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Forage and Tree Experiment (FATE)

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Abstract
Trees are becoming an increasingly important component of the Iowa landscape. For tree plantings to be more common in Iowa two major problems related to establishment must be overcome: (1) intense weed competition and (2) a lack of market or non-market values for several years for newly planted trees. To develop information that addresses these problems, a research project was initiated during the spring of 1998 at the ISU Rhodes Research Farm. The objectives of the project are: (*i*) to evaluate the influence of seven weed control treatments [four small grain/forage crop combinations (oats and red fescue; oats, red fescue, and red clover; and oats, orchardgrass, and red clover; red clover and hairy vetch), one herbicide treatment (conventional mix of preemergents with additional control from RoundUp), mowing, and no treatment] on the survival and growth of two groups of tree species (fast-growing hardwoods [two poplar clones and silver maple] and highvalue hardwoods [red oak and black walnut as seedlings and from seed]); (*ii*) to evaluate the influence of seedlings of the tree species on the productivity of small grain/forage crop combinations, and (*iii*) to determine the cost effectiveness of planting trees with different weed control techniques.

Keywords
Forestry, Agronomy, Horticulture

Disciplines
Agricultural Science | Agriculture | Agronomy and Crop Sciences | Forest Sciences | Horticulture

Forage and Tree Experiment (FATE)

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Introduction

Trees are becoming an increasingly important component of the Iowa landscape. For tree plantings to be more common in Iowa two major problems related to establishment must be overcome: (1) intense weed competition and (2) a lack of market or non-market values for several years for newly planted trees. To develop information that addresses these problems, a research project was initiated during the spring of 1998 at the ISU Rhodes Research Farm.

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Materials and Methods

Moderately uniform upland and bottomland pasture sites at the north end of the farm were selected for planting. Farm personnel disked both sites to prepare them for the study. Each site was divided into six blocks: three for the fast-growing hardwoods, and three for the high-value hardwoods. Forages were seeded in the spring and within a few days tree seedlings and seed were planted. In all, 3,528 seedlings and 5,800 seeds were planted.

Initial plans for the study called for harvesting the oats at grain maturity, and subsampling forages to determine yield. Beginning in June, 1999, forages were subsampled using a rising plate meter, which can be used to estimate yield. Subsamples were taken from three of the four small grain/forage combinations. Subsampling was not performed on the hairy vetch treatment, because the species is not able to withstand the winter conditions. The three remaining grain/forage treatments were sampled in early June, mid July, and early September. These sampling dates were consistent with the recommended forage harvest dates for the state of Iowa. Subsamples were dried and ground for use in analysis of protein content and digestibility.

Tree height and diameter are measured annually in the fall. In the spring of 1999 tree seedlings were thinned to approximately four or five trees per species in a row depending on the number of species surviving and tree spacing. Trees planted from seed were not thinned to allow for the study of competition in relation to rate of growth.

Results and Discussion

The spring and early summer of 1998 were very wet, restricting access to the sites for general maintenance. Following the rain came a period of hot and humid weather that caused a growth spurt in the weeds relative to the oats and forage treatments that were to be used for weed control. When the ground dried enough to access the plots with equipment, weeds dominated both planting sites, particularly the

bottomland one. Given the weed competition, forage production was very low. As a consequence, we decided to not sample for forage production. Instead, steps were taken to promote the growth of the forages by mowing the plots, because mowing is a practice used to help establish forages. Mowing was done three times during the growing season, which allowed the forages to increase to 80% or better coverage within most plots. Mowing improved forage establishment but prevented us from estimating forage production. Data collected to calibrate the rising plate method showed a very weak relationship between actual biomass and measurements, so that no estimates of biomass have been developed. That phase of the project has been dropped.

The trees have been less impacted by the variation in weather. Survival has been good for all plantings except for oaks from seed. Apparently, the seed had not been adequately stratified because few acorns germinated. As a result, oak from seed has been effectively dropped from the experiment. Analysis of variance of the average tree height per plot by species showed no treatment by species interaction ($P>0.30$), and showed differences among fast-growing and among slow-growing species ($P<0.001$), differences among treatments applied to fast-growing species ($P<0.008$), and showed an indication of differences among treatments applied to slow-growing species ($P<0.12$). On the upland sites Crandon, Eugenii, and silver maple averaged 3.1, 2.5, and 1.0 m, respectively. On the lowland sites the three averaged 3.5, 4.5, and 1.88 m, respectively. To simplify the results and show differences among treatments, average height for the fast-growing species and the slow-growing species (except for oak from seed, which was dropped) was calculated for each treatment on the bottomland site (Table 1). Not surprisingly seedlings on the herbicide treatment plots averaged the tallest. But surprisingly the fast-growing trees averaged almost exactly the same height for the other treatments. For slow-growing trees the averages by treatment were more variable. The forage treatments do not seem to reduce growth of the seedlings. On the upland site the averages were closer together, partially because deer browsing has been a larger problem there.

Table 1. Average height at end of 2000 of fast-growing species and slow-growing species by treatment on bottomland sites.

Treatment	Fast-Growing (m)	Slow-Growing (m)
Oats and red clover	3.2	0.92
Oats, red fescue, and red clover	3.2	1.11
Oats, orchardgrass, and red clover	3.1	0.92
Preemergents and roundup	4.1	1.21
Oats and hairy vetch	3.0	0.82
Mowing	3.0	0.77
Control	3.0	1.00
Standard error	0.2	0.16