



# Transitioning British Columbia To Climate Based Seed Transfer

## CBST and Genetic Suitability

Information Bulletin 3

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### In This Issue

- Genetic Suitability under CBST
- Areas of Genetic Suitability – Seed Deployment and Seed Procurement
- Genetic Worth explained
- Building resilience to a changing climate
- GW and CBST

*The Ministry of Forests, Lands, Natural Resource Operations and Rural Development Forest Improvement and Research Management Branch is leading the development of a Climate Based Seed Transfer (CBST) system to support forest ecosystem resilience, health, and productivity in a changing climate. On **April 5, 2018** amendments to the Chief Forester's Standards for Seed Use were published to allow the option to use CBST on Crown land reforestation.<sup>1</sup> Implementation of CBST is phased (incremental) with a minimum of 2 to 3 years currently anticipated for full transition to CBST.*

### Genetic suitability under CBST

With advancements in the forest genetic program and emergence of climate science, the use of the term "**genetic suitability**" is now being used to describe the adaptive capacity of climatically-suitable seed and vegetative lots selected under CBST. Genetic suitability under CBST is a measure of the relative height growth associated with transferring seed (climatic distances) between each pair of BEC units (associated with the projected climate space of that species). Transfers where the relative height growth exceeds a minimum threshold are used to identify the area (aggregated BEC units) of genetic suitability.<sup>2</sup> Minimum genetic suitability thresholds for each species are set by the Forest Improvement and Research Management Branch (FIRM), as determined through extensive analysis, provenance testing, and expert opinion (Forest Genetics research scientists).

### Areas of Genetic Suitability

Under CBST, there are two sets of areas (aggregated BEC units) that delineate genetic suitability: 1) a seed deployment area and 2) a seed procurement area. A **seed deployment area**, associated with (assigned to) a seed source (seedlot) is an area identified as suitable for deploying (transfer and use of) seed - commonly referred to as a CBST Area of Use. A **seed procurement area**, associated with a plantation (cutblock) is an area identified as suitable for collecting seed. CBST Areas of Use (CBST AOU) are published in the **CBST Areas of Use for British Columbia** Excel workbook (Figure 1). Seed and vegetative lot seed deployment areas (CBST AOU's) can be viewed on the Seed Planning and Registry (SPAR) system and in the CBST

<sup>1</sup> On **April 9, 2019**, further amendments were published including minor changes for some species (expansion of CBST Areas of Use).

<sup>2</sup> O'Neill G, Wang, T, Ukrainitz N, et al. 2017. A proposed climate-based seed transfer system for British Columbia. Prov. B.C., Victoria, B.C. Tech. Rep. 099. [www.for.gov.bc.ca/hfd/pubs/Docs/Tr/tr099.htm](http://www.for.gov.bc.ca/hfd/pubs/Docs/Tr/tr099.htm)

**For more information on CBST:**

Climate Based Seed Transfer:  
[www.gov.bc.ca/climatebasedseedtransfer](http://www.gov.bc.ca/climatebasedseedtransfer)

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>

**For more general information:**

BC Government, Forest Improvement and Research Management Branch: Tree Seed  
<https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/tree-seed>

FORHTIP.SEEDHELP@gov.bc.ca

Tool (hosted by Forsite). Seed procurement areas currently can only be viewed on the CBST Tool.

Climate Based Seed Transfer (CBST) Areas of Use for British Columbia - April 10th, 2019  
 Seed or cutting transferability, by Species, from the BEC zone/subzone/variant (BECvar) of the seed, to the BECvar of plantation.  
 "X" means that seed or cuttings cannot be transferred from the BECvar of the seedlot to the BEC var of the plantation.  
 "Yes" means that seed or cuttings can be transferred from the BECvar of the seedlot to the BEC var of the plantation.  
 Cells marked by pale green fill indicate an expansion in area of use as of April 10th, 2019

BECvar of plantation	BECvar of seedlot	At	Ba	Bg	Bl	Cw	Dr	Ep	Fdc	Fdi	Hm	Hw	Lt	Lw	Other	Pa	Pj	Plc	Pli
ICHvc	ICHmc1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	X	X	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICHvk1	CWHws1	Yes	X	X	X	X	X	Yes	Yes	Yes	Yes	X	X	Yes	X	Yes	Yes	Yes	Yes
ICHvk1	ICHmw2	Yes	Yes	X	X	X	X	Yes	X	Yes	Yes	X	X	Yes	X	Yes	Yes	Yes	Yes
ICHvk1	ICHmw3	Yes	Yes	X	X	X	X	Yes	X	Yes	Yes	X	X	Yes	X	Yes	Yes	Yes	Yes
ICHvk1	ICHmw4	Yes	Yes	X	Yes	Yes	X	Yes	X	Yes	Yes	Yes	X	Yes	X	Yes	Yes	Yes	Yes
ICHvk1	ICHwk1	Yes	Yes	X	X	X	X	Yes	X	Yes	Yes	X	X	Yes	X	Yes	Yes	Yes	Yes
ICHvk1	ICHwk1	Yes	Yes	X	Yes	Yes	X	Yes	X	Yes	Yes	Yes	X	Yes	X	Yes	Yes	Yes	Yes
ICHvk2	ICHwk3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	X	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICHwc	ICHmc1	Yes	Yes	X	X	X	X	Yes	X	X	Yes	X	X	Yes	X	Yes	Yes	Yes	Yes
ICHwc	ICHvc	Yes	Yes	X	Yes	Yes	X	Yes	X	X	Yes	X	X	Yes	X	Yes	Yes	Yes	Yes
ICHwc	ICHwc	Yes	Yes	X	Yes	Yes	X	Yes	X	X	Yes	Yes	X	Yes	X	Yes	Yes	Yes	Yes
ICHwk1	ICHmw2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	X	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICHwk1	ICHmw3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	X	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Figure 1: CBST Areas of Use in British Columbia - April 10, 2019

**What do we mean by the term Genetic Worth?**

The genetic value (gain) of a seed or vegetative lot is expressed as its **Genetic Worth (GW)**. Genetic gain is a measure of the percentage increase (or resistance) in a trait of interest (e.g., stem volume, relative wood density, pest resistance) assigned to trees grown from seed orchards or natural stand superior provenances, over those grown from wild-stand seed. The GW of stem volume is measured as the percentage gain in volume expected for a seed or vegetative lot at or near harvest age (60 years on the coast; 80 years in the interior). GW values for orchard and superior provenance seed and vegetative lots are regularly updated on SPAR as new breeding values become available as a result of extensive forest genetic research, testing and tree breeding.

**Building Resilience to a Changing Climate**

Planting seeds that have been selected for genetic resistance to pests and pathogens is important to help forest professionals maintain **forest health**, especially as climate change is projected to increase the impacts of some insects and diseases. Identifying **resistance** (tolerance levels) of improved seed sources to a range of pests will help natural resource managers and forest practitioners select the most suitable seed to meet their forest health-related management objectives. New GW codes have recently been added to enable the recording of values (scores) that are more specific to the trait of interest (e.g. DFW – Swiss Needle Cast; IWS – White Pine Spruce Weevil).

**Genetic Worth and Climate Based Seed Transfer**

**Genetic worth** is a relative measure of how much more volume tested orchard (Class "A") seed will add to a stand at the end of its rotation, compared to that of local populations registered as natural stand seed sources (Class "B"). CBST, including **Assisted Migration**, is expected to affect orchard (Genetic Class A) and natural stand (Genetic Class B) seed sources equally; hence, there is no expectation that the relative difference between them will change. Therefore, no adjustments to GW are anticipated at this time.