



Tracking the Establishment of Invasive Exotic Species in a Timber Harvest

by Kevin Devine, Jeff Stinger, Songlin Fei, Chris Barton

Many woodland owners have significant interest in protecting their properties from invasive species, especially those that are exotic. As would be expected, invasive species are easier to control and perhaps eradicate when they first appear, before they have established and spread throughout a woodlands. Disturbances such as storms or harvesting can provide conditions that are conducive for invasion by exotic species. This research project was undertaken specifically for the purpose of helping woodland owners and foresters to define where and when certain invasive species will become established after a timber harvest. Results will help woodland owners develop appropriate control practices and prioritize areas to look for invasive species after a harvest.

Problem

Kentucky has a number of exotic invasive trees, shrubs, grasses, and forbs that can invade woods where storm damage or harvesting opens the canopy. The strength of invasion can be affected by the distance from a seed source, presence of a suitable seed bed, soil moisture, and landscape position. All of these factors combine to affect the establishment or colonization by invasive species and their spread within woodlands.



Kevin Devine, a UK Forestry graduate student, recording the presence of invasive plants following a timber harvest. Photo courtesy: Jeff Stringer

Determining how to predict when and where a species will invade will help woodland owners and foresters manage for invasive problems.

Research Project

To provide information on invasive species establishment and spread, the University of Kentucky Department of Forestry conducted a research project at Robinson Forest in eastern Kentucky. Because of the invasive species involved and the common forest type where the research was undertaken, the research has widespread application. The study was completed as a part of the larger Streamside Management Zone hydrology project involving eight small watersheds, six of which were subjected to a timber harvest

treatment. Prior to the harvest treatment, the occurrence of 11 invasive exotic species common to the region and occurring on adjacent surface-mined lands was determined for the watersheds in the study. One year after the timber harvesting treatments four of the watersheds (1 control and 3 harvested) were re-sampled to determine the presence of invasive species. The post-treatment inventory recorded the presence of the invasive species and a number of attributes associated with their location including topographic position, soil type and heat load index, degree of soil and duff disturbance, presence of skid trails and where they occurred within the skid trails, abundance of residual standing trees, distance to invasive seed sources, and other important variables. The variables were subject to analysis to determine which invasive species were present and where and what conditions were found to affect their abundance.

Results

Out of the 11 possible invasive species only 2, tree-of-heaven (*Alianthus altissima*) and Japanese stilt grass (*Microstegium vimineum*) were found to have established in enough numbers to warrant further investigation and analysis. This was significant in itself given the large numbers of other exotic invasive species occurring on adjacent surface mine lands. Both species of interest are found statewide and have invasive potential throughout Kentucky. While both tree-of-heaven and Japanese stilt grass increased statistically in the harvested watersheds, they established in different areas. For both species as distance from seed source increased invasive establishment decreased. Japanese stilt grass spread was associated with equipment passing



Tree-of-heaven

Photo top courtesy: Kris Johnson, Great Smoky Mountains National Park



Japanese stilt grass

Photo left courtesy: James H. Miller, USDA Forest Service, www.forestryimages.org

through patches of this grass that was already present prior to harvest on old skid trails; the farther away the less the establishment. Tree-of-heaven establishment decreased with distance from seed-bearing trees on adjacent surface mines. This indicates that eradicating seed sources in and around the area prior to harvesting is important in helping with their control. Also areas within the harvesting where more trees were removed had an increased amount of tree-of-heaven. This effect was not related to soil disturbance or the intensity of the trafficking of the harvesting equipment and appears to be an effect related to increased sunlight. Therefore areas in a harvest that were lightly cut would not warrant as much attention as those that are heavily cut. Generally skid trails were found to contain more invasive species than non-disturbed areas and this study provided specific information on where on a skid trail the species established. Figure 1 shows the occurrence of the two species on different parts of a skid trail. Tree-of-heaven established significantly more on the loose dirt associated with the downslope side of the skid trail (commonly called a berm) compared to the skid trail surface itself. Japanese stilt grass however, was found on all parts of the skid trail and had the ability to colonize the trail bed. This indicates that establishing a ground cover on the skid trail itself as is required by Kentucky's minimum requirements for silvicultural best management practices might lessen Japanese stilt grass invasion or spread while it would have little impact on tree-of-heaven. Increase in these two species was found in association with the harvest, but the numbers present indicated that control was not warranted at this time. However, control of these species will occur when the developing stands reach canopy closure. At that time remaining tree-of-heaven will be individually killed and assessment of Japanese stilt grass will be made and control will be considered if necessary.

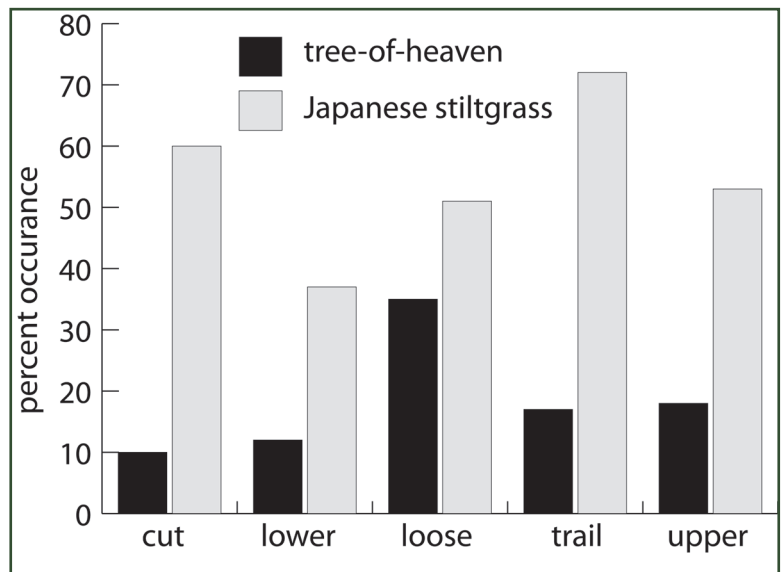
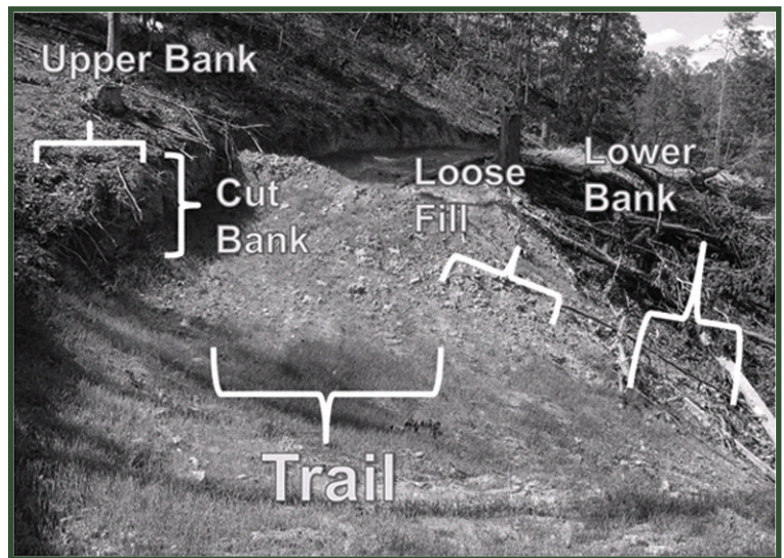


Figure 1. Tree-of-heaven was most prevalent on the loose fill with little invasion on trail surface itself. Japanese stiltgrass was more common and predominated on the trail surface itself.

About the Authors:

This research was funded by the University of Kentucky Department of Forestry and conducted as a Master of Science in Forestry project by Mr. Kevin Devine. The project was directed by Jeff Stringer, PhD, Songlin Fei, PhD, and Chris Barton, PhD, professor and associate professors respectively in the Department of Forestry at the University of Kentucky.

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