



Tree Seed Production and Use in British Columbia: Past, Present and Future

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300 Million trees planted/year = 1000s Kg Seed !



PRT Armstrong Nursery
- one of two dozen nurseries in BC



Shipping seed from Tree Seed Centre
Photo: S. Reitenbach

Outline

1. Short History of Tree Improvement in BC
2. Forest Genetics Council of BC
3. Regulations and Standards
4. Tree Seed Orchards in BC
5. Seed Production & Use Statistics
6. Climate-based seed transfer
7. Forecasting Seedling Demands
8. Current Challenges & Future Opportunities



70 years of Forest Genetics in BC

1950s - Dr Allan Orr-Ewing, Cowichan Lake Research Station

- Coastal Douglas-fir range-wide crosses, Plus Tree Selection Weeks, Seed Prod. Areas

1960s - Tree Improvement Councils – Seed and Seedling Production

- Coastal Douglas-fir seed orchards established,

1970s & 80s - Tree Breeding and Orchard Expansion

- Provenance tests, Kalamalka Forestry Centre, Credits to Stumpage,

1990s – Forest Practices Code

- Seed transfer guidelines, conservation, somatic embryogenesis (fir and spruce)

2000s – Forest Genetics Council of BC

- Provincial planning, orchard expansion in interior via SelectSeed.
& consolidation on coast

2010s – Forest and Range Practices Act & Chief Forester's Standards for Seed Use

- Climate-modelling, assisted migration, breeding for pest resistance, genomics

2020s – Climate-based Seed Transfer

- New breeding zones, 2nd & 3rd cycle selections, new orchards, genomic selection?





Forest Genetics Council of British Columbia

- Appointed by Provincial Chief Forester
- Representatives from Government, Forest Tenure Holder and Academia
- Three Technical Advisory Committees: Coast, Interior and Conservation.
- Advises Ministry on policy, tree breeding, funding priorities.
- Coordination and Communication
- New 5-Year Strategic Plan 2021-2025 - Goals, Activities and Performance Measures
- Owns Select Seed Company Ltd.

Website: <https://forestgeneticsbc.ca/>



Roles and Responsibilities

Ministry = Seed policy, research, conservation, breeding, orchards, Tree Seed Centre, and reforestation (e.g. BC Timber Sales).

Forest Companies = Harvest & reforestation, progeny & provenance test assistance, and seed orchards (Mosaic, Tolko, VSOC, WFP)

Contractors = measure & maintain field tests,, wild stand seed collections and planting.

SelectSeed Co. Ltd = 15 seed orchards, support to FGC and Ministry

Seedling Nurseries = Seedling and cutting production under contract, seed orchards (PRT)

Universities = Research, Education, Next Gen

GenomeBC/Canada = Fundraising and funding



Tree Seed Regulations and Standards

- Persons planting trees must use seed in accordance with Chief Forester's Standards.
- CF Standards for Seed Use requires orchard seed...
 - Effective population size >10
 - Registered, tested, and stored at the Provincial Tree Seed Centre
 - Purity $\geq 97\%$ and moisture content 4% to 9.9%
 - Selected over wild stand seed, if available
 - Planted within prescribed transfer limits
- Seed prices not regulated; established by the producers independently.



Shane Berg, RPF
BC's new Chief Forester

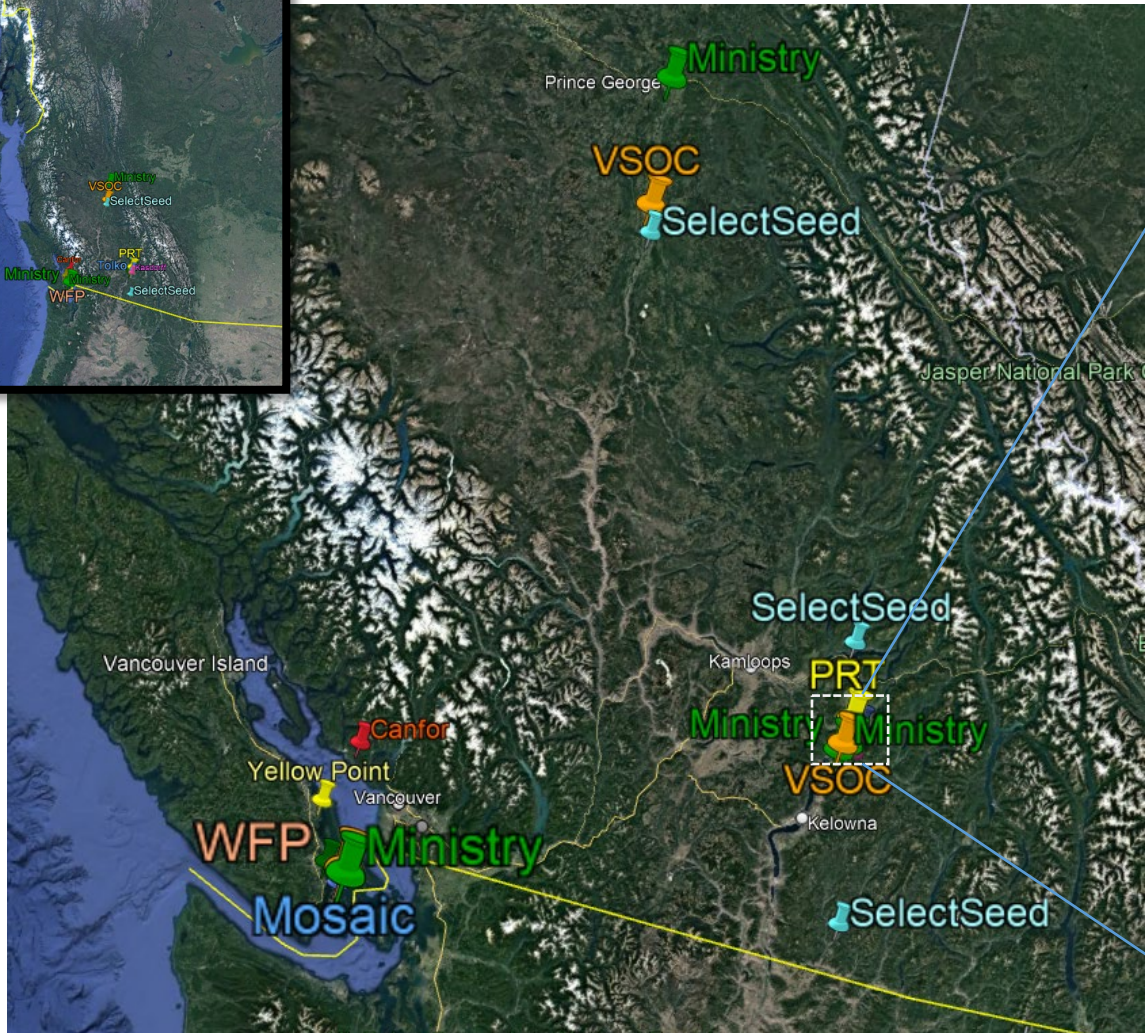
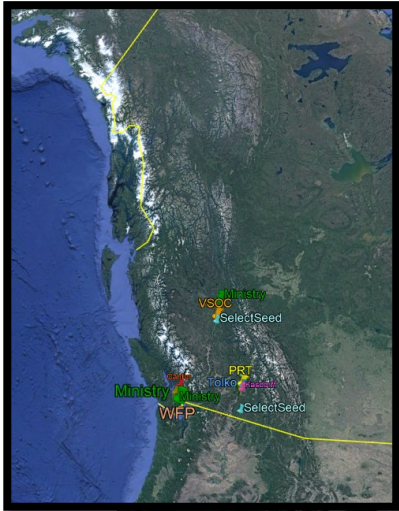


Tree Seed Orchards in BC

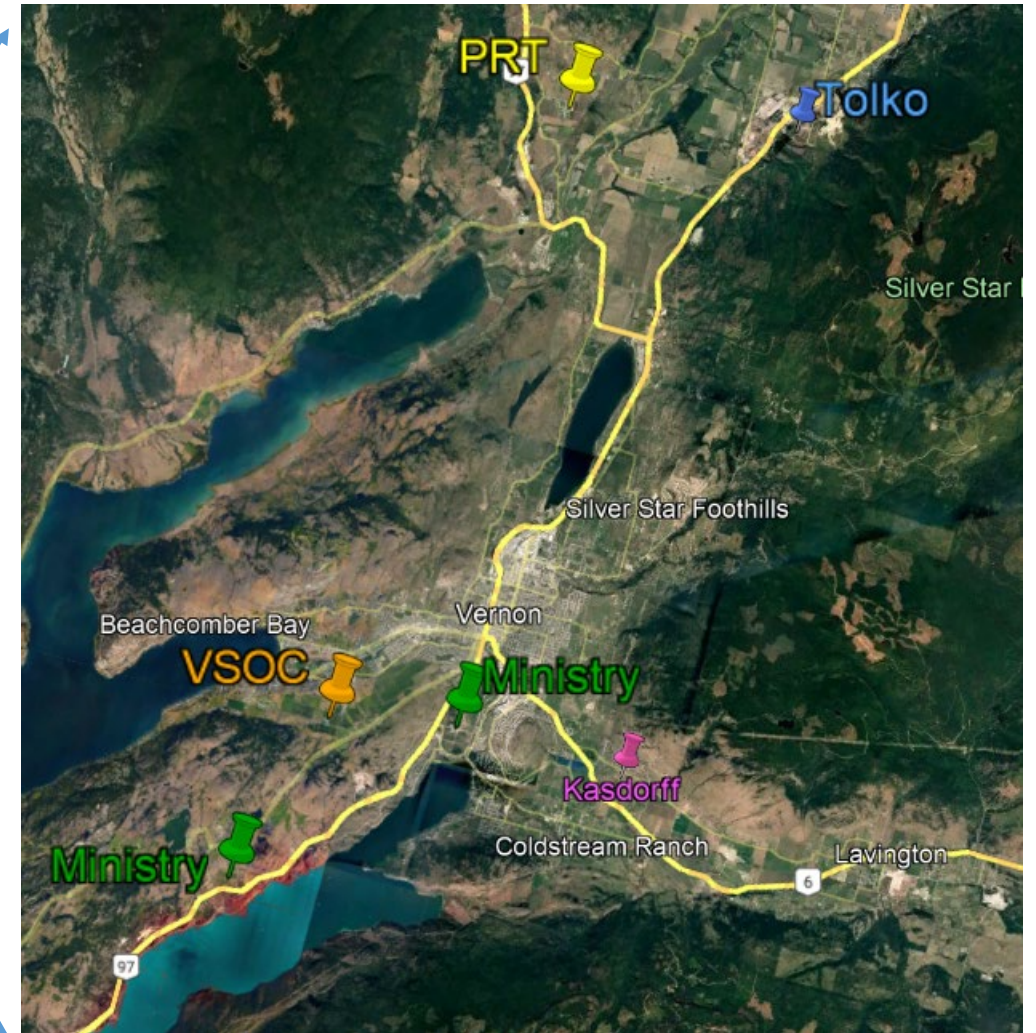
- Delivery system for tree improvement and tree breeding for 13 species
- 93 active orchards containing 102 K ramets (Nov '22)
- 17 orchard sites (including remote whitebark pine)
- Owned and managed by Ministry of Forests and several private companies.
- 14 orchards managed under contract with SelectSeed



BC Seed Orchard Locations



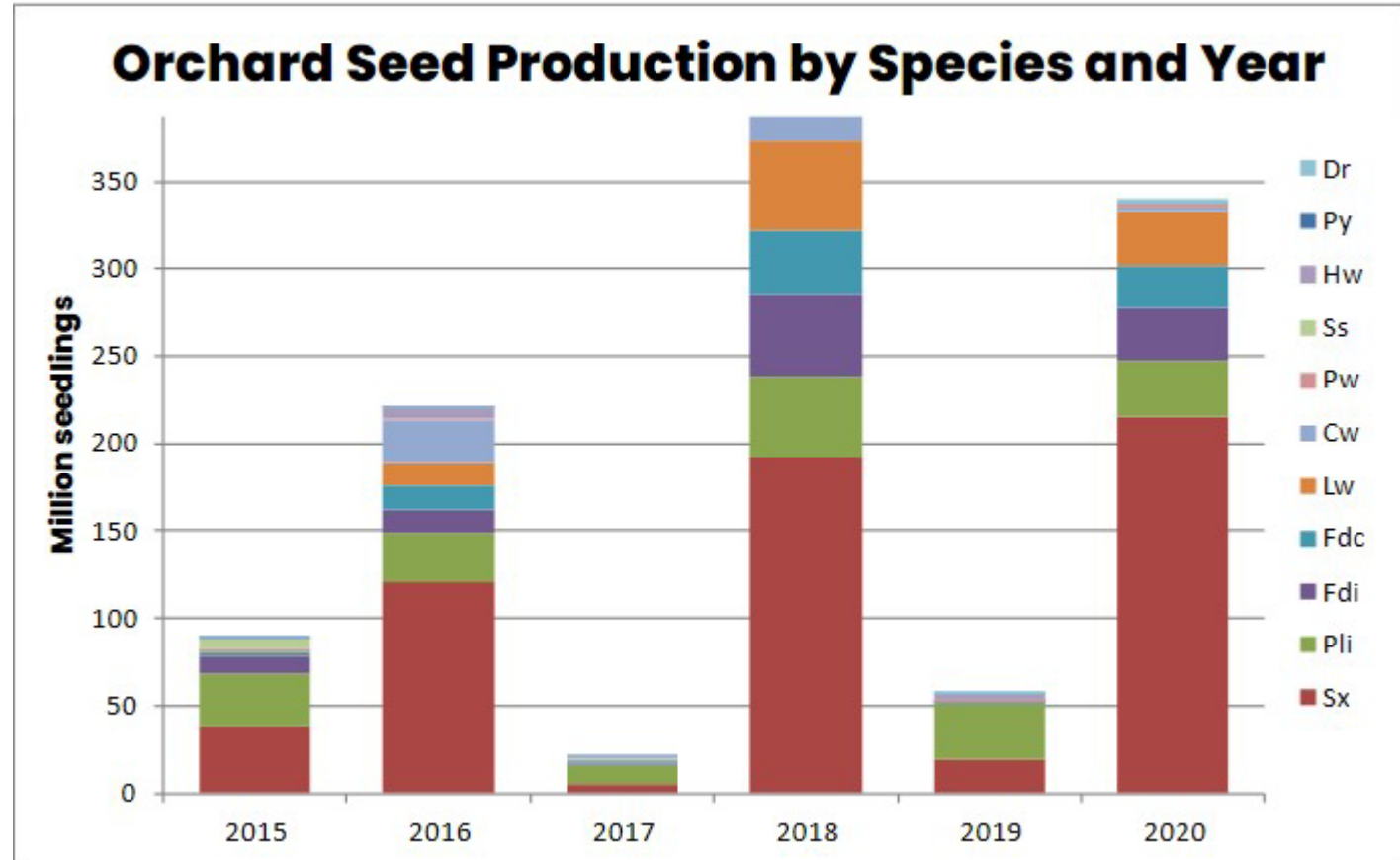
Southern BC



North Okanagan

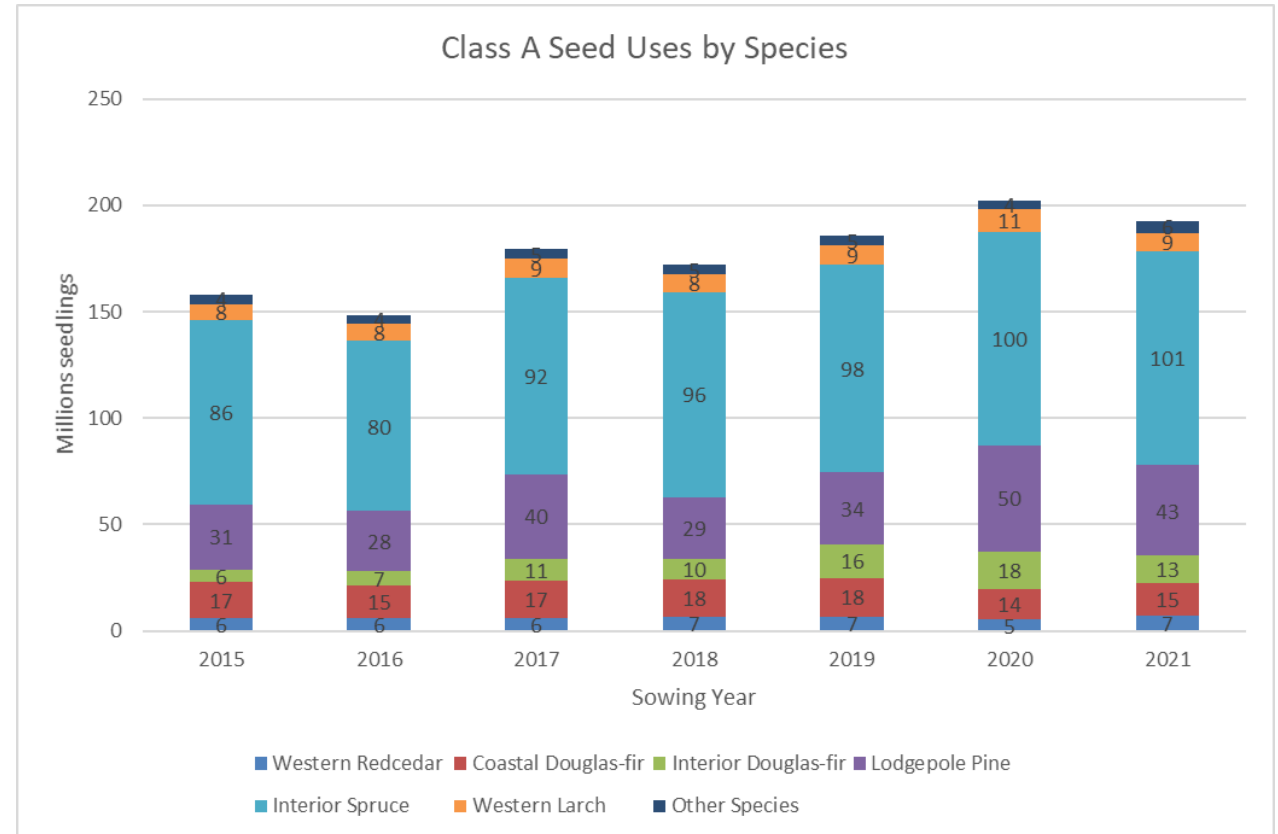
Orchard Seed Production 2011-2020

- Top 5 species - 2020 crop
 - Interior Spruce (Sx) 63%
 - Lodgepole pine (Pli) 9%
 - Interior Douglas-fir (Fdi) 9%
 - Western Larch 9%
 - Coastal Douglas-fir (Fdc) 7%
- Average 20 % genetic gain for wood volume at rotation age*



Provincial Seedling Demand by Species - 2021

Species	Total (M)	Class A
Interior Spruce (Sx)	102.5	98%
Lodgepole pine (Pli)	102.1	42%
Interior Douglas-fir (Fdi)	38.2	34%
Coastal Douglas-fir (Fdc)	15.5	98%
Western redcedar (Cw)	10.2	69%
Western Larch (Lw)	9.6	90%
Ponderosa Pine (Py)	3.6	13%
Western Hemlock (Hw)	2.5	57%
White pine (Pw)	2.3	100%
Sitka spruce (Ss)	0.5	90%
Total	291	69.5%



includes seedling requests for public (285.5 M) and private (5.5M) forestlands.

New North-Central Lodgepole Pine Orchards



Grafting ramets at Ministry's Kalamalka Forestry Centre



Vernon Seed Orchard Co. - Quesnel

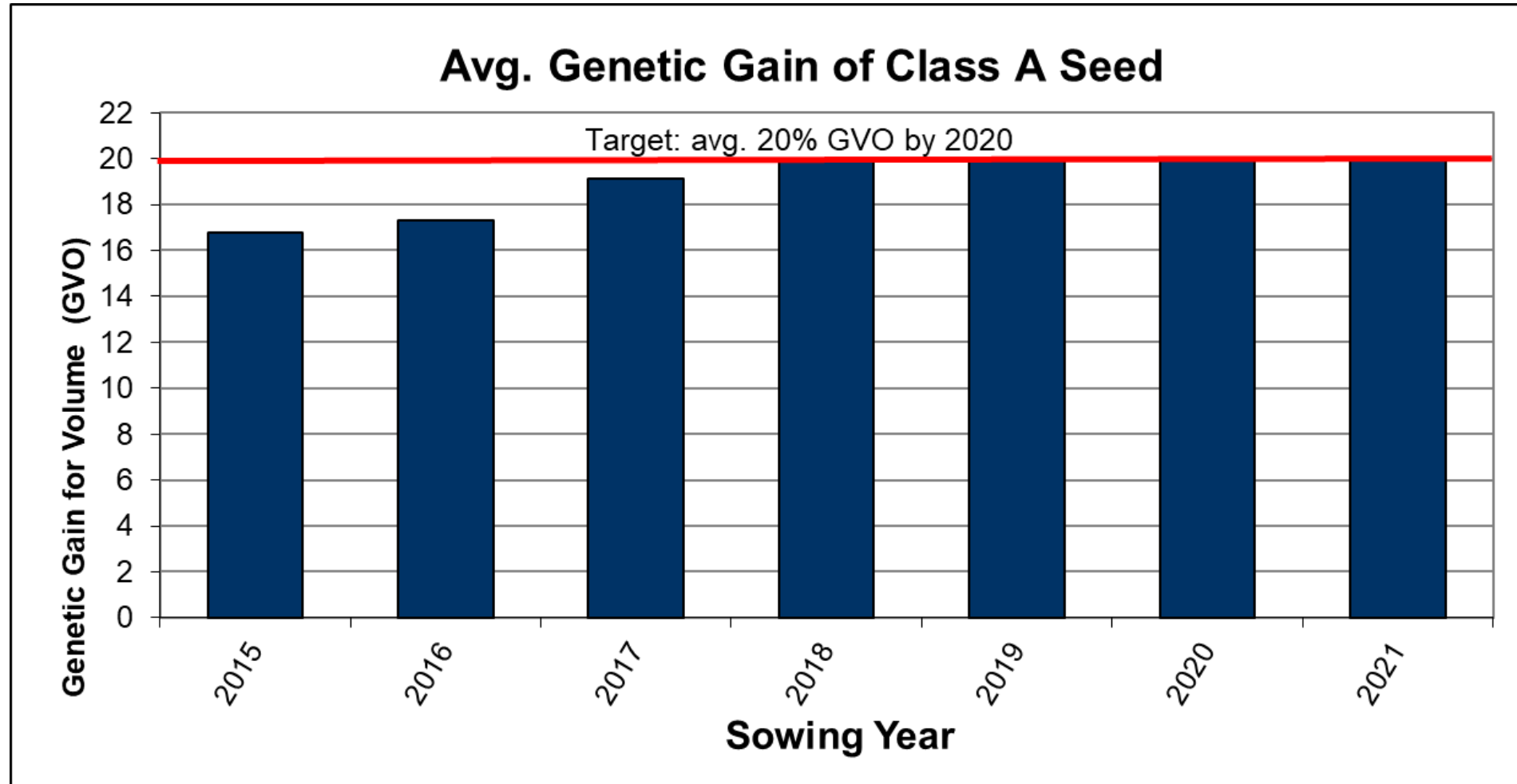


SelectSeed Board and Staff at Quesnel



Ministry – Prince George Tree Improvement Station

Average Genetic Gain for Volume



Pest Resistance Seed Orchards



Interior and Sitka Spruces – terminal weevil



Lodgepole pine – gall and comandra rusts



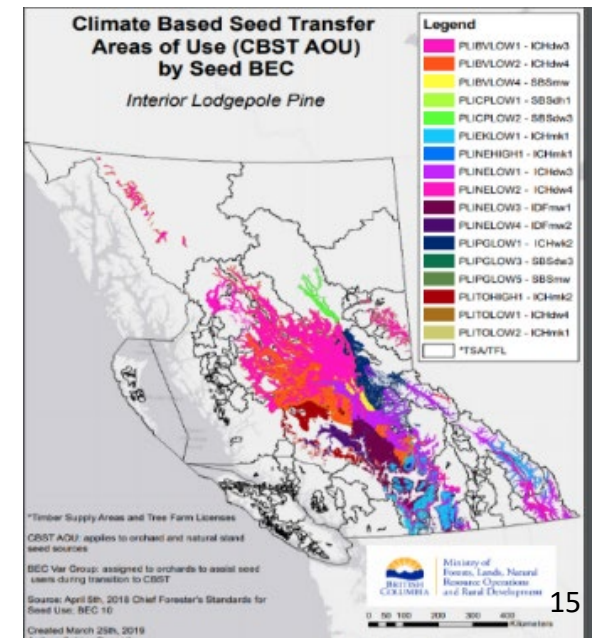
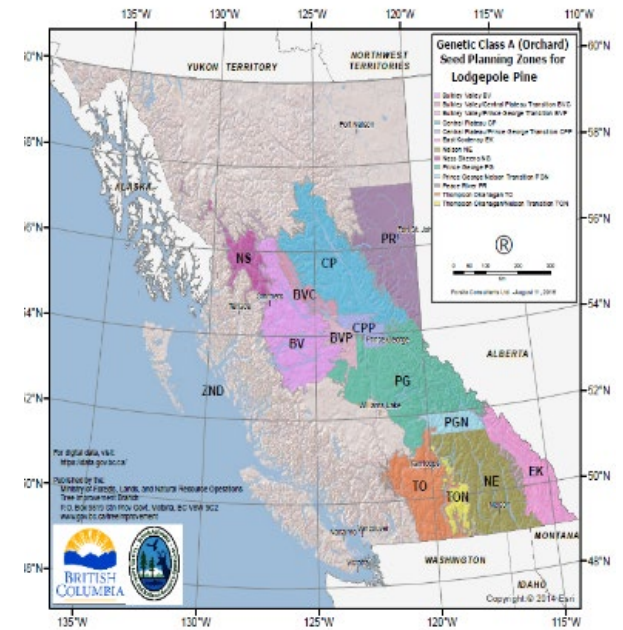
White and whitebark pines - blister rust



Western redcedar – leaf blight and deer browse

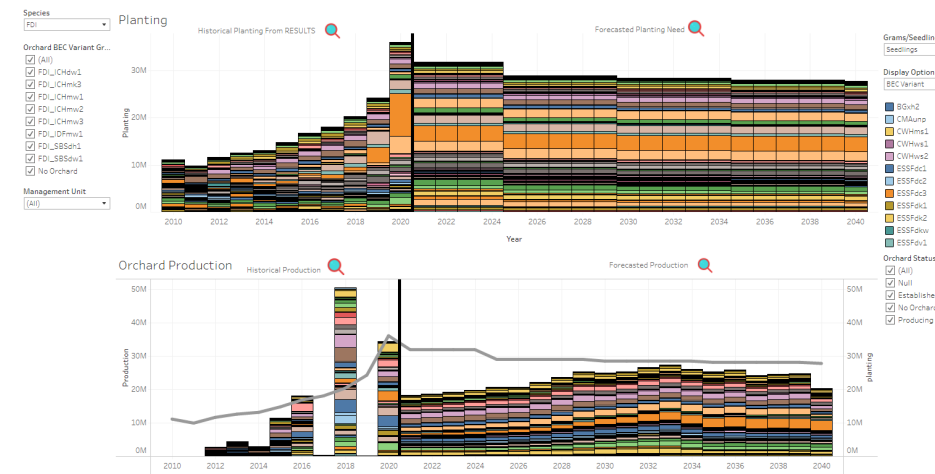
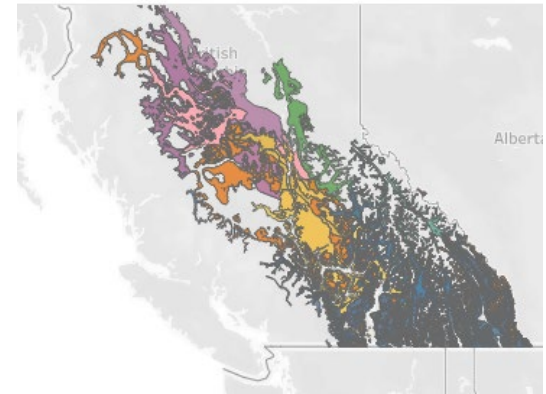
Climate-based Seed Transfer

- Introduced by Chief Forester in April 2018
- Transition period ended April 1, 2022
- Uses BC's Biogeoclimatic Ecosystem Classification System (BEC): 16 zones and ~240 variants.
- Seed orchards assigned a source BEC variant based on the parents' locations avg. climate.
- Seed transferred into BEC variants with climate similar or warmer than source BEC of orchard.
- Considerable overlap in orchards' areas of use.
- 57% of seedlings sown in 2021 selected with CBST.
- Significant impacts to seed demand and supply for BC's seed orchards.



Forecasting Future Seedlings Needs

- 2018 – Estimated future seedling demand under CBST and changed to mature timber inventory
- Demand estimate to drop from +300M to 232M by 2049
- Pli demand drops 120M to 60 M (-50%)
- 2021-22 Updated Seed production forecasts
- Currently comparing demand and supply to identify gaps, opportunities and priorities
- On-line updateable seed planning dashboards
- Released in April 2022



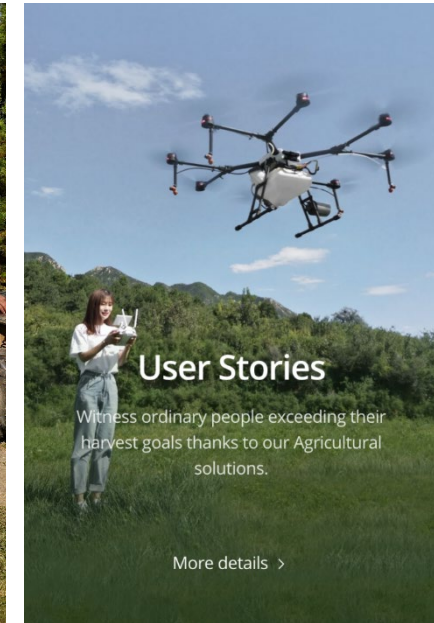
Other Challenges

- COVID 19 - health orders and safety
- Wildfires and air quality
- Seasonal labour shortages
- Changes to Pesticide Use & Regulations
- Maintaining seed processing capacity
- Predicting future seedling and orchard needs



Opportunities

- Genetics part of Climate Crisis solution = healthy forests, adaptation, carbon storage
- New 2nd Cycle Seed Orchards
- Pest-resistant, wood quality
- Genomics to shorten selection cycle
- Temporary Foreign Worker Program
- First Nations involvement
- Extending life & heights of existing orchards
- Use of Drones to survey and apply pesticides
- Information sharing thru virtual conferences 😊



Thank you. Any Burning Questions?

