Managing your timber resource: Which trees to cut, which trees to leave?

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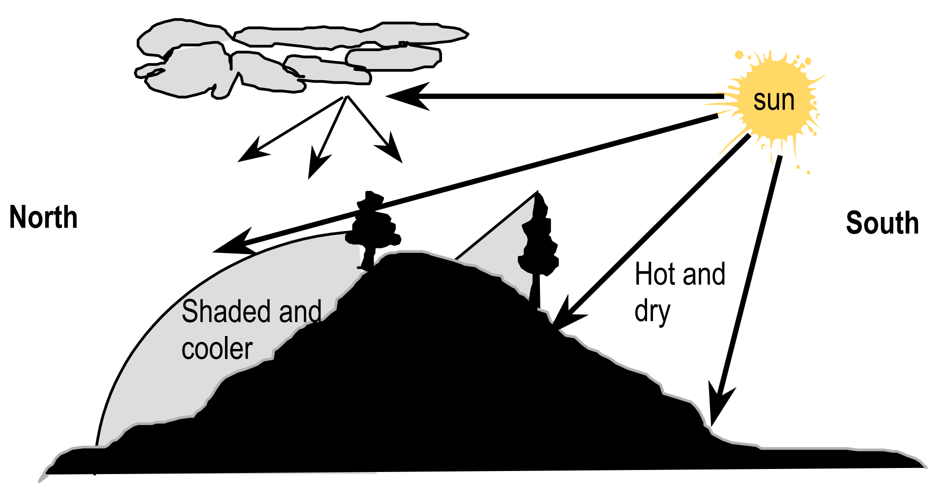
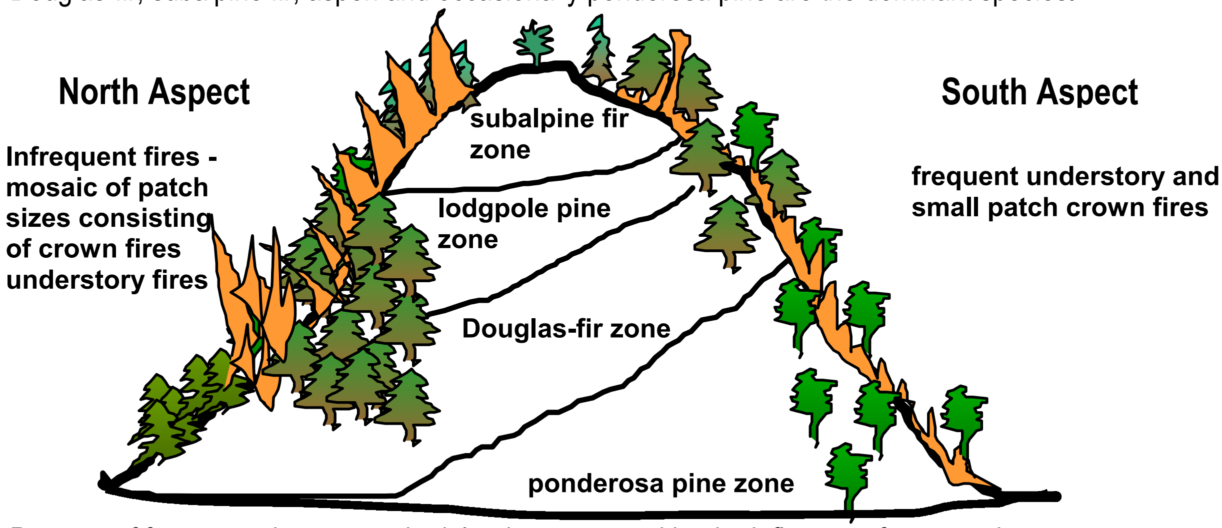
The first step in any type of land management is to formulate a set of objectives and goals for the acreage in question. While these goals will reflect the personal needs of the landowner, whether they are to minimize human impact on the land in question or convert it into a plantation, these goals should also be tempered by the ecological capacity of the site. Throughout history, the biggest “screw-ups” occurred when land managers tried to impose objectives that the land was incapable of supporting. With that in mind, all forested land management goals and objectives ultimately involve which trees should be left and which trees should be removed from a particular site. The most daunting challenge to the art and science of forestry is still represented by this basic decision making process, and can result in leaving all the trees or cutting every tree. To a forest landowner, setting objectives and goals for their land is relatively simple compared to finally standing in the forest and trying to decide which trees to favor.

With the recognition that any forest management practice on a portion of the landscape will impact the functioning of the rest of the landscape, the first step in deciding which tree to leave or cut involves determining what scale of tree removal will work best for the landscape. One technique is to first determine what patterns of natural disturbance occurred on the property in question. The best tools for this determination are to look at the topographic position of the property, and then to look for clues in the forested stand structure and composition. Topography affects how much energy from the sun is transferred to the plants and soil. South slopes intercept almost all the sun’s energy and are hot and dry, north slopes receive most of their sunlight from light reflected off the atmosphere and are, therefore, cooler and often wetter. East and west slopes get equal energy from morning or afternoon sun, however, the air temperature is usually already at its highest point of the day in the afternoon, thus west slopes start getting direct sunlight when they are already warmed up, making them warmer than east slopes. Typically the temperature rating from hottest to coolest aspects follows a south, west, east and north slope pattern.

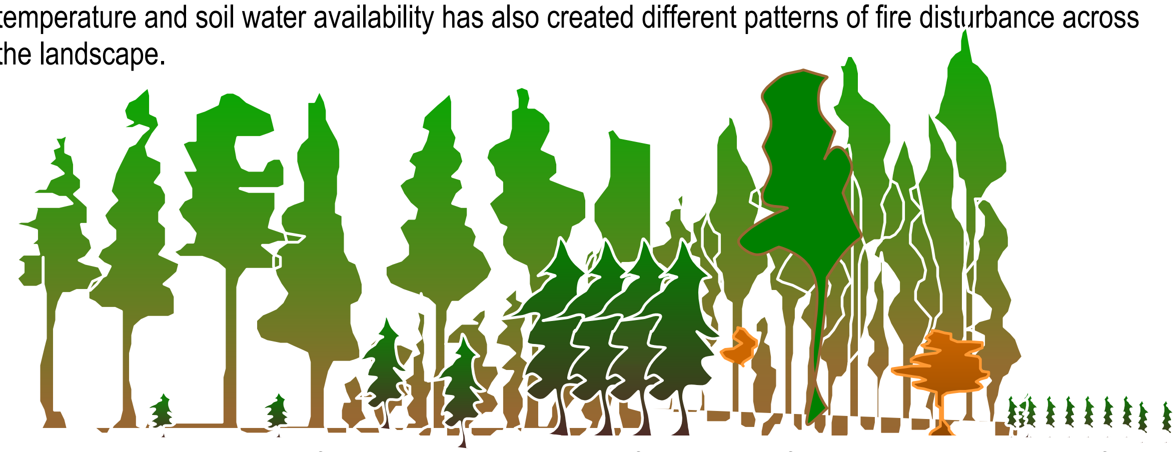


The effect of aspect on sunlight absorption and temperature regimes

The suns energy absorption and resulting temperature patterns are important because they control the moisture availability of the site, and the combined moisture and temperature regime determines the tree species and also the potential for wildfire to occur. In the inland western United States wildfire has been shown to have been the single largest disturbance force that forests have evolved with and in some cases are dependant on. In a general sense, the pattern of fire history is closely related to landscape topography. Hotter drier slopes, ie. southern and western aspects tended to burn more frequently than northern and eastern aspects. Tree species, understory vegetation, and forest structures reflect those differences in disturbance patterns. Forests that experienced frequent fires (every 3 – 10 years) support an open forest structure with a predominance of ponderosa pine and Douglas-fir, usually at lower elevations. Those areas that supported a combination of frequent and infrequent fires (10 – 100 years) are characterized by a patchwork of stand structures including multi-aged and even-aged stands with species that include ponderosa pine, Douglas-fir, aspen and lodgepole pine. These sites typically occur at higher elevation south slopes, intermediate elevation east and west slopes and across north aspects. Since north slopes are typically cooler and wetter than other aspects, they also support faster tree growth, which allows dense stand conditions and large amounts of fuel to develop. In addition, a drought event coinciding with a lightning strike is usually required for a fire to get started. This typically results in large forest stand replacing fires that occur at a frequency of greater that 100 years and created areas greater than 50 acres in size of even-aged trees, of which lodgepole pine, Douglas-fir, subalpine fir, aspen and occasionally ponderosa pine are the dominant species.

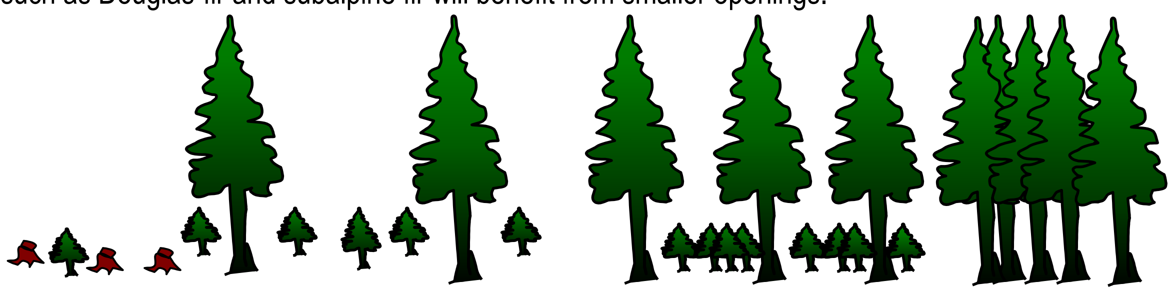


Patterns of forest species across the inland west caused by the influence of topography on temperature and soil water availability has also created different patterns of fire disturbance across the landscape.



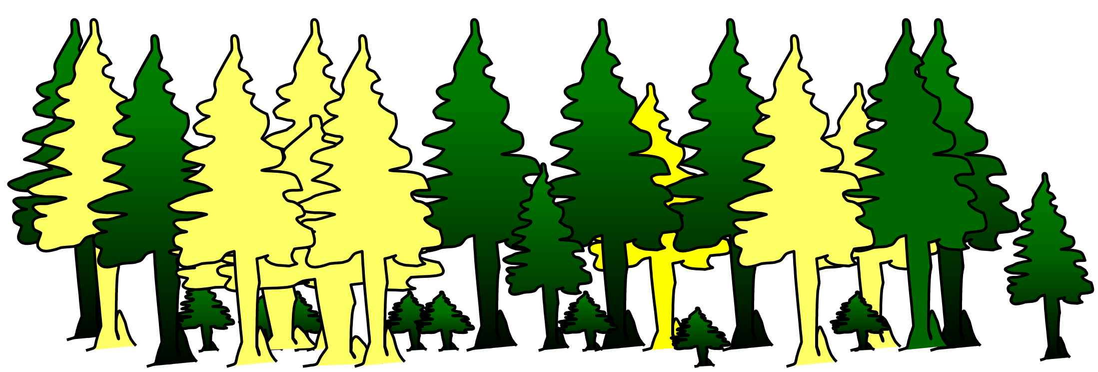
Different patterns of disturbance result in unique adaptations of species and distinct patterns of forest stand structures and composition. By knowing which types of structures and disturbance patterns have historically occurred, we can tailor our forest management to simulate past disturbances without the destructive consequences of fire. This will provide the necessary habitat for all of the organisms that over the centuries have become dependant on these unique forest patterns and structures.

Forest management practices of the past typically focused on the ecosystems where large stand replacement fires shaped the forests. The practice of clearcutting, seed tree and shelterwood cuts, all of which are referred to as "evenaged" management practices, are well suited for simulating stand replacement or crown fires. Which of these practices was used depended largely on the species mixture and individual tree characteristics in a stand. Where individual trees of desirable species have stem and crown dimensions that suggest their ability to withstand the shock of a more open environment, a seed tree or shelterwood cut is recommended. Stands that are dominated by sick or suppressed trees may benefit greatest from a series of clearcuts. Tree species that require full sunlight (shade intolerant) such as ponderosa pine, lodgepole pine and aspen will benefit from larger openings. Species that prefer intermediate shade (shade tolerant) such as Douglas-fir and subalpine fir will benefit from smaller openings.



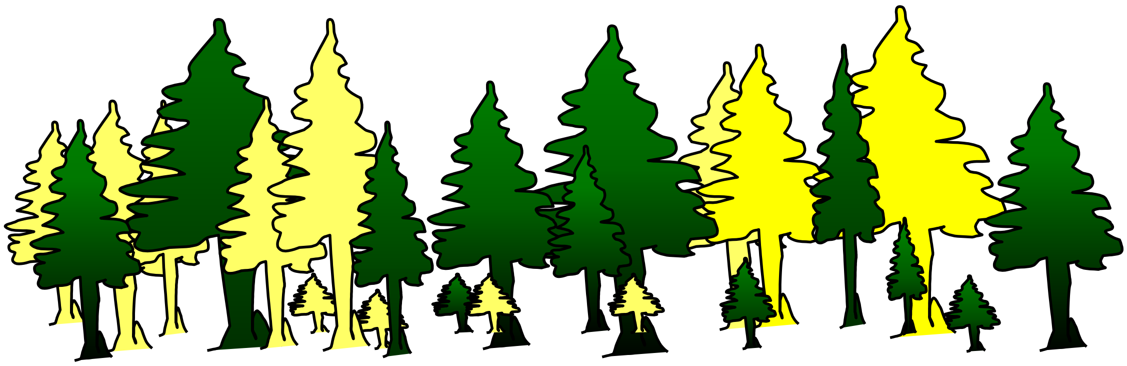
Clearcut **Seed tree *(shade intolerant)*** **Shelterwood *(shade tolerant)***

Sites that typically had mixed severity fires provide for the greatest options in forest management practices. Simulating those types of disturbance often calls for patches of trees to be treated differently although large scale evenaged treatments also work. Often the stand of trees itself will indicate what naturally would have occurred. For example, an area that has dense standing trees with large amounts of down woody debris would have led to a crown fire, burning all trees in that area and creating a large clearing. Stands that have a random spacing of dense and open grown trees would have burned in clumps creating small opening while leaving the more open spaced trees intact. Areas that are composed of large well spaced trees would have supported a fire that stayed on the ground with an occassional tree burning up. Mosaics such as these provide multistructural forests and are often the most productive wildlife habitats. Harvesting patterns can vary from several acre openings to individual tree selection. It is important to recognize that many different treatments can be used within the same stand of trees.



Single tree selection and group selection (*light color are cut trees*)

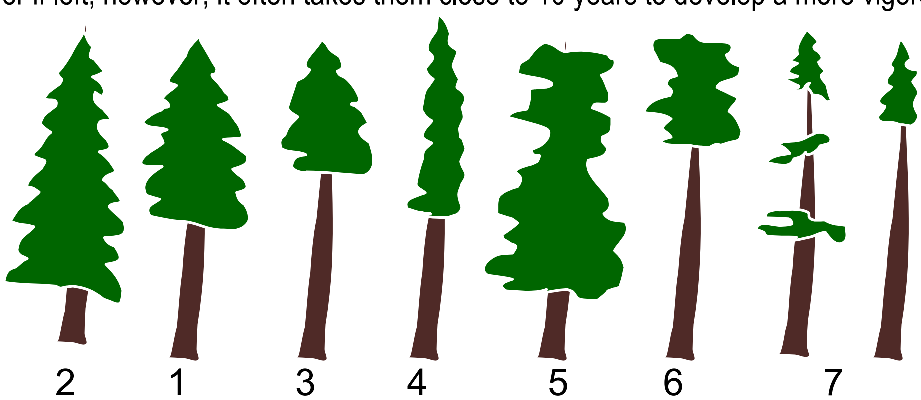
Drier ponderosa pine and Douglas-fir sites usually supported frequent fires that kept most of the stands in an open savanah- like composition. Quite often these areas are also used extensively by deer and elk for winter range because of the lush bunchgrass understory that was promoted by frequent fires. In the absence of fire prolific tree regeneration can occur resulting in dense stagnant stands of small diameter pine and fir trees. These stands not only represent a significant fire danger, but lose their bunchgrass understory to shading resulting in loss of winter range. Overgrazing of such sites will accelerate the development of dense tree regeneration. Land managers are often challenged in their efforts to restore such situations because there are currently poor markets for small diameter tree stems making these sites expensive to manage. Thinning combined with with light grazing (to reduce the fire hazard from cured grasses) is a good management alternative for these sites. Unevenaged management is also a good option on these sites.



Thinning and unevenaged management (*light color indicates cut trees*)

Tree selection criteria for vigorous high value trees

The criteria used for determining which individual trees to cut or leave are usually based upon their crown characteristics. Since the green needles are the food producing part of the tree, the more needles a tree has, the better the growth rates will be. In general, if less than a third of the entire tree height supports green needles, the tree is a poor choice as a leave tree. Optimal tree crowns occupy between 60 and 40 % of the tree height. Greater than 60% crown area results in a healthy tree, however one that also requires more water, nutrients and space relative to the amount of stem wood it produces. Less than 30% crown results in a tree that is top heavy and subject to wind breakage, slow growing, and often reflects a poor root system that may be inadequate to supply the tree with enough water during dry periods. Trees of lesser quality may eventually recover if left, however, it often takes them close to 10 years to develop a more vigorous crown.



1) Best form **2)** Still good -knotty wood **3)** Will recover though risk of wind breakage **4)** Over crowded, may sun scald, may recover **5)** An older # 2, good wildlife, may live another century **6)** Overmature, low vigor, high risk **7)** Diseased, low vigor, raptor nest trees

Tree selection for wildlife

Wildlife requires food sources and hiding cover. Tree structural and species diversity are the most common desired components for wildlife. Tree selection criteria should favor size and crown diversity. A spindly tree with a small crown may be favored by an owl or eagle whereas a dense bushy shrub is preferred by nesting warblers. Large snags, vigorous trees, odd shaped trees all contribute to wildlife habitat. For diversity, clumps of dense, evenaged trees can also be left in a mosaic with savannah-like openings. Wildlife species are especially sensitive to changes in their historical forest enviroment. It is important to match the patch size of the management areas to the patch size that fire historically created.

Insect and disease criteria

Most insects and diseases prefer specific tree species. Observing which tree species is suffering in a stand of trees will often indicate which species to select more heavily against. It is easy to overreact, however. Some degree of tree mortality is normal and necessary as insects are an important food source for a variety of wildlife species. Maintaining a healthy population of insect predators is the best way to keep pests in balance. Selecting for a diversity of tree species will keep any one insect or disease from devastating an entire stand of trees.

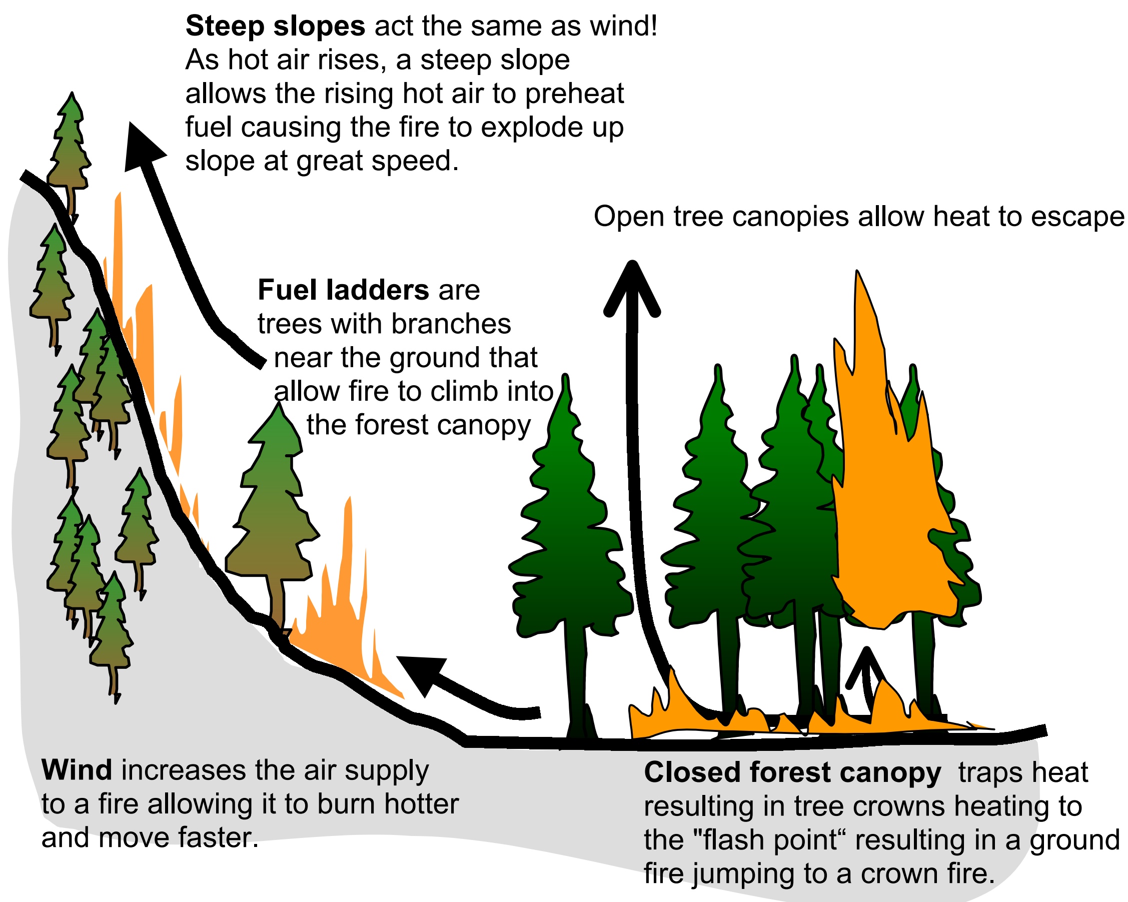
The wildfire issue

Although it is extremely important for humans to consider the historical ecology of a forest ecosystem when we contemplate alternative management scenarios, it is of equal importance to consider the risks associated with wildfire. Wildfire does not respect property boundaries and has little concern for human residences other than the fact that a house is a fuel to be consumed. When considering managing your forest, several facts about wildfire need to be taken very seriously. First, there is no such thing as a "fireproof" forest. Second, we need to take into consideration wildfire behavior during normal years when weather patterns are fairly typical, and we need to take into consideration wildfire behavior during "extreme" years when drought, wind and lightning are much more prevalent than normal.

Forest wildfires typically erupt into dangerous events when they encounter three types of fuel conditions. The first is an accumulation of "fine" fuels - dead debris ranging from cured grasses to dead tree branches less than 4 inches in diameter. Since these types of fuels ignite very easily, a lightening strike or spark will easily start and spread. The second situation is a continuous layer of fuel across the landscape. This allows fires to "run" across the landscape creating enough energy to preheat and ignite larger fuels. The third condition is unique to forests and consists of a dense conifer overstory. Heat from a fire on the ground will get trapped by the dense canopy until the needles get hot enough to ignite into a "crown" fire. If a continuous dense forest canopy exists across the landscape, condition two will be met and a running crown fire will result, often creating flames over 300-ft tall. It is often impossible or undesireable to create forest conditions that remove all fine fuels or dense forest canopies. However, by manipulating the distribution of these conditions across the landscape it is possible to create "fuel breaks" that will slow a fire down and allow control measures to be used effectively.

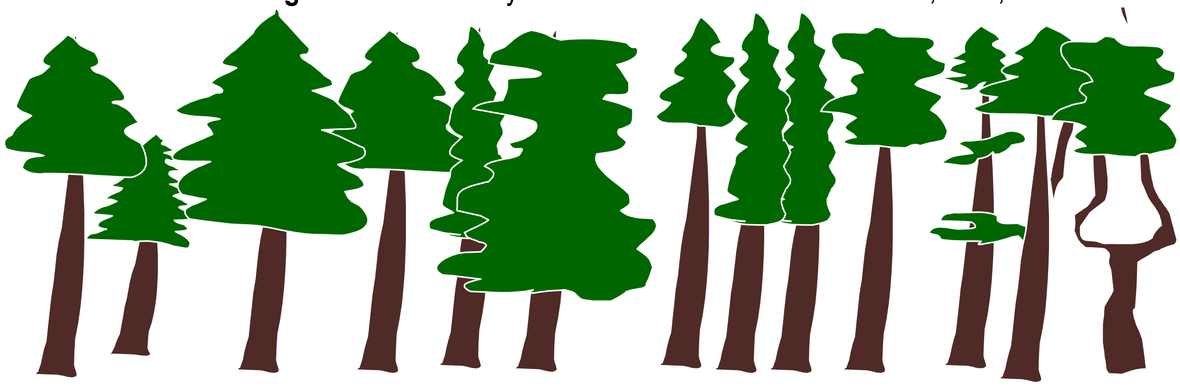
During typical years, south aspects are more subject to fire danger because they are hotter and drier than north aspects. A rigorous management strategy that addresses dried grasses as well as tree density needs to be considered. Since these aspects historically supported frequent fires, manageing these areas for more open savannah stands with some minor proportion in denser patches meets the ecological as well as fire danger issues.

North aspects represent a unique situation since they are often capable of growing a very productive dense forest. Ecologically, dense forests have been the normal condition and the wildlife that frequents these areas usually desires this type of habitat. Landowners who build homes into this type of forest often desire privacy and enjoy the conditions of a dense forest. Since north aspects are often cooler and wetter than south aspects, they also do not burn as readily during a "normal" year. During and extreme year, however, north aspects often support severe wildfires that are diffucult or impossible to suppress. It is therefore important to consider more "heavy-handed" management to reduce the risk of severe wildfire near homes. As mentioned previously, it is impossible to "fireproof" a forest. It is possible to reduce the risk of severe wildfires however, by reducing the fuels in strategic areas around homesites and across the forest in a mosaic of firebreaks.



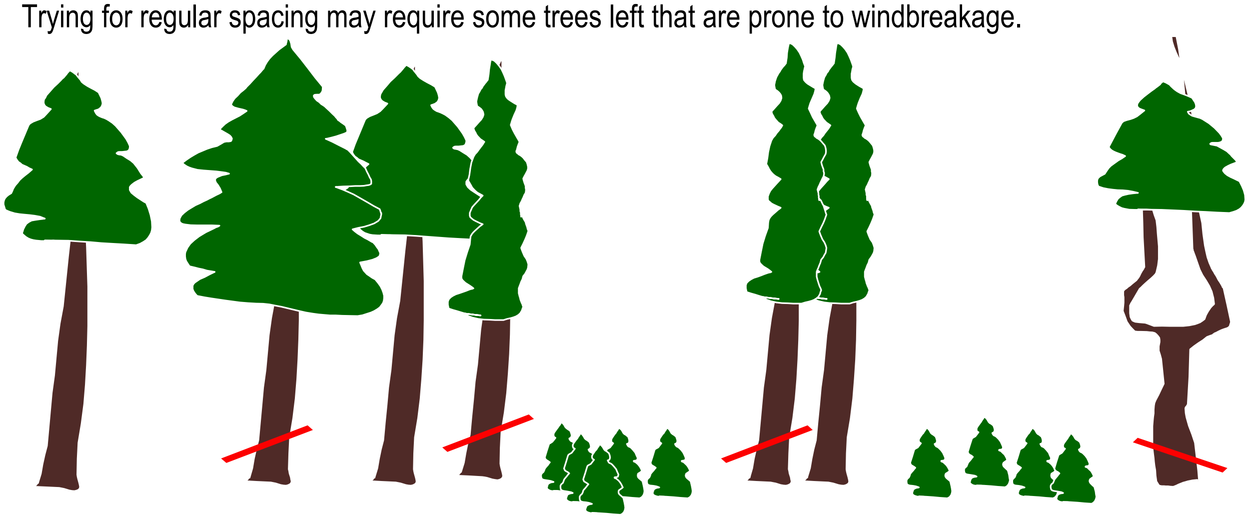
Factors affecting fire behavior

Alternative harvesting scenarios. Every stand of trees has a mixture of thin, wide, forked and



diseased crowns. “V” shaped crowns are inherited and are structurally weaker, “U “ crowns are the result of prior tip damage and make good wildlife trees.

Dominant trees are left for aesthetics, forage production, wildlife and simulation of frequent fires. Trying for regular spacing may require some trees left that are prone to windbreakage.



Trees left based upon crown size and shape. Residual trees also have the ability to grow bigger for an eventual valuable product. Clumped pattern is determined by the natural occurrence of tree's with suitable crowns. Crowns prone to windbreakage are left in tighter groups for mutual protection. As crowns recover, more trees can be harvested for a wider spacing if desired. Selection criteria should be a trees ability to tolerate sudden opening of the stand, ability to grow well, and most importantly, ability to survive for a longer period of time. Simulates a mixed severity fire mosaic.