Pine Straw – an Agroforestry Enterprise

Introduction

The foundation of agroforestry is putting trees to work in conservation and production systems for farms, forests, ranches, and communities. *Working Trees* that produce pine straw can provide supplemental income to woodland owners during years that no timber is being harvested or if used in a silvopasture system during the years that livestock are being raised.

Pine straw (fresh, un-decomposed pine needles that have fallen on the forest floor) is a valuable woodland resource in the southern pine region of the US. Geographically, most pine straw markets are in the southern United States with a slow but steady expansion both northward and westward. Pine straw has been a popular landscape ground cover throughout the South for the past 25 years. It is one of the most widely used mulches for all size projects from residential flowerbeds to industrial complexes and highway landscapes.

Benefits

Why use pine straw as a garden or landscaping mulch? There are many excellent mulch options, from lawn clippings and compost to newspapers and coconut — what is so great about pine straw? Besides it being produced naturally and sustainably, there are numerous garden and landscape health and beauty advantages to using pine straw mulch.

Benefits of using pine straw for groundcover:

- long lasting
- light weight
- high in nitrogen
- fine textured and uniform color
- deters weeds
- insulates tender roots from temperature extremes,
- conserves soil moisture
- encourages water infiltration and reduces runoff
- controls soil erosion
- adheres well to slopes and does not wash away
- keeps some vegetables from forming mildew, mold, or developing rot
- pest free – it doesn't attract termites

Getting Started

The easiest way to get started in pine straw management is with an already established plantation of pines. Another alternative is to plant pines on unused or marginal cropland or pastureland and then harvest pine straw after pine establishment. Either way, the following are some important management steps in getting started with pine straw production.

1. Develop a management plan. To successfully begin and manage a pine straw enterprise, it is important to have a management plan that includes objectives, level of involvement, market potentials, and assistance needed.

2. Identify sites. Start with sites that have the greatest potential for pine straw. Existing native pine stands or pine plantations eliminate the need and cost of starting from scratch. *Caution: Natural pine stands with unusually high quality native understory vegetation, sites that support rare plants, and sites that support threatened and endangered species should not be used for pine straw production. Do not use sites on erodible soils with slopes greater than 8%.*
3. Control weeds. The pine stand must be free of vegetation in the understory because these plants will interfere with raking. Shrubs and trees can be controlled with fire, herbicides, livestock or mechanical weeding.
4. Establish management units. Divide the acreage to be raked into several units and rotate the raking regime so that only a portion of any area is raked each year.

General Operations

Prepare the site. A great deal of effort and planning is required to prepare pine stands for harvest of pine straw that is free of cones, leaves, limbs and trash. In fact, at least two years of preparation may be required before high quality clean pine straw can be mechanically harvested with minimal effort. Before raking, the area must be cleared of all twigs, pine cones, and tree limbs.

- Remove (prune) the lower limbs of every tree that might block the movement of equipment and laborers within the rows. Prune by hand or remove limbs more cost effectively by using a modified cutter attached to a small tractor. Depending on tree height, pruning may not be necessary in hand-raking operations.
- Remove all trees and shrubs within the baling rows. This is also a good time to remove diseased trees within the rows as well.
- Remove all limbs and other debris from the baling rows. The debris must be picked up or raked off the site. Depositing the debris every sixth or seventh row eliminates the need to move the debris great distances and reduces labor cost.

Rake pine straw. Surprisingly, raking and baling are the easiest and fastest parts of harvesting. Raking can be done by hand or machine. When raking by hand, rake the pine straw into piles, which can be later pitch-forked into a baling machine. Machines, on the other hand, rake the pine straw into windrows which can then be picked up by hand or machine. Production is higher with raking machines but a disadvantage is that machines can damage pine trees. Damaged trees will have reduced growth and are more susceptible to bark beetle attack and possible mortality. August through November are usually the ideal months for harvesting pine straw. Harvesting pine straw in a typical pine plantation generally requires the following steps:

- Rake the pine needles by hand or by machine into windrows. Exclude any insects (especially ants), excess litter, grass, and hardwood leaves that might reduce the value of the bale. Low-grade straw that contains extraneous debris or partially decomposed needles may be sold at a discount. Be careful to avoid seeds of noxious weeds and other plants that might present a problem in landscaping yards or flower beds.
- Rake only “red needles” which are the un-decomposed, recently fallen needles. Leave undisturbed the “gray needles” which are the partially decomposed older needles. Rake needles in the middle of the peak needle fall period, typically October. Subsequent needle fall in November will contribute a small amount of new needles to the forest floor even in years when raking occurs.

Bale pine straw. Many farmers already have the equipment needed for a start up venture. Basic equipment includes a hay rake, mechanical baler, small tractor, equipment trailer, storage barn, and truck. Some people use an old style, dump rake which can go between trees more easily, can be lifted over obstructions and will windrow the straw.

Baling pine straw is very labor intensive. The most common method today uses box balers with an individual capable of baling between 100 and 200 bales per day. Tractor-powered balers can also be used with one person pitch-forking the straw into the baler, another tying the wire around the bale, and another person stacking the bales. A three-person crew can produce 250 to 300 bales per day. If the straw is raked into windrows and then mechanically picked up and baled, production can reach 1000 bales per day. A highly productive crew of five people will require 2 to 3 weeks to prepare, clean, rake, bale, and haul pine straw bales from a typical 30-acre pine plantation.

Fertilize. As the nutrients are removed, tree growth and vigor may decline. As much as 40 lbs of Nitrogen is lost for every 100 bales of straw per acre harvested. Fertilizer can be used to improve tree growth and replace the nutrients that are removed with this raking. Fertilization may also increase pine needle (pine straw) production. Studies have shown two to five times more needle biomass after fertilization. Monitor fertility levels by periodic soil testing and pine needle nutrient analysis and, if indicated, be prepared to add fertilizer at recommended rates.

Typical fertilization recommendations generally suggest broadcasting 150 to 200 lbs of nitrogen per acre and 50 lbs of elemental phosphorus per acre every five years. Broadcast 250 lbs of DAP per acre will apply about 45 lbs of the nitrogen and the 50 lbs of phosphorus needed. The additional 100 to 150 lbs of nitrogen per acre can be applied as urea fertilizer. Trees use phosphorus to increase wood growth, and nitrogen stimulates foliage growth and thereby pine straw yields. Potassium might also be supplemented at a rate of 50 to 80 pounds per acre. Careful fertilization will increase needle fall volumes but over-fertilization can damage or kill some pine trees. It is important for harvesting operations to leave a layer of straw and organic matter. Harvesting pine straw may also have long- term effects on soil chemistry.

Rotate harvests. The biggest concerns over pine-straw management are the possible negative effects on tree growth and soil productivity. Pine needles serve as a cover for the soil and also recycle many of the nutrients that pine trees need for growth. By removing the pine needles, the soil is exposed to erosion and nutrients are removed from the ecosystem. The frequency of raking will depend upon landowner goals and objectives and the resilience of the site. Fertile sites can be raked more often than sandy non-fertile sites. To avoid long-term negative effects from pine straw management, it is advisable to rake an area only up to five times during a 20-year rotation.

Studies have shown that productive soils and sites can be managed on a 3-year “rest-rake-burn” rotation. Needles accumulate the first year, raking occurs the second year and the third year needle fall is used as fuel to carry a prescribed burn. Burns can be conducted either in late winter (December-February) or during the growing season (April-July). Other sources recommend a longer 3-4 year raking interval. This interval may be suitable for less productive or more environmentally sensitive sites. Decisions about when to rake and when to burn, should be based upon the condition of the understory and whether fire is called for to set back woody species encroachment.

Marketing and Selling

Typically, pine stands will yield 100 to 150 bales per acre per year if all conditions are right or approximately two tons per acre each year. This quantity can vary from 60 bales per acre on less suitable sites to as much as 200 bales per acre on exceptional sites. Factors such as tree age, species, stand density, soil fertility and season affect straw yields. Other variables that contribute to pine straw yields include interval between harvests, bale size, "cleanliness" of stand, and raking efficiency.

Landowners have generally two choices when selling pine straw:

- Harvest the straw and sell retail with payments typically on a per bale basis.
- Lease the land for baling rights to a pine straw company which will rake, bale, and market the pine straw. Payment is usually on a per acre basis.

References

Straw raking in Southern Pine Stands and Fertilization Recommendations. 2003. Dickens, D.E., D.J. Moorhead, L.A. Morris and B.C. McElvany. Warnell School of Forest Resources, Univ. of GA, Athens, GA.

Pine Straw Management in Florida's Forests. 2003. Mary Duryea. Univ. of FL, IFAS Extension Circular 831.

Silvicultural Guidelines for Pinestraw Management in the Southeastern United States. 1992. Morris, L.A., Jokela, E.J. and J.B. O'Connor. GA Forestry Comm., GA Forest Research Paper No. 88.

Managing Pine Straw Harvests to Minimize Soil and Water Losses. 2008. Pote, D. H. and Daniel, T.C. Journal of Soil and Water Cons. Vol. 63, No.1.

Managing Your East Texas Forest for the Production of Pine Straw. 2003. Taylor, E.L. and C.D. Foster. TX A&M CES Pub 805-113.

Pine Straw Feasibility Study – Great Lakes Region. 2005. Donald R. Peterson. Glacierland Resource Conservation and Development (RC&D). 24 pgs.

Production and Management of Louisiana Pine Straw. 1991. Robert Mills and Daniel Robertson. Louisiana Cooperative Extension Service. Pub. 2430.

Authors

Douglas Wallace
Thomas Ward