FIDS REPORT 84-4

SURVEYS OF EXOTIC PLANTATIONS IN BRITISH COLUMBIA 1956 - 1983

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Forest Insect and Disease Survey

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Introduction

The purpose of this report is to briefly summarize observations of insect and disease problems encountered during 17 years of examination of selected exotic plantations in British Columbia. In this report, "exotic" species include non-indigenous species and native species planted beyond their normal range.

Efforts to find tree species which grow faster than species native to British Columbia, which produce forest products equal or superior in quality to native species and which are resistant to insect and disease pests, led to the establishment of "exotic" plantations in a number of areas in British Columbia.

Purposes for Establishment

The Forest Insect and Disease Survey (FIDS) of the Canadian Forestry Service in cooperation with the British Columbia Ministry of Forests, industry and other organizations, examined plantations for the following purposes:

1. To evaluate the impact of native forest pests on the success of introduced tree species in their new habitat.

2. To document the occurrence and evaluate the impact of native pests as to their potential threat to foreign tree species in their native habitat (carried out in cooperation with the International Union of Forest Research Organization).

3. To check for the introduction of foreign insects or diseases which may have been established in planting stock, although most introduced species were grown from seed in British Columbia nurseries.

Although the establishment of exotic plantations in British Columbia (Appendix 1) began before 1900, most of those included in this report were established in the 1950s (Table 1).

Table. 1. Number and location of exotic plantations established in British Columbia, 1890-1964.

Year established	No. of plantations Coast	Interior	Total
1890-1899	1	0	1
1900-1929	3	3	6
1930-1939	6	0	6
1940-1949	4	0	4
1950-1959	142	30	172
1960-1964	47	17	64
TOTAL	203	50	253

Organizations

There were 22 organizations including industry, federal and provincial agencies, involved in the establishment of exotic plantation trials in the Province (Table 2).

Table 2. Organizations involved in the establishment of exotic plantations in British Columbia, 1890-1964.

Organization	No. of Plantations
B.C. Forest Products	9
B.C. Forest Service (Research Div.)	61
Canada Dept. of Agriculture	5
Canadian Forest Products Ltd.	4
Canadian Forest Service	2
Celgar Ltd.	3
Columbia Cellulose Co.	40
Corp. of District of Mission	1
Crown Zellerbach Ltd.	1
Eagle Lake Sawmills	1
Elk Falls Co. Ltd.	5
Elk River Timber Co.	3
J.H. Jacobsen	1
Kootenay Forest Products	5
MacMillan Bloedel Ltd.	61
McMahon Lumber Co.	2
Powell River Timber Co.	2
S.M. Simpson Ltd.	4
Tahsis Co. Ltd.	8
University of B.C. (Faculty of Forestry)	26
Western Plywoods Ltd.	6
West Tree Farms Ltd.	3
TOTAL	253

Beginning in the 1920s when a plantation was established, information such as the location, size of plantation, date of establishment, species and source of trees planted, the organization and individuals responsible was recorded on a special form (Appendix 2) and forwarded to the B.C. Ministry of Forests (BCMF) in Victoria. Formal cataloguing of exotic plantations, however, began in 1956 cooperatively between the Research Division (BCMF) and Canadian Forestry Service (CFS). At this time companies and universities were canvassed for records and information pertaining to exotic plantations under their supervision or jurisdiction.

CFS-FIDS Surveys, 1956-1983

In 1956, when annual examinations by the FIDS group began, 45 plantations were examined mainly on Vancouver Island and in coastal areas of the mainland. In 1957 the number of plantations examined increased to 64. These included the 45 in the Vancouver Region and an additional 19 at interior locations from Cranbrook to Prince George. Examinations continued between 1957 and 1968, but by 1969 the number of established plantations had increased and due to FIDS staff reductions, only 68 plantations were examined. In 1972, examination of the remaining 64 plantations was rescheduled from an annual examination to a staggered rotation. This reduced to about one-third the number of plantations examined annually:-

Table 3. Schedule of examination of exotic plantations, British Columbia, 1972-74

FIDS District	No. of plantations scheduled for examination			
	1972	1973	1974	Total
Vancouver Island	10	5	8	23
Vancouver Mainland	5	5	6	16
Prince Rupert (West)	6	5	9	20
Cariboo	1	–	–	1
Kamloops	1	–	–	1
Nelson (West)	2	–	–	2
Nelson (East)	1	–	–	1
TOTAL	26	15	23	64

In 1973 budget restraints and an increased FIDS work program resulted in the plantation surveys being discontinued.

Plantations and survey methods

Plantations ranged in size from 0.2 to 24 ha. Examinations by FIDS staff were conducted in late summer when the reaction of the host species to current pest activity, especially insect pests, would be most evident and when specimens may still be present for collection and accurate identification.

Examinations initially consisted of a broad ecological description and checking of a representative number of trees, usually 50 per species per plantation, once each year; however, plantations which had little likelihood of providing useful information because of depletion or poor performance were excluded from the schedule of examinations in 1972. In those plantations retained in the schedule after 1972, all the trees were examined, not just 50.

In this report a plantation was classed as a failure if it had no living trees of the species planted when the last examination was made, or if it had been destroyed or abandoned.

Tree performance

Of all the species planted, the most successful was Larch in the north coastal region (Tables 4 and 5). Both European L. decidua and Japanese larch L. leptolepis performed well with annual leader growth averaging 0.5 to 1 metre. Problems were confined primarily to light snow breakage as the trees reached six metres plus in height.

Of the Scots and red pine (P. sylvestris and P. resinosa) at 45 locations, 42% were failures. These species fared better on the Coast than in the Interior. Near Vancouver, Scots pine grew to 7.5 m in 12 years and to 12 m after 22 years. On Vancouver Island near Courtenay, heights of from 2.4 to 3 m were recorded after 18 years despite initial damage from deer browsing. Near Quesnel, the average annual leader growth of Scots pine was 27.5 cm, with heights of more than 2 m after 7 years. Further north near Chetwynd annual growth was up to 50 cm, while in the south near Yahk it was from 25 to 30 cm with a height of 1.8 m in 8 years.

Red pine had similar growth patterns, on the Coast attaining heights of from 3 to 4.5 m in 16 years. Unfortunately, two of the three plantations of red pine in the Interior failed because of drought shortly after planting.

Bishop pine, P. muricata and Monterey pine, P. radiata were the fastest growing pines, attaining up to 7 and 5 metres in 8 years, respectively. However, both species were severely infected by a needle disease, Scirrhia pini, and a rust, Cronartium comptoniae, which destroyed 9 of 12 Monterey pine plots and killed up to 16% of the Bishop pines.

Poplar plantations were the most numerous with more than 100 varieties planted at 44 coastal and six interior sites. Height growth records for hybrid poplars at coastal sites included: Herrling Island, 9 m in 12 years; Terrace, 12 m in 8 years; Sproat Lake, 6 m in 8 years and at Lakelse River, 6 m in 7 years. In the Interior, hybrid poplars at Marblehead near Kootenay Lake grew to 9 m in 12 years. Although some exotic tree species did show a favourable growth response, none exhibited qualities superior to native species.

Table 4. Performance of exotic trees, British Columbia, 1956-83.

Tree Species	Region	No. of plantations	Age at last examination	Tree performance
CONIFERS				
Abies concolor white fir	S. coast	1	14	overgrown 5 yrs - 0.3 m
	N. Interior	1	10	7 yrs - 0.6 m
A. grandis grand fir	N. coast	2	6-17	7 yrs - 1 m max 0.3 m per yr
		2	Failed	
A. lasiocarpa alpine fir	S. coast	1	17	N.A.
A. magnifica Shasta fir	S. coast	1	16	5 yrs - 0.5 m 16 yrs - max 0.2 m
		2		Failed
A. procera Noble fir	S. coast	1	-	Failed
A. siberica Siberian fir	S. coast	1		Failed
Chamaecyparis lawsoniana Port Orford cedar	S. coast	5	12-19	6 yrs - 1 m 11 yrs - 4 m
Cunninghamia konishii China-fir (Formosa)	S. coast	1		Failed
C. lanceolata China-fir (China)	S. coast	1		Failed
Larix gmelini Dahurian larch	S. coast	3	13-36	8 yrs - 8 m 30 yrs - 20 m
L. decidua European larch	S. coast	12	10-23	6 yrs - 2.5 m 15 yrs - 9 m 23 yrs - 13 m
		5		Failed
	N. coast	5	6-14	slow start, followed by 0.5 to 1 m growth per year 10 yrs - 3-5 m
	Cariboo	2	-	Failed
	Okanagan	2	-	Failed
	Kootenay	2	6-8	6 yrs - 1-2 m
	Kootenay	5	-	Failed

Tree Species	Region	No. of plantations	Age at last examination	Tree performance
L. leptolepis Japanese larch	S. coast	3	15-32	8 yrs - 5 m 30 yrs - 18 m
	N. coast	3	6-11	after 3-4 yrs annual growth 0.5 to 1 m
L. occidentalis Western larch	S. coast	1		Failed
	Okanagan	1		Failed
L. siberica Siberian larch	S. coast	1		Failed
	N. Interior	1		Failed
Larch hybrids primarily	S. coast	3	9-13	good growth equal to D-fir
	N. coast	6		Failed
L. eurolepis	N. coast	1	13	7 yrs - 0.3 m after 7 yrs .7 m annual growth
Libocedrus formosana Incense cedar	S. coast	1		Failed
Matesequoia Dawn redwood	S. coast	1		Failed
Ormasia formosana Necklace tree	S. coast	1		Failed
Picea abies Norway spruce	S. coast	6	14-21	3 yrs - 0.5 m 10 yrs - 1 m
	N. Interior	1	12	7 yrs - max 2.5 m
		1		Failed
P. albicaulis Whitebark pine	S. coast	1		Failed
P. cembra Swiss stone pine	N. Interior	1		Failed
P. engelmannii Engelmann spruce	S. coast	1	17	poor growth due to competition
		3		Failed
P. glauca white spruce	S. coast	3	6-36	6 yrs - 0.5-1 m 11 yrs - 3 m
		3		Failed
	N. coast	1	10	slow growth
P. koriensis Korean pine	S. coast	2		Failed

Tree Species	Region	No. of plantations	Age at last examination	Tree performance
P. kosteriana Koster spruce	N. Interior	1	-	Failed
P. lambertiana	S. coast	2	-	Failed
sugar pine	S. coast	1	-	Failed
P. mariana black spruce	S. coast	1	13	1 yr max 1 m
P. mugo mountain pine	N. Interior	1	-	Failed
P. omorika	S. coast	1	10	10 yrs - 1 m
Serbian spruce		2		Failed
P. pungens Colorado spruce	S. coast	1	-	Failed
P. sitchensis	Kootenay	3	3-7	severe competition 0.2 m annual growth
Sitka spruce				
P. taiwanensis	S. coast	1	-	Failed
Pinus banksiana	S. coast	1	17	3 yrs - 1 m
jack pine	N. Interior	1	-	Failed
P. latifolia contorta lodgepole pine	S. coast	1	36	23 yrs - 7 m
P. densiflora	S. coast	1	12	growing strongly
Japanese red pine		2	-	Failed
	Cariboo	1	-	Failed
P. echinata shortleaf pine	S. coast	2	5/8	2 yrs - 0.5 m
P. flexilis limber pine	S. coast	2	11	growing well
P. griffithii Himalayan pine	S. coast	2	11	growing well
P. jeffreyi	S. coast	1	4	up to 0.8 m annual growth
Jeffrey pine		2	-	Failed
P. muricata	S. coast	10	8-13	3 yrs - 1.2 m
Bishop pine				7 yrs - 7 m
		1	-	Failed

Tree Species	Region	No. of plantations	Age at last examination	Tree peformance
P. murrayana X banksiana jack pine	S. coast	2	8/13	7 yrs - 3 m
		1		Failed
P. nigra Austrian pine	S. coast	11	4-12	3 yrs - 2.5 m
				7 yrs - 3.2 m
P. nigra poiretiana Corsican pine	S. coast	1	15	8 yrs - 2 m
				15 yrs - 6 m
P. pinaster cluster pine	S. coast	20	4-13	3 yrs - 1 m
				7 yrs - 2 m
		5		Failed
	Cariboo	1		Failed
P. ponderosa yellow pine	S. coast	6	10-38	7 yrs - 2-4 m
				27 yrs - 12 m
		5		Failed
	N. coast	2	9/13	13 yrs - 4-6 m
		1		Failed
P. radiata Monterey pine	S. coast	16	2-14	3 yrs - 1 m
				8 yrs - 5 m
		5		Failed
P. resinosa red pine	S. coast	18	4-30	8 yrs - 2 m
				15 yrs - 4 m
				25 yrs - 8 m
		7		Failed
	N. coast	2	9/12	5 yrs - 2 m
	Okanagan	1	-	9 yrs - 3-4 m
	Cariboo	1		Failed
	N. Interior	1		Failed
P. rigidataeda pitch/loblolly pine	S. coast	2	7/13	N.A.
		1		Failed
P. strobus eastern white pine	S. coast	2	12	N.A.
		3		Failed
	N. Interior	1		Failed

Tree Species	Region	No. of plantations	Age at last examinations	Tree performance
P. sylvestris Scots pine	S. coast	14	12-33	generally poor form 6 yrs - 1-2 m 15 yrs - 5 m max 8 m 22 yrs - 7 max 13 m
		5		Failed
	N. coast	1	7	7 yrs - 4 m
	N. Interior	3	13-15	7 yrs - 2 m 14 yrs - 4 m
		2		Failed
	Cariboo	1	12	4 yrs - to 2 m after 8 yrs - 0.3 to 0.5 m annually
		2		Failed
	Okanagan	2	38	32 yrs - 10 m
		2		Failed
	Kootenay	1	12	10 yrs - 2 m
		5		Failed
P. thunbergii Japanese black pine	S. coast	2	13	7 yrs - 2.5 m
	Cariboo	1		Failed
Pseudotsuga forestii (P. wilsoniana)	S. coast	1	2	N.A.
P. macrocarpa Bigcone D-fir	S. coast	1	7	N.A.
		1		Failed
P. menziesii Douglas-fir	S. coast (interior D-fir)	1	17	overgrown 5 yrs - 1 m
		3		Failed
	N. coast (interior D-fir)	3	10-14	7 yrs - max 2 m 14 yrs - 9 m
	N. coast (coast D-fir)	5	6-14	3 yrs - 1 m
P. sinensis (China)	S. coast	1	7	N.A.
P. wilsoniana (China)	S. coast	1	12	N.A.

Tree Species	Region	No. of plantations	Age at last examinations	Tree performance
Sequoia sempervirens redwood	S. coast	1	31	N.A.
		1		Failed
Sequoidendron giganteum, big tree	S. coast	1	35	35 yrs - 15-25 m
Tsuga sieboldii (Japan)	S. coast	1	12	N.A.
		1		Failed
Ts. mertensiana	"	1 (1958 Squamish)		
Thuja occidentalis Northern white cedar	S. coast	1		Failed
HARDWOODS				
Populus 'Grandis' canadensis	S. coast	2	6/14	5 yrs - 8 m
	N. coast	1	11	11 yrs - 13 m
P. 'Robusta', Bachelieri	S. coast	2	6/14	5 yrs - 10 m
P. berolinensis	S. coast	1	-	Inferior
P. 'Eugenei'	S. coast	1	-	Inferior
P. euramericana	S. coast	1	-	Inferior
P. 'Issendorf'	S. coast	1	-	Inferior
P. 'Robusta'	S. coast	6	-	Inferior
P. 'Robusta Issendorf'	N. coast	4	-	Inferior
P. 'Regenerata'	S/N coast	12	-	Inferior
P. tremula X tremuloides	S. coast	2	-	Inferior

Other hardwoods planted, but with no specific record of growth included: Acer spp.; Aesculus hyprocastanum; Betula spp.; Carya ovata; Castanea sativa; Catalpa speciosa; Eucalyptus gigantea; Fagus spp.; Fraxinus spp.; Gleditsia spp.; Juglans spp.; Nothofagus spp.; Quercus spp.; Robinia pseudoacacia; Prunus serotina; Salix spp.; Tilia americanus; Ulnus spp.

Of the 253 plantations and more than 40 tree species, 203 were in coastal locations of which nearly 25% were classed as failures (Table 5). In the Interior, 76% of the 50 plantations established failed. Generally, 35% of all plantations were recorded as failures but it should be noted that the project was terminated before any of the exotic species reached maturity and had it been continued, the end result would probably be changed. Some followup examinations in 1984 are planned to determine long term performance.

Table 5. Success and failure of exotic tree plantations in Coastal and Interior British Columbia.

	Tree Species	No. of Plantations			
		Coast		Interior	
		Success	Failure	Success	Failure
CONIFERS					
Abies concolor (Gord.) Engelm.	White fir	0		1	1
A. grandis (Dougl.) Lindl.	Grand fir	2	0	0	
A. lasiocarpa var. *arizonica* (Merr.) Lemm.	Arizona fir	0		1	0
A. magnifica A. Murr	Red (Shasta) fir	1	0	0	
Abies spp.	(mixed)	1	1	0	
TOTAL		4	1	2	1
L. decidua Mill.	European larch	11	0	9	8
Larix leptolepis (Sieb. & Zucc.) Gord.	Japanese larch	4	0	0	0
Larix spp.	(hybrids)	3	1	0	0
Larix spp.	(mixed)	6	1	2	2
TOTAL		24	2	11	10
P. abies (L.) Karst	Norway spruce	2	0	1	1
P. engelmannii Parry	Engelmann spruce	0		1	1
P. glauca (Moench) Voss	White spruce	4	1	0	
P. sitchensis (Bong.) Carr	Sitka spruce	0		3	0
TOTAL		6	1	5	2
P. banksiana Lamb.	Jack pine	1	0	0	0
P. contorta Dougl.	Lodgepole pine	1	0	0	0
P. densiflora Sieb. & Zucc.	Japanese red pine	0	0	1	1
P. echinata Mill.	Shortleaf pine	1	1	0	1
P. muricata D. Don	Bishop pine	1	0	0	0
P. nigra Arnold	Austrian pine	4	0	0	
P. nigra var. *poiretiana* (Ant.) Aschers. & Graebn.	Corsican pine	7	0	0	0
P. pinaster Ait.	Cluster (Maritime) pine	5	2	1	1

Tree Species	Tree Species	No. of Plantations			
		Coast		Interior	
		Success	Failure	Success	Failure
P. ponderosa Laws.	Yellow pine	6	0	0	0
P. radiata D. Don	Monterey pine	4	3	0	0
P. resinosa Ait.	Red pine	17	3	3	2
P. strobus L.	Northern white pine	1	1	0	0
P. sylvestris L.	Scots pine	10	3	15	12
P. thunbergii Parl.	Japanese black pine	0	0	1	1
P. spp.	(mixed)	20	7	0	0
P. spp.	(with Eucalyptus)	1	1	0	0
TOTAL		79	21	21	17
P. menziesii (Mirb.) Franco	Douglas-fir	11	7	0	
P. macrocarpa (Vasey) Mayr	Big cone Douglas-fir	1	1	0	
TOTAL		12	8	0	
Chamaecyparis lawsoniana (A. Murr.) Parl.	Port Orford cedar	4	1	0	
Sequoia sempervirens (Lamb.) Endl.	Redwood	1	1	0	
Tsuga sieboldii Carr.	Japanese hemlock	1	1	0	
Formosan conifers		1	1	0	
Conifers	(with hardwoods)	5	0	0	
Conifers	(mixed)	14	4	2	1
DECIDUOUS TREES					
Acer saccharinum L.	Silver maple	0		1	1
A. pseudoplatanus L.	Sycamore maple	2	0	0	
TOTAL		2	0	1	1
Quercus robus L.	English oak	2	0	0	
Quercus coccinea Muenchh.	Scarlet oak	1	0	0	
TOTAL		3	0	0	
OTHER DECIDUOUS TREES					
Betula pendula Roth	European birch	1	0	1	
Fagus sp.	Beech	0	0	0	
Fraxinus excelsior L.	European ash	1	0	0	
Populus spp.	Poplars	44	7	6	4
Ulmus americana L.	White elm	0		1	1
	mixed deciduous	6	2	1	1
TOTAL		53	9	8	6
TOTAL ALL SPECIES		203	50	50	38

Pest conditions

Insect and disease pests recorded during plantation examinations were common (Tables 6 and 7).

Problems common to many plantations were diverse, including: rodents and herbivores damage, frost, snow, suppression by native plants and flooding. Flooding occurred mostly at Interior locations where planting sites were often located close to fast-flowing waterways subject to increased flow during spring thawing of heavy snowpack.

Most of the failures in interior plantations were caused by drought or frost which occurred within 6 years of planting; near Cranbrook, drought killed all the Scots pine seedlings in one year. One plantation on Martin Mountain survived for 38 years during which time Scots pine grew to 22.5 cm diameter and 13.5 m high. The plantation was finally abandoned because mountain pine beetles, porcupines and root rot, probably Phellinus weirii, had killed all but a few trees.

There were no records of exotic pests in poplar plantations, neither was there evidence of resistance to native pests.

Table 6. Insect and disease pests most frequently recorded in exotic plantations in British Columbia.

Organisms	Host(s)	Remarks
Adelges cooleyi Spruce gall aphid	Douglas-fir, white spruce	Caused the clear-cutting and removal of 5 plantations in Terrace area.
Altica ambiens Alder flea beetle	poplar	Light defoliation at one plantation for one year.
Armillaria mellea Root rot	mixed poplars, Port Orford cedar	Common in plantations subject to flooding, up to 25% of trees infected.
Atropellis piniphila Stem canker	red, lodgepole, ponderosa pines	Present in both Coastal and Interior sites; infecting up to 12% of trees.
Cryptosporium sp. Canker disease	mixed poplars	Recorded at 11% of Coastal plantations, affecting up to 24% of trees.
Cronartium comptoniae Sweetfern blister rust	Monterey, red, lodgepole, Bishop pines	Infected 95% of trees at one location.

Organisms	Host(s)	Remarks
Cytospora sp. Canker disease	mixed poplars	From 8 to 70% of trees infected at two plantations.
Hemichroa crocea Alder sawfly	poplar	Light defoliation at one plantation for one year.
Lophodermium pinastri A needle disease	mixed pines	Light to moderate infection on 2-70% of trees at 7 locations.
Melampsora spp. Needle rust	Douglas-fir	Severe infection on all new growth on 90% to 100% of trees at two plantations.
Melanconium sp. Branch canker	poplar	Undocumented intensity at one Coastal plantation.
Pikonema alaskensis Yellowheaded spruce sawfly	white spruce	From 20 to 90% of new foliage lost at one plantation for two consecutive years.
Pissodes strobi Spruce weevil	Norway spruce	Light damage at two Interior plantations.
Sclerophoma sp. A canker disease	Douglas-fir	Undocumented intensity at six plantations.
Scirrhia pini Red band needle disease	red, Bishop, Monterey, cluster pines	Infection on 99% of trees examined at one plantation.
Sydowia polyspora Dieback	poplar	Recorded on 18% of trees at one plantation.
Taphrina populina Yellowleaf blister	poplar	Light infection at one plantation.
Vespamima sequoiae Pitch moth	red, lodgepole, jack, Scots, Corsican, Monterey, ponderosa, Bishop pines	Recorded at three plantations with severe tree mortality at one.

Table 7. Pests and conditions of Exotic Tree Species, British Columbia, 1956-1983.

Tree species	Region	No. of plantations	Age at last examination	Pests
CONIFERS				
Abies concolor white fir	S. coast	1	14	Healthy
		4		Failed
	N. Interior	1	10	Healthy
A. grandis grand fir	N. coast	2	6-17	Healthy
		4		Failed
A. lasiocarpa alpine fir	S. coast	1	17	Healthy
A. magnifica Shasta fir	S. coast	1	16	Healthy
		2		Failed
A. procera	S. coast	1		Failed
Noble fir	N. coast	1		Failed
A. siberica Siberian fir	S. coast	1		Failed
Chamaecyparis lawsoniana Port Orford cedar	S. coast	5	12-19	*Phytophthora* sp. - destroyed most of 1 plot Snow/climatic injury, severe in two plots
Cunninghamia konishii	S. coast	1		Failed
C. lanceolata	S. coast	1		Failed
Larix gmelini Dahurian larch	S. coast	3	13-36	Stem cankers-42% in plot Snow damage - bent & sweeping leaders
L. decidua European larch	S. coast	12	10-23	Snow damage - 10 to 60% of trees in 4 plots Stem cankers - 15% in 1 plot *Armillaria mellea* - 2 + 10% mortality, 2 plots

Tree species	Region	No. of plantations	Age at last examination	Pests
L. decidua European larch	S. coast	5		Failed
	N. coast	5	6-14	Snow damage - light in most plots leading to multi tops
	Cariboo	2		Failed
	Okanagan	2		Failed
	Kootenay	2	6/8	Browse-50% early mortality
		5		Failed
L. leptolepis Japanese larch	S. coast	3	15-32	Sun scald - when brushed Stem cankers - 84% of trees in 1 plot
	N. coast	3	6-11	Snow damage - light in all plots some stem deformation
L. occidentalis Western larch	S. coast	1		Failed
	Okanagan	1		Failed
L. siberica Siberian larch	S. coast	1		Failed
	N. Interior	1		Failed
Larch hybrids primarily L. eurolepis	S. coast	3	9-13	Snow damage-50-90% of trees severely trees severely bent
	N. coast	1	13	Healthy
Libocedrus formosana Incense cedar	S. coast	1		Failed
Metasequoia Dawn redwood	S. coast	1		Failed
Ormosia formosana Necklace tree	S. coast	1		Failed
Picea abies Norway spruce	S. coast	6	14-21	Pissodes strobi - 6-10% of leaders in 3 plots Adelges cooleyi - 50/-75% of tips in 2 plots Frost - late frost killed 35 & 65% of tips in 2 plots

Tree species	Region	No. of plantations	Age at last examination	Pests
Picea abies Norway spruce	N. Interior	1	12	Healthy
		1		Failed
P. engelmannii Engelmann spruce	S. coast	1	17	P. strobi - 20% of leaders killed
		3		Failed
P. glauca white spruce	S. coast	3	6-36	A. cooleyi - 65% of trees mod. 1 plot
		3		Failed
	N. coast	1	10	Pikonema sp. - severely defoliated
P. kosteriana Koster spruce	N. Interior	1		Failed
P. mariana black spruce	S. coast	1	13	Healthy
P. omorika Serbian spruce	S. coast	1	10	Snow press - slight
		3		Failed
P. pungens Colorado spruce	S. coast	1		Failed
P. sitchensis Sitka spruce	Kootenay	3	3-7	Severe competition
Pinus albicaulis whitebark pine	S. coast	1		Failed
P. banksiana jack pine	S. coast	1	17	Snow damage - 15% mortality
	N. Interior	1		Failed
P. cembra Swiss stone pine	N. Interior	1		Failed
P. contorta latifolia lodgepole pine	S. coast	1	36	Endocronartium harknessii - severe all trees Cronartium comptoniae - severe 80% of trees Atropellis piniphila - severe 40% of trees mortality from above 50% @ 36 yrs

Tree species	Region	No. of plantations	Age at last examination	Pests
P. densiflora Japanese red pine	S. coast	1	12	Healthy
		2		Failed
		1		Failed
P. echinata shortleaf pine	S. coast	2	5/8	Healthy
P. flexilis limber pine	S. coast	2	11	Healthy - not infected by Cronartium ribicola, present in adjacent stands
P. griffithii Himalayan pine	S. coast	2	11	Healthy - not infected by C. ribicola, present in adjacent stands
P. jeffreyi Jeffrey pine	S. coast	1	4	Healthy
		2		Failed
P. koriensis Korean pine	S. coast	2		Failed
P. lambertiana sugar pine	S. coast	2		Failed
	S. coast	1		Failed
P. mugo mountain pine	N. Interior	1		Failed
P. muricata Bishop pine	S. coast	10	8-13	Scirrhia pini - 5-16% mortality in 5 of 11 plots C. comptoniae - avg. 17% infection in 6 plots occasional mortality snow breakage - 40% in 1 plot
		1		Failed
P. murrayana X banksiana jack pine	S. coast	2	8/13	Scirrhia pini - severe Endocronartium harknessii-severe
		1		Failed

Tree species	Region	No. of plantations	Age at last examination	Pests
P. nigra Austrian pine	S. coast	11	4–12	Scirrhia pini - severe in 1 plot, 5% mortality Lophodermium pinastri - light to severe in 4 of 11 plots, 5% mortality Snow damage - 20–40% stem breakage, 3 plots
P. nigra X poiretiana Corsican pine	S. coast	1	15	L. pinastri - light damage E. harknessii - light damage
P. pinaster cluster pine	S. coast	20	4–13	Scirrhia pini - mod/sev. in 10 plots 40 + 90% mortality in 2 plots Armillaria mellea - 5–14% mortality, 3 plots Snow breakage - over 50% in 12 plots
		5		Failed
	Cariboo	1		Failed
P. ponderosa yellow pine	S. coast	6	10–38	Vespamima sequoiae - mod. in 50% of plots Atropellis piniphila - 2 plots, 14 and 10% of trees. Snow breakage - 2 plots, 14 and 50% of trees.
		5		Failed
	N. coast	2	9/13	Healthy
		1		Failed
P. radiata Monterey pine	S. coast	16	2–14	Scirrhia pini - severe in 12 plots; over 90% mortality in 9 plots C. comptoniae - severe in 9 plots 25–60% mortality in 3 plots Armillaria mellea - 25% mortality in 1 plot Snow breakage - severe stem breakage 1 plot
		5		Failed

Tree species	Region	No. of plantations	Age at last examination	Pests
P. resinosa red pine	S. coast	18	4–30	Snow breakage – 10–40% in 6 plots L. pinastri – severe 3 plots, 30% mortality in 1 plot A. mellea – 4 to 15% mortality in 4 plots Browse – severe in most plots
		7		Failed
	N. coast	2	9–12	Snow breakage – initial years, recovered (Healthy in 1983)
	Okanagan	1		Failed
	Cariboo	1		Failed
	N. Interior	1		Failed
P. rigidataeda pitch/loblolly pine	S. coast	2	7/13	Armillaria mellea – 5% mortality
		1		Failed
P. strobus eastern white pine	S. coast	2	12	Healthy – C. ribicola present in adjacent stands
		3		Failed
	N. Interior	1		Failed
P. sylvestris Scots pine	S. coast	14	12–33	Snow breakage – 40% in 5 plots; to 20% mortality L. pinastri – severe in 3 plots E. harknessii – 5–15% in 3 plots
		5		Failed
	N. coast	1	7	Healthy
	N. Interior	3	13–15	Climatic caused leader mortality 60%
		2		Failed
	Cariboo	1	12	E. harknessii – 15% infection multileaders – 60%
		2		Failed

Tree species	Region	No. of plantations	Age at last examination	Pests
P. sylvestris Scots pine	Okanagan	2	38	Mountain pine beetle - destroyed plots
		2		Failed
	Kootenay	1	12	Drought - severe mortality @ 10 yrs.
		5		Failed
P. taiwanensis Formosa pine	S. coast	1		Failed
P. thunbergii Japanese black pine	S. coast	2	13	Healthy
	Cariboo	1		Failed
Pseudotsuga forestii (Formosa)	S. coast	1	2	Healthy
P. macrocarpa Bigcone D-fir	S. coast	1	7	Stem cankers - light
		1		Failed
P. menziesii Douglas-fir	S. coast (interior D-fir)	1	17	Healthy
		3		Failed
	N. coast (interior D-fir)	3	10-14	*Adelges cooleyi* - 25/50% of tips in 2 plots *Melampsora* spp. severe in 2 plots Snow damage - severe dieback 2 plots
	N. coast (coastal D-fir)	5	6-14	*A. cooleyi* - all plots cut down due to severe damage *Melampsora* spp. severe in 1 plot
P. sinensis (China)	S. coast	1	7	*Rhabdocline pseudotsugae* - severe
P. wilsoniana (China)	S. coast	1	12	*Rhabdocline pseudotsugae* - severe
Sequoia sempervirens redwood	S. coast	1	31	winterkill of tops severe
		1		Failed

Tree species	Region	No. of plantations	Age at last examination	Pests
Sequoidendron giganteum big tree	S. coast	1	35	Healthy
Thuja occidentalis Northern white cedar	S. coast	1		Failed
Tsuga sieboldii (China)	S. coast	1	12	Physiological needle cast
		1		Failed
HARDWOODS				
Populus berolinensis	S. coast	1		Cytospora dieback; competition
P. 'eugenei'	S. coast	1		Cytospora dieback; competition
P. euramericana	S. coast	1		Cytospora dieback; competition
Populus 'grandis' X canadensis	S. coast	2	6/14	Cytospora sp., dieback light wind damage - severe on open trees
	N. coast	1	11	Cytospora sp., dieback light
P. 'Regenerata'	S/N. coast	12		Cytospora sp., dieback
P. 'Issendorf'	S. coast	1		Cytospora sp.; dieback
P. 'Robusta'	S. coast	6		Cytospora sp.; dieback
P. 'Robusta Bachelieri'	S. coast	2	6/14	Cytospora sp., dieback light
P. 'Robusta Issendorf'	N. coast	4		Cytospora sp.; dieback
P. tremula X tremuloides	S. coast	2		Cytospora sp.; dieback

Other hardwoods planted, but no specie fir record of pests included: Acer spp.; Aesculus hippocastanum; Betula spp.; Carya ovata; Castanea sativa; Catalpa speciosa; Eucalyptus gigantea; Fagus spp.; Fraxinus spp.; Gleditsia spp.; Juglaus spp.; Nothofugus spp.

References Cited

Boyce, J.S. 1941. Exotic trees and disease. Journ. For. 39:907-913.

Molnar, A.C. and E.H. Garman. 1958. Introduction of exotic trees to British Columbia. B.C. Lumberman. March. 2 pp.

Molnar, A.C. and R.C. Howard. 1949. Diseases of exotic plantations on Vancouver Island. Unpubl. Rept., Lab. of For. Path., Victoria, B.C. 5 pp.

Molnar, A.C. 1961. An outbreak of Cronartium comptoniae on monterey and bishop pines on Vancouver Island. Plant Dis. Rep. 45:11.

~~APPENDIX I List of Exotic Plantations in British Columbia (available on request)~~

APPENDIX I

INTRODUCED SPECIES IN B.C.

Information for Forest Service Records. (Please return to Research Division, B.C. Forest Service, Victoria, B.C. One form for each plantation, or area seeded, with exotic trees.)

1. Name of organization growing this species _____

_____

2. Name or number of plot _____

3. Location of plot _____

4. Area of plot _____

5. Plantation or seeded? _____

6. Date of planting or sowing _____

7. Stock used:

   (a) Species and number per acre _____

   (b) Where was stock raised? _____

   (c) Type and age (transplants, seed, or cuttings) _____

   _____

   (d) Source of seed _____

   (e) Provenance or native habitat of seed _____

8. Management: plot burned or cleared; plantation cleaned, pruned, thinned or otherwise treated _____

_____

_____

9. Who is in charge of plot? _____

10. Is there a local employee acquainted with location of plot? _____

_____

_____

For Forest Service Use
Project No. 483, file No. 0211584
" reference number
Date received:

No. 2

Appendix 1

EXOTIC PLANTATIONS IN BRITISH COLUMBIA

XP #	Location	Trees		Area (ha)	Seed Source	Year		Condition
		Species	No. planted			Established	Last examined	
1	Shawnigan Lake	Pinus resinosa	5000	2.4	Ontario	1954	1970	Poor
2	Nanaimo River	" "	"	"	"	"	"	Good
3	Tsable River	" "	"	"	"	"	1971	"
4	Northwest Bay	" "	-	2.8	"	"	"	"
5	Elsie Lake Road	" "	5000	"	"	"	"	30% of trees damaged
6	Nanaimo Lakes	" "	"	2.0	"	1955	"	" " " "
7	Copper Canyon	" "	"	2.4	"	"	1973	92% " " "
8	Nanaimo River	P. pinaster	500	0.2	England	"	1969	Abandoned
9	" "	P. radiata	"	"	New Zealand	"	1956	"
10	Northwest Bay	20 spp. hardwoods	-	0.68	Ontario	1948	1968	Browsed to ground level
11	Craig Creek (Northwest Bay)	"	-	0.36	"	"	1957	Abandoned
12	Powell River	Conifers - 9 spp. Hardwoods - 19 spp.	-	1.2	Ontario & Saskatchewan	1949	1968	Diseased
13	Tsolum River	P. sylvestris	-	12.0	Sweden	1951	1973	1 to 6 m high
14	" "	Picea abies	1000	0.4	"	"	1971	-
15	" "	Pinus sylvestris	-	7.88	"	1951 & 52	1973	Dominant trees 9 m high
16	missing records		-	-	-	-	-	-
17	Tsolum River	Chamaecyparis lawsoniana	-	0.3	Oregon	1953	1971	Growth uneven
18	" "	Picea abies Pinus sylvestris Abies alba	3600+	0.24	Sweden	"	"	Deer damage to 40% of Scots pine
19	Echo Lake (Campbell River)	Chamaecyparis lawsoniana	-	-	-	1963	Abandoned	
20	Pitt Meadows	Populus regenerata	1300	1.8	Germany	1955	1970	Healthy

Appendix 1

EXOTIC PLANTATIONS IN BRITISH COLUMBIA

XP #	Location	Trees		Area (ha)	Seed Source	Year		Condition
		Species	No. planted			Established	Last examined	
21	Woss Camp	Conifers - 9 spp.	-	-	"	1953	1957	Abandoned
22	" "	Pinus sylvestris	-	-	"	"	1963	Destroyed
23	Nimpkish River	Conifers - 4 spp.	-	-	Sweden, Germany	"	1957	Abandoned
24	" "	" 10 spp.	-	-	" "	"	1967	Few remaining
25	Echo Lake (Campbell River)	Pinus ponderosa	2500	1.44	Interior B.C.	1933	1971	Poor
26	John Hart Lake	P. sylvestris with Douglas-fir	2000	-	Belgium	1939	"	"
27	Quinsam Lake	P. contorta latifolia	4350	3.04	Burns Lake	1933	1969	"
28	Cowichan Lake	Larix decidua	2225	0.4	Czechoslovakia	1951	1973	Deer browse common
29	Robertson River	Picea abies P. glauca Pinus strobus	350	0.8	Quebec	1954	1968	24 trees remaining
30	Sutton Creek	P. sylvestris	750	-	-	1953	1970	Suppressed
31	" "	Picea glauca	350	-	-	"	1963	Good shape
32	" "	Pinus resinosa	"	-	-	"	1970	Good form
33	" "	P. banksiana	150	-	-	"	"	Poor
34	Campbell River	P. ponderosa	-	3.48	Interior B.C.	1933	1969	"
35	" "	Picea abies	1200	-	-	1953	1968	Competition
36	" "	Quercus coccinea	225	-	-	1952	1970	Good
37	" "	Q. robur	130	-	-	1953	"	Suppressed
38	" "	Pinus resinosa	25	-	-	"	1968	Abandoned
39	Silverdale	P. resinosa P. sylvestris	150 "	1.6	-	1956	1959	"
40	Suicide Creek (Mission)	P. resinosa P. sylvestris	50	0.4 to 0.8	-	"	"	"

Appendix 1

EXOTIC PLANTATIONS IN BRITISH COLUMBIA

XP #	Location	Trees		Area (ha)	Seed Source	Year		Condition
		Species	No. planted			Established	Last examined	
41	Garibaldi Park	Pinus - 4 spp. Picea - 1 sp. Sequoia - 1 sp. Larix - 2 spp. Fraximus - 1 sp. Ulmus - 1 sp. Quercus - 1 sp. Acer - 1 sp.	2241	1.2	-	1927	1971	Very poor
42	Thames Creek	Pinus resinosa	25	-	Ontario	1953	1970	Poor
43	Green Timbers	P. sylvestris	12000	5.6	Belgium	1939	1971	"
44	" "	" "	-	1.6	-	1956	"	Trees dead
45	" "	P. resinosa	-	2.0	Ontario	1942	"	Overcrowded
46	" "	Quercus robur	-	0.48	-	1936	1970	Healthy
47	Agassiz Exp. Farm	mixed hardwoods and pines	-	2.0	-	1892	1967	"
48	Ucluelet	Chamaecyparis lawsoniana	-	0.4	Oregon	1955	1970	Not located
49	Cottonwood Cr. (Fraser R.)	Populus regenerata	8500	"	Germany	"	1962	Abandoned
50	Aleza Lake	Pinus sylvestris	-	-	-	-	1971	Suppressed
51	Progress	P. sylvestris	-	1.3	-	1954	1973	No trees located
52	Herrling Island	Populus regenerata	9000	24.0	Germany	1956	1967	Windthrown
53	Renfrew	Chamaecyparis lawsoniana	-	-	Oregon	1955	1966	Good
54	Robertson River	Picea glauca	100	-	-	1954	1958	Abandoned
55	" "	Pinus strobus	300	-	Quebec	"	1957	"
56	Salmon River	P. resinosa	4050	2.0	-	1951	1973	Excellent
57	" "	Larix decidua	1800	0.4	Czechoslovakia	"	"	Good
58	Lois Lake (Powell River)	Sequoia sempervirens	417	0.24	-	1925	1962	Abandoned

Appendix 1

EXOTIC PLANTATIONS IN BRITISH COLUMBIA

XP #	Location	Trees		Area (ha)	Seed Source	Year		Condition
		Species	No. planted			Established	Last examined	
59	Douglas L. Rd.	Pinus, Larix, Picea	-	-	-	mid-1920's	1962	Abandoned
60	" " "	Ulmus americana	-	-	-	" "	"	"
61	Squamish	L. decidua Metasequoia Tsuga mertensiana	12 6 1	-	-	-	1958	"
62	Pritchard	Pinus sylvestris	62	.028	Ontario	1924	1962	"
63	Youbou	P. ponderosa	500	-	Heffley Cr.	1956	1968	Suppressed
64	Tahsis Valley	Populus maximowiczii X berolinensis	400	-	-	"	1957	Abandoned
65	Gold River	P. berolinensis			Denmark	1957	1971	Poor
66	" "	Populus eucalyptus	-	-	"	"	1969	Destroyed
67	" "	P. robusta	-	-	"	"	1959	Abandoned
68	" "	Larix decidua	-	-	"	"	1968	Good
69	Prince George	Pinus sylvestris	-	.066	Germany	1953	1967	Destroyed
70	Quesnel	Picea abies	-	0.66	"	"	1968	"
71	"	P. engelmannii	-	"	Arizona	"	"	"
72	"	Abies concolor	-	"	Colorado	"	"	"
73	Skidegate Inlet	Pseudotsuga menziesii	4	-	-	1929	1962	Abandoned
74	Ash River	Pinus - 9 spp.	-	1.5	-	1956	1970	Snow damaged
75	Harmac	Pinus, Picea Chamaecyparis, Larix	-	1.28	-	"	1968	Drought damaged
76	"	Fugus, Quercus, Carya, Robinia, Eucalyptus, Populus	-	1.28	-	"	"	Healthy
77	Green Timbers	Pinus resinosa	-	-	-	1957	1970	Suppressed
78	Duncan	P. pinaster P. radiata	-	-	Portugal & New Zealand	1956	1960	Abandoned

Appendix 1

EXOTIC PLANTATIONS IN BRITISH COLUMBIA

XP #	Location	Trees		Area (ha)	Seed Source	Year		Condition
		Species	No. planted			Established	Last examined	
79	Duncan	*Pseudotsuga macrocarpa*	-	-	California	1957	1960	Abandoned
80	"	*Tsuga siebaldii*	-	-	Japan	"	"	"
81	"	5 species of Formosan conifers	-	-	"	"	1959	"
82	"	*Pinus* - 7 spp. *Abies* - 2 spp. *Sequoia* - 1 sp.	-	-	-	-	-	"
83	Tahsis	*Larix decidua*	500	-	Germany	1957	1969	Good
84	"	*Populus tremula* X *tremuloides*	-	-	Denmark	"	1968	Healthy
85	"	*P. regenerata*	-	-	-	"	"	Severe dieback
86	Cowichan	*Aesculus hippocastanum*	48	0.16	England	"	1970	Trees dead
87	"	*Castanea sativa* *Platanus* sp.	79 31	"	"	"	1968 "	Healthy
88	"	*Quercus* prob. *robur* *Platanus* sp.	82 28	1.6	"	"	"	Healthy
89	"	*Fraxinus excelsior*	120	"	"	"	"	"
90	"	*Nothofagus procera* *N. obliqua*	110	0.16	Chile, S.A.	"	"	Diseased
91	"	*Acer pseudoplatanus*	"	1.6	England	"	"	Light insect damage
92	Haney	*Larix leptolepis*	220	0.192	-	1956	1972	Good
93	"	*L. eurolepis* *L. decidua*	" "	"	-	"	"	Very good
94.	"	*L. eurolepis* *L. decidua*	24	0.16	-	"	"	Diseased
95	"	*L. leptolepis*	240	0.08	-	"	1971	Snow damage
96	"	*Abies magnifica*	300	0.1	California	"	"	Healthy

Appendix 1

EXOTIC PLANTATIONS IN BRITISH COLUMBIA

XP #	Location	Trees		Area (ha)	Seed Source	Year		Condition
		Species	No. planted			Established	Last examined	
97	Haney	*Pinus n. poiretiana*	150	0.06	England	1956	1972	Good
98	"	*Pseudotsuga menziesii* *Pinus sylvestris* *Picea abies* *Betula verrucosa*	800	0.4	Germany	1953	1971	Snow damage
99	"	*Pinus sylvestris* in mix	"	"	"	"	"	Diseased
100	"	*Picea abies* in mix	"	"	"	"	"	Insect damage
101	"	*Betula vernucosa* *B. pendula*	"	"	"	"	1970	Snow damage
102	"	*Populus eugenei*	100	0.08	Ontario	1956	1968	Good
103	"	*P. regenerata* *P. X canadensis*	"	"	"	"	"	"
104	"	*P. c. regenerata*	55	0.1	-	1957	1970	Healthy
105	"	*P. regenerata*	50	0.06	-	"	"	4 trees
106	"	*Pinus resinosa*	600	0.32	-	"	1971	Snow damage
107	"	*Populus* spp.	-	0.4		"	1970	Good
108	"	*P. grandis*	60	-	-	"	"	"
109	"	*P. robusta* var. *bachelieri*	180	-	-	"	"	"
110	"	*P. issendorf*	52	-	-	"	"	"
111	"	*P. regenerata*	108	-	-	"	"	Healthy
112	Kennedy R. Rd.	*Pinus radiata* *P. muricata* *P. pinaster*	640 600 1320	4.8	New Zealand and England	1958	1971	Poor
113	Clinton	*P. sylvestris*	95	-	Poland	1957	1963	Abandoned
114	"	*P. resinosa*	95	-	-	"	1962	"

Appendix 1

EXOTIC PLANTATIONS IN BRITISH COLUMBIA

XP #	Location	Trees: Species	No. planted	Area (ha)	Seed Source	Year: Established	Year: Last examined	Condition
115	Clinton	P. pinaster	12	-	Spain	1957	1960	Abandoned
116	"	Larix decidua	50	-	Germany	"	"	"
117	Prince George	Pinus sylvestris P. cembra P. strobus P. resinosa Larix sibinica Picea excelsa	-	-	-	-	1971	Healthy
118	" "	Populus deltoides Ulmus americana U. pumila U. laciniala Betula papynifera	-	-	-	1946-53	1960	Abandoned
119	Clinton	Larix decidua	100	0.16	Austria	1958	"	"
120	"	Pinus thunbergii	15	"	Japan	"	"	"
121	"	P. densiflora	"	"	"	"	"	"
122	"	P. sylvestris	280	0.36	Ontario	"	"	"
123	Terrace	Abies grandis A. procera P. monticola P. ponderosa Picea pungens Pseudotsuga menziesii		0.6	-	"	1966	Healthy
124	"	Populus regenerata P. r. grandis P. robusta bachelierii P. robusta issendorf	-	0.6	-	1957	1965	Mortality
125	"	Pseudotsuga menziesii	1700	1.2	Campbell River	"	1966	Eradicated
126	"	" " (Coastal)	2800	1.44	Great Central Lake, V.I.	1958	1971	"

Appendix 1

EXOTIC PLANTATIONS IN BRITISH COLUMBIA

XP #	Location	Trees		Area (ha)	Seed Source	Year		Condition
		Species	No. planted			Established	Last examined	
127	Terrace	Pseudotsuga menziesii (Interior)	370	0.12	B.C.	1957	1970	Good
128	"	" "	1000	1.48	Shuswap	1958	1968	Fair
129	"	Larix decidua	700	0.52	E. Germany	"	1971	Good
130	"	L. leptolepis	900	1.08	-	"	1972	"
131	"	Hybrid larch	450	0.64	-	"	1968	"
132	"	Larix decidua	-	0.16	Austria	"	1970	"
133	"	Populus regenerata P. r. grandis P. r. bachelierii P. r. issendorf	40 " " "	0.4	Germany	"	1971	Suppressed
134	Babine Lake Rd.	Pinus sylvestris	2500	-	Ontario	1957	1963	No trees found
135	Giscome	Acer saccharinum	-	0.04	"	1951	1966	Cancelled
136	Cranbrook	Larix decidua	350	0.4	-	1958	1962	Abandoned
137	"	Pinus sylvestris	5500	3.12	Ontario	"	"	"
138	"	" "	5000	1.2	"	"	1959	"
139	"	Larix decidua	"	4.4	Austria	"	1962	"
140	"	Pinus sylvestris	300	0.4	Ontario	"	"	"
141	"	" "	3200	2.0	"	1957	"	"
142	"	Larix decidua	100	0.4	Austria	"	"	"
143	"	Pinus sylvestris	"	"	Ontario	1956	1969	Competition
144	Terrace	P. resinosa	85	"	-	1959	1968	Good
145	"	Populus regenerata P. regenerata var. grandis P. robusta var. issendorf	10	0.16	probably Germany	"	"	"

Appendix 1

EXOTIC PLANTATIONS IN BRITISH COLUMBIA

XP #	Location	Trees		Area (ha)	Seed Source	Year		Condition
		Species	No. planted			Established	Last examined	
146	Terrace	Pseudotsuga menziesii (Interior)	3000	1.84	E. Kootenay	1959	1968	Insect damaged
147	"	Picea glauca	1000	0.52	Prince George	"	"	" "
148	"	Pinus ponderosa	-	0.04	Salmon Arm	1957	1971	Good
149	Cranbrook	Larix decidua	3175	0.2	Austria	1959	1965	Severe browsing
150	"	" "	-	-	-	"	1962	Abandoned
151	Alberni	Pinus radiata P. muricata P. pinaster	800 400 800	2.4	New Zealand and England	1960	1968	Poor
152	Cowichan	Larix europaea	1000	-	-	1958	1971	Good
153	"	Pinus muricata	200	-	-	"	"	Poor
154	"	P. radiata	"	-	-	"	1966	8 trees
155	"	P. pinaster	175	-	-	"	1968	Failed
156	Renfrew	Populus spp.	1200	-	-	1959	1961	Abandoned
157	Cowichan	Larix decidua L. leptolepis	500 "	0.8	-	"	-	Not located
158	Alberni	Pinus radiata P. muricata P. pinaster	1760 500 1400	4.0	New Zealand and England	1958	1968	Very poor
159	Cowichan	Larix decidua L. leptolepis Larix sp. (hybrid)	500 " "	-	-	1959	1971	Poor
160	Terrace	Pseudotsuga menziesii	270	0.16	Tatlayoko L.	"	"	Cut out
161	"	" "	4000	2.6	Bella Coola	"	"	" "
162	Haney	" "	-	0.192	Washington Oregon Colorado Interior B.C.	1956	1970	Good