



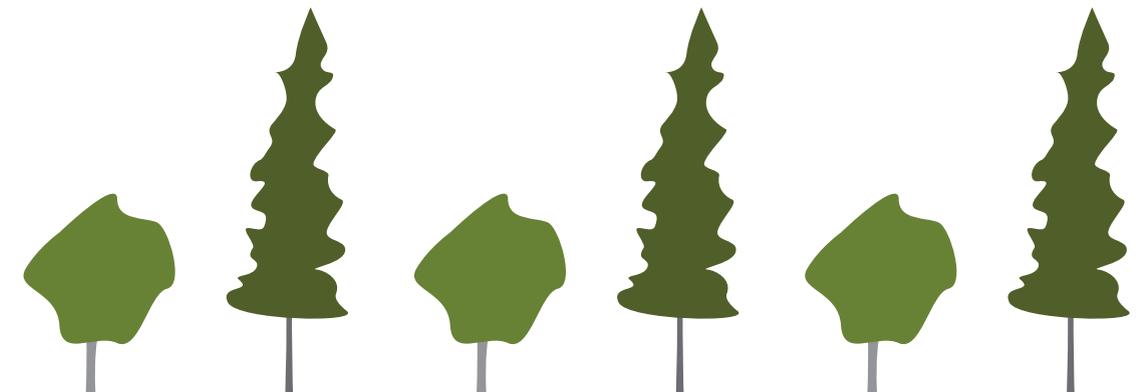
FIREWISE LANDSCAPING

IN NORTHEASTERN MINNESOTA

*A Guide to Protecting Your Home or Business from
Wildfire Using Resistant Landscaping and Plants*

This guide is designed to provide northeastern Minnesota property owners in wildfire-prone areas with practical tips for protecting their homes and businesses from wildfires through the use of appropriate landscaping techniques, including the use of wildfire-resistant plants. This type of landscape design to prevent wildfire damage is referred to as Firewise Landscaping.

The goal is to encourage local solutions for living more safely with wildfire threats by involving homeowners in taking individual responsibility for preparing their properties to better survive wildfires.





Neighbors participated in an educational Firewise Demonstration Day in Ely, Minnesota during summer 2015

Much of northeastern Minnesota's boreal forest is naturally wildfire prone. Some trees, such as jack pine, require fire to fully open their cones, while other species—like balsam fir—have highly flammable foliage.

Fire risk is accentuated by the fact that many areas have thin or sandy soils that can dry out easily during droughts. In addition, decades of fire suppression have allowed dead vegetation to build up and permitted flammable shade tolerant species such as balsam fir to proliferate in the understory of many upland forests.

In the 1800s, wildfires burned hundreds of thousands of acres of what is now the Boundary Waters Canoe Area Wilderness (BWCAW), and significant fire events have occurred periodically since then. Areas closer to Lake Superior have experienced fire less often, but wildfires still occur there occasionally. Today, wildfire remains a significant force in northeastern Minnesota. On average, there are 200 wildfire ignitions each year in northeastern Minnesota¹. The 2006 Ham Lake fire (-76,000 acres) and 2011 Pagami Creek fire (-93,000 acres) have proven that large landscape scale wildfires are still possible².

As more people build in the forest, it is increasingly important to protect cabins, homes, and businesses from wildfire. Nearly all of these properties and their assets, including human life, could be saved if the owners followed a few simple principles.

Understanding Wildfire Fuels & Behavior

Protection of property from wildfire, requires a basic understanding of wildfire fuels and behavior.

Wildfire Fuel Types

Ground fuels include all combustible materials found beneath the surface. Examples are deep duff, roots, and buried logs. Duff is the top surface layer of partly decayed leaves and needles that accumulates under dense stands of large brush or trees. Although slow to ignite, ground fuels can burn below the surface and be very hard to find and extinguish.

Surface fuels include all materials resting on the surface or immediately above the ground. Examples are pine needles, leaves, grass, and downed woody materials.



Ladder fuels are material near the surface that can spread fire into the crown of a tree. The most common ladder fuels in northeastern Minnesota are balsam fir and spruce trees with live or dead lower branches near the ground. Other examples include thick patches of blown-down trees or flammable shrubs.

Canopy fuels include all the green and dead vegetation in the forest canopy. The elevated position increases airflow to the flame and increases wind exposure. When trees are densely spaced or when there are many understory trees or shrubs, the fuel density can be high enough to sustain a crown fire.

Wildfire Types

Two types of wildfires can threaten your property. These are surface fires and crown fires.

Surface fires³ move along the ground and burn dry materials lying on or immediately above it including tree limbs, grass, stumps, shrubs, leaves, pine needles and pine cones. Similar to crown fires, surface fires can throw burning embers, although not nearly as far. Surface fires can quickly surround a property and accelerate in vulnerable areas where brush is piled or where ladder fuels allow fire to reach

tree canopies. They also can move quickly and cause great damage and injury when there is wind or steep terrain. After winters with little snow, spring wildfires in tall, un-compacted grasses are a common form of surface fire in northeastern Minnesota.

Crown fires⁴ burn through the canopy of forested areas either independent from surface fuels or in addition to the surface fuels. Crown fires need a lot of heat energy from the surface fire, ladder fuels, and wind to get going. Individual trees often "torch" - called passive crown fire - but typically, this type of burning cannot be sustained for long. Active and independent crown fires create the most heat, the most smoke, and typically move quite rapidly. Because active and independent crown fires require wind to get started, the potential exists for wind transport of embers over long distances, threatening homes or igniting new "spot" fires.



Wildfire Fuel Species

The flammability of individual trees and fuels varies depending on what type they are. In general, trees with evergreen needles are more flammable than broadleaved deciduous trees. This is because most needle-leaved evergreens typically (1) have leaves with lower moisture content, especially during drought, and (2) have sap containing flammable resins.

In northeastern Minnesota, the two most flammable tree species are balsam fir and black spruce (see table at right). Jack pine and white spruce are also quite flammable, while white pine, red pine, and white cedar (*arbor vitae*) are somewhat less flammable.

Wildfire Fuel Ecology

The flammability of a forest or landscape depends on many factors, including the type of trees, the history of management, and events like droughts or insect outbreaks. These are not always things you as a homeowner have control over, but they can put your property at higher risk and call for more vigilance.

Besides being highly flammable, balsam fir and white and black spruce are highly shade tolerant, allowing them to reproduce in large numbers under the shade of an existing forest canopy. This often results in patches of very dense (“dog-hair”) balsam fir and spruce.

Furthermore, balsam fir is generally short-lived, has little

timber value, and is subject to regular outbreaks of severe defoliation by the spruce budworm (*Choristoneura fumiferana*) that occur roughly every 25-35 years. While white and black spruce are impacted, the oddly-named spruce budworm prefers balsam fir. The resulting defoliation and mortality are typically most severe in nearly-pure balsam fir forests, often leaving large patches of standing dead and dying trees that dry out and become increasingly flammable. In time, these standing dead trees often blow over, creating jack-strawed piles of bone-dry dead wood. While young balsam fir is important breeding habitat for the Magnolia Warbler (*Setophaga magnolia*), the tree is so common that habitat conservation has not been of great concern.

Unlike balsam fir, white spruce and black spruce are longer lived trees, have timber value, and are typically defoliated less frequently and less severely by the spruce budworm. If thinned and tended well, white and black spruce are less likely to create the types of dangerous heavy fuel loadings usually caused by thick balsam fir. Nonetheless, both species are flammable and potentially hazardous, leading some to conclude that occurrence of these species should be reduced in some areas. However, efforts in some areas seek to maintain upland black spruce for spruce-grouse breeding habitat.

Jack pine, in contrast to balsam fir and the spruces, has very little shade tolerance. This means that it does not reproduce well in the understory of a mature forest.

Instead, jack pine reproduces well in full sun, where it sometimes creates dense “dog-hair” thickets in large, sunny openings. These thickets can also pose a considerable fire hazard. However, because jack pine is moderately long-lived and has limited timber value, it can also be thinned to reduce fire risk. And, like upland black spruce, conservation organizations in some areas are now trying to restore certain jack pine habitats to enhance biodiversity.

In summary, balsam fir is typically considered the most hazardous wildfire fuel tree in northeastern Minnesota, while black spruce, white spruce, and jack pine are considered hazardous but also desirable in some areas for timber and habitat reasons.

Table 1: Relative Flammability of Boreal Trees⁵

Tree Species	Flammability
Aspen	Very Low
Birch	Low
Maple	Very Low
Poplar	Very Low
Elm	Very Low
Black Spruce	Very High
White Spruce	High
Jack Pine	High
White Pine	Medium
Red Pine	Medium
Eastern White Cedar	Medium
Balsam Fir	Very High
Tamarack (Larch)	Low
Bur Oak	Very Low
Green Ash	Very Low
Basswood	Very Low
Eastern Cottonwood	Very Low
Peachleaf Willow	Low
Large-tooth Aspen	Low

Defend Your Property: Create Defensible Space

The most important thing you can do is create defensible space, or a safety zone, immediately surrounding your home. Wildfire experts divide defensible space into two zones:

1. The Intensive Zone, 0-30 ft around buildings.
2. The Extensive Zone, 30-70 ft around buildings.

The 30 foot number comes from the 1999 International Crown Fire Experiment, when wildfire scientists found that wooden walls separated from an active crown fire by 30 feet of non-combustible material did not burst into flame, but rather suffered only minor scorching. These results showed that

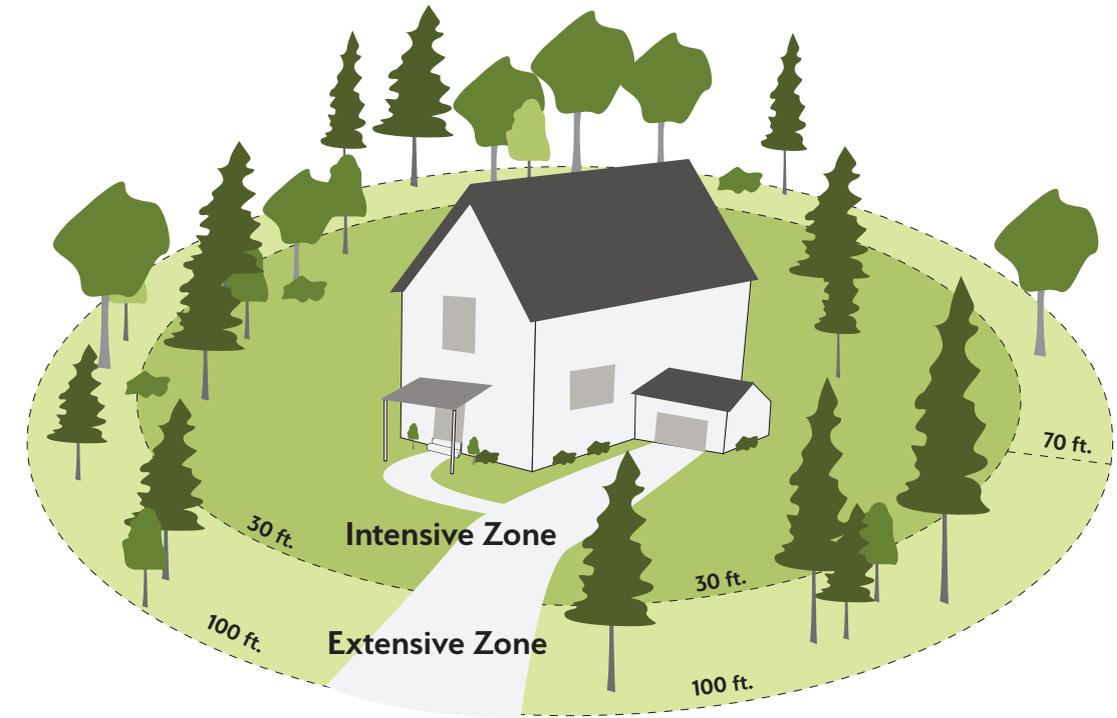
reducing fuels in a building's defensible space can greatly improve the building's chances of surviving a wildfire.

Most Firewise work should be concentrated in the intensive zone, with work proceeding outwards into the larger extensive zone. There are five basic steps to creating a well-managed defensible space:

1. Remove canopy fuels to force canopy fires to the surface.
2. Remove ladder fuels to keep fires on the surface.
3. Remove and minimize surface fuels to eliminate paths for surface fires.
4. Create non-combustible borders around the base of your buildings.
5. Maintain your defensible space every year.

These steps are explained in more detail on the next page.

Defensible Space Zones



General Management Zone





Five Steps to Create Defensible Space in the Intensive Zone

Step #1: Remove or Thin Mature Conifer Trees

Ideally, remove all mature conifer trees in the defensible space. If you do keep a few favorite conifer trees, be sure they are well spaced with at least 10 feet between their crowns and that they are pruned up at least 6-10 feet from the ground. Remove any branches within 10 feet of the roof or chimney.

When removing vegetation for wildfire fuel reduction, remember to properly dispose of the debris. Debris should be chipped and spread thinly to decompose, piled in large openings outside of the defensible space for winter burning, or brought to a designated county or municipal disposal site.

Step #2: Remove All Understory Ladder Fuels Conifers

Remove all flammable understory conifers (balsam fir, spruces, and pines) within the defensible space. As a rule of thumb, consider a tree in the understory if it is less than 5 inches dbh (diameter at breast height, or 4.5 feet above the ground). If trees are small, cutting them with a brush-saw can be very quick and effective.

Step #3: Remove and Minimize Surface Fuels

Remove hazardous surface fuels and minimize the amount of surface fuel in the intensive zone of the defensible space using fire-resistant design.

- Use fire-resistant landscape plants (those with “low” flammability ratings in Table 2).
- If you have grass and are not able to mow it regularly, consider replacing it with rock mulch, wood chips, or fire-resistant herbaceous ground covers (see Table 2).
- Make sure plantings are well spaced to prevent fire from moving from one plant to the next.
- Avoid planting under trees to avoid creating new ladder fuels.
- Create fire breaks using paths, rock mulch, or ponds.

Step #4: Create Non-Combustible Borders and Buildings

Plant nothing within the first 3-5 feet around the base of your buildings. Decorative rock creates an attractive, easily maintained, non-flammable ground cover. Keep this area free of all wildfire fuels, including leaves, pine needles, straw bales, organic landscaping mulch, shrubs, woodpiles, and grasses.

Step #5: Maintain Defensible Space Every Year

- If you have grass, keep it mowed short (1-2”).
- Water during drought periods to prevent landscape plants from becoming dry.
- Rake up and dispose of pine needles and/or leaves every fall.
- Frequently prune and maintain plants to ensure vigorous growth and a low growth habitat.

- Remove dead branches, stems, and any trees that blow down.

- Every year, “weed out” the little conifer seedlings that inevitably seed into your defensible space. These seedlings are easy to pull when the soil is damp, and are much easier to remove when they are little than when they are 15 feet tall. A weed whip or small brush-saw can also be efficient.

Creating Defensible Space in the Extensive Zone

- Thin trees and large shrubs so there is at least 10 feet between crowns.
- Prune remaining trees to a height of 6-10 feet.
- Remove ladder fuels under remaining trees.
- Encourage fire-resistant trees and plants with “low” or “medium” flammability rating in Table 2.

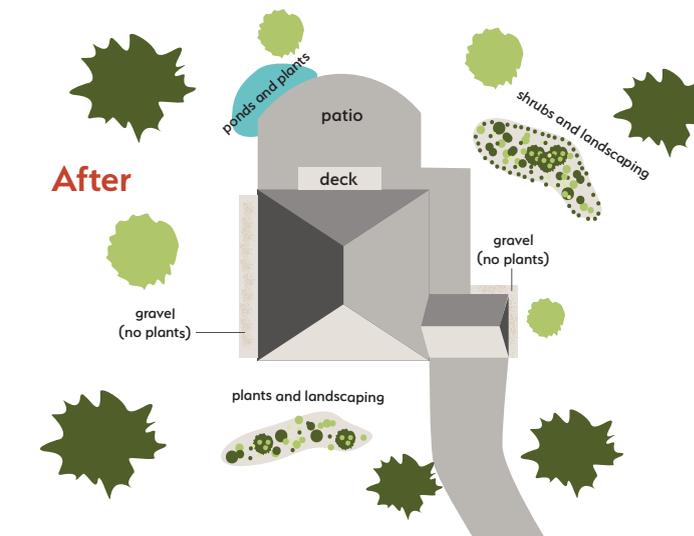


Table 2: Wildfire-Resistant Plants

Proper landscape plant selection and placement can aid in preventing homes and buildings from igniting during a wildfire. Plants that do not burn easily are referred to as wildfire-resistant and are less likely to contribute to a fire. Wildfire-resistant plants have several helpful characteristics. For example, conifers commonly contain resins that can ignite and produce intense flames and heat whereas many deciduous plants do not contain these flammable resins. Other helpful characteristics include loosely packed foliage, lack of persistent dead foliage, no serious insect and disease problems, and trees with good separation between the ground and lower branches. Of course, any plant can burn if it is dry enough or in extreme heat conditions.

The plants below have been rated “low” or “moderate” flammability⁸ and are not invasive. Low flammability plants can be planted between 3 to 30 feet of a building, whereas “moderate” flammability plants should be planted beyond 30 feet of a building.

Common Name	Latin Name	Flammability Rating	Plant Type	Soil Moisture	Sun	Hardiness Zones
Blueberries	Vaccinium spp.	Low	Low Shrub	Dry-Med	Sun to Part	3 to 7
Currants	Ribes spp.	Low	Low Shrub	Med-Wet	Sun to Part	3 to 8
Dwarf Bush Honeysuckle	Diervilla lonicera	Low	Low Shrub	Dry-Med	Sun to Part	3 to 9
Black-Eyed Susan	Rudbeckia hirta	Low	Perennial Flower	Med	Sun	3 to 9
Blazing Star	Liatris spp.	Low	Perennial Flower	Dry-Med	Sun	4 to 9
Blue Giant Hyssop	Agastache foeniculum	Low	Perennial Flower	Dry-Med	Sun to Part	4 to 8
Blue Vervain	Verbena hastata	Low	Perennial Flower	Med-Wet	Sun	3 to 9
Butterfly-weed	Asclepias tuberosa	Low	Perennial Flower	Dry-Med	Sun	3 to 9
Cardinal Flower	Lobelia cardinalis	Low	Perennial Flower	Med-Wet	Sun to Part	2 to 9
Columbine	Aquilegia canadensis	Low	Perennial Flower	Med	Sun to Part	3 to 9
Coneflower	Echinacea spp.	Low	Perennial Flower	Dry-Med	Sun to Part	3 to 8
Culver's Root	Veronicastrum virginicum	Low	Perennial Flower	Med-Wet	Sun	3 to 8
Cup Plant	Silphium perfoliatum	Low	Perennial Flower	Med-Wet	Sun	4 to 8
Fireweed	Epilobium angustifolium	Low	Perennial Flower	Dry-Wet	Sun to Part	2 to 7

Common Name	Latin Name	Flammability Rating	Plant Type	Soil Moisture	Sun	Hardiness Zones
Goldenrods	Solidago spp.	Low	Perennial Flower	Dry-Wet	Sun to Shade	4 to 9
Hairy Solomon's Seal	Polygonatum pubescens	Low	Perennial Flower	Med	Part to Shade	3 to 8
Jack-in-the-Pulpit	Arisaema triphyllum	Low	Perennial Flower	Med-Wet	Part to Shade	3 to 9
Joe Pye Weed	Eutrochium maculatum	Low	Perennial Flower	Med-Wet	Sun	3 to 9
Milkweed (Common)	Asclepias syriaca	Low	Perennial Flower	Dry-Med	Sun	4 to 9
Native Violets	Viola spp.	Low	Perennial Flower	Dry-Wet	Sun to Shade	4 to 9
Nodding Trillium	Trillium cernuum	Low	Perennial Flower	Med	Part to Shade	3 to 8
Northern Bluebells	Mertensia paniculata	Low	Perennial Flower	Med	Part to Shade	3 to 9
Prairie Smoke	Geum triflorum	Low	Perennial Flower	Dry	Sun	3 to 7
Purple-stemmed Aster	Symphyotrichum puniceum	Low	Perennial Flower	Med-Wet	Sun	2 to 9
Shooting Star	Dodecatheon meadia	Low	Perennial Flower	Med	Part to Shade	4 to 8
Spreading Jacob's Ladder	Polemonium reptans	Low	Perennial Flower	Med	Sun to Part	3 to 8
Thimbleberry	Rubus parviflorus	Low	Perennial Flower	Med	Sun to Part	3 to 10
Bunchberry	Cornus canadensis	Low	Ground Cover	Dry-Wet	Part to Shade	2 to 6
Dewberry	Rubus pubescens	Low	Ground Cover	Med	Sun to Shade	3 to 8
Hostas	Hosta spp.	Low	Ground Cover	Med	Part to Shade	3 to 9
Large-Leaved Aster	Eurybia macrophylla	Low	Ground Cover	Med	Part to Shade	4 to 8
Mountain Mint	Pycnanthemum virginianum	Low	Ground Cover	Med	Sun	3 to 7
Prairie Phlox	Phlox pilosa	Low	Ground Cover	Med	Sun	4 to 9
Prairie Sage	Artemisia frigida	Low	Ground Cover	Dry	Sun	3 to 10
Sedges	Carex spp.	Moderate	Ground Cover	Dry-Wet	Sun to Shade	3 to 8
Wild Geranium	Geranium maculatum	Low	Ground Cover	Med	Sun to Part	3 to 8
Wild Ginger	Asarum canadensis	Low	Ground Cover	Med-Wet	Part to Shade	4 to 8
Wild Strawberry	Fragaria virginiana	Low	Ground Cover	Med	Sun to Part	3 to 10

Nurseries:

Many wildfire-resistant species can be found at these local nurseries.

Blue Moose Garden Shop (Grand Marais)
218-387-9303
www.thebluemoosemn.com/lowershop.php

Boreal Natives (Cloquet)
218-729-7001
www.prairieresto.com/boreal__natives.shtml

Cherry Greenhouse (Cloquet)
218-263-9304
www.facebook.com/Cherry-Greenhouse-81365897047/

Dirt Lady Gardens & Greenhouse (Virginia)
218-741-0174
www.organicgoldblackdirt.com

Engwell's Garden Center (Duluth)
218-727-8964
www.engwalls.com/engwallsgardencenters/

Ely Flower and Seed (Ely)
218-365-6555
www.uwebconnect.com/elyflower/home

Early Frost Farms & Greenhouse (Embarrass)
218-984-3411
www.earlyfrostfarms.com

Gracie's Plant Works (Ely)
218-365-0055
www.graciesgarden.wix.com/graciesplantworks

Greenstone Nursery (Ely)
218-365-6037

Heidi's Greenhouse (Chisholm)
218-929-0990
www.madeontherange.com/heidis-greenhouse.html

Kunnari Greenhouse (Eveleth)
218-744-5853
www.kunnarigreenhouse.com/

Maxwell's Woodland Nursery (Finland)
218-353-7726

McMillian Landscape & Tree Service (Grand Marais)
218-370-0118

Northern Landscapes (Hibbing)
218-263-9739
www.northernlandscapes.net

Swanson Greenhouses (Eveleth)
218-744-5099
www.swansongreenhouses.com/contact

Vern's Greenhouse & Nursery (Virginia)
218-749-2981
www.verns-greenhouse.com/

Additional Firewise Landscaping Tips

- Ensure that the area beneath decks is completely clear of the previously mentioned wildfire fuels. Screening and enclosing that area can help to prevent fuel accumulation..
- Keep all firewood at least 30 feet from all structures, including outbuildings and decks.
- Keep propane tanks clear of vegetation and debris for approximately 10 feet.
- Remove flammable materials such as leaves, pine needles and other organic debris from your roof and gutters since burning embers from crown fires can ignite them.
- Keep your driveway clear of brush and make sure that it is at least 12 feet wide with a vertical clearance of 14 feet. This will ensure that emergency vehicles have access to your property.
- Work together with your neighbors to create defensible spaces on your properties. Assist each other in implementing Firewise landscaping techniques and planting wildfire-resistant plants.
- Work with your neighbors or neighborhood association to keep common areas between homes thinned, pruned and well managed.

The safer your neighbors' homes are from wildfire risks, the safer your home will ultimately be.

References

- 1) Wildfires Tracked by Minnesota DNR, 2016. <https://gisdata.mn.gov/dataset/env-wildfires-tracked-by-mndnr>.
- 2) USFS Data. Patty Johnson, Superior National Forest East Zone Fire Management Officer, personal communication.
- 3) Surface fire photo source: www.fs.usda.gov/detail/psicc/home/?cid=stelprd3856216
- 4) Crown fire photo source: www.fs.usda.gov/detail/r2/recreation/?cid=stelprdb5370444
- 5) Source: Manitoba Conservation Fire Program. "Be FireSmart – A Guide to Landscaping Practices that Protect Your Home from Wildfire." www.gov.mb.ca/conservation/fire/Prevention/FireSmart%20Landscape%20brochure2011.pdf
- 6) Image Source: Minnesota Department of Natural Resources Firewise Program. "Creating a Firewise Property." 2004. <http://files.dnr.state.mn.us/assistance/backyard/firewise/creatingfirewiseproperty.pdf>
- 7) Image source: Manitoba Conservation Fire Program. "Be FireSmart – A Guide to Landscaping Practices that Protect Your Home from Wildfire." www.gov.mb.ca/conservation/fire/Prevention/FireSmart%20Landscape%20brochure2011.pdf
- 8) Plant flammability was rated using the methodology developed in: Behm A.L., A.J. Long, M.C. Monroe, C.K. Randall, W.C. Zipperer, L.A. Hermansen-Baer. (2004) Fire in the wildland–urban interface: preparing a firewise plant list for WUI residents. University of Florida, Institute of Food and Agricultural Services, Florida Cooperative Extension Service (Circular 1453). Gainesville, FL. 8p. http://old.interfacesouth.org/products/flammability__key__2.html



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**FIRE ADAPTED
COMMUNITIES**
LEARNING NETWORK

