Red Pine Sawfly
Neodiprion nanulus nanulus Schedl
Hymenoptera: Diprionidae

Objective: To develop a sequential sampling plan for *N. nanulus nanulus* defoliation.

Abstract: The red pine sawfly, *Neodiprion nanulus nanulus* Schedl, can cause considerable damage to red pine, *Pinus resinosa* Ait., plantations in the northeastern USA and Canada. The larvae are gregarious and usually consume all of the mature needles from one branch before migrating to another branch. Little or no tree mortality results from complete defoliation in a single year, but can occur with repeated defoliation in multiple years. Eggs are laid in the needles in early fall, and do not hatch until the following spring, which offers ample opportunity to determine if control is warranted. A sequential sampling plan, based on the number of egg-infested needles on a 15-cm twig, is presented to predict damage levels. Damage is classified as either zero to light or moderate to heavy defoliation.

One twig is sampled from each of five trees, the cumulative number of egg infested needles is recorded, and then compared to the sequential sampling table (Table 1). If further sampling is required to reach a decision, the sixth sample should be taken from the first tree sampled. This method continues until each of the five trees have been sampled up five times in order to reach a decision. If after 25 twig samples are obtained no classification decision is reached, then decisions are made on the basis of whether or not the count is closer to 21 (zero to light infestation) or 49 (moderate to heavy infestation) and classified accordingly. A field validation test showed that predictions failed only once in 25 attempts (i.e., 96% precision).

Sampling Procedure: Follow the sequential plan in Table 1. Sampling sites should be distributed evenly within a plantation. In large plantations, sampling should be done every 1.6-2 ha. Sample in fall and winter when eggs are present.

Sample one 15-cm long twig from each of five trees. Count and record the cumulative number of egg infested needles and then refer to Table 1. If further sampling is necessary to reach a decision, then take a sixth sample from the first tree sampled. This method continues until each of the five trees have been sampled up to five times. If after 25 twig samples are obtained no decision is reached, then base decision on whether or not the count is closer to

21 (zero to light infestation) or 49 (moderate to heavy infestation). The confidence level for this plan was set at 90%.

Table 1. Sequential sampling plan for red-pine sawfly egg populations on 15-cm red pine tips.

No. twig samples	Cumulative total number of egg-infested needles		
	No. expected to produce zero to light defoliation	Range within which the amount of defoliation expected is doubtful[a]	No. expected to produce moderate to heavy defoliation
1	—	0-14	≥15
2	—	0-16	≥17
3	—	0-17	≥18
4	—	0-19	≥20
5	—	0-20	≥21
6	—	0-21	≥22
7	—	0-23	≥24
8	—	0-24	≥25
9	—	0-26	≥27
10	0	1-27	≥28
11	≤1	2-28	≥29
12	≤3	4-30	≥31
13	≤4	5-31	≥32
14	≤5	6-33	≥34
15	≤7	8-34	≥35
16	≤8	9-35	≥36
17	≤9	10-37	≥38
18	≤11	12-38	≥39
19	≤12	13-40	≥41
20	≤14	15-41	≥42
21	≤15	16-42	≥43
22	≤17	18-44	≥45
23	≤18	19-45	≥46
24	≤19	20-47	≥48
25	≤21	22-48	≥49

[a]Continue sampling if count falls in this column.
Note: Chances are 1 in 10 that defoliation will be predicted incorrectly.