



Seed Planning and Registry (SPAR) system

Seed Selection, Use, and Seed/Seedling Request Ordering

The ministry's **Seed Planning and Registry (SPAR)** is a web-based information management system and registry supported and maintained by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) Forest Improvement and Research Management Branch. SPAR provides clients with direct online access to: 1) A provincial **registry** of forest tree seed/vegetative material, orchards, and parent trees; and 2) A comprehensive **seed/seedling request ordering and reporting system** for meeting annual reforestation needs.

In addition to SPAR, the ministry's **Tree Seed Centre (TSC)** supports and maintains the Cone and Seed Processing System (CONSEP) through overnight batch processing with SPAR. SPAR comprises three main components:

Registry Apply for a formal identification number (Lot Number; Orchard ID or Parent Tree ID). Enter, update and maintain information associated with seed and vegetative lot, orchard, and parent trees. Conduct queries related to active and expired (historical) lots, orchards and parent trees.

Requests Order seedling requests, direct seed withdrawals, cone and seed processing, testing, and other services. Requests are entered through SPAR and downloaded to CONSEP at the Tree Seed Centre. SPAR guides the user through selection of a suitable lot for a seedling request using the transfer standards described in the *Chief Forester's Standards for Seed Use*.

Reporting Generate SPAR reports in pdf format via report submission screens. Data extracts can also be produced in MS Excel (csv) format.

This document is intended for those persons who use SPAR to prepare for, plan, conduct and report on forest tree seed use (seed/seedling) activities required to support reforestation, forest and ecosystem rehabilitation and wildfire recovery in British Columbia. Information pertinent to **Climate Based Seed Transfer (CBST)** introduced as amendments to the Chief Forester's Standards for Seed Use on April 5, 2018 (effective August 6, 2018) has also been added, where applicable. Table 1 (below) provides a summary of topics covered in this document.

Table 1: Activities Associated with the Seed Planning and Registry System (SPAR) listed by Topic, Subtopic, and related Climate Based Seed Transfer changes.

Topic	Subtopic	Climate Based Seed Transfer (APR 5 2018; effective August 6, 2018)
Cone Collection	<ul style="list-style-type: none"> Collection Criteria for lots collected from natural stands Mapping Collection Areas using the Seedlot Collection tool 	<ul style="list-style-type: none"> Single BEC Variant (required) Natural stand Seed Planning Zone (collection information only)
Cone and Seed Processing	<ul style="list-style-type: none"> Seed Extraction Seed Sampling and Testing Priority Processing Seed Storage 	<ul style="list-style-type: none"> <i>See the Cone Collection and CBST Information Bulletin – v2 April 2018</i>
Nursery Seedling Production	<ul style="list-style-type: none"> Seed Preparation Nursery Latest Sowing Dates Seedling Production at Nurseries Nursery Seedling Crops – Spring, Summer and Fall Lifts 	<ul style="list-style-type: none"> <i>For seedlings grown on spec, confirm CBST options using the CBST Tool and the SPAR CBST Area of Use tool</i>
Seed Planning	<ul style="list-style-type: none"> Natural Stand SPZs Orchard SPZs Orchard SPUs 	<ul style="list-style-type: none"> Species and BEC variant CBST Tool (e.g. use to compare CBST with GBST areas of use) Orchard BEC variant Groups (interim)
Seed Registration	<ul style="list-style-type: none"> Seed and Vegetative Lots Orchards Parent Trees Identification of Seed Sources 	<ul style="list-style-type: none"> Seed BEC variant – orchard (Class A) Seed BEC Variant – natural stand (Class B) Seed BEC variant – natural stand superior provenance (Class B+)
Seed Sales and Transfers	<ul style="list-style-type: none"> Seed sales and transfers Seed Gram Amounts and Potential Trees 	<ul style="list-style-type: none"> <i>See the Suitable Seed/Vegetative Lot for CBST feature on SPAR</i>
Seedling Requests	<ul style="list-style-type: none"> Seedling Request Planning and Entry Tree Species Selection and Stocking Seedling Requests Other Request Types 	<ul style="list-style-type: none"> CBST–FRPA Climate Based Seed Transfer (flag for tracking purposes)
Seed Selection and Use	<ul style="list-style-type: none"> Best Genetic Quality Genetic Class Genetic Worth 95% Standard (5% rule) 	<ul style="list-style-type: none"> CBST – BEC Variant List (Area of Use) Suitable Seed/Vegetative Lot for CBST Recommended order of selection
Seed Transfer	<ul style="list-style-type: none"> What is seed transfer? Geographically Based Seed Transfer (GBST) Climate Based Seed Transfer (CBST) 	<ul style="list-style-type: none"> CBST Seed Deployment (use/plant in) CBST Seed Procurement (purchase/collect) SPAR CBST Area of Use tool
Seed Use Legislation, Regulation, and Standards	<ul style="list-style-type: none"> FRPA Forest Planning and Practices Reg. (FPPR) Woodlot Planning and Practices Reg. (WLPPR) Chief Forester’s Standards for Seed Use 	<ul style="list-style-type: none"> Amendments to the Standards (April 5, 2018) Climate Based Seed Transfer (CBST) Areas of Use May 2018 v.4
Web-based Resources	<ul style="list-style-type: none"> Tree Seed Chief Forester’s Standards for Seed Use 	<ul style="list-style-type: none"> Climate Based Seed Transfer Climate Based Seed Transfer (CBST) Area of Use May 2018 v4

Cone Collection

- Seed Orchards - Select Seed (Class A)
- Natural Stand - Select Provenance (Class B+); Standard (Class B)

Seed orchards have been established to produce improved seed that may result in enhanced growth potential, frost tolerance, insect or disease resistance, and better wood quality.

In specific locations in the province; Pli, Sx and Ss trees are known to have superior growth characteristics and/or resistance to pests. Natural stand collections from these areas are classified as Superior Provenance (B+).

Note: For interior species Sx, Pli, Lw, Pw and Fdi cone collectors should check the supply of Select Seed prior to collection of cones for Standard Seed.

Implications of new (CBST-related) Collection Standards on Seed Transfer options

The intention of the April 5, 2018 amendment to the collection Standards is that all new collections of seed will be for use **with the CBST transfer standards**. This is primarily to reduce the likelihood of increasing seed inventories that may not be plantable after the transition period.¹

Under CBST transfer standards, the collection area must be within a **single BEC unit**¹ and within 8 km of a central collection point; and, may comprise one or more seed planning zones. However, If you wish to maintain the option to use geographically based seed transfer (GBST) standards during the transition period, you will need to collect seed from a single BEC unit¹ and the same natural stand seed planning zone.

Table 2: Collection criteria for lots collected from natural stands within British Columbia under CBST

Section of Standards	Previous Standards	Change	Amended Standards (in effect August 6, 2018)
5.2.1.1 (a)	a) Material must be collected from a minimum of 10 trees of the same species	a) No Change	a) Material must be collected from a minimum of 10 trees of the same species
5.2.1.1 (b)	b) The trees must all be located in i. The same natural stand seed planning zone, ii. The same biogeoclimatic zone, and iii. A collection area with a radius of no greater than 8 kilometers.	b) i. Deleted ii. Changed iii. No change	b) The trees must all be located in i. A single BEC unit² (zone, subzone, variant)* and ii. A collection area with a radius of no greater than 8 kilometers.
5.2.1.1 (c)	c) The range between the lowest and highest elevation of the collection area must be no greater than the range specified in an appendix to the Standards, for that species and natural stand seed planning zone.	c) Deleted	

¹ Currently, a minimum of 2 years is anticipated for full implementation to transition from use of geographically-based seed transfer to CBST.

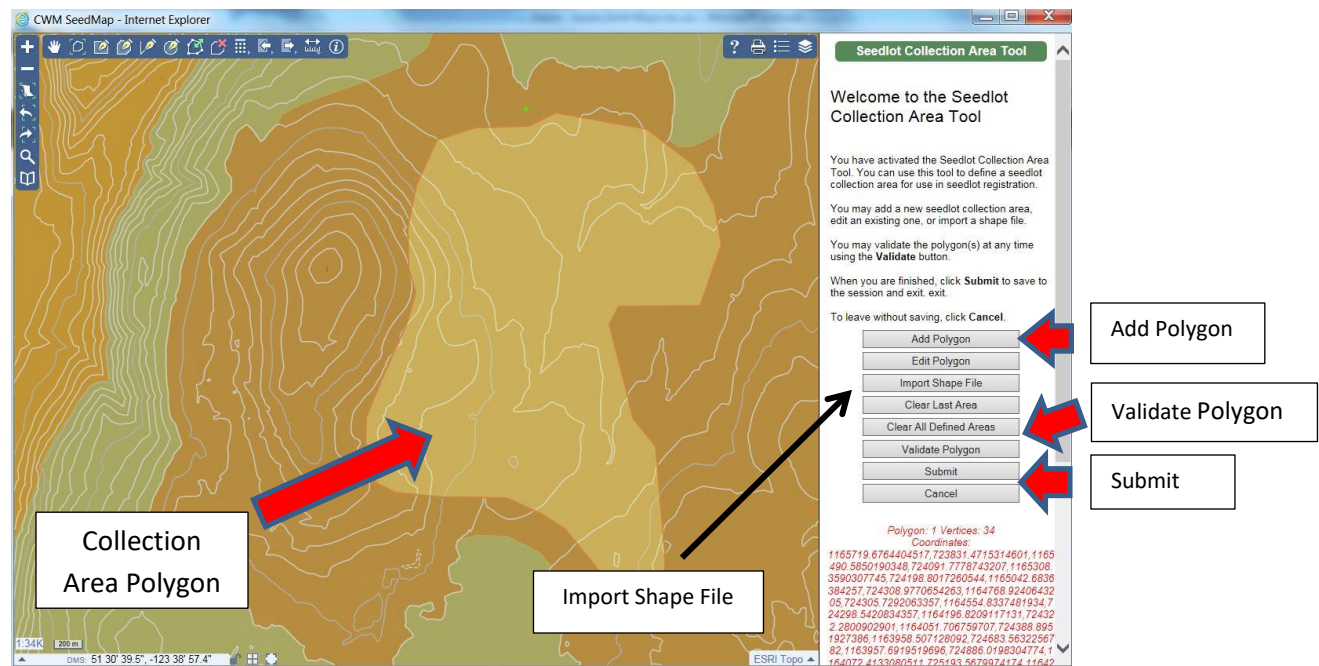
² BEC Unit is within one zone, subzone and variant, where applicable; or, within one subzone, where a variant is not applicable.

* Overrides to the published BEC map may apply based on field identification (field-based BEC classification) by a forest professional. Override comments must also be added to SPAR.

Mapping collection areas using the Seedlot Collection Area Tool in SPAR

The Collection Area Capture link opens **SPAR CWM SeedMap** with the geographic location displayed based on the latitude and longitude coordinates entered on the lot registration screen.

Click on “Add Polygon”, draw polygon on map, click on “Validate Polygon,” and then click “Submit”. In the example below the lighter brown area is the collection polygon drawn on the map. **Alternatively**, you can import your own shape file by following the prompts at “Import Shape File”, and “Submit”.



Cone and Seed Processing

Seed Extraction

Once cones are collected and identified with a Seedlot number, they are stored in sacks on cool, ventilated racks.

Cones are shipped to either the Tree Seed Centre (TSC) or a private extraction facility for processing. Cone and seed processing is the operation of removing seed from the cones and obtaining viable seed. It usually includes removing seed wings, eliminating debris, and separating empty non-viable seeds from those that have developed, are mature, and have potential to grow. If the seed has been extracted at a private facility, it is then sent to the Tree Seed Centre.

Seed Sampling and Testing

A representative sample of each new Seedlot is X-rayed and tested to determine purity, moisture content, seed weight, germination rate and potential. To monitor viability -- the number of seeds that will grow - germination tests for each Seedlot are repeated periodically. This information is used

to predict how much seed will be needed to produce the number of seedlings required for a planting project.

Priority Processing

There are several reasons to process Seedlots on a priority basis. The TSC processes collections of western red cedar and western hemlock on a priority basis because of the low seed dormancy of these species. Clients may request that Seedlots be processed on a priority basis if the Seedlot must be immediately available for seedling production, or if there are concerns with pre-germination or insect activity. Notify the Tree Seed Centre by October 31 of each year regarding priority processing requests.

Seed Storage

Tree seed is stored in secure vaults at -18°C at the Tree Seed Centre until it is required for the reforestation program. Processed seed can be stored for up to 30 years or more.

Seed Sales and Transfers

To submit a request for a seed sale or transfer, forward a complete and signed Seed Sale and Withdrawal Form (FS 723) to the TSC, or forward request details and owner's authorization in writing

Reserved portions of Seedlots on SPAR can be accessed only by the seed owner. Surplus portions are available to all agencies to submit seedling requests (SRQ) against. The TSC will forward an invoice for surplus MOF owned seed at the current published seed price (refer to the Ministry Surplus Seed Price Schedule). All other Seedlots will require a purchase agreement with the Seedlot owner prior to approval of the seedling request.

For each sale or transfer, the TSC prepares and forwards written confirmation to the seller and purchaser when the transaction is complete on SPAR.

Seed Gram Amounts and Potential Trees

Seed quantities are measured in grams. In SPAR, grams are translated into Potential Trees, using a specific formula. This formula takes into account the MOF Sowing Guidelines, using seed lot germination capacity to determine Potential Trees. Potential Trees is displayed in thousands on SPAR.

Seed Registration

SPAR is the corporate database, information management system, and registry for forest tree seed and vegetative lots, orchards and parent trees for use in Crown land reforestation; ecosystem rehabilitation; and, forest carbon, enhancement and wildfire recovery programs. Lot Identification numbers, Orchard Identification numbers and Parent Tree numbers are assigned through a system-generated (automatic and sequential) process at the time of registration.

Seed and Vegetative Lots

Seed and vegetative lots can have one of four registration statuses:

- Active – with a seed balance 'greater than zero';

- Expired – with a seed balance of ‘zero’;
- Pending – an interim status pending approval and/or completion of testing and/or provision of further information; and,
- Incomplete - registration not activated; incomplete (e.g. family or small sized seed collection to be blended at a future date).

Orchards

Seed orchards are assigned an Orchard identification number upon establishment of an orchard. Seed orchards can have one of four registration statuses:

- Established - new orchard established (in the ground), but not yet producing a cone/seed crop
- Producing – orchard producing a cone/seed crop
- Retired – orchard no longer producing (reached the end of its production cycle)
- Incomplete – registration not activated; incomplete (e.g. pending approval of licensing).

Production facilities are also registered for the production of vegetative materials (cuttings) from hedges and for the registration of vegetative lots. Note: A vegetative lot is assigned a unique (new) Orchard ID for each crop produced each year.

Parent Trees

Parent trees are assigned a Parent Tree Identification number upon scion collection and/or selection in a tree breeding program. Note: In many cases, parent trees may have also been assigned a Local No. as a unique identifier tied to a research trial or test (e.g. Experimental Project).

Identification of seed sources under CBST

To maintain the identity of the Province’s forest tree gene resources in a changing climate, we identify the “climate space” (represented by a single BEC unit³) from which seed is collected. Together with geographic coordinates, this will enable each seed source’s (seedlot’s) ‘climatic origin’ to be recorded as the climate space of its geographic origin continues to change over time. This information is critical to monitoring and evaluation of CBST and creation of future seed transfer standards.

Note: The Natural Seed Planning Zone will continue to be recorded in the transition period (to full implementation to CBST transfer system), to maintain maximum flexibility in deploying seed. This information will not be required after the option to use geographically based seed transfer (GBST) standards is removed.

³ BEC Unit is within one zone, subzone and variant, where applicable; or, within one subzone, where a variant is not applicable.

Table 3: Collection area information required to register lots collected from natural stands within British Columbia, including superior provenances **under CBST**

Section of Standards	Amended Standards (in effect August 6, 2018)
Appendix 1	<ol style="list-style-type: none"> 1. Provenance name of collection area or closest geographic feature identified on a map (e.g., Birch Island) 2. Radius of collection area in kilometres 3. Mean latitude of collection area in degrees, minutes and seconds 4. Mean longitude of collection area in degrees, minutes and seconds 5. Collection area map in digital spatial format (<i>using the Seedlot Collection Area Tool in SPAR CWM SeedMap; or by uploading a shape file</i>) 6. Mean, lowest and highest elevation of collection area in metres 7. BEC unit¹ (Biogeoclimatic zone, subzone, variant) in which collection area is located 8. Natural stand seed planning zone in which collection area is located 9. If the answer to #8 is the Maritime (M) Natural Stand Seed Planning Zone, is collection area on Haida Gwaii, Vancouver Island or the BC Mainland?

Seedling Requests

Seedling Request Planning and Entry

Silviculture systems create openings that require regeneration to be established and achieve free growing status. A range of systems are available, including: clearcutting, patch cutting, group selection, group shelterwood and seed tree silvicultural systems. Two options are available for regeneration: natural and artificial (planting). Seedlings to be grown for planting are ordered through SPAR. Upon submission, a seedling request order will assign a unique Request Identification number (Request ID) through a system-generated (automatic and sequential) process.

Seedling requests can have one of five statuses:

- Approved – seedling request approved for processing;
- Pending – seedling request given an interim status, pending final approval/further information;
- Incomplete – seedling request incomplete; further information required; and
- Cancelled – seedling request cancelled; no further processing required.

Tree Species Selection and Stocking

Most of the information required to plan for the ordering of seedling requests resides in the Silviculture Prescription developed for for the Silviculture opening (cutblock), including preferred and acceptable species, stocking standards, regeneration date, etc.

The ministry's **Reference Guide for Forest Development Stocking** is an aid to providing guidelines for the development of stocking standards by tree species, BEC variant and site series.

Note: **Establishment to Free Growing guidebooks** offer help in selecting preferred and acceptable tree species from the primary, secondary and tertiary species now summarized in the Reference Guide to FDP stocking standards. They outline a process for species-selection decision making. The legislative references are no longer valid but provide context for the Reference Guide and guidance for developing stocking standards.

When all of the information has been gathered to order seedlings, the SPAR user can proceed with the seedling request entry. After entry of requests, the user will approve their requests in SPAR. Upon approval, the **Tree Seed Centre (TSC)** proceeds with withdrawal and preparation of the seed at the appropriate time. The seedling request can still be updated when the request is PND (pending) or APP (approved) status.

Seedling Requests

Only registered seed and vegetative lots may be used for Crown land reforestation. All registered seed and vegetative lots are listed on SPAR. Requests for seedlings may be made against seed registered by the respective owner(s).

Seed and vegetative lots listed on SPAR as surplus is available to other agencies. In the case of non-ministry use of a ministry seedlot, the TSC will invoice the purchaser for the cost of the seed and requested services using the current fee. In the case of surplus portions against non-ministry seedlots, interested purchasers should contact the owners directly to verify seed availability and cost. When a purchase agreement has been reached, the TSC should then be contacted to update the request on SPAR.

Other Request Types

Other request types include direct withdrawals, seed testing / re-test requests, seed upgrading, etc. To submit a direct withdrawal request for seed to be used for research, education, public relations, private land reforestation or direct seeding, complete and sign a **Seed Sale and Withdrawal Form (FS 723)**.

Nursey Seedling Production

Seed Preparation

Seed is withdrawn from storage in time to meet the sowing (seeding) dates of each nursery that will provide the seedlings requested by foresters. In most cases, the seeds are soaked in water and stratified (exposed to cold temperatures to overcome dormancy and induce rapid germination) prior to shipment.

Non-ministry clients may request that seed be forwarded dry for preparation at the nursery or other facility. Most seed withdrawals continue to be prepared by the TSC and are offered to non-ministry clients on a fee basis.

Nursery Sowing Dates

Each forest nursery has specific dates that it prefers to sow seed for different species/ stock type/ container type/ stock age combinations. These are referred to as Latest Sowing Dates, and nurseries can add or update their own dates. When a seedling request is entered in SPAR, the 'Recommended Sowing Date' is derived from the nursery's latest sowing dates. From the **Recommended Sowing Date**, SPAR derives the Recommended Action Date.

When the **Recommended Action Date** is reached, the status of a seedling request becomes ACT (active) and The Tree Seed Centre begins withdrawal and preparation of the seed. During this time, seedling request information is transferred nightly between SPAR and CONSEP (Cone and Seed Processing system), a local TSC system. The seed is shipped to the nursery just prior to the Recommended Sowing Date. Some nurseries do their own seed stratification (and upgrading of some species) and the seed is shipped dry close to the Recommended Action Date.

Seedling Production at Nurseries

Seedlings are grown in facilities ranging from highly sophisticated greenhouses to open compounds. The stock standards achieved depend on factors such as sowing date, type of facility, and cultural program. Strict adherence to sowing dates that have been shown to produce a satisfactory species/ stock type is important. The choice of container in which the crop is to be grown is a major factor determining the final morphology of the trees.

The growing medium used in **container production** has no soil and is peat based. The peat goes through standardised testing procedures and the bulk density of the medium is controlled during container filling. Sowing is mechanised using either precision or vacuum drum seeders. Sown seeds are covered with a thin layer of coarse sand and transported to the growing facilities. In both open compounds and greenhouses; water, light, temperature, and nutritional management are adjusted to the needs of the crop to achieve balanced growth and ensure that trees leaving the nursery have a balanced complement of nutrients.

Nursery Seedling Crops - Spring, Summer, and Fall Lifts

The practice in British Columbia is usually to produce one crop per production area per year rather than to produce multiple crops. January to early February sowing dates permit the development of large, vigorous stock that is suitable for planting in the summer and fall of the same year. If the stock is properly treated to ensure stress resistance and proper phenology before planting, and if the sites are suitable, this stock will establish a good root system on the site before winter and will develop in physiological synchronisation with the following season.

Later sowing dates, ranging from late February through April, are commonly used for the more conventional 1+0 spring plant or outdoor 2+0 **stock types**. In most instances, the 1+0 stock will have achieved the required standards by the fall and will be frozen-stored for spring planting the following year. In contrast, open compound-grown 2+0 seedlings are overwintered in their first year and then out planted the following summer.

As stock is lifted, it is generally bundled in groups of 15 to 20 and the roots are wrapped with a thin plastic film. The bundles are placed in moisture-proof bags, inside waxed cartons, to prevent desiccation during storage and transport. Early 1+0 and 2+0 seedlings lifted during the summer and early fall are planted at that time. Stock that is destined for reforestation sites the next spring is generally frozen at -4°C. If conditions are carefully controlled, stock may be stored for prolonged periods with very little deterioration.

Seed Selection and Use

In BC, seed registered for use in Crown land reforestation (to meet silviculture obligations), forest carbon, forest enhancement, and ecosystem recovery (e.g. wildfire) programs is stored in the Seed Planning and Registry system. Seed (seed and vegetative lots) may be selected through an online submission process such as a seedling request order or through a direct seed withdrawal request transaction.

Area of Use

Upon registration, seed and vegetative lots are assigned an **Area of Use (AOU)**, defined as an area in which seed may be deployed (used) on ecologically-suitable planting sites. The location and extent of natural stand and orchard AOU are based on extensive forest genetic research, analysis and testing. Both spatial and non-spatial information is stored to delineate /describe a seed/vegetative lot AOU.

GBST Area of Use

Attributes used to denote a GBST AOU include:

- Species
- Geographic coordinates (Latitude/Longitude);
- Elevation (Mean, Minimum, Maximum);
- Seed Planning Zone (SPZ) – Natural stand (SPZ-B) and Orchard (SPZ-A);
- Geographic location (for Maritime SPZs: VI Vancouver Island, ML-Mainland, HG-Haida Gwaii); and,
- Biogeoclimatic Ecosystem Classification (BEC) unit (BGC zone, Subzone and Variant).

CBST Area of Use

Attributes used to denote a CBST AOU include:

- Species; and,
- Biogeoclimatic Ecosystem Classification (BEC) unit (BGC zone, Subzone and Variant).

Under CBST, the framework for delineating seed deployment areas is shared among species (and BEC unit), regardless of genetic class (e.g. a CBST AOU for PLI SBSmk1 is the same for Class A (orchard) and Class B/B+ (natural stand) seed and vegetative lots. However, it is important to keep in mind when selecting seed for Crown land reforestation that seed selection standards (i.e. selection of a GW of 5% or greater) still apply under FRPA.

Best Genetic Quality

There are three measures of genetic quality – **genetic class**, **genetic worth**, and **genetic suitability**. Genetic class is often further refined as either a ‘select’ seed source or a ‘non-select’ seed source.

Genetic class is based on a classification used to denote the origin of seed or vegetative material. There are three genetic classes:

- Class A – assigned to seed originating (produced) from a seed orchard;
- Class B – assigned to seed originating from a natural stand; and,
- Class B+ - assigned to seed originating from a natural stand superior provenance.

Select seed includes Class A (orchard) and B+ (superior provenance) seed sources (i.e. with a known Genetic Worth). Non-select seed refers to Class B (natural stand) seed sources (i.e. no known genetic gain). Genetic class is assigned at registration.

Genetic Worth (GW) is an estimate of genetic gain of an orchard seedlot, based on extensive forest genetic research and progeny trials) compared to that of a local wild population (natural stand) seed source. GW is currently estimated for 12 possible traits, with the primary one being GVO – Volume Growth.

Genetic Suitability (GS) is a term used to describe the geographic area or climate space in which seed is considered genetically adapted. Minimum genetic suitability thresholds are set to ensure adaptation is balanced with operational needs.

Under CBST, the area defined as genetically suitable is a **set of BC units** that are climatically similar to the **Seed BEC variant** assigned to the seed source (i.e. in which the seedlot is expected to be well adapted for a future climate). For natural stand seed sources, the Seed BEC Variant is the BEC unit of origin (collection area). For orchard seed sources the Seed BEC variant is assigned based on the mean BEC variant of the climate space of the parent trees in that orchard (seedlot). For most species, the minimum GS has been set to ‘97.5’ to maximize seed deployment while maintaining adaptation (projected for a future climate; 15 years on the coast; 20 years in the interior).

Seed Transfer

The primary goal of a seed transfer system is to achieve healthy and productive forests by ensuring that plantations are regenerated with seed that is well adapted to the planting site. Seed transfer standards are described in the **Chief Foresters Standards for Seed Use (April, 2004)**, as amended from time to time. See the Amendments to the Standards (April, 2018) for changes regarding the option to use CBST: <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/legislation-standards/chief-forester-s-standards-for-seed-use>.

Seed transfer standards are automated in SPAR and are applied when a seedling request is submitted; and/or, when conducting a Suitable seed/Vegetative Lot Search /Suitable CBST Lot Seed/Vegetative Lot Search. Surplus stock trading applications such as Plant Wizard also apply seed transfer standards to assist foresters in genetically suitable (adapted) stock selection at the time of planting.

As of April 5, 2018, two options are available for transferring (moving) seed used in Crown land reforestation:

- 1) Geographically-based Seed Transfer (GBST); and,
- 2) Climate Based Seed Transfer (CBST).

Either option is available for use during the **period of transition**. Currently, a minimum of 2 years is anticipated for full implementation to transition from use of a geographically-based seed transfer system to one based on climate (CBST).

Geographic Based Seed Transfer

Geographically Based Seed Transfer (GBST) is a **fixed zone** transfer system based on the use of fixed seed planning zones (SPZs) and, in the case of natural stand seed sources, transfer limits applied to the mean elevation, latitude and longitude. Two sets of **Seed Planning Zones (SPZs)** exist: 1) Natural Stand (SPZ-B), applied to across all species; and, 2) Orchard (SPZ-A), applied at the species level. For orchard lots, the combination of species, SPZ-A and elevation range (LOW, MID, HIGH) is referred to as a **Seed Planning Unit (SPU)**. Natural stand seed sources also use BEC unit to apply additional transfer standards (i.e. transfer may occur outside the SPZ of origin within the same BGC zone). Table 4 describes GBST transfer standards as compared between select and non-select seed sources.

Table 4: **Geographically Based Seed Transfer – Select versus Non-Select Seed Sources**

Select Seed Sources Orchard (Class A/B+) Seed Transfer Standards	Natural Stand (Class B) Seed Transfer Standards
Seed Planning Zones (multiple). Interior SPZ's are species specific. Seed may be deployed in all zones for which it is registered.	Seed Planning Zones - one only, not multiple, except for B+ (superior provenance).
No BGC zones transfer limits applicable to select seed.	Seed can be transferred between SPZ as long as it is within the transfer limits and in the same BGC, e.g. WK-ESSF and SA-ESSF.
Transfer as per intended Area of Use ranges (min/max Latitude, Longitude and Elevation), within assigned SPZs.	Transfer limits applied to the mean (up/down, N/S, and automated on SPAR).
Elevation limits applied to seed/vegetative lot mean elevation.	Elevation limits applied to the seed/vegetative lot mean elevation.
Latitude limits applied to seed/vegetative lot mean latitude on coast only.	Latitude limits applied to the mean seed/vegetative lot mean latitude.
Longitude limit <u>not</u> applied. Geographic area does not apply.	Longitude limits applied to the seed/vegetative lot mean longitude.
	Geographic area applies only in the Maritime SPZ.

Climate Based Seed Transfer

Climate Based Seed Transfer (CBST) is a **focal zone** seed transfer system based on use of a focal point system (centred on the seed origin or plantation location – the “focus”) where the focus is a set of fixed zones (as opposed to a point). These fixed zones are delineated on ecology (**BEC**) and climate (**climatically-suitable sets of BEC units**). In BC, the BEC unit for seed transfer is delineated for the most part at the **BGC variant** level; however, in some cases, it may be at the subzone level, where variant does not exist.

Climatically-suitable BEC pair combinations by species (i.e. seed source BEC cross-referenced with plantation BEC) may be viewed in the “**Climate Based Seed Transfer (CBST) Areas of Use for British Columbia**” (May, 2018) document posted on the Chief Forester’s Standards for Seed Use website at <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/legislation-standards/chief-forester-s-standards-for-seed-use>.

As an **interim measure during transition from GBST to CBST**, the CBST Seedlot Selection Tool (commonly referred to as the “CBST Tool”) is also available for planning and assessment (includes GBST AOU maps); and, for the selection of suitable seedlots in the Kootenay Boundary region where BEC 11 variant changes may apply. Table 5 describes CBST transfer standards as compared between select and non-select seed sources.

Table 5: **Climate Based Seed Transfer – Select (A and B+) versus Natural Stand Seed Sources (B)**

Select Seed Sources Orchard (Class A/B+) Seed Transfer Standards	Natural Stand (Class B) Seed Transfer Standards
Species and Set of BEC Variants (or subzone, where variant does not exist) – see, CBST Area of Use (map). See, SPAR CWM SeedMap CBST AOU tool. No Seed Planning Zones (<i>may be developed at a future date for reporting purposes</i>).	Species and Set of BEC Variants (or subzone, where variant does not exist) - see, CBST Area of Use (map). See, SPAR CWM SeedMap CBST AOU tool. No Seed Planning Zones (<i>may be developed at a future date for reporting purposes</i>).
Elevation limits (minimum) for some coastal species. <ul style="list-style-type: none"> CW - seed from CWHvm1 may be used in CWHmm2, but only below 800 m. 	Elevation limits (minimum) for some coastal species. <ul style="list-style-type: none"> CW - seed from CWHvm1 may be used in CWHmm2, but only below 800 m.
Latitude limits for some coastal species. <ul style="list-style-type: none"> CW - seed from CWHvm1 may be used in CWHvh2, but only below latitude = 52.5°; HW - if seed is from CWHdm, can use it in CWHvm1, but only south of 52.5° 	Latitude limits for some coastal species. <ul style="list-style-type: none"> CW - seed from CWHvm1 may be used in CWHvh2, but only below latitude = 52.5°; HW - if seed is from CWHdm, can use it in CWHvm1, but only south of 52.5°
Longitude limits do not apply.	Longitude limits do not apply.

Seed Planning and Reporting

The provincial framework for seed planning and reporting, including the status of forest tree genetic resources (parent trees, orchards, seed/vegetative lots), is largely based on a system of seed (planning) zones. Seed planning zones (SPZ-A, SPZ-B) describe areas where seed is considered adapted for a given species, population and/or provenance (i.e. breeding population). A number of reports and data extracts (seedlot, seedling request) are available on SPAR for seed planning and reporting purposes. **Seed use and genetic gain history reports** are also available to support the provincial Timber Supply Review (TSR) process and analyses.

Geographically Based Seed Planning and Reporting

Two seed planning models are currently in place for the planning and reporting of operational seed use for the province: The Natural Stand SPZ (Class B/B+) model which applies to all species; and, the Orchard SPZ/SPU (Class A) model, which is species specific.

Orchard SPZ and SPU (maps) are available for five orchard species (Spruce, Interior Lodgepole Pine, Interior Douglas-Fir, Western Larch and Western White Pine). The SPZ's are, for the most part, aligned with BEC boundaries (BGC zone, sub-zone and variant. (In a few cases heights of land or lake crossings may apply). An important feature of the orchard seed planning and reporting framework is the use of "transition zones", commonly referred to as "**zones of overlap**". Transition zones are applicable to all species, except for Western White Pine. These "zones of overlap" essentially widen suitable seed/vegetative lot searches by including a selection of lots that can be used in either of its "mother zones" (e.g. PGN includes seed sources from both PG and PG orchards). Note: On SPAR a suitable seed /vegetative lot search will return seed sources registered with 'PG and PGN' and lots registered with 'NE and PGN' (the former produced from a PG orchard and the latter from an NE orchard).

Under CBST, a new seed planning and reporting framework is planned to accommodate CBST Areas of Use identified under CBST transfer standards. As an interim, some new features have been put in place to aid interested parties (e.g. cone collectors and seed users) in the seed planning and reporting process during the transition period. This includes the addition of a new field (flag) "**CBST – FRPA Climate Based Seed Transfer**" to be applied when entering seedling requests when selecting seed and vegetative lots under CBST. Changes to RESULTS to track CBST planting activities are also planned.

Seed Use Legislation, Regulation, and Standards

Seed use is authorized under the Forest and Range Act (FRPA) and regulated through the Forest Planning and Practices Regulation (FPPR) and Woodlot Planning and Practices Regulation (WLPPR). Legally enforceable standards for seed use are described in the **Chief Forester's Standards for Seed Use**.

The purpose of the standards is to maintain the identity, adaptability, diversity, and productivity of the Province's tree gene [genetic] resources. Standards, including definitions, are described for registration (incl. collection information), storage and testing, seed selection and use, and transfer. See Table 6 for a brief description of legislation, regulations, standards and policies relevant to seed use.

Under CBST, amendments to the Standards were made on April 5, 2018 (come into effect August 6, 2018) to introduce new collection, registration and seed transfer standards that mitigate the impacts of climate change and support resilient, climate adapted stands. Refer to the “CBST Information Bulletin – April 2018” for more information.

Table 6 Seed Use Legislation, Regulation, and Standards (and Policies)

Legislation, Regulation, Standards (and Policy)	Description
<i>Forest and Range Practices Act</i> (FRPA)	Authority for the Chief Forester to set standards for seed use. Silviculture and [forest tree] Gene Resources
Forest Planning and Practices Regulation (FPPR)	Seed Use
Woodlot Planning and Practices Regulation (WLPPR)	Seed Use
Chief Forester's Standards for Seed Use (April 2004)	Registration (collection), Storage and Testing, Selection and Use, and Transfer:
Climate-relevant Amendments to the Standards:	<ul style="list-style-type: none"> • CBST (April 2018) • Expanded LW AM maps (May 2014) • Limited Range and Population Expansion (LW) (June 2010) • Upward Elevation Transfer Limits (November 2008)
Climate Based Seed Transfer (CBST) Areas of Use for British Columbia” (May 2018)	<ul style="list-style-type: none"> • BEC Pair matrices [Seed source BEC x Plantation BEC] by species
Tested Parent Tree Areas of Use (GBST)	<ul style="list-style-type: none"> • Coastal PT AOUs • Interior PT AOUs
Seed Use Policies:	<ul style="list-style-type: none"> • Amendment Policy • Alternatives Policy • Parent Tree Information Policy • Procedure for Updating Parent Tree and Lot Information

Web Based Resources

Tree Seed:

<https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed>

Climate Based Seed Transfer:

<https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/seed-planning-use/climate-based-seed-transfer>

Chief Forester’s Standards for Seed Use:

<https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/legislation-standards/chief-forester-s-standards-for-seed-use>

Seed Planning and Registry (SPAR) system:

<https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed/seed-planning-use/spar>