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Tree Health Resources

On September 26, 2013 the City of Ouray hosted experts to speak about tree health and how trees in and around the City of Ouray are being affected by beetle infestations. This packet contains a listing of specialists that individuals may contact with questions about trees on private and public lands. Additional information about beetles and tree health is also included.

Specialists:

Local private land forest management assistance or sick tree identification

Jodi Rist, Montrose District Forester, Colorado State Forest Service
970-249-9051, x132
Jodi.rist@colostate.edu

General information on local federal land forest management

Todd Gardiner, Silviculturalist, US Forest Service
Tgardiner@fs.fed.us

Roy Mask, Entomologist, US Forest Service
rmask@fs.fed.us

Wildfire mitigation and information about County Wildfire Protection Plan

Lilia Falk, Coordinator, West Region Wildfire Council
970-249-8407, x125
Wrwc.lilia@gmail.com

Assistance with spraying White Fir trees to prevent beetle attack

Linda Corwine, Montrose Landscape Consulting and Spraying
970-249-2659
lcorwine@sopris.com

Paul Stutzman, High Country Turf Care
970-323-0272

Assistance cutting down large, dead, hazardous trees

Tyler Schultz, Telluride Arborist Services
970-596-7231
Paul or Andy, P&A Tree Service
970-406-0228
Mtntreeservice@yahoo.com

Chris Chaput, Alpine Arborist
970-596-3527
chris@alpinearborist.com

Gary Rushing
970-327-4179
*specializes in removing trees that are not near structures

Purchase products to improve general tree health

True Value Hardware Store, Ouray
970-325-0555

Purchase MCH tablets for Douglas Fir Beetle prevention

Don Fowler, Contech
(800) 767-8658 x157
Don.fowler@contech-inc.com
www.contech-inc.com

John Vanderhart, Pest Warehouse/Forestry Distributing
(800) 603-6271

TREE IDENTIFICATION MATRIX			
	Blue Spruce	**White Fir**	**Douglas Fir**
General Growth	Grows below 9,000'	Grows below 9,000'	Grows below 9,000'
Facts	Grows along canyon bottoms & creeks	Grows on hillsides & in canyons w/Douglas Fir	Grows on hillsides & in canyons w/White Fir
	Crown spirelike	Crown of tree not necessarily spirelike but	Crown spirelike
		can be	Not a true fir or spruce tree
Trunk/Bark Facts	Relatively thick, grey-brown, breaking into	4 to 7" thick on old trunks, ashy gray and	Dark gray brown.
	furrows and rounded ridges.	divided by deep irregular furrows in thick	Corky looking, deeply furrowed in mature tree
	Many tiny twigs are produced on the main	horny flattened ridges.	Inside furrows often rust red.
	trunk giving it an unkept appearance		
Needles	Stiff and sharp to the touch.	Blunt and soft to the touch	Blunt and soft to the touch
	4-sided, NOT flat shape.	Flat shape	Narrow and flat until joining twig
	Grow singly on all sides of twig.	Silvery blue to silvery green	Length of needle: 3/4 to 1-1/4" long
	Color silver to green	Length of needle: 2" or more	When needle is broken off of twig, it leaves
	Needles 1" long	When needle is broken off of twig, it leaves	a round flat surface
	When needle is broken off of twig, it leaves	a round flat surface.	Grow singly on twigs, only on two sides,
	a rough surface like a grater.	Grow singly on twigs, only on two sides,	thus the more flattened appearance
		thus the more flattened appearance	
Cones	Up to 4" long	2-3" long	2-3" long
	Seed cones are green or violet, ripeninng	Grow ERECT only only on upperost branches	Grow hanging down rather than erect
	to pale buff.	of the crown	throughout entire crown of tree
	Grow hanging down rather than erect.	Pale green on some but more often are a	Distringuished by 3-pronged tongues that stic
		deep rich purple.	out between cone scales.
		Scales fall off mature cones before the "naked"	Entire cone falls off tree.
		cone falls from the tree.	

Blue Spruce

Douglas Fir

White Fir

MATURE

YOUNG

Fir Engraver

Horizontal egg galleries

Name and Description—*Scolytus ventralis* LeConte [Coleoptera: Curculionidae: Scolytinae]

The fir engraver is an important bark beetle of true firs. In the central Rocky Mountains, this insect is most frequently observed in white fir, *Abies concolor*. Epidemics of fir engraver are observed most frequently in the Pacific Northwest and California and are often associated with periods of drought. The adults are 1/10-1/7 inch (2.5-3.8 mm) long (fig. 1). The larvae are small, white, legless grubs.

Figure 1. Fir engraver adult. *Photo: Don Owen, California Department of Forestry and Fire Protection, Bugwood.org.*

Egg galleries are transverse, often with a visible nuptial chamber at the center of the two arms of the gallery. The female deposits eggs in niches on both sides of the gallery. The larval galleries are longitudinal, and both the egg and larval galleries score the wood deeply (fig. 2). Pupation occurs in the inner bark at the end of the larval galleries.

Hosts—In the southern Rocky Mountains, this insect is most commonly found in white fir. Throughout the West, the fir engraver may be found in a variety of true fir species, including white fir, grand fir, and California red fir and may occasionally be found infesting other species, including Douglas-fir. The range of this bark beetle includes British Columbia south through the Pacific Northwest and Rocky Mountains into New Mexico and Arizona.

Life Cycle—The fir engraver has a 1-year life cycle except in cooler portions of its range where complete development takes 2 years. In Colorado, flight may occur any time from early spring until early fall. The fir engraver is monogamous, and females initiate attack on host trees. Apparently, this species does not utilize aggregating pheromones during its attack, and the dynamics of attack appear to be associated with primary host volatiles alone. The fir engraver transports a brown-staining fungus that is important for successful development of the brood larvae.

Damage—The fir engraver infests boles, large branches, slash, and windthrown trees larger than 4 inches (10 cm) in diameter. Trees infected with root disease or defoliated by Douglas-fir tussock moth or western spruce budworm are especially subject to attack. Trees may be killed outright (fig. 3) or attacked repeatedly for multiple years, leading to patches of dead bark. The beetles also may attack the tops of trees, causing top-kill.

Figure 2. Fir engraver egg and larval galleries. *Photo: Intermountain Region, USDA Forest Service, Bugwood.org.*

Management—Maintaining good tree vigor in ornamental settings is important for preventing losses to fir engraver. Also, care during construction and soil disturbing activities should be practiced to limit root and lower stem damage. Natural controls include predators and parasitoids.

Direct control methods are considered impractical due to the tendency of beetles to be common in portions of living trees that are out of view from the ground. Insecticides labeled for bark beetles will provide protection from fir engraver attack.

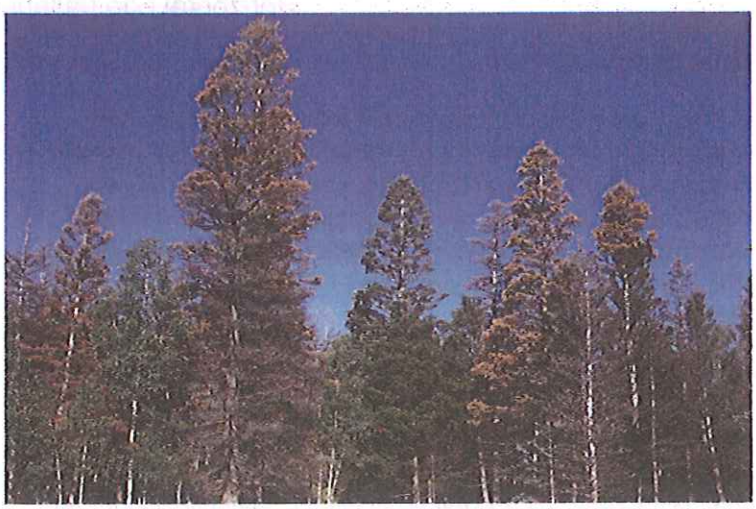

Figure 3. White fir mortality caused by fir engraver on the Rio Grande National Forest.
Photo: William M. Ciesla, Forest Health Management International, Bugwood.org.

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1. Wood, S.L. 1982. The bark and ambrosia beetles of North and Central America (Coleoptera: Scolytidae), a taxonomic monograph. Great Basin Naturalist Memoir 6. 1359 p.

Douglas-Fir Beetle

Attacks and kills Douglas-fir trees

Name and Description—*Dendroctonus pseudotsugae* Hopkins [Coleoptera: Curculionidae: Scolytinae]

The Douglas-fir beetle is a common bark beetle that kills Douglas-fir trees. Adult beetles are cylindrically-shaped and about a 1/4 inch (6 mm) long. The head and thorax are black, and wing covers are reddish brown. Eggs are white and very small (1/25 inch [1 mm] long). Larvae are legless and white with light brown heads. Larvae can grow up to 1/4 inch (6 mm) long. Pupae are white, and some adult features are often present.

Hosts—Douglas-fir

Life Cycle—Douglas-fir beetles have a 1-year life cycle and overwinter as adults or larvae. Beetles usually emerge mid to late spring, when the temperature is 60° F and above. However, a small portion of beetles emerge later in midsummer. Some adults that make early spring attacks can reemerge and make a second attack from late June to August. Distinctive vertical egg galleries (5-12 inches [13-30 cm] long) are constructed by the female in the phloem layer (fig. 1). Eggs are laid in groups, alternating along opposite sides of the gallery. Eggs hatch in 1-3 weeks, and newly hatched larvae mine out at right angles from the egg gallery. Mature larvae construct a pupal chamber at the end of their mines.

Figure 1. Douglas-fir beetle egg and larval galleries. Photo: Kenneth Gibson, USDA Forest Service, Bugwood.org.

Damage—The larvae feed under the bark in the phloem layer, introducing fungi, yeasts, and other organisms, and lead to tree death. The first sign of attack is reddish orange frass in bark crevices that is expelled by attacking beetles (fig. 2). However, frass can wash away and attacks may be above eye-level, making it difficult to locate attacked trees. Pitch-tubes are not usually present, but many trees will have pitch streaming (clear resin) down the tree bole from the top of the beetle-colonized area. Tree foliage discolors several months to a year later, transitioning from green to reddish brown in that time.

Figure 2. Reddish orange frass from Douglas-fir beetle attack. Photo: Sandy Kegley, USDA Forest Service, Bugwood.org.

Douglas-fir beetles prefer to attack trees that are injured by fire scorch, defoliation, windthrown, or root disease. When low beetle populations are present, individual or small groups of trees will be attacked. Once populations build up, large outbreaks can occur that kill thousands of trees. Stand conditions and weather can also strongly influence Douglas-fir beetle populations.

Management—The best management is to promote stand vigor by thinning. Prompt removal of windthrown, severely fire-damaged trees or trees damaged by other stand disturbances is also recommended. Because Douglas-fir beetles preferentially attack burned trees, removing fuels from beneath large-diameter Douglas-fir trees before a prescribed burn can reduce tree scorch and, consequently, the tree's susceptibility to attack by Douglas-fir beetle. Attacks are most severe in unmanaged stands, on trees that are largest in diameter, and in dense stands. If direct

control is deemed necessary, trees can be protected using the anti-aggregation pheromone methylcyclohexanone (MCH), which disrupts beetle aggregation. Combining MCH with salvage of infested trees has been successful at reducing subsequent tree mortality. However, under condition of intense or long-lived outbreaks, even MCH has sometimes failed to protect trees. Direct control is usually implemented in small, high-value areas.

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1. Furniss, R.L.; Carolin, V.M. 1977. Western forest insects. Misc. Publ. 1339. Washington, DC: U.S. Department of Agriculture, Forest Service. 654 p.

2. Schmitz, R.F.; Gibson, K.E. 1996. Douglas-fir beetle. Forest Insect and Disease Leaflet 5. Washington, DC: U.S. Department of Agriculture, Forest Service. 8 p.

DOUGLAS-FIR BEETLE PROTECTION

The Douglas-fir beetle is normally present in forests at low densities, breeding in Douglas-fir trees that are injured or have recently died. These beetle outbreaks typically last for several years and may result in the mortality of large numbers of trees.

Beetle larvae need fresh, moist inner bark for food, so trees that have been dead for more than a year are not suitable habitat. Injured or recently killed trees have little or no defensive capabilities making them ideal sites for beetle larvae. They also prefer to attack large, older trees. Trees with a diameter (at breast height) of more than 14 inches are at the highest risk for infestation during outbreaks**. Individual mature trees in residential settings may also be at high risk for infestation when local beetle populations are at high levels.**

Until recently, there were no easy options for protecting high-valued trees from Douglas-Fir beetle infestation. However, in 2000, a tested alternative application became available. This treatment, known as MCH, has been found to be successful in thorough testing in the Pacific Northwest and Northern Rocky Mountain regions.

Bark beetles, including the Douglas-fir beetle, rely on chemicals known as pheromones to communicate with one another. Pheromones are chemicals that are released by one beetle that affect the behavior of others of the same species.

The two most important types of bark beetle pheromones are "aggregation" and "anti-aggregation" pheromones. Female Douglas-fir beetles initiate new attacks. Upon finding a suitable breeding site, the female releases an aggregation pheromone that is attractive to both male and female beetles. As more beetles arrive and mate, the concentration of aggregation pheromone declines while the concentration of anti-aggregation pheromone increases. The changes in pheromone concentrations result from females ceasing to release aggregation pheromone while males release the anti-aggregation pheromone, MCH. The anti-aggregation pheromone serves to prevent overcrowding and optimize brood survival. In simple terms, MCH acts as a "no vacancy" signal to late-arrival beetles, causing them to avoid that tree or log.

MCH effectively protects treated stands by preventing beetles from initiating new attacks. Beetles will move through a treated area and continue to disperse until they find suitable habitat elsewhere or until they die. Because beetles moving through a treated stand will spend more time searching for a host, they will have a greater chance of dying as a result of longer exposure to natural enemies and other mortality factors.

HOW TO APPLY MCH

MCH is most effective when it is applied before beetles begin to fly and attack trees in the early spring when the weather starts warming up.

Throughout the interior of the Northern Rocky Mountain Region, Douglas-fir beetles begin flying around late April or early May, so MCH applied by the first or second week in April should be fully effective unless it is an unusually warm year. If it begins to warm up earlier, the MCH would be applied earlier. The bubble capsule formulation of MCH will last throughout the period that beetles fly and attack trees, but needs to be reapplied each year that protection is desired.

For all areas less than half acre and with multiple Douglas-fir on the property, a minimum of 16 bubble capsules should be evenly placed around the unit boundary. Although this is a higher dose than recommended for larger units, it is necessary to ensure complete coverage of small areas. **If you are a homeowner with only a few Douglas-fir in your yard, tests have shown that applying two bubble capsules per tree placed on opposite sides of the tree will protect all but the largest susceptible Douglas-fir. For trees larger than 24 inches in diameter, it is suggested that four bubble capsules per tree be placed equidistantly around the bole of the tree. The larger of the trees are the most susceptible in attracting the beetle.**

The current price of bubble capsules is about $2.00 each. For areas greater than half acre and with multiple Douglas-fir, bubble capsules should be applied at a rate of 30/acre. Those with half acre or less, 20 bubbles would be sufficient. The first step in conducting a treatment is to determine the size of area to be treated and calculating the number of bubble capsules needed.

Bubble capsules are applied by stapling or otherwise attaching them to trees, snags, shrubs, fence posts or any other object so as to surround the property on which there are Douglas-fir. **They are usually applied at a height that applicators can easily reach (6-8 feet), but they can be placed higher in areas such as campgrounds or residential sites where it is likely that they may be disturbed.** If it is necessary to achieve the proper spacing, they can also be attached to objects such as stumps or logs as low as 1-2 feet above the ground. **Bubble capsules are placed with the flat side facing out and the bubble side toward the object to which they are attached. They should be attached on the north side of trees and snags where possible to protect them from direct sunlight, although this is not critical for an effective treatment.**

MCH contained in a bubble capsule diffuses through the plastic and is dispersed by air movement. In essence, an invisible cloud of MCH develops around the point at which it is dispensed. Since air movement disperses MCH as it diffuses out of the

bubble capsules, there is a lot of flexibility in the distribution of bubble capsules provided the entire area containing multiple Douglas-firs is covered. In the following description, distances between bubble capsules are only approximate and pacing is accurate enough for effective treatments. In all cases, bubble capsules should be placed about 30 feet beyond the boundary of the area to be protected to avoid an edge effect. If this is not possible, placing bubble capsules closer together along the unit boundary will also help to prevent any untreated spots. For areas less than about two acres, the best approach is to place the bubble capsules evenly around the perimeter of the unit. Spacing them about 15 feet apart will result in a dose close to 30/acre.

For larger areas than two acres, bubble capsules can be placed around the perimeter and in parallel lines across the land unit spacing them about 15-20 apart. For those that have these acreage conditions, you should go online and access "Forest Health Technology Enterprise Team" – "Using MCH to Protect Trees and Stands from Douglas-fir Beetle Infestation".

Excerpts from
Forest Health Technology Enterprise Team
"Using MCH to Protect Trees and Stands from Douglas-fir Beetle Infestation"