

## What Loblolly Pine Seedlings Should Landowners Purchase?



Once the decision has been made to plant loblolly pine on a forest site, the primary concern for a landowner is to choose adapted seedlings that will grow and survive well at that site. There are numerous publications about the genetics of loblolly pine and what are the appropriate seed sources to use. An excellent, comprehensive guide from the USDA Forest Service is [Southern Pine Seed Sources](#). Below are a few

simple guidelines that we use when recommending what to plant:

1. When purchasing seedlings, make sure that you deal with a reputable individual that understands the genetics and silviculture of loblolly pine. Virtually all loblolly pine seedlings originate from tree improvement programs, so consultants, nursery managers, and tree breeders can provide a wealth of information about the seedlings you intend to plant.
2. **Seed Sources:** Local sources or provenances<sup>[1]</sup> of loblolly pine will be adapted and will grow well under most conditions. When in doubt, using local sources is a good bet. However, in many cases, seedlings from non-local seed sources will grow better seedlings of local origin.

Seedlings that originated from geographic regions that have a milder climate than the local conditions will generally grow faster than seedlings from the local provenance. The [USDA Plant Hardiness Zones](#) Map (Figure 1) is a very useful tool when deciding on seed sources that are adapted to your area. Loblolly pine grows primarily in Zones 7a, 7b, 8a, and 8b (Figure 1). Seedlings from one Hardiness Zone can be moved northward and inland to the next zone and still survive and grow well. “Seedlings will survive and grow well if they come from the any area having a minimum temperature within 5°F of the planting site’s minimum temperature. Seedlings from an area with warmer winters will grow faster than seedlings from local sources; seedlings from an area with cooler winters will grow slower. The differences in winter lows can be as much as 10°F, but with increased risk of damage at the cold end of the range and growth loss at the warm end...” (Quote from Schmidting 2001, [Southern Pine Seed Sources](#), page 6). For instance, seedlings from the South Carolina Coastal Plain (Zone 8a) can be planted in the North Carolina Coastal Plain (Zone 7b), and they should grow quite well. But, remember that the lines on the Plant Hardiness Zones represent broad areas. If seedlings from the southern end of Zone 7a are transferred to the northern end of Zone 7b, then an annual minimum temperature difference of about 10°F will be reached. Movement of this magnitude will probably result in poorly adapted seedlings and plantations that do not grow as well as anticipated.

Provenance variation in loblolly pine is complex when the East-West variation is considered. For instance, in southern Alabama, families from the Coastal Plain of South Carolina grow much faster than the local source and are very well adapted to the region. When looking at the [USDA Plant Hardiness Zones](#) Map (Figure 1), this does not follow the “rules” described above since both regions are in the same Plant Hardiness Zone. We have found that movement of Atlantic Coastal Plain provenances and Piedmont NC, SC, and GA provenances westward results in superior growth.

Movement of eastern provenances west of the Mississippi River is tricky. Not only is winter hardiness a concern, but drought hardiness is often of overriding importance. We recommend that landowners in the western part of the range carefully follow the guidelines in [Southern Pine Seed Sources](#).

Other excellent references concerning seed source and provenance variation include (Lambeth et al. 2005, Sierra et al. 2002, others), and these are listed at the end.

3. **What family or families to plant?** Most industry nurseries and some state nurseries sell individual families that are the progeny from selections made in tree improvement programs. For example, family 5-199 would normally be open-pollinated (OP) progeny from parent tree 5-199 that was established in a seed orchard with other selections and was managed to produce seed for regeneration. This family will have been tested and its performance for growth, disease resistance (mainly fusiform rust disease), and stem form should be well characterized.

Individual OP families, FS families, and selected clones of loblolly pine display remarkable stability and predictability of growth performance across sites in the southern US. As long as genotypes are planted in climatic zones to which they are adapted (e.g. Schmidting 2001), there is little important genotype by environment interaction for most traits (McKeand et al. 2005). This stability of performance is important when trying to predict genetic gains in growth across different sites. Across a wide range of sites, a family or clone will yield the same percentage of volume growth improvement on all sites (McKeand et al. 1997).

*One absolute given is that not all loblolly pine families are created equally.* There is tremendous genetic variation among families of loblolly pine for almost all traits. If there are 30 families available to plant, there will be the best, second-best, third-best, and so on for all the traits (growth, rust resistance, and form). All the families from a seed orchard will be good and should be adapted to your region, but some will be better than others.

Compared to the average families coming from a seed orchard, some families can result in substantial increases in site productivity (as much as a 10-foot increase in

site index or  $SI_{25}$ ), substantial reduction in fusiform rust levels, and very straight trees (see Li et al 1999, McKeand et al. 2005 for details).

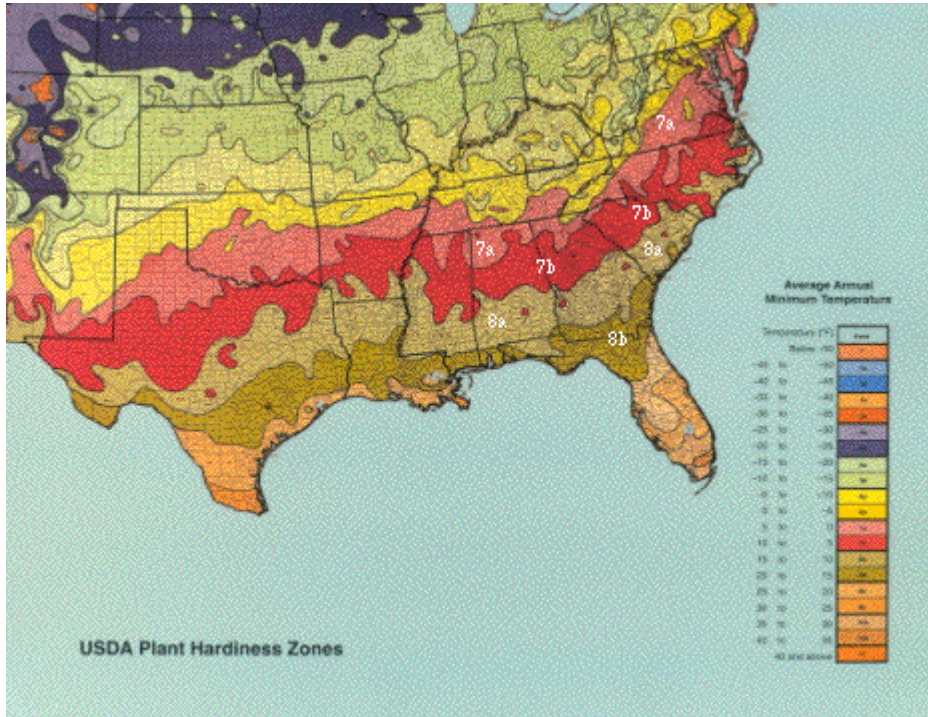
A **Seed Orchard Mix** (SOM) would be a collection of many different families that originated from a given orchard. All the families will be good performers for most traits, but a SOM is a diverse mix of families that breeders would consider average.

***Our strong recommendation*** is that forest landowners should purchase the best genetic quality seedlings possible from nurseries that sell individual families that are adapted to their sites. The benefits from planting the fastest growing genotypes that have acceptable quality traits will result in tremendous financial benefits to landowners for essentially all management regimes. Even if a premium price is paid for the best seedlings, the best seedlings are well worth the additional costs (see McKeand et al 2005).

## References

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Figure 1. [USDA Plant Hardiness Zones](#) (Southern Regions)



## Average Annual Minimum Temperature in Zones 6a – 9b

Zone	Fahrenheit	Celsius	Example Cities
6a	-10 to -5 F	-20.6 to -23.3 C	St. Louis, Missouri; Lebanon, Pennsylvania
6b	-5 to 0 F	-17.8 to -20.5 C	McMinnville, Tennessee; Branson, Missouri
7a	0 to 5 F	-15.0 to -17.7 C	Oklahoma City, Oklahoma; South Boston, Virginia
7b	5 to 10 F	-12.3 to -14.9 C	Little Rock, Arkansas; Griffin, Georgia
8a	10 to 15 F	-9.5 to -12.2 C	Tifton, Georgia; Dallas, Texas
8b	15 to 20 F	-6.7 to -9.4 C	Austin, Texas; Gainesville, Florida
9a	20 to 25 F	-3.9 to -6.6 C	Houston, Texas; St. Augustine, Florida
9b	25 to 30 F	-1.2 to -3.8 C	Brownsville, Texas; Fort Pierce, Florida

<sup>[1]</sup> The term Provenance is used to describe the original location of a loblolly pine selection. For example, if a parent tree (e.g. number 5-999) was originally selected in Williamsburg County, South Carolina, then it's provenance is the SC Coastal Plain. Selection 5-999 may be grafted into numerous seed orchards in different geographic regions, but it's origin or provenance is still Williamsburg County, SC. Progeny from 5-999 will retain the adaptive, growth, and quality characteristics of the parent tree as well as the characteristics of the pollen parents in the seed orchard. These pollen parents would usually come from the same provenance, but this is not always the case.