Even-aged slash pine to uneven-aged longleaf pine ecosystem in hydric flatwoods

Ajay Sharma, Shibu Jose and Kimberly Bohn*

School of Forest Resources and Conservation, University of Florida, Gainesville, FL-32611

***West Florida Research and Education Center, University of Florida, Milton , FL-32583**

Abstract

- Restoration of offsite even-aged slash pine grown on former longleaf pine site to uneven multifunctional longleaf pine ecosystem is currently the focus of significant restoration efforts in the southeastern U.S.
- We design and implement various stand conversion strategies (reproduction cuttings and thinnings, gap planting) to covert even aged structure to uneven and gradually replacing slash pine with longleaf pine.
- The preharvest stand structure data has been used to develop tree marking guides using residual basal area, gap size and /or diameter classes to guide and regulate stand conversion. The harvest is scheduled to complete in late 2009.
- Longleaf pine and slash pine seedlings will be planted in the gaps created by harvest and their survival and growth dynamics will be observed over the time. We will also assess variation in microclimatic conditions, variation in canopy light transmission and understory light availability, regeneration, growth, understory response, and carbon sequestration
- The initial observations will be used to initiate a spatially-explicit stand model that predicts timber production, overstory and understory structure over multiple cutting cycles in an uneven-aged slash/longleaf pine ecosystem

Uneven-aged management and Conversion

- Even-aged stands contain one age class of trees and have characteristic bell-shaped diameter distribution 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.
- Stand conversion is affected by conversion cuttings

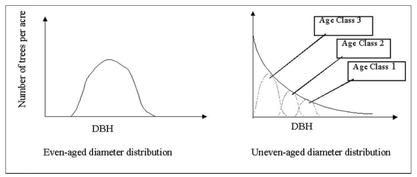
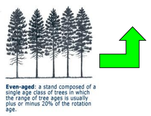


Figure: Diameter distribution in even aged and uneven aged forest

Uneven aged slash and longleaf pine mixed



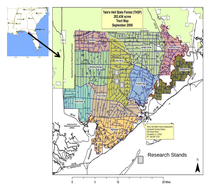
Even aged slash pine

Figure: Even to uneven aged conversion

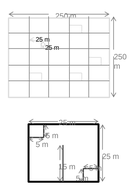
Experimental approach

Study area and vegetation sampling procedure

- The study area consists of three unthinned stands of slash pine plantation established in 1976 in Tate's Hell State Forest, Franklin county, FL.
- 5 measurement plots (25m X 25 m) were selected randomly for preharvest overstory data collection. Nested quadrats and transect were laid to sample understory vegetation.

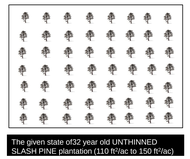


6 treatments in 3 replications
RCB
15.44 acre plot (250 m x 250 m)

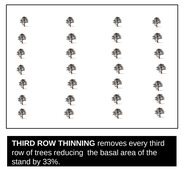


Experimental treatments (Reproduction cuttings and thinnings) and tree marking strategy

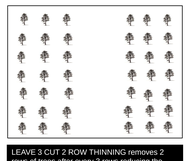
- Different types of conversion cuttings including thinnings (*third row, leave 3 cut 2 row*) and reproduction cuttings (*Group selection, staggered third row cut, Irregular shelterwood*) have been designed.
- The preharvest basal area of the stands ranges between 110 ft^2/ac to 150 ft^2/ac with mean diameter at breast height (dbh) of 9.1 inch.
- All the trees below the dbh of 8-9 inch have been marked for reproduction cutting which reduced the post harvest basal area to 30-50 ft^2/ac.



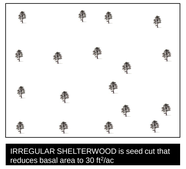
The given state of32 year old UNTHINNED SLASH PINE plantation (110 ft²/ac to 150 ft²/ac)



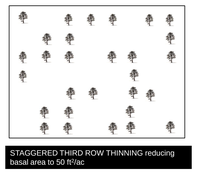
THIRD ROW THINNING removes every third row of trees reducing the basal area of the stand by 33%.



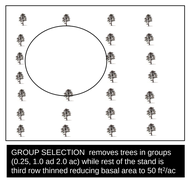
LEAVE 3 CUT 2 ROW THINNING removes 2 rows of trees after every 3 rows reducing the basal area of the stand by 40%



IRREGULAR SHELTERWOOD is seed cut that reduces basal area to 30 ft²/ac



STAGGERED THIRD ROW THINNING reducing basal area to 50 ft²/ac



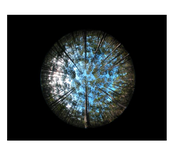
GROUP SELECTION removes trees in groups (0.25, 1.0 and 2.0 ac) while rest of the stand is third row thinned reducing basal area to 50 ft²/ac

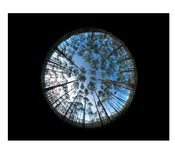
Figure: Schematic demonstration of different conversion cutting patterns

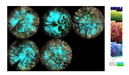
Figure. Tree marking and a stand marked for Irregular shelterwood cut

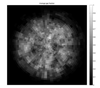
Light transmittance and understory illumination

- The preharvest canopy has been photographically mapped and light transmittance characteristics have been studied. Can_Eye software has been used to derive gap fraction, leaf area index and clumping index.
- The post harvest light transmittance characteristics will be monitored over the time at 3-month interval.









Gap planting (slash vs. longleaf pine)

- Containerized seedlings of slash pine and longleaf pine will be planted at 1.5m spacing in the gaps created in group selection cuttings in a planting design explained below
- We will assess seedlings' performance with respect to species (slash vs. longleaf pine), gap size, location within gap openings, direction and micro environment altered by conversion harvesting

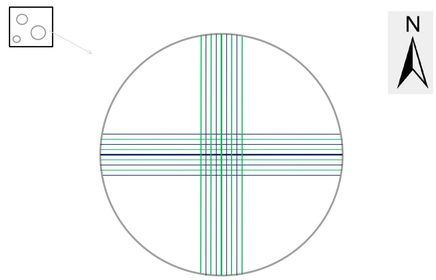


Figure . Planting design for studying relative survival and growth of slash pine (blue rows) and longleaf pine seedlings. The between row and within row spacing is 1.5m. Only inner rows will be considered for observation purpose. The area of intersection of rows provides plot for studying the effects of gap size on survival and growth of seedlings.

Modeling approach

- Different uneven-aged harvest methods with prescribed fire will be evaluated using simulation modeling .
- The sustainable multifunctional uneven-aged method will be one providing sustained values over multiple cutting cycles during the simulation period

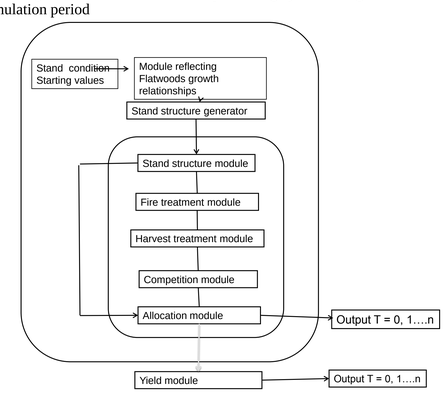


Figure . Schematic simulation modeling for testing harvesting regimes for stand conversion.

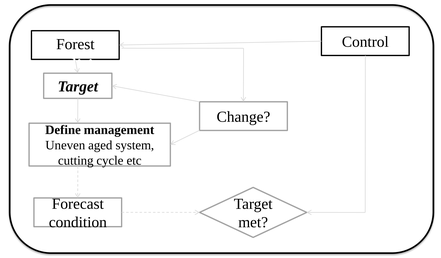


Figure . Adaptive management while shifting from even-aged to uneven aged forest. Reference conditions will be quantified and specified exactly in uneven to judge if and when they have been achieved. Therefore an iterative procedure has been conceptualized

Acknowledgments

For further information

Please contact Ajay Sharma (ajay.sharma@ufl.edu), Shibu Jose (sjose@ufl.edu) and Kimberly Bohn (kkbohn@ufl.edu). More information on this and related projects can be obtained at http://www.sfrc.ufl.edu/cfeor/