

Douglas-Fir Bark Beetle

What is it?

- Douglas-fir bark beetle (*Dendroctonus pseudotsuga*) is a tiny insect (4.4 – 7 mm long) in the bark beetle genus, related to mountain pine beetle and spruce beetle.
- It is a native species that typically affects trees that are already dead and dying. In recent years, populations are increasing into epidemics because of warmer winters and other favourable environmental factors.
- Epidemic-sized populations are able to attack and kill otherwise healthy mature Douglas-fir trees.

Adult beetles.

Photo Credit: USDA Forest Service



How does it reproduce?



Red attack at Wensley Creek.
Photo Credit: Christine Nielsen

- The beetles typically have a one year life cycle and go through four life stages – egg, larva, pupa, and adult.
- Adult beetles generally hatch and fly to host trees in May and June. They tunnel under the bark and lay the eggs in galleries.
- A second flight may occur in July and August of the same year if the weather is favourable.
- Most beetles will reproduce within a short distance of their own hatch tree. However, when assisted by winds and other environmental factors, individual flights can range as far as 32 km. These longer flights allow movement across geographic barriers and range expansions.

How does it kill trees?



Red attack at Wensley Creek.
Photo Credit: Christine Nielsen

- Adult beetles mass-attack mature Douglas-fir trees, targeting dead/dying trees first and then healthy trees if the population is large enough.
- Bore into the cambium of host trees (between the bark and wood) to mate and lay their eggs. The galleries (tunnels) of adult beetles and larvae girdle the tree under the bark, stopping the tree's flow of nutrients and water.
- Adult beetles inoculate the trees with pouch fungus (veiled polypore, *Cryptoporus volvatus*), which also helps to kill the tree and speeds up decay.
- Approx. 1000 beetles will contribute to the death of a single tree.

How can I recognize Douglas-Fir Bark Beetle?

Frass: Fine, reddish-brown boring dust that accumulates where beetles have tunneled through bark. Visible within the current attack season.

Frass showing on bark.
Photo Credit: Province of BC



Pitch streamers: Streaming Douglas-fir pitch could be a symptom of IBD attack. However, it can also be the result of a number of other forest health influences so should not be considered a conclusive indicator.



Pitch streaming down bark.
Photo Credit: Nature Chronicles

Pouch fungus: Small, round, white or tan fungus fruiting bodies (conks) can be seen on the bark of dead trees. Evidence of the fungus will usually not appear until at least a year after the tree has been attacked and killed.

Pouch fungus conks on dead tree.
Photo Credit: Province of BC



Larval galleries: The distinct branching of the larval galleries on the underside of the bark is also a reliable indicator. However, the thick bark must be completely separated from the tree to see it so it is not a very practical means to identify beetle presence on large numbers of trees.

Larval galleries on tree cambium with bark removed.
Photo Credit: USDA Forest Service

Tree death:

- **Green attack:** Tree has been recently attacked, generally within the same year of attack, and there is not yet any noticeable change in foliage colour.
- **Red attack:** Foliage may first shade yellowish or orange but has usually turned bright red by the spring of the year following attack. Red needles may remain for up to 2 years after attack.
- **Grey attack:** Trees that were killed and have lost their needles.
 - Beetle-killed fir decay faster than normal because the trees are inoculated with pouch fungus by the adult beetles.

Red attack.

Photo Credit: Christine Nielsen



What are the management options?

Pheromone strategies: Synthetic pheromones are used to lure or fool the beetles in various ways and thereby control their spread. As beetle presence increases to epidemic levels over a larger landscape, pheromone baiting strategies become less practical as a containment strategy and are increasingly limited to being a monitoring strategy.

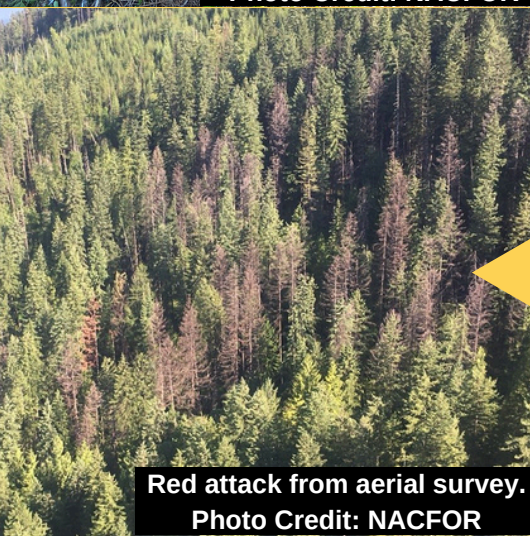
Trap trees: Trees are felled near an existing infestation before beetles emerge in early spring, so that the beetles are attracted to the susceptible, downed trap trees. These infested trees and any subsequent spillover trees are removed and de-barked (usually at a mill) before the beetles hatch in the following spring. This has the potential to eliminate or remove a large portion of the population. The logistical viability of trap tree programs becomes more limited as the beetle's presence expands to epidemic levels.



Pheromone Funnel Traps Photo
Credit: NACFOR



Trap Trees
Photo Credit: NACFOR



Red attack from aerial survey.
Photo Credit: NACFOR

Sanitation and salvage harvest options

- **Single tree treatments:** Falling and burning or harvesting of individual infested trees. With the objective of addressing beetle attack prior to further spread, this strategy's effectiveness is limited to low levels of attack.
- **Salvage harvesting:** Can be an effective strategy if diligently applied. However, it is a largely reactive strategy that requires early identification, consistent action and thorough follow-up monitoring to avoid continuously "chasing the beetle."
- **Pro-active harvesting:** Involves identifying susceptible Douglas-fir leading stands (i.e. adjacent to beetle-infested stands or drought stressed) and harvesting them prior to attack or while the stands are still only subject to spot attacks. A potential problem with this strategy is that it can be difficult to achieve public buy-in.
- **Minimal management; let nature run its course:** Forests are subject to more dynamic, ecosystem-changing forces than we've ever seen before. The Douglas-fir bark beetle is just one of the dynamic factors that is rapidly changing our forests, with or without our involvement. Therefore, a preference for minimal management does not necessarily equate with a preference to keep things as they are.

What is the current status of Douglas-fir bark beetle in this forest district?

The 2022-23 Arrow Forest District health strategy for the Arrow Timber Supply Area (TSA) highlighted the following with respect to Douglas-fir bark beetle findings:

- Ranked **second only to wildfire** among all forest health damage agents in terms of consequence and management priority
- Determined to have the potential to significantly impact timber supply and other resource values in the Arrow TSA
- 5335 ha of attack identified in 2022, not much changed from 5841 ha in 2021.
- Forest inventory data indicate many stands are approaching age and diameter thresholds that will make them more susceptible to bark beetle attack.
- States that current response by forest licensees has been too minimal and too slow to effectively reduce beetle populations.
- Recommends harvest of at least 70 % of prior year's attack within 1 to 2 years.
- Specifies that pro-active management may be even more important for small licensees such as woodlots and community forests.

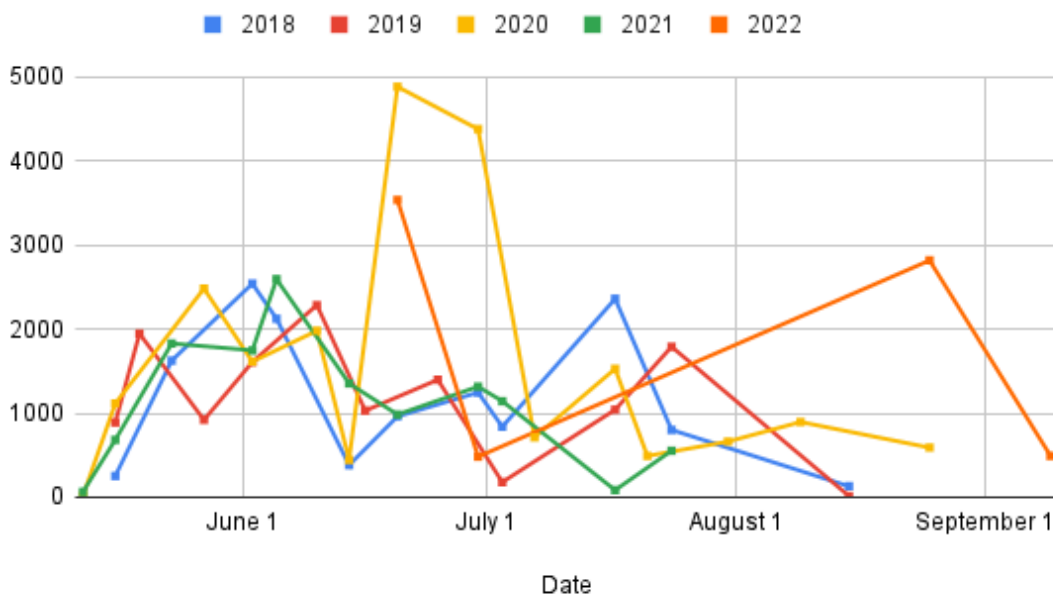
“Douglas-fir accounts for approximately 40% of tree volume in low-mid elevation stands and 28% of tree volume overall for stands >60 years of age in the Arrow TSA.”



Red attack on Box Mountain, as seen from Brouse Loop. Photo Credit: Christine Nielsen

What about specifically around Nakusp and within NACFOR's chart area?

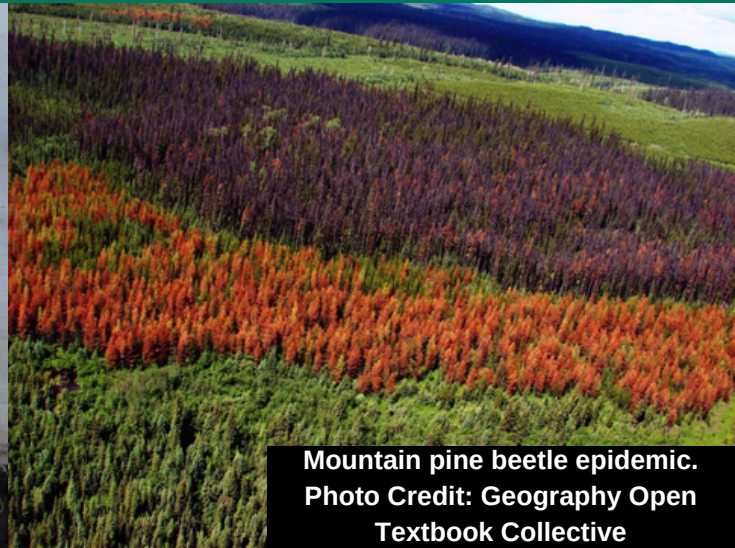
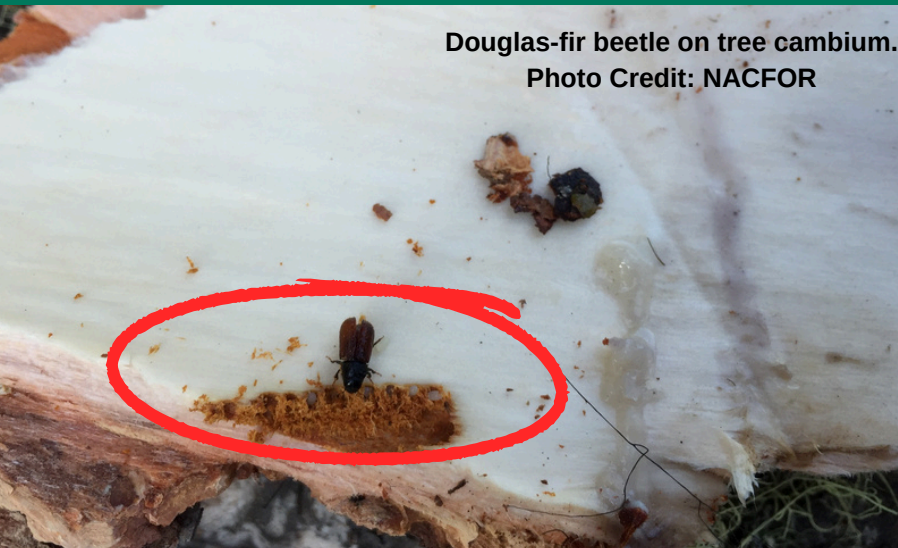
2018-2022 Douglas-Fir Beetle Trap Data



Douglas-fir beetles in funnel trap cup. Photo Credit: NACFOR

Is this a repeat of the problem B.C had with the mountain pine beetle?

Douglas-fir bark beetle population trends do share a lot of characteristics with another bark beetle epidemic: the well documented mountain pine beetle epidemic of the 1990's and early 2000's. The most obvious distinction between the two is the difference in the targeted tree species (pine vs Douglas-fir). However, there are other key differences; the most noteworthy of these differences from a management perspective is discussed below.



- Lodgepole pine, the primary host for mountain pine beetle, tends to either dominate forest stands or have a very low presence within them. Consequently, mountain pine beetle epidemics were generally very dramatic, with large swathes of red trees suddenly dominating previously healthy parts of the forested landscape.
- By contrast, Douglas-fir typically shares forest stands with other species, especially in the West Kootenays. Therefore, Douglas-fir beetle attacked stands are less obvious than mountain pine beetle.
- However, Douglas-fir is spread over virtually the entire low and mid-elevation West Kootenay landscape, generally comprising anywhere between 20 and 60 % of stands, with the higher proportions being found on south and west facing slopes. While Douglas-fir monoculture stands are rare in this part of the world, the species is consistently found almost everywhere below about 1300 m in elevation.
- The above differences in host tree presence can result in some notable differences in actioning the two types of beetle attack:
 - Douglas-fir bark beetle is more difficult to target than mountain pine beetle because Douglas-fir (and consequently, beetles as well) is spread across the entire low to mid-elevation landscape;
 - Douglas-fir bark beetle's presence within mixed species stands can complicate prevention and response strategies;
 - Douglas-fir bark beetle's less dramatic spread can lead to lower public awareness of the threat;
 - Douglas-fir bark beetle's less dramatic spread can result in management complacency.

Isn't this an issue for forest licensees to deal with? Why should I get involved?

Epidemic bark beetle attacks are generally not compatible with other forest values, including **recreation, consumptive water, biodiversity, wildlife habitat** and **visuals**.

NACFOR's objective is to achieve as much public consensus on management strategies as possible. Therefore, **your knowledge about the issue and your subsequent input is valued**.



NACFOR tenure with grey attack.
Photo Credit: NACFOR

Without diminishing the importance of any of the values listed above, the main public concern posed by epidemic levels of Douglas-fir beetle attack in wildland/urban interface areas is increased wildfire threat. This increase results from a combination of high numbers of dead, standing trees and a substantial increase in forest floor fine fuels as dead branches drop from those same trees to the ground.

The **fine surface fuels increase the rate of wildfire spread** while the standing dead trees make easy conduits for the ground fire to ladder upwards and become a running crown fire.

Any red attacked trees in the stand then facilitate the crown fire's momentum, allowing it to ignite the dead foliage in these trees like a continuous line of torches as winds push it across the landscape. This increased threat should additionally be considered in the context that wildfire threat is already increasing in all of our surrounding forests even without the added factor of epidemic bark beetle attack.



Taite Creek after the 2021 Octopus wildfire.
Photo Credit: BC Wildfire Service



Interface Wildfire. Photo Credit:
Village of Nakusp FireSmart

What can I do?

- **Watch** the local forest landscape. You may already have noticed the increase in red trees on the local forested landscape. Maybe you already even knew that the increased red is caused mainly by Douglas-fir bark beetle attack. Otherwise, as you start looking, you'll likely be surprised by how many red trees you begin to notice.
- **Learn** as much about Douglas-fir bark beetle management as you can. We're not asking you to rely on this document for your knowledge. We encourage you to use the sources provided at the end of this document and if you have time, to seek other credible sources of information as well.
- **Tell others.** We know most people won't have the time or the inclination to make bark beetle education a hobby. But we do think it's possible for lots of people to take at least a little bit of interest in this topic. You can help with this by spreading the word.
- **Think** about what you want your local forests to look like. Contemplate what type of forest you will have in 10 or 20 or 30 years by employing the various management strategies discussed here – and maybe other strategies you may encounter as you study this topic!

www.nakuspcommunityforest.com

SOURCE MATERIALS

Government of Canada. Trees, insects and diseases of Canada's forests.
tidcf.nrcan.gc.ca

Province of British Columbia. Douglas-fir beetle.
www2.gov.bc.ca

Province of British Columbia. Douglas-fir beetle management
www2.gov.bc.ca

Forest Ecology and Management, V 513, June 1, 2022. Patterns of infestation after widespread wildfires in mature Douglas-fir forests.
www.sciencedirect.com

Nelson Star, May 29, 2019. Douglas-fir beetle infestation is a provincial crisis: expert.
<https://www.nelsonstar.com/news/douglas-fir-beetle-infestation-is-a-provincial-crisis-expert-4873959>

Canadian Journal of Forest Research, V 49 # 9, Sept, 2019. Factors influencing dispersal by flight in bark beetles: from genes to landscapes
<https://cdnsiencepub.com/doi/full/10.1139/cjfr-2018-0304%40cjfr-tria.2019.01.issue-01>

Ministry of Forests, June 26, 2023. Selkirk Natural Resource District Arrow & Cascadia TSA's Forest Health Strategy 2022-23.
<https://www.nakuspcommunityforest.com/wp-content/uploads/2023/12/ArrowFHStrategy2022-23DMSIGNED.pdf>