3-PG Simulation of Loblolly Pine Growth and Yield

PINEMAP

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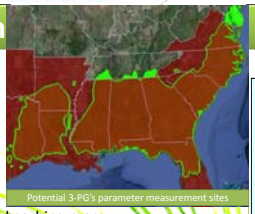
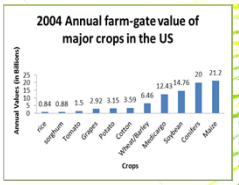
Introduction

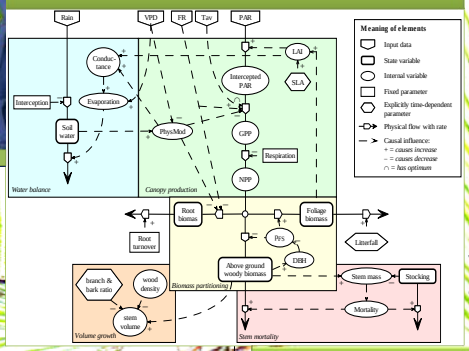


Loblolly pine is one of the most important commercial timber species in the United States. The southern states provide 58% of the wood in the U.S. temperate forests are absorbing more carbon in photosynthesis than they through respiration. so because of high productivity in the southeastern region, loblolly pine forests are also considered to be a major carbon sink.



Since the southeastern region's loblolly pine forests are making an important contribution to the U. S. economy and the global carbon cycle, how to best manage and improve this forest resource under different soil and climate conditions is becoming a critical question. In this study, we are going to conduct a model simulation of loblolly pine growth and yield under different climate change scenarios and soil conditions.

3-PG model flowchart



Abstract

Loblolly pine makes important contributions to the economy and the global carbon cycle. As a result, methods to enhance forest productivity and carbon sequestration have become important, particularly in regard to climate change impact. In this study, we will use the 3-PG model to predict the loblolly pine productivity in the southeastern region. In addition, we will choose and link a soil carbon model to 3-PG in order to simulate the carbon sequestration regionally.

Objectives

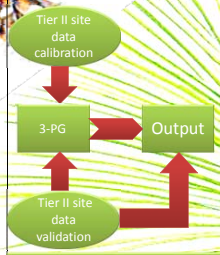
(1) Develop sets of accurate physiological parameters for the 3-PG model, validate model accuracy and then use 3-PG to predict regional productivity for both non-clonal and clonal loblolly pine plantations;
(2) Predict the impact of climate change on loblolly pine productivity;
(3) Link a soil carbon model to 3-PG model to predict the carbon sequestration of southeastern clonal and non-clonal loblolly pine.

Overview of 3-PG Model

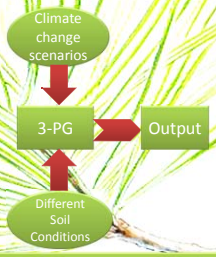
3-PG model is a process-based model that simplifies the physiological process of the stand and accurately predicts stand growth. In general, 3-PG uses utilized absorbed PAR to calculate GPP. GPP is then converted to NPP by an empirical relationship. Canopy quantum efficiency is the function of absorbed PAR that is modified by environmental factors. The carbon allocation to stem and root is calculated by using empirical relationships derived from literature and measurement. A 3-PG model flow diagram is shown above.

Methods

(1) To achieve objective 1



(2) To achieve objective 2



(3) To achieve objective 3

References

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