

Large-scale Experiment at the Harvard Forest: Forest and Habitat Dynamics in Former Plantations

The Harvard Forest is harvesting about 80 acres of mature plantation forests during 2007-2010 in order to restore a diversity of native tree species to these sites, to conclude several long term experiments, and to initiate a new suite of long term experiments. For the next 10-15 years, the harvested areas will provide early successional habitat for a variety of wildlife species. The area



of this harvest represents less than 3% of the Forest's 3,500 acre land base in Petersham, and two-thirds of the remaining plantation land on the property. The plantations of primarily non-native conifers (including red pine and Norway spruce) were established in old fields during the early years of the Harvard Forest as long-term experiments on forest growth, productivity, and suitability of species to New England conditions. In the early 1900s, forestry was a new science and practice in the United States and much emphasis

was placed on plantation forestry. In contrast, current forest practices in Massachusetts emphasize working with natural processes and native species. The stands we are harvesting are 65 – 90 years old and are nearing or past maturation. They range in size from 1-15 acres, plus one 38-acre block. Some of the stands have substantial areas blown down and the harvest will take down trees in a controlled way.

Scientists at the Harvard Forest consulted with foresters of the Massachusetts Division of Fisheries and Wildlife (DFW) to determine the best way to harvest these plantations. The final plan was to clear-cut stands that are smaller than three acres, and to remove 85-90% of the overstory canopy with reserve trees in stands that are larger than three acres. Mechanized harvest with cut-to-length forwarder operations is being used. Approximately 45 acres of other plantations will remain unharvested to protect existing study sites and to provide for scientific comparisons with the harvested stands.



For the next one to two decades, we will test whether the harvested areas will provide food, shelter and breeding habitat that benefit species that use this regionally uncommon habitat type—early successional forest. Pre-harvest biological monitoring did not detect any rare plant or animal species that would be affected by the change in forest type. For more information, the Massachusetts Comprehensive Wildlife Conservation Strategy is available from DFW at : http://www.mass.gov/dfwele/dfw/habitat/cwcs/cwcs_home.htm.

The quality of the habitat will be enhanced by controlling exotic invasive plant populations in and around harvest areas. As the stands age they will provide important structural diversity to the Harvard Forest and regional landscape, which is dominated by maturing forests.



Harvard Forest is also conducting intensive long-term studies of the flora and fauna in the early successional habitats that are created by the harvests. Considerable information on the planting histories and long-term management of these stands is available to help understand ongoing changes in the forest vegetation. A network of permanent plots in harvest and non-harvest areas was installed and sampling began during the summer of 2007. This pre-harvest sample provides important base-line data for documenting the impacts of the harvest. For the next two decades, the Harvard Forest research team will examine: changes in composition of native and non-native plants, changes in composition of ants and beetles, the influence of site history, soil conditions and forest composition on subsequent vegetation and arthropod dynamics, and the trajectory of habitat changes over time.

To broaden the range of research at the Harvard Forest and on these sites we invited interested researchers and naturalists to join this effort to address basic and applied questions. To-date, several innovative studies have been initiated that specifically utilize the forest openings, including:

- An eddy flux tower is measuring carbon exchange between the atmosphere and vegetation during the very dynamic years just post-harvest in a 15-acre opening
- Carbon budgets are being constructed to compare side-by-side harvested and unharvested portions of a red pine plantation
- A series of paired exclosures in four harvest openings ranging from two to 38 acres aims to disentangle the effects of moose and deer browsing on forest regeneration. One fenced plot excludes both deer and moose; the other excludes moose but allows deer through a gap at the bottom of the fence. These exclosures are part of a regional study coordinated with the University of Massachusetts, the Commonwealth of Massachusetts, and Highstead in Connecticut.
- Changes in moth community composition are being studied in the largest harvest area, as the others are not large enough for changes to be expected

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FAQ

Why are you doing this?

The plantations at Harvard Forest were established in old fields during the early years of the Harvard Forest as long-term experiments on forest growth, productivity, and suitability of species to New England conditions. The stands are now 65 – 90 years old and are nearing or past maturation. Some of the stands have substantial areas blown down and the harvest takes down

trees in a controlled way and decreases fire risk. The harvested areas will, in time, add to the forest age and habitat diversity at the Harvard Forest. Ultimately, these forests will form mature stands of native tree species. In contrast to plantation forests, which are composed of a single tree species, native forests with diverse composition host greater biodiversity of native fauna.

Do you have a plan?

This project is part of a comprehensive Master Plan for the Harvard Forest, drafted collaboratively by the director and science staff of the Forest. This plan consolidates historical data for all Harvard Forest properties and defines zones within Harvard Forest that are appropriate for different levels of research, education, recreation, and management activity. This Master Plan will help guide the use and management of Harvard Forest's properties as the Forest enters its second century.

In addition, a specific management plan for the plantation harvest was completed based on field and archival work and discussions with other foresters and Harvard Forest researchers. The overall plantation management plan was divided into four Massachusetts Forest Cutting Plans.

How will the profits from the harvest be used?

Proceeds will be used to advance the research, education, and conservation mission of the Harvard Forest. A portion of the proceeds will be dedicated to long-term monitoring and research in the harvested areas.

What are the objectives and future plans for the land?

Our aim is to restore native forest by terminating experimental plantations established during the early decades of research at the Harvard Forest.

What will be the visible changes along the Harvard Forest trails?

Most recreational trails at Harvard Forest will be unaffected by this harvest. The two areas where harvesting is quite visible are along the road to the Prospect Hill fire tower (area fire officials specifically asked us to remove these plantations) and along the west side of Harvard Pond.

Isn't clearcutting bad for the environment?

Silvicultural clearcutting, as is planned here, is an accepted and effective method to regenerate forests. In larger openings, we are retaining large-crowned trees to diversify habitat structure within the harvest blocks. The largest harvest area along the west side of Harvard Pond was partially harvested about 10 years ago, and now abundant pine and hardwood regeneration is established on the site. Our management plan includes careful attention to using Best Management Practices to minimize impacts on water and soil quality.

How will this harvest affect wildlife populations?

We expect that this activity will diversify our forest wildlife by maintaining some existing mature conifer stands while transforming others into early successional habitat. Young woodlands are used by a suite of wildlife, and are regionally uncommon. Increasing such habitat is a major management goal of the Massachusetts Division of Fisheries and Wildlife (MA

DFW). We received technical assistance from MA DFW to tailor our harvest in order to benefit wildlife that depends on early successional woodlands.

This management activity provides food, shelter, and breeding habitat that will potentially benefit several at-risk species, including regionally rare and declining species such as golden-winged warbler and yellow-breasted chat, as well as American woodcock, chestnut-sided warbler, blue-winged warbler, and rufous-sided towhee. Approximately 45 acres of plantations will not be harvested, as these are located near sensitive research areas and provide nesting habitat for several bird species that are otherwise locally uncommon (e.g., Evening Grosbeak, Golden-crowned Kinglet, Blackburnian Warbler, Dark-eyed Junco). Pre-harvest biological monitoring did not detect any rare plant or animal species in the harvest areas, and we followed guidance from the Massachusetts Natural Heritage and Endangered Species Program in priority habitat areas.

Won't the harvest areas be overrun with invasive species?

In conjunction with the planned harvest, we are conducting invasive plant control activities. Invasive plant populations are documented on approximately 32 acres of Harvard Forest land, primarily in small populations, which make them amenable to control. Invasive plant removal areas are being monitored and re-treated as necessary to maintain control of the target species. Focused monitoring of the harvested areas for invasive exotic plant species is being conducted, allowing us to control any populations that become established. In addition to the control program, long-term monitoring will help us to document how vulnerable forest clearings are to invasion.