

The logo for HSA CWPP features the letters in a large, bold, sans-serif font. The letters are filled with a grayscale landscape image showing a mountain range and a body of water under a cloudy sky.

HSA CWPP

Horseshoe Springs Association, Inc.

COMMUNITY WILDFIRE PROTECTION PLAN

September 2026

Version Control

Table 1. Version Control

Version / Revision	Description of Change	Reviewed By / Date	Approved By / Date
Rev 1.0	Initial Draft Release	Core Team (06/25/2026)	HSA Board (08/05/2026)
Rev 1.1	Board & Core Team Review	HSA Board (07/10/2026)	Core Team (07/15/2026)
Rev 1.2	HSA Community Public Review	HSA Community (07/30/2026)	CWPP Lead Team (08/05/2026)
Rev 1.3	Final Board Review & Sign-Off	HSA Board (08/15/2026)	HSA Board (08/17/2026)
Rev 2.0	Final Plan Submission to EMNRD	EMNRD Review (Upcoming)	Formal Adoption (08/20/2026)

Signatures

The entities listed below participated in the development of and / or reviewed and are in support of the Horseshoe Springs Association, Inc. Community Wildfire Protection Plan:

Signature	Date
Michael Van Hecke	
President, HSA Board	
Horseshoe Springs Association, Inc.	

Signature	Date
Luis Saenz	
CWPP Lead	
Horseshoe Springs Association, Inc.	

Signature	Date
Jody Bickel	
CWPP Project Lead & Core Team	
Horseshoe Springs Association, Inc.	

Signature	Date
Dan Heerding	
County Representative	
Sandoval County Emergency Services	

Signature	Date
Sam Berry	
Program Manager	
NM EMNRD Forestry Division	

Signature	Date
Lawrence Crane Bernalillo District Forester NM EMNRD Forestry Division	

Signature	Date
Lee Taylor Local Fire Department Representative Sandoval County Fire Department	

Signature	Date
Jeremy Golston Jemez District Ranger U.S. Forest Service	

Signature	Date
Jess Lewis Firewise Representative Jemez Mountains Firewise Association	

Signature	Date
Martha Graham Source Water Protection Specialist New Mexico Rural Water Association	

Signature	Date
Rafael De La Torre Essential Utility Partner Jemez Mountains Electric Coop	

Signature	Date
Gayle Odell	
Neighbor Representative	
Hoffeins Neighboring Community	

Signature	Date
Dana Heusinkveld	
GIS Mapping Support Analyst	
New Mexico Forest and Watershed Restoration Institute	

DRAFT

Table of Contents

Version Control.....	3
Signatures.....	4
Table of Contents.....	7
List of Images.....	9
List of Tables.....	10
Executive Summary.....	11
Section 1: Introduction and Background.....	13
1.1 Purpose and Goals of the CWPP.....	13
1.2 Planning Area Location and WUI Boundary.....	14
1.3 How to Use this CWPP Document.....	16
1.3.1 Recommended Alignment with IBHS.....	17
1.4 Community Risk Profile and Conditions.....	17
1.5 Community Accomplishments to Date.....	19
1.6 Accomplishment Highlights.....	19
1.7 Early Implementation Actions During CWPP Development.....	21
1.8 Summary.....	21
Section 2: Collaboration & Community Engagement.....	22
2.1 Core Team and Mutual Agreement.....	22
2.2 Community Engagement Process.....	22
2.3 Formal Adoption.....	23
Section 3: Planning Area Background and Risk Assessment.....	25
3.1 Location and Risk Status.....	25
3.2 Social Vulnerability Index for the La Cueva / Horseshoe Springs CWPP Area.....	28
3.3 Wildfire Threat and Hazard Ratings.....	31
3.3.1 Drought Trends and Climate Projection.....	36
3.4 Fuel Conditions and Fire Behavior Potential.....	37
3.5 Lidar Forest Canopy Assessment.....	40
3.6 Highly Valued Resources and Assets (HVRAs).....	42
Section 4: Mitigation Strategy.....	46
4.1 Prioritized Fuel Reduction Projects (HFRA Requirement 2).....	46
4.2 Reducing Structural Ignitability (HFRA Requirement 3).....	48
4.3 Post-Fire Recovery and Watershed Protection.....	53
Section 5: Emergency Response & Preparedness.....	55
5.1 Evacuation Planning and Preparedness.....	55
5.2 Evacuation Planning and Strategy.....	56
5.3 Vulnerable Populations and Pet Evacuation.....	58

5.4 Fire Suppression Resources and Infrastructure Hardening.....	59
5.5 Emergency Access.....	62
Section 6: Action Plan & Implementation.....	64
6.1 Project Implementation Table.....	64
6.2 Potential Funding Sources.....	70
Section 7: Monitoring and Evaluation.....	71
7.1 Plan Maintenance and Timeline.....	71
7.2 General Monitoring Strategies.....	71
7.3 HSA Fire & Safety Inspection Progress Tracking.....	71
Section 8: Wildfire Risk Modeling & Composite Risk Assessment.....	73
8.1 Overview of Risk Modeling.....	73
8.2 Composite Risk Assessment Mapping.....	73
8.3 Analysis and Modeling Results Narrative.....	76
Section 9: Maps.....	77
9.1 Required Map Layers Specifications.....	77
Glossary of Terms and Acronyms.....	79

List of Images

List Of Images

Figure 1. HSA Logo

Figure 2. Horseshoe Springs General Location

Figure 3. La Cueva Community Home Hardening

Figure 4. Highly Valued Resources and Assets (HRVAs)

Figure 5. Land Ownership

Figure 6. Social Vulnerability Index

Figure 7. Natural Resources Federally Recognized Critical Habitats

Figure 8. Fire History Surrounding Area

Figure 9. HSA's Fire History

Figure 10. Vegetation Classification

Figure 11. Pre & Post Fire Erosion Mitigation Considerations

Figure 12. Lidar Canopy Height Model of HSA

Figure 13. Canopy Cover and Canopy Base Height around the 19 Buildings

Figure 14. Critical Infrastructure Energy & Communication

Figure 15. Highly Valued Resources and Assets (HVRAs)

Figure 16. Fuel Treatment Status

Figure 17. Addresses & Structures (North)

Figure 18. Addresses & Structures (South)

Figure 19. HSA Safety Egress Map

Figure 20. Fire Response

Figure 21. Critical Infrastructure Transportation and Safety

Figure 22. Planned Projects

Figure 23. HSA Composite Risk Assessment

Figure 24. Sandoval County Composite Risk Assessment

List of Tables

List Of Tables

- Table 1. Version Control
- Table 2. Communities at Risk Ratings with Community Field Evaluation Summary
- Table 3. Top 5 Critical Priorities
- Table 4. Infrastructure & Hardening
- Table 5. Policy & Governance
- Table 6. Community Outreach & Education
- Table 7. Maintenance (Ongoing)

Executive Summary

The Horseshoe Springs Association, Inc. (HSA) Community Wildfire Protection Plan (CWPP) is a locally-driven, collaborative document establishing a strategic framework to mitigate the elevated wildfire risk within the 130-acre Wildland-Urban Interface (WUI) community near the unincorporated La Cueva area, located approximately 10 miles north of Jemez Springs, New Mexico. The plan's objective is to reduce the threat to life and property from catastrophic wildfire and post-fire conditions by addressing hazards and improving community resilience, while aligning with the federal Healthy Forests Restoration Act (HFRA) and integrating the Insurance Institute for Business & Home Safety (IBHS) Wildfire Prepared Home™ standards.

Historically, the HSA has maintained a proactive stance on wildfire risk, codified through CC&Rs that mandate defensible space and ignition-resistant materials. This CWPP serves as a dynamic, collaborative guide, preserving the autonomy of property owners while ensuring that all mitigation activities—including home hardening and vegetation management—are performed in compliance with the HSA's Architectural Review Committee (ARC) and Fire & Safety rules and guidelines. This living document will be formally re-evaluated and updated every five years.

Key Risk Factors & Assessment:

The HSA community is designated as a High-Risk area due to dense forest conditions (227 trees per hectare), constrained access (single primary ingress/egress, plus three emergency routes), and vulnerable above-ground utilities. Our 2026 lidar-based assessment underscores the necessity of distinguishing between site-specific conditions and broader regional indexes, and localized thinning projects completed via conservation grants may not yet be captured in county-wide data. Furthermore, while the community relies on its centralized water system, this infrastructure is engineered exclusively for domestic supply. The five storage tanks are not feasible for active firefighting, requiring a focus on gravity-fed domestic resiliency rather than suppression capacity.

Prioritized Mitigation Strategy:

- 1) **Zone 0 & Home Ignition Zone (HIZ) Hardening:** Implementation of rigorous 0-5 foot critical ignition zone hardening, including the maintenance of a 5-foot vertical clearance column around structures to prevent vertical fire spread and ember intrusion.
- 2) **Fuel Reduction:** Systematic fuel management using defined standards, including mechanical chipping (chip depth $\leq$ 2 inches) and lop-and-scatter treatments (height $\leq$ 18 inches).
- 3) **Community Preparedness:** Formalized annual fire safety inspections that track photographic evidence and quantitative metrics (e.g., Zone 0 compliance, ember-resistant vent installation, Class A roofing status, and retrofitting efforts). These records may provide insurer-legible proof of work for homeowners.
- 4) **Collaborative Partnerships:** Active coordination with partners, including the Jemez Alliance of Water Systems (JAWS) to enhance infrastructure resiliency and the La Cueva Volunteer Fire Department (LCVFD) for suppression support.

Implementation and Funding:

The plan requires annual board review and a formal update every five years. The community may pursue major funding through federal and state programs such as the USFS Community Wildfire Defense Grants (CWDG), FEMA Hazard Mitigation Grant Program (HMGP), New Mexico Legislative Finance Committee Loans, which provide low-interest opportunities for community infrastructure and capital improvement projects, and New Mexico Home Strong, which provides retrofit grants to homeowner recipients insured through the New Mexico FAIR Plan. Past accomplishments, including annual inspections, chipper days, and pro-bono GIS mapping support from New Mexico Forest and Watershed Restoration Institute (NMFWRI), provide a strong foundation for continued implementation.

Section 1: Introduction and Background

1.1 Purpose and Goals of the CWPP

A Community Wildfire Protection Plan (CWPP) is a crucial planning document that establishes a community on the path toward preparing for wildfire and post-fire conditions. Its primary intent is to reduce the threat to life and property from catastrophic wildfire by identifying and mitigating hazards to communities and essential infrastructure located in the Wildland-Urban Interface (WUI).

The CWPP is a collaborative, dynamic process rather than a static document, intended to be re-evaluated and formally updated every five years. It functions as a guiding framework to identify potential treatments and suggest priorities; it does not have the authority to mandate the implementation of recommendations, which remains at the discretion of the landowner or jurisdictional entity.

This plan aligns with federal and national strategic objectives:

- **Healthy Forests Restoration Act (HFRA) of 2003:** The HSA CWPP meets the three minimum statutory requirements of the HFRA: collaboration among local, state, and federal representatives; prioritized hazardous fuel reduction; and recommendations for the treatment of structural ignitability.
- **National Cohesive Wildland Fire Management Strategy:** The plan's efforts integrate with the three primary national goals: creating resilient landscapes, fostering fire-adapted communities, and ensuring a safe, effective, risk-based wildfire response.

A Community Wildfire Protection Plan (CWPP) is a voluntary, locally driven planning framework that helps a community identify wildfire risks, set shared priorities, and guide coordinated action over time. For HSA, this CWPP is intended to serve as a directional planning document rather than a regulatory instrument. It does not create new land use controls, impose legal obligations on private property owners, or replace the Association's governing authority. The HOA retains full responsibility for establishing and enforcing its own covenants, rules, policies, and safety requirements, while using the CWPP as a practical tool to inform decision-making, support grant and partnership opportunities, and encourage actions that are compatible with community values, existing governance, and long-term wildfire resilience goals.

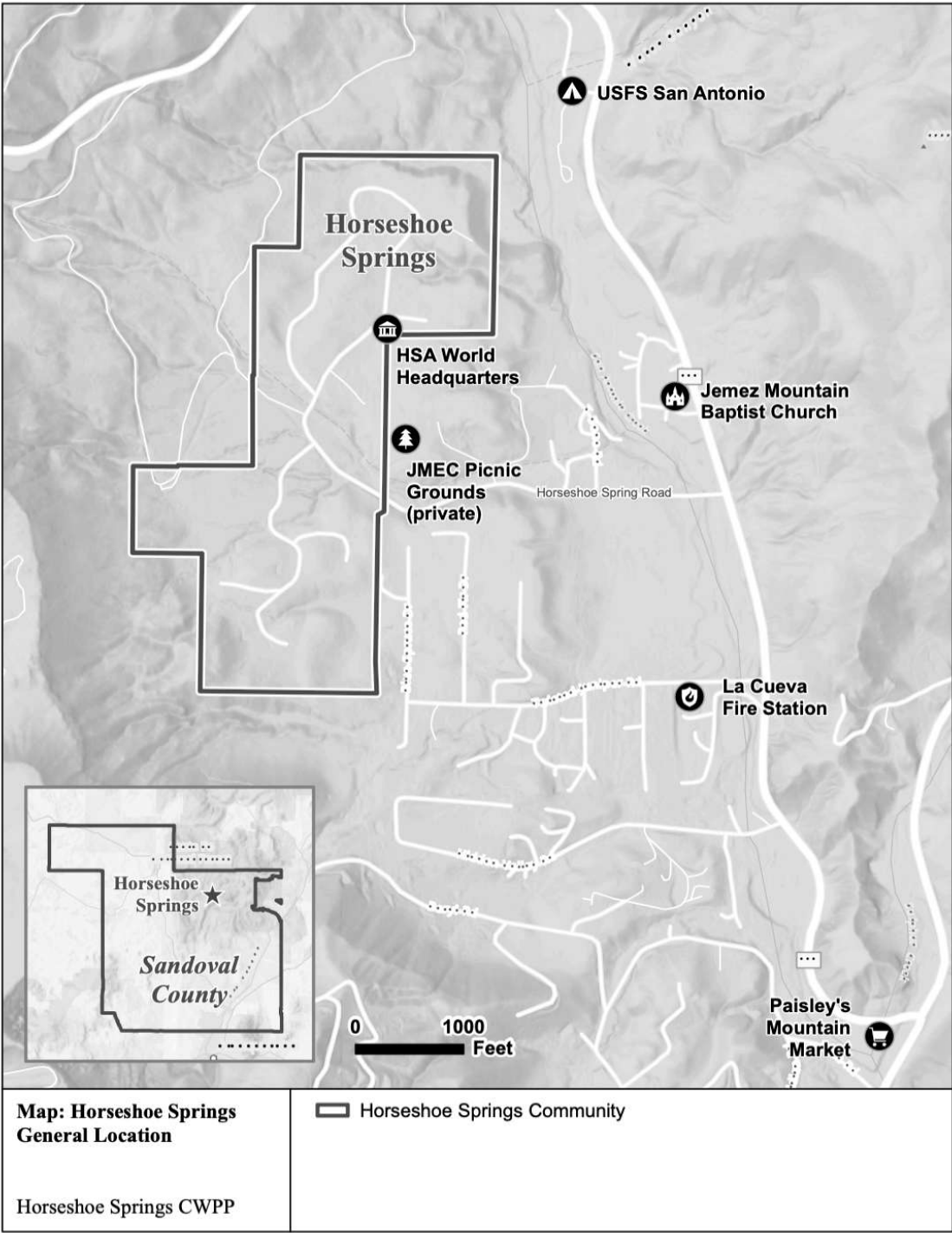
1.2 Planning Area Location and WUI Boundary

The HSA is a community primarily made up of second homes with limited full-time residents situated ~10 miles north of Jemez Springs, New Mexico. These residences are nestled within the forest, located either to the north or south of the main entrance road (Horseshoe Spring Road) west and south of NM 126.

The total property spans 130 acres, consisting of roughly 60 acres of private tracts, 6 acres of roads, and 64 acres of common area belonging to the Association (see Figure 2 below). These private tracts consist of 50 platted lots.

DRAFT

Figure 2. Horseshoe Springs General Location



Wildland-Urban Interface (WUI) Boundary: The WUI represents the area where human infrastructure directly intersects with wildland fuels. For the purposes of this CWPP, the defined WUI boundary for Horseshoe Springs encompasses the entire 130-acre property nested within the surrounding Santa Fe National Forest and adjacent private properties. This boundary overlaps with state-identified Community Mitigation Buffers, which delineate priority areas for fuel reduction and operational planning.

Similar to neighboring WUI communities like Sierra Los Pinos, HSA has established a localized WUI boundary to specifically target our highest-risk operational areas.

1.3 How to Use this CWPP Document

This Community Wildfire Protection Plan (CWPP) provides a structured assessment of wildfire risk for the HSA community and establishes a strategic framework for reducing that risk over time. The plan documents existing conditions, evaluates relative wildfire exposure and vulnerability, and identifies prioritized actions intended to improve community preparedness, structure survivability, emergency access, defensible space, and landscape resilience. As the first CWPP prepared specifically for HSA, this document is intended to serve as a foundational planning and implementation resource for the Association, property owners, local fire and emergency response partners, and cooperating agencies. It should be used as a living document to guide decision-making, support implementation, track completed actions, and inform future updates as conditions, risks, and opportunities evolve.

CWPPs provide an important mechanism for organizing wildfire risk reduction across parcel boundaries, ownerships, and jurisdictions, particularly in communities such as HSA where wildfire risk is influenced by both site-specific conditions and broader landscape-scale factors. The community risk ratings, project priorities, and recommended actions contained in this plan should be used to support project sequencing, annual work planning, capital improvements, and funding applications. Projects identified in this CWPP—particularly those located in higher-risk areas or those that improve evacuation readiness, ingress and egress reliability, fuel conditions, and home ignition zone resilience—may be more competitive for state, federal, county, nonprofit, and insurance-aligned funding opportunities when clearly documented in an adopted CWPP. This document is therefore intended not only to guide local action, but also to provide a clear and

defensible rationale for investment in wildfire risk-reduction measures that benefit the HSA community.

This CWPP should be used in coordination with other applicable planning, policy, and technical guidance documents at the local, county, and state levels. In particular, implementation of this plan should consider alignment with the 2025 Sandoval County CWPP, the New Mexico Forest Action Plan, relevant Shared Stewardship priorities, and other applicable emergency management, watershed, or land stewardship plans where appropriate. HSA should also consider present and emerging research, best practices, and implementation guidance related to home hardening, defensible space, and community wildfire resilience, including recommendations developed by the Insurance Institute for Business & Home Safety (IBHS) and the New Mexico Office of Superintendent of Insurance (NMOSI). Incorporating such evolving research and guidance can help ensure that future mitigation efforts remain practical, credible, and aligned with improving standards for wildfire resilience, insurability, and long-term community adaptation. This CWPP may also support related efforts such as Firewise USA® participation, homeowner education, with ongoing HOA governance decisions, and should be revisited periodically to remain current and effective.

1.3.1 Recommended Alignment with IBHS

To maximize the effectiveness of mitigation efforts and improve community insurability, this CWPP promotes alignment with the rigorous standards set by the Insurance Institute for Business & Home Safety (IBHS). IBHS, the research arm of the insurance industry, develops nationally recognized, science-based standards focusing on structure survivability in distance zones of 0-5 feet and 5-30 feet. While this CWPP does not create regulations or impose HOA enforcement, residents are strongly encouraged to pursue the IBHS Wildfire Prepared Home™ certification, as this demonstrates compliance with accepted mitigation standards and can support a homeowner's case when negotiating for insurance coverage. The CWPP should establish a long-term goal to achieve broad-scale community adoption, which research indicates requires a minimum of 80% total practice adoption goal, to effectively protect the community from wildfire risk. The stronger, defensible claim is that wildfire risk reduction becomes substantially more effective when home hardening and defensible space are implemented community-wide, because neighboring structures and parcels influence each other's ignition risk.

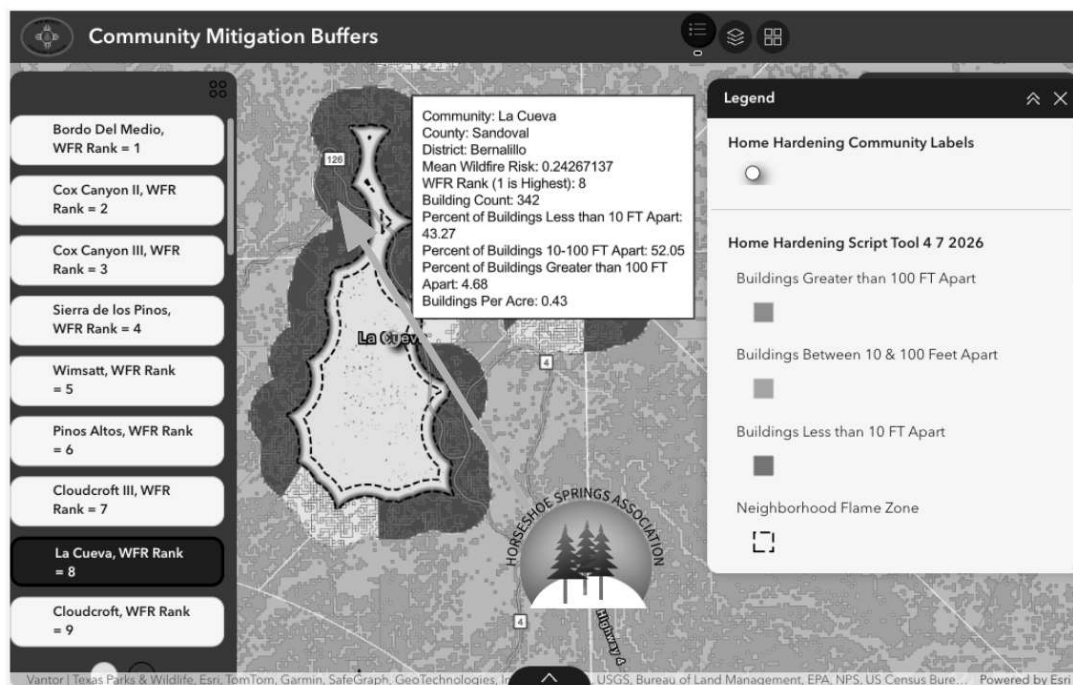
A simplified implementation checklist is provided in Appendix 7 to assist property owners in assessing their homes against these standards.

1.4 Community Risk Profile and Conditions

This section provides a baseline profile of the community's current wildfire risk conditions. HSA is formally recognized as an "at-risk community" by EMNRD and the broader Jemez Springs Corridor area carries a High-Risk designation for wildfire. The community faces elevated vulnerability due to several interacting factors:

- **Vegetation and Fuels:** The surrounding WUI is predominantly categorized by dry shrub fuels and timber litter, featuring timber with a grass understory.
- **Access and Topography:** While the community sits on low-grade slopes, access is severely constrained by a single ingress and egress route (Horseshoe Spring Road off of NM 126) and long, narrow, unpaved internal roads with limited turnarounds for responding fire vehicles.
- **Structural Vulnerability:** Given the generally far spacing of primary structures at HSA on large lots, the risk of extra-parcel (house-to-house) fire spread is low. However, fire spread risk is concentrated on intra-parcel conditions, where accessory structures or outbuildings may be positioned close enough to the main residence to facilitate fire spread on the same parcel. These conditions are frequently compounded by the use of combustible exterior materials such as wood siding and decking and the presence of dense vegetative cover overhead and immediately adjacent to structures. Collectively, these factors increase susceptibility to ember intrusion, radiant heat exposure, and direct flame contact during a wildfire event.
- **Infrastructure:** The community relies on vulnerable above-ground utility lines.
- **Urban Conflagration Risk:** The Lidar-based WUI assessment detailed in Section 3.1 indicates that 43.27% of buildings in the broader La Cueva area are less than 10 feet apart, while the HSA community is characterized by a dispersed structure layout with structures more than 10 feet apart. Consequently, extra-parcel fire spread is not a primary risk factor for the HSA community itself; instead, risk is concentrated on localized structural ignition from intra-parcel conditions or external ember showers.

Figure 3. La Cueva Community Home Hardening



1.5 Community Accomplishments to Date

The HSA community has demonstrated a sustained and proactive commitment to wildfire risk reduction through ongoing mitigation, resident engagement, and coordination with regional partners. These efforts reflect a strong foundation of leadership and shared responsibility that directly supports the priorities outlined in this Community Wildfire Protection Plan (CWPP). The accomplishments summarized below highlight HSA's continued investment in reducing wildfire risk at both the parcel and community scale.

1.6 Accomplishment Highlights

- Annual Fire Safety Inspections (Private Parcels):** HSA conducts annual fire safety inspections across private parcels, providing a consistent and structured approach to identifying hazardous conditions, reinforcing defensible space practices, and encouraging homeowner participation in wildfire mitigation.

-
- **Needle Removal (Roll-Away Bin Program):** The community facilitates seasonal roll-away bin services during inspection periods, enabling residents to efficiently dispose of pine needles generated through mitigation activities.
 - **Periodic Chipper Days for Slash Removal:** HSA coordinates chipper services in partnership with the La Cueva Volunteer Fire Department (LCVFD) to assist homeowners in reducing accumulated woody fuels (slash), lowering barriers to participation in vegetation management and improving overall community fuel conditions.
 - **Participation in Federal Cost-Share Thinning Programs:** Private parcel owners and HSA common lands have actively participated in federal cost-share grant programs to implement fuels reduction treatments. Current data, reflecting treatments 10 years and younger, shows that 22 of the 65 total acres of common land have been treated (~34%), while 51 of the 62 total private parcel acres have been treated (~82%). These efforts have significantly improved forest structure, reduced fuel loading, and increased familiarity with effective mitigation practices.
 - **Percent of boundary/perimeter adjacent to treatments by USFS and other adjacent landowners:**
 - Total perimeter: 16,630 ft
 - Treated perimeter: 8,040 ft
 - Percentage treated perimeter: ~ 48%
 - **Engagement with the Jemez Mountains Firewise Association:** HSA participates in regional Firewise efforts, strengthening community awareness, education, and alignment with best practices related to home ignition zone resilience and wildfire preparedness.
 - **Coordination with U.S. Forest Service (USFS):** The community has coordinated with the USFS on egress routes and adjacent thinning and pile burn activities, recognizing the importance of cross-boundary fuels management and landscape-scale wildfire risk reduction.
 - **Participation in Jemez Alliance of Water Systems (JAWS):** HSA actively coordinates with the Jemez Alliance of Water Systems to enhance wildfire preparedness and post-fire resiliency for our water infrastructure. This partnership provides access to critical information regarding post-fire watershed management and ensures that regional fire responders have data to protect sensitive drinking water resources, such as the Horseshoe Spring, during wildfire suppression operations.

1.7 Early Implementation Actions During CWPP Development

The development of this CWPP has already helped catalyze additional wildfire risk reduction activity within the HSA community. As the planning process has progressed, HSA leadership, residents, and partner stakeholders have undertaken several early implementation actions that reflect growing alignment around community wildfire preparedness, emergency readiness, and mitigation. These actions demonstrate that the CWPP is functioning not only as a planning document but also as an active driver of near-term risk reduction and community engagement.

Notably, Jemez Mountains Electric Cooperative vegetation management crews have revisited and trimmed utility line corridors throughout the HSA area, helping reduce vegetation-related ignition risk and improve utility corridor conditions. At the parcel level, the CWPP process has also corresponded with increased participation by individual property owners in available federal cost-share thinning grant programs, along with stronger engagement in community-supported mitigation activities such as chipper days. HSA has also advanced several important emergency access and communication improvements, including the identification and communication of three egress safety routes, the establishment of unified gate codes for those routes, and the distribution of updated community maps to cabin owners to improve situational awareness and emergency navigation. In addition, the community is actively developing an emergency text messaging service intended to strengthen rapid notification and information sharing during wildfire incidents and other emergencies. In parallel, HSA has begun modernizing and strengthening its fire safety inspection requirements to better reflect current wildfire risk conditions, defensible space priorities, and Home Ignition Zone considerations. Together, these early actions indicate that the CWPP process is already contributing to measurable progress and building momentum for continued implementation across the community.

1.8 Summary

Collectively, these accomplishments demonstrate that HSA has already taken meaningful and sustained action to reduce wildfire risk and improve community preparedness. The combination of parcel-level mitigation, community-supported services, and regional coordination provides a strong platform for continued implementation under this CWPP. Building on this foundation will be critical to further reducing risk, improving resilience, and positioning the community for future funding and partnership opportunities.

Section 2: Collaboration & Community Engagement

2.1 Core Team and Mutual Agreement

The development of the HSA Community Wildfire Protection Plan requires a collaboratively developed Core Team. This team consists of governmental bodies and fire safety organizations with statutory authority, as well as critical partners in the Jemez Springs area of Sandoval County, New Mexico, fulfilling HFRA Requirement 1.

The HSA CWPP Core Team includes the following representatives:

Michael Van Hecke: President, HSA.

Dan Heerding: Sandoval County Emergency Services.

Lee Taylor: Local Fire Department Representative, Sandoval County Fire Department.

Sam Berry: EMNRD Forestry Division, Community Wildfire Defense Program Manager.

Lawrence Crane: Bernalillo District Forester, NM EMNRD Forestry Division.

Martha Graham: Source Water Protection Specialist, New Mexico Rural Water Association (NMRWA).

Dan Heerding: County Representative, Sandoval County Emergency Management.

Jeremy Golston: Federal Land Manager, U.S. Forest Service, Jemez District Ranger.

Rafael De La Torre: Essential Utility Partner, Jemez Mountains Electric Coop (JMEC).

Gayle Odell: Neighbor, Hoffeins Neighboring Community.

Dana Heusinkveld: GIS Mapping Support Analyst. New Mexico Forest and Watershed Restoration Institute (NMFWR).

2.2 Community Engagement Process

The HSA CWPP was developed through active engagement with the residents of Horseshoe Springs to ensure local priorities were integrated into the hazard mitigation strategy.

A critical factor enabling the detailed and accelerated development of this CWPP is the unique, pro bono collaboration with the New Mexico Forest and Watershed Restoration Institute (NMFWR). NMFWR provided high-granularity GIS mapping and risk modeling services, leveraging data from sources like the recent National Park Service's (NPS) Valles Caldera area Lidar flyover (lidar data provided courtesy of the NPS). This strategic partnership, completed at no cost to the HSA, allowed

the community to develop a comprehensive plan within a 20-month timeframe. The effort serves as a case study for NMFWR to explore offering similar services to other sub-county communities across New Mexico.

- **Core Team Meetings:** The Core Team held an initial kickoff meeting on August 27, 2025; to discuss WUI risks and outline the CWPP process. A subsequent team meeting was hosted on May 9, 2026 at La Cueva's Jemez Mountain Baptist Church to review the draft risk assessment and gather feedback.
- **HOA Leadership Meetings:** The HSA Board maintained regular oversight and engagement throughout the plan development process, including: **August 4, 2024** (project launch briefing); **January 19, 2025** (structure and planned actions review); **March 16, 2025** (membership social presentation); **April 17, 2025** (Task Force 1 Communications briefing); **June 22, 2025** (Task Force 2 Safe Passages Egress briefing); **August 30, 2025** (Annual Meeting briefing); **November 15, 2025** (governance alignment, water system hardening, and mapping partnerships); and **February 21, 2026** (schedule review and egress mapping overview). The Board also met on **May 9, 2026** (briefing on the schedule, egress map distribution, and handline construction project) and held a **June 6, 2026**, special work session for draft plan review, with a briefing on plan progress and completion schedule at the **July 11, 2026** board meeting.
- **Resident Input:** Inputs were captured through multiple pathways throughout the plan development process, including owner contributions as participants in Task Forces 1, 2, and 3, ideas and considerations shared at public meetings and other association events.
- **Public Review:** The draft CWPP was made available for a public comment period from July 14th, 2026 to July 30th, 2026, with notices distributed via email and/or community website¹.

2.3 Formal Adoption

For the CWPP to be formally adopted and compliant, the final contents must be mutually agreed upon and signed by the applicable jurisdictional entities. Final signatories must include:

- Local/county government (Sandoval County)
- Local fire departments (Jemez Springs VFD and Sandoval County Fire Rescue)
- The state entity responsible for forest management (NM EMNRD Forestry Division).

¹ <http://www.horseshoespringshoa.org/>

- The HSA².
- USFS Jemez District Ranger

HSA is committed to any further formal consultation, if deemed necessary, with the Tribal Historical Preservation Officer (THPO) to ensure that cultural and historic sites within the planning area are protected and their needs are addressed³. Contacts are available at the State of New Mexico Department of Cultural Affairs Historic Preservation Division. Based on prior site stewardship requirements, HSA fully mitigated all identified cultural sites within the full HSA property boundaries as per the 1998 USFS land exchange.

² See Attachment: [HOA CWPP resolution.docx](#)

³ [New Mexico Tribal Historic Preservation Office](#)

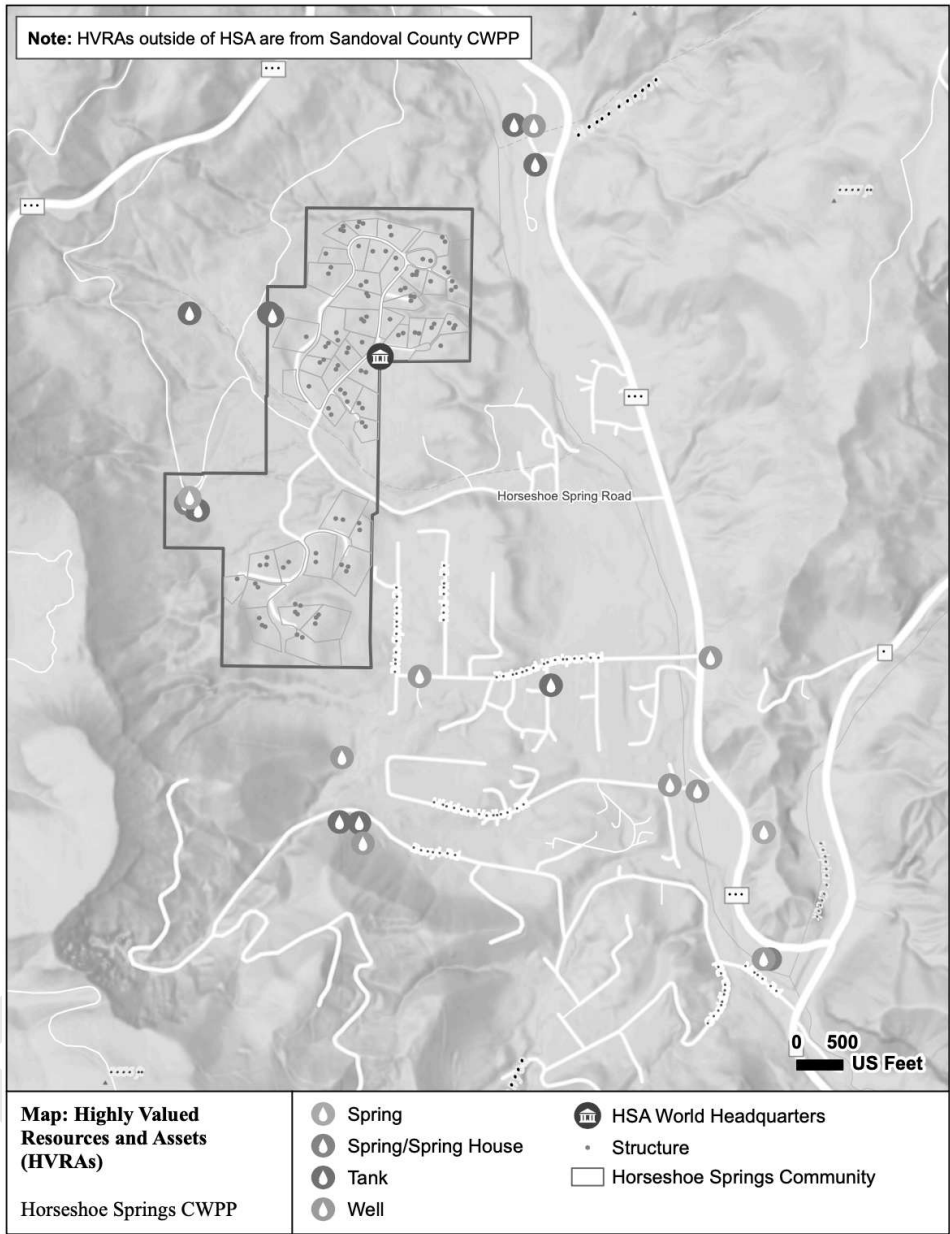
Section 3: Planning Area Background and Risk Assessment

3.1 Location and Risk Status

The Horseshoe Springs community is a small, historic enclave of summer homes and cabins located near La Cueva community, a small rural mountain unincorporated community in Sandoval County, about 10 miles north of Jemez Springs, New Mexico. Nestled within a mixed-conifer forest at approximately 2,500 meters (8,200 feet) elevation, the community occupies a setting of exceptional natural beauty that also carries an increasing wildfire risk. The property totals 130 acres, consisting of both privately owned lots and common association lands⁴.

⁴ Lidar-Based Assessment of Forest Canopy Around the Horseshoe Springs Community. Draft Report. March 2026. Thomas W. Swetnam

Figure 4. Highly Valued Resources and Assets (HVRAs)

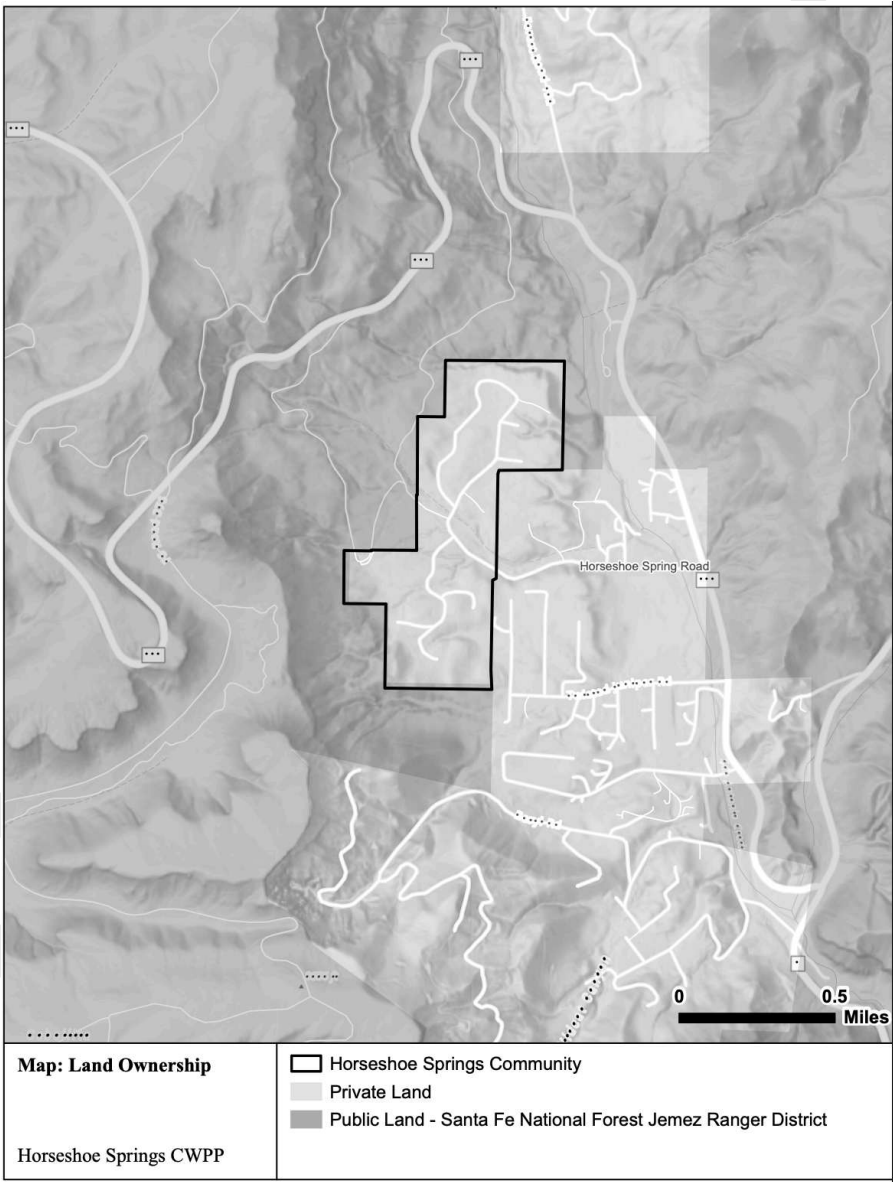


HSA lies within the wildland-urban interface (WUI) of Sandoval County and overlaps state-identified Community Mitigation Buffers (See Figure 5⁵ below). The La Cueva community is currently ranked

⁵ The Community Mitigation Buffers (referenced in Figure 3) are derived from the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) Forestry Division’s authoritative state-level data. These buffers are based

as the 8th highest at-risk community in the state (WFR Rank = 8), with a Mean Wildfire Risk of 0.24267137. Appearance in this high-ranking layer indicates an elevated statewide priority for mitigation actions.

Figure 5. Land Ownership



on a *hotspot analysis* that identifies clusters of buildings. The underlying structural layer for this analysis is the Microsoft Buildings Footprint Dataset.

The new data dictates the following targeted WUI buffer assessments for HSA:

- **Building Spacing and House-to-House Spread:** Within HSA over 95% of buildings are spaced more than 10 feet apart, and strict HOA fire safety guidelines are actively enforced. While our internal risk of house-to-house ignition is significantly lower, the high density of unmitigated structures in the immediately surrounding areas still poses a severe external threat. Therefore, strongly recommending IBHS hardening standards remains critical for HSA homes to defend against encroaching fires and ember storms originating from neighboring properties. The following publicly available data set is not representative of on-the-ground conditions within the Horseshoe Springs community. Within the unincorporated La Cueva community boundaries, EMNRD's State-level risk assessment for the broader La Cueva area identifies a critical structural vulnerability: 43.27% of buildings are spaced less than 10 feet apart, creating conditions where house-to-house fire spread is not just possible but highly probable in those adjacent neighborhoods.
- **Neighborhood Ember Zone:** Because ember transport vectors can easily cross the community boundaries, almost all of the community is considered a Neighborhood Ember Zone, requiring hardening modifications to protect against embers entering the community⁶.

3.2 Mapped Community Mitigation Buffers for the La Cueva Community.

Community Mitigation Buffers are state-identified priority zones that delineate critical areas for fuel reduction and operational planning, ensuring mitigation efforts are concentrated where they can most effectively protect communities from wildfire and post-fire conditions. The HSA boundary overlaps with these buffers.

3.2 Social Vulnerability Index for the La Cueva / Horseshoe Springs CWPP Area.

Social Vulnerability Indexes analyze community demographics to identify populations that may require specialized assistance during a wildfire emergency or evacuation due to factors like age, disability, poverty, or lack of transportation.

⁶ *ibid.*

Figure 6. Social Vulnerability Index

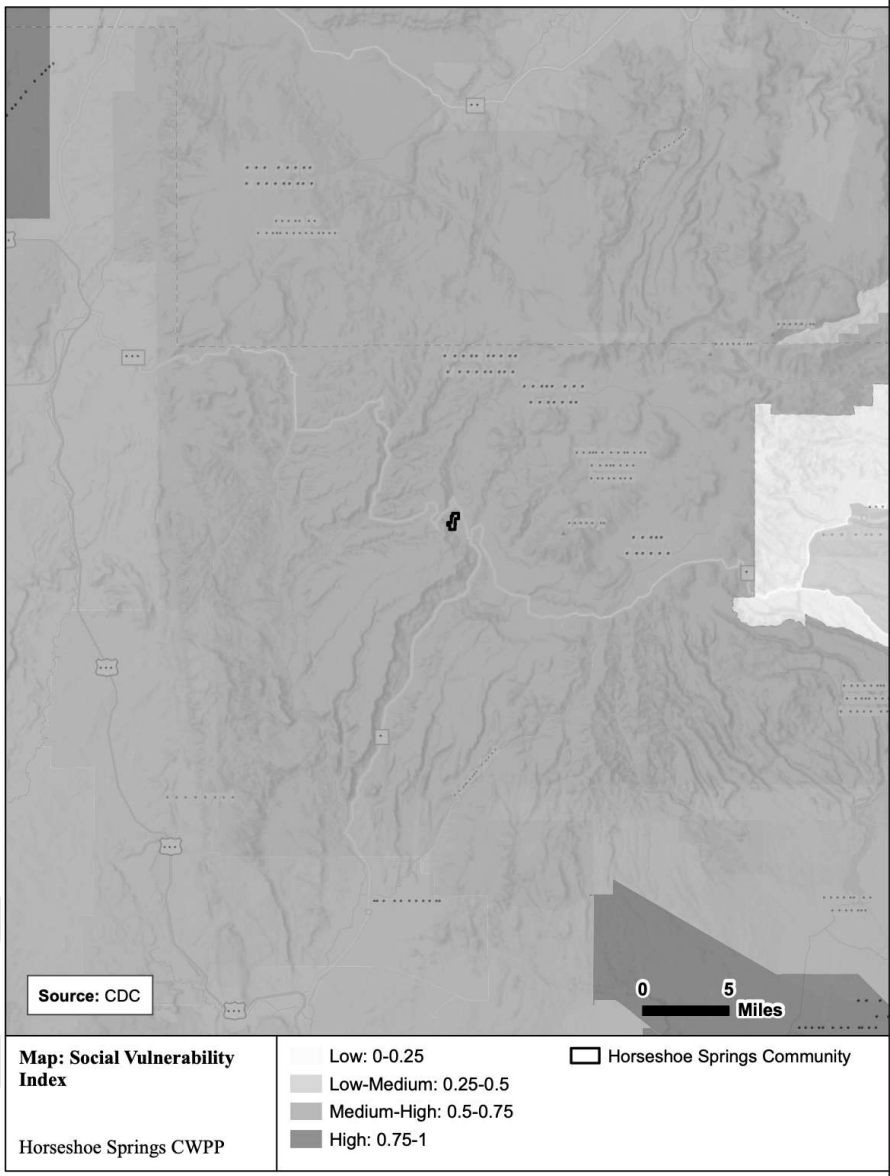
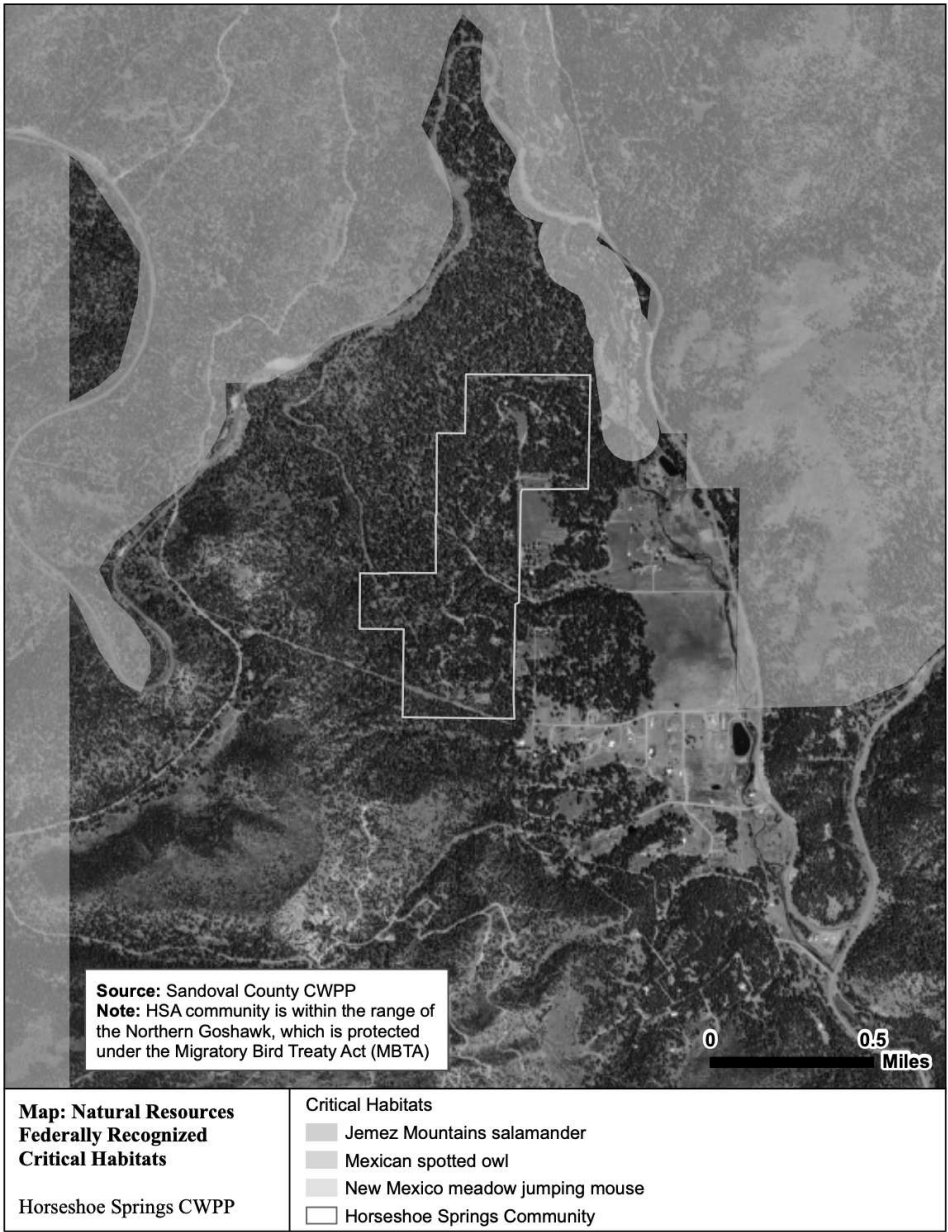


Figure 7 below illustrates the federally recognized critical habitats within the vicinity of the Horseshoe Springs community, specifically identifying protected areas for the Jemez Mountains salamander, the Mexican spotted owl, and the New Mexico meadow jumping mouse.

Figure 7. Natural Resources Federally Recognized Critical Habitats

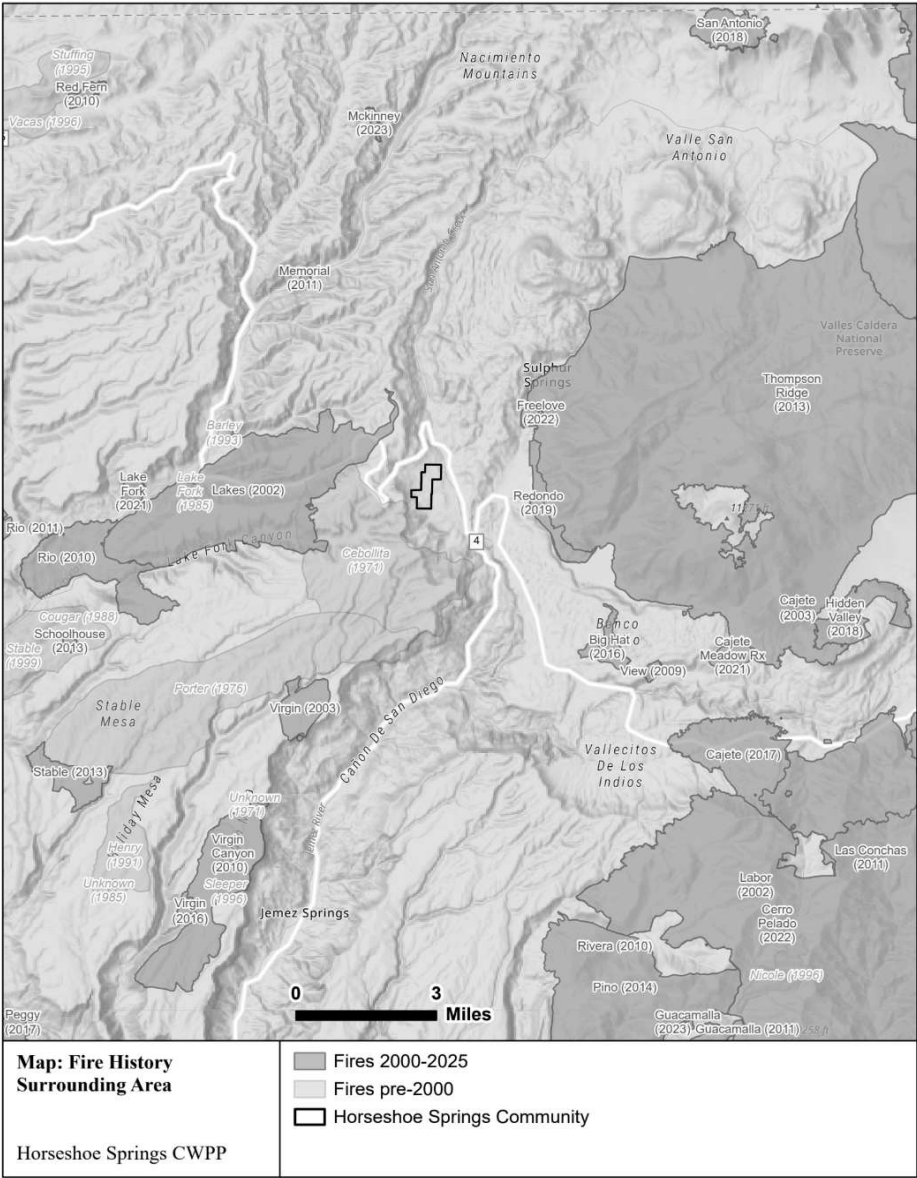


3.3 Wildfire Threat and Hazard Ratings

The surrounding Jemez Springs Corridor is formally designated as High-Risk for wildfire. Per the New Mexico EMNRD Communities-at-Risk (CAR) interactive map⁷, the La Cueva area carries a High Threat rating (most recent update, 2025). This regional designation informs the plan's context and reinforces the urgent need for targeted mitigation treatments and evacuation readiness at HSA, despite the community's specific structural and topographical risk profile.

⁷ https://www.emnrd.nm.gov/sfd/wp-content/uploads/sites/4/2024_CAR_Plan_Update_FINAL_12.10.2024.pdf

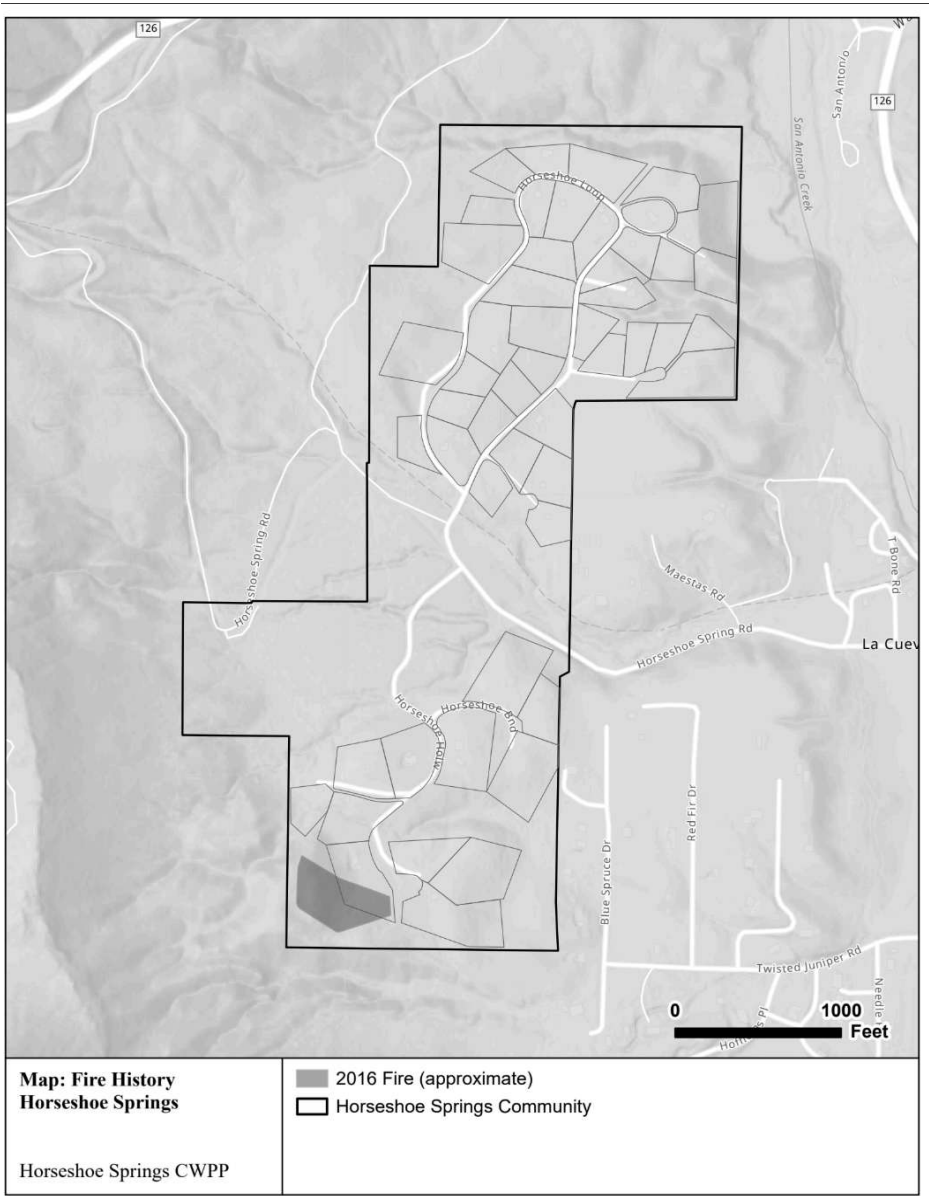
Figure 8. Fire History Surrounding Area



Fire history within the HSA is minimal, with only one 2-acre event recorded in 2016 (See Figure 9 below). This fire, caused by a wind-blown downed electric power line maintained by the Jemez Mountain Electric Cooperative (JMEC) was reported by a resident and extinguished by local responders within 15 minutes. The fire's spread was significantly limited as it moved from the powerline right-of-way into areas maintained according to community fire safety standards (combustible material raking and removal required within 30 feet of structures, propane tanks and firewood storage areas). Following the incident, JMEC and property owners completed additional vegetation thinning and removal.

DRAFT

Figure 9. HSA's Fire History



The Jemez Mountains is one of the most studied landscapes in the world using tree-rings and charcoal in sediments to reconstruct fire history over past centuries and millennia. Fire scars in tree rings from more than 1,000 sampled trees across the Jemez show that prior to heavy livestock grazing and then active fire suppression by the U.S. Forest Service beginning about 1905, low intensity surface fires burned in ponderosa pine and dry mixed conifer forests at intervals ranging

from about 5 to 15 years (Swetnam, Thomas W., Joshua Farella, Christopher I. Roos, Matthew J. Liebmann, Donald A. Falk, and Craig D. Allen. "Multiscale perspectives of fire, climate and humans in western North America and the Jemez Mountains, USA." *Philosophical Transactions of the Royal Society B: Biological Sciences* 371, no. 1696 (2016): 20150168.). The frequent, low severity fires stopped burning through the La Cueva area around 1880. These findings are directly extended to the Horseshoe Springs area in a recent report on a dead fire-scarred tree sampled within the HSA area, showing 12 different fire dates between 1752 and 1900, at typical intervals of 5 to 15 years (Swetnam, Thomas W. A fire scarred ponderosa pine from Horseshoe Springs, Jemez Mountains, New Mexico, 2023, on Jemez Valley History web site). The lack of these frequent surface fires after circa 1880 led to ingrowth of many trees in the understory of these forests in the 20th century.

A 2025 Community Field Evaluation Summary⁸ for the HSA was conducted to identify localized risk factors distinct from the broader La Cueva unincorporated community. The results of this field evaluation are summarized below and in Table 2 below , emphasizing both the community's assets and its remaining vulnerabilities.

- **Positives:** The community benefits from low-grade topography and relatively well-spaced structures.
- **Negatives:** Risk is heavily compounded by having only one road in/out, dense timber with a grass understory, long roads with limited turnarounds for responding fire vehicles, and above-ground utilities.

⁸ Sandoval County 2025 CWPP. SWCA Environmental Consultants 2025.

Table 2. Communities at Risk Ratings with Community Field Evaluation Summary

Community	Risk Rating (2012)	Risk Rating (2025)	Positives (HSA Field Evaluation)	Negatives (HSA Field Evaluation)
HSA	(High - Based on La Cueva WUI)	(High - Based on La Cueva WUI)	Topography: Low-grade roads and limited slope. Separation of Structures: Homes are generally well-spaced (most are more than 10 feet apart). Defensible Space: High homeowner adoption of 30-foot defensible space protocols. Organized Response: Strong partnership with local VFD (LCVFD) and established community response framework. Proactive Mitigation: Significant fuel reduction and thinning work has already been completed across private and common lands over the past 10 years. Established Guidelines: Robust HOA fire safety covenants and mitigation rules are already in place. Active Enforcement: Strong community compliance and active enforcement of existing safety rules.	Access: Single primary ingress/egress point, including three secondary emergency routes. Vegetation: Predominantly dense timber with grass understory. Fire Access: Long internal roads with limited turnarounds for fire apparatus. Utilities: All above-ground utility lines pose a vulnerability.

3.3.1 Drought Trends and Climate Projection

Sandoval County is currently experiencing abnormally dry and moderate drought conditions, contributing to increasingly impactful wildfires. The length of the fire season in the southwestern

United States has increased significantly since 1979, and the frequency of large fires has risen by 462% in southwestern forests. Climate change, characterized by rising temperatures and unpredictable weather patterns, is expected to intensify this risk further, leading to longer and more severe fire seasons in the future⁹.

3.4 Fuel Conditions and Fire Behavior Potential

HSA encompasses 130 acres nested within the Santa Fe National Forest and is categorized primarily by dry shrub and timber litter fuels.

Data from the state's Flame Fuel Assessment¹⁰ Zone for the La Cueva Bernalillo District 8 area highlights the following environmental conditions:

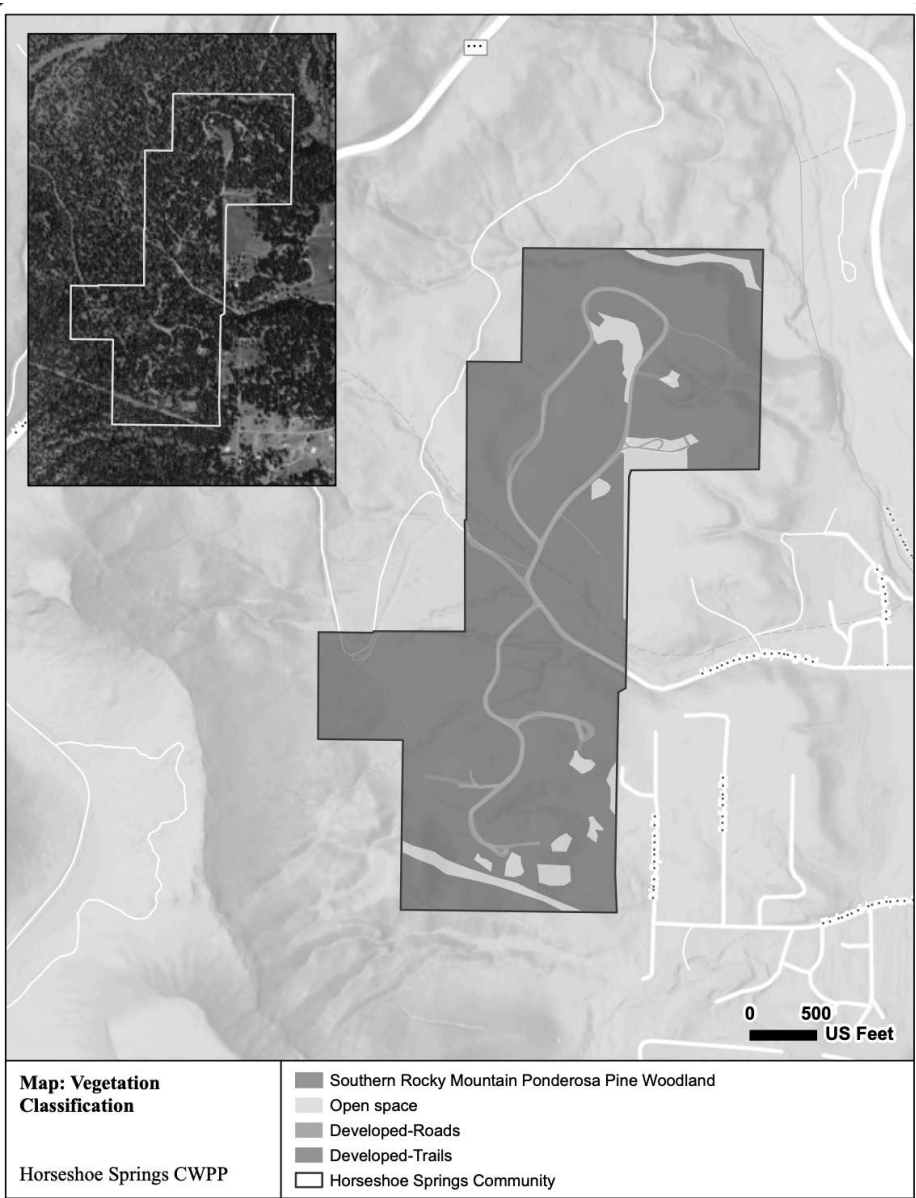
- **Surface Fuels:** The predominant surface fuel (Code TL8) consists of dead and down woody fuel beneath the forest canopy, comprising 30.14% of the surface fuels.
- **Canopy Density:** The sum of canopy acres represents 34.37% of the sector.
- **Neighborhood Flame Zone¹¹:** The flame zone extends 62 feet without canopy considerations, and up to 292 feet when canopy fuels are factored in.

⁹ *ibid.*

¹⁰ <https://www.emnrd.nm.gov/sfd/fire-prevention-programs/community-mitigation-maps/>

¹¹ The Neighborhood Flame Zone is an area of a defined neighborhood which has a high likelihood of direct flame and radiant heat exposure from external fuel sources, as defined in the IBHS Wildfire Prepared Neighborhood Standard.

Figure 10. Vegetation Classification



This map identifies areas with increased wildfire risk factors, including steeper slopes, proximity to roads, and critical public and private infrastructure. By highlighting these high-risk zones, it serves as a planning tool to prioritize strategic erosion mitigation actions that can be implemented before or after a fire event to enhance community resilience.

Figure 11. Pre & Post Fire Erosion Mitigation Considerations



3.5 Lidar Forest Canopy Assessment

To provide a highly accurate, wall-to-wall characterization of the community's forest structure, a 2026 Lidar-Based Assessment by Thomas W. Swetnam (Regents Professor & Director, Emeritus, Laboratory of Tree-Ring Research, University of Arizona and Jemez Mountains Tree-Ring Lab) was conducted using 2024 Valles Caldera National Preserve data. The analysis evaluated 30.9 hectares of the Horseshoe Springs community, identifying 7,018 individual trees—an overall density of approximately 227 trees per hectare (1 hectare = ~2.5 acres).

Figure 12. Lidar Canopy Height Model of HSA



The Lidar data¹² reveals a mature, multi-layered forest with a distinctive bimodal tree height pattern that directly impacts fire behavior:

- **Ladder Fuels:** There is a concerning peak of shorter trees in the 2-4 meter height class (7.6% of total trees), representing understory vegetation that can carry fire from the forest floor into the upper canopy.
- **Dominant Canopy:** The forest is dominated by a mature canopy peak at 24-26 meters (11.9% of trees), with 19.1% of all trees exceeding 30 meters (approximately 100 feet).
- **Building-Level Canopy Risk:** Canopy cover around individual structures is notably high, averaging 62% to 66% within a 20-meter zone, suggesting a dense forest setting. However, Lidar estimates show that average Canopy Base Heights (CBH) range from 6 to 10 meters above ground. This clear bole (distance from the ground to the first live branches) reduces the overall risk of a surface fire transitioning to a crown fire under normal conditions (See figure 12 below).

¹² The Lidar-derived Canopy Assessment, detailed in the [Lidar-Based Assessment of Forest Canopy Around the Horseshoe Springs Community Report](#), provides a detailed analysis of vegetation structure. *It is important to note that the initial technical analysis was conducted only on the north half of the community.* Furthermore, the analysis utilized the public Microsoft buildings layer for structure identification, which is not fully accurate to current on-the-ground conditions for all Horseshoe Springs structures. Despite these limitations, the analysis is valuable as it strongly suggests that due to the community's dense canopy cover, virtually no structure in Horseshoe Springs meets the recommended 30-foot clearance standard from tree canopy and vegetation.

Figure 13. Canopy Cover and Canopy Base Height around the 19 Buildings

Horseshoe Springs — Canopy Cover (%) and Crown Base Height h10 (m) by Building Footprint and Buffer Zones						
Bldg #	5 m Buffer Zone		15 m Buffer Zone		20 m Buffer Zone	
	Cover (%)	CBH h10 (m)	Cover (%)	CBH h10 (m)	Cover (%)	CBH h10 (m)
1	42.0	2.7	47.0	6.1	48.1	7.5
2	82.5	6.3	77.7	9.8	76.3	10.1
3	71.6	5.6	64.0	9.1	65.3	9.5
4	55.4	5.6	59.5	9.1	61.7	9.4
5	68.9	8.5	66.5	8.5	69.0	8.4
6	52.6	3.3	33.3	6.6	36.3	8.2
7	81.3	4.7	80.7	8.6	77.9	9.1
8	73.7	6.7	80.1	10.8	77.4	10.7
9	76.3	5.7	64.4	9.0	63.4	10.0
10	90.5	9.4	81.3	12.7	82.6	12.8
11	69.4	9.7	72.0	10.9	70.5	11.0
12	52.1	4.5	64.4	10.0	70.4	11.1
13	46.3	3.2	40.3	6.7	45.4	7.8
14	72.2	4.8	71.1	9.2	68.3	9.7
15	52.6	3.2	39.9	9.1	41.2	10.7
16	60.6	7.3	50.8	8.3	50.3	8.4
17	38.3	3.4	40.6	9.7	49.3	10.5
18	85.7	10.3	70.2	10.8	68.3	10.8
19	83.1	10.1	79.0	10.3	73.7	10.2
Mean	66.1	6.1	62.3	9.2	62.9	9.8
Min	38.3	2.7	33.3	6.1	36.3	7.5
Max	90.5	10.3	81.3	12.7	82.6	12.8

Notes: Canopy Cover (%) = proportion of CHM pixels ≥ 2 m within each zone (CHM pixel size = 0.31 m). CBH h10 (m) = mean of 10th-percentile canopy base height from voxel-based LiDAR analysis (CBH raster pixel size = 2 m). Buffer zones are measured outward from outer building polygon edges and include the building footprint itself.

Color scale — Cover (%): < 35% (orange) 35–50% (yellow) 50–65% (pale green) 65–80% (medium green) $\geq 80\%$ (dark green)
 | CBH h10 (m): < 3.5 m (orange) 3.5–6 m (pale blue) 6–9 m (medium blue) 9–11 m (strong blue) ≥ 11 m (deep navy)

3.6 Highly Valued Resources and Assets (HVRAs)

Given the dense, mature forest canopy and specific ladder fuel vulnerabilities identified in the Lidar assessment, protecting the community's critical infrastructure is paramount. The following infrastructure is specifically identified as Highly Valued Resources and Assets (HVRAs):

Critical Water System Infrastructure The HSA water system (PWS #NM3593823) is registered with the New Mexico Environment Department and is vital for domestic use.

Critical Operational Constraint: The HSA water system was designed for domestic use. Using the water from the 5 community storage tanks is NOT feasible for emergency response use.

- **Source & Treatment:** Facility ID 93823001: HORSESHOE SPRING (Source Water) and the spring house; Facility ID 93823002: CHLORINATOR.
- **Storage Tanks:** A total of 5 community storage tanks (3 Northside tanks and 2 Southside tanks). *(Note: The state registry currently identifies four tanks under Facility IDs 93823003 through 93823006; HSA should ensure the 5th tank is properly documented if required).*
- **Domestic Design and Capacity:** The community's water system is engineered exclusively for domestic supply. Due to infrastructure limitations, the five community storage tanks and the spring source lack the necessary volume and pressure for active firefighting. Consequently, this water **cannot be used for fire suppression**, and the system's use during an incident must be limited to maintaining essential domestic service.

Community and Residential Assets

- **Residences:** 50 residential structures and connections, plus one additional structure for HSA sheds. These homes are entirely dependent on the community's centralized infrastructure, meaning they are directly connected to the vulnerable above-ground JMEC electric grid and the localized Horseshoe Spring Road water distribution system.
- **Utilities:** Individual propane tanks located throughout the community and above-ground electric lines acting as critical utility corridors.
- **Access:** The main access road, Horseshoe Spring Road off of NM 126, acting as the sole ingress/egress for the community.
- **Community Structures:** The "World Headquarters" storage shed, water system storage shed, springhouse, five 3000-gallon tanks for water storage.

Figure 14. Critical Infrastructure Energy & Communication

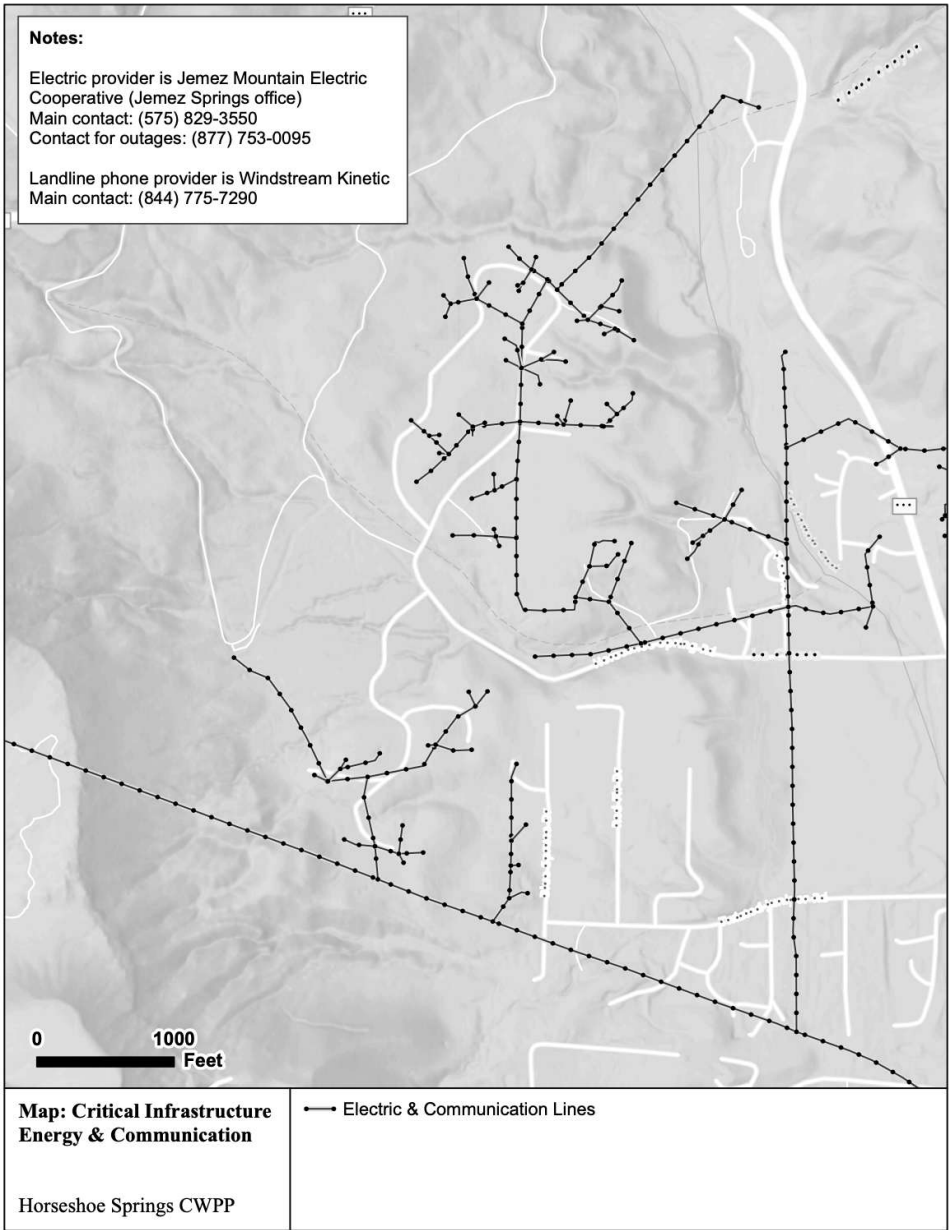
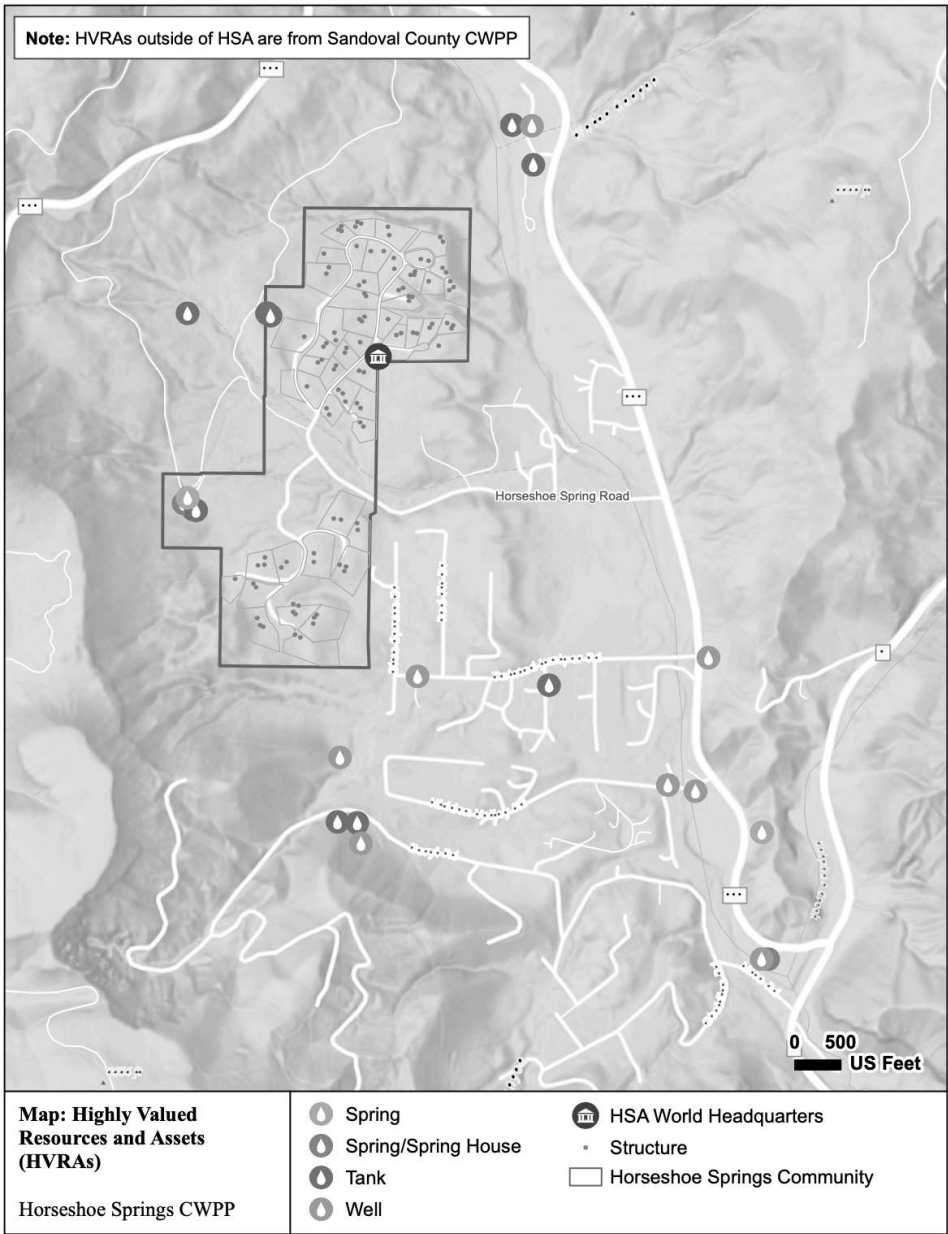


Figure 15. Highly Valued Resources and Assets (HVRAs)



Section 4: Mitigation Strategy

4.1 Prioritized Fuel Reduction Projects (HFRA Requirement 2)

Fuel management priorities for the HSA must address the high risk associated with dense, continuous fuels, proximity to water infrastructure (HVRAs), and limited ingress/egress.

Recommended Fuel Modifications

- **Roadside Fuel Reduction & Utility Protection (High Priority):** Thinning along roads and driveways by maintaining the full width of the County's 14-foot right-of way along the edge of roadways and removing invasive species to ensure safe evacuation. Protect power lines by removing fuels around poles and infrastructure, ensuring wider clearance to avoid the inadequate 10-foot easements identified as a risk in nearby areas. In alignment with the structural ignitability standards in Section 4.2, all thinning and vegetation management work must maintain a 5-foot vertical clearance column around structures and prune tree branches to a height of 6-10 feet.
- **Water Resources (High Priority):** Prioritize the protection of the domestic water system (Spring and Storage Tanks) within a 1,000-foot radius of the Horseshoe Spring asset. Perform careful fuel reduction around these critical assets using hand tools and light-duty equipment to prevent physical damage and potential contamination. Beyond vegetation removal, focus on infrastructure hardening—such as installing protective covers over exposed pipes and tanks—to protect against thermal degradation. Additionally, incorporate erosion control measures in advance of an event to safeguard the area's watershed and infrastructure integrity.
- **Surface Fuel Reduction (High Priority):** Directly address the predominant surface fuel (Code TL8¹³, dead and down woody fuel comprising 30.14% of surface fuels) by implementing a community-wide strategy for ground fuel removal. This project will focus on the systematic removal or treatment of existing woody debris, especially in areas with high surface fuel accumulation, to disrupt fire continuity and reduce fire line intensity.

¹³ Scott, J. H., & Burgan, R. E. (2005). *Standard fire behavior fuel models: A comprehensive set for use with Rothermel's surface fire spread model* (Gen. Tech. Rep. RMRS-GTR-153). Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. https://www.fs.usda.gov/rm/pubs/rmrs_gtr153.pdf

- **Fuel Breaks Maintenance (Medium Priority):** Sustain maintenance, construction, and expansion of fire breaks/handlines along the Forest Service (FS) boundary and the full extent of the HSA property boundary. This includes maintaining the existing line (northern half of the western HSA boundary), maintaining future planned line (SW end of the western HSA boundary scheduled for 2027 FS vegetation thinning work), and building and maintaining a new line along the remainder of the full HSA boundary (north, all of east, and south) utilizing the 10-foot HSA easement along the boundary fenceline.

Treatment Methods Fuel treatments should employ suitable methods like hand thinning, pile burning (under approved conditions), and chipping or mastication.

- **Thinning/Mastication:** Focus on reducing stand density to 60 feet of Basal Area per acre and raising crown base height to 15-20 feet or higher in ponderosa areas. Thinning from below is the recommended silvicultural method¹⁴ to remove ladder fuels, reduce interlocking crowns, and remove mistletoe-infected trees. All vegetation mitigation must adhere to the community's ARC standards.
- **Slash Treatment:** Treat thinned material by mechanical chipping, lop-and-scatter (in appropriate areas), offsite removal, biochar production, or pile burning in cool, wet periods while strictly adhering to air quality regulations. For mechanical chipping, maintain a chip depth of two inches or less. For lop-and-scatter treatments, ensure the slash is cut to a height of no more than 18 inches.

¹⁴ Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society (such as wildlife habitat, timber, water resources, restoration, and recreation) on a sustainable basis.

Figure 16. Fuel Treatment Status



4.2 Reducing Structural Ignitability (HFRA Requirement 3)

While comprehensive mitigation significantly reduces risk, homeowners must understand that no single measure—including the reduction of fine fuels like pine needles—guarantees protection from

a catastrophic wildfire event. Based on the Core Team and HSA Risk Matrix results¹⁵, Home Ignition Zone (HIZ) Work (Score: 13.91) and Defensible Space Expansion (Score: 13.68) were identified as Critical Priorities for reducing structural ignitability. These categories are characterized by a high perceived likelihood of necessity and a severe impact on life safety and property protection. Conversely, Retrofitting (Score: 9.88) was ranked as a Lower Relative Risk priority, likely due to perceived difficulty in implementation (including costs) or lower immediate impact compared to evacuation and fuel reduction. All structural mitigation and HIZ activities must be performed in compliance with ARC review rules and guidelines.

Given the risk and typical prevalence of combustible materials in the Jemez Springs area, such as wood siding and wood piles, structural mitigation is critical. Wind-driven embers are the leading cause of structure loss in wildfires. Embers can travel from nearby active burning hundreds of feet up to six or more miles. Distance groupings include: Routine spotting - often hundreds of feet to ~1 mile; Severe wildfire spotting: commonly 1–3 miles; Extreme plume-driven spotting: documented at 3–6+ miles, with some exceptional cases even farther.

To align with nationally recognized structure hardening practices, this CWPP incorporates recommended principles from the IBHS Wildfire Prepared Home™ program.

1. Home Ignition Zone (HIZ) & Defensible Space Homeowners are encouraged to focus on the area within 100 feet of a structure where embers and radiant heat pose the highest risk.

- **Zone 0: Critical Ignition Zone (0-5 feet):** This zone must be entirely noncombustible, using materials like gravel, stone, bare mineral soil, or concrete. Prohibited materials include mulch, wood chips, firewood, combustible fencing, and vegetation. To protect combustible siding where the structure meets the ground, it is recommended to incorporate the IBHS practice of maintaining a 0–6 inch vertical clearance of noncombustible material (such as rock, concrete, or metal flashing) from the ground up. In addition to horizontal clearance, maintain a 5-foot vertical clearance column around the structure. This means keeping the space from the ground up to 5 feet on the building exterior free of any vegetation,

¹⁵ [Core Team and HSA Risk Matrix](#)

combustible attachments, or debris to prevent vertical fire spread from the ground to the structure.

- **Zone 1: Reduced Fuel Zone (5-30 feet):** Maintain low grass height (under 4 inches), space shrubs to avoid continuous fuel beds, prune tree branches for 6-10 feet of vertical clearance, and remove ladder fuels.
- **Zone 2: Fire Behavior Modification Zone (30-100 feet):** Maintain discontinuity in vegetation to reduce fire intensity by increasing horizontal spacing between tree crowns (10-15 feet depending on slope) and removing dead trees.

2. Ember-Resistant Construction & Hardening Wind-driven embers are the leading cause of structure loss in wildfires. HSA will strongly recommend property owners to prioritize the following IBHS-aligned mitigation measures. Note that all hardening and construction activities must consult and adhere to the community's ARC standards:

- **Vents:** Consider upgrading all attic, crawlspace, and foundation vents to ember-resistant designs using corrosion-resistant metal mesh with openings no greater than 1/8 inch.
- **Roofing System:** All structures should maintain or retrofit to ignition-resistant Class A roofing system (metal, tile, asphalt fiberglass) and are highly recommended to be sealed at ridgelines, edges, and joints to prevent ember intrusion. Avoid untreated wood shake. Install metal flashing at roof-to-wall intersections.
- **Chimneys:** It is required to install spark arrestor mesh on chimneys. Per Cal Fire and IBHS standards, the mesh should be between 3/8 and 1/2 inch. This precise sizing is critical to minimize embers from going INSIDE the building, as well as outward.
- **Eaves, Soffits, and Gutters:** Whenever possible, enclose open eaves and soffits using ignition-resistant or noncombustible materials. Maintain gutters free of debris and consider installing metal gutter covers. Gutters and downspouts should be constructed of noncombustible materials like aluminum or steel.
- **6-Inch Vertical Clearance:** Ensure a minimum 6-inch vertical clearance between the ground and the start of the exterior wall siding. This area must consist of noncombustible materials (e.g., concrete, masonry, metal, or bare foundation) to prevent ground fires from igniting the siding.

-
- **Decks:** Construct or retrofit decks with ignition-resistant or noncombustible materials, and enclose the underside with metal screening or ignition-resistant skirting. Avoid storing combustible materials beneath decks.
 - **Windows and Doors:** Install dual-pane tempered glass windows to reduce breakage under radiant heat, minimize large window openings facing heavy vegetation, and ensure exterior doors are tight-fitting.
 - **Outbuildings:** Any shed, detached garage, or outbuilding within 30 feet of the primary residence must also adhere to these Zone 0 and structural hardening guidelines to prevent them from acting as a massive fuel source.

DRAFT

Figure 17. Addresses & Structures (North)

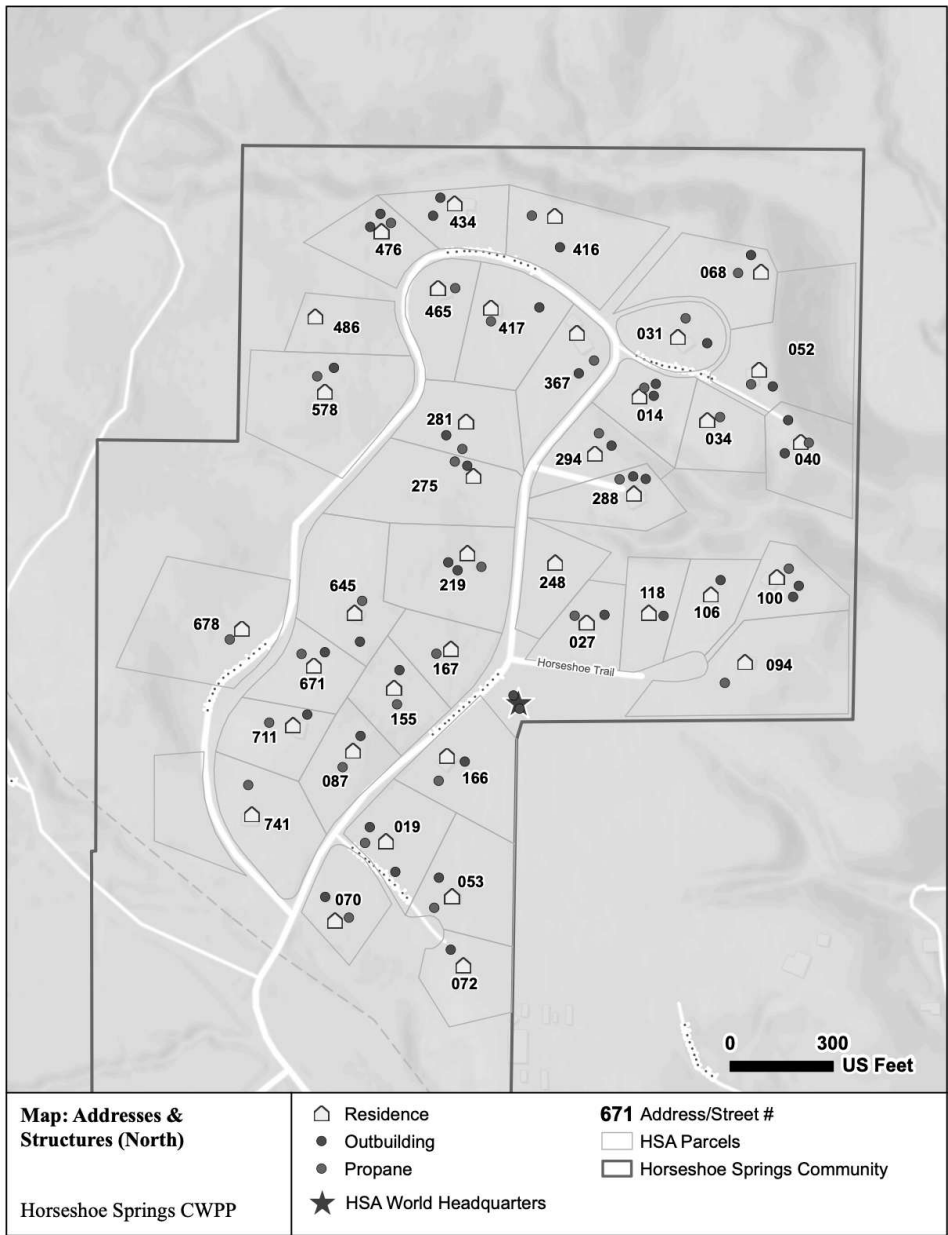


Figure 18. Addresses & Structures (South)



4.3 Post-Fire Recovery and Watershed Protection

The post-fire recovery plan is crucial given the high-risk designation of the Jemez Springs corridor, HSA constrained drinking water resource and the area's high susceptibility to erosion and cascading

impacts after a wildfire. The loss of the forest canopy and the creation of water-repellent soils post-fire increase runoff exponentially. This can cause debris flows that can easily overwhelm the Horseshoe Spring and distribution lines.

Recovery Planning & Coordination Effective recovery hinges on strong coordination and preparing the community before an ignition occurs.

- **Post-Fire Coordinator Designation:** The HSA will appoint a community leader to serve as the single point of contact, which is a high-priority action for ensuring timely recovery.
- **Agency Coordination:** The designated coordinator must work directly with Sandoval County Emergency Management and regional agencies. The plan identifies the Natural Resources Conservation Service (NRCS) Emergency Watershed Protection (EWP) program and NM State Forestry as the primary mechanisms for financial and technical assistance.
- **Pre-Fire Watershed Planning:** To support advance mitigation action and minimize catastrophic post-fire impacts, the HSA (Board, Fire Safety Committee, hired contractors) will establish baseline data for watershed health. This crucial planning phase includes mapping drainages that feed the Spring and Spring House and implementing pro-active landscape measures before a fire event occurs.

Immediate Stabilization & Mitigation Strategies: Should mitigation efforts fail to prevent catastrophic watershed damage, efforts should focus on preventing cascading impacts:

- **Hillslope Treatments:** Apply dry or wet mulch, spread slash, or use seeding to restore ground cover. Install erosion barriers, such as log erosion barriers, fiber rolls, or silt fencing, staked perpendicular to the hillslope contour to catch sediment.
- **Channel Treatments:** Pre-plan for check dams or debris racks in the micro-drainages above the spring house to catch coarser rocks and branches before they hit the water infrastructure.
- **Road and Trail Treatments:** Utilize techniques like outsloping and rolling dips to disperse water, and modify or upgrade culverts to prevent road damage.

Section 5: Emergency Response & Preparedness

The Insurance Services Office (ISO) fire suppression rating is a critical factor for property insurance costs, assessing a fire department's fire protection capabilities on a scale of 1 (best) to 10. For the Horseshoe Springs community, which is served by Sandoval County Fire District #5 (LCVFD) and is situated in a wildland-urban interface, the rating is highly impacted by terrain and infrastructure challenges. Given the reliance on water tenders, limited hydrants, long response distances, long and narrow access roads, and high vegetative fuel load, properties in Horseshoe Springs are often pushed toward a lower rating, typically **Class 8, 9, or even 10**, even if a station is nearby. Insurers determine the exact ISO class for each parcel by evaluating factors like distance to the nearest station (drive time), water supply, road access (width, grade, turnaround), and structure spacing/fuels, meaning that two homes on the same road may receive different ISO classes. ISO rating classifications are a factor in insurance coverage and rate determinations, with low class numbers recognized as lower risk areas to insure. While ISO rating classifications are heavily dependent on factors like having full-time paid staff—a significant challenge for rural volunteer departments—HSA can still advocate for strategic improvements. Specifically, HSA will explore and support opportunities to secure grant funding through the Forestry Division for a dedicated wildfire mitigation staffer. While this may not immediately result in a lower ISO rating, it provides a realistic, actionable path to significantly reduce risk for the broader La Cueva Community.

5.1 Evacuation Planning and Preparedness:

Top Priority - Predicted Fire Weather: The very top priority in evacuation planning is monitoring predicted fire weather (e.g., Red Flag Warnings). This advanced warning provides 3-6 days of critical time.

- **Pre-Departure Property Prep:** Hardened homes can still burn down if they are not prepared before departure. Residents must use early warning time to turn off the propane valve at their tanks, clear combustible patio furniture, decor and other items, close all windows, and secure the property before leaving.
- **Residents Who Stay Behind:** While early evacuation is strongly encouraged, the community must consider that some people may choose to stay behind to fight the fire. These individuals face extreme danger and must have independent water supplies and protective gear.

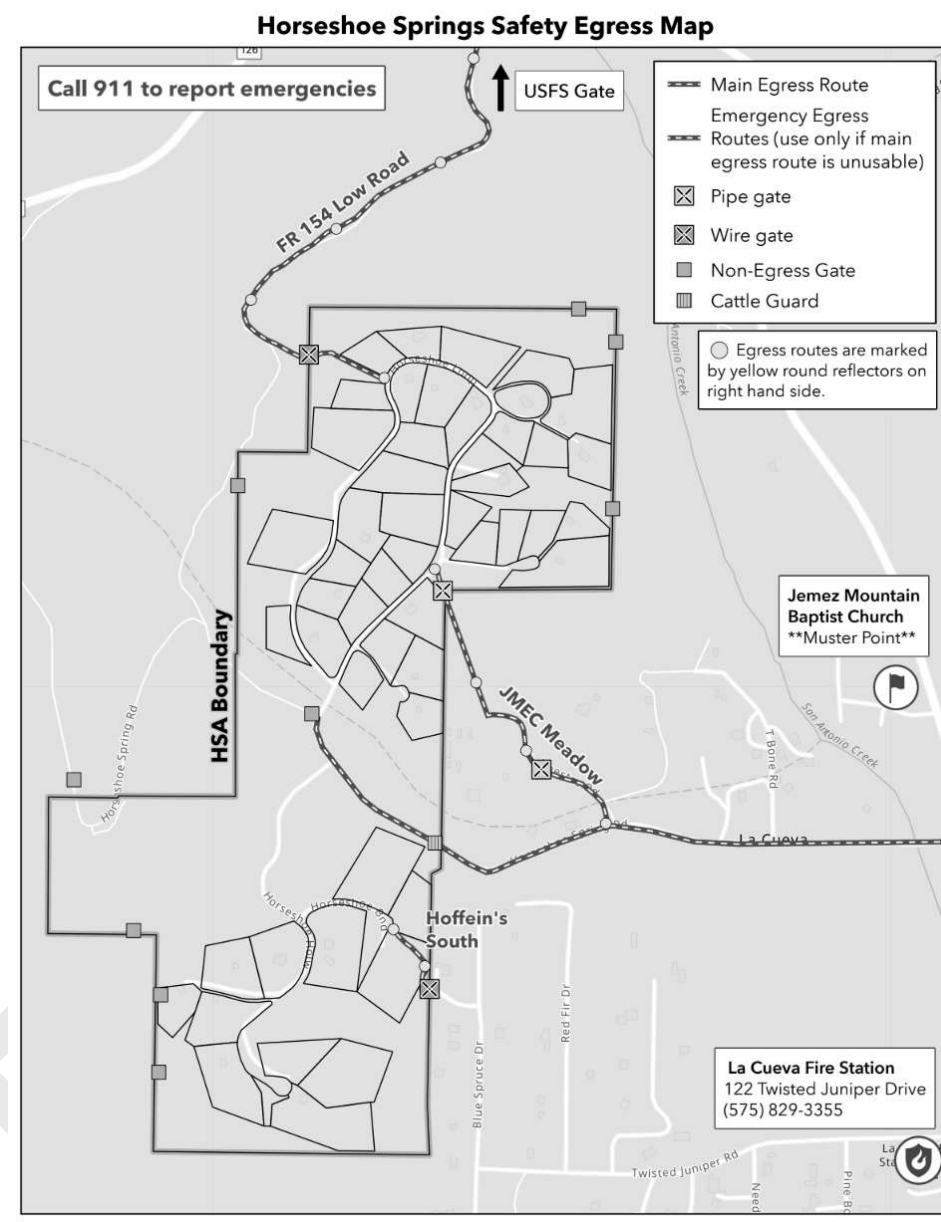
5.2 Evacuation Planning and Strategy

Effective evacuation planning is vital for HSA, particularly because the community relies on a single entry and exit point (Horseshoe Spring Road) which feeds into State Road NM 126 and Highway 4, both of which are narrow, rural, winding mountain routes.

Evacuation Routes & Alternatives

- **Primary Egress:** The main access road, Horseshoe Spring Road off of NM 126, serves as the primary evacuation route.
- **Alternative Egress Coordination:** Due to the "one road in/out" constraint, HSA will coordinate with the U.S. Forest Service (USFS) to identify and improve "back roads" or other closed roads on public lands to serve as alternative emergency egress routes where feasible. Recent HSA workdays have established three approved routes, including a new, short egress route and gate near the cabin located at 93 Horseshoe Bend. *[Note: HSA will establish a formal protocol with the USFS to ensure designated community leaders have immediate access to gate keys or lock combinations for these alternate routes in the event Horseshoe Spring Road is compromised.] Refer to the HSA Safety Egress map below and Appendix 2: Safe Passages (Emergency Egress and Access).*

Figure 19. HSA Safety Egress Map



- **Mapping:** Primary and alternate routes, potential pinch points (narrow roads or bottlenecks), and temporary refuge areas must be clearly mapped and distributed to residents.

Communication and the READY/SET/GO Framework: HSA utilizes a "Ready/Set/Go" framework, emphasizing early evacuation when a fire threatens.

- **Notifications:** Residents are heavily encouraged to register for the Sandoval County Alerts and Notification (SCAN)¹⁶ emergency notification system.
- **Location Sharing:** The community will educate residents on the use of the "*What3words*" application¹⁷, which allows individuals to share highly precise location information with first responders in WUI areas with poor address visibility.

5.3 Vulnerable Populations and Pet Evacuation

Vulnerable Populations Registry: To protect high-risk residents, HSA will create an internal, confidential phone tree and registry of individuals who are elderly, have mobility limitations, or require electricity for life-sustaining medical equipment, such as oxygen tanks. Residents should proactively assist their elderly neighbors or others with physical limitations during a Sandoval County Alerts and Notifications ("SCAN") Everbridge system alert. To ensure everyone's safety, each property owner should develop a personal emergency evacuation plan, coordinate directly with their vulnerable neighbors to establish a mutual support system, and practice these plans regularly.

Small Animal and Pet Protocol: A lack of planning for pets can dangerously slow down or entirely prevent a family's evacuation during a fire.

- **Preparation:** All property owners must include their dogs, cats, and birds in their personal emergency evacuation plans and prepare pet emergency kits containing food, carriers, leashes, and medications ahead of wildfire season.
- **Action:** Pets should be contained and loaded into vehicles early, without waiting for a mandatory evacuation order.
- **Shelter Coordination:** HSA will work with Sandoval County Emergency Management to identify temporary shelters for small animals and will direct residents to Animal Protection New Mexico¹⁸ for specialized disaster preparedness guidance.

¹⁶ <https://www.sandovalcountynm.gov/departments/scan/>

¹⁷ <https://what3words.com/>

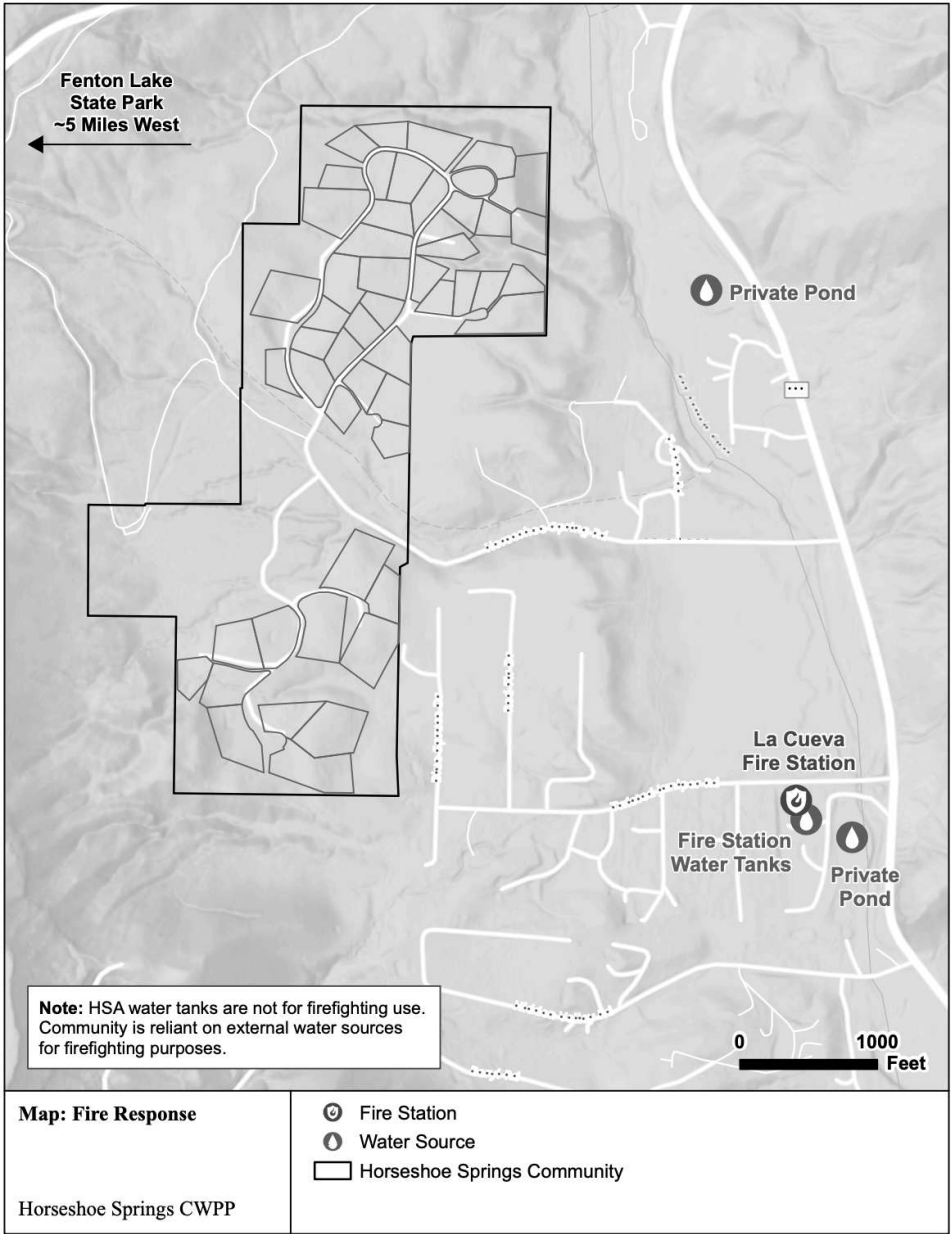
¹⁸ <https://apnm.org>

5.4 Fire Suppression Resources and Infrastructure Hardening

Protecting HSA's critical water resources—the spring, spring house, Southside tanks, and Northside tanks—is vital for maintaining system resilience for domestic supply and clean water access.

- **Fire Response Reality Check:** During a major WUI incident, firefighters are probably NOT coming to every home, or even some homes. Residents must prepare their properties for this reality. Residents are recommended to prepare their properties for this reality. All property owners have a responsibility to perform hardening tasks, ensuring that highly combustible items susceptible to ember ignition—such as welcome mats, upholstered furniture, seat cushions, decorative flags, and stored materials—are cleared from decks, porches, and the immediate structure perimeter when they leave their cabins for an extended period.

Figure 20. Fire Response



Suppression Water Supply and Access

- **Standardized Fire Access:** HSA has determined that retrofitting the five community storage tanks with universal drafting fittings or Fire Department Connections (FDCs) is not feasible. The entire water system is engineered exclusively for domestic usage and is not suitable for fire suppression. This distinction is critical to avoid confusion during an incident and to prevent damage to the domestic infrastructure; therefore, the association will not authorize the installation of fire-suppression fittings on these tanks. Future efforts will instead focus on identifying and securing alternative water resources for emergency response use and fire apparatus connectivity.
- **Resource Mapping & Flow Rates:** HSA will map and record flow rates for all existing water resources, noting that the HSA water system is designed for domestic use only and is not suitable for fire suppression.
- **Working with the local fire department to procure the most important items for fire suppression in our area.** HSA recognizes that regional fire response capabilities are deeply tied to local water availability. Based on the priorities of the LCVFD, HSA will actively advocate for and assist in raising funds to install additional water storage tanks at the neighboring LCVFD. During a wildfire, each mile traveled between a fire scene and a water fill site translates into a time factor that severely reduces the gallons per minute available to firefighters to protect homes.

Dedicated Fire Suppression Water Sources: HSA recognizes that utilizing the primary domestic water storage tanks for fire suppression poses a severe risk to the community's infrastructure; draining these tanks during an incident leaves them vulnerable to melting and catastrophic system failure. Therefore, rather than retrofitting the five main domestic tanks, HSA will focus on identifying and securing *alternative* water resources for fire apparatus.

Future mitigation efforts will prioritize:

- **Natural Drafting Points:** Mapping and establishing safe, rapid-access drafting points at existing natural sources, such as the local lake and stream, where fire engines can draw water quickly without impacting the domestic supply.

- **Dedicated Fire Tanks:** As part of long-term infrastructure planning, the Association will explore the feasibility of installing a dedicated, roadside-accessible water storage tank exclusively for fire suppression. This proposed asset would be maintained separately from the domestic water system to ensure it provides a reliable, high-volume reserve for fire apparatus without risking the integrity of community drinking water. Future efforts may include site suitability analysis, cost estimation, and pursuing potential grant funding to support this capital improvement project.
- **Regional Capacity:** Continuing to advocate for additional water storage at the neighboring LCVFD to minimize turnaround times for water tenders.

Water System Hardening (Hazard Mitigation)

- **Gravity-Fed Resiliency during Power Outages:** As established in Section 3.5, the HSA water system is designed for domestic use only; however, it remains highly resilient to electrical failures common during wildfires. Because the distribution system is naturally gravity-fed from the spring, it maintains domestic pressure without the need for electrical pressure pumps. This built-in redundancy ensures the system can continue providing domestic water during prolonged power outages without relying on emergency backup generators.
- **Preventing Thermal Degradation:** Extreme heat from wildfires can melt or degrade exposed plastic water pipes, causing them to leach volatile organic compounds (VOCs) like benzene into the drinking water. HSA will work to further harden the overall system including plastic piping with fire-resistant materials.

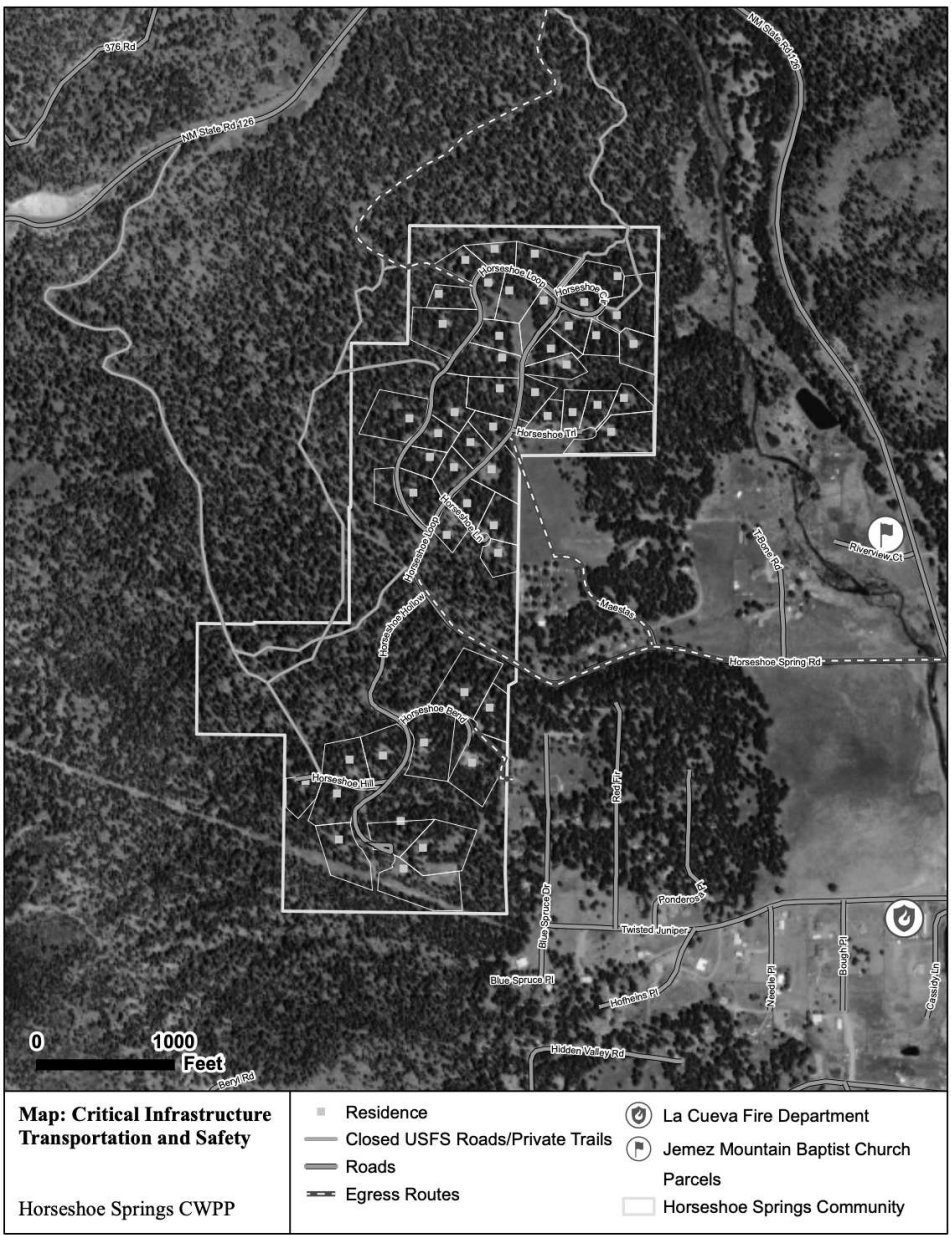
5.5 Emergency Access

HSA will develop a proactive plan to regularly maintain community roads to ensure they consistently meet width, height, and vegetation clearance standards¹⁹ for the safe ingress and turnaround of emergency vehicles and to ensure that waterlines are buried at least 24-36 inches below the ground surface. Additionally, HSA strongly recommends and encourages property owners to proactively maintain their private driveways to meet these same safety standards. The HSA will ensure that

¹⁹ Based on the National Fire Protection Association (NFPA) guidance for fire department access roads, which calls for 20 feet of unobstructed width and 13.5 feet of unobstructed vertical clearance.

Based community road maintenance and vegetation clearance standards, encompassing both width and height, follow Sandoval County requirements to accommodate the safe ingress and turnaround of emergency vehicles.

Figure 21. Critical Infrastructure Transportation and Safety



Section 6: Action Plan & Implementation

6.1 Project Implementation Table

The Horseshoe Springs Association (HSA) project strategy is organized into distinct categories to ensure a comprehensive approach to community wildfire resilience. Beyond the five top critical priorities—which focus on primary access, common lands, defensible space, asset protection, and home ignition zone assessments—the plan categorizes initiatives into Infrastructure & Hardening, Policy & Governance, Community Outreach & Education, and Ongoing Maintenance. This structured framework allows the association to address immediate high-risk mitigation needs while maintaining a steady, long-term commitment to preparedness and collaborative community engagement.

DRAFT

While the prioritization process focuses the HSA's immediate resources on the top five measures for implementation, are essential for achieving comprehensive, long-term community wildfire resilience. The HOA must establish a clear, documented follow-up plan and timeline to systematically pursue and complete all identified mitigation and preparedness actions, ensuring that the plan evolves beyond initial, critical priorities.

Table 3. Top 5 Critical Priorities

Project ID	Project Name	Primary Benefit	Target Timeline	Mapped Yes / No
HS-1	Primary Access Corridor Fuel Reduction	Improves evacuation and responder access and reduces fire spread potential along primary travel routes	Near-Term (1-2 Years)	Yes
HS-7	Strategic Fuel Reduction in HOA Common Lands	Slows wildfire spread and reduces exposure to structures and addresses terrain-driven fire-spread risk	Near-Term (1-2 Years)	Yes
HS-5	Community Defensible Space Initiative	Reduces structure-to-vegetation fire transmission	Ongoing	Yes
HS-9	Community Asset Protection Zones	Protects shared infrastructure and supports emergency functionality	Near-Term (1-2 Years)	Yes
HS-4	Neighborhood Home Ignition Zone Assessment Program	Reduces structure ignition potential	Ongoing	Yes

Table 4. Infrastructure & Hardening

ID	Project Name	Description	Priority	Mapped Yes/No
HS-1	Primary Access Corridor Fuel Reduction	Reduce hazardous vegetation and ladder fuels along the community's primary ingress and egress corridor.	High	Yes
HS-7	Strategic Fuel Reduction in HOA Common Lands	Identify and implement strategic vegetation treatments in high-risk areas such as drainages and steep slopes.	High	Yes
HS-9	Community Asset Protection Zones (HVRAs)	Establish defensible conditions around shared community infrastructure (utility nodes, water, entry).	High	Yes
HS-11	Water Source Risk Mitigation	Increase fire hardening of Spring House, north, and south tanks areas. Address flood/erosion risks.	Medium	Yes

Table 5. Policy & Governance

ID	Project Name	Description	Priority	Mapped Yes/No
HS-19	Governance Enhancements	Clarify and align wildfire rules in governing documents; unify approach for homeowners.	High	No
HS-17	Grant-Ready Project Development	Package priority projects for future funding opportunities and partner coordination.	Medium	Yes

ID	Project Name	Description	Priority	Mapped Yes/No
HS-20	Wildfire Coordinator Advocacy	Advocate for a dedicated Sandoval County Wildfire Coordinator to support cross-jurisdictional alignment.	Medium	No

Table 6. Community Outreach & Education

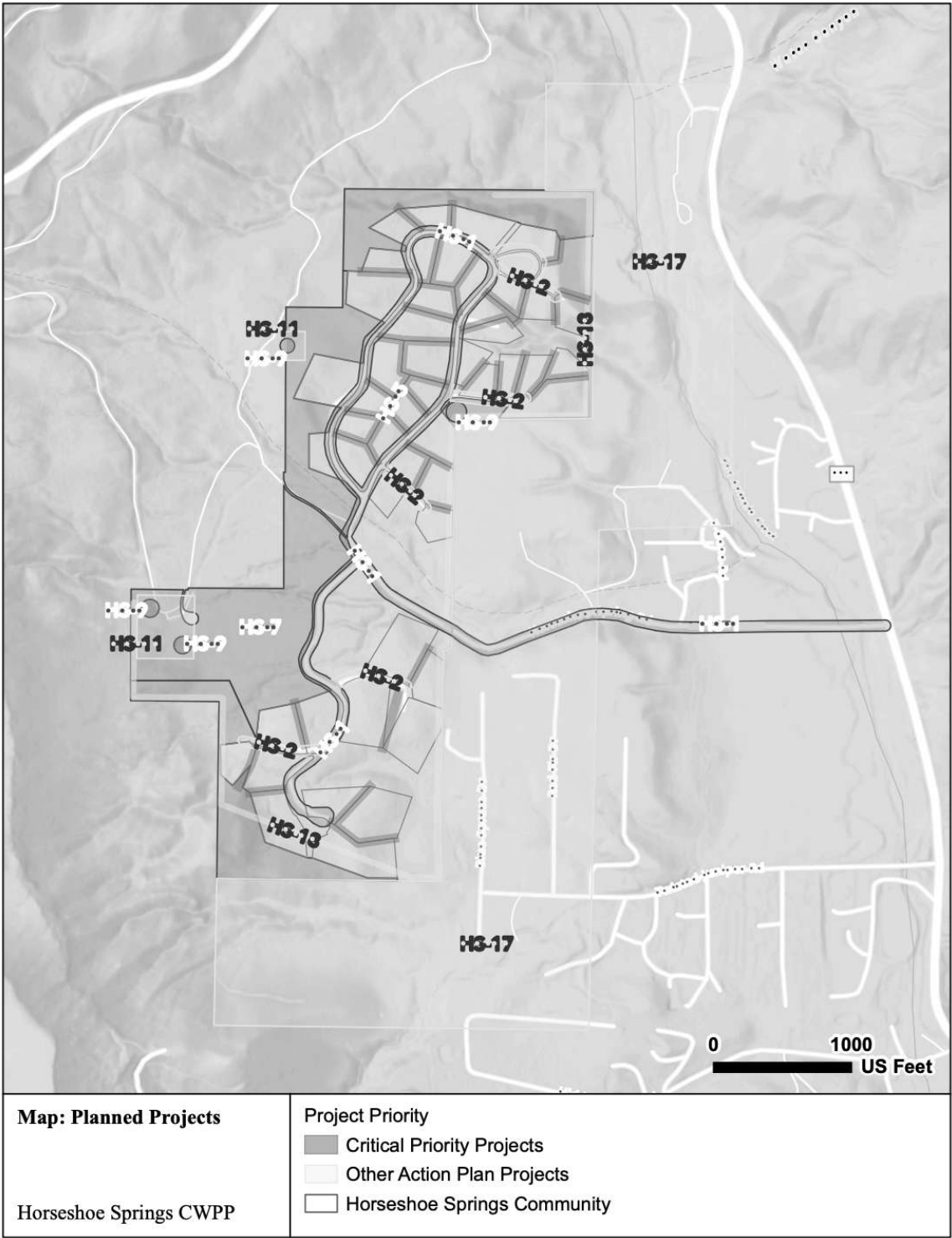
ID	Project Name	Description	Priority	Mapped Yes/No
HS-3	Signage & Addressing	Improve emergency wayfinding through visible address signage and directional identification.	Medium	No
HS-4	HIZ Assessment Program	Coordinate parcel-level risk assessments focused on the Home Ignition Zone (HIZ).	Medium	No

Table 7. Maintenance (Ongoing)

ID	Project Name	Description	Priority	Mapped Yes/No
HS-2	Secondary Egress Evaluation	Evaluate internal circulation constraints and secondary emergency egress opportunities.	Ongoing	Yes
HS-6	Slash Disposal & Chipping	Coordinate periodic slash disposal and green waste collection to reduce fuel accumulation.	Ongoing	No

ID	Project Name	Description	Priority	Mapped Yes/No
HS-8	Utility Corridor Maintenance	Annual walk-throughs of the JMEC utility corridor to address fire risks from lines.	Ongoing	No
HS-18	Neighborhood Fireline Maintenance	Establish and maintain handline width firelines on the HOA/USFS boundary.	Ongoing	Yes

Figure 22. Planned Projects



6.2 Potential Funding Sources

Securing funding is critical for the execution of these high-priority mitigation actions. HSA may actively pursue relevant financial assistance programs. Careful consideration of reporting and other commitments associated with any funding programs is essential. Typical programs include:

- USFS Community Wildfire Defense Grants (CWDG).
- New Mexico Association of Counties: Wildfire Risk Reduction Program (WRRGP), which funds Hazardous Fuels Reduction Projects up to \$100,000.
- FEMA Hazard Mitigation Grant Program (HMGP) and Building Resilient Infrastructure and Communities (BRIC) for water infrastructure hardening.
- State and Volunteer Fire Assistance (SFA/VFA) programs administered by the NM State Forester's office.
- NM Legislative Finance Committee loans: Provides low-interest funding opportunities for community infrastructure and capital improvement projects.
- New Mexico Home Strong: Provides retrofit grants to homeowner recipients insured through the New Mexico FAIR Plan (insurance "of last resort").

Section 7: Monitoring and Evaluation

7.1 Plan Maintenance and Timeline

The HSA CWPP is a dynamic document that requires constant review and monitoring to reflect changing conditions on the ground. It is recommended that the CWPP be evaluated annually, with a formal revision occurring at minimum every five years, or sooner if significant disturbances occur.

To ensure implementation continuity and long-term success, a critical component of post-adoption governance is the commitment for the HSA board to designate a member to serve as the lead responsible for the overall stewardship of the CWPP. This designated lead will be responsible for managing project implementation, coordinating communication with local partners, and overseeing the plan's status as a "live document." The HSA board is proposed to review the CWPP's progress annually, specifically during its Quarter 4 meeting. Progress on the plan will be reported to the community twice a year, at the midwinter and Labor Day gatherings.

7.2 General Monitoring Strategies

To ensure accountability and measure success, the HSA plans to monitor the status of projects, capacity changes, and environmental conditions through the following methods:

- Track hazardous fuels projects spatially, noting the acreage treated using GPS/GIS data.
- Maintain a photographic record of pre- and post-treatment work in Home Ignition Zones (HIZs) and along boundaries.
- Track community involvement by recording the number of participants in outreach and workshops.
- Review the conditions of fire roads, trails, and utility clearances annually.

7.3 HSA Fire & Safety Inspection Progress Tracking

To measure tangible progress toward becoming a fire-adapted community, HSA will track structure and parcel mitigations using the HSA official form along with any added IBHS-aligned indicators. Additive voluntary annual assessments may be conducted through voluntary homeowner surveys, visual inspections, or participation in Firewise or similar programs.

The annual HSA Fire and Safety Committee's inspection records the following items to track community progress and provide documentation for insurance purposes:

- **Photographic Documentation:** Objective visual records of specific deficiencies, using pin flags or markers to identify areas for improvement.
- **Metric Tracking:** Quantitative data including:
 - Percentage of homes meeting Zone 0 (0-5 ft) noncombustible requirements.
 - Percentage of homes with ember-resistant vents.
 - Percentage of homes with Class A roofing systems.
 - Number of homes retrofitted with ignition-resistant decking or enclosed eaves.
- **Voluntary Assessments:** Data gathered via surveys, visual inspections, or Firewise program participation.

This documentation may also serve as insurer-legible proof of completed mitigation work for homeowners.

HSA will heavily encourage residents to pursue official designation under the IBHS Wildfire Prepared Home™ program where feasible. This can improve insurability and reduce wildfire losses by demonstrating compliance with nationally recognized mitigation standards.

To ensure the highest level of objectivity, consistency, and governance alignment, HSA could consider exploring the use of qualified third-party inspection services for both the annual fire safety inspection and any enhanced structure monitoring.

Section 8: Wildfire Risk Modeling & Composite Risk Assessment

8.1 Overview of Risk Modeling

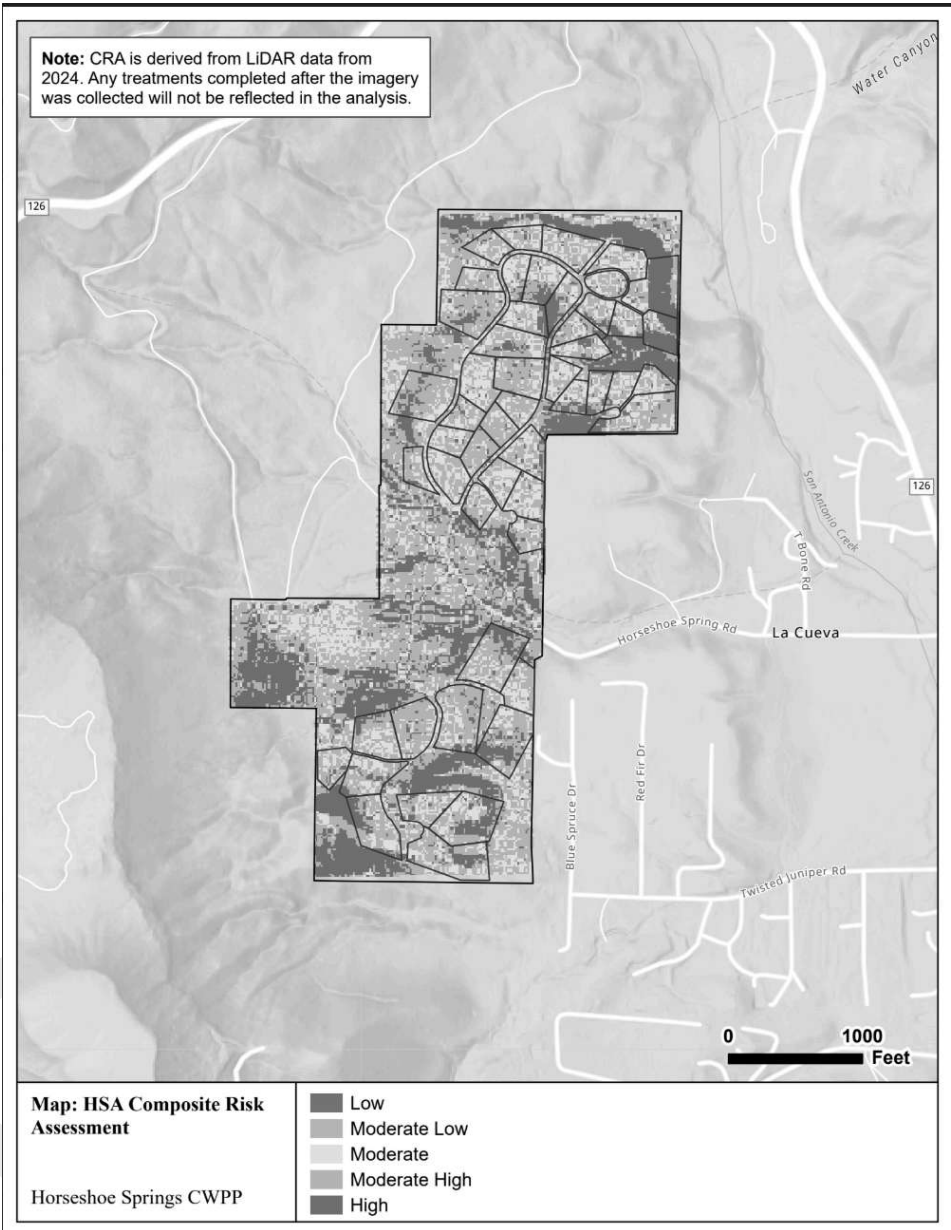
To accurately quantify the wildfire vulnerabilities unique to the HSA community, advanced fire behavior and risk modeling was conducted in collaboration with the New Mexico Forest & Watershed Restoration Institute (NMFWR). This modeling integrates localized baseline data—including fine-scale vegetation canopy parameters from regional LiDAR datasets, topographically critical community assets, fuel load variations, and structural infrastructure layouts—to simulate potential fire behavior, intensity, and community exposure under severe weather scenarios.

8.2 Composite Risk Assessment Mapping

The primary outputs of this modeling effort are spatial risk maps that visualize vulnerability gradients across both the immediate subdivision level and the surrounding landscape geography. Dana Heusinkveld (NMFWR) generated two specific draft maps for this purpose:

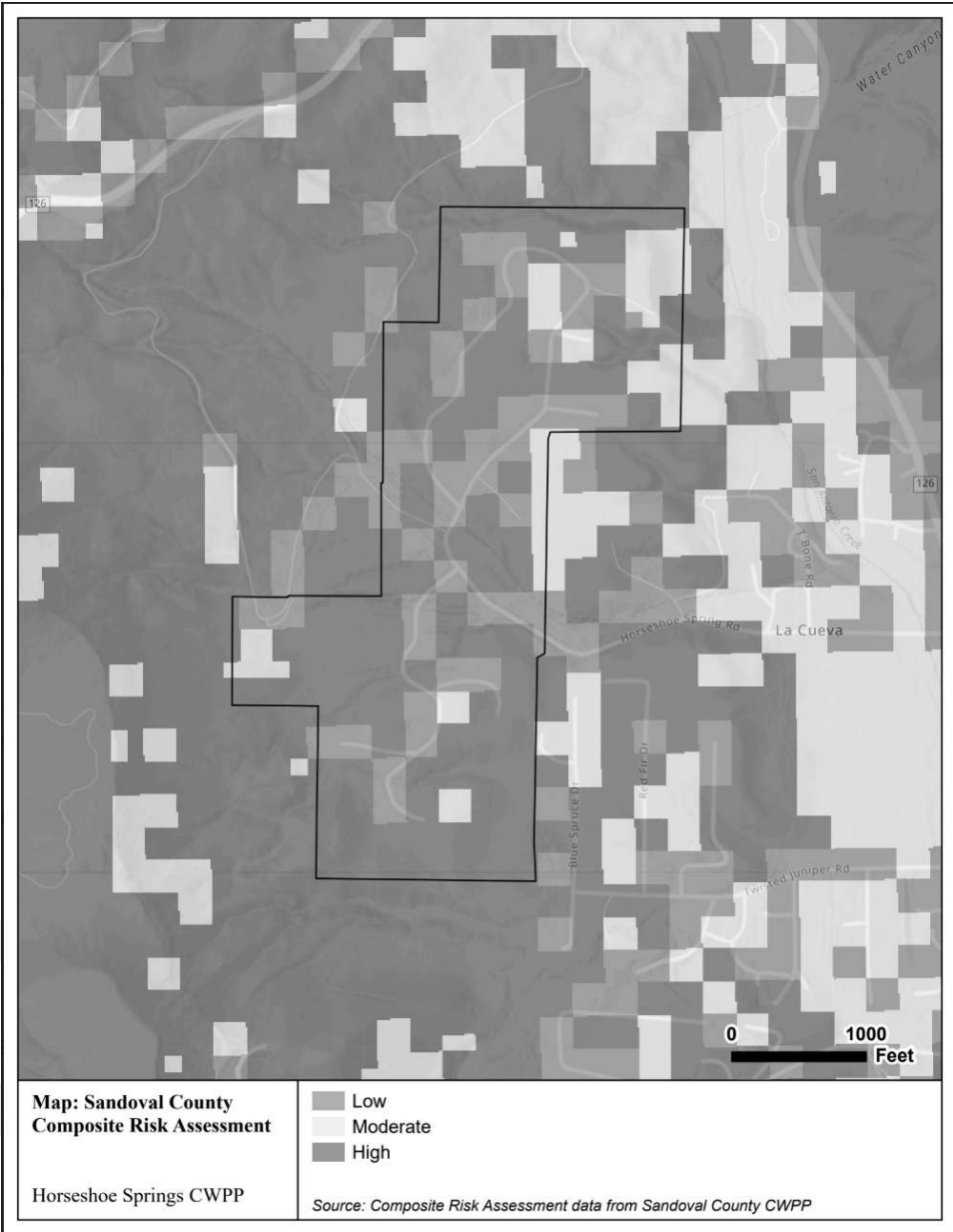
- **HSA Composite Risk Assessment Map:** This localized model focuses specifically within the HSA community boundaries, detailing how simulated fire intensity and risk intersect directly with residential structures and critical community infrastructure.

Figure 23. HSA Composite Risk Assessment



- **Sandoval County Composite Risk Assessment Map:** This regional model contextualizes the HSA community within the broader county-level risk landscape, mapping continuous fuel beds and potential fire sheds that present external risk factors to the community.

Figure 24. Sandoval County Composite Risk Assessment



The HSA-specific dataset is based on high-resolution 2024 Lidar data, which reflects the precise vegetation and fuel conditions at the time of its collection. In contrast, the Sandoval County Composite Index dataset utilizes regional modeling that may not account for localized fuel reduction treatments completed by HSA residents after the county-level data was compiled. Specifically, following the 2024 Lidar collection, the Association initiated an effort for property owners to utilize

Cuba Soil and Water Conservation District (CSWCD) grants to thin tree stands. As a result, several properties characterized as moderate-high risk in the 2024 Lidar-based HSA Composite Risk Assessment Map may appear as lower risk in the regional Sandoval County Composite Index. These discrepancies arise because the Sandoval County Index reflects a broader temporal and spatial snapshot that does not yet integrate the most recent, parcel-level mitigation efforts performed by individual HSA cabin owners.

8.3 Analysis and Modeling Results Narrative

A detailed technical narrative evaluating the modeling methodology, underlying input datasets, fire behavior criteria, and localized risk conclusions compiled by the New Mexico Forest & Watershed Restoration Institute (NMFWR) is available in full in Appendix 6²⁰: NMFWR Wildfire Risk Modeling and Assessment Report.

²⁰ Appendix 6_NMFWR Wildfire Risk Modeling Assessment Report

Section 9: Maps

9.1 Required Map Layers Specifications

The HSA CWPP incorporates a comprehensive suite of eighteen maps and figures to guide risk assessment and mitigation. All official GIS-ready maps are developed using professional software utilizing the NAD83 UTM Zone 13N projection.

The following 18 maps are required and referenced for a complete, actionable plan:

1. **Community Base Map:** Foundational layout including parcel boundaries, internal/external roads, and all 48 residential connections.
2. **Social Vulnerability Index Map:** Analyzes community demographics to identify populations requiring specialized evacuation assistance.
3. **Natural Resources Map:** Documents protected ecosystems and watershed features within the planning area.
4. **Fire History_Area Map:** Illustrates regional wildfire occurrences and historic burn perimeters surrounding Sandoval County.
5. **Fire History_HSA Map:** Provides high-granularity data on lightning strikes and small ignitions within Association boundaries.
6. **Vegetation Classification Map (VegetationClassification):** Categorizes specific forest species to inform silvicultural treatment methods.
7. **Fuel Hazard Map:** Visualizes environmental risk factors including vegetation/fuel type, canopy density, slope gradients exceeding 20%, and flame length behavior potential.
8. **CI_Energy_Communication Map:** Maps electrical lines, propane assets, and communication nodes.
9. **Highly Valued Resources and Assets (HVRA) Map (HVRAs):** Highlights Tier 1-3 assets and associated 100-300 ft defensible space perimeters.
10. **Treatment Priority Map (FuelTreatmentStatus):** Directs work via 26-ft roadside buffers, utility corridors, 100-ft water infrastructure buffers, and fuel break zones (High/Medium/Maintenance symbology).
11. **HSA Addresses & Structures (North):** Detailed identification of residential structure locations and addresses in the northern sector of the community.
12. **HSA Addresses & Structures (South):** Detailed identification of residential structure locations and addresses in the southern sector of the community.
13. **Evacuation Map (HSA_SafetyEgress):** Details primary/secondary egress, choke points, apparatus turnarounds, and Temporary Refuge Areas (TRAs).
14. **Fire Response Map (FireResponse):** Maps all fire suppression resources, including universal drafting points (FDCs), water flow rates, and the locations of the 5 community water storage tanks in relation to apparatus access.
15. **CI_Transportation Map:** Analyzes road widths and surfacing to determine apparatus accessibility.

16. **Water Infrastructure Map:** Identifies the spring house, Northside/Southside tanks, hydrants, drafting points, and access points for suppression.
17. **Socioeconomic Resources Map:** (Note: Referenced for local data relevance regarding property values and regional economic dependencies).
18. **Pre & Post Fire Mitigation Considerations:** Side-by-side visualization of simulated fire behavior before and after the implementation of planned treatment scenarios.

DRAFT

Glossary of Terms and Acronyms

- **ARC (Architectural Review Committee):** The HSA body or process responsible for monitoring enhanced structure standards (governance), often referenced in ARC assessments.
- **BAER (Burned Area Emergency Response):** A program managed by the U.S. Forest Service (USFS) that addresses post-fire rehabilitation and hazard mitigation.
- **BRIC (Building Resilient Infrastructure and Communities):** A FEMA grant program that provides funding for hazard mitigation projects.
- **CAR (Communities-at-Risk):** A designation and interactive map layer maintained by the state to identify communities with elevated wildfire threat ratings.
- **CWPP (Community Wildfire Protection Plan):** A collaborative planning document intended to reduce the threat to life and property from catastrophic wildfire by identifying and mitigating wildfire hazards in the WUI.
- **Defensible Space:** The modified area around a structure where vegetation and fuels have been treated, cleared, or reduced to slow the spread of wildfire and create a safer zone for firefighters.
- **EMNRD (Energy, Minerals and Natural Resources Department):** The New Mexico state agency whose Forestry Division is responsible for state forest management and CWPP approvals.
- **EWP (Emergency Watershed Protection):** A program managed by the NRCS that provides federal technical and financial assistance for post-fire watershed recovery.
- **FDC (Fire Department Connection):** Universal drafting fittings on water storage tanks that allow wildland fire engines and water tenders to connect seamlessly to access water for suppression.
- **FEMA (Federal Emergency Management Agency):** The federal agency responsible for coordinating disaster response and providing mitigation funding.
- **HFRA (Healthy Forests Restoration Act of 2003):** The federal law that established the mechanism for CWPPs to prioritize communities at risk and directs federal funds toward hazardous fuel reduction.
- **HIZ (Home Ignition Zone):** The area within 100 feet of a structure where embers and radiant heat pose the highest risk of causing structure ignition.
- **HMGP (Hazard Mitigation Grant Program):** A FEMA funding program utilized to support critical infrastructure hardening and long-term risk reduction.
- **HSA (Horseshoe Springs Association, Inc.):** The 130-acre community governed by this CWPP.
- **HVRAs (Highly Valued Resources and Assets):** Critical community infrastructure (such as the spring, storage tanks, and power lines) prioritized for protection from wildfire and post-fire impacts.
- **IBHS (Insurance Institute for Business & Home Safety):** A scientific research organization whose Wildfire Prepared Home™ standards are integrated into this plan to reduce structural ignitability.

- **ISO (Insurance Services Office):** A rating organization that assesses a fire department's fire protection capabilities on a scale of 1 (best) to 10, which is a critical factor for property insurance costs.
- **LCVFD (La Cueva Volunteer Fire Department):** The local volunteer fire department serving Sandoval County Fire District #5, including the HSA community.
- **JAWS (Jemez Alliance of Water Systems):** A collaborative alliance that HSA coordinates with to enhance wildfire preparedness and post-fire resiliency for local water infrastructure.
- **JMEC (Jemez Mountains Electric Coop):** The essential utility partner providing electrical infrastructure to the area.
- **Ladder Fuels:** Vegetation (such as tall grasses, shrubs, and small trees) that connects ground surface fuels to the upper tree canopies, allowing a fire to climb into the crowns.
- **Lidar:** High-accuracy remote sensing technology used for the 2026 forest canopy assessment and risk modeling.
- **NM 126:** The main access road acting as the primary ingress and egress route for the HSA community.
- **NMFWRI (New Mexico Forest and Watershed Restoration Institute):** The partner organization that provided pro bono GIS mapping support and risk modeling services for this CWPP.
- **NRCS (Natural Resources Conservation Service):** A federal agency that manages the EWP program to assist communities with watershed stabilization after a wildfire.
- **SCAN (Sandoval County Alerts and Notifications):** The emergency alert and notification system utilized by Sandoval County, which replaced CodeRED, to broadcast evacuation orders and critical information.
- **Third-Party Inspector:** Qualified external inspection services used for annual fire safety inspections or structure monitoring to ensure objectivity, consistency, and defensible data for compliance and insurance purposes.
- **Localized Structural Ignition Risk:** The potential for a structure to ignite from radiant heat, direct flame contact, or embers, particularly in areas where structures or fuel sources are in close proximity, such as intra-parcel accessory buildings.
- **Thinning from Below:** A recommended forest management method that involves removing the smallest trees first (ladder fuels) to give remaining mature trees more space and reduce the potential for crown fires.
- **TRAs (Temporary Refuge Areas):** Designated locations identified on evacuation maps where residents or first responders can temporarily seek safety if primary evacuation routes are compromised.
- **VFD:** Volunteer Fire Department (e.g., Jemez Springs VFD).
- **WUI (Wildland-Urban Interface):** The geographical area where human habitation and infrastructure intersect directly with wildland vegetative fuels.
- **Zone 0 / Immediate Zone:** The critical 0-5 foot perimeter directly adjacent to a structure that must be kept entirely clear of combustible materials.

Appendix

Appendix 1: Community Emergency Communication Strategy

Horseshoe Springs Association Community Wildfire Protection Plan (CWPP)

Prepared by Task Force 1

1. Purpose and Scope

Effective communication is a critical component of wildfire preparedness, situational awareness, and evacuation readiness within the Horseshoe Springs Association (HSA). This appendix establishes a structured, layered communication strategy designed to improve the timely dissemination of wildfire and emergency-related information while reinforcing that official federal and state agency emergency alerts remain the primary source of life-safety instructions. This framework is intended as guidance and may evolve over time.

The HSA Messaging System is designed to provide hyper-local situational awareness that complements the Ready, Set, Go! (RSG) wildfire preparedness framework detailed in Section 5.2 of the HSA CWPP. It is a supplemental, last-resort notification tool – intended primarily for residents who are on-site at the time of an incident. It is not a substitute for official alerts and should never be used as a basis for returning to or securing property during an active wildfire threat. Residents should always defer to official Sandoval County SCAN[1] instructions for their current RSG status.

IMPORTANT: The HSA Messaging System is not an emergency alerting service. Residents must register for official alert systems – described in Section X.2 below – and take personal responsibility for monitoring wildfire conditions.

2. How to Register for Official Alert Systems

Registering for official alert systems is the single most important action every HSA property owner and resident can take. These systems provide legally authorized evacuation orders and life-safety instructions that HSA messaging cannot replicate. Registration takes less than five minutes and is free.

2.1 Sandoval County SCAN (Formerly Code Red) – Primary Alert System

Sandoval County Alert Network (SCAN)¹ is the official county emergency notification system. SCAN delivers evacuation orders, shelter-in-place notices, and emergency instructions directly to registered phone numbers and email addresses. All HSA residents and property owners are strongly urged to register.

To register for SCAN, follow these steps:

1. Navigate to: <https://www.sandovalcountynm.gov/departments/scan/> and follow the Everbridge registration link on that page.
2. Create an account (recommended) or continue as a guest. An account allows you to manage delivery preferences in the future.
3. Enter your name, HSA property address, and contact preferences (phone, text, email). Accept the terms and conditions.
4. On the verification screen, confirm the map pin is correctly placed at your property. If needed, drag the pin to the correct location.
5. Review your information and confirm. Registration is complete.

2.2 Watch Duty – Secondary Situational Awareness Tool

Watch Duty² is a 501(c)(3) nonprofit wildfire monitoring application that alerts you of nearby wildfires and firefighting efforts in real-time. Watch Duty does not issue evacuation orders but is a highly valuable tool for maintaining situational awareness between official SCAN notifications. Residents are encouraged to download the app and enable notifications for Sandoval County.

3. Communication System Overview

HSA utilizes a layered communication approach consisting of three distinct systems, each serving a different purpose and intended to function in coordination with the others:

- **Layer 1 – Official Emergency Alerts (Primary / Authoritative)**

¹ Sandoval County Alert Network (SCAN), formerly Code Red. Register at: <https://www.sandovalcountynm.gov/departments/scan/>

² Watch Duty is available at www.watchduty.org and as a mobile application (iOS and Android).

- **Layer 2** – Situational Awareness Tools (Secondary / Informational)
- **Layer 3** – HSA Messaging System (Tertiary / Supplemental)

4. Primary Layer: Official Emergency Alerts

Sandoval County SCAN represents the highest-priority communication channel for HSA residents and must be relied upon for all emergency decision-making, including evacuation. SCAN alerts are issued by authorized government agencies and provide legally binding directives such as evacuation orders. No HSA communication supersedes a SCAN alert. When SCAN issues a GO order, residents must evacuate immediately, regardless of any concurrent HSA messaging.

5. Secondary Layer: Situational Awareness Tools

Watch Duty and similar tools (InciWeb, NIFC active incident data, NOAA/NWS Red Flag Warnings) provide early awareness and incident context. Residents are encouraged to actively monitor these resources during elevated fire weather conditions. These tools do not replace official alerts and do not provide evacuation direction.

6. Tertiary Layer: HSA Messaging System

The HSA messaging system is a supplemental, community-operated notification tool intended to provide concise, factual updates regarding nearby wildfire activity and, on rare occasions, other significant non-fire emergencies that warrant community notification. It is not an official alerting system and should not be relied upon for emergency instructions or evacuation decisions.

Use is intentionally limited to prevent alert fatigue and preserve credibility. All messages are informational only and do not include directives or instructions. The HSA system may be activated in rare non-fire circumstances – such as a significant infrastructure failure or other credible safety concern – at the discretion of the HSA Board.

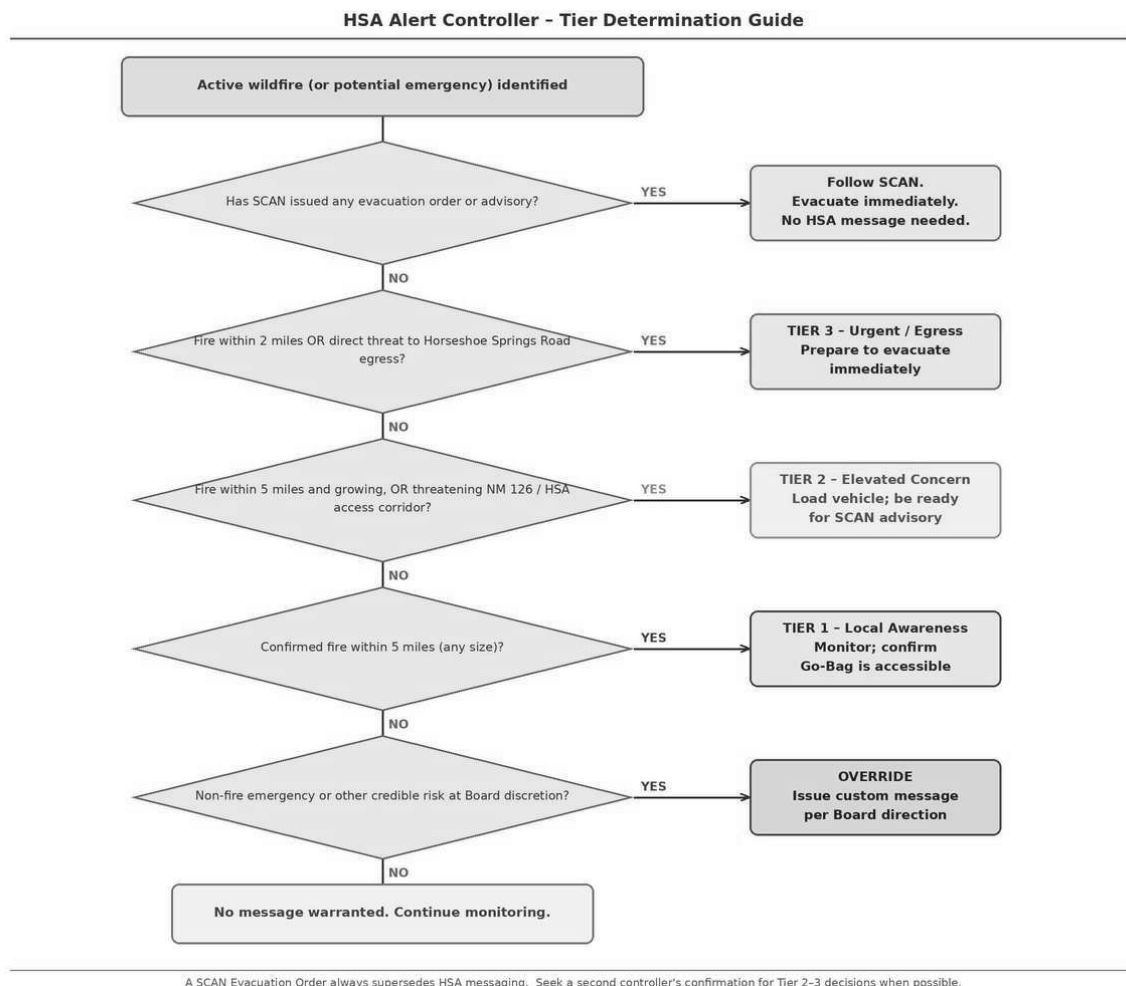
7. Notification Thresholds

The following thresholds guide when the HSA Messaging System is activated. These criteria are designed to provide hyper-local situational awareness without duplicating information already available through SCAN and Watch Duty. Thresholds are focused on proximity and credible threat to HSA access and egress – not merely fire size – so the system captures fast-moving spot fires that may be small but pose an immediate risk.

HSA Tier	Trigger Criteria	Communication Intent	Resident Guidance
Tier 1 – Local Awareness	Confirmed fire within 5 miles (any size) OR active fire within 10 miles $\geq$ 10 acres with reported growth	Hyper-local notification of a nearby ignition. Ensures on-site residents are aware of activity that SCAN and Watch Duty may not yet have flagged at the community level.	Monitor HSA messaging and Watch Duty. Confirm Go-Bag is accessible. No immediate action required unless conditions change.
Tier 2 – Elevated Concern	Active fire within 5 miles and growing OR any fire posing a credible threat to NM 126 or the Horseshoe Springs Road access corridor	Heightened awareness; fire could affect community access or egress within hours. Bridges awareness gap between Watch Duty monitoring and official SCAN SET advisory.	Load vehicle. Account for all family members and pets. Be prepared for a SCAN advisory at any time.
Tier 3 – Urgent Egress	Fire within 2 miles OR direct, credible threat to Horseshoe Springs Road egress	Imminent threat to life safety and community access. Supports SCAN GO notification. This tier is egress-focused: on-site residents should not wait.	Evacuate immediately or be prepared to do so upon SCAN order. Do not wait for further HSA messaging.
Override	Non-fire emergency or other credible risk, at HSA Board discretion	Rare circumstances outside fire criteria where community notification is warranted (e.g., significant infrastructure failure, road closure affecting egress).	Follow specific guidance in the message.

A SCAN Evacuation Order always supersedes HSA messaging. If SCAN issues a GO order, residents must evacuate immediately, regardless of the current HSA Tier status.

Figure .1 – Alert Controller Tier Determination Guide



8. Message Format and Content

All HSA messages will be concise (≤ 320 characters), informational, and action-first. Each message will include, where applicable:

- Approximate distance from HSA
- Estimated fire size and behavior (growing, contained, etc.)
- Current RSG tier context
- Source and link to official information

Example – Tier 1 message:

HSA Alert: A wildfire has been reported approximately 4 miles from HSA, currently estimated at 2 acres with active growth. No evacuation order. Monitor SCAN and Watch Duty for updates. Source: [link]

Example – Tier 2 message:

HSA Alert [ELEVATED]: Active fire approximately 3 miles from HSA and growing. Credible risk to area access. Load vehicles and account for all occupants. Monitor SCAN closely – an advisory may follow. Source: [link]

Example – Tier 3 message:

HSA Alert [URGENT]: Wildfire approximately 1.5 miles from HSA. Immediate threat to egress. If on-site, prepare to evacuate NOW. Await or monitor SCAN for official order. Source: [link]

9. System Governance and Administrator Protocol

The HSA messaging system operates under a defined governance structure to ensure consistent, authorized, and accountable communications.

9.1 Roles and Responsibilities

- **Alert Controllers / Reviewers** – 3–5 trained volunteers authorized to issue or approve alerts.
- **Information Monitor** – Manually checks official sources during elevated risk periods and composes alert drafts for controller review.
- **Custodian** – Maintains the sender roster, message templates, logs, and audit records.
- **Approver** – An HOA officer or Safety Coordinator who may provide final approval, particularly for Tier 3 messages.

The HSA Messaging System's operational flow begins with the **Information Monitor** tracking official data sources (Section 9.3) and drafting initial alert messages. **Alert Controllers / Reviewers** validate the source data, ensure the message meets the format standards (Section 8), and authorize the final message for broadcast. For Tier 1 (Local Awareness) and Tier 2 (Elevated Concern) messages, authorization by a single Alert Controller / Reviewer is sufficient for distribution.

For high-urgency **Tier 3 (Urgent / Egress)** messages, which relate to imminent threats to life safety and community egress, the designated **Approver** (HOA officer or Safety Coordinator) must provide final sign-off. If the primary Approver is unavailable, approval defaults to the consensus of two senior, available Alert Controllers/Reviewers to prevent delay in delivering this critical, egress-focused notification.

● 9.2 Duty Rotation and Activation

To ensure consistent coverage, the HSA will need to actively develop and maintain a complete roster of trained Alert Controllers and Reviewers for this volunteer service.

Alert Controller duty rotates on a weekly or incident-based schedule. If the primary controller is unavailable, a backup must be reachable within five minutes. During high-risk conditions (Red Flag Warnings, nearby active incidents), at least one controller should be actively monitoring official data sources.

The system currently operates in manual monitoring mode: controllers check official sources and compose alerts based on observed conditions. The governance structure is designed to support potential future integration of automated or semi-automated data feeds (such as Watch Duty webhooks or NWS alerts) as that capability is developed and validated. Any automation will require human review before messages are sent.

9.3 Official Data Sources

Alert Controllers shall rely only on the following vetted sources when determining whether to issue a notification:

- National Weather Service (NWS) – Red Flag Warnings and fire weather advisories.
- Watch Duty – Verified wildfire incident reports and perimeter updates.
- InciWeb (USFS) – Official wildfire incident pages.
- NIFC – National active incident data.
- Sandoval County / Local Emergency Management – Official evacuation or shelter orders.

- Local fire departments and law enforcement – Direct communication or confirmed public advisories

Controllers shall not issue evacuation or shelter instructions unless those directives have been formally issued by local authorities.

10. Implementation Timeline

The HSA messaging system is currently in active development. The following phases outline the expected path to full operation:

Phase	Target Timeframe	Key Activities
Phase 1 – Platform Setup	Q4 2025	Finalize platform selection (10DLC / Carolina Digital Phone TextNow), configure opt-in enrollment, test message delivery, recruit and train Alert Controllers.
Phase 2 – Community Enrollment	Q2 2026	Distribute enrollment instructions to all 48 property owners. Confirm SCAN and Watch Duty enrollment drives are completed. Collect opt-ins.
Phase 3 – Pilot Operation (Manual)	Q3 2026	Begin manual monitoring operations. Send test alert. Evaluate controller workflows, refine message templates, and document lessons learned.
Phase 4 – Automation Integration	Future	Evaluate integration of automated data feeds as capability matures. Validate accuracy before enabling. Transition to hybrid mode only after successful piloting.

11. Limitations and Liability Disclaimer

All communication systems described in this appendix, including the HSA Messaging System, may experience outages, delays, or incomplete information. Residents must maintain personal preparedness and rely on official SCAN alerts for evacuation instructions.

The Horseshoe Springs Association, its Board of Directors, officers, and designated administrators do not guarantee the performance, timeliness, or accuracy of the HSA Messaging System. HSA messaging is a voluntary,

community-operated service. Neither the Association nor any individual acting in an administrative capacity shall be held liable for any failure to issue a notification, any delay in messaging, or any decision made by a resident in reliance on HSA communications.

Residents are solely responsible for their own safety, their family members, and their property. Enrollment in the HSA messaging system does not reduce or replace the obligation to register for official Sandoval County SCAN alerts and to maintain an individual emergency preparedness plan consistent with the Ready, Set, Go! framework.

12. Flexibility and Future Adaptation

The communication tools, thresholds, processes, and governance structures described in this appendix may evolve over time based on technological advancements, community needs, feedback from real-world activations, and lessons learned from wildfire events. The HSA Board will periodically review this appendix in conjunction with the five-year CWPP update cycle and may make interim revisions as circumstances warrant.

13. Post-Fire Communication and Watershed Recovery

13.1 Purpose

The transition from active fire to recovery is a critical phase where communication shifts from life-safety evacuation to resident re-entry and long-term community stabilization. This section ensures that residents are informed about the heightened risks of erosion, debris flows, and infrastructure impacts that can affect Horseshoe Springs – particularly its drinking water resources – in the weeks and months following a wildfire. Consistent with the Watershed Protection Goals outlined in Section 4.3 of the HSA CWPP, post-fire communication is an integral part of community resilience.

13.2 Re-entry and Immediate Safety Messaging

Once Sandoval County SCAN has lifted the GO status and authorities have confirmed that re-entry is permitted, the HSA Messaging System will shift to disseminating localized safety information, including:

- **Utility Status Updates** – Direct notifications regarding the Horseshoe Springs water system, including system pressure, chlorinator functionality, and any Boil Water advisories.
- **Hazard Awareness** – Communication regarding unstable trees, degraded power lines, and the potential for thermal degradation of plastic water distribution pipes.
- **Official Clearance Confirmation** – Re-confirming that re-entry is permitted only after county officials have deemed the area structurally safe.

13.3 Watershed Protection Coordination

Post-fire messaging will include timely notifications focused on preventing cascading impacts to the community spring and distribution infrastructure:

- **Erosion and Debris Flow Alerts** – Timely notifications during the monsoon season or heavy rain events following a fire, warning of potential debris flows in the micro-drainages above the Spring House.
- **Stabilization Workdays** – Coordination of community-led stabilization activities such as spreading mulch, seeding, or maintaining log erosion barriers on common area slopes.

13.4 Post-Fire Coordinator Role

The HSA Board will designate a Post-Fire Coordinator to serve as the single point of contact for external agencies, including the Natural Resources Conservation Service (NRCS) and Sandoval County Emergency Management. This coordinator will use the HSA Messaging System to:

- **Agency Liaison** – Provide updates on technical and financial assistance programs, including the NRCS Emergency Watershed Protection (EWP) program.
- **Resident Resources** – Distribute guidance on post-fire landscape management resources available to individual parcel owners.
- **Recovery Resources** – Share information on “New Mexico After the Fire” and similar state and federal recovery resources³.

13.5 Long-Term Recovery and Funding Updates

To ensure continuity of community recovery efforts, the HSA Messaging System will provide periodic status updates on:

- Repairs to critical infrastructure, including water storage tanks, the spring system, and access roads.
- Progress on securing state and federal recovery grants.
- Scheduled community workdays and volunteer coordination efforts.

Post-fire communication will continue until the HSA Board, in consultation with relevant agencies, determines that recovery milestones have been achieved and routine communication protocols can resume.

³ New Mexico After the Fire: nmafterthefire.org NRCS Emergency Watershed Protection (EWP) program: nrcs.usda.gov/programs-initiatives/ewp-emergency-watershed-protection-program.

Appendix 2: Safe Passages (Emergency Egress & Access)

Horseshoe Springs Association Community Wildfire Protection Plan ("CWPP")

Prepared by Task Force 2

Purpose and Scope

Task Force 2: Safe Passages was established to directly address one of the most critical risks facing the Horseshoe Springs Association (HSA): limited ingress and egress within a high wildfire risk Wildland-Urban Interface ("WUI") setting. As documented in this CWPP, HSA is functionally dependent on a single primary access route—Horseshoe Springs Road connecting to NM 126—creating significant vulnerability in the event of a fast-moving wildfire.

The purpose of Task Force 2 is to identify, evaluate, and formalize three viable emergency egress routes; ensure all designated routes are mapped, communicated, and field-marked; establish and maintain road clearance standards that support safe evacuation and emergency response; and improve operational readiness for wildfire evacuation scenarios where primary access may be compromised. This task force operates at the intersection of life safety, emergency response effectiveness, and infrastructure resilience, and is considered a core implementation function of the CWPP.

Core Objectives

Task Force 2 is responsible for delivering and maintaining the following outcomes:

1. Emergency Egress Route Identification

The first objective is to identify three (3) viable emergency egress routes capable of supporting evacuation under wildfire conditions. Routes are evaluated based on physical access and continuity, surface conditions and grade, gate access and control, and connectivity to safe exit points or refuge areas. These pathways include a combination of internal HSA roadways, adjacent private access points, and U.S. Forest Service (USFS) roads and connectors (where applicable). As reflected in the **HSA Safety Egress Map**, routes extend beyond the community footprint and connect toward external corridors such as Forest Road access and the La Cueva area.

2. Mapping and Standardization

The task force must develop and maintain an official Emergency Egress Map. This map must identify primary and secondary routes, known pinch points and constraints, gate locations and access requirements, turnaround points and route transitions, and muster or refuge areas (e.g., Jemez Mountain Baptist Church). The map is maintained as a standalone operational tool and is distributed to all property owners to support rapid decision-making during an incident.

3. Route Marking and Field Visibility

All designated emergency routes are marked using uniform, community-approved signage and blue round reflectors placed approximately 5 feet high on the right-hand side of routes. These markers provide visibility in low-light and smoke conditions and consistent directional guidance for both residents and responders. Field marking standards are designed to function under degraded visibility conditions typical of wildfire events, when conventional signage may be insufficient.

4. Roadway Clearance and Maintenance Standards

A central responsibility of Task Force 2 is ensuring that all roads—public and private—are maintained to support safe evacuation and emergency vehicle access.

- **4.1 Road Systems Covered:** This includes Horseshoe Springs Road (primary access route), Horseshoe Loop (county-maintained), Horseshoe Hollow (county-maintained), all private side lanes and driveways, and designated emergency egress routes.
- **4.2 Clearance Requirements:** All routes must be maintained to meet or exceed Sandoval County roadway clearance specifications (where applicable)¹ and emergency vehicle access standards. The latter includes adequate width for fire apparatus passage, vertical clearance for engines and equipment, and vegetation clearance to reduce ignition risk and obstruction.
- **4.3 Emergency Route Standard:** Designated emergency egress routes must additionally meet 4WD-capable passage standards. They must maintain surface and clearance conditions that allow reliable use under emergency conditions, including limited maintenance environments and adverse weather or fire-related impacts.

¹ Maintain roadside vegetation to provide at least 10 feet of horizontal clearance from the drivable edge where feasible, and at least 13 feet 6 inches of vertical clearance for emergency access, with additional clearance at curves, pull-offs, intersections, and designated evacuation routes.

1 Work Completed During CWPP Development

2 The CWPP development process directly accelerated progress on emergency access
3 planning, and Task Force 2 has completed significant foundational work.

4 **1. Identification of Three Emergency Egress Routes:** The task force conducted
5 a field review and validation of potential routes, coordinated across private
6 landowners, HSA leadership, and external access points, and confirmed route
7 viability under emergency scenarios.

8 **2. Development of the HSA Safety Egress Map:** A comprehensive map was
9 produced, identifying the primary evacuation route (Horseshoe Springs Road to
10 NM 126), secondary/emergency routes, gate locations and conditions (including
11 locked, unlocked, and unknown access points), and key navigation markers and
12 the community boundary. This map also incorporated critical operational
13 considerations, specifically the likelihood of power and cellular network failure
14 during wildfire events and the resulting need for self-reliant communication and
15 navigation preparedness.

16 **3. Field Marking of Routes:** Blue reflector markers were installed along
17 designated routes, and a consistent marking protocol was established across all
18 emergency pathways, improving route visibility for both residents and emergency
19 responders.

20 **4. Gate Identification and Access Awareness:** Task Force 2 documented gate
21 locations and conditions, including known access codes (where available),
22 unlocked or unmanaged access points, and unknown or variable USFS gate
23 access conditions. This work highlighted the need for formalized access
24 protocols as a future priority.

25 **5. Integration with Task Force 1 - Community Communication Systems:**
26 Evacuation planning was linked with community alert systems (Everbridge
27 transition underway) and emergency notification protocols. This reinforced the
28 importance of early evacuation decision-making and pre-event awareness of
29 routes.

30 **6. Increased Community Awareness with Task Force 3 – Training &
31 Education:** Progress and findings were presented at HSA Board and community
32 meetings (June 22, 2025, and ongoing). This elevated community understanding
33 of access limitations, evacuation timing risks, and the importance of route
34 familiarity.

2. Mapping and Standardization

- Develop and maintain an official Emergency Egress Map

- Identify:

- Primary and secondary routes
- Known pinch points and constraints
- Gate locations and access requirements
- Turnaround points and route transitions
- Muster or refuge areas (e.g., Jemez Mountain Baptist Church)

The map is maintained as a standalone operational tool and is distributed to all property owners to support rapid decision-making during an incident.

3. Route Marking and Field Visibility

All designated emergency routes are marked using:

- Uniform, community-approved signage
- Blue round reflectors placed approximately 5 feet high on the right-hand side of routes

These markers provide:

- Visibility in low-light and smoke conditions
- Consistent directional guidance for both residents and responders

Field marking standards are designed to function under degraded visibility conditions typical of wildfire events, when conventional signage may be insufficient.

4. Roadway Clearance and Maintenance Standards

A central responsibility of Task Force 2 is ensuring that all roads—public and private—are maintained to support safe evacuation and emergency vehicle access.

4.1 Road Systems Covered

- Horseshoe Springs Road (primary access route)
- Horseshoe Loop (county-maintained)
- Horseshoe Hollow (county-maintained)
- All private side lanes and driveways

- 1 o Designated emergency egress routes

2 **4.2 Clearance Requirements**

3 All routes must be maintained to meet or exceed:

- 4 o **Sandoval County roadway clearance specifications**, where applicable
- 5 o **Emergency vehicle access standards**, including:
 - 6 ▪ Adequate width for fire apparatus passage
 - 7 ▪ Vertical clearance for engines and equipment
 - 8 ▪ Vegetation clearance to reduce ignition risk and obstruction

9 **4.3 Emergency Route Standard**

10 Designated emergency egress routes must additionally meet:

- 11 o 4WD-capable passage standards
- 12 o Surface and clearance conditions that allow reliable use under emergency conditions, including:
 - 13 ▪ Limited maintenance environments
 - 14 ▪ Adverse weather or fire-related impacts

16 **Work Completed During CWPP Development**

17 The CWPP development process directly accelerated progress on emergency access
18 planning. Task Force 2 has completed the following foundational work:

19 **1. Identification of Three Emergency Egress Routes**

- 20 • Conducted field review and validation of potential routes
- 21 • Coordinated across private landowners, HSA leadership, and external access points
- 22 • Confirmed route viability under emergency scenarios

24 **2. Development of the HSA Safety Egress Map**

- 25 • Produced a comprehensive map identifying:
 - 26 o Primary evacuation route (Horseshoe Springs Road to NM 126)
 - 27 o Secondary/emergency routes
 - 28 o Gate locations and conditions (including locked, unlocked, and unknown access points)
 - 29 o Key navigation markers and community boundary

1 • Incorporated critical operational considerations:

- 2 o Likelihood of power and cellular network failure during wildfire
3 events
4 o Need for self-reliant communication and navigation preparedness

5 **3. Field Marking of Routes**

- 6 • Installed blue reflector markers along designated routes
7 • Established consistent marking protocol across all emergency pathways
8 • Improved route visibility for both residents and emergency responders

9 **4. Gate Identification and Access Awareness**

10 **Ongoing Responsibilities and Future Role**

11 Task Force 2 transitions from planning to permanent operational function under CWPP
12 implementation. This ongoing work would be considered a function of HSA's existing
13 Roads & Trails Committee.

14 **A. Route Maintenance and Inspection:** Annual inspections of all designated
15 routes will be conducted to identify and address vegetation encroachment,
16 erosion or surface degradation, and obstructions or access limitations. This
17 requires coordination with Sandoval County (for maintained roads), property
18 owners (for private lanes), and USFS (for external connectors).

19 **B. Clearance Enforcement and Coordination:** The task force supports HOA and
20 community efforts to maintain required road width and vertical clearance and
21 encourage compliance on private roads and driveways. They also provide clear
22 guidance and education to property owners on emergency access requirements
23 and vegetation management along access routes.

24 **C. Signage and Marker Maintenance:** All reflectors and signage must be
25 maintained in functional condition, with damaged or missing markers replaced,
26 and effectiveness periodically evaluated and upgraded as needed.

27 **D. Gate Access Strategy:** The task force must develop and maintain a formal gate
28 access protocol, including coordination with USFS and adjacent landowners,
29 secure but accessible emergency entry solutions, and documentation of access
30 procedures for responders.

1 **E. Map Updates and Distribution:** The Emergency Egress Map must be updated
2 as conditions change and updated versions redistributed to all residents. This
3 ensures alignment with CWPP updates and on-the-ground conditions.

4 **F. Integration with Emergency Response Planning:** The task force will
5 coordinate with Sandoval County Emergency Management, local fire
6 departments, and regional partners to ensure routes are known to responders
7 and integrated into response planning where feasible.

8 **G. Resident Education and Preparedness:** The team will reinforce that
9 evacuation success depends on early departure (Ready/Set/Go framework),
10 familiarity with multiple routes, and understanding that primary access may fail.
11 They will also encourage pre-season route review and practice navigation and
12 awareness among residents.

13 Key Considerations and Constraints

14 Task Force 2 operates within several important real-world constraints:

15 1. **Single Access Dependency:** Horseshoe Springs Road remains the primary and
16 most reliable evacuation route, and all alternative routes are contingency
17 pathways, not equivalents.

18 2. **Variable Route Reliability:** Emergency routes may be impacted by fire behavior,
19 downed trees, limited maintenance conditions, and gate access issues.

20 3. **Limited Infrastructure Environment:** The community lacks a hydrant-based fire
21 suppression system, and has narrow roads, limited turnaround capacity, heavy
22 vegetation, and overhead canopy conditions.

23 4. **Communication Limitations:** There is a high likelihood of power and cellular
24 failure during wildfire events, emphasizing pre-event preparedness and
25 self-sufficiency.

26 5. **Strategic Importance:** Task Force 2 represents one of the most life-critical
27 components of the HSA CWPP. Effective evacuation depends on route
28 availability, clearance and passability, visibility and marking, and resident
29 awareness and timing. Even with strong mitigation and structure hardening,
30 unsafe or delayed evacuation remains the highest consequence risk to the
31 community.

1 Recommendation

2 Task Force 2 has established a practical, field-based emergency egress system that
3 significantly improves HSA's wildfire preparedness. The identification, mapping, and
4 marking of three emergency routes—combined with a commitment to ongoing
5 maintenance and coordination—provides a critical layer of protection for residents and
6 responders. Moving forward, the continued success of this effort will depend on
7 consistent maintenance and enforcement of access standards, strong coordination with
8 county, state, and federal partners, and ongoing resident engagement and
9 preparedness. This work transforms evacuation from a single-point vulnerability into a
10 managed, multi-route system, materially improving the community's ability to respond
11 safely during a wildfire event.

12

Appendix 3: Training & Education

Horseshoe Springs Association Community Wildfire Protection Plan (“CWPP”)

Prepared by Task Force 2

1. Purpose and Scope

Task Force Three – Training & Education serves as the ongoing outreach, awareness, and capacity-building arm of the Horseshoe Springs Association (HSA) CWPP. Its purpose is to ensure that HSA property owners, residents, and stakeholders remain informed, engaged, and prepared to reduce wildfire risk at both the individual property level and the community scale.

Consistent with the voluntary, non-regulatory nature of the HSA CWPP, this Task Force focuses on advancing owner awareness and decision-making by translating technical wildfire science and policy into practical, actionable guidance. It works to reinforce Firewise-aligned behaviors and defensible space practices, support community-wide readiness—including evacuation awareness and emergency coordination—and provide education on topics outside formal HOA regulation where voluntary action is essential.

Task Force Three plays a critical role in ensuring that the CWPP is not a static document, but a living framework supported by continuous learning and engagement.

2. Activities and Accomplishments (October 2024 – CWPP Approval)

Since its inception in October 2024, Task Force Three has established a consistent and credible foundation for community education and engagement.

2.1 Monthly Wildfire Education Communications

Task Force Three initiated and maintained a monthly fire awareness and prevention email distributed to all HSA members. Topics have included defensible space best practices (home ignition zones), seasonal wildfire risk awareness, preparedness actions (such as pre-evacuation planning, go-bags, and access readiness), vegetation management and fuels reduction guidance, and lessons learned from regional wildfire events. These communications are shared via HSA email distribution and community Facebook channels, increasing reach and accessibility. This monthly cadence of HOA

owners educating HOA owners has successfully created a predictable and trusted information stream, reinforcing ongoing awareness rather than one-time engagement.

2.2 Guest Speakers and Expert Engagement

Task Force Three has actively brought subject matter experts and Core Team partners directly to the HSA community. In December 2025, a presentation was given at the HSA Board Meeting by Martha Graham of the New Mexico Rural Water Association, focusing on water systems, infrastructure considerations, and wildfire-related impacts on rural water access and resilience. Subsequently, in March 2026, Lawrence Crane of the New Mexico Energy, Minerals and Natural Resources Department presented at the Mid-Winter Community Meeting on the statewide wildfire risk context, mitigation strategies, and CWPP alignment with state priorities. These engagements have strengthened direct connections between HSA and key agencies, increased the credibility and technical accuracy of information shared, and helped residents understand how local actions connect to broader wildfire systems.

2.3 Integration with CWPP Development Process

Task Force Three has supported CWPP development by reinforcing community participation and awareness during planning phases and helping translate CWPP concepts (risk, mitigation, prioritization) into resident-understandable language. This support has led to increased participation in Chipper days, property inspections compliance, and Firewise-aligned activities. This role has been particularly important given HSA's high structural vulnerability factors, including limited ingress/egress (NM 126 access), a narrow internal road network, heavy vegetative cover near structures, and the prevalence of combustible materials and limited defensible space.

3. Strategic Importance to HSA Risk Reduction

Task Force Three directly supports mitigation outcomes by influencing behavior change, which is essential in a voluntary framework. Key contributions include increasing defensible space adoption on private parcels, improving homeowner understanding of structure-to-structure fire risk, and reinforcing the importance of routine maintenance (e.g., needle removal, chimney cleaning). Additionally, the Task Force supports awareness of utility corridor management and vegetation clearance and promotes evacuation readiness and shared community protocols.

Without sustained education, even well-designed CWPP strategies will not translate into on-the-ground risk reduction. Task Force Three ensures that knowledge leads to action.

4. Forward-Looking Program (Post-CWPP Approval)

Task Force Three is designed as a permanent, ongoing function of HSA, with structured but flexible programming.

4.1 Continued Monthly Education Program

The Task Force will maintain monthly wildfire education communications and evolve content to reflect emerging wildfire science and best practices, insurance and risk considerations (e.g., defensibility, insurability trends), and post-fire recovery and resilience strategies. The programming will incorporate seasonal readiness cycles: Spring will focus on fuels reduction and property preparation; Summer on active fire season awareness and readiness; Fall on maintenance and mitigation follow-through; and Winter on planning, learning, and community engagement.

4.2 Expanded Training and Events

Task Force Three will continue to organize and expand:

4.2.1 Guest Speaker Program

The Guest Speaker Program will continue, targeting partners such as the La Cueva Volunteer Fire Department, the Sandoval County Office of Emergency Management, and the New Mexico Energy, Minerals and Natural Resources Department and Rural Water Association. Other partners include the Jemez Mountains Firewise Association, Santa Fe National Forest Jemez Ranger District, Cuba Soil and Water Conservation District, Jemez Mountains Electric Cooperative, and state, regional, and national wildfire experts. These partners provide expertise across fire behavior and suppression, emergency response and evacuation, forest and fuels management, infrastructure resilience, and insurance and risk reduction.

4.2.2 Workshops and Practical Training

Future programming for Workshops and Practical Training may include defensible space and home hardening workshops, property walkthrough demonstrations (what “good” looks like on the ground), evacuation readiness exercises (routes, timing, coordination), emergency communication system training, and contractor education sessions to align local service providers with CWPP goals.

4.3 Community Engagement Channels

Task Force Three will continue to use email communications as the primary channel, the HSA Facebook group for supplemental engagement, and in-person meetings and

seasonal events. Potential future channels include special virtual sessions with wildfire experts and establishing a resource library or document repository. The goal is to meet residents where they are, ensuring consistent and accessible engagement.

4.4 Coordination with Other Task Forces

Task Force Three will actively coordinate with mitigation-focused project teams to reinforce implementation priorities, with emergency preparedness efforts to align messaging on evacuation and response, and with HOA leadership to ensure consistency with inspection programs and community standards. This coordination ensures that education is not isolated, but directly tied to action and outcomes.

5. Measures of Success

Success for Task Force Three will be evaluated through increased participation in community events, Chipper days, and mitigation programs. It will also be measured by observable improvements in defensible space conditions and property maintenance behaviors, as well as growth in resident awareness, engagement, and the use of emergency communication systems.

Over time, the ultimate measure of success is reduced community vulnerability to wildfire.

6. Conclusion

Task Force Three – Training & Education ensures that the HSA CWPP remains active, relevant, and effective over time. By maintaining a steady cadence of communication, bringing in trusted experts, and fostering a culture of shared responsibility, the Task Force supports meaningful, sustained wildfire risk reduction.

In a community where many of the most critical actions occur on private property and outside formal regulation, this work is not optional—it is foundational.

Lidar-Based Assessment of Forest Canopy Around the Horseshoe Springs Community

Jemez Mountains, New Mexico

DRAFT REPORT

Thomas W. Swetnam

Jemez Mountains Firewise Association

With technical assistance by Tyson L. Swetnam

March 1, 2026

Introduction

The Horseshoe Springs community is a small, historic enclave of summer homes and cabins located near La Cueva in the Jemez Mountains of north-central New Mexico. Nestled within a mixed-conifer forest at approximately 2,500 meters (8,200 feet) elevation, the community occupies a setting of exceptional natural beauty—but also one of increasing wildfire risk. The surrounding Jemez landscape has experienced several major wildfires in recent decades, including the Las Conchas Fire (2011) and the Thompson Ridge Fire (2013). The 2013 wildfire burned within a few kilometers of the community.

Understanding the structure and density of the forest canopy surrounding homes in communities like Horseshoe Springs is critical for developing effective Community Wildfire Protection Plans (CWPPs). Traditional field-based assessments of forest structure are time-consuming, expensive, and limited in spatial coverage. A team of foresters conducting plot-based measurements might require weeks to characterize forest conditions across an area the size of the Horseshoe Springs community, and the resulting data would represent only a statistical sample rather than a wall-to-wall characterization.

Lidar (Light Detection and Ranging) technology offers a powerful alternative approach that can rapidly characterize forest structure over large areas with high spatial resolution and accuracy. Airborne Lidar systems emit thousands of laser pulses per second toward the ground surface, recording the three-dimensional coordinates of each reflected return. In forested environments, some pulses reflect off the tree canopy while others penetrate through gaps to reach the ground, enabling the simultaneous measurement of both terrain elevation and vegetation height. The resulting point clouds can be processed to generate detailed models of canopy height, individual tree dimensions, and forest density at spatial resolutions of one meter or better.

The purpose of this report is to describe and illustrate the use of 2024 Lidar data encompassing the Horseshoe Springs community for possible application in their Community Wildfire Protection Plan. Specifically, I demonstrate how Lidar-derived data products—including canopy height models, tree height distributions, canopy cover percentages, and building-level canopy assessments—can provide detailed, spatially explicit information about forest conditions that is directly relevant to wildfire risk assessment and mitigation planning. This report is intended as an initial demonstration of the analytical capabilities that Lidar data provide, and the methods described here could be refined and extended for a more comprehensive community-level wildfire risk assessment.

Methods

Lidar Data Acquisition

I acquired the 2024 Lidar data from the Valles Caldera National Preserve, collected by the National Park Service as part of their ongoing resource monitoring program. The full dataset is approximately 3 terabytes in size and covers the Valles Caldera and surrounding areas in the Jemez Mountains of northern New Mexico. The data were collected using an airborne Lidar system that provides high-density point cloud coverage with multiple returns per pulse, enabling detailed characterization of both terrain and vegetation structure.

For this analysis, I extracted a subset of six Lidar tiles arranged in a 2-column (East–West) by 3-row (North–South) grid centered on the Horseshoe Springs community. The study area encompasses approximately 30.9 hectares of mixed-conifer forest and the residential properties within the community. The approximate coordinates of the study area corners are: Northwest (35.895° N, 106.650° W), Northeast (35.895° N, 106.635° W), Southwest (35.880° N, 106.650° W), Southeast (35.880° N, 106.635° W). The elevation across the study area ranges from approximately 2,450 to 2,550 meters above sea level.

Software and Analysis Environment

All geospatial analyses were conducted using QGIS, an open-source geographic information system, with an AI-assisted interface provided by Claude Sonnet 4.6 (hereafter referred to as CS). CS was used interactively through a Model Context Protocol (MCP) connection to QGIS, enabling me to direct complex geoprocessing operations through natural-language instructions. This approach substantially accelerated the analysis workflow, as CS was able to execute processing algorithms, manage layer styling, and generate cartographic outputs on my behalf.

Canopy Height Model Generation

The fundamental data product for this analysis was a Canopy Height Model (CHM), generated by subtracting the Digital Elevation Model (DEM) from the Digital Surface Model (DSM) for each of the six Lidar tiles. The DEM represents the bare-earth terrain surface, while the DSM represents the highest return surface, which corresponds to the top of vegetation, buildings, or other elevated features. The difference (DSM minus DEM) yields the height of objects above ground level—in forested areas, this primarily represents tree canopy height. The resulting CHM was mosaicked into a single continuous raster layer covering the full study area.

Tree Height Analysis

Using the CHM, I asked CS to identify and label local maxima representing individual tree tops across the study area. A minimum height threshold of 2 meters was applied to exclude ground-level vegetation and shrubs. CS then computed the frequency distribution of tree heights across the entire study area, binned into 2-meter height classes from 2 meters to 46 meters. These results were tabulated and visualized as a bar chart. I also asked CS to compute crown base height (CBH), which it did from a sampling of the raw point cloud data for all trees (in the las files), and using the h10 metric: mean of 10th-percentile canopy base height from voxel-based LiDAR analysis (CBH raster pixel size = 2 meters).

Ancillary Data Layers

To provide geographic context for the analysis maps, I asked CS to retrieve road and stream course vector layers from the OpenStreetMap (OSM) database via the Overpass API (<https://overpass-api.de/api/interpreter>). These layers were overlaid on the Lidar-derived products to provide spatial reference for interpreting the results.

Canopy Cover Analysis

Using the CHM, I directed CS to carry out a tree segmentation analysis to delineate individual tree crowns across the study area. From the segmentation results, CS computed a canopy cover percentage raster by calculating the proportion of pixels with canopy height greater than 2 meters within a moving window. The resulting canopy cover surface was then contoured at 10-percent intervals to produce a canopy cover map illustrating spatial variation in forest density across the study area.

Building-Level Canopy Assessment

To assess wildfire risk at the individual structure level, I asked CS to import a building footprint database from the Microsoft Building Footprints dataset (<https://github.com/microsoft/USBuildingFootprints>), which provides georeferenced building polygons derived from satellite imagery using computer vision techniques. This open dataset covers the entire United States and provides polygonal outlines of detected building structures. CS then calculated the percentage of canopy cover within a 20-meter radius around each building centroid for the 19 structures identified within the core Horseshoe Springs community area. The results were tabulated and mapped, with each building labeled by its identification number and canopy cover percentage.

Results

Canopy Height Model and Tree Heights

The Canopy Height Model (CHM) reveals a landscape dominated by tall, mature forest surrounding the Horseshoe Springs community. Figure 1 shows an overview of the CHM across the study area with labeled maximum tree heights. The color gradient progresses from green (shorter vegetation) through yellow and orange to red (tallest trees), providing an intuitive visual representation of the forest canopy structure.



Figure 1. Canopy Height Model (CHM) of the Horseshoe Springs study area showing tree heights (green to red color gradient) overlaid on the terrain. Labeled points indicate maximum tree heights detected by the Lidar analysis. Roads (yellow lines) and stream courses (pink lines) are from Sandoval County databases.

The CHM clearly shows that tall trees (exceeding 25–30 meters) are abundant throughout much of the study area, particularly along stream corridors and in areas that were never subject to commercial logging. The Horseshoe Springs community,

historically an old campground and summer home area, retains many large, old-growth trees that contribute to its forested character but also pose significant wildfire risk.

Figure 2 presents a more detailed map of the central part study area around the Horseshoe Springs community with maximum tree heights labeled at specific locations across the landscape. This map includes road and stream layers for geographic context, and illustrates the spatial distribution of the tallest trees in the area.

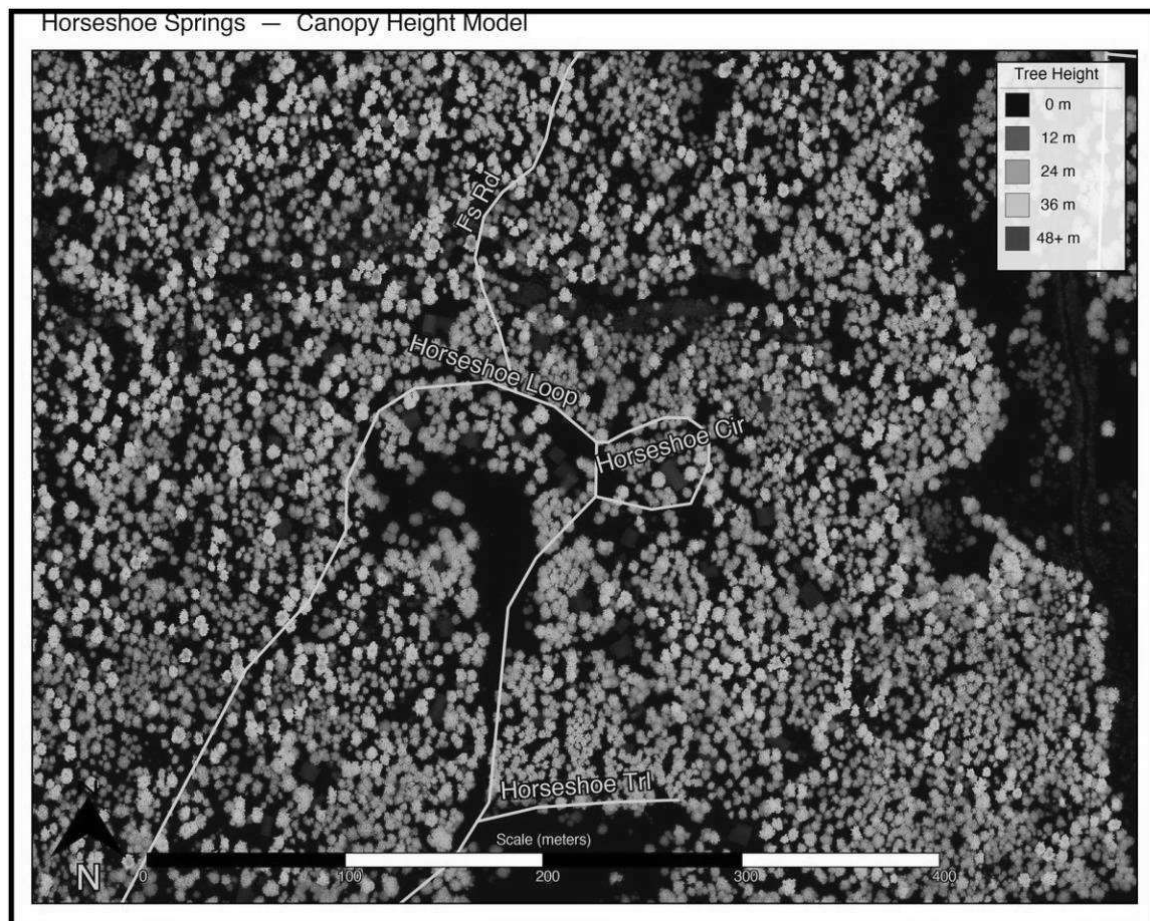


Figure 2. Map of the Horseshoe Springs study area with maximum tree heights (in meters) labeled at selected locations. Roads (yellow lines) are shown for geographic reference (however, note they are slightly mislocated in places). Background color indicates canopy height (green to red gradient).

Maximum tree heights detected across the study area range from approximately 20 meters to over 45 meters (66 to nearly 150 feet). Trees exceeding 35 meters in height are concentrated in several areas, including along riparian zones and in dense forest stands to the north and west of the main residential cluster. Figure 3 provides an oblique Google Earth perspective view of the study area with tree height labels overlaid, offering a three-dimensional sense of the landscape and forest structure.

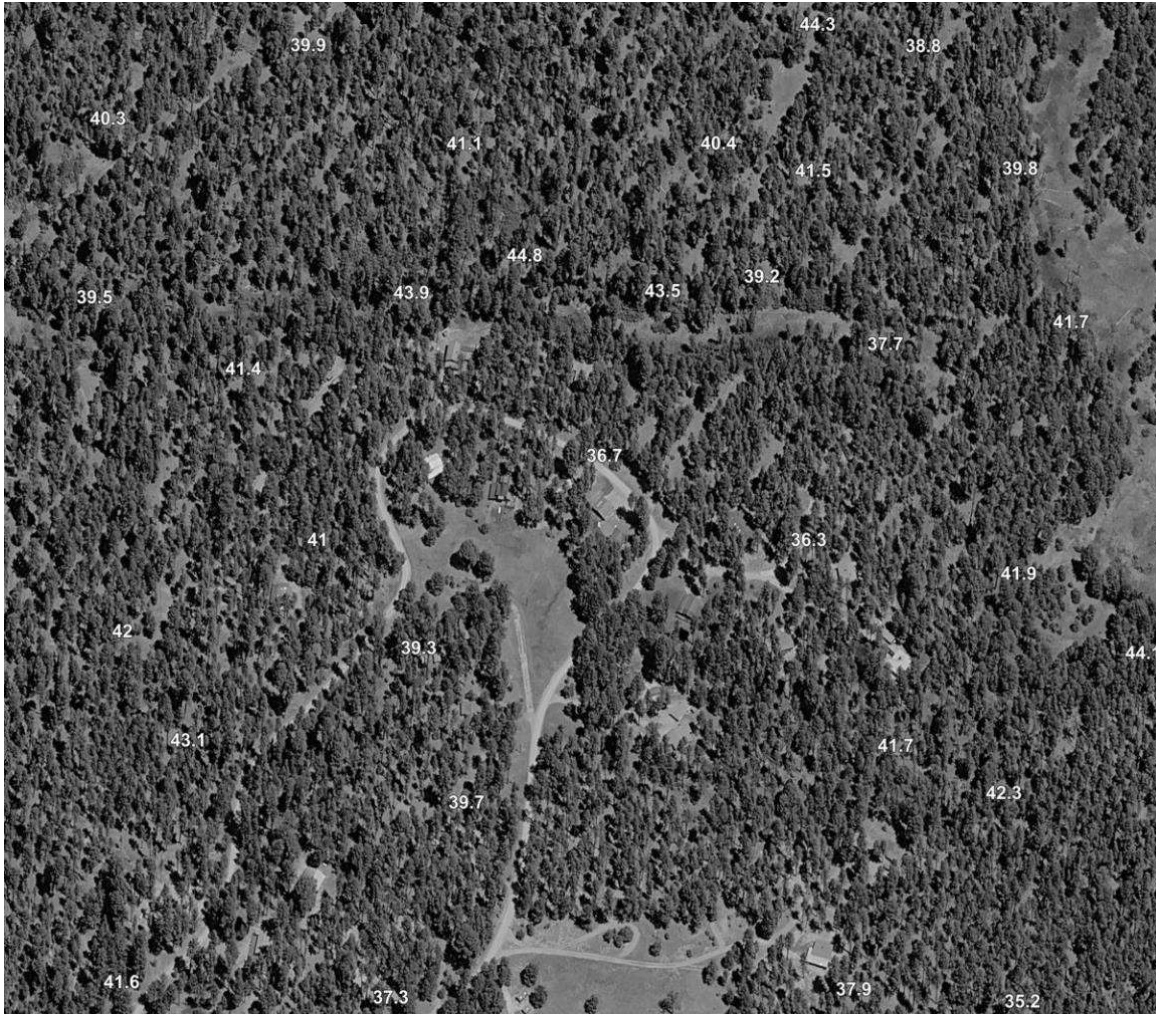


Figure 3. Oblique Google Earth view of the Horseshoe Springs area with maximum tree heights (in meters) labeled at selected locations. This perspective illustrates the terrain and forest setting of the community.

Tree Height Distribution

The tree segmentation analysis identified a total of 7,018 individual trees across the 30.9-hectare study area, yielding an overall tree density of approximately 227 trees per hectare. Figure 4 shows the frequency distribution of tree heights, and Table 1 presents the detailed breakdown by 2-meter height class.

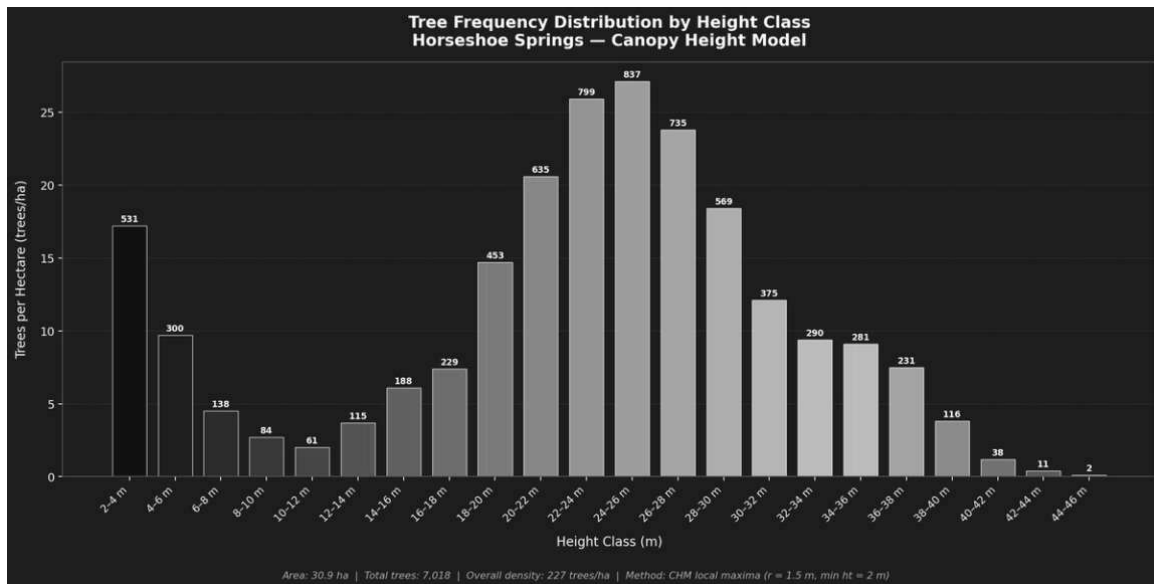


Figure 4. Frequency distribution of tree heights across the Horseshoe Springs study area, based on individual tree segmentation from the Canopy Height Model. Heights are binned in 2-meter classes.

The distribution reveals a distinctive bimodal pattern. There is a peak of shorter trees in the 2–4 meter height class (531 trees, 7.6% of total), which likely represents regenerating understory trees, saplings, and tall shrubs. Tree counts then decline through the 6–12 meter range before increasing again, with the dominant peak occurring in the 24–26 meter height class (837 trees, 11.9%). This second, larger peak represents the mature canopy trees that dominate the forest overstory.

Trees taller than 30 meters (approximately 100 feet) constitute a substantial component of the forest, with 1,344 trees (19.1% of all trees) exceeding this height. The 24–30 meter height range alone accounts for 2,171 trees (30.9% of the total), forming the dominant canopy stratum. A small number of exceptionally tall trees (13 individuals) exceed 42 meters (138 feet) in height, representing some of the tallest conifers in the Jemez Mountains. These giants are likely old-growth ponderosa pine or Douglas-fir specimens that have survived multiple fire cycles over centuries.

From a wildfire risk perspective, the bimodal distribution is significant. The abundance of shorter trees in the 2–10 meter range represents ladder fuels—vegetation that can carry fire from the forest floor into the upper canopy. When ladder fuels connect to a dense overstory canopy, the conditions are favorable for the initiation and spread of crown fire, which is the most destructive and difficult-to-control fire behavior. The vertical continuity of fuels from the understory through the mid-canopy to the upper canopy is a primary concern for wildfire protection.

This height distribution is consistent with an uneven-aged, multi-layered forest structure typical of mixed-conifer stands in the Jemez Mountains that have not been commercially

logged. The preponderance of tall trees (20–32 meters) underscores the old-growth character of the forest surrounding Horseshoe Springs and implies high fuel loading in the canopy layer. In natural fire regimes, frequent low-intensity surface fires would have thinned the understory and maintained a more open forest structure, but decades of fire suppression have allowed these ladder fuels to accumulate.

Table 1. Tree Height Distribution by 2-Meter Height Class.

Height Class (m)	Tree Count	Trees per ha	% of Total	Cumulative %
2–4 m	531	17.2	7.6	7.6
4–6 m	300	9.7	4.3	11.9
6–8 m	138	4.5	2.0	13.9
8–10 m	84	2.7	1.2	15.1
10–12 m	61	2.0	0.9	16.0
12–14 m	115	3.7	1.6	17.6
14–16 m	188	6.1	2.7	20.3
16–18 m	229	7.4	3.3	23.6
18–20 m	453	14.7	6.5	30.1
20–22 m	635	20.6	9.0	39.1
22–24 m	799	25.9	11.4	50.5
24–26 m	837	27.1	11.9	62.4
26–28 m	735	23.8	10.5	72.9
28–30 m	569	18.4	8.1	81.0
30–32 m	375	12.1	5.3	86.3
32–34 m	290	9.4	4.1	90.4
34–36 m	281	9.1	4.0	94.4
36–38 m	231	7.5	3.3	97.7
38–40 m	116	3.8	1.7	99.4
40–42 m	38	1.2	0.5	99.9
42–44 m	11	0.4	0.2	100.1
44–46 m	2	0.1	0.0	100.1
Total	7018	227.1	100.0	

Note: Analysis is based on 7,018 individual trees identified across 30.9 hectares. Trees below 2 meters in height were excluded from the analysis.

Canopy Cover Analysis

Figure 5 presents the canopy cover map for the study area, displaying contoured zones of percent canopy cover derived from the tree segmentation analysis. This map provides a spatial overview of how forest density varies across the landscape and within the community.

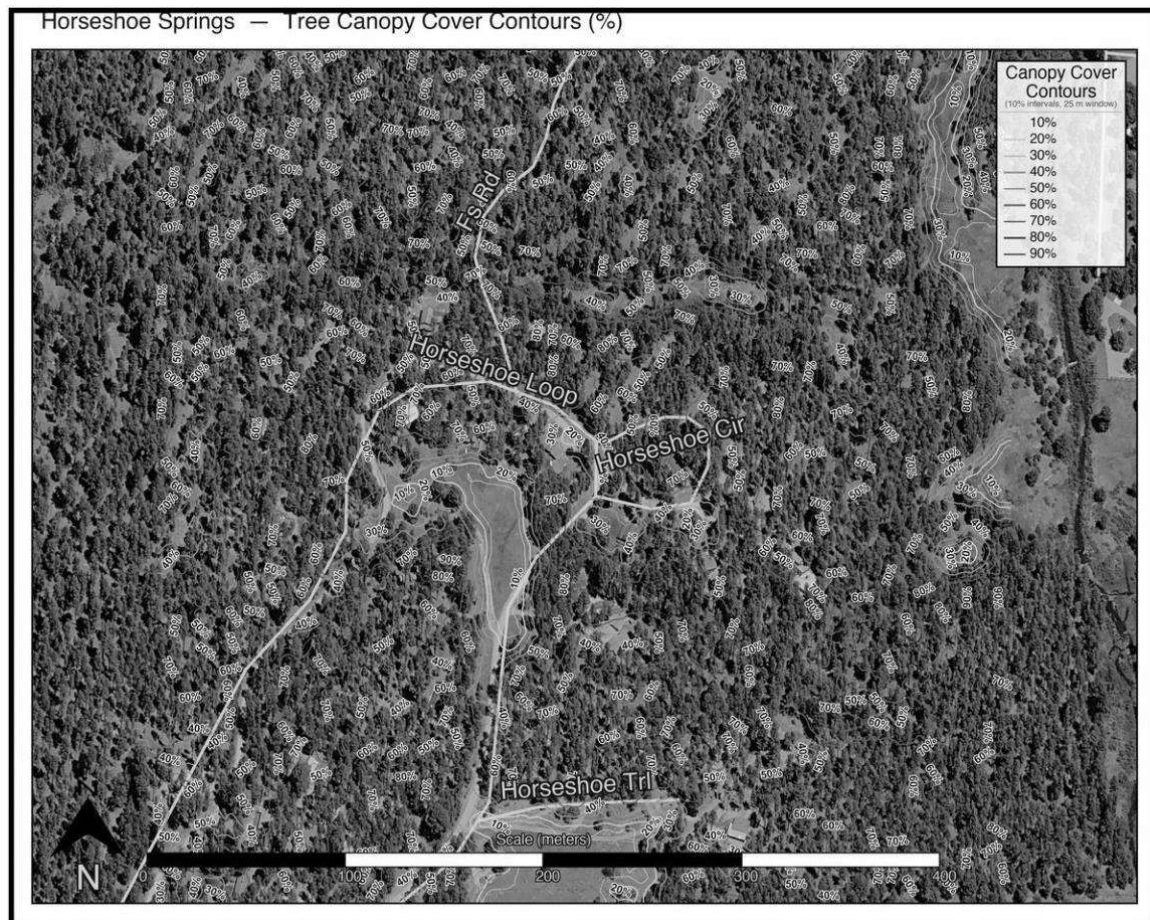


Figure 5. Canopy cover percentage map of the Horseshoe Springs study area. Contour lines represent percent canopy cover at 10% intervals. The labels mark the % contours. Dark green color contours indicate higher canopy density; light green indicate lower density. See Figure 6 for easier to see contours in blue to red color scale, and zoom in to see more detail.

The canopy cover analysis reveals considerable spatial variation in forest density across the study area. Some portions of the community, particularly along access roads and in areas where previous clearing or natural openings occur, exhibit relatively low canopy densities of less than 30 percent. These areas represent locations where defensible space around structures may already be partially established, either intentionally or by circumstance.

In contrast, other portions of the study area—particularly in the interior forest stands and along riparian corridors—show canopy densities exceeding 50 percent, and in some locations approaching 70–90 percent. These high-density areas represent zones of elevated wildfire risk where crown fire spread is most likely under extreme fire weather conditions. The juxtaposition of homes with areas of high canopy density is a primary concern for wildfire protection planning.

Building-Level Canopy Assessment

Figure 6 presents the building-level canopy cover analysis for structures within the Horseshoe Springs community. Using the Microsoft Building Footprints database, 19 buildings were identified within the core community area and labeled with their respective canopy cover percentages within a 20-meter radius.

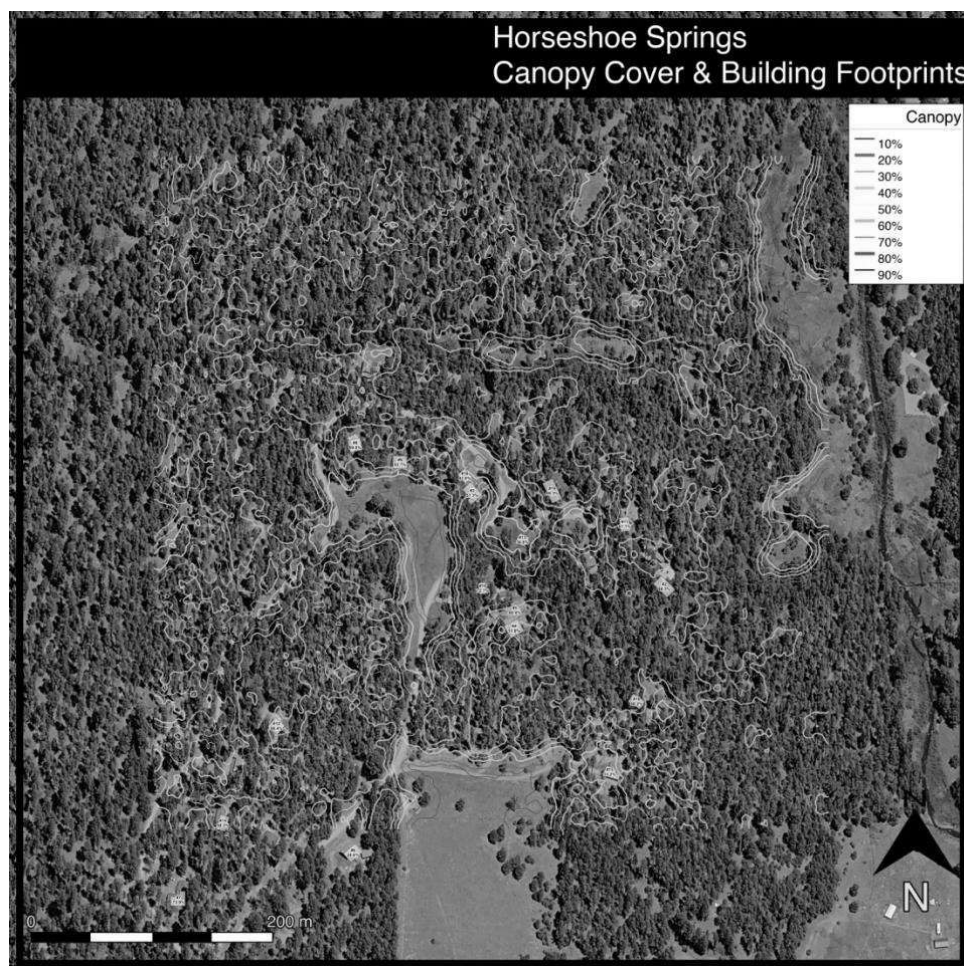


Figure 6. Building-level canopy cover assessment for the Horseshoe Springs community using the Microsoft Building Footprints database. Each building is labeled with its identification number and the percentage of canopy cover within a 20-meter radius from a centroid. The canopy cover percentage is shown as contours with a blue to red color scale. The dark orange to red contoured areas might be priority areas for canopy reduction. Zoom in to see labels on the houses and details of the contours.

Table 2 presents the detailed canopy cover and base height results for each of the 19 buildings identified in the analysis for 5, 15, and 20-meter buffer zones around the buildings (Figure 6 labels on the buildings show the canopy cover % for a 20-meter centroid of the buildings).

Table 2. Canopy Cover and Canopy Base Height around the 19 Buildings.

Bldg #	5 m Buffer		15 m Buffer		20 m Buffer	
	Cover	CBH h10	Cover	CBH h10	Cover	CBH h10
1	42.0	2.7	47.0	6.1	48.1	7.5
2	82.5	6.3	77.7	9.8	76.3	10.1
3	71.6	5.6	64.0	9.1	65.3	9.5
4	55.4	5.6	59.5	9.1	61.7	9.4
5	68.9	8.5	66.5	8.5	69.0	8.4
6	52.6	3.3	33.3	6.6	36.3	8.2
7	81.3	4.7	80.7	8.6	77.9	9.1
8	73.7	6.7	80.1	10.8	77.4	10.7
9	76.3	5.7	64.4	9.0	63.4	10.0
10	90.5	9.4	81.3	12.7	82.6	12.8
11	69.4	9.7	72.0	10.9	70.5	11.0
12	52.1	4.5	64.4	10.0	70.4	11.1
13	46.3	3.2	40.3	6.7	45.4	7.8
14	72.2	4.8	71.1	9.2	68.3	9.7
15	52.6	3.2	39.9	9.1	41.2	10.7
16	60.6	7.3	50.8	8.3	50.3	8.4
17	38.3	3.4	40.6	9.7	49.3	10.5
18	85.7	10.3	70.2	10.8	68.3	10.8
19	83.1	10.1	79.0	10.3	73.7	10.2
Mean	66.1	6.1	62.3	9.2	62.9	9.8
Min	38.3	2.7	33.3	6.1	36.3	7.5
Max	90.5	10.3	81.3	12.7	82.6	12.8

Notes: Canopy Cover (%) = proportion of CHM pixels ≥ 2 m within each zone (CHM pixel size ≈ 0.31 m). CBH h10 (m) = mean of 10th-percentile canopy base height from voxel-based LiDAR analysis (CBH raster pixel size = 2 m). Buffer zones are measured outward from outer building polygon edges and include the building footprint itself.

Color scale — Cover (%): < 35% (orange) 35–50% (yellow) 50–65% (pale green) 65–80% (medium green) $\geq 80\%$ (dark green) | CBH h10 (m): < 3.5 m (orange) 3.5–6 m (pale blue) 6–9 m (medium blue) 9–11 m (strong blue) ≥ 11 m (deep navy)

The building-level analysis reveals a wide range of canopy cover conditions around individual structures. Canopy cover percentages range from 33.3% (Building #6, 15-meter zone) to 90.5% (Building #7, 5-meter zone), with a mean canopy cover across all

19 buildings of approximately 62 to 66% (all zones). This is a notably high average, suggesting a somewhat dense forest setting of the Horseshoe Springs community. This might suggest that most of the identified properties are surrounded by dense forest that could facilitate fire spread to the structures.

However, many of the trees in the Horseshoe Springs community area are quite tall (and old) ponderosa pines, with clear boles for some distance above ground before live branches appear. The average canopy base height estimates from the Lidar point cloud analyses show that, in general, the tree branches and foliage range from about 6 to 10 meters above ground within the 5-to-20-meter buffer zones around the buildings. This means that overall fire risk is probably not as high as the canopy cover percentages alone might suggest. There are four buildings (Buildings #s 1, 6, 13, and 17), however, that appear to have somewhat lower canopy base height nearby (within the 5-meter zone), with minimum heights of 2 to 4 meters. These might be candidates to assess on the ground for potential tree removal or other risk mitigation.

It is important to note several limitations of this building-level analysis. First, the Microsoft Building Footprints database does not include all buildings in the Horseshoe Springs community. The database detected 19 structures within the analysis area, but the actual number of homes, cabins, and outbuildings in the community is higher (maybe ~25?). The Microsoft dataset is derived from automated computer vision analysis of satellite imagery, and smaller structures, buildings obscured by dense tree canopy, or structures built after the imagery was captured may not be represented. A visual comparison with high-resolution imagery (Figure 6) shows that several additional buildings exist in the community that were not captured in the database.

Second, the geographic locations of some buildings in the Microsoft database are slightly offset from their true positions. This positional inaccuracy arises from the automated detection process and can affect the precision of the canopy cover calculation for individual structures. In most cases, the offset is small (on the order of a few meters), but in a forested environment where canopy conditions can change substantially over short distances, even a modest positional error can influence the calculated cover percentage.

Despite these limitations, this analysis demonstrates the potential for individual house-level assessment of wildfire risk using Lidar-derived canopy data. The building-specific canopy cover percentages provide a quantitative basis for prioritizing which properties would benefit most from vegetation management and thinning operations. Future analyses could incorporate more complete and accurate building inventories—potentially derived from the Lidar data itself or from higher-resolution imagery—to provide a more comprehensive assessment.

To view a similar analysis across broader scales in Jemez Mountains communities, see this interactive map server weblink on the Jemez Mountains Firewise Association website: <https://sites.google.com/view/jmfa-nm/forest-assessment-project> This analysis was done several years ago, with detailed house-level mapping in the Area 3 and Seven Springs areas. The lidar data was also augmented with canopy data acquired with drone video and Structure From Motion analysis, all carried out by Tyson L. Swetnam, University of Arizona, CyVerse.

Conclusions

This report is intended to demonstrate the potential of Lidar remote sensing technology for assessing forest structure within and around a community of homes in the wildland-urban interface. The 2024 Lidar data from the Valles Caldera National Preserve provide remarkably detailed information about the three-dimensional structure of the forest surrounding the Horseshoe Springs community, and this information can be translated into quantitative metrics directly relevant to wildfire risk assessment.

Several key findings emerge from this analysis. First, many tall and large trees remain in and around Horseshoe Springs because this historic campground and summer home community was never commercially logged. The tree height distribution reveals a mature, multi-layered forest with a dominant canopy layer of trees in the 20–32 meter range and numerous individuals exceeding 35 meters. With an overall density of 227 trees per hectare and 7,018 individual trees detected across the 30.9-hectare study area, the forest represents substantial biomass and fuel loading. This old-growth forest character, while ecologically valuable and a defining feature of the community's identity, creates conditions where high-intensity crown fire is possible under severe fire weather conditions.

Second, canopy densities are relatively low in some areas (below 30%) within the community, but higher densities (exceeding 50%) are evident in other areas. The spatial pattern of canopy density is complex, with dense forest stands interspersed among clearings and areas of lower tree density. This heterogeneity means wildfire risk varies significantly over short distances within the community, and a one-size-fits-all approach to vegetation management may not be appropriate.

Third, the building-level canopy assessment using the Microsoft Building Footprints database shows that it is feasible to evaluate forest conditions around individual structures using Lidar data. The 19 buildings analyzed had a mean canopy cover of 63% within a 20-meter zone, with more than half exceeding 60%. Canopy base height, however, is generally greater than 6 meters, and this greatly reduces risk from surface fire, but not necessarily from spreading crown fire under very windy, dry conditions.

While the current analysis has limitations related to the completeness and positional accuracy of the building database, the approach shows clear promise for supporting parcel-level wildfire risk assessment and mitigation planning. Combining other building database information would likely yield a more complete inventory and analysis of buildings and the forest conditions around them.

This analysis and future refinements could assist the Horseshoe Springs community in several specific ways. Identifying individual homes and the surrounding areas that would benefit from canopy cover reduction is a direct application of these data. Setting quantitative targets for defensible space creation—for example, reducing canopy cover to below 30% within 20 meters of structures—becomes feasible when baseline conditions can be measured precisely from Lidar data. Monitoring the effectiveness of thinning and vegetation management treatments over time can be accomplished by comparing pre- and post-treatment Lidar datasets.

Looking ahead, several enhancements to this analysis could strengthen its utility for community wildfire protection planning. Lidar data can provide a 3-dimensional measurement of every tree within the scanned area. Using a whole-tree analysis of the point clouds, it would be possible to estimate a broad range of other metrics around individual homes, such as 1) shrub density, 2) tree canopy base height, 3) canopy volume, 4) tree diameter and basal area estimates (from allometric equations), and others.

Repeated Lidar acquisitions over time would enable monitoring of forest growth, treatment effectiveness, and natural disturbance impacts. Integration with other data sources—such as fuel moisture indices, weather station data, fire behavior modeling outputs, and historical fire perimeters—could provide a more comprehensive risk assessment framework. Additionally, higher-resolution building databases, possibly generated from the Lidar data itself, could improve the accuracy of structure-level assessments. On-site evaluations by trained experts will be key in validating/correcting Lidar-based estimates. A combination of on-site, expert assessments and remotely sensed metrics may provide the best available overall house-level to neighborhood-level, and broader assessments.

As wildfire risk continues to increase across the American West due to climate change, prolonged drought, and accumulated fuel loading from decades of fire suppression, tools like Lidar offer communities in the wildland-urban interface an objective, data-driven approach to understanding and mitigating their fire risk. The Jemez Mountains have already experienced devastating wildfires that have threatened nearby communities, and the question is not whether fire will return to the Horseshoe Springs landscape, but when. Being prepared with detailed, quantitative information about forest

conditions around homes and across the community is an essential first step in developing an effective response.

The analysis presented here represents an initial demonstration of what is possible with currently available Lidar data and open-source analysis tools, including QGIS and AI-assisted geospatial analysis workflows. I hope this report will contribute to the Horseshoe Springs community's ongoing efforts to protect their homes and their remarkable forest setting, and that it illustrates the broader potential of Lidar technology for supporting community wildfire protection planning throughout the fire-prone landscapes of the American West.

Acknowledgments

I thank Tyson L. Swetnam for technical assistance with Lidar data processing, QGIS configuration, and the Claude Sonnet AI interface. The 2024 Lidar data were provided by the Valles Caldera National Preserve, National Park Service. Building footprint data were obtained from the Microsoft Building Footprints dataset (<https://github.com/microsoft/USBuildingFootprints>). Road and stream vector data were sourced from OpenStreetMap via the Overpass API.

Assistance in generating a draft of this report was obtained using Claude (Opus 4.6). I (TWS) prepared a detailed outline to guide the drafting process, and I then extensively checked, edited, and revised the current draft.

Jemez 2024 Lidar tile IDs used in the analyses:

Position	Tile ID	Easting (m)	Northing (m)
NW	VCaldera_1712	350250–351000	3972750–3973500
NE	VCaldera_1713	351000–351750	3972750–3973500
MW	VCaldera_1674	350250–351000	3972000–3972750
ME	VCaldera_1675	351000–351750	3972000–3972750
SW	VCaldera_1632	350250–351000	3971250–3972000
SE	VCaldera_1633	351000–351750	3971250–3972000

Appendix 5: Base IBHS Homeowner Checklist

This checklist is based on IBHS Wildfire Prepared Home™ standards to help homeowners identify and mitigate structural and landscape vulnerabilities to achieve the **Essential** level certification. Additionally, the New Mexico Office of Superintendent of Insurance (OSI) provides a certification process through the IBHS for participating homeowners to qualify for potential insurance benefits and wildfire mitigation recognition.

Base Level (Essential) Requirements¹

Focuses on essential protection against wind-blown embers, the leading cause of home ignitions.

DEFENSIBLE SPACE

- ☐ **0-5 FT. Noncombustible Zone:** Maintain a continuous zone free of vegetation, mulch, overhanging branches, and combustible items. Replace wood or vinyl fencing within 5 feet of the home with noncombustible fencing (e.g. metal).
- ☐ **5-30 FT. Defensible Space - Vegetation:** Space trees and shrubs properly, keep grass trimmed, remove dead vegetation, and store firewood at least 30 feet from the home.
- ☐ **10-30 FT. Defensible Space - Detached Structures & Other Large Items:** Ensure hot tubs, propane tanks, sheds, and outdoor kitchens are properly placed, constructed, and surrounded by noncombustible materials. Limit to a maximum of 3 detached structures within 30 feet of the home. Maintain proper requirements and spacing from the home, decks, and other structures.

ROOF

- ☐ **Roof Covering:** Use a Class A fire-rated roof covering (e.g., asphalt shingles, tile, slate, or metal).
- ☐ **Gutters:** Install noncombustible gutters and downspouts (e.g., metal, aluminum).
- ☐ **Roof & Gutter Maintenance:** Routinely remove leaves, needles, and other vegetative debris from roof, gutters, and downspouts.

BUILDING FEATURES

- ☐ **6-Inch Vertical Noncombustible Siding Clearance:** Maintain 6 inches of noncombustible siding or exposed concrete foundation at the base of exterior walls and above attached decks or patios (also applies to deck post bases).
- ☐ **Decks, Patios, & Overhead Structures:** Remove debris regularly, replace combustible furniture with noncombustible options, maintain the 0-5 Foot Noncombustible Zone, remove underdeck storage, enclose low-elevation decks, and retrofit pergolas as needed.

¹ Follow the [link](#) for the official IBHS Base Certification checklist.

- [] **Vents:** Install flame- and ember-resistant vents, or cover existing vents with 1/8-inch corrosion-resistant metal mesh (roof, attic, eaves, foundation). Dryer vents must have functional louver/flap and no mesh.