



SPECIAL POINTS OF INTEREST:

- Current climate models predict a dry winter and summer which could stress trees and lead to a possible increase in insect activity next summer.
- Watch for forest health related workshops and trainings in your area.

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Insects, Fungi, and Dead Trees...Oh My!

Imagine a forest where the forest is so thick that light cannot make it to the ground. Where woodpeckers and squirrels are searching for a home. And the fire danger is high all the time. That is what many forests would be like if it were not for "bugs and crud."

Insects and diseases have always been an important part of natural ecosystems. They help to maintain a healthy forest where weak trees die off, dead trees are decomposed slowly providing a home for animals, and the nutrients and carbon that the trees have absorbed and utilized are returned to the soil to be used by other plants and animals. Without a method to recycle nutrients forests would be much different places.

While this may sound rather dire and like the world revolves around insects and diseases, I am hoping to demonstrate that they are important and should always be considered when planning to manage a forest.

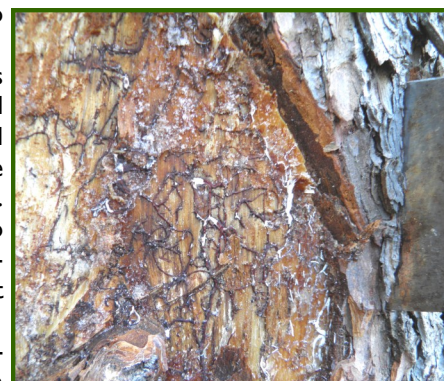
A tree's life is (hopefully) a long and stress free one that will achieve what ever the management goals are. Having a plan on how to deal with insects and diseases will help the most trees reach those goals.

The goal of these bulletins is to provide a framework to present relevant information on the management and science behind forest insects and diseases. It is a tool that landowners and managers can use to better understand what is happening in their forests.

This bulletin will present information on the relevant insect and disease issues facing New Mexico's forests today as they face different threats from a changing climate, invasive pests, and recurring issues with endemic insects and diseases. It is a way to answer questions that people might have and a way to show some of the work that is going on in New Mexico's

forests relating to forest health.

While it may sound like we are focused on forest pests and pathogens, there are also a great number of issues that



Strands of the shoestring root rot (*Armillaria*) grow under the bark of a spruce. It is the most common root rot in New Mexico. (NMSF Photo)



Often found in firewood, flatheaded borers (*Buprestids*) are secondary to the death of a tree. (NMSF Photo)

arise in the urban forest as well. These distinct ecosystems have issues all of their own and often times more complex than the natural forest as there are exotic trees, insects and diseases brought in by humans.

I hope that you will find these useful and that you will send in questions and contributions when ever you like. Inside this issue you will find a brief introduction to bark beetles and one on mistletoe as we move into the holiday season.



Bug of the Moment: Bark Beetles

You have seen pictures of mountain slopes covered in red, dead trees attributed to **bark beetle** infestations that have swept through and killed hundreds of thousands of trees. This scenario has been playing out in several areas throughout the western United States in recent years. And New Mexico has not been immune to their affects, quite the contrary actually. In the early part of the decade, large areas of piñon pine trees were killed when a combination of drought and beetle populations combined to cause an infestation that lasted for several years and killed millions of trees.



Fir engraver galleries
(highlighted here by a fungus)
are horizontal. (NMSF Photo)

In the western United States bark beetles are most often associated with coniferous species but they are also an issue on hardwoods throughout the world. The growth of international trade has led to the introduction of approximately 50 invasive species of bark beetles to the United States, primarily from Europe and central Asia.

Bark beetles are small beetles (~1-8mm in length) that feed on the growth and transport tissue (cambium) beneath the bark of a tree. Adults burrow in to the bark and mate after which the female will burrow under the bark and deposit eggs, often in specific patterns. These eggs hatch and the small, white, c-shaped larvae feed on the cambium until



Bark holes in fir. Approximately BB sized holes produced by emerging adults.
(NMSF photo)

they mature to adults and leave the tree. The gallery pattern that the female creates is distinctive for each bark beetle and are one method of identification.


Split into two different subjective groups, there are primary and secondary bark beetles. Where primary beetles are those that are able to attack and kill trees and secondary are most often associated with dead or dying trees and also branch bark beetles that attack small branches (notably those associated with the emerging 1,000 cankers disease of black walnut). The primary type are of most concern as they are able to cause mortality of the tree.



Gallery trails in aspen.
(NMSF Photo)

Fungi and bark beetles have formed a close relationship in many circumstances. Bark beetles have special anatomical structures that carry fungus and fungal spores into attacked trees. Once inside the fungus will grow in the sapwood reducing the trees defenses and helping to kill the tree.

These insects play an important role in the ecology of natural forests. They create wildlife habitat by creating snags, provide a food source for many birds and other insects, and play an important role in the creation of large woody debris on the forest floor.

Managing for bark beetles is often tied closely to management practices that are beneficial to the trees and forest as well. By increasing the vigor of trees bark beetles are less likely to successfully attack a tree. Through thinning and vegetation management that increases the availability of water and resources to trees they are better able to produce enough pitch to force out an attacking beetle. 

Mistletoes: the parasitic plant of the season

When someone says “mistletoe,” you might think about the holidays, roasting chestnuts (a story for another day), and kissing under a leafy branch hung in a doorway. But mistletoes are more than a holiday decoration and play an important role in forests all over the globe. From the meandering bosque to the rugged mountains and tree line, mistletoe infections are important forest health issues.

The traditional Christmas mistletoe seen around this time or year is a leafy variety named *Viscum album*. The species is from Europe and is not naturally found in the United States. There is a population of the species found in California, apparently introduced by horticulturalist Luther Burbank. A close relative to *V. album* is the *Phoradendron* genus, of which there are several species. Mistletoe seen in cottonwoods along rivers belongs to the species *P. macrophyllum*. While not often considered a overly parasitic species, it has been reported to kill cottonwoods in southern New Mexico.

These leafy mistletoes are known as the true mistletoes (opposed to dwarf mistletoe that we will get into in a minute). Most leafy mistletoes derive most of their carbon from their own photosynthetic tissue and rely on the host tree for little more than water and some nutrients. Leafy mistletoes are important food sources for many different animals including birds and squirrels.

Dwarf mistletoes are the more pathogenic type of mistletoe. Found on conifers, dwarf mistletoes are host specific and considered to be more evolutionarily advanced than the leafy mistletoes. There are 34 identified species of dwarf mistletoes found throughout the world, 16 of which occur in North America. All of these are in the genus *Arceuthobium*.

Most conifer tree species have a specific dwarf mistletoe associated with it. For instance, there is a ponderosa pine dwarf mistletoe (*A. campylopodum*), a larch dwarf mistletoe (*A. laricis*), one on Douglas-fir (*A. douglasii*), and so on. It is fairly easy to identify a dwarf mistletoe infection, even while driving down the highway. The para-



***Phoradendron jiniperinum* found on juniper species throughout New Mexico is a true mistletoe with pink berries. (NMSF photo)**

sitic plant will cause hypertrophic growth around the infection, what is normally called a witches broom.

While leafy mistletoes are spread around by birds and other small animals that feed on the seeds, dwarf mistletoes have developed a unique method of spreading from branch to branch and tree to tree. Using water pressure that builds up in a sheath surrounding the seed, it is explosively ejected from the sheath and can travel up to 12 meters from the plant. The seed then sticks to the new host, germinates and causes an infection.

Mistletoes can have a variety of effects on forests. They increase fire risk due to witches brooms, pull nutrients away from the rest of the tree, and cause a significant amount of growth loss over the entire forest. Estimates of conifer growth loss have been as high as 1.7×10^7 cubic meters per year in the western United States. That is the equivalent of 6800 full Olympic sized swimming pools, or a cube with 257 meter sides, or enough wood to build about 252,150 two thousand square foot homes. This is a very large amount of wood and lumber and defiantly makes an impact on both the environment and economics of forestry.

To some, mistletoes are parasitic plants that have little worth or importance. But when you look at all of the different influences that this relatively small group of parasitic plants has, it starts to look considerable and a key part of forest health in the region. 🐛

If you are interested in learning more about mistletoes and their influences, a few references are:


- ◆ **Mistletoes of North American Conifers, USDA Forest Service General Technical Report RMRS-GTR-98**
- ◆ **Biology and Classification of Dwarf Mistletoes (*Arceuthobium*), USDA Forest Service Ag. Handbook No. 401**
- ◆ **Dwarf Mistletoes: Biology, Pathology, and Systematics, USDA Forest Service Ag. Handbook No. 709**

What's in my wood? ♦

The weather is cooling off and many New Mexico residents use wood as their heat source. Even more have stoves and fireplaces that see occasional use. This means that there is a lot of fire wood floating around the state. Whether you gather your own or buy your wood there are bound to be insects (and fungi) in that wood, unless it has been heat treated.

So, what are those bugs? By far the most common insects found in firewood are borers. But there can also be bark beetles, spiders, centipedes, and many others. Here are a few examples.

- ♦ Flatheaded borers (Buprestidae): the larvae of metallic wood borers, they are long, segmented larvae with heads that are flattened and broader than the rest of the body. Found on dead and dying trees they usually do not kill trees and are secondary to other insects and diseases. Adults tend to have a metallic sheen and are found in spring and summer.
- ♦ Roundheaded borers (Cerambycidae): Similar to flatheaded borers, the larvae of longhorned beetles (whose antennae are longer than the length of the body). They fill a similar niche to the previous and are not usually a forest health issue, actually helpful in nutrient cycling.
- ♦ Insect predators are often found inhabiting firewood. These include click beetles that click their hind legs when on their back and clerids. The larvae of these two beetles prey on other larvae and insects.
- ♦ Various wood rotting fungi inhabit dead wood as part of the natural decay process. Typically white mycelia mats are formed and can be seen under the bark.

Invasive insects: There are a variety of invasive borers and defoliators that are tree killers. These include the Asian longhorned beetle (a roundheaded borer), the emerald ash borer (a flatheaded borer), and gypsy moths. Remember, burn it where you buy it! 



1) Emerald ash borer.



2) Asian longhorned beetle



5) Metallic woodborer



4) Flatheaded borer damage



3) Flatheaded borer larvae

- 1: Pennsylvania Department of Conservation and Natural Resources - Forestry Archive, Bugwood.org
 2: Donald Duerr, USDA Forest Service, Bugwood.org
 3: Pest and Diseases Image Library, Bugwood.org
 4: Hannes Lemme, Bugwood.org
 5: Ladd Livingston, Idaho Department of Lands, Bugwood.org

Your Questions:

Each issue will feature a question and answer section (except this one). So send in your questions.

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This bulletin is meant as an overview and for general information. For more detailed information contact the NMSF forest health specialist or your district forester. It is not meant as a management guide and should not be used as such.