

IMPROVING TREE ESTABLISHMENT WITH FORAGE CROPS

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Tree establishment in Iowa can be difficult without adequate weed control. Although herbicides are effective at controlling weeds, they may not be desirable in riparian settings and some landowners are opposed to using them. An alternative to herbicides is the use of forage crops to control weeds. A research project was established in 1998 to evaluate the influence of various weed control methods on the growth and survival of a diverse group of tree species.

Seven weed control treatments were used including four forage treatments, one herbicide, one mowing, and a control (no treatment)]. The four forage treatments include hairy vetch (*Vicia villosa* Roth), red clover (*Trifolium pratense* L.), red clover plus red fescue (*Festuca rubra* L.), and red clover plus orchard grass (*Dactylis glomerata* L.). Forage treatments were seeded with cultivated oats (*Avena sativa* L.) as a cover crop.

The tree species included slower growing red oak (*Quercus rubra* L.) and black walnut (*Juglans nigra* L.) from seed and as seedlings and faster growing silver maple (*Acer saccharinum* L.) and two cottonwood (*Populus deltoides* Bartr.) clones Eugenii and Crandon, all as seedlings. In the fall of 1998 and 1999, tree height and basal caliper were recorded for all of the trees. In the fall of 2000 and 2001 height was recorded for all trees, and diameter at breast height was recorded for the Crandon and Eugenii clones.

Survival after the first year on the bottomland site averaged 75 percent for the Crandon clone, 97 percent for the Eugenii clone, 90 percent for silver maple, 93 percent for black walnut, and 98 percent for red oak seedlings. Survival on the upland site averaged 85 percent for the

Crandon clone, 95 percent for the Eugenii clone, 91 percent for silver maple, 93 percent for black walnut, and 94 percent for red oak seedling. Survival was not estimated for the red oak and black walnut from seed. In the spring of 1999, tree seedlings were thinned to approximately 8 to 10 trees per plot to reduce competition.

Trees arising from seed were not thinned to allow for the study of competition in relation to the rate of growth. By the end of the 2001 growing season, the number of Crandon, Eugenii, silver maple, and black walnut seedlings was about equal to the 1999 levels, indicating little mortality. The black walnut from seed had 71 percent survival from 1999 levels on the upland site and 84 percent survival on the bottomland site. Most of the red oak from seed had died with survival from 1999 levels of 16 percent on the upland and 21 percent on the bottomland site. The red oak seedlings also fared poorly in the bottomland site with 20 percent survival from 1999 levels, but had 80 percent survival on the upland site.

At the end of the fourth growing season, sapling height on the bottomland site averaged 5.7 m for the Crandon clone, 6.1 m for the Eugenii clone, 2.6 m for the silver maple, 1.5 m for the black walnut from seed, 1.3 m for the black walnut from seedlings, 0.6 m for the red oak from seed, and 1.0 m for the red oak from seedlings. At the end of the fourth growing season, sapling height on the upland site averaged 5.1 m for the Crandon clone, 3.5 m for the Eugenii clone, 1.0 m for the silver maple, 1.2 m for the black walnut from seed, 1.1 m for the black walnut from seedlings, 0.4 m for the red oak from seed, and 0.8 m for the red oak from seedlings.

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Citation for proceedings: Van Sambeek, J.W.; Dawson, J.O.; Ponder, F., Jr.; Loewenstein, E.F.; Fralish, J.S., eds. 2003. Proceedings, 13th Central Hardwood Forest conference; 2002 April 1-3; Urbana, IL. Gen. Tech. Rep. NC-234. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 565 p. [Research note from poster presentation].

After 4 years, the different types of treatment did not appear to influence seedling survival but the type of treatment had a definite impact on height growth with herbicide treatment producing the most growth (2.8 m), followed by the forage crops (2.4 m), the control (2.2 m), and mowing (2.1 m).

Although the herbicide treatment resulted in significantly greater growth than the forage treatments, the 16 percent increase in growth may not be biologically meaningful. In a situation in which tree growth is not a primary consideration the apparent "loss" in productivity due to using forage crops as a way to help establish trees could be a minor concern. It is logical to conclude that given a reasonable level of production from the forage crops, using such crops to help establish trees could be a viable technique.