Effective Mitigation for Berkeley's Ember Resilience (EMBER) FAQ's

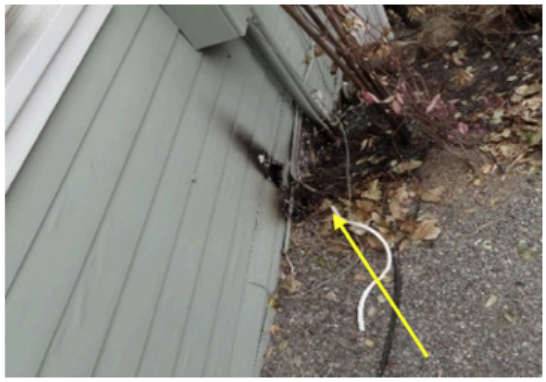
1. What is the science underlying Zone Zero proposed in EMBER?

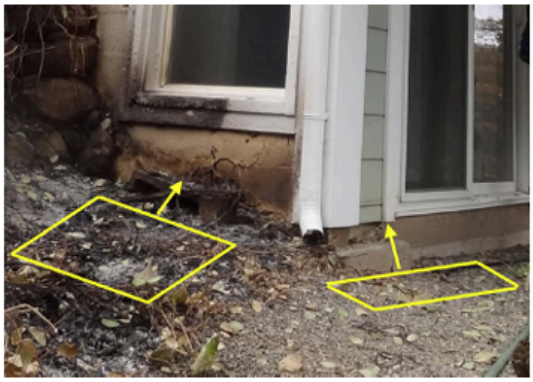
There's a robust set of evidence, based on experiments, studies, actual experience from firefighters, and post-wildfire analysis, that provides the foundation of the EMBER proposal. Key links to review the scientific consensus around Zone Zero & home hardening:

- A study published in Nature Communications (2025) analyzed five major California wildfires and found that the risk of losing homes in the wildland-urban interface (WUI) is shaped not just by fire exposure, but also by building design, defensible space, and critically, how close homes are to one another. Using on-the-ground assessments, remote sensing, and machine-learning models, the researchers showed that coordinated action, especially combining structure hardening and defensible space across entire communities, could cut wildfire-related structural losses by more than 50%. This underscores that wildfire resilience is most effective when tackled collectively, not just property by property.

- The 2021 peer-reviewed study titled "Housing Arrangement and Vegetation Factors Associated with Single-Family Home Survival in the 2018 Camp Fire" analyzed factors influencing home survival during the 2018 Camp Fire. Key findings indicate strong associations between both distance to nearest destroyed structure and vegetation within 100 m and home survival. This indicates building and vegetation modifications substantially improve outcomes including home hardening, defensible space, and eliminating near-home combustibles, especially in areas closest to the home (0-5 feet).
- Defensible Space Analysis in California: Following an analysis of over 2000 structures in San Diego County, Syphard et al. concluded that structures were more likely to survive a fire with an effective defensible space "immediately adjacent" to them. Syphard et al. also report that reducing woody vegetation cover up to 40% immediately adjacent to structures and preventing vegetation from overhanging or touching structures were the most effective actions to reduce risk of home ignition.
- Post-wildfire investigations support both experimental and computational research in that the elimination of combustible material from Zone 0 is a necessary mitigation action to reduce the risk of home ignitions. The investigation performed after the Grass Valley Fire in 2008 (Cohen et al. 2008) concluded that home ignitions were caused by embers igniting buildings or creating spot fires in the immediate areas around the building rather than high intensity flames. The National Institute of Standards and Technology's post-Camp Fire report likewise concludes that overhanging trees, fences, and other combustible items within Zone 0 provided fuel pathways that led to home ignitions (photos below 2min apart show fire spreading from the fence and tree to the home). Additionally, this work provided examples where overhanging trees within the 0–5-foot zone could also ignite the building.

Similarly, the IBHS post-Glass Fire investigation observed vegetation that likely provided a pathway for ignition when plants—even in small amounts—touch the building as shown in photo below. The house in the photo below was likely defended by first responders during the event.

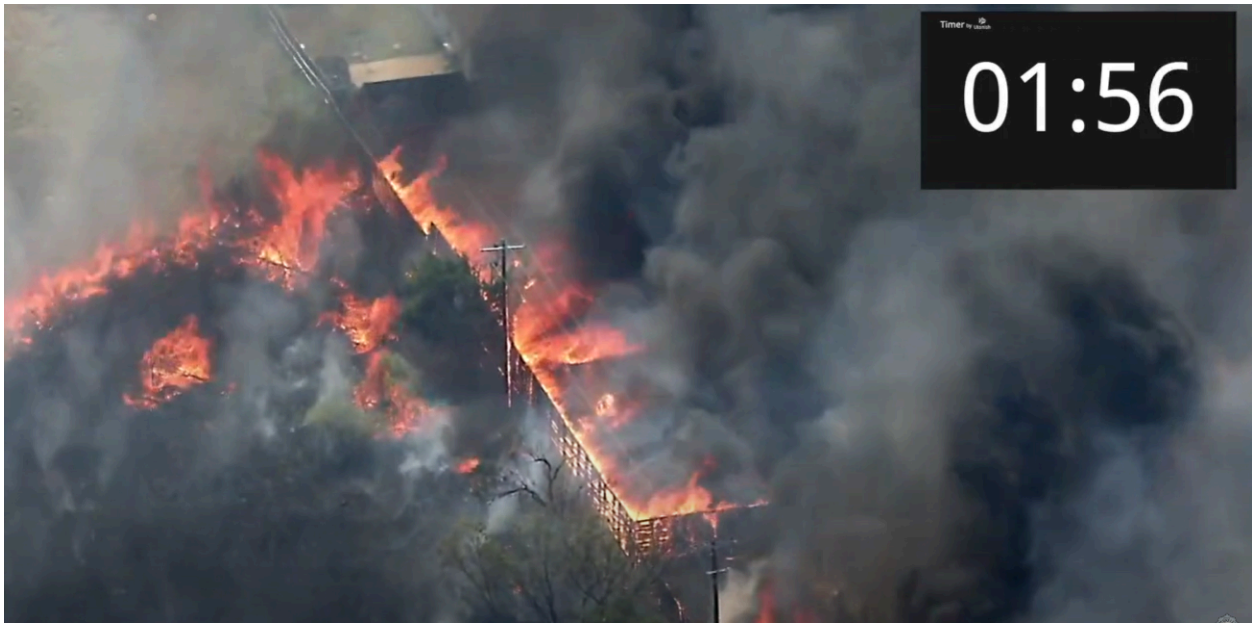




- The IBHS white paper "Return of Conflagration to the Built Environment" examines how modern suburban communities, especially those in the wildland-urban interface (WUI), are increasingly vulnerable to wildfire-driven conflagrations due to factors such as drought, high winds, human-caused ignitions, dense combustible structures, and inadequate building codes. Historical urban fires, like the 1871 Great Chicago Fire, were mitigated through improved building practices and codes; however, similar vulnerabilities have reemerged in today's suburban areas, as evidenced by recent events like the Marshall Fire in Colorado and the Lahaina Fire in Hawaii, where over 1,000 structures were destroyed within hours. The report emphasizes the necessity of comprehensive community-level strategies—including ignition-resistant construction, elimination of combustible materials near homes, and coordinated planning—to prevent and mitigate the spread of such devastating fires.
- The NIST Technical Note 2228, titled Wind-Driven Fire Spread to a Structure from Fences and Mulch, investigates how common landscaping elements like fences and mulch contribute to the spread of wildfires in wildland-urban interface (WUI) areas. Through 187 controlled

experiments, researchers found that combustible materials, especially when combined—such as wooden fences adjacent to mulch beds—significantly accelerate fire spread, with flames reaching nearby structures in as little as four minutes. The study emphasizes the need for homeowners to avoid placing combustible materials in close proximity and advocates for the adoption of fire-resistant landscaping practices to mitigate wildfire risks.

- The NIST Technical Note 2205 introduces the Hazard Mitigation Methodology (HMM), a performance-based framework designed to reduce wildfire risk in Wildland-Urban Interface (WUI) communities by addressing vulnerabilities at the structure, parcel, and community levels. The methodology emphasizes the necessity of complete ember hardening for all structures, as partial measures do not proportionally reduce risk, and highlights the importance of managing combustible materials and structural layouts to prevent fire spread via embers and direct flame contact. By integrating strategies such as fuel reduction, structure hardening, and community-wide planning, HMM aims to enhance the resilience of WUI communities against increasingly severe wildfire threats.



Click here to watch a video of the Balch Springs Fire in Texas spread from low grass and then use connective fuels to move from one structure to another.

- The IBHS report Wildland Fire Embers and Flames: Home Mitigations That Matter emphasizes that protecting homes from wildfires requires a comprehensive, two-tiered approach: first, implementing foundational defenses against embers; second, adding measures to guard against direct flame exposure. Key recommendations include installing Class A fire-rated roofing, using noncombustible gutter covers, screening vents with fine metal mesh, maintaining a five-foot noncombustible perimeter around the home (known as Zone 0), and ensuring fences and decks near the structure are made of fire-resistant materials. The report underscores that partial mitigation efforts are insufficient; only a fully integrated strategy addressing all vulnerable components can significantly reduce the risk of home ignition during wildfires.

- The IBHS report Near-Building Noncombustible Zone emphasizes the critical role of maintaining a 0–5 foot noncombustible zone around structures to mitigate wildfire risks. Through controlled experiments simulating ember exposure and radiant heat, the study found that combustible materials within this zone significantly increase the likelihood of ignition, especially at building corners where wind patterns can intensify heat exposure. Recommendations include removing flammable items such as wooden fences, mulch, and vegetation within this area and replacing them with noncombustible alternatives like gravel or concrete to enhance the building's resilience against wildfires.
- The IBHS report on the 2023 Lahaina Fire identifies three primary factors contributing to the rapid spread of the conflagration: high structure density, the presence of combustible connective fuels (such as vegetation and vehicles), and the use of building materials that were insufficiently fire-resistant under extreme thermal conditions. The study emphasizes that effective mitigation requires a comprehensive, community-wide approach, including increasing the spacing between structures, removing combustible materials that can act as fire pathways, and constructing homes with materials resistant to both embers and direct flame exposure. The report also highlights the critical role of homes located at the edges of communities, particularly those adjacent to grasslands, noting that if these homes are built with fire-resistant materials and maintain adequate defensible space, they can serve as a crucial barrier against the spread of wildfires into more densely populated areas.
- Fort McMurray Wildfire Investigative Report (ICLR/FireSmart 2017): A post-fire investigation by the Institute for Catastrophic Loss Reduction into the 2016 Fort McMurray wildfire in Canada found that direct flames or radiant heat from the forest fire were not the main cause of home ignitions. Instead, wind-driven embers were identified as the primary cause of most early home ignitions as the fire entered neighborhoods, often igniting combustible materials immediately around homes. The study noted that homes which adhered to FireSmart guidelines – including maintaining a noncombustible 0–1.5 m (5 ft) zone around the structure – survived at significantly higher rates than those that did not, demonstrating that Zone 0 defensible space is highly effective in preventing home ignition. Home survival was not random; it depended on conditions in the home ignition zone, reinforcing that eliminating fuels right next to the house greatly improves survivability
- Ember Accumulation Near Walls – IBHS/UL Study (Quarles et al. 2023): A peer-reviewed study in International Journal of Wildland Fire examined where wind-blown embers tend to accumulate around buildings using experiments at the IBHS Research Center. It found that ember accumulation was greatest right up against exterior walls, indicating the highest ignition vulnerability is immediately adjacent to the structure. Higher wind speeds delivered more embers to the building and, critically, rough surfaces like wood mulch captured embers at the base of walls, whereas smoother noncombustible surfaces allowed embers to blow past – demonstrating that a noncombustible Zone 0 prevents embers from piling up and igniting next to the home
- Australian Bushfire Case–Land Management Practices Associated with House Loss in Wildfires (Gibbons et al. 2012): A rigorous statistical study of the devastating 2009 “Black Saturday” bushfires in Australia evaluated how fuel management around homes affected house loss. The logistic regression results showed the cover of trees and shrubs within 40 m of houses was the top predictor of home destruction, and all fuel-reduction measures were more effective the closer they were to the house. The authors conclude that focusing on

"intensive fuel treatments close to property" (e.g. eliminating combustibles in the immediate 0–5 ft and near-yard area) will most effectively reduce wildfire impacts on homes, far more than distant vegetation management

- The IBHS report on the January 2025 Los Angeles County wildfires details how extreme wind conditions, with gusts exceeding 60 mph, rapidly transformed initial ignitions into widespread urban conflagrations, notably in Pacific Palisades and Altadena. The fires, fueled by dense housing, combustible landscaping, and inadequate defensible space, overwhelmed firefighting efforts, leading to the destruction of over 5,000 structures and eight fatalities. The report emphasizes the critical need for comprehensive mitigation strategies, including the elimination of combustible materials within five feet of structures (Zone 0), adherence to modern building codes, and community-wide planning to enhance resilience against future wildfires.
- The 2021 report An Impact Analysis for the National Guide for Wildland-Urban Interface Fires, prepared by the Institute for Catastrophic Loss Reduction for the National Research Council of Canada, evaluates the potential benefits of implementing the National Guide for Wildland-Urban Interface (WUI) Fires. The analysis highlights that adopting the guide's recommendations—such as using fire-resistant building materials, creating defensible space around properties, and enhancing community planning—can significantly reduce the risk of wildfire-related damages and losses in WUI areas. The report underscores the importance of proactive mitigation strategies and coordinated efforts among stakeholders to enhance community resilience against wildfires.
- The 2023 Milliman report, Town of Paradise California Resilience Challenge: Task 1 to Task 4, presents a comprehensive analysis of wildfire risk reduction strategies for the Town of Paradise, California, following the devastating 2018 Camp Fire. Conducted in collaboration with CoreLogic and supported by the Bay Area Council Foundation's California Resilience Challenge, the study quantifies the effectiveness of various mitigation measures, including home hardening, zoning reforms, and the establishment of external buffers. The findings indicate that implementing these strategies could reduce wildfire-related losses by up to 75% and insurance premiums by up to 55%, offering a viable blueprint for enhancing resilience and affordability in wildland-urban interface communities.
- Alexandra Syphard's article about The Role of Defensible Space for Residential Structural Protection During Wildfires. Some have suggested Ms. Syphard's research does not support Zone Zero. However, when we asked her, she replied that "Zone Zero requirements are one of the most important things residents can do to protect their property from wildfire." Here is a letter that Dr Syphard and Dr Gollner wrote to the CA Board of Forestry. Her letter explaining why Zone Zero is critical and is pasted here:

"I am sorry to learn that my work is being somewhat misrepresented in a way that could make residents more at risk to wildfire. The study in which I recommend that excessive defensible space may not be needed is specifically talking about those who want to far exceed the 100' minimum, or those who want to moonscape their property and thus invite excessive colonization by un-irrigated invasive annuals (a concern most relevant to southern CA). My study found significant benefits of defensible space, particularly the closer you are to the structure. It is my thought that the Zone Zero requirements are one of the most important things residents can do to protect their property from wildfire. Studies that show a relatively larger effect of construction

materials should not be taken to mean that defensible space should not be done or that it will not have benefits. This is particularly the case for Zone Zero, but it is also important to maintain 100 feet of appropriate defensible space (i.e., according to Cal Fire guidelines) for firefighter safety and maneuverability. I would put less weight on the defensible space measurements in the 2019 paper because we did not measure defensible space ourselves. Please let me know if there is anything else I can do to help. Alexandra D. Syphard, PhD"

And here's a good digestible summary:

Inconvenient truths about the fires burning in Los Angeles from two fire experts

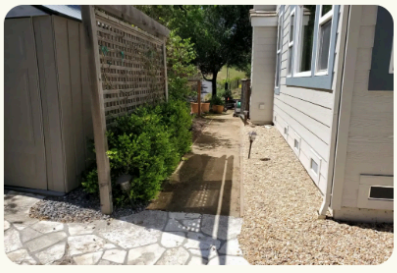
2. What, if any, plants are permitted in Zone Zero (the first 5 feet around your home)?

The plants allowed in Zone Zero are:

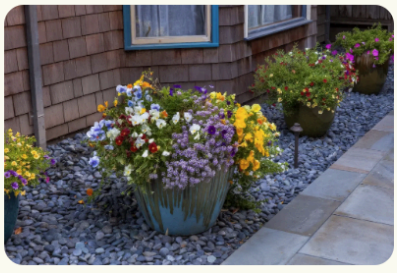
- Mature trees taller than your house with branches overhanging the roof at least 10-ft above the roof. Mature trees are less likely to ignite and pose an ignition risk to structures during a wildfire/ember storm. More fire prone species like Juniper, Monterey Pine, or Blue Gum Eucalyptus can be removed by the resident if desired to increase resiliency.
- Plants in pots are allowable if they are in areas that are not directly beneath, above, or adjacent to a window or eave; are kept in an unaffixed, non-combustible pot or container that is no larger than 5-gallon capacity; and set apart by 1.5 times the height of the plant or 12 inches, whichever is greater, from the structure and each other. These plants shall be no greater than 18 inches in height. Dead or dying material on, around and under the plants must be removed.

Many of these catastrophic wildfires follow periods of drought and are accompanied with extremely low humidity and hot winds. The combination of these factors will lead any plant, even fire resistive, native species to be ignitable during a wildfire. Further, most plants produce dead woody materials that are often not maintained and can cause ignition. Pending California Board of Forestry regulations are very likely to **not** include exceptions for fire resistive plant species.

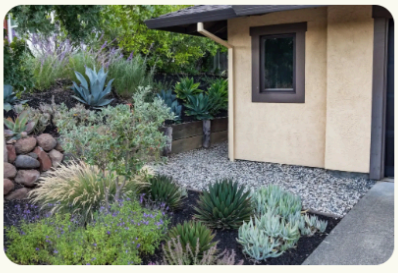
You can have beautiful gardens that adhere to Zone 0 guidelines.
See images below for just a couple examples:



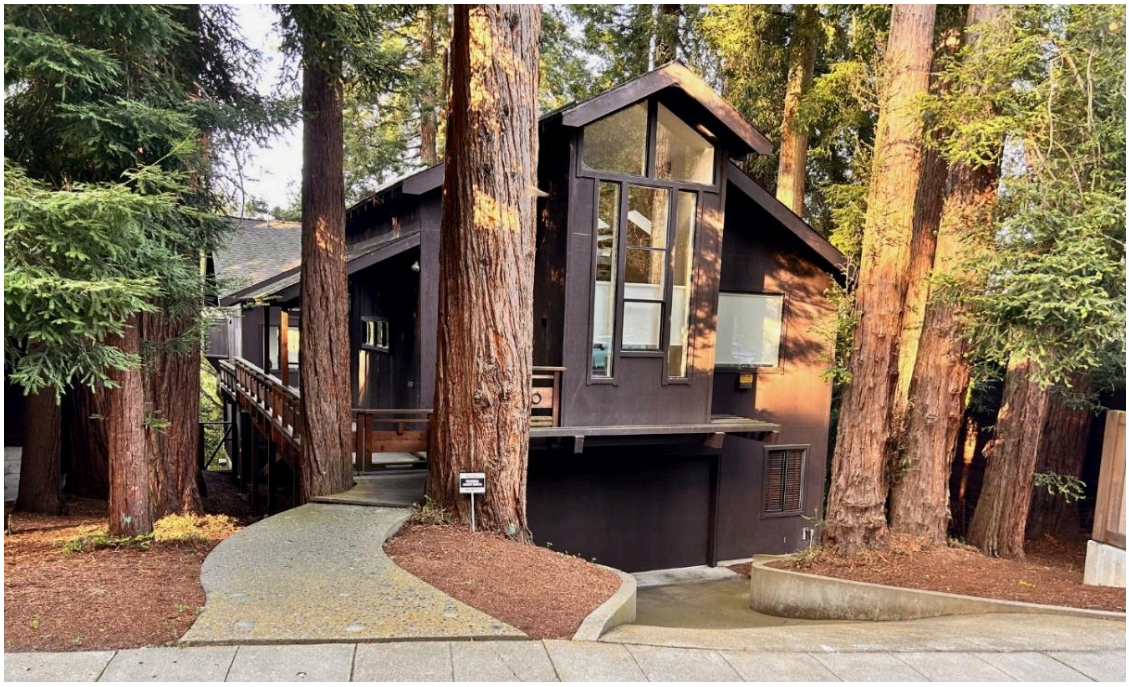
Good use of gravel mulch and hardscape walkway in Zone 0



Colorful, low growing flower pots on rock mulch is a good design for Zone 0



Firesafe vegetation setback five feet (zone 0) with gravel path



3. Can I get financial support to help pay for Zone Zero work?

The Fire Department has already secured a $1 million dollar grant, targeted toward the homes in the Grizzly Peak and Panoramic Hill Mitigation Areas, to help residents who are unable to remove vegetation within Zone 0.The city is also currently running the Grizzly Peak Project, and can remove privacy hedges within 10 feet of the road on private property (and will extend the work further into the yard for hazardous species), and offers free plant replacement.

In addition, the City is working to secure additional sources of financing – ranging potentially from additional grants to tax credits and low-interest loans. City Council is lobbying the Legislature and Congress to enact several key bills, including AB888 (Calderon), AB389 (Willis), and the Firewall Act (Schiff), which, if enacted, would provide financial incentives and support for Zone Zero and Home Hardening.

4. Opportunities for Public Input and Engagement?

In August 2020 the State Legislature enacted AB-3074 to create an "ember-resistant-zone". However, due to political and administrative issues, the formal rulemaking process necessary to implement the requirements has not yet been completed. Had the processes been completed, new houses would have had to comply by 2023 and existing homes by 2024. On February 6, 2025 Governor Newsom signed an Executive Order "to further prepare for future urban firestorms, stepping up already nation-leading strategies." The order directs the State Board of Forestry to accelerate its work to adopt regulations known as "Zone 0."

Given the clear science on Zone Zero and the devastation of the Los Angeles Fires, Berkeley Fire

Chief David Sprague and his team moved forward with a local version in January 2025, known as EMBER - Effective Mitigations for Berkeley's Ember Resilience.

The following public announcements, Council Meetings, Forums and Outreach about EMBER have taken place since that time:

- 1/11/2025: Berkeleyside / Berkeley Scanner OpEd
- 1/22/2025: Presentation at the City's Disaster Fire Safety Commission
- 2/05/2025: Citywide outreach Surveys in Berkeley Considers
- 2/05/2025: Berkeley Scanner Article
- 2/05/2025: FireWise meeting
- 2/07/2027: Berkeleyside Article
- 2/10/2025: Information Session with Wildcat Canyon Neighbors
- 2/11/2025: Special Council Meeting: EMBER Proposal – for feedback & next steps
- 2/24/2025 FireWise meeting
- 2/27/2025: East Bay Wildfire Coalition Presentation
- 3/10/2025: FireWise Meeting
- 3/05/2025: Information Session with Park Hills Community
- 3/20/2025: District 6 Community EMBER webinar
- 3/24/2025: Public Safety Policy Committee
- 3/26/2025: City of Berkeley Community E-Mail & Web Message
- 4/15/2025: Berkeley Scanner and numerous national publications
- 4/15/2025: Council Meeting: approve 1st reading of Fire Code Amendments Ordinance

We are holding two additional opportunities for community discussion on May 15 and May 27. City Council will meet on June 17th for the 2nd reading of the Ordinance.

After the ordinance is approved, we will work with BFD to organize a wide variety of additional implementation workshops, neighborhood meetings, and individual homesite visits to help educate homeowners and provide additional guidance & support.

5. Broader environment impact from removing vegetation in Zone Zero (EIR?)

The environmental impact of a Wildland-Urban Interface (WUI) fire is tremendous. The National Institute for Health states that WUI fire emissions have disproportionately large impacts on global air quality and human health. Removing vegetation around a small area of a home to create a safe zone of defensible space against showering embers does not compare. This is especially true given the abundance of vegetation 5ft and beyond in the Berkeley Hills. Work within 30' (and up to 100') is categorically exempt from Environmental review if conducted for the purposes of wildfire risk reduction.

6. The City should FIRST focus on Eucalyptus Removal in Tilden Regional Park

Managing and thinning Eucalyptus groves is *part* of the solution, but it is not *the* solution. Why? Look at the Los Angeles fires and Lahaina fire. Both these fires burned in grass and shrubs but quickly spread to structures. Look at the Balch Springs Fire video from Texas – this fire spread in low grass. Fuel management beyond the immediate areas around structures accounts for just 20% of the ignition risk. Said another way, 80% of the risk of structural ignition is posed by the fuels within 30 feet of homes (Brinkman et al. 2022).

As a thought experiment, imagine if all Eucalyptus were removed, and native grasses and shrubs returned. Berkeley would still be a fire prone landscape with vegetative fuels that are capable of carrying fire quickly to the edge of the community and causing structural ignition.

7. The City should FIRST focus on PGE Undergrounding Power Lines

Yes, this should be *part* of the solution but it is not *the* solution. Similarly, to the wholesale removal of Eucalyptus, Berkeley is in a fire prone landscape. Fire ran through this land frequently pre-European settlement, pre-PGE. The most effective way to reduce the risk of structural ignition, no matter the source, is to implement defensible space, inclusive of Zone 0, and harden your home.

8. Enforcement Timeline, Violations and Fines are too Aggressive

The City and Fire Department have always taken an education first approach. This is demonstrated by its performance over the next three years and the extremely small number of citations issued when compared to total inspections and total violations discovered:

- 21,000 inspections completed
- 9,000 violations identified
- Fewer than 70 citations issued (0.8% of violations, 0.3% of inspections)

When EMBER is enacted the Fire Department is going to pivot all its resources to engage and support the Grizzly Peak and Panoramic Neighborhoods and employ the same education first approach. The understands that it is much more effective to build a coalition of the willing and uses citations only as a last resort.

The new Zone Zero would be effective January of 2026, however defensible space inspections wouldn't begin until May of 2026. This gives residents about a year from adoption (anticipated June 2025) to inspections (start May 2026) to create Zone Zero. Then, after inspections begin in May of 2026, the inspection cycle would provide another ten weeks before the process would result in citations.

The department has a general policy of citing at the lowest possible level when that becomes necessary. This starts at a $100 citation for the first month (cumulative, not daily). Fines can increase sharply if required based on the severity of the violation if deemed prudent by the inspecting official, or if properties remain non-compliant. This has not yet occurred in our inspection process.

Big picture on enforcement: The Fire Department's goal is voluntary compliance, not penalization. Enforcement steps (citations, fines, abatement, etc.) are tools to ensure everyone follows the rules that keep our community safe. In public statements, fire officials have repeatedly emphasized that they intend to roll out these requirements with an emphasis on education, outreach, and phased compliance. Indeed, the City is phasing the Zone 0 requirement to start with two specific high-risk neighborhoods (the Panoramic Hill area and the Grizzly Peak/Wildcat Canyon interface) with a lead time for residents of almost a year. This shows a measured approach, not a "gotcha" approach. Homeowners will receive inspection reports identifying what needs correction, group and 1:1 coaching from the department and will have the opportunity to fix issues before any penalties. Fines or other enforcement actions only come if a homeowner persistently neglects to address the hazards. And even then, the fines are there because *an unchecked fire hazard at one property puts the whole neighborhood at risk*. It's comparable to health codes or building codes – if someone refuses to fix an imminent hazard, eventually authorities must step in for the greater good.

9. If I do all this work, will I keep my home insurance?

Thousands of policy holders in the Berkeley Hills have already been hit with substantial rate increases or notices of non-renewal. EMBER is aligned with regulations issued by the California Department of Insurance (CDI) and the Institute of Business and Home Safety (IBHS) Wildfire Prepared Home Checklist. While conducting this work on and around your home does not guarantee insurance, or premium discounts, they are much more likely to occur when a home has adopted these protective measures. In many cases, this might be a larger reduction in one year's insurance than the cost of doing the vegetation work.

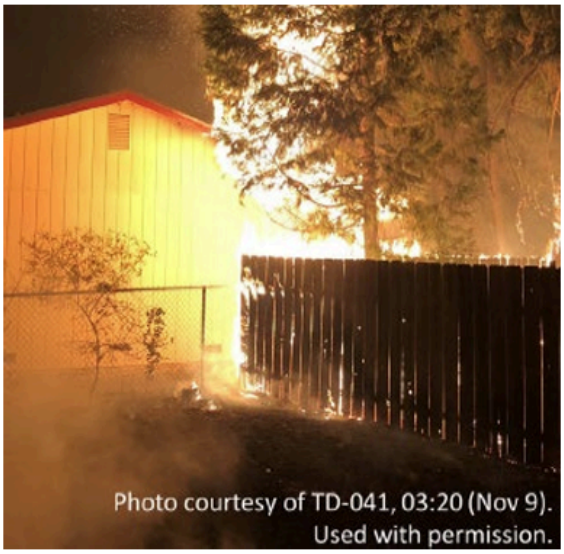
Note that State Farm's website lists discounts for wildfire mitigation on the community level and property level. One Berkeley homeowner received a -29.4% adjustment after implementing Zone Zero.

10. Do I have to remove my fence?

No, you will not be required to remove or replace any fence that runs parallel to structures.

Fences that connect to a structure must have only the first five feet removed and/or replaced with a non-combustible

Why? Fences are connective fuels that act like a wick and move fire from one structure to another. See the Balch Springs video here for a perfect example or the pictures below from the Camp Fire in California.



The best practice based on volumes of scientific research, observed fire behavior over decades and after-action reports is that any fence within 5-feet of a structure should be moved to beyond that zone or replaced with a non-combustible alternative. **However, this will not be required in EMBER**.

11. Does EMBER require that I replace my roof?

EMBER does not require replacing your roof. For those residents that still have a wood shake roof, we know that these are one of the biggest contributors of additional structural ignitions during a wildfire and thus we strongly encourage replacement with a Class-A Fire Resistant Roof. However, EMBER does not require this.

12. Does EMBER require that I replace my deck?

EMBER does not require that you remove or replace your deck. Decks are considered part of your home. The area under decks must be maintained free of vegetative and non-vegetative combustible material and a Zone 0 must be maintained around decks and stairs. Once a wooden deck reaches the end of its useful life, **it should be replaced** with fire resistant materials.

13. Does EMBER require that I remove trees in Zone Zero?

Trees can remain in Zone 0 as long as they are mature: This means they are taller than the structure, are maintained free of any dead and dying branches and that branches are maintained ten feet (10') above the roof. No new trees may be planted in Zone 0.

14. Will I have a list of contractors to work with? Will I get guidance about how to do all this work?

Yes, the Berkeley Fire Safe Council (BFSC) has a list of reputable contractors who can create Zone Zero and do home hardening work and they are working towards increasing the numbers of contractors. The Fire Department will provide educational workshops to the contractors on Zone Zero and Home Hardening but cannot recommend contractors directly to residents.

15. Does EMBER include mandates for Home Hardening, or is it just about Zone Zero?

EMBER does not require residents to perform home hardening – it is focused on Zone Zero, and just in the two most vulnerable areas in the Berkeley Hills at this time, Grizzly Peak Mitigation Area and Panoramic Hill Mitigation Area.

Home Hardening is not mandated, but it is highly recommended. When Zone 0 and home hardening are done together – the risk of ignition will also substantially decrease. This may qualify homeowners for insurance and/or insurance discounts – check with your broker.

16. Will Fire Protection Plan (FPP) be Required for All Parcels?

The requirement is being misrepresented in public comments and is a long standing existing language. A Fire Protection Plan in the context of fire codes is a formal document that analyzes fire hazards and specifies mitigation measures for a given site or project. It is commonly required for new developments or construction in Wildland-Urban Interface (WUI) areas under the California Fire Code and building code. For example, California Code (CBC Chapter 7A / CFC Chapter 49) allows jurisdictions to require a Fire Protection Plan for new buildings in Very High Fire Hazard Severity Zones to ensure the design accounts for defensible space, ignition-resistant materials, water supply for firefighting, etc. Many Bay Area cities have adopted similar ordinance language. This is not a Berkeley invention – it's a standard tool in WUI fire safety.

What Berkeley's existing FPP language does is extend the use of FPPs to certain existing situations where they can be helpful. It does *not* mean every individual homeowner will be randomly ordered to write up a plan for their home. The Fire Department doesn't have the bandwidth or desire to demand thousands of separate Fire Protection Plan documents from each homeowner – nor is that necessary. Instead, the ordinance's FPP provision is intended for special cases. For instance, if a property is unusually large, complex, or poses particular challenges, the Fire Code Official can require a customized Fire Protection Plan to ensure compliance. This could apply to, say: a large estate in the hills with multiple structures and extensive vegetation, or a situation where an owner is proposing an alternative method of compliance and needs to document it in a plan. Essentially, it's a way to require a site-specific wildfire safety plan when the basic one-size-fits-all rules might not suffice.

17. Scientists Don't Support Zone 0

There is an incredible amount of cherry-picking and miss-information that is being used by opponents of EMBER to elevate positions that are convenient to them – but not scientifically validated. It's often difficult to determine what is science, and what is an opinion of a scientist; especially one with little to no experience in this field. Below is an email from one of the leading researchers on the issue, Dr. Michael J. Gollner, Ph.D., University of California, Berkeley Fire Lab:

Thanks for sharing this. A lot of information below, hopefully you can use this in discussion with neighbors and other residents.

I haven't seen this letter, but I've been working in this field for 15 years and involved with what IBHS has been promoting to the committee, including organizing several letters of support, and know some committee members and the long history in this process. It's a little disturbing

reading this letter as it reminds me of expert witness work - they'll selectively pick anything they can to promote their stance out of papers, ignoring those points that don't support their views. They also completely tried to tear apart our new manuscript without actually understanding the issues. I ran into the same issues when testifying to Congress, this appears to be a very political interpretation of the literature.

First, it's important to understand the scientific role of defensible space and home hardening. Homes can be exposed to large radiant heating from the wildfire itself or neighboring structures burning, direct flame contact from small flames adjacent to the structure, and flying embers that land and ignite new fires. The concept of protecting structures is to create a defensible space around the home that reduces exposure from the FIRE (both radiant and direct flame contact) to the home, and to make the outside "shell" of the home itself resistant to EMBERS and small flames. Defensible space therefore must accomplish moving flammable materials that can result in flames away from the structure. Hardening incorporates finer mesh over vents to prevent ember intrusion as well as fire resistant materials (and construction methods) to prevent embers from igniting outside materials. The issue is that even small flames, 1 foot tall can penetrate building materials that otherwise are fire resistant if left long enough. Heat fluxes from small sustained flames can far exceed ignition properties of most otherwise fire-resistant materials, therefore there is a need to support hardening on a home by moving any possible flames back some distance, preventing another "pathway" to ignition. The 5-foot zone "0" helps accomplish this.

Defensible space guidelines aren't to create completely barren landscapes. Within 30 feet there is room for "islands" of vegetation and other materials, however the 5 feet within the home has been highlighted to be clear of any flammable materials to prevent the intrusion of sustained flames to structures. I know it's a broad stroke, saying to remove everything flammable, but to take an alternative path would be incredibly complicated and have a lot to do with what materials a structure is made with, what wind and direction it might come from, the location of neighbors, and more details than we can possibly specify and understand. Keeping this small area as a "safe zone" around the structure will help give any hardening applied a real chance to actually survive the onslaught and help prevent more destruction. Because many houses are located so close to one another your neighbor's house is also a potential source so protecting entire communities is critical.

It's hard to make a better visual than IBHS' full scale demonstrations: https://www.youtube.com/watch?v=AYvwogREEk4

We've been burning houses (7 now) on structure to structure experiments and we're learning a lot. I do believe the 5-foot zone is an integral part of the solution.

Regarding the criticism of our study (under revision in Nature Comm), what we did is really incorporate the interplay between variables using a machine learning method. Most previous studies did not do this. It becomes apparent when we look at the end that you need BOTH defensible space and hardening to make a substantial difference in losses, but there is SOME reduction from either independently. Of course, home spacing is one of the most important, but we know this can't be changed. I think whoever wrote this letter has no idea what fire modeling

is or what the different techniques used were doing, or purposefully avoided stating the facts. The moisture conditions were set to match weather conditions input from NOAA weather data, which is standard fire modeling practice, and we don't use the fire modeling to influence the structure loss information, we use the fire modeling as an input of EXPOSURE (fire and embers), missing from all previous studies. Most previous studies also looked at 30-foot defensible space, not 5 feet. We had access to high resolution imagery and Lidar that allowed us to look closer at 5 feet. It's not perfect, you'd need pre-fire on the ground studies, but there is a strong and clear relationship between zone 0 and reduced destruction, especially combined with home hardening. That also makes physical sense, we expect zone 0 to be most influential in reducing those local exposures and making hardening more effective.

I know Alexandra Syphard and her stance on the trees blocking embers. There is no field or test evidence for that anywhere. There is compelling evidence from investigations that local fuels that are connected leading to a structure help drive the fire to the structure and lead to ignition. I think all scientists agree you need flammable materials out of the 5-foot zone, they are debating on what is "flammable" and that sort of depends on whether you are talking about ignition from embers, a small fire creeping up, or a massive flame from a neighbor's house that lights your bush on fire that then lights your house on fire.

Sorry there is a lot of information here, but you are welcome to share this with neighbors. I don't like how clear cut it has to be, but I understand how difficult any regulation in practice will be. A bush honestly is a bad idea - flammability, it's a lot of fuel if it dries out, litters, how is it maintained, etc. Mulch - we tested it, it is all pretty bad that close to a house. A little potted petunia, probably fine, but how to distinguish how large is not, or if the flower pot is flammable. Do we create a flower pot certification process? It's really hard. So, I support a straightforward plan that's going to lower risk in high risk areas.

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