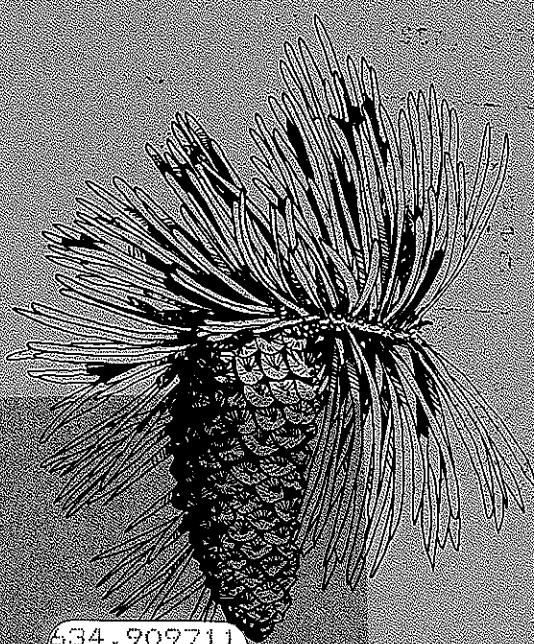


SEED PLANNING ZONES AND TRANSFER GUIDELINES FOR INTERIOR SPRUCE AND LODGEPOLE PINE



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INTRODUCTION

After determining the best species to plant on a site, the next most important decision to be made by the silviculturist is the choice of an appropriate provenance. Knowing the extent to which seed may be transferred and still produce a well-adapted plantation is necessary to make that decision. As our knowledge of forest communities, ecosystems, provenance and progeny testing improves, decisions for restocking sites can be made more intelligently. Planting seedlings of the most suitable species, and provenance, will help ensure adaptability and optimum utilization of the site's growth potential.

This pamphlet is designed to assist silviculture staff in selecting and specifying the most appropriate seedlots for reforestation.

BACKGROUND INFORMATION

As adequate supporting data has not been available until recently, seed transfer in the past represented a conservative approach — local seed was considered "safest," and seed transfer was limited. In 1974, fifty-one seed zones were established within broad biogeoclimatic regions (as defined by Krajina, 1972) with boundaries representing a compromise between biological and administrative zones.

A number of provenance tests of both interior spruce and lodgepole pine had been established by Research Branch during the mid-1960s and the early 1970s. In 1983, it was felt that those trials were old enough to provide information useful to the revision of seed zones and seed transfer rules. Accordingly a task group, consisting of representatives from both government and industry, was appointed to review seed zones and transfer rules for interior spruce and lodgepole pine.

The task group commenced its review of interior spruce early in 1983. An internal report, entitled, "An Evaluation of Interior Spruce Seed Zones and Seed Transfer Rules Based on Genological, Provenance and Progeny Test Results," by Barry Jaquish, Gyula Kiss and Cheng Ying guided the task group in the review

process. This report is based on the results of 17-year-old (from seed) provenance trials in the Prince Rupert and Prince George Forest Regions and from the results of 9-year-old wind pollinated progeny tests, distributed throughout the interior. In addition, a field examination was made of the spruce provenance test at Quick, near Smithers.

Lodgepole pine provenance test results were reviewed in 1984. A report entitled, "Geographic Variation in Lodgepole Pine and its Implications for Tree Improvement in British Columbia" by Cheng Ying, Keith Illingworth and Mike Carlson served as a reference to the task group. As well, Research Branch's all-range Lodgepole Pine Provenance Test E.P. 657.06 provided invaluable information. The task group visited 4 lodgepole pine provenance test sites in the Prince George Region and 7 in the Nelson Region.

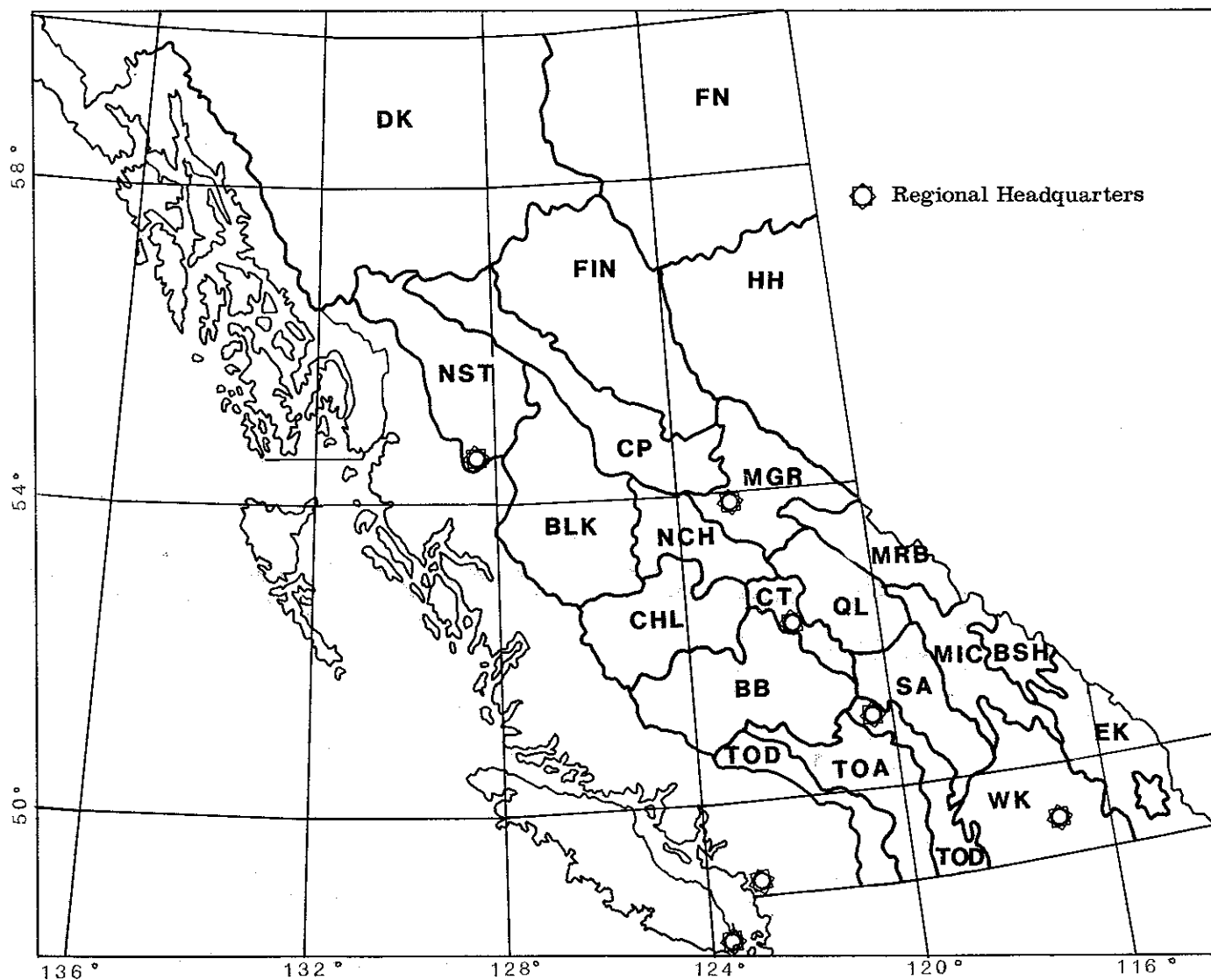
After reviewing the above reports and the provenance and progeny test results, and after visiting the sites, the task group found that certain general patterns existed. From these, it was apparent that Interior Spruce and Lodgepole Pine seed could be safely transferred beyond the limits previously recognized.

The following points summarize the task group's conclusions of all the data available:

1. The local provenance is not always the best in terms of growth.
2. Growth performance is improved when seed is transferred
 - a) upwards in elevation from source, rather than downwards, and
 - b) from south to north in latitude, rather than north to south.
3. Fixed-boundary seed zones used in conjunction with floating transfer principles will improve biological safety and also increase administrative flexibility in regulating seed movement.
4. Superior provenances have been identified for both interior spruce and interior lodgepole pine.
5. Seed planning zones and transfer guidelines should be reviewed at 5-year intervals.

INTERIOR SPRUCE AND LODGEPOLE PINE SEED PLANNING ZONES

- | | |
|-------------------------|------------------------------|
| (BB) Big Bar | (MIC) Mica |
| (BLK) Bulkley | (MGR) McGregor |
| (BSH) Bush | (MRB) Mt. Robson |
| (CHL) Chilcotin | (NCH) Nechako |
| (CP) Central Plateau | (NST) Nass-Skeena Transition |
| (CT) Cariboo Transition | (QL) Quesnel Lake |
| (DK) Dease-Klappan | (SA) Shuswap Adams |
| (EK) East Kootenay | (TOA) Thompson Okanagan Arid |
| (FIN) Finlay | (TOD) Thompson Okanagan Dry |
| (FN) Ft. Nelson | (WK) West Kootenay |
| (HH) Hudson Hope | |



SEED PLANNING ZONES AND TRANSFER RULES FOR INTERIOR SPRUCE AND INTERIOR LODGEPOLE PINE

Seed Planning Zones (map page 2) have been delineated according to the pattern of geographical variation exhibited by provenance performance in field tests, and their boundaries correspond, more or less, to biogeoclimatic subzones and will be continuously adjusted as ecological classification progresses.

Seed may be moved within the seed planning zones as follows:

INTERIOR SPRUCE

TEST DATA RECOMMENDS MAXIMUM
TRANSFER FROM SOURCE

LATITUDE south to north rather than north to south	2° south to north 1° north to south	
LONGITUDE east to west rather than west to east	5° east to west 2° west to east	
ELEVATION — upward in elevation rather than downward. Decrease elevational transfer with increase in latitude, as follows:		
LATITUDE	UPWARDS	DOWNWARDS
58°—60°N	100 m	50 m
56°—58°N	200 m	100 m
53°—56°N	300 m	100 m
49°—56°N	300 m	100 m
49°—53°N*	400 m	200 m

*(Nelson only)

Seed may be transferred across a planning zone boundary provided the above transfer rules are followed and movement is within the same biogeoclimatic zone.

INTERIOR LODGEPOLE PINE

TEST DATA RECOMMENDS MAXIMUM TRANSFER FROM SOURCE		
LATITUDE south to north rather than north to south		2° south to north 1° north to south
LONGITUDE east to west (seed sources with coast- al genetic influ- ences grow poorly at interior sites)		3° east to west 2° west to east
ELEVATION — upward in elevation rather than downward as follows:		
LATITUDE	UPWARDS	DOWNWARDS
56°—60°N	100 m	50 m
49°—56°N	300 m	100 m

In the interior cedar-hemlock (ICH) subzones, local low elevation provenances should be utilized. (Test results indicate that higher elevation provenances planted at lower elevations are highly susceptible to needle cast disease infection.)

In some instances, seed may be transferred between planning zones (e.g. — moist zone into wet) if the above constraints are observed.

NOTES

1. The revised seed planning zones and transfer rules reflect the information gained from reviewing provenance and progeny test results.
2. Some precautionary notes regarding this data are in order. During the review of seed transfer rules, the following shortcomings of the data were recognized:
 - relatively juvenile data even at 17 years;
 - inadequate early site maintenance of the test sites; and an
 - inadequate number of provenances and test sites overall, interior spruce in particular.
3. When in doubt, biogeoclimatic zone boundaries or major geographic boundaries should not be crossed (e.g. Coast Range and/or Rocky Mountain Ranges) and avoid moving seeds from dry biogeoclimatic zones into moist or wet zones and vice versa.
4. Local experience may dictate use of more conservative transfer rules than indicated in (2) above, especially when checking with snow belt areas and cool north aspects. For example, light snow belt seed sources should not be used in heavy snow belt areas.
5. Consult the tree breeder or provenance forester for the species in question concerning any specific questions about transfer of seed or seedlings for reforestation.

TRANSFERRING SEED

INTERIOR SPRUCE EXAMPLE:

A hypothetical provenance from latitude 52°, longitude 119° and elevation 1000 metres may be used within the following geographic range:

- latitude 52° to 54°
- longitude 117° to 124°
- and the new elevation may be between 900 and 1300 metres (800 and 1400 metres, Nelson only)

LODGEPOLE PINE EXAMPLE:

A hypothetical provenance from latitude 52°, longitude 119° and elevation 1000 metres may be used within the following geographic range:

- latitude 51° to 54°
- longitude 117° to 122°
- and the new elevation may be between 900 and 1300 metres

GOOD PROVENANCE AREAS

During the revision of seed planning zones and transfer rules, a number of superior interior spruce and interior lodgepole pine provenances were identified.

To capitalize on the existence of the superior provenances listed on page 5, it is recommended that:

- i) Special effort be made to collect extra quantities of seeds (ie. in addition to normal operational needs in these areas).
- ii) The number of parent trees from these outstanding seed source areas be increased.
- iii) Seed stands be reserved in these areas.
- iv) Seeds from (i) be used to either:
 - a) establish operational trial plantings to expand on present juvenile provenance test results. The trials located in major planting areas in the interior should be approximately (10+ ha), and must contain a "control" (local seedlot). The latitudinal transfer of these plantations may be extended up to 3° of latitude from source; or,
 - b) initiate new cooperative reciprocal provenance trials using these provenances as well as additional prospective good seed sources to provide additional "in-depth" data for improving seed transfer guidelines.

INTERIOR SPRUCE (map page 6)

The juvenile (17 year old) provenance test results for interior spruce indicate that outstanding provenances are located along the dry-wet belt transition area. Based on provenance test sites in the vicinity of Prince George, Smithers and in the vicinity of Germansen Landing north of Fort St. James, the following four provenances consistently performed very well and were in the top 10 in terms of height at each test site:

Location	Elevation	Latitude	Longitude	BGC ¹ Zone	SPZ ²
Horsefly	670 m	52°-25'	121°-25'	SBS	CT
Birch Island	425 m	51°-37'	119°-30'	IDF	SA
McGillvary Lk.	1280 m	50°-52'	119°-50'	ICH-ESSF	SA
Fly Hills	1280 m	50°-42'	119°-30'	ICH	SA

LODGEPOLE PINE (map page 7)

Based on 12 — 14 year data from the family plantation at Red Rock and from the E.P. 657 test sites, a number of Lodgepole pine provenances emerge as being well above average in terms of growth and resistance to disease, regardless of planting location. These provenances are listed below:

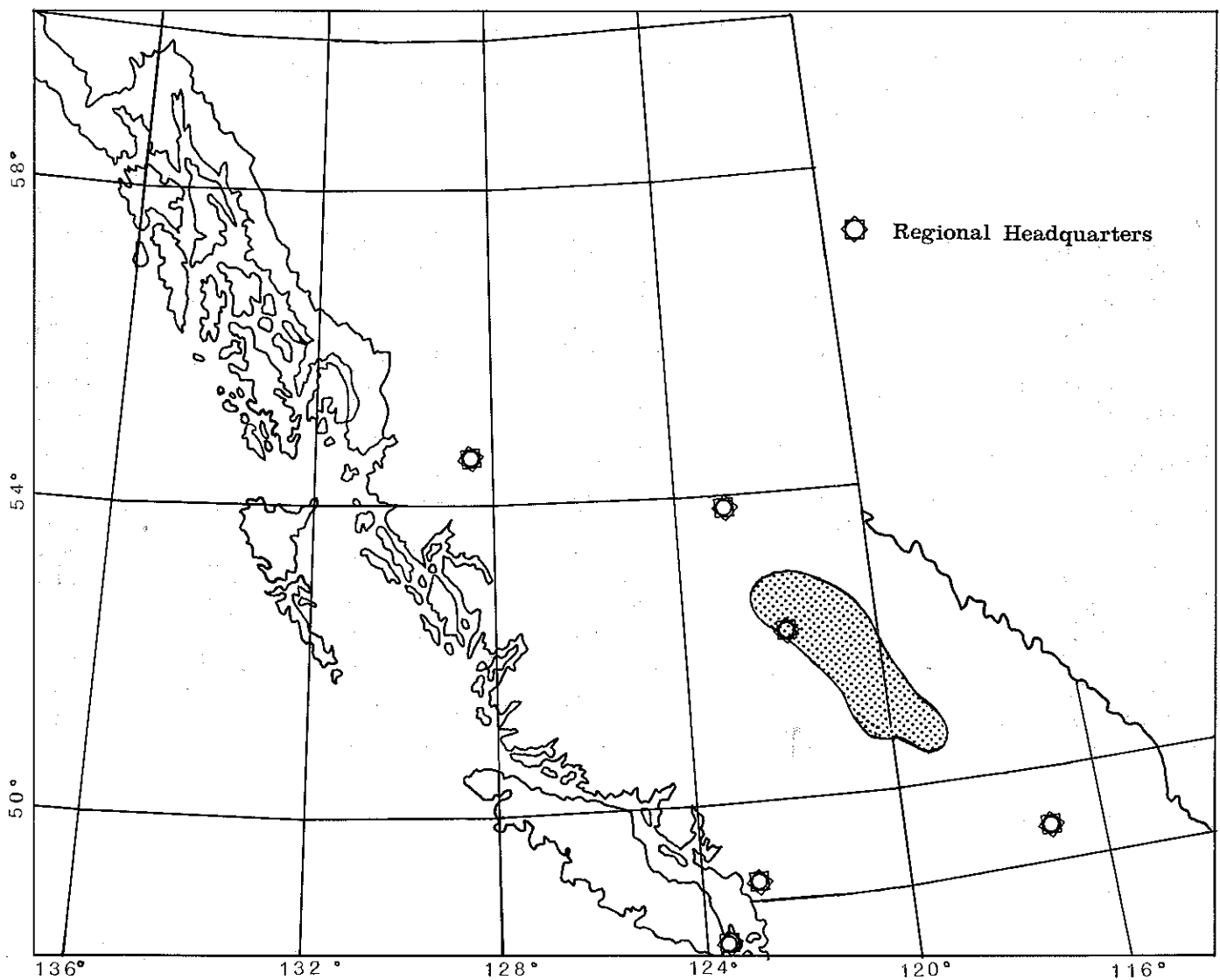
Location	Elevation	Latitude	Longitude	BGC ¹ Zone	SPZ ²
Finlay Forks	686 m	55°-57'	123°-48'	SBS	FIN
Telkwa Low	518 m	54°-39'	127°-03'	SBSd	BLK
Nechako	732 m	54°-01'	124°-32'	SBSd	NCH
Lynx Lake	823 m	53°-39'	122°-58'	SBSb	NCH
Purden	838 m	53°-52'	121°-48'	ESSFn	MGR
Bowron River	671 m	53°-54'	122°-00'	SBSjl	MGR
Udy Creek	983 m	53°-01'	123°-14'	SBSsc	NCH
Beaver River	762 m	52°-40'	122°-10'	—	CT
Puntchesakut	914 m	52°-58'	122°-40'	—	NCH
Oie Lake	991 m	52°-00'	121°-12'	SBSb	CT
Marl Creek	945 m	51°-31'	117°-11'	ICHa2	BSH
Cartwright	1173 m	50°-49'	116°-26'	MSa	EKA
Wentworth Ck.	1059 m	50°-58'	120°-20'	IDFd	TOD
Larch Hills	777 m	50°-42'	119°-11'	IDFj2	SA
Cherryville	670 m	50°-13'	118°-33'	—	SA
Bisson Lake	1137 m	50°-02'	118°-34'	ICHa2	WK
Inonoaklin R.	579 m	49°-54'	118°-12'	ICHa1	WK
Champion Lks.	998 m	49°-11'	117°-35'	ICHa2	WK

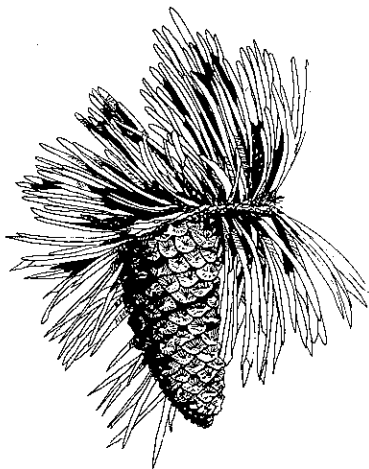
¹BGC Zone = Biogeoclimatic Zone

²SPZ = Seed Planning Zone



GENERAL LOCATION OF BEST PROVENANCES OF INTERIOR SPRUCE





GENERAL LOCATION OF BEST PROVENANCES OF LODGEPOLE PINE

