Challenges to our Future Tree Seed Supply:

Seed Production Efficiency Practices

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Seed Produced in Orchards is mainly deployed on public lands in BC

- Must meet certain standards:

  Genetic diversity (Ne)

  Genetic Gain (GW)

  Adaptability

  Resilient against insects and diseases

Gamete Contribution Effects on Ne

Clones	p	p^2		p	p^2
1	0.3	0.09		0.7	0.49
2	0.2	0.04		0.2	0.04
3	0.3	0.09		0.1	0.01
4	0.2	0.04		0	0
Sum:	1.0	0.26		1.0	0.54
Ne =1/Σp^2		3.8			1.8
(Ne/Nc)		0.95			0.45

Seed Production Options to Increase Ne:

- Cone inductions using phytohormones
- Combine crops from previous years
- Supplemental Mass Pollinations
- Unequal clonal representation in orchard
- Avoid relatedness in selections

Successful seed crops do not guarantee that all assumptions are met….

- Are gamete estimates reliable and accurate
- Random mating and mating dynamics
- Family differences in seed germination behaviour

Cone analysis

Pedigree analysis using molecular tools

Germination tests

Pollen Contamination

Reduces genetic gain

More impact on advanced generation orchards:

Reduces adaptability of seedlings

Affects future harvest levels and allowable cut allocations

Pollen contamination is difficult to estimate

Only reliable way is to use molecular tools

- SNP chip technology
- Possible to have a chip for several conifer species
- More R&D required to make it operationally feasible

Seed Production Research

- Forestry on Public Lands
    - Moral obligation to use best information as model inputs: Public Trust
- Verify our assumptions
- Unforeseen problems: Be prepared!
- Many seed orchards are ideal research installations

Research Needs

- Research in orchard seed production was done with early selections
  - Advanced generation parents with genetic gain above 25 to 30%

- Use of forward selections may create relatedness in orchards
  - Mating preferences or barriers?
  - Pedigree analysis using molecular approaches: SNP chips

Research Needs cont.

- Pollen contamination will have more impact:
  - Detection and Estimation
  - Prevention

- Supply chain: From seed production to seedlings in the field