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Title: Prescribing Fire in Managed Oak Forest Landscapes: Interactions with the Invasive Tree Ailanthus Altissima

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Objective 1. ***Distribution of Ailanthus in relation to fire and other factors*****.**

1. Surveying and mapping of Ailanthus within study areas

We successfully developed a standardized, cost-effective methodology to map the location of seed-producing *Ailanthus* in the study landscape. An aerial helicopter survey was conducted in December 2008 to map the location of *Ailanthus* patches with seed-producing female trees. Surveys were conducted by Ohio Department of Natural Resources (ODNR) Division of Forestry cooperators (Mike Bowden and Aaron Kloss, Fire Management Staff) using digital aerial sketch mapping (DASM). During a two hour flight, 98 seed-bearing females and 42 patches, ranging in size from 0.18 to 13.4 ha, were identified within a 3885 ha (9600 acre) area. Aerially-identified females were ground-truthed (N=75 trees at 95.7% accuracy) using hand-held GPS units in January-February 2009. Tree and plot level data were collected for each of these female trees at time of ground-truthing.
The ONDR Division of Forestry has adopted this newly developed helicopter survey technique to locate and geo-reference Ailanthus and other woody exotic invasives within Ohio State Forests. These mapped trees will be chemically treated by newly hired staff with federal stimulus dollars through the Ohio Woodlands Job Corp Program.

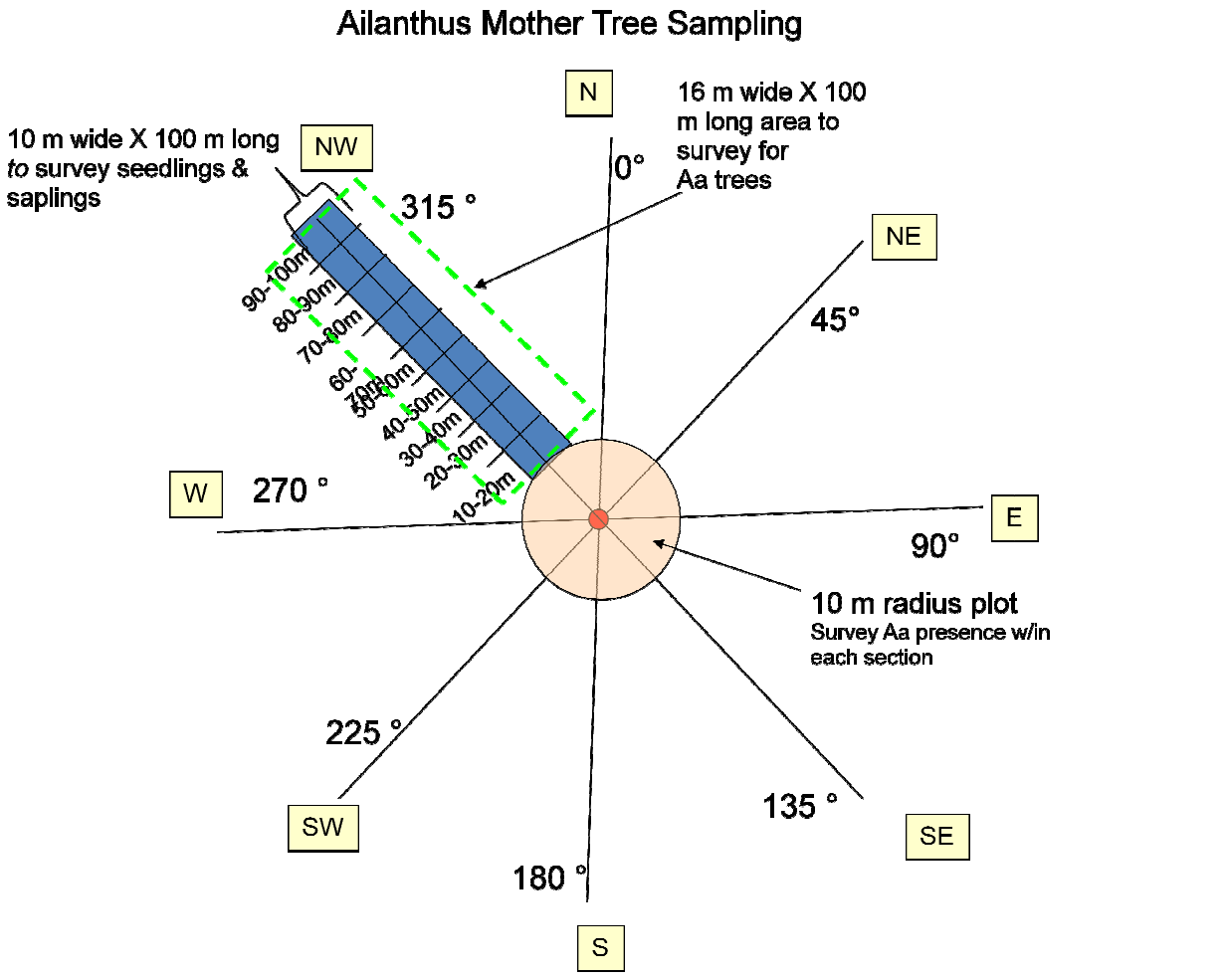
2. Past paper ODNR stand harvest records were digitized and incorporated into a GIS.

Written records of past prescribed burns at Tar Hollow State Forest (N=12) dating from 2001-2008, were reviewed and summarized in an electronic format. These data will be incorporated into a GIS. Aerially-identified patches with seed-producing trees are being incorporated into a GIS that already has multiple layers for the study area, including soils, 10-m digital elevation model, Integrated Moisture Index (Iverson et al. 1997), fire management, imagery, and other landscape features.

3. A 400-m grid of geo-referenced sample points (n = 267) was established throughout the study area from March-May 2009. Sampling across a systematic grid of plots was completed in summer 2009 to quantify *Ailanthus* abundance and demography.
At each plot, a 20-m radius area (0.5 ha) from the center point was surveyed to record the presence of *Ailanthus* by size class: *Ailanthus* trees ($\geq$10 cm DBH) and saplings ($\geq$ 1.4 m tall) were recorded. In addition, all seedlings within four 1-m wide (20 m^2) belt transect emanating from the center point were tallied. When *Ailanthus* was present, the timing of its establishment was estimated by counting bud scars on smaller stems to determine whether *Ailanthus* establishment events occurred immediately following prescribed fires or other known disturbance events, e.g., timber harvests. Presence of *Ailanthus* seedlings, saplings, and trees was detected in 26, 18, and 11% of the grid plots, respectively. For plots in burned areas, we developed a simple classification of past fire intensity based on the following criteria:

Fire intensity Class (M-B scale)	Sapling (1-4") Topkill/ mortality	Midstory (4-10") Injury (older burns only)	Midstory (4-10") Topkill/ mortality	Bark scorch
Low	<50%	None/little	None	None to little
Medium	50-100%	Some to frequent	Little to infrequent	Some
High	~100 %	Frequent	Some to frequent	Frequent

In addition, areas around female trees in unburned and burned areas were surveyed to determine if burns facilitated the spread of Aa. These plots supplemented the 400 X 400 m grid point plots (N=15 in each area). Eight transects (each 100-m long) were sampled for presence for Ailanthus (new germinants, seedlings, sprouts, saplings and trees) as shown in the following diagram:



Attributes of forest structure (overstory and understory) were sampled within each 0.125 ha plot. Photosynthetically active radiation (PAR) was measured in each grid point plot (N=267) with an AccuPAR LP-80 ceptometer (Decagon Devices, Pullman, WA); however it proved to be very challenging given the summer's unpredictable weather conditions.

Objective 2. ***Direct effects of fire and herbicide on the demography of Ailanthus***

A factorial study was installed in August 2009 to study the direct effects of fire and herbicide on *Ailanthus* populations in which the short-term demography (births, deaths, etc) of *Ailanthus* will be quantified. Sample plots (experimental units) were established within areas to be treated with the following: (1) no burn/no herbicide (control); (2) burn/no herbicide; (3) no burn/herbicide; and (4) burn+herbicide. Pre-treatment data on *Ailanthus* populations were collected at plot installation. All Ailanthus saplings and trees were mapped and tagged within each 10-m radius plot. Seedlings and small saplings were counted within four 2-m wide belt-transects within each plot. A total of 22 plots were installed in units to be burned and 18 plots in control units. Dormant-season prescribed fires will be conducted in March-April 2010. The ODNR Division of Forestry will conduct the prescribed fires. Herbicide application via stem injections (hack and squirt) will be done in late September 2009. Imazapyr, found to be most effective in treating large *Ailanthus* stems (>12 cm DBH) will be used to treat all Ailanthus stems (>2 cm dbh). Any *Ailanthus* (>12 cm DBH) within a 10-m buffer surrounding each sampling plot will be treated. Herbicide efficacy will be evaluated in 2010 and 2011 using commonly reported rating systems (Lewis 2007).