

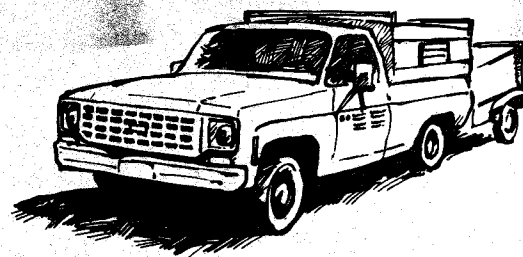


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1980 Forest Insect and Disease Conditions

Vancouver Forest Region
E.V. Morris, R.O. Wood

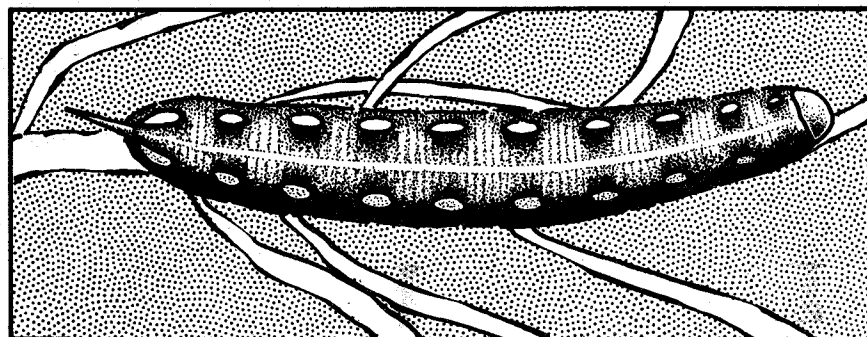
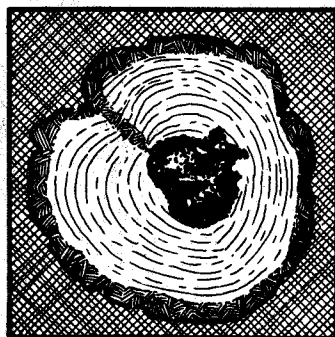


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SUMMARY OF PEST CONDITIONS

This report outlines forest insect and disease conditions in the Vancouver Forest Region for 1980 and forecasts population trends of potentially damaging forest pests.

Western spruce budworm infestations, primarily in Douglas-fir stands showed an increase to over 27 000 hectares of visible defoliation in 1980 with a substantial increase in the areas of severe defoliation. Mountain pine beetle infestations expanded at Haylmore-Spruce creeks, Mowhokam Creek, along the upper Klinaklini River and Eastgate in Manning Provincial Park. Conifer sawfly populations at Keta Lake and Big Tree Creek on Vancouver Island collapsed in 1980 after causing severe defoliation and tree mortality to mature amabilis fir and western hemlock in 1979. Fir root bark beetles attacked many of the amabilis fir trees that were severely defoliated by the sawfly. Winter moth larvae again defoliated deciduous trees in the Victoria area and surrounding municipalities. Moderate to severe discoloration of broadleaf maple foliage was widespread on Vancouver Island and the mainland for the seventh consecutive year.

Details on individual insect and disease problems appear under host trees in subsequent sections.

The number of collections containing larvae on Vancouver Island decreased from 51% in 1979 to 42% in 1980; on the Vancouver mainland there was a decrease from 60% in 1979 to 56% in 1980. These figures represent the lowest number of collections containing larvae since 1971.

A total of 500 insect and disease collections from the Region were submitted to the Pacific Forest Research Centre, by Forest insect and disease survey personnel and an additional 70 collections were submitted by outside agencies. Map 1 shows drainage divisions and general locations of field collection points. Fifty flying hours were used on aerial defoliation and bark beetle mapping, and sampling permanent sample plots along the west coast of Vancouver Island (Map 2).

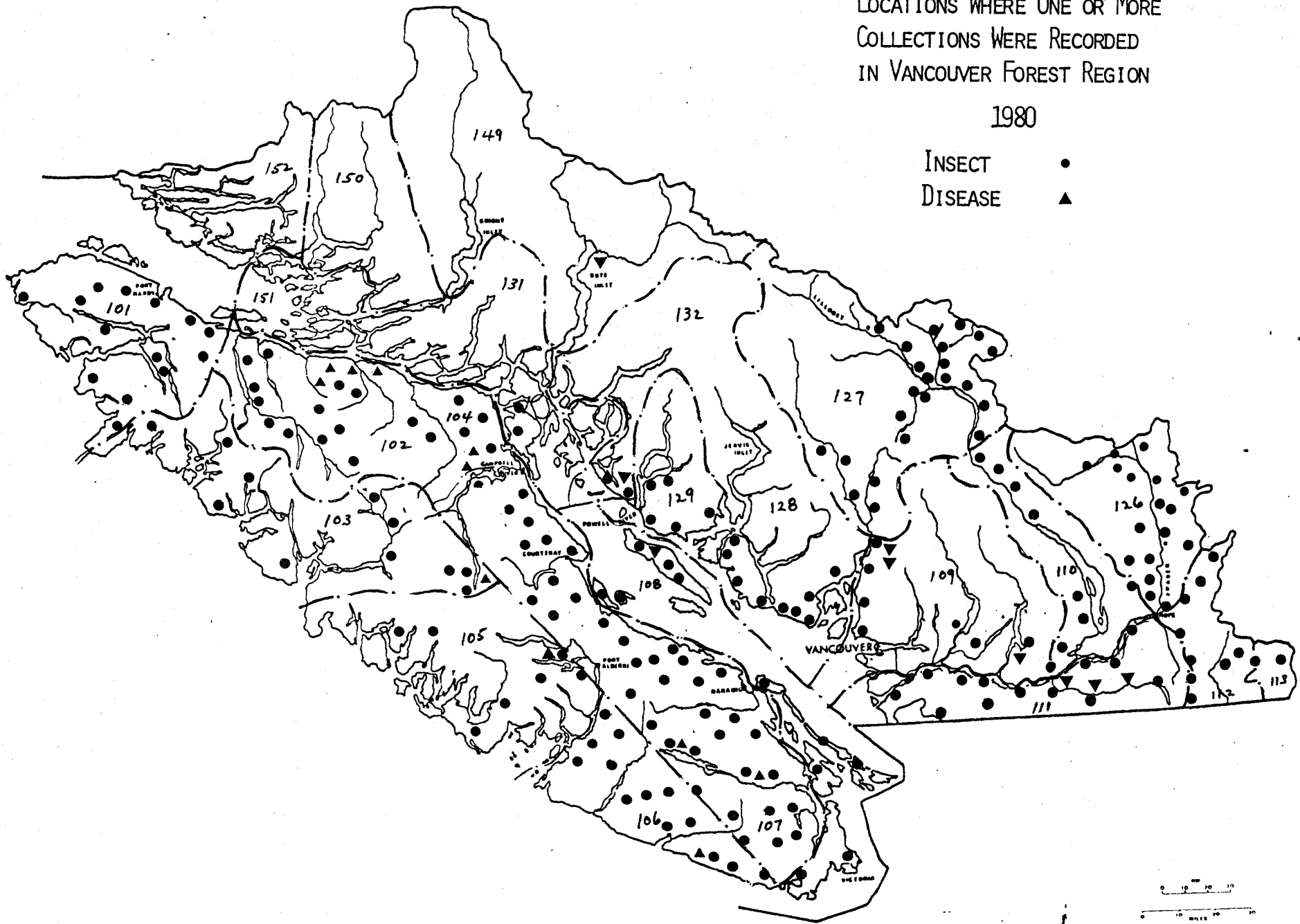
Regular field work in the Region commenced on April 15 and ended on October 17. Special surveys were as follows: western spruce budworm egg, defoliation, top-kill and mortality, winter moth larval collections for parasitism studies, fir root bark beetle cruises, and the examination and sampling of 32 managed and natural second growth stands for pest problems.

MAP 1

LOCATIONS WHERE ONE OR MORE
COLLECTIONS WERE RECORDED
IN VANCOUVER FOREST REGION

1980

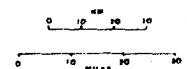
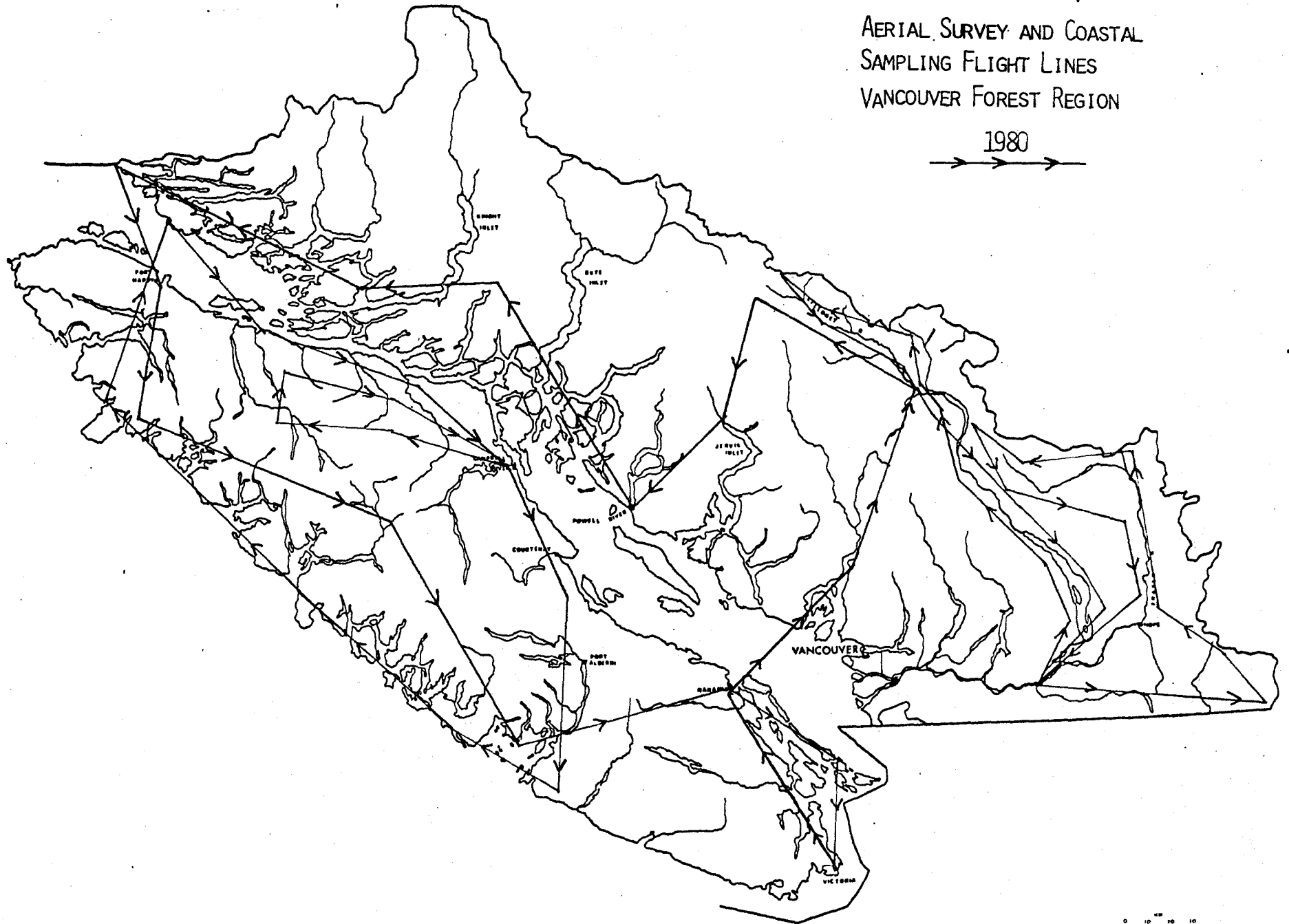
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MAP 2

AERIAL SURVEY AND COASTAL
SAMPLING FLIGHT LINES
VANCOUVER FOREST REGION

1980



DOUGLAS FIR PESTS

Western spruce budworm, Choristoneura occidentalis

Defoliation of Douglas-fir stands occurred on a total of 27 300 ha in 1980 compared with 19 800 ha in 1979, an increase of 7 500 ha. Severe defoliation occurred along the Lower and Upper Skagit River, Coquihalla River, Siwash Creek and East Anderson River. Patches of light and moderate defoliation also occurred in these areas and along the east side of the Fraser River from north of Hope to Mowhokam Creek, along Nahatlatch River and Lake, and Spuzzum Creek. Two small patches of moderate defoliation were recorded on the west side of the Lower Lillooet River at Smith Creek and Glacier Lake (Map 3). No current defoliation was recorded in the Pemberton - Upper Lillooet River area for the third consecutive year.

For a preliminary evaluation of the infestation, one hundred buds were examined on three Douglas-fir trees at each of 17 locations in infestation areas in late May. Infested bud counts were up substantially compared with 1979 except at Kookipi Creek, where there was a decline (Table 1).

Table 1. Percentage of Douglas-fir buds infested with spruce budworm, Vancouver Forest Region 1978-80

| Locality | Percentage of buds infested | | | 1980 defoliation |
|---------------------------|-----------------------------|------|------|---------------------|
| | 1978 | 1979 | 1980 | |
| <u>Fraser Canyon Area</u> | | | | |
| Kookipi Creek | 20 | 4 | 2 | nil |
| Keefers | - | - | 15 | light |
| Mowhokam Creek | 7 | 8 | 10 | light |
| Anderson River | 14 | 7 | 12 | light |
| Gilt Creek | 15 | 8 | 23 | moderate |
| Siwash Creek | - | - | 25 | severe |
| <u>Hope-Princeton Hwy</u> | | | | |
| Sumallo River | 0 | 1 | 7 | nil |
| Rhododendron Flats | 3 | 10 | 36 | moderate |
| Cedar Creek | - | - | 27 | severe |
| Skaist Creek | - | - | 40 | severe |
| <u>Coquihalla River</u> | | | | |
| Boston Bar Creek | 16 | 14 | 22 | moderate |
| Ladner Creek | - | - | 46 | severe |

(Cont'd)

Table 1. (Cont'd)

| Locality | Percentage of buds infested | | | 1980 defoliation |
|-------------------------------|-----------------------------|------|------|---------------------|
| | 1978 | 1979 | 1980 | |
| <u>Silver-Skagit Area</u> | | | | |
| Silver-Skagit Road (km 45) | 20 | 7 | 12 | light |
| Shawatum Creek | 28 | 12 | 58 | moderate |
| <u>Pemberton Area</u> | | | | |
| Owl Creek | 8 | 0 | 0 | nil |
| Birkenhead Lake | 6 | 1 | 0 | nil |
| Joffre Creek | 3 | 0 | 0 | nil |

The number of spruce budworm larvae in 3-tree beating samples from Douglas-fir increased in 1980, but the number of collections containing larvae decreased (Figure 1). During the period 1970-80 the areas of defoliation fluctuated from 5 000 hectares in 1970 to 90 000 hectares in 1977 and declined to 19 800 hectares in 1979 and increased to 27 300 hectares in 1980 (Figure 2). Table 2 shows an increase in number of larvae per sample and percent samples containing larvae in two drainages where infestations are still active.

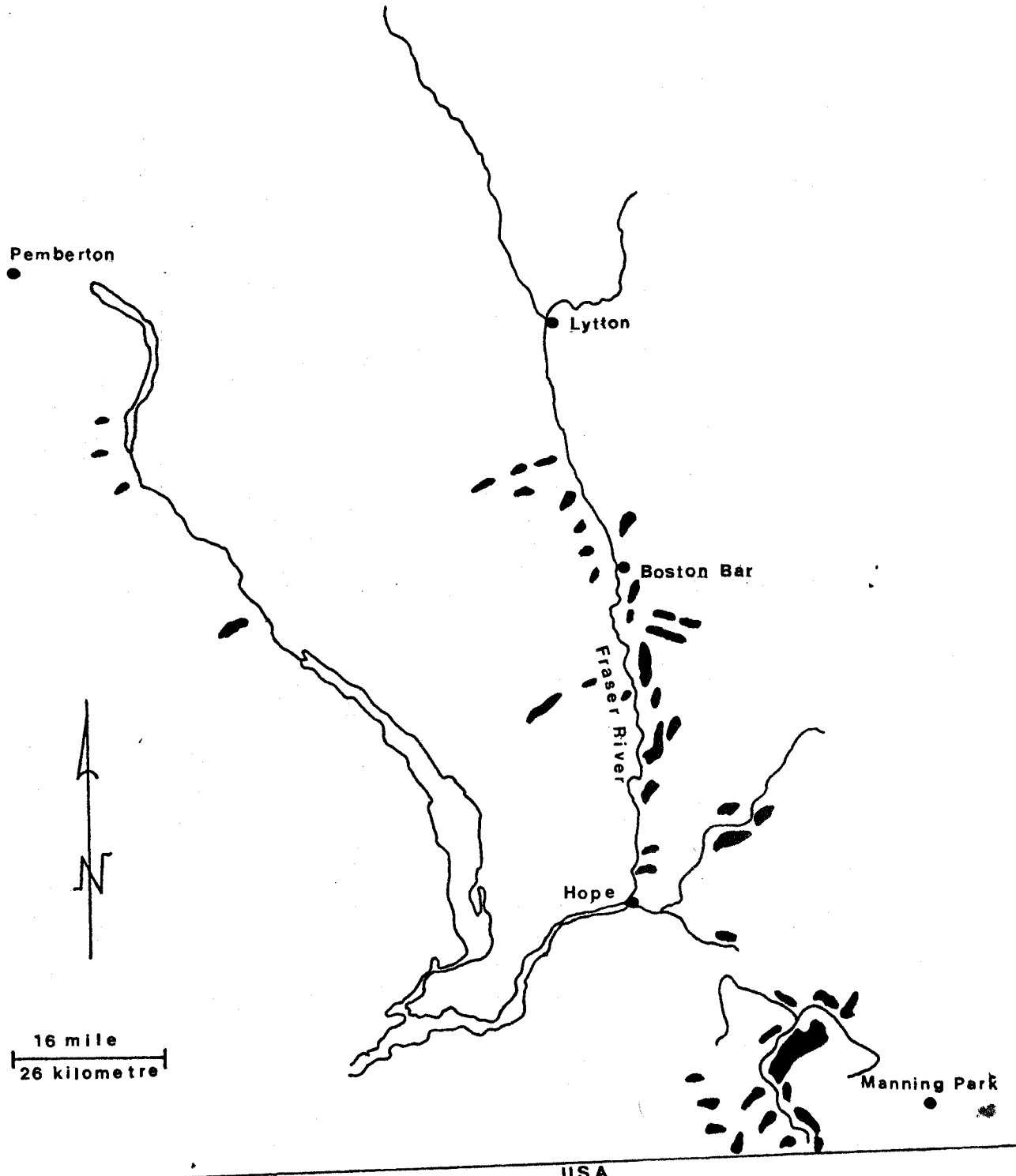
Table 2. Summary of beating collections containing spruce budworm from Douglas-fir stands Vancouver Forest Region, 1978-1980.

| Drainage* Divisions | Number samples taken during larval period | | | Percent samples containing larvae | | | Average number larvae per positive sample | | | Average number larvae per sample | | |
|------------------------|---|------|------|--|------|------|--|------|------|--|------|------|
| | 1978 | 1979 | 1980 | 1978 | 1979 | 1980 | 1978 | 1979 | 1980 | 1978 | 1979 | 1980 |
| | 104 | 5 | 7 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 107 | 16 | 20 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 109 | 4 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110 | 2 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111 | 8 | 5 | 5 | 0 | 20 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 112 | 6 | 4 | 5 | 83 | 75 | 100 | 29 | 23 | 122 | 24 | 18 | 122 |
| 126 | 10 | 6 | 11 | 60 | 17 | 45 | 7 | 7 | 40 | 4 | 1 | 18 |
| 127 | 19 | 11 | 10 | 72 | 9 | 10 | 1 | 3 | 1 | 1 | 1 | 0.1 |
| 133 | 3 | 2 | 2 | 66 | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 0 |

* See map

MAP 3
WESTERN SPRUCE BUDWORM DEFOLIATION
OF DOUGLAS-FIR IN VANCOUVER MAINLAND
1980

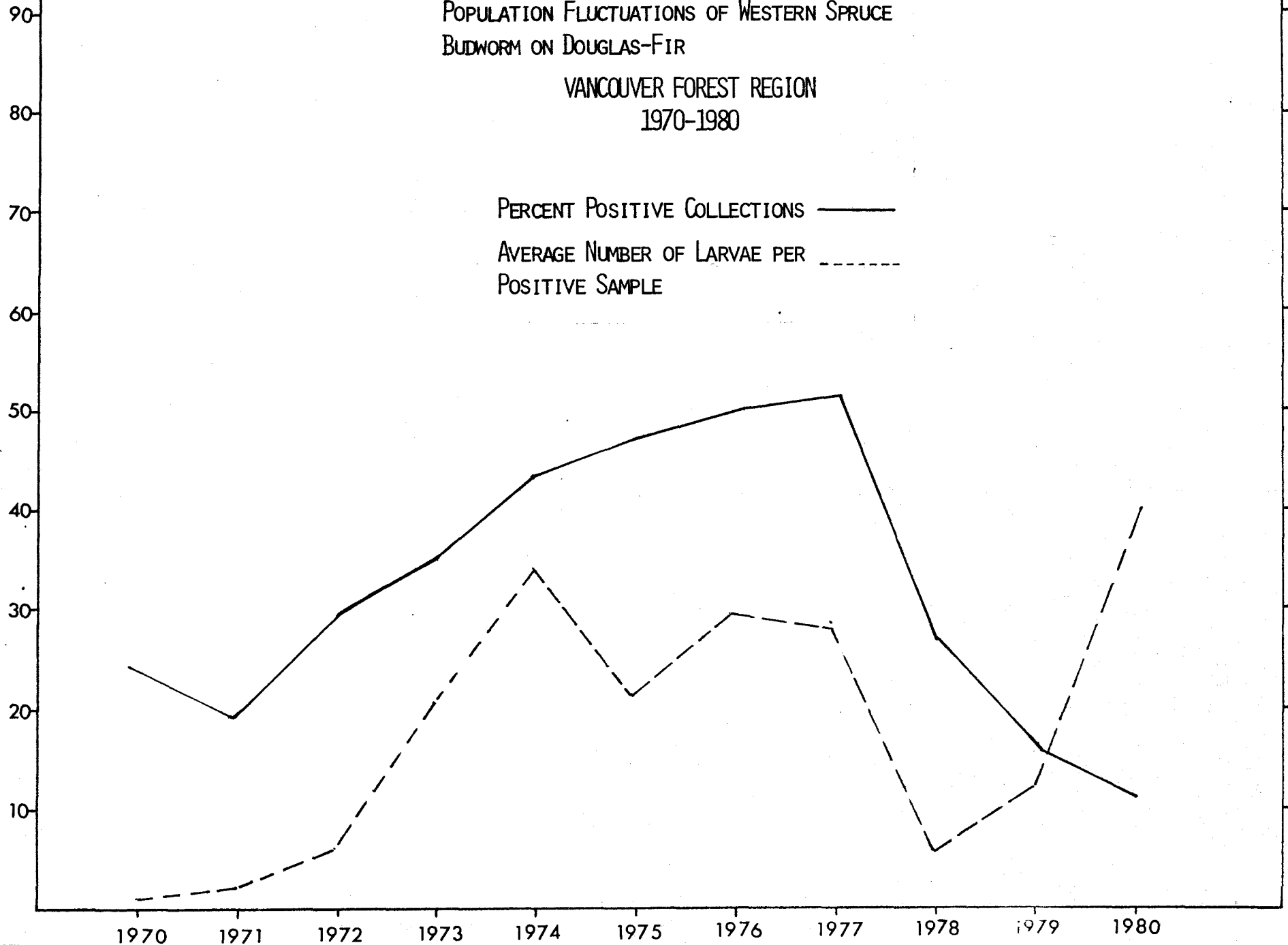
AREAS OF DEFOLIATION 



USA

FIGURE 1

POPULATION FLUCTUATIONS OF WESTERN SPRUCE
BUDWORM ON DOUGLAS-FIR
VANCOUVER FOREST REGION
1970-1980



Larval samples at seven localities within the infestation collected for disease studies showed that Entomophthora fungus was present at four of the sample plots; at Shawatum Creek and Rhododendron Flats (Skagit River), Coquihalla River and Siwash Creek in the Fraser Canyon. Subsequent egg sampling at these localities in August showed low egg populations at three localities and medium egg populations at one, suggesting some influence by the pathogen.

Aerial surveys in late July mapped areas of current budworm defoliation and grey areas where top-kill and tree mortality has occurred and classified as follows: severe defoliation 12 000 ha, moderate 14 300 ha, and light 1 000 ha (Figure 2). A total of 5 800 ha were mapped where grey tops and tree mortality has occurred and classified as follows: Light: up to 10 percent top-kill and tree mortality, Moderate 11-30 percent and Severe 31+ percent. The highest concentration of grey areas was in the Fraser Canyon and tributary valleys from north of Yale to Boston Bar (Table 3). Ground surveys in 12 grey areas in the Fraser Canyon and Pemberton area showed that on average 39% of the Douglas-fir trees had top-kill, 13% were dead from repeated annual defoliation, and 15% were dead from a combination of repeated annual defoliation and Douglas-fir beetle attacks on the larger diameter trees (Table 4).

Photograph available from
Pacific Forest Research Centre

Spruce budworm top stripping of Douglas-fir Haylmore Creek 1976. (Arrow shows forking caused by the 1950's infestation).

Table 3. Areas and intensity of spruce budworm defoliation and "grey areas" in Douglas-fir stands recorded from aerial surveys Vancouver Forest Region, 1980.

| Location | Intensity and area defoliated (ha) ^{1/} | | | "Grey Areas" (ha) ^{1/} | | |
|---------------------------------|--|---------------|---------------|---------------------------------|--------------|------------|
| | Light | Moderate | Heavy | Light | Moderate | Heavy |
| Lower Skagit River | 0 | 5 400 | 1 728 | 0 | 0 | 0 |
| Upper Skagit River | 192 | 960 | 4 288 | 0 | 512 | 0 |
| Coquihalla River | 0 | 1 600 | 2 048 | 576 | 0 | 0 |
| Fraser Canyon (Hope to Keefers) | 128 | 4 352 | 3 968 | 448 | 2 432 | 512 |
| Nahatlatch River | 0 | 1 216 | 0 | 0 | 0 | 0 |
| Lower Lillooet River | 640 | 768 | 0 | 128 | 0 | 0 |
| Upper Lillooet River | 0 | 0 | 0 | 192 | 256 | 128 |
| Birkenhead Lake | 0 | 0 | 0 | 128 | 128 | 0 |
| D'Arcy (area) | 0 | 0 | 0 | 64 | 320 | 0 |
| Totals | 960 | 14 336 | 12 032 | 1 536 | 3,648 | 640 |

^{1/} See text for description of classes.

The criterion used to classify the three defoliation categories during aerial surveys: LIGHT - discolored foliage barely visible from the air, some branch tip and upper crown defoliation; MODERATE - pronounced discoloration, noticeable, thin foliage, top third of many trees severely defoliated, some completely stripped; SEVERE - bare branch tips and completely defoliated tops, most trees more than 50% defoliated.

Defoliation estimates of 10 trees at each of 29 egg sample plots showed that the heaviest defoliation occurred at Nahatlatch Mtn., Gilt, Mowhokam, and Skaist creeks (Table 5).

Egg populations were assessed in August by counting egg masses on two 50 cm branches from mid-crown of each of three Douglas-fir trees at each of the 29 locations. Eggs were present at 16 of the sample plots (Table 5) and the highest number of eggs was in the Skagit River area at Skaist, Cedar and Shawatum creeks, in the Fraser Canyon at Urquhart, Hallecks, Gilt creeks, Nahatlatch Mtn., East Anderson River (Branch 300) and at Smith Creek on the west side of Lillooet Lake, which could result in moderate to severe defoliation occurring in these areas in 1981. Lower numbers of eggs were found at Siwash and Stoyoma creeks in the

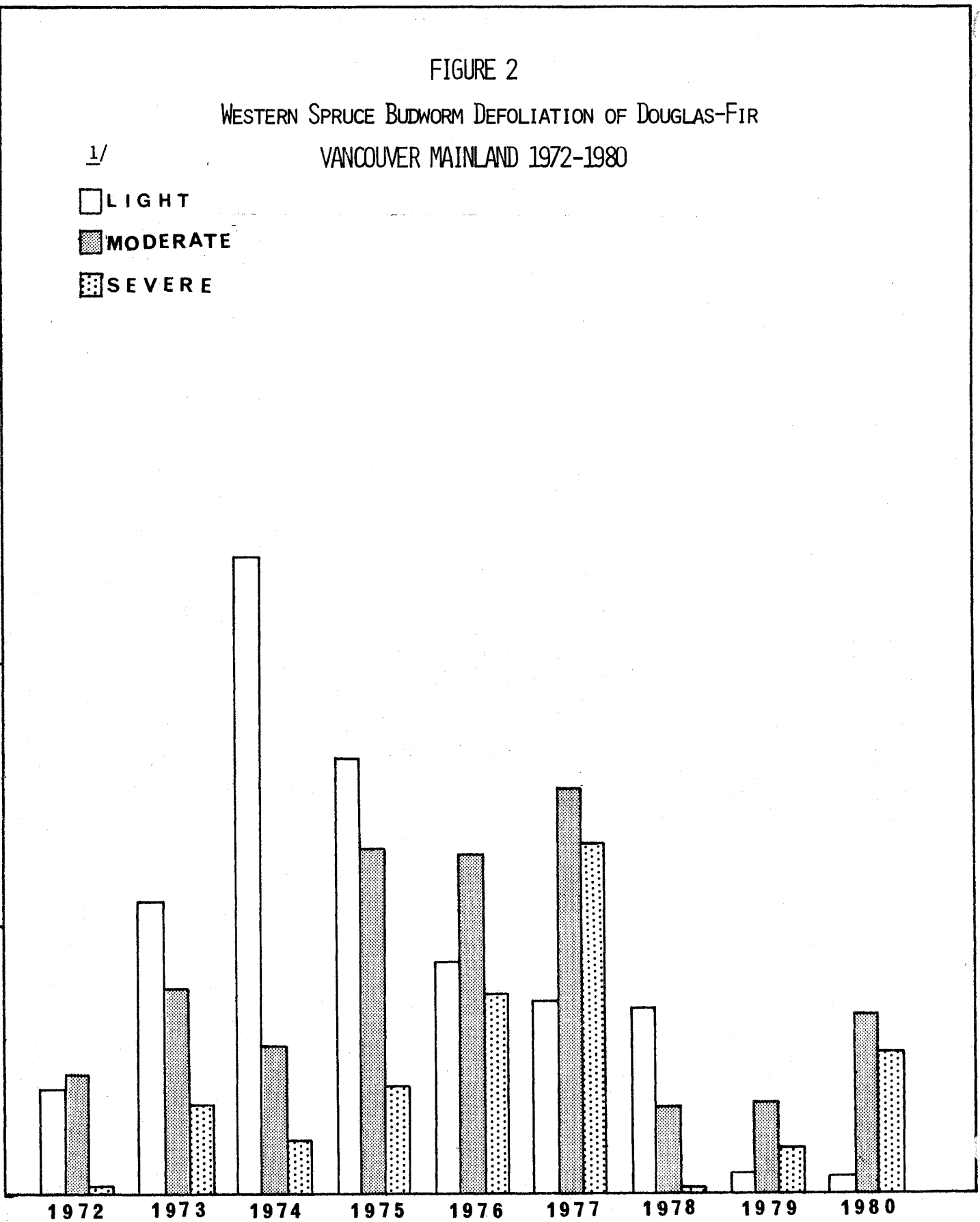
FIGURE 2

WESTERN SPRUCE BUDWORM DEFOLIATION OF DOUGLAS-FIR
VANCOUVER MAINLAND 1972-1980

1/

- LIGHT
- ▒ MODERATE
- ▤ SEVERE

75
50
25



1/ see text for description of classes

Table 4. Top-kill and tree mortality of spruce budworm defoliated Douglas-fir stands.
Vancouver Forest Region, 1980.

| Location | Elev (m) | Slope % | Site | Aspect | Age | Grey area ^{1/} aerial rating | Percent Mortality | | | |
|---------------------------|----------|---------|----------|-----------|-------------------|---|---------------------|-----------|--------------|-----------|
| | | | | | | | Percent Top-kill | Defol. | Bark beetles | |
| <u>Fraser Canyon</u> | | | | | | | | | | |
| Spuzzum Mtn | 923 | 20 | Moderate | South | immature | Moderate | 27 | 0 | 26 | |
| S Tsileuh Creek | 923 | 30 | Moderate | South | immature | Moderate | 6 | 34 | 39 | |
| North Anderson Ridge | 900 | 10 | Moderate | Southwest | immature | Moderate | 11 | 24 | 31 | |
| Above Hells Gate | 953 | 0 | Poor | South | regenera- tion | Moderate | 14 | 50 | 0 | |
| Tikwalus-Tsileuh Rd | 800 | 40 | Poor | Southeast | immature | Light | 40 | 20 | 4 | |
| | | | | | | | <u>Average</u> | <u>20</u> | <u>26</u> | <u>20</u> |
| <u>Pemberton Area</u> | | | | | | | | | | |
| Railroad Creek | 822 | 50 | Moderate | West | mature | Moderate | 50 | 0 | 23 | |
| Blackwater Creek | 1 168 | 50 | Poor | Northeast | immature | Moderate | 34 | 0 | 28 | |
| Birkenhead Lake | 1 058 | 30 | Moderate | Southeast | immature | Moderate | 52 | 2 | 0 | |
| McKenzie Basin | 780 | 60 | Moderate | Southwest | mature | Moderate | 48 | 0 | 34 | |
| Haylmore Creek | 987 | 10 | Poor | Southwest | immature | Moderate | 84 | 5 | 0 | |
| Phelix Creek | 810 | 70 | Poor | East | mature | Light | 34 | 5 | 0 | |
| Owl Creek | 780 | 60 | Poor | South | immature | Light | 67 | 15 | 0 | |
| | | | | | | | <u>Average</u> | <u>53</u> | <u>4</u> | <u>12</u> |
| <u>Average both areas</u> | | | | | | | <u>39</u> | <u>13</u> | <u>15</u> | |

^{1/} Light = up to 10 percent top-kill and tree mortality.

Moderate = 11-30 percent top-kill and tree mortality.

Severe = 31+ percent top-kill and tree mortality.

Table 5. Number of spruce budworm egg masses and estimated percentage defoliation on Douglas-fir stands.

Vancouver Forest Region, 1980.

| Location | Average number egg masses per 10 m ² of foliage | | | Estimated loss of current years foliage (%) | | | Estimated total defoliation (%) | | | Predicted ^{1/} defoliation for 1981 |
|-----------------------------|---|------|------|---|-------|-------|------------------------------------|-------|-------|--|
| | 1978 | 1979 | 1980 | 1978 | 1979 | 1980 | 1978 | 1979 | 1980 | |
| <u>West of Fraser River</u> | | | | | | | | | | |
| Urquhart Creek #1 | - | - | 111 | - | - | 46 | - | - | 16 | moderate |
| Urquhart Creek #2 | - | - | 25 | - | - | 39 | - | - | 13 | light |
| Tikwalus-Tsileuh Rd | - | - | 0 | - | - | 15 | - | - | 2 | nil |
| Hallecks Creek | - | - | 60 | - | - | 69 | - | - | 37 | moderate |
| Nahatlatch Mtn #1 | - | - | 73 | - | - | 83 | - | - | 48 | moderate |
| Nahatlatch Mtn #2 | - | - | 142 | - | - | 84 | - | - | 49 | moderate |
| Keefers | - | 54 | 0 | - | 10 | 8 | - | 3 | 7 | nil |
| Kookipi Creek | 0 | - | 0 | 13 | - | trace | 13 | - | trace | nil |
| Twin One Creek | 0 | 0 | 0 | trace | 0 | 0 | trace | 0 | 0 | nil |
| Haylmore Creek | 0 | 0 | 0 | trace | trace | 0 | trace | trace | 0 | nil |
| Birkenhead Lake | 0 | 0 | 0 | 2 | trace | 0 | 3 | 26 | 5 | nil |
| Owl Creek | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | nil |
| Glacier Lake | - | - | 0 | - | - | - | - | - | - | nil |
| Smith Creek | - | - | 105 | - | - | - | - | - | - | moderate |
| <u>East of Fraser River</u> | | | | | | | | | | |
| Gilt Creek #1 | 7 | 52 | 0 | 3 | 9 | 55 | 24 | 4 | 18 | nil |
| Gilt Creek #2 | - | - | 172 | - | - | 72 | - | - | 43 | severe |
| Siwash Creek | - | 75 | 22 | - | 69 | 64 | - | 28 | 28 | light |
| East Anderson (Br 300) | 0 | - | 141 | 10 | - | 54 | 13 | - | 34 | moderate |
| Stoyoma Creek | 0 | 12 | 39 | trace | 0 | 8 | 15 | 0 | 9 | light |
| Mowhokam Creek (Br 100) | - | - | 0 | - | - | 20 | - | - | 45 | nil |
| Coquihalla River | - | 45 | 19 | - | 67 | 32 | - | 32 | 14 | light |
| Boston Bar Creek | 16 | 11 | 0 | trace | 15 | 41 | 2 | 6 | 21 | nil |
| East Ladner Creek | 6 | 215 | 0 | 4 | 50 | 74 | 22 | 15 | 39 | nil |
| Rhododendron Flats | 52 | 243 | 25 | 21 | 29 | 59 | 28 | 29 | 18 | light |
| Skaist Creek | - | 275 | 219 | - | 85 | 82 | - | 51 | 46 | severe |
| Skagit R Bridge | - | - | 95 | - | - | 70 | - | - | 24 | moderate |
| Cedar Creek | 0 | 163 | 173 | 33 | 35 | 76 | 16 | 14 | 35 | severe |
| Skagit River (KM 45) | 0 | 16 | 0 | 20 | 7 | trace | 8 | 3 | trace | nil |
| Shawatum Creek | 0 | 65 | 51 | 30 | 37 | 74 | 16 | 17 | 36 | moderate |

^{1/} 50 eggs per 10 m² = light defoliation
 51-150 eggs per 10 m² = moderate defoliation
 151+ eggs per 10 m² = severe defoliation

Fraser Canyon and at Coquihalla River and Rhododendron Flats, which could result in patches of light defoliation. Egg surveys in the Pemberton area showed no eggs present for the third consecutive year.

The prediction for 1981 defoliation is based on the criterion that up to 50 egg masses per 10 m² of foliage could result in light defoliation; from 50 to 150 egg masses in moderate defoliation and more than 150 egg masses in severe defoliation.

Spruce budworm populations remained at a low level on Vancouver Island; no larvae were collected in beating samples, and only a few male spruce budworm adults were caught in pheromone traps at three locations (Table 6).

Traps baited with three concentrations of pheromone were used at 11 locations to assess adult male budworm populations. The results of this survey are shown in Table 6.

Table 6. Western spruce budworm adult males in pheromone-baited traps, Vancouver Forest Region, 1980

| Location | Pheromone concentration (Average number adults per trap) | | | 1980 Defoliation |
|---------------------------|---|-------|--------|---------------------|
| | 0.1% | 0.01% | 0.001% | |
| <u>Vancouver Mainland</u> | | | | |
| Skagit River (km 45) | 22 | 24 | 3 | light |
| Rhododendron Flats | 48 | 40 | 15 | moderate |
| Kookipi Creek | 25 | 5 | 1 | nil |
| Gilt Creek | 30 | 44 | 16 | severe |
| Twin One Creek | 10 | 2 | 0 | nil |
| Birkenhead Lake | 3 | 1 | 0 | nil |
| Owl Creek | 30 | 8 | 0 | nil |
| Haylmore Creek | 6 | 5 | 0 | nil |
| <u>Vancouver Island</u> | | | | |
| Green Mountain | 0.2 | 0 | 0 | nil |
| Fuller Lake | 1 | 1 | 0 | nil |
| Highland Valley | 11 | 1 | 0 | nil |

Douglas-fir beetle, *Dendroctonus pseudotsugae*

There was an increase in the number of Douglas-fir trees recently killed by bark beetles in the eastern part of the Vancouver mainland. Spot infestations were recorded along the east side of the Birkenhead River from Poole Creek to Pemberton, along the west side

of the Anderson River and along the Fraser River from Boston Bar south to Saddle Rock (Table 7).

Table 7. Areas within which recently-killed Douglas-fir trees were recorded during aerial surveys.

Vancouver Forest Region 1980.

| Locality | Area (ha) | |
|------------------------|-----------|------------------------|
| | Light | Moderate ^{1/} |
| <u>Fraser Canyon</u> | | |
| Lower Nahatlatch River | 30 | 0 |
| Chaumox | 16 | 0 |
| Anderson River | 16 | 0 |
| Tsileuh Creek | 0 | 16 |
| Spuzzum Mountain | 16 | 20 |
| Chapmans | 32 | 0 |
| Stout | 16 | 0 |
| <u>Pemberton</u> | | |
| Birkenhead River | 80 | 0 |
| Totals | 208 | 36 |

^{1/} Light = 1 to 5 % tree mortality
Moderate = 6 to 30% tree mortality.

Ground surveys in 12 spruce budworm "grey areas" to determine the incidence of bark beetle attacks on Douglas-fir trees that have been severely defoliated by budworm for the past several years, showed that on average 15% of the larger diameter trees were dead from a combination of severe defoliation and Douglas-fir beetle attacks. Douglas-fir beetle does not appear to be successful in establishing broods in the defoliated trees, as only occasional trees were found where 1980 progeny were present and it requires more than one year of beetle attack to kill the tree (Table 8).

No current Douglas-fir bark beetle activity was noted on Vancouver Island.

Table 8. Douglas-fir bark beetle tree mortality in "grey areas" of (Douglas-fir) stands defoliated by spruce budworm. Vancouver Forest Region, 1980.

| Location | Elev. (m) | Slope (%) | Site | Aspect | Age | Percent Mortality by Defoliation + beetles |
|-----------------------|-----------|-----------|----------|-----------|---------------------------|--|
| <u>Fraser Canyon</u> | | | | | | |
| Spuzzum Mtn | 923 | 20 | moderate | south | immature | 26 |
| S. Tsileuh Creek | 923 | 30 | moderate | south | immature | 39 |
| North Anderson Ridge | 900 | 10 | moderate | southwest | immature | 31 |
| Above Hells Gate | 953 | 0 | poor | south | regeneration | 0 |
| Tikwalus-Tsileuh Rd | 800 | 40 | poor | southeast | immature | 4 |
| | | | | | Average | 20 |
| <u>Pemberton Area</u> | | | | | | |
| Railroad Creek | 822 | 50 | moderate | west | mature | 23 |
| Blackwater Creek | 1168 | 50 | poor | northeast | immature | 28 |
| Birkenhead Lake | 1058 | 30 | moderate | southwest | immature | 0 |
| McKenzie Basin | 780 | 60 | moderate | southwest | mature | 34 |
| Haylmore Creek | 987 | 10 | poor | southwest | immature | 0 |
| Phelix Creek | 810 | 70 | poor | east | mature | 0 |
| Owl Creek | 780 | 60 | poor | south | immature | 0 |
| | | | | | Average | 12 |
| | | | | | <u>Average both areas</u> | <u>15</u> |

Phellinus root rot, Phellinus weirii

Surveys to determine the intensity of root rot infections in Douglas-fir stands, initiated by the British Columbia Ministry of Forests in 1979 as an aid in stand tending planning, were continued in 1980 at 13 locations on Vancouver Island and the Mainland: Parksville (6) Duncan (3) Cowichan Lake (1) Powell River (2) Cultus Lake (1) (Table 9).

The surveys incorporated methods designed by Dr. W.J. Bloomberg of the Canadian Forestry Service and field training and identification techniques were provided by personnel of the C.F.S.

Evidence of the disease was also found on Vancouver Island at the following locations: Deadwood Creek, Cous Creek, Gosling Lake,

Comox, Sproat Lake, Menzies Bay, McCreight Lake, Pye Lake, Quinsam Lake, Mohun Lake and near Ganges on Saltspring Island.

More intensive surveys will be required before the exact status of the disease is known in those areas (Root Rot Surveys. 1979. Pest Management, Protection Branch, Ministry of Forests, Feb. 1, 1980. S. Raine Appendix 1).

Table 9. Incidence of Phellinus weirii in Root Rot Surveys. Vancouver Forest Region, 1979-80.

| Locations | Stand Area (ha) | Percent Stand Infected |
|----------------------|-----------------|------------------------|
| <u>Parksville</u> | | |
| Cook Cr. 1 | 32 | 6 |
| Cook Cr. 2 | 93 | 4 |
| Cook Cr. 3 | 257 | 6 |
| Cook Cr. 4 | 301 | 4 |
| Cook Cr. 5 | 89 | 2 |
| Cook Cr. 6 | 73 | 3 |
| <u>Duncan</u> | | |
| Hillcrest 1 | 105 | 4 |
| Hillcrest 2 | 85 | 4 |
| Banon Cr | 295 | 7 |
| <u>Cowichan Lake</u> | | |
| Skutz Falls | 270 | 2 |
| <u>Powell River</u> | | |
| Sliamam Lake | 82 | 1 |
| Okeover Inlet | 70 | 0 |
| <u>Cultus Lake</u> | | |
| Tamihi Cr | 128 | 4 |
| Total | 1 880 | Average 4 |

Root weevil, Steremnius carinatus

Populations of this weevil were reported by industrial personnel to have caused increased mortality of Douglas-fir seedlings in a reforested area at Ritherdon Creek on Alberni Inlet where mortality increased from 5% in 1979 to 25% in 1980. The weevils also killed a smaller number of western hemlock seedlings.

The root weevils were also suspected of being vectors of black stain root disease, Verticicladiella wagnerii, in Douglas-fir stands at Nitinat River and Tugwell Creek on Vancouver Island, but results of experiments to determine if the weevil was the disease vector conducted at each location were negative.

Between April and July, bolts of Douglas-fir were buried in the duff to act as trap logs near diseased trees and glass jars baited with fresh Douglas-fir sapwood were placed in the same area as pitfall traps. The bolts were replaced with fresh ones at one month intervals and the jars emptied and re-baited with fresh sapwood at weekly intervals.

The pitfall traps at Tugwell Creek produced 10 weevils and those at Nitinat River trapped 30 but none were found to be vectors of black stain root disease. No insect vectors were found in the trap logs.

Nursery Pests

An unidentified insect pest girdled and killed an undocumented number of 2-0 Douglas-fir seedlings at the Koksilah Nursery at Duncan. It was expected that 1.5% of the 5 million seedlings would be lost by the spring of 1981.

Between October and December, 32 pitfall weevil traps and 32 poison bait traps were set in the seed beds and examined at weekly intervals but no insects were caught.

Douglas-fir tussock moth, Orgyia pseudotsugata

There was no defoliation of Douglas-fir stands by tussock moth larvae in the Vancouver Forest Region in 1980 and no larvae were collected in 75 beating samples.

Five pheromone traps were set out at each of 10 locations to monitor the population of tussock moth adults. Traps at Qualicum and Silver-Skagit caught two and one moths respectively indicating a low endemic population level. The traps at North Vancouver, Cultus Lake, Sechelt, Cowichan Lake, Salt Spring Island, Colwood, Fuller Lake and Comox were negative.

Adult males of the rusty tussock moth, Orgyia a badia were caught in low numbers in the pheromone traps at seven of the trap locations but no larvae were collected at these localities.

Cooley spruce gall aphid, Adelges cooleyi

No serious aphid damage was recorded in conifer plantations and seed orchards in 1980, and although the aphid was present in Douglas-fir and Sitka spruce seed orchards on the Saanich Peninsula there was no serious damage. Insecticidal spray programs probably were instrumental in controlling the populations.

There was some evidence of cooley spruce gall aphid damage in Douglas-fir plantations at Bute Inlet and a moderate number of branch galls were present on a low percentage of young Sitka spruce trees in plantations in the Holberg and Port Alice areas.

Pests of Young Stands

A survey of 32 young managed and natural stands was conducted to appraise and identify pests causing damage (Table 10).

Phellinus root rot was found in 34% of the stands with the heaviest infection to Douglas-fir occurring at Nanaimo River, Campbell River, Menzies Bay, McCreight Lake, Pye Lake and Cowichan Lake on Vancouver Island and at Slesse Creek on the Vancouver Mainland. Hemlock dwarf mistletoe infected 15% of the stands where western hemlock occurred in the Squamish and Silver-Skagit area, on the Vancouver Mainland. Wind damaged 12% of the spaced stands, with an average of 10 trees per hectare blown over or leaning, at Chilliwack River and Mission on the Vancouver Mainland. Spruce budworm damaged 16% of the Douglas-fir stands examined in defoliated areas in the Fraser Canyon and Pemberton. (Results of Examination and Sampling of Plantations and Second Growth Stands Vancouver Forest Region 1980 Appendix 2).

Dessication damage

Douglas-fir, Sitka spruce, amabilis fir, bigleaf maple and miscellaneous shrubs along a narrow coastal strip between Campbell River and Shelter Bay sustained severe dessication damage in 1980.^{1/} The damage was attributed to unseasonal cold winds and salt spray between May 19 and 22 after new buds had flushed during early warm weather which was followed by strong, unseasonal cold winds augmented by salt spray.

^{1/} Pest Report Dessication Damage J.C. Hopkins June 16, 1980.

Table 10. Pest conditions in young forest stands, Vancouver Forest Region, 1980.

| Stand type ^{1/} | Stand status | Number stands examined | Pest problems found | | Remarks |
|--------------------------|--------------|------------------------|-----------------------|--|--|
| | | | Minor | Major | |
| D | natural | 9 | | Phellinus spruce budworm | 25% of the stands had Phellinus root rot infections evident. 37% of the stands showed evidence of spruce budworm damage. |
| | managed | 9 | aphids needle cast | Phellinus | 33% of the stands had Phellinus root rot infections. Aphids caused light damage on regeneration trees. |
| D, wH | natural | 3 | | Phellinus | 66% of the stands had Phellinus root rot. |
| | managed | 4 | | Phellinus Dwarf mistletoe Blowdown | 25% of the stands had Phellinus root rot. 25% of the stands had dwarf mistletoe infections. Blowdown was found in 50% of the stands, averaged 10 trees per hectare both D, wH effected. |
| wH, aF, wrC | natural | 5 | | Phellinus Dwarf mistletoe | 20% of the stands had Phellinus root rot. 20% of stands had hemlock dwarf mistletoe. |
| wH, aF, wrC | managed | 1 | | | no pests found |
| wwP | managed | 1 | | white pine blister rust | 60% of the trees infected with blister rust. |

^{1/} D = Douglas-fir
wH = Western hemlock
aF = Amabilis fir
wrC = Western red cedar
wwP = Western white pine

Extensive shoot mortality occurred in conifers which had recently flushed and discoloration of needle tips and mortality of older needles was common. On deciduous hosts, marginal leaf necrosis occurred and some entire leaves, and occasionally shoots, were killed. The most severe damage occurred on the southeast side of plants and was usually absent on sheltered sides, even on severely damaged individuals.

Similar damage occurred in Douglas-fir seed orchards at Deadwood Creek west of Ladysmith and at Gordon River.

PINE PESTS

Mountain pine beetle, Dendroctonus ponderosae

Mountain pine beetle infestations in lodgepole pine increased on the Vancouver mainland in 1980 to more than 1800 ha compared with less than 300 hectares in 1979 (Table 11). The infestation along the Klinaklini River showed renewed activity with 1200 hectares infested at Knot Creek, Klinaklini Lake and upper Klinaklini River. The infestations at Haylmore-Spruce creeks and Mowhokam Creek which have persisted for the past several years increased in area to over 100 hectares at Haylmore-Spruce Creeks and 270 hectares at Mowhokam Creek. A new infestation was recorded at Eastgate in Manning Provincial Park where 20 hectares were found infested.

Table 11. Mountain pine beetle infestation areas Vancouver Forest Region, 1980.

| Location | No infestations ^{1/} | | | Infestation areas (ha) ^{2/} | | | Total | No red trees |
|------------------|-------------------------------|--------|-------|--------------------------------------|----------|--------|-------|--------------|
| | Small | Medium | Large | Light | Moderate | Severe | | |
| Klinaklini River | 0 | 1 | 2 | 1 195 | 0 | 0 | 1 195 | 2 350 |
| Fraser Canyon | 1 | 1 | 1 | 144 | 288 | 0 | 432 | 9 446 |
| Pemberton | 2 | 2 | 0 | 66 | 70 | 64 | 200 | 9 440 |
| Manning Park | 1 | 0 | 0 | 20 | 0 | 0 | 20 | 400 |
| Totals | 4 | 4 | 3 | 1 425 | 358 | 64 | 1 847 | 21 636 |

^{1/} small, up to 50 ha
 medium, 51 to 250 ha
 large, 250 to 1 000 ha

^{2/} Light, 1 to 5% red trees
 Moderate, 6 to 30% red trees
 Severe, 31% plus

Ground surveys were completed in two infested stands to determine the 1980 attack (Table 12).

Table 12. Status of mountain pine beetle attacks in two lodgepole pine stands, Vancouver Forest Region 1980.

| Location | Percent trees healthy | Percent trees attacked | | |
|----------------|-----------------------|------------------------|-----------------|---------------------------|
| | | green attack 1980 | red attack 1979 | grey attack prior to 1979 |
| Mowhokam Creek | 52 | 5 | 11 | 32 |
| Eastgate | 60 | 22 | 16 | 2 |

The expansion of mountain pine beetle infestations in 1980 and the large beetle populations found in the 1980-attacked trees forecast increasing additional tree mortality in 1981, provided extreme climatic factors do not affect the beetles development. (Special Report) Mountain Pine Beetle Infestation Eastgate, Manning Provincial Park September, 1980. Appendix 3)

TRUE FIR PESTS

Fir root bark beetle, Pseudohylesinus granulatus

Amabilis fir stands near Keta Lake and at Big Tree Creek on northern Vancouver Island were severely defoliated by Neodiprion sawfly in 1979 and were attacked by fir root bark beetles in 1980.

Surveys at Keta Lake showed that 46% of the 135 amabilis fir trees tallied in 25 prism plots had been attacked by the beetles. Attacks were recorded only in those trees which had sustained an average of 80% defoliation by sawfly in 1979 and 4% of the trees were dead. The tree mortality was attributed directly to defoliation by sawfly.

At Big Tree Creek, 56% of 52 amabilis fir trees in 7 prism plots were attacked by beetles. Intensity of 1979 defoliation was similar to that at Keta Lake but at Big Tree Creek, 15% of the trees died from the effects of defoliation.

At both locations, no other tree species was attacked and beetle broods were recorded only in those trees which had been defoliated more than 85%.

The survey indicated that the bark beetle problem was secondary to the sawfly and the threat of further beetle damage will lessen as the trees recover from the effects of the 1979 defoliation. However, many of these trees will remain attractive to bark beetles until they are removed or recover. (Pest Report; Status of Amabilis Firs and Associated Bark

Photograph available from
Pacific Forest Research Centre

1978

1979

1980

Mountain pine beetle infestation in lodgepole pine Haymore - Spruce
Creeks showing expansion 1978-1980.

Beetles in Sawfly Defoliated stands near Kelsey Bay and Big Tree Creek by R.L. Fiddick, R.O. Wood and L.H. McMullen. October 1980. Appendix 4)

A conifer sawfly Neodiprion sp.

The sawfly infestation, which occurred in 1979 at Keta and Haihte lakes and Big Tree Creek on Vancouver Island, collapsed in 1980. There were numerous colonies of early-instar larvae on western hemlock in June at Haihte Lake but they failed to develop during the subsequent cool, wet weather. In July, aerial surveys disclosed no new defoliation in the areas between Haihte and Schoen lakes.

Low numbers of sawfly larvae were common in beating collections along the west coast of Vancouver Island and mainland but no defoliation was observed.

Balsam woolly aphid, Adelges piceae

The known range of true fir stands infested by balsam woolly aphid in the Vancouver Forest Region remained unchanged in 1980 with no new areas of infestation reported.

Persistent crown infestations on mature trees at Raffuse Creek near Squamish have resulted in thinning of foliage, top-killing and some tree mortality on approximately 40 hectares^{2/} and some amabilis fir trees, weakened from aphid damage, have been attacked by fir root bark beetle, Pseudohylesinus granulatus.

Aphid damage was also recorded at Seymour and Furry creeks on the mainland and at Muir Creek on Vancouver Island.

Fir-fireweed rust, Pucciniastrum epilobii

Severe infections on amabilis fir occurred in the White, Adam and Eve River valleys and at Haihte Lake on Vancouver Island in 1980, induced by cool, damp weather.

The disease was common on trees from 3 to 20 m high, infecting all but the top third of the crowns and resulting in up to an estimated 60% defoliation. Evidence indicated that the disease was present prior to 1980.

^{2/} Deterioration and Tree Mortality of Amabilis Fir and Western Hemlock, Raffuse Creek. October 1980. E.V. Morris (Appendix 8).

SPRUCE PESTS

Spruce weevil, Pissodes strobi

One hundred trees at each of four Sitka spruce plantations on Vancouver Island were examined to record the percentage of immature trees infested by spruce weevil (Table 13). Between 1 and 20% were currently attacked; 36 to 52% were attacked prior to 1980 and 36 to 51% were healthy unattacked.

Damage also occurred in a seed orchard at Gold River but was reduced by the clipping and burning of infested leaders by forest industry personnel.

Table 13. Status of spruce weevil damage in spruce plantations, Vancouver Island, 1980.

| Location | No. trees examined | Percent of trees with: | | |
|---------------------------------|--------------------|------------------------|-------------|-----------------|
| | | no attacks | old attacks | current attacks |
| Holberg area | 100 | 49 | 50 | 1 |
| Port Hardy - Port Alice Highway | 100 | 51 | 36 | 13 |
| Salmon River | | | | |
| Plot 1 | 100 | 40 | 52 | 8 |
| Plot 2 | 100 | 36 | 44 | 20 |

WESTERN HEMLOCK PESTS

Western hemlock looper, Lambdina f. lugubrosa

Three-tree beating samples from western hemlock and western red cedar in a mature stand on the east side of Coquitlam Lake north of the 1970-1971 infestation averaged 31 larvae per collection but no visible defoliation was observed. Samples on the west side of the lake averaged three larvae and hemlock looper larval populations remained at low levels in other areas sampled in the Vancouver Forest Region. Overwintering egg samples taken in October showed low numbers of eggs present in the moss samples taken from the lower bole of six trees, indicating larval populations will remain about the same in 1981.

Western hemlock looper populations on Vancouver mainland fluctuated during the period 1970-1980 when infestations at Coquitlam

Lake occurred and where some tree mortality occurred in a mature hemlock-cedar stand on 250 hectares (Figure 3).

Western hemlock dwarf mistletoe, Arceuthobium tsugense

Dwarf mistletoe infections are established in many western hemlock stands in the Vancouver Forest Region. At Ralph River campsite on Buttle Lake, Vancouver Island, 100% of the understory western hemlock examined was infected and 50% of the understory at Storey Creek on Nimpkish Lake was infected.

Western blackheaded budworm, Acleris gloverana

Larval populations in western hemlock stands on Vancouver Island and mainland have been at low levels since 1975 and the trend continued in 1980, when the percentage of samples containing larvae was only 2%, the lowest level since 1977.

The number of larvae collected annually from western hemlock on Vancouver Island since 1970 are compared in Table 14.

Table 14. Blackheaded budworm larvae in western hemlock 3-tree beating collections on Vancouver Island 1970-1980.

| Year | Total number of collections | Percent of collections* containing larvae | Average number* larvae per positive collection |
|------|-----------------------------|---|--|
| 1970 | 172 | 44 | 24 |
| 1971 | 132 | 55 | 65 |
| 1972 | 103 | 81 | 60 |
| 1973 | 133 | 78 | 45 |
| 1974 | 89 | 27 | 9 |
| 1975 | 77 | 5 | 2 |
| 1976 | 100 | 3 | 1 |
| 1977 | 104 | 1 | 1 |
| 1978 | 81 | 7 | 19 |
| 1979 | 62 | 8 | 5 |
| 1980 | 95 | 2 | 2 |

* 1970-74 were outbreak years.

Pheromone-baited adult flight traps of various concentrations of pheromone were used at 15 locations to measure adult populations and results indicated very low populations in all areas (Table 15).

Table 15. Western blackheaded budworm adult males in pheromone-baited traps, Vancouver Forest Region 1980

| Location | Average number males per trap by pheromone concentration | | |
|-------------------------|---|------|------|
| | .001% | .01% | 0.1% |
| <u>Vancouver Island</u> | | | |
| Clapp Creek | - | - | 0 |
| Zebellos | 0 | 0 | 0 |
| Kelsey Bay | 0 | 0 | 3.2 |
| Port McNeill | 0.4 | 0.4 | 2.4 |
| Port Alice (Mill) | 0 | 0.8 | 1.4 |
| Port Alice (Town) | 1.0 | 4.8 | 9.6 |
| Gracie Lake | 1.4 | 7.8 | 18.4 |
| Loss Creek | 0 | 0.4 | 0.4 |
| Holberg | 0 | 0 | 0.2 |
| Marshall Creek | 0 | 5.6 | 8.2 |
| Dunsmuir Creek | 0.3 | 2.4 | 3.6 |
| <u>Mainland</u> | | | |
| Sumallo River | - | - | 0.6 |
| Lost Creek | - | - | 0 |
| Capilano River | - | - | 0 |
| Coquihalla River | - | - | 2.2 |

Green-striped forest looper, Melanolophia imitata

Populations remained low in the Vancouver Forest Region in 1980 with only slightly more than 10% of collections from western hemlock with an average of less than one larvae per collection. There was no evidence of damage in the Port Alice area on Vancouver Island where defoliation occurred between 1967 and 1971.

Population fluctuations between 1970 to 1980 are shown in Figure 5.

FIGURE 3

POPULATION FLUCTUATIONS OF WESTERN HEMLOCK LOOPER
ON WESTERN HEMLOCK AND WESTERN RED CEDAR

VANCOUVER MAINLAND 1970-1980

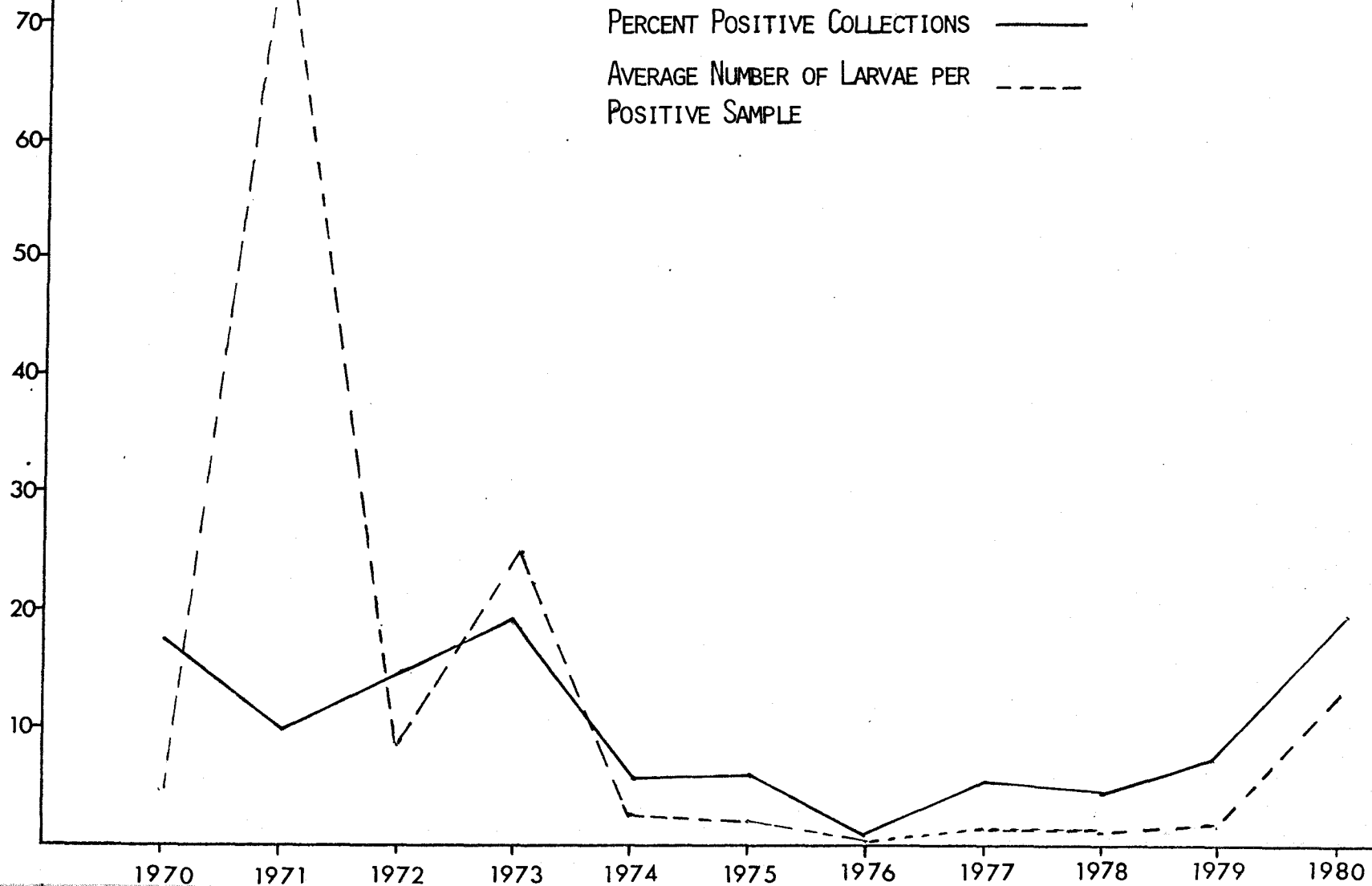


FIGURE 4
POPULATION FLUCTUATIONS OF WESTERN BLACKHEADED
BUDWORM ON WESTERN HEMLOCK
VANCOUVER ISLAND 1970-1980

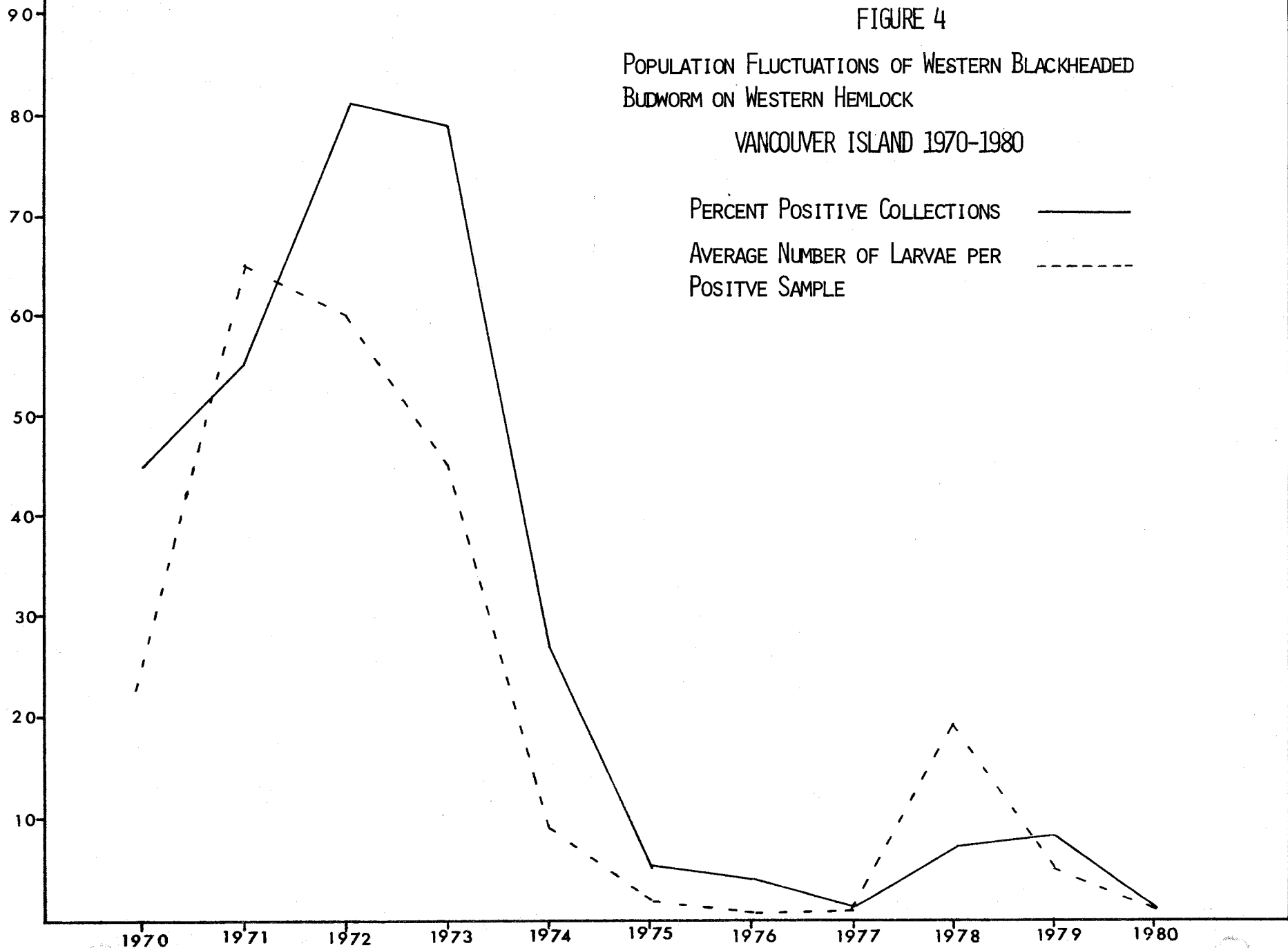
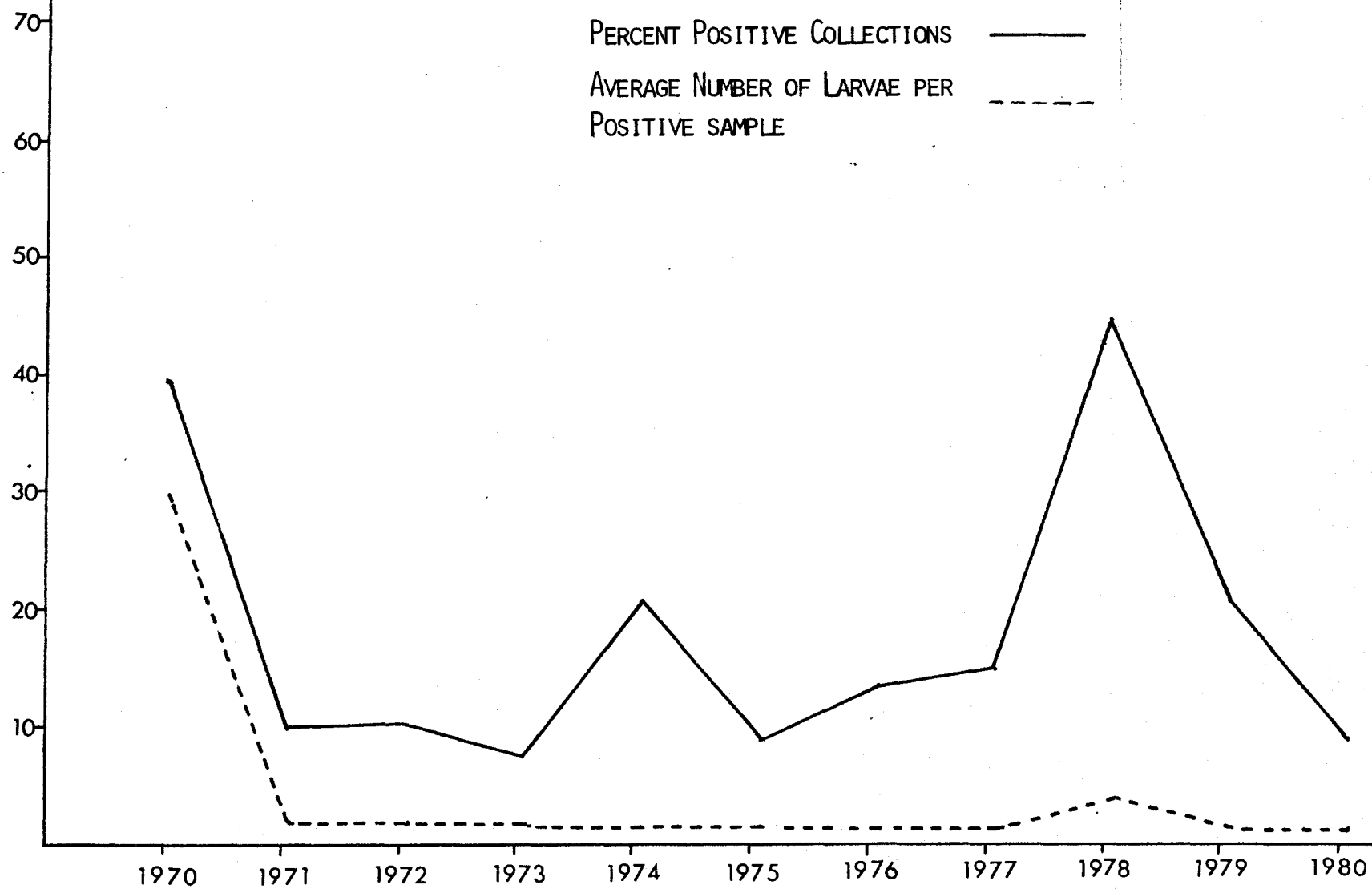


FIGURE 5

POPULATION FLUCTUATIONS OF GREEN-STRIPED FOREST
LOOPER ON WESTERN HEMLOCK

VANCOUVER FOREST REGION
1970-1980



DECIDUOUS TREE PESTS

Winter moth, Operophtera brumata

Defoliation by winter moths was again widespread on southern Vancouver Island in 1980, over the same general area as in 1979: throughout Greater Victoria, Esquimalt and the Saanich Peninsula to Sidney and Brentwood.

Damage was most evident on Garry oak, broadleaf maple, willow and miscellaneous fruit trees. Feeding also occurred on Sitka spruce in a seed orchard and on heather and laurel at private residences.

The parasite release program was continued in 1980 with a total of 11,084 male and female Cyzenis albican flies and 5,017 Agrypon flaveolatum wasps released in April and May at 27 sites from Victoria to Sidney (Map 4). The project was coordinated by the winter moth committee and funded by the British Columbia Ministry of Agriculture.

In May, 5,000 winter moth larvae were collected from the 1979 release sites to determine if parasites had become established in the moth population but results of that project will not be available until 1981. (Winter Moth Committee Meeting. October 29, 1980. Appendix 5).


Gypsy moth, Porthetria dispar

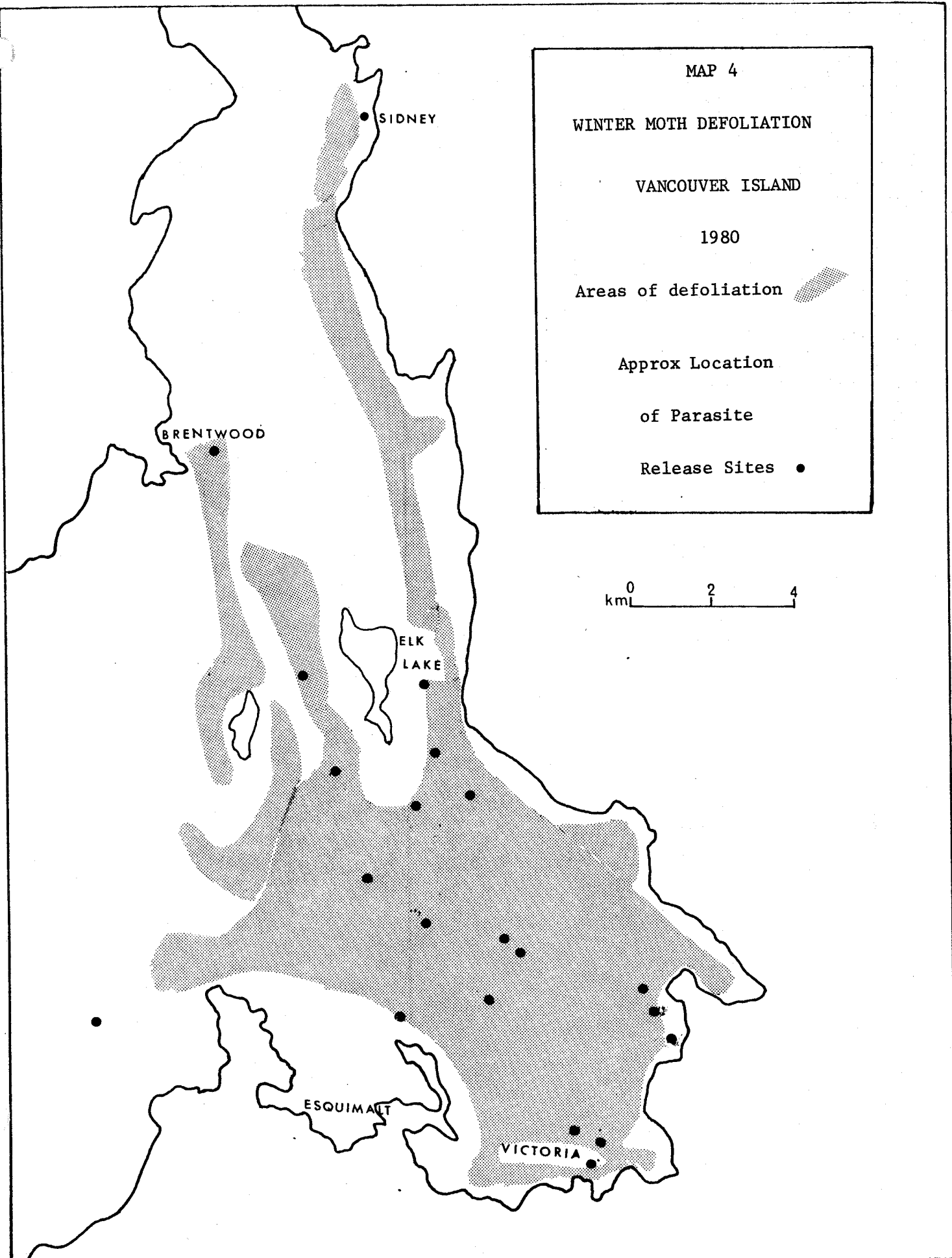
Gypsy moth pheromone traps were set out singly at 20 locations in the Fraser Valley, Lower Mainland and along the east side of Vancouver Island from Victoria to Campbell River and all traps had negative results.

The Plant Quarantine Section of Agriculture Canada carried out a pheromone-trap survey throughout the Lower Mainland, Fraser Valley, Sechelt Peninsula and southern Vancouver Island and all traps showed negative results except at Tsawwassen where one male adult was caught. Subsequent egg surveys in October in the Tsawwassen area failed to find any gypsy moth eggs. (Minutes of the Gypsy Moth Subcommittee Meeting October 28, 1980. Appendix 6)

Birch casebearer, Coleophora sp.

Birch casebearer again caused moderate damage to white birch foliage along the Deas Island Freeway in the Delta and Richmond municipalities for the third consecutive year. Sporadic damage was also evident on birch trees throughout the Lower Mainland and Fraser Valley.

MAP 4
WINTER MOTH DEFOLIATION
VANCOUVER ISLAND
1980
Areas of defoliation 
Approx Location
of Parasite
Release Sites •



Discoloration of broadleaf maple foliage

Discolored foliage of broadleaf maple trees was observed at many locations throughout the range of the host tree on Vancouver Island and mainland. Damage was diagnosed as a nutrient deficiency but there was some unconfirmed evidence that it may be caused by a virus disease. The condition has been present since 1974 but no serious damage has yet been recorded and affected trees are expected to recover.

Willow leaf blight, Venturia saliciperda

This blight occurred on willow leaves throughout most of the host range surveyed on Vancouver Island in 1980. The most severe infection was recorded west of Cowichan Lake along the Nitinat River where up to 100% of the leaves were infected on 80% of the trees. Lighter intensities of infection was noted from Gold River to Port Hardy and at widely separated locations on the southern part of the Island.

An Oak leaf skeletonizer, Bucculatrix sp.

Oak skeletonizer larvae severely defoliated exotic Oak trees at a number of localities in the City of Vancouver. The heaviest damage occurred in the Alma district, where damage was evident on Oak trees along boulevards and residential properties. The City of Vancouver sprayed with an insecticidal soap in some of the severe infestation areas but it proved ineffective in controlling the infestations. (Oak leaf skeletonizer data, R. Duncan, Nov. 1980, Appendix 7.)

Fall webworm, Hyphantria cunea

High concentrations of webworm tents were recorded on a variety of deciduous hosts near Ladysmith, and at a number of locations along the Island highway from Duncan to Menzies Bay, along the Cowichan Lake Road and at Kye Bay near Comox. On the mainland section of the Region tents were common on roadside deciduous trees and shrubs in the lower mainland and Fraser Valley area, particularly in the Agassiz - Harrison Lake and Haig Highway areas. Trees and shrubs appear to recover from this defoliation when infestations subside.