

Douglas-fir Beetle – Best Management Practices

Management Strategies

Strategies for managing Douglas-fir beetle depend on a number of factors:

- Infestation size
- Stand susceptibility
- Values
- Access
- Infestation history

A decision framework for managing Douglas-fir beetle is presented in Table 1, and recommended management activity time table for Douglas-fir beetle management is presented in Table 2.

Douglas-fir Beetle - Current Attack

Two difficulties can arise when determining if host trees are currently infested with Douglas-fir beetle: 1) colour change of foliage can take anywhere from 3 to 15 months; 2) Douglas-fir bark beetle may attack higher on the stem where bark is thinner, making checking for current brood difficult.

Current attack trees are defined as trees that contain larvae, pupae or adult beetles. In many situations, current attack trees may be green, red or grey. Red and grey trees must be checked to determine if they contain larvae, pupae or adults. In the early spring before beetle flight, many grey and red trees may still contain beetles. After beetle flight in early summer, most grey and red trees should not have current attack. By late-June and early-July the newly current attacked trees may begin to turn colour, however colour change is highly variable and full colour change can take 12-15 months after attack. By mid-winter approximately 50% of the current attack will be red and 15% grey.

If live beetles cannot be located at breast- to head height in red and/or grey trees the following generalizations may be applied:

- Old Attack = Red and grey trees with large number of emergence holes, major checks, and sloughing bark.
- Current Attack = Red and grey trees do not have obvious emergence holes, phloem is still moist, evidence of fresh frass on the tree stem, pitch streamers.

Tactics and Treatment Options

A variety of options are available to deal with existing or potential Douglas-fir beetle infestations. The selection of the appropriate option depends on the stand condition, level of infestation, condition of adjacent stands, existence of access, and the management objectives for the area.

There are four main control methods for Douglas-fir beetle:

1. Trap trees
2. Sanitation harvesting
3. Single tree treatment (fall and burn or peeling)
4. Post Treatment clean-up

1. Trap trees

Trap trees are used to reduce overall beetle population levels. They are large, healthy Douglas-fir trees that are felled into *shade* to attract Douglas-fir beetle. Trap trees attract and absorb emerging beetles and must be removed after the end of beetle flight. Use one trap tree for every four standing current attack. Felling more trees than this rule of thumb can provide excessive host material and can actually increase or continue the beetle problem. When trap trees are removed from the site Douglas-fir beetles are killed during timber processing. Trap trees mop-up beetles emerging from windthrow, stumps, and slash, thereby protecting adjacent healthy timber.

Guidelines for trap tree site location and tree selection:

- Place trap trees as close to the infestation as possible.
- Fall one trap tree for every three to four currently attacked trees. Green windthrow on site may be used as trap trees and reduce the number of trap trees required.
- In chronic beetle areas, or with scattered beetle populations, grid with groups of trap trees at 400 to 600 m intervals.
- Trap trees should be felled into the shade in such a way as to facilitate removal or subsequent treatment.
- Trap trees should be left unlimbed and unbuckled.
- Pre-felled rights-of-way, landings, and skid trails can be used as trap trees to absorb beetle populations. Due to the large volume of timber felled during these operations, improper shading should not impede the effectiveness of control.
- Trap tree diameters should be greater than or equal to 30 cm.
- Large openings should not be created at trap tree sites.
- Remove trap trees as early as possible after beetle flight (late summer – early fall).

- Probe the site for spillover/overflow attack in adjacent standing trees before trap tree extraction.

Single tree treatment or sanitation harvest of Douglas-fir beetle current attack should be followed by trap tree deployment prior to the next beetle flight.

2. *Sanitation harvesting*

Sanitation harvesting for Douglas-fir beetle suppression maximizes the removal of currently attacked Douglas-fir to reduce the existing population and inhibit the infestation expansion. All trees containing beetles, including 'green attack' and 'current red attack' should be harvested and milled before the adults emerge in the spring (end of April). Logging priority should be given to active beetle infestations and adjacent high hazard stands. Various harvesting methods may be used to remove infested trees.

Sanitation harvesting must-do's:

- Remove all currently infested trees and mill logs before beetle flight (late-April).
- Avoid mechanical damage (scars, root damage, and broken tops) to residual trees as this will attract beetles.
- Keep stumps as low as possible, with a maximum height of 30 cm. Stumps greater than 30 cm must be peeled.
- Remove, destroy, or peel bark off all debris containing beetle progeny if it is greater than 20 cm in diameter and greater than 2 m in length.
- Do not long butt or top in the bush. Tree length logging is preferred. If, however, damage to residuals or regeneration is foreseen, topping and bucking trees in the bush is acceptable but should not be greater than 10 cm diameter.
- Eliminate all infested material from sanitation sites.
- Burn all debris piles completely before beetle flight.
- Remove for milling all infested decked logs and windthrow before beetle flight (late-April).

Residual stands and/or trap tree sites should be monitored to ensure all infested material is eliminated. Residual stands and suspect trees injured during harvesting and road construction should be marked monitored and infested trees removed.

3. *Single tree treatments*

It is critical to prevent Douglas-fir beetle from building up into epidemic levels in patches of windfall or scattered felled green trees not yet containing bark beetles. Single tree treatments are a suitable method for dealing with Douglas-fir beetle as well as other bark beetles, however the bark thickness of Douglas-fir makes falling-and-burning and bark peeling very difficult, time consuming and expensive. These treatments should be considered only when no other option is available. Treatments include:

- Falling and burning - bark must be burned so as to completely destroy the phloem.
- Peeling and burning the bark (seldom used).
- Single tree removal using small equipment.
- Bucking felled or windblown trees into fifteen cm (six inch) segments in fall and early winter to ensure drying, therefore making the logs unsuitable for Douglas-fir beetle.

If burning is used as a treatment, burn piles must be located in *clearings* in order to ensure neighbouring Douglas-fir trees are not scorched or scarred. Younger Douglas-fir trees do not have the thick bark characteristic of large mature trees and are easily damaged by burn piles. Cambial die-back due to fire injury significantly increases risk of attack by Douglas-fir beetle even in smaller trees. Ideally, burning of slash will occur *concurrently* with treatment. In addition to burning slash in clearings consideration of *wind direction* when igniting piles is important to minimize damage to residual trees.

4. *Post logging clean-up*

It is absolutely necessary to remove decked logs before beetle flight and for mills to process logs promptly. As the harvesting site it is necessary to perform post logging clean-up after sanitation or other harvesting that creates suitable host material through accumulations of fresh logging debris or windthrow. Sanitation harvesting in areas with chronic beetle populations should be followed up with trap trees to absorb residual populations if necessary. Areas where logging has been completed should be monitored yearly to locate fresh outbreaks.

Anti-aggregation pheromones (i.e., MCH) should be used on trees that were damaged (basal scar, root damage, fresh fire scorch) during logging to disperse beetles away from susceptible timber. The use of the pheromone is most useful when there are *low* numbers of trees infested trees, less than 5, or low numbers of susceptible trees. MCH is applied by stapling bubble caps (bubble facing towards tree stem) as high as possible on the north side of trees no later than the 3rd week May. Check the product MSDS sheet for proper storage and handling instructions. If MCH is thought to be an appropriate tool it is recommended that you contact the Cariboo Forest Entomologist for further information about its correct use and deployment.

Table 1: Decision framework for managing Douglas-fir beetle.

Step	Consideration	YES – go to:	NO – go to:
1	Map of affected area		
2	Beetle probe/walkthrough		
3	Access available for harvesting or other treatment?	4	5
4	New attack or highly susceptible timber?	5	Monitor
5	Resource management concerns?	6	Develop access as appropriate for treatment
6	Management desired?	Develop management plan utilizing harvest, trap trees, single tree treatments	Monitor
7	Economic to harvest?	6	Monitor/single tree treatment

Table 2: Recommended management activity time table for Douglas-fir beetle.

Activity	Preferred Time Frame	Possible Time Frame
Detection		
Funnel trapping	April - August	
<i>Aerial Survey</i>		
Overview	July - September	July - October
Detailed heli-GPS	August 15 – February	
<i>Ground Surveys</i>		
Walkthrough	August – October	August – March
Probes	September – November	September – March
Overwinter mortality	February – March	January – April
Administration		
Strategic plan review	March & September	
Beetle management plan amend.	October - December	
Map updates	Mid-September	
District & Licensee action plans	October – November	October - January
Control		
<i>Harvesting</i>		
Trap tree placement	January – March	November – April
Trap tree removal	September – December	September – April
Cutting permits issued	September 15 – October 15	September – February
Sanitation harvesting	September – January	September – March
Helicopter logging	September - November	September - March
<i>Single tree treatment</i>		
Anti-aggregation MCH (indirect)	March – April 25	March – May 15
Fall and burn	November – December	November – March
De-barking	September – October	September – March