

# Defensible Space for the Farm and Ranch

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What is defensible space? Defensible space is the safety buffer you create around structures and crops to slow or stop the spread of wildfire from embers, direct flame contact, or radiant heat from fire in the surrounding vegetation. Another key aspect of wildfire mitigation is hardening your structures to be fire resistant by ensuring you are ember prepared. The extreme fire behavior of today requires increased defensible space.





Karen, this video is on YouTube: <https://www.youtube.com/watch?v=N3xT2-ZApf8&t=38s>

This video was created in 2020 by the [Climate & Agriculture Initiative BC](#) through the Agriculture and Agri-Food Canada and the BC Ministry of Agriculture.

Many agricultural areas in the west are even more fire prone than areas shown in this video in British Columbia. The same defensible space concepts apply here. Later this module will explore defensible space specifics for dryland crops and rangelands in the inland Pacific Northwest.



We will now explore areas of fire mitigation discussed in the video in more detail throughout this module. The first and primary threat of wildfire spread is from embers, as shown in this ember shower.



**Karen - hope these images will work in PACE**

Often we think of fire spread occurring through direct flame contact and envision a large wall of flames barreling down towards structures. But the reality is that most structures burn from embers, which are small but dangerous given how many are produced.

See full videos

at: <https://www.youtube.com/watch?v=lvbNOPSYyss> and [https://www.youtube.com/watch?v=Dq6wy\\_tffpg](https://www.youtube.com/watch?v=Dq6wy_tffpg)



Embers need a place to land and collect, such as in gutters and roofs (ember traps), in order to linger long enough to set a structure on fire.

See full videos

at: <https://www.youtube.com/watch?v=lvbNOPSYyss> and [https://www.youtube.com/watch?v=Dq6wy\\_tffpg](https://www.youtube.com/watch?v=Dq6wy_tffpg)





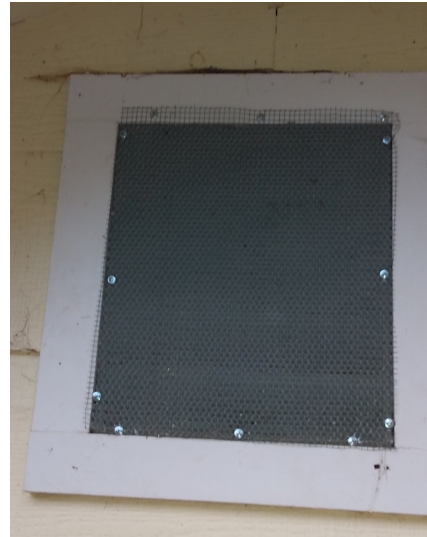
Embers easily fly into structures through vents or openings. Proper screening is needed to keep these small embers out.

See full video at: [https://www.youtube.com/watch?v=nd3p6ai\\_c-Q](https://www.youtube.com/watch?v=nd3p6ai_c-Q)





Here you can see the dramatic difference in embers that enter the home based on screening size. 1/8 inch non-combustible screening is needed to effectively screen embers out.



Which screen should be used in attic vents? The one on the left clearly has openings greater than a 1/4 inch that embers could easily go through. The vent on the right is screened with 1/8 inch metal screening that few if any embers would enter through.



Here you can see a proper screen for vents and for gutters. Vulcan screens are worth considering (<https://www.vulcanvents.com/>) or similar type screens. You may be able to easily retrofit existing screens with 1/8 metal screening purchased at the hardware store, make sure there are not gaps between the screening and mounting frames. These are just a few examples of home hardening tips. For more, see the Home Retrofit Guide, <https://naes.agnt.unr.edu/PMS/Pubs/2020-3810.pdf>

## The Home Ignition Zone (HIZ)

The 3 zones are:

- **Immediate**
  - 0 ft to 5 ft
  - Ember resistant
- **Intermediate**
  - 5 ft to 30 ft
  - keep it lean, clean, and green!
- **Extended**
  - 30 ft to 100 ft (min)
  - thin, prune, and separate



Now that we have covered the unique dangers of embers, let's focus on defensible space outside and around our structures. The Home Ignition Zone (HIZ) serves as a guide to help homeowners create an effective defensible space around their homes. The HIZ also holds true for any other structures on a farm or ranch. These guidelines aim to protect homes not only from wildfires themselves but also against ignition due to radiant heat and burning embers. HIZ considers the home itself, immediate, intermediate, and extended zones out to a min of 100 feet. In many agricultural areas the extended zone should be extended another 50-100 ft depending upon the surrounding fuel types and slope of terrain near structures.

## Immediate HIZ



Photo: Stephen Fitzgerald,  
© Oregon State University

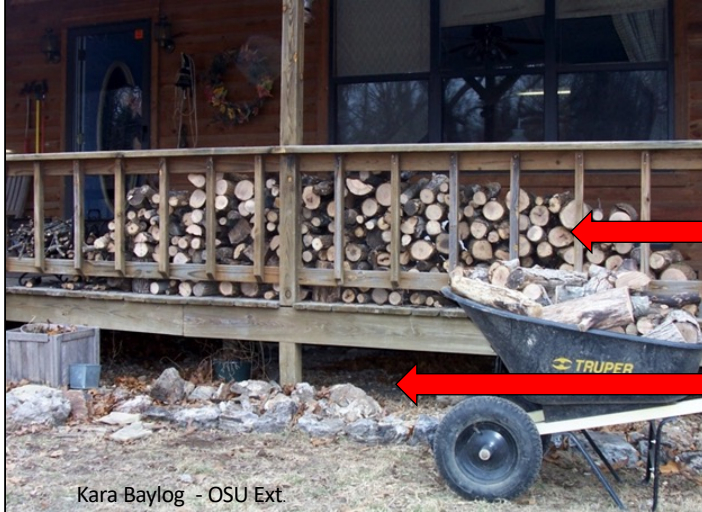


The Immediate HIZ is the surrounding 5 ft around structures and should only contain noncombustible materials.

- Ember resistant siding
- DO NOT use bark mulch
- Consider rock, gravel, concrete, or pavers adjacent to structures



## Immediate HIZ



Store firewood piles, lumber piles, propane tanks and gas cans at least 30 feet from structure.

Clean debris, ensure noncombustible footprint, and install 1/8" screening

Consider other fuels around your farm and home that could burn, such as lawn furniture, door matts, flower planters, cardboard boxes etc. Be aware of anything else that may be connected to structures that could act as a conduit for fire spread from the surrounding vegetation. Fences should transition out of burnable fencing materials within at least 5 feet of house or barn. Minimize the amount of trash within this zone, don't leave any flammable debris out around your farm shop. More information can be found in the Wildfire Retrofit Guide: <https://naes.agnt.unr.edu/PMS/Pubs/2020-3810.pdf>



The wooden fencing panels connecting to the barn should be replaced with non-combustible fence materials. In addition, keep vegetation inside corrals short by grazing or mowing.





The Intermediate HIZ is 5 ft - 30 ft around structures.

- Keep vegetation short, lean, and green
- Landscaping mulch is acceptable around trees or groupings of vegetation
- Remove dead vegetation
- Thin trees so individual or small groups of trees are separated by at least 18 ft at their tops
- Increase the intermediate zone treatment to 50 feet on steep slopes or windward sides.
- Be selective what trees and shrubbery are within 30ft – picture on the left shows ornamental junipers trees against the house, which are extremely flammable

## Intermediate HIZ



This house has fairly adequate green space in the intermediate zone extending out further. Trees provide many benefits to structures by blocking the wind and providing shade. However, the large tree to the left of the deck is too close. If an ember lands and ignites the tree the house will burn too.





The Extended HIZ is 30 ft to 100 ft (min) from structures.

- Keep vegetation short, but it doesn't have to be watered
- Thin, prune, and separate trees
- Remove any dead vegetation



- Reduce “ladder fuels” -  
small trees and brush  
growing under larger trees  
and lower tree limbs

- Prevent soil and water erosion by keeping soil surface covered
- Consider establishing short growing perennial fire resistant vegetation
- Consider increasing extended zone up to 200 feet on steeper slopes
- More information can be found here: <https://idahofirewise.org/>

## Extended HIZ



This is a good example of tree spacing in the extended HIZ. The trees have some separation distance without any ladder fuels present. The trees are too dense to be within 30 ft of structures, but this is reasonable in the extended zone. The crowns of many of these trees are touching, which would allow for fire to be carried through the stand should a few start on fire in their upper crowns. Manage forests so there is more separation distance in the canopy. Proper tree spacing and lack of ladder fuels will help minimize wildfire intensity and reduce tree damage from wildfire. Consider extending thinning out 200 ft beyond structures into surrounding woodlands. Grazing can also be used in forests to reduce tall grasses and shrubs.

## Extended HIZ



This is an example of good defensible space in the Extended Home Ignition Zone (HIZ). Note the short and green grass on the other side of the gravel road. This mowed area would need to be extended if it wasn't for the wide gravel road. On the direct right of this photograph there is a farm shop and additional housing. The next module will cover fuel breaks and defensible buffers in more detail.





Does this look like good defensible space around this structure? Click on different areas to learn more:

1. Roof: This metal roof is decent protection from fires, flying embers won't be able to ignite it. However, consider the entire roof as a system that includes the covering, underlayment, soffit, and fascia. Not all roofing materials are the same, refer to the Home Retrofit Guide pg. 6 for more details.
2. Windows / loft: Flying embers can easily fly inside of this barn, you should be able to close barn doors or cover with non combustible canvas tarps to keep embers out. The top steeple should be screened with 1/8 inch metal screening to keep embers out.
3. Sides of the barn: The old wood on this barn would be easy to ignite, if possible keep in good shape with fire resistant siding.
4. The ground surrounding the barn: The dry vegetation touching the sides of the barn needs to be removed and the road behind it mowed.





This shop building has great wildfire hardening with metal construction with a good tight garage door to seal out embers. However, the propane and fuel tanks are too close to the structure. Experts recommend keeping propane tanks 30 ft away (outside intermediate zone). The surrounding gravel also does a good job of improving defensible space.



Another component of defensible space is to consider if you have water sources available

In some cases, there may be funding opportunities to help offset the costs of water sources such as tanks that may also benefit wildlife and livestock.



This house has excellent defensible space in North Central Washington, but note the pump shed in the lower right next to the two pine trees.

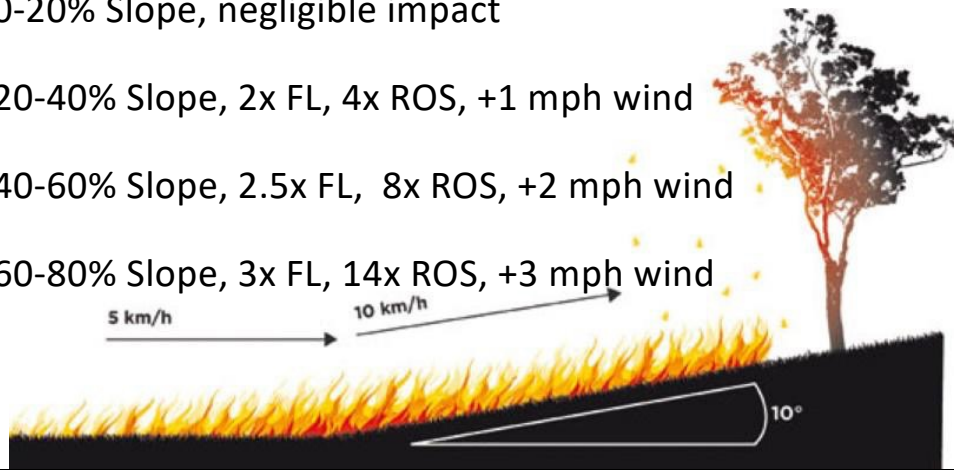




A wildfire burned through the area and the defensible space paid off. However, you will notice the pump shed near the green electrical box was burned. Why did the house survive and not the pump house? The door was broken on the pump house and a bungee was holding it shut. During the fire the bungee broke and the winds produced by the fire pushed the door open, allowing embers inside. This stresses the importance of screening out those small embers that are a larger threat to structures than the actual flames.

## Slope Effects on Fire Rate of Spread (ROS) and Flame length (FL)

- 0-20% Slope, negligible impact
- 20-40% Slope, 2x FL, 4x ROS, +1 mph wind
- 40-60% Slope, 2.5x FL, 8x ROS, +2 mph wind
- 60-80% Slope, 3x FL, 14x ROS, +3 mph wind

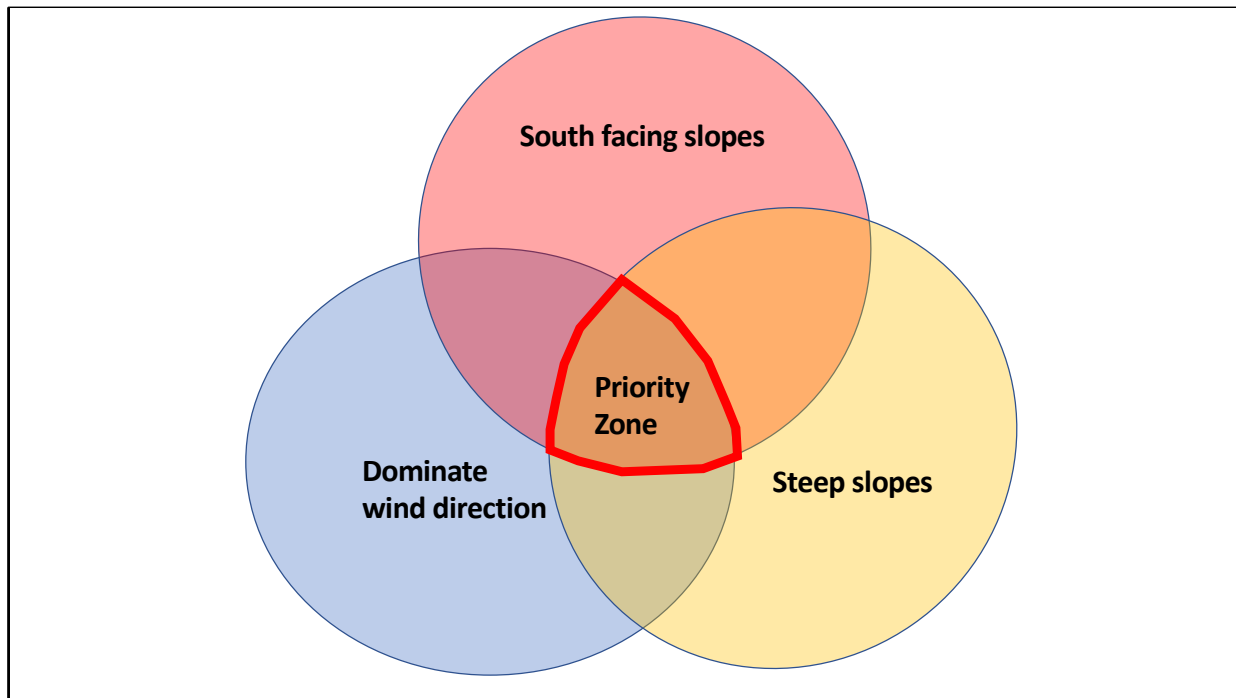


Why do you need to be so concerned with the slope of surrounding areas and wildfire risk? As slope increases flame length increases as well. Larger flame lengths over 4 ft make firefighting efforts more difficult. In addition, the larger flame lengths will lead to increased heat produced near structures. More embers will be produced and will travel upslope with the rising heat since hot air rises. The rate of spread will also increase with slope. As a result, landowners and first responders will have less time to react. Therefore having additional space on the downslope side of key structures or crops will give you the added safety margin needed.



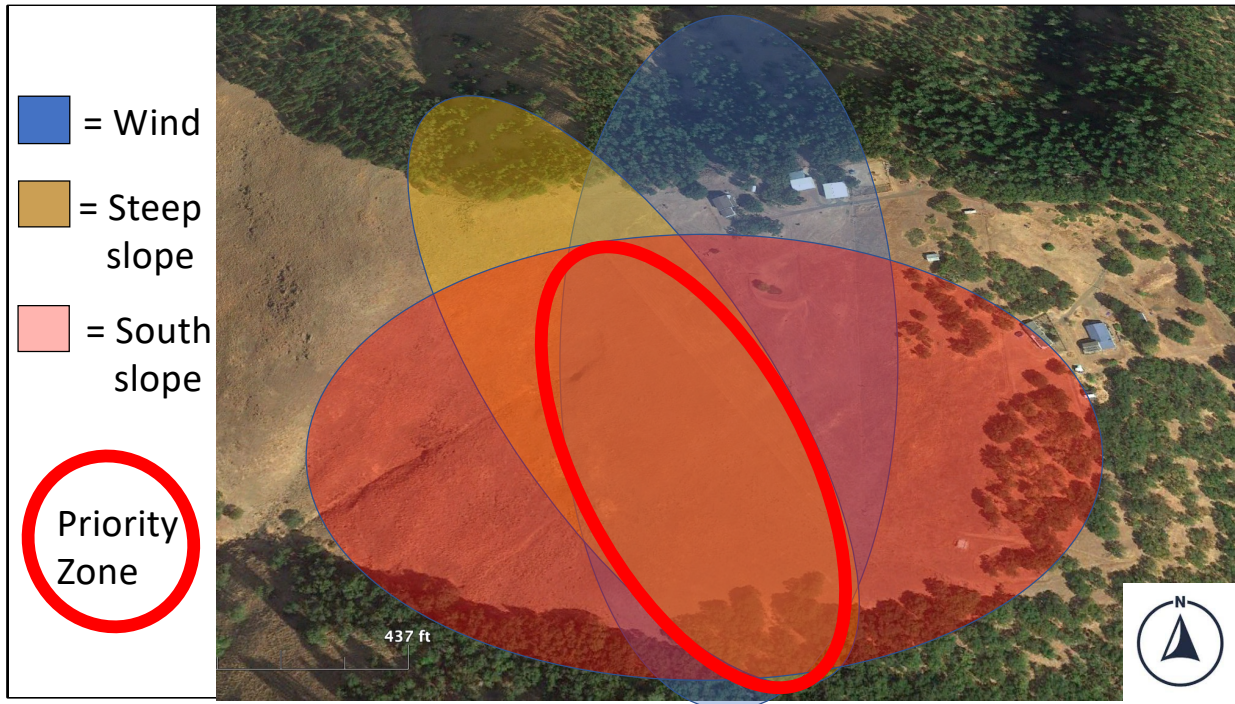
This house had a close call when the surrounding agricultural land ignited in a wildfire and burned up close to the house. Notice the steep slope directly below the house and the dark burned area to the right.





Creating adequate defensible space around your entire farming operation will take several years. Start with areas where wildfire risk is the greatest and multiple factors increase wildfire hazard:

- areas above steep slopes
- areas where dominate winds would push fires
- south facing slopes where fuels are drier





Windbreaks are a blessing and a curse when it comes to defensible space. They can help reduce winds and help catch embers but can also add fuel to the fire and produce a lot of radiant heat that could spread to structures nearby. Windbreaks should be constructed with fire resistant trees and shrubs. This windbreak has some decent fire resistant trees, but it also has ornamental juniper trees. Junipers are often referred to as “little green gas cans” by firefighters. Embers can smolder in them for 15 minutes unnoticed and then suddenly explode into flame.

Be weary of embankments that are behind structures as this can cause the wind to funnel embers towards structures, consider placing a fuel break at least as far back from your house as it is tall.





Agricultural areas in Australia often use the tree species Photinia and Lily Pilly as good fire resistant windbreaks. Trees with large gaps in between trunks may need shrubs planted in between them to better deflect embers.





Consider using shorter shrubs, such as lilacs that are fire resistant and drought tolerant in dry agricultural areas.

**The best structured windbreaks:**

- surround 3 sides of the building
- extend 300 ft beyond buildings to reduce whip around eddies
- 22-25 times long as tree or shrub height
- 3 times the plants mature height away from buildings
- Fences at least 6.5 ft tall can also deflect wind blown embers

Lilacs can reach 6 ft tall and would ideally be planted in a stretch measuring 132 – 150 ft along structures and pastures where livestock may shelter in place.



This windbreak will help reduce winds created by wildfires. However, the trees are not planted/spaced close enough to completely shelter out embers along their lower trunks.

In agricultural areas like these embers are typically not as large as those near forests. However, burning sagebrush can produce significant embers that may test the hardening of your structures.



Brush piles are common in agricultural areas. Keep these piles away from farm infrastructure and in areas with minimal fuel. During fire season these piles are targets for embers. The best practice is to burn piles before the fire season starts.





We have focused so far primarily on defensible space for farm structures, but now we will look at other assets on the farm and ranch that we can take steps now to mitigate the wildfire hazard.

Fences are conduits for the fire to travel, use only non combustible materials when possible. Metal fences likely won't need to be replaced following a wildfire, unlike wooden fences as the one shown here. The fence on the left is in good shape, but the wooden rock crib will likely burn, consider using metal for the crib instead. After wildfires is a great time to replace older fences that have burned with metal construction to ensure future fires won't require as much rebuilding.



Sometimes fences collect weeds and other debris in the wind, consider cleaning fences periodically where you see weeds and trash accumulating. You probably don't need a fence sweeper, but this is one innovative tool in use in the mid-west. If fences are metal and accumulations are not too thick, you may consider using a prescribed fire to help alleviate accumulations.



Where you keep hay on your operation can be critical during a wildfire. Consider placing hay in multiple locations rather than one large fuel source at one location. Keep hay storage areas away from key farm infrastructure, such as housing and equipment storage. These hay piles would need to be covered with tarps to keep embers out during a wildfire. The two piles are close enough that if one ignites the other will too. The metal building would also burn from the extreme heat. A bale of hay burns hotter than a puddle of gasoline given the large surface area available to burn in between the flakes.





Though grain bins are metal, adequate defensible space is needed to ensure stored grain and dust does not ignite from the heat. Often operations have older grain bins that are no longer used, but if grain is being stored it is worth removing the surrounding sagebrush, wooden fence posts, and gravel at least a ten ft radius around each one. Vegetation within the surrounding 30ft should be kept short and green if possible. Keep vegetation to a minimum in areas where grain augers are stored and used.



The defensible space in this equipment storage area is lacking, much of it would be damaged if a fire were to come through.



This is a perfect storage place for equipment with easy access, right off the road. This area can act as a fire break or safety zone if vegetation is kept short or completely removed.





Road access is another critical piece of defensible space for both evacuation and firefighter access. If you have two escape routes off your property try your best to maintain both routes. This two track would make for a narrow escape if you had to evacuate in a hurry. Likewise try to maintain all roads if possible for firefighter access with these requirements:

- 12 ft wide with 14 ft height clearance
- 45 ft turnaround if roads are longer than 150 ft.
- Slope less than 10% large firetrucks might not make it.
- Bridges with a minimum capacity of 18 tons reflective signs for private roads and addresses



Picture access roads in the worst case scenario and then decide if you need to remove vegetation within 5-10 ft of the road depending on the fuel type.





What do you think of the defensible space around this older barn?

**Good defensible space features:**

- Green garden plants and bare dirt against the front side of the barn, without any dead combustible materials or vegetation to ignite
- Green lawn around the garden
- Fruit tree is well pruned and green
- Metal roof on the barn

**Things to work on:**

- Wooden fence to the right could potentially ignite and is a direct conduit to the structure.
- Dry and dead grasses on the right of the hedge should be mowed and kept short or watered.
- Barn windows and top steeple lack proper screens to keep embers out – they could also be covered and sealed.
- The wooden telephone poles could potentially ignite from embers falling in between them, though the risk is mitigated by how far out they are from the barn.





How is the defensible space around this house? The extended zone looks great, you can see how much shorter the grass is than in the field on the other side of the fence. However, the trees right next to the house in the intermediate zone have potential to ignite and burn the house from direct and radiant heat. The trees are limbed, which will help, but they should be spaced further away from the house.



This concludes the focus on defensible space for farm structures, infrastructure, and access. In summary remember to keep it clean within 5 ft (non combustibles only), green within 30ft (keep watered), and lean in the outer 100 ft (thinned and short). The next module will cover creating defensible buffers and fuel breaks to better build defensible space at the field and landscape level.