INTRODUCTION
In 1964, the USDA Forest Service established the Regional Longleaf Pine Growth Study (RLGS) in the Gulf States. The original objective of the study was to obtain a database for the development of growth and yield predictions for naturally regenerated, even-aged longleaf pine (Pinus palustris Mill.) stands. Initially, 185 plots were installed to cover a range of ages, densities, and site qualities. Plots are remeasured on roughly a 5-year cycle. A total of 305 plots are now in the study. They are located in central and southern Alabama, southern Mississippi, southwest Georgia, northern Florida, and the sandhills of North Carolina. Within this distribution are four time replications of the youngest age class that have been installed to detect growth changes over time. All four time replications are located on the Escambia Experimental Forest in Brewton, AL. The original study has been expanded to include the development of taper equations, site index curves, pole prediction models, and pine straw production models. As part of the Southern Global Change Project, the Regional Longleaf Pine Growth Study plots and database were used to examine the impacts of climate (precipitation and atmospheric temperature) on longleaf pine productivity in relation to stand age, site quality, and stand density. As a part of this project, studies related to longleaf pine needle fall, specific leaf area, and projected leaf area were conducted. Studies were also conducted to determine the stability of parameters in growth models over time and the inclusion of weather variables in growth models. The Regional Longleaf Pine Growth Study project represents a stable long-term data base and an active “field laboratory” for natural, even-aged, longleaf pine stands. The value of this project increases as more and more ownerships in the South consider longleaf pine management alternatives. Public and private land managers are seeking a range of ecological and economic outcomes related to the restoration, rehabilitation, and regeneration of longleaf pine.

METHODS
The study consists of 305 permanent 1/10- and 1/5-acre measurement plots located in central and southern Alabama, southern Mississippi, southwest Georgia, northern Florida, and the sandhills of North Carolina. Plot selection was based upon a rectangular distribution of cells formed by four stand-age classes ranging from 20 to 80 years, five site-index classes ranging from 50 to 90 feet at 50 years, and five density classes ranging from 30 to 150 square feet per acre. The oldest plots will be in the 120-year age class with the completion of the current 30-year remeasurement.

At the time of establishment, plots are assigned a target basal area class of 30, 60, 90, 120, or 150 square feet per acre. They are left unthinned to grow into that class if they are initially below the target basal area. In subsequent remeasurements, the plot is thinned back to the previously assigned target if the plot basal area has grown 7.5 square feet per acre or more beyond the target basal area. The thinnings are generally of low intensity and are done from above.

Net (measurement) plots are circular and 1/5-acre (14 net plots are 1/10-acre) in size surrounded by a similar and like-treated half-chain wide isolation strip, with both surrounded by a half-chain wide protective buffer strip that receives extensive management. Plots are inventoried, and treated as needed, every 5 years. The measurements are made during the dormant season (October through March) and it takes 3 years to complete a full remeasurement of all plots. Cooperators are asked to use cool, winter burns on a 3-year cycle to control hardwood competition.

Each tree on the net plot with a d.b.h. >0.5 inches is numbered by progressive azimuth from magnetic north and has its azimuth and distance from plot center recorded. At every remeasurement, each tree has its d.b.h. recorded to the nearest 0.1 inch, and its crown class and utility pole class and length determined. A systematic subsample of trees from each 1-inch d.b.h. class has been permanently selected and measured for height to the live-crown base, total height, and, if the tree is dominant or co-dominant, for age from seed.

Associated Studies
The RLGS represents a stable, long-term database and an active “field laboratory” for natural, even-aged, longleaf pine
stands. The value of this project increases as more and more ownerships in the South consider longleaf pine management alternatives. Public and private land managers are seeking a range of ecological and economic outcomes related to the restoration, rehabilitation, and regeneration of longleaf pine. The plots are also available for cooperative studies that would not harm the plots or interfere with future activities. An example is our USDA Forest Service Southern Global Change Program (SGCP)/RLGS project (which is nearing completion). This study was undertaken to examine the productivity of natural stands of longleaf pine in relation to competition and climatic factors.

Using the existing RLGS plots and database, the project is investigating the relationship between productivity (biomass) of natural stands of longleaf pine in relation to stand age, site quality, stand density (competition), and the climatic factors of precipitation and atmospheric temperature. A major component of the SGCP project was to examine longleaf pine litter (pine straw) production. Needle fall has been monitored monthly since August 1992 via litter traps on a representative subsample of plots across the range of site, age, and density combinations. Efforts are underway to model annual litter production (tons per acre, dry weight) as a function of stand variables. The results from the various components of the project will be published as individual manuscripts.

Other studies directly associated with the RLGS sites include: (1) soil samples have been taken on the RLGS plots to provide baseline data and to improve estimates of site productivity; (2) utility pole information is being used to develop relationships between stand characteristics, thinning activities, and pole production; (3) efforts are being completed to improve estimates of longleaf pine taper equations by including crown ratio as an independent variable; (4) data are being examined in an effort to improve the estimates of site index for naturally regenerated longleaf pine stands; (5) basal area and mortality models are being developed to improve the predictions of stand dynamics; (6) prescribed burning history has been added to the database; (7) old-growth stands are being identified and measured to improve estimates of growth and mortality for longer rotations and to assess the stability of old-growth stands; and (8) economic projections are being developed.

RESULTS
The 30-year remeasurement is nearing completion. Efforts continue to examine longleaf pine litter (pine straw) production, which was a major component of the SGCP; and utility pole production, which was an addition to the 25-year measurement cycle.

Over the course of the RLGS, several stand and individual tree-level models have been developed to provide data to evaluate management alternatives. Individuals interested in predicting stand growth and mortality are directed to the works of Farrar (1979, 1985), Somers and Farrar (1991), Farrar and Matney (1994), and Quicke and others (1994 and in press). Work will continue to incorporate new data and refine growth relationships as new models are developed.

Through the 25-year remeasurement, there are 28 publications and numerous presentations that are a direct result of the RLGS. Another 14 related publications use information from the RLGS. (The Appendix provides a listing of these.)

CONCLUSION
The RLGS has adapted to changes in the resource base and shifting public concerns over the last 30 years. The initial installation in the mid-60's resulted in 185 sample plots. This number increased to 267 in 1986 and is now at 305. As the number of plots have grown and in response to changing questions, the objectives of the RLGS have expanded. It is no longer meaningful to have growth projection models estimate only to stand-level merchantable basal area and total volumes in pulp and saw timber. Users are demanding more information on multiple products, and want trees per acre and merchantable volume by d.b.h. classes, to answer their current questions. The RLGS is keeping pace with ever-changing demands and is proving once again that well designed, long-term studies are wise research investments.

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LITERATURE CITED


APPENDIX


35. Shaw, Dennis J. 1994. Inclusion of a crown ratio as a measure of form to improve estimates of taper for...


