



# APPENDIX

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# SUMMARY TABLE OF SEED DATA AND AVERAGE PRICES

## Bottomland Species

Common Name	Ave Seed/#	Approx Retail Price *	IDNR Purchase Price **
Water Hickory	164	\$3.00	\$0.75/#, husked
Nuttall Oak	95	\$4.25 to \$5.00	\$1.90/#
Willow Oak	462	\$5.00 to \$8.00	
Sweetgum	82,000	\$55.00	
Baldcypress	5,200	\$7.50 to \$8.00	
Overcup Oak	140	\$3.40 to \$5.50	\$1.90/#
Persimmon	1,200	\$8.00 to \$19.00	
Silver Maple	1,700	\$4.00 to \$5.00	
Shingle Oak	415	\$2.50 to \$9.00	\$0.60/#
Shumard Oak	100	\$3.25 to \$5.50	\$0.90/#
Shellbark Hickory	30	\$1.25 to \$4.00	\$0.75/#, husked
Swamp Chestnut Oak	85	\$2.50 to \$4.50	\$1.10/#
Cherrybark Oak	580	\$4.25 to \$9.00	\$3.00/#
Sycamore	150,000	\$9.50	
Pecan	100	\$3.00	\$1.25/#, husked
Hackberry	4,300	\$22.00 to \$35.00	\$5.00/#, fruit
Green Ash	17,000	\$5.00 to \$10.00	
Black Walnut	40	\$1.50 to \$4.00 husked	\$0.10/#, unhusked
Bur Oak	75	\$1.20 to \$6.00	\$0.60/#
Swamp White Oak	120	\$1.75 to \$6.00	\$1.10/#
Pin Oak	410	\$2.30 to \$3.85	\$1.90/#

\* 1998 prices from several commercial seed vendors.

\*\* Prices as of October 2000 are subject to change. Contact a local DNR Forester for the required seed collection permit.

# SUMMARY TABLE OF SEED DATA AND AVERAGE PRICES

## Upland Species

Common Name	Ave Seed/#	Approx Retail Price/# *	IDNR Purchase Price **
Black Cherry	4,200	\$6.00 to \$12.00	
Black Oak	245	\$1.60 to \$6.00	\$1.10/# approx \$49/bu
Black Walnut	40	\$1.50 to \$4.00	\$0.10/# approx \$4.40/bu
Hickories	100-200	\$1.25 to \$4.00	\$0.75/#, husked approx \$30/bu
Red oak	125	\$1.25 to \$4.50	\$0.90/# approx \$56/bu
Tuliptree	10,000	\$17.50 to \$20.00	
White Ash	13,000	\$9.50 to \$13.00	
White Oak	120	\$1.25 to \$4.00	\$0.90/# approx \$65/bu
Chinkapin Oak	395	\$2.00 to \$5.00	\$1.90/# approx \$95/bu

\* 1998 prices from several commercial seed vendors.

\*\* Prices as of October 2000 are subject to change. Contact a local DNR Forester for the required seed collection permit.

# SEED BROKERS

BUYERS AND SELLERS (AS OF 10/2000)

## **Cascade Forestry Service, Inc.**

21995 Fillmore Ave  
Cascade, Iowa 52033  
(563)852-3042 or (800)596-9437  
Fax : (563)852-5004  
WWW.CASCADEFORESTRY.COM.  
E-mail: Cascade@netins.net

## **Dunagan Tree Seed & Nut Co.**

Dan Burke  
2016 Timea St.  
Keokuk, IA 52632  
(319)524-9845  
E-mail: treeseed@interl.net

## **Geode Forestry, Inc.**

Bob Petrzelka  
3002 A Winegard Drive  
Burlington, IA 52601  
(319)752-6395

## **Michael G. Hamilton**

385 Northaven Drive  
Robins, IA 52328  
(319)378-0537  
(most native hardwoods)

## **Steve Hamilton**

1156 Highway 965 NW  
Cedar Rapids, IA 52404  
(319)857-4935  
(most native hardwoods)

## **Pat Hayes**

967 Riker Street  
Dubuque, IA 52003  
(319)582-1680  
E-mail: condi220@aol.com

## **Ray Herman**

154 Lake Road  
Seymour, IL 61875  
(217) 687-2712  
(eastern Illinois)

## **Lovelace Seeds, Inc.**

Browns Mill Road  
Elsberry, MO 63343  
(573)898-2103  
fax (573)898-2855  
www.inweb.net/~lovelace  
E-mail: lovelace@inweb.net

## **Mike Macke**

1521 Wildwood Drive  
Monmouth, IA 52309  
(319)652-6052  
(most native hardwoods)

## **One-Stop Forestry**

PO Box 916  
Postville, IA 52162-0916  
(319)864-3586 or -7112  
(NW Illinois)

## **Prairie Hills Forestry**

Jeff Hudgens  
321 University Avenue  
Macomb, IL 61455  
(309)833-4747

## **Smith Nursery Company**

PO Box 515  
Charles City, IA 50616  
(515)228-3239

## **Southwest Badger RC&D**

P.O. Box 751  
Platteville, WI 53818  
(608)348-3235  
E-mail: steve.bertjen@wi.usda.gov

## **Timber Services**

Ken Hoene  
RR 1, Box 247A  
Shelbyville, IL 62565  
(217)774-5611

## **State Forestry Seed Buyers**

Contact your nearest IDNR District Forester

## **Vallonia State Nursery**

2782 West County Road 540 South  
PO Box 218  
Vallonia, IN 47281  
(812)358-3621

## **Jasper-Pulaski State Nursery**

15508 West 700 North  
Medaryville, IN 47957  
(219)843-4827  
(also Terre Haute buying station)

## **Walnut Buying Locations in Illinois for Hammons Products Company\***

### **Kevin Massie**

Illinois Forest Products  
Company  
RR 1, Box 312  
Beardstown, IL 62618  
(217)323-4540

### **Jess Willard**

RR 1, Box 62A  
Pleasant Hill, IL 62366  
No Phone  
(Southern Pike County, between  
Pittsfield and Pleasant Hill, 1/2 mile  
south of Martinsburg, turn east at Cold  
Run Bakery sign, 3/4 miles to sawmill.)

### **Summersfield Farms**

Ed or Leah Meyer  
Godfrey, IL  
(618)466-2678  
(North of Alton, NW Madison Co.)

### **Stacey Gilpin**

Dallas City, IL  
(217)852-3280  
(Northern Hancock Co.)

\* 2000 price: \$10 per 100 pounds after hulling. Season begins 10/2 and ends 11/7 at most locations. Buying locations change annually. For more information, contact John Rickman or Susan Zartman, Hammons Products Co.: (417)276-5181  
E-mail: szartman@blackwalnuts.com

# CONTRACT PLANTERS AND CONSULTING FORESTERS

WHO ADVERTISE DIRECT SEEDING (AS OF 10/2000)

## **Roy Bailey**

8479 E. 250th Ave.  
Mason, IL 62443  
(618)238-4865

## **Bundy Tree Farm**

Shelby Bundy  
1242 Bethel Road  
Odin, IL 62870  
(618)775-8246

## **Mick Cherry**

306 South State Street  
Geneseo, IL 61254  
(309)944-4763  
(all of Illinois)

## **Cascade Forestry**

RR 1  
Cascade, IA 52033  
(319)852-3042  
www.cascade@netinsnet  
(northern half of Illinois)

## **Tony Colvin**

1340 County Road 900N  
Lacon, IL 61540  
(309)246-3348  
Email: 2sis@joysta.com  
(small acreages only)

## **Forest Improvement Services**

RR 1, Box 393  
Janeville, IA 50647  
(319)987-2345  
(site prep & planting; post planting  
maintenance; tree planting)

## **Forest Management Services, Inc.**

4120 Haythorne Avenue  
Terre Haute, IN 47805  
(812)466-4445  
(7:30-3:00 M, W, TH)  
www.forest-management.com  
E-mail: Larry@forest-management.com

## **Full Circle Forestry**

Geode RC&D  
Bob Petrzelka  
3002 A Winegard Drive  
Burlington, IA 52601-2060  
(319)752-6395  
(northern half of Illinois)

## **Michael G. Hamilton**

385 Northaven Drive  
Robins, IA 52328  
(319)378-0537  
(site prep & planting; seed sales; post  
planting maintenance; tree planting)

## **Steve Hamilton**

1156 Highway 965 NW  
Cedar Rapids, IA 52404  
(319)857-4935  
(site prep & planting; seed sales; post  
planting maintenance; tree planting)

## **Jerry Heinz**

471 Conty Rd. 800E  
Tolono, IL 61880  
(217)598-2407  
cell phone: 369-8181  
heinzfarms@prairieinet.net

## **Manning Tree Farm**

Al Manning  
1404 Colwell Avenue  
Charles City, IA 52328  
(319)378-0537

## **Shane Morris**

Northeast Iowa T.R.E.E.S.  
RR 3, Box 191  
Manchester, IA 52057  
(319)927-4108  
(site prep & planting; post planting  
maintenance; tree planting)

## **Oakwood Timber Improvement Service**

Mark Webb  
3006 Pleasant View Road  
Decorah, IA 52101  
(319)382-3502

## **One-Stop Forestry**

PO Box 916  
Postville, IA 52162-0916  
(319)864-3586 or -7112  
(NW Illinois)

## **Prairie Hills Forestry Consulting**

321 University Drive  
Macomb, IL 61455  
(309)833-4747  
(all of Illinois)

## **Dan Price**

Southeastern Illinois College  
3575 College Road  
Harrisburg, IL 62946  
(618)252-6376  
Fax (618)252-3156

## **Paul Roth**

9588 Old Route 13  
Murphysboro, IL 62966-4411  
(616)453-7468  
(southern half of Illinois)

## **Dave Steere**

806 Fourth Street SE  
Waverly, IA 50677  
(319)352-3988

## **Timber Services**

Ken Hoene  
RR 1, Box 247A  
Shelbyville, IL 62565  
(217)774-5611

## **Woodland Forestry Consulting**

10571 - 18<sup>th</sup> Avenue  
Monmouth, IA 52309  
(319)673-2146  
(site prep & planting; seed sales; post  
planting maintenance; tree planting)

# EQUIPMENT SUPPLIERS (TREE SEEDERS AND PLANTERS - MAY, 2000)

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## Seeders

### **Bag-A-Nut, Inc.**

Bag-A-Nut is designed to harvest a large variety of nuts and other products quickly and efficiently. Website has information and video.

[www.baganut.com](http://www.baganut.com)

### **Cruz Enterprises**

316 Hillcrest Drive  
Hamilton, IL 62341  
(217)847-2456, ask for Randy  
E-mail: [rcruz@adams.net](mailto:rcruz@adams.net)

### **Truax Co.**

4821 Xerxes Avenue North  
Minneapolis, MN 55430  
(612)537-6639  
[www.truaxcomp.com](http://www.truaxcomp.com)

# SEED POUNDAGES REQUIRED FOR DIRECT SEEDING

Listed below are the amounts of seed needed to meet NRCS standards for direct seeding when seed is planted in rows (3000 heavy seeded species/acre) and when seed will be broadcast (4800 heavy seeded species/acre). Note that walnut, pecan, and all hickory species are husked. \*See reference below.

Species	Range of Seeds/lb	Avg #/lb	3,000 Seeds per Acre (pounds needed)			4,800 Seeds per Acre (pounds needed)		
			Small Seed	Avg Seed	Lg Seed	Small Seed	Avg Seed	Lg Seed
Bitternut Hickory	125-185	156	17	20	24	26	31	39
Black Oak	125-400	245	8	13	24	12	20	39
Black Walnut	11-100	40	30	75	272	48	120	436
Bur Oak	40-135	75	23	40	75	36	64	120
Cherrybark Oak	420-745	580	4	5	7	7	9	12
Chinkapin Oak	263-520	395	6	8	12	10	13	19
Mockernut Hickory	34-113	90	27	34	88	43	54	142
Northern Red Oak	75-256	125	12	24	40	19	39	64
Nuttall Oak	56-143	95	21	32	54	34	51	86
Overcup Oak	139-154	140	20	22	23	31	35	37
Pecan	151-174	162	18	19	20	28	30	32
Persimmon	665-1764	1200	2	2.5	5	3	4	7
Pignut Hickory	175-225	200	14	15	17	22	24	28
Pin Oak	320-540	410	6	8	10	9	12	15
Shagbark Hickory	80-150	100	20	30	38	32	48	60
Shellbark Hickory	25-35	30	86	100	120	137	160	192
Shingle Oak	315-795	415	4	8	10	6	12	16
Shumard Oak	78-128	100	24	30	39	38	48	62
Swamp Chestnut Oak	35-195	85	16	35	86	25	57	137
Swamp White Oak	90-175	120	17	25	34	28	40	53
Water Hickory	138-190	164	16	19	22	25	30	35
White Oak	70-210	120	15	25	43	23	40	69
Willow Oak	272-695	462	5	7	11	7	11	18

\* SOURCE: Seeds of Woody Plants in the United States. 1974. Ag. Handbook No. 450. USDA-Forest Service. 883 pp.

# Nuts

## to Forestry: New Technology for New Forests

by

Stan Tate

Originally Printed in *The Iowa Conservationist*

March/April 1996

We all know squirrels plant walnuts, and the seedlings come up everywhere — in the flower beds, in the yard, even in that impossibly small patch of real estate between the house foundation and the gravel mulch that runs right up to the concrete blocks. If it is so easy for the squirrels, it should be easy for us to do the same thing.

Over the years I have seen several cases where direct seeding of walnuts has been quite successful, and a huge number of cases where it has been a miserable failure. Why can it work so well in a few cases, but fail so often in most cases? Why is it extremely rare to find oak plantings successfully established by planting acorns?

We have been working pretty hard here in southeast Iowa trying to find the answer to these questions, and to develop a system that will help us reestablish new forests quickly, easily and for less cost. We still have a lot to learn, but feel we are beginning to understand how to successfully start new forests by planting acorns and walnuts.

This summary of tips, thoughts and rules of thumb comes from the efforts of a unique team of local people who are intensely interested in forestry, and in seeing forestry used as an economic development tool for our region — providing jobs, saving soil, filtering water and making our countryside more beautiful. More than 40 persons made major contributions of time, money and resources to this project, organized and financed through the Geode Rural Conservation and Development (RC&D) of Burlington, and the Rural Development Through Forestry Program, administered by the Iowa DNR Forestry Division.

A word of caution to readers — the best way to establish new forests is still by planting seedlings, using the well-developed technology of seedling cold storage, cold handling, machine and hand planting, combined with a rigorous program of weed and grass control for at least three years. We have a great deal of experience with this system, and confidence in good survival and growth. Contact any DNR district forester for the information that, if carefully followed, will go a long way towards insuring a successful new forest.

Despite this warning, many Iowans have been fascinated with the potential gains direct seeding promises. Labor reductions can be substantial. A young person in great shape may be able to hand plant 500 seedlings a day in easy terrain. I have a good deal of gray hair, and most people would say I'm not a great athlete, but I can hand plant 360 nuts per hour (at least for a couple of hours) and never break a sweat. I use a special tool called a trapdoor planter sold by Geode RC&D in Burlington for \$25.

The savings for machine-planting are equally promising. Experienced three-person machine planting crews seldom average much more than 10 or 12 acres per day planting seedlings. The new automatic machine developed by Geode RC&D can plant 20 acres per day, and only requires one operator.

Seed is cheaper than seedlings. You can purchase walnuts for 2 to 5 cents apiece, while good quality seedlings cost 22 cents apiece or more. This may or may not constitute a real savings however, since not even cleaned and floated seed will yield 100 percent seedlings. Viability can be as low as 30 percent.

## Nuts to Forestry (continued)

If your primary aim is to save time and money on establishing your new forest, remember, the most expensive planting is the one that fails. If, however, you want to help Iowa develop a new and exciting land conservation technology, you may want to try direct seeding. Study up, don't cut corners, and have fun.

Success is insured, at least in part, by avoiding mistakes. If you are planting tree seeds, here is a short list of things to avoid:

**Don't plant seed that is already dead.**  
(Think this sounds silly, read on.)

**Don't plant in grass or weeds.**

**Don't plant in good mouse or squirrel habitat.**

**Don't plant too deeply or too shallow.**

If I wanted to write a recipe for direct seeding failure, it would go something like this: Collect your walnuts and acorns, put them in a big pile and let them really get heated up as the walnut hulls break down. Or better yet, let the seed dry out really well (either way is sure to kill them). Then store the seed over the winter, and plant real early in the spring, when the squirrels and mice are really hungry. Heck, even groundhogs like those acorns you worked so hard to collect. While you're at it, plant into deep grass, right at the edge of the timber, where the mice and squirrel population is really high. Don't try to control the grass or weeds (too much work), which will insure any seed that sprouts will have almost no chance to survive the grass and weed competitions.

I am embarrassed to say the previous paragraph is almost an exact description of my own first attempt at direct seeding some 15 years ago, and is amazingly typical of why direct seeding fails so often.

On a more positive note, here are a few things to concentrate on that we have learned promotes success.

**Make sure you have good seed.** Collect it as soon as it falls, or buy it from a reputable seed dealer. Clean off the walnut hulls only if you are going to use one of the new automatic machines for planting. Soak acorns overnight in water, and never let them get

completely dry. Crack open a bunch of the nuts to make sure they are OK. The nut meats should be moist, firm and brightly colored. If you think you have a bad batch, clean off the hulls and caps, and float them. Most of the bad seed will float. Keep and recheck the "sinkers." If most of the sinkers are unsound, toss out the lot, but

***Many people have observed that once the direct seeded seedling has completed its first growing season in good shape, it does exceptionally well in the following years.***

don't give up. Often the first nuts to fall off the tree are unsound. Go back a little later in the seed drop and try again.

If you are buying seed from a dealer, ask him to sell you seed on a "pure live seed basis," or to guarantee a minimum percentage of seed that is sound.

***Plant the seed right away, if you can.*** Virtually all of the hardwood species in Iowa can be planted as soon as the seed falls off of the tree.

If you must wait until spring to plant, properly store your seed over winter. Even properly stored seeds can lose some of their viability. Walnut and oak require cold, damp storage, except for trees in the white oak group which must be planted in the fall.

***Plant at the right depth.*** Avoid loose soil and pack the seed in well. Seed on or near the soil surface will dry out and die, or be eaten by birds, mice and squirrels. Never underestimate how much, and how quickly, your planting can be gobbled up. Planting deeply, and packing the seed in very tightly makes it more difficult (but definitely not impossible).

Plant walnuts two to five inches deep, and plant acorns one to three inches deep. The shallower depths are better if there is plenty of soil moisture and you are sure you will have very little rodent pressure.

***Choose your planting site carefully.*** Avoid using direct seeding in areas with a lot of surrounding timber. If there is good squirrel habitat within 100 yards, you should use seedlings rather than seed. If there is heavy, unmown grass or weeds within 50 feet, you should use seedlings to establish your planting.

## Nuts to Forestry (continued)

If you have grass or weeds in or within 50 feet of your planting site, they must be eliminated as completely as possible for at least the first growing season. Plowing, disking or burning will provide some short-term control. These practices need to be followed up with herbicide applications to provide weed control for at least the first 90 days of the growing season. Mowing is not an acceptable grass control practice by itself because it does nothing to eliminate the grass roots, and even very short mowing may not reduce the mouse population to acceptable levels.

The new seedling that grows from the acorn or walnut uses almost all of the food reserves stored within the nut itself within the first 20 to 30 days of growth. At this time the seedling has only a few small leaves to collect sunlight and make food for the plant. Dry soil, shade from weeds, or insect or rodent damage at this stage can cause serious problems. Young seedlings are very vulnerable during the first 60 to 90 days of growth, and therefore, must have almost perfect growing conditions to make maximum growth. It is certainly possible to get seedlings firmly established and 6 to 12 inches tall by the end of the first growing season. Many people have observed that once the direct seeded seedling has completed its first growing season in good shape, it does exceptionally well in the following years. It seems to make up for a slower first year by not suffering the “transplant shock” a nursery seedling goes through.

**Use machines for larger plantings.** Tree planting machines can be used successfully if you can accurately limit their planting depth, and you have a very low gear on your tractor. You will need to go one m.p.h., and drop one nut every second (difficult to do) in order to have your seeds planted 18 inches apart.

High-density plantings seem to be the most successful. Planting seeds six inches apart in the row seems to help the new seedlings get off to a faster start. I like to mix walnuts and acorns together in the row, using one walnut to every four or five acorns.

Truax Company of Minneapolis is manufacturing a machine for direct seed planting. It is designed to be mounted on a three-point hitch tractor and is ground driven.

Geode RC&D of Burlington has developed and tested prototypes for both one- and two-row planters, and may have machines commercially available in the future. Geode can be hired to do large-scale direct seeding projects. Several other forestry vendors plan to get into commercial direct seeding in the near future.

These automatic machines make large-scale direct seeding much more practical. They can plant seeds at accurate depths at six inches apart in the row, and can work at field speeds of two to three m.p.h.

Broadcasting and disking can be used successfully, but we have also seen a lot of failures. The seed can be spread by hand, by a manure spreader or fertilizer cart. The seed is then covered by disking and/or harrowing. Caution must be taken not to get the seed too deep — one to three inches is about right. Use at least four bushels of walnuts and one bushel of oak per acre, since this is not a precision technique. Rolling with a cultmulcher after planting is important.

If you would like more information on direct seeding, contact:

Geode RC&D  
3002A Winegard Dr.  
Burlington, IA 52601  
Phone: 319/752-6395

**Stan Tate is a District Forester for the department located in Wapello.**

# Forestry Invades the Cornfields

Originally Printed in *The Iowa Conservationist*  
March/April 1996

In 1991, Geode RC&D of Burlington, in cooperation with the DNR's Forestry Division and the Rural Development Through Forestry Program, attempted their first "multicropping project" growing walnut and red oak seedlings in a corn field. Even though the project was beset with weed control problems, it showed a possible 80 to 90 percent cost reduction in establishing trees.

Based on these early experiences with multicropping, the board of directors of Geode RC&D decided to support additional work as an integral component of their upcoming direct seeding project.

In 1993, a direct seeding project was started. Part of this project used prototype machines to plant acorns and walnuts in a no-till corn field.

Both acorns and walnuts were planted as part of the field testing of a two-row nut planter and a one-row nut planter. After the nuts were planted in rows about 12 feet, 6 inches apart, corn was no-till planted in the areas between the tree rows. Considering this is the first time either the foresters or the farmers ever attempted tree/corn intercropping, things turned out good. The trees grew to a height of 6 to 18 inches the first year, and the corn produced a modest crop of 93 bushels per acre.

Growing trees within a no-till corn field eliminates the need for many previously important tree establishment steps. The herbicides used to control grass and weeds in the cornfield also benefit the trees. The need for mowing is eliminated. In addition, the corn plants will shelter the young tree seedlings from drying winds and hot sun. In the 1994 test, trees shaded by corn grew more than trees with equally good weed control in full sunlight (and wind).

This system can be used with any size corn planter. The tree rows can be as close together as 12 feet, 6 inches (for four-row narrow corn) or as far apart as you like, but preferably some even-multiple of the width of your planter. You need to allow one corn row width for the trees. In other words, skip one row of corn and plant one row of trees instead.

If the tree rows are close together, you may only be able to grow corn for three to five years before the trees get big enough to start getting in the way of planting and harvesting operations. Tree rows planted further apart will allow corn to be grown for longer periods.

In our area, there is still quite a bit of four-row equipment. A farmer might plant a multicrop of corn and trees on a field to eventually be taken out of production. The farmer would plant 12 rows of corn and then skip one row, leaving space for the trees to be planted. The tree planting could be done using either seedlings or direct seeded using acorns and walnuts. After the trees begin interfering with the machinery, the farmer could switch from 12 rows of corn to 8 rows. Eventually the entire area could be seeded down for hay production or filled in with more trees. Many different cropping scenarios are possible, allowing great flexibility in designing multicropping plans to fit virtually any situation.

Using a multicropping system can provide continued income until the trees get large enough to provide their full benefits. At the same time, it will be easier for us to begin moving our most highly erodible land into more conserving uses with benefits for the economy, soil, wildlife, water quality, and beauty of our state.

— Stan Tate

# SEVEN RULES

## FOR DIRECT SEEDING SUCCESS

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by  
Iowa DNR District Forester Stan Tate

**Plant live seed.** I know this sounds dumb, but unless you test your seed before it is planted, you may be making a very dangerous assumption that it is actually viable. Seed absolutely must be tested if you are serious about making direct seeding successful.

**Plant at the right depth.** Planting too shallow increases losses to rodents and dry soils. Planting too deep increases losses to wet soils and late emergence, which increases winter kill and reduces next year's growth.

**Manage rodents and their habitat.** Mice, chipmunks, voles, and squirrels will destroy every planting if their numbers are high. Reduce their numbers by burning, mowing, disking, or otherwise minimizing their habitat.

Large open fields with little ground cover offer the best chance of success. Small wooded openings offer the least chance of success.

Planting deeper in hard ground reduces the ability of small rodents to destroy plantings. Supplemental feeding with small grains may also be helpful.

**Use lots of seed.** Large quantities of seed can help overwhelm rodent seed predators. High density plantings seem to establish themselves much more quickly. Use the cheapest seed as a "woody cover crop."

**Control competition.** New seedlings from seed are very small and fragile. Their first growing season builds the basis for their future growth. Concentrate your greatest efforts in their first year to assure survival and early growth. A minimum of 2 years of effective weed control will pay dividends.

**Match species to the site.** Use soils maps and local knowledge to choose species that are well suited to the site.

**Use combinations of species.** Mixed plantings seem to do the best and provide a hedge against pockets of poor soil and changing weather patterns. We recommend using at least 3 or 4 species in every planting.

# Direct Seeding Hardwoods on the Cache River Joint Venture

by  
Dave Maginel and Max D. Hutchinson  
The Nature Conservancy  
January 1997

The Nature Conservancy began direct seeding hardwoods on the Cache Wetlands Joint Venture properties in southern Illinois during the fall of 1989. The direct seeding method, planting seed rather than seedlings, was initiated in response to a well-documented seedling shortage in Illinois. Since 1989, many tree species were direct seeded on a wide variety of soils, slopes, aspects, and elevations which were in turn heavily influenced by ground covers and hydrological conditions. The results, though mixed, have encouraged us to continue the direct seeding program.

The following recommendations are based on the research and experience of resource professionals in Arkansas, Louisiana, Mississippi, and Missouri, as well as our own.

- 1) seed should be placed in storage at 34 degrees F in 4 mil plastic bags as soon as possible after collection; the seed should be stored on racks with expanded metal shelves to allow weevils to fall away from the bags; good circulation should be provided around the bags; red oak seed stored in this manner should remain viable for up to three years; no successful method of long-term storage for white oak seed is presently known,
- 2) limited information on fertilization indicates that growth, predation, and competition all increase on sites that have been fertilized; where hardwood seed was no-tilled into newly limed, fertilized and planted CRP land, good stands were established, but these were later lost to rodent predation; on this 144-acre site, red top was used in the seed mixture to control Johnsongrass; the red top seeding successfully controlled the Johnsongrass, but it also provided excellent rodent habitat which ultimately doomed the hardwoods,
- 3) seed can be mechanically or hand planted; many types of mechanical planters can be modified to handle acorns; four-row planters pulled by tractors and single-row planters pulled with 4WD ATVs have been used on the Cache;
- 4) seed should be sown at a depth of 2-4"; research indicates that seed planted 6" deep still has good survival; what is important is to keep seed from drying out before sprouting,
- 5) according to work done in the south, a planting rate of 1,300 seeds per acre produces a good stand; at the Cache, TNC usually plants 2,500 seeds/acre,
- 6) no maintenance of direct seeded hardwoods is needed or practiced in the south or on the Cache; at the Cache, chemicals have been used to control Johnsongrass in some plantings,
- 7) the timing, depth, frequency, and duration of flooding and the age and species of the seedlings influence flood mortality; high temperatures during flooding often prove deadly to seedlings; ice and wind can combine during flooding to girdle stems,
- 8) it is extremely important to correctly match species and sites, such is particularly evident as seedlings grow older,
- 9) direct seeding is not recommended (and is usually not necessary) in areas with a forest canopy or in areas less than two acres in size; in such situations, rodent damage has proven excessive,

## DIRECT SEEDING HARDWOODS (CONTINUED)

- 10) after five years, there is little size difference between trees that were planted as seedlings and those that were direct seeded,
- 11) mowing and disking increase early growth, but the benefits of cultivation disappear by the time the trees reach age fifteen,
- 12) the most common reasons for failure of direct seeding are: residual chemicals, late freezes, poor species-to-site matching, animal damage, flooding coupled with high temperatures or ice, improper seed storage, drought, poor quality seed, and competition,
- 13) costs of direct seeding on the Cache project are approximately \$50/acre,
- 14) approximately 20 acres/day are planted on the Cache using a 12', four-row planter and planting 2,500 seeds/acre, and
- 15) as long as there is adequate soil moisture, direct seeding can take place any time of the year.

Direct seeding has several advantages over the use of seedlings, including cost, time, and availability of plant material. Direct seeding is faster and can take place over a much longer time period. When seedlings are unattainable or when local seed sources are preferable, plant material for direct seeding is often available and the best alternative. Perhaps the greatest advantage direct seeding offers is the opportunity to fall plant wetlands. Sites that stay too wet to spring plant successfully with seedlings can often be disked and direct seeded in the fall.

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# COLLECTION AND CARE OF ACORNS

\* **F. T. Bonner of the Southern Forest Experiment Station in Mississippi gives a good summation of how best to handle oak acorns:**

1. Do not let them dry out below the critical moisture content of 25 to 35%.
2. Use mature seed.
  - a) Color of the nut
  - b) Acorn caps loosen easily
3. Cut a sample of each batch to check to make sure nuts are full and moist. Also check for insect larvae. If more than 25% of the nuts contain larvae, make sure the crews collect enough extra nuts to make up for the loss.
4. Do not allow nuts to dry out during collection or transport. Place in plastic bags or covered bins.
5. Do not allow the nuts to heat up in the bags or bins. Keep them out of the sun.
6. As soon as possible, immerse the acorns in water to help restore any lost moisture.
7. When the acorns are immersed, this is a good time to float off loose caps, sticks, and leaves.
8. Often many good acorns will float initially. If you seem to have a lot of sound floaters, let them soak for up to 24 hours. Most of the good nuts will sink.
9. Always cut samples of floaters and sinkers to determine the effectiveness of floatation to separate bad acorns.
10. If possible, plant the acorns immediately after cleaning and rehydration.
11. If storage is necessary, both red and white oaks can be stored in cold, damp conditions. Store at 34 to 40 degrees F. in sealed plastic bags. Use 4 mil thickness for red oak and 1.75 mil for the white oaks, because of their greater need for aeration. The white oaks can be stored for 6 months, and the red oaks for up to 3 years. Storage of *Quercus alba* white oak, even for 6 months, is considered risky.
12. Often acorns will sprout in storage and a radicle will emerge. Broken radicles do not adversely affect the seedling, and some believe that broken radicles result in an improved root system.

\* *SOURCE: Seed Biology and Technology of Quercus. 1987. GTR-SO-66. USDA-Forest Service, So. For. Exp. Sta., New Orleans, LA. 21 pp.*



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## Direct Seeding

Direct seeding is the process of establishing a stand of trees by planting tree seed instead of the conventional use of seedlings. Not all sites may be suited for direct seeding (steep slopes, rocky ground, etc.) but where it can be used there's great potential for establishing 1000's of seedlings per acre. High density plantings result in seedlings growing faster to compete for the limited available sunlight which in turn results in better formed trees. These plantings, if properly maintained, will often canopy or shade the ground after 3 or 4 growing seasons. The shade inhibits the growth of competing weeds and grasses and also reduces evaporation resulting in a more favorable growing environment. A couple of disadvantages of direct seeding include the need to make many passes over a field and the fact that seed availability and quality varies widely from year to year making the planning of these projects a bit uncertain. Seedings are typically done in fall as this is when most of the seed drops and becomes available. It also allows for the natural, over winter stratification most seeds need prior to germinating.

**Seed Collection & Handling:** Most native hardwood species such as black walnut, oak species, ash species, sugar maple, black cherry and hickory drop their seed in the fall. Collection should take place as soon as possible after the seed drops. The season may begin in late August with bur oak and end in late October or even early November with red oak and walnut.

Walnuts can be sewn with husks on. If they are husked, keep the nuts moist to prevent loss of viability. In addition, avoid large piles of walnuts to keep them from heating up, which will also destroy the seed. Smaller piles of 10" or less will more effectively dissipate any heat.



Here are some considerations for the proper handling of acorns:

- Acorns lose their viability if they become dehydrated, therefore, collect them SOON after they drop.
- Store the collected acorns in breathable bags such as onion sacks, burlap bags or standard feed sacks. These bags will reduce heat buildup, allow the seed to breathe and permit excess moisture to drain off.
- Immediately after collecting, immerse the acorns in water for up to 24 hours, remove and allow the bags to drain for 30 minutes. Store the soaked acorns in a cool (34 to 40 degrees) dark place until planting. If the acorns have been stored for an extended period, rehydrate for several hours prior to planting.

Ash and maple seed should be air dried and stored in a cool, dry place until sown.

**Site preparation:** The ideal site immediately prior to planting is one with as much exposed soil as possible. Soil to seed contact is critical to the success of direct seedings. Turning over existing sod also appears to greatly reduce mice and vole populations. If the site to be planted is in perennial grasses, mow the site in mid-August. After the grass has grown back 2-4', usually by early to mid-September, broadcast the field with Roundup Ultra at the rate of 1.5-2.0 qts. per acre. Add 1/2 pint of 2,4-D if legumes are present. Following dieback, till under all vegetation. Plowing (moldboard or chisel) and then disking is the most effective means of site prep tilling. If the site is currently in soybeans or corn, disk the stubble once after the harvest, then seed.

**Seed Needed:** Seeds of native trees should be selected to match the growing conditions of the planting site, e.g. bottomland, upland, heavy soils, light soils, etc. We currently utilize a limited number of species but hope to expand the list as our knowledge of planting with seed increases. Species presently used include red, white, bur, and swamp white oak, black walnut, shagbark hickory, green, white and black ash, black cherry and sugar maple. We have also recently seeded white birch along with several shrub species. The results of these species won't be known for a growing season or two. To get the desired high numbers of seedlings to germinate, we must plant tens of thousands of seeds per acre, even more if local populations of deer, turkeys and squirrels are high. These high numbers are easily obtained by using green ash seed. This species is quite common, is a fairly consistent annual seed producer, and has approximately 120,000 seeds per bushel. White ash and black ash are utilized as well, but the seed is harder to locate. Ash is also a quick grower forcing the oak and walnut to grow fast and straight. We recommend the following seeding ranges. Use whatever rate and combination of species that is appropriate for the site and meets the goals of the landowner. Seed costs will range from \$1.80/acre up to \$300/acre depending on species and rates with an average of \$250/acre.



Species:

- Ash (green, white, black combined)
- Red Oak
- White Oak
- Black Walnut
- Bur Oak
- Swamp White Oak
- Shagbark Hickory
- Sugar Maple
- Black Cherry

Seeding Rate:

- 1/2 - 1 bu./acre
- 1/2 - 2 bu./acre
- 1/4 - 1 bu./acre
- 10 - 15 bu./acre
- 1/2 - 1 bu./acre
- 1/4 - 1 bu./acre
- 1/4 - 1 bu./acre
- 1/8 - 1/2 bu./acre
- 1/4 - 1/2 lb./acre

**Seeding:** The acorns, walnuts and hickory nuts should be seeded first by broadcasting over the entire field. Disk these in to a depth of 1/2 to 2 inches. Then broadcast the ash, cherry and maple seed and lightly disk, culti-pack, or drag to a depth of 1/4 to 1/2 inch. Seeding labor costs will range from \$60/acre up to \$110/acre depending on the size of the project and its proximity to Postville.

**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, our 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 1/2 to 3/4 pint per 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 1/2 oz./acre of Oust and 2 qts./acre of 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.

Most of the above applications will run from \$40/acre up to as much as \$75/acre depending on herbicides and rates used.



## 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

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**IOWA STATE UNIVERSITY**  
University Extension

Ames, Iowa

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competition from grasses, weeds, and woody 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.

<u>Species</u>	<u>Bushels per Acre</u>
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 (Not on ash or maple)	1-4 lb/acre

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)

Prepared by Paul H. Wray, extension forester, Gary Beyer and Stan Tate, District Foresters, Iowa DNR

**CONSERVATION RESERVE ENHANCEMENT PROGRAM**  
**Riparian Forest Buffers CP22 Plan**

**Prepared for:**

**Jim & Dorothy Woller**  
**3168 Co. Rd. 2700 East**  
**Penfield, IL 61862**



**June 8, 2001**

**Prepared By:**

**Jay C. Hayek, District Forester**  
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## PROJECT DATA

**LANDOWNER:** Alma Jean French – Owner, Ben Rokey - Operator

**COUNTY:** McLean

**SEEDING AREA:** 11.1 acres to be broadcast seeded

**SOIL TYPE (S):** See plan

**SEED NEEDED:** 55,500 seeds

**SPECIES LIST:** Species selection should be based on soil types present, habitat, and the native range of the species. You must consult your District Forester prior to species substitution! *{This list is not intended to be exhaustive}* Prices are “estimated” and are subject to change based on annual seed crops.

BOTTOMLAND SPECIES	APPROX. RETAIL COST/LBS.	AVE. NUMBER OF SEEDS/LBS.
Black Walnut *	\$1.50 - \$4.00	40
Butternut *	\$1.50 - \$6.00	35
Bur Oak	\$1.20 - \$6.00	75
Swamp White Oak	\$1.50 - \$6.00	120
Pin Oak	\$2.30 - \$3.85	410
Shumard Oak *	\$1.50 - \$6.00	100
Shingle Oak *	\$2.50 - \$9.00	415
Shellbark Hickory *	\$1.25 - \$4.00	30
Bitternut Hickory *	\$1.25 - \$4.00	150
Pecan *	\$1.15 - \$3.00	100
K. Coffeetree *	\$6.00	230
Green Ash	\$5.00 - \$10.00	17,000

**\* Plant only these species on “well-drained” soils.**

UPLAND SPECIES	APPROX. RETAIL COST/LBS.	AVE. NUMBER OF SEEDS/LBS.
Black Walnut	\$1.50 - \$4.00	40
Butternut	\$1.50 - \$6.00	35
Bur Oak	\$1.20 - \$6.00	75
Northern Red Oak	\$1.25 - \$4.50	125
White Oak	\$1.25 - \$4.00	120
Chinkapin Oak	\$2.00 - \$4.00	365
Black Oak	\$1.45 - \$6.00	245
Hickory Species	\$1.25 - \$4.00	100-200
White Ash	\$9.50 - \$13.00	13,000
Black Cherry	\$6.00 - \$12.00	4,200

# IFDA/CREP DIRECT SEEDING PLAN

## LANDOWNER GOALS

To establish a stand of forest trees in order to satisfy the program requirements of the Conservation Reserve Enhancement Program's CP22 practice, create/improve habitat for wildlife, generate raw material for wood production, provide recreational opportunities, and provide aesthetic beauty. Multiple benefits of your Riparian Forest Buffer practice may easily be derived with proper planning, patience, and effort.

## BENEFITS OF DIRECT SEEDING AND EXISTING FORESTS

*Trees* beautify the landscape, enhance water quality by filtering sediment and absorbing excess nutrients and pollutants, protect and improve streams, regulate stream water temperatures for aquatic benefit, replenish water tables, conserve and stabilize soil, provide the raw materials for our homes, serve as preserves of biological diversity, shape the recreational landscape, mitigate flood damage, create riparian habitat and corridors for wildlife, prevent erosion of streambanks, increase global oxygen levels, reduce so-called greenhouse gases, sequester carbon, clean pollutants from the air, provide shade and buffers against high winds, and provide food and shelter to countless forms of wildlife. *In Illinois, 61% of the state's native plants and 75% of its wildlife habitat are found in its forests.*

## WHAT YOU SHOULD KNOW ABOUT DIRECT SEEDING

Direct seeding no doubt has advantages over planting seedling stock: lower initial costs, better form of trees resultant from higher densities (if broadcasting), full canopy develops more quickly, easier to use in remote areas, root systems of the young seedlings develop naturally, higher seeding rates accommodate deer browsing damage, longer window to plant, and a more natural appearance (if broadcasting). However, there are several disadvantages to direct seeding: reduced control of spacing and stocking (if broadcasting), high mortality in droughty soils, seed handling and storage, depredation, and overall lower survival. It is important that you understand, realize, and accept both the advantages and disadvantages of direct seeding. If you have any questions or concerns, please contact your District Forester, NRCS office, or Wildlife Biologist immediately.

## SITE DESCRIPTION

The direct seeding area is located in McLean County, IL, within Danvers Township. The total area to be broadcast seeded is approximately **11.1 acres** in size (see aerial photo). The planting site has been seeded to a perennial rye cover crop. The Sugar Creek borders the planting site on the east. The topography of the practice area is flat to gently rolling. Soils are predominantly of the following type:

### **Camden silt loam (134B)**

Camden soils are well drained, *forest derived* soils found on shoulders and convex back slopes. Air and water move through this soil at a moderate rate, and the surface runoff is medium. The available water capacity is high, and the organic matter content is moderately low. The seasonal high water table is at a depth of more than 6 feet. The shrink-swell potential is moderate and the potential for frost action is high. Camden soils have a site index (tree height attained in 50 years) of 85 for hardwoods. Productivity on this site is 402bd.ft./ac./yr. The capability subclass is IIe. Walnut is **suitable** for planting on this soil type.

## DIRECT SEEDING SITE RECOMMENDATIONS

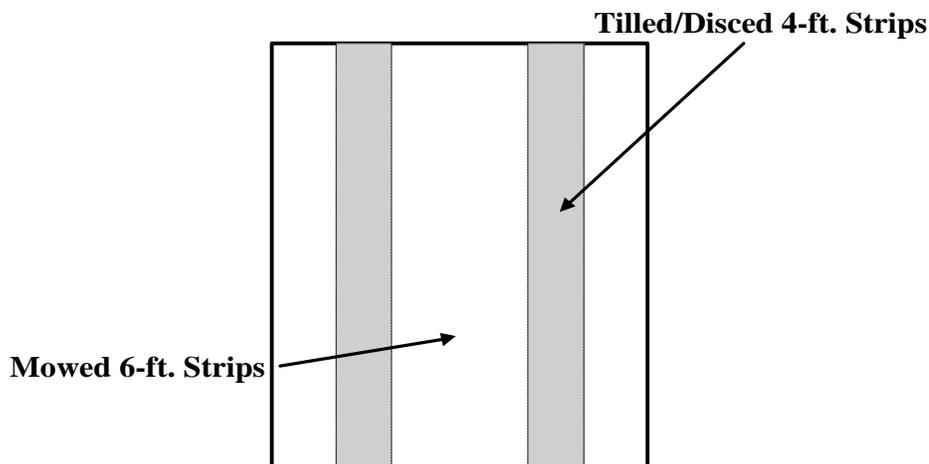
All direct seedings must meet the standards as set forth in **Appendix 2 - Section 1536.30**. Approval and allocation of cost share monies will be contingent upon meeting these standards.

### SITE PREPARATION

(In Central Illinois, the number one cause of plantation failure or stunted growth is the planting of seedlings into sod-forming grasses (brome, fescue, orchard grass, etc.). Therefore, it is in the best interest of the landowner and the trees to prepare the site for the establishment of a suitable and “tree-friendly” cover crop)

**Direct Seeding** - Site preparation will vary with the method of direct seeding that is used. If you are using a commercial direct-seeder, the rows should be worked as if you were planting a crop. If you are row seeding, mow the site to eliminate rodent/rabbit habitat and to facilitate the seeding process. Till/disc (tilling is more effective) 4-ft strips across the planting site while alternating with 6-ft non-disc'd/tilled strips. Areas to be broadcast seeded need to be completely worked prior to broadcasting the seed. If the area is in heavy grass/sod, you should burn and then plow/chisel and disc the field. If the sod comes up in large clumps, then you must disc the field again to reduce the soil clod size. If the site is currently in soybeans, simply broadcast the seed following the bean harvest and disc-in the tree seed. If the field is in corn, disc the stubble once after the harvest, then broadcast the seed and disc-in. The final step using the broadcast method is to culti-pack the site to ensure firm soil-to-seed contact and to eliminate air pockets.

If the seeding site has been grazed by cattle, sheep, etc., then the areas to be seeded **must** be ripped/chisel-plowed to ameliorate the compacted soil – if this step is not completed, the survival and probability of a successful seeding may be virtually eliminated. Grassy fields may need to be mowed or broadcast sprayed with herbicide (see *Herbicide Appendix*) to kill existing grass cover. To control perennial grasses such as brome, fescue, and orchard grass prior to seeding, mow in mid-August and broadcast 1 ½ - 2 qt. *RoundUp Pro* plus surfactant when regrowth is 6-inches tall. Add ½ pint of 2,4-D if legumes are present. The second best way to kill these perennials is in the Spring to mow or burn if there is much litter, wait for 6-inches of regrowth, then broadcast 1 quart *RoundUp Pro* and ¾ oz. *Oust* and wait as long as possible before direct seeding (residual *Oust* may negatively affect seed germination). After the grass has browned, plow and disc the areas in order to prepare a good seed bed. Plowing and then discing is the most effective means of site prep tillage. The field should look ready to plant corn. If erosion is a severe problem, then leave strips oriented across the slopes at variable spacing depending upon the steepness and length of the slopes.



## TEMPORARY COVER CROPS

**Row Seeding** - If a commercial row-seeder is used, it is important that the site is disced heavily and a cover crop planted. Winter wheat at 15-35 lbs./ac, annual cereal rye at 15-35 lbs./ac, or oats at a rate of 15 lbs./acre should be applied prior to direct seeding. Oats is recommended over rye and wheat due to the fact that it is not as prolific in its re-seeding. The wheat, rye, and oats at this rate will not compete with the seedlings and will actually serve to protect (nurse) the young seedlings from the sun and wind during the hot summer months. Mow the cereal crops before they go to “head”, around June 1<sup>st</sup> – June 15<sup>th</sup>. Redtop or Timothy, together or individually at 1-3 lbs./acre, also serve well as conservation cover crops and may be used in the area that will receive direct seeding. Absolutely do **not** plant alfalfa, brome grass, blue grass, fescue, switch grass, or orchard grass!

**Broadcast Seeding** - If the broadcast seeding method is used, it is not as important to apply a conservation cover crop because the cover crop will be completely eliminated prior to seeding. However, if the site is in heavy perennial grass, it is in the landowner’s best interest to eliminate this vegetation type prior to seeding.

## SEED COLLECTION, INSPECTION, CARE, AND STORAGE

*{See Seed Collection, Inspection, Care, and Storage Appendix for Species Specifics}*

All of the species listed in this management plan drop their seed in late summer or early fall. The timing of seed drop varies by species and genetics and often fluctuates by a week or more from year to year depending on biotic and abiotic influences. Generally speaking, the first seeds to fall are not viable – wait until seed begins falling on a regular basis. Seed should be collected as soon as it drops so as to avoid further insect damage. Only undamaged, viable, mature seed will be used. It is advisable to collect seed from only visually healthy tree specimens. Husks should be left on the walnuts if there will be a delay in the planting (as this keeps the nut moist). Avoid large piles of walnuts, as they will heat up resulting in a potential loss of viability. Inspect by species at least 10 randomly selected nuts per bushel. Crack or cut-open a sample of the all species of seed to be sure it is filled, moist, normal colored, and not degraded by insects.

Acorns should also be collected immediately. Viability of acorns from all native oak species is greatly reduced if the nuts become dehydrated. Acorns must be collected between mid September and November. Collect seed from yard, park, street, and cemetery trees by hand or via a rake or Bag-a-Nut collection device. Acorns should be float-tested (without hulls or caps) in a horse trough or children’s swimming pool before direct seeding; viable acorns of most oaks sink in water. This process allows you to remove all caps, debris, and non-viable seed. Acorns may have up to one insect hole and ¼ of the nut damaged by insects and still be viable. If any non-viable seed is found, the seeding rate will then be increased by the percentage of non-viable seed. Place recently collected/float-tested acorns in a breathable bag such as an onion sack. These bags allow air movement and permit excess moisture to drain out. Allow the bag to drain; then store in a cool, dark setting - preferably a cooler kept at 34 – 40 degrees. If storing for extended periods, rewet the seed every 7-10 days.

Ash, Kentucky Coffeetree, and maple seed should be air-dried only. Store in a cool place until planting (please see Appendix for this section).

## DIRECT SEEDING

**Direct Seeding** – The window for direct seeding is typically October through June. Spacing can vary depending upon your equipment and your maintenance plan. Row seeding rates should fall somewhere in the 2,500 – 4,000 seeds/acre range. Broadcast seeding rates should fall somewhere in the 5,000 – 15,000 seeds/acre rate and should further be supplemented with light-seeded species (i.e. ash, maple, cottonwood, etc.) to increase stocking levels. Below are some **row-seeding** spacings that will meet the desired row seeding rates above:

*6 ft. row spacing = plant a seed every 2.4 ft. within row = 3025 seeds*  
*7 ft. row spacing = plant a seed every 2.0 ft. within row = 3100 seeds*  
*8 ft. row spacing = plant a seed every 1.8 ft. within row = 3025 seeds*  
*9 ft. row spacing = plant a seed every 1.6 ft. within row = 3025 seeds*  
**10 ft. row spacing = plant a seed every 1.8 ft. within row = 2420 seeds**  
**10 ft. row spacing = plant a seed every 1.5 ft. within row = 2900 seeds**  
**10 ft. row spacing = plant a seed every 1.2 ft. within row = 3600 seeds**  
*12 ft. row spacing = plant a seed every 1.2 ft. within row = 3025 seeds*  
*14 ft. row spacing = plant a seed every 1.0 ft. within row = 3100 seeds*

Mix all species in a tub and plant them randomly. Plant acorns, walnuts, and hickories in an open trench 2-3 inches deep (2-inches is the optimum depth) and 2-4 nut inches wide with the seed planting machine. Better survival usually results when acorns are sown at 2-3 inches, but deeper sowing is recommended if the soil surface dries out completely. Where machines can't operate, hand plant seed using any device to make a 2-3 inch-deep hole. Direct seeding is usually done in the fall following seed drop. However, with the increased number of commercial seed dealers in the area, there is now seed available for spring planting. If row seeding, plant the seeds at the required depth and spacing interval. After the rows are finished, you must drive over the row with a truck or tractor tire to provide firm soil to seed contact. If broadcasting, all mast seed should be broadcast over the entire field. Disc these to a depth of 2-3 inches and culti-pack to provide firm soil to seed contact. Then broadcast the ash, cherry, and maple seed (if applicable) and culti-pack or harrow to a depth of 1/8 - 1/4 inch. Some light seed may also be drilled-in with the use of certain prairie type seed drills. The light-seeded species are needed for biodiversity and stocking and to create forested conditions.

## SEED SPECIES

*(SEE MAP)*

The **11.1-acre** afforestation area needs approximately **55,500 seeds**. This seeding must be maintained at 10 -15% of the initial stocking/seeding level (this amounts to 300 - 450 seedlings/acre). Notify this office if you experience mortality, or lack of germination, that reduces your numbers below this level. *Seed substitutions must be approved by the District Forester.*

**Field 1 – assuming broadcast seeding rates (5,000-hardmast seeds/ac).**

Species*	Ave. # of Seeds/lbs.	lbs. Seed/ac	Total Seed/ac.	Total lbs. of Seed Needed
Bur Oak ( <i>Quercus macrocarpa</i> )	75	20	1500	220
Swamp White Oak ( <i>Quercus bicolor</i> )	120	12.5	1500	137.5
N. Red Oak ( <i>Quercus rubra</i> )	125	2	250	22
Black Walnut ( <i>Juglans nigra</i> )	40	12.5	500	138
Pecan ( <i>Carya illinoensis</i> )	100	4	400	44
Bitternut Hickory ( <i>Carya cordiformis</i> )	150	2	300	22
Shellbark Hickory ( <i>Carya laciniosa</i> )	30	5	150	55
Pin Oak ( <i>Quercus palustris</i> )	410	1	410	11
Green Ash ( <i>Fraxinus pennsylvanica</i> )	17,000	1	17,000	11
<b><u>TOTALS</u></b>		<b><u>60</u></b>	<b><u>5,010**</u></b>	<b><u>661</u></b>

\*All species substitutions **must** be approved by the District Forester.

\*\* Total seed per acre represents hardmast seed only.

**If you seed the practice yourself, please keep track of your hours as well as expenses (tractor gas, rental equipment, etc.) for potential cost share reimbursement. If you hire a contractor, do not pay the contractor until the District Forester has approved the direct seeding project.**

## VEGETATION CONTROL

Weed and grass control around each tree is required of your practice in order to receive *establishment* cost-share benefits. Herbicide applications are recommended as an effective and economical way to control both grasses and broadleaf weeds, to maintain rows (if row seeding) and to facilitate growth and survival of the new trees.

**Table 1. Herbicides for First Year Pre-emergent Weed Control**

Chemical	Controls	Rate/Acre
Pendulum	Grasses and Some Broadleaves	2-4 qts. or 3.3 lbs.
Surflan	Grasses and Some Broadleaves	2-4 qt.
Goal	Grasses and Broadleaves	½ - 1 lb.
Pennant	Grasses and some yellow nutsedge	16 – 32 oz.

**Table 2. Herbicides for Post Emergent Weed Control (apply only when trees fully leafed-out)**

Chemical	Controls	Rate/Acre
Envoy	Grasses	17 – 34 oz.
Transline*	Broadleaves (Thistle)	8 - 12 oz.
Classic*	Broadleaves and nutsedge	½ - 1 lb.
Oust*	Grasses and Broadleaves	½ - 1 oz.

\* Some foliar damage may occur, usually consisting of leaf discoloration and arrested growth. Trees typically recover.

Either apply a 48-inch band (if row seeding) or broadcast spray the entire site (if broadcast seeding) in the fall after the seed is incorporated into the soil using 2 –4 qt. or 3.3 lbs./acre of *Pendulum* (or a selected herbicide in table 1). If a fall herbicide was not applied, use the above *Pendulum* (or a selected herbicide in table 1) treatment in the spring. By mid-June, an application of *Transline* (or a selected herbicide in table 2) at a rate of 8 – 12 oz./acre to control broadleaves and/or *Envoy* (or selected herbicide in table 2) at 17 – 34 oz./acre to control grasses may be needed. The second year’s herbicide application will depend on the competition observed after the first growing season. The need for chemical weed control after the second growing season should become more of a spot spraying job (assuming broadcast seeding was used at higher rates).

*Read and follow all herbicide label directions carefully. Two additional years of vegetation control (post tree establishment) are required to control competing vegetation and to facilitate any mowing that may be needed. Cost-share assistance for two sprayings within the first 24 months of your practice establishment is available through your county FSA office. Additional assistance for spraying may be available to you from IFDA, but only if funding exists. However, you are obligated to spray even if cost-share funding is not available. Cost-share assistance will not be approved if the vegetation control is not applied.*

### **Mowing**

Mowing does not control the roots of competing vegetation. However, it is an important aspect in controlling the height of competing vegetation, identifying tree rows, and reducing rodent habitat in the fall and winter. There is some indication (although not conclusive) that mowing may increase deer browsing on dormant seedlings in the winter. Therefore, my recommendations are:

1. Do not mow if you have a **well established**, recommended conservation cover crop (e.g., rye, oats, timothy and/or redtop) that is keeping out undesirable vegetation.
2. Mow once prior to May 1<sup>st</sup> to avoid affecting ground-nesting birds and to identify rows.
3. Mow only half of your plantation after September 30<sup>th</sup>
4. This is a test to see how prevalent deer browsing is around and in your tree plantation.
5. \*\*\*If deer browsing becomes a problem in your tree plantation...then discontinue mowing\*\*\*
6. \*\*\*If deer are not a problem...then continue to mow\*\*\*
7. If rodent (rabbits, mice, voles, etc.) damage is high...then continue to mow (nuisance permits for rabbits *may* be available from IDNR Wildlife Biologists).

**Mowing is not eligible for cost-share reimbursement in CRP/CREP practices or with IFDA.** A \$5/acre maintenance supplement is included with your annual payment from the Farm Service Agency (FSA) and should be used to offset the cost of mowing.

## **RESOURCE PROTECTION**

Protecting your direct seeding project to ensure survival and growth is required at all times. Livestock grazing and fire **must** be excluded from your seeding area. Inspect your trees periodically during the growing season. Remedial steps may need to be taken when/if appropriate. Browsing damage from wildlife and damage from pest and pathogens may occur in your seeding site and should immediately be brought to the attention of the District Forester. If threatened or endangered species are discovered, this plan should be reviewed and modified, if needed, to protect those species.

## MAINTENANCE SCHEDULE

*(fall seeding)*

The following schedule has been developed in order to give you direction and to help you prioritize the recommended practices in your plan. Deviation from this schedule must be cleared with the District Forester. Consulting foresters and contractors are available to perform many of the practices recommended in your plan. Regardless of how the work is carried out, you are responsible for seeing that these practices are carried out according to the specifications set forth in your management plan.

<b>YEAR</b>	<b>PRACTICE</b>	<b>STAND</b>	<b>ACRES</b>
Fall 2000*/Spring 2001	Establish Conservation Cover Crop (only if row seeding)	1	All
Fall 2001	Commence Direct Seeding Project (seeding site/rows must have received site prep) Apply Herbicide** from Table 1	1	All
Spring 2002	Apply Herbicide from Table 1 (if not applied the previous fall)	1	All
Early June 2002	Mow*** Non-Seeded Strips (if row seeding)		
Mid-June 2002	Apply Herbicide from Table 2 (use as rescue treatment <b>only if necessary</b> )	1	All
Late Summer 2002	Mow Non-Seeded Strips (if row seeding)	1	All
Fall 2002	Apply Herbicide from Table 1	1	All
2003-2015	Apply additional herbicide treatments if and when needed. Maintain an effective mowing regime throughout the year. Thin trees when necessary (contact DNR Forester for assistance)	1	All

*\* If using wheat as a cover crop, seed-in the wheat at the end of September or beginning of October.*

*\*\* If row seeding, you are only required to spray a four foot band over top of the seeded row. If broadcast seeding, you are required to spray the entire field.*

*\*\*\* Mowing of the cereal cover crop is recommended prior to the cereal going to "head".*

## PERFORMANCE CRITERIA

Natural factors beyond our control, i.e., late-spring flooding that extends into summer, a droughty spring after planting, and deer and small mammal depredation – can cause failure. Therefore, this practice will be completed when at least 300 - 450 seedlings/acre of the desired species are in a “free to grow” condition, that is equal to or greater than the height of all competing vegetation, out of reach of deer browse (usually 5 feet), and with a ground level caliper of at least 1 inch, deterring rabbit girdling. Sample plots should be mil-acre (1/1000 of an acre) size for broadcast areas. This is a circular plot with a radius of 3 feet 8.7 inches, which can be measured using string from a center point or making a permanent plot. Twenty-five is the minimum number of plots for any seeded area. To get the number of seedlings per acre on the area, a two-step process is involved: (1) Get an average number of seedlings per plot by dividing the total number of counted seedling by the total number of plots (2) Multiply the average number of seedling per plot by 1,000...this then will provide you with the average number of seedlings per acre.

## COST-SHARE ASSISTANCE

*(be sure to read and understand)*

Various State and Federal cost-share (C/S) programs are available to help you implement your practices as outlined by your plan. Since these are reimbursement programs, expenses must be documented and bills/invoices paid before reimbursement can be made.

<b>Contract</b>	<b>Federal C/S</b>	<b>50% C/S rate/acre<sup>1</sup></b>	<b>State C/S<sup>2</sup></b>	<b>IFDA C/S<sup>3</sup></b>	<b>Max C/S rate/acre<sup>4</sup></b>
Non CRP – IFDA only	N/A	N/A	N/A	Up to 75%	Variable
CRP – 15 yr.	50%	\$214 <sup>5</sup>	N/A	If available	Variable
CRP – 15 yr. + Perm. Easement	50%	\$214	Up to 50%	N/A	\$426
CRP – 15 yr. (CP22 = SIP/PIP) (CP3A = PIP)	50% + incentive payment	\$214	N/A	N/A	\$383
CREP – 15 yr.	50%	\$214 <sup>5</sup>	N/A	If available	Variable
CREP – 15 yr. (CP22 = SIP/PIP)	50% + incentive payment	\$214	N/A	N/A	\$383
CREP – 15 yr. + 15 yr. state extension (CP22 = SIP/PIP)	50% + incentive payment	\$214	Up to 40%	N/A	\$383
CREP – 15 yr. + 35 yr. state extension (CP22 = SIP/PIP)	50% + incentive payment	\$214	Up to 40%	N/A	\$383
CREP – 15 yr. + Perm. Easement (CP22 = SIP/PIP)	50% + incentive payment	\$214	Up to 50%	N/A	\$426

1) Cost-share rates cover seeding costs, purchase of seed, site preparation, and herbicide spraying costs.

2) State cost-share is in addition to the Federal cost-share amount.

- 3) IFDA cost-share is available to those CRP/CREP enrollees who have a minimum of 5 contiguous acres and to those that sign an IFDA certification sheet.
- 4) The maximum cost-share rate per acre is the sum of all applicable cost-share programs.

\*\*\***IMPORTANT:** IFDA funds are limited and are allocated on a first come first serve basis for the establishment of your trees. Your acceptance into CRP does not guarantee that IFDA funds will be available to you for your establishment practices. Please check with your FSA office and the District Forester to confirm C/S reimbursement PRIOR to planting\*\*\*

## **PROGRAM BENEFITS**

- Eligible for cost share funding to implement recommended practices, pending availability.
- Technical assistance from the Illinois Department of Natural Resources.
- Eligible for Federal Reforestation Tax Credit.
- If your practice area is 5-acres (contiguous) or more in size and the landowner signs the IFDA certification page, then the IFDA acreage is guaranteed the lowest possible tax assessment rate as defined under the Illinois Farmland Assessment Act (see attached form regarding the physical wording of the Assessment Act and the personal contacts for your county).

***Check with the county tax assessor to make sure your acreage under this plan is being properly assessed. This acreage is to be classified as other farmland. The effective date will be January 1<sup>st</sup> following the approved plan certification date.***

## PROGRAM RESTRICTIONS

- If after (3) growing seasons you have failed to plant seedlings, direct seed, or naturally regenerate your CRP practice with a minimum stocking of 300 trees/acre, you may be removed from both the Federal and State program for noncompliance.
- Converting CRP tree plantings to other types of land use will result in repayment of state cost-share payments associated with the planting. This penalty applies to practices not maintained for a minimum of 10 years from the date the practice was established and approved. This does not necessarily coincide with the management plan approval date or any concurrent federal programs on this acreage.
- Repayment of all cost-share monies earned if the management plan is not followed. This penalty also applies in the event of land ownership changes and the new owner does not assume all obligations under this management plan.
- Any planting stock obtained from the state nurseries cannot be removed from the property with the roots attached. This restriction is binding to all subsequent landowners.
- Modifications to this plan must be approved by the landowner and the District Forester. Any changes must be submitted in writing and documented by amending the original certification indicating the change with the appropriate dates and initials. The original plan approval date does not change.
- Must return annual review letter to retain your participation in IFDA program.
- It is unlawful to use state produced plants and plant materials for ornamental plantings, shade trees, landscaping, banquet or party favors or commercial promotion (17 IL Adm. Code; Chapter 1; Section 1540.30; Paragraph d).
- \*\*For direct seeding, the cost-share practice may be attempted a second time if, by no fault of the landowner, fewer than 300 seedlings of acceptable size per acre survive after one full growing season.
- \*\*For direct seeding projects, if after two full growing seasons there are fewer than 300 seedlings of acceptable size per acre no further attempts will be made to direct seed and seedlings will have to be planted.

## CONCLUSION

Signing the management plan certification initiates a partnership between you and the Illinois Department of Natural Resources (IDNR). By accomplishing the objectives in your plan, you will have demonstrated your commitment to the principles of land stewardship. It is important for you to read and understand your plan and the information in the appendices. Do not sign the certification page of this plan until all questions and concerns have been resolved to your complete satisfaction. Any future decisions regarding your forest resources should be carried out in consultation with a professional forester.

This plan prepared by<sup>1</sup>:

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<sup>1</sup> Much of the technical information provided within this plan was compiled from both published and unpublished literature and personal observations. A list of references is available upon request.

# IDNR SEED PRICE LIST \*

\* October 2000 prices are subject to change. Contact a local DNR District Forester to obtain the required seed collection permit.

Species	Price per Pound
Hickory ( <i>Carya</i> sp.)	0.75 <i>husked</i>
Hackberry ( <i>Celtis occidentalis</i> )	5.00 fruit
Black Walnut ( <i>Juglans nigra</i> )	0.10
White Oak ( <i>Quercus alba</i> )	0.90
Bur Oak ( <i>Quercus macrocarpa</i> )	0.60
Red Oak ( <i>Quercus rubra</i> )	0.90
Pecan ( <i>Carya illinoensis</i> )	1.25 <i>husked</i>
Black Oak ( <i>Quercus velutina</i> )	1.10
Chinkapin Oak ( <i>Quercus muehlenbergii</i> )	1.90
Shumard Oak ( <i>Quercus shumardii</i> )	0.90
Swamp White Oak ( <i>Quercus bicolor</i> )	1.10
Cherrybark Oak ( <i>Quercus pagoda</i> )	3.00
Shingle Oak ( <i>Quercus imbricaria</i> )	0.60
Hazelnut ( <i>Corylus americana</i> )	5.00 <i>husked</i>
Pin Oak ( <i>Quercus palustris</i> )	1.90
Swamp Chestnut Oak ( <i>Quercus michauxii</i> )	1.10
Nuttall Oak ( <i>Quercus nuttallii</i> )	1.90
Overcup Oak ( <i>Quercus lyrata</i> )	1.90
Post Oak ( <i>Quercus stellata</i> )	1.90