



WILL WILDLIFE GET THE SHORT STRAW?

Ecological Considerations for Raking Pine Straw

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Photo: Charles Rondeau

Photo: Caleb Putnam



Photo: Kevin Enge

Ecological Services of Straw in Natural Pine Stands

- Decomposing needles essential for soil microorganisms and invertebrates; base of food web
- Insulate soil from temperature extremes
- Retain soil moisture



Michael Caterino

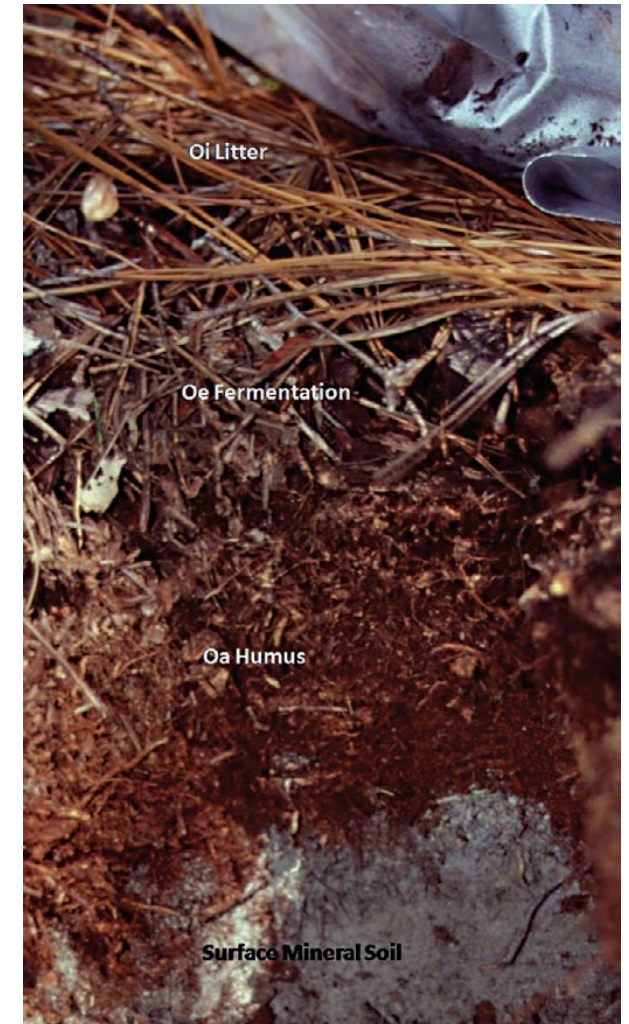


Photo by Morgan Varner; from Hood (2010)

Ecological Services of Straw in Natural Pine Stands

- Reduces runoff and erosion
- Returns nutrients to soil and contributes to fertility
- Provides fuel for fire; natural process that supports ecosystem
- Builds organic matter



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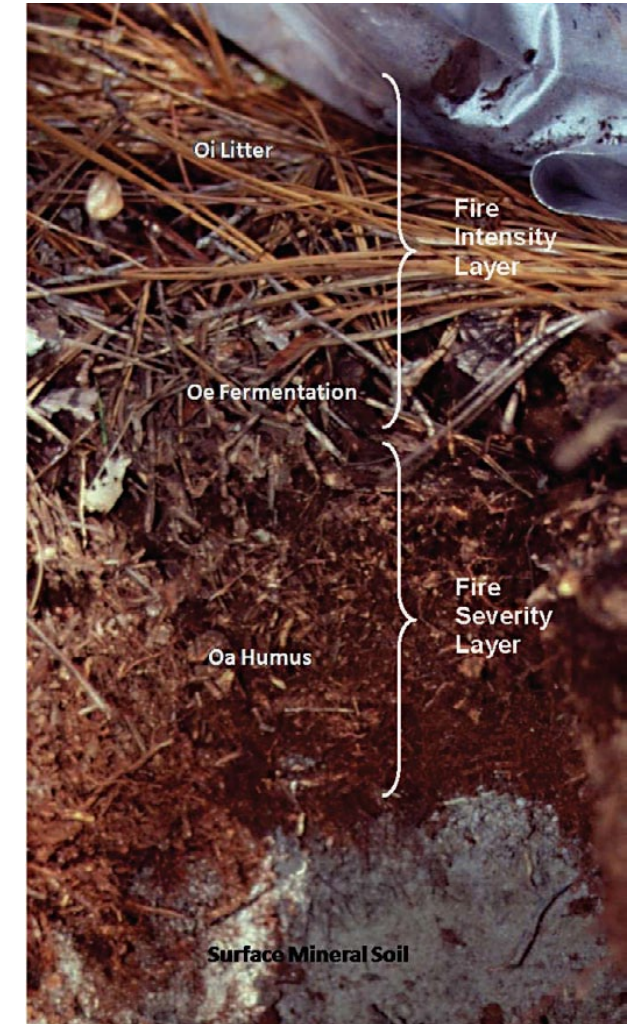
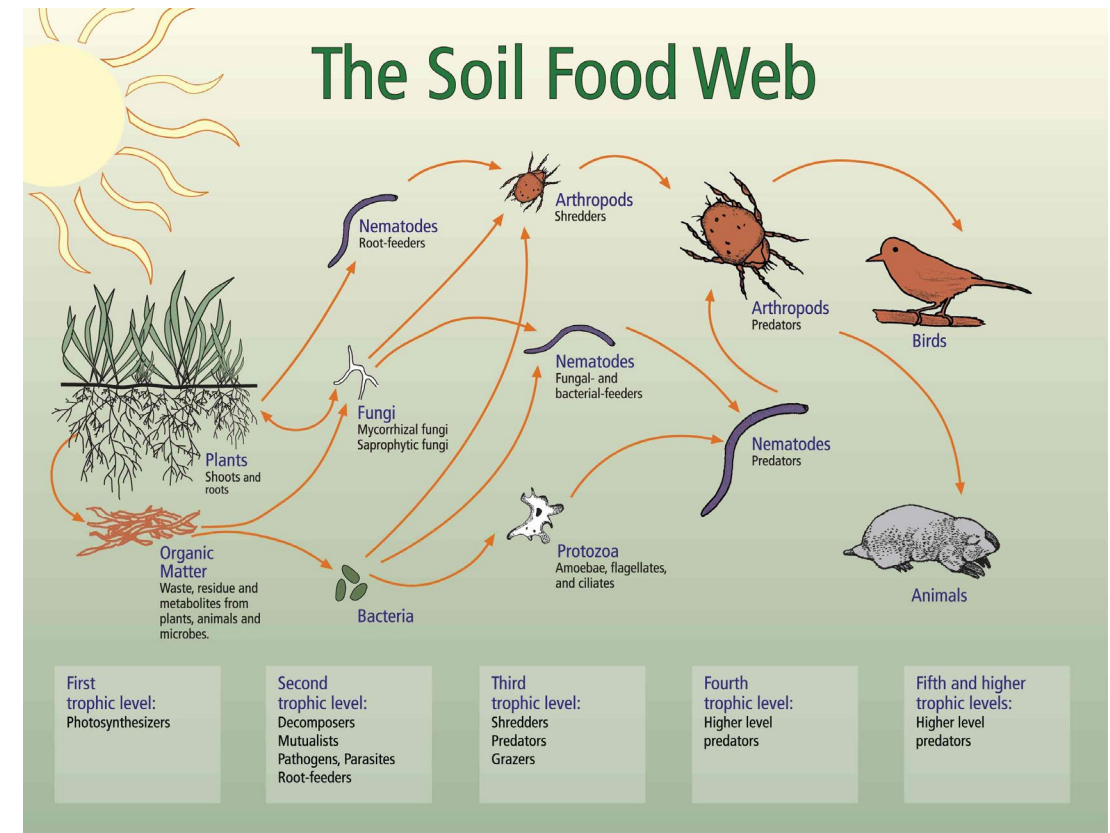


Photo by Morgan Varner; from Hood (2010)

Ecological Services of Straw in Natural Pine Stands

Decomposing needles essential for soil microorganisms and invertebrates

- Removal of litter layer **influences patterns of abundance** for dominant arthropod orders (Ober and DeGroot 2011)
- Changes in relative abundance of organisms at certain trophic levels likely induce **changes in key ecosystem functions**.
- **Physical contributions (structure)** more important than nutritional contributions; **unlikely that adding fertilizer will assist in maintaining arthropod biodiversity**
- More research needed.



SO WHAT? WHY BE CONCERNED?

Plant Diversity

Natural longleaf ecosystem is one of most diverse in the world. As many as 40 species/m² (Peet and Allard 1993).



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Plant Diversity Supports Animal Diversity

Insects and other invertebrates

- 4000 to 5000 invertebrates found in xeric longleaf pine habitats alone in Southeast (Folkerts et al. 1993)
- 10% endemic

All Photos: T J Savereno



Plant Diversity Supports Animal Diversity

Herpetofauna (Amphibians and Reptiles)

- Perform wide variety of roles (Guyer and Bailey 1993)
 - Regulate prey population densities
 - Food sources for variety of predators
 - Seed dispersal agents
 - Creators of nesting and hiding sites



J.D. Willson



Krista Schlyer



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Plant Diversity Supports Animal Diversity

Herpetofauna (Amphibians and Reptiles)

- 35% listed by at least one conservation agency as species of concern (Guyer and Bailey 1993).
- Threats include habitat loss and fragmentation, fire suppression, introduced predators, alteration of breeding sites, and certain site preparation practices.



John White



J.D. Wilson

Plant Diversity Supports Animal Diversity

Birds

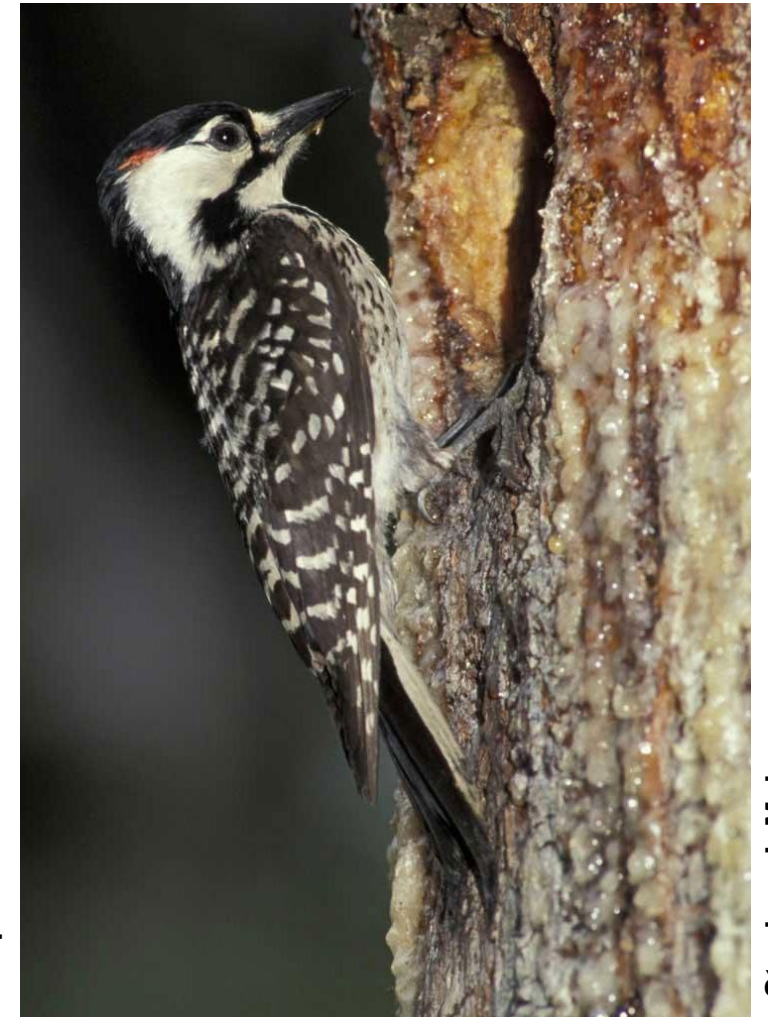
- 86 bird species (35 residents, 29 breeders and 22 winter visitors) are characteristic of longleaf pine forest (Engstrom 1993).
- 36% forage on or close to the ground.



Shelley Rutkin



Stephen J. Maka



Stephen J. Maka

Plant Diversity Supports Animal Diversity

Mammals

- Approximately 36 species of mammals
- 69% forage on or near the ground

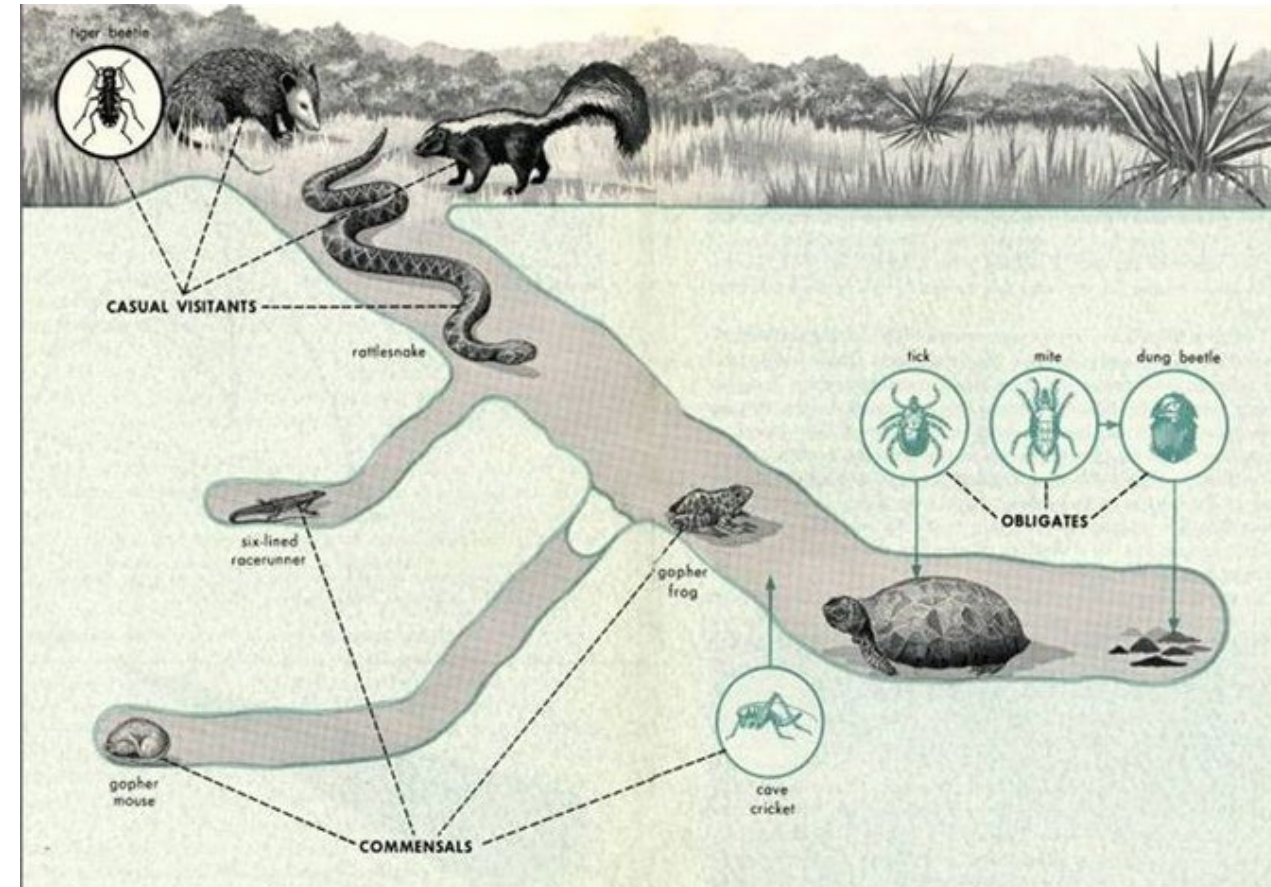


N.M. Moore



Endangered, Threatened, and Species of Concern

- USFWS has listed 29 species as endangered or threatened
- Some species are keystone species (gopher tortoise, red-cockaded woodpecker)



What are the values (worth) of species or biodiversity?

- Intrinsic
- Aesthetic
- Cultural
- Ecological
- Economic



Patrick Elliott – The Longleaf Pine “Barrens”

What are the values (worth) of species or biodiversity?

- Intrinsic - the value that an entity has in itself, for what it is, or as an end; independent of man.
- Aesthetic
- Cultural
- Ecological
- Economic

Philosophical question?
How do you determine?

"These things [species] count, whether or not there is anybody to do the counting" (Rolston 1986).

"Species have value in themselves, a value neither conferred nor revocable, but springing from a species' long evolutionary heritage and potential" (Soule 1985).

"[Species] may not be valuable in themselves but they certainly may be valued for themselves. According to this...account, value is, to be sure, humanly conferred, but not necessarily homocentric" (Callicott 1989).

"[E]very species counts as having the same value in the sense that, regardless of what species a living thing belongs to, it is deemed to be prima facie deserving of equal concern and consideration...[Its good is] worthy of being preserved and protected as an end in itself and for the sake of the entity whose good it is" (Taylor 1986).

"[E]ndangered species are objectively valuable kinds, good in themselves; they do have their own welfare. Respect for life ought to be directly based on this value" (Rolston 1986).

What are the values (worth) of species or biodiversity?

- Aesthetic – subjective; beauty in the eye of the beholder.
- Cultural
- Ecological
- Economic
- Intrinsic



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What are the values (worth) of species or biodiversity?

- Cultural
- Ecological
- Economic
- Intrinsic
- Aesthetic



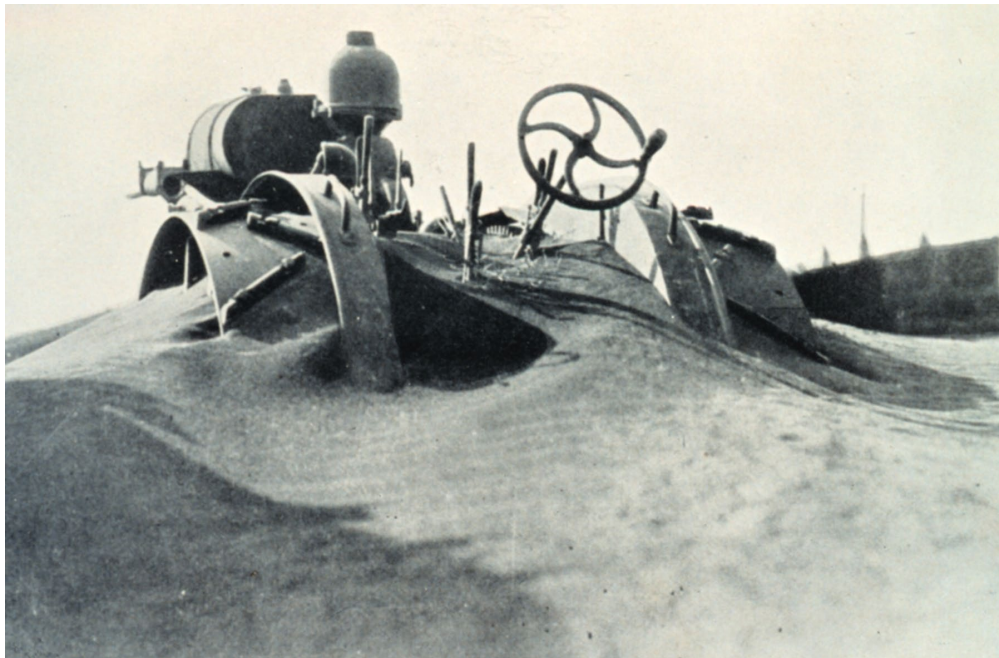
John Dreyer



Bonnie Block

What are the values (worth) of species or biodiversity?

- Ecological – all species have a place in food webs; also provide ecological services that stabilize the system.
- Economic
- Intrinsic



What are the values (worth) of species or biodiversity?

- Economic – lease hunting opportunities; sustainable harvest of forest products.
- Intrinsic



NPS



Josh Honeycutt

Ways Intensive Straw Raking Can Negatively Affect Biodiversity

- Dense stocking results in early canopy closure and reduced sunlight; good for controlling understory, but bad for diversity; also disease risk
- Direct mechanical damage to plants
- Non-selective herbicides (if used)
- Removal of nutrients lowers fertility



Ways Intensive Straw Raking Can Negatively Affect Biodiversity

- Loss of organic matter ➡ loss of soil arthropods and other invertebrates; loss of fertility
- Increased erosion potential
- Higher soil temperatures ➡ damage feeder roots and decrease invertebrate numbers and diversity
- Potential soil compaction



BEST MANAGEMENT GUIDELINES (Bailey 2015)

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

- Integrate wildlife objectives at both **site-specific** and **landscape scales** as part of straw harvest sustainability plan and overall forest management plan.
- Incorporate wildlife diversity when pine straw production is conducted in **natural longleaf stands**.
- Incorporate wildlife diversity when plantations for straw production are established on **sites previously converted from natural longleaf** (i.e., old fields, Conservation Reserve Program lands, 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**.

Best Management Guidelines: Landscape and Site Selection Considerations

Natural stands with high quality native understory should be avoided.



Best Management Guidelines: Landscape and Site Selection Considerations

Plant longleaf on existing cropland or pine plantation lands (do not convert natural stands)



Brian Patnode



TJ Savereno

Best Management Guidelines: Landscape and Site Selection Considerations

Avoid sites with erodible soil having slopes greater than 8 percent



Best Management Guidelines: Management Considerations

Avoid mechanical raking; hand rake or lift



Best Management Guidelines: Management Considerations

- Incorporate prescribed fire on 2-3 year rotation



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- 4-year rotation may be more appropriate for less productive or environmentally sensitive sites.



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Best Management Guidelines: Management Considerations

Implement thinning to prevent total crown closure

Once pine straw raking ceases, continue with burning and thinning program



Best Management Guidelines: Management Considerations

- Divide harvest areas into units and rotate

Year 1 Rest	Year 2 Rake	Year 3 Burn
Year 2 Rake	Year 3 Burn	Year 1 Rest

Interspersion

- Each block on a rotation of rest-rake-burn (Wallace and Ward 2011)

Best Management Guidelines: Management Considerations

Maintain connectivity; travel corridors



European Green Belt – 5281 miles; Finland to Greece



Best Management Guidelines: Management Considerations

- Leave a few scattered brush/debris piles for cover
- Don't burn piles near trees



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Best Management Guidelines: Management Considerations

Collect only the undecomposed "red needles"

- Significantly decreases soil erosion and nutrient losses in runoff (Pote and Daniel 2008).
- If hand-raking or lifting, allow 2 years between harvest; if all straw is removed by intensive hand or mechanical raking, then 3 years.



Best Management Guidelines: Management Considerations

Harvest needles in middle of needle fall period (Sept – Oct – Nov)

- Residual needle fall after harvest reduces nitrogen and phosphorus loss and soil erosion (Pote and Daniel 2008).



Best Management Guidelines: Management Considerations

Use herbicides only if necessary

- Consider mowing prior to needle-fall as an alternative
- If herbicides are required, consider spot application as opposed to broadcast



Dave Dickens



Best Management Guidelines: Management Considerations

If intensive, “high-impact” raking is to be conducted, consider setting aside sanctuaries

- Choose areas within a stand that may be of a little higher quality as wildlife habitat



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Best Management Guidelines: Management Considerations

Avoid spread of invasives

- Avoid raking areas where species such as Japanese climbing fern and Cogongrass are present
- Inspect and sanitize equipment
- Inspect raked straw and bales for invasives before transport



UGA1197026

Dennis Teague, U.S. Air Force, Bugwood.org



A Management Guide for Invasive Plants in Southern Forests

SLIGHTLY REVISED NOVEMBER 2015


James H. Miller, Steven T. Manning, and Stephen F. Enloe



 United States Department of Agriculture • Forest Service • Southern Research Station
General Technical Report SRS-131

A Field Guide for the Identification of Invasive Plants in Southern Forests



 United States
Department
of Agriculture

Forest Service
Southern Research Station
General Technical Report SRS-119

James H. Miller, Erwin B. Chambliss, and Nancy J. Loewenstein

https://www.srs.fs.fed.us/pubs/gtr/gtr_srs119.pdf

https://www.srs.fs.fed.us/pubs/gtr/gtr_srs131.pdf

Invasive Plants in Southern Forests

Identification and Management

This app is based on the U.S. Forest Service publication: A Field Guide for the Identification of Invasive Plants in Southern Forests. Invasions of nonnative plants into forests of the Southern United States continue to go unchecked and only partially unmonitored. These infestations increasingly erode forest productivity, hindering forest use and management activities, and degrading diversity and wildlife habitat. Often called nonnative, exotic, nonindigenous, alien, or noxious weeds, they occur as trees, shrubs, vines, grasses, ferns, and forbs. This app provides information on accurate identification of the 56 nonnative plants and groups that are currently invading the forests of the 13 Southern States. Recommendations for prevention and control of these species is provided from the booklet, "A Management Guide for Invasive Plants of Southern Forests," published by the Southern Research Station as a General Technical Report. Basic strategies for managing invasions on a specific site include maintaining forest vigor with minimal disturbance, constant surveillance and treatment of new unwanted arrivals, and finally, rehabilitation following eradication.



<https://apps.bugwood.org/apps/southern-forests/>

Summary

- Fallen pine straw plays ecological roles once on the forest floor.
- These functions can support a rich diversity of plants and animals.
- Removal of pine straw through raking or lifting has an impact on the ecology of the pine forest.
- The degree of impact is dependent on the intensity and timing of straw management and harvest practices.
- Managing for pine straw and wildlife are possible, but probably not without sacrificing production from one or both.
- Following best management guidelines can help optimize (not maximize) production of pine straw and wildlife.

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Questions?

