GREAT LAKES EDITION

Protect Your Property from Wildfire

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YOU CAN MAKE A DIFFERENCE

In the Great Lakes region, an average of 6,000 wildfires burn more than 740,000 acres of land each year. Changing weather patterns, including prolonged drought, are making many houses and businesses increasingly vulnerable to larger and more destructive fires. In rural areas, where the wildfire risks often are the greatest, houses and businesses may be located farther apart and not as accessible for firefighters. This guide was created for property owners in the states of Michigan, Minnesota and Wisconsin who are looking for solutions to reduce their risk of wildfire damage. The guide takes into account regional building styles and construction materials, common topographical characteristics, and other risk factors identified by fire science research. While wildfire protection begins with the individual, this research proves that a community-wide approach to fire protection is the most effective, so please share this guide with neighbors and friends. If something combustible is located within a 100-foot perimeter of your house or business (including your neighbor's house, business, surroundings or landscaping), it could potentially increase your risk of wildfire damage. Everyone benefits from a wildfire-adaptive community.

Wildfire research has shown that individuals and families can protect their properties against wildfires by addressing three clear sources of vulnerability: the house or business itself, the landscaping nearby and the vegetation in the area surrounding the structure. Each of these sources can be dealt with through maintenance, material and design improvements and vegetation control. Many of these projects are affordable and can be done over a weekend. Some of the projects have the added financial benefit of improving energy efficiency.

UNDERSTANDING EFFECTIVE WILDFIRE PROTECTION

Wildfires are called wild for a reason - they are often uncontrollable. What is controllable, however, is the preparation you can undertake to protect your house or business from damage or loss when a wildfire threatens. Ultimately, the difference between survival and destruction is whether some part of the structure catches on fire.

There are two primary areas of concern around a house or business when it comes to minimizing the chance of a building igniting from exposure to a wildfire. First, a number of features, materials, and design details can make it more vulnerable. Second, the surrounding forests or wildlands and vegetation near a house or business can provide a pathway for an approaching wildfire to get close enough for the flames to touch the outside or allow for radiant energy (such as that generated when you stand in front of a campfire) to generate enough heat to cause it to ignite. It is also important to remember that wind-driven embers from a fire a mile or more away can fall on the house or business, secondary buildings or nearby vegetation and cause them to ignite. Photographs from post-fire surveys consistently show examples of buildings that have been completely destroyed, and green vegetation near the building remains. These photographs reinforce the important role of burning embers in fire damage and building loss.

MANAGING YOUR HOUSE OR BUSINESS

The most vulnerable part of your house or business is the roof. If you have a roof made of anything other than Class "A" fire-rated materials almost anything else you do will be of little consequence in reducing the chances it will ignite and burn the rest of the building when a wildfire approaches. Other key risk factors include the entry of embers into attic or crawlspace vents. Embers that reach enclosed spaces through vents can ignite fine fuels. Embers also can ignite debris that has collected in gutters or at roof-to-wall intersections. Single-pane windows are vulnerable to glass breakage from radiant heat, and once shattered will allow embers and flames inside. Decks and fences that ignite can bring a fire right up to the building. This guide provides ideas for how you can reduce the ignition risks by making improvements to your house or business.

MANAGING VEGETATION AND FUEL SOURCES AROUND YOUR HOUSE OR BUSINESS

Fire officials recommend a vegetation management zone around your house or business of at least 100 feet, depending on the type of vegetation in the adjacent forests or wildland areas and the slope of the land. The actions you take to modify the vegetation in this area are intended to reduce the severity of the fire. This also reduces the chance that flames could come into direct contact with any part of the house or business or that radiant energy from the high-intensity flames could break the glass in windows or ignite combustible siding. Regardless of the size of the property surrounding a house or business, the goal is the same-- to reduce the amount of fuel that would allow the wildfire to get dangerously close. This zone, which is widely referred to as defensible space, also creates a safer area for firefighters to protect the structure.

IMPROVING YOUR STRUCTURE'S WILDFIRE RESISTANCE

You probably already have a list of projects, both large and small, to improve your house or business. Maybe you need a new roof, want to replace old windows or doors to improve energy efficiency or need to rebuild a deck or porch. Review your list to see if it includes projects in any of the following building-related sections. If so, by slightly modifying your project plans you may be able to simultaneously improve the condition of the structure, add to its value and reduce your risk of wildfire damage. You also may decide to add new projects to the list, ones that can both provide vital protection against wildfire and, in some cases, save money on energy bills.

ROOF

WHAT YOU SHOULD KNOW

Replacing a roof is a major project, but it also yields major benefits. The roof should be a top priority. Research has shown that combustible roof coverings are the greatest threat to a house or business during a wildfire. Roof combustibility is described by a rating system – with Class "A" being the least combustible. Roof shape also plays an important role. Take a careful look at your roof. If you have a lot of ridges and valleys or roof segments that intersect with the vertical walls of the building, you have a complex roof. This makes your house or business more vulnerable to wildfires, even if you have a Class "A" roof, because vegetative debris can readily accumulate at the intersections and so can burning embers. Additionally, if the roof is adjacent to combustible siding the resulting fire can burn into the stud cavity and enter the entire building.

Here are some examples of roofing materials common in the Great Lakes region. Rolled roofing, also known as a flat or pitched roof, typically does not carry a Class "A" rating, but it is often used as an underlayment in a "Class 'A' by assembly" roof (learn more about this in the following section). Asphalt composition shingles usually are Class "A" fire-rated.

WHAT YOU SHOULD DO

Always keep the roof clean of debris.

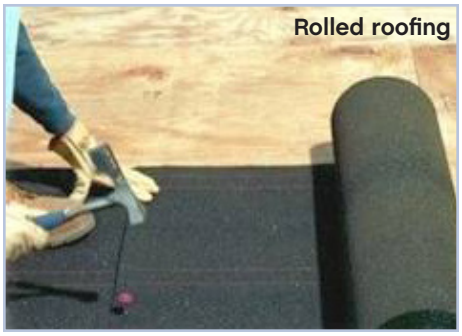
It can be difficult to tell whether you have a Class "A" fire-rated roof, unless it is made of an obviously noncombustible material, such as tile. If you are not sure about your roof, schedule a professional roof inspection to find out. If you replace your roof, choose a Class "A" fire-rated roof and completely remove the old covering.

Regardless of the specific Class "A" roofing material you choose, it must be inspected regularly, properly maintained and replaced when needed.

Here are some things to keep in mind when choosing a Class "A" roof covering:

- Many roof coverings have a Class "A" rating based only on the top/external covering (i.e., the part of the roof that you can see). Some common examples include asphalt composition fiberglass shingles, steel and clay or concrete tiles. Asphalt composition shingles also can use organic fibers instead of fiberglass, which would result in a Class "C" fire rating.

- Other roof coverings obtain their Class "A" rating because additional materials that enhance the fire resistance are used in the roof assembly. The assembly is composed of the roof covering that you see and the additional underlying materials that you can't see. These coverings are considered "Class 'A' by assembly." Examples include aluminum, and some of the newer composite roofs made from recycled plastic and rubber materials, which require an additional layer of a fire-resistant material (such as a fire-rated rolled roofing material) to achieve a Class "A" rating. Wood shakes also are now available with pressure-impregnated, exterior-rated fire-retardant chemicals that provide a standalone Class "B" fire rating, and can have a "Class 'A' rating by assembly."



Wood shake roofs are now available with chemical treatments that provide a Class "B" fire rating.

Asphalt shingles are available with Class "A" fire ratings, but also may use organic fibers that can result in a Class "C" rating with less fire resistance.

Rolled roofing, also known as a flat or pitched roof, typically does not carry a Class "A" rating, but it is often used as an underlayment in a "Class 'A' by assembly" roof (learn more about this in the following section).

- It is important to note that the fire rating of most roof coverings and assemblies is evaluated using new materials. One exception is wood shakes, which are subjected to a natural weathering protocol prior to roof fire testing. Keep in mind that over time, as the products weather, both wood shake and shingle roofs may become more vulnerable to fire.

EAVES, SOFFITS, ATTICS AND CRAWLSPACE OPENINGS

WHAT YOU SHOULD KNOW

Researchers have learned from post-fire surveys of buildings damaged and destroyed by wildfires that attic/roof and foundation vents are entry points for embers and flames. Depending on topography and the location of the building on the slope, vents in the eave and soffit areas and gable end vents, can be very vulnerable to the entry of embers. In flat terrain, the eave area can be somewhat protected from the heat of a wildfire, but winds can still blow embers into the area underneath the eave. There also can be risks associated with the most common type of eave, known as open (or exposed) eave construction, even if vents are absent. You have this type of construction if you can see the rafter tails from your roof framing on the exterior underside of the roof. If the blocking is improperly installed, gaps will exist where the blocking and rafter tails intersect; as a result, wind-blown embers could become lodged there and ignite debris and the wood.

WHAT YOU SHOULD DO

If you have vent openings into your attic or crawlspace, check for screening. At a minimum, these vents should be covered with ⅛-inch metal mesh screens (usually the finest mesh allowed by the building code). Post-fire surveys and laboratory research have shown embers large enough to cause ignitions of fine fuels can pass through ¼- and even ⅛-inch mesh screening, so while screening will help it won't be the perfect solution. Also, keep in mind that while a finer mesh screen will offer better protection against embers, it also requires more maintenance to keep it free of debris. It is important to keep air flowing freely to help manage the moisture in your attic and crawlspace (i.e., keep the moisture content low enough to avoid fungal problems).

Home and business owners in every area vulnerable to wildfire can benefit from new vents being designed as a result of stricter building codes in California. Although these vents may not be required in your state, they are designed to offer enhanced protection by reducing the chance embers will enter your space. These products are currently in the testing and approval phase. These vents can incorporate a finer mesh secondary screen that is set back in the vent device and other design features on the exterior side. Depending on the ease of accessing your vents, you could prepare vent covers using ½-inch plywood or a thin metal plate. Include the installation of the vent covers as part of your wildfire evacuation preparedness plan. These covers should be removed upon your return.

If you have open eaves (i.e., you can see the exposed rafters in the eave), you can inject a sealant (such as caulking) into any gaps that you observe or enclose the underside of the roof overhang to help keep embers from lodging there. To do this, fasten sheathing made from a noncombustible or ignition-resistant material to the underside of the rafter tails. This enclosure can follow

Boxed eave

Open eave

Open Foundation

the slope of the roof and is sometimes referred to as boxing-in the eave. This also can be accomplished by extending the material from the roof edge horizontally to the exterior wall, thereby making a soffited eave. If you have a vented attic or cathedral ceiling, don't forget to add soffit vents as part of your project. Position the vents close to the roof edge, not the exterior wall.

TILE AND OTHER NONCOMBUSTIBLE ROOF COVERINGS WITH GAPS ALONG THE EDGES

WHAT YOU SHOULD KNOW

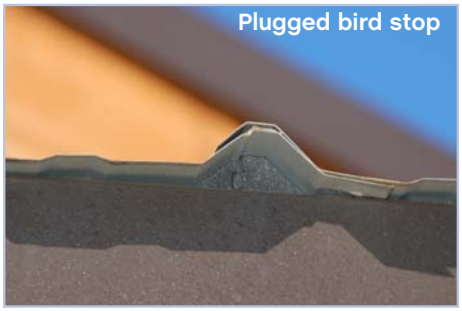
While asphalt composition shingles are the most common roof covering found in the Upper Mississippi Valley region, tile roofs are gaining in popularity. If you are unfamiliar with tile roofs, keep in mind that some roofing materials have a gap at the ridge and edge. The most common example is a clay barrel tile roof covering, but it also occurs in some metal roofs (mainly shingle style) and other cement (flat tile) roof coverings. Even with flat profiles, gaps will occur at the ridge of the roof. The gaps can allow birds and rodents to get into the opening and build nests. The small bits of vegetation used for nesting material are highly combustible, and easily ignited by wind-blown embers. The flames can then quickly spread to the structural members that support your roof and bypass any protection offered by Class "A" fire-rated roof covering materials.

WHAT YOU SHOULD DO

Use a form of protection called a bird stop to seal the open edges of the roof covering. Bird stops are a manufactured shield that can be purchased from roofing supply stores and are typically provided by the manufacturer of the roof covering. The bird stop is inserted into the opening at the edge of the roof. You can also use a mortar mix to plug the ends. The mortar mix would be the best option for openings at the ridge of the roof. Remember, the idea is to keep fuel sources, such as nesting materials and wind-blown debris, and embers from getting underneath the roof covering.

Do not forget to inspect the ridge (peak) of your roof. A flat tile roof may not have a gap at the roof edge, but it could have openings at the ridge. These openings also need to be closed.

Flat tile


Plugged bird stop

Smaller gaps can occur in standing seam metal roofs. As shown here, material is also available to plug the ends of these roof coverings.

GUTTERS

WHAT YOU SHOULD KNOW

Wind-blown vegetative debris and overhanging trees can lead to the accumulation of leaves and needles on your roof and in your gutters. Once dry, this debris can be readily ignited by embers from a wildfire. Debris accumulated in gutters and at roof-to-wall intersections are both particularly vulnerable to ignition by wind-blown embers. Even if you have a Class "A" fire-rated roof covering, such as tile, concrete or asphalt composition shingles, if vegetative debris ignites, it can expose the edge of the roof or, if your house or business has dormer windows, the exterior siding adjacent to the roof to flames.

Many checklists suggest replacing vinyl gutters with metal gutters. Debris in any gutter will be readily ignited by embers. Depending on the amount of accumulated debris, a vinyl gutter will likely quickly detach from the fascia due to deformation from heat or flames and fall to the ground. The debris will burn

Gutter with debris

out on the ground, potentially igniting any other vegetation or combustible siding. The metal gutter will remain attached to the fascia, and the ignited debris will burn out there, continuing to expose the edge of the roof to flames. The most fire-safe solution is to minimize the build-up of debris in the gutter.

WHAT YOU SHOULD DO

Remove tree branches that overhang the roof and any dead vegetation, including branches, within your defensible space, the zone where you are actively managing your vegetation. This should be part of your routine maintenance. Do this at least once each year, at a time best suited for the health of the tree or plant.

Clean gutters and roof areas where debris collects. Inspect these areas at least twice a year. Remove accumulated leaves, pine needles and any other combustible debris.

Covering your gutters with screens or other cover devices can minimize the build-up of debris. Remember that even gutters with screens should be inspected to make sure covers are still in place and performing properly. Some screens and cover devices will keep debris out of the gutter, but debris can still accumulate on the roof behind the device. If ignited, this can increase your vulnerability if you don't have a Class "A" roof. Even if you have a Class "A" roof, debris should still be removed on a regular basis to reduce ember generation and exposure to other building components.

WINDOWS AND DOORS

WHAT YOU SHOULD KNOW

The doors and windows of your house or business should be able to resist wind-blown embers and protect against radiant heat and flame exposure. Depending on the type of glass, a window that is exposed to flames may break after only 1 to 3 minutes of exposure to intense heat (radiant exposure) or flames. When windows break from exposure to heat and/or flames, embers and flames can get inside. Testing has shown that single-pane windows are highly vulnerable to breaking when exposed to wildfire conditions. While single-pane, tempered glass windows perform better than dual-pane, annealed glass windows, the best protection is provided by dual-pane, tempered glass windows. Remember, even dual-pane, tempered glass windows will not protect your house or business if they are left open. So, close all windows before you evacuate during a wildfire.

Studies have shown that the glass is the most vulnerable part of the window as opposed to the frame. Glass breaks because of temperature differences that develop between the exposed glass and the glass protected by the window framing material when the window is subjected to the heat from a wildfire (or the heat from your neighbor's burning house or business). Cracks develop at the edge of the glass and propagate inward, which makes larger windows more vulnerable to breaking because they tend to have more edge than smaller windows.

The outer pane of this dual-pane window broke during a 2007 wildfire. Having the dual-pane window was one reason why this home survived.

Tempered glass in a window will have a marking etched on one of the corners, similar to that shown here.

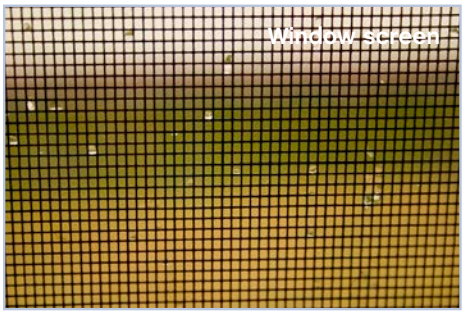
WHAT YOU SHOULD DO

Determine what kind of windows are in your house or business. Single-pane windows are more common in older structures. Dual-pane windows have two sheets of glass that are separated by airspace. Regardless of what types of windows are in place, the key is the use of tempered glass. To find out if your windows contain tempered glass, look for an etching (called a bug) in the corner.

You should replace your windows with ones that have tempered glass, preferably dual-pane windows that have at least one pane of tempered glass on the outside. Remember, dual-pane windows without tempered glass don't protect as well in wildfire conditions. Current energy code requirements usually require dual-pane windows, upgrading will increase both fire resistance and energy efficiency.

If you cannot afford to replace your windows, it is important to manage the fuels close to your house or business, including the surrounding vegetation, and use noncombustible mulch and ignition-resistant materials for yard structures. Once you have done this, and provided your windows are accessible, a less expensive alternative would be to make shutters out of ½-inch plywood. Cut them to size and label them for each window so they can be installed quickly when wildfire threatens.

Take the time to pre-install the anchorage hardware and prepare your shutter materials in advance. The ½-inch plywood will provide an extra measure of protection from radiant heat or the impact of wind-blown embers. Shutters that are used when buildings are closed seasonally also can be closed during wildfires. Some seasonal-use buildings may already have shutters in place to provide protection against intrusion and damage from falling tree limbs during the off-season.



DECKS, PATIOS AND PORCHES

WHAT YOU SHOULD KNOW

Decks, patios and porches are important because they often are attached to the house or business and are next to windows, sliding glass doors, and possibly combustible siding. Consider the construction material used to build the deck, patio or porch, along with the types of items that are on and beneath it. This includes vegetation leading up to the structure, which can act as a wick and move the fire through to the building materials, igniting it and other items stored underneath or nearby. This is particularly important for decks when the house or business is sited on a sloped lot. Depending on the type and condition of the vegetation, flame lengths on a slope can reach more than 30 feet, so even an elevated deck can be vulnerable.

It is common knowledge that wood deck boards are combustible. There is sometimes a misunderstanding regarding the combustibility of wood-plastic composite decking products. These products also are combustible; some manufacturers are now incorporating fire retardant chemicals into their products, and fire performance information for many decking products is now available online at the manufacturer's Web site. Wood decking that has been treated with an exterior fire retardant also is available.

Some checklists and guides suggest attaching a metal flashing strip, approximately 18 inches tall, between the top of the deck, patio or porch and

Use noncombustible materials when building a deck. Never store flammable materials on top of or beneath the deck.

the exterior (combustible) siding. The purpose of the flashing strip is to provide protection from ember exposure – both the embers themselves and the flaming exposure that could occur if accumulated debris at the point where the house or business intersects with the deck, patio or porch were ignited by the embers. This is a good idea, as long as the flashing is tucked in behind the siding where the top of flashing terminates so water cannot seep between the flashing and the siding.

WHAT YOU SHOULD DO

Enclosing your elevated deck, patio or porch can help reduce the risk of damage from wildfire. These can be enclosed vertically by applying an exterior siding product around the edge of the deck, patio or porch or horizontally by applying an exterior panelized product to the bottom of the support joists.

To determine if enclosing your deck, patio or porch would be beneficial, consider whether you store combustible materials underneath it, or if your vegetation management plan is inadequate, particularly in the 0- to 30-foot zone. If you can avoid storing combustible materials underneath and if you create and maintain your vegetation management plan, enclosure will not significantly increase the protection of your house or business from wildfire.

If you choose to enclose your deck, patio or porch make sure you provide sufficient ventilation or other means for water to drain out. The building code requirement for a crawlspace is one square foot of venting for each 150 square feet of floor area. You should have at least this much ventilation and maybe more if you are in a particularly wet area. If you do not allow the structural support members and boards to dry out, fungal decay will become the biggest threat to your deck, patio or porch.

Enclosing your deck, patio or porch will not reduce the risk of the top being exposed to embers. For that, the best protection is to keep the surface clear of leaves, pine needles and other vegetative debris. If your house or business is supported by a column and beam system, and it doesn't have skirting around the perimeter, add a skirting of an ignition-resistant material. Remember to provide vents on all sides to ensure proper ventilation.

Learn more about how to choose wildfire-resistant decking materials at: http://www.fire.ca.gov/fire_prevention/fire_prevention_wildland.php.

SIDING

WHAT YOU SHOULD KNOW

Siding can be vulnerable for two reasons. First, if ignited, combustible siding can provide a path for flames to reach other vulnerable components of your house or business, such as windows and the eave area. Second, if penetrated, a horizontal or vertical lap joint can provide access for flames to enter the house or business. Combustible siding products increase the likelihood of flame penetration at lap joints.

Log buildings will resist ignition better than smaller members, which are typically used for wood siding products. The most vulnerable part of a log wall is between log joints, but this risk is minimized if the joint is chinked with a resistant material that provides protection from flame penetration. Log houses or businesses with more complicated joints (e.g., scribed log joint, profiled

log-to-lap joint) would be less vulnerable to fire penetration at the joint. Wood siding with a more complicated lap joint, such as tongue-and-groove or shiplap, offers better resistance than other bevel-type joints from flame penetration into the stud cavity. Incorporating an underlying sheathing material into the wall assembly will improve the ability of any siding material to resist lap-joint penetration.

Vinyl siding, which is not commonly found in this region, will deform and fall off the wall at relatively low radiant energy or flame exposure during a fire. In these cases, protection of your house or business will depend on the performance of the underlying sheathing material.

Noncombustible siding such as fiber cement will provide the best protection. Wood siding that has been treated with an exterior-rated fire retardant chemical will also improve the performance of siding against both radiant and flaming wildfire exposures.

WHAT YOU SHOULD DO

If you have combustible siding, consider incorporating a noncombustible zone next to your house or business. In order to best resist fire penetration at lap joints, avoid plain bevel lap joints or use exterior-type fire retardant treated siding. If you have a chinked-style log house or business, inspect the chinking for cracks and missing pieces. Repair and replace with ignition-resistant chinking.

Replacing siding is expensive. There are other, less expensive items discussed in this guide that will provide more protection for your house or business.

FENCES

WHAT YOU SHOULD KNOW

Fences can be a wildfire hazard, particularly if they connect directly to the house or business. The bottoms of fences collect debris that, when combined with combustible materials can become a fuel source and act as a wick to carry fire directly to the structure.

Some checklists recommend inserting a metal shield where the fence connects to the exterior combustible siding. How effective this will be contingent on the size of the metal. Also, depending on how it is attached, over time it may result in other moisture-related degradation problems with the siding. The following section provides more effective solutions.

Use metal gates and noncombustible materials when installing or replacing a fence.

WHAT YOU SHOULD DO

New fences should be entirely constructed of noncombustible or other ignition-resistant materials. A wood frame with steel mesh infill is another option that will provide adequate protection. Existing wood fences that are attached to the house or business should be retrofitted so the fence ends with a noncombustible material like masonry or metal, or with a larger wood member (i.e., heavy timber) to keep fire from spreading to the house or business. A

common technique is to use a metal gate that is attached to the fence on one side and to the exterior siding on the other side.

It is important not to store firewood or other combustible materials against the fence, and to regularly remove debris and dead vegetation at the bottom of the fence.

CHIMNEYS

WHAT YOU SHOULD KNOW

Spark arrestors are required to prevent large embers from escaping through your chimney. Think of it as a community-wide approach to wildfire protection – you protect your neighbors and they protect you by having a chimney spark arrestor.

WHAT YOU SHOULD DO

Install a spark arrestor that has ½-inch mesh. These are available at lumber yards, hardware stores or fireplace specialty stores.

CREATING DEFENSIBLE SPACE

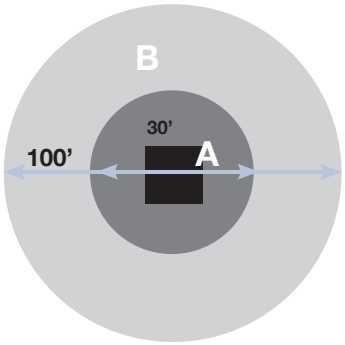
IDENTIFYING FUEL MANAGEMENT ZONES

The first zone is the one closest to your house or business extends outward at least 30 feet (or to the property line). This zone will require the most thinning and (horizontal) separation of trees and other vegetation and removal of items that could cause a very intense fire close to your house or business. The objective of the thinning and separation in this zone is to reduce the chance that vegetation will provide flames with a direct path to your house or business. The other kinds of items to be removed include wood structures, boats, RV's and other items that could create a very intense fire close to your house or business.

The next zone extends from 30 feet to approximately 100 feet or to the property line. Trees and other vegetation here should be maintained and dead plant materials and tree branches should be removed. The objective of the work in this zone is to slow down and reduce the energy of the wildfire and drop any crowning fire to the ground.

In forested areas, there is a risk that a wildfire could spread to the tops of the trees. By making modifications in the 30- to 100-foot zone, including increasing the separation between trees and vegetation and eliminating tree branches located close to the ground, you can help drive the wildfire back to the ground before it reaches your house or business. These improvements also will help to reduce the chance that a fire will climb back up into the crown of the tree. Once created, it is critical to maintain these modifications.

Because of the importance of the area closest to your house or business, some experts suggest an additional zone that extends from 10 to 15 feet from your structure. In high risk areas, particularly in areas with a lot of vegetation, this extra attention needs to be extended throughout the full 30-foot zone. Pay close attention to the types of vegetation and mulch you select for this area. Whatever types of plant materials are chosen, they must be carefully



Defensible space involves two zones extending out from a home or business.

maintained. There are products on the market such as noncombustible mulches, including rock, gravel and noncombustible hardscape features, such as brick and concrete walkways, and surfacing that will reduce your wildfire exposure. Choosing low-growing, irrigated herbaceous plant materials is another good option.

THE AREA CLOSEST TO YOUR HOUSE OR BUSINESS (0 TO 30-FEET)

Take stock of what is in your yard and the common areas outside your business. Consider the plants, but look beyond them to other items that could increase the risk that your house or business will catch on fire.

PLANTS

WHAT YOU SHOULD KNOW

Close to a building, plants can become a major fire hazard. Plants adjacent to combustible siding, as well as plants underneath or next to windows or the interior corners of buildings, present the greatest hazard. Embers from a wildfire can reach a house or business from a mile or more away, and can become lodged in corners, igniting nearby plants and exposing siding and the roof overhang to flames.

WHAT YOU SHOULD DO

Remove dead vegetation close to the house or business, paying attention to material on and underneath plants. Mulch can help keep the ground moist and reduce the need for watering, but it also can become a fire hazard. Avoid using wood, bark and rubber mulch products, particularly small pieces of bark or those with hairy components such as “gorilla hair” mulch. Consider rock mulch or other noncombustible materials. For plants, shorten the height, remove branches that are close to the ground, prune to reduce the amount of material in the plant, and remove dead material.

BETTER VEGETATION CHOICES FOR YOUR AREA

Choose fire-resistant plants. Learn more about choosing plants, and community-based programs by visiting the links at DisasterSafety.org/megafires or directly at:

Michigan
http://michigan.gov/dnr/0,1607,7-153-30301_30505_30816-24040--,00.html

Minnesota
http://www.dnr.state.mn.us/firewise/landscaper.html
http://www.boreal.org/fireinfo/house or businesssafe.html

Wisconsin
http://www.dnr.state.wi.us/forestry/fire/prevention/firewise/vegetation.htm

YARD AND GARDEN STRUCTURES

WHAT YOU SHOULD KNOW

Arbors, pergolas or trellises, combustible fencing, playground equipment, gazebos and other structures located close to your house or business will increase its vulnerability to wildfire. Wind-blown embers can accumulate in or on such structures and ignite them. Depending on how close the items are to a building, they might act as a fuel source driving the fire to your house or business. Trellises and pergolas are especially susceptible because they are often made of wood, are covered with vegetation, and are attached or adjacent to the structure.

Wooden playground equipment can be a fire risk if located too close to a home or business.

WHAT YOU SHOULD DO

Consider removing arbors or pergolas made from combustible materials. Structures made from metal and other noncombustible materials would be acceptable choices. Wood arbors and pergolas can be more resistant to fire if they are made with exterior-rated, fire retardant lumber, or larger dimension material. If you go this route, you should also use the heartwood of a naturally durable species (such as cypress or cedar). A treatment for lumber that functions as both a fire retardant and a preservative against wood-destroying organisms is not available. Even when a larger dimension material is used, remember that wood members with smaller cross-sections ignite and burn more easily. You could also consider mixing materials - the supporting structural members could be large timbers and the smaller members could be noncombustible. Don't forget to remove dead vegetation on these structures. Keep all yard structures free of accumulated debris. Any structures, such as a child's play set or gazebo, built from combustible materials, should be relocated at least 30 feet away from the house or business.

OUTBUILDINGS, FUEL TANKS AND FLAMMABLE PERSONAL PROPERTY

WHAT YOU SHOULD KNOW

All buildings on the property face the same types of risks when it comes to wildfire. Once ignited, these buildings would act just like a large plant, bringing flames closer to the house or business and potentially resulting in ignition. If ignited, outbuildings will burn much longer than a typical plant, resulting in a longer fire exposure for any other buildings on the property. They also will generate their own embers. Boats, RVs and other personal property also can burn very intensely. They should be protected inside a building or parked at least 30 feet from the house or business.

Locate propane tanks at least 30 feet from a home or business and create defensible space around the tank.

If fire comes too close to exterior liquefied petroleum (LP) tanks, a leak can develop at the pressure relief valve, resulting in a column of flame. Flame impinging on the upper surface of the tank can result in an explosion, particularly when the fuel level is lower. It is important to follow your local building code requirements regarding tank placement. It is also important to

locate propane tanks at least 30 feet from your house or business and to create 10- to 15-feet of defensible space around the tank.

WHAT YOU SHOULD DO

Relocate combustible outbuildings at least 30 feet away from your house or business. Other options are to create defensible space around the outbuilding or to incorporate noncombustible or ignition-resistant materials into the building.

If necessary, relocate propane tanks at least 30 feet away from your house or business. Create a noncombustible zone within 10 feet of the tank. Another option is to enclose the tank. If enclosure is used, it should be made of noncombustible materials (i.e., fiber cement siding, stucco, or metal.)

FIREWOOD, LEFTOVER BUILDING/CONSTRUCTION MATERIALS AND COMBUSTIBLE MULCH

WHAT YOU SHOULD KNOW

It may seem obvious, but firewood, combustible mulch or other combustible materials located too close to a house or business can act as a fuel and spread wildfire. Mulch offers several beneficial attributes to the soil, including weed and erosion control and water retention, but it does come with a certain measure of wildfire risk. Carefully balance the benefits of mulch with the potential risk from spreading fire to the house or business.

The ease with which combustible mulches ignite, and the speed with which fire will spread, will depend on the characteristics of the particular mulch. All mulches will burn. Smaller mulches or ones that have fine fuel component (hairy bark or needle mulches) will ignite and spread fire more quickly. Studies have shown that composted mulches perform better than other combustible mulches, but even this material exhibits smoldering combustion. Learn more by watching the mulch burning demonstration video at www.livingwithfire.info.

WHAT YOU SHOULD DO

Move firewood and leftover building/construction materials, and items such as wheelbarrows containing these materials, as far away as possible from your house or business. Firewood piles should be located at least 30 feet from any building on the property. Consider using noncombustible mulches in the area immediately adjacent to your house or business.

ASSESSING AND MANAGING SURROUNDINGS BEYOND 30 FEET

VEGETATION MANAGEMENT

WHAT YOU SHOULD KNOW

If your house or business faces a wildland and you own or can get access and permission to modify the vegetation in the area between 30 and 100 feet from your building, you should manage the vegetation to reduce the intensity of the fire in this area and make sure that it does not progress beyond a surface fire.

WHAT YOU SHOULD DO

You should regularly remove any dead brush from this extended fuel modification area and thin out trees, including removing branches close to the ground, so that a crown fire cannot be supported and a fire on the ground will not climb up into the tree canopy.

IMPORTANCE OF TOPOGRAPHY

WHAT YOU SHOULD KNOW

The topography around your home or business, which includes the slope of the land and the direction the structure faces, is a major consideration in assessing your risk exposure to wildfire. Wildfires burn up a slope faster and more intensely than along flat ground. A steeper slope will result in a faster moving fire, with longer flame lengths.

WHAT YOU SHOULD DO

Determine the steepness of the slope. Select a mark on the slope and walk ten paces downhill, if your head is below the mark you have a steep slope.

If your house or business is mid-slope, or at the top of a slope but set back less than 15 feet for a single-story and 30 feet for a two-story building, fire science research indicates a need to take additional precautions. These include being more aggressive with your vegetation modification and maintenance plan and more aware of the materials used to build the house or business, deck or any outbuildings. You also will want to push the fuel modification area beyond the 100-foot length if at all possible. A target for the extended fuel modification area would be between 150 feet and 200 feet.

Consider increasing the protection of your house or business by constructing a noncombustible retaining wall to help increase the set back. When making future improvements, incorporate ignition-resistant features and materials into the house or business and surrounding landscape.

IMPORTANCE OF ENVIRONMENTAL CONDITIONS

WHAT YOU SHOULD KNOW

Higher wind speeds are frequently associated with fast moving wildfires. Strong winds blowing a fire toward your house or business will have the same effect as being located on a slope, that is to say the fire will move faster, burn more intensely, blowing embers in front of the fire. The flame lengths also will be longer.

WHAT YOU SHOULD DO

If your house or business is located on the side of a development that faces into the prevailing strong wind direction or on a side that is parallel to the prevailing strong wind direction, consider pushing the fuel modification area beyond the 100-foot length if at all possible. A target for the extended fuel modification area would be between 150 and 200 feet.

DEFENSIVE ACTIONS

WHAT YOU SHOULD KNOW

Some states, including northern Minnesota, have been given grants from the Federal Emergency Management Agency (FEMA) for the installation of exterior roof-mounted fire sprinklers. The use of exterior sprinklers is considered a defensive action and a primary use is to help limit the spread of the fire to the house or business. The sprinklers would be turned on prior to evacuation.

Using exterior sprinklers can help to reduce the chances of a house or business being damaged by a wildfire, but like all other actions that can be taken, it requires planning and the system must be maintained. It must also be treated as one component of a fire safe plan and it does not eliminate the need for other actions recommended in this guide.

WHAT YOU SHOULD DO

If you are considering an external sprinkler system, check with your local fire department. They may have installation plans, and other suggestions. In order to maximize the effectiveness of exterior sprinklers, they should be operated by a stand-alone, independent water system (i.e., tank, pool, or lake) and must be attached to a pressurized delivery system or use a generator for needed pumps.

Separate water and power supplies will reduce the reliance on municipal power sources, which could be affected by the wildfire, and water sources that could be needed by firefighters to protect other properties.

Minnesota Grant Program:
http://co.cook.mn.us/index.php/fema-sprinkler-grant

Wisconsin Department of Natural Resources publication:
http://dnr.wi.gov/forestry/fire/pdf/sprinklers_for_house or business_fire.pdf

YOUR HOME OR BUSINESS	REQUIRED ACTION OR RETROFIT	RELATIVE COST
ROOF COVERING - Your roof, both in terms of its covering and design, is the most vulnerable part of your home or business when considering exposure to wildfire.		
1. Do you have a non-combustible or Class "A" roof?	A professional roof inspection can help determine this. If not, replace your roof covering with a Class "A" fire-rated covering. Many styles are available.	$$$$
2. Do you have a tile or metal roof? If yes, are the gaps between covering and roof sheathing, which can occur at the edge and ridge, filled with either a bird stop or other material to seal the openings? Are there other roof openings?	Install bird stops. Plug any roof openings that are not functioning as vents.	$-$$
3. Do you have combustible siding where a lower level roof meets and on the upper level roof or wall?	Replace siding with a more fire-resistant material.	$$-$$$$
4. Has vegetative debris accumulated on your roof?	Ember accumulation at the roof-wall intersection increases the risk of fire exposure, particularly if combustible siding is present. The problem is exacerbated with a buildup of debris. Routinely remove debris from the roof. Consider hiring a professional to help with this task.	FREE
VENTS are vulnerable to wind-blown embers and flames from nearby vegetation, combustible siding that has ignited or if combustible materials are stored nearby that could potentially catch on fire. Maintaining appropriate defensible space will help minimize wildfire risks.		
1. Are your vents covered with ⅛-inch mesh metal screens?	There are many types of new vents on the market that are designed to reduce the risks of wind-blown embers getting inside. Consider installing new vents; availability and styles will vary by region. A less expensive alternative is to attach a minimum of 1/8-inch mesh metal screens over existing vents.	$
2. If your vents are not covered with metal screens, have you attached ⅛-inch mesh metal screens and have you prepared vent covers that can be easily installed when a wildfire is approaching?	Attach screens and/or prepare covers. Attaching a solid cover would provide additional assurance that large embers would be kept out of the attic or crawlspace. Since the primary purpose is to prevent embers from getting inside your vents, ½-inch plywood could be used. Keep the areas around the vents clear of vegetation and other combustible materials. Install covers before evacuation and remove them upon your return. Use caution when installing and removing covers over vents on higher floors.	$

3. Are you planning to replace vents?	Several ember-resistant vents were recently accepted for use under the strict new California Building Code. These are a good idea for any home or business owner in any wildfire-prone state. Find a list of accepted vents at: http://osfm.fire.ca.gov/	$$
GUTTERS - Debris can collect in gutters and become fuel for falling embers during a wildfire. It's then possible for the fire to burn into the attic space.		
1. Has vegetative debris accumulated in your gutters?	Clean out your gutters on a regular basis. Use caution when doing this or consider hiring a professional to complete the task.	FREE
2. Have you installed gutter cover devices that are available to help keep your gutters clear of debris?	Consider installing a gutter cover device to help manage debris buildup. A number of designs and devices are available. Devices can result in the accumulation of debris on the roof area behind the gutter, so maintenance is still required.	$$-$$$
EAVES - Eaves are vulnerable to flame and ember exposures and can provide a way for a wildfire to get into your attic.		
1. Do you have boxed-in or open-eave construction? Because of the gaps that typically occur between blocking and rafter tails, open-eave construction is more vulnerable in wildfire conditions. Are these gaps visible?	Plug openings in open-eave area with durable caulk, or install a non-combustible covering over blocking to eliminate openings. An alternative method is to enclose or box-in the eaves. This method may require that vents be installed in the soffit material to allow for excess moisture to be removed from attic and enclosed soffit spaces, particularly if combustible siding is present, combustible materials are stored adjacent to the building, or the nearby vegetation is poorly maintained.	$-$$$
2. If your eave area is boxed-in, is the soffit material non-combustible?	Replace with non-combustible or other material that is fire or ignition-resistant. Common soffit materials include those that are non-combustible, such as a fiber-cement product or exterior fire-retardant treated plywood, or combustibles such as plywood or solid wood boards. Vinyl soffit materials are not recommended due to the lower temperature at which it will deform and sag.	$$-$$$

Notes

WINDOWS - During a wildfire the most vulnerable window is one that is open. The most vulnerable part of a closed window is the glass. Close windows to prevent embers and flames from entering the home.		
1. Do you have single-pane windows?	At a minimum, install dual-pane windows, which will provide more protection from wildfire. Preferred are dual-pane, insulated glass windows, which have the added benefits of greater energy conservation and insulation during cooler and warmer months.	$$$-$$$$ Costs vary with the location and number of windows.
2. Does your window have tempered glass?	Tempered glass is about four times more resistant to breaking during a wildfire. When replacing single-pane windows consider dual-pane, tempered glass. This will provide significant wildfire protection against flames and wind-blown embers. The cost increases are relative to the opening size.	
3. Do your windows have shutters?	Shutters and pre-made covers will protect your window from wildfire exposures such as embers, the impacts of other airborne debris and radiant heat exposures. These devices would be installed prior to evacuation and removed upon returning to the property.	$-$$$
4. Have you made covers for your windows that can be easily installed prior to evacuation during a wildfire?	A less expensive alternative is ½-inch plywood. Before installation, clear the surrounding area of vegetation and other combustible materials that could ignite the plywood covers.	$$

Notes

SIDING - Fire from ignited siding can spread into the stud cavity and up the wall into the eave and the soffit area. Vertical fire spread up the wall also can expose the windows to flames.		
1. Is your siding made of a noncombustible material?	Re-siding is an expensive, and can be a worthwhile proposition, particularly if the surrounding defensible space is inadequate or if the building is 15 feet or closer to surrounding properties that, if ignited, could spread the flames. Panelized products have fewer lap joints, so can be considered less vulnerable. Wood siding shingles and plain bevel lap joints are the most vulnerable to flames. Since noncombustible siding won't ignite, vertical flame spread will not be a problem unless you have stored combustible materials or planted highly flammable vegetation next to the wall. Vertical flame spread also will be minimal when ignition-resistant material (e.g. exterior fire retardant-treated wood) is used. Siding products and assemblies that are better able to resist the penetration of flames into the stub cavity can be found at http://osfm.fire.ca.gov/strucfireengineer/pdf/bml/wuiproducts.pdf	$$$$
2. If you have a combustible siding product (e.g., wood siding), is it a panel or horizontal lap product?		
3. If you have a combustible horizontal lap siding product, does it have a simple lap joint, such as a plain bevel joint?		

Notes

YOUR SURROUNDINGS	REQUIRED ACTION OR RETROFIT	RELATIVE COST
DEFENSIBLE SPACE - This is the area within 100 feet of your home or business or to your property line and should be thought of in three sections: 0-5 feet, 0-30 feet and 30-100 feet. The purpose of defensible space is to modify the landscape through pruning and maintaining it to keep a wildfire from getting too close to the structure.		
0 to 5 feet	Plants adjacent to combustible siding, as well as plants under or next to windows or interior corners present the greatest hazard. Embers may still be able to ignite individual islands of plants, so plant selection and maintenance is most critical in this zone. Avoid plants with the following characteristics: 1. Generate ground litter from bark, leaves, or seeds that slough off 2. Have (very low moisture content) dead material within the plant 3. Have small branches and needles that can easily ignite 4. Have a high resin or volatiles content	
0 to 30 feet	In this zone, the goal is to prevent any surface fire from burning up the building. Prune lower branches in trees and remove nearby shrubs (ladder fuels) to prevent the fire from moving back into the tree crown, Separate groups of non-tree vegetation to make it more difficult for fire to move horizontally.	FREE - $
Do you have vegetation that is close to, adjacent to or under vents, soffits or windows?	Carefully maintain or remove. All vegetation needs to be maintained, but ground cover or small plants will be less of a problem here. Larger plants, particularly those that tend to generate an abundance of dead material will pose a significant threat to your home or business.	FREE

Notes

TREES		
1. Do trees or branches hang over your home or business?	Prune back to a minimum of 10 feet from your home or business.	FREE-$
2. Are your trees pruned to eliminate ladder fuels? Ladder fuels are those that will allow fire to climb up the bark and into the upper portion of the tree	Prune trees to eliminate ladder fuels.	FREE-$
Has vegetative debris accumulated in the areas that connect the deck and walls, under the deck or at the base of exterior walls or fencing?	Inspect for and clear all vegetative debris on a regular basis.	FREE
LP Tank - If fire comes too close to exterior liquefied petroleum (LP) tanks, a leak can develop at the pressure relief valve, resulting in a column of flame. Flame impinging on the upper surface of the tank can result in an explosion, particularly when the fuel level is lower.		
Is your LP tank located within 30 feet of your home or business?	Relocate your LP / Propane tank.	$$-$$$

Notes

Have you created a defensible space around it?	Created 10 to 15 feet of defensible space around your LP / Propane tank.	FREE - $
DECKS - If ignited, decks will lead a wildfire directly to your home or business. The flames can burn siding, break the glass in nearby windows or sliding glass doors, and ignite the eaves and vents. All of these scenarios result in fire moving into your structure.		
1. Are your deck boards made of combustible material? (i.e., solid wood or one of the wood plastic composite products). There are a limited number of metal (non-combustible) deck boards. Exterior fire-retardant treated lumber can also be used to decrease the vulnerability of the deck to wildfire.	When it's time to replace the deck, choose a fire- or ignition-resistant material. As previously mentioned, the new California Building Code requirements pay strict attention to wildfire risks. Learn more about how to choose wildfire-resistant decking materials at http:// osfm.fire.ca.gov/strucfireengineer/pdf/bml/wuiproducts.pdf	$$$-$$$$
2. Do you have combustible materials stored under or on top of your deck?	Move this material to an enclosed area away from your home or business. If you choose to enclose the underside of your deck, be sure to address moisture management issues through drainage and ventilation.	FREE-$$

Notes

FENCES		
Does a fence come within 5 feet of your home or business, or come into direct contact with it?	Replace with a noncombustible fence or use noncombustible components such as heavy wire mesh in a wood frame. Noncombustible fencing (at least a 5-foot span) should be used in locations where the fence is directly attached to the building.	$-$$$
YARD STRUCTURES – Any fuel source, decorative or functional, within 30 feet of your home or business.		
Do you have any playground equipment, firewood, trellises or other yard features that could bring flames too close?	Combustible structures should be moved 30 feet to 50 feet from the home or business.	FREE

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