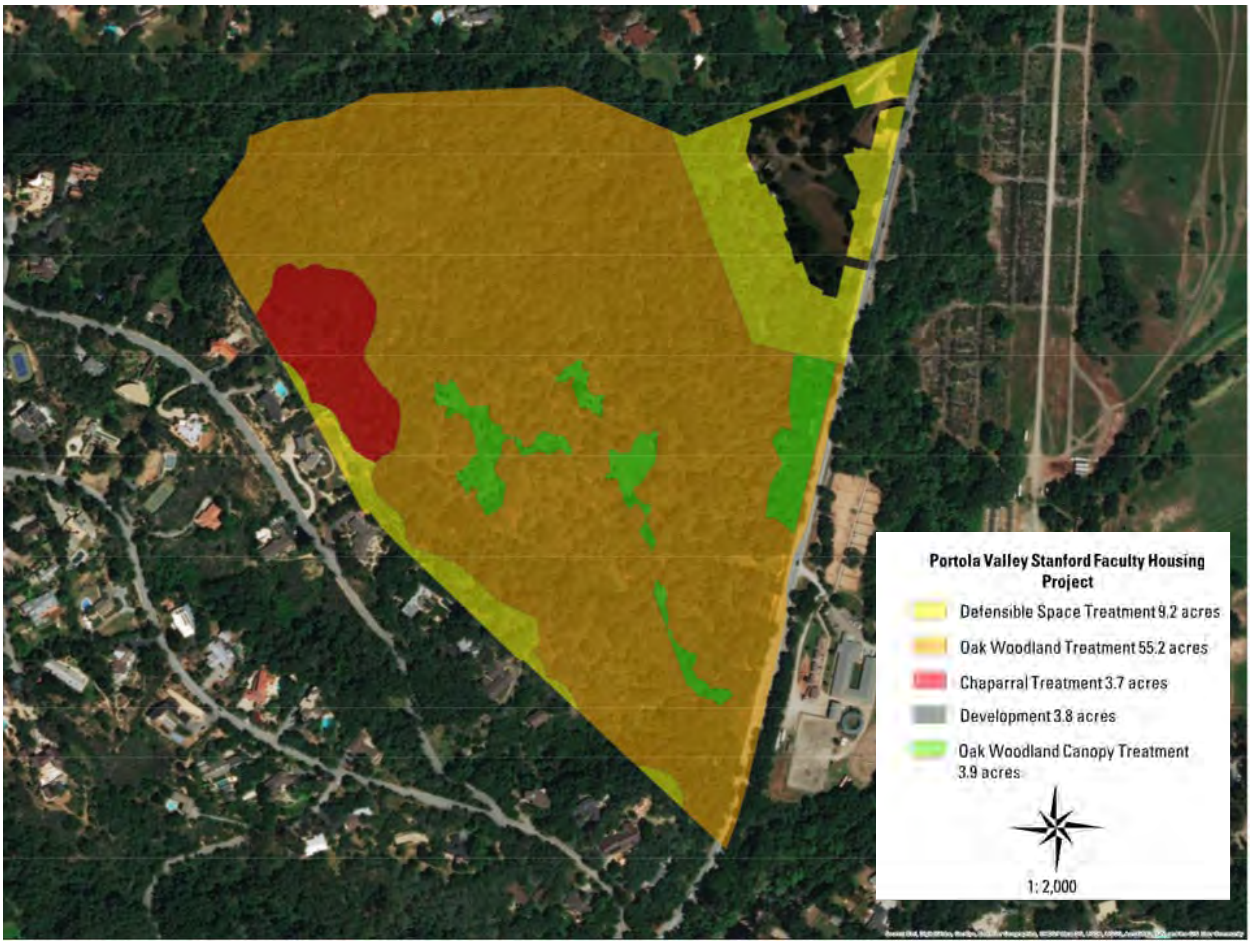


Table 2 Treatment Areas and Objectives

Treatment Areas	Objectives	Treatment Method
Defensible Space	1. Meet and maintain all CALFIRE and Woodside Fire Protection requirement for defensible space. 2. Reduce fuel volumes and maintain fuel volumes consistent with very low severity fire 3. Reduce fuel flammability and cultivate plants on the landscape that are fire-resistant 4. Establish and maintain fuel discontinuity 5. Reduce the possibility of fire traveling through tree crown; maintain that separation 6. Select fire resistant landscape plants for any additional landscaping	**Initial Treatment and On-Going Maintenance**: Manual Planting, cutting, and removal of vegetation

Oak Woodland - Cover	1. Reduce fuel volumes and maintain fuel volumes consistent with low severity fire 2. Reduce volume of flammable fuels and cultivate plants on the landscape that are generally native and fire-resistant 3. Establish and maintain fuel discontinuity 4. Reduce the possibility of fire traveling through tree crown; maintain that separation 5. Maintain healthy, dominant, natural, fire-resistant vegetation cover that is consistent with historical densities in an intact fire regime 6. Maintain active dusky-footed woodrat (*Neotoma fuscipes*) nest sites	**Initial Treatment:** Manual cutting and removal with some mastication and steep slope mastication with manual support **On-Going Maintenance:** Grazing with manual support
Oak Woodland - Canopy	1. Maintain fuel volumes consistent with low severity fire 2. Maintain fuel discontinuity 3. Reduce the possibility of fire traveling through tree crown; maintain that separation 4. Maintain healthy, dominant, natural, fire-resistant vegetation cover that is consistent with historical densities in an intact fire regime 5. Maintain active dusky-footed woodrat (*Neotoma fuscipes*) nest sites	**Initial Treatment:** Manual cutting and removal with some mastication and steep slope mastication with manual support **On-Going Maintenance:** Grazing with manual support
Chaparral Cover	1. Maintain fuel volumes consistent with low severity fire 2. Maintain fuel discontinuity 3. Reduce the possibility of fire traveling through tree crown; maintain that separation 4. Maintain healthy, dominant, natural, fire-resistant vegetation cover that is consistent with historical densities in an intact fire regime 5. Maintain active dusky-footed woodrat (*Neotoma fuscipes*) nest sites	**Initial Treatment:** Manual cutting and removal **On-Going Maintenance:** Grazing with manual cutting

1.5 Post-Treatment Fire Behavior Modeling

1.5.1 Modeling Inputs

Post treatment fire behavior modeling was performed using FlamMap with Minimum Travel Time and BehavePlus to demonstrate that the treatments adequately reduce fire hazards. In order to effectively model treatment changes to the landscape, each vegetation cover type was adjusted to reflect the expected changes in cover, bulk, vegetation heights, and surface fuels from implementing the detailed treatments defined in the VMP.

1.5.2 Outputs

Flame Lengths

Post-treatment, where most of the material is removed, has predicted flame lengths less than 1 foot across the parcel, coupled with an average flame length of 0.7 feet. Post-treatment, where material is rearranged and left on site in some areas, has predicted flame lengths that never

exceed 4 feet. With all of these areas showing flame lengths less than 4 feet, the parcel will most likely exhibit lower fire intensities compared to current conditions (less than 8-foot flame lengths in places with 4.8-foot weighted mean flame lengths). Behave runs confirmed both sets of FlamMap modeling runs are within expectations.

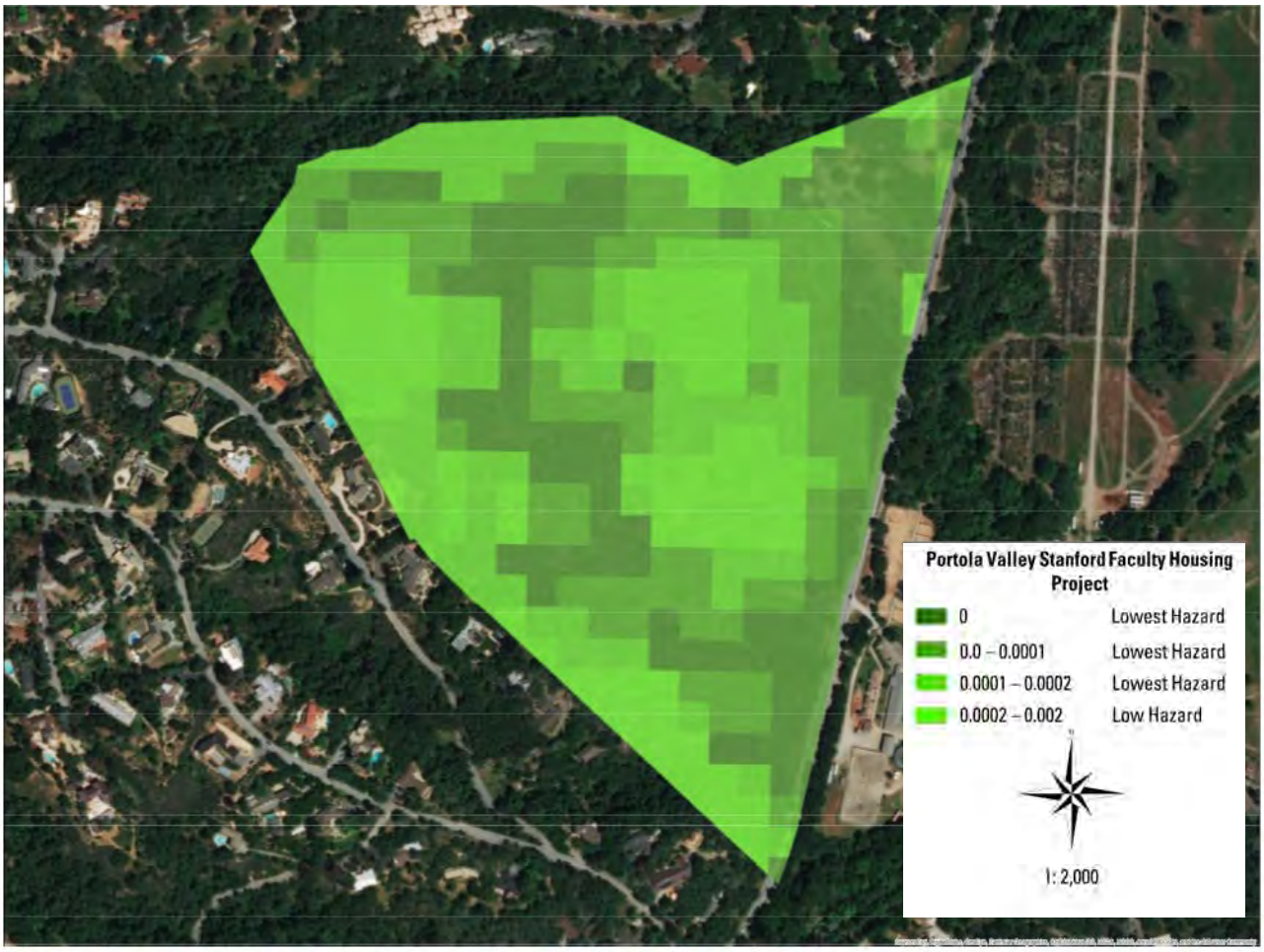
Even if mastication is used in some places, as long as the maintenance plan is implemented and current, if a fire occurred within the parcel, suppression resources would more likely to be able to directly attack the fire. Suppression success would increase compared to the current condition.

Integrated Hazards

The modeled post treatment conditions show a dramatic reduction in integrated hazard (probability and intensity) and thus a reduction in fire exposure to surrounding homes and infrastructure. When the majority of material is removed, hazard is reduced by as much as 99 percent, as shown in Figure 5. Thus, if a fire affected the parcel post-treatment, with an intact maintenance plan, the likelihood that the fire would remain on the ground (versus spreading to the canopy) would increase. Direct suppression would be better facilitated, and the exposure to property compared to the current condition would be reduced.

Mastication may be used in some areas where material cannot be removed. This condition was also modeled, as leaving masticated material in some areas of oak woodland would affect fire behavior. The modeling of this condition showed that all flame lengths would remain less than 4 feet and hazard would be significantly reduced. Therefore, conditions would still likely exhibit much lower fire intensities compared to current conditions.

Figure 5 Modeled Integrated Hazards for the Project Parcel – Most Material Removed



*The integrated hazard is a scale from 0 to 1 where 0 represents low burn probability and small flame length and 1 is the combination highest burn probability and large flame length. The scaling allows for comparisons before and after treatment.

2 Introduction

2.1 Proposed Housing Development Project

Stanford University (Stanford) proposes to develop a portion of university property (often referred to as the "Stanford Wedge") in the Town of Portola Valley (Town) to create 27 single-family residences for Stanford faculty and 12 affordable multifamily housing units. Approximately 6 acres, or 8 percent of the project site, would be developed, and the remainder of the 75.4-acre site would be undeveloped. Development would be clustered in the small portion of the property that is flattest and closest to existing infrastructure. Figure 6 and Figure 7 show the project area and the lot and parcel plan for the development.

2.2 Purpose and Need for a Vegetation Management Plan

The development requires several approvals from the Town. As part of the entitlement process for the Town, the site plans must be reviewed by the Woodside Fire Protection District (WFPD).

Stanford submitted the site plans for review to the WFPD. The WFPD required preparation of this Vegetation Management Plan (VMP). The plan needs to address the existing fire hazards on the parcel (identified via fire behavior modeling of the site) and the methods to reduce the hazards by identification of vegetation management activities in the open space areas. The VMP must identify the activities to be performed prior to construction of the project to initially reduce the hazards and the activities to maintain the undeveloped portion of the property once the housing is built and occupied. The purpose of the vegetation management activities or "prescriptions" is to reduce fuel loads across the property and, thus, the potential severity of wildfire, should it occur, protecting both the new development and surrounding structures.

All activities identified in this VMP will become part of the project for which Stanford is seeking Town approval and that the Town currently is analyzing under the California Environmental Quality Act (CEQA).

Figure 6 Site Location

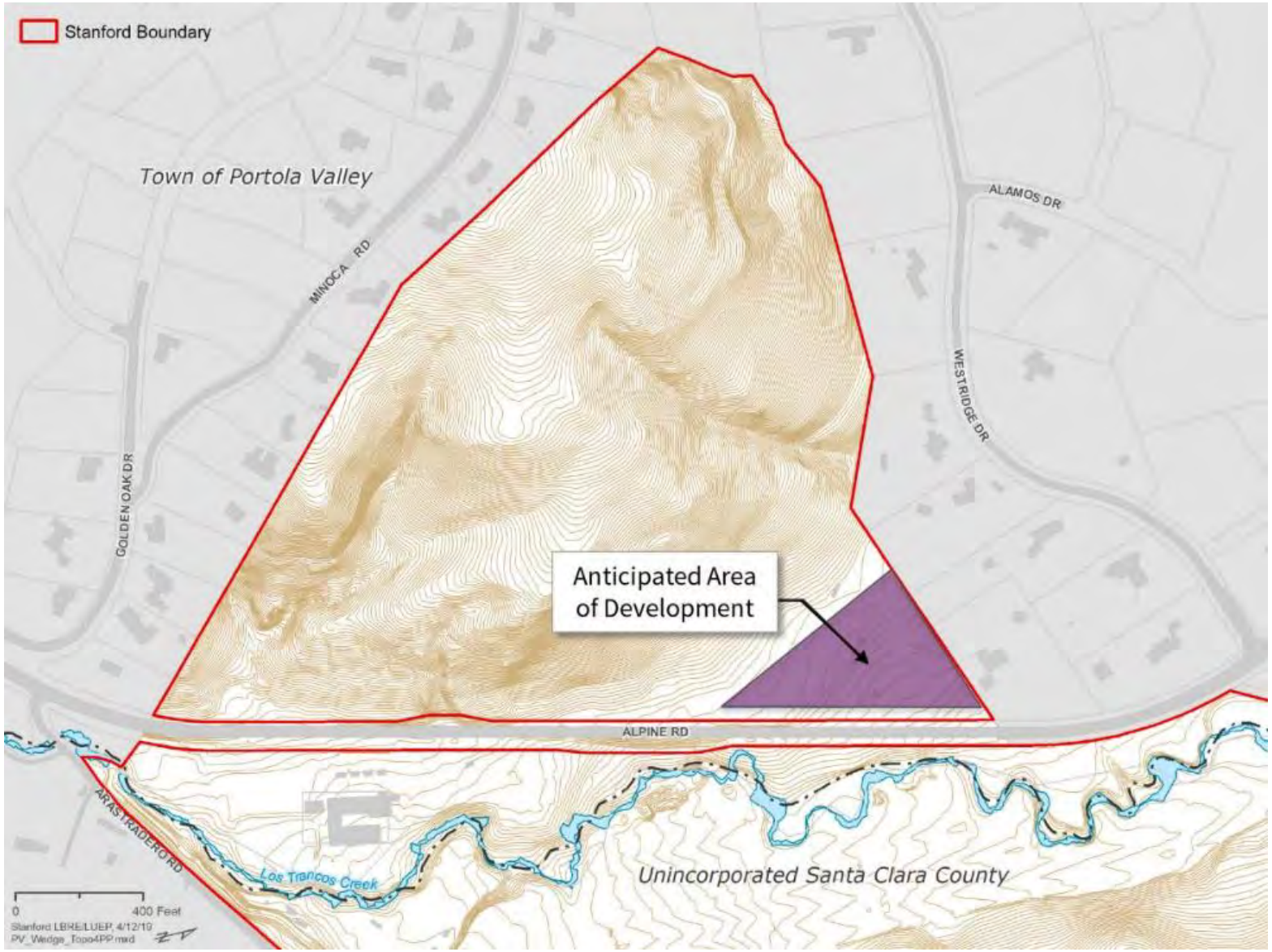
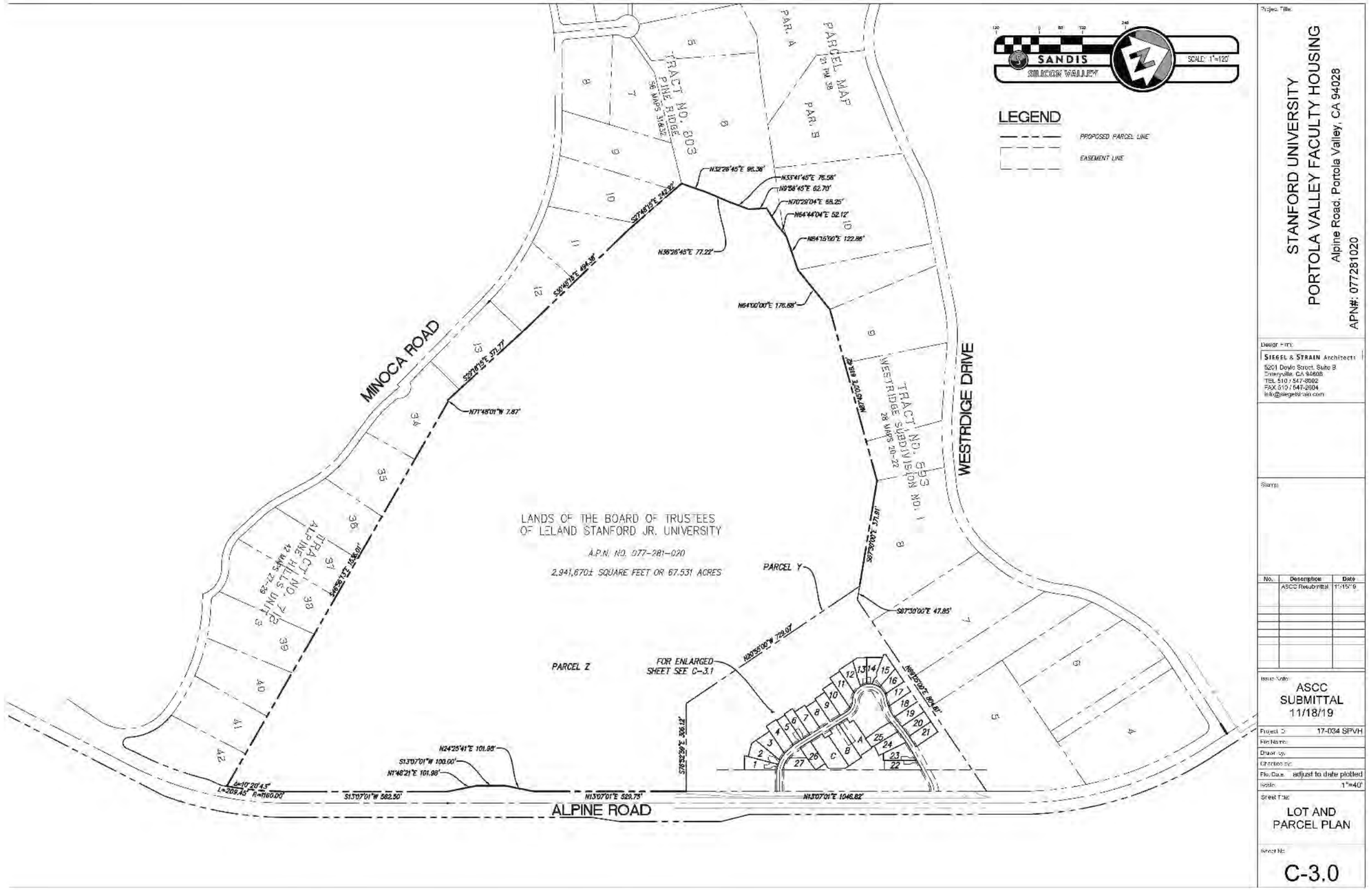


Figure 7 Lot and Parcel Plan



3 Description of Property and Existing Conditions

3.1 Property Location

The project site is located immediately west of Alpine Road in the northeastern part of the Town (APN 077-281-020). The site is largely undeveloped, but the portion of the site proposed for development is currently occupied by the Alpine Rock Ranch, a horse boarding facility with stables. The Glenoaks Stables are located across Alpine Road at the southeastern boundary of the site. Single-family homes are located to the north, west, and south of the project site on Minoca Road and Westridge Drive.

3.2 Existing Conditions

3.2.1 Topography

Elevations within the project site range from approximately 323 feet to 678 feet above sea level. The developable portion of the site is limited to a relatively flat portion along Alpine Road (encompassing approximately 6 acres). This flat area is surrounded by steep hillsides with over 30 percent slope in some places. Figure 8 shows the topography of the parcel. The aspect of the parcel is northeast facing.

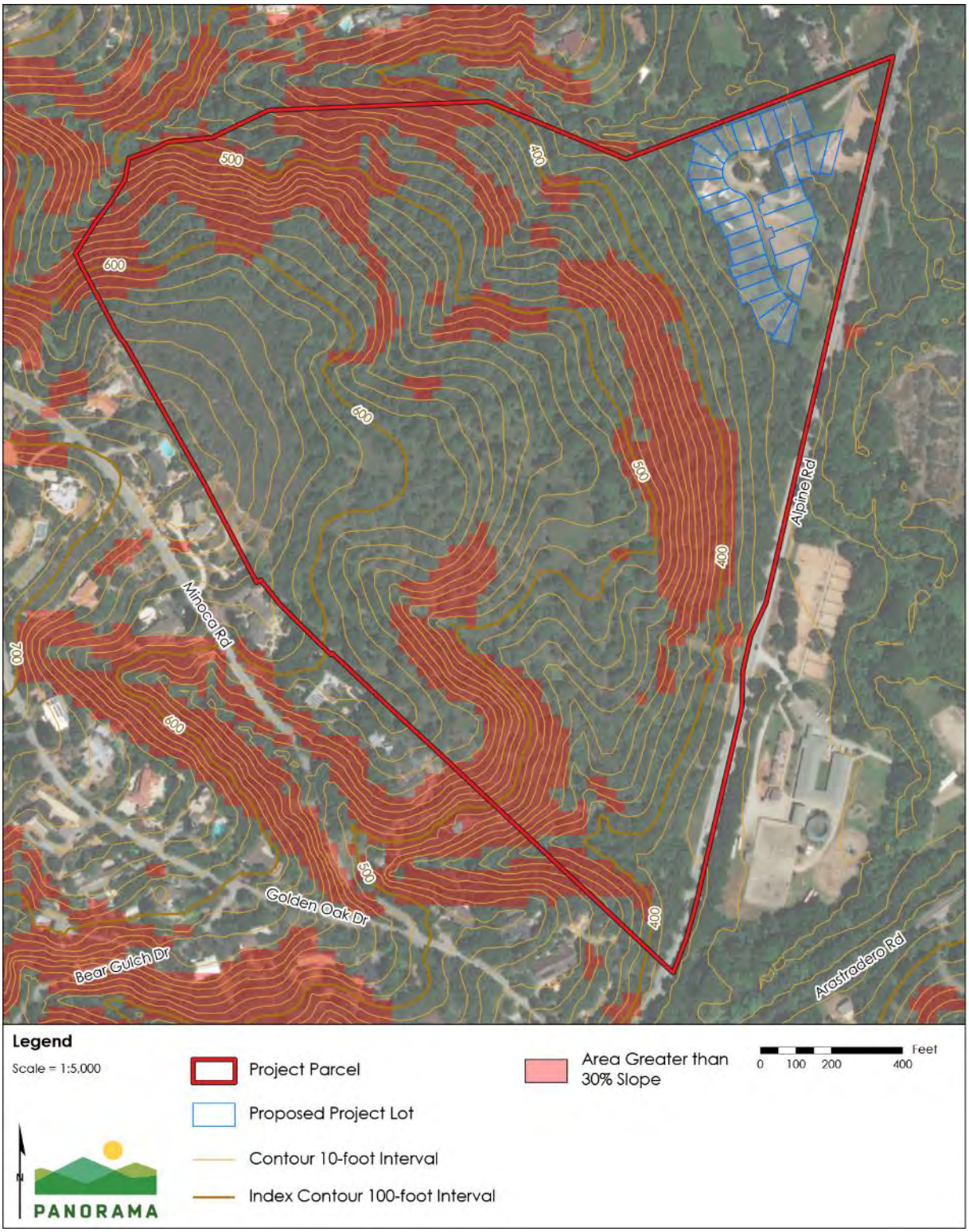
3.2.2 Vegetation and Fuels

Vegetation Type

The site is currently largely undeveloped and in its natural condition, with some disturbance and development at Alpine Road in the area of the proposed development, where horse stables are currently located. The dominant vegetation types across the larger property present significant opportunities for vegetation management to reduce fire risk. These vegetation types are generally based on descriptions include in *A Fuel Hazard Assessment Study Town of Portola Valley* (Moritz Arboricultural Consulting, 2008).

- **Oak Woodland:** Consists of the native oak woodland dominated by a dense canopy of coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), California buckeye (*Aesculus californica*), and Pacific madrone (*Arbutus menziesii*). The dense understory of this woodland consists of poison oak (*Toxicodendron diversilobum*), toyon (*Heteromeles arbutifolia*), and other shrubs that create fairly contiguous ladder fuels from the forest floor to the tree canopy.

Figure 8 Site Topography



- **Chaparral:** Consists of dense evergreen and deciduous shrubs that can reach 10 feet tall and supports a sparse understory of herbaceous plants and litter. Dominant shrubs in this type include chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos glauca, A. tomentosa)*, California-lilac (*Ceanothus cuneatus, C. oliganthus* var. *sorediatus*), redberry (*Rhamnus crocea* ssp. *crocea*), scrub oak (*Quercus berberidifolia*), coffeeberry (*Rhamnus californica*), and holly-leafed cherry (*Prunus ilicifolia* ssp. *ilicifolia*).

A seasonal tributary is located east to west across the northern portion of the property. The vegetation types and corridor are shown in Figure 9.

Fuels

The fuels were identified through data provided in the Interagency Fuel Treatment Decision Support System (IFTDSS).

IFTDSS is a web-based application designed to make fuels treatment planning and analysis more efficient and effective. IFTDSS provides access to data and models through one simple user interface. It is available to all interested users, regardless of agency or organizational affiliation. IFTDSS is designed to address the planning needs of users with a variety of skills, backgrounds, and needs. A simple and intuitive interface provides the ability to model fire behavior across an area of interest under a variety of weather conditions and easily generate downloadable maps, graphs, and tables of model results. Additionally, the application provides a step by step process for testing a variety of fuels treatment impacts (thin, clear cut, prescribed burn) on fire behavior and for comparing results to determine the modeled treatment that best achieves desired results in terms of reduced fire behavior potential. It can be used at a variety of scales from local to landscape level (US Department of Interior, 2020).

Current condition fuels, represented by surface fuels (Figure 10), canopy cover (Figure 11) canopy base height (Figure 12), and canopy bulk density (Figure 13), show ubiquitous surface fuels, continuous ladder fuels, and pockets of very high canopy cover with a moderate amount of bulk.

3.2.3 Surrounding Land Uses and Properties

The project parcel is surrounded by single family residential development along Minoca Road, Westridge Drive and between Westridge Drive and Alpine Road to the northeast. Glenoak Stables are located across Alpine road to the east of the parcel. Figure 14 shows the parcel boundaries, and the distances from the parcel boundary to the nearest existing structures.

Figure 9 Existing Vegetation Types

Figure 10 Surface Fuels

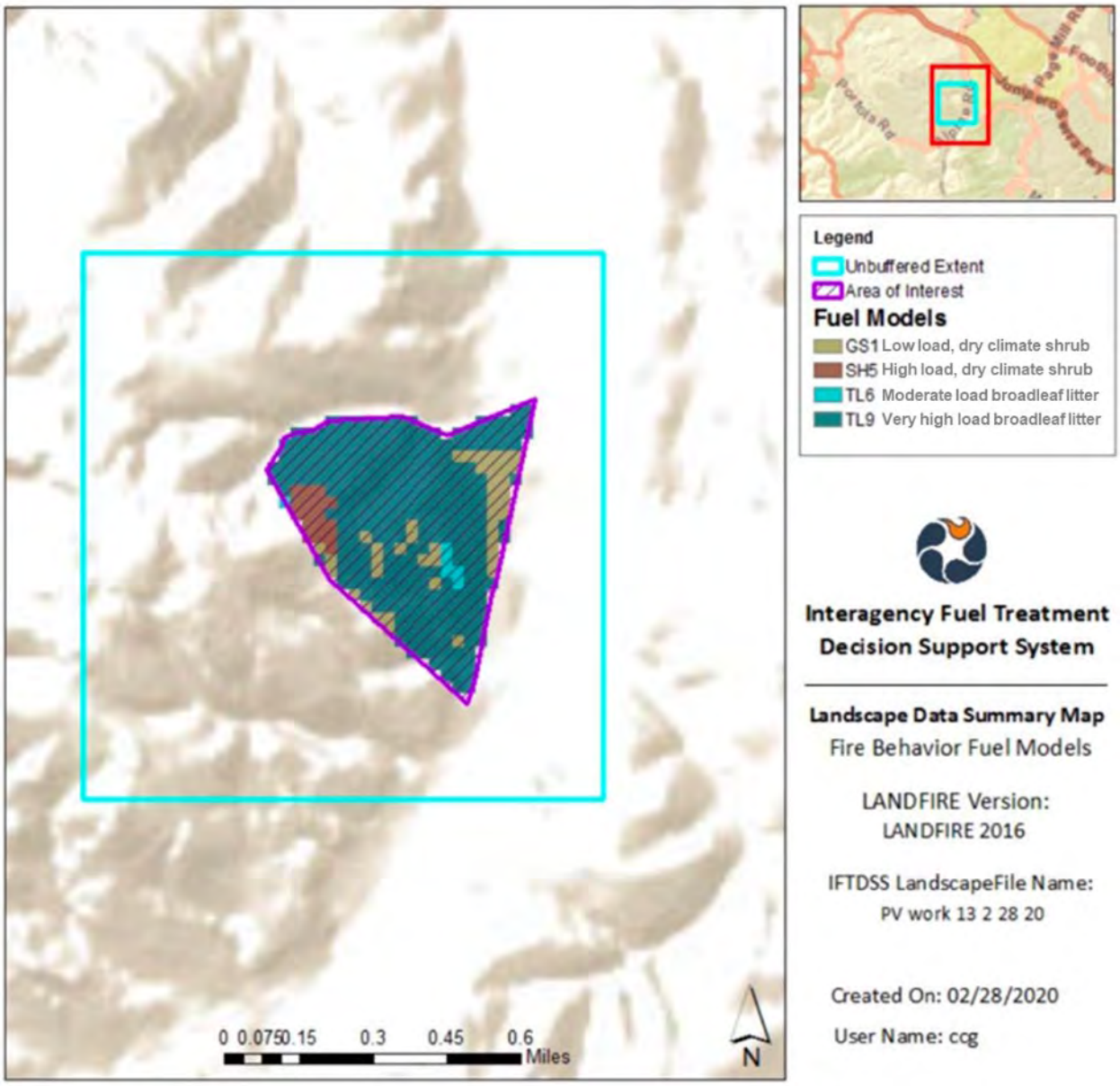


Figure 11 Canopy Cover

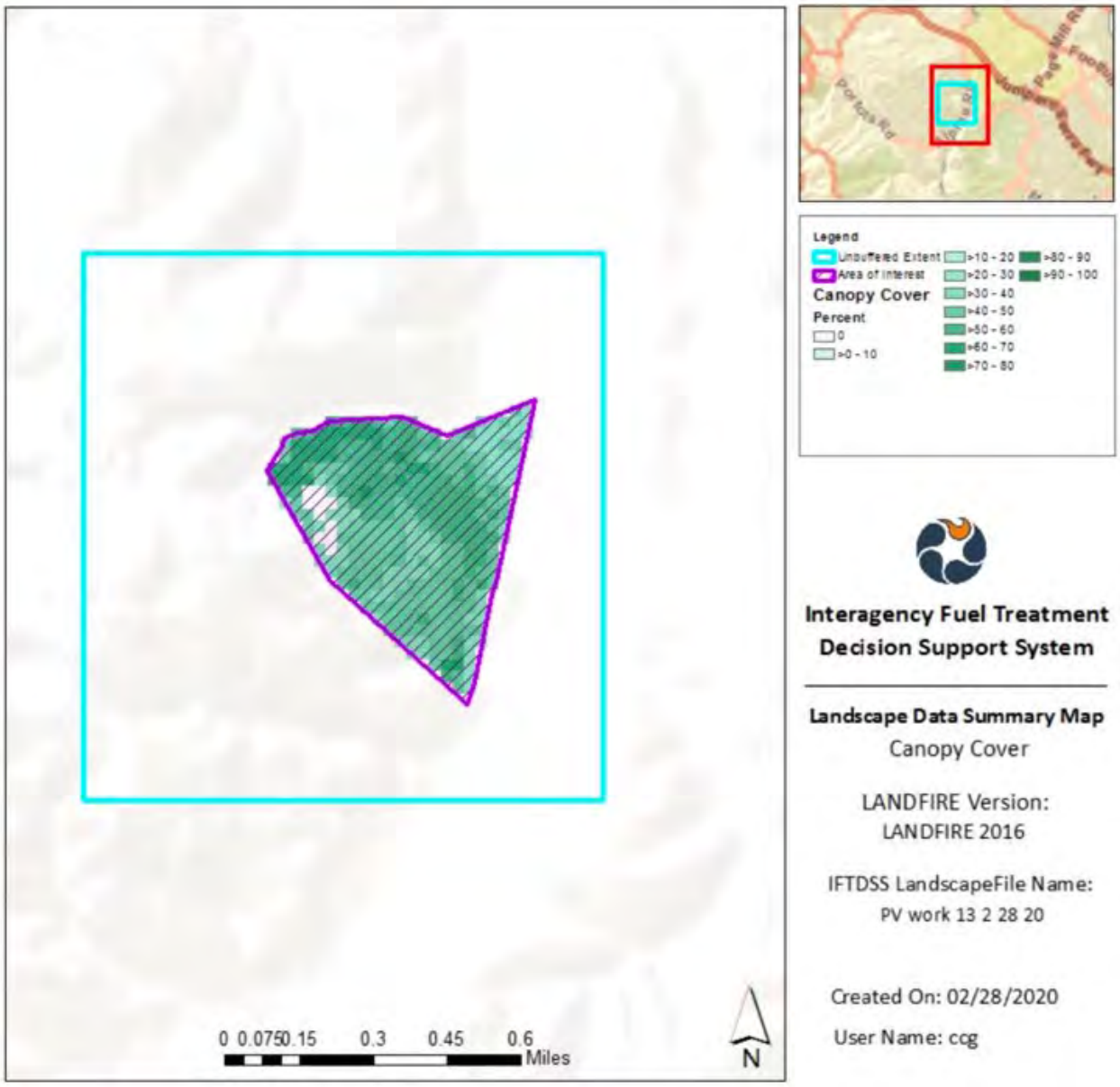


Figure 12 Canopy Base Heights

Figure 13 Canopy Bulk Density

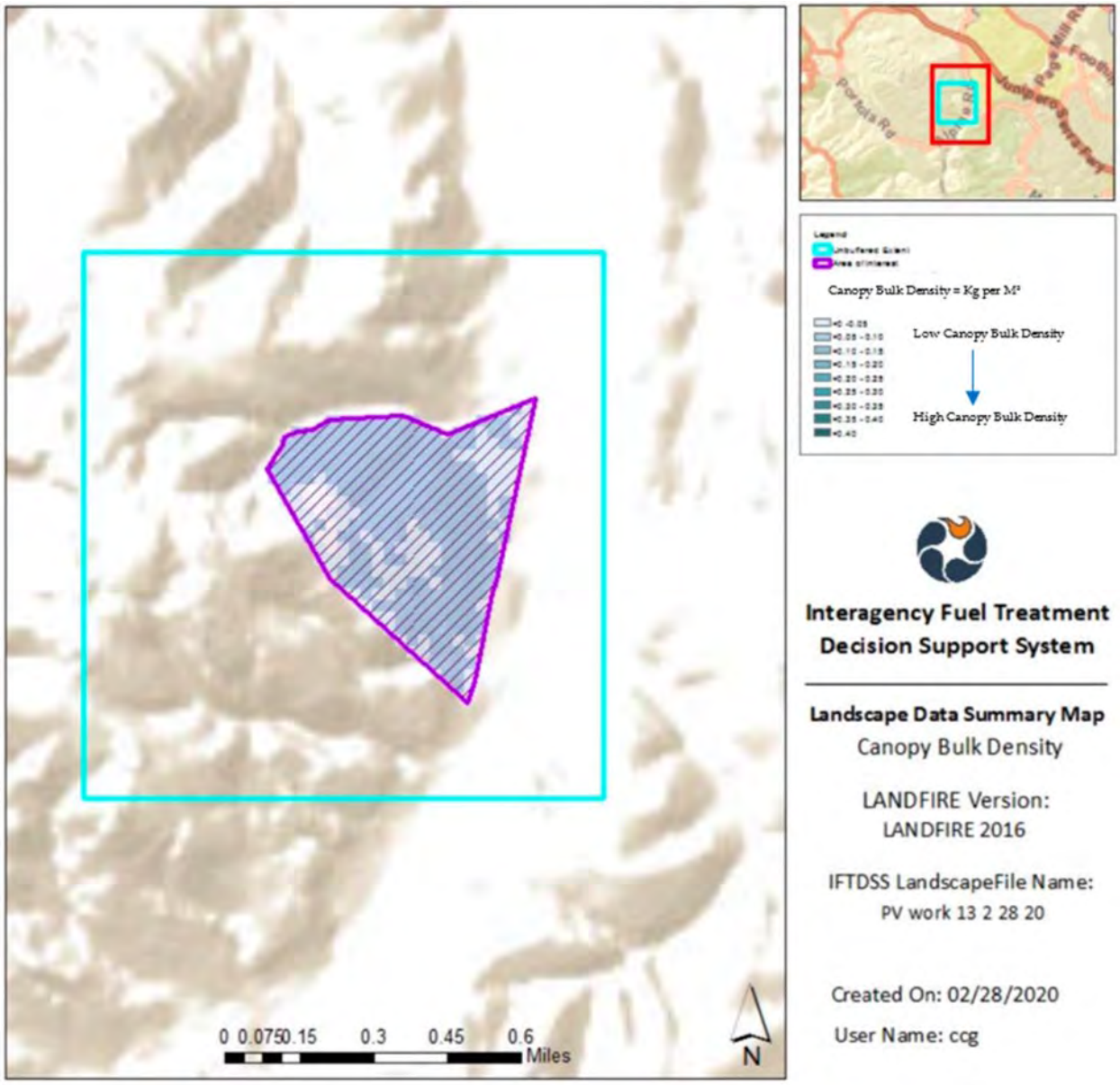


Figure 14 Distances from Parcel to Nearest Structures

4 Regulations and Requirements that Relate to Vegetation Management on the Parcel

4.1 Introduction

This section briefly introduces the rules and regulations that could apply to vegetation management on the parcel. Defensible space treatments identified in the VMP would help to meet code requirements, for example. The VMP has also been prepared considering requirements of the WFPD fire protection ordinance (Ordinance 12). While the VMP had been defined to be consistent with these requirements, where relevant, the main goal of treatments defined in the VMP are to reduce the fire hazard based on modeling of existing conditions.

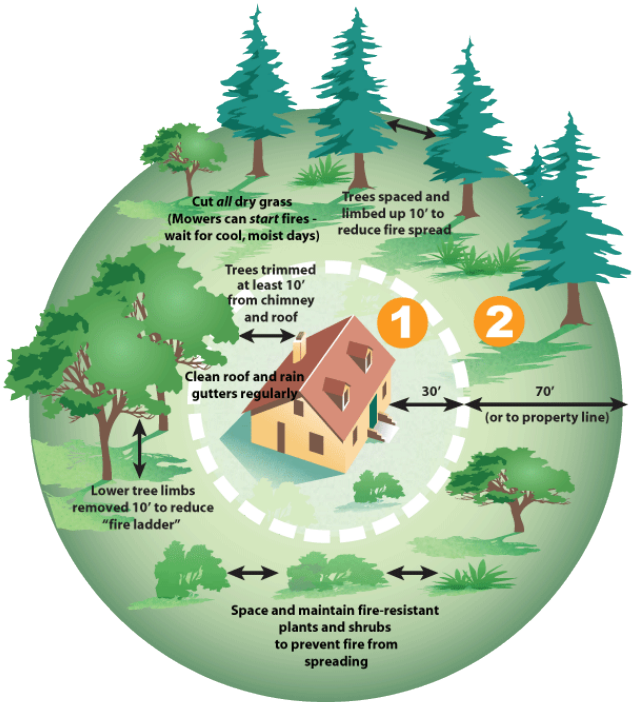
4.2 Defensible Space Requirements Per Public Resources Code

4.2.1 Requirements

Public Resources Code (PRC) 4291 requires that:

a) A person who owns, leases, controls, operates, or maintains a building or structure in, upon, or adjoining a mountainous area, forest-covered lands, brush-covered lands, grass-covered lands, or land that is covered with flammable material, shall at all times do all of the following:

(1) Maintain defensible space of 100 feet from each side and from the front and rear of the structure, but not beyond the property line except as provided in paragraph (2). The amount of fuel modification necessary shall take into account the flammability of the structure as affected by building material, building standards, location, and type of vegetation. Fuels shall be maintained in a condition so that a wildfire burning under average weather conditions would be unlikely to ignite the structure. This paragraph does not apply to single



(Woodside Fire Protection District, 2020)

specimens of trees or other vegetation that are well-pruned and maintained so as to effectively manage fuels and not form a means of rapidly transmitting fire from other nearby vegetation to a structure or from a structure to other nearby vegetation. The intensity of fuels management may vary within the 100-foot perimeter of the structure, the most intense being within the first 30 feet around the structure. Consistent with fuels management objectives, steps should be taken to minimize erosion. For the purposes of this paragraph, "fuel" means any combustible material, including petroleum-based products and wildland fuels.

(2) A greater distance than that required under paragraph (1) may be required by state law, local ordinance, rule, or regulation. Clearance beyond the property line may only be required if the state law, local ordinance, rule, or regulation includes findings that the clearing is necessary to significantly reduce the risk of transmission of flame or heat sufficient to ignite the structure, and there is no other feasible mitigation measure possible to reduce the risk of ignition or spread of wildfire to the structure. Clearance on adjacent property shall only be conducted following written consent by the adjacent landowner.

(3) An insurance company that insures an occupied dwelling or occupied structure may require a greater distance than that required under paragraph (1) if a fire expert, designated by the director, provides findings that the clearing is necessary to significantly reduce the risk of transmission of flame or heat sufficient to ignite the structure, and there is no other feasible mitigation measure possible to reduce the risk of ignition or spread of wildfire to the structure. The greater distance may not be beyond the property line unless allowed by state law, local ordinance, rule, or regulation.

(4) Remove that portion of a tree that extends within 10 feet of the outlet of a chimney or stovepipe.

(5) Maintain a tree, shrub, or other plant adjacent to or overhanging a building free of dead or dying wood.

(6) Maintain the roof of a structure free of leaves, needles, or other vegetative materials.

(7) Prior to constructing a new building or structure or rebuilding a building or structure damaged by a fire in an area subject to this section, the construction or rebuilding of which requires a building permit, the owner shall obtain a certification from the local building official that the dwelling or structure, as proposed to be built, complies with all applicable state and local building standards, including those described in subdivision (b) of Section 51189 of the Government Code, and shall provide a copy of the certification, upon request, to the insurer providing course of construction insurance coverage for the building or structure. Upon completion of the construction or rebuilding, the owner shall obtain from the local building official, a copy of the final inspection report that demonstrates that the dwelling or structure was constructed in compliance with all applicable state and local building standards, including those

> described in subdivision (b) of Section 51189 of the Government Code, and shall provide a copy of the report, upon request, to the property insurance carrier that insures the dwelling or structure.

(b) A person is not required under this section to manage fuels on land if that person does not have the legal right to manage fuels, nor is a person required to enter upon or to alter property that is owned by any other person without the consent of the owner of the property.

> (c)(1) Except as provided in Section 18930 of the Health and Safety Code, the director may adopt regulations exempting a structure with an exterior constructed entirely of nonflammable materials, or, conditioned upon the contents and composition of the structure, the director may vary the requirements respecting the removing or clearing away of flammable vegetation or other combustible growth with respect to the area surrounding those structures.
>
> (2) An exemption or variance under paragraph (1) shall not apply unless and until the occupant of the structure, or if there is not an occupant, the owner of the structure, files with the department, in a form as the director shall prescribe, a written consent to the inspection of the interior and contents of the structure to ascertain whether this section and the regulations adopted under this section are complied with at all times.

(d) The director may authorize the removal of vegetation that is not consistent with the standards of this section. The director may prescribe a procedure for the removal of that vegetation and make the expense a lien upon the building, structure, or grounds, in the same manner that is applicable to a legislative body under Section 51186 of the Government Code.

(e) The department shall develop, periodically update, and post on its Internet Web site a guidance document on fuels management pursuant to this chapter. Guidance shall include, but not be limited to, regionally appropriate vegetation management suggestions that preserve and restore native species that are fire resistant or drought tolerant, or both, minimize erosion, minimize water consumption, and permit trees near homes for shade, aesthetics, and habitat; and suggestions to minimize or eliminate the risk of flammability of nonvegetative sources of combustion such as woodpiles, propane tanks, decks, and outdoor lawn furniture.

(f) As used in this section, "person" means a private individual, organization, partnership, limited liability company, or corporation.

(Amended by Stats. 2018, Ch. 641, Sec. 7. (AB 2911) Effective January 1, 2019.)

4.2.2 Applicability to the Project Site

The VMP considers and incorporates the requirements for defensible space listed above and has been prepared in coordination with WFPD and their recommendations. California Government Code Section 51177 provides that "defensible space" means the area adjacent to a structure or dwelling where wildfire prevention or protection practices are implemented to provide defense from an approaching wildfire or to minimize the spread of a structure fire to wildlands or

surrounding areas. Defensible space refers to the area between wildlands and a structure and applies to structures that abut wildlands on at least one side of the structure.

4.3 Ordinance No. 12 of the Woodside Fire Protection District

4.3.1 Requirements

Ordinance No. 12 of the Board of Directors of the WFPD is an ordinance that adopts the 2018 International Fire Code with the 2019 California Amendments, including local amendment and standards. It also establishes a Bureau of Fire Prevention in the WFPD.

Portions of the ordinance related to this Vegetation Management Plan include:

- **Section 304.2.A Perimeter Line Clearance**, which states that, "Persons owning, controlling, or leasing structures and or property are required to remove, a minimum of 50 feet from the perimeter of the property line and 100 feet from any neighboring structure, specifically; flashy fuels consisting of dead weeds and dry annual grasses, as well as dead vegetative material and litter that is capable of being easily ignited and endangering property as determined by the Fire Marshal."
- **Section 304.1.2.B Weed Abatement.** Due to heavy growth of fuels, unmaintained lots are a hazard to the surrounding properties and the community. Woodside Fire Protection District shall carry out weed abatement program activities throughout the territory of the Woodside Fire Protection District. Vacant parcels, without any structures, shall be mowed of flashy fuels, consisting of dead weeds and dry annual grasses, in their entirety with the exception of conservation areas, sensitive habitat, marsh land, creek banks and a minimum of 50 feet from any riparian corridor, prior to July 1 of every year.
- **Section 304.1.2.D Limited Planting Around Structures.** Due to the combustible nature of structures throughout the territory of the Woodside Fire Protection District, the planting of new landscape vegetation within the 0 – 5ft zone, adjacent to wood sided habitable buildings, shall be limited as described in this section. When a habitable building includes wood siding on the first floor, no new landscape vegetation, except ground cover, shall be allowed within 5ft of the wood siding. New landscape vegetation, except for ground cover, shall not be allowed within 5ft, in any direction, of any first story window or glass door opening. There is no setback requirement for new landscape vegetation adjacent to Non-combustible siding, such as fiber cement board, stone and stucco.

4.3.2 Applicability to the Project Site

The VMP incorporates perimeter line clearances and limited planting around structures. The plan is meant to address reduction of flashy fuels across the parcel.

5 Fire Behavior Modeling of Baseline Conditions

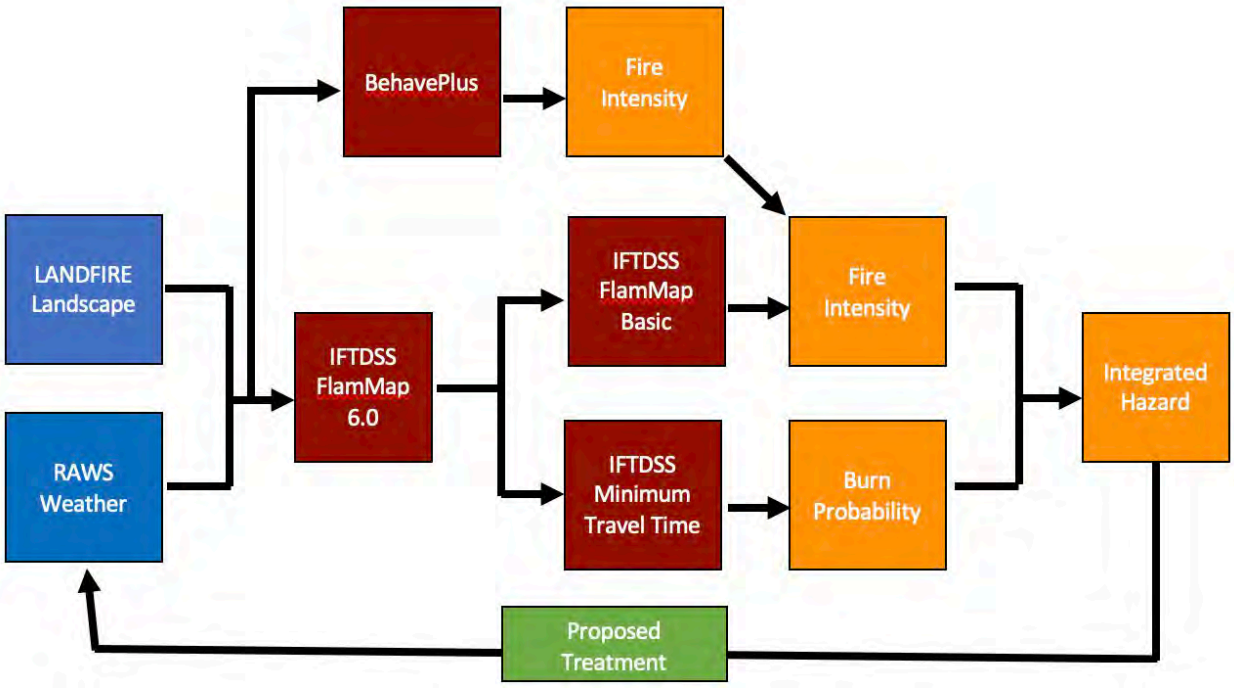
5.1 Methods

5.1.1 Overview of Modeling Protocol

The WFPD requested that two fire behavior models be utilized to understand the fire hazards on the parcel. The modeling exercise was undertaken by Fire Ecologist, Scott Conway, of Spatial Informatics Group (SIG). Mr. Conway's resume is included in Appendix A.

The methods chosen to model the fire behavior on the project parcel took advantage of several best in class, comprehensive datasets, modeling technologies, and systems to consistently and appropriately quantify the vegetation and fuels on the parcel. The modeling protocol, custom designed, was presented to the WFPD Fire Marshal, Don Bullard, on February 14th, 2020 to which he concurred with the approach, and is graphically represented in Figure 15.

Figure 15 Modeling Protocol



5.1.2 Inputs into the Model

LANDFIRE Landscape

Landscape Fire and Resource Management Planning Tools (**LANDFIRE**) is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service (USFS) and U.S. Department of the Interior, providing landscape scale geo-spatial products to support cross-boundary planning, management, and operations. LANDFIRE fuel products describe the composition and characteristics of surface and canopy fuel. These characteristics provide consistent fuel information to support fire planning, analysis, and budgeting and to support the evaluation of fire management alternatives that supplement strategic and tactical planning for fire operations (LANDFIRE, 2020).

This analysis utilized recently updated 2016 LANDFIRE data, which was generated through remote sensing. In addition, multiple field visits to the project parcel were conducted by Phil Dye of Prometheus Fire Consulting, Sasha Berleman of Poppy Fire Consulting, and Scott Conway of Spatial Informatics Group to verify and augment through profession judgement and photo interpretation the LANDFIRE remotely sensed datasets to ensure actual current conditions were being appropriately represented within the model inputs.

Historical RAWS Weather

The Remote Automatic Weather Stations (RAWS) system is a network of automated weather stations run by the USFS and Bureau of Land Management (BLM) and monitored by the National Interagency Fire Center (NIFC), mainly to observe potential wildfire conditions (Desert Research Institute, 2020).

This analysis utilized 97th percentile historical weather (average wind speed, average wind direction, dead and live fuel moistures) to analyze fire behavior. Percentiles are based on a scale of 0-100 and are used to sort and rank a collection of data. For wildfire, when values at the upper end of the scale occur, complex fires are expected, where initial attack may often fail. The 97th percentile is often termed "the worst-case scenario" (US Department of Interior, 2020).

The data from RAWS that was used for the analysis of the project parcel is as follows:

Calculated 97th Percentile Model Weather Parameters:

- Run Date: Feb 28, 2020 12:18:21 PM
- Wind Type: Gridded Winds
- Wind Speed: 9 mph
- Wind Direction: 45 deg
- Crown Fire Method: Scott/Reinhardt
- Foliar Moisture: 100
- Fuel Conditioning: On - Extreme - South Central California Foothills and Coastal
- Days conditioned:
    - Conditioning start: 1300, 7/9/2012
    - Conditioning end:1600, 7/12/2012

- Station Name: LOS ALTOS
- Station Observation Start Date: Mar 6, 2005 12:00:00 AM
- Station Observation End Date: Oct 4, 2016 12:00:00 AM
- Station Elevation: 539
- Station Aspect: 6
- Station Latitude: 37.355
- Station Longitude: 122.1419444
- Fuel Moisture:
  - 1 Hour Fuel Moisture: 3%
  - 10 Hour Fuel Moisture: 4%
  - 100 Hour Moisture: 9%
  - Live Herbaceous Moisture: 147%
  - Live Woody Moisture: 173%

5.1.3 Fire Models

Overview

The two models that were utilized for the analysis included:

1. FlamMap with embedded Minimum Travel Time through the Interagency Fuels Treatment Decision Support System (IFTDSS), and
2. BehavePlus

Each of the models used is described below.

FlamMap with embedded Minimum Travel Time

FlamMap is a fire analysis desktop application that runs in a 64-bit Windows Operating System environment, or in this case, the IFTDSS system. It can simulate potential fire behavior characteristics (spread rate, flame length, fireline intensity, etc.), fire growth and spread, and conditional burn probabilities under constant environmental conditions (weather and fuel moisture) (US Department of Agriculture Forest Service, 2020b).

BehavePlus

The BehavePlus fire modeling system is a Windows® based computer program that can be used for any fire management application that involves modeling fire behavior and some fire effects. The system is composed of a collection of mathematical models that describe fire behavior and the fire environment. The program simulates rate of fire spread, spotting distance, scorch height, tree mortality, fuel moisture, wind adjustment factor, as well as other variables; so it is used to predict fire behavior in multiple situations (US Department of Agriculture Forest Service, 2020a).

BehavePlus was used in this analysis to verify and confirm FlamMap fire intensity outputs. Although both modeling systems draw from the same base algorithms, Behave can perform with a much more limited set of inputs that aren't assigned to a particular place on the

landscape where FlamMap requires extensive and spatially explicit inputs. However, comparison between models is still reasonable when the spatial component output of FlamMap is ignored. For example, if both BehavePlus and FlamMap are showing greater than 8-foot flame lengths with the same surface fuel model and weather, then it is understood that fire intensities are incompatible with project goals. Treatment is warranted and further modeling is unnecessary.

5.1.4 Outputs

Fire Intensity

"Frontal fire intensity is a valid measure of forest fire behavior that is solely a physical attribute of the fire itself. It is defined as the energy output rate per unit length of fire front and is directly related to flame size. Numerically, it is equal to the product of net heat of combustion, quantity of fuel consumed in the active combustion zone, and a spreading fire's linear rate of advance. This concept of fire intensity provides a quantitative basis for fire description useful in evaluating the impact of fire on forest ecosystems" (Alexander, 1982).

Flame length was focused on to quantify fire intensity for this study. "The flame length of a spreading surface fire within the flaming front is measured from midway in the active flaming combustion zone to the average tip of the flames." Figure 16 shows surface fire behavior fire characteristics (US Department of Interior, 2020). Generally, if flame lengths are less than 4 feet, then fire can be effectively controlled with professional suppression resources. Flame lengths between 4 and 8 feet require multiple, more specific types and numbers of professionally trained firefighting resources; suppression success goes down. Flame lengths greater than 8 feet generally preclude resources from directly attacking the fire front. When flame lengths are modeled to exceed 4 feet, effort should be made to closely examine and prescribe treatment to reduce undesirable fire intensities. The project parcel should also be maintained after development such that, on average, flame lengths remain below 4 feet.

Fire Probability

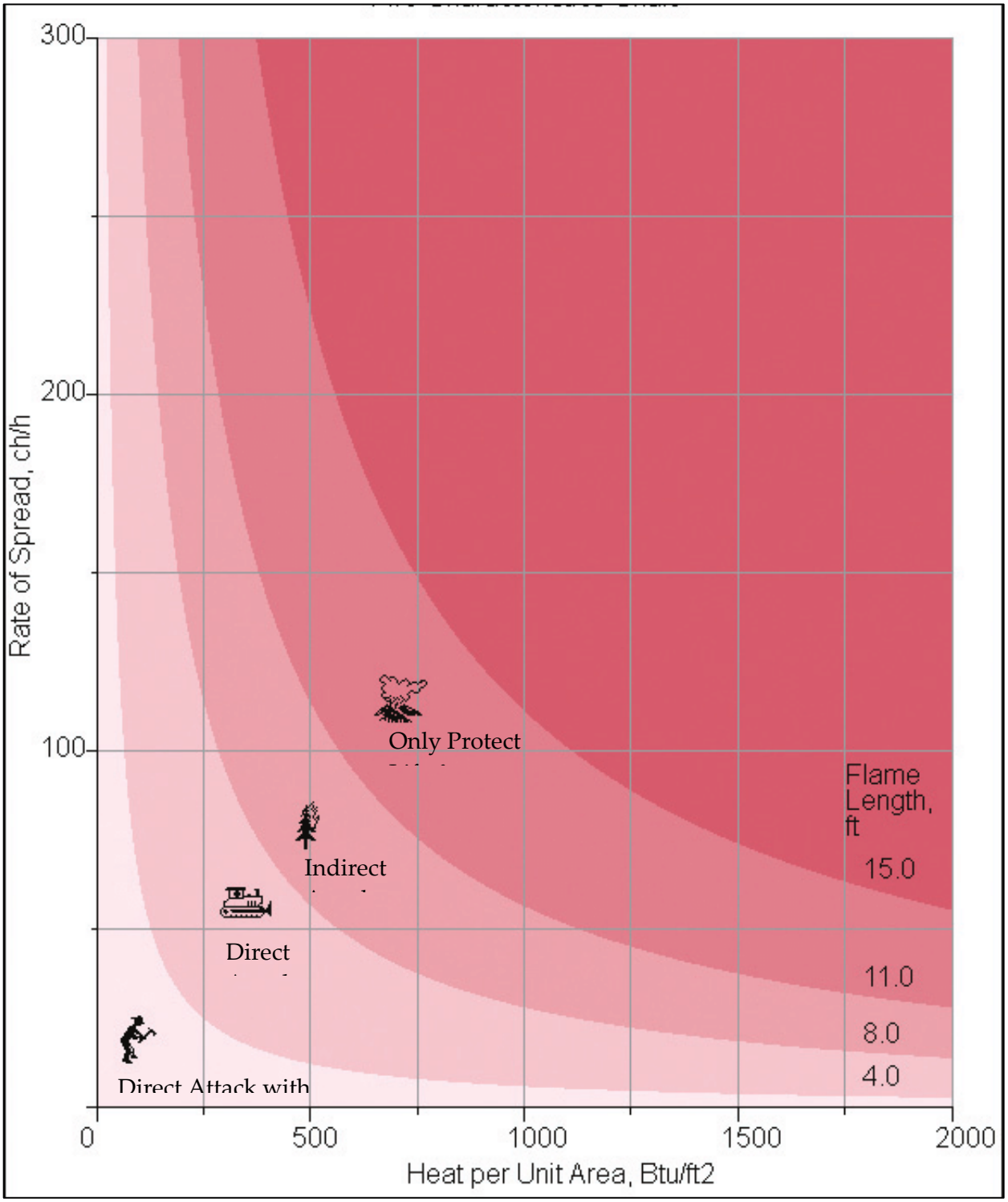
Fire probability quantifies the relative likelihood of a fire occurring under a fixed set of weather and fuel moisture conditions (US Department of Interior, 2020).

Integrated Hazard

The term "hazard" is used by the wildland fire community to define a variety of conditions or situations where damage to assets by fire is being evaluated. Hazard is quantified and categorized in IFTDSS using the FlamMap and Minimum Travel Time models evaluating (US Department of Interior, 2020):

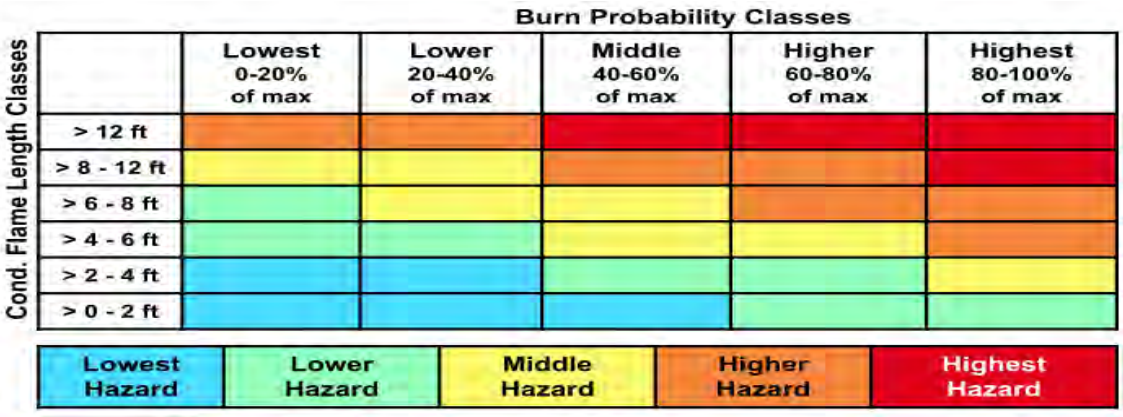
- The probability of a fire occurring at a specific point under a specified set of conditions (burn probability)
- The intensity at a specific point given a fire occurs (flame length)

Figure 16 Surface Fire Behavior Fire Characteristics Chart



"Integrated Hazard" in IFTDSS then combines these two important measures into a single value that can be easily understood and mapped. Figure 17 shows the integrated hazard classification chart, comparing flame length classes to burn probabilities.

Figure 17 Integrated Hazard Classification Chart



(US Department of Interior, 2020)

Although high flame lengths will always be correlated to higher hazard, the relative classification of burn probabilities means there is no absolute set of integrated hazard heuristics. In fact, the value results are relative to the area analyzed within each modeling run and between each modeling run, when model parameters and some inputs remain constant. For the purposes of this analysis, landscape adjustments (surface fuel model, canopy cover, canopy base height, canopy bulk density) based on treatment scenarios are the only changes between integrated hazard modeling runs. All weather and model parameters remained constant. Therefore, comparisons can be statistically made through the differences between integrated hazard metrics based solely on fuel treatment changes to the landscape.

5.2 Results

5.2.1 Modeled Current Condition Flame Length

IFTDSS (With FlamMap and Minimum Travel Time)

Figure 18 shows the predicted size and location of flame lengths that could occur within the project parcel under existing conditions. Figure 19 quantifies spatial distribution across a set of flame length classes. Approximately 52% of the project parcel is exhibiting flame lengths greater than 4 feet and the entire parcel has a modeled weighted mean flame length of 4.8 feet.

It is apparent that under current conditions, as modeled, the project parcel would likely exhibit high intensity fire and put the surrounding homes and infrastructure at risk because suppression resources would have trouble safely directly attacking the fire and direct suppression effectiveness might be limited during the first burn period.

Figure 18 Modeled Flame Lengths for the Project Parcel – Current Conditions

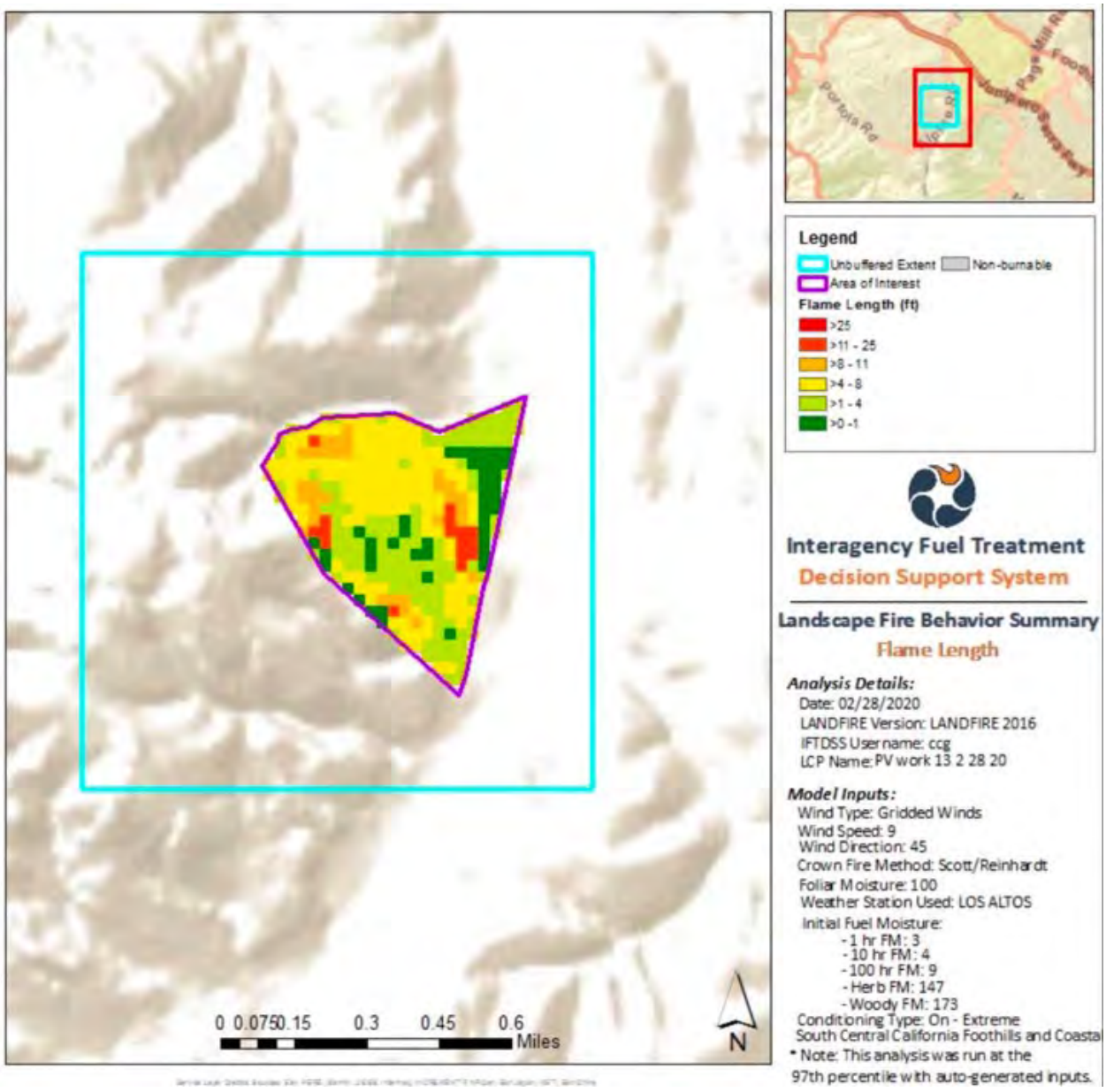
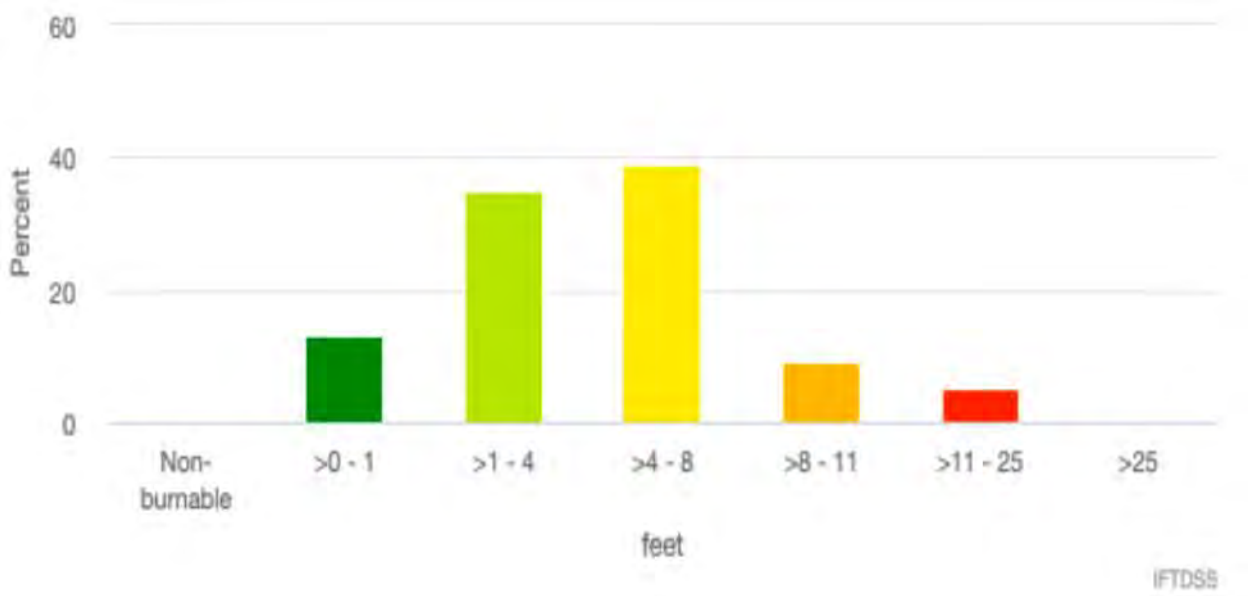


Figure 19 Spatial Distribution of Flame Length Classes – Current Conditions



Behave Comparison

Table 3 exhibits the comparison of results between the FlamMap modeling effort and Behave Plus. It is important to note that FlamMap is a spatially explicit model, in this case down to a 30-meter square pixel, that incorporates spatial inputs across the modeled area. This approach creates a mosaic of conditions that can be comprehensively modeled. Behave has no spatial component and is dependent on translating the realities of the site into the model by the modeler. Although it inherently takes out the complexity of the larger area of interest, it does allow for more customization, particularly since different fuel models tend to exist within an area as small as a 30-meter square pixel. In order to make an appropriate comparison, median flame length of all FlamMap pixels within a surface fuel model is compared to the median flame length of the blended fuel models one can achieve with the Behave architecture.

Although there is some variance within areas where fuels and topography overlap, particularly with the high load, dry climate shrub (SH5) mixed with very high load broad leaf litter (TL9) surface fuel models, the pattern of high intensity fire (greater than 8-foot flame lengths) is confirmed in those areas and treatment is warranted across the project parcel.

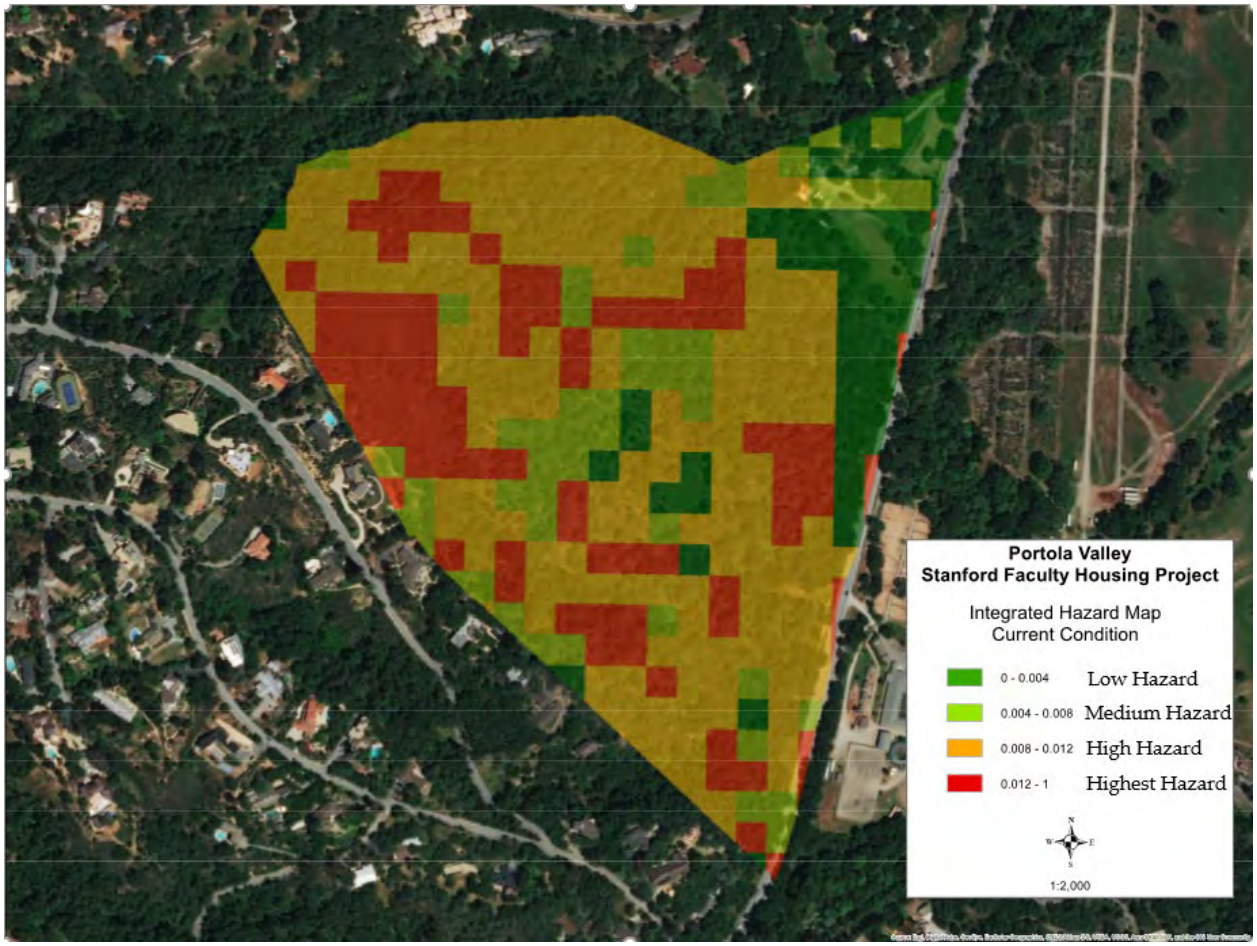
5.2.2 Modeled Current Condition Integrated Hazard Outputs

Current condition integrated hazard inputs were modeled with the same weather as FlamMap and Behave. Figure 20 highlights areas where there is a high fire intensity that overlaps with a high fire probability. Although some areas are considered low hazard, much of the area has elevated hazard numbers, which creates undesirable exposure to the surrounding homes and infrastructure.

Table 3 Comparison of Results Between FlamMap and BehavePlus – Current Conditions

Fuel Model	Definition	Behave 6.0 Median Flame Length	Flammap Basic Median Flame Length	Variance
TL9/SH5	Very high load broadleaf litter/high load, dry climate shrub	12.5 ft	9.4 ft	-3.1 ft
GS1/TL2	Low load, dry climate shrub/Low load broad leaf litter	0.9 ft	0.2 ft	-0.7 ft
SH5/GS2	High load dry climate shrub/Moderate load, dry climate grass-shrub	8.65 ft	9.1 ft	0.45 ft

Figure 20 Modeled Integrated Hazard for the Project Parcel – Current Condition



*The integrated hazard is a scale from 0 to 1 where 0 represents low burn probability and small flame length and 1 is the combination highest burn probability and large flame length. The scaling allows for comparisons before and after treatment

6 Vegetation Management Plan

6.1 Treatment Methods

6.1.1 Overview

Given the existing condition of the project parcel, nearly all areas will require some form of vegetation treatment to reduce fire hazard. The type of treatment will depend primarily on the vegetation type, cover, and location. Treatment areas are discussed here as either 1) defensible space areas around structures, 2) in oak woodland cover type, or 3) in chaparral cover type. Figure 21 shows treatment types by area.

Defensible space within 100 feet of the proposed subdivision structures and the wildland area will need to be created in accordance with law. The treatments in the defensible space areas are described in Section 5.2. The undeveloped areas of the parcel beyond the zone of defensible space will nearly all require vegetation treatment to reduce the fire hazards. The treatments will depend on the cover type and are described in Section 5.3 and Section 5.4. Initial treatments will be more intensive to achieve the desired vegetation conditions. On-going maintenance will need to occur on an annual basis across areas of the parcel but should involve considerably less alteration and effort to maintain the desired conditions.

This plan also includes the methods that should be employed to implement the vegetation treatments, how material should be handled and removed, access needs and equipment, and the environmental protections that should be included in the plan to reduce effects to sensitive species and habitat, as feasible.

6.1.2 Treatments

Treatment Activities

Several treatment methods or "prescriptions" are available in vegetation management practice. The activities selected for each cover type have been selected to help achieve the desired treatment objectives for the project parcel, given the condition of the vegetation, the topography, costs, and efficiency, and any regulatory or environmental constraints. The treatment activities that would be used are described in Table 4. Also, see Appendix B for in-depth descriptions and specific requirements.

Figure 21 Vegetation Treatment Areas by Type

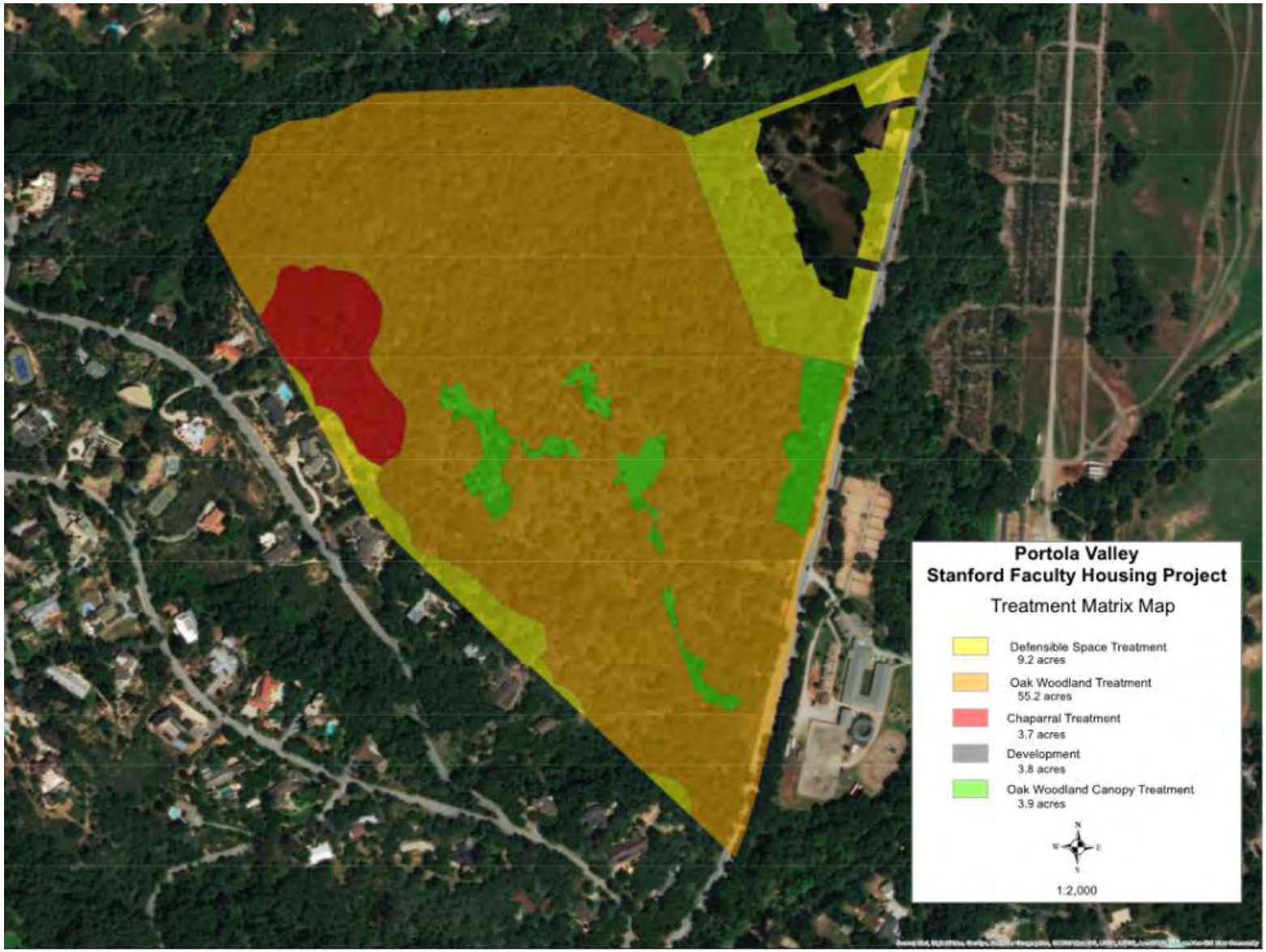


Table 4 Treatment Activities

Treatment Activity	Description	Method of Application	Initial or Maintenance?
Steep Slope Mechanical Treatment with Manual Support	Use of specialized self-leveling motorized equipment to cut, uproot, crush/compact, or chop existing vegetation. On inaccessible terrain: manual cutting and removal of vegetation to machine for comprehensive treatment Used on slopes from 30 to 70 percent only (self-leveling machines up to 50%).	Mastication, chipping, brush raking, tilling, mowing, roller chopping, chaining, skidding and removal, piling; often combined with pile burning (if allowed)	Initial and Maintenance
Mechanical Treatment	Use of motorized equipment to cut, uproot, crush/compact, or chop existing vegetation Used on slopes from 0 to 30 percent only.	Mastication, chipping, brush raking, tilling, mowing, roller chopping, chaining, skidding and removal, piling; often combined with pile burning (if allowed)	Initial and Maintenance
Manual Treatment	Use of hand tools and hand-operated power tools to cut, clear, or prune herbaceous or woody species	Hand pull and grub, thin, prune, hand pile, hand plant; often combined with pile burning (if allowed)	Initial and Maintenance
Prescribed Herbivory	Use of domestic livestock to reduce a target plant population thereby reducing fire fuels or competition of desired plant species	Grazing or browsing goats	Maintenance

Source: (CALFIRE, 2019)

6.1.3 Access, Material Collection, and Removal

The property would need to be accessed from the existing entrance along Alpine Road in order to perform the vegetation management activities. No roads are currently located on the parcel, beyond the driveways and access at the stables off of Alpine Road. Access throughout the open space area to perform the vegetation management will be primarily on foot with some heavy

equipment in inaccessible areas. Masticators and other heavy equipment can access portions of the site where the slope safely allows. Generally, slopes under 30 percent can be accessed with masticators and other equipment. Slopes between 30 and 50 percent can be accessed with specialized equipment while minimizing disturbance. Areas with greater than 30 percent slope are shown in Figure 22. Skid steer loaders may also be used, which are small, rigid-frame, engine-powered machines with lift arms that can attach to a wide variety of labor-saving tools or attachments. The machine can be used to minimize disturbance and may have a bucket or grapple attachment to move material or a mastication attachment to augment the work of larger machines.

Other equipment that can be used includes handsaws, chainsaws, brushcutters, chippers, and trucks to remove material. The most effective way to remove large amounts of woody debris is through manual cutting and removal. In order to facilitate removal, an access road will be constructed to allow for access to portions of the parcel for off-hauling of materials to a composting site. The access road (that can later be used for fire access and maintenance) would provide access and staging and would serve as central landing areas to collect material for off hauling.

The access and landing areas are shown in Figure 23. The storage areas should be approximately 25 feet by 25 feet in size for daily off-hauling of material during initial treatments and during on-going property maintenance. An estimated 45 cubic yards of material per acre treated is anticipated during initial treatment and 8 cubic yards per acre for on-going maintenance. One haul vehicle can usually hold approximately 10 cubic yards of material. Although SOD did not seem to be pervasive in the parcel during field inspections, if any material potentially infected with the pathogen *phytophthora ramorum* that causes sudden oak death is present, it will likely have to remain on-site. It is expected that material left on site due to SOD infection will be minimal and have little effect on fire behavior.

Some areas of vegetation may need to be masticated. Masticated material will be left on site and spread over the ground surface or chipped and spread over the ground site.

Figure 22 Areas of the Project Parcel with Slopes Greater than 30 Percent

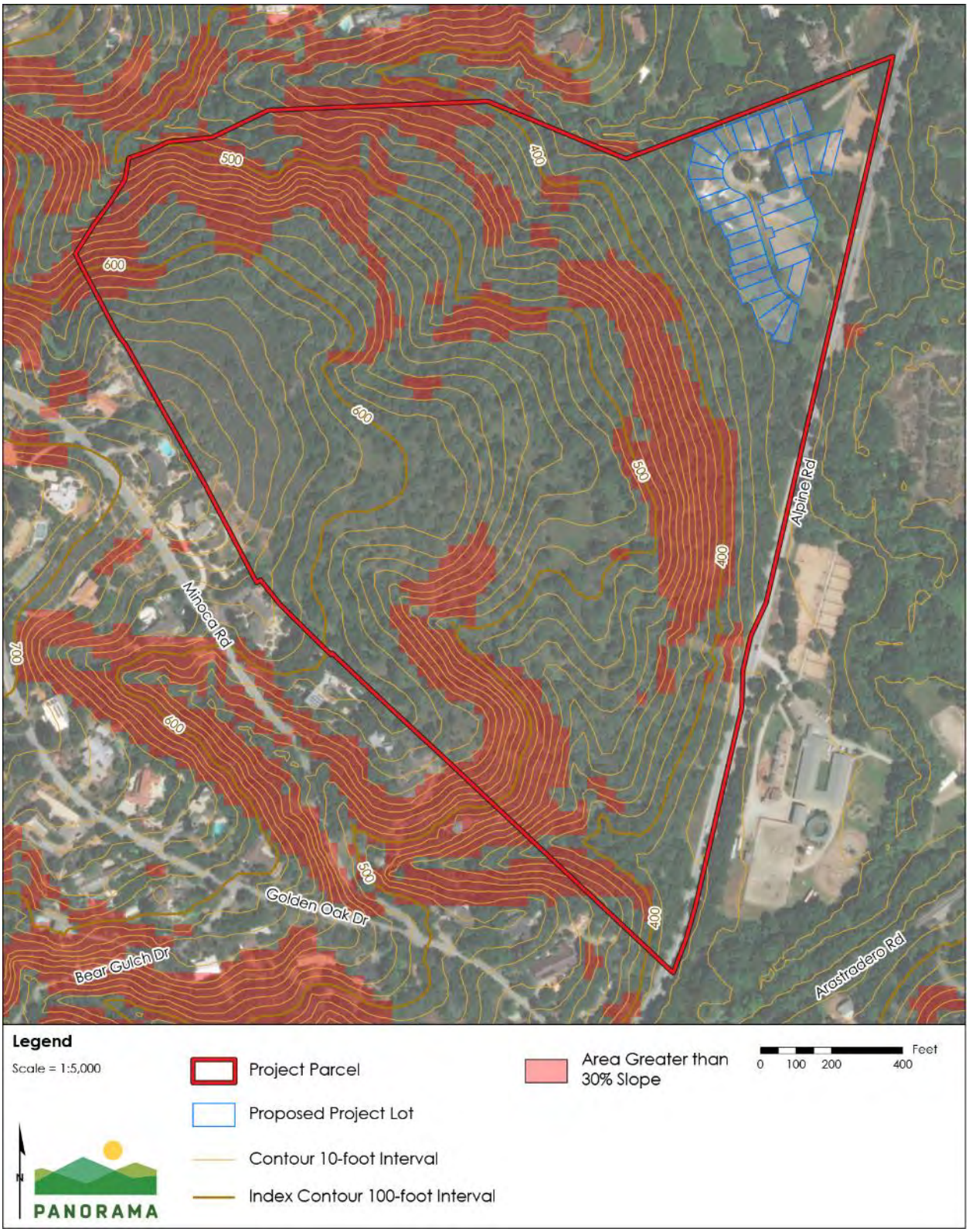
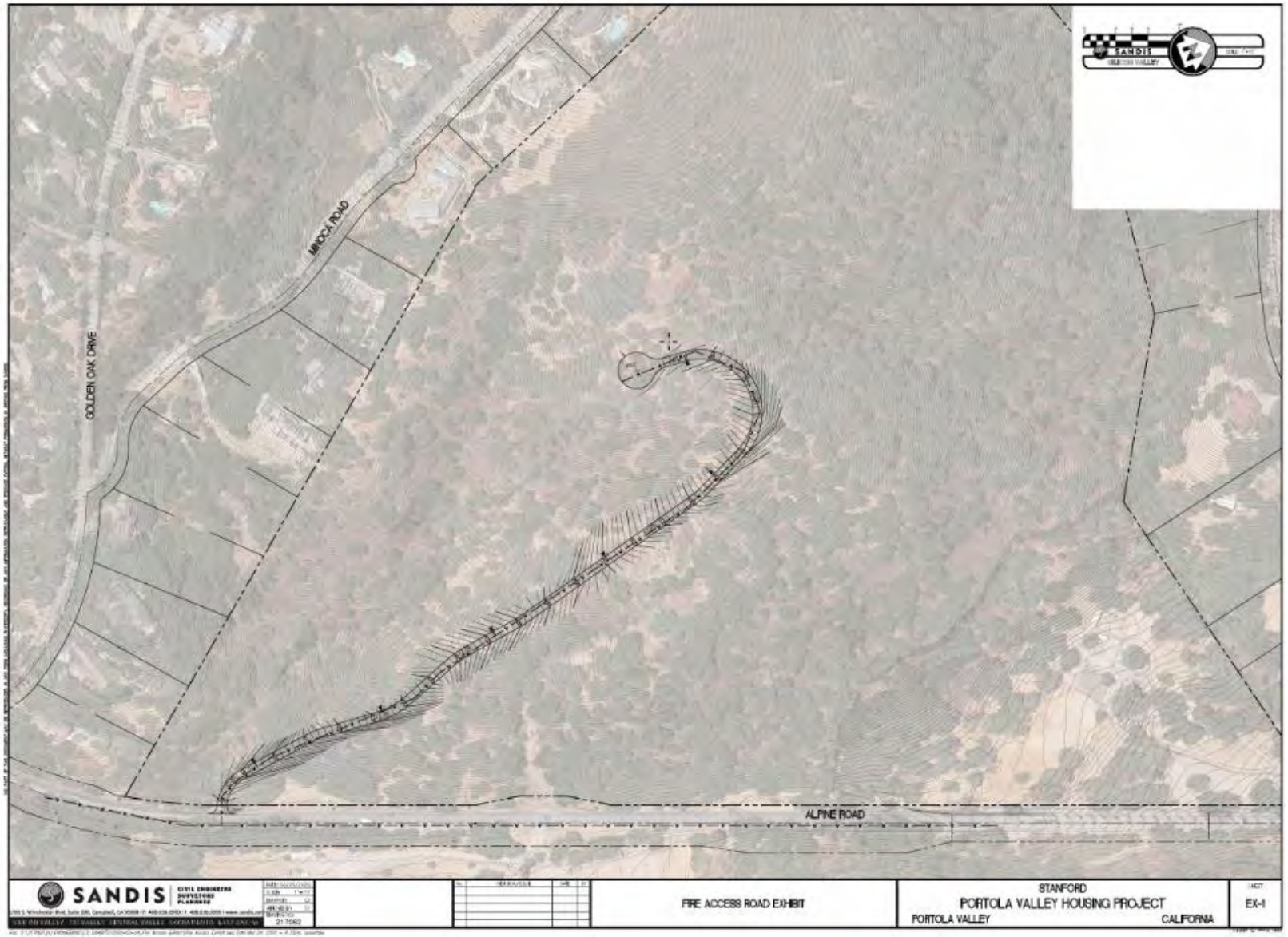


Figure 23 Landing/Staging Area and Access Road for Material Storage and Removal



6.1.4 Environmental Protection

Significant Trees

Habitats in Portola Valley range from natural oak woodland to moist/riparian areas that support a number of native trees that the Town seeks to protect. One of the types of trees listed in the table below, that meets or exceeds either the circumference or diameter listed, it is considered a "significant tree", and its removal requires a site development permit (tree removal permit) in accordance with the Portola Valley Municipal Code Section 15.12.070.A. Circumference or diameter is measured fifty-four (54) inches above natural grade. Significant tree removal may be subject to additional review by the Town of Portola Valley's Conservation Committee.

Significant trees can generally be avoided in the open space portions of the property. Some may need to be removed in areas of defensible space within 100 feet of structures (as explained further in Section 5.2), and as such, removal would be subject to the requirements of the Town.

Table 5 Significant Trees per Portola Valley Municipal Code

Tree Species	Circumference (inches)	Diameter (inches)
Coast Live Oak (*Quercus agrifolia*)	36	11.5
Black Oak (*Quercus kelloggii*)	36	11.5
Valley Oak (*Quercus lobata*)	36	11.5
Blue Oak (*Quercus douglasii*)	16	5
Coast Redwood (*Sequoia sempervirens*)	54	17.2
Douglas Fir (*Pseudotsuga menziesii*)	54	17.2
California Bay Laurel (*Umbrellularia californica*) (if multiple trunk, measurements pertain to largest trunk)	36	11.5
Big Leaf Maple (*Acer macrophyllum*)	24	7.6
Madrone (*Arbutus menziesii*)	24	7.6

Nesting Birds

The Migratory Bird Treaty Act (MBTA), first enacted in 1918, provides for protection of international migratory birds and authorizes the Secretary of the Interior to regulate the taking of migratory birds. The MBTA provides that it shall be unlawful, except as permitted by regulations, to pursue, take, or kill any migratory bird, or any part, nest, or egg of any such bird. The current list of species protected by the MBTA can be found in Title 50 of the Code of Federal Regulations (CFR), Section 10.13 (50 CFR 10.13). The list includes nearly all migratory birds native to the United States.

Section 3503 of the California Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Section 3503.5 specifically states that it is

unlawful to take, possess, or destroy any raptors (e.g., hawks, owls, eagles, and falcons), including their nests or eggs. Section 3513 of the California Fish and Game Code codifies the federal Migratory Bird Treaty Act.

Nesting birds are likely common on the project site. A nesting bald eagle pair was also observed nearby (approximately 0.5 miles from the parcel) on the south side of Felt Lake in 2015 and with two young in 2016 (CNDDB 2020). For all activities that could result in potential noise and other land disturbances that could affect nesting birds (e.g., tree removal, mowing during nesting season, mastication, chipping), treatment sites should be surveyed to evaluate the potential for nesting birds. Trees should be removed outside the nesting season of March 15 to August 30 for smaller bird species such as passerines and February 15 to August 30 for raptors. If activities that could disturb nesting birds are performed during the nesting season (generally if work is performed from February 15 to August 30), then preconstruction nesting surveys would be performed and any active nests and a buffer area around the nest avoided until the young have fledged.

San Francisco Dusky-footed Woodrat

Woodrat stick houses are found across the project site. Woodrats build fortress-style "stick houses" around hollow trees, logs, rock piles, and the like. The structures have a central nest chamber, larders for vegetation and nut storage, and multiple tunnels, entrances, exits and latrines. Houses protect them from weather and predators and maintain a consistent habitat for living and long-term food storage. Woodrats sometimes maintain multiple houses and move among them to forage more broadly. Great climbers, they also occasionally build houses up in trees. Woodrats are a keystone species for their houses, which are relied upon by numerous live-in species, including mice, lizards, snakes, salamanders, frogs, crickets, beetles, and millipedes.

The species of woodrat in the Portola Valley is likely the San Francisco dusky-footed woodrat *(Neotoma fuscipes annectens).* This species is a California Species of Special Concern with a limited range in the Santa Cruz Mountains and foothills. The species is not listed as federally or state threatened, endangered, or candidate, and as such, no federal or state Endangered Species Act permitting is required for impacts to the species. As Species of Special Concern, it will be addressed under the California Environmental Quality Act (CEQA) compliance review for the issuance of permits for the housing project.

A Woodrat Relocation Plan will be prepared prior to any vegetation management work. The plan will describe the process for determining active woodrat houses before dismantling. Woodrat houses will need to be removed entirely from the defensible space areas shown in Figure 21. In other areas, some houses may need to be dismantled in order to access and remove understory and ladder fuels. Houses will be avoided with a 5-foot buffer, where feasible. Material from dismantled houses will be left in place for woodrat reconstruction after work is completed. The Vegetation Management Plan will result in considerable additional material being left on the ground, benefitting woodrat house construction, and it is anticipated the

woodrats will rebuilt at a similar density to current conditions once vegetation management work is complete.

California Red-Legged Frog

California red-legged frog (*Rana draytonii*) is a federally Threatened species and a California Species of Special Concern. The species occurs from sea level to elevations of 1,500 meters (5,200 feet). Breeding occurs in streams, deep pools, backwaters within streams and creeks, ponds, marshes, sag ponds, dune ponds, lagoons, and stock ponds. Breeding adults are often associated with deep (greater than 0.7 meter [2 feet]), still, or slow-moving water and dense, shrubby riparian or emergent vegetation (Hayes & Jennings, 1988). The species also utilizes non-aquatic habitats for refuge and dispersal. The species is known to rest and feed in riparian vegetation and it is believed that the moisture and cover of the riparian zone provides foraging habitat and facilitates dispersal. Dispersal patterns are dependent on habitat availability and environmental conditions (Scott & Rathbun, 1998).

California red-legged frog may have some potential to occur on the project site. A biologist should check areas within 300 feet of the riparian corridor for frogs before work occur in the activity footprint at the time the activity is undertaken. If California red-legged frogs are found, no work shall occur until the frogs have moved on their own from the activity area.

Archaeological Resources

Archaeological resources can be impacted by use of heavy equipment and any activity that results in ground disturbance. A cultural resources survey would likely be required prior to initial implementation of the Vegetation Management Plan, with identification of the appropriate measure to address any resources discovered. Measures would likely include avoidance with an appropriate buffer given the resources or use of hand tools only in the area of the resource.

6.2 Treatments by Area/Cover Type

6.2.1 Overview

This treatment requires the construction of a road to at least the center of the parcel from Alpine road with small adacent landings so the majority of the cut material can be staged and removed. All material to be removed would need to be within 300 feet of small landings so it can be processed, chipped, and be removed by truck. In order to augment the reach of the constructed road, a temporary road system may need to be designed, constructed, and then deconstructed during initial treatment to effectively reach material the permanent road cannot access. Temporary roads and landings may be impractical in other places. Mastication or steep slope mastication with manual support might need to be employed in some areas.

This section describes both the initial treatments and the on-going maintenance plan for each cover type within the project parcel. This section also describes the schedule and then presents the post-treatment modeling to demonstrate the reduction in fire hazards after treatments are implemented.

Defensible Space Treatment Objectives

1. Meet and maintain all CALFIRE and Woodside Fire Protection requirement for defensible space.
2. Reduce fuel volumes and maintain fuel volumes consistent with very low severity fire
3. Reduce fuel flammability and cultivate plants on the landscape that are fire-resistant
4. Establish and maintain fuel discontinuity
5. Reduce the possibility of fire traveling through tree crown; maintain that separation
6. Select fire resistant landscape plants for any additional landscaping

6.2.2 Defensible Space Treatments

Overview

This treatment consists of about 9.2 acres surrounding the proposed faculty housing development as well as adjacent homes on the southwestern portion of the parcel boundary and is consistent with both CALFIRE and Woodside Fire Protection District spacing guidelines of 100 feet from structures in accordance with PRC 4291. All initial and maintenance treatment strategies where taken from Moritz Arboricultural Consulting, 2008, and augmented to meet the needs of this project.

Initial Treatments and Design Criteria

Responsible Party: Stanford Univeristy

Treatment Method: The majority of this area will utilize manual planting, cutting, and removal.

1. Remove all flammable shrubs
2. Remove deadwood from trees
3. Select low-growing shrubs and ground covers as replacement plants
4. Remove/reduce lofty, loosely compacted litter accumulations, especially large debris such as branches and replace with compact, small particle mulch to prevent invasion of noxious weeds and elevate live fuel moisture
5. Mow/trim all grass to below 10 inches when it is 50% cured
6. Possibly replace annual grass with plants that do not cure (dry out), or low or non-flammable landscaping such as boulders, rocks, patios, or gravel, or establish an irrigated landscape in carefully selected areas close to the home
7. Remove deadwood in trees and fire-resistant shrubs
8. Remove diseased, dying and dead shrubs and trees
9. Remove/reduce “ladder” fuels (grass to brush to trees)
10. Where feasible, create shrub/grass mosaics from continuous masses by installing hardscape
11. Remove all shrubs from beneath and around existing and emerging trees
12. Thin thickets of small trees and tree reproduction from large tree understories
13. Create low fuel zone near structural vulnerabilities such as windows, decks, large overhangs
14. Separate overlapping tree and large shrub canopies
15. Thin fire-prone tree canopies, like oak and bay, to an open canopy structure

16. Prune live and dead ladder fuels to a minimum of 10 feet above ground under any portion of the canopy or to an elevation 10 feet above the highest ground elevation
17. For landscaping; select native tree, shrub, or grass species or if necessary non-native, non-invasive species with low flammability

Maintenance Plan

Responsible Party: Faculty Housing Homeowner Association and Stanford

Treatment Method: The majority of this area will utilize manual planting, cutting, and removal.

1. Remove deadwood from trees
2. Select low-growing native or if necessary non-native shrubs and ground covers with low flammability as replacement plants
3. Remove/reduce lofty, loosely compacted litter accumulations, especially large debris such as branches and replace with compact, small particle mulch to prevent invasion of noxious weeds and elevate live fuel moisture
4. Mow/trim all grass each year to below 10 inches when it is 50% cured (typically by June 1st but may vary with amount and timing of winter precipitation)
5. Remove deadwood in trees and fire-resistant shrubs
6. Remove sick, dying and dead shrubs and trees
7. Monitor and remove/reduce if necessary "ladder" fuels (grass to brush to trees)
8. Ensure no shrubs establish beneath and around existing and emerging trees
9. Keep tree and large fire-resistant shrub canopies from overlapping
10. Prune live and dead ladder fuels to a minimum of 10 feet above ground under any portion of the canopy or to an elevation 10 feet above the highest ground elevation
11. For landscaping; select native tree, shrub, or grass species or if necessary non-native, non-invasive species with low flammability

6.2.3 Oak Woodland Treatment

Overview

This treatment will affect most of the project area which covers of about 55.2 acres. These areas currently consist of native oak woodland dominated by a dense canopy of coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), California buckeye (*Aesculus californica*), and Pacific madrone (*Arbutus menziesii*). The dense understory of this woodland consists of poison oak (*Toxicodendron diversilobum*), toyon (*Heteromeles arbutifolia*), and other shrubs that create contiguous ladder fuels from the forest floor to the tree canopy. The combination of dense understory vegetation, ladder

Oak Woodland Treatment Objectives

1. Reduce fuel volumes and maintain fuel volumes consistent with low severity fire
2. Reduce volume of flammable fuels and cultivate plants on the landscape that are generally native and fire-resistant
3. Establish and maintain fuel discontinuity
4. Reduce the possibility of fire traveling through tree crown; maintain that separation
5. Maintain healthy, dominant, natural, fire-resistant vegetation cover that is consistent with historical densities in an intact fire regime
6. Maintain active dusky-footed woodrat (Neotoma fuscipes) nest sites

fuels, and disease caused by sudden oak death or "SOD" (*Phytophthora ramorum*) makes this type extremely flammable and prone to crown fires. In order to increase the resiliency of these areas to high severity fire and other density dependent insect infestation and disease, the following treatment and maintenance plan is proposed in order to meet treatment area objectives.

Initial Treatment

Responsible Party: Stanford

Treatment Method: The majority of this area will utilize manual cutting and removal. Some mastication and steep slope mastication with manual support might need to occur in steep and inaccessible areas.

1. Thin out with manual cutting or mastication overly dense stands to provide crown separation. Favor fire resistant species (such as oak rather than bay). Do not thin below an overall canopy cover of 40% across this treatment area.
2. Cut and remove or Rearrange (masticate) all fire prone shrubs. Ex poison oak (*Toxicodendron diversilobum*), toyon (*Heteromeles arbutifolia*)
3. Cut and remove or Rearrange (masticate) all fire-resistant shrubs within the drip line of any tree designated to remain. Separate remaining fire-resistant shrubs by a distance of at least two times their height, crown to crown.
4. Raise tree crowns to a minimum of 8.0 feet above grade. All parts of the canopy less than 3 inches in diameter should be no lower than eight feet vertical distance above grade. The canopy line will be horizontal to slope.
5. Cut and remove or Rearrange (masticate) dead and diseased trees or branches and foliage
6. Cut and remove or Rearrange (masticate) bay and conifer reproduction, if it exists.
7. Cut and remove or Rearrange (masticate) down and dead debris.
8. Remove heavily SOD infested trees.
9. Flag (designated by a wildlife biologist) and avoid active dusky-footed woodrat nest sites. Disassemble and remove deserted nest sites, if they can not be avoided, in accordance with any biological requirements.

Maintenance Plan

Responsible Party: Faculty Housing Homeowner Association and Stanford

Treatment Method: The majority of this area will utilize grazing with manual support.

1. Annually graze area in late spring/early summer (May – June) but prior to fire season to keep grass heights low while minimizing shrub sprouting and regeneration. If grazing isn't appropriately applied (time of year and intensity); a follow up mastication and/or mowing with manual support may be required, every 5 years.
2. Periodically (every 5 years) manually remove dead and diseased trees or branches and foliage.

3. Periodically (every 5 years) manually remove bay and conifer reproduction.
4. Monitor conditions to ensure the above maintenance plan is maintaining treatment area objectives.

6.2.4 Oak Woodland Canopy Treatment

Oak Woodland Canopy Treatment Objectives

1. Maintain fuel volumes consistent with low severity fire
2. Maintain fuel discontinuity
3. Reduce the possibility of fire traveling through tree crown; maintain that separation
4. Maintain healthy, dominant, natural, fire-resistant vegetation cover that is consistent with historical densities in an intact fire regime
5. Maintain active dusky-footed woodrat (*Neotoma fuscipes*) nest sites

Overview

This treatment will affect about 3.9 acres. These areas currently consist of native oak woodland dominated by a moderately dense canopy of coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), California buckeye (*Aesculus californica*), and Pacific madrone (*Arbutus menziesii*). Much of this understory of this woodland has already been treated by a previous mastication contract and although there is some poison oak (*Toxicodendron diversilobum*), toyon (*Heteromeles arbutifolia*), and other shrubs, they are more isolated and less dense than the surrounding, untreated oak woodlands. Still, the combination of some understory vegetation, ladder fuels, and disease caused by sudden oak death or "SOD" (*Phytophthora ramorum*) makes this type flammable and prone to moderate fire behavior. In order to increase the resiliency of these areas to moderately severe fire and other density dependent insect infestation and disease, the following treatment and maintenance plan is proposed to meet treatment area objectives.

Initial Treatment

Responsible Party: Stanford

Treatment Method: The majority of this area will utilize manual cutting and removal. Some mastication and steep slope mastication with manual support might need to occur in steep and inaccessible areas.

1. Thin out with manual cutting or mastication overly dense stands to provide crown separation. Favor fire resistant species (such as oak rather than bay). Do not thin below an overall canopy cover of 40% across this treatment area.
2. Cut and remove or Rearrange (masticate) all fire prone shrubs. Ex poison oak (*Toxicodendron diversilobum*), toyon (*Heteromeles arbutifolia*)
3. Cut and remove or Rearrange (masticate) all fire-resistant shrubs within the drip line of any tree designated to remain. Separate remaining fire-resistant shrubs by a distance of at least two times their height, crown to crown.
4. Raise tree crowns to a minimum of 8.0 feet above grade. All parts of the canopy less than 3 inches in diameter should be no lower than eight feet vertical distance above grade. The canopy line will be horizontal to slope.
5. Cut and remove or Rearrange (masticate) dead and diseased trees or branches and foliage
6. Cut and remove or Rearrange (masticate) bay and conifer reproduction if it exists.
7. Cut and remove or Rearrange (masticate) down and dead debris.

8. Remove heavily SOD infested trees.
9. Flag (designated by a wildlife biologist) and avoid active dusky-footed woodrat nest sites. Disassemble and remove deserted nest sites, if they can not be avoided, in accordance with any biological requirements.

Maintenance Plan

Responsible Party: Faculty Housing Homeowner Association and Stanford

Treatment Method: The majority of this area will utilize grazing with manual support.

1. Annually graze area in late spring/early summer (May – June) but prior to fire season to keep grass heights low while minimizing shrub sprouting and regeneration. If grazing isn't appropriately applied (time of year and intensity); a follow up mastication and or mowing with manual support may be required, every 5 years.
2. Periodically (every 5 years) manually remove or lop and scatter dead and diseased trees or branches and foliage.
3. Periodically (every 5 years) manually remove or lop and scatter bay and conifer reproduction.
4. Monitor conditions to ensure the above maintenance plan is maintaining treatment area objectives.

6.2.5 Chaparral Treatment

Chaparral Treatment Objectives

1. Reduce fuel volumes and maintain fuel volumes consistent with low severity fire
2. Reduce volume of flammable fuels and cultivate plants on the landscape that are generally native and fire-resistant
3. Establish and maintain fuel discontinuity
4. Maintain healthy, dominant, natural, fire-resistant vegetation cover that is consistent with historical densities in an intact fire regime
5. Maintain active dusky-footed woodrat (*Neotoma fuscipes*) nest sites
6.

Overview

Chaparral occurs on 3.7 acres within the parcel and consists of dense evergreen and deciduous shrubs that can reach 10 feet tall and supports a sparse understory of herbaceous plants and litter. Dominant shrubs in this type include chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos glauca, A. tomentosa*), California-lilac (*Ceanothus cuneatus, C. oliganthus var. sorediatus*), redberry (*Rhamnus crocea ssp. crocea*), scrub oak (*Quercus berberidifolia*), coffeeberry (*Rhamnus californica*), and holly-leafed cherry (*Prunus ilicifolia ssp. ilicifolia*). This type is notorious for exhibiting extreme fire behavior due to the heavy horizontal fuel continuity and abundant fine material, almost 100% available to a potential fire. Species within the Chaparral type typically have very low fuel moisture and are therefore more flammable. Also, the densely, twiggy, and foliated species found in this fuel type (i.e., chemise) tends to be more flammable. The expected fire behavior of this type under severe fire weather may be extreme. Fire in this fuel type displays high to extreme rates of spread with high intensities in strong winds. It can generate a blizzard of fire brands and this fuel bed is very receptive to spot fire ignitions.

Initial Treatment

Responsible Party: Stanford

Treatment Method: The majority of this area will utilize mastication with some manual cutting, and removal.

1. Thin out with manual cutting or mastication all chamise (*Adenostoma fasciculatum*)
2. Thin out with manual cutting or mastication brush or brush islands up to 10.0 feet tall to a spacing of 2 X the height, on center. Always favor fire resistant species.
3. Raise (trim up) the crowns by 1/3 the height
4. Remove deadwood subcanopies.
5. Masticate and/or mow all grass, cured herbs, and flammable debris from under the shrub canopies.
6. Cut and remove or rearrange (masticate) dead shrubs.
7. Remove structurally unstable trees
8. Clean up down and dead debris

Maintenance Plan

Responsible Party: Faculty Housing Homeowner Association and Stanford

Treatment Method: The majority of this area will utilize grazing with manual cutting.

1. Annually graze area in late spring/early summer (May – June) but prior to fire season to keep grass heights low while minimizing shrub sprouting and regeneration. If grazing is not appropriately applied (time of year and intensity); a follow up mastication and/or mowing with manual support may be required, every 5 years.
2. Ensure all grass, cured herbs and flammable debris does not accumulate under the shrub canopies.
3. Periodically (every 5 years) manually remove dead and diseased trees or branches and foliage.
4. Periodically (every 5 years) manually remove bay and conifer reproduction.
5. Monitor conditions to ensure the above maintenance plan is maintaining treatment area objectives.

6.2.6 Schedule and Timing of Treatments

Initial Treatments

Initial treatments would commence prior to construction of the development but after the construction of the permanent and temporary road system. Work would generally occur outside nesting bird season. Work would generally occur after August 15th and before February 15th but could occur during this timeframe if nesting bird surveys are conducted. Work should occur within timeframes established under an approved fire safety plan.

The initial clearing of the site is anticipated to take approximately 2 months. Work would only occur during the allowable timeframes set by the Town of Woodside, between 7:30 am and 5:30 pm Monday through Friday and 8:00 am to 1:00 pm on Saturdays. No work would be performed on Sundays and holidays.

Vegetation Maintenance Plan Schedule

The following table summarizes the schedule of ongoing maintenance. Each area should be maintained every 5 years; however, the work can be staggered such that 1/5 of the site is treated each year.

Table 6 Vegetation Maintenance Plan Schedule

Location	Scheduled Annual Activities	Scheduled Quinquennial Activities
Defensible Space	Spring: maintain irrigated and non-irrigated plants Late Spring/Early Summer: mow/trim grass while grass is still > 50% green	N/A
Oak woodland canopy	Late Spring/Early Summer: Graze with goats	Late Spring/Early Summer: Cut and remove or Rearrange (masticate)
Oak woodland	Late Spring/Early Summer: Graze with goats	Late Spring/Early Summer: Cut and remove or Rearrange (masticate)
Chaparral	Late Spring/Early Summer: Graze with goats	Late Spring/Early Summer: Cut and remove or Rearrange (masticate)

6.2.7 Modeling of Fire Behavior After Fuel Treatments

Post-Treatment Modeling

Post-treatment conditions were modeled to demonstrate that the fuel treatments adequately reduce fire hazards. In order to effectively model treatment changes to the landscape, the current condition landscape for each cover type was adjusted to reflect the treatment prescriptions outlined in Section 5.2. It is understood that post treatment and maintained conditions would, on average, be represented by these changed fire model inputs:

- **Defensible Space**
  - Surface Fuel Model: GR1 – short sparse, dry climate grass
  - Canopy Cover: average 35%
  - Canopy Base Height: average 3 meters (10 feet)
  - Canopy Bulk Density: 0.03 kg/m^3
- **Oak Woodland Treatment**
  - Surface Fuel Model: GS1 – low load, dry climate grass-shrub
  - Canopy Cover: average 40%
  - Canopy Base Height: average 2.5 meters (8 feet)
  - Canopy Bulk Density: 0.04 kg/m^3

- **Oak Woodland Canopy Treatment**
  - Surface Fuel Model: GS1 – low load, dry climate grass-shrub
  - Canopy Cover: average 40%
  - Canopy Base Height: average 2.5 meters (8 feet)
  - Canopy Bulk Density: 0.04 kg/m^3
- **Chaparral Treatment**
  - Surface Fuel Model: SH1 – low load, dry climate shrub
  - Canopy Cover: average 0%
  - Canopy Base Height: average 0 meters (0 feet)
  - Canopy Bulk Density: 0.00 kg/m^3

There is a possibility that some mastication may need to occur on some inaccessible areas where material removal from the project parcel is impractical. Masticating and leaving some material in place instead of removing all material would alter the changed fire model outputs above and requires a separate modeling effort to estimate fire behavior changes. Section 5.2.8 describes the effects of that potential treatment. The likely scenario will be somewhere between all material removed and the mastication left on-site as described in Section 5.2.8.

Modeled Post Treatment Flame Length

IFTDSS (with FlamMap and Minimum Travel Time)
Figure 24 predicts what flame lengths occur where within the project parcel if the above treatment design was implemented. Figure 25 quantifies spatial distribution across a set of flame length classes. With all of the parcel showing flame lengths less than 1 foot coupled with a weighted mean flame length of 0.7 feet, the parcel would likely exhibit lower fire intensities compared to the current condition post treatment (> 8 foot flame lengths in places with 4.8 foot weighted mean flame lengths) assuming actual fire weather and fuel conditions were similar to those in the modeling environment.

If there was a fire within the project parcel post treatment and the maintenance plan was current, suppression resources would be more likely able to directly attack the fire and suppression success would increase compared to the current condition.

Behave Comparison
Table 7 exhibits the comparison of results between the FlamMap modeling effort and Behave Plus. It is important to note that FlamMap is a spatially explicit model, in this case down to a 30-meter square pixel, that incorporates spatial inputs across the modeled area. This creates a mosaic of conditions that can be comprehensively modeled. Behave has no spatial component and is dependent on translating the realities of the site into the model by the modeler. Although it inherently takes out the complexity of the larger area of interest, it does allow for more customization, particularly since different fuel models tend to exist within an area as small as a 30-meter square pixel. In order to make an appropriate comparison, median flame length of all FlamMap pixels within a surface fuel model is compared to the median flame length of the

blended fuel models one can achieve with the Behave architecture. There is little variance between the median flame length of the two modeling systems and FlamMap results are confirmed that if there was a fire within the post treatment parcel and the maintenance plan was current, suppression resources would likely to be able to directly attack the fire and suppression success would increase compared to the current condition assuming actual fire weather and fuel conditions were similar to those in the modeling environment.

Figure 24 Modeled Flame Lengths for the Project Parcel – Post-Treatment with All Material that is Cut Removed

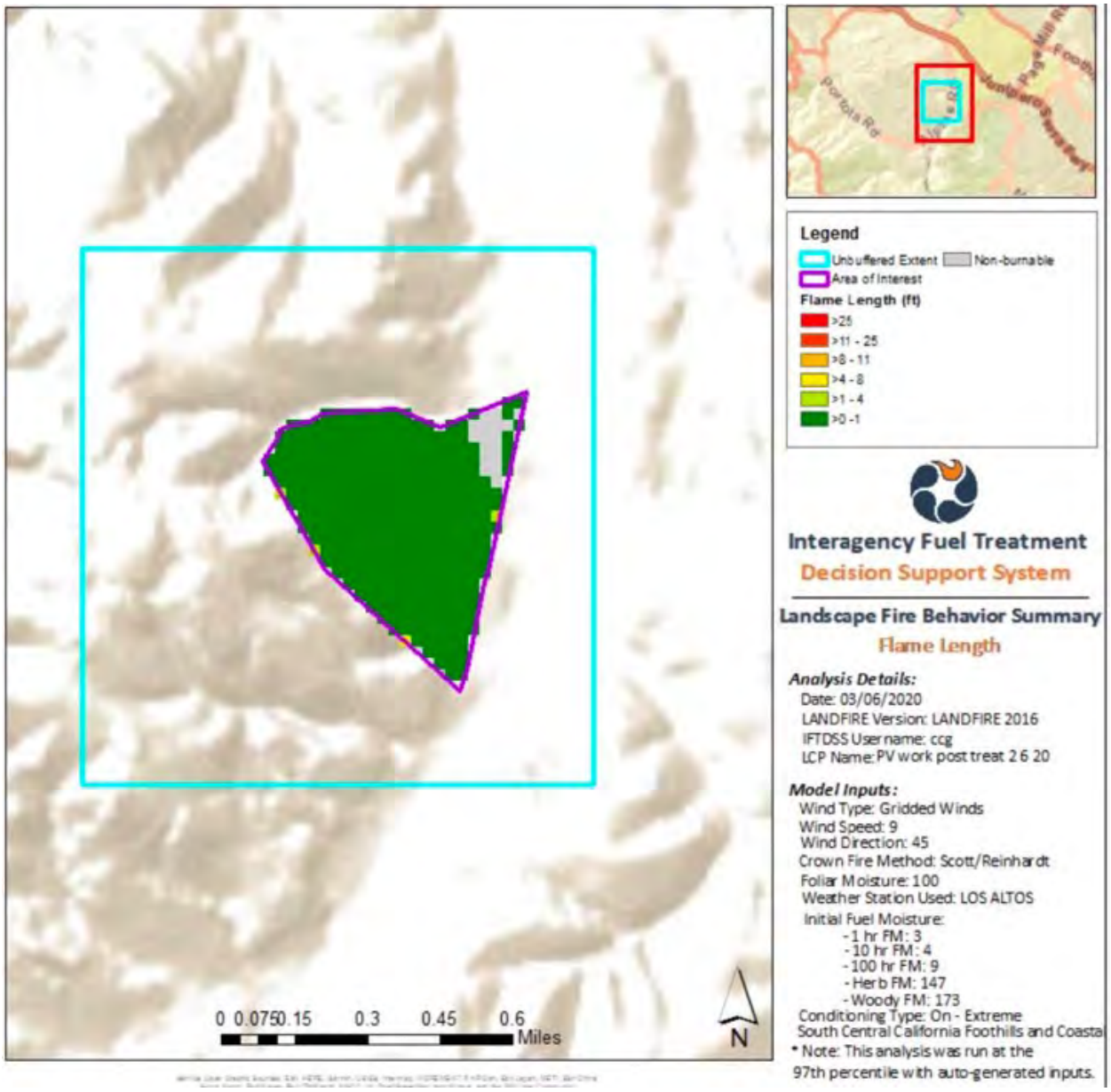


Figure 25 Spatial Distribution of Flame Length Classes – Post-Treatment Scenario

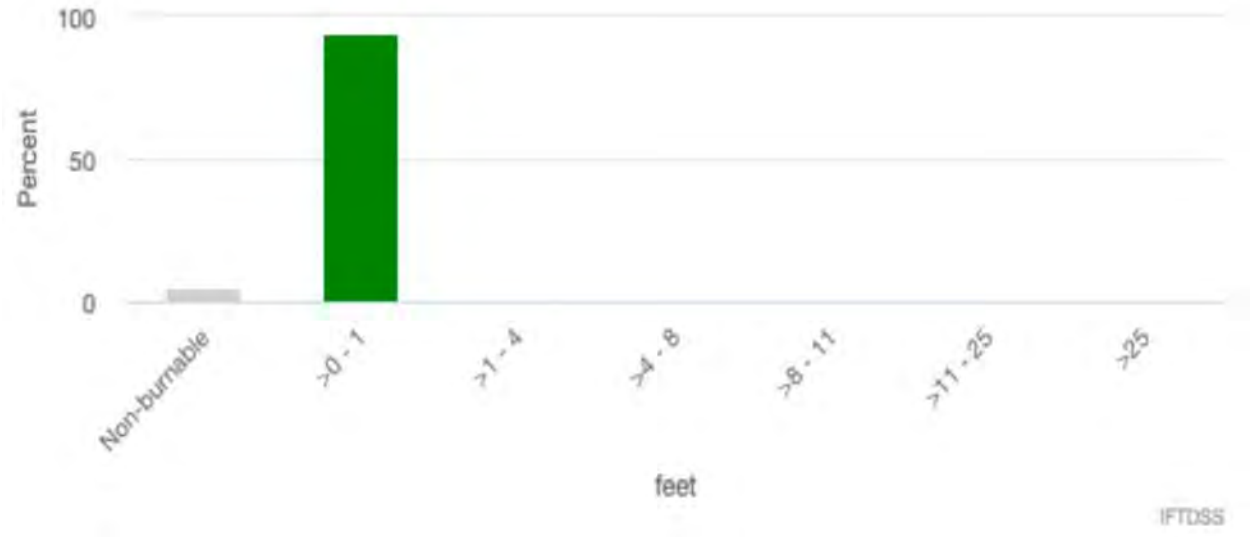


Table 7 Comparison of Results Between FlamMap and BehavePlus – Post-Treatment Conditions Scenario 2

Fuel Model	Definition	Behave 6.0 Median Flame Length	Flammap Basic Median Flame Length	Variance
GR1/GR2	short sparse, dry climate grass/short sparse, dry climate gras	0.1 ft	0.1 ft	0 ft
GS1/GR1	Low-load dry climate grass-shrub/short sparse, dry climate grass	0.2 ft	1 ft	0.8 ft
SH1/GR1	Low-load dry climate shrub/short sparse, dry climate grass	0.3 ft	1 ft	0.7 ft

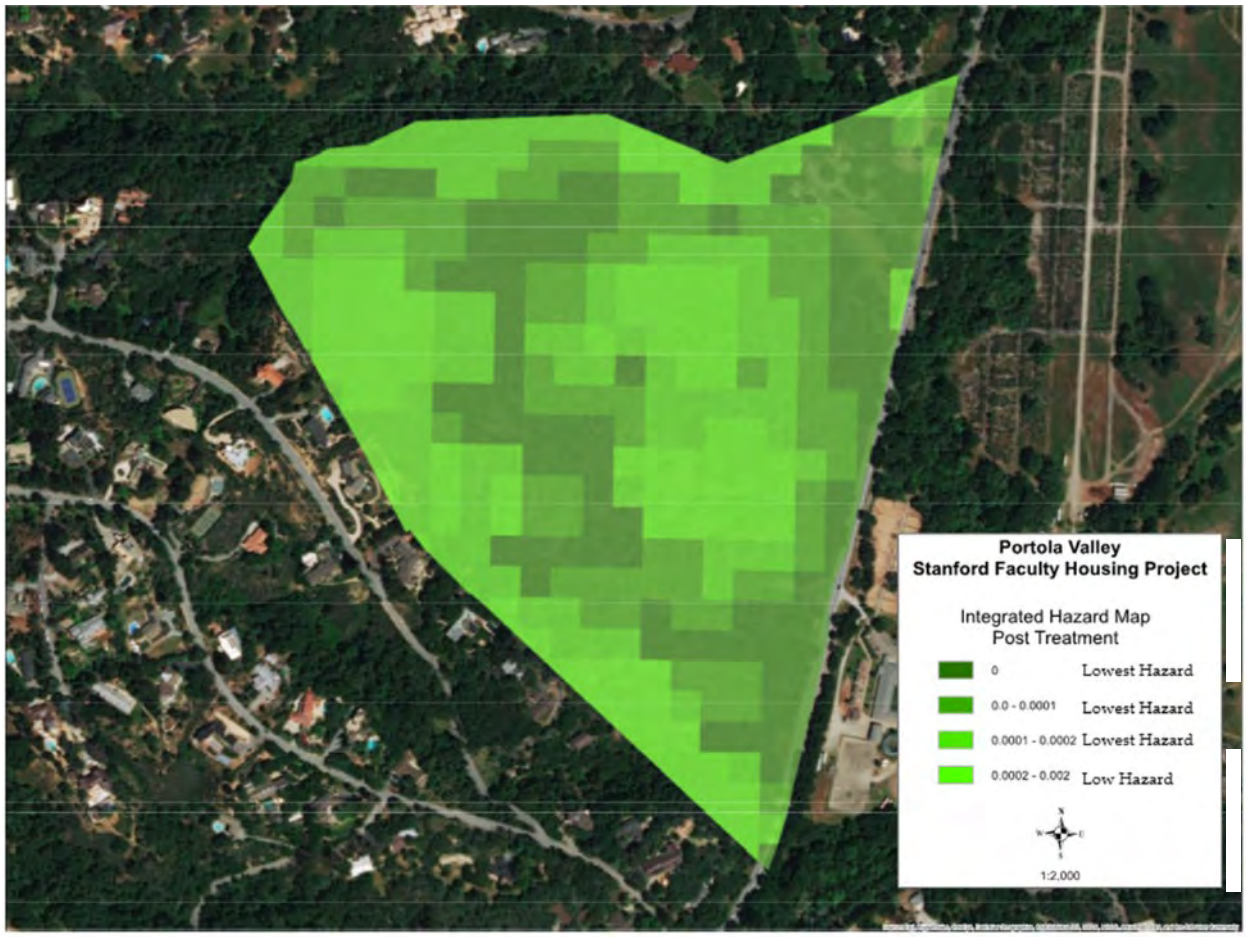
Modeled Post Treatment Integrated Hazard Outputs

Post treatment integrated hazard inputs were modeled with the same weather as FlamMap and Behave and same model parameters as the current condition modeling. Figure 26 exhibits where there is fire intensity that overlaps with fire probability. The post treatment conditions show a dramatic reduction in hazard and thus exposure to surrounding homes and infrastructure. In fact, hazard is reduced to a mean of .0002 where the current condition integrated hazard was .015 – a reduction of about 99% across the parcel. Further the highest hazard rating of 0.002 in the post treatment results still doesn't exceed even the first quartile of the current condition integrated hazard results; meaning that the highest 3 quantiles of hazard are predicted to be eliminated if treatment was implemented and the maintenance plan was current.

Considering the significant reduction in hazard, the project parcel will likely exhibit lower fire intensities compared with the current condition assuming actual fire weather and fuel

conditions were similar to those in the modeling environment. This will reduce exposure to fire to surrounding homes if an ignition did occur within the parcel.

Figure 26 Modeled Integrated Hazards for the Project Parcel – Post-Treatment



*The integrated hazard is a scale from 0 to 1 where 0 represents low burn probability and small flame length and 1 is the combination highest burn probability and large flame length. The scaling allows for comparisons before and after treatment.

6.2.8 Modeling of Fire Behavior After Mastication

Post-Treatment Modeling

Mastication may be needed as a treatment method where removal of all material is impractical due to inaccessibility, as previously mentioned. Mastication rearranges fuel and leaves the cut material on site. Representative post-treatment conditions were also modeled to show the results if some material must be masticated and left on-site, (as opposed to removing all material as shown in Section 5.2.7) to ensure that project objectives to reduce flame lengths and fire hazard would still be met.

The expected permanent and temporary road system (constructed off the new permanent road) will likely make all but some of the oak woodland treatment areas accessible for manual cut and

removal. This analysis, therefore, only focuses on the predicted post-treatment masticated conditions in the oak woodland areas where removing material may not be possible.

In order to effectively model treatment changes to the landscape, the current condition landscape for each cover type was adjusted to reflect mastication. It is understood that post treatment and maintained conditions would, on average, be represented by these changed fire model inputs:

- **Oak Woodland Treatment**
  - Surface Fuel Model: SB1 – low load activity fuels (Heinsch, Sikkink, Smith, & Retzlaff, 2018)
  - Canopy Cover: average 40%
  - Canopy Base Height: average 2.5 meters (8 feet)
  - Canopy Bulk Density: 0.04 kg/m^3

Modeled Post Treatment Flame Length

IFTDSS (with FlamMap and Minimum Travel Time)
Figure 27 predicts the location and flame length within the project parcel anywhere oak woodland treatment intersected with the potential use of mastication. More areas show on the map as having 1 to 4 foot flame lengths, whereas with removal of all material, nearly all areas are under 1 foot (Figure 24). Conditions will still likely exhibit lower fire intensities compared to the current condition post treatment (where current condition is less than 8-foot flame lengths in places with 4.8-foot weighted mean flame lengths).

If a fire occurred within the project parcel and the maintenance plan was current, suppression resources would likely to be able to directly attack the fire assuming actual fire weather and fuel conditions were similar to those in the modeling environment. Suppression success would increase compared to the current condition.

Behave Comparison
Table 8 exhibits the comparison of results between the FlamMap modeling effort and Behave Plus. It is important to note that FlamMap is a spatially explicit model, in this case down to a 30-meter square pixel, that incorporates spatial inputs across the modeled area. This capability creates a mosaic of conditions that can be comprehensively modeled. Behave has no spatial component and is dependent on translating the realities of the site into the model by the modeler. Although it inherently takes out the complexity of the larger area of interest, it does allow for more customization, particularly since different fuel models tend to exist within an area as small as a 30-meter square pixel. In order to make an appropriate comparison, median flame length of all FlamMap pixels within a surface fuel model is compared to the median flame length of the blended fuel models one can achieve with the Behave architecture.

There is little variance between the median flame length of the two modeling systems and FlamMap results confirm that if there was a fire within the post treatment parcel, even if mastication was implemented on parts of the parcel, and the maintenance plan was current,

suppression resources would more likely to be able to directly attack the fire and suppression success would likely increase compared to the current condition.

Figure 27 Modeled Flame Lengths for the Project Parcel – Post-Treatment Using Mastication in Some Oak Woodland Areas

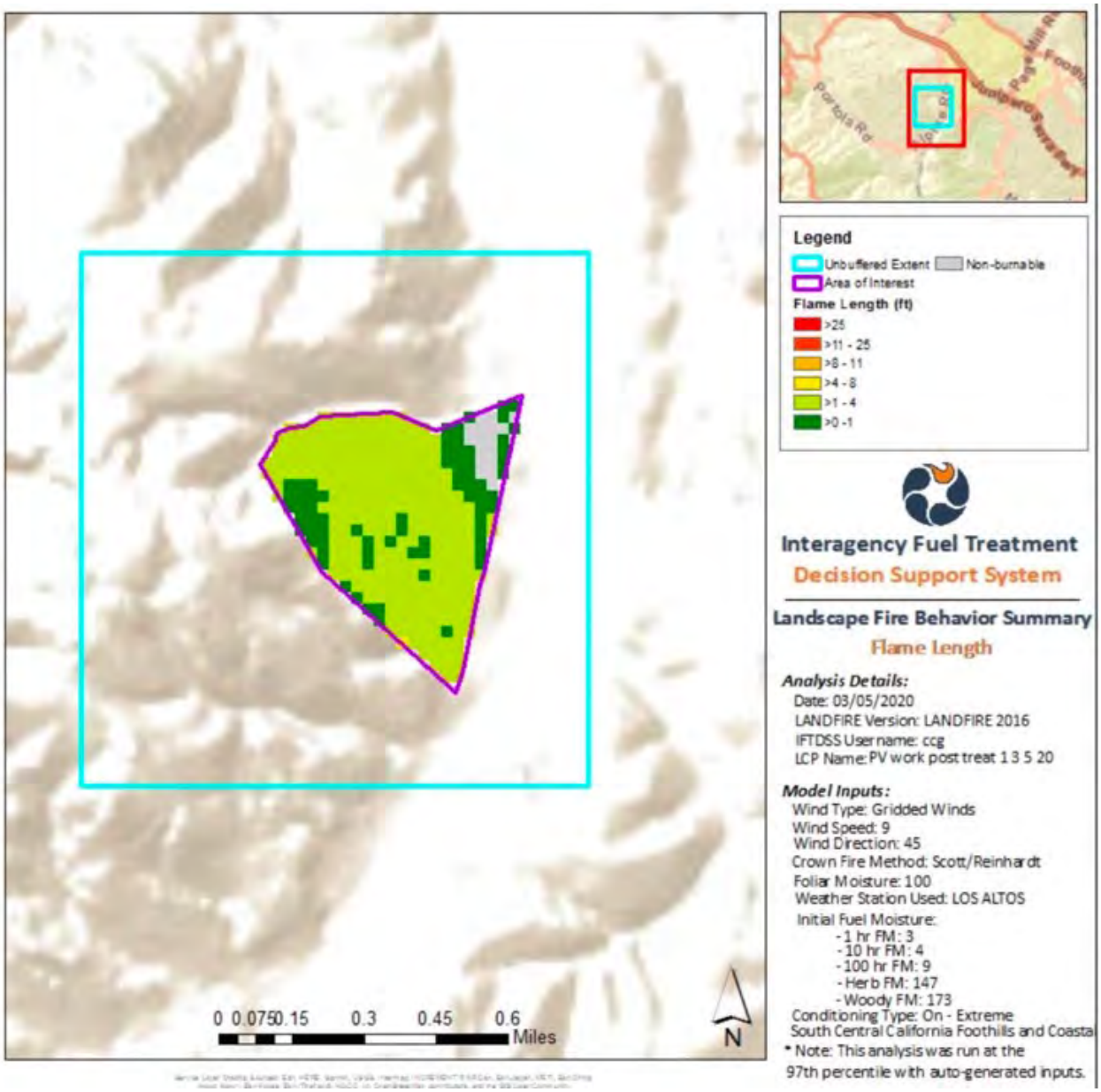


Table 8 Comparison of Results Between FlamMap and BehavePlus – Post-Treatment Conditions

Fuel Model	Definition	Behave 6.0 Median Flame Length	Flammap Basic Median Flame Length	Variance
GR1/GR2	short sparse, dry climate grass/short sparse, dry climate gras	0.1 ft	0.1 ft	0 ft
GS1/SB1	Low load dry climate grass-shrub/ Low load activity fuel	2.7 ft	1 ft	-1.7 ft
SH1/SB1	Low load dry climate shrub/ Low load activity fuel	2.85 ft	1 ft	-1.85 ft
SB1/GR1	short sparse, dry climate grass/short sparse, dry climate grass	2.7 ft	1.5 ft	-1.2 ft

7 References

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Appendices

PANORAMA
ENVIRONMENTAL, INC.

Appendix A: Conway Resume

Scott Conway

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Incline Village, NV.
sconway@sig-gis.com
(530) 277-3010

Project Experience

Mr. Conway is a proficient forest and fire ecologist with extensive project assessment, analysis, planning, implementation, and monitoring experience in the western United States. He has also pioneered project level application of remote sensing datasets, like LiDAR.

Education

Colorado State University – 1998
BS, Natural Resource Management with a focus in Remote Sensing and GIS

Areas of Expertise

- Applied Forest & Fire Ecology
- Remote Sensing
- Modeling & GIS
- Forest Mensuration
- Contract Administration
- Project Planning & Prioritization

Locations of Experience

- Western US
- Baja, MX
- Pacific Islands

Experience

2019-Present	**Forest Ecologist** – Spatial Informatics Group, LLC, Pleasanton, CA
2019-Present	**Adjunct Forest Ecology Professor** – Sierra Nevada College, Incline Village, NV
2019	**District Ranger** – Tahoe National Forest, Truckee, CA
2016-2018	**Spatial Ecologist** – USFS Pacific Southwest Region, CA and Pacific Islands
2008-2016	**Vegetation Management Officer** – Tahoe National Forest, Truckee, CA
2004-2008	**Forester and Wildland Fire Fighter** – Tahoe National Forest, Sierravile, CA
2000-2004	**Harvest Inspector** – Tahoe National Forest, Sierravile, CA
1998-2000	**Lead Forestry Technician** – Arapaho-Roosevelt National Forest, Fort Collins, CO
1996-1998	**Timber Cruiser** – Private Contractor, CO, WY, SD, ID
1995	**Nature and Ecology Director** – Worth Ranch, Palo Pinto, TX
1992	**Trail Crew Leader** – Philmont Scout Ranch, Cimarron, NM

Publications

“LITIDA: a cost-effective non-parametric imputation approach to estimate LiDAR-detected tree diameters over a large heterogeneous area.” 2019 Forestry: An International Journal of Forest Research, Volume 92, Issue 2.

“Cover of tall trees best predicts California spotted owl habitat.” 2017. Forest Ecology and Management. 405, 166-178

“Managing Sierra Nevada Forests.” 2012. Pacific Southwest Research Station General Technical Report 237.

Appendix B: Modeling Outputs

- IFTDSS SPVP Auto97th Current Condition Report
- IFTDSS SPVP Auto97th Scenario 1 Post Treatment Report
- IFTDSS SPVP Auto97th Scenario 2 Post Treatment Report

Report: Auto97th
Landfire Version: LANDFIRE 2016
Landscape Name: PV_work_13_2_28_20
Landscape Acres: 470
Area of Interest: pv_aoi_3_3_20

Prepared for: Scott Conway
3/7/2020, 11:58:40 AM

Model Parameters

Run Name: PV_work_13_2_28_20 - Auto97th

Model Type: Landscape Fire Behavior

Run Date: Feb 28, 2020 12:18:21 PM

Wind Type: Gridded Winds

Wind Speed: 9 mph

Wind Direction: 45 deg

Crown Fire Method: Scott/Reinhardt

Foliar Moisture: 100

Conditioning: On - Extreme - South Central California Foothills and Coastal Mountains

Conditioning start: , NaN/NaN/NaN

Days conditioned:

Conditioning start: 1300, 7/9/2012

Conditioning end:1600, 7/12/2012

Station Name: LOS ALTOS

Station Observation Start Date: Mar 6, 2005 12:00:00 AM

Station Observation End Date: Oct 4, 2016 12:00:00 AM

Station Elevation: 539

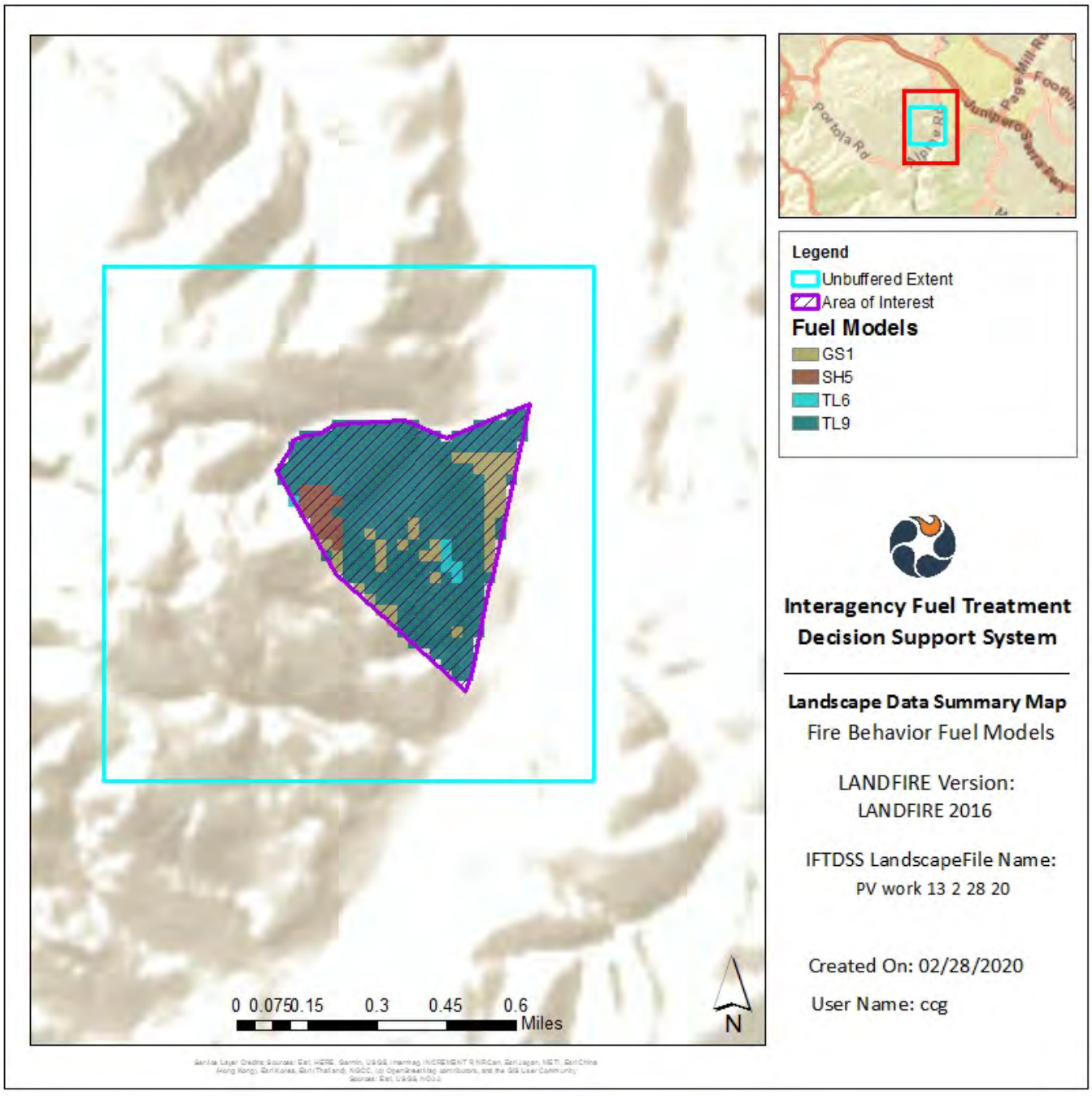
Station Aspect: 6

Station Latitude: 37.355

Station Longitude: 122.1419444

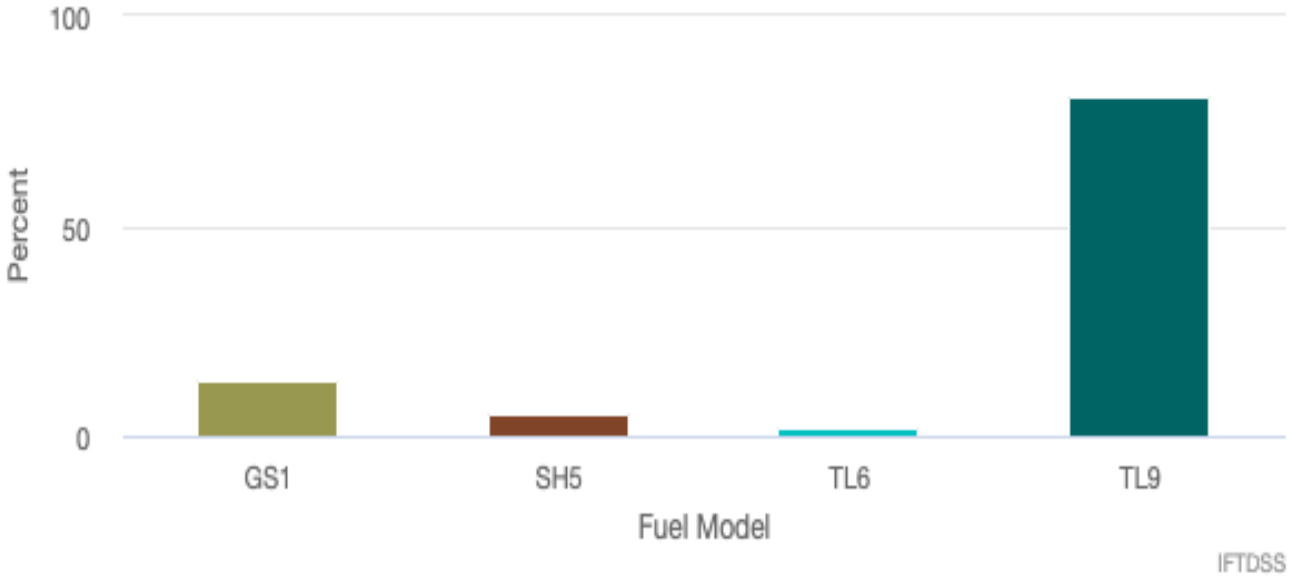
Fuel Model	1 Hr Fuel Moisture	10 Hr Fuel Moisture	100 Hr Fuel Moisture	Live Herbaceous Fuel Moisture	Live Woody Fuel Moisture
All	3	4	9	147	173

Fuel Model (FBFM)



Fuel Model Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

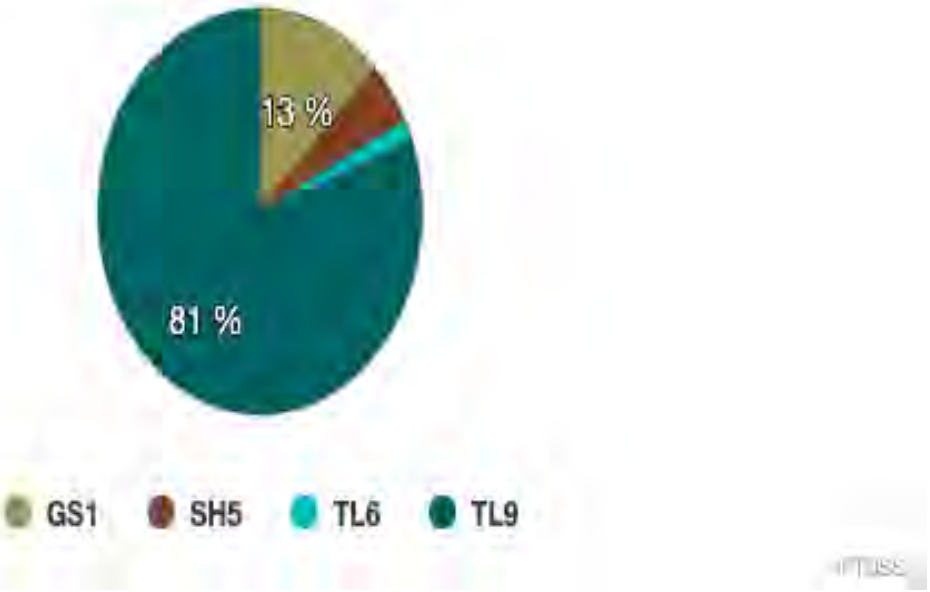
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th
Distribution under 1% not shown



Fuel Model (FBFM)

Fuel Model Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

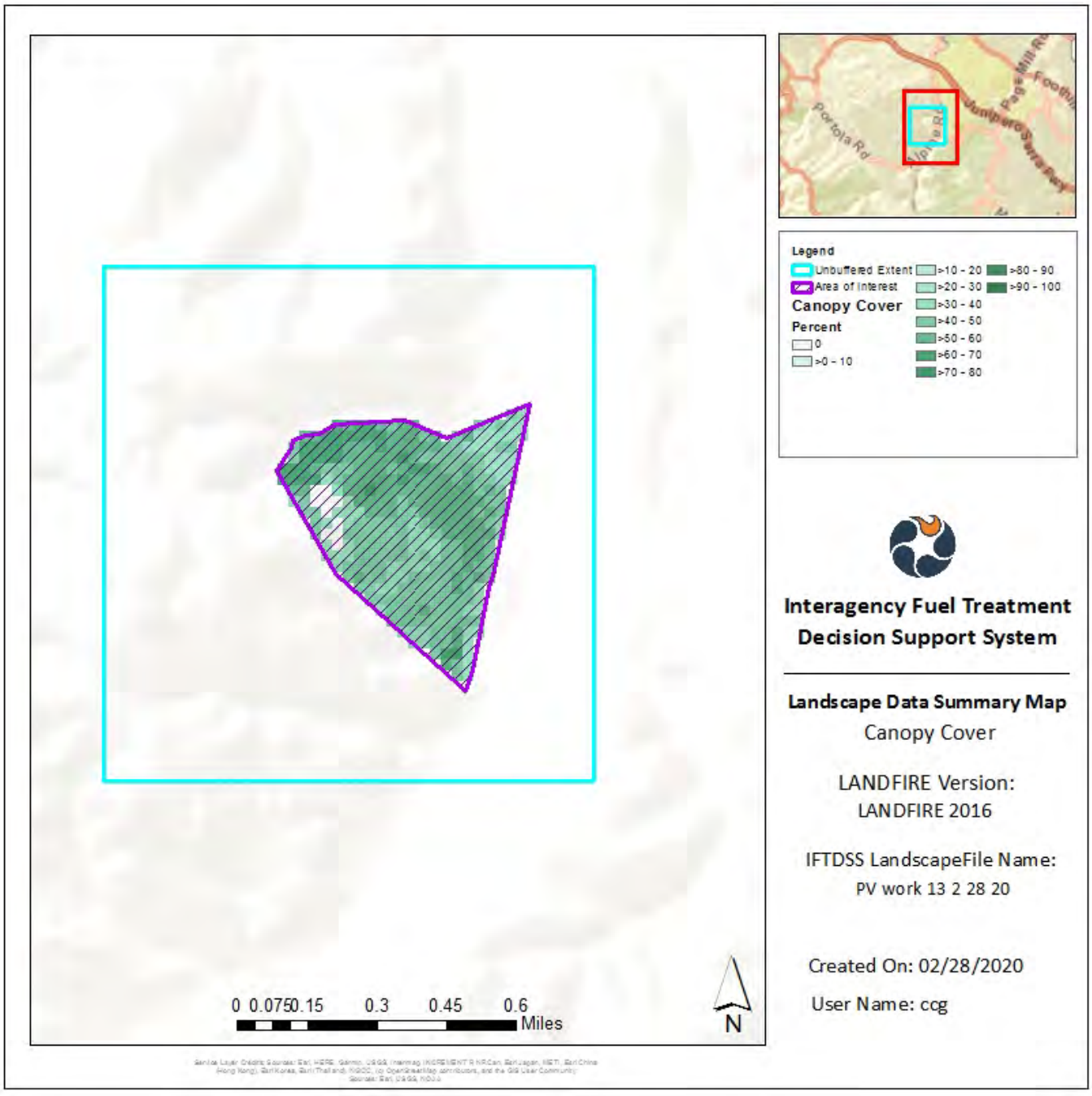
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Fuel Model (FBFM)

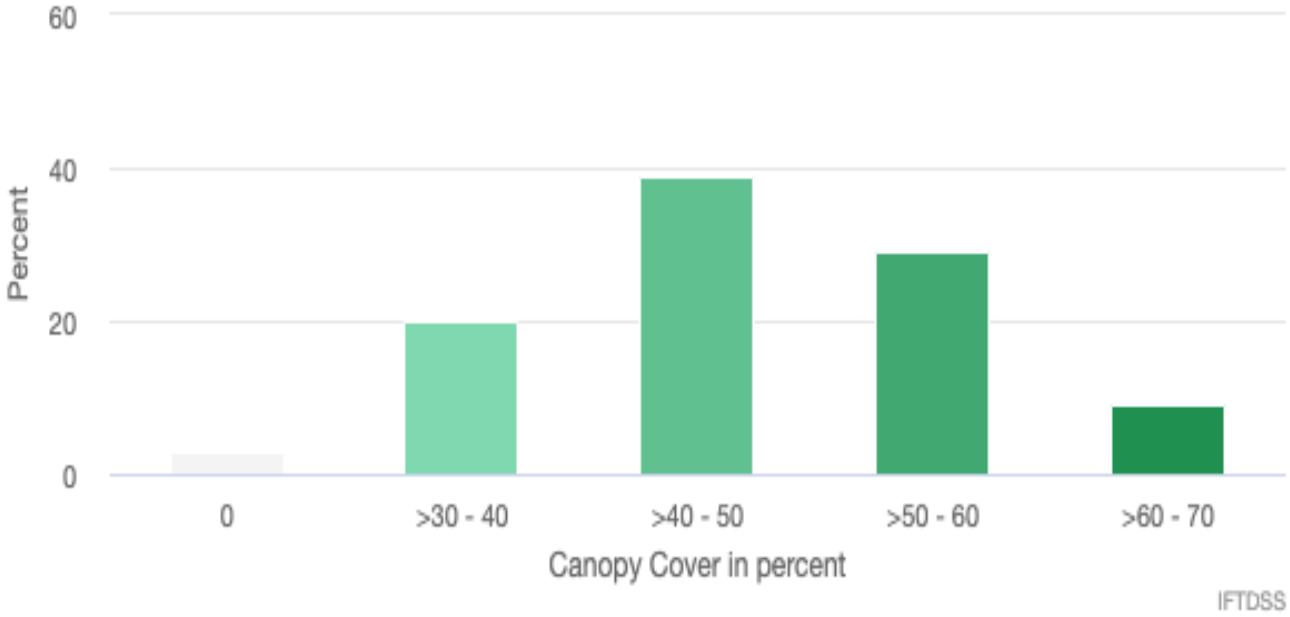
Fuel Model	Pixel Count (freq)	Acres In AOI	Percent In AOI
GS1 (121)	43	10	13
SH5 (145)	17	4	5
TL6 (186)	6	1	2
TL9 (189)	276	61	81

Canopy Cover



Canopy Cover (percent) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Canopy Cover

Canopy Cover (percent) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

Source Landscape Name: PV_work_13_2_28_20
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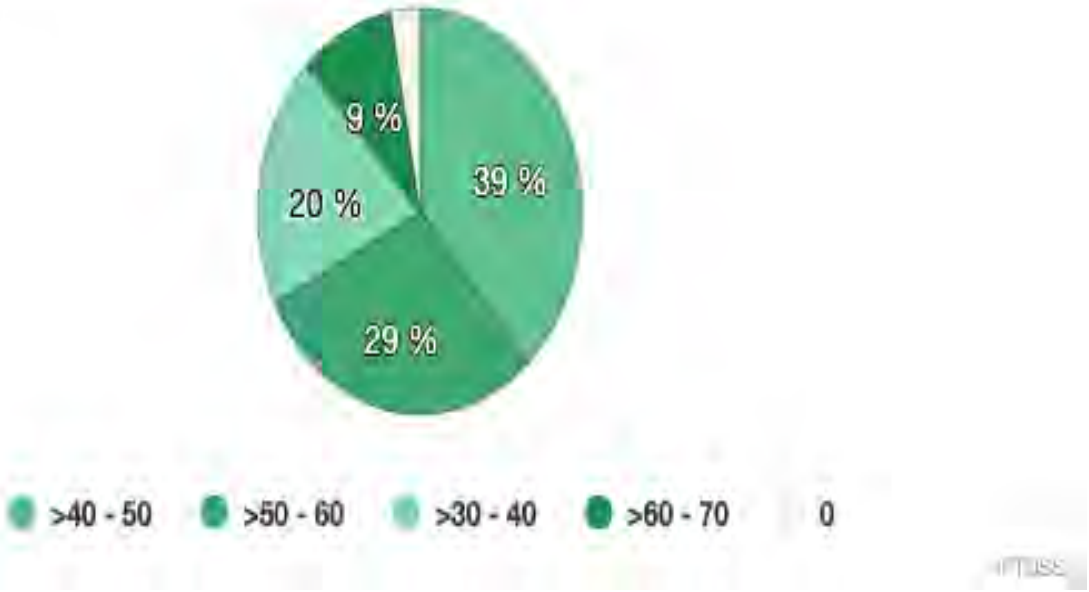
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



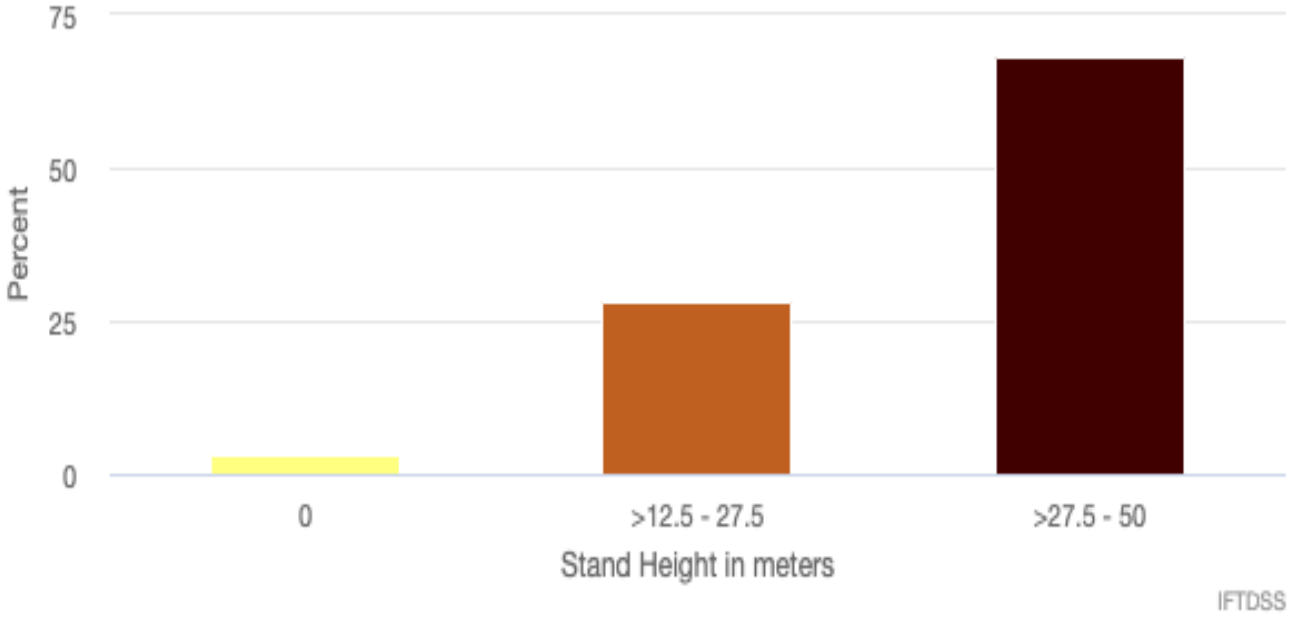
Canopy Cover

Canopy Cover (percent)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	10	2	3
>30 - 40	69	15	20
>40 - 50	132	29	39
>50 - 60	99	22	29
>60 - 70	32	7	9

Stand Height

Stand Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

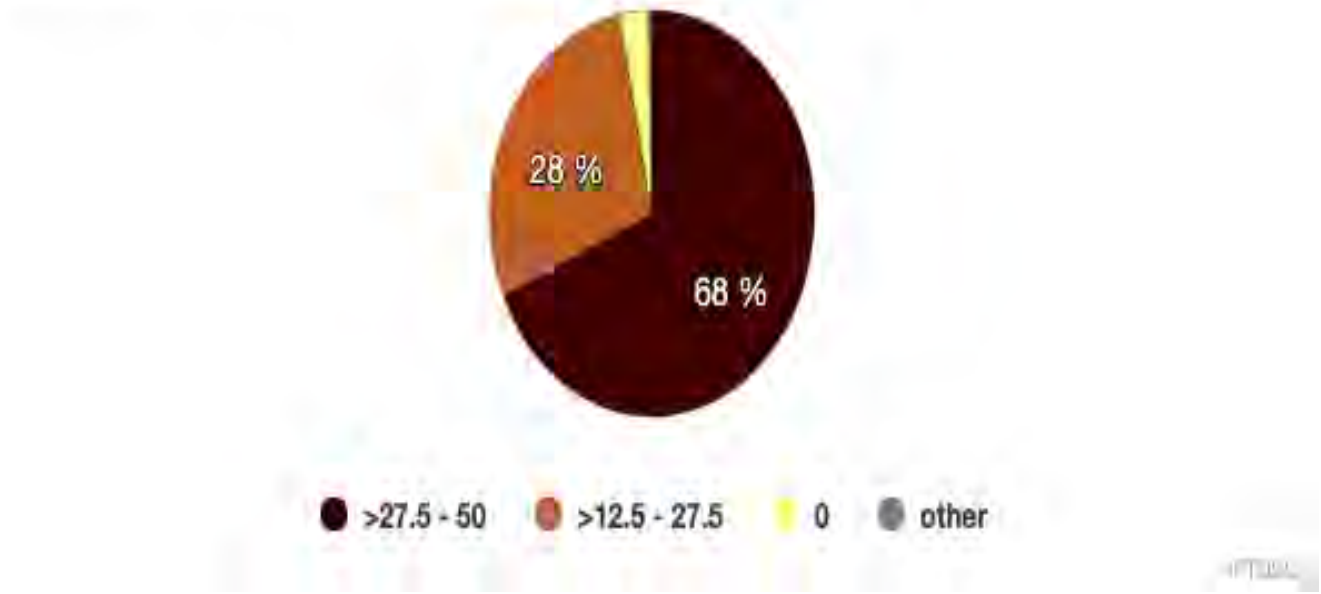
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Stand Height

Stand Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

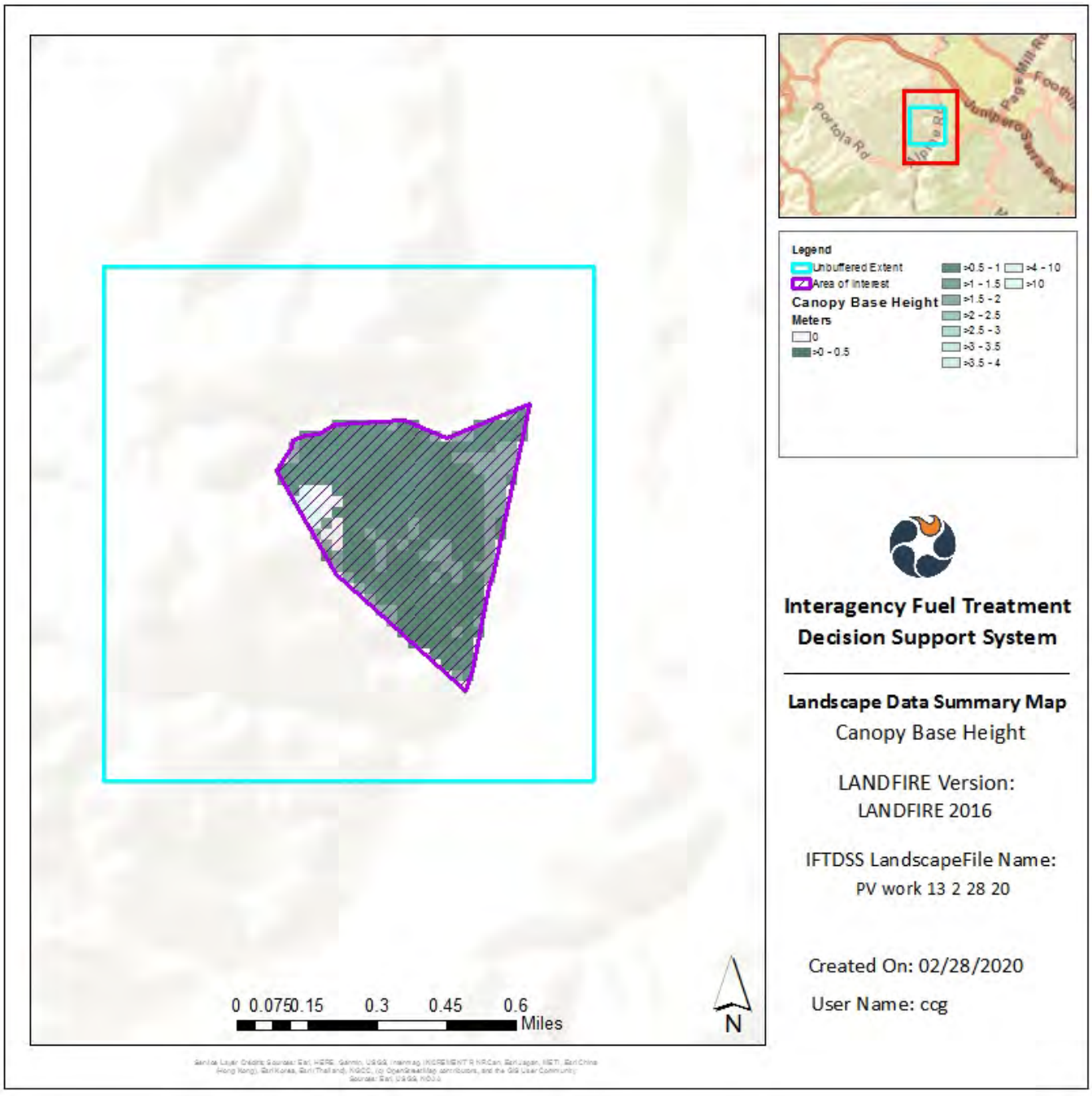
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Stand Height

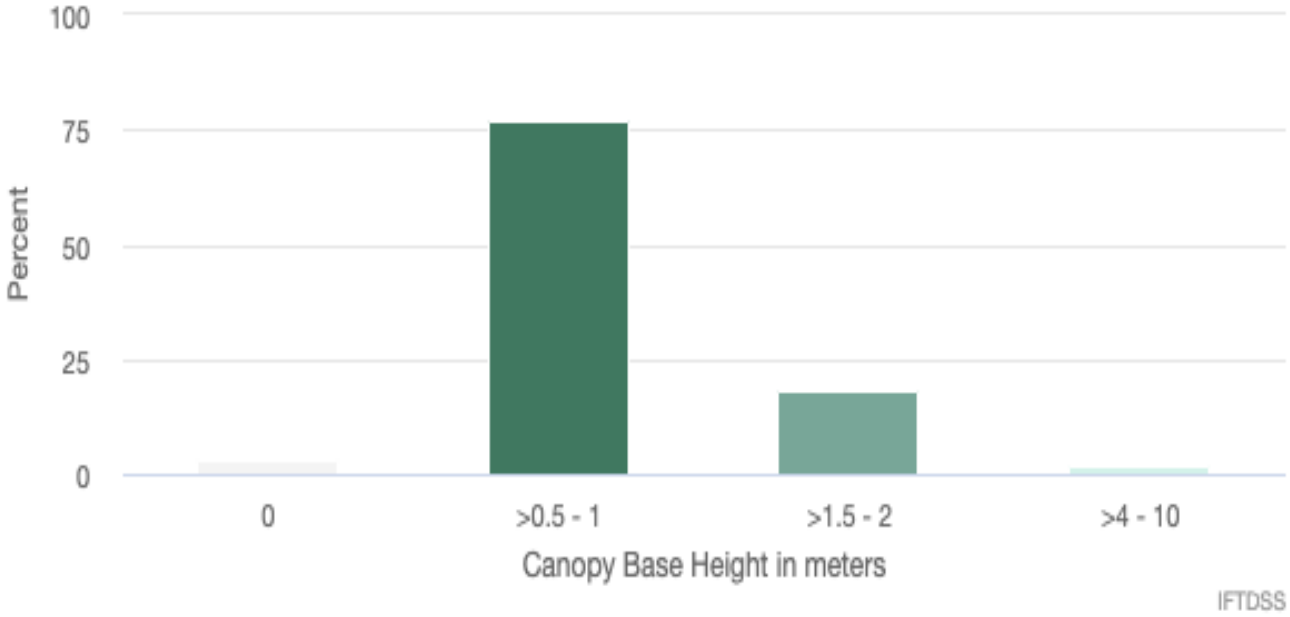
Stand Height (meters)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	10	2	3
>5 - 12.5	1	0	0
>12.5 - 27.5	97	22	28
>27.5 - 50	234	52	68

Canopy Base Height



Canopy Base Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

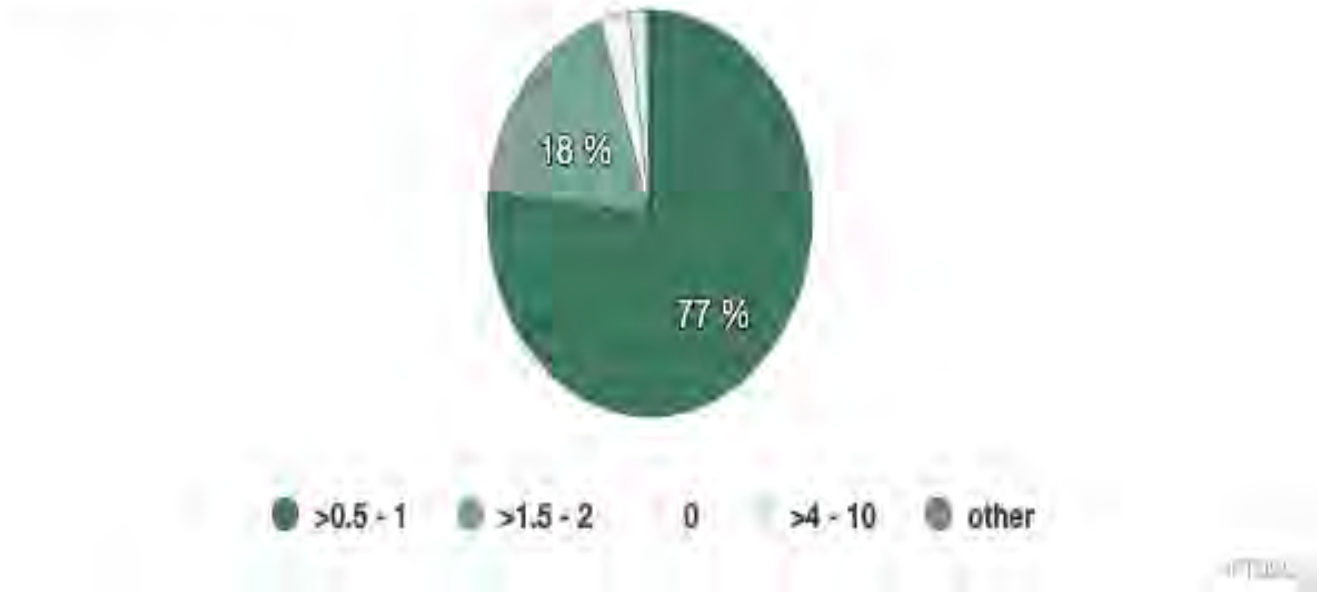
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Canopy Base Height

Canopy Base Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

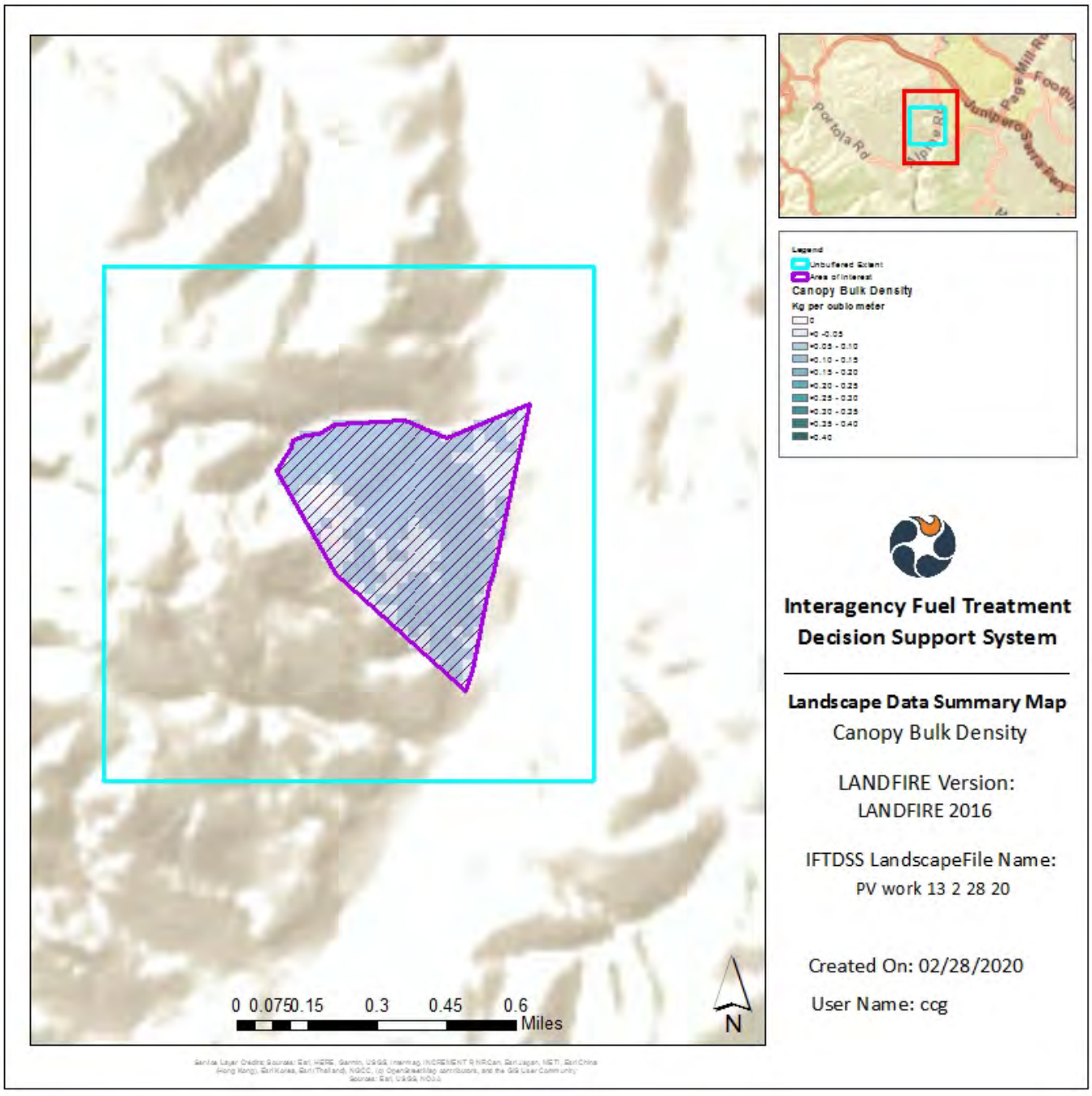
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Canopy Base Height

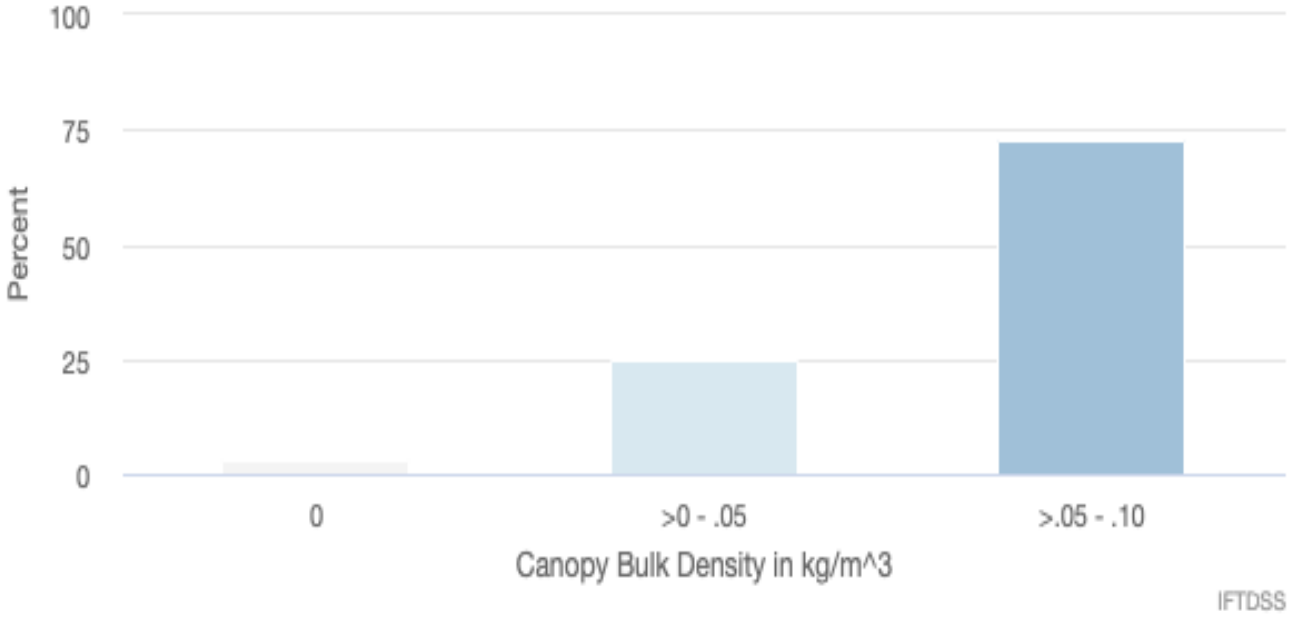
Canopy Base Height (meters)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	10	2	3
>0.5 - 1	262	58	77
>1 - 1.5	1	0	0
>1.5 - 2	63	14	18
>4 - 10	6	1	2

Canopy Bulk Density



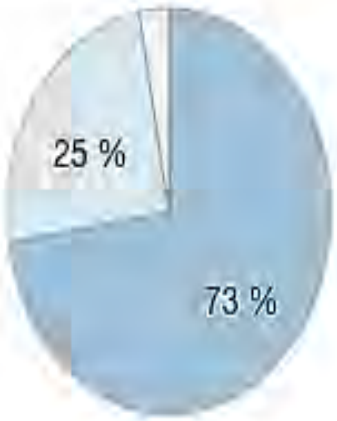
Canopy Bulk Density (kg/m^3) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Canopy Bulk Density (kg/m^3) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th

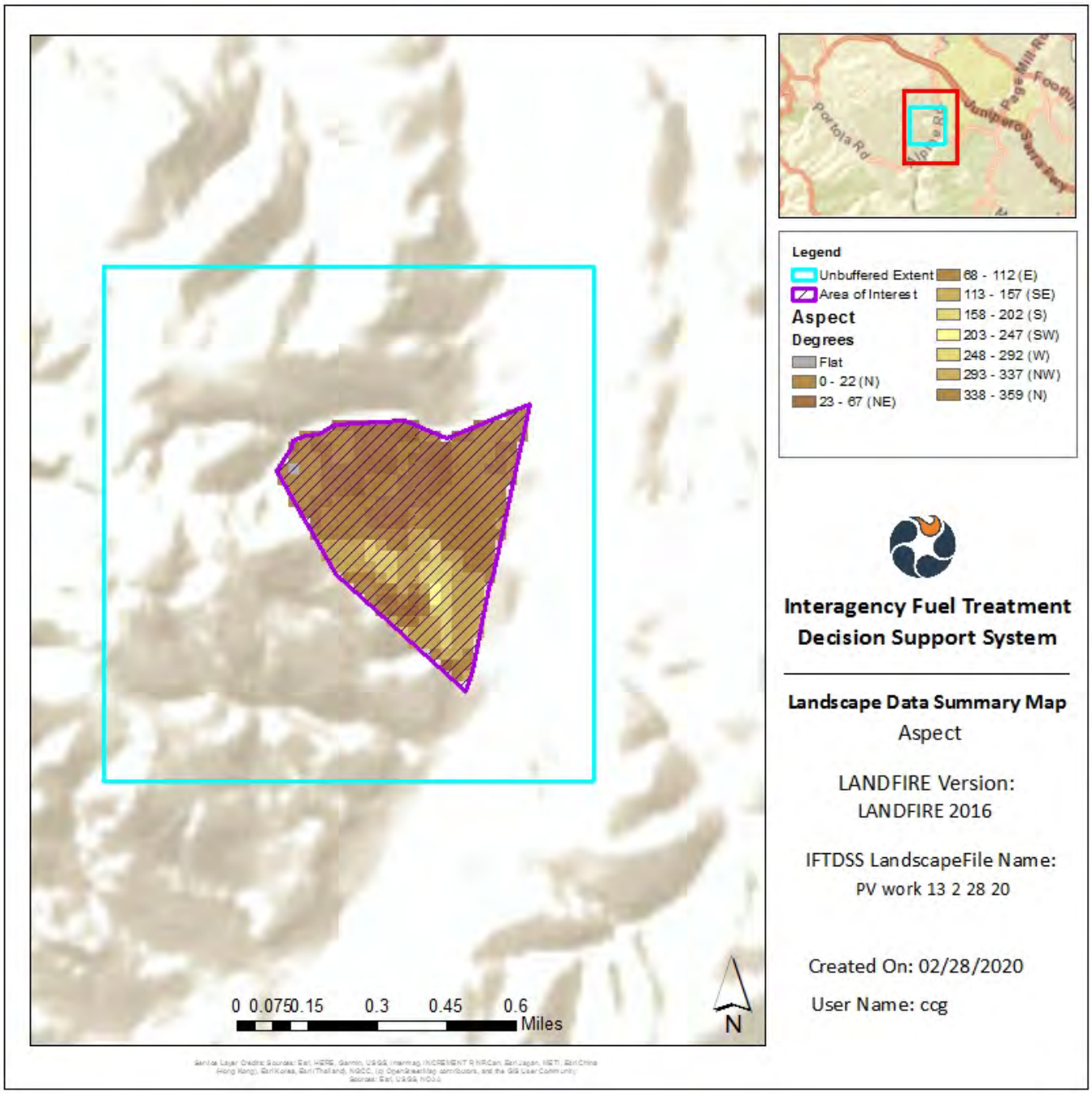


>.05 - ,10 >0 - .05 0

Canopy Bulk Density

Canopy Bulk Density (kg/m^3)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	10	2	3
>0 - .05	84	19	25
>.05 - .10	248	55	73

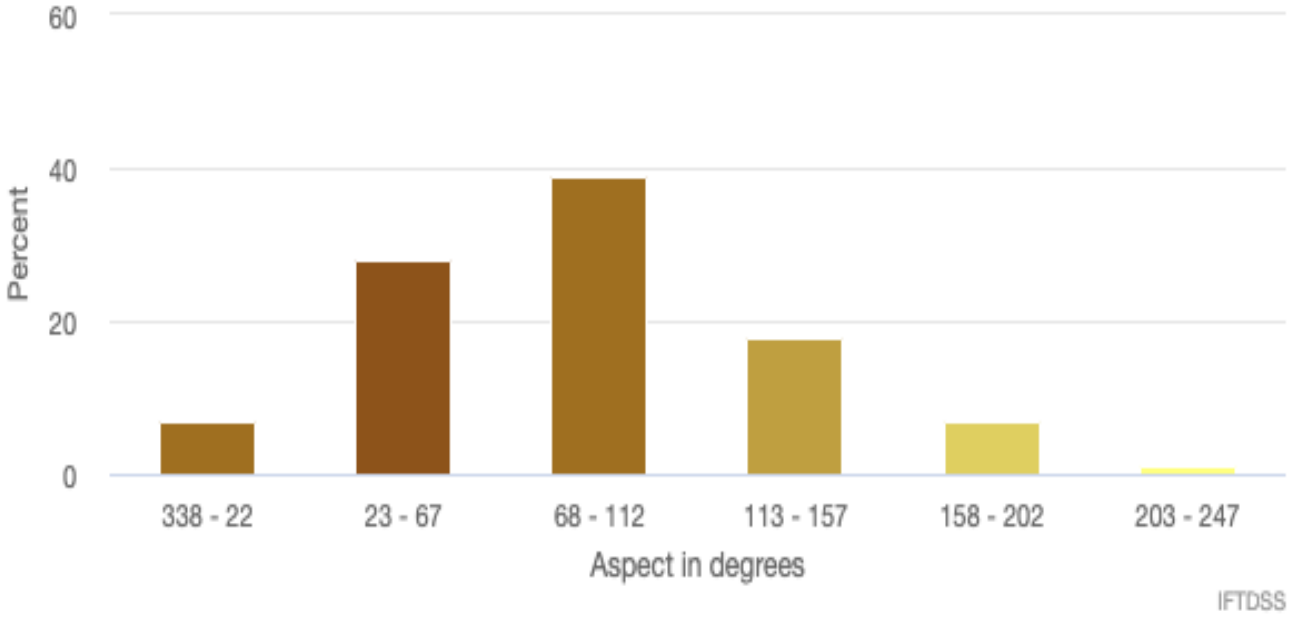
Aspect


Portola Rd
Page Mill Rd
Foothill
Junipero Serra Fwy
Legend
Unbuffered Extent
Area of Interest
Aspect
Degrees
Flat
0 - 22 (N)
23 - 67 (NE)
68 - 112 (E)
113 - 157 (SE)
158 - 202 (S)
203 - 247 (SW)
248 - 292 (W)
293 - 337 (NW)
338 - 359 (N)
0 0.075 0.15 0.3 0.45 0.6
Miles
N
Interagency Fuel Treatment Decision Support System
Landscape Data Summary Map
Aspect
LANDFIRE Version:
LANDFIRE 2016
IFTDSS LandscapeFile Name:
PV work 13 2 28 20
Created On: 02/28/2020
User Name: ccg

Aspect

Aspect (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

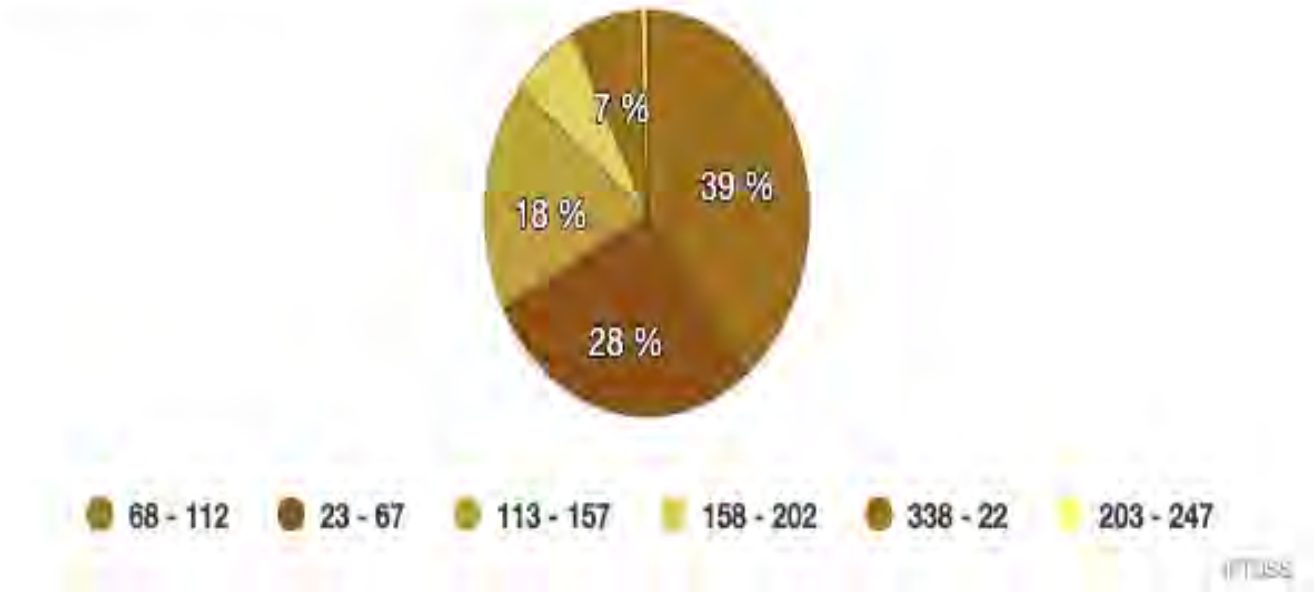
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Aspect

Aspect (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

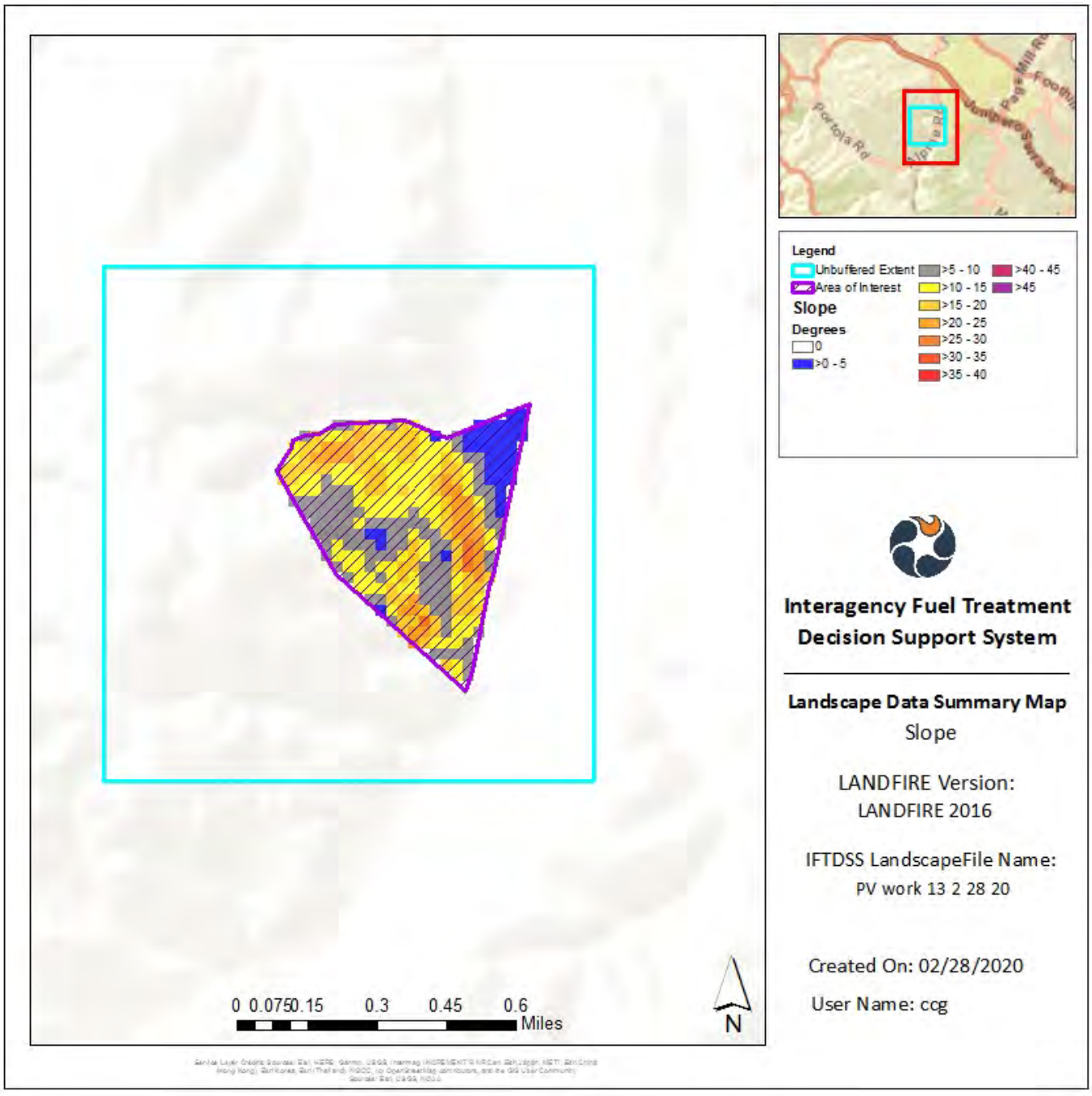
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Aspect

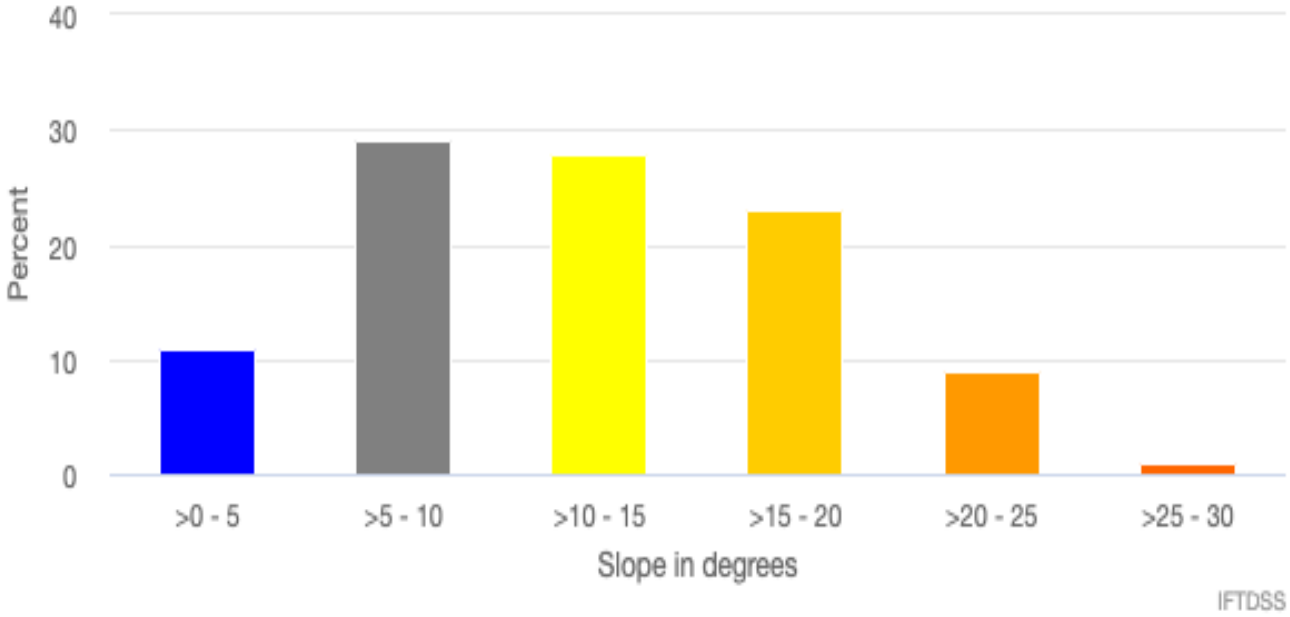
Aspect (degrees)	Pixel Count (freq)	Acres In AOI	Percent In AOI
338 - 22 (N)	24	5	7
23 - 67 (NE)	95	21	28
68 - 112 (E)	135	30	39
113 - 157 (SE)	63	14	18
158 - 202 (S)	23	5	7
203 - 247 (SW)	2	0	1

Slope


Legend
Unbuffered Extent
Area of Interest
Slope
Degrees
0
>0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 25
>25 - 30
>30 - 35
>35 - 40
>40 - 45
>45
0 0.075 0.15 0.3 0.45 0.6
Miles
N
Interagency Fuel Treatment Decision Support System
Landscape Data Summary Map
Slope
LANDFIRE Version:
LANDFIRE 2016
IFTDSS LandscapeFile Name:
PV work 13 2 28 20
Created On: 02/28/2020
User Name: ccg

Slope (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

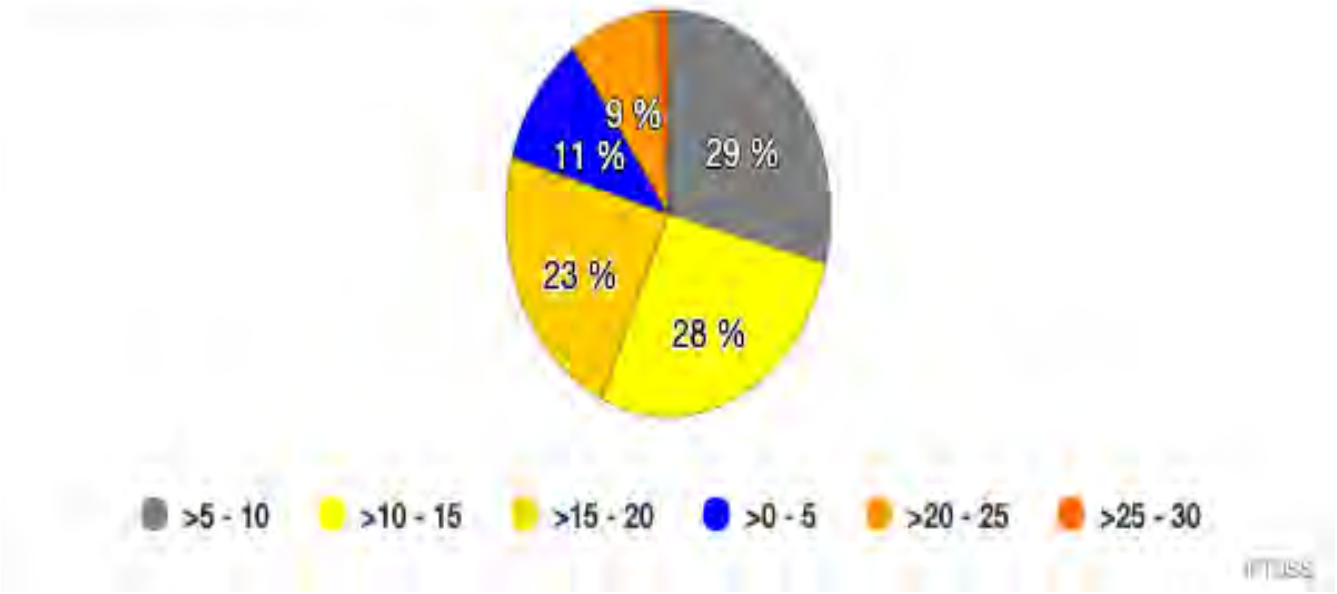
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Slope

Slope (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

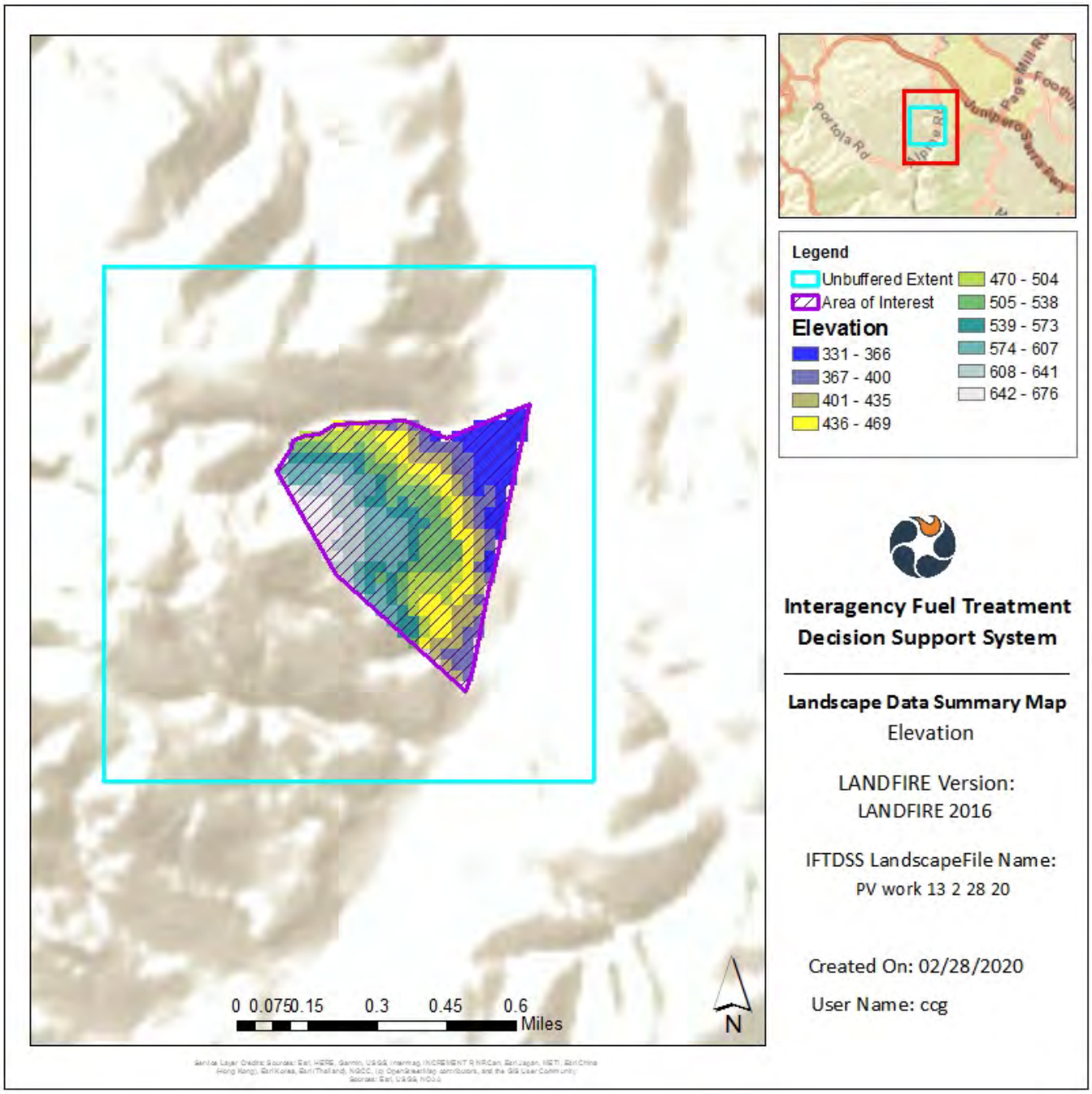
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Slope

Slope (degrees)	Pixel Count (freq)	Acres In AOI	Percent In AOI
>0 - 5	36	8	11
>5 - 10	99	22	29
>10 - 15	95	21	28
>15 - 20	78	17	23
>20 - 25	30	7	9
>25 - 30	4	1	1

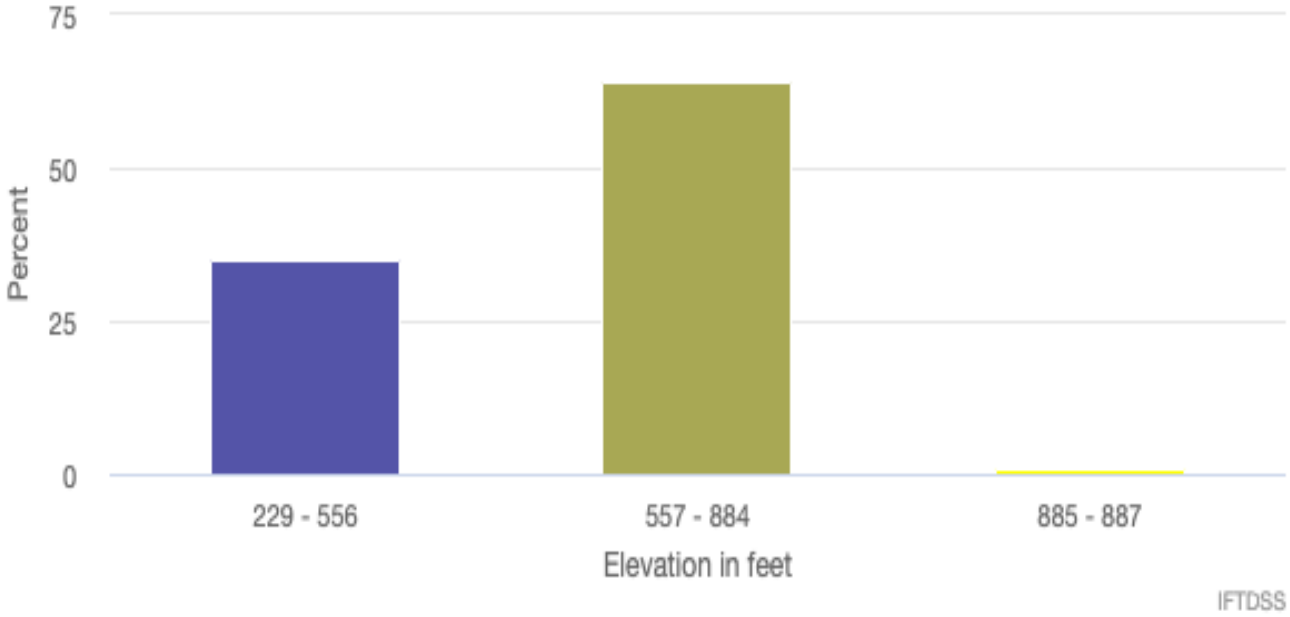
Elevation


Portola Rd
Page Mill Rd
Foothill
Junipero Serra Fwy
Legend
Unbuffered Extent
Area of Interest
Elevation
331 - 366
367 - 400
401 - 435
436 - 469
470 - 504
505 - 538
539 - 573
574 - 607
608 - 641
642 - 676
Interagency Fuel Treatment Decision Support System
Landscape Data Summary Map
Elevation
LANDFIRE Version:
LANDFIRE 2016
IFTDSS LandscapeFile Name:
PV work 13 2 28 20
Created On: 02/28/2020
User Name: ccg
0 0.075 0.15 0.3 0.45 0.6
Miles
N

Elevation

Elevation (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

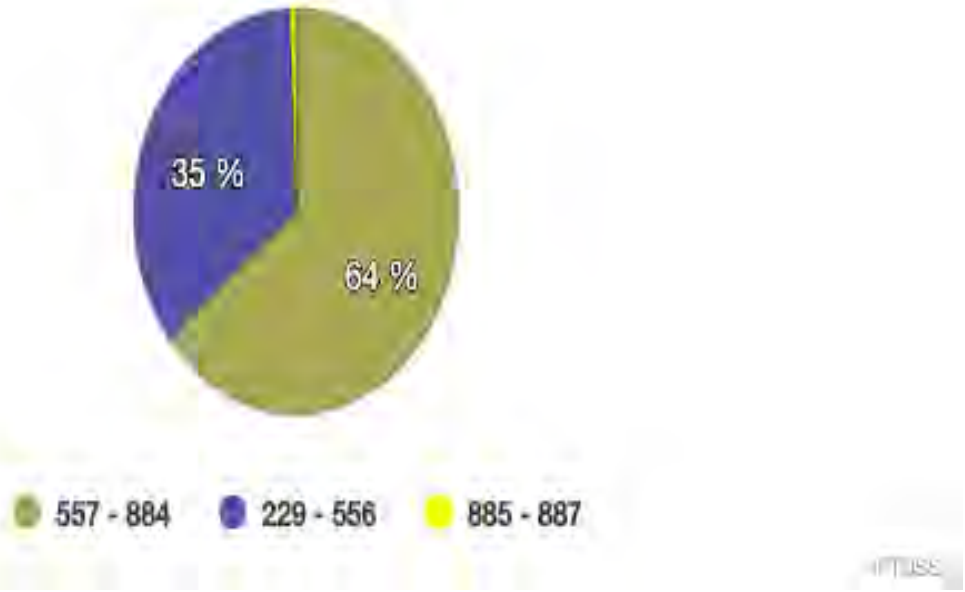
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Elevation

Elevation (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

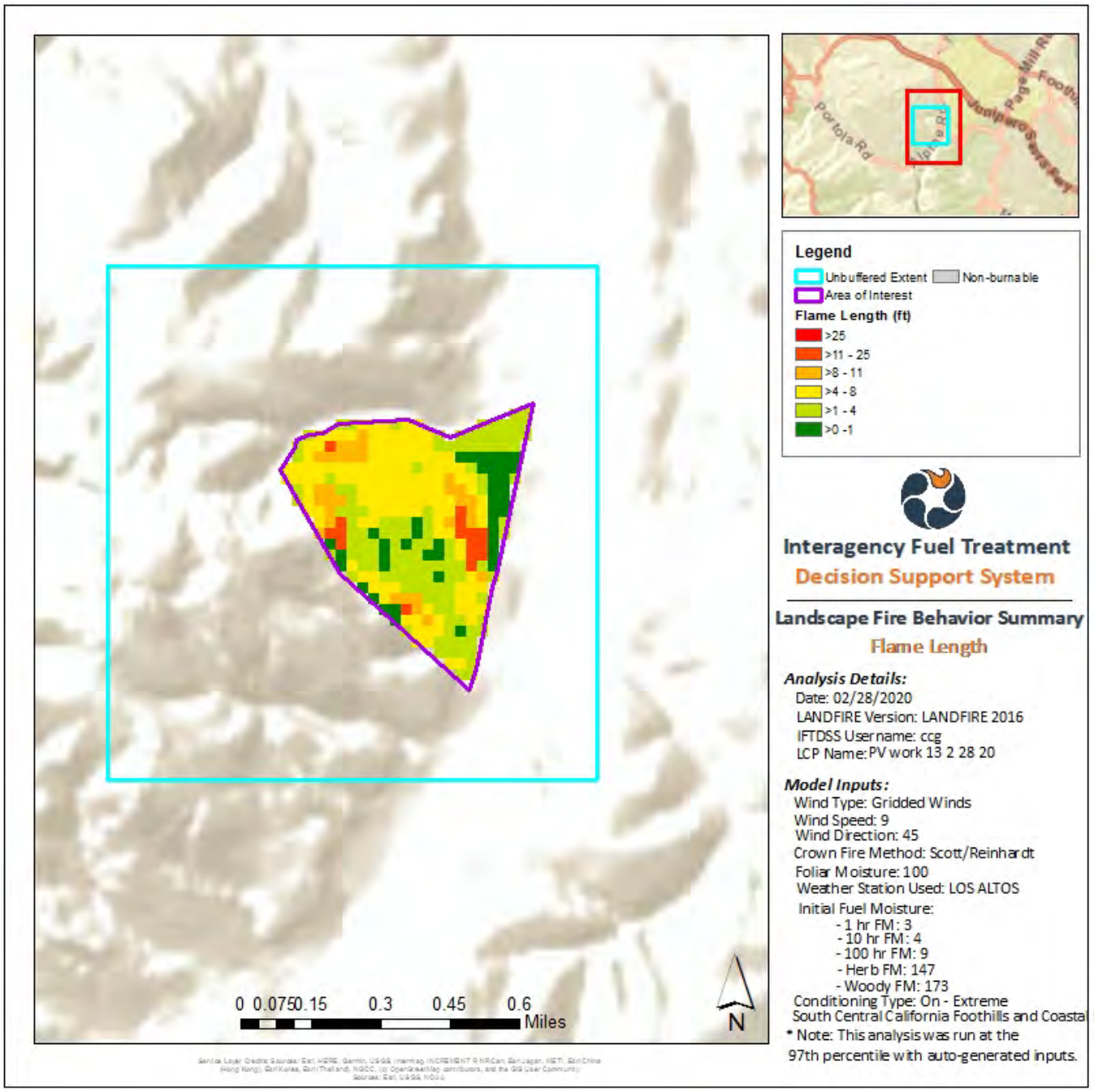
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Elevation

Elevation (feet)	Pixel Count (freq)	Acres In AOI	Percent In AOI
229 - 556	120	27	35
557 - 884	220	49	64
885 - 887	2	0	1

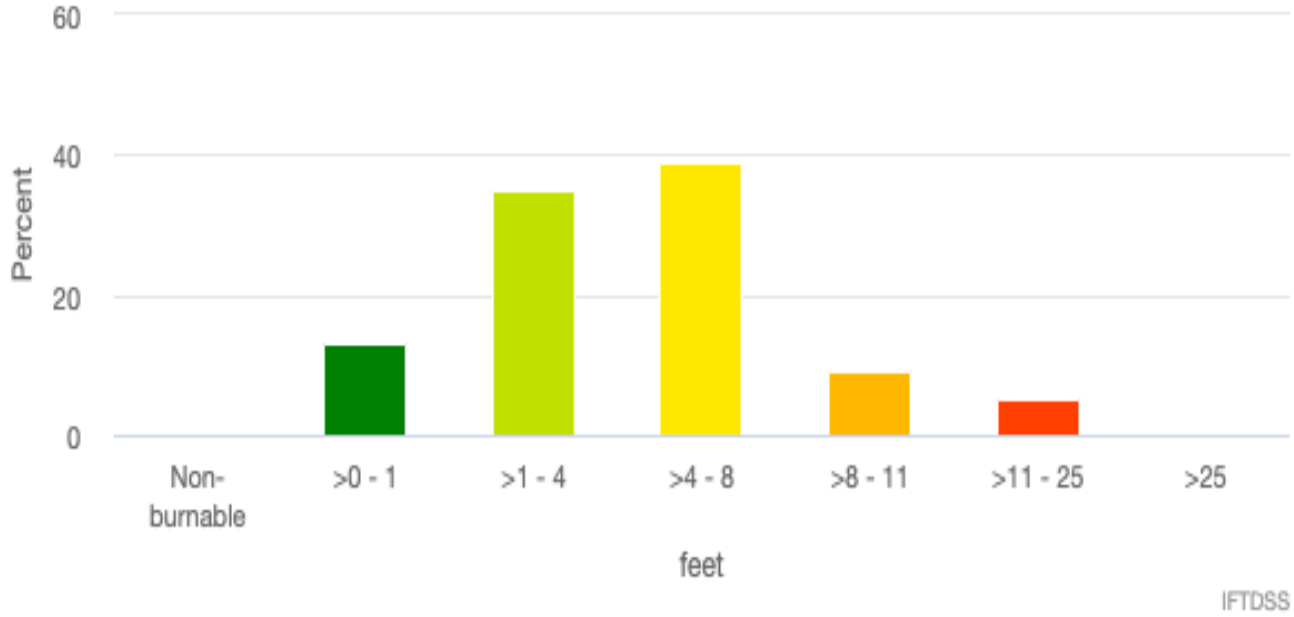
Flame Length



Flame Length

Flame Length (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

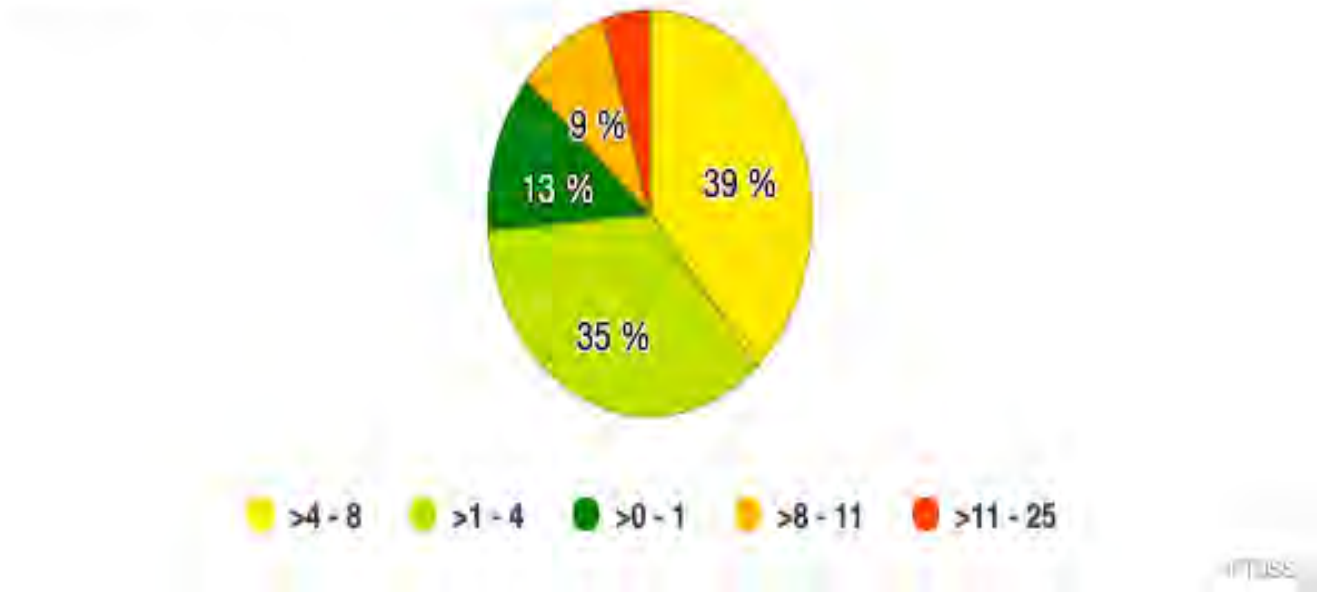
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Flame Length

Flame Length (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

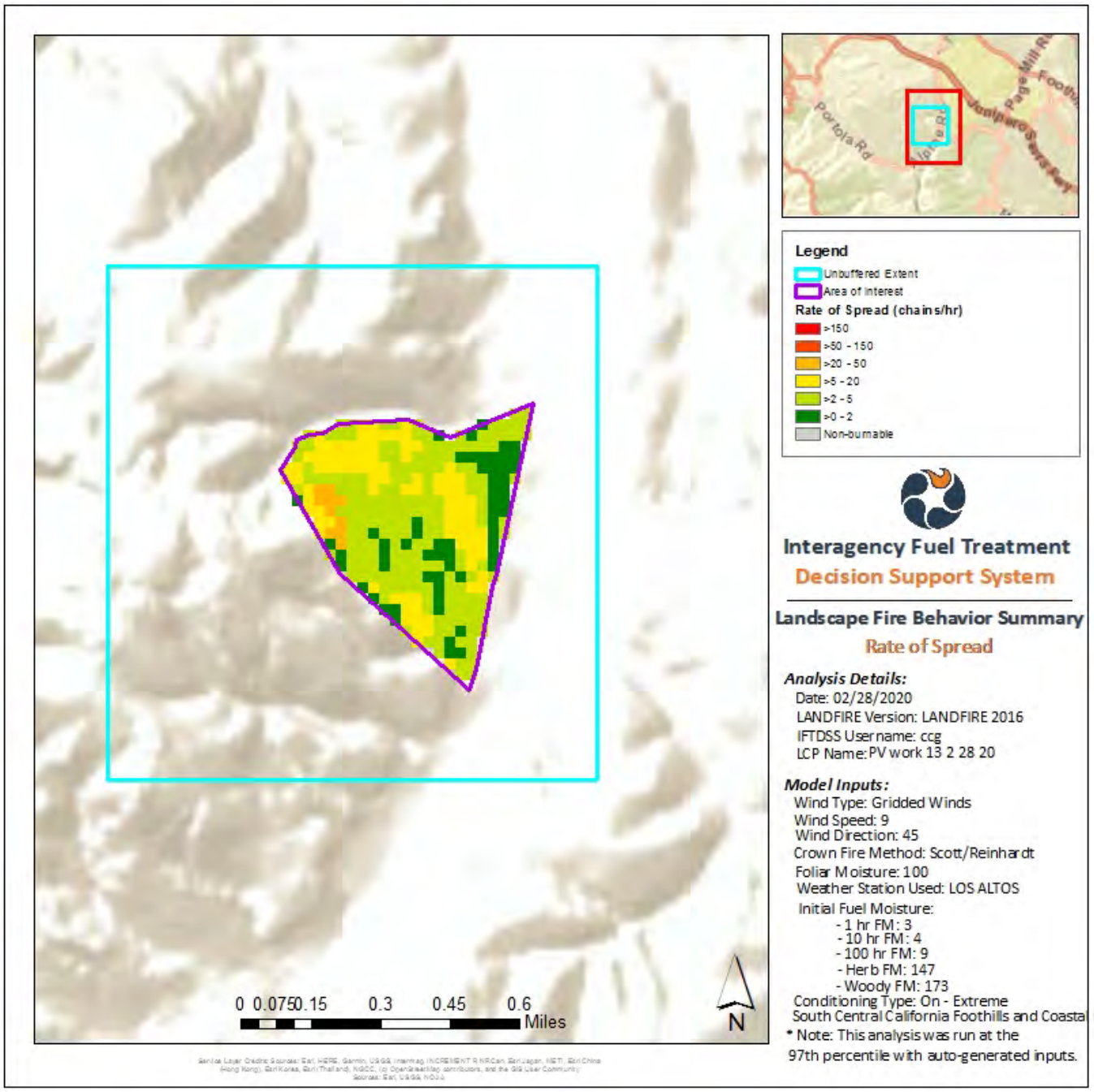
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Flame Length

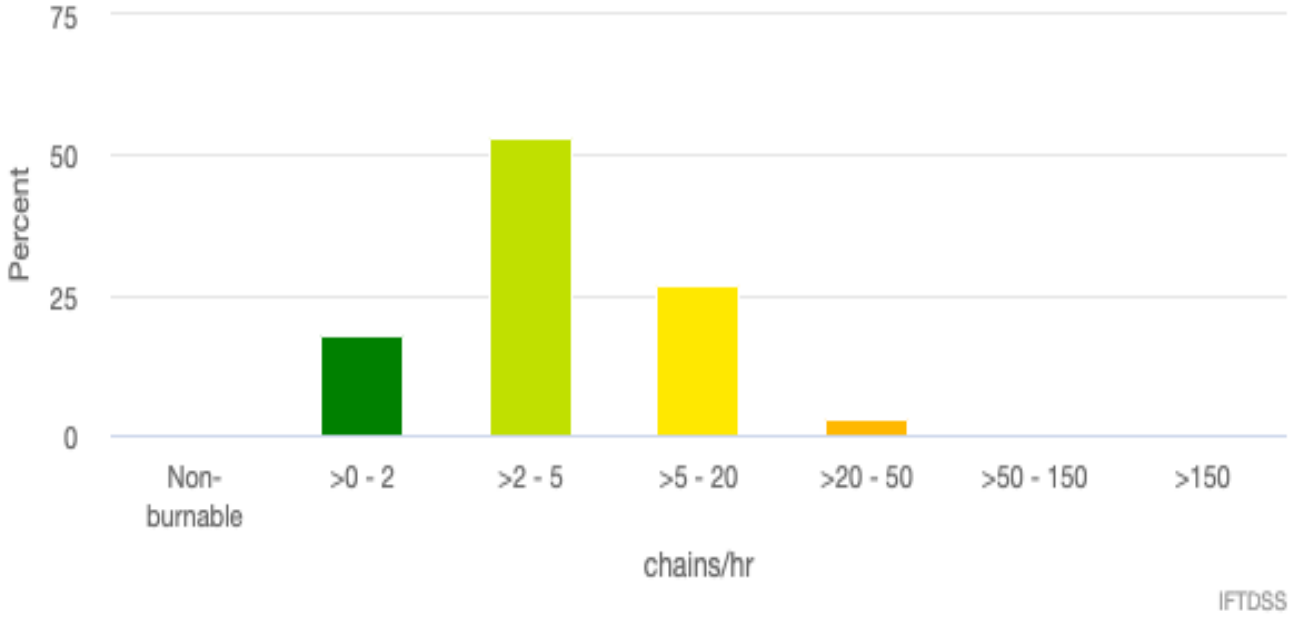
Flame Length (feet)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	0	0	0
>0 - 1	43	10	13
>1 - 4	120	27	35
>4 - 8	132	29	39
>8 - 11	31	7	9
>11 - 25	16	4	5
>25	0	0	0

Spread Rate


Legend
Unbuffered Extent
Area of interest
Rate of Spread (chains/hr)
>150
>50 - 150
>20 - 50
>5 - 20
>2 - 5
>0 - 2
Non-burnable
0 0.075 0.15 0.3 0.45 0.6
Miles
N
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Rate of Spread
Analysis Details:
Date: 02/28/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work 13 2 28 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.

Rate of Spread (chains/hr) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

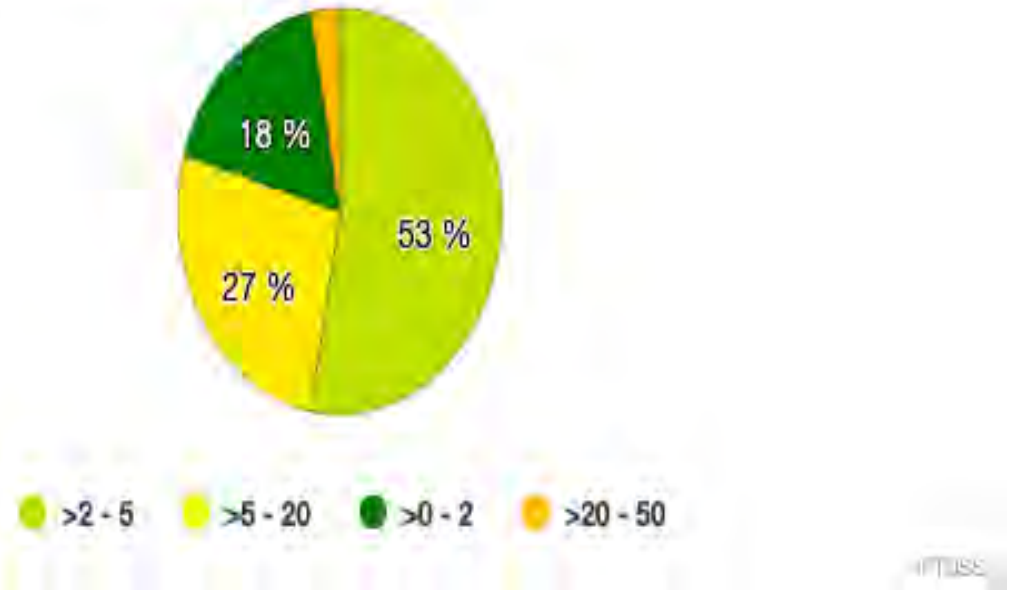
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Spread Rate

Rate of Spread (chains/hr) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

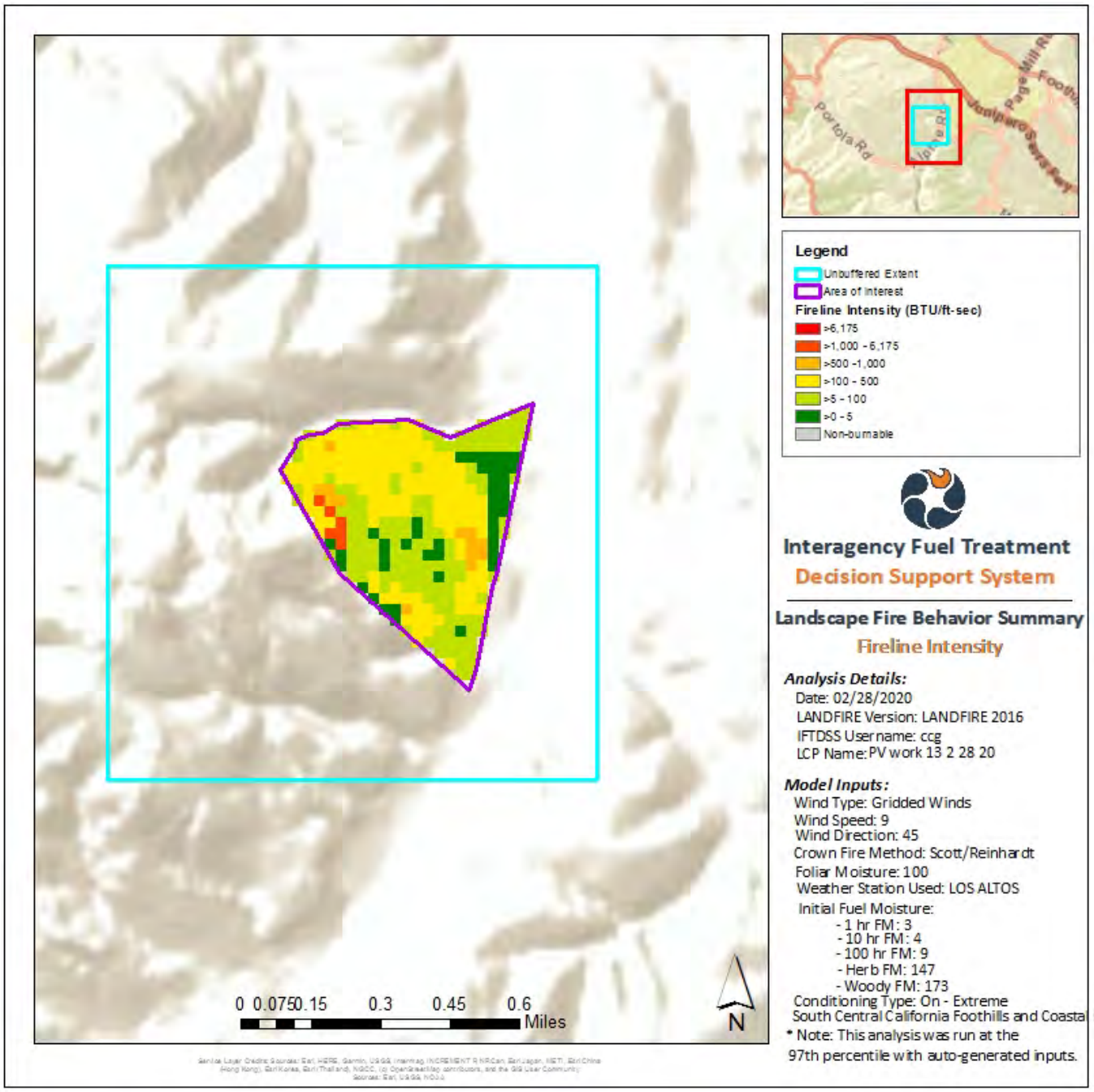
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Spread Rate

Rate of Spread (chains/hr)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	0	0	0
>0 - 2	60	13	18
>2 - 5	181	40	53
>5 - 20	91	20	27
>20 - 50	10	2	3
>50 - 150	0	0	0
>150	0	0	0

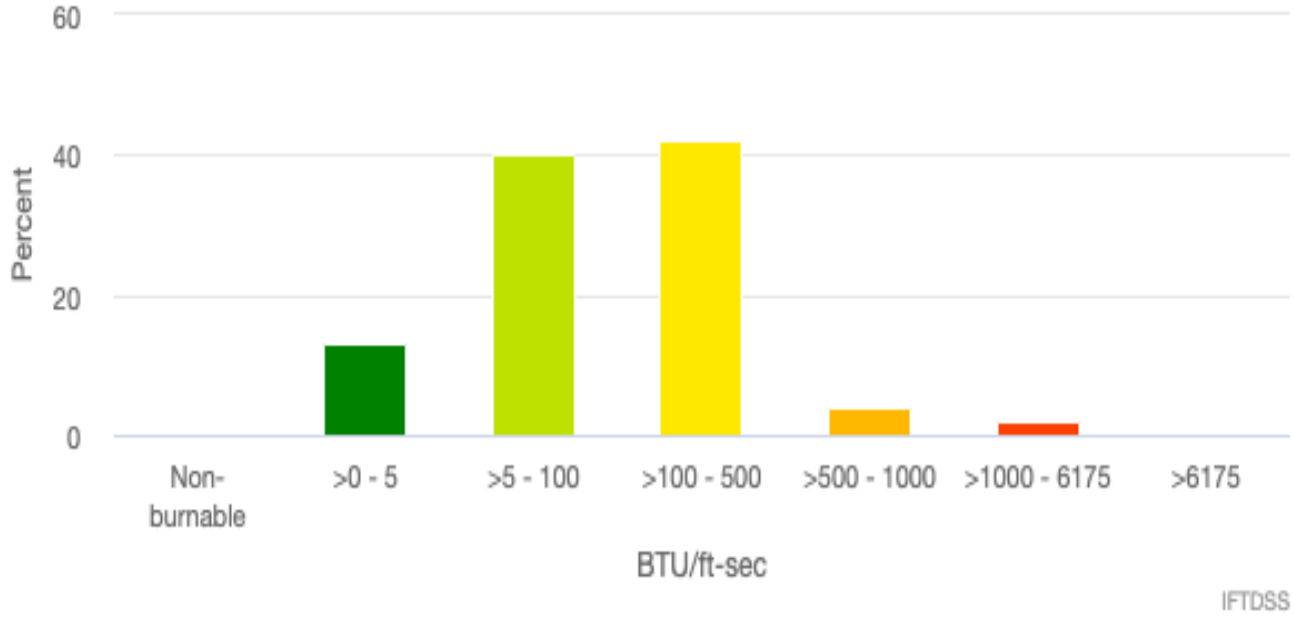
Intensity


Legend
Unbuffered Extent
Area of Interest
Fireline Intensity (BTU/ft-sec)
>6,175
>1,000 - 6,175
>500 -1,000
>100 - 500
>5 - 100
>0 - 5
Non-burnable
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Fireline Intensity
Analysis Details:
Date: 02/28/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work 13 2 28 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.
0 0.075 0.15 0.3 0.45 0.6
Miles
N

Intensity

Fireline Intensity (BTU/ft-sec) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

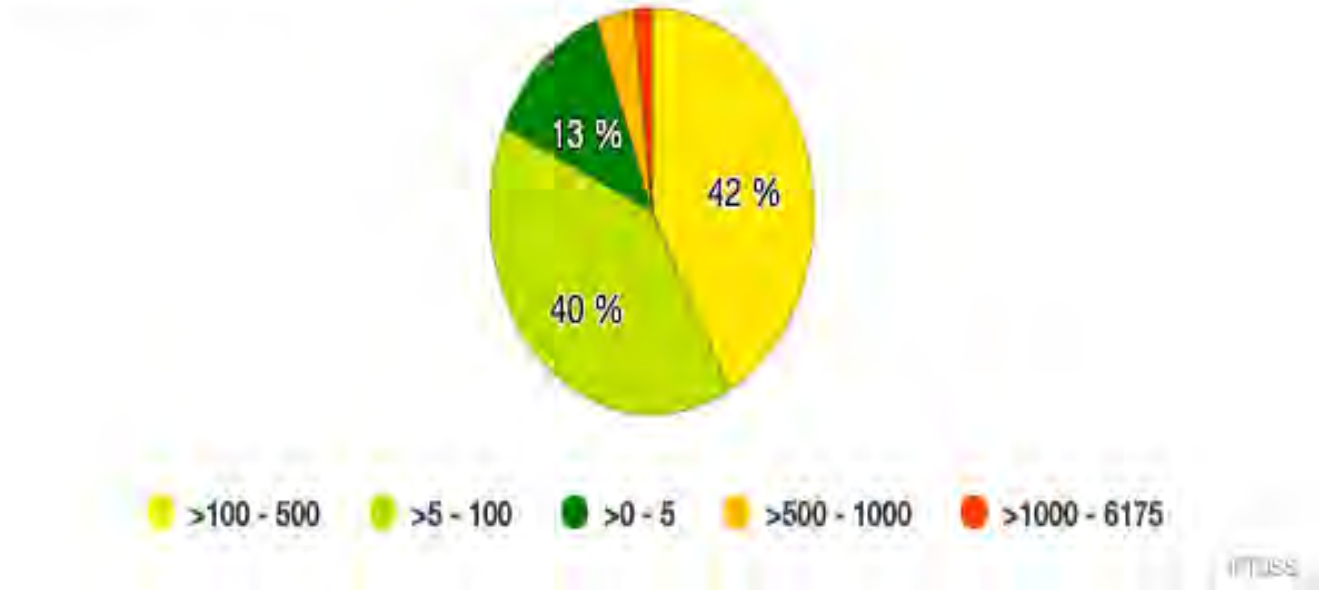
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Intensity

Fireline Intensity (BTU/ft-sec) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

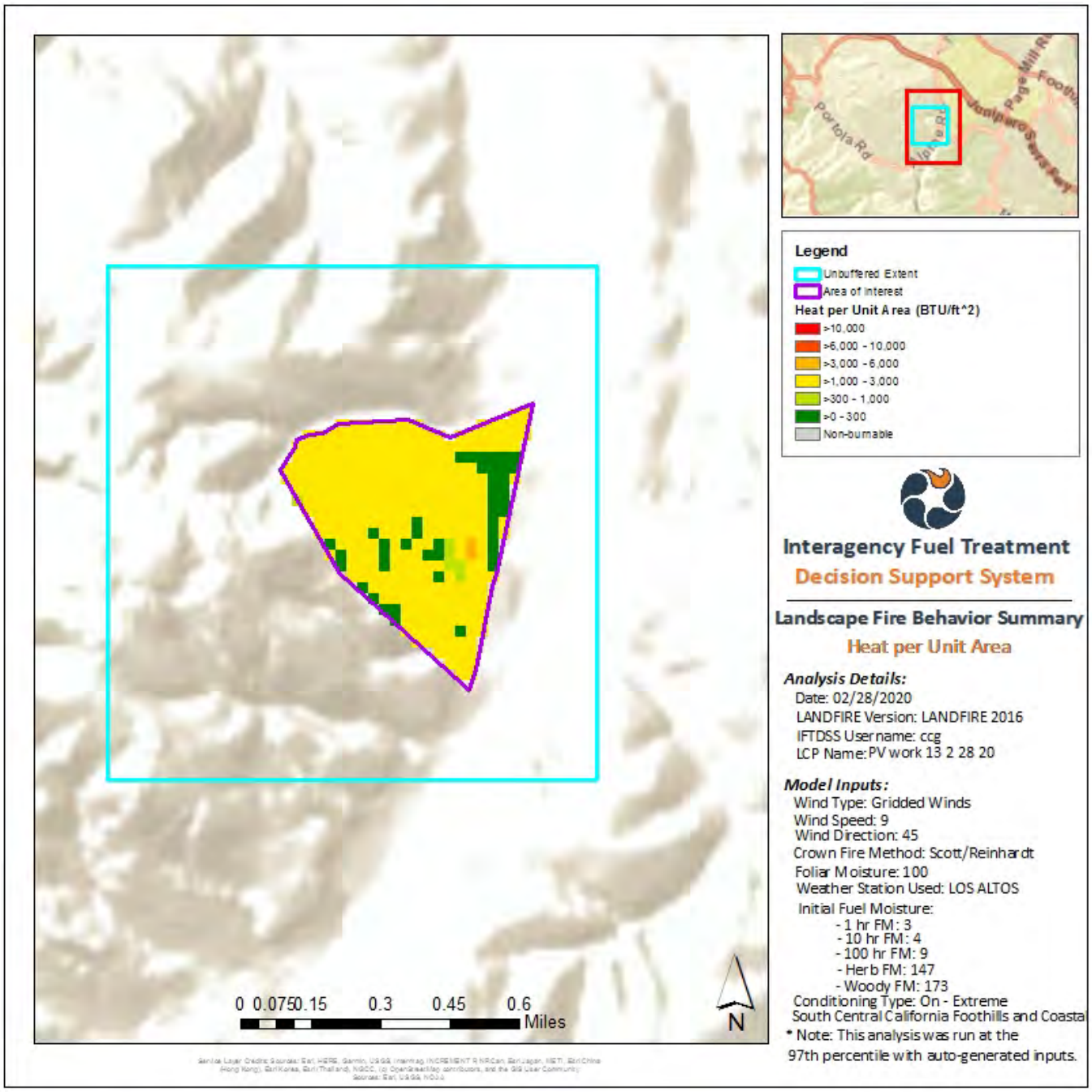
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Intensity

Fireline Intensity (BTU/ft-sec)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	0	0	0
>0 - 5	43	10	13
>5 - 100	136	30	40
>100 - 500	144	32	42
>500 - 1,000	13	3	4
>1,000 - 6,175	6	1	2
>6,175	0	0	0

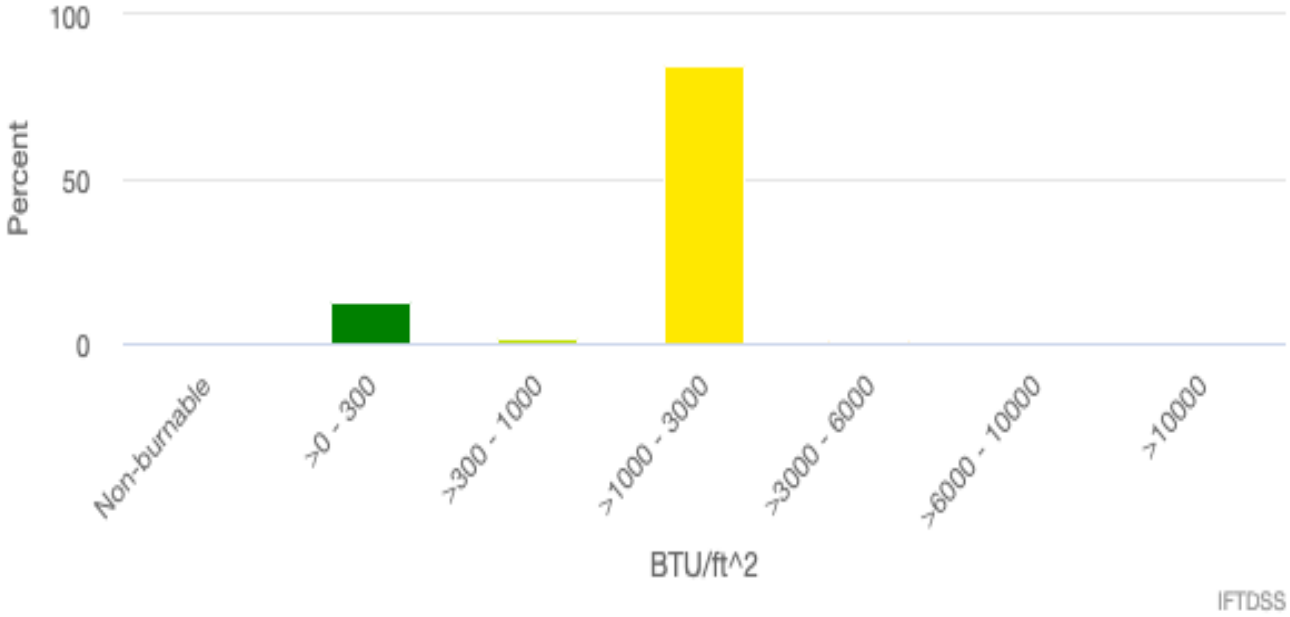
Heat/Area


Legend
Unbuffered Extent
Area of interest
Heat per Unit Area (BTU/ft^2)
>10,000
>6,000 - 10,000
>3,000 - 6,000
>1,000 - 3,000
>300 - 1,000
>0 - 300
Non-burnable
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Heat per Unit Area
Analysis Details:
Date: 02/28/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work 13 2 28 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.
0 0.075 0.15 0.3 0.45 0.6
Miles
N

Heat/Area

Heat per Unit Area (BTU/ft^2) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

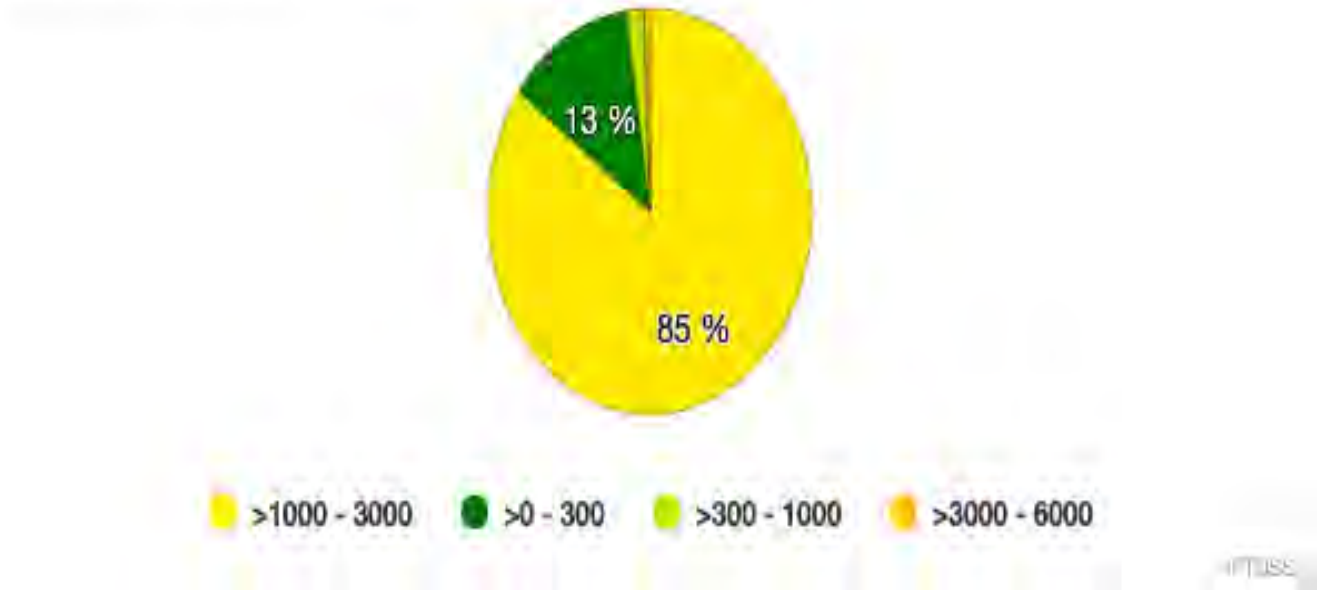
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Heat/Area

Heat per Unit Area (BTU/ft^2) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

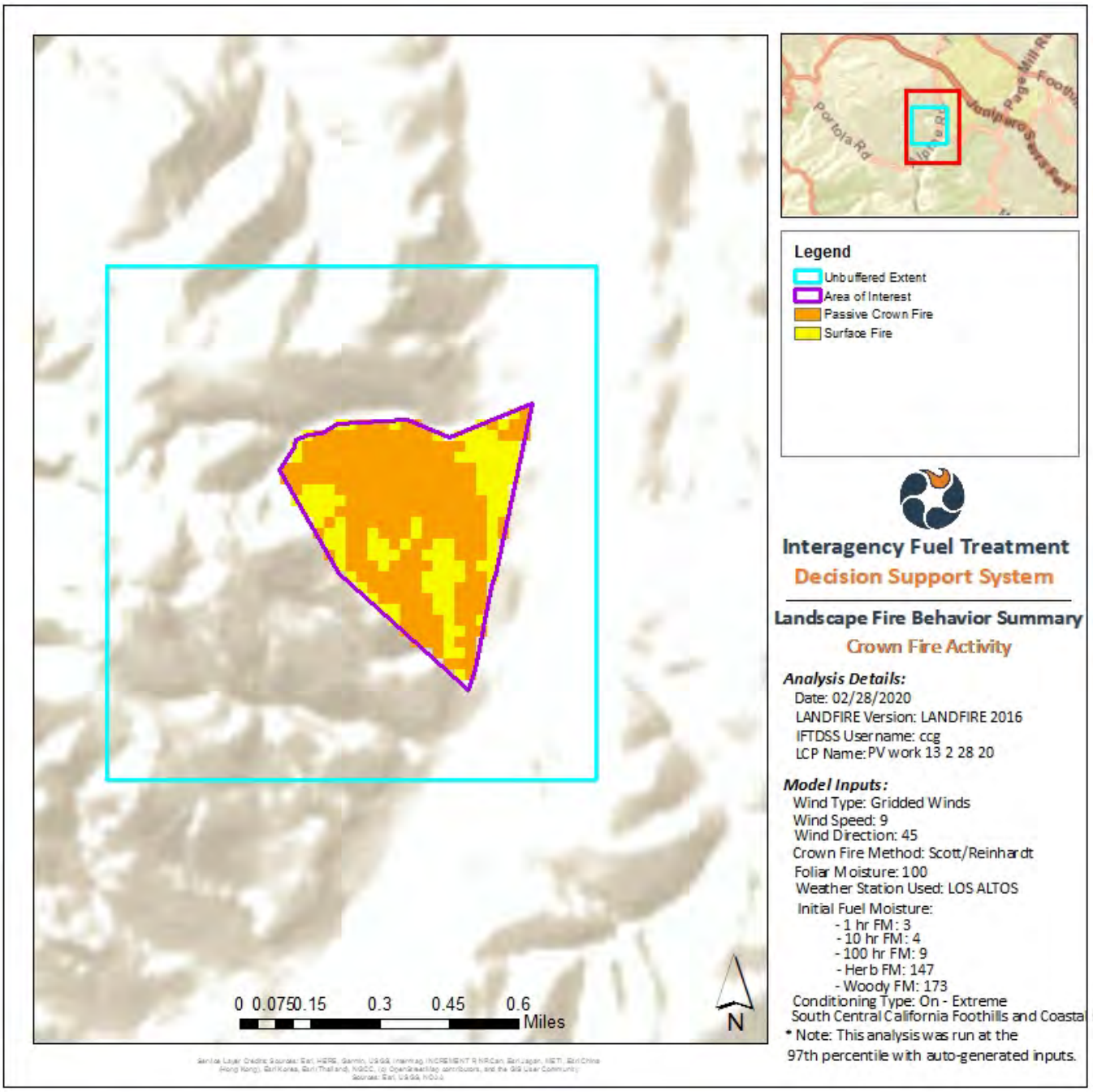
Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Heat/Area

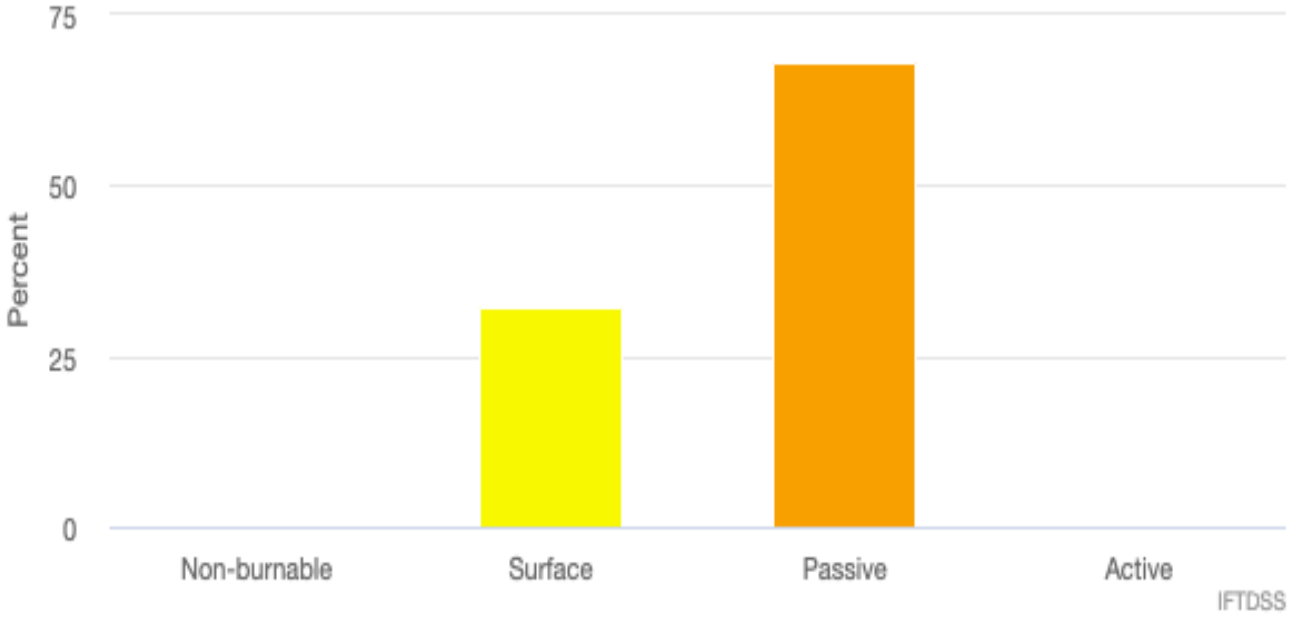
Heat per Unit Area (BTU/ft^2)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	0	0	0
>0 - 300	43	10	13
>300 - 1,000	6	1	2
>1,000 - 3,000	291	65	85
>3,000 - 6,000	2	0	1
>6,000 - 10,000	0	0	0
>10,000	0	0	0

Crown Fire


Legend
Unbuffered Extent
Area of Interest
Passive Crown Fire
Surface Fire
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Crown Fire Activity
Analysis Details:
Date: 02/28/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work 13 2 28 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.
0 0.075 0.15 0.3 0.45 0.6
Miles
N

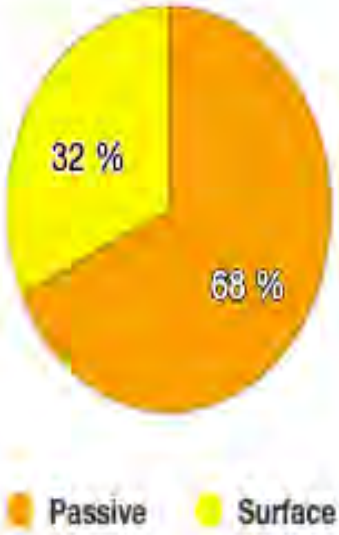
Crown Fire Activity Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Crown Fire Activity Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_13_2_28_20" Landscape

Source Landscape Name: PV_work_13_2_28_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_13_2_28_20 - Auto97th



Crown Fire

Crown Fire Activity	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	0	0	0
Surface Fire	109	24	32
Passive Fire	233	52	68
Active Fire	0	0	0

Report: Auto97th
Landfire Version: LANDFIRE 2016
Landscape Name: PV_work_post_treat_1_3_5_20
Landscape Acres: 470
Area of Interest: pv_aoi_3_3_20

Prepared for: Scott Conway
3/10/2020, 1:06:17 PM

Model Parameters

Run Name: PV_work_post_treat_1_3_5_20 - Auto97th

Model Type: Landscape Fire Behavior

Run Date: Mar 5, 2020 1:22:07 PM

Wind Type: Gridded Winds

Wind Speed: 9 mph

Wind Direction: 45 deg

Crown Fire Method: Scott/Reinhardt

Foliar Moisture: 100

Conditioning: On - Extreme - South Central California Foothills and Coastal Mountains

Conditioning start: , NaN/NaN/NaN

Days conditioned:

Conditioning start: 1300, 7/9/2012

Conditioning end:1600, 7/12/2012

Station Name: LOS ALTOS

Station Observation Start Date: Mar 6, 2005 12:00:00 AM

Station Observation End Date: Oct 4, 2016 12:00:00 AM

Station Elevation: 539

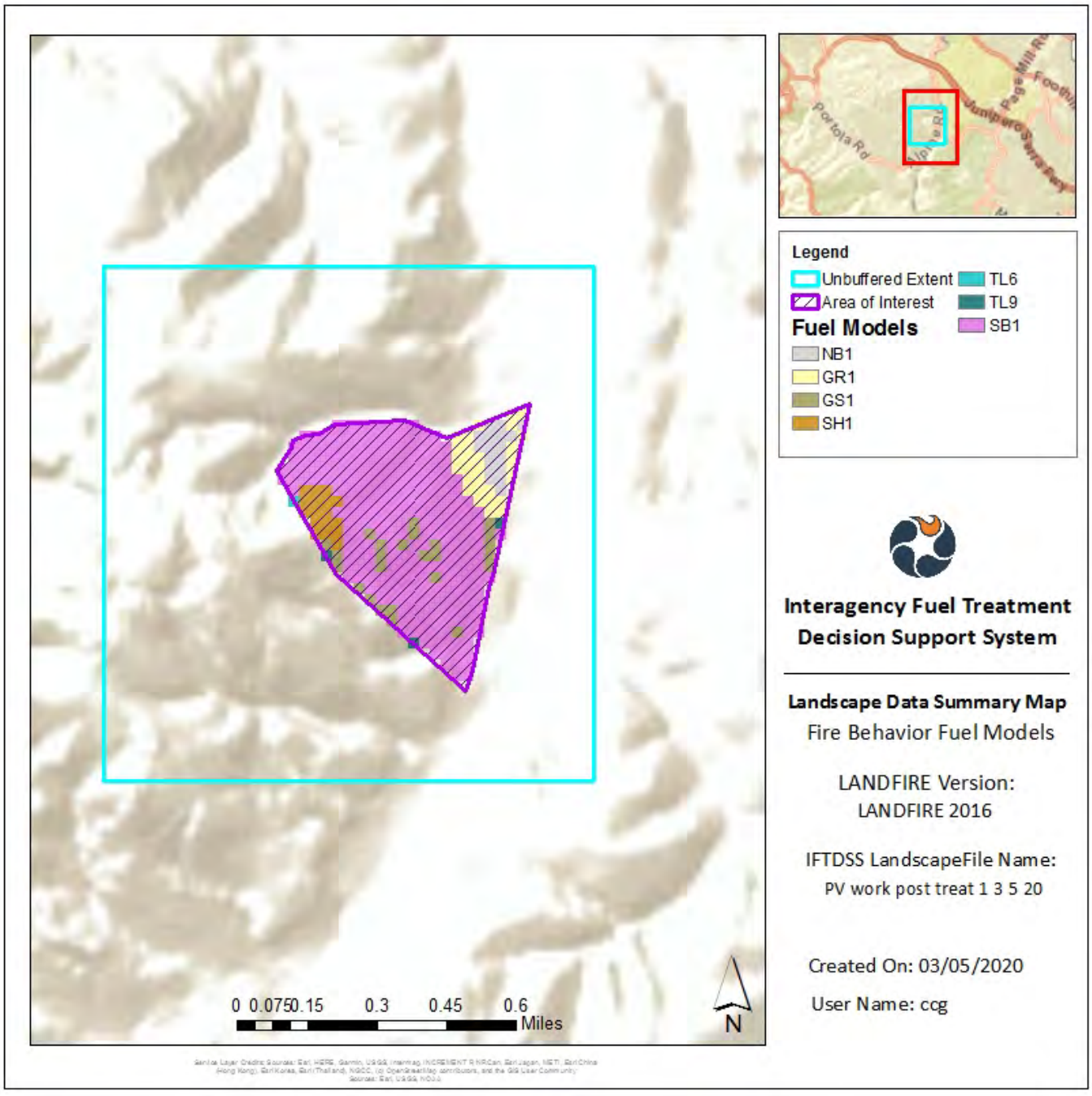
Station Aspect: 6

Station Latitude: 37.355

Station Longitude: 122.1419444

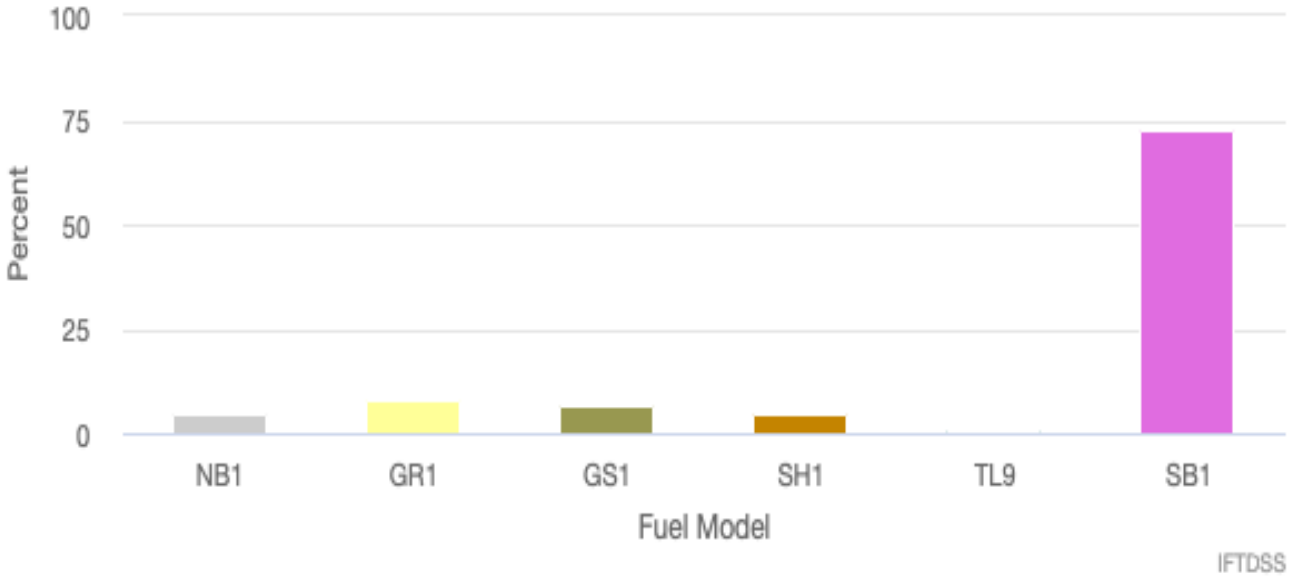
Fuel Model	1 Hr Fuel Moisture	10 Hr Fuel Moisture	100 Hr Fuel Moisture	Live Herbaceous Fuel Moisture	Live Woody Fuel Moisture
All	3	4	9	147	173

Fuel Model (FBFM)



Fuel Model Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

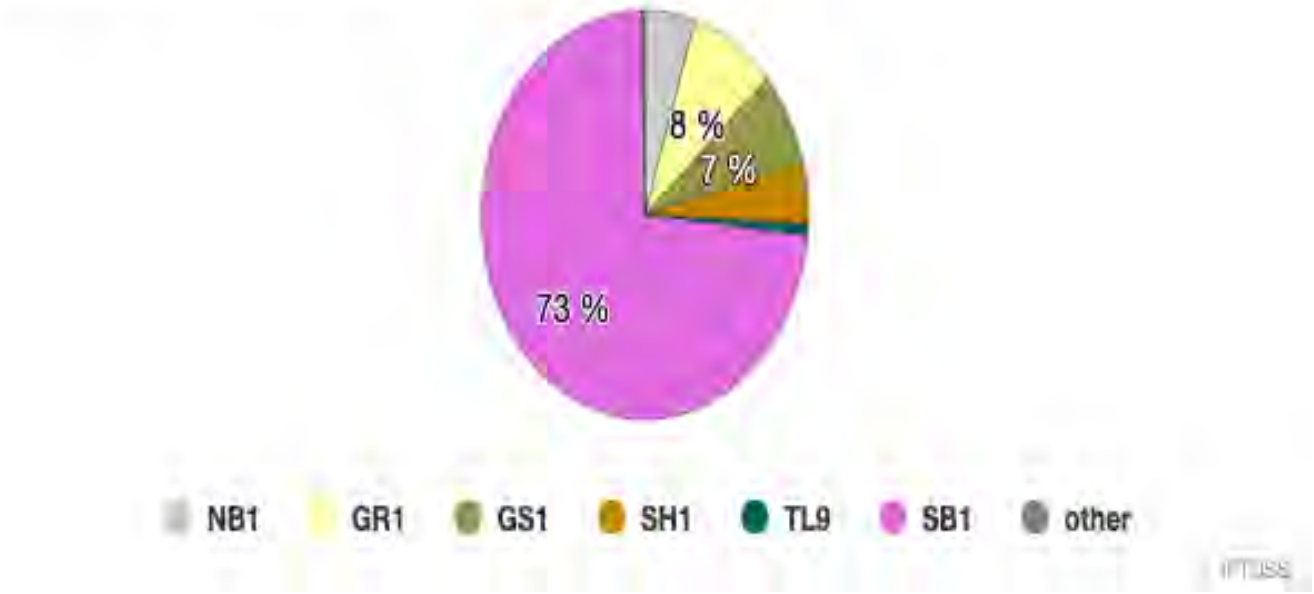
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th
Distribution under 1% not shown



Fuel Model (FBFM)

Fuel Model Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

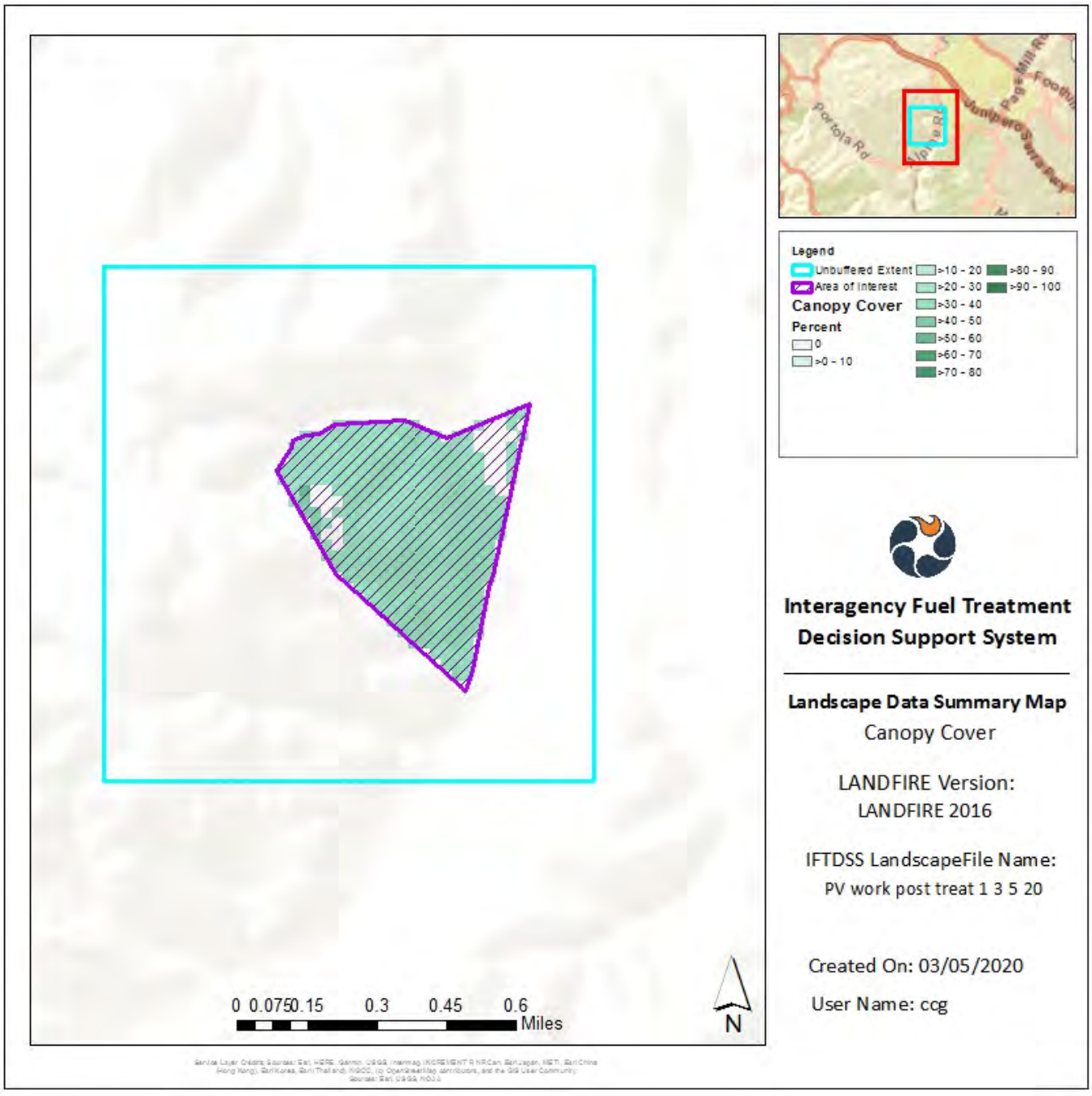
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Fuel Model (FBFM)

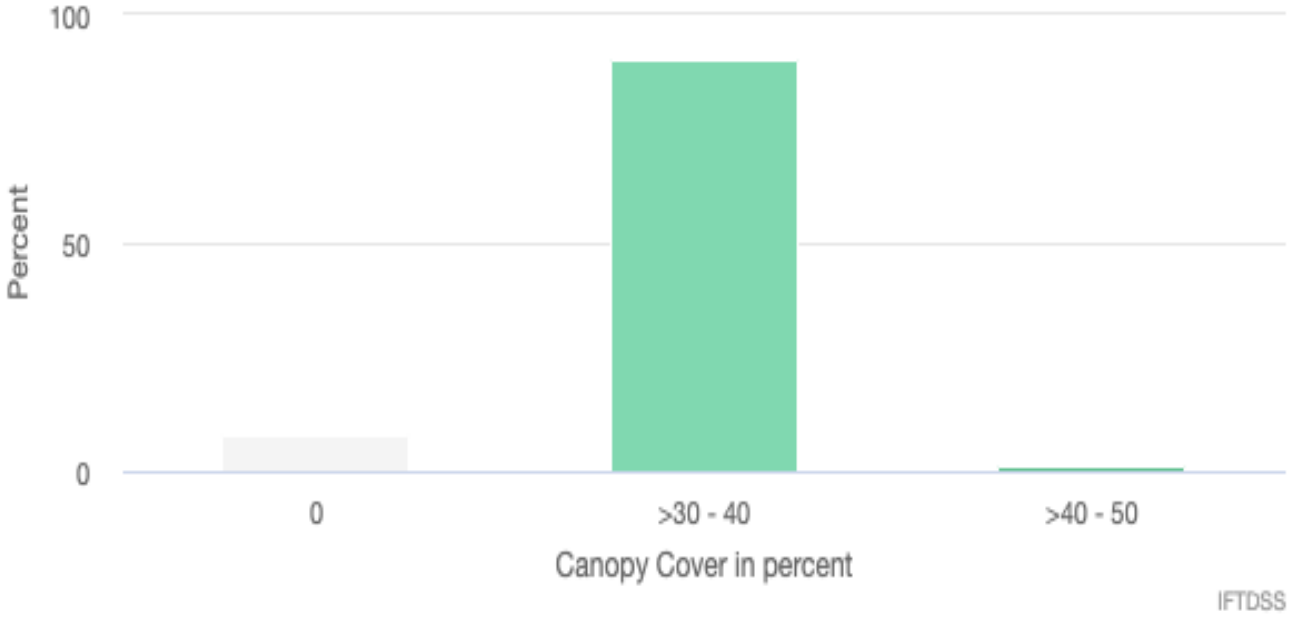
Fuel Model	Pixel Count (freq)	Acres In AOI	Percent In AOI
NB1 (91)	17	4	5
GR1 (101)	29	6	8
GS1 (121)	25	6	7
SH1 (141)	17	4	5
TL6 (186)	1	0	0
TL9 (189)	3	1	1
SB1 (201)	250	56	73

Canopy Cover



Canopy Cover (percent) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

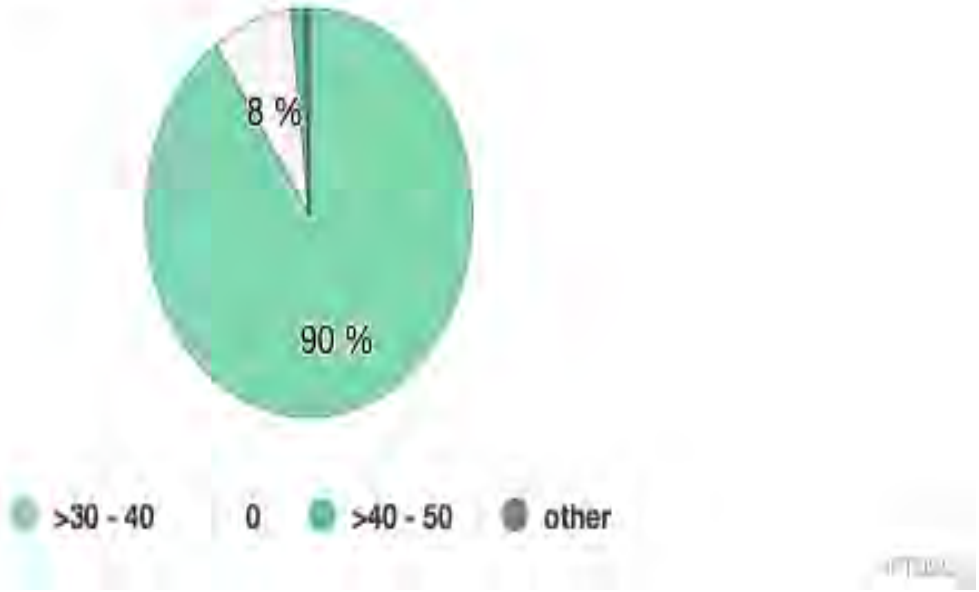
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Canopy Cover

Canopy Cover (percent) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

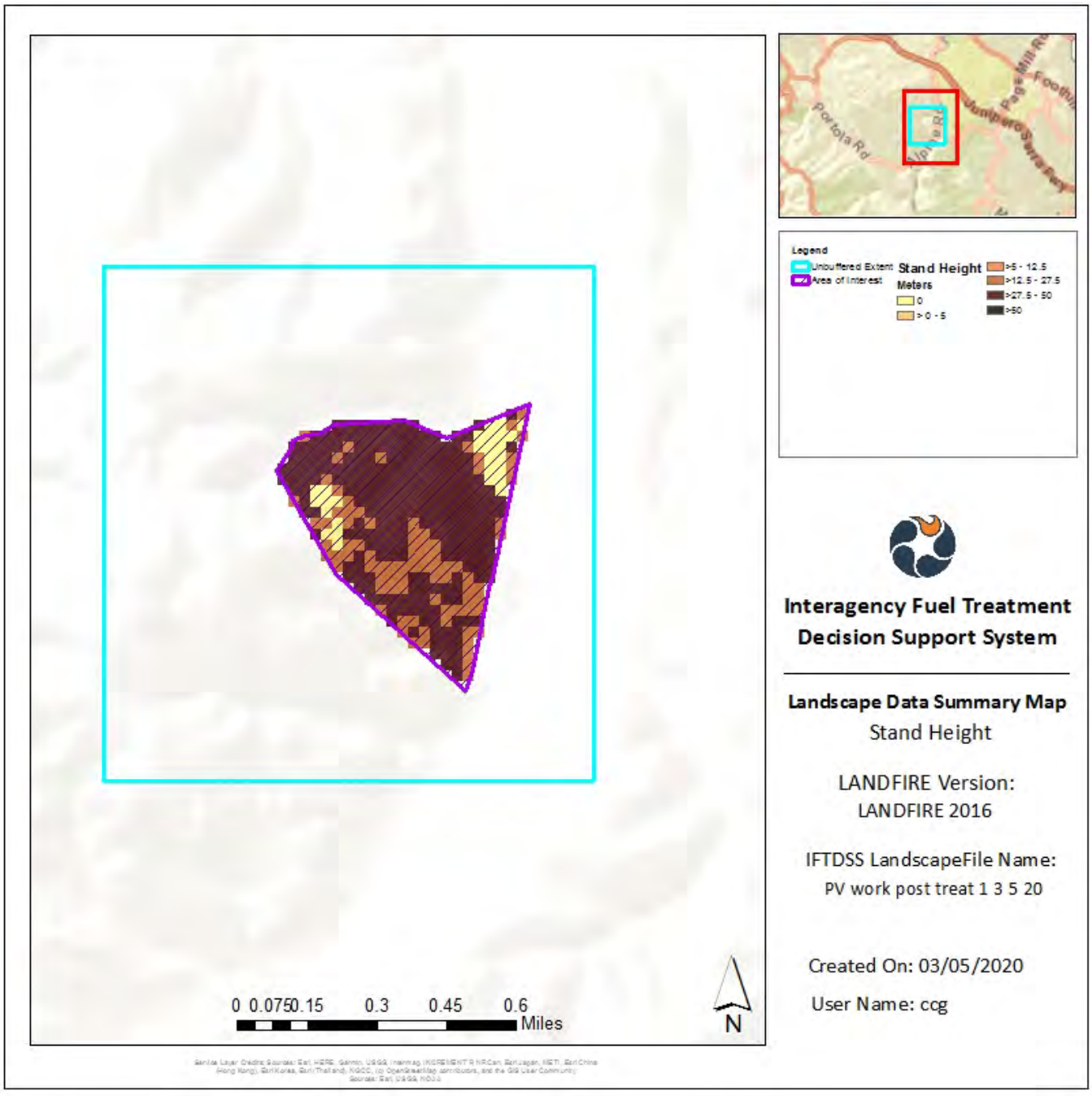
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Canopy Cover

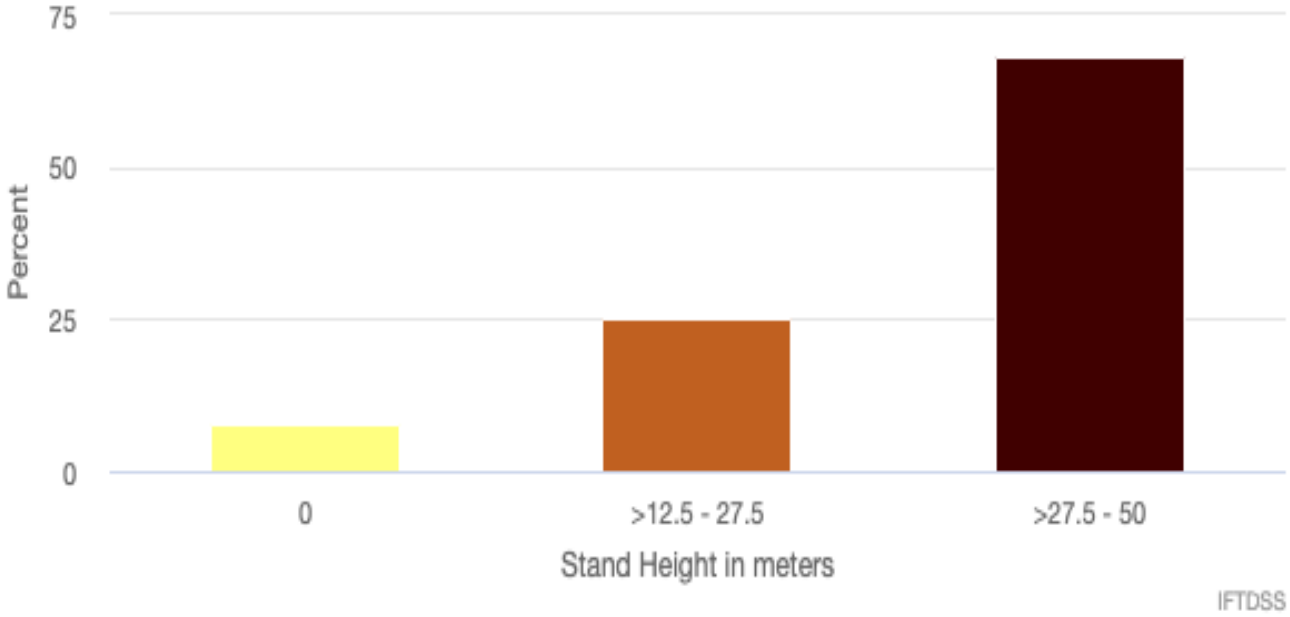
Canopy Cover (percent)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	27	6	8
>30 - 40	309	69	90
>40 - 50	5	1	1
>50 - 60	1	0	0

Stand Height



Stand Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

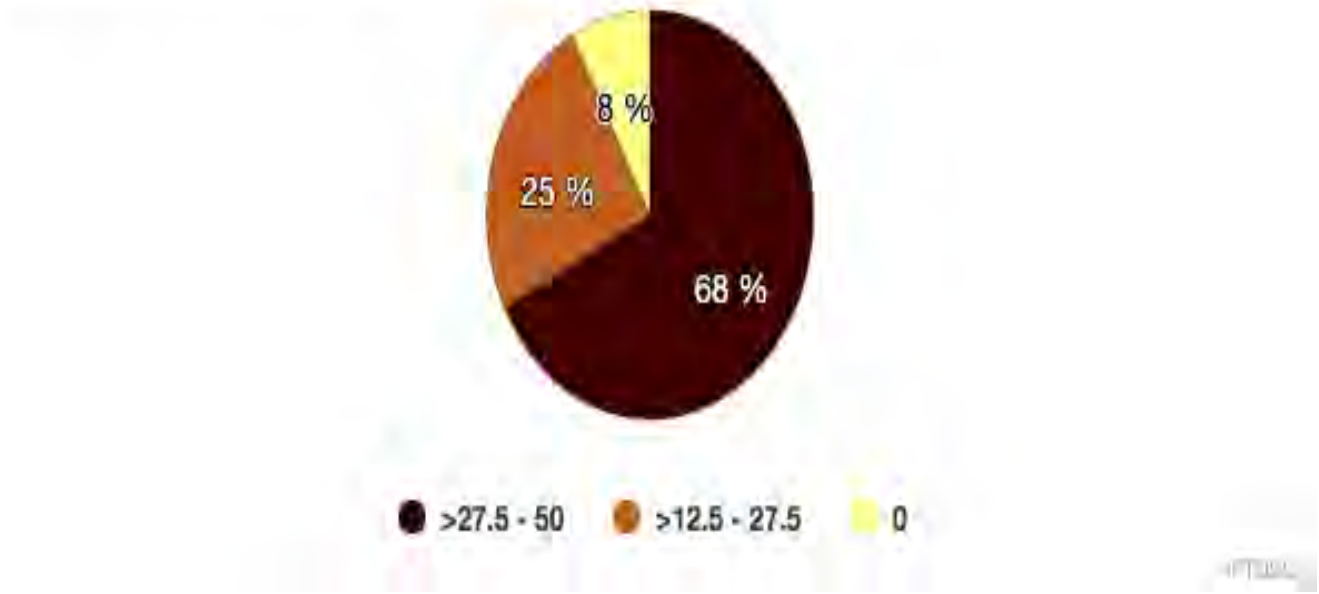
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Stand Height

Stand Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

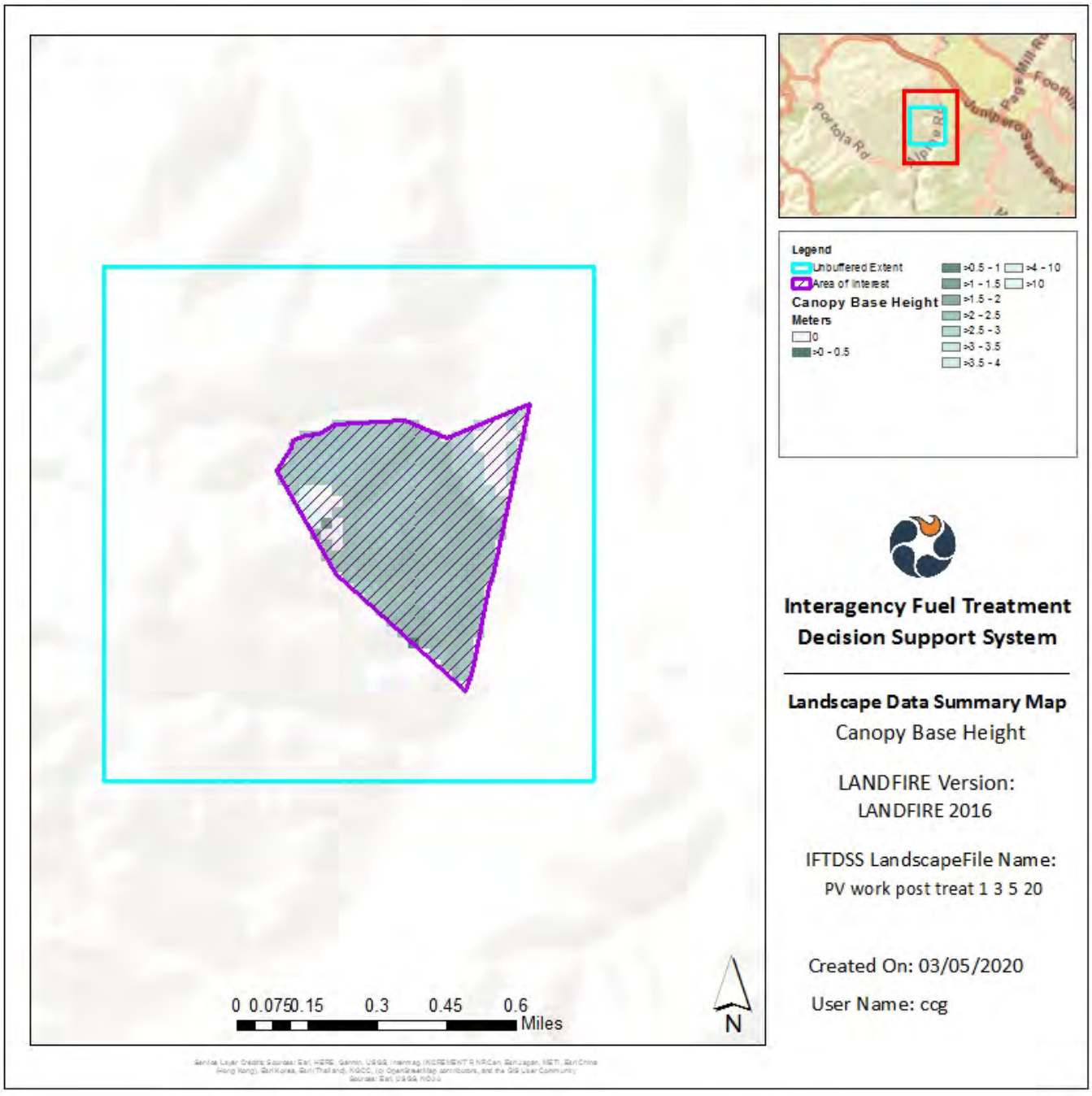
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Stand Height

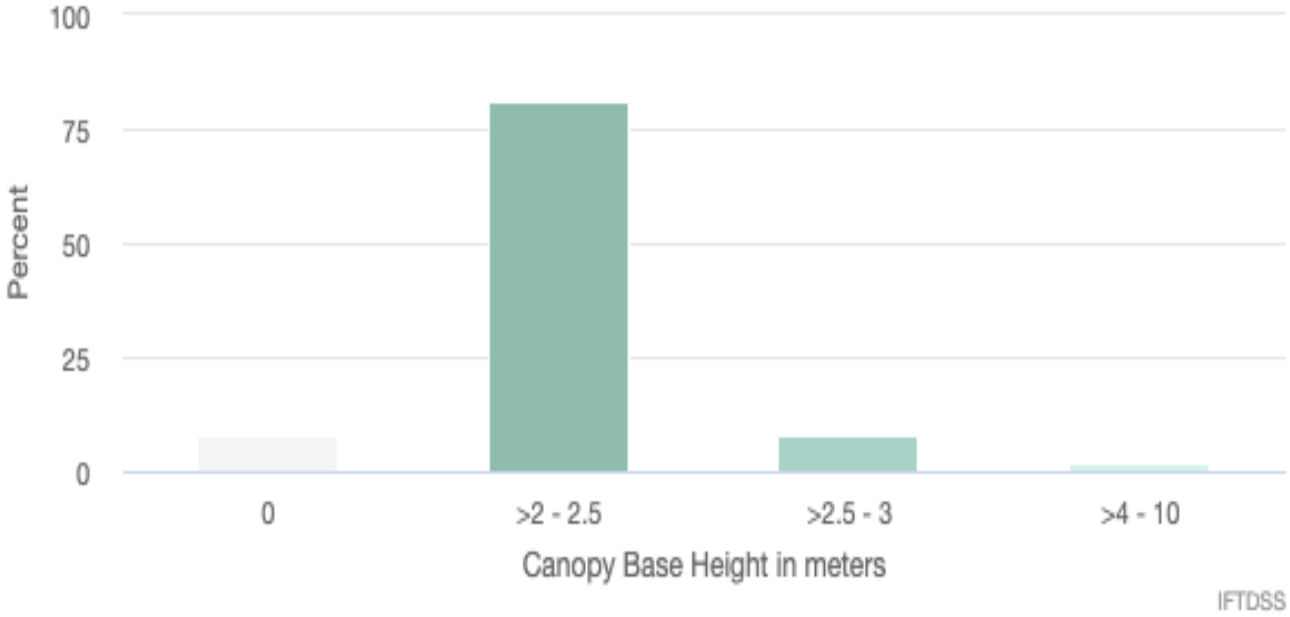
Stand Height (meters)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	27	6	8
>12.5 - 27.5	84	19	25
>27.5 - 50	231	51	68

Canopy Base Height



Canopy Base Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

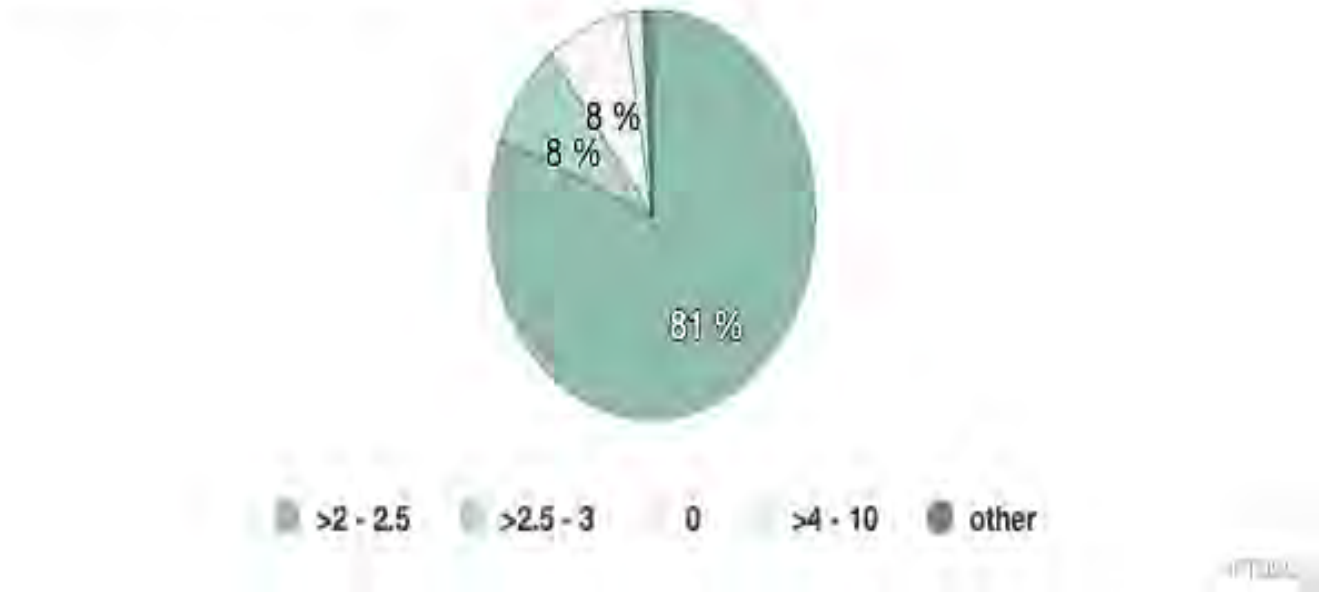
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Canopy Base Height

Canopy Base Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

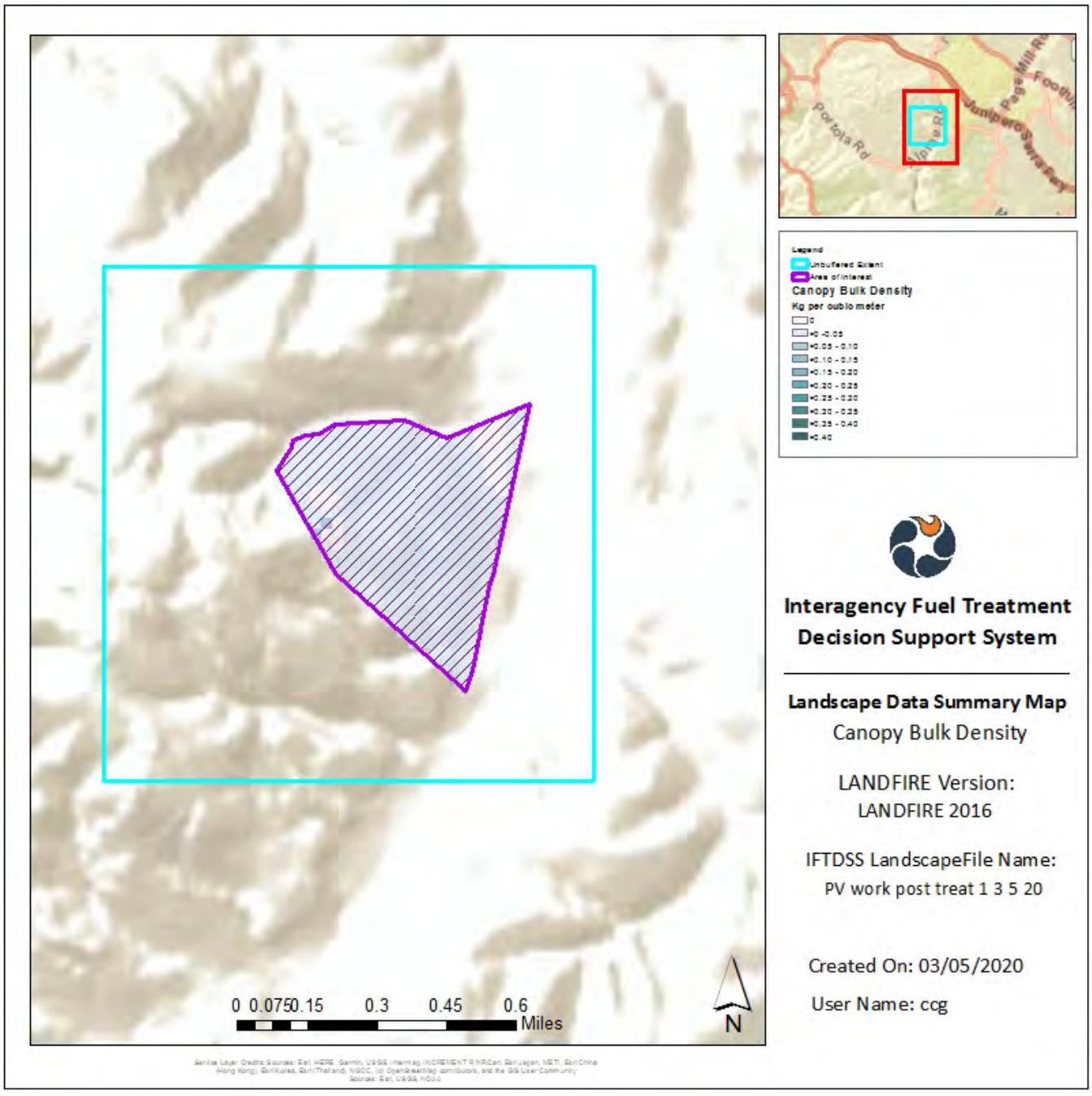
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Canopy Base Height

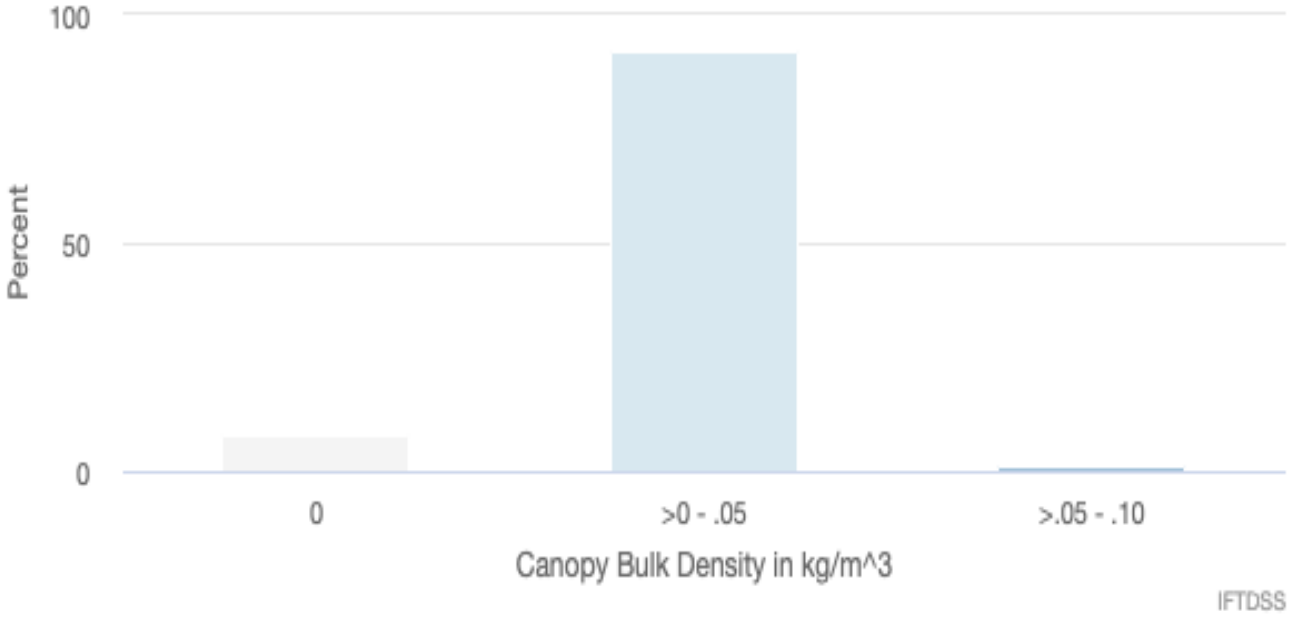
Canopy Base Height (meters)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	27	6	8
>0.5 - 1	1	0	0
>1 - 1.5	1	0	0
>1.5 - 2	1	0	0
>2 - 2.5	277	62	81
>2.5 - 3	29	6	8
>4 - 10	6	1	2

Canopy Bulk Density



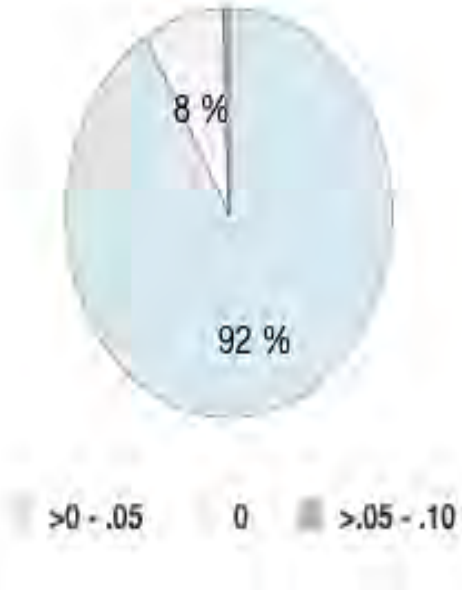
Canopy Bulk Density (kg/m^3) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Canopy Bulk Density (kg/m^3) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

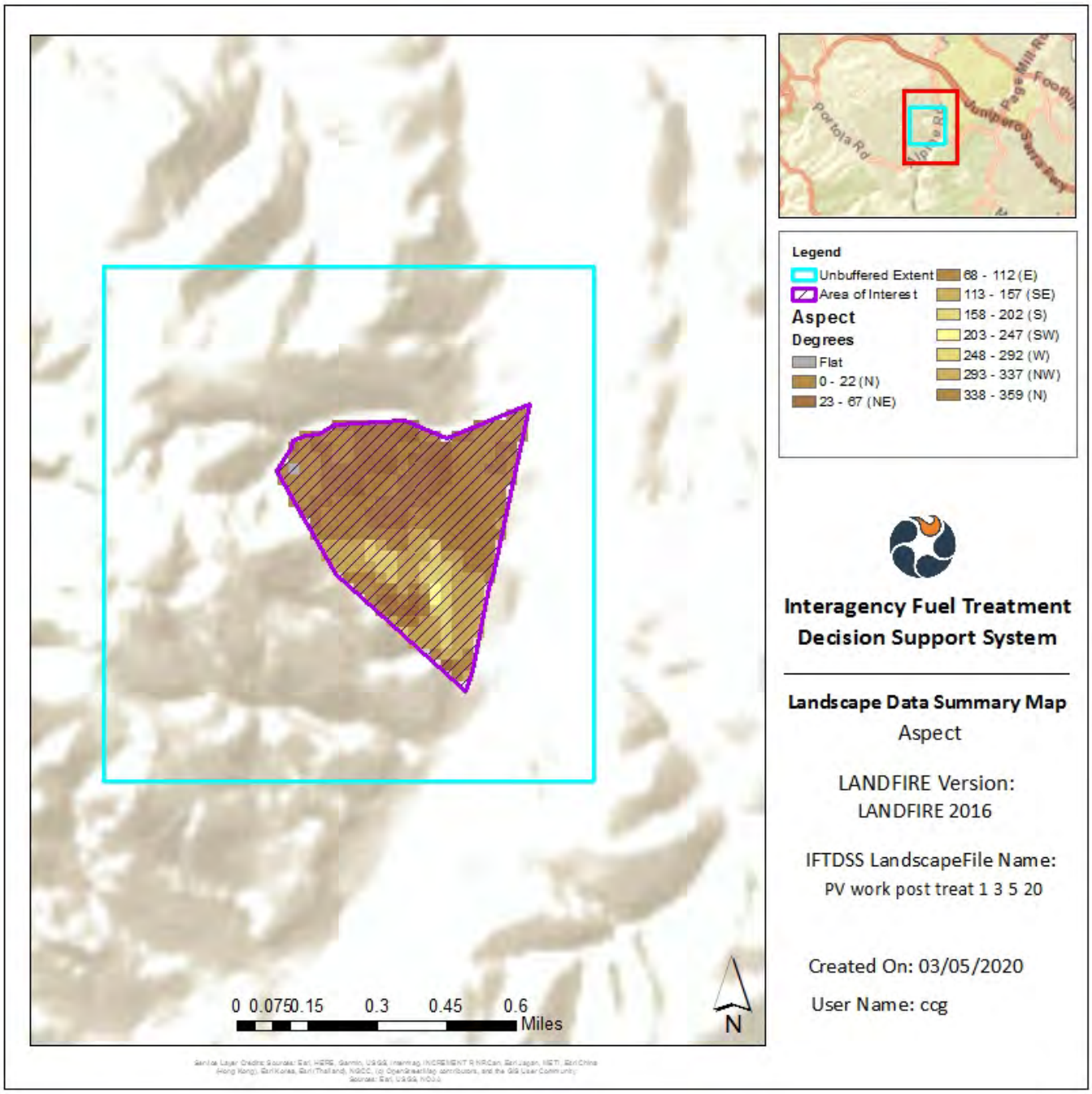
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Canopy Bulk Density

Canopy Bulk Density (kg/m^3)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	27	6	8
>0 - .05	313	70	92
>.05 - .10	2	0	1

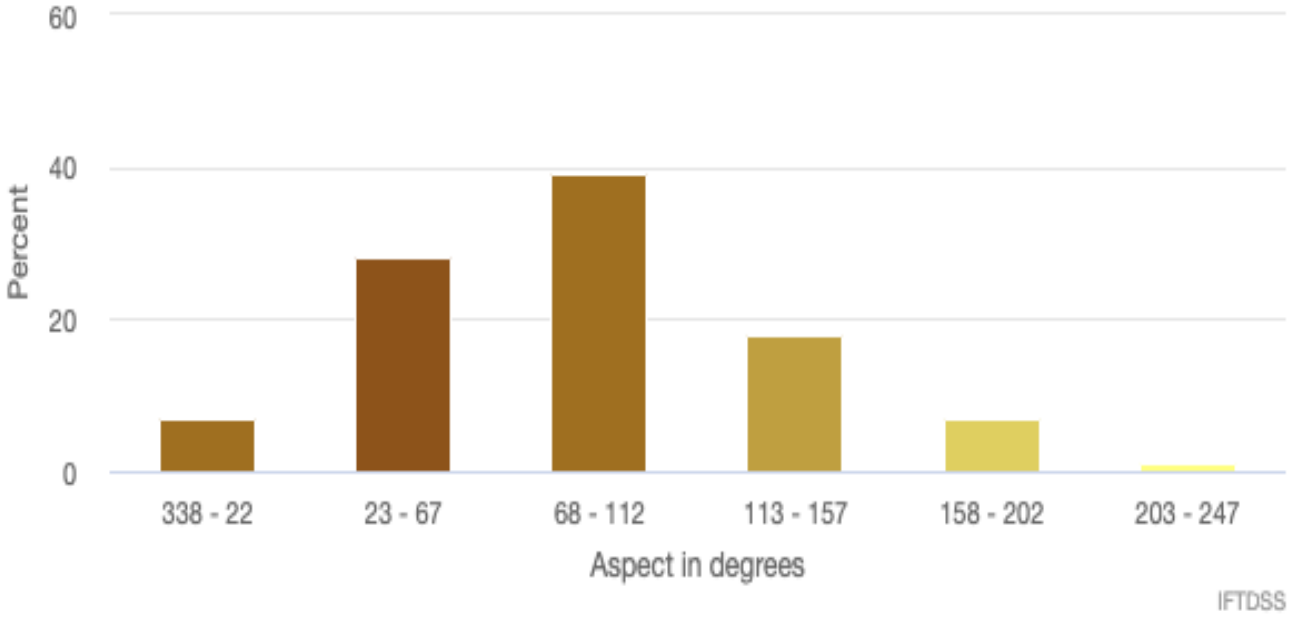
Aspect


Portola Rd
Page Mill Rd
Foothill
Junipero Serra Fwy
Legend
Unbuffered Extent
Area of Interest
Aspect
Degrees
Flat
0 - 22 (N)
23 - 67 (NE)
68 - 112 (E)
113 - 157 (SE)
158 - 202 (S)
203 - 247 (SW)
248 - 292 (W)
293 - 337 (NW)
338 - 359 (N)
0 0.075 0.15 0.3 0.45 0.6
Miles
N
Interagency Fuel Treatment Decision Support System
Landscape Data Summary Map
Aspect
LANDFIRE Version:
LANDFIRE 2016
IFTDSS LandscapeFile Name:
PV work post treat 1 3 5 20
Created On: 03/05/2020
User Name: ccg

Aspect

Aspect (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

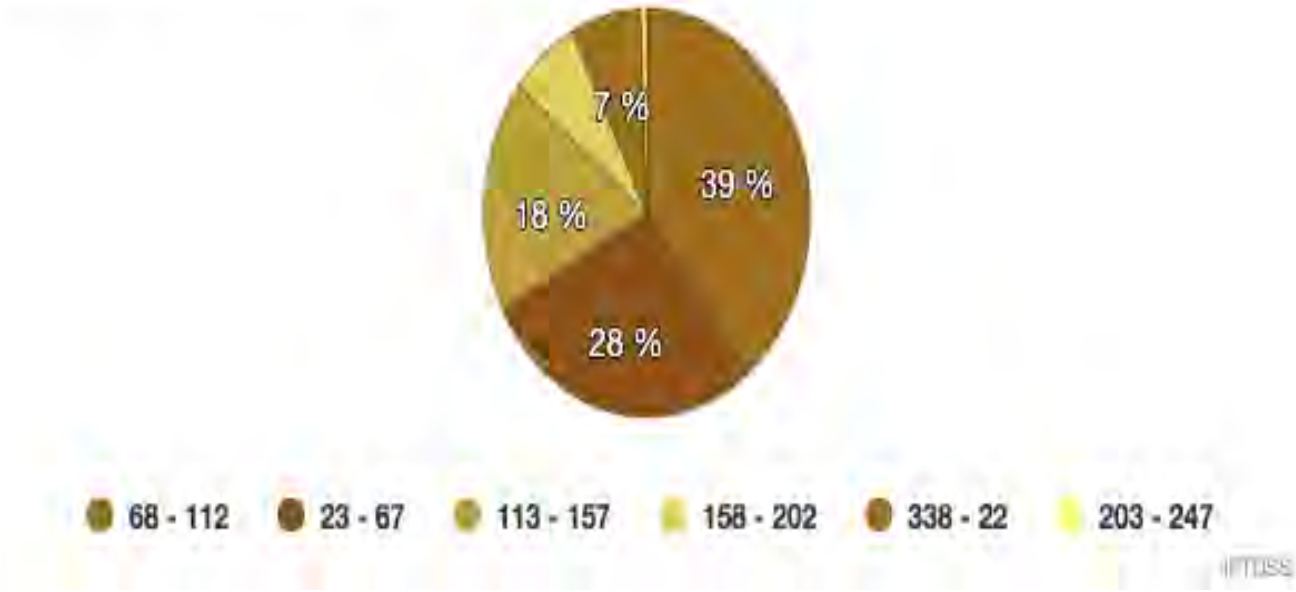
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Aspect

Aspect (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

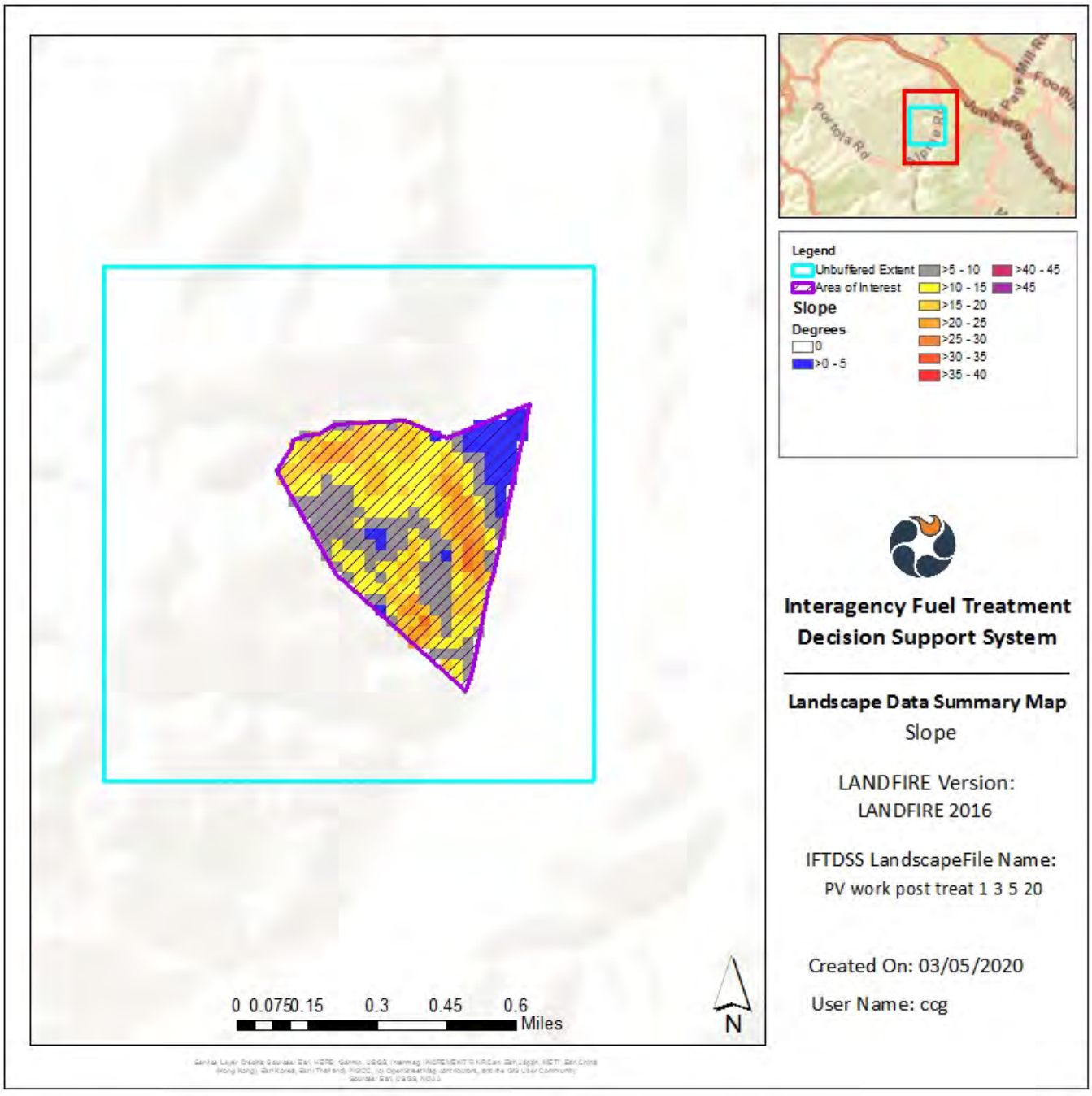
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Aspect

Aspect (degrees)	Pixel Count (freq)	Acres In AOI	Percent In AOI
338 - 22 (N)	24	5	7
23 - 67 (NE)	95	21	28
68 - 112 (E)	135	30	39
113 - 157 (SE)	63	14	18
158 - 202 (S)	23	5	7
203 - 247 (SW)	2	0	1

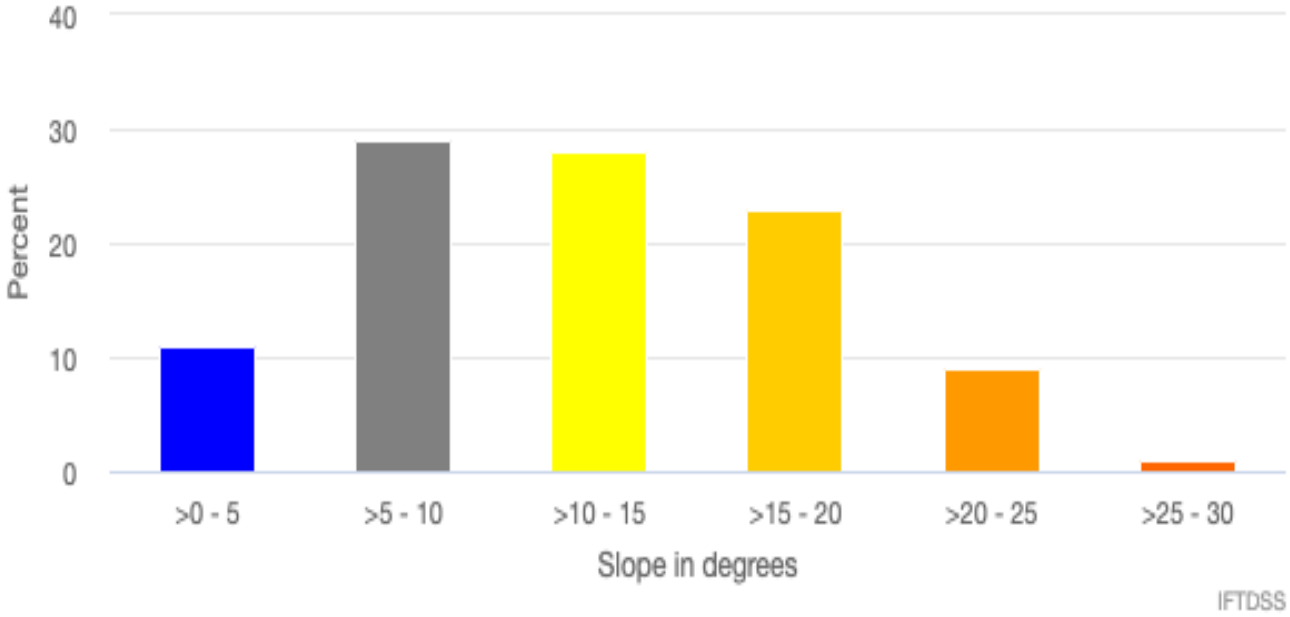
Slope


Legend
Unbuffered Extent
Area of Interest
Slope
Degrees
0
>0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 25
>25 - 30
>30 - 35
>35 - 40
>40 - 45
>45
0 0.075 0.15 0.3 0.45 0.6
Miles
N
Interagency Fuel Treatment Decision Support System
Landscape Data Summary Map
Slope
LANDFIRE Version:
LANDFIRE 2016
IFTDSS LandscapeFile Name:
PV work post treat 1 3 5 20
Created On: 03/05/2020
User Name: ccg

Slope

Slope (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

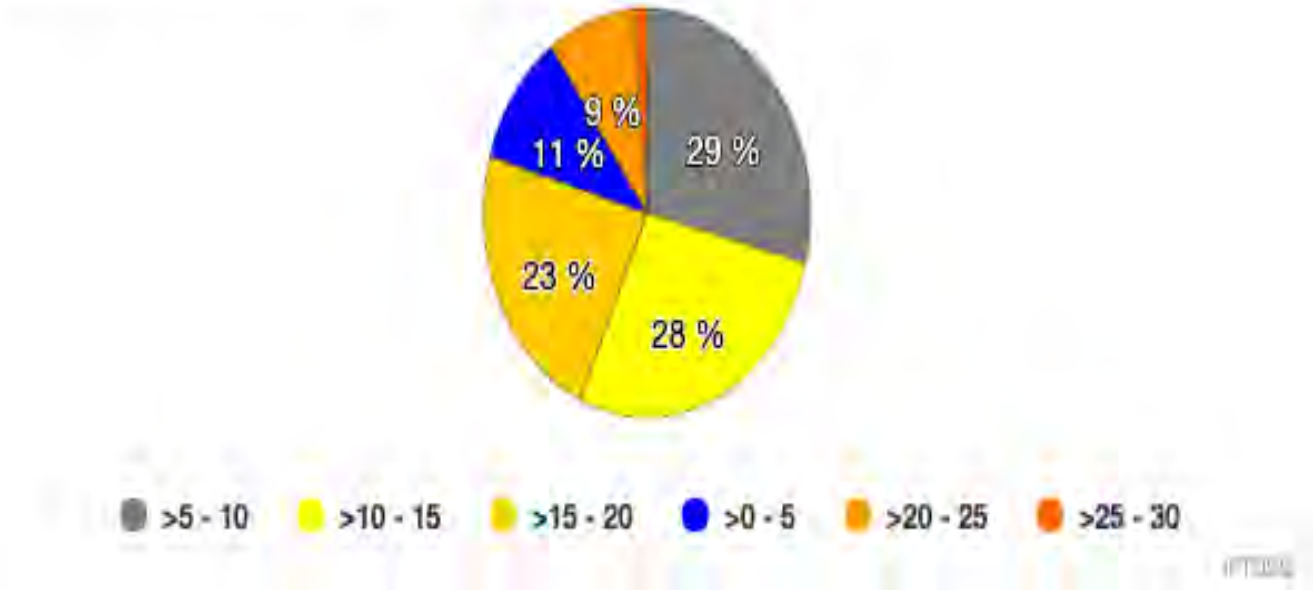
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Slope

Slope (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

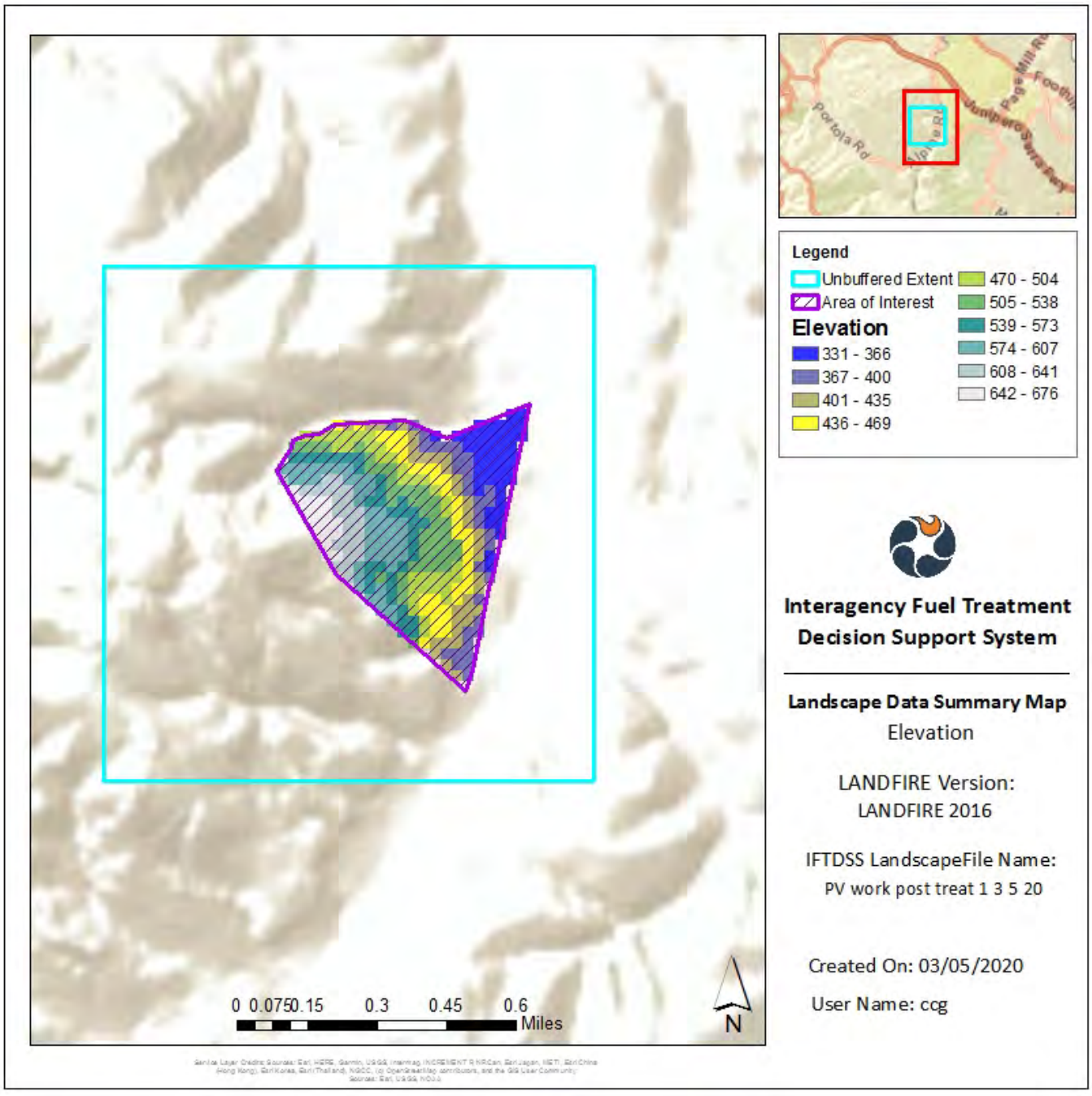
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Slope

Slope (degrees)	Pixel Count (freq)	Acres In AOI	Percent In AOI
>0 - 5	36	8	11
>5 - 10	99	22	29
>10 - 15	95	21	28
>15 - 20	78	17	23
>20 - 25	30	7	9
>25 - 30	4	1	1

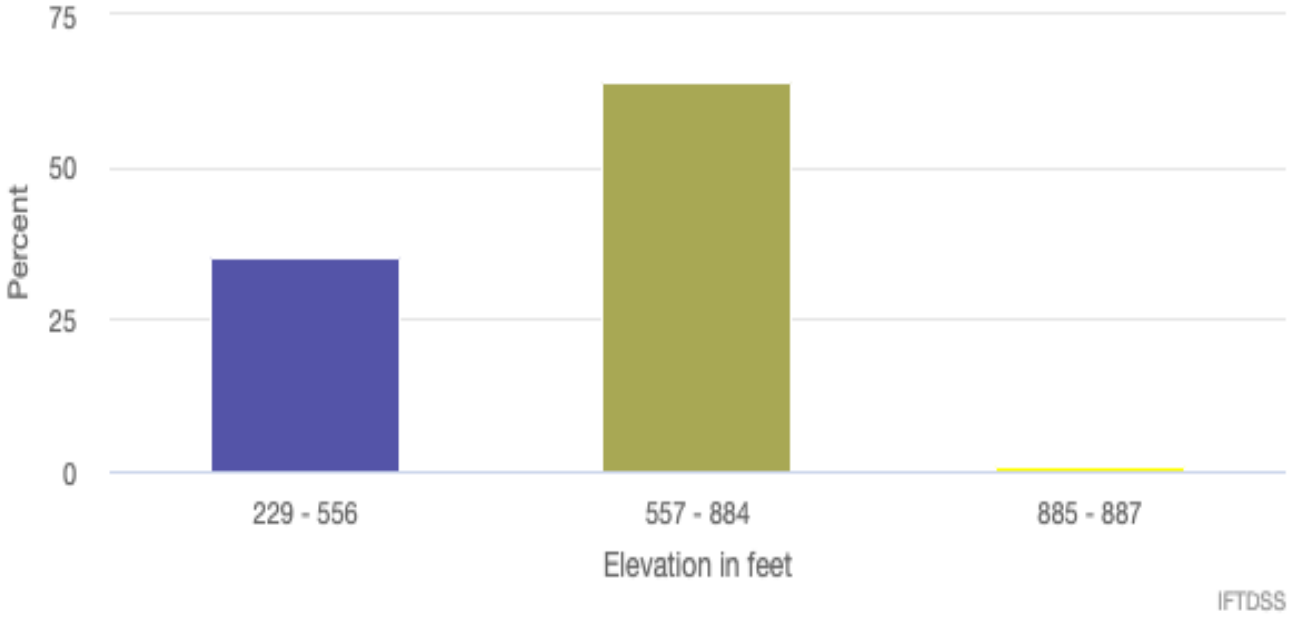
Elevation


Portola Rd
Page Mill Rd
Foothill
Junipero Serra Fwy
Legend
Unbuffered Extent
Area of Interest
Elevation
331 - 366
367 - 400
401 - 435
436 - 469
470 - 504
505 - 538
539 - 573
574 - 607
608 - 641
642 - 676
Interagency Fuel Treatment Decision Support System
Landscape Data Summary Map
Elevation
LANDFIRE Version:
LANDFIRE 2016
IFTDSS LandscapeFile Name:
PV work post treat 1 3 5 20
Created On: 03/05/2020
User Name: ccg
0 0.075 0.15 0.3 0.45 0.6
Miles
N

Elevation

Elevation (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

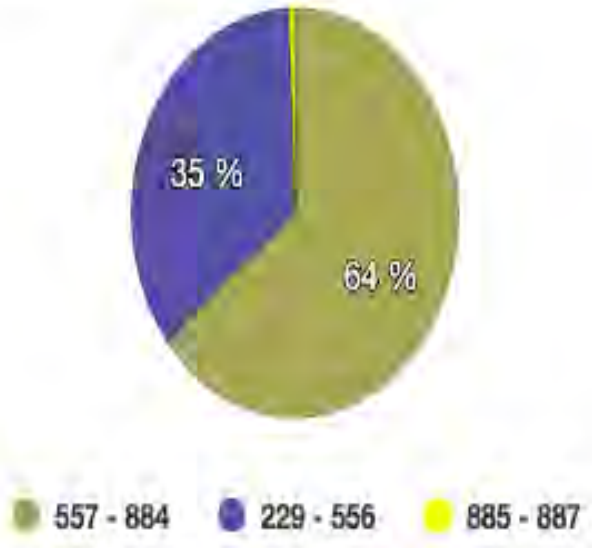
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Elevation

Elevation (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

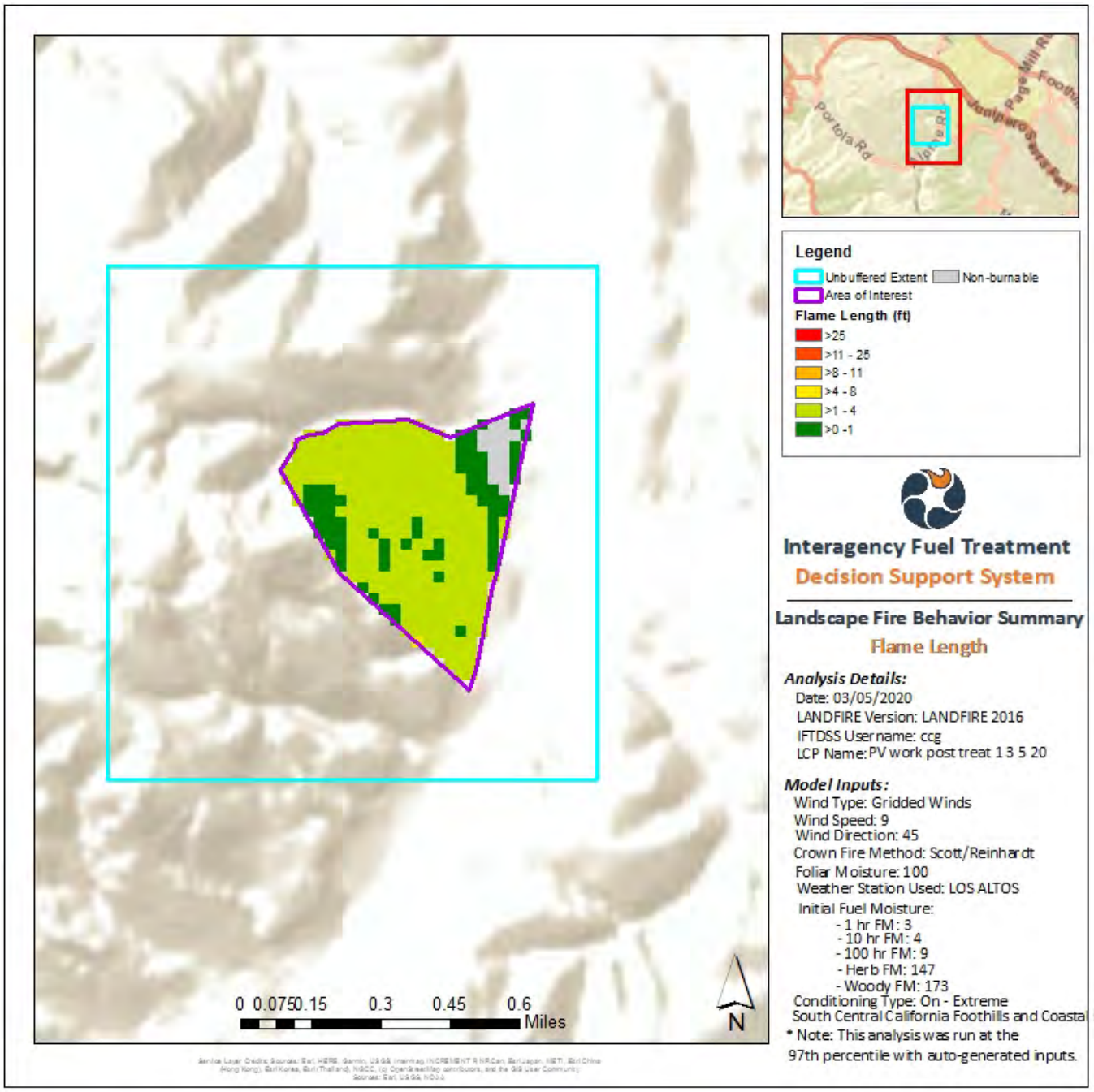
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Elevation

Elevation (feet)	Pixel Count (freq)	Acres In AOI	Percent In AOI
229 - 556	120	27	35
557 - 884	220	49	64
885 - 887	2	0	1

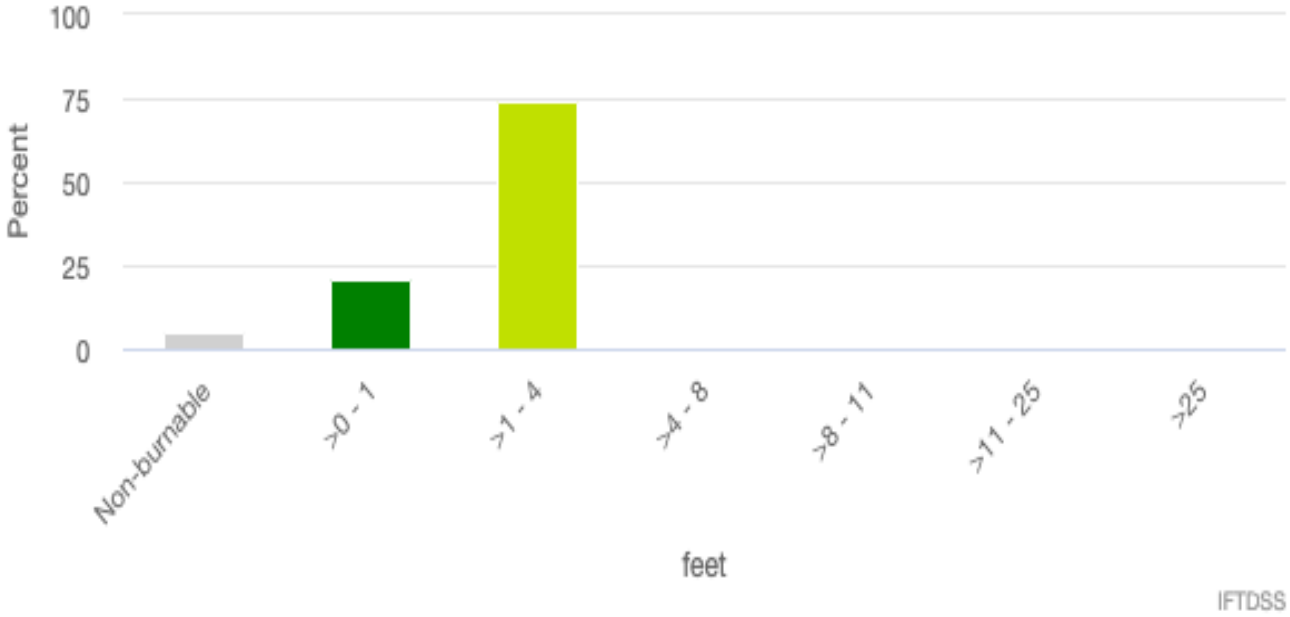
Flame Length



Flame Length

Flame Length (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

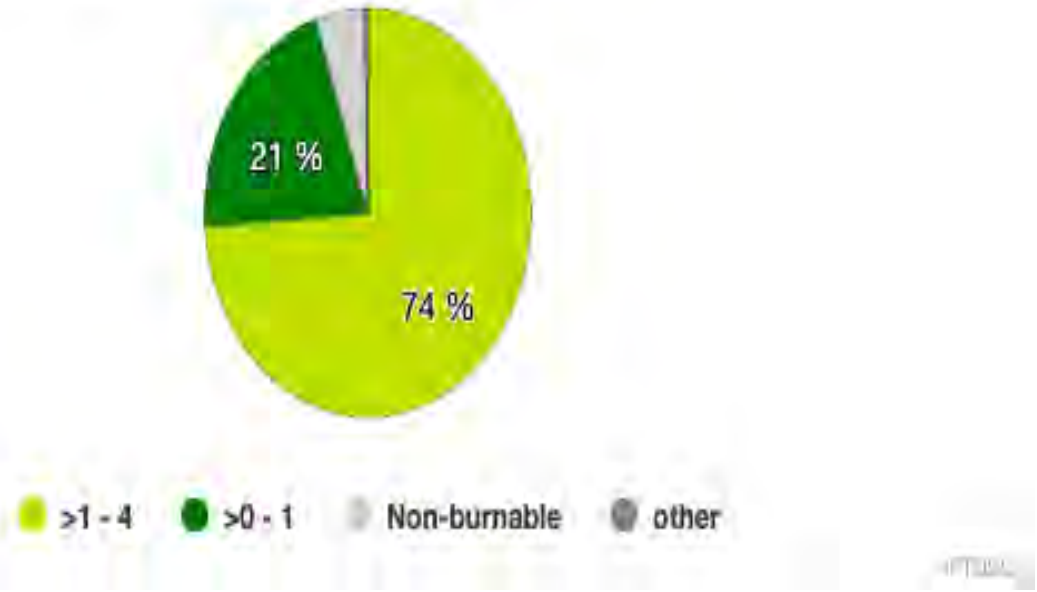
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Flame Length

Flame Length (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

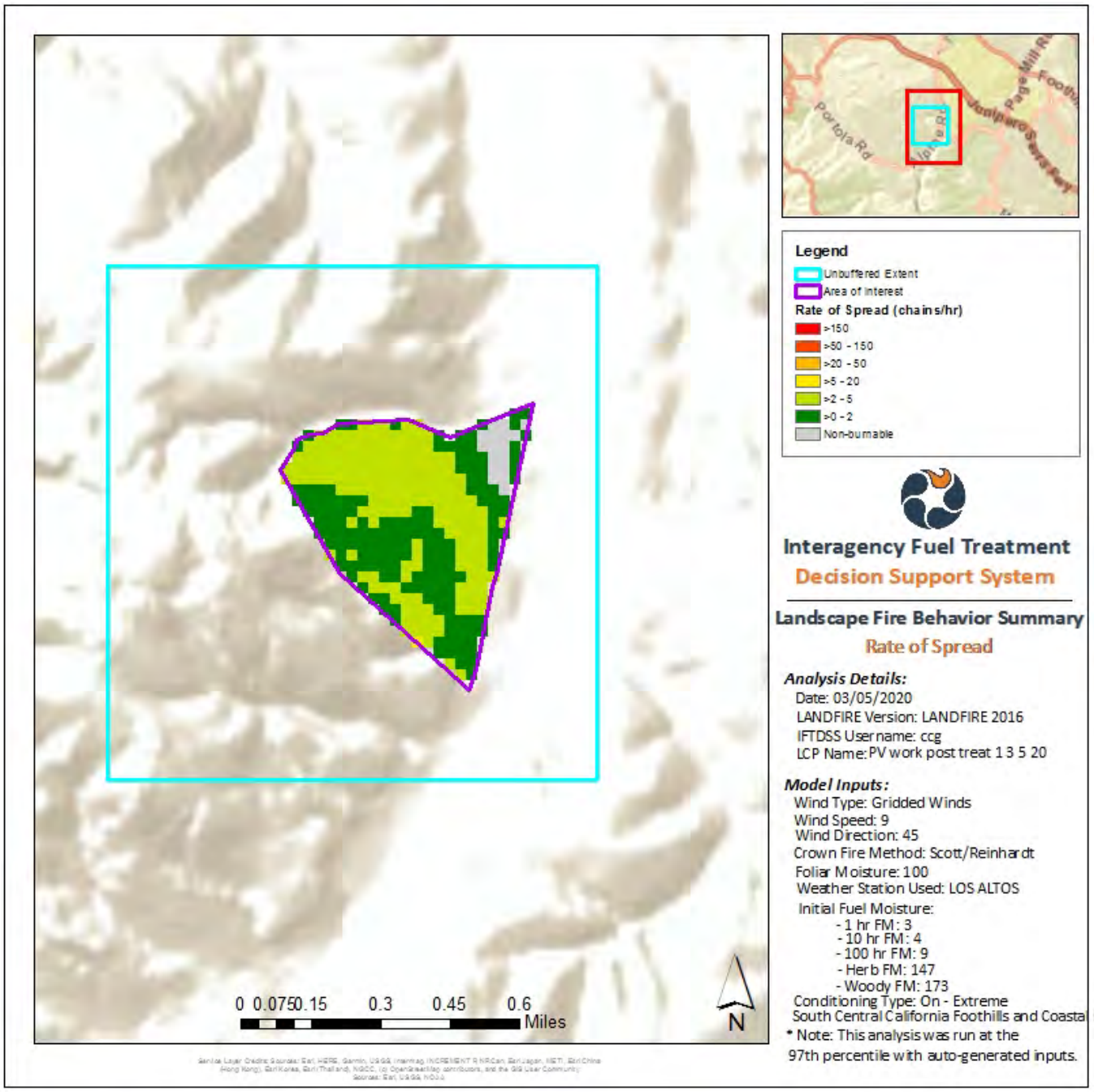
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Flame Length

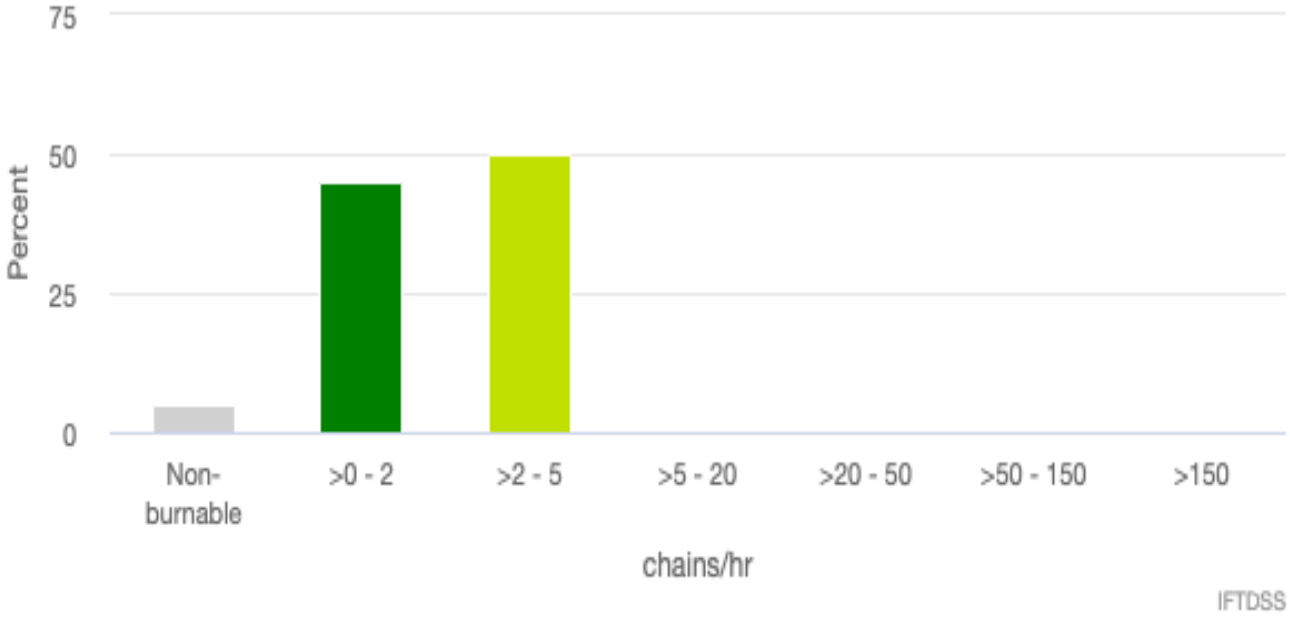
Flame Length (feet)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
>0 - 1	71	16	21
>1 - 4	253	56	74
>4 - 8	1	0	0
>8 - 11	0	0	0
>11 - 25	0	0	0
>25	0	0	0

Spread Rate


Legend
Unbuffered Extent
Area of interest
Rate of Spread (chains/hr)
>150
>50 - 150
>20 - 50
>5 - 20
>2 - 5
>0 - 2
Non-burnable
0 0.075 0.15 0.3 0.45 0.6
Miles
N
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Rate of Spread
Analysis Details:
Date: 03/05/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work post treat 1 3 5 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.

Rate of Spread (chains/hr) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

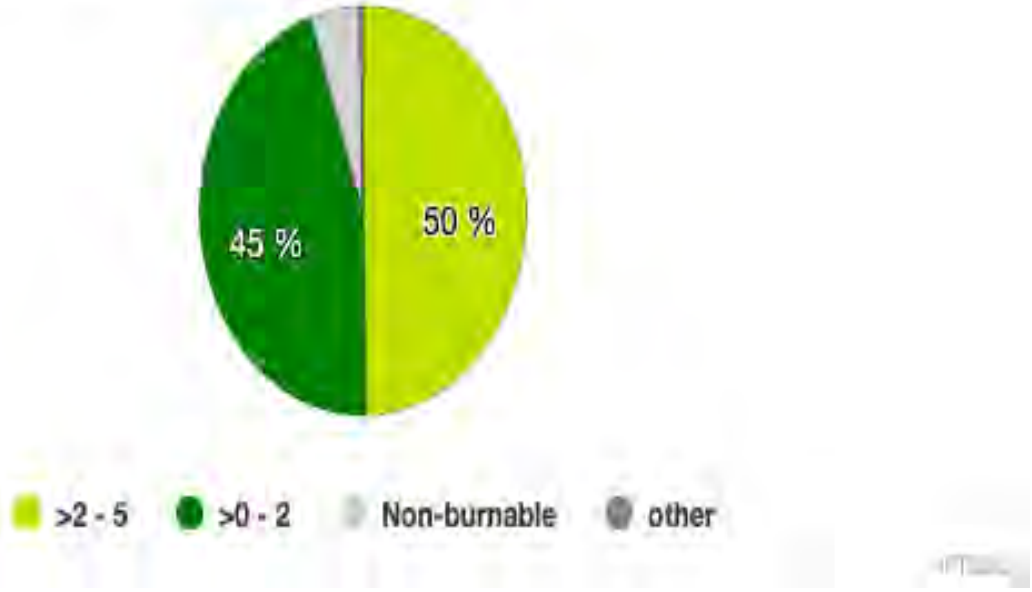
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Spread Rate

Rate of Spread (chains/hr) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

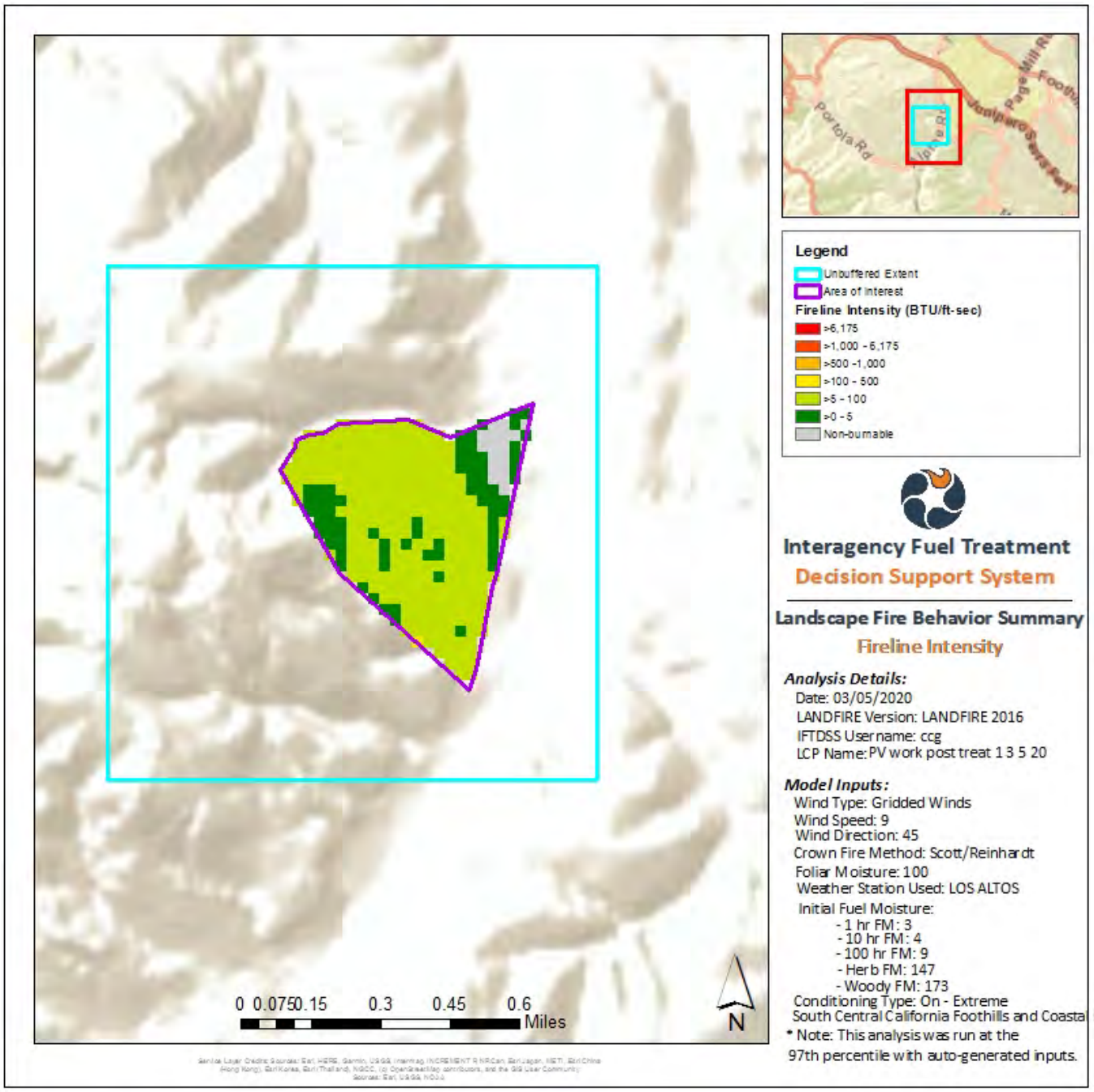
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Spread Rate

Rate of Spread (chains/hr)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
>0 - 2	154	34	45
>2 - 5	170	38	50
>5 - 20	1	0	0
>20 - 50	0	0	0
>50 - 150	0	0	0
>150	0	0	0

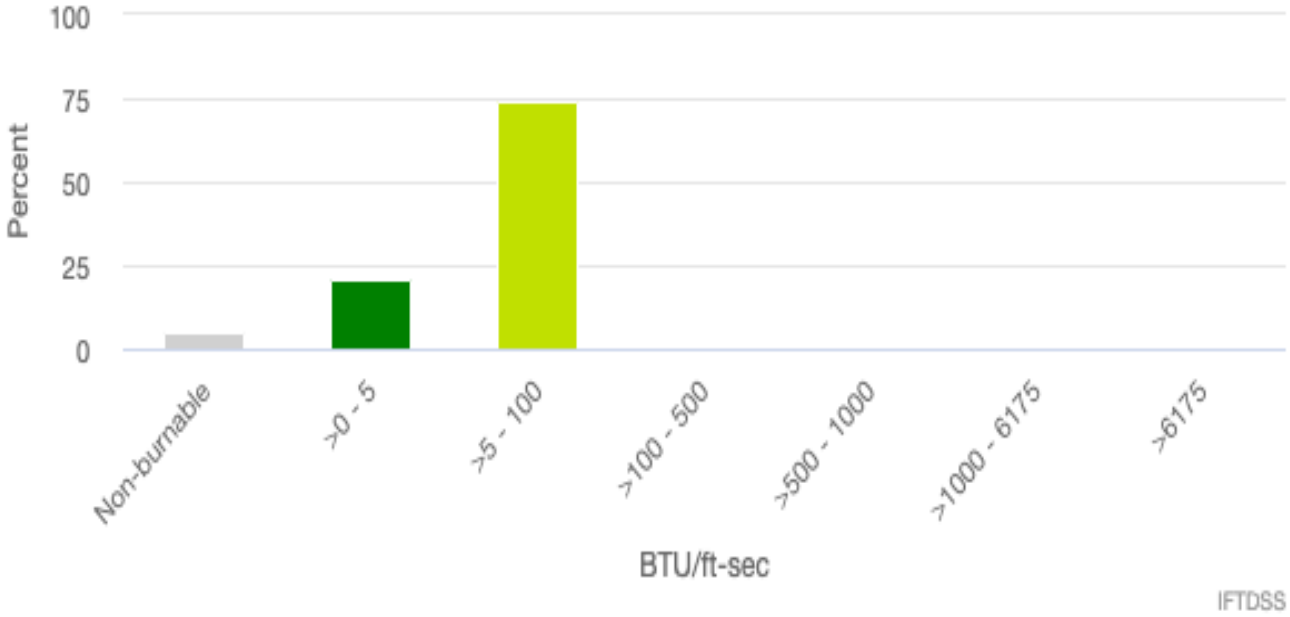
Intensity


Portola Rd
Page Mill Rd
Foothill
Junipero Serra Fwy
Legend
Unbuffered Extent
Area of Interest
Fireline Intensity (BTU/ft-sec)
>6,175
>1,000 - 6,175
>500 -1,000
>100 - 500
>5 - 100
>0 - 5
Non-burnable
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Fireline Intensity
Analysis Details:
Date: 03/05/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work post treat 1 3 5 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.
0 0.075 0.15 0.3 0.45 0.6
Miles
N

Intensity

Fireline Intensity (BTU/ft-sec) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

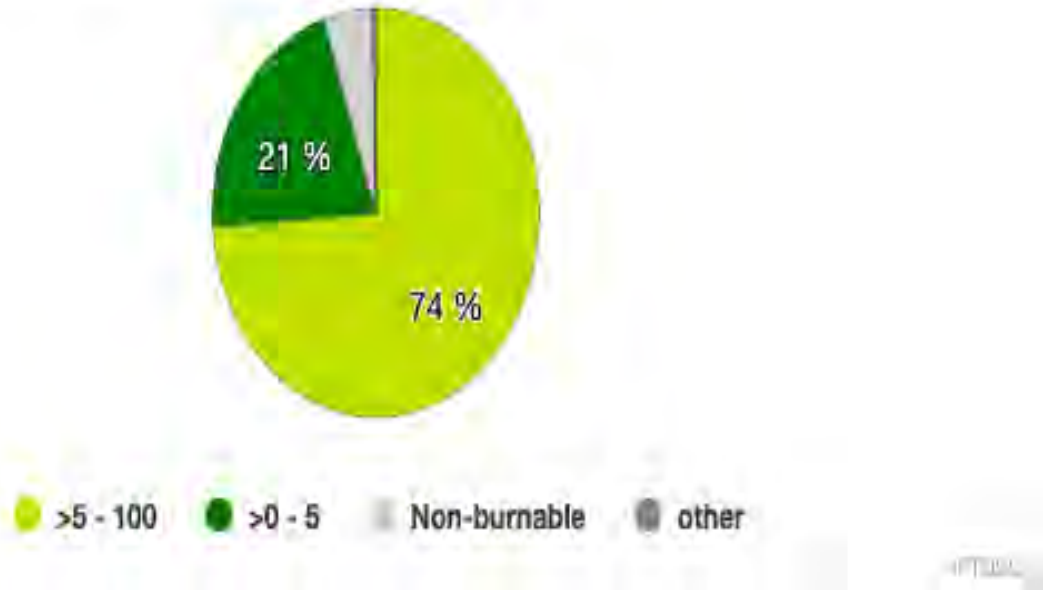
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Intensity

Fireline Intensity (BTU/ft-sec) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

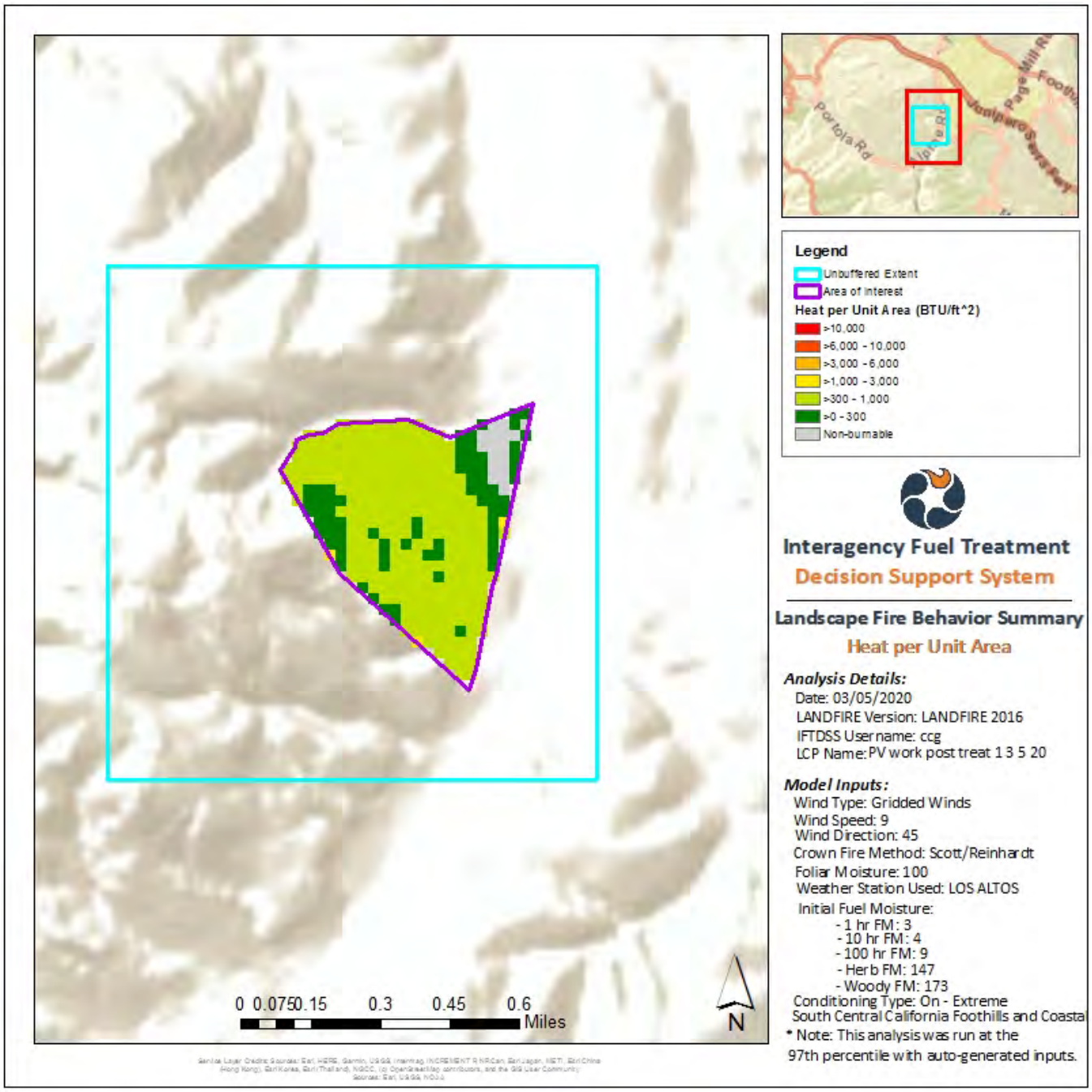
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Intensity

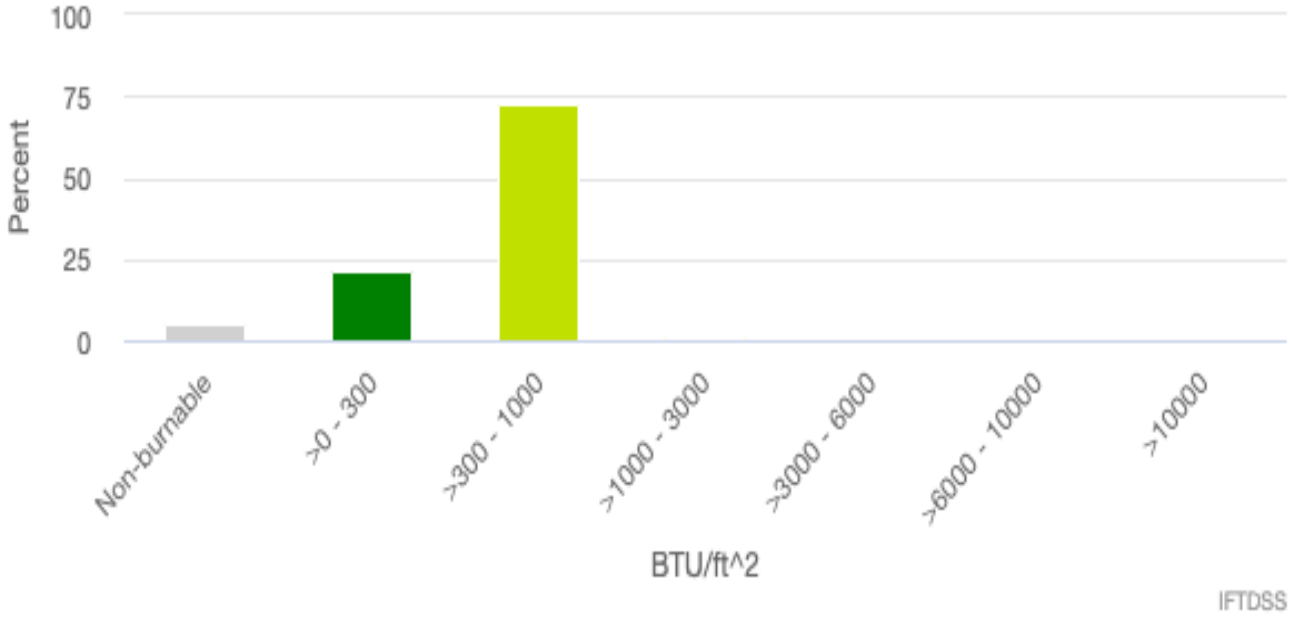
Fireline Intensity (BTU/ft-sec)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
>0 - 5	71	16	21
>5 - 100	253	56	74
>100 - 500	1	0	0
>500 - 1,000	0	0	0
>1,000 - 6,175	0	0	0
>6,175	0	0	0

Heat/Area


Legend
Unbuffered Extent
Area of interest
Heat per Unit Area (BTU/ft^2)
>10,000
>6,000 - 10,000
>3,000 - 6,000
>1,000 - 3,000
>300 - 1,000
>0 - 300
Non-burnable
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Heat per Unit Area
Analysis Details:
Date: 03/05/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work post treat 1 3 5 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.
0 0.075 0.15 0.3 0.45 0.6
Miles
N

Heat per Unit Area (BTU/ft^2) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

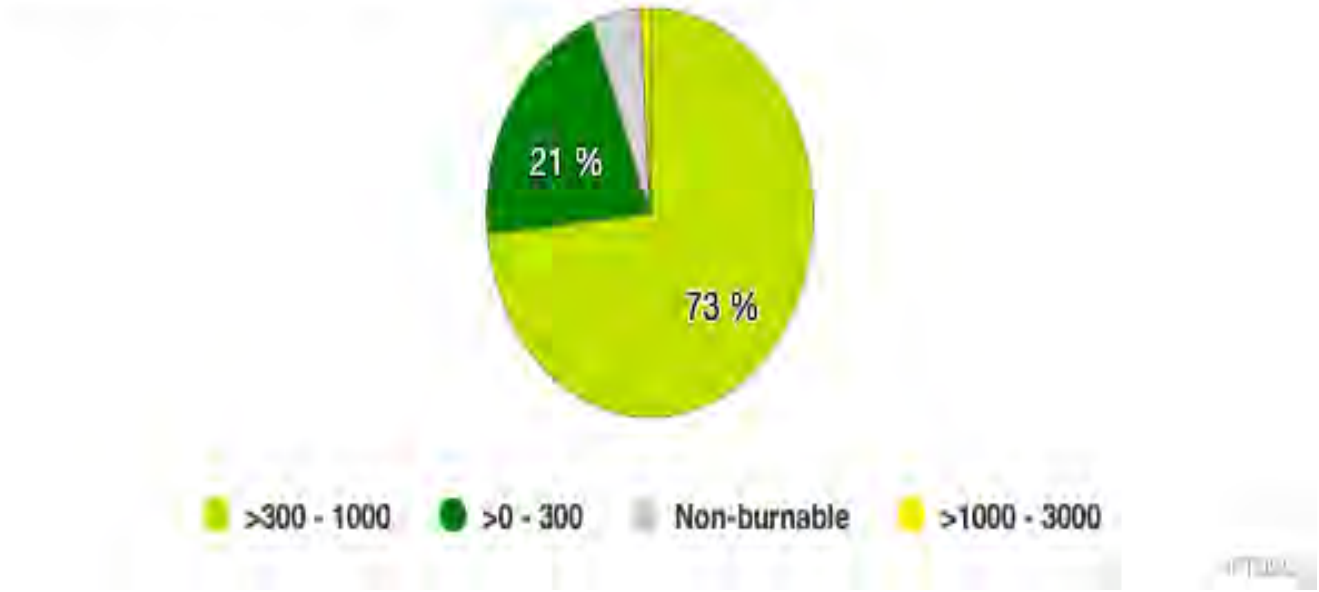
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Heat/Area

Heat per Unit Area (BTU/ft^2) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

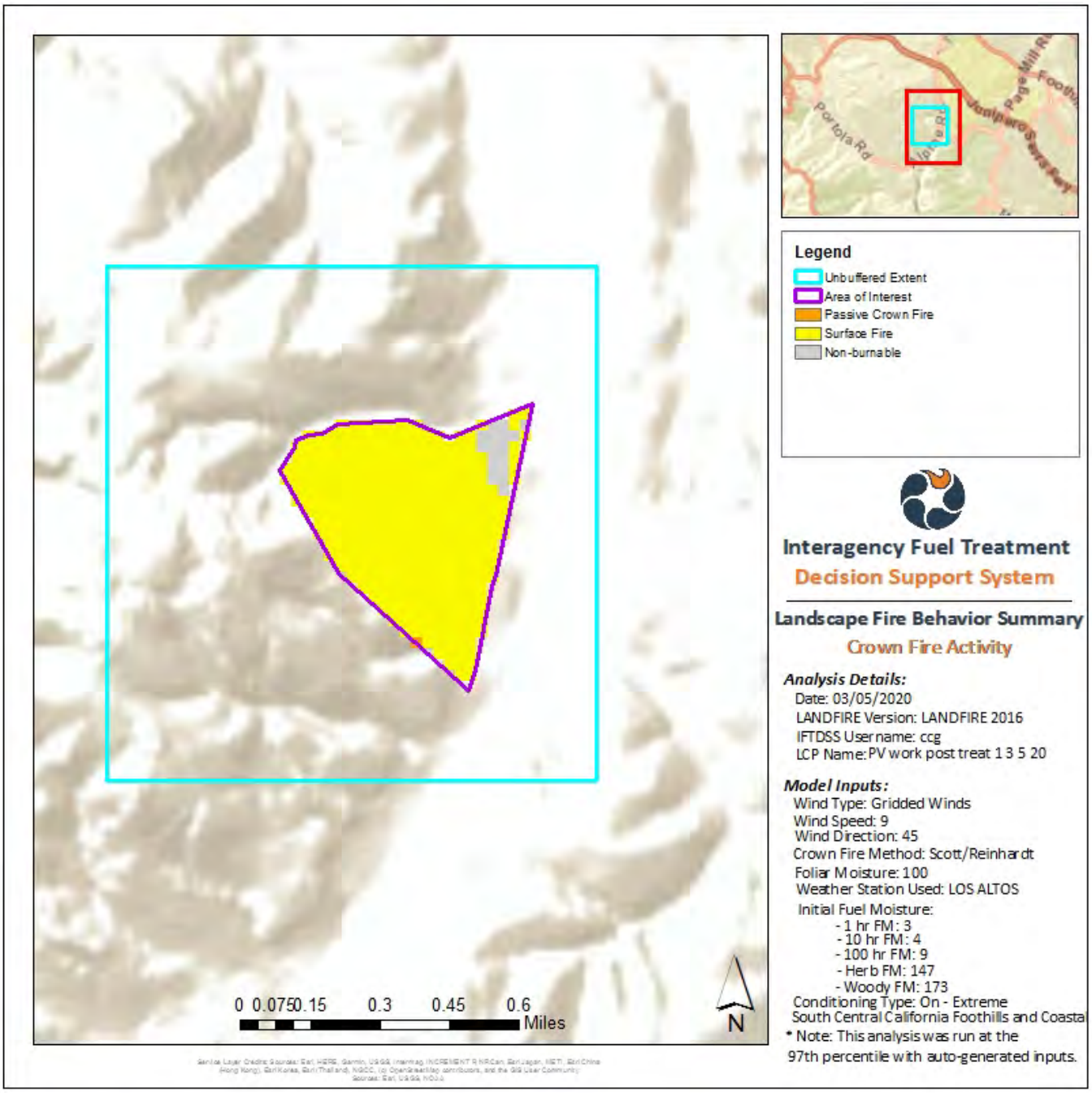
Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Heat/Area

Heat per Unit Area (BTU/ft^2)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
>0 - 300	71	16	21
>300 - 1,000	251	56	73
>1,000 - 3,000	3	1	1
>3,000 - 6,000	0	0	0
>6,000 - 10,000	0	0	0
>10,000	0	0	0

Crown Fire



Interagency Fuel Treatment
Decision Support System

Landscape Fire Behavior Summary
Crown Fire Activity

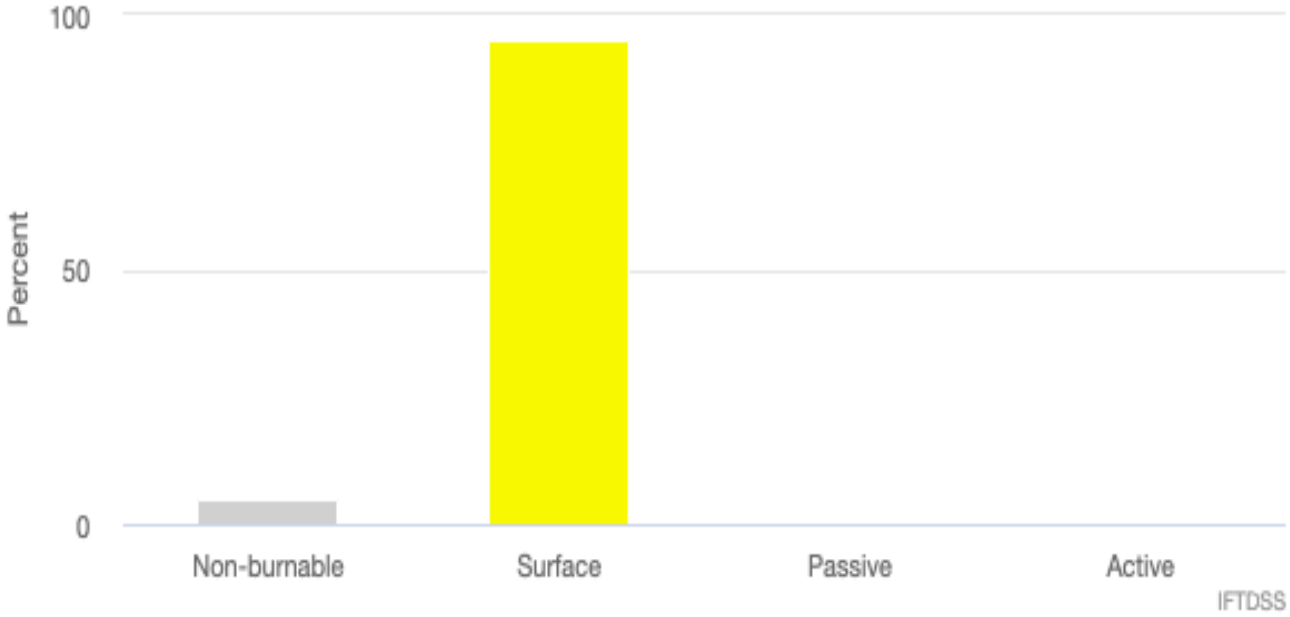
Analysis Details:
Date: 03/05/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work post treat 1 3 5 20

Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173

Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.

Crown Fire Activity Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th



Crown Fire

Crown Fire Activity Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_1_3_5_20" Landscape

Source Landscape Name: PV_work_post_treat_1_3_5_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_1_3_5_20 - Auto97th

Surface Non-burnable other

Crown Fire

Crown Fire Activity	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
Surface Fire	324	72	95
Passive Fire	1	0	0
Active Fire	0	0	0

Report: Auto97th
Landfire Version: LANDFIRE 2016
Landscape Name: PV_work_post_treat_2_6_20
Landscape Acres: 470
Area of Interest: pv_aoi_3_3_20

Prepared for: Scott Conway
3/6/2020, 5:27:40 PM

Model Parameters

Run Name: PV_work_post_treat_2_6_20 - Auto97th

Model Type: Landscape Fire Behavior

Run Date: Mar 6, 2020 8:14:14 PM

Wind Type: Gridded Winds

Wind Speed: 9 mph

Wind Direction: 45 deg

Crown Fire Method: Scott/Reinhardt

Foliar Moisture: 100

Conditioning: On - Extreme - South Central California Foothills and Coastal Mountains

Conditioning start: , NaN/NaN/NaN

Days conditioned:

Conditioning start: 1300, 7/9/2012

Conditioning end:1600, 7/12/2012

Station Name: LOS ALTOS

Station Observation Start Date: Mar 6, 2005 12:00:00 AM

Station Observation End Date: Oct 4, 2016 12:00:00 AM

Station Elevation: 539

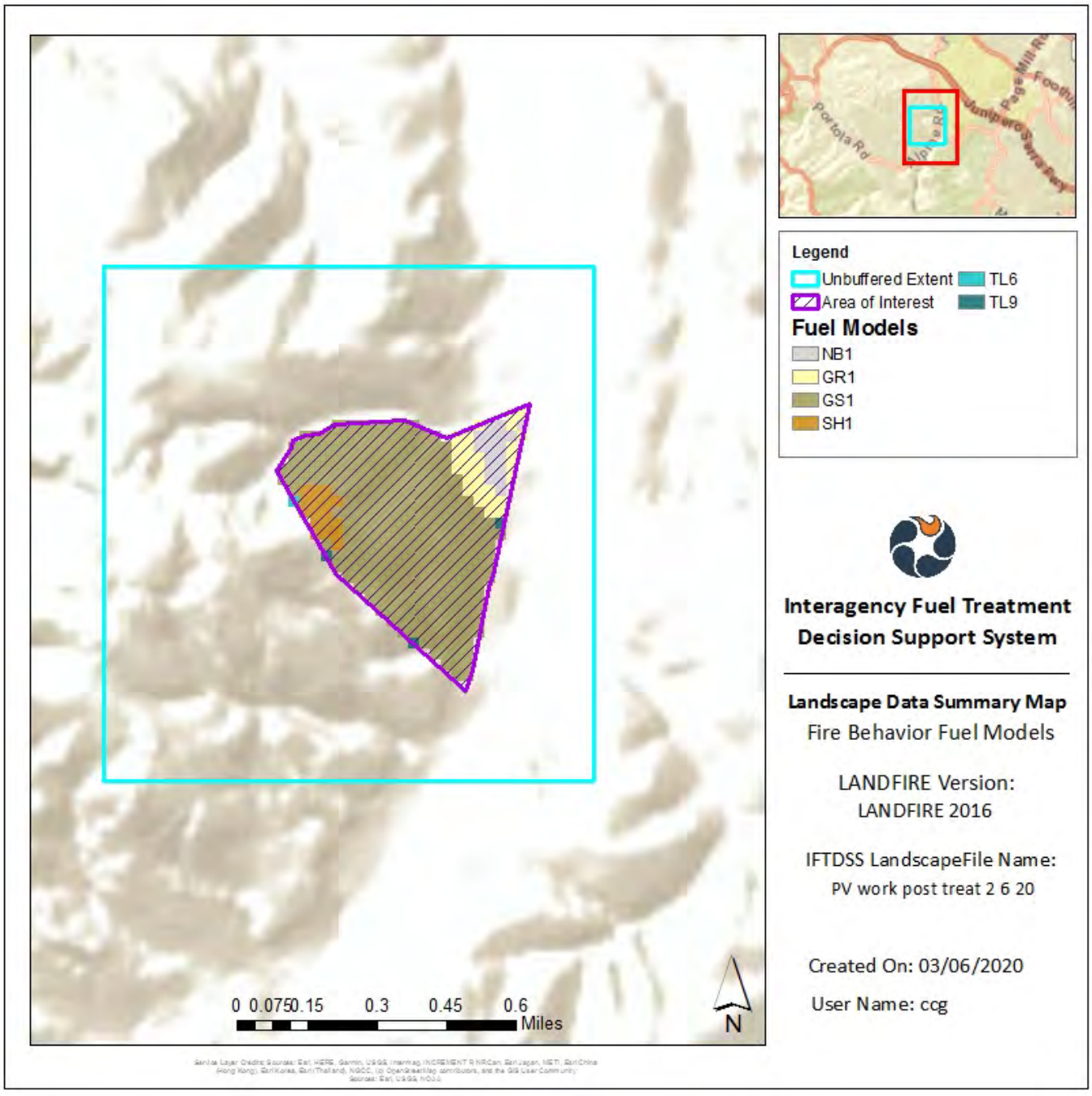
Station Aspect: 6

Station Latitude: 37.355

Station Longitude: 122.1419444

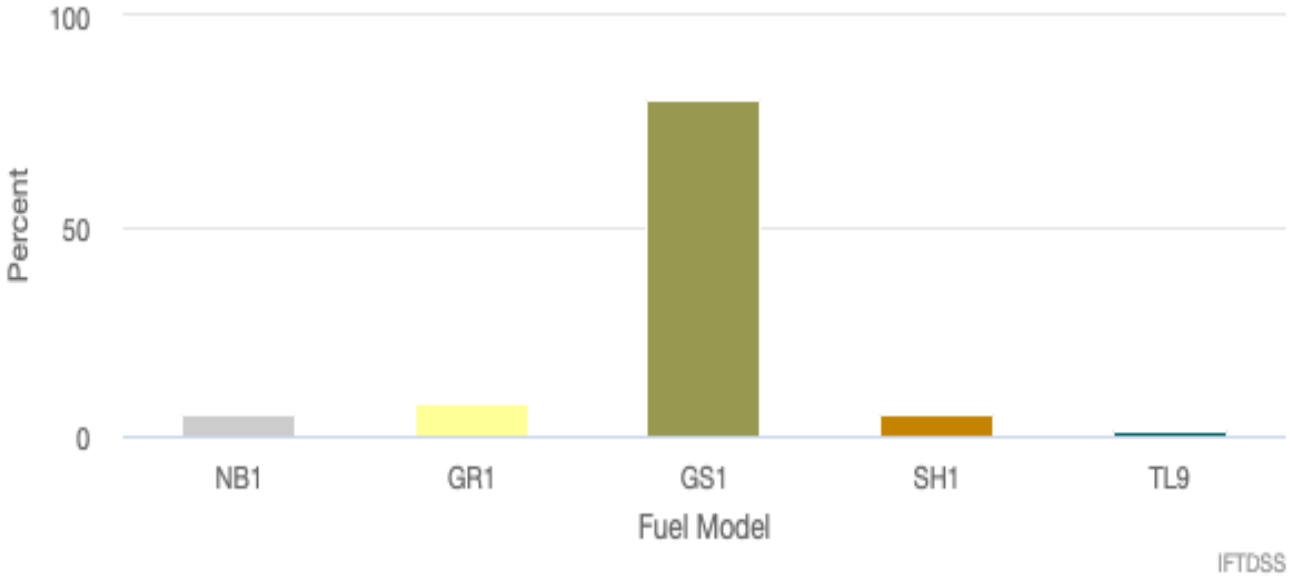
Fuel Model	1 Hr Fuel Moisture	10 Hr Fuel Moisture	100 Hr Fuel Moisture	Live Herbaceous Fuel Moisture	Live Woody Fuel Moisture
All	3	4	9	147	173

Fuel Model (FBFM)



Fuel Model Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

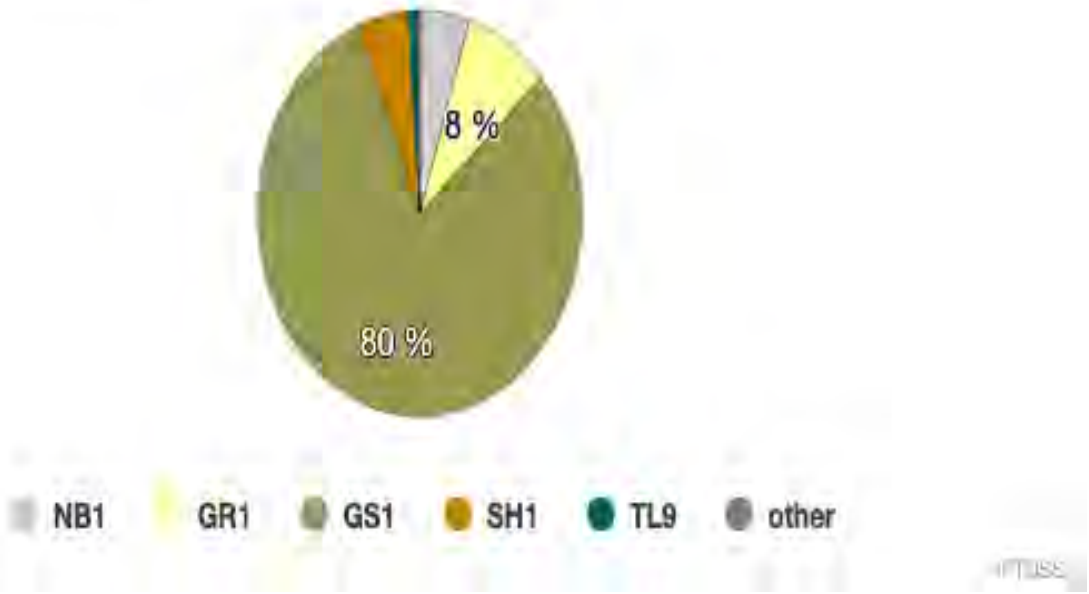
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th
Distribution under 1% not shown



Fuel Model (FBFM)

Fuel Model Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

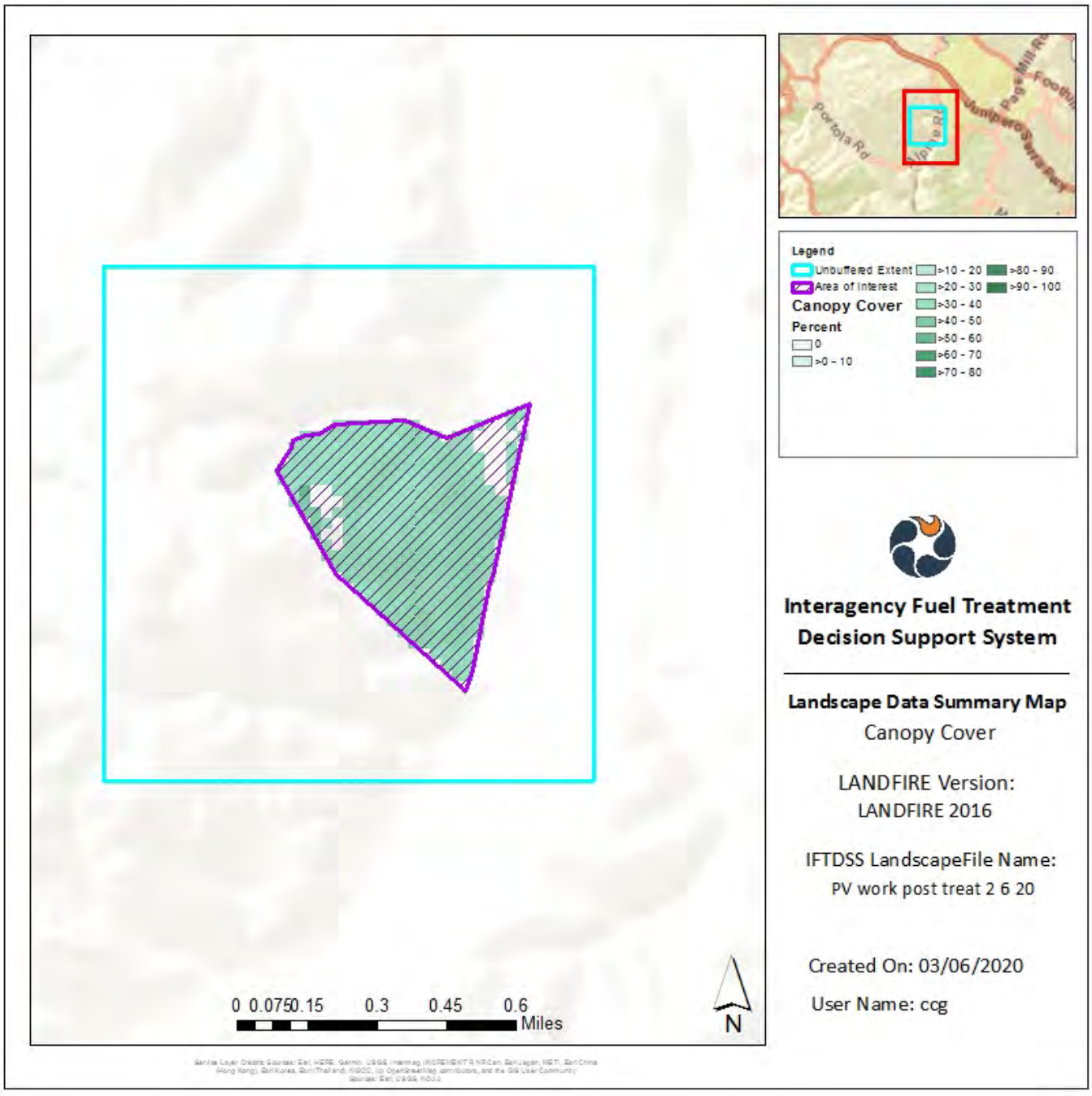
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Fuel Model (FBFM)

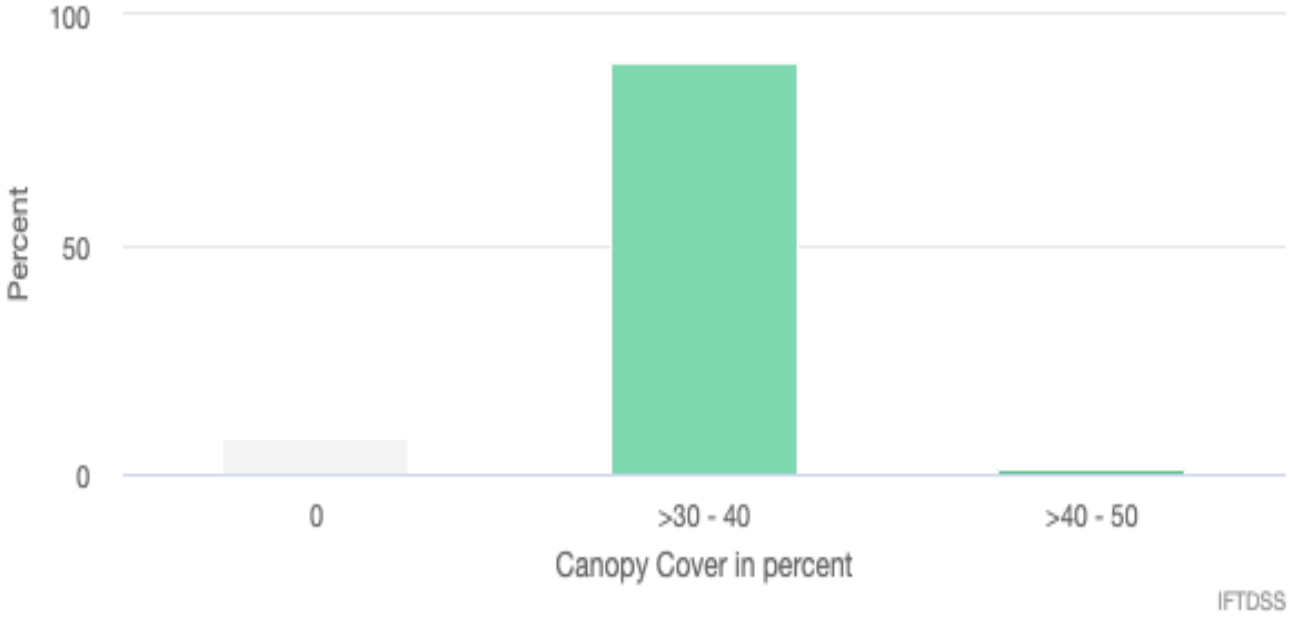
Fuel Model	Pixel Count (freq)	Acres In AOI	Percent In AOI
NB1 (91)	17	4	5
GR1 (101)	29	6	8
GS1 (121)	275	61	80
SH1 (141)	17	4	5
TL6 (186)	1	0	0
TL9 (189)	3	1	1

Canopy Cover



Canopy Cover (percent) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

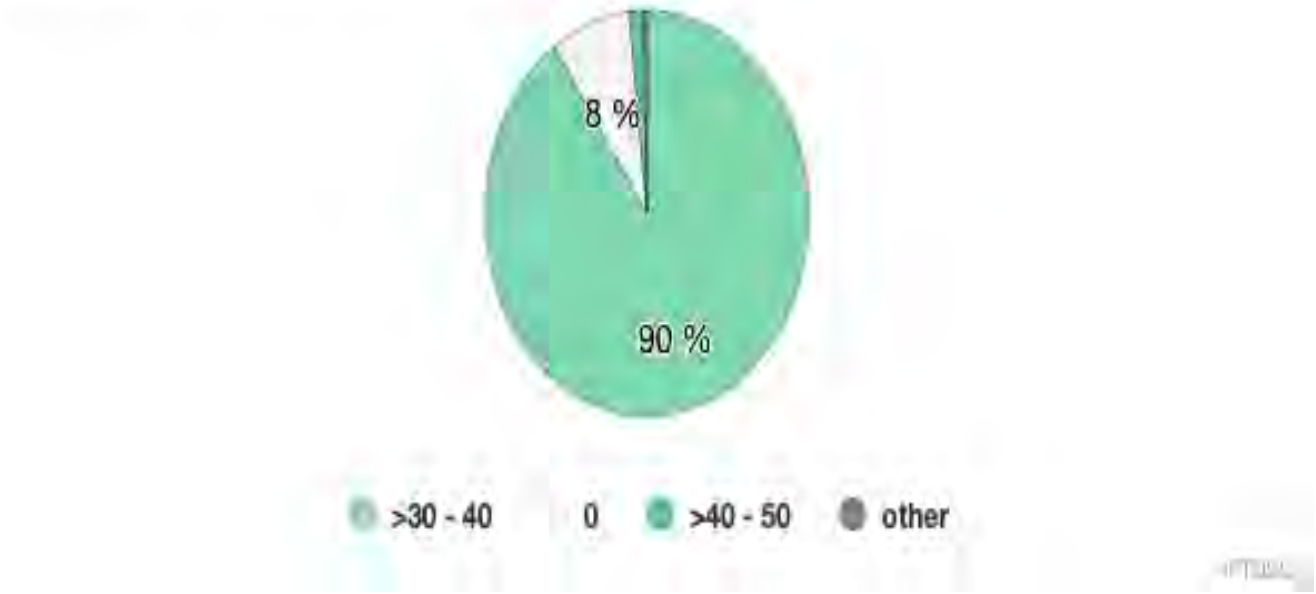
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Canopy Cover

Canopy Cover (percent) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

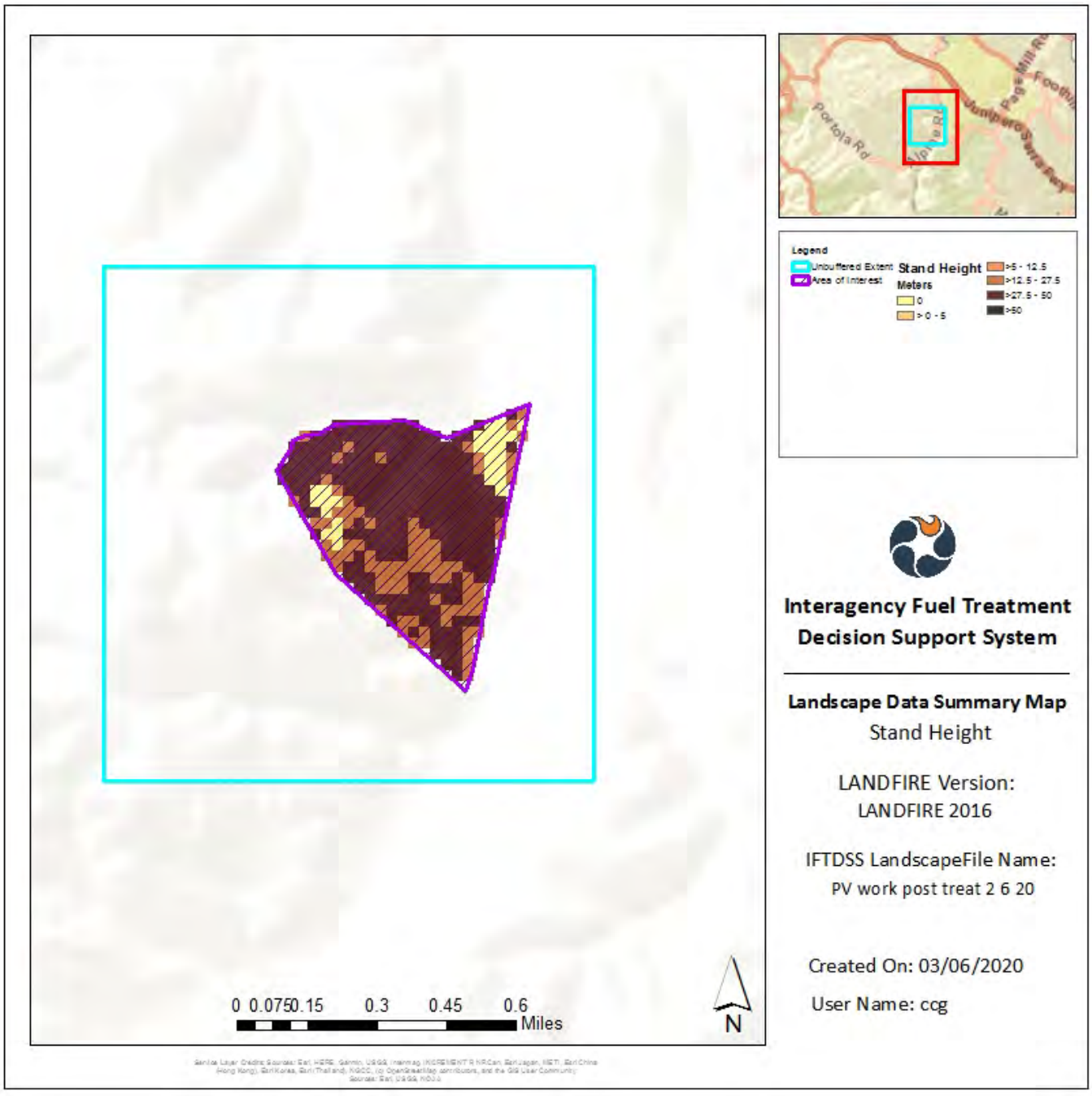
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Canopy Cover

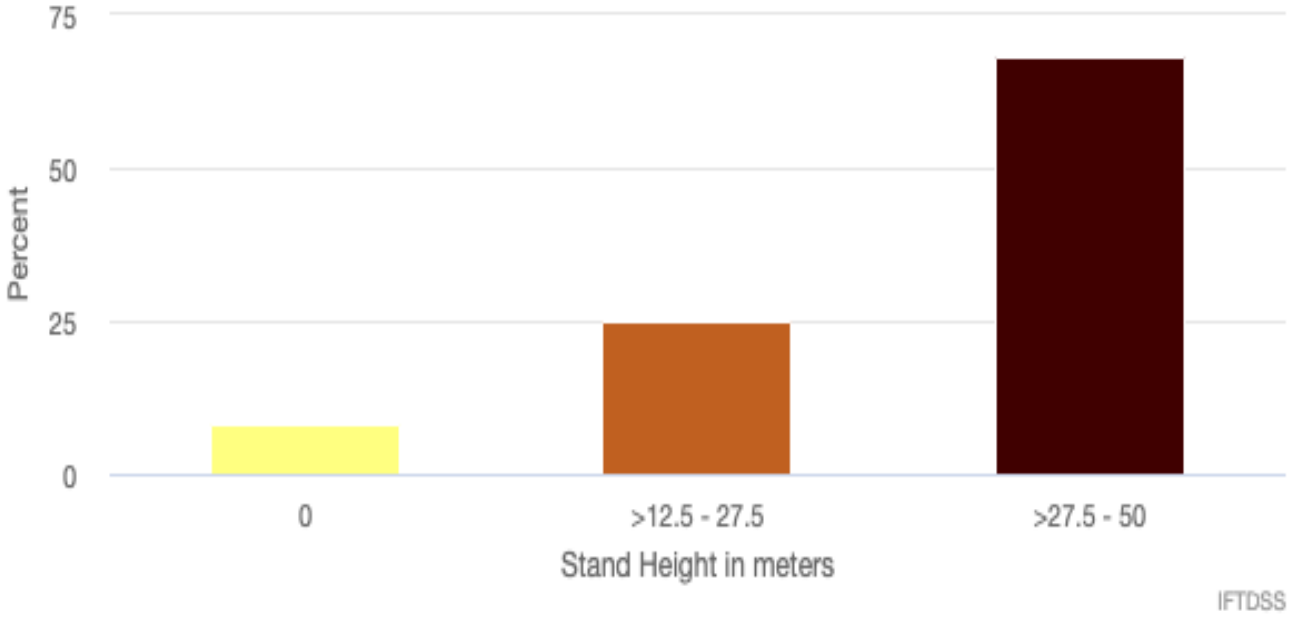
Canopy Cover (percent)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	27	6	8
>30 - 40	309	69	90
>40 - 50	5	1	1
>50 - 60	1	0	0

Stand Height



Stand Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

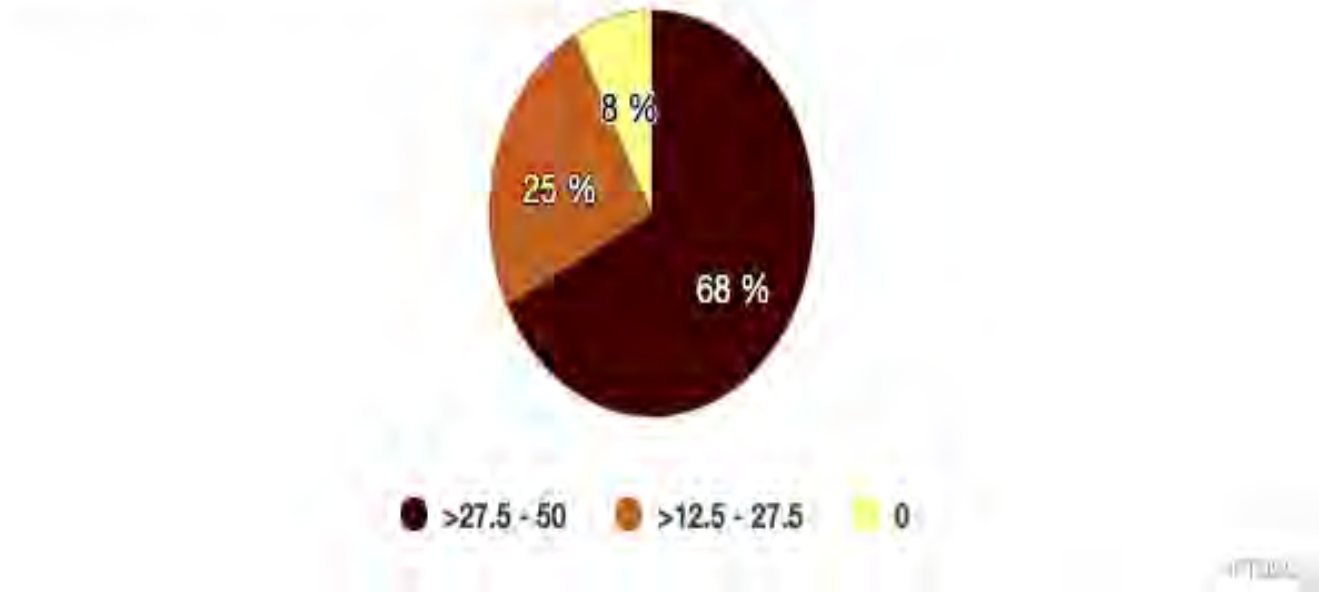
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Stand Height

Stand Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

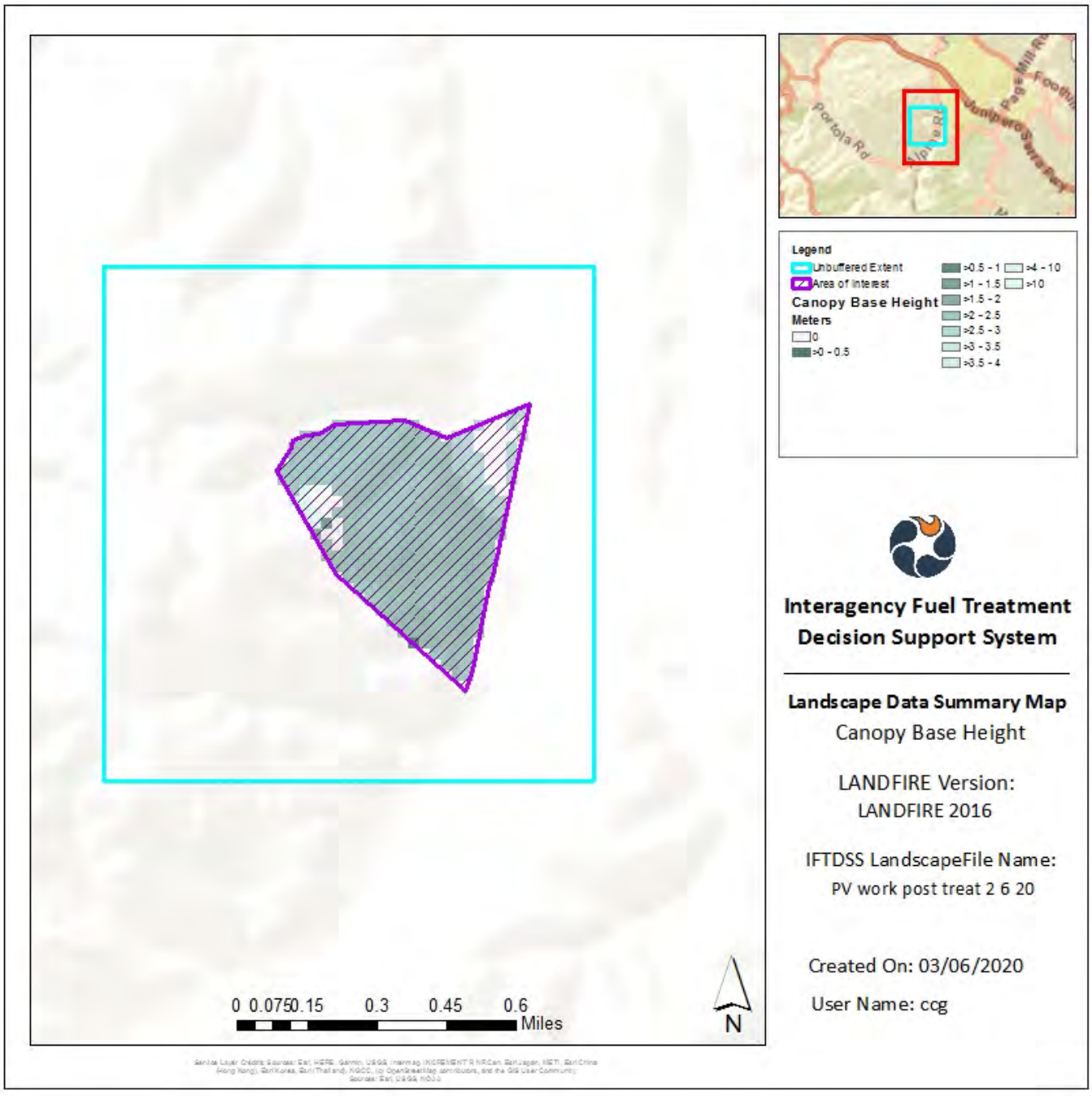
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Stand Height

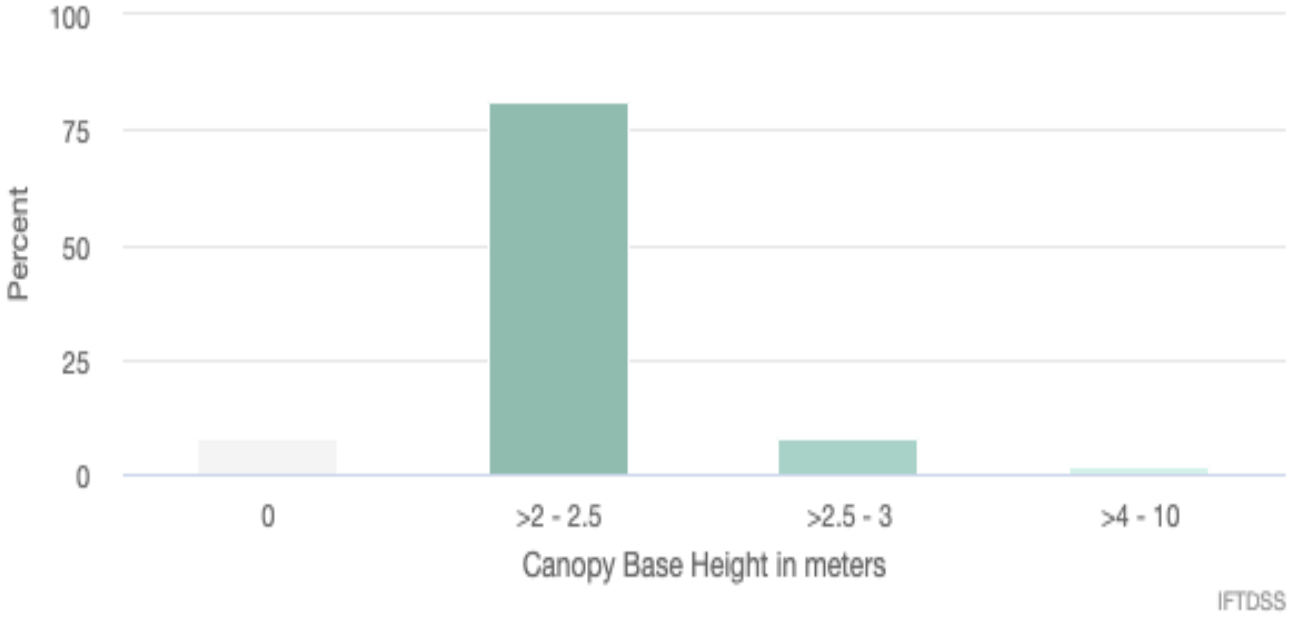
Stand Height (meters)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	27	6	8
>12.5 - 27.5	84	19	25
>27.5 - 50	231	51	68

Canopy Base Height



Canopy Base Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

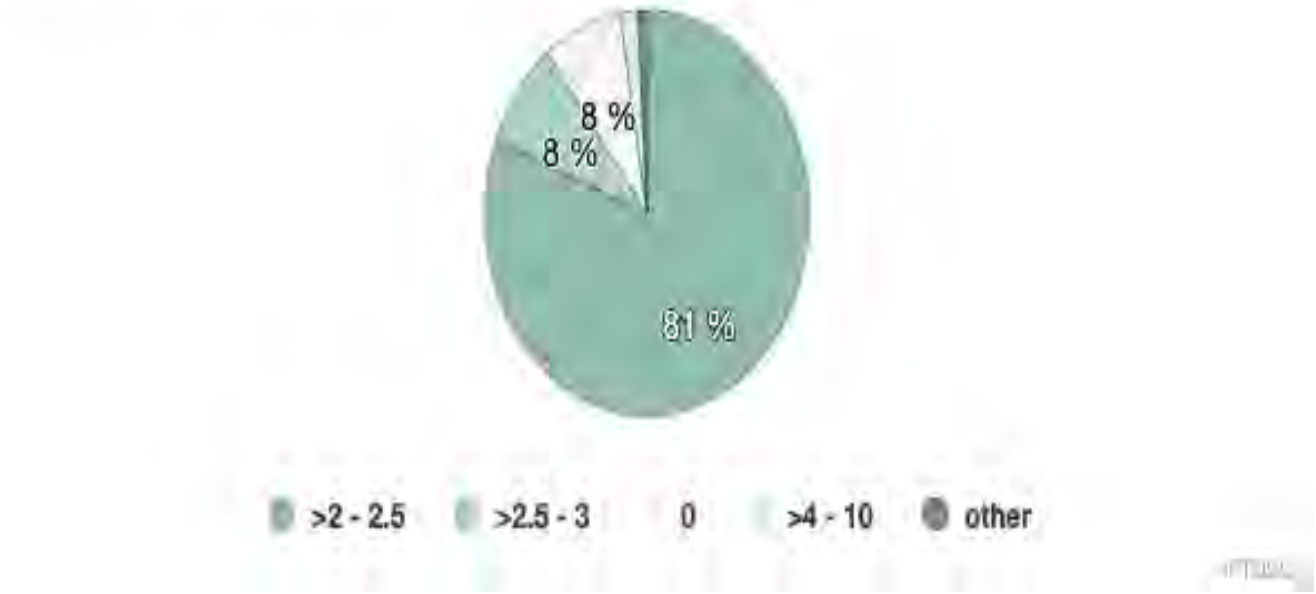
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Canopy Base Height

Canopy Base Height (meters) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

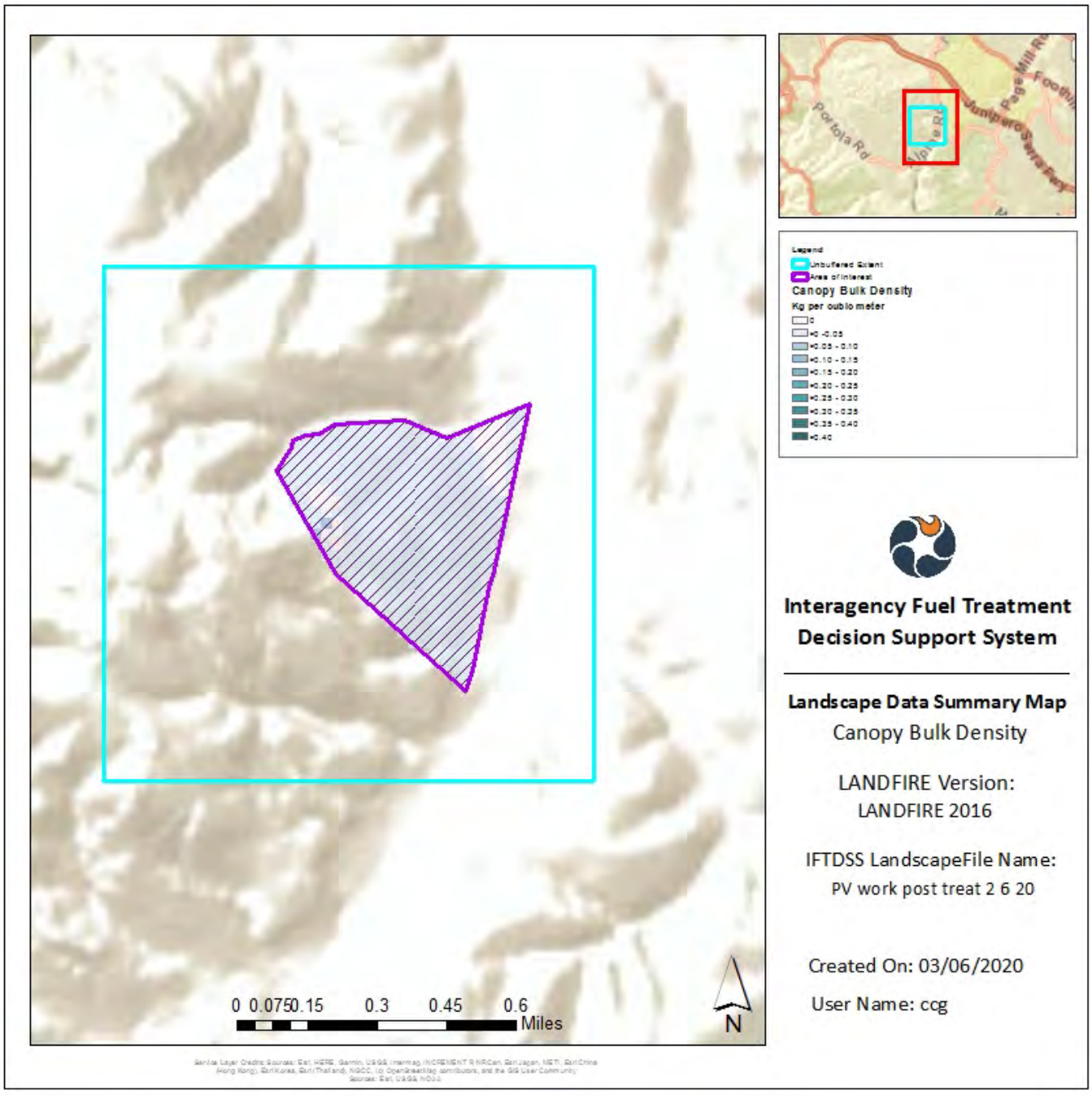
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Canopy Base Height

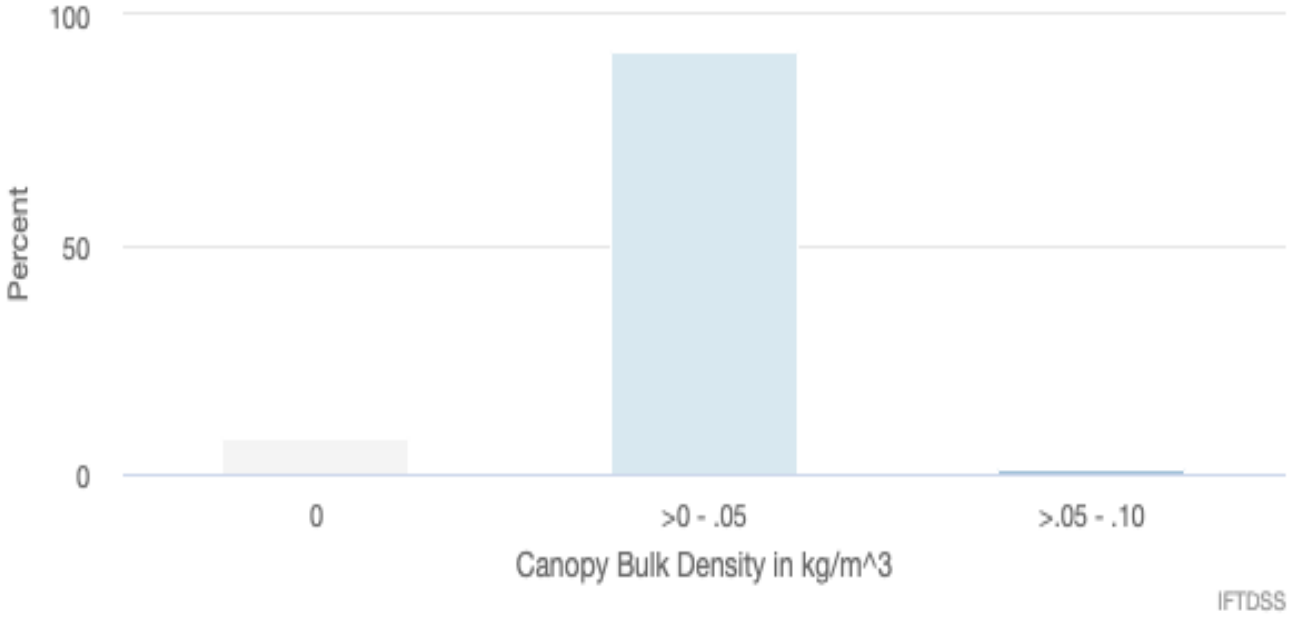
Canopy Base Height (meters)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	27	6	8
>0.5 - 1	1	0	0
>1 - 1.5	1	0	0
>1.5 - 2	1	0	0
>2 - 2.5	277	62	81
>2.5 - 3	29	6	8
>4 - 10	6	1	2

Canopy Bulk Density



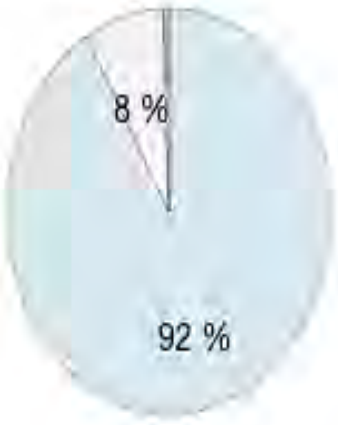
Canopy Bulk Density (kg/m^3) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Canopy Bulk Density (kg/m^3) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th

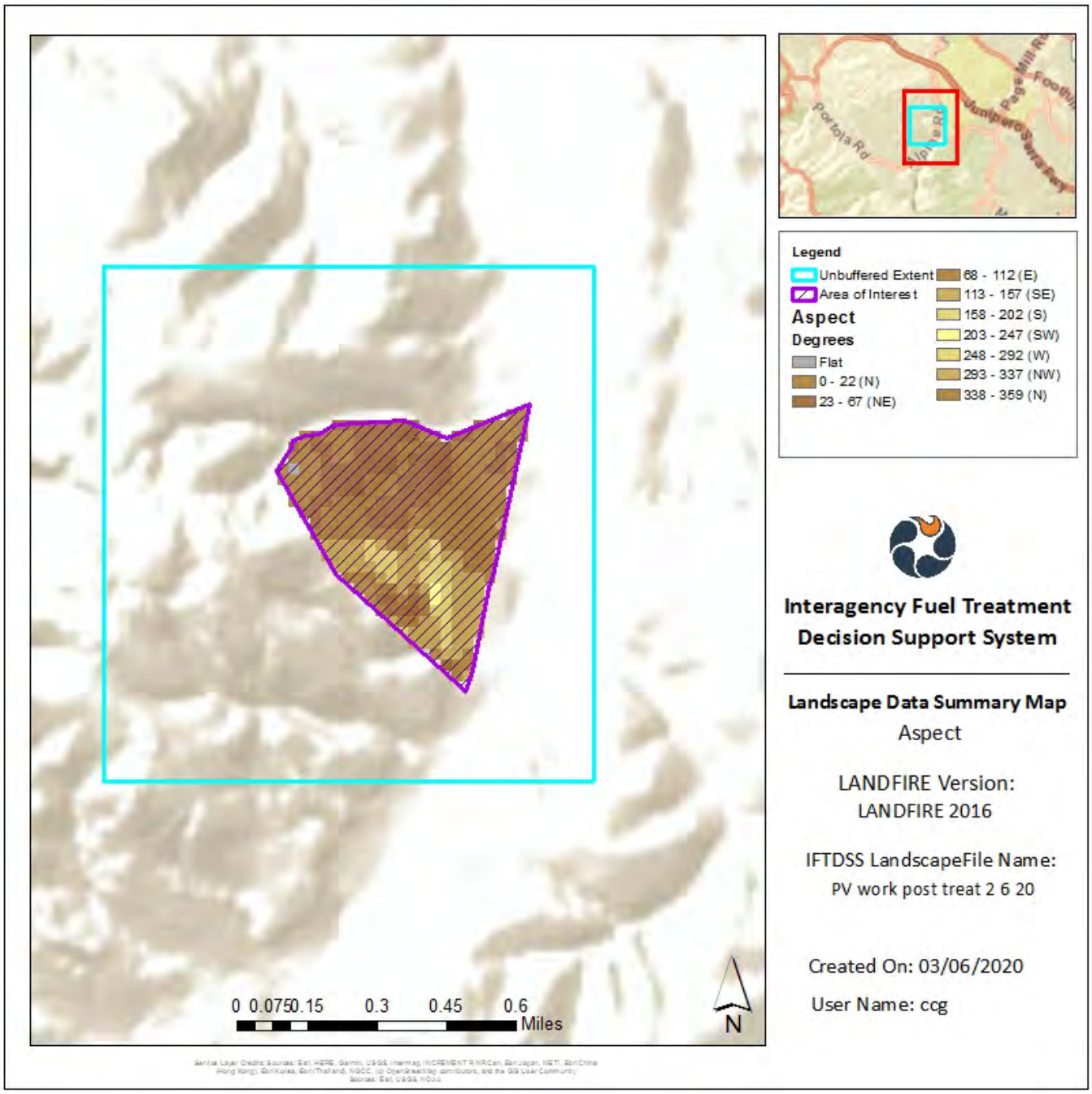


>0 - .05 0 >.05 - .10

Canopy Bulk Density

Canopy Bulk Density (kg/m^3)	Pixel Count (freq)	Acres In AOI	Percent In AOI
0 (non-forested)	27	6	8
>0 - .05	313	70	92
>.05 - .10	2	0	1

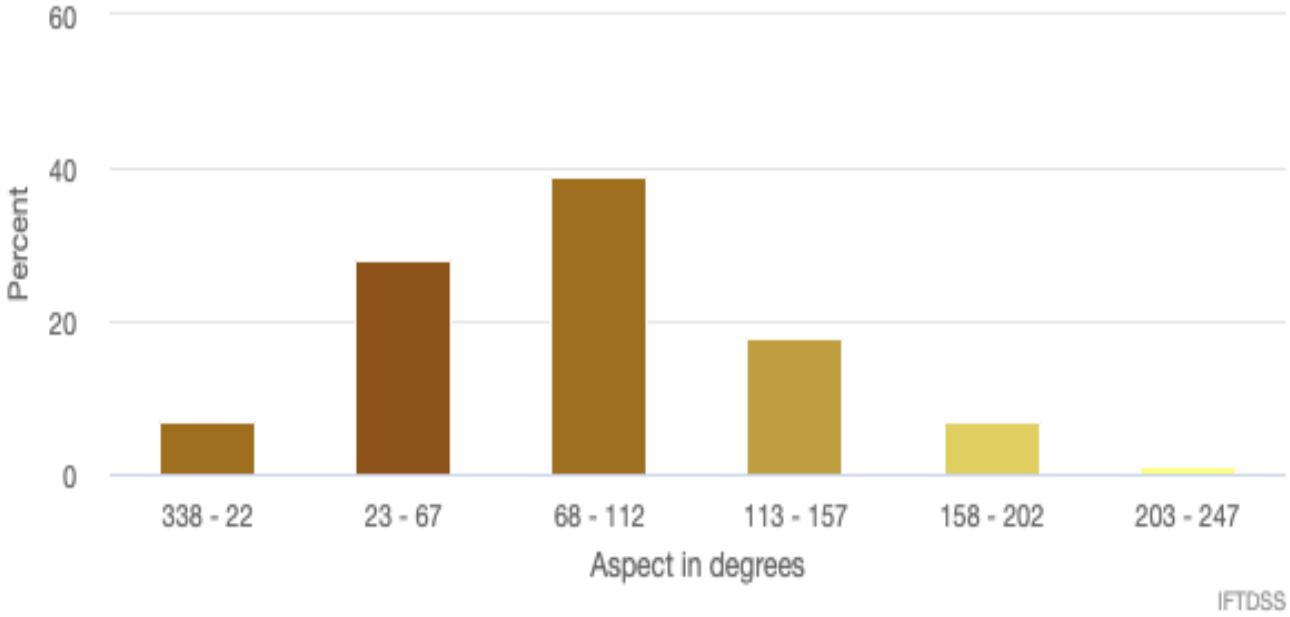
Aspect


Portola Rd
Page Mill Rd
Foothill
Junipero Serra Fwy
Legend
Unbuffered Extent
Area of Interest
Aspect
Degrees
Flat
0 - 22 (N)
23 - 67 (NE)
68 - 112 (E)
113 - 157 (SE)
158 - 202 (S)
203 - 247 (SW)
248 - 292 (W)
293 - 337 (NW)
338 - 359 (N)
0 0.075 0.15 0.3 0.45 0.6
Miles
N
Interagency Fuel Treatment Decision Support System
Landscape Data Summary Map
Aspect
LANDFIRE Version:
LANDFIRE 2016
IFTDSS LandscapeFile Name:
PV work post treat 2 6 20
Created On: 03/06/2020
User Name: ccg

Aspect

Aspect (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

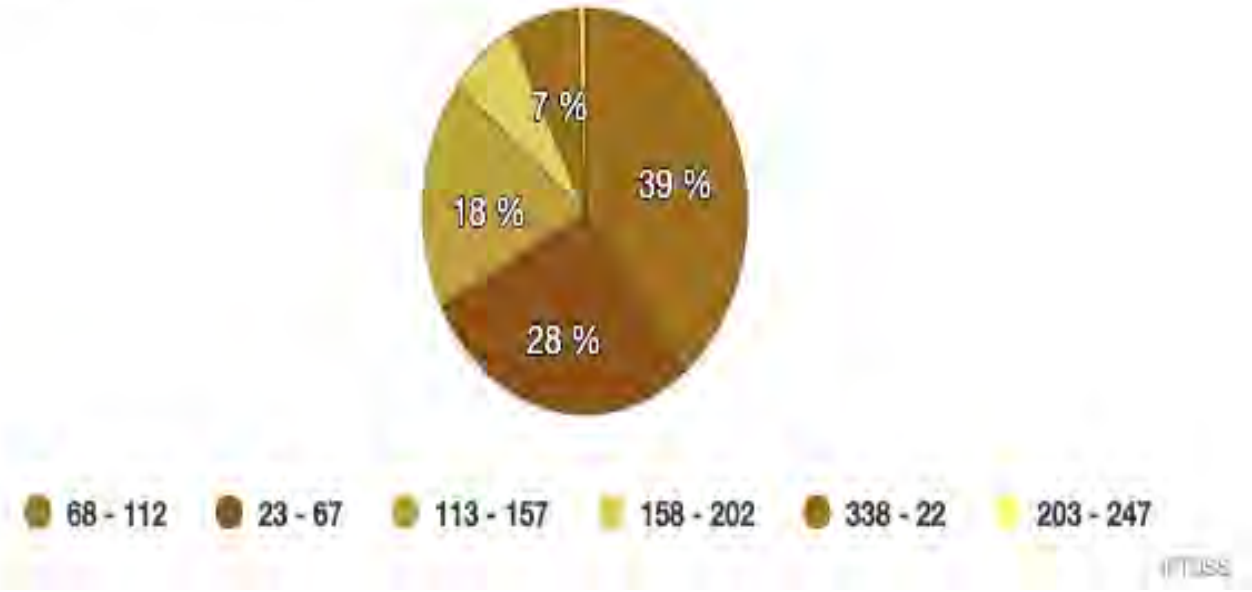
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Aspect

Aspect (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

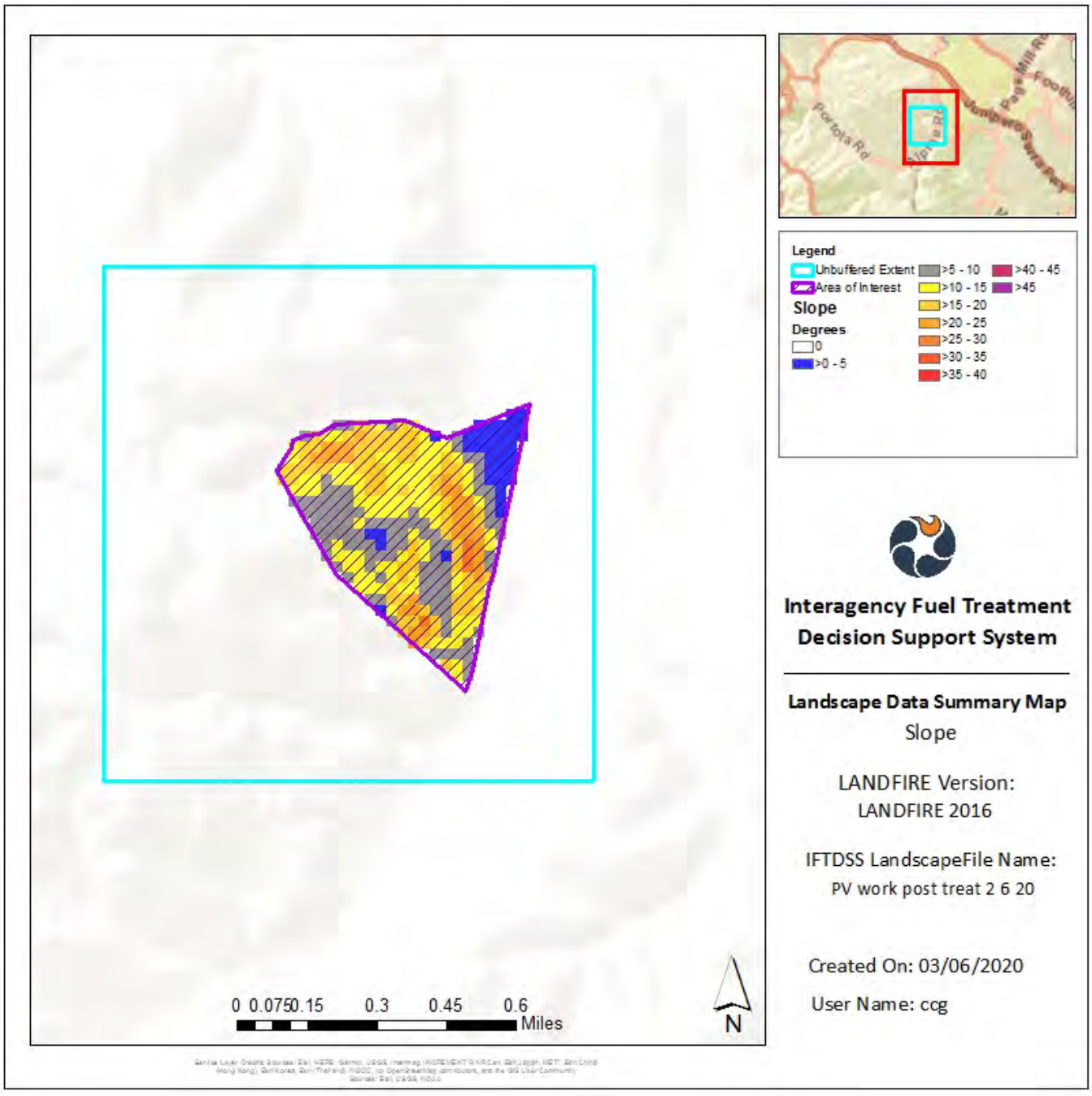
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Aspect

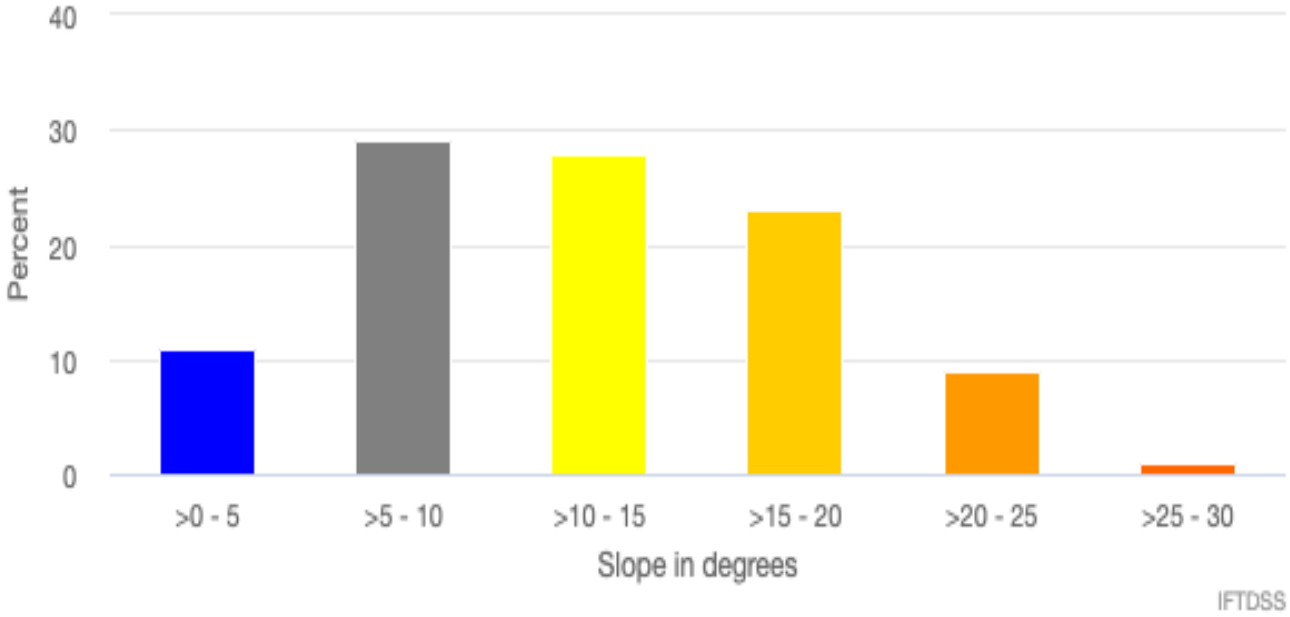
Aspect (degrees)	Pixel Count (freq)	Acres In AOI	Percent In AOI
338 - 22 (N)	24	5	7
23 - 67 (NE)	95	21	28
68 - 112 (E)	135	30	39
113 - 157 (SE)	63	14	18
158 - 202 (S)	23	5	7
203 - 247 (SW)	2	0	1

Slope


Legend
Unbuffered Extent
Area of Interest
Slope
Degrees
0
>0 - 5
>5 - 10
>10 - 15
>15 - 20
>20 - 25
>25 - 30
>30 - 35
>35 - 40
>40 - 45
>45
0 0.075 0.15 0.3 0.45 0.6
Miles
N
Interagency Fuel Treatment Decision Support System
Landscape Data Summary Map
Slope
LANDFIRE Version:
LANDFIRE 2016
IFTDSS LandscapeFile Name:
PV work post treat 2 6 20
Created On: 03/06/2020
User Name: ccg

Slope (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

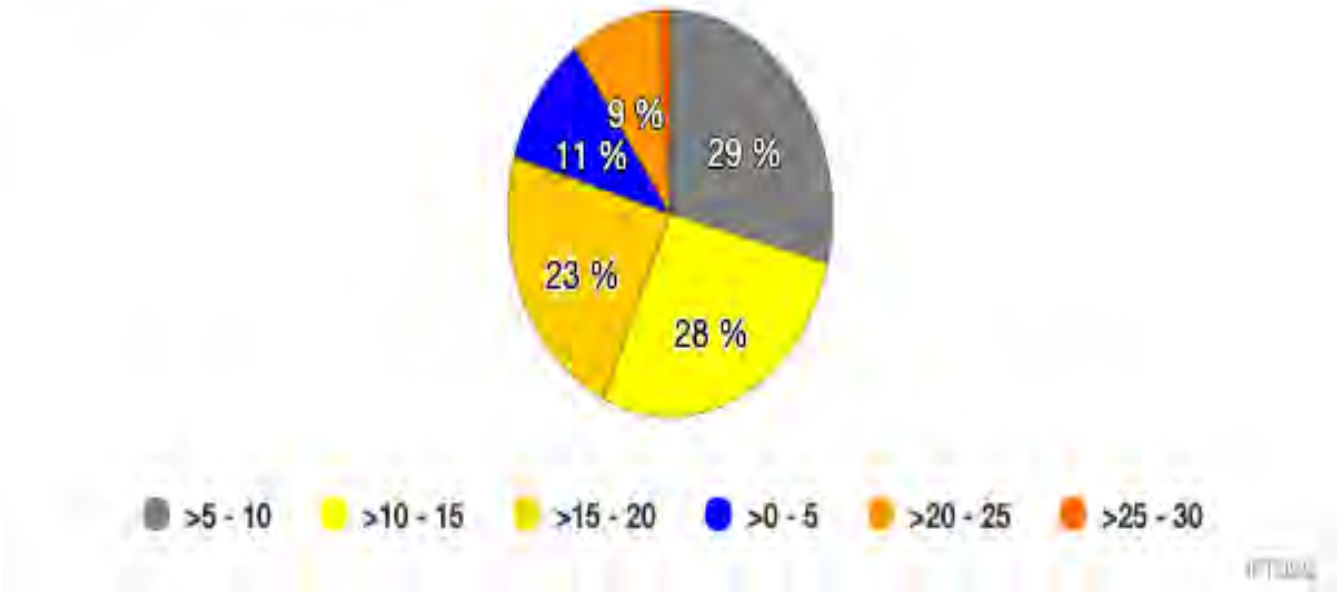
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Slope

Slope (degrees) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

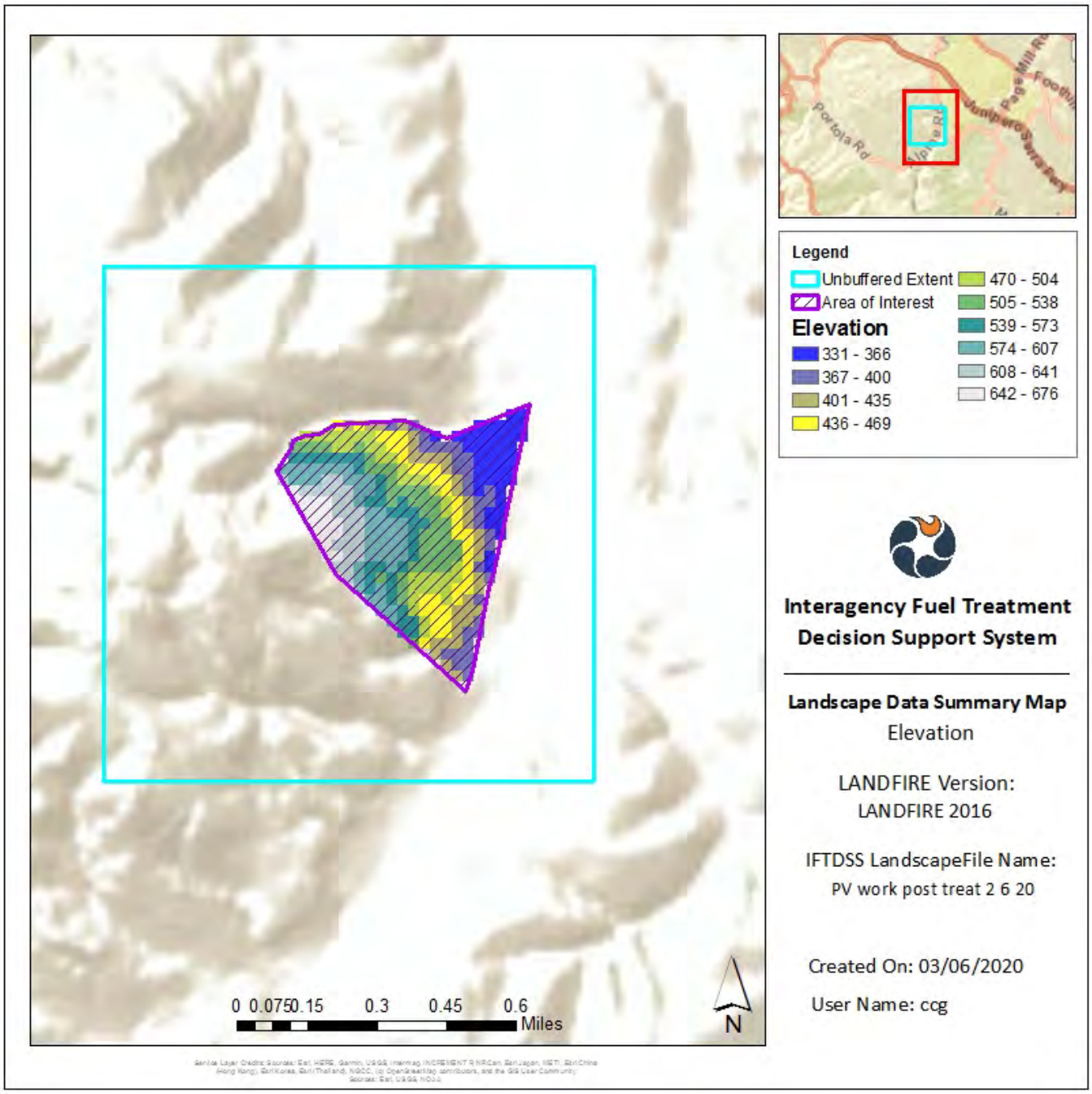
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Slope

Slope (degrees)	Pixel Count (freq)	Acres In AOI	Percent In AOI
>0 - 5	36	8	11
>5 - 10	99	22	29
>10 - 15	95	21	28
>15 - 20	78	17	23
>20 - 25	30	7	9
>25 - 30	4	1	1

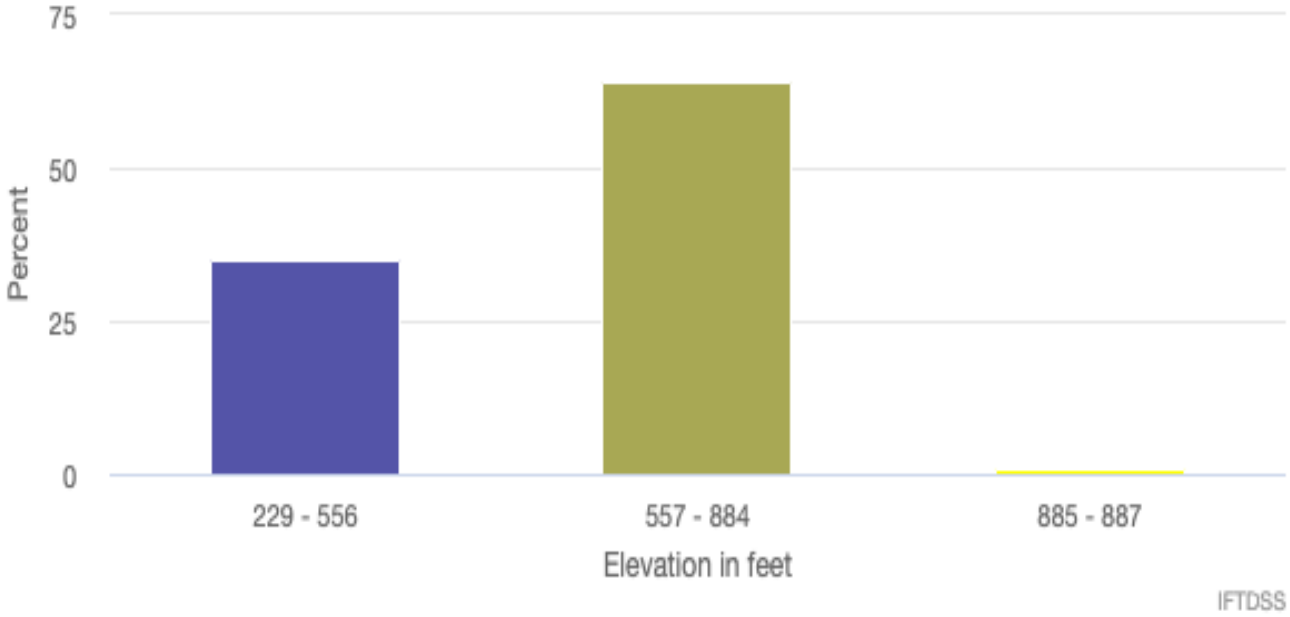
Elevation


Portola Rd
Page Mill Rd
Foothill
Junipero Serra Fwy
Legend
Unbuffered Extent
Area of Interest
Elevation
331 - 366
367 - 400
401 - 435
436 - 469
470 - 504
505 - 538
539 - 573
574 - 607
608 - 641
642 - 676
Interagency Fuel Treatment Decision Support System
Landscape Data Summary Map
Elevation
LANDFIRE Version:
LANDFIRE 2016
IFTDSS LandscapeFile Name:
PV work post treat 2 6 20
Created On: 03/06/2020
User Name: ccg
0 0.075 0.15 0.3 0.45 0.6
Miles
N

Elevation

Elevation (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

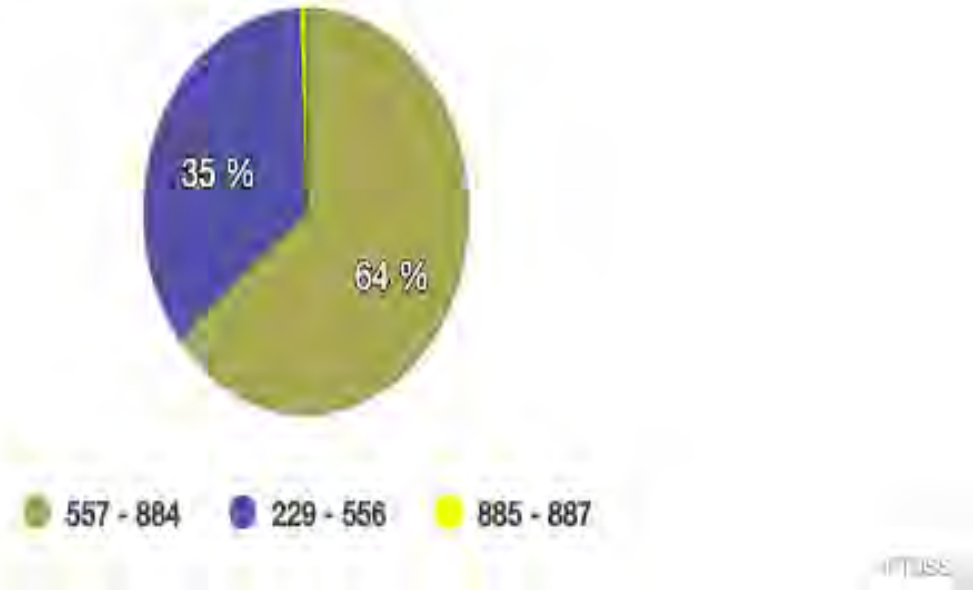
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Elevation

Elevation (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

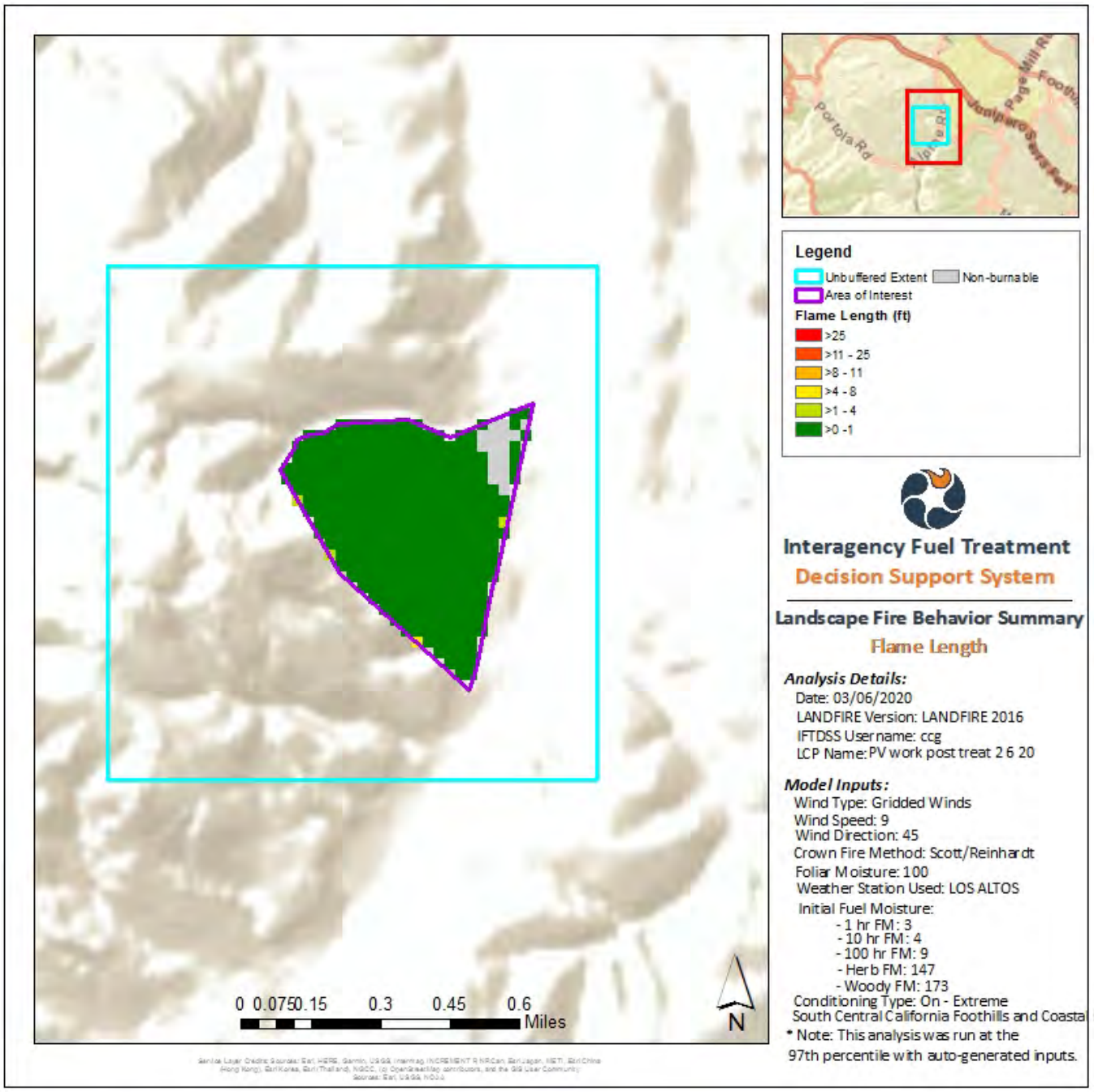
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Elevation

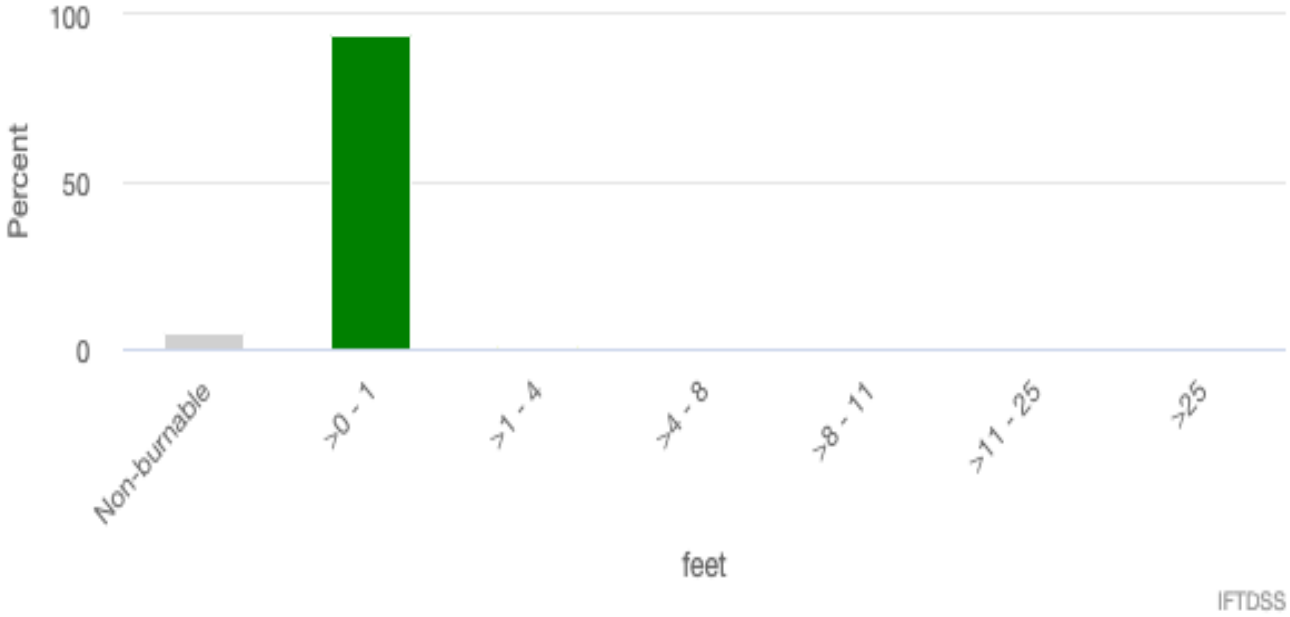
Elevation (feet)	Pixel Count (freq)	Acres In AOI	Percent In AOI
229 - 556	120	27	35
557 - 884	220	49	64
885 - 887	2	0	1

Flame Length



Flame Length (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

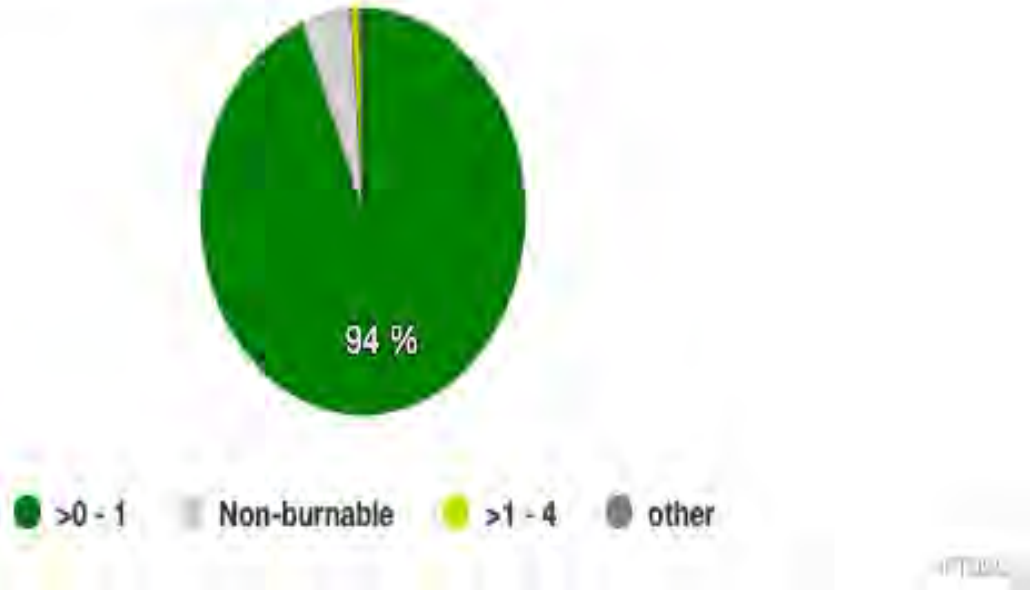
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Flame Length

Flame Length (feet) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

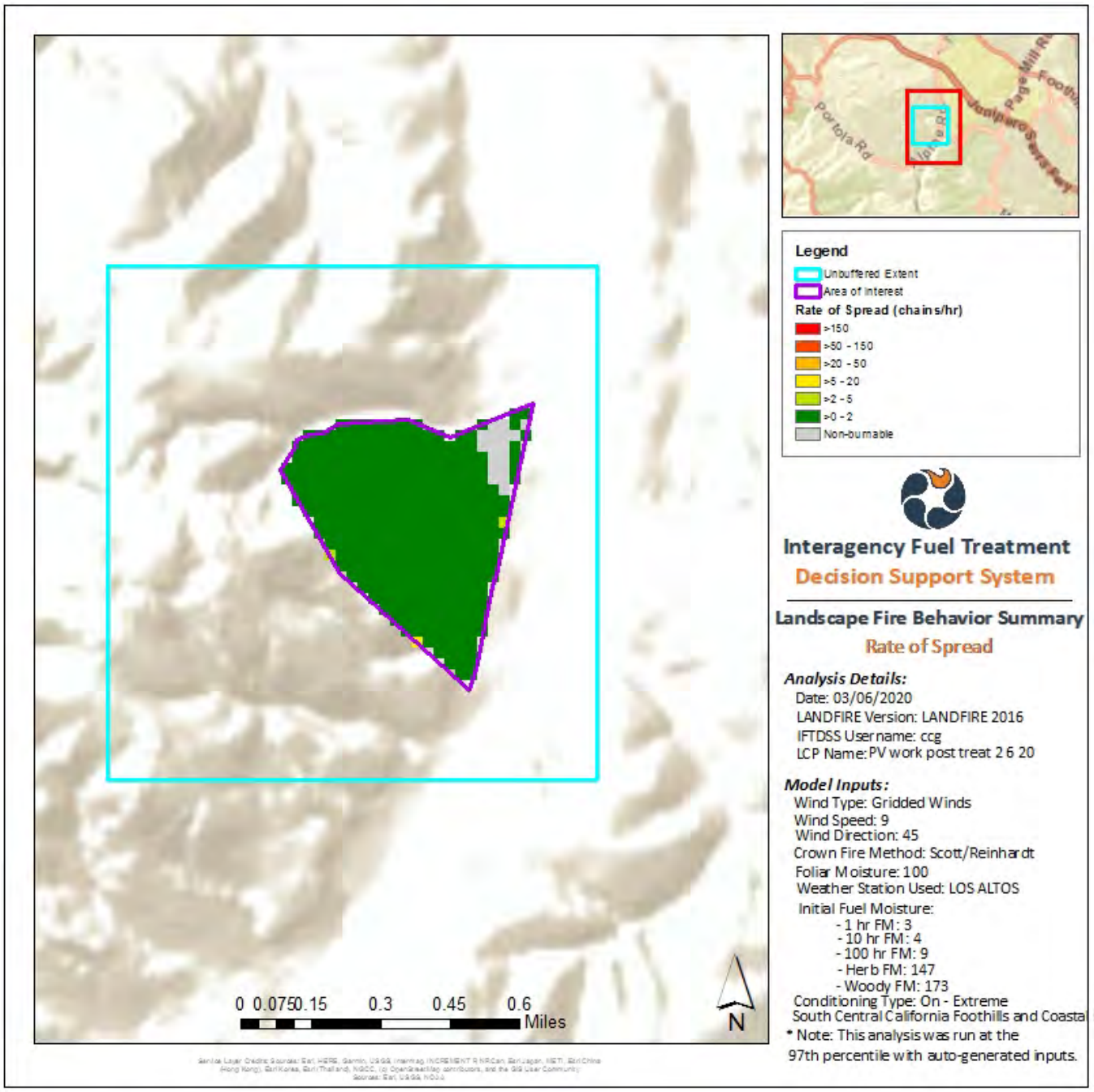
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Flame Length

Flame Length (feet)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
>0 - 1	321	71	94
>1 - 4	3	1	1
>4 - 8	1	0	0
>8 - 11	0	0	0
>11 - 25	0	0	0
>25	0	0	0

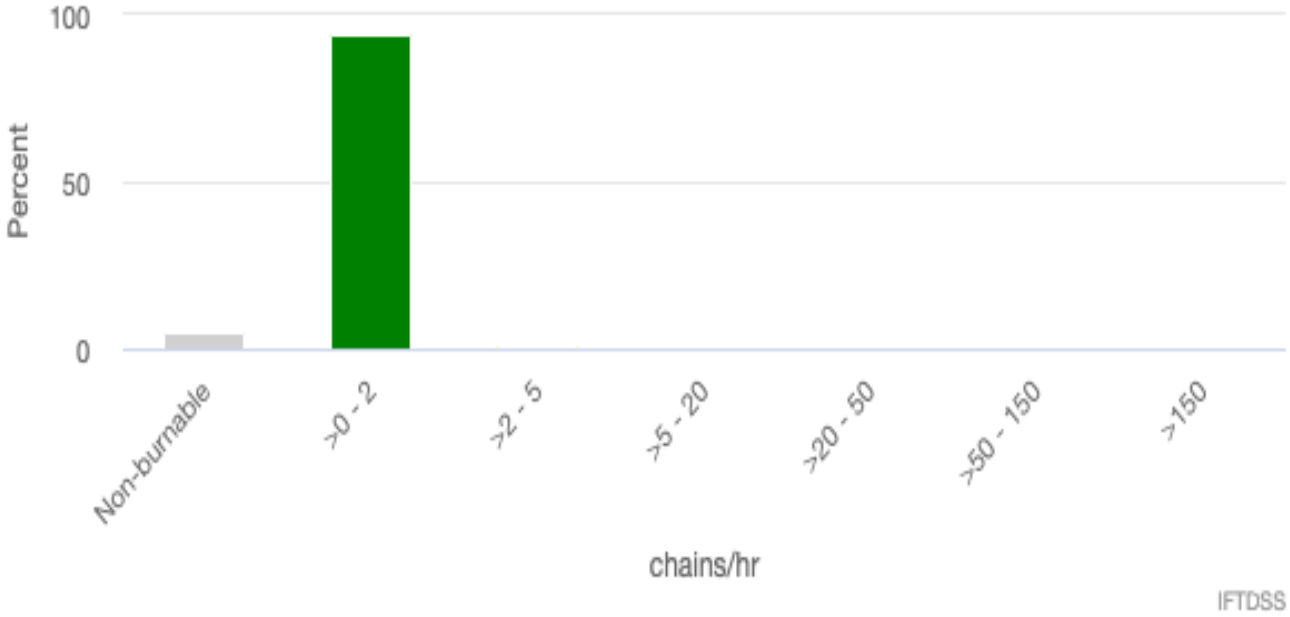
Spread Rate


Legend
Unbuffered Extent
Area of interest
Rate of Spread (chains/hr)
>150
>50 - 150
>20 - 50
>5 - 20
>2 - 5
>0 - 2
Non-burnable
0 0.075 0.15 0.3 0.45 0.6
Miles
N
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Rate of Spread
Analysis Details:
Date: 03/06/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work post treat 2 6 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.

Spread Rate

Rate of Spread (chains/hr) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

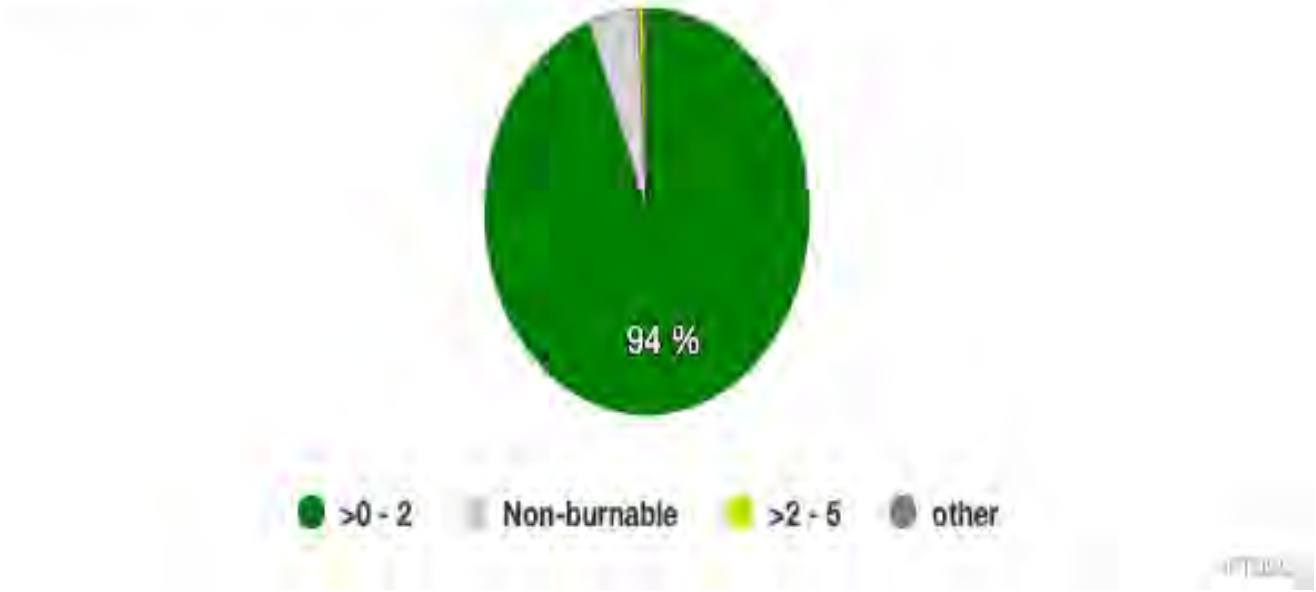
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Spread Rate

Rate of Spread (chains/hr) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

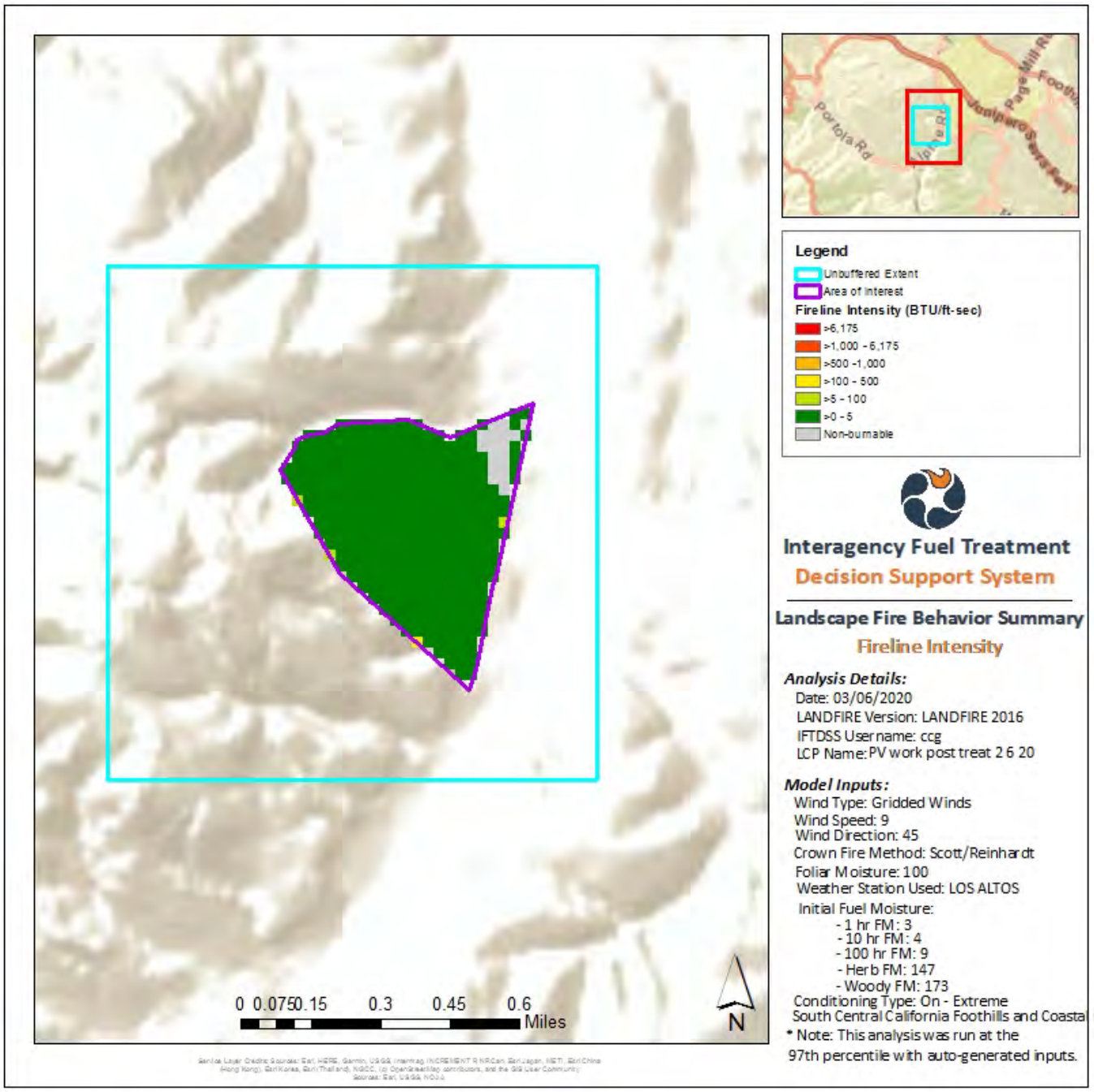
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Spread Rate

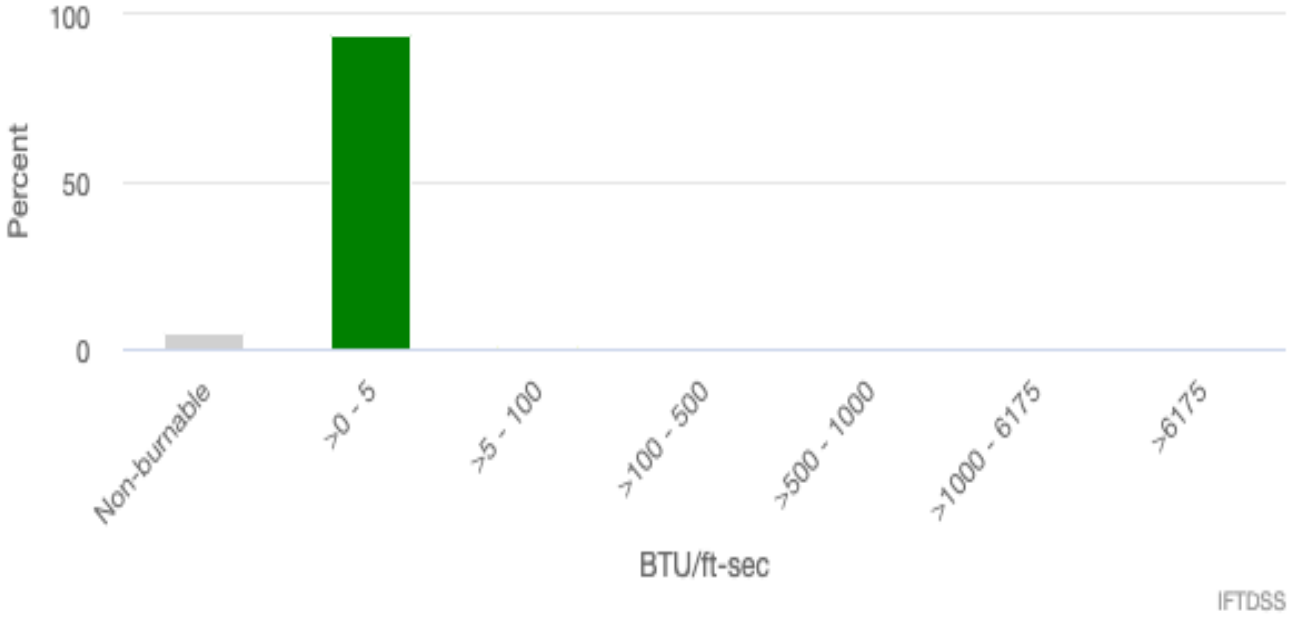
Rate of Spread (chains/hr)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
>0 - 2	322	72	94
>2 - 5	2	0	1
>5 - 20	1	0	0
>20 - 50	0	0	0
>50 - 150	0	0	0
>150	0	0	0

Intensity


Legend
Unbuffered Extent
Area of Interest
Fireline Intensity (BTU/ft-sec)
>6,175
>1,000 - 6,175
>500 -1,000
>100 - 500
>5 - 100
>0 - 5
Non-burnable
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Fireline Intensity
Analysis Details:
Date: 03/06/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work post treat 2 6 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.
0 0.075 0.15 0.3 0.45 0.6
Miles
N

Fireline Intensity (BTU/ft-sec) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

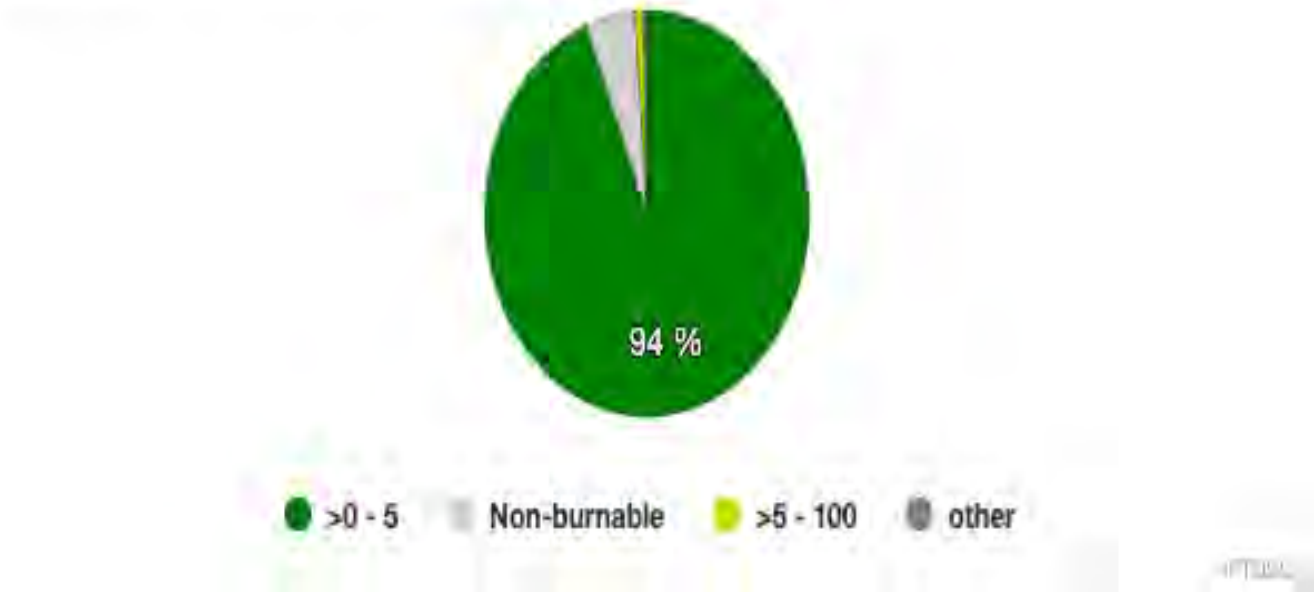
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Intensity

Fireline Intensity (BTU/ft-sec) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

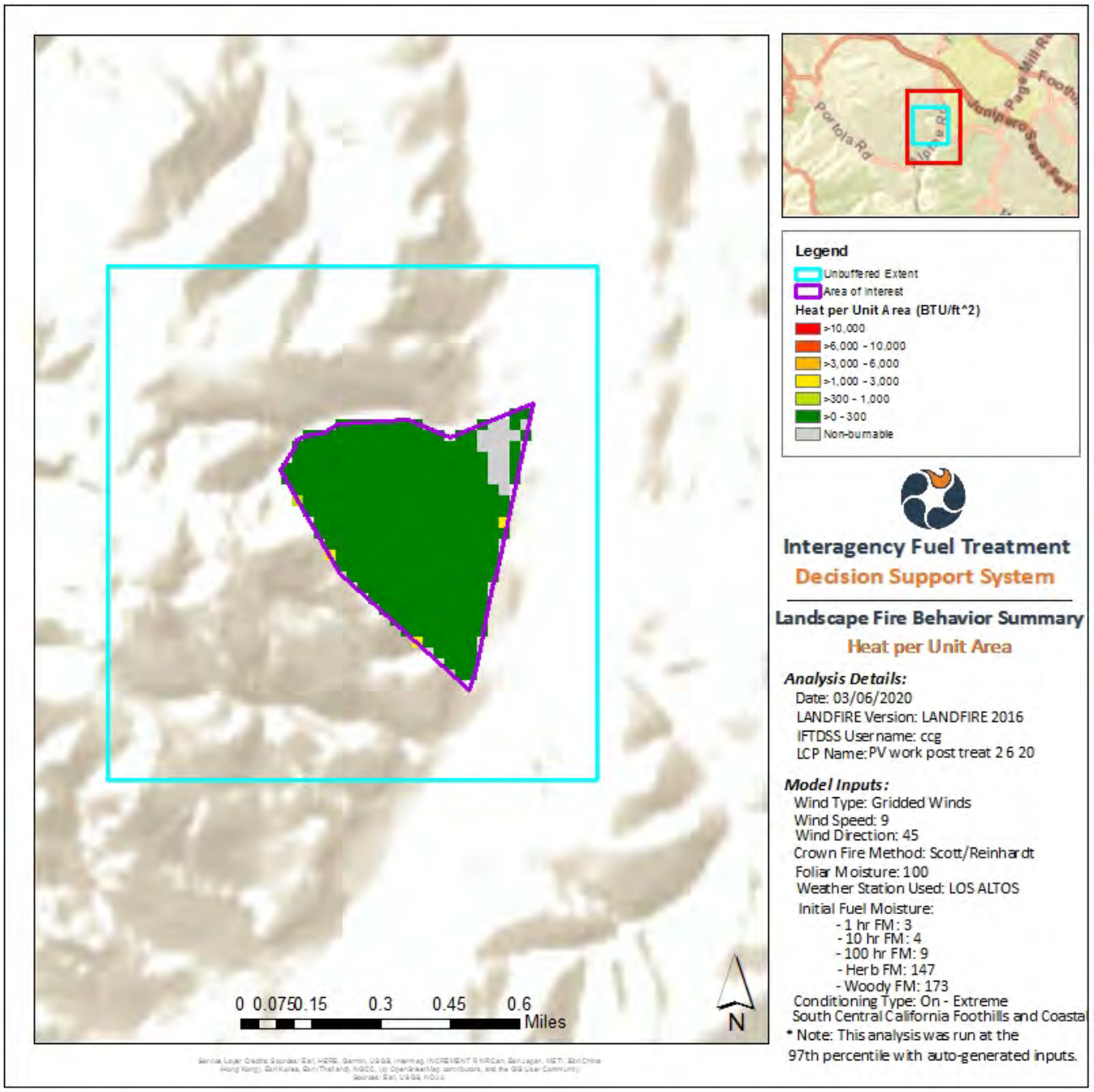
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Intensity

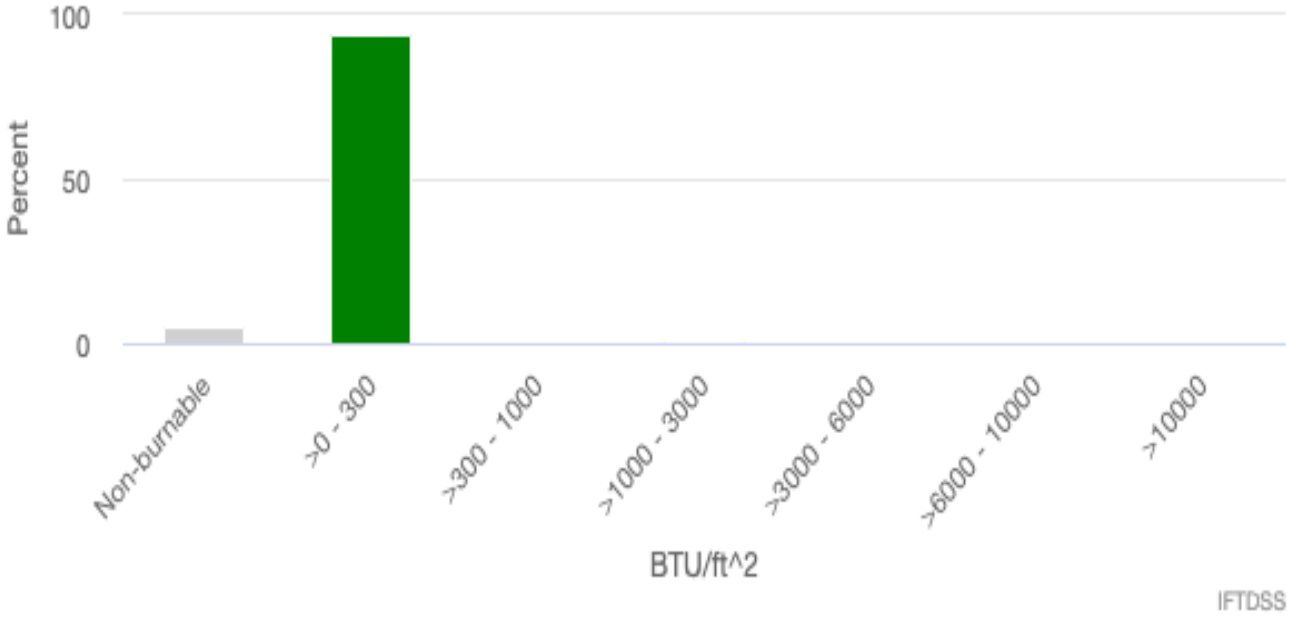
Fireline Intensity (BTU/ft-sec)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
>0 - 5	321	71	94
>5 - 100	3	1	1
>100 - 500	1	0	0
>500 - 1,000	0	0	0
>1,000 - 6,175	0	0	0
>6,175	0	0	0

Heat/Area


Legend
Unbuffered Extent
Area of interest
Heat per Unit Area (BTU/ft^2)
>10,000
>6,000 - 10,000
>3,000 - 6,000
>1,000 - 3,000
>300 - 1,000
>0 - 300
Non-burnable
Interagency Fuel Treatment
Decision Support System
Landscape Fire Behavior Summary
Heat per Unit Area
Analysis Details:
Date: 03/06/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work post treat 2 6 20
Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173
Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the
97th percentile with auto-generated inputs.
0 0.075 0.15 0.3 0.45 0.6
Miles
N

Heat per Unit Area (BTU/ft^2) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

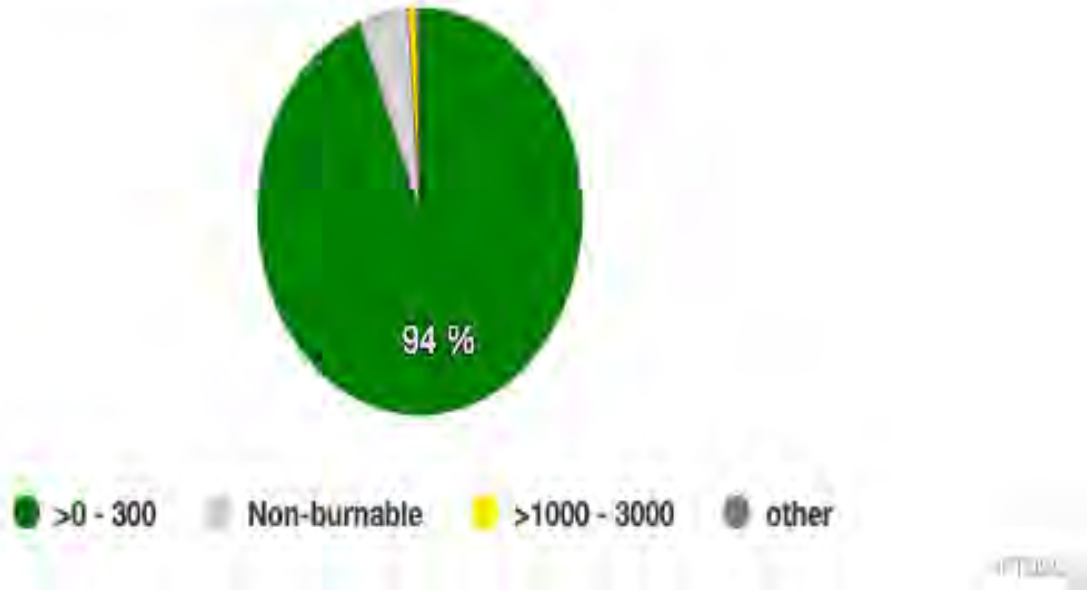
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Heat/Area

Heat per Unit Area (BTU/ft^2) Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

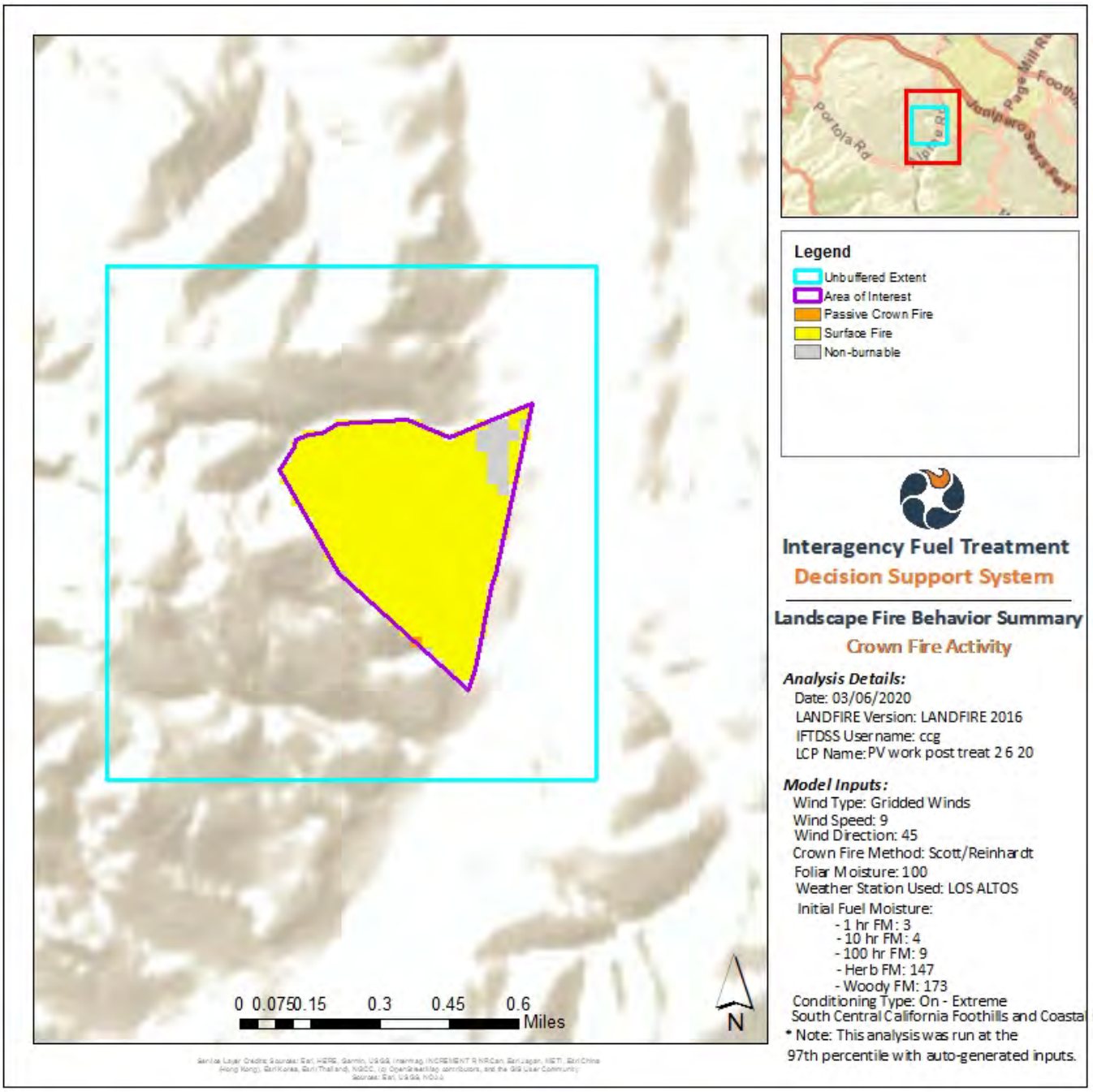
Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Heat/Area

Heat per Unit Area (BTU/ft^2)	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
>0 - 300	321	71	94
>300 - 1,000	1	0	0
>1,000 - 3,000	3	1	1
>3,000 - 6,000	0	0	0
>6,000 - 10,000	0	0	0
>10,000	0	0	0

Crown Fire



Interagency Fuel Treatment
Decision Support System

Landscape Fire Behavior Summary
Crown Fire Activity

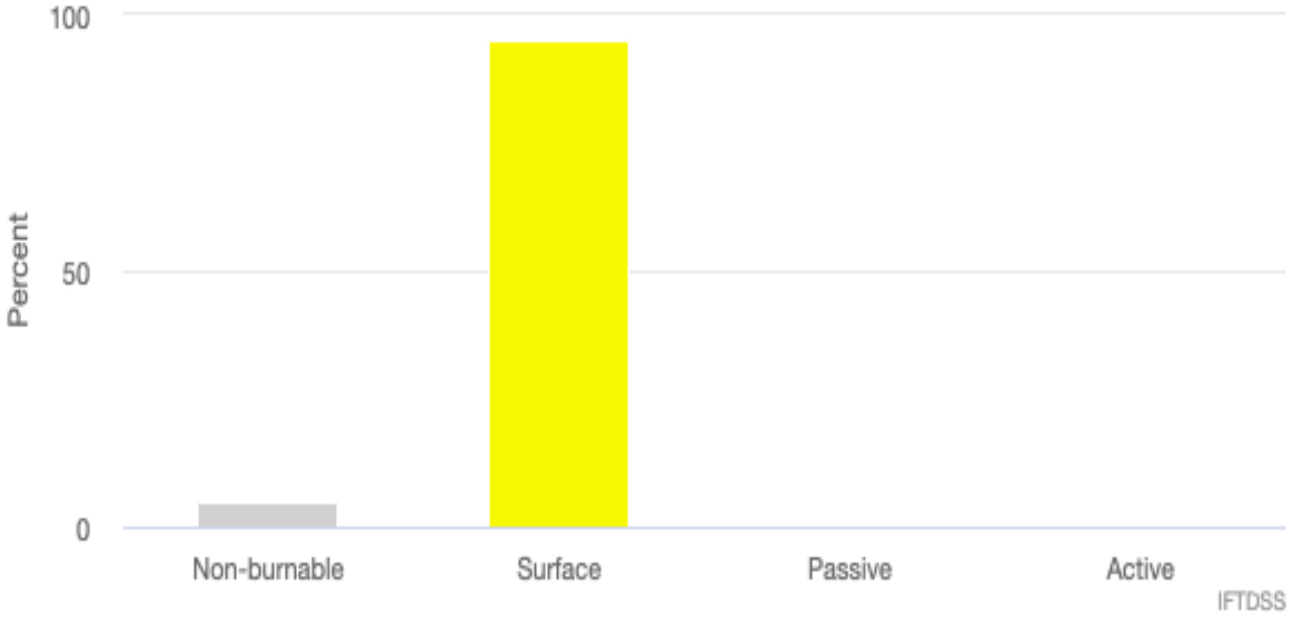
Analysis Details:
Date: 03/06/2020
LANDFIRE Version: LANDFIRE 2016
IFTDSS Username: ccg
LCP Name: PV work post treat 2 6 20

Model Inputs:
Wind Type: Gridded Winds
Wind Speed: 9
Wind Direction: 45
Crown Fire Method: Scott/Reinhardt
Foliar Moisture: 100
Weather Station Used: LOS ALTOS
Initial Fuel Moisture:
- 1 hr FM: 3
- 10 hr FM: 4
- 100 hr FM: 9
- Herb FM: 147
- Woody FM: 173

Conditioning Type: On - Extreme
South Central California Foothills and Coastal M
* Note: This analysis was run at the 97th percentile with auto-generated inputs.

Crown Fire Activity Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th



Crown Fire

Crown Fire Activity Data Summary for Area of Interest "pv_aoi_3_3_20" within "PV_work_post_treat_2_6_20" Landscape

Source Landscape Name: PV_work_post_treat_2_6_20
Landfire Version: LANDFIRE 2016
Source Landscape Acres: 470
Area of Interest Name: pv_aoi_3_3_20
Area of Interest Acres: 76
Model Name: PV_work_post_treat_2_6_20 - Auto97th

Crown Fire

Crown Fire Activity	Pixel Count (freq)	Acres In AOI	Percent In AOI
Non-burnable	17	4	5
Surface Fire	324	72	95
Passive Fire	1	0	0
Active Fire	0	0	0

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Appendix C: Detailed Treatment Methodology Report

Detailed Treatment Methodology Report

Steep Slope Mastication with manual support

Summary: Due to the steepness and inaccessibility of approximately 20 acres within the Stanford-Portola Valley Parcel (SPVP), a self-leveling excavator with a rotor or drum style recirculating and hydraulically powered mastication head may be required to maximize treatment effectiveness. Ground pressure of this machine is low, with manufactures specification noting average ground pressure of 7.5 psi. Machine width maximum shall not exceed 12 feet. The machine must have a boom capable of reaching at least 10 feet from center of machine to perform the work. Within the 20 acres there is an additional 5 acres that even a self-leveling excavator can't access. In these areas, manual cutting with chainsaws and loppers will cut targeted vegetation and remove cut vegetation to an area the masticator can access for piling and subsequent masticating.

Treatment Specifications:

- Masticate all material within operation limits that is < = 10" on the large end of the designated vegetation or fuel to be treated.
- All rearranged (masticated) material must, on average, be less than 4 inches long and 2 inches wide.
- Ensure masticated material doesn't exceed an average depth of 4 inches across the treatment unit (dusky-footed woodrat nests – active or deserted – does not count against this requirement).
- Cut all branches and tree stumps within 6 inches of the ground.
- See each treatment area design and description for the vegetation species removal hierarchy as well as any canopy cover limitations.
- Follow an approved Woodside Fire Protection fire plan during implementation.

Mastication

Summary: Due to the steepness and inaccessibility of the majority of the SPVP, access via permanent or temporary road for fuel removal may be impractical. Therefore, a masticator with a rotor or drum style recirculating and hydraulically powered mastication head is required to maximize treatment effectiveness. Ground pressure of this machine is low, with manufactures specification noting average ground pressure of 7.5 psi. Machine width maximum shall not exceed 12 feet. The machine must have a boom capable of reaching at least 10 feet from center of machine to perform the work. Although a self-leveling excavator isn't required on these inaccessible but moderately sloped surfaces, it is understood that it may not make sense to bring in two different machines to treat the entire area but may occur depending on a contractor's capacity.

Treatment Specifications:

- Masticate all material within operation limits that is < = 10" on the large end of the designated vegetation or fuel to be treated.
- All rearranged (masticated) material must, on average, be less than 4 inches long and 2 inches wide.
- Ensure masticated material doesn't exceed an average depth of 4 inches across the treatment unit (dusky-footed woodrat nests – active or deserted – does not count against this requirement)
- Cut all branches and tree stumps within 6 inches of the ground.
- See each treatment area design and description for the vegetation species removal hierarchy as well as any canopy cover limitations.
- Follow an approved Woodside Fire Protection fire plan during implementation.

Manual Cutting

Summary: Manual cutting is generally the traditional treatment method when all other treatment methods have been eliminated because of proximity to important resources, access, slope limitations, vegetation, and fuels. Generally, cutting occurs with a chainsaw or a lopper. The resulting material can either be chipped on site, chipped and hauled offsite, or piled for burning or mastication.

Treatment Specifications:

- Cut all branches and tree stumps within 6 inches of the ground.
- Cut any side branches flush with remaining branches or tree bole.
- See each treatment area design and description for the vegetation species removal hierarchy as well as any canopy cover limitations.
- Follow an approved Woodside Fire Protection fire plan during implementation.

Mowing

Summary: Using traditional landscaping equipment, like lawn mowers and weed eaters, is an appropriate way to manage fine fuels in accessible areas.

Treatment Specifications:

- Ensure the equipment is suited for material to be treated.
- Follow an approved Woodside Fire Protection fire plan during implementation.

Goat Grazing

Summary: Grazing using goats has several benefits over other treatment methods including impacts, access, and less fire ignitions. However, if there is too much vegetation or the target vegetation is out of reach, they are much less effective at reducing fuels. This makes them best suited as part of a follow up treatment and/or maintenance plan.

Treatment Specifications:

- Sectional fencing may be required in order to focus grazing on problem fuel areas, keep animals on the SPVP, and protect sensitive resources.
- Mountain lions are known to be in the area; therefore, predator protection measures might need to be employed.
- Optimal grazing time will be in late spring/early summer to minimize plant carbohydrate storage, plants going to seed, while maximizing the attractiveness of target species.

Manual Remove

Summary: When manually cut material is in close proximity to a road system or where a masticator can access, it can be carried/dragged to where it can be further processed (often with a chipper) and trucked away. Generally, removing material more than 300 feet from where it is cut is impractical and counterproductive as the loss of material while manually transporting can sometimes exceed what is actually removed.

Treatment Specifications:

- Remove all activity slash (branches and logs) that is longer than 1 foot and is greater than 1-inch diameter on the large end.
- Limit manual removal distances to less than 500 feet.
- Follow an approved Woodside Fire Protection fire plan during implementation.

Manual Piling

Summary: In some instances, because pulling material to a machine or road is impractical due to distance or terrain, it may be appropriate to build piles for a future prescribed pile burn.

Treatment Specifications:

- All activity slash (branches and logs) exceeding 1 foot in length and is greater than 1-inch diameter on the large end will be piled.
- Piles shall be constructed by hand to facilitate full consumption when they are burned.
- All piles shall be built and compacted by laying limbs, stems, cut boles, and other slash so there are no air spaces. Each pile shall include an area of kindling for prompt ignition and to aid in combustion of larger slash. These fuels shall be placed in the center or bottom of the pile. The piles will be constructed so that they will burn after a rainstorm.
- All piles shall have a piece of waterproof material not less than 3 feet by 3 feet secured to the top of the pile to maintain a dry ignition zone during seasonal rains.
- As a minimum all slash shall be bucked to the pile diameter.
- The minimum pile size will be 6 feet high and 7 feet in diameter. The pile diameter will be symmetrical to each side, in a circle shape. The minimum distance between piles will be the pile height. Measurement is taken at the bottom of the pile for pile size and distance. The maximum size of the piles will

be determined by the opening dimension of the residual forest canopy and tree susceptibility to crown scorch or mortality.

- All material will be contained within the general contour of the pile and any material protruding out 2 feet or more will be sawed off and placed back on the pile.
- Stanford and/or Woodford Fire Protection District may designate maximum, minimum, or both pile sizes when it determines this is required to meet resource objectives.
- The piles will be constructed so that there will be a break in residual slash around the pile of at least 10 feet. This is needed to protect wildlife features such as logs. This is also needed to prevent fire from spreading when piles are burned.
- Piles shall be located so that burning will not damage standing live trees or physical improvements such as fences, poles, buildings, signs, tables, grills or cattle-guards.
- Piles shall not be located on roads, bearing survey markers, in drainage ditches, or within stream-courses
- Piles will be located outside the drip-line of trees where possible. Forest canopy openings will be utilized for acceptable piling areas.
- The following is a list of preferred pile placements that the contractor will follow:
  a. Outside of the drip-line of trees on the south west side of an opening.
  b. In the center of large openings.
  c. Outside of the drip-line of trees on the downhill to middle of an opening on a slope.
- No piles shall be built within 200 feet of the SPVP boundary.
- Follow an approved Woodside Fire Protection fire plan during implementation.

Manual Planting

Summary: In order to make the SPVP more fire resistant, fire prone plant species will be removed or rearranged. To keep those growing sites from reestablishing with fire prone plant species, it may require the manual planting of fire-resistant trees and plants. Planting is likely to occur in areas with and without irrigation, so thoughtful plant selection is required to ensure the site's resources is conducive to that species establishment and health.

Treatment Specifications:

- When planting fire resistant trees without irrigation, like in chaparral for site conversion, consider replacement with SOD resistant native trees (i.e: Interior Live Oak (Q. Wislizenii), Valley Oak (Q. Lobata), etc.). Trees should be of sufficient size and root depth to survive without irrigation in a natural substrate. Tree protection is required to minimize indigenous or introduced grazing animal damage.
- When planting other fire-resistant vegetation without irrigation, plants should be of sufficient size and root depth to survive without irrigation in a natural substrate.
- When planting other fire-resistant vegetation with irrigation, follow horticulture protocol to ensure establishment and health.

Manual Pile Burning

Summary: Piles that are built will be burned under an approved burn permit coordinated with CALFIRE and Woodside Fire Protection District.

Treatment Specifications:

- Follow an approved Woodside Fire Protection fire plan during implementation.

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Appendix D: October 2008 Fuel Hazard Assessment Study – Town of Portola Valley

FUEL HAZARD ASSESSMENT STUDY

TOWN OF PORTOLA VALLEY

October 2008

Prepared by Moritz Arboricultural Consulting

Preface

This study was commissioned by the town to provide fundamental information with respect to the types of vegetation in the town and the relative potential fire hazards posed by each type. The report is intended to have four fundamental applications, as follows:

First, it will form an important part of the new Safety Element to be developed by the town as a part of the town's General Plan. This will help fulfill a requirement of the state planning law.

Second, it will provide a basis for the establishment of programs and measures by the town and the Woodside Fire Protection District in assisting in the protection of all properties in the town.

Third, it will allow residents to locate their properties with respect to the several vegetation categories with different degrees of fire hazard and to begin to take prudent precautions on their properties.

Fourth, it will provide an outline of fuel reduction measures along the major roads in the town, most of which will be a responsibility of the town.

Residents and town officials are encouraged to read the study and view the illustrative map. These should provide a good background on the fire hazards posed by the vegetation in the town.

Residents will likely be most interested in the section "Specific Fire Hazard Mitigation Strategies by Fuel Type" starting on page 10. Here, the reader will find detailed mitigation strategies that they can consider applying to their property. As noted in the report, property owners are encouraged to call on assistance from the Fire Marshal's office of the Woodside Protection District.

Residents may also find Appendix II, "Implementation of the Portola Valley Fuel Hazard Assessment Study," starting on page 20, as a good starting point when considering overall approaches to providing vegetation fire safety on their properties.

The town and the Woodside Fire Protection District will want in particular to consider the recommendations in the section "Fire Response and Evacuation Routes" starting on page 16. This section includes recommended general standards and more specific recommendations for eight main roads in the town. A next step that the town and the fire protection district will consider will be a more detailed application of the standards. The standards are general guidelines and their application will need to take into consideration the practical realities of conditions in the various parts of the town.

George Mader, Town Planner

Portola Valley Fuel Hazard Assessment
Town of Portola Valley

Prepared by
Moritz Arboricultural Consulting

October 2008

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INTRODUCTION

The goals of this fuel hazard assessment for the Town of Portola Valley are to assist the town and its residents to (1) develop a landscape that has a reasonable level of fire safety for citizens and emergency responders and (2) create a sustainable, aesthetic, and environmentally balanced response to fire threat, taking into account the natural values of the area (e.g., residential use and enjoyment, biodiversity, maintenance of native species, and more).

The project addresses potential fire behavior and offers strategies for fire hazard mitigation in the Town. The following areas are highest in priority for treatment:

- Major emergency access/egress routes
- Areas adjacent to structures/residences
- Areas with potential for severe fire behavior

The values at risk include homes, businesses, government and public infrastructure, the local economy, residents, emergency responders, and aesthetics.

This assessment includes mapping of vegetation fuels and ranking of fuels as to fire behavior, i.e., ability to suppress or fight a fire. Based on the fuel assessment, general and specific strategies are presented to facilitate both public and private actions that can be taken to reduce fire risk. In particular, this assessment has been developed to assist the town in its work on future revisions to the safety element of the general plan.

METHODOLOGY

A fuel hazard assessment of Portola Valley was conducted using color aerial photography (dated 2005), ground reconnaissance (August and September 2007), and published references on fire behavior. This assessment is presented on the "Fuel Hazard Map" dated July 17, 2008. For each mapped unit (or polygon, 5-acre minimum) a ranking of fire behavior potential (highest, high, moderate, and low) was developed using general fuel models created by the Northern Forest Fire Laboratory (USDA Forest Service: NFFL) as modified by Moritz Arboricultural Consulting (MAC) to account for stage of fuel development and regional conditions. In addition, the USDA Forest Service National Fire Danger Rating System (a system of nine fuel models) was used as a reference.

Of the fuel types identified by MAC as occurring in Portola Valley, six are not precisely defined in the national models and required developmental stage modifications for ranking. Consideration was also given to potential changes in fire behavior caused by sudden oak death (SOD)

A follow-up field review of the fuel and fire behavior severity map and methodology was conducted with Woodside fire officials in March 2008. Comments received during this meeting were incorporated into the final fire hazard map and the hazard evaluations presented in this report.

GENERAL DESCRIPTIONS OF VEGETATION FUELS

General vegetation fuel types and rankings as to potential fire behavior for Portola Valley are:

"highest" (h+) includes a shrub type (chaparral) and three forest types (fire-prone oak woodland, mixed evergreen forest, fire-prone urban forest)

"high" (h) includes two forest types (fire-prone urban forest and redwood forest) and one shrub type (coastal scrub);

"moderate (m) includes urban savannah and grassland;

"low" (l) includes mowed grass and vineyard.

There are eleven plant communities/habitats within the borders of Portola Valley as mapped by TRA Environmental Services (TRA). MAC also identified eleven vegetation fuel types in both wildland and urban areas. Eight of the MAC fuel types correspond directly to TRA plant community/habitat types, and two are mapped in a related category. For example, where TRA mapped grassland, MAC divided it into mowed grass and grassland because these distinctions affect the fire hazard.

The comparison of the TRA and MAC types are listed below with corresponding potential fire behavior ratings assigned by MAC. The sequence of plant communities listed under MAC ranges from those with the highest fire potential to those with the lowest potential.

MAC:	**TRA:**
Chaparral (h+)	Chaparral
Fire-Prone Oak Woodland (h+)	Oak Woodland
Mixed Evergreen Forest (h+)	Mixed Evergreen Forest
Fire-Prone Urban Forest [heavy undergrowth] (h+)	Urban Forest/Garden
Fire-Prone Urban Forest (h)	Urban Forest/Garden
Redwood Forest (h)	Redwood Forest
Urban Savannah [grass carries fire] (m)	Oak Savannah
Grassland (m)	Grassland
Mowed Grass (l)	Grassland
Vineyard (l)	Vineyard
N/A	Aquatic Feature

The vegetation fuel types are generally described below in terms of dominant species and general percent cover in the overstory and understory. The prevalence and trends of invasion of exotic species is noted, as are any shifts in species which can be expected over time without manipulation (i.e., shift from oak to bay or oak to Douglas-fir, or shift from grass to coyote bush, etc.). The locations of the fuel types are shown on the July 17, 2008 "Fuel Hazards Map," that is part of this report.

CH – CHAPARRAL (HIGHEST HAZARD) consists of dense evergreen and deciduous shrubs that can reach 10 feet tall and supports a sparse understory of herbaceous plants and litter. Dominant shrubs in this type include chamise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos glauca*, *A. tomentosa*), California-lilac (*Ceanothus cuneatus*, *C. oliganthus* var. *sorediatus*), redberry (*Rhamnus crocea* ssp. *crocea*), scrub oak (*Quercus berberidifolia*), coffeeberry (*Rhamnus californica*), and holly-leafed cherry (*Prunus ilicifolia* ssp. *ilicifolia*). This type is notorious for exhibiting extreme fire behavior.

FPO - FIRE-PRONE OAK WOODLAND (HIGHEST HAZARD) consists of the native oak woodland dominated by a dense canopy of coast live oak (*Quercus agrifolia*), California bay (*Umbellularia californica*), California buckeye (*Aesculus californica*), and Pacific madrone (*Arbutus menziesii*). The dense understory of this woodland consists of poison oak (*Toxicodendron diversilobum*), toyon (*Heteromeles arbutifolia*), and other shrubs that create fairly contiguous ladder fuels from the forest floor to the tree canopy. The combination of dense understory vegetation, ladder fuels, and disease caused by sudden oak death (*Phytophthora ramorum*) makes this type extremely flammable and prone to crown fires.

MEF - MIXED EVERGREEN FOREST (HIGHEST HAZARD) supports a mixture trees including coast live oak (*Quercus agrifolia*), tan oak (*Lithocarpus densiflora*), Pacific madrone, black oak (*Quercus kellogii*), with minor components of bigleaf maple (*Acer macrophyllum*), coast redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*). The shrub layer is minimal but includes: tree reproduction, western sword fern (*Polystichum munitum*), California hazel (*Corylus cornuta* var. *californica*), poison oak and various brooms in limited areas. This mixture of trees and shrubs has a great potential for creating severe fire behavior.

FPUF - FIRE-PRONE URBAN FOREST (HIGHEST AND HIGH HAZARD) includes residential areas that are moderate to densely landscaped with fire-prone ornamentals such as juniper (*Juniperus* spp.), pine (*Pinus* spp.), acacia (*Acacia* spp.), and eucalyptus (*Eucalyptus* spp.). Also present in these areas may be sparse to dense remnants of the native trees and shrubs such as coast live oak, Pacific madrone, and poison oak. This forest type is also strongly affected by sudden oak death. Areas with dense understory vegetation were ranked as having the highest hazard.

CS – COASTAL SCRUB (HIGH HAZARD) supports low shrubs, typically 3 to 6 feet tall that are densely arranged with scattered openings supporting non-native annual grasses. Dominant plants in this type include coyote brush (*Baccharis pilularis*), poison oak (*Toxicodendron diversiloba*), California-lilac (*Ceanothus thyrsiflorus*), California bee plant (*Scrophularia californica*), blackberry (*Rubus ursinus*), toyon (*Heteromeles arbutifolia*), and sagebrush (*Artemisia californica*). Fire behavior in coastal scrub is strongly affected by the live fuel moisture in the coyote bush.

RF - REDWOOD FOREST (HIGH HAZARD) consists of a dense overstory of young-growth coast redwood (*Sequoia sempervirens*), tan oak (*Lithocarpus densiflorus*), big-leaf maple (*Acer macrophyllum*), salal (*Gaultheria shallon*), sword fern, Douglas-fir,and California bay (*Umbellularia californica*). Associated understory shrubs include California hazel, wood rose (*Rosa gymnocarpa*), and thimbleberry (*Rubus parviflorus*). Redwood forest is surprisingly flammable. The thick duff layer is especially receptive to fire brands and redwood bark ignites easily. Tan oak is highly susceptible to sudden oak

death; dead leaves retained on these mid-canopy trees exacerbate the fire hazard by creating ladder fuels.

US - URBAN SAVANNAH (MODERATE HAZARD) consists of residential areas where grass occupies greater than 50 percent of the overall landscape. Areas along roadways and near homes are typically densely landscaped with ornamental trees, shrubs, irrigated flowerbeds, and lawns. Other than the overstory canopy [typically valley oak (*Quercus lobata*) or coast live oak (*Quercus agrifolia*)] the grassland species dominate this plant community (See Grassland). While there may be some areas of down and dead overstory materials, grass usually is the fuel that carries the fire. Crowning and torching of the overstory are highly unlikely. Thus, fire behavior in grassy areas is determined by whether the grass has been mowed or not.

GR – GRASSLAND (MODERATE HAZARD) includes unmanaged, introduced annual grasses and native forbs including: oatgrass, annual agoseris (*Agoseris heterophylla*), ripgut grass (*Bromus diandrus*), soft chess (*Bromus horeaceus*), barley (*Hordeum murinum* ssp. *leporinum*), foxtail barley (*H. jubatum*), Italian ryegrass (*Lolium multiflorum*), needlegrass (*Nasella pulchra*), and California fescue (*Festuca californica*). When dry, this flashy fuel supports fires with high rates of spread under windy conditions.

MG - MOWED GRASS (LOW HAZARD) includes grazed and mowed introduced annual grasses and both exotic and native forbs, including: oatgrass, annual agoseris (*Agoseris heterophylla*), ripgut grass (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), barley (*Hordeum murinum* ssp. *leporinum*), foxtail barley (*H. jubatum*) Italian ryegrass (*Lolium multiflorum*), needlegrass (*Nasella pulchra*), and California fescue (*Festuca californica*). Rates of fire spread are greatly reduced by grazing or the alteration of the fuel arrangement as a result of mowing; a fire in this type may self extinguish.

VIN – VINEYARD (LOW HAZARD) consists of rows of irrigated grapes (*Vitis* sp.) vines with an exceptionally sparse to barren soil surface. Associated fences are often lined with showy shrubs such as lavender or rose. Fires typically do not burn this vegetation type.

FUEL BEHAVIOR SEVERITY RANKING

The following table ranks the Vegetation Fuel Types in terms of their Fire Behavior. The Fire Behavior Ranking was calculated by Moritz Arboricultural Consulting based on an evaluation of the information in columns (2) – (4).

Vegetation Fuel Type	NFFL Model	Developmental Stage	Flame Length)	Fire Behavior Ranking (current study)
(1)	(2)	(3)	(4)	(5)
Chaparral	4	High	45	Highest – h+
Fire-Prone Oak Woodland	7	Extreme	20+	Highest – h+
Mixed Evergreen Forest	10	Extreme	20+	Highest – h+
Fire-Prone Urban Forest	7	Extreme	20+	Highest – h+
Fire-Prone Urban Forest	7	High	13	High – h
Coastal Scrub	5	High	18	High – h
Redwood Forest	9	Extreme	14	High – h
Urban (Oak) Savannah	3	Low	7	Moderate – m
Grassland (tall grass)	3	Low	7	Moderate - m
Mowed Grass	1	Moderate	5	Low – l

Explanation of columns:
(1) Vegetation Fuel Type by MAC,
(2) NFFL Fuel Model Number,
(3) Fuel Model Stage of Development (eg. old Douglas fir forest has a different structure and fire behavior than Douglas fir reproduction),
(4) expected flame length (fire intensity) for a given model and its stage of development,
(5) expected difficulty to suppress by MAC.

GENERAL FIRE HAZARD MITIGATION STRATEGIES

The following are general strategies that the town and others at risk can employ to reduce fire threat and "Behavior Ranking:"

Strategy: Select fire resistant plants
Actions:

- Select species with low surface to volume ratios (i.e., southern magnolia vs. pine, rhododendron vs. Australian tea, English laurel vs. cypress screen)**.** As an example, for a given weight, southern magnolia leaves have less total surface areas than pine needles.
- Select broadleaf vs. needle-leaf species
- Select clean looking species with stout branches and twigs (non-twiggy)
- Select species listed as pest and disease resistant
- Select deciduous trees and shrubs with supple, moist foliage
- Select species with out volatile oils in their leaves (use the smell test). Sap is water-like and does not have a strong oil odor

Strategy: Reduce fuel volumes
Actions:

- remove deadwood from trees and shrubs
- thin forest stands that produce great amounts of litter and debris
- create shrub/grass mosaics from continuous shrub masses
- remove shrubs beneath and around existing and emerging trees
- select low-growing shrubs and ground covers as replacement plants
- remove/reduce lofty, loosely compacted litter accumulations, especially large debris such as branches and replace with compact, small particle mulch to prevent invasion of noxious weeds and elevate live fuel moisture

Strategy: Reduce fuel flammability
Actions:

- mow grass when it is 50% cured (by June 1st)
- replace annual grass with plants that do not cure (dry out)
- remove deadwood in trees and shrubs
- establish an irrigated landscape in carefully selected areas close to the home (along foundations, under windows, under overhangs, and around decks and other structures)
- remove sick, dying and dead shrubs and trees

Strategy: Establish/maintain fuel discontinuity
Actions:

- remove/reduce "ladder" fuels (grass to brush to trees)
- create shrub/grass mosaics from continuous masses by installing hardscape
- remove shrubs from beneath and around existing and emerging trees
- thin thickets of small trees and tree reproduction from large tree understories
- create low fuel zone near structural vulnerabilities such as windows, decks, large overhangs,

Strategy: Reduce the possibility of fire traveling through tree crown
Actions:

- Separate overlapping tree and large shrub canopies
- Thin fire-prone tree canopies (oak, bay, eucalyptus, pines, redwood and Douglas fir) to open canopy structure (no more than 30% foliar reduction)
- Prune out low hanging fire-available branches and twigs up to 3 inches in diameter to a minimum of 10 feet above ground under any portion of the canopy or to an elevation 10 feet above the highest ground elevation
- Perform fuel volume reduction actions mentioned above

SPECIFIC FIRE HAZARD MITIGATION STRATEGIES BY FUEL TYPE

The following mitigation strategies are specific to the vegetation fuel type.

Chaparral – H+

Dominant shrubs in this type include chemise (*Adenostoma fasciculatum*), manzanita (*Arctostaphylos glauca, A. tomentosa*), California lilac (*Ceanothus cuneatus, C. oliganthus var. sorediatus*), redberry (Rhamnus crocea ssp. crocea), scrub oak (*Quercus dumosa*), coffeeberry (*Rhamnus californica ssp. californica*), and holly-leaved cherry (*Prunus ilicifolia*), but may have up to 35% fir or hardwood reproduction.

Chaparral - Fire Hazard: This type is notorious for exhibiting extreme fire behavior. This is one of the serious fire hazardous types due to the heavy horizontal fuel continuity and abundant fine material, almost 100% available to a potential fire. The sclerophyllus species typically have very low fuel moisture and are therefore more flammable. Also, the densely, twiggy and foliated species found in this fuel type, i.e. chemise, tend to be more flammable. The expected fire behavior of this type under severe fire weather may be extreme. Fire in this fuel type displays high to extreme rates of spread with high intensities in strong winds. It can generate a blizzard of fire brands and this fuel bed is very receptive to spot fire ignitions.

Maintenance: Maintenance actions in this fuel type are affordable, effective and necessary for the health, vigor and survivability of the shrubs. Fire safe maintenance is critical to safety and includes the following actions:

- You may wish to favor a particular native species on site or convert to a new or more fire resistant type such as perennial grass. However, all of the chamise should be removed.
- Thin brush or brush islands up to 10.0 feet tall to a spacing of 2 X the height, on center. Always favor fire resistant species.
- Raise (trim up) the crowns by 1/3 the height in defensible space zones and along roads.
- Remove deadwood subcanopies.
- Clear all grass, cured herbs and flammable debris from under the shrub canopies.
- Remove dead shrubs near homes, drives, and roads.
- Remove structurally unstable trees within falling distance of homes, drives and roads.
- Clean up down and dead debris.

Fire-prone Oak Woodland (Pyrophytic Hardwood) - H+

Oak woodland with associated hardwoods, heavy undergrowth or down and/or dead ground fuels. This type consists of a canopy of coast live oak, tan oak, black oak, madrone and bay. It may have a minor component conifers and/or exotics. It has dense undergrowth of, coffeeberry, poison oak, hardwood reproduction, excessive fir reproduction and or exotic brush. This is a hazardous fuel type. It may have an unhealthy over-story/canopy and, as a consequence, excessive down and dead debris.

Fire-prone oak woodland hazard: The fire hazard of this fuel type is among the highest in the area. Under high to extreme fire weather conditions the fire rate of spread is rapid and intensity is very high to extreme. Crowning, branding and

spotting is common. Sudden Oak Death may be a significant factor in the flammablility of this type.

Maintenance: Mitigative actions may be most successful in this forest/fuel type. It can be converted from one of the most hazardous types to one of the least fire-prone. Fire safe maintenance of this type includes the following actions:

- Thin out overly dense stands to provide crown separation. Favor fire resistant species (such as oak rather than bay).
- Remove or substantially thin undergrowth. Separate shrubs by a distance of at least two times their height, crown to crown. Any fire prone shrubs should be cut to no more than two feet in height. Keep the undergrowth sparse. When thinning out undergrowth always favor fire resistant plants.
- Raise tree crowns to a minimum of 8.0 feet above grade. All parts of the canopy less than 3 inches in diameter should be no lower than eight feet vertical distance above grade. The canopy line will be horizontal to slope.
- When thinning out undergrowth or planting, favor fire resistant plants.
- Remove dead and diseased trees or branches and foliage prior to the fire season or as they develop.
- Remove bay and conifer reproduction.
- Clean up down and dead debris. Chip materials up to 6 inches and cut larger branches and trunks flat to maximize soil contact.
- Remove heavily SOD infested trees. Consider replacement with SOD resistant native trees (i.e: Interior Live Oak (Q. Wislizenii), Valley Oak (Q. Lobata), etc.).
- Maintain trees in good health. See California Oak Foundation guide.

Mixed Evergreen Forest – H+

This forest type is dominated by mature evergreen hardwoods such as oak, bay and tanoak. It may have a 25 to 35% fir and/or redwood component. It has sparse or no continuous undergrowth. The dominant trees are in good (healthy) condition. There is no significant accumulation of down and dead materials.

Mixed Evergreen Forest - fire hazard: The fire hazard of this fuel type is among the highest. Most fires will be in surface fuels with short flame lengths and slow rates of spread but there is a high potential for torching, crowning and branding where fuel concentrations are heavy. Crown fires may be infrequent but in severe fire weather when crowning does occur fires are hard to suppress. The crowning potential may be minimized through proper management of ground fuels and crown raising. The opportunity to provide ongoing maintenance and improvements in fire resistance is great.

Maintenance: Maintenance actions in this forest/fuel type are affordable and effective. If this type is not maintained and **is** allowed to decline, it will become a very serious fire-prone type, one of the most hazardous types. Fire safe maintenance of this type includes the following actions:

- Thin out overly dense stands to provide crown separation. Favor the more fire resistant species (such as oak and other broadleaf species rather than bay laurel and fir).
- Keep the fire prone undergrowth sparse and low. Separate fire prone shrubs by a distance of at least two times the height, crown to crown.

Any fire prone shrubs should be cut to no more than two feet in height. When thinning out undergrowth always favor fire resistant species.

- Raise tree crowns to a minimum of 10 feet above grade. All parts of the canopy less than 3 inches in diameter should be no lower than 10 feet vertical distance above grade. On slopes the canopy line will be 10 feet above highest point. Raise the crowns of redwoods and firs as high as practical.
- When thinning out undergrowth or planting, favor fire resistant plants.
- Remove deadwood trees thoroughly, particularly firs.
- Remove dead and diseased trees or branches and foliage prior to the fire season or as they develop.
- Remove bay and Fir reproduction.
- Chip down and dead debris.
- Maintain trees in good health. See California **O**ak Foundation for a guide.

Fire Prone Urban Forest (with heavy undergrowth) – H+

This extremely hazardous forest/fuel type is dominated by mature evergreen hardwoods (e.g., coast live oak, bay, tanoak, madrone, etc.) and 25 to 35% mature fir or redwood. It has a heavy undergrowth of tree reproduction, herbs and/or shrubs. Often it has excessive bay or fir reproduction. It typically has excessive down and dead debris due to SOD and/or competition.

Mixed Evergreen Forest with undergrowth - fire hazard: The fire behavior of this fuel type is high. The opportunity to provide improvements in fire resistance is great but at a greater cost than for hardwood forest or park-like mixed evergreen forest. However, once the initial work is done, maintenance will be significantly less over time.

Maintenance: Maintenance actions in this forest/fuel type are affordable and effective. Fire safe maintenance of this type includes the following actions:

- Thin out overly dense stands to provide crown separation. Favor the more fire resistant species (such as oak and bay and fir).
- Clear undergrowth leaving only well spaced, fire resistant plants. Separate other shrubs by a distance of at least two times the height, crown to crown. Any fire prone shrubs retained should be cut to no more than two feet in height. When thinning out undergrowth**,** favor fire resistant species.
- Raise hardwood tree crowns to a minimum of 10 feet above grade. All parts of the canopy less than 3 inches in diameter should be no lower than eight feet vertical distance above grade. On slopes the canopy line will be horizontal with slope. Raise the crowns of fir and redwood as high as practicable leaving no attached deadwood below the live crown.
- When thinning out undergrowth or planting, favor fire resistant plants.
- Remove deadwood trees thoroughly, particularly bays, redwoods and firs.
- Remove dead and diseased trees or branches and foliage prior to the fire season or as they develop.
- Remove fire-prone shrubs, and bay and Fir reproduction.
- Chip down and dead debris, up to six inches diameter and cut up larger branches and trunks down flat to maximize soil contact.
- Maintain trees in good health. See California Oak Foundation guide.

Fire-prone Urban Forest (hardwoods with minor components of conifers) - H

Mixed hardwoods with heavy undergrowth. This type consists of a canopy of tanoak, coast live oak, bay laurel and madrone, with minor components of Douglas-fir, redwood and exotics. It has excessive down and dead material and/or a dense undergrowth of douglas fir reproduction, oak reproduction, hardwood reproduction, bay and tanoak reproduction, ceanothus, manzanita, hazel, and exotics. This is the areas' second-most hazardous fuel type. It may have an unhealthy over-story/canopy.

Fire-Prone Urban Forest Hazard: The fire hazard of this fuel type is among the highest in the area. Under high to extreme fire weather conditions the fire rate of spread is rapid and intensity is very high to extreme. Crowning, branding and spotting is common.

Maintenance: Mitigation may be most successful in this forest/fuel type. It can be converted from one of the most hazardous types to one of the least fire prone. Fire safe maintenance of this type includes the following actions:

- Thin out overly dense stands to provide crown separation. Favor fire resistant species (such as oak or redwood rather than bay and fir).
- Remove or substantially thin undergrowth. Separate shrubs by a distance of at least two times their height, crown to crown. Any fire prone shrubs should be cut to no more than two feet in height. Keep the undergrowth sparse. When thinning out undergrowth always favor fire resistant plants.
- Raise tree crowns to a minimum of 10 feet above grade. All parts of the canopy less than 3 inches in diameter should be no lower than eight feet vertical distance above grade. The canopy line will be horizontal to slope.
- When thinning out undergrowth or planting, favor fire resistant plants.
- Remove dead and diseased trees or branches and foliage prior to the fire season or as they develop.
- Remove invasive shrubs, and bay laurel and **f**ir reproduction.
- Clean up down and dead debris. Chip small materials and cut larger branches and trunks flat to maximize soil contact.
- Maintain trees in good health. See California Oak Foundation guide.

Coastal Scrub - H

This vegetation fuel type is highly invasive in grassland and open hardwood forest in the absence of natural fire. This type is dominated by a "doghair" stand of Ceanothus, coyote bush, coffeeberry, manzanita and possibly fir reproduction, but may have up to 35% fir or hardwood reproduction.

Coastal Scrub - Fire Hazard: This is one of the serious fire hazardous types due to the heavy horizontal fuel continuity and abundant fine material, almost 100% available to a potential fire. The high density of shrubs water stresses the stand. The expected fire behavior of this type is equivalent to heavy chaparral. Fire in this fuel type displays high to extreme rates of spread with high intensities in strong winds. It can generate a blizzard of fire brands and this fuel bed is very receptive to spot fire ignitions.

Maintenance: Maintenance actions in this fuel type are affordable, effective and necessary for the health, vigor and survivability of the shrubs. Fire safe maintenance is critical to safety and includes the following actions:

- First decide on the kind of mature landscape you envision. You may wish to favor a particular native species on site or convert to a new or more fire resistant type.
- Thin brush reproduction up to 10.0 feet tall to a spacing of 2 X the height, on center. Always favor fire resistant species.
- Raise (trim up) the crowns by 1/3 the height.
- Clear all grass, dried herbaceous herbs and flammable debris from under the shrub canopies.
- Remove dead shrubs near homes, drives, and roads.
- Remove structurally unstable trees within falling distance of homes, drives and roads.
- Clean up down and dead debris.

Redwood Forest – H

This forest/fuel type is more than 50% mature coast redwood and occurs on more mesic (cooler, more moist areas with better than average soil development) slopes and in drainages. Where there is no significant sub-canopy of hardwoods, such as tanbark oak (*Lithocarpus densiflora*) and California bay laurel (*Umbellularia californica*), an abundance of dead-and-down debris, and/or heavy layer of vegetation ground fuels (sword fern, huckleberry, poison oak, toyon, tree reproduction or invasive exotics such as brooms), and the understory is park-like the fire hazard tends to be relatively moderate. Where such forest do have excessive down-and-dead, heavy continuous undergrowth or young redwood forest with attached "ladder fuels" (continuous attached branches from low to high, living or dead).

Coast Redwood Forest - fire hazard: The fire hazard of this fuel type is typically low on mesic sites with rich well-developed soils and relatively cool microclimates (north to northeast facing slopes, along canyon/valley bottom lands, seep sites and along streams). Most fires will be low intensity fires in surface fuels with short flame lengths and slow rates of spread. There could be occasional torching if spot fuel ("jackpot") concentrations are heavy. Crown fires are infrequent but when they do occur, particularly on steep slopes under extreme fire weather conditions.

The fire hazard in this fuel type may be moderate where there is a buildup of down and dead debris and/or heavy undergrowth, and they are hard to suppress. Stand replacement fires are more likely occur in this subtype.

The fire hazard in this fuel type may be high in young to juvenile stand development stages where there is ground to top "ladder" fuels, a heavy buildup of down and dead debris and/or heavy undergrowth, and they are very hard to suppress. Stand replacement fires are more likely to occur in this subtype.

The crowning potential may be minimized through proper management of ground fuels, crown raising and occasionally selective stand thinning. The opportunity to provide ongoing maintenance and improvements in fire resistance is high.

Maintenance: Maintenance actions in this forest/fuel type are affordable and effective. Stand thinning, if needed, is more expensive (It can come to $2,000 per tree in the developed residential setting.). In wildland fuel threat mitigation,

with some thinning of mature trees, may pay for itself. Fire safe maintenance of this type includes the following actions:

- Thin out overly dense stands to provide crown separation. Too many stems per acre deplete soil water, available nutrients and healthy growing space.
- Remove basal sprouts.
- Remove unstable, sick, declining and dead trees.
- Limb up trees as high as practical (More than 10 feet above grade).
- Remove diseased, dying, and dead branches, trunk-attached twigs, dead branches and branch stubs.
- Remove Douglas fir, bay laurel, tanbark oak and other flammable tree reproduction (except where redwood regeneration is necessary).
- Clear undergrowth leaving only well spaced, fire resistant plants. Separate other more flammable shrubs by a distance of at least two times the height, crown to crown. Any fire prone shrubs (broom, poison oak), should be removed. When thinning out undergrowth favor fire resistant species.
- Clean up dead and down debris.
- Remove SOD killed trees.

Grassland and Urban (Oak) Savannah – L to M

This fuel type typically presents relatively low levels of fire intensity but can exhibit rapid rates of spread. Also grasses are important ignition fuels that should be treated where ignition is likely to occur (around homes, roads and other developed areas**)**.
Grass should receive particular attention where it serves as a transition fuel to heavier fuel types (grass to brush to trees). Grass should be mowed to no more that 4 inches in height in the Fire Apparatus Clear Zone **(**FACZ**)** and defensible space areas. It should also be mowed or grazed in fuel management zones where it might serve as a transition fuel.

FIRE RESPONSE AND EVACUATION ROUTES:

During a major wildfire, emergency personnel direct evacuees from local streets to the larger collector roads leading to arterial avenues. Portola Valley is served by three arterial roads: Alpine Road, Los Trancos Road, and Portola Road. Collector roads in the area include Westridge Drive, Cervantes Road, Golden Oak Drive, and Indian Crossing leading to Valley Oak Street. In addition Wayside Road serves as a collector. Vegetation fuel management should be undertaken along these roads initially and on an annual basis in order to provide Fuel Modification Zones (FMZ).

Initial Treatment and Annual Maintenance Requirements for FMZ:

Fuel Modification Zones (FMZ) (commonly referred to as Fire Apparatus Clear Zones) should be constructed and maintained along all roads and other emergency access/evacuation routes if so designated by the Woodside Fire Department. The FMZ along the main routes and collector roads should extend a minimum of 20 feet from either side of the paved surface (note this is greater then required by State and local codes but considering potential flame lengths, it is necessary for fire safe access/egress).

Standards to be Applied within each FMZ :

- In a distance extending 10 feet out from the paved road surfaces, brush and shrub species should not exceed three feet in height and be separated by a distance equal to at least twice the height of the brush or shrub.

- Shrubs and shrub islands (shrub islands should not be greater than 15 feet in diameter) in the 10- to 20-foot-zone out from the road pavement edge shall be separated by a distance no less than two times the shrub or shrub island height

- All cured grasses shall be mowed to a maximum of three inches (3") in height prior to June 15th of any given fire season and debris should be removed. This zone should be so maintained throughout the fire season (as declared by local and State agencies), but at least until October 15. Annual and perennial grasses can be retained in the 10 to 20 foot zone, provided the grasses are mowed annually to a maximum three-inch (3") height. Perennial grasses should be favored where irrigation is absent because of their longer green period.

- Individual oak and ornamental trees can be retained adjacent to the roadway provided a minimum 14-foot clearance is maintained above the paved surface.

- All tree canopy fuels less than 3 inches in diameter (100 hour time-lag fuels) within the 0' to 20' foot zone shall be limbed up (crown raised) one third the height of trees less than 30 feet in total height and a minimum of ten feet above grade for all trees 30 feet or greater in height. Any plants constituting a "ladder fuels" shall be removed from below the tree canopy. (Ladder fuels consist of continuous vegetation from the ground to tree crowns.)

- All tree crowns within the FACZ shall be separated by a distance of no less than ten feet (10') above the road surface. As young trees mature, removal of trees may be required to maintain proper separation of tree crowns within this zone.

- Treatments for specific fuel types are discussed under the maintenance provisions for each vegetation type in the previous section**.**

Comments and Recommendations for Specific Routes

Portola Road: This major emergency access/egress route varies greatly in roadside fuel conditions. The north end of the road, on the east side is perhaps the greatest fire threat where a Eucalyptus stand with an Acacia and brush understory could generate high intensity fire and significant torching, crowning and branding. Smoke and branding from this stand could significantly inhibit fire response and evacuation along this critical route. This condition, capable of generating extreme fire behavior, should be abated. Other areas along this road should receive standard FACZ treatment. Fuels should be modified as described in the fuel treatment section above.

Westridge Drive: This major emergency access/egress connecting Portola Valley Road with Alpine Road passes through large areas of high to highest fire behavior potential urban forest. These areas require the full 20 feet of roadside treatment as prescribed in the fuel treatment section.

Cervantes Road: This secondary access route that connects Westridge Dr. with Golden Oak Drive and ultimately out to Alpine Road. The road runs adjacent to some highest fire behavior potential sites and should receive FACZ attention equivalent to Westridge.

Golden Oak Drive: This road borders some significantly fire hazardous topographic conditions, as well as high to highest fire behavior potential vegetation types. The “chimney drainages” running up to this road should receive as much as 30 feet of vegetation fuel treatment. The remainder of this road should receive that standard recommended treatment described above.

Alpine Road: This road has good FACZ management along most of its extent due to commercial development and other roadside treatments. However, the west end of Alpine, west of the intersection of Portola Valley Road present some FACZ challenges that require attention. This western extent of Alpine is a connector with Willowbrook and could play an important access for wildland fire in the Open Space Preserve. Thus, this area should receive the recommended fuel treatment specified above.

Indian Crossing/Valley Oak: These connected roads are the one-way-in/one-way-out emergency access/evacuation route for Portola Valley Ranch. Therefore this road should receive the full 20 feet of roadside treatment recommended above. The Town and Fire Department may whish to also consider an emergency exit connector to Los Trancos Road from Valley Oak.

Los Trancos Road: This road is an important emergency access/egress for the Blue Oaks development and the Los Trancos Woods development. The fuels on the **Santa Clara** County (east) side of the road are particularly problematic due to the creek, the steep topography and the unmanaged wildland. This road also requires the full 20 feet of treatment recommended above.

Wayside Road. It is an extremely substandard road with substandard road width, turn radii and significant vegetation fuel threats along the road. Consequently, this road should have more than the minimum required roadside fuel treatment. At the east end (low end) of the road there is heavy vegetation off to the north and south side, dominated by fire-prone “pyrophytic” hardwoods. Moving up the road on the south side, in the drainage, is a redwood stand with widespread mortality of tanoak due to SOD. This road requires particularly full treatment for fire safe access/egress to the extent possible.

APPENDIX I

FIRE-RESISTANT PLANTS
10/02/08

Select species and varieties that are relatively fire resistant:

1. Plants that are well adapted to the local climatic zones, microclimate, aspect, slope and local environmental conditions.
2. Plants with low fuel volumes: low growing, limited spread and open architecture.
3. Plants with a low surface to volume ratio (a clean open appearance, not twiggy and dense)
4. Plants that are deep-rooted and proficient at acquiring water.
5. Trees and shrubs with watery sap lacking volatile chemicals, fats and oils.
6. Plants lacking an internal canopy of dead material.
7. Plants with relatively more fire resistant foliage:
   Most deciduous trees and shrubs.
   Trees and shrubs with large fleshy leaves.
   Trees and shrubs with foliage lacking volatile chemicals, oils, waxes, etc.

Examples:

Locally Native Trees	Locally Native Shrubs	Non-native Trees
Valley oak (a.k.a. California white oak)	Pacific wax myrtle	Magnolias
Oregon oak	California beaked hazel	Maples
California sycamore	Magnolias	Oaks (most non-native deciduous oaks)
Big leaf maple	Flannel-bush	Fruit & nut trees (almost all)
Oregon ash	Spicebush (sweet shrub)	Sycamores
Red alder	Pacific rhododendron	Alders
White alder	Western redbud	Ashes
Buckeye		Palms (no dead leaves)
Fremont cottonwood		Birches
Black cottonwood		Buckeyes
Willows		Elms and Zelkovas
Hinds black walnut		Beeches
California box elder		Willows
Pacific madrone		Privets
		Plums
		A variety of broadleaf trees with above Characteristics.

APPENDIX II

Implementation of the Portola Valley
Fuel Hazard Assessment Study
(10/02/08)

Residents are encouraged to outline an approach they are going to take to reduce the fire hazard posed by vegetation on their properties. As a first step they should locate their properties on the Fuel Hazard Map to determine the "Vegetation Fuels" on their property. They should review the "Maintenance" recommendations for the types of vegetation on their property. If questions arise with respect to the recommendations, they should seek advice from the Fire Marshall's office of the Woodside Fire Protection District.

In addition, attention should be given to establishing **Shaded Fuel Breaks** and **Fuel Reduction Zones** on each property. A shaded fuel break is a strip of vegetation where the vertical fuel continuity (fire ladder) has been disrupted and the plants maintained so as to resist fire spread, high fire intensity and ignition of a house. In the first 10 feet from buildings vegetation should be irrigated regularly or monthly depending on the plant requirements. The information that follows is intended to provide guidance with respect to these topics. (For a more information, the reader is referred to the state publication "General Guidelines to Implement Performance Based Defensible Space Regulation under Public Resources Code Section 4291.")

Defensible Space is the area within the perimeter of a parcel where basic wildfire protection practices are implemented. The focus of these guidelines is on fuel modification measures, meaning where vegetation is managed and maintained so that it reduces the spread and intensity of encroaching wildfires. Vegetation surrounding homes is fuel for a fire. Experience has shown that fuel reduction around a structure increases the probability of a structure surviving a wildfire. Good defensible space allows firefighters to protect and save homes safely without unacceptable risk to their lives. Fuel reduction through vegetation management is the key fundamental to creating defensible space. **Defensible Space** comprises a **Shaded Fuel Break** next to structures and a **Fuel Reduction Zone** beyond.

A **Shaded Fuel Break** should be established within 30 feet of each building or structure by removing and clearing away all fire prone vegetation, with certain exceptions. Exceptions include: single specimens of trees or other vegetation that is well-pruned and maintained so as to effectively manage fuels and not form a means of rapidly transmitting fire from other nearby vegetation to any building or structure.

A **Fuel Reduction Zone** should be established from 30 to 100 feet away from a building or to the property line, whichever is less, and limited to your land. Adjacent property owners are not required to clear beyond 100 feet from their structure, but are encouraged to do so to create appropriate defensible space on a community-wide basis. Within the **Fuel Reduction Zone**, the following are recommended:

> Dead and dying woody surface fuels and aerial fuels should be removed. Loose surface litter, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches, should be permitted to a height no greater than 3 inches. This guideline is primarily intended to eliminate trees, bushes, shrubs and surface debris

that are completely dead or with substantial amounts of dead branches or leaves/needles that would readily burn.

Downed logs or stumps, when embedded in the soil, may be retained when isolated from other vegetation.

Fuel reduction does not mean cutting down all trees and shrubs, or creating a bare ring of earth across the property. It does mean arranging the trees, shrubs and other fuel sources in a way that makes it difficult for fire to transfer from one fuel source to another.

General Notes:

Properties with greater fire hazards will require more clearing. Clearing requirements will be greater for those lands with steeper terrain, larger and denser fuels, fuels that are highly volatile.

Fuel reduction activities that remove trees may require permits from the Town.

Care should be taken with the use of equipment when creating a defensible space zone. Internal combustion engines must have spark arresters and metal cutting blades should be used with caution to prevent starting fires during periods of high fire danger. A metal blade striking a rock can create a spark and start a fire. This is a common cause of fires during summertime.

Vegetation removal can cause soil disturbance, soil erosion, regrowth of new vegetation, and introduction of non-native invasive plants. Keep soil disturbance to a minimum, especially on steep slopes. Erosion control techniques such as minimizing use of heavy equipment, avoiding stream or gully crossings, use of mobile equipment during dry conditions, and covering exposed disturbed soil areas will help reduce soil erosion and plant regrowth.

In the **Fuel Reduction Zone**, one of the following fuel treatments should be implemented. Combinations of the methods may be acceptable as long as the intent of the guidelines is met.

Separation Between Fuels

Surrounding each structure, minimum clearance between fuels will range from 4 feet to 10 feet in all directions. Clearance should be in both the horizontal and vertical directions. The clearance distance between vegetation will depend on the slope, vegetation size, vegetation type (brush, grass, trees), and other fuel characteristics (fuel compaction, chemical content, etc.). Properties with greater fire hazards will require greater clearing between fuels.

If your property is on steeper slopes or has larger sized vegetation, this justifies greater spacing between individual trees and bushes (see Plant Spacing Guidelines and Case Examples below).

Grass generally should not exceed 4 inches in height. However, grass and other herbs, may be maintained less than 18 inches in height above the ground when isolated from other fuels or where necessary to stabilize the soil and prevent erosion.

Clearance requirements
Horizontal clearance should be maintained between aerial fuels, such as the outside edge of the tree crowns or high brush. Horizontal clearance helps stop the spread of fire from one fuel to the next.

Vertical clearance should be maintained between lower limbs of aerial fuels, and the nearest surface fuels and grass/weeds. Vertical clearance removes “ladder fuels” and helps prevent a fire from moving from the smaller fuels to the taller fuels.

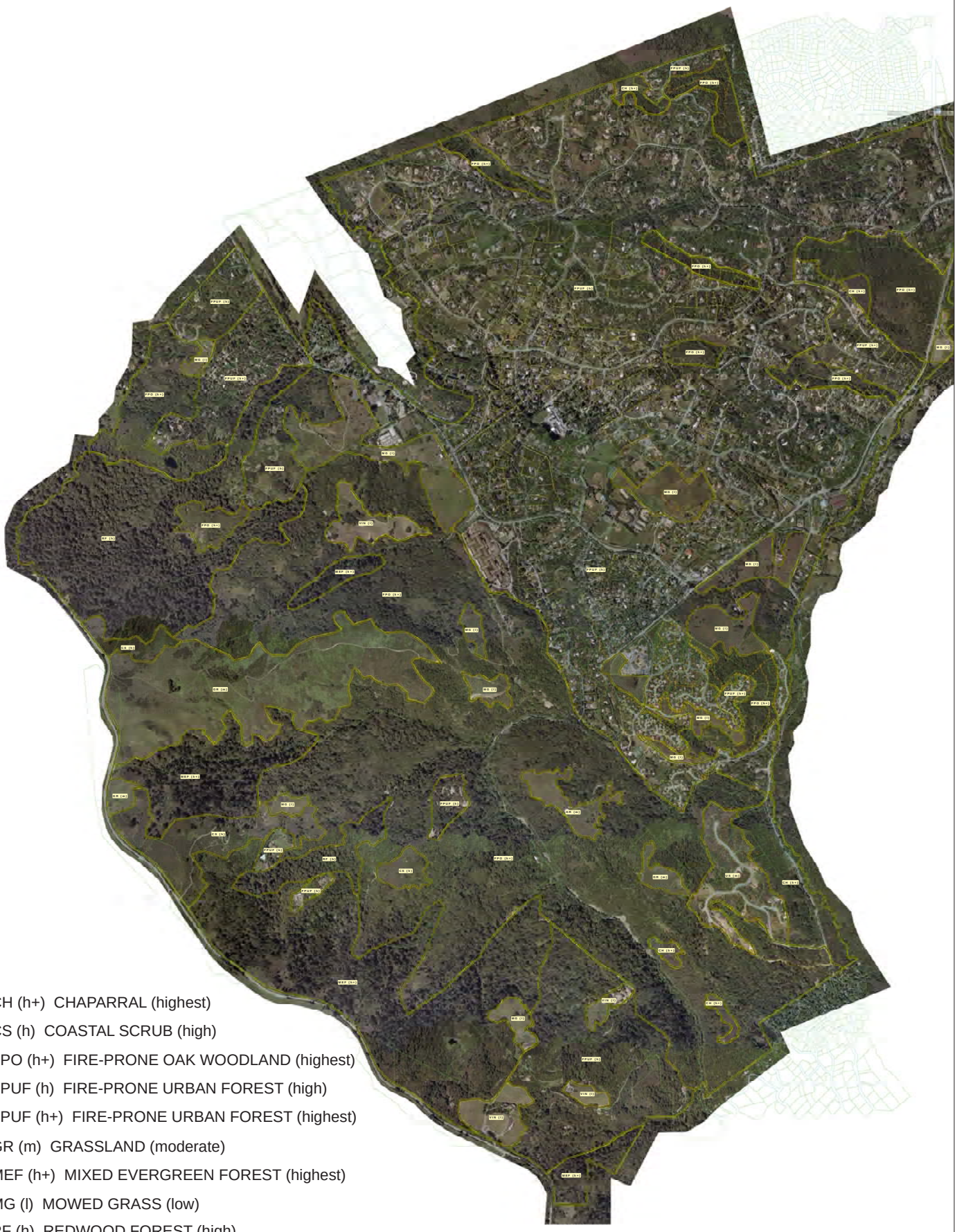
Plant Spacing Guidelines
Guidelines are designed to break the continuity of fuels and can be used as a “rule of thumb.”

Minimum Horizontal Space from the edge of one tree canopy to the edge of the next on slopes greater than 20% should be 10 feet.

Minimum horizontal space between edges of shrubs on slopes greater than 20% should be twice the height of the shrub.

Minimum Vertical Spacing between top of shrub and bottom of lower tree branches should be three times the height of the shrub**.**

Defensible Space with Continuous Tree Canopy
A vegetation removal option is available for those wanting to retain a continuous stand of larger trees with no space between tree canopies while creating defensible space. For this guideline, within the Reduced Fuel Zone, spacing between aerial fuels is not required, such as in a stand of larger trees. In this situation, remove all surface fuels greater than 4 inches in height; remove lower limbs (3” or smaller) of trees (“prune”) to at least 8 feet above ground or up to 1/3 height for small trees). Properties with greater fire hazards, such as steeper slopes or more severe fire danger, will require pruning heights in the upper end of this range. Where there is shrub undergrowth, apply Plant Spacing Guidelines. A minimum clearance of 8 feet should be maintained where there is grass or other ground cover.



CH (h+) CHAPARRAL (highest)

CS (h) COASTAL SCRUB (high)

FPO (h+) FIRE-PRONE OAK WOODLAND (highest)

FPUF (h) FIRE-PRONE URBAN FOREST (high)

FPUF (h+) FIRE-PRONE URBAN FOREST (highest)

GR (m) GRASSLAND (moderate)

MEF (h+) MIXED EVERGREEN FOREST (highest)

MG (l) MOWED GRASS (low)

RF (h) REDWOOD FOREST (high)

US (m) URBAN SAVANNAH (moderate)

VIN (l) VINEYARD (low)

0 1,200 2,400

Feet

N

Basemap: Town of Portola Valley
Vegetation Data Source: Moritz Arboricultural Consulting
Map: TRA Environmental Sciences, Inc.
October 2008