Competition Control for Cottonwood Plantation Establishment

Forest landowners have always been interested in the possibility of growing a crop of trees in a few years rather than in a few decades. In the 1960s, eastern cottonwoods (*Populus deltoides*) were planted to produce pulpwood on a short rotation (typically fewer than 10 years). Both industrial and private landowners quickly learned that establishing a successful cottonwood plantation required more input than pines, and, like other hardwoods, they perform best on sites that have the right soil and moisture conditions.

Today, bioenergy and biofuels hold promise for rapidly growing short rotation species such as cottonwood. The same general concepts used in establishing a successful cottonwood plantation for pulpwood must also be employed for bioenergy plantations.

Eastern cottonwood is a tree species capable of rapid growth when planted on appropriate sites and when given sufficient cultural treatment to ensure establishment and early development. If planted off-site, eastern cottonwood at best survives, but growth is greatly reduced. The worst case scenario will lead to poor early survival followed by high death rates because of insects and diseases.

This species is extremely sensitive to all forms of competition, and one of the greatest threats to successful establishment of cottonwood plantations is competition from undesirable vegetation.

Successful establishment of eastern cottonwood plantations depends on a wide variety of factors, including sufficiently preparing the site, attending to spacing, using properly prepared cuttings, and controlling competition.

In addition to competing for the resources of the site, undesirable vegetation also makes early cultivation more difficult by limiting your ability to see the planted row. Historically, mechanical cultivation was the only competition control used in cottonwood plantations. Although cultivation is very important for soil aeration and competition control, it can seriously injure or kill young sprouting cottonwood cuttings. Any delays in mechanical cultivation caused by inclement weather and unacceptable site conditions will typically result in greater growth of competing vines and weeds, which makes it even more difficult to obtain adequate control. If this competition gets out of hand, it could dramatically reduce cottonwood survival and growth.

Herbicides and Insecticides

Herbicides offer the possibility of controlling herbaceous weed competition without damaging planted cottonwood cuttings. The herbicide oxyfluorfen, marketed as Goal 2XL, has great potential for controlling competition without harming young developing cottonwood trees.

Oxyfluorfen (Goal 2XL) is typically applied very soon after planting while the cottonwood cutting is dormant. This application is usually done in January or early February. If the planting is done later, then the application should be done immediately after planting.

Field studies have shown that the most cost effective rate is 64 ounces of Goal 2XL per acre with Triton AG-98 added at 0.25 percent volume/volume. Gramoxone can be added to the mix at the rate of 32 ounces per acre, and the mixture is applied as a 6-foot-wide band over the top of the planted cottonwood cuttings. Gramoxone provides immediate control of any vegetation present in January and early February; however, it should not be used if the cuttings have already broken dormancy. Goal provides competition control for the following 90 to 120 days. Typically, the applications are made using 20 gallons of spray solution per acre. Overall, 64 ounces of Goal 2XL provide adequate competition control, and increasing the rate is not considered cost effective.

During the first year, the use of Oust (sulfometuron-methyl) as a pre-emergent has been examined with the results showing extremely high rates of mortality. However, if applied following the end of the first growing season to a well-tilled plantation along with Goal 2XL, it alleviates the need for competition control during the second year. The rates that were tested ran between ¼ to 1 ounce of Oust plus 32 ounces of Goal 2XL. The lower rate of Oust was best for high pH soils that ranged between 7.0 and 8.5, while the higher rate was better for more acidic soils. The application should be a direct spray toward the base of the tree. Goal 2XL applied as a pre-emergent during the first year can be mixed with Pendulum 3.3EC (Pendimethalin) to control pre-emergent grasses in cottonwood plantations. The use of Oust should be done at the end of the first growing season and in combination with Goal 2XL to control competition during the second year.

Competition control using herbicides is only one component of successful cottonwood plantation establishment and management. Mechanical cultivation during the first years of a plantation may still be highly desirable on many sites, and the timing of cultural operations can have a great impact on the growth and development of cottonwoods. However, use of mechanical treatments in the first 120 days following planting is often difficult because of weather and site conditions, and can result in damage or destruction of the planted cuttings. For that reason, competition control with herbicides is preferable for plantation establishment. Using herbicides enhances both the survival and growth of the crop trees compared to untreated areas.

Eastern cottonwood plantation managers now have alternatives to early mechanical cultivation. The potential impact of these options on cottonwood production is significant as it reduces the number of entries with machinery that could pose possible unintended injury during the cultivation process.

In addition to controlling competition, insects may play a critical role in first-year survival. In particular, cottonwood leaf beetles and June beetles and their larvae feed on the tender leaves and shoots of first-year cottonwood, causing loss of growth and even death.

To control this type of insect feeding, you can spray with Sevin 4F or Sevin XLR Plus at the rate of 1 quart per acre. Another technique that works is to soak the dormant, unrooted cuttings in a solution of water and Admire Pro Systemic Protectant for 8 hours before planting. The rates needed are 5.8 to 11.6 fluid ounces for unhydrated cuttings or 11.6 to 17.5 fluid ounces for partially hydrated cuttings in 100 gallons of water. The cuttings draw in the insecticide, providing up to 2 years of control of various beetles. The only problem in using such a technique is that planters must use waterproof gloves while planting to avoid contact with the insecticide.

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