

FOREST HEALTH – Jan 2018

General Forest Health

Insect infestation within our Ranch's forests, the effects of the drought, and years of forest neglect have led to a growing need to examine the steps we can take to improve the health of our forest. A healthy forest mitigates fire danger by reducing fuel loads; is more resistant to infections, infestations, and drought; encourages the growth of trees of varying ages; and is attractive to a range of wildlife. In general, a healthy forest has the following characteristics:

- Species diversity
- Age diversity
- Limited numbers of dead, dying and sick trees
- Separation between younger, shorter trees and more mature, taller trees to minimize ladder fuels and to remove their competing needs for water and nutrients
- Densities which encourage growth by allowing water and nutrients to feed the healthiest, larger diameter trees
- Sunlight reaching the forest floor to support the growth of grasses, shrubs, wildflowers

A healthy forest is not uniform in density or character.

Achieving forest health is a multi-year effort. Environmental conditions change from year to year, making it important to revisit and update forest health plans and priorities over time.

Specific forest health issues and solutions differ by tree age and species. What follows are three sections: young forest, aspen forest, and mature lodgepole pine forest.

The Young Conifer Forest

As the old dead and dying lodgepole forest is removed, dramatic changes take place on the forest floor. Sunshine reaching the ground stimulates growth of native grasses, wildflowers, and shrubs like Buffaloberry, knick knick, and wild roses. In dryer locations, sagebrush may establish itself. Among this proliferation of native plants one finds thousands of tiny pine and spruce seedling trees. Mother nature will take care of revegetation if we can wait.

Tree replacement, especially around homes, where we may want larger trees, should take into account the growth characteristics of our native trees. There are five species of tree that grow and proliferate in our harsh climate:

[1] Lodgepole pine. It's hard to see why we want this tree around; it's given us such problems in the past decade. But, there is a reason that our mountains are covered with the lodgepole and that its seedlings proliferate. It is uniquely suited to survive in the nutrient-poor rocky soil at this elevation and in these temperatures. It thrives in the dry sunshine. It is the successor forest; growing naturally after the demise of the parent trees.



[2] Englemann Spruce. This is the species of spruce that grows best at our elevation. Some trees may appear 'blue' but it is not the same as the Colorado Blue Spruce which prefers lower and milder climates. Spruce naturally occurs on the northern slopes of the ranch, where it stays cooler and has more moisture. It will not thrive if it's planted on southern or western facing sites. This tree lives for 300 to 500 years. You are truly planting for your children's children etc. when you put these in the ground in their preferred location.



[3] Aspen. These trees thrive here and are an excellent choice to plant for immediate effect after the demise of the lodgepole forest. Over time the lodgepole may overtake them, but for the decades before that happens, they are a fast growing and attractive alternative.



[4] Douglass Fir. A beautiful tree which requires “wet feet”. Few places on the ranch are suitable for it. Not only does it need the cooler wetter northern slopes, but a good supply of water close under the surface. These proliferate along South Willow Creek below the NW corner of the ranch. They are shallow rooted and where they existed for a century on the ranch, they died a few years ago during the drought when the surface waters retreated. We do not recommend planting them here.



(5) Sub-Alpine Fir.

Has bark that is gray and smooth with resin blisters while young; shallow fissures and scaly when mature. Evergreen needles are dark, blue-green with silvery lines

on both surfaces; 1 to 1-1/2 inches long; flat and blunt tipped; crowded and curved upward on twigs at nearly right angles. Cones are upright, cylindrical, very dark purple, 2 to 4 inches long in the upper part of the crown; fine, hairy, cone scales; long, broad-winged seeds. These deciduous cones fall apart when mature so they are rarely found on the ground. Grows at 8,000 to 12,000 feet and reaches a height of 60 to 100 feet.



Maintenance of the new forest

One cannot just plant these trees and walk away. As the trees grow over the first one to two decades of their lives, they will require thinning and, for specimen trees near houses, spraying for pests.

Both Lodgepole pine and Englemann spruce do best in very crowded conditions for the first decades of their growth. The competition for light will force them to grow straight and tall. This is their natural way. It is only after 15 - 20 years that we should thin them--taking the weaker, smaller, shorter, bent, split topped, etc. trees out. The thinning at this stage should keep the trees from touching each other. This allows the remaining trees to receive more moisture and sun and therefore be healthier and stronger. A healthier tree can withstand high winds, diseases and pests better than a weak one.

The Colorado State Forest Service advises against indiscriminate spraying of insecticide to kill boring beetles and other insect pests. CSFS believes the pine bark beetles that killed the mature lodgepole forest are now largely gone due to no host trees left to infect. While spruce beetles are a problem, the only effective spraying requires reaching the trunk of the tree through thick branches, which is difficult to do. Spraying also kills beneficial insects and adversely affects birds. For these reasons, CSFS recommend judicious spraying of specimen trees only.

Steps for Achieving Aspen Grove Health

Aspen groves are some of the largest organisms in the world. Enormous groves covering many square miles have been identified as having identical cellular and DNA structure and are joined and connected by a maze of underground roots. As a result, aspen trees do not function independently but rather as a part of the structure as a whole. There are various physical and chemical processes that are used by the aspen grove to ensure its success, prevent competition among trees and ensure that the grove maximizes its ability to use the moisture and nutrients available to it.

Aspen trees are generally quite fire resistant. They tend to grow in areas with somewhat moister conditions and they do not produce volatile gases when heated. However, even live aspen trees will burn if their condition is dry enough and the flames are hot enough.

Even under circumstances where the aspen trees themselves do not burn if a fire burns on the ground beneath the trees it will often kill the trees because they are shallow rooted and therefore have a great risk of root damage from fire burning along the forest floor.

In order to ensure adequate nutrients and moisture for survival, mature aspen trees produce a hormone called "Oxyn". The effect of this hormone is to prevent suckers from growing off the root system underneath a healthy tree. When an aspen tree dies from old age or blight, it will continue to release the remaining Oxyn into the

area below the tree for a number of years. In addition, standing dead trees continue to produce shade and reduce the ability of sunlight to reach the forest floor. Sunlight and heat will destroy the remaining Oxyn in the soil over time. As a result, it is very important to remove standing dead or diseased trees in an aspen grove. By removing the standing dead and diseased trees, as well as the downfall, the production of Oxyn ceases and sunlight more readily reaches the forest floor thereby destroying any remaining Oxyn and permitting rapid regeneration from the root structure. The quickest way to ensure the return of a healthy aspen grove is to remove the dead and diseased/dying trees in order to allow the regeneration process to accelerate.

By allowing sunlight to reach the forest floor, the root system is given the signal to send up suckers and produce new trees. Healthy trees in an aspen grove should not be cut, but should be allowed to flourish. Their low fire risk does not require that thinning occur for fire protection. When regrowth begins to occur, the root system will send up a significant number of small young trees that should not be mechanically thinned but should be allowed to self-thin ensuring that the remaining trees will be the healthy and successful ones. As in all other forest environments good fire mitigation practices suggest that clearing the underbrush dead trees and debris is very important in order to limit the ability of a forest fire moving through the understory.

The fire mitigation priorities for aspen groves are similar to those for lodgepole pine forests:

- Remove slash
- Remove fallen dead trees

Forest Health in a Mature Lodgepole Pine Forest

Forest health experts advise that dead, dying, and sick lodgepole pine trees be removed over time to improve forest health. Ideally, undesirable trees should also be removed, at least selectively, over time.

It is easy to identify dead (all brown-red trees) or dying (multiple areas of brown-red foliage and beetle-infected) lodgepole pine trees. It is more difficult to distinguish between healthy and sick lodgepole pine. Sometimes even a deep green tree may not be the healthiest tree if it is wrapped in mistletoe. The matter is further complicated when less desirable trees are robbing nutrients and water from healthier and more desirable trees.

Steps for achieving lodgepole pine forest health are listed below. Note that these steps should be tailored to the needs of individual properties, that there may be aesthetic and wildlife-related reasons to preserve even dead and dying trees in some cases, and that taking some action on a few steps is a good way to get started. Also keep in mind that, if done improperly, thinning of lodgepole pine forest areas can leave the remaining trees vulnerable to blow down in heavy winds.

[1] Remove dead trees and trees with dead tops. Trees with dead tops are frequently that way due to infection with mistletoe or the Calandra fungus, or to drought in older trees.

[2] Evaluate trees with foliage on less than 30% of the tree. These trees have insufficient foliage to support sufficient photosynthesis to retain life and thus are in the process of dying. It may be beneficial to surrounding trees to remove some trees with low foliage that are only a few years from dying.

[3] Preferentially remove smaller diameter trees of the same age as larger diameter trees if their canopy foliage is within 5 to 10 feet laterally from that of the larger trees. These trees provide ladder fuels and will not become mature healthy trees due to the presence of the larger tree. They also drain water and nutrients from the larger healthy tree as well as from seedlings in the area.

[4] Employ the “rule of 7” when considering removing trees in a lodgepole forest. Forest consultants advise calculating the distance between lodgepole “stems” (trunks) by converting the diameter of a tree in inches into feet (a 16-inch diameter becomes 16 feet for this exercise) and adding 7 feet to get the spacing to the next tree. In this example, 16+7=23 feet distance to the next stem. However, experts also advise taking aesthetics into account and avoid creating the look of an orchard. An alternative to this kind of spacing between stems is to prune higher up trees than the recommended 10-12 feet.

[5] Selectively remove significant “leaners” that can serve as significant crown fire ladder fuels.

[6] Remove trees with high concentrations of mistletoe or stimulation brooms also known as stress blooms. These trees will die from the parasitic mistletoe or other infections, and they also serve as a nidus for spreading the disease to other trees.

[7] Remove trees developing a light green or yellowish discoloration. These are ‘anemic’ trees that have been stressed and are in the process of dying. It is important to emphasize that ‘anemic’ trees can be truly identified only in the

summer; in the winter, many trees look ‘anemic’ but will ‘come back’ in the summer.

[8] Selectively remove trees with split tops. These trees are not inherently less healthy but they are certainly weaker than their single topped and straight brethren

[9] Thin stands of shorter younger trees when they reach 10-20 years of age. Stands of shorter younger trees of various ages should be allowed to densely grow until they reach about 10-15 years of age. This encourages tall, straight growth. At that time, future growth will stagnate unless they are thinned to allow for penetration of sunlight and easier competitive access to water and nutrients. Thinning at this age should be sufficient so their branches don’t touch. As they approach 20 years thinning should begin to deal with crown separation of 10 feet to maintain tree health and fire reduction principles. This will enable them to grow as more full and healthier straight trees

These actions should be applied in order to the following areas:

1. Defensible perimeter of our homes
2. Remainder of our lots
3. Common areas of the Ranch

As a practical matter, it is helpful to develop a stepped approach. This is important because one’s view of the problems that need to be addressed in the forest may change as the worst offenders are removed. For example, if the trees with dead tops have been removed, then go to the next step. Before removing them, however, one should tag only those trees one wishes to remove and visualize the result before beginning. This will help to focus on the greatest offenders first and prevent removing too many trees at once. It also makes review and approval by the Architectural Review Committee immeasurably easier.

The Ranch is subject to high wind gusts. It is important to remove fewer trees in areas of high wind gusts than in areas of normal or low wind gusts.

If these steps are taken, the health of the forest will be much greater and will encourage growth of trees of varying age. The visible trees will not only appear more viable, they will be. Our forest will better survive insect infestations and drought. The fuel load in the forest will be lowered such that any fire starting on

the Ranch will be of a lower intensity so it can be more easily contained. In addition, ladder fuels will be reduced so a fire will be unlikely to become a disastrous crown fire. Further, an approaching fire, even a crown fire, would be more likely to go to ground upon reaching the Ranch and thus be more easily controlled.

Since these principles will remove some portion of the canopy, an interesting by-product is that the availability of surface water will significantly increase, leading to higher water yields for the remaining trees, shrubs, streams and aquifers.

REFERENCES

The background information in this report was used as one input to the Ruby Ranch Fire Mitigation and Forest Health Plan. Although some of the details in this report were not incorporated into the current Plan, the information provides a valuable context for individual owners who are thinking through forest health issues on their property.

The following organizations and resources were consulted in putting together this report:

- Lake Dillon Fire and Rescue
- Colorado and U.S. Forest Service
- Numerous publications and expert interviews

www.firewise.org

-www.fs.fed.us/rm

www.colostate.edu/Dept/CSFS -www.na.fs.fed.us/spfo

