Several LLP studies were established with container stock at the Palustris Experimental Forest in central Louisiana to evaluate long-term effects of container type (Cu coating or none) and size and nursery nutrient rate on longleaf pine (LLP) seedlings. We have observed the followings.

- Seedling nursery development, early field growth, and percent of seedlings exiting the grass stage increased with increasing cavity size, increasing nursery nutrient rate, and late season P loading.
- Seedlings grown in Cu-cavities for lateral root pruning grew as well in nursery and two years after planting as the non-Cu seedlings. However, height growth from the Cu seedlings exceeded that of the non-Cu seedlings since year four in field.
- Fertilizer incorporated into soil before planting increased the growth of competing vegetation instead of LLP seedlings during the first two years after planting.

Indeed, these results confirmed the benefits of using container stock to regenerate LLP stands. However, assessment of root system architecture from these studies showed that there were both short- and long-term negative effects of container on LLP seedlings and saplings, and thus the stand sustainability.

**CONCLUSIONS**

Longleaf pine sapling and tree stability comes from vertical anchorage from the taproot and sinkers and horizontal anchorage from lateral roots that horizontally extending into all directions.

Growing LLP in Cu-coated cavities helped ameliorate, partially, the negative physical limitations imposed on lateral roots by the hard cavity wall.

Much improvement in the container design, nursery culture, and handling and planting container stock is still required to meet the increasing needs for container LLP seedlings to regenerate and restore LLP plantations and ecosystems in a sustainable way in the southern U.S.

Saplings with leaning or sinuous stems were found in all stock types of Cu (yes or no) and cavity size since year four after planting.

Deformed root system architecture did not improve after planting. As long as there are no severe drought, too much rain, or strong wind events, container LLP seedlings can continue their growth and remain standing.

Deformed root systems of toppling over/leaning 10-y-o LLP trees from container stock. Taproots were very short and they did not have sinkers extending downward. These trees lacked vertical anchorage provided by a taproot or sinkers.