



United States Department of Agriculture

DIRECT SEEDING OF TREES & SHRUBS

Forestry Technical Note No. 16

Natural Resources Conservation Service (NRCS)

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WHAT IS DIRECT SEEDING?

Direct seeding is a method to establish woody vegetation by planting trees and or shrub seed by hand or by mechanical methods. This technical note is intended to establish trees and woody shrub vegetation on agricultural land to improve wildlife habitat. Consult FOTG Standard 612, Tree/Shrub Establishment for further information.

SPECIES SELECTION

In most instances it is advisable to use a mixture of species for a direct seeding. A mixture will enhance wildlife habitat by providing a variety of food types that will fruit at different times of the year. A mixture also has a better chance for success due to the variability of seed germination of the different species.

Species selected will be adapted to the soil-site conditions and will be suitable for the planned purpose. Adapted species can be found at the NRCS Soil Data Mart or Web Soil Survey by generating the Forestland Productivity or Windbreak and Environmental Plantings reports. Species information is also available in Tables 1 & 2. Only viable, high quality seed will be used. It is recommended that the seed source be located within 200 miles north or south of the planting site.

SEEDBED PREPARATION

Before seeding all competing vegetation should be eliminated using conventional tillage or systemic herbicides. Follow all local, state and federal guidelines and labels related to the use of pesticides. Consult the landowner or operator for potential herbicide carryover before direct seeding as soil applied herbicides may prevent seed germination. Cultipacking the tilled soil to firm

the seedbed before and after the seeding is recommended. A no-till drill suitable for the species selected may also be used.

All direct seedings should have a nurse crop sown to help prevent frost heaving and for weed suppression.

SEED HANDLING, SEED STORAGE AND SEEDING METHODS

Seed should be sown in the fall between September 15th and December 1st or stratified seed may be sown in the spring before May 15th. All seed will be planted under favorable soil site specific conditions. It is recommended that only clean seed be purchased. Store seed under refrigeration in plastic bags keeping the seed moist between seed purchase and planting or as directed by seller. If the seeding cannot be completed in the fall proper seed storage is critical to keep the seed viable for a spring seeding. For long term storage (more than 1 week) store seed moist under refrigeration between 34° and 40° F. Before planting allow seed to air dry.

Before seeding the proper equipment must be selected as the larger seed may not go thru some drills. However, some newer drills with multiple seed boxes may be satisfactory. In addition a soybean drill or corn planter may work for the larger seeded species. When using a corn planter or soybean drill the small seeded species would need to be planted separately with a drill able to handle the smaller seeds.

Seed may be broadcast using a hand seeder, or planted using a drill. Seed should be carefully sown to insure that the proper rate is being used. If the seed is hand sown it should be covered using a cultipacker with care not to cover too deep.

Heavy Seed will be sown to a depth approximately 2 times the seed diameter. In general, most heavy seeds will be seeded 1 to 4 inches deep. Lighter seed should be planted just below the soil surface no deeper than 1/4 inch. Extremely light seeded species such as Buttonbush, Black Chokeberry and Elderberry will be sown on the surface of the soil and firmed by rolling or cultipacking no deeper than 1/8 inch deep.

SEEDING RATES

Plant a minimum of 3,000 seeds per acre (see Table 1. Direct Seeding Rates Table) if row planting. Broadcast plantings will need a minimum of 4,500 seeds per acre.

If there is not a source of light seeded species within 500 feet of any portion of the site, consider seeding an additional 1000 seeds/acre of heavy or light seeded species. If heavy predation by wildlife is anticipated, double the seeding rate for the first 100 feet beyond a forest or grassland edge.

Potential nurse crop species include the light seeded tree species (see Species Selection). Other potential trees and shrubs include hazelnut, redbud, sumac, dogwood, pawpaw, chokecherry, and plum.

The following is an example of a mixed shrub stand:

Common Name	Scientific Name	Seeding Rate oz./acre
Silky Dogwood	<i>Cornus amomum</i>	2
Black chokeberry	<i>Aronia melanocarpa</i>	0.5
*Elderberry	<i>Sambucus canadensis</i>	1
Winter wheat should be seeded for a nurse crop using 1 bushel/acre		
*Smooth Sumac (<i>Rhus glabra</i>) may be substituted on MWD – ED soils using 1 oz./acres		
*Flowering Dogwood (<i>Cornus florida</i>) may be substituted on MWD – WD soils using 5 oz./acre		

MAINTENANCE

To control weedy vegetation during shrub establishment mow high so newly emerged seedlings are not damaged. Spot treatment of herbicides or a rope wick applicator may also be used to control noxious weeds. Follow all local, state and federal guidelines and labels related to the use of pesticides.

Consider replanting with direct seed or seedlings if survival after 2 growing seasons is less than 500 evenly distributed seedlings per acre.

REFERENCES

Schopmeyer, C. S., 1974. Seeds of Woody Plants in the United States, Agricultural Handbook No. 450.

Illinois Direct Seeding Handbook, Assoc. of IL SWCDs, USDA-NRCS, IL Dept. of Nat. Res., & IL EPA. 2002. Regeneration, Natural and Artificial. Central Hardwood Notes, USDA-Forest Service, 1989.

Table 1. Direct Seeding Rates Table (Note: walnut and all hickory species are husked)

Common Name	Scientific Name	Ave. Seeds/lb	Lbs/Ac. for 1000 Seeds/Ac	Lbs/Ac. for 3000 Seeds/Ac	Lbs/Ac. for 4500 Seeds/Ac
Bald Cypress	<i>Taxodium distichum</i>	1125	0.9	2.7	4
Black Cherry	<i>Prunus serotina</i>	4000	0.25	0.75	1.1
Hackberry	<i>Celtis occidentalis</i>	4000	0.25	0.75	1.1
Yellow Poplar	<i>Liriodendron tulipifera</i>	550	1.8	5.5	8.2
Heavy Seeded Species					
Black Walnut	<i>Juglans nigra</i>	40	25	75	112.5
Kentucky Coffeetree	<i>Gymnocladus dioica</i>	150	6.7	20	30
Hickory, Bitternut	<i>Carya cordiformis</i>	156	6.4	19.2	28.9
Hickory, Mockernut	<i>Carya tomentosa</i>	90	11.1	33.3	50
Hickory, Pignut	<i>Carya glabra</i>	200	5	15	22.5
Hickory, Shagbark	<i>Carya ovata</i>	90	11.1	33.3	50
Hickory, Shellbark	<i>Carya laciniosa</i>	30	33.3	100	150
Oak, Black	<i>Quercus velutina</i>	125	8	24	36
Oak, Bur	<i>Quercus macrocarpa</i>	55	18.2	54.5	81.8
Oak, Cherrybark	<i>Quercus pagoda</i>	265	3.8	11.3	17
Oak, Chinkapin	<i>Quercus muhlenbergii</i>	130	7.7	23.1	34.6
Oak, Overcup	<i>Quercus lyrata</i>	75	13.3	40	60
Oak, Pin	<i>Quercus palustris</i>	215	4.7	14	20.9
Oak, Red	<i>Quercus rubra</i>	65	15.4	46.2	69.2
Oak, Shingle	<i>Quercus imbricaria</i>	230	4.3	13	19.6
Oak, Shumard	<i>Quercus shumardii</i>	70	14.3	42.9	64.3
Oak, Swamp Chestnut	<i>Quercus michauxii</i>	45	22.2	66.7	100
Oak, Swamp White	<i>Quercus bicolor</i>	75	13.3	40	60
Oak, White	<i>Quercus alba</i>	90	11.1	33.3	50
Pecan	<i>Carya illinoensis</i>	125	8	24	36
Persimmon	<i>Diospyros virginiana</i>	785	1.3	3.8	5.7
Shrub Species					
American Elderberry	<i>Sambucus nigra ssp. canadensis</i>	230	4.35	13.04	19.57
America Plum	<i>Prunus americana</i>	395	2.53	7.59	11.39
Black Chokeberry	<i>Photinia melanocarpa</i>	1,078	0.93	2.78	4.17
Buttonbush	<i>Cephalanthus occidentalis</i>	134,000	0.01	0.02	0.03
Chokecherry	<i>Prunus virginiana</i>	2,173	0.46	1.38	2.07
Dogwood, Gray	<i>Cornus racemosa</i>	13,000	0.08	0.23	0.35
Dogwood, Silky	<i>Cornus amomum</i>	12,200	0.08	0.25	0.37
Hazelnut	<i>Corylus americana</i>	490	2.04	6.12	9.18
Ninebark	<i>Physocarpus opulifolius</i>	4,000	0.25	0.75	1.13
Pawpaw	<i>Asimina triloba</i>	700	1.43	4.29	6.43
Small Trees					
America Plum	<i>Prunus americana</i>	395	2.53	7.59	11.39
Dogwood, Flowering	<i>Cornus florida</i>	4,500	0.22	0.67	1.00
Redbud	<i>Cercis canadensis</i>	14,000	0.07	0.21	0.32
Washington Hawthorn	<i>Crataegus phaenopyrum</i>	29,800	0.03	0.10	0.15

Seed data were obtained from the Indiana Department of Natural Resources, Division of Forestry, Nursery Section and Seeds of Woody Plant Seed Manual.

Table 2. Species Information

Common Name	Scientific Name	CTSG Area	Soil Drainage	Flooding Tolerance	Soil pH Range
Tree Species					
Bald Cypress	<i>Taxodium distichum</i>	Central, South	VPD-WD	Tolerant	4.5-7
Black Cherry	<i>Prunus serotina</i>	All	MWD-WD	Intolerant	4.5-7.5
Black Walnut	<i>Juglans nigra</i>	All	MWD-WD	Intolerant	6.6-7.8
Cedar, Northern White	<i>Thuja occidentalis</i>	North	PD-WD	Somewhat	5.5-7.5
Hickory, Shagbark	<i>Carya ovata</i>	All	MWD-WD	Intolerant	4.5-7.5
Hickory, Shellbark	<i>Carya laciniosa</i>	All	VPD-WD	Somewhat	6.1-7.4
Kentucky Coffeetree	<i>Gymnocladus dioicus</i>	All	SPD-WD	Somewhat	5.5-6.5
Maple, Red	<i>Acer rubrum</i>	All	VPD-WD	Somewhat	4.5-6.5
Maple, Silver	<i>Acer saccharinum</i>	All	VPD-WD	Tolerant	4.5-7.0
Norway Spruce	<i>Picea abies</i>	All	VPD-WD	Somewhat	5.0-7.5
Oak, Black	<i>Quercus velutina</i>	All	MWD-ED	Intolerant	4.5-6.5
Oak, Bur	<i>Quercus macrocarpa</i>	All	PD-ED	Somewhat	4.5-7.5
Oak, Chinkapin	<i>Quercus muhlenbergii</i>	All	MWD-ED	Intolerant	5.0-8.0
Oak, Cherrybark	<i>Quercus pagoda</i>	South	SPD-WD	Intolerant	4.5-6.5
Oak, Overcup	<i>Quercus lyrata</i>	South	VPD-WD	Tolerant	4.5-7.0
Oak, Pin	<i>Quercus palustris</i>	All	VPD-WD	Somewhat	4.5-6.1
Oak, Scarlet	<i>Quercus coccinea</i>	All	MWD-ED	Intolerant	4.5-6.5
Oak, Shingle	<i>Quercus imbricaria</i>	All	SPD-WD	Intolerant	4.5-6.5
Oak, Shumard	<i>Quercus shumardii</i>	All	SPD-WD	Somewhat	6.1-7.4
Oak, Swamp Chestnut	<i>Quercus michauxii</i>	South	SPD-WD	Somewhat	4.5-6.5
Oak, Swamp White	<i>Quercus bicolor</i>	All	VPD-WD	Somewhat	4.5-6.1
Oak, White	<i>Quercus alba</i>	All	MWD-WD	Intolerant	4.5-6.5
Pecan	<i>Carya illinoensis</i>	Central, South	SPD-WD	Tolerant	6.1-7.8
Pine, White	<i>Pinus strobus</i>	All	MWD-WD	Intolerant	6.1-7.5
Persimmon	<i>Diospyros virginiana</i>	All	MWD-WD	Somewhat	4.5-6.5
River Birch	<i>Betula nigra</i>	All	VPD-WD	Somewhat	4.5-6.5
Sweetgum	<i>Liquidambar styraciflua</i>	South	PD-WD	Tolerant	5.5-6.5
Tuliptree	<i>Liriodendron tulipifera</i>	All	MWD-WD	Intolerant	5.0-7.0
Shrub Species					
American Elder	<i>Sambucus nigra ssp. canadensis</i>	All	VPD-WD	Tolerant	4.5-7.4
America Plum	<i>Prunus americana</i>	All	MWD-ED	Somewhat	4.5-6.5
Black Chokeberry	<i>Photinia melanocarpa</i>	All	PD-WD	Somewhat	4.5-6.5
Buttonbush	<i>Cephalanthus occidentalis</i>	All	VPD-WD	Tolerant	6.1-7.8
Chokecherry	<i>Prunus virginiana</i>	All	SPD-WD	Intolerant	5.5-8.0
Dogwood, Gray	<i>Cornus racemosa</i>	All	VPD-WD	Tolerant	4.5-7
Dogwood, Silky	<i>Cornus amomum</i>	All	VPD-WD	Tolerant	4.5-7.4
Hazelnut	<i>Corylus americana</i>	All	MWD-WD	Intolerant	4.5-7.4
Ninebark	<i>Physocarpus opulifolius</i>	All	VPD-WD	Somewhat	4.5-7.4
Pawpaw	<i>Asimina triloba</i>	All	SPD-WD	Intolerant	5.5-7.4
Small Trees					
America Plum	<i>Prunus americana</i>	All	MWD-ED	Intolerant	4.5-6.5
Dogwood, Flowering	<i>Cornus florida</i>	All	MWD-WD	Intolerant	5.5-7.4
Redbud	<i>Cercis canadensis</i>	All	MWD-WD	Intolerant	6.0-7.4
Washington Hawthorn	<i>Crataegus phaenopyrum</i>	All	SPD-ED	Intolerant	4.5-7.4

VPD = Very Poorly Drained; PD = Poorly Drained; MWD = Moderately Well Drained; WD = Well Drained; ED = Excessively Drained

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