



FORESTRY EXTENSION NOTES

DIRECT SEEDING

For years the standard practice in tree planting has been the use of seedlings, with a planting rate of 500 to 1,000 per acre and 5 to 10 years of follow up weed control until the site is occupied by the trees. Recently, there has been renewed interest in direct seeding for the establishment of tree planting in Iowa.

Direct seeding can offer several advantages over planting seedlings. First, seedlings from seeds develop normal undisturbed taproots. Second, normal growth rate is undisturbed by transplanting shock, third, seeds can be planted in the fall or in the spring after stratification for some species. The white oaks (white, bur, swamp white, chinkapin and post) must be planted in the fall because they germinate in the fall. Fourth, seeds of selected, high-quality trees can be planted instead of run-of-the-mill seedlings. Fifth, direct seeding may facilitate the establishment of a larger number of trees per acre, thus resulting in a site occupied by trees in a shorter period of time. Sixth, plantings with large number of trees suffer less significant damage from deer, rabbits and other animals because they are overwhelmed by the large number of trees.

Direct seeding also has some drawbacks. Germination is not always predictable; this requires seeding a larger number of seeds than seedlings to establish the stand. Seed loss to squirrels and other predators can also be extremely high especially on small scale plantings. Control of competing vegetation may be more difficult than with seedlings. Seed is a perishable commodity and requires care in the collection, storage and handling to maintain viability. Finally, seed may be difficult to collect or may not even be available some years.

Seed Collection and Storage

Seed quality is critical for success. The percent of sound seed can be determined by simply cutting or cracking open seed. Viable nuts have white, sound-looking nut meats; non-viable seeds have darkened, or shriveled kernels which may be watery or give off a foul or rancid odor. Walnuts which have not filled, can be separated simply by floating. The unfilled nuts will float, while filled nuts will sink. This process is less reliable with oak, because of varying moisture content. In some years, acorns are heavily damaged by the *Curculio* acorn weevil. The amount of damage can be estimated by acorn inspection and/or from simply cutting open a sample of the collected acorns. Any of the other seeds with shrunken, brown, or empty seeds are not viable.

Walnut seed can be collected as soon as the walnut husks begin to change color. Collect acorns as soon as they fall and before they become dry, and less viable. Walnut husks do not have to be

removed for either fall planting or storage and stratification. Seed collected locally is better adapted to local growing conditions; seed from walnut and oaks should not be moved more than 150 miles north or south. Choose the best trees for seed trees; straight vigorous seed trees increase the chance of straight, vigorous offspring. Collect ash seed when the color begins to fade from green to yellow or brown. For more information on seed collection, see "Growing Seedlings from Seed", Iowa State University Forestry Extension Note F-304.

Walnut and the red oaks (red oak, black oak, pin oak, shingle oak) and most other species of trees produce seed which is dormant; it will not germinate unless exposed to a period of moist cold. This period of "stratification" can be satisfied by planting in the fall, storing the seed over winter in a stratification pit, or with cold storage over the winter. Pit stratification is simply a hole in well drained (soil 2 to 3 feet deep), filled with alternating layers of nuts and sand and covered with an insulating layer of straw or other material. Cold storage is accomplished by dipping the nuts or acorns in water, draining for 10 minutes, and sealing in 4 mil plastic bags. Store in cold storage at temperatures between 34 to 37 degrees. For optimum germination, both walnut and red oak acorns must have at least 90 days of cold stratification.

The white oaks (white oak, bur oak, swamp white oak, post oak) do not require stratification; they germinate soon after falling, sending down a tap root. White oak acorns must be fall planted; it is not possible to store them.

For short term storage of seed for fall planting consider the following points:

- keep walnuts in relatively small piles (less than 18" deep) to reduce heating, but minimize drying as much as possible. If the walnuts are husked, keep moist until planted.
- store acorns in feed bags, or bags which will allow for some air movement.
- immediately after collection, immerse the acorns in water for 24 hours, and place in a cool dark place until planting.
- ash should be allowed to air dry and then stored in a dry place until it is planted.

The longer the period of seed storage, even under the best of conditions, the greater the loss of viability.

Site Preparation

Excellent site preparation is imperative for success in direct seeding. The goal of site preparation is to prepare the seed bed and reduce the competition from grasses, weeds, and woody

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vegetation. The amount and type of site preparation depends on the slope and initial condition of the planting site. Plantings on crop fields may require no site preparation. In fields with perennial grasses, strip spraying in the early fall is adequate for row plantings; for broadcast plantings, spraying with roundup followed with tillage (field should look like it is ready to plant corn) is recommended. On erosive sites and slopes, leave strips of vegetation to minimize the soil loss during establishment of trees. Remember the goal of site preparation is to eliminate the competition from perennial plants.

Planting seed in the understory of existing woodlands is usually not successful because of shade and competition. Direct seeding can be used with the clearcut or shelterwood regeneration systems to increase the amount of oak and/or walnut regeneration.

Good site preparation will also help in reducing depredation of the seed. If rodents represent a significant loss of nuts and acorns, good site preparation in combination with habitat removal may be necessary before seeding. With adequate habitat, rodent populations may be high enough to destroy any planted seeds.

Planting

For natural stratification of dormant seeds, fall planting is best. If planting in the fall, plant as soon as the seed has been collected. Seeds planted in the fall can germinate as soon as conditions are favorable, and depredation pressure may be less because of an abundant supply of other food. For spring planting, the period of depredation is shorter; however, weather conditions may delay planting. Spring planting is necessary for silver maple; collect and plant in the spring as soon as the seed begins to fall from the tree.

Seed can be planted by hand or by using mechanical methods. Tools which can be used for hand planting include shovels, spades, planting bars, or bulb planters. Modified tree planters (with good depth control) or corn planter shoes have been used to plant oak and walnut. Mechanical tree planters have been developed and may be available. For all planting techniques, avoid planting too deep; seed should not be planted more than two times the diameter of the seed. Acorns and walnuts will germinate when sitting on top of bare mineral soil with adequate moisture; seed planted very shallow or only in soil contact will suffer greater predation than seed planted at the correct depth.

Trees can also be broadcast seeded. Walnuts and acorns are broadcasted using a fertilizer cart. Disk the seed into the ground so that the majority is one inch deep. Ash and smaller seeds are spread with a broadcast seeder and harrowed lightly. On some soils and sites, packing may improve the incorporation of the seed into the soil.

There is little information available to indicate the proper rate of seeding. To determine the number of seeds required, determine the desired trees per acre; then estimate the percent of sound seed, percent germination, and percent survival during the first year. For example, 1600 trees per acre with 80% sound seeds, 80% germination and 50% survival will require the initial planting of 5000 seeds per acre. Number of seeds per pound or bushel varies tremendously. The average number of seeds per bushel are: black walnut (400), red oak (4,500), white oak (5,000) and ash (100,000).

To secure many of the benefits of broadcast seeding of trees, the following are recommended as the minimum of green, uncleaned seeds per acre. The desired number of trees per acre after the first growing season should exceed 5,000 trees.

Species	Bushels per Acre
Green or white ash, hard maple	1
Oaks, hickory, coffeetree	3-4
Black walnut	10-15

Weed Control

Most tree plantations including seedling established or those established using seed, suffer from intense competition resulting in poor survival and growth until the trees fully occupy the site. Once the canopies or foliage area of the trees shade the site, weed and grass competition is no longer a growth factor. In fact, at that stage, the plantation begins to function like a forest, not an open or grass field. One potential advantage of using seed is the ability to plant larger number of trees, reducing the time to full occupancy of the site by the trees. Large number of trees may also aid in the development of better tree form. Trees which are crowded during early development form straighter trunks and begin self pruning at an earlier age; however, these plantations may require earlier thinning than wider spaced plantings. The practice of planting large number of seeds has had limited although expanding use in Iowa.

As with more traditional plantings, weed control is still essential for good survival and growth. Work with your district forester or consultant for the best method. The first growing season is critical as the seed germinates, begins to grow and must compete with weeds on Iowa's fertile soils. There are a host of chemicals and techniques which may be used for adequate weed control. The choice may dependent on tree species planted as well as the potential weed problem. During the first year for broadcast plantings, apply a pre-emergent herbicide (Table 1) or monitor the planting carefully during the first year, using selected post-emergent herbicides as necessary (Table 2).

For row seeding, the application of pre-emergent herbicides is required to maintain rows and facilitate growth and survival of the new trees. After the establishment period, follow weed control recommendations according to the Iowa DNR publication "Weed Control for Trees and Shrub Seedlings".

Table 1. Herbicides for 1st year pre-emergent weed control

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

Table 2. Herbicides for post emergent weed control

Envoy	Grasses and some broadleaves	17-34 oz/acre
Fusilade	Grasses	24-48 oz/acre
Transline	Broadleaves	.5-1.5 pt./acre (may cause damage)
Classic	Broadleaves and nut sedge	.5-.75 oz/acre (may cause damage)
Oust	Grasses and broadleaves	.5-1 oz/acre (may cause damage)
Kerb	Grasses	2-4 lb/acre (fall appliation)

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