

Integration of Ecology and Forest Management in Forests of Southeastern Massachusetts

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Managing forests in southeastern Massachusetts to provide desired ecological conditions over time while turning at least a small-to-modest profit is a worthy goal. Foresters at the Myles Standish State Forest in the coastal area of Massachusetts are doing just that despite the relatively low timber quality compared to the rest of the State. Before we briefly describe their successes, let's examine some of the ecological conditions of these forests. Part of the following discussion on the ecology of these forests is adapted from information provided by [The Nature Conservancy](#).

Pitch pine (*Pinus rigida*) woodlands are typically associated with coastal areas such as Cape Cod. They are primarily found on extremely well-drained and acidic sandy soils. They were historically called "barrens" because the soils are infertile—too barren to produce agricultural crops. High soil acidity limits decomposition of organic matter, resulting in a heavy duff accumulation on the soil surface. Dry soils and heavy duff result in volatile conditions that make the pine barrens susceptible to burning. In the absence of wildland fire, the density of overstory trees and understory shrubs increases, as does the thickness and cover of the duff layer, to the detriment of understory plants [for example, wild lupine (*Lupinus perennis*), golden heather (*Hudsonia ericoides*), and bearberry (*Arctostaphylos uva-ursi*)] that comprise an important part of the natural plant communities of the barrens. Wildland fire removes overstory trees and shrubs, and reduces the duff layer, thereby increasing light penetration to the forest floor and increasing the amount of bare soil for native plants to regenerate. However, fire does not readily kill older pitch pines in the overstory because of their thick bark, and induces some of their cones to open, thereby releasing their seed to perpetuate the species. Scrub oak, another understory species, readily resprouts from a still viable root system following fire. In addition, some plants, such as wild lupine and sand cherry (*Prunus pumila*), produce seed that is viable for many years in the soil seed bank, and will quickly repopulate a site following fire. These remarkable adaptations to fire help to perpetuate the distinctive plant communities of the pine barrens. The pitch pine and scrub oak associations support high concentrations of rare and endangered plants and animals.

Pitch pine communities throughout New England have significantly decreased in acreage during the past several decades because of fire suppression. Current wildland fire management dictates rapid control of fires because of the danger they pose to nearby residential communities. Although prescribed burns have been attempted as a replacement for natural wildfires, this option is limited in many areas because of the challenges of applying prescribed burns over large areas, especially those with extensive housing development. In the absence of fire, managing vegetation by thinning densely stocked stands has become another option that forest managers use to open up the stands and to prepare areas for followup prescribed fire applications where feasible. Thinnings,

like fire, reduce the overstory cover and increase light on the forest floor to the benefit of shrub and forb species. Although thinning goals do not primarily focus on reducing the shrub and duff layers, the logging equipment secondarily breaks down some of the shrub layer and removes some of the duff layer by mechanical disturbance. However, prescribed fire is more effective than the use of thinnings alone in temporarily reducing the shrub and duff layers to benefit forbs. Thinnings also benefit the health and growth of residual trees by increasing growing space, and allowing the crowns freedom to grow. Whole-tree harvesting is normally used because of the low quality of the material removed. Some nutrients are lost from the stands when the tops and branches are removed, and this is a tradeoff with the other ecological benefits from thinning as described. When useful products can be commercially removed during the thinning process, so much the better, because the restoration operations pay for themselves.



Thinning densely stocked pine stands (above) produces growing space for residual trees and creates an open ground layer (below) for the benefit of desired plant species in southeastern Massachusetts.

As a result of past planting programs, mixed stands of varying species composition, including pitch pine, white pine (*Pinus strobus*), red pine (*Pinus resinosa*), Scotch pine (*Pinus sylvestris*), and Norway spruce (*Picea abies*), are commonly found on public lands in southeastern Massachusetts. Prescriptions in these mixed stands reflect differences in tree ecology and desired conditions. For example, foresters recommend that thinnings should remove most of the non-native species, including red pine, Scotch



pine, and Norway spruce, to help restore the original pitch pine stands. Because red pine is also severely impacted by introduced pests such as the red pine scale and red pine adelgid, sites with red pine are recommended for conversion to other species (see this article in [Forest Health Highlights: Rhode Island](#) from July 1999). Prescriptions also call for maintaining the larger, more “fireproof” pitch pine in the community, while at the same time reducing the density of smaller pitch pines to improve growth of residual trees. Native white pine, though more prone to fire damage than pitch pine, is also managed by thinning to release the best-formed, healthiest, and/or largest trees because they are desirable for wood production and aesthetics. Prescribed fire is used in thinned stands



Forester Jim Rassman stands next to some dead and downed woody debris left on the ground to provide ecological benefits and to help block off-road-vehicle traffic.

where feasible to promote desired ecological conditions and further diversify stand structure. However, stands dominated by white pine are not normally selected for prescribed fires because white pine is more susceptible to being damaged or killed by fire than pitch pine. Pure stands of non-native tree species are monotypes and lack the desired vertical and horizontal structure of native stands. These non-native stands are removed to restore native plant communities. During the layout of all harvest operations, care is taken to assure that snag and dead-and-downed coarse woody debris levels are retained at levels required under forest certification guidelines.

In the last few years, foresters at the Myles Standish State Forest have conducted harvests on more than 400 acres of pure pitch pine and mixed pine stands with the prescriptions described above. All of these projects were commercially profitable, indicating that markets for low-quality wood removed in the thinnings are viable in this region of New England. Commercial products from these thinnings included chips and

landscape mulch produced onsite, firewood for local markets, and pulp that is harvested and subsequently trucked to Maine for processing. Additional products that can be made from chips include wood bricks and wood pellets used for heating.



These photographs illustrate low-quality material felled during thinning (left) and processed to produce landscape mulch (right).



Wood chips can be used to make wood bricks (for example, BioBricks™.)

Forester Jim Rassman of the Massachusetts Department of Conservation and Recreation (MA DCR) noted that, “Having loggers who are flexible; who have appropriate equipment to produce either pulp, chips, or mulch; and who can quickly change production goals as markets change is the key to success.”

What is the bottom line for Rassman? He feels that he has been successful if he improves the ecological conditions of the stand, even if he only makes \$1 from a sale. Statewide, for fiscal years 2005 to 2007, the Southeastern District of the MA DCR produced the lowest cash revenue of all districts in Massachusetts, reflecting the lower quality of the timber in this region due primarily to site conditions—nutrient-poor, sandy soils. However, Rassman surmised it may have cost him several hundred thousand dollars to produce the same ecological conditions without the sale of the resulting wood products.

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Wood chips can also be used to make wood pellets for pellet stoves.



Jim Rassman stands in a landing used for processing low-quality wood into mulch used by the landscaping industry in southeastern Massachusetts. Acceptable growing stock is retained in the stand (background) along with snags and coarse woody debris according to forest certification guidelines.