

The Hidden Threat in Firewood: Invasive Forest Pests

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Invasive, non-native, insects and diseases are a direct threat to trees and forests in Oregon. We know that invasive forest pests are being transported throughout the continent in untreated firewood. Examples of these non-native threats include the emerald ash borer, Asian longhorned beetle, Sirex wood wasp, sudden oak death, oak wilt, and pitch canker, all of which can survive months in firewood.

In Oregon, native forest pests are generally not a concern unless the firewood is being taken from Oregon to another region. However, there are non-native pests established in Oregon. For example, in Curry County there is a quarantine zone where the non-native invasive disease sudden oak death, caused by *Phytophthora ramorum*, is killing trees. It is unlawful to transport tanoak from inside the quarantine to other regions in the state. Thousand canker disease and Dutch elm disease are also present in Oregon, and moving wood with bark intact is a major threat to the area's remaining black walnut and American elm trees.

The purpose of this publication is to alert Oregonians to the risk of introducing or dispersing invasive forest pests through firewood. Although Oregon law restricts the import of untreated commercial firewood, there still is a risk that people moving firewood will introduce or spread pests. Interstate transport of firewood by people is one of the most important avenues for dispersal of many invasive forest pests. This has prompted public awareness campaigns, with slogans like "Buy It Where You Burn It!" and "Don't Move Firewood!" from such groups as the Continental Dialogue on



Some suggest never moving firewood in western Oregon more than 50 miles because the natural dispersal of most forest insects and disease is within this threshold.

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Non-Native Forest Insects and Diseases. (see: www.dontmovefirewood.org)

Firewood can contain pests, invaders

In 2012, scientists purchased over 400 bundles of firewood at convenience and grocery stores in four Western states. The bundles were placed in specialized rearing chambers, and checked for live insect emergence for 18 months. Insects emerged from 47 percent of these bundles, with an average of 11

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insects from each bundle. Researchers collected 24 families of beetles, with bark beetles, ambrosia beetles, and wood borers being the most common. The study showed that even dried-looking wood can have insects hitching a ride.

The primary concern in Oregon and the Pacific Northwest is the movement of firewood *into* the region. There are many pests that could be very destructive if introduced into Oregon. In addition, we would not want our forest pests transported to other regions. Below are some examples of notorious firewood hitchhikers that could be particularly damaging to our region's forests as well as to trees in urban settings.

Pests established elsewhere in North America but not yet in Oregon that have the potential to invade the state:

- Emerald ash borer: This insect, native to Asia, was first found in Michigan in 2002. It has spread to 25 states and has killed millions of ash trees. Over \$1 billion has been spent nationwide on control and eradication attempts. If introduced to Oregon, it will have serious consequences to streamside habitats, where Oregon ash is widespread, and in urban areas, where ash is a common street tree.
- Asian longhorned beetle: Native to Asia, the Asian longhorned beetle is active in Massachusetts and Ohio, despite ongoing eradication efforts. Eradication efforts rely on destroying the host, which has significantly impacted homeowners and neighborhoods.
- Sirex wasp: The Sirex wood wasp is established in pine forests of New York State, but is a significant pest of planted pines throughout the world, including ponderosa pine in Argentina. We don't know the threat this insect poses to our native ponderosa pine, but it is feared the wood-boring wasp, and its associated fungus, could pose a threat to our native pines.
- Oak wilt: Oak wilt is a fungal disease that kills oak trees. It is found in many Midwestern states.

Non-native pests that have established in Oregon:

- Dutch elm disease: Dutch elm disease was introduced into Oregon in about 1990 and has



Figure 1. Black walnut killed by thousand canker disease. Note streaking where bark has been removed showing many cankers. The walnut twig beetle occupies this fresh material, and if transported could lead to new infestations.

Photo © Oregon State University

spread throughout most cities and towns that have significant populations of American elm. Although elms are non-native in Oregon, they are historical and beautiful components of urban landscapes.

- Bronze birch borer: The bronze birch borer is native to North America but has emerged as a serious pest of European white birch and other ornamental birches in urban and rural areas of Oregon. The loss of these historic and beautiful trees from landscapes is significant.
- Sudden oak death: Sudden oak death was discovered in Oregon in 2001 in Curry County near Brookings, Oregon, and an active eradication and spread-prevention program has been in place ever since. The disease has intensified and spread in the county, but currently is still limited to a region in Curry County.
- Thousand canker disease of walnut: Thousand canker disease of walnut has been in Oregon for several years. It is spread by the walnut twig beetle. In the past, it was limited to western states, but has now been discovered in the eastern U.S. and threatens black walnut across its native range (Figure 1).

Native insects and pathogens can also be a problem in firewood

While exotic invaders are the primary concern, insect pests that are native to Oregon can persist in firewood and then spread to nearby living trees. This may be a particular problem with bark beetles that inhabit freshly cut or killed pine trees. Examples include the mountain pine beetle, pine engraver, and California five-spined ips. In these cases, there may be concerns if the tree was still alive when cut or recently killed by bark beetles. Ambrosia beetles are also common on recently dead wood (Figure 2), while some wood may have root disease or wood decay fungi already present, such as *Armillaria* species (Figure 3) or other root, butt, and stem rots (Figure 4). Some moisture is required for these fungi to survive, but wood stored directly on the ground will likely maintain decay fungi and the community of organisms associated with them.

Insects and fungi are part of the life cycle of a tree

Throughout their long lives and after they die, trees harbor many insects, fungi, and other organisms. This community changes as time elapses, from organisms that utilize leaves, live roots, and cones to organisms that inhabit dead wood after the tree's death. When a tree is weakened, the first insects on the scene are small bark beetles, which are adapted to feeding on fresh bark. Once the inner bark begins to decompose, the beetles are no longer interested. Bark beetles transport fungi that colonize the sapwood and bark of the freshly dead tree.

The bark beetles (Figure 5, page 4) typically inhabit the freshly killed tree no more than one year after death, and are quickly followed by flat-headed and round-headed wood borers. Wood borers initially mine the inner bark, then the sapwood, and, depending on species, the heartwood. These insects tend to be around longer than bark beetles, from a year or two up to a decade or more. Wood borers are major helpers in decomposition of wood. They introduce wood decay fungi into the tree directly, and through their boring activity, allow decay fungi and other micro-organisms, including small insects, to invade the dead tree. Some wood borers, such as the emerald ash borer and flat-headed fir borer, can



Figure 2. Ambrosia beetle (pin hole borers) gallery holes, indicating beetles in this freshly split firewood



Figure 3. *Armillaria mycelial* fans under the bark of firewood sitting in contact with the ground. Moving this firewood could move the fungus.



Figure 4. Sapwood of oak colonized by wood decay fungi, and stacked for firewood

Photos © Oregon State University

kill trees outright. Lastly, termites (Figure 6) and carpenter ants take harbor in dead trees and can persist for decades, although they may have been present in the living tree. Termites eat wood, while carpenter ants excavate wood for nest construction, although it is thought carpenter ants require wood decay fungi to soften the wood.

Sapwood in a living tree is more resistant to decay than the heartwood because the living tree can respond to invasion in sapwood, but not heartwood. In the dead tree, this is reversed—sapwood decays first, and the heartwood is most resistant to decay due to tree extracts. The fungi that colonize live trees may continue to rot the tree, while new dead-wood decomposers eventually take over (Figure 4, page 3). Vertebrates arrive on the scene, perhaps using a cavity created by decay and insects. Or perhaps a bear will destroy the tree looking for carpenter ants or yellow jacket grubs. The moisture content and temperature are key factors in the success of these fungi and insects.

So what does this mean to you? Depending on how long the tree had been dead prior to cutting into firewood, how long the wood has been stored, and the conditions in which the wood was stored, you can be packing various biological passengers in your firewood, no matter what the age.

Can firewood of one species affect other tree species?

Many insects and fungi on firewood are generalists, although some are specialists. Mountain pine beetle will not invade Douglas-fir, for example, and the alder bark beetle won't invade Douglas-fir. But the host list for the causal agent of sudden oak death is over 100 plant species! The biggest concern is non-native invasive pests, such as emerald ash borer, Asian longhorned beetle, and Sirex wasps.

Proper firewood storage

Proper firewood processing, curing, and storage can minimize these problems. Cutting live pine trees into firewood during the peak bark beetle flight season is risky, as the beetles are looking for fresh wood to breed in. The “safe” window for cutting live pine to avoid this problem is late October to early April. It is also important to avoid stacking fresh pine wood against live pine trees; bark beetles, attracted to or already present in the firewood, may

move to the live trees. Firewood that has been cut, split, stacked, and left on site for at least one year will ensure the wood has dried or “cured” to the point it is no longer suitable habitat for many wood-boring pests. Debarked firewood is even better—its protective “coating” has been stripped so that it is no longer a suitable host for pests, and you have a cleaner, more efficient heating source.



Figure 5. Douglas-fir beetles invading a dying Douglas-fir
Photo by Kara Shaw, used with permission



Figure 6. A termite in a recently split piece of firewood
Photo © Oregon State University

How far can I move firewood?

It is safe to move most firewood within regions of the state, unless there is a known quarantine zone, such as in Curry County, or you have a known agent in a tree. For example, of particular concern in Oregon is Dutch elm disease and American elm, and thousand canker disease in walnut. If an American elm or black walnut dies, it is often likely it has disease and will be infested by bark beetles. It is recommended that American elm and black walnut wood be debarked or destroyed immediately after tree death.

There is much discussion of how far firewood can be moved. Some suggest never moving firewood in western Oregon more than 50 miles because the natural dispersal of most forest insects and disease is within this threshold. However, in the broad expanse of Ponderosa pine forests of eastern Oregon, this may be arbitrary. Long-distance movement of firewood, especially interstate movement, could introduce new invaders to those final destinations.

Regulations for firewood transport

In other parts of the country, the long-distance movement of firewood has been implicated in numerous cases as the pathway for new invasions of these and other pests. As a result, there are various rules and restrictions in place for commercial firewood sellers. As of 2012, any commercially produced firewood sold in Oregon that originates outside Oregon, Washington, or Idaho must be heat-treated for a minimum of 60 minutes at 60°C (140°F) and certified, to eliminate any unwanted organisms. However, this rule, which is administered by the Oregon Department of Agriculture, does not apply to individuals who might cut and transport their own firewood.

What can you do? “Buy it where you burn it!” and “Don’t move firewood!”

1. Limit the distance you move firewood to what makes sense for your region. Keep your untreated firewood in the general region it comes from.
2. When you purchase firewood, choose locally cut and processed wood. If out-of-state wood is the only option, make sure that it is labeled “Approved Pest Free” (Figure 7).



Figure 7. Packaged firewood that is certified infestation free

Photo © Oregon State University

3. If you are a manager of a recreation area or campground, purchase wood from local companies. Encourage campground managers to buy firewood locally.
4. Check the general appearance of the firewood you produce or buy. Clean, dry firewood does not mean you will eliminate the transportation of ALL potential pests, but chances are diminished that pests may be moved to another location. Look for grayness or bleached-out wood (split a piece and observe the contrast in color). If not already removed, is the bark loose or separating from the wood? If necessary, remove the bark and look for evidence of pests. Don't take firewood to other states from Oregon.
5. Split, stack, and cover piles of firewood. Tarps or other forms of plastic will generate heat in the pile and make an inhospitable environment for pests. If you live in a humid area, monitor the wood for mold or other fungal growth.
6. Encourage your out-of-town visitors to leave their firewood at home when they plan camping trips to Oregon. Likewise, when you go camping elsewhere in the country, don't take firewood from Oregon with you or bring firewood back home.

It is your responsibility to ensure there are no hidden threats in your firewood. Examine your wood for pernicious pests who may be stowaways hitching a ride to a new home.

Resources/websites

Commercial Firewood Law OAR 570.720. Establishes treatment and labeling requirements for firewood imported from outside the Pacific Northwest. See http://arcweb.sos.state.or.us/pages/rules/bulletin/0113_bulletin/0113_ch603_bulletin.html

Information on nationally significant pests that are established elsewhere but not yet in Oregon:

Emerald ash borer: <http://www.emeraldashborer.info/>

Asian longhorned beetle: <http://www.hungrypests.com/the-threat/asian-longhorned-beetle.php>

Sirex wood wasp: http://na.fs.fed.us/spfo/pubs/pest_al/sirex_woodwasp/sirex_woodwasp.htm

Oak wilt: <http://www.na.fs.fed.us/spfo/pubs/fidls/oakwilt/oakwilt.htm>

Information on regionally significant pests that have established in Oregon:

Dutch elm disease: http://www.na.fs.fed.us/spfo/pubs/howtos/ht_ded/ht_ded.htm

Bronze birch borer: <http://www.na.fs.fed.us/SPFO/pubs/fidls/bbb/bbb.htm>

Sudden oak death: <http://www.suddenoakdeath.org/>

Thousand canker disease: <http://www.thousandcankers.com/>

Native forest pests noted in text:

Mountain pine beetle: <http://www.fs.fed.us/r6/nr/wildlife/decadid/IandDSpecies/Mountain%20pine%20beetle.html>

Pine engraver beetle: <http://www.oregon.gov/ODF/Documents/ForestBenefits/pineengraver.pdf>

California five-spined ips: <http://www.oregon.gov/ODF/Documents/ForestBenefits/calif5spine.pdf>

Armillaria root disease: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5187208.pdf

General Information

Oregon Forest Pest Detectors: Website describes a program to train people in early detection of invasive species such as the emerald ash borer and Asian longhorned beetle. <http://pestdetector.forestry.oregonstate.edu/>

Wood Heat.Org: website describes good firewood handling: <http://woodheat.org/good-firewood.html>

Don't Move Firewood: <http://www.dontmovefirewood.org/>

Oregon Invasive Species Council: <http://www.oregoninvasivespeciescouncil.org/>

U.S. Forest Service Invasive Species: <http://www.fs.fed.us/invasivespecies/>

Oregon Department of Forestry–Forest Health Management: <http://www.oregon.gov/ODF/ForestBenefits/Pages/ForestHealth.aspx>

Stop the spread of sudden oak death: <http://www.oregon.gov/ODF/Documents/ForestBenefits/SODGuide.pdf>

Oregon firewood law (ORS 570.720):

<http://www.oregonlaws.org/ors/570.720>

How to identify signs and symptoms of emerald ash borer and Asian longhorned beetle:

<http://pestdetector.forestry.oregonstate.edu/>

References

Jacobi, W.R., J.G. Hardin, B.A. Goodrich, and C.M. Cleaver. 2012. Retail firewood can transport live tree pests. *Journal of Economic Entomology* 105: 1645-1658.

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