CHAPTER 8
PLANTATION ESTABLISHMENT

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INTRODUCTION

The two most critical issues in establishing tree plantations are controlling competing vegetation (weeds, both broadleaf and grass) and controlling wildlife damage (seed predators such as squirrels and mice and subsequent seedling damage from rabbits, voles and deer).

Weed control for the first 2 or 3 growing seasons is essential to establish any kind of tree plantation, but it may be even more important for direct seeding than for seedling tree planting. Weed competition will greatly reduce seedling growth and eventually reduce seedling survival. Imagine an acorn just beginning to establish a root system and a leafy crown in the midst of a mass of roots and stems of fully developed grass and broadleaf weeds. The limited amount of energy stored in the acorn is quickly exhausted and opportunities to replenish those reserves are severely limited by competition. As a practical matter, chemical herbicides are often the best choice for competition control for direct seeding projects that are more than a few acres in size. Mulches can be used, but their per-acre costs can be quite high. Cultivation has the problems of timing and repetition with increased soil erosion potential and increased root disturbance, therefore making it less practical. The section on controlling competing vegetation will, therefore, focus on chemical methods.

Wildlife damage is probably the most common cause of direct seeding failures. All direct seeding plans should include practices to minimize damaging wildlife by eliminating their habitat for at least the first 2 or 3 years. Practices to eliminate habitat might include cultivating or mowing areas that are not treated by herbicides. It is necessary to either incorporate weed residue into the soil or remove it. Residue left on the planting site becomes rodent nesting habitat. In addition, it is important to determine the present population of potentially damaging wildlife species so that population reduction efforts can be taken if necessary.

CHEMICAL VEGETATION CONTROL*

Would you direct seed your vegetables and not do any weed control? If so stop here, read no further. If you think weed control is important, read more. For success with direct seeding, weed control is essential. Remember, *your objective* is to get trees to replace grass and broadleaf plants and to do this in a bigger, better and faster way. When trees can be made to grow faster during the first three years, the saplings begin to provide their own weed control due to shading.

Both survival and height growth are directly related to vegetation control. We should not accept poor growth after working so hard to collect and sow good seed.

Site Preparation: Before planting seed, do a good job of site preparation. The ideal site is one with a great amount of bare mineral soil. A firm seedbed is essential.

For perennial grasses, mow in mid August and allow 4 to 8 inches of regrowth. Then broadcast glyphosate (Roundup Pro) at the rate of 1 ½ to 2 quarts per acre. Add 8 ounces (1 pint) of 2, 4-D if legumes are present. After dieback, till the field. This assumes fall seeding.

If seeding will not be done in the fall, delay tillage and leave crop residue. Till in late winter for spring seeding. Plowing followed by disking prepares the seedbed. If erosion is a possibility, leave strips with residue oriented across the slopes at variable spacings depending upon the steepness and length of slopes.

If soybeans are the present crop, you planned well. Simply sow the seed during the fall. With wheat stubble, some burn down or tillage may be needed. For corn stubble, disk or chop the site before seeding, depending on residue density. If tillage has been performed, it may be necessary to roll or cultipack the site to produce a firm seed bed and achieve proper seed planting depth.

* *Brand names appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned. Persons using such products assume responsibility for their use in accordance with current label directions of the manufacturer.*

The following information comes from One Stop Forestry, Decorah, Iowa and represents successful direct seeding in northeast Iowa using high volume, broadcast seeding.

> "**Maintenance:** At least one other advantage of direct seedings is the shortened period of maintenance required to control competing grasses and broadleaf weeds. Ten thousand seedlings per acre will shade out the competition much sooner than 700, often within a period of three years. We have yet to settle on an exact prescription for chemical weed control but we feel we're getting close. Currently, out first year weed control recommendation is a fall or early spring application of Goal herbicide at a rate of 2-3 qts/acre. Goal is a pre-emergent product that controls a number of annual grass and broadleaf weeds. Another option is to wait for the weeds to sprout, identify them, and treat in early to mid June using Transline at a rate of ½ to ¾ pint/acre to control broadleaves and Envoy at 1 pint/acre for grasses. Best results will be seen when spraying weeds less than 12" tall.
>
> "The second years' application will depend on the competition observed after the first growing season. Typically we are applying, in the fall or early spring, a solution of ½ oz/acre of Oust and 2 qts/acre Princep. Another alternative may be to repeat the Transline and/or Envoy treatment at the beginning of the second growing season. The need for chemical weed control after the second growing season should become more of a spot spraying concern. By the end of 3 growing seasons, many of the seedlings should be 6' or more in height and 1" caliper. At this point, the planting is on its own until the first thinning after year 9 or 10."

Remember, this scenario is with 10,000 plus seedlings per acre, which is the best but may come at an unacceptable cost. With only 1,500 to 3,000 seedlings per acre in rows, a 3rd treatment with herbicides may be required. With good luck natural invasion of seedlings may occur and boost total number of trees per acre. Whether these trees are valuable commercial species is a different question. The real benefit of natural invasion is that weeds are controlled sooner and the invader trees serve as a nurse crop for the oak and walnut. Don't despair if boxelder and mulberry or black cherry appear in large numbers. Instead, celebrate because this is a good thing. To quote an expert, Larry Krotz from Iowa says "I can kill out an unwanted tree later on, but it is even harder to establish a tree." In any case, don't be content with the high risk scenario presented by an abandoned fescue or orchard grass pasture. Left to natural forces, it takes 15 to 20 years for a grass pasture to succeed into a forest. Weed control before, during and after planting will yield better results.

There are several effective herbicides available which have been used, especially in Iowa. The following information has been adapted from "Direct Seeding" F-363 11/99 Forestry Extension Notes, Iowa State University, Ames and is authored by Extension Forester Paul Wray and Iowa DNR District Foresters Gary Beyer and Stan Tate.

Before you jump into the tables, understand 2 broad kinds of herbicides:

Preemergence herbicides are applied either before or after the crop emerges, but they must be applied before the weeds emerge, or at the very early seedling weed stage. Preemergents are best applied in late fall and early spring. It is critical that a pre-emergent herbicide be incorporated into the soil, primarily through precipitation. Wait until 1" soil temperature drops to 50°F to avoid biological degradation of the herbicide.

Postemergence refers to the use of a herbicide after the crop or weeds have emerged. Postemergence herbicides are applied to the foliage and, for many herbicides, must remain on the foliage for several hours to be effective. A postemergence herbicide may be broadcast directly over the top of the weeds and the trees if it is selective enough not to damage trees; an example is Fusilade. Less selective postemergence herbicides will have to be applied as a directed spray that does not come in contact with foliage on green tissues of seedling trees and shrubs.

Table 1

Herbicides for First Year Preemergent Weed Control

Surflan (Oryzalin)	Grasses, some broadleaves	2-4 qts./acre
Pendulum (Pendimethalin)	Grasses, some broadleaves	2-4 qts./acre
Pennant (Metolachlor)	Grasses, some yellow nutsedge	1-2 pts./acre
Goal (Oxyfluorfen)	Grasses and broadleaves	.5-1 lb/acre
Simazine (Not on ash or maple)	Grasses and broadleaves	1-4 lb/acre

Table 2

Postemergent Weed Control

Envoy (Clethodim)	Grasses	17-34 oz/acre
Fusilade (Fluazifop-p-butyl)	Grasses	24-48 oz/acre
Transline (Clopyralid)	Broadleaves	.5-1.5 pt./acre *may cause damage**
Classic (Chlorimuron Ethyl)	Broadleaves and nut sedge	.5-.75 oz/acre *may cause damage**
Scepter (Imazaquin)	Broadleaves and grasses	2/3 pt/acre *may cause damage**
Oust (Sulfometuron Methyl) *Exhibits both preemergent and postemergent activity*	Grasses and broadleaves	.5-1 oz/acre *may cause damage**

** Damage will be minor, usually consisting of leaf discoloration and arrested growth. Trees generally recover.*

Points to keep in mind

Ö Know and calibrate all spray equipment and properly apply the lowest effective dose.

Ö If trees are in rows and a band treatment is applied instead of broadcast, use a minimum 4' band the first growing season. Increase the band width to 5' to 6' for the 2nd year. Tree roots grow in length more than the tree top grows in height during the first few years.

Ö Take the training for general standards and the pesticide applicator test. Contact any county Cooperative Extension service for the schedule.

Ö Alternative herbicides to check out:

- Goal 2XL - Rohm and Hass - labeled for conifers and conifer seedbeds (nurseries)
- Envoy - Valent Corp. - a post emergent grass herbicide. Lists Reed Canary grass as susceptible.
- Scepter ODG - Cyanimid (BASF) - labelled now for cottonwood & hybrid poplar which are extremely sensitive to most herbicides. Both pre-emergent & postemergent activity.
- Oust DF - Dupont - black walnut and white oak are sensitive. Use lowest dose on black walnut, use less than 1 oz rate and avoid high pH sites.

Ö **Bottom Line:** more reforestation practices have failed in Illinois due to heavy grass competition than for any other reason.

Mechanical Vegetation Control

Cultivation can also be used to effect excellent weed control. Several points are important for tillage:

- Cultivate on nearly level slopes to avoid excessive erosion.
- Establish rows across slopes to reduce erosion.
- On slopes, leave short, 2' to 4'spots or strips *untilled*. This breaks the erosive power of runoff.
- Timing is crucial; cultivate early to destroy seedling weeds.
- Maintain a depth of not more than 1 inch.
- Three or more passes per growing season will be needed for effective weed control.

WILDLIFE DAMAGE MANAGEMENT

Habitat management is the key to managing wildlife populations. Mice, voles, squirrels and rabbits will be found in higher numbers if they have suitable habitat, especially cover. Burning, plowing, disking and mowing can be used to destroy cover for damaging wildlife species. By removing cover predators such as hawks, owls, foxes and coyotes are more effective, reducing existing populations, and preventing future population increases. Every direct seeding plan should address both weed control and manipulation of cover for damaging wildlife, both on the planting site and on adjacent areas.

A snap trap survey before planting is the best way to assess present rodent populations. This is critical information if for any reason it is not possible to destroy all of the rodent habitat in the planting area. Contact in advance a biologist who is willing and able to identify species of small rodents. Place as many traps as possible, at least 10 on a straight line transect diagonally across the center of the planting site. Use peanut butter and acorns together for bait. Rat traps work better than mouse traps, especially if chipmunks or squirrels may be present. Mark and anchor the traps with a wire flag. Count and empty the traps daily in the morning and continue trapping for 3 nights. Record robbed or sprung traps as an indication of the amount of pressure from unidentified species. Freeze the trapped rodents until they can be identified. White footed mice, deer mice, squirrels and chipmunks are the most serious seed predators, since they are proficient diggers. Voles are a serious pest of young seedling plantations since they can consume seedling roots and girdle small stems.

Tabulate results in terms of "captures per 100 trap nights," which is equal to: # captured/# of nights x number of traps x 100. If the number of captures per 100 trap nights/ac of damaging species is greater than 2, plan to place bait stations on the site before seeding to reduce damaging rodent populations. Plan to place bait stations at least one week before beginning to plant. Place bait stations uniformly over the site at about 50 to 100 yard intervals starting 50 to 100 yards out from the field edge (this is approximately the foraging distance of damaging species). Place at closer intervals if the field is not clean tilled. Mark traps with wire flags. Follow label directions on bait stations. Bait stations can be made from 18 inch lengths of 1.5 or 2 inch PVC pipe, use the larger size if chipmunks are believed to be present. A $^{3}/_{8}$ inch hole is drilled through the center of the pipe and an 8 inch metal rod is pushed through the hole and into the ground to anchor the pipe. A commercially available bag of rodent bait will fit into each end of the pipe. These stations should not pose a threat to non-target wildlife.

Raptor perches may help control small mammals. Obtain 4" x 4" treated timbers or naturally decay resistant posts at least 16 feet long and securely attach a short cross bar on top. Auger a post hole 3 to 4 feet deep, the smaller the post hole diameter the longer the perches will remain vertical. Pack fill tightly around posts. Place approximately one perch per acre through the center of the plantation.

Annual Inspection

Regular inspection of direct seeding sites will help build experience with the practice and provide an early warning about problems such as weed competition, damaging wildlife, poor quality seed, etc. At least one inspection per year should be made. The best time during the first growing season is the last 2 weeks of June, when the majority of seedlings will have emerged and weed growth will occur.

To estimate seedlings per acre in a row plantation, count the number of seedlings in 100 feet of row. Multiply the width between rows (in feet) by 100 feet (the row length). Next, divide that number by 43,560 to obtain the fraction of an acre sampled. Then, divide the number of seedlings counted by the fraction of an acre sampled. Sample at least 1 randomly located length of row per acre or a total of 10 lengths for plantations larger than 10 acres.

Example

50 seedlings are counted in a 100 foot length of row.
The distance between rows is 8 feet.

100' X 8' = 800 sq. ft.
800 sq. ft. / 43,560 sq. ft. per acre = 0.018 acres
50 seedlings / 0.018 acres = 2,722 seedlings/acre

To sample a broadcast plantation, obtain a 37 foot, 3 inch length of nylon cord (the radius of a 1/10-acre circular plot). Make a loop on one end. Establish a transect through the center of the planting site. Randomly locate 1 plot per acre along the transect or a maximum of 10 plots for plantations over 10 acres. Push a tile spade firmly into the ground to mark the plot center and fit the loop in the nylon cord over the handle of the tile spade. Walk the circle delineated by the length of cord and count the number of seedlings inside the circular plot. Multiply by 10 to obtain the number of seedlings per acre. Record your results on the Direct Seeding Inspection Data Sheet that follows. Summarize the plot data for a particular plantation on the Direct Seeding Summary Data Sheet.

Direct Seeding Inspection Data Sheet

Copy this form and keep the original in your binder.

Landowner _____ Farm No. _____ Tract No. _____

Sec. _____ TWN _____ RGE _____ Acres _____

Species Planted _____

Condition of Site Prep or Annual Weed Control _____

Planting Method _____ Soil Series _____ Spacing and Seed/Ac _____

Planted by _____ Planting Dates _____

Inspected by _____ Inspection date _____

Risk of Wildlife Damage _____

Plot No.	Species	Approximate Height and Condition	Plot No.	Species	Approximate Height and Condition

DIRECT SEEDING SUMMARY DATA SHEET

Copy this form and keep the original in your binder.

Plot No. Species	No./ac	Approximate Average Height and Condition	Plot No. Species	No./ac	Approximate Average Height and Condition

Plot No. Species	No./ac	Approximate Average Height and Condition	Plot No. Species	No./ac	Approximate Average Height and Condition

Plot No. Species	No./ac	Approximate Average Height and Condition	Plot No. Species	No./ac	Approximate Average Height and Condition

Plot No. Species	No./ac	Approximate Average Height and Condition	Plot No. Species	No./ac	Approximate Average Height and Condition

SUBTOTALS

Species	Avg No./ac	Average Height	Average Condition

Grand Total Average No./Acre ______ Average Condition __________ Average Height ________

REFERENCES

"Chemical Weed Control in Tree Plantings." W. L. Loucks and W. A. Gexen. Pub. MF-656. March 2001, Kansas State University. 8 pp. Available on the web at: www.oznet.ksu.edu/library/forst2/mf656.pdf

Since this chapter is necessarily brief and incomplete, check out these references for more information on chemical weed control:

www.greenbook.net/free.asp.
www.ilvirtualforest.nres.uiuc.edu. Select the icon "Herbicides" for Forest Herbicides, A Reference Manual for Herbicide use in...
www.townsendchemical.com. Provides direct links to manufacturers and current labels.

Also contact the school of agriculture at these universities. Ask for weed science.

1) University of Illinois - Urbana-Champaign (217)333-0460
2) Southern Illinois University - Carbondale (618)453-2469
3) Western Illinois University - Macomb (309)295-1414
4) Illinois State University - Normal (309)438-7602