Forest Stewards Guild

2021

Genesee Fire Protection District

Jefferson County, Colorado

Community Wildfire Protection Plan

Executive Summary

EXECUTIVE SUMMARY

GENESEE FIRE PROTECTION DISTRICT COMMUNITY WILDFIRE PROTECTION PLAN 2021 UPDATE

Prepared for Genesee Fire Rescue

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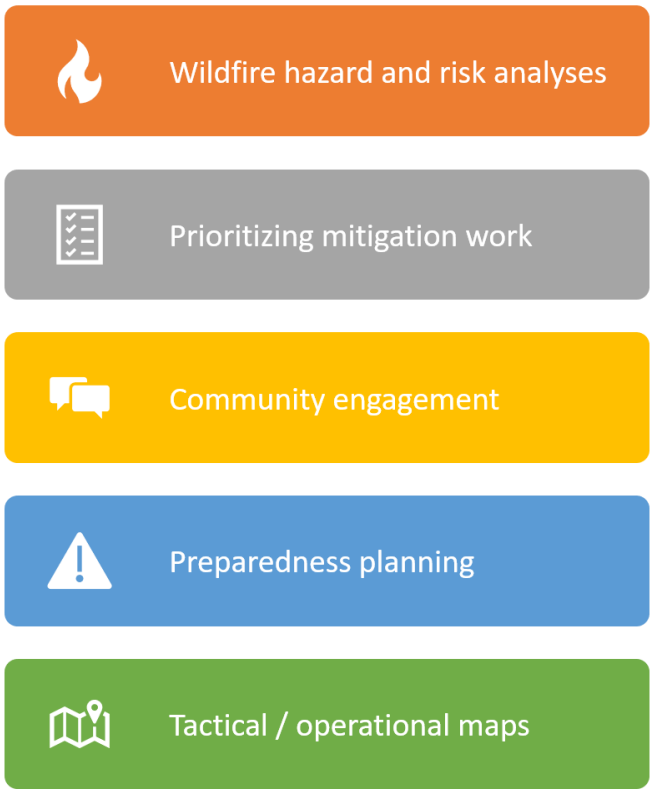
The 2021 Genesee Fire Protection District Community Wildfire Protection Plan (CWPP) provides an assessment of local wildfire hazards and identifies strategic investments to mitigate risk and promote preparedness.

The 2021 Genesee Fire Protection District (GFPD) Community Wildfire Protection Plan (CWPP) document is a tool and a **call-to-action** for Genesee Fire Rescue (GFR), land managers, residents, and homeowner's associations (HOAs) to begin implementing projects that make GFPD a safer community and more resilient to wildfire. The 2021 CWPP includes scientific-based modeling of wildfire behavior, which is used to predict exposure of homes to radiant heat and embers and roadway survivability. The 2021 CWPP includes results from evacuation capacity modeling to predict evacuation pinch points and assess the potential impact of additional egress routes. The 2021 CWPP also provides suggestions for mitigating home ignition zones, improving evacuation planning and capacity, and helping protect the GFPD with strategic fuel treatments.

Community engagement is a vital aspect of CWPP development and implementation. GFR and the Forest Stewards Guild engaged residents through an introductory CWPP video, a survey for HOA community managers, HOA board presidents, business property managers, and other community leaders, and a survey of GFPD residents to gauge their knowledge of wildfire risk and assess their concerns. The results of the survey informed the development of recommendations and priorities for the 2021 CWPP (see Appendix A of the 2021 CWPP for survey results).

We divided the GFPD into 16 planning units as part of the 2021 CWPP to assess relative risk across the community. The hope is that residents in the same CWPP planning unit will discuss joint risk and organize efforts in their neighborhoods to mitigate hazards and enhance emergency preparedness.



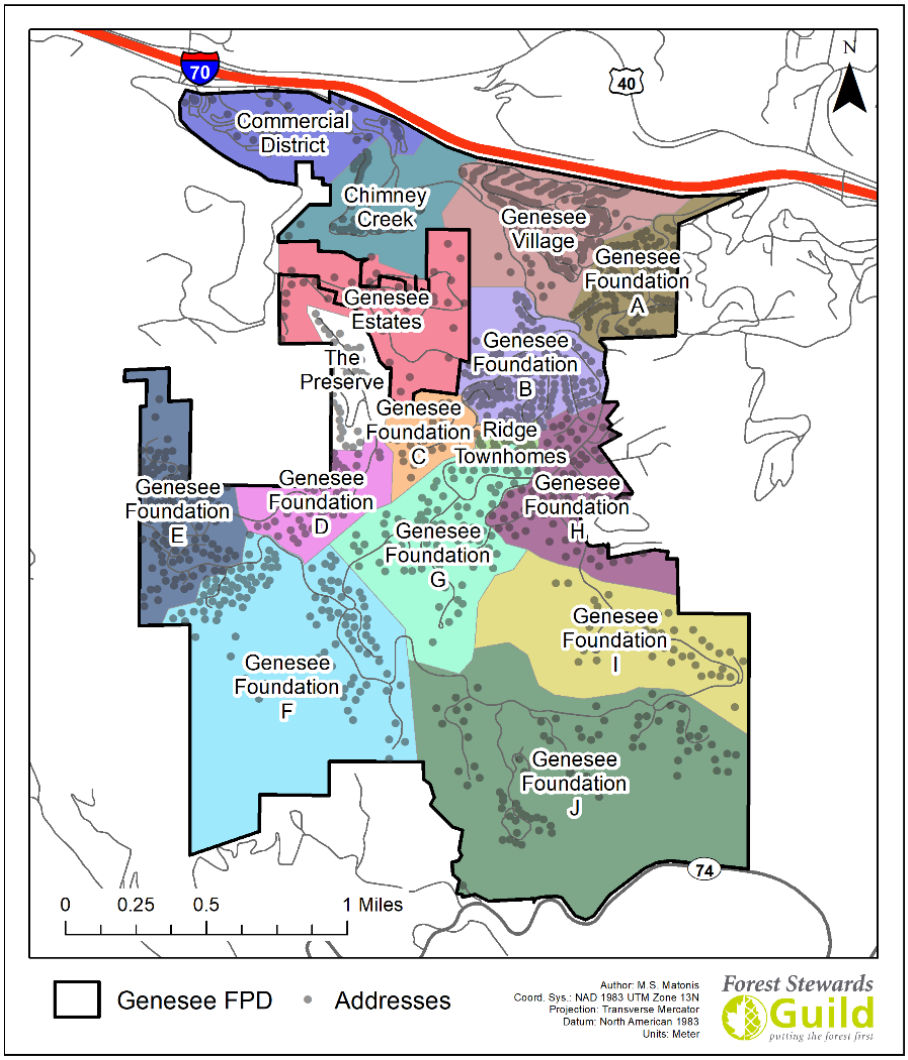
Elements of a holistic and actionable CWPP.

The CWPP is a useful planning document, but it will only affect real change if residents, HOAs, and the entire community come together to address shared risk and implement strategic projects on the ground.

This summary document provides an overview of key findings from the 2021 CWPP and references locations in the full CWPP where you can find additional information. We hope this summary and the CWPP provide you with insights and inspiration to address the wildfire risk shared across the GFPD. **Collective action is crucial to reduce the potential for catastrophic wildfires and protect lives and property.**

Key Messages from the 2021 CWPP

1. High risk of extreme fire behavior exists across the GFPD due to topography, winds, and fuel conditions.
2. There is high potential for structure loss across the GFPD and dangerous conditions for firefighters defending structures during wildfires. It is essential that residents mitigate their property to reduce the chances that their homes will be lost.
3. Genesee Fire Rescue, residents, and HOAs can mitigate risks to homes and firefighters by treating home ignition zones. The impact of these efforts can be amplified by collective action across the GFPD.
4. The GFPD has limited egress routes and a potential for extreme congestion, slow evacuation times, and dangerous conditions along many roadways.
5. Pre-planning, awareness, and strategic action is needed to mitigate evacuation concerns across the GFPD.
6. Ecological restoration and fuel treatments across the GFPD and the broader landscape can help create fire-resilient forests, reduce the likelihood of high-severity wildfires, and address roadway survivability concerns.



We assessed relative risk among 16 CWPP planning units and made strategic recommendations to address wildfire risk across the Genesee Fire Protection District. Portions of the Genesee Estates planning unit are in the Evergreen Fire Protection District, but we included them in the Genesee Fire Protection District CWPP because Genesee Fire Rescue is the nearest emergency responder to residents in that area.

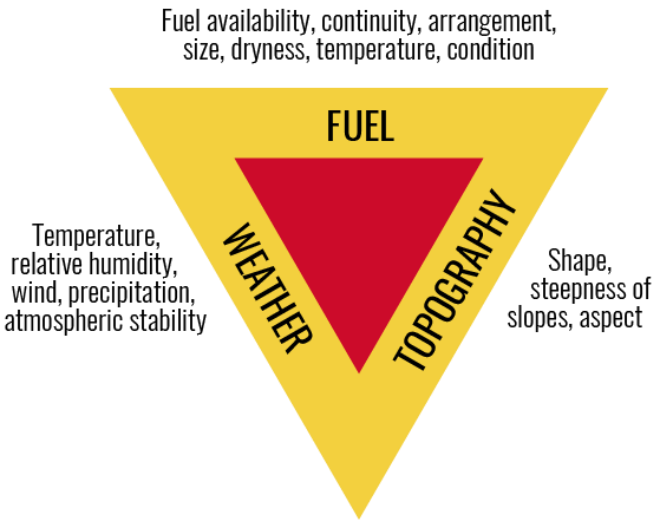
High risk of extreme fire behavior exists across the GFPD due to topography, winds, and fuel conditions.

Fire behavior triangle

Complex interactions among wildland fuels, weather, and topography determine how wildfires behave and spread. Fires burn more quickly up steep slopes due to radiant and convective heating, so topographic features, such as draws and ravines across the GFPD and the canyon along Highway-74, can exacerbate fire behavior. Winds along the Front Range of Colorado can be gusty and unpredictable, resulting in rapid spread of wildfires and long-distance transport of embers.

Human activities cannot realistically alter weather and topography, but we can alter fuel conditions and thereby influence fire behavior. Fuels include live vegetation such as trees, shrubs, and grasses, dead vegetation like pine needles and cured grass, and materials like houses, sheds, fences, trash piles, and combustible chemicals.

Fuel loads are variable across the GFPD. Some areas have widely spaced trees with few ladder fuels (shrubs, saplings, and low branches that can carry surface fire into tree crowns); these areas would most likely experience surface fires with occasional passive crown fires. Other areas are densely forested on steep north-facing slopes and could experience active crown fires that would be difficult if not impossible for firefighters to contain. Grassy areas are interspersed across the GFPD and could experience fast-moving surface fires. Homes serve as an additional source of fuel that could produce high-intensity flames, emit embers, and initiate home-to-home ignitions.



Interactions between fuels, weather, and topography dictate fire behavior (source: California State University).

Categories of Wildfire Behavior

- **Surface fire –** Fire that burns fuels on the ground, which include dead branches, leaves, and low vegetation. Surface fires can emit significant radiant heat, which can ignite nearby vegetation and homes. Mowing grass and removing shrubs can reduce the intensity of surface fires, and creating non-burnable barriers within 5 feet of your home can prevent direct contact with flames.
- **Passive crown fire –** Fire that arises when surface fires ignite the crowns of trees or groups of trees (aka, torching). Torching trees reinforce the rate or spread, but these fires travel along with surface fires. Radiant heat and ember production from passive crown fires can threaten homes during wildfires. Removing shrubs and low branches that hang below 10 feet decreases the risk of torching because these ladder fuels can help surface fire transition into tree crowns.
- **Active crown fire –** Fire in which a solid flame develops in the crowns of trees and advances from tree crown to tree crown independent of surface fires. Crown fires are very difficult to contain, even with the use of aircraft dropping fire retardant, due to tremendous flame lengths and energy release. Radiant heat and ember production from active crown fires can threaten homes during wildfires. Removing shrubs and low branches that hang below 10 feet decreases the risk of torching, and spacing the canopy of overstory trees by at least 15 feet decreases the risk of tree-to-tree fire spread.

Fuel loads are variable across the GFPD, ranging from dense forests with abundant ladder fuels (top), to open forests with widely spaced trees and few ladder fuels (middle), to grasslands with scattered trees (bottom). Fuel type and fuel loads greatly influence fire behavior, fire intensity, and rate of spread. Fire rate of spread is faster through grassy fuels, but flame lengths and the amount of energy released from active and passive crown fires are greater. Torching and active crown fires are more likely in forests with abundant ladder fuels. Photographs from Meg S. Matonis, Forest Stewards Guild.

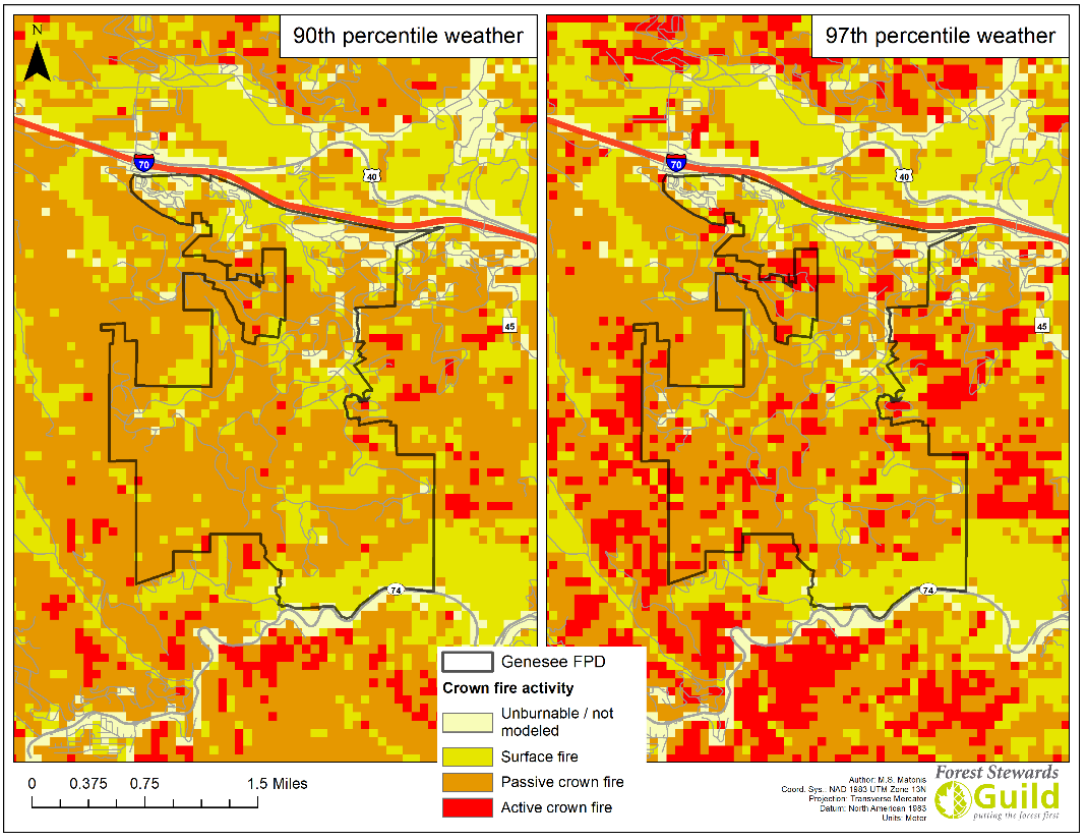
Fire behavior predictions for the GFPD

The GFPD is at high risk for large, high-severity wildfires due to dense forest conditions, steep draws and ravines, and the potential for dry and hot weather with strong, gusty winds. Increasing drought and warming temperatures due to climate change will continue to exacerbate wildfire risk in the area. **Genesee Fire Rescue and residents in the GPFD must prepare for large wildfire events. Proactive work is imperative.**

We used the fire behavior model FlamMap to make predictions of potential flame length, crown fire activity, and conditional burn probability. Fire behavior models like FlamMap have been rigorously developed and tested based on over 40 years of experimental and observational research. FlamMap is one of the most common models used by land managers to assist with fuel treatment prioritization, and it is often used by fire behavior analysts during wildfire incidents.

We modeled fire behavior under 60th, 90th, and 97th percentile fire weather conditions—conditions that occurred in the GFPD about 40%, 10%, and 3% of days between June 15th and October 15th from 2009 to 2019. Conditions used for 97th percentile fire weather scenarios would constitute a red-flag warning day because of extremely dry fuels and high wind speeds; conditions used for 90th percentile fire weather scenarios would constitute a red-flag warning day only if widespread thunderstorms were predicted for the area. Conditions used for 60th percentile weather scenarios have higher fuel moistures and lower wind speeds.

Under 90th percentile fire weather conditions, 5% of the GFPD is predicted to experience active crown fire and 60% to experience passive crown fire. The portion of the GFPD that could experience active crown fire increases to 20% under 97th percentile fire weather conditions. There is substantial potential for active crown fire (1) around Genesee Estates and Chimney Creek HOAs, (2) in the southwestern portion of the GFPD, and (3) south of Highway-74. See Section 3b (Fire Behavior Analysis) in the 2021 CWPP for additional information on potential fire behavior across the GFPD.



Crown fire activity under 90th and 97th percentile fire weather conditions in the GFPD. Parking lots, roadways, bodies of water, and barren areas are considered unburnable; areas dominated by homes and buildings were classified as "not modeled" because fire behavior models do not include structures as a fuel type.

There is high potential for structure loss across the GFPD and dangerous conditions for firefighters defending structures during wildfires.

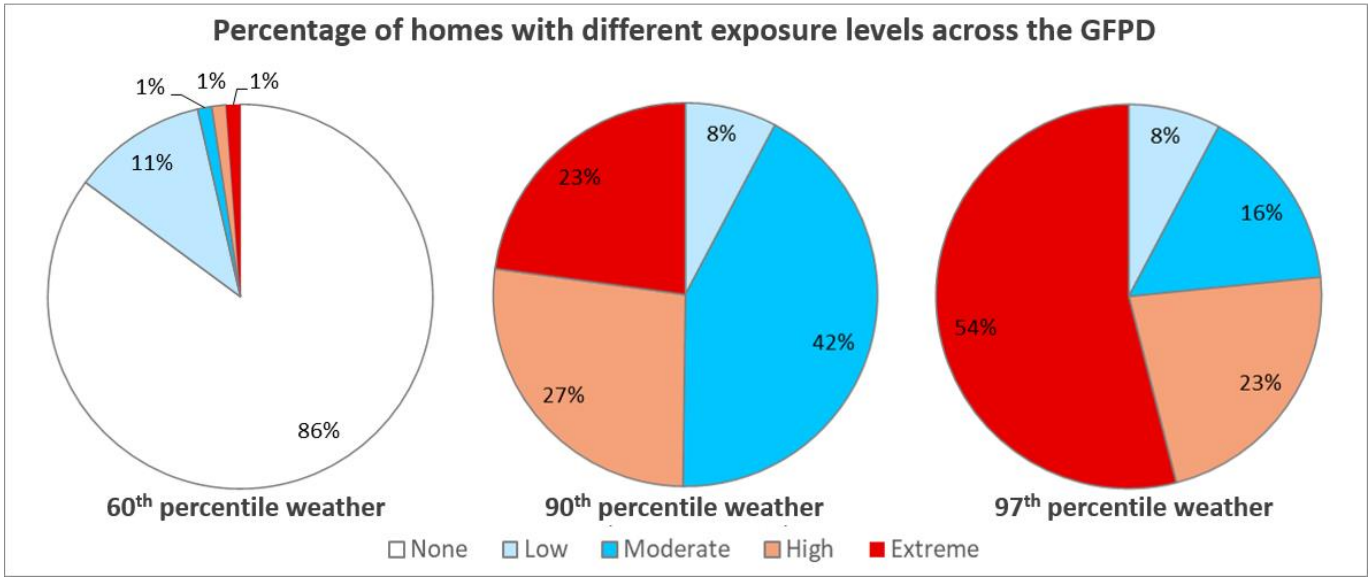
Exposure to radiant heat and short- and long-range spotting

Potential exposure to radiant heating and short- and long-range spotting are widespread across the GFPD. **Spotting** occurs when a fire produces embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire. Spotting is classified as short-range or long-range depending on the distance traveled by the embers. Residents and business owners to need to create defensible space and complete home hardening activities to reduce the risk that exposure to radiant heat and/or embers will result in ignition of their structures. **During many wildland fires, 50 to 90% of homes ignite due to embers rather than radiant heat or direct flame contact.**

Almost a quarter of structures in the GFPD could be exposed to radiant heating and short- and long-range embers under 90th percentile fire weather conditions, and over 50% could have extreme exposure under 97th percentile fire weather conditions. This percentage is only 1% under 60th percentile fire weather conditions.

The entire GFPD has potential exposure to long-range spotting under 90th and 97th percentile fire weather conditions because of the proximity of all portions of the GFPD to areas that could support active crown fires. See Section 3c (Predicted Radiant Heat and Spotting Potential) in the 2021 CWPP for additional information on structure exposure.

Firefighters are committed to protecting lives and property, but firefighting is particularly perilous in the wildland urban interface. Protecting firefighters' lives may require the difficult decision to cease structure protection when conditions become exceedingly dangerous, particularly in areas with inadequate defensible space, safety zones, and egress routes. Homes that are less ignitable, surrounded by defensible space, and safely accessible are more likely to receive the protection of firefighters and fire engines; such homes have a greater chance of being successfully defended and pose fewer hazards to the lives of firefighters.



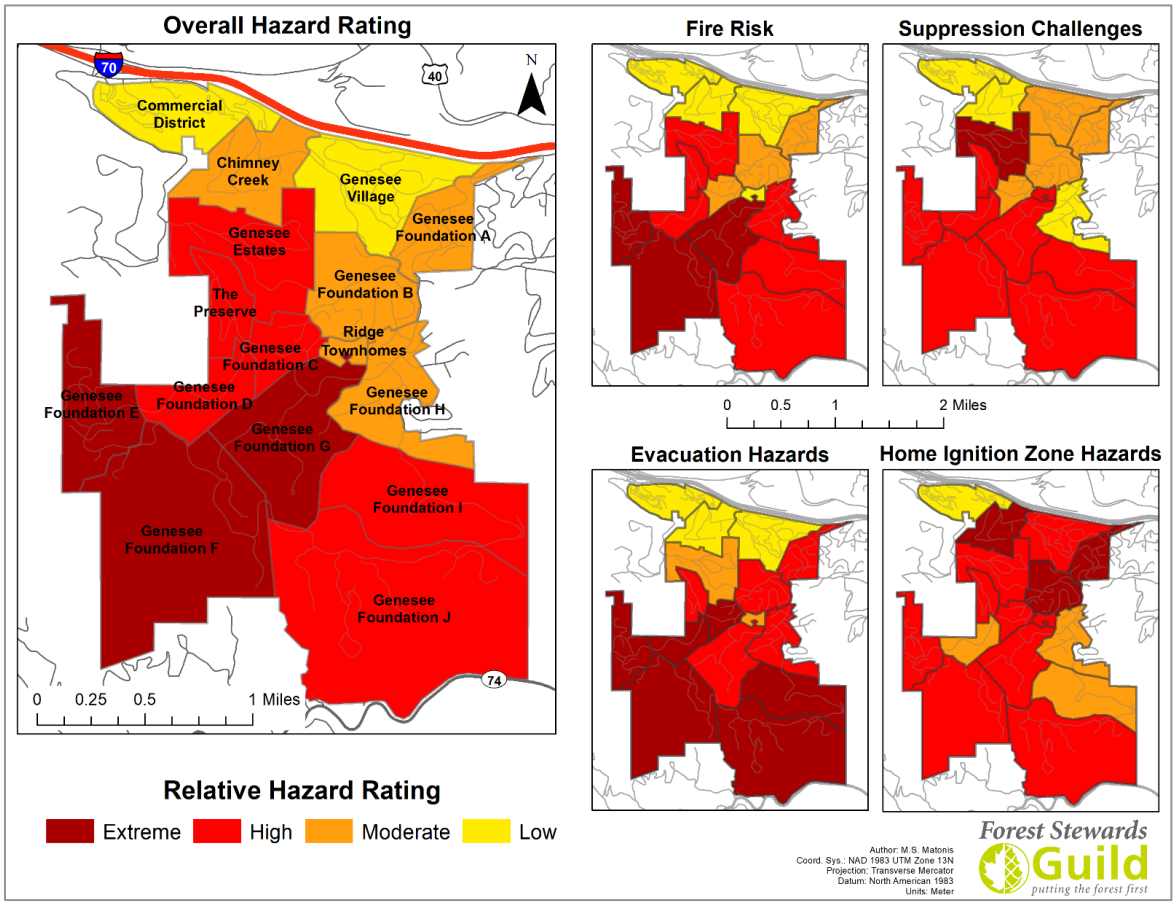
Percentage of homes across the entire Genesee Fire Protection District with different levels of exposure to embers and radiant heat under 60th, 90th, and 97th percentile fire weather conditions. Structure exposure ratings are as follows: low ratings indicate potential exposure to long-range spotting only, moderate ratings indicate potential exposure to short- and long-range spotting, high ratings indicate potential exposure to long-range spotting and radiant heat, and extreme ratings indicate potential exposure to short- and long-range spotting and radiant heat.

Planning-Unit Relative Hazard Ratings

We compared the **relative** risk that wildfires pose to life and property among the 16 planning units across the GFPD. We assessed hazards in four categories: fire risk, fire suppression challenges (e.g., limited hydrant availability and engine access), evacuation hazards, and home ignition zone hazards. Our assessment was based on predictions of fire behavior, radiant heat and spotting potential, roadway survivability, and evacuation time, as well as an on-the-ground assessment of each planning unit conducted by the Forest Stewards Guild.

A plan unit with a relative rating of "low" still has risk, it is just at lower risk than other plan units in the GFPD. All portions of the GFPD are at risk from wildfire due to the potential for long-range spotting. We developed this rating scale specifically for the GFPD based on the range of values observed across the community; the ratings are not intended to or suitable for comparing the GFPD to other communities. See Appendix D of the 2021 CWPP for assessment methodology.

Plan units with the highest overall hazard ratings are concentrated in the southwestern portion of the GFPD. Wildfire risk is high in these plan units because of steep slopes and dense vegetation with ladder fuels, particularly in the adjacent privately-owned property outside the GFPD. Suppression capabilities are hindered in some parts of the GFPD, largely due to access issues. Depending on fire behavior, it, could be unsafe to drive structural fire engines or even smaller wildland firefighting type 6 engines down long and narrow private drives and driveways that have inadequate turn arounds. A limited number of cistern-supplied fire hydrants and exceptionally narrow roads, private drives, and driveways create additional suppression challenges in the Genesee Estates plan unit. See Section 3g (Plan Unit Hazard Assessment) for more results.



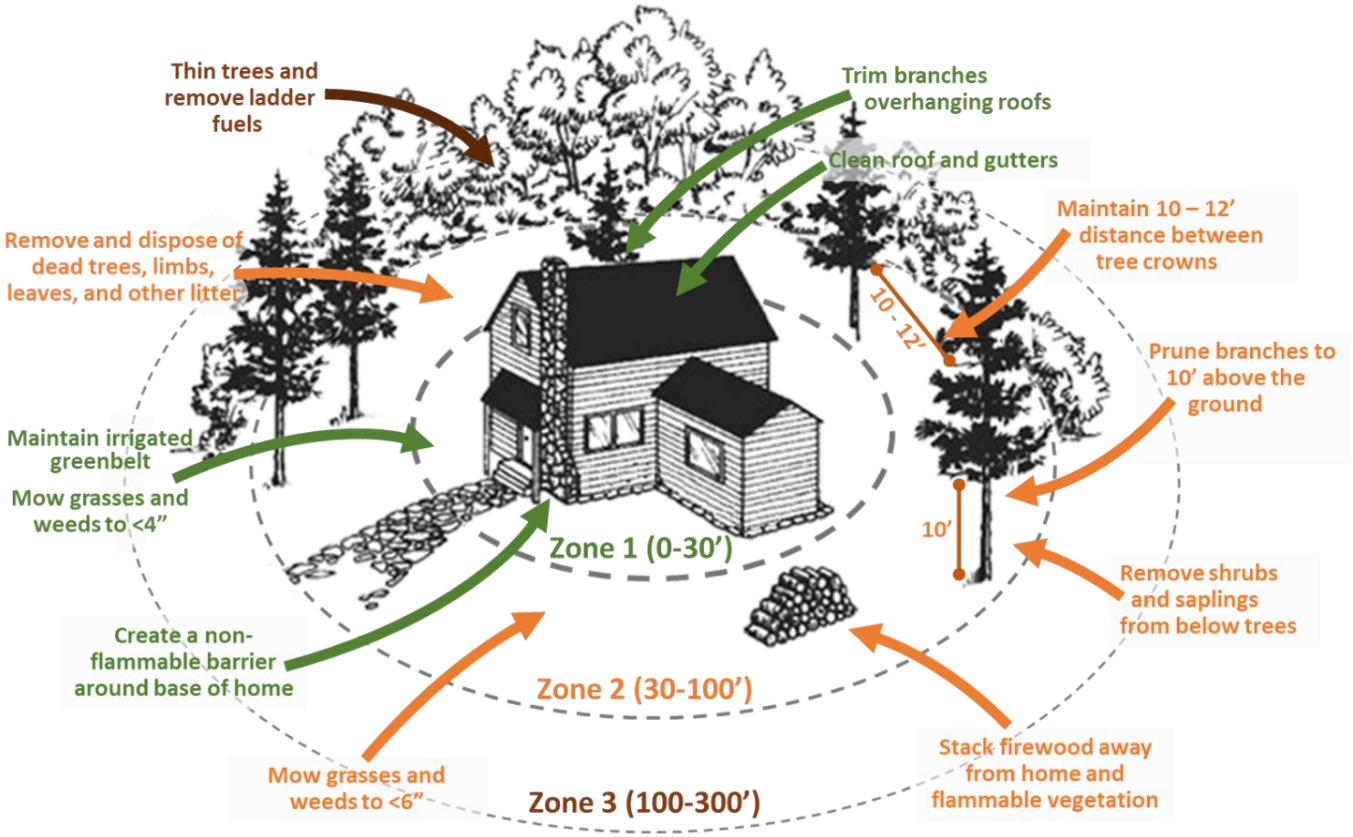
We assessed relative hazards in four categories: fire risk, fire suppression challenges, evacuation hazards, and home ignition zone hazards. Planning units with lower relative risk still possess conditions that are concerning for the protection of life and property in the case of a wildfire.

Genesee Fire Rescue, residents, and HOAs can mitigate risks to homes and firefighters by treating home ignition zones. The impact of these efforts can be amplified by collective action across the GFPD.

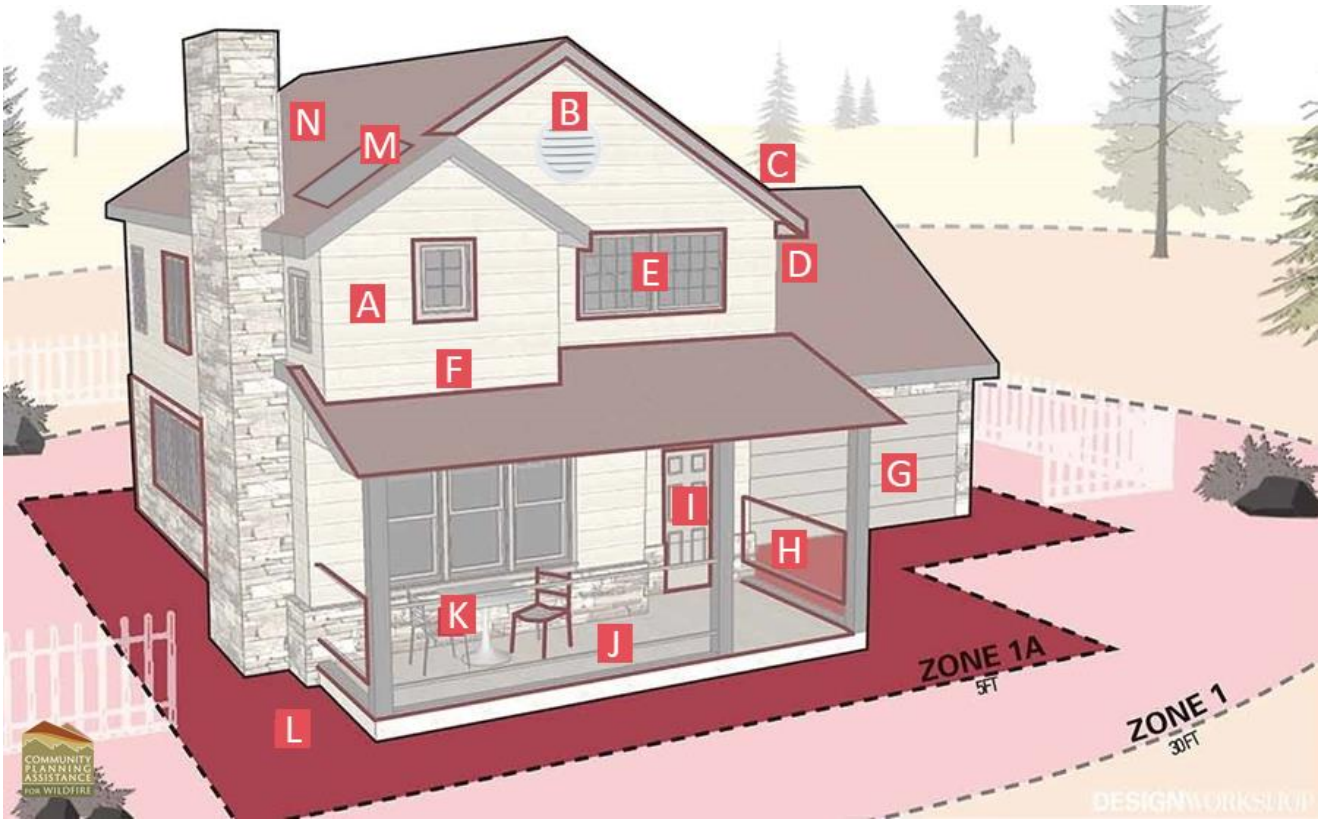
The risk of high-severity wildfires across the GPFD is concerning, but there is hope. GFR, residents, and HOAs are already undertaking efforts to mitigate fire hazards, and the 2021 CWPP provides tangible recommendations to accelerate effective and strategic action. See Section 2d (Accomplishments Since the 2008 CWPP) in the 2021 CWPP for a description of accomplishments and ongoing efforts to reduce fire risk and enhance community preparedness.

You can increase the likelihood that your home will survive a wildfire and help protect the safety of firefighters by mitigating your home ignition zone. Doing so involves creating defensible space, hardening your home to make it less susceptible to ignition, and taking steps to increase firefighter access along your private drive or driveway. A home can never be made fireproof, but home hardening practices decrease the chance that flames, radiant heat, and embers will ignite your home. Section 4b (Mitigating the Home Ignition Zone) of the 2021 CWPP outlines tangible actions you can take to create defensible space and harden your home.

Collective action by residents will magnify the impact of individual defensible space projects, create tactical opportunities for wildland firefighters, and reduce the likelihood that homes will ignite due to embers produced from adjacent, combusting homes. Linked defensible space has greater strategic value, and projects that span ownership boundaries are better candidates for grant funding.



Defensible space zones and mitigation measures recommended by the Colorado State Forest Service. Zone 1 is further subdivided into Zone 1a (0 to 5 feet from a home), which should be completely free of vegetation and other flammable materials. Image from the CFSF with modification by M.S. Matonis.



A. Use noncombustible or ignition resistant siding and trim (e.g., stucco, fiber cement, fire-retardant treated wood).

B. Cover vent openings with 1/16th to 1/8th inch corrosion-resistant metal mesh.

C. Clear debris from roof and gutters regularly. Install noncombustible gutters, gutter covers, and downspouts.

D. Install ignition-resistant or noncombustible roofs (composition, metal, or tile). Use noncombustible eaves and cover eaves with screened vents.

E. Install multi-pane windows with at least one tempered-glass pane and metal mesh screens. Use noncombustible materials for window frames. Limit the size and number of windows facing large areas of vegetation.

F. Install a 6-inch vertical noncombustible surface on all gables above roofs.

G. Install weather stripping around and under garage doors. Consider installing 1-hour fire rated garage doors.

H. Avoid combustible lattice, trellis, or other decorative features.

I. Install weather stripping around and under doors. Consider installing a 1-hour fire rated door.

J. Use ignition-resistant or noncombustible decking. Enclose crawl spaces. Remove combustible materials from underneath, on top of, or within 5 feet of deck.

K. Use noncombustible patio future.

L. Establish and maintain a 5-foot noncombustible buffer around the home. Use noncombustible fencing within this zone.

M. Use glass panes for skylights, not materials that can melt (e.g., plexiglass).

N. Cover chimneys and stovepipe outlets with 3/8th to ½ inch corrosion-resistant metal mesh.

A home can never be made fireproof, but home hardening practices decrease the chance that flames, radiant heat, and embers will ignite your home. Infographic by Community Planning Assistance for Wildfire with modifications to include information from CAL FIRE.

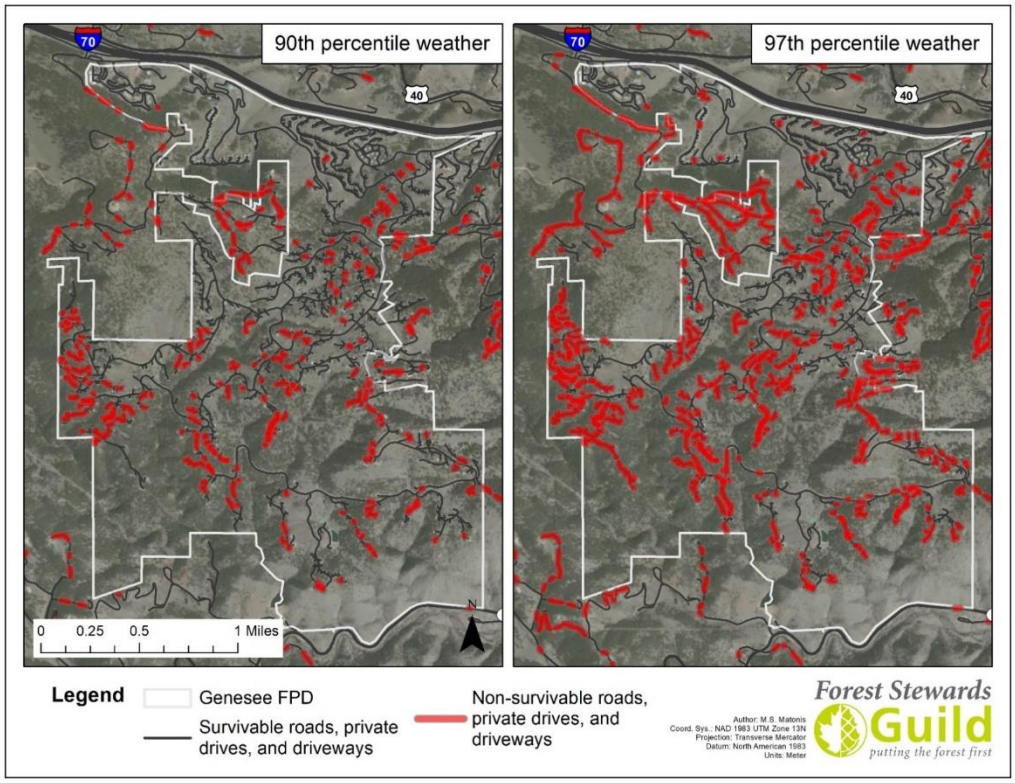
The GFPD has limited egress routes and a potential for extreme congestion, slow evacuation times, and dangerous conditions along many roadways.

Genesee Fire Protection District has a high likelihood of substantial evacuation congestion and long evacuation times during a wildfire event. Several segments of road in the northern half of the GFPD could experience substantial congestion during an evacuation due to funneling of traffic towards a limited number of egress routes to I-70. Evacuation times for individual residents could exceed 90 minutes based on modeling estimates outlined in Section 3d (Evacuation) of the 2021 CWPP. Our modeling of different scenarios demonstrated that evacuation times would be substantially reduced for all residents if each household evacuated with only one vehicle. Building a new southern egress route would reduce evacuation times by up to 60% for some residents in the southern portion of the GFPD.

Tall vegetation growing along roadways could impact the safety of residents during evacuations. Non-survivable conditions could occur if an active wildfire reaches the roadway and the combustion of thick forest vegetation results in flame lengths greater than 8 feet. Drivers stopped or trapped on these roadways would have a low chance of surviving radiant heat from fires of this intensity.

Up to 30% of the 56 miles of roads, private drives, and driveways in the CWPP planning area (the GFPD and Genesee Estates) could potentially experience non-survivable conditions under extreme to severe fire weather conditions. Section 3e (Roadway Survivability) of the 2021 CWPP describes roadway survivability across the GFPD.

Some of the roadway segments with potentially non-survivable conditions are part of key evacuation routes and a high priority for mitigation to reduce fuels and potential flame lengths. We identified these areas as evacuation pinch points and incorporated them into fuel treatment recommendations for the GFPD, as outlined in Section 5d (Suggestions for Roadway Fuelbreaks) of the 2021 CWPP.



Under 90th percentile fire weather conditions, 13% of the 56 miles of roads, private drives, and driveways in the Genesee Fire Protection District could potentially experience non-survivable conditions during wildfires (i.e., flame lengths over 8 feet). This percentage rises to 31% of roads, private drives, and driveways under 97th percentile fire weather conditions.

Pre-planning, awareness, and strategic action can mitigate evacuation concerns across the GFPD.

Evacuation within the GFPD can be mitigated with concerted effort by residents, HOAs, GFR, and the Jefferson County Sherriff's Office. GFR met with the Jefferson County Sherriff's Office, including the Director of Emergency Management, in January 2021 to discuss evacuation concerns, methods to improve coordination among agencies, and approaches to evacuation pre-planning.

Section 4a (Evacuation Planning and Capacity) of the 2021 CWPP outlines steps to improve preparedness, such as mitigating fuels along roadways, particularly along evacuation pinch points, pursuing alternate evacuation routes, and encouraging all households to develop family evacuation plans.

In the horrible instance that residents could become stranded in their vehicles during a wildfire, proactive work to reduce fuel loads along roadways can increase the chance of survival for trapped residents and decrease the chance that flames make roadways impassable. Residents in high-risk areas can work together to mitigate fuels along private drives and driveways to increase the safety of their families, neighbors, and first responders in the case of a wildfire. Section 5d (Suggestions for Roadway Fuelbreaks) of the 2021 CWPP outlines strategic locations and treatment recommendations to mitigate hazardous conditions along roadways.

Genesee Fire Rescue is actively evaluating the technical and financial feasibility of developing a southern egress route to increase the evacuation capacity of the GFPD. There are many barriers to building a southern egress route, but the 2021 CWPP and previous planning efforts demonstrate a clear and strong need to address limited egress options and long evacuation times for residents, especially in the southern part of the GFPD. See Section 3d (Evacuation) of the 2021 CWPP for a comparison of potential alternate egress options and the impact these options might have on congestion and evacuation times.

All residents should have go-bags packed and ready and register for CodeRED, the reverse 911 system used by JeffCom to contact residents during emergencies. Visit the Rotary Wildfire Ready website and the Genesee Fire Rescue website to learn about preparing go-bags and evacuation plans, and register for emergency alerts on the CodeRED website. **Residents need to follow guidance from law enforcement personnel during evacuation events and practice safe driving and good evacuation etiquette.**

Follow evacuation etiquette to increase the chance of everyone existing the GFPD in a safe and timely manner during a wildfire incident:

- Leave as quickly as possible after receiving an evacuation notice.
- Have a go-bag packed and ready during the wildfire season, especially on days with red flag warnings.
- Leave with as few vehicles as necessary to reduce congestion and evacuation times across the community.
- Drive safely and with headlights on. Maintain a safe and steady pace. Do not stop to take pictures.
- Yield to emergency vehicles.
- Follow directions of law enforcement officers and emergency responders.

Ecological restoration and fuel treatments across the GFPD and broader landscape can help create fire-resilient forests, reduce the likelihood of high-severity wildfires, and address roadway survivability concerns.

Altering potential wildfire behavior and restoring ecological conditions requires a landscape-scale approach to treatments, so it is important to promote forest management within and around the GFPD. Most of the priority treatment locations identified in the 2021 CWPP fall on privately-owned land and span multiple parcels. This can create a challenge for designing and implementing treatments and requires a community-wide commitment to implementing strategic treatments to decrease shared fire risk. Coordination with surrounding landowners is important, such as Jefferson County Open Space, Denver Mountain Parks, and adjacent fire protection districts.

Restoration-style treatments can meet both ecological and fuel reduction objectives in ponderosa pine and dry-mixed conifer forests along the Front Range of Colorado. Most of the forested area within and around the GFPD are ponderosa pine or mixed-conifer forest types, and many of these forests had fewer trees prior to Euro-American settlement due to a higher frequency of wildfires. The Jefferson Conservation District and other land management agencies encourage an approach to forest management that transforms a dense forest into a mosaic of single trees, groups of trees, denser patches, and meadows—conditions similar to historical forests that were maintained by wildfires and very resilient to them.

A holistic approach to forest restoration reduces crown-fire hazard, increases the abundance and diversity of grasses, shrubs, and wildflowers, and improves habitat for many wildlife species, including deer and elk. Forest management can look messy and destructive in the first years following treatment; however, ecosystems recover quickly, and well-designed treatments can result in beautiful, open forests with lower fire risk. See Section 5c (Suggestions for Ecological Restoration and Stand-level Fuel Treatments) of the 2021 CWPP for general treatment guidelines, including recommendations for reducing surface fuels created by forest thinning.

Grasses, shrubs, and wildflowers quickly respond to increased light availability after tree removal, resulting in beautiful ecosystems with lower fire risk. Photos from the Jefferson Conservation District.