Containers and Growing Longleaf Pine

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Do the types of container used to grow longleaf pine seedlings really make that much difference? Researchers – based in the Pineville, Louisiana, branch of the Southern Research Station (SRS), Restoring and Managing Longleaf Pine Ecosystems unit – continue to show that indeed they do.

Initiatives interested in restoring longleaf pine across its native range in the southeastern United States focus on increasing the acres growing the tree from 3.4 million acres to 6 to 8 million by the mid-2020s. This will require reforesting or converting lands to longleaf pine, primarily by planting seedlings. Demand for longleaf pine seedlings also continues to increase as landowners and managers become more aware of the advantages of planting longleaf pine in areas prone to disturbances such as fires and hurricanes.

Up to 69 million seedlings are produced every year, with 70 to 90 percent grown in containers. Container-grown seedlings are twice as expensive as bare-root seedlings, so managers reasonably expect a higher long-term survival rate from container-grown seedlings.

Almost 10 years ago, SRS research forester Dave Haywood and plant physiologist Mary Anne S. Sayer noticed that an unusual number of longleaf pine saplings were leaning or had toppled after wind storms passed through plots on the Palustris Experimental Forest (the Palustris) [located on the Kisatchie National Forest in Louisiana]. The researchers suspected that the saplings were container-grown, and that the problem was poor root system architecture: the taproots were too deformed or lateral roots too unevenly distributed around the taproot to hold the stem upright against the wind. Root architecture is a specific interest of their colleague Shi-Jean Susana Sung, SRS research plant physiologist also based in Pineville.

In 2006, Sung revisited plots on the Palustris where artificial regeneration experiments had been established three decades before and dug up longleaf pine trees 12 to 35 years old to look more closely at their root systems. She sampled trees grown from seeds, bare-root seedlings, and in containers. As she expected, the trees grown from seeds had the longest taproots and more evenly distributed lateral roots, both signs of good root architecture, while trees from container-grown seedlings had the shortest taproots and an uneven distribution of woody lateral roots.

From these and other results, Sung recommended that those growing longleaf seedlings start using containers with a copper-coating on the inside cavity wall. Copper (in miniscule amounts) essentially "zaps" lateral roots as they grow towards the container cavity wall, keeping these roots from turning vertically. When the seedlings are outplanted, the lateral roots resume growing into their natural architecture.

These recommendations are reinforced by recent findings by all three researchers from a study Sayer and Haywood installed on the Palustris in 2004 to look at effects of both container size and copper treatment. At five years, they found that seedlings outplanted from copper containers were significantly taller and had greater volume, and that trees outplanted from the smallest containers were significantly smaller than trees from medium and large containers.

In a 2012 article which reports their findings, the researchers recommend that to get seedlings out of the grass stage quickly and into height growth, managers should take the following steps:

1. plant large-container seedlings if not using copper;
2. if planting medium-size seedlings, grow them in copper containers; and
3. on a grassy site, plant large seedlings grown in copper containers to help them compete with the understory.

To access the full article on copper root pruning and cavity size in relation to longleaf pine growth, visit **www.treesearch.fs.fed.us/pubs/42191**. For more information, contact: Dave Haywood at dhaywood@fs.fed.us; Mary Anne S. Sayer at msword@fs.fed.us; or Susana Sung at ssung@fs.fed.us.