LODGEPOLE PINE SUPERIOR TREE SELECTION PROJECT

Comparison Tree Method

General Information and Guidelines

Tree Improvement Centre
Smoky Lake, Alberta
Technical Report GTIC 91-12

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LODGEPOLE PINE SUPERIOR TREE SELECTION PROJECT

General Information and Guidelines

This package provides information, guidelines and standards for superior tree selection project planning. It is organized into four sections with tally sheets and forms added in the APPENDIX.

*** Section 1 General Information for Superior Tree Cruising**

- This section provides an overview of project objectives, stand and tree selection methodology and documentation

*** Section 2 Candidate Stand Requirements and Superior Tree Selection Guidelines**

- This section is the main reference for "Candidate Stand" requirements and methodology and criteria for "Superior Tree" selection

*** Section 3 Guidelines for Field Collection of Wood Samples, Scions, and Cones**

- This section outlines procedures and requirements for collection of wood density samples, scions, and cones after the selected tree has been felled

*** Section 4 Guidelines for Writing Superior Tree Project Reports**

- This section describes the format and and desired content of reports to be submitted to Genetics and Tree Improvement Section

APPENDIX

Lodgepole Pine Potential Superior Stand Cruising Form
Lodgepole Pine Candidate Superior Stand Cruising Form
Priorized Candidate Stand List
Equipment List
Superior Lodgepole Pine Code Sheet
Superior Parent Tree Data Form

Lodgepole Pine Superior Tree Selection Project

SECTION 1

General Information for Superior Tree Cruising

LODGEPOLE PINE SUPERIOR TREE SELECTION PROJECT

General Information for Superior Tree Cruising

1.0 Listing of "Candidate" Stands for Cruising

There are several possible sources which may be used to compile a list of potential stands from which Candidate stands may be chosen.

- Request to the districts for a list of superior stands based on their local knowledge.

- Computer search of forest inventory records (e.g. AVI, Phase 3) for potential lodgepole pine stands i.e. C and D density, 3 and greater height class.

- Records of information from previous cruises or forest inventories.

Ideally, a thorough superior stand cruise project should be completed during the planning phase of a superior tree selection project. This will require two field cruises rather than one, however, when enough lead time exists and it is done as part of operational work it makes the actual selection project much more efficient by eliminating stands without potential eg. to old, logged, poor phenotypic traits, inaccessible etc.

PRIORITIZED CANDIDATE STAND FORM

Forest: Bow/Crow Date: 86/11/10

Stand#	Priority	Location	Access	Remarks
66	1	10-11-27-6	Road	D3Pl
09	4	7-6-27-5	Road	D3Pl
52	8	13-11-27-6	Road winter quad summer	C4Pl
63	5	6-32-26-5	Road permission required	C4Pl(Aw)
35	6	16-4-27-5	Quad	C3PlSw
114	9	1-9-27-5	Quad	C3PlSw
117	11	8-32-27-5	Quad	B4Pl
135	2	11-9-27-5	Road	C3SwPl
147	13	4-36-26-6	Helicopter	C3SwPlAw
16	3	15-12-28-6	Road	C4Pl
17	7	13-35-27-5	Road	C4Pl
210	10	14-31-27-5	Helicopter	B3Pl
211	12	16-31-27-5	Helicopter	C3Pl

LODGEPOLE PINE POTENTIAL SUPERIOR STAND CRUISING FORM

Stand # 137 Legal Location: LS 6-24-030-07-W5

Access: All weather road

I. Visual checks to be made prior to filling out "Lodgepole Pine Candidate Stand Cruising Form" (maybe from air, ground, or a combination of air photo and ground survey)

1)	Is the stand in the "planting zone" (± 50 miles)?	Y	or	N
2)	Is the stand within elevational limits (± 500')?	Y	or	N
3)	Is the stand greater than or equal to 5 ha?	Y	or	N
4)	Is the stand well stocked (C or D density)?	Y	or	N
5)	Is the stand pure or predominantly lodgepole pine?	Y	Or	N
6)	Do most of the trees show good leader growth?	Y	Or	N
7)	Does the stand lack 'wolf' or bushy trees?	Y	Or	N
8)	Does the stand have a collectable cone crop?	Y	Or	N

If any of the preceding questions were answered with a no, reject stand as a "Candidate Superior Stand"

Comments: Dense healthy mature stand; good leaders, visible cones

II. Checks to be made in stand if all Section I responses were yes

1)	Are 5% or fewer trees forked?	Y	Or	N
2)	Do at least 70% of trees lack crooks or sweeps?	Y	Or	N
3)	Do the majority of trees have branches attached perpendicular or nearly perpendicular to the bole?	Y	Or	N
4)	Do majority of trees exhibit fine branching?	Y	Or	N
5)	Is the stand relatively disease free?	Y	Or	N
6)	Does the stand generally show good natural pruning?	Y	Or	N

Comments: ~5% trees forked

III. If the answer was yes to the preceding questions determine the following for two randomly chosen, actively growing Pl dominants

Tree#	DBH AGE (cm)	Total Height (m)	Ht/Age	DBH (cm)	Radial Increment	
					1-10	11-20
1	83	23.3	28.1	23.2	0.7	1.0
2	74	20.2	27.3	21.6	0.6	1.0

If the Ht/Age ratio for one or both is greater than 30 cm/yr for trees 40-70 years, 25 cm/yr for trees 71-100 years, or 20 cm/year for trees 101-130 years, fill out a Lodgepole Pine Candidate Superior Stand Cruising Form

LODGEPOLE PINE CANDIDATE SUPERIOR STAND CRUISING FORM

1) Phase III Stand Description for candidate stand:
   a) Timber type: C3P
   b) Stand number: 137
   c) Area: 37.4 ha

2) Ground Survey:
   a) legal location (exact): LS 6-24-030-07-W5
   b) elevation (m): 1470
   c) Aspect: Flat
   d) slope (%): 0
   e) landform/topography: Flat terrace
   f) stand access (road, helicopter, trike, etc): All weather road
   g) stand composition

	species	%
major	Pl	90
minor	Sw	8
minor	Sb	2

   h) estimated number of lodgepole pine stems/ha: 550
   i) ground truthed timber type of stand: D4 Pl (Sw/Sb)
   j) biogeoclimatic subzone: SBSDC subzone
      site type: Pl Sw Alder Dry phase
   k) additional comments: v-good form 80% of trees; dense, healthy & vigorous

3) Observations on Lodgeople Pine Only:
   Age-class distribution:

Class	% of Trees
Overmature (100+)	0
Mature (70-100)	100
Immature to mature (40-70)	0

4) Focusing only on Mature Age-class of Lodgepole pine:
   a) General observations (circle yes or no)
      i) are the trees generally straight stemmed? Y or N
      ii) stand lacks "wolf" or bushy crowned trees? Y or N
      iii) do the trees have pronounced leader growth? Y or N
   b) sample tree data – from 5 randomly chosen dominant trees spread throughout the stand:

				Radial Increment (cm)	
Tree#	BH Age (yrs)	Height (m)	DBH (cm)	Last 10 yrs	Last 11-20 yrs
1	83	21.4	23.5	0.9	0.8
2	86	23.0	28.6	0.9	1.1
3	86	21.6	26.4	0.8	0.9

6) Cone Crop Status of Lodgepole Pine Good Fair Poor

7) Lodgepole Pine Superior Stand # _____

NOTE: Superior stand # to be given only after a review and short listing of a sufficient number of candidate stands has occurred.

Once The Information is collected on the "Lodgepole Pine Potential and Candidate Superior Stand Cruising Forms" a prioritized list of candidate superior stands can be compiled quickly in the office based on location, access, and potential of the stand to provide a selectable tree.

Example "Lodgepole Pine Potential and Candidate Superior Stand Cruising Forms" and "Prioritized Candidate Stand List" are attached (see Appendix).

If lead time does not allow for full execution of these steps, prioritization of potential stands on the "Prioritized Candidate Stand List" using whatever information is available should still improve the efficiency of the Superior Tree Cruise.

Detailed guidelines for stand selection are contained in Section 2.

1.1 Cruising for Superior Trees

The cruise will consist of a systematic search for superior trees.

Selected superior trees must have the following characteristics:

- Very good to excellent form.
- Good leader growth (at least 15 cm in the current year).
- Height/age ratio must:
- Exceed 25 cm per year wherever possible.
- Must exceed the height/age ratios of at least two of the comparison dominants (preferably all three).
- The last ten years diameter growth should generally not indicate any rapid slowing in growth over last 11-20 years diameter growth.
- Have a relatively slender crown and thin branches.
- Branches attached to the stem as near to perpendicular as possible.
- Not be crooked or forked (even at base)
- Must be free from any apparent disease or defects.

1.2 Quick-check to Confirm Tree has Superior Potential

When a tree has been found which looks superior:

- Confirm height, age and height/age ratio (age here is defined as Dbh ring count).

- Ascertain that it has good leader growth.

- Ascertain that it is free from disease and defect.

1.3 Documenting and Marking of a Superior Tree

- If it passes the preliminary quick-check, the tree should be documented and described completely on the "Parent Tree Selection Form" using the attached "Superior Lodgepole Pine Code Sheet".

- This also involves picking three comparison trees that are the tallest 'dominants' within a 50 metre radius of the select tree and documenting each of them. Note that comparison 'dominant' trees are to come from the same age class category as the selected superior tree.

- The tree should be given a field number until the unique identifier and clonal number is assigned after scion collection. Unique numbers can be made using the management unit, year of selection, and tree number, eg. G10-90-1 and is to be marked in the upper right corner of the "Parent Tree Selection Form". Each selected tree should be numbered consecutively to the end of the project. This field number is important as it prevents confusing trees from different projects.

- A completed "Parent Tree Selection Form" from an earlier project is attached for guidance.

- The superior tree and comparison dominants are marked with orange and blue paint. The comparison dominants are marked '1', '2' and '3' in orange paint. The superior tree is marked 'S' in orange paint with a band of orange above and blue below. Two coats should be applied as these trees will have to be located again in the future for scion and cone collections.

- Finally, the superior tree should be photographed from a couple of different angles to illustrate it for permanent pedigree records.

Parent Tree Selection Form - Wild Stands and Plantations

Species	Lodgepole Pine	***Field Number***	P8-04-09	***Unique Identifier***	AT00170
Selection Agency	SRD/ATISC			***Selection Date***	2/6/2008

STAND INFORMATION

Collection Site:	Fontas Tower	Natural Subregion:	Lower Foothills
Legal Location:	14-12-103-09-W6M	Seed Zone:	LBH 1.6
Latitude:	57° 55' 54.5" N	Site Type:	LF e3.2 Pl/Sw/Aw/Alnus Crispa
Longitude:	119° 20' 45.5" W	Stand Type:	C4PL
Elevation (m):	799	Moisture Regime:	Mesic

Stand Comments: Lots of underbrush (Aspen, alder and white spruce)

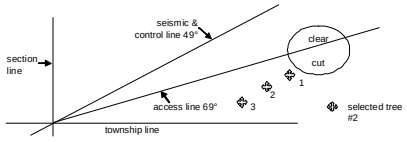
TREE INFORMATION

Sex	Male		Female		*Monoecious*	X
Wood Sample	YES	X	NO		Collection Date:	6-Feb-08
Scions	YES	X	NO		Collection Date:	6-Feb-08
Open Pollinated Seed	YES	X	NO		Collection Date:	6-Feb-08
Root Sections	YES		NO	X	Collection Date:	

Trait	Select Tree	Dom.[1] 1	Dom.[1] 2	Dom.[1] 3	Superiority[1] (%)	Comments
Height (m)	29.3	25.6	25.3	27.9	11.5	
Age	93	95	91	95		
Natural Pruning (%)	65.0%	80.0%	70.0%	40.0%	2.6	
Height/Age (cm/yr)	31.5	26.9	27.8	29.4	12.4	
DBH (cm)	39.8	31.8	32.5	44.5	9.7	
Radial Increment						
Last 10 yrs (mm)	8.0	9.0	6.0	9.0	0.0	
Last 11-20 yrs (mm)	11.0	9.0	7.0	11.0	22.2	
Stem Form	4	4	4	4	0.0	
Branch Angle	2	3	2	3	-25.0	
Branch Thickness	1	2	2	2	-50.0	
Crown Width	3	2	2	2	50.0	
Taper 37.0	0.93					

[1] Dominant tree data required when making selections using the comparison tree method

Tree Remarks: Thick branches on superior tree.

Parent Tree Location Map	Description
	Location/Access: Landing spot: 57° 55' 37.4"N and 119° 20' 23.1" Tree Marking: Photo Attached Yes X No

AGENCY REPRESENTATIVE _____ Signature _____ Date _____

1.4 Report on the Project

A report should be submitted on completion of this phase of the project. Guidelines for this are provided in the attachment "Guidelines for Writing Superior Tree Project Report".

1.5 Scion Collection

Scion collections will be made after tree is felled for wood sample and cone collection.

Lodgepole Pine Superior Tree Selection Project

SECTION 2

Candidate Stand Requirements & Superior Tree Selection Guidelines

LODGEPOLE PINE SUPERIOR TREE SELECTION PROJECT

Candidate Stand Requirements & Superior Tree Selection Guidelines

2.0 "Candidate" Stand Requirements:

It is central to Superior Tree Selection methodology to select Superior trees from stands showing good form, growth and vigor.

To be cruised for superior trees stands must meet most of the following requirements:

- Be well stocked and relatively uniform.
- Show active and better than average height growth.
- Not be overmature or decadent.
- Be pure or predominantly lodgepole pine.
- Be a minimum of 5 ha in size.
- Distance between candidate stands should be a minimum of 3 km, this may be relaxed to 2 km if difficulty is encountered in finding sufficient numbers of candidate stands. This is to provide an adequate geographic distribution of selected trees
- Although the objective is to select only one tree per stand, in the case of exceptional quality stands, two trees may be selected providing they are separated by a minimum of 200 m to avoid their being related.
- Have been reviewed for cutting plans to reduce the possibility of a selected tree being logged.

2.1 Selection of a Superior Tree and Comparison Trees within "Candidate" stands

- Once a potential superior tree has been located the 3 tallest dominants within a 50 m radius are chosen as comparison trees and statistics for all 4 are documented on the "Parent Tree Selection Form" attached.
- Comparison trees are to be of the same age-class as the potential superior tree.

2.2 Aging Requirements of Selected and Comparison Trees

- Ages from the selected tree and dominants can be initially read from the small increment core sample.

- The final age for the selected tree must be read off the disc taken from Dbh. As well, the disc should be used to take diameter growth measurements.

- The increment borer must be kept sharp so that rings can be easily read.

- Ages and the disc sample must be taken at Dbh (1.3 m).

- Selected trees should, where possible, fall between 60 and 100 years.

- The Dbh age is to be regarded as the actual ring count. Unlike timber cruising, there is no correction factor to be added for stump height.

- Age count must be correct and verifiable within $\pm$2 years.

2.3 Height Requirements of Selected and Comparison Dominants

- Heights must be within $\pm$0.5 metres using a 30 metre tape and hand held clinometer or laser or sonic hypsometer.

2.4 Mean Annual Height Increment of Selected Trees

- The mean annual height increment should be 25 cm/year or greater.

- If the mean annual height increment is less than 25 cm/year but greater than 23 cm/year, then at least two trait categories (form, branch angle, branch thickness, crown size) must be rated as excellent.

- The mean annual height increment of the selected tree must be greater than at least two of the comparison dominants which allows for selection of trees which:

  a) Are slightly taller and older than the comparisons.

  b) Have excellent stem form and branching traits.

2.5 Selected Tree Height

- The selected tree should be taller than comparison dominants: if it is not (eg. it is younger) it must meet the mean annual height increment requirement outlined in section 2.4 above.

2.6 Dbh of Selected and Comparison Dominants

- Dbh to be taken at 1.3 metres.

- Dbh to be read in cm to the nearest 0.1 cm.

- Dbh of selected tree to be average or greater than that of dominants and co-dominants in the stand; emphasis on DBH is not as great as other traits due to its sensitivity to competition history.

2.7 Radial Increment

- Radial increment to be taken at dbh and measured in cm for:

  a) the last 10 years (0 - 10).

  b) the prior 10 years (10 - 20).

2.8 Leader Growth

- When possible, selected trees should have minimum leader growth of 15 cm, large healthy scions improve the chances of grafting success.

2.9 Natural Pruning

- Height to be taken from ground to base of lowest living branches and expressed as a % of total tree height.

2.10 Taper (measurement to be taken when scion, cone and wood sample collection is being done)

- Ratio between diameter at 6.3 metres and diameter at breast height, i.e. breast height and 5 metres above.

2.11 Stem Form and Crown Characteristics

The following codes are to be used in filling out the attached "Parent Tree Selection Form".

a) the selected tree stem form score must be at least 3.

code

1 crooked in two planes or forked stem
2 crooked in one plane
3 slight sweep in one plane or pronounced basal sweep
4 slight basal sweep
5 straight

b) the selected tree crown size score must be at least 2.

Scoring to be based on general crown profile as compared with other crop trees in stand.

code

1 crown visibly wider than average for the stand
2 crown approximately average for the stand
3 crown visibly narrower than average for the stand

c) branch angle between branch and stem in upper middle crown.

code

1 most branch angles less than 70°
2 most branch angles greater than 70° but less than 90°
3 most branch angles 90°

d) branch thickness in area of upper middle crown based on average for crop trees in the stand.

code

1 most branches thicker than average for stand
2 most branches about average for stand
3 most branches thinner than average for stand

Note: In the field it may be useful when comparing selected and comparison trees to use a code along with a + or - sign to provide more gradations eg. 1+ or 3-.

2.12 Disease and Defects

- Selected trees must be carefully scrutinized for any signs of disease (conks, punks, broken tops, heart or saprot) or defects (spiral grain, frost cracks, unaccountable scars, etc.).

- If any of these symptoms or signs are present the tree should be discarded unless the defect can definitely be attributed to mechanical damage rather than biological origin.

2.13 Disc Collection for Density Analysis

- For lodgepole pine, a 5 cm wide disc is cut out at Dbh as a sample for wood density testing. This is done when the selected tree is felled for scion and cone collection.

- Discs should be taken out as accurately as possible at Dbh and used for final aging of the selected tree.

- After age count, the disc should be marked with the trees field number for forwarding to ATISC.

2.14 Location and Marking of Superior and Comparison Trees

- Trees should be marked as outlined in section 1.5 of "General Information for Superior Tree Cruising".

- Plot should be tied with a bearing and chainage to an identifiable landmark or located with a high resolution GPS unit ($\pm$15m). A diagram and location notes can be made on the "Parent Tree Selection Form" in the Map and Description sections.

2.15 Data Sheets

- In the stand remarks section, notes can be made of such things as unusual defects or disease indicators in the stand, blowdown, widespread crooks, poor vigour etc. The tree remarks section should be reserved for any similar comments to be made on the selected tree.

- The formula for calculating % superiority is:

$$\frac{\text{superior tree value - avg. value for 3 comparison trees}}{\text{avg. value for 3 comparison trees}} \times 100$$

- When calculating the percent superiority, only the whole numbers from the various traits are used (e.g., 3+ becomes 3 while doing the calculations).

Lodgepole Pine Superior Tree Selection Project

SECTION 3

Guidelines for Taper Measurement and Field Collection of Wood Sample, Scions and Cones

LODGEPOLE PINE SUPERIOR TREE SELECTION PROJECT

Guidelines for Taper Measurement and Field Collection of Wood Sample, Scions and Cones

For lodgepole pine it is customary to fell the tree with a powersaw after selection for collection of a wood density sample scions, cones, and measurement of taper. This may occur at the time of selection, or more likely, at a time convenient for grafting of scions.

3.0 Wood Density Sample Discs

- After the tree has been felled a 5 cm thick disc is removed by power saw from Dbh (1.3 m). Care is required to make the cuts equidistant above and below Dbh.

- Final age for the selected tree must be counted off this disc.

- The tree's field number is to be marked clearly on this disc with a waterproof marker. Discs from collections should be forwarded as soon as possible to ATISC.

3.1 Scion Collection

- Through vegetative propagation an exact genetic duplication is made of the parent tree. This grafted material is used for both gene conservation and seed orchard establishment. A healthy scion is essential for successful grafts, so the general rule when collecting scions is to carefully select the most suitable material as described as follows . . .

3.2 Characteristics of a Good Scion:

- 4 to 9 cm in length consisting of current years growth
  NOTE: When collecting from over-mature trees, scions tend to be very short and spindly and it may be necessary to cut several years growth to obtain reasonable scion length.
  See Figure 1.

- Straight.

- 4 to 8 mm in diameter.

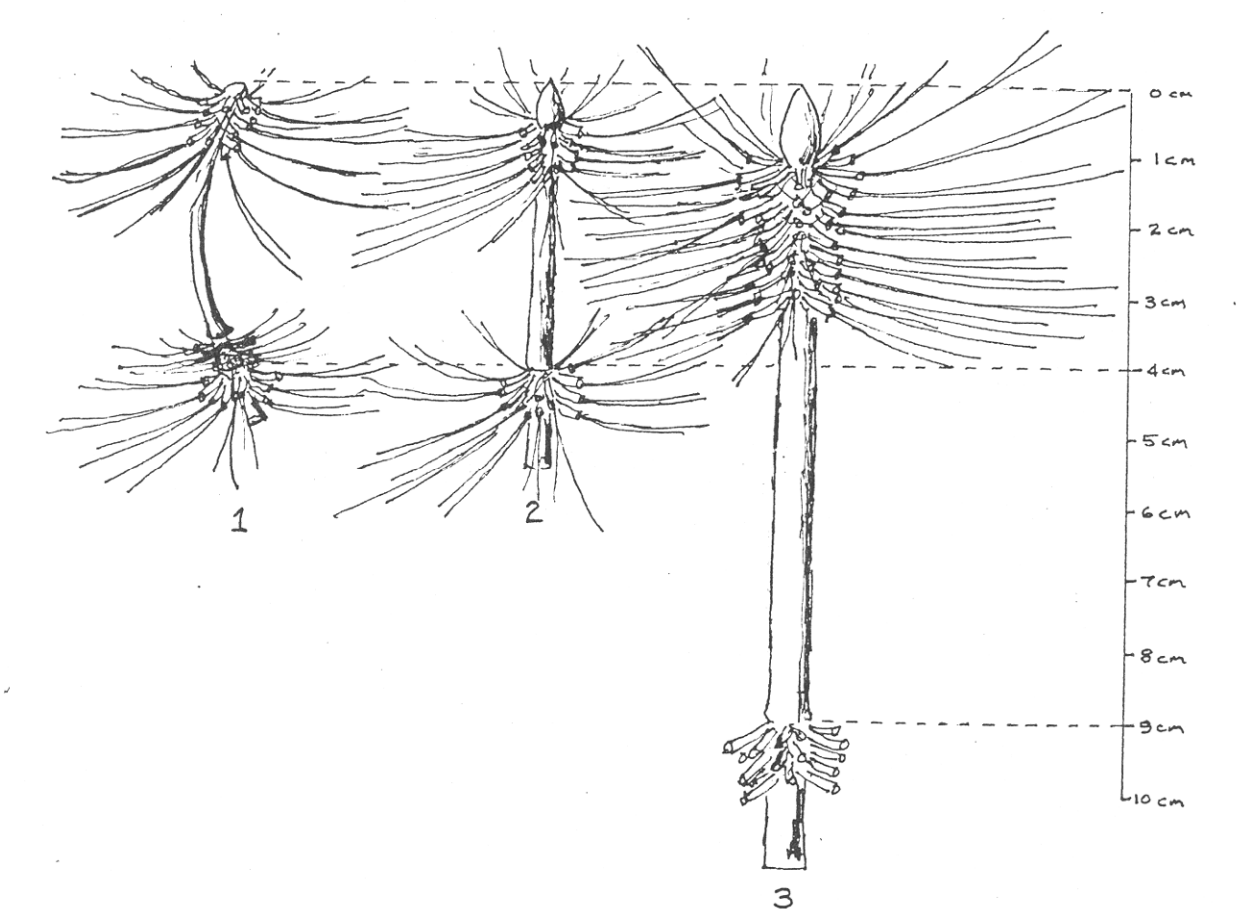


Fig. 11 Scale diagram showing grades of lodgepole pine scions

1. Unacceptable scion showing aborted bud, curved and spindly stem and inadequate current years growth.

2. Acceptable scion with minimum current years growth and diameter.

3. Ideal scion with healthy bud, straight stem and good current years growth.

- At least **ONE LIVING BUD**

- Free from insect and disease damage

3.3 Collection Procedures:

- Scions are selected from the top 2 to 4 whorls of the crown.

- Scions are collected from the terminals of secondary and tertiary branches. See Figure 2.
  Note: Scions from other areas of the tree retain branch characteristics after grafting i.e. grow horizontally rather than vertically. However, upper crowns of over-mature trees provide poor scion material because of slow growth and greater possibility of buds being reproductive rather than vegetative. Therefore, it may be necessary to collect from the lower crown to obtain scions meeting the minimum requirements for grafting.

- Cut scions with pruning shears (do not rip or wrench off).

- Cut more length than the 4 to 9 cm needed for actual grafting.

- Collect a minimum of 35 scions from each selected tree.

3.4 Storage and Shipping:

- Place scions in a heavy plastic bag (2 mil) packed with snow.

- Write parent tree number on 2 tags with water proof pen. Place one tag in bag and attach other to outside of bag.

- Close bag tightly and place in cooler packed with snow.

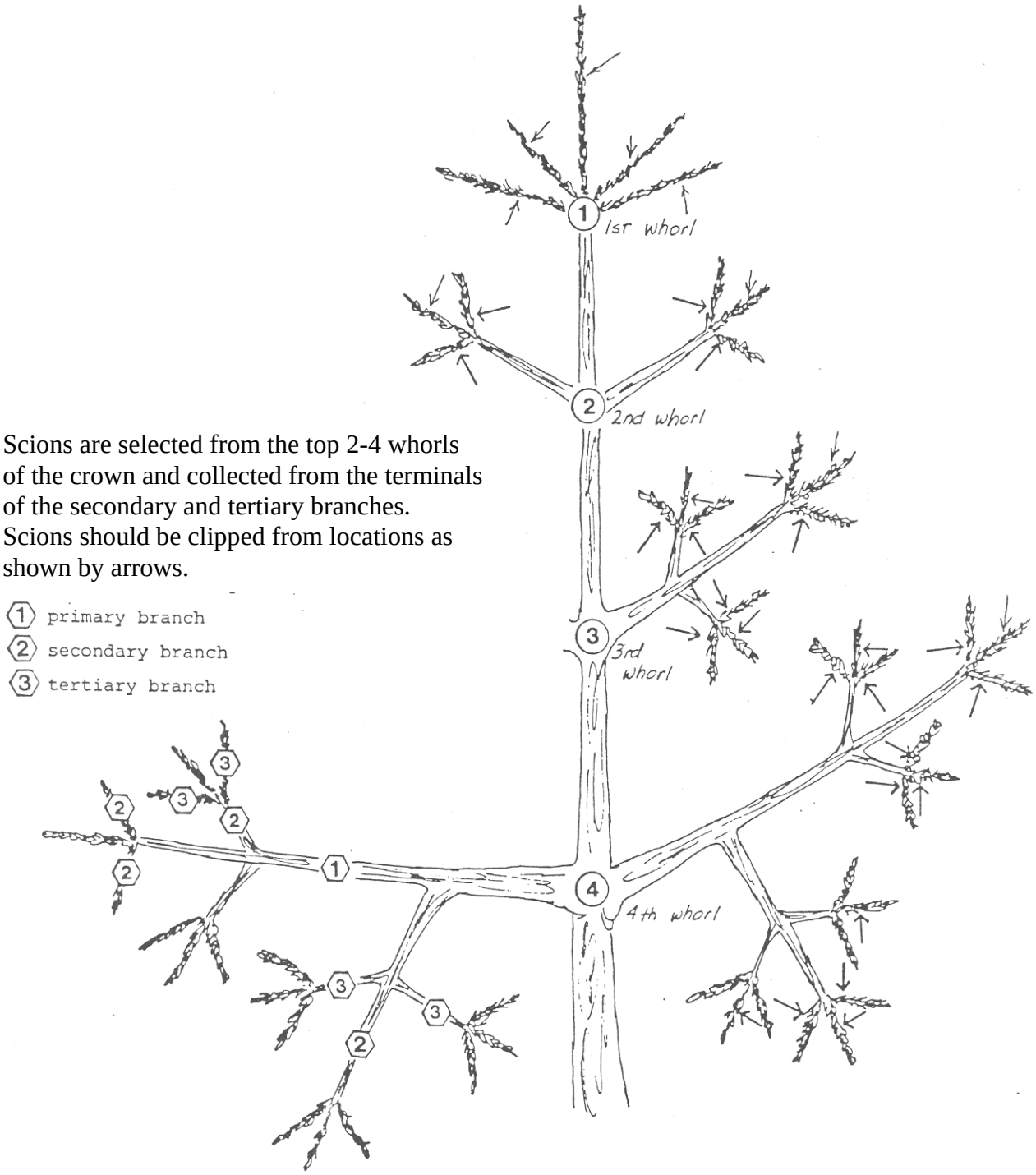
- Store cooler at temperatures of -5°C to -18°C for a MAXIMUM of two weeks.

- Secure coolers well for travel and address clearly.

- Ship scions by coolest, fastest, available way.

- If shipping to ATISC, all shipping arrangements to be made through the Tree Improvement Forester, Alberta Tree Improvement & Seed Centre; telephone # 780/ 656-5072.

Scions are selected from the top 2-4 whorls of the crown and collected from the terminals of the secondary and tertiary branches. Scions should be clipped from locations as shown by arrows.



3.5 Cone Collections

- Pick only cones that appear sound.

- Cones from upper crown are usually younger and will contain more viable seed.

- Collect as many cones as possible from the selected tree (minimum is 80, desired is about 400 cones).

- Cones to be shipped in conventional cone bags.

- Bags to have two tags labelled in waterproof marker with tree field number and unique identifier if known. One to be placed inside and one tied on the outside of the bag.

NOTE: taper measurement should be made at this time.

3.6 Procedure for the Storage of Scions After Field Collection

Objectives:

- Avoid dehydration of plant tissue.
- Avoid temperature fluctuation of plant material in storage.
- Transport harvested scions to ATISC as soon as possible by method of transportation guaranteed to maintain moderate frozen temperatures.

Scion storage procedure:

- Bury scions in soft snow in a heavy (4ml) plastic bag. Freezer sip-lock bags are recommended.
- Identify scions and note date of collection with a waterproof pen on two tags – one inside the bag and one secured to the outside of the bag.
- Seal the bag and store buried in snow in a cooler.
- Store the cooler at a temperature of -5°C for a maximum of 2 weeks. Storage outside in a shaded area, preferable buried in snow, at the same temperature scions were collected is acceptable. Avoid fluctuations in temperature.

In the event of insufficient snow for packing:

- Wrap scions (totally cover) with several layers of damp unbleached paper towels. Procedure: Saturate paper towels in 2 cm water in a large shallow pan. Lay 2-3 layers of dripping paper towels on flat surface. Place scions on paper towels and wrap tightly. Pack in sip-lock plastic bags. Store in a cooler as above.

Conditions to avoid:

- Do not store plant material in gunnysacks, scented garbage bags or paper boxes.
- Do not thaw and refreeze plant material.
- Do not store scions in water or blocks of ice.

Lodgepole Pine Superior Tree Selection Project

SECTION 4

Guidelines for Writing Superior Tree Project Reports

LODGEPOLE PINE SUPERIOR TREE SELECTION PROJECT

Guidelines for Writing Superior Tree Project Reports

Once the superior tree cruise and related field work is completed, the Forest Area or Company should complete a report to be forwarded to Alberta Tree Improvement & Seed Centre, Forest Management Branch. The report serves as permanent documentation for all superior tree cruise projects and the information is extremely important as pedigree records and related details on the selected trees for the future.

Standard format for the report and an outline of the items on which information should be provided is described below.

4.0 Area Covered

Provide a paragraph or so description, i.e., management units, general topography, elevation zone, forests of the area, general comments on existing reforestation, etc.

4.1 Stand Cruised

Provide a paragraph or so description on how many stands were compiled and how many were priorized and cruised; a few comments on size of stands, their elevations, composition, sites, etc.

4.2 Description of Field Work

Provide 1-2 paragraph description on it:

- Staff who did the field work.
- Time when field work was done.
- General comments on problems, difficulties, etc., that may have been encountered.

4.3 Cost Summary

Provide cost summary:

- Manpower spent.
- Truck miles spent, helicopter time, etc.
- Miscellaneous expenses.

Note: Scion collections cost can be accounted for in a separate memo type report once that work is finished.

4.4 Parent Tree Records

Forms for this purpose should be fully filled out for each tree and given in the report (see attached example). It is desirable to take one good photo for each tree. The tree should be identified in the photo with its unique identifier or field number. Photos maybe digital.

4.5 Location of Selected Trees

Provide location of individual trees on a scaled map (see attached example).

4.6 General Comments

Provide any feedback and critique you may like which would help in planning organizing or carrying out of similar projects.

APPENDIX

- containing forms, code sheet and equipment list

LODGEPOLE PINE POTENTIAL SUPERIOR STAND CRUISING FORM

Stand # _____ Legal Location: _____

Access: _____

I. Visual checks to be made prior to filling out "Lodgepole Pine Candidate Stand Cruising Form" (maybe from air, ground, or a combination of air photo and ground survey)

1)	Is the stand in the "planting zone" (± 50 miles)?	Y	or	N
2)	Is the stand within elevational limits (± 500')?	Y	or	N
3)	Is the stand greater than or equal to 5 ha?	Y	or	N
4)	Is the stand well stock (C or D density)?	Y	or	N
5)	Is the stand pure or predominantly Pl?	Y	Or	N
6)	Do most of the trees show good leader growth?	Y	Or	N
7)	Does the stand lack 'wolf' or bushy trees?	Y	Or	N
8)	Does the stand have a collectable cone crop?	Y	Or	N

If any of the preceding questions were answered with a no, reject stand as a "Candidate Superior Stand"

Comments: _____

II. Checks to be made in stand if all Section I responses were yes

1)	Are 5% or fewer trees forked?	Y	Or	N
2)	Do at least 70% of trees lack crooks or sweeps?	Y	Or	N
3)	Do the majority of trees have branches attached perpendicular or nearly perpendicular to the bole?	Y	Or	N
4)	Do majority of trees exhibit fine branching?	Y	Or	N
5)	Is the stand relatively disease free?	Y	Or	N
6)	Does the stand generally show good natural pruning?	Y	Or	N

Comments: _____

III. If the answer was yes to the preceding questions determine the following for two randomly chosen, actively growing Pl dominants

Tree#	DBH AGE (cm)	Total Height (m)	Ht/Age	DBH (cm)	Radial Increment	
					1-10	11-20

If the Ht/Age ratio for one or both is greater than 30 cm/yr for trees 40-70 years, 25 cm/yr for trees 71-100 years, or 20 cm/year for trees 101-130 years, attached and fill out a Lodgepole Pine Candidate Superior Stand Form

LODGEPOLE PINE CANDIDATE SUPERIOR STAND CRUISING FORM

1) Phase III Stand Description for candidate stand:
   a) Timber type
   b) Stand number
   c) Area

2) Ground Survey:
   a) legal location (exact) _____
   b) elevation (m) _____
   c) aspect _____
   d) slope (%) _____
   e) landform/topography _____
   f) stand access (road, helicopter, trike, etc) _____
   summer, 4x4 winter _____
   g) stand composition

	species	%
major		
minor		
minor		

   h) estimated number of lodgepole pine stems/ha _____
   i) ground truthed timber type of stand _____
   j) biogeoclimatic subzone: _____
   site type: _____
   k) additional comments: _____

3) Observations on Lodgepole pine Only:
   Age-class distribution:

Class	% of Trees
Overmature (120+)	
Mature (80-120)	
Immature to mature (40-80)	

4) Focusing only on Mature Age-class of Lodgepole pine:
   a) General observations (circle yes or no)
      i) are the trees generally straight stemmed? Y or N
      ii) stand lacks "wolf" or bushy crowned trees? Y or N
      iii) do the trees have pronounced leader growth? Y or N
   b) sample tree data – from 5 randomly chosen dominant trees spread throughout the stand:

				Radial Increment (cm)	
Tree#	BH Age (yrs)	Height (m)	DBH (cm)	Last 10 yrs	Last 11-20 yrs
1					
2					
3					

5) Additional Remarks on the Stand (defects, windblow, excellent growth, excellent timber-type stand)

_____

6) Cone Crop Status of White Spruce GOOD FAIR POOR

7) Lodgepole Pine Superior Stand# _____

NOTE: Superior Stand # to be given only after a review and short listing of a sufficient number of Candidate Stands has occurred.

PRIORITIZED CANDIDATE STAND FORM

Forest: _____ Date: _____

Stand#	Priority	Location	Access	Remarks

Equipment List

Checklist of Equipment for Superior Tree Cruising

Sunto Clinometer
Metal Diameter Measuring Tape
Increment Borer (standard size)
Pocket Calculator
Permanent Felt Marker
Binoculars
Phase III Stand Maps
Surveyors Hand Compass
Metric Topofil (with string)
Cloth Tapes (30 and 50 metres)
Plastic Ribbon (flagging)
Cruiser Vest
Magnifying Glass (10X)
Tree Paint (aerosol -- blue and orange)
Camera and film (b/w)
Altimeter or topographic maps
Superior parent tree data forms
Clipboard

Equipment for Collection of Wood Samples, Cones, and Scions

Power saw with attachments and safety gear
Cooler
Plastic bags with twist ties
Tags
Indelible pencils (waterproof)
Pruning shears
Cone bags

LODGEPOLE PINE SUPERIOR TREE SELECTION PROJECT

Standards and Code Sheet for Field Use

Age

Taken at breast height (1.3m)
Must be correct within ±2 years

Height

Must be correct to ±0.5 m
Using 30 metre tape and
handheld clinometer.

Natural Pruning

Height to live crown expressed as a percentage of total height.

Dbh

Taken at 1.3 m in cm
must be correct to ±0.1 cm

Radial Increment

Radial increment for the last 10 year growth period and for the last 11-20 year growth period in cm's. (taken at dbh)

Form (VIEW THE TREE STEM FROM ALL SIDES)

1. Crooked in two planes, forked stem
2. Crooked in one plane
3. Slight sweep in one plane or pronounced basal sweep
4. Slight basal sweep or lean not effecting stem
5. Straight

Branch Angle

(upper middle crown)

1. Most branch angles (i.e., between branch and stem) less than 70°
2. Most branch angles less than 90° but greater than 70°
3. Most branch angles 90'

Branch Thickness
(upper middle crown)

1. Most branches greater than 4 cm diameter
2. Most branches between 2 cm and 4 cm diameter
3. Most branches less than 2 cm diameter.

Crown (general crown profile)

1. Comparatively wide crown
2. Average Crown width
3. Comparatively wide crown

Taper (ONLY TO BE MEASURED ON FELLED TREES AFTER CONE COLLECTION)

Ratio between diameter at 6.3 metres and diameter at breast height.

Notes:

The highest value of a code always represents the most desirable expression of that feature

Be rigorous in the application of standards. If in doubt grade downwards

Parent Tree Selection Form - Wild Stands and Plantations

Species _____ ***Field Number*** _____ ***Unique Identifier*** _____

Selection Agency _____ ***Selection Date*** _____

STAND INFORMATION

Collection Site: _____ Natural Subregion: _____

Legal Location: _____ Seed Zone: _____

Latitude: _____ Site Type: _____

Longitude: _____ Stand Type: _____

Elevation (m): _____ Moisture Regime: _____

Stand Comments: _____

TREE INFORMATION

Sex Male ☐ Female ☐ *Monoecious* ☐

Wood Sample YES ☐ NO ☐ Collection Date: _____

Scions YES ☐ NO ☐ Collection Date: _____

Open Pollinated Seed YES ☐ NO ☐ Collection Date: _____

Root Sections YES ☐ NO ☐ Collection Date: _____

Trait	Select Tree	Dom.[1] 1	Dom.[1] 2	Dom.[1] 3	Superiority[1] (%)	Comments
Height (m)						
Age						
Natural Pruning (%)						
Height/Age (cm/yr)						
DBH (cm)						
Radial Increment						
Last 10 yrs (mm)						
Last 11-20 yrs (mm)						
Stem Form						
Branch Angle						
Branch Thickness						
Crown Width						
Taper						

[1] Dominant tree data required when making selections using the comparison tree method

Tree Remarks: _____

Parent Tree Location Map	Description
	Location/Access: Tree Marking: Photo Attached Yes ☐ No ☐

AGENCY REPRESENTATIVE _____ Signature _____ Date _____