

MODULE 3: CREATING AND MAINTAINING A DEFENSIBLE SPACE

Outline

- A. Creating and Maintaining a Defensible Space
- B. Definition of a Defensible Space
- C. Rationale for Creating a Defensible Space
- D. Debunking the Myths About Defensible Spaces
- E. Federal, State, and Local Guidelines for Defensible Spaces
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MODULE 3 GOALS

The goal of this module is to provide basic information about creating and maintaining a defensible space, tailored to the shrub steppe. The module content defines a defensible space, provides a rationale for creating a defensible space, and discusses some of the myths associated with defensible spaces. It also discusses defensible spaces found in forested and in urban areas as well as the unintentional consequences of creating a defensible space. Finally, the module will provide some guidelines for creating a defensible space and offer suggestions for creating and maintaining a defensible space in the shrub steppe.

The objectives for this module are:

- Increase participants' ability to define a defensible space.
- Increase participants' knowledge about the importance of defensible spaces.
- Increase participants' knowledge about traditional defensible spaces.
- Increase participants' ability to mitigate the unintentional consequences of creating defensible spaces.
- Increase participants' understanding of the myths surrounding the creation of a defensible space.
- Increase participants' ability and likelihood of creating a defensible space to protect property and life.

DEFINITION OF A DEFENSIBLE SPACE

A traditional defensible space is an area around a man-made structure where vegetation, debris, and other types of combustible fuels have been treated, cleared or reduced to slow the spread of fire (FEMA, 2008). Defensible spaces serve as a buffer between the structure(s) on a property and surrounding combustible fuel sources. The buffer may be a natural or intentionally constructed feature whose purpose is to reduce potential fire danger from windblown embers, direct flame contact, and/or radiant heat.

To create a defensible space in the shrub steppe, however, it is necessary to expand this definition. While they still serve as a buffer to ward off fire danger, defensible spaces in the shrub steppe protect more than structures like houses, barns, windmills, and equipment sheds. They are designed to protect fences, haystacks, fallow fields, crops, pasture, watering holes/ponds, and livestock. They can be designed also to protect wildlife and wildlife habitat.

RATIONALE FOR CREATING A DEFENSIBLE SPACE

The unpredictable nature of fire makes it difficult to plan for when developing land in or near areas that are susceptible to wildfire. In recent years, however, a record number of devastating wildfires have raised awareness of the dangers of fire, particularly in western states. Many communities have witnessed firsthand the intensity of wildfires and how quickly they can spread, change course, burn thousands of acres and dozens of structures, and take human life—all in the blink of an eye.

This is especially true when communities intersect with wildlands. The area where communities and wildlands meet is called the Wildland Urban Interface (WUI). In these areas, both communities and homes are at great risk of wildfire. Risks are exacerbated by population growth and increased housing development. If the risks are to be mitigated, building both resilient structures and resilient communities within the WUI is paramount. It is the only way humans can safely co-exist with wildfire on the landscape; this is especially true in the shrub steppe.

The maps in figures 1 and 2 represent the hazard potential of wildfire and the risk to homes throughout the United States. It is clear from both maps there is significant risk of wildfire in the intermountain west where a large part of the shrub steppe exists.

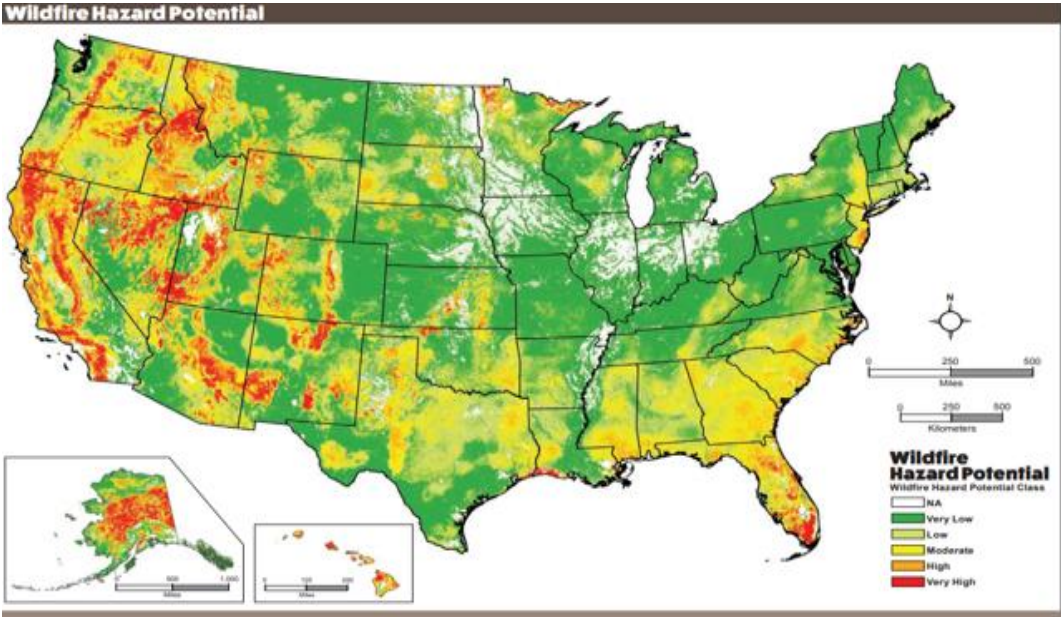


Figure 1: Wildfire Hazard Potential for Communities in the United States
US Forest Service: Department of Agriculture

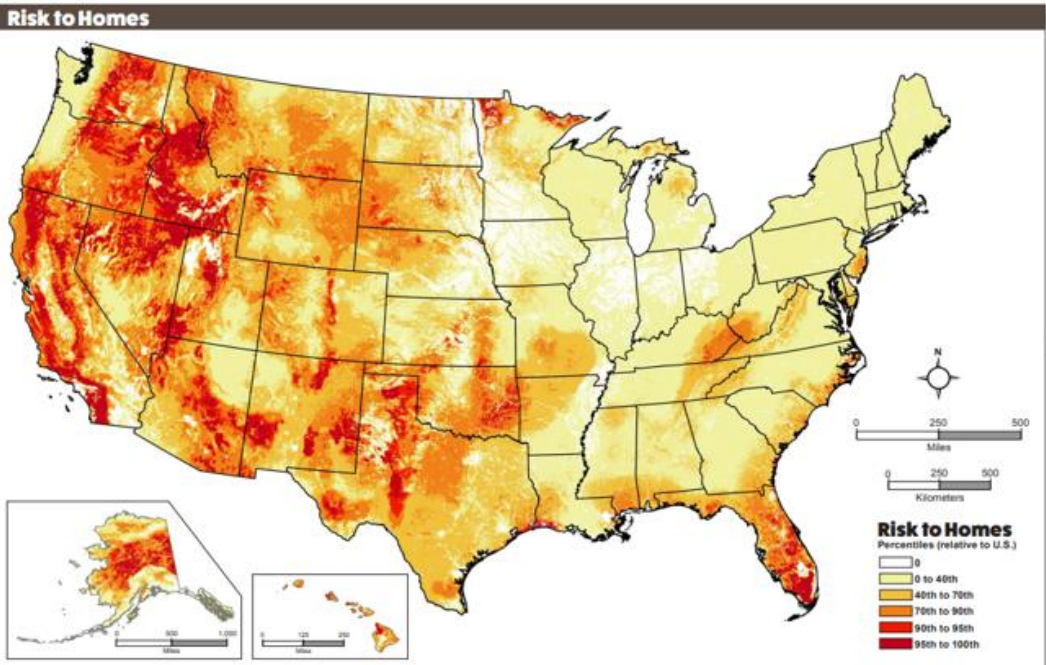


Figure 2: Wildfire Risk to Homes in the United States
US Forest Service: Department of Agriculture

These two graphics make it clear that creating defensible spaces in the shrub steppe is important. The high risk of fire encroachment is not the only reason to create defensible spaces, however.

There are many other reasons to create defensible spaces as well. Defensible spaces are known to improve chances of surviving a wildfire; help firefighters; and protect wildlife. In addition, they can be created in cost effective ways by homeowners or landowners. The narrative below examines each of these reasons in more depth.

First and foremost, defensible spaces can save lives—the lives of property owners and the lives of those responding to the wildfire. By creating and maintaining defensible spaces, property owners take a precautionary measure that improves the likelihood they, their structures, crops, livestock and fields will be saved. [Fields can be affected by high intensity fires that cause the soil to suffer nutrient loss (McColl & Grigal 1977) that in turn decreases site productivity (Carter & Foster 2003)]. For farmers and ranchers in rural shrub steppe communities, defensible spaces may very well save families and entire livelihoods that rely on crops and livestock for food and income.

Although all humans in a fire zone are at risk, firefighters, especially, put themselves in great danger to mitigate the impact of wildfire. Defensible spaces were originally created to provide firefighters with a “safe zone” from which to work. By creating and maintaining defensible spaces, property owners help alleviate the stress and risks associated with firefighters carrying out their duties. A space that meets defensible space requirements also can provide a safe space for firefighters and other first responders to get organized, regroup, park, or seek refuge from encroaching flames. Through this lens, a defensible space means fire crews have one less worry and increases chances of early containment.

As humans are in danger during a wildfire, so are wildlife. Saving buildings and crops, however, de-escalates both the chance of fire and the severity of a wildfire should one occur. This, in turn, protects surrounding wildlife communities. Whether plants or animals, wildfires can displace and diminish sensitive wildlife species that sometimes do not recover effectively from the disturbance. Defensible spaces give these species a margin of protection that makes it more likely they will survive and flourish.

Another benefit of defensible spaces, intended to protect both structures and open spaces, is that they are created by property owners who have the ability and freedom to design—within defensible space parameters—a layout that caters to their aesthetic and landscaping interests. A defensible space, around a home, need not be bland and boring in appearance. It can incorporate fun and colorful patios, rock walls, gardens, pathways, and other non-combustible features. Carefully selected vegetation species

that are planted and maintained properly can spark creativity, giving the landowner an on-going project that keeps them engaged and interested in their defensible space. There are many ways to achieve desired results while continuing to adhere to defensible space requirements.

Like homeowners, large property owners can decide to what extent aesthetics matter when designing defensible spaces in open areas such as fallow fields or pastures. They have full discretion to decide whether a fence line will be wire mesh, high tensile wire, barbed-wire, or cable. They might select from dozens of other options as well including galvanized steel rails or boards, rod iron, or chain link. They may be able to choose a “landscaped” pond over a metal watering trough. They can also choose whether to leave a small patch of bare ground uncovered or to embellish it with river rock, gravel, or masonry pavers, for example.

The cost of creating a defensible space is wholly determined by the property owner. Costs can be kept to a minimum if the property owner does most of the work and selects inexpensive building materials. Over time, however, most defensible space projects and the small amount of upkeep required to maintain them, pay for themselves by providing homeowners with the peace-of-mind that comes from knowing the risk of losing everything is lessened and humans, wildlife, and the environment are safer.

Creating defensible spaces in the shrub steppe to protect crops, livestock, and fields can be a bit more challenging, and more costly, than creating spaces around structures in a WUI setting. The defensible spaces are often larger and therefore require more effort by landowners to maintain than those in the WUI. It needs to be said, however, that the benefits of creating a

defensible space in the shrub steppe are very nearly the same as for WUI areas. Protecting crops, livestock, and fields by creating defensible spaces also results in protecting lives, personal property, and wildlife in the shrub steppe. The cost-benefits of these can be realized over time.

DEBUNKING THE MYTHS ABOUT DEFENSIBLE SPACES

There are nearly as many myths surrounding the development of defensible spaces as there are designs for defensible spaces. This section of the module describes and debunks a few of the most common ones related to (1) vegetation; (2) the role of fire and enforcement officials; (3) harm to the environment; and (4) the appropriate time to worry about wildfire.

First, many people believe that creating a defensible space means clearing all vegetation, cutting down trees, and ruining a cultivated landscape. None of these things are true. With the careful selection of fire-resistant plants, fire-resistant building materials, and a good design, defensible spaces can actually enhance the appearance of a landscape.



*Figure 3: Creating a Defensible Space Around a Home Before (L) and After (R)
PC: Marine County, CA Fire Safe Marin*

While the plants shown in Figure 3 may not be typical in the shrub-steppe, they demonstrate the ability of homeowners to create beautiful spaces using hardscapes and fire-resistant plants. Below are before and after photos that show another defensible space created by simply clearing a bank and adjacent trees.



*Figure 4: Before (left) and After (right:) Creating a Defensible Space With No Additional Planting
PC: Unknown*

Second, there are those who believe if everyone were required by law to create a defensible space and authorities enforced the law, everyone would be safe. This simply is not the case. Although there are a variety of laws that address defensible spaces, laws do not present the complete picture of what threatens or protects properties. Laws that pertain to defensible spaces are generally grounded in the concept of zones. For example, 0 to 5 feet from a structure is the lean, clean, and green zone. Five to 10 feet from any structure grasses should be cut and trees limbed. Beyond 30 feet, the key is basic maintenance—the removal of dead vegetation. Simply put, there are no laws that create a template for the perfect defensible space. This is especially true with respect to larger defensible spaces (e.g., farms, ranches, orchards) in the shrub steppe.

Third, one of the most frequently asked questions is “Will creating a defensible space harm the environment?” This myth is easily debunked. It is quite possible to create a defensible space that is healthy, fire resistant, and attractive to animals, birds, and pollinators. Defensible spaces do not destroy the environment; to the contrary they can help protect the environment to keep it from being destroyed. Figure 4, below, demonstrates the many ways hardscapes and fire-resistant vegetation can be used by homeowners to create defensible spaces that are designed to protect the environment, attract wildlife, and at the same time provide a fire-resistant landscape.



*Figure 5: Examples of Defensible Spaces That Protect the Environment
PC: Marin County, CA Fire Safe Marin*

Finally, there are two myths that involve property owners directly. The first one is the only time a property owner needs to be concerned about fire is during the wildfire season or on “red flag” days. The second one is that by creating a defensible space the owner’s property can defend itself. Neither of these is the case and could lead to deadly consequences (Living with Wildfire, retrieved Nov. 3, 2021). Property owners need to be proactive in managing and maintaining their defensible spaces at all times, despite the wildfire potential at a given time of year.

With climate change, the fire season is nearly year around. In fact, in 2021 Colorado, Texas, Kansas, and Oklahoma reported wildfires as late as December. A wildfire in Nevada, also in 2021, burned eight homes on a day with no wind, moderate temperatures, and normal levels of humidity. (It is worth noting that none of the owners of these burned homes had created a defensible space). The fact that wildfires can occur year around and on days where conditions are normal demonstrates that property owners in fire-prone environments need to be vigilant every day of the year.

Creating a defensible space, however, is not sufficient for guaranteeing protection of a property. It is estimated that between 60 and 90 percent of home loss during a wildfire is due

to embers carried by the wind (Marin Wildfire Prevention Authority 2021). Embers can breach the defensible space from great distances through the air (as occurred when the Pearl Hill fire in Douglas County, Washington jumped the Columbia River). Embers can ignite unmaintained spaces where vegetation has grown or organic material has piled up over time.

Finally, there is always a chance that severe weather conditions can overcome a homeowner's defensible space or that lack of routine maintenance exposes vulnerabilities of any given defensible space. Both situations provide the potential for wildfire to destroy property. So, even though defensible spaces do not guarantee property owners their property will survive a wildfire, they greatly increase the chances of preventing the unfortunate loss of structures and other valuable assets of landowners.

FEDERAL, STATE, AND LOCAL GUIDELINES FOR DEFENSIBLE SPACES

There are federal laws, regulations, standards, and guidelines that govern the creation of defensible spaces. They vary across states in type, number, coverage, and enforcement. Wildfire safety laws at the federal level generally fall under the purview of the US Forest Service and the Bureau of Land Management. These organizations have offices and agents in every state who work in tandem with state and local agencies such as Departments of Fish and Wildlife, Forestry, and Natural Resources, conservation districts, and fire departments to assist with wildfire mitigation and management efforts. There are several other national organizations that play a role in assisting state and local agencies as well. Two well-known ones are the [National Interagency Fire Center](#) and the [National Fire Protection Association](#).

Some states also have codified general requirements for defensible spaces. In Washington State, [Chapter 6 of the Washington State Building Code](#) addresses guidelines and requirements for both "new and existing buildings, structures, and premises within wildland-urban interface areas (Chapter 6 §601.1). The objective of Chapter 6 is to "establish minimum requirements to mitigate the risk to life and property from wildland fire exposures, exposures from adjacent structures and to prevent structure fires spreading to wildland fuels" (Chapter 6 §601.2). Sections 603 and 604 of Chapter 6 address creating and maintaining defensible spaces. Utilizing

the concepts of zones, discussed later in this module, the regulations hold homeowners (or those who lease, control, operate, or maintain a property) responsible for complying with Chapter 6 regulations.

Through the Department of Natural Resources (DNR), Washington State also works with local fire districts, [conservation districts](#) (including [Foster Creek Conservation District](#)), counties, and [WSU Extension](#) programs to help Washington residents benefit from the [Firewise USA](#)[®]. Administered through the National Fire Protection Association, the Firewise USA[®] Program encourages homeowners and communities to prepare for wildfire. The [DNR website](#) provides excellent guidelines and resources for creating defensible spaces.

California might be considered to have the most comprehensive guidelines for creating defensible spaces. [Marin](#) and [Alpine](#) Counties are among the many California communities that have specific codes to guide homeowners, builders, and community organizers trying to defend against wildfire. Readers may find the links above of special interest in learning more guidelines for creating and maintaining defensible spaces.

At the local level, guidelines can vary greatly depending on the exact location of the township or country in which the home or landowner resides. Plans and resources may be scarce or non-existent in one community; but in another town, there might be an entire website dedicated to wildfire where information is consolidated and organized. One such example is the [City of Ashland, Oregon](#).

In some areas, it may be the county that houses the wildfire mitigation plan. Douglas County, in the state of Washington, for example, has [Multi-Jurisdictional Hazard Mitigation Plan](#) with detailed information about local wildfire hazards. The plan also describes protocols to be followed and the roles of local entities in coordination of emergency management efforts. These documents are often required to be updated regularly. Individuals are encouraged to review local documents often to assure they have the most current information about best practices.

TRADITIONAL DEFENSIBLE SPACES

Traditional defensible spaces are governed by a concept known as ignition zones. Referred to briefly above, this section of the module will discuss them in more detail. The concept of the home ignition zone (HIZ) was developed in the 1990's by retired USDA Forest Service fire scientist Jack Cohen. He was conducting breakthrough experimental research about how homes ignite due to the effects of radiant heat. He divided property surrounding a home into three zones: Immediate, Intermediate, and Extended.

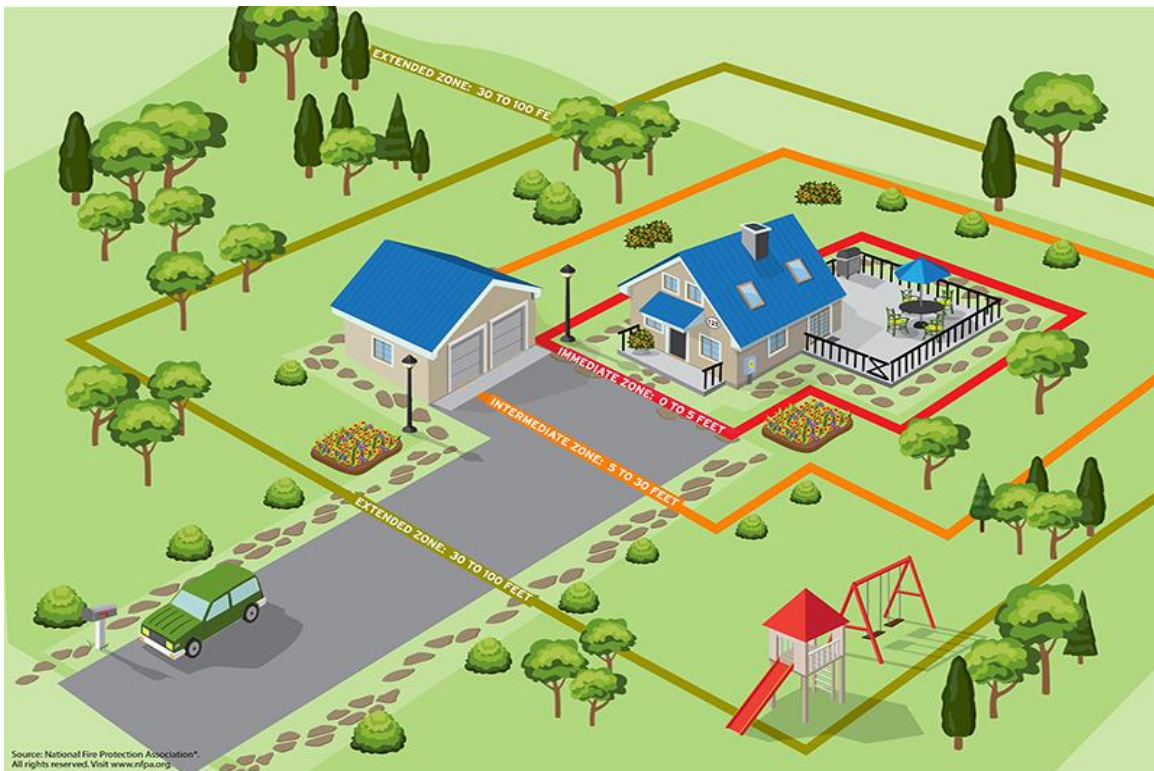


Figure 6: Three Ignition Zones Around a Home
National Fire Protection Agency

The following information is provided by the National Fire Protection Association. It describes the three home ignition zones and requirements for keeping them safe from fire danger.

Immediate Zone: Also known as the ember resistant zone or non-combustible area, the Immediate Zone includes the home and the area 0-5 feet from the furthest attached exterior point of the home. Scientific studies indicate this is the most important zone in which to take immediate action as it is the most vulnerable to embers. **Start with the house itself**, then move into the landscaped areas of the Immediate Zone.

- Remove dead leaves, pine needles, and debris from roofs and eaves.
- Replace or repair loose or missing shingles or roof tiles.
- Install 1/8-inch metal mesh screening in exterior and attic eave vents to reduce ember penetration.
- Repair or replace damaged or loose window screens and broken windows.
- Screen or box-in areas below patios and decks with wire mesh to prevent debris and combustible materials from accumulating.
- Move flammable material (mulch, flammable plants, leaves, needles, and firewood piles) away from exterior walls.
- Remove anything stored underneath decks or porches.

Intermediate Zone: Located between 5-30 feet from the furthest exterior point of the home, this zone is described as lean, clean and green. It is the area where grasses are typically cut to three or four inches and trees are limbed. It is the zone where landscaping and hardscaping are used to create breaks that can influence fire behavior by decreasing or extinguishing it. To create and maintain this area

- Clear vegetation from under large stationary propane or diesel tanks.
- Create fuel breaks with driveways, walkways/paths, patios, and decks.
- Keep lawns and native grasses mowed to a height no greater than four inches.
- Remove ladder fuels (vegetation under trees) so a surface fire cannot reach the crowns. Prune trees up to six to ten feet from the ground; for shorter trees do not exceed 1/3 of the overall tree height.
- Space trees to have a minimum of eighteen feet between crowns with the distance increasing with the percentage of slope.
- Tree placement should be planned to ensure the mature canopy is no closer than ten feet to the edge of any structure.
- Tree and shrubs in this zone should be limited to small clusters of a few each to break up the continuity of the vegetation across the landscape.

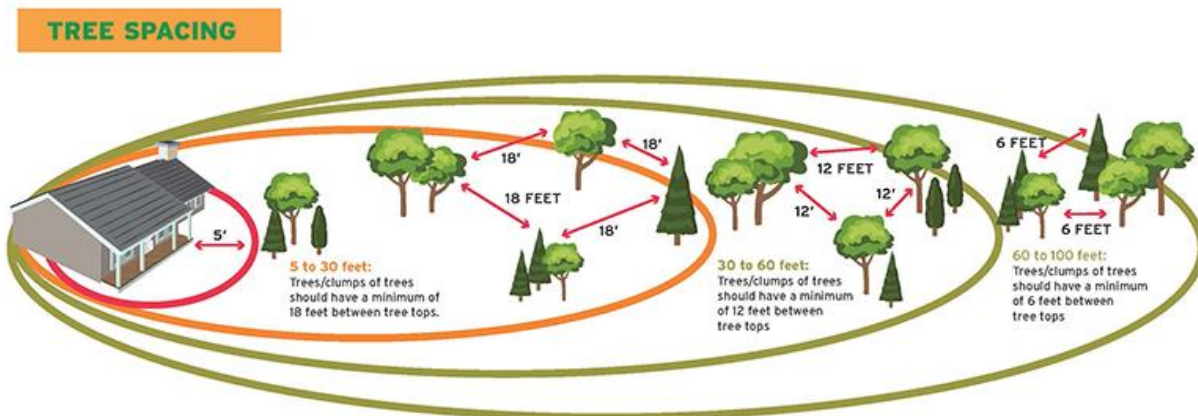


Figure 7: Tree Spacing Protocols in Home Ignition Zones
National Fire Prevention Association

Extended Zone: This zone reaches 30-100 feet and beyond. The goal in the Extended Zone is to maintain the area in such a way that the path of the fire is interrupted and smaller flames are kept on the ground. This can be done by accomplishing the following

- Dispose of heavy accumulations of ground litter/debris.
- Remove dead plant and tree material.
- Remove small conifers growing between mature trees.
- Remove vegetation adjacent to storage sheds or other outbuildings within this area.
- Trees 30 to 60 feet from the home should have at least 12 feet between canopy tops.*
- Trees 60 to 100 feet from the home should have at least 6 feet between the canopy tops.*

**The distances listed for crown spacing are suggested based on NFPA 1144. However, the crown spacing needed to reduce/prevent crown fire potential could be significantly greater due to slope, the species of trees involved and other site-specific conditions. Check with your local forestry professional to get advice on what is appropriate for your property.*

Understanding ignition zones is critical to assuring property owners become familiar with their land and its potential vulnerabilities to wildfire. It also puts them in a better place to respond to risks that arise from wildfire. Property owners who internalize the information related to ignition zones, and revisit it frequently, will be better prepared to resist the

devastating consequences of wildfire. They will also be better prepared to help first responders save homes and property.

UNINTENTIONAL CONSEQUENCES OF CREATING A DEFENSIBLE SPACE

Unfortunately, creating a defensible space can have some unintended consequences. It could mean removal of desirable and/or native vegetation as well as removal or refitting of combustible structures. These actions disturb the ground and may exacerbate erosion issues related to wind and rain.

When the ground is disturbed, it also makes room for the proliferation of invasive species. Oftentimes invasive species are the first to establish in recently disturbed soils, quickly growing and spreading across the landscape. This competitive advantage prevents key native species from responding well following ground disturbance.

For plant lovers, the decision to remove plants or replace them with fire-resistant species can be difficult. Creating an attractive defensible space requires time to learn more about plant species. It requires planning and landowners may need the help of a horticulturist or Master Gardener to make the best choices for their property. It also requires gaining perspective and taking decisive actions for the greater good—saving personal property and that of thy neighbor. Around the home, then, the solution to mitigating unintended consequences, related to the removal or replacement of vegetations is to find alternative landscaping schemes that are Firewise, cost-effective, and do not take away from the aesthetics of the property.

For owners of large properties, like farms and ranches, building defensible spaces presents additional unintended consequences and more complex challenges. For example, it could mean giving up some crop or grazing land. It could mean finding alternative ways to store harvested crops or altering grazing practices. In addition, there is no single “one-size-fits-all” solution for landowners because of the variability in vegetation, topographical features, proximity to the WUI, and much more. Mitigating unintended consequences on large properties requires a great deal of thinking outside the box and paying careful attention to the details.

CREATING A DEFENSIBLE SPACE IN THE SHRUB STEPPE

Creating a defensible space around a home, or other structure, located in the shrub steppe follows the guidelines for developing traditional defensible spaces discussed above. The main principles are to (1) keep property around the home ember resistant; (2) keep areas lean, clean, and green; (3) reduce fuel loads; and (4) keep a regular schedule of maintenance. To follow these principles, homeowners often use fire resistant vegetation and hardscape features to create firebreaks.

To create a defensible space for a larger property, such as a farm or ranch, some of these principles apply but must be modified so they can be more effective. There are, however, some aspects of protecting large properties, especially in the shrub steppe, that are unique. The following paragraphs describe some of the more common practices.

Property modifications that keep lands lean, clean, and green may apply but may not always be possible across an entire property (think canyons, gorges, gullies, swales) in the shrub steppe. This holds true for incorporating fire-resistant vegetation into the defensible space as well. Using hardscapes, such as patios, stairs, retaining walls, sleeper walls, or paved areas as firebreaks are not possible across the landscape of large properties. So, creating firebreaks requires some creative thinking and problem-solving.

Firebreaks can be naturally occurring or man-made. Naturally occurring firebreaks are things like bluffs, bodies of water, or even bare ground. Man-made firebreaks are ground that has been intentionally cleared or planted with fire-resistant vegetation. Areas of fire-resistant vegetation are sometimes called fuel breaks because they seldom stop a fire but rather, they slow the rate of spread.

The purpose of both firebreaks and fuel breaks is to deny a fire any combustible material and to stop or slow the advancement of surface flames. They are most effective for slowing the rate of spread. Firebreaks are also useful because they provide access to fire crews and firefighting vehicles. "It is highly recommended that fuel break planning take a whole watershed/landscape view to match the scale of the wildfire threat. Working collaboratively with landowners, managers, and the fire and fuels community in the region to develop a

strategic plan will help ensure fuel breaks are implemented in the right places and effectively utilized when fire occurs.” (Hersey and Barros, 2022)

There are two types of firebreaks. Those created before a fire starts are called established firebreaks, and those created as a fire burns are labeled suppression firebreaks. Established firebreaks include things like hardscapes, intentionally cleared (bare) ground, access roads, plowed/disked areas or fields, or planted fire-resistant vegetation. Suppression firebreaks are created by firefighters and are located away from the main fire. Strategies include creating buffer zones by removing or reducing the fuel load, creating fire lines, utilizing backfires, and dousing large areas of flammable vegetation with water or other fire-retardant chemicals.

When creating man-made fire breaks, a number of things are worth considering such as (1) protection priorities; (2) minimizing the spread of invasive species; (3) location or placement; and (4) weather patterns and climate. These elements will vary from region to region, area to area, and property to property. (Hersey and Barros, 2022) noted the following in their paper:

“Key concerns include sage-grouse and other wildlife habitat fragmentation, risk of increasing invasive weeds, effects of non-native plant introductions on native plant communities, impacts to wilderness characteristics, and challenges with implementation across multiple jurisdictional boundaries. Ultimately, whether or not fuel breaks are appropriate for a particular landscape comes down to local stakeholders weighing risks against potential benefits and conducting appropriate assessments to evaluate social and environmental impacts” (Maestas et al. 2016).

In addition to the elements listed above, landowners must choose firebreak strategies that will work best for them. Among those they should consider are:

- Maintenance of adjacent public roads, access roads, and lanes
- Elimination or reduction of vegetation surrounding croplands and pastures
- Creating brown strips (bare ground) or green strips (fire-resistant vegetation)
- Mowing or disking fields; creating summer fallow fields,
- Controlling grazing patterns and schedules
- Chemical treatments
- Prescribed burning

Brown strips: Brown strips are created parallel to existing roads and highways to prevent the spread of fire. Although roads and highways are fire breaks in themselves, the brown strips ensure that a fire can't spread from the road and creep into land on either side of the road. Brown strips are devoid of vegetation and typically span 3-6 meters in width (Shinneman et al. 2018). Brown strips can also be helpful as access points for firefighters to help put out existing fires.

Green Strips: Green strips on the other hand differ from brown strips in that they aren't devoid of vegetation. Green strips are created using vegetation that retains moisture later in the growing season (Shinneman et al. 2018). They can be anywhere from 30-90 meters long on both sides of a roadway, spanning much larger distances than a brown strip. By encouraging targeted vegetation, these indirectly benefit the landscape by discouraging the establishment of undesirable fuels like invasive grasses. Not only do invasive grasses spread extremely fast on the landscape (especially in disturbed roadside conditions), but they encourage wildfire to spread fast because they are highly flammable. That is why both brown and green strips require a good deal of maintenance to remain effective through the fire season. Maintenance is performed via mowing, disking, targeted grazing and/or chemical treatment to prevent the growth of vegetation in the strip.

Mowing: Mowing is a technique that not only cuts back the vertical extent of the fuels (typically reducing to 1-4 inches), but it also compacts the fuels which lowers flame lengths and reduces rate of spread (Shinneman et al. 2018). Excessive litter in a mowed strip should be accompanied by bailing or raking to completely remove fuels from an area.

Disking: Disking is a similar technique that also involves disturbing the soil. Using a piece of farming machinery called a disc harrow, disking penetrates the soil at a shallow level of 2-3 inches. Disc harrows have a series of concave metal discs that chop into the soil at oblique angles, churning up vegetation and overturning soil. Disking also can promote increases in plant diversity and can be a preferred management strategy for retaining and improving wildlife habitat (NRCS).

Chemical Treatment: Chemical treatment can be used to maintain green and brown strips. Sometimes it is used in conjunction with mowing or disking, often being applied directly after a

field gets mowed or disked. Chemical treatment assures that undesired vegetation won't immediately grow back, keeping the area functionally sound as a fire break.

Targeted Grazing: Targeted grazing is another approach to creating and maintaining fuel breaks that has shown to be successful on multiple occasions. This strategy is essentially the same as mowing but uses cattle instead of farm machinery to strategically chow down on vegetation in order to reduce fuel loads. Furthermore, managers are specifically targeting cheatgrass in the spring, when it is most palatable to cattle (Kaplan, 2021). This provides multiple benefits to the landscape, landowners and their property. In the past three years, it has limited the range of several fires in Nevada that would likely have spread across thousands of acres of land had there been no targeted grazing of annual grasses (Kaplan, 2021). So, while there are success stories, it should be known that the implementation of targeted grazing is challenging. It requires a deep understanding of ecological processes, along with a set of skills related to monitoring and moving livestock and feeding the soil microbiome. Timing is critical in these processes.

Additionally, practitioners must navigate a variety of social constraints (Gosnell 2020). An article by Nader (2007) sums it up well by stating that "Modification of wildfire fuels is an important issue in many regions of the world. At present, limited research knowledge exists to help guide managers in using grazing animals for fuel management. That knowledge is necessary to direct the timing and intensity of grazing to reach fuel management objectives similar to other methods".

Prescribed burning: Prescribed burning is another strategy used in the shrub steppe to reduce fuels, therefore acting as a fire break that can stop or slow the spread of wildfire. Prescribed burning has the unique benefit of returning nutrients to the soil that aid the regeneration of plant communities. This is more commonly applied in woodland areas with encroaching pine and juniper trees but is being trialed in other parts of the shrub steppe to control fuel loads.

Landowners should not rely on firebreaks, however, to prevent the spread of fire. It does not matter whether natural or man-made, all firebreaks have limitations. Many of those limitations are determined by the weather. For example, firebreaks do not control wind-borne embers, which have been known to cross man-made structures such as 8-lane highways and

natural structures like the Columbia River. In addition to firebreaks, landowners can engage in several preventive measures to protect their property. Some of those preventive measures include

- Regular servicing and/or modification of equipment,
- Designating a water truck or other equipment for suppressing or fighting fire,
- Constructing barns, sheds, and other outbuildings using fire-resistant materials,
- Making site improvements
- Implementing ecological restoration projects to enhance degraded landscapes

The first four of these strategies are self-explanatory. The last one however, deserves more attention.

Ecological Restoration of Degraded Land: Ecological restoration is a field of study that assesses and improves the health of an ecosystem. A big driver of ecological restoration before and after a fire is the need to limit erosion and improve water quality. After a fire, erosion increases because there is less vegetation to hold the soil and its nutrients together. Soil, then, gets swept into streams and rivers by wind and rain, causing adverse conditions for the aquatic life, such as salmon, that inhabit riparian systems. Common practices in the field of restoration include things like planting native species, removing invasive species, and building features within the landscape that serve a particular ecological function. These practices all play a role in reducing the negative impact of large intensity wildfire on the landscape in addition to providing many benefits to the ecosystem.

Planting native species, for example, mitigates fire risk by establishing more abundant native plant communities. By developing deeper root networks, retaining greater levels of moisture, and delivering nutrients to the soil, native plant communities dissuade the spread of invasive, flammable species like cheatgrass.

Planting native species may have a positive impact on wildlife as well. When two or more species within an ecosystem web adapt and evolve together, they may form a symbiotic relationship. There are many kinds of symbiotic relationships, but one commonly found in the shrub steppe is called commensalism—one species benefits the other is unaffected. An

example of this is the reliance of several animal species on sagebrush for food and cover. Planting sagebrush seedlings (as pictured below) provides key animal species like the pygmy rabbit and the greater sage grouse with a winter food source, habitat for nesting, and cover from predators.



*Figure 8: Sagebrush Seedlings Being Planted by Volunteers in Douglas County, WA
PC: Rebecca Schexnayder (FCCD)*

Below is an example of planting native species as part of a post-fire recovery restoration project in norther Douglas County, WA. On the left, is a picture of a volunteer steward standing near the edge of a stream where a fire had burned all the vegetation one month before. He is standing on a strip of erosion control fabric known as jute. This fabric is made of plant material and put into the ground to stabilize the soil, The jute also prevents excess erosion of soil from wind and rain and the runoff of nutrients into the nearby stream.

Pictured on the right is the same restoration site about eight months after the fire. Though taken from a slightly different angle, it is easy to notice how much grass regeneration occurred, especially near the stream. The pink flags mark places where native plant species were planted to foster site recovery.

Eventually the jute will biodegrade and its role will be overtaken by the root networks of the native shrubs and grasses that congregate in the area. This plant community will slowly build fire resiliency as it becomes lusher with vegetation. As the new vegetation continues to develop, it will store more water and provide cool shade to the area.



*Figures 9 and 10: (L) Volunteer Steward on a Restoration Site.
(R) Near the Same Site 8 Months After the Fire
. PC: Dan Hammond.*

Another common restoration practice is removing invasive weeds. This is done in a variety of ways including manual removal, chemical treatment or introduction of a biocontrol. Due to the aggressive nature of invasive species, they often outcompete native plants. When they do, they create thickets and monocultures across an area, which reduces biodiversity and increases fuel loads.

In addition, many invasive species of the shrub steppe are highly flammable increasing both the risk and spread of wildfire. These species often recover quickly, further exacerbating the problems associated with fire. This cyclical process can rapidly alter large swaths of land in very negative ways. The photos below show how cheatgrass takes over a landscape and how highly combustible it is.



*Figure 11. Pictures of Invasive Cheatgrass and Its Combustibility.
PC: Sage Grouse Initiative.*

Building features such as Beaver Dam Analogs (BDAs) (pictured below) and Post-Assisted Log Structures (PALS) are two additional options for low-tech, process-based ecological restoration. By driving in wooden posts across a stream channel and weaving in brushy, organic material, restoration practitioners can successfully mimic the services and functions of beavers in an ecosystem. Results from a 2020 study by Fairfax indicated that “beaver damming plays a significant role in protecting riparian vegetation during wildfires, and that this is a consistently observable phenomenon across landscapes”. Riparian areas with active damming have an improved storage capacity for water and thus the plants in these areas hold enough moisture to create a natural firebreak and/or slow the spread of wildfire.

Fairfax goes on to state that “Drought-stricken vegetation burns more easily than lush, green vegetation so it follows that the vegetation around beaver ponds would be more difficult to burn than vegetation around undammed creeks”. This may be particularly important for species that cannot escape encroaching wildfire since it could provide temporary refuge from the fire. So, this technique not only increases fire resistance, but it performs other important ecological services like promoting water storage, capturing sediment, and creating conditions that assure other native plants and animals of the shrub steppe thrive.



*Figure 11: BDA on the Day of Installation in Spring
PC: Foster Creek Conservation District*



*Figure 12: BDA Six Months Later in Fall
PC: Foster Creek Conservation District*

Seed collection is the last form of restoration to be discussed. It has several benefits central to mitigating potential problems that may arise from species extinction. Seed collection can be viewed as an insurance policy should there be a dramatic decline in species numbers. Having a stockpile of seeds gives managers the capability to grow seedlings to be transplanted in both active and future restoration projects.

Furthermore, seed collection can contribute to research about the response of species to projected climate conditions. Ecologists, plant biologists and land managers are among those piloting studies referred to as ‘common garden experiments’ and ‘field provenance tests’ to develop seedlings that are better adapted to heat and drought. Because these seedlings are more able to withstand the projected climatic conditions of the shrub steppe, this strategy can help increase survivorship of newly planted seedlings and withstand impacts of future wildfires.



*Figure 12: Sagebrush Seeds.
PC: Chelan Douglas Land Trust*



*Figure 13: Sagebrush Seeds
PC Natural Resources Conservation Service*

Creating a defensible space is a necessary, but insufficient, step for protecting life and property from wildfire. Equally as important is maintaining the space to maximize its

effectiveness over time. Keeping property lean, clean, and green; servicing and repairing equipment; maintaining firebreaks; and restoring degraded lands are critical to a developing a long-range plan of protection from wildfire.

It is incumbent upon landowners to include a maintenance plan in the defensible space plan designed for their specific property. The next module will provide a more tangible, step-by-step framework for becoming fire adapted in the shrub steppe. It will guide landowners through the process of creating and implementing a tailored defensible space plan in the shrub steppe.