



MEMORANDUM REPORT

DATE: August 18, 2026

TO: Board of Commissioners of the Los Altos Hills County Fire District

FROM: Black Mountain-Purissima Project Team,
Harmon, Field Manager
Eugenia Woods, Programs, Planning and Grants Manager

SUBJECT: Black Mountain-Purissima Evacuation Route Maintenance Project Final Reports

RECOMMENDATION:

Receive Black Mountain-Purissima Evacuation Route Maintenance Project Final Reports

BACKGROUND

The Los Altos Hills County Fire District (LAHCFD) 2023-2027 Strategic Plan (Attachment 3) emphasizes the importance of prevention, protection, and community resiliency. As outlined in Strategic Goal “1. Prevention, Protection, Resiliency” the District is committed to funding, developing, and maintaining programs that protect life and property while enhancing safety to build a resilient community. A key initiative under this goal is the Evacuation Route Hardening program.

The Integrated Hazardous Fuel Reduction (IHFR) programs, identified in the LAHCFD Chart of Services (Attachment 4), include Community-Focused Evacuation Route Hardening projects. These programs are grounded in fire science, the LAHCFD Community Wildfire Protection Plan (CWPP) Annex 4, and the District’s annual budget allocations. The IHFR projects aim to improve community resiliency, educate residents, and mitigate fire hazards.

The Black Mountain-Purissima Evacuation Route is a high-priority corridor within the northern portion of Los Altos Hills and serves as a critical route for residents, emergency responders, bicyclists, pedestrians, and other roadway users during wildfire and emergency evacuation conditions. The project includes treatment along Black Mountain Road, Elena Road, Natoma Road, and Purissima Road, extending from the intersection of Purissima Road and Arastradero Road to the intersection of Black Mountain Road and Altamont Road. During a wildfire or other emergency incident, these connected roadway segments may be relied upon for both vehicular evacuation and emergency response access.

The project corridor is located entirely within District boundaries and received hazardous fuels reduction treatments consistent with IHFR program standards.

Information about this project, as well as other District wildfire mitigation and evacuation route projects, is available on the District website at:

<https://www.lahcfd.org/community-projects/>

DISCUSSION

The Black Mountain-Purissima Evacuation Route Maintenance Project represents a coordinated vegetation management effort along Black Mountain Road, Elena Road, Natoma Road, and Purissima Road. The project was designed to improve emergency access and evacuation readiness by reducing encroaching roadside vegetation, increasing vertical and horizontal clearance, improving sight distance, and enhancing roadway usability for emergency responders and evacuating residents. Treatment activities focused on vegetation located within the public right-of-way and on participating private properties where permissions were obtained, creating a more resilient evacuation corridor while maintaining consistency with environmental compliance requirements and project prescriptions.

This District Final Report is provided to document project implementation, summarize outcomes, and present actual treatment extents and costs. The Santa Clara County FireSafe Council Final Report for the Black Mountain-Purissima Evacuation Route is included as an attachment and provides contractor-managed project details and supporting documentation. The Air Metrix Post-Treatment Report is also included and provides an aerial assessment of vegetation conditions before and after treatment.

The Air Metrix analysis complements the District's field-based tracking by documenting vegetation changes across the broader project corridor. Detailed UAS measurements and the distinction between the aerial analysis area and the field-verified treatment footprint are presented in the Quantitative Results section.

These four roadway segments function collectively as a single evacuation corridor, and untreated or inadequately maintained portions can reduce the effectiveness of adjacent treated areas during an emergency.

Project planning and implementation emphasized life-safety outcomes, including improved roadway and intersection visibility, pedestrian clearance, and reduced roadside ignition potential. Treatments were conducted consistent with applicable local codes governing sight distance and roadway safety, reinforcing both wildfire mitigation objectives and everyday traffic safety.

Strategic partnerships were integral to successful project implementation. Coordination included the Los Altos Hills County Fire District, Santa Clara County FireSafe Council, Town of Los Altos Hills, Santa Clara County Roads and Airports, Caltrans, Dudek, Miabella Expert Tree Service, and AWP Safety. The project was completed over four treatment days, from April 6 through April 9, 2026.

QUANTITATIVE RESULTS and EXPENSES

Quantitative Results:

The Black Mountain-Purissima Evacuation Route Maintenance Project was successful in achieving the District's objective of reducing hazardous vegetation to support safer evacuation and emergency response conditions along a high-priority evacuation corridor.

LAHCFD operational tracking and field verification were used to document the project's completed treatment quantities. Air Metrix separately evaluated vegetation conditions across a broader 125-acre analysis area covering approximately 2.13 roadway miles. Because the aerial analysis area is not equivalent to the field-verified treatment footprint, the two data sets are presented as complementary measures of project implementation and vegetation-condition change.

PROJECT WORK TRACKER									
Black Mountain - Purissima									
Total Weeks Worked	Total Days Worked	Treatment Dates	Totals for the Treated Area Per Day				Acreage Information Totals		Recorded from the amount in the trucks
1	1	Monday, April 6, 2026	Linear Mileage Treated	Linear Footage Treated	Average Treatment Width	Total Square Footage Treated	Total Acreage Treated	Cubic Yards of Chipped Material	
	2	Tuesday, April 7, 2026	0.98	5174.40	20.00	103488.00	2.38	28.40	
	3	Wednesday, April 8, 2026	1.07	5649.60	20.00	112992.00	2.59	46.00	
	4	Thursday, April 9, 2026	1.20	6336.00	20.00	126720.00	2.91	30.00	
			1.19	6285.00	20.00	125700.00	2.89	38.00	
			4.44	23445.00	<-- Weekly Totals -->	468900.00	10.76	142.40	
2									
			0.00	0.00	<-- Weekly Totals -->	0.00	0.00	0.00	
			Total Linear Miles Treated	Total Linear Footage			Total Square Footage	Total Acreage Treated	Total Cubic Yards
			4.44	23445.00			468900.00	10.76	142.40
			Average Linear Miles Treated Per Day	Average Linear Footage Treated Per Day			Average Square Footage Treated Per Day	Average Acreage Treated Per Day	Average Cubic Yards Per Day
			1.11	5861.25			117225.00	2.69	35.60

Based on operational tracking and field verification, the Black Mountain-Purissima Evacuation Route Maintenance Project achieved the following treatment results:

- Total linear miles treated: 4.44 miles.
- Total linear footage treated: 23,445 feet.
- Total square footage treated: 468,900 square feet.
- Total acreage treated: 10.76 acres.
- Total cubic yards of chipped material: 142.40 cubic yards.
- Total treatment duration: 4 days.

Daily production averaged approximately 1.11 linear miles, 5,861.25 linear feet, 117,225 square feet, 2.69 acres, and 35.60 cubic yards of chipped material per treatment day.

Air Metrix documented a 10% reduction in medium-height vegetation area and a 13% reduction in medium-height vegetation volume between March and May 2026. High vegetation area decreased by 2%, and high vegetation volume decreased by 5%. Low vegetation area remained unchanged at 0.07 acre, while modeled low vegetation volume increased from 123 to 180 cubic yards. These findings provide independent aerial verification of vegetation changes along the corridor and are not equivalent to the District's field-tracked treatment quantities. The rise in low volume vegetation is due to recording dates, spring precipitation and grasses regrowth. It is not a reflection of lack of materials removed rather than the quick rate of regrowth for certain vegetation classes during this time of year. This highlights the necessity for monitoring in the IHFR Flashy Fuels program as the summer progresses.

Expenses:

Costs associated with the Black Mountain-Purissima Evacuation Route Maintenance Project reflect expenditures incurred directly by the District to support project planning, implementation, traffic control, environmental review, outreach, and post-treatment verification.

District-incurred expenses included Integrated Hazardous Fuel Reduction (IHFR) project management, personnel mileage, traffic control planning and implementation, hazardous fuel reduction activities, biological surveying, public outreach and Right of Entry mailings, and pre- and post-treatment UAS data collection and analysis.

The total project cost incurred by the District for the Black Mountain-Purissima Evacuation Route Maintenance Project was \$113,043.00.

Detailed cost documentation and contractor expenditures are maintained as part of the project record and are summarized in the District's Project Cost Breakdown.

Black Mountain-Purissima Evacuation Route				
Project Cost Breakdown				
Service Description	Contractor	Completed	Amount	Notes
IHFR Project Management	SCC FireSafe Council	Mar 2026 - May 2026	8,762.96	
Personnel Mileage	SCC FireSafe Council	Mar 2026 - Apr 2026	163.51	
Project Supplies				
Project Supplies Reimbursement (LAHCFD)				
Traffic Control Plan	City Rise	Feb-26	1,680.00	
Traffic Control Contractor	AWP Traffic Control	Apr-26	24,192.00	
Fuel Reduction	Mlabella	Apr-26	44,800.00	
Biological Survey	Dudek	Apr 2026 - May 2026	22,738.31	
Postcard, Cover Letters, & ROE Mailers	Folger Graphics		1,106.22	
Pre-Project UAS Flyover/Data	Air Metrix	Mar-26	2,900.00	
Post-Project UAS Flyover/Data	Air Metrix	Apr 2026 - May 2026	6,700.00	Two bills, Apr = flyover / May = addit. analysis
Total Project Cost			113,043.00	

SUCSESSES

The Black Mountain-Purissima Evacuation Route Maintenance Project achieved several notable successes that reinforce the effectiveness of the District's evacuation route hardening and maintenance program.

Unmanned Aircraft Systems (UAS) were successfully utilized to support project planning and post-treatment verification. The before-and-after mapping strengthened project documentation, provided an independent method of evaluating treatment outcomes, and established a useful baseline for future maintenance monitoring. The report also illuminates potential future treatment frequency needs for varying vegetation classes.

The project was implemented efficiently and without injuries or traffic-related incidents. Daily safety briefings, clearly defined traffic control measures, and close coordination among vegetation crews, traffic control providers, and District staff contributed to a safe and orderly operation within active roadways.

Operational coordination among project partners was another key success. The District worked closely with the Santa Clara County FireSafe Council, Town of Los Altos Hills, Santa Clara County Roads and Airports, Caltrans, Miabella Expert Tree Service, Dudek, AWP Safety, and Air Metrix to support regulatory compliance, environmental protection, traffic safety, consistent treatment standards, and effective field execution across the project corridor.

Vegetation management efforts resulted in improved roadway and intersection visibility, enhanced pedestrian clearance, and reduced roadside ignition potential while maintaining appropriate overstory canopy for shade and vegetation health. These outcomes directly support safer evacuation conditions and improved access for emergency responders during wildfire and other emergency events.

COMMUNITY OUTREACH

Community outreach was an integral component of the Black Mountain-Purissima Evacuation Route Maintenance Project and was conducted to inform residents of planned activities, minimize disruptions, and encourage participation where applicable.

Outreach efforts included mailed project materials, media release, door-to-door visits, and a social media campaign. Postcards, cover letters, and Right of Entry requests were mailed to adjacent property owners to explain the project scope and provide opportunities for voluntary participation on the frontage area of private property.

LAHCFD staff surveyed the project corridor to identify priority parcels within the project scope. Property owners were provided approximately three weeks to return Right of Entry forms, with a deadline of March 27, 2026. LAHCFD and Santa Clara County FireSafe Council staff also

conducted door-to-door outreach approximately two weeks before project implementation to answer questions and encourage participation.

Of the 71 parcels identified within the project area, Right of Entry authorization was obtained for three parcels. Vegetation treatment was completed within the public right-of-way and on participating private properties where authorization had been secured.

Overall, outreach efforts supported transparency, facilitated coordination with residents, and contributed to the successful implementation of the project.

INSIGHTS / LESSONS LEARNED

The Black Mountain-Purissima Evacuation Route Maintenance Project provided several insights that will inform future evacuation route hardening and hazardous fuel reduction efforts.

Despite extensive outreach, Right of Entry participation remained limited. Future projects may benefit from additional lead time for property-owner coordination and repeated outreach throughout the planning period.

Evacuation route treatments require careful calibration to balance wildfire risk reduction objectives with roadway constraints, environmental protection, private-property participation, and residential context. Treatment focused on roadside vegetation, fine fuels, ladder fuels, and sight-distance obstructions while retaining healthy overstory canopy where appropriate.

The use of UAS technology demonstrated the value of combining aerial analysis with field-based operational tracking. Future reports should continue to distinguish between the broader area evaluated through aerial imagery and the actual treatment footprint documented by field crews, ensuring that each data set is used for its intended purpose.

Operational coordination and safety planning remain critical to successful project delivery. Pre-project meetings, daily safety briefings, and clearly defined traffic control measures contributed to safe execution within active roadways and should remain standard practice for future projects.

These insights will be applied to future evacuation route hardening and hazardous fuel reduction projects to further improve program efficiency, community engagement, data accuracy, and life-safety outcomes.

ACKNOWLEDGMENTS / APPRECIATION

The Los Altos Hills County Fire District expresses its appreciation to the many partners and individuals who contributed to the successful completion of the Black Mountain-Purissima Evacuation Route Maintenance Project.

The District acknowledges the continued support of the Board of Commissioners, whose leadership and commitment make evacuation route hardening and hazardous fuel reduction efforts possible.

Appreciation is extended to the Santa Clara County FireSafe Council for project management, coordination, outreach, and implementation support. The District also recognizes Miabella Expert Tree Service, Dudek, and AWP Safety for their respective contributions to vegetation treatment, biological monitoring, and traffic control. Their professionalism and adherence to established safety and environmental protocols contributed to the efficient and incident-free completion of the project.

The District further appreciates Air Metrix for pre- and post-treatment UAS data collection and analysis, as well as the Town of Los Altos Hills, Santa Clara County Roads and Airports, Caltrans, and other participating agencies that supported planning, permitting, and field operations.

The District also appreciates the residents and property owners along the Black Mountain-Purissima corridor for their cooperation and engagement throughout the project.

ATTACHMENT(s):

Attachment 1

Santa Clara County FireSafe Council Final Report

Black Mountain-Purissima Evacuation Route

Attachment 2

Air Metrix Post-Treatment Report

Purissima Road, Elena Road, Natoma Road, and Black Mountain Road

Attachment 3

Los Altos Hills County Fire District 2023–2027 Strategic Plan

[LAHCFD Strategic Plan - Los Altos Hills County Fire District](#)

Attachment 4

Los Altos Hills County Fire District Chart of Services, Current Version

[LAHCFD Chart of Services – V20, January 7, 2026](#)



Santa Clara County FireSafe Council

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FINAL REPORT

Black Mountain-Purissima Evacuation Route

April 2026

Introduction:

The Black Mountain- Purissima in Los Altos Hills and Palo Alto, California, represents a significant thoroughfare for the northern portion of Los Altos Hills Community. This interchange is a primary means of egress and ingress in case of an emergency evacuation. To secure this egress/ingress' integrity, Santa Clara County FireSafe Council, Los Altos Hills County Fire District, the City of Palo Alto and Palo Alto Fire Department proposed a joint roadside treatment of fuels.

Cooperators:

There were multiple agencies, contractors, and organizations that contributed to the project; Santa Clara County Fire Safe Council, Los Altos Hills County Fire District, Santa Clara County Roads and Airports, Caltrans, the Town of Los Altos Hills, Miabella Expert Tree Service, and AWP Safety.

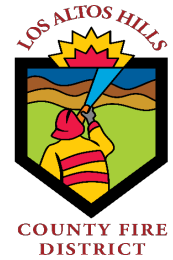
Goals For This Project:

- Trim woody vegetation and clear grasses and weeds along the roadside to enhance safety and visibility.
- Remove dead or dying woody debris to reduce fire risk and improve overall roadway conditions. Remove all downed woody vegetation, brush, tree branches, dry weeds, and deep accumulations of leaves.
- Reduce ladder fuels around larger trees.
- Remove dead, diseased, or damaged trees smaller than 8 inches DBH posing a hazard.
- Vegetation clearance will extend fourteen feet vertically above the pavement and up to fifty feet horizontally from the centerline of the road within the public right-of-way managed by the County of Santa Clara, the Town of Los Altos Hills, or Caltrans.
- Clear any eucalyptus bark on the ground, in the tree forks, or hanging loose from trees.



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Project Site:

The Black Mountain - Purissima Evacuation Route Project provided hazardous fuels reduction and defensible space treatments along four (4) roads including Black Mountain Road, Elena Road, Natoma Road, and Purissima Road.

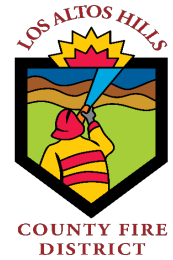
Field operations commenced at the north end of the project located at the intersection of Purissima Road and Arastradero Road, proceeding along Purissima Road taking the turn towards Natoma Road, until the southern end of the project located at the intersection of Black Mountain Road and Altamont Road.

Overall, the Black Mountain - Purissima Evacuation Route Project successfully treated approximately 142.4 cubic yards of hazardous fuels along 4.4 miles, or 10.76 acres, of critical evacuation routes, improving the roadway defensibility and community wildfire safety.



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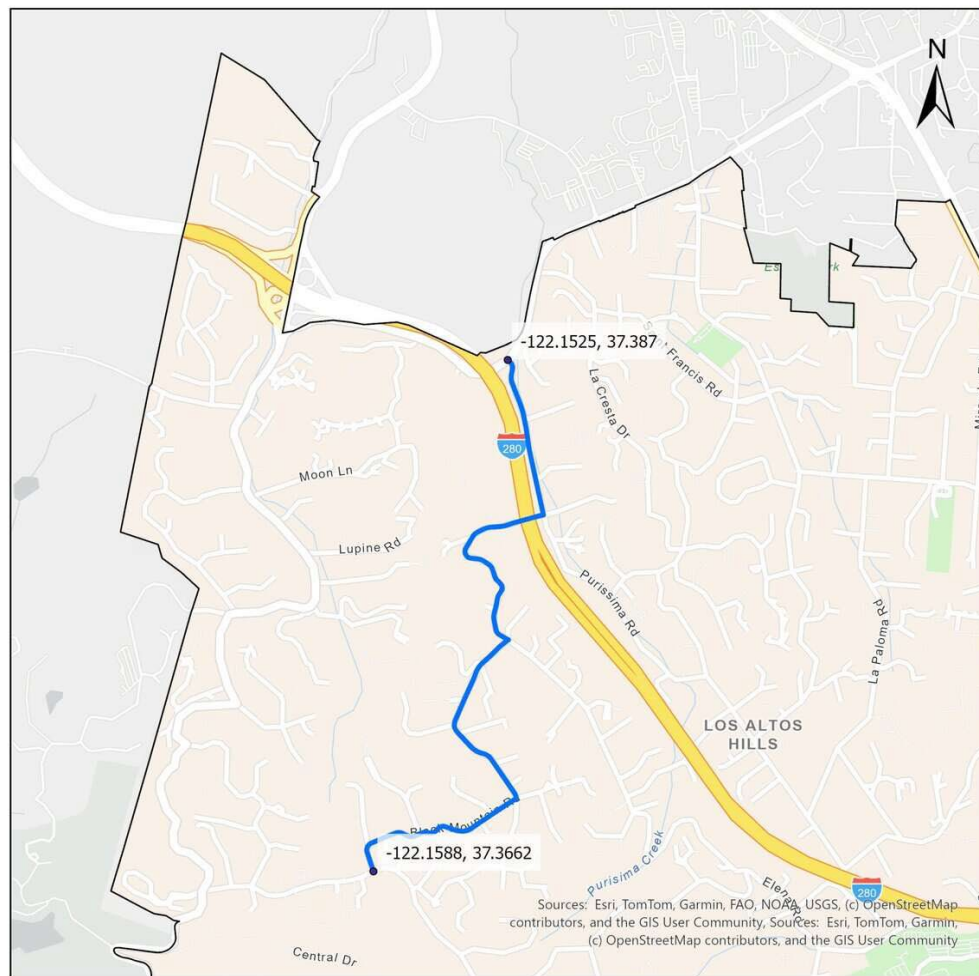
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Black Mountain-Purissima Evacuation Route Project Map

Black Mtn Natoma Purissima Project Area Map

2026



- BLACK MOUNTAIN RD
- ELENA RD
- NATOMA RD
- PURISSIMA RD
- LAHCFD Boundary

0 0.25 0.5 1 Miles



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Permissions:

One of the biggest challenges in these types of projects is getting permission to treat the properties. During planning of the project we conducted an extensive public outreach effort to get the permissions needed. It included mailers, newspaper articles, door-to-door visits, and a social media campaign. We were able to include 3 of the 71 parcels involved. Prior to the project, LAHCFD staff conducted a survey of the area to identify key parcels within the project scope. SCCFSC's timeframe for ROE forms to be returned was approximately 3 weeks with a due date of Friday March 27, 2026. LAHCFD and SCCFSC Staff went out to conduct door knocking 2 weeks prior to project start date.

Biological Precautions:

As with all of our projects, protecting the biodiversity of the area is a high priority. A Biological Survey was conducted on Wednesday April 1st, by Dudek, 5 days before the project started. The biologist identified and flagged wood rats nests, 2 active birds nests, drainages, and any habitats within the treatable area. The biological review was completed within the nesting season. Heritage trees were not identified during the field verification stage and were not included in the work plan. Finally, a buffer of 25 feet was implemented along stream beds and seasonal waterways. The biological monitor was completed daily and alongside the vegetation crews prior to work commencing to further ensure the protection of habitats.

Project Duration:

The project started on Monday April 6, 2026 and was completed on Thursday April 6, 2026. A total of 4 Days. We encountered 0 red flag days.

Jurisdictions And Funders Involved:

Santa Clara County Fire Safe Council, Los Altos Hills County Fire District, Santa Clara County, Caltrans, and Town of Los Altos Hills.

Contractors Selected:

Dudek was selected for this project due to availability and competitiveness of the bid. Miabella Expert Tree Service was selected for this project due to availability and competitiveness of the bid.

AWP Safety provided a traffic control plan and provided six flaggers and traffic control for project duration.



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Project Photos

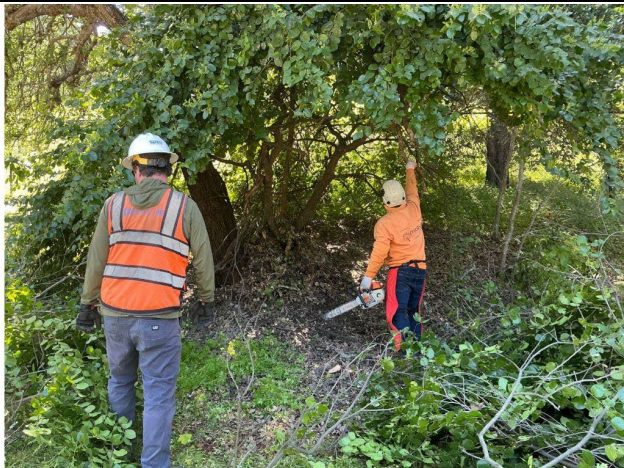




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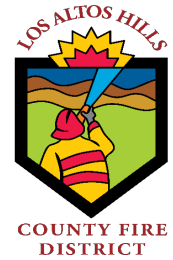
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By The Numbers:

- Area treated - 4.4 miles
- Acres treated - 10.76 acres
- No poison oak was treated during this project.
- 4 days of treatment on the project itself was carried out by Miabella Expert Tree Service.

We successfully completed the maintenance evacuation route and vegetation treatment. This project also supports goals in the LAHCFD CWPP annex as well as the overall Community Wildfire Protection Plan.

We would like to acknowledge the contribution made by Miabella Expert Tree Service, Dudek, and AWP Safety. All entities were committed to assisting Santa Clara County FireSafe Council with the project from start to finish.

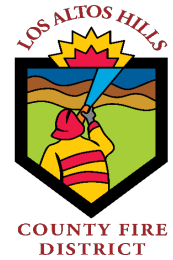
AWP Safety provided six traffic control personnel throughout the project to ensure that the work could be done in an efficient and safe manner. All roads worked on are commuter roads with high bike and foot traffic routes; the traffic control personnel were necessary for the safety of the tree crews, SCCFSC staff, LAHCFD staff, general traffic, pedestrians and bicyclists in the Los Altos Hills area. I'm happy to report, with AWP Safety traffic control coverage and the safe working practices of Miabella Expert Tree Service, we were able to finish the project with no reported injuries or incident reports. In addition to that, Los Altos Hills County Fire District granted permission for the project crew to use their parcel for a staging area.

Safety briefings were held by the safety officers, Barbara Gonzalez, and Andrew Harmon each morning before start of work to discuss traffic control, personal protective equipment (PPE), local emergency services, environmental hazards, and weather conditions.



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We would like to thank all the cooperators and property owners for all their support. If you have any questions or concerns please feel free to direct them to:

Barbara Gonzalez -

Project Manager

e-mail: bgonzalez@sccfiresafe.org

Phone: (408) 444-0711

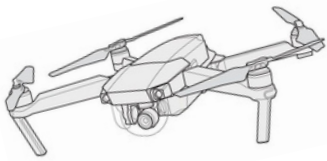
Amanda Brenner-Cannon -

Program Director

e-mail: abrennercannon@sccfiresafe.org

POST TREATMENT REPORT

*PURISSIMA ROAD
ELENA ROAD
NATOMA ROAD
BLACK MOUNTAIN ROAD*



MAY 2026

EXECUTIVE SUMMARY



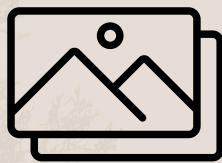
125 acres



2.13 mi



May 2026



1,985 images



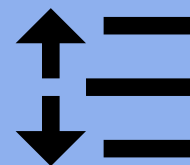
63x



Moisture level
analysed

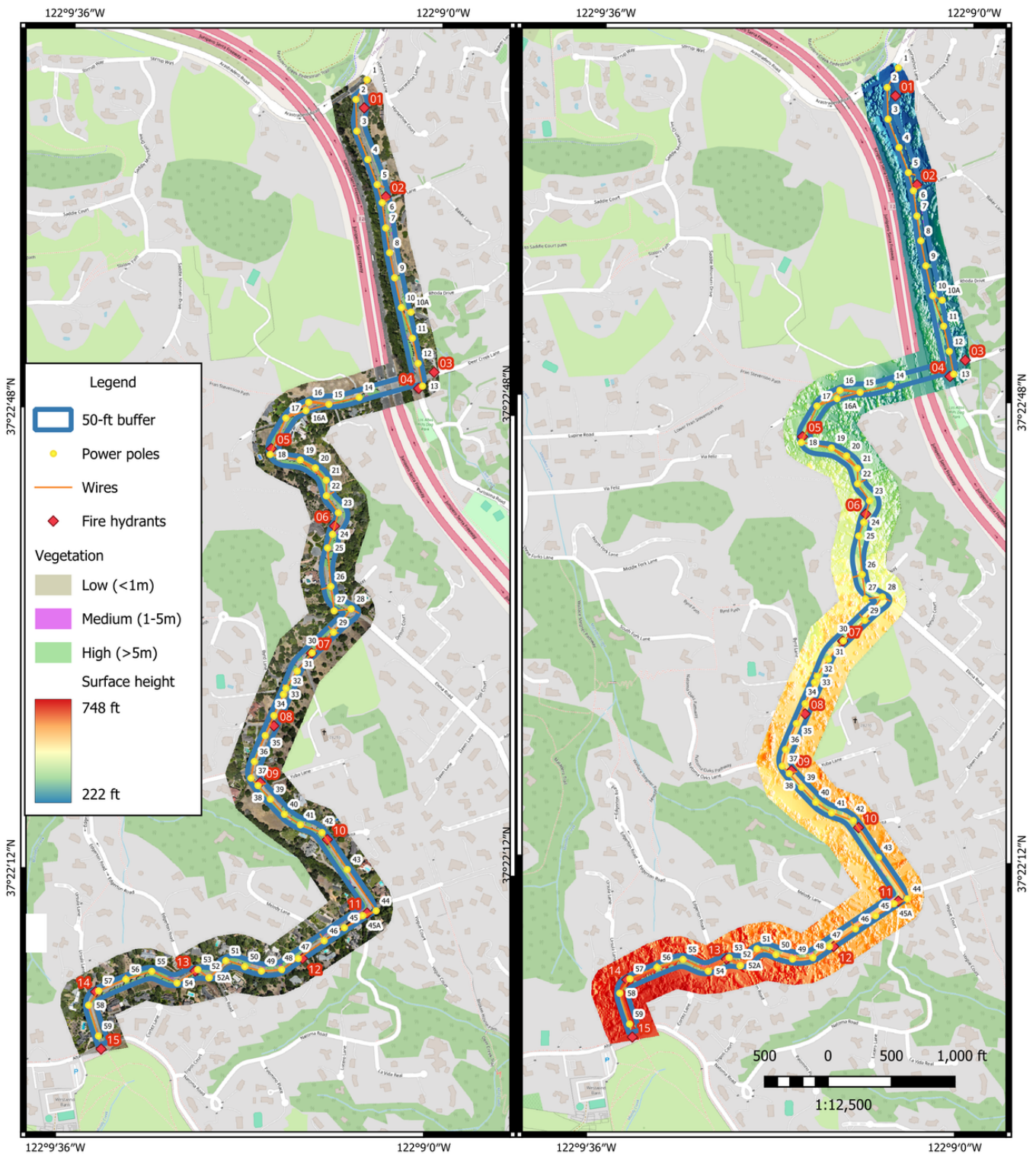


Health status
analysed

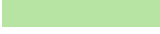


Vegetation height
groups

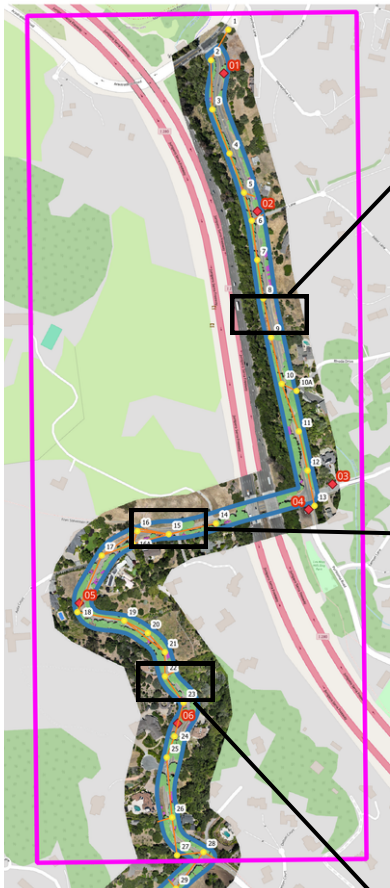
OVERVIEW



CHANGES: BEFORE (MARCH) - AFTER (MAY) (1ST MILE)

	Low vegetation before		Low vegetation after
	Medium vegetation before		Medium vegetation after
	High vegetation before		High vegetation after

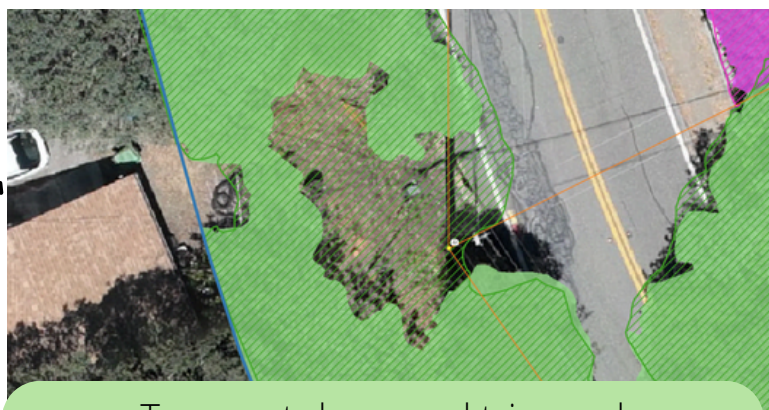
1st mile



Bushes cut down



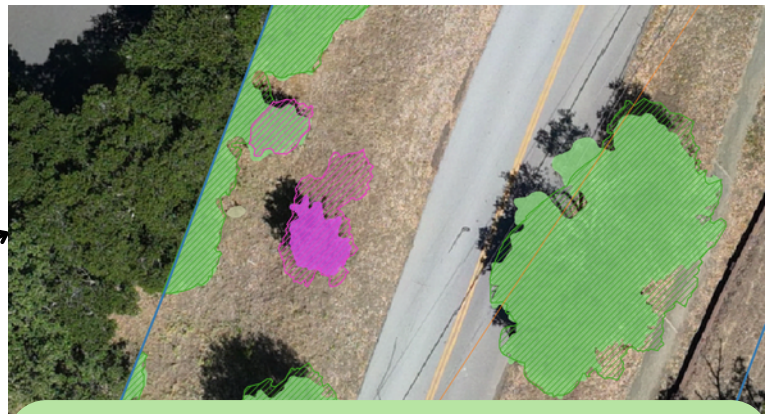
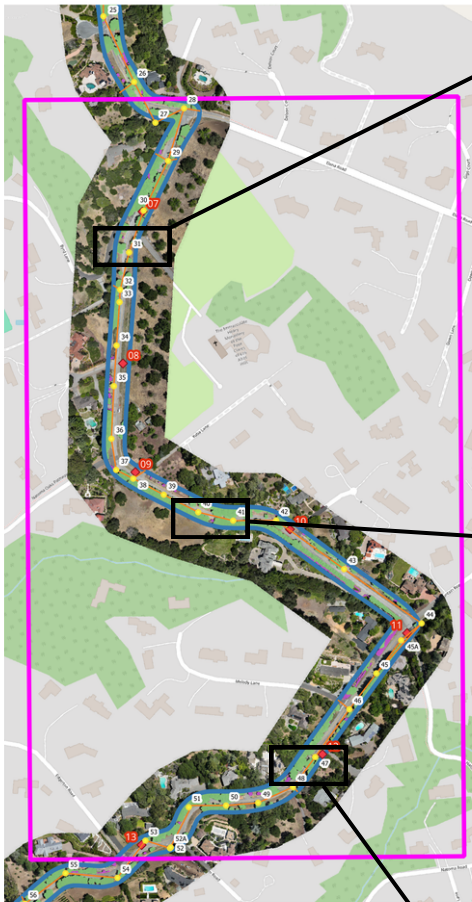
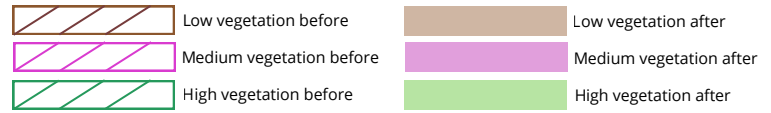
Bushes cut down



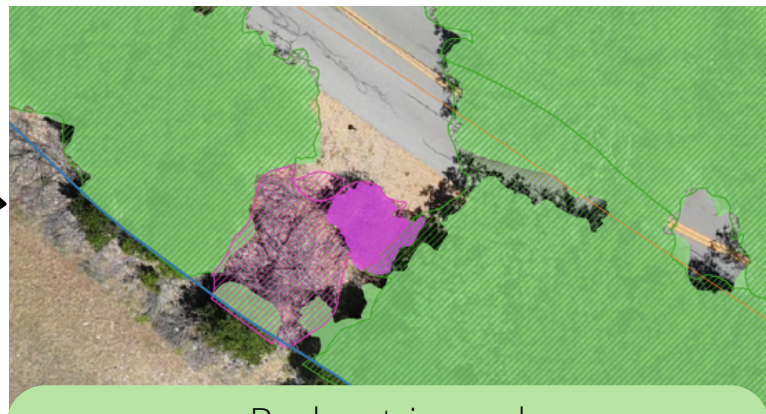
Trees cut down and trimmed

CHANGES: BEFORE (MARCH) - AFTER (MAY) (2ND MILE)

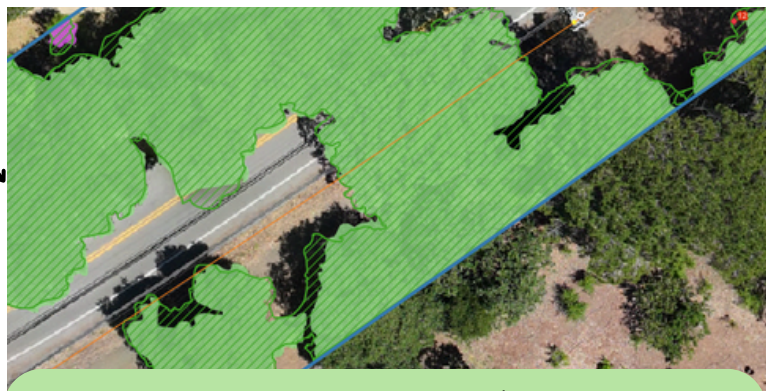
2nd mile



Tree trimmed

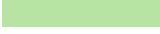


Bushes trimmed

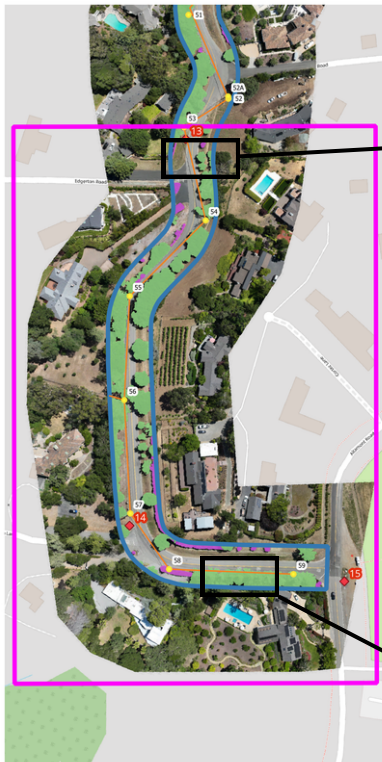


Trees trimmed

CHANGES: BEFORE (MARCH) - AFTER (MAY) (3RD MILE)

	Low vegetation before		Low vegetation after
	Medium vegetation before		Medium vegetation after
	High vegetation before		High vegetation after

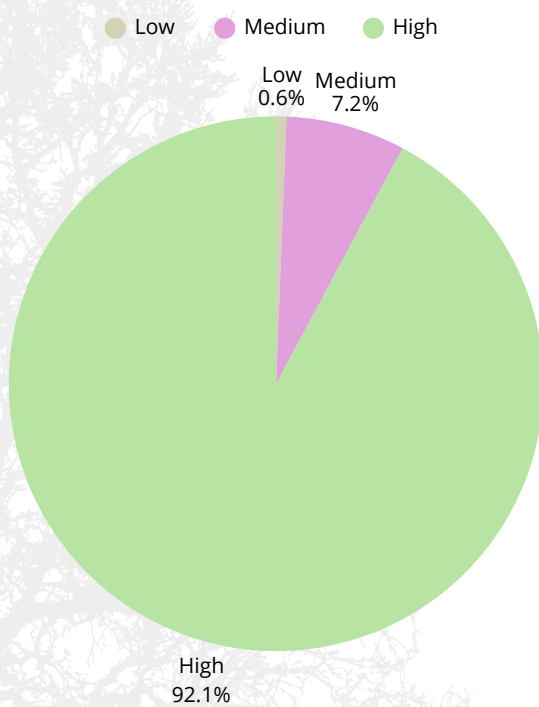
3rd mile



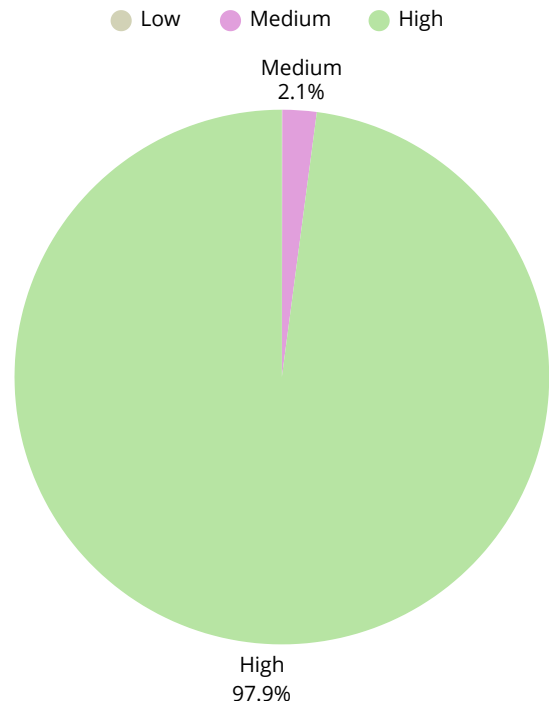
SHAPSHOT OF VEGETATION PROFILE

A primary goal of an evacuation route treatment is to reduce low height vegetation such as grasses and medium height vegetation such as shrubs and saplings that are ladder fuels. Finally the retention of a healthy tree canopy in the high height provides shade and cooler temperatures.

Vegetation area, %

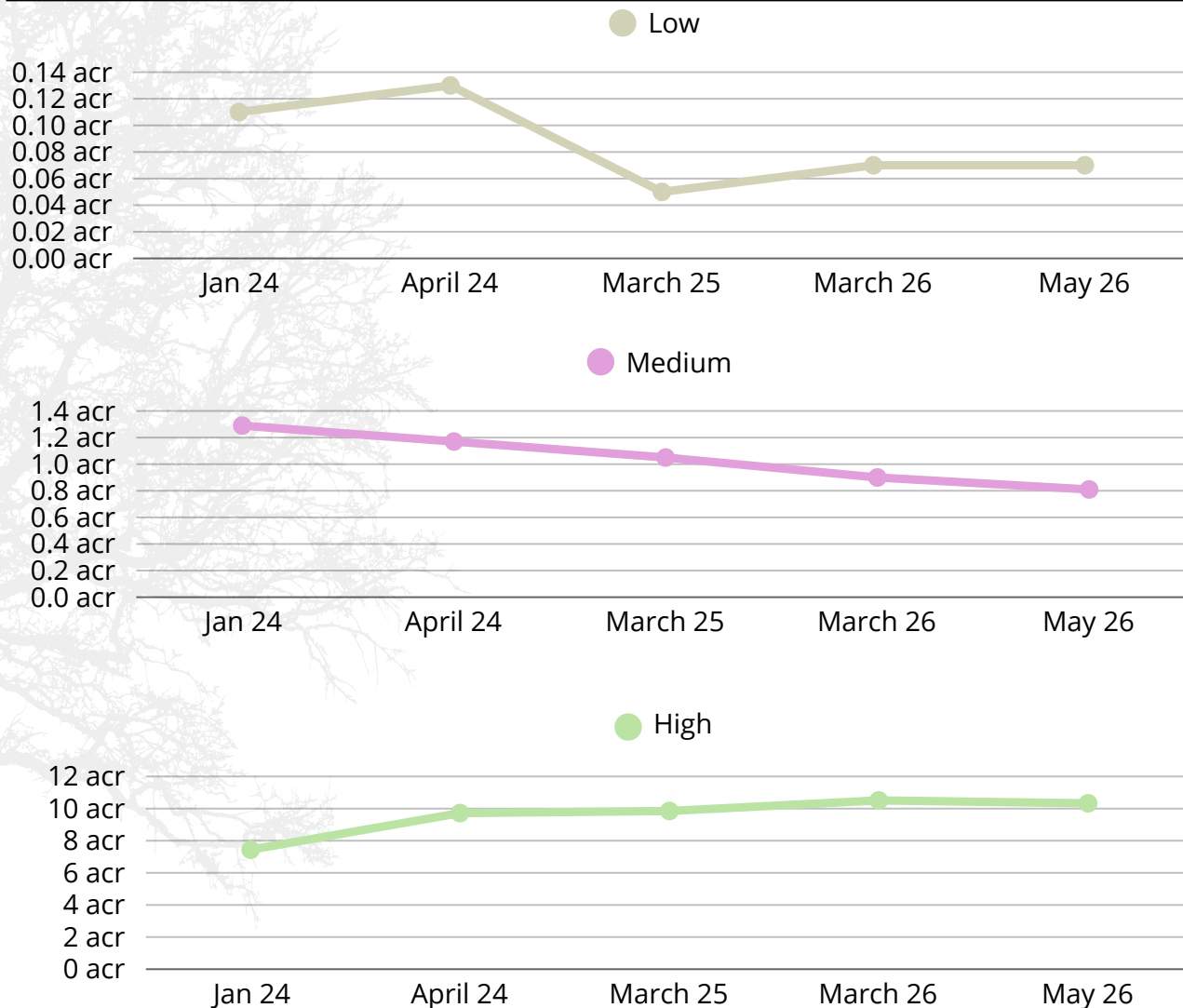


Vegetation volume, %



SHAPSHOT OF VEGETATION PROFILE

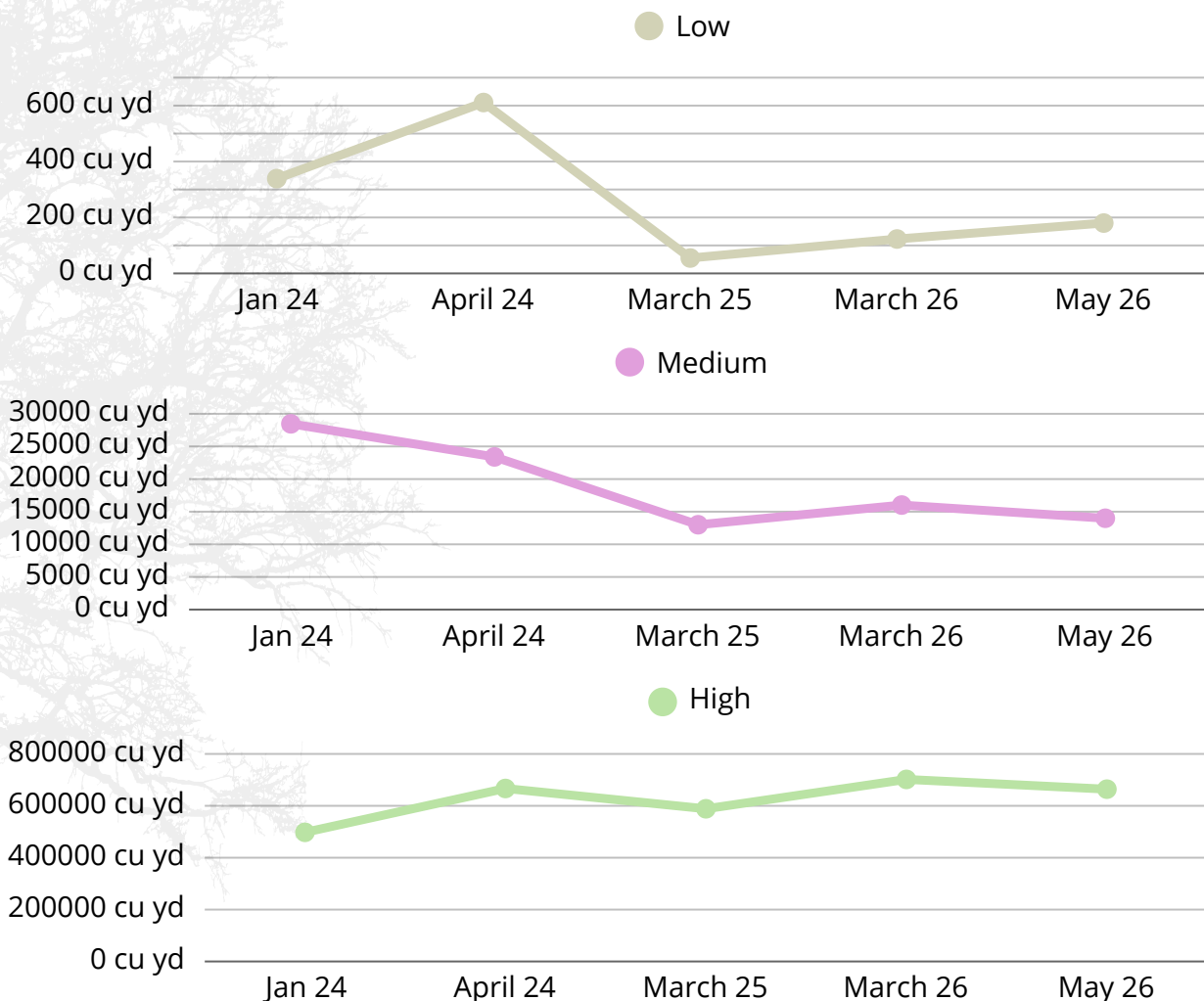
Vegetation height\ Area (acres)	Jan '24	April '24	March '25	March '26	May '26	Acreage change
Low (up to 1 m)	0.11	0.13	0.05	0.07	0.07	0%
Medium (1-5 m)	1.29	1.17	1.05	0.9	0.81	-10%
High (more than 5 m)	7.44	9.72	9.85	10.51	10.33	-2%



SHAPSHOT OF VEGETATION PROFILE

Volume is another way to measure a primary goal of an evacuation route treatment. Again the goal is to reduce low height vegetation and medium height vegetation. Retention of high height vegetation creates a shaded fuel break effect.

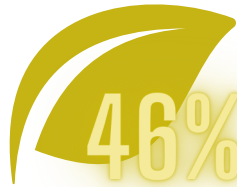
Vegetation height \ Volume (cubic yards)	Jan '24	April '24	March '25	March '26	May '26	Volume change
Low (up to 1 m)	339	611	55	123	180	+46%
Medium (1-5 m)	28,462	23,396	13,000	16,017	13,996	-13%
High (more than 5 m)	497,731	666,821	588,559	701,773	664,123	-5%



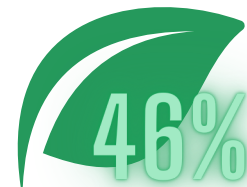
VEGETATION HEALTH STATUS (NDVI)



Very stressed

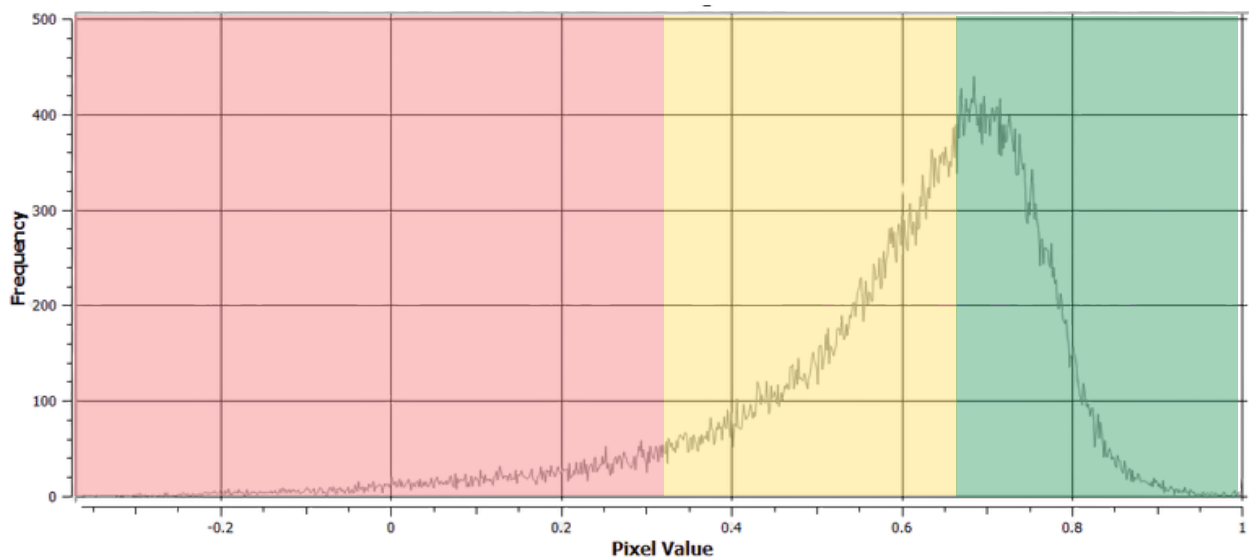


Moderately stressed



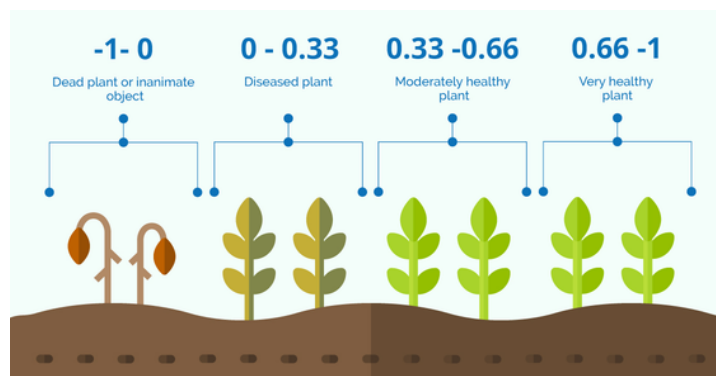
Low stressed

NDVI Distribution Chart



NDVI, or Normalized Difference Vegetation Index, is a numerical indicator used to assess the presence and health of vegetation by analyzing how surfaces reflect light at specific wavelengths. It is calculated using the formula $(NIR - Red) / (NIR + Red)$, where NIR stands for near-infrared reflectance and Red refers to red light reflectance.

The NDVI values range between -1 and +1. Values closer to +1 indicate dense, healthy vegetation, such as a forest canopy or thriving crop field. Moderate values (around 0.3 to 0.66) suggest sparser or less healthy vegetation like grasslands or shrubs. Values near zero or negative values typically represent diseased or dead plants.



MOISTURE CONTENT (GNDVI)



Water stressed



Low level of
water content

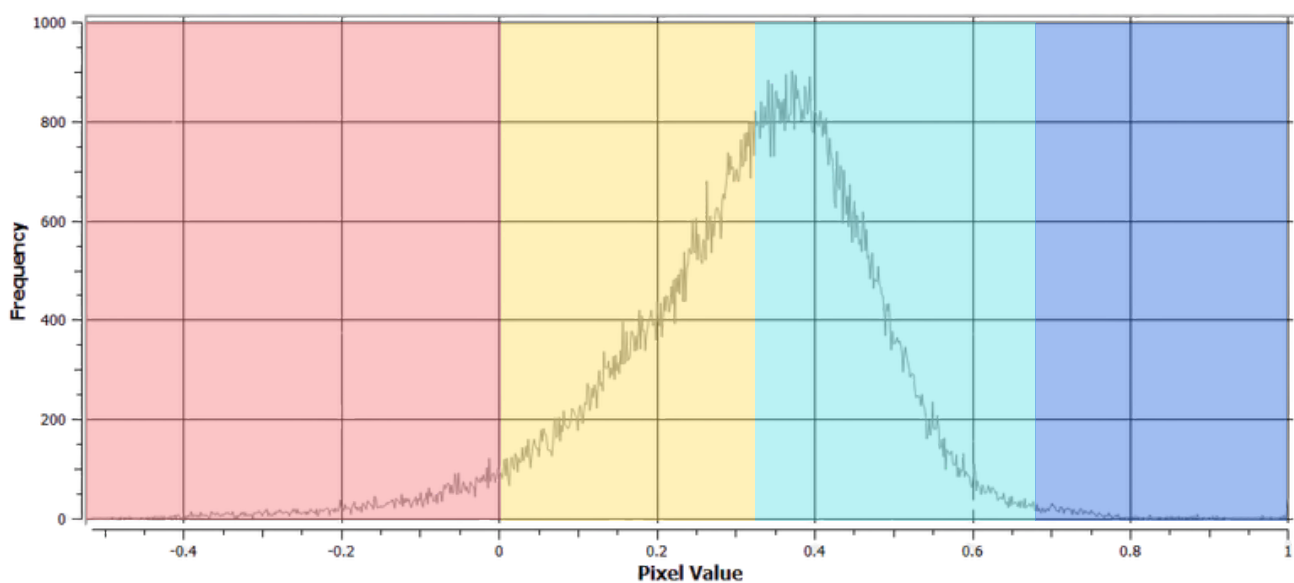


Medium level of
water content



High level of
water content

GNDVI Distribution Chart



GNDVI, or Green Normalized Difference Vegetation Index, is a vegetation index similar to NDVI but it uses the green band instead of the red band. It is particularly sensitive to chlorophyll content in leaves and is often used for assessing plant water stress, nitrogen content, or overall plant vigor, especially in crops with high chlorophyll concentrations.

The output values range from -1 to +1, just like NDVI. Higher values indicate high level of moisture in plants, while lower or negative values suggest sparse and water stressed vegetation. Compared to NDVI, GNDVI may be more sensitive to early signs of water or nitrogen deficiency, since green reflectance changes earlier in response to plant stress.