

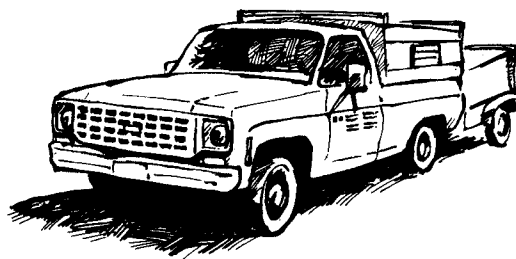


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1980 Forest Insect and Disease Conditions

Nelson Forest Region
R.D. Erickson C.S. Wood

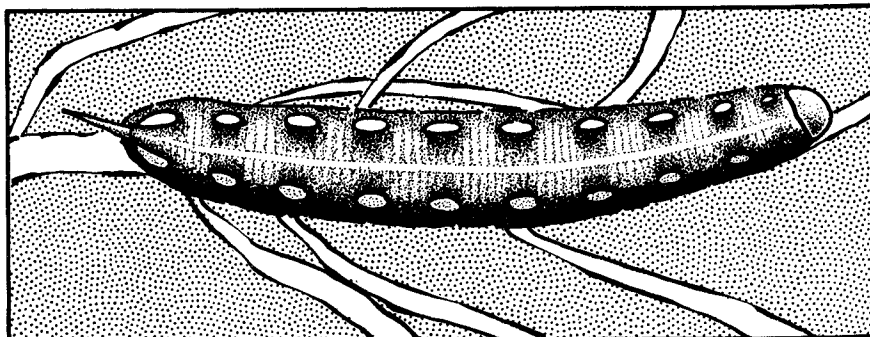
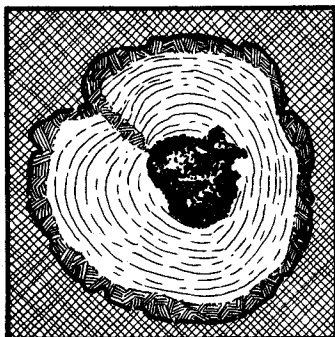


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SUMMARY

This report outlines the status of forest pests in the Nelson Forest Region in 1980, and attempts to forecast pest population trends.

Mountain pine beetle, the major pest of lodgepole, western white and ponderosa pine, killed 9 million trees over 33 410 ha in 3,600 separate infestation areas compared to 4.5 million trees over 23 845 ha in 1979. Pine engraver beetle and red turpentine beetle attacks were common in intensively managed stands in the Kimberley-Skookumchuck area. Pine needle casts persisted in many areas in the region. Root and butt rots, particularly Black stain root disease, caused significant volume loss in pine stands throughout the Forest Region.

Larch casebearer continued to defoliate western larch stands throughout much of the host range. Larch needle diseases, often in conjunction with larch casebearer defoliation, severely discolored stands in many areas of the region. Larch sawfly infestations collapsed in the Fernie-Sparwood area where defoliation had persisted since 1977.

Spruce beetle outbreaks occurred at three areas near Revelstoke and Golden, the first time, in several years. The two-year-cycle spruce budworm defoliated Engelmann spruce-alpine fir stands in 13 valleys in the region, three locations recorded for the first time in 1980.

The western spruce budworm infestation at Johnstone Creek near Rock Creek continued, and defoliated Douglas-fir stands for the third consecutive year. Douglas-fir beetle killed single mature trees at scattered locations, and fir engraver beetle killed Douglas-fir Christmas trees near Radium Hot Springs. Needle midges and aphids severely discolored and deformed new needles in Douglas-fir stands throughout the region. A bud blight or Douglas-fir continued to cause bud necrosis and poor tree form in two areas in the West Kootenay.

Western balsam bark beetle killed an increased number of alpine fir trees throughout much of the region.

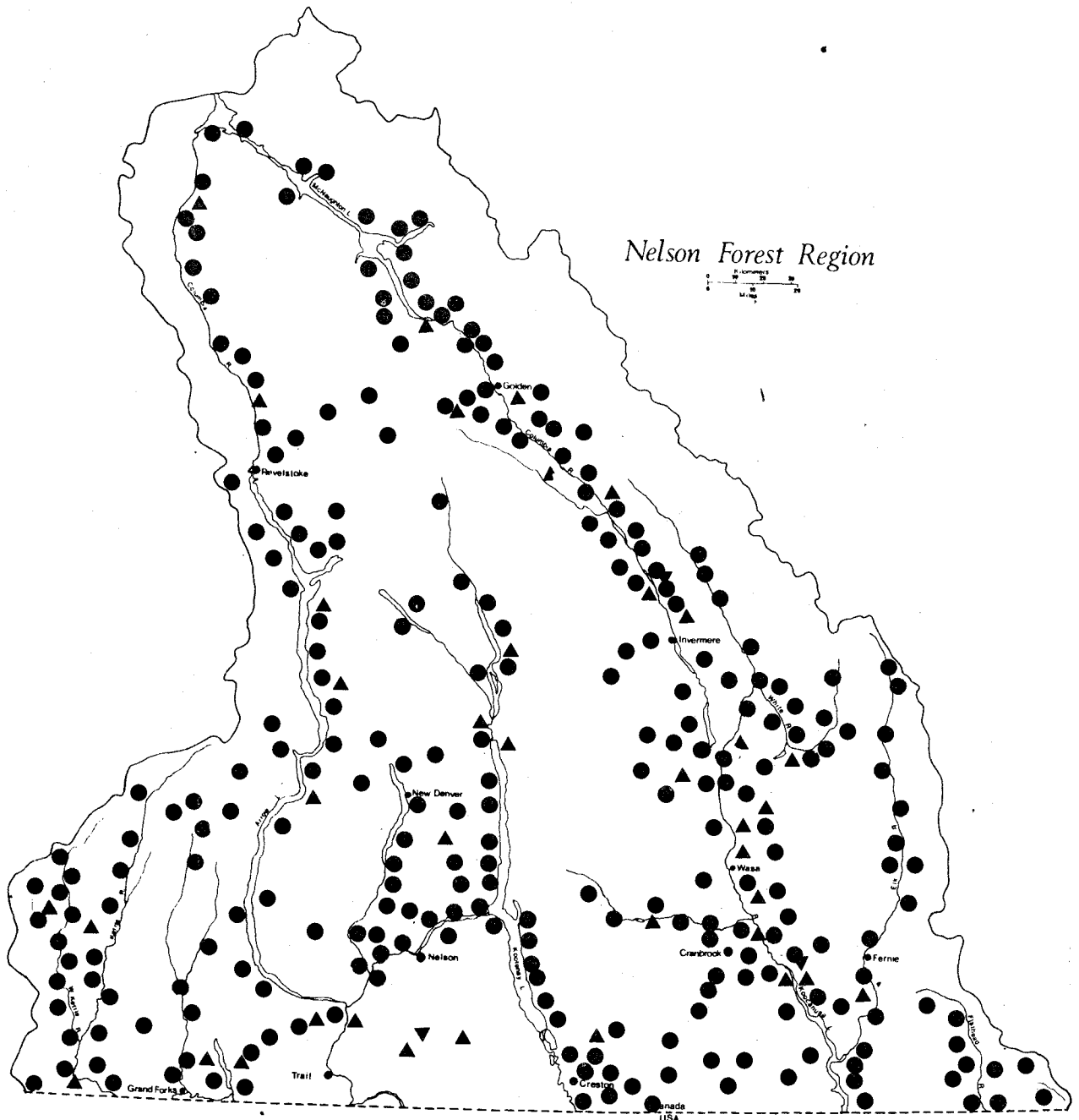
Birch leaf skeletonizer discolored large areas of white birch and satin moth defoliated balsam poplar trees near Rossland. Saskatoon and apple trees were discolored for the fourth year by the apple and thorn skeletonizer in the Slocan and Creston valleys, and for the first time at Nakusp.

The Forest Insect and Disease Survey sampling program extended from May 15 to November 7 and included special surveys to appraise damage and population trends of mountain pine beetle, larch casebearer and larch sawfly.

A total of 420 insect and disease collections (Map 1) were submitted for identification to the Pacific Forest Research Centre by pest survey technicians and 50 by Provincial agencies, Industry and private sources.

Aerial surveys which mapped and photographed pest outbreak areas totalled 18 hrs fixed wing aircraft and 11 by helicopter; 16 hrs were provided by the B.C. Ministry of Forests; flight lines are shown on Map 2. Oblique 70 mm aerial photographs were taken of mountain pine beetle infestation areas from Arlington Lakes to Hydraulic Lake in the W Kettle River Valley, in Elk Creek and White River and in the lower Flathead River Valley. Aerial oblique 35 mm photographs were taken at Elk Creek and adjacent White River valley.

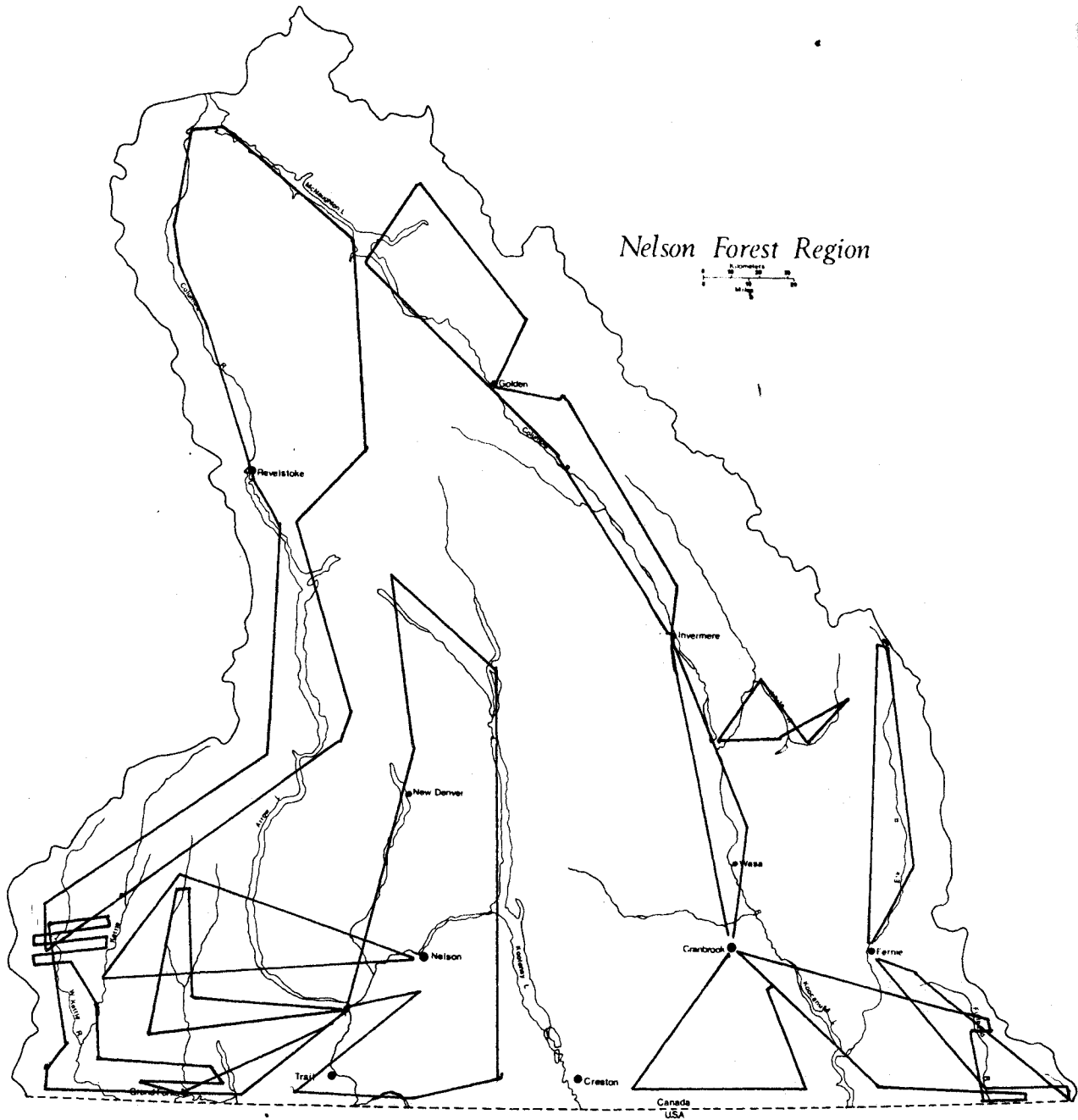
A total of 14 sites were visited with BCMF & industry to appraise pest problem, and 30 pest problems were answered by telephone. Forest pest conditions in B.C. and the Nelson Forest Region were outlined to second year students at Selkirk Regional College and at two meetings of the East Kootenay Insect and Disease Control Committee.



Map 1

Location of points where one
or more collections were
made and field records taken
in 1980

Insect : ●
Disease : ▲



Map 2

Flight lines, 1980

PINE PESTS

Mountain pine beetle, Dendroctonus ponderosae

Mountain pine beetle killed an estimated 10 million pine trees over 33 400 ha in 3,600 infestation areas in the Nelson Forest Region in 1980, (Table 1), compared to 4.5 million trees over 24 000 ha in 1979.

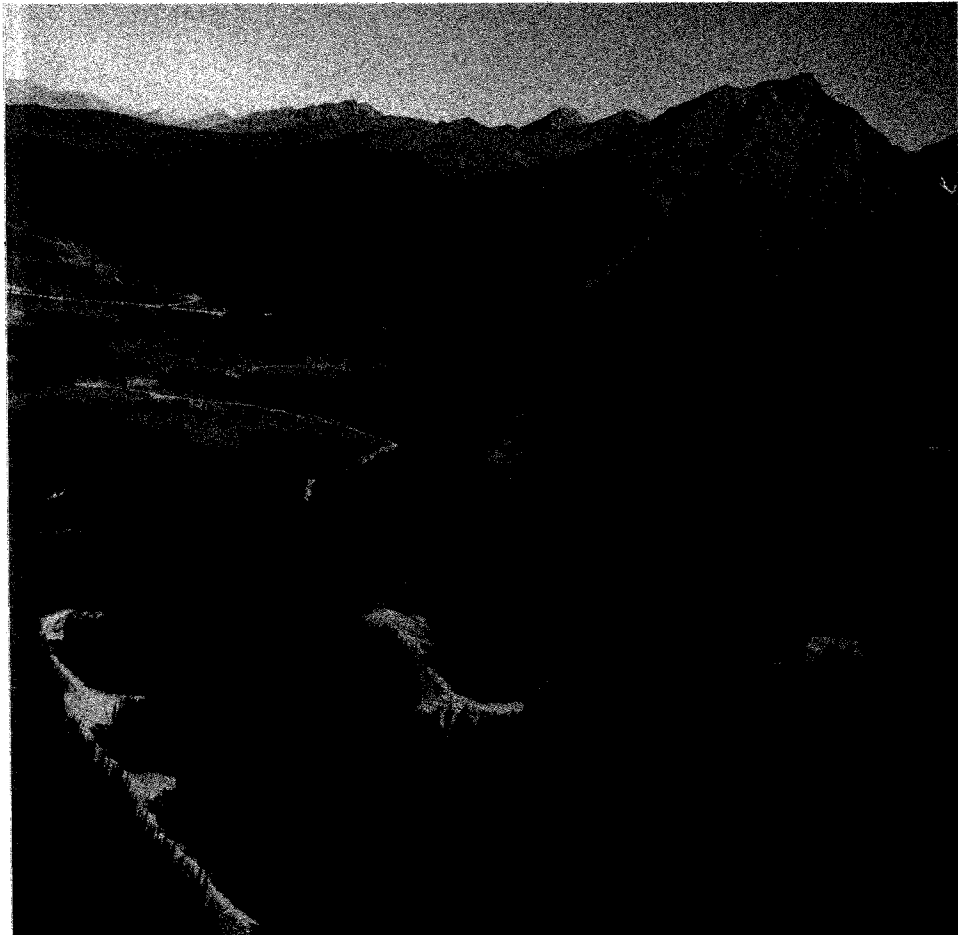
An estimated 10 million trees were killed over 30 000 ha in 3,500 infestation areas in the East Kootenay compared with 4.5 million in 1979 (Map 3). In the West Kootenay infestation covered 3 800 ha with 22,400 trees in 95 infestation areas in 1980 compared with 14,800 trees over 1 840 ha in 1979, (Map 4).

Infestations in the East Kootenay expanded and intensified in most areas including the Flathead River Valley where they covered 14 750 ha, compared with 9 150 in 1979, and in 1,190 separate infestation areas from Frozen Lake east into the Akamina-Kishinena creeks valley to Waterton National Park boundary north to the Flathead Pass. Numerous pockets of 5 to 10, 1979 killed trees increased in all the drainages adjacent to the Flathead including Morrissey, Lodgepole, Wigwam, Bighorn, Michel and Corbin creeks and in the Elk River Valley.

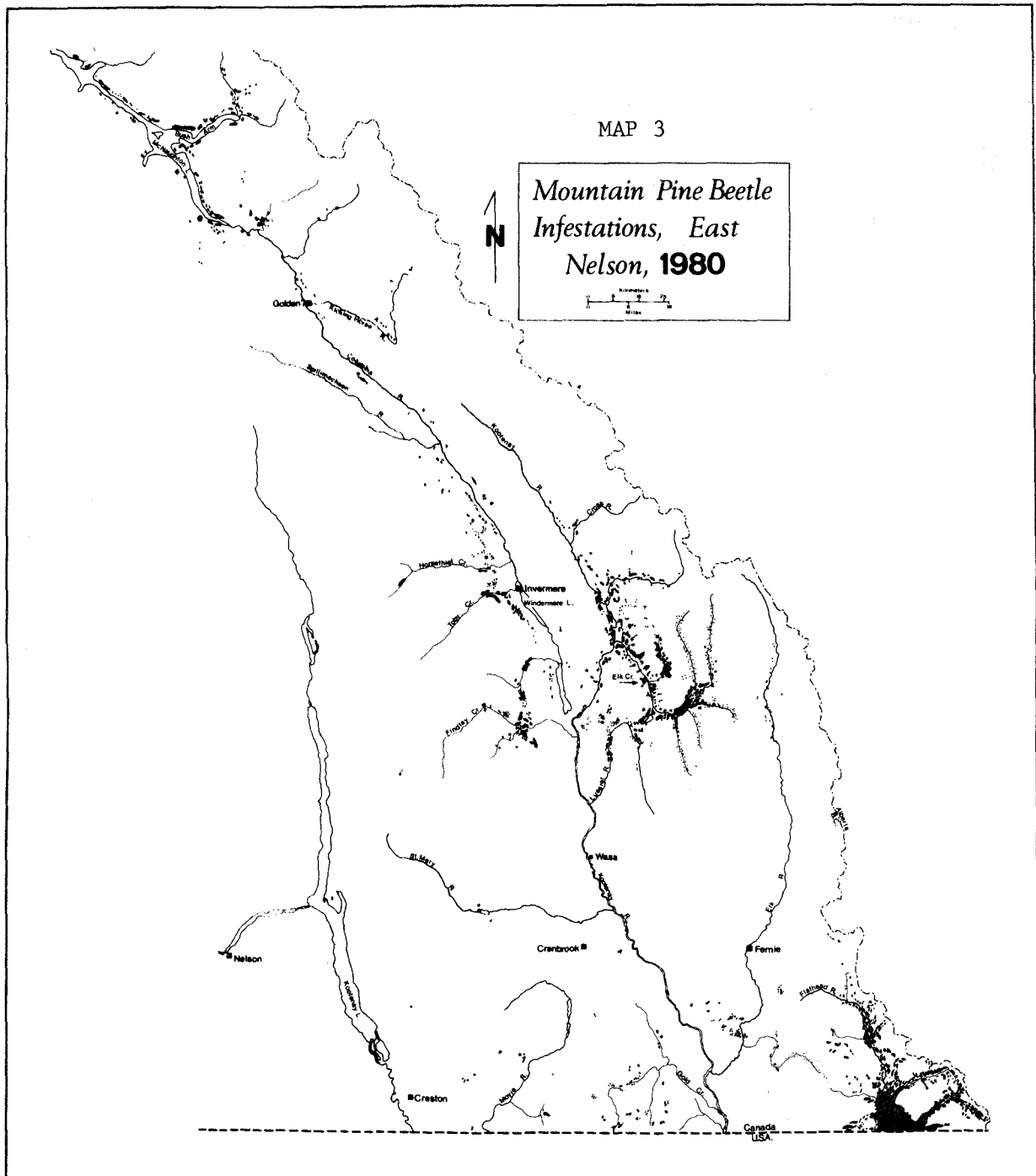
Near Elko and west of Koocanusa Lake localised areas of 1979 beetle-killed lodgepole pine, in 110 areas over 560 ha, expanded near Sheep Mountain, north of Elko in the Ward-Gilnockie-Caven-Plumbob creek areas and in Hawkins Creek east of Yahk. Beetle-killed trees were recorded for the first time in the lower Yahk River Valley, in Phillips Creek east of Roosville and west of Koocanusa Lake in Bloom Creek, south of where large outbreaks have occurred in the Kootenay National Forest in Montana since 1973.

In the White-Kootenay river drainages, where large areas of pine have been destroyed since 1971, infestations continued to expand covering 10 600 ha in 1 500 infestation areas compared to 8 950 ha in 1979. The major areas of expansion were in the East, Mid and North Forks of the White River and in the adjacent upper Bull River Valley, in the Lussier River - Coyote Creek- Whiteswan Lake area; in the main White River Valley and in Elk Creek; in the Kootenay River Valley and adjacent Palliser, Albert and Cross river valleys north into Kootenay National Park where the number of beetle-killed pine doubled to 50 from 25 in 1979.

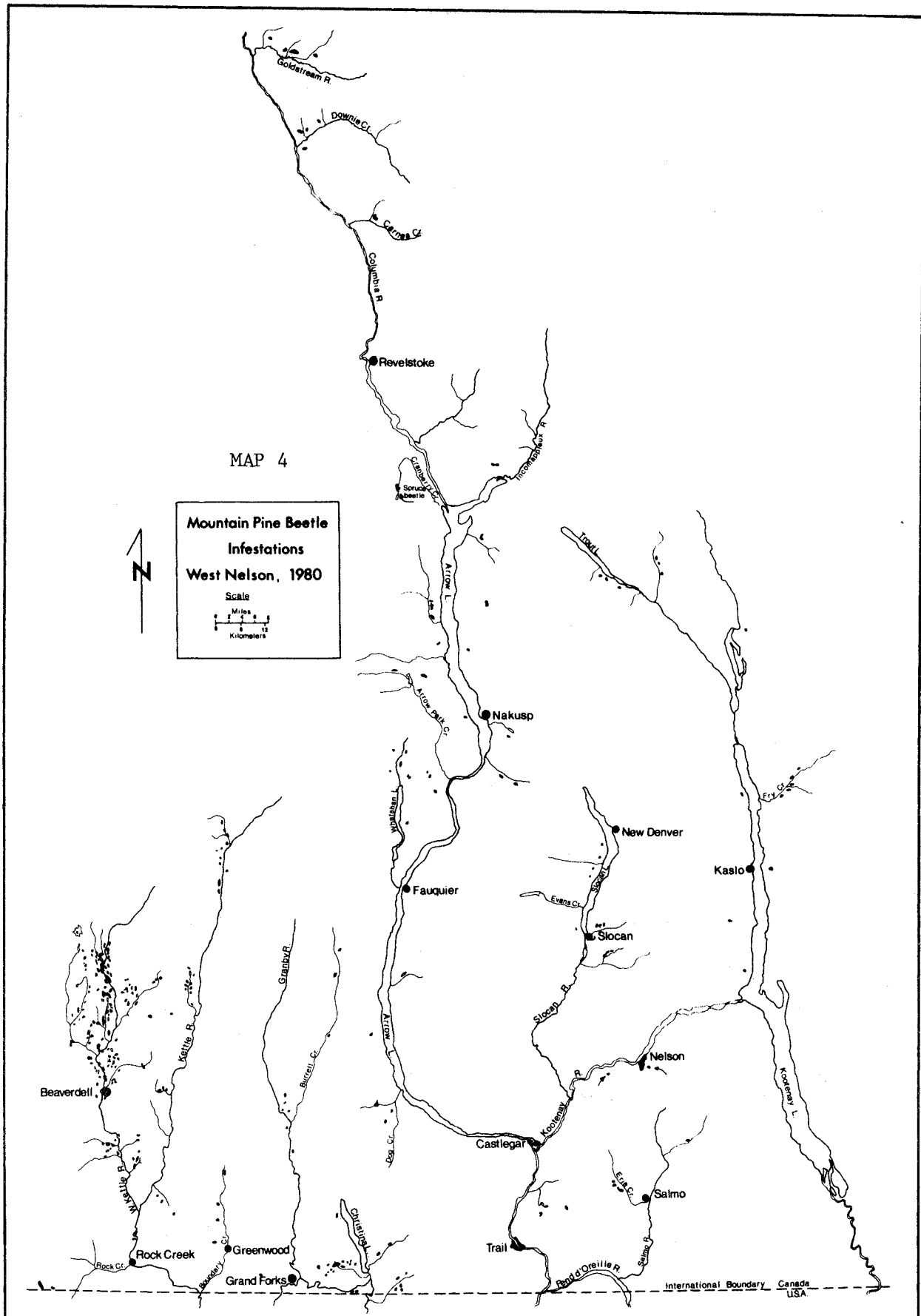
In the Columbia River Valley infestation areas expanded and the area of beetle-killed trees increased to 2 430 ha, in 370 infestation areas in 1980 from 1 300 ha in 1979. The major outbreak areas persisted from Findlay-Dutch creeks west of Columbia Lake north to Toby Creek; between Toby Creek and Spillimacheen including Horsethief Creek and the Steam boat Mountain area and east of the Columbia River Valley between Edgewater and Brisco.



Mountain pine beetle infestations
Flathead River Valley
Nelson Forest Region, 1980



LARGER SCALE MAPS AVAILABLE
AT: FOREST INSECT & DISEASE
SURVEY, 506 WEST BURNSIDE
VICTORIA



LARGER SCALE MAPS AVAILABLE
AT: FOREST INSECT & DISEASE
SURVEY, 506 WEST BURNSIDE
VICTORIA

Small pockets of beetle-killed lodgepole pine persist in the Columbia River Valley from Parson north to Golden; east of the river north of Golden to Moberley and in the Blaeberry River Valley. The numbers of red trees between the west gate of Yoho National Park and Wapta Falls doubled from 25 to 50 in 1980 and persisted near Field and in the Otterhead River Valley west of Field, however no red trees were observed in the adjacent Beaverfoot River Valley.

Infestations continued in lodgepole pine stands near Donald; along Columbia Reach to Beavermouth, on Blackwater Ridge; in the Marl-Waitabit creeks area and expanded in the Bush River valley.

In the West Kootenay the major infestations continued in the Kettle River Valley from Beaveraldell north to Goathide Creek including Arlington Lakes, Trapping and Weird creeks. There was a 30% increase in the number of beetle-killed trees in Lower Kettle River Valley from Beaveraldell south to Rock Creek and west to Anarchist Summit and in the Grand Forks area. Beetle-killed trees, in seventeen areas of 5 to 40 trees, were recorded for the first time in Dale Creek near Carmi. Detailed locations are listed in Appendix 1.

Infestations in white pine stands continued in the McNaughton Lake area north of Golden; along Succour Creek; on the north side of Bush Arm between Game Creek to east of Prattle Creek; to north of the Kinbasket River along the east side of the lake to Mica; and in Glacier and Mount Revelstoke National parks.

The number of beetle-killed white pine increased two to four fold in the Columbia River valley north of Revelstoke between Downie and Carnes creeks. A four to ten fold increase occurred in mixed white and lodgepole pine stands in Springer and Chapleau creeks near Slocan and four localised infestations were recorded for the first time at Dog and Faith creeks near Renata on Lower Arrow Lake.

An estimated 50 pockets of two to ten white bark pine were killed by the beetle in higher elevation stands west and north of the Flathead River Valley.

Table 1. Mountain pine beetle infestation areas and
numbers of trees killed.
Nelson Forest Region, 1980

Location	Number of infestation areas	Number of beetle-killed trees	Area (ha)
Flathead River Valley incl. Akamina-Kishinena creeks	1,190	7,000,000	14 750
White-Kootenay river Valleys incl. Elk Creek, Palliser and Cross River valleys	1,500	2,550,000	10 600
Columbia River Valley incl. Toby, Horsethief Cr Steamboat Mtn.	370	149,000	2 450
Blackwater-Bush Arm- Bush River	275	300,000	1 000
Lodgepole-Morrissey Corbin creeks-Elk River	60	500	260
Elko-Yahk-Cranbrook	110	500	560
Kootenay-Arrow lakes	35	10,000	1 320
Grand Forks-Upper Kettle River	30	800	600
W Kettle River-Rock Creek	35	12,700	1 860
TOTAL	3,600	10,023,500	33 400

Cruise data in pine stands at three locations in the West Kootenay (Table 2) indicate an increase in tree mortality and expansion of infestation areas in 1981. Although cruise strip data from infestation areas in the East Kootenay was not available in 1980, random ground examination, in attack-free pine stands adjacent to infestation area to determine the status of 1980 beetle attack in green trees, indicated that the outbreaks would continue in 1981, precluding any adverse climatic impact.

Table 2. Condition of pine trees in mountain pine beetle infestation areas, Nelson Forest Region, 1980

Location		Tree Species	1980 attack	Partial 1980 attack	1979 attack	Attack prior to 1979	Healthy
Carmi	No. stems/ha	Lodgepole pine	50	33	40	73	360
	% stems/ha		9	6	7	13	65
	Avg. d.b.h. (cm)		26	18	23	24	21
Arlington Lakes	No. stems/ha	"	85	34	111	118	356 ^{1/}
	% stems/ha		12	5	16	17	50
	Avg. d.b.h. (cm)		21	20	23	20	18
Moody Creek	No. stems/ha	Mixed white and lodgepole pine	64	73	17	15	62
	% stems/ha		28	31	7	7	27
	Avg. d.b.h. (cm)		29	30	33	37	28

^{1/} 50% pine; 50% other conifer species.

Sequential, oblique aerial 70 mm color photographs of infestation areas in the lower Flathead River Valley, Elk Creek-White River area and at Arlington Lakes were taken for the fourth consecutive year. Oblique 35 mm photographs were taken of infestation areas in the Elk Creek - White River areas.

Black stain root disease, Verticicladiella wagnerii

Since the disease was first found in British Columbia at Rock Creek in 1976 it has been collected from other areas in the Nelson Forest Region including the Kettle River Valley, near Nancy Greene Lake and in the Goat River drainage, east of Creston (Map 5).

Data from three cruise strips near Nancy Green Lake to assess the incidence of the disease indicated that between 5 and 8% stems/ha were infected by V. wagnerii; <1% to 23% infected by Armillaria mellea and <1% to 16% infected by a combination of both root rots (Table 3). Infection foci ranged in size up to 3 ha.

MAP 5

NELSON FOREST REGION

0 30 60 90
MILES

Black Stain Root Disease

Collection locations,
1976-1980: ●

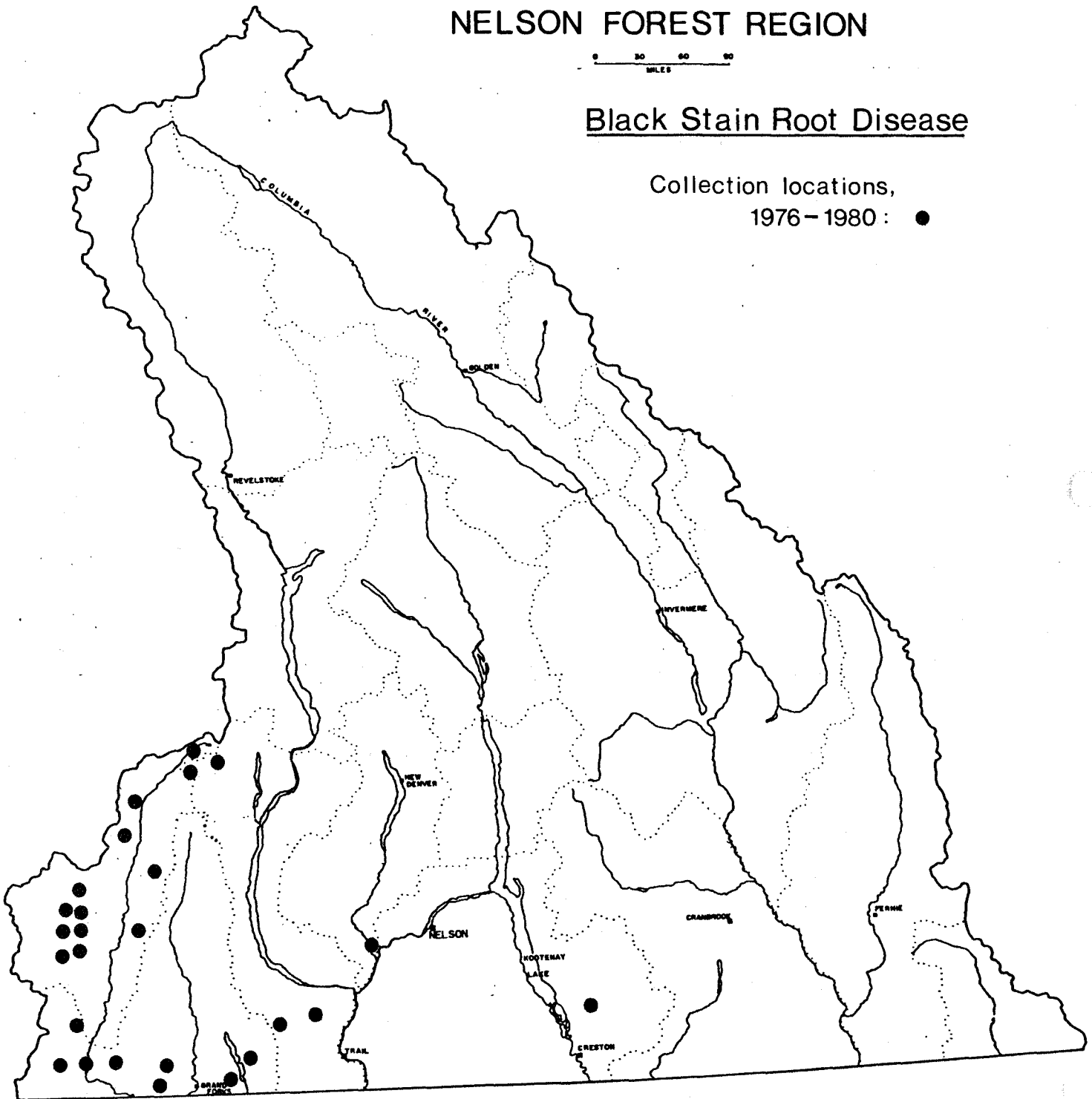


Table 3. Percent Infection by Black Stain and Armillaria Root Rots
near Nancy Greene Lake
Nelson Forest Region, 1980

Strip No.	Stems/ha ^{1/}	Black Stain only	Armillaria only	Black Stain and Armillaria	Dead other causes	Healthy
1	Number	66	26	13	38	722
	Percent	8	3	2	4	83
2	Number	17	76	52	7	171
	Percent	5	23	16	2	54
3	Number	66	4	2	299	675
	Percent	6	<1	<1	29	64

^{1/} Based on 5 BAF metric, at 50 m intervals

Red ring rot, Fomes pini

The heart rot is common in overmature western white pine in the interior wet belt stands in the south-western part of the East Kootenay. Five infected trees, with external sporophores, were attacked by mountain pine beetle in the upper Kid Creek drainage.

White pine blister rust, Cronartium ribicola

The rust, which is epidemic throughout western white pine stands in the Region, infected up to 100% of the immature whitebark pine over 2 ha in Mark Creek in the Boundary-Summit creeks area. Recent studies^{1/} indicate that pruning branch infection up to 120 cm or more from the ground can assist the growth and development of immature white pine trees.

Red root and butt rot, Polyporus tomentosus

This rot has infected up to 30% of the mature lodgepole pine in pockets up to 2 ha in parts of Whiteswan Provincial Park in the White

^{1/} The possibility of pruning white pine to control Blister Rust in British Columbia, Dr. R.S. Hunt, CFS, PFRC, unpublished, 1980.

River Valley and resulted in windthrow of the infected trees. A secondary, brown cubical rot, Coniophora puteana was found in the windthrown trees.

Atropellis canker, Atropellis piniphila

This stem disease severely infected lodgepole pine stands near Nancy Greene Lake where stem cankers, 30 to 245 cms long, occurred on up to 5% of the immature pine in a 200 ha area, and over 150 ha at Fiva Creek.

Lodgepole needle cast, Lophodermella concolor

Infection of older needles in lodgepole pine, resulting in premature needle loss was common in the Nelson Forest Region. The disease infected 30% of the needles on 90% of the trees along Blueberry Creek from Nancy Greene Lake to Judkin Creek; along the Granby River from Miller Creek to Rendell Creek; and along the Kettle River from Crouse Creek to State Creek to Beaverdell. A hyperparasite, Hendersonia pinicola was attributed to having reduced the intensity of L. concolor infection in pine stands on the Monashee Highway; and in Boundary, Beaverdell and Blueberry creeks.

In Gold Creek, south of Cranbrook, and in the Fernie - Sparwood areas up to 85% of the foliage was infected on trees of all age classes, primarily immature densely stocked stands, where similar infection intensities were common in 1979.

Pine needle blight, Leptomelanconium cinereum

Infection of 1978 and 1979 needles persisted in 1980 in ponderosa pine stands in the Elko-Grasmere-Roosville area and between Bull River and Norbury Lake Provincial Park where 100% of the foliage was infected in 1977 and 1978. Areas of infected stands varied from small groups of trees in less than 1/10 of a hectare to 10 ha, with up to 75% of the 1978 needles infected and up to 20% of the 1979 needles. At Baymen Lake, west of Elko, only 1979 and 1980 needles remain on some trees.

European pine shoot moth, Rhyacionia buoliana

Mugho pine from coastal nurseries that were infested by this insect and transplanted in 1978 at the Insurance Corporation of British Columbia Claim Centre in Trail and at the Hugh Keenlyside Dam viewpoint in 1968, were uninfested in 1980. The pruning of the infested shoots and insecticide application have controlled the pest at both location; no infested shoots were found in adjacent native lodgepole pine stands.

Mites, Trisetacus spp.

Damage to lodgepole pine shoots caused by mites, commonly referred to as "Kinky disease" was collected for the first time on mature lodgepole pine in the Nelson Forest Region at Powder Creek north of Riondel on the east side of Kootenay Lake. Damage by T. campnodus was found on less than 10 shoots on 4 immature trees. T. campanodus damage was previously limited to interior provenance lodgepole pine in Coastal plantations. T. ehmanni was collected from a "Huntingdon" (U.S.A.) provenance immature lodgepole pine tree in a B.C.M.F. Provenance Experimental Plot, #65706, in Wuho Creek in the Moyie River Valley.

Pine twig beetle, Pityophthorus sp.

Up to 30% of branch tips was killed on scattered mature western white pine between Shelter Bay and Cranberry Creek; this is the first year damage has been found in the area.

Western pine shoot borer, Eucosma spp.

Five pheromone baited sticky traps located at Johnstone Creek west of Rock Creek to monitor moth populations trapped 81 moths. There was no damage to any of the 100 immature ponderosa pine trees examined in adjacent stands.

Sequoia pitch moth, Vespamina sequoiae

Pitch globules caused by the moth larva were common around the butts of sixty-year old lodgepole pine trees over an estimated 20 ha in the Mathers-Lost Dog creeks area east of Kimberley. Damage was commonly associated with an unidentified root rot, possibly Polyporus tomentosus, which resulted in windthrow of old infected stems in approximately 10 centres with an estimated 5 trees per centre.

A needle feeding weevil, Scythropus californicus

Up to 100% of the 1979 needles of 50% of the ponderosa pine, in mixed stands along major access routes between Elko and Canal Flats, were discolored in early 1980 by the weevils feeding activity the previous year. Similar discoloration was common in the host range in 1978.

Pine sawfly, Neodiprion sp.

A single localised endemic colony lightly defoliated less than 5% of the foliage of a single immature lodgepole pine near Jim Smith Lake

south west of Cranbrook. Single localised colonies have been observed annually since 1977 in immature lodgepole pine stands between Yahk and Cranbrook but only light defoliation has occurred.

Pine needle scale, Phenacaspis pinifoliae

A localised, endemic population infested less than 20% of the needles of ten immature lodgepole pine trees near Moyie Lake Provincial Park causing highly visible discoloration but little significant damage.

Animal damage

Damage to lodgepole pine trees continued in many areas in the Nelson Forest Region, where there has been a long recorded history. Mature trees adjacent to a recently logged area between Fernie and Sparwood were severely damaged by porcupine feeding which predisposed the trees to attack by pine engraver beetles Ips pini. Near Nancy Greene Lake, an average of 7% of the stems of mature trees were butt scarred and girdled by porcupines in a 200 ha.

Branch "flagging" caused by squirrels chewing the bark near or adjacent to branches infected with globose gall rust, Endocronartium harknessii or lodgepole pine dwarf mistletoe, Arceuthobium americanum was common throughout the region, including the Monashee Highway from Galloping Creek to the Kettle River; from Beaverdell to Boomerang Creek along the West Kettle River, and from Eholt to Boundary Creek and along Boundary Creek for 23 km.

WESTERN LARCH PESTS

Larch casebearer, Coleophora laricella

Defoliation continued for the fifteenth consecutive year throughout much of the host range in the Nelson Forest Region. Severe defoliation occurred from Creston to Arrow Creek, south to Rykerts and in the Wynndel area; from the International border to Summit Creek on the west side of the Creston Valley and west to Blazed Creek; southwest and southeast of Cranbrook and in the Jaffray-Elko area; from Nelway north to the Salmo-Creston Highway; in 5-20 ha pockets from Grand Forks north to Eholt, from Rock Creek to Bridesville; up Rock Creek to McKinney Creek; along Highway 3 near to the summit of Anarchist Mountain; north east of Christina Lake in several 2 ha areas and along the Granby River from Rendell Creek to Howe Creek.

Moderate defoliation was common in 2-10 ha patches west of Kaslo along the Kaslo River; from Edgewood to Valley Creek; from Patterson to Rossland, Fruitvale to Salmo and from Cranbrook to Kimberley.

Light defoliation was visible from Castlegar to Nelson; Arrow Creek to Creston, in the Christina Lake area; in the Salmo River Valley south of Salmo; from Thrums to Slocan Lake; along the Granby River from Grand Forks to Rendell Creek; on the south side of the Pend d'Orielle River; in the Wigwam and Lodgepole creeks and at Premier Lake near Skookumchuck.

Defoliation intensity was recorded at five permanent sample plots from Fruitvale to East Arrow Creek near Creston (Table 4).

Table 4. Western larch defoliation by larch casebearer at five permanent plots.
Nelson Forest Region, 1980

Location	Elevation (m)	Defoliation ^{1/}
Fruitvale (Thrums)	690	light
Salmo	660	light
Rykerts	660	severe
East Arrow Creek	720	none
Yahk	840	none

^{1/} Light : 0-25% discolored
Moderate: 26-50% discolored
Heavy : 51-75% discolored
Severe : 76-100% discolored

The defoliation was often associated with larch needle cast, Hypodermella laricis and a needle rust, Melampsora medusae infections, which made precise separations difficult.

Larch casebearer parasites are monitored annually and in late May pupae were collected at eleven locations between Okanagan Falls and Yahk to determine parasitism (Table 5).

The parasite, Chrysocharis laricinellae, introduced into the eastern U.S. from Europe in 1930 and into western U.S. first in 1972, has spread into much of the casebearer population in B.C. Parasitism of the casebearer population increased in all of the 9 permanent sample areas in 1980, particularly at Salmo, from 4.5% to 57%, and increases from <1 to 45% in other areas (Table 5).

The parasite was credited with the reduction of casebearer population and defoliation intensity in western larch stands between Nelson and Castlegar, in the Fruitvale area; at Arrow Creek; between Yahk and Kitchener and from Salmo to Ross Spur.

An estimated 450 (male and female) adult Chrysocharis laricinellae were free released in late June at Shuttleworth Creek in the Kamloops Forest Region.

Table 5. Number of adult parasites reared from larch casebearer pupae.
Nelson and Kamloops Forest Regions, 1980

Location	Date Collected	No. of pupae reared	No. of pupae adults (percent)	
			<u>Agathis pumila</u>	<u>Chrysocharis laricinellae</u>
<u>Nelson F.R.</u>				
Fruitvale	May 25	200	0	75 (37)
	June 2	200	1 (0.5)	54 (27)
Salmo	May 25	200	0	115 (57)
Rykerts	May 25	200	1 (0.5)	1 (0.5)
East Arrow Creek	May 24	200	2 (1)	19 (9)
	June 2	171	1 (0.5)	18 (10)
Yahk	May 24	152	0	44 (29)
	June 2	200	0	90 (45)
Christina Lake Plot C13	May 24	200	0	30 (15)
Creston Plot C1	May 24	36	0	0
North Creston Plot C2	May 24	200	0	62 (31)
<u>Kamloops F.R.</u>				
Osoyoos	May 22	200	0	29 (14)
Okanagan Falls	May 23	200	0	71 (35)
Cherryville	May 26	200	0	29 (14)

Overwintering larval samples from eight permanent plots, taken to determine the status of the population and potential defoliation in 1981, indicated light to moderate defoliation at Rykerts near Creston and light defoliation at Fruitvale, Salmo, East Arrow Creek, Yahk, Cherryville, Anarchist Mountain and Shuttleworth Creek (Table 6).

Table 6. Average number of overwintering larch casebearer larvae per branch and predicted defoliation for 1981 at permanent sample plots.

Kamloops and Nelson Forest Region, 1980

Location	Avg. no. larvae per (percent)		Predicted defoliation ^{1/} 1981
	45 cm branch	100 facicles	
<hr/>			
<u>Nelson Forest Region</u>			
Fruitvale	5	3	light
Salmo	18	6	light
Rykerts	158	70	moderate
East Arrow Cr	6	4	light
Yahk	21	8	light
Thrums	6	2	light
<hr/>			
<u>Kamloops Forest Region</u>			
Anarchist Mtn.	108	49	light
Shuttleworth Cr	52	13	light
Cherryville	30	17	light

^{1/} Forecasting larch casebearer defoliation in the northern region. (W.M. Ciesla, W.E. Bousfield), progress report, U.S.D.A., Northern Region, #71-33, 1971.

Larch sawfly, Pristiphora erichsonii

Defoliation of western larch stands in the Elk River Valley from Sparwood to Fernie was extremely light; <5% of the foliage over 500 ha compared with 4 000 ha of light to severe, 5-100%, defoliation in 1979.

The sawfly adult emergence and egg laying appeared normal in early July, however in late July it was evident that early larval development had ceased and the population collapsed. The cause of the collapse is not known, but considered to be associated with adverse weather condition during the early larval development period.

Approximately 465 male and female adult parasitic wasps Olesicampe benefactor were released in sawfly infected stands near Sparwood, between Sparwood and Hosmer; and north of Fernie. (Pest Report Release of the larch sawfly parasite in B.C., C. Wood 1980, Appendix IV).

This was the second release of parasites in the area, the first was 57 adults was near Sparwood in 1978.

Results of ten-1000 ~~100~~ cm² duff samples from defoliated stands in four areas between Sparwood and Fernie indicated a complete collapse (Table 7). Small localized infestations west of Fernie could persist, increase in number and expand in area in 1981.

Table 7. Number of overwintering larch sawfly larvae in cocoons per 1000 cm² duff^{1/}, Elk River Valley.
Nelson Forest Region, 1980

Location ^{2/}	1976	1977	1978	1979	1980
Sparwood, old hwy	<2	561	675	452	2
Sparwood, water tower ^{3/}	-	-	497	268	2
Olsen ^{3/}	-	-	-	-	10
Fernie ^{3/}	-	-	-	-	11
Total no. of cocoons	<2	561	1172	720	25
Avg. no. of cocoons/ 1000 cm ² duff	5	56	58	36	25

- 1/ 1000 cm² duff samples from each of 10 trees at each of 4 locations.
- 2/ Three areas sampled previously; Hosmer Trailer Park, farm on the Elkford Rd and the pipeline crossing on the Elkford Rd were discontinued because of limited access and population migration.
- 3/ Olsen and Fernie were established as parasite release areas and sampled for cocoons, because of the large population and good access.

Larch needle blight, Hypodermella laricis

Discoloration of western larch foliage was common throughout the host range in the Nelson Forest Region for the fourth consecutive year. Between 50 and 100% of the foliage was discolored, often associated with larch needle rust, Melampsora medusae infection, in 20-200 ha areas between 660 and 1200 m elevation, from Mosquito Creek to Arrow Park Lake; Whatshan Lake and River; from Creston to Castlegar south of Hwy #3; in the Ymir area; from Nelson to Balfour, Kaslo to New Denver, Lemon Creek to Vallican and on the west side of the Slocan River Valley. Many of the infected stands were also defoliated by larch casebearer.

Defoliation and infection areas varied from 60% of single and small groups of scattered trees at Toby Creek, to 50% over 1 000 ha in the Gold Creek-Cranbrook area. In the Roam-Ram creeks area of the Lussier River drainage repeated annual infections have resulted in mortality of 5% of the lower branches of immature trees in a localised area along the access road.

Animal damage

Top kill of two to five metres, caused by rodent girdling was common in many immature western larch stands throughout the host range, where the damage has occurred for many years. The number of dead tops varies annually from single isolated trees to 25 or more in localised areas. No evidence of a canker, Phomopsis pseudotsugae on western larch, reported to cause top girdling of immature trees has yet been found in British Columbia.

DOUGLAS-FIR PESTS

Western spruce budworm, Choristoneura occidentalis

Larvae defoliated 60% of the current years needles of Douglas-fir and western larch over 100 ha in the lower end of Johnston Creek near Rock Creek, for the third consecutive year. Two parasitic fungi, Entomophthora and Sphaerosperme isolated from larvae may help reduce larval populations in 1981.

Armillaria root rot, Armillaria mellea

The root rot is common in Douglas-fir stands in many areas of the Nelson Forest Region and causes substantial annual volume loss. An estimated 20% of the total volume of mature Douglas-fir trees scattered over 1 000 ha of a mixed stand were recently killed by the root rot, on the north side Bush Arm, west of Chatter Creek on McNaughton Lake. Many of the infested trees were windthrown after the removal of mountain pine beetle-killed western white pine from the stands in 1979-1980.

At Copper Creek, in the Waitabit Creek drainage east of Donald, there was evidence of old inactive infection pockets of less than two per hectare, but there are no currently active infections in mature Douglas-fir trees.

At Nancy Greene Lake west of Castlegar <1 to 26% of the lodgepole pine in a 200 ha area were infected with Armillaria root rot.

A bud blight, Dichomera gemmicola

Bud necrosis on Douglas-fir trees, caused by the blight, persisted in areas at the north end of Kootenay Lake. At Davis Creek, 30% of the buds were killed on 80% of the trees over 50 ha and over approximately 100 ha at Argenta; at Kaslo 20% of the buds on 80% of the trees over 25 ha were infected and at Meadow Creek 20% of the buds on 60% of the trees in a 150 ha plantation were damaged. In the same plantation the blight and a secondary fungus Cytospora sp. were suspected to have caused dead tops, resulting in multiple leader development to 60% of ten year old Douglas-fir trees in the plantation.

Up to 40% of the 1979 buds were infested on single Douglas-fir trees between Creston and Sirdar on the east side of Kootenay Lake, where similar damage to 1978 buds was recorded in 1979.

Douglas-fir beetle, Dendroctonus pseudotsugae

Populations remained at low endemic levels on the region but attacks persisted in single, predisposed, overmature trees between Creston and Riondel and from Roosville to Parson east of the Kootenay River. At Hamil Creek, east of Lardeau five mature Douglas-fir infested by the beetle were predisposed by Armillaria root rot, Armillaria mellea.

Rhabdocline needle cast, Rhabdocline pseudotsugae

The needle cast was common throughout the Douglas-fir range in the southern East Kootenay, infecting less than 50% of the previous years needles of isolated single and small groups of 2 to 5 immature trees. The incidence and intensity of infection was less than in 1979, when up to 75% infection caused widespread premature needle loss.

Douglas-fir needle midge, Contarinia sp.

Discoloration of the current years needles was common in many areas of the Nelson Forest Region, particularly in the pure native stands and Christmas tree plantations in the Kootenay-Columbia river valleys and in the Invermere-Radium-Brisco area where it has persisted for many years. Damage varied from a few infested needles on single trees of all age classes to localized 1 ha areas where up to 100% of the current years needles were infested, on increase from a maximum of 30% in 1979.

Douglas-fir stands between Grand Forks and Rock Creek and in the West Kettle River Valley north to Beaverdell were infested for the first time in several years.

Leaf beetles, Dichelonyx sp.

Large numbers of the beetle, up to 50 per tree, lightly defoliated the current years foliage of single immature Douglas-fir trees at widely scattered location in the Skookumchuck-Premier Lake-Canal Flat-Columbia Lake areas. In 1978 high numbers of beetles defoliated up to 50% of the 1978 needles on single trees in the Kikomun-Elko-Jaffray; they declined dramatically in 1979.

Western false hemlock looper, Nepytia freemani

The average number of larvae, in the 32% of positive beating collections from Douglas fir and western hemlock in the Arrow and Kootenay lakes areas in the West Kootenay increased to three in 1980 from one in 1979 which indicates an increase trend. Larval population remained low in Douglas-fir stands elsewhere in the Nelson Forest Region.

Douglas-fir tussock moth, Orygia pseudotsugae

Study traps baited with synthetic pheromone attractant to monitor male adult populations at five locations between Moyie and Radium Hot Springs did not attract any male moths indicating zero populations. However traps at Cascade, Downie creek, Mica creek and Fauquier all contained moths, showing a wide distribution of the insect in the West Kootenay. ("Summary of Pheromone Trap Program, Nelson Forest Region, 1980," Appendix IX.)

Climatic Damage

Many of the Douglas-fir trees, along major access roads from Yahk to Brisco, which exhibited drought damage in 1978 and 1979 and which showed initial signs of recovery in late 1979, died in 1980. The drought factors contributed to additional, premature needle drop of ponderosa pine and Douglas-fir on poor sites in the dry belt areas of the Kootenay-Columbia Trench where similar conditions occurred in 1979.

ENGELMANN SPRUCE PESTS

Spruce beetle, Dendroctonus rufipennis

Spruce beetles killed mature Engelmann spruce trees over 500 ha in Copper and Quartz creeks in the Golden area in 1980. (Pest Report Spruce Beetle Infestation near Golden, B.C. J.S. Monts Dec. 1980; Appendix V).

In Copper Creek, a tributary of Waitabit Creek, more than 30% of the tree in leave blocks on 300 ha were infested and 10% of the trees

were infested in a leave block south of the creek. At Quartz Creek, west of Donald, mature trees in the valley bottom of a 200 ha stand were severely attacked.

Assessments of 1980-81 overwintering broods indicated increasing population at both locations. At Coursier Lake, south of Revelstoke, spruce beetle infested Engelmann spruce trees over 100 ha, 5% of which were green standing trees attacked in 1979.

Sanitation and trap tree programs proposed for all the areas are expected to contain the infestations.

Two-year-cycle spruce budworm, Choristoneura biennis

Defoliation of Engelmann spruce and alpine fir trees occurred in 12 high elevation stands in the East Kootenay region of the Nelson Forest Region, (Table 8). The infestations persisted in nine previously recorded areas and were recorded for the first time in three areas; damage intensity varied from less than 10% to 75% defoliation of the current years foliage of immature and mature trees.

The infestation in the North Fork of the White River, which has persisted since 1977, has resulted in top stripping and bud mortality; similar damage is also evident in the East Fork of the White River. In the Mid Fork, White River and Thunder Creek, defoliation was not visible from either ground or aerial surveys where defoliation was suspected but not continued in 1979.

Table 8. Defoliation and area of Alpine fir and Engelmann spruce stands defoliated by the two-year-cycle spruce budworm, Choristoneura biennis
Nelson Forest Region, 1980

Location	Area (ha) (approx)	Defoliation ^{1/} Intensity	First Reported
Blaeberry River	500	<10%	1979
Glenogle Creek	200	25%	1977
McMurdo Creek	100	<20%	1975
Bugaboo Creek (S. Fork)	500	60%	1978
Vowell Creek	200	<20%	1980
St. Marys River	750	<20%	1978
La Pointe Creek	250	<10%	1978
Baker Creek	250	<10%	1980
Redding Creek	250	<10%	1980
Sanca Creek	250	<10%	1979
North Fork White River	2 500	50%	1968
East Fork White River	600	75%	1977

^{1/} Current years foliage

An Entomopox virus, to which was attributed the collapse of an outbreak in the North Fork infestation between 1968 and 1974, was isolated from one larve collected in the current infestation. Damage to new buds and shoots of both Engelmann spruce and alpine fir trees is expected to continue in 1981 in all of the above infestation areas.

ALPINE FIR PESTS

Western balsam bark beetle, Dryocoetes-ceratocystis complex

Mature alpine fir trees killed by the beetle-fungus complex occur annually in groups of usually less than 10 per ha throughout much of the higher elevation host range in the Nelson Forest Region. An estimated 8,150 trees were recorded in 1980; 2,000 in the northern Columbia River Valley and its tributaries between Invermere and Parson including the Spillimacheen River Valley; 2,500 in the upper St. Marys River Valley including Baker and Redding creeks; in the Goat River drainage; in Summit Creek west of Creston; in Silverton Creek 1,200; 550 near Rossland, New Denver 1,000, Renata Creek 500 and Schroeder Creek 400 trees.

In the Summit Creek and Goat River areas the root rot, Armillaria mellea was evident on less than 15% of trees killed by the bark beetle, but was not considered a primary causal agent.

WESTERN HEMLOCK AND WESTERN RED CEDAR PESTS

Western hemlock looper, Lambdina f. lugubrosa

The looper and a conifer sawflies, Neodiprion sp., very lightly defoliated western hemlock and western red cedar stands for 10 km along the Akolkolex River Valley near Revelstoke. The number of larvae per beating sample ranged from 15-35 compared with 0-5 in 1979. In the West Kootenay the number of larvae in collection increased to 5 from 2 in 1979; and the percent collections containing larvae increased to 38% from 15% in 1979, which indicate an increasing population in 1981.

Berckmanns' blight, Lepteutypa cupressi

An estimated 20% of the branch tips, 10-20 cms long, on 80% of all age classes of western red cedar over 100 ha in the Downie Creek area, were infected and killed. There was no damage in the area in 1979.

Winter damage

Most of the immature western red cedar, western hemlock and western white pine damaged as a result of temperature fluctuation in

early 1979 throughout much of the Interior wet belt forest type in the Nelson Forest Region, recovered by late 1980. In the Creston-Kitchener area less than 5% of exposed immature cedar and hemlock have top kill; from Nakusp to Revelstoke 30-60% of the immature western hemlock and western red cedar had .5-2 m top-kill in 200 ha areas. More damage could occur if secondary fungi infect the damaged trees.

PESTS OF NATURAL AND MANAGED SECOND GROWTH STANDS AND PLANTATIONS

Red turpentine beetle, Dendroctonus valens and engraver beetles, Ips spp.

Both pests attacked an estimated 75% of the butts and stems of felled ponderosa and lodgepole pine trees over an estimated 100 ha area, within an 800 ha Forest/Range management unit in the McGinty Lake area between Kimberley and Wasa Lake, (Pest Report: "Turpentine and Engraver Beetle Attacks in the McGinty Lake Forest/Range Management Unit, Cranbrook T.S.A., C.S. Wood, G.A. Van Sickle, June 6, 1980". Appendix VI). Attacks were mainly in larger diameter butts and trees where populations increased to attack green standing trees.

An estimated 5,000 immature ponderosa pine trees, ≤ 10 cm dbh, on 800 ha near Ta Ta Creek near Kimberley, which had been damaged by a range fire in 1979, were attacked and killed by Ips pini and to a lesser degree by D. valens. Populations of both beetles had built-up in previous years slash and other pre-disposed trees in the surrounding area.

An estimated 10% of the smaller diameter (<10 cm dbh), ponderosa pine were killed by Ips sp. in a 20 ha spaced stand near Skookumchuck Dendroctonus valens attacked the butts of 2% of the standing green trees.

Ten groups of 1 to 5 immature lodgepole pine trees, often associated with land clearing, were killed by Ips sp. in the Elko-Ft. Steele area east of Cranbrook.

At Wasa Provincial Park an estimated 25 ponderosa pine trees from 10 to 45 cm dbh in five areas within the park were killed by both beetles in 1979 and 1980. Ponderosa pine tree mortality has been common in the area since 1977.

An immature lodgepole pine stand in the Driftwood River Valley near Spillimacheen where a cooperative spacing and fertilization program is being conducted by C.F.S. and B.C.M.F. personnel was examined for type and incidence of pests and damage. (Pest Report, "Assessment of Pest Damage in Managed Lodgepole Pine Regeneration near Spillimacheen, Nelson Forest Region." J.S. Monts, Dec. 16, 1980, Appendix VII).

Insect damage occurred in all three spaced and unspaced areas. In three spaced areas nearly 10% of the trees were attacked by more than

one pest, including rabbits which girdled and killed 8% of the trees in one area.

Gouty pitch midge, Cecidomyia piniopsis

Up to 80% of the 1979 shoots of approximately 50% of the ponderosa pine trees in plantations at km.2 Findlay Creek Road west of Canal Flats were infested and killed for the fourth consecutive year. No damage to adjacent native ponderosa pine has been found.

Fir engraver beetle, Scolytus unispinosus

The beetle killed an estimated 1,000 potential Christmas trees over approximately 40 ha in a plantation area, north of Radium Hot Springs. The trees killed between July 1979 and May 1980 were predisposed by mechanical wounding or "shock treatment" to induce slow growth prior to harvesting and were of low vigor and poor quality and many were on poor quality sites. Revised pruning programs and slash disposal have since reduced the problem.

Spruce weevil, Pissodes strobi

Damage to Engelmann spruce terminals is common in most areas of spruce regeneration in the region but damage to the terminals is not known to exceed 10% in any one area, and is not considered a major pest at this time.

CONE AND SEED PESTS

Cone crops of the major conifer species were sampled at eleven locations to determine the incidence of insect attack and suitability for collection, (Pest Report: Cone and seed pests 1980, D.S. Ruth et al., Nov. 3, 1980. Appendix VIII).

Between 5% and 78% of the twenty cones from each of seven locations were damaged by cone and seed insects; four samples were free from insect attack but the Douglas-fir cones from three areas were considered unsuitable for collection because of the low mean number of seeds per slice.

DECIDUOUS TREE PESTS

Birch leaf skeletonizer, Bucculatrix canadensis

Severe discoloration of white and water birch occurred in widely scattered stands in the East and West Kootenay, for the seventh and fourth year respectively.

Severest discoloration was in the lower Spillimacheen, McMurdo, Horsethief and Toby creek areas in the east Kootenay and from Lardeau to Argenta, and north to Berger Creek on Trout Lake. Light discoloration was common from Riondel to Powder Creek on Kootenay Lake; from Kaslo along the Kaslo River to Keen Creek, to Lardeau and in Caribou Creek.

Satin moth, Silpnotia salicis

Balsam poplar stands at Hanna Creek near Rossland were 50 to 100% defoliated over 200 ha compared with similar defoliation intensity over 100 ha in 1979. Satin moth infestations have persisted in the Rossland area for the past four years.

Apple and thorn skeletonizer, Anthophila pariana

Discoloration of apple trees and saskatoon bushes persisted in the Slocan and Creston Valleys. In Nakusp, damage was the most severe in five years, however between South Slocan and Castlegar and from Creston to Wyndell damage was much reduced to less than 25% discoloration of single scattered trees in 1980, compared with widespread 100% discoloration in 1979.

Fall webworm, Hyphantria cunea

Deciduous shrubs, mainly western chokecherry, were 100% defoliated in many parts of the Nelson Forest Region, including Christina Lake, Trail south to Waneta and at Fairmont, Wasa and near Cranbrook.

Poplar-and-willow borer, Cryptorhyncus lapathi

Populations persisted at endemic levels throughout the Region, killing one to five stems of single clumps of native willow at widely scattered locations where similar levels of damage have persisted for at least five years. Several ornamental willows were severely damaged along a street in Kinnaird.

Pacific willow leaf beetle, Pyrrhalta carbo

Discoloration of less than 5% of the foliage of single willow bushes by beetle larvae, was common at widely scattered locations where similar damage intensity has occurred for many years. Ninety percent of the willow along the Mica Dam Road between Carnes and Bigmouth creeks, were 60-100% discolored, the first year damage has been recorded in this area.

Aspen leaf miner, Phyllocnistis populiella

Up to 100% of the foliage of valley bottom black cottonwood and higher elevation trembling aspen stands in the Illecillewait River Valley, east of Revelstoke, were discolored by larval mining, for the third consecutive year.

Poplar leaf and twig blight Venturia macularis

Infection of trembling aspen stands was common in parts of the West Kootenay. Several 20-100 ha areas were discolored between Zincton and Retallack, where similar damage was common in 1979. Little damage was evident in the East Kootenay.

A poplar leaffolding sawfly, Phyllocolpa bozemani

An estimated 70% of the foliage of 80 immature black cottonwood trees about six metres high in Fort Steele Provincial Park were lightly damaged by the insect. Similar damage was common on mature black cottonwood trees in nearby Wildhorse Creek and on single trees at widely scattered locations between Creston and Golden.

Gypsy moth, Porthetria dispar

Sticky traps baited with synthetic pheromone attractant located at seven locations throughout the region between Nelson and Radium, did not trap any male adults of this potentially damaging deciduous forest pest, indicative of a negative population.