

Nursery Seedlings Increase Genetic Diversity

by Thomas D. Landis

Several years ago, while perusing the published literature for FNN, I came across an article that really caught my eye because it shows that using nursery stock in reforestation has advantages from a biodiversity standpoint. It was written by some research foresters in Canada who collected needle tissue from lodgepole pine (*Pinus contorta* var. *contorta*) in 12 stands in Alberta. Their objective was to use two biochemical tests to examine the impact of reforestation method on genetic diversity of stands in the foothill region of Alberta, and sampled three stand classes and one batch of nursery seedlings:

1. Unharvested, mature stands
2. Harvested stands which were left for natural regeneration
3. Harvested stands which were planted with nursery stock
4. Nursery seedlings from the same region

The procedure consisted of collecting current-year needle tissue and analyzing these samples using two DNA-based markers: RAPD (randomly amplified polymorphic DNA) and microsatellite SSR (simple sequence repeat). With my limited understanding of genetics, I'm not even going to try and explain what these tests actually measure. If you are interested, let me know and I'll send you a copy of the article and you can explain it to me!

The results are reported in terms of the "Expected Heterozygosity" which I'm interpreting as "More Genetic Variation". Using either the RAPD test (Figure

1A) or the SSR test (Figure 1B), the planted seedlings had as much genetic variation as the unharvested stands and more variation than the natural seedlings. The nursery seedlings in the RAPD test had the most genetic variation of all the samples (Figure 1A).

One of the things that has always bothered me is that some people just assume that natural regeneration is better than artificial regeneration. This viewpoint is particularly true of the environmental community which believe that "nature always knows best" and that the less interference by man the better. I've always believed just the opposite - that by managing forests and other plant communities we can actually improve on nature. To me, it's intuitively obvious that, because seeds are collected from a variety of trees in a seed zone, the nursery stock grown from these seeds would be more genetically diverse than natural seedlings. The same situation should apply to fire restoration. It would be better to plant the burned area with source-identified, locally-adapted stock than wait for natural regeneration to occur.

So, it's nice to finally see some hard evidence that this actually occurs. My hunch is that if more of these sorts of tests were done, we could further prove that planting nursery stock after timber harvest, forest fire, or other type of disturbance improves the genetic diversity of the resulting plant community.

Source:

Thomas BR, Macdonald SE, Hicks M, Adams DL, Hodgetts RB. 1999. Effects of reforestation methods on genetic diversity of lodgepole pine: an assessment using microsatellite and randomly amplified polymorphic DNA markers. *Theoretical and Applied Genetics* 98: 793-801.

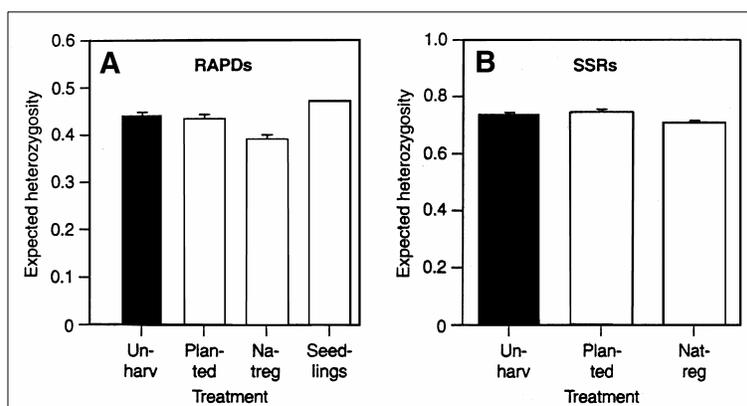


Figure 1. Two Measures of Genetic Diversity on Lodgepole Pine Reforestation Sites. "Unharv" = Unharvested stands, "Planted" = Harvested stands with nursery stock, "Natreg" = Harvested stands with natural regeneration, and "Seedlings" - Nursery stock from Same Region.