

1. PINEMAP Monitoring Network

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The PINEMAP monitoring network generates the biological and ecological data that enables researchers to understand how pine forest productivity responds to soils, climate, and management, and to develop and test models that simulate forest dynamics under future climate conditions. By developing and using standardized measurement and data sharing protocols, forest scientists across the Southeast United States are better able to collaborate on important research questions now and in the future.

Establishment of a monitoring network to develop carbon, water, and nutrient storage and flux baselines and responses to climate and management is one of the primary requirements of the National Institute of Food and Agriculture (NIFA) grant that funds PINEMAP. The three-tiered monitoring network developed by PINEMAP leverages the enormous investments in cooperative research trials from the past several decades and creates an unprecedented resource for regional pine plantation research.

The Tier I legacy network (Figure 1.1) consists of hundreds of existing silviculture experiments and growth-and-yield plots that blanket the region and provide extensive, spatially explicit information on regional variability in productivity. The Tier II active experiments network (Figure 1.2) contains 127 existing silvicultural trials that cover the full range of climate and soils in the region on which detailed carbon (C) and nutrient balance will be measured. Finally, the Tier III throughfall reduction x fertilization network (Figure 1.3) was established on four sites situated at the edges of the loblolly pine range. In these studies, nutrients and water are manipulated through fertilization and ~30% reduction of rain falling through the forest canopy (throughfall). Table 1.1 summarizes the characteristics of the three-tiered monitoring network, including number of sites in each tier, treatments, measurements, and questions to be answered.

The PINEMAP monitoring network provides a wealth of data for model development and testing as well as improved understanding of how southern pine productivity responds to climate and soils now and in the future.

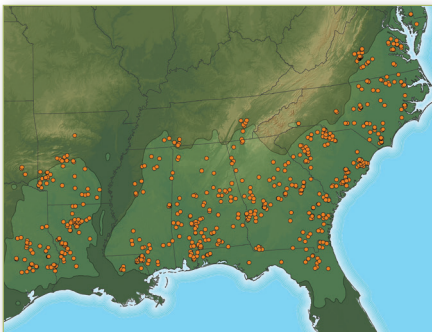


Figure 1.1. Tier I legacy network.

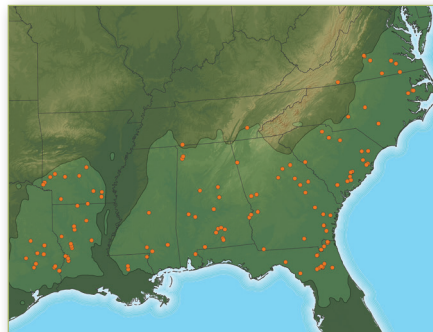


Figure 1.2. Tier II active experiments network.

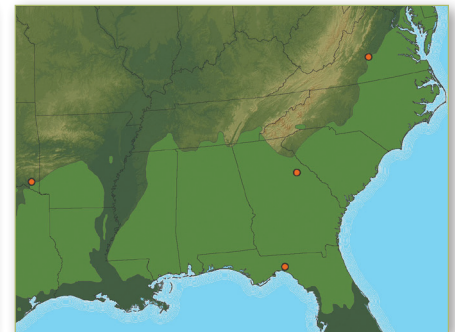


Figure 1.3. Tier III throughfall reduction x fertilization network.



Throughfall reduction structures at the PINEMAP Tier III site in Taylor County, Florida. Photo by Geoffrey Lokuta.

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Network Level	# Sites	Treatments	Measurements	Questions to be Addressed
Tier I (legacy network)	~ 700	Combinations of fertilization, competition control, planting density, thinning, and stand age.	Existing inventory data shared among regional forestry research cooperatives.	How does tree productivity vary with climate, soils, stand development, and management factors?
Tier II (active experiments network)	~ 125	Combinations of fertilization, competition control, planting density, thinning, and stand age.	Inventory, carbon and nitrogen pools, soil greenhouse gas fluxes, and key ecophysiological model parameters on a subset.	How do aboveground and belowground carbon and nitrogen pools and fluxes, as well as key biological and ecological modeling parameters, vary with climate, soils, stand development, and management factors?
Tier III (throughfall reduction x fertilization network)	4	Factorial combination of fertilization (control and "optimum") and precipitation (rain fed and 30% reduction).	Same as Tier II, plus intensive carbon, nitrogen, and water ecophysiology.	Same as Tier II, plus exposure of loblolly pine to climatic conditions likely not experienced within the historic range.

Table 1.1. Summary of the characteristics of the PINEMAP monitoring network.