
Pine Straw Management Workshop

Mary Duryea and Alan Long

School of Forest Resources & Conservation, Cooperative Extension Service University of Florida

Markets & Contracts

1. Markets

a. Retail Markets

- i. Nurseries and home supply outlets
- ii. Landscape contractors and developers
- iii. Municipal agencies

b. Avenues to the markets for landowners

- i. Producers who rake, bale and may conduct vegetation management operations
- ii. Rake and bale themselves and sell directly to wholesalers, retailers or customers
- iii. Rake only and sell loose straw to balers

c. Prices

- i. Unraked to landowner
 1. \$.25 to \$1.00 per bale
 2. \$60 to \$80 per acre/year (range \$50 to \$200 per acre)
- ii. Raked, delivered to baler: \$1.00 to \$1.50 per bale

2. Sale Methods

a. Per acre

- i. Owner is paid a lump sum (per acre or total property), regardless of number of bales removed
- ii. Advantages
 1. payment before harvesting
 2. competitive bidding can bring highest prices
 3. owner does not keep track of number of harvest bales
 4. producers will rake as much as possible

b. Per bale

- i. Owner is paid for each bale removed or sold in market
- ii. Advantages
 1. do not need pre-harvest estimates of production in yield over time
 2. better for irregular conditions

3. Contracts (a necessity to protect landowner)

- a. May cover single or multiple year harvests

- i. Annual contracts most common right now, but may be extended
 - ii. May include pre-raking operations such as vegetation management
 - b. Sign before harvest begins
 - c. Important specifications (but list is not all-inclusive)
 - i. Location and area (especially if pay per acre)
 - ii. Payment methods, dates, and prices
 - iii. Record keeping methods if pay per bale
 - iv. Responsibilities for vegetation management, site cleanup, fertilization
 - v. Reimbursement for damaged or removed trees, fence lines, roads, etc.
 - vi. Fire prevention and control
 - vii. Duration of contract, dates of baling, and number/frequency of harvests
 - viii. General contract terms regarding:
 - 1. non-employee relationship
 - 2. insurance requirement and non-liability issues
 - 3. workers compensation responsibilities
 - 4. contract revision and revocation
 - 5. access rights
- 4. Opportunities for landowner
 - a. Mid-rotation income, some of which may be used for other operations, eg thinning, fertilization, prescribed burning
 - b. Allows longer rotation for solid wood products
 - c. Can be combined with cattle grazing at earlier age which helps to maintain low levels of ground vegetation

Stand Management

- 1. Appropriate sites and species
 - a. Most favorable sites and conditions
 - i. Old fields and CRP plantations (however, CRP plantations are usually on erodible soils and cannot be rake during life of contract)
 - ii. Sandy or loamy sand soils
 - iii. Minimal hardwood understory
 - iv. Slope < 15%
 - b. Sites to avoid:
 - i. Above average erosion potential
 - ii. Susceptible to soil compaction
 - iii. Deep sandy soils
 - iv. Vines and hardwoods established in understory unless they are killed first
 - c. Species preferences

- i. Longleaf and slash pine for landscaping mulch
 - ii. Loblolly for other purposes, such as mulch around vegetables
- 2. Management Plans
 - a. Outlines stand development/protection operations and harvest schedules
 - b. Defines record keeping needs and financial objectives
 - c. Assistance available through county and consulting foresters
- 3. Natural Stands (especially longleaf pine or longleaf/slash mixtures)
 - a. Maintain stand density around 90-100 sq ft/acre basal area
 - b. Treatment prior to raking
 - i. Fertilization of fully stocked stands, similar to prescriptions for plantations
 - ii. Prescribed burning, mowing and/or herbicides to remove or reduce litter and vegetation
 - c. Raking
 - i. Usually by hand
- 4. Plantation Establishment
 - a. Site preparation and weed control
 - i. Slash removal by piling and/or burning
 - ii. Chemical weed control
 - 1. herbaceous treatment for early seedling establishment (rows or broadcast)
 - 2. woody treatment (brush and trees) to avoid larger problems when raking begins (broadcast)
 - iii. Bedding or other irregular surface features will hinder baling equipment
 - b. Planting and spacing
 - i. Use genetically improved (rust resistant, straight) seedling, preferably large caliper (morphologically "improved"/low density)
 - ii. Machine plant 750 to 900 trees/acre, straight rows with at least 9 to 10 feet between rows
- 5. Vegetation Management and Slash Reduction Prior to Raking
 - a. Reduce litter (branches and cones) and hardwoods with prescribed burning, more than one year before raking begins
 - b. Treat other vegetation during two years preceding first raking
 - i. Mowing (frequency depends on vegetation)
 - 1. 2 seasons before harvest
 - 2. late spring prior to raking to reduce height of low vegetation
 - 3. early fall before harvest

- ii. Herbicide applications 6 to 24 months before mowing or raking to allow time for plants to fall/decompose
 - 1. prescriptions depend on understory vegetation
 - 2. broadcast application with ground-based system
 - 3. repeat treatments may be necessary
 - iii. Prescribed burning
 - 1. cool fires retain underlying organic matter
 - 2. one year before harvest **only**, unless used to control understory vegetation between infrequent straw harvests
- 6. Age and frequency of harvest
 - a. Age depends on crown closure and needle fall
 - i. Focus on early years, immediately after crown closure
 - ii. As stands get older, needle production levels off, and branches and cones compose larger amount of litterfall
 - iii. First thinning usually halts pine straw harvest because of residual litter
 - b. Recommendations
 - i. Begin at age 8 to 12 years
 - ii. Harvest 3 to 4 times at 1-2 year intervals
- 7. Fertilization: Is it required to harvest pine straw?
 - a. No – but you may limit harvests and income
 - b. Yes – to maintain a sustainable harvest of both needles and timber
 - c. Two general prescriptions
 - i. Annual raking (starting in young plantations, age 8 to 10 years)
 - 1. age 6 years (crown closure): 200 lb N, 50 lb P, 80 lb K
 - 2. every 5 years after: 200 lb N
 - ii. Periodic raking (2x – 3x in established stands)
 - 1. age 8-12 years: 150-200 lb N, 50 lb P
 - 2. upland sites (E, F soil Groups): same + 50 lb/A K
 - iii. Different application methods are generally equally effective but it should occur in mid winter (December to February)
 - d. Fertilizing will probably require herbicide applications at the same time
 - e. For annual raking operations, regularly monitor foliar nutrient status
- 8. Stand Monitoring
 - a. Evaluate stand growth, health, and nutrient status regularly if raking planned more than one or two times
 - b. Compare with a small, nearby unraked area

Ecological Impacts

- 1. Role of Needles in Nutrient Cycling

- a. Needles decompose over a 2 to 4 year period after falling with:
 - i. Gradual release of nutrients into soil
 - ii. Addition of organic matter to soil
 - b. Inherent differences among sites
 - i. Old fields
 - 1. residual nutrients higher than cutover sites
 - 2. most suitable for pine straw harvesting
 - 3. nitrogen, most likely to limit growth
 - ii. Flatwoods – less fertile than Middle and Upper Coastal Plain sites;
 - iii. Soils with fine texture horizons – more suitable for pine straw management
 - iv. Sandy uplands – least likely to support nutrient removals
 - c. Single harvests remove (depending on proportion of area that is raked):
 - i. Nitrogen 5-60 lb/A
 - ii. Phosphorus 1-5 lb/A
 - iii. Potassium 1-29 lb/A
 - iv. Calcium 3-21 lb/A
 - d. Higher rates of removal for loblolly than slash or longleaf because:
 - i. Higher foliar concentrations in loblolly
 - ii. Greater needle production in loblolly
 - iii. Higher fertility on typical loblolly sites
 - e. Repeated harvests in slash pine plantations (eg annual, age 10-22) remove:
 - i. N 225 lb
 - ii. P 16 lb
 - iii. K 13 lb
 - iv. Ca 104 lb
 - v. Mg 25 lb
 - f. Repeated harvests remove 2 to 4 times more nutrient (N, P, K) than harvest of merchantable portions of stems
 - g. Conclusions
 - i. Few forested sites can be expected to support repeated removals of pine straw without fertilization
 - ii. With fertilization, most sites can support higher pine straw harvests
2. Effects on Timber Harvest Levels
- a. Decease foliage and wood production: inference from research on the effects of fertilizers
 - b. With fertilization, more foliage and pine straw:
 - i. Increased straw production about 1050 lb/a/yr for first 3 years after mid-rotation fertilization with nitrogen
 - ii. Increased stem volumes

- c. Damage to trees during raking/baling operations may result in regrowth loss, mortality or pest problems
3. Effects on Other Soil and Soil Surface Functions
- a. Invertebrates and microorganisms
 - i. Ecological roles
 - 1. links in food chain for larger animals
 - 2. decompose and decay litter and create organic matter
 - ii. Removal of pine straw reduces number and diversity (hypothetical)
 - b. Soil insulation
 - i. Reduced/removed litter and needle layer increases soil temperature
 - ii. Increases evaporation from soil, thereby decreasing soil moisture
 - iii. Increases rate of oxidation of humus and organic matter
 - iv. Decreases water and nutrition binding sites on organic matter and litter
 - c. Water quality
 - i. Filtration through soil – effect on this function is not clear:
 - 1. water movement through soil probably increases, but..
 - 2. there are fewer nutrients to be leached
 - ii. Erosion potential
 - 1. Yes – if harvests at less than 2-year intervals on erodible soils on slopes > 8 - 12%
 - 2. No – if slopes < 8% or sandy/sandy-loam soil
- if harvests at 2 to 3 year intervals or longer (layer of partially decomposed needles remains intact)
 - d. Soil compaction?
 - i. No effects (generally) because:
 - 1. most soils under pine straw management are coarse textured
 - 2. equipment is relatively light weight
 - 3. baling usually done in dry weather
 - ii. Yes (some risk) – with frequent repeated baling on fine-textured soils
4. Effects on Wildlife
- a. Food source
 - i. Negligible forage for ground-feeding animals, except at edges
 - ii. Minimal source for insectivorous animals
 - b. Stands may still be used for thermal cover, escape and nesting in tree crowns
 - c. Overall: reduced diversity and numbers during periods of pine straw management

Herbicides

Site Preparation

1. Current Technology
 - Herbaceous control with Oust, Arsenal, Velpar, Accord
 - Hardwood and shrub control with Arsenal, Velpar, Accord, Garlon
 - Herbicides often combined with fire or mechanical treatments
 - Treatments more effective with site preparation than waiting two or more years after planting
2. New Formation
 - Chopper (27% imazapyre, emulsifiable concentrate mixable with water and oils, which require constant agitation in mix tank)
 - Apply as broadcast or directed foliar spray (40-80 oz/ acre in 5 gal emulsion)
 - Wide application window: April to November
 - Early growing season treatment allows time for burning or mechanical treatments and reduces/eliminates seed production
 - Late season application provides herbaceous control after planting
 - Also used for conifer release or mid-rotation release below pine canopies
3. Other Site Preparation Considerations
 - Compact soils: combine mechanical treatment (plow/ripper) on contour with herbicide

Mid-Rotation Release

1. Benefits
 - Reduce understory shrubs and hardwoods
 - Increase volume and tree diameters
 - Change wildlife forage from shrubs to herbs
 - Reduce wildfire intensity
 - Improve visibility for hunting, thinning, recreation
2. Chemicals
 - Arsenal: loblolly pine, 16 oz/acre, midsummer to fall; slash or longleaf, <12 oz/acre
 - Chopper: 32-64 oz/acre
3. Treatment Applications
 - Ground sprayers or aerial
 - 10-15 year old stands

Water Quality and Herbicides

1. pH
 - Most herbicides function better in acidic water than in alkaline
 - Acidic solutions stick better to leaf surfaces
 - pH 5.0-6.0 ideal; above 7.5 a problem

- Test with pool kit or other pocket pH test kit
- 2. Soft vs Hard Water
 - Herbicides perform better in soft water (<1000 ppm dissolved solids)

New Developments

1. Herbicides + Fertilization in New Plantations
 - Broadcast herbicides (Arsenal, Garlon, Accord, Velpar, others) usually as site preparation
 - Fertilizer (often 250 lb DAP) at age 3, and every 5 years after (just N)
2. Mid-Rotation Herbicides + Fertilizer
 - Herbicides depend on understory, for example
 - Garlon 4 (for heavy gallberry, palmetto)
 - Chopper or Arsenal (hardwoods, gallberry, titi, fetterbush, yaupon, waxmyrtle)
 - Accord (hardwoods)
 - Mixes, et Accord + Arsenal
 - N or N+P 1 to 2 years later; mid-rotation prescriptions