Update
Extension Note

Tree Improvement Branch

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Testing and Selection of Weevil Tolerant Interior Spruce

Background

This information is provided as a brief technical update on MoF activities and involvement in the testing and selection of weevil tolerance interior spruce (Sx) using a tissue culture method known as somatic embryogenesis. This new technology brings with it many complexities in the area of forestry policies, regulations and practices and the following information may therefore be of use for those with reforestation obligations.

Approximately 20 years ago Sx parent trees were selected in an area known as the Prince George Selection Unit and incorporated into the Ministry's breeding program. This Unit encompasses the existing McGregor, Mt. Robson, Quesnel Lakes, Cariboo Transition, and part of the Nechako Seed Planning Zones. These parents were selected for their superior growth and form and established in arboretums, as grafts, at both the Prince George Tree Improvement Station (PGTIS) and Kalamalka Forestry Centre, near Vernon. The progeny (offspring) of these parents, derived through controlled crosses, have been established on 3 field test sites within the Unit.

These same parents have also been grafted into seed orchards managed by both the Vernon Seed Orchard Company and Ministry of Forests in Vernon. Both of these orchards are producing significant amounts of seed for the above mentioned seed planning zones. These orchards represent the Interior Tree Improvement Council's, and the Ministry's, operational delivery strategy for genetically improved Sx material for the central interior.

In 1990, a number of the parents established in the PGTIS breeding arboretum were observed to have some tolerance to the terminal weevil (Pissodes strobii). Further observations of their progeny confirmed that these parents/families have a higher than average tolerance to the weevil in comparison with other families and populations.

Testing

The Ministry of Forests therefore initiated, in 1992, the testing of interior spruce (Sx) trees derived through a tissue culture process known as somatic embryogenesis (SE), in co-operation with B. C. Research Inc. (BCRI) of Vancouver, B.C., with the intent of identifying individuals with tolerance to the terminal weevil. SE is a process by which an embryo is extracted from a

seed and differentiated into an unlimited number of genetically identical copies - essentially cloning. This embryonic material may be further cultured to produce plants, complete with shoot and roots, and/or stored for an indefinite amount of time in cryopreservation.

To-date the Ministry has established 515 clones, representing 23 families on 13 sites representing the following Biogeoclimatic (BGC) zones and variants: SBSwk1, SBSwk2, SBSmk, SBSmw, SBSvk, ICHvk, ESSF. In addition to these clonal trials small block trials (2 - 4 ha in size) have been established with a subset of this material on 9 sites representing the same BGCs. Following spring planting in 1997 the number of clones and families established will increase to 761 and 37 respectively. Also, 3 more small "operational" sites are planned for 1997 in both the Quesnel and Prince George Forest Districts. Establishment of approximately 1200 clones in field tests will conclude in 1998 and the Ministry will continue to monitor and assess the plantations for a 5-15 years before determining which individuals should be included in a production population for more wide spread deployment. Only by testing individual clones in the field can advancements in tolerance and volume gain be made over the selected families from which these clones are derived.

Selection

Of the 1200 individuals to be tested approximately 50 individuals with marked weevil tolerance and superior growth and form will be identified. When these proven, high performing individuals have been identified their original embryonic material may be accessed from cryopreservation and used to produce operational quantities of planting stock. Final selections, from all 1200 clones, can occur no sooner than 2003 - when the last out-planting from 1998 is five years old. Utilisation of this material will also be subject to the registration requirements for vegetative lots (which are undergoing further refinement) and landscape level deployment guidelines (under development).

Available Material

At present, operational delivery for genetically improved Sx material, in the central interior, is through existing seed orchards. The Ministry's ongoing clonal research strategy, being conducted in partnership with BCRI, is adequate for the purposes of identifying specific weevil tolerant Sx individuals.

Deployment

When superior individuals are identified through clonal testing, the province will benefit through their deployment and the resulting higher yields and reduced terminal weevil damage. In the interim, deployment of plants derived from SE or rooted cuttings, from selected families, is permitted in accordance with the registration requirements for vegetative lots. As the field of tissue culture is developing so are Ministry policies which regulate the registration and deployment of family/clonal material across the landscape. More information on the latter will be forthcoming within the year.