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Montana Department of Military Affairs Wildfire Risk Assessment

Introduction

Wildfires pose substantial and lasting threats to public safety, critical infrastructure, regional economies, and ecological systems. For military training installations and nearby communities, the increasing frequency and severity of wildland fires jeopardize mission readiness, operational continuity, and long-term land sustainability. To address these challenges, it is essential to identify wildfire vulnerabilities and implement effective, scalable mitigation strategies that align defense priorities with community safety and regional resilience.

The Fort Harrison Training Area (FHTA) and Limestone Hills Training Area (LHTA) are critical Montana Army National Guard (MTARNG) training installations situated within wildfire-prone landscapes characterized by complex terrain, continuous fine fuels, shared transportation corridors, and close proximity to civilian communities. Both installations interface with multiple jurisdictions, including Lewis & Clark County, Broadwater County, state lands managed by the Montana Department of Natural Resources and Conservation (DNRC), and federal lands administered by the U.S. Forest Service (USFS) and Bureau of Land Management (BLM).

The nearby communities of Helena and Townsend function as military defense communities, providing essential support to MTARNG missions through housing, medical services, utilities, transportation networks, workforce availability, and emergency response capacity. Wildfire impacts affecting these communities, such as evacuations, infrastructure disruptions, or access restrictions, have direct consequences for installation operations, force readiness, and continuity of training missions at both FHTA and LHTA.

Recent wildfire seasons in Montana have demonstrated increased fire frequency, longer fire seasons, and growing operational complexity, resulting in greater reliance on interagency coordination for initial attack, aviation operations, evacuation, and public safety. Fires originating either on or off military installations can rapidly threaten training lands, adjacent defense communities, critical infrastructure, and regional transportation corridors, requiring coordinated action among military, local, state, and federal partners.

This Wildfire Risk Assessment (“assessment”) focuses on FHTA and LHTA assessment areas within Lewis & Clark and Broadwater Counties in West-Central Montana. This assessment also analyzes FHTA and LHTA themselves to the extent analyses of the surrounding areas affect the installations and management on the installations affect the surrounding areas. The FHTA installation, its surrounding three-mile CUB area, and associated WUI zone will be referred to as the “FHTA assessment area” throughout this assessment (Figure 1). The LHTA installation, its surrounding three-mile CUB area, and associated WUI zone will be referred to as the “LHTA assessment area” throughout this assessment (Figure 2). This assessment provides a structured framework to evaluate wildfire hazards across these critical military landscapes, supporting the

dual priorities of sustaining military readiness and enhancing ecological resilience, consistent with the objectives of the Readiness and Environmental Protection Integration (REPI) program. Through REPI, the United States Department of War (DoW) fosters partnerships with local governments, conservation organizations, and landowners to implement coordinated wildfire risk reduction efforts that preserve compatible land uses and protect mission-critical resources.

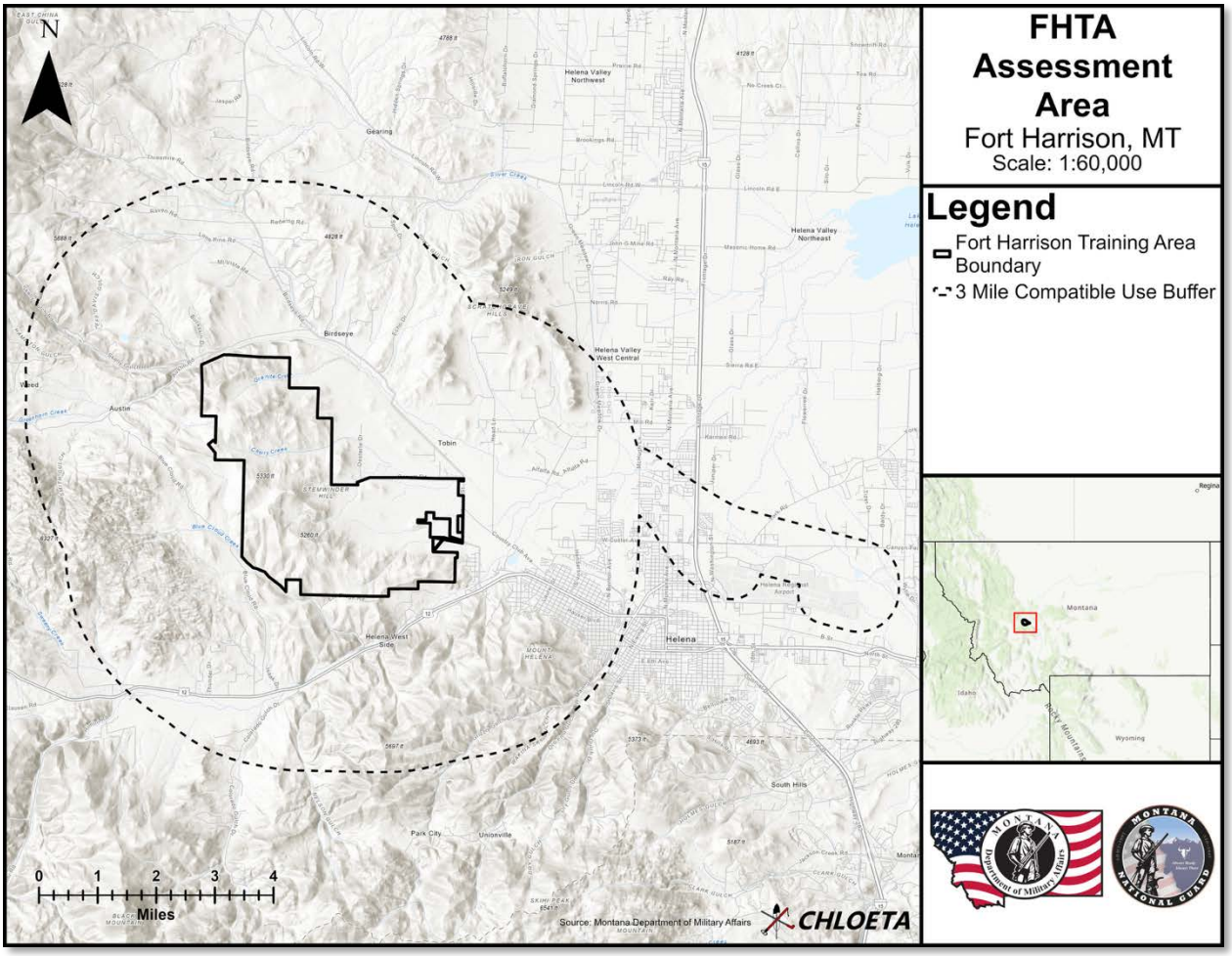


Figure 1. FHTA Assessment Area

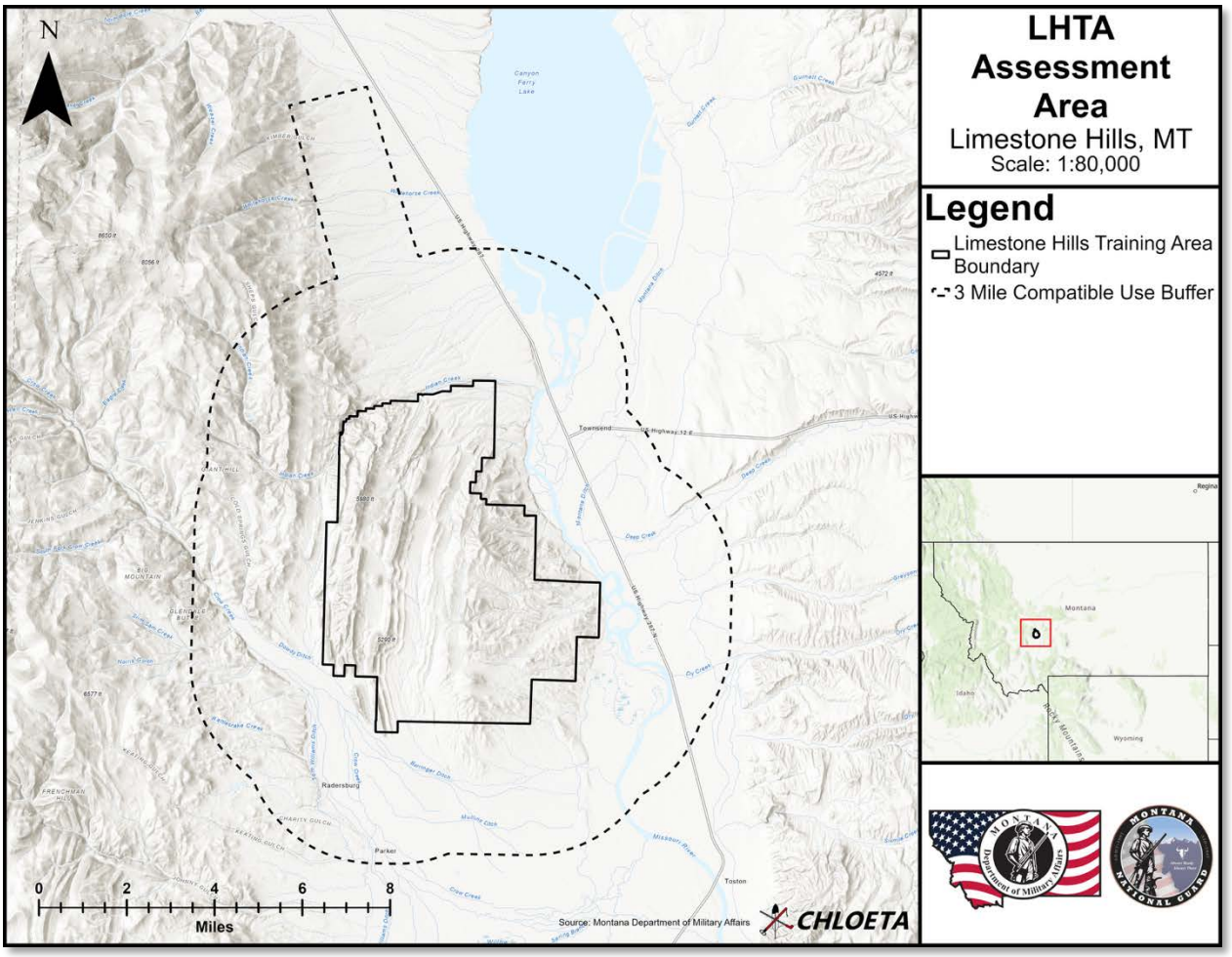


Figure 2. LHTA Assessment Area

The methodology used in this assessment centers on three core components: 1) modeling wildfire likelihood and intensity, 2) assessing fire effects and exposure, and 3) evaluating the relative importance of at-risk resources and assets that are vital to military operations and community integrity.

The goals of this assessment are to 1) reduce wildfire vulnerabilities 2) protect FHTA and LHTA training and emergency response capability; and 3) strengthen regional partnerships that support long-term resilience and national defense priorities.

This assessment focuses on evaluating and addressing wildfire risks that threaten the operational resilience of FHTA and LHTA assessment areas. The Montana Department of Military Affairs (DMA) currently relies on the Tri-County Regional Community Wildfire Protection Plan (CWPP) as the standardized tool for assessing wildfire risk and coordinating with local agencies that provide emergency response. Interagency Agreements (IAAs) are established with the Veterans Administration Fire Department (VAFD) for wildfire response on FHTA and with the USFS for response on LHTA. However, DMA lacks a site-specific assessment for either installation. Distinct

geology, vegetation, and climatic conditions between the two sites require independent analyses to accurately define each installation's risk profile. Most burnable acreage consists of unimproved natural lands that transition directly into developed, high-risk fire shed Wildland Urban Interface (WUI).

The WUI refers to areas where homes, businesses, and infrastructure meet or intermingle with undeveloped wildland vegetation, creating zones of elevated wildfire risk to both people and property. In 2023, the Montana Legislature formally adopted a statewide WUI definition and enabling WUI Code authority, directing state agencies and local jurisdictions to identify, map, and manage WUI zones using standardized criteria. This legislative action reinforces the requirement for state facilities, to understand their WUI exposure and to integrate WUI-specific mitigation measures, defensible-space standards, and building-resilience considerations into planning and operations. The adoption of this statewide framework underscores the urgency for installation-specific wildfire assessments that align with current Montana law, regional fire-management policy, and evolving wildfire behavior driven by landscape and weather conditions.

This assessment identifies targeted, achievable actions aligned with Tri-County FireSafe Working Group efforts and addresses the specific operational and environmental challenges withing the FHTA and LHTA assessment areas. While cooperative agreements with BLM, USFS, and DMA support wildfire suppression, proactive hazard reduction, selective thinning, prescribed burning, and firebreak maintenance, remains limited due to staffing and certification constraints. This assessment delivers actionable, site-specific recommendations to enhance resilience, reduce risk, and strengthen coordination across military and civilian jurisdictions.

Priority Findings and Recommendations

This assessment prioritizes findings and recommendations that directly address the most significant wildfire-related vulnerabilities impacting the FHTA and LHTA assessment areas. Findings were derived from detailed field assessments, stakeholder interviews, data analysis, and review of existing wildfire planning efforts. They focus on critical gaps in wildfire prevention, mitigation, coordination, and land use management. The recommendations that follow each finding are designed to be specific, feasible, and actionable. They identify responsible entities, geographic focus areas, and potential funding sources and outline strategies for integrating military resilience priorities into local and regional wildfire planning. Table 1 summarizes the priority findings, associated high-level recommendations, and provides related appendices and data sources.

Table 1. Finding and Recommendation Overview

Finding	High-Level Recommendation	Related Data Areas
1. Outdated Plans, Gap Analyses, and Unaligned Planning Frameworks	Deliver a planning realignment program that updates and embeds installation annexes in HMP/CWPP and establishes a 3–5-year plan	• Institutional Planning and Governance • 1. Outdated Plans, Gap Analyses, and Unaligned Planning Frameworks

Finding	High-Level Recommendation	Related Data Areas
	refresh cycle tied to OLDCC compliance.	• Appendix A: Policy, Procedures, Plans Gap Analysis
2. Governance and Coordination Gaps	Create an interagency governance structure (Joint Wildfire Coordination Group) to unify military, local, and state wildfire planning, response, and recovery functions.	• Stakeholders • Stakeholders Engaged in Wildfire Related Activities • 2. Governance and Coordination Gaps • Appendix B: Stakeholder Notes
3. Zoning and Policy Gaps Undermine Long-Term Wildfire Resilience	Amend county zoning to include wildfire overlays and defensible space standards; require wildfire mitigation in permitting and incentivizing clustered development.	• Institutional Planning and Governance • 3. Zoning and Policy Gaps Undermine Long-Term Wildfire Resilience • Appendix A: Policy, Procedures, Plans Gap Analysis
4. Incompatible Land Use and Encroachment Near Military Installations	Establish mandatory WUI overlay areas; implement interagency development review; conduct public education on military-compatible wildfire mitigation.	• Land Use • Land Use Compatibility • FHTA Assessment Area Hazard Summary • LHTA Assessment Area Hazard Summary • 4. Incompatible Land Use and Encroachment Near Military Installations • Appendix A: Policy, Procedures, Plans Gap Analysis • Appendix C: Wildfire Hazard Characterization
5. Infrastructure Vulnerabilities Impacting Access, Suppression, and Installation Operations	Upgrade FHTA and LHTA tactical roads, staging areas, and water storage infrastructure; coordinate facility hardening with DCIP and OLDCC partners.	• Critical Infrastructure and Access • Emergency Response Capacity • 5. Infrastructure Vulnerabilities Impacting Access, Suppression, and Installation Operations • Table 21. Utility Corridor Protection Locations, Actions, and Purposes • Table 22. Emergency Responder Optimized Routes, Recommendations, and Purposes

Finding	High-Level Recommendation	Related Data Areas
		• Table 23. Equipment Staging Area Locations, Recommendations, and Purposes • Table 24. Priority Protection Areas, Recommendations, and Rationale • Table 25. Water Availability Recommendations, Descriptions, and Priority Areas
6. Declining Availability of Resilience Funding	Advocate for bond renewal; create a blended funding pipeline (REPI, OLDCC); document acquisition and mitigation outcomes to strengthen future proposals.	• Institutional Planning and Governance • 6. Declining Availability of Resilience Funding • Appendix A: Policy, Procedures, Plans Gap Analysis
7. Wildfire Risk to Military Installations and Mission Readiness	Establish Joint Military–Civilian Wildfire Coordination Protocols (JMCWCP); create defensible space and fuel breaks; enable controlled burn authority for Range Operations.	• Regional Hazard Exposure • Critical Infrastructure and Access • 7. Wildfire Risk to Military Installations and Mission Readiness • Appendix C: Wildfire Hazard Characterization
8. Inadequate Access Routes and Infrastructure for Fire Response	Prioritize road hardening (e.g., Country Club Road, Williams Road) under OLDCC/DCIP; implement access planning and erosion control with NRCS and fire agencies.	• Critical Infrastructure and Access • 8. Inadequate Access Routes and Infrastructure for Fire Response • Appendix A: Policy, Procedures, Plans Gap Analysis • Table 22. Emergency Responder Optimized Routes, Recommendations, and Purposes)
9. Fragmented Land Use and Incompatible Development in the Compatible Use Buffer (CUB)	Require Fire-Wise standards in all CUB subdivisions via Growth Policy updates; fund strategic parcel acquisition using REPI and Open Space bonds.	• Land Use • Land Use Compatibility (FHTA) • Land Use Compatibility (LHTA) • 9. Fragmented Land Use and Incompatible Development in the Buffer • Land Use Planning and Zoning Updates • Compatible Use Buffers • Table 15. Areas of Concern Within the FHTA

Finding	High-Level Recommendation	Related Data Areas
		• Table 16. Areas of Concern Adjacent to the FHTA • Table 17. Areas of Concern Impacting the LHTA • Table 18. Areas of Concern Adjacent to the LHTA
10. Limited On-Site Fire Suppression and Over-Reliance on Regional Mutual Aid	Expand on-installation fire response capacity through cooperative staffing models, equipment sharing, and mutual-aid agreements codified under the Montana Master Cooperative Wildland Fire Management Agreement (2023–2027).	• Emergency Response Capacity (FHTA) • Emergency Response Capacity (LHTA) • Emergency Response Capacity • 10. Limited On-Site Fire Suppression and Over-Reliance on Regional Mutual Aid • Appendix A: Policy, Procedures, Plans Gap Analysis
11. Delayed or Constrained Aviation and Interagency Resources	Coordinate pre-season aviation agreements and resource-sharing triggers between DNRC, BLM, and DMA. Designate LHTA helispots and FHTA refueling areas as shared regional assets.	• Emergency Response Capacity (FHTA) • Emergency Response Capacity (LHTA) • Emergency Response Capacity • 11. Delayed or Constrained Aviation and Interagency Resources
12. Uncoordinated Civilian–Military Evacuation and Response Planning	Develop a joint evacuation annex (JMCWCP) integrating county EOPs, FHTA/LHTA access maps, and VA continuity routes; conduct joint tabletop and field exercises.	• Critical Infrastructure and Access • Emergency Response Capacity • 12. Uncoordinated Civilian–Military Evacuation and Response Planning • Appendix A: Policy, Procedures, Plans Gap Analysis • Table 24. Priority Protection Areas, Recommendations, and Rationale
13. Secondary Hazard Cascades from Wildfire Events	Establish post-fire recovery protocols addressing flooding, debris flow, and erosion risk; integrate NRCS and DNRC watershed programs for rapid stabilization.	• FHTA Assessment Area Hazard Summary • LHTA Assessment Area Hazard Summary • 13. Secondary Hazard Cascades from Wildfire Events • Appendix D: Endangered Species

Assessment Organization

This assessment is organized to provide a concise, actionable evaluation of wildfire vulnerabilities that threaten mission assurance in the FHTA and LHTA assessment areas. The plan details background information, describing the operational significance of FHTA and LHTA, stakeholder roles, and the unique landscape characteristics influencing wildfire risk starting with regional wildfire hazard assessment then focuses on FHTA and LHTA hazard assessments. The core of this assessment is organized around clearly defined impacts identified through stakeholder interviews, field observations, and existing documentation. Each Impact is addressed in its own subsection and fully detailed, identifying location, responsible entities, military training and public safety effects, and current management conditions. These Impact descriptions are informed by and support the Findings section, which presents the most urgent vulnerabilities based on feasibility and effect. The plan concludes with a set of prioritized, location-specific recommendations tied directly to each finding, offering implementable strategies and identifying potential funding sources. Supporting maps, datasets, and stakeholder input are embedded or referenced throughout to ensure clarity, traceability, and usability.

Assessment Methodology

This assessment employed a multi-tiered methodology designed to integrate local operational knowledge, regional planning frameworks, and geospatial hazard modeling to produce actionable, landscape-specific recommendations. The process began with a comprehensive review of existing local, state, and federal plans to align this assessment with current hazard mitigation strategies, land use policies, and mission-critical military planning documents. These sources provided the background for the policy and planning context currently in place for FHTA, LHTA, and the surrounding assessment areas.

Parallel to this document review, the project team conducted in-depth stakeholder interviews with over 30 agency representatives, including military range managers, county planners, emergency managers, conservation staff, and utility and fire officials. These interviews provided direct insight into real-world operational gaps, response challenges, interagency coordination barriers, and mitigation needs that may not be captured in existing plans.

To quantify wildfire hazard exposure, the team applied a Geographic Information System (GIS)-driven spatial analysis framework incorporating current vegetation and fuels data (LANDFIRE 2022), topography (USGS 10m Digital Elevation Models) and fire behavior modeling inputs (Remote Automated Weather Station [RAWS] and FlamMap). Ignition sources, critical infrastructure, evacuation constraints, and community assets were overlaid to develop a composite wildfire risk surface for both installations and adjacent high-risk development areas. This dual approach, rooted in both policy analysis and technical modeling, enabled the identification of measurable and actionable wildfire vulnerabilities while providing a foundation for prioritizing cross-jurisdictional mitigation investments.

Local, State, and Federal Plans

This assessment utilized a robust set of existing local, regional, and federal planning documents to identify current land use policy, mission assurance priorities, and wildfire mitigation frameworks. While these documents provide a strong foundation, gaps remain in enforceable WUI-specific land use standards, pre-disaster evacuation planning, and integrated mitigation funding strategies. This assessment bridges those gaps by identifying practical, location-specific recommendations that align with current plans while strengthening operational coordination and fundability across jurisdictions. Table 2 summarizes local, state, and federal plans, studies, and frameworks with additional detail developed in Appendix A: Policy, Procedures, Plans Gap Analysis.

Table 2. Local, State, and Federal Integrated Plans, Studies, and Frameworks

Plan/Study/Source	Use in Assessment	Noted Weakness(es)
Lewis & Clark County HMP (2021)	Identifies wildfire as a top hazard; promotes defensible space, community awareness, and WUI risk reduction.	Does not address wildfire threats specific to FHTA or include REPI-supported strategies.
Broadwater County HMP (2022)	Recognizes wildfire exposure in rural areas; references interagency coordination needs.	Lacks detail on LHTA-specific risks or adjacent buffer areas.
Tri-County Regional CWPP (2020)	Guides shared fuel mitigation areas, fire response, and regional collaboration.	General strategies; lacks site-specific mitigation actions for fire start moving on or off installation.
Western Montana Regional Hazard Mitigation Plan (2024)	Offers regional context and multi-county coordination mechanisms.	No direct integration of military training sites or CUB priorities.
2023 Montana State Multi-Hazard Mitigation Plan	Confirms wildfire as a statewide concern driven by extended dry conditions and WUI development.	Strategic-level plan; lacks operational recommendations for military-civilian areas.
Northwestern Energy Wildfire Mitigation Plan (2025)	Informs ignition risks from power infrastructure and vegetation management around critical corridors.	Utility-focused; limited alignment with military mission protection.
Department of Defense Issuance [DoDI] 6055.17 (Installation Emergency Management Program) (2017)	Defines DoW emergency preparedness and response compliance expectations.	Does not specify wildfire mitigation actions or off-post engagement requirements.
Department of Homeland Security (DHS) Mission Assurance and Infrastructure Guidance (2024)	Supports continuity planning and resilience of key defense infrastructure.	Strategic scope only; lacks tactical detail relevant to Montana installations.

Plan/Study/Source	Use in Assessment	Noted Weakness(es)
REPI Program and Conservation Project Documentation (2023)	Promotes compatible land use and limits encroachment through easements and acquisition.	Relies on matching funds; future availability and prioritization remain uncertain.
Lewis & Clark County Zoning Regulations (2022)	Provides parcel-level land use context to assess development pressure and compatibility around FHTA.	Does not include fire-adapted construction or WUI-specific land use provisions.
Lewis & Clark County Growth Policy (Draft 2024)	Highlights development trends and recommends open-space protection in high-risk fire corridors	Lacks enforceable measures or implementation strategies linked to wildfire mitigation.
Broadwater County Growth Policy Addendum (2024)	Supports agricultural and open land conservation near LHTA and Townsend; aligns with resilience themes.	No dedicated wildfire overlay areas or WUI-specific growth restrictions.
FHTA and LHTA Real Property Master Plans (2023)	Provide installation layout, land management areas, and training area constraints affecting fire mitigation.	Do not include wildfire vulnerability mapping or risk prioritization in buffer areas.
INRMPs (2021)	Outline habitat management, prescribed burn capacity, and stewardship around sensitive areas.	Not fully coordinated with CWPP or community mitigation efforts.
FHTA JLUS (2014)	Identifies compatibility concerns and growth pressure near FHTA and Helena Valley.	Outdated; does not reflect recent land use changes or current wildfire planning needs.
Local Evacuation Plans (None)	Not integrated; relied on informal references and emergency procedures from partner agencies.	No formal published evacuation plans for fire scenarios near installations.
MTARNG Integrated Wildland Fire Management Plan (IWFMP) (2024)	Establishes the framework for wildfire prevention, preparedness, and suppression at the FHTA and LHTA Training Areas; provides risk ratings, fuel models, and response coordination procedures consistent with Army G9 and DoW fire management policy.	Focused primarily on on-installation operations with limited integration into local and regional planning frameworks. Does not include ignition density or smoke dispersion overlays, lacks joint fuel-management and evacuation coordination with counties, and omits detailed interagency communication playbooks or grid disruption contingencies.
Montana Legislature – MCA 76-13-145 (2023)	Establishes framework for governing development, defensible space, and building standards within Wildland–Urban Interface areas; used to evaluate compliance, vulnerability, and hazard exposure in assessment area.	No formal municipality adoption.

Stakeholders

Effective wildfire risk analysis for FHTA and LHTA assessment areas required coordinated input from a diverse network of stakeholders spanning military operations, emergency management, land use planning, infrastructure management, and environmental stewardship. The engagement process was designed to gather qualitative insights, validate technical data, and ensure alignment with existing and future planning efforts.

Key elements of the process included the following:

- A kickoff meeting with core project partners to establish goals, timeline, and engagement structure.
- Interviews with personnel from the DMA, Montana Army National Guard (MTARNG), the Montana Department of Natural Resources and Conservation (DNRC), the USFS, the City of Helena, Lewis & Clark and Broadwater county governments, emergency managers, utility providers, and land conservation organizations.
- Field visits and windshield surveys with installation and agency personnel to ground-truth asset conditions and hazards.
- Stakeholder workshops to review findings, identify data gaps, and prioritize recommendations.
- Public engagement through targeted outreach, including surveys and community meetings (where applicable).

This multi-level engagement ensured a locally informed, actionable assessment rooted in operational realities and community perspectives. Table 3 summarizes interview participants, their roles, and identified concerns.

Table 3. Local, State, and Federal Stakeholder Interview Participants and Roles

Agency/Organization	Role	Concern(s) Identified
Baxendale Volunteer Fire Department (VFD) and Broadwater Rural Fire District	Provides mutual aid near rural training areas; supports access preservation and interface response.	Limited volunteer staffing and water supply; access delays during wildfire due to steep terrain and narrow roads.
BLM – Butte Field Office	Oversees public lands adjacent to installations; supports access route planning and fuels management. Oversees fuels, and land stewardship on BLM parcels near training areas.	Limited suppression access in UXO-adjacent areas; need for shared fuel break maintenance schedule.
Broadwater Conservation District	Advises post-fire recovery and land conservation priorities for wildfire-impacted lands.	Juniper encroachment, erosion, poor access, and long-term vegetation maintenance funding gaps.

Agency/Organization	Role	Concern(s) Identified
Broadwater County Disaster and Emergency Services (DES)	Facilitates multi-jurisdictional hazard response near LHTA; manages local EOC operations and continuity planning.	Limited staff capacity; communication interoperability gaps with MTARNG Range Control; no pre-scripted resource sharing plan.
Broadwater County Growth Planning	Oversees development growth and infrastructure planning in areas impacting LHTA access and compatibility.	Incomplete mitigation integration: no wildfire overlay zoning or buffer requirements; unregulated rural subdivision growth.
Broadwater County Planning	Local government planning.	No wildfire planning requirements near LHTA; lack of incentives for fire-resilient development or defensible space compliance.
Broadwater County Rural Fire	Responds to fire incidents near LHTA; coordinates with mutual aid districts and volunteers.	Extended response times; insufficient apparatus for rugged terrain.
Burlington Northern Santa Fe (BNSF) Railway	Maintains regional freight corridors with known fire and flood exposure; coordinates with DMA on risk mitigation along rail-adjacent areas.	Sparks from freight operations pose ignition risk; coordination protocols with DMA not formalized.
City of Helena – Grants Office	Coordinates funding applications for mitigation, resilience, and infrastructure projects.	Lack of designated mitigation funding stream for installation-adjacent fuel management or evacuation infrastructure.
City of Helena – Open Lands Division	Manages urban-adjacent recreation lands; maintains public access and fuels management programs.	Fuels accumulation at trailheads; increased recreational ignition potential near southern FHTA perimeter.
City of Helena Emergency Services	Supports regional emergency response, evacuation planning, and continuity of public safety operations.	Limited evacuation planning for residents adjacent to the FHTA buffer; interoperability gaps with Range Control.
City of Townsend	Coordinates local government services, public works, and hazard mitigation policies relevant to LHTA corridors.	Indian Creek and Hazmat Row high risk; limited hydrant coverage; volunteer constraints; no community evacuation plans. Heavy fuel loading on eastern approach to LHTA; limited local response funding; public outreach gaps.
Department of Veterans Affairs (VA) – FHTA Campus	Operates co-located VA hospital and critical services; requires coordinated access and continuity during hazard events.	Shared ingress/egress with FHTA; smoke and evacuation concerns; coordination gaps for joint drills.

Agency/Organization	Role	Concern(s) Identified
DNRC Helena Unit– Fire Management Officer & Supervisor	Coordinates regional wildfire operations and resource deployment.	Resource prioritization during concurrent incidents; jurisdictional overlap with DMA and counties.
Helena Fire Department	Responds to municipal and WUI fire incidents; supports interagency suppression near FHTA.	
Helena Airport Authority	Manages dual-use aviation infrastructure; supports emergency air operations and MTARNG logistics.	Limited radar coverage and ramp space for wildfire suppression aircraft; smoke intrusion disrupts operations.
Lewis & Clark Conservation District	Promotes soil, water, and vegetation conservation practices in WUI and agriculture interfaces.	Post-fire erosion and sedimentation risks; need for coordinated restoration funding.
Lewis & Clark County Emergency Management	Leads county-level all-hazards emergency planning, incident command coordination, and response asset deployment.	Resource strain during simultaneous incidents; limited shared evacuation coordination with FHTA and VA campus.
Lewis & Clark County Planning	Guides land use decisions, subdivision review, and zoning regulations that affect hazard exposure and access near the FHTA.	WUI encroachment, insufficient road widths, lack of defensible space enforcement.
Lewis & Clark Rural Fire Council	Aligns strategies across fire districts; promotes ICS-based training and suppression coordination.	Volunteer turnover; inconsistent radio interoperability between districts and MTARNG Range Control due to outdated technology.
DMA	Oversees strategic planning, infrastructure investment, and intergovernmental coordination for FHTA and LHTA; leads on mission assurance and state-military partnerships.	Fuel accumulation near boundaries; lack of integrated burn program coordination; limited access routes for suppression.
Montana Department of Transportation (MDT)	Maintains state roads and bridges; supports resilience upgrades to installation access routes and post-disaster clearance.	Right-of-way vegetation and debris accumulation along U.S. 12 and secondary access routes; limited coordination for closures.
Montana Economic Assistance Counsel	Coordinates funding strategies for resilience investments aligned with compatible growth, infrastructure modernization, and hazard mitigation.	Fire risk threatens insurability and infrastructure investment; no funding mechanism for installation-adjacent mitigation.
MT DES – State Hazard Mitigation Officer	Guides state-level mitigation planning and supports local resilience alignment and funding.	Limited integration of military installations in statewide mitigation priorities; no dedicated funding stream for defense-related wildfire risk reduction.

Agency/Organization	Role	Concern(s) Identified
MTARNG Range Operations (FHTA/LHTA)	Range and land manager.	Training disruptions due to fire bans; incomplete firebreak network; coordination gaps with civilian responders.
Northwestern Energy	Operates energy infrastructure supporting FHTA, East Helena, and Townsend; coordinates PSPS and hardening measures.	No cross-agency ignition prevention protocol; aging wooden poles; delayed restoration following wildfire, vegetation encroachment; insufficient PSPS readiness.
Prickly Pear Land Trust (PPLT)	Leads conservation and buffer zone land stewardship; manages easements, fuels treatments, and flood mitigation.	Encroachment from new subdivisions; fragmented buffer continuity; limited access to suppression water.
Tri-County FireSafe Working Group	Supports risk communication, pre-disaster planning, and fuel mitigation programs relevant to WUI-adjacent communities. Regional fire mitigation and outreach.	Limited funding and training for fuel treatments; fragmented project coordination between agencies. No community-wide evacuation exercises; reliance on volunteers; resistance to prescribed fire.
USDA Natural Resources Conservation Service (NRCS)	Provides conservation and fuels management assistance to landowners in risk areas; supports erosion control and watershed resilience.	Post-fire sedimentation threats to shared watersheds; need for defensible grazing and erosion control coordination.
USFS – Helena-Lewis & Clark National Forest	Manages high-elevation lands near training routes and drainage corridors; supports interagency hazard response and forest health.	Limited resource availability during regional fires; overlapping command boundaries with MTARNG and DNRC.
Veterans Administration Fire Dept. at Ft. Harrison (VAFD)	Protects VA facilities and assists with on-base fire response.	Resource limitations for off-installation support; need for coordinated suppression training with DMA and Helena Fire.
Vigilante Electric Cooperative	Provides local utility service; manages infrastructure exposure to wildfire near WUI areas.	Limited hardening in high-fuel areas; vegetation management gaps along service corridors.

Missions

The federal mission of the MTARNG, which includes both FHTA and LHTA is:

To provide trained, equipped, and ready units, prepared to mobilize, under the authority of the President and Department of War, in response to national interests on the homeland or overseas for missions including contingency operations, national emergencies, and humanitarian efforts.

The DMA is the central agency responsible for directing and supporting the state's military, emergency management, and veteran service programs. Administered by The Adjutant General, the DMA oversees the operations of the MTARNG and the Montana Disaster and Emergency Services (MT DES) and provides administrative support to the Montana Veterans Affairs Division. The DMA manages a joint federal-state program that maintains trained and equipped military forces available to the Governor during state emergencies and to the President of the United States during national emergencies. In addition to its defense responsibilities, the DMA coordinates statewide disaster response under Title 10, Chapter 3, Montana Code Annotated, administers environmental compliance programs for the MTARNG, and cooperates with state and federal agencies to deliver essential services to discharged veterans and their families.

MTARNG's mission is to:

To provide trained and ready Soldiers who are equipped to aid the Governor of Montana in protection of life and property and uphold the preservation of peace, order and public safety for the citizens of Montana.

MTARNG operates under the authority of both the Governor of Montana and the President of the United States, maintaining a dual federal–state mission that supports national defense objectives and state emergency operations. MTARNG provides trained, ready, and equipped forces capable of rapid mobilization in support of both domestic and overseas contingencies. Its Soldiers serve as a vital component of Montana's emergency response system, bridging defense readiness, disaster assistance, and community resilience.

Background

Fort William Henry Harrison is the statewide headquarters and logistical hub for the MTARNG. It sustains administrative functions, personnel support, and facility operations year-round while providing ranges and infrastructure designed to accommodate individual and collective training. FHTA is a Level IV Training Center. It services training requirements for all branches of military forces, with support capability for federal, state and local law enforcement as well. FHTA contains about 130 permanent buildings (primarily in the cantonment area), eight live-fire ranges, 12 training ranges and one unimproved runway. Fort Harrison is home of the MTARNG's Joint Forces Headquarters, 95th Troop Command, 208th Regional Training Institute, Training Center Headquarters, 190th Chemical Reconnaissance Detachment – Special Forces, the 83rd Civil Support Team, I CO of the 145th Brigade Support Battalion, the Montana State Veteran's Cemetery, and the Montana Military Museum. Aviation maneuver training occurs between the FHTA runway and the Helena Regional Airport less than three miles to the east.

LHTA is a live-fire and maneuver range. Its rugged, austere terrain supports helicopter gunnery, demolitions, and weapons training from small arms to infantry squad vehicles, replicating real-world conditions for complex field exercises. LHTA has supported the military mission of the MTARNG since the 1950s. LHTA provides a challenging, realistic training environment and provides world-class training at both the individual and unit level to train soldiers of the MTARNG and other units. LHTA is a larger training area than FHTA providing 17 designated live-fire training ranges and a dismounted training area for mechanized infantry, aviation, and cavalry units.

Live-fire training at LHTA includes helicopter, tank, artillery, mortar, and Bradley infantry fighting vehicle gunneries. The Federal Aviation Administration approved LHTA for restricted airspace in 2025, opening new training opportunities including drone technology training.

Together, FHTA and LHTA anchor the MTARNG's operational readiness, enabling mobilization exercises, annual training rotations, and rapid-response deployments both statewide and nationally. FHTA directly supports military and civilian personnel, including soldiers, VA hospital staff, and full-time technicians, with seasonal surges during monthly, annual and periodic training events. Both installations also provide mutual aid during civilian emergencies, including wildfire suppression through aerial bucket drops and coordinated responses to floods or evacuations in partnership with the DNRC, county emergency managers, and local law enforcement.

FHTA is comprised of approximately 6,553.6 acres owned mostly by the US Department of the Army, interspersed with ownership by the DMA, DNRC, and BLM. It is located less than two miles west of Helena city limits, the State Capital, in Lewis & Clark County. The County's population is 73,832 and Helena's population is 33,885. This area is growing 4-8 times faster than the national average population growth rate, and the county's population is expected to increase 30% by 2060, mostly in the Helena metropolitan area. Steady population growth has driven residential and mixed-use expansion within a two-mile radius of the installation boundary. This growth, coupled with shifts in agricultural landownership and increased recreation use, continues to alter the character of the surrounding assessment areas.

Elevations at FHTA range from 3,900 to 5,288 feet. The land generally slopes downward toward the northeast. The Helena valley, in which FHTA sits on its west end, has a semiarid climate due to its location on the eastern side of the continental divide. The average relative humidity is 57%, and the average annual precipitation is 11.37 inches, falling primarily from April through July. Average annual snow accumulation is 48 inches.

The 21,295-acre LHTA is located two miles from the City of Townsend in Broadwater County and 41 miles southeast of FHTA. The BLM owns the majority of LHTA, with significant acreage in the western portion having been withdrawn from the public domain for use by the military. The DMA, DNRC and one private owner comprise the remaining ownerships. Public recreation occurs on the east side of Old Woman's Grave Road, grazing occurs across the installation (except Graymont mine) managed by BLM, and private mining operations (Graymont Indian Creek Plant, an active limestone quarry) occur in the northwest portion of LHTA. The County's population is 7,793 and Townsend's population is 2,071. These numbers are expected to double in 12 years and triple in 20 years. Broadwater County contains Montana's fastest growing population. Townsend is between two rapidly growing urban centers, Helena and Bozeman, accounting for the projected fast-paced growth. Lands surrounding LHTA are seeing increased residential development, grazing conversion, and recreational access along the Missouri River corridor and Canyon Ferry Lake, particularly between the Helena Regional Airport and Townsend and continuing south of Townsend near and around LHTA, contributing to changing landscape dynamics and access considerations for training.

LHTA is located in the Middle Rocky Mountain physiographic province. The area varies in elevation from about 3800 feet along the Missouri River to about 5900 feet at the highest point of the Limestone Hills. The area has a semi-arid climate characterized by low annual rain and

snowfall averaging 10.65 and 23.3 inches respectively, moderate to low humidity, and wide temperature variations annually.

Both installations are positioned within the upper Missouri watershed (Figure 9), characterized by steep terrain, high wildfire fuel loads, and variable hydrologic conditions. These environmental features provide valuable training realism but also contribute to management complexity, especially as longer fire seasons increasingly affect range conditions and infrastructure reliability.

The primary threat at both FHTA and LHTA is wildfires, impacted by drought and flooding. The primary encroachment threat is residential development. These risks are inter-related. In 2021, a prairie grass fire adjacent to FHTA further pressed the importance of addressing the need for wildfire mitigation. The WUI continues to change and develop as the population density increases in the localities surrounding the installations. The demand to convert agricultural lands and wildlands into residential and commercial developments is increasing at a high rate. The ever-growing needs of the community and the MTARNG require a high level of coordination and cooperation to ensure a long-term solution to land constraints and resiliency challenges.

Regional Overview

FHTA and LHTA occupy a shared regional setting in West-Central Montana that links defense operations with nearby communities, transportation corridors, and natural resource systems. The area encompasses portions of Lewis & Clark and Broadwater Counties and is defined by a patchwork of federal, state, and private lands.

Regional resilience around FHTA and LHTA depends on the ability of surrounding communities, ecosystems, and infrastructure systems to withstand and recover from increasingly frequent and severe wildfire, drought, and flooding events. These trends are consistent with trends and modeled projections indicating West-Central Montana is experiencing higher annual temperatures, extended wildfire seasons, and more variable precipitation patterns that stress both built and natural systems (Montana Climate Assessment 2021).

Unlike other parts of the state, the Helena–Broadwater region combines mountain-valley hydrology, semi-arid grasslands, and high-elevation forested corridors, resulting in rapid runoff, steep-slope erosion, and increased ignition potential where grass fuels transition to timber. Roads, utilities, and water systems serving both military installations and civilian populations are functionally interdependent. For example, Fort Harrison's water supply and access routes are tied to the City of Helena's municipal infrastructure and Lewis & Clark County's emergency management network. This shared dependency amplifies the consequences of hazard impacts including wildfire-induced power outages, road closures, or flood-damaged culverts that restrict emergency access.

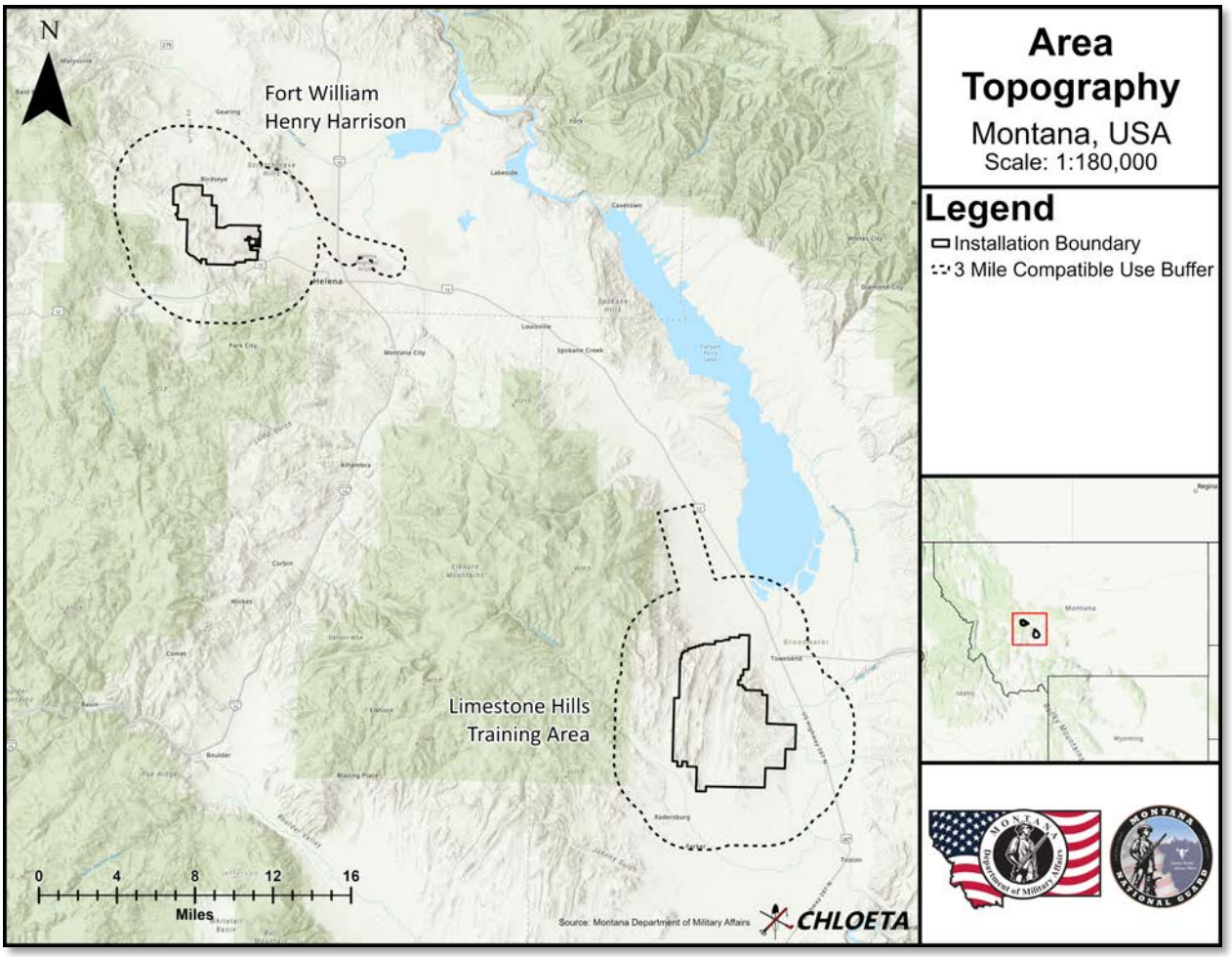


Figure 3. Area Topography Map

The complex land ownership mosaic of West-Central Montana further complicates resilience planning. Within a 20-mile radius of FHTA and LHTA, federal forested lands, state trust parcels, private land, and rapidly expanding residential developments converge, creating overlapping regulatory and response boundaries. This spatial fragmentation, illustrated in Figure 4, increases the difficulty of implementing consistent fuels management, zoning, and emergency coordination measures. For example, zoning ordinances in Lewis & Clark County and Broadwater County differ in their treatment of WUI setbacks, subdivision review, and building materials, limiting the effectiveness of regional defensible-space enforcement.

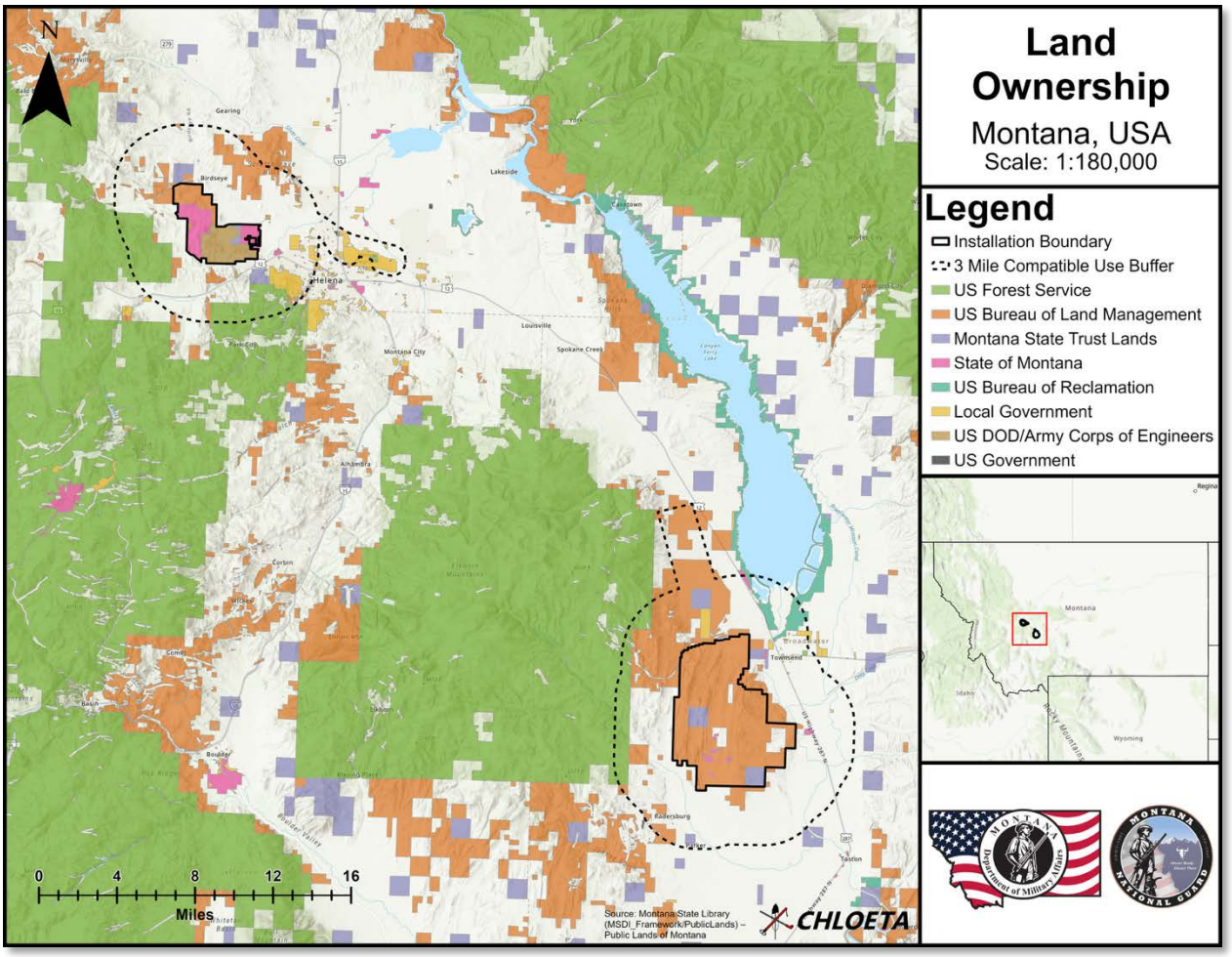


Figure 4. Area Land Ownership Map

Stakeholder interviews confirmed mutual aid capacity among volunteer fire departments is limited by personnel shortages, distance, and lack of standardized dispatch protocols (2024 IWFMP). Combined with inconsistent WUI code application (Appendix C), this capacity shortfall reinforces the need for cross-jurisdictional coordination to manage fuels, standardize risk reduction measures, and protect access corridors supporting both installations and communities. These insights form the basis of several Findings and Recommendations that call for regional coordination frameworks, shared GIS data systems, and multi-year funding strategies linking federal grant assistance for infrastructure strengthening land acquisition and land management to state resilience programs.

Assessment Evaluation Data

Determining wildfire risk demands a data-driven approach that combines spatial analysis, field-verified fuel conditions, and community vulnerability indicators to accurately define and prioritize areas of greatest threat. Table 4 identifies wildfire risk components. This assessment evaluates the FHTA and LHTA assessment areas using the following criteria, with wildfire risk as the principal focus and other compounding hazards considered where relevant.

Table 4. Wildfire Risk Component, Description, and Impact on Wildfire Risk

Component	Description	Impact on Wildfire Risk
Vegetation (Fuel Type and Load)	Type, quantity, and arrangement of grasses, shrubs, and trees.	More vegetation or dry, dense fuels increase fire ignition and spread.
Topography	Slope, aspect, and elevation of the land.	Steeper slopes lead to faster fire spread; south-facing slopes are drier.
Weather and Climate	Temperature, humidity, wind, and drought conditions.	Hot, dry, and windy conditions promote ignition and intensity.
Drought Conditions	Prolonged periods of low precipitation.	Dry vegetation becomes highly flammable, extending fire season.
Land Use and Development	Human activities, infrastructure, and proximity to WUI.	Structures and roads increase ignition sources and values at risk.
Access and Response Time	Availability of roads and firefighting infrastructure.	Limited access delays response and containment.
Historical Fire Occurrence	Past fire frequency and severity.	Indicates areas prone to recurring wildfires.
Air Quality and Smoke Impacts	Potential for smoke to affect communities and critical services.	Adds public health and operational challenges.
Fuel Management Practices	Grazing, thinning, prescribed fire, etc.	Proactive practices can reduce wildfire intensity and spread.

Regional Hazard Exposure

The primary hazard of concern for the FHTA and LHTA assessment areas is wildfire, driven by increasingly dry conditions, fuel accumulation, and changing weather patterns. These risks are compounded by prolonged drought cycles, which elevate ignition potential and reduce water availability for suppression. Secondary hazards, including post-fire flooding, debris flows, and degraded air quality, can further disrupt both military operations and surrounding communities. For an explanation of wildfire weather, mapping terminology and characterization see Appendix C.

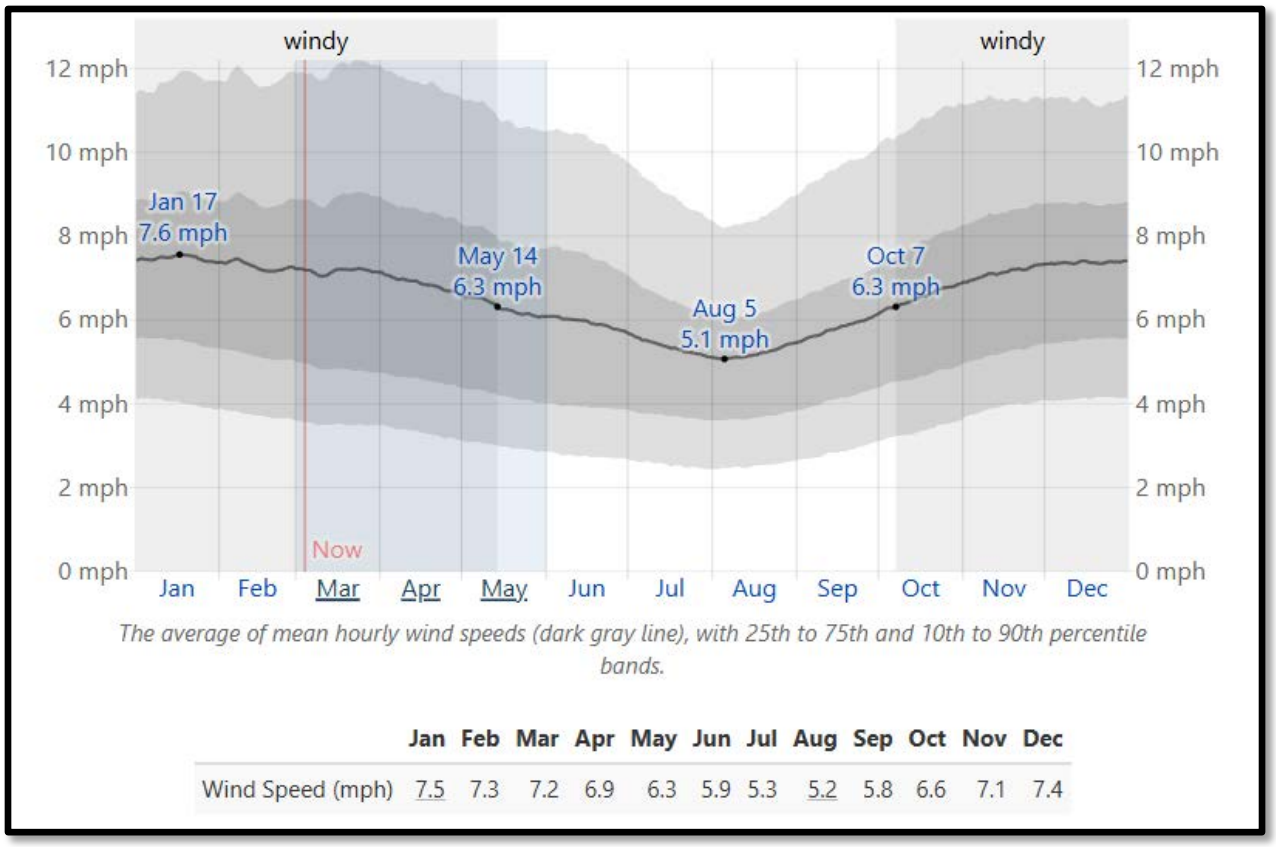
Winds and Wildfire Impact

Wind speed variability throughout the year is a critical factor influencing wildfire potential and suppression operations in the area, particularly around FHTA and LHTA assessment areas. As illustrated in Figure 5, the windier season spans from October 7 to May 14, with average wind speeds consistently exceeding 6.3 miles per hour. The peak occurs around January 17, where average hourly wind speeds reach 7.6 mph.

In contrast, the calmer season lasts from May 14 to October 7, with the lowest average wind speeds occurring around August 5, at approximately 5.1 mph. Although wind activity is lower during this period, it overlaps with the peak wildfire season when temperatures are high, and vegetation is

driest. As a result, even moderate winds during summer months can significantly intensify fire behavior, particularly in fine fuel environments.

These seasonal wind trends, supported by historical data (Figure 5) and directional patterns (Figure 6) are essential for refining fire behavior models, scheduling prescribed burns, and guiding the deployment of aerial and ground suppression resources.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind Speed (mph)	7.5	7.3	7.2	6.9	6.3	5.9	5.3	5.2	5.8	6.6	7.1	7.4

Figure 5. Average Wind Speed Around FHTA and LHTA

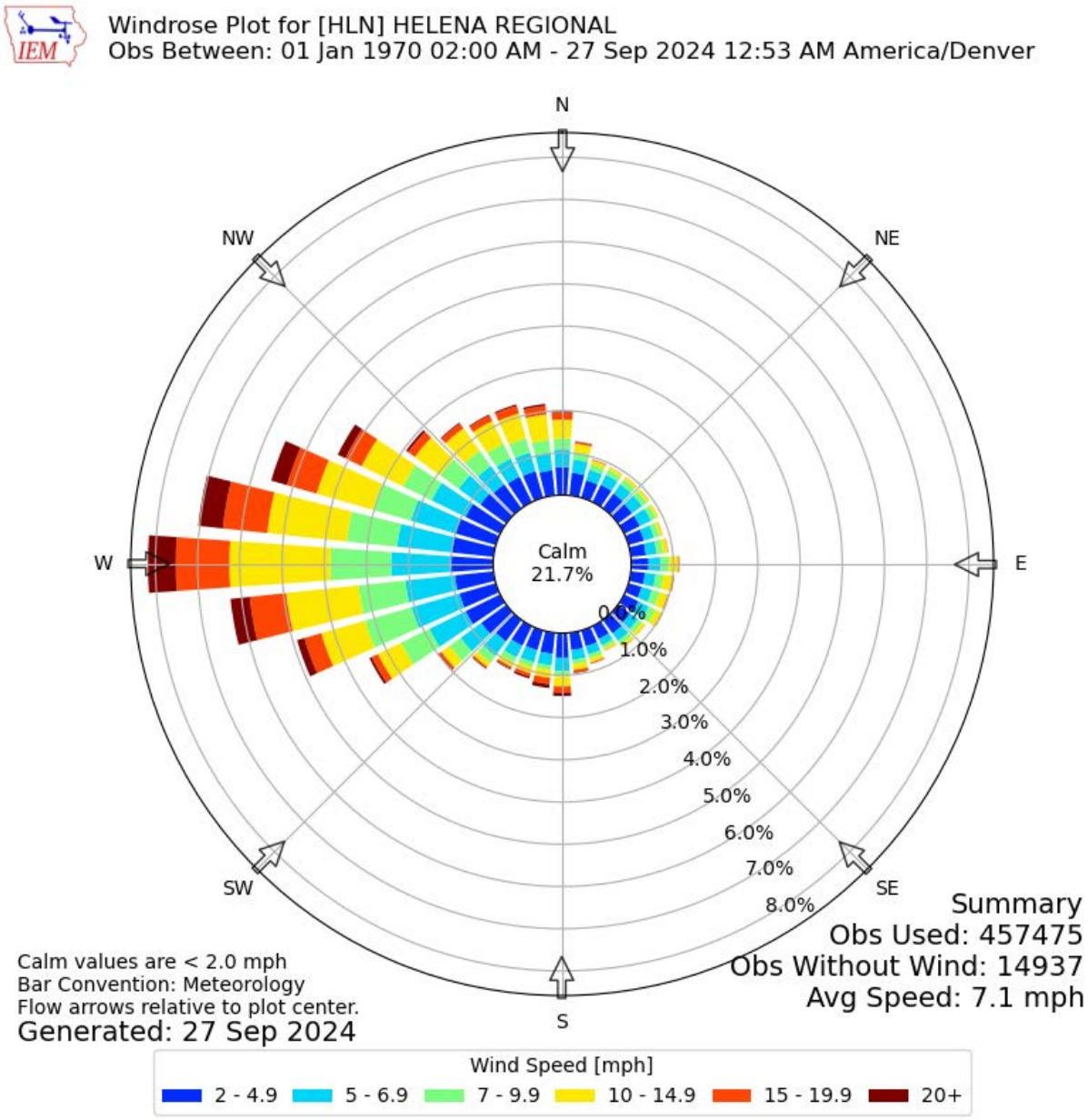


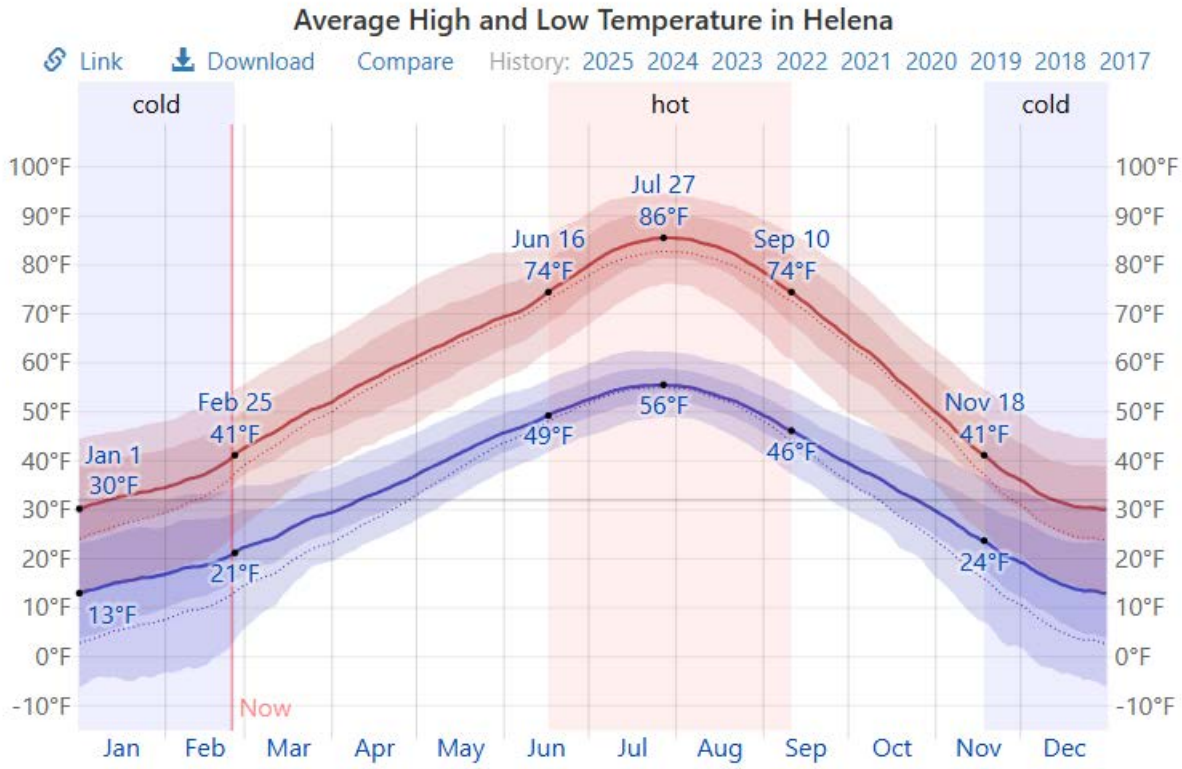
Figure 6. Windrose Plot Graph from the Helena Region

Winds commonly originate from the west and southwest, especially during the late summer and fall fire season. These directional winds can channel fires through canyons, across ridgelines, and into developed areas posing significant challenges for containment and evacuation. This data also supports coordination of aerial suppression tactics and helps determine the most vulnerable downwind communities and assets.

In addition, wind shifts can contribute to rapid drying of fuels and can dramatically accelerate fire spread, increase flame lengths, and intensify fireline activity, often overwhelming ground crews and making aerial suppression unsafe or ineffective. Even moderate wind shifts can change fire direction abruptly, creating unpredictable and fast-moving fire fronts that pose serious threats to firefighter safety and community protection.

Temperature Trends and Wildfire Relevance

Temperature patterns play a significant role in shaping wildfire conditions, particularly by influencing fuel moisture levels, ignition likelihood, and fire intensity. The hot season extends for approximately 2.8 months, from June 16 to September 10, when average daily high temperatures exceed 74°F. July is typically the hottest month, with an average high of 84°F and a low of 55°F, aligning closely with the peak of wildfire season when fuels are at their driest and fire behavior is most volatile. Conversely, the cold season lasts for about 3.2 months, from November 18 to February 25, with average high temperatures below 41°F. December marks the coldest period, with an average low of 15°F and a high of 32°F, reducing fire risk but not eliminating it, particularly in the presence of wind events that can warm and dry fuels rapidly even in winter. Temperature patterns (Figure 7) provide essential context for planning seasonal wildfire readiness, fuel treatments, and prescribed fire windows.



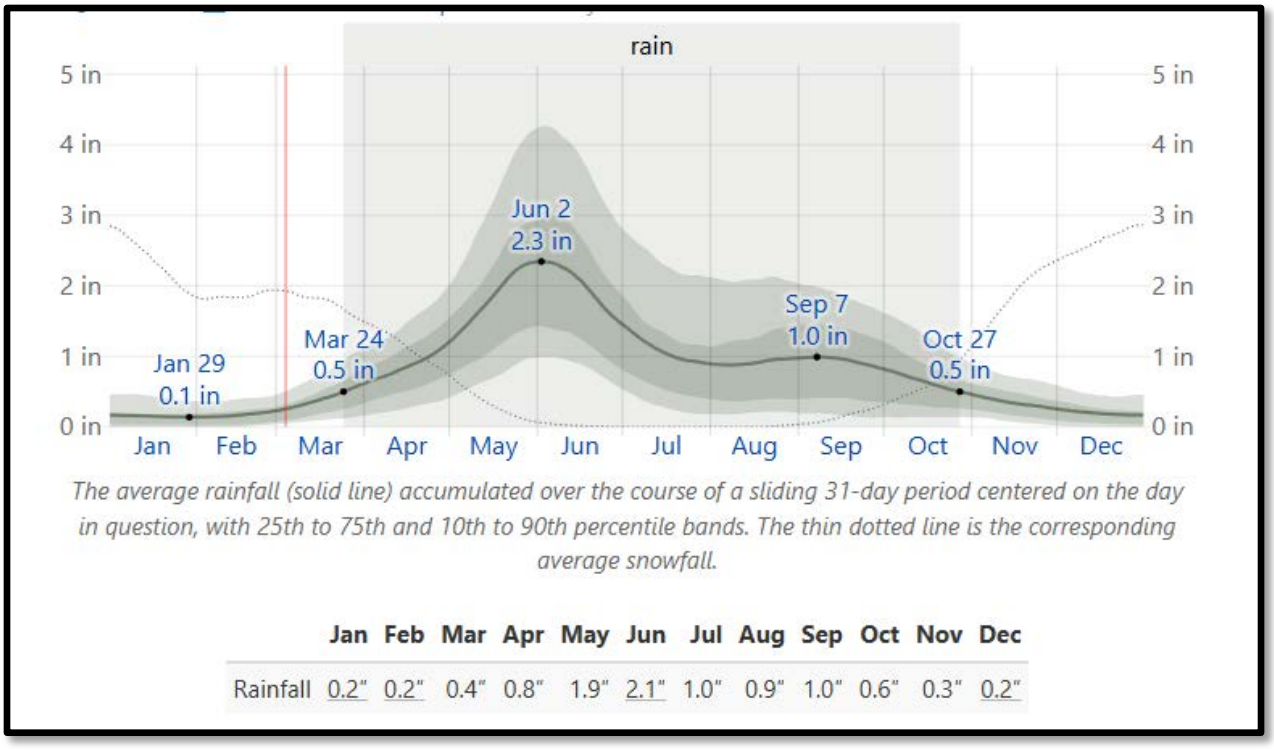
The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	33°F	38°F	48°F	57°F	66°F	75°F	84°F	83°F	72°F	57°F	42°F	32°F
Temp.	23°F	27°F	35°F	43°F	52°F	61°F	69°F	67°F	56°F	44°F	32°F	22°F
Low	15°F	19°F	26°F	34°F	42°F	49°F	55°F	53°F	44°F	34°F	24°F	15°F

Figure 7. Average High and Low Temperatures in Helena

Precipitation Patterns and Wildfire Implications

Precipitation trends (Figure 8) in these assessment areas are key drivers of seasonal wildfire conditions, influencing fuel moisture, vegetation growth, and the timing of fire season onset. The wetter season spans just two months, from May 4 to July 4, during which the likelihood of experiencing a wet day exceeds 22%. June stands out as the wettest month, averaging 9.2 days with at least 0.04 inches of precipitation and receiving the highest monthly rainfall total of 2.1 inches, as illustrated in the Average Monthly Rainfall chart shown in Figure 8. This brief period of rainfall supports early-season vegetation growth, which can later cure into fine, flammable fuels during the dry summer months.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	0.2"	0.2"	0.4"	0.8"	1.9"	2.1"	1.0"	0.9"	1.0"	0.6"	0.3"	0.2"

Figure 8. Average Monthly Rainfall in Helena

In contrast, the drier season lasts a substantial 10 months, from July 4 to May 4, with January being the driest month, averaging only 2.8 wet days and 0.2 inches of precipitation. This extended dry period contributes to prolonged fuel curing, reduced soil moisture, and increased ignition potential, particularly when paired with above-average temperatures and wind events. The region also experiences a rainless period from October 27 to March 24, during which wildfire risk can persist in the presence of dormant fuels and unseasonably warm, windy conditions.

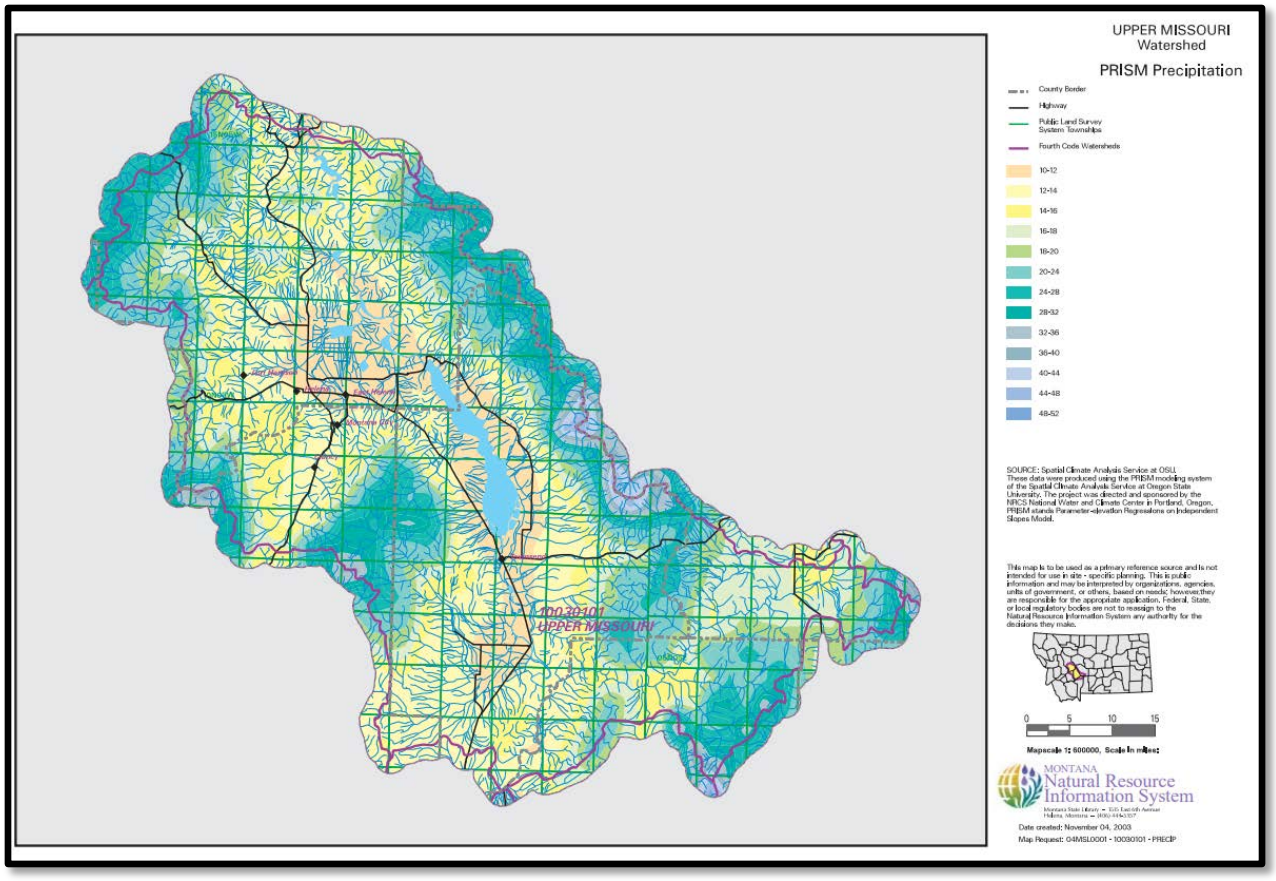


Figure 9. Upper Missouri Watershed Parameter-Elevation Regression PRISM

Both assessment areas, along with the surrounding communities of Helena and Townsend, are situated within one of the drier areas of the Upper Missouri Watershed, receiving an average of 15 to 20 inches of annual precipitation, as indicated by Parameter-Elevation Regressions on Independent Slopes Model (PRISM) climate data (Figure 9). This relatively low precipitation level places the region at heightened risk for wildfire due to extended dry periods, especially from mid-summer through early fall when fuel curing is most pronounced. The area experiences only a brief wet season, primarily in May and June, which promotes early-season vegetation growth. However, this growth quickly dries out under increasing heat and reduced rainfall, contributing to the buildup of fine, flammable fuels.

The prolonged drier season, spanning from early July through the following spring, aligns closely with the region's most active fire period. In this context, precipitation patterns directly influence fuel moisture availability and fire behavior potential. Areas with consistently low rainfall, including the Helena Valley and rangelands surrounding LHTA, face sustained wildfire vulnerability and require prioritized mitigation efforts, including vegetation management, fuel load monitoring, and strategic prescribed burns timed ahead of peak dryness.

Drought Conditions and Wildfire Implications

Drought is one of the most influential environmental stressors contributing to wildfire risk across FHTA, LHTA, and local communities (Figure 10 and Figure 11). According to the US Drought Monitor (USDM), Lewis & Clark and Broadwater counties experienced repeated periods of severe to exceptional drought (D3–D4) in 2002–2005, 2007, 2015, and again from 2021 to 2022. The USDM categorizes drought in five levels, from Abnormally Dry (D0) to Exceptional Drought (D4), and highlights these repeated events are not anomalies, but part of a broader climate trend affecting the region.

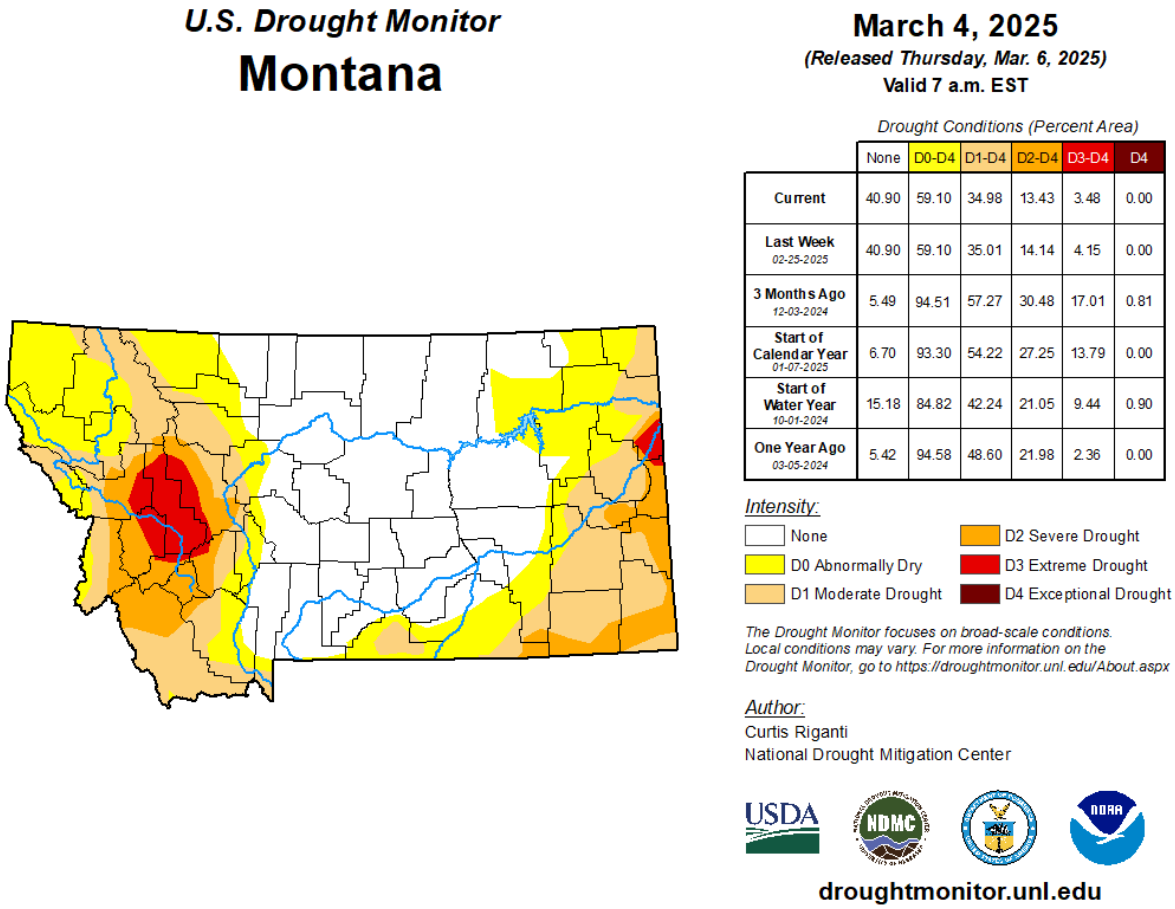


Figure 10. US Drought Monitor Data for Montana

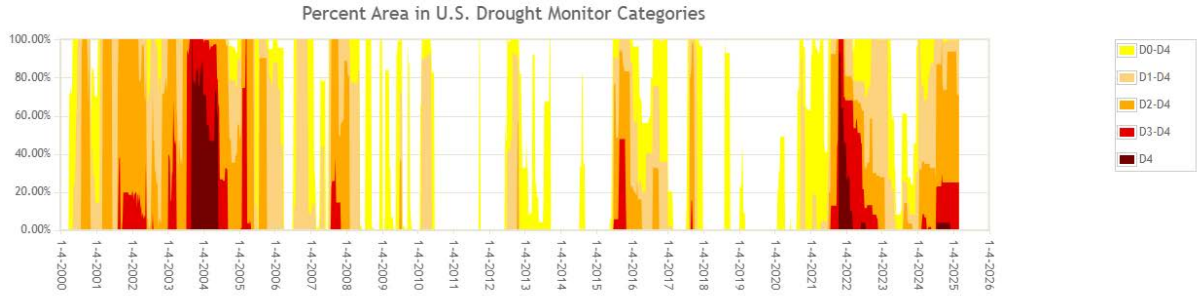


Figure 11. US Drought Monitor Graph

During drought conditions, vegetation and surface fuels, including grasses, shrubs, and forest understory, become significantly more flammable. The combination of low precipitation, elevated temperatures, reduced soil moisture, and dry winds can lead to faster ignition, increased fire spread, and greater difficulty in fire suppression. Particularly dangerous are scenarios where a wet spring promotes abundant vegetation growth, followed by a rapid drying period in early summer, a common sequence in this region that converts high biomass into highly combustible fuel beds.

The relationship between drought and fire is further complicated by fuel-limiting effects during prolonged, extreme droughts where vegetation is so sparse that fire may be less likely to ignite, but any fire that does start can burn with extreme intensity due to the dryness of available fuels.

Weather Monitoring and Fire Forecasting Resources

The FHTA and LHTA assessment areas fall within Fire Weather Forecast Zone MT118 (Figure 12), as designated by the National Weather Service (NWS). Daily fire weather forecasts for this

zone including temperature, humidity, wind, and fire danger indices can be accessed online at NWS Fire Forecasts for Zone MT118.

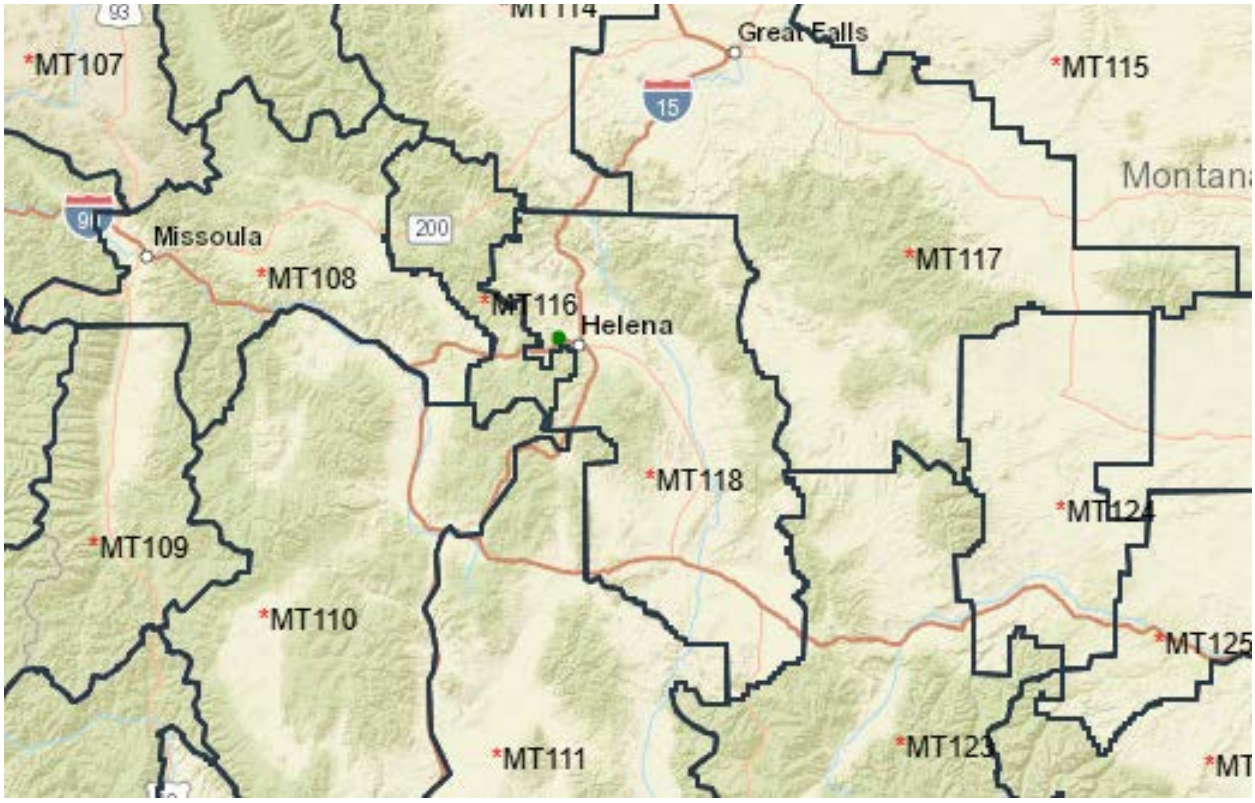


Figure 12. Fire Weather Zones

Two key systems support local fire weather monitoring:

- **NWS Stations (**Figure 13**),** which provide general atmospheric observations and forecasting capabilities across the region.
- **RAWS (**Figure 14**),** which are strategically located in wildland areas and deliver near-real-time data on conditions including wind speed, fuel moisture, and temperature. These

stations are critical inputs for fire danger rating systems and support predictive modeling for both initial attack and extended incident planning.

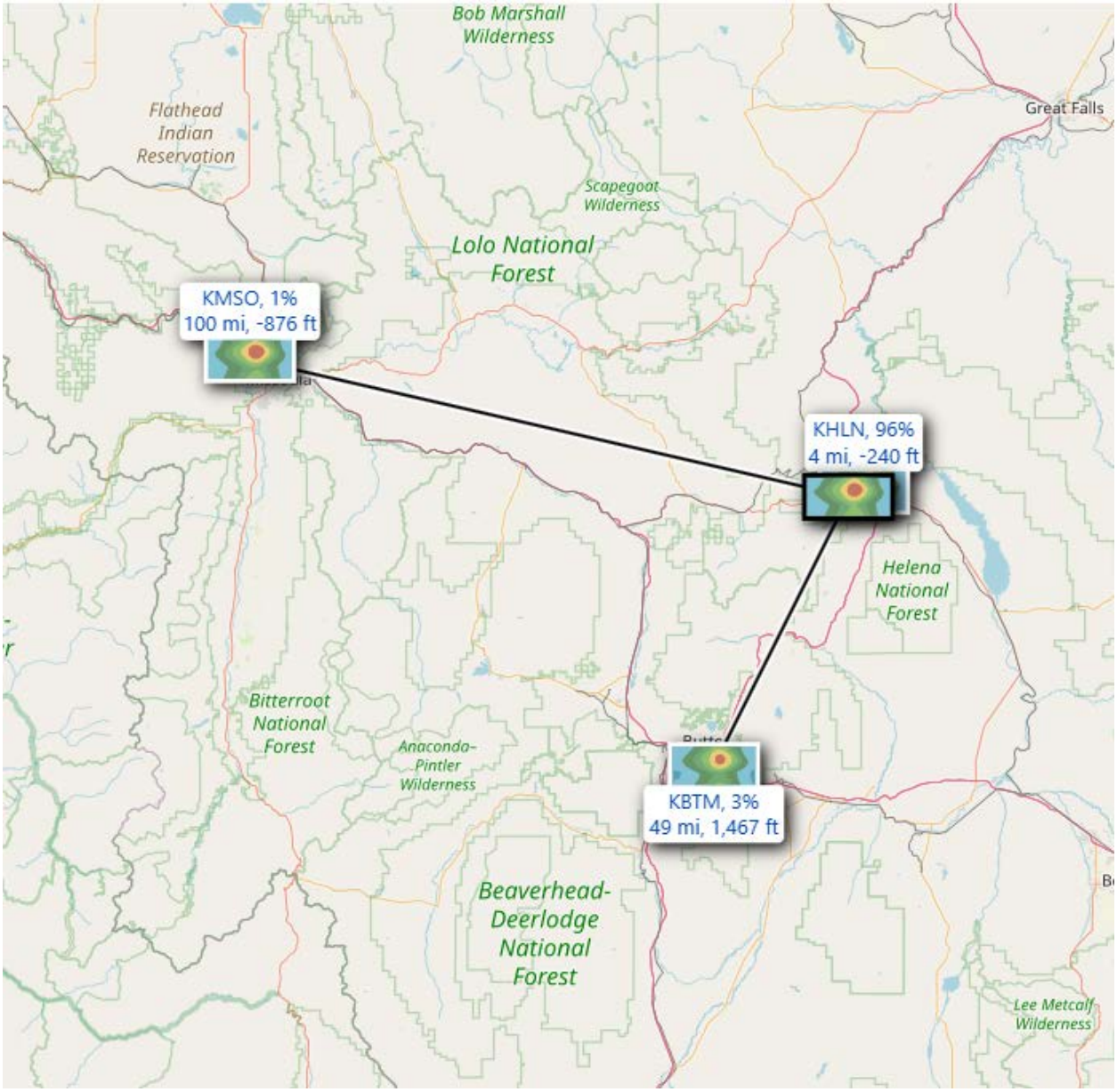


Figure 13. National Weather Stations

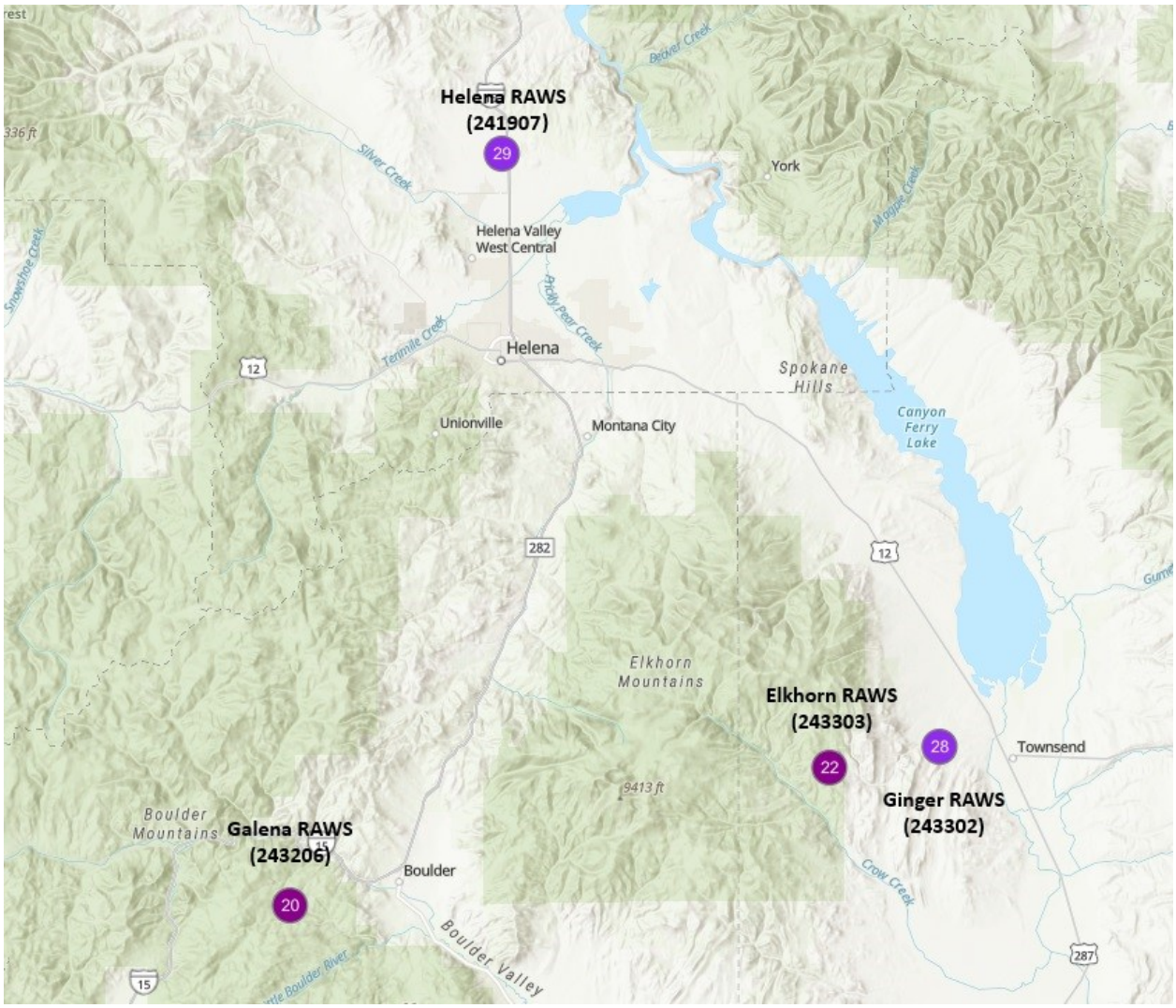


Figure 14. Remote Automated Weather Stations (RAWS)

Seasonal Climatology

In the assessment areas, fire activity tends to peak (Figure 15) in the summer in mountainous areas and in spring/fall on the plains driven largely by the interplay of fuel availability, wind, and drought conditions. Integrating drought history and ongoing drought monitoring into wildfire preparedness strategies is critical for anticipating fire behavior, optimizing mitigation timing, and allocating suppression resources effectively. Wildfire activity in the FHTA and LHTA assessment areas follow a clear seasonal pattern shaped by the region's climate, fuel conditions, and land use.

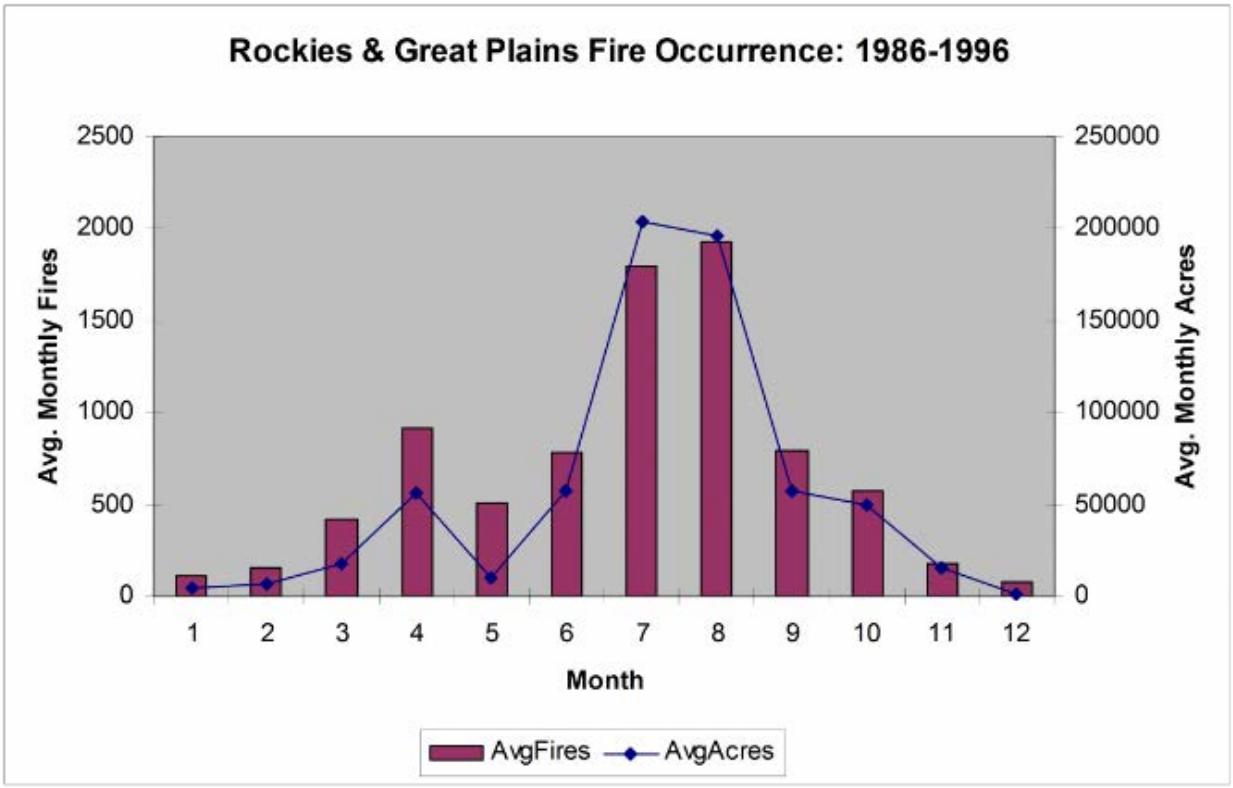


Figure 15. Rockies and Great Plains Fire Occurrence from 1986-1996

Peak Fire Season (Mid-July through Early October): The majority of large and damaging wildfires in this area occur between mid-July and early October. This period aligns with the following:

- Prolonged dry spells following early summer moisture.
- Accumulated heat units drying out fine fuels (i.e., grasses, shrubs).
- Reduced relative humidity and increased wind activity.
- Increased human outdoor activity during summer recreation and fire-prone holidays (e.g., Fourth of July, Labor Day).

Early Summer (May–June): While typically cooler and wetter, this transitional period can still produce wildfires, especially during abnormal drought years or when early-season heat waves accelerate fuel curing. Military training, recreational use, and burning activities during this time have resulted in ignitions in years past.

Late Fall through Winter (November–March): Wildfire activity significantly decreases in the colder months due to increased precipitation, snowpack accumulation, and reduced human presence in wildland areas. However, occasional dry periods combined with strong winds can still produce small fires, especially from structure or debris burns that escape containment.

Key Seasonal Observations:

- 2021 and 2024 showed extended fire seasons with fires persisting into October and November due to dry fall conditions.
- Diurnal patterns play a key role in fire behavior, with intensity typically increasing in the afternoon and early evening as temperatures rise and relative humidity decreases.
- Drought Conditions in recent years have extended the window of fire potential beyond traditional norms, stressing the need for year-round preparedness.

Slope

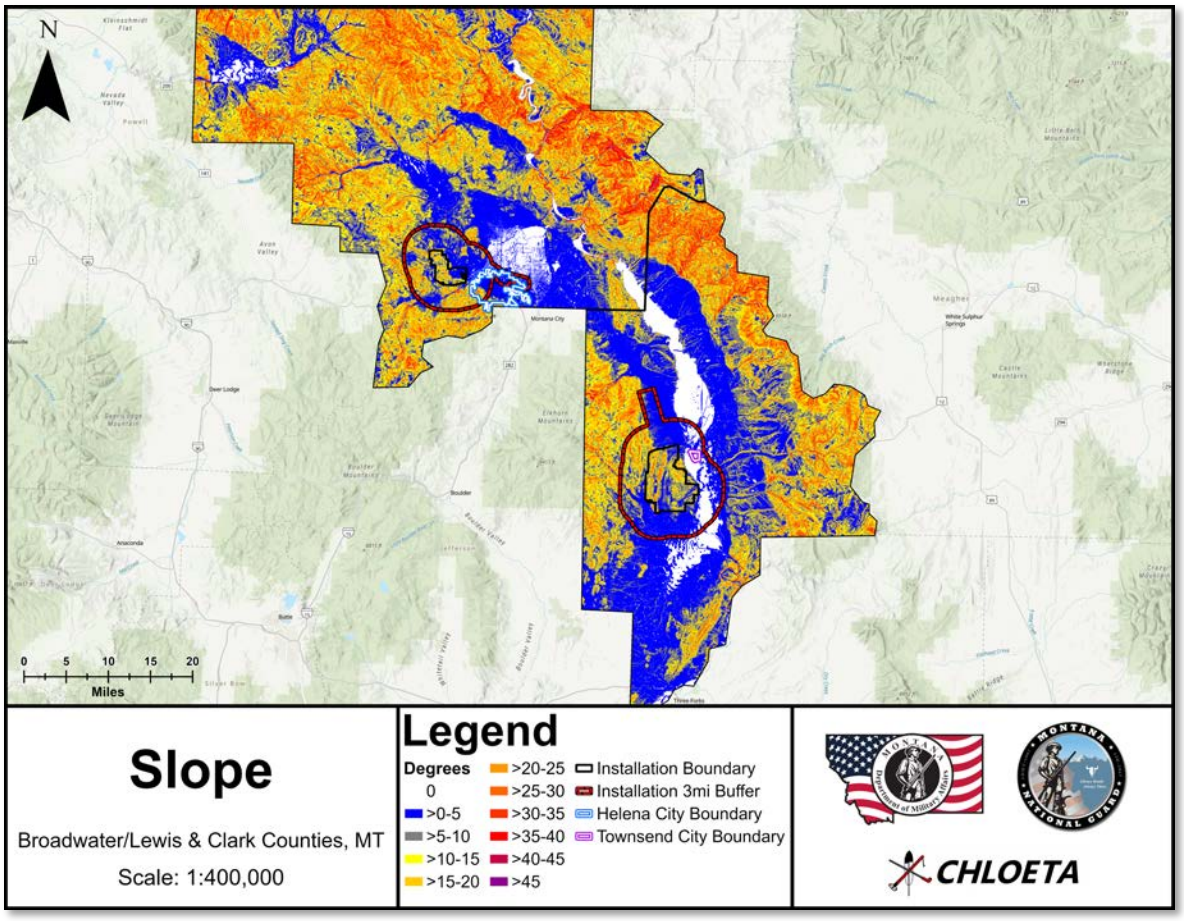


Figure 16. FHTA and LHTA Slope Area Map

The terrain surrounding the FHTA assessment area presents multiple high-risk corridors for wildfire to spread, particularly along the steep eastern flanks and ridgelines bordering the installation buffer. Slope values in these areas often exceed 30 degrees, as shown in red and purple on the slope map, indicating elevated potential for rapid uphill fire movement. These slopes align with known wind-driven fire pathways that could carry flames from the assessment area toward the installation or vice versa, depending on ignition source and weather conditions. The limited extent of flat terrain (0–5° slope) along river benches and lowlands reduces opportunities for defensible staging areas or temporary fire lines. These topographic constraints require coordinated mitigation strategies within the assessment areas, including fuel breaks, pre-positioned suppression resources, and aerial response planning. Access for engines remains restricted along these gradients, adding time and complexity to any response effort.

The LHTA assessment area lies within a more rugged and mountainous landscape where slopes commonly exceed 35–40 degrees. The installation is enclosed by critical ridgeline corridors to the west and southwest that could channel fire rapidly across boundaries during hot, dry, and windy conditions. These ridgelines, extending into assessment areas, are prone to extreme flame lengths

and spotting due to the combination of slope, aspect, and heavy fuel loading. The scarcity of low-slope areas within or near LHTA and its assessment area limits the potential for establishing defensible areas or safe fire line construction. Steep, inaccessible terrain also constrains mechanical thinning and prescribed fire operations, reinforcing the need for remote monitoring, targeted fuel management, and pre-incident evacuation and coordination protocols between installation and community fire partners.

Aspect

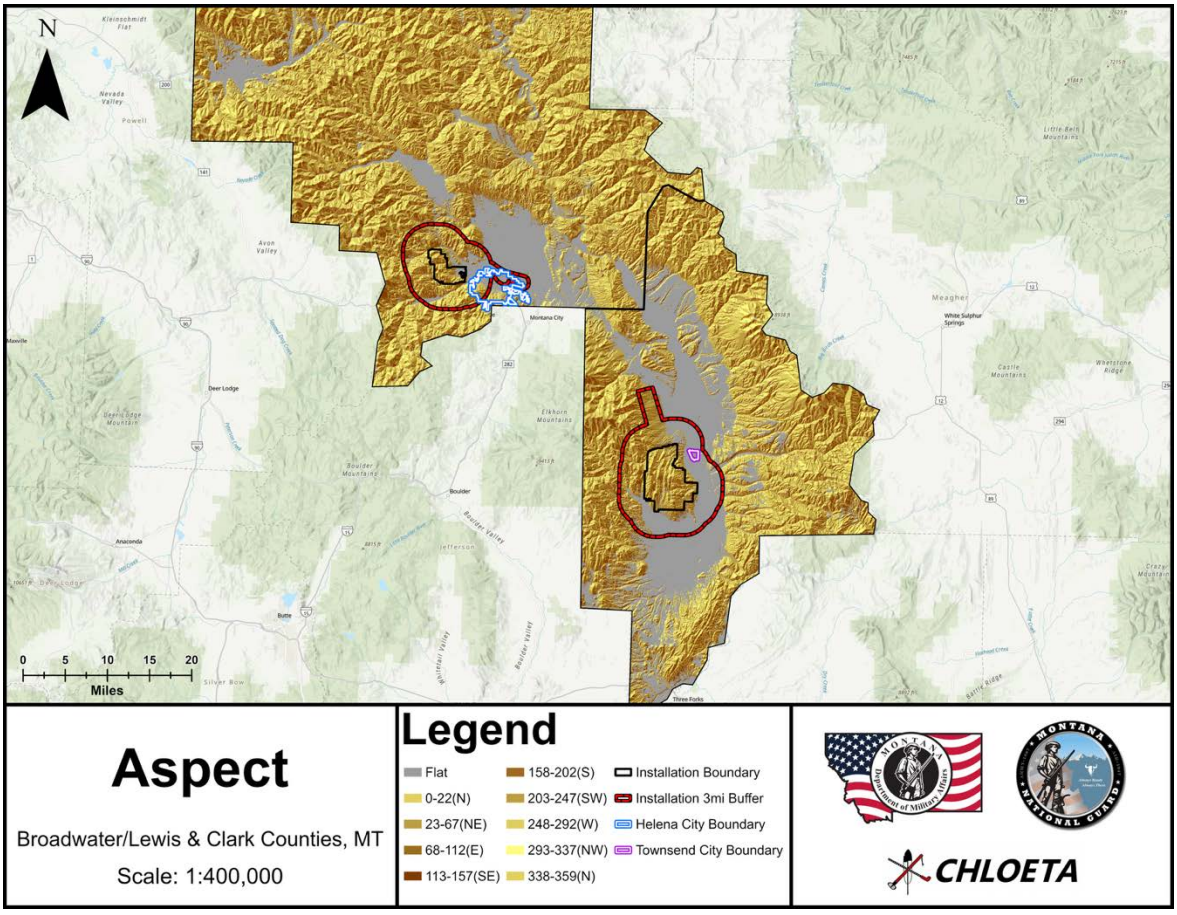


Figure 17. FHTA and LHTA Aspect Area Map

FHTA assessment area is surrounded by slopes that predominantly face south to southwest (158°–247°), as shown in orange and brown hues on Figure 16. These aspects (

Figure 17) receive more direct solar radiation, resulting in drier fuels, lower fuel moisture content, and an extended fire season. When combined with steep slopes and prevailing summer winds, these sun-exposed hillsides significantly increase fire behavior potential, including rapid ignition and upslope fire spread. In the event of a fire, these slopes would likely promote intensified flame lengths and faster rates of spread, challenging containment efforts. The limited northeast or flat

terrain within or around the installation reduces the effectiveness of natural fire breaks and safe deployment areas.

LHTA assessment area shows a broad concentration of south-, southwest-, and west-facing slopes (Figure 16), particularly along the interior ridgelines and flanks of the installation boundary. These aspects (

Figure 17) are thermally favored for fuel drying and ignition, especially in late summer. The dominance of southwest aspect (203°–247°) amplifies vulnerability during fire-prone weather patterns, particularly under afternoon winds from the northwest or west. While north- and east-facing aspects (cooler and moister) do exist, they are fewer and mostly peripheral. The aspect composition in the LHTA assessment area reinforces the need for targeted mitigation on sun-exposed ridges, where fire is likely to run fast, burn intensely, and challenge suppression efforts, especially when aligned with steep slope corridors.

Elevation

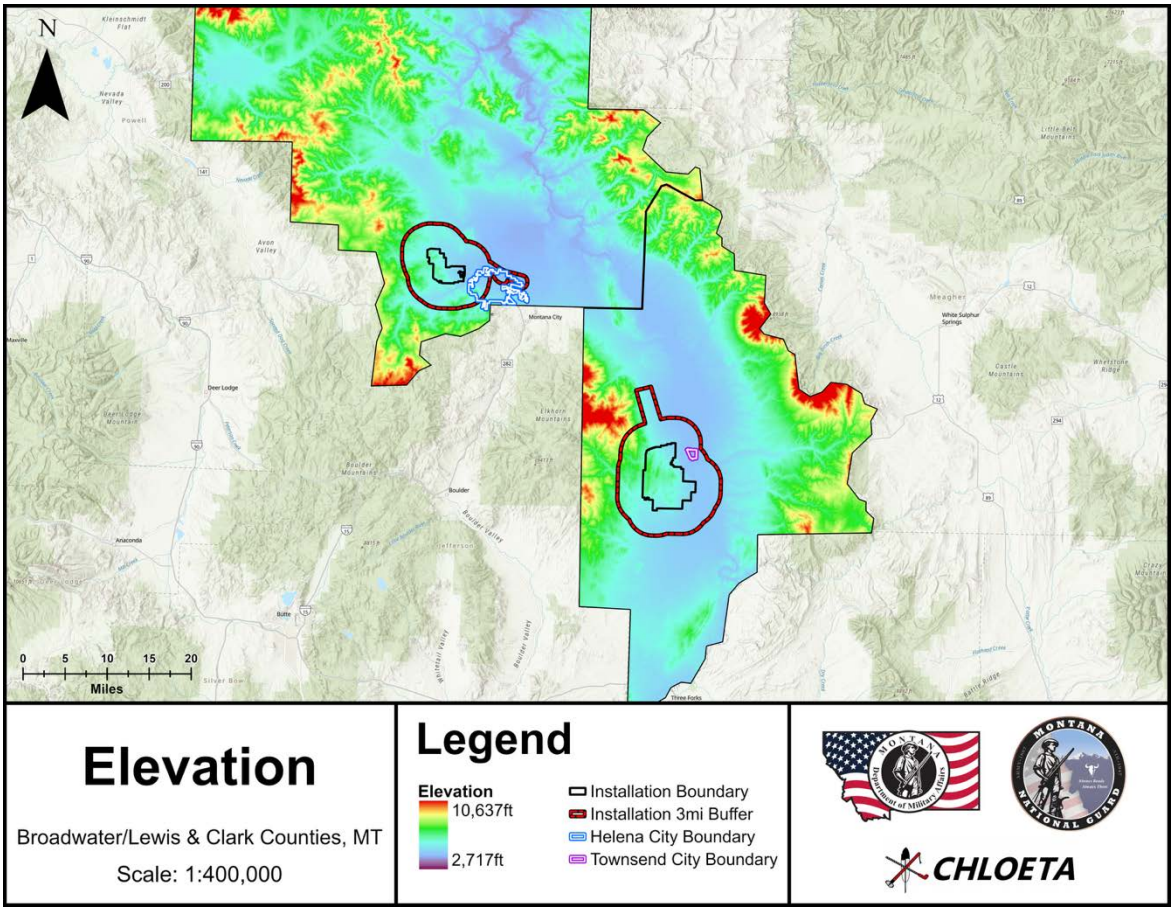


Figure 18. FHTA and LHTA Elevation Area Map

FHTA assessment area lies within a relatively lower elevation zone, primarily between 4,000 to 5,000 feet, as represented by the light blue gradient on Figure 18. These low-lying areas are surrounded by moderate ridgelines to the west and north. While these elevations are less likely to experience rapid vegetation transitions, they are more susceptible to warm, dry valley winds, which can funnel wildfire activity across flatter areas and contribute to ember transport. The elevation pattern suggests limited natural elevation breaks, so fire could traverse the area rapidly if not checked by fuel breaks or suppression lines. Accessibility at these elevations is generally better, but wildfire intensity can still be high due to fuel accumulation and sun exposure, especially on surrounding foothills.

LHTA assessment area spans a wider elevation gradient, ranging from approximately 3,900 feet in the southern valleys to over 6,000 feet in the surrounding ridgelines and buttes, as indicated by the red and orange areas on Figure 18. These elevation shifts create natural chimneys for fire movement, with steep terrain amplifying convective heat and encouraging upslope fire runs. The ridges east and southeast of the installation show particularly high elevation and steep relief, increasing potential for intense fire behavior and difficult suppression access. Furthermore, the juxtaposition of low valley floors adjacent to steep ridges makes rapid elevation gains a concern for fire spread modeling. Fires igniting at lower elevations could quickly accelerate as they move upslope, particularly under strong diurnal wind patterns common in Montana.

Rate of Spread

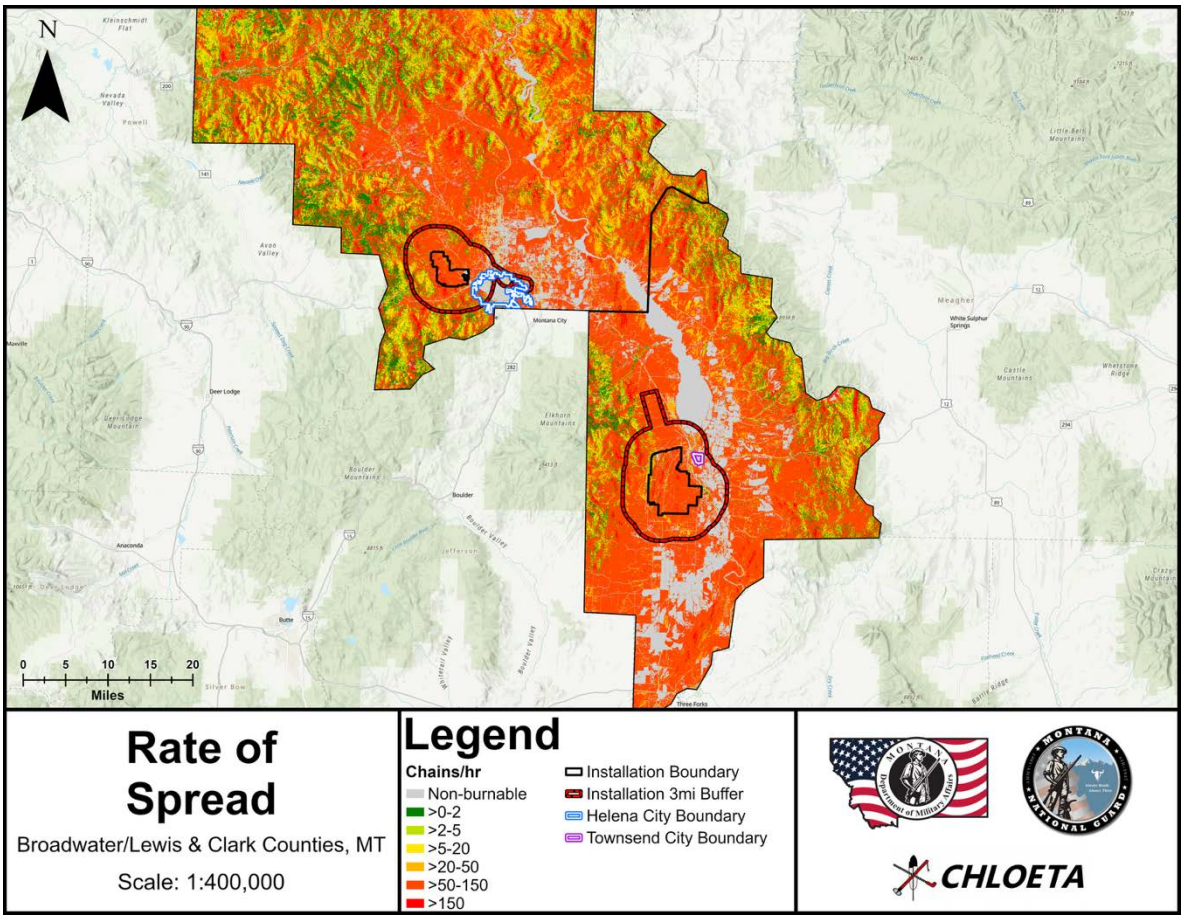


Figure 19. FHTA and LHTA Rate of Spread Area Map

The Rate of Spread (ROS) map for the assessment areas highlights significant potential wildfire behavior patterns (Figure 19). The data, measured in chains per hour, reveals critical differences in how quickly fires may advance across the landscape due to vegetation, topography, and fuel conditions.

The FHTA assessment area is largely dominated by orange and red areas, representing rates of spread ranging from 20 to over 150 chains per hour. This indicates rapid fire advancement potential, particularly on the west and southwest flanks where vegetation density and slope combine to support aggressive fire runs. These high-ROS areas intersect with developed WUI areas, suggesting elevated risk to life safety, infrastructure, and operational readiness. Mitigation strategies including pre-positioned fire lines, fuel breaks, and enhanced detection capabilities are essential for this area.

The LHTA assessment area exhibits similar elevated ROS values, particularly in the southern and southeastern slopes, which are blanketed in red (>150 chains/hr.) and orange (50–150 chains/hr.)

hues. These steep; fuel-rich corridors promote fast-moving wildfire pathways that are likely to challenge suppression resources. Additionally, the eastern side of LHTA assessment area presents limited access routes, compounding the hazard from a fire operations standpoint. The map emphasizes the need for focused fuel reduction treatments and the establishment of staging areas in areas with slower expected ROS (e.g., green and yellow areas at 0–5 chains/hr.).

Overall, this ROS analysis confirms both assessment areas are positioned in high-risk fire environments where wildfires can spread rapidly under critical weather conditions. These insights should be directly integrated into pre-incident planning, evacuation modeling, and resource allocation frameworks.

Flame Length

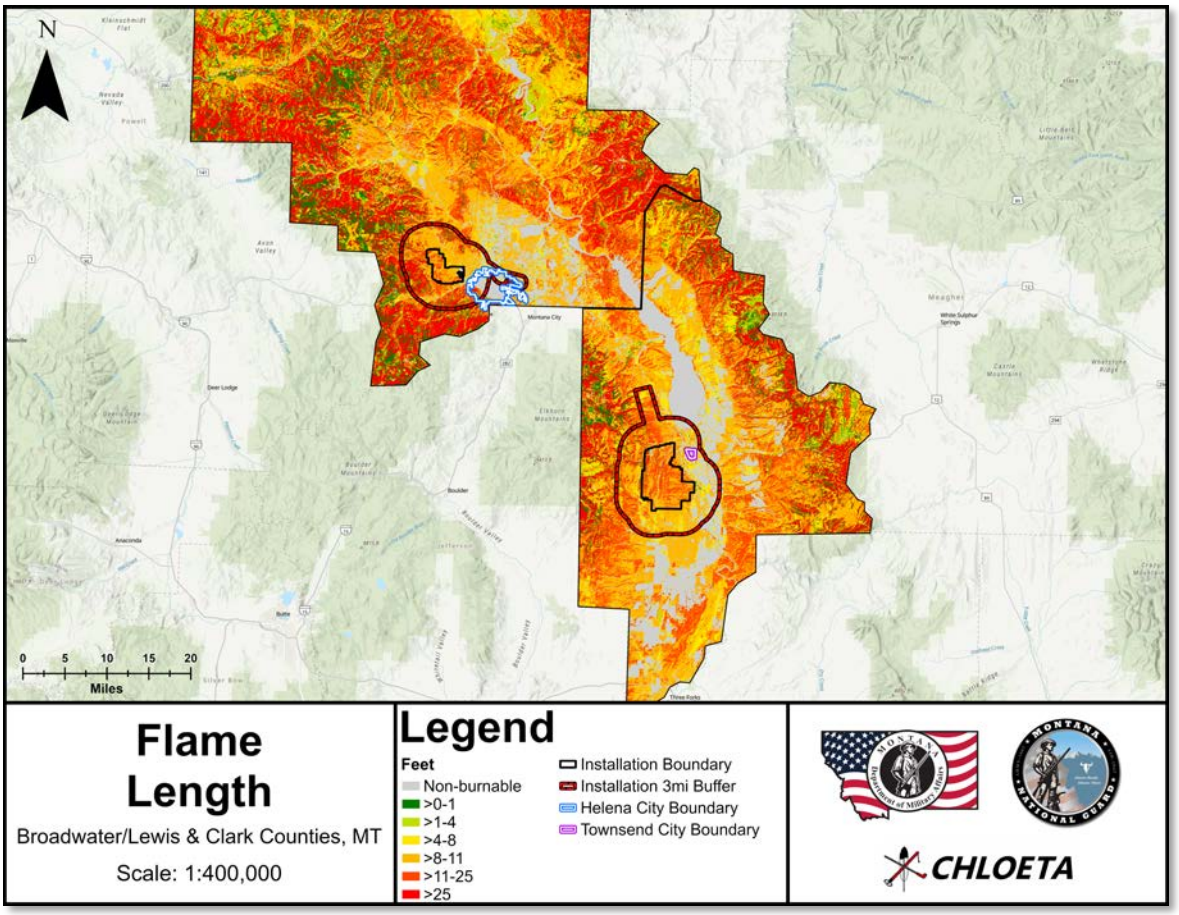


Figure 20. FHTA and LHTA Flame Length Area Map

The flame length model highlights significant areas within both FHTA and LHTA assessment areas that are prone to high-intensity fire behavior (Figure 20). Flame length is a vital indicator of fire severity and suppression difficulty, with longer flames (>four feet) requiring mechanized suppression or indirect tactics due to the increased danger to personnel

Within FHTA assessment area, much of the landscape is characterized by moderate to high flame lengths ranging from four to 11 feet, shown in orange to red. These lengths significantly limit ground crew operations and indicate a strong likelihood of crown fire behavior in forested sections. Some isolated pockets, especially to the west and south, exhibit flame lengths exceeding 11 feet, signaling areas of critical concern for suppression and evacuation planning. These areas may also coincide with dense canopy, steep slopes, and continuous fuels identified in previous maps. Smaller areas of less than four-foot flame lengths exist but are rare and limited to developed or fuel-modified locations.

LHTA assessment area displays extensive coverage of flame lengths in the four to eight -foot and eight to 11-foot ranges, especially within the core installation and buffer area. This distribution aligns with the dominant shrub/grass fuels and moderate slopes. The prevalence of orange and red areas, particularly to the west and southeast, indicates a consistent threat of fast-moving surface fires that may transition to crown fire under windy conditions. Flame lengths exceeding 11 feet are less extensive than in FHTA assessment area but still appear near fuel-heavy ridgelines and historically dry vegetation areas. This data reinforces the need for proactive thinning, prescribed burns, and strategic breaks in vulnerable corridors.

These flame length patterns underscore the operational challenge posed by topography and vegetation synergy. Fire crews operating in areas with flame lengths greater than four feet will require enhanced mechanized support, indirect strategies, and a focus on firefighter safety. Pre-identification of defensible space, staging areas, and evacuation routes is essential to respond effectively under dynamic fire conditions.

Canopy Cover

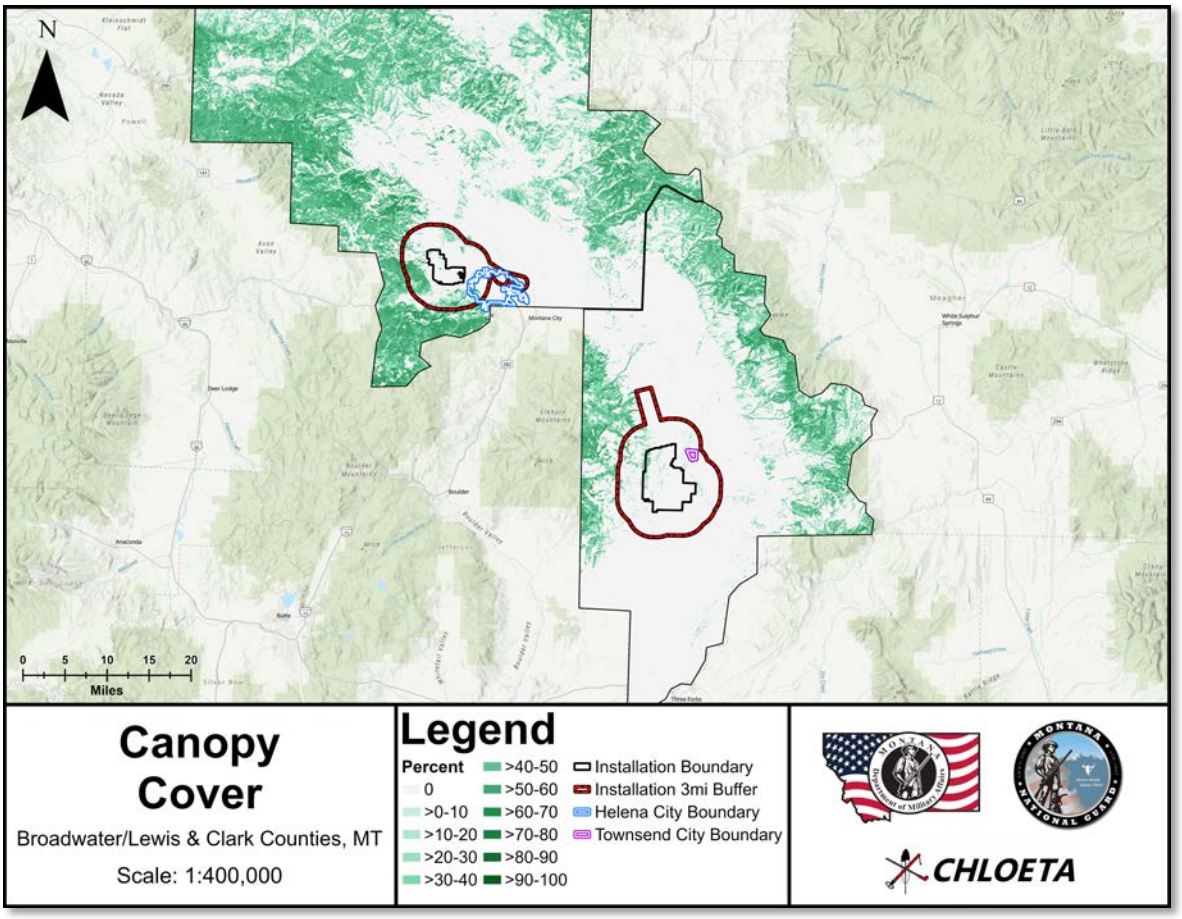


Figure 21. FHTA and LHTA Canopy Cover Area Map

FHTA assessment area shows moderate canopy coverage within the installation boundary, predominantly ranging from 10% to 50%, with some adjacent areas reaching 60–80% (Figure 21). These mid-range canopy areas suggest a continuous horizontal fuel layer that can support crown fire transition under dry and windy conditions. The presence of structured canopy fuels, especially when layered over slopes, increases the likelihood of rapid vertical fire spread and sustained flame lengths, complicating suppression efforts. This pattern emphasizes the importance of managing surface fuels and thinning overstory vegetation to interrupt fire pathways.

In contrast, LHTA assessment area presents more variable canopy cover (Figure 21), with large sections within the installation boundary reflecting low to moderate canopy density (10–30%) , and little to no cover in the central interior. However, the surrounding buffer area, especially to the east and northeast, shows higher canopy concentrations (30–60%). These adjacent dense-canopy corridors act as fire conduits, channeling embers and supporting torching or crown runs that can threaten the installation from the flanks. The variability in canopy density across the LHTA assessment area suggests the need for zone-based fuel treatments, focusing on edge areas where canopy cover supports spotting potential.

Canopy Base Height

Areas with low Canopy Base Height (CBH) are priority areas for fuel reduction treatments to include understory thinning, prescribed burns, or ladder fuel removal. By identifying and managing low CBH areas, planners can disrupt vertical fire continuity and improve fire resilience.

The CBH distribution across the FHTA and LHTA assessment areas (Figure 22) illustrates key differences in vertical fuel structure, which significantly influence crown fire potential and suppression difficulty.

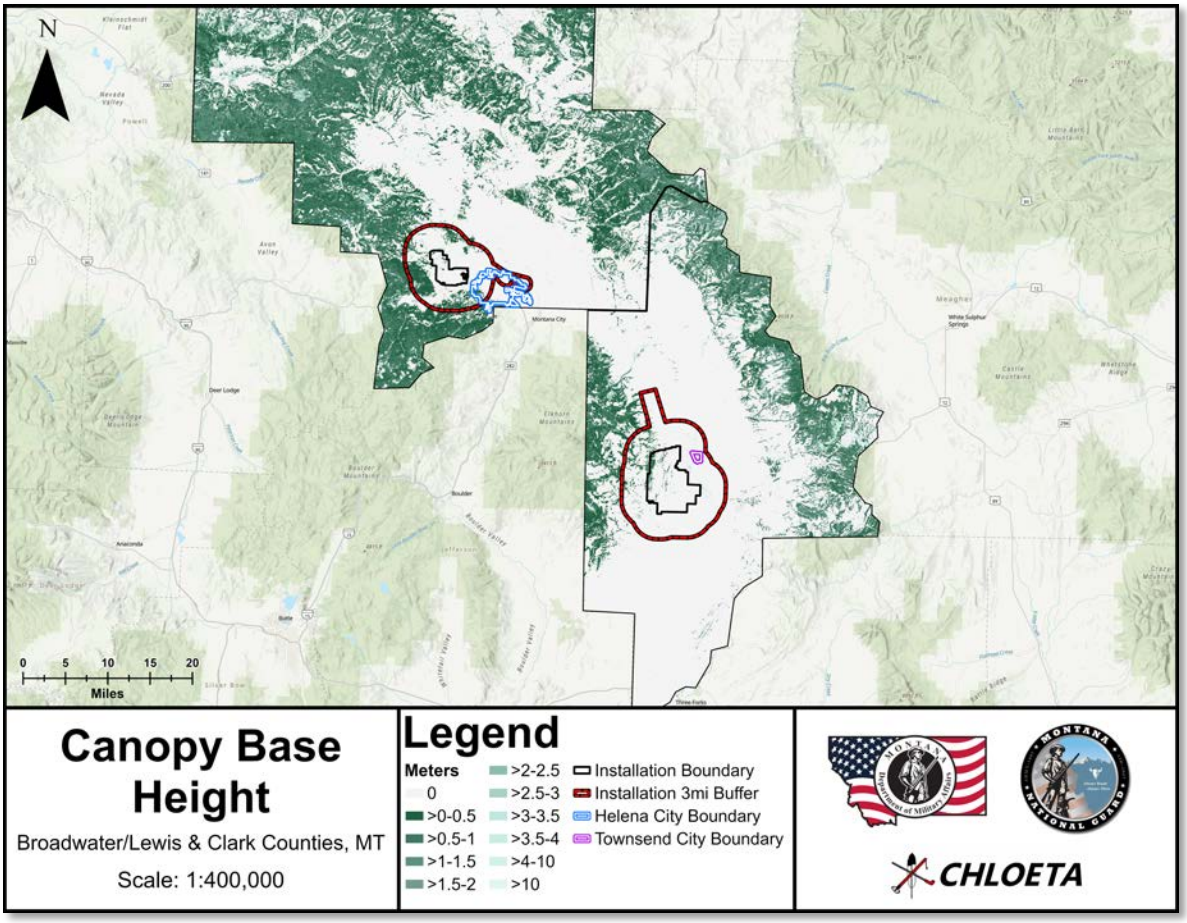


Figure 22. FHTA and LHTA Canopy Base Height Area Map

The FHTA assessment area shows a concentration of low CBH values (0–2 meters), particularly in the forested areas northwest and southwest of the installation boundary. These areas represent high-risk areas for crown fire initiation, as the proximity between surface fuels and canopy layers allows fire to ladder into the tree crowns with minimal resistance. This analysis reveals that even within the assessment area, low CBH values dominate, highlighting a broad region of elevated crown fire potential. This suggests a need for targeted ladder fuel treatments including thinning, pruning, or prescribed understory burns to increase vertical separation.

The LHTA assessment area presents a more mixed canopy base height profile. While moderate CBH ranges (2–5 meters) are common around the installation boundary, there are patches of very low CBH (<1 meter) on the western flanks and higher CBH areas (>5 meters) to the east and southeast. This variability implies differing levels of vulnerability within the training area. The lower CBH pockets align with previously identified steep slopes and heavy vegetation, creating hotspots where fires could rapidly intensify. Conversely, areas with CBH above four meters provide some natural buffer, especially in sparsely vegetated or open woodland areas, reducing the likelihood of crown fire spread.

Overall, the CBH analysis underscores the importance of site-specific fuel management strategies across both installations. Areas with low canopy base heights should be prioritized for mitigation to disrupt vertical fire continuity and enhance defensible space effectiveness, particularly in areas already exposed to high rates of spread and dense canopy cover.

Wildfire History and Trends

Montana's fire season typically spans from May through October, with peak fire activity occurring between mid-July and early October, a critical 12-week period when temperatures are highest, and fuels are driest. As summer progresses, decreasing fuel moisture, persistent high temperatures, and dry wind events create ideal conditions for ignition and rapid-fire spread. According to national fire season patterns, Montana aligns with the broader Northwest region, where peak fire season extends from June to October.

Within the FHTA and LHTA assessment areas, this seasonality demands heightened preparedness beginning in late spring and extending through the early fall months. Recognizing this window of elevated fire danger allows agencies and communities to strategically time fuel treatments, public outreach, burn restrictions, and response readiness activities. Regional and national fire season maps (Figure 111.) further contextualize Montana's position within broader wildfire trends, underscoring the need for coordinated interagency planning across seasonal boundaries.

Table 5 presents a summary of significant wildfires that occurred from within and around the assessment areas. These incidents highlight the region's ongoing exposure to wildfire threats, underscore the importance of coordinated preparedness efforts, and inform the prioritization of resources for wildfire mitigation, response planning, and community resilience initiatives.

Table 5. Wildfire History for FHTA, LHTA Assessment Areas

Fire Name	Year	Acres Burned	Agency	Jurisdiction Impacted
Little Hogback	2025	26	Local	Broadwater
Meadowlark	2025	250	Local	Lewis & Clark
Horse Gulch	2024	15,167	DNRC / Local	Lewis & Clark, Broadwater
Hellgate Gulch	2024	108	Local	Lewis & Clark

Fire Name	Year	Acres Burned	Agency	Jurisdiction Impacted
No Name	2024	2.5	—	FHTA
No Name	2024	23.5	—	LHTA
No Name	2023	3.9		LHTA
Matt Staff Road	2022	1,521.47	Local / DNRC / BLM / USFS	Lewis & Clark, Broadwater
Birdseye	2022	3.0	Local / VA / DNRC	Lewis & Clark
No Name	2022	39.7	—	FHTA
Deep Creek Canyon	2021	4,643.03	USFS	Broadwater
American Fork	2021	21,867.00	USFS	Lewis & Clark
Woods Creek	2021	55,882.00	USFS	Broadwater
No Name	2021	0.6	—	FHTA
No Name	2021	65.3	—	LHTA
Eustis Support	2015	8,719.99	US BLM	Broadwater
Meriwether	2007	42,551.89	USFS	Lewis & Clark
Canyon Ferry Complex (Bucksnort)	2000	15,356.83	USFS	Broadwater
Maudlow/Toston	2000	81,755.69	USFS	Broadwater
Canyon Creek	1988	204,600.00	USFS	Lewis & Clark
Canyon Creek East	1988	20,636.00	USFS	Lewis & Clark
Warm Springs Creek	1988	46,900.00	USFS	Lewis & Clark

Between 2000 and 2025, the Lewis & Clark and Broadwater County regions experienced a persistent and varied pattern of wildfire activity. Significant fires were recorded during this period, ranging from small ignition events to large, landscape-altering incidents. These fires reflect both natural wildfire behavior and the increasing complexity of managing risks within the WUI, military training lands, and resource-constrained rural areas.

Large-scale wildfires have repeatedly impacted LHTA assessment area, including multiple multi-thousand-acre incidents spanning several decades. The 1988 Canyon Creek Fire, which burned approximately 174,000 acres across Lewis & Clark County and affected Broadwater County, remains one of the largest wildfires on record in the region and required a sustained, multi-agency response. Other major fires affecting Broadwater County include the Maudlow/Toston Fire (81,756 acres in 2000), the Woods Creek Fire (55,882 acres in 2021), the American Fork Fire (21,867 acres in 2021), and the Canyon Ferry Complex (15,357 acres in 2000). More recent incidents, such as Deep Creek Canyon (4,643 acres in 2021), Horse Gulch (15,167 acres in 2024), and Matt Staff Road (1,521 acres in 2022), demonstrate the continued frequency of large and moderate-scale fires in and adjacent to the county. Collectively, these events have exposed critical

infrastructure, challenged evacuation and access routes, and placed sustained demand on suppression resources, emergency response capacity, and long-term community resilience.

In the FHTA assessment area several significant wildfire incidents near populated areas underscore the growing threat to communities at the wildland–urban interface. Large fires such as the Meriwether Fire (42,552 acres in 2007) and the Horse Gulch Fire (15,167 acres in 2024) demonstrate the scale of potential impacts in proximity to Helena and surrounding development. More moderate but operationally significant incidents, including the Matt Staff Road Fire (1,521 acres in 2022), further illustrate the vulnerability of transportation corridors and nearby communities. Smaller, recent fires such as Hellgate Gulch (108 acres in 2024), Meadowlark (250 acres in 2025), and Birdseye (3 acres in 2022) reinforce that even limited-acreage events in densely populated or strategically located areas can pose substantial public safety, evacuation, and emergency response challenges.

FHTA and LHTA also show consistent wildfire activity during this period, although the individual incidents are relatively small in scale. Fires at FHTA between 2021 and 2025 ranged from 0.6 to 125.8 acres while LHTA experienced several ignitions in the 3.9–65.3-acre range. These military facilities require special attention due to the nature of their ignition sources (e.g., munitions training) and their location in areas with limited public access but high regional ecological and operational importance. These sites also represent a unique risk profile, as fires can start during mission-critical activities and escalate quickly if suppression assets are delayed, or access is restricted.

Recent years, particularly 2021–2025, reflect an increase in both the frequency and complexity of wildfire incidents across the assessment areas. In 2021, multiple large fires ignited under drought-stressed conditions, including Woods Creek (55,882 acres), American Fork (21,867 acres), and Deep Creek Canyon (4,643 acres), requiring coordinated suppression efforts led primarily by the USFS with support from state and local partners. Subsequent fires in 2024 and 2025, most notably Horse Gulch (15,167 acres), Meadowlark (250 acres), and Little Hogback (26 acres), demonstrate continued wildfire activity across a range of fire sizes. Collectively, these incidents highlight the ongoing need for pre-incident planning, interagency coordination, and proactive fuels mitigation to reduce risk to communities, infrastructure, and emergency response capacity under increasingly extreme fire weather conditions.

Several major wildfires have impacted the assessment areas over the past two decades, illustrating both the scale of wildfire risk and the increasing threat to human life, property, and military readiness. The most significant incidents follow:

- **Canyon Creek Fire (1988):** One of the largest wildfires in recent memory, this fire burned over 204,600 acres across Broadwater and Lewis & Clark counties. Its scale and severity prompted widespread firefighting efforts and highlighted vulnerabilities in the region's forested terrain, prompting greater interagency coordination for suppression and mitigation.
- **Maudlow/Toston Fire (2000):** This 81,755-acre blaze in Broadwater County had far-reaching impacts on local infrastructure, private lands, and training areas. The fire

reinforced the need for improved vegetation management and fire-adapted community practices near military and civilian areas.

- **Woods Creek Fire (2021):** Burning over 55,000 acres in Meagher and Broadwater Counties, this fire posed a direct threat to communities near LHTA and resulted in evacuations, road closures, and significant ecological impacts. The fire behavior was influenced by steep topography, dense fuels, and prolonged drought conditions, serving as a case study for future fuel reduction strategies.
- **Horse Gulch Fire (2024):** A more recent and human-caused wildfire, this fire rapidly spread through over 15,000 acres of Lewis & Clark and Broadwater Counties, including areas near Compatible Use Buffers. It resulted in evacuation orders, power outages, and major public safety concerns. The fire behavior in WUI areas underscored the importance of defensible space, public outreach, and inter-jurisdictional collaboration.
- **Deep Creek Canyon Fire (2021):** Though smaller in size (4,643 acres), this fire burned close to developed areas in Broadwater County and was notable for its complex containment needs due to difficult terrain. It highlighted the risk of ignition near transportation corridors and the importance of rapid initial attack capabilities.

Figure 23 summarizes the Western Montana wildfire history and illustrates clear spatial and temporal patterns that inform the wildfire vulnerability assessment. Decades of mapped fire perimeters and ignition points show repeated fire activity across the landscape, with concentrations near transportation corridors, populated valleys, and wildland–urban interface areas. The distribution of both large historic fires and frequent recent ignitions highlights a trend toward increasing exposure, complexity, and cumulative risk. Together, these patterns underscore that wildfire vulnerability in the planning area is not isolated or episodic, but persistent and shaped by a combination of fuels, topography, climate conditions, and human activity.

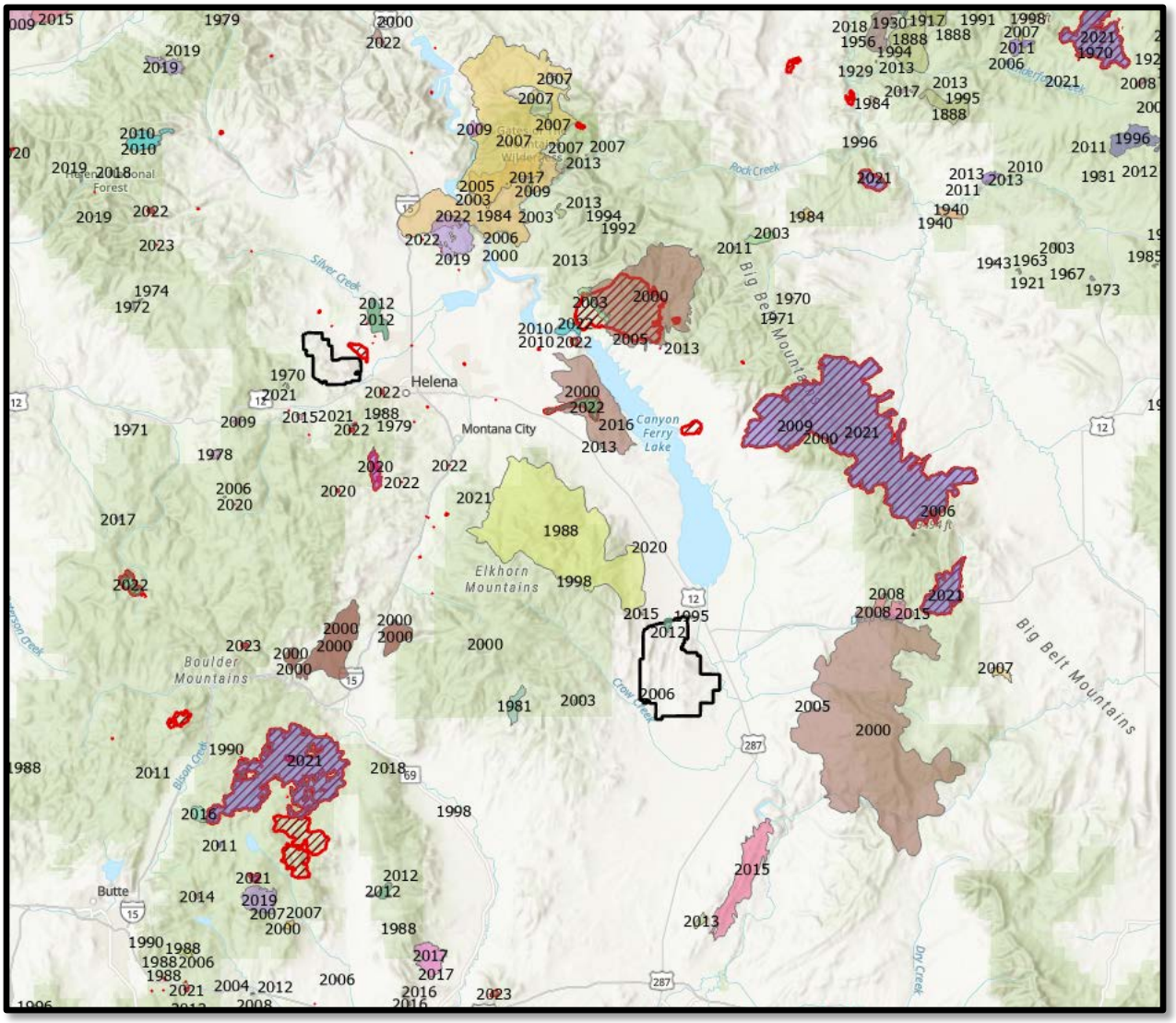


Figure 23. Wildfire History in West-Central Montana Map

Wildfire Fire Ignition Locations

These ignitions originated from a combination of natural and human-caused sources, often influenced by terrain, land use, and proximity to development or critical infrastructure. Table 6 summarizes key wildfire ignition areas.

Key Ignition Areas

- Roadside Corridors and Transportation Routes: Many ignitions have occurred along heavily traveled corridors, including Highways 12 and 287, where vehicle sparks, mechanical failures, and discarded smoking materials are common causes. These ignition points are particularly concerning due to their proximity to WUI areas and their potential to escalate quickly during dry, windy conditions.

- Military Training Ranges (FHTA & LHTA): Live-fire exercises and heavy equipment operations within training areas present ongoing ignition risks. While managed under strict protocols, these activities result in spot fires, especially during periods of low humidity and high fuel loading. The Matt Staff Road fire highlights this risk in and near the LHTA.
- Utility Corridors and Power Infrastructure: Downed power lines, transformer failures, or vegetation contact with transmission infrastructure can spark fires in dry grassland and forested areas. Proximity of these corridors to both military installations and residential neighborhoods necessitate coordination with utility providers for vegetation management and response planning.
- Recreational Use Areas and Public Lands: Unattended campfires, fireworks, and off-road vehicle use in national forests and open lands contribute to recurring ignitions, particularly during holiday weekends and hunting seasons. Areas near Helena and Townsend have seen seasonal spikes in fire starts due to human recreation.
- WUI Areas: Residential developments extending into forested or grassland regions often become ignition areas through common activities including burning yard waste or using equipment that generates sparks. The 2024 Horse Gulch Fire, which started in a WUI area near York, is a prominent example of this trend.

Patterns and Implications

- Ignition points tend to cluster along the urban edge and near critical infrastructure or high-use areas.
- Early detection, rapid suppression capability, and public education in these areas are vital.
- Ignition risk maps should be integrated with fuel models and evacuation planning tools to prioritize mitigation projects and patrol strategies.

Table 6. Key Wildfire Ignition Zone Summary

Fire Name	Year	Acres Burned	Jurisdiction Impacted	Agency	Ignition / Cause	Key Notes
Little Hogback	2025	26	Broadwater	Local	Human-caused (suspected)	Small WUI fire; rapid response limited spread.
Meadowlark	2025	250	Lewis & Clark	Local	Human-caused	Fire near populated areas; access and structure protection concerns.
Horse Gulch	2024	15,167	Lewis & Clark, Broadwater	DNRC / Local	Human-caused	Large, complex incident near Helena WUI; evacuations and multi-agency coordination.

Fire Name	Year	Acres Burned	Jurisdiction Impacted	Agency	Ignition / Cause	Key Notes
Hellgate Gulch	2024	108	Lewis & Clark	Local	Human-caused	Small but strategically located fire near development and transportation corridors.
No Name	2024	23.5	LHTA	—	Training-related / human-caused	Recurrent ignition area within training lands.
No Name	2024	2.5	FHTA	—	Training-related / human-caused	Small ignition with localized operational impacts.
Matt Staff Road	2022	1,521.47	Lewis & Clark, Broadwater	Local / DNRC / BLM / USFS	Human-caused	Steep limestone terrain; post-fire flooding and debris-flow concerns.
Birdseye	2022	3.0	Lewis & Clark	Local / VA / DNRC	Human-caused	Roadside/WUI fire; rapid knockdown prevented spread.
No Name	2022	39.7	FHTA	—	Training-related / human-caused	Repeated ignition pattern within training footprint.
Woods Creek	2021	55,882.00	Broadwater	USFS	Lightning-caused	Large, high-severity fire under drought conditions; watershed impacts.
American Fork	2021	21,867.00	Lewis & Clark	USFS	Lightning-caused	Significant fire in steep terrain; long-duration suppression.
Deep Creek Canyon	2021	4,643.03	Broadwater	USFS	Lightning-caused	Fire in confined drainage with post-fire flood risk.
No Name	2021	65.3	LHTA	—	Training-related / human-caused	Indicates frequent ignition recurrence.
No Name	2021	0.6	FHTA	—	Training-related / human-caused	Minor fire; illustrates persistent ignition exposure.

Fire Name	Year	Acres Burned	Jurisdiction Impacted	Agency	Ignition / Cause	Key Notes
Eustis Support	2015	8,719.99	Broadwater	BLM	Lightning-caused	Wind-driven rangeland fire with rapid spread.
Meriwether	2007	42,551.89	Lewis & Clark	USFS	Lightning-caused	Major fire near Helena; prolonged suppression and smoke impacts.
Canyon Ferry Complex	2000	15,356.83	Broadwater	USFS	Lightning-caused	Multiple starts around Canyon Ferry Reservoir.
Maudlow/Toston	2000	81,755.69	Broadwater	USFS	Lightning-caused	Large rangeland/interface fire; extensive suppression footprint.
Warm Springs Creek	1988	46,900.00	Lewis & Clark	USFS	Human-caused	Historic fire during extreme drought; structural losses reported.
Canyon Creek East	1988	20,636.00	Lewis & Clark	USFS	Lightning-caused	Part of the 1988 fire season cluster.
Canyon Creek	1988	204,600.00	Lewis & Clark	USFS	Lightning-caused	One of the largest fires on record in the region; extreme fire behavior.

Past Fires Frequency and Cause

Historical wildfire data indicates that the region experiences multiple ignitions annually, with a clear increase in both the frequency and scale of significant fire events since 2020 (Table 6). The 2021 fire season was particularly active, with multiple large incidents igniting under drought-stressed conditions, including Woods Creek (55,882 acres), American Fork (21,867 acres), and Deep Creek Canyon (4,643 acres). Similarly, the 2024 season reflected elevated wildfire activity, most notably with the Horse Gulch Fire (15,167 acres), alongside smaller but operationally significant incidents such as Hellgate Gulch. Recent fires in 2025, including Meadowlark and Little Hogback, demonstrate continued ignition pressure near populated areas and the wildland–urban interface. Fires have occurred consistently over the past two decades, with both recurring hotspots near Townsend and Helena-area WUI corridors, as well as dispersed ignitions across training areas and buffer lands (LHTA and FHTA), underscoring sustained regional vulnerability driven by climate conditions, fuel accumulation, and human activity.

Common Wildfire Causes

- Human-Caused Ignitions: Many recent wildfires have been linked to human activities. These include recreation-related incidents (e.g., campfires, fireworks), roadside ignitions

(e.g., sparks from vehicles), and utility-related fires. Military training operations also pose an ignition risk, particularly during dry conditions.

- Lightning Strikes: While less frequent, lightning-caused fires still account for a portion of ignitions, especially in more remote or elevated terrain within LHTA assessment area. These events often occur during dry thunderstorms and can smolder undetected before flaring up.
- Infrastructure and Equipment Failure: Fires have also originated from downed power lines, malfunctioning equipment, and structure-related incidents that spread into wildland areas. As development continues within the assessment areas, this cause is expected to increase in frequency without preventive action.

Key Observations

- Human-caused fires dominate ignition sources and are most frequent near roadways, developed areas, and recreation sites.
- Fire frequency is rising, with several high-acreage fires occurring in short succession (e.g., 2021–2024).
- Seasonal peaks in fire occurrence align with late summer and early fall, when fuels are driest, and winds increase.

Critical Infrastructure and Access

Wildfire poses significant risks to the interconnected systems that support both military and civilian populations. Road networks provide critical access to training areas, evacuation routes, regional supply chains and also serve as the main routes MTARNG would use in the event they are mobilized to respond to an emergency, yet can be easily disrupted by smoke, closures, or fire damage. Electrical transmission lines, communications systems, and water supply infrastructure are also highly exposed, and disruption to any one of these systems can result in cascading failures that affect training readiness, delay or limit emergency response operations, and undermine overall community resilience across the region. Protecting these assets through hardening measures, redundancy planning, and coordinated maintenance is essential to sustaining operational continuity.

The Regional Assessment and Planning Tool (RAPT) enhances the analysis process by allowing planners to overlay hazard data including wildfire potential, population density, and infrastructure with critical layers to include hospitals, evacuation routes, and socially vulnerable populations. RAPT integrates a wide range of national datasets including hazard exposure, community vulnerability, critical infrastructure, and response capabilities into an interactive, map-based environment. The tool is particularly valuable for identifying gaps in preparedness, prioritizing mitigation investments, and supporting data-driven planning across multiple hazard types and operational scales. RAPT was used to overlay wildfire hazard data with demographic and infrastructure layers to inform evacuation planning, community outreach, and resource staging strategies (Figure 24).

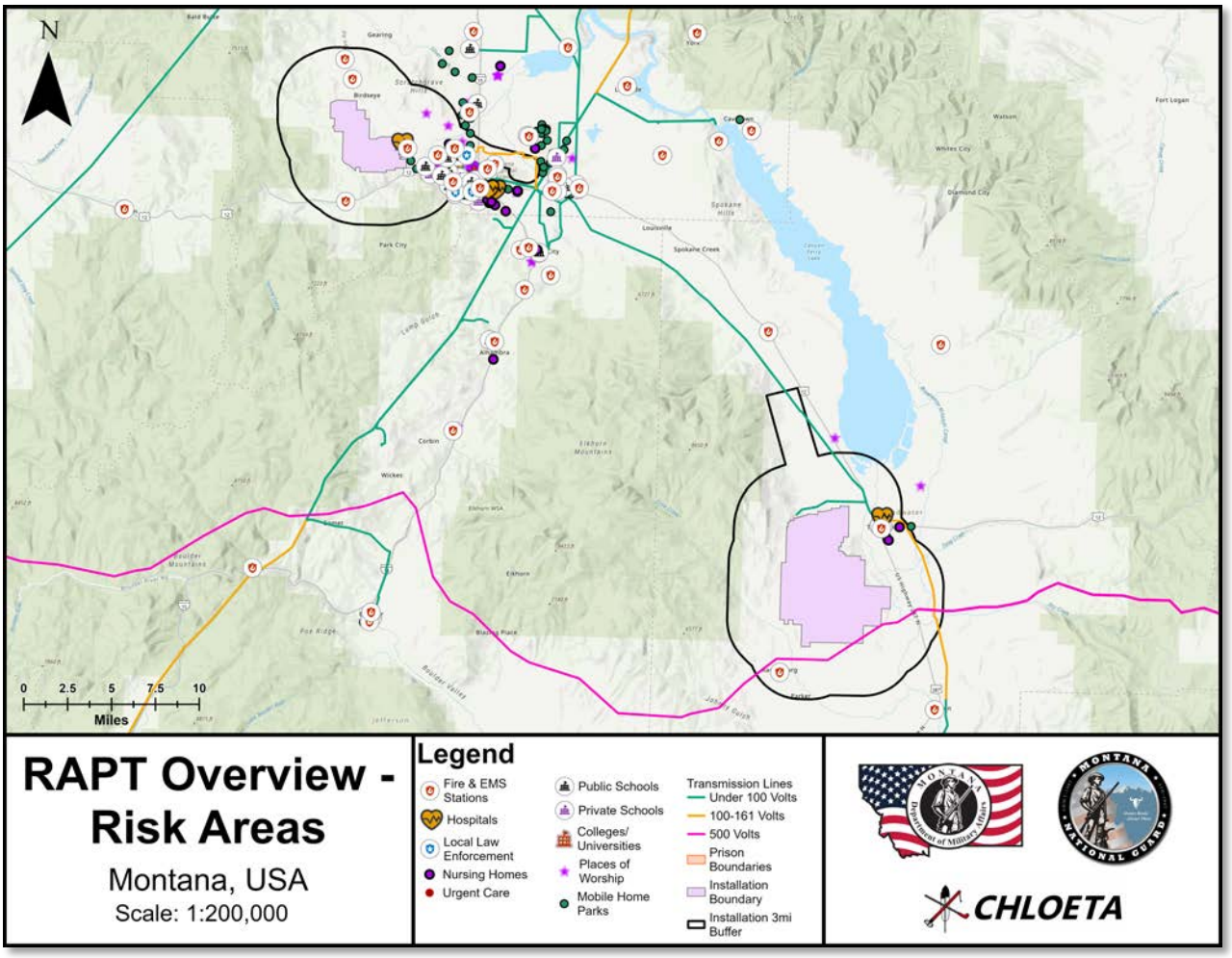


Figure 24. RAPT Overview Risk Areas for FHTA, LHTA, and Surrounding Land Map

FHTA

The RAPT risk map for FHTA (Figure 26) reveals a concentrated pattern of infrastructure and population exposure within the assessment area, particularly in relation to wildfire vulnerability and cascading infrastructure threats. Table 7 lists facilities in high-risk areas. Several critical facilities are located within high-risk areas, including three hospitals, Shodair Children's Hospital, St Peters Hospital and the Lewis & Clark County Health Center, situated within one mile of both the 100–161 kilovolt (kV) and 500 kV transmission lines that form the eastern utility corridor. These facilities, if compromised by fire or infrastructure failure, could result in acute healthcare service disruptions during emergencies.

Table 7. FHTA Facilities in High-Risk Areas

Place	Quantity
Fire/EMS Stations	9
Hospitals	3
Local Law Enforcement	1
Nursing Homes	3
Public Schools	6
Private Schools	1
Colleges/Universities	1
Prisons	0
Places of Worship	40
Mobile Home Parks	11
Transmission Lines	6

Capital High School and two nursing homes, lie immediately north of a key rail line, placing them within a narrow zone of exposure should the line become blocked or impassable during a wildfire. Additionally, the majority of fire and Emergency Medical Service (EMS) stations are concentrated in Helena's urban core, located downhill and downslope from the higher-risk terrain of FHTA. During an incident, steep topography and active fire behavior could delay engine access to more remote or elevated areas of the buffer.

The area also demonstrates several evacuation and access vulnerabilities. Single-corridor dependencies, particularly where mobile home parks and recreational areas lie between the eastern 500 kV line and the northern rail line, pose a significant risk. If either route is closed by fire or debris, residents and emergency responders may be cut off from safe egress or ingress. Further compounding these risks is the presence of a mid-voltage substation located near the eastern buffer edge, which powers both the regional hospital and Helena's main 911 center. A failure at this node could disable street lighting, traffic control infrastructure, and critical communication capabilities during a wildfire, creating a cascade effect that slows response times and increases community vulnerability.

In the FHTA assessment area, wildfire risk is significantly influenced by the orientation and limitations of major access routes (Figure 25). The area's primary transportation and utility corridors, including rail lines, highway arteries, and power transmission infrastructure, form narrow, single-path dependencies. These corridors serve as critical lifelines for evacuation, emergency response, and continuity of services. However, these pathways' steep terrain and adjacency to high flame length areas make them especially vulnerable during active fire events. If these corridors become compromised by fire, access into and out of the FHTA may be severely

restricted, delaying evacuations and hindering emergency response. The positioning of fire stations downslope of these corridors increases the time needed for engines to deploy upslope into affected areas, further exacerbating response challenges.

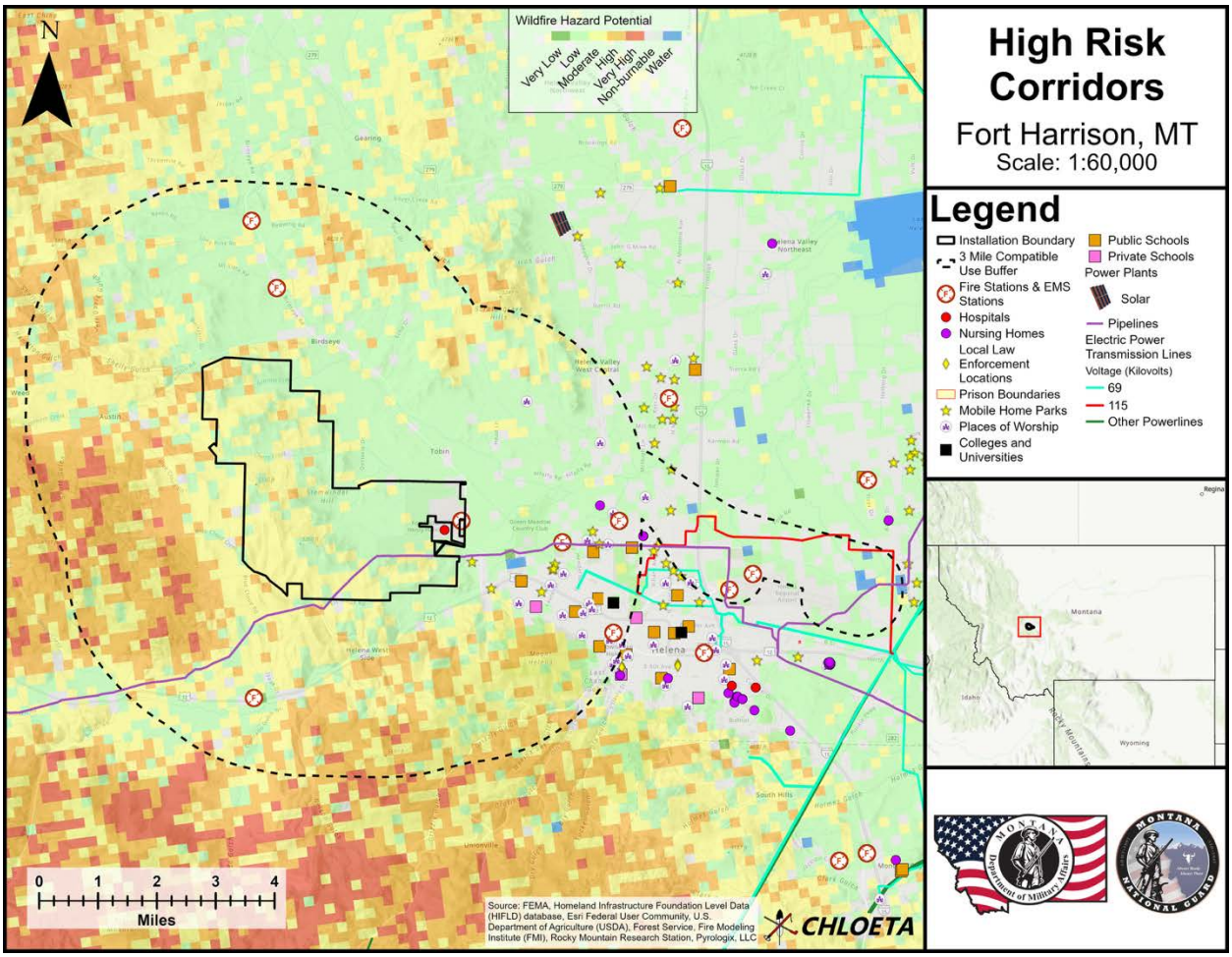


Figure 25. FHTA High Risk Corridors Map

Within the FHTA assessment area and its surrounding landscape, several prominent fire pathways and high-risk corridors have been identified based on topography, vegetation, and modeled fire behavior particularly along the Rimini Road corridor, Tenmile Creek drainage, and foothills west of Birdseye and Austin. These pathways present elevated risk not only due to their capacity for fast-moving fire but also because they connect wildland fuels directly to critical infrastructure, transportation routes, and populated areas, including the Helena Valley.

Additionally, open grasslands interspersed with shrublands south and east of FHTA assessment area present expansive fine fuel beds that can carry flame quickly under high wind, threatening assets within the installation and the WUI edge of Helena. Overall, the FHTA RAPT assessment emphasizes the need for contingency planning around infrastructure redundancy, evacuation coordination, and the hardening of critical facilities in areas with overlapping hazard and service footprints.

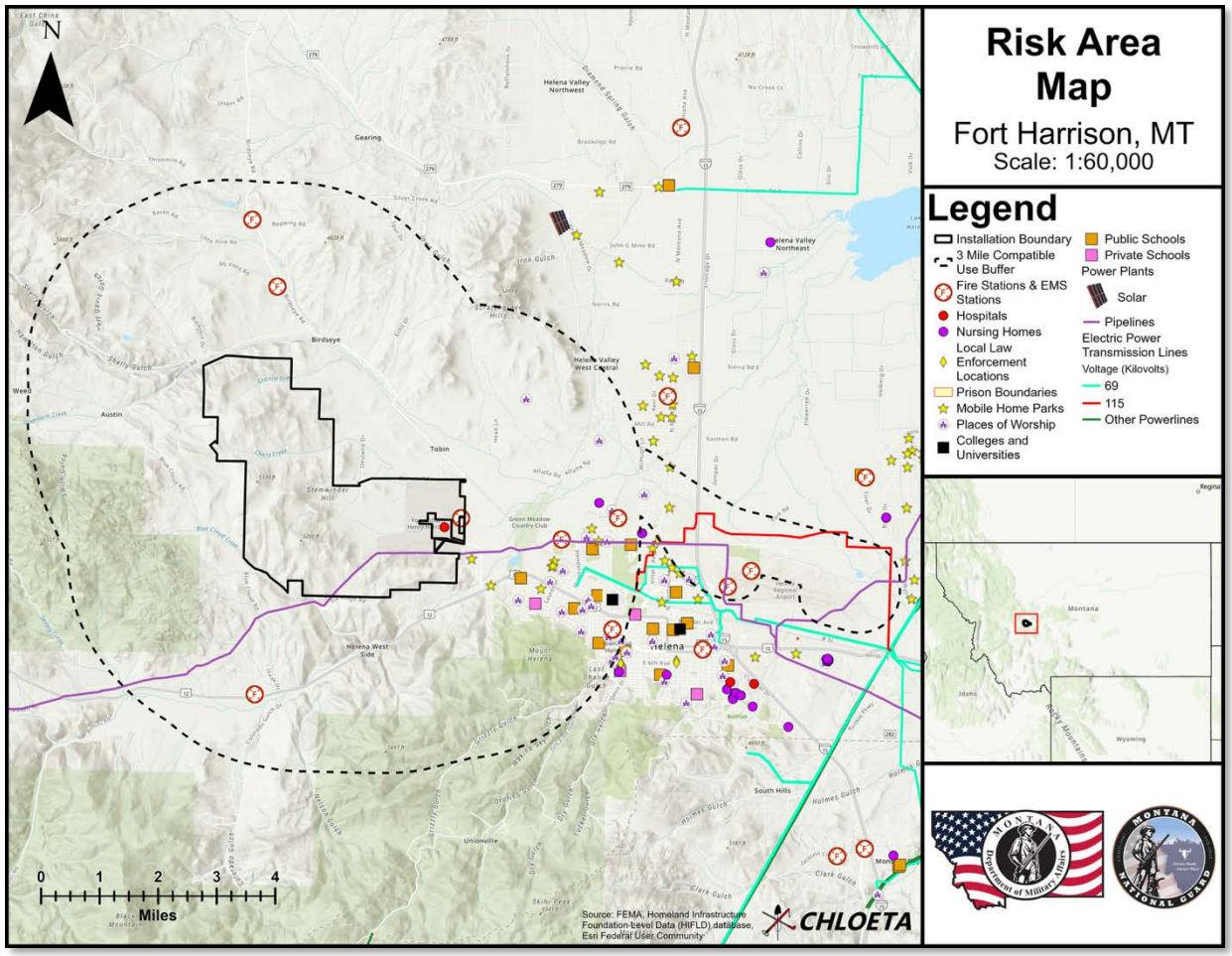


Figure 26. FHTA RAPT Risk Area Map

LHTA

The RAPT risk map for LHTA (Figure 28) highlights key infrastructure vulnerabilities and critical facility exposures within and surrounding the installation's buffer zone. A small cluster of essential facilities, including a hospital, nursing home, and law enforcement station, is located northeast of the installation, positioned between utility corridors and key transportation routes. This proximity to multiple hazards increases the potential for cascading impacts in the event of wildfire or power infrastructure failure.

Several critical services lie within areas susceptible to wildfire exposure and infrastructure disruption (Table 8). Notably, the hospital and emergency medical services are situated just east of the buffer, close to the 100–161 kV power corridor. Wildfire advancing from the west could directly impact these assets, particularly if prevailing winds push fire toward the valley communities.

Table 8. LHTA Facilities in High-Risk Areas

Place	Quantity
Fire/EMS Stations	2
Hospitals	1
Local Law Enforcement	1
Nursing Homes	4
Urgent Cares	0
Public Schools	3
Private Schools	0
Colleges/Universities	0
Prisons	1
Places of Worship	4
Mobile Home Parks	4
Transmission Lines	6

Multiple roads and utility lines traverse the area in narrow corridors, including a key north-south route that runs parallel to the buffer's eastern edge and intersects with the utility corridor. These single access points could easily become impassable in a fire event, cutting off evacuation routes and delaying emergency response. The buffer's southeastern portion includes residential and care facilities that depend on these corridors for ingress and egress.

The presence of high- and mid-voltage transmission lines, including a 500 kV line skirting the southern buffer edge, introduces risk of cascading failures. Disruption to this system could affect hospital operations, emergency communication systems, and residential areas. If fire activity were to compromise these lines, the outage could extend beyond the buffer zone and affect regional service areas, amplifying the scale of impact.

The LHTA assessment area presents similar vulnerabilities due to its dependence on limited access routes threading between natural terrain barriers and critical energy infrastructure (Figure 27). The area is bordered by high-voltage transmission lines and steep canyons, leaving a narrow band of habitable and accessible land between potential ignition points and essential facilities. One primary corridor along the southern boundary, which includes U.S. Route 12 and associated power lines, is particularly susceptible to disruption during wildfire events. Should this corridor be compromised, residents and emergency services could face isolation or delayed response. These factors create a concentrated risk zone where infrastructure, population centers, and potential wildfire paths intersect.

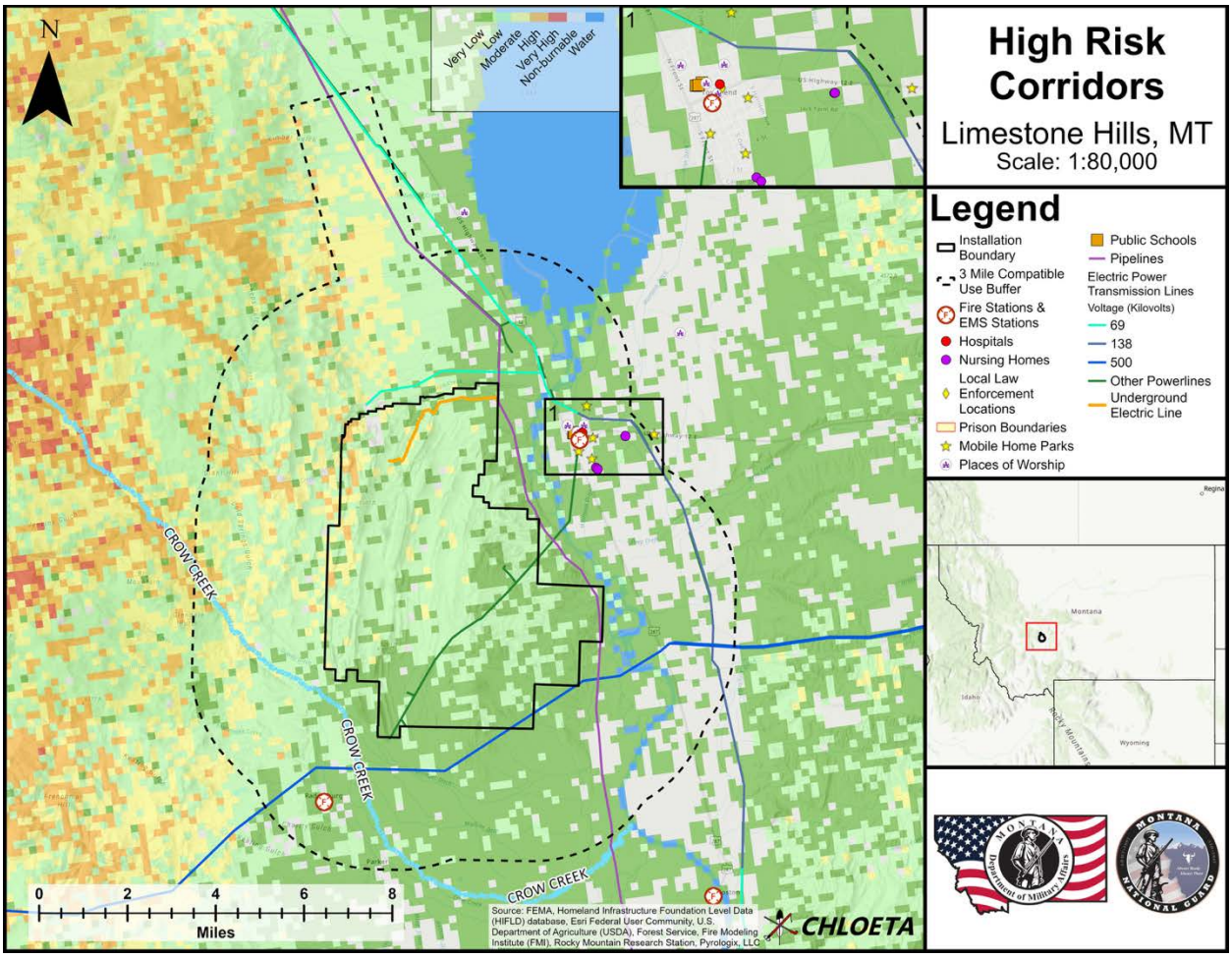


Figure 27. LHTA High Risk Corridor Map

Within the LHTA assessment area, key fire pathways and high-risk corridors have been identified through analysis of terrain, vegetation patterns, and modeled fire spread dynamics. The dominant wildfire corridors in this region generally follow north-south and east-west drainage basins and canyon systems that funnel wind and flame toward critical assets. Notably, the Missouri River corridor and the steep ridgelines along the western perimeter create natural channels for fire movement, especially under prevailing westerly wind conditions. These topographic features, combined with high fuel loads in adjacent grassland and shrubland areas, increase the likelihood of rapid-fire expansion toward infrastructure, energy transmission lines, and population clusters around Canyon Ferry Reservoir.

The presence of contiguous fine fuels in the valley floor, especially along the primary utility and road corridors east and south of LHTA assessment area enhances the risk of fast-moving, wind-driven surface fires. These corridors, which intersect with residential areas and critical facilities near Winston and along US Route 287, pose a significant threat due to limited egress and the potential for cascading infrastructure failures.

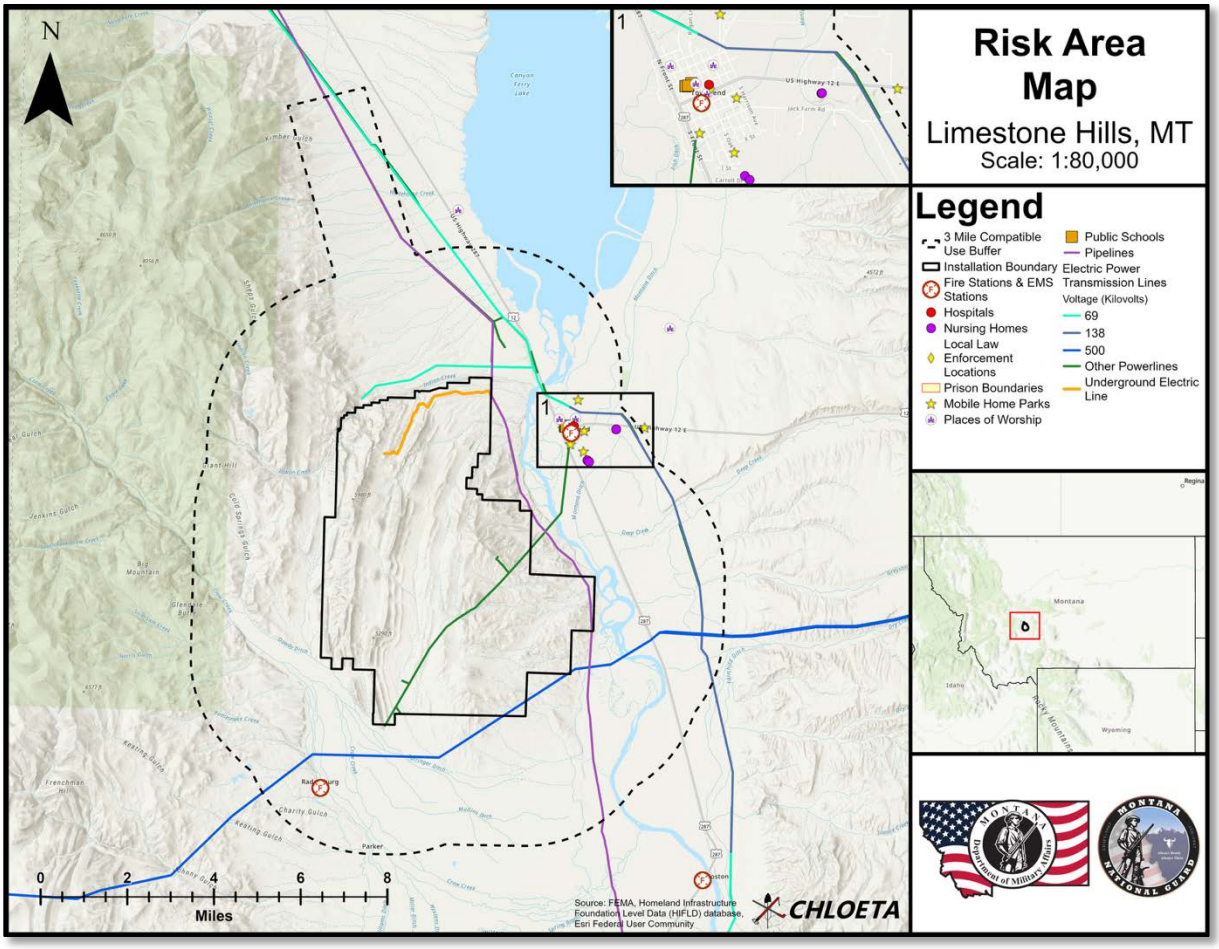


Figure 28. LHTA RAPT Risk Area Map

The LHTA RAPT (Figure 28) analysis reveals a tightly interlinked web of critical infrastructure and vulnerable populations within a confined, corridor-dependent zone.

Emergency Response Capacity

Response in both assessment areas is challenged by rugged terrain, limited staging areas, and finite local firefighting capacity. While mutual aid agreements exist, resource availability during large regional fire events is uncertain, creating potential gaps in coverage. By identifying these limitations, including response time, air support constraints, and surge capacity, this assessment highlights where investments in equipment, training, and interagency coordination can directly enhance readiness.

Land Use

In both assessment areas, expanding residential development along the wildland fringe and within the WUI increases the complexity of fire management and emergency response. Analyzing land

use patterns allows planners to identify at-risk areas, anticipate growth pressures, and guide mitigation strategies that support safe and sustainable development.

Land Ownership

FHTA assessment area land ownership, shown on Figure 29 is characterized by a patchwork of federal, state, and private entities that contribute to the complex jurisdictional landscape influencing land management, wildfire mitigation, and response coordination. Within the FHTA boundaries, the DoW is the primary landholder, managing the core area of military operations. Surrounding the installation, significant portions of land are owned by the State of Montana. To the west and south of FHTA assessment area, expansive areas fall under the jurisdiction of the USFS, representing federally managed forestlands that provide natural fuel breaks and are critical to regional wildfire response coordination. To the north and northeast, large tracts are managed by the BLM, which also plays a key role in fire mitigation and interagency coordination. Closer to Helena, land transitions to county, city, and local government ownership, including facilities associated with Montana State University and Montana Department of Transportation holdings. Private lands are interspersed throughout, particularly along the eastern and northern boundaries, increasing the WUI complexity. This mix of ownership requires multi-agency cooperation for effective land use planning, emergency access, and fire suppression efforts, especially where jurisdictional boundaries intersect in high-risk areas.

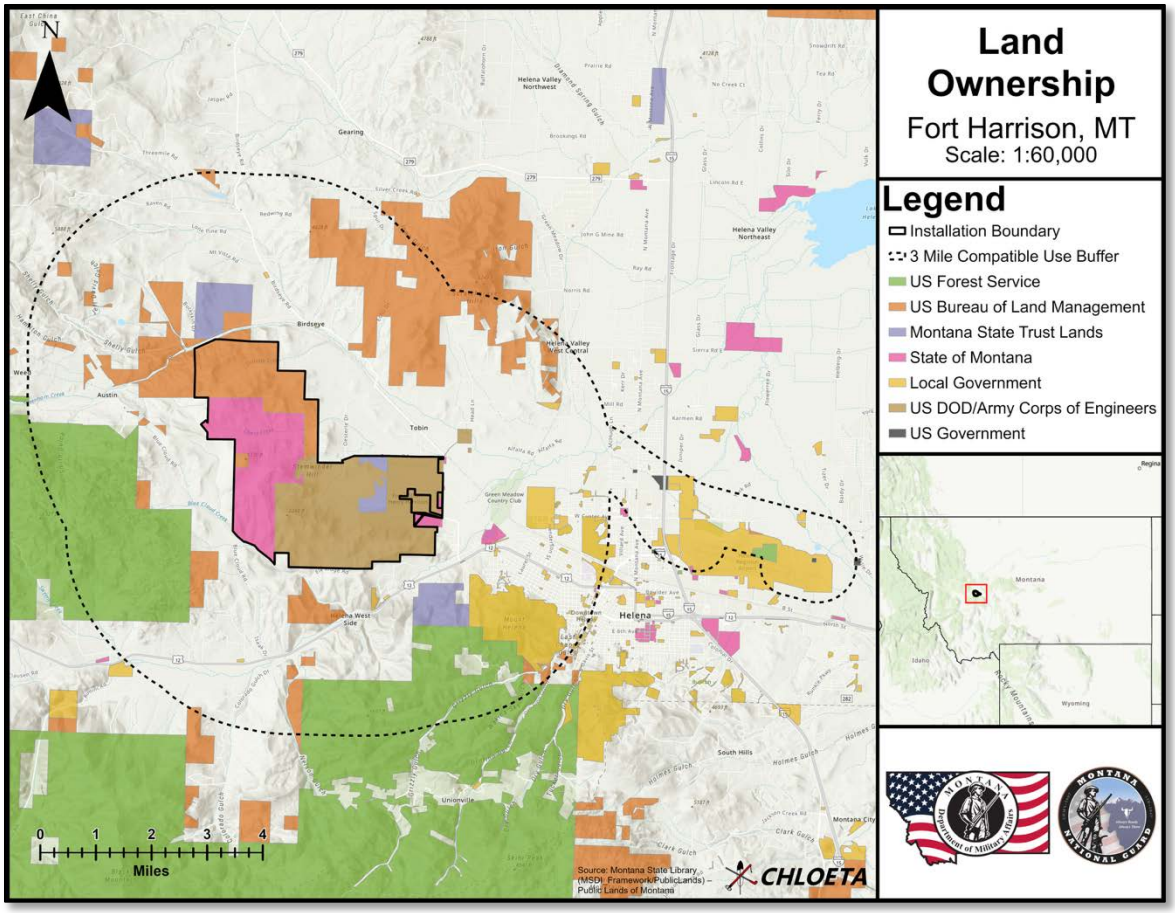


Figure 29. FHTA Assessment Area Surface Land Ownership Map

LHTA assessment area is primarily situated within a broad matrix of federal lands, with much of the surrounding and interior land owned and managed by BLM (Figure 30). These federal lands provide a buffer and serve as critical habitat and watershed areas but also contribute to the overall wildfire risk due to continuous fuels and limited ingress/egress corridors. Overall, LHTA assessment area land ownership structure, characterized by an embedded federal installation within expansive BLM-managed terrain, requires comprehensive collaboration between DoW, BLM, and fire management partners.

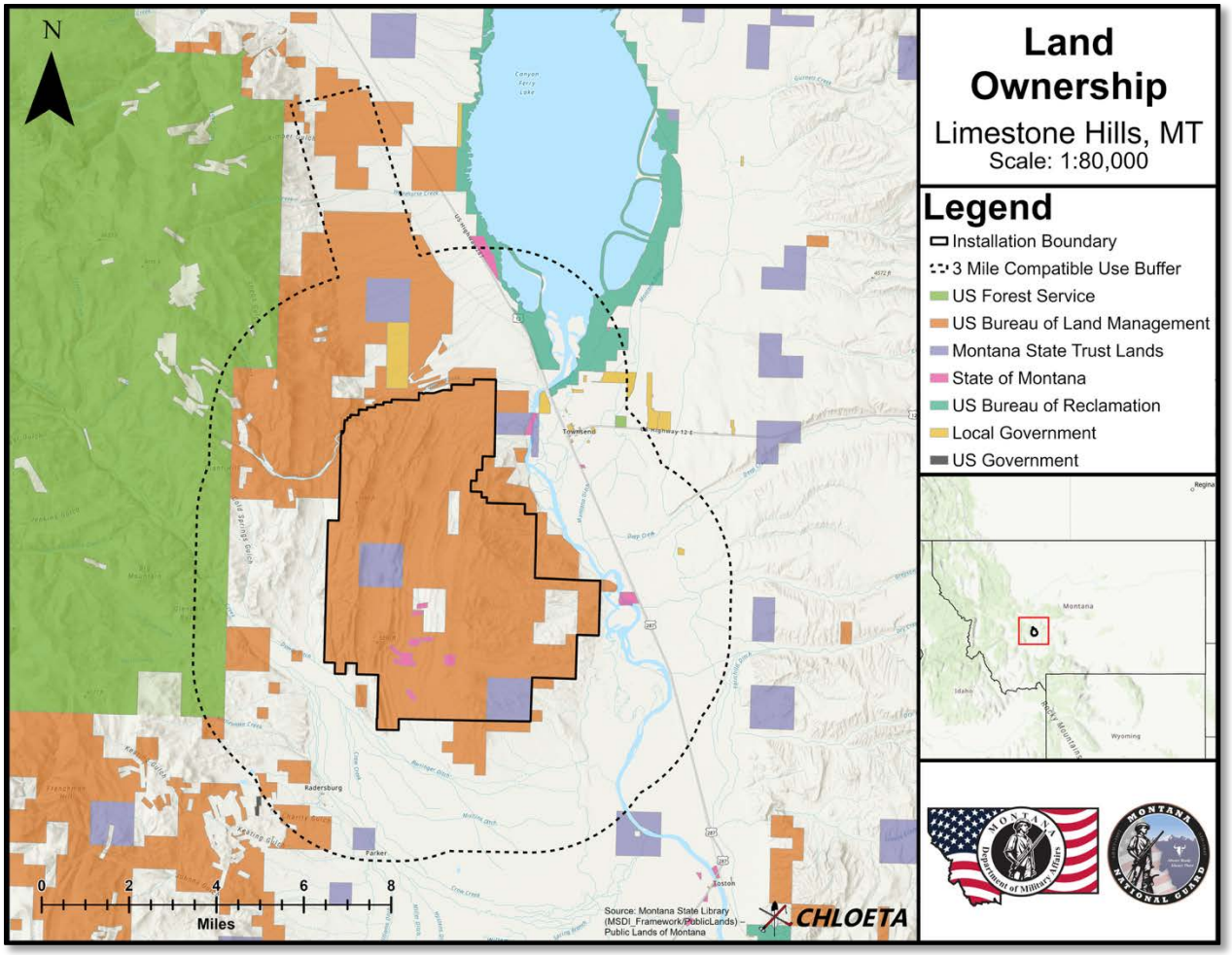


Figure 30. LHTA Assessment Area Surface Land Ownership Map

Power, Pipelines and Communication Lines

Different companies own Montana's transmission lines and have varying capacities as shown in Figure 31. In-state transmission ownership is dominated by a few companies, including Northwestern Energy, Bonneville Power Administration, Western Area Power Administration, and Avista. The double 500 kV Colstrip lines are the largest transmission lines in the state and are owned by a consortium of five utilities that serve both in-state and out-of-state customers. Montana currently exports about 40% of the electricity it produces. Under certain conditions, Montana utilities import electricity as well. Few new lines have been put into service in the past few decades, with the most recent being the Montana-Alberta Tie Line, which came online in 2013 and the NextEra Energy-owned line connecting the Clearwater Wind project to the Colstrip substation, which came online in 2022. Most distribution lines in Montana are owned by Northwestern, Montana-Dakota Utilities or one of the 25 rural electric cooperatives that serve customers across the state.

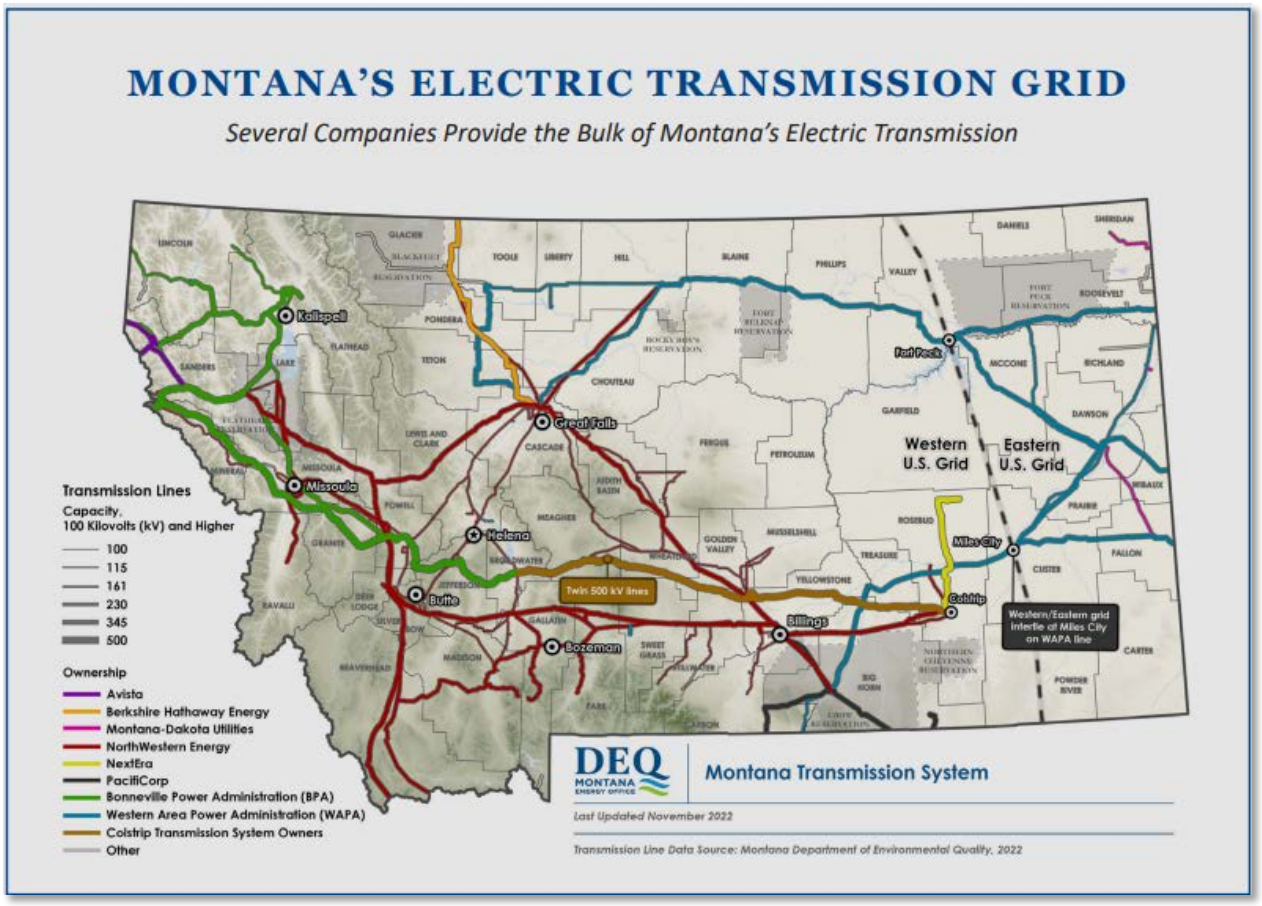


Figure 31. Montana's Electric Transmission Grid, Including Northwestern Energy LLC, Vigilante Electric Coop. INC, and Bonneville Power Administration

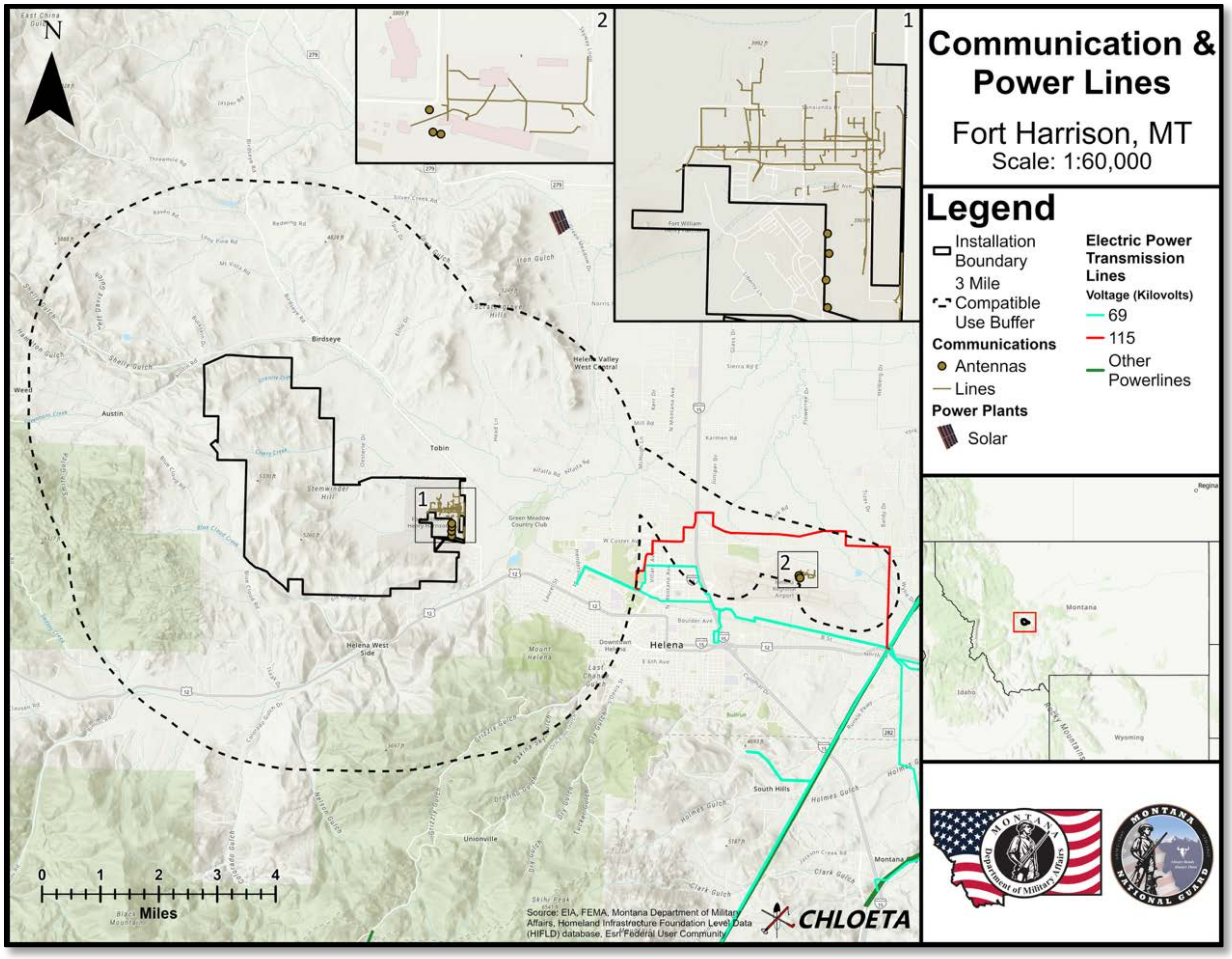


Figure 32. FHTA Power and Communication Lines Map

The FHTA assessment area is supported by critical electrical and communications infrastructure, but its proximity to high-voltage transmission lines and regional corridors introduces both strategic benefits and potential vulnerabilities (Figure 32). Power to the installation is primarily supplied via local grid connections extending from the greater Helena area, with multiple transmission lines, ranging from 100–161 kV to 500 kV, traversing the surrounding landscape. While this network supports redundancy and reliability during normal operations, it also creates cascading risk in wildfire scenarios, where fire near key corridors could lead to extended outages. FHTA location within the broader Helena power grid also enables access to stable communications, including both wired and wireless systems supported by local providers. However, much of the installation terrain features include narrow canyons and elevated ridgelines which can interfere with radio signal transmission, complicating field communications during emergencies. Backup power systems and mobile communications assets are necessary to maintain continuity during utility disruption or wildfire events. Overall, while FHTA benefits from municipal power and communications infrastructure, strategic upgrades, including protected backup power, hardened relay points, and terrain-adapted communications towers would significantly reduce the area's vulnerability to cascading infrastructure failures during wildfire emergencies.

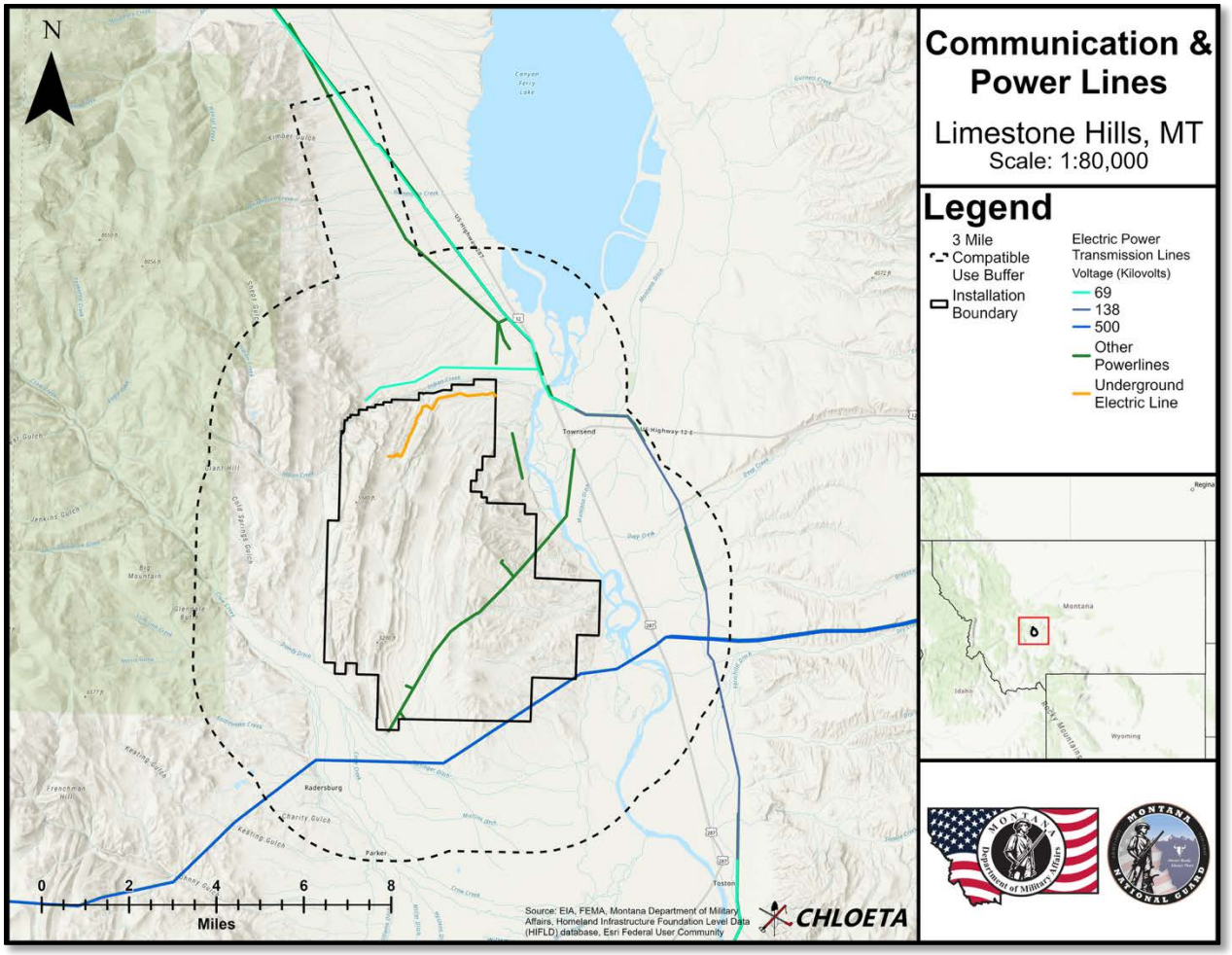


Figure 33. LHTA Power and Communication Line Map

The LHTA assessment area is intersected and surrounded by major electric transmission corridors that provide essential regional connectivity but simultaneously introduce infrastructure vulnerabilities (Figure 33). High-voltage transmission lines rated between 100–161 kV and up to 500 kV flank the training area on multiple sides, with one 500 kV corridor cutting directly across its southeastern buffer. These transmission lines and adjacent utility easements are critical for regional energy distribution and could provide limited access options for temporary power deployment during exercises. However, they also represent ignition hazards and operational barriers during wildfire events. Two cell and radio towers located along LHTA eastern boundary provide limited external connectivity, supported by above-ground power lines that originate off-installation and feed into the towers. These exposed transmission lines create a single-point vulnerability during wildfire or extreme weather events, increasing the likelihood of communication disruption at a time when response coordination may be most critical. All training units operating at LHTA must maintain two forms of communication with Range Control, typically via pre-programmed Motorola radios and cellular backup when coverage is available. Dead areas across the terrain, affected by both weather and elevation, frequently disrupt transmission, requiring contingency systems including mobile repeaters, cell, or satellite

communications to ensure continuity (2024_MTARNG_IWFMP). Because LHTA lacks embedded utility or communications infrastructure, the site remains dependent on adjacent transmission corridors and limited external systems for operational support. This dependence increases susceptibility to power loss, communication failure, or physical damage during wildfire, wind, or severe weather events.

Both assessment areas are influenced by their proximity to major electric transmission and communications infrastructure, but they differ in access and vulnerability. The FHTA assessment area benefits from direct municipal utility services from the City of Helena, including power and communication lines, making it more resilient in terms of operational continuity. However, this connectivity also creates vulnerability through dependence on critical infrastructure corridors, particularly where high-voltage lines and substations intersect with high-risk wildfire areas.

The Phillips 66 Yellowstone Pipeline is a critical regional energy transmission asset that extends across portions of western and central Montana, transporting refined petroleum products, including gasoline, diesel, and jet fuel, from refineries in Billings to distribution terminals in Missoula, Spokane, and other destinations throughout the northern Rocky Mountain region. Within the context of this assessment, the Yellowstone Pipeline holds particular significance because it traverses both the assessment areas and installation boundaries, representing a shared infrastructure and wildfire exposure concern. In the FHTA assessment area, the pipeline alignment runs near developed and training-use areas, intersecting portions of the installation's operational buffer and adjacent lands within the Helena Valley. Its proximity to critical infrastructure and the WUI elevates the potential for cascading impacts should a wildfire threaten or damage the line or associated facilities. In the LHTA assessment area, the pipeline crosses steep, rugged terrain and passes through areas with high fuel loads and limited access, compounding response challenges during a fire event. A wildfire ignition near the corridor could disrupt operations, hinder firefighting mobility, or create secondary hazards due to heat exposure and potential release of flammable product. The Yellowstone pipeline's presence within both assessment areas constitutes an essential consideration in wildfire planning and emergency coordination.

Fire Protection Responsibility

Fire protection responsibility within and surrounding both assessment areas is shared among multiple jurisdictions and agencies, depending on land ownership and incident location. Within the installation boundaries, the DoW holds primary responsibility for wildfire prevention, preparedness, and initial response. MTARNG has an IAA with the VAFD for fire suppression on FHTA and an IAA with the USFS for fire suppression on LHTA. Outside designated boundaries, wildland fire protection responsibilities are distributed across multiple jurisdictions based on land ownership and use. Within the FHTA assessment area, fire management authority spans state and private lands under the DNRC, adjacent USFS lands, and BLM parcels administered in coordination with DNRC. In the LHTA assessment area, fire protection responsibilities are similarly complex, with USFS and BLM managing federal lands and DNRC providing fire protection on state lands under county jurisdiction. Local rural fire districts and volunteer departments maintain responsibility for private lands throughout both areas. Given this mosaic of land ownership and management authority, mutual aid agreements and established interagency

coordination protocols are essential for managing cross-boundary incidents and ensuring rapid, unified suppression efforts, particularly in landscapes characterized by limited access, overlapping jurisdictions, and the potential for high-intensity fire behavior.

Wildfire protection responsibilities in the FHTA assessment area shown in Figure 34 are divided among multiple agencies and jurisdictions, creating a complex patchwork of authority. The MTARNG is responsible for managing fire risks within the installation boundary itself. Surrounding lands are protected by a combination of federal and state agencies, including the USFS and the DNRC, each overseeing significant adjacent tracts. County and local fire protection responsibility, representing lands where primary wildland fire response is provided by county rural fire districts, municipal fire departments, and other local fire authorities, covers a substantial portion of the FHTA assessment area. These county and local lands are generally private, developed, or locally governed parcels located near communities and transportation corridors adjacent to the installation.

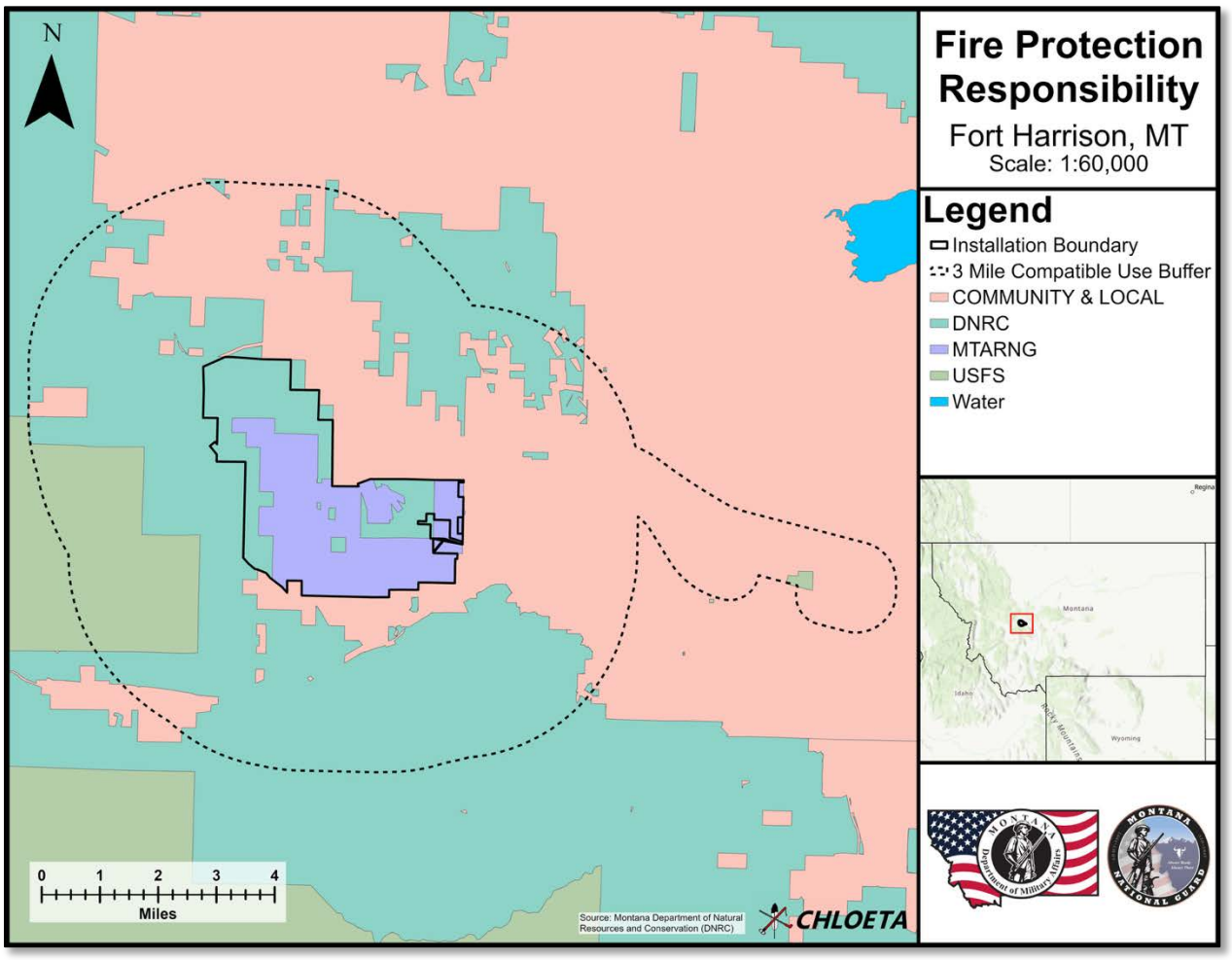


Figure 34. FHTA and Surrounding Lands Fire Protection Responsibility Map

Fire protection service areas immediately surrounding FHTA, as shown in Figure 35, fall primarily within the West Valley Fire Rescue District, including the Birdseye and Baxendale fire districts. Additional coverage is provided by the Helena Fire Department through its Westside and Contract Service Areas along the urban fringe. Surrounding rural lands are served by a patchwork of designated fire districts and fire service areas rather than a single countywide service area. This overlapping network reflects a complex mix of urban, suburban, and wildland–urban interface conditions, requiring coordinated response strategies, clear jurisdictional boundaries, and strong interagency cooperation to effectively manage wildfire risk across the region.

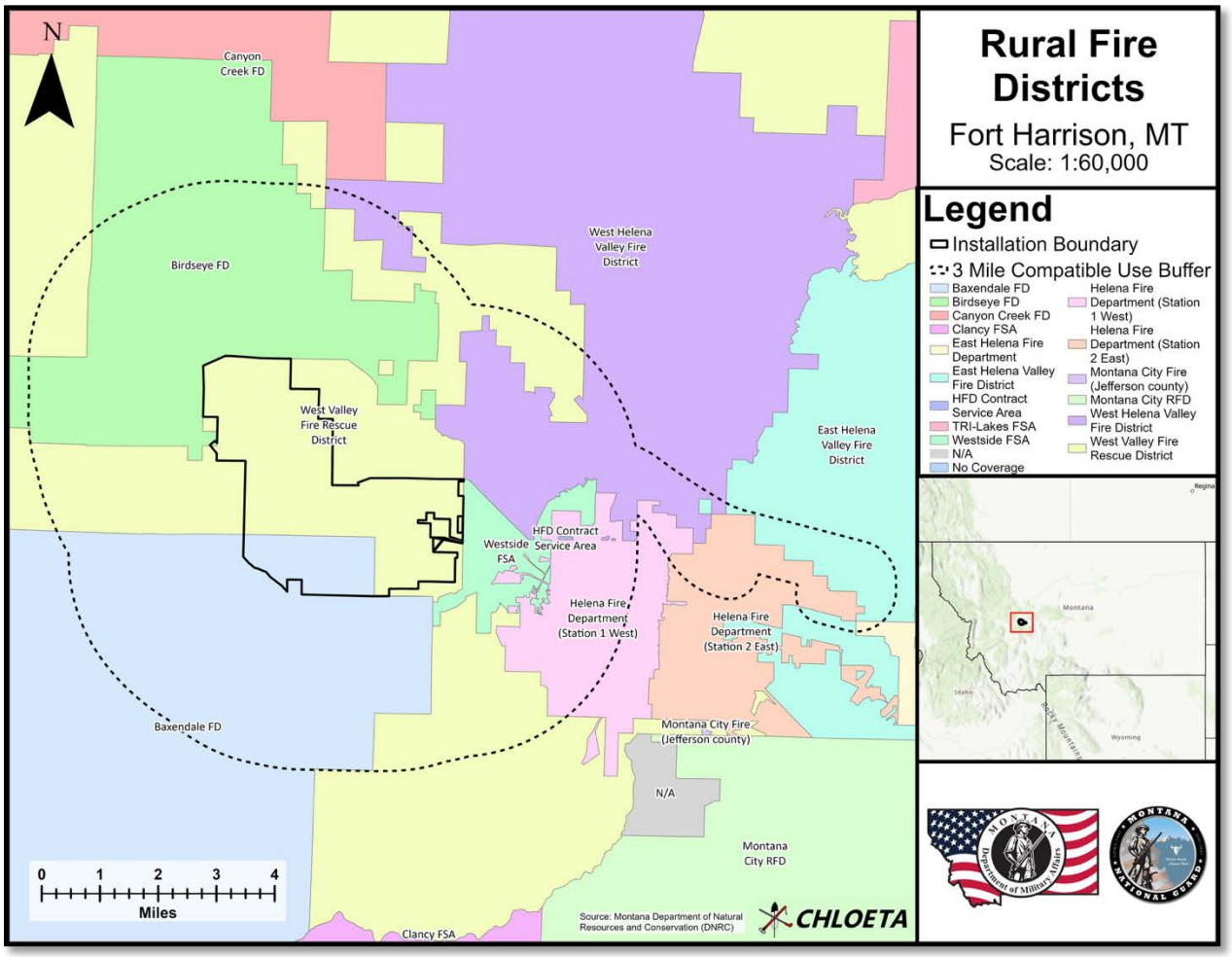


Figure 35. Rural Fire Districts Surrounding FHTA Map

The fire protection landscape in the LHTA assessment area (Figure 36), reflects a complex mix of federal and local protection responsibilities. The surrounding area falls under the jurisdiction of the USFS within federally managed wildlands. Lands managed by the U.S. Bureau of Reclamation (USBOR) are also present, particularly near Canyon Ferry Lake, where fire protection responsibility aligns with federal land management and water-resource protection priorities. In addition to these federal jurisdictions, extensive areas surrounding LHTA are designated as county and local fire protection responsibility. These county and local areas are managed by Broadwater

Fire Rural Fire District (BRFD). BRFD maintains an agreement with USBOR for fire protection in Broadwater County. The intermingling of USFS, USBOR, and county and local protection areas underscores the importance of clear interagency coordination, shared response protocols, and pre-incident planning to support effective wildfire response across jurisdictional boundaries surrounding LHTA.

This federal dominance in fire protection responsibility means that coordination between MTARNG fire units and adjacent federal agencies is essential for effective wildfire response. Given the complexity of jurisdictional overlaps and the remote nature of the terrain, unified command structures, shared response protocols, and mutual aid agreements are critical.

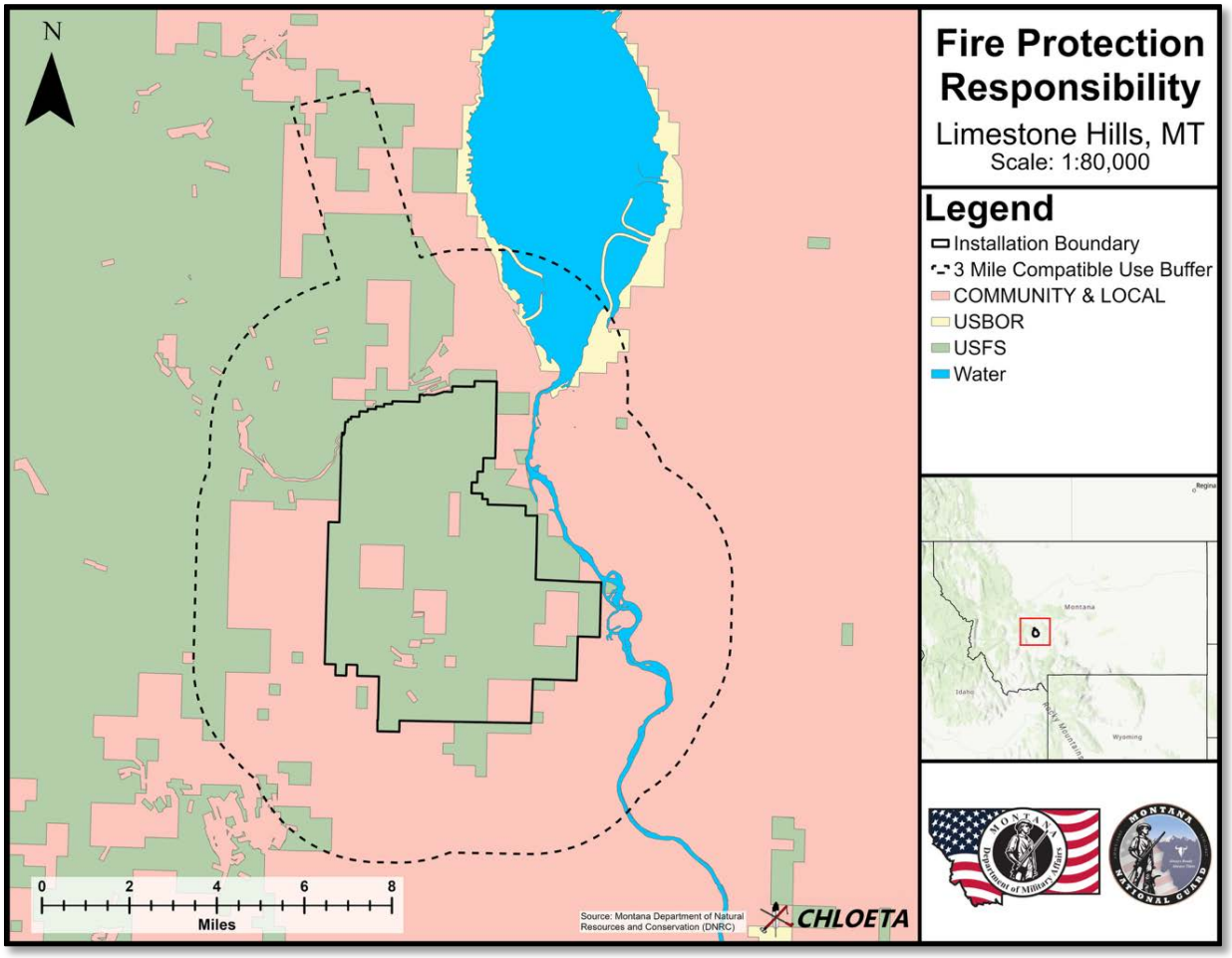


Figure 36. LHTA and Surrounding Lands Fire Protection Landscape Map

Fire protection responsibility around the LHTA shown in Figure 37 is divided among several rural fire departments all part of Broadwater Rural Fire District. The core of the installation lies within the Broadwater Rural Fire District (BRFD), which provides fire protection on private property immediately surrounding LHTA with five (5) separate fire stations. Adjacent to the north is the Townsend Fire Department (FD), covering the town and portions of the WUI along the Missouri River. This mosaic of coverage, combined with gaps and shared jurisdictional borders, highlights

the importance of regional cooperation, pre-incident planning, and interagency agreements to ensure adequate wildfire response capability.

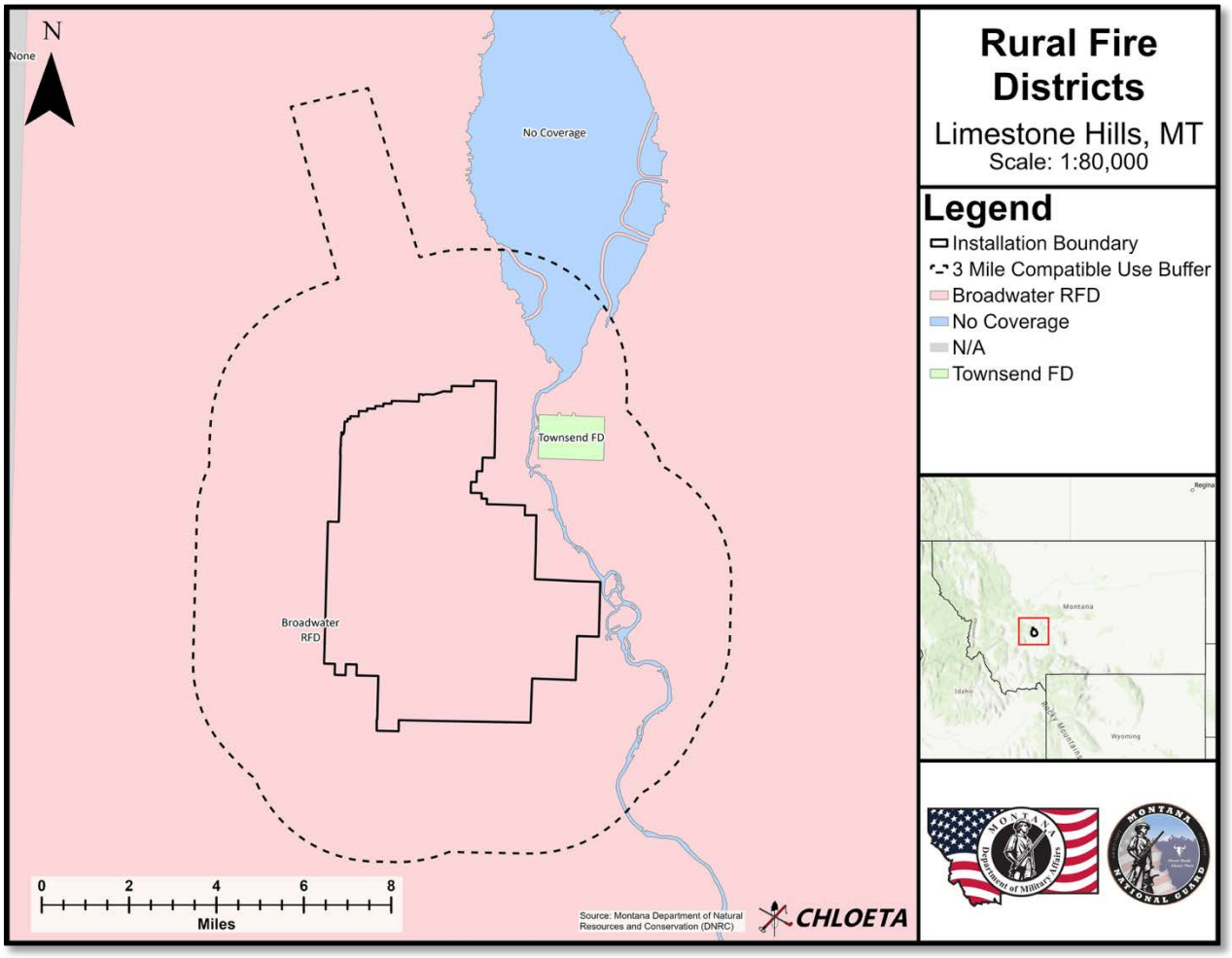


Figure 37. Fire Protection Districts Surrounding LHTA Map

Both assessment areas lie within a complex matrix of land management jurisdictions, primarily DoW, BLM, and USFS, which requires coordinated planning for wildfire response and mitigation. Although areas directly surrounding the training facilities are federally managed, they border private lands and state-managed parcels that introduce variability in fuel management practices and response capacity.

Fire protection capability across both training areas is constrained not only by jurisdictional boundaries but also by land-use and safety restrictions. While portions of the FHTA fall within established fire service areas and rural fire districts, large areas of the LHTA are designated as Restricted, No Entry, or Off-Limits Impact Areas shown in the Figure 42, where fire suppression activities are limited or prohibited due to unexploded ordnance hazards. These restrictions, particularly within the central and western portions of the installation, may delay initial attack, limit the use of ground resources, and require specialized coordination before suppression actions

can occur. Even where nominal fire protection coverage exists, response effectiveness is influenced by fragmented responsibilities among county agencies, RFDs, and federal or military authorities, reinforcing the need for pre-established mutual aid agreements, clear decision thresholds, and unified command protocols that account for UXO-related access and safety constraints. The presence of high-risk corridors exacerbates vulnerability by enabling rapid fire to spread and limiting safe access or evacuation. Given the proximity of critical infrastructure, natural fire pathways, and jurisdictional boundaries, both installations face elevated risk scenarios that demand a proactive, interagency fire management strategy.

Land Use Compatibility

Expanding development in the WUI increases ignition sources, strains emergency services, and can restrict training activities due to heightened safety concerns. Zoning practices, buffer zone management, and defensible space standards vary across jurisdictions, creating inconsistencies in wildfire mitigation.

Infrastructure and Access

Roads, utility lines, communication systems, and water supply networks all contribute to a community's ability to prevent, respond to, and recover from wildfire incidents. In both assessment areas the placement, condition, and capacity of critical infrastructure directly influence evacuation effectiveness, firefighter access, and the resilience of essential services. This section examines key components of infrastructure to identify vulnerabilities.

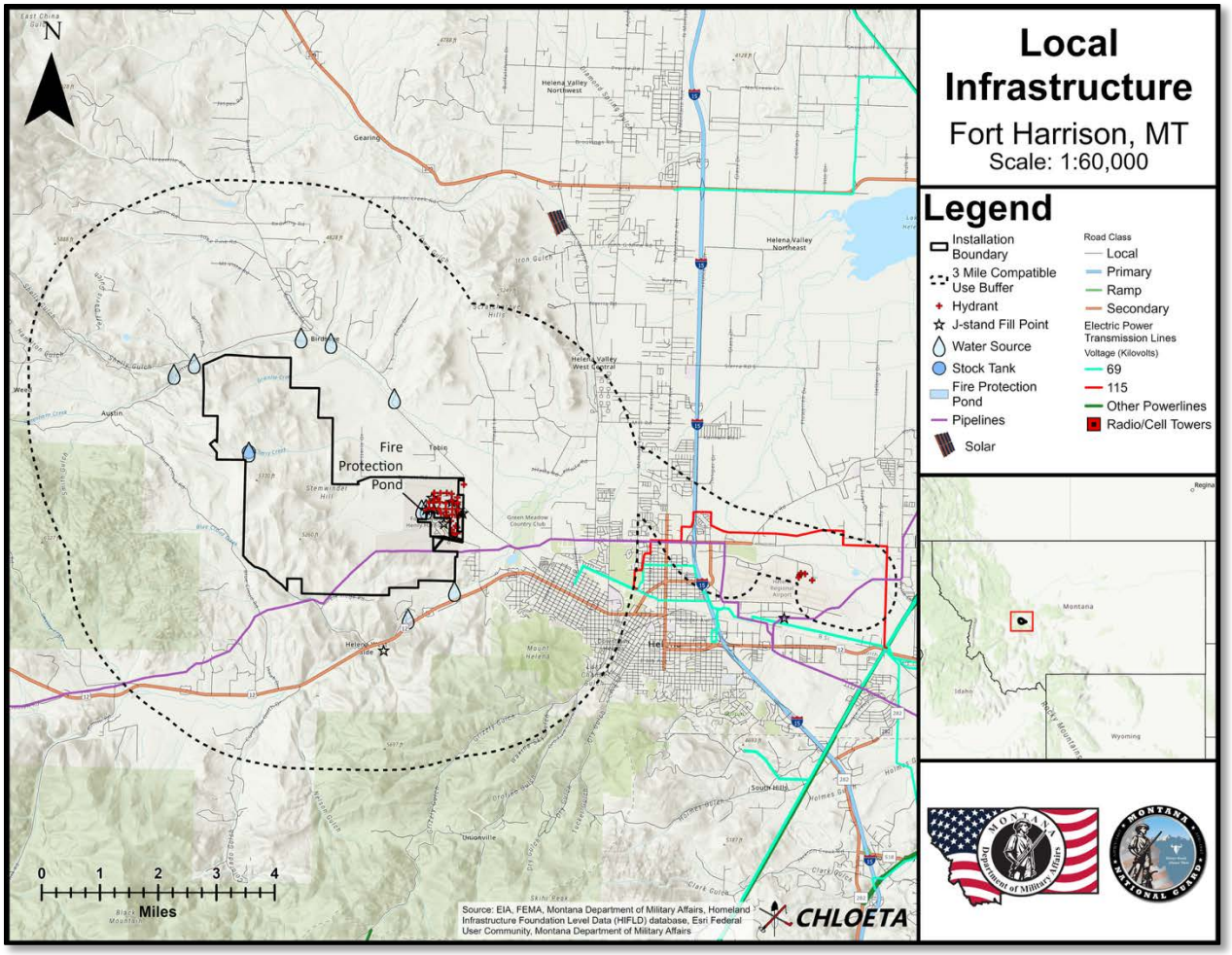


Figure 38. FHTA Infrastructure Map

Infrastructure access within the FHTA assessment area is relatively well-developed due to its proximity to the City of Helena and existing transportation and utility networks; however, several factors limit response efficiency and operational mobility during wildfire scenarios. Primary access is provided by a network of paved and gravel roads, including Williams Street, Rimini Road, and access routes extending west and south into the training range. These roads support routine movement, to include military ingress and egress for community members but may become compromised during high-flame or wind-driven fire events, particularly in narrow drainage corridors or areas with steep terrain.

Key infrastructure within and around the FHTA assessment area (Figure 38) including the Phillips 66 Pipeline, power lines, water infrastructure, and communications facilities, benefit from established utility corridors, but these same corridors can act as wildfire conduits. Road ingress and egress options are limited in some buffer areas west of the FHTA assessment area, where vegetation density and single-road dependencies create potential bottlenecks for evacuation and response operations. In areas near Birdseye and Austin, limited road redundancy increases the risk of isolation if primary routes are obstructed by flame fronts, debris, or emergency traffic.

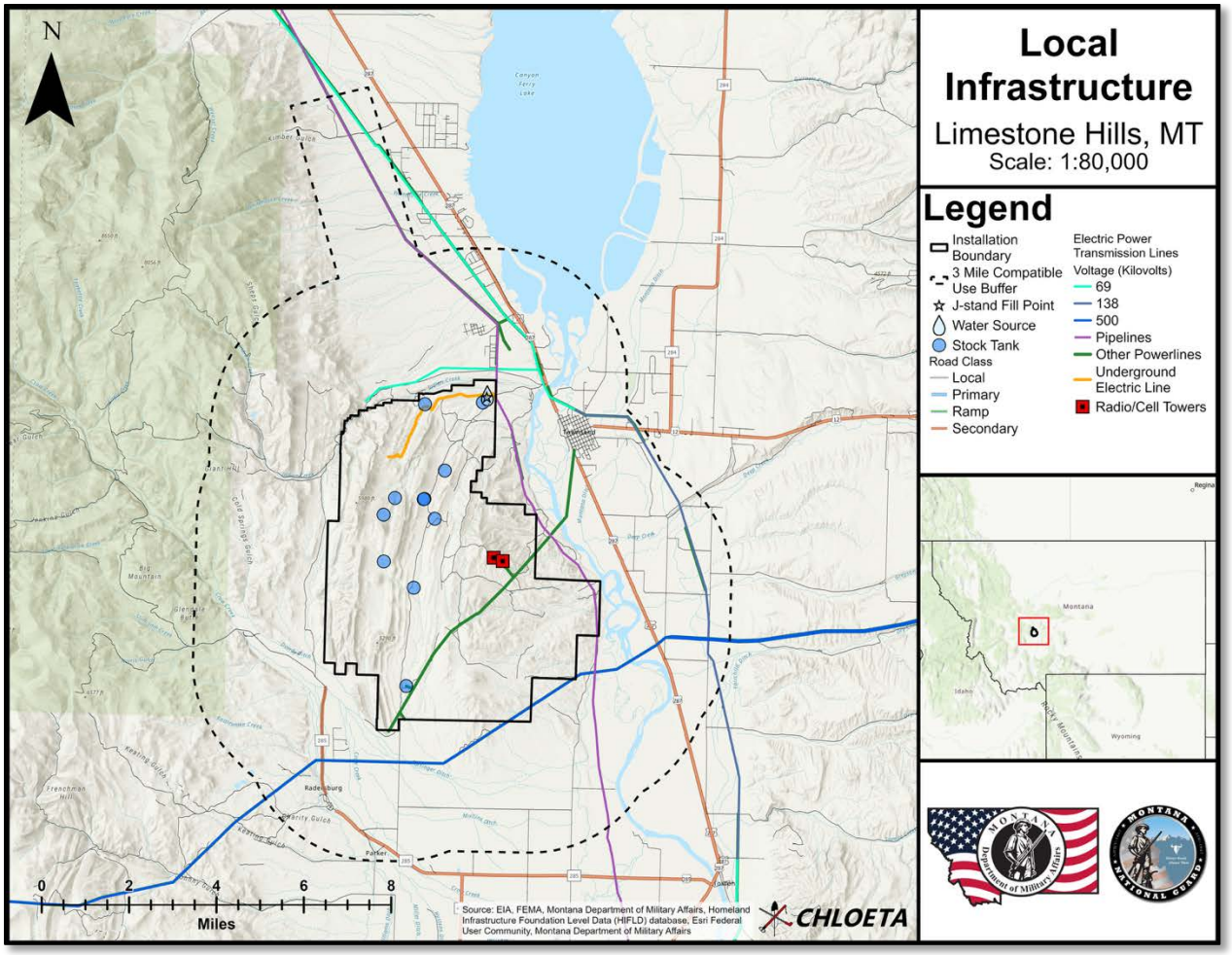


Figure 39. LHTA Infrastructure Map

Infrastructure access in the LHTA assessment area (Figure 39), is limited and presents several operational challenges due to the remote and rugged nature of the landscape. The primary access points to the LHTA assessment area are via US Highway 287 and a network of rural, unimproved roads and trails that traverse mountainous terrain, foothills, and riparian corridors. Old Woman's Grave Road is the main road to the entrance of LHTA from US Hwy 287. These routes are adequate for low-volume training and administrative use and become quickly overwhelmed or impassable during wildfire events. These routes are the only way to access portions of LHTA where a MTARNG training induced wildfire start is most likely. The routes are especially difficult under conditions of high flame lengths or smoke-reduced visibility. The internal road system within LHTA is sparse and lacks redundancy, with few alternative routes available in the event of blockage or damage. Steep grades, narrow shoulders, and limited turnarounds further constrain large apparatus movement, making the pre-positioning of firefighting assets and staging areas essential to response success. Additionally, the area's proximity to critical utility infrastructure, including the 500kV transmission lines and nearby substations, as well as the Phillips 66 Pipeline require careful coordination to ensure those assets remain accessible and operational during emergencies.

The FHTA assessment area benefits from closer proximity to urban infrastructure and a more developed transportation network; however, FHTA internal access routes are vulnerable to obstruction from steep terrain, flame fronts, and limited escape corridors, particularly during high fire behavior scenarios. In contrast, the LHTA assessment area is more remote, with minimal ingress and egress routes, many of which are unimproved and traverse rugged landscapes. This limited connectivity restricts the movement of emergency personnel and equipment, especially under extreme fire or weather conditions.

Roads and Fire Breaks

Roads serve as primary evacuation routes and provide essential access for fire suppression resources. Their layout, connectivity, and condition can either support or hinder wildfire response operations. WUI developments, dead-end roads, narrow lanes, and limited egress points significantly increased risk to life and property. Additionally, strategically placed roads and utility corridors may function as fire breaks, interrupting fuel continuity and slowing fire spread. This section evaluates existing road networks, their potential role in fire control, and where improvements are needed to enhance mobility and safety during fire events.

FHTA

There are 14.53 miles of road within the FHTA perimeter (Figure 40). A vulnerability assessment of FHTA roads and firebreaks reveals several key concerns and critical gaps. While a network of primary and secondary roads exists throughout the training area, several locations remain underserved by accessible or defensible infrastructure. Specifically, areas with steep terrain, dense vegetation, or limited road connectivity hinder emergency vehicle access and effective fire suppression. A notable concern is the lack of continuous perimeter roads in several sectors, which limits opportunities for containment and operational firebreak establishment. In addition, overgrown vegetation along roadways is a recurring issue, diminishing the effectiveness of these corridors during wildfire events. Gaps in defensible space and vegetation clearance are especially prominent along FHTA southern and western boundaries, where fine fuel continuity and prevailing winds can rapidly drive wildfire toward critical assets. Compounding this vulnerability is the absence of a formalized schedule for firebreak maintenance or secondary road grading, leaving portions of the road network subject to erosion and seasonal inaccessibility. These conditions collectively increase deployment time for suppression resources and heighten risk to mission-critical infrastructure and personnel.

Initial fire response on FHTA requires coordination with range control to ensure there is no active firing occurring on any range. Suppression resources have very few access points into the installation. Assets responding from outside the installation also encounter city traffic congestion, which would delay most responses. There is a network of roads and trails that can be utilized once resources get on to the property. The only roads that access the perimeter of the installation are Williams Street, Wyoming Avenue, Veterans Drive, Mt. Defense Avenue, Barrett Road, Austin Road, Blue Cloud Creek Road, Elk Ridge Road, and Old Broadwater Lane. Coordination is required to open additional gates for responding to resources to avoid the control check point. Access outside the installation is intermixed with the public, heavy with traffic lights, and crisscrossed with utility corridors and train crossings. In the event of an evacuation, many access

roads would be extremely congested as there are numerous one-way in, one-way out roads in the neighborhoods and subdivisions, including all the access points to the installation. Numerous stream corridors that the fire could cross would stop any mechanized fire apparatus.

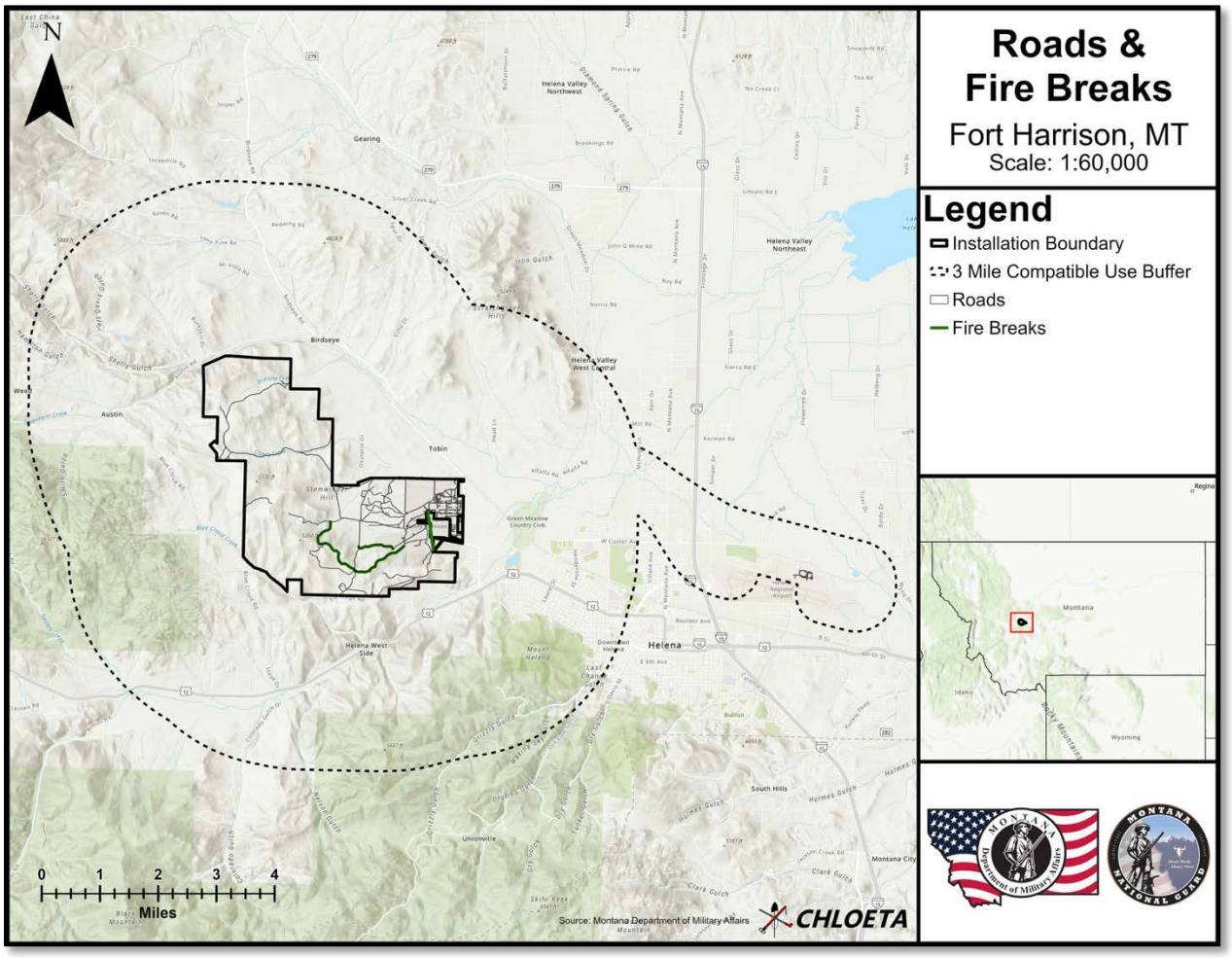


Figure 40. FHTA and Surrounding Areas Road and Fire Break Map

LHTA

Figure 41. Image of Old Woman's Grave Road.

A vulnerability assessment of the LHTA roads and firebreaks highlights notable deficiencies that could hinder effective wildfire responses and increase risk to critical training assets. While LHTA contains a series of rugged access roads, much of the terrain is characterized by steep slopes, narrow ridgelines, and limited all-weather infrastructure, which collectively restrict the movement of fire engines, dozers, and suppression crews. The existing road network does not form a fully connected loop, and some interior sectors are only reachable via single-entry points, creating chokepoints and

limiting tactical flexibility during a fire event. There are 22.37 miles of road within the LHTA perimeter (Figure 44). Initial fire response requires coordination with range control to ensure there is no active firing occurring on any range. Suppression resources have very few access points into the installation. Assets that are responding from outside the installation also have to navigate long distances and rarely maintained dirt roads. A network of roads and trails can be utilized once resources are on the property. There is potential to encounter unexploded ordinance (UXO) (Figure 42) west of Old Woman's Grave Road preventing ground disturbing assets, which alters the tactics to a direct and indirect attack. The actively used Off-Limits High Explosive Impact Area prohibits direct attack and ground disturbing assets within 300 feet of its perimeter as well as prohibits aircraft from conducting water or retardant drops further increasing the risk of severe wildfire escaping initial containment (MTARNG IWFMP).

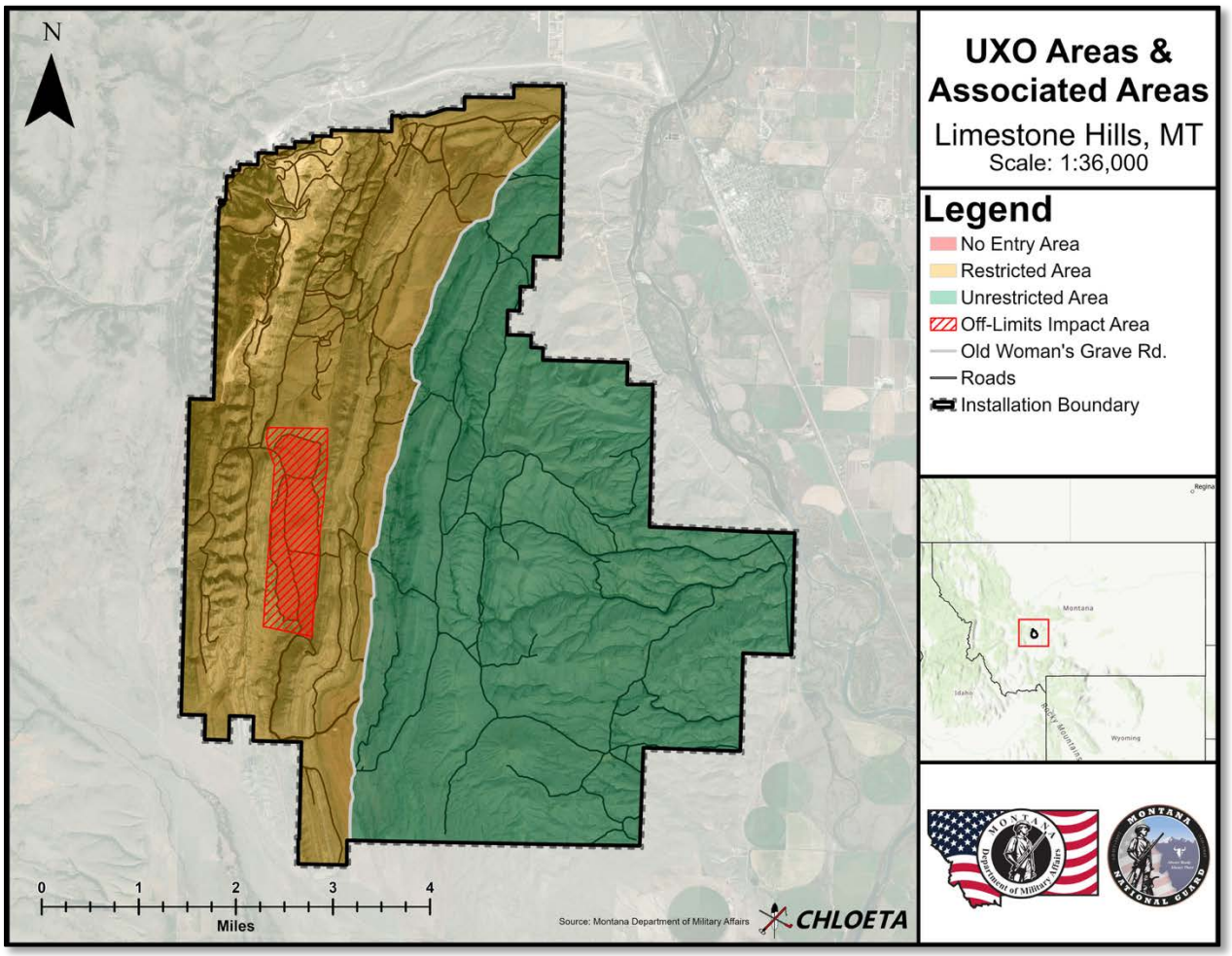


Figure 42. LHTA UXO Map

Additionally, vegetation encroachment and lack of consistent road maintenance exacerbate access. In particular, the northeastern slopes and central canyon areas contain dense, continuous fuels with limited clear areas along roads or firebreaks, providing few options for holding lines or staging equipment. Unlike FHTA, LHTA has fewer improved firebreaks or planned shaded fuel breaks,

and several topographic pinch points present significant barriers to maneuverability under fire conditions. These constraints increase the likelihood that a wildfire ignition, whether on or off installation, could rapidly escalate beyond initial attack capacity.

The only roads that access the perimeter of the installation are Old Woman Grave Road, River Road, Forest Roads 621 and 424, and Mud Springs Road. Coordination is required to open additional gates west of Old Woman's Grave Road for responding resources. Access outside the installation is intermixed with USFS, BLM, DNRC, and private ownerships that are crisscrossed with utility corridors and train crossings. This high recreation area enjoys close proximity to the Missouri River and Canyon Ferry Lake. In the event of an evacuation, many access roads would be extremely congested as there are numerous one-way in, one-way out roads in the neighborhoods and subdivisions. Numerous stream corridors and ridgelines that the fire could cross would stop any mechanized fire apparatus. Access difficulty combined with a rapid moving fire would increase the incident complexity and exceed initial attack response capabilities. Any fire whether moving onto or outside LHTA would require rapid notification and response.

Figure 43. Image of Limited Ingress Egress Home

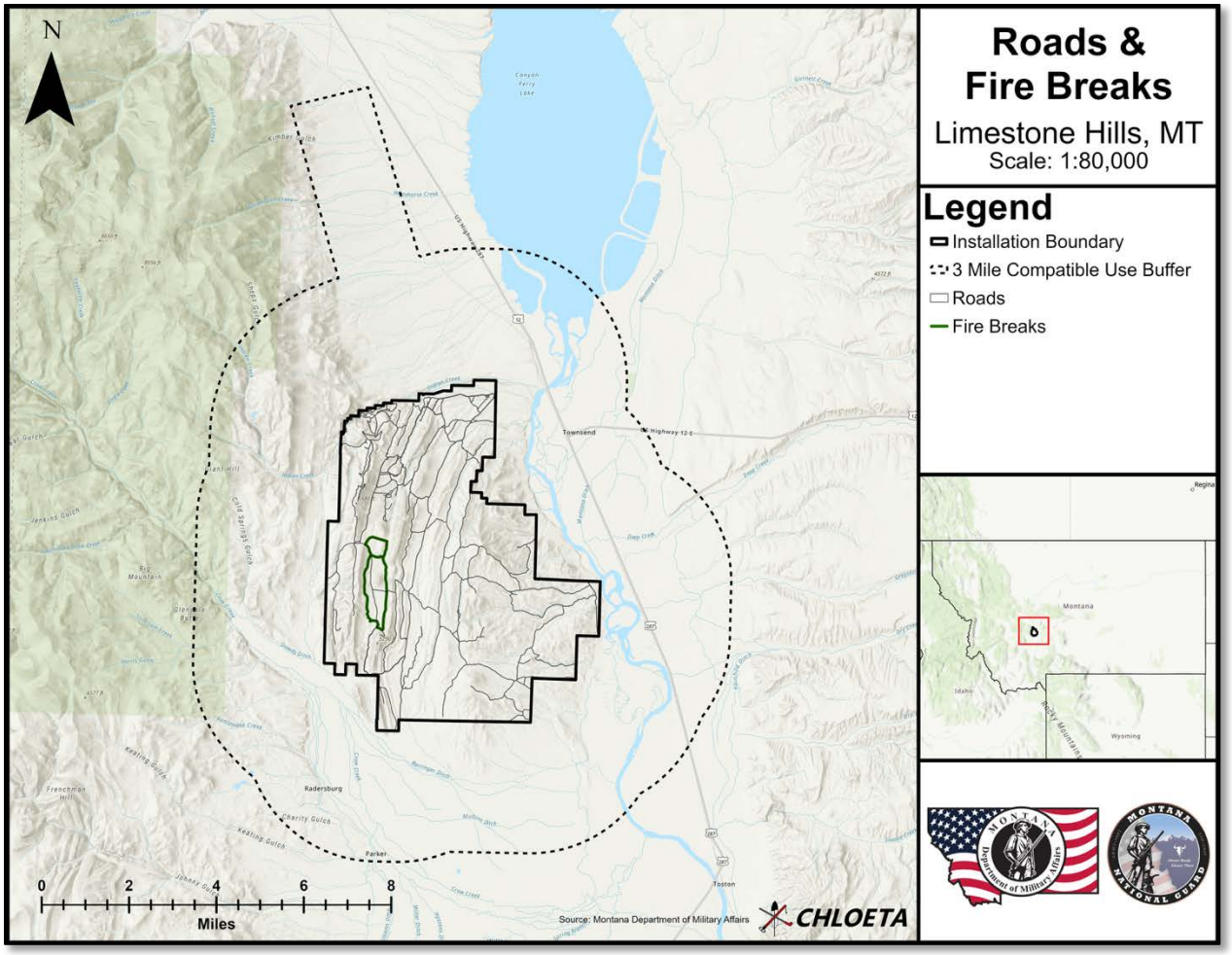


Figure 44. LHTA and Surrounding Areas Road and Fire Break Map

Railroads

Railroads are a critical component of regional infrastructure and emergency planning due to their role in potential wildfire ignition sources. These corridors often intersect with WUI areas and run adjacent to or through military installations, increasing both strategic importance and vulnerability. Sparks from rail operations, equipment failure, or accidents involving hazardous materials can ignite surrounding vegetation, particularly during periods of high fire danger. Incorporating railroads into wildfire mitigation and response planning is essential to ensure coordinated emergency access, protect nearby communities and assets, and minimize risk to human health, infrastructure, and natural resources.

Figure 45 illustrates the network of railroad lines in proximity to the FHTA assessment area. Key rail segments run east-west just north of the installation and curve along the eastern boundary, passing through the town of Birdseye and continuing toward Helena. The railroad's close alignment with critical transportation corridors (US Highway 12) and natural features including

Cherry Creek and Granite Creek underscore the interconnectedness of infrastructure and natural systems in the region.

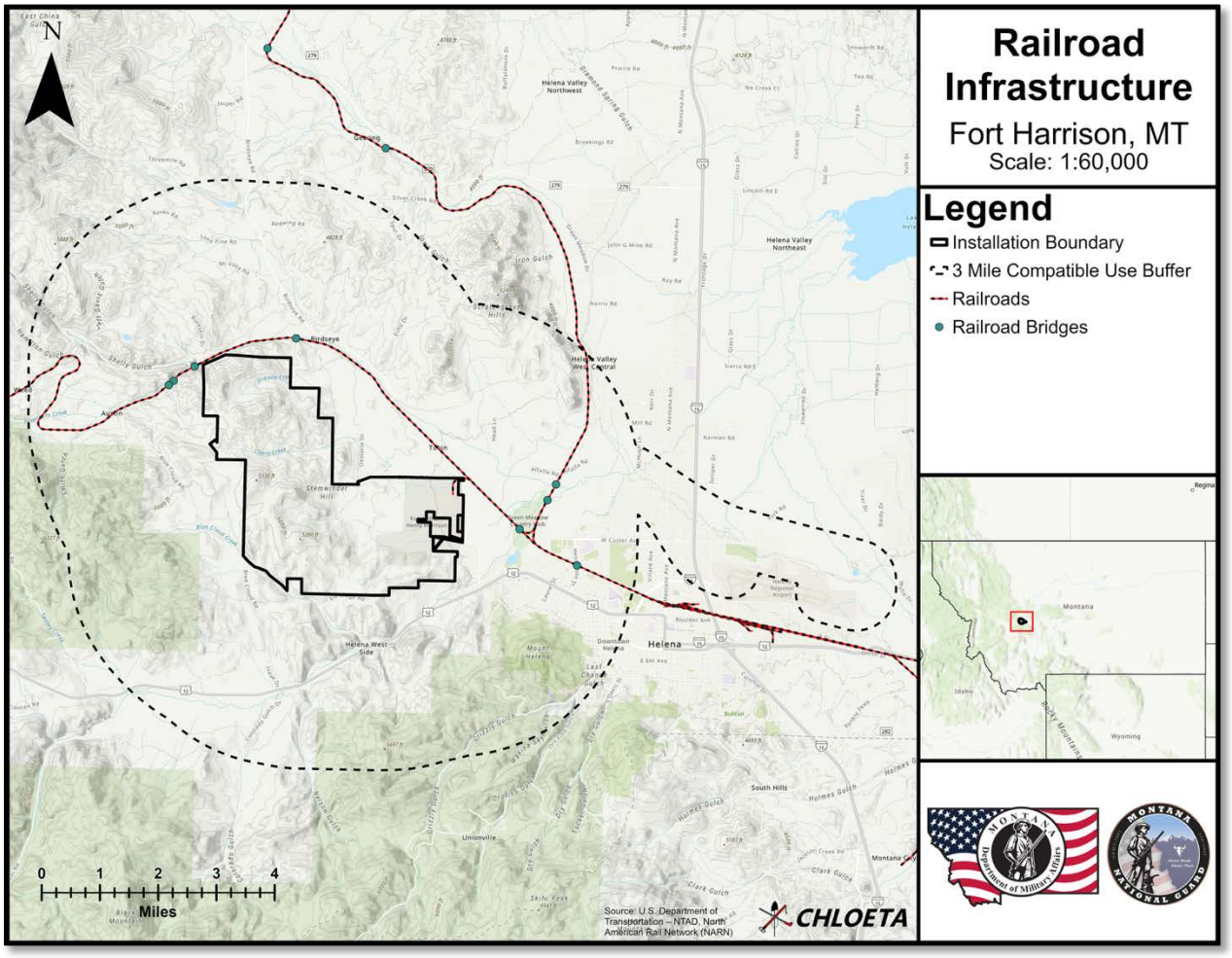


Figure 45. Railroad Infrastructure in proximity to FHTA Map

Figure 46 illustrates the railroad infrastructure in proximity to the LHTA assessment area. A major rail line runs along the eastern edge of the installation near the US Highway 12 corridor and the Missouri River drainage, intersecting key access points near Townsend. The railroad's location poses both logistical and hazard considerations. Railways are recognized as potential wildfire ignition sources due to mechanical sparks, braking systems, and human activity. Given the proximity of the rail line to vegetated areas and drainage systems including Indian Creek, there is an elevated risk of fire ignition and rapid spread toward LHTA under dry and windy conditions. Additionally, trains routinely stop on the tracks on Indian Creek road blocking the intersection. This could potentially block emergency service access to LHTA. Wait times have ranged from 5-30 minutes. There are two (2) Alternate routes are available to get to LHTA but could extend response time. There is a crossing to the north of Indian Creek going to Springville subdivision and to the south of LHTA along MT Hwy 285.

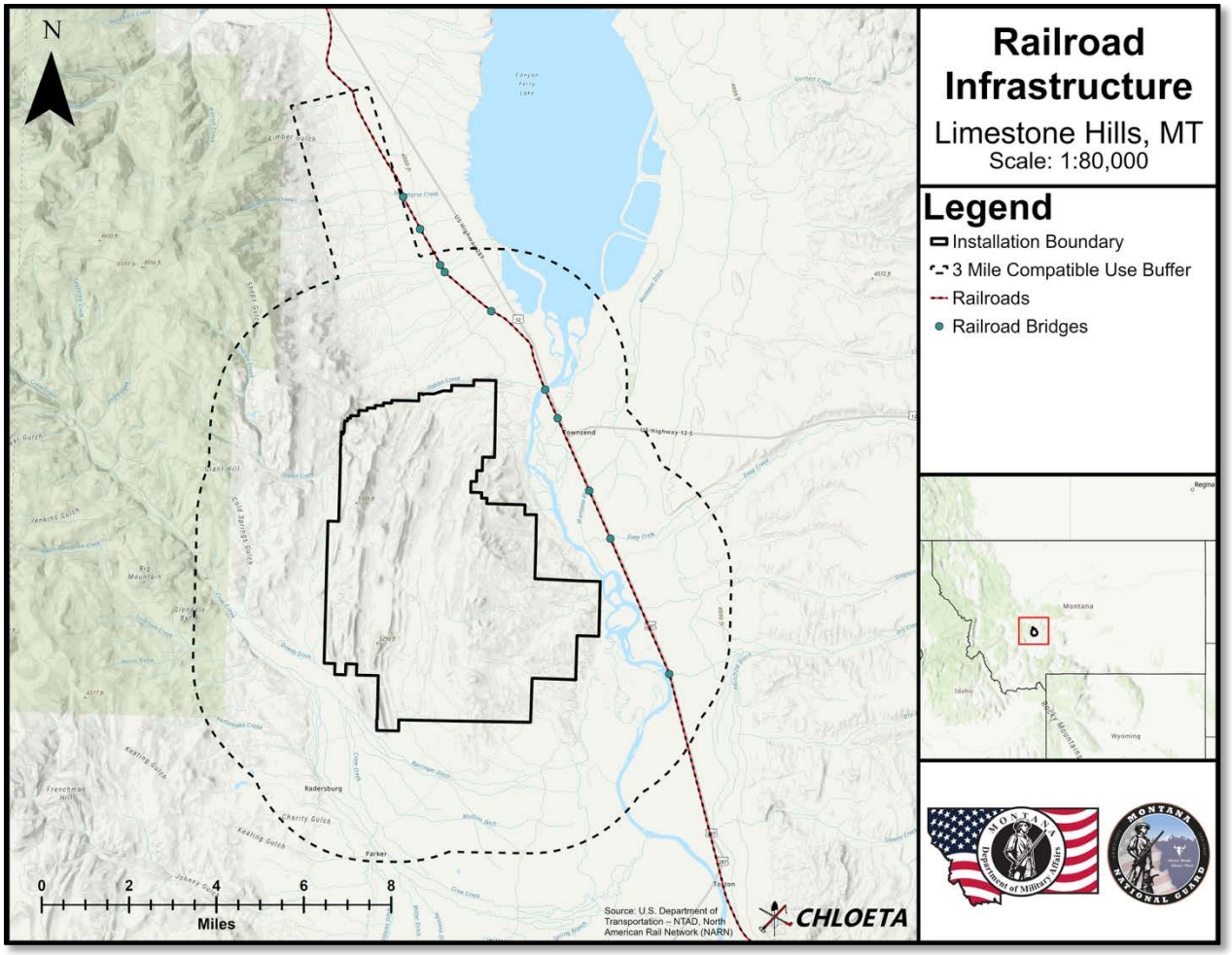


Figure 46. Railroad Infrastructure in Proximity to LHTA Map

Water Sources

In rural and semi-developed areas, limited water infrastructure can delay emergency response and reduce the effectiveness of structural protection during large wildfire incidents. While water resources in the planning area are not intended for direct wildland fire suppression, they are critical for protecting infrastructure, facilities, and life safety when wildfires encroach on developed areas. This section identifies the location, type, and accessibility of available water sources and highlights areas where targeted investments may be needed to expand capacity, improve access, and support infrastructure protection during large-scale wildfire events that threaten built assets.

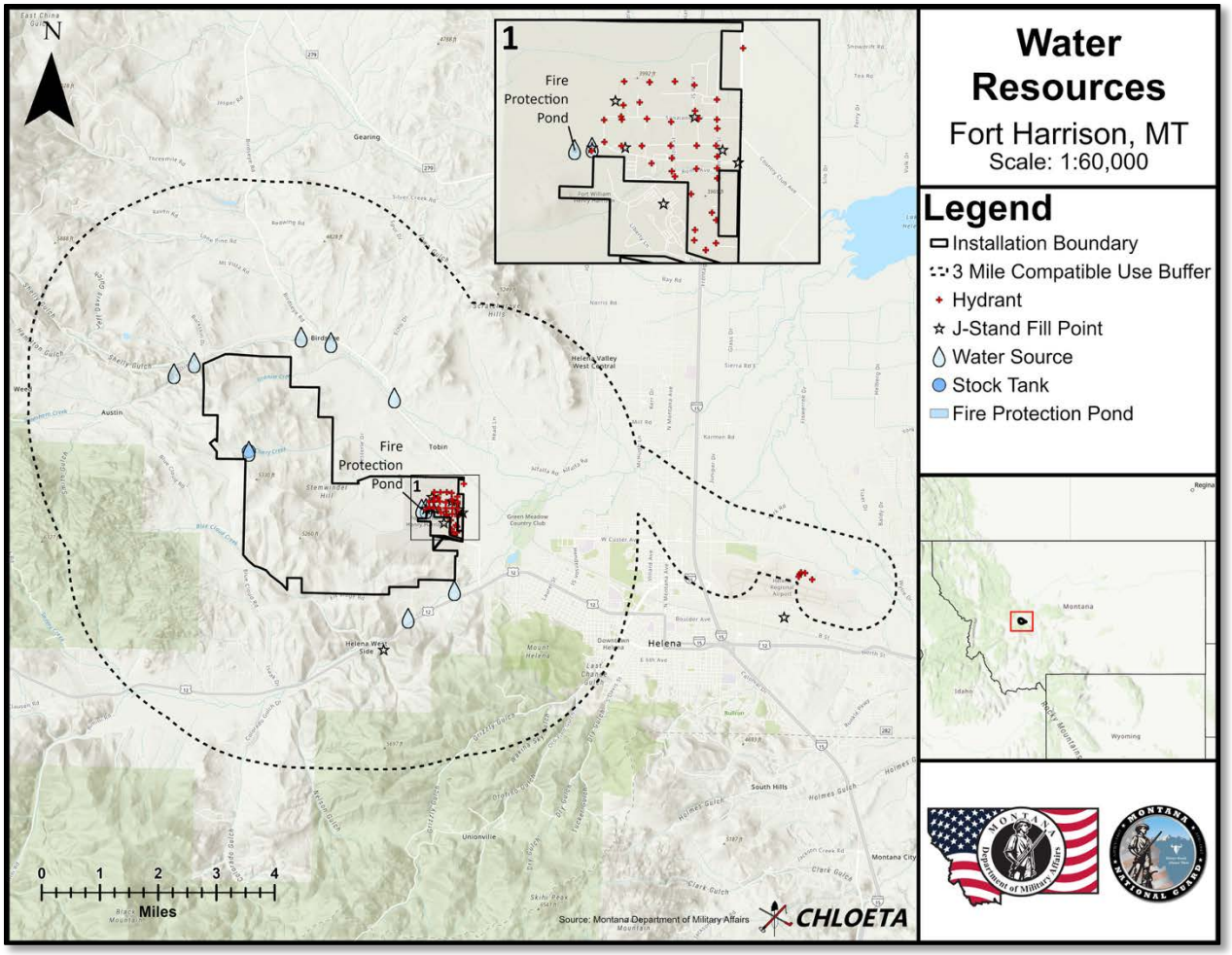


Figure 47. FHTA Water Resource Map

A water resource analysis for the FHTA assessment area reveals both strategic opportunities and critical limitations for suppression and emergency response (Figure 47). Currently, the FHTA assessment area's primary water supply is sourced through a municipal connection to the City of Helena's water system, which provides potable water for daily operations, training support, and initial suppression activities. However, this urban supply is not designed to meet the demands of a sustained response efforts, especially during peak summer usage or if municipal infrastructure is disrupted by fire or power outages. To supplement this, the MTARNG maintains a backup water plan that includes mobile water tenders, access to several constructed ponds, and the utilization of Tenmile Creek, which runs through the installation (Figure 48). Tenmile Creek provides a valuable natural water source for drafting operations, but its usefulness is affected by terrain, vegetation encroachment, and limited direct access points. Additionally, small ponds and water catchments exist throughout FHTA but are highly dependent on seasonal precipitation and may not retain sufficient volume during prolonged drought conditions.

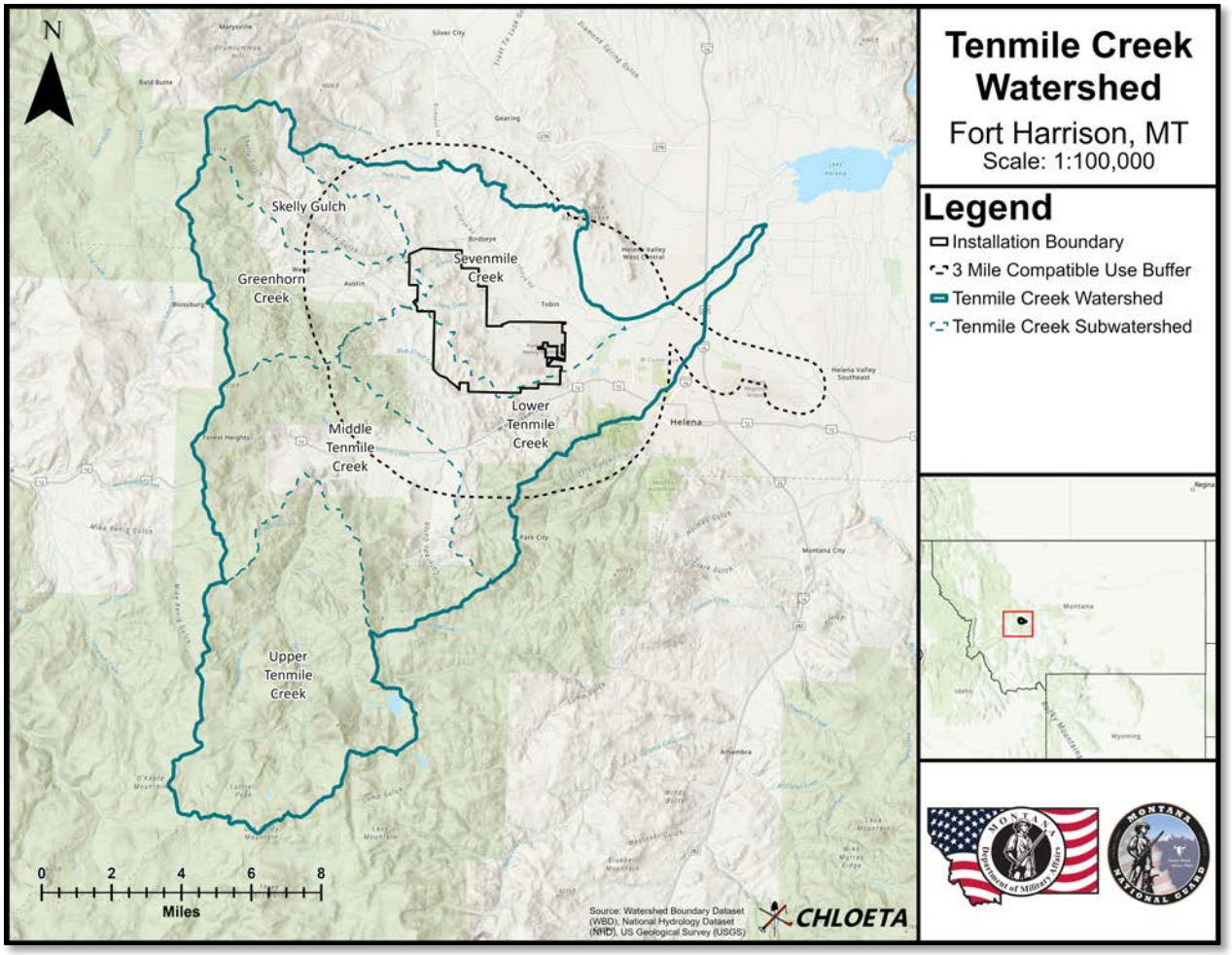


Figure 48. Tenmile Creek Watershed Map

No fixed hydrant or pressurized fire suppression infrastructure is located across the FHTA training area or undeveloped natural areas, making response efforts reliant on portable pump systems and water shuttle operations. Accessing water during a wildfire incident is further constrained by steep terrain, narrow roads, and limited staging areas for equipment. To enhance readiness, it is recommended that FHTA expand water storage capacity near critical assets, improve drafting infrastructure along Tenmile Creek, and establish permanent refill points supported by the municipal system wherever feasible. These improvements would significantly increase suppression reliability and reduce response delays during high-risk fire events.

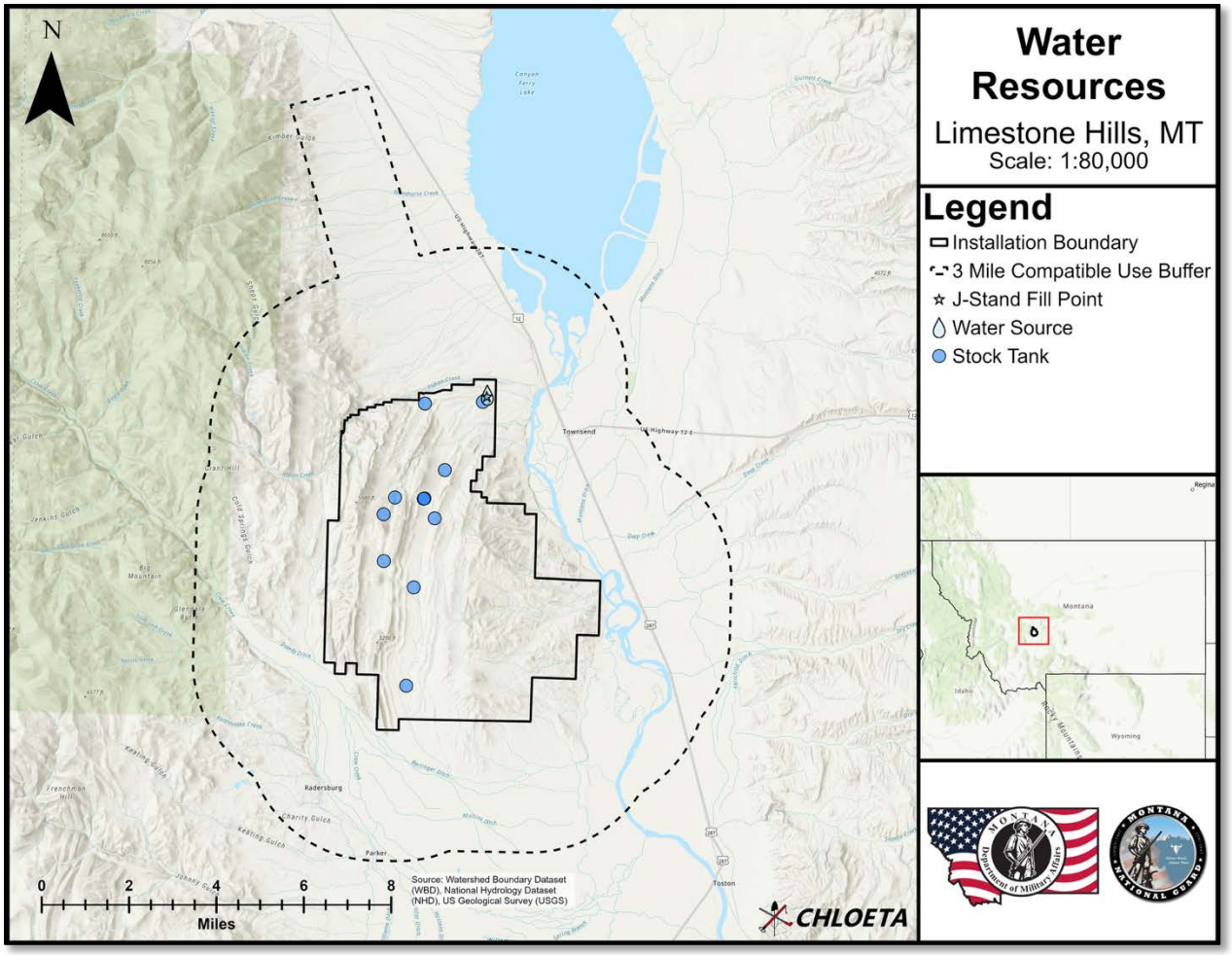


Figure 49. LHTA Water Resource Map

LHTA faces significant limitations in water availability for suppression and emergency response due to its remote location and lack of direct connection to any municipal water system. Unlike FHTA, which relies on the City of Helena's infrastructure, LHTA has a well-fed hydrant and gravity-fed J-stand fill point, fed by 30,000-gallon underground storage tank, both located near the LHTA barracks (Figure 49). Once the 30,000-gallon storage tank is empty, it takes approximately 24 hours to refill. There is no fixed hydrant or pressurized fire suppression infrastructure on the training ranges or in the undeveloped natural areas. As a result, fire response operations in this area easily become dependent on mobile water sources, including water tenders and portable tanks transported from FHTA or nearby cooperating agencies. The rugged terrain and isolation of the training area exacerbates access issues, making it difficult to stage water support equipment near ignition points or at the head of a rapidly advancing fire. Seasonal precipitation patterns influence the availability of natural water catchments or ephemeral streams within LHTA, which may offer limited drafting options in wet years but are unreliable during summer drought or extended dry periods. In many locations, these water sources are inaccessible due to steep grades or dense vegetation, rendering them unusable during critical response windows.

Both assessment areas face distinct challenges regarding water availability and access for wildfire suppression, though the nature and severity of those challenges differ. The FHTA assessment area benefits from direct access to the City of Helena's municipal water system, which includes hydrants and infrastructure capable of supporting firefighting operations. However, vulnerabilities remain due to terrain constraints and limited reach of hydrants into the more remote or fuel-heavy areas. As a contingency, FHTA has a backup plan that includes mutual aid support and mobile water tender operations to extend coverage beyond the municipal network. In contrast, LHTA assessment area water service can easily become dependent on off-site water hauling and mobile suppression tactics. Its remote location, steep topography, and quickly refillable water infrastructure significantly hinder timely water access. Seasonal water sources, while occasionally present, are unreliable and often inaccessible due to terrain.

Watersheds

Both assessment areas are situated within distinct watershed systems, highlighting the importance of watershed-specific considerations in planning and resource management (Figure 50). The FHTA assessment area lies within the Tenmile Creek watershed, which ultimately contributes to the Upper Missouri River basin. The LHTA assessment area, meanwhile, is positioned within the Deep Creek watershed, also feeding into the Upper Missouri basin but through different sub-watershed channels.

In the FHTA assessment area, the surrounding watershed provides critical water resources for both domestic and emergency firefighting needs. This area includes WUI areas, meaning that effective fire suppression is dependent on available water sources whether from municipal hydrants, creeks, or water storage facilities. A compromised watershed following wildfire could limit water quality and pressure needed for suppression efforts, particularly during periods of high demand.

In the LHTA assessment area, the setting is more rural and remote. Fire response in this area relies heavily on local water catchments, natural water bodies, and portable water supply operations including water tenders. If wildfire affects the watershed's ability to retain and deliver clean water through increased sedimentation or infrastructure damage, it could hamper both immediate suppression efforts and long-term recovery operations.

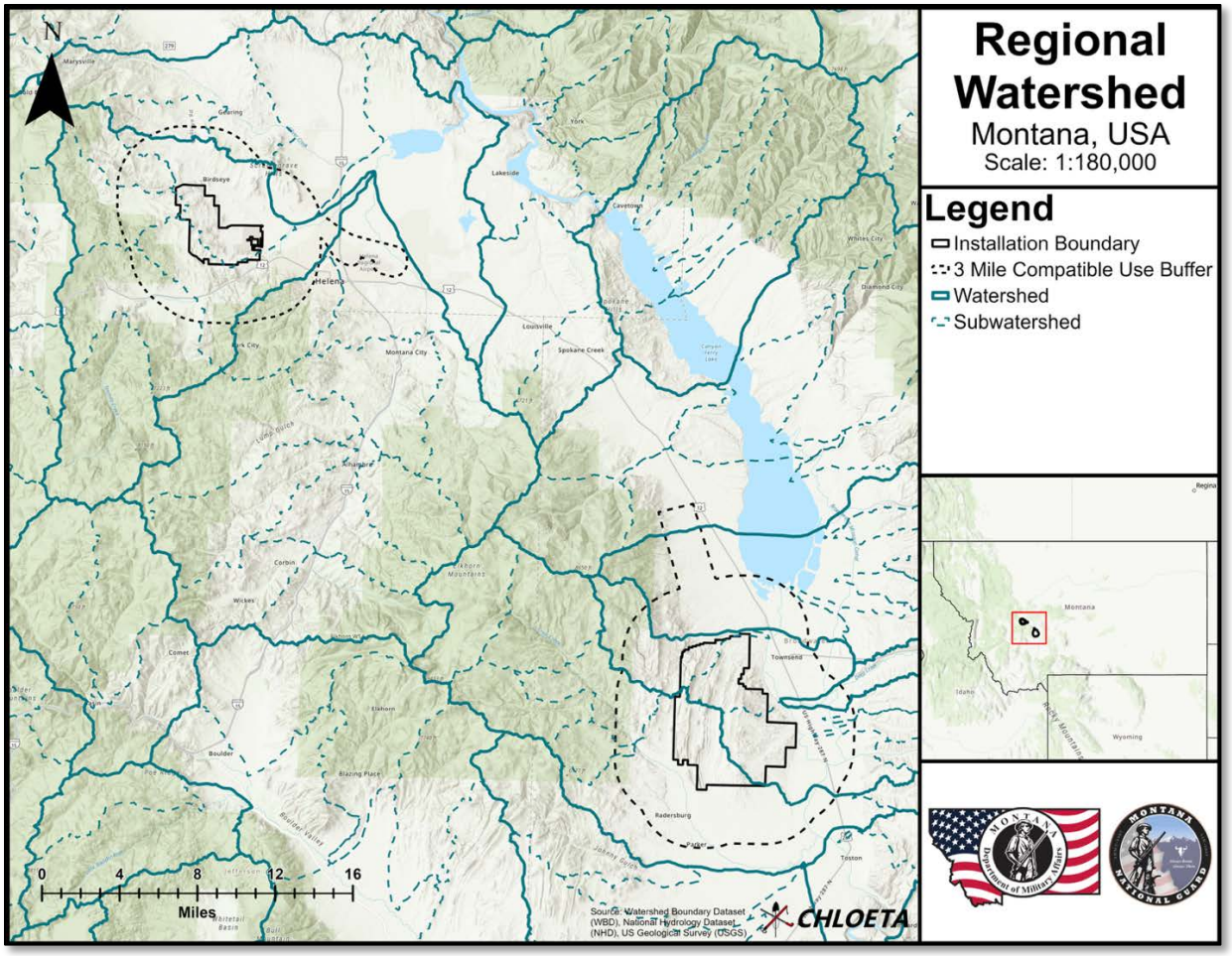


Figure 50. Regional Watershed FHTA and LHTA Map

Figure 51 depicts the various watersheds overlapping and surrounding the LHTA. Watersheds including Whitehorse Creek–Canyon Ferry Lake, City of Townsend–Missouri River, Dry Creek–Missouri River, and Crow Creek–Missouri River provide critical hydrologic infrastructure for the area. For the LHTA assessment area, being situated at the confluence of multiple watershed basins means that wildfire activity in any part of the training area can result in downstream consequences across several hydrologic units. Fire-damaged vegetation and soils in these catchments can lead to increased sedimentation and nutrient loading into creeks and reservoirs, degrading water quality and reducing available water volume. Additionally, altered water flow regimes may impair access for fire suppression operations that depend on stable surface water sources.

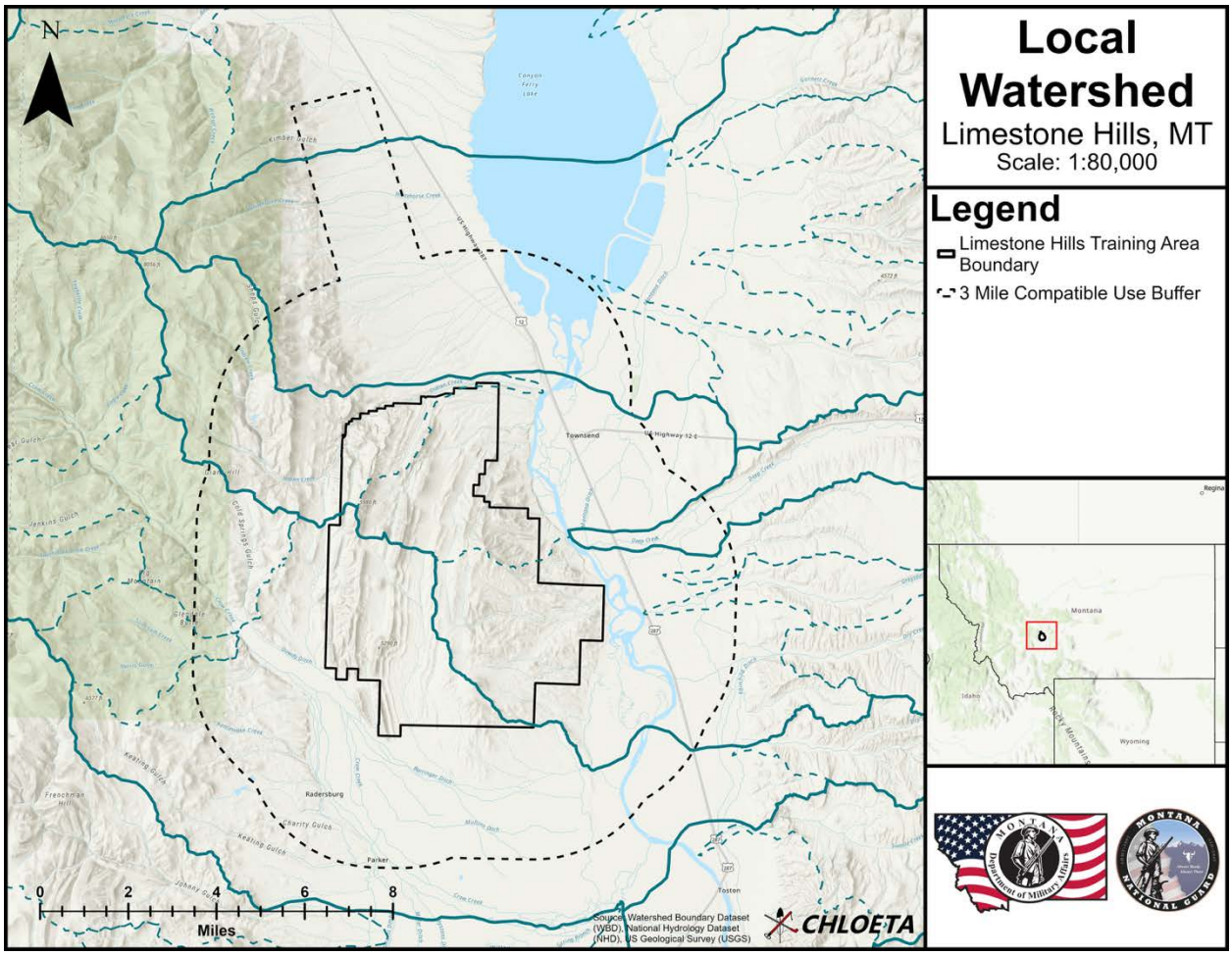


Figure 51. Watersheds Overlapping and Surrounding LHTA Map

Figure 52 displays the network of watersheds surrounding the FHTA assessment area, highlighting several key hydrologic basins including Seven Mile Creek, Greenhorn Creek, Lower Tenmile Creek, and Last Chance Gulch. These watersheds are integral to the region's natural hydrology and serve as essential sources of water for wildfire suppression operations within and around the installation. Wildfire impacts in this area could severely disrupt watershed function by degrading vegetation, compacting soils, and increasing runoff and erosion. Such disturbances can compromise the quality and availability of water in these creeks, which are vital for both ecological balance and emergency response support. The FHTA assessment area's dependency on local watershed systems underscores the importance of managing upstream and surrounding lands to preserve water reliability for fire mitigation efforts.

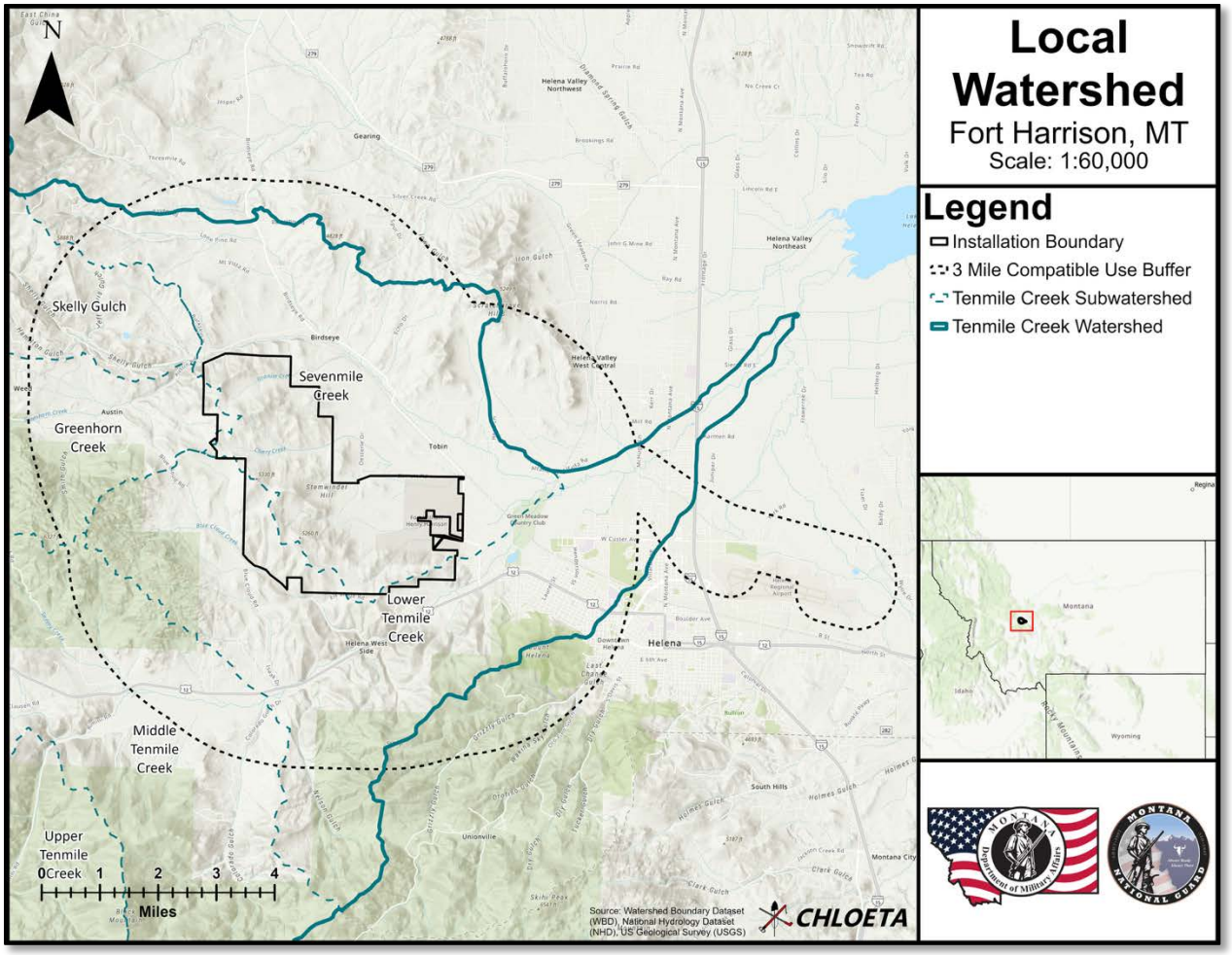


Figure 52. Watersheds Overlapping and Surrounding FHTA Map

Figure 53 displays wildfire exposure rankings across watershed basins, indicating the potential risk of fire impacts within each watershed area. The color-coded categories range from "Extremely Low" to "Very High," the FHTA assessment area falls within a watershed ranked as “Moderately Low” to “Low,” signaling a manageable but notable risk of wildfire exposure to critical watershed functions. In contrast, the LHTA assessment area is situated in a watershed area ranked as “Very Low,” suggesting reduced vulnerability to wildfire-related impacts on water quality and availability. Despite these differences, wildfires within any watershed, especially those supporting firefighting operations, can result in downstream effects to include sedimentation, degraded water quality, and damage to aquatic habitats.

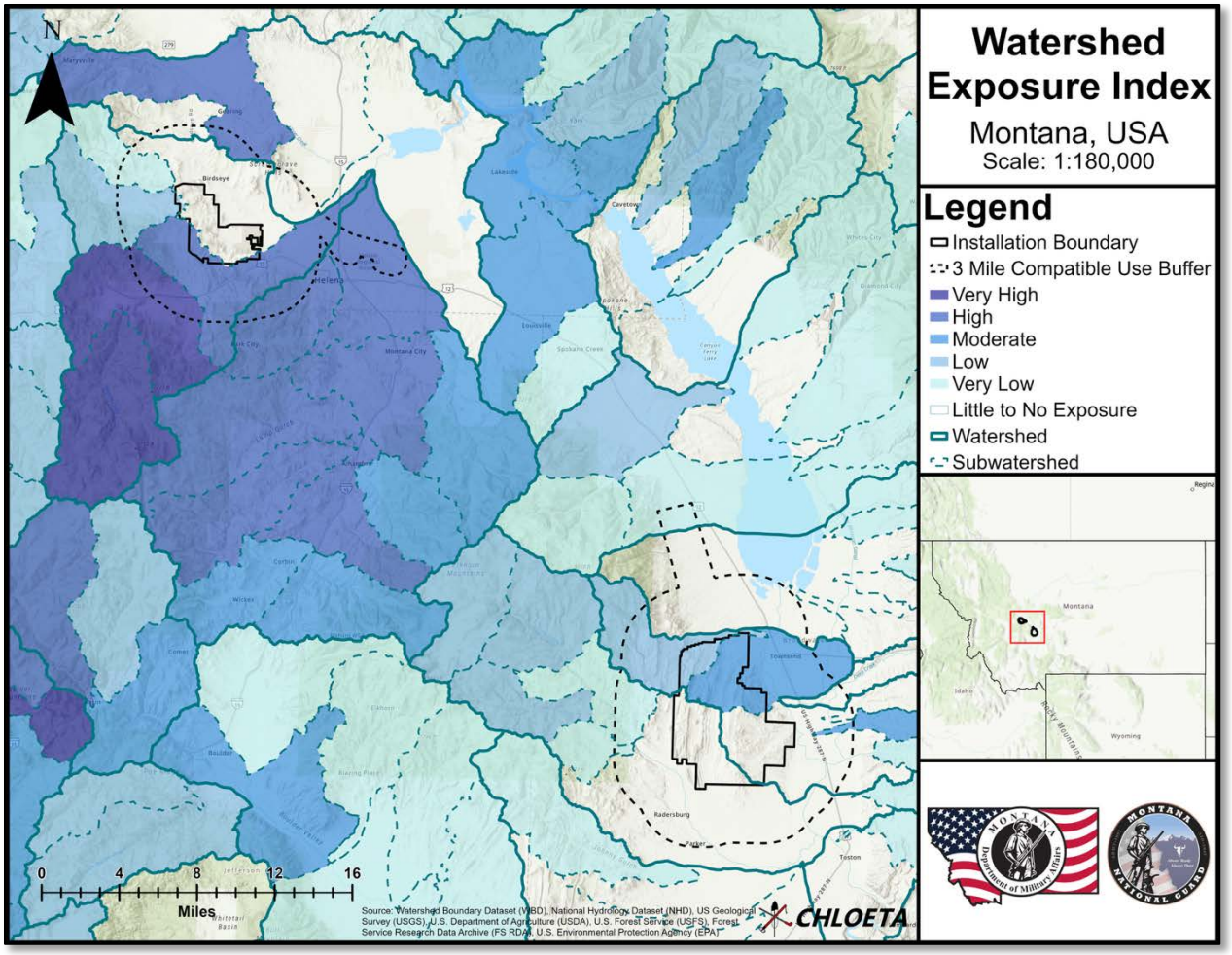


Figure 53. Watershed by Exposure Ranking for Areas Overlapping FHTA and LHTA Map

Rangeland and Grazing

When properly managed, grazing can reduce wildfire risk by decreasing fine fuel loads including grasses and forbs, which are the primary carriers of fire in rangeland ecosystems. This vegetation reduction lowers ignition chances and can also slow wildfire spread. Grazing can also create natural fuel breaks in frequently grazed areas.

Figure 54 highlights managed grazing of federal allotments and rangeland units in proximity to FHTA, shown in blue, and delineates their relationship to the FHTA assessment area boundary. Several key grazing areas, including Granite Creek, Ten Mile Creek, Blue Cloud, War Eagle Hill, and Iron Ridge, directly border or overlap the installation's perimeter, underscoring their relevance to land and fire management strategies. These lands represent active rangeland use that may influence fuel loads, vegetation patterns, and wildfire behavior in and around the installation. Because grazing practices within these allotments can either mitigate or exacerbate fire risks, understanding their location, management intensity, and ecological condition is critical when assessing overall wildfire vulnerability. Additionally, the proximity of these lands to military

operations may pose unique challenges or coordination opportunities for integrated land and fire stewardship across jurisdictions.

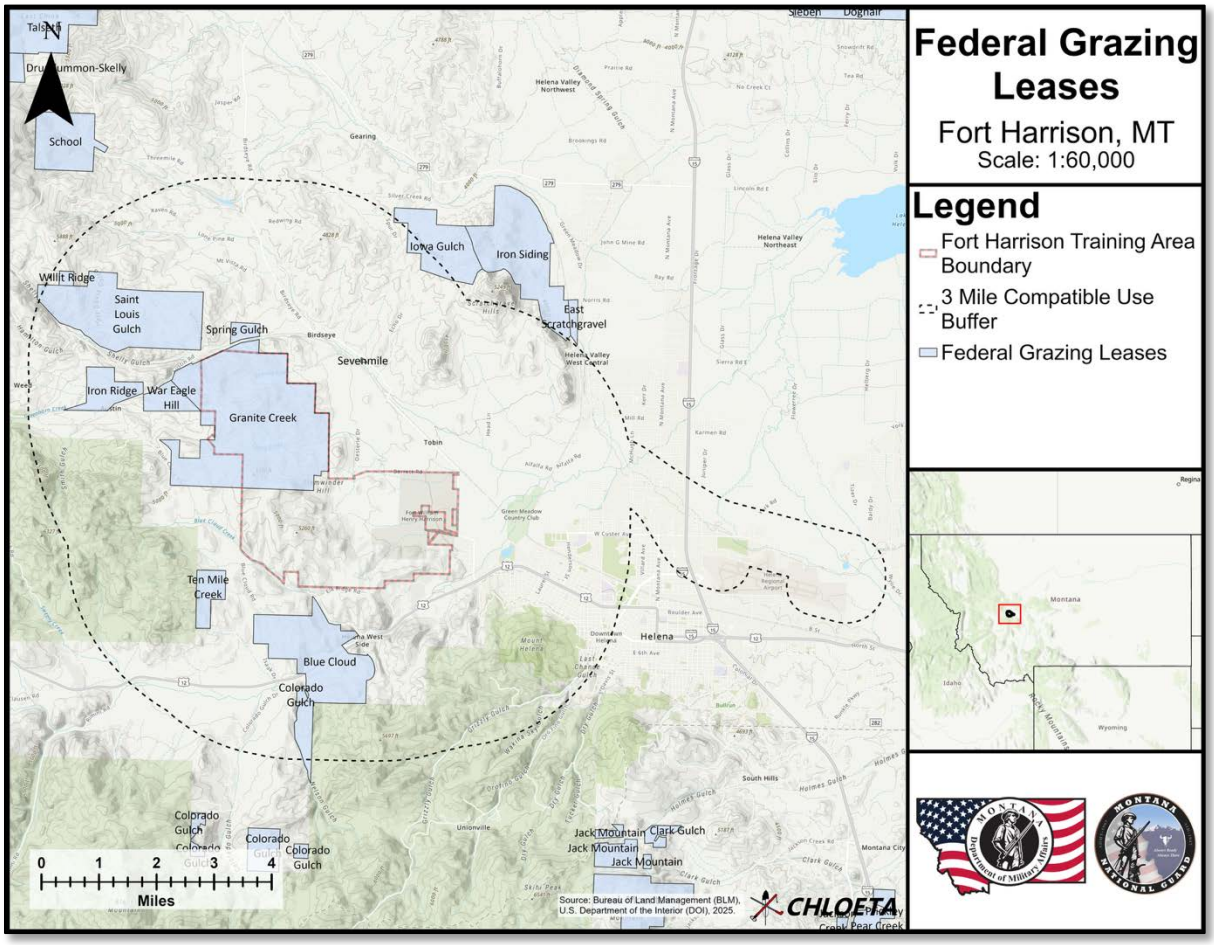


Figure 54. FHTA Federal Grazing Lease Map

Figure 55 highlights the prominence of the LHTA assessment area grazing allotments, which encompass the majority of the area surrounding the LHTA assessment area and are among the most expansive grazing units in the region. Managed under federal grazing regulations by the BLM, the LHTA supports seasonal livestock use while also contributing to fuel load conditions that affect wildfire behavior. Due to its proximity to the installation and its size, the condition of vegetation and land management practices within LHTA play a significant role in wildfire vulnerability. If not properly managed, overgrown or drought-stressed grasses and shrubs in this area can serve as continuous fuels, increasing the potential for ignition and fire spread toward critical infrastructure. Conversely, coordinated grazing can help reduce fine fuels and contribute to fire mitigation objectives. Integrating the management of the LHTA allotments into wildfire planning is essential for reducing risks to military assets, protecting public and private lands, and supporting broader landscape resilience.

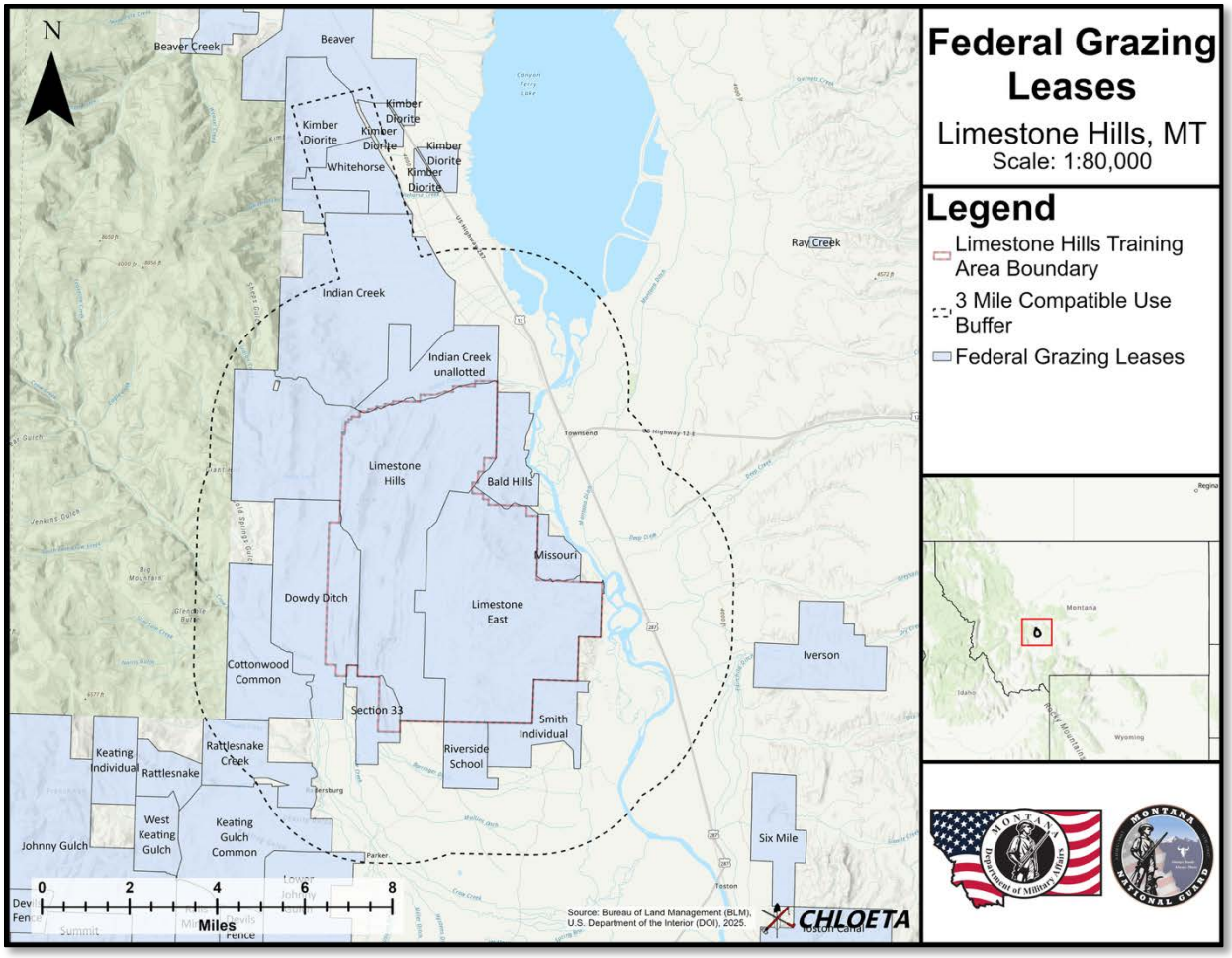


Figure 55. LHTA Federal Grazing Lease Map

Institutional Planning and Governance

Currently, planning efforts are fragmented across HMPs, CWPPs, Population Protection Plans (PPPs) and defense-specific resilience frameworks, leading to duplication and uneven application of mitigation strategies. By integrating DMA priorities into regional wildfire planning processes and ensuring consistent participation in county and state emergency planning forums, this assessment promotes a unified, landscape-scale approach. Institutional alignment will strengthen both funding competitiveness and the effectiveness of mitigation investments.

This structured, systems-based approach identifies where joint investments in infrastructure, fuels management, land use planning, and emergency response coordination are most urgently needed. The framework ensures a shared understanding of wildfire risk and fosters cross-jurisdictional collaboration, enabling both military and civilian stakeholders to strengthen resilience and safeguard mission assurance across the FHTA–LHTA operational footprint.

Stakeholders Engaged in Wildfire Related Activities

The wildfire risk environment surrounding FHTA and LHTA involves a complex network of stakeholders with intersecting responsibilities for land management, emergency response, utility infrastructure, conservation, and planning (Table 9).

Table 9. FHTA and LHTA Assessment Area Stakeholders

Organization	Role
Department of Military Affairs (DMA)	Develops and implements plans to ensure regulatory compliance in support of the MTARNG mission.
MTARNG	Responsible for the operation and maintenance of FHTA and LHTA to support federal, state, and local training missions.
MTARNG Range Operations	Maintains operational control of FHTA and LHTA, schedules training events, manages live-fire training, installation safety, and coordinates wildfire response on the installations.
Tri-County Firesafe Working Group	Coordinates community wildfire education, mitigation strategies, and grant planning.
Prickly Pear Land Trust (PPLT)	Leads conservation and buffer zone land stewardship; manages easements and fuels treatments.
MT Department of Natural Resources and Conservation (DNRC)	Directs fire protection statewide; deploys wildfire suppression assets and technical assistance.
Lewis & Clark County Planning	Guides local zoning and subdivision regulation; promotes wildfire-adapted community development.
Lewis & Clark County DES	Facilitates local disaster coordination, Emergency Operations Center (EOC) operations, and emergency mitigation planning.
Broadwater County Planning	Oversees rural development; integrates wildfire considerations in county growth management.
Broadwater County DES	Facilitates local disaster coordination, Emergency Operations Center (EOC) operations, and emergency mitigation planning.
Broadwater County Rural Fire	Responds to fire incidents near LHTA; coordinates with mutual aid districts and volunteers.
City of Helena – Open Lands Division	Manages urban-adjacent recreation lands; maintains public access and fuels management programs.
City of Helena – Grants Office	Coordinates funding applications for mitigation, resilience, and infrastructure projects.
City of Townsend	Provides local leadership and coordination of public safety and wildfire planning.
Lewis & Clark Rural Fire Council	Aligns strategies across fire districts; promotes Incident Command System (ICS)-based training and suppression coordination.
Helena Fire Department	Responds to municipal and WUI fire incidents; support interagency suppression near FHTA.

Organization	Role
Veterans Administration (VA) Fire Department at FHTA	MTARNG has an IAA with VAFD to provide emergency services / wildfire suppression on FHTA.
United States Forest Service (USFS) – Helena-Lewis & Clark National Forests	MTARNG has an IAA with USFS to provide emergency services / wildfire suppression on LHTA
Baxendale Volunteer Fire Department	Provides mutual aid near western Lewis & Clark County; supports suppression in rural areas.
United States Bureau of Land Management (US BLM) – Butte Field Office	Oversees fuels and land stewardship on US BLM parcels near training areas.
USDA NRCS	Provides conservation and fuels management assistance to landowners in risk areas.
Lewis & Clark Conservation District	Promotes soil, water, and vegetation conservation practices in WUI and agriculture interfaces.
Broadwater Conservation District	Advises post-fire recovery and land conservation priorities for wildfire-impacted lands.
Helena Regional Airport Authority	Manages aviation infrastructure; critical coordination hub during wildfire emergencies.
MT Economic Assistance Connection	Supports community development through funding alignment and resilience grants.
Northwestern Energy	Manages critical electrical infrastructure; supports PSPS and ignition reduction programs.
Vigilante Electric Cooperative	Provides local utility service; manages infrastructure exposure to wildfire near WUI areas.
DNRC Helena Unit – Fire Supervisor	Coordinates regional wildfire operations and resource deployment.
DNRC Helena Unit – Fire Management Officer	Oversees wildfire operations in support of local and interagency suppression near DMA lands.
MT Disaster and Emergency Services (DES) – State Hazard Mitigation Officer	Guides state-level mitigation planning and supports local resilience alignment and funding.

Planning Frameworks and Policies

This assessment is structured to strengthen and integrate existing wildfire and resilience planning efforts across Lewis & Clark and Broadwater counties while directly supporting the MTARNG. This assessment functions as a cross-cutting framework that links military, civilian, and environmental wildfire strategies to reduce duplication, align resources, and advance both mission assurance and regional resilience.

County-Level Integration

At the local scale, this assessment builds on the Western Montana Regional HMP (2025) Annexes for Lewis & Clark and Broadwater counties. These plans establish priority hazards, including

wildfire, and outline mitigation goals that serve as prerequisites for FEMA grant eligibility. By providing a deeper analysis of wildfire threats to military training areas and highlighting shared civilian–military vulnerabilities, this assessment enhances the effectiveness of local HMPs and strengthens the region's competitive standing for federal mitigation funding.

This assessment also extends the Tri-County CWPP (2020), which identifies WUI fuel reduction priorities and public education initiatives. Expanding CWPP objectives to encompass specific FHTA, LHTA, and surrounding buffer areas ensures that wildfire risk reduction strategies address the full landscape of military and civilian exposure.

Consistent map analysis is critical to ensuring defensible and comparable conclusions across wildfire, WUI, access, and risk assessments. All spatial analyses used to support these documents should be developed using standardized platforms, datasets, and classification methods, including consistent basemaps, coordinate systems, scale, and data vintages. Applying uniform standards for WUI delineation, ignition density, access constraints, and hazard overlays reduces discrepancies between analyses, supports interagency coordination, and improves transparency for decision-makers. Maintaining consistency across mapping products also ensures that planning assumptions remain aligned across jurisdictions and over time, strengthening the reliability of risk identification and mitigation prioritization.

Federal and Defense Planning Alignment

At the defense level, this assessment aligns with DMA and broader DoW resilience frameworks, including Installation Energy and Water Plans (IEWPs) and the Defense Climate Assessment Tool (DCAT). These tools identify threats to mission-critical resources including energy, water, and access routes, all of which are directly jeopardized by wildfire. Integrating wildfire risk into these frameworks ensures that installation resilience planning reflects both operational priorities and the broader regional hazard environment.

Alignment Benefits

- Increased Funding Competitiveness: Wildfire risk reduction actions that align with established county, state, and federal frameworks are positioned for higher success in securing FEMA, DoW, and USDA Forest Service mitigation funding.
- Greater Implementation Feasibility: Leveraging existing planning cycles and capital improvement programs allows wildfire mitigation actions to be phased, budgeted, and institutionalized more effectively.
- Strengthened Stakeholder Buy-In: Grounding wildfire mitigation in familiar planning frameworks builds community trust, improves participation, and reinforces partnerships with utilities, land managers, and emergency services.

Regional and Landscape-Scale Context

Resilience around in both assessment areas depends on the capacity of interconnected communities and systems to withstand and recover from wildfires that are growing in frequency and severity. These installations sit within a mosaic of federal forest lands, private development, and military

training areas, all connected by interdependent roadways, utilities, and water systems. This shared infrastructure supports both military operations and civilian communities, making it collectively vulnerable to wildfire disruptions.

Large fires including Woods Creek (2021), Canyon Creek (1988), and Horse Gulch (2024) demonstrated the cascading operational consequences of wildfire, including prolonged road closures, disrupted training schedules, damaged utilities, and delayed emergency response. These incidents highlight how wildfire events in the surrounding landscape can directly affect MTARNG mission readiness and regional emergency management.

The fragmented nature of land ownership and jurisdiction adds further complexity. Federal forest managers, county officials, private landowners, and the MTARNG must coordinate fuel reduction treatments, zoning practices, and emergency response strategies. Gaps in mutual aid capacity and inconsistent defensible space enforcement illustrate the urgent need for coordinated landscape-scale wildfire mitigation approaches.

By framing military training areas within the broader wildfire risk environment, this assessment emphasizes the need for sustained coordination among MTARNG, civilian emergency managers, utility providers, land use planners, and conservation stakeholders. Only through joint planning and investment can the region effectively reduce wildfire risk while ensuring mission assurance for military operations. A range of existing plans and frameworks provide the foundation for this assessment's recommendations, summarized in Table 10.

Table 10. Existing Plans, Frameworks and Assessment Use

Plan/Study	Use in Assessment
Lewis & Clark County Annex - HMP	Identifies wildfire as a top hazard; supports defensible space and promotes WUI risk reduction across priority areas near the FHTA.
Broadwater County Annex - HMP	Highlights wildfire exposure in rural areas and references interagency coordination needs near LHTA.
Tri-County Regional CWPP	Guides shared fuel treatment areas and regional mitigation priorities; provide baseline for cross-jurisdictional efforts.
Montana Western Regional HMP	Offers regional coordination framework and multijurisdictional hazard context applicable to military-adjacent areas.
2023 State Multi-Hazard Mitigation Plan (MHMP)	Establishes statewide hazard trends and supports high-level alignment for installation risk profiles.
Northwestern Energy Wildfire Mitigation Plan	Evaluates ignition risk and vegetation management along utility corridors serving or crossing MTARNG infrastructure.
Department of Defense Issuance (DoDI) 6055.17 (Installation Emergency Management Program)	Defines baseline expectations for emergency preparedness across military installations.
Department of Homeland Security (DHS) Mission Assurance and Infrastructure Guidance	Reinforces strategic infrastructure resilience and continuity planning for defense missions.

Plan/Study	Use in Assessment
REPI Program and Conservation Project Documentation	Outlines conservation easements and compatible use buffers to reduce encroachment and support installation resilience.
Lewis & Clark County Zoning Regulations (2022)	Establishes local development context near the FHTA and helps evaluate zoning compatibility with wildfire risk.
Lewis & Clark County Growth Policy (2025)	Identifies growth trends and recommends conservation in high-risk areas near military training routes.
Broadwater County Growth Policy Addendum (2024)	Supports land preservation near LHTA and aligns with broad resilience goals across the county.
FHTA and LHTA Real Property Master Plans (2023)	Maps training areas and infrastructure assets; highlight management constraints influencing mitigation options.
Integrated Natural Resources Management Plans (INRMPs)	Details habitat management and prescribed fire strategies within and adjacent to military lands.
FHTA Joint Land Use Study (JLUS, 2014)	Identifies historic land use conflicts and sets precedent for compatibility planning near military facilities.

Fort Harrison Training Area

FHTA is a significant military installation located approximately one mile west of Helena, MT, in Lewis & Clark County. This MTARNG-managed installation is situated within the southwestern portion of the Helena Valley and is characterized by a mix of urban, suburban, and rural landscapes. FHTA encompasses 6,294.5 burnable acres out of 6,553.6 total acres. Burnable acres are comprised of 159.5 acres of range facilities and operational ranges, and 6,135 acres of underdeveloped natural areas (MTARNG IWFMP). The surrounding lands include scattered farms, residences, grazing areas, and hilly mountainous terrain. FHTA serves as the MTARNG principal training installation and administrative center. The installation is home to the MTARNG's Joint Forces Headquarters, the Fort Harrison VA Medical Center, and the Montana State Veterans Cemetery. Additionally, the FHTA Army Airfield (AAF) supports aviation operations for the MTARNG. The installation encompasses a range of mission-critical assets including armories, barracks, vehicle maintenance shops, logistical storage, training classrooms, and a medical facility co-located with the VA Montana Health Care System. Its infrastructure supports a continuous year-round training and mobilization schedule and is central to Montana's military readiness, coordination with federal partners, and emergency response operations.

The FHTA assessment area is located in a high fire-risk and occurrence area. The conditions and activities in this area lend themselves to numerous ignition categories, including lightning, equipment use, arson, fireworks, military training, and recreation. The city of Helena borders the installation and is a community at risk with a large WUI area. This area is also seeing rapid new-home construction, further complicating any fire response. Neighborhoods in the analysis area of highest concern outside the installation are West Helena, Birdseye, and Scratch Gravel. Ignitions from any of these borders could affect FHTA, but the area of most concern is anything along Highway 12. The prevailing winds, fuels, and topography would push any fire start in this area

towards and onto the installation. Winds are commonly seen at more than 50 mph during the dry season. Fires can reach speeds in excess of 10 mph where all factors are aligned.

Within the FHTA assessment area, critical community assets are tightly co-located with military facilities and high-exposure WUI neighborhoods. These assets include the VA Medical Center and Montana State Veterans Cemetery, public schools and childcare centers in West Helena, multiple mobile-home parks, Helena Fire/EMS stations, and lifeline infrastructure U.S. Highway12, the Country Club–Williams access corridor, municipal water conveyance from the Tenmile Creek watershed, and NorthWestern/Vigilante distribution lines and telecom backhaul. The proximity of these lifelines and vulnerable populations to federally managed training areas, coupled with ignition-prone activities, repeat roadside starts along U.S. Highway 12 and frequent Red-Flag wind events, creates a single, shared risk envelope. Because transportation and utility redundancies are limited, any wildfire, smoke, or post-fire flooding that disrupts these corridors can simultaneously affect civilian life safety and mission assurance. This geography makes the FHTA buffer a priority zone for integrated risk management, linking perimeter fuel breaks, secondary egress and traffic control, utility hardening/PSPS coordination, on-site water storage/draft sites, and joint evacuation planning across the installation and adjacent Helena Valley neighborhoods.

FHTA Assessment Area Hazard Summary

The FHTA assessment area lies within one of the highest wildfire exposure regions in Montana due to a convergence of ignition sources, fuel types, topographic features, and extreme fire weather conditions. This exposure has direct consequences for both military readiness and surrounding communities. Within this assessment, hazard and risk analyses evaluate scenarios in which MTARNG training activities ignite a wildfire on the installation that escapes containment and moves off-site, threatening nearby communities and infrastructure, as well as the inverse condition of a wildfire originating off installation and moving onto the training area during active military operations. These dual-risk pathways represent a significant concern for mission assurance, firefighter safety, and interagency coordination, underscoring the need for robust mitigation, prevention, and response planning across both installation and their assessment areas.

Ignition Sources: FHTA wildfire exposure is amplified by the diversity of ignition sources present both on and adjacent to the installation:

- Military training operations – Live-fire exercises, vehicle use in dry grasslands, and range activities are frequent ignition sources, particularly during summer months. Training ignited wildfires occur as early as April in dry years.
- Lightning strikes – Central Montana consistently ranks among the most lightning-prone areas in the Rocky Mountain West. Between 2000–2023, lightning caused approximately 65% of wildfires in Lewis & Clark County (DNRC fire records).
- Human-caused ignitions – Proximity to Helena and surrounding WUI communities increases exposure to roadside ignitions, fireworks, debris burning, and recreational activity.
- Repeat ignition corridors – DNRC records and local suppression reports confirm U.S. Highway 12 corridor, Birdseye Rd, and the Country Club/Williams Rd corridor as repeat

ignition areas. More than 35 wildfire starts occurred within 10 miles of FHTA (2010–2023), with these corridors cited as the most frequent origin points due to traffic, recreation, and adjacent WUI development.

- Utility corridors – Wooden distribution poles, particularly along Tenmile Creek and Birdseye Road, pose ignition risks under high wind and low moisture conditions.

Fuel Conditions

In both assessment areas, a mix of fine fuels (e.g., grasses), ladder fuels (e.g., shrubs), and heavy fuels (e.g., dense conifer canopies) create a complex and dynamic fire environment. Fuel load assessments help identify areas with high biomass accumulation or poor ecological management, which are prone to high-intensity fire behavior. By mapping fuel types and loading conditions across the landscape, this data supports targeted mitigation actions including prescribed burns, mechanical thinning, and defensible space enforcement. It also informs predictive fire behavior modeling and guides land management planning across both military installations and surrounding communities.

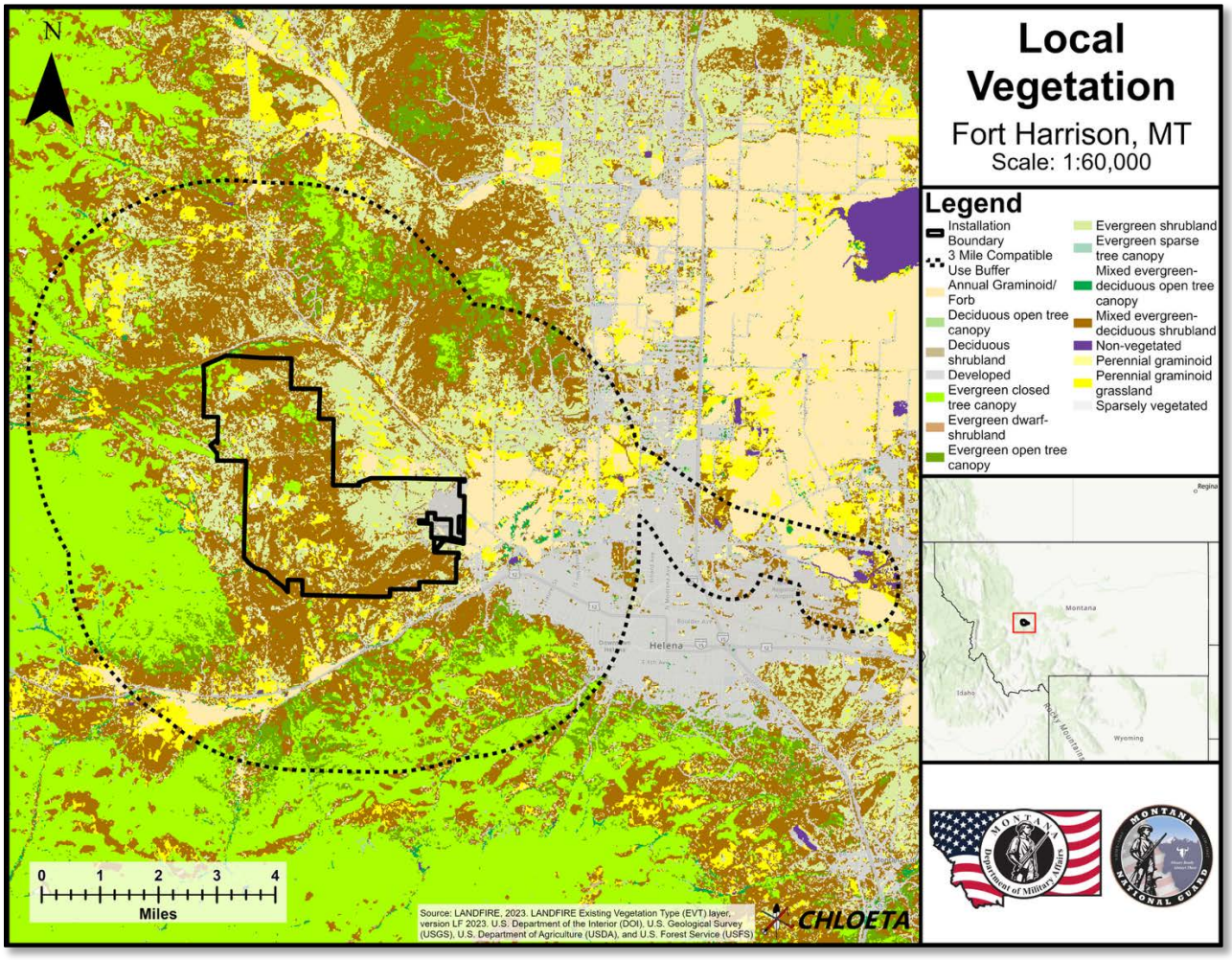


Figure 56. FHTA Vegetation Map

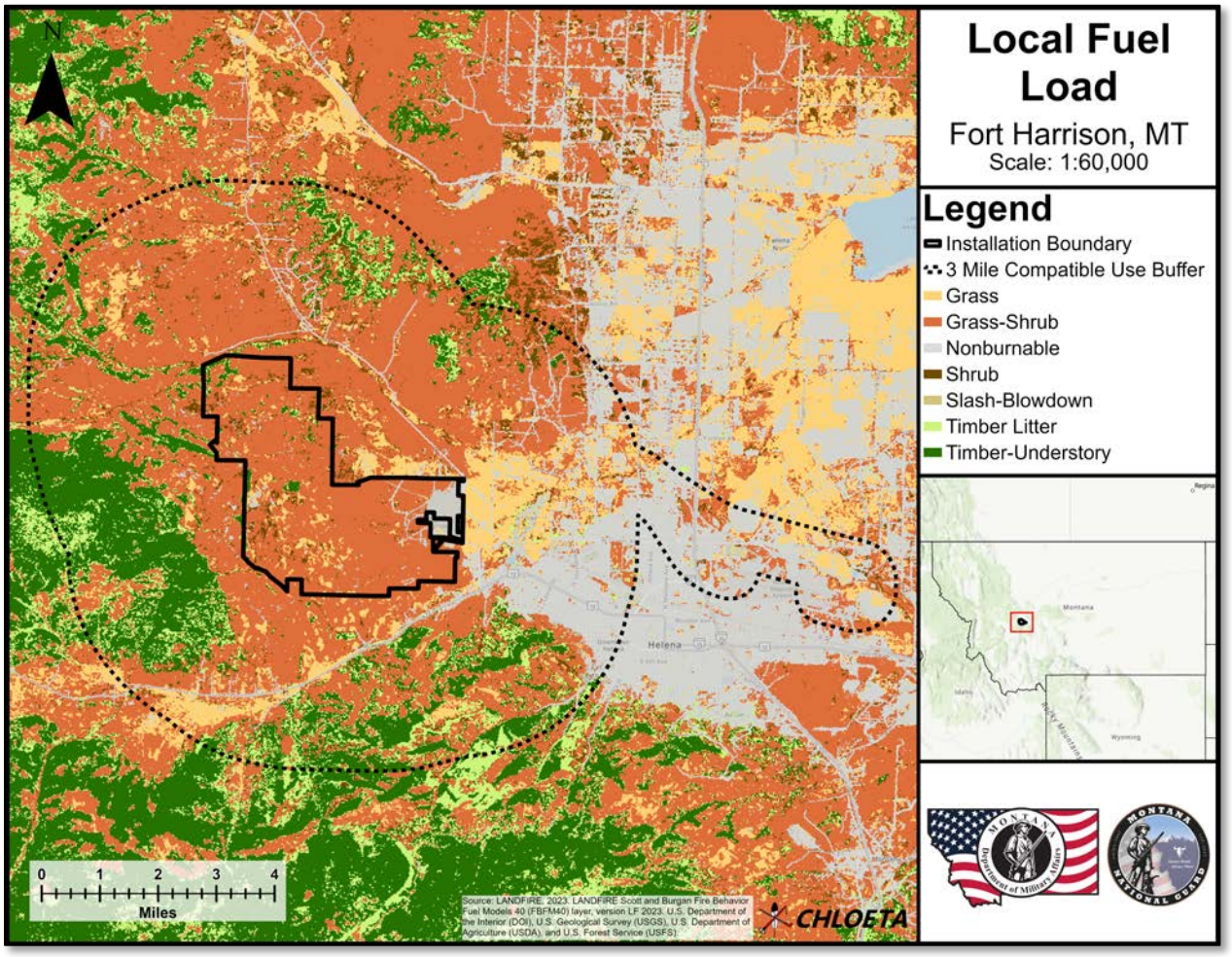


Figure 57. FHTA Fuel Load Map

The FHTA assessment area is characterized by a diverse vegetation matrix and a wide range of wildland fuel types, which strongly influence potential fire behavior and suppression challenges (Figure 56). The western and southern areas are dominated by evergreen open tree canopy and evergreen shrubland, as seen in various green and brown shades. These vegetation types, especially coniferous fuels, contribute to high surface and ladder fuel continuity, which increases the likelihood of torching and crowning under dry and windy conditions. Pockets of non-vegetated and developed areas to the east and southeast of the installation provide minor breaks in fuel continuity but are limited in extent. To the north and northwest, patches of deciduous shrubland and perennial grassland appear, which may contribute to fast-moving surface fires, especially during late summer when fine fuels cure. This is particularly relevant along the WUI of Helena, which borders the eastern side of FHTA.

The fuel model classification on Figure 57 reveals a predominance of Grass-Shrub (GS) and Timber-Understory (TU) fuel types, particularly around the western and southern buffer. These fuels are known to produce rapid rates of spread and intense flame lengths under low humidity and

moderate wind. There are also areas mapped as Timber Litter (TL) within the FHTA boundary, indicating dense duff layers and surface debris that can smolder and resist suppression efforts. Areas identified as non-burnable in Figure 57 generally correspond to developed portions of Helena; however, these areas remain functionally burnable during wildfire events. Urban infrastructure is interspersed with vegetation, ornamental landscaping, open spaces, and transportation corridors that create continuous or patchy fuels capable of supporting ember-driven fire spread, particularly during wind events. Buildings, fences, decks, utility corridors, and other constructed features further contribute to ignition potential and fire transmission. As a result, developed areas can experience structure-to-structure fire spread and infrastructure impacts even where wildland fuels are limited, underscoring the need to consider urban areas as part of the wildfire risk environment rather than truly non-burnable zones.

The vegetation and fuel conditions in the FHTA assessment are primarily classified under Fuel Models 1, 5, and 10, representing short grass and dry brush, brush, and timber litter with understory, respectively. These fuels support rapid fire spread rates, particularly under low fuel moisture and high-wind conditions, both of which are common during the regional fire season. Vegetation across the FHTA assessment area consists predominantly of Ponderosa Pine, Douglas Fir, Limber Pine, Rocky Mountain Juniper, Narrow-leaf Cottonwood, and Quaking Aspen, along with mixed grass and shrub understory species. These species occur throughout the range in association with grass and brush-dominated fuels that define the primary fire behavior patterns across much of the installation.

Approximately half of the installation participates in a livestock grazing program, which helps reduce fine fuel accumulation in managed areas. However, no grazing occurs on the firing ranges, resulting in continuous fine fuel buildup that can support fast-moving fire spread during dry, windy periods that routinely exceed 50 mph. Areas with denser brush or timber litter (Fuel Model 10) sustain higher-intensity fire behavior and increased resistance to control throughout the year, particularly during extended dry or drought conditions. Adjacent assessment areas and community lands are generally similar to those within the installation but are further complicated by WUI development, where grass, brush, and ornamental fuels intermingle with structures and infrastructure (Figure 58). This creates a continuous fuel network across the installation boundaries, heightening the potential for wildfire transmission between FHTA and the surrounding community during extreme weather or training-related ignitions.

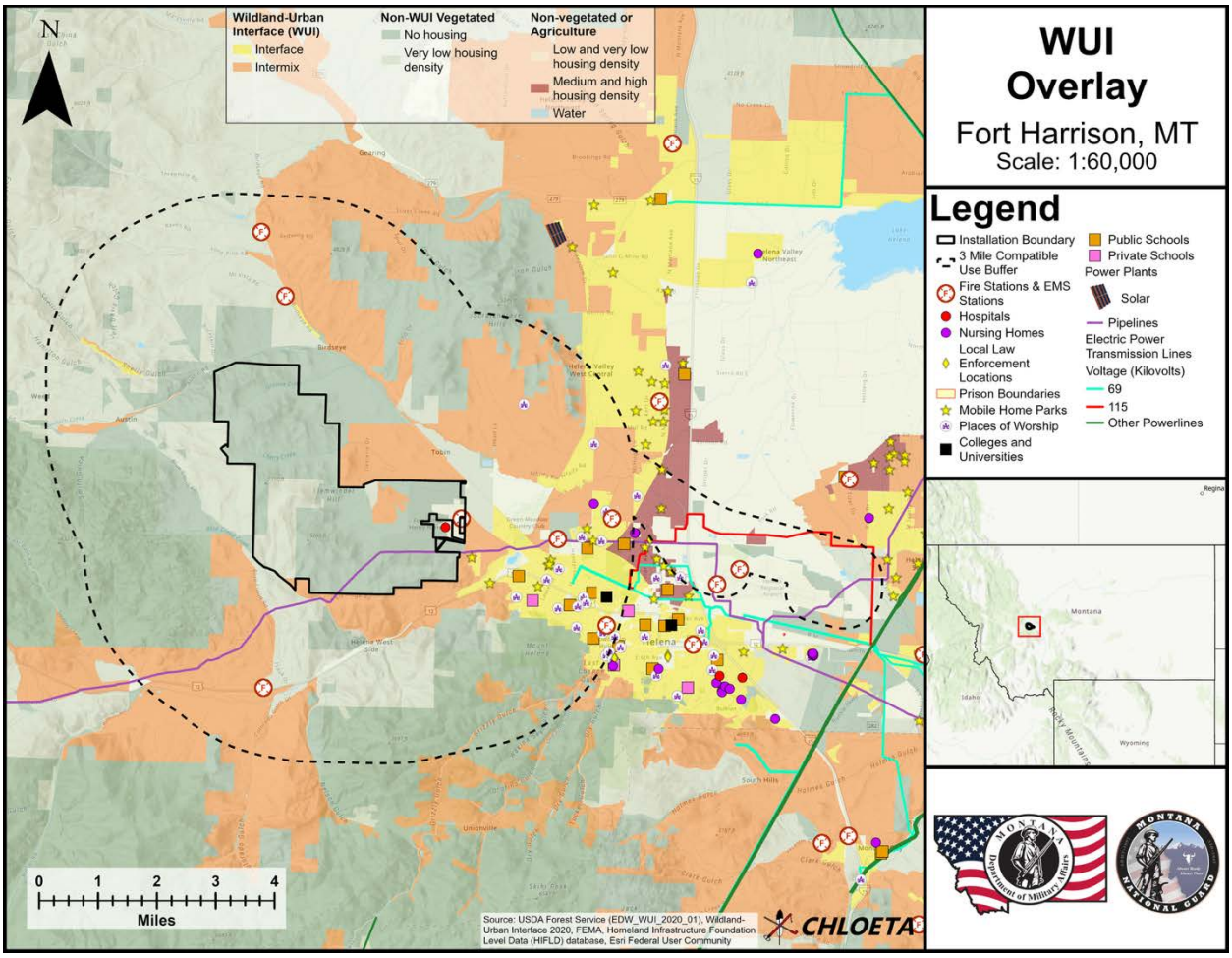


Figure 58. WUI Overlay FHTA Map

Figure 59. Images of FHTA Dominant Trees and Brush

- Coniferous stands in the Scratchgravel Hills (Figure 60) and Birdseye Foothills (Figure 61) increase ladder fuel hazards and crown fire potential.

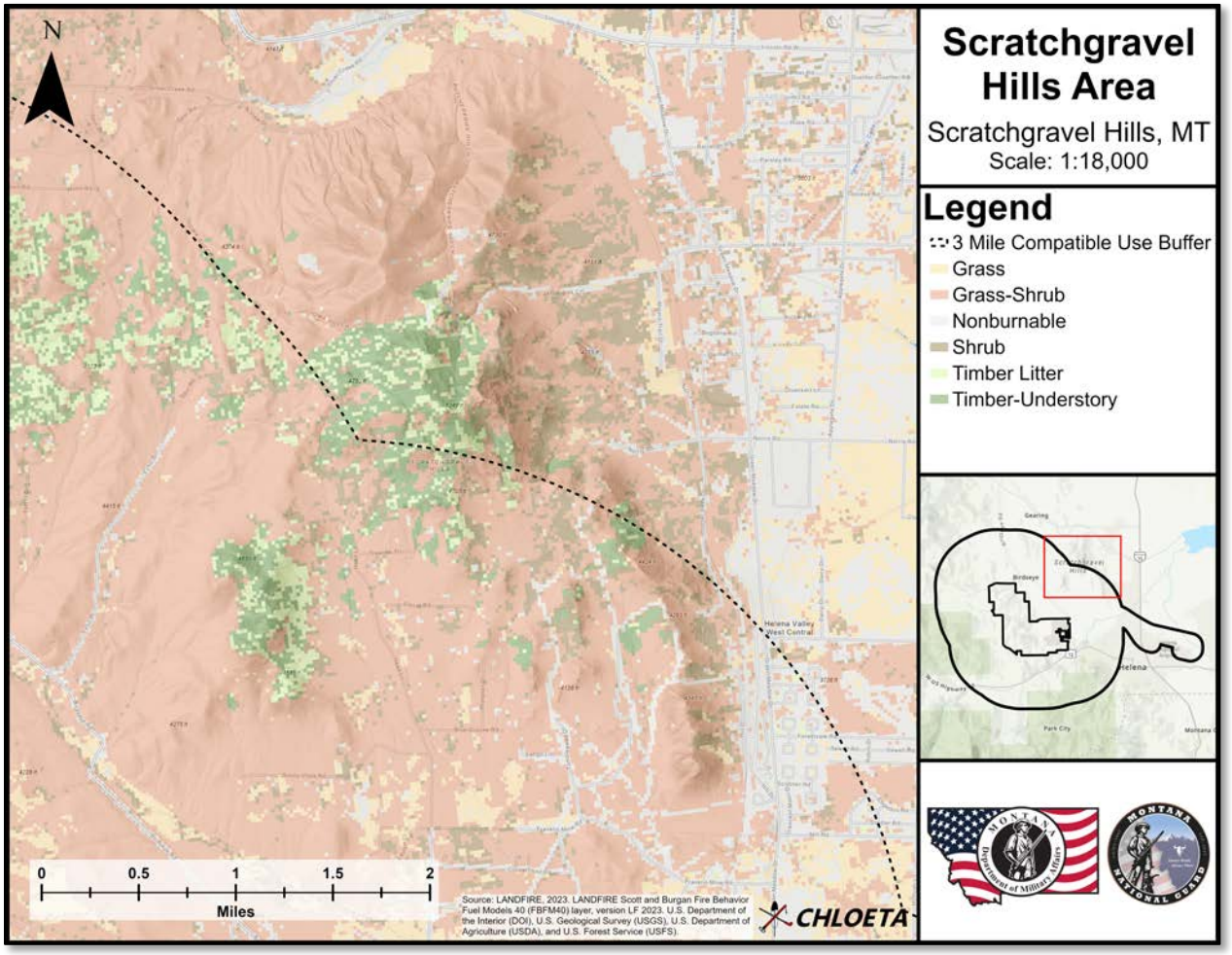


Figure 60. Scratchgravel Hills Map

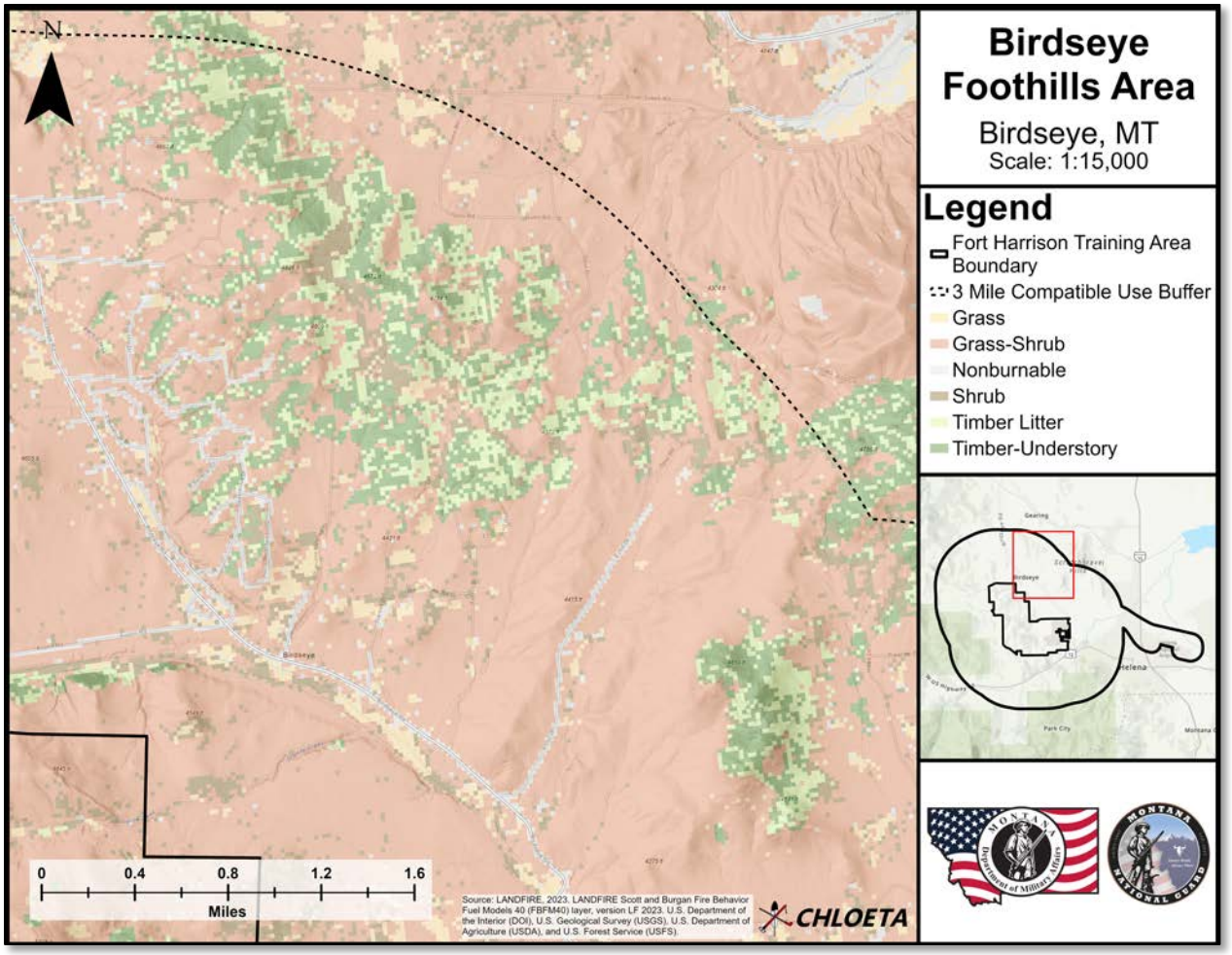


Figure 61. Birdseye Foothills Map

- Juniper encroachment along portions of the southeastern perimeter (Figure 62) introduces volatile fuels with high heat release rates, documented as problematic in other Montana fire events.

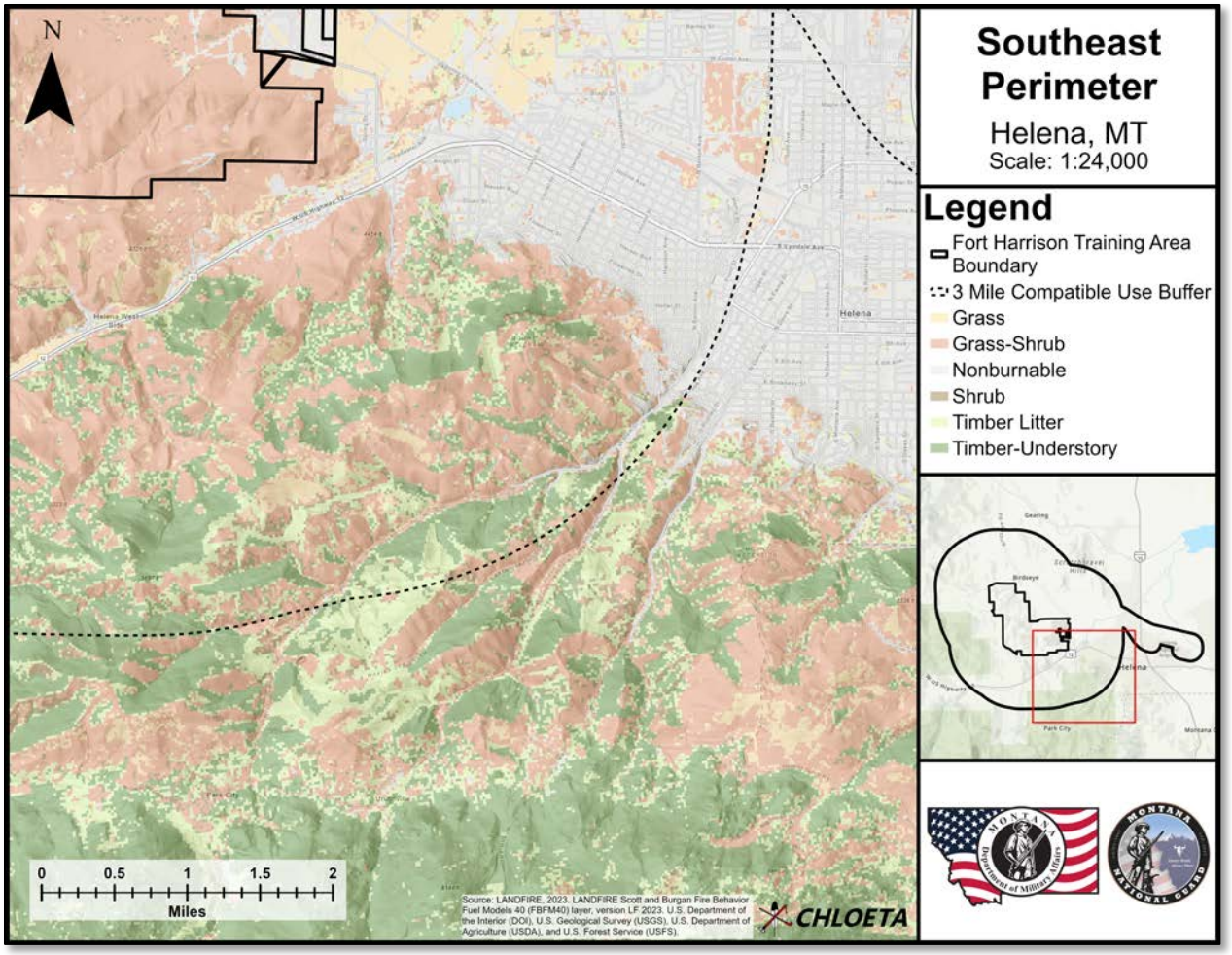


Figure 62. Southeastern Perimeter Map

Weather Drivers: Wildfire exposure in the FHTA assessment area is strongly influenced by seasonal and extreme fire weather patterns:

- High winds – Winds and frontal passages frequently produce gusts exceeding 50 mph, capable of turning small grass fires into large-scale incidents in under an hour.
- Extended drought – The U.S. Drought Monitor has classified Lewis & Clark County in "Severe to Extreme Drought" conditions for seven of the last 15 fire seasons, reducing live fuel moisture and water availability for suppression.
- Low humidity and high temperatures – During July–August, daytime humidity regularly drops below 15%, while maximum temperatures exceed 90°F, both of which accelerate ignition potential.
- Red Flag Days – Between 2018–2023, the Helena RAWS station recorded an average of 19 Red Flag Warning days per season, significantly above the statewide average.

Topographic Influences:

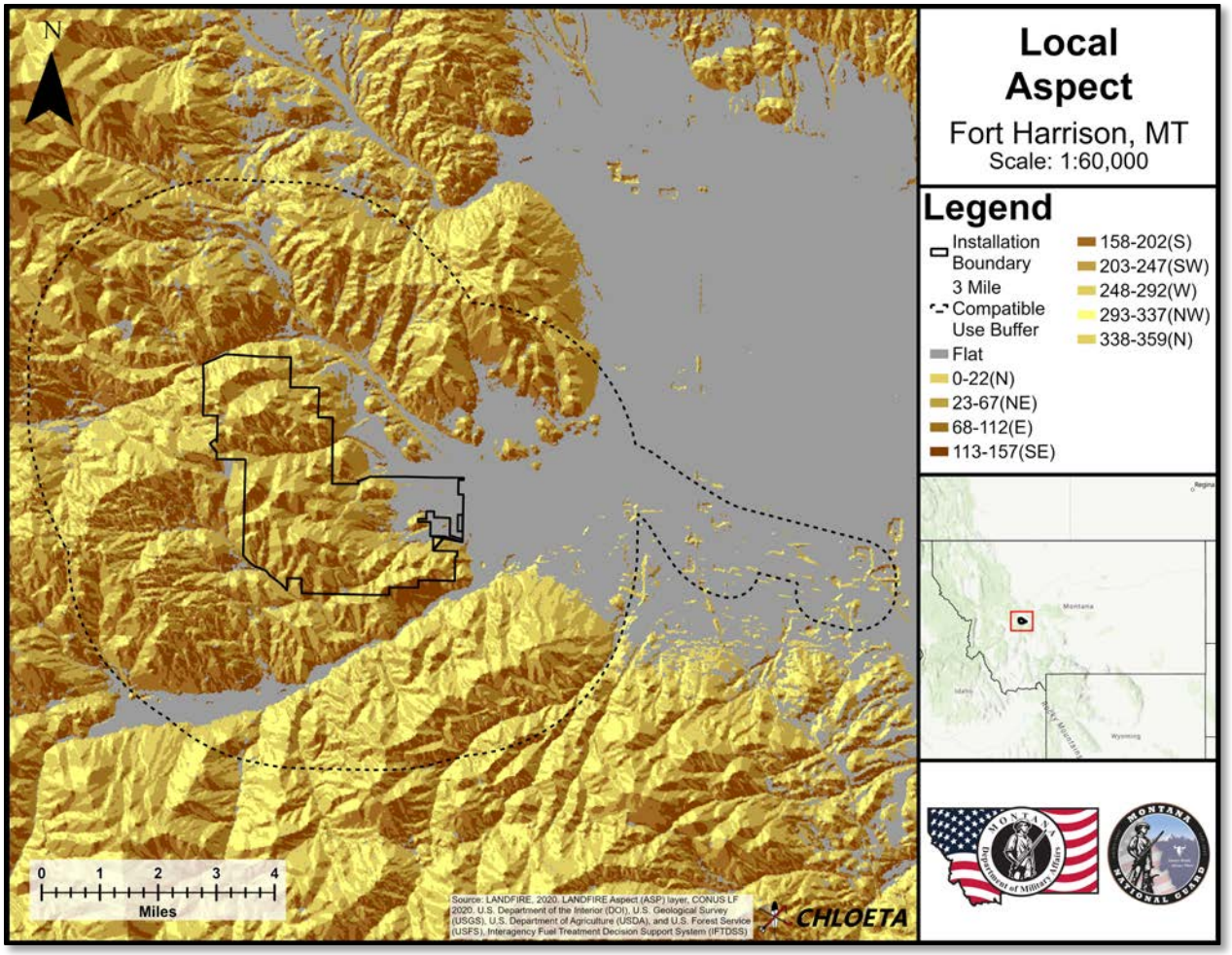


Figure 63. FHTA Aspect Map

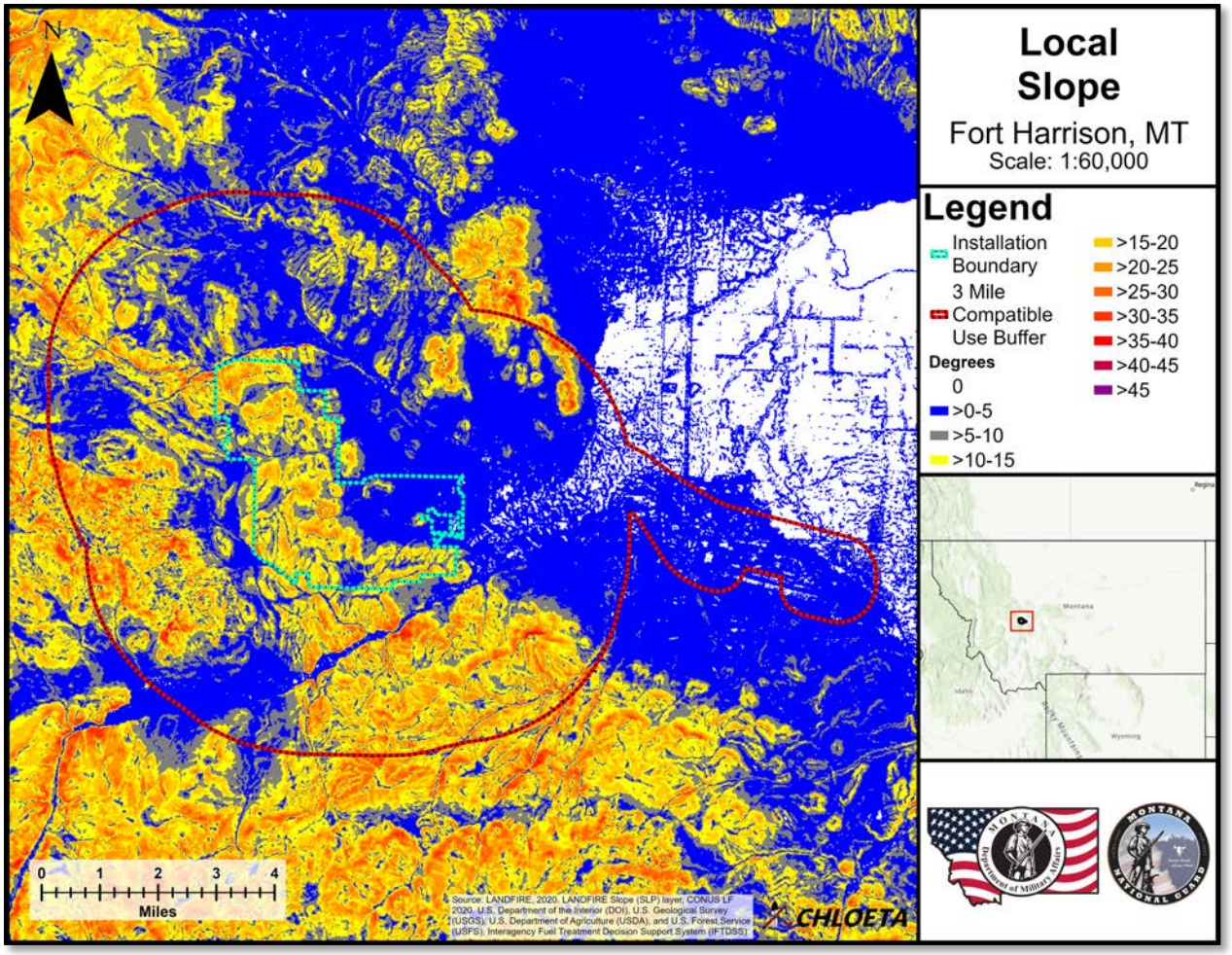


Figure 64. FHTA Slope Map

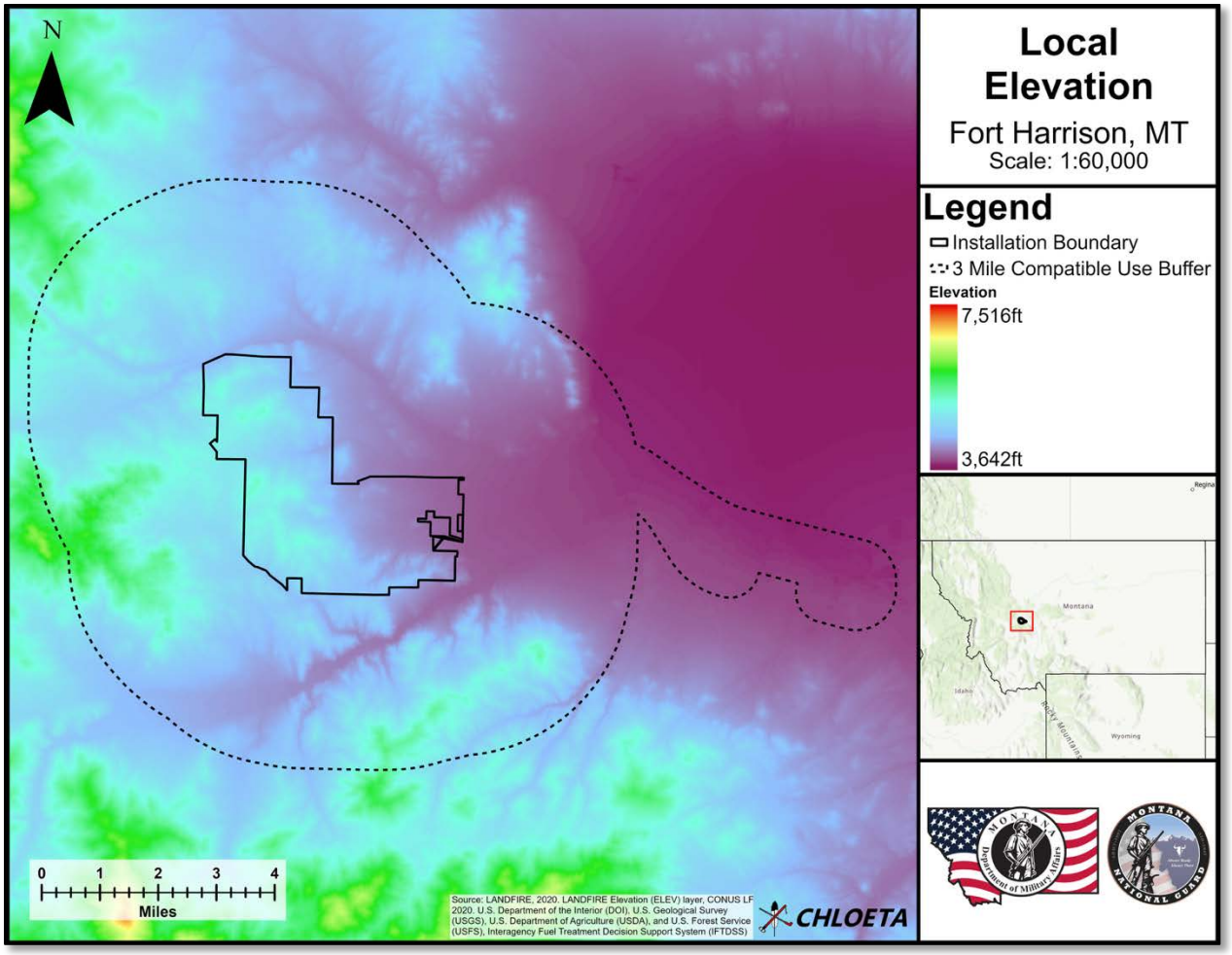


Figure 65. FHTA Elevation Map

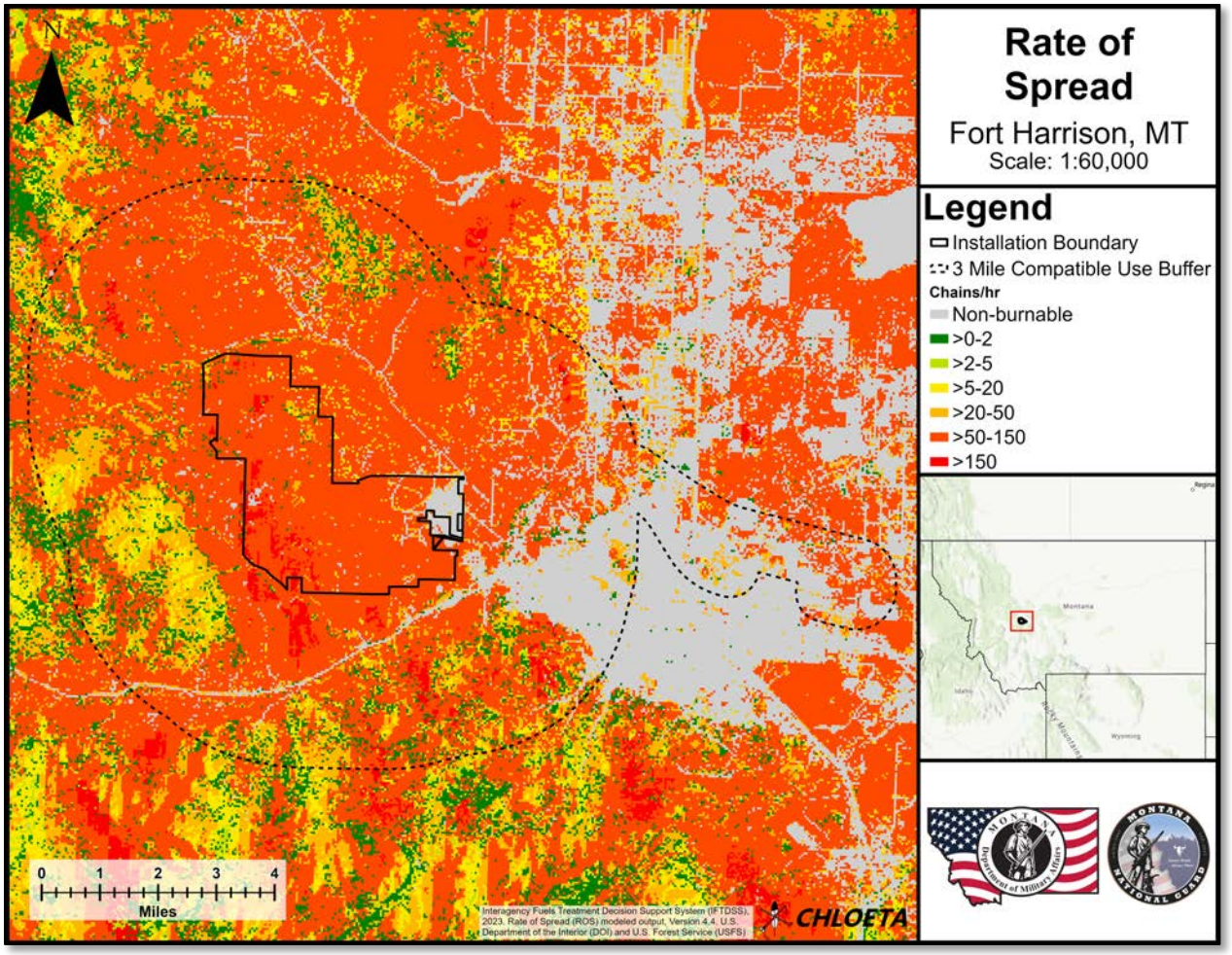


Figure 66. FHTA Rate of Spread Map

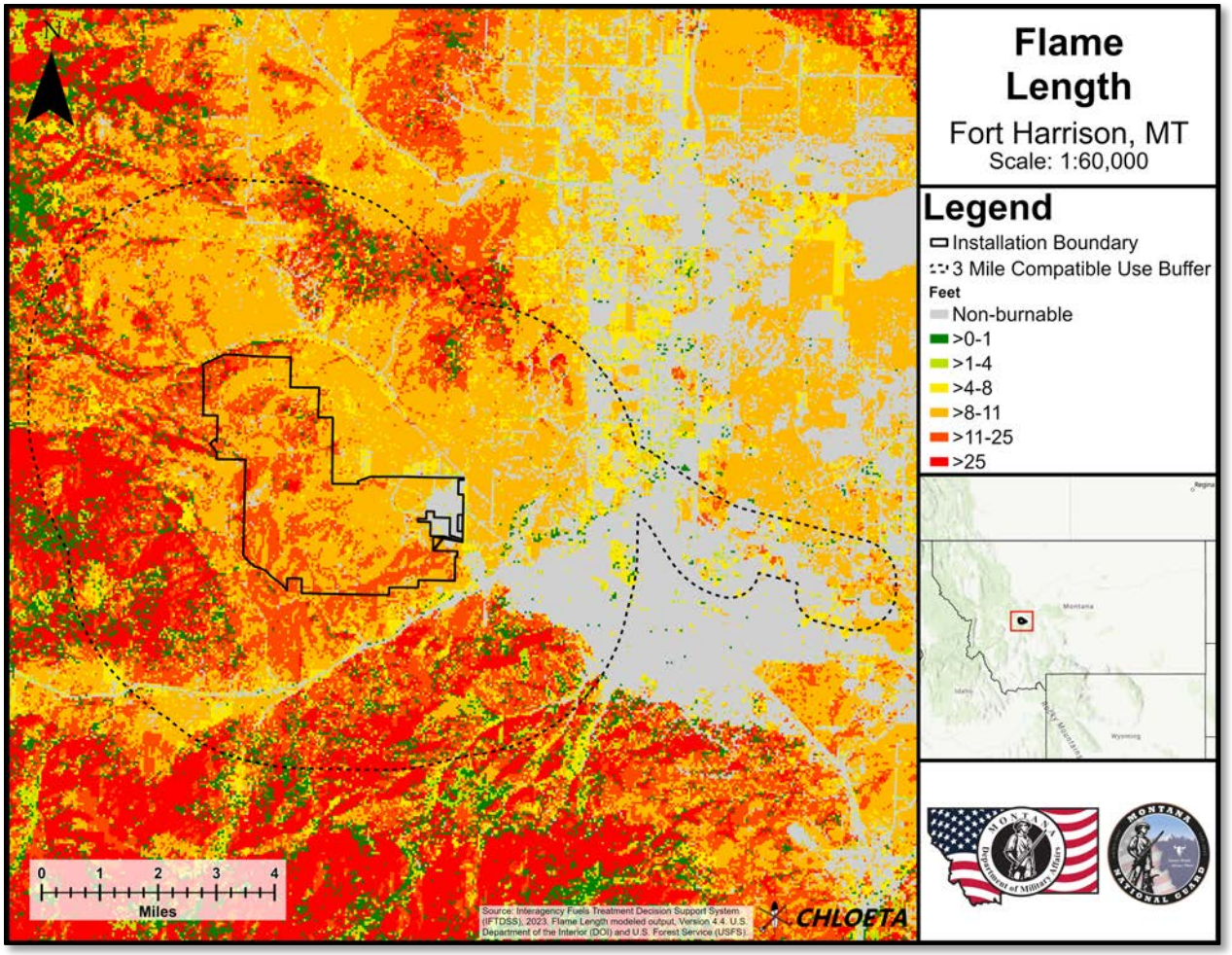


Figure 67. FHTA Flame Length Map

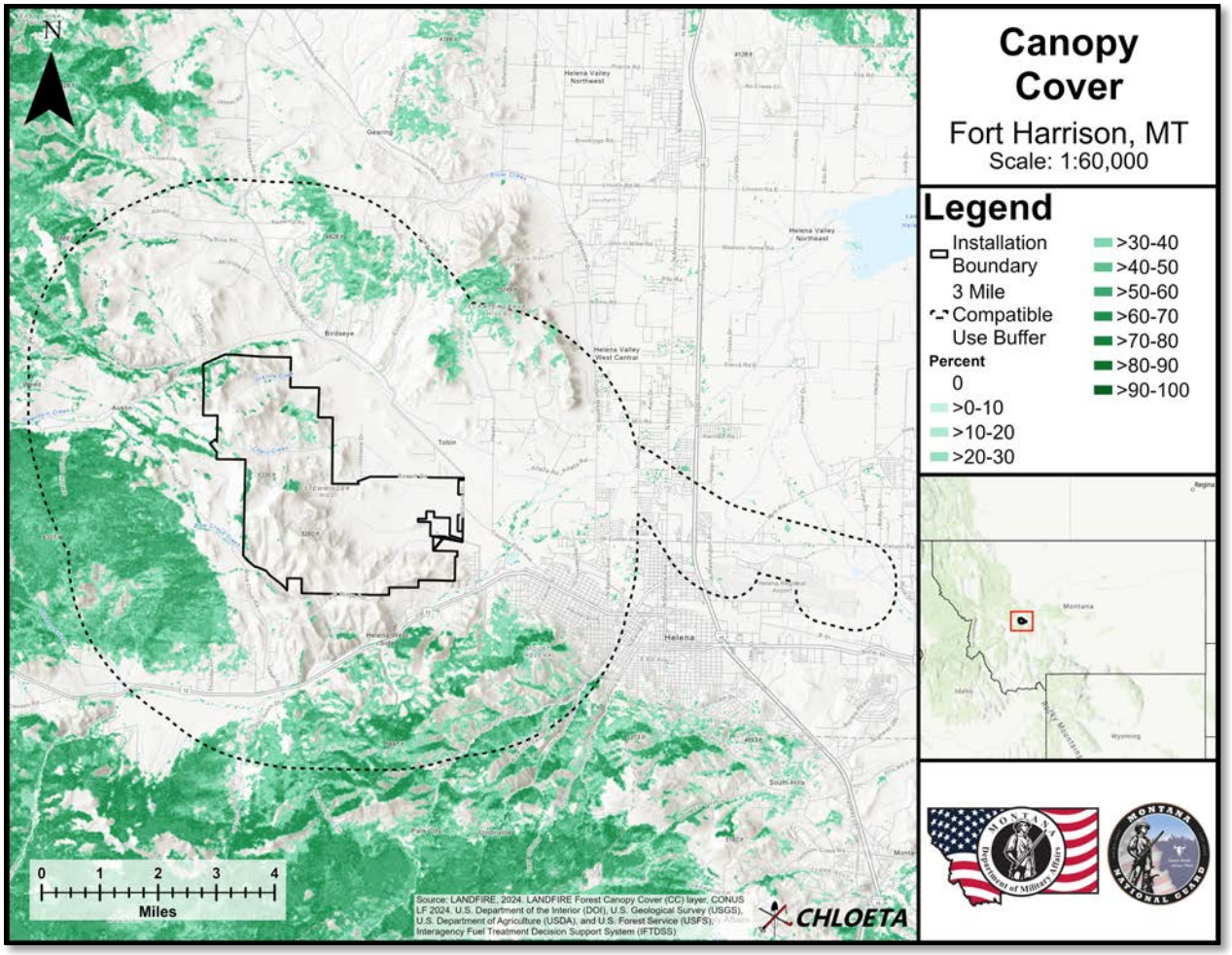


Figure 68. FHTA Canopy Cover Map

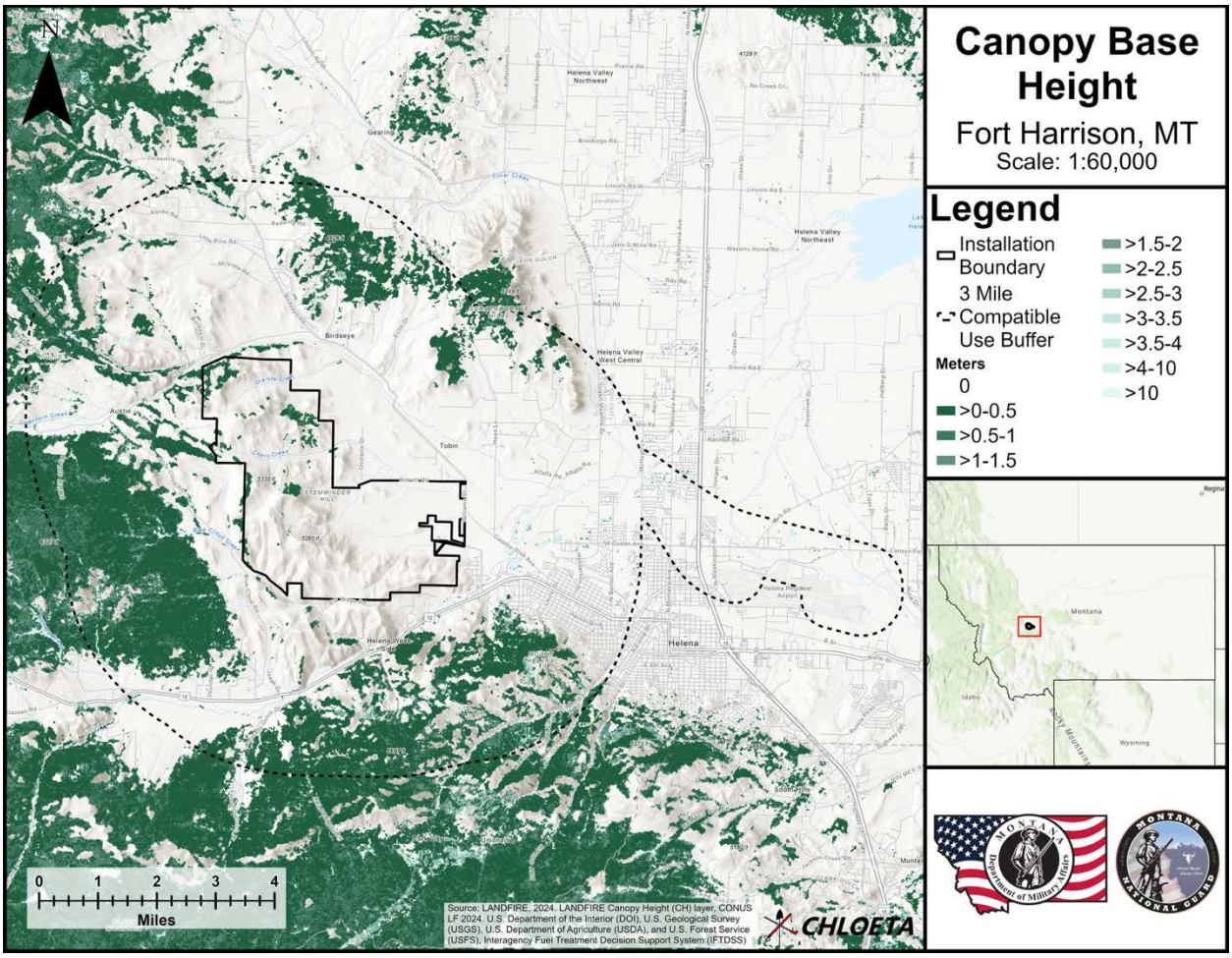


Figure 69. FHTA Canopy Base Height Map

- Slopes (Figure 63) and drainages (Figure 64) – South-facing slopes around FHTA accelerate drying and increase flame length. Canyon features can channel fire directly toward the cantonment area.
- Elevational (Figure 65) differences – Rapid shifts between valley floor and foothill ridges create erratic winds and variable fire behavior that complicates suppression efforts.
- Continuous grass–shrub fuels support rapid rates of spread (Figure 66) and sustained flame fronts (Figure 67) under wind-driven conditions, increasing the likelihood of fast-moving surface fires that can quickly threaten adjacent infrastructure and access routes.
- Surrounding forested areas exhibit sufficient canopy cover (Figure 68) and low-to-moderate canopy base heights (Figure 69) to support torching and short-range crown fire, particularly on slopes and in drainages, allowing fires to transition between surface and canopy fuels under drought and wind conditions.

Historical Wildfire Events: Past fires in the region provide strong evidence of exposure risk:

- Woods Creek Fire (2021, 55, 882 acres) – Occurred under severe drought conditions and produced prolonged smoke periodically degrading regional air quality, contributed to reduced visibility and air quality concerns in nearby valleys, amplifying public health and operational impacts highlighting how large, long-duration wildfires can affect not only fire-prone landscapes but also community health, transportation, and emergency response.
- Warm Springs Creek Fire (1988, ~46,900 acres) – Burned during the extreme 1988 fire season in the Elkhorn Mountains southeast of Helena, causing widespread high-severity impacts to forested watersheds and nearby communities. The fire resulted in loss of residences and infrastructure, placed heavy demand on regional suppression resources, and led to long-term changes in vegetation and hydrologic response. Its post-fire effects influenced erosion and runoff patterns for years and continue to inform wildfire risk and resilience planning in the region.
- Local ignitions – DNRC fire incident records indicate recurring wildfire ignitions within and adjacent to the FHTA, with repeat fire-start areas concentrated along the railroad right-of-way and U.S. Highway 12, all of which are recognized high-risk ignition corridors associated with transportation and human activity. Increased residential development near Iron Ridge further elevates exposure and response complexity.

Post Fire Flooding and Debris Flow

Burn scars in drainages including Blue Cloud Creek and Tenmile Creek increase runoff and erosion risk, threatening culverts, local roads, and Helena's municipal water supply (Figure 70).

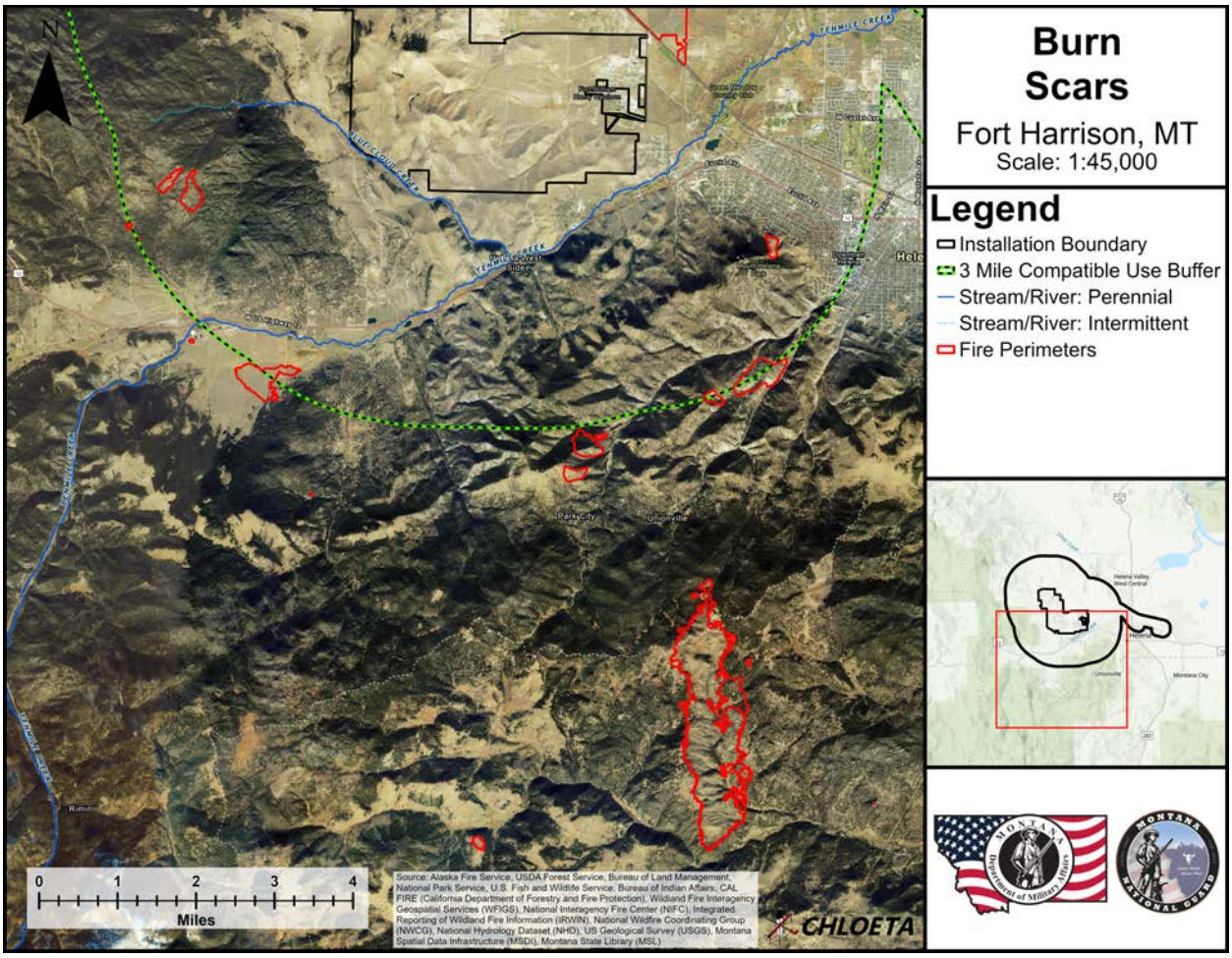


Figure 70. FHTA Burn Scar Map

Air Quality

Wildfire smoke poses a significant hazard to the FHTA assessment area, particularly because the area hosts sensitive populations including veterans receiving care at the VA Montana Health Care System. Smoke generated by nearby ignitions or regional wildfires contains fine particulate matter (PM2.5), carbon monoxide, nitrogen oxides, and hydrocarbons, all of which penetrate deep into the lungs and exacerbate cardiovascular and respiratory conditions. The Helena Valley's topography intensifies this exposure; valley inversions frequently trap smoke, causing pollutant concentrations to remain elevated for days. Between 2017 and 2021, the Helena monitoring station recorded multiple periods where AQI levels reached "Unhealthy" or worse, directly impacting outdoor training and patient safety. Co-location of military personnel, medical facilities, and residential neighborhoods amplifies risk, as simultaneous exposure can degrade mission readiness, restrict airfield operations, and overwhelm local healthcare systems. Real-time air monitoring by Lewis & Clark Public Health and the Montana DEQ provides critical situational awareness.

Figure 71 illustrates the relative wildfire smoke exposure risk in the FHTA assessment area. The color-coded grid indicates varying levels of long-term smoke exposure, with darker browns

showing higher cumulative exposure and greens indicating lower levels. FHTA itself is predominantly within an area of low-to-moderate exposure, suggesting that while smoke from wildfires can reach the site, it is not consistently exposed to high concentrations. However, the FHTA assessment area to the west and south show patches of higher exposure, highlighting potential pathways for smoke intrusion under certain wind and fire conditions.

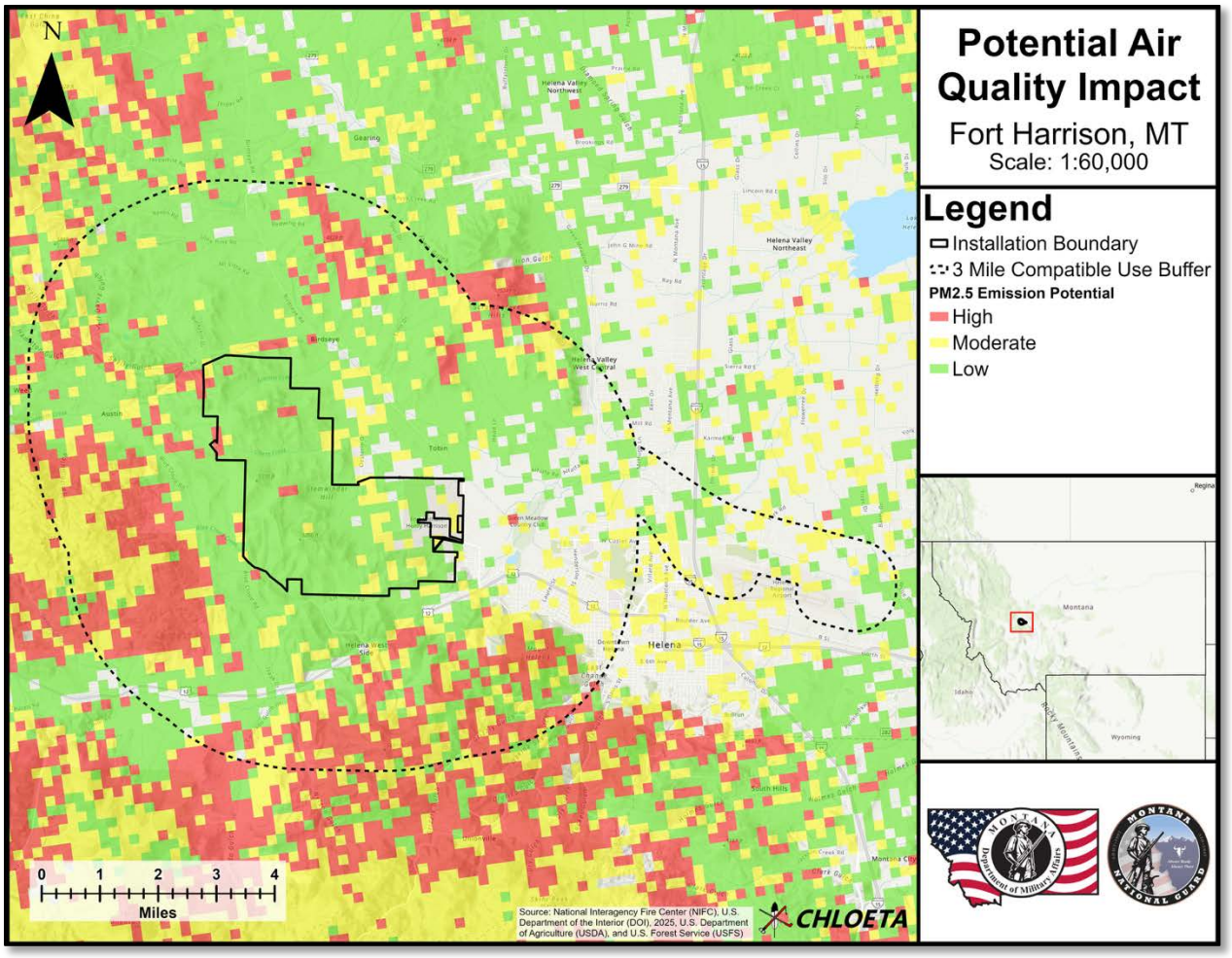


Figure 71. FHTA Potential to Impact Air Quality Map

Hazard Exposure Summary

Figure 72 illustrates wildfire exposure areas in the FHTA assessment area and represents the potential consequences of a wildfire if one were to occur in the area. It focuses specifically on impacts to important community infrastructure, including schools, hospitals, power lines, and other critical assets. It does not estimate the likely occurrence of wildfire in any given spot; rather, it identifies areas where, if a fire were to occur, the damage would be severe. The categories displayed include the following:

- **Direct Exposure** (dark red): Areas most vulnerable to ignition and flame contact.

- **Indirect Exposure (red):** Areas at risk from embers and radiant heat, even without direct flame.
- **Minimal Exposure** (light yellow orange): Areas with low fire transmission risk.

The FHTA assessment area is almost entirely surrounded by areas of direct and indirect wildfire exposure. The eastern and southeastern edges of the training area, nearest to residential and community infrastructure, show the highest density of exposure, suggesting heightened vulnerability for both the installation and nearby communities. Limited minimal exposure buffers mean that few natural or developed breaks exist to slow or halt wildfire spread.

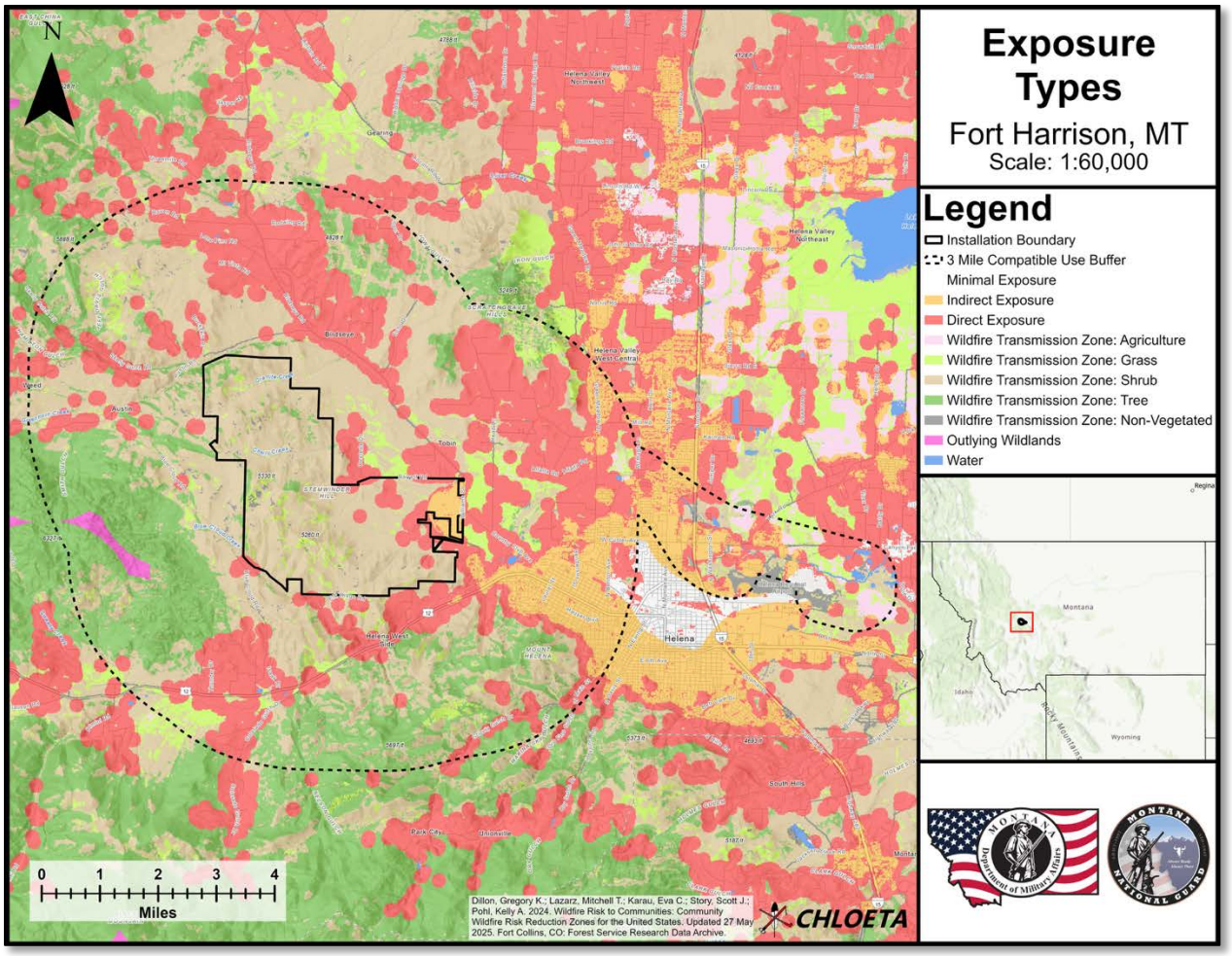


Figure 72. FHTA Exposure Types Map

Summary of Hazard Exposure: The FHTA assessment area's hazard exposure (Table 11) is high and escalating due to the overlap of ignition-prone training activities, fine grass and brush fuels, extreme seasonal fire weather, and rapid WUI expansion along its boundaries. Historic fire activity confirms the installation's vulnerability to direct fire impact, smoke disruption, and cascading infrastructure failures.

Table 11. Hazard Exposure – FHTA

Hazard Factor	Local Evidence / Data	Implications for FHTA
Ignition Sources	• 65% of fires in Lewis & Clark County (2000–2023) were caused by lightning (DNRC records). • Frequent ignitions from military training, roadside fires along U.S. Hwy 12, fireworks, and recreation. • Utility corridors with wooden poles identified in Northwestern Energy Wildfire Mitigation Plan.	• High likelihood of ignitions both on-installation and in surrounding WUI areas. • Required during red-flag days. No live-fire or spark producing activities on any range during Red Flag conditions. • Cascading outages possible from utility-related starts.
Fuel Conditions	• LANDFIRE 2022 data show dominance of fine grass fuels in Helena Valley. • Brush and shrub fuels concentrated along Blue Cloud Creek & Tenmile Creek. • Juniper encroachment increases volatile fuel loads.	• Rapid fire spread potential (>6–10 mph). • Crown fire risk in nearby conifer stands. • Increased suppression complexity along drainages and foothills.
Weather Drivers	• 19 Red Flag Days annually (2018–2023, Helena RAWS). • Seasonal winds >50 mph and frontal winds are common. • 7 of last 15 fire seasons under "Severe–Extreme Drought" (U.S. Drought Monitor).	• High ignition probability and rapid spread during summer fire season. • Training suspensions frequent under fire weather warnings. • Limited water supply stressed during drought years.
Topography	• South-facing slopes accelerate fuel drying. • Canyon features act as fire conduits. • Elevation shifts create erratic winds and suppression challenges.	• Fires can channel directly toward cantonment area. • Suppression difficulty elevated in steep terrain.
Historical Fire Activity	• Woods Creek Fire (2021, 55,000 ac) disrupted air quality and power. • Canyon Creek Fires (1988, 204,600 ac) caused regional road closures. • >35 wildfire starts within 10 miles of FHTA between 2010–2023.	• Confirms recurring wildfire exposure in installation buffer. • Demonstrates risk of road closures, smoke, and mission disruption.
Secondary Hazards	• Post-fire flooding & erosion in Tenmile & Blue Cloud Creek drainages. • 2017 & 2021 smoke events reduced visibility <6 miles and elevated PM2.5 to hazardous levels.	• Post-fire flooding threatens access roads and Helena's water system. • Smoke disrupts training, endangers VA patient population. • Increased risk of cascading mission impacts beyond fire perimeter.

FHTA Assessment Area Summary of Findings

Roads: The transportation network serving the FHTA assessment area is limited and highly vulnerable to wildfire and secondary hazards (Figure 73):

- Primary Routes: U.S. Highway 12 is the main arterial linking Helena to FHTA and surrounding communities. It carries both civilian and military traffic and has no immediate redundancy if blocked by fire or flooding. Country Club Road and Williams Road provide primary local access to the installation, but both are narrow, fuel-lined (vegetation), and prone to erosion.
- Ingress/Egress Limitations: Evacuation and response are constrained by single-lane sections, limited shoulders, and lack of turnouts. During a wildfire, simultaneous use by evacuees, military personnel, and emergency responders could lead to bottlenecks.
- Secondary Roads: Local connectors (e.g., Birdseye Road, Blue Cloud Creek Road) are unpaved, prone to washouts, and often impassable under extreme fire or post-fire flood conditions.
- Redundancy: The regional road network lacks viable alternate routes. If Highway 12 or Country Club Road is closed, emergency response times increase significantly, delaying suppression and medical transport.

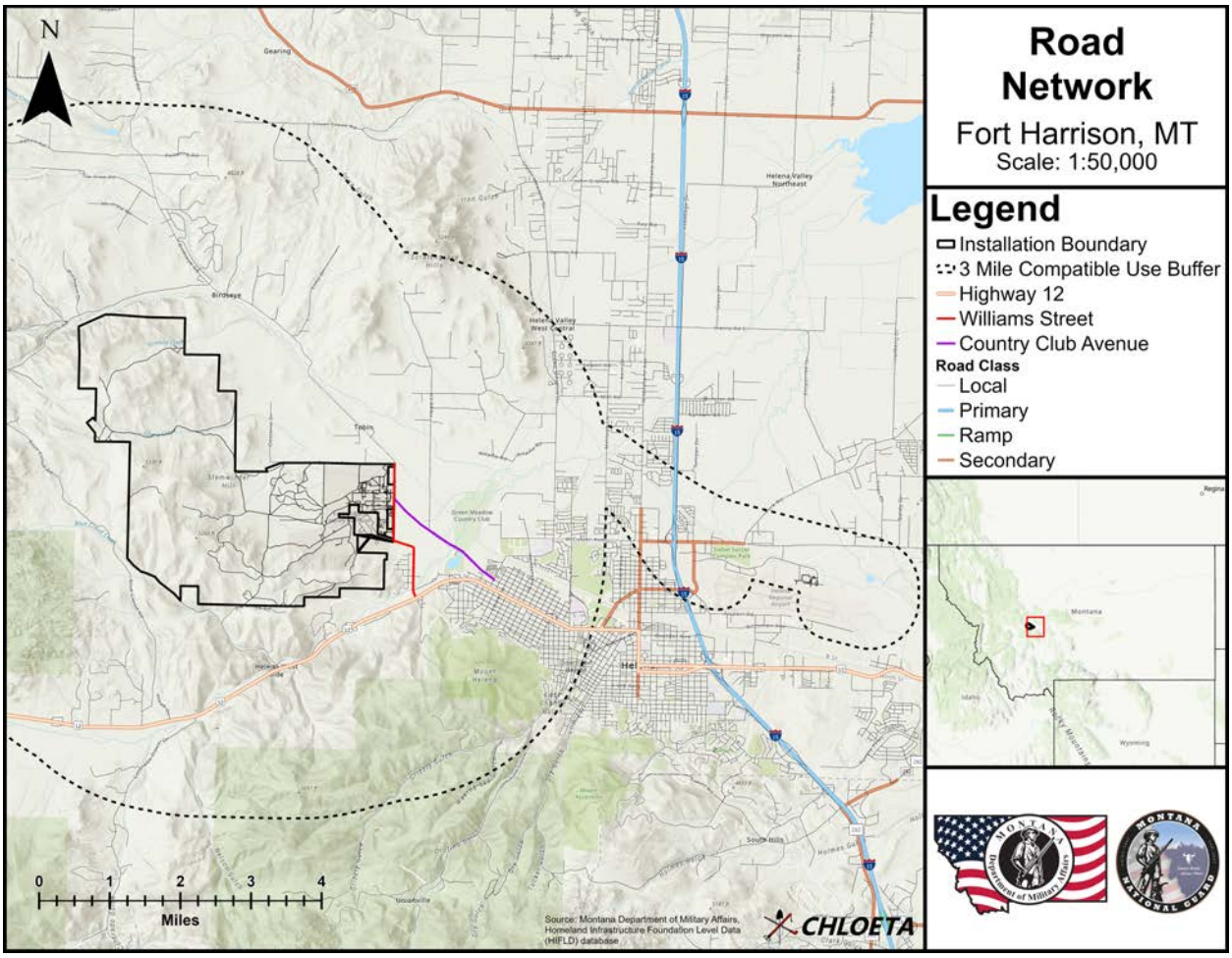


Figure 73. Road Network FHTA Map

Utilities: The FHTA assessment area's essential services are provided by external civilian systems, creating vulnerabilities if infrastructure is damaged by wildfire:

Water Supply: Potable water for the FHTA assessment area is provided through the City of Helena's municipal system, sourced from the Tenmile Creek watershed (Figure 74). Wildfire activity within this watershed could compromise water quality through increased ash, debris, and sedimentation, placing strain on treatment and distribution capacity. According to the 2024 IWFMP, FHTA does not maintain independent water storage or a dedicated hydrant network beyond the cantonment area. This means that southern portions of the installation and adjacent undeveloped training lands lack direct hydrant access, requiring reliance on tanker shuttles or mutual-aid support for suppression operations. This limitation underscores a critical dependency on municipal infrastructure and interagency coordination for sustained firefighting capability during large or multi-day wildfire events.

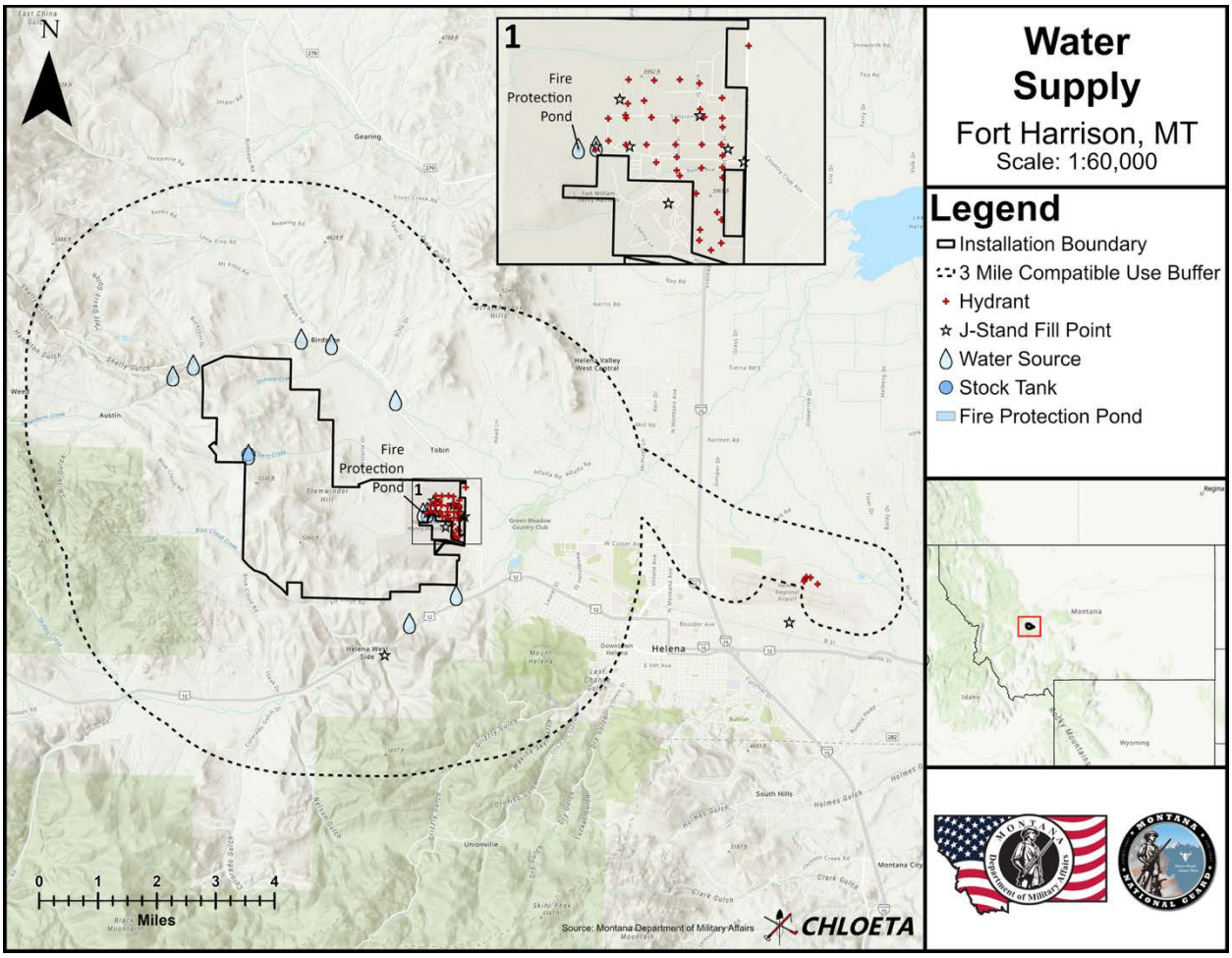


Figure 74. Water Supply Mapping FHTA Map

- Electric Power: Electrical service is provided by Northwestern Energy and Vigilante Electric Cooperative (Figure 75). Overhead distribution lines, especially wooden poles along Tenmile Creek and Birdseye Road, are exposed to ignition and outage during wildfire events. A Public Safety Power Shutoff (PSPS) event would disrupt operations, barracks, and medical support facilities.

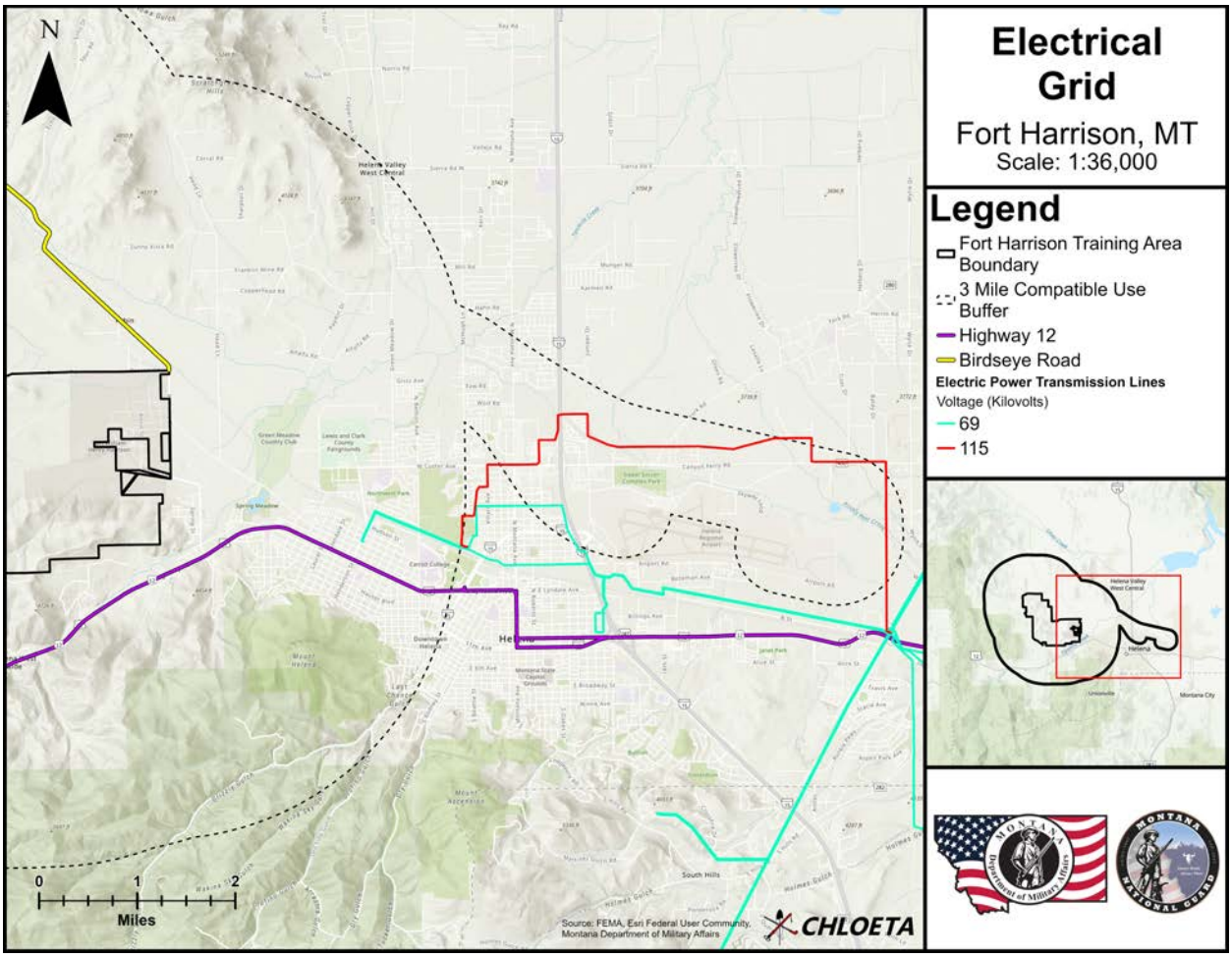


Figure 75. Electrical Grid FHTA Map

- Waste Management: Wastewater and solid waste rely on Helena's municipal systems. Disruptions caused by fire or post-fire flooding could impair disposal operations and affect sanitation.
- Communications: Broadband and cellular service are dependent on regional providers using aerial lines and hilltop towers. Wildfire-induced outages in nearby corridors could affect command, control, and coordination capacity across the FHTA assessment area.

Facilities: FHTA hosts a range of mission-critical facilities co-located with vulnerable civilian assets:

- Military Facilities: Joint Forces Headquarters, armories, barracks, vehicle maintenance shops, and the Army Airfield (AAF) are central to MTARNG readiness. Wildfire exposure around training ranges and storage facilities increases risk of ignition from both external and internal sources.

- Medical Facilities: The VA Medical Center and Montana State Veterans Cemetery are located within the installation. Both serve vulnerable populations; wildfire smoke and disrupted access routes present direct risks to patient safety and medical logistics.
- Training Areas: Open grasslands used for maneuvers and live-fire ranges create ignition risks but also serve as potential fire corridors toward the cantonment. Fuel breaks are limited, especially on the southern and southeastern edges.
- Airfield: The FHTA AAF supports aviation training and emergency response. Smoke events reduce visibility, grounding aircraft during critical wildfire suppression or evacuation operations.

Shared Infrastructure: Fort Harrison is embedded in a broader civilian network, making mission continuity dependent on shared systems:

- Transportation: The installation shares US Highway 12 and surrounding secondary roads with Helena residents, emergency services, and freight carriers. Wildfire closures not only isolate the FHTA assessment area but also cut civilian access to Helena's west valley.
- Utilities: Electrical distribution and water supply infrastructure serve both the installation and Helena Valley communities. Disruption impacts both civilian households and military operations simultaneously, creating competition for restoration priorities.
- Emergency Services: Fire protection and suppression are supported by Helena Fire Department, VA Fire Department, DNRC, and rural volunteer districts. During large fire events, these resources are overtaxed, and mutual aid becomes stretched thin.
- Interdependencies: Because FHTA relies heavily on civilian-managed systems without on-base redundancy, cascading failures from wildfire (e.g., downed power lines, compromised water sources, blocked evacuation routes) directly translate into operational standstills.

FHTA operational continuity is critically dependent on off-installation systems and shared civilian infrastructure. Limited redundancy in roadways, water supply, power distribution, and emergency response magnifies wildfire exposure. Without targeted mitigation, including hardened access routes, perimeter fuel breaks, on-site water storage, and strengthened interagency response agreements, wildfire has the potential to cause both immediate mission disruption and long-term operational degradation at Fort Harrison.

Emergency Response Capacity

Wildfire response capacity at FHTA is limited by geography, resource availability, and heavy reliance on surrounding civilian and state firefighting agencies. On-installation suppression resources are minimal, with the VAFD providing primary response capability. While capable of initial attack on small ignitions, the VAFD does not maintain the personnel, engines, or aerial assets required to manage large-scale wildfire incidents. The installation therefore depends heavily on the Helena Fire Department and West Valley Fire District including Baxendale for reinforcement during wildfire emergencies.

Coverage gaps remain significant. The rugged terrain in the FHTA assessment area restricts access for engines and creates limited staging areas, while much of the southern training lands lack hydrants or refill sites for tenders. During peak fire season, regional resources are already strained by multiple concurrent incidents across Lewis & Clark County and the broader Helena National Forest protection area. Historical examples, including the Canyon Creek Fire (1988) and Woods Creek Fire (2021), demonstrated how quickly suppression capacity in the region can be exceeded, with extended response times and diverted resources. Mutual aid agreements do exist but provide no guarantee of availability during high-demand periods.

Aviation resources, including helicopters and single-engine air tankers (SEATs), are critical for rapid suppression in grass- and brush-dominated fuels. However, these assets are managed at the state or interagency level and are often committed to higher-priority fires across Montana. Smoke and visibility issues at the Fort Harrison Army Airfield further limit aerial suppression effectiveness.

The complexity of protecting both military facilities and adjacent WUI subdivisions also challenges response capacity. Simultaneous demands for structure protection, evacuation support, and perimeter containment could overwhelm available personnel and equipment. Current wildfire evacuation and staging plans for FHTA remain underdeveloped, increasing the risk of uncoordinated civilian–military response in the event of a fast-moving incident.

While the FHTA assessment area benefits from proximity to Helena's fire services and DNRC assets, its emergency response capacity remains constrained by limited on-site resources, heavy reliance on regional mutual aid, and strained suppression capabilities during high-activity fire years. Without expanded water storage, hardened staging areas, pre-positioned equipment, and formalized interagency evacuation planning, wildfire events exceeding initial attack will continue to pose significant risks to mission continuity and community safety.

Land Use Compatibility

The FHTA assessment area sits at the interface of military land, Helena's west-valley neighborhoods, and open rangeland. An arrangement that concentrates wildfire exposure and land-use conflicts inside the assessment area. The cantonment (Joint Forces HQ, VA Medical Center, barracks, AAF) is bordered by fast-growing WUI neighborhoods (e.g., West Helena/Birdseye/Scratchgravel/Blue Cloud Creek Rd), open space, and grazing parcels where fine fuels and juniper/brush encroachment create rapid spread potential toward the installation perimeter. RAPT mapping within the FHTA buffer shows co-located critical community lifelines, hospitals, nursing homes, fire/EMS stations, mobile home parks, and transmission infrastructure, underscoring that any land-use decision in the buffer simultaneously affects civilian life safety and mission assurance.

Development patterns and encroachment: The FHTA assessment area is undergoing modest but significant development, driven by Helena's westward expansion and the military importance of the installation. Residential development in the surrounding West Helena, Birdseye, Austin, and Tobin areas has expanded steadily since 2015, with subdivision approvals in Lewis & Clark County's west valley increasing more than 20% (county planning data). A growing portion of this expansion occurs as rural, large-lot parcels (5–10 acres or more) are marketed to families or multi-

generational use. These dispersed homes are often built outside formal subdivisions, meaning they bypass county subdivision review and are not subject to wildfire-specific planning requirements. As a result, many lack dual ingress/egress, adequate roadway widths, turnarounds, or access to hydrants, creating significant constraints for emergency response and evacuation.

In contrast, more structured development along U.S. Highway 12 and West Custer Avenue benefits from municipal water, sewer, and paved road access. These areas align with Lewis & Clark County growth policies and provide comparatively better resilience through coordinated planning and infrastructure investment. However, the patchwork of regulated subdivisions and unregulated rural expansion has produced a fragmented WUI where some neighborhoods meet FireWise standards while others remain highly vulnerable.

For FHTA, this development pressure narrows available space for perimeter fuel breaks, increases ignition likelihood from residential activity, and creates greater demand for evacuation coordination. As the community footprint expands toward the installation's southern and southeastern boundaries particularly along Country Club Road and Williams Road, the risk to both military operations and civilian populations escalate without enforceable wildfire-adapted growth standards.

Regulatory framework and gaps: Current County frameworks do not consistently require WUI-specific standards in the FHTA assessment area. Lewis & Clark County Zoning Regulations (2022) and related growth policies highlight development trends and open-space conservation but lack enforceable wildfire overlays, ignition-resistant construction, or defensible-space requirements within one mile of the installation boundary. The 2014 Joint Land Use Study (JLUS) identified compatibility concerns near FHTA; however, it has not been updated to reflect the post-2014 expansion of WUI development and contemporary wildfire conditions. As a result, subdivision reviews rarely mandate fire-adapted street geometry, hydrant spacing, or vegetation management tied to operational corridors needed by Range Operations and mutual-aid partners.

Compatibility with military operations. Range and training activities (maneuver, small-arms, vehicle operations) introduce ignition potential; conversely, adjacent WUI development can constrain training windows, prescribed burn programs, and night or red-flag operations due to safety buffers, smoke impacts, and community tolerances. Where fence lines abut backyards or hobby agriculture uses, recurring complaints and gate/fence access issues delay suppression and patrols. Lack of continuous, engineered fuel-break corridors on the south/southeast perimeter (Country Club/Williams focus area) forces responders to defend scattered structures rather than anchor lines, an inversion that elevates risk to both neighborhoods and cantonment facilities.

Infrastructure interdependencies. Because FHTA assessment area shares roads, water, and power with the Helena Valley, incompatible land use in the buffer (e.g., higher-density cul-de-sac subdivisions without secondary egress, landscaping that violates defensible-space principles, utility extensions through heavy fuels) magnifies ignition likelihood and complicates evacuation, while also threatening the very lifelines the area depends on. RAPT results confirm dense co-location of vulnerable populations and lifelines within the buffer, increasing the probability that structure protection will divert suppression resources from perimeter control.

Evidence base and planning alignment. The Tri-County CWPP prioritizes WUI fuel treatment areas and public education but does not designate installation-specific treatment blocks or education. HMPs recognize wildfire as a top hazard but omit FHTA-specific mitigation and compatibility measures; the Real Property Master Plan (2023) maps training and facilities but does not integrate wildfire vulnerability mapping or enforceable buffer standards. Together, these gaps perpetuate parcel-by-parcel decisions that incrementally erode maneuver space, access reliability, and suppression effectiveness at the installation boundary.

As shown in Figure 76, FHTA assessment area hosts a concentrated cluster of infrastructure, medical, and community assets, primarily situated in the eastern portion of the installation near the main entry. This cluster includes essential infrastructure including the FHTA VA Medical Center, emergency services facilities, a post office, and other public service buildings. These structures not only support military and veteran personnel but also serve broader community needs. Given the density and significance of these facilities, any wildfire or infrastructure disruption in this zone could have cascading impacts on health services, communications, and emergency response operations.

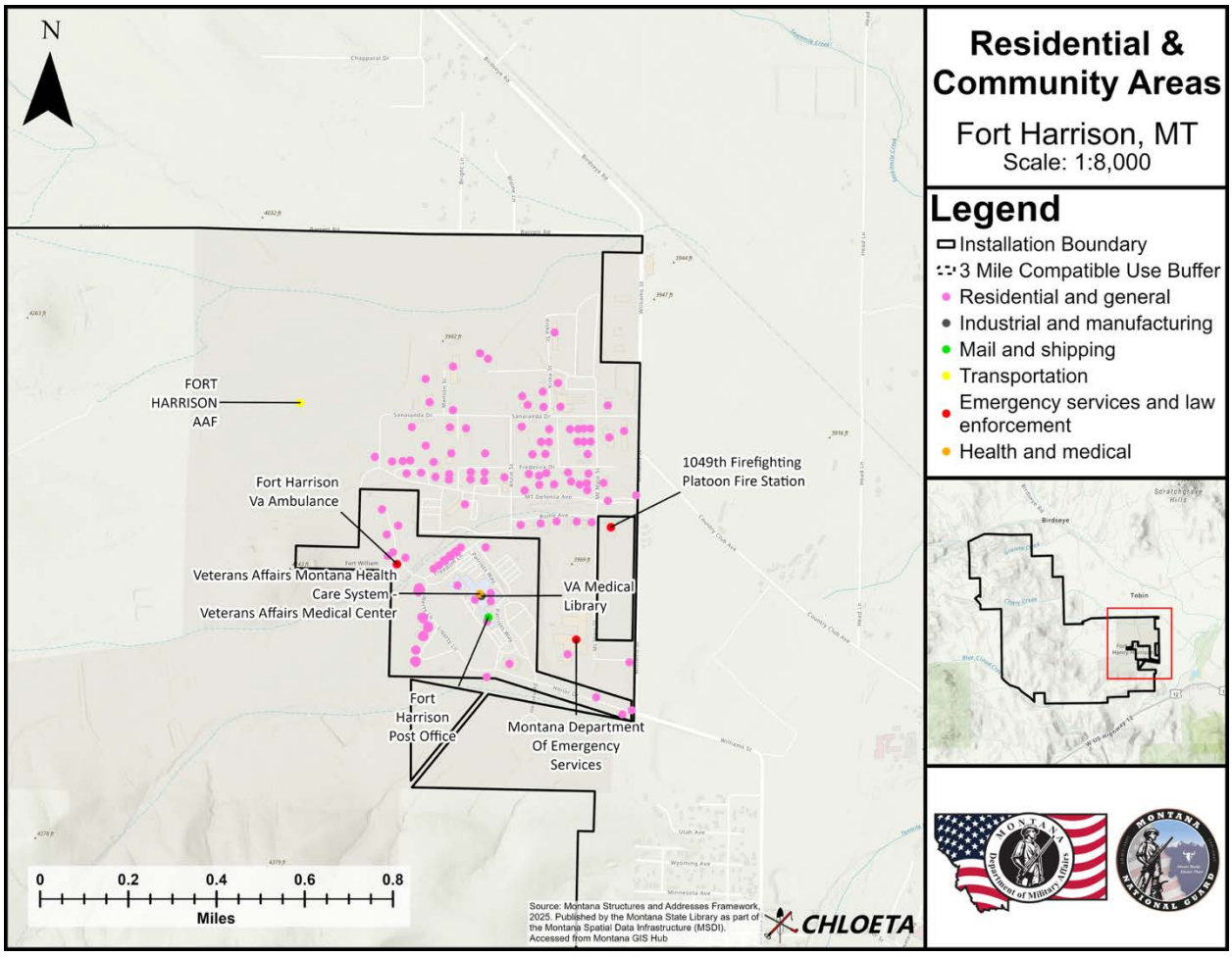


Figure 76. Residential and Community Areas within FHTA Map

Table 12. Structures within the FHTA Assessment Area

Structures within Perimeter	Count
1049th Firefighting Platoon Fire Station	1
FHTA AAF	1
FHTA Post Office	1
FHTA VA Ambulance	1
MT DES	1
VA Medical Library	1
VA Montana Health Care System - VA Medical Center	1
Structures	136
Grand Total	143

FHTA contains a concentrated cluster of critical residential and community structures that support both military operations and the surrounding civilian population. Within the training area boundary, there are 143 identified structures, including key facilities including the 1049th Firefighting Platoon Fire Station, FHTA AAF, the VA Medical Center, a post office, ambulance services, the MT DES, and the VA Medical Library. Beyond the perimeter, within a two-mile area, there are an additional 1,568 structures, including schools, churches, fire stations, and residential properties. These assets represent a mix of essential services and residential development, underscoring the need for integrated planning to ensure continuity of operations, public safety, and wildfire resilience in the WUI surrounding FHTA (Figure 77).

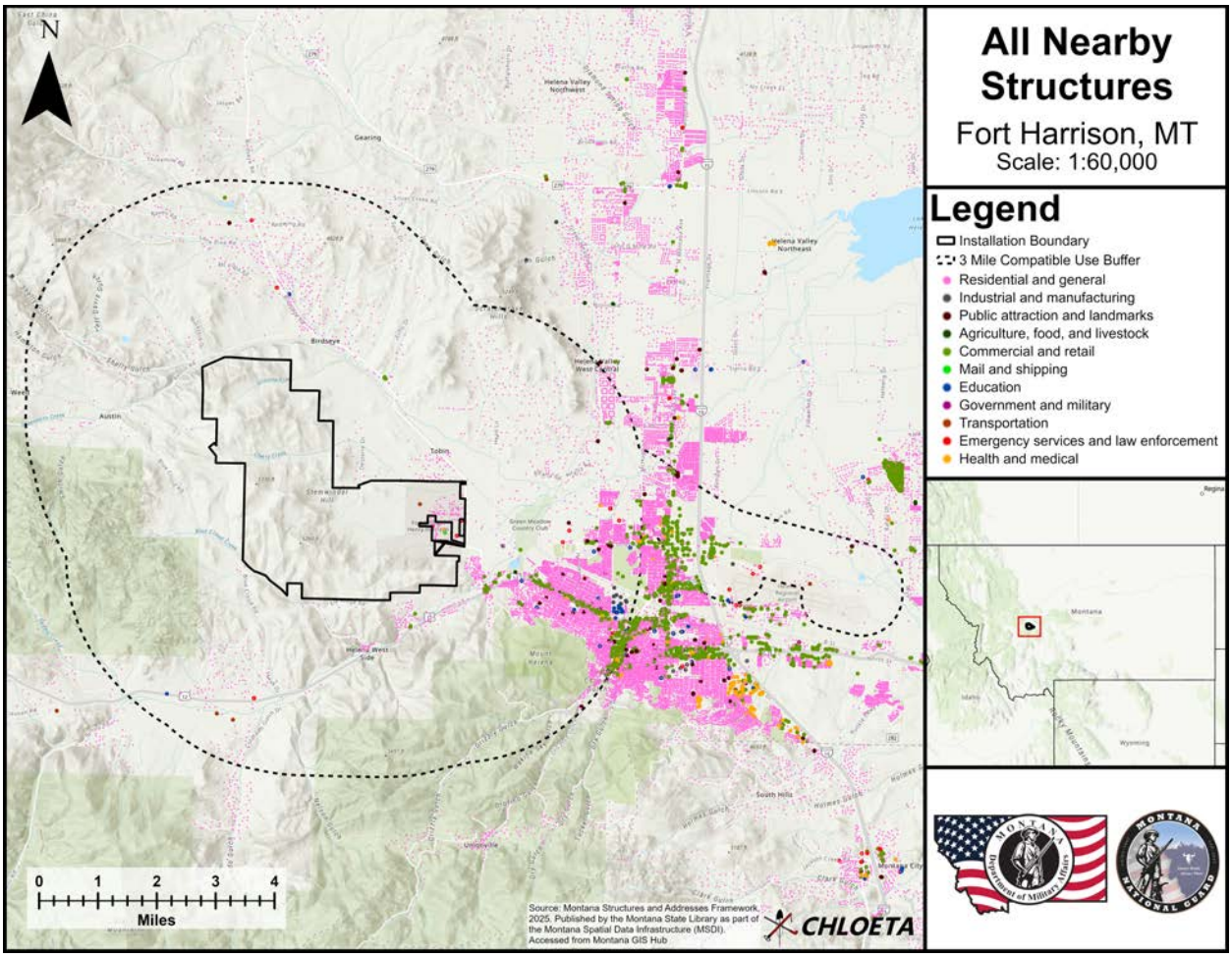


Figure 77. Map of Structures within the FHTA Area Map

Institutional Planning and Governance

Wildfire governance around FHTA is distributed across military, municipal, county, state, and federal entities. While the region has multiple plans (HMPs, CWPP, INRMPs, Real Property Master Plan), they are not fully integrated for installation-specific mitigation, access, or joint suppression operations, producing duplication in some areas and gaps in others. Stakeholder interviews and plan reviews show strong willingness to coordinate, but no single framework currently aligns land-use decisions, fuel management, evacuation, and mission assurance at the installation boundary.

Institutional landscape and roles. DMA/MTARNG oversees installation lands and training; Lewis & Clark County (planning, emergency management) regulates development and coordinates county response. The city of Helena provides critical lifelines (water, waste, power interconnections) and municipal fire response. DNRC directs wildfire protection statewide and provides technical resources; Tri-County Firesafe Working Group coordinates community mitigation. PPLT and other conservation partners support buffer easements. Utility providers (NorthWestern Energy, Vigilante Electric and Phillips 66) manage ignition-prone corridors; USFS

and BLM manage adjacent federal lands and interagency suppression. This network is documented in the assessment's stakeholders (Table 1) and planning frameworks (Table 3) tables.

Existing plans and limitations.

- HMPs (Lewis & Clark Annex): recognize wildfire as a top hazard but lack FHTA-specific mitigation, staging locations, or buffer standards tied to mission assurance needs.
- Tri-County CWPP: identifies WUI fuel-treatment priorities and education campaigns but does not designate installation fuel blocks or control points that reflect Range Operations access and safety areas.
- INRMPs & Real Property Master Plans (2023): map training areas and habitat stewardship but do not embed vulnerability mapping, burn-window protocols, or joint suppression playbooks with county/state partners.
- JLUS (2014): documented compatibility risks near FHTA but is outdated relative to post-2014 WUI growth and current fire weather/extremes; recommendations were not translated into enforceable local overlays.

Coordination gaps affect operational readiness.

- **No formal Joint Military-Civilian Wildfire Coordination Protocol (JMCWCP):** mutual aid exists, but trigger conditions, staging sites, control lines, priority protection areas, and communications procedures are not codified for FHTA incidents.
- **Prescribed fire authority & timing:** INRMPs support burning in principle, yet shared burn-window criteria and smoke notification protocols with DNRC/local districts are not defined, limiting proactive fuel work along the southern/southeastern perimeter.
- **Evacuation integration:** county evacuation planning near FHTA is informal and not published, leaving inconsistent roles for traffic control, resource staging, and medical movement when U.S. Highway 12, Country Club, or Williams are compromised.
- **Policy levers not implemented:** zoning overlays, secondary egress requirements, hydrant spacing/flow standards, and defensible-space maintenance are not uniformly required within one mile of the fence, constraining perimeter operations and prescribed fire options.

Limestone Hills Training Area

LHTA is a designated military training site located approximately 30 miles southeast of Helena, MT, within Broadwater County. Positioned along the eastern slopes of the Elkhorn Mountains, the area spans roughly 21,295 acres and serves as an important training ground for the MTARNG and other federal, state, and local training missions. Bounded to the east by the Missouri River and to the west by a series of rugged limestone ridges, LHTA includes terrain that ranges from gently sloping benches to steep, rocky outcrops. Elevations vary from about 3,840 to 6,000 feet, offering a diverse and challenging environment for field exercises and tactical operations.

The federal government formally designated the area for military use through LHTA Withdrawal Act of 2014 (S.1169), which withdrew these lands from public use and reserved them for defense-related activities. This legislation allows the MTARNG to use the area for live-fire exercises, maneuver training, and facility development while also permitting use by state and local law enforcement agencies. This remote training site features rugged terrain and extensive vegetative fuels. LHTA is surrounded by natural landscapes susceptible to ignition and fire spread, requiring specialized wildfire mitigation strategies.

The LHTA assessment area is a high fire-risk and occurrence area. The conditions and activities in this area lend themselves to numerous ignitions categories, with the primary sources being lightning, public recreation, and military training. The City of Townsend sits approximately one mile east of the installation and is a community at risk with a large WUI area. The area north of Townsend is seeing rapid growth, further complicating any fire response. The areas of highest concern outside the installation are the communities of Radersburg, Townsend, the Silos subdivision, Canyon Ferry subdivision, Bedford, and a subdivision along River Road. Ignitions from any of these borders could affect LHTA assessment area. The area of most concern is anything west of the Missouri River, south to Radersburg, and over to the Crow Creek drainage. The prevailing winds, fuels, and topography would push any fire start in this area towards and onto the installation. Winds are commonly seen at more than 50 mph during the dry season. Fires can reach speeds more than 10 mph where all factors are aligned. Elevation changes of up to 2,000 feet exist on the installation, which would increase fire growth significantly.

Within the LHTA assessment area, key community assets, including public schools, mobile home parks, hospitals, fire stations, and transmission infrastructure concentrated near Townsend and surrounding rural areas. The proximity of these assets to the federally managed lands, combined with the potential for military training-related ignition sources and prevailing regional fire weather patterns, underscores the necessity for integrated risk management strategies. Given the limited emergency response capacity in this remote area, the LHTA assessment areas represent a critical focus area for wildfire mitigation and emergency preparedness efforts.

LHTA Assessment Area Hazard Summary

The LHTA assessment area exhibits a high-to-extreme wildfire exposure profile driven by ignition-prone training activities, extensive fine and shrub fuels, steep limestone topography, and frequent Red Flag weather. This exposure directly affects MTARNG training continuity, access/egress reliability, and nearby communities around Canyon Ferry Lake and Townsend.

Ignition Sources

- Military training operations – Maneuver, live-fire, tracers/pyrotechnics, and heavy vehicles operating in cured grasses and sagebrush elevate start probability during late spring–summer.
- Lightning strikes – Ridge tops and exposed bluffs concentrate strikes; Broadwater County fire records (2000–2023) attribute ~60–65% of wildfires to lightning.

- Human-caused ignitions – Recreation pressure around Canyon Ferry Lake (campfires, fireworks, OHV use), ranch/farm operations, and roadside starts along Indian Creek Rd.
- Repeat ignition corridors – DNRC and Broadwater County records highlight River Road corridor, and Canyon Ferry recreation areas as repeat start areas (2010–2023, >15 separate ignitions documented). These corridors consistently generate roadside or recreation-related ignitions during peak fire season, compounding exposure in the area elevating the risk outside of the LHTA northeast assessment area.
- Utility/transportation corridors – Overhead rural distribution lines and gravel road networks crossing fine fuels present spark/vehicle-start risk under wind and low RH.

Fuel Conditions

The LHTA assessment area lies within a landscape dominated by shrubland, sparse tree cover, and grass fuels, creating a fire environment highly susceptible to fast-moving surface fires and sustained burning in complex topography. The installation core is largely covered by evergreen shrubland and mixed evergreen-deciduous shrubland, indicated by brown and olive tones on

Figure 78. These fuel beds are highly flammable during the late summer and early fall, especially during prolonged dry spells and wind events. The immediate buffer surrounding LHTA contains significant stretches of annual and perennial grassland, particularly to the southeast and southwest, fuels that are fine, fast-drying, and prone to rapid ignition and spread. To the northeast, the installation is bordered by non-vegetated and sparsely vegetated areas, including developed infrastructure and exposed rock, offering limited natural firebreaks. However, these non-fuel patches are insufficient in scale or location to provide operational advantages during high wind events. The LHTA fuel-type map indicates the assessment area falls primarily into the GS and Shrub (SH) fuel categories, with some intermixing of TL in the northwestern elevation bands. These fuel types align with high rate-of-spread potential and flame lengths exceeding safe direct-attack thresholds during near-worst-case fire conditions (Figure 79).

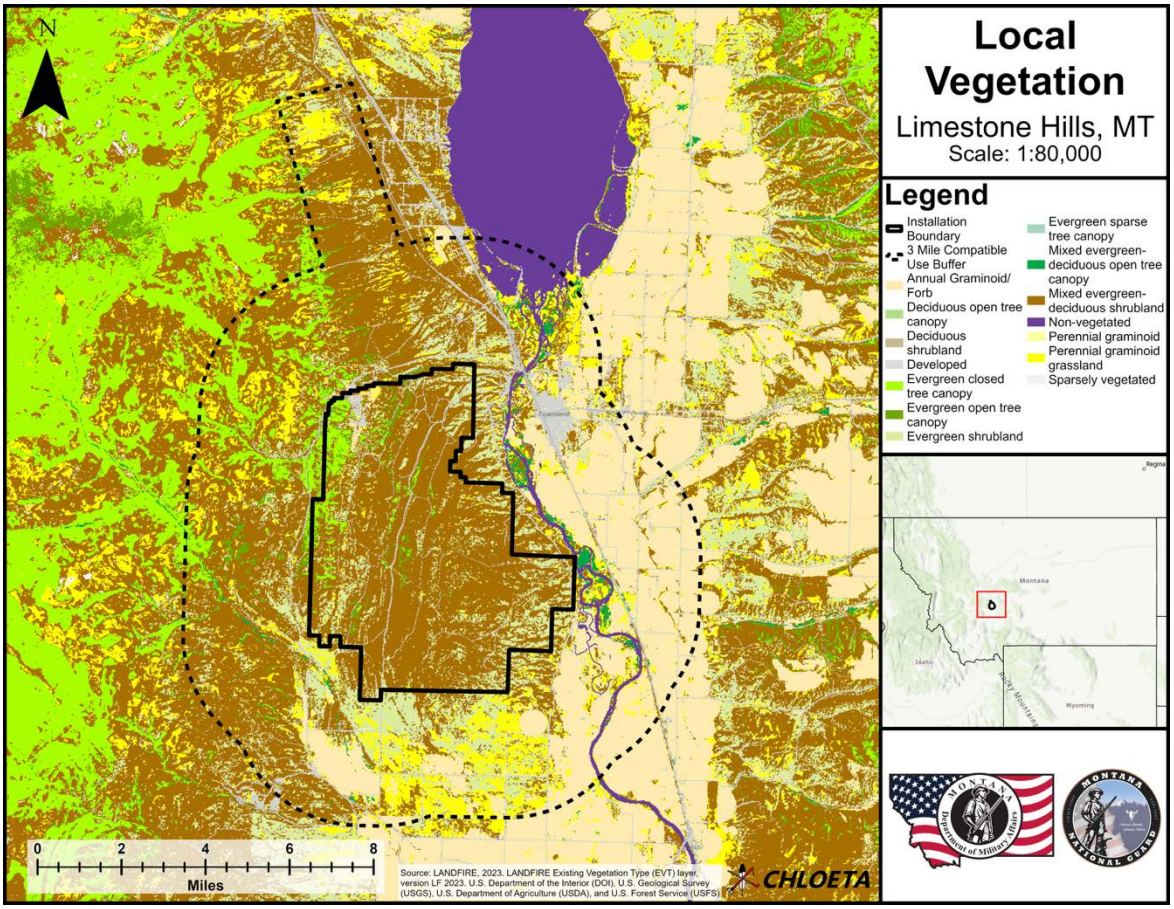


Figure 78. LHTA Vegetation Map

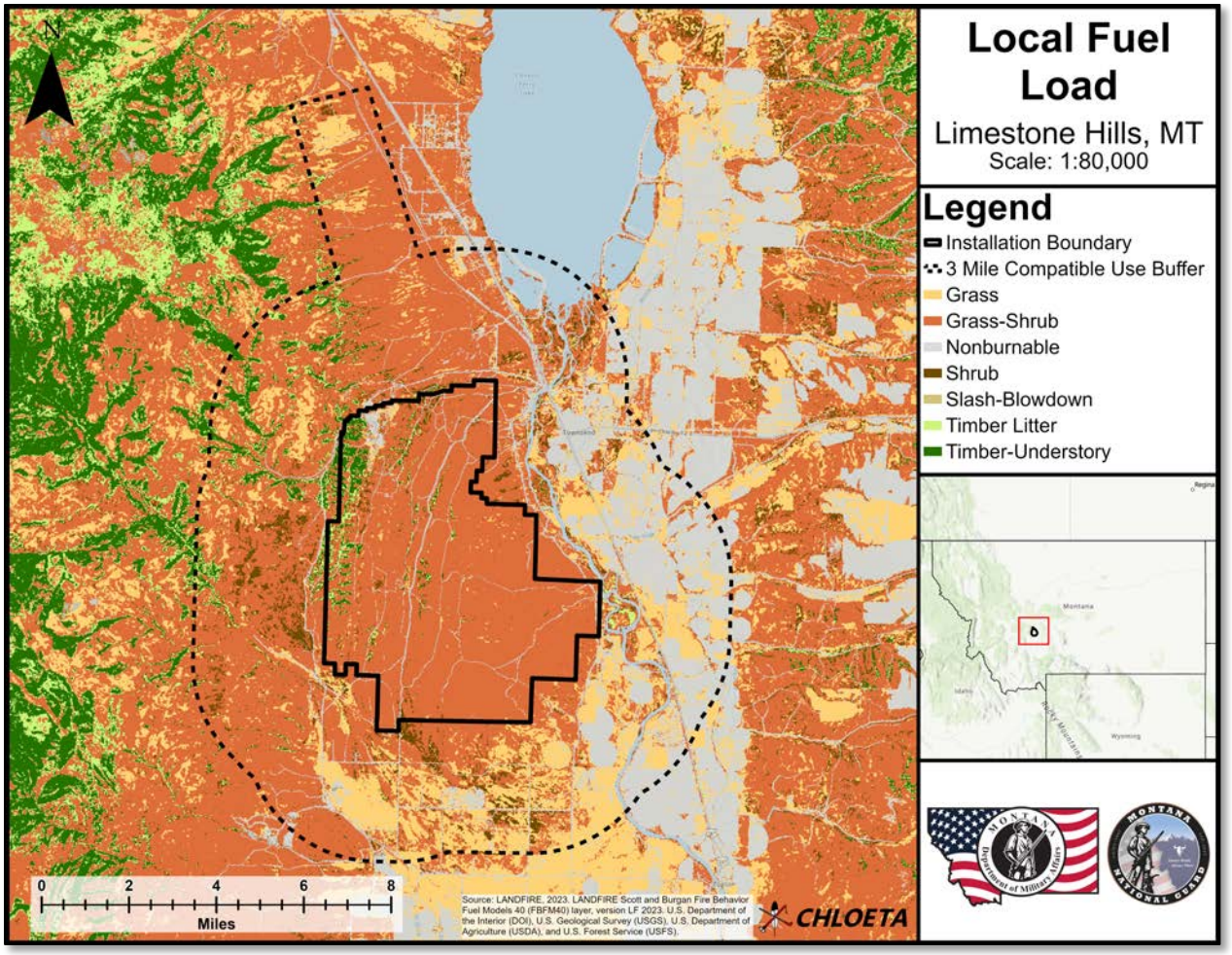


Figure 79. LHTA Fuel Load Map

Particularly notable is the continuous belt of GS and SH fuels running through the central and eastern portion of the buffer, creating potential fire corridors that could carry flame fronts rapidly into or out of the installation, depending on wind direction.

- The LHTA assessment area is situated within a fast-burning fire environment dominated by volatile fine fuels and shrublands.
- Given the lack of significant vegetative breaks and the limited presence of non-burnable areas, the LHTA assessment area is at elevated risk for flank growth and perimeter breaches during high wind or red flag conditions.

The vegetation and fuel conditions across the LHTA assessment areas are characterized by a diverse mix of Fuel Models 1, 5, and 10, encompassing short grass and dry brush, brush, and timber litter with understory. These fuels promote rapid fire spread, long-range spotting, and high sensitivity to wind and low fuel moisture, conditions common throughout the summer fire season. Vegetation patterns vary with elevation and aspect: fine grass and shrub fuels dominate the lower southern and eastern portions, transitioning into juniper, mountain mahogany, and regenerating

conifer stands along mid-slopes. The upper western and northern slopes support dense Douglas Fir, Limber Pine, Rocky Mountain Juniper stands, scattered Ponderosa Pine, with a well-developed understory of mixed grasses, duff, and shrubs. Small stands of Narrow-leaf Cottonwood are present in riparian areas. This structure creates continuous fuel connectivity across terrain areas, allowing fire to move quickly upslope and between vegetation types. Under dry, windy conditions, these fuels sustain high-intensity, fast-moving fire behavior with limited opportunities for direct suppression, particularly within steep, rugged terrain where access is restricted.

The LHTA assessment area operates a livestock grazing program across the entire installation, with rotational pasture management helping to reduce fine fuel accumulation. However, even with grazing, the fuel structure supports rapid fire movement and growth during critical fire weather, especially when sustained winds exceed 40–50 mph. Areas with heavier fuel loading, including timber litter and dense brush, can sustain high-intensity fire activity and present greater resistance to control throughout the year.

A network of unimproved road systems provides partial access across the property but requires significant fuel treatment and maintenance to function effectively for wildfire suppression. Recommended improvements include road widening, surface maintenance, fuel mastication, and the installation of shaded fuel breaks along key corridors within timbered areas to enhance access and containment potential.

According to USFS and NWCG fuel management standards, a shaded fuel break typically extends 200–400 feet in total width (100–200 feet on either side of a road or ridge) and is designed to reduce surface and ladder fuels while retaining a partial canopy (approximately 40–60% cover). Trees should be spaced 10–20 feet apart, pruned to a height of 8–12 feet or one-third of total height, and surface fuels maintained below 5 tons per acre to limit flame lengths and improve suppression effectiveness. Figure 81 demonstrates the LHTA assessment area trees and brush.

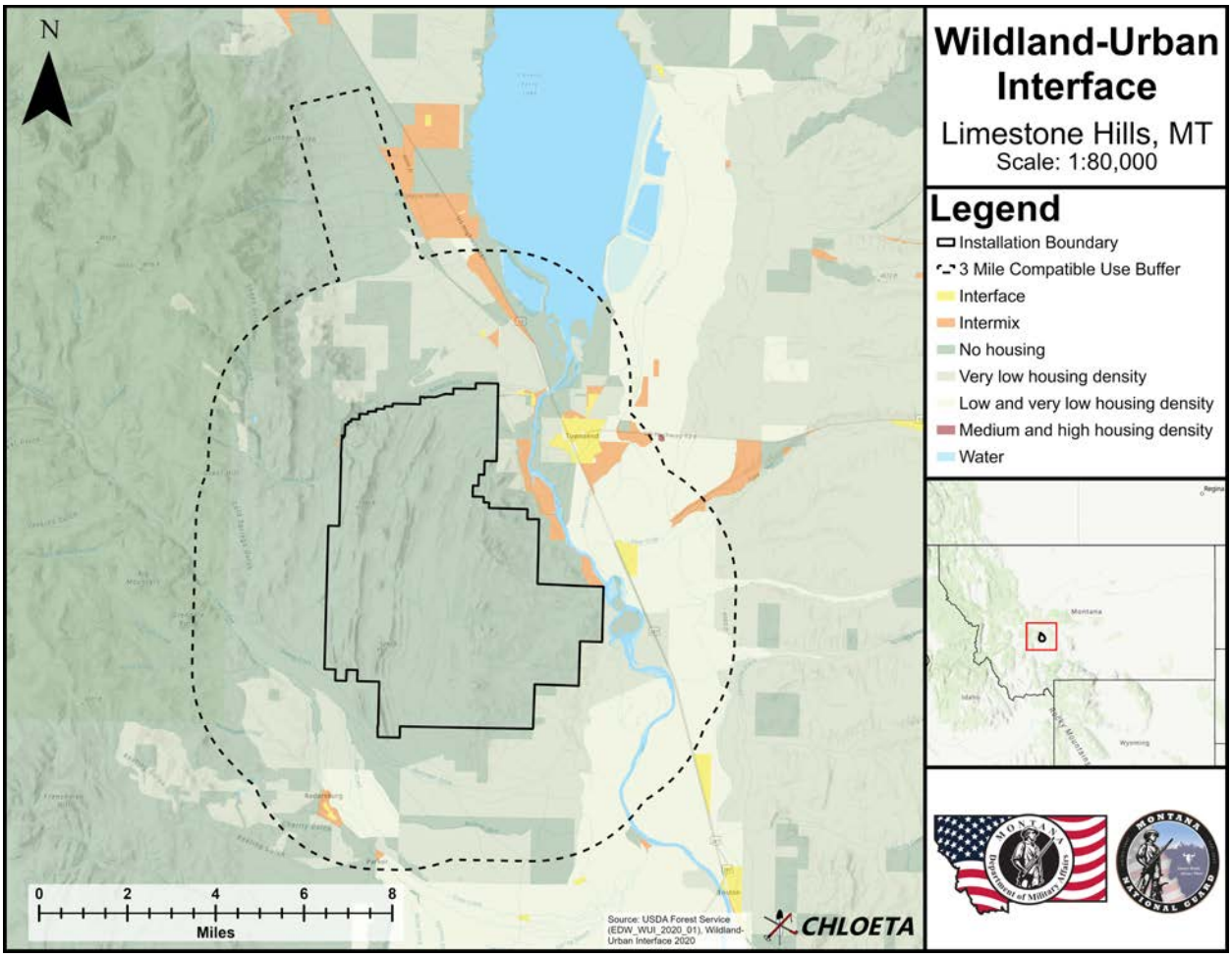


Figure 80. WUI Overlay LHTA Map

Figure 81. Images of LHTA Dominant Trees and Brush

Weather Drivers

- High winds – Basin and gap winds, downslope flows from the Big Belt Mountains; Canyon Ferry RAWS observes frequent gusts 45–60 mph, rapidly driving grass/shrub fires.
- Extended drought – Broadwater County recorded Severe–Exceptional Drought in 6 of the past 15 fire seasons (USDM), lowering live fuel moisture and stressing water supply.
- Low RH / high temps – July–August RH often <15%; daily highs >90°F; frequent Haines 5–6 days.
- Red Flag Days – Canyon Ferry RAWS averages ~15–18 Red Flag days/year (2015–2023).

Topographic Influences

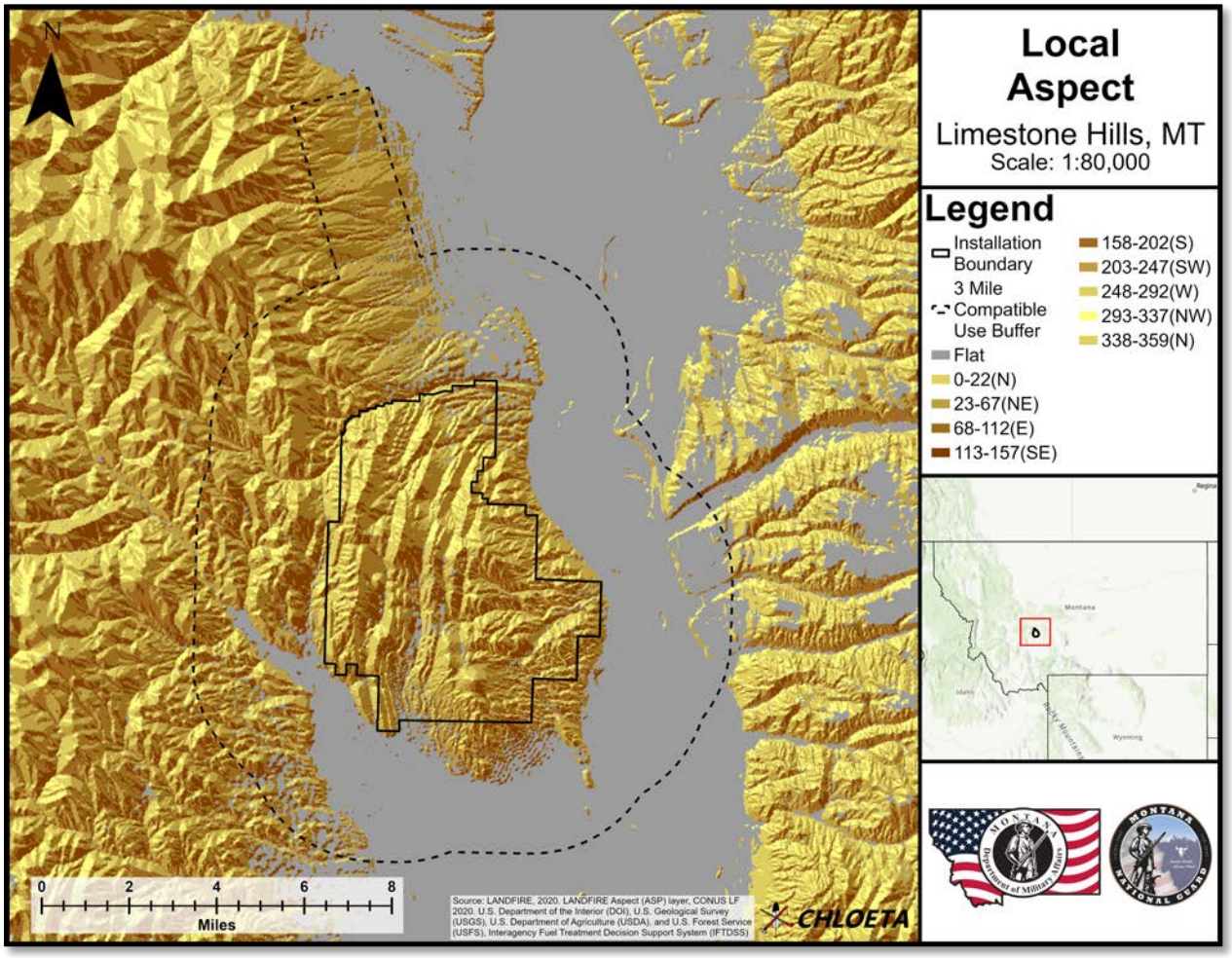


Figure 82. LHTA Aspect Map

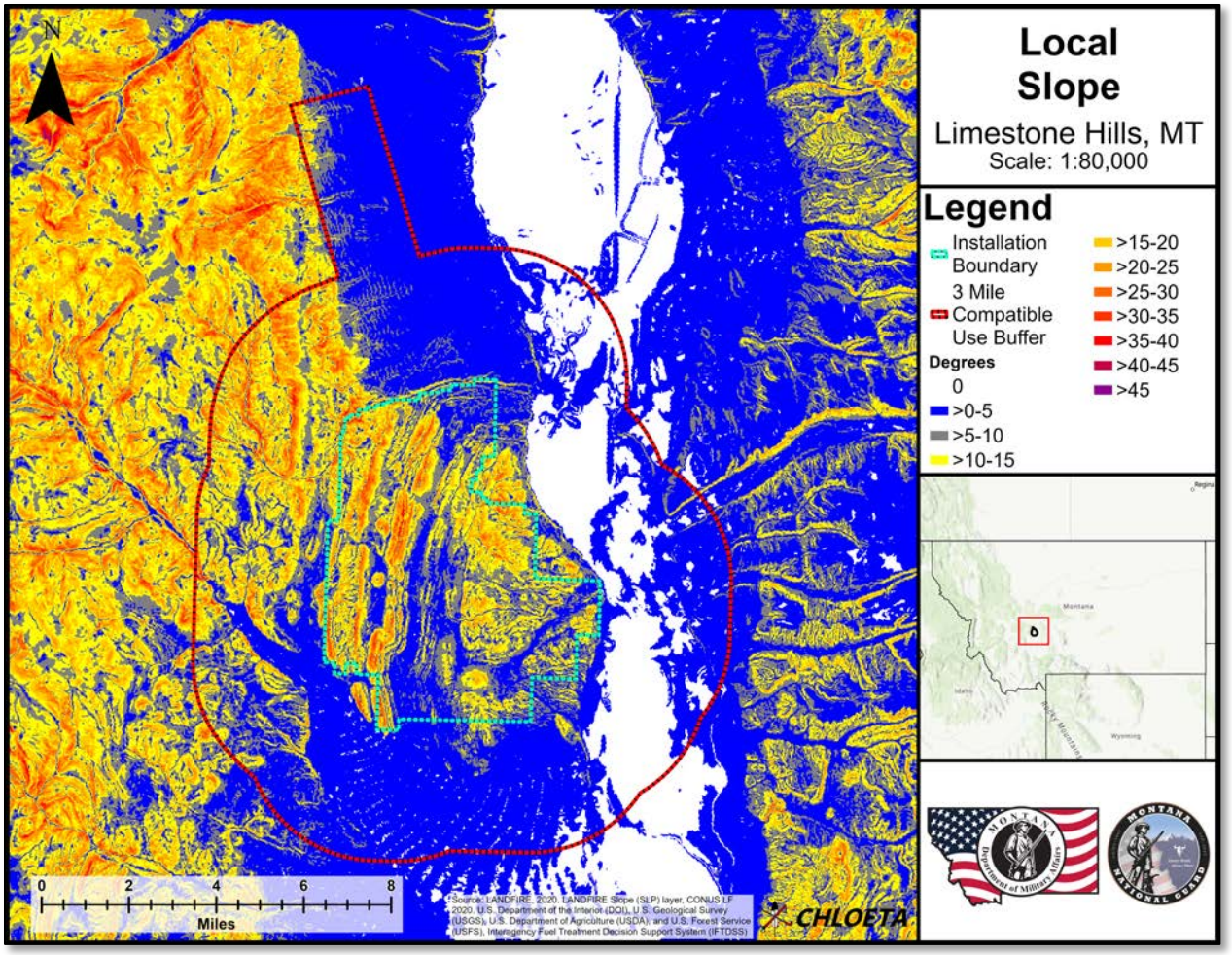


Figure 83. LHTA Slope Map

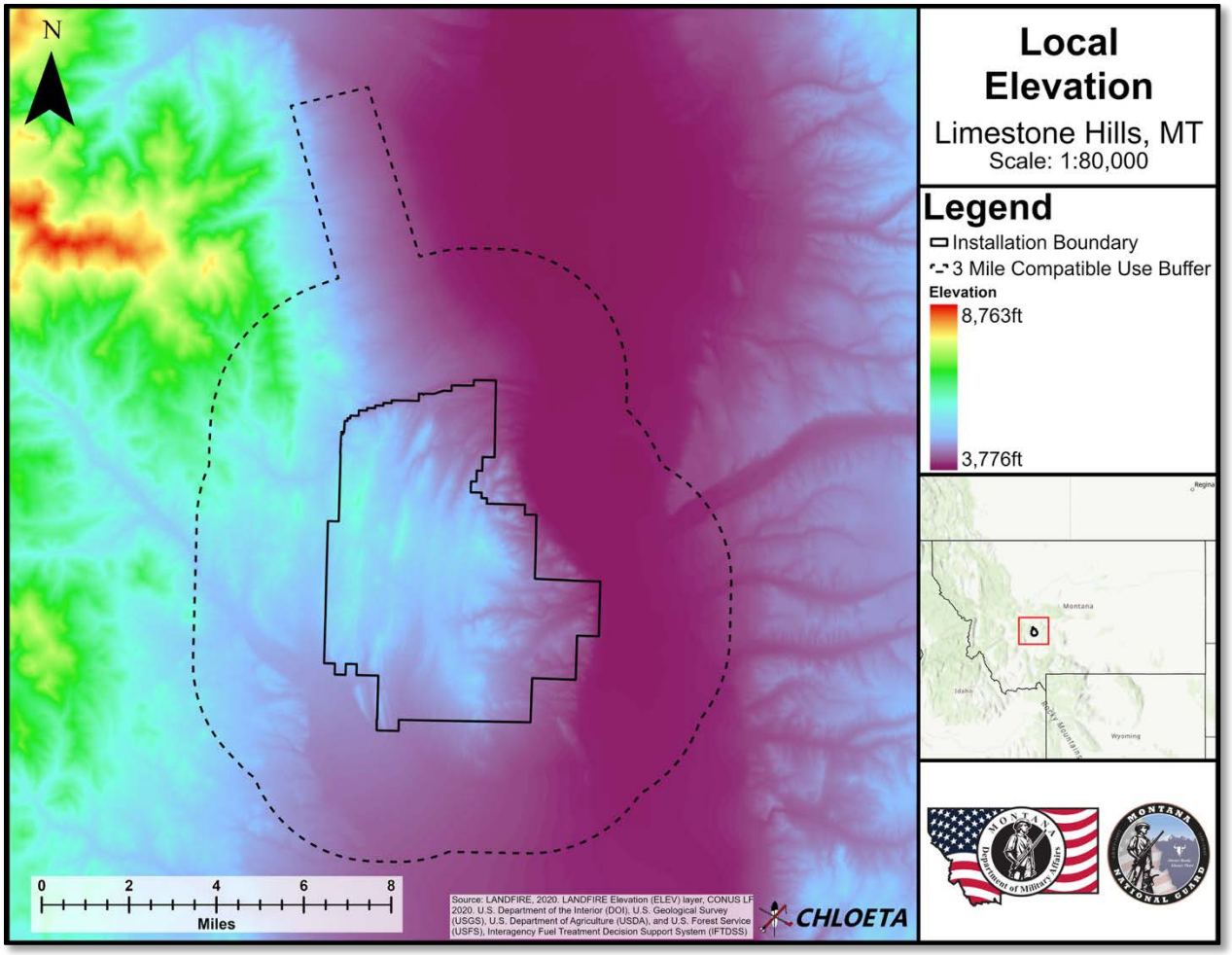


Figure 84. LHTA Elevation Map

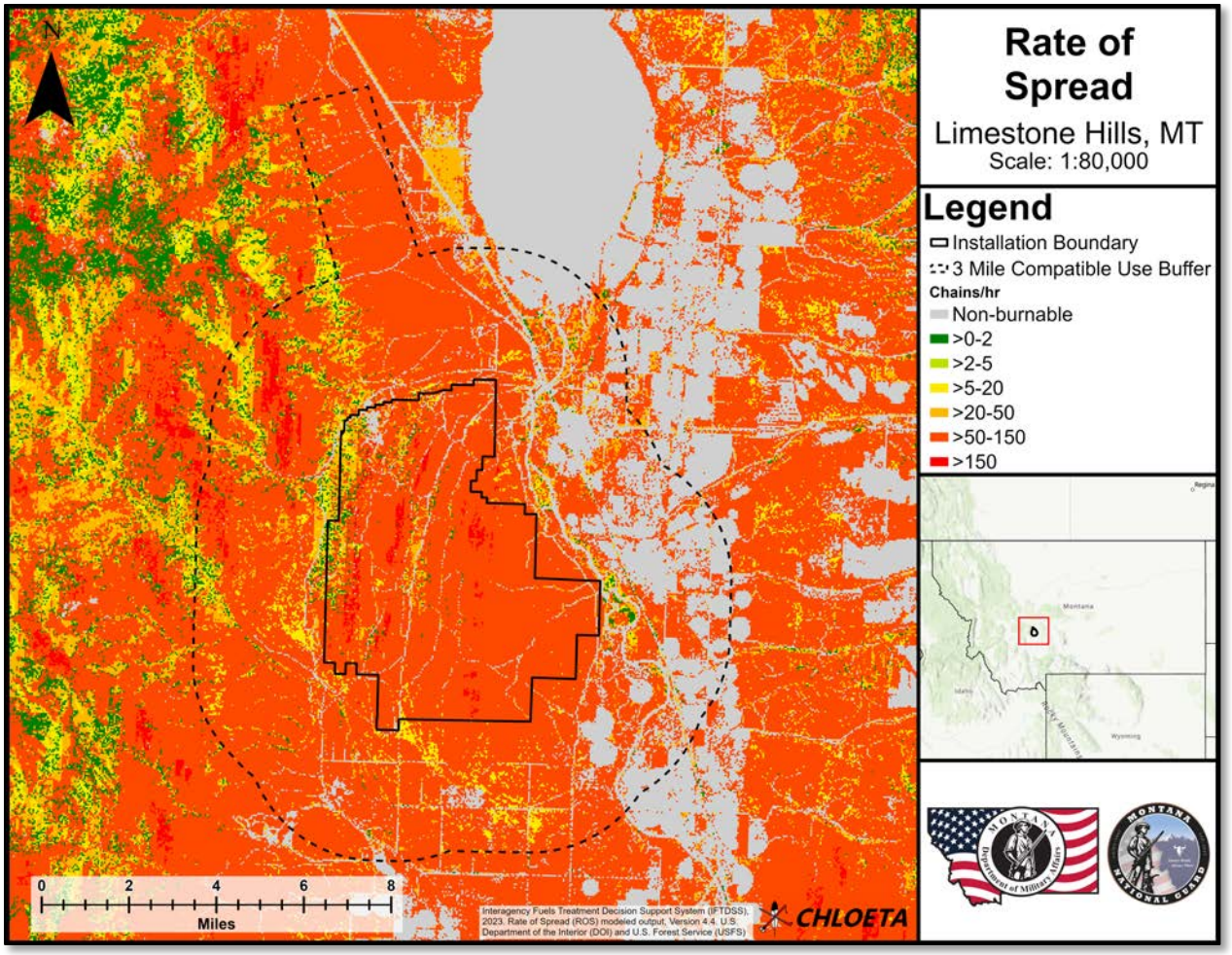


Figure 85. LHTA Rate of Spread Map

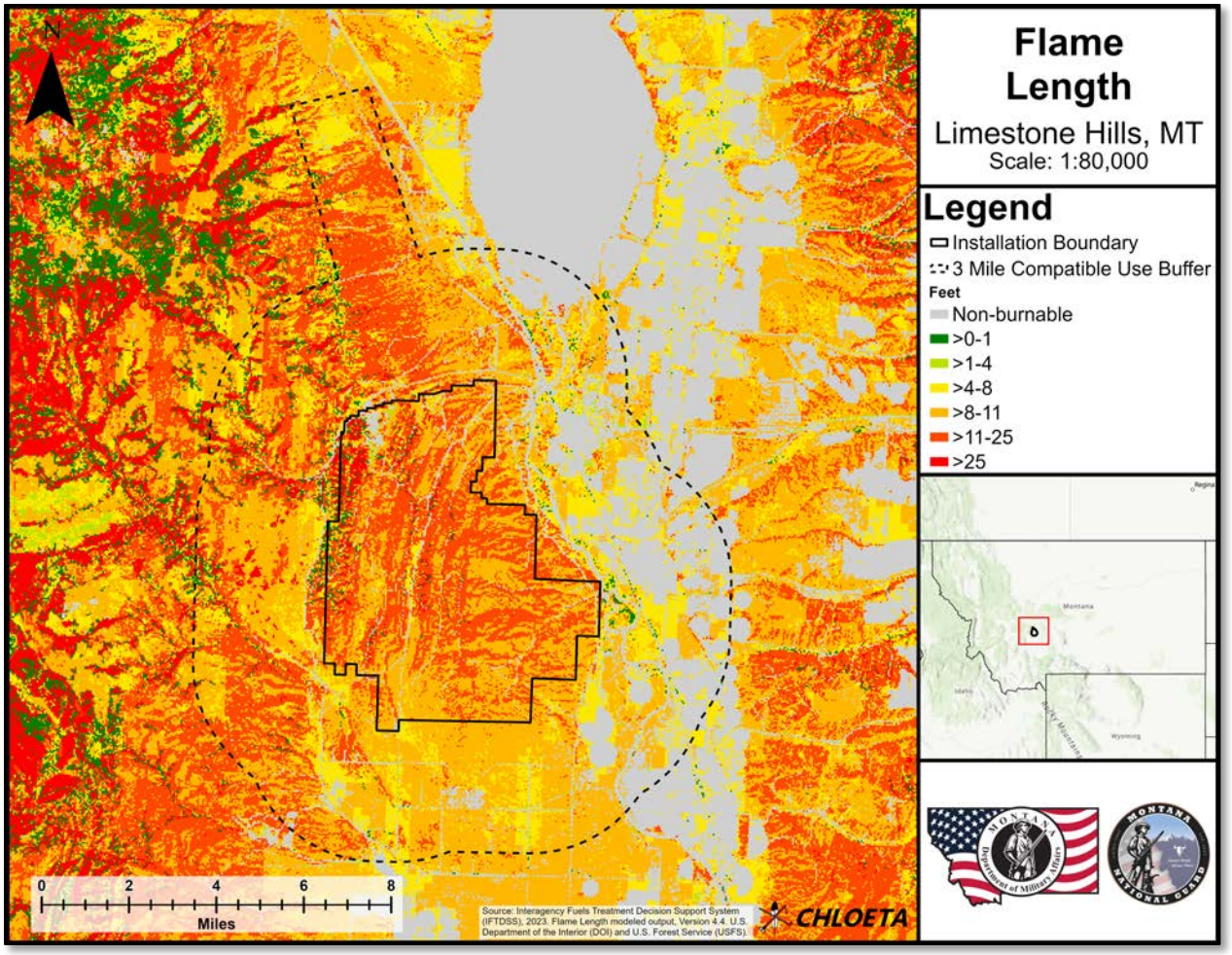


Figure 86. LHTA Flame Length Map

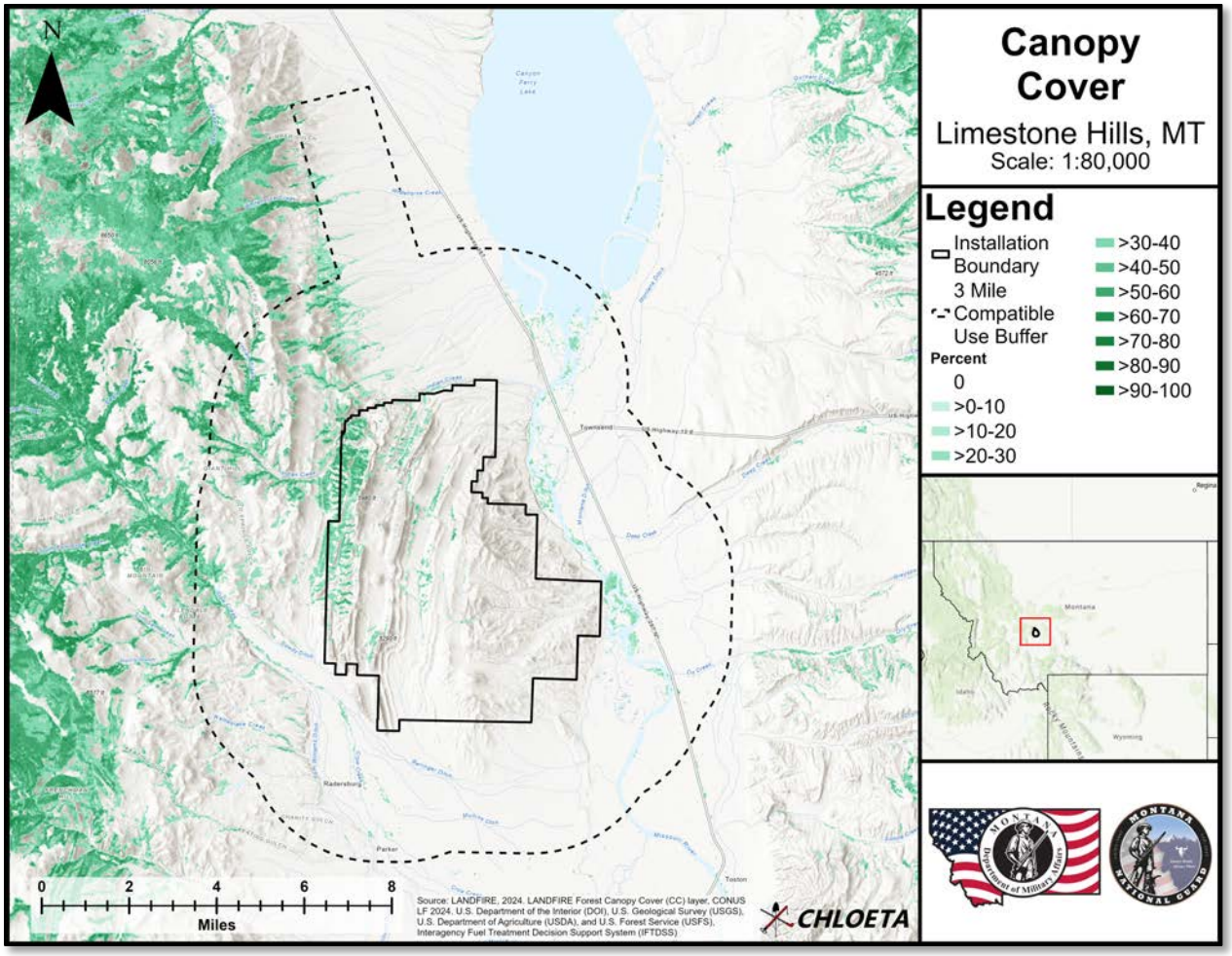


Figure 87. LHTA Canopy Cover Map

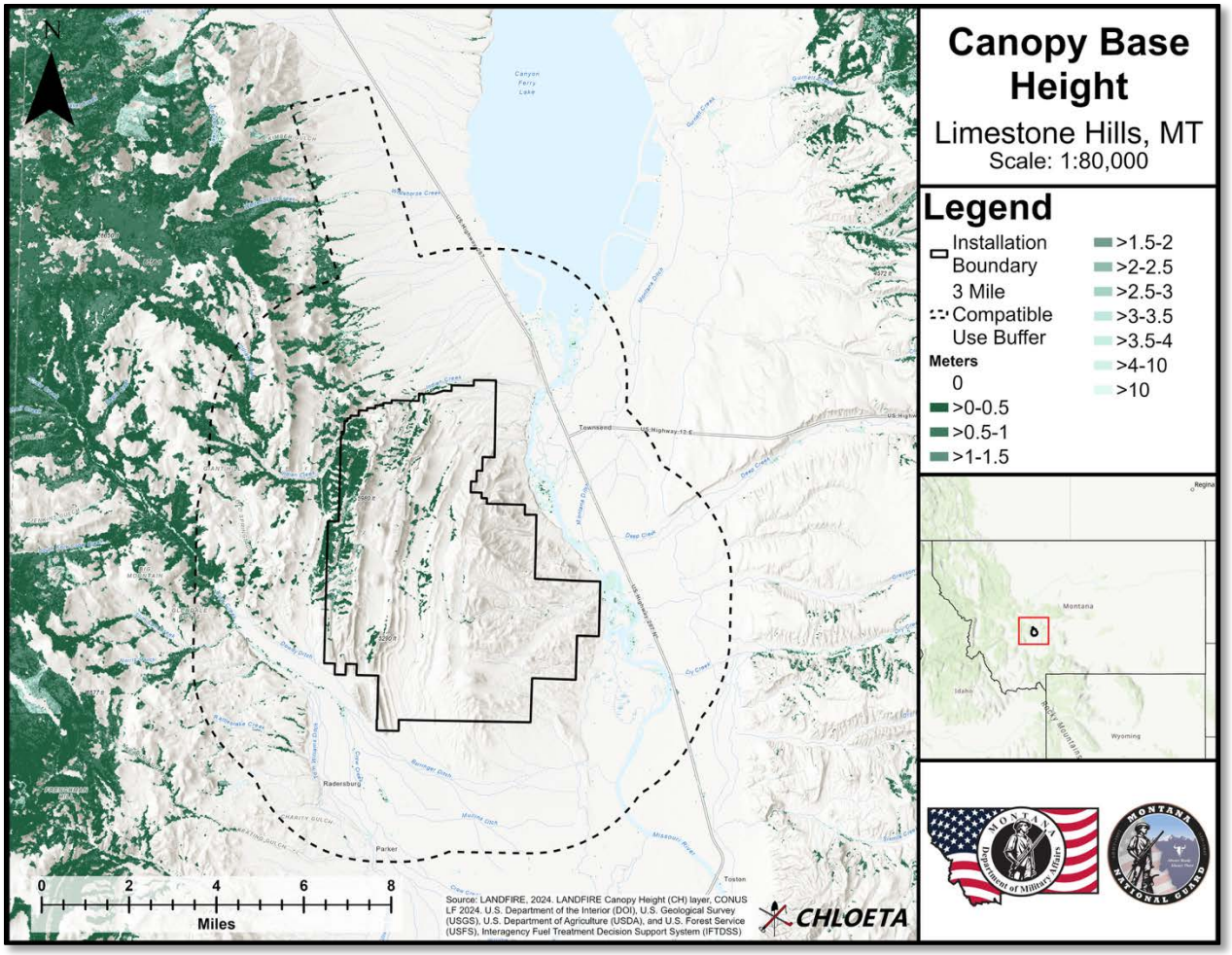


Figure 88. LHTA Canopy Base Height Map

- South-/west-facing aspects (Figure 82) cure early and sustain longer burn windows.
- Elevation (Figure 84) breaks between benches and ridge crests create erratic winds, rotor areas, and variable fire behavior that complicate aviation and line holding.
- High potential for rapid surface fire spread (Figure 85), driven by continuous grass–shrub fuels (Figure 86) and steep slopes (Figure 83) that align with prevailing winds, allowing fires to move quickly upslope and through drainages toward developed areas and access corridors.
- Moderate canopy cover (Figure 87) with low-to-moderate canopy base heights (Figure 88), supporting torching and short-range crown fire under wind-driven and drought conditions, particularly along ridgelines and in narrow draws where topography concentrates fire behavior.

Historical Wildfire Events

- Regional large fires (e.g., Woods Creek 2021 ~55k ac; Indian Ridge 2012 ~18k ac; Deep Creek Canyon 2021) degraded air quality, diverted resources, and intermittently closed corridors serving Townsend/Canyon Ferry.
- Local starts – DNRC incident data indicate 20+ ignitions within 10 miles of LHTA (2010–2023), with repeat activity along Indian Creek Road, River Road and lake-adjacent recreation areas.

Post Fire Flooding/Debris Flow

Post-fire conditions in limestone terrain promote rapid runoff and debris-laden flooding, with flows concentrated in north-draining draws that rapidly shed runoff and intersect Old Woman's Grave Road and Indian Creek Road. These processes increase flood and debris-flow hazards, with culvert overtopping, debris blockage, and road washouts posing a credible risk to access and emergency mobility, potentially isolating training areas and nearby communities. Addressing these vulnerabilities through resilient roadway design, increased drainage capacity, redundant access, and watershed-scale mitigation is critical to supporting community safety, emergency response capability, and operational continuity during high-intensity rainfall and future extreme precipitation events (Figure 89).

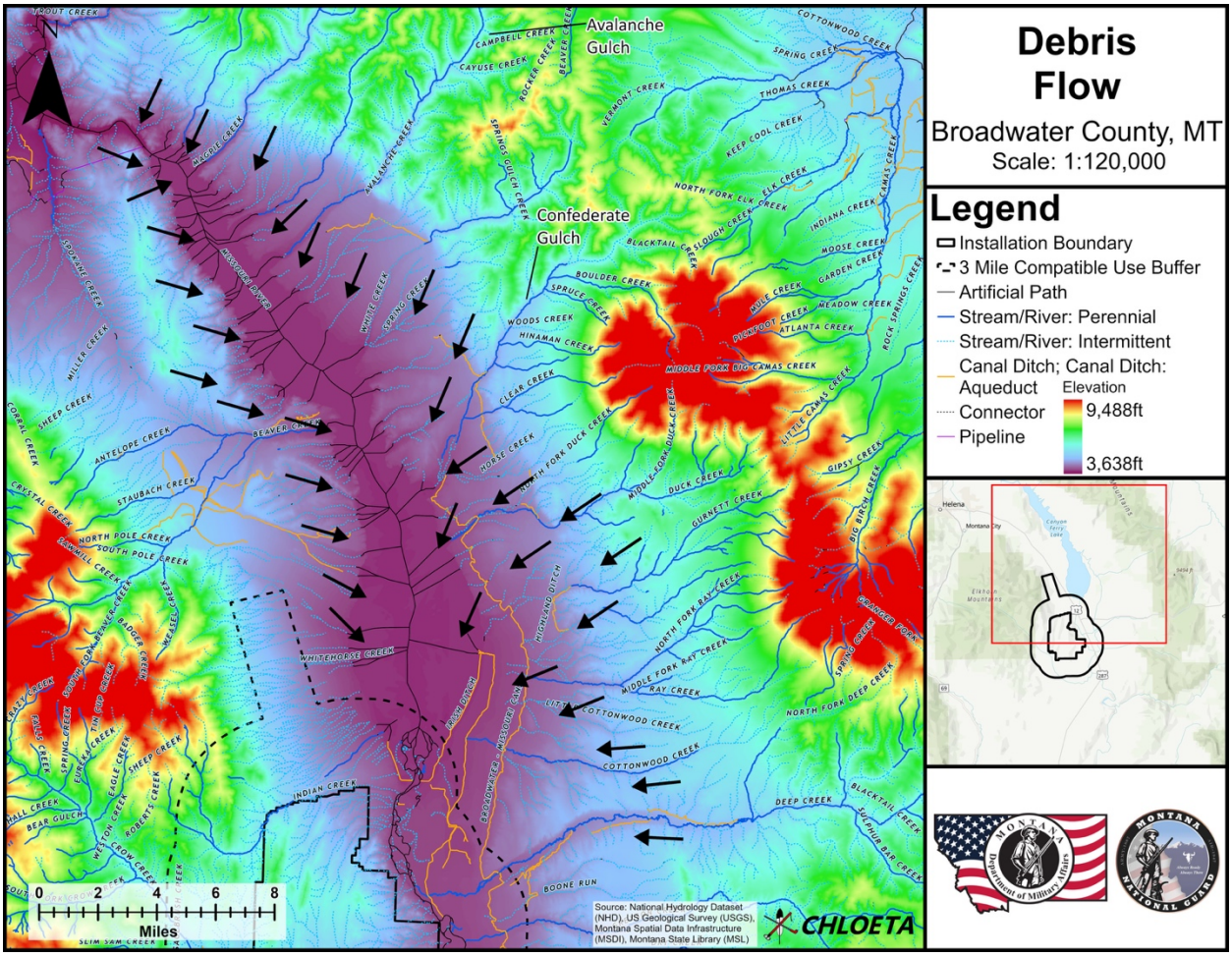


Figure 89. Debris-Flow & Post-Fire Flood Risk Areas

Air Quality Degradation

The LHTA assessment area faces elevated exposure to wildfire smoke due to its location along the eastern slopes of the Elkhorn Mountains and its proximity to Canyon Ferry Lake recreation areas and the Townsend community. LHTA extensive training lands are surrounded by shrubland, grass fuels, and steep draws that contribute to fast-spreading, high-smoke-producing fires. Smoke from both local ignitions and large regional fires (Deep Creek Canyon Fire 2021) have historically degraded visibility to below Visual Flight Rules (VFR) thresholds, delaying rotary- and fixed-wing support critical for both military training and fire suppression. Broadwater County does not have the same density of monitoring stations as Helena, leaving gaps in real-time AQI data and increasing reliance on state and interagency smoke modeling tools. When smoke conditions deteriorate, impacts extend beyond training operations: residents, seasonal recreationists, and agricultural workers in the Townsend and Silos areas face increased respiratory health risks without readily available refuge infrastructure. Figure 90 presents cumulative wildfire smoke exposure levels for the area surrounding the LHTA assessment area. Most of the installation lies within a zone of low long-term smoke exposure, shown in green, indicating relatively clean air quality under normal conditions. However, a moderate exposure band extends through the southern and eastern perimeter, with more intense exposure areas (in yellow and brown) beginning just beyond the buffer zone, particularly to the west and southwest. This suggests that while the LHTA assessment area is not in a persistently high-risk smoke zone, regional wildfire activity and wind direction could lead to occasional air quality degradation.

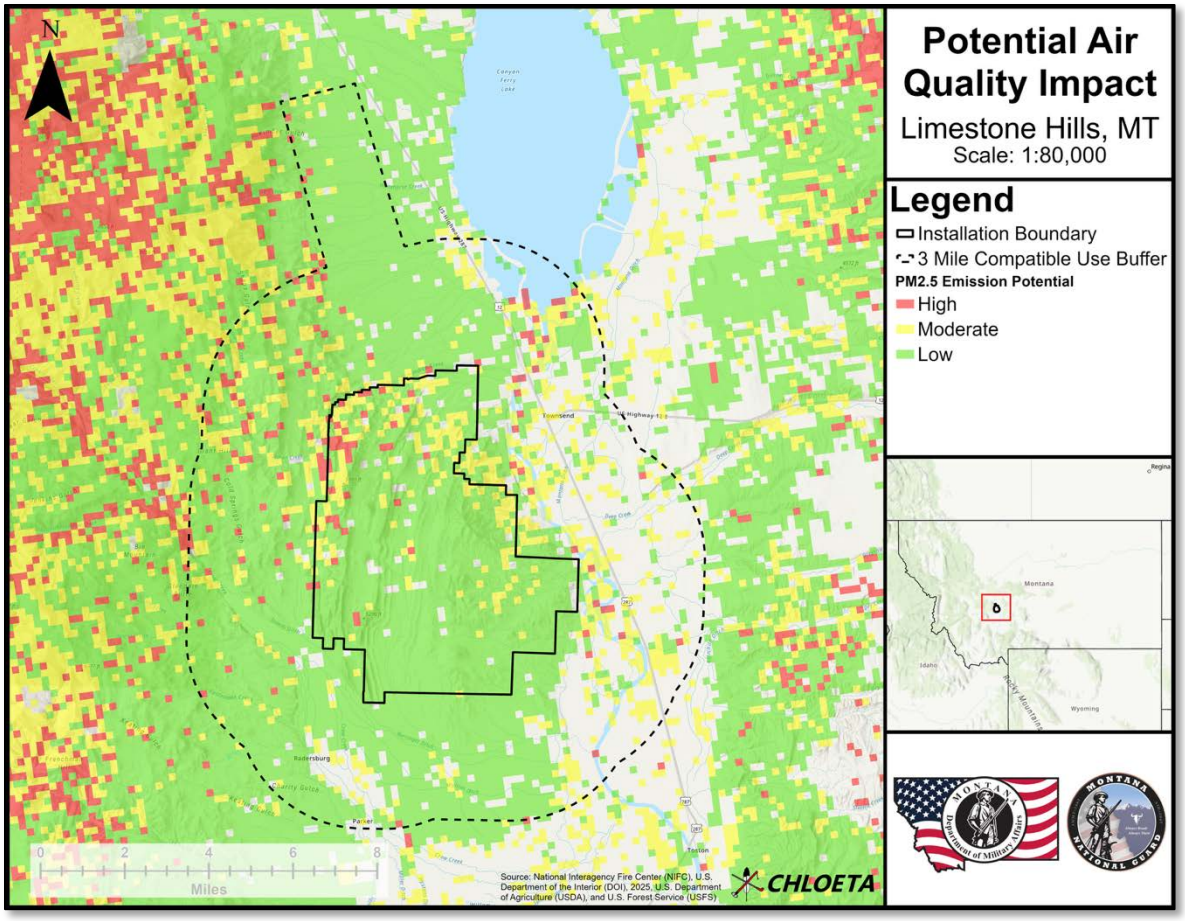


Figure 90. LHTA Potential to Impact Air Quality Map

Hazard Exposure Summary

The LHTA assessment exposure area shown in Figure 90, includes a mix of minimal, indirect, and direct wildfire exposure areas that indicate wildfire potential impacts on critical infrastructure and valued community assets. This analysis does not estimate the likely occurrence of wildfire in any given spot. It identifies areas where, if a fire were to occur, the damage would be severe. Most of the LHTA assessment area falls within areas of minimal exposure, meaning there are few structures or essential facilities within the core zone. However, the area includes significant regions of indirect and direct exposure, particularly closer to Townsend and nearby residential clusters. These areas include assets to include the power lines, the Phillips 66 Pipeline, roads, and homes that would face varying degrees of impact from wildfire.

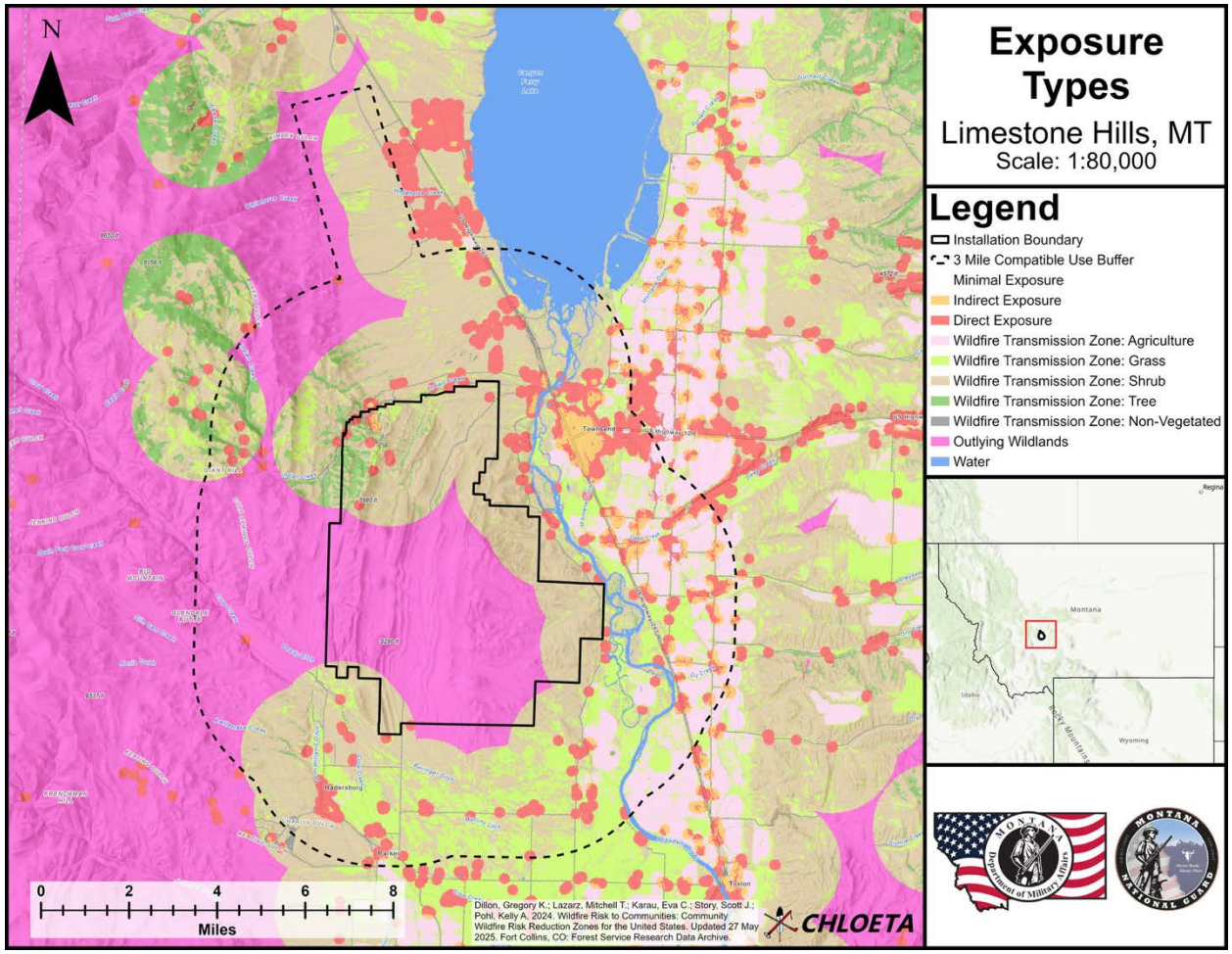


Figure 91. LHTA Exposure Types Map

The LHTA assessment area's exposure is high (Table 13) and escalating due to overlapping ignition-prone training, fast grass/sage fuels, juniper expansion, topography, and frequent Red Flag weather. Historic ignitions confirm recurrent risk, while secondary hazards (post-fire flooding, smoke, access loss) create cascading mission and community impacts.

Table 13. Hazard Exposure – LHTA

Hazard Factor	Local Evidence / Data	Implications
Ignition Sources	Lightning responsible for ~60–65% of starts (2000–2023, Broadwater Co.); training ignitions during dry season; recreation starts around Canyon Ferry; roadside/utility-related starts along Indian Creek Road.	High on-range and perimeter start probability; operational pauses no live-fire during Red Flag; potential utility-caused outages.

Hazard Factor	Local Evidence / Data	Implications
Fuel Conditions	LANDFIRE 2022: fine grass/sage dominate; juniper encroachment; ponderosa pockets on ridges.	Spread >8–12 mph in wind; long flame lengths in shrub/juniper; episodic crown potential; difficult line holding.
Weather Drivers	Canyon Ferry RAWS: 15–18 Red Flag days/yr; frequent 45–60 mph gusts; recurring Severe–Exceptional Drought; RH <15%, Tmax >90°F.	Rapid growth from small starts; limited initial-attack window; Off-limits Impact Area; water supply stress; range suspensions.
Topography	Steep limestone draws with south-facing aspects; sharp elevation breaks; Off-Limits Impact Area, UXO.	Winds blow toward training blocks; erratic winds; complex air operations and access.
Historical Fire Activity	20+ starts within 10 miles (2010–2023); regional large fires (Woods Creek 2021; Indian Ridge 2012; Deep Creek Canyon 2021).	Confirms recurrent exposure; smoke/road closures; resource competition delays.
Secondary Hazards	Post-fire flooding in gulches; smoke-driven visibility reductions; overhead line exposure; limited local water storage.	Access isolation; degraded air operations; outage cascades; mission disruption beyond flame front.

LHTA Assessment Area Summary of Findings

Roads

The transportation network that serves LHTA assessment area is sparse, predominantly two-lane rural roads with long single-access segments and limited engineered turnouts, conditions that are highly vulnerable to wildfire, smoke, and post-fire flooding.

- Primary approaches. Access to LHTA is primarily provided via U.S. Highway 287 to Indian Creek Road and Old Woman's Grave Road, which serve as the primary ingress and egress routes for military, support, and emergency response vehicles. These roads connect directly to the Townsend side of the installation and provide the most reliable all-season access for emergency services responding from Helena and Broadwater County. A secondary access route exists via Highway 284 near Canyon Ferry Lake. These segments are narrow, with limited shoulders and constrained turning radii, and traverse areas of continuous fine grass, sagebrush, and juniper fuels, which can quickly become impassable under active fire conditions.
- Ingress/egress constraints. Long single egress stretches create evacuation bottlenecks for soldiers, contractors, and any co-located public recreators. Steep grades and sharp curves reduce heavy-engine speeds; dust and smoke further degrade sight lines. Several creek crossings along these routes rely on undersized culverts, many of which are vulnerable to overtopping, sedimentation, and debris blockage following wildfire or intense precipitation. These access limitations present significant challenges for engine mobility, evacuation, and sustained suppression operations, emphasizing the need for route

hardening, fuel clearance, and drainage improvements to ensure reliable emergency response capability to and from the installation.

- Seasonal reliability. Wind-driven dust, washboards, and post-storm rilling reduce travel speeds and can strand equipment.
- Redundancy. There is no true parallel alternate route if Indian Creek Road is blocked. Available detours rely on low-standard ranch roads (when open), add substantial travel time, and are not suitable for simultaneous evacuation and response. This redundancy limitation primarily affects residents and local responders along Indian Creek Road. From an installation access perspective, Highway 284 provides the most reliable alternate route should the primary U.S. Highway 12/287 corridor be compromised.

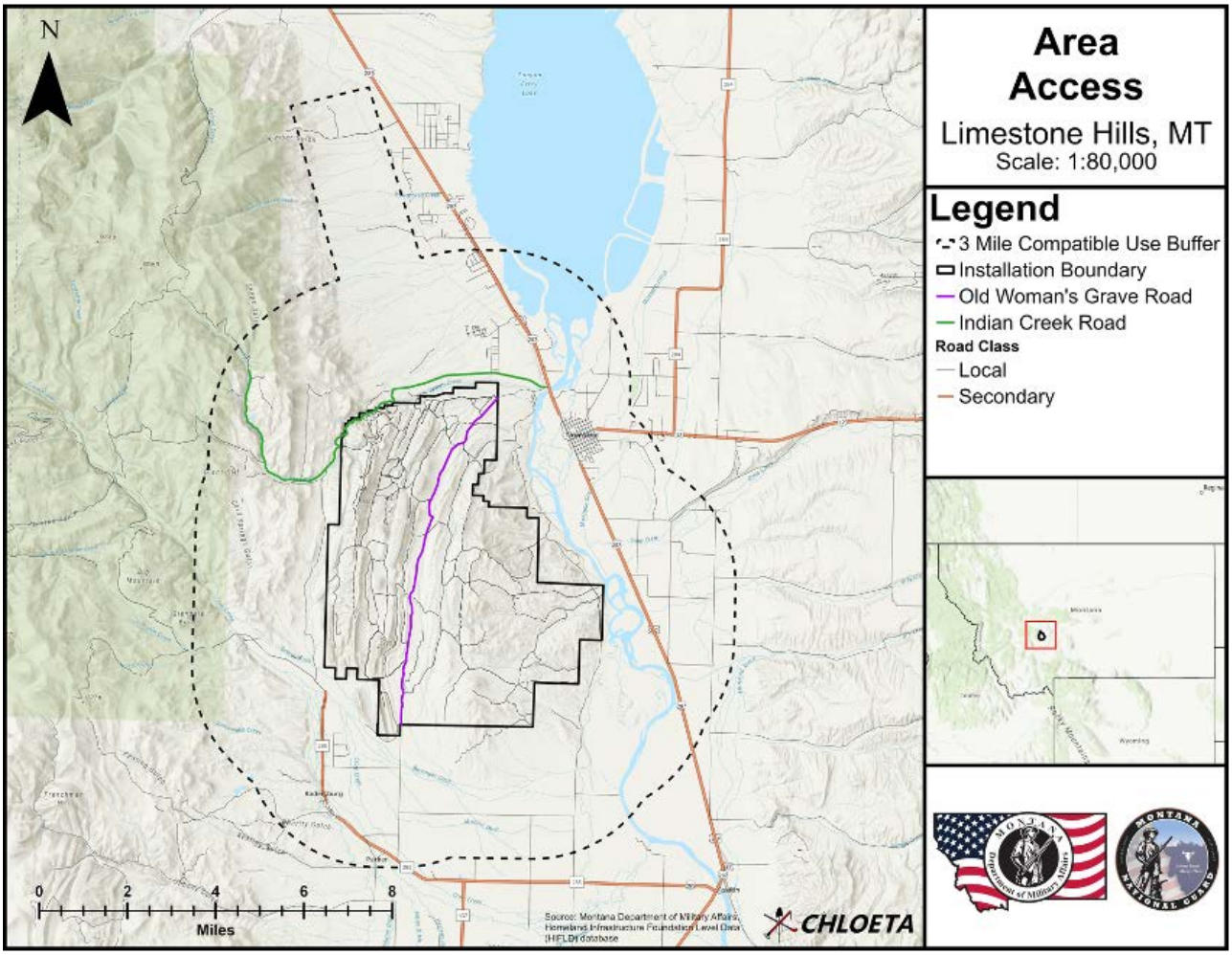


Figure 92. Road Network LHTA Map

Utilities

The LHTA assessment area relies on off-installation, rural utility systems with limited hardening and few built-in redundancies.

- Water supply. The training area does not have a municipal potable connection; operations depend on hauled water, small tanks, portable blivets, or drafting from Canyon Ferry/creeks when flows permit. Drought reduces available drafting points; ash/sediment loads after fire increase turbidity and can foul pumps and nozzles. On-site hydrant networks are minimal; there is one well-fed hydrant, and one well-fed J-stand fill point gravity fed by a 30,000-gallon underground storage tank. Once depleted, it takes 24 hours to refill. Both are near the LHTA cantonment area / barracks.

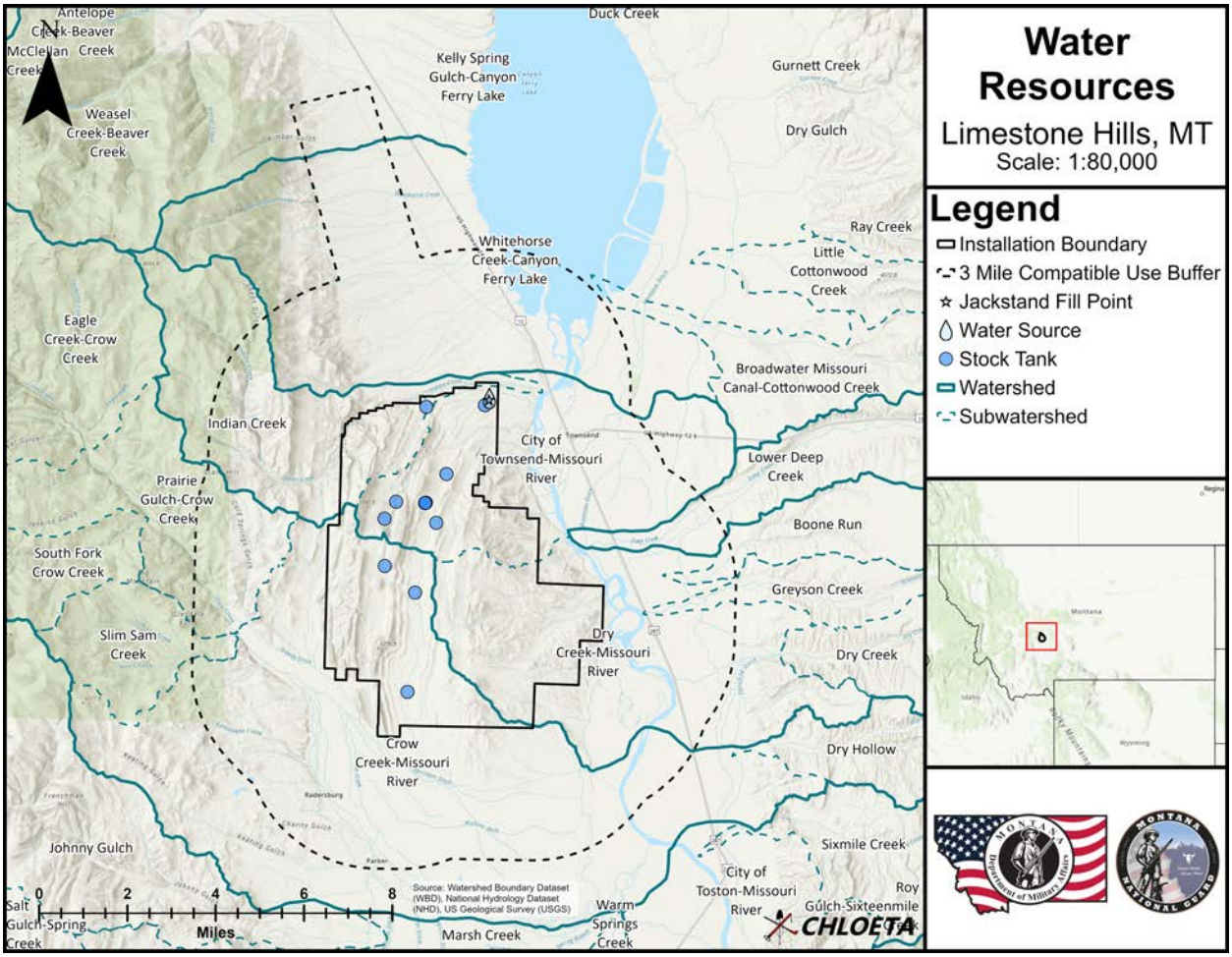


Figure 93. LHTA Water Supply Mapping

- Electric power. Service is provided by overhead rural distribution feeders (NorthWestern Energy/coop territory). Wood poles through sage/juniper corridors are exposed to ignition and conductor faults during high-wind/low-RH periods. Outages are common during regional fire weather; any protective de-energization would halt comms, lighting, and pump operations.

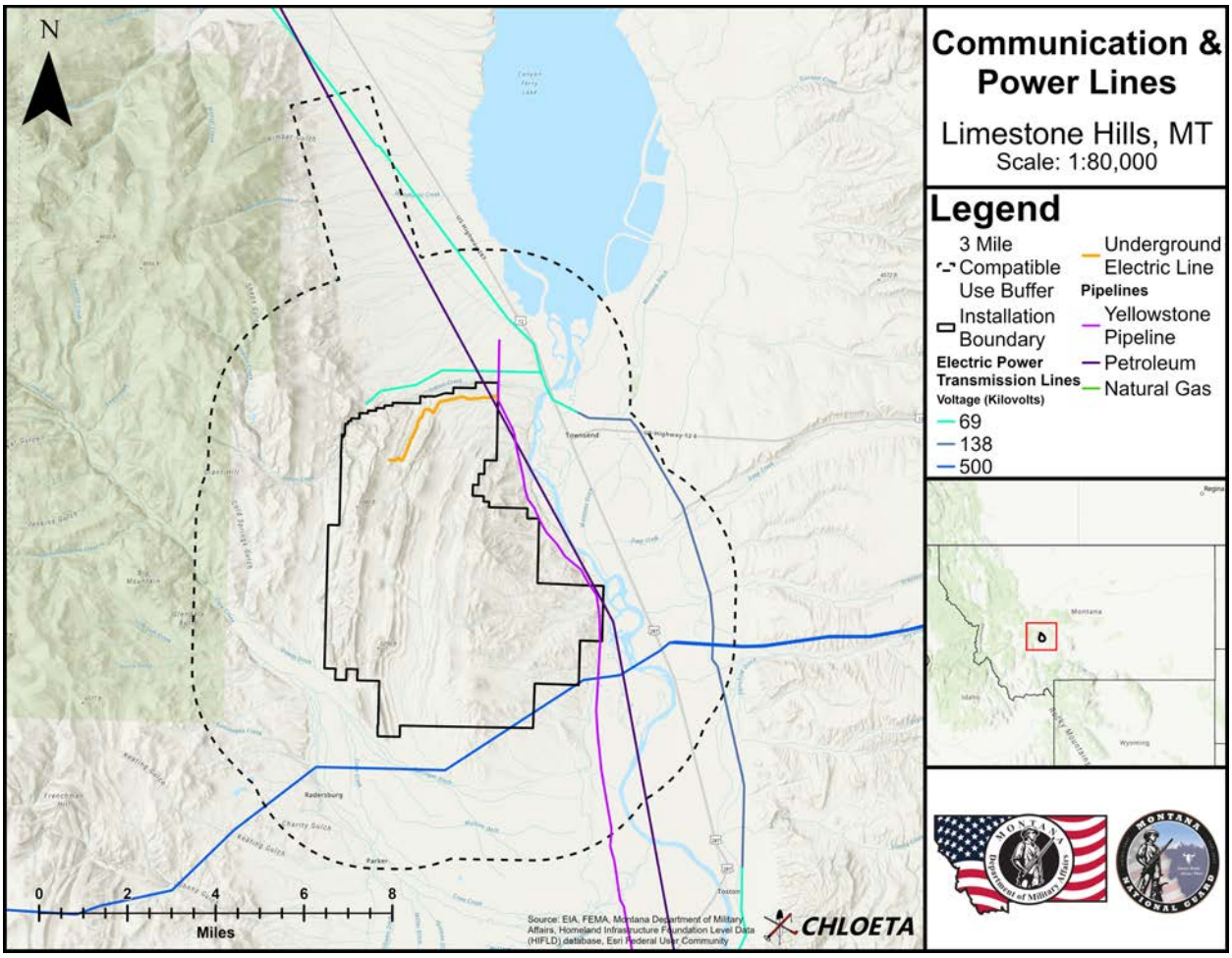


Figure 94. Electrical Grid LHTA Map

- Communications. Cellular/BH microwave coverage is topography-dependent; ridge shadowing and smoke can degrade signal quality. Several hilltop sites are reachable only by unimproved roads that may be closed by fire or post-fire washouts, delaying restoration. Loss of these links would complicate air/ground coordination and range safety.
- Waste management. Field operations use portable sanitation and haul-off services; access disruptions can create health and environmental compliance risks during extended incidents.

Facilities

LHTA contains dispersed training pads and range features set within continuous grass–sage–juniper fuels.

- **Training/range features.** Maneuver lanes, firing positions, and ammo breakdown points are co-located with fast-spread fuels. MTARNG conducts no spark producing activities during known red flag warnings. Training limitations are up to the Training Center / Range

Control for Very High fire danger and below. Engineered blacklines/fuel breaks are discontinuous, especially along ridge spines and draw mouths.

- **Staging/ICS sites.** Existing pads support company-sized elements but lack hardened turnaround radii for Type-3/Type-4 engines and tenders. Limited night-lighting and marked helispots constrain after-dark operations.
- **Sensitive resources.** Cultural/natural resources and karst features in the limestone belt limit where dozer lines and retardant can be applied, narrowing tactical options during initial attack. Dozer lines will not be constructed by USFS or partner agencies west of Old Woman's Grave Road (restricted area) due to potential UXO. Direct attack with water, burn out, aerial water only (USFS IAA SOG).

Although remote compared to FHTA, LHTA continuity is still tied to regional civilian systems that are co-exposed to wildfire.

- **Transportation interdependence.** Incident surge and evacuation in the LHTA assessment area to include Townsend & Canyon Ferry communities and recreation traffic rely on Hwy 12/Hwy 287–284 corridor. Closures isolate the training area and redirect responders to longer approaches.
- **Utility interdependence.** Rural distribution feeders and telecom backhaul that serve LHTA also serve ranches, recreation areas, and residences; restoration priorities during widespread outages may not favor the training area absent formal agreements.
- **Emergency services.** Initial attack and extended attack are supported by USFS, DNRC, Broadwater County rural districts, and interagency aviation (helicopters/SEATs staged regionally). During multi-start or plume-dominated days, asset competition can delay response to LHTA.
- **Water & public health.** Post-fire sediment pulses from drainages affect downstream ranch and recreation water intakes; restrictions on drafting from creeks/lake during turbidity events can lengthen refill cycles for all responders.

Emergency Response Capacity

Wildfire response capacity at the LHTA is limited by its remote location, rugged terrain, and reliance on external agencies. Unlike Fort Harrison, which benefits from proximity to Helena's fire services, LHTA is more than 20 miles from full-time municipal suppression resources. The USFS Townsend Ranger District fire services are approximately seven miles from LHTA where training induced wildfire is most likely. Other portions of LHTA can be up to 20 miles. This distance, combined with access constraints and regional resource competition during peak fire season, significantly reduces initial-attack effectiveness.

On-Site Resources

- No dedicated fire department or permanent suppression assets are stationed at LHTA. Fire protection relies on portable equipment. Range Operations stations fire suppression

equipment at LHTA when live-fire training occurs. If a fire starts when MTARNG personnel are not on the range, Townsend USFS and Broadwater County respond.

- Training staff may provide first-observer reporting and minor suppression (fire extinguishers, initial tool lines), but they lack the depth of qualified wildland personnel and heavy equipment to contain fast-moving grass and shrub fires.
- The absence of a hydrant network or permanent water storage points increases refill cycle times, forcing reliance on hauling or drafting from the LHTA cantonment area, intermittent creeks or Canyon Ferry Lake.

External Response Partners

- Broadwater County Rural Fire Districts (Townsend) provide initial mutual aid, but these are volunteer-based agencies with limited staffing and seasonal availability.
- DNRC (Helena) maintains wildland engines and aviation resources but prioritizes dispatch based on regional fire load. During peak activity, DNRC and USFS crews may be committed elsewhere, delaying arrival at LHTA.
- Aviation resources (SEATs, Type II helicopters) are managed interagency at Helena, but travel time plus competing incident demands may delay drops. Smoke and wind turbulence in limestone canyons further reduce aviation safety windows.

Coverage Gaps

- Response time. Travel from Townsend or Helena typically requires 30–60 minutes, depending on access route and road conditions. This lag is critical, as grass/brush fires at LHTA can exceed 8–12 mph spread rates, often escaping containment before suppression forces arrive.
- Terrain barriers. Steep gulches constrain apparatus mobility; narrow single-lane access prevents simultaneous evacuation and response.
- Water supply. Limited refill points lengthen tender cycles, with >45 minutes round-trip when drafting from Canyon Ferry Lake.
- Manpower surge capacity. Volunteer districts and county assets are often overextended during regional fire busts, leaving LHTA with minimal support during multi-start days.

Coordination and Planning

- Mutual aid agreements exist between MTARNG, USFS, but trigger thresholds, staging areas, and communications procedures are not fully codified for LHTA-specific incidents.
- Evacuation protocols for soldiers and contractors training at LHTA are not formally integrated with county evacuation plans. In fast-moving scenarios, simultaneous needs for structure defense (nearby ranch homes), range protection, and personnel evacuation could overwhelm available capacity.
- Incident Command integration is delayed within the LHTA assessment area; staging areas and helispots are not hardened, mapped, or pre-designated, reducing interoperability.

Operational Implications

LHTA wildfire response capacity is reactive and externally dependent. The absence of dedicated on-site suppression, coupled with long external response times, leaves the installation highly vulnerable during Red Flag days or drought-driven fire seasons. Without pre-positioned resources, expanded water storage, hardened staging/turnaround areas, and a formalized joint response plan, LHTA faces elevated risks of mission disruption, uncontrolled fire spread, and cascading impacts on nearby communities.

Land Use Compatibility

The LHTA assessment area is situated at the intersection of military range lands, dispersed rural ranch properties, and recreational foothill areas in southwestern Broadwater County. This landscape creates overlapping wildfire exposure and potential land-use conflicts within the assessment area. While less urbanized than FHTA, LHTA surroundings include rural subdivisions, grazing allotments, and recreation access routes leading toward Canyon Ferry Lake, all of which increase ignition potential and constrain safe suppression access. RAPT mapping within the LHTA assessment area identifies co-located lifelines, including power transmission lines, ranch water infrastructure, recreation sites, and seasonal housing clusters, that influence both community safety and mission assurance across the region.

Development Patterns and Encroachment: The LHTA assessment area faces a more rural but equally concerning development pattern, shaped primarily by growth in Broadwater County and the outward expansion of Townsend. While the bulk of the installation remains surrounded by rugged limestone ridges and public lands, residential development is gradually increasing along the northern and eastern boundaries near U.S. Highway 287, Townsend, and the Missouri River corridor.

Most new homes near LHTA are built on dispersed rural lots, often 10 acres or larger, developed by individual landowners without subdivision review. These properties typically lack essential wildfire resilience features including dual ingress/egress routes, engineered road widths, or access to reliable water supplies for firefighting. Because Broadwater County does not currently enforce wildfire-specific overlays or subdivision standards in the WUI, new construction often proceeds without defensible space, fire-resistant materials, or hydrant spacing requirements. This creates heightened vulnerability for both residents and first responders in wildfire scenarios.

More structured development is concentrated in and around Townsend, where established infrastructure, road networks, utilities, and volunteer fire services provide a measure of resilience. However, the continued expansion of dispersed rural and informal housing increases the difficulty of coordinated emergency response. In these surrounding areas, road networks often function both as primary access routes and as natural fire corridors, while also serving as single points of entry and egress for residences. This dual role creates potential bottlenecks during wildfire events, particularly when evacuation and suppression operations must occur simultaneously.

For the LHTA assessment area, the intersection of steep terrain, dispersed growth, and limited emergency response capacity compounds wildfire exposure. Encroaching residential and recreational development constrains prescribed fire windows, increases complaint pressure against

ignition-prone training activities, and diverts limited suppression resources toward structure defense rather than perimeter control. Without stronger county-level land use standards and proactive coordination with DMA, continued expansion near Townsend and the Missouri River corridor will erode both community safety and military training continuity.

Regulatory Framework and Gaps: Broadwater County's zoning and subdivision review standards do not currently mandate wildfire-specific overlays, defensible-space enforcement, or ignition-resistant construction near LHTA. While the county's growth policy references WUI hazards, there are no enforceable standards for road width, hydrant spacing, or vegetation management in high-risk corridors. Unlike Fort Harrison, no Joint Land Use Study (JLUS) has been conducted specifically for LHTA, leaving a planning gap where compatibility and wildfire exposure are considered ad hoc rather than systematic. As a result, new development near the training area often lacks design features that would support coordinated suppression and safe military training access.

Compatibility with Military Operations: MTARNG activities at LHTA, particularly maneuver training, live-fire exercises, and vehicle operations carry ignition risk. Encroaching residential and recreational uses create conflicts over burn windows, noise, and safety areas, narrowing training flexibility. Fence lines adjacent to rural homesteads complicate patrols and delay suppression entry. Where rural residences cluster along gulch roads, responders may be forced into structure protection roles rather than anchoring on ridge-top control lines, raising the risk to both community safety and mission continuity. Without continuous, engineered fuel breaks along the perimeter, particularly near Canyon Ferry access points, suppression resources are repeatedly divided between defending scattered structures and holding fire lines.

Infrastructure Interdependencies: The LHTA assessment area shares transportation, utility, and water infrastructure linkages with surrounding rural users in Broadwater County. The primary access route serving both training and emergency operations is U.S. Highway 287 via Indian Creek Road and Old Woman's Grave Road, which connects directly to Townsend.

Overhead distribution lines supplying both rural customers and LHTA training infrastructure remain highly vulnerable to wind-driven ignitions and fire damage, posing a risk of extended power outages across shared service areas. Local water systems, including domestic wells and small ranch irrigation networks, are similarly susceptible to drought stress and post-fire sediment or ash contamination. Because these lifelines are shared among multiple jurisdictions, post-fire restoration priorities may not immediately favor the installation, exposing MTARNG operations to potential cascading delays in recovery and mission readiness.

Evidence Base and Planning Alignment: The Tri-County CWPP designates fuel treatment priorities and education campaigns across Broadwater County but does not identify LHTA-specific treatment blocks or controls. The Broadwater County HMP Annex acknowledges wildfire as a primary hazard but lacks installation-focused vulnerability analysis or joint planning provisions. The MTARNG Real Property Master Plan maps training infrastructure but does not integrate wildfire vulnerability overlays or land-use compatibility constraints. Together, these gaps perpetuate parcel-by-parcel development decisions that incrementally erode suppression effectiveness, staging reliability, and the ability to conduct full-scope training at LHTA.

The LHTA assessment area is surrounded by a broad range of residential and community structures that are dispersed within the assessment area (Figure 91). A total of 246 structures are in the assessment area, with 189 categorized as residences, indicating a substantial nearby population that may be affected by training operations or wildfire activity. The spatial distribution of these assets highlights the importance of coordinated emergency planning and hazard mitigation strategies to safeguard the public, infrastructure, and critical facilities adjacent to LHTA operational footprint.

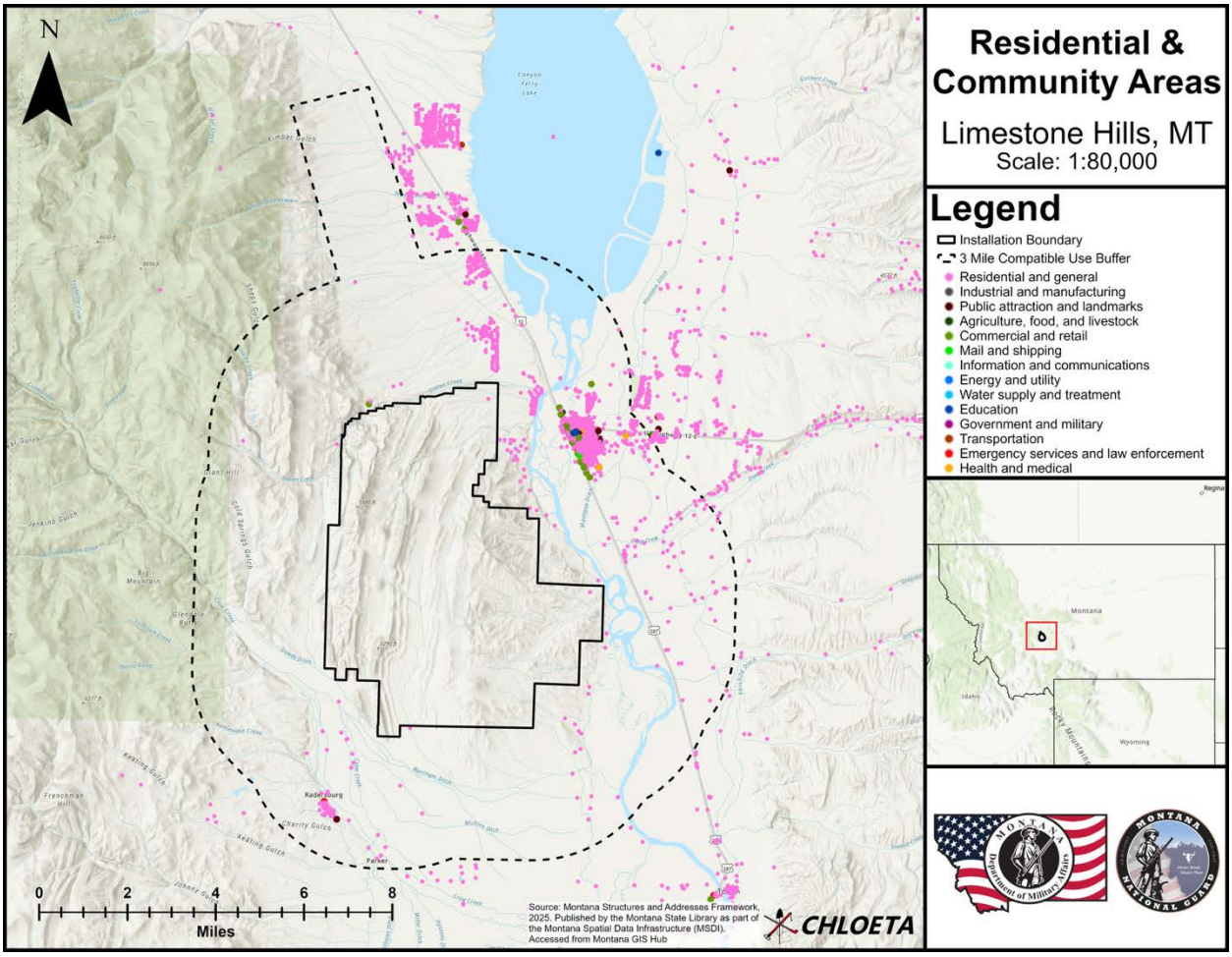


Figure 95. Residential and Community Areas within LHTA Assessment Area Map

Table 14. Structures within the LHTA Assessment Area

Structure	Quantity
Office	1

Structure	Quantity
Other	37
Residence	189
Unknown	19
Grand Total	246

Institutional Planning and Governance

Wildfire governance in the LHTA assessment area is fragmented across military, county, state, and federal stakeholders, with multiple plans in place but no integrated framework that specifically addresses installation vulnerabilities, access, or joint suppression requirements. While Broadwater County, USFS, DNRC, and MTARNG demonstrate willingness to collaborate, wildfire governance in the LHTA assessment area remains reactive and plan-by-plan, producing both overlaps and gaps.

Institutional Landscape and Roles

- MTARNG/DMA – Oversees training lands, range operations, and environmental stewardship at LHTA.
- Broadwater County – Responsible for planning, zoning, subdivision review, and emergency management, but lacks wildfire overlays or subdivision-level WUI standards adjacent to LHTA.
- DNRC (Helena) – Provides primary wildland protection and mutual aid resources for state and private lands surrounding the training area.
- USFS & BLM – Manage adjacent federal lands, contributing suppression capacity when jurisdiction overlaps (e.g., Big Belt Mountains to the north; BLM tracts near Canyon Ferry). USFS provides emergency suppression on LHTA through an IAA with the MTARNG.
- Rural Fire Districts (Townsend) – Provide initial suppression but rely heavily on volunteers with limited surge capacity.
- Utility Providers (NorthWestern Energy, cooperatives) – Operate overhead distribution feeders that traverse sagebrush/juniper corridors near LHTA, posing both ignition risk and service continuity issues.
- Conservation stakeholders (PPLT, local land trusts, ranchers' associations) – Manage open-space easements and grazing lands around Canyon Ferry, offering potential partners for buffer treatments.

Existing Plans and Limitations

- Broadwater County HMP Annex (2024): Identifies wildfire as a top hazard but lacks LHTA-specific mitigation measures, egress analysis, or buffer standards tied to mission assurance.
- Tri-County CWPP (2020): Provides regional fuel treatment priorities but does not designate installation-focused fuel breaks or controls.
- MTARNG INRMP & Real Property Master Plan (2023): Map training and habitat areas but do not include wildfire vulnerability overlays, burn-window protocols, or codified suppression playbooks with county/state partners.
- JLUS (2014, Fort Harrison focus): Did not extend compatibility analysis to LHTA; no subsequent study has addressed LHTA unique wildfire context.

Coordination Gaps Affecting Operational Readiness

- No Joint Military Civilian Wildfire Coordination Protocol (JMCWCP). While mutual aid exists, trigger thresholds, staging areas, tactical control lines, and priority protection areas are not codified for LHTA.
- Prescribed fire authority & timing. INRMP allows for ecological burning, but shared burn-window criteria and smoke notification protocols with USFS / DNRC and county districts are not defined. This limits proactive juniper and sagebrush management.
- Evacuation integration. County evacuation planning near LHTA, Townsend, and Canyon Ferry is informal and unpublished. Roles for traffic control, staging, and troop movement during a wildfire are unclear.
- Policy levers unimplemented. Broadwater County zoning lacks wildfire overlays, secondary egress mandates, defensible-space maintenance, and utility hardening requirements in subdivisions near LHTA. These gaps constrain suppression, evacuation, and fuel treatment options.

Governance Risks

- Incident conflicts. Competing objectives (defending rural homes vs. securing range assets) could overwhelm volunteer and DNRC resources during fast-moving fires.
- Incremental encroachment. Parcel-by-parcel development along Indian Creek and River Road erodes maneuver space and staging options, driving higher suppression costs over time.
- Funding disadvantages. Without codified overlays, agreements, or plan integration, LHTA-related mitigation projects are less competitive for REPI, and OLDCC resilience funding.

Findings, Implications, and Recommendations

1. Outdated Plans, Gap Analyses, and Unaligned Planning Frameworks

Findings

Wildfire resilience planning across military, county, and regional stakeholders is active but misaligned, with significant gaps in installation-specific integration. For FHTA, the 2014 Joint Land Use Study (JLUS) identified compatibility issues but has not been updated to reflect post-2014 WUI expansion or evolving fire-weather conditions. HMPs recognize wildfire as a top hazard but lack installation-specific staging, buffer standards, or mission-assurance considerations. The 2020 Tri-County CWPP outlines fuel treatments but does not designate installation-focused projects or coordinated control points. At LHTA, the absence of a dedicated Joint-Use or CWPP-aligned overlay leaves canyon development and training access unmitigated. Meanwhile, MTARNG's INRMP and Real Property Master Plan map training and habitat stewardship but do not embed wildfire-vulnerability overlays or interagency suppression protocols. The result is a patchwork of plans that acknowledge wildfire risk but fail to align shared priorities, leaving critical resilience measures underfunded and inconsistently implemented. Appendix A provides a detailed analysis of all plans impacting the assessment areas. A summary of these findings can be found in Table 2 with summary of use in this assessment and documents weaknesses that directly contribute to this finding.

Current planning also does not fully align with the Montana Master Cooperative Wildland Fire Management and Stafford Act Response Agreement (2023–2027), the standing interagency framework that governs coordination, resource ordering, and cost sharing among DNRC, USFS, BLM, U.S. Fish and Wildlife Service (UFWS), National Park Service (NPS), and local governments during large wildfire incidents. While the 2024 MTARNG IWFMP cites this Agreement in its Appendix D, its operational provisions, including unified-command activation, fiscal authorities, and mutual-aid thresholds, are not yet embedded in MTARNG or county wildfire annexes. The absence of cross-referenced triggers, pre-identified staging areas, and cost-share templates undercuts interoperability with state and federal partners during initial attack and extended operations.

Current planning does not meet the integration and currency expectations of FEMA's Local Mitigation Planning Policy (2023) for cross-plan alignment (HMP or CWPP compatibility studies), nor the DoW "Compatible Use" planning standard that requires routine updates when exposure materially changes (post-2014 growth near FHTA). At the installation level, AR 420-1 and DoDI 6055.06 / 6055.17 call for an integrated fire/emergency program with current mutual-aid procedures, hazard overlays, and interagency agreements consistent with the Montana Master Cooperative Agreement, none of which are yet fully codified in county plans or zoning. County subdivision and growth policies remain out of sync with installation exposure, lacking mandatory wildfire overlays or evacuation-annex references.

FHTA

- JLUS (2014) no longer reflects current WUI exposure: Post-2014 growth along Country Club–Williams corridor and increased Red-Flag frequency remain unaddressed; JLUS recommendations were never codified into a Military Wildfire Compatibility Overlay, leaving no binding standards for egress, fuel-mod areas, or ignition-resistant construction.
- HMP / CWPP cite wildfire but lack installation annexes: Tri-County plans omit FHTA-specific control lines / backfire windows, staging pads and helispots by type, hydrant spacing and fire-flow targets south of the cantonment, evacuation schematics linking VA patient movement and contraflow. While these elements are addressed within community-level PPPs, those plans are maintained separately by individual jurisdictions, are not unified or fully integrated, and are in most cases outdated.
- INRMP / RPMP (2023) not operationalized for wildfire: Plans map training and habitat assets but omit vulnerability overlays (ERC exceedance, ignition density, smoke corridors), burn-window criteria, and signed interagency playbooks defining roles, triggers, comms channels, and control points.
- 2024 IWFMP meets Army G9 and DoW standards but does not address off-installation pressures or land-use conflicts identified since completion. It maintains a total-suppression posture without mechanisms for joint fuel-management projects, coordinated evacuation routes, or CWPP integration, functioning primarily as an internal response document rather than a cross-jurisdictional framework.
- Data & metrics not embedded: RAWS trends (Red Flag days, ERC), Evacuation Clearance Time modeling, tender cycle-time isochrones, and lifeline outage risk (power / water / comms) are not wired into annex decision metrics.

LHTA

- No JLUS-equivalent or joint-use study; wildfire exposure and single-access routes remain unmitigated.
- HMP / CWPP lacks LHTA-specific projects: HMP / CWPP cite wildfire but lack installation annexes: Tri-County plans omit LHTA-specific control lines / backfire windows, staging pads and helispots by type, hydrant spacing and fire-flow, evacuation schematics linking movement and contraflow. While these elements are addressed within community-level PPPs those plans are maintained separately by individual jurisdictions, are not unified or fully integrated, and are in most cases outdated.
- No codified WUI standards: County code lacks secondary egress, road geometry minimums, ignition-resistant construction, and utility hardening near training area.
- No integrated ICS / evac annex: Trigger thresholds, TCP maps, refuge areas, air-to-ground comms, and role transfer (county ↔ DNRC ↔ DMA) are not codified, causing ad hoc coordination under the 2023–2027 Cooperative Agreement.

Cross-Cutting Misalignments (Both Installations)

- Strategy-to-capital gap: Plans list hazards but do not convert them into engineered, phased projects with site control, 30 % design, NEPA path, and O&M commitments, lowering REPI and OLDCC scores.
- Policy disconnects: Plan recommendations are not mirrored in zoning or overlay code (egress, hydrants / flow, defensible space, utility hardening, prescribed-burn protocols).
- Authoritative map set missing: No shared, version-controlled operational atlas (control lines, staging pads, helispots, draft sites, egress, debris-flow pinch points, lifelines) for all agencies.
- Governance not formalized: No Joint Military–Civilian Wildfire Coordination Protocol (JMCWCP) or MOU network that codifies the 2023–2027 Cooperative Agreement's roles, triggers, and cost-share responsibilities.
- Update cadence lagging: No defined refresh cycle (3–5 years) linking HMP / CWPP / INRMP / IWFMP updates and annual review under the Master Cooperative framework.
- FAA restricted airspace updates (2025) not incorporated into county emergency annexes, potentially affecting coordinated air operations during wildfire events.
- NorthWestern Energy Wildfire Mitigation Plan not cross-referenced with MTARNG or county plans, leaving ignition-risk zones and PSPS considerations unaligned with evacuation planning.
- BLM and USFS fuels-management programs not integrated, no crosswalk exists between federal treatments and county/installation priority corridors.
- No incorporation of DEQ watershed or post-fire sediment models into road-failure, debris-flow, or water-supply assessments within county or MTARNG plans.
- Climate and ERC trend data (PRISM, RAWS, NIFC) not embedded into annual readiness updates or wildfire annex triggers.
- Conservation easement and open-space partnership opportunities (PPLT/REPI) are not reflected in county growth policy or zoning overlays to prevent incompatible subdivision expansion in high-risk blocks.
- Lack of formal joint mapping of ignition-density hotspots, including rail, utility, recreational-access, and historic fire-start zones identified through NIFC and LANDFIRE datasets.

Implications

The persistence of outdated and unaligned planning frameworks in both assessment areas has serious operational, governance, and funding consequences. Without updated, installation-specific annexes aligned with the Montana Master Cooperative Wildland Fire Management and Stafford Act Response Agreement (2023–2027), wildfire mitigation remains largely reactive and fragmented. Jurisdictions operate under different response assumptions and resource ordering

protocols, delaying unified command activation and cost-share implementation when large fires occur.

From a governance standpoint, the absence of synchronization across HMPs, CWPPs, INRMPs, and Real Property Master Plans contradicts DoW and FEMA policy requirements for cross-plan integration and hampers eligibility for federal resilience funding. Because FEMA and DoW programs increasingly reward alignment, project readiness, and policy enforceability, installations risk losing competitive standing for REPI, and OLDCC grants if they cannot demonstrate compliance with the 2023–2027 Agreement's operational principles.

Ultimately, the implications are:

- Slower and costlier incidents: Without pre-approved control lines, staging pads, or water points recognized under the Master Cooperative framework, first-period response is delayed by improvisation.
- Mission downtime risk: Lack of integrated evacuation / ICS annexes and role transfer protocols under the Agreement delays re-entry and complicates VA Medical patient movement and MTARNG training operations.
- Reduced funding competitiveness: Absent annex alignment and Cooperative Agreement reference lower scores for policy alignment and maintained benefits in grant review.
- Inconsistent enforcement: Guidance without zoning or mutual-aid code adoption continues to erode defensible depth and interagency accountability.

Recommendations

Deliver a coordinated Planning Realignment and Integration Program that updates and synchronizes all major federal, state, and local frameworks governing wildfire management and mission assurance for FHTA and LHTA. The program must explicitly align with the Montana Master Cooperative Wildland Fire Management and Stafford Act Response Agreement (2023–2027) and DoW/Army requirements for integrated emergency management (AR 420-1, DoDI 6055.06, DoDI 6055.17). The package should:

- Modernize and replace outdated frameworks (legacy RPMP, CWPPs, PPPs) with installation-specific annexes.
- Integrate installation response and evacuation protocols directly into county HMPs, CWPPs, and local zoning ordinances.
- Produce a single, authoritative Operational Atlas for all incident-response partners.
- Establish a 3–5-year refresh cycle with data governance, cooperative agreement alignment, and maintained-benefit tracking to sustain OLDCC, and REPI funding eligibility.

A. Land Use & LHTA Compatibility Studies

- Prepare a comprehensive compatibility study analysis for FHTA and LHTA assessment areas to address WUI growth, changes in ignition density, and increased Red Flag warning frequency that evaluates terrain-driven access constraints, and evacuation feasibility.
- Translate study findings into enforceable planning and regulatory mechanisms, including establishment of Military Wildfire Compatibility Overlay Zones (MWCOZs), adoption of secondary-egress requirements, and implementation of critical-infrastructure hardening standards, consistent with DoD compatible-use guidance and FEMA (2023) policy alignment criteria.
- Ensure the compatibility studies incorporate operational triggers, cost-share frameworks, and cooperative command structures identified in the 2023–2027 Montana Master Cooperative Agreement.

B. Installation Annexes to County Plans (HMP & CWPP)

- Develop FHTA and LHTA wildfire annexes for inclusion in the Lewis & Clark County and Broadwater County Annexes of the Western Montana Regional Hazard Mitigation Plan and the Tri-County Community Wildfire Protection Plan (CWPP).
- Define coordination roles, decision thresholds, and resource-ordering frameworks applicable to FHTA and LHTA that are consistent with the Master Cooperative Agreement, including cost-share provisions and unified command principles, without duplicating incident-specific operational plans or ICS procedures.
- Establish performance-tracking and maintenance expectations for fuels treatments and response infrastructure (e.g., treatment effectiveness, anticipated maintenance intervals, inspection considerations, and water-supply functionality) to support FEMA hazard-mitigation reporting and DoW readiness requirements, with implementation details maintained in installation-specific annexes, operational atlases, and annual work plans.

C. Operational Atlas (Authoritative, GIS-based)

- Develop and publish an integrated, version-controlled GIS atlas encompassing all operational layers: control lines, staging pads, helispots, TCPs, hydrants/tanks/draft sites, culverts/sensors, utility corridors, RAWS stations, and MWCOZ/WUI boundaries.
- Link all map layers to the 2023–2027 Cooperative Agreement's resource-sharing areas and jurisdictional boundaries for rapid incident coordination.
- Provide field-ready map books and QR-code access for responders; maintain a web-map interface with permissioned access for USFS, DMA, DNRC, counties, and utilities.

D. Data Governance & Refresh Cycle

- Establish a Data Stewardship MOU between DMA, counties, DNRC, and utilities defining ownership of GIS layers, annual update frequencies, and QA/QC procedures.

- Integrate plan refreshes into the Master Cooperative Agreement's annual review cycle, ensuring shared data consistency for wildfire, fuel treatments, and evacuation assets.
- Conduct an annual After-Action and Lessons-Learned Workshop to incorporate incident outcomes and exercise feedback into operational maps and annexes.

E. Alignment with Funding & Compliance

- Perform a crosswalk between the updated plans and OLDCC, REPI, and State Hazard Mitigation Assistance (HMA) criteria, ensuring inclusion of maintained benefits, and shovel-ready project placeholders.
- Prepare grant boilerplate materials, risk narratives, cost-benefit data, O&M commitments, linked to the Operational Atlas and wildfire annexes to improve scoring on readiness, feasibility, and maintained benefits.
- Document plan alignment with AR 420-1, DoDI 6055.17, and the 2023–2027 Montana Master Cooperative Wildland Fire Management and Stafford Act Response Agreement, demonstrating compliance with interagency coordination and operational-integration requirements.

Lead / Partners

- Leads: MTARNG/DMA (Range Ops & Real Property), Lewis & Clark & Broadwater County Planning, Tri-County FireSafe Working Group.
- Key Partners: VAFD, USFS, DNRC; City of Helena Utilities; NorthWestern Energy & Vigilante Electric; Fire Districts; DES; USFS/BLM (adjacent lands).
- Advisory: FEMA Region VIII (HMGP), OLDCC, DoW REPI, ISO PPC advisors, MDT (traffic ops), public health/hospitals.

Supporting Facts

- **Outdated Baseline:** The 2014 JLUS predates major WUI expansion along the Country Club–Williams corridor and does not capture current fire-weather conditions, including an average of ~19 Red Flag Days per year (2018–2023) and updated LANDFIRE 2022 fuel classifications. These data shifts indicate higher ignition probability and faster fire spread potential, particularly near the southern FHTA perimeter.
- **Plan Gaps and Cooperative Misalignment**: Current HMPs and the Tri-County CWPP acknowledge wildfire as a top hazard but lack installation-specific operational layers, including staging pads, helispots, TCPs/contraflow routes, hydrant/tank/draft nodes, debris-flow pinch points, and fuel-break maintenance schedules, needed for coordinated suppression. Moreover, neither plan formally references or adopts operational procedures defined under the Montana Master Cooperative Wildland Fire Management and Stafford Act Response Agreement (2023–2027), the standing interagency framework governing DNRC, USFS, BLM, FWS, NPS, and local jurisdictions during large wildfire incidents.

This omission limits interoperability and resource-ordering consistency between MTARNG and civilian partners during unified command operations.

- **Mission Assurance:** Past wildfire incidents, including Canyon Creek (1988) and Woods Creek (2021), caused prolonged road closures, power interruptions, and dense smoke intrusions, demonstrating that current installation and county evacuation frameworks are not aligned for sustained access or re-entry. These recurring disruptions highlight the need to embed military evacuation, communication, and continuity procedures into county and state emergency annexes under the Cooperative Agreement structure.
- **Funding Reality:** Federal resilience programs (REPI, OLDCC) are increasingly oversubscribed and prioritize projects demonstrating clear interagency policy alignment, metrics-based readiness, and maintained-benefit documentation. Plans without cross-referenced annexes, cooperative-agreement triggers, or mapped decision metrics (e.g., Evacuation Clearance Time reductions, outage hours avoided, tender cycle-time improvements) receive lower technical scores, directly reducing DMA and county competitiveness for resilience and mitigation funding.

Cost Estimate (planning-level ranges)

- Land compatibility study: $250k–$450k.
- HMP/CWPP installation annexes (both counties): $150k–$300k.
- Operational atlas (build, field map books, web map, QR deployment): $120k–$250k.
- Data stewardship & refreshments (MOUs, QA/QC, scripts): $40k–$90k.
- Annual AAR workshop & minor atlas updates: $25k–$60k/yr.
- Total initial program: $560k–$1.09M, plus $25k–$60k/yr sustainment.

Potential Funding

- OLDCC– Planning & Community Infrastructure pre-development.
- USFS Community Wildfire Defense Grant (CWDG) – planning track: CWPP modernization with enforceable, mapped actions.
- DoW REPI (planning/pre-acquisition): buffer alignment and corridor mapping tied to easements.
- DNRC preparedness & state mitigation planning grants.
- Local matches: planning staff time, Open Lands program (data to support conservation corridors), utility GIS support.

Why this matters: Updating and aligning HMP/CWPP/INRMP with a shared operational atlas turns disparate documents into a single playbook that unlocks funding, speeds operations, and measurably improves wildfire resilience in FHTA and LHTA assessment areas.

2. Governance and Coordination Gaps

Findings

Wildfire resilience for both assessment areas are constrained by a fragmented governance environment in which military, civilian, state, federal, and private stakeholders share responsibility but operate without a unified framework for wildfire mitigation, suppression, evacuation, or recovery. While multiple plans (HMPs, CWPPs, INRMPs, RPMPs, IWFMP) acknowledge wildfire risk, they are not aligned into an operational framework, leading to duplication in some areas and dangerous gaps in others.

The absence of a signed, triggered Unified Command/JMCWCP (with ICS-205/205A, control points, staging, and evacuation roles) falls short of DoDI 6055.17 (Emergency Management Program) and NIMS/ICS implementation expectations for interagency coordination. Mutual-aid is present, but scenario-based SOGs, activation thresholds, and typed resources are not formalized, which weakens compliance with AR 420-1 fire program governance and state NIMS adoption requirements for local partners. County EOP/HMP annexes do not include installation-specific evacuation/traffic control plans as encouraged under 44 CFR §201.6 integration guidance.

Institutional Landscape – Multiple but Uncoordinated Roles

- Military (MTARNG): Oversees training lands and cantonments but lacks on-site suppression capacity beyond VAFD, USFS; depends on civilian mutual aid.
- County & City: Lewis & Clark and Broadwater Counties regulate zoning, approve subdivisions, and coordinate emergency management; the City of Helena provides critical lifelines (water, waste, power).
- State (DNRC): Primary wildfire protection agency; manages aviation, mutual aid, and statewide fuel-treatment priorities but with limited resources during peak fire years.
- Federal (USFS/BLM): Manage adjacent public lands but have different objectives (timber, habitat, recreation).
- Non-governmental partners: Tri-County FireSafe Working Group, PPLT, and utilities (NorthWestern Energy, Vigilante Electric) and Phillips 66 (Yellowstone pipeline) contribute, but their activities are not codified into installation-centric strategies.

No Joint Military–Civilian Wildfire Coordination Protocol (JMCWCP):

- Existing mutual aid agreements cover general support but do not codify triggers, staging areas, control lines, or communication protocols specific to FHTA/LHTA wildfire incidents.
- Lessons learned from Canyon Creek Fire (1988) and Woods Creek Fire (2021) highlighted delayed coordination between incident commanders, military, and county responders.

Plan Misalignment and Outdated Frameworks:

- JLUS (2014) identified compatibility risks near FHTA but has not been updated to reflect post-2014 WUI growth or current fire-weather conditions.
- HMPs and CWPP recognize wildfire as top hazards but lack FHTA/LHTA-specific annexes for staging, evacuation, and buffer standards.
- INRMPs and RPMPs (2023) describe training areas and habitat stewardship but omit vulnerability overlays, burn-window protocols, and joint suppression playbooks which are included in the 2024 MTARNG IWFMP but not integrated uniformly.

Zoning and Enforcement Deficiencies:

- Neither county mandates wildfire overlays, ignition-resistant construction, defensible-space compliance, nor secondary egress in subdivisions within 1–3 miles of installation perimeters.
- This absence of enforceable code translates into parcel-by-parcel approvals that gradually erode defensible depth around FHTA and LHTA.

Funding and Project Delivery Gaps:

- Misaligned plans to reduce competitiveness for REPI, and OLDCC funding, as grant scoring favors integrated, multi-jurisdictional frameworks with enforceable codes and shovel-ready projects.
- Lack of a unified governance dashboard means progress (treated acres, access upgrades, hydrant installations, outcome metrics) is not consistently tracked or reported across agencies.

Limited Exercise and After-Action Integration:

- Exercises remain siloed, military TTXs focus on mission assurance, while county/state scenarios prioritize civilian evacuation.
- No recurring, joint wildfire exercise integrates FHTA/LHTA corridors, VA Medical Center patient movement, Canyon Ferry recreation surge, and interagency suppression roles.

Implications

The fragmented governance structure surrounding the FHTA and LHTA assessment areas produces delays, inefficiencies, and missed opportunities that directly undermine wildfire resilience and mission assurance. Without a unified framework, incident commanders face conflicting objectives, civilian structure protection, VA patient evacuation, perimeter control, and training asset defense, without a shared decision tree to prioritize actions. Outdated plans, the 2014 JLUS no longer match current WUI conditions, and the absence of enforceable wildfire overlays means parcel-by-parcel development continues to narrow defensible buffers around both installations. At the same time, overlapping but uncoordinated planning documents (HMPs, CWPPs, INRMPs, RPMPs) create duplication in strategy but gaps in execution, leaving critical

needs to include joint staging areas, pre-approved control lines, and coordinated evacuation protocols unaddressed.

From a funding standpoint, this lack of alignment diminishes grant competitiveness for programs like REPI, and OLDCC, which increasingly reward integrated, multi-jurisdictional approaches with enforceable codes and shovel-ready projects. Operationally, governance gaps extend incident duration and mission downtime, as suppression and recovery hinge on ad hoc agreements rather than codified roles, trigger thresholds, and performance metrics. Unless addressed, governance fragmentation will perpetuate a cycle of slower responses, higher costs, and incremental vulnerability growth, eroding both community resilience and the installations' long-term readiness.

- Delayed response and unclear priorities during wildfire incidents, as perimeter control, structure protection, and evacuation support compete without a joint decision tree.
- Higher incident costs and extended mission downtime due to reliance on ad hoc agreements rather than codified suppression and recovery protocols.
- Incremental vulnerability growth around both installations as unregulated WUI development proceeds without military coordination.
- Reduced funding competitiveness for resilience grants, as misaligned frameworks and lack of enforceability weaken benefit–cost ratios and feasibility scores.

Recommendations

Establish and adopt a Joint Military–Civilian Wildfire Coordination Protocol (JMCWCP) for FHTA and LHTA assessment areas that converts today's informal, personality-driven coordination into a triggered, typed, and exercised operating system. The JMCWCP sets unified command triggers, pre-assigned roles, radio/comms plans, resource-typing and staging, and evacuation/medical movement integration, all mapped in a shared Operations Playbook & Atlas. It directly addresses observed coordination gaps during Red Flag periods (approximately 19 days per year, Helena RAWS), long tender cycles greater than 45 minutes at LHTA, and recurrent access conflicts on U.S. Highway 12 / Country Club / Williams / Old Woman's Grave / Indian Creek and River Road corridors.

A. Unified Command Triggers & Governance

- Define automatic activation criteria: e.g., ERC/BI ≥ 90th percentile, RH < 15%, sustained winds ≥ 20–25 mph, any start within three miles upwind of installations, or plume arrival ≤60 min.
- Publish an ICS org chart with pre-named staff for support in Unified Command during assessment area wildfires or threatened wildfires.
- Formalize via MOUs/IGAs, with legal review and authorities to close roads, order evacuations, redirect lifeline crews, and request aviation.

B. Resource Staging & Control Points

- Pre-assign staging/refuge pads and priority control lines by polygon:
  - FHTA: Williams/Country Club pads; Birdseye foothill control; Blue Cloud line.
  - LHTA: Old Woman's Grave / Indian Creek and lower River Road pads/lines.

C. Air–Ground & Interoperable Communications

- Pre-plan TFR request templates and deconflict AAF/UAS operations; publish initial check-in points for SEAT/helo.

D. Evacuation & Traffic Integration

- Embed evacuation areas, Traffic Control Points (TCPs), contraflow, no-parking fire lanes, and Temporary Refuge Areas (TRA) into the playbook; include Evacuation Clearance Time (ECT) targets by zone.

E. Common Operating Picture (COP) & Playbook

- Maintain a real-time COP (web map dashboard) with pads/helispots/TCPs/hydrants/tanks/draft sites/culvert sensors/utility outages/RAWS; auto-ingest weather & alerts.
- Publish a field map book with QR codes for all first-due companies and ICPs, version annually with change logs.

F. Exercises, AARs, and Continuous Improvement

- Annual tabletop exercise and functional or full-scale exercise rotation (FHTA one year, LHTA next) covering IA, aviation, TCPs, and medical movement.
- Require AARs within 14 days; update playbook/SOPs within 60 days; track corrective actions to closure.

Lead / Partners

- Leads: MTARNG/DMA (Range Ops & Real Property), Lewis & Clark & Broadwater County Emergency Management, DNRC Fire Protection Bureau.
- Key Partners: Rural fire districts; Sheriff/LE & MDT (traffic ops); VA EM; City of Helena Utilities; NorthWestern Energy & Vigilante Electric; USFS/BLM (adjacent lands/aviation).
- Advisory: Hospitals/clinics, public health, school districts, Tri-County FireSafe Working Group, airport/AAF managers.

Supporting Facts

- Frequent Red-Flag periods (~19 days/yr, 2018–2023) and fine-fuel spread 6–10 mph demand minute-scale coordination.

- >35 wildfire starts within 10 mi of FHTA (2010–2023) with repeat ignition areas along U.S. Highway 12 and Blue Cloud; LHTA canyon access and tender cycles >45 min routinely delays IA.
- Current HMP/CWPP/INRMP lacks a unified, triggered annex, producing delays in TCP staffing, aviation ordering, and lifeline de-energization/sectionalizing during fast starts.

Cost Estimate

- MOU/IGA development, legal, governance workshops: $60k–$120k.
- Playbook build (SOPs, ICS forms, radio plan) + COP integration with atlas: $120k–$250k.
- Interoperability radio cache & programming: $60k–$120k.
- Exercises & AARs (annual): $50k–$100k/yr.
- Training (NWCG/ICS refreshers, UC clinics): $25k–$60k/yr.
- Total initial: $240k–$490k; sustainment $75k–$160k/yr. (Capital for pads/helispots/tanks is covered in Recs #5, #8, #9, #12.)

Potential Funding

- DHS Homeland Security Grant Program (state pass-through): interoperable comms, ICS training/exercises.
- OLDCC Planning / Community Infrastructure (pre-development): defense-adjacent coordination systems.
- USFS Community Wildfire Defense Grant (planning track): regional playbook with CWPP annexing.
- DNRC preparedness grants; AFG (radios/PPE for partners); utility cost-share for comms & de-energization protocols.

Why this matters: A formal, trigger-based JMCWCP turns multi-agency improvisation into a repeatable, timed operation, aligning aviation, access, evacuations, utilities, and medical movement so fast-moving fires near FHTA and LHTA are caught early, and mission assurance is preserved.

3. Zoning and Policy Gaps Undermine Long-Term Wildfire Resilience

Findings

Wildfire exposure around both assessment areas is being locked in by regulatory gaps detailed in Appendix A, subdivision and zoning codes near the installations do not require WUI-specific standards, defensible-space maintenance, secondary egress, or utility hardening. Existing plans (HMPs, CWPP, INRMP/RPMP) acknowledge fire risk but do not translate into binding, map-based requirements at the parcel or corridor scale. The result is a steady increase in ignition sources

and evacuation constraints, shrinking tactical options for suppression and eroding mission assurance over time.

Neither county has adopted enforceable WUI codes/overlays (IWUIC, NFPA 1141/1144/1145 analogs) in the three-mile buffers, leaving subdivision approvals without secondary egress, hydrant/flow standards, or ignition-resistant construction, contrary to best-practice benchmarks now cited in FEMA C&CB scoring and state wildfire-adapted community guidance. This also undermines the DoW Compatible Use objective (OLDCC/REPI) to maintain defensible depth around ranges.

No enforceable WUI overlay near installation boundaries

WUI conditions are a defining risk driver for both the FHTA and LHTA assessment areas, where development patterns, vegetation, topography, and access constraints directly influence wildfire ignition potential, fire behavior, evacuation feasibility, and suppression effectiveness. Montana has established a statewide WUI code framework through statute and implementing rules, intended to guide counties in adopting enforceable standards for setbacks, fuel modification, access, and ignition-resistant construction in high-risk areas. However, despite its relevance, this statewide WUI framework is not analyzed, cited, or operationalized in the current vulnerability or wildfire assessments, nor is it reflected in county subdivision or zoning ordinances affecting lands adjacent within both assessment areas. The absence of locally adopted WUI overlays leaves development approvals largely discretionary, limits the use of standardized mitigation tools, and misses an opportunity to align county land-use decisions with state policy, potential state technical or financial assistance, and MTARNG mission-assurance needs. The following findings describe how this gap manifests around FHTA and LHTA and why adoption of state WUI standards, or targeted elements of them, represents a critical, actionable mitigation opportunity.

- FHTA Assessment Area (Lewis & Clark County/City of Helena): Subdivisions along the Country Club–Williams corridor proceed without a WUI overlay that mandates setbacks, fuel-modification areas, or training-compatible buffer widths; approvals rarely condition continuous perimeter fuel breaks or patrol roads.
- LHTA Assessment Area (Broadwater County): Development lacks wildfire-informed standards (secondary egress, roadway width, ignition-resistant construction, and vegetation management) despite repeated local ignitions, steep terrain, and limited access.

Secondary egress and roadway standards not required or inconsistently applied

- New or infill plats near both assessment areas are frequently single-egress, with narrow ROWs (sub-20-foot lanes), tight turn radii, and limited turnouts, conditions that prevent simultaneous evacuation and Type-3/4 engine access and complicated staging.

Building ignition-resistance is optional, not required

- Neither jurisdiction uniformly requires Class A roofing, ember-resistant vents, non-combustible 0–5 ft areas, or tempered glazing in the buffer; HOAs commonly permit

combustible fencing and ornamental conifers to the structure line, increasing ember and direct flame contact risk.

Defensible-space standards exist in guidance but lack enforcement

- No countywide inspection/maintenance program exists to enforce 0–30 ft lean/clean/green and 30–100+ ft thinning around structures near the fence lines; compliance is largely voluntary and decays over time without covenants or enforcement.

Water supply and fire-flow are not codified to WUI needs

- FHTA Assessment Area: Hydrant spacing and minimum fire-flow south/southeast of cantonment are not specified in a WUI overlay; there is no requirement for developer-funded storage or hydrant loops that support structure defense along the perimeter.
- LHTA Assessment Area: No hydrant standard exists; subdivision approvals near access corridors do not trigger on-site tanks or permanent draft sites, leaving 45+ minute refill cycles during drought or turbidity events.

Utility hardening and vegetation management not tied to land-use approvals

- Overhead distribution feeders on wooden poles traverse grass/juniper fuels with no local ordinance requiring covered conductor, spacer cable, high wind reclosing settings, or enhanced clearance areas as a condition of subdivision or site plan approval.

Prescribed fire and blackline creation lack a permitting "fast lane"

- INRMPs support burning, but there are no shared burn-window criteria, smoke notification areas, or pre-approved treatment blocks adopted in local code.

Plans are unaligned and out of date

- FHTA Assessment Area: The 2014 JLUS is outdated relative to post-2014 WUI growth; HMP/CWPP mentions wildfire but lacks installation-specific annexes and reference information for Population Protection Plans which contain additional wildfire response and control measures.
- LHTA Assessment Area: No JLUS-equivalent exists; the CWPP does not map LHTA fuel-break corridors or canyon egress requirements; county zoning lacks a military-compatibility article.

Funding competitiveness reduced by missing policy hooks

- REPI & OLDCC favor projects backed by adopted overlays, MOUs, and codified standards; without them, both counties score lower on feasibility, community lifelines, and maintained benefits, constraining long-term mitigation pipelines.
- FHTA Assessment Area: Country Club/Williams corridor lacks: secondary egress mandates; 24-ft minimum lane widths with 96-ft turnarounds for heavy apparatus; hydrant

spacing (≤500–1,000 ft) and ≥1,500 gpm at 20 psi for 2 hr. near the fence; covenanted 0–5 ft non-combustible areas; and a mapped 50–150 ft engineered fuel-break system tied to rights-of-way/easements.

- LHTA Assessment Area: Lacks two independent egress routes for clusters of residences/cabins; specific road width/grade standards; Class A roof/ember-resistant vent requirements; and utility-hardening conditions along access corridors.

Implications

The absence of enforceable wildfire-specific zoning and development standards near FHTA and LHTA places both assessment areas on a trajectory of escalating vulnerability and diminishing mission assurance. Each new subdivision approval without secondary egress, hydrant spacing, or ignition-resistant construction further erodes defensible depth and complicates suppression. Voluntary defensible-space compliance and non-binding growth policies create a patchwork of resilience, where one poorly planned parcel can compromise entire corridors. In the FHTA assessment area, unchecked growth along the Country Club–Williams corridor narrows space for tactical fuel breaks and increases complaint-driven limits on prescribed fire, constraining Range Operations. In the LHTA assessment area, canyon developments without redundant access or water storage heighten the risk of entrapment, structure loss, and delayed suppression in terrain already prone to extreme fire runs. Over time, these zoning and policy gaps lock both installations into higher recurring costs, diverting limited resources to structure protection and infrastructure recovery, while reducing competitiveness for resilience funding programs to include REPI, and OLDCC that prioritize projects with codified policy support. Without urgent adoption of wildfire overlays, buffer easements, and enforceable construction/egress standards, both assessment areas will face increasingly frequent trade-offs between protecting adjacent development and sustaining uninterrupted military readiness.

Recommendations

Description: Adopt, align, and enforce a wildfire-resilient policy stack for the 3-mile buffers so new growth, reinvestment, and utilities measurably reduce ignition potential and improve suppression/evacuation performance. This package updates county ordinances, subdivision regulations, and public-works standards and embeds enforceable requirements on plats and permits.

A. Adopt WUI & Development Standards (code text + technical specs)

- WUI Construction (IWUIC/NFPA 1144/1145 aligned):
- Class-A roof, ignition-resistant siding, ember-resistant vents, tempered glazing on exposures.
- 0–5 ft non-combustible zone, 5–30 ft Lean-Clean-Green, 30–100+ ft defensible space by slope.
- Site & Street Geometry (NFPA 1141/IFC-D104 analogs):

- Secondary egress for all new subdivisions; primary access ≥24-ft paved with 13'6″ vertical clearance, grades ≤10%, turnarounds ≥96-ft; gated access with KNOX spec.
- Hydrants/Fire Flow (FHTA buffer): spacing ≤500–1,000 ft, available fire flow ≥1,500 gpm for 2 hours; looped mains; modeled via ISO/NFPA 1142.
- Water Supply (LHTA buffer): require fixed tanks (≥50–100k gal) or year-round draft/dry hydrants within 10 minutes of every lot; recorded as easements with O&M.
- Utility Hardening: covered conductor or spacer cable in Very High areas; widened clearances; steel/concrete poles at ridge saddles; recloser settings for Red Flag operations.
- Fuel-Break/Access Easements: record 50–150 ft Tactical Fuel Break Corridors and patrol roads on plats along Country Club/Williams and Old Woman's Grave/Indian Creek.
- Staging/Refuge on Plats: require pre-engineered Type-3/4 staging pads, helispot reservations, and signed TCP pull-outs on arterial frontages.

B. Create the Military Wildfire Compatibility Overlay (MWCOZ)

- Maps ½-mile near-fence band at FHTA and 1-mile band at LHTA with the above standards mandatory; limits high-density and cul-de-sac-only layouts; ties approvals to demonstrated Evacuation Clearance Time (ECT) and fire-flow/tank compliance.

C. Enforcement & Maintenance

- Stand up a WUI Inspection Program (final + annual checks on DS/vegetation, tank/draft upkeep).
- Require HOA maintenance covenants for defensible space, tank access, and fuel-break re-entries (≤5-year cycle).
- Create a public WUI Compliance Portal (permits, inspections, notices of violation, renewal reminders).

D. Plan Alignment & Updates

- Insert code standards and MWCOZ maps as adopted annexes to HMP, CWPP, and INRMP/RPMP; publish an authoritative operational atlas (control lines, pads, helispots, draft sites, TCPs, debris-flow pinch points).

Lead / Partners

- Leads: Lewis & Clark County Planning & Building; Broadwater County Planning & Public Works; MTARNG/DMA (Range Ops & Real Property).
- Key Partners: DNRC Fire Protection Bureau; City of Helena Utilities; rural fire districts; NorthWestern Energy & Vigilante Electric; Tri-County FireSafe Working Group; PPLT; VA Medical Center EM.

- Advisory: USFS/BLM (adjacent lands), ISO PPC advisors, local homebuilder associations.

Supporting Facts

- Outdated frameworks: JLUS (2014) is not aligned with post-2014 WUI expansion near FHTA; HMP/CWPP lack installation-specific, enforceable requirements.
- Access deficits: Multiple plats within the Country Club–Williams corridor approved with single egress and substandard widths, documented bottlenecks during peak fire weather.
- Water gaps: Hydrant scarcity south/southeast of FHTA; no hydrant network at LHTA, tender cycles >45 min to stable draft points.
- Ignition & weather: DNRC shows >35 starts within 10 miles of FHTA (2010–2023); Helena RAWS averages ~19 Red Flag days/year (2018–2023); fine-fuel/brush regimes produce 6–10 mph spread in wind events.
- Funding rubrics: FEMA /OLDCC scoring favors adopted codes/overlays, secondary egress, and maintained benefits; REPI emphasizes compatible-use buffers.

Cost Estimate (planning-level)

- Code drafting/adoption & map prep: $100k–$200k (legal, public process, GIS).
- WUI Inspection start-up (2 FTE + equipment): $250k–$400k year-1; $180k–$300k/yr ongoing O&M.
- Compliance Portal (build + hosting 3 yrs): $40k–$90k.
- Annex integration/atlas: $250k–$450k.
- Stakeholder training (builders/real estate/HOAs): $25k–$60k.

Potential Funding Sources

- FEMA HMGP Post-Fire / Pre-Disaster: pair with code-driven infrastructure items.
- OLDCC: planning and compatibility policy development near defense sites.
- USFS Community Wildfire Defense Grant (CWDG): CWPP updates with enforceable standards and public education.
- DNRC Community Preparedness & Fire-Adapted MT: planning, training, inspection support.
- REPI/REPI Challenge: to secure fuel-break/compatibility easements required by MWCOZ.
- Local: Planning fees, subdivision exactions, Open Lands (easement match), utility cost-share for hardening conditions.

Why this natters: This recommendation turns best-practice guidance into enforceable standards, stopping the parcel-by-parcel erosion of defensible depth and lifting the county/installation portfolio to the top tier of REPI & OLDCC scoring.

4. Incompatible Land Use and Encroachment Near Military Installations

Findings

Wildfire risk in both assessment areas are magnified by land-use patterns and encroachment. Rapid residential infill, seasonal recreation growth, and fragmented zoning standards have allowed development to advance directly into high-risk WUI areas that border training ranges. These patterns introduce ignition sources, constrain evacuation and suppression operations, and reduce defensible depth around military boundaries. At FHTA, dense subdivision growth in the Country Club–Williams corridor erodes space for fuel breaks and staging areas, while at LHTA, seasonal cabins and dispersed homes in steep canyons create untenable evacuation routes and complex suppression requirements. In both locations, incompatible development increases ignition density, limits prescribed fire options, and forces military responders and mutual-aid partners to prioritize scattered structure defense over perimeter control. This encroachment represents a systemic vulnerability: it simultaneously undermines mission assurance, strains emergency response, and amplifies wildfire consequences for civilian populations and military operations alike.

The lack of a Military Wildfire Compatibility Overlay (MWCOZ) and egress/hardening conditions in subdivision review conflicts with OLDCC Compatible Use planning intent and REPI program objectives (10 U.S.C. §2684a) to preserve mission compatibility. County road standards are not consistently aligned with IFC D-series fire-apparatus access analogs (widths/turnarounds/grades), and defensible-space enforcement mechanisms are absent, leaving local implementation out of step with state wildfire-adapted community standards and FEMA mitigation policy expectations.

FHTA

- WUI growth inside the assessment area has added dense residential infill along the Country Club–Williams corridor, increasing ignition sources and reducing defensible depth at the fence line.
- Single-egress subdivisions and sub-standard road geometry (narrow lanes, limited shoulders, tight turn radii) impede simultaneous evacuation and Type-3/4 engine access.
- Hydrant coverage and water supply south/southeast of the cantonment are sparse, forcing long tender cycles and limiting structure protection adjacent to the installation.
- Ornamental vegetation, wooden fences, and non-ignition-resistant features dominate perimeter neighborhoods, elevating ember exposure to both homes and installation assets.
- Continuous fine-grass and juniper/brush fuels extend from private parcels to the boundary, with no continuous engineered fuel-break system on the south/southeast perimeter or south/west perimeter of FHTA for a fire start on installation moving into Blue Cloud.

- Utility extensions on wooden distribution poles (Tenmile/Birdseye corridors) traverse heavy fuels, adding start potential and outage risk that directly affects mission facilities.
- Lifelines co-located in the buffer (hospital/VA, nursing homes, transmission corridors, mobile-home parks, schools, utilities, water) increase the likelihood that structure defense will divert resources from perimeter control.
- Subdivision approvals occur without enforceable WUI overlays (egress, defensible space, ignition-resistant construction), perpetuating parcel-by-parcel compatibility loss.
- Net effect: land-use patterns convert perimeter control missions into scattered structure protection, raising suppression cost, duration, and mission-disruption probability.

LHTA

- Rural and WUI development along Crow Creek Road, River Road and east and southeast of LHTA, places homes and seasonal cabins in narrow, wind-aligned risks during wildfire events. Fires originating in these areas could rapidly move toward LHTA boundary, while a fire ignited on the training area could spread into these same populated areas, threatening residences and complicating suppression or evacuation operations.
- Access remains single-threaded via Old Woman's Graves Road with steep grades, single-lane segments, and culvert pinch points that fail during post-fire debris flows.
- No municipal hydrant network and limited draft sites force >45-minute refill cycles during drought/turbidity events, constraining structure defense.
- Overhead rural distribution feeders through sage/juniper fuels elevate ignition and outage risk, with restoration priorities shared across dispersed civilian customers.
- Discontinuous fuel breaks and limited hardened staging/helispots leave few safe anchor points when defending the installation–community interface.
- Recreation-driven growth near Canyon Ferry (campgrounds, short-term rentals, OHV routes) increases human-caused starts and evacuation complexity on peak-use weekends.
- County land-use tools lack wildfire overlays, secondary-egress mandates, and defensible-space enforcement in subdivisions near LHTA, embedding long-term incompatibility.
- Private easement and land-tenure mosaics complicate construction of continuous perimeter breaks, and patrol roads needed for rapid containment.
- Net effect: encroaching development and weak WUI standards increase ignition density, slow responder access, and convert tactical perimeter control into dispersed structure defense, elevating mission and community risk.

Implications

- Subdivision development in high-exposure areas, including Indian Creek Estates and residential nodes east of Townsend, lacks ignition-resistant construction or evacuation redundancy. These developments are located within areas designated as high wildfire hazard by the Tri-County CWPP but are not subject to any local fire overlay regulations.

The Lewis & Clark County Zoning Regulations (2022) and Broadwater County Growth Policy Addendum (2024) contain no mandatory WUI standards or restrictions near installations.

- Encroachment along the southeastern edge of FHTA and the northern slope interface of LHTA has reduced opportunities to maintain fuel breaks and implement defensible space. The FHTA JLUS (2014) identified these areas as critical for operational compatibility, but no enforceable land use mechanisms have been adopted.
- No wildfire hazard mitigation requirements exist in county subdivision review processes, despite recommendations from the Lewis & Clark County Growth Policy (2025) to preserve open space and limit sprawl in fire corridors. No WUI-specific subdivision criteria or density caps are currently applied within one mile of either installation boundary.
- Public misunderstanding of prescribed fire and military activities continues to generate resistance to land management practices, particularly in areas where new subdivisions abut open space or Range Operations areas. This situation is exacerbated by the lack of a coordinated outreach strategy, even though the Tri-County FireSafe Working Group has identified public education as a priority need.

Recommendations

Adopt and implement Military Wildfire Compatibility Overlay Zones (MWCOZs) in Lewis & Clark and Broadwater County zoning codes to directly address land-use incompatibility and encroachment in both assessment areas. They would be formally adopted and enforced by Lewis & Clark and Broadwater Counties through their zoning codes, with MTARNG and DMA providing technical data, compatibility mapping, and interagency coordination. The overlay would function as a zoning amendment that adds wildfire and military compatibility standards to existing land-use districts, consistent with DoW's ACUB authority and the OLDCC Compatible Use framework. These overlay zones should:

- Restrict continued high-density development within a designated Military Buffer Zone (½ mile around FHTA, 1 mile around LHTA). Restricting high-density development within the designated Military Buffer Zone) will be coordinated through county Growth Policy and zoning updates, consistent with DoW's ACUB authority (10 U.S.C. § 2684a), DoDI 4165.70, and OLDCC Compatible Use guidance. MTARNG and DMA will serve as technical partners to county planners, ensuring compatible land uses that preserve operational readiness and community safety.
- Codify secondary ingress/egress requirements for all new subdivisions and enforce road widths/turnouts to support simultaneous evacuation and suppression.
- Mandate ignition-resistant construction and defensible space standards (Class A roofing, ember-resistant vents, 30–100 ft vegetation clearance).
- Require subdivision reviews to include wildfire hazard assessments and integration of Tactical Fuel Break Opportunity Corridors to maintain maneuver and suppression access.

- Designate wildfire staging/refuge areas and identify road ROW expansions in subdivision plats adjacent to the installations and both assessment areas.

Implementation should be supported by an Interagency Development Review Panel, convened quarterly, to review land-use proposals within three miles of installation boundaries. The panel should include Lewis & Clark County Planning, Broadwater County Planning, MTARNG, DNRC Fire Protection Bureau, PPLT, utility providers (NorthWestern Energy, Vigilante Electric) and Phillips 66 (Yellowstone Pipeline) to ensure both land-use compatibility and lifeline hardening are evaluated prior to approval.

Complementary actions should include:

A. Public Information Campaign (with Tri-County FireSafe Working Group and DMA PAO) to educate residents on prescribed fire, WUI construction standards, and the operational realities of military training.
B. Strategic Conservation Easements & Land Acquisition in high-priority parcels, particularly Country Club Road, Old Woman's Grave Road, and the Indian Creek floodplain, to secure tactical access, buffer areas, and fuel management corridors.

Lead / Partners

- Lead Agencies: MTARNG/DMA, Lewis & Clark County Planning, Broadwater County Planning.
- Key Partners: DNRC Fire Protection Bureau, Tri-County FireSafe Working Group, PPLT (land trust), NorthWestern Energy, Vigilante Electric, Phillips 66, NRCS, U.S. DoW REPI Program, local fire districts.
- Advisory Partners: VA Medical Center Emergency Management, City of Helena Utilities Department, County Emergency Management Offices.

Supporting Facts

- WUI Growth: Since 2015, subdivision approvals in Lewis & Clark County west valley (Country Club–Williams corridor) have increased over 20%, narrowing defensible space near FHTA.
- Road Constraints: Subdivision plats frequently include single-lane ingress/egress, lacking secondary evacuation or fire apparatus access, contradicting NIST WUI best practices.
- Historical Wildfires: DNRC records confirm >35 ignitions within 10 miles of FHTA (2010–2023); local responders cite congestion and narrow ROWs as recurring suppression barriers.
- Plan Gaps: The JLUS (2014) documented land-use conflicts near FHTA but was not updated; HMP's don't incorporate installation annexes and CWPPs are planning documents and are not designed to establish enforceable standards or regulatory installation annexes.

- Conservation Need: PPLT analysis shows open space fragmentation in Helena Valley accelerated by subdivision growth; NRCS mapping confirms critical easement opportunities in Indian Creek and Country Club corridors.
- Funding Alignment: FEMA scoring guidance (2023) prioritizes zoning overlays, egress, and defensible-space codes; DoW REPI Challenge emphasizes compatible use buffer acquisition near high-risk installations.

Cost Estimate

- Overlay Zoning Development: $150,000–$250,000 (staff time, legal review, planning commission process, adoption).
- Public Information Campaign: $100,000 (3-year campaign with outreach materials, workshops, online portal).
- Interagency Review Panel Operations: $25,000 annually (administration, GIS mapping support, meeting facilitation).
- Conservation Easements / Strategic Acquisition: $5–10 million over 10 years (priority parcels near Country Club Rd, Old Woman's Grave Rd, Indian Creek floodplain; costs vary by parcel size/market rate).

Potential Funding Sources

- DoW REPI Challenge Grants: CUBs and conservation easements directly adjacent to installations.
- OLDCC Community Infrastructure Program: Military–civilian buffer protection, infrastructure hardening near installations.
- DNRC Community Preparedness Grant Program: Supports local planning, defensible space campaigns, and fuels reduction in WUI.
- NRCS Agricultural Conservation Easement Program (ACEP): Match for agricultural and floodplain easements in Indian Creek corridor.
- Lewis & Clark County Open Lands Program (pending 2025 renewal): Match for land acquisition and conservation near Country Club corridor.
- Local Match: Planning staff hours, county bond revenue, and PPLT partnership contributions.

Why this matters: Together, these measures will establish enforceable wildfire-compatible growth standards, mitigate WUI encroachment pressures, and preserve maneuver and suppression space around the cantonments and training ranges.

5. Infrastructure Vulnerabilities Impacting Access, Suppression, and Installation Operations

Finding

Mission continuity at both the FHTA and LHTA are reliant on civilian lifelines, roads, water, power, and communications, that are exposed to wildfire and lack redundancy. When any one of these systems is compromised, suppression timelines lengthen, evacuation and re-entry slow, and installation operations are interrupted. The evidence below details where and how those vulnerabilities manifest at each site.

FHTA assessment area lacks codified perimeter hydrant spacing/fire-flow targets and contingency storage, falling short of NFPA 1142/ISO-style water supply benchmarks typically referenced in WUI overlays and local public-works standards. LHTA assessment area has no hydrant network and limited draft/tank siting in plats in winter weather, which fails to meet common WUI water-supply criteria adopted by many counties. Interoperable radio plans and backup power for key repeaters are not fully standardized across agencies, which is inconsistent with DoDI 6055.17's interoperable communications expectations and state NIMS/ICS communications planning practices. Utility-hardening conditions (covered conductor/sectionalizing/vegetation standards) are not linked to land-use approvals, weakening compliance with modern state grid-resilience policy guidance and FEMA lifelines mitigation best practices.

Access & Egress (Roads and Bridges)

FHTA

- Primary access depends on U.S. Highway 12, Country Club Rd, and Williams Rd; all have fuel-lined segments, limited shoulders, and chokepoints that bottleneck simultaneous evacuation and responder ingress.
- Secondary connectors (e.g., Birdseye Rd, Blue Cloud Creek Rd) are unimproved in places and subject to washouts and post-fire debris that can render them impassable.
- Intersections near the cantonment and VA complex in the assessment area were not designed for heavy engine/tender turning radii, slowing staging and line-building during incidents.

LHTA

- Old Woman's Grave Road is the single-threaded ingress/egress; steep grades, single-lane segments, and narrow culvert crossings constrain heavy apparatus.
- Debris-flow susceptibility means a single culvert failure can isolate and cut off resupply for hours to days.
- Detours add >30–60 minutes via low-standard ranch roads (when open), insufficient for concurrent evacuation and response.

Water Supply & Fire Flow

FHTA

- Relies on City of Helena potable system sourced from the Tenmile watershed; wildfire in this basin raises ash/sediment loads that stress treatment capacity and can trigger conservation or turbidity-driven restrictions.
- Hydrant spacing south/southeast of the cantonment is sparse; tenders must shuttle from distant fill points, lengthening refill cycle times during structure protection.
- While FHTA maintains a 258,226-gallon lined storage pond adjacent to the Range Operations building the installation does not have redundant or independent contingency water storage dedicated to wildfire suppression. If municipal water service is inoperable or constrained prior to seasonal filling, the pond would be ineffective for initial or extended wildfire operations. In addition, no comparable large-volume contingency water storage exists south of the cantonment area, limiting suppression endurance and aerial support in that portion of the training area during prolonged incidents.

LHTA

- No municipal hydrant network: operations depend on a Well-fed hydrant and J-stand fill point near the LHTA barracks which can be constrained by drought and turbidity after fire.
- Typical tender round-trip times to reliable drafting points can exceed 45 minutes, reducing the number of effective fireline deliveries per hour.

Electric Power, Pipeline & Utility Corridors

FHTA

- Overhead distribution feeders (e.g., Tenmile Rd, Birdseye Rd) cross heavy grass/juniper fuels; high winds and low RH elevate conductor fault and pole-top ignition risk.
- Any PSPS-style de-energization or storm outage disrupts barracks, Joint Forces HQ, VA Medical Center, comms, and pumping capacity; backup generation is not sized to support extended wildfire operations campus-wide.
- The Yellowstone pipeline corridor intersects grassy and brush-dominated fuels that could sustain prolonged flame exposure; wildfire in this zone could compromise cathodic protection systems, signage, or surface valves, creating downstream integrity hazards. Requires formal coordination with Phillips 66 Pipeline LLC for pre-incident mapping, emergency access routing, and suppression protocols, ensuring that pipeline integrity inspections and training activities are synchronized to prevent mechanical or thermal damage during high fire danger operations.

LHTA

- Rural feeders on wood poles traverse sage/juniper corridors; wind-driven outages are common during fire weather, affecting comms, lighting, and pumps.
- The Yellowstone pipeline traverses rugged terrain and sage/juniper corridors, where limited access and steep slopes increase response time in the event of a release or exposure. Requires formal coordination with Phillips 66 Pipeline LLC for pre-incident mapping, emergency access routing, and suppression protocols, ensuring that pipeline integrity inspections and training activities are synchronized to prevent mechanical or thermal damage during high fire danger operations.

Communications (Radio, Cellular, Data Backhaul)

FHTA

- Cellular and microwave backhaul are routed through shared civilian corridors; smoke, heat, or power loss can degrade network capacity precisely when incident traffic spikes.
- Interoperability between installation and city/county communications is not fully standardized, slowing unified command during fast-moving fires.

LHTA

- Topographic shadowing in limestone canyons degrades handheld and cellular coverage; loss of nearby hilltop sites (access/backup power issues) can create dead areas for air-to-ground coordination.
- Limited portable repeaters and satcom caches are pre-positioned, increasing setup time at incident start.

Facility Exposure & Staging Limitations

FHTA

- Co-location of Joint Forces HQ, VA Medical Center, barracks, AAF concentrates risk; smoke/heat can ground aircraft, disrupt medical logistics, and force shelter-in-place vs evacuation tradeoffs.
- Staging pads and engine turnarounds are limited along the south/southeast perimeter; lines of operation must cross narrow local streets near neighborhoods.

LHTA

- Discontinuous fuel breaks and few hardened staging pads/helispots restrict safe anchor points; cultural/natural resource and UXO constraints limit dozer line placement along some ridges/draw mouths.
- Training features are embedded in continuous grass–sage–juniper fuels; during Red Flag conditions, live-fire and any spark producing activities are not authorized on any ranges or training areas on both FHTA and LHTA to avoid starts, eroding training throughput.

Implications

- Longer response and control timelines: Single-threaded access, limited water points, and fragile utility corridors increase the probability that fires outrun initial attack and escalate to extended attack.
- Cascading mission disruptions: Outages or water restrictions in shared lifelines can halt training, interrupt medical services, and delay re-entry even when flames are distant.
- Higher incident complexity: Limited staging and comms interoperability force structure protection vs perimeter control tradeoffs, increasing resource needs and incident duration.
- Equity and prioritization conflicts: Because lifelines are shared, restoration priorities may not align with installation needs without codified agreements, prolonging downtime.

Recommendations

Description: Design and deliver a critical lifelines hardening program for both assessment areas that reduces wildfire- and post-fire-driven failures across transportation, water, power, and communications. The program integrates engineered upgrades, redundancy, and monitoring so wildfire does not cascade into prolonged operational standstills.

A. Transportation (Access & Egress Reliability)

- Widen and hard-surface priority segments on U.S. Highway 12, Country Club Rd, Williams Rd and Old Woman's Grave Rd with 24-ft lanes, shoulders, and turnouts every ½–1 mi to support simultaneous evac/response.
- Debris-flow–resilient drainage: replace/upsized culverts with debris racks, armored inlets/outlets, overflow dips, and design storm >25-yr post-fire; map and sign pre-planned closures/detours at overtopping points.
- Staging/refuge pads (Type-3/4 apparatus turning radii, 96-ft circles) and marked control points tied to perimeter fuel breaks; certify night-capable helispots proximate to these nodes.
- Roadside fuel conversion (30–100 ft) along these corridors to reduce roadside ignitions and flame impingement.

B. Water Supply (Fire Flow & Draft Reliability)

- FHTA: Implement new dry hydrant installations along the south/southeast perimeter near the Country Club–Williams and Birdseye interface to provide dedicated refill points for local fire agencies, improving suppression support and reducing turnaround times during mutual-aid response.
- LHTA: Develop new dry hydrant locations at key access nodes, including Old Woman's and Grave/Indian Creek, to create reliable year-round refill access that enhances local firefighting effectiveness and shortens water-haul cycles.

- Tenmile watershed protection: add online turbidity/TOC sensors, emergency baffling/PAC dosing options, and raw-water bypass/valving to keep flows available during post-fire sediment pulses.

C. Electric Power (Ignition Reduction & Continuity)

- Utility hardening along Tenmile Rd, Birdseye Rd, Indian Creek and Old Woman's Grave corridors: covered conductor or spacer cable, steel/concrete poles at ridge saddles, fused cutouts, high wind reclosing profiles, and widened vegetation clearances.
- On-site continuity: install cantonment microgrid (gensets + transfer switch; optional PV/ battery) sized 1–2 MW with ≥72-hr fuel; add portable gensets for pumps, helispots, and comms huts.

D. Communications (Interoperability & Redundancy)

- Hilltop backup power (48–96 hr.) for primary repeaters; deploy portable repeaters + satcom kits to cover LHTA assessment area canyon shadowing; add redundant microwave/fiber backhaul to FHTA assessment area command nodes.
- Publish an air-to-ground/cross-agency channel plan and cache interoperability radios at staging pads.

E. Instrumentation & Dashboards

- SCADA/telemetry for tank levels, hydrant pressures, turbidity, and road/culvert water-level sensors feeding a shared operations dashboard (DMA–counties–utilities–DNRC) to trigger pre-staging, TCPs, and boil/no-boil decisions.

Lead / Partners

- Lead Agencies: MTARNG/DMA (mission continuity), Lewis & Clark & Broadwater County Public Works/EM, City of Helena Utilities.
- Key Partners: NorthWestern Energy, Vigilante Electric, Phillips 66, telecom providers, DNRC, VA Medical Center EM, rural fire districts, USFS/BLM (site approvals for helispots/dip sites), FHWA (for road elements).

Supporting Facts

- Single-threaded corridors (U.S. Highway 12; Country Club/Williams; Old Woman's Grave) produce evac/response conflicts and delay IA; unpaved connectors prone to washouts.
- Hydrant gaps south/southeast of FHTA assessment area force tender shuttles; LHTA tender cycles >45 min to reliable draft points during drought/turbidity.
- Overhead electrical feeders on wood poles along Tenmile, Birdseye, and Indian Creek, and the transmission line crossing LHTA assessment area, are ignition and outage vectors

during Red Flag winds; PSPS de-energization events can disrupt operations and limit fire-response capability.

- Comms dead areas in LHTA gulches and shared backhaul at FHTA reduce ICS reliability when incident traffic surges.
- Post-fire debris-flow risk in Blue Cloud, Tenmile, multiple gulches threaten culverts/low crossings, isolating access for hours–days.

Cost Estimate (planning-level ranges)

- Road widening/shoulders/turnouts & culvert armoring: $3–8M (priority segments at both sites).
- Staging/refuge pads & night-capable helispots: $0.25–0.9M.
- FHTA new dry hydrant installations and associated connections to support perimeter and mutual-aid response $0.3–0.8M; LHTA new dry hydrant locations at key access nodes with hardened approaches and access improvements $0.4–1.2M.
- Utility hardening (feeders & sectionalizing): $2–6M (corridor-dependent).
- Microgrid/backup generation (FHTA cantonment + key nodes): $4–8M (size/config dependent).
- Comms redundancy (backup power, repeaters, satcom, backhaul): $0.25–0.75M.
- Instrumentation/SCADA & dashboard: $0.2–0.5M.
- Total program (multi-year phasing): $11–21M capital, with $300–600k/yr O&M and periodic replacements.

Potential Funding Sources

- OLDCC Community Infrastructure Program: mission-critical utility/road hardening adjacent to defense facilities.
- DOE Grid Resilience & Innovation Partnerships (GRIP) / State Grid Resilience Formula: conductor replacement, sectionalizing, backup generation.
- EPA Drinking Water SRF (DWSRF) & USDA Rural Development – Water & Waste: tanks, mains, hydrants, draft sites.
- FHWA Emergency Relief / PROTECT (IIJA): post-fire flood/landslide resilience, culverts, slope stabilization.
- USFS State & Private Forestry (with DNRC): dip/draft sites, roadside fuel conversion.
- Utility cost-share & franchise agreements; county capital programs; REPI (where easements tie to access/fuel corridors).

Why this matters: By hardening the lifelines that both communities and installations share, this program cuts minutes from initial attack, keeps fire flow and comms online, and prevents single-point road failures from turning a manageable wildfire into a multi-day mission outage. The

upgrades also raise grant competitiveness (clear lifeline co-benefits, shovel-ready engineering, and maintained benefits) across OLDCC & DOE.

6. Declining Availability of Resilience Funding

Finding

Even as wildfire exposure increases, available and attainable resilience funding is tightening for projects that would protect the local communities in the assessment areas. Competition for federal/state dollars (e.g., FEMA and HMGP, DoW REPI/OLDCC, state hazard-mitigation and forest health programs) continues to rise, be reduced or completely disappear, while award criteria increasingly favor codified local policies, shovel-ready designs, interagency governance, and multi-benefit outcomes. Projects around both installations currently underperform on these dimensions due to policy gaps (no WUI overlay, limited egress standards), fragmented land tenure, incomplete engineering, and limited proof of long-term O&M, all of which suppresses scoring and slows delivery.

Grant competitiveness is suppressed because project packages lack the policy prerequisites and readiness elements favored by FEMA HMGP, OLDCC, and REPI: adopted WUI overlays, signed MOUs, 30% designs/NEPA path, site control, and maintained-benefit commitments. While not a "violation," this is functional non-compliance with current scoring criteria and federal guidance on plan integration and deliverability, causing repeated down-scores and missed cycles.

Higher competition and shifting scoring rubrics

- National demand for resilience funds has outpaced annual appropriations; recent cycles see multi-X oversubscription (funding requests exceed available appropriations by several times), with a growing share awarded to jurisdictions that demonstrate adopted codes/overlays, equity/vulnerable-population benefits, and cross-jurisdictional governance.
- Programs increasingly require quantified benefit–cost (BCA) with defensible inputs (ignition probability, structure loss avoided, avoided downtime), favoring applicants with robust data pipelines.

Project readiness and deliverability requirements

- Priority now goes to projects with 30%–100% design, environmental compliance pathways, site control/easements, and agency MOUs in hand; concept-only proposals are routinely down-scored.
- Right-of-way and easement delays around the buffers make fuel-break corridors and patrol roads hard to certify as "ready," depressing competitiveness.

Policy hooks and code alignment

- Scoring favors jurisdictions that have adopted WUI codes, secondary egress requirements, hydrant/flow standards, utility-hardening conditions, and prescribed-burn protocols, all still emerging or absent near the installations.
- Plans (HMP, CWPP) that lack installation-specific annexes weaken the "alignment and integration" narrative that reviewers now expect.

Match, maintenance, and lifecycle finance

- Local match ratios (often 10–30%) and O&M commitments are gating;(limiting/control progress) many fuel-treatment or access projects lack secured maintenance funding (e.g., 5–10-year re-entries), lowering lifecycle cost-effectiveness scores.
- Inflation and supply constraints (equipment, culverts, pumps, covered conductor) raise total project cost, widening the match gap and risking de-obligation if timelines slip.

Fragmentation and equity/performance metrics

- Parcel-by-parcel landscapes in both assessment areas reduce treatment contiguity, eroding the acres-treated per dollar and risk-reduction per dollar metrics.
- Proposals without clear lifeline co-benefits (e.g., patient safety, evacuation reliability, water quality) miss equity/performance points that now tilt awards.

Limited On-Site Fire Suppression and Over-Reliance on Regional Mutual Aid

- Stakeholders, including PPLT and the City of Helena Grants Office, reported increasing competition for FEMA and DNRC grants and limited match funding to make applications competitive.

FHTA:

- Lack of an adopted Military Wildfire Compatibility Overlay and formal evacuation/ICS integration annexes lowers OLDCC "policy alignment" scores.
- Hydrant spacing/flow gaps south southeast and discontinuous fuel breaks complicate BCA and phasing; without easements and 30% designs, "readiness" ranks low.
- Shared lifelines (Helena water/power/roads) are not yet knitted into a single, multi-benefit capital package, missing points for cross-jurisdiction integration.

LHTA:

- Single-threaded access and no hydrant network strengthen the need but weaken deliverability (ROW, debris-flow design standards, tank siting, draft reliability).
- No JLUS-equivalent and limited county WUI standards reduce policy points; dispersed ownership slows easements for perimeter fuel-break and patrol-road systems.

- Absence of documented O&M cycles for fuel treatments (e.g., 5-year re-entries) lowers long-term benefits in scoring.

Implications

Without rapid improvements to policy alignment, project readiness, and multi-agency governance, both installations will continue to lose out in competitive cycles, delaying fuel treatments, access hardening, water storage, and utility resilience that directly affect readiness. Each missed cycle effectively locks in another fire season with elevated ignition probability, longer response times, and greater likelihood of mission disruption. Over time, higher construction costs, inflation, and tighter program guidance will increase the match burden and shrink the feasible project set, making today's unfunded needs more expensive and harder to deliver in future rounds.

- Fiscal Year (FY) 2026 REPI allocations have been reduced by 40%, leaving fewer funds for competitive land protection around training sites.
- Lewis & Clark County's Open Space bond expired in 2025. Its renewal is uncertain, despite its use in several acquisitions in the FHTA assessment area and in funding wildfire mitigation easements.

Recommendations

Stand up a Joint Resilience Funding & Readiness Program so assessment area projects remain competitive despite shrinking or oversubscribed federal programs. The program builds grant-ready pipelines, standardizes benefit–cost evidence, and aligns policy prerequisites that boost scoring for HMGP, REPI, OLDCC, and state funds.

A. Joint Funding Governance Cell (JFGC).

- Create a permanent cell (DMA + counties + DNRC + utilities + PPLT) to manage the annual grant calendar, track NOFO changes, assign owners, and bundle military–civilian lifeline projects (roads/water/power/comms).
- Publish a quarterly Portfolio Scorecard: ask/award $, leverage ratio, match secured, readiness (30% design/NEPA/site control), equity metrics, and maintained benefits.

B. Project Readiness Pipeline (Design/NEPA/Site Control).

- For top projects (e.g., fuel-break corridors, secondary egress, water support, grid protection): complete 30% designs, cost estimates, permits/SHPO, right-of-way/easements, and NEPA/CE in advance.
- Use standard scopes/specs (hydrant spacing, tank sizes, conductor types, culvert design storms) so estimates and maintenance commitments are consistent across applications.

C. Standardized Metrics & Benefit–Cost Evidence.

- Maintain a shared data spine (county + DMA + utilities) and a "BCA kit" with pre-vetted methods for:
  - Evacuation Clearance Time (ECT) reduction (minutes saved).
  - Tender cycle time reduction (minutes saved to refill).
  - Outage hours avoided (power/telecom/water), and customer hours protected.
  - Crash/fatality risk reduction from contraflow/TCP plans.
  - Acreage and structures protected by contiguous fuel breaks; ERC/BI thresholds tied to training curtailment avoided.
- Translate metrics into annualized loss avoided and O&M savings, with maintained-benefit commitments (inspection logs, vegetation re-entries, service intervals).

D. Policy Alignment for Scoring.

- Finish adoption of MWCOZ/WUI codes, secondary egress requirements, and utility-hardening conditions.
- Add installation annexes to HMP/CWPP/ RPMP and publish an Operational Atlas.

E. Match Strategy & Braided Funding.

- Pre-approve local match lines (open-space bond, road/utility CIP, in-kind O&M) and pair federal sources:
  - HMGP for lifelines & planning
  - REPI for buffer easements
  - OLDCC for defense-adjacent infrastructure
  - DOE Grid Resilience for conductor/sectionalizing
  - EPA DWSRF/USDA RD for tanks and mains.

F. Grant Development Capacity.

- Retain on-call BCA & design support, plus a grant writer to push multi-application packages (same project framed for OLDCC and REPI).
- Train local partners on equity documentation, maintenance plans, and environmental compliance.

Lead / Partners

- Leads: MTARNG/DMA (Real Property & Range Ops), Lewis & Clark & Broadwater County EM/Planning, City of Helena Utilities.
- Key Partners: DNRC Fire Protection Bureau; NorthWestern Energy & Vigilante Electric; Tri-County FireSafe Working Group; PPLT/land trusts; VA EM; USFS/BLM (coordination on adjacent lands).
- Advisory: FEMA Region VIII (HMGP), OLDCC, DoW REPI program staff, DOE grid program staff, EPA/USDA water program reps.

Supporting Facts

- Oversubscription trend: Recent Grant cycles have been multiple-times oversubscribed, with awards concentrating on code adoption, critical lifelines, and shovel-ready designs; REPI Challenge and OLDCC are similarly competitive.
- Readiness gap: Many rural projects fail on site control, partial design, or unclear maintenance, not on need.
- Scoring alignment: Programs consistently reward policy adoption (WUI codes/overlays), joint governance, equity/maintained benefits, and multi-jurisdiction lifelines, all gaps we can close with this program.
- Local capacity: County/DMA staff workloads limit complex multi-NOFO submissions without a central cell and on-call BCA/design help.

Cost Estimate

- JFGC set-up & operations (PM, data, meetings, scorecards): $150k–$250k year-1; $100k–$150k/yr ongoing.
- On-call BCA & grant writer (multi-NOFO): $150k–$300k/yr.
- 30% design/NEPA/site control for top 6–10 projects: $400k–$1.0M (pooled).
- Data spine & dashboard (ECT, outage, tender, ERC/BI): $75k–$150k.
- Training & equity documentation support: $25k–$50k.
- Total Year-1: $800k–$1.75M (scales with number of projects).

Potential Funding

- FEMA HMGP – Advance Assistance: design/NEPA/site control for post-disaster HMGP packages.
- OLDCC planning & community infrastructure pre-development.
- DoW REPI (pre-acquisition & due diligence) for buffer/easement projects.
- USFS Community Wildfire Defense Grant (CWDG) – planning/capacity track.
- DNRC preparedness & state planning grants.
- Utility cost-share (grid hardening studies/design) and local CIP lines for match.

Why this matters: By institutionalizing a governance cell, readiness pipeline, and standardized metrics, DMA and county partners can compete successfully in an era of tighter, more selective funding, accelerating delivery of the lifelines, buffers, and access projects the installations and communities need.

7. Wildfire Risk to Military Installations and Mission Readiness

Findings

Wildfire represents one of the most direct and consequential threats to military readiness at both FHTA and LHTA. Each installation is located within landscapes that rank among Montana's highest wildfire exposure areas, where fine fuel regimes, topographic fire channels, and extreme seasonal weather converge with human ignition sources. This convergence creates a persistent, high-probability hazard that directly interferes with training schedules, installation operations, and long-term mission assurance.

This assessment specifically considers bidirectional wildfire risk, examining both on-installation ignitions that could escape containment and move into surrounding communities, and fires originating in local communities or the assessment area that could move onto the installations, impacting military operations and infrastructure. The primary focus remains on the surrounding areas and local communities, requiring installation-level analysis to accurately anticipate and mitigate cross-boundary wildfire behavior, protect public safety, and sustain mission assurance.

Standing range/operations modifications on Red Flag/ERC days exist, but bidirectional community-installation risk controls (blackline corridors, pre-approved control lines, evacuation/medical movement annexes, and air-to-ground comms) are not yet codified across county/installation plans, which undercuts AR 420-1 program effectiveness and DoDI 6055.06/6055.17 expectations for comprehensive, all-hazard EM integration. Assessment area HMP/CWPPs lack installation annexes with measurable performance targets (e.g., Evacuation Clearance Time), falling short of FEMA 2023 policy integration standards that call for linkage to other mechanisms and actionable, maintained benefits.

High frequency of ignition sources.

- DNRC fire records (2000–2023) show that ~65% of wildfires in Lewis & Clark County were lightning-caused, with additional ignitions tied to roadside fires along U.S. Highway 12, fireworks, debris burning, and live-fire training exercises on the installation itself.
- Broadwater County data shows repeated fire starts along Old Woman's Grave Road and surrounding grazing allotments, with seasonal recreation (ATVs, campfires, hunting) introducing additional human-caused ignitions, and live-fire training exercises on the installation itself.

Fuel-driven fire spread potential.

- LANDFIRE 2022 data confirm dominance of fine grass fuels in the Helena Valley, where fire spread rates regularly exceed 6–10 mph under wind-driven conditions. Juniper encroachment along the southeastern perimeter increases volatile fuel loads and crown fire potential.
- Shrub–grass complexes dominate canyon drainages, with steep slopes acting as fire corridors. Heavy fuel accumulations in juniper stands, and mixed conifer pockets elevate flame lengths and ladder fuel risk, complicating suppression.

Extreme fire weather trends.

- The Helena RAWS station recorded an average of 19 Red Flag Days per fire season (2018–2023), well above statewide averages. Frontal wind events often produce gusts >50 mph, capable of rapidly escalating small ignitions into major fires.
- The Townsend RAWS station shows similar trends, with 15–18 annual Red Flag Days and frequent low humidity (<15%) and high temperature (>90°F) days during July–August. Steep topography compounds erratic fire behavior.

Documented historical fire impacts.

- The Canyon Creek Fire (1988, 204,600 acres) and Woods Creek Fire (2021, 55,000 acres) both caused regional road closures, degraded air quality, and power outages affecting Helena-area operations. DNRC records show over 35 ignitions within 10 miles of FHTA since 2010.
- Multiple smaller but high-intensity fires (e.g., Indian Creek Fire, 2012) have occurred within 10–15 miles of LHTA, demonstrating how quickly canyon fuels and steep terrain drive spread toward military ranges.

Operational exposure and mission disruption.

- Wildfire smoke in 2017 and 2021 reduced visibility below 6 miles and elevated PM2.5 levels to hazardous ranges, forcing temporary suspension of training activities and creating health impacts at the VA Medical Center.
- Live-fire training activities at LHTA are often suspended during high fire-weather days to avoid ignitions. Wildfires can also isolate training ranges due to the single-threaded Old Woman's Grave and Indian Creek Roads, delaying responding local fire fighters and first responders into the area as well as evacuation of residents, ranchers and recreationists.

Implications

- High likelihood of disruption: Both installations face annual conditions under which wildfire or smoke can suspend training operations, ground aircraft, and delay range schedules.
- Infrastructure vulnerability: Fires threaten lifeline systems at FHTA including power, water, and transportation that directly sustain installation and assessment area operations and emergency response capacity should the guard be mobilized by the Governor during an emergency response, range access and wildfire response at LHTA.
- Operational trade-offs: Fires near the installation force commanders to balance protection of mission-critical facilities with support for local evacuation and suppression needs, stretching already-limited resources.
- Escalating exposure: With continued WUI expansion near FHTA and increasing recreational use near LHTA, wildfire risk to mission readiness is projected to grow without significant mitigation investments.

Recommendations

Develop and implement a comprehensive wildfire risk reduction program at both FHTA and LHTA that integrates defensible space, fuels management, tactical fuel breaks, water supply improvements, and pre-positioned suppression resources directly into installation operations and the local communities. This recommendation addresses documented wildfire exposure, frequent ignition sources, and mission continuity risks by:

A. Establishing Defensible Perimeters and Fuel Break: Construct and maintain engineered fuel breaks (200–500 ft) along the southern and southeastern edges of FHTA (Williams Rd, Country Club Rd) and the northeastern perimeter of LHTA (Old Woman's Grave Rd, Indian Creek). These corridors should be linked to subdivision ROWs and Range Operations patrol routes, ensuring maneuver and suppression access.
B. Hardening Critical Facilities and Lifelines: Prioritize the hardening of off-installation critical lifelines that directly support operations, including power, transportation, and communication infrastructure in the Tenmile Road, Birdseye Road, and Indian Creek corridors. Partner with Lewis & Clark County, DNRC, Northwestern Energy, and local utilities to upgrade wood-pole distribution lines, improve substation protection, and apply ember-resistant retrofits to community-serving lifeline facilities (e.g., water treatment, power substations, and medical support centers). These projects protect both civilian and installation operations by ensuring continuity of power, water, and access during wildfire events. Partner with utilities to harden pole lines along Tenmile Rd, Birdseye Rd, and Indian Creek corridors.
C. Operational Burn Window Protocols: Establish coordinated prescribed-fire protocols between Range Operations, USFS, DNRC, and local districts to reduce fine fuel loads in training ranges and along perimeters while minimizing smoke impacts to adjacent WUI subdivisions.
D. Integrated Risk Monitoring: Install a dedicated RAWS station at LHTA/FHTA to improve localized fire weather observation and alignment with regional predictive services. However, because Range Operations does not have the staff capacity to continuously monitor or analyze ERC/BI indices, real-time data should feed directly into Helena Interagency Dispatch for evaluation. Dispatch would continue providing daily fire danger ratings and operational guidance to MTARNG as they do currently, with the RAWS station serving as an enhanced data source rather than an internal monitoring requirement. This ensures improved situational awareness and more accurate training restrictions while maintaining an external monitoring workflow that supports capacity realities.

Lead / Partners

- Lead Agencies: MTARNG/DMA (Range Operations, Real Property), Lewis & Clark County EM, Broadwater County EM.
- Key Partners: DNRC Fire Protection Bureau, Helena Fire Department, Broadwater County Rural Fire, Tri-County FireSafe Working Group, PPLT, NRCS, VA Medical Center EM.

- Utility & Infrastructure Partners: NorthWestern Energy, Vigilante Electric, City of Helena Utilities, Broadwater County Water District and Phillips 66.
- Advisory Partners: USFS Helena–Lewis & Clark NF, BLM, FEMA Region VIII, DoW REPI Program.

Supporting Facts

- Ignition Sources: DNRC records confirm that 65% of wildfires in Lewis & Clark County (2000–2023) were lightning-caused, with >35 wildfire starts within 10 miles of FHTA. Training-related ignitions and roadside starts remaining frequent along U.S. Hwy 12 and Old Woman's Grave Rd.
- Fuel Conditions: LANDFIRE 2022 maps identify dominance of fine grasses and juniper encroachment, producing spread rates exceeding 6–10 mph in windy conditions.
- Water & Access Gaps: Much of LHTA lacks hydrant coverage or refill points; FHTA relies entirely on Helena's municipal supply drawn from Tenmile Creek, which is at risk of post-fire debris flows.
- Weather Drivers: Helena RAWS station recorded an average of 19 Red Flag Warning days per year (2018–2023), exceeding Montana's statewide average.
- Infrastructure Risk: Utility corridors with wooden poles cross high-risk drainages (Tenmile, Indian Creek), creating ignition hazards and potential PSPS disruptions.
- Mission Assurance Impacts: Historic fires (Canyon Creek 1988, Woods Creek 2021) caused road closures, smoke disruptions, and prolonged power outages, illustrating cascading threats to both military and civilian systems.

Cost Estimate

- Fuel Break Construction & Maintenance: $2–4M initial, $200K/year for maintenance (dozer lines, mastication, hand-thinning).
- Water Storage & Pumpkin Tanks: $750K–$1M (multiple 50K–100K gal tanks, distribution lines, collapsible systems).
- Suppression Caches & Pre-Positioned Equipment: $250K–$400K (per cache, multiple locations).
- Facility Hardening: $3–5M (retrofits for HQ, VA, airfield).
- Prescribed Fire & Monitoring Protocols: $500K (planning, burn crews, RAWS stations on installations).
- Total Program Estimate: $7–10M initial capital, plus $500K–$750K annually for maintenance, monitoring, and panel operations.

Potential Funding Sources

- DoW REPI Challenge Grants: Buffer areas, easement-supported fuel breaks.

- OLDCC Community Infrastructure Program: Mission-critical infrastructure hardening.
- DNRC Hazard Mitigation & Preparedness Grants: Community wildfire protection measures.
- NRCS EQIP & ACEP: Cost-share for fuel treatments on grazed/ag parcels.
- VA Emergency Preparedness Funds: Facility hardening and smoke mitigation at VA Medical Center.
- State/County Matches: Lewis & Clark Open Lands Program, Broadwater County rural fire levies.

Why this matters: This program would directly mitigate ignition, spread, and mission interruption risk at both installations, while aligning with FEMA, DoW, state and county resilience priorities.

8. Inadequate Access Routes and Infrastructure for Fire Response

Finding

Wildfire suppression in both assessment areas is constrained by single-threaded access, fuel-lined road corridors, limited water supply, scarce staging/turnaround space, and communications gaps. These constraints lengthen response times, narrow tactical options (anchor/hold/secure), and force incident commanders into structure-protection tradeoffs rather than perimeter control, especially under Red Flag conditions.

Critical infrastructure supporting both assessment areas lacks redundancy and integrated wildfire contingency planning. The LHTA assessment area has no embedded utility systems and depends on external high-voltage transmission corridors and limited radio/cell coverage, while the FHTA assessment area relies solely on the City of Helena's potable water system with no independent storage south of the cantonment. These dependencies heighten the risk of power, water, and communications failure during wildfire or multi-hazard events.

These deficiencies place operations out of alignment with DoDI 4170.11 (Installation Energy and Water Management) and AR 420-1, which require installations to ensure mission-critical infrastructure resilience and redundancy. The absence of interoperable communications plans and redundant repeater networks does not fully meet DoDI 6055.17 (Emergency Management Program) standards for continuity of command and control. At the state and county level, lack of coordination with Montana DNRC utility-hardening policy and Lewis & Clark/Broadwater County emergency annexes leaves both sites below the expectations for critical infrastructure resilience and interagency mutual-aid readiness identified in the FEMA Lifelines Mitigation Framework.

Access & Egress (geometry, redundancy, and reliability)

FHTA

- Primary corridors: U.S. Highway 12, Country Club Rd, Williams Rd; multiple chokepoints with limited shoulders and roadside fine fuels; queues during simultaneous evacuation/response.
- Redundancy: Practical alternates are unimproved or indirect (e.g., portions of Birdseye/Blue Cloud Creek), prone to washboards, rutting, and post-storm washouts, unreliable during initial attack.
- Apparatus movement: Several intersections and local streets south/southeast of the cantonment do not meet Type-3/4 engine turning radii and lack safe pull-outs for staging.

LHTA

- Single-threaded access: Indian Creek, River and Old Woman's Grave Roads are narrow, steep, and discontinuous in shoulder width; single-lane stretches impede opposing traffic.
- Debris-flow susceptibility: Culvert pinch points in are vulnerable to post-fire blockages, isolating training blocks for hours–days after intense cells.
- Detours: When Indian Creek is blocked, alternates add >30–60 minutes via ranch roads, unsuitable for concurrent evacuation and heavy engine ingress.

Water Supply & Fire Flow (availability, pressure, and cycle time)

FHTA

- Municipal dependence: Water from Helena's Tenmile system is vulnerable to turbidity spikes after watershed fire; pressures can fall during peak demand.
- Hydrants: Sparse coverage south/southeast of cantonment; many perimeter neighborhoods require tender shuttles, increasing refill cycle time and reducing effective gallons-per-hour on the line.
- Contingency storage: No redundant or independent large-volume (≈258k gal) wildfire water reserve; existing dip tank is seasonally filled from municipal supply and is ineffective if municipal service is constrained or unavailable prior to filling.

LHTA

- No hydrant network: Suppression depends on a Well-fed hydrant and gravity-fed J-stand at LHTA cantonment.
- Cycle times: Typical tender round-trip >45 minutes to stable draft sites, sharply reducing line-building productivity during the first operational period.

Staging, Turnarounds, and Anchor Points

FHTA

- Limited hardened staging pads along the south/southeast perimeter; 96-ft turnarounds for tenders/engines are scarce near control lines; few pre-designated backfire windows.

LHTA

- Discontinuous fuel breaks and few hardened pads/helispots near ridge spines and draw mouths; UXO constraints prohibit dozer options west of Old Woman's Grave Road.

Traffic Control & Evacuation Concurrency

FHTA

- Shared corridors (U.S. Highway 12, Country Club, Williams) serve residents, responders, and military personnel; no codified lane-use/contraflow plans; potential gridlock during peak evacuation.

LHTA

- Recreation peaks (Canyon Ferry) add off highway vehicles/boat trailers to a single access road; no formal staging or traffic control points to separate evac/response flows in narrow canyon segments.

Communications & Wayfinding

FHTA

- Incident demand can overwhelm shared cellular/backhaul; partial interop gaps between installation/VA/city/county/DNRC channels slow unified command.

LHTA

- Topographic shadowing in gulches produces comms dead areas; limited portable repeaters/satcom caches increase setup time; unmarked helispots delay aviation integration.

Implications

Inadequate access routes and weak supporting infrastructure in the FHTA and LHTA assessment areas directly elevate wildfire risk by slowing suppression, delaying evacuation, and increasing the likelihood of extended, high-cost incidents. In the FHTA assessment area, chokepoints along U.S. Highway 12, Country Club, and Williams Roads mean that any simultaneous use by evacuees, responders, and military personnel can lead to gridlock, while sparse hydrant coverage south of the cantonment forces reliance on long tender shuttles with limited capacity. In the LHTA assessment area, access via the Indian Creek, including segments of MT Hwy 284, contains single-lane constrictions and multiple drainage crossings. Failure of one or more culverts or washouts along this corridor could render Hwy 284 impassable. If this occurs concurrently with an incident on US Hwy 12/287, the LHTA assessment area including Townsend could be temporarily isolated from emergency response and reinforcement originating from Helena, delaying medical access, evacuation, and incident support for hours or days.

The road lies within a natural drainage corridor, meaning that snowmelt, heavy rainfall, or post-fire runoff moves downslope directly toward the roadway. Culverts are the only pathway for that water to pass beneath the roadbed. If even one becomes clogged with debris, is undersized for peak flow, or is overtopped during a runoff surge, water is forced across the road surface instead. Once overtopping begins, flowing water can rapidly erode the gravel and soil road base, undercut the driving surface, and ultimately wash out the roadway, severing the only vehicle access route into those range areas. Across both sites, the absence of large on-site water storage, hardened staging areas, and redundant helispots reduces tactical options, while communications gaps in canyon terrain further limit safe coordination. These vulnerabilities mean that fires in fast-moving grass and brush fuels are more likely to outpace initial attack, forcing agencies into reactive structure defense and evacuation support rather than proactive perimeter control. Over time, the lack of engineered access, water, and staging infrastructure compounds mission disruption risk, increases long-term suppression costs, and undermines the installations' ability to sustain uninterrupted training and readiness.

- Slower initial attack and more extended attack: Single-threaded access, long water cycles, and limited staging increase time-to-anchor, allowing fires in fine fuels to outrun resources.
- Life-safety risk during concurrent evac/response: Shared, narrow corridors force tradeoffs between public evacuation and responder ingress, raising risk to troops, patients, and residents.
- Higher suppression cost and duration: Inefficient water logistics and scarce anchor points inflate resource needs and extend operational periods.
- Greater mission disruption likelihood: Any road/water/comms outage along these corridors directly translates to training suspension, delayed re-entry, and prolonged recovery.

Recommendations

Deliver a coordinated program to upgrade, harden, and operate the key access corridors and firefighting infrastructure serving the FHTA and LHTA assessment areas so responders can reach, anchor, and hold fires under Red Flag conditions. The package combines engineering upgrades, policy requirements, modular assets, and joint operations, and mapped into an operational annex (pads, TCPs, helispots, draft sites, debris-flow pinch points).

A. Corridor Hardening & Geometry

- FHTA: Country Club Rd (Custer Ave → FHTA gate), Williams Rd (Birdseye → south fence), Blue Cloud Creek Rd, Birdseye Rd.
- LHTA: Old Woman's Grave Rd, River Rd, Indian Creek and River Road connectors.
- Standards (minimum): 14-ft clear width with reinforced shoulders (near-term) progressing to 24-ft paved lanes with 2–4 ft shoulders; grades ≤10%; vertical clearance 13'6"; turnouts every 0.5–1.0 mi; Type-3/4 turnarounds ≥96 ft; mile-markers & directional signage per DoDI 6055.17; 30–100 ft roadside fuel conversion.

B. Secondary Egress & Traffic Operations

- Design/construct redundant egress links where feasible (e.g., Country Club ↔ Williams interties; Old Woman's Grave alternates).
- Publish a Traffic Control Point (TCP) & contraflow plan with Evacuation Clearance Time (ECT) modeling; set activation triggers by wind/visibility/fire location.

C. Staging/Refuge Pads & Helispots

- Build hardened staging/refuge pads at control points (gravel/asphalt, lighting, Knox access).
- Certify night-capable helispots with surveyed approach/departure paths at Williams/Country Club and Indian Creek/River Road nodes; post ICS-grade wayfinding.

D. Drainage & Debris-Flow Resilience

- Replace/upsized culverts with debris racks, armored inlets/outlets, overflow dips, and post-fire 25–50 yr design storms at Blue Cloud, Tenmile, River Road and Indian Road pinch points; add level sensors/cams tied to dashboards for pre-emptive closures.

E. Policy Alignment in 2025 Growth Policies

- Require FireWise/WUI standards for all assessment area subdivisions (construction, defensible space, egress geometry, hydrant/flow or tanks/draft).
- Condition plats on recorded fuel-break/ROW easements, staging pads, and compliance with TCP/contraflow maps.

F. Buffer Continuity via Strategic Parcels

- Use REPI + local open-space bond (if renewed) to acquire easements/fee title that complete fuel-break and patrol corridors along Country Club/Williams and Old Woman's Grave/Indian Creek, prioritizing parcels that improve defensibility and public evacuation.

G. Parcel-Level Review with Fire Officials

- Stand up a Wildfire Route Coordination Group (DMA Real Property lead; County PW/EM; MT DES; DNRC; utilities; rural FDs).
  - Annual pre-season inspections (roads, pads, tanks, culverts).
  - Parcel-level review of developments adjacent to routes to verify egress, pad siting, and water coverage.
  - Integrate tactical evac/access schematics into INRMPs and county EOPs.

Lead / Partners

- Leads: MTARNG/DMA (Range Ops/Real Property); Lewis & Clark & Broadwater County Public Works/EM; City of Helena Utilities.
- Partners: DNRC Fire Protection Bureau; rural FDs (Baxendale, West Valley, Townsend); NorthWestern Energy & Vigilante Electric; USFS/BLM (site approvals); VA EM; Tri-County FireSafe Working Group; NRCS.

Supporting Facts

- Access latency: LHTA assessment area tender cycles often >45 minutes to stable draft points; many road segments are single-threaded and fuel-lined.
- Red Flag exposure: Helena RAWS averages ~19 Red Flag days/yr (2018–2023); fine fuels enable 6–10 mph spread, minutes matter.
- Ignition history: >35 starts within 10 miles of FHTA (2010–2023); roadside/training ignitions repeat along named corridors.
- Post-fire hazards: Debris-flow susceptibility documented in Blue Cloud, Tenmile, River Road and Indian Creek. Single culvert failure can isolate ingress/egress for hours–days.
- Standards gap: DoDI 6055.17 calls for reliable emergency access; current geometry, staging, and signage are inconsistent.
- Community interface: Shared corridors must carry evacuees, responders, and military personnel simultaneously without gridlock.

Cost Estimate (planning level)

- Corridor widening/shoulders/signage: $3–7M (priority segments).
- Secondary egress links & emergency interties: $2–7M (alignment dependent).
- Staging/refuge pads (5–8 sites): $0.25–0.60M.
- Helispots (3–5 sites): $0.10–0.30M.
- Hydrant loops/extensions: $1.0–2.5M.
- Tanks/dry hydrants/draft sites: $1.0–2.0M.
- Sensors/ops atlas/ECT modeling: $0.15–0.40M.
- O&M: $0.2–0.4M/yr (brushing, re-striping, inspections, tank upkeep).

Potential Funding

- OLDCC / DCIP: defense-relevant road and staging improvements.
- FEMA HMGP: evacuation route resilience, hydrants/tanks, TCP signage, modeling/atlas.

- NRCS EWP: drainage stabilization & post-fire culvert controls (e.g., Williams/Indian Creek).
- FHWA PROTECT & ER: culverts, shoulders, rockfall/slope works.
- USFS CWDG / DNRC Fire Adapted MT: roadside fuel conversion, dip/draft enhancements.
- DoW REPI (buffers/easements) + local open-space bonds (if renewed) for parcel acquisition and ROW/fuel-break continuity.
- County capital & utility cost-share (hydrants, line relocations, hazard signage).

Why This Matters: Inadequate access routes, water supply, staging capacity, and communications in FHTA and LHTA assessment areas directly undermine initial attack effectiveness and safe evacuation, increasing the likelihood that fast-moving wildfires will overwhelm response capacity, force reactive structure protection, disrupt training and mission readiness, and escalate into extended, high-cost incidents under Red Flag conditions.

9. Fragmented Land Use and Incompatible Development in the Buffer

Finding

Both assessment areas exhibit a mosaic of residential, agricultural, recreational, and utility parcels whose fragmented patterns undermine suppression coordination, increase ignition density, and erode defensible depth. Because many of these parcels fall outside strict zoning oversight, small developments accumulate cumulatively as barriers, creating a “Swiss cheese” landscape of risk that complicates tactical fire operations and burdens installation readiness.

Coordination with the Tri-County FireSafe Working Group and DNRC for shared treatments is intermittent, and no joint fuel-management projects with county or REPI partners are formally scheduled. The 2024 IWFMP establishes a suppression-first doctrine, but implementation of landscape-scale mitigation remains limited, particularly in the areas of prescribed fire, fuel-break maintenance, and invasive species control across both installations. Although firebreak upkeep is referenced in Section 3.10.4 and noxious weed management in Section 3.10.3, these treatments are primarily reactive, periodic, and installation-only rather than coordinated with regional agencies or neighboring land managers. Coordination with the Tri-County FireSafe Working Group and DNRC for shared treatments occurs informally, yet no scheduled or jointly funded fuel-management projects are planned with counties, landowners, or REPI partners.

A more effective posture would shift from suppression-dominant to proactive fuels reduction and cooperative stewardship. This may include establishing recurring mechanical thinning and prescribed burn cycles on the LHTA perimeter, expanding fuel breaks outward into shared assessment areas through joint projects, and integrating invasive species removal with reseeding of more fire-resistant native grasses. A formal treatment schedule, co-designed and executed with DNRC, county wildfire officials, and the Tri-County FireSafe Working Group, would help transition the plan from guidance to implementation. Additionally, creating a standing cross-

boundary fuels-management agreement or MOA could allow planning, permitting, and funding to occur ahead of fire season instead of reactively. These actions would not only meet IWFMP intent, but also demonstrate shared risk reduction, strengthen community protection, and improve conditions for live-fire training without increasing suppression workload.

Partial implementation fails to satisfy AR 200-1 (Environmental Protection and Enhancement) and AR 420-1 fire-management provisions that require integrated ecological fire management to sustain training land viability. The lack of annual monitoring data also diverges from DoDI 4715.03 (Natural Resources Conservation Program). Federally, it is inconsistent with Executive Order 14008 and the Federal Wildland Fire Management Policy (2001, updated 2023), which calls for cross-boundary, ecosystem-based risk reduction. At the state and county level, these gaps leave the program short of Montana DNRC Fuels Reduction Grant eligibility criteria and CWPP 2020 regional objectives for coordinated mitigation. Partial implementation fails to satisfy AR 200-1 (Environmental Protection and Enhancement) and AR 420-1 fire-management provisions that require integrated ecological fire management to sustain training-land viability. While DMA does map every training-ignited wildfire and conducts post-burn surveys to determine whether rehabilitation is needed or if natural recovery is expected, this type of documentation is incident-based, not continuous monitoring. It demonstrates responsible post-fire assessment and recovery planning, but it does not fulfill the annual resource-condition trend tracking required under DoDI 4715.03, which calls for recurring, measurable data collection to evaluate long-term ecosystem function, fuel conditions, and treatment effectiveness, not just recovery outcomes after ignition.

An Environmental Assessment was completed during the most recent INRMP update, and no new land-management activities were proposed. Current wildland fire prevention, suppression, prescribed burning, and post-burn rehabilitation activities are NEPA compliant and are referenced in Section 2.2 of the IWFMP. However, compliance alone does not replace the requirement for ongoing ecological monitoring with annual metrics. Federally, this creates a gap with Executive Order 14008 and the Federal Wildland Fire Management Policy (2001, updated 2023), both of which emphasize proactive and cross-boundary, ecosystem-based risk reduction rather than reactive suppression-only management. At the state and county level, the absence of structured, recurring monitoring also limits alignment with Montana DNRC Fuels Reduction Grant eligibility criteria and CWPP 2020 objectives, which prioritize multi-year fuels tracking, collaborative treatment schedules, and landscape-level treatment outcomes.

Dense parcelization and parcel-level variability

FHTA

- Within the 3-mile assessment area, over 1,200 parcels range from <1 acre to five-acre subdivisions. Many residential infill lots that lack harmonized defensible space design or coordination.
- Residential density increases markedly along the Country Club, Williams, and Scratchgravel corridors, where subdivisions appear incrementally rather than through master plans.

LHTA

- The buffer includes scattered cabins, ranch parcels, and recreational leases, often with nonconforming setbacks and highly variable topography. Many parcels sit in steep gulches or ridge slopes, complicating uniform mitigation.
- Parcel consolidation is limited; property lines dissect terrain in narrow fire conduits to include, creating small, disjointed treatment units.

Ignition potential increases from fragmented uses

- In both assessment areas, ornamental landscaping, fencing, and outbuildings are common along boundaries. These features, allowed under limited zoning review, serve as ember traps along wildfire paths.
- Utility extensions, driveways, and low voltage wiring from dispersed parcels add sparking ignition sources near heavy fuels.
- Recreational use is high on and around LHTA, particularly east of Old Woman's Grave Road, where recreational shooting, hunting, and ATV/4x4 activity by Townsend-area residents is common. These activities are not controlled by MTARNG, meaning civilians may be shooting or recreating on LHTA during high fire danger or Red Flag conditions without awareness of restrictions. The area near Bivouac 2 is a frequent recreational shooting site and represents a persistent ignition risk. Combined with overflow OHV and camping activity near water-access parcels around Canyon Ferry Lake, this recreational pressure increases ignition density and complicates suppression efforts during the summer season.

Barrier to coherent fuel management

- Because parcels are split across multiple owners, fuel-treatment continuity is disrupted. One unmanaged lot can act as a conduit for flame or ember propagation.
- Tactical control lines, blacklines, and suppression corridors must thread around private property boundaries, limiting anchor strength.
- In both assessment areas, trails or small roads between parcels complicate backburn potential, firebreak efficiency, and mutual-assistance routes.

Spatial overlap with critical lifelines and vulnerabilities

- RAPT layers show that buffers are not just raw fuels: they host hospital/VA, nursing homes, mobile-home parks, transmission lines, and water storage/collection systems. As fragmentation increases, so does the chance that structure protection missions will compete with perimeter awareness and wildfire suppression.
- In high-density sectors near the FHTA assessment area (e.g., Birdseye, Scratchgravel, Blue Cloud Creek Rd), parcel fragmentation and subdivision depth have pushed utilities, roads, and drainage systems deeper into fire corridors.

Lack of coordinated standards or buffer easements

- Few buffer easements or coordinated mitigation agreements exist in either jurisdiction. Fragmented ownership minimizes economies of scale for fuel treatment investment and makes landowner participation voluntary, leading to sporadic coverage.
- Fragmentation also discourages large-scale, cost-effective projects: each parcel must coordinate individually with DMA/Range Ops, which slows project delivery and complicates funding proposals.

Implications

Fragmented land use and incompatible development patterns within the FHTA and LHTA assessment areas create a persistent drag on wildfire resilience and mission assurance. Each additional parcel, whether a one-acre subdivision, seasonal cabin, or recreational lease, introduces ignition sources, evacuation demand, and infrastructure exposure without corresponding requirements for defensible space, secondary egress, or fuel management. This pattern forces incident commanders to divert limited resources toward scattered structure protection rather than perimeter control, increasing response costs, and extending incident duration. Over time, the patchwork of private ownership prevents the creation of continuous fuel-treatment corridors or pre-engineered control lines, leaving installations and civilian agencies to fight fire around gaps in cooperation and compliance. For FHTA, this means shrinking room for prescribed burns and perimeter fuel breaks near Country Club–Williams developments; for LHTA, it means canyon residents competing for the same single-lane egress used by military convoys on Old Woman's Grave Road and Hwy 12/287. Without buffer-scale easements, overlay zoning, or coordinated standards, the cumulative effect of fragmented development is a steady increase in ignition density, suppression complexity, and mission disruption risk, eroding both military readiness and community safety.

- Lewis & Clark County's zoning regulations are outdated and lack enforcement mechanisms for defensible space or ignition-resistant building materials, especially around FHTA.
- Broadwater County does not require fire mitigation plans for new subdivisions and has not adopted CWPP-based development criteria.
- Multiple landowners (including absentee parcel owners) have refused fuel reduction treatments or fire access easements, per feedback from PPLT, Tri-County Firesafe Working Group, and Lewis & Clark Rural Fire.
- Incompatible uses adjacent to training areas, including RV parks and hobby farms, significantly increase ignition risk and restrict maneuverability for firefighting equipment. This is especially evident along and east of Old Woman's Grave Road (OWG) near LHTA, where dispersed residential and recreational development constrains access, limits defensible space, and elevates potential ignition exposure to the installation boundary.
- Increased ignition density and lateral flame pathways: Fragmented patterns allow fire to bypass fuel breaks via "gap jumps" across lots, advancing embers and flame into strategic corridors.

- Reduced suppression efficiency: Control lines must meander parcel boundaries, resulting in longer hand-line lengths, weak anchor points, and slower suppression initiation.
- Greater structure-protection load: As fragmentation places homes adjacent to wild fuels, suppression assets are increasingly diverted toward structure defense rather than line control, diluting mission-focused operations.
- Escalating risk premium over time: Each new parcel adds complexity to evacuation, staging, and patrol planning, steadily eroding the installations' ability to command landscape-scale wildfire defense.
- Mitigation funding hampered: Fragmentation lowers project coherence; funding agencies penalize patchwork treatment areas lacking broad contiguous coverage or enforceable policies that assure long-term maintenance.

Recommendations

Implement a coordinated program that converts the fragmented assessment areas around FHTA and LHTA into continuous, defensible, mission-compatible areas. The package combines policy updates, subdivision conditions, parcel acquisitions/easements, and parcel-level review so new and existing development: (1) preserves continuous fuel-treatment and patrol corridors, (2) maintains evacuation and suppression space, and (3) hardens utilities that traverse high-hazard fuels.

A. Growth Policy & Code Updates (2026 cycle).

- Require FireWise/WUI standards in all assessment area subdivisions: Class-A roofs, ember-resistant vents, 0–5 ft non-combustible zone, 30–100+ ft defensible space by slope. Implementation and enforcement occur through county planning and building departments, supported by local fire districts, DNRC, and MTARNG/DMA under coordinated subdivision and WUI inspection programs.
- Make secondary egress and compliant geometry (≥24-ft primary lanes, 96-ft turnarounds, ≤10% grades) mandatory.
- Condition plats on water supply coverage: hydrant spacing ≤500–1,000 ft & ≥1,500 gpm×2 hr. in the FHTA assessment area; fixed tanks (≥50–100k gal) or year-round draft/dry hydrants within 10 road-minutes in the LHTA assessment area.
- Record 50–150 ft Tactical Fuel-Break & Patrol-Road easements along mapped opportunity corridors (Country Club–Williams, Birdseye edge, Old Woman's Grave–Indian Creek, lower River Road).
- Require utility-hardening conditions (covered conductor/spacer cable, expanded clearance, steel/concrete poles at saddles) for new/rehab feeders crossing Very-High hazard polygons.
- Favor clustered/conservation subdivision designs; prohibit cul-de-sac-only layouts within 1 mile of installation boundaries.

B. Strategic Easements & Acquisitions (Buffer Continuity).

- Use easements/PDR or fee purchase to close corridor gaps that break treatment continuity and patrol access, priority blocks:
  - FHTA: Country Club–Williams corridor, Birdseye foothills, Blue Cloud interface.
  - LHTA: Old Woman's Grave spine, Indian Creek floodplain/benches, lower River Road approaches.
- Each acquisition package includes pre-engineered staging pads/refuge areas and maintenance covenants (≤5-yr re-entry).

C. Interagency Parcel-Level Review.

- Create a standing assessment area Development Review Panel (County Planning/Building, DMA/Range Ops, DNRC FPB, rural FDs, utilities, Tri-County FireSafe Working Group, PPLT).
- Require a Wildfire Compatibility Sheet with every application (egress map, fuel-break easements, water plan, WUI checklist, utility hardening).
- Tie approvals to ECT modeling and verified hydrant/flow or tank/draft coverage.

D. Maintenance & Compliance.

- Launch a WUI Inspection & Maintenance program (annual DS/tank/draft checks; HOA covenants for vegetation and 5-yr fuel-break re-entries).
- Publish an assessment area Compliance Portal (permits, inspections, renewal reminders, NOVs), linked to the operational atlas.

E. Public Information & Recreation Interface.

- With DMA PAO & Tri-County FireSafe Working Group, run an assessment area outreach campaign on prescribed fire, training operations, and fire-adapted landscaping.
- Designate seasonal no-parking fire lanes on patrol/fuel-break corridors; mark refuge/overflow pullouts near canyon pinch points.

Lead / Partners

- Leads: MTARNG/DMA (Range Ops/Real Property), Lewis & Clark & Broadwater County
- Planning/Building. Partners: DNRC Fire Protection Bureau; Tri-County FireSafe Working Group; City of Helena Utilities; NorthWestern Energy & Vigilante Electric; rural FDs (Baxendale, West Valley, Townsend); PPLT/land trusts; NRCS; VA EM. Advisory: USFS/BLM (adjacent lands), homebuilder associations, title/escrow firms (easement recording).

Supporting Facts

- Parcelization & growth: Since 2015, subdivision approvals in the Country Club–Williams corridor increased >20%, shrinking defensible depth near FHTA; scattered lots along Old Woman's Grave/Indian Creek add mixed fuels and driveways that complicate access.
- Egress & water deficits: Many assessment area plats remain single egress; hydrant scarcity south/southeast of FHTA and no hydrant network at LHTA drive tender cycles >45 min in drought/turbidity.
- Ignition & spread: DNRC records show >35 starts within 10 miles of FHTA (2010–2023); LANDFIRE fuels and juniper encroachment support 6–10 mph spread under wind.
- Utility exposure: Rural wood-pole feeders and aerial telecom in Very-High hazard polygons elevate both ignition and outage risk.
- Funding alignment: OLDCC and REPI score higher where codes, overlays, easements, and maintained benefits are in place.

Cost Estimate

- Growth Policy/WUI/TDR code work & hearings: $150k–$250k.
- Assessment area Review Panel & Compliance Portal (startup): $60k–$120k; O&M $75k–$150k/yr.
- Outreach (3-year campaign): $75k–$120k.
- Easements/strategic acquisitions: $4–12M over 10 years (location/acreage dependent).
- ECT modeling & operational atlas updates: $100k–$200k.

Potential Funding

- DoW REPI / REPI Challenge: compatible-use buffers & corridor easements.
- FEMA HMGP (projects): shared fuel-breaks, staging pads, tank/draft nodes tied to plat conditions.
- USFS Community Wildfire Defense Grant (CWDG): CWPP updates with enforceable assessment area actions and outreach.
- NRCS ACEP & EQIP: ag/floodplain easements and fuel treatments on working lands.
- Local Open-Space Bonds (L&C renewal pending) + county impact fees; utility cost-share for hardened extensions.

Why this matters: This recommendation turns a fragmented assessment area into a connected, enforceable, and maintained buffer, enforced through county codes, local fire and DNRC standards, and MTARNG/DMA range management policies, reducing ignition pressure at the fence line, speeding evacuations, improving suppression options, and protecting mission assurance for FHTA and LHTA.

10. Limited On-Site Fire Suppression and Over-Reliance on Regional Mutual Aid

Findings

Both FHTA and LHTA suffer from minimal in-house suppression capacity, compelling heavy reliance on external agencies including USFS on LHTA and VAFD on FHTA, municipal fire departments, and volunteer districts. This dependence introduces latency, unpredictability, and resource competition, especially during high fire-activity seasons, putting mission-critical assets and operations at sustained risk.

Wildfire and all-hazards exercises at both installations are ad hoc and not tied to the Homeland Security Exercise and Evaluation Program (HSEEP) cycle. Range Control and county emergency management agencies do not conduct annual joint drills validating evacuation, communication, or ICS transfer of authority.

This is a partial non-compliance with DoDI 6055.17 and DoDI 3020.52 (Continuity of Operations), both of which require recurring exercises to validate emergency response and continuity plans. At the federal level, HSEEP 2020 guidance (FEMA Homeland Security Exercise and Evaluation Program Doctrine, 2020) mandates evaluation and after-action tracking; no such AAR/IP documentation exists for MTARNG wildfire or all-hazards scenarios. State compliance with MT DES Training Standards and county ICS interoperability objectives under 44 CFR §201.6(c)(4) remain unfulfilled, limiting grant alignment and certification eligibility. This represents partial compliance rather than full alignment with DoDI 6055.17 and DoDI 3020.52 (Continuity of Operations), both of which require recurring exercises to validate emergency response and continuity planning across hazards. MTARNG conducts an annual fire-season After-Action Review (AAR), and these are maintained on the local share drive, demonstrating a documented cycle of review and applied learning for wildfire response. However, HSEEP (2020) doctrine and federal exercise standards require broader all-hazards validation with Improvement Plans (IP) and evaluation-measure tracking. No HSEEP-compliant AAR/IP documentation exists for non-wildfire scenarios or continuity-of-operations activations, leaving a gap in all-hazards readiness.

At the state and county level, this shortfall also limits full alignment with MT DES training standards and the ICS interoperability requirements under 44 CFR §201.6(c)(4). Establishing a recurring all-hazards exercise cycle, using HSEEP format with AAR/IP integration, would close the compliance gap, strengthen county-state-Guard interoperability, and improve eligibility standing for future grant applications.

Staffing and Equipment Constraints On-Site

- FHTA: The VA Fire Department on base provides through an IAA a basic engine and crew capable of structure response and limited initial-attack, but it lacks wildland-class engines, dozers, heavy tenders, and air assets required for sustained wildfire events.

- LHTA: No permanent fire department, fire station, or suppression apparatus exists within the training area. MTARNG transports and stages fire suppression equipment to LHTA prior to live fire training. Response from the beginning is by USFS through IAA.

Mutual Aid Dependence and Regional Load

- FHTA: Primary support is IAA with VAFD. Mutual aid is provided by Helena Fire Department, DNRC (Helena Unit), and West Valley Fire District all of which routinely support large regional incidents.
- LHTA: Primary support comes from USFS Townsend Ranger district and Broadwater County through an IAA. Mutual aid is provided by additional Broadwater County Fire Department assets if primary support is not available or sufficient.
- During peak seasons, all these agencies are often committed across multiple fronts, e.g. in 2021, the Woods Creek Fire and several satellite starts taxed local and state suppression assets simultaneously, delaying responses to smaller ignitions.
- State-based aviation resources (SEAT, large helicopters) and hotshot crews are allocated based on national priority; local needs compete with regional wildfires in Idaho, Montana, and the Northern Rockies.

Response Time Metrics & Geography

- FHTA: If VAFD is unable to suppress a wildfire and/or it escapes initial containment, VAFD calls DNRC and local RFDs for mutual aid. Local support from staging to periphery takes 15-30 minutes under ideal conditions; delays escalate when resources are committed elsewhere or roads smoke. If VAFD is on site, response time is less than 5 minutes.
- LHTA: Response times from Townsend USFS, or from DNRC stations, often exceed 30–60 minutes; distance and fragmented access add travel latency.
- The first 10–15 minutes are critical for controlling fast-moving grass/brush fires; these delays often shift incidents beyond successful initial-attack.

Terrain, Water, and Logistical Barriers

- FHTA: Rugged terrain on the southern and southeastern edges restricts ground movement; limited hydrant coverage and distant tender refill points mean suppression assets must battle time and distance.
- LHTA: Steep gulch drainage systems, lack of staging pads, and limited water availability increase logistical burden on arriving mutual aid.
- The lack of redundancy in water sources, staging infrastructure, and engine caches means arriving suppression often begins from disadvantageous positions.

Scaling and Surge Capacity Limits

- DNRC, as a backbone suppression agency, must triage access across hundreds of active units; during multi-start days, allocation of engines or airtankers may bypass small ignitions near installations until critical threats elsewhere are mitigated.

Implications

The absence of robust on-site suppression resources at both FHTA and LHTA creates a structural and wildland vulnerability that leaves installations highly dependent on external agencies whose availability cannot be guaranteed during peak wildfire activity. This dependency introduces delays in initial-attack response, reducing the probability of containing fast-moving grass and brush fires within the critical first 15 minutes. Overcommitted mutual aid partners, including DNRC, municipal fire departments, and rural volunteer districts, frequently prioritize larger regional fires, leaving smaller but strategically critical ignitions near installations underserved. For FHTA, this translates into heightened risk of wildfire encroachment on the cantonment, VA Medical Center, and airfield, with cascading impacts on mission continuity and public health. For LHTA, long travel times and poor water availability amplify suppression challenges, increasing the likelihood that a single ignition could expand beyond containment before aid arrives. In both cases, reliance on strained external resources exacerbates mission disruption, elevates recovery costs, and prolongs downtime for training operations, ultimately eroding resilience and exposing both military assets and neighboring WUI communities to disproportionate risk.

- Elevated early-stage risk: Fires starting near installations face prolonged exposure, and in many instances outpace the mutual aid arrival window, allowing them to establish beyond initial control.
- Competing priorities crowding out installation defense: During large regional fire events, mutual aid may be preoccupied, leaving training-area incidents underserved or delayed.
- Reduced tactical leverage: Without heavy on-site equipment, installations must rely on arriving forces to catch up, often at disadvantageous positions where terrain, fuel, or wind favor spread over suppression.
- Mission suspension and asset exposure: Delays in suppression increase the likelihood of range closures, utility or road damage, and extended smoke exposure, disrupting training cycles, aviation operations, and VA/medical logistics.
- Escalating cost curve: Delayed response increases the area burned, structure defense burden, resource consumption, and post-incident recovery time, forcing installations to pay a mitigation tax through higher suppression and restoration costs.
- Vulnerability to multiple concurrent incidents: Over-reliance means that when regional fire loads are high, both FHTA and LHTA could be left without timely defense, escalating risk to mission-critical facilities and civilian infrastructure in the buffer areas.

Recommendations

Enhance wildland fire initial-attack and extended-attack capability protecting areas immediately adjacent to FHTA and LHTA by supporting typed, community-based ground resources that protect the WUI and provide rapid mutual-aid response to the installations. Positioning these resources in

Baxendale, West Valley, and Broadwater places suppression and mitigation capacity where it is most effective while maintaining direct protection of installation values.

A. Community Initial Attack Capability Supporting Installations: Support stakeholder agencies seeking to establish or expand NFPA 1051-qualified Initial Attack (IA) resources with the installations identified as priority response and protection areas.

- Baxendale / West Valley Area (Fort Harrison Interface):
  - 1× Type-3 engine (500+ gal, pump-and-roll)
  - 2× Type-6 engines
  - 1× water tender (2,000–3,000 gal)
  - 1× UTV skid unit for perimeter patrol and rapid response
- Broadwater Area (LHTA Assessment Area Interface):
  - 1× Type-4 engine or skidgine
  - 1× Type-6 engine
  - 2× water tenders (limited hydrant availability)
  - 1× dozer/tractor-plow or contract dozer for line construction and access improvement
- Local Fire Districts / VAFD / County Partners: Own and operate equipment, provide staffing, and serve as the primary responding agencies within their jurisdictions, including mutual-aid response to Fort Harrison and LHTA.
- DNRC / USFS: Provide technical assistance, equipment typing guidance, training support, and cooperative cost-share opportunities through existing state and federal fire programs.
- MTARNG / DMA: Provide coordination, planning support, and limited cost-share where allowable; integrate partner capabilities into installation WFMP as external response and mutual aid.
- Frame equipment and staffing needs as community wildfire resilience investments that protect critical military infrastructure by reducing fire intensity and response time before incidents reach installation boundaries.
- Identify FHTA and LHTA as high-value assets within grant applications to strengthen competitiveness for:
  - REPI
  - OLDCC
  - Cooperative Fire Assistance (CFA)
  - State resilience and mitigation programs
- Long-term sustainment remains with stakeholder agencies, reducing reliance on installation suppression funding while preserving response capability.

B. Seasonal Hand Crew (Partner-Hosted, Installation-Supporting)

- 10–12-person seasonal hand crew (May–September) hosted by local fire districts or county partners.
- Cross-staffed with VAFD and rural partners to support:

- Patrol and rapid response in within installation interface and adjacent response areas
- Mop-up and extended-attack support
- Fuels treatment and prescribed-fire preparation in priority off-installation zones that influence installation fire behavior

C. Pre-Positioned Suppression Caches & Tools

- Pre-positioned suppression caches owned and maintained by partner agencies, with access agreements supporting installation response.
- Caches at Williams/Country Club and Indian Creek/Old Woman's Grave: hose packs, nozzles, portable pumps, hose lays, Class-A foam/gel, hand tools, bladder bags, spare PPE, and fire shelter resupply; Knox-secured and inventoried.
- Spark control kits for training areas: spark arresters, fire blankets, drip-torch kits for quick blackline, tow-behind water trailers.

D. Red-Flag Surge Protocols & MOUs

- Codify trigger thresholds (ERC/BI, wind >25–35 mph, RH <15%) that:
  - Stand up pre-identified staffing and resources, open caches, and pre-stage engines/tenders.
  - Activate call-when-needed contracts (dozer for east side of OWG, water tender).
- Update mutual-aid MOUs to typed resource requests, shared radio plans, and staging locations (align with the JMCWCP).

E. Detection, Intel, and Comms

- Install one additional RAWS or micro-RAWS per site and tie into a shared dashboard; deploy lookouts/UAS IR recon on Red-Flag training days. MTARNG/DMA would own and maintain the on-installation RAWS; NIFC/BLM provides network calibration and data integration support; and local partners access real-time data through a shared, multi-agency dashboard maintained a shared, multi-agency dashboard accessible to installation staff and partner agencies for coordinated decision-making. A shared RAWS dashboard is typically a cloud-based digital interface that automatically pulls real-time weather data (temperature, wind speed, relative humidity, fuel moisture, etc.) from one or more RAWS or micro-RAWS units and displays it in an easy-to-read format for decision-makers.
- Cache interoperability radios and publish air-to-ground channels.

F. Training, Exercises, & After-Action

- Annual joint IA drill with DNRC and rural districts; cross-train VAFD and DMA staff to NWCG task books.
- Maintain after-action reviews for each start and refresh SOPs annually.

Lead / Partners

- Leads: MTARNG/DMA (planning, coordination, integration); VA Fire Department.
- Partners: DNRC Fire Protection Bureau; West Valley Fire Districts; City of Helena Utilities; NorthWestern Energy & Vigilante Electric (safety during operations); USFS/BLM (coordination at LHTA); VA EM.

Supporting Facts

- Reliance on mutual aid: FHTA primary response is the VAFD with limited wildland engines; LHTA has no hydrants (1 well-fed hydrant and a gravity fed J-stand with 30,000-gallon below ground tank and depends on tenders from rural districts.
- Operational latency: LHTA tender refill cycles frequently >45 minutes in drought/turbidity; distances and canyon roads slow IA.
- Weather & fuels: Helena RAWS averages ~19 Red Flag days/year (2018–2023); fine grass and brush can spread 6–10 mph under wind, minutes matter.
- Historic strain: During Canyon Creek (1988) and Woods Creek (2021), regional resources were already committed, leading to extended response times and delayed containment near Helena Valley and Townsend.

Cost Estimate (planning-level ranges)

- Engines & tenders: Type-3 $350k–$450k; Type-6 $180k–$250k each; Water tender $250k–$400k (×3–4 units across sites).
- Dozer/tractor-plow (purchase or seasonal contract): $150k–$350k (or $3k–$6k/day contract).
- Suppression caches & PPE: $150k–$300k (two large caches).
- RAWS/micro-RAWS + UAS IR kit: $75k–$200k.
- Staffing/training: Seasonal IA crew & OT $400k–$700k/yr; refreshers/exercises $50k–$100k/yr.
- Total initial capital: $2.0M–$4.5M, plus $0.5M–$0.9M/yr O&M and seasonal staffing.

Potential Funding

- FEMA HMGP (project): eligible for wildfire mitigation equipment when tied to a strategy (water storage, engines/tenders, caches), and for RAWS/comms.
- USDA Community Facilities & EDA Public Works (rural apparatus/sites): apparatus, station.
- USFS State & Private Forestry – State Fire Assistance (SFA)/Volunteer Fire Assistance (VFA): equipment and training cost-share via DNRC.

- DoW OLDCC Community Infrastructure: defense-adjacent water storage/staging improvements.
- DoW REPI (where water/pads also support buffer corridors) & REPI-partner easements for sites.
- Assistance to Firefighters Grant (AFG): PPE, radios, small apparatus (coordinate through VAFD and rural districts).
- Local: county fire levies, utility safety cost-share (operations near energized lines), city utilities (hydrant loops at FHTA).

Why it matters: Wildland fires do not recognize jurisdictional boundaries. Strengthening interface-focused, typed Initial Attack (IA) capacity and clearly defined Red-Flag surge triggers reduces the critical minutes that determine whether a start is contained quickly or escalates into a multi-day, mission-disrupting incident. This capability is significant for both MTARNG and the surrounding defense communities of Helena and Townsend, as fires originating on or near the installations can rapidly spread into adjacent civilian areas and likewise, off-installation fires can threaten training areas and mission infrastructure.

Regional fire resources are frequently committed during peak fire weather, increasing response times and exposure for both military and civilian assets. Improving coordinated suppression capability at the wildland–urban interface through a mutual-protection framework enables partner agencies to engage fires off installation more effectively while reducing the likelihood that fires move onto or off installations. This shared-benefit approach directly aligns with OLDCC objectives by enhancing community resilience, protecting defense-critical infrastructure, and reducing wildfire risk across jurisdictional boundaries rather than shifting it between military and civilian lands.

11. Delayed or Constrained Aviation and Interagency Resources

Findings

Aviation assets including helicopters and single-engine air tankers (SEATs) are critical for rapid containment of wildfire runs in both assessment areas. However, these resources are managed at the state and interagency level, meaning they are often reassigned to higher-priority fires across Montana and the Northern Rockies during peak demand. At FHTA, smoke and visibility issues at the Army Airfield (AAF) further constrain aerial suppression and evacuation support, while at LHTA, canyon topography restricts safe air operations in narrow corridors, and the Off-Limits Impact Area prevents water drops within 300 feet of its boundary. Historical records from the Helena RAWS station (2018–2023) show an average of 19 Red Flag Days annually, conditions under which simultaneous large fires across the region draw down aerial resources quickly. Both training areas remain at risk of delayed aerial response, undermining initial attack effectiveness and increasing the likelihood of large, uncontrolled fires.

Aviation and interagency surge resources (helicopters, SEATs, LATs, air attack, hotshot/IMT modules) are critical to catching fast grass- and shrub-fueled fire runs in both assessment areas,

yet they are frequently delayed, visibility-limited, or reassigned during peak fire periods, reducing initial-attack effectiveness and increasing the likelihood of extended incidents.

Within both assessment areas , wildfire risk is significantly amplified by the potential for delayed or constrained aviation and interagency suppression response. These constraints are most consequential where rapid fire spread, limited access, and mixed ownership create conditions in which early suppression effectiveness is critical. Fires originating on or adjacent to installation lands frequently threaten surrounding WUI parcels, transportation corridors, and shared infrastructure within a short time window. When aviation and interagency resources are delayed, grounded, or reassigned during periods of high regional fire demand, initial attack effectiveness is reduced, increasing the likelihood that fires will escape containment.

High demand, shared fleets, and priority reassignments

- Helicopters and fixed-wing retardant platforms are regionally shared and dispatched by interagency coordination centers; during Red Flag stretches they are re-prioritized to higher-threat complexes, potentially leaving local ignitions at FHTA/LHTA without immediate air support.
- In severe seasons (e.g., 2017, 2021), multi-start days across the Northern Rockies routinely exceeded available aviation sortie capacity, producing request queues and multi-hour gaps before the first drop on smaller incidents.

Weather/visibility windows often close before arrival

- FHTA (Helena basin): An average of ~19 Red Flag days/yr (2018–2023) with frequent gusts >50 mph; smoke and turbulent /frontal winds routinely force temporary grounding or altitude/weight restrictions.
- LHTA (Canyon Ferry/Townsend): ~15–18 Red Flag days/yr (2015–2023) with RH <15% and Haines 5–6 days common; canyon-channeling winds create rotor and downdraft conditions that reduce safe drop windows.
- Regional smoke events (e.g., 2017, 2021) degraded visibility to IFR similar conditions at times, preventing low-level retardant/gel applications precisely during peak spread periods.

Terrain and airspace constraints reduce drop effectiveness

- LHTA: Steep limestone draws channel and accelerate winds, while narrow canyon geometry limits safe approach angles and reduces effective drop lengths for aerial resources, complicating line construction and decreasing continuity of suppression.
- FHTA: Proximity to the VA Medical Center and cantonment/AAF creates sensitive airspace coordination needs; smoke plumes over the Helena Valley can close pattern work and delay medevac or suppression flights.

Interagency ground surge is likewise capacity-limited

- Hotshot crews, dozers, and Type 2 IA modules are committed by regional priority; during large incidents (e.g., Woods Creek 2021, Deep Creek Canyon 2021), ground reinforcements to the Helena–Townsend area arrived late in the first operational period, with aviation covering gaps rather than anchoring to established lines.
- FHTA: Aerial suppression operations are frequently restricted by poor visibility and strong winds in the Helena Basin. When the airspace pattern over the Helena Regional Airport and the associated AAF becomes smoke-impacted, both firefighting and medical evacuation flights face operational limits. The surrounding WUI requires precise, short-run retardant or water drops, maneuvers that become difficult and hazardous under turbulent or low-ceiling conditions.
- LHTA: Steep, narrow gulches force short, high skill drops. Aerial suppression will not be delivered or conducted in the LHTA impact area by USFS**,** further increasing the likelihood that a fire start could escape initial containment and spread off-installation. When aviation is unavailable or delayed, single-lane access, and extended hose-lay distances mean the fire can rapidly outrun ground forces, reducing suppression effectiveness and elevating exposure for surrounding communities.

Airspace restrictions, TFRs, and aviation coordination lines

Within the assessment areas, aviation response is further constrained by complex airspace management requirements, including Temporary Flight Restrictions (TFRs), military operating areas, and congested civil airspace. These constraints directly affect the timeliness and effectiveness of aerial suppression, where early aviation engagement is often critical to preventing fire spread into developed areas and evacuation corridors.

- TFRs: The establishment, modification, or expansion of wildfire-related TFRs introduces additional coordination and approval steps that can delay the use of aerial resources during the most critical phases of initial attack. While TFRs are essential for aviation safety, the time required to initiate or adjust them, particularly in airspace overlapping military operations, can create gaps between fire detection and effective aerial engagement. In the assessment areas, these delays are especially consequential because:
  - Fires can reach WUI edges or critical corridors before aviation operations are fully authorized.
  - Initial attack aircraft may be forced to hold, divert, or operate under interim restrictions that limit drop effectiveness.
  - Short operational windows created by wind and visibility conditions may close before aviation can be deployed.
- Military and Civil Airspace Deconfliction: Both assessment areas are influenced by complex military aviation activity, including training operations, as well as nearby civilian aviation corridors, requiring effective airspace deconfliction to support wildfire aviation operations. Effective wildfire aviation requires timely deconfliction among:
  - Military flight operations and training schedules,
  - Civilian firefighting aircraft,
  - Medical evacuation and other priority flights.

- Aviation Coordination and Command Lines: Wildfire aviation response within the assessment area depends on clear and rapid coordination across multiple entities, including dispatch centers, incident command, military range or airfield authorities, and aviation supervisors. When these coordination "lines" are not clearly defined or activated early:
  - Requests for aircraft may be delayed or duplicated.
  - Aircraft may arrive without full situational awareness of ground operations, access constraints, or WUI exposure.
  - Aviation may be underutilized or restricted to indirect support rather than direct suppression along WUI edges.

Implications

The limited and delayed availability of aviation and interagency resources at both FHTA and LHTA has direct consequences for wildfire containment, cost, and mission assurance. When helicopters, SEATs, or LATs are not available within the first 30–60 minutes of ignition, grass- and shrub-fueled fires can escape initial attack, transition to extended incidents, and grow beyond control lines, forcing longer suppression campaigns and diverting resources from other regional priorities. Constrained aviation also means ground crews are left unsupported in steep, inaccessible terrain, raising firefighter safety risks and prolonging suppression timelines.

For installations, these delays translate into greater exposure of mission-critical assets and lifelines, from the VA Medical Center at FHTA to training ranges at LHTA. Prolonged smoke and disrupted airspace not only hinder suppression but also interrupt military flight operations and medical evacuation capabilities, compounding operational downtime. At the community level, delayed drops allow wildfire perimeters to expand toward WUI neighborhoods, highways, and power corridors, increasing the likelihood of evacuation bottlenecks and cascading lifeline failures.

Ultimately, aviation delays heighten the probability of larger, costlier, and more destructive incidents, eroding public trust in emergency response and undermining military readiness. Without pre-positioned assets, hardened helispots, and faster dispatch protocols, wildfire events in both assessment areas could potentially escalate beyond local suppression capacity, threatening both regional resilience and defense operations.

- Lower initial-attack success rates: When aircraft and IA crews are delayed or grounded, fast-moving grass/shrub fires in both assessment areas are more likely to escape initial attack and require extended operations.
- Higher incident size and cost: Extended attack drives more line to build and hold, larger retardant needs, and longer operational periods, raising costs and mission downtime.
- Increased community and lifeline exposure: Delays elevate the chance that flames or embers reach WUI edges, utility corridors, and evacuation routes, forcing structure-protection tradeoffs over perimeter control.
- Training disruption: Repeated airspace/visibility constraints reduce flying windows for both suppression support and military aviation training, amplifying schedule impacts.

Recommendations

Address delayed or constrained aviation and interagency response within the assessment areas by improving early authorization, coordination, and operational effectiveness of existing aviation resources during the initial attack period. The approach focuses on reducing delays caused by airspace restrictions, TFRs, and complex coordination lines, while supporting safe aviation operations in canyon and valley wind regimes. These actions directly reduce the likelihood that fires escape initial attack and spread into WUI neighborhoods, evacuation corridors, and critical infrastructure.

A. Early Authorization & Coordination Triggers

- Establish Red Flag and high fire-behavior triggers (e.g., ERC ≥ 90th percentile, RH < 15%, sustained winds ≥ 20–25 mph) that prompt early aviation coordination and authorization when fires threaten assessment areas.
- Treat airspace coordination and aviation authorization as early operational priorities rather than downstream administrative steps when fires occur within identified assessment-area transmission pathways.
- Align aviation readiness with realistic weather, fuel, and terrain conditions to ensure available aircraft can engage during the narrow windows when aviation is most effective.

B. Helispots and Aviation Access Locations

- Identify and maintain aviation access locations within the assessment areas based on wildfire transmission pathways, WUI exposure, and access limitations rather than installation convenience alone.
- Certify and document helispots with surveyed approach and departure paths suitable for operations under variable wind and visibility conditions:
  - FHTA Assessment Area: Williams/Country Club corridor and Birdseye Foothills interface zones.
  - LHTA Assessment Area: Bivouac 2, South Old Woman's Grave/Indian Creek, and Lower River Road corridors.
- Ensure helispots are sited to minimize conflicts with evacuation traffic, utilities, and public staging while supporting rapid aerial engagement along WUI edges.

C. Air-to-Ground Communications & Airspace

- Publish a standardized air-to-ground communications plan applicable to fires within the assessment areas, including command, air-to-ground, and guard frequencies.
- Pre-plan TFR request templates and airspace coordination procedures to reduce delays associated with establishing, modifying, or expanding restricted airspace when fires threaten assessment areas.

- Clarify aviation coordination and approval lines among dispatch, incident command, airspace authorities, and aviation supervision to ensure timely integration of aircraft into suppression operations.

D. Detection, Situational Awareness, and Briefing Products

- Integrate aviation availability, airspace constraints, and expected authorization timelines into early situational assessment and decision-making for assessment area fires.
- Develop and maintain aviation briefing materials that include terrain influences, powerline hazards, helispot locations, wind-driven turbulence zones, and known access limitations within the assessment areas.
- Ensure aviation constraints are considered alongside suppression and protective action planning as fires approach developed areas.

E. Exercises, Review, and Continuous Improvement

- Conduct periodic aviation-focused coordination reviews using realistic assessment area fire scenarios that involve rapid fire spread toward assessment areas.
- Use lessons learned to refine airspace coordination procedures, helispot locations, communication plans, and suppression decision-making frameworks.
- Incorporate identified aviation constraints and coordination improvements into CWPPs, mitigation strategies, and assessment area planning documents to reduce repeated exposure to the same risks.

Lead / Partners

- Leads: MTARNG/DMA (Range Ops/Real Property), DNRC Aviation.
- Key Partners: USFS/BLM (cooperator aircraft, helispot approvals), West Valley Fire District (staging & ground support), City of Helena/County EM, FHTA Army Airfield & airport managers, NorthWestern Energy & Vigilante Electric (airspace/powerline safety), Tri-County FireSafe Working Group.
- Advisory: FAA (TFR/deconfliction)

Supporting Facts

- Weather & spread: Helena RAWS averages ~19 Red-Flag days/year (2018–2023); fine-fuel and brush regimes around both sites can produce 6–10 mph head-fire spread, making first-drop timing decisive.
- Operational delays: Aerial assets are frequently committed statewide during surge periods; reload/turn times lengthen when bases are distant, and FHTA AAF visibility is degraded by smoke.

- Terrain limits: LHTA canyons generate turbulence and downdrafts; safe aviation requires surveyed approaches, marked hazards, and short bucket cycles.
- Wildfire aviation response: Aerial suppression at LHTA is constrained by restricted airspace and associated approval and deconfliction requirements, while both LHTA and FHTA experience delays due to unclear aviation coordination roles during initial attack. These factors can result in delayed aerial suppression during critical initial-attack periods.

Cost Estimate (planning-level ranges)

- Helispot identification, construction, and certification: $50k–$150k per site: Includes grading, pads, markings, lighting where appropriate, and surveyed approach/departure paths to support safe aviation operations in assessment areas.
- Portable retardant or water reload capability and containment: $250k–$600k: Covers site preparation and materials to reduce aircraft turnaround times and improve aviation effectiveness during initial attack along WUI edges and evacuation corridors.
- Air-to-ground communications and interoperability kits: $75k–$150k: Supports standardized air-to-ground coordination, aviation communications, and integration across agencies operating within complex airspace environments.
- Detection, situational awareness, and briefing tools (e.g., micro-RAWS, IR/UAS support): $75k–$200k: Enhances early identification of fire behavior, weather constraints, and aviation limitations to inform suppression and airspace decision-making in the assessment areas.
- Aviation coordination reviews, exercises, and procedural validation: $25k–$60k annually: Supports periodic testing and refinement of airspace coordination, TFR procedures, communications, and aviation integration under realistic fire scenarios in the assessment areas.
- Estimated total initial investment: $0.6M–$1.4M: Represents combined site preparation, communications, detection, and planning enhancements, with additional seasonal operations and maintenance costs as applicable.

Potential Funding

- HMGP: Helispots, dip/draft and reload infrastructure, communications, detection, and situational awareness improvements that demonstrably reduce wildfire transmission risk in the assessment areas and provide long-term mitigation benefits.
- OLDCC – Community Infrastructure: Defense-adjacent aviation access improvements, including helispots and support sites that protect surrounding WUI areas, evacuation corridors, and shared community infrastructure.
- State aviation and federal cooperator agreements: Cost-share opportunities for aviation access locations, airspace coordination planning, and site development that improve initial attack effectiveness in high-risk interface areas.

- USFS State & Private Forestry / CWDG: Planning, communications, detection equipment, and infrastructure that improve WUI initial attack coordination, reduce response delays, and address known aviation constraints.
- DoW REPI: Where aviation access improvements also support CUB objectives, land-use compatibility, fuel breaks, or long-term wildfire risk reduction adjacent to installations.
- Local and regional partners: County emergency management and public works contributions for site preparation, access improvements, and staging support; utility mitigation and safety funds for powerline marking, relocation, or protection near aviation approaches and WUI corridors.

Why this matters: Delayed or constrained aviation and interagency response is a determining factor in whether wildfires within the assessment areas are contained or escalate. When aviation is delayed by airspace restrictions, TFR requirements, or coordination barriers, fires rapidly outpace ground resources, forcing an immediate shift from containment to structure protection and evacuation. Failure to address aviation delays may result in exposure to larger, more dangerous, and more costly wildfire incidents.

12. Uncoordinated Civilian–Military Evacuation and Response Planning

Findings

Despite overlapping wildfire exposure, civilian and military evacuation planning remains fragmented around both installations. In the FHTA assessment area, U.S. Highway 12, Country Club Road, and Williams Road are shared by military personnel, VA Medical Center patients, and West Helena residents, yet evacuation protocols and traffic-control responsibilities are not formally codified. In the LHTA assessment area, Indian Creek Road provides the sole ingress and egress route for training support and range maintenance activities. This corridor is also relied upon by residents, ranchers, and recreationists during wildfire incidents, yet there is no established coordination framework to manage simultaneous civilian evacuation and fire-response movement. The lack of alternate access or controlled staging routes increases exposure to congestion and delays during emergency operations. Stakeholder interviews indicate that county-level evacuation plans do not explicitly incorporate installation populations or training schedules, while installation emergency plans lack integration with county traffic-management schemes. This gap increases the likelihood of gridlock, delayed medical transport, and uncoordinated structure protection during wildfire incidents. Without a Joint Civilian–Military Evacuation Framework, both installations face heightened risks of confusion, delayed response, and compromised life safety during fast-moving fires.

FHTA

- Shared, choke-point corridors with no contraflow doctrine. U.S. Highway 12, Country Club Rd, and Williams Rd simultaneously serve residential evacuees, responders, and military personnel; there is no signed, multi-agency Traffic Control Point (TCP) plan (lane

assignments, contraflow triggers, detour ladders) specific to wildfire incidents near the installation boundary.

- Medical movement not formally integrated. The VA Medical Center requires patient-specific transport and continuity-of-care protocols; Evac/EMS routing, ambulance staging, and prioritization are not mapped or drilled with county EM and fire districts for Red Flag conditions.
- Undefined staging and refuge areas. Engine/tender staging pads, public refuge areas, and helicopter landing zones near the south/southeast perimeter are not hardened, pre-designated, or published in a joint annex, slowing unified command and increasing on-scene improvisation.
- Alerting/interoperability gaps. Public alerting (e.g., reverse-911/SMS) and installation mass notification are not synchronized; air-to-ground and cross-agency radio channel plans are not standardized in a standing IAP for FHTA incidents.
- No pre-approved perimeter control lines: Although steep and variable terrain limits where dozer lines or backfire corridors can be established, the absence of jointly mapped and pre-permitted perimeter control areas along the installation–community interface remains a critical vulnerability. These control features are essential for preventing fire movement both onto and off installation and for protecting surrounding residential and agricultural areas during high-wind or Red Flag events. Without pre-designated and coordinated control lines, incident commanders must improvise structure protection and access during active wildfire conditions, increasing response time and risk to nearby communities.
- Exercises are limited or ad hoc. After-action reviews from recent regional fire seasons cite traffic congestion and message latency, yet there is no recurring, multi-agency functional exercise focused on FHTA specific corridors and the VA campus.

LHTA

- Single-threaded egress with mixed users: Indian Creek Road serves as the sole ingress and egress route for range maintenance, residents, ranchers, and recreationists near LHTA. No coordinated plan defines traffic-control points (TCPs), evacuation priorities, or alternating one-way flow procedures when smoke, debris, or suppression equipment narrows the corridor to single-lane operations. This creates a high potential for congestion and delayed evacuation or response during wildfire incidents, increasing risk to nearby communities and responders alike.
- Recreation surge complicates evacuations. Peak-season Canyon Ferry activity (trailers, OHVs, boat launches) adds non-resident evacuees to a single corridor with no pre-staged traffic management or overflow refuge areas identified in a joint annex.
- Lack of mapped refuge/helispots and water points for evac support. Safe refuge areas, medevac helispots, and water points to support evac/structure defense are not hardened or pre-published, increasing setup time and risk during fast-moving runs.

- Notification/situational awareness gaps. Seasonal residents and recreators may not be enrolled in county's alert systems; cellular shadowing in canyons creates alerting blind spots, and no satellite/mesh fallback is referenced in a joint plan.
- ICS integration is informal with MTARNG. While mutual aid exists, role assignments, trigger thresholds, and span-of-control transfers for LHTA incidents are not codified, delaying unified command.
- No evacuation time modeling. Evacuation clearance time (ECT) under Red Flag, smoke-limited visibility, and debris-flow closures has not been quantified; without ECT, priorities (who leaves first, who shelters, who defends) are not evidence-based.

Cross-Cutting Gaps (Both Installations)

- Missing Joint Military–Civilian Evacuation Annex. No signed annex defines TCP locations, contraflow triggers, refuge areas, special-needs transport, medevac integration, comms channel plans, and public information roles.
- Re-entry and credentialing are undefined. Re-entry tiers (utility crews, damage assessment, mission-critical staff, residents) and credential checks at TCPs are not standardized, prolonging downtime and increasing corridor conflict.
- Data and maps did not operationalize. RAPT lifelines, WUI growth, and known culvert/debris-flow hotspots are not compiled into a single operational map set (control lines, staging pads, draft sites, helispots) carried by all agencies.
- No common playbook for simultaneous missions. Structure protection in WUI, VA patient movement, perimeter control, and training asset defense compete for the same corridors without a predefined decision tree.

Implications

The absence of a unified evacuation and response framework for the FHTA and LHTA assessment areas create critical vulnerabilities in life safety, mission assurance, and regional emergency management capacity. Without codified traffic control points, contraflow protocols, and medical evacuation integration, wildfire events are likely to generate gridlock on single-threaded corridors, delaying both civilian evacuations and responder ingress. VA Medical Center patients at FHTA and canyon residents near LHTA face elevated risks of delayed evacuation clearance times (ECTs), while responders lose precious minutes establishing ad hoc staging and refuge areas.

Operationally, these gaps mean that suppression priorities will be forced into conflict with evacuation support, stretching limited resources between perimeter control, structure defense, and traffic management. In the LHTA assessment area, unmanaged recreation surges along Old Woman’s Grave Road, east of Old Woman’s Grave to River Road and Canyon Ferry corridors could overwhelm the only access road, compounding response delays. In the FHTA assessment area, lack of synchronization between installation notifications and county alert systems risks mixed or contradictory evacuation messaging, undermining public trust.

For mission continuity, delayed or chaotic evacuations raise the probability of installation isolation, training suspension, and extended downtime, as re-entry and credentialing procedures are undefined. The inability to demonstrate coordinated evacuation planning also reduces competitiveness for resilience funding, since FEMA and DoW increasingly prioritize integrated, multi-jurisdictional evacuation strategies in REPI and OLDCC grant scoring. Unless addressed, wildfire incidents will continue to expose both installations and surrounding communities to avoid loss of life, higher suppression costs, and degraded military readiness.

- Higher probability of gridlock and delayed fireline establishment when evacuation and responder ingress converge on the same narrow routes.
- Increased life-safety risk for canyon residents, and responders operating without clear TCP authority and refuge areas.
- Longer incident duration and higher costs as ground resources shift to traffic management and structure defense instead of anchoring and holding perimeter lines.
- Extended mission downtime due to unclear re-entry, damage assessment, and credentialing protocols.

Recommendations

Develop and adopt a Joint Civilian–Military Evacuation & Response Annex for the FHTA and LHTA assessment areas that converts ad-hoc evacuations into modeled, mapped, and exercised operations. The annex integrates zone-based evacuations, Traffic Control Points (TCPs), contraflow, medical movement, staging/refuge sites, alerting/comms, and unified command triggers, aligned with NIMS/ICS and DoDI 6055.17 emergency access principles. It directly addresses delays and conflicts documented on U.S. Highway 12, Country Club Rd, Williams Rd and Old Woman's Grave/Indian Creek Road/River Road corridors.

A. Evacuation Zoning, Clearance Modeling & Triggers

- Define pre-approved evacuation areas (fenceline to 3-mile assessment area) using road networks, fire spread pathways, and population clusters (VA medical campus, WUI blocks, recreation areas).
- Perform Evacuation Clearance Time (ECT) micro-simulation for day/night, Red Flag, and recreation-surge scenarios; publish zone-by-zone clearance targets.
- Establish trigger matrices that initiate WARN/GO orders using ERC/BI percentiles, wind thresholds, RAWS RH/temperature, fire location, and visibility.

B. Traffic Operations: TCPs, Contraflow & Refuge

- Map and sign TCPs, one-way rotations/contraflow segments, and no-parking fire lanes on:
  - FHTA: U.S. Highway 12, Country Club, Williams, Blue Cloud/Birdseye connectors.
  - LHTA: Old Woman's Grave, Indian Creek, River Road and Hwy 284.

- Construct hardened staging/refuge pads (Type-3/4 apparatus geometry) and designate Temporary Refuge Areas (TRA) with defensible space for trapped motorists.
- Coordinate with MDT/local traffic for portable DMS placement and signal pre-emption at key intersections during evacuations.

C. Medical Movement & Access/Special Populations

- Create a VA Medical Movement Plan (bed counts, oxygen/ventilator transport, ambulance bus contracts, priority routing, hospital receiving MOUs).
- Maintain special-needs registries (mobility, dialysis, durable medical equipment) and animal/livestock evacuation SOPs for canyon corridors.
- Pre-assign medical and EMS staging nodes and re-entry credentialing for healthcare staff.

D. Alerting, Communications & Unified Command

- Integrate installation alerts with county mass notification (SMS/voice/email), NOAA weather radio, outdoor siren coverage where appropriate, and social/AM/FM partners.
- Publish a radio channel plan (command/tactical, air-to-ground) and cache interoperability radios; pre-write IAP templates (ICS-201/202/205/206/220) for FHTA/LHTA wildfire incidents.
- Define Unified Command activation and handoff procedures among MTARNG, county EM/LE, DNRC, fire districts, VA EM, and MDT.

E. Exercises, Public Education & Maintenance

- Conduct annual tabletop, functional, and full-scale exercises rotating between FHTA and LHTA (with aviation, TCPs, and medical movement).
- Run an evacuation readiness campaign (maps, QR codes, go-kits, pet plans) through Tri-County FireSafe Working Group & DMA PAO.
- Update the annex and Operational Atlas annually (zones, TCPs, helispots/dip sites, debris-flow pinch points) and track After-Action items to closure.

Lead / Partners

- Leads: MTARNG (Range Ops/Real Property), Lewis & Clark & Broadwater County Emergency Management, Sheriff/LE, MDT (traffic).
- Key Partners: DNRC Fire Protection Bureau; West Valley Fire District; City of Helena; VA EM; utilities (NorthWestern Energy/Vigilante Electric); USFS/BLM (site approvals).
- Advisory: Hospitals/clinics, school districts/childcare providers, public health, animal control, tourism/recreation managers.

Supporting Facts

- Single-thread corridors (U.S. Highway 12; Country Club/Williams; Old Woman's Grave/Indian Creek Road/River Road) force evacuees and engines onto the same lanes, creating gridlock and delayed IA.
- Hydrant scarcity and long tender cycles at LHTA (often >45 min) demand precise routing and staging to avoid blocking water shuttles.
- Red Flag frequency: Helena RAWS averages ~19 Red Flag days/year (2018–2023) with grass/brush spread 6–10 mph, leaving minutes to issue orders and position TCPs.
- Complex populations: VA hospital, mobile-home parks, recreation surges, and vulnerable occupancy in the assessment area to increase clearance time and require medical movement SOPs.
- Plan misalignment: Current planning documents do not include shared evacuation atlas, contraflow plans, or unified command triggers for installation-adjacent incidents.

Cost Estimate

- Planning & modeling (zones, ECT, trigger matrices, atlas): $150k–$300k.
- TCP/contraflow equipment & signage (barricades, cones, MUTCD signs, portable DMS leases): $150k–$400k.
- Staging/refuge pad improvements & striping: $200k–$600k.
- Interoperability radios & cache: $75k–$150k.
- Exercises (TTX/functional/full-scale) & AARs: $50k–$100k/yr.
- Public education & materials (3-yr campaign): $60k–$120k.
- Total initial: $635k–$1.57M, plus $110k–$220k/yr sustainment.

Potential Funding

- DHS Homeland Security Grant Program (state pass-through): interoperable comms, exercises, credentialing.
- OLDCC Community Infrastructure (defense-adjacent): pads, signage, and access improvements tied to mission assurance.
- DNRC preparedness grants; USFS CWDG (planning track) for WUI evacuation components.
- Local/MDT contributions for traffic control devices and intersection operations.

Why this matters: A joint, modeled, and exercised annex turns evacuations from last-minute improvisation into repeatable operations, cutting clearance times, preventing corridor gridlock, protecting vulnerable populations, and preserving initial-attack access and mission continuity at FHTA and LHTA.

13. Secondary Hazard Cascades from Wildfire Events

Findings

Wildfire in both assessment areas generate cascading hazards that extend far beyond the fire perimeter. Burn scars in drainages including Tenmile Creek heighten risks of post-fire flooding, debris flows, and sedimentation that threaten municipal water supplies, culverts, and road networks. Helena's reliance on the Tenmile watershed for potable water makes it especially vulnerable to post-fire ash and sediment loads, as documented in similar watersheds across the Rocky Mountain West. Air quality degradation is another persistent secondary hazard, with smoke events in 2017 and 2021 driving PM2.5 concentrations in Helena into hazardous ranges, directly impacting VA Medical Center patients and outdoor training operations. At both installations, cascading infrastructure failures, including downed power lines, blocked evacuation corridors, and water contamination, compound the direct effects of fire, creating multi-layered disruptions that extend response and recovery timelines. Without proactive planning for these secondary hazards, installations and surrounding communities remain exposed to long-duration operations.

FHTA

- Post-fire flood/debris risk: Burn scars in Tenmile Creek and Blue Cloud Creek drainages elevate culvert blockage and road overtopping risks affecting Country Club Rd, Williams Rd, and interior service roads; small convective cells can produce debris pulses that isolate the cantonment.
- Water supply vulnerability: Helena's municipal supply draws from Tenmile watershed; post-fire turbidity spikes and organic loading stress filtration, increase disinfection by-product precursors, and can trigger operational conservation or intake throttling, reducing fire-flow resilience and training support.
- Air quality & visibility: Regional events (e.g., 2017, 2021) produced multi-day PM2.5 exceedances and visibility <6 miles over the Helena Valley, forcing AAF pattern restrictions and training suspensions; smoke impacts disproportionately affect VA Medical Center patients.
- Utility exposure: Overhead distribution along Tenmile/Birdseye corridors faces pole-top ignition and wind fault risk; fire or PSPS similar de-energization can interrupt cantonment power, comms, and pumping, prolonging recovery even when flames are distant.
- Transportation: Rockfall/debris on slopes above U.S. Highway 12 and local connectors increases closure frequency, delaying mutual aid and medical transport during and after events.

LHTA

- Debris-flow: Steep limestone draws produce rapid debris surges after burn; plugged culverts create back-ponding and road washouts on Indian Creek Rd, the area's sole reliable egress.

- Water logistics: Ash/turbidity in creeks and along Canyon Ferry margins can shut down drafting points, extending tender cycle times >45 min and degrading first-period suppression productivity.
- Air quality & visibility: Proximity to Canyon Ferry/Townsend corridors concentrates smoke and dust; degraded visibility grounds or delays rotorcraft/SEAT drops in narrow approach windows.
- Power/telecom fragility: Rural wood-pole feeders and hilltop telecom sites lack hardening and long-duration backup; post-fire wind events precipitate repeated outages, weakening air-to-ground coordination and situational awareness.
- Access isolation: A single culvert failure can sever ingress/egress to training blocks for hours–days, complicating medevac and demobilization.

Cross-Cutting Consequences (Both Sites)

- Life safety: Elevated flashflood and debris-flow hazard during Year 1–3 post-fire monsoon seasons; higher crash risk on smoke-impacted corridors; PM2.5 exposure for troops, and residents.
- Mission assurance: Grounded aircraft, water-flow constraints, and utility/telecom outages force training suspensions, delay re-entry, and extend contingency ops.
- Cost & schedule: Repeated emergency road/culvert repairs, water-treatment upcharges, temporary power/telecom restoration, and additional patrol staffing inflate O&M and recovery costs.
- Public confidence & funding: Visible secondary losses (flooded roads, boil notices, outages) erode trust and lower benefit–cost ratios if not anticipated in project design, hampering future grant competitiveness.

Implications

The cascading hazards that follow wildfire events in both assessment areas carry longer-term risks to both mission assurance and community resilience. Post-fire flooding and debris flows can wash out the only reliable access routes (e.g., U.S. Highway 12, Country Club), isolating installations for hours to days and delaying mutual aid. For the FHTA assessment area, wildfires in the Tenmile Creek watershed could degrade Helena's municipal water supply, the same system that sustains both the cantonment and city residents, forcing restrictions that reduce firefighting capacity and mission support. In the LHTA assessment area, ash and sediment in canyon creeks can disable drafting points, extending tender cycles and undermining initial attack effectiveness.

Air-quality degradation compounds these risks. Regional smoke episodes, already averaging nearly 20 Red Flag Warning days annually in Lewis & Clark and Broadwater counties, regularly push AQI into "Unhealthy" or "Hazardous" ranges. In the FHTA assessment area, this not only grounds Army Airfield operations but also poses disproportionate health threats to the VA Medical Center's sensitive patient population. For both sites, smoke-limited visibility disrupts aviation suppression when it is most needed, creating a dangerous cycle of escalating fire growth and delayed response.

Infrastructure interdependencies make these cascades particularly destabilizing. Power shutoffs, pole-top ignitions, and comms outages along rural corridors can simultaneously cut service to military and civilian users, producing competition for restoration priority. Combined with blocked roads and contaminated water, these overlapping failures create an environment where even moderate fires yield multi-week disruptions. Unless mitigated through hardened lifelines, pre-planned debris-flow protocols, and redundant water and power supplies, secondary hazards will continue to magnify the destructive reach of wildfires, converting single incidents into prolonged regional crises.

Recommendations

Develop a Secondary Hazard Cascade Mitigation Strategy that anticipates and addresses the multi-hazard consequences of wildfire affecting both assessment areas. The strategy incorporates post-fire flooding and debris-flow risk reduction, smoke and air quality management, lifeline hardening, and coordinated recovery planning. It integrates hydrologic modeling, infrastructure design, health monitoring, and cross-agency coordination to ensure that wildfire does not trigger cascading failures that undermine mission assurance and community safety.

A. Hydrology & Post-Fire Debris Flow Mitigation

- Conduct burn-scar hydrologic modeling in Blue Cloud Creek, Tenmile Creek and Indian Creek/River Roads to identify peak-flow increases and debris-flow areas after 10-, 25-, and 100-year rain-on-burn events.
- Harden culverts, bridges, and crossings on Williams Rd, Country Club Rd, and Old Woman's Grave Rd with larger conveyance capacity, debris racks, and armored aprons.
- Install early-warning sensors (rain gauges, stage recorders, debris-flow tilt meters) linked to county alert systems.
- Pre-plan rapid stabilization of burned slopes with BAER-type treatments (mulch, hydro mulch, check dams).

B. Air Quality & Health Resilience

- Expand air quality monitoring (RAWS + PAir sensors) near the VA Medical Center and Broadwater communities.
- Develop a VA smoke continuity plan with patient shelter-in-place strategies, backup HVAC filters (MERV-13+), and oxygen/ventilator surge resources.
- Issue public smoke advisories using existing county mass notification and VA patient portals, aligned with EPA AQI thresholds.

C. Critical Lifelines – Power, Water, Communications

- Harden power distribution lines along Tenmile, Birdseye, Old Woman's Grave, and Indian Creek corridors with covered conductors, composite poles, sectionalizing devices, and PSPS protocols.
- Protect Helena's Tenmile water intake and LHTA Indian Creek wells with sediment basins, diversion ditches, and upstream erosion controls to limit post-fire turbidity spikes.
- Ensure telecom redundancy with microwave or fiber alternate routes outside of high-burn probability polygons.

D. Integrated Recovery & Funding Alignment

- Establish post-fire recovery annexes in county HMPs/EOPs with clear DMA roles in debris clearance, lifeline restoration, and health monitoring.
- Pre-identify debris disposal and staging sites outside floodplains.
- Integrate maintained benefits (culvert O&M, slope inspections, filter change cycles) into project plans to ensure FEMA and OLDCC compliance.

E. Exercises & After-Action Learning

- Run flood-after-fire exercises with DMA, VAFD, USFS, counties, DNRC, and utilities.
- Use recent events (Woods Creek 2021, Rice Ridge 2017) as vignettes to test cascading impacts on lifelines and medical continuity.

Lead / Partners

- Leads: MTARNG/DMA (Range Ops/Real Property), Lewis & Clark & Broadwater County EM/Planning, City of Helena Utilities, VA EM.
- Key Partners: DNRC (watershed & post-fire recovery), MDT (roads/culverts), USFS/BLM (federal lands adjacent), NorthWestern Energy/Vigilante Electric (lifelines), EPA & MT DEQ (air/water quality), Tri-County FireSafe Working Group, local hospitals/clinics.

Supporting Facts

- Post-fire flooding: After major Montana fires (e.g., Canyon Creek 1988, Woods Creek 2021), burned watersheds experienced 2–5 times higher peak flows and channel-blocking debris events, damaging culverts and isolating communities.
- Air quality: Smoke events in 2017 and 2021 reduced visibility in Helena below 6 miles, with PM2.5 reaching "hazardous" AQI levels (>250 $\mu g/m^3$), disrupting VA care and DMA training.
- Lifeline vulnerability: Tenmile watershed supplies Helena's municipal water, with post-fire turbidity spikes already noted by Helena Utilities. Utility poles in Birdseye/Indian

Creek corridors remain unhardened wood, with PSPS outages affecting both military and civilian customers.

- Health systems: The VA serves approximately 25,000 veterans/year, many with respiratory vulnerabilities; unmitigated smoke and outage risk threatens life safety.

Cost Estimate (planning-level ranges)

- Hydrologic & debris-flow modeling: $200k–$400k.
- Culvert/bridge upgrades (Country Club, Williams, Old Woman's Grave, Indian Creek): $1.5M–$4M total.
- Sensors (rain/stage/tilt + network): $50k–$150k.
- Watershed stabilization (mulch, BAER treatments): $250k–$800k/event, scalable.
- Air quality (monitors + HVAC retrofits): $200k–$500k.
- Utility hardening (covered conductor, pole replacement, sectionalizing): $2M–$5M (multi-year).
- Telecom redundancy projects: $500k–$1.5M.
- Exercises/AARs: $50k–$100k.
- Total initial: $4.75M–$12M (scalable to hazard priority corridors).

Potential Funding

- FEMA HMGP: culvert/bridge upsizing, sensors, watershed stabilization, air filtration retrofits.
- FEMA Flood Mitigation Assistance (FMA): culvert upgrades, channel hardening.
- OLDCC Community Infrastructure: Lifeline Resilience projects protecting installations.
- DoW REPI (buffer/stream easements): where water quality and access corridors intersect with buffer areas.
- EPA/DEQ water grants: turbidity/quality protection for municipal intakes.
- DOE Grid Resilience grants: covered conductors, sectionalizers, pole replacements.
- USFS BAER and CWDG: post-fire stabilization, community protection.
- Local bonds/utility cost-share: water, power, and telecom upgrades.

Why this matters: By treating wildfire as a multi-hazard trigger, this program prevents cascading failures, roads blocked by debris flows, hospitals overwhelmed by smoke, utilities knocked out by pole burns, that could disable both military operations and civilian safety systems long after flames are out.

Identified Areas of Concern and Recommended Mitigation Actions

The following locations in the FHTA and LHTA assessment areas were identified through the assessment analyses, stakeholder interviews, and field observations as areas of concern in need of mitigation.

FHTA

The FHTA assessment area contains several high-risk locations that elevate wildfire vulnerability due to topographic exposure, vegetation density, proximity to critical infrastructure, or limited suppression access and represent priority areas for mitigation and coordination.

- **Rimini Road Corridor.** This corridor runs along steep terrain with continuous vegetative fuels, presenting a prime fire pathway into FHTA (Figure 92). Rapid upslope fire movement, limited access routes, and proximity to residential areas make this a critical concern for both ingress/egress safety and wildfire containment.

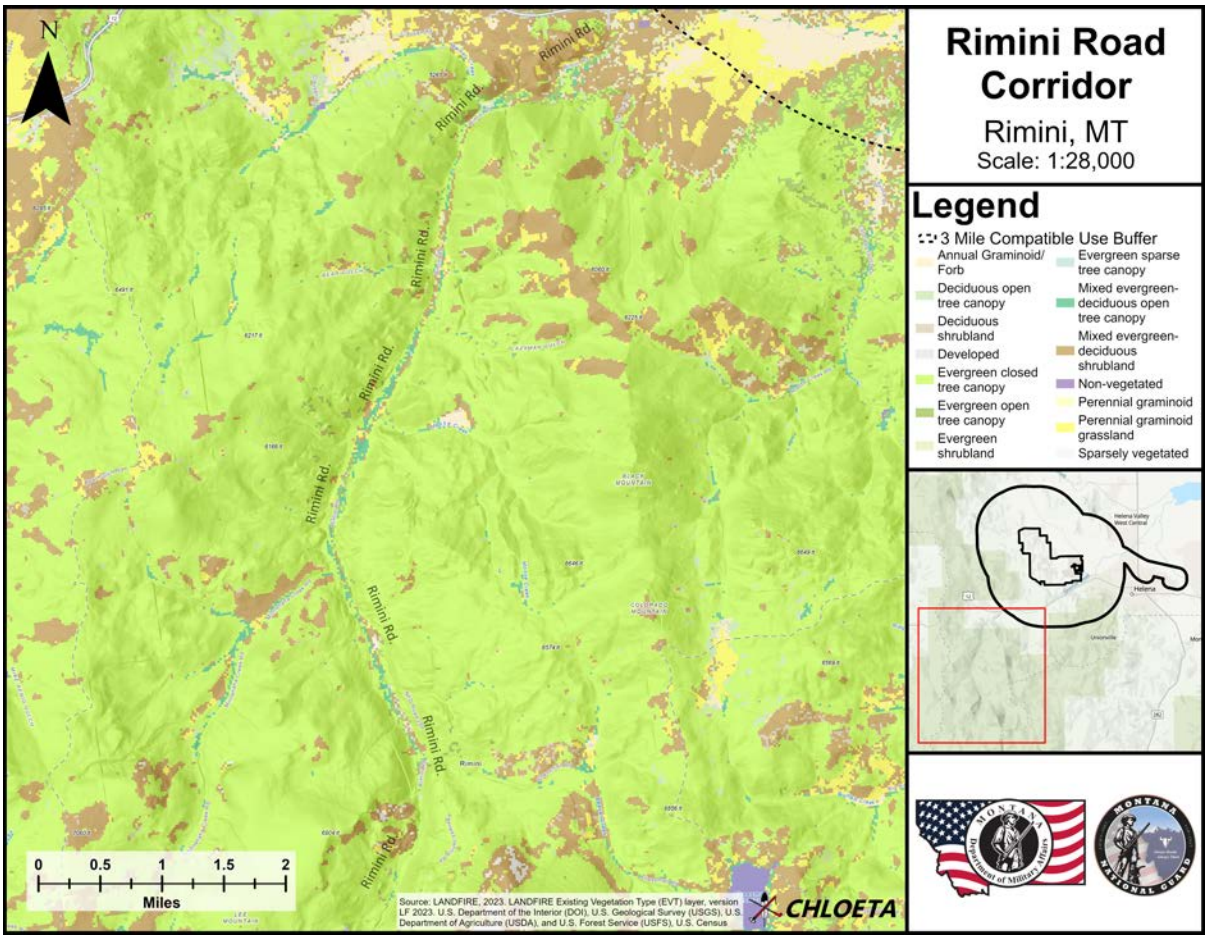


Figure 96. Rimini Road Corridor Map

- **Tenmile Creek Drainage.** Located west of the FHTA, this drainage channel funnels wind and fire toward training infrastructure and residential areas (Figure 93). It supports dense riparian and ladder fuels, and its position below high-risk slopes increases ember transport potential during active burns.

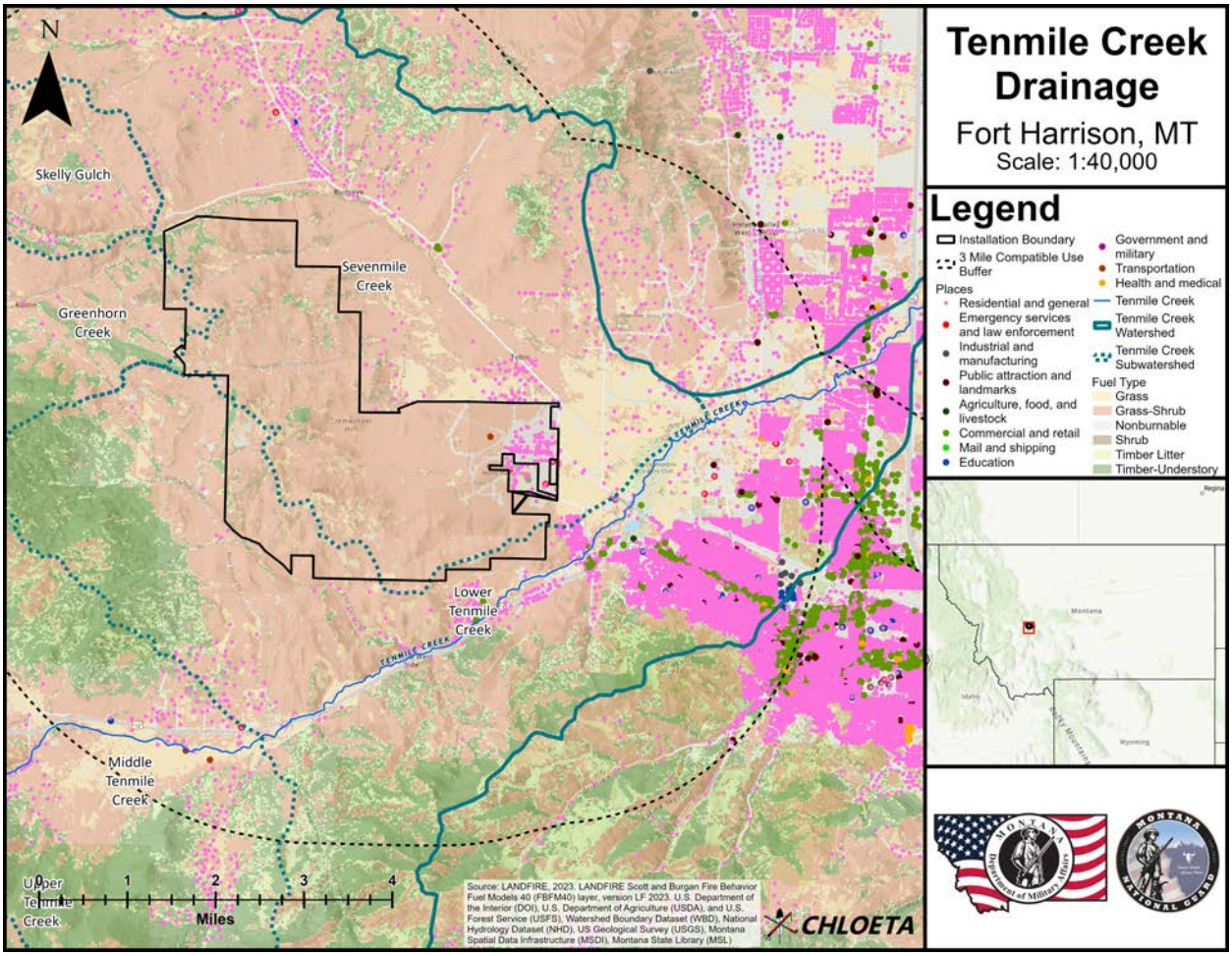


Figure 97. Tenmile Creek Drainage Map

- **Birdseye Foothills.** Northwest of the installation, this area includes rugged terrain, complex fuel beds, and past fire scars (Figure 94). The slopes face prevailing wind directions and connect directly to WUI developments, increasing risk of community exposure.

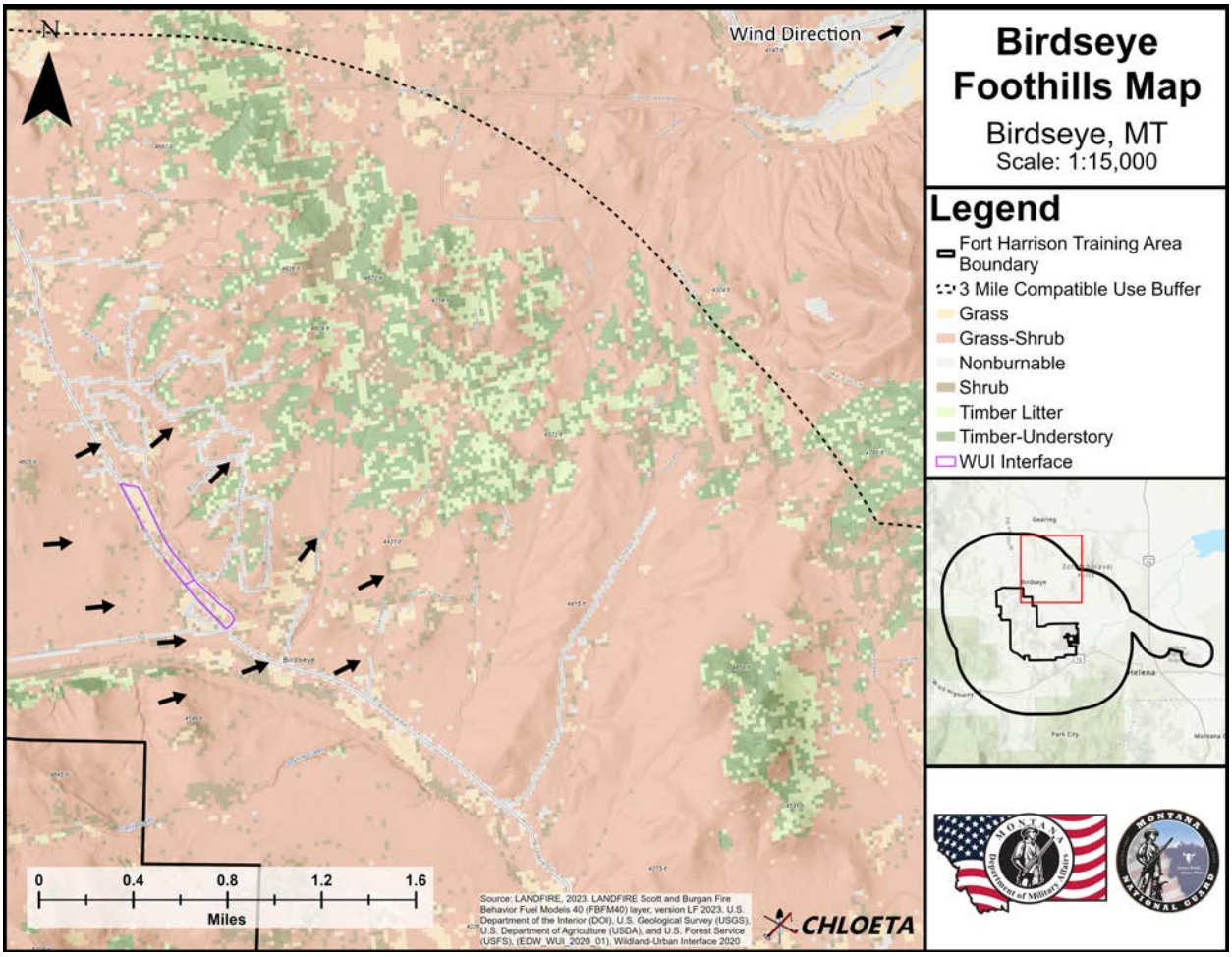


Figure 98. Birdseye Foothills Map

- **Austin Ridge.** The elevated ridge west of the FHTA includes fine grasses and sparse tree stands susceptible to ignition and fast fire spread (Figure 95). The topography enables fast upslope runs and poses visibility and access challenges for responders.

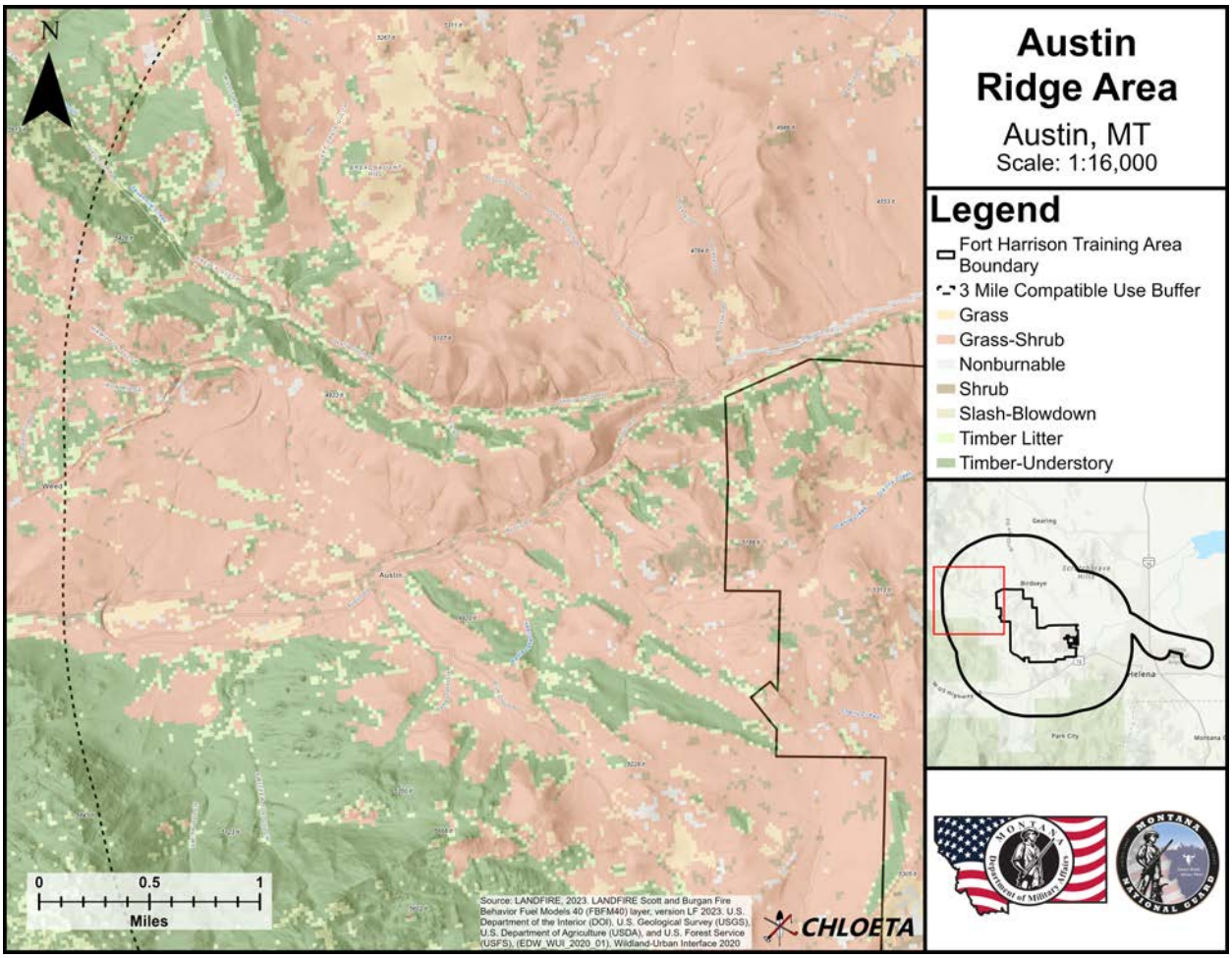


Figure 99. Austin Ridge Map

- **Complex/Infrastructure Belt.** The VA Medical Center and supporting structures sit near multiple critical infrastructure corridors (i.e., rail, electric, roads). Dense vegetation immediately surrounding the facilities requires fuel breaks and maintained defensible space to reduce impact potential from ember cast or direct flame contact (Figure 96).

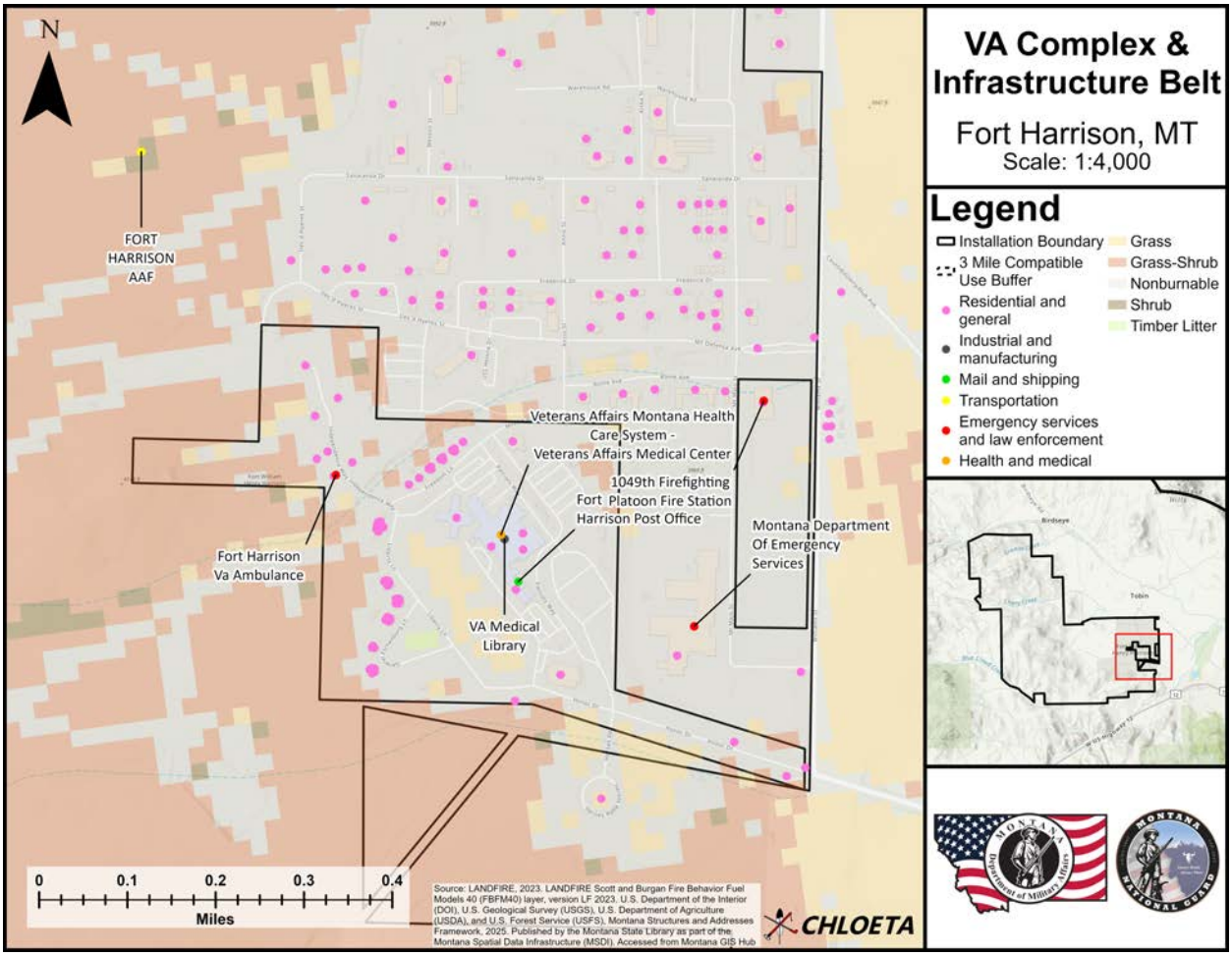


Figure 100. VA Complex/Infrastructure Belt Map

- **Mobile Home Parks between Rail Line and Power Corridor.** Mobile home parks east of the installation sit between two high-risk corridors, the 500kV transmission line and the rail spur (Figure 97). These parks face heightened vulnerability during wildfire events due to potential evacuation bottlenecks and limited structural defensibility.

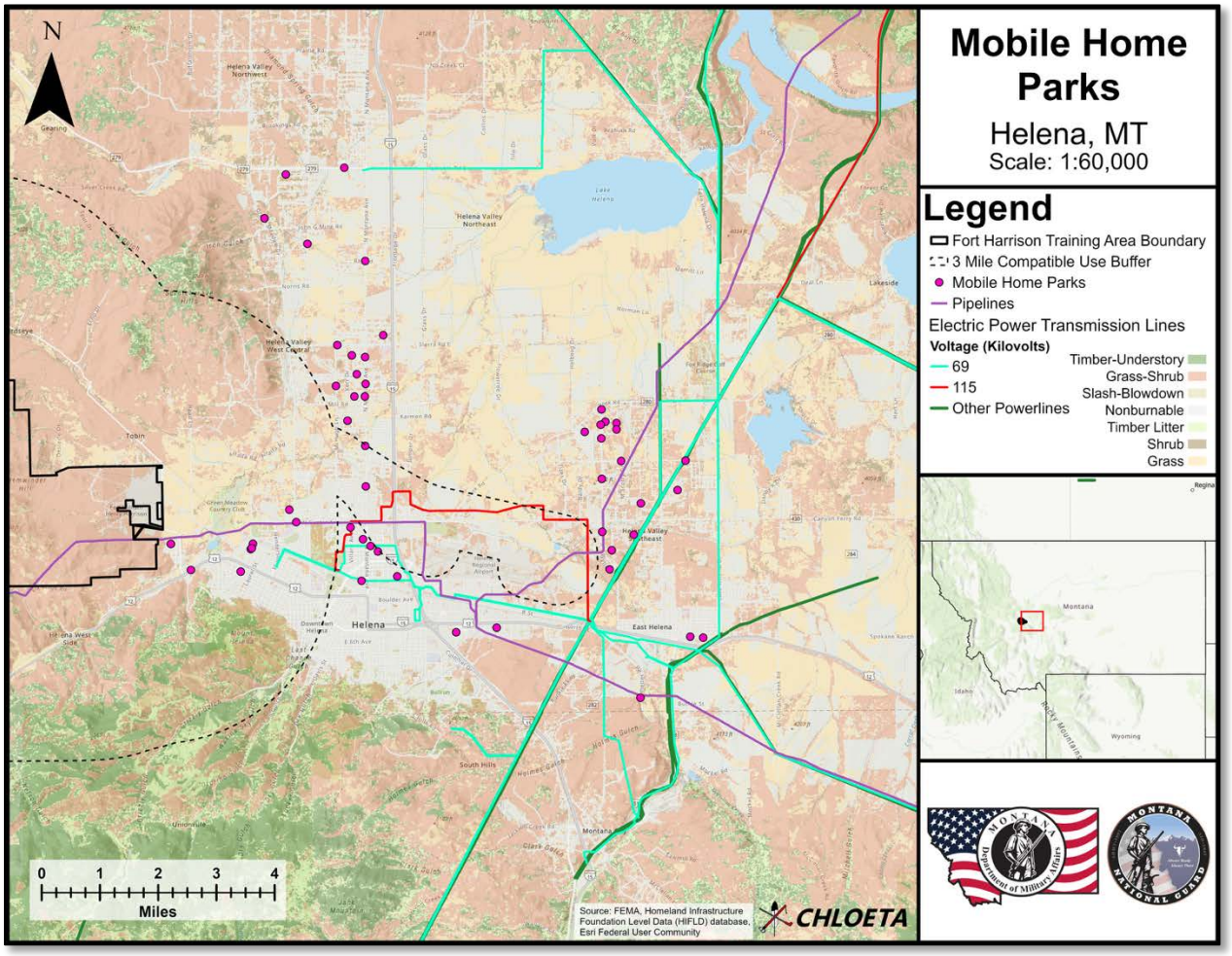


Figure 101. Mobile Home Parks Map

Each of these locations demonstrates the need for proactive mitigation planning, interagency coordination, and investment in access improvement and early detection capabilities. Their identification informs prioritization for treatments including thinning, prescribed fire, fuel breaks, and infrastructure hardening (Table 15).

Table 15. Areas of Concern Impacting the FHTA Assessment Area

Area of Concern	Description
Rimini Road Corridor	Steep terrain with continuous vegetative fuels; prime fire pathway with limited access and proximity to residential areas.
Tenmile Creek Drainage	Drainage west of FHTA funnels wind and fire; supports dense fuels and increases ember transport potential from higher slopes.
Birdseye Foothills	Rugged terrain with complex fuels and fire scars; faces prevailing winds and connects to WUI areas, heightening exposure risk.
Austin Ridge	Elevated ridge with fine grass and sparse trees; rapid upslope fire potential and limited access for responders.
VA Complex/Infrastructure Belt	VA Medical Center and critical utilities are adjacent to fast-burning grass–shrub fuels, requiring ongoing fuel maintenance to reduce flame exposure and ember risk during wildfire events.
Mobile Home Parks (Rail Line and Power Corridor)	Vulnerable parks situated between high-risk utility corridors with poor evacuation infrastructure and limited fire defensibility.

Adjacent to the FHTA assessment area, several additional areas of concern present elevated wildfire risk due to their topography, development patterns, and proximity to fire pathways. While technically outside the planning boundary, these areas have high potential to influence fire behavior entering or exiting the installation, contribute to ember cast, or complicate evacuation and response strategies. Including them in mitigation and preparedness planning is essential for a more holistic risk reduction strategy.

- **Helena Valley West and South.** This rapidly growing residential region includes dispersed homes on large, often uncleared lots with limited ingress/egress routes (Figure 98). Many properties lack defensible space and are not required to comply with wildfire-resistant construction or vegetation management standards. The valley sits directly downslope from potential fire corridors and is at risk from ember showers and fast-moving grass fires.

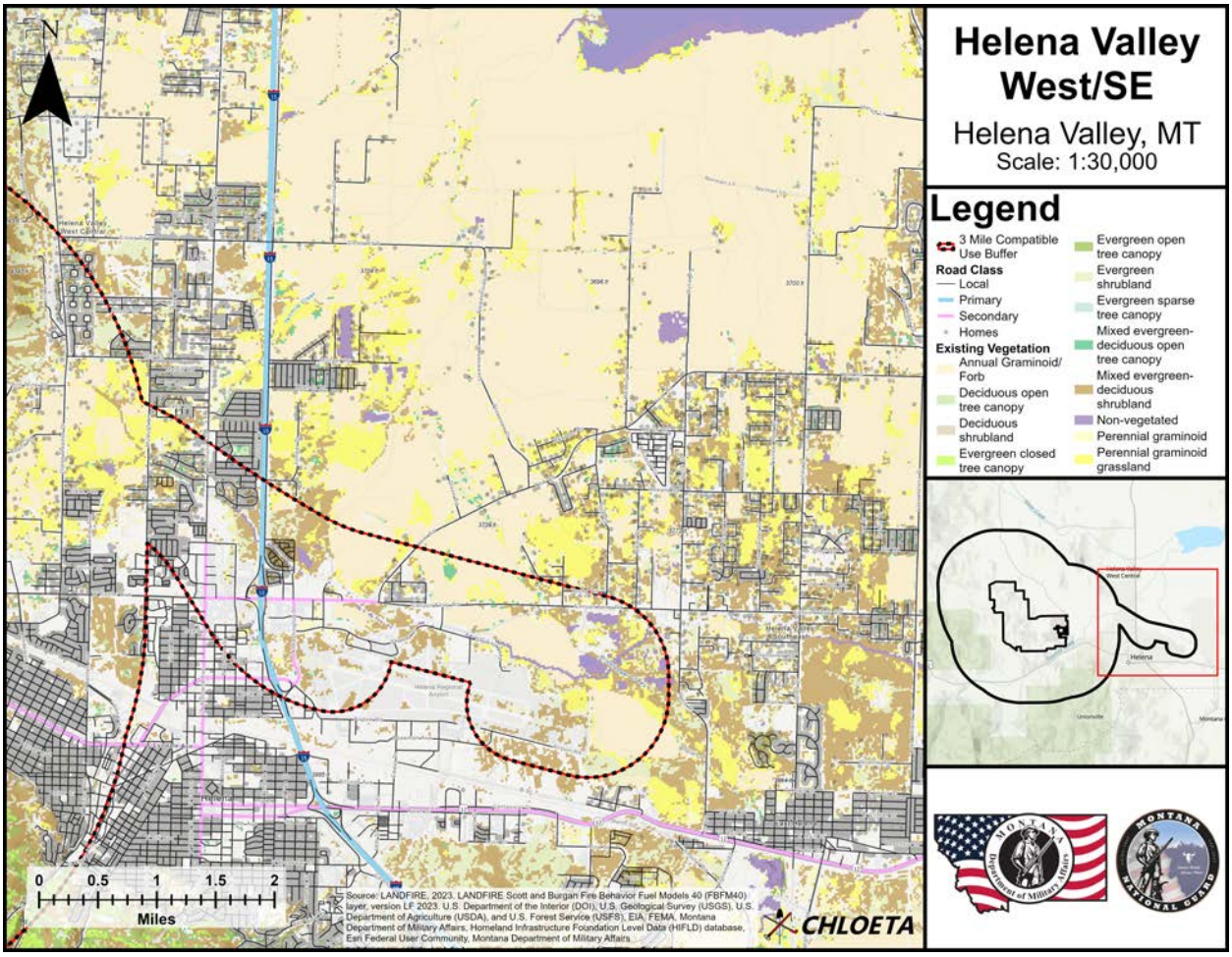


Figure 102. Helena Valley West and South Wildland-Urban Interface Map

- **McDonald Pass Corridor.** Located southwest of FHTA, this high-elevation route features steep grades and dense mixed conifer fuels (Figure 99). It is a potential ignition zone and pathway for westward-moving fire during wind-driven events. The corridor also serves as an emergency access/egress route, and closure during fire activity could isolate communities or slow suppression efforts.

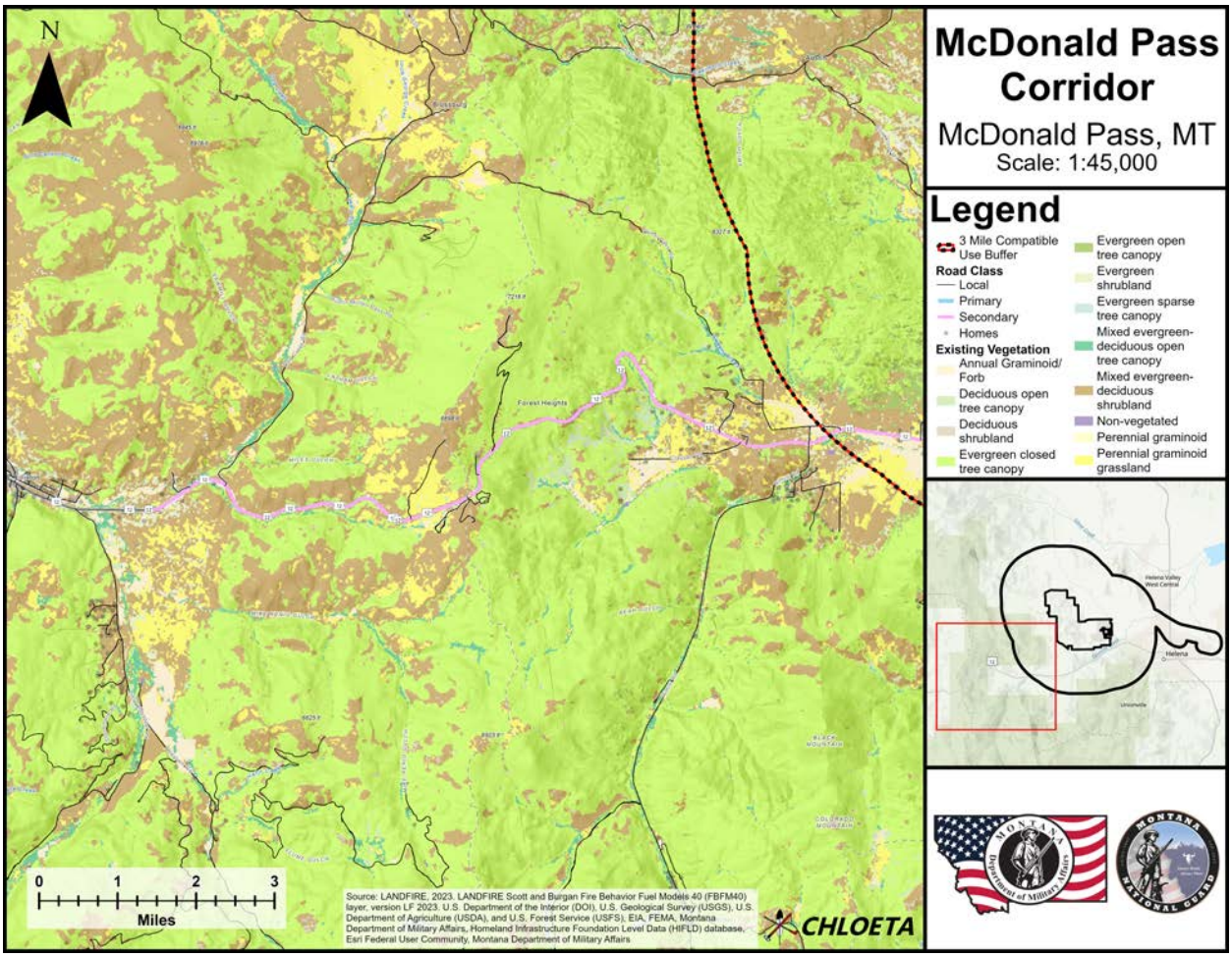


Figure 103. McDonald Pass Corridor Map

- **West Main Street WUI Zone.** On the northern edge of the assessment area, this WUI includes residential and small commercial structures intermixed with grass and shrub fuels (Figure 100). Ingress/egress limitations and minimal fuel breaks increase both ignition risk and evacuation challenges.

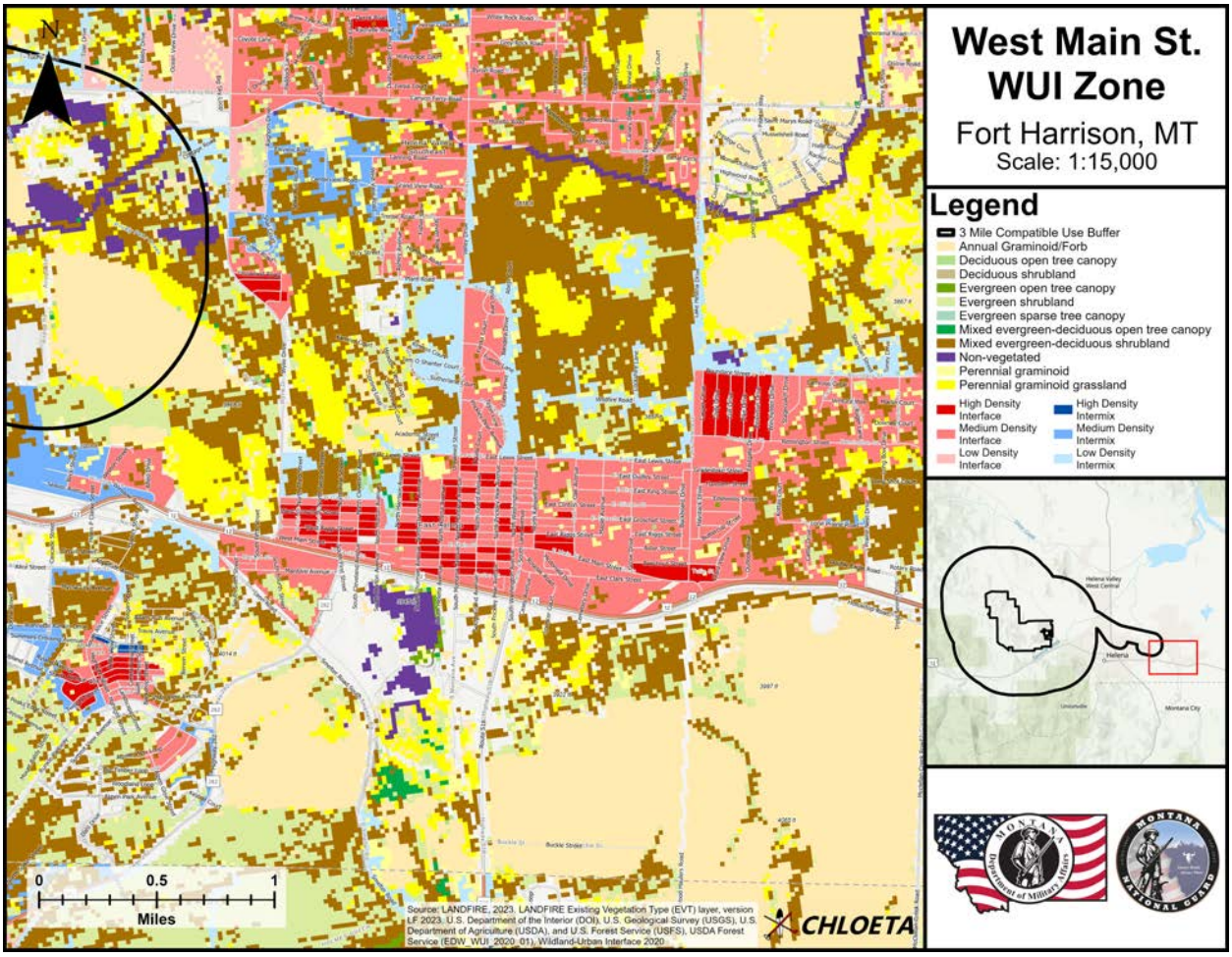


Figure 104. West Main Street Wildland-Urban Interface Zone Map

- **Montana City and Clancy Communities.** Located southeast of FHTA and just outside the assessment area, these fast-developing communities are connected to Helena by limited road networks and sit near known ember pathways from historical fire runs (Figure 101). Growth pressures are outpacing infrastructure improvements, and vegetation clearance is inconsistent.

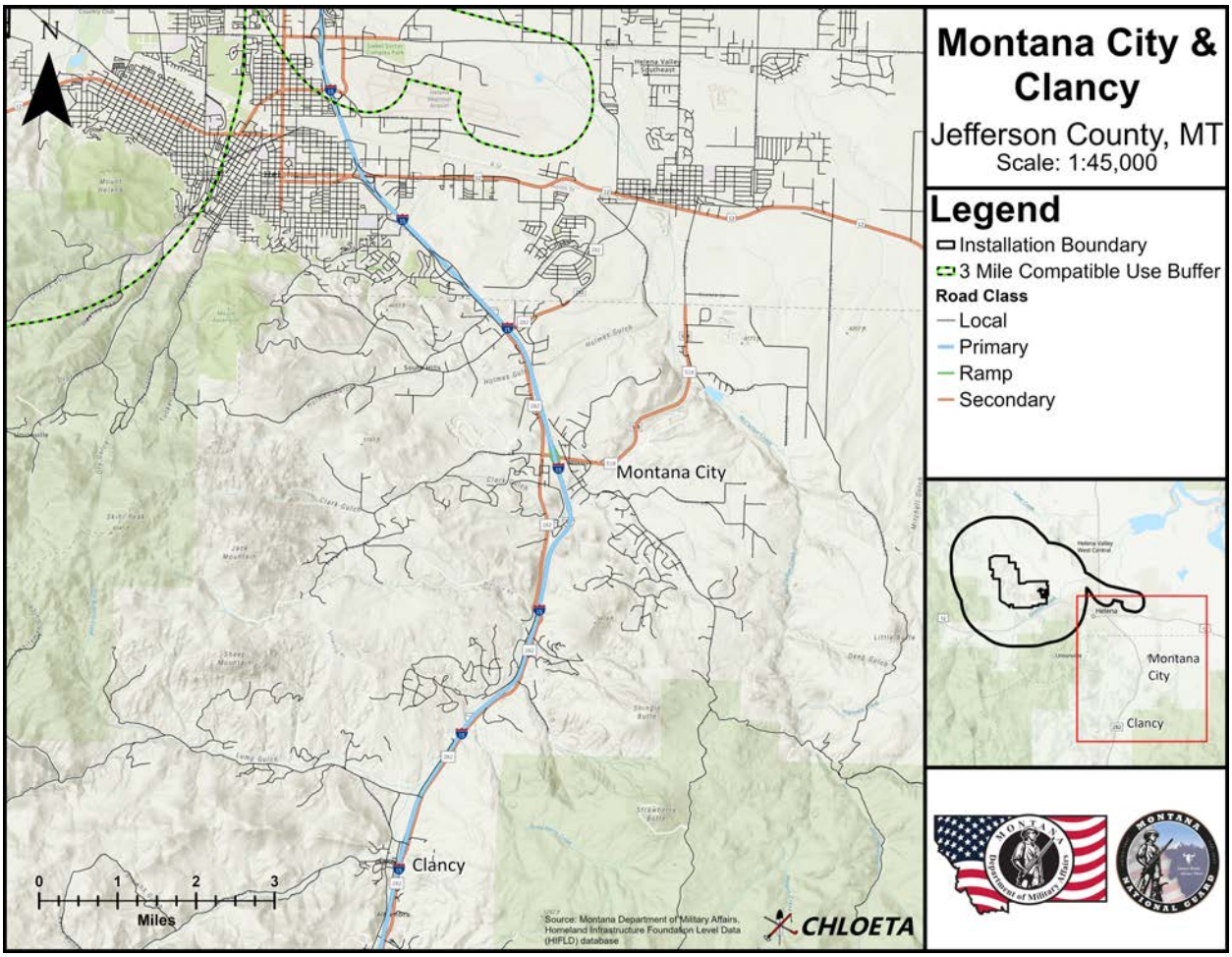


Figure 105. Montana City and Clancy Communities Map

- **Recreational Areas (e.g., Scratchgravel Hills).** Popular for hiking and off-road use, these lands northeast of the buffer contribute to human-caused ignition risks (Figure 102). Steep slopes and highly flammable vegetation make this area a likely source of fire spread toward critical infrastructure and residences.

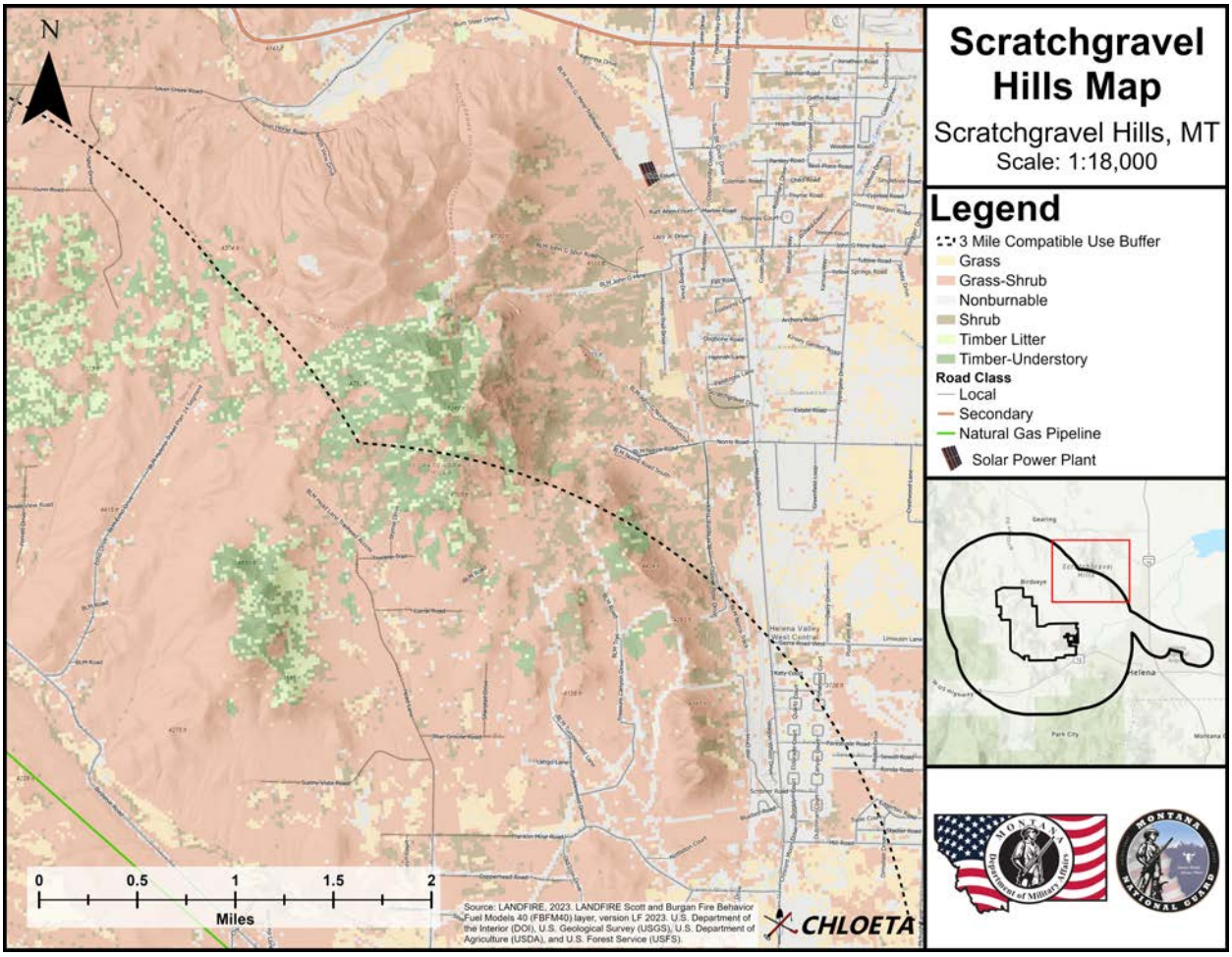


Figure 106. Scratchgravel Hills Map

Although not within the formal assessment area, fire behavior does not follow administrative lines. Fires igniting or advancing from these locations could quickly move into the FHTA assessment area (Table 16). Including these adjacent areas in coordination efforts, including mutual aid planning, shared fuel treatments, and public outreach, can dramatically improve regional wildfire resilience and reduce overall exposure across jurisdictional boundaries.

Table 16. Areas of Concern Adjacent to the FHTA Assessment Area

Area of Concern	Description
Helena WUI	Residential areas exposed to ember cast and fire spread from FHTA.

Area of Concern	Description
Mobile Home Parks and Low-Infrastructure Developments	Clusters with poor ingress/egress and vegetation overgrowth.
Shodair Children's Hospital, St. Peters Hospital and County Health Facilities	Critical facilities within 1 mile of utility corridor and exposure areas.
West Helena and South Helena	Growing residential areas with limited defensible space and evacuation challenges.
McDonald Pass Corridor	High-elevation zone with dense fuels and critical transportation routes.
West Main Street WUI Zone	Ingress-limited community with intermix of homes and flammable grass/shrub fuels
Montana City and Clancy Communities	Rapid-growth areas near known ember paths and with strained infrastructure
Scratchgravel Hills Recreational Area	High-use public area prone to human ignitions and steep terrain-driven fire spread

LHTA

LHTA assessment area locations include rugged drainages which support dense vegetation and historically limited suppression access. The surrounding ridgelines present topographic conditions that promote upslope fire spread. Additionally, military training areas and equipment sites embedded in these areas face heightened exposure due to both terrain and ignition risk. Managing these internal threats is essential for protecting LHTA personnel, operations, and infrastructure.

Several landscape features surrounding the LHTA function as wildfire transmission pathways and pose elevated exposure risks (Table 17). Steep, fuel-continuous terrain in the western slopes of the Big Belt foothills and wind-aligned features such as the eastern ridgelines facing Crow Creek Valley can channel fire, embers, and heat toward the installation over long distances. Within the installation, sloped drainages and interior two-track trails further influence fire behavior by funneling wind and fire through fine fuels while simultaneously constraining suppression access and egress. Recognizing the influence of these adjacent and internal features is critical for developing coordinated regional response strategies, aligning with neighboring land managers and agencies, and maintaining situational awareness beyond the installation boundary.

Table 17. Areas of Concern Impacting the LHTA Assessment Area

Location	Concern Description
Western slopes of the Big Belt Foothills	Steep, fuel-continuous Big Belt foothills increase flame lengths, direct fire spread toward the assessment area, and constrain suppression access.
Eastern ridge lines facing Crow Creek Valley	Wind-exposed wildfire transmission features where fires can rapidly spread along ridge crests, generate long-range spotting, and extend fire influence downslope toward the LHTA, increasing exposure.

Location	Concern Description
Interior two-track trails	Narrow, rugged access trails through heavy fuels limit ingress and egress for suppression equipment.
Sloped drainages through central training area	Drainages act as fire pathways with fine fuels and downed woody debris, funneling wind and fire toward egress routes.

Areas situated just outside the LHTA assessment area also play a significant role in shaping wildfire behavior and influencing risk within the training area. Adjacent areas often serve as ignition points or wildfire conduits due to their topography, fuel characteristics, or ongoing human activity (e.g., recreation, grazing, or military transportation (ground and air). Even if technically outside the designated assessment area, fire activity in these locations can quickly escalate and breach into LHTA through natural corridors or prevailing wind conditions (Table 18).

Table 18. Areas of Concern Adjacent to the LHTA Assessment Area

Location	Concern Description
Crow Creek Valley agricultural interface	Agricultural fields and equipment storage near heavy fuels create ignition and exposure risks to infrastructure (Figure 103).
North perimeter roads and grazing parcels	Perimeter roads are not fire-hardened and bisect unmaintained fine fuels, reducing their effectiveness as control lines (Figure 104).
Residential developments east of buffer	Scattered residences on large lots lack defensible space, with no cohesive fire planning standards enforced (Figure 105).
BLM-managed grazing areas surrounding LHTA	Public land parcels are interspersed with high-fuel rangeland and lack suppression staging or fuel break integration (Figure 106).

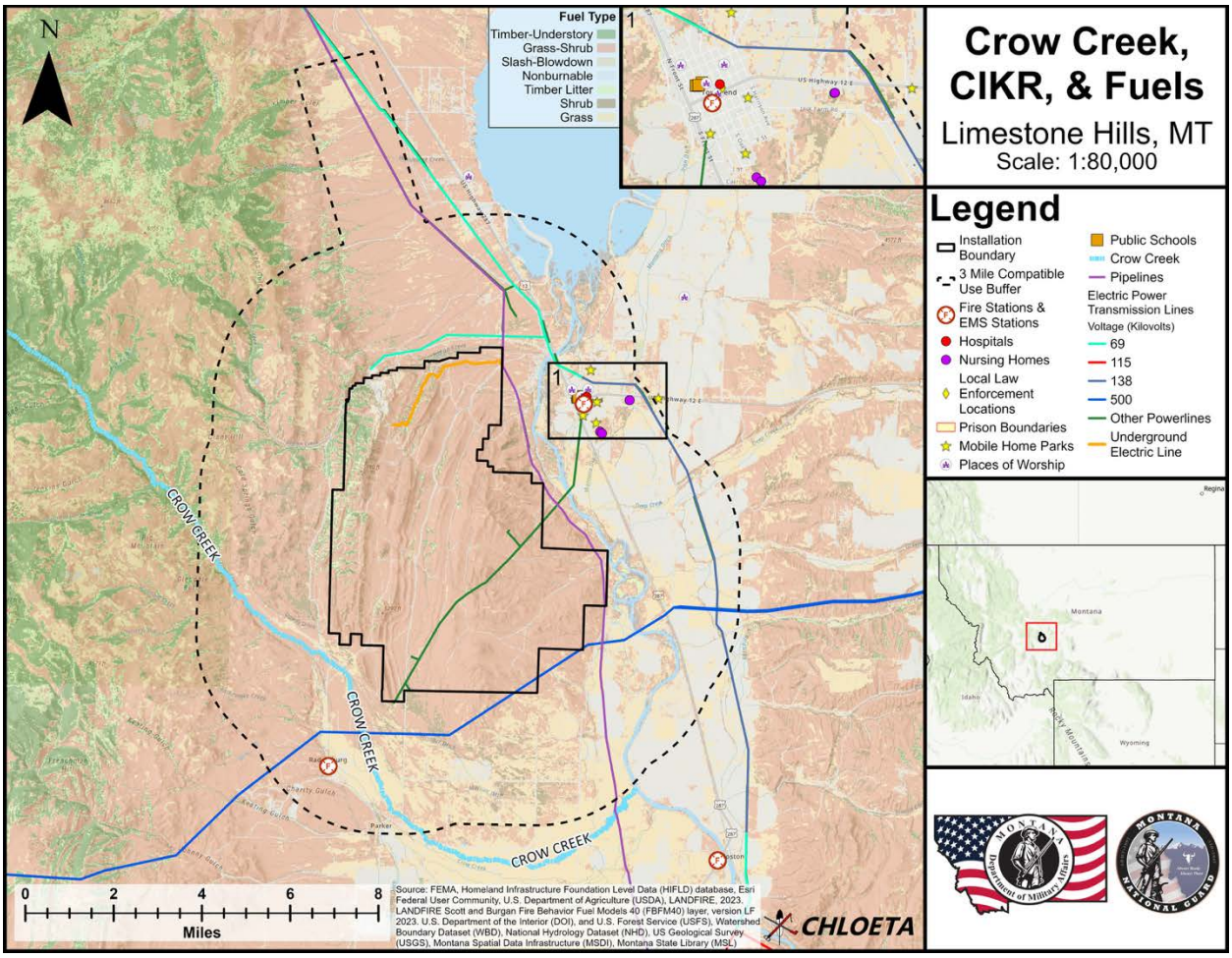


Figure 107. Crow Creek Map

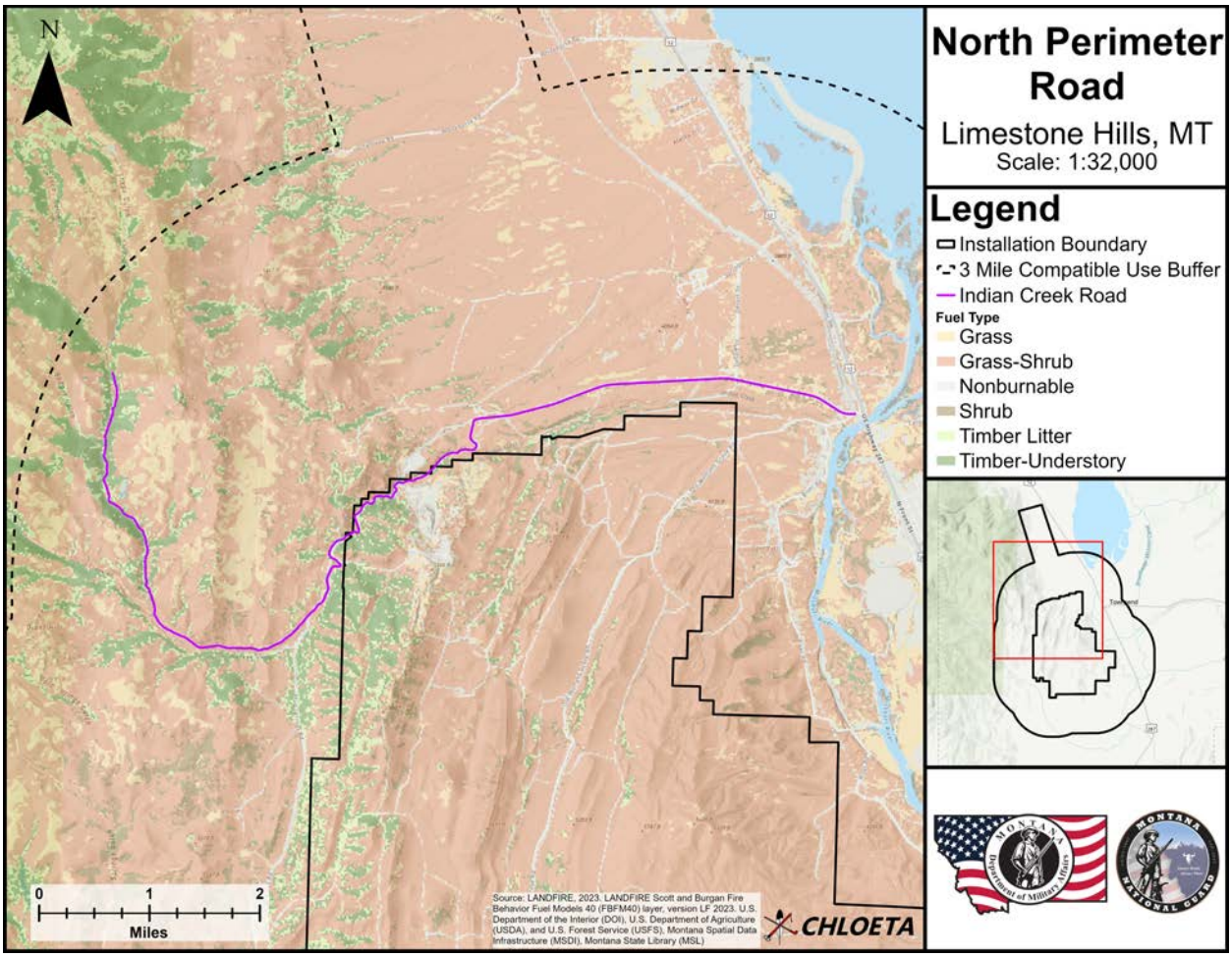


Figure 108. North Perimeter Road Map

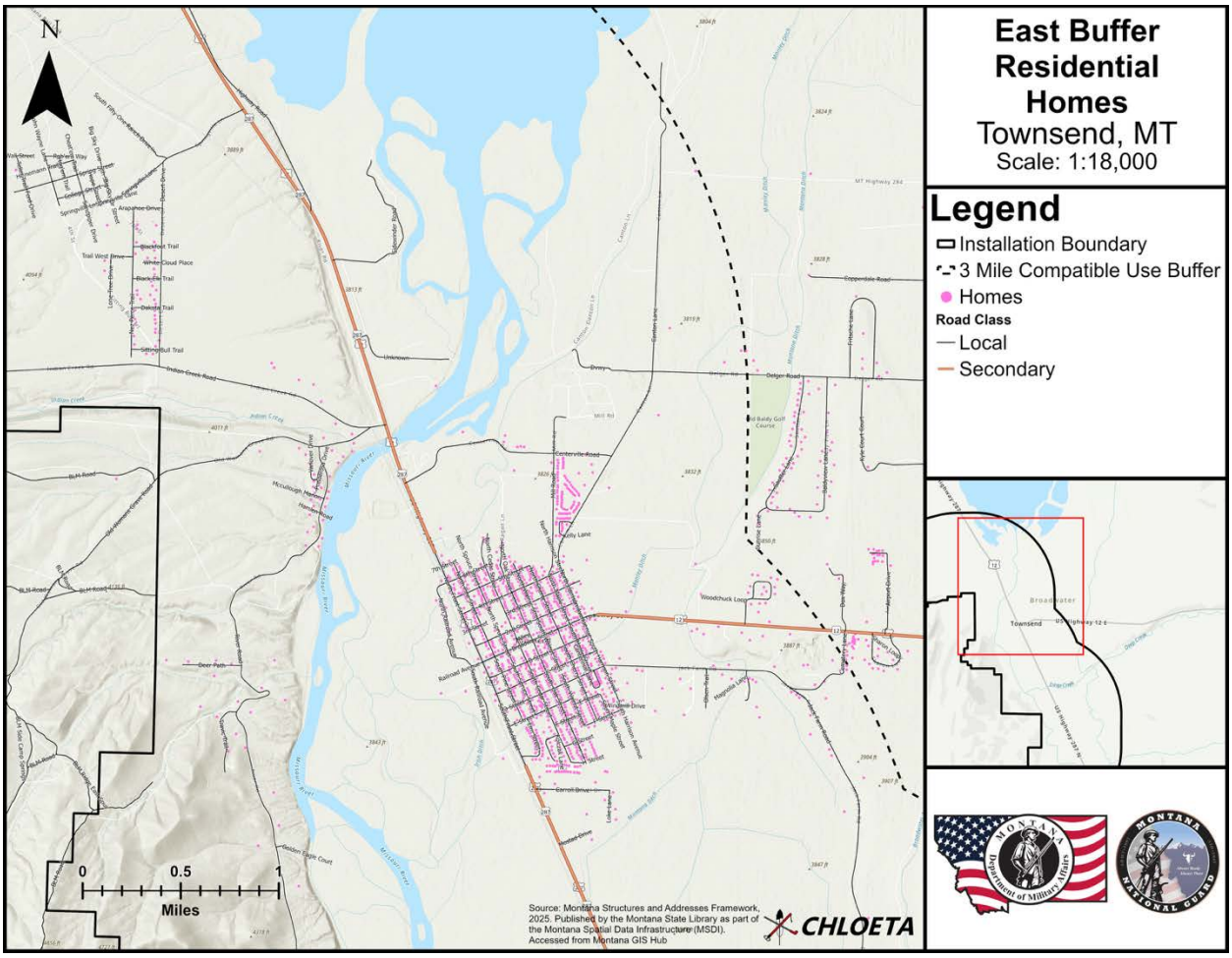


Figure 109. East Buffer Residential Homes Map

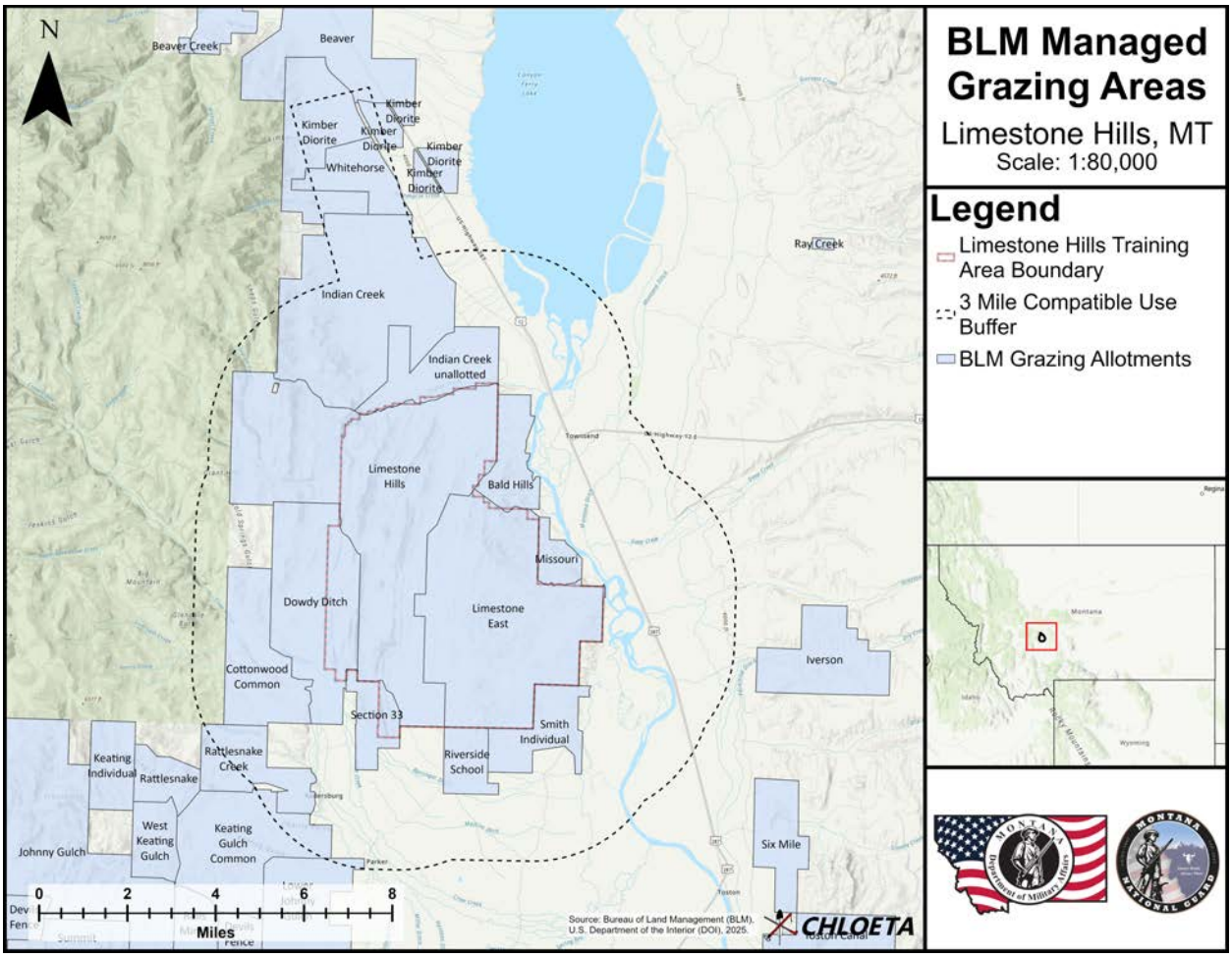


Figure 110. BLM Managed Grazing Area Map

Management Strategies

Fire Breaks and Buffer Areas

Evaluating existing fire lines should be prioritized in high-risk and strategic locations across both the FHTA and LHTA assessment areas. Table 19 outlines key management strategies tailored to these priority locations identified as areas of concern.

Table 19. Wildfire Risk Mitigation Strategies by Area of Concern

Area of Concern	Recommended Management Strategy
Birdseye and Austin Foothills	Establish mapped fuel-break corridors, patrol roads, and slope access, designate staging pads and control lines in the Operational Atlas. See Figure 98 & Figure 99. See Management Recommendations 4, 8 & 9.
Tenmile Creek Drainage	Reduce ladder fuels and defensible-space conflicts near riparian corridors; integrate watershed fire behavior and debris-flow risk into

Area of Concern	Recommended Management Strategy
	annexes and the Operational Atlas (See Figure 97), See Management Recommendations 3, 4, & 8.
Rimini Road Corridor	Harden evacuation and suppression access, clear roadside fuels, and steer development away from chokepoints through WUI/MWCOZ land-use controls (See Figure 96.) See Management Recommendations 5, 10 & 11.
Birdseye Corridor	Prevent additional development at access chokepoints through MWCOZ adoption and preserve corridor width for evacuation and suppression (see Figure 98) See Management Recommendations 2 & 11.
VA Medical Center and Utility Corridor	Maintain defensible space and harden facilities; integrate VA evacuation, power, and water continuity into Unified Command playbooks and annexes Figure 100. See Management Recommendations 3, 7, 10 & 12.
Helena WUI	Implement community defensible-space programs, prescribed-fire coordination, and adopt enforceable WUI code provisions consistent with the statewide framework. See Management Recommendations 8 & 11.
Mobile Home Parks and Low-Infrastructure Developments	Require evacuation planning, secondary egress, and structure-hardening retrofits through WUI overlays and targeted mitigation programs. See Management Recommendations 5, 10 & 11.
Shodair Children's Hospital, St Peters Hospital and County Health Facilities	Integrate smoke forecasting, air-quality triggers, and medical coordination into wildfire annexes and Unified Command protocols. See Management Recommendations 3, 10 & 12.
Granite Creek (West/Southwest of Townsend)	Conduct targeted vegetation thinning and coordinated prescribed burns under shared burn-window criteria and SOPs. See Management Recommendations 8 & 12.
Saint Louis Gulch (Big Belt Mountain Foothills)	Reduce fuels at historic ignition points and improve access for suppression, map tactics and control points in the Operational Atlas. See Management Recommendation 4, 8, & 9.
Iron Ridge Loop	Install access controls and reduce fuel continuity along ridgelines critical for perimeter control and aviation operations. See Management Recommendations 8 & 9.
Spring Gulch (Big Belt Mountain Foothills and Townsend)	Monitor fuels and implement erosion-control measures to limit fire spread and post-fire access failure. See Management Recommendations 5 & 8.
War Eagle Hill	Apply mosaic fuel treatments and establish response staging areas to break fuel continuity and support IA. See Management Recommendations 8 & 9.
Ten Mile Creek (Lower Basin)	Balance riparian protection with ladder-fuel reduction; coordinate upstream/downstream mitigation actions. See Management Recommendations 3 & 8.

Area of Concern	Recommended Management Strategy
Blue Cloud	Reduce understory fuels and increase water availability for suppression; map ember-transport pathways and anchor points. See Management Recommendations 6, 8 & 9.
East Scratchgravel	Map wind corridors and ember transport; deploy alerts and integrate slope-fire behavior into evacuation planning. See Management Recommendations 4 & 10.
Indian Creek	Coordinate with BLM on grazing and fuel continuity; prioritize restoration and access protection post-fire. See Management Recommendations 3 & 8.
Limestone Hills Grazing Allotment	Implement large-scale prescribed burns and maintain fuel breaks along slope bases in coordination with DNRC. See Management Recommendations 8 & 12.
Missouri Drainages	Improve defensible space near utilities and evaluate ingress/egress reliability for evacuation and suppression. See Management Recommendations 5, 7 & 10.
Public Land Surveys	Establish shaded fuel breaks and formal mitigation agreements with landowners near the installation boundary. See Management Recommendations 8 & 11.
Townsend Perimeter (North and East Sides)	Map, maintain, and enforce continuous fire lines along municipal boundaries as part of perimeter defense See Management Recommendations 4 & 8.
Access Points along U.S. Highway 12 and South Rail Spur	Maintain continuous fire-line treatments and harden ingress/egress routes critical for evacuation and suppression mobility. See Management Recommendations 5, 8 & 10.
Birdseye, Austin Foothills, Tenmile Creek Drainage, VA Complex infrastructure belt, Limestone East, and adjacent WUI neighborhoods	Prioritize fire-resilient landscaping and compatible land-use updates via MWCOZ/WUI adoption and Operational Atlas integration. See Management Recommendations 4, 8 & 11.

By targeting these specific areas, fire line evaluation will enhance operational readiness, protect critical infrastructure, and support the broader wildfire risk reduction strategies outlined throughout the plan.

Vegetation and Land Use Management

This management strategy emphasizes the importance of aligning land stewardship with wildfire mitigation by promoting defensible space, reducing fuel continuity, restoring fire-adapted ecosystems, and coordinating with grazing permit holders and surrounding jurisdictions.

Promote Fire-Resilient Plantings

Incorporating fire-resilient plant species into landscaping, buffer areas, and rehabilitation areas remains a critical strategy for reducing ignition potential and slowing fire spread. Fire-resilient plantings, typically characterized by low flammability, high moisture content, and minimal

maintenance requirements, are most effective when paired with proactive conifer and juniper management along range perimeters, access routes, and training corridors. At FHTA and LHTA, establishing native, fire-adapted vegetation near infrastructure, utility corridors, and interface areas can enhance defensible space and reduce suppression complexity; however, successful seed germination in these areas often requires long establishment periods or supplemental watering to ensure viability. Integrated vegetation management should also include targeted removal of encroaching juniper and conifer stands that elevate crown-fire risk, as well as noxious weed control, which are essential for maintaining low-fuel ground cover and preventing rapid ignition or post-burn erosion. This combined approach supports fire-resilient ecosystems, protects transportation and training lifelines, and aligns with long-term habitat and watershed management objectives identified in the 2024 IWFMP.

Compatible Land Uses in High-Risk Areas

For the FHTA and LHTA assessment areas, promote low-density or non-residential uses, including training fields, solar installations, or open-space conservation, in areas with steep slopes, dense fuel loads, or poor access. Additionally, land use planning should steer development away from chokepoints to include Rimini Road or the Birdseye corridor, where limited egress could jeopardize public and responder safety. Coordinated planning efforts with local jurisdictions and land managers can ensure future uses align with long-term fire resilience goals.

For both FHTA and LHTA, areas identified with high flame lengths, dense fuels, or limited evacuation routes, including the Rimini Corridor, Birdseye Foothills, and Limestone East, should be reserved for fire-compatible land uses. These may include managed open space, non-structural training areas, defensible perimeters, or infrastructure with minimal staffing requirements. Collaborative planning with local jurisdictions and adjacent landowners is essential to enforce compatible zoning and reduce structural density in buffer-adjacent hazard areas.

Management Recommendations

Several areas have been identified where implementation of fire-resilient plantings and compatible land use updates should be prioritized. These areas exhibit high wildfire risk due to fuel density, topography, and proximity to critical infrastructure or population centers. Integrating these strategies into land management and development planning will reduce vulnerability and improve defensible space. Focus areas include the Birdseye and Austin Foothills, Tenmile Creek Drainage, VA Complex infrastructure belt, Limestone East, and adjacent WUI neighborhoods. These recommendations should be incorporated into updated facility plans, cooperative fire management agreements, and installation-wide hazard mitigation strategies.

Implementing fire-resilient plantings and compatible land use in high-risk areas involves a multi-step, coordinated approach that integrates planning, policy, and field-level action. Here's how it could happen:

Vegetation Treatments and Planting

- Actions:
  - Remove ladder fuels and non-native, fire-prone vegetation.

  - Replace with low-flammability native species.
  - Maintain fuel breaks and shaded firebreaks near key infrastructure and ingress/egress routes.
- Purpose: Slow fire spread and reduce intensity while preserving ecological function.

Land Use Planning and Zoning Updates

- Actions:
  - Work with local and county planning offices to discourage development in highest-risk areas.
  - Promote compatible land uses including ag leases, open space, or low-density development near FHTA and LHTA.
  - Update Installation Development Plans (IDPs) to reflect fire behavior modeling results.
- Purpose: Minimize exposure and create buffers between hazards and assets.

Plan Integration and Policy Adoption

- Actions:
  - Embed strategies into IWFMPs, (IDPs), and local HMPs.
  - Require fire-resilient landscaping in site design standards for new construction.
- Purpose: Institutionalize wildfire resilience and ensure consistent implementation.

Ongoing Maintenance and Monitoring

- Actions:
  - Schedule recurring assessments (e.g., annual fuel inspections, post-burn evaluations).
  - Monitor vegetation regrowth, invasive species, and development pressures.
- Purpose: Maintain effectiveness over time and adjust as conditions or use patterns change.

Community and Stakeholder Engagement

- Actions:
  - Conduct public outreach, especially for mobile home parks and WUI neighborhoods.
  - Promote defensible space, Firewise landscaping, and evacuation awareness.
- Purpose: Build community buy-in and support proactive mitigation efforts.

This process ensures fire-resilient practices are not just temporary fixes but are embedded in the land management fabric of both training areas and their surrounding communities.

Hardening Infrastructure

Within both assessment areas, key assets, including the VA Medical Center, utility transmission corridors, rail infrastructure, and military facilities, face elevated exposure due to proximity to vegetated fuels and prevailing fire paths. Proactive measures including ember-resistant upgrades, defensible space creation, and utility pole retrofitting are essential to maintain operational continuity and minimize the risk of system-wide disruption during a fire event. These strategies

also serve to protect mission-critical functions and ensure safe ingress and egress for emergency response.

Retrofit Recommendations for Structures

Numerous structures face elevated risk from ember intrusion, radiant heat, and direct flame contact (Table 21). Retrofit efforts should prioritize upgrading roofing and siding materials to ignition-resistant alternatives, installing ember-resistant vents, and enclosing eaves and decks. Additional recommendations include clearing vegetation around buildings, creating non-combustible defensible areas, and installing spark arrestors on chimneys.

Table 20. Structure Retrofit Areas and Rationale for Recommendations

Area	Rationale for Retrofit Recommendation
VA Medical Center	Critical infrastructure located within high flame length areas and surrounded by vegetative fuels. Retrofitting roofs, vents, and windows to ember-resistant standards is crucial.
Birdseye Residential Foothills	Adjacent to steep slopes and prevailing wind corridors. Homes face exposure from rapid upslope fire movement and should be hardened with non-combustible siding and defensible space areas.
Mobile Home Parks Between Rail Line and Power Corridor	High vulnerability due to combustible materials, limited defensibility, and egress constraints. Fire-resistant skirting, screened vents, and metal roofing upgrades are recommended.
Helena WUI Edge Neighborhoods (e.g., Spring Gulch, Scratchgravel Hills)	High exposure to ember cast and spot fires from adjacent wildland areas. Retrofit homes with ignition-resistant materials and improve lot-level fuel mitigation.
Tenmile Creek Corridor Structures	Located along a high-risk drainage prone to wind-driven fire runs. Retrofit structures and improve access for fire suppression.
Rimini Road Corridor Residences	Limited access, recreation-related ignition potential, and continuity of fuels. Retrofit homes for ember resistance and incorporate driveway defensibility.
Structures Along Utility Corridors (especially near Cherry Creek and Austin areas)	Adjacent to transmission and rail lines, which pose linear ignition sources. Retrofit should focus on roof and gutter protection and screened openings.

Utility Corridor Protection

This section outlines strategic measures to reduce ignition potential and enhance defensibility in utility corridors in both assessment areas (Table 22).

Table 21. Utility Corridor Protection Locations, Actions, and Purposes

Location/Corridor	Action	Purpose
Along the 500V and 100–161V electric transmission lines east of FHTA	Create defensible space buffers.	Reduce vegetation that could ignite and damage power infrastructure; limit ember cast near critical facilities to include but not limited to hospitals and 911 centers.
Rail spur north of FHTA and adjacent to mobile home parks	Clear vegetation within the rail corridors.	Decrease ignition risks from sparks, improve emergency access, and protect nearby residential clusters.
Near overlapping utility and road corridors (power + Rimini Road)	Install fuel breaks and fire access lines.	Enhance response access and contain potential spread along narrow, single-egress corridors.
Substations feeding hospitals and 911 centers	Harden infrastructure near junctions.	Protect critical power junctions with non-flammable fencing, surface clearing, and backup power redundancies.
Along rail and electric corridors crossing buffer areas	Conduct targeted patrol and maintenance during fire season	Detect and address ignition hazards promptly; coordinate with BNSF and utility providers.
Mobile home communities between the rail line and transmission corridor	Integrate utility corridors in evacuation and protection planning	Identify alternate routes and reinforce evacuation planning where fire could simultaneously impact power and access.

Fire Response Enhancement

Both assessment areas are exposed to fast-moving wildfires driven by complex terrain, limited access routes, and proximity to expanding WUI. Strengthening fire response involves a multifaceted approach that includes improving infrastructure for emergency access, increasing suppression capabilities, pre-positioning firefighting resources, and enhancing interagency coordination.

Optimized Access Routes

In both assessment areas, steep terrain, limited road connectivity, and overgrown vegetation can impede emergency mobility. Prioritizing road maintenance, improving turnarounds, and establishing alternative ingress and egress paths are vital for protecting personnel, critical infrastructure, and nearby communities (Table 22).

Table 22. Emergency Responder Optimized Routes, Recommendations, and Purposes

Route Area	Recommendation	Purpose
Rimini Road Corridor	Widen shoulder and maintain clearance of overgrown brush.	Improve emergency ingress/egress and reduce fire spread risk.
Birdseye Foothills	Upgrade road surfaces and install signage for emergency access.	Enable safer and faster navigation for fire response units.

Route Area	Recommendation	Purpose
Tenmile Creek Drainage	Establish alternative egress via maintenance roads or fire lanes.	Ensure redundancy in case of blocked or compromised access.
FHTA and LHTA Internal Roads	Conduct regular grading and vegetation trimming on perimeter and access roads.	Maintain clear emergency routes and vehicle maneuverability.
Limestone East and Bald Hills Ridge	Improve gravel stability and install turnouts on narrow segments.	Support access for engines and heavy suppression equipment.
Townsend Utility Corridor	Ensure dual-access pathways for both personnel and equipment along the utility line.	Secure operational continuity and infrastructure defense.

Equipment Staging Areas

Designated staging areas near high-risk corridors, major access roads, and defensible areas enable swift response and operational flexibility. Incorporating water supply access, communication lines, and vehicle maneuverability further enhances readiness (Table 23).

Table 23. Equipment Staging Area Locations, Recommendations, and Purposes

Location	Recommendation	Purpose
Range Operations Vicinity	Establish Range Ops building and adjacent open ground as staging/ICP location for range-area wildland ignitions.	Reduces travel time to ignition points, improves ground access, and supports faster IA with tenders, engines, and suppression crews.
Training Range Access Points	Clear and grade flat areas near range entry gates.	Support rapid deployment of engines and tenders.
Rimini Road Turnouts	Utilize existing wide areas along corridors for forward-deployed staging.	Pre-position crews for rapid response to west slope ignitions.
Townsend Rail Spur Area	Develop gravel pad with shade structure and fuel cache.	Serve dual roles in staging and refueling areas.
Missouri Overlook (LHTA East) (Bivouac 2 off Old Woman's Grave Road)	Clear fire-safe turnaround with room for heavy equipment.	Provide overlook access and Heli-landing zone if needed.

Priority Protection Areas

These areas include hospitals, military installations, utility corridors, and residential areas adjacent to fuel-rich environments. Establishing clear protection boundaries and applying focused fuel mitigation and defense strategies in these areas allows for concentrated suppression efforts where they are needed most, limiting both operational disruption and community risk (Table 24).

Table 24. Priority Protection Areas, Recommendations, and Rationale

Zone	Recommendation	Rationale
VA Medical Center and FHTA	Create and maintain defensible space (minimum 200 feet); install perimeter fuel breaks, harden structures.	Protect critical federal infrastructure and medical facilities.
Helena WUI	Coordinate with city on mutual aid protection areas and WUI buffer treatments.	Minimize fire spread from training lands to residential neighborhoods.
Rail Line, Pipeline and Power Transmission Corridors	Implement roadside fuel reduction; restrict ignition sources; maintain emergency access trails.	Protect vital infrastructure corridors with regional economic implications.
Limestone East Facilities and MTARNG Range	Prioritize this cluster with fuel thinning, backup water sources, and rapid response planning.	High ignition potential from training and proximity to adjacent grasslands.
Rimini Road Entry Corridor	Establish ember protection zone and mobile suppression staging nearby.	Strategic ingress route exposed to slope-driven fire movement.
Townsend Interface and Missouri Drainage	Create dual-purpose areas with grazing/fire break overlap and community engagement.	Protect rural homes and critical infrastructure from eastern slope fire paths.

Water Availability

Identifying, developing, and maintaining access to static and pressurized water systems is essential. This includes evaluating hydrant networks, natural water bodies, dip sites, and mobile water supply capacity to ensure that fire response teams can deploy rapidly and sustain suppression efforts under extreme fire conditions (Table 25).

Table 25. Water Availability Recommendations, Descriptions, and Priority Areas

Recommendation	Description	Priority Areas
Map and Assess Existing Water Sources	Conduct a comprehensive inventory of all existing water sources, including hydrants, tanks, ponds, and dip sites. Ensure accessibility and seasonal reliability.	Entire FHTA and LHTA; especially Rimini Road Corridor and Tenmile Creek
Reinforce Hydrant Infrastructure	Evaluate and upgrade hydrant pressure and coverage within and adjacent to developed areas, including FHTA and mobile home communities.	FHTA Facilities; VA Complex; Helena WUI.
Coordinate Access to Private/Shared Water Resources	Formalize agreements with nearby landowners and agencies for access to ponds, irrigation systems, and agricultural water sources during fire response.	Adjacent ranchlands; Townsend perimeter; Indian Creek zone.
Ensure Year-Round Access and Marking	Maintain clear, signed access routes to water sources, and implement seasonal inspections to	All high-risk corridors within buffer areas.

Recommendation	Description	Priority Areas
	verify functionality. Integrate with emergency response maps and mobile GIS platforms.	
Mobile Water Supply Cache	Establish mobile water trailers or bladders that can be pre-positioned during red flag periods or training operations.	LHTA staging areas; Rimini and Austin Ridge trailheads.

Resource-Sharing Opportunities

Leveraging mutual aid agreements, joint training exercises, and shared equipment caches can dramatically enhance response capacity across the region. Identifying and formalizing resource-sharing opportunities between the military, local fire districts, and emergency management agencies fosters a more adaptive, scalable, and cost-effective approach to risk reduction and incident response (Table 26).

Table 26. Resource Sharing Information, Descriptions, and Application Areas

Recommendation	Description	Application Areas
Formalize Mutual Aid Agreements	Update or establish interagency agreements for wildfire suppression, equipment sharing, fuel break maintenance, and emergency staffing. Ensure inclusion of city, county, state, and federal partners.	FHTA and assessment areas; Helena WUI, Townsend area, US BLM-managed rangelands.
Develop Joint Training and Exercises	Host coordinated drills involving installation fire crews, local fire districts, US BLM, and DNRC to align communication protocols, suppression strategies, and access routes.	Cross-boundary wildfire corridors (e.g., Birdseye, Rimini, Tenmile).
Create Shared Equipment Pools	Identify and share wildfire suppression tools (e.g., pumps, foam systems) and recovery resources across jurisdictions based on proximity and demand.	Helena-area departments; FHTA Logistics; Townsend VFD.
Designate Joint Staging Areas	Establish predetermined shared staging areas near buffer areas for multi-agency deployment and supply distribution during active wildfire incidents.	Blue Cloud, War Eagle Hill, Indian Creek.
Integrate Resource Management Platforms	Use shared GIS, interagency dispatch, or incident management software to track crew locations, suppression efforts, and available resources in real time.	Entire LHTA/FHTA assessment area.
Coordinate with Utility and Transportation Providers	Include power companies, rail operators, and public works departments in wildfire contingency planning for shared response and asset protection.	Rail corridor adjacent to VA Complex and Townsend.

Appendix A: Policy, Procedures, Plans Gap Analysis

This section summarizes how current wildfire planning, response capability, infrastructure conditions, and land-use practices in the FHTA and LHTA assessment areas compare against required federal, state, and local standards. The data highlights where installation practices meet expectations, where capability or policy gaps remain, and what targeted actions are needed to improve wildfire readiness, strengthen mission assurance, and ensure consistent coordination with surrounding jurisdictions.

Crosswalk of Policies vs. Practice, Gaps & Corrective Actions (FHTA/LHTA)

This crosswalk in the tables below outlines how current wildfire planning, response capabilities, infrastructure conditions, and coordination practices in FHTA and LHTA assessment areas compare to the standards required by DoW, Army, federal interagency, state, and county frameworks. It identifies where installation practices meet policy intent, where gaps or shortfalls exist, and the specific corrective actions needed to close those gaps. The purpose is to clearly show what is expected, what is in place, and what must be implemented to ensure compliant, resilient, and mission-ready wildfire management across both installations.

Table 27. DoW / Army (installation level)

Area	What policy/standard expects	Current state (FHTA/LHTA)	Gap / Non-adherence	Corrective action (owner)
Wildland planning	AR 200-1 / INRMP & WFMP: site-specific fuels, suppression pre-plans, smoke plans	Uses regional CWPP; no installation-specific Type 3 assessment	Planning gap (precision + mission tailoring)	Complete Type 3 Assessment for each site; append to INRMP/IWFMP with shaded fuel-breaks, patrol roads, helispots, Red-Flag SOPs (MTARNG)
Range fire weather thresholds	DoDI 6055.06 & NWCG: documented go/no-go, patrol & mop-up standards for Red-Flag ops	Red-Flag controls used operationally, but not a consolidated, signed SOP set tied to RAWS indices	Procedure gap	Issue Range Fire SOP (indices, triggers, patrol/mop-up times, UAS-IR recon) and train annually (Range Ops/Environmental)
Data & decision support	NIMS/ICS, interop, incident pre-plans	No on-site RAWS/micro-RAWS at each site; dashboard access ad-hoc	Sensing gap	Install RAWS/micro-RAWS per site; register to NIFC; publish shared dashboard; add to

Area	What policy/standard expects	Current state (FHTA/LHTA)	Gap / Non-adherence	Corrective action (owner)
				dispatch pre-plans (MTARNG + NIFC)
Encroachment/compatible use	DoDI 4165.57/4165.70; 10 USC 2684a (ACUB/REPI) encourages overlays and buffers	Active REPI/PPLT work, but no county-adopted MWCOZ; parcel review not formalized	Policy implementation gap	Co-develop MWCOZ text/maps with counties; stand up Assessment Area Parcel Review Panel; fund easements via REPI/OLDCC (Counties + DMA)
Critical infrastructure coordination	DoDI 3020-26, resilience; PHMSA 49 CFR 195 (pipelines)	No formal pipeline MOU (Phillips 66) for fire/heat exposure; PSPS-style utility MOU not codified	Coordination gap	Execute MOUs: pipeline access/inspection/standoff; utility de-energization decision trees & hardening priorities (DMA + Phillips 66 + NWE/Vigilante)

Table 28. Federal Interagency

Area	Expectation	Current state	Gap	Fix
ARA integration (smoke/health)	IWFAQRP/NWCG: ARAs embedded on significant smoke incidents	No pre-designated ARA request triggers for Red-Flag training	Procedure gap	Add ARA request criteria to Range Fire SOP; pre-identify contact chain (MTARNG↔DNRC/DEQ/USFS)
Resource ordering	National Mobilization Guide; pre-plans in CAD/dispatch	IA relies on partner dispatch; no published pre-plan for typed on-base resources	Ops gap	Fire dispatch pre-plan with Helena Interagency Dispatch; cache IDs, access gates, comms plan (MTARNG/Dispatch)

Table 29. State of Montana (DNRC/DEQ) & Funding

Area	Expectation	Current state	Gap	Fix
WUI land-use standards (state code)	Counties evaluate and adopt applicable provisions of the Montana statewide	Statewide WUI code exists but is not analyzed or referenced in the	Policy and implementation gap: lack of enforceable setbacks, fuel-	Analyze WUI code applicability to FHTA/LHTA; recommend county adoption of full

Area	Expectation	Current state	Gap	Fix
	WUI code (MCA 76-13-145 and implementing rules) through subdivision regulations or WUI overlays near high-risk areas and installation boundaries	vulnerability or wildfire assessments; Lewis & Clark and Broadwater Counties have not adopted the code or equivalent overlays adjacent to FHTA or LHTA	modification zones, access standards, and ignition-resistant construction requirements near MTARNG installations	code or targeted provisions via overlays; coordinate DNRC technical assistance and pursue state funding support tied to WUI adoption
DNRC cooperative programs	Use SFA/VFA, FEPP/FFP for engines & training	Some mutual aid: no FEPP/FFP plan tied to IA module build-out	Resourcing gap	Apply for FEPP/FFP engines; SFA/VFA grants for training/equipment (MTARNG↔DNRC)
Smoke/burn coordination	DEQ permits; burn bans; public messaging	Not fully embedded in range SOPs	Procedure gap	Align burn/smoke permits & notification trees in SOP; add public info templates (MTARNG↔DEQ)

Table 30. County/Local (Lewis & Clark, Broadwater; Helena/Townsend; Rural FDs)

Area	Expectation	Current state	Gap	Fix
Typed Initial Attack (IA) Capability (Installation–Community Interface)	Off-installation expectation is the ability to support surrounding community infrastructure during wildfire incidents and to rapidly contain ignitions to prevent cross-spread (installation to community and community to installation). DoD (DoDI 6055.06 / AR 420-1) and NWCG doctrine imply interoperable response forces capable of integrated IA with local, state, and	IAAs exist (VAFD supporting FHTA; USFS/DNRC supporting LHTA). Response is primarily external, with limited pre-positioned capability and no dedicated, typed IA module aligned to shared WUI risk.	Gap in coordinated, immediately available suppression capacity to check fires at jurisdictional boundaries and protect shared infrastructure; reliance on arrival of off-site resources increases risk of cross-boundary spread.	Establish collaboratively staffed, NWCG-typed IA capability integrated with mutual-aid partners; formalize cross-staffing (MTARNG/DMA, VAFD, DNRC, USFS) and pre-incident dispatch protocols. Add new dry-hydrant refill points to improve local apparatus turnaround and sustained structure-protection operations.

Area	Expectation	Current state	Gap	Fix
	federal partners in the WUI.			
Water supply / resilience (Community-Based)	UFC 3-600-01 and NFPA standards expect reliable, accessible fire-flow and refill capability to sustain suppression and protect critical infrastructure across the installation–community interface. Emphasis is on interoperable water access that enables local jurisdictions to defend communities and prevent cross-spread during wildfire events.	FHTA and LHTA lack dedicated refill infrastructure tied to surrounding jurisdictions; local fire agencies rely on limited or distant sources, increasing shuttle times and reducing operational tempo. No purpose-built interface support features currently exist.	Community-facing infrastructure gap: insufficient rapid-refill locations and access improvements to sustain IA and structure protection operations in the Local Defense Communities, elevating risk of installation-to-community and community-to-installation fire transmission.	Implement community-based infrastructure improvements external to the installations, including new dry hydrant installations, access hardening, and turnout/apron upgrades at strategic locations coordinated with local VFDs, DNRC, and county partners to reduce refill times and improve sustained suppression capacity.
WUI codes in assessment areas	Adopt IWUIC/FireWise standards by ordinance	Varies; defensible space & access/hydrant conditions not uniformly required in assessment areas	Code gap	Adopt MWCOZ: Class-A roofs, ember vents, 0–5 ft NCZ, 30–100+ ft DS by slope; dual egress & geometry; water/tank coverage (Counties)
Subdivision review	Tie approvals to ECT, water flow/tanks, fuel-break easements	No standing interagency panel; no ECT tie-in	Process gap	Create Assessment Area Development Review Panel; require Wildfire Compatibility Sheet + ECT gate (Counties + DMA + DNRC + FDs)
Inspection/maintenance	Annual DS/tank/draft checks; 5-yr re-entry on fuel breaks	No countywide WUI inspection program in assessment areas; maintenance covenants uneven	Compliance gap	Launch WUI Inspection & Maintenance program; HOA covenants; compliance portal (Counties/FDs)

Area	Expectation	Current state	Gap	Fix
Access/water deficits (LHTA)	Tender cycles ≤20–30 min; all-weather routes	Tender cycles >45 min in drought/turbidity; culvert pinch-points	Operational deficit	Add fixed tanks/draft nodes; culvert upsizing/armoring; road widen/turnouts (County + DMA)

Cross-Boundary, Bidirectional Risk (core to this plan)

What policy expects: Cohesive Strategy + NIMS/ICS + DoW encroachment policies = shared planning and maintained benefits across the fence line.

Current state: Many elements exist (IAAs, REPI projects, Tri-County FireSafe Working Group), but they are not yet linked through enforceable county overlays, parcel-level gates, or installation SOPs that reference specific triggers (indices, patrol times, de-energization, ARA, evacuation ECT).

Bottom line gap: Governance is present; integration is incomplete.

Table 31. Prioritized Corrective Actions-Policies, Practice, Gaps

Priority #	Fix / Action	Who Owns	Funding Pathways	Outcome / Result
1	Secure utility MOUs for PSPS-style power shutoff coordination and pipeline MOU with Phillips 66	DMA, utilities	Utility cost-share, franchise utility wildfire mitigation funds	Reduces ignition risk and defines operational authority during Red Flag events
2	Build water nodes at FHTA (tank, loop, hydrants) and LHTA (tanks, draft nodes)	DMA, utilities, county	Utility cost-share, county mitigation funds, REPI if tied to assessment area resilience	Improves IA success, reduces tender cycles, enables sustained suppression
3	Harden access roads with culvert upgrades, widening and turnouts at Old Woman's Grave and Indian Creek corridors	County, DMA	County capital improvements, Public Works funds, REPI for shared access corridors	Ensures egress, reduces washout risk, improves responder and evacuation access
4	Establish typed IA modules and staff with FEPP and FFP engines	DMA, VA Fire Department, DNRC	FEPP and FFP equipment programs, DNRC wildfire support grants	Creates dedicated fire response capacity without reliance on external response
5	Install RAWS or micro-RAWS stations and create a shared fire-weather dashboard	MTARNG/DMA, NIFC support	NIFC RAWS expansion support, USFS/DNRC monitoring grants	Provides localized indices for risk-based restrictions and dispatch decisions

Priority #	Fix / Action	Who Owns	Funding Pathways	Outcome / Result
6	File wildfire response pre-plans with Helena Interagency Dispatch	MTARNG/DMA, dispatch	Minimal cost, internal administrative action	Establishes run cards, contact flow, resource ordering and triggers
7	Publish Range Fire SOP with Red Flag triggers, mop-up standards, UAS-IR and ARA criteria	MTARNG	Internal cost, staff time only	Standardizes expectations across personnel and prevents procedural drift
8	Execute ACUB and REPI easements to secure treatment and patrol corridors	DMA, Prickly Pear Land Trust	REPI, private conservation match, landowner partnership funds	Protects access for fuel breaks, prevents encroachment, supports patrol mobility
9	Adopt MWCOZs through counties and map into MTARNG operational atlas	Counties, MTARNG GIS, DMA	County zoning funds, planning authority cost	Adds enforceable compatibility controls and improves long-term land buffering
10	Complete Type 3 wildfire site assessments and attach to INRMP and IWFMP	MTARNG/DMA	Internal program funds	Closes compliance documentation gap and strengthens project justification

Specific "Not Adhered / Not Yet Implemented" vs. DoW Guidance (callouts)

- DoDI 6055.06 / NFPA 1051/NWCG typing: on-installation typed IA capability not yet implemented (reliance on IAAs alone).
- AR 200-1 (wildland planning): installation-specific wildland risk analysis (Type 3 Assessment) absent.
- DoDI 4165.57/4165.70 (compatibility): MWCOZ/overlay not yet adopted by counties (DoW guidance urges coordination; local action pending).
- UFC/NFPA fire-flow resilience: FHTA lacks southern storage/looping for sustained flows; LHTA lacks fixed tanks/draft nodes, resilience shortfall (not a code violation for unimproved lands, but a mission-risk gap).
- Interagency SOP integration: ARA, PSPS, and pipeline protocols not formalized in signed MOUs/SOPs.

Appendix B: Stakeholder Notes

Effective wildfire risk reduction and installation resilience depend on meaningful collaboration among the many agencies, organizations, and community groups that share responsibility for preparedness, mitigation, and emergency response. To support the development of the Wildfire Risk Assessment and Vulnerability Assessment for the FHTA and LHTA assessment areas, the project team conducted a series of targeted stakeholder interviews with federal, state, local, military, and community partners.

This annex summarizes the perspectives, insights, and areas of concern identified by stakeholders during the assessment process. Their input provides essential context for understanding operational conditions, interagency roles, resource constraints, wildfire behavior challenges, and infrastructure vulnerabilities affecting the assessment areas. Stakeholders contributed expertise on fire management practices, fuels conditions, emergency response capabilities, evacuation limitations, utility and infrastructure exposure, and conservation priorities that influence risk.

The findings captured in this annex help ensure that this assessment reflects real-world conditions on the ground and aligns agency and community experiences most affected by wildfire. These perspectives inform the recommendations and mitigation strategies presented in the main body of this assessment and support DMA's ongoing efforts to strengthen mission assurance, reduce wildfire risk, and enhance regional coordination across jurisdictional boundaries.

The summaries that follow are organized by stakeholder group and highlight the key themes, challenges, and opportunities identified throughout the engagement process.

Local Fire Departments & Fire Districts. Stakeholder discussions across rural and municipal fire agencies emphasized significant capacity constraints. Volunteer departments operate with limited staffing, aging equipment, and long response times, particularly in remote areas surrounding LHTA. Agencies reported increasingly hazardous visitor behavior, fireworks and campfires, creating more ignition potential. Widespread noxious vegetation and juniper encroachment near River Road subdivisions intensify wildfire risk. Chokepoint and roads that transition from paved to unpaved create major evacuation issues, and several WUI subdivisions lack engine access altogether. Fire departments underscored the need for more mitigation crews, improved mapping, and coordinated evacuation, mitigation and land use planning.

Tri-County Firesafe Working Group. The Tri-County Firesafe Working Group, a 501(c)(3), collaborates with DNRC, Forest Service, NRCS, BLM, and local fire councils across Lewis & Clark, Broadwater, and Jefferson Counties. Staffing reductions and the loss of experienced personnel have dramatically reduced mitigation capacity. Key concerns include:

- No formal evacuation plan in Lewis & Clark County.
- High wildfire exposure across the assessment areas.
- Broadwater County's limited perception of risk.
- Lack of prescribed fire programs, though they are actively involved in Firewise outreach, realtor-based education campaigns, and multiple grant applications.

- The need for multi-jurisdictional planning and more interagency support.

Montana State Hazard Mitigation Officer. The SHMO highlighted systemic statewide challenges especially the developments expanding into high-risk fire areas without codes, outdated infrastructure, lack of evacuation capacity, and insufficient defensible space. Key insights included:

- South Hills and FHTA-adjacent neighborhoods are among the most dangerous in the Helena region.
- Fuel conditions upslope of Highway 12 requires treatment.
- Fire modeling often underestimates large fire events because major conflagrations produce their own winds.
- Infrastructure vulnerabilities include water systems, utility lines, schools, and narrow road networks.
- Evacuation gridlock is a major issue due to inadequate ingress/egress planning.
- The SHMO emphasized improving codes, strengthening land-use planning, and aligning mitigation investments across agencies.

DMA / MTARNG Internal & Interagency Fire Management Stakeholders. DMA and MTARNG staff identified operational barriers affecting wildfire mitigation and response**:**

- Limited prescribed burn authority and insufficient NG staffing.
- Fire Management Plans exist but are not shared widely, causing information gaps.
- Mapping products are outdated and not consolidated in a single accessible platform.
- Coordination occurs annually, but more frequent engagement is needed to prevent knowledge gaps.
- Several UXO-cleared locations are ready for treatment but unfunded.
- Stakeholders also highlighted that firebreaks along north–south corridor roads and additional road maintenance would meaningfully increase resilience.

Townsend / Montana Economic Assistance. Economic development perspectives revealed critical intersections between wildfire vulnerability and new industrial activity. Key points include:

- BNSF rail corridors are a major ignition source near LHTA.
- Off-road recreation and old mining roads create additional ignition pathways.
- Industrial redevelopment (lumber mill, copper mining, South Limestone Range proposals) may intensify risk without defensible-space standards.
- Southern LHTA region suffers from weak communication infrastructure, limited emergency access, and volunteer fire dependency.

- Radersburg and other rural communities face extreme vulnerability due to poor connectivity and limited emergency services.
- Military logistics depend heavily on the rail corridor; disruption poses mission-assurance concerns.

Broadwater & Lewis & Clark Stakeholders. Feedback identified multiple vulnerability factors to include:

- Elderly and assisted-living residents require targeted evacuation planning.
- Rural communities are isolated and lack reliable emergency alert coverage.
- Hydrant system upgrades and new rural fire stations improved capability but unevenly across the region.
- Defensible space is not consistently enforced, especially in WUI-heavy subdivisions.
- Industrial corridors including Hazmat Row present dual threats: ignition risk and hazardous-material exposure.

Utility & Critical Infrastructure Stakeholders (Electric, Communications). Utility stakeholders highlighted growing exposure of distribution lines, transformers, and wooden poles to wildfire. Key findings include:

- PSPS zones west of Helena and LHTA assessment area could disrupt communications and heating for vulnerable residents.
- Integration of fire cameras and Watch Duty App into county dispatch is improving but incomplete.
- GIS infrastructure data (wooden pole inventory, exposure indices) is outdated and fragmented.
- Mitigation priorities include line hardening, sensor expansion, transformer protection zones, and expanding remote detection systems for early fire identification.
- Utilities also noted that red-flag warnings reduce training capacity at FHTA due to safety and PSPS risks.

NRCS & Broadwater Conservation District. NRCS identified high-risk vegetation patterns around LHTA and River Road subdivisions. Rocky Mountain juniper encroachment is rapidly increasing fuel density and fire spread potential. Key insights include:

- EQIP contracts help private landowners reduce fuels, but short-term timelines and lack of reseeding limit sustainability.
- Infrastructure at risk includes cell towers, pipelines, training facilities, and recreation corridors vulnerable to public encroachment.
- Erosion, creek blockage, and sedimentation pose post-fire flooding hazards.
- Rural subdivisions have limited egress.

- NRCS emphasized the need for multi-agency data integration, more funding for treatments, and expanded community outreach.

Municipal Planners. Water-system stakeholders noted improvements from 37 hydrant replacements but acknowledged gaps remain in rural areas where dry hydrants are still needed. Water access is a major limiting factor for suppression capability around industrial corridors and remote subdivisions.

Emergency Management Stakeholders. Feedback highlighted:

- No universal or countywide siren system; Reverse-911 coverage is inconsistent in remote areas.
- Integration with Watch Duty App shows promise but lacks statewide uniformity.
- Several communities lack published evacuation routes.
- Lack of consolidated data and outdated mapping complicate real-time decision-making.

County Planners & Land-Use Stakeholder. Land-use stakeholders highlighted conflicting priorities between development interests and wildfire resilience. Key concerns:

- Housing growth in WUI areas outpaced mitigation standards.
- Clustered developments without adequate access.
- Resistance from older homeowners or industrial operators to defensible-space requirements.
- Lack of zoning alignment with hazard conditions.

Cross-Stakeholder Themes Identified

Wildfire Risk Drivers

- Unmanaged fuels, juniper encroachment, and high-risk WUI expansion
- Limited prescribed burning and insufficient mitigation staffing
- Recreation-related ignitions and rail-related sparks

Evacuation & Access Constraints

- No formal evacuation plan in Lewis & Clark County
- Subdivisions with single-access roads
- Major regional chokepoints affecting both civilian and MTARNG mobility

Coordination, Data & Planning Gaps

- Outdated GIS and mapping

- Annual, not continuous, coordination
- Fragmented risk communication across agencies

Infrastructure & Mission Assurance Risks

- Vulnerable power distribution, communication towers, and transportation corridors
- PSPS impacts on training
- Limited rural water availability

Appendix C: Wildfire Hazard Characterization

Wildfire is an unplanned, uncontrolled fire burning in natural vegetation, which may threaten lives, property, infrastructure, and natural resources. Wildfires can be caused by lightning, human activity, or military training operations and are influenced by fuel conditions, weather, and topography. WUI refers to areas where human-built environments including homes, businesses, and infrastructure directly abut or intermingle with wildland vegetation. These transitional areas are of heightened concern due to their susceptibility to structure loss, rapid fire spread, and the complexity of wildfire suppression and evacuation efforts. WUIs represent critical human-environment interfaces where risks associated with wildfire, habitat fragmentation, invasive species introduction, and biodiversity loss are intensified.

In the context of Lewis & Clark and Broadwater counties, including FHTA, LHTA, and surrounding assessment areas, WUI areas are rapidly expanding due to continued residential development and land conversion. Managing fire behavior in these areas is a top priority for both military and civilian planners due to the proximity of critical infrastructure, evacuation constraints, and limited defensible space enforcement in newly developed parcels.

This assessment adopts and adapts WUI classifications as defined in *A Report to the Council of Western State Foresters: Fire in the West – The Wildland/Urban Interface Fire Problem* (2000), which outlines three primary community types:

- **Category 1** – Interface Community: Defined by a clear boundary between dense development and adjacent wildland fuels. Typically features three or more structures per acre with shared municipal services and is served by local government fire departments. Population density exceeds 250 people per square mile.
- **Category 2** – Intermix Community: Characterized by scattered structures interspersed within wildland vegetation with no clear boundary. Development densities range from clustered homes to isolated residences on 40-acre parcels. Population densities generally range from 28 to 250 people per square mile. Fire protection is often shared among rural fire districts and volunteer services.
- **Category 3** – Occluded Community: Typically found within or adjacent to urban cores where structures surround smaller islands of wildland fuels including parks or open spaces. Though generally less than 1,000 acres, these areas present high-intensity ignition risks within otherwise urbanized settings.

This classification informs the risk modeling, vulnerability analysis, and mitigation prioritization efforts in this assessment. Both the Intermix and Interface categories are widespread across the FHTA and LHTA assessment areas, with significant implications for evacuation planning, fuel treatment priorities, and collaborative mitigation investments.

Compatible Use Buffers

CUB refers to land areas surrounding military installations that are managed or preserved to prevent incompatible development and reduce land-use conflicts between military operations and

civilian communities. CUBs help maintain military readiness while also protecting environmental and community resources.

CUB key characteristics are as follows:

- **Buffer Areas:** They serve as spatial buffers between military training areas (e.g., FHTA or LHTA) and nearby residential or commercial development.
- **Land Use Coordination:** CUBs are used to guide zoning, development, and conservation strategies that are compatible with military activities (e.g., low-density development, agricultural or conservation easements).
- **Noise and Safety Mitigation:** CUBs reduce conflicts related to noise, dust, vibrations, and safety areas around training areas, airfields, or weapons ranges.
- **Military-Civilian Collaboration:** Often developed through partnerships between the DoW (REPI program), local governments, and land trusts.

The CUBs around FHTA and LHTA are critical for protecting the DMA mission while also managing wildfire risk, especially in areas where WUI development is expanding.

Wildfire Types

Wildfires are typically classified into three main types based on how they burn and spread: surface fires, crown fires, and ground fires. Each presents distinct threats to military installations, infrastructure, and communities within the assessment area.

- **Surface fires** are the most common type in Montana and burn along the forest floor, consuming grasses, brush, and low-lying vegetation. These fires can spread rapidly in areas with dense fuels and are influenced by wind, slope, and fuel moisture, posing a significant threat to fence lines, training areas, and perimeter infrastructure.
- **Crown fires** occur when flames reach the canopy of trees, allowing fire to move from treetop to treetop. These are the most dangerous and fast-moving type of wildfire, especially in dense coniferous forests near mountainous terrain including those found in the LHTA and Helena National Forest fringe areas. Crown fires can quickly overwhelm suppression efforts and endanger both military assets and adjacent communities.
- **Ground fires** burn beneath the surface, smoldering through organic soils and duff layers. While less common, they can occur in areas with thick, dry organic matter and can be difficult to detect and extinguish. Ground fires may smolder for days or weeks, threatening underground utilities, pipelines, and training lands if not carefully monitored.

Understanding these fire types is essential for modeling spread potential, assigning suppression resources, and designing appropriate mitigation strategies across variable terrain and vegetation areas within the WUI.

Contributing Factors

Several interrelated environmental factors influence wildfire ignition, spread, and intensity across the FHTA, LHTA, and surrounding communities. These include fuel characteristics, weather conditions, and topography, each of which plays a critical role in determining wildfire behavior and suppression difficulty.

Meteorological conditions are among the most influential factors in determining wildfire ignition, spread, and intensity. Key variables including temperature, relative humidity, wind speed and direction, and precipitation patterns directly shape fire behavior across landscapes. In the FHTA and LHTA regions, seasonal wind events, summer heatwaves, and prolonged droughts have contributed to increased fire activity and complexity. Meteorological data, both historical and real-time, are essential for understanding past fire events, modeling future scenarios, and informing daily operations for fire prevention and suppression. This section incorporates climate data and weather modeling to assess fire risk trends, identify high-alert periods, and support proactive planning and emergency response strategies across the assessment areas.

Weather: Wildfire behavior in this region is heavily influenced by prevailing weather patterns, including low relative humidity, high temperatures, and strong downslope winds, particularly during late summer. Prolonged drought conditions, shifting climate norms, and episodic red flag warnings exacerbate fire risk. Wind events aligned with slope direction can dramatically accelerate fire spread and overwhelm suppression efforts, especially during lightning-prone storm cycles.

From a seasonal climatology perspective, the following statements explain typical weather:

- Winter typically brings periodic storm systems and mountain snowfall, reducing fire activity.
- Spring brings heavy mountain precipitation but also the highest wind potential, increasing drying risk on the plains.
- Summer is marked by warm, dry conditions and peak fire activity in mountain regions in FHTA and LHTA assessment areas.
- Fall can bring renewed fire activity on the plains when winds and cured fine fuels align.

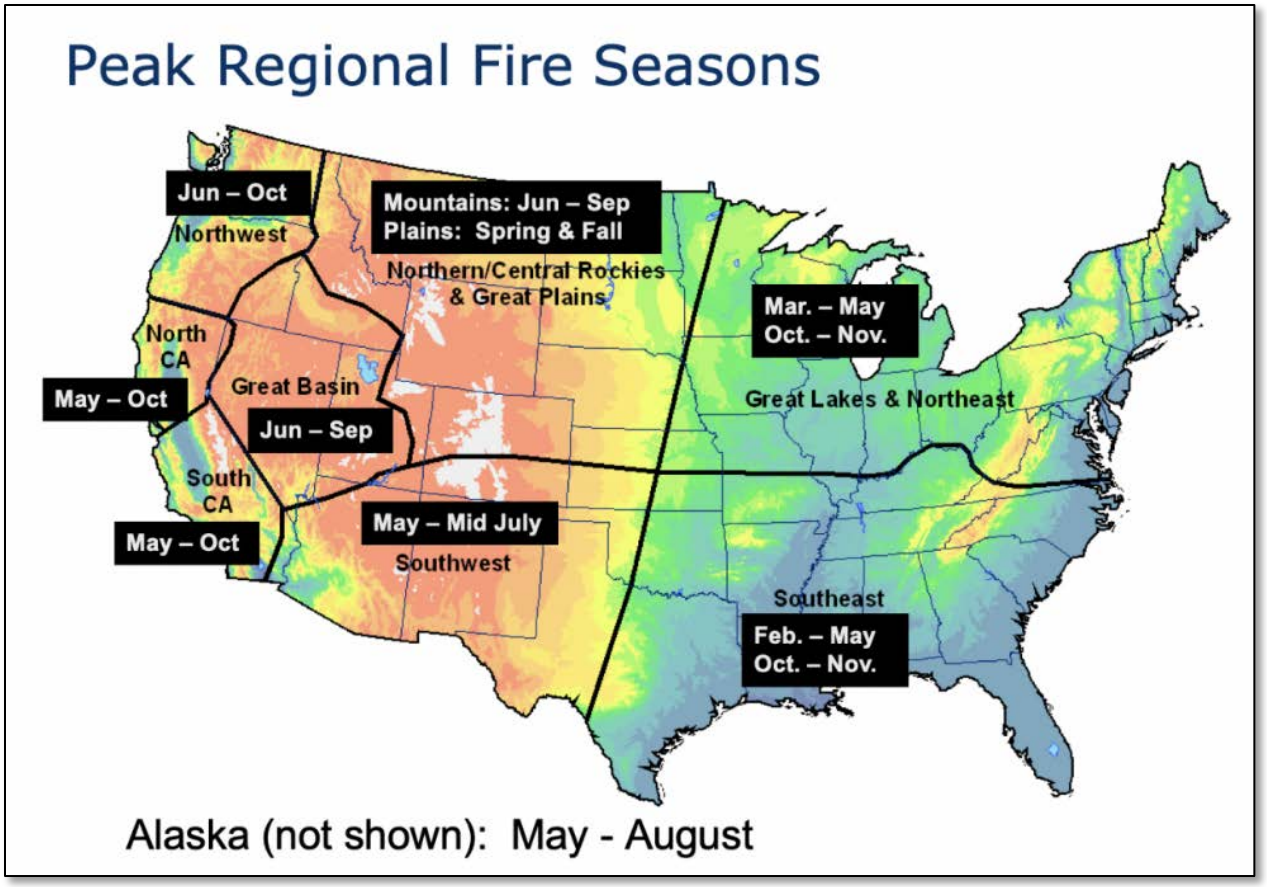


Figure 111. National Peak Regional Fire Seasons

These seasonal insights are crucial for developing fire management calendars, coordinating prescribed burns, conducting public outreach, and deploying early-warning systems in advance of peak conditions. Proactive planning based on seasonal fire behavior increases community resilience and reduces emergency response burdens.

Topography: Terrain features in the FHTA and LHTA regions, including steep slopes, canyon drainages, and variable elevation, further complicate wildfire response and planning. Fires tend to move more rapidly uphill, and aspects with prolonged sun exposure (typically south- and west-facing slopes) dry out earlier in the season, increasing ignition likelihood. Elevation gradients also affect vegetation type and fuel moisture, which are key considerations in modeling and mitigation.

- Slope is one of the most critical topographic factors affecting wildfire behavior. As the angle of terrain increases, so does the speed and intensity with which fire can spread. Fires move more rapidly uphill because heat rises, preheating and drying fuels upslope and creating more favorable conditions for ignition. In the FHTA and LHTA regions, areas with steep slopes, particularly those adjacent to WUI areas, present heightened challenges for both wildfire suppression and evacuation. Identifying and mapping slope gradients help prioritize locations for defensible space, fuel breaks, and infrastructure hardening.

This analysis is foundational to predict fire behavior and tailoring mitigation strategies to the terrain.

- Aspect, the compass direction that a slope faces, plays a significant role in determining wildfire risk by influencing fuel moisture, vegetation type, and drying patterns. In the Northern Hemisphere, south- and west-facing slopes receive more direct sunlight throughout the day, leading to drier conditions and more flammable fuels. In contrast, north- and east-facing slopes tend to retain more moisture and support denser, less fire-prone vegetation. Within the FHTA and LHTA planning areas, analyzing aspects allows for the identification of high-risk slopes where rapid ignition and fire spread are more likely. This information is essential for refining fuel management plans, prioritizing mitigation areas, and modeling fire behavior under varying seasonal and wind conditions.
- Elevation influences wildfire behavior by affecting temperature, humidity, fuel types, and weather patterns. As elevation increases, environmental conditions typically become cooler and moister, altering the types and moisture content of vegetation. However, mid-elevation areas, including those common throughout FHTA and LHTA regions, often host dense fuel loads and transitional ecosystems that are particularly vulnerable to wildfire. Elevation also affects wind patterns and fire behavior during inversions or thermal shifts. Mapping elevation helps identify ecological areas, predict potential fire intensity, and guide suppression strategies. In the context of wildfire planning, elevation data is vital for understanding landscape variability and adapting risk reduction efforts to local terrain conditions.
- Fire spread refers to the movement of wildfire across a landscape and is influenced by a combination of fuel characteristics, weather conditions, and topography. Among fuel-related variables, canopy cover and canopy height play critical roles in determining how quickly and intensely a fire can move through an area. Dense canopy cover can trap heat and embers, allowing surface fires to transition into crown fires that spread rapidly through the treetops. Taller canopy structures, particularly when coupled with ladder fuels to included shrubs and low branches, can facilitate vertical fire movement and increase the likelihood of intense, high-elevation flame activity. One of the most visible indicators of fire intensity and spread potential is flame length, which correlates directly with fireline intensity and the difficulty of suppression. Longer flame lengths often result from heavy, dry fuels and can signal the potential for extreme fire behavior, especially in forested areas with closed canopies and elevated biomass. Understanding these interconnected factors is vital for accurately modeling fire behavior and prioritizing areas for fuel reduction or defensible space treatments.
- Fuel Types and Fuel Load: The planning area features a diverse mix of fine fuels (grasses and forbs), ladder fuels (shrubs and young trees), and heavy forest fuels (coniferous stands and deadfall). Areas within and adjacent to the installations often contain high fuel continuity with minimal breaks, particularly along training corridors, rangelands, and forested perimeters. The accumulation of dry vegetation, dead timber, and invasive species significantly increases fuel load and ignition probability. Vegetation and fuel load data are foundational to assessing wildfire risk, as they determine both the likelihood of ignition and the potential intensity and spread of wildfire. Different vegetation types including

grasslands, shrublands, and forested areas carry varying fuel characteristics, including moisture content, continuity, and volume.

- Flame length is a critical metric used to assess wildfire behavior, suppression difficulty, and overall fire intensity. Defined as the distance from the base of the flame to its tip, flame length directly correlates with heat output, fuel type, and wind conditions. Longer flames typically indicate higher fireline intensity, greater heat release, and more severe impacts on vegetation and infrastructure. In operational terms, flame length serves as a key threshold for determining safe and effective suppression tactics, flame lengths over four feet generally exceed the reach of hand tools while those exceeding eight feet often preclude direct attack altogether. Variables including canopy cover, fuel loading, slope, wind, and canopy base height all influence flame length, with dense vegetation and steep terrain contributing to longer, more dangerous flames. Understanding spatial variations in flame length across training areas including FHTA and LHTA enables planners to identify areas of elevated threat, prioritize mitigation, and allocate resources for effective response.
- Canopy cover refers to the percentage of the ground that is shaded by the vertical projection of tree crowns when viewed from above. It is a key indicator of forest density and plays a significant role in wildfire behavior. Dense canopy cover can act as a continuous layer of fuel, enabling fires to move from the surface into the tree crowns, resulting in more intense, fast-moving crown fires. In contrast, areas with sparse canopy cover may limit vertical fire spread but can still carry surface fires under dry and windy conditions. Canopy cover analysis is essential because it influences several critical factors, including flame length, rate of spread, ember production, and fire intensity. Canopy characteristics also affect microclimate conditions including shade, wind penetration, and fuel moisture levels. Evaluating canopy cover helps planners identify areas where wildfires are more likely to escalate in severity and inform decisions about thinning, shaded fuel breaks, and vegetation management to reduce risk.
- Canopy Base Height (CBH) refers to the average height from the ground to the lowest living branches of the tree canopy. It is a crucial metric in wildfire behavior modeling because it determines how easily surface fires can transition into crown fires. A lower CBH means that flames from surface fuels, including grass or shrubs, can more readily ignite overhead tree canopies, increasing the likelihood of intense, fast-spreading crown fires. Conversely, a higher CBH creates vertical separation between surface and aerial fuels, reducing the potential for crown fire initiation. Canopy base height into wildfire assessments enhances the accuracy of fire spread predictions and supports targeted mitigation strategies.
- Watersheds play a critical role in sustaining ecological health, water quality, and community resilience. A watershed is an area of land where all precipitation and surface water drain to a common outlet, including a river, lake, or reservoir. These natural systems support drinking water supplies, agricultural irrigation, wildlife habitat, and recreational opportunities. Protecting and managing watersheds is essential for mitigating flood risks, maintaining biodiversity, and ensuring the long-term availability of clean water. In the context of hazard planning and natural resource management, understanding watershed boundaries and functions helps identify vulnerabilities and guide sustainable land-use practices.

By analyzing these contributing factors through spatial datasets and fire modeling tools, this assessment identifies areas of heightened wildfire vulnerability and informs targeted risk reduction efforts for both military operations and neighboring communities.

Critical Fire-Driving Weather Events

Wildfire behavior is profoundly influenced by atmospheric conditions. Certain weather patterns and events act as critical accelerants to fire growth, intensity, and spread. Understanding and tracking these phenomena improves the accuracy of fire behavior modeling and supports real-time decision-making for suppression efforts, resource mobilization, and public warning systems.

Certain atmospheric patterns and events significantly elevate wildfire risk by intensifying fire behavior, accelerating spread rates, and complicating suppression efforts. These critical fire-driving weather events can arise quickly, often overwhelming preparedness measures and triggering extreme fire growth across landscapes. In the FHTA and LHTA regions, weather phenomena including strong winds, dry cold fronts, monsoonal transitions, and mid-level dry intrusions have historically contributed to some of the area's most challenging fire conditions.

Understanding the timing, mechanics, and local impacts of these events is essential for fire managers, planners, and emergency responders aiming to anticipate high-risk periods, allocate resources effectively, and implement proactive mitigation strategies. This section outlines key fire weather drivers that should be closely monitored throughout the fire season.

- **Breakdown of the Upper Ridge (Dynamic Dry Slot and Dry Cold Front):** When a strong upper-level ridge breaks down, it can be followed by a dry cold front or a dynamic dry slot with a narrow corridor of dry air descending through the mid-level atmosphere. These events increase surface winds and rapidly dry fuels, often leading to explosive fire growth and long-range spotting.
- **Subtropical Ridge (Mid-Level Dry Intrusion):** Under this pattern, subsiding air suppresses cloud formation and enhances heat and dryness at the surface. Combined with light winds aloft, this traps heat in valleys and foothills, drying out fuels and leading to intensified fire behavior, especially in sheltered terrain.
- **Edge of a Monsoon Burst (Hybrid Events):** The periphery of a monsoonal moisture surge can lead to dry thunderstorms, with lightning ignitions and minimal rainfall. These "hybrid" setups often spark multiple ignitions in remote areas simultaneously, straining response capacity.
- **Foehn or Downslope Wind Events:** These high-speed winds descend from mountains, warming and drying rapidly. In areas, to include the Rocky Mountain Front and Helena Valley, winds cause sharp drops in fuel moisture, increase fire spread rates, and create critical suppression challenges even in winter.
- **Low-Level Jet and Surface Dryline on the Great Plains**: These boundary-layer phenomena enhance wind speeds and vertical mixing. When combined with dry air advection, they produce sustained red flag conditions over broad areas, particularly east of the Rockies where grass fuels dominate.

Fire-Slowing or Stopping Weather Events

While many weather conditions can intensify wildfire behavior, certain atmospheric patterns can significantly slow fire progression or even halt active fire spread. These fire-slowing or stopping events play a crucial role in wildfire suppression, offering natural opportunities for containment, mop-up operations, and resource reassignment. Events including cold frontal passages, closed low systems, monsoonal moisture surges, and dense smoke inversions can temporarily shift fire dynamics by increasing humidity, lowering temperatures, or reducing available solar radiation. In the context of the FHTA and LHTA regions, these moderating weather patterns often signal brief but vital windows for firefighting advantage. Recognizing and planning around these events helps fire managers make strategic operational decisions and improves the accuracy of incident-level forecasting.

- **Closed Low/Pacific Trough/Cold Frontal Passage:** These events bring increased humidity, cooler temperatures, and in some cases wetting rain, which temporarily reduces fire intensity and may help containment. However, strong pre-frontal winds may cause fire growth just before conditions improve.
- **Monsoon Burst:** A strong influx of monsoonal moisture can result in high humidity, cloud cover, and precipitation, dampening fuels and temporarily reducing fire spread. This is often the signal for end-of-season fire relief in late summer.
- **Smoke Events:** Persistent smoke from nearby fires can reduce solar heating and limit fire growth by shading fuels. However, smoke inversions also trap heat and pollutants near the surface, complicating air operations and public health messaging.

Wildfire Risk Mapping

Wildfire risk mapping is a foundational component of this assessment, enabling the identification, visualization, and analysis of areas most susceptible to ignition, rapid spread, and loss. This assessment leverages multiple spatial datasets and geospatial modeling tools to develop risk maps that guide planning, mitigation, and response coordination across FHTA, LHTA, the surrounding assessment areas, and adjacent communities.

Key data sources include the LANDFIRE program, which provides national-scale vegetation and fuel models used to assess fuel characteristics, fire behavior potential, and burn probability. LANDFIRE layers were integrated with local GIS datasets from Lewis & Clark and Broadwater counties, including parcel boundaries, structure locations, fire districts, and critical infrastructure assets. Terrain data including slope, aspect, and elevation were also incorporated to refine fire spread models using FlamMap and FARSITE.

In addition, this assessment references CWPPs, RAWS station data, and historical wildfire perimeters from the US Forest Service and Montana DNRC to validate modeled fire risk with real-world fire behavior patterns. These layers are synthesized into composite wildfire hazard areas that reflect the interplay of fuels, topography, ignition sources, and values at risk.

Together, these mapping tools provide actionable intelligence for identifying high-risk WUI areas, prioritizing mitigation projects, and coordinating response strategies across jurisdictional boundaries.

Understanding and predicting wildfire behavior requires a suite of indices and environmental metrics that reflect the dynamic interactions between vegetation, weather, and topography. For the FHTA and LHTA planning areas, several key indicators support operational decision-making and strategic mitigation planning.

Growing Season Index – Climate Variables and Thresholds

The Growing Season Index (GSI) is a climate-based metric that estimates plant physiological readiness for photosynthesis and foliar development. It plays a critical role in understanding seasonal vegetation dynamics, especially for live fuel availability and flammability in wildfire modeling. GSI is based on three key environmental variables that influence plant growth: minimum temperature, Vapor Pressure Deficit (VPD), and Photoperiod (daylength).

Minimum Temperature

Minimum temperature affects plant metabolic processes and water uptake, particularly through the root system. While air temperature matters, soil temperature often limits growth when it falls below optimal levels. Many ecosystems exhibit reduced or delayed greening when minimum temperatures are suboptimal.

- Unconstrained (optimal for growth): ≥ 5°C (41°F).
- Completely limiting: ≤ -2°C (28°F).

Vapor Pressure Deficit

VPD is a surrogate for atmospheric water demand and is strongly linked to plant water stress. High VPD levels restrict plant function through stomatal closure, reduced leaf production, and decreased cell activity, all of which impact fuel moisture.

- Unconstrained: ≤ 900 Pascals.
- Completely limiting: ≥ 4100 Pascals.

Photoperiod

Photoperiod is a stable and reliable climatic signal for seasonal plant development. It defines the outer envelope for growth conditions, as many species rely on daylength to initiate greening or dormancy.

- Unconstrained: ≥ 11 hours.
- Completely limiting: ≤ 10 hours.

Fire Behavior Interpretation

Each variable is scaled between 0 and 1. The GSI is the product of the three indicators, meaning if any one factor is completely limiting (0), overall growth potential is zero. Conversely, when all factors are near-optimal (value of 1), plants are actively growing, and live fuels are typically green and less flammable.

The GSI is highly useful for the following:

- Predicting green-up and curing periods.
- Understanding live fuel transitions.
- Improving seasonal fire behavior models.

These thresholds help identify when live vegetation shifts from being a fire retardant to becoming a fuel source, which is key for fire season preparedness and landscape-scale mitigation efforts. Table 32 below shows upper and lower limit thresholds for GSI functions.

Table 32. Upper and Lower Limits Thresholds for Growing Season Indicator Functions.

Input Variable	Unconstrained	Completely Limiting
Minimum Temperature	5ºC /41º F	-2ºC /28º F
Vapor Pressure Deficit (Pascals)	900 Pascals	4100 Pascals
Photoperiod	11 hours	10 hours

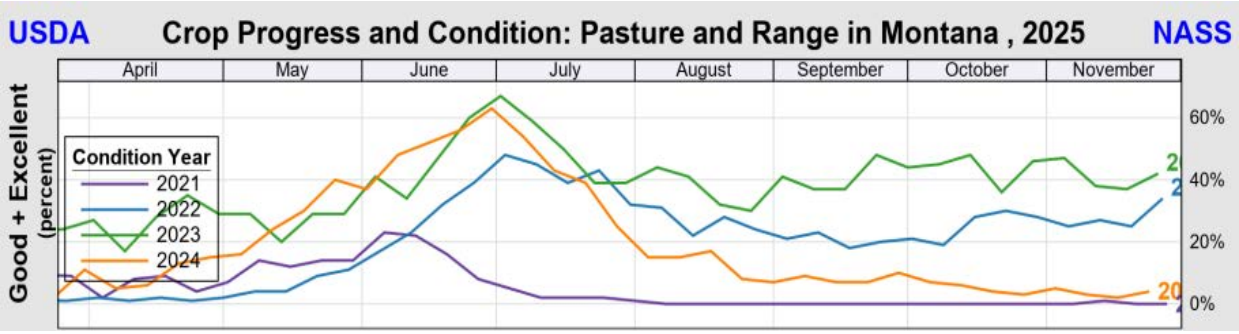


Figure 112. Graph of Montana Pasture and Range Crop Progress and Conditions, 2021-2025.

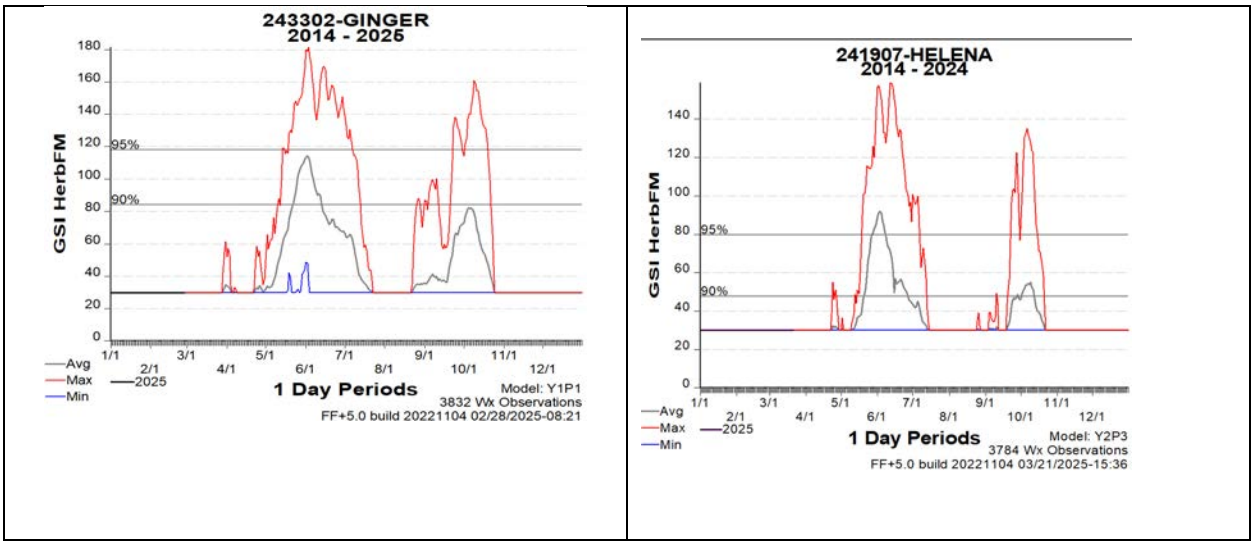


Figure 113. Growing Season Indicator Factor and Hours for the Ginger and Helena Weather Stations.

Figure 113 illustrates the GSI Factor/Hours for the Ginger and Helena weather stations, representing the cumulative influence of minimum temperature, VPD, and Photoperiod on plant growth conditions. These environmental indicators are essential for understanding when and how live fuels become available to burn. In the FHTA and LHTA planning areas, tracking these factors provides insight into the timing of vegetation green-up and curing, which directly influences wildfire ignition potential and fire behavior. For instance, sharp declines in GSI factor and hours indicate rapid transitions from moist, photosynthetically active fuels to dry, flammable ones typically aligning with the region's peak fire season. By monitoring GSI patterns at these key stations, fire managers can more accurately anticipate high-risk windows, adjust readiness levels, and better inform mitigation and suppression strategies across Lewis & Clark and Broadwater counties.

Additionally, these GSI displays for the Ginger and Helena stations over multiple years provide a dynamic view of vegetation growth cycles in the planning area. The GSI integrates critical climate variables temperature, atmospheric moisture stress (VPD), and daylength to represent plant physiological activity and the availability of live, green fuels. In the FHTA, LHTA, Helena, and Townsend areas, these graphs reveal seasonal patterns in fuel moisture and live fuel flammability, helping to pinpoint when vegetation shifts from a fire-resistant state to a fire-conducive condition. High GSI values indicate periods when fuels are least likely to ignite, while low values signal increased wildfire risk due to cured or senescent vegetation. By comparing these trends across multiple years, planners gain insight into the impact of drought, extended fire seasons, and climate variability, enabling more informed decisions about prescribed burns, suppression resource staging, and public outreach during critical wildfire periods.

Energy Release Component

The Energy Release Component (ERC) measures the total energy output of a fire's flaming front and reflects fuel dryness in both live and dead vegetation. As a "build-up" index, the ERC has

memory and responds slowly to weather changes, making it an excellent indicator of long-term fire potential. It is especially useful for the following:

- Tracking seasonal fire intensity trends.
- Staffing decisions.
- Comparing current conditions to historical fire years.

ERC thresholds support the assignment of Adjective Ratings:

- Low (0–12th percentile).
- Moderate (13–25).
- High (26–50).
- Very High (51–56).
- Extreme (57+).

Seasonal graphs provide a good view of the current ERC trend and also allow comparison to recent years or significant fire years to the current year.

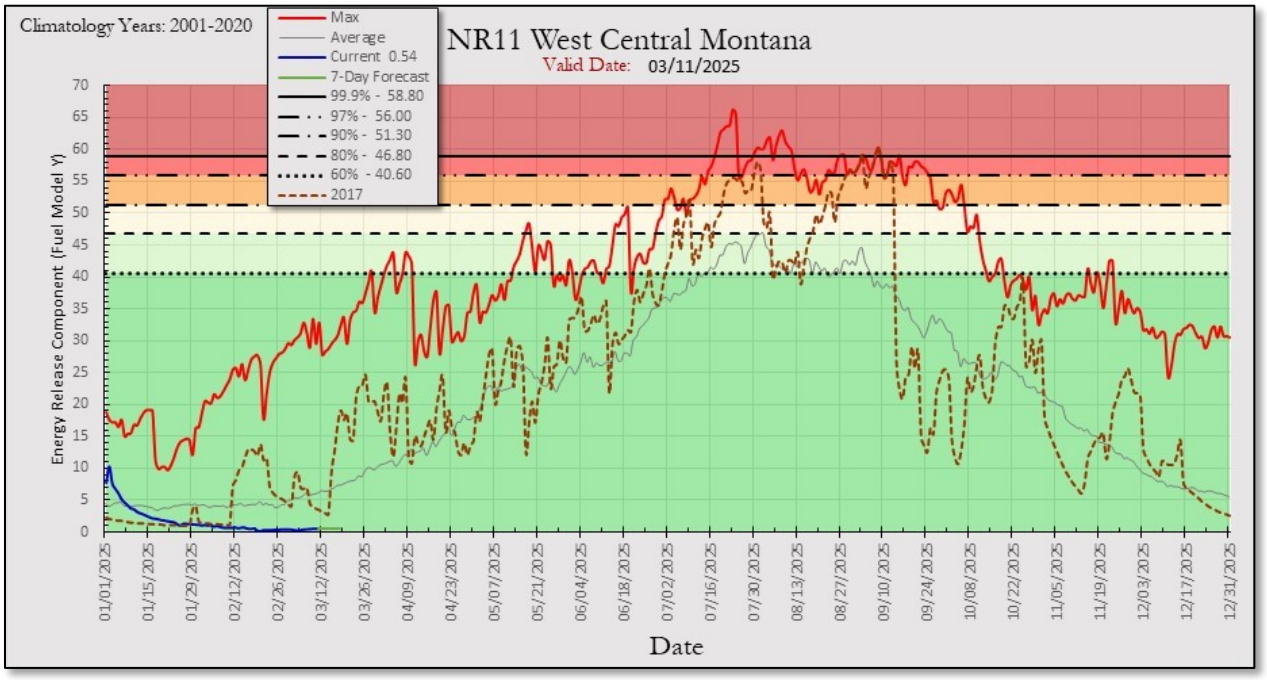


Figure 114. ERC Threshold Data Graph for West Central Montana.

Daily ERC Observations and forecasts can be obtained at https://www.wfas.net/images/firedanger/fdr_obs.txt and https://www.wfas.net/images/firedanger/fdr_fcst.txt, and calculations can be obtained through FireFamily+ software.

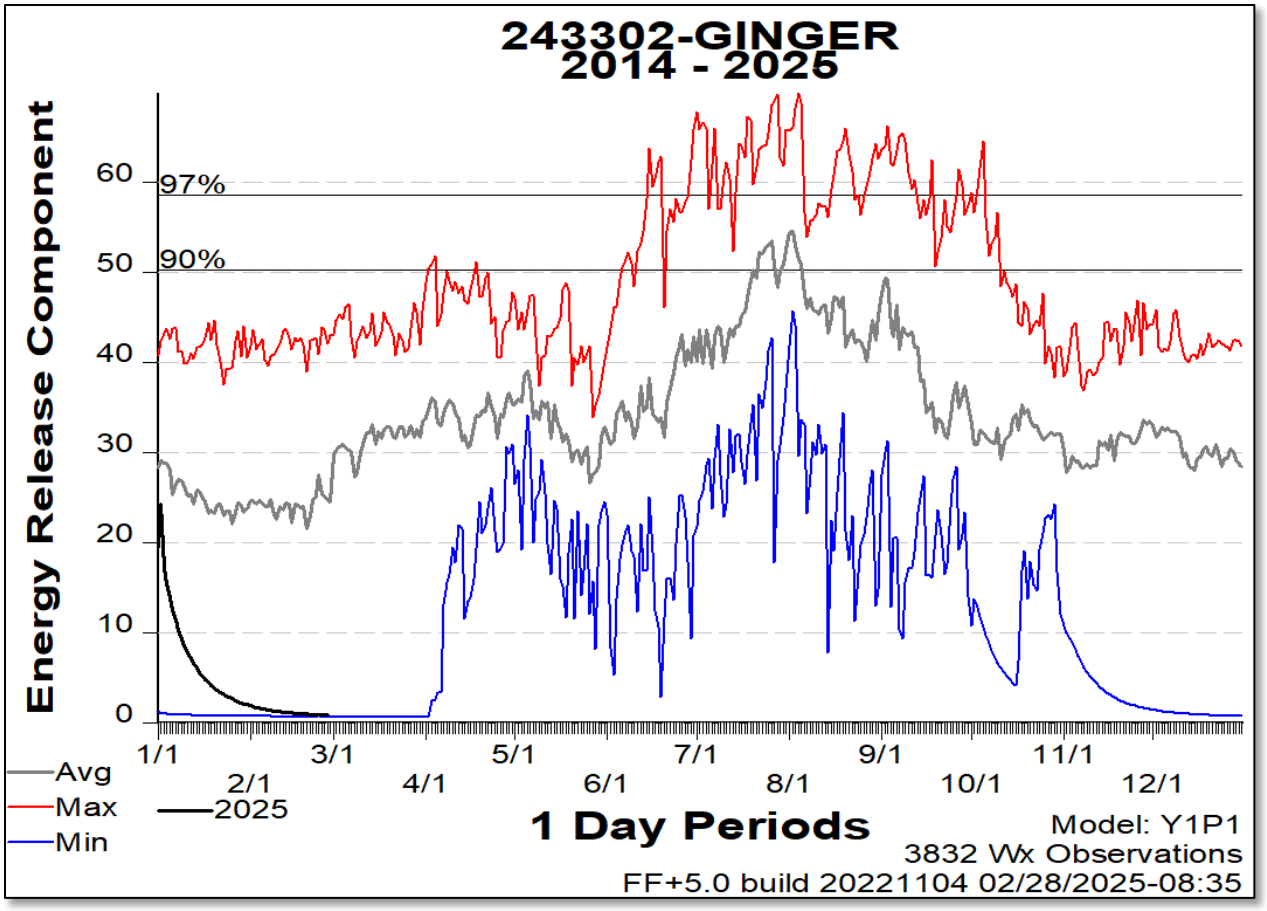


Figure 115. Daily ERC Observation Example

The ERC is used to assign adjective ratings for fire danger. Figure 115 offers a one-day example. These ratings provide a simplified, standardized way for fire managers, responders, and the public to understand current wildfire risk based on fuel conditions. Table 33 and

Table 34 offer adjective rating explanations.

Table 33. A List of Standard Fire Adjective Terminology and Corresponding ERC Ratings

Adjective Rating	Percentile	Energy Release Component
Low		**0-12**
Moderate		**13-25**
High		**26-50**
Very High	**90**	**51-56**
Extreme	**97**	**57+**

Table 34. ERC-Based Adjective Fire Danger Rating Interpretation

Adjective Rating	Percentile Range	ERC Range	Interpretation
Low	0–12%	Very low ERC	Fuels are moist; fire activity is unlikely.
Moderate	13–25%	Low ERC	Some drying has occurred; light fuels may burn, but fire spread is limited.
High	26–50%	Moderate ERC	Fuels are drying; wildfires can spread in receptive fuels.
Very High	51–56%	High ERC	Fire behavior intensifies; live and dead fuels are dry; aggressive spread likely.
Extreme	57% and above	Very high ERC	Fires start easily, spread rapidly, and are difficult to control.

ERC is a core part of the National Fire Danger Rating System (NFDRS) and is especially useful in long-term preparedness, burn restrictions, and staffing level determinations. By understanding how ERC maps to adjective ratings, planners and emergency managers in areas like FHTA, LHTA, and Helena can accomplish the following:

- Trigger alert systems or resource surges.
- Justify burn bans or public safety measures.
- Align modeling thresholds with historical fire years for scenario planning.

Burning Index

The Burning Index (BI) combines rate of spread and energy release to reflect the difficulty of fire control, correlating to potential flame length. Expressed as a numeric value, it indicates fireline intensity and suppression effort:

- BI < 30: Prescribed burning and low-intensity fire.
- BI 30–60: Challenging for direct attack; mechanical or indirect tactics often required.
- BI > 80: Extreme fire behavior; spotting, fire whirls, and crowning likely.

BI is an operational tool used for firefighting resource readiness, burn permit decisions, and daily planning.

Table 35 provides BI descriptions.

Table 35. Burn Index Descriptions

BI 1978	Potential Flame	Fireline Intensity (BTUS/SEC/FT)	Narrative Comments
0-30	0-3	0-55	Most prescribed burns are conducted in this range.
30-40	3-4	55-110	Generally, represent the limit of control for direct attack methods.
40-60	4-6	110-280	Machine methods usually necessary or indirect attack should be used.
60-80	6-8	280-520	The prospects for direct control by any means are poor above this intensity.
80-90	8-9	520-670	The heat load on people within 30 feet of the fire is dangerous.
90-110+	9+	670-1050+	Above this intensity, spotting, fire whirls, and crowning should be expected.

FireFamily+ Analysis

The FireFamily+ software was used to generate percentile-based thresholds for fire modeling in this assessment. This includes weather and fuel moisture inputs at the 90th percentile (High-Very High) and 97th percentile (Very High-Extreme) fire behavior conditions. Key modeled values include information displayed in the following graphs (Figure 116 to Figure 120):

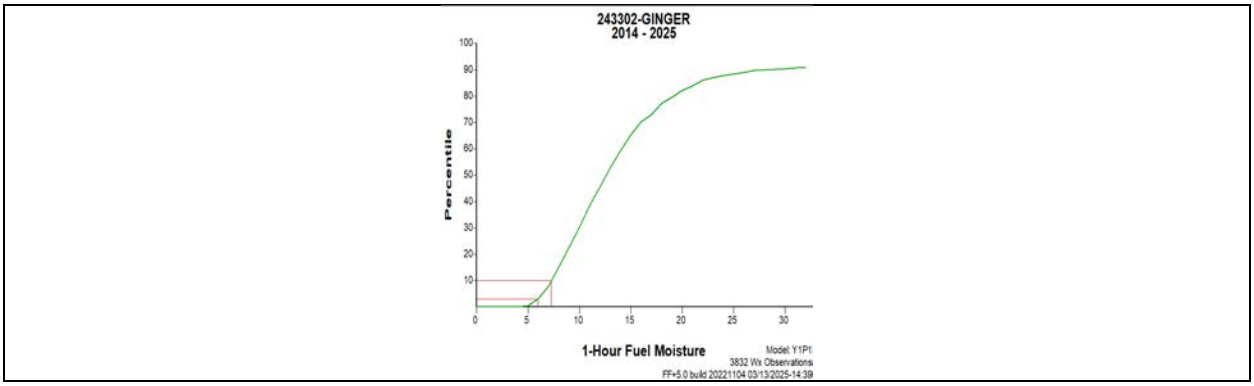


Figure 116. Graph of 1-Hour Fuel Moisture: 6–7%

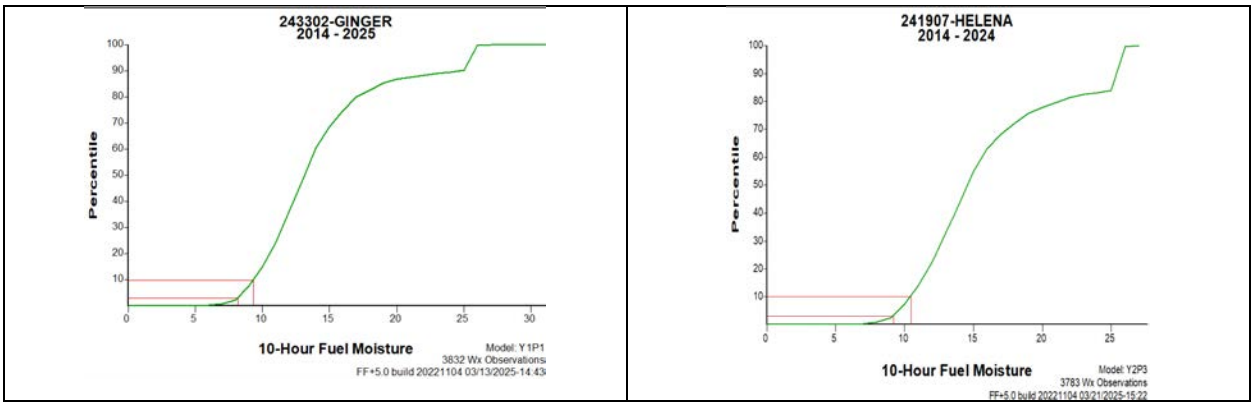


Figure 117. Graph of 10-Hour Fuel Moisture: 8–9%

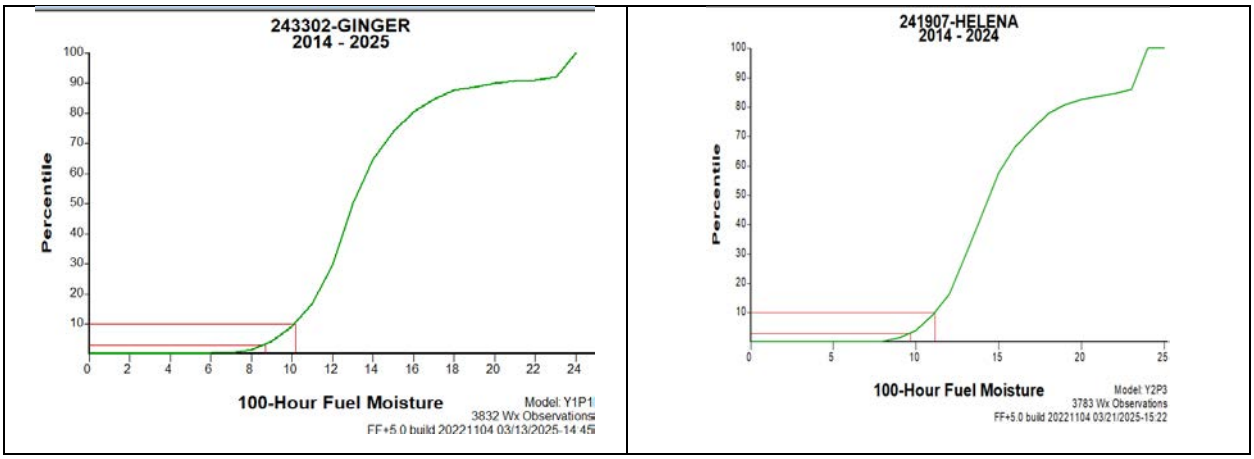


Figure 118. Graph of 100-Hour Fuel Moisture: 9–10%

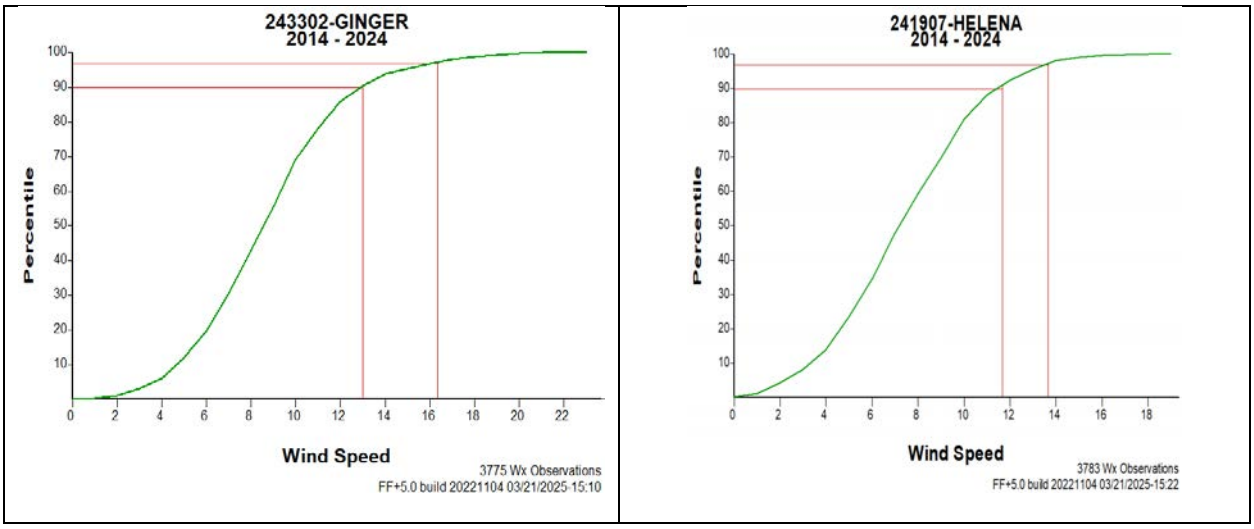


Figure 119. Graph of Wind Speed: 13–16 mph

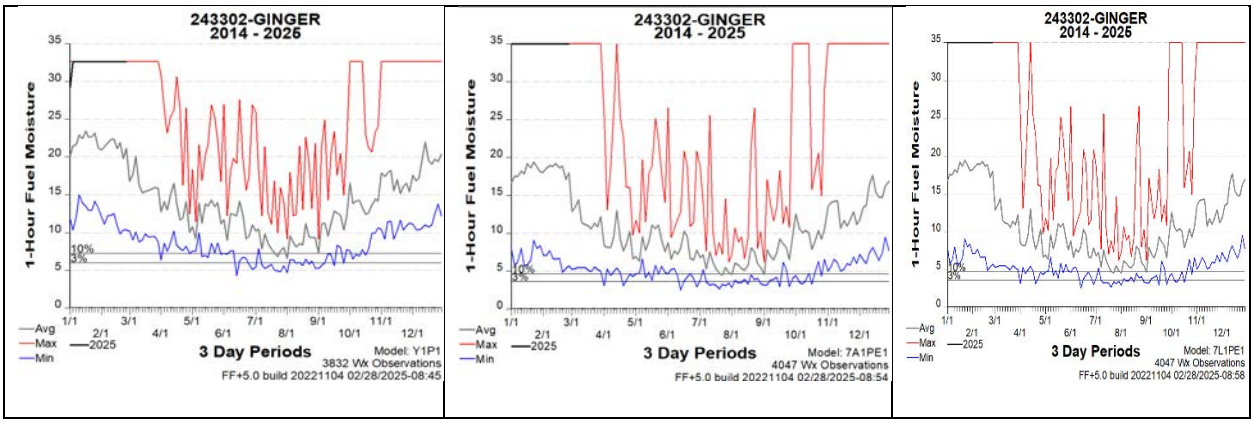


Figure 120. Three-Day Fuel Moisture Graphs

These percentile thresholds were applied in support of dynamic fire behavior modeling to represent both average high-risk conditions and extreme worst-case scenarios across the region.

Fire Growth Potential Indicators

A range of quantitative indicators have been developed to evaluate how likely wildfires start, spread, and intensify under specific conditions. These indicators incorporate weather, fuel moisture, vegetation health, and drought metrics to provide a comprehensive picture of wildfire potential across landscapes. In the FHTA, LHTA, and greater Helena region, tools including the ERC, BI, LFI, and satellite-derived vegetation indices offer critical insight into both daily fire danger and seasonal trends. These metrics inform operational decisions, support pre-positioning of suppression resources, and guide long-term mitigation planning. This section outlines the key indices and data sources used to monitor and forecast fire growth potential in the planning area.

- ERC and BI: The Energy Release Component (ERC) measures total heat potential in the flaming front, while the BIC reflects flame length and difficulty of control. Together, they are core operational indicators of fire behavior severity.
- National Fuel Moisture Database: Provides current dead fuel moisture levels across multiple fuel sizes (1-hr, 10-hr, 100-hr), helping responders gauge how receptive fuels are to ignition and spread.
- LFI/GSI: These metrics track vegetation greenness and health. Low LFI/GSI values indicate senescence or drought stress key triggers for increased wildfire flammability in live fuels.
- Advanced Very-High-Resolution Radiometer (AVHRR) Normalized Difference Vegetation Index (NDVI) Data Assimilation (DA) and Relative Greenness (RG): Using satellite-derived NDVI, this tool estimates vegetation condition and fuel curing. NDVI and RG are especially valuable for monitoring large rangeland and forest systems.
- National Aeronautics and Space Administration (NASA) Short-term Prediction Research and Transition Center (SPoRT) Green Vegetation Fraction (GVF): A real-time vegetation

index that quantifies the proportion of green vegetation cover. Used in fire behavior models to simulate fuel availability and potential intensity.

- NWS Quantitative Precipitation Estimates (QPE - 30 to 60 Days): Tracks accumulated rainfall, supporting assessments of fuel moisture recovery or drought persistence across key fire-prone landscapes.
- United States Drought Monitor (USDM): Integrates precipitation, soil moisture, and vegetation condition to map short-term and long-term drought severity a foundational tool for identifying prolonged periods of elevated fire risk.

These indicators and weather patterns are critical for situational awareness, wildfire forecasting, and strategic mitigation in wildfire-prone areas including FHTA, LHTA, and greater Lewis & Clark and Broadwater counties. Integrating these tools supports a data-driven approach to both proactive planning and real-time fire operations.

Fire Behavior Modeling

Fire behavior modeling is a critical element in assessing wildfire risk, enabling the prediction of how fires may ignite, spread, and impact values at risk under varying conditions. Fire scientists have developed Fire Behavior Fuel Models (FBFMs) to simulate these dynamics using detailed descriptions of fuel bed inputs, including vegetation type, structure, moisture content, and terrain features.

The foundation of this analysis draws on the work of Rothermel (1972, 1983), Anderson (1982), and the updated Scott and Burgan (2005) fuel models. These models expand the scope beyond the original 13 to account for more diverse fuel types and management scenarios, including post-treatment conditions, combined litter/grass/shrub beds, and a wider range of weather and humidity conditions.

Fuel Model Groups

Fuel model groups describe the dominant surface fuel types that influence fire spread. The following standardized categories were used in this assessment, based on LANDFIRE 2023 Remap data and further refined through expert consultation and local fuel disturbance updates through 2023:

- Grass: FM 101–104 (GR1–GR4).
- Grass-Shrub: FM 121–123 (GS1–GS3).
- Shrub: FM 141–147 (SH1–SH7).
- Timber Litter: FM 181–189 (TL1–TL9).
- Timber-Understory: FM 161–163, 165 (TU1–TU3, TU5).
- Slash/Blowdown: FM 202 (SB2).
- Non-Burnable (Other): FM 91–93, 99 (NB1–NB3, NB9).

- Non-Burnable (Water): FM 98 (NB8).

Custom Fuel Models for Developed and Agricultural Areas

To accurately simulate fire spread in areas initially classified as non-burnable, custom fuel models were introduced using LANDFIRE EVT and CropScape layers:

- Burnable Developed:
  - BU1 (251) – same parameters as TL9.
  - BU2 (252) – same parameters as TL3.
- Burnable Agriculture:
  - Identified using Fuels Vegetation Type (FVT) and CropScape data for row crops and wheat.

These custom models allow for realistic spread modeling in urban and agricultural areas that have exhibited fire behavior in recent wildfire events.

Fire Regime Classification

Fire regimes describe the long-term patterns of fire occurrence, severity, and frequency in an ecosystem, representing the Historical Range of Variability (HRV) before Euro-American settlement and widespread fire suppression. These regimes are determined by interactions between climate, ignition sources, and vegetation.

Understanding the fire regime helps guide restoration and fuels management strategies by comparing current conditions to desired future states. It also supports prioritization of treatments where fire exclusion has significantly altered natural cycles, increasing the risk of high-severity wildfires.

Annual Burn Probability

Annual Burn Probability (ABP) quantifies the likelihood that a wildfire larger than 250 acres will ignite and spread at a given location within one year. This metric is derived using wildfire simulation models calibrated with historical burn data across Montana, particularly within Lewis & Clark and Broadwater counties.

Burn probability values across the FHTA and LHTA reflect a combination of topographic variability, grass and shrub-dominated fuel beds, and regionally increasing fire weather intensity. These probabilities help guide preparedness and mitigation investments for both civilian and military operations (Table 36).

Local Fire Behavior Considerations

- **Topography:** Steep slopes and dissected drainages in the Big Belt Mountains and Missouri River corridors influence fire movement and intensity.

- **Fuels:** Fine fuels including grass, sagebrush, and scattered timber dominate the landscape, especially in the Inter-Mountain Basins Big Sagebrush Steppe (EVT 2125) and Montane Douglas-fir Forest (EVT 1911660).
- **Weather:** Local wind events, high summer temperatures, and prolonged drought conditions contribute to rapid ignition and spread potential, particularly in June through September.

Table 36. Burn Probability Categories in the Wildfire Risk Assessment Area

Burn Probability Range	Annual Chance of Fire >250 acres	Context for Lewis & Clark/Broadwater Counties
Nonburnable	None (e.g., urban core, water bodies)	Helena City Center, Missouri River.
>0–0.0001	<1 in 10,000	Lower elevations with sparse fuels.
>0.0001–0.0002	1 in 5,000 to 1 in 10,000	Some foothill and prairie areas.
>0.0002–0.0004	1 in 2,500 to 1 in 5,000	Lower WUI perimeters near FHTA.
>0.0004–0.001	1 in 1,000 to 1 in 2,500	LHTA boundary and access corridors.
>0.001–0.002	1 in 500 to 1 in 1,000	WUI communities: Montana City, East Helena.
>0.002–0.01	1 in 100 to 1 in 500	Forest-fringe WUI areas near York, Clancy.
>0.01–0.02	1 in 50 to 1 in 100	Areas of training activity in LHTA.
>0.02–0.04	1 in 25 to 1 in 50	Ridge tops and steep slopes with wind exposure.
>0.04–0.1	1 in 10 to 1 in 25	Highest-risk areas in WUI/timber mix interface near FHTA training grounds.

Key Vegetation Types Influencing Fire Behavior

Existing Vegetation Type

The Existing Vegetation Type (EVT) dataset classifies terrestrial ecological systems by dominant plant associations, based on data through 2018. This classification helps evaluate fire behavior, fuel loads, and vegetation response to fire.

Inter-Mountain Basins Big Sagebrush Steppe

- Dominant Cover: Sagebrush with perennial grasses and forbs.
- Prevalence: Found in both FHTA and LHTA lower elevations.
- Fire Characteristics:
  - Highly flammable in late summer.
  - Fire return intervals vary based on management: 10–70 years.
  - Frequent fire eliminates shrubs and promotes invasive grasses like *Bromus tectorum*.

Middle Rocky Mountain Montane Douglas-Fir Forest

- Dominant Cover: Douglas-fir (*Pseudotsuga menziesii*) with mixed understory.
- Prevalence: Found on cooler, moister slopes in higher elevations near Helena.
- Fire Characteristics:
  - Mixed-severity fire regime.
  - Fire return interval typically 20–50 years.
  - Fire suppression has led to denser stands and higher risk of crown fire behavior.

Fire Behavior Influence Summary

Three core components shape wildfire behavior in the landscape, as shown in:

- **Fuel Availability:** Composition, structure, and continuity of live and dead vegetation.
- **Weather Conditions:** Wind speed, temperature, humidity, and drought severity directly influence ignition and fire spread.
- **Terrain Topography:** Slope, aspect, and elevation accelerate or slow fire progression.

Flame Length and Fire Intensity Mapping

Flame length represents the average height of flames expected under normal weather conditions, based on local fuel types, topography, and weather patterns. It is one of the most important visual indicators of wildfire intensity and is used to assess firefighter safety, suppression difficulty, and potential damage to resources, structures, and infrastructure. Mapped flame lengths provide an estimate of baseline fire behavior, but actual flame lengths may exceed these values, particularly under severe conditions including high winds, drought, or extreme heat. This information is essential for guiding mitigation efforts that aim to reduce the intensity and spread of wildfires in high-risk areas.

Table 37. Flame Length Categories and Interpretation

Flame Length Range	Fire Intensity	Expected Behavior
Nonburnable	No fire spread	Dominated by non-burnable fuels (e.g., water, urban, rock, agriculture).
0–4 feet	Low intensity	Fires generally remain on the surface; control is possible with hand tools.
4–8 feet	Moderate intensity	Too intense for direct control at the flame front; embers may travel moderate distances.
8–12 feet	High intensity	Active torching, likely; spotting and ember cast increase; suppression is very difficult.
>12 feet	Extreme intensity	Crown fire behavior and long-range spotting; major fire movement and control challenges.

Considerations for Planning and Safety

- **Mitigation Planning:** Flame length maps help identify priority areas for fuel reduction, defensible space, and community protection areas. Reducing flame lengths can lower wildfire severity and improve firefighter access.
- **Suppression Safety:** Firefighter safety guidelines use flame length as a key determinant for whether direct attack is possible.
- **Local Variability**: Flame lengths can vary significantly based on slope, fuel moisture, wind speed, and fuel type, even within small geographic areas.

Appendix D: Endangered Species

Ecological or Culturally Significant Areas

Ecologically and culturally significant areas within and surrounding military training installations play a crucial role in shaping land management, access policies, and emergency response strategies. These areas may include habitats for sensitive species, historically significant sites, tribal lands, or locations with ongoing conservation or cultural stewardship. Both FHTA and LHTA assessment areas require tailored planning approaches that integrate ecological protection and cultural site preservation with mission readiness.

The FHTA assessment area contains several areas of ecological and cultural significance that must be factored into wildfire mitigation and planning efforts. The installation borders the Scratchgravel Hills, which supports diverse native vegetation, wildlife corridors, and serves as a popular recreation area for the local community. Streams including Cherry Creek and Granite Creek run through or adjacent to the site, providing riparian habitat that supports ecological health but also poses wildfire spread risks during dry conditions. Additionally, FHTA sits within a landscape historically significant to Native American tribes, and archaeological or heritage sites may be present, requiring cultural sensitivity in land management and suppression activities. Any fuel treatments or infrastructure development must account for the preservation of these sensitive features while enhancing operational resilience.

FHTA supports a diverse range of wildlife due to its varied topography, vegetation types, and proximity to undeveloped public lands. The area provides important habitat, seasonal movement corridors, and over-wintering areas for numerous species of ungulates and carnivores. FHTA provides nesting habitat for both resident and migratory avian species. FHTA is not considered preferred habitat for Grizzly Bear or Canada Lynx. These species may use the mountains west of the installation as movement corridors between the Northern Continental Divide and Greater Yellowstone Ecosystems.

Vegetation communities in the FHTA are integral to ecological function and fire behavior dynamics. These communities range from native grasslands and shrublands to riparian and forested areas, each contributing unique fuel characteristics and habitat values. Some vegetation areas within FHTA may also harbor rare or sensitive plant species, meriting additional protection during planning and mitigation efforts. Table 38 outlines the major vegetation types and protected plant features within the training area.

Table 38. Vegetation Found in FHTA.

Vegetation Type	Description
Native Grasslands	Bluebunch wheatgrass, fescue, and Idaho fescue dominate open and training areas.
Riparian Areas	Lined with willows, aspen, narrow-leaf cottonwood and sedges along Cherry Creek and minor tributaries.
Foothill Shrublands	Sagebrush and bitterbrush; provide critical wildlife forage.

Vegetation Type	Description
Forested Slopes	Ponderosa pine, Limber pine, Douglas-fir, and Rocky Mountain Juniper offer canopy cover and wildlife shelter. .
Rare/Watch Plant Species	Possible presence of species tracked by Montana Natural Heritage Program (MTNHP).

The LHTA assessment area encompasses a landscape of notable ecological and cultural importance, offering unique values that extend beyond its military training function. Ecologically, the region supports sagebrush steppe ecosystems and pockets of native grasslands, which provide habitat for a range of species including raptors, big game species, and specialized pollinators. These ecological communities are increasingly rare across the Intermountain West, making their preservation within LHTA vital to regional biodiversity.

Culturally, the area holds historical significance related to Indigenous land use and settlement patterns, with potential archaeological sites that may include artifact scatters, traditional gathering areas, or culturally modified features. While some of these areas remain undocumented or unverified, any disturbance, particularly from wildfire or fuels management operations, necessitates strict compliance with cultural resource protection protocols under Section 106 of the National Historic Preservation Act.

LHTA lies within a rugged and ecologically diverse landscape that supports a variety of wildlife species adapted to dry shrub-steppe, open pine woodlands, and rocky terrain. Its remote location and limited human development make it a refuge for both large mammals and bird species. The area provides important habitat, seasonal movement corridors, and over-wintering areas for numerous ungulate and carnivore species. LHTA provides nesting habitat for both resident and migratory avian species. LHTA is not considered preferred habitat for Grizzly Bear or Canada Lynx. They may use the mountains west of the installation as movement corridors between the Northern Continental Divide and Greater Yellowstone Ecosystems. Wildlife management in LHTA is particularly important due to the presence of nesting raptors, mule deer and elk over-wintering areas, and habitat used by species of concern.

Vegetation in the LHTA is characterized by fire-adapted communities including big sagebrush steppe and mixed-grass prairie, with scattered Douglas-fir, Mountain Mahagony, and juniper stands at higher elevations. These vegetation types not only define fire behavior potential but also support diverse plant and animal communities. Several areas within LHTA include sensitive ecological features or rare plant species that require careful consideration during fire mitigation efforts. Maintaining the integrity of these vegetation areas is essential for ecosystem resilience and biodiversity preservation.

Table 39 below summarizes the primary vegetation communities and protected plant features found in LHTA.

Table 39. Vegetation Found in LHTA

Plant Community/Type	Status/Sensitivity	Management or Protection Notes
Native Sagebrush Steppe	Declining in many areas.	Prioritize invasive species control and fire regime management.
Riparian Areas (Deep Creek, Crow Creek)	High ecological value.	It protects from erosion, sedimentation, and adjacent fire spread.
Perennial Grasses	Moderate resilience.	Important for erosion control; reestablish after fire or training impact.
Noxious/Invasive Weeds	Present in disturbed areas.	Active treatment required per DNRC guidelines.

Critical Habitat

The following provides an overview of critical habitat considerations for the Canada lynx (*Lynx canadensis*), a federally listed threatened species whose survival is closely linked to post-disturbance forest conditions.

The Canada lynx (*Lynx canadensis*), listed as a threatened species, depends on expansive tracts of land featuring a mix of forest successional stages to meet its habitat needs. These landscapes must support healthy populations of snowshoe hares, the lynx's primary prey. Optimal habitat typically consists of areas that have burned roughly 30 years prior, interspersed with mature, unburned forest patches that support both foraging and denning. To replicate natural fire patterns and sustain habitat quality, periodic small-scale habitat disturbances, including selective timber harvests or controlled burns, can play a critical role in maintaining a suitable environment for the species' survival.

The critical habitat for the Canada lynx (Figure 121) lies west of the FHTA installation boundary, placing the facility adjacent to designated conservation lands. The installation itself is not within critical habitat, but its proximity to the mapped area raises important considerations for land and fire management activities. Wildfire mitigation efforts, fuel treatments, and any future development or expansion near the western edge should be assessed for potential impacts on lynx habitat. Coordinated planning with federal and state wildlife agencies is advised to avoid habitat fragmentation or disruption of natural ecological processes.

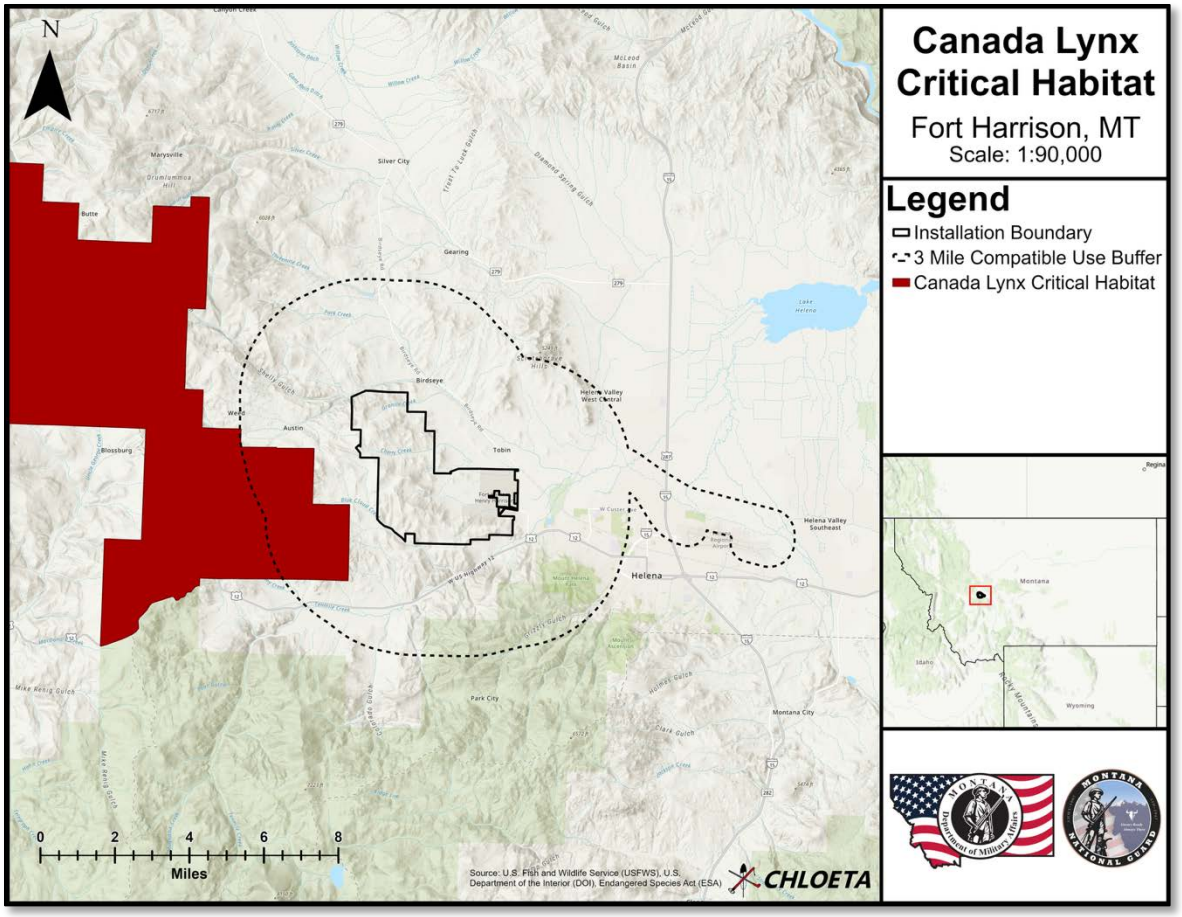


Figure 121. Map of Canada Lynx Habitat Near FHTA

Table 40. Threatened Species

Group	Name	Status/Type
Mammals	Canada Lynx (*Lynx canadensis*)	Threatened
Mammals	Grizzly Bear (*Ursus arctos horribilis*)	Threatened
Mammals	North American Wolverine (*Gulo gulo luscus*)	Threatened
Birds	Rufa Red Knot (*Calidris canutus rufa*)	Threatened
Birds	Yellow-billed Cuckoo (*Coccyzus americanus*)	Threatened
Fishes	Bull Trout (*Salvelinus confluentus*)	Threatened
Fishes	Pallid Sturgeon (*Scaphirhynchus albus*)	Endangered
Insects	Monarch Butterfly (*Danaus plexippus*)	Proposed Threatened
Insects	Suckley's Cuckoo Bumble Bee (*Bombus suckleyi*)	Proposed Endangered
Flowering Plants	Ute Ladies'-tresses (*Spiranthes diluvialis*)	Threatened

Group	Name	Status/Type
Conifers and Cycads	Whitebark Pine (*Pinus albicaulis*)	Threatened
Critical Habitat	Bull Trout (*Salvelinus confluentus*)	Final
Critical Habitat	Canada Lynx (*Lynx canadensis*)	Final

Acronyms

AAF – Army Airfield

ABP – Annual Burn Probability

ACEP – Agricultural Conservation Easement Program

AQI – Air Quality Index

AVHRR – Advanced Very-High-Resolution Radiometer

BCA – Benefit Cost Analysis

BI – Burning Index

BNSF – Burlington Northern Santa Fe (Railway)

BRIC – Building Resilient Infrastructure and Communities (Grant)

CBH – Canopy Base Height

CFMO – Construction and Facilities Management Office

CUB – Compatible Use Buffer

CWDG – Community Wildfire Defense Grant

CWiRRZ – Community Wildfire Risk Reduction Zones

CWPP – Community Wildfire Protection Plan

DA – Data Assimilation

DCIP – Defense Community Infrastructure Pilot

DEM – Digital Elevation Model

DES – Disaster and Emergency Services

DEQ – Department of Environmental Quality

DHS – Department of Homeland Security

DMA – Department of Military Affairs (Montana)

DNRC – Department of Natural Resources and Conservation (Montana)

DoW – Department of War

DoDI – Department of Defense Issuance

ECT – Evacuation Clearance Time

EMS – Emergency Medical Service

EOC – Emergency Operations Center

EOP – Emergency Operations Plan

EQIP – Environmental Quality Incentives Program

ERC – Energy Release Component

EVT – Existing Vegetation Type

EWP – Emergency Watershed Protection

FBFM – Fire Behavior Fuel Model

FD – Fire Department

FEMA – Federal Emergency Management Agency

FHSZ – Fire Hazard Severity Zone

FHTA – Fort Harrison Training Area

FlamMap – Fire Behavior and Growth Simulation Tool

FSA – Fire Service Area

FVT – Fuels Vegetation Type

FY – Fiscal Year

GIS – Geographic Information System

GS – Grass-Shrub

GSI – Growing Season Index

GVF – Green Vegetation Fraction

HMGP – Hazard Mitigation Grant Program

HMP – Hazard Mitigation Plan

HRV – Historical Range of Variability

IC – Incident Command

ICS – Incident Command System

IDP – Installation Development Plans

IIJA – Infrastructure Investment and Jobs Act

INRMP – Integrated Natural Resources Management Plan

IWFMP – Integrated Wildland Fire Management Plan

JLUS – Joint Land Use Study

JMCWCP – Joint Military-Civilian Wildfire Coordination Protocols

kV – Kilovolt

LATs – Large Air Tankers

LF – LANDFIRE

LFI – Live Fuel Index

LHTA – Limestone Hills Training Area

MWCOZ – Military Wildland Urban Interface Compatible Operations Zone

MDT – Montana Department of Transportation

MHMP – Multi-Hazard Mitigation Plan

MOU – Memorandum of Understanding

mph – Miles Per Hour

MT – Montana

MTARNG – Montana Army National Guard

MTNHP – Montana Natural Heritage Program

MT DES – Montana Disaster and Emergency Services

NASA – National Aeronautics and Space Administration

NDVI – Normalized Difference Vegetation Index

NOAA – National Oceanic and Atmospheric Administration

NPS – National Park Service

NRCS – Natural Resources Conservation Service

NWS – National Weather Service

OLDCC – Office of Local Defense Community Cooperation

OWG – Old Woman's Grave Road

O&M – Operations and Maintenance

Photoperiod – Daylength

PM – Particulate Matter

PPLT – Prickly Pear Land Trust

PRISM – Parameter-elevation Regressions on Independent Slopes Model

PSPS – Public Safety Power Shutoff

RAPT – Resilience Analysis and Planning Tool

QPE – Quantitative Precipitation Estimates

RAPT – Regional Assessment and Planning Tool

RAWS – Remote Automated Weather Station

REPI – Readiness and Environmental Protection Integration (Program)

RFD – Rural Fire District

RG – Relative Greenness

ROS – Rate of Spread

RPMP – Resource Preservation and Management Plan

RV – Recreational Vehicle

SEAT – Single Engine Air Tanker

SH – Shrub

SPoRT – Short-term Prediction Research and Transition Center

TCP – Traffic Control Point

THPO – Tribal Historic Preservation Officer

TL – Timber Litter

TRA – Temporary Refuge Area

TU – Timber-Understory

UC – Unified Command

US – United States

US BLM – United States Bureau of Land Management

USBOR – United States Bureau of Reclamation

USDA – United States Department of Agriculture

USDM – United States Drought Monitor

US EPA – United States Environmental Protection Agency

USFS – United States Forest Service

USFWS – U.S. Fish and Wildlife Service

USGS – United States Geological Survey

UXO – Unexploded Ordinance

VA – Veterans Affairs

VAFD – Veterans Affairs Fire Department

VFP – Volunteer Fire Department

VPD – Vapor Pressure Deficit

WUI – Wildland-Urban Interface

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