LINDGREN FUNNEL TRAPS

This document provides specific information on the use of Lindgren funnel traps to monitor beetle development and flight, as described in section 8 of *Omineca Region Guidelines for Spruce Beetle Haul and Mill Strategies* (March 2016).

1 Background

Lindgren funnel traps (invented by Dr. B. Staffan Lindgren, professor emeritus UNBC) are primarily used for monitoring and sampling insect populations; they can also be used to mop up infestations or to suppress small localized insect populations. If used for monitoring bark beetle flights, traps must be established before the beetle flight period (often early May through July for major bark beetles). Funnel traps may be quickly overwhelmed with insects during large outbreaks, so if suppression of bark beetle populations is the goal, baited trees slated for harvest or conventional trap trees may be better options. In addition, for some bark beetles, anti-aggregation pheromones are commercially available and are useful for repelling attacking insects from high value trees or stands.

2 Set Up

Funnel trap assembly is illustrated in the Figure 1. Funnel traps can be suspended from a rope tied between two trees or from stand-alone metal hangers. Lures (containing pheromone components that act as attractants to target insects) are suspended in the centre of the trap using plastic extensions. Vendors sell both baits and lures (see Table 2). Baits are designed to attach to trees (standing or cut) in order to concentrate beetles in an area that will be harvested and processed. Lures are used in funnel traps.

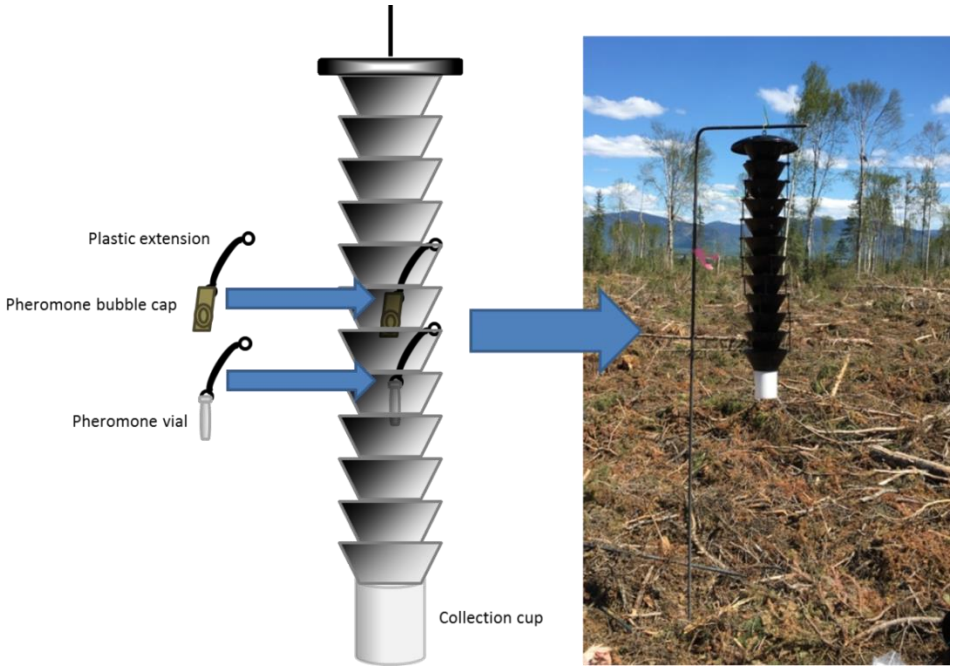

Figure 1 – Funnel trap assembly. Lures, such as pheromone bubble caps or vials, are attached to the black plastic extensions and placed in the centre of the trap. The right photo shows the final trap setup suspended from a rebar hanger.

Hangers can be made from rebar, aluminum conduit, or any other sturdy material. If using rebar or aluminum, dimensions should be approximately 3 metres in length with a 0.6 metre bend at the top and at least a 0.6 metre section that is inserted into the ground. Welded cross bars at the base of the stand are recommended for both stand stability and as a method for placing the hanger in the ground.
Ideally, traps should be placed well away from susceptible host trees (usually between 40 and 100 metres away). ***Because funnel traps are attracting forest pests using lures, there is always a risk of 'spillover' attacks on healthy trees in the area, especially if insect populations are high.***

Trap layout can vary, depending on the objectives of the trapping exercise. Single traps can be used to effectively monitor flight times and populations, especially if checked frequently and populations are low enough not to quickly fill the trap. For monitoring or suppressing very high populations of insects during outbreaks, a more intense trap layout may be useful. For example, groups of three traps may be placed in a grid or line with 30 to 100 metre intervals in between.

3 Trapping Cups

The white cup on the bottom of the trap can be either a 'wet cup' or a 'dry cup'.

A wet cup is designed to hold a liquid that both kills and preserves trapped insects. Normally, wet cups are filled with propylene glycol – camper antifreeze – that is nontoxic (Figure 2). This can be diluted up to 50% with water.

Figure 2 – An example of propylene glycol or camper and marine antifreeze.

Dry cups are designed to be used with volatile insecticides (such as Vaportape insecticidal strips manufactured by Hercon Environmental, see vendors below). ***Insecticidal strips are not currently approved for use in funnel traps in Canada***, but the BC government is working to obtain approval. If dry cups are used without insecticidal strips, insect numbers may not be accurate as trapped insects attract other predatory insects that will munch on your catch, or target insects may simply just fly away! These factors decrease the accuracy of target insect counts. If you have dry cups, the drainage holes can be plugged for a quick conversion to wet cups, if required, or you can purchase wet cups that will attach to existing funnel traps.

4 Data Collection

Lindgren funnel traps are used for a number of purposes. Data collected may include:

- monitoring date
- location
- collector's name
- treatment / lure type
- local environmental data (e.g., elevation, aspect, features such as log yards that may influence or explain trap catches)
- number, weight or volume, and species of collected insects
- notes

If possible, please send any relevant trapping data to regional provincial entomologist (for the Omineca Region, please send to Jeanne.Robert@gov.bc.ca). The data is very useful in confirming and tracking insect occurrences in multiple locations, especially for information such as bark beetle flight times and numbers.

5 Checking the Traps

The frequency of checks depends on weather, but most traps should be checked weekly. Heavy rain or wind, or damage by bears, may necessitate more frequent checks to prevent loss of data. During each check, remove the insects from the cup. Use paint filters (Figure 2) within funnels to separate insect samples from the used antifreeze, and collect the used antifreeze in a container for disposal. Pour fresh antifreeze into cups.

Count, weigh, or estimate the volume of the insect samples on site, or preserve samples in jars, containers, or plastic bags that contain 70-90% ethanol or isopropyl alcohol. This will preserve specimens for counting or identifying later. If you want to preserve specimens for more than a few days, storing them in the fridge or freezer is recommended. Samples should contain clear labels written on paper in pencil (pens or felts will dissolve in alcohol!) – the paper labels can be stored in the jar, submerged in the ethanol with the insect samples.

6 List of field equipment needed for collection

- fresh anti-freeze for filling or re-filling cups
- empty container to collect and dispose of used antifreeze
- filters and funnel to separate insects from antifreeze
- squeeze bottle for rinsing insects in the filter
- 70-90% ethanol or isopropyl alcohol if you want to preserve specimens (for later identification or experiments)
- data labels written on paper with pencil
- leak proof containers for storing collected insects

Figure 2 – examples of paint filters that will work for mass trapping efforts

7 Vendors for Equipment and Supplies

Hardware stores and paint supply shops are best bets for purchasing funnels, filters, and general storage containers. Dollar stores can also be a good source for inexpensive storage containers. Information on vendors can be found in Tables 1 and 2.

Table 1: Entomological equipment and scientific supplies

Vendor	Items available	Website
Bioquip	• insect collecting supplies (e.g., forceps) • squeeze bottles • ethanol • high quality storage jars and vials	https://www.bioquip.com/

Table 2: Traps and lures

Vendor	Items available	Website
Synergy semiochemicals	• lures and baits for bark beetles and other insect pests • anti-aggregation pheromones • funnel traps	http://www.semiochemical.com/
Westgreen global technologies	• lures and baits • vaportape insecticidal strips • funnel traps	http://www.westgreenglobaltechnologies.com/

For additional information on spruce beetle suppression, please contact your region or district FLNRO office.