



**Alberta Forest Genetic Resource Management and
Conservation Standards
Volume 1A – *Stream 1***

21/12/2016

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Corrigendum

Section	Standard	December 21, 2016	Change (Effective April 1, 2018)
19.0	19.1	<i>Wild</i> transplants and <i>propagules</i> from within 5 km and 100 m elevation of the target planting site or from within 20 km of the planting site and in the same <i>seed zone</i> , may be deployed without <i>registration</i> . These transplants and <i>propagules</i> may not be multiplied or serially propagated.	<i>Wild</i> transplants and <i>vegetative propagules</i> from within 5 km and 100 m elevation of the target planting site or from within 20 km of the planting site and in the same <i>seed zone</i> , may be deployed without <i>registration</i> . These transplants and <i>vegetative propagules</i> may not be multiplied or serially propagated.

This document is available on the government website by searching Alberta Forest Genetic Resource Management and Conservation Standards.

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Table of Contents

General	1
1.0 Authority, Principles and Rationale	1
2.0 Development and Review of the Standards	2
3.0 Applicability	4
4.0 Document Structure	5
5.0 Standards Framework	6
6.0 Effective Date and Retroactivity	7
Policy Issues and International Agreements	8
Preamble	8
Goals	8
7.0 Prior Informed Consent, Benefit-Sharing and Material Transfer Agreements	8
8.0 Intellectual Property Rights	9
9.0 Access to Data and Information	9
Material Collection, Handling, Registration and Storage (MCHRS)	11
Goals	11
MCHRS Standards	11
10.0 Registration	11
11.0 Collection	12
12.0 Transportation of Material	12
13.0 Processing	13
14.0 Seed Testing	13
15.0 Storage	14
16.0 Excess Seed, Seedlings and Vegetative Material	14
17.0 Retention of Material for <i>Ex Situ</i> Gene Conservation	14
Green Area Deployment (GAD)	16
Goals	16
GAD Standards	16
18.0 Deployment of Registered Material	16
19.0 Deployment of Unregistered Material (for limited use only)	17
20.0 <i>In Situ Gene Conservation</i>	18
21.0 Deployment Planning and Reporting	18
22.0 Post-Deployment Monitoring	18

List of Figures

Figure 5.1	Functional arrangement for Stream 1 components of the Alberta Forest Genetic Resource Management and Conservation Standards (FGRMS) 2016.	6
Figure A7.1	Seed zones of Alberta.	30
Figure A7.2	Seed zones of Alberta. Southern Rocky Mountains.	31
Figure A7.3	Seed zones of Alberta. Northern Rocky Mountains.	32
Figure A13.1	Pre-2003 seedlot collections: variance requirements.	38
Figure A13.2	Point collections (2003 and later): variance requirements.	39

List of Appendices

Appendix 2.	Registration Request Form for Stream 1 Material	20
Appendix 4.	Requirements for Registration of Stream 1 Material.....	21
Appendix 6.	Stream Categories and Genetic Class Codes for Alberta Regeneration Information System (ARIS) Reporting	24
Appendix 7.	Seed Zone Descriptions, Areas and Maps	26
Appendix 8.	Request for Deployment Variance for Stream 1 Material	33
Appendix 10.	(Temporary Field Authorization Form) REPEALED.....	34
Appendix 10A.	Authorization to Collect Plant Material Request Form for Stream 1 Material.....	35
Appendix 13.	Decision Tree for Deployment of Stream 1 Material Outside the Seed Zone of Origin.....	37
Appendix 14.	Stream 1 Seedling and Vegetative Propagule Lot Deployment Limit by Seed Zone	40
Appendix 16.	Research, Conservation or Controlled Parentage Program Transportation and Interim Storage of Plant Material Form	41
Appendix 17.	Seed and Vegetative Materials Withdrawal and Transportation Form.....	42
Appendix 24A.	Species-Specific Seed Zone Research Program Plan – Contents for Stream 1 Material.....	43
Appendix 25	Unique Identifier (U.I.) Codes for <i>Stream 2</i> Material.....	45
Appendix 32A.	Stream 1 Seed Orchard Establishment Report	49
Appendix 38.	Species Codes	50

List of Appendix Tables

Table A4.1	Requirements for point collections of Stream 1 Material.	21
Table A4.2	Requirements for seed zone collections of Stream 1 Material.	22
Table A4.3	Requirements for Stream 1 seed orchard collections.	23
Table A7.1	Seed zones of Alberta.	27
Table A14.1	Deployment limits for seed zone and point collections.	40
Table A14.2	Deployment limits for Stream 1 seed orchard/vegetative collections.	40
Table A14.3	Examples: seed required to produce one million seedlings, and area to be covered.	40
Table A25.1	U.I. field description for use in reforestation only.	45
Table A25.2	An example of an alternate unique identifier.	46
Table A25.3	U.I. field description for use in reclamation or reforestation.	46
Table A25.4	An example of a unique identifier for use in reclamation.	47
Table A25.5	Agency names and codes.	47
Table A38.1	Native tree species (pure species and known natural hybrids).	50
Table A38.2	Shrub species.	51
Table A38.3	Non-native trees (pure species and hybrids).	54
Table A38.4	Selected boreal shrubs: some clonal and reproductive characteristics.	55
Glossary		58
Acronyms.....		65

GENERAL

In this manual, all texts in italics are terminologies defined in the glossary at the end of the manual; species Latin names are underlined not italicized.

1.0 Authority, Principles and Rationale

Alberta Forest Genetic Resource Management and Conservation Standards (these Standards) are rules under the Timber Management Regulation 144.2 (1) (“The Minister may establish rules governing the source and type of tree seed and vegetative propagules used to reforest public land”). All rules in this manual facilitate the collection, development, processing, documentation, tracking, custody and eventual use of forest reproductive materials.

The forest genetic resources of Alberta are crucial to the long-term economic and ecological stability of the province.

The Government of Alberta (*Alberta*) and industry operating on Alberta *public lands*:

- i) endeavour to ensure the adaptability, diversity and health of *wild* and managed plant populations, and to conserve the genetic integrity of *wild* forest plant populations on the landscape; and
- ii) recognize the value of genetic improvement in enhancing the productivity of the forest landbase and generating economic benefit.

Resource managers operating on Alberta *public lands* have responsibilities for maintaining the value of the genetic resources of the province. This is an ethical commitment to future generations as well as support to *Alberta* in meeting its commitments under the 1992 Convention on Biological Diversity to conserve and sustainably use forest genetic resources.

In meeting these commitments, the role of *Alberta* is to:

- i) protect the public interest and conserve the forest genetic resource by implementing conservation and sustainable use programs and enacting and enforcing policies, regulations and standards;
- ii) promote development of that resource for the economic benefit of the people of Alberta; and
- iii) participate in the development and implementation of genetic improvement and related technologies.

The role of industry and other resource users is to:

- i) respect the public interest by complying with enacted policies, regulations and standards; and
- ii) develop objectives and strategies that will increase the value derived from the forest genetic resource.

The need for standards related to sustainable use and conservation of forest genetic resources arises largely from human activity and development, which may interrupt natural genetic processes on the landscape. Without management, human activity can lead to genetic erosion, reduced fitness and loss of evolutionary resilience in *wild* populations, and can also reduce opportunities for development of new and useful plant varieties and gene products.

Although plant breeding can result in significant benefits, it also typically results in the displacement of *wild* plants by domesticated varieties, and is generally recognized to have the potential to reduce genetic variation and alter population gene frequencies (through *Stream 2* activities). Not as well understood is the potential of *artificial regeneration* using *wild* plant materials (through *Stream 1* activities) to pose similar risks, through human interference in natural selection (through collection and deployment of seed and other *propagules*), and gene migration (through plant transport to new locations).

Maintaining adequate levels of *genetic diversity* is important for conserving the adaptive potential of species and populations in changing environments. It is also essential for minimizing inbreeding, which can reduce the fitness (survival, growth and reproductive capability) of a population.

Ideally, *genetic diversity* of a population would be measured through direct genomic assessment; however this is not yet practical. *Effective population size* (N_e) is a surrogate diversity measure used in many tree breeding programs. The concept of N_e is also used in risk assessment and management strategies for endangered animal species. N_e is the number of individuals in an idealized population that would undergo inbreeding or genetic drift at the same rate as the population of interest (e.g., a *seed orchard*) if left to reproduce naturally. N_e is a function of the number of *genotypes* (i.e., parents) in the population, the degree of variation in genotypic representation among *genotypes*, and the degree of relatedness among *genotypes*.

The minimum N_e of 18 required for *unrestricted registration* of *Stream 2* material in FGRMS (see Standard 34.2 in Volume 1 for exception) was based on the following factors:

- i) Natural stands of open-pollinated conifers exhibit inbreeding coefficients of about 0.05 - 0.125. Based on a precautionary approach, it was determined that planted stands of genetically improved trees should be able to reproduce naturally for at least three generations without exceeding an inbreeding coefficient of 0.1.
- ii) Each step required in the calculation of N_e introduces error into the estimation and the result is therefore imprecise.

For *unrestricted registration* of *Stream 1* materials (see Appendix 4), collections are based on the same principle of meeting a minimum $N_e \geq 18$.

2.0 Development and Review of the Standards

Management and conservation standards were developed through extensive consultation with geneticists and other scientific and management professionals. The Alberta Forest Legacy document guided the original development of the standards.

The standards were implemented in 2003, under the name Standards for Tree Improvement in Alberta (STIA), and were revised in 2005, 2009 and 2016; they were renamed Alberta Forest Genetic Resource Management and Conservation Standards (FGRMS) in 2009.

The original 2003 standards represented science-based policy that was developed to maintain the genetic integrity, health and productivity of Alberta's *wild* and managed forests. The standards guided the management of forest genetic resources in *reforestation* and tree improvement activities on public forest lands.

With ongoing industrial development, the use of appropriate plant genetic material in *reclamation* is essential for the maintenance of ecosystem function and biological diversity. One of the main outcomes of the 2016 review is that the revised standards now apply to the use of all woody plants in *reclamation* of land within the *Green Area*, as well as to *reforestation* and tree improvement.

In revising the standards, it was recognized that *reclamation* personnel will generally utilize *Stream 1* materials (seed or vegetative material collected from stands of *wild* or *artificially regenerated* native species), rather than *Stream 2* materials (seed or vegetative material produced in *production units*). Consequently, the standards are presented in two separate documents. The first, entitled “Alberta Forest Genetic Resource Management and Conservation Standards Volume 1: *Stream 1* and *Stream 2*” will contain all standards. The second, entitled “Alberta Forest Genetic Resource Management and Conservation Standards Volume 1A: *Stream 1*”, will contain only those standards that apply to *Stream 1* material. This will facilitate use by *reclamation* personnel and those not involved in tree improvement activities. All forest genetics testing and research on public land requires a Research Program (RP) plan reviewed and approved by *Alberta* (see Standard 25 in Volume 1).

The major changes in FGRMS 2016 are:

- i) new clonal deployment standards;
- ii) standards applicable to shrubs;
- iii) enabling of deployment of *Stream 2* seed on more than 50% of *species-specific target strata* area;
- iv) incorporation of a new method of estimating *genetic gain* at rotation age;
- v) a revised process for establishment of *species-specific seed zones*;
- vi) revised seed testing and storage standards;
- vii) a revised and expanded section on Policy Issues and International Agreements; and
- viii) *in situ* gene conservation standards.

The current version (FGRMS 2016) could not resolve all issues, largely due to insufficient knowledge. Issues to be addressed before completion of the next review include:

- i) inclusion of other vascular plants (herbaceous native species) for *reclamation*;
- ii) implications of seed sales on *cumulative Ne* reporting of deployed populations;
- iii) implications of seed sales for *in situ* conservation areas required for *controlled parentage programs (CPPs)*;
- iv) consideration of mapping requirements in Standard 21.2.3 and 21.2.5 with respect to Alberta Regeneration Information System (ARIS) spatial capability;
- v) consideration of an FGRMS stated criterion on when to permit use of seed with *restricted registration* and the amount to approve;
- vi) duration of orchard phenology monitoring and implications of results; and
- vii) age-age correlation.

Issues to be addressed to support future development of standards include:

- i) development of a provincial shrub provenance testing research program to inform shrub seed transfer standards and *species-specific seed zones (SSSZs)* for shrubs;
- ii) development of seed transfer and deployment standards to address adaptation to climate change, through continued testing of populations and species over a wide environmental range, including extreme environments;
- iii) development of standardized protocols for realized gain *trials*, and for assessment of gain in plantations established with *Stream 2* materials; and
- iv) consideration of the use of exotic species, hybrids and provenances in *reclamation* and *reforestation*.

3.0 Applicability

These standards apply to lands in the *Green Area*. In addition, the standards for Material Collection, Handling, Registration and Storage (MCHRS) apply to material collected from *public land* as well as all material intended for *deployment* in the *Green Area*, regardless of where the material was collected. Native trees and shrubs commonly encountered in Alberta are listed in Appendix 38; species codes are provided for *registration* purposes. For species not listed in Appendix 38 contact *Alberta*.

Users of these standards are:

- i) all forest companies and public institutions that collect *Stream 1* and *Stream 2* material and vegetative materials or develop genetically improved seed and vegetative materials for reforestation and/or research on public land;
- ii) all energy companies that use woody plants (trees and shrubs) for assisted revegetation on public land (ref. Alberta Energy Regulator Integrated Standards and Guidelines 200.2.7(c) and 200.2.9) & other Environmental Protection Enhancement Act approvals that mandate use of FGRMS when planting woody plants on public land);
- iii) all private collectors and/or distributors of plant propagation materials from public land intended for commercial use and/or reforestation, revegetation and research on public land or research elsewhere, and gene conservation;
- iv) all individuals and institutions intending to conduct planted genetic experiments (trials) on public land or other types of planted experiments which if installed on public land have potential to compromise the genetic integrity of wild stands of native species (e.g., through hybridization with native species) irrespective of the origin of propagation materials; and
- v) All collectors of plant materials of trees and shrubs on public land for research including non-propagation uses where the government collection permit is required.

If unsure whether or not these standards are applicable to your case, consult *Alberta*.

Submission and Approval of Documents

Plans and forms that are required to be submitted to *Alberta* will receive one of four responses:

- i) approved;
- ii) approved with conditions;
- iii) requires additional information; and
- iv) rejected with reasons.

4.0 Document Structure

As noted in Section 2, these standards are published in two documents, i.e., a complete document including all standards, and a reduced document containing standards applicable to *Stream 1* materials only.

Following this general information section are five sections containing goals and standards. Goal statements describe the intent and scope of each section. Standards define the specific results that must be attained or, in some cases, specific procedures that must be followed.

The three sections in Volume 1A are:

- i) Policy Issues and International Agreements;
- ii) Material Collection, Handling, Registration and Storage (MCHRS);
- iii) Green Area Deployment (GAD);

This document also contains a glossary, a list of acronyms, and a number of appendices containing tables, forms and other supplements to the standards. The glossary provides definitions of terms specific to their usage in this policy.

5.0 Standards Framework

Figures 5.1 below illustrate the functional arrangement of components of FGRMS 2016, as applicable to *Stream 1* materials.

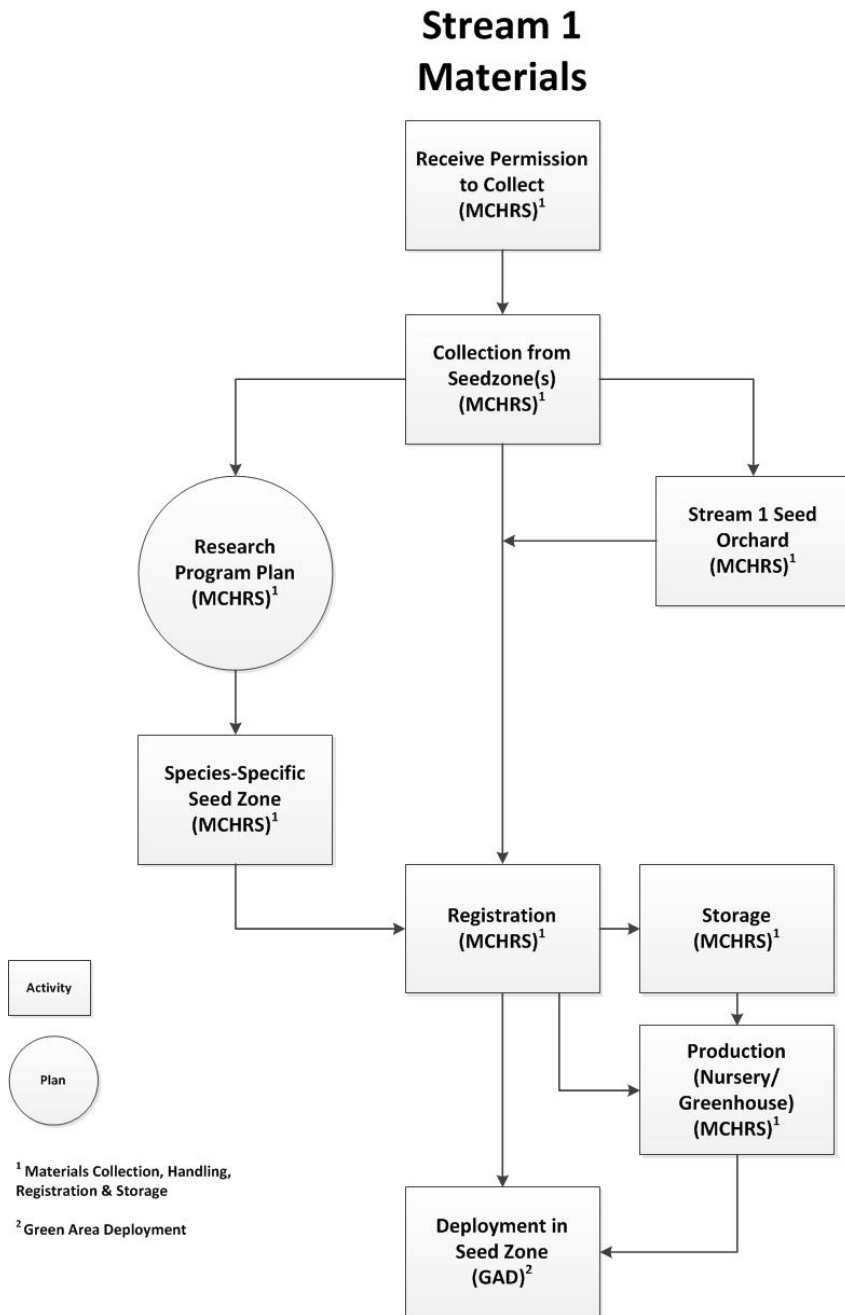


Figure 5.1. Functional arrangement for Stream 1 components of the Alberta Forest Genetic Resource Management and Conservation Standards (FGRMS) 2016.

6.0 Effective Date and Retroactivity

The standards were enabled through *Alberta's* Timber Management Regulation 144.2 and were effective as of May 01, 2003. FGRMS 2016 is effective as of its date of publication.

Controlled parentage programs and research programs that already existed or were under development prior to May 01, 2003 will be implemented or upgraded to the standards through discussion between *Alberta* and the proponent(s). The intent is to capitalize on work in progress while phasing in standards.

POLICY ISSUES AND INTERNATIONAL AGREEMENTS

Preamble

The Government of Alberta (*Alberta*) has stewardship responsibility for the management of forest genetic resources on *public land* in Alberta. *Alberta*, resource-based industries, research organizations, and tree improvement cooperatives undertake research, conservation, genetic improvement, and breeding programs jointly or individually, and are involved in the collection of forest genetic resources and *deployment* of trees and shrubs on *public land* in Alberta.

Goals

The goals of this section are to:

- i) establish the requirements for access rights to *Alberta's* forest genetic resources;
- ii) clarify the requirements for benefit-sharing in relation to the commercialization of forest genetic resources obtained from *public land* in Alberta;
- iii) enhance awareness of international agreements that address access and benefit-sharing of genetic resources; and
- iv) provide *Alberta's* policy on *genetically modified organisms*.

7.0 Prior Informed Consent, Benefit-Sharing and Material Transfer Agreements

All genetic resources collected from *public land* in Alberta require prior and informed consent, obtained from *Alberta*. Forest genetic material collected from *public land* in Alberta, and utilized for commercial purposes other than fiber production in Alberta, could be subject to a benefit-sharing agreement, or *material transfer agreement (MTA)*, with *Alberta*. The province will endeavour to retain benefits in the form of revenue when such material from *public land* is utilized for commercial means. However, the province will not seek to obtain revenue when material is used for operational *deployment* of trees and shrubs in Alberta, or for strengthening genetic improvement programs in Alberta.

Exchanges of material between *Alberta* and other jurisdictions might require an *MTA*, or other type of agreement, indicating the terms of benefit-sharing and third-party use. *MTAs* may be required between *Alberta* and other entities (e.g., industrial, academic or research organizations) involved in forest genetic resource use activities in Alberta, nationally, or internationally. Requirements will be determined on a case-by-case basis. Situations where these agreements may apply include:

- i) where a third party wishes to use material and associated *genotypes* from *Alberta public land* for propagation or further breeding for commercial or profit objectives; and
- ii) where a member of a cooperative involving *Alberta* wishes to use material and associated *genotypes* for propagation or further breeding outside the cooperative(s) in which they are participants.

Once authorized by the province, through licenses, permits or otherwise, and subject to any terms of benefit-sharing, including in relation to *intellectual property rights* and any conditions on subsequent third party use, an organization or person(s) shall become the owner(s) or holder(s) of the trees or shrubs that have been harvested, or of other physical material that is collected from *public land* for the purpose of genetic improvement. Their right remains until the material is deployed back on to *public land*, at which time ownership transfers to the province (*Alberta*).

The province (*Alberta*) reserves the right to retain some collected material for conservation or research purposes (see Standards 17.0, 29.2, 29.3 and 29.4 in Volume 1).

Forest Management Agreement (FMA) holders have ownership rights to timber on land subject to an FMA, and are entitled to compensation for any damages to timber or improvements they have created (such as to genetically improved material that has been deployed on *public land*).

8.0 Intellectual Property Rights

For existing and future genetic improvement cooperatives involving the province, *Alberta* will endeavour to establish agreements that define the respective *intellectual property rights* of all parties.

For collections of material by parties who do not hold timber dispositions with associated *reforestation* obligations in Alberta, a letter of authorization, map, and collection plan are required as per Standards 11.1.3 and 11.1.4. A condition may be placed on such authorizations stating that the province will retain all *intellectual property rights* to material collected, unless otherwise defined in an agreement.

The province will endeavour to define commercialization arrangements by way of an agreement at the earliest opportunity, wherever possible. The province may also directly charge a collection fee or royalty on material collected from *public land* when material is for commercial ventures (e.g., sale of genetically improved material and associated information) that are unrelated to genetic improvement or are outside Alberta.

If these standards conflict with copyright, patent and/or intellectual property laws, or other federal laws, such legislation would supersede these standards.

9.0 Access to Data and Information

Alberta will have access to data and information pertaining to improved stock or research and breeding programs. Access to, and retention and long-term storage or archiving of data is required because of *Alberta's* stewardship responsibility to monitor diversity and adaptation of materials to be deployed on forested *public land*. Specific data needs will be outlined in requirements for plan submission and reporting as detailed in other sections of this document.

All information provided to *Alberta*, or in the custody or control of *Alberta*, may be disclosed under Freedom of Information and Protection of Privacy (FOIP) legislation, if a request for disclosure is made. It is recognized that information submitted to *Alberta* regarding cooperative genetic improvement programs involving *Alberta* is subject to FOIP legislation, and that other parties may request access to such information through FOIP requests. *Alberta* will refuse to release information from cooperative programs that meet all conditions as per section 16 of the FOIP Act.

In summary, disclosure would be refused where information:

- i) would reveal trade secrets or scientific/technical information of a third party; and
- ii) would harm the competitive position of a third party or result in undue financial loss or gain to any person or organization; and
- iii) is supplied in confidence to *Alberta*.

9.1 International Treaties and Agreements on Access to Genetic Resources and Benefit-Sharing, and Safe Transfer of *Living Modified Organisms*

Individuals, organizations, industry, and governments that import genetic resources from outside Canada or that export genetic resources including forest genetic resources for any purpose, including research, should be aware of international treaties and protocols with respect to genetic resources. Such treaties and protocols may contain legally binding commitments in regard to obtaining genetic resources from other countries, benefit-sharing arrangements, and the safe transfer of *living modified organisms*.

- i) The Convention on Biological Diversity came into force in 1993. Canada is a party to this Convention, which contains general provisions for accessing genetic resources from other countries that are parties to the Convention. This requires prior informed consent from the party providing the genetic resources, based on mutually agreed terms.
- ii) The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity came into force in October of 2014. Canada has not yet become a party to this Protocol. The Nagoya Protocol is a complex legal document that aims to enhance legal certainty and transparency for both providers and users of genetic resources. Obligations to support compliance with domestic legislation or regulatory requirements of the party providing genetic resources, and contractual obligations reflected in mutually agreed terms, are considered innovations of the Protocol. The Protocol also supports benefit-sharing arising from the utilization of traditional knowledge associated with genetic resources. The Protocol sets out a number of administrative arrangements, including a certificate of compliance; it also establishes clear rules for prior informed consent and mutually agreed terms. It will be important for any person or organization that accesses forest genetic resources from other countries for any purpose, including research, to be aware of the obligations of the Nagoya Protocol and its administrative arrangements, including any measures that might be required in Canada, should Canada become a party to this Protocol.
- iii) The Cartagena Protocol on Biosafety to the Convention on Biological Diversity came into force in 2003. The Nagoya – Kuala Lumpur Supplementary Protocol was open for signature in 2011, but has not yet come into force. Canada is not a party to the Cartagena Protocol. Both Protocols address the safe transfer of *living modified organisms* and are only relevant here to individuals or organizations that are engaged in the transfer and handling of any *living modified organisms* to other countries.

9.2 Genetically Modified Organisms

Genetically modified organism (GMO) refers to an organism that, through human intervention in a laboratory, has had its genome, or genetic code, deliberately altered through the mechanical insertion of a specific identified sequence of genetic coding material (generally DNA) that has been either manufactured or physically excised from the genome of another organism. This definition of *GMO* is substantially equivalent to that of *living modified organism*, as defined in the Cartagena Protocol on Biosafety to the Convention on Biological Diversity.

Although it is recognized that *GMO* material has possible utility for *reforestation* and *reclamation*, the potential performance and impacts on forest ecosystems are poorly understood. In view of the risks associated with *reforestation* and *reclamation* with *GMOs*, and in accordance with the current position of the Alberta Forest Genetic Resources Council, *GMOs* are not approved for use on *public land* in Alberta at this time.

The federal government has jurisdiction over testing and use of *GMOs* in Canada. Proponents should contact the appropriate federal department prior to undertaking a program for testing of *GMOs*. If federal approval for testing of *GMOs* is granted, FGRMS 2016 outlines provincial requirements for review, testing, and research (see Standards 23.5 and 25.3).

MATERIAL COLLECTION, HANDLING, REGISTRATION AND STORAGE (MCHRS)

Goals

Genetic materials of forest plants intended for *deployment on public land* will be collected, handled, registered and stored in a way that is designed to:

- i) ensure adaptation and diversity;
- ii) maintain documented *genetic identity* and ensure materials are appropriately tracked; and
- iii) ensure that the genetic integrity and physical quality of materials are maintained.

MCHRS Standards

10.0 Registration

- 10.1 All material to be deployed on *public land*, with exceptions as noted in Standard 19, must be registered with *Alberta*. See Appendix 2 (re: *Stream 1*).
- 10.2 Requests for *registration* are subject to review and acceptance by *Alberta*. If one or more of the relevant standards are not met, material may not be registered.
- 10.3 Required *registration* information must be complete and submitted to *Alberta*. All collection, handling, storage and processing information is to be made available for *Alberta's* review upon request.
- 10.4 Material that does not meet requirements for *unrestricted registration* may be eligible for *restricted registration* or for holding, pending *registration* eligibility, See Appendices 2, 3, 4, and 5 for *registration* requirements.
- 10.5 Upon *registration*, *Alberta* will assign a *registered lot number*.
- 10.6 For *Stream 1* material, the material collection criteria defined in Appendix 4 must be met.
- 10.7 For *registration* of *Stream 1* material the information in Appendix 2 is required.
 - 10.7.1 For *registration* of *Stream 1* seed, the following additional information is required: *temporary lot number*, volume of material collected (e.g., cones, berries, catkins), yield, and a *moisture measurement*. (See Standard 14.0, Seed Testing.)
 - 10.7.2 For *registration* of *Stream 1* vegetative material, no additional information is required.
- 10.8 Material meeting *unrestricted registration* requirements of Table A4.1 (see Appendix 4; *point collections*) is eligible for *deployment* up to 1 km outside the *seed zone* of origin (see Appendix 7) provided the difference in elevation between point of collection and point of *deployment* does not exceed 100 m. Such material is also eligible for transfer across a *seed zone* boundary according to Standard 18.2.5 and Appendix 13.
- 10.12 *Restricted registration* (see Appendices 1, 2 3 and 4) may apply where:
 - i) documentation requirements in Standard 10.7 have not been met; or
 - ii) collections (*Stream 1*) do not meet *point* or *seed zone collection* requirements for *unrestricted registration* (see Appendix 4); or
- 10.13 Conditions on *deployment* may be applied to *restricted registration* material. (See Standard 18.2.6 and Appendix 8 [for *Stream 1*].)
- 10.14 For locally infrequent species or *rare species*, special *registration* and deployment provisions may be enabled by *Alberta* for conservation, restoration or *reclamation* purposes.

11.0 Collection

- 11.1 Collections from *public land*
 - 11.1.1 All collections of plant material from *public land* require authorization from *Alberta* (except as noted below).
 - 11.1.2 *Forest tenure holders* responsible for *reforestation* will outline their intent to collect in their *Reforestation Program Plan*. *Alberta* is to be notified of the target species and general location of a collection not less than two working days prior to collection taking place.
 - 11.1.3 Collections of forest tree or plant material by other than *forest tenure holders* require a letter of authorization from an *Alberta Forest Area Office*. The proponent(s) will submit a map and collection plan identifying the area of collection, type of material, method of harvest, timing, and target species (see Appendix 10A).
 - 11.1.4 REPEALED.
 - 11.1.5 For collections outside *Alberta's* jurisdiction (e.g., on federal lands), collections must satisfy the requirements of the agency responsible for the land on which collection occurs.
- 11.2 Each *forest tenure holder* will maintain a minimum of one registered *Stream 1* lot, for each species and in each *seed zone*, where *artificial regeneration* is planned using *Stream 1* seed or seedlings of that species. Exceptions may be made when other appropriate seed sources are demonstrated to meet *reforestation* commitments.
- 11.3 The maximum size of a registered seedlot or vegetative lot depends on numerical restrictions on *deployment* from a single seedlot or vegetative lot. See Appendix 14 for maximum number of seedlings or vegetative propagules deployable by *seed zone* size.
- 11.4 *Stream 1* vegetative material may be multiplied in *stoolbeds* established from collections that contain the required minimum number of plants per collection for *Stream 1* material (see Appendix 4 – Material Category D).
 - 11.4.1 *Alberta* reserves the right to inspect *Stream 1 stoolbed* sites and facilities.
 - 11.4.2 Collections from approved *Stream 1 stoolbeds* do not require *Alberta* authorization.
- 11.7 *Stream 1* seed may be produced in *Stream 1 seed orchards* (see Appendix 2, 4, 14, 25 and 32A for requirements).
 - 11.7.1 Prior to initiating development of a *Stream 1 seed orchard*, the proponent(s) must submit a letter of intent to *Alberta*.
 - 11.7.2 *Alberta* reserves the right to inspect proposed *Stream 1 seed orchard* sites and facilities.
 - 11.7.3 Collections from approved *Stream 1 seed orchards* do not require *Alberta* authorization.

12.0 Transportation of Material

- 12.1 An identification tag must accompany each container of material (e.g., cones) from the time of collection to the time of delivery to the processing or storage facility.
 - i) Identification for *Stream 1* material must include the *temporary lot number*, holder's name, collection location (Section, Township, Range, and Meridian, or latitude and longitude in decimal degrees), year of collection, and species.
- 12.3 Transportation of materials from *public land*
 - 12.3.1 A completed *Registration Request Form* (Appendix 2 [*Stream 1*]) must accompany all shipments of *public land collections* of seed and vegetative material intended for *reforestation* or *reclamation*.
- 12.4 Transportation of materials from an approved *production site*

- 12.4.1 A completed *Registration Request Form* (Appendix 2 [*Stream 1*]) must accompany all cones, fruits and material shipments.
- 12.5 Withdrawal and transportation
 - 12.5.1 A Seed and Vegetative Materials Withdrawal and Transportation Form (see Appendix 17) must be received by *Alberta* before a seed or vegetative material withdrawal may be made.
 - 12.5.2 Unless approved by *Alberta*, withdrawals of seed or vegetative material for *deployment* are not permitted until *registration* is complete.
 - 12.5.3 A Seed and Vegetative Materials Withdrawal and Transportation Form (see Appendix 17) must be used for tracking materials from withdrawal from storage through to arrival at nurseries or related facilities. *Alberta* must be notified of any deviation from original documentation.

13.0 Processing

- 13.1 Processing of seed for operational *deployment* must be carried out at a seed processing facility approved by *Alberta*. In order to be approved, seed processing facilities must have the verifiable capability to maintain accurate identity and seedlot integrity. For a list of approved seed processing facilities, see *Alberta's* website.
- 13.2 Seed and vegetative materials must have verifiable identity documentation, and the integrity of individual lots must have been maintained throughout. Any mixing of collections must be done and documented in such a way that the eventual distribution of individuals can reasonably be assumed to be random within the *deployment* lot.
- 13.3 Seed shall be processed and delivered for storage to *Alberta* or other approved storage facility within six months of collection (see Standard 15.7).
- 13.4 The completed *Registration Request Form* (see Appendix 2 [*Stream 1*]) must accompany the seed to *Alberta* or other approved storage facility.
- 13.5 Where seed or vegetative material lots are divided for any reason, the *Registration Request Form* (see Appendix 2 or 3) must be included with each portion.
- 13.6 Seed processing facilities are not permitted to withhold any *reforestation* or *reclamation* seed, or ship that seed to any location except Alberta Tree Improvement and Seed Centre (ATISC) or another approved storage facility, without written permission from the seed owner and *Alberta*.

14.0 Seed Testing

- 14.1 Testing of seed for operational *deployment* must be conducted in accordance with *Alberta's* Seed Testing Standards, which are published on the *Alberta* website.
- 14.2 Seed testing must be conducted in an *approved facility*, and seed test result reports must be signed by an experienced seed testing technician or laboratory scientist responsible for the seed testing laboratory.

- 14.3 For all tree species except *Pinus albicaulis*, seed test results other than a *moisture measurement* must be provided to *Alberta* within four months of receipt of seed for storage. Test results for *Pinus albicaulis* and all non-tree species must be submitted within one year of receipt of seed for storage. For *moisture measurement* see Standard 15.1.1.

15.0 Storage

- 15.1 All registered seed must be stored at ATISC or another storage facility approved by *Alberta*.
- 15.1.1 All seed submitted for storage to *Alberta* or other approved storage facility must be accompanied by a *moisture measurement*.
- 15.2 *Production population* materials that need to be maintained in growing conditions for *propagule* production must be stored or maintained at an approved storage facility. An approved *production site* undertaking *propagule* production for *deployment on public land* is considered an approved storage facility.
- 15.3 *Alberta* will review requests for approval of storage facilities on the basis of physical infrastructure and management processes. Contact *Alberta* for approval process.
- 15.4 Seed and vegetative material received for storage must be securely packaged and clearly labelled with the *temporary lot number* or *registered lot number* as written on the accompanying *Registration Request Form - Stream 1* (see Appendix 2). Containers must have one tag inside and one tag securely affixed to the outside.
- 15.5 All seed and vegetative materials storage facilities must follow handling and storage procedures that maintain lot identity and integrity.
- 15.6 For storage of unregistered collections from other agencies, the minimum information required is: date of collection, owner, species, seed source, a *moisture measurement*, and total seed amount submitted for storage.
- 15.7 When submitted for cold storage, seedlots of lodgepole pine, jack pine, white spruce, Engelmann spruce, black spruce, Douglas-fir, tamarack and hybrids of any of these species must have 4-8% *moisture content* (MC) or 15-40% *equilibrium relative humidity* (eRH) at 20-30°C; seed of all other *orthodox* species will only be accepted with 15-25% eRH at 20-30°C. See Standard 14.0.

16.0 Excess Seed, Seedlings and Vegetative Material

- 16.1 Nurseries and/or propagation facilities are not permitted to sell or distribute excess seed, seedlings or vegetative material for *deployment on public land* without prior approval of the material owner and *Alberta*. An exchange of material between material owners does not require *Alberta* approval as long as all FGRMS 2016 standards are followed.

17.0 Retention of Material for *Ex Situ* Gene Conservation

- 17.1 *Alberta* has the right to retain samples of seed and vegetative material collected from *public land* for the purpose of conservation of *wild* seed or vegetative genetic material resources.
- 17.1.1 For *Stream 1* seedlots, *Alberta* may, at the time of *registration*, retain up to 30,000 viable seeds or 5% of the initial total seedlot, whichever is less. In the absence of seed viability test data, *Alberta* may retain up to 60,000 seeds or 10% of the initial total seedlot, whichever is less. *Alberta* will notify the owner of any withdrawals. Amounts greater than this will require written consent from the owner.

- 17.1.4 For all other *public land* seed or vegetative material collections not intended for *reforestation*, *reclamation* or tree improvement in Alberta, the owner may be required to provide 10% of seed or vegetative material to *Alberta*.

GREEN AREA DEPLOYMENT (GAD)

Goals

Genetic resources of forest vegetation will be deployed within the *Green Area* in a manner that strives to:

- i) conserve the genetic integrity, adaptability, diversity and health of *wild* and managed populations while recognizing that genetic change will occur through evolutionary pressure, breeding and *deployment*,
- ii) maintain or enhance forest productivity, and plant and landscape diversity,
- iii) be consistent with sustainable forest management principles (economic, social and environmental sustainability), and
- iv) recognize that Forest Management Plans (FMPs) and *reclamation* plans, or plans of an equivalent level, guided by this and other policies, will determine how *deployment* will occur.

GAD Standards

18.0 Deployment of Registered Material

18.1 General

18.1.1 Except as noted in Standard 19.0, only registered materials – *unrestricted* or *restricted* – may be deployed within the *Green Area*.

18.2 Deployment of *Stream 1* materials

18.2.1 *Stream 1* materials will be deployed within the *seed zone* of origin. *Seed zones* are those delineated on the *Seed Zone* Maps provided in Appendix 7.

18.2.2 For seed and vegetative material collections made before May 1, 2003, the need for a variance approval to move seed outside the *seed zone* of origin will be determined using the decision tree in Appendix 13.

18.2.3 To maintain population diversity within a *seed zone*, total seedling and/or vegetative material *deployment* from *Stream 1* seed or vegetative lots with *unrestricted registration* will be limited on the basis of *seed zone* size as set out in Appendix 14.

18.2.4 *Unrestricted point collections* that meet requirements in Appendix 4 are eligible for application for *deployment* outside the *seed zone* of origin (see Appendices 8 and 13). Without applying for a variance, *deployment* may occur within 1 km of the *seed zone* boundary, provided the difference in elevation from the point of collection (mid-point of range) to the point of *deployment* does not exceed 100 m. See Appendix 14 for additional *deployment* considerations.

18.2.5 Movement of seed or *vegetative propagules* outside the *seed zone* of origin requires variance approval by *Alberta*.

- i) Variances for *Stream 1* material may be requested by submitting a Request for Deployment Variance for *Stream 1* Material (see Appendices 8 and 13) to *Alberta*;
- ii) Where the same variance to deploy seed outside the *seed zone* of origin is requested several times, a standing approval may be issued for a five-year period;
- iii) Any three requests for the same variance, or a standing approval for variance, may initiate a request from either *Alberta* or the deploying party to review the *seed zone* boundaries or seed or vegetative material collection practices.

18.2.6 For *deployment* of *Stream 1* material with *restricted registration*, a determination is to be made by *Alberta* on the basis of a request for variance (see Appendix 8).

18.2.7 For *deployment* of *Stream 1* materials originating outside *Alberta*, a variance request for *registration* and *deployment* in *Alberta* may be applied for where all of the following are met:

- i) Lots proposed for transfer will be deployed within a 50 km radius and 100 m elevation of origin;
 - ii) The lot meets *registration* requirements for a *point collection* and other requirements for *unrestricted registration*;
 - iii) The lot originates in a comparable ecological region with similar climate;
 - iv) A completed Request for Deployment Variance for *Stream 1* Material (see Appendix 8) is submitted;
 - v) A completed *Registration Request Form – Stream 1* (see Appendix 2) is submitted.
- 18.3 *Species-specific seed zone* development and amendment
- 18.3.1 A proponent is required to submit a letter of intent to *Alberta* prior to developing a *species-specific seed zone* (SSSZ) research program plan, outlining *propagule* collection and *trial* design. *Alberta* will respond within three months.
- 18.3.2 Development of *species-specific seed zones* will require testing according to the following standards:
- 18.3.2.1 Establishment of *species-specific seed zones* will require a research program plan (see Appendix 24 in Volume 1) and provenance testing for adaptation.
 - 18.3.2.2 For establishment of *species-specific seed zones*, the number of *test* sites will be specified in the research program plan in consultation with *Alberta*. A minimum of five *test* sites is required. The number required may vary depending on characteristics of the proposed *species-specific seed zone* (e.g., *seed zone* size and heterogeneity). The number required may also depend on a review of ecological similarity (e.g., climate, taxonomy, crossability, ecological classification).
 - 18.3.2.3 Sites will be well distributed geographically and elevationally across, and representative of, the existing climatic variability in the actual or proposed *species-specific seed zone*.
 - 18.3.2.4 For revision of *species-specific seed zone* boundaries, the number of *test* sites will be specified in the research program plan.
 - 18.3.2.5 Research program plans for *species-specific seed zones* must also comply with Standards 25, 27, and 30 in Volume 1.

19.0 Deployment of Unregistered Material (for limited use only)

- 19.1 *Wild* transplants and *vegetative propagules* from within 5 km and 100 m elevation of the target planting site, or from within 20 km of the planting site and in the same *seed zone*, may be deployed without *registration*. These transplants and *vegetative propagules* may not be multiplied or serially propagated.
- 19.2 Where *deployment* will be without nursery production, and will be completed within nine months of the collection date, a maximum of 5,000 *propagules*, cumulative over years, from a single *genotype* may be deployed without *registration*.
- 19.3 Records must be maintained for review by *Alberta* to ensure standards have been met.

20.0 ***In Situ Gene Conservation***

- 20.1 *In situ gene conservation* for *Stream 1* material or for species not identified in a CPP for a specified seed zone will be implemented through the provincial gene conservation plan.

21.0 **Deployment Planning and Reporting**

21.2 Reporting

- 21.2.1 Compliance monitoring for timber disposition holders' *deployment* activities will be reported in the five year Stewardship Report of the FMP. Performance measures will be FMP-specific and designed to assure plan assumptions are adequately monitored. At a minimum, cumulative *deployment* of each source and type of material will be reported.
- 21.2.2 *Deployment*
- 21.2.2.1 *Deployment* by timber disposition holders, of all registered material will be reported annually to *Alberta* in the Alberta Regeneration Information System (ARIS).
- 21.2.2.2 *Deployment* by non-timber disposition holders of all plant material used in *reforestation* or *reclamation* requires documentation of: the registered seed lot number; *deployment* location (centroid decimal degrees or geospatial representation); area of *reclamation* unit/polygon; number of individuals planted by species; *deployment* date; and type of *deployment* area, i.e., one of a) linear feature (road, seismic, pipeline), b) polygon (e.g., well pad, borrow pit, mine, compressor station). This information shall be maintained by the disposition holder and made available to the regulatory body upon request.

22 **Post-Deployment Monitoring**

- 22.1 Growth and yield monitoring will be as per FMP and FMA requirements.

APPENDICES

Appendix 2. Registration Request Form for *Stream 1* Material

See Standards 10.1, 10.4, 10.7, 10.12, 12.3.1, 13.4, 13.5, 15.4 and 18.2.7.

All plant seed and vegetative materials to be used on *public land* must be registered with *Alberta*. Completion of this form initiates the *registration* process for materials collected on *public land*. The agency or company doing the collection assigns a *temporary lot number*, writes it on the tag with the material, and completes the *Registration Request Form*. *Alberta* assigns a *registered lot number* once *registration* is complete.



STREAM 1 REGISTRATION REQUEST (APPENDIX 2 FGRMS)

1. ADMINISTRATIVE INFORMATION			
OWNER/ADDRESS	(For Department Use Only)		
	SIMS INVENTORY NO.		
	REGISTRATION CATEGORY		
	<input type="checkbox"/> UNRESTRICTED	<input type="checkbox"/> RESTRICTED	<input type="checkbox"/> PENDING REGISTRATION ¹
REGISTERED LOT NUMBER (For Department Use Only)			
2. STAND AND SITE INFORMATION			
SPECIES		ARIS CODE ²	
TEMPORARY LOT NUMBER THE TEMPORARY LOT NUMBER IS ASSIGNED BY THE AGENCY AND MUST CORRESPOND WITH LABELLING ON SACKS, CONTAINERS, ETC.			
ELEVATION RANGE (m)	min	Sample	max
LEGAL LOCATION			SEED ZONE ³
PROVIDE LATITUDE & LONGITUDE INFORMATION BELOW: Record the four most outside collection points using degrees in decimal format, to six decimal places (Example: Lat 56.123456 Long 118.123456). If the collection was made within ONE legal subdivision, report the legal subdivision in the space above and provide only one latitude and longitude below.			
LATITUDE		LONGITUDE	
LATITUDE		LONGITUDE	
LATITUDE		LONGITUDE	
LATITUDE		LONGITUDE	
3. COLLECTION INFORMATION			
COLLECTION SUPERVISOR		CONTRACTOR	
COLLECTION METHOD		PICKING METHOD	TYPE OF MATERIAL COLLECTED & TOTAL VOLUME AND/OR AMOUNTS COLLECTED
Aerial <input type="checkbox"/>	Felled trees <input type="checkbox"/>	Slash <input type="checkbox"/>	Cuttings <input type="checkbox"/>
	Climbing /ladder/lift <input type="checkbox"/>	Squirrel cache <input type="checkbox"/>	Hand picked <input type="checkbox"/>
			Mechanically picked <input type="checkbox"/>
COLLECTION DATES		NUMBER OF PLANTS FROM WHICH THE COLLECTION WAS MADE ⁴	COLLECTION PERMIT (APPENDIX 10A) YES <input type="checkbox"/> NO <input type="checkbox"/> OTHER ⁵ <input type="checkbox"/>
4. INTERIM STORAGE AND SHIPPING INFORMATION			
INTERIM STORAGE DATES (INCLUDES COLD STORAGE)		DATE SHIPPED TO PROCESSING FACILITY	
PROCESSING FACILITY			
5. DECLARATION I HEREBY DECLARE THAT THE INFORMATION GIVEN ABOVE (SECTIONS 1, 2, 3 & 4) IS VALID AND CORRECT FOR THIS LOT.			
NAME		POSITION	
SIGNATURE OF REGULATED PROFESSIONAL		DESIGNATION	COMPANY
REMARKS			
6. EXTRACTION AND CLEANING INFORMATION (TO BE COMPLETED BY PROCESSING FACILITY FOR SEED ONLY).			
DATE RECEIVED	DATES EXTRACTED	AMOUNT CLEANED (KG)	SEED MOISTURE MEASUREMENT eRH <input type="text"/> MC <input type="text"/>
Approval Decision (Department use only)			
Reviewed by		Date	

A COPY OF THIS FORM MUST ACCOMPANY MATERIAL TO PROCESSING AND/OR STORAGE FACILITIES IN COMPLIANCE WITH T/M REGULATION 144.3

¹ Pending fulfillment of all requirements for registration such as adequate number of trees sampled.

² See Alberta Regeneration Information System code listing in Appendix 6 FGRMS.

³ If material from outside Alberta indicate province or state.

⁴ Provide exact number of plants if minimum trees per collection for unrestricted registration (see relevant table in Appendix 4) has not been exceeded; provide estimates if minimum number of trees has been exceeded.

⁵ Annual Operating Plan, or other plans.

Appendix 4. Requirements for Registration of *Stream 1* Material

See Standards 10.4, 10.6, 10.8, 10.12, 11.4, 18.2.4 and 20.

POINT COLLECTIONS

Where a collection meets the number, area and elevation requirements as shown in Table A4.1 and is otherwise eligible for *unrestricted registration*, material may be deployed up to 1 km outside the *seed zone* of origin, provided the difference in elevation from point of collection to point of *deployment* does not exceed 100 m. Such collections are also eligible for wider movement outside the *seed zone* of origin through application for a *Stream 1* variance (see Appendices 8 and 13). See Appendix 14 for *deployment* limits.

Table A4.1. Requirements for point collections of *Stream 1* Material.

Material category	<i>Stream 1</i> material	Minimum plants per collection for <i>unrestricted registration</i> or establishment of <i>serial propagation</i>	Range of plants per collection eligible for <i>restricted registration</i> ¹	Maximum elevation range from which plants collected	Maximum area from which collection is made
A	All seedlot collections except aspen and balsam poplar, and clonal shrubs ⁴	30	20-29	100 m	2 km radius
B	Aspen and balsam poplar and clonal shrubs ⁴ seedlot collections	10 (well-spaced clones/patches) ²	7-9 (well-spaced clones/patches) ²	100 m	5 km radius
C	Vegetative lots (deployed without <i>serial propagation</i>)	75 ³	N/A	100 m	5 km radius
D	Vegetative lots (<i>serial propagation</i> before <i>deployment</i>)	120 ³	75-119	100 m	5 km radius

¹ Collections from plants fewer than listed in this column may be stored “pending registration” (see Appendix 2) and will only be registerable when combined to meet *unrestricted* or *restricted registration* requirements.

² Must be collected from aspen and balsam poplar *clones* separated by a minimum of 500 m, or by 50 m for clonal shrubs (separation between nearest edges of patches or *clones*).

³ Must be collected from plants separated by at least 10 m.

⁴ See Table A38.4 (Appendix 38).

SEED ZONE COLLECTIONS

Where a collection does not meet the area and elevation requirements in Table A4.1 but is collected within a *seed zone* and meets the minimum number requirements in Table A4.2, and *Stream 1 unrestricted registration* requirements, this collection is eligible for *registration*. However, variance requests for *deployment* outside the *seed zone* of origin will not be considered. See Appendix 14 for *deployment* limits.

Table A4.2. Requirements for seed zone collections of *Stream 1* Material.

Material category	<i>Stream 1</i> material	Minimum plants per collection for <i>unrestricted registration</i> or establishment of <i>serial propagation</i>	Range of plants per collection eligible for <i>restricted registration</i> ¹	Collection area
A	All seedlot collections except aspen and balsam poplar, and clonal shrubs ⁴	30	20-29	Within <i>seed zone</i>
B	Aspen and balsam poplar and clonal shrubs ⁴ seedlot collections	10 (well-spaced clones/patches) ²	7-9 (well-spaced clones/patches) ²	Within <i>seed zone</i>
C	Vegetative lots (deployed without <i>serial propagation</i>)	75 ³	N/A	Within <i>seed zone</i>
D	Vegetative lots (<i>serial propagation</i> before <i>deployment</i>)	120 ³	75-119	Within <i>seed zone</i>

¹ Collections from plants fewer than listed in this column may be stored “pending *registration*” (see Appendix 2) and will only be registerable when combined to meet *unrestricted* or *restricted registration* requirements.

² Must be collected from aspen and balsam poplar *clones* separated by a minimum of 500 m, or by 50 m for clonal shrubs (separation between nearest edges of patches or *clones*).

³ Must be collected from plants separated by at least 10 m.

⁴ See Table A38.4 (Appendix 38).

STREAM 1 SEED ORCHARD COLLECTIONS

Where a collection meets the requirements in Table A4.3 and *Stream 1 unrestricted registration* requirements, it is eligible for *registration*. Variance requests for *deployment* outside the *seed zone* of origin will not be considered. See Appendix 14 for *deployment* limits.

Table A4.3. Requirements for *Stream 1* seed orchard collections.

Material Category ¹	Seed orchard type ²	Minimum number of clones or families for establishment of a <i>Stream 1</i> seed orchard	Requirements for representation of genotypes in <i>Stream 1</i> seed orchard	Collection area for seed orchard establishment
A1	Clonal <i>seed orchard</i>	100 - 300 clones/patches ³	Plants per <i>clone</i> must be between 0.5% and 10% of orchard total, or minimum $N_e = 18$	Within <i>seed zone</i>
A2	Clonal <i>seed orchard</i>	>300 clones/patches ³	Documentation at establishment	Within <i>seed zone</i>
B1	Seedling <i>seed orchard</i>	50 - 150 parents/patches ³	Minimum 4 plants /parent and maximum plants/parent must not exceed 10% of orchard total	Within <i>seed zone</i>
B2	Seedling <i>seed orchard</i>	>150 parents/patches ³	Documentation at establishment	Within <i>seed zone</i>

¹ These orchards can also be used for vegetative lot collections provided requirements in Table A4.2 are met.

² Spatial design requirements for *seed orchards* must be followed (see Appendix 32a).

³ Plants collected for *seed orchard* establishment must be separated by at least 50 m (between *clone* or patch edges) and they cannot be sourced from *artificially regenerated* areas.

RESTRICTED REGISTRATION COLLECTIONS

Collections not fully meeting *point collection* or *seed zone collection* requirements may be eligible for *restricted registration* (see Appendix 2).

COLLECTIONS PENDING REGISTRATION

Lots that do not meet requirements for *unrestricted* or *restricted registration* (e.g., lots collected from fewer than the minimum number of plants specified above) may be collected and stored, pending fulfillment of *registration* requirements (which can include combining lots from the same *seed zone* to meet *registration* requirements).

Geographic collection limits and *deployment* number caps (see Appendix 14) are in place to safeguard *genetic diversity* by considering biological differences among species, patterns of natural variation, and quantitative implications of vegetative and sexual reproduction.

Appendix 6. Stream Categories and Genetic Class Codes for Alberta Regeneration Information System (ARIS) Reporting

See Standard 10.7.

A. SEED

List of potential materials for *deployment* on provincial *public land*

Material Type	Stream	Genetic Class Code ¹
a. Native seed collections in <i>wild</i> stands		
1. Unselected parents in unselected stands	1	AIa1
2. Unselected parents in selected stands ²	1	AIa2
3. Selected parents ² in unselected stands	1	AIa3
4. Selected parents ² in selected stands ²	1	AIa4
b. Native seed collections in <i>artificially regenerated</i> stands		
5. Unselected parents in unselected stands	1	AIb5
5.i Unselected parents in <i>Stream 1 seed orchards</i>		AIb5so
6. Unselected parents in selected stands ²	1	AIb6
7. Selected parents ² in unselected stands	1	AIb7
8. Selected parents ² in selected stands ²	1	AIb8
c. Seed collections in <i>production units</i>³		
9. Improved orchard	2	AIc9
10. Unimproved orchard	2	AIc10
11. Seedlot with $N_e < 18$ (<i>registration restricted</i>) ⁴	2	AIc11
12. <i>Hybrid orchard</i> ⁵	2	AIc12
13. <i>Non-local material</i>	2	AIc13
14. <i>Genetically Modified Organisms (GMOs)</i>	2	AIc14

List of potential precursor materials for *deployment* on provincial *public land*

a. Local seed		
15. Individual family	R	
16. Pollen	R	
17. <i>GMOs</i>	R	
b. Non-local seed		
18. Provenances	R	
19. Species	R	
20. Hybrids	R	
21. Individual family	R	
22. <i>GMOs</i>	R	
23. Pollen	R	

Stream 1 = traditional *reforestation* stream (see glossary)

Stream 2 = *controlled parentage* stream (see glossary)

R = *research material* (see glossary)

¹ *Genetic class codes* assigned only to *Stream 1* and 2 materials; research materials cannot be deployed operationally.

² A selected parent tree or stand refers to a tree or stand of trees that has been systematically selected from a population of trees or stands based on a documented process of selection for one or more desirable phenotypic traits (e.g., height, form, canopy position).

³ Orchards may include some trees from adjacent areas with *Alberta* approval or based on testing.

⁴ If material fits this category in addition to any other category, this category over-rides.

⁵ Orchard designed to produce hybrid seed.

B. VEGETATIVE PROPAGULES

List of potential materials for *deployment* on provincial *public land*

	Material Type	Stream	Genetic Class Code ¹
a.	Native <i>propagule</i> collections in <i>wild stands</i>²		
1.	Unselected parents in unselected stands	1	BIa1
2.	Unselected parents in selected stands	1	BIa2
3.	Selected parents ³ in unselected stands	1	BIa3
4.	Selected parents ³ in selected stands	1	BIa4
b.	Native <i>propagule</i> collections in <i>artificially regenerated stands</i>		
5.	Unselected parents in unselected stands	1	BIb5
5.i	Unselected parents in <i>Stream 1 stoolbeds</i>		BIb5sb
6.	Unselected parents in selected stands	1	BIb6
7.	Selected parents ³ in unselected stands	1	BIb7
8.	Selected parents ³ in selected stands	1	BIb8
c.	<i>Propagules generated in production units or production populations</i>⁴		
9.	<i>Selected population</i>	2	BIc9
10.	<i>Tested population</i>	2	BIc10
10.i	<i>Tested population used in intensive deployment</i> ⁵	2	BIc10i
10.ii	<i>Tested population used in extensive deployment</i> ⁵	2	BIc10e
11.	<i>Lot with $N_e < 18$ (registration restricted)</i> ⁶	2	BIc11
12.	<i>Amplified family</i>	2	BIc12
13.	<i>Hybrids</i>	2	BIc13
14.	<i>Non-local material</i>	2	BIc14
15.	<i>GMOs</i>	2	BIc15

List of potential precursor materials for *deployment* on provincial *public land*

a.	Local material	
16.	Individual family	R
17.	Individual <i>clones</i>	R
18.	Pollen	R
19.	<i>GMOs</i>	R
b.	<i>Non-local material</i>	
20.	Provenance material	R
21.	Species material	R
22.	Hybrid material ⁷	R
23.	Individual <i>clones</i>	R
24.	Pollen	R
25.	<i>GMOs</i>	R

Stream 1 = traditional *reforestation* stream (see glossary)

Stream 2 = controlled parentage stream (see glossary)

R = *research material* (see glossary)

¹ *Genetic Class Codes* assigned only to *Stream 1* and 2 materials; research materials cannot be deployed operationally.

² Materials may be multiplied in *stoolbeds* that meet the minimum number of trees required per collection for *Stream 1* material (see Standard 11.4 and Appendix 4).

³ A selected parent tree or stand refers to a tree or stand of trees that has been systematically selected from a population of trees or stands based on a documented process of selection for one or more desirable phenotypic traits (e.g. height, form, canopy position).

⁴ *Production units* and populations may include some trees from adjacent areas with *Alberta* approval or based on testing.

⁵ See standards 18.4.3.4 and 18.4.3.5.

⁶ If material fits this category in addition to any other category, this category over-rides. *Propagules* in *intensive deployment* are allowed to have N_e below 18 and thus should not be reported in this category (Standard 18.4.3.5.1).

⁷ Hybrid with at least one non-local parent.

Appendix 7. Seed Zone Descriptions, Areas and Maps

See Standards 10.8, 18.2.1, 18.3 and 20.2 (in Volume 1).

Plant populations' exhibit genetic variation associated with differences in geography and climate of origin. Such variation is the result of long-term evolutionary processes and is key to biological adaptation to regional habitats, and to maintenance of future evolutionary potential. For these reasons, movement of all plant material for *reforestation* and *reclamation on public land* is regulated.

SEED ZONES

A seed zonation system for Alberta has been developed for natural seed movement, and replaces the old Seed Provenance Rule (*deployment* within a 50 mile [80 km] radius and plus/minus 500 feet (150 m) elevation movement from location of collection). *Seed zones* are geographic subdivisions of Natural Regions and Subregions, and are based on general genetic and ecological criteria. They limit seed movement to a conservative area where native plants of all species can be moved without risk of maladaptation or erosion of genetic integrity. Seed collections from natural stands of all species that meet *unrestricted registration* requirements can be moved freely within a *seed zone* of origin. There are a total of 90 described *seed zones* for Alberta, which cover all species and areas of the province. Seventy-four *seed zones* are applicable to the *Green Area*.

Forestry *Seed Zones* of Alberta are delineated for all areas of the province, and are applicable to all native forest plant species. The intent of *seed zones* is to provide delineated ecological land units within which planning, collection, inventory maintenance, conservation and *deployment* can occur for reproductive materials of natural forest plant species.

Seed zone delineation is hierarchical and based on Alberta's six Natural Regions, their Natural Subregions and Ecodistricts. Where there was a concern that the Natural Regions, Subregions or Ecodistricts did not adequately capture natural adaptive genetic variation, elevation contours were used for further subdivision. While current seed zones were developed for trees, the current scientific opinion is that they work sufficiently well for shrubs to guard against maladaptation; however, when new information is available, shrub-specific seed zones may be created.

Seed zone labelling is structured so that:

- a. the designated alphabetic descriptor denotes the Natural Subregion in which the *seed zone* falls;
- b. the number preceding the decimal designates groupings of *seed zones* within a subregion that are similar in climate; and
- c. the decimal portion designates the individual *seed zone* within a climate grouping. Numbering generally follows a pattern of cooler growing seasons, milder winters and increased precipitation.

Seed zones are listed in Table A7.1 and mapped in Figures A7.1, A7.2, and A7.3. *Species-specific seed zones* may be developed (see Standards 18.3 and Appendix 24A).

For *seed zone* shape files, maps, and an electronic listing of *seed zones*, contact *Alberta*.

Table A7.1. Seed zones of Alberta.

SEED ZONE LABEL	2014 REVISED AREA IN HECTARES	NATURAL REGION	NATURAL SUBREGION	SEED ZONE NAME	MIN. ELEV*	MAX. ELEV*	MEAN. ELEV*	SD. ELEV*
A 1.1	341,795	Rocky Mountain	Alpine	Kakwa-Athabasca Alpine	1306	3280	2211	182
A 1.2	572,916	Rocky Mountain	Alpine	Athabasca-Kootenay Alpine	1325	3637	2419	249
A 1.3	491,424	Rocky Mountain	Alpine	Kootenay-Bow Alpine	1739	3498	2405	220
A 1.4	86,951	Rocky Mountain	Alpine	Bow-Crowsnest Alpine	1867	3275	2390	187
A 1.5	15,371	Rocky Mountain	Alpine	Crownsnest-Waterton Alpine	1876	2901	2281	137
AP 1.1	1,352,525	Boreal	Athabasca Plain	Athabasca Plain	199	646	311	101
BSA 1.1	952,530	Boreal	Boreal Subarctic	Caribou Mountains Boreal Subarctic Uplands	655	1000	847	62
BSA 1.2	229,742	Boreal	Boreal Subarctic	Cameron Hills Boreal Subarctic Uplands	581	825	697	47
CM 1.1	1,675,648	Boreal	Central Mixedwood	Great Slave Central Mixedwood Plains	196	522	253	37
CM 1.2	1,209,780	Boreal	Central Mixedwood	Vermillion Central Mixedwood Lowlands	241	696	367	82
CM 1.3	1,739,345	Boreal	Central Mixedwood	Hay River Central Mixedwood Lowlands	279	630	391	55
CM 2.1	1,243,579	Boreal	Central Mixedwood	Saskatchewan Central Mixedwood Plains	210	670	438	85
CM 2.2	1,384,867	Boreal	Central Mixedwood	Mackay Central Mixedwood Lowlands	228	682	482	83
CM 2.3	1,103,602	Boreal	Central Mixedwood	Loon Lake Central Mixedwood Lowlands	358	690	556	55
CM 2.4	1,786,122	Boreal	Central Mixedwood	Wabasca Central Mixedwood Lowlands	222	759	558	65
CM 3.1	2,524,589	Boreal	Central Mixedwood	Mostoos Hills Central Mixedwood Uplands	443	867	628	58
CM 3.2	1,301,511	Boreal	Central Mixedwood	Swan Hills-Pelican Central Mixedwood Uplands	510	897	657	50
CM 3.3	1,402,207	Boreal	Central Mixedwood	Swan Hills-Utikuma Central Mixedwood Uplands	551	877	671	52
CM 3.4	992,783	Boreal	Central Mixedwood	Wapiti-Smoky Central Mixedwood Uplands	576	928	763	50
CM 3.5	421,425	Boreal	Central Mixedwood	Drayton Central Mixedwood Plains	733	1039	863	52
CP 1.1	3,487,579	Parkland	Central Parkland	Northern Central Parkland Plains	497	1028	705	77
CP 1.2	1,883,038	Parkland	Central Parkland	Southern Central Parkland Plains	601	1254	825	130
DM 1.1	1,476,415	Boreal	Dry Mixedwood	Vermillion Dry Mixedwood Lowlands	194	613	340	57
DM 1.2	1,735,991	Boreal	Dry Mixedwood	Peace River Dry Mixedwood Lowlands	259	829	588	86
DM 1.3	1,704,194	Boreal	Dry Mixedwood	Smoky River Dry Mixedwood Lowlands	286	969	625	72
DM 2.1	1,138,702	Boreal	Dry Mixedwood	Lac La Biche Dry Mixedwood Plains	488	739	604	46
DM 2.2	1,951,240	Boreal	Dry Mixedwood	Edmonton Dry Mixedwood Plains	487	934	689	67
DM 2.3	525,537	Boreal	Dry Mixedwood	Red Deer Dry Mixedwood Plains	828	1235	994	71
DMG 1.1	4,693,714	Grassland	Dry Mixedgrass	Southeastern Dry Mixedgrass Plains	567	1102	798	81
FF 1.1	1,362,345	Grassland	Foothills Fescue	Southwestern Foothills Fescue	799	1524	1106	128
FP 1.1	355,167	Parkland	Foothills Parkland	Southwestern Foothills Parkland	1022	1533	1235	78
FP 1.2	37,001	Parkland	Foothills Parkland	Waterton Foothills Parkland	1245	1587	1380	55
KU 1.1	971,882	Canadian Shield	Kazan Uplands	Kazan Upland	165	409	273	41
LBH 1.1	624,356	Boreal	Lower Boreal Highlands	Bistcho Lower Boreal Highlands	389	792	523	62
LBH 1.2	469,632	Boreal	Lower Boreal Highlands	Caribou Mountains Lower Boreal Highlands	410	896	607	86
LBH 1.3	1,042,176	Boreal	Lower Boreal Highlands	Birch Mountains Lower Boreal Highlands	437	838	666	54
LBH 1.4	595,419	Boreal	Lower Boreal Highlands	Buffalo Head Hills Lower Boreal Highlands	468	834	687	49

SEED ZONE LABEL	2014 REVISED AREA IN HECTARES	NATURAL REGION	NATURAL SUBREGION	SEED ZONE NAME	MIN. ELEV*	MAX. ELEV*	MEAN. ELEV*	SD. ELEV*
LBH 1.5	665,699	Boreal	Lower Boreal Highlands	Stony Mountain Lower Boreal Highlands	558	871	689	36
LBH 1.6	1,985,568	Boreal	Lower Boreal Highlands	Clear Hills Lower Boreal Highlands	510	1064	738	74
LBH 2.1	178,450	Boreal	Lower Boreal Highlands	Cameron Hills Lower Boreal Highlands	563	777	655	42
LF 1.1	253,333	Foothills	Lower Foothills	Pelican Mountains Lower Foothills	663	1021	800	76
LF 1.2	295,179	Foothills	Lower Foothills	Saddle Hills Lower Foothills	641	1019	816	57
LF 1.3	952,135	Foothills	Lower Foothills	Swan Hills Lower Foothills	678	1141	882	84
LF 1.4	779,453	Foothills	Lower Foothills	Wapiti-Athabasca Lower Foothills	675	1210	916	75
LF 1.5	999,615	Foothills	Lower Foothills	McLeod-North Saskatchewan Lower Foothills	704	1168	932	63
LF 2.1	663,891	Foothills	Lower Foothills	Athabasca-McLeod Lower Foothills	817	1575	1042	72
LF 2.2	335,231	Foothills	Lower Foothills	Brazeau-Clearwater Lower Foothills	965	1700	1100	66
LF 2.3	211,005	Foothills	Lower Foothills	Clearwater-Bow Lower Foothills	1067	1648	1268	92
M 1.1	30,948	Rocky Mountain	Montane	Cypress Hills Montane	1119	1474	1340	80
M 2.1	48,420	Rocky Mountain	Montane	Grande Cache Montane	825	1555	1141	135
M 2.2	33,608	Rocky Mountain	Montane	Jasper Lower Montane	926	1314	1053	68
M 3.2	94,211	Rocky Mountain	Montane	Jasper Upper Montane	941	1864	1212	120
M 4.1	17,078	Rocky Mountain	Montane	Kootenay Lower Montane	1198	1640	1326	61
M 4.2	2,170	Rocky Mountain	Montane	Ya Ha Tinda Montane	1533	1749	1609	42
M 4.3	71,657	Rocky Mountain	Montane	Bow Lower Montane	1176	1921	1358	76
M 4.4	139,316	Rocky Mountain	Montane	Bow-Porcupine Lower Montane	1198	1687	1385	75
M 4.5	137,019	Rocky Mountain	Montane	Crowsnest Lower Montane	1151	1793	1417	91
M 5.1	25,298	Rocky Mountain	Montane	Kootenay Upper Montane	1195	2015	1418	77
M 5.3	77,029	Rocky Mountain	Montane	Bow Upper Montane	1241	2100	1545	108
M 5.4	102,078	Rocky Mountain	Montane	Bow-Old Man Upper Montane	1362	1908	1557	75
M 5.5	20,759	Rocky Mountain	Montane	Porcupine Hills Upper Montane	1407	1814	1590	71
M 5.6	77,150	Rocky Mountain	Montane	Crowsnest Waterton Upper Montane	1242	1917	1506	89
MG 1.1	1,719,776	Grassland	Mixedgrass	Western Mixedgrass Plains	648	1341	953	88
MG 1.2	38,334	Grassland	Mixedgrass	Sweetgrass Mixedgrass Uplands	942	1262	1066	36
MG 1.3	249,066	Grassland	Mixedgrass	Cypress Hills Mixedgrass Uplands	825	1446	1099	95
NF 1.1	1,493,335	Grassland	Northern Fescue	Northern Fescue Plains	643	1096	809	68
NM 1.1	2,380,309	Boreal	Northern Mixedwood	Great Slave Northern Mixedwood Plains	159	521	316	60
NM 2.1	570,971	Boreal	Northern Mixedwood	Bistcho Lake Northern Mixedwood Uplands	445	660	568	30
PAD 1.1	553,542	Boreal	Peace-Athabasca Delta	Peace-Athabasca Delta Plains	188	261	216	11
PRP 1.1	312,042	Parkland	Peace River Parkland	Peace River Parkland Lowlands	302	797	620	86
SA 1.1	574,886	Rocky Mountain	Subalpine	Wapiti-Athabasca Lower Subalpine	1030	2126	1496	107
SA 1.2	307,191	Rocky Mountain	Subalpine	Athabasca-Kootenay Lower Subalpine	1036	2319	1629	119
SA 2.1	384,771	Rocky Mountain	Subalpine	Wapiti-Athabasca Upper Subalpine	1275	2697	1837	126
SA 2.2	333,920	Rocky Mountain	Subalpine	Athabasca-Kootenay Upper Subalpine	1247	2754	1950	137
SA 3.1	270,422	Rocky Mountain	Subalpine	Kootenay-Bow Lower Subalpine	1401	2329	1766	101

SEED ZONE LABEL	2014 REVISED AREA IN HECTARES	NATURAL REGION	NATURAL SUBREGION	SEED ZONE NAME	MIN. ELEV*	MAX. ELEV*	MEAN. ELEV*	SD. ELEV*
SA 3.2	172,157	Rocky Mountain	Subalpine	Bow-Crowsnest Lower Subalpine	1371	2319	1772	97
SA 3.3	65,679	Rocky Mountain	Subalpine	Crowsnest-Waterton Lower Subalpine	1383	2419	1727	118
SA 4.1	232,365	Rocky Mountain	Subalpine	Kootenay-Bow Upper Subalpine	1558	2730	2020	113
SA 4.2	139,361	Rocky Mountain	Subalpine	Bow-Crowsnest Upper Subalpine	1707	2694	2045	109
SA 4.3	41,073	Rocky Mountain	Subalpine	Crowsnest Waterton Upper Subalpine	1429	2648	2027	129
UBH 1.1	601,181	Boreal	Upper Boreal Highlands	Birch Mountains Upper Boreal Highlands	647	870	759	39
UBH 1.2	168,900	Boreal	Upper Boreal Highlands	Buffalo Head Upper Boreal Highlands	668	911	789	31
UBH 1.3	415,729	Boreal	Upper Boreal Highlands	Clear Hills Upper Boreal Highlands	772	1112	961	63
UF 1.1	215,721	Foothills	Upper Foothills	Swan Hills Upper Foothills	908	1388	1133	72
UF 1.2	85,116	Foothills	Upper Foothills	Mayberne Upper Foothills	1015	1457	1204	67
UF 1.3	912,772	Foothills	Upper Foothills	Wapiti-Athabasca Upper Foothills	807	1737	1214	99
UF 1.4	471,904	Foothills	Upper Foothills	Athabasca-North Saskatchewan Upper Foothills	1033	1703	1305	113
UF 1.5	196,392	Foothills	Upper Foothills	North Saskatchewan-Bow Upper Foothills	1131	1860	1391	100
UF 2.4	75,247	Foothills	Upper Foothills	Brazeau Upper Foothills	1288	1972	1537	68
UF 2.5	196,549	Foothills	Upper Foothills	Red Deer Upper Foothills	1286	2145	1588	83

* The elevation data was calculated from gridded raster cells.

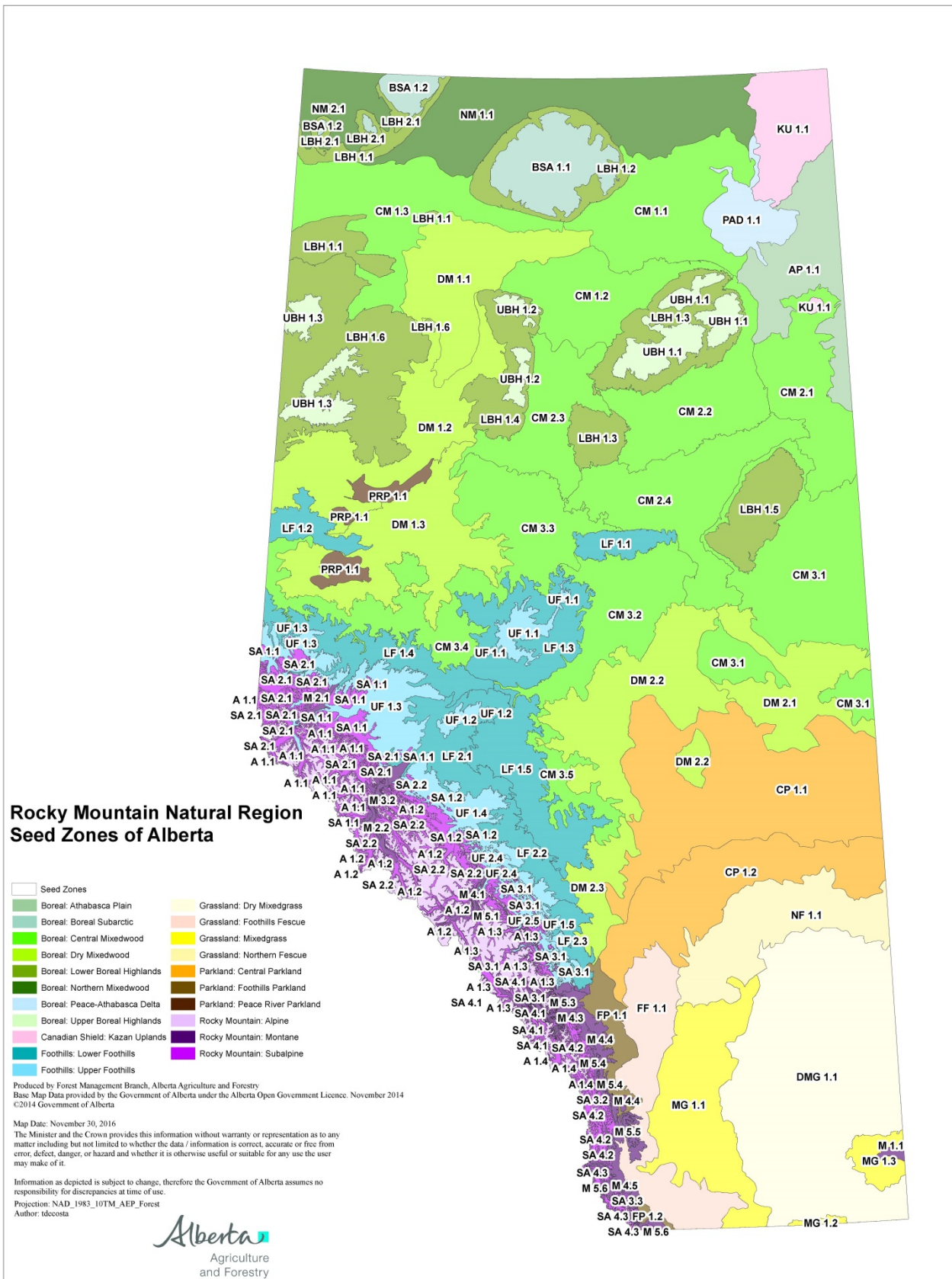


Figure A7.1. Seed zones of Alberta.

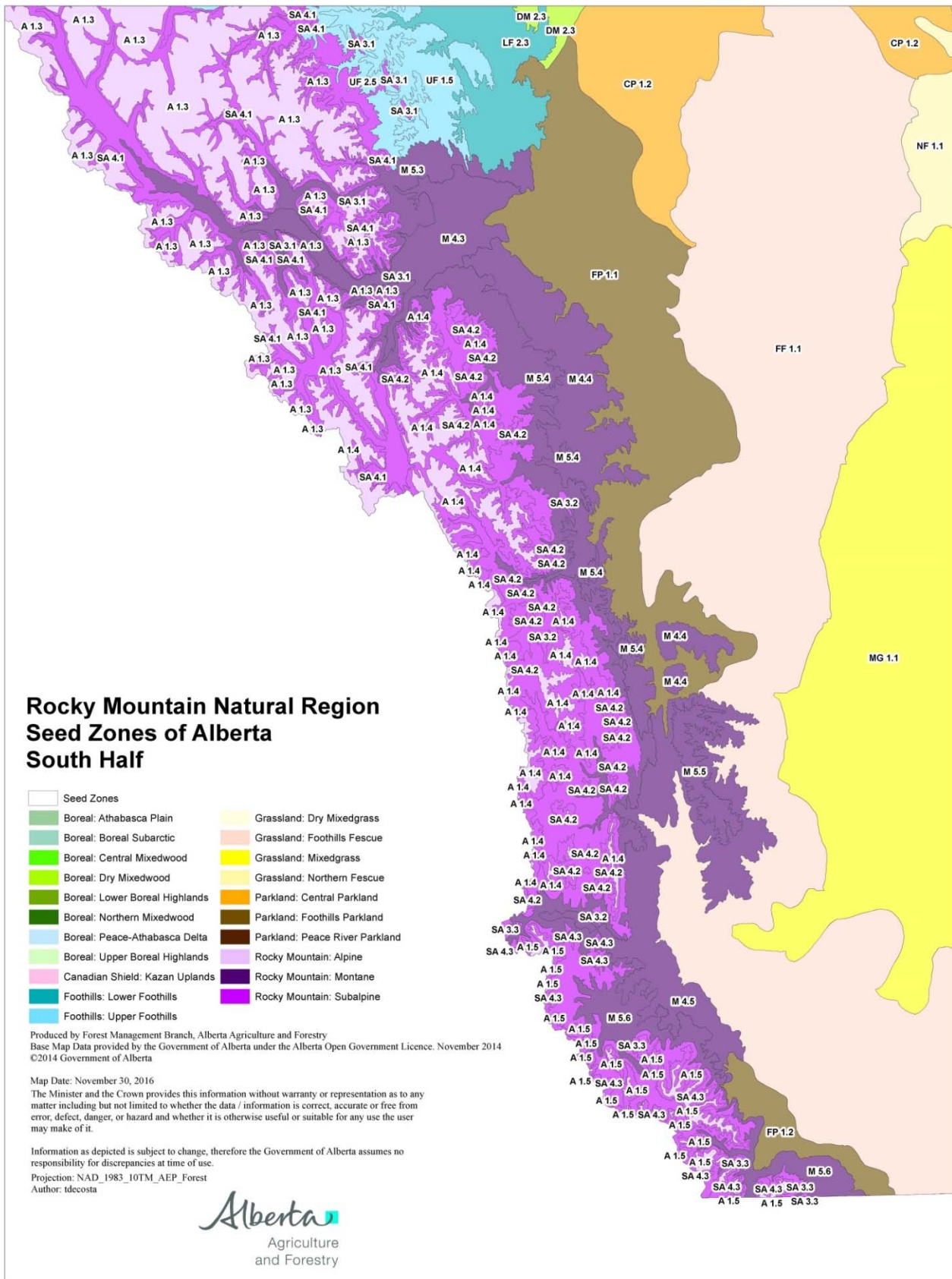


Figure A7.2. Seed zones of Alberta. Southern Rocky Mountains.

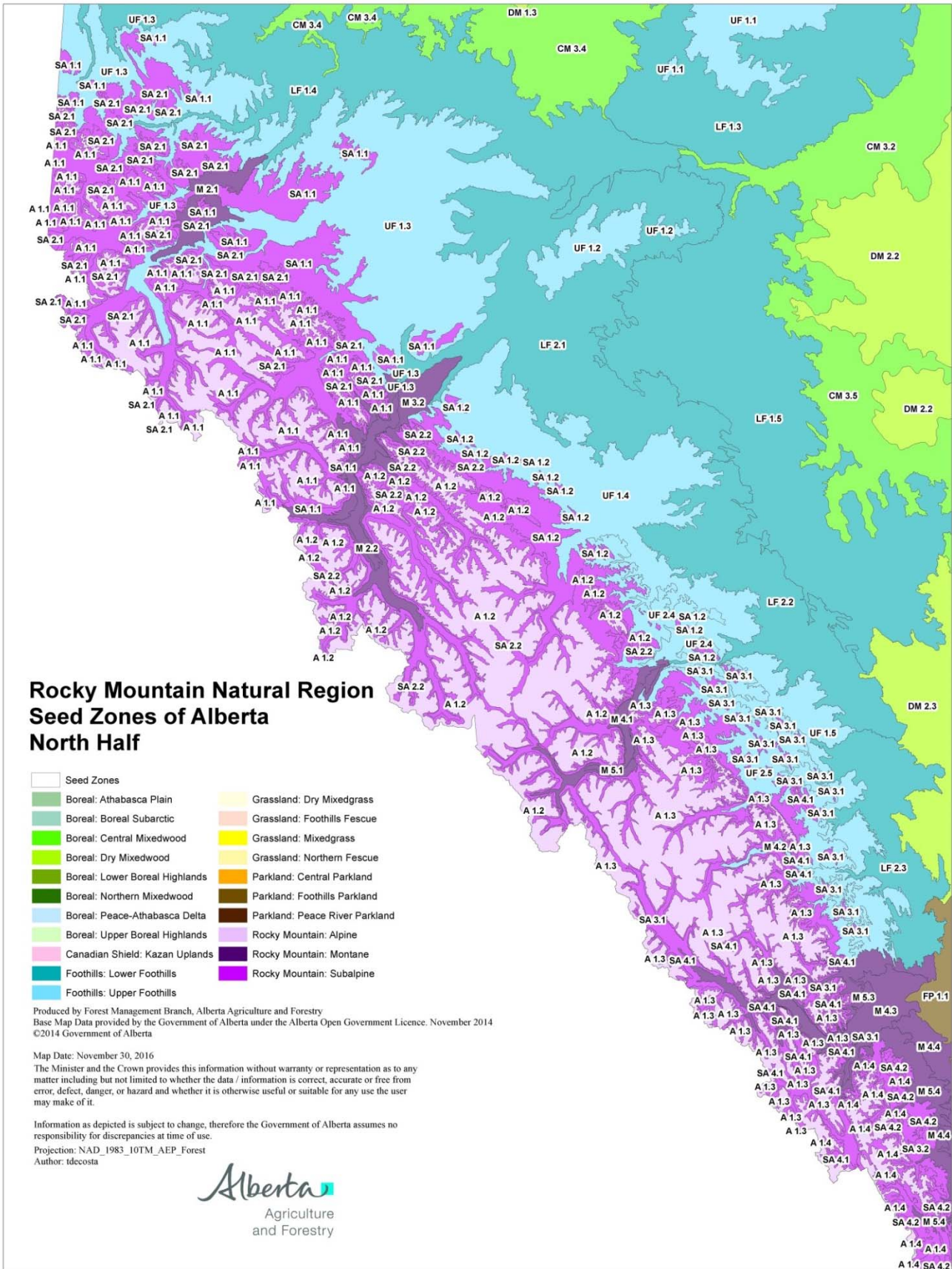


Figure A7.3 Seed zones of Alberta. Northern Rocky Mountains.

Appendix 8. Request for Deployment Variance for *Stream 1* Material

See Standards 10.13, 18.2.4, 18.2.5, 18.2.6 and 18.2.7.



STREAM 1 REQUEST FOR DEPLOYMENT VARIANCE (APPENDIX 8 FGRMS)

REQUESTING AGENCY		DATE _____	
Agency Name _____			
Mailing Address _____			
Contact _____			
Phone _____		Fax _____	
E-mail _____			
REQUEST CATEGORY			
Lot has restricted registration		Transfer outside of seed zone origin <input type="checkbox"/>	
		Transfer from outside Alberta <input type="checkbox"/>	
TYPE OF VARIANCE REQUESTED			
<input type="checkbox"/> Annual		<input type="checkbox"/> Standing	
REASONS FOR REQUEST			
CROP DESCRIPTION			
Registered lot number _____		Species _____	
Seed Zone ¹ _____		Legal Location (to Section) ² sec _____ twp _____ rge _____ W _____	
Mean Lat., Long. ³ and Elev.(m) _____		Lat. Long ³ . and Elev. Range (m) min _____ max _____	
<input type="checkbox"/> Seed		<input type="checkbox"/> Seedling	
		<input type="checkbox"/> Vegetative	
		Crop size _____	
PROPOSED DEPLOYMENT		ARIS Opening No(s) or Disposition No(s). Attach sheet for additional openings _____	
Seed Zone _____		Legal Location (to Section) sec _____ twp _____ rge _____ W _____	
Mean Lat., Long ³ . and Elev.(m) _____		Lat., Long ³ . and Elev. Range (m) min _____ max _____	
Years of Deployment (Standing Variance only) _____			
# of seedlings/propagules to be deployed in proposed deployment _____			
PROPONENT/AGENCY			
Name _____		Position _____	
Signature _____		Date _____	
VARIANCE APPROVAL (DEPARTMENT USE ONLY)			
		Date _____	
		Reviewed By: _____	
		Date _____	
<input type="checkbox"/> Approved		<input type="checkbox"/> Denied	
Approved with conditions <input type="checkbox"/>		Approved by _____	
Conditions _____			
Variance No. _____			

¹ If material from outside Alberta indicate province or state.

² Optional.

³ Degrees in decimal format, to six decimal places (Example: Lat 56.123456 Long 118.123456).

Appendix 10. Temporary Field Authorization Form

REPEALED

Appendix 10A. Authorization to Collect Plant Material Request Form for *Stream 1* Material

See Standards 7.0, 11.1 and 17.



Authorization to Collect Plant Material Request Form for *Stream 1* material: Collections of plant material by other than *forest tenure holders* require authorization by *Alberta*. A request for authorization is made by completing this form and submitting it to *Alberta*. (Appendix 10A FGRMS)

AAF Region:		Date of application:	
Applicant name/organization:			
Address:			
City:		Province:	Postal code:
Telephone:	Fax:	Email:	
Requested start date:		Estimated completion date:	
1. Purpose of collection:			
2. Collection location: Provide <i>seed zone</i> and attach maps of the collection area(s) (add lat. and long. in decimal degree format where applicable; e.g.,: Lat. 56.123456, Long. 118.123456).			
3. Target species (attach list)*:		4. Material type and amounts expected (attach list)*:	
5. Harvest method: (attach list)*			
6. Will collected materials be used for <i>reforestation</i> or <i>reclamation</i> on Alberta public lands? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Other and specify:			
7. Retention of seed For <i>Stream 1</i> seedlots, <i>Alberta</i> may, at the time of <i>registration</i> , retain up to 30,000 viable seeds or 5% of the initial total seedlot, whichever is less. In the absence of seed viability test data <i>Alberta</i> may retain up to 60,000 seeds or 10% of the initial total seed lot, whichever is less. <i>Alberta</i> will notify the owner of any withdrawals. Amounts greater than this will require written consent of the owner. (Standard 17.1.1) . For all other <i>public land</i> seed or vegetative material collections not intended for <i>reforestation</i> , <i>reclamation</i> or tree improvement in Alberta, the owner may be required to provide 10% of harvested seed or vegetative material to <i>Alberta</i> . (Standard 17.1.4) .			
Signature of Applicant:			
8. Other permission(s) and/or notifications required (Area office department use only) Road access: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not required Land use TFA: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not required Disposition permission: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not required Other (specify) _____ If TFA is required, attach application and submit to Area Office for approval.			
9. Approval Decision: (Department Use Only) <input type="checkbox"/> Approved <input type="checkbox"/> Approved with conditions		Date: _____ <input type="checkbox"/> Denied	
Approved by: _____			

*If there are two or more species attach an Excel file to the application, with the following four columns for items 3, 4 and 5: Target species, Material type, Amounts expected, and Harvest method.

Information for completing an authorization to collect plant material request form.

1. Purpose of collection: State the purpose of the collection (e.g., research, education, *reclamation*, conservation, or saleable product).
2. Collection location: Provide the *seed zone* name and attach maps of the collection area(s).
3. Target species: Provide the scientific or accepted common name of the species to be collected.
4. Material type and amounts: Provide the material to be collected (e.g., cones, cuttings, seed, catkins, or berries) and provide an estimate of the amounts to be collected (volumes or weights).
5. Harvest method: Include the harvesting method to be used (e.g., felling trees, climbing trees, aerial rakes, slash collections, ladders, pruning poles, secateurs, hand collections).
6. The issuance of an authorization to collect plant material does not necessarily eliminate the need for other approvals for the use of *public land*. For example, a Temporary Field Authorization (TFA) is required for staging areas and camps, and private roads or rights of way may require access permission. The applicant is required to ensure all additional approvals required are obtained prior to entry or commencement of the activity.
7. Materials collected for *reforestation* or *reclamation* purposes on Alberta *public land* must be collected, transported, processed, tested, registered and stored in accordance with FGRMS, 2016, which can be found on the *Alberta* website. For collections intended for *public land* use, a completed *Registration Request* form – *Stream 1* (see Appendix 2) must accompany all material shipments.
8. *Alberta* requires a minimum of five full working business days from receipt of application for review. An *Alberta* representative will contact the applicant within that time to discuss the application and status of approval.
9. Conditions may include requirements for stakeholder notification, TFAs, existing land reserves, road restrictions, and debris disposal methods. The amount of material to be retained by *Alberta* for conservation purposes may be established at the time of collection authorization, or at the time of *Stream 1* material registration.

Appendix 13. Decision Tree for Deployment of *Stream 1* Material Outside the Seed Zone of Origin

See Standards 10.8, 18.2.2 and 18.2.4.

These *deployment* decision trees (Figures A13.1 and A13.2) are based on seedlot type, seed collection and use history, ecological classification, the known relationship between climate and plant population genetics, and results from Alberta conifer provenance *trials* in Alberta. These conifer provenance *trials* show that:

- i) moderate movement up in elevation is neutral or can increase growth without reducing survival, whereas downward movement in mountains and hill systems can seriously reduce growth;
- ii) populations from mid latitudes and mid elevations have high genetic growth potential over much of Alberta, whereas populations from high latitudes and high elevations have high genetic growth potential only when planted in their native areas.

It is recognized that locally adapted populations have other attributes, such as tolerance to local strains of insects and diseases, tolerance of extreme weather conditions, and optimal reproduction, which have yet to be systematically tested in Alberta. The risk for these traits is mitigated through progressive moderate seed transfers as research data become available.

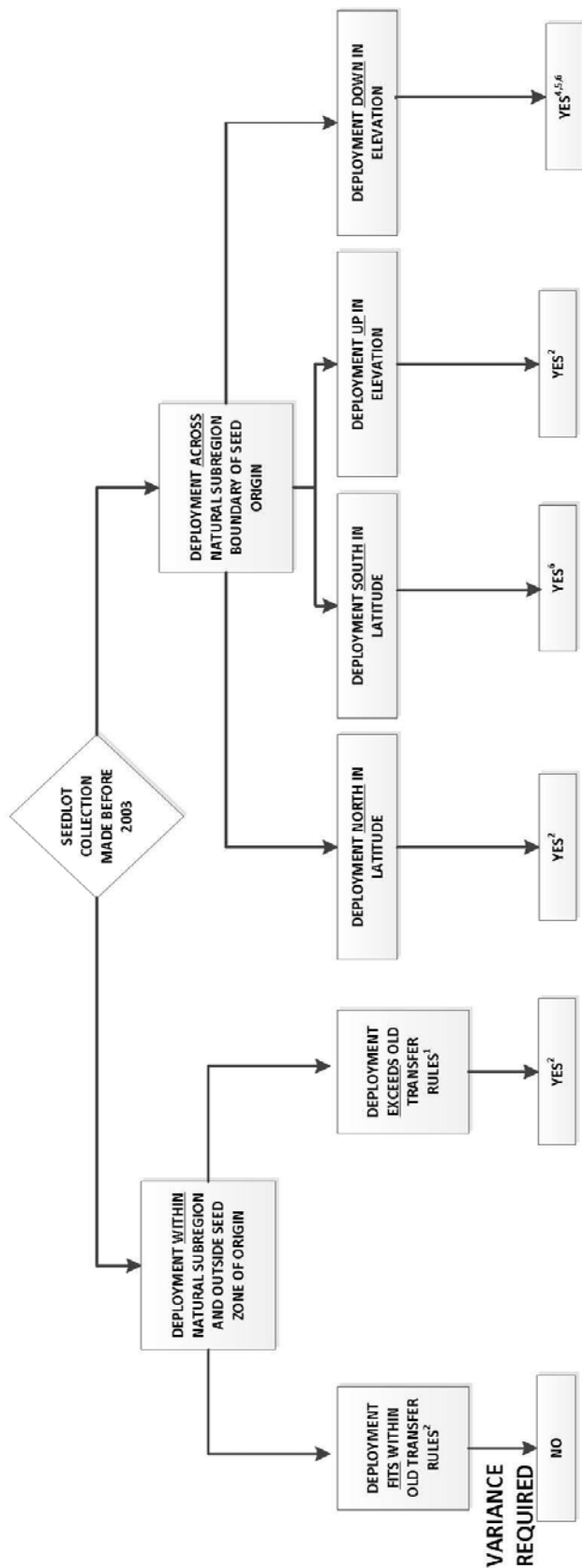


Figure A13.1. Pre-2003 seedlot collections: variance requirements.

- 1 “Old transfer rules” refers to *deployment* within 50 miles (80 km) and within 500 feet (150 metres) elevation from the collection location.
- 2 Quality of seed origin information, potential for undesirable hybridization numbers being transferred and adaptation to current and future predicted climate will be considered in reviews.
- 3 For a description of point collection see Appendix 4.
- 4 Eligible in the boreal forest region where transfer North in latitude coincide with transfer down in elevation.
- 5 Not eligible in mountainous regions (Foothills, Boreal highlands, Montane, Alpine).
- 6 Eligible only where the opening bisects seed zone boundaries.

Fuzzy Boundary Note:
 Point collections are eligible for deployment up to 1 km outside the seed zone of origin boundary without variance provided the difference in elevation from the point of collection to point of deployment does not exceed 100 m.

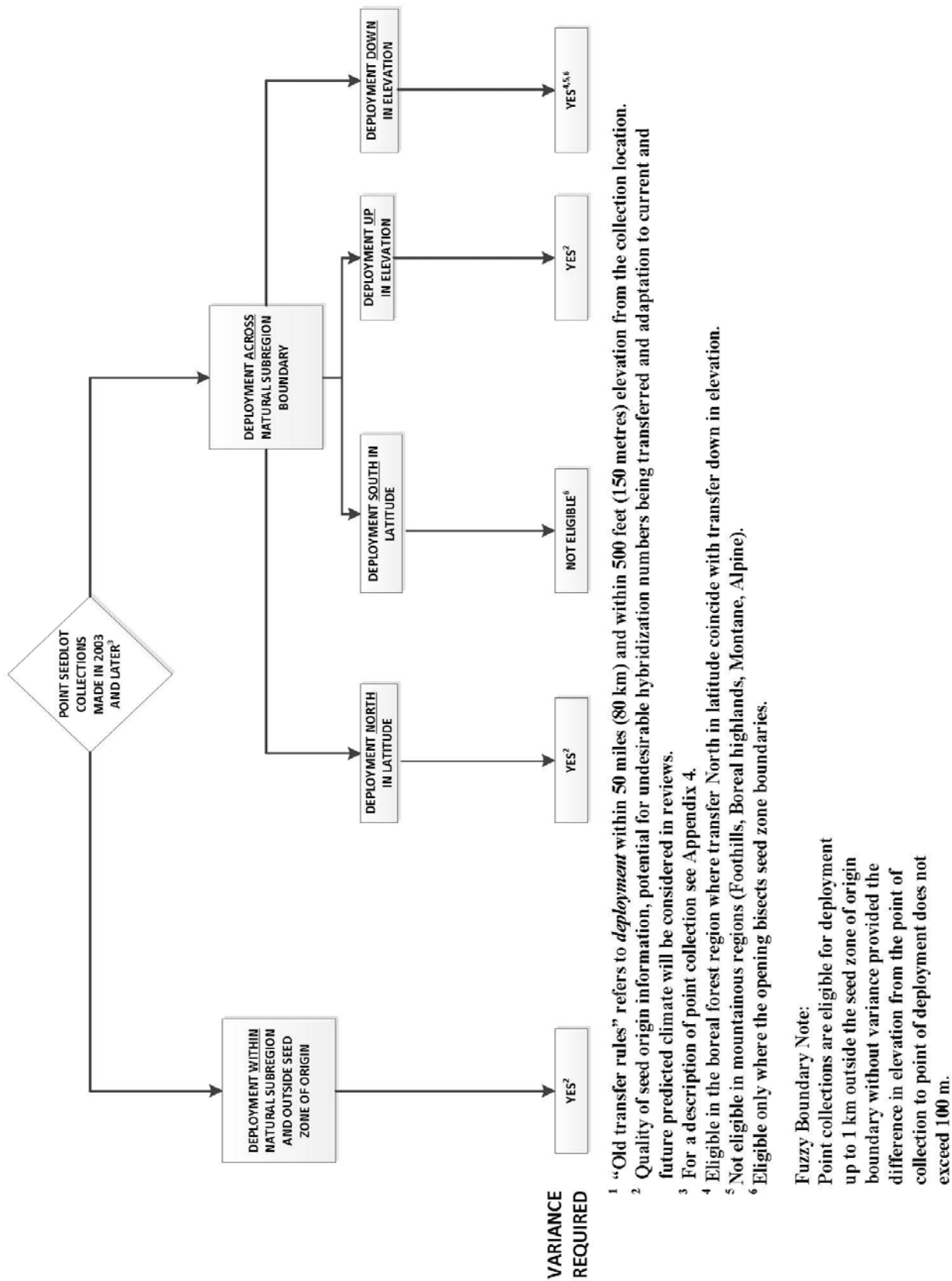


Figure A13.2. Point collections (2003 and later): variance requirements.

Appendix 14. Stream 1 Seedling and Vegetative Propagule Lot Deployment Limit by Seed Zone

See Standards 11.3, 18.2.3 and 18.2.4.

Seed zone collections are permitted; however *point collections* are recommended, and are eligible for variance requests for transfer outside *seed zone* boundaries.

Table A14.1 provides limits on *deployment* for *seed zone* and *point collections*; Table A14.2 provides limits on *deployment* for *Stream 1 seed orchard (seed zone specific)* collections.

Table A14.3 provides examples showing the amount of seed required to produce 1,000,000 seedlings, and the area of land that could be planted, for a number of different species.

Table A14.1. Deployment limits for seed zone and point collections.

Size category	Seed zone area (ha) ¹	Maximum number deployable per lot ²	
		Seedlings	Vegetative propagules
1	> 1 million	25 million	20 million
2	500,000 to 1 million	20 million	16 million
3	100,000 to 500,000	15 million	12 million
4	< 100,000	10 million	8 million

¹ See Appendix 7 for *seed zone* sizes.

² *Deployment* limit includes seed and *vegetative propagules* from a single lot.

Table A14.2. Deployment limits for Stream 1 seed orchard/vegetative collections.

Size category	Seed zone area (ha) ¹	Maximum number deployable ²	
		Seedling	Vegetative propagules ³
1	> 1 million	82.5 million	66 million
2	500,000 to 1 million	66 million	53 million
3	100,000 to <500,000	50 million	40 million
4	< 100,000	33 million	26 million

¹ See Appendix 7 for *seed zone* sizes.

² Contact *Alberta* if greater *deployment* is wanted.

³ Refers to material from Appendix 4 Table A4.3 Orchard types A2 and B2 only.

Table A14.3. Examples: seed required to produce one million seedlings, and area to be covered.

Species ¹	Average seeds/kg	Seeds required per delivered seedling	Seed required (kg)	Planting density (/ha)	Coverage (ha)
Pl	250,000	2.5	10.0	1800	555
Sw	425,000	2.5	5.9	1800	555
Aw	8,100,000	5.0	0.617	1800	555
Pb	4,600,000	5.0	1.09	1800	555
Alnuvir	4,500,000	5.0	1.11	200 ²	5000
Cornser	35,000	4.0	114.3	200 ²	5000
Shepcan	135,000	4.0	29.6	200 ²	5000
Amelaln	330,000	4.0	12.12	200 ²	5000

¹ See Appendix 38 for common and Latin names associated with species codes.

² Average from oil sands mine closure plans.

Appendix 16. Research, Conservation or Controlled Parentage Program Transportation and Interim Storage of Plant Material Form

See Standard 12.1 and 12.2.



Research, Conservation or Controlled Parentage Program Transportation and Interim Storage of Plant Material Form) (APPENDIX 16 FGRMS) ¹

UNIQUE IDENTIFIER	
	(or other genetic identifier including accession, temporary or registered lot number)
OWNER(S)	

DESTINATION FACILITY			
Mailing Address			
Contact		Phone	
		Fax	
E-mail			

COLLECTING AGENCY	
Representative	Sample
Phone	
E-mail	

DATE OF COLLECTION

DATE OF SHIPPING

MATERIAL DESCRIPTION	
Species	Collection Location
Latitude ²	Longitude ²
Type of Material (e.g. cones, fruit, seed, pollen, cuttings, roots)	
Quantity of Material (specify measurements units: e.g. grams of seed, metres of roots, number or volume of cones)	

¹This form is to accompany all genetic material (seed, pollen, cuttings, tissue etc.). Where there are multiple genetic identities, an attached sheet listing the individual genetic identities in the shipment may be used. Material representing each genetic identity in the shipment must be unequivocally labelled with a label both inside and outside the container clearly identifying its genetic identity number.

² Degrees in decimal format, to six decimal places (Example 56.123456).

Appendix 17. Seed and Vegetative Materials Withdrawal and Transportation Form

See Standards 12.5.1, 12.5.3 and 16.1.



SEED AND VEGETATIVE MATERIALS WITHDRAWAL AND TRANSPORTATION (STREAM 1 AND 2) (APPENDIX 17 FGRMS)

ATISC REF. NO.	
----------------	--

A	B	C	D	E	F	G	H
REGISTERED LOT NUMBER	SUBLOT NUMBER <small>(if applicable)</small>	ORIGIN SEED ZONE	RESTRICTED OR UNRESTRICTED	# OF SEEDLINGS OR PROPAGULES ORDERED	NURSERY/ PRODUCTION FACILITY	DEPLOYMENT/ SEED ZONE	AMOUNT (kg of seed)

Sample

DELIVER TO
DELIVERY FROM
SHIP VIA
ORDERED BY <small>(Person authorizing withdrawal)</small>

PURPOSE (Check)

- C NURSERY PRODUCTION (Complete columns A, B, C, D, E, F, G & H)
- C DIRECT SEEDING/PLANTING (Complete columns A, B, C, D, G & H)
- C TESTING (Complete columns A, B & H)
- C OTHER - specify below

DELIVERY DATE
DATE ORDERED

This form is used in tracking and inventory control of registered material and must accompany the material described above during transport. A copy must be sent to the Alberta Tree Improvement and Seed Centre (ATISC) Box 750, Smoky Lake, Alberta T0A 3C0 or by fax (780) 656-5109. Unused seed should be returned to storage unless instructed otherwise by owner.

Appendix 24A. Species-Specific Seed Zone Research Program Plan – Contents for *Stream 1* Material

See Standards 18.3 (in Volume 1A), 25, 27 and 30 (in Volume 1).

Proponents are encouraged to discuss their proposal with *Alberta* prior to preparation of research program (RP) plan.

This appendix is to be used when a proponent wishes to establish a new *seed zone* for a species or group of species.

The following topics are to be addressed in a *species-specific seed zone* (SSSZ) RP plan.

Where the SSSZ RP plan requires field testing, *Genetic Test Site* Information Form(s) (Appendix 29) shall be submitted as per Standard 30.3.2.

Introduction

- i) Project title;
- ii) Research proponents;
- iii) Research objective(s);
- iv) Traits of interest (must include survival and growth; for shrub testing, reproduction must be considered).

Proposed *seed zone* description and delineation must include:

- i) Current *seed zones* existing within proposed boundary;
- ii) Digital shape file of proposed boundary;
- iii) Proposed SSSZ description (latitude, longitude, elevation, range);
- iv) Ecological information (ecological classification at various scales and general biome description);
- v) Forest types and plant communities (e.g., general description of ecosite types and plant communities) (see Natural Regions Committee, 2006);
- vi) Topography (general description of terrain and surface expression);
- vii) Climate (e.g., precipitation, frost-free period, growing degree days, average July and average January mean daily temperatures, wind patterns, chinooks);
- viii) Information on adaptive genetic variation that is pertinent to the description and delineation of the SSSZ;
- ix) Administration and land use information (land management jurisdiction, main land use activities, and planning objectives for the area);
- x) Process used to delineate the SSSZ.

Materials

- i) Target species or group of species;
- ii) Genetic *test* material (e.g., provenances, populations, families);
- iii) Genetic *test* material origin (must include material from all *seed zones* within the proposed SSSZ);
- iv) Physical *test* material (e.g., seedling, seed, rooted cuttings; also stock type).

Methods

- i) *Propagule* collection (number of plants per site, number and location of sites);
- ii) Experimental *trial* design;
- iii) Criteria for selection and protection of *test* site(s) if applicable;
- iv) Site description (completed *Genetic Test Site* Information Forms; Appendix 29);
- v) Description of assessed traits and assessment methods;
- vi) Data collection schedule;
- vii) Analysis procedures.

Anticipated deliverables

- i) List and discussion of deliverables in terms of research objectives.

Field *test* area justification and risk/benefit assessment for *test* sites greater than 17 ha

- i) Where a research *test* requires more than 17 ha per site or more than 85 ha cumulatively across *test* sites to meet *test* objectives, a justification must be made.
- ii) In addition, where a research *test* exceeds 17 ha per site or occupies more than 85 ha across *test* sites, and includes previously untested non-local species or provenances, a risk/benefit assessment is required that addresses the pertinent issues from the following list:
 - a. Volume/growth expectations, benefit(s);
 - b. Genetic composition (i.e., based on flowering, leaf morphology analysis, DNA analysis);
 - c. Gender;
 - d. Fertility (hybridization potential [phenology, viability, control]);
 - e. Gene flow;
 - f. Suckering potential (possible control [if a *genetically modified organism (GMO)* may be specific to type]);
 - g. Planting location, design, timeline, size;
 - h. Buffer requirements, maintenance standards;
 - i. Harvesting method and clean-up;
 - j. Potential for release of toxins;
 - k. Potential to be a centre for insect and disease outbreaks;
 - l. Potential to ameliorate risk (e.g., through silviculture practices);
 - m. Invasiveness;
 - n. Ecosystem impact;
 - o. Monitoring.

References

- i) Citation of pertinent literature.
- ii) Provincial strategy (in preparation).

Literature cited

Natural Regions Committee. 2006. Natural Regions and Subregions of Alberta. Compiled by Downing, D.J. and W.W. Pettapiece. Government of Alberta. Pub. No. I/005.

Appendix 25. Unique Identifier (U.I.) Codes for *Stream 1 and 2* Material

See Standard 25.5 (in Volume 1), Appendix 32A and Appendix 38.

Agencies without a two-letter code in Table A25.5 should contact *Alberta* to have a code issued.

Introduction

U.I.s is one form of *genetic identity*. They differ from some others (e.g., *accession number*, *registered lot number*) in that they denote a single *genotype*, and can apply to different forms of that *genotype* (e.g., *ramets*, *parents*).

All *genotypes* included in *CPPs* or in *Stream 1 seed orchards* must be assigned *unique identifiers (U.I.s)*

Selected *genotypes* should be identified with *U.I.s* at the time of selection. Identification of each *genotype* with a single coded label throughout the processes of (e.g.) selection, collection, storage, bulking up, and orchard establishment reduces the chance of confusion.

U.I.s is assigned by proponents. They do not require, or imply, parent registration by *Alberta*.

Each agency's identification number for a parent/selection/*clone* (fields 3 – 7) is a unique number for that agency, and is to be used only once by that agency, regardless of species.

Table A25.1 describes the structure of *U.I.s* for use only in *reforestation*, and Table A25.2 provides an example. Table A25.3 describes the structure of *U.I.s* for use in either *reclamation* or *reforestation*, and Table A25.4 provides an example.

A. UNIQUE IDENTIFIERS FOR USE IN REFORESTATION ONLY (TWO-DIGIT SPECIES CODES).

Table A25.1. U.I. field description for use in reforestation only (two-digit species codes), with example.

Field numbers*	Character type	Mandatory/optional	Description	Example DM00045AW001S	Example description
1 – 2	Alpha	Mandatory	Agency Code	DM	Daishowa-Marubeni
3 – 7	Numeric	Mandatory	Agency's unique <i>clone</i> identification number for the parent tree/selection/ <i>clone</i>	00045	<i>Clone</i> number 45
8 – 9	Alpha	Optional	Species Code	AW	Trembling aspen
10 – 12	Numeric	Optional	Agency's identification number for the individual or collection	001	First collection
13	Alpha	Optional	Type of material	S	Seedlot

*Fields 1 – 7 provide the unique *genotype* and are **compulsory** fields.

Fields 1 and 2 must be the agency code;

Fields 3 and 4 should be the last two digits of the selection year;

Fields 5, 6 and 7 are a unique (within the selection year) number assigned to the selection.

*Fields 8 – 13 provide the material description and are **optional** fields;

Fields 8 -9 are two digit species codes as listed in Tables A38.1 and A38.2, Appendix 38;

Fields 10-13 provide material description identifiers. See below for field 13 codes.

Type of Material (field 13): *grafted ramet* (G)
rooted ramet (C)
seedlot (S)
scion (N)
root (R)
flower buds (B)
pollen (P)
whole tree/seedling/plant (T)
other (X)

Table A25.2. An example of an alternate unique identifier (only for tree species used in reforestation, with two-digit species codes).

Field number	1	2	3	4	5	6	7	8	9	10	11	12	13
Example	H	U	0	0	0	4	5	P	L	0	0	1	S

Each agency’s identification number for a parent/selection/*clone* (fields 3 – 7) is a unique number for that agency, and is to be used only once by that agency, regardless of species.

B. UNIQUE IDENTIFIERS FOR USE IN RECLAMATION OR REFORESTATION (SEVEN-LETTER SPECIES CODES).

Table A25.3. U.I. field description for use in reclamation or reforestation (seven-letter species codes), with example.

Field numbers*	Character type	Mandatory/optional	Description	Example DM00045AW001S	Example description
1 – 2	Alpha	Mandatory	Agency Code	AT	ATISC
3 – 7	Numeric	Mandatory	Agency’s unique <i>clone</i> identification number for the selected individual	00045	<i>Clone</i> number 45 selected in year 2000
8 – 14	Alpha	Optional	Species Code	ARCTUVA	kinnikinnick
15 – 17	Numeric	Optional	Agency’s identification number for the individual or collection	001	First collection
18	Alpha	Optional	Type of material	S	Seedlot

*Fields 1 – 7 provide the unique *genotype* and are **compulsory** fields.

Fields 1 and 2 must be the agency code;

Fields 3 and 4 should be the last two digits of the selection year;

Fields 5, 6 and 7 are a unique (within the selection year) number assigned to the selection;

*Fields 8 – 18 provide the material description and are **optional** fields.

Fields 8 -14 are seven digit species codes as listed in **Tables A38.1A, A38.1B and A38.2**, Appendix 38;

Fields 15-18 provide material description identifiers. See below for field 18 codes.

Type of Material (field 13): *grafted ramet* (G)
rooted ramet (C)
seedlot (S)
scion (N)
root (R)
flower buds (B)
pollen (P)
whole tree/seedling/plant (T)
other (X)

Table A25.4. An example of a unique identifier for use in reclamation.

Field number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Example	A	T	1	5	0	4	5	A	R	C	T	U	V	A	0	0	1	S

Each agency's identification number for a parent/selection/*clone* (fields 3 – 7) is a unique number for that agency, and is to be used only once by that agency, regardless of species.

Table A25.5. Agency names and codes.

Agency name	Code
770538 ALBERTA LTD	AA
AINSWORTH LUMBER COMPANY	AI
ALBIAN SANDS ENERGY INC	AS
ALBERTA-PACIFIC FOREST INDUSTRIES INC	AF
ALBERTA PLYWOOD LTD	AP
ALBERTA TREE IMPROVEMENT AND SEED CENTER	AT
ANC TIMBER LTD	AN
BLUE RIDGE LUMBER	BR
BOSS TIMBER LTD	BT
BOUCHER BROTHERS LUMBER	BB
BUCHANAN LUMBER	BL
CANADIAN FOREST PRODUCTS LTD, GRANDE PRAIRIE	CG
CANADIAN FOREST PRODUCTS LTD, HINES CREEK	CH
CARDINAL RIVER COALS	CR
CYPRESS HILLS INTERPROVINCIAL PARK	CY
DAISHOWA-MARUBENI INTERNATIONAL LTD	DM
FOOTNER FOREST PRODUCTS	FF
FOREST RESOURCE IMPROVEMENT ASSOCIATION	FR
HANSEN FOREST PRODUCTS	HF
HUALLEN SEED ORCHARD COMPANY	HU
INDIAN AND NORTHERN AFFAIRS, CANADA	IN
FORESTRY DIVISION, ROCKY MOUNTAIN HOUSE AREA	LC
FORESTRY DIVISION, EDSON FOREST AREA	LF
FORESTRY DIVISION, LAC LA BICHE FOREST AREA	LL
FORESTRY DIVISION, SLAVE LAKE FOREST AREA	LS
FORESTRY DIVISION, PEACE RIVER FOREST AREA	LP
FORESTRY DIVISION, GRANDE PRAIRIE FOREST AREA	LG
FORESTRY DIVISION, CALGARY FOREST AREA	LR
FORESTRY DIVISION, HIGH LEVEL FOREST AREA	LU
FORESTRY DIVISION, FORT MCMURRAY FOREST AREA	LW
FORESTRY DIVISION, WHITCOURT FOREST AREA	LO
FORESTRY DIVISION, PRFN	LN
L H REHN LUMBER LTD	RE
LITTLE RED RIVER FORESTRY LTD	RR
LUSCAR LTD –COAL VALLEY MINE	CV
LUSCAR LTD –GREGG RIVER MINE	GR
LUSCAR LTD –LINE CREEK MINES	CM
LUSCAR LTD –OBED MOUNTAIN MINE	OM
MANNING DIVERSIFIED FOREST PRODUCTS	MD

Agency name	Code
MEDICINE LODGE TIMBER PRODUCTS	ML
METIS SETTLEMENTS TRANSITION COMMISSION	MS
MILLAR WESTERN FOREST PRODUCTS – BOYLE	MB
MILLAR WESTERN FOREST PRODUCTS – WHITECOURT	MW
NATURAL RESOURCES CANADA	NR
NORTHLAND FOREST PRODUCTS LTD	NF
ROCKY WOOD PRESERVERS LTD	RW
SEEHTA FOREST PRODUCTS	SF
SLAVE LAKE PULP LTD	SA
SMOKY RIVER COALS LIMITED	SR
SOSNOWSKI, MIKE	SM
SPRAY LAKES SAWMILLS LTD	SL
ST JEAN LUMBER LTD	SJ
SUNCOR ENERGY INC	SE
SUNDANCE FOREST INDUSTRIES LTD	SU
SUNDRE FOREST PRODUCTS LTD	SP
SYNCRUDE CANADA LTD	SC
TALL PINE TIMBER COMPANY LTD	TP
TIMEU FOREST PRODUCTS	TF
TOLKO INDUSTRIES LTD – HIGH PRAIRIE	TH
TOLKO INDUSTRIES LTD – HIGH LEVEL	TL
VANDERWELL CONTRACTORS LTD	VC
WABASCA LAKES SAWMILL COMPANY LTD	WL
WALLACH, PAUL	WP
HINTON WOOD PRODUCTS	WW
WESTERN BOREAL ASPEN CORP	WB
WEYERHAEUSER COMPANY LTD, DRAYTON VALLEY	WD
WEYERHAEUSER COMPANY LTD, EDSON	WE
WEYERHAEUSER COMPANY LTD, GRANDE PRAIRIE	WG
ZAMA MILLS	ZM
PARENT MATERIAL COLLECTIONS MADE PRIOR TO May 1, 2003	XX ¹

¹ For all parent materials collected prior to May 1, 2003 and documented by *Alberta*, a *U.I.* is assigned for each unique *genotype* as outlined in the standards and Appendix 25. The agency code “XX” is used for such parent material collections.

Appendix 32A. Stream 1 Seed Orchard Establishment Report

See Standards 11.7, 11.7.1 and 11.7.2; also Appendix 2, 4, 14 and 25.

Prior to initiating development of a *Stream 1 seed orchard*, proponent must submit a letter of intent to *Alberta*.

Establishment reports are due June 30 in the year following the establishment of the *Stream 1 seed orchard*. Establishment reports must contain the following information:

Project Title

Project proponent(s)

Seed zone

Species (include information about mating system)

Orchard type (see Table A4.3, Appendix 4)

Anticipated life of orchard

Location of *seed orchard*

- i) Site name;
- ii) Legal land description;
- iii) Latitude, longitude (use decimal format), and elevation.

Site Information

- i) Physical description;
- ii) History of site use;
- iii) Planting dates.

Description of orchard parental material

- i) *Unique identifier (U.I.)* (assigned by proponent) for each *clone* or parent (parent registration not required);
- ii) Collection site latitude, longitude, and elevation for each *clone* or parent;
- iii) Number of plants per *clone* or per parent planted in the orchard.

Orchard design

- i) Design software used.

Orchard layout map

- i) Showing orchard design and positions with planted positions keyed to *genetic identity*.

Site layout map

- i) Showing position of orchard in relation to other plantations on site.

Access map

- i) Providing directions to the orchard.

Appendix 38. Species Codes

Species codes are used to construct *unique identifiers (U.I.s)*, which are used to identify *genotypes* in *production populations* and *Stream 1 seed orchards* (see Appendix 25).

For species not listed in Appendix 38 contact *Alberta*.

Table A38.1. contains a listing of native tree species and naturally occurring hybrids.

Table A38.2. contains a listing of shrub species found in Alberta.

Table A38.3. contains a listing of non-native trees (pure species and hybrids).

Table A38.4. lists clonal and reproductive characteristics of selected boreal shrubs.

Table A38.1. Native tree species (pure species and known natural hybrids).

Family	Genus	Species	Common name	2-letter ¹	7-letter
Aceraceae (Sapindaceae)	<u>Acer</u>	<u>negundo</u>	Manitoba maple		Acerneg
Betulaceae	Betula	neoalaskana	Alaska/resin birch		Betuneo
Betulaceae	Betula	occidentalis	water/black birch		Betuocc
Betulaceae	Betula	papyrifera	paper (white) birch	Bw	Betupap
Betulaceae	<u>Betula</u>	<u>papyrifera</u> x <u>occidentalis</u>	paper x water birch hybrid		Betupxo
Betulaceae	<u>Betula</u>	<u>papyrifera</u> x <u>neoalaskana</u>	paper x Alaska birch hybrid		Betupxn
Cupressaceae	Juniperus	scopulorum	Rocky Mountain juniper		Junisco
Cupressaceae	Thuja	plicata	western red cedar		Thujspl
Pinaceae	Abies	balsamea	balsam fir	Fb	Abiebal
Pinaceae	Abies	lasiocarpa	alpine fir	Fa	Abielas
Pinaceae	Larix	laricina	tamarack	Lt	Larilar
Pinaceae	Larix	lyallii	alpine larch	La	Larilya
Pinaceae	Larix	occidentalis	western larch	Lw	Lariocc
Pinaceae	Picea	engelmannii	Engelmann spruce	Se	Piceeng
Pinaceae	Picea	glauca	white spruce	Sw	Picegla
Pinaceae	<u>Picea</u>	<u>engelmannii</u> x <u>glauca</u>	Engelmann x white spruce hybrid		Piceexg
Pinaceae	Picea	mariana	black spruce	Sb	Picemar
Pinaceae	Pinus	albicaulis	whitebark pine	Pa	Pinualb
Pinaceae	Pinus	banksiana	jack pine	Pj	Pinuban
Pinaceae	<u>Pinus</u>	<u>banksiana</u> x <u>contorta</u>	jack x lodgepole pine hybrid		Pinubxc
Pinaceae	Pinus	contorta	lodgepole pine	Pl	Pinucon
Pinaceae	Pinus	flexilis	limber pine	Pf	Pinufle
Pinaceae	Pinus	monticola	western white pine		Pinumon
Pinaceae	Pseudotsuga	menziesii	Douglas-fir	Fd	Pseumen
Pinaceae	Tsuga	heterophylla	western hemlock		Tsughet
Salicaceae	Populus	angustifolia	narrow-leaf cottonwood		Popuang
Salicaceae	Populus	balsamifera	balsam poplar	Pb	Popubal
Salicaceae	<u>Populus</u>	<u>balsamifera</u> x <u>trichocarpa</u>	balsam x black poplar hybrid		Popubxt
Salicaceae	Populus	deltoides	cottonwood western/plains	De	Popudel
Salicaceae	<u>Populus</u>	<u>deltoides</u> x <u>balsamifera</u>	western/plains x balsam cottonwood hybrid		Popudxb
Salicaceae	<u>Populus</u>	<u>deltoides</u> x <u>balsamifera</u> x <u>angustifolia</u>	western/plains x balsam x narrow-leaf cottonwood hybrid		Popudba
Salicaceae	Populus	tremuloides	trembling aspen	Aw	Poputre
Salicaceae	Populus	trichocarpa	black poplar	Tr	Poputri
Salicaceae	Salix	amygdaloides	peachleaf willow		Saliamy
Salicaceae	Salix	scouleriana	Scouler's willow		Salisco
Taxaceae	Taxus	brevifolia	western yew		Taxubre

¹Two-letter abbreviations are historical; seven-letter abbreviations are mandatory for *reclamation*.

Table A38.2. Shrub species.

The use of naturally occurring shrub hybrids must also follow FGRMS 2016.

Family	Genus	Species	Common name	2-letter	7-letter
Aceraceae	<u>Acer</u>	<u>glabrum</u>	mountain maple		Acer gla
Anacardiaceae	<u>Rhus</u>	<u>aromatica</u>	fragrant sumac		Rhusaro
Anacardiaceae	<u>Rhus</u>	<u>trilobata</u>	See <u>Rhus aromatica</u>		
Apocynaceae	<u>Apocynum</u>	<u>androsaemifolium</u>	spreading dogbane		Apocand
Apocynaceae	<u>Apocynum</u>	<u>cannabinum</u>	Indian hemp		Apoccan
Araliaceae	<u>Oplopanax</u>	<u>horridus</u>	devil's club		Oplohor
Asteraceae (Compositae)	<u>Artemisia</u>	<u>cana</u>	silver sagebrush		Artecan
Asteraceae (Compositae)	<u>Artemisia</u>	<u>tridentata</u>	big sagebrush		Artetri
Berberidaceae	<u>Berberis</u>	<u>repens</u>	creeping mahonia (barberry)		Berbrep
Betulaceae	<u>Alnus</u>	<u>crispa</u>	See <u>Alnus viridis</u>		
Betulaceae	<u>Alnus</u>	<u>incana</u>	river alder		Alnuinc
Betulaceae	<u>Alnus</u>	<u>tenuifolia</u>	See <u>Alnus incana</u>		
Betulaceae	<u>Alnus</u>	<u>viridis</u>	green alder		Alnuvir
Betulaceae	<u>Betula</u>	<u>nana</u> (includes <u>glandulosa</u>)	bog birch		Betunan
Betulaceae	<u>Betula</u>	<u>pumila</u>	dwarf bog birch		Betupum
Betulaceae	<u>Corylus</u>	<u>cornuta</u>	beaked hazelnut		Corycor
Caprifoliaceae	<u>Linnaea</u>	<u>borealis</u>	twin-flower		Linnbor
Caprifoliaceae	<u>Lonicera</u>	<u>caerulea</u>	blue-fly honeysuckle		Lonicae
Caprifoliaceae	<u>Lonicera</u>	<u>dioica</u>	twining honeysuckle		Lonidio
Caprifoliaceae	<u>Lonicera</u>	<u>involuta</u>	bracted honeysuckle		Loniinv
Caprifoliaceae	<u>Lonicera</u>	<u>utahensis</u>	red twinberry		Loniuta
Caprifoliaceae	<u>Sambucus</u>	<u>racemosa</u>	red elderberry		Samrac
Caprifoliaceae	<u>Symphoricarpos</u>	<u>albus</u>	common snowberry		Sympalb
Caprifoliaceae	<u>Symphoricarpos</u>	<u>occidentalis</u>	buckbrush		Sympocc
Caprifoliaceae	<u>Viburnum</u>	<u>edule</u>	low-bush cranberry		Vibuedu
Caprifoliaceae	<u>Viburnum</u>	<u>opulus</u>	high-bush cranberry		Vibuopu
Celastraceae	<u>Paxistima</u> (<u>Pachistima</u>)	<u>myrsinites</u>	mountain lover/boxleaf		Paximyr
Chenopodiaceae	<u>Sarcobatus</u>	<u>vermiculatus</u>	greasewood		Sarcover
Cistaceae	<u>Hudsonia</u>	<u>tomentosa</u>	sand heather		Hudstom
Cornaceae	<u>Cornus</u>	<u>sericea</u>	red-osier dogwood		Cornser
Cornaceae	<u>Cornus</u>	<u>stolonifera</u>	See <u>Cornus sericea</u>		
Cupressaceae	<u>Juniperus</u>	<u>communis</u>	ground juniper		Junicom
Cupressaceae	<u>Juniperus</u>	<u>horizontalis</u>	creeping juniper		Junihor
Elaeagnaceae	<u>Elaeagnus</u>	<u>commutata</u>	wolf willow		Elaecom
Elaeagnaceae	<u>Shepherdia</u>	<u>argentea</u>	silver buffaloberry		Sheparg
Elaeagnaceae	<u>Shepherdia</u>	<u>canadensis</u>	Canada buffaloberry		Shepcan
Empetraceae (Ericaceae)	<u>Empetrum</u>	<u>nigrum</u>	crowberry		Empenig
Ericaceae	<u>Andromeda</u>	<u>polifolia</u>	bog rosemary		Andrpol
Ericaceae	<u>Arctostaphylos</u>	<u>rubra</u>	See <u>Arctous rubra</u>		
Ericaceae	<u>Arctostaphylos</u>	<u>uva-ursi</u>	bearberry/ kinnikinnick		Arctuva
Ericaceae	<u>Arctous</u>	<u>rubra</u>	alpine bearberry		Arctrub
Ericaceae	<u>Cassiope</u>	<u>mertensiana</u>	western moss heather		Cassmer
Ericaceae	<u>Cassiope</u>	<u>tetragona</u>	white arctic mountain heather		Casstet
Ericaceae	<u>Chamaedaphne</u>	<u>calyculata</u>	leatherleaf		Chamcal

Family	Genus	Species	Common name	2-letter	7-letter
Ericaceae	<u>Gaultheria</u>	<u>hispidula</u>	creeping snowberry		Gaulhis
Ericaceae	<u>Gaultheria</u>	<u>humifusa</u>	alpine spicy wintergreen		Gaulhum
Ericaceae	<u>Kalmia</u>	<u>microphylla</u>	alpine laurel		Kalmmic
Ericaceae	<u>Kalmia</u>	<u>polifolia</u>	bog laurel		Kalmpol
Ericaceae	<u>Kalmia</u>	<u>procumbens</u>	alpine azalea		Kalmpro
Ericaceae	<u>Ledum</u>	<u>glandulosum</u>	See <u>Rhododendron columbianum</u>		
Ericaceae	<u>Ledum</u>	<u>groenlandicum</u>	See <u>Rhododendron groenlandicum</u>		
Ericaceae	<u>Ledum</u>	<u>palustre</u>	See <u>Rhododendron tomentosum</u>		
Ericaceae	<u>Loiseleuria</u>	<u>procumbens</u>	See <u>Kalmia procumbens</u>		
Ericaceae	<u>Menziesia</u>	<u>ferruginea</u>	mock azalea		Menzfer
Ericaceae	<u>Oxycoccus</u>	<u>microcarpus</u>	See <u>Vaccinium oxycoccos</u>		
Ericaceae	<u>Oxycoccus</u>	<u>quadripetalus</u>	See <u>Vaccinium oxycoccos</u>		
Ericaceae	<u>Phyllodoce</u>	<u>empetriformis</u>	red mountain heath		Phylemp
Ericaceae	<u>Phyllodoce</u>	<u>glanduliflora</u>	yellow mountain heath		Phylgla
Ericaceae	<u>Rhododendron</u>	<u>albiflorum</u>	white rhododendron		Rhodalb
Ericaceae	<u>Rhododendron</u>	<u>columbianum</u>	glandular Labrador tea		Rhodcol
Ericaceae	<u>Rhododendron</u>	<u>groenlandicum</u>	common Labrador tea		Rhodgro/ Ledugro
Ericaceae	<u>Rhododendron</u>	<u>lapponicum</u>	Lapland rose-bay		Rhodlap
Ericaceae	<u>Rhododendron</u>	<u>tomentosum</u>	marsh Labrador tea		Rhodtom
Ericaceae	<u>Vaccinium</u>	<u>cespitosum</u>	dwarf bilberry		Vaccces
Ericaceae	<u>Vaccinium</u>	<u>membranaceum</u>	tall bilberry		Vaccmem
Ericaceae	<u>Vaccinium</u>	<u>myrtilloides</u>	dwarf blueberry		Vaccmyr
Ericaceae	<u>Vaccinium</u>	<u>myrtilus</u>	low bilberry		Vaccmyt
Ericaceae	<u>Vaccinium</u>	<u>ovalifolium</u>	Alaskan blueberry		Vaccova
Ericaceae	<u>Vaccinium</u>	<u>oxycoccos</u>	small bog cranberry		Vaccoxy
Ericaceae	<u>Vaccinium</u>	<u>scoparium</u>	grouseberry		Vaccsco
Ericaceae	<u>Vaccinium</u>	<u>uliginosum</u>	bog bilberry		Vacculi
Ericaceae	<u>Vaccinium</u>	<u>vitis-idaea</u>	bog cranberry/ lingonberry		Vaccvit
Grossulariaceae	<u>Ribes</u>	<u>americanum</u>	wild black currant		Ribeame
Grossulariaceae	<u>Ribes</u>	<u>aureum</u>	golden currant		Ribeaur
Grossulariaceae	<u>Ribes</u>	<u>glandulosum</u>	skunk currant		Ribegla
Grossulariaceae	<u>Ribes</u>	<u>hirtellum</u>	hairy-stem gooseberry		Ribehir
Grossulariaceae	<u>Ribes</u>	<u>hudsonianum</u>	wild black currant		Ribehud
Grossulariaceae	<u>Ribes</u>	<u>inermis</u>	white stemmed gooseberry		Ribeine
Grossulariaceae	<u>Ribes</u>	<u>lacustre</u>	bristly black currant		Ribelac
Grossulariaceae	<u>Ribes</u>	<u>laxiflorum</u>	trailing black currant		Ribelax
Grossulariaceae	<u>Ribes</u>	<u>oxyacanthoides</u>	prickly currant		Ribeoxy
Grossulariaceae	<u>Ribes</u>	<u>triste</u>	wild red currant		Ribetri
Grossulariaceae	<u>Ribes</u>	<u>viscosissimum</u>	sticky currant		Ribevis
Hydrangeaceae	<u>Philadelphus</u>	<u>lewisii</u>	mock orange		Phillew
Myricaceae	<u>Myrica</u>	<u>gale</u>	sweet gale		Myrigal
Ranunculaceae	<u>Clematis</u>	<u>ligusticifolia</u>	white/western clematis		Clemlig
Rhamnaceae	<u>Ceanothus</u>	<u>velutinus</u>	snowbush		Ceanvel
Rhamnaceae	<u>Rhamnus</u>	<u>alnifolia</u>	alderleaf buckthorn		Rhamaln

Family	Genus	Species	Common name	2-letter	7-letter
Rosaceae	<u>Amelanchier</u>	<u>alnifolia</u>	Saskatoon		Amelaln
Rosaceae	<u>Amelanchier</u>	<u>ovalis</u>	round leaved hawthorn		Amelova
Rosaceae	<u>Dasiphora</u>	<u>floribunda</u>	See <u>Dasiphora fruticosa</u>		
Rosaceae	<u>Dasiphora</u>	<u>fruticosa</u>	shrubby cinquefoil		Dasifru/ Dasiflo
Rosaceae	<u>Crataegus</u>	<u>douglasii</u>	black/river hawthorn		Cratdou
Rosaceae	<u>Crataegus</u>	<u>rotundifolia</u>	See <u>Amelanchier ovalis</u>		
Rosaceae	<u>Potentilla</u>	<u>fruticosa</u>	See <u>Dasiphora fruticosa</u>		
Rosaceae	<u>Prunus</u>	<u>pensylvanica</u>	pin cherry		Prunpen
Rosaceae	<u>Prunus</u>	<u>virginiana</u>	chokecherry		Prunvir
Rosaceae	<u>Rosa</u>	<u>acicularis</u>	prickly rose		Rosaaci
Rosaceae	<u>Rosa</u>	<u>arkansana</u>	prairie rose		Rosaark
Rosaceae	<u>Rosa</u>	<u>woodsii</u>	Woods' rose		Rosawoo
Rosaceae	<u>Rubus</u>	<u>idaeus</u>	wild red raspberry		Rubuida
Rosaceae	<u>Rubus</u>	<u>parviflorus</u>	thimbleberry		Rubupar
Rosaceae	<u>Sorbus</u>	<u>scopolina</u>	Greene's mountain ash		Sorbsco
Rosaceae	<u>Sorbus</u>	<u>sitchensis</u>	western mountain ash		Sorbsit
Rosaceae	<u>Spiraea</u>	<u>alba</u>	narrow-leaved meadowsweet		Spiralb
Rosaceae	<u>Spiraea</u>	<u>betulifolia</u>	white meadowsweet		Spirbet
Rosaceae	<u>Spiraea</u>	<u>densiflora</u>	See <u>Spiraea splendens</u>		
Rosaceae	<u>Spiraea</u>	<u>splendens</u>	rose meadowsweet		Spirspl
Salicaceae	<u>Salix</u>	<u>alaxensis</u>	feltleaf willow		Saliala
Salicaceae	<u>Salix</u>	<u>arbusculoides</u>	little tree willow		Saliarb
Salicaceae	<u>Salix</u>	<u>arctica</u>	arctic willow		Saliarc
Salicaceae	<u>Salix</u>	<u>athabascensis</u>	Athabasca willow		Saliath
Salicaceae	<u>Salix</u>	<u>barclayi</u>	Barclay's willow		Salibar
Salicaceae	<u>Salix</u>	<u>barrattiana</u>	Barratt's willow		Salibat
Salicaceae	<u>Salix</u>	<u>bebbiana</u>	Bebb's willow/ beaked willow		Salibeb
Salicaceae	<u>Salix</u>	<u>boothii</u>	Booth's willow		Saliboo
Salicaceae	<u>Salix</u>	<u>brachycarpa</u>	sand dune willow		Salibra
Salicaceae	<u>Salix</u>	<u>candida</u>	sage leaf willow		Salican
Salicaceae	<u>Salix</u>	<u>commutata</u>	undergreen willow		Salicom
Salicaceae	<u>Salix</u>	<u>discolor</u>	pussywillow		Salidis
Salicaceae	<u>Salix</u>	<u>drummondiana</u>	Drummond's willow		Salidru
Salicaceae	<u>Salix</u>	<u>exigua</u>	coyote/sandbar willow		Saliexi
Salicaceae	<u>Salix</u>	<u>farriac</u>	Farr's willow		Salifar
Salicaceae	<u>Salix</u>	<u>glauca</u>	greyleaf willow		Saligla
Salicaceae	<u>Salix</u>	<u>lanata</u>	woolly willow		Salilan
Salicaceae	<u>Salix</u>	<u>lucida</u>	shining willow		Saliluc
Salicaceae	<u>Salix</u>	<u>lutea</u>	yellow willow		Salilut
Salicaceae	<u>Salix</u>	<u>maccalliana</u>	MacCalla's willow		Salimac
Salicaceae	<u>Salix</u>	<u>melanopsis</u>	dusky willow		Salimel
Salicaceae	<u>Salix</u>	<u>myrtilifolia</u>	blueberry willow		Salimyr
Salicaceae	<u>Salix</u>	<u>pedicellaris</u>	bog willow		Saliped
Salicaceae	<u>Salix</u>	<u>petiolaris</u>	meadow/slender willow		Salipet
Salicaceae	<u>Salix</u>	<u>planifolia</u>	diamondleaf willow		Salipla

Family	Genus	Species	Common name	2-letter	7-letter
Salicaceae	<u>Salix</u>	<u>prolixa</u>	MacKenzie's willow		Salipro
Salicaceae	<u>Salix</u>	<u>pseudomonticola</u>	false mountain willow		Salipse
Salicaceae	<u>Salix</u>	<u>pyrifolia</u>	balsam willow		Salipyr
Salicaceae	<u>Salix</u>	<u>reticulata</u>	netleaf willow		Saliret
Salicaceae	<u>Salix</u>	<u>serissima</u>	autumn willow		Saliser
Salicaceae	<u>Salix</u>	<u>sitchensis</u>	Sitka willow		Salisit
Salicaceae	<u>Salix</u>	<u>stolonifera</u>	sprouting leaf willow		Salisto
Salicaceae	<u>Salix</u>	<u>vestita</u>	rock willow		Salives

Table A38.3. Non-native trees (pure species and hybrids).

Species are listed in this table for historical identification. Use of these and other non-native species and hybrids is limited to *Alberta*-approved research programs.

Family	Genus	Species	Common name	2-letter ¹	7-letter
Salicaceae	<u>Populus</u>	<u>alba</u>	white poplar	Ab	Popualb
Salicaceae	<u>Populus</u>	<u>dauriana</u>	Chinese/Korean aspen	Da	Popudav
Salicaceae	<u>Populus</u>	<u>grandidentata</u>	bigtooth aspen	Gr	Popugra
Salicaceae	<u>Populus</u>	<u>laurifolia</u>	laurel-leaf poplar		Populau
Salicaceae	<u>Populus</u>	<u>maximowiczii</u>	Japan poplar	Ma	Popumax
Salicaceae	<u>Populus</u>	<u>nigra</u>	black poplar	Ni	Popunig
Salicaceae	<u>Populus</u>	<u>sargentii</u>	Sargent's poplar	Sa	Popusar
Salicaceae	<u>Populus</u>	<u>tremula</u>	European aspen	Ta	Poputrm
Salicaceae	<u>Populus</u>	<u>deltooides</u> x <u>balsamifera</u>	northwest poplar		Popudxb

¹Two-letter abbreviations are historical; seven-letter abbreviations are mandatory for *reclamation*.

Table A38.4. Selected boreal shrubs: some clonal and reproductive characteristics.

Family	Species	Common name	Previous name	Clonal and other reproductive info C=clonal, N=not clonal, U=unknown	
Araliaceae	<u>Oplopanax horridus</u>	devil's club		U	Diploid, pollination, dispersal and vegetative reproduction unknown
Betulaceae	<u>Alnus incana</u>	river alder	<u>Alnus tenuifolia</u>	N	Diploid, wind pollinated, wind dispersed, not clonal†
Betulaceae	<u>Alnus viridis</u>	green alder	<u>Alnus crispa</u>	N	Diploid, wind pollinated, wind dispersed, not clonal†
Betulaceae	<u>Betula nana</u>	bog birch	includes <u>B. glandulosa</u>	N	Clonal in north, diploid, wind pollinated, wind dispersed‡
Betulaceae	<u>Betula pumila</u>	dwarf (bog) birch		N	Clonal in north, diploid, wind pollinated, wind dispersed‡
Betulaceae	<u>Corylus cornuta</u>	beaked hazelnut		N	Diploid, wind pollinated, wind dispersed, not clonal‡
Caprifoliaceae	<u>Lonicera caerulea</u>	blue-fly honeysuckle		N	Tetraploid, bee pollinated, wildlife dispersed, not clonal‡
Caprifoliaceae	<u>Lonicera dioica</u>	twining honeysuckle		N	Diploid, bee pollinated, wildlife dispersed, not clonal‡
Caprifoliaceae	<u>Lonicera involucrata</u>	bracted honeysuckle		N	Diploid, bee pollinated, wildlife dispersed, not clonal‡
Caprifoliaceae	<u>Symphoricarpos albus</u>	common snowberry		C	Polyploid, clonal (rhizome)† likely wind pollinated and wildlife dispersed
Caprifoliaceae	<u>Symphoricarpos occidentalis</u>	buckbrush		C	Insect pollinated, wildlife dispersed, clonal (rhizome)†
Caprifoliaceae	<u>Viburnum edule</u>	low-bush cranberry		U	Diploid, insect poll, wildlife disperse, possibly clonal (rhizomes)†
Caprifoliaceae	<u>Viburnum opulus</u>	high-bush cranberry		U	Diploid, insect pollinated*, bird dispersed ^h , clonal (rhizomes)
Cistaceae	<u>Hudsonia tomentosa</u>	sand heather		N	Diploid, pollination and dispersal unknown, not clonal‡
Cornaceae	<u>Cornus sericea</u>	red-osier dogwood	<u>Cornus stolonifera</u>	U	Diploid, insect pollinated, dispersed by wildlife, clonal (stolons)†
Cupressaceae	<u>Juniperus communis</u>	ground juniper		N	Diploid, pollination unknown, wildlife dispersed, not clonal‡
Elaeagnaceae	<u>Elaeagnus commutata</u>	wolf willow		U	Diploid, insect pollinated, bird dispersed, clonal (rhizome/stolon)†
Elaeagnaceae	<u>Shepherdia canadensis</u>	Canada buffaloberry		U	Diploid; insect pollinated, wildlife dispersed, clonal by roots†
Ericaceae	<u>Andromeda polifolia</u>	bog rosemary		N	Diploid, self-incompatible, insect pollinated, wind dispersed‡
Ericaceae	<u>Arctostaphylos uva-ursi</u>	bearberry, kinnikinnick		C	Diploid and tetraploid, clonal, self pollinated (stolon)†
Ericaceae	<u>Arctous rubra</u>	alpine bearberry	<u>Arctostaphylos rubra</u>	C	Diploid, wildlife dispersed, clonal (rhizome/stolon)‡
Ericaceae	<u>Chamaedaphne calyculata</u>	leatherleaf		U	Diploid, insect pollinated, wind dispersed, clonal (rhizome)‡
Ericaceae	<u>Gaultheria hispidula</u>	creeping snowberry		U	Diploid, pollination and dispersal unknown, clonal (rhizome)‡
Ericaceae	<u>Kalmia microphylla</u>	alpine laurel		U	Diploid, pollination unknown, wind dispersed, clonal (rhizome)‡
Ericaceae	<u>Kalmia polifolia</u>	bog laurel		U	Diploid, pollination unknown, wind dispersed, clonal (rhizome)‡
Ericaceae	<u>Rhododendron groenlandicum</u>	common Labrador tea	<u>Ledum groenlandicum</u>	N	Diploid, insect pollinated, self-incompatible wind dispersed, not clonal‡
Ericaceae	<u>Rhododendron lapponicum</u>	Lapland Rose-bay		U	Diploid
Ericaceae	<u>Rhododendron tomentosa</u>	northern Labrador tea	<u>Ledum palustre</u>	N	Tetraploid, likely insect pollinated, wind dispersed, not clonal‡

Family	Species	Common name	Previous name	Clonal and other reproductive info C=clonal, N=not clonal, U=unknown	
Ericaceae	<u>Vaccinium caespitosum</u>	dwarf bilberry		U	Diploid, likely insect pollinated and wind dispersed, clonal (rhizome)
Ericaceae	<u>Vaccinium myrtilloides</u>	dwarf blueberry		U	Diploid, insect pollinated, wildlife dispersed, clonal (rhizomes)†
Ericaceae	<u>Vaccinium oxycoccos</u>	small bog cranberry	<u>Oxycoccus microcarpus</u>	C	Diploid, insect pollinated, wind dispersed, clonal (rhizome)‡
Ericaceae	<u>Vaccinium uliginosum</u>	bog bilberry		U	Tetraploid, bird dispersed, clonal (rhizome)‡, likely insect pollinated
Ericaceae	<u>Vaccinium vitis-idaea</u>	bog cranberry, lingonberry		U	Diploid, wildlife dispersed, clonal (rhizome)‡, insect pollinated ^e
Grossulariaceae	<u>Ribes americanum</u>	wild black currant		N	Diploid, insect pollinated*, wildlife dispersed, not clonal‡
Grossulariaceae	<u>Ribes glandulosum</u>	skunk currant		N	Diploid, insect pollinated, wildlife dispersed, not clonal (RIBES)
Grossulariaceae	<u>Ribes hirtellum</u>	hairy-stem gooseberry		N	Diploid, insect pollinated, wildlife dispersed, not clonal (RIBES)
Grossulariaceae	<u>Ribes hudsonianum</u>	wild black currant		N	Insect pollinated, wildlife dispersed, not clonal (RIBES)
Grossulariaceae	<u>Ribes lacustre</u>	bristly black currant		N	Diploid, insect pollinated, wildlife dispersed, not clonal (RIBES)
Grossulariaceae	<u>Ribes oxycanthoides</u>	prickly currant		N	Diploid, insect pollinated, wildlife dispersed, not clonal (RIBES)
Grossulariaceae	<u>Ribes triste</u>	wild red currant		N	Diploid, insect pollinated, wildlife dispersed, not clonal‡
Myricaceae	<u>Myrica gale</u>	sweet gale		U	Tetraploid, clonal (rhizome), likely wind pollinated and wildlife dispersed‡
Rhamnaceae	<u>Rhamnus alnifolia</u>	alderleaf buckthorn		N	Insect pollinated, wildlife dispersed, not clonal‡
Rosaceae	<u>Amelanchier alnifolia</u>	Saskatoon		C	Clonal (stolons), insect pollinated, dispersed by wildlife†
Rosaceae	<u>Dasiphora fruticosa</u>	shrubby cinquefoil	<u>Potentilla fruticosa</u> / <u>Dasiphora floribunda</u>	N	Tetraploid, wind dispersed, not clonal‡, insect pollinated ^o
Rosaceae	<u>Prunus pensylvanica</u>	pin cherry		U	Tetraploid, self-incompatible, insect poll, wildlife dispersed†
Rosaceae	<u>Prunus virginiana</u>	chokecherry		U	Tetraploid, self-incompatible, insect poll, wildlife dispersed†
Rosaceae	<u>Rosa acicularis</u>	prickly rose		C	Tetraploid, clonal (10-20m ²), wildlife dispersed‡, polyploid, insect pollinated*
Rosaceae	<u>Rosa woodsii</u>	Woods' rose		N	Diploid, insect pollinated, wildlife dispersed, not clonal‡
Rosaceae	<u>Rubus idaeus</u>	wild red raspberry		C	Polyploid, clonal (rhizome/sucker), insect poll, wildlife dispersed‡
Rosaceae	<u>Sorbus scopulina</u>	Greene's mountain ash		N	Insect pollinated, wildlife dispersed, not clonal ^t
Salicaceae	<u>Salix</u> species	willows		C	many clonal, wind pollinated, wind dispersed

†Chai, S.L., B. Eaton, J. Woosaree, D. Rweyongeza and E. Fraser. 2013. Seed Transfer of Woody Shrubs in Alberta – Are current seed zones applicable? Prepared by Alberta Innovates Technology Futures, Vegreville, AB and Alberta Environment and Sustainable Resource Development, Edmonton, AB. 41 pp.

‡Species profile on FEIS. <http://www.fs.fed.us/database/feis/plants/shrub/>

€Rook, E.J.S. Boundary Waters Compendium <http://www.rook.org/earl/bwca/index.html>

*Plants for a Future database.

°Elkington, T.T. and S.R.J. Woodell. 1963. *Potentilla fruticosa* L. (*Dasiphora fruticosa* (L.) Rydb.). Journal of Ecology 51: 769-781.

±McGregor, S.E. 1976. Insect pollination of cultivated crop plants. U.S. Department of Agriculture, Washington, DC. 411 pages.

‡Francis, J.K. 2004. Wildlands Shrubs of the United States and its Territories: Thamnisc Descriptions: Volume 1. General Technical Report IITF-GTR-26. San Juan, PR. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 830 pp.

‡ USDA NRCS Plant Materials Program. 2002. American Cranberry bush *Viburnum opulus* L. var. *americanum* Ait. United States Department of Agriculture, Natural Resources Conservation Service. Available online: http://plants.usda.gov/factsheet/pdf/fs_viopa2.pdf

Devil's Club:

Clonal – Trevor C. Lantz and Joseph A. Antos (2002). “Clonal expansion in the deciduous understory shrub, devil’s club”. *Can. J. Bot.* **80** (10): 1052–1062.

Photo of bees (Wikipedia) implying insect pollination and “bugGuide” <http://bugguide.net/node/view/898275> has a photo of a black and white fly.

Dispersed by wildlife. <http://www.uaf.edu/files/ces/publications-db/catalog/anr/HGA-00232G.pdf>

Lapland Rose-bay

Pollinated by insects (bees): http://www.wildflower.org/plants/result.php?id_plant=RHLA2 & PFAF

Likely not clonal, occupying limited areas

Likely wind dispersed, dry capsule similar to *Kalmia*, *Andromeda* and *Chamaedaphne*

Glossary

Term	Definition
Accession number	Four-digit number historically assigned by <i>Alberta</i> to research or conservation seedlots. These may include individual family collections or bulked seedlots. <i>Accession number</i> is one category of <i>genetic identity</i> .
Alberta	The government of Alberta, or the appropriate agency within the government of Alberta (e.g., Alberta Tree Improvement and Seed Centre [ATISC]).
Amplified family	An aggregate of multiple <i>vegetative propagules</i> from each of a number of members of a half- or full-sib family, without individual testing of the constituent clones.
Approved facility	A designation provided by <i>Alberta</i> to a facility that is qualified to produce, process, test or store material destined for <i>deployment</i> .
Artificial regeneration	The creation of a new stand by direct seeding or by planting seedlings or cuttings.
Artificially regenerated	Established through <i>artificial regeneration</i> .
Base population	The larger source population from which a <i>selected population</i> for a <i>controlled parentage program</i> is chosen. May include one or more <i>wild</i> populations, plantations, or genetic <i>tests</i> (e.g., a progeny or provenance <i>test</i>).
Breeding population	The population within which crosses are made to generate material for the next cycle of selection. <i>Breeding populations</i> are generally large, compared to the <i>production population</i> .
Breeding value (BV)	The genetic value of an individual for a given trait at a specified age. <i>BV</i> is usually expressed in relative terms, as a percent deviation from the population mean, but it may be expressed in terms of measurement units such as m or cm.
Checked dataset	A set of raw data that has been examined and corrected for format, unambiguous errors and omissions, and credibility. Checking is now largely conducted during the data collection phase by programming the data logger to detect anomalies such as shrinking trees, trees that are too tall for the given diameter at breast height (DBH), and live trees that were previously reported dead.
Clone	A population of individuals all originating asexually from the same single parent and, therefore, genetically identical. Clones are named with non-Latin names preceded by the abbreviation ‘cl’.
Collections, public land	Genetic material gathered and removed from <i>public land</i> for the purposes of <i>reforestation</i> , breeding or research. It does not include collections from approved <i>production populations</i> or <i>production units</i> .
Comparison tree method	A method for selection of parent trees in which measurements of the candidate are compared to those of nearby dominant trees. See Appendix 11.
Contributing landbase (Operable area)	The area available for timber harvesting activities. In the forecasting model, it is the area available for timber harvest action(s). Also known as the net landbase, active landbase, AAC-contributing landbase, or timber harvesting landbase.
Controlled parentage program (CPP)	A program to produce <i>Stream 2</i> material for <i>deployment</i> within the associated <i>CPP region</i> .
CPP region	A geographic area, defined initially by adaptation criteria as indicated by ecological and geographical proximity, and to be confirmed by testing, for which <i>Stream 2</i> material is produced.
Cumulative effective population size	See <i>effective population size</i> . The <i>effective population size</i> (N_e) of <i>deployment populations</i> aggregated across years, <i>production units</i> , or <i>production populations</i> . Can also refer to <i>deployed populations</i> aggregated across years. See Appendix 20 for calculation method.

Term	Definition
Cumulative Ne	See <i>cumulative effective population size</i> .
Deployment	Establishment of plants through <i>artificial regeneration</i> ; through physical movement from one site (e.g., a nursery) to the establishment site; or through planting or seeding designed to meet resource management objectives or obligations.
Deployment population	The collection of <i>propagules</i> , produced from a single <i>production population</i> or its associated <i>production unit(s)</i> and registered under a single <i>registered lot number</i> (e.g., a seedlot from a <i>seed orchard</i> ; a collection of cuttings from a <i>stoolbed</i> or <i>stoolbeds</i> ; a collection of <i>rootlings</i> ; a collection of micropropagated plantlets).
Dioecious	Refers to a plant having distinct male and female reproductive structures on separate plants.
Effective population size (Ne)	The size of an ideal population, which when contrasted to the population under study, would possess the same rate of increase in inbreeding, or decrease in genetic diversity due to genetic drift. As used in FGRMS: <i>Effective population size (Ne)</i> is a measure of <i>genetic diversity</i> and relatedness in a seed or vegetative lot, and is a function of the number of <i>genotypes</i> (parents), the degree of relatedness among parents, and the degree of balance among parental contributions to the given lot.
Equilibrium relative humidity (eRH)	The relative humidity of the air in an enclosed environment containing seeds, at the point where seeds are no longer gaining or losing moisture from the surrounding air. The <i>eRH</i> measurement is non-destructive and is expressed as a percentage.
Ex situ conservation; Ex situ gene conservation	Transfer of organisms (plant or animal) from one site (e.g. in the wild) to another site (e.g., seed banks, zoos) for the purpose of maintenance or breeding as a means of conserving the organism.
Extensive	<i>Artificial reforestation</i> of a cutblock or cutblocks where there is minimal follow-up treatment that would impact re-establishment of native vegetation. (With respect to management intensity; see Appendix 9.)
Forest tenure holder	A person or institution with defined ownership rights and obligations for the management and use of forest resources.
Genetic class code	A code assigned to <i>Stream 1</i> and <i>Stream 2</i> materials, and used for <i>deployment</i> reporting in ARIS. See Appendix 5.
Genetic diversity	The genetic variability within a population or a species.
Genetic gain	The heritable change in the population mean for a specified trait as a result of selection and breeding.
Genetic identity	One of several unambiguous current or historical identifiers (e.g., <i>unique identifier</i> , <i>accession number</i> , <i>registered lot number</i>) of seed or vegetative material, that can be used to identify the genetic source of the material.
Genetic research planting	A planting associated with a research plan or <i>CPP</i> plan. All materials in <i>genetic research plantings</i> must be <i>Stream 1</i> materials, <i>Stream 2</i> materials, <i>local research materials</i> or <i>non-local research materials</i> , and must be registered or have a <i>genetic identity</i> .
Genetic test site	A field experimental area containing research <i>trials</i> related to genetics and plant breeding.
Genetic worth	For a seed or vegetative lot, the predicted difference in value of a given trait (e.g., height or volume) at a specified age from the value of that trait at that age in <i>wild</i> stand material. This difference is expressed as a percentage of the <i>wild</i> stand value.

Term	Definition
Genetically modified organism (GMO)	An organism that, through human intervention in a laboratory, has had its genome, or genetic code, deliberately altered through the insertion of a specific identified sequence of genetic coding material (generally DNA) that has been either manufactured or physically excised from the genome of another organism. Genetic modification may be used to alter any of a wide range of traits, including insect and disease resistance, herbicide tolerance, tissue composition and growth rate. Substantially equivalent to <i>living modified organism</i> .
Genotype	The genetic makeup of an individual organism, usually with reference to a specific characteristic under consideration. May also refer to a specific individual plant or clone.
Green Area	The area outlined and colored green on a map annexed to the order Classifying <i>Public Lands</i> dated April 16, 1963, and published in The Alberta Gazette on April 30, 1963, as amended from time to time. The <i>Green Area</i> includes <i>public land</i> that is primarily forested and is managed for timber production, oil/gas development, watershed, wildlife and fisheries, recreation and other uses.
Hybrid orchard	An orchard including non-hybrid parents that is managed to produce hybrid seed. This term does not apply to orchards that include naturally occurring hybrid parents (e.g., white x Engelmann spruce).
<u>In situ</u> conservation; <u>In situ</u> gene conservation	Retention, conservation, and propagation of germ plasm resources on the site as a means of continuing the organism or ecosystem in its original habitat or location.
Intellectual property rights	The rights to intangible property that is the product of the human intellect. Intellectual property may be protected by copyright, trademark or patent. The holder of <i>intellectual property rights</i> is usually the person or persons who developed the product or the organization that funded it. In the context of Forest Genetic Policy, <i>intellectual property rights</i> apply to genetic data and to the <i>genotypes</i> to which they apply, either separately or in aggregate.
Intensive	Planting of an entire cutblock, or cutblocks across a large area, with recurrent near-complete control of native vegetation prior to canopy closure. Site is dominated by artificial regeneration material through use of vegetation management techniques. (With respect to management intensity; see Appendix 9.)
Living modified organism	Any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology. (Definition from the Cartagena Protocol.) Substantially equivalent to <i>genetically modified organism</i> .
Local research material	See <i>research material, local</i> .
Locally adapted material	Material deemed to be adapted by virtue of origin or testing. <i>Locally adapted material</i> may be one of: 1. <i>Stream 1</i> material collected from within the <i>seed zone</i> in which <i>deployment</i> is planned, 2. <i>Stream 2</i> material from <i>genotypes</i> under test, or scheduled for testing, but accepted by <i>Alberta</i> as locally adapted, or 3. <i>Stream 2</i> material from <i>genotypes</i> confirmed as adapted on the basis of field testing.
Lot number, registered	A number used to uniquely identify a seed or vegetative lot from the time of <i>registration</i> through storage, <i>deployment</i> and monitoring. The <i>registered lot number</i> is assigned by <i>Alberta</i> when material is registered.
Lot number, temporary	A number used to uniquely identify a seed or vegetative lot prior to <i>registration</i> .

Term	Definition
Material transfer agreement (MTA)	<i>Material transfer agreements (MTAs)</i> are contractual legal agreements between two or more parties governing the transfer and subsequent use of genetic materials. MTAs specify which rights are conferred, and may contain clauses concerning such topics as record keeping, reclaim rights, liability disclaimers and prohibitions on use of the material for further breeding.
Material use rights	The right to use genetic materials (e.g., seeds, seedlings, somatic seedlings or rooted cuttings) for plantation purposes. The holder of <i>material use rights</i> does not usually have propagation or breeding rights.
Moisture content	A measurement of the quantity of water contained in seed. In the case of seed, it is a destructive method and is calculated on a wet weight basis. Moisture content is expressed as a percentage.
Moisture measurement	A measurement of the water status of a seedlot. Can refer to non-destructive <i>equilibrium relative humidity</i> (eRH) measurement or to the destructive <i>moisture content</i> measurement (MC).
Monoecious	Refers to a plant in which male and female reproductive structures occur on the same individual.
Natural regeneration	The renewal of a forest stand by natural rather than human means, such as seeding-in from adjacent stands, with the seeds being deposited by wind, birds, or animals. Regeneration may also originate from sprouting, suckering, or layering.
Ne	See <i>effective population size</i> .
Non-local material	Material of unknown adaptation. Either of: 1. <i>Wild</i> material collected from outside the <i>seed zone</i> in which <i>deployment</i> is proposed, 2. <i>Stream 2</i> material that is not deemed to be locally adapted.
Non-local research material	See <i>research material, non-local</i> .
Opening	An area created by timber harvest which is the unit for reforestation management (i.e., Regeneration surveys) and tracking of reforestation activities in the Alberta Regeneration Information System (ARIS). Openings have a unique administrative identification, contain one reforestation stratum, and a single timber disposition holder with reforestation responsibility.
Operable area	The total area of all stands included in the Annual Allowable Cut (AAC) calculation.
Orthodox seed	Seed which will survive drying to a low moisture content and subsequent freezing.
Pedigree	A record of parentage, sometimes also including data on the performance of parents and other relatives.
Phenotype	The visible, observable and measurable characteristics of an organism, such as morphology, physiology, biochemistry, and behavior, resulting from the influence of environmental conditions on its genetic constitution.
Point collection	Registerable <i>Stream 1</i> material collected within area and elevation limits, and diversity criteria, as defined in Appendix 4; compliance enables application for variance.
Production population	The population of <i>genotypes</i> used for <i>propagule</i> production, or the aggregate of <i>genotypes</i> represented in the <i>production unit(s)</i> for a given <i>CPP region</i> .
Production site	The physical location or place where <i>propagules</i> are produced (e.g., a <i>seed orchard</i> site, <i>stoolbed</i> site, collection of pots at a nursery, or laboratory).
Production unit(s)	The direct physical source(s) of <i>Stream 2</i> seed or vegetative lots (e.g., the group of trees or other plants that is a <i>seed orchard</i> ; individual or aggregate <i>stoolbeds</i> , or a collection of tissues used for <i>rootling</i> propagation or micro-propagation).

Term	Definition
Propagule	Plant material (e.g., cutting, root segment, seed, or cultured callus tissue) from which a new individual can be grown.
Public land collections	See <i>collections</i> , <i>public land</i> .
Public land(s)	“Land of the Crown in right of <i>Alberta</i> ” (definition from <i>Alberta’s Public Lands Act</i>). Includes <i>Green Area</i> (land managed primarily as forest land) and <i>White Area</i> (land managed primarily for agriculture and uses other than forestry).
Ramet	A genetically identical individual produced by vegetative propagation.
Ramet, grafted	A <i>ramet</i> created by grafting a twig or bud from the original plant onto a physically distinct rootstock. The portion of the <i>grafted ramet</i> above the graft union is genetically identical to the original plant (see also <i>ramet, rooted</i> .)
Ramet, rooted	A <i>ramet</i> created by rooting a twig or cutting from the original plant. The whole <i>ramet</i> is genetically identical to the original plant (see also <i>ramet, grafted</i>).
Rare species	A species belonging to either of these two categories: <ol style="list-style-type: none"> 1. Species that are ranked provincially as S1 or S2 (or any combination including either S1 or S2) by the Alberta Conservation Information Management System (ACIMS). 2. Species ranked nationally as N1, N2 or N3 or that have been designated in the Species at Risk Act (SARA) or listed as threatened and/or endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
Reclamation	As used in FGRMS: A planned process to assist the ecological recovery of an ecosystem that has been disturbed. It does not require the recovery process to target the pre-disturbance system, but should return the specified land to an equivalent (but not necessarily identical) land capability.
Reforestation	The reestablishment of trees on denuded forest land by natural or human-mediated means such as planting and seeding.
Registered lot number	See <i>lot number, registered</i> .
Registration	Process that allows a seed or vegetative lot to be used for <i>deployment</i> within its <i>CPP region</i> or <i>seed zone</i> . Only <i>Stream 1</i> and <i>Stream 2</i> materials can be registered. <i>Registration</i> may be <i>restricted</i> or <i>unrestricted</i> . A registered seed or vegetative lot is one that has completed the <i>registration</i> process.
Regulated professional	A person regulated by a recognized professional body to be accountable and to provide competent and ethical services.
Rehabilitation	In reference to clonal standards <i>rehabilitation</i> refers to planting on road sides, landing and decking areas, and forest voids created by regeneration failures.
Remediation	The establishment of locally adapted material tested and employed for the purpose of re-establishing the biophysical capacity of a site.
Research material, local	Seed or vegetative materials from within the target <i>CPP region</i> or an adjacent <i>CPP region</i> that may not be eligible for <i>registration</i> (e.g., an open-pollinated seedlot collected from a single plant). These materials may be included in a <i>CPP</i> leading to production of <i>Stream 2</i> material, and must have <i>U.I.s</i> assigned before being established in <i>genetic research plantings</i> or included in a <i>CPP</i> . Breeding, Testing and Verification Standards apply to this material.

Term	Definition
Research material, non-local	Seed or vegetative materials of unknown adaptation (such as species, provenance, family or hybrid material from outside the <i>seed zone</i> or <i>CPP region</i> of origin). Untested <i>non-local research materials</i> are not eligible for <i>deployment</i> within the <i>Green Area</i> , or inclusion in <i>production populations</i> or <i>units</i> associated with <i>CPPs</i> (with some exceptions of material from adjacent <i>CPP regions</i>), but may be included in <i>genetic research plantings</i> . These materials must have <i>U.I.s</i> assigned before being established in <i>genetic research plantings</i> . Following testing and demonstration of adaptedness, these materials may be included in <i>CPPs</i> leading to production of <i>Stream 2</i> materials. Breeding, Testing and Verification Standards apply to this material.
Restricted registration	<i>Registration</i> of material not in compliance with one or more documentation, adaptation and diversity requirements, that allows a seed or vegetative lot to be used for <i>deployment</i> within its <i>CPP region</i> or <i>seed zone</i> . Restrictions on <i>deployment</i> may be imposed.
Rolling front orchard	A <i>seed orchard</i> in which individual plants or groups of plants of known <i>breeding value</i> are replaced on a more or less continuous basis as new material of higher <i>breeding value</i> becomes available.
Rootling	A plant generated from a root segment.
Seed orchard	A plantation, usually several hundred to several thousand plants in number, established and managed primarily for early and abundant production of seed for <i>deployment</i> . Plants in the orchard are derived and propagated from selected parents, usually by grafting or by seed.
Seed zone	A geographic area, defined on the basis of ecological characteristics and genetic information, within which <i>Stream 1</i> material meeting <i>unrestricted registration</i> requirements may be collected and freely deployed. (<i>Seed zones</i> may apply to group of species, or <i>species-specific seed zones</i> may be developed).
Seed zone collection	Registerable <i>Stream 1</i> material collected within a single <i>seed zone</i> , not otherwise subject to constraints of area or elevation range; not eligible for variance (see Appendix 4).
Selected population	A population of plants, chosen from a <i>base population</i> , from which <i>breeding populations</i> and <i>production populations</i> are chosen or derived by breeding or propagation.
Serial propagation	The propagation of multiple clonal copies of a plant through repeated cycles of collection of vegetative units (e.g., scions or cuttings), creation of new plants from these units, and vegetative growth of the derived plants, without returning to the original plant. Also known as “bulking up” or multiplication.
Serotinous cones	Cones that after seed maturity remain closed on the tree and open to release seed following fire or excessive heat (e.g., lodgepole and jack pine cones).
Species-specific seed zone	A <i>seed zone</i> , delineated for a single species or group of species on the basis of adaptation as assessed from genetic <i>trials</i> , within which <i>Stream 1</i> material may be collected and freely deployed.
Species-specific target strata	The area to be regenerated to the species produced by the <i>production unit(s)</i> for a given <i>CPP</i> .
Stoolbed	An aggregation of closely spaced stumps, or stools, managed for the production of vegetative sprouts (whips). Harvested whips are used for operational planting stock and can be pre-rooted prior to <i>deployment</i> .
Stream 1	<i>Stream 1</i> material refers to seed or vegetative material collected from <i>wild</i> or artificially regenerated stands (including <i>Stream 1 seed orchards</i>) of native species within a given <i>seed zone</i> , having <i>restricted</i> or <i>unrestricted registration</i> for <i>deployment</i> in that <i>seed zone</i> .
Stream 2	<i>Stream 2</i> material refers to registered or registerable seed or vegetative material produced from an approved <i>production population</i> or <i>production unit(s)</i> .

Term	Definition
Stream 1 seed orchard	A <i>seed orchard</i> established to produce seed for a single <i>seed zone</i> .
Temporary lot number	See <i>lot number, temporary</i> .
Test	A <i>genetic research planting</i> designed to address a given genetic issue. May stand alone or may be one planting of a series including the same or overlapping material (e.g., a single progeny <i>test</i> site). Used interchangeably with <i>trial</i> .
Test series	A group of <i>genetic research plantings</i> of the same or overlapping material, on one or several sites, designed to address a given genetic issue (e.g., a progeny <i>test</i> established on four sites). Used interchangeably with <i>trial series</i> .
Trial	A <i>genetic research planting</i> designed to address a given genetic issue. May stand alone or may be one planting of a series including the same or overlapping material (e.g., a single progeny <i>trial</i> site). Used interchangeably with <i>test</i> .
Trial series	A group of <i>genetic research plantings</i> of the same or overlapping material, on one or several sites, designed to address a given genetic issue (e.g., a progeny <i>trial</i> established on four sites). Used interchangeably with <i>test series</i> .
Unique identifier (U.I.)	An alphanumeric code of 7 to 18 characters assigned to genetic material. The first seven characters of the <i>U.I.</i> are essential, and uniquely identify the <i>genotype</i> by agency and sequence number. Subsequent characters may be included as applicable, and specify material type (e.g., scions, pollen), individual number (e.g., cutting 103), and species (e.g., Sw, Picegla). A <i>U.I.</i> is required for all unregistered material included in research <i>trials</i> related to <i>CPPs</i> , and for all material in <i>Stream 1 seed orchards</i> . See Appendix 25 for details of variables, structure and agency codes.
Unrestricted registration	<i>Registration</i> based on compliance with documentation, adaptation and diversity requirements that allow a seed or vegetative lot to be used for <i>deployment</i> within its <i>CPP region</i> or <i>seed zone</i> . Restrictions on <i>deployment</i> may be imposed (see Appendices 4, 9 and 21).
Vegetative propagule	A part of a plant used for vegetative propagation (e.g., a root, a stem, or somatic embryonic tissue).
White Area	Private and <i>public land</i> in the settled portion of the province, managed primarily for agriculture use, but not excluding other uses such as timber, oil/gas development, recreation, soil and water conservation, and fish and wildlife habitat.
Wild	Of natural origin; not derived from material established through <i>artificial regeneration</i> .

Acronyms

AAC	Annual Allowable Cut
AOP	Annual Operating Plan
ARIS	Alberta Regeneration Information System
ATISC	Alberta Tree Improvement and Seed Centre
BLP	Best Linear Prediction
BLUP	Best Linear Unbiased Prediction
BTV	Breeding, Testing and Verification (Section of FGRMS 2016)
BV	Breeding Value
CNT	Consultative Notation
CPP	Controlled Parentage Program
DBH	Diameter at Breast Height
DNA	Deoxyribonucleic acid
DRS	Disposition Reservation (see Standard 30.4.1)
eRH	Equilibrium Relative Humidity
FGRMS	Forest Genetic Resource Management and Conservation Standards (formerly STIA)
FMA	Forest Management Agreement
FMP	Forest Management Plan
FOIP	Freedom Of Information and Protection of Privacy Act
GAD	Green Area Deployment (Section of FGRMS 2016)
GMO	Genetically Modified Organism
GW	Genetic Worth
ISP	Industrial Sample Plot Designation
LMO	Living Modified Organism
MCHRS	Material Collection, Handling, Registration and Storage (Section of FGRMS 2016)
MLL	Miscellaneous Lease
MTA	Material Transfer Agreement
Ne	Effective Population Size
PCPM	Production of Controlled Parentage Material (Section of FGRMS 2016)
PNT	Protective Notation (see Standard 30.4.1)
PST	Permanent Sample Tree
RP	Research Program
SMP	Supplemental Mass Pollination
SSSZ	Species-Specific Seed Zone
STIA	Standards for Tree Improvement in Alberta
U.I.	Unique Identifier