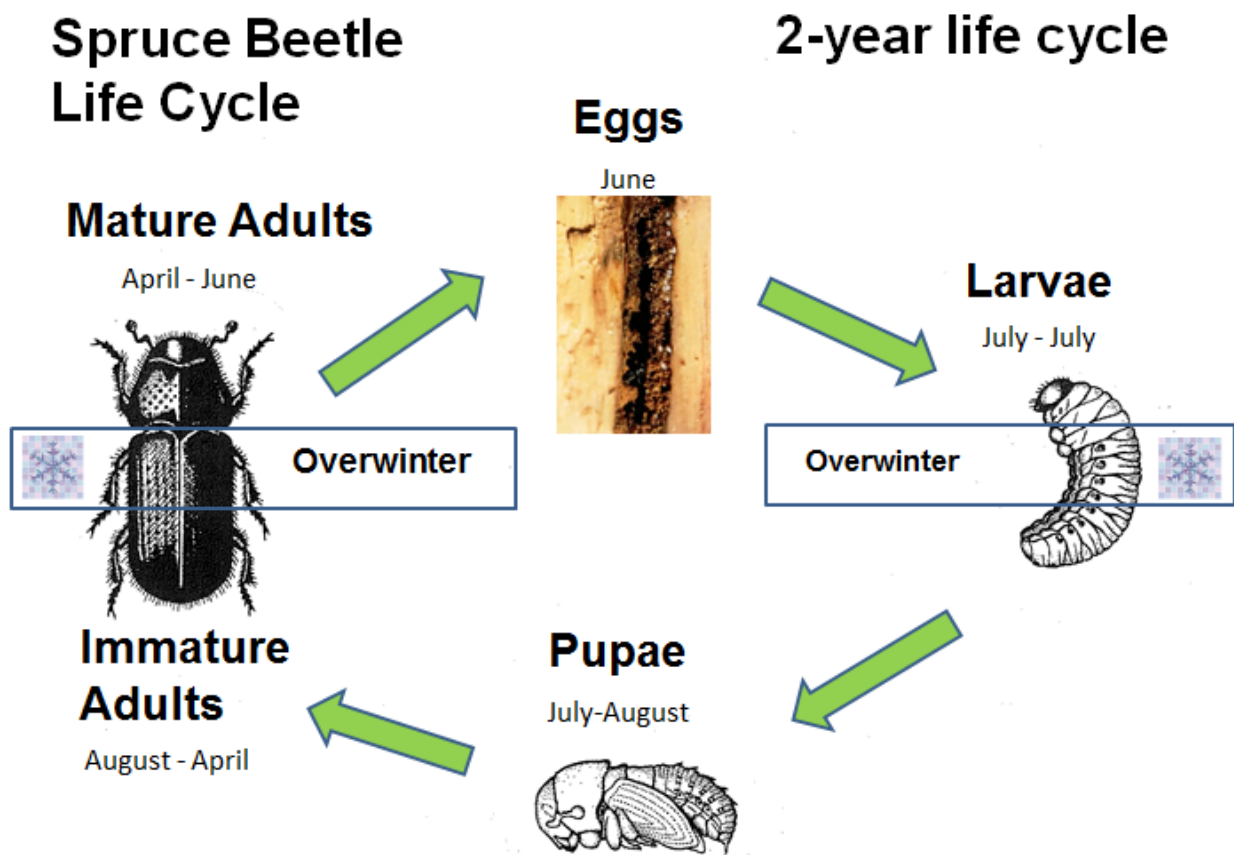


Spruce Beetle life cycle

In British Columbia, the spruce beetle usually has a 2-year life cycle. Some populations (or parts of them) may mature in 1-3 years, according to geographical location, elevation, and variations in the mean temperature of the spring and summer months. In the most exposed host materials such as stumps and log decks and along stand edges, broods often develop as mixtures of 1-year and 2-year cycle individuals, depending on the amount of solar radiation on the beetle infested tree.

Diagram 1. Two year life cycle diagram of Spruce Beetle. (Courtesy of Robert Hodgkinson, 2015).



A brief synopsis of the life history of the spruce beetle species is as follows:

- Adult females emerge when ambient air temperature exceeds approximately 16 degrees Celsius; find new suitable host material; and emit aggregating pheromones to initiate mass attack. Adult emergences usually occur between April and June 27th and the adult flight is usually over by the end of June.
- Males join the females and each pair construct an egg gallery under the bark, parallel to the grain.
- The sapwood is inoculated with spores of a blue stain fungus as the egg gallery is built.
- Eggs are laid and hatch into larvae which feed on the phloem in feeding channels constructed at right angles to the egg gallery.
- After four instars, larvae pupate and develop into adults under the bark. Young adults pick up blue stain fungal spores while in the pupal chamber.
- Spruce beetle must overwinter as adults before emerging to attack a new host. In the normal life cycle of two years, spruce beetle overwinter as larva in the first year and as adults in the second.
- The length of the spruce beetle life cycle is highly dependent on the rate of heat accumulation. In warm summers, spruce beetle can complete its life cycle in 1 year. The duration of the life cycle affects the assessment of risk and hazard of damage.

Operational Timing

Suppression, holding and maintain low can have all of the operations performed following the trap tree schedule. The falling can be done after the spruce beetle flight at the end of June. Harvested stands need to be milled by the end of March to destroy all of the potential pupae and adults.

Action: Spruce beetle may overwinter in decked logs. These need to be removed prior to the adult spring flight in April.

Operational timing is shown in the following charts. Two months have been allocated to the preparation and release of the operational contracts. Based on the lack of recent bids for the beetle survey work, the timing must be moved ahead by two months for this year.

Table 3. Operational timing for Spruce beetle field operations compared against the life cycle of the spruce beetle.

Stage / Month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Egg						■	■																	
Larva								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Pupa																			■	■				
Immature Adult	■	■	■																	■	■	■	■	■
Adult Flight				■	■	■																		
Trap tree falling			■	■											■	■								
Trap tree removal or burning	■	■	■							■	■	■	■	■	■							■	■	■
Log deck removal	■	■	■							■	■	■	■	■	■							■	■	■
Harvesting or sanitation cutting	■	■	■						■	■	■	■	■	■	■						■	■	■	■
Ground walk through and probing	■	■	■						■	■	■	■	■	■	■						■	■	■	■
DMK Overview flight								■	■	■	■									■	■	■	■	

Table 4. Yearly timing of contract development and implementation.

Contract type/ Development dates To contract completion	J	F	M	A	M	J	J	A	S	O	N	D
Aerial overview												
Digitize Maps												
Walk Through and Probe												
Spring Trap tree												
Fall Trap Tree Removal												
contract development timing =		contract window timing=										

Blue is the contract development timing and brown is the contract window.

Baiting (associated with harvesting) – The use of semiochemical tree baits in grid patterns in spruce beetle infested stands is a temporary holding tactic until the stand can be sanitation logged. Baiting should be done on a 50 m ´ 50 m grid throughout the entire infested portion of the stand(s) proposed for sanitation logging.

Appropriate situations for deploying spruce beetle baits on standing trees:

- smaller, distinct blocks having a light scattered attack with no heavily- infested patches
- stands where it doesn't matter if many additional trees are attacked within the stand prior to clearcut sanitation logging
- stands where sanitation clearcutting is clearly scheduled to occur at the soonest opportunity after the beetle flight and before emergence for hibernation
- stands where the licensee/contractor could not otherwise pick up smaller patches of attacked conventional trap trees in early winter (for whatever legitimate reason) and/or where early deep snow would make trap tree retrieval difficult (e.g., at the bottom of a shaded slope).

Baits up by the 15th of May and good for 90 days June July and August.

Harvest last half of August September for summer ground after freeze up for the winter ground areas.