Pine Straw Management in Florida's Forests

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- Pine plantations in Florida can be managed for pine straw by raking, baling, and selling freshly fallen pine needles to homeowners or garden centers.

- The greatest needle fall is during the autumn months (September through November) and, hence, one of the best times to rake needles is during winter.

- A blanket of pine needles on the forest floor serves many important purposes for the forest; some of these include: recycling nutrients to be used for tree growth, providing food and habitat for animals, and protecting the soil from erosion.

- Because of these important benefits of pine straw to the forest, we recommend that the raking and baling of pine straw be limited to 5 times during the life of a plantation.

- The best time during the life of a pine stand to begin raking is around 8 years when pine yield will be between 100 to 150 bales per acre. The maximum yield is at age 15 (200 to 300 bales per acre).

- In the most commonly employed method for pine-straw management, the landowner sells to a pine-straw company, which will rake, bale, and market the pine straw. Payment is usually on a per acre basis.

- The management steps for a pine-straw operation include developing a management plan, controlling weeds, raking and baling pine straw, and selling the pine straw. Fertilizing the pine stand may increase tree growth and pine-straw production.

<table>
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<tr>
<th>Pine Straw (or pine needle litter)</th>
<th>The fresh, undecomposed pine needles that have fallen to the forest floor.</th>
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<tr>
<td>Forest Floor</td>
<td>All the twigs, leaves, and other organic materials which rest on the soil surface which have not been mixed with the soil.</td>
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<tr>
<td>Understory</td>
<td>All the plants growing under the main stand of pines.</td>
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<td>Rotation</td>
<td>The time from planting of pine seedlings to the harvest of pine trees. (Usually 20 to 30 years for slash pine.)</td>
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Table 1. Useful Definitions for Pine Straw Management.
Pine Straw Management in Florida’s Forests

Introduction

Managing for pine straw is a relatively new enterprise in Florida’s pine forests. Pine straw is composed of the needles that annually fall from pine trees. This freshly fallen pine straw can be raked, baled and sold to garden centers. Landscapers and homeowners use pine straw as a mulch or ground-cover in gardens and landscaping.

The easiest way to get started in pine-straw management is in an already established stand of pines that is at least 8 years old. Slash and longleaf pines are the two Florida pine species that can be baled. Needles of the other pines are too short to be baled properly and are considered to be of inferior quality by landscapers. The pine stand, which is to be raked, must contain undecayed fresh pine straw, must be free of other vegetation in the understory, and must be cleared of all twigs and limbs before raking.

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. To avoid long-term negative effects from pine-straw management, it is advisable to rake an area only up to five times during a 25-year rotation.

Natural Production of Pine Straw

When to Rake During the Year

Pines grow in height during the spring and summer; at these times they are also growing pine needles. The needles stay on the pine tree for two years providing food for the tree through the process of photosynthesis as well as many other important functions. After needles are two years old they turn brown and fall from the tree. This can occur anytime during the year but the greatest needle fall is during the autumn months (September through November) (Figure 1). Consequently, one of the best times to rake needles is during winter. There is also less rainfall during the winter so the pine needles are drier which makes raking and baling easier.

Figure 1. Monthly pine needle fall over a year (adapted from Gholz 1989, unpublished data).

When to Rake During the Life of A Pine Stand

Needle-fall in a pine stand increases with age to a peak at age 15 years (Figure 2). There is a slight decline in needle fall after age 15 but it remains relatively constant through age 35. The best time during the life of a pine stand to begin raking is around 8 years.

Figure 2. Annual pine needle fall over 35 years in a slash pine plantation (Gholz et al 1985).
Why Forests Need Pine Straw and The Effects of Removing It

A blanket of pine needles on the forest floor serves many important purposes for the forest (Figure 3). Some positive benefits are:

1. Nutrients (such as nitrogen, phosphorus, and potassium) in the pine needles are recycled as they decay and the trees take up these nutrients and use them to grow. Decayed pine needles become part of the soil's organic matter, which holds nutrients making them more available for trees and other plants. Nutrients are also stored in the litter; for example, by age 30, a pine forest has as much phosphorus in the forest floor as in the trees (Gholz et al. 1985).

2. Pine litter provides food and habitat for many animals. These animals (for example, earthworms and beetles) help decompose the litter and are a source of food for many species of wildlife such as birds, frogs, and turtles.

3. Pine litter helps insulate the soil from extremes in temperature and moisture. It also protects the soil from rain, reducing erosion.

4. The fresh and partially-decayed pine litter has great water-holding capacity, thereby providing water for tree growth. The litter layer can also reduce evaporation of water from the surface making more water available for trees.

Because of the benefits of pine straw to the forest, repeated annual removal of the pine straw for many years may have drastic effects on a forest stand. Research data on long-term effects of pine management on Florida's forests is limited. Some possible negative effects are reduced tree growth (McLeod et al. 1979), tree mortality if trees are damaged by machinery, a change in the wildlife in the forest with a reduction in some animals such as birds, increased soil erosion and lower soil productivity.

We recommend that, to reduce these deleterious effects, forests be raked up to 5 times during the rotation. For example, begin raking when the stand is 10 years old and rake for 5 years. Using this moderate approach to raking removes no more than 25% of all the needles produced by the pines, insuring that pine litter can build up and protect the soil between rakings.

Marketing of Pine Straw

Landowners may market pine straw in two ways:

1. The landowner rakes, bales, and sells pine straw directly to the consumer or retailer. Payment is on a per bale basis (Figure 4).

2. The landowner sells to a pine straw company, which will rake, bale, and market the pine straw. Payment is usually on a per acre basis (Figure 4).

Figure 4. Two ways that a landowner may market pine straw.

The second method is most common because the landowner spends little time and money during the operation and does not need to own any equipment. Steps involved include:
Pine Straw Management in Florida’s Forests

1. Landowner obtains competitive bids from several companies (bids are usually made on a per acre basis).

2. Landowner and pine straw company (contractor) draw up a contract with conditions of sale, and provisions including date of payment, what is to be done if trees are damaged, dates of the baling.

3. Contractor pays landowner.

4. Contractor rakes, bales, and ships pine straw.

Yields of Pine Straw

If you begin raking when a pine stand is 6 years old, the yields will be relatively low (50 to 75 bales per acre). As we previously mentioned, to avoid possible deleterious effects of frequent removals, we recommend raking up to five times during the life of the pine plantation (the rotation). At age 10, pine straw yield will be between 125 to 200 bales per acre. The maximum yield is at age 15 (200 to 300 bales per acre) (Figure 5). Thereafter, there is a slight decrease to approximately 200 bales per acre. Because of these differences in yield over the life of a stand, it is important that the landowner obtain competitive bids for each year of baling.

Managing For Pine Straw

The easiest way to get started in pine straw management is in an already established plantation of pines that is around 8 years of age. Another alternative is to plant pines on unused or marginal cropland and then harvest pine straw 8 years after pine establishment. The following are management steps in an established stand of pines:

1. Develop a management plan. To successfully begin and manage a pine straw enterprise, it is important to have a management plan. Ten of the steps to establishing a plan are included in IFAS Circular 810, “Alternative Enterprises For Your Forest Land”, (Duryea 1988) and include: defining your objectives and level of involvement, investigating marketing potential, and deciding what kind of assistance you will need (Figure 6). Steps for determining the financial feasibility of a new enterprise are provided in IFAS Circular 836, “Estimating the Profitability of Your Forestland Enterprise” (Hubbard et al. 1998).

2. Control weeds. The pine stand must be free of vegetation in the understory because these other plants will interfere with raking (Figure 7 and Figure 8). Shrubs and trees can be controlled with herbicides or mechanical weeding.

3. Rake pine straw. Before raking, the area must be cleared of all twigs, pine cones, and tree limbs. Raking is done by hand or machine. When raking by hand, one or two persons rake the pine straw into piles, which are later, pitchforked into the baling machine (Figure 9 and Figure 10). 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 easily damage pine trees. Damaged trees have reduced growth and are susceptible to bark beetle attack and possible
Figure 7. Vegetation in the understory must be controlled before a pine stand can be managed for pine straw. A pine stand where the understory vegetation has been eliminated to allow raking of pine straw.

Figure 8. Vegetation in the understory must be controlled before a pine stand can be managed for pine straw. A pine stand where understory trees and shrubs make raking impossible.

mortality especially when damaged during the winter dry season.

Figure 9. Before raking, the area must be cleared of all twigs, pine cones, and tree limbs.

Figure 10. Raking by hand is the most common method of raking.

4. Bale pine straw. Baling pine straw is very labor intensive. The most common method today uses box balers with an individual baling between 100 and 200 bales per day. Tractor-powered balers can also be used with one person pitchforking the straw into the baler, another tying the wire around the bale, and another person stacking the bales. This three-person crew can produce 250 to 300 bales per day (Stanton 1986)(Figure 11). If the straw is raked into windrows and then mechanically picked up and baled, production can reach 1000 bales per day (Stanton 1986).

Figure 11. For mechanical baling, a three-person crew usually works on a tractor-powered baler with one person pitchforking the straw into the baler, another tying the wire around the bale, and another person stacking the bales.

5. Fertilize. Fertilizer may be used to improve tree growth and replace the nutrients that are removed with raking. Fertilization may also increase pine needle (pine straw) production; studies have shown two to five times more needle biomass after fertilization (Jokela 1989, unpublished data; Colbert 1988). (For more information on fertilization of pine stands, see Kidder et al. 1987).
Assistance for pine-straw management is available through County Extension offices, Florida Division of Forestry, university personnel, and consultants. It is advisable to consult with these people for assistance in forest management planning, contract negotiations, financial analyses, marketing, and many of the other important steps in planning and management of a pine straw enterprise.

Literature Cited


