Pine Straw Management and Harvest in Longleaf Pine Forest

Best Management Guidelines to Sustain Wildlife

Written by Mark A. Bailey
on behalf of National Wildlife Federation

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Executive Summary

The goal of this document is to help landowners balance income from pine straw harvest, which can offset some of the costs of restoring and managing longleaf pine, while preserving critical wildlife benefits of straw-harvested stands. Balancing the economic and environmental benefits of pine straw can be challenging to landowners and natural resource scientists alike, as maximizing one compromises the other. While pine straw is valuable to homeowners as a mulch, pine needles are also valuable to the forest, serving critical ecological functions, including helping to carry prescribed fires as a fine fuel, protecting soil and water resources, and cycling nutrients. This document attempts to balance pine straw's economic value to landowners with its ecological values to the forest, i.e., optimizing rather than maximizing those values. The Best Management Guidelines (BMGs) presented in this document are intended to show how pine straw harvest can be integrated into a larger management system that minimizes detriments to wildlife and eventually transitioning to an open, fire-maintained, woodland-savanna condition more favorable to wildlife.

Without periodic fires, the flora and fauna adapted to longleaf pine ecosystems cannot flourish, so conducting prescribed burns is integral to these guidelines. Though developed specifically for longleaf pine, these guidelines are also relevant to pine straw harvests from loblolly and slash pine stands, with modification of recommendations regarding timing of first fire.

These BMGs were developed through a process that involved an advisory group of natural resource professionals with expertise in pine straw production, wildlife (insects, amphibians, reptiles, birds, and mammals), forestry, and native ecosystems. Presented here are general recommendations based on basic ecological principles and practical experience. Although pine straw harvest has been conducted in the Southeast for decades, data on its effects on wildlife are limited. As research brings additional information to light, these BMGs may need modification.

Click here for more on NWF's work on longleaf pine ecosystem restoration.

Introduction and Background

The harvest of freshly-fallen pine needles is a growing industry in the southeastern United States. Pine straw makes an excellent and attractive mulch and is much in demand for landscaping. Commercial operators bale pine straw and sell it to contractors and garden centers who, in turn, sell it to homeowners. Pine straw can be a valuable source of income for forest landowners, providing an opportunity to cover some of the costs of plantation establishment and pay for prescribed burning and other management practices to maintain and enhance longleaf forest habitat conditions. Longleaf pine is the favored species because of its long and durable needles, followed by slash and then loblolly. Pine straw collection can usually begin at about the eighth year of a plantation with production peaking at about age 18, with longleaf stands typically yielding 50-100 bales per acre.[1] Peak needle fall occurs between September and November. Landowners may harvest pine straw themselves but the collection, baling and marketing is typically done by a contractor who pays the landowner on a per-acre or per-bale basis.

Pine straw can be collected from both natural stands and plantations. It is frequently obtained from plantations where evenly spaced trees facilitate hand or mechanical gathering in which needles are collected and bundled using either manual or tractor-powered balers. Both mechanical and hand raking may result in significant soil disturbance and damage to ground cover. While heavily raked, densely stocked, row-planted stands on relatively bare soils may generate more revenue, these stands have little wildlife value.

A third collection technique, lifting of straw using a pitchfork, is by far the least detrimental to the groundcover and soil. In natural (*i.e.*, non-plantation) stands, pine straw harvesting is typically done using hand rakes or pitchforks and a simple box baler. Because hand crews can maneuver between trees more easily than large equipment can, less preparation is required than if the site were a plantation to be mechanically harvested.[2]

To facilitate pine straw harvesting, most stands require periodic "cleaning up" to remove limbs, sticks, weeds, and shrubs. Depending on the site, this is accomplished with any combination of prescribed fire, herbicides,[3] and mechanical and/or hand clearing. Dead or live standing woody growth is often cut and piled.

Pine straw harvesting does not suit every landowner's needs. Plans for wildlife habitat may call for wide tree spacing and fewer trees per acre than are ideal for pine straw production. For example, bobwhite quail and gopher tortoise management necessitates maintaining open forest canopies coupled with frequent prescribed fire to provide sufficient sunlight and retain seed-producing and forage plants. Because traditional intensive pine straw harvesting methods require limiting understory debris and vegetation that often serve as habitat and food for wildlife, intensive straw removal is not a good fit for landowners seeking to maximize wildlife values.[2]

Repeated total removal of pine needles from the forest floor comes at a cost to water quality and wildlife.[4,5] Intensive raking can damage understory plants and remove decaying pine needles that contribute to soil nutrients and soil organic matter, both of which foster site productivity. Decomposing pine needles are essential for soil microorganisms and invertebrates which are food for birds, reptiles,

and amphibians which in turn are prey for other animals farther up the food web. Pine needles insulate the soil from temperature extremes, help retain soil moisture, and protect the soil surface from erosion. Prescribed fire in longleaf pine forests is essential in maintaining native understory plants and associated insects and wildlife. Pine needles provide much of the fine fuels necessary to carry prescribed fire across a stand.

The following guiding principles helped define the uses and limitations of the BMGs:

- Integrate considerations addressing wildlife objectives at both the site-specific and landscape scales as part of pine straw harvest sustainability plan that can be used as part of the overall forest management plan
- Incorporate wildlife diversity when pine straw production is conducted in natural longleaf stands
- Incorporate wildlife diversity when plantations intended for pine straw production are established on sites previously converted from natural longleaf (i.e., old fields, Conservation Reserve Program lands[6], former loblolly or slash stands, etc.)
- Balance environmental sustainability and the needs of production economics
- Must be feasible to adopt and include profit potential
- Intended for use by both the pine straw industry and landowners

These BMGs emphasize longleaf pine since (1) longleaf-dominated ecosystems with their characteristic suite of flora and fauna historically predominated in most places where pines are currently grown in the Southeast, and (2) longleaf is the favored species for pine straw operations. The same principles can be applied to slash and loblolly pine, except for prescribed burning in stands under 12 to 15 years old. The guidelines were designed to focus on the effects of site selection, planting design, establishment, management, and harvest of pine straw on wildlife and their habitats. Effects on longleaf-associated birds, mammals, reptiles, amphibians, and insects are considered.

Sustaining wildlife with pine straw harvesting operations necessitates considering, in the context of the differing needs of individual species, the type of stand (natural vs. planted), existing groundcover condition (many, few, or no native species), presence/absence of invasive exotics, how intensively the stand will be managed, and with what inputs (fire, thinning, herbicides, fertilizers), how much area the stands occupy, how they are to be harvested (manually vs. mechanically) and the timing and frequency of various management operations. The advisory group of natural resource professionals worked together to consider, sort out implications, and identify approaches that integrate a basic level of consideration of wildlife needs.

Wildlife of Longleaf Pine Forests

The plant diversity found in some native longleaf pine habitats is among the highest known for any in the temperate zone.[7] On sites that have not been farmed and where fire has not been excluded, **wiregrass** (left) is the most conspicuous component of the groundcover through most of the Coastal Plain in the eastern part of the longleaf range, with bluestem and other grasses replacing it in western Alabama, Mississippi, Louisiana, and Texas. More than the trees themselves, the rich fire-maintained

herbaceous ground cover of native forbs and grasses is integral to the ecosystem's wildlife health and diversity, and should be retained wherever present.

Insects and other Arthropods

Although in need of further study, arthropod herbivores and litter detritivores have important roles related to community function. Of the estimated 4,000 to 5,000 arthropod species characteristic of xeric (dry) longleaf pine habitats, perhaps ten percent are found only in this forest type.[8] Ant diversity is particularly high, with one arboreal species being the dominant food item in the diet of adult red-cockaded woodpeckers in the Florida panhandle.

Amphibians and Reptiles

Collectively referred to as herpetofauna, these two groups have reached a high level of diversification in longleaf woodlands. Of over 70 species found in the ecosystem, about a third are considered "longleaf specialists" and are rarely found elsewhere.[9] Many are dependent on the soil microclimate, so maintaining native groundcover through fire and reduced canopy cover is essential. [10, 11] Burrows of gopher tortoises and Southeastern pocket gophers, where present, provide important below-ground retreats for other species. The herbivorous gopher tortoise has been documented to feed on 53 plant species,[12] and needs a diverse herbaceous groundcover. Other "longleaf specialist" species of conservation concern include the eastern indigo snake, Louisiana and Florida pine snakes, southern hognose snake, eastern diamondback rattlesnake, dusky and Carolina gopher frogs, frosted and reticulated Flatwoods salamanders, striped newt, eastern tiger salamander, and ornate chorus frog.

Birds

Longleaf pine forests provide nesting and foraging habitat for many bird species, including the endangered Red-cockaded Woodpecker, which requires old living pines for nesting and roosting. Frequent prescribed burns control woody stem growth and promote the early successional herbaceous understory required by many ground nesters such as Northern Bobwhite, Common Ground-dove, Common Nighthawk, and Bachman's Sparrow. Of the 86 bird species characteristic of longleaf pine forest, 36 percent forage primarily on or near the ground.[13]

Mammals

Most mammals of the region tend to be habitat generalists, but species with ranges closely paralleling longleaf pine and that are most commonly found in the habitat type include Oldfield Mouse, Southeastern Pocket Gopher, and Southeastern Fox Squirrel (four subspecies). Of the 36 mammals characteristic of longleaf pine forest, 69 percent forage primarily on or near the ground in longleaf forest.[13]

Importance of Site History and Condition

Every situation is unique, but tracts to be harvested for pine straw will probably fall into one of two types:

Type 1 includes longleaf plantations on old fields or former intensively managed loblolly/slash plantation in early stages of stand establishment, having little if any native groundcover due to past management practices. Type 1 represents the majority of pine straw producers. If prescribed fire has not been part of the management history, wildlife habitat will likely be poor at the first, second, and perhaps third straw harvests. A mechanical first raking of such sites may have negligible impact on wildlife. But as prescribed burning is employed, and especially once the first thinning occurs, managing for understory will become more important; major factors include light entry, basal area, and burning frequency. Plant diversity and structure can be expected to improve over time with frequent fire, especially when seed sources are available on adjacent or nearby sites. As conditions improve, straw harvest techniques more compatible with the habitat may be required.

Type 2 includes natural or re-planted semi-natural stands and plantations that retain at least some native understory or stands where understory could be quickly restored with management such as burning and frequent thinning. Type 2 represents better wildlife habitat and—assuming conditions are maintained—perhaps a less lucrative pine straw source, but there is still potential for long-term sustainable management that does not negatively impact current habitat and provides income to support sustainable ecosystem management practices.

Best Management Guidelines (BMGs)

Landscape and Site Selection Considerations

- Natural stands with unusually high quality native understory vegetation and sites that support rare, threatened, or endangered plants and/or animals should be managed for those values and either not raked for pine straw or only occasionally hand-lifted with great care.

- Plant longleaf on existing cropland or pine plantation lands (do not convert natural stands). Many landowners manage for straw income early on with the idea of concentrating on habitat and wildlife diversity after the first thinning.

- Avoid sites with erodible soils having slopes greater than eight percent.[14]

Management Considerations

- To minimize soil disturbance, soil compaction, and damage to trees and understory plants, avoid mechanical raking when possible, particularly if understory is present. Hand raking can be less damaging than mechanical raking, though it can still damage understory plants. Least damaging to understory, pitchforks can be used to lift straw, though it is not always available and requires skilled labor. Some productivity may be sacrificed with lifting pine straw, but it can be economically viable and most of the understory should remain intact.

- *A prescribed burning program is essential to wildlife management in longleaf pine stands.* Use regular (i.e., two to three year rotation) prescribed fires to maintain an open understory and groundcover plants important to wildlife. Burns can be conducted either in the dormant (December-March) or growing (April-July) season. Decisions about when to collect straw and when to burn should be based upon the condition of the understory, but native grasses and other groundcover species respond best to growing season burns.

- Implement thinning as needed to prevent total crown closure and loss or significant reduction of herbaceous groundcover, maintaining sufficient openings in crown/overstory to encourage and sustain native ground cover.

- Once a stand ages past peak pine straw productivity and is first thinned, which is when many straw operations cease, maintain prescribed fire and don't allow the canopy to close. Low-impact hand-collection of pine straw can continue to generate revenue for landowners managing for longer rotations.

- Divide harvesting areas into units with appropriate straw harvesting intensity to maintain a frequent burning plan and enhance habitat quality.

- Maintain connectivity of quality habitat both between and within stands to provide habitat corridors to facilitate wildlife movement and full utilization of habitat.

- After clearing limbs, sticks, etc., leave a few scattered brush/debris piles. These are important cover for reptiles, amphibians, and small songbirds. Avoid piling near tree trunks, as subsequent hot fires can kill trees.

- Collect only the undecomposed, recently fallen "red needles." Leave undisturbed the partially decomposed older needles which are of little economic value anyway.

- When possible, harvest needles in the middle of the fall (October) so that the residual needle fall can reduce nitrogen and phosphorous losses by up to 70% and soil erosion by up to 90%.[15]

- Use herbicides only if necessary (e.g., for control of invasives, etc.) in directed-spray treatments. Choose formulations that will target undesirable species while favoring desirable habitat components, particularly native grasses and forbs.

- If intensive, “high-impact” straw collection is to be conducted, consider setting aside scattered sanctuaries of relatively open canopy where present that retain natural groundcover and are managed with either no straw removal or hand collection only. These can provide a source of recolonization of plants and animals (such as gopher tortoises) once the forest is no longer used to produce pine straw.

- Invasive species disrupt ecological process and pose a significant threat to native wildlife and ecosystems, and efforts to reduce and eliminate the spread of non-native plants in the pine straw harvesting process. To prevent the spread of invasive plants such as Cogongrass and Japanese climbing fern, areas or portions of areas that contain groundcover with such species should not be raked for pine straw. Pine straw equipment should be inspected and sanitized on a regular basis to prevent spreading of invasive species. Raked straw and bales should be examined for seeds and fragments of plants before transport off site.

Conclusion

We encourage the adoption and adaptation of these guidelines as befit local conditions while minimizing negative impacts of pine straw production on wildlife. We hope that the BMGs will make it easier for landowners, the pine straw industry, policymakers, and others to understand and integrate wildlife needs as the pine straw industry expands in the Southeast.

Because our understanding of ecology and natural resource management improves over time, we appreciate any feedback on these guidelines, particularly based on experience or new research findings.

Please send feedback to Ben Larson
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