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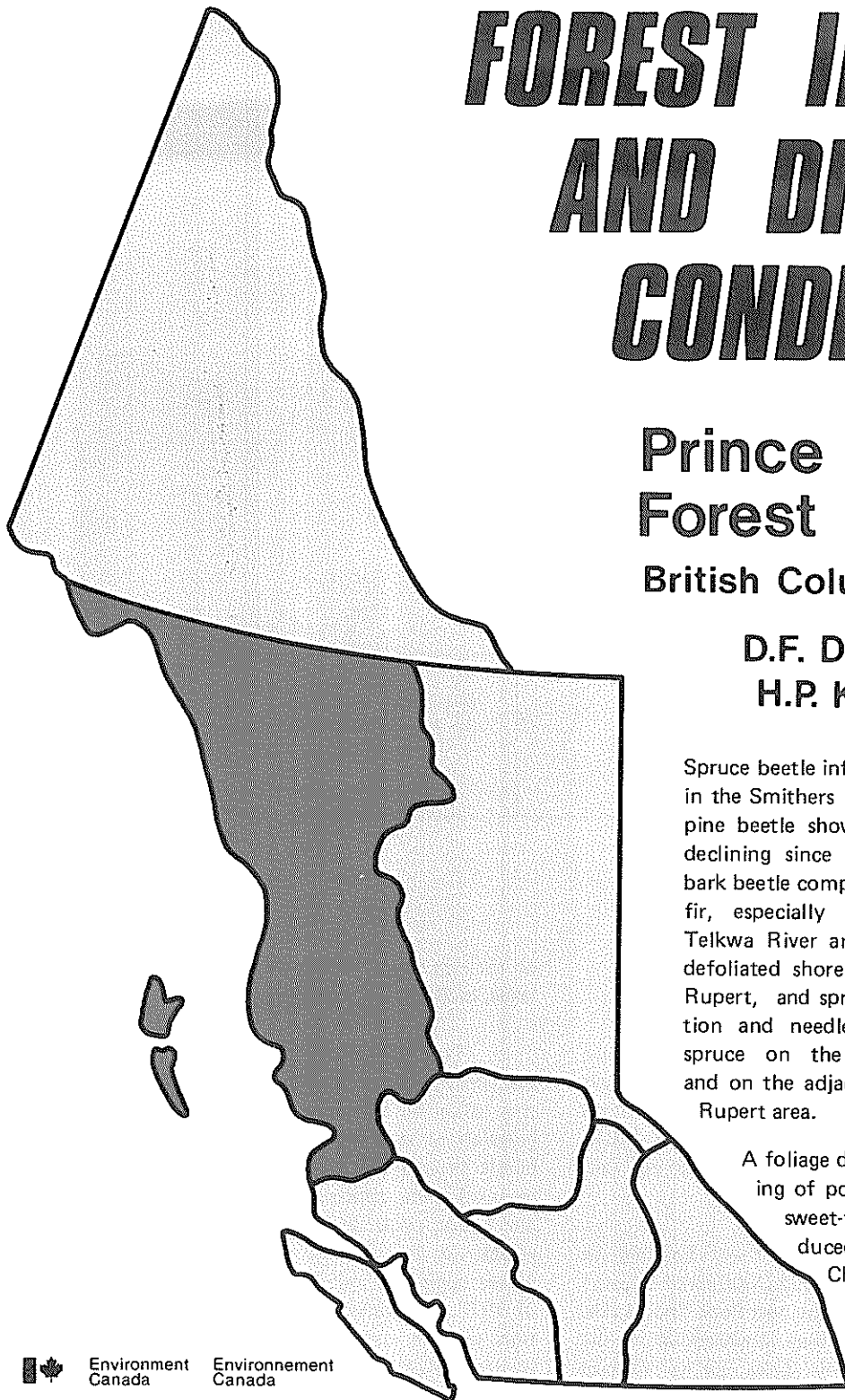
FOREST INSECT AND DISEASE CONDITIONS

Prince Rupert Forest District British Columbia, 1977

D.F. Doidge
H.P. Koot

Spruce beetle infested an estimated 2 000 ha in the Smithers Landing area, and mountain pine beetle showed the first indications of declining since 1969. The western balsam bark beetle complex continued to kill alpine fir, especially in McKendrick Pass and Telkwa River areas. The pine sawfly again defoliated shore pine on islands near Prince Rupert, and spruce aphid caused discoloration and needle drop of shoreline Sitka spruce on the Queen Charlotte Islands and on the adjacent mainland in the Prince Rupert area.

A foliage disease caused severe browning of poplars in the Hazelton area; sweet-fern blister rust was introduced via a provenance trial at Chist Creek, and a bud necrosis continued to be a major problem in spruce plantations.



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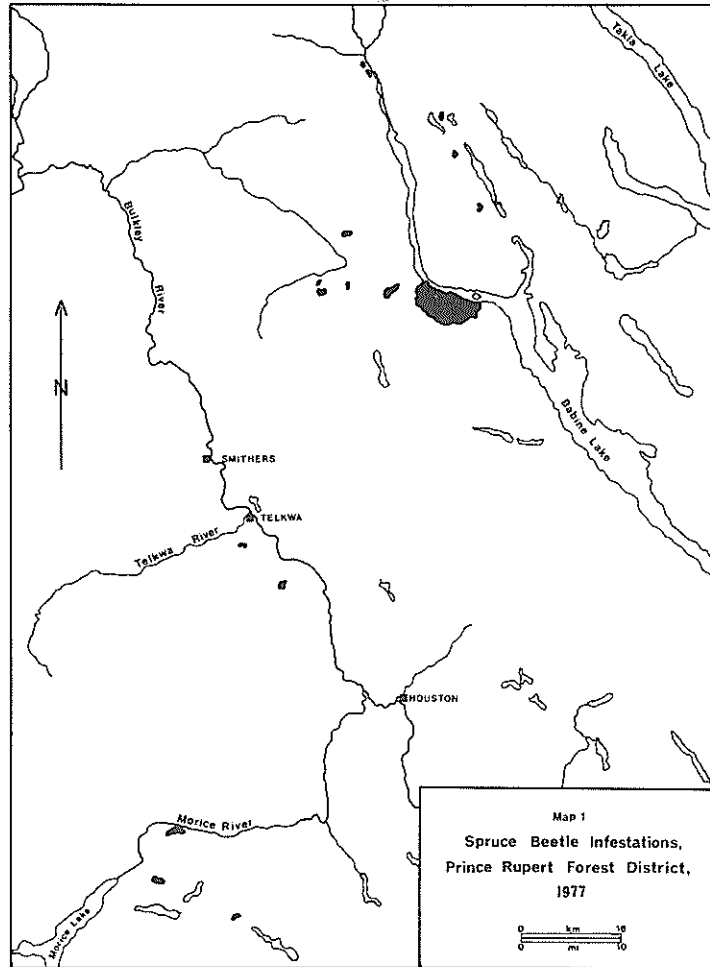
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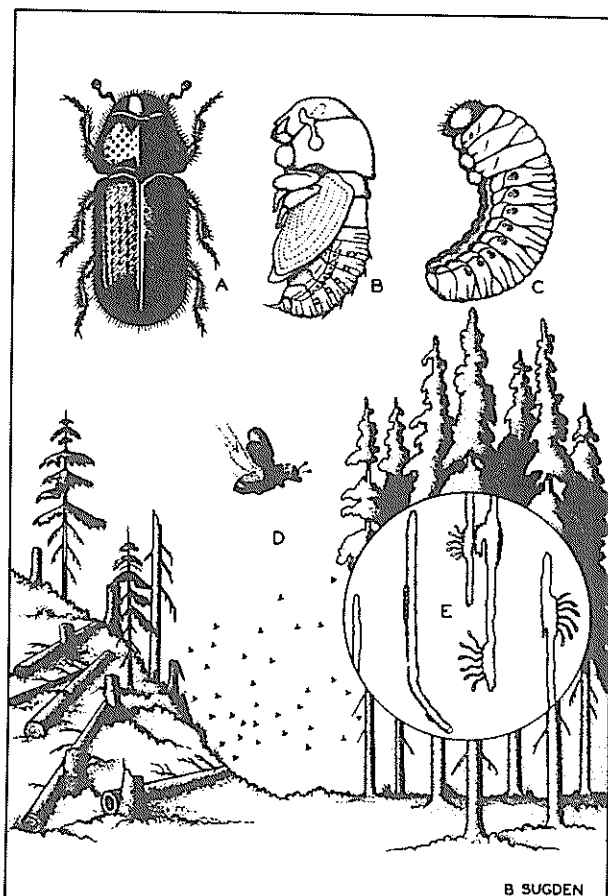
SPRUCE BEETLE, *Dendroctonus rufipennis*

Spruce beetle infestations increased dramatically to 2 280 ha from 100 ha in 1976, the year the epidemic was first reported. The population build-up began in windfalls in 1973, the initial attack on standing trees probably occurring first in 1975.

Aerial surveys near Smithers Landing in September revealed an estimated 2 000 ha of infested spruce type, along with 200 ha near Pork Chop Lake. Infested spruce trees were also recorded: along the Morice River, 30 ha; Coffin Lake, 20 ha; Frypan Lake, 10 ha, and Bill Nye Lake, 5 ha. Infestations of one to five standing trees were noted at Babine River near the fish fence, Haul and Morrison lakes

on the east side of Babine Lake, Holland and Torkelsen lakes, McBride Lake and near Telkwa.

The spruce beetle normally has a 2-year life cycle, i.e., overwintering first as a larva and the following winter as an adult, before attacking windfall or standing trees. Examinations of spruce beetle broods in the Smithers Landing infestation revealed that approximately 60% of the progeny are 1-year cycle and will overwinter as adults and attack in late spring of 1978. Presumably, the 1-year cycle was induced by the long, warm summer of 1977. Thus any attempts at reducing the population with a trap tree program should begin this winter. Salvage operations should commence immediately, as cruise data near Smithers Landing disclosed that 83% of the spruce trees were killed in 1977.



SPRUCE BARK BEETLE

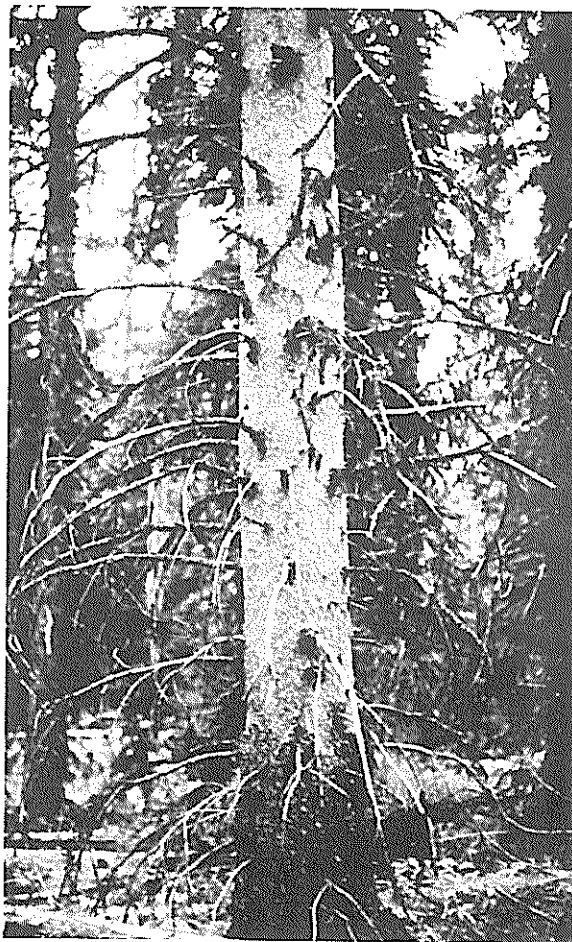
A, adult; B, pupa; C, larva; D, beetles from logging debris and stumps attacking adjacent living trees; E, galleries under bark with eggs and young larvae.

Mature spruce stands are usually winter-logged and clear-cut, producing large openings which, if not designed to ameliorate the effects of wind on the remaining stand, will result in blowdown along the edges. Shaded windfall is the primary breeding site for spruce beetles^{1/}. Snow cover on windthrow prevents woodpecker predation, a very important factor in reducing bark beetle populations in standing trees. Annual removal of windthrown trees

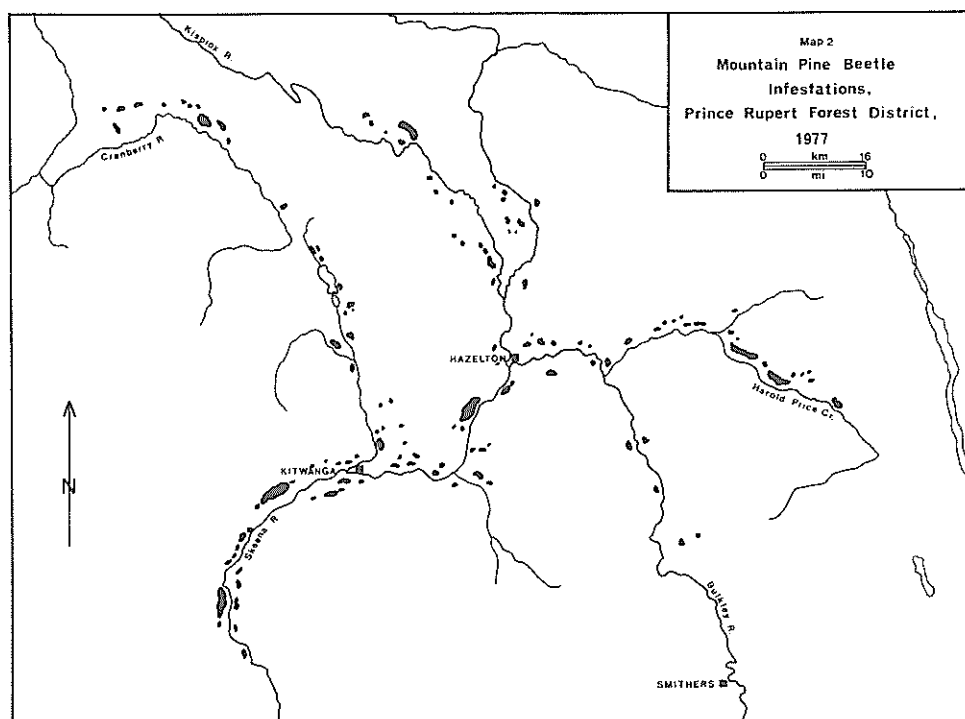
^{1/} Spruce beetle brood production in logging slash and wind-thrown trees in British Columbia, E.D.A. Dyer and D.W. Taylor. Can. Dep. Environ., Pac. For. Res. Cent., Victoria, BC-X-62, 1971.

from cutting boundaries for at least 2 years following logging and road construction is recommended.

As usual with bark beetles, an extremely cold winter in conjunction with below normal snowfall could significantly reduce the spruce beetle population.



Woodpecker scaling of spruce beetle infested tree.



MOUNTAIN PINE BEETLE,
Dendroctonus ponderosae

Mountain pine beetle continued to kill lodgepole pine trees in the western interior of Prince Rupert Forest District. There were some 11,000 red-tops in the area, a reduction from the 18,000 of 1976. This apparently is the first decline in the epidemic since it was detected near Date Creek in 1969.

In 1972, the British Columbia Forest Service mounted a salvage and control program, then expanded it in 1973, using methods recommended by Dr. L. Safranyik of the Canadian Forestry Service. This program has been continuous to date. The operation was successful in effectively reducing beetle populations in the Smithers - Houston areas. The only areas in the eastern portion of the District with continued infestations were at Cunningham Lake (40 red-tops), and across from Donald Landing on Babine Lake, where 70 red-topped lodgepole pine were noted. Beetles continued to kill trees along the Bulkley River between Smithers and

Hazelton, notably at: Bulkley Canyon, 200 red-tops; New Hazelton, 150, and Four Mile Creek, 140. In the western portion of the Smithers Ranger District, the Harold Price Creek infestation declined to 2,575 red-tops in 1977 from 4,200 in 1976. The numbers of red-tops in the Suskwa River Valley also declined from 1,900 to 465 in 1977. The counts for Harold Price Creek and the Suskwa River were made from oblique 5" x 5" (70 mm) Hasselblad photographs. Control and fringe clean-up logging in the Kispiox River Valley in the Hazelton Ranger District reduced the numbers of red-tops from 1,900 in 1976 to 1,200 in 1977. Small groups of red-tops were recorded near Kitseguecla Lake, and the Nipples in the Kitseguecla River Valley had 150 red-tops in 1977 compared to 350 in 1976.

The infestation along Harold Price Creek, which was inaccessible to salvage logging in 1976, now has an access road ready for use if the beetle spreads onto the flats at the headwaters of the creek. The present infestation along the creek is not being salvage logged because of the extreme roughness of the terrain, and it is a sensitive fish and wildlife area.

The western districts (Hazelton and Kitwanga) still have large beetle problems from Hazelton to Dorreen along the Skeena River with a total of 5,475 red-tops, notably at Ritchie (1,500 red-tops), an increase of 500; Woodcock (1,000), an increase of 500; opposite Carnaby (1,000), a decrease of 1,000; Price Creek (570), an increase of 170; Seeley Lake (330), a decrease of 670; Andimaul-Andi Creek (250); Juniper Creek (150); Kitwanga (140), a decrease of 60; Flint Creek (105); Insect Creek (100), and Cedarvale (100). Also cause for concern are Kitwanga and Cranberry rivers areas with 975 red-topped lodgepole pine; along with Aluk-Douse creeks (360), reduced by logging from the original 3,000 recorded in 1975; Kitwanga Lake (180); Radio Tower Hill (110), down from 5,000 in 1975, and Kitwancoo Creek (100). The areas along the Skeena River and the Kitwanga-Cranberry rivers are presently being salvage logged where feasible; some areas such as Woodcock are inaccessible and will be left. The northern expansion of the beetle (Derrick Creek) is being monitored closely to detect any further extension of the beetle in the Cranberry-Nass rivers.

The third area of concern is in Tweedsmuir Park near the junction of the Dean and Takia rivers where 1,150 red-tops were mapped on 450 ha. This area, as well as being in the park, is inaccessible to normal salvage and control methods; therefore, the progress of the infestation will be monitored for historical purposes.

Assessment of beetle broods along the Kispiox River, Harold Price Creek, Cranberry River, Kitwanga and Seeley Lake indicated that the infestations may persist in 1978.

WESTERN BALSAM BARK BEETLE, Dryocoetes-Ceratocystis complex

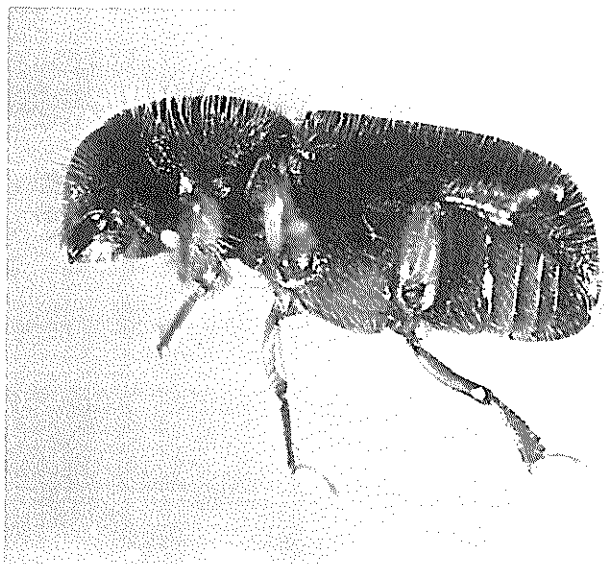
In 1977, Dryocoetes confusus, in association with the lesion-causing fungus Ceratocystis-Dryocoetidis, continued to kill alpine fir trees in the Prince Rupert Forest District. An estimated 2,700 red-topped alpine fir were mapped in scattered patches near Smithers, in addition to 5 900 ha in McKendrick Pass, a chronic infestation area. Smoke from slash burns and rainy weather made it impractical to complete aerial surveys in 1977; therefore, comparisons of total tree mortality for the District with earlier years are invalid. Areas and numbers of red-

tops mapped during aerial surveys in 1977 were: McDonnell Lake, 50; Serb Creek, 250; Winfield Creek, 500; Jonas Creek, 200; Cumming Creek, 500; Pine Creek, 200; Howson Creek, 500 and Dome Mountain, 500.

Studies have shown that approximately 35% of alpine fir mortality is due to direct attack by the beetle, the remainder being attributed to the beetle-induced, lesion-causing fungus Ceratocystis dryocoetidis. Initial beetle attacks may be pitched out, but subsequent attacks on trees weakened by lesions are often successful; coalescing lesions may kill trees without further beetle activity.

Alpine fir trees killed by the insect-disease complex may retain discolored needles for up to 5 years; therefore, determination of year of actual attacks must be made on the ground. Aerial surveys are the best method for surveying the large tracts of infested alpine fir, especially since the infested stands are usually inaccessible.

Control is feasible only through stand management.



"Male" Dryocoetes confusus adult.

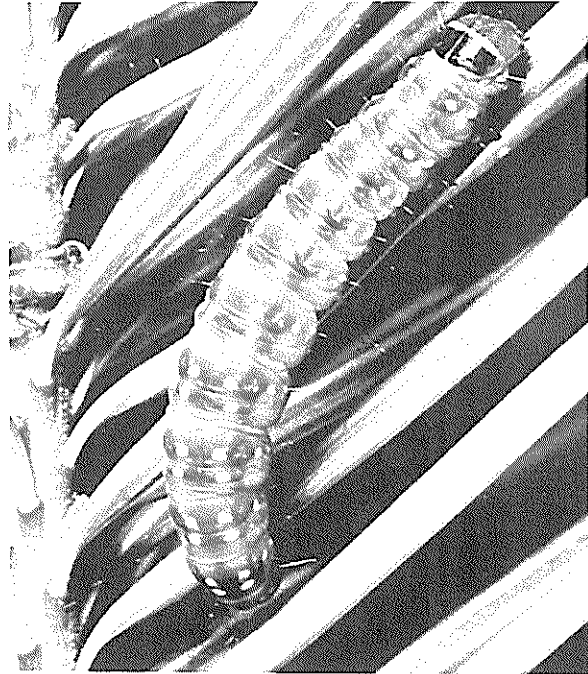
TWO-YEAR-CYCLE SPRUCE BUDWORM,
Choristoneura biennis

Larval populations of this 2-year-cycle budworm, on white spruce and alpine fir, continued at low levels. No significant defoliation by this species has occurred since the termination of the outbreak in 1964 along Babine Lake.

Traps to assess adult male budworm populations were baited with a sex attractant (97 parts trans-11-tetradecenal) and set out at eight locations (five traps per location) in the interior of the District (Table 1).

Even though 1977 is considered to be a non-flight year for C. biennis, substantial numbers of adults were captured in the traps north of Meziadin Lake in 1975 and 1977, leading to the consideration that C. fumiferana may have been carried into the area by air currents. There is no evidence in larval beating samples that an "off cycle" phase of C. biennis is present.

Light C. biennis populations are expected in 1978 in most areas; no significant defoliation is predicted.



Choristoneura biennis "larva".

Table 1. Average number of Choristoneura sp. male adults collected by pheromone traps, Prince Rupert District.

Location	1972	1973	1974	1975	1976	1977
Oweege Cr	—	—	—	102	150	70
Glacier Cr	—	—	—	65	201	56
Bell Irving R	—	—	—	118	202	59
Skunsnat Cr	69	3	—	75	17	37
Smithers Landing	8	5	—	74	34	23
Telkwa R	—	—	—	1	3	1
Morice R	2	4	31	19	6	0
W. Morice R	2	2	18	5	—	4

BLACKHEADED BUDWORM,Acleris gloverana

Blackheaded budworms remain at low population levels in the District; only 7% of beating samples contained larvae. Highest populations were found at mile 18, Nilkitkwa road and Oweegee Creek, Highway No. 37.

Plots with 50 trees each, established to study the effects of defoliation over a period of years, were re-examined in mid-summer on the Queen Charlotte Islands at Kwaikans Island in Masset Inlet and at Deena Creek. Cumulative tree mortality, as a result of severe budworm defoliation in 1973 and 1974, was 62% on immature western hemlock at Kwaikans Island and 27% in a mature stand at Deena Creek. Additional tree mortality can be expected in both areas for several more years.

Assessment of adult male budworm populations was attempted, using traps baited with a sex attractant (trans-11-tetradecenal). Traps set out at Oweegee Creek averaged 1.0 moth each, indicating a light population in the area.

PINE SAWFLIES,Neodiprion sp.

The infestation of sawflies on shore pine on the outer islands south of Prince Rupert appears to have collapsed south of Porcher Island. No new defoliation was noted, but heavy tree mortality resulting from 2 years of severe defoliation was evident along Grenville Channel on Pitt Island between Kxngaal Inlet and Rippon Point, a distance of approximately 30 km. Shore pines are typically stunted and have only esthetic value.

In mid-June, high sawfly populations were found lightly defoliating shore pine at Hunts Inlet on Porcher Island; however, further examination was not feasible, so the resultant damage is unknown. A few sawfly colonies were also found on Prescott Island, but no significant defoliation occurred. There was no evidence of sawflies on Digby Island, a primary source of Christmas trees for Prince Rupert.

Further reductions of sawfly populations on shore pine are expected in 1978 as disease and parasitism become more prevalent.

HEMLOCK SAWFLIES,Neodiprion sp.

At Flint Creek, south of Cedarvale, sawflies caused some light defoliation of immature western hemlock at 180-metre elevation. A trace of defoliation was also evident on western hemlock along coastal portions of the District at Allard Bay, Kwatna Bay, Labouchere Channel and at Carlson Inlet.

A SPRUCE BUDMOTH,Zeiraphera sp.

During the past 3 years this budmoth has caused deformed tops and laterals on 54 ha of pre-commercially-thinned Sitka spruce along Deena Creek on Moresby Island. Alterations in form and height growth resulting from bud destruction were evident on approximately 30% of the trees examined.

Elsewhere in the District populations were low.

SPRUCE APHID,Elatobium abietinum

The spruce aphid caused severe discoloration and needle drop of shoreline Sitka spruce on the Queen Charlotte Islands and on the adjacent mainland in the Prince Rupert area. Some light needle drop occurred farther inland on the Queen Charlotte Islands.

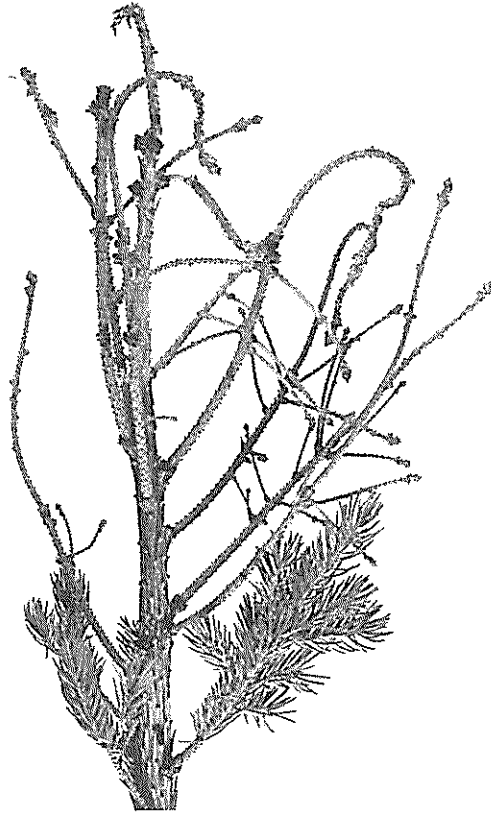
Discoloration was particularly evident on Moresby Island between Sandspit and Alliford Bay, and at Cumshewa Head; on Louise Island between Skedans and Girard Point; on Graham Island in scattered locations from Queen Charlotte City along the coastline to Tlell, near Masset, along Rennell Sound, and south of Van Inlet.

In Prince Rupert and neighboring Port Edward areas, aphid damage was prevalent on both native and ornamental spruces. Trees on Lucy Island, west of Prince Rupert, were also severely attacked. No tree mortality was evident, but another mild winter (which favors the aphid) could result in heavy attack in 1978 and cause some tree-kill.

WOOLLY APHIDS,
Pineus prob. similis

Spruce plantations throughout the interior of the Prince Rupert Forest District were infested by this gall-producing aphid. Two areas examined by the Canadian Forestry Service were: Sweetin River, which had an average of 25% of the foliage infested on 35% of the white spruce trees, and Perow, where there was 30% average infestation on 20% of the trees. Pineus infests both planted and natural stock, although usually planted trees are the preferred host.

Abundant gall formation was reported at Perow and Chapman Lake in 1976, so the B.C. Forest Service initiated a complete survey of all plantations where a preliminary survey had indicated significant damage to the planted trees. B.C. Forest Service data indicated that Pineus was the most common type of damage encountered on the 16 plantations examined in the interior of the District.



Pissodes strobi damage on Sitka spruce.

SPRUCE WEEVIL,
Pissodes strobi

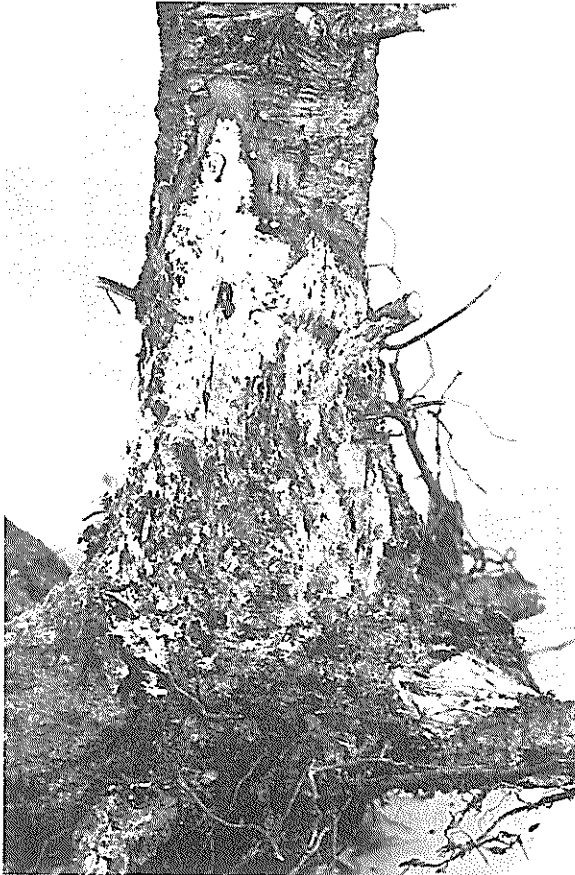
There are 10 permanent spruce weevil plots of 100 marked white spruce trees each in the eastern area of the Prince Rupert Forest District, and they are examined bi-annually for evidence of weevil attack in both natural stands and plantations. Nine of the plots were located and the only new attacks occurred at Glacier Creek where 8% of the trees in the plot were attacked. The other areas: Erickson Seed Production area (Buck Creek Flats), Morice F.D.R., Endako River, Taltapin Lake, Chapman Lake, Telkwa River, McKendrick Creek and Sheedy Creek were not attacked in 1977. In addition to the plot examinations, the roadside was surveyed from a moving vehicle along Highway No. 16 between Smithers and Hazelton; 78 new attacks were noted along the 60 km of highway.

Continued emphasis on the planting of white spruce in the District may lead to spruce weevil becoming a major problem when the plantations are older.

LEAF AND TWIG BLIGHT OF POPLARS,
Venturia macularis, V. populina

Leaf and twig blight were prominent throughout the District on both trembling aspen and black cottonwood. Severe browning of trembling aspen stands surrounding Hazelton and near Kitwanga was caused by V. macularis. On black cottonwood, V. populina was also severe in this area and along the Nass River between Kiteen River and Cranberry Junction. Elsewhere, moderate browning of trembling aspen was observed from Smithers to Quick, along the Perow Burn access road, from Eastman Creek to Kinaskan Lake, and near Iskut along Highway No. 37.

Some refoilation occurred during the summer, but crowns of severely infected trees remained thin during the growing season.



Armillaria mellea (fan-like growth of mycelium).



Camarosporium strobilinum leader damage on white spruce.

ARMILLARIA ROOT ROT, Armillaria mellea

Armillaria root rot was detected in proposed spacing areas of 15-year-old Douglas-fir at Noosgulch and near Firvale in the Bella Coola Valley. A survey of the spacing areas revealed scattered patches of Douglas-fir with chlorotic foliage, heavy pitch flow at the base of the trees and the usual distress crop of cones. A portion of the infected trees had Armillaria fruiting bodies (mushrooms) at their bases.

The root rot spreads from tree to tree by means of root contact. If spacing of Douglas-fir is being considered, an intensive survey should be conducted to determine the presence, extent and intensity of root rot.

BUD NECROSIS, Camarosporium strobilinum

This disease, normally a bud fungus, caused leader dieback on 34% of the white spruce in a 4- to 6 year-old plantation near Division Lake. This same area had 80% infection in 1976. Other plantations infected were Ganokwa Creek, where three areas examined had 64, 44 and 8% infection; Parrott Creek, 39%; Decker Creek, 20%; Whitesail Lake, 20%, and Sam Goosly Lake, 28%. This disease pattern is different from that expected, and the long-term effect on these spruce plantations is not known. However, leader dieback is prevalent enough for concern and continued monitoring is necessary.

SNOW BLIGHT,Lophophacidium hyperboreum

Dieback affected about one-third of the lower branches on 80% of 7- to 13-year-old white spruce on two parts of the Perow Burn and on 85% of 9-year-old spruce at Chapman Lake.

In 1977, the B.C. Forest Service examined 16 plantations in which problems were detected. In the Perow Burn, 21% of the planted trees and 1% of the naturals were infected. Comparable values were: Chapman Lake 43% and 14%; infection in the other 14 plantations in the Interior varied from 0-4%.

WESTERN GALL RUST,Endocronartium harknessii

This rust of lodgepole pine, with its conspicuous galls, continues to infect 12% of trees at mile 8 of the Morice River Development road, 26% at mile 18, and 38% at Bulkley Canyon. Stem galls, the most damaging to the tree as they produce a weakening of the stem, occurred on 6% of the trees at mile 8, 18% at mile 18, and 24% of the trees at Bulkley Canyon.

The above areas were along roadsides, usually in low value trees varying from 5 to 25 years; however, this disease is a potential problem in pine plantations, i.e., an example of E. harknessii damage was collected by the B.C. Forest Service from a plantation along Tagetochlain Lake, indicating that high-value planted trees are susceptible.

STALACTIFORM RUST,Cronartium coleosporioides

This rust of lodgepole pine is often prevalent in reproduction stands, along roadsides and in restocking burns. The rust occurred at the Junction of Francois-Morice lakes roads, where 11% of the pine examined were infected, Bulkley Canyon 10%, and Telkwa Pass 10%. Branch and tree mortality result from girdling; on larger stems, growth loss and deformity are the principal results of infection.

SWEET-FERN BLISTER RUST,Cronartium comptoniae

In a shore pine provenance trial at Chist Creek flats, 3% of 2,580 .5 to 1-metre trees were infected by C. comptoniae. This rust has been found only once before in the Kitimat Valley. Much of the stem rust canker was probably introduced from Cowichan Lake, where the stock originated. The alternate host, Myrica gale, was not found in the vicinity of the plantation.

NEEDLE RUSTS

Rusts infected conifer species throughout the District; some examples collected were: a pine needle cast, Coleosporium asterum, which lightly infected 80% of the roadside lodgepole pine at mile 8 on the Morice River Forest Development road and 50% of the trees at mile 17 of the Telkwa River road. A leaf rust, Melampsora epitea complex, caused light infections on willows at Topley Landing and Taltapin Lake. Fir-fireweed rust, Pucciniastrum epilobii, lightly infected alpine fir at Topley Landing, Chapman Lake, Moricetown and the Nash area. Vaccinium rust, Pucciniastrum goeppertianum, caused light infection on alpine fir at the junction of Morice-Francois lakes roads and at Byman Creek. The aforementioned rusts are not expected to cause any problems in 1978.

A SPRUCE NEEDLE CAST,Lirula macrospora

Up to 100% of the 1- and 2-year-old foliage on immature and mature Sitka spruce was discolored in several inland areas of the Queen Charlotte Islands, particularly in T.F.L. 39 along Deena Creek and near Alliford Bay. Lighter infections were common elsewhere on Graham and Moresby islands. Nearer the coastline, aphid damage was also present.

Light infections were noted east of Atlin Lake for 10 km along O'Donnell Creek where 30% of the foliage on 25% of the white spruce was affected.

Lirula macrospora causes the needles to be prematurely cast.

PORCUPINE DAMAGE

Porcupine feeding on lodgepole pine and western hemlock appears to be increasing in several locations in the District. Continued killing of immature lodgepole pine occurred in scattered pockets of 10 to 100 trees along both sides of the Skeena River from Terrace to Flint Creek. In other areas, small patches of pine mortality and top-killing were observed at Clio Bay south of Kitimat, north of Terrace along Lean-to and Crater creeks, and at Guess and Mooseskin Johnny lakes. Small patches of immature western hemlock were killed near Stewart by porcupine feeding.

CHLORINE INJURY

Nearly all shore pine in a 30-ha swath across Ridley Island turned brick red following a chlorine gas escape from the Canadian Cellulose pulp mill at Port Edward on April 26, 1977. Approximately 50% of the trees examined had dead buds; the remainder had flushed. Shore pine on the island are stunted and have little commercial value. Western red cedar appeared unaffected.

CLIMATIC INJURY, Red Belt

Aerial surveys revealed needle discoloration on lodgepole pine over approximately 1 600 ha near Johnny Lake in the southeast part of the Prince Rupert District. Injury occurs most frequently on south- and west-facing slopes during late winter, when warm winds remove needle moisture which cannot be replaced through still frozen roots and bole. All native conifers may be affected but lodgepole pine is the most susceptible. Damaged trees usually recover.

FROST DAMAGE

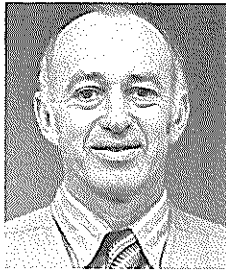
Late frosts in May killed up to 80% of the new shoots on young Sitka spruce and western hemlock in low lying areas of the Kalum and Kitimat River valleys. The most severe damage occurred to Sitka spruce near Alice Creek in the Kalum Block, and to 70 ha of planted spruce and hemlock in the Chist Creek flats south of Terrace. No permanent damage is likely to occur, unless young terminal shoots are killed.

STATUS OF FOREST PESTS IN PACIFIC REGION 1977

PEST	DISTRICTS						
	PRINCE RUPERT	PRINCE GEORGE	VANCOUVER	CARIBOO	KAMLOOPS	NELSON	YUKON
MOUNTAIN PINE BEETLE	Epidemic declining excepting Kitwanga to Dorreen	Infestations around McNaughton L	Widespread infestation Klinakiini R	Widespread infestation throughout District	Widespread infestation throughout District	Infestations throughout District	Not found
SPRUCE BEETLE	Epidemic - Smithers Land-ing area	Outbreaks at Carp and Inzana lakes	Localized attacks Mowhokam Cr	Light, localized attacks Bowron L	Epidemic in Lambly Cr, Bouleau L. area. Increasing elsewhere	Low populations	Low populations Haines Jct.
DOUGLAS-FIR BEETLE	Not found	Populations very low	Light attacks Fraser Canyon, Pemberton, Vancouver I	Light population in trap trees Joes L Road	Infestations near Kamloops and Cache Cr. Increasing elsewhere	Low populations	No host
WESTERN SPRUCE BUDWORM (1-YEAR-CYCLE)	Low populations	Low populations	Extensive infestations Fraser Canyon - Pemberton areas	Moderate population south of Clinton	Heavy defoliation Fraser R -Carpenter L. Decreasing in Shuswap L	Small outbreak near Revelstoke	Low population
SPRUCE BUDWORM (2-YEAR-CYCLE)	Low populations	Moderate population along Holmes R	Not found	Bowron Lakes, MacKay R - Hendrix L moderate	No defoliation noted in off-year	Populations increasing, some defoliation	Not found
WESTERN BLACKHEADED BUDWORM	Minor defoliation Oweegee Cr and Babine L	Low populations	Low populations	Low populations	Blue R infestation near collapse	Generally low. One light outbreak near Kimberley	Low populations
FOREST TENT CATERPILLAR	Not found	Severe defoliation near McBride	Not found	Not found	Infestation near Vavenby and Gosnell	Decrease from 1976	Not found
CONIFER SAWFLIES <i>Neodiprion</i> spp.	Shore pine defoliation Porcher I, Tree mortality Pitt I	High populations east of Prince George	Low populations	Moderate populations	Heavy defoliation Vavenby and near Clearwater L	Generally low	Low population
CONE RUSTS	Poor cone crop - spruces	Not found	Not found	Not found	Not found	Not found	Low incidence southwestern Yukon

Forest District Ranger Assignments - 1978

CARIBOO

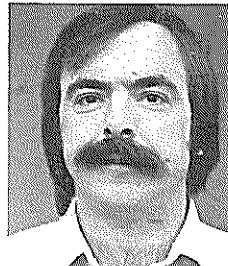


Stan Allen

VANCOUVER



Ernie Morris



Colin Wood

KAMLOOPS



Dick Andrews

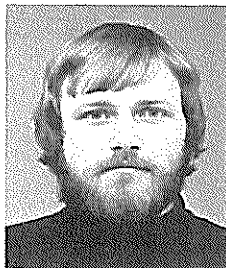


Jack Monts

PRINCE GEORGE & YUKON TERRITORY

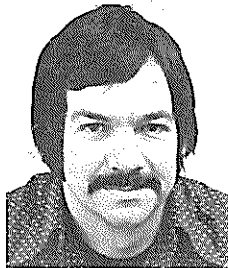


Roly Wood



Leo Unger

PRINCE RUPERT



Don Doidge

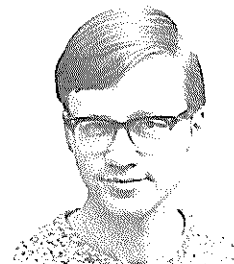


Peter Koot

NELSON



Cliff Cottrell



Bob Erickson

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