

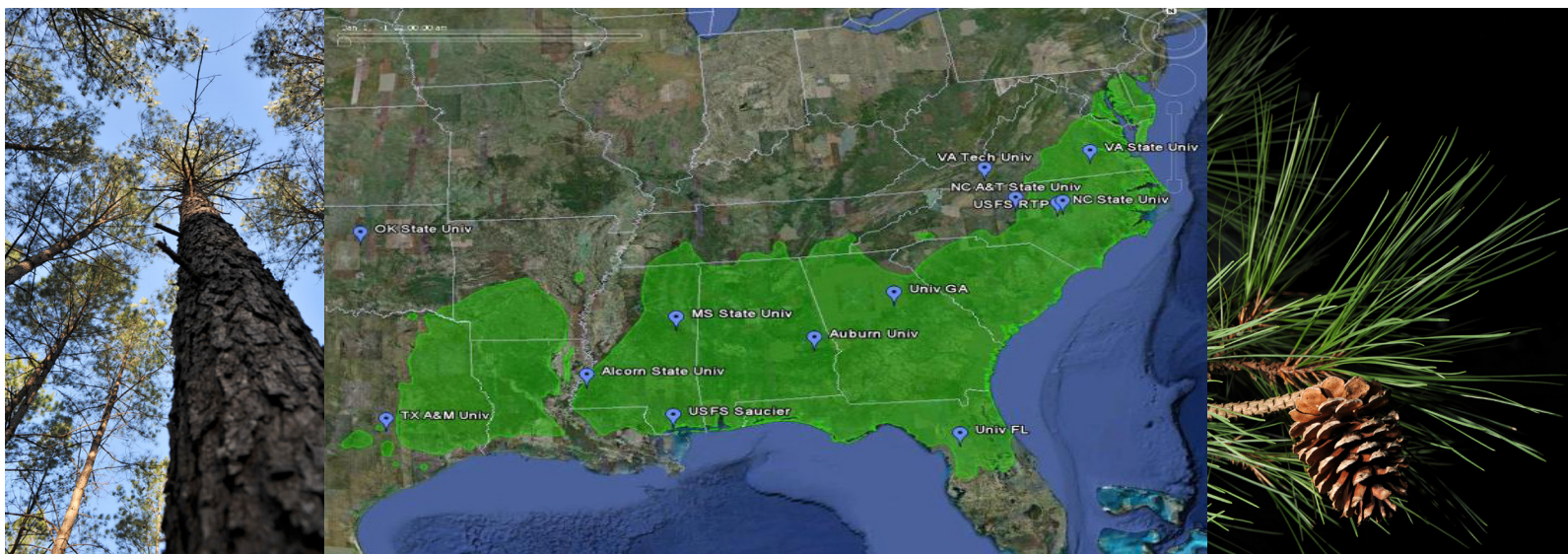
Pine Integrated Network: Education, Mitigation, and Adaptation Project (PINEMAP) is one of three Coordinated Agricultural Projects funded in 2011 by the USDA National Institute of Food and Agriculture. PINEMAP focuses on the 20 million acres of planted pine forests managed by private landowners in the Atlantic and Gulf coastal states from Virginia to Texas, plus Arkansas and Oklahoma. These forests provide critical economic and ecological services to U.S. citizens.

PINEMAP's overall goal is to create, synthesize, and disseminate knowledge that enables southern pine landowners to

- manage forests to increase carbon sequestration by 15% by 2030;
- increase the efficiency of nitrogen and other fertilizer inputs by 10% by 2030;
- adapt forest management approaches and plant improved tree varieties to increase forest resilience and sustainability under variable climates.

Project Background and Rationale

- PINEMAP focuses on loblolly pine (*Pinus taeda*), which is the most productive and valuable commercial forest species in the southeast U.S. and which comprises 80% of the planted forestland in the southeast U.S.
- 60% of the land in the southeast U.S. is forest, with 85% of the forest in private ownership.
- Over the past 50 years, the productivity of genetically improved planted pine has tripled.
- Southeastern forests contain 1/3 of the contiguous U.S. forest carbon and form the backbone of an industry that supplies 16% of global industrial wood, 5.5% of the jobs, and 7.5% of the industrial economic activity in the region.
- PINEMAP benefits from collaboration with the long-established forestry research cooperatives, the members of which manage more than 20 million acres of planted forest in the region and produce 95% of the pine seedlings that are planted in the region each year.
- PINEMAP utilizes an extensive network of several thousand growth and yield and Forest Service permanent inventory plots, as well as manipulative field experiments, most of which have had repeated measurements over time.
- The southern region is the only region with a Regional Extension Forester whose position has been co-funded by 13 Extension Directors for more than 30 years.



Loblolly pine (*Pinus taeda*)

The shaded area in this map depicts the native range of loblolly pine; tags denote collaborating institutions.

Project Objectives

- Establish a region-wide monitoring network to develop carbon, water, and nutrient storage and flux baselines and responses to climate and management.
- Apply a multi-scaled modeling program incorporating monitoring network data with spatially-explicit historical and predicted future climate data to assess alternative forest management approaches and the impacts on carbon sequestration and resilience to disturbance.
- Develop guidelines to help growers understand where to plant specific southern pine seed sources given future climate scenarios and identify genes controlling traits such as growth, nitrogen responsiveness, cold hardiness, water usage, and resistance to southern pine beetle and fungal diseases.
- Analyze life-cycle carbon balance of regional forest management systems and conduct multi-scale analyses of market and non-market forest benefits and services under future management and climatic conditions.
- Create resources and programs to educate high school students and teachers as well as university students about the relevance of forests, forest management, and climate impacts. The education program also engages university students in collaborative, interdisciplinary research aimed at solving complex societal problems.
- Disseminate emerging knowledge, practices, and decision support tools to enable corporate and non-corporate landowners to increase forest carbon sequestration, nitrogen fertilizer efficiency, and forest resilience under changing climate.

Project Outcomes

- Utilize the loblolly pine reference genotype from the Pine Genome CAP, in combination with phenotype data from extensive regional genetic trials, to identify alleles that control productivity, disease and pest resistance, and adaptive characteristics.
- Develop and facilitate implementation of management regimes and genetic systems that mitigate C and fertilizer N and increase forest resilience to disturbances.
- Complete “cradle to grave” LCA accounting for C, N, water, and energy footprints that emphasize alternative forest management scenarios, harvesting and transportation, and processing parameters that are affected by biomass quality.
- Achieve, by project end in 2016, proportional progress toward 2030 goal of 200 million Mg C of added sequestration, which is 15% above present.
- Achieve, by project end in 2016, proportional progress toward 2030 goal of 10% increase in efficiency of nitrogen and other fertilizer inputs.
- Create and foster undergraduate research and summer internship experiences.
- Develop Project Learning Tree (PLT) secondary module on southern forests and climate change.
- Train 7 postdoctoral associates and 29 graduate students.
- Engage participation of forestry professionals who manage 25 million acres in Extension programs.
- Reach 10,000 landowners owning a total of 10 million acres through Extension programs.

Project Participants

PINEMAP is coordinated and managed by the University of Florida; project collaborators include the following:

- eight regional university-corporate-governmental research cooperatives;
- over 50 scientists at 11 land grant universities, including three 1890s institutions;
- the USDA Forest Service;
- the Southern Regional Extension Forester and associated Extension professionals;
- secondary school educators and the Project Learning Tree network;
- state climate offices and the multi-state Southeast Climate Consortium.



Throughfall exclusion structures at the PINEMAP “throughfall exclusion x fertilization” sites (left: McCurtain County, OK; right: Taylor County, FL).

For additional information visit www.pinemap.org or contact Dr. Timothy A. Martin (tamartin@ufl.edu) or Jessica Ireland (jjireland@ufl.edu).



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