



# Cone and Seed Improvement Program BCMoF Tree Seed Centre

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## Seed From Dead Lodgepole Pine Trees

At the 2003 Forest Genetics Council Northern species committee meeting questions arose with regards to the collection of seed from dead lodgepole pine (Pli) trees. This was primarily in response to the need for increased seed to regenerate beetle-killed stands. Foresters should check seed inventories on SPAR first as there are large quantities of surplus seed for 'most' areas. In speaking with foresters at last summers Northern Silviculture Committee (NSC) meeting (Burns Lake) it was apparent that some are also interested in using prescribed burning to regenerate some Pli stands and there were concerns regarding how long seed remains viable on dead trees.

An invitation was extended to operators interested in determining whether stands of dead trees still contained viable seed. I received a total of 9 collections from Carolyn Stevens of the Nadina forest district. Since this data is being made available to everyone – a big thank you to Carolyn for her efforts and enthusiasm regarding these questions.

Collections were received at the Tree Seed Centre, cone evaluations performed and seed extracted and hand dewinged. The seed quantities were quite small and we decided to perform germination tests on unprocessed seed and perform cutting tests on the ungerminated seed. This does not provide estimates of germination capacity (GC) for a seedlot collected from these stands, but would provide information regarding whether viable seed is present in these dead stands of Pli. Following our 21-day test period, ungerminated seeds were cut and assessed as to whether the observed seed categories could reasonably be removed during processing. This is not a perfect or precise assessment, but it does provide some information concerning these small available samples. For four of the nine collections enough seed was available to perform both an unstratified (W1) and stratified (G20) test. The results are presented in Table 1.

Table 1. Site characteristics, germination results and estimated seedlot potential based on cutting tests on ungerminated seed for stratified (G20) and unstratified (W1) tests.

| Site           | Elev.<br>(m) | BEC    | Mortality<br>Year | G20<br>GC% | Potential<br>GC% | W1<br>GC% | Potential<br>GC% |
|----------------|--------------|--------|-------------------|------------|------------------|-----------|------------------|
| Sand #1        | 850          | SBSmc2 | 1994              | 28         | 75%              |           |                  |
| Sand #2        | 875          | SBSmc2 | 1994              | 10%        | 74%              |           |                  |
| Sand #3        | 960          | SBSmc2 | 1994              | 54%        | 87%              | 60%       | 86%              |
| Sand #4        | 885          | SBSmc2 | 1994              | 40%        | 66%              | 26%       | 78%              |
| Sand #5        | 850          | SBSmc2 | 1994              | 12%        | 72%              |           |                  |
| Tetachuk N. #1 | 900          | SBSdk  | 1997/98           | 13%        | 70%              |           |                  |
| Tetachuk S. #2 | 850          | SBSdk  | 1997/98           | 67%        | 85%              | 47%       | 86%              |
| Bryan East #3  | 1065         | SBSdk  | 1995              | 11%        | 70%              | 26%       | 59%              |
| Bryan East #4  | 1040         | SBSdk  | 1995              | 3%         | 70%              |           |                  |

Results of germination tests were low, but this reflects unprocessed seed. The potential GC% columns indicate our best estimate of germination without sacrificing seedlot yield (i.e. increases in GC beyond this point would probably result in the loss of viable seed). Two stands Sand #3 and Tetachuk S. are potential stands, but they are still below the 95% level obtained by most Pli seedlots collected today. A further concern with collections from dead trees is that yields may be lower due to a decreased ease in cone opening and the possible deterioration of seed within cones. At this point my recommendation is to try to obtain surplus seed on SPAR and only collect from dead trees if no seed is available from seed orchards or natural stands for the area.

The results on seed viability are perhaps more optimistic as the results indicate that even ten years after tree mortality viable seed can still be found within the cones. This agrees with many studies on the long-term viability of seed on Pli trees. The theory is that following cone and seed maturity, the vascular connection between the cone and tree are broken and the cone functions independently (no further water or sugar exchange). The serotinous cone provides good insulation and protection for the seed.

Questions were raised regarding lethal temperatures for lodgepole pine seed. A study that used a flame front designed to stimulate a crown fire indicated that cones exposed for 10-20 seconds had germination capacities of 37 to 64%, but exposures of one minute reduced this to 0.3 to 14% (Despain *et al.* 1996). It should be pointed out that this is germination of unprocessed seed. Another study that focused solely on seed indicated that exposure to temperatures of 76-80° C significantly decreased germination (Knapp and Anderson 1980).

There is the potential for there to be a quality issue if a tree is dying and trying to develop cones at the same time. There may not be adequate reserves to try and prevent dying and transport sugar to the cones resulting in poor quality or non-viable seed. Maybe the tree senses its demise and will devote resources to its offspring first? There is some anecdotal evidence on collections from red and green attack trees. We performed some seed evaluations and found no observable difference between seed collected from red and green attack trees. We did not process this seedlot and have no idea of the relative proportions of the two tree types, but the final seedlot did achieve a germination of 96%. In 2004, there are also two more seedlots that were collected from green and red attack trees. These are currently being processed at a private extractory.

I hope that this information is useful as you consider all your options for the regeneration of beetle-killed stands. I also have a literature search (keywords = lodgepole pine; seed viability; fire) of 36 references with abstracts that I can e-mail to anyone interested.

## **References**

Despain, D.G., D.L. Clark and J.J. Reardon. 1996. Simulation of crown fire effects on canopy seed bank in lodgepole pine. *International Journal of Wildland Fire* 6:45-49.

Knapp, A.K. and J.E. Anderson. 1980. Effect of heat on germination of seeds from serotinous lodgepole pine cones. *The American Midland Naturalist* 104:370-372.

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