Trends in Stand Improvement Needs and Treatments on National Forest System Lands

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Overview:

- The National Forest Management Act (NFMA) of 1976 states it is the policy of Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designated to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans.
- Stand improvement treatments (also referred to as stand tending), such as thinning trees and removing competing vegetation, are critical for increasing the growth rate, disturbance resilience, shift species composition, and meeting management objectives such as timber production or other resource uses such as creating wildlife habitat.
- The acres that need stand improvement have been increasing nationally each year over the past few decades; unfortunately, for a variety of reasons the number of acres that are treated have been declining over the same period. This dilemma is creating a national imbalance in stand improvement needs versus implementation that is inconsistent with statutory direction contained in NFMA.
- This paper summarizes the growing stand improvement acres that need treatments, the shortfall in implementation of stand improvement treatments, and the estimated costs and commitment associated with meeting stand improvement needs over the next 10 years.

Summary:

Acres needing stand improvement, except for 2009, have consistently remained above 2.0 million acres per year from 2010 through 2019 (fig. 1a). Most of the acres consist of precommercial thinning (70%) followed by release (26%) with only a small portion of acres needing pruning and/or fertilization (4%). However, the proportion (an average of 11.7%) of acres treated are much smaller when compared to the acres that need treatment (fig. 1a, dark line). This is causing a critical imbalance concerning stand tending that is inconsistent with statutory direction contained in the National Forest Management Act.

Stand improvement accomplishments varied from 198,000 to 364,000 acres per year over the last 10 years (FY 2009–2019) and has been constant over the last 4 years (fig. 1b). Precommercial thinning accomplishments are normally the largest followed by release and/or weeding accomplishments (fig. 1b). In FY 2019, the agency accomplished 198,206 acres of precommercial thinning, release, pruning, and fertilization. SI (stand improvement) treatments are significantly fewer than acres diagnosed for treatment. In fact, the agency has been treating only between 9 and 15% of the SI needs over the 10-year period (fig. 1b).

In 2020, stand improvement cost $33.7 million dollars with precommercial thinning (68.2%) absorbing most of the cost followed by release and weeding (30.4%) with the remainder being spent on pruning and fertilization (1.4%) (table 1). Average cost per acre depended on the specific activity but ranged as low as $9 dollars per acre (fertilization) to $244 per acre for precommercial thinning.

Silvicultural Concepts:

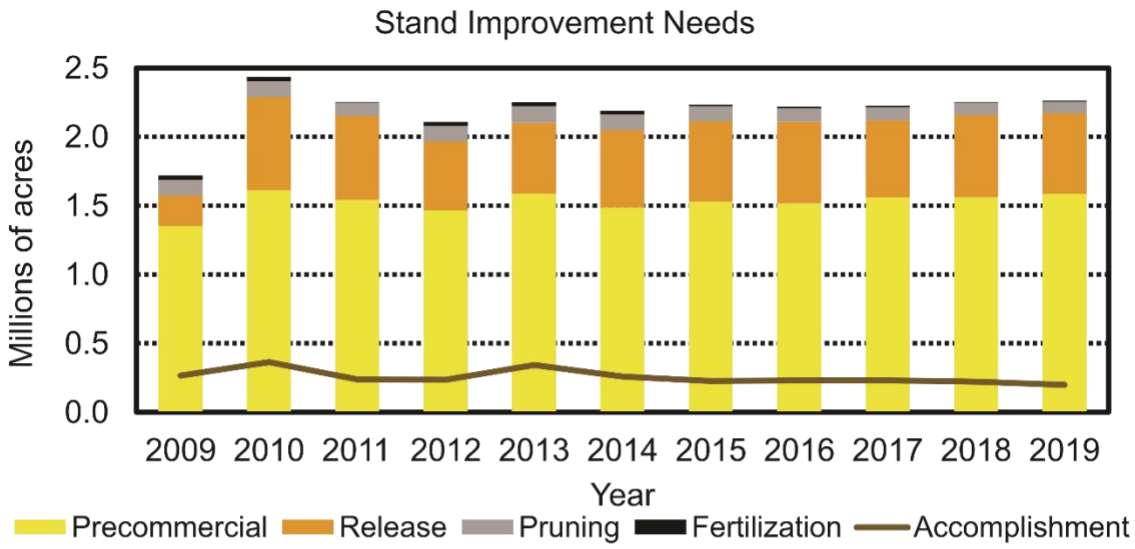
- Terminology associated with stand improvement can be confusing. In this paper we refer to stand improvement, precommercial thinning (also referred to as noncommercial thinning), weeding, cleaning, releasing, and other terms such as liberation and crop tree release. The FACTS database (Forest Service Activity Tracking System) uses terminology documented in the Dictionary of Forestry (Deal 2018) and was the source of the data discussed in this manuscript. Therefore, using consistent terminology is critical if we are to successfully enhance stand improvement opportunities. For example, stand improvement is a category of intermediate treatments (synonym is stand tending) that are applied to improve the composition, structure, condition, health, and growth of a stand (table 2).
- Precommercial thinning (sometimes referred to as noncommercial) is a catch-all phrase that is often used to reflect that the material being removed is not yet commercial size (table 2)—such as when suppressed trees (sometimes up to 6 inches d.b.h.) are removed beneath old ponderosa pine. But this phrase can also include treatments often only applied in stands not past the sapling stage (liberation, cleaning, weeding).
- Pruning is primarily used to reduce blister rust infection and tree mortality in white pine. Pruning removes the lower branches where infections are most likely to occur.
- Fertilization was used to improve growth of pine plantations in the past but recently its use has been rare.

Management Applications:

There are several strategies we can use to balance SI needs with accomplishments:

- Increase line officer support by designating targets for stand improvement at all levels in the agency.
- Demonstrate the value of SI in meeting the Agency's mission and obligation to NFMA and resource management to ensure long-term leadership commitment and sustainable funding.
- Secure long-term funding for SI by (1) emphasizing the importance of funding these activities in future FS budgets, (2) use innovation to identify funding opportunities for SI activities such as those being used to fund reforestation, and (3) because successful reforestation is dependent upon meeting stand improvement needs.
- Seek opportunities with state, tribal, private, and non-profit partners to leverage expertise, resources, and capacities to augment stand improvement by using mechanisms such as Shared Stewardship Agreements, Good Neighbor Authority, Stewardship Contracting, and Agricultural Conservation Experienced Services.
- Explore the potential to utilize nontraditional sources of funding by working with other key staffs (i.e., WO-Biological & Physical Resources; WO-Forest Health Protection; WO-Fire and Aviation Management) to determine the potential for funding SI work to meet habitat objectives, watershed objectives, and reduction of wildfire risk.
- Increase SI program staff capacity to respond to current and future SI needs.

a



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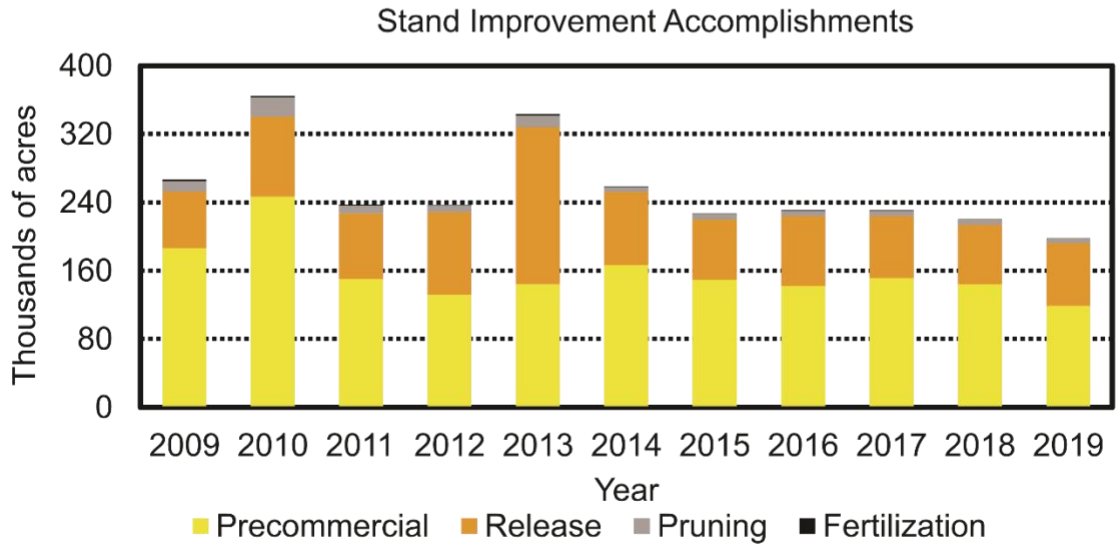

Figure 1—National stand improvement needs and distribution of types of tending needs (a) versus the accomplishments in stand improvement by distribution of types of tending accomplished (b).

Table 1—Costs associated with stand improvement accomplishments in fiscal year 2020.

Activity	Total cost ($)	Average cost per acre ($)
Tree release and weed	10,262,337	225
Precommercial thin	22,974,371	244
Prune	468,705	116
Fertilization	730	9
Total cost	33,706,143	--

Table 2—Terminology associated with tending treatments and definitions adapted from the Dictionary of Forestry (Deal 2018).

Terminology	Definition
Stand improvement	A category of intermediate treatments intended to improve the composition, structure, condition, health, and growth within a stand.
Precommercial thinning (sometimes also referred to noncommercial thinning)	A tending treatment that reduces density and spaces crop trees in stands, *where the material being removed* is not yet of commercial size, typically done as an investment and may be combined in the practice with liberation, weeding, or cleaning and can occur past the sapling stage.
Release	A treatment that is applied to provide growing space to young trees inhibited by undesirable, usually overtopping, competing vegetation.
Liberation	A release treatment that is applied in stands not past the sapling stage, to provide growing spaces to favored trees inhibited by competition with older and often trees that overtop the favored tree.
Cleaning	A release treatment that is applied in any age class not past the sapling stage, to provide growing space to favored trees that are inhibited by less desirable individuals of the same age class that either overtop or are likely to overtop the favored trees.
Weeding	A release treatment that is applied in stands not past the sapling stage, that eliminates or suppresses undesirable vegetation regardless of crown position.
Crop tree	Any tree selected to remain a component of the stand until the end of the rotation, usually after being released from competition in a tending treatment.