Forest Tent Caterpillar (*Malacosoma disstria Hübner*) Egg Mass Survey to Forecast Defoliation Severity in the Following Year

Forest Health Manuals and Standards

FOREST HEALTH

Objective

To describe a sequential sampling procedure on using the number of current year egg bands of forest tent caterpillar (FTC) to predict the FTC defoliation profile in the following year.

Sampling Procedure

This is a sequential sampling procedure that is designed to forecast severity of forest tent caterpillar defoliation on aspen stands by counting the number of egg masses on twigs in the upper crown of trees. If sampling with sliding boundaries is included predictions based on this method are considered to be 75% accurate. This procedure is based on a paper published by Shepherd and Brown (1971).

Pre-selection of Sampling Sites

Use Alberta Vegetation Inventory (AVI) maps to pre-select representative aspen stands located within the area of interest. The selected stands should have the following characteristics:

- have access;
- be representative of the range of stand densities and age classes in the area; and
- be large enough (at least 0.5 ha) to leave a 30-m buffer to avoid “edge effect”

Sampling Intensity

The sampling density depends on the resources available and the degree of confidence desired. On the average, sample five trees at least per plot. A sampling intensity of one plot per 3000 ha of aspen forest is considered extensive. Note that the accuracy of the defoliation forecast decreases towards the end of the outbreak.

Timing

The egg band survey can be carried out at any time after aspen leaves drop-off in the fall. It is better to carry out the surveys early in the fall when new egg masses can be differentiated (glistening) from the old ones (dull surface).

Tree Selection

Select only dominant and co-dominant trees for this survey. Trees with dbh between 7.5 – 12.0 cm are preferred. To remove possible “edge effect’” sample trees should be located at least 30 metres away from the edge of the stand.

Methodology

1. Once a suitable stand is selected, record the Global Positioning System (GPS) coordinates at that location. Assign a plot number and a tree number to each sample tree (e.g., Tree 5-3 indicates the third tree in the 5th plot).

2. Collect two branch samples, each 45-cm long, from among the top four branches of the crown excluding the terminal branch. Count and record the number of new egg masses on each branch sample and its lateral shoots.

3. Alternatively, use a pair of binoculars to count the number of new egg masses on two top branches, each an estimated 45-cm long. Count and record the number of new egg masses on the branch and its lateral shoots.

4. Use Table 1 (Fixed Class Sequential Table of Decisions) given below to determine the expected defoliation severity in the following year.

5. Continue sampling until a decision can be reached. For example, if two or less egg masses per sample (two branch tips) were found after sampling four trees, then light defoliation can be expected in the following year. If 11 or more egg masses per sample (two branch tips) were found after sampling one tree, then severe defoliation can be expected in the following year.

Forecast Accuracy

1. Defoliation forecast tend to be less accurate in later years of an outbreak because egg hatch is lower in the latter part of the outbreak.

2. Use the Fixed Class Sequential Table (Table 1) to forecast defoliation severity at the outset of an outbreak. This forecast has an average accuracy of 66 per cent.

3. If the age of the outbreak is known, then use the Sliding Class Sequential Table (Table 2) to forecast expected defoliation severity in the following year. This forecast has an accuracy of up to 75 per cent.

Defoliation Categories and Characteristics

- **Light:** No tree is completely defoliated. Feeding damage is either non-existent or confined to the top third of the crown. Little or no feeding on other tree species or underbrush.
- **Moderate:** Occasional aspen is completely defoliated. Most aspen with partial defoliation of the top crown. Little FTC feeding on underbrush.
- **Severe:** Aspen trees completely defoliated. Feeding visible on other tree species and on underbrush

Table1. A fixed class sequential table of decision lined for three defoliation severity levels of aspen associated with forest tent caterpillar egg mass densities[1]

No. of Trees	Accumulated no. of egg masses per sample of two branches								
		≤		≥		≤		≥	
1	Light	-	Continue Sampling	-	Moderate	-	Continue Sampling	11	Severe
2		-		-		-		13	
3		-		-		-		15	
4		2		-		-		17	
5		3		-		-		19	
6		4		-		-		22	
7		5		-		-		25	
8		6		-		-		27	
9		7		13		13		30	
10		8		14		16		32	
11		9		15		18		34	
12		10		16		20		37	
13		11		17		23		39	
14		13		18		25		42	
15		14		19		28		44	
16		15		21		30		46	
17		16		22		32		49	
18		17		23		35		51	
19		18		24		37		53	
20		19		25		39		56	
21		20		26		42		58	
22		21		27		44		61	
23		22		28		47		63	
24		24		29		49		65	
25		25		30		51		68	

[1]Use this table to forecast severity of defoliation in the first year of an infestation.

Table 2. A sliding class sequential table showing relationship between defoliation class boundaries for aspen stands as denoted by the number of egg bands of the forest tent caterpillar and the age of the outbreak.[2]

	Defoliation class boundary	
	Light-Moderate	Moderate – Severe
Age of Outbreak (year)	Average egg bands per two branch sample	
1	1.20	2.40
2	1.55	2.75
3	1.90	3.10
4	2.25	3.45
5	2.60	3.80
6	2.95	4.15
7	3.30	4.50
8	3.65	4.85

[2]Use this table to forecast severity of defoliation in stands that have had several years of defoliation.

Reference:

Shepherd, R.F.; Brown, C.E. 1971. Sequential egg-band sampling and probability methods of predicting defoliation of *Malacosoma disstria* (Lepidoptera:Lasiocampidae). Canadian Entomologist: 103: 1371-1379.

Forest Tent Caterpillar Egg Mass Sampling Data Sheet

Area		Location No.	
Collection Date		Sampling Crew	

Tree No.	GPS Coordinates	Branch #	Length (cm)	# Egg Masses		Forecast	Comments
				New	Old		
	N	1					
	W	2					
	N	1					
	W	2					
	N	1					
	W	2					
	N	1					
	W	2					
	N	1					
	W	2					
	N	1					
	W	2					
	N	1					
	W	2					
	N	1					
	W	2					
	N	1					
	W	2					
	N	1					
	W	2					
	N	1					
	W	2					