Restoration of longleaf/slash pine ecosystem from slash pine plantations in Florida coastal flatwoods

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Introduction and Objectives

Restoration of longleaf pine ecosystems is currently the focus of significant restoration efforts in southeastern U.S. and is of global concern with respect to sustaining biodiversity. Many prior longleaf pine sites now exist as slash pine and other pine plantations. Restoration of such sites involves gradually replacing slash pine or other pine with longleaf pine and managing these complex ecosystems (longleaf/slash) with uneven-aged approaches (e.g. selection systems) to meet diverse objectives of production, conservation, and recreation. Our objective is to model conversion of an even-aged slash pine plantation to an uneven-aged slash/longleaf pine ecosystem and develop an adaptive multifunctional uneven-aged management system for such ecosystems in Florida coastal flatwoods.

We will establish different uneven-aged harvesting treatments which would be variations of single tree selection, group selection and irregular shelterwood, with two fire frequencies (1 year and 2year) at Tate' Hell State Forest, Carrabelle, FL (Figure 1 and 3). The longleaf pine seedlings will be planted in the gaps and their survival and growth dynamics will be observed over the time. The structural conditions, regeneration and growth responses resulting from field trials will be used to initiate a spatially-explicit stand model that predicts timber production, forest and understory structure over multiple cutting cycles in an uneven-aged longleaf/slash pine ecosystem. (Figure 4 and 5).

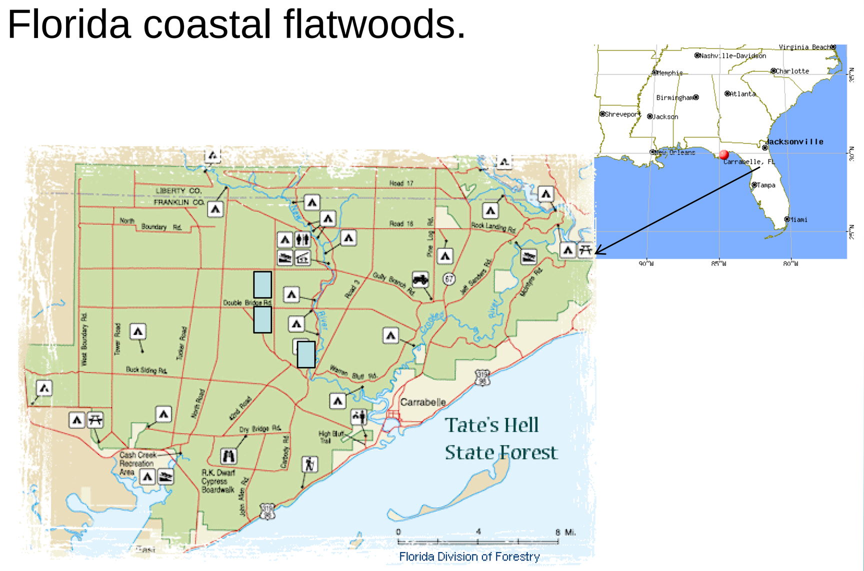

Figure 1. Study Site: Tate's Hell State Forest, Carrabelle, FL (: Location of research stands)

The model will be used to evaluate the parameters (gap size, residual basal area, cutting cycle, fire frequency) of the uneven-aged harvesting treatment that optimize and sustain values in a multifunctional management system (Figure 4 and 5).

Conversion and Uneven-aged Management

Managing for uneven-aged conditions that are structurally and compositionally diverse is an alternative in achieving sustainable forest management. While even-aged management systems create stands with one age class of trees, and a diameter distribution that follows a smooth bell-shaped curve, uneven-aged management systems create stands that contain at least three distinct age classes. The diameter distribution of an uneven-aged stand follows a reverse J-shape (Figure 2). Land managers are seeking harvesting techniques that can convert even-aged plantations to uneven-aged. We will use variation of single tree selection, group selection and irregular shelterwood using residual basal area, gap size and /or diameter classes to to develop tree marking methodology to guide and regulate stand conversion. We will compare current conditions to reference conditions. Trees will be cut from dbh classes that have higher numbers of trees than the target, and dbh classes that have less will be left. The gaps will be planted by the longleaf pine seedlings. Different harvest/management regimes will be evaluated in terms of their productive capacity (volume of trees cut in each cutting cycle), basal area, size diversity, number of large trees, number of dead trees and their size diversity, and net present value of cuts. We will also compare time to achieve the reference conditions.

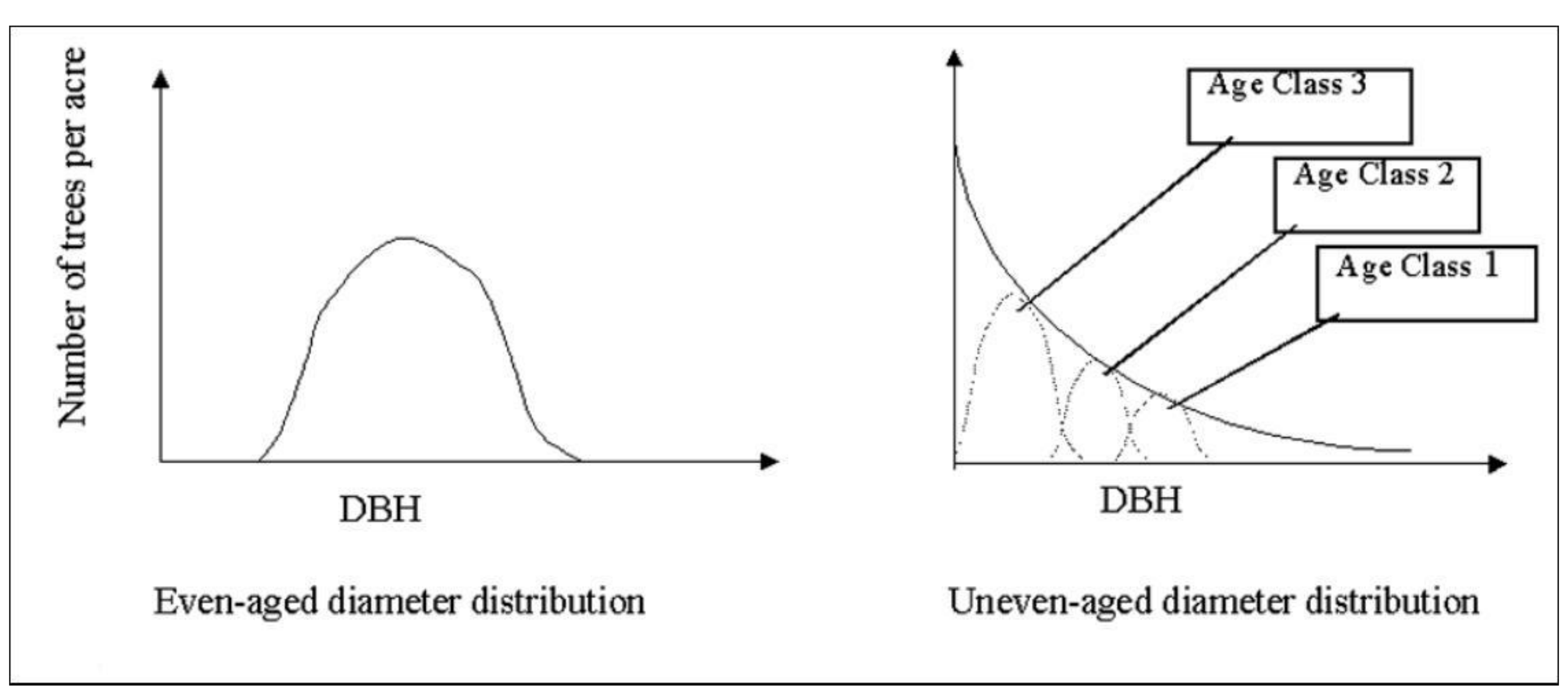

Figure 2. Diameter distribution in even-aged and uneven-aged forests

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Experimental Approach

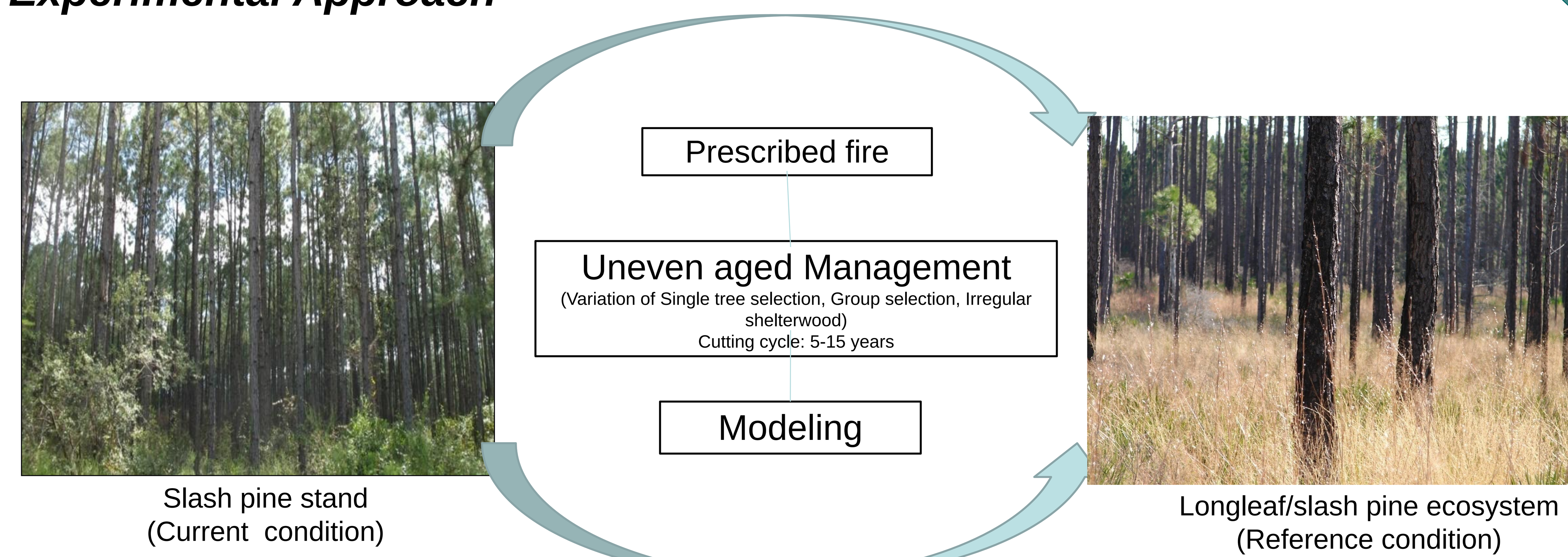

Figure 3. Different uneven-aged harvest methods with prescribed fire will be evaluated simulation modeling. Reference condition is desirable forest conditions existing on the same site.

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Conceptual Models

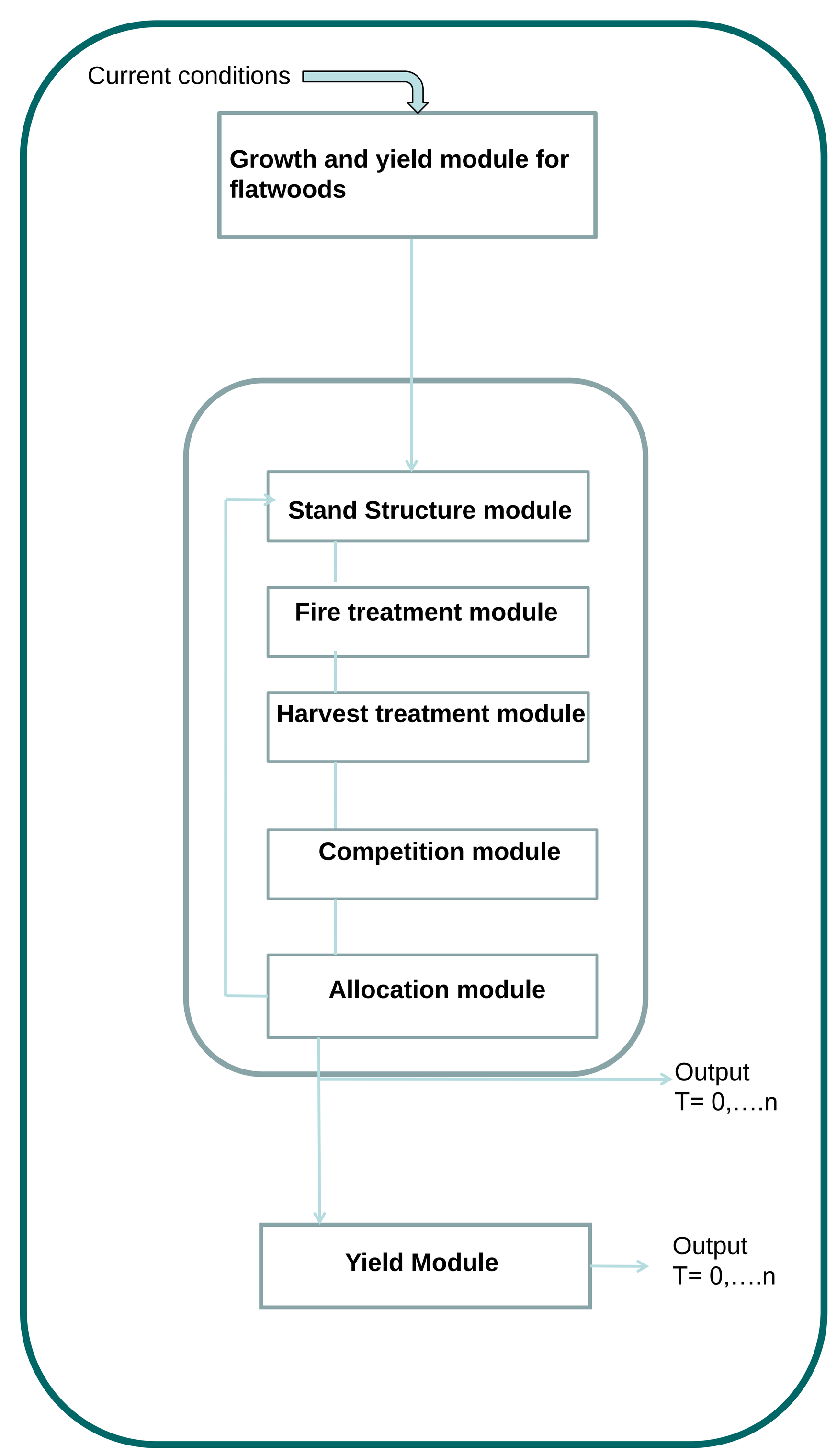

Figure 4. Schematic simulation modeling for testing harvesting regimes for stand conversion.

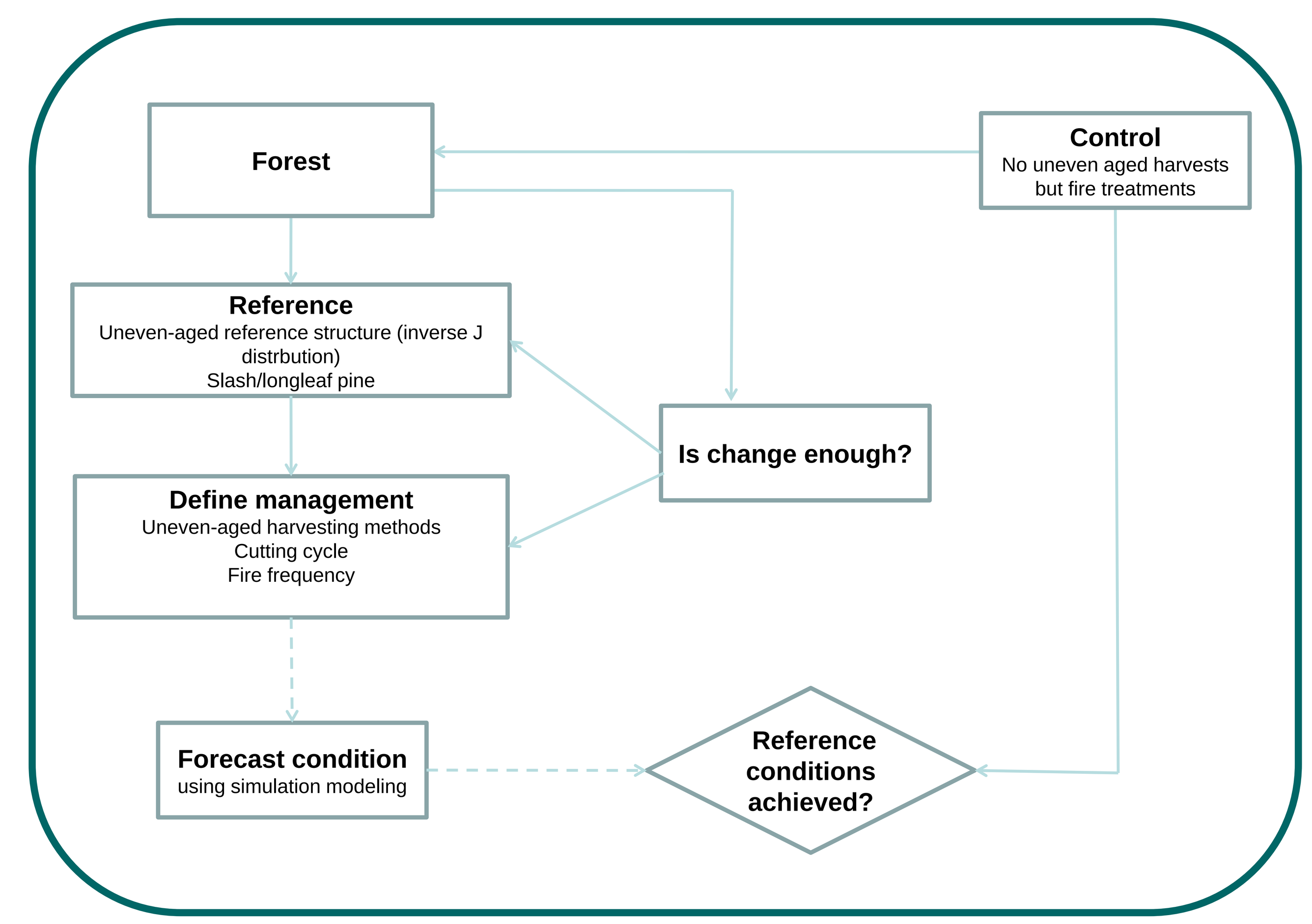

Figure 5. Adaptive management while shifting from even-aged to uneven aged forest**.** Reference conditions will be quantified and specified exactly in order to judge if and when they have been achieved. Therefore an iterative procedure has been conceptualized.

The sustainable multifunctional uneven-aged method will be one providing sustained values over multiple cutting cycles during the simulation period.

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