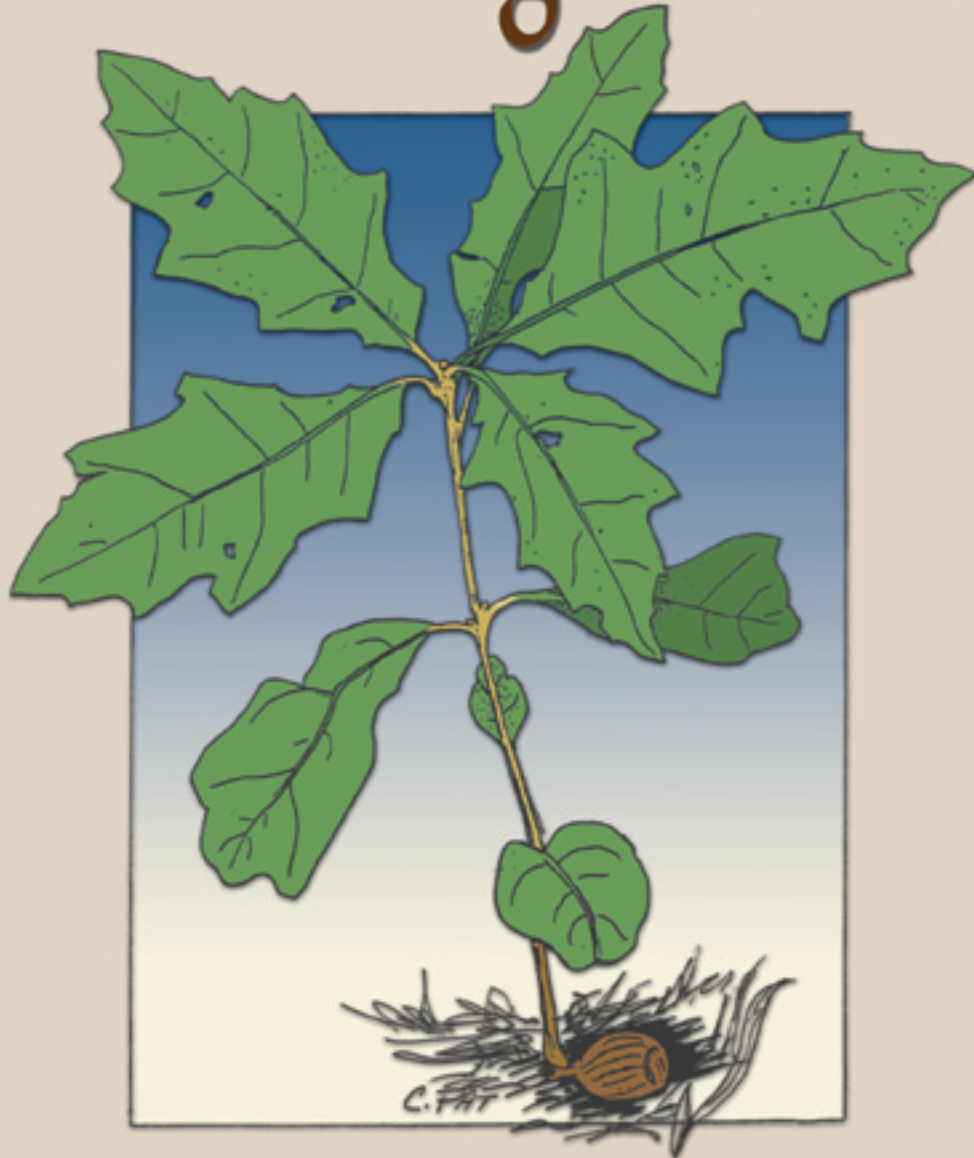


Illinois

Direct Seeding Handbook



*A Reforestation Guide
-2003-*



ACKNOWLEDGEMENTS



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The authors gratefully acknowledge the following individuals for their invaluable assistance in preparation of this Handbook. Thank you to Stan Tate, DNR, Wapello, IA; John Olds and the staff of One Stop Forestry, Postville, IA; and Larry Krotz, Washington, IA for their suggestions, experience, and assistance in writing several chapters of this Handbook. We would also like to recognize Jean McConkey and Jill Creamean, USDA-NRCS, Champaign, IL for review and preparation of the manuscript.

Tree identification photos provided courtesy of John M. Edgington, Dendrologist, Department of Natural Resources and Environmental Sciences, University of Illinois Urbana-Champaign and Paul Wray, Extension Forester, Iowa State University, unless otherwise noted.

Original cover illustrations were drawn by Clint Patterson, District Forester, IDNR-Division of Forest Resources, Olney, IL.

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CHAPTER 1

INTRODUCTION TO DIRECT SEEDING

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Row seeding with tree planter



INTRODUCTION

The purpose of this Direct Seeding Handbook is to establish guidelines for the who, what, when, where, how, and how much as relates to seeding directly nuts and seeds to establish a variety of hardwood tree species.

The intent of this handbook is to provide practical information that allows for local modification and input. It may be necessary for the user to read or collect needed information from reference materials provided. It is the intent of the primary developers to borrow from existing knowledge to the fullest extent and to broaden the scope of contents only when local users require further information.

Modifications and improvements will be considered annually, but they will be the result of local requests or a need for more exacting technical information in line with policies and procedures of the Illinois Department of Natural Resources, Division of Forest Resources or the USDA Natural Resources Conservation Service (NRCS).

This handbook provides the basics for successful direct seeding of a variety of forest species. Direct seeding is presented as another tool, together with seedling tree planting, for achieving high-quality stands of hardwood trees.

DIRECT SEEDING SUBCOMMITTEE

of the Association of Illinois Soil and Water Conservation Districts (AISWCD) Forestry Committee

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SWCDs PROMOTING DIRECT SEEDING

SWCD/NRCS Field Offices involved in direct seeding are indicated with darker shading. This map is current as of May 2002. Prepared by the Natural Resources Conservation Service.



DIRECT SEEDING COORDINATORS

These individuals have a high level of interest in making direct seeding of woody species happen locally and statewide. These individuals are willing, ready, and able to tackle this activity because of current knowledge or ability to learn new skills. These individuals will typically be Resource Conservationists or other persons who work for or with the local Soil and Water Conservation District (SWCD).

Direct Seeding Coordinator Responsibilities

- ◆ Acts as first level of contact locally.
- ◆ Is knowledgeable of direct seeding techniques, local activities, and sites planted.
- ◆ Maintains list of direct seeding contractors.
- ◆ Helps establish seed needs.
- ◆ Helps identify seed trees and/or shrubs for local collection.
- ◆ Organizes seed collection.
- ◆ Networks with other coordinators concerning seed needs and availability.
- ◆ Develops needed reports in a timely manner.
- ◆ Arranges for local storage of seeds to maintain quality for planting.
- ◆ Helps establish local or regional purchase price and resale price by species needed.
- ◆ Has a list or knows what direct seeding equipment is available for collecting, sorting, storing, and planting.
- ◆ Determines, with supervisor, what training is needed to carry out these responsibilities.
- ◆ Schedules and receives needed training in a timely manner.
- ◆ Provides review and development comments to develop and maintain a useful Direct Seeding Handbook.
- ◆ Publicizes locally the practice of direct seeding (radio, newspapers, newsletters, information sheets, etc.).
- ◆ Maintains photo files for various direct seeding activities.
- ◆ Engages in any other activity that positively promotes direct seeding.

DIRECT SEEDING TECHNICAL CONTACTS

These individuals have a high level of interest in making direct seeding of woody species a common occurrence in their county or district. They will generally be individuals with strong technical backgrounds in forestry or forestry related activities. These individuals will typically be District Foresters, District Conservationists, or other professionals proficient with programs and activities related to direct seeding. These persons will be in direct or regular contact with the Coordinator.

Technical Contact Responsibilities

- ◆ Provides guidance and/or training to the Coordinator.
- ◆ Provides technical support for program funded or individually initiated direct seeding activities, i.e. develops conservation plans, forest management plans, planting plans, etc. needed to assure successful direct seeding activities.
- ◆ Develops with others local seed quality criteria and provides this information to local collectors.
- ◆ Communicates with appropriate Foresters (IDNR, District or State level, or NRCS Agroforester) on direct seeding issues when guidance is needed.
- ◆ Follows state level guidance (standards, handbook, published reference lists, etc.) for carrying out direct seeding activities or obtains a variance.
- ◆ Reviews Direct Seeding Handbook and other guidance materials and offers suggestions and comments for improvements.
- ◆ Helps contractors and others to improve equipment and ability to establish forest plantations by direct seeding.
- ◆ Talks with Coordinator regularly during busy seasons (collecting, planting, follow-up) to assure quality criteria are followed.
- ◆ Determines, schedules, and completes training needs in a timely manner.

DIRECT SEEDING COORDINATORS & TECHNICAL CONTACTS BY COUNTY

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NOTE: *In lieu of those listed, contact an IDNR District Forester.*

LIST OF COUNTY CONTACTS

People who, for various reasons, are important resources for seed collection and direct seeding.

Name	Address	Telephone, E-mail	Resource Provided
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
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_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

LIST OF COUNTY SUPPORT PERSONS

People who can support seed collection and direct seeding in various ways.

Name	Address	Telephone, E-mail	Resource Provided
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
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_____	_____	_____	_____
_____	_____	_____	_____

REFERENCES

- *Direct Seeding.** Nov. 1999, Iowa Forestry Extension Note F-363. Wray, P.H., G. Beyer, and S. Tate. 2 pp.
- *Direct Seeding.** 1998, One-Stop Forestry, Postville, IA. 3 pp.
- *Direct Seeding Hardwoods on the Cache River Joint Venture.** 1997. Maginel, D. and M.D. Hutchison. The Nature Conservancy, Ullin, IL. 3 pp.
- Growing Illinois Trees From Seed.** 1983. Circular 1219. C.E.S., College of Agriculture, University of Illinois, Urbana-Champaign. 32 pp.
- “Growing Illinois Trees from Seed.”** Spring 1996, Mike Bolin. *IL Steward Magazine*, 6 pp.
- Guide to Regeneration of Bottomland Hardwoods.** 1992. GTR-SE-76. USDA-Forest Service, SE For. Exp. Sta., Asheville, NC. 35 pp.
- * “Nuts to Forestry: New Technology for New Forests.”** Mar.-April 1996, Stan Tate. *Iowa Conservationist*, 5 pp.
- Oak Regeneration: Serious Problems, Practical Solutions.** 1993. GTR-SE-84, USDA-Forest Service, SE For. Exp. Sta., Asheville, NC. 319 pp.
- Regeneration of Oaks by Direct Seeding.** Johnson, R.L. and R.M. Krinard, USDA-Forest Service, So. For. Exp. Sta., New Orleans, LA. In: Proceedings, Third Symposium of Southeastern Hardwoods. 1985. pp 56-65.
- Seed Biology and Technology of Quercus.** 1987. GTR-SO-66. USDA-Forest Service, So. For. Exp. Sta., New Orleans, LA. 21 pp.
- Seeds of Woody Plants in the United States.** 1974. Agricultural Handbook No. 450. USDA-Forest Service. 883 pp. Available on the Web at: <http://wpsm.net/>
- OR**
- Seeds of Woody Plants in North America.** 1992. Young, J.A. and C.G. Young. Dioscorides Press. 407 pp.
- Silvics of North America, Vol. 1, Conifers and Vol. 2, Hardwoods.** 1990. Agricultural Handbook 654. USDA Forest Service. Vol. 1, 675 pp. Vol. 2, 877 pp. Available on the Web at: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm.
- USDA PLANTS database.** USDA, NRCS 1999. National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Available on the Web at: <http://plants.usda.gov/plants>.

**Copy provided in Appendix of Direct Seeding Handbook.*

NOTE: *Copies of all of the above are available for up to a 2-week loan from the NRCS State Agroforester. Some references may also be available from IDNR District Foresters, the IDNR Forest Management Staff Forester, and the State Cooperative Extension Forester.*



CHAPTER 2

OVERVIEW OF DIRECT SEEDING

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- ◆ Keys to Making It Work 2-6
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INTRODUCTION

Information in this chapter will expand the knowledge and increase the level of confidence of anyone who wants to try direct seeding and be successful.

As in any new venture, it is best to glean as much information as possible from others who have acted as innovators or early achievers. These early Johnny Appleseeds have provided a trial and error pathway toward achieving a high level of success with direct seeding of hardwoods.

Direct seeding of hardwoods is not new. It has just not been as widely accepted as planting seedlings (which, by the way, started from seed).

This chapter is not meant to be all-inclusive and give you answers to all your direct seeding questions. Subsequent chapters will provide much additional and specific information.

This chapter will provide a practical overview to an activity that squirrels, wind, and water have done for years. Surely, we can do it better!



Top: Broadcast seeding with fertilizer spreader

Bottom: Row seeding with tree planters.

EXAMPLES OF DIRECT SEEDING

This section provides contacts in and out of Illinois who have experience with successful seeding projects. Call them to “talk out” any particular aspect of planning, collecting, planting or establishing direct seeded tracts.

Illinois

<u>Contact name</u>	<u>Location and Telephone Number</u>	<u>Type of activity</u>
Mark Cender	NRCS Soil Conservation Technician, Champaign, IL 217/377-9740	direct seeding
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Ken Hoene	Timber Services RR 1 Box 247A Shelbyville, IL 62565 217/774-5611	direct seeding, seed collection, seeding equipment
Jeff Hudgens	Prairie Hills Forestry Consulting 321 University Drive Macomb, IL 61455 309/833-4747	direct seeding, seed collection, seeding equipment
David Johnson	IDNR District Forester, Fairfield, IL 618/847-3781 email: djohnson@dnrmail.state.il.us	direct seeding
Dave Maginel	The Nature Conservancy, Ullin, IL 618/634-2524	seed collection, direct seeding (mostly oaks)
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Randy Timmons	IDNR District Forester, Oglesby, IL 815/224-4048 email: rtimmons@dnrmail.state.il.us	seed collection, seed inspection

EXAMPLES OF DIRECT SEEDING

Adjoining States

<u>Contact name</u>	<u>Location and Telephone Number</u>	<u>Type of activity</u>
Steve Bertjens	RC&D Coordinator, Platteville, WI 608/348-3235 Steve.Bertjens@wi.usda.gov	seed collection, direct seeding
Gary Beyer	IA DNR Forester, Charles City, IA 515/228-6611 email: Gary.Beyer@dnr.state.ia.us	seed collection, broadcast seeding
Larry Krotz	Tree Farmer, Washington, IA 319/653-4959 email: lkrotz@lisco.com	seed collection, high volume seeding
John Olds	One Stop Forestry P.O. Box 916 Postville, IA 52162-0916 319/864-3586 or -7112, fax -7113	seed collection, broadcast seeding
Larry Owen	Consultant, Terre Haute, IN 812/466-4445 website: www.forest-management.com email: Larry@forest-management.com	direct seeding
Bob Petrzelka	Geode Forestry 3002A Winegard Drive Burlington, IA 52601 319/752-2291 email: bpivo@lisco.com	seed collection, row seeding, equipment
John Seifert	Purdue Univ., Butlerville, IN 812/458-6978, fax -6979 purfor@seidata.com	herbicides
Stan Tate	IA DNR Forester, Wapello, IA 319/523-2216 email: Stanley.Tate@dnr.state.ia.us	seed collection, equipment, row seeding

OPPORTUNITIES AND CHALLENGES

This section lists some important considerations as you begin the process of planning with individuals interested in direct seeding. The listings under Opportunities and Challenges are not all-inclusive, but should provide “food for thought” items to help you avoid pitfalls or stumbling blocks as you proceed with collection, planting and establishment.

Opportunities





- As long as there is adequate soil moisture, direct seeding can take place in any season.
- Direct seeding offers the potential for reduced costs compared to seedling planting.
- Direct seeding is often faster and can cover more acres than other kinds of planting.
- Direct seeding is more practical when using native seed sources; a wide variety of species can easily be planted.
- Direct seeding is often easier than planting tree seedlings.
- Tree seed is normally more readily available than other kinds of planting stock.
- Direct seeding allows for more normal root development (avoids seedling transplant shock).
- Fall seeding allows for natural in-the-ground seed stratification that most seeds need to germinate.
- Planting nuts or seeds into corn or soybeans (minimum 30 inch row width) has shown excellent first year results.
- Temporary cereal grain cover crops (oats, rye or wheat) work well as a row planting nurse crop and provide weed control for at least part of the first growing season.
- Potentially higher tree populations reduce the need for weed control and promote self-pruning.

Challenges

- Residual chemicals, late freezes, poor species to site matching, animal damage, flooding with high water temperatures or ice, improper seed storage, drought, poor quality seed, and weed competition may reduce the success of direct seeding.
- Competing vegetation, especially grasses, must be controlled for a minimum of 3 years. Mowing is not an effective or acceptable grass control practice by itself.
- Several passes over the field with various types of equipment may be necessary, especially when broadcast seeding.
- Seed of desired species may not always be available locally and quality varies year to year.
- Cover crops add expense and may not always be useful.
- If a variety of species are needed, they may not be available at the same time due to differences in seed ripening dates. Species that drop early may need to be stored.
- If acorns from the white oak group are used, planting is best done in fall because acorns are difficult to successfully refrigerate and store more than a few months.
- Effective herbicides may not be readily available for all needs and may be somewhat expensive.
- Improper storage can kill seed.
- Planting density is hard to control and may result in overstocking in some areas and understocking in others.
- Heavy seed predation may occur where rodent populations are high, sometimes resulting in plantation failure.

KEYS TO MAKING IT WORK

This section provides the tried and tested components that most often result in successful nut and seed plantings. Many of these key points are listed in the published articles identified later in references. There are four (4) essentials to follow for increasing the chances of success:

-  Site selection and site preparation must provide tree seeds from selected species with an opportunity to sprout, compete, and grow rapidly. Match species to site.
-  Plant quality seed at proper depth for species and site.
-  Control seed predators.
-  Eliminate or control competing vegetation until seedlings are established (this may require 3 years).

Items that will make direct seeding successful:

- Develop a written plan well in advance of seed collection.
- Prepare the planting site. Do not plant in grass or weeds.
- Plant quality seed on appropriate site.
- Control weed competition for at least a 3-year establishment period.
- Plant at proper depth (a rule of thumb is 2x the seed diameter) and get good seed-soil contact.
- Generally, plant walnuts 2 to 5 inches deep and acorns 1 to 3 inches deep (use shallower planting with high soil moisture and low predator pressure).
- Minimize predation pressure. Do not plant in good mouse or squirrel habitat without habitat modification or seed protection.
- Plant promptly after seed collection or store in a controlled temperature/moisture environment.
- Do not plant seed from sources more than 200 miles from your planting site.
- Collect only mature, ripe seed. Perform a cut test on at least 10 seeds/bushel; inspect for filled seed, weevil damage, and proper color.
- Use a variety of species and a variety of seed sources (different seed trees of same species). Mix the seed before planting.
- Be patient; seed germination and seedling emergence will be quite variable and may not be complete even by mid-summer. Final population may be higher than it first appears.

NOTE: If preparations for seeding do not go well, wait another year rather than start wrong. Maintain records showing: what, where, when, how, and whom. Remember the bottom line: the most expensive planting is one that fails!

REFERENCES

- *Direct Seeding.** Nov. 1999, Iowa Forestry Extension Note F-363. Wray, P.H., G. Beyer, and S. Tate. 2 pp.
- *Direct Seeding.** 1998, One-Stop Forestry, Postville, IA. 3 pp.
- *Direct Seeding Hardwoods on the Cache River Joint Venture.** 1997. Maginel, D. and M.D. Hutchison. The Nature Conservancy, Ullin, IL. 3 pp.
- Growing Illinois Trees From Seed.** 1983. Circular 1219. C.E.S., College of Agriculture, University of Illinois, Urbana-Champaign. 32 pp.
- Growing Trees from Seed.** Spring 1996, Mike Bolin. *IL Steward Magazine*, 6 pp.
- * “Nuts to Forestry: New Technology for New Forests.”** Mar.-April 1996, Stan Tate. *Iowa Conservationist*. 5 pp.
- Seed Collection Manual.** circa 1980. Illinois Department of Natural Resources, Division of Forest Resources. 23 pp.
- “Seven Rules for Direct Seeding Success.”** Personal Communications from Stan Tate, Iowa DNR, Forestry Division, Wapello, IA.

**Copy provided in Appendix of Direct Seeding Handbook.*

NOTE: *Copies of all of the above are available for up to a 2-week loan from the NRCS State Agroforester. Some references may also be available from IDNR District Foresters, the IDNR Forest Management Staff Forester, and the State Cooperative Extension Forester.*



CHAPTER 3

SPECIES LISTS AND SPECIES REFERENCE SHEETS

◆ Introduction	3-2
◆ Plant Suitability Zones for Illinois	3-3
◆ Species Lists	3-4
• Bottomland Species	3-4
• Upland Species	3-5
◆ Species Reference Sheets	3-6
◆ References	3-37



INTRODUCTION

This chapter is devoted to essential information about the most common trees used for direct seeding in Illinois. Species appropriate for direct seeding are not limited to those identified in this section. Feel free to develop similar reference sheets for additional species and include them in your copy of this handbook.

To read more about the species included or to develop reference sheets for other species, trees or shrubs, see the references at the end of this chapter.

As with the other chapters of this handbook, this chapter will undergo an annual review to determine what additions, improvements or changes are needed to better meet your needs.

Use these species reference sheets to:

- develop direct seeding plans,
- identify, collect, and store seeds, and
- assure successful planting and establishment.

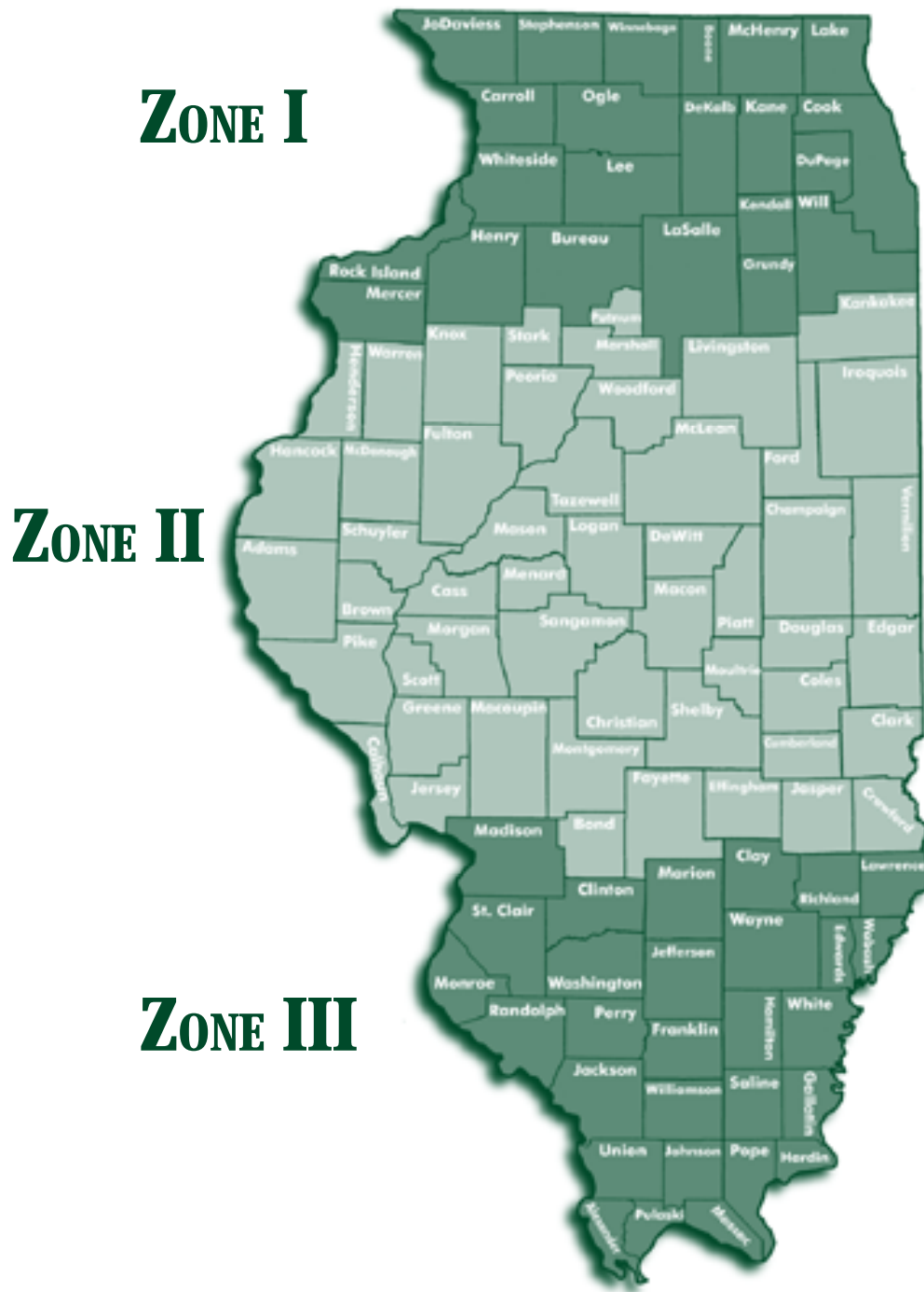
Direct seeding of hardwoods is not new. It has just not been as widely accepted as planting nursery stock (which, by the way, started from seed).

NOTE: *Subsequent chapters will provide much additional and specific information.*

PLANT SUITABILITY ZONES IN ILLINOIS

These broad zones are based on certain plant growth factors including average January-July temperatures, frost-free days, and annual rainfall.

These zones are used as a guide in selecting grasses, legumes, shrubs, trees, and vines for planting in Illinois. This map is provided by the USDA-Natural Resources Conservation Service.



SPECIES LISTS

This section identifies species best adapted to bottomland (riparian) soils or upland soils. It is essential to match the species with the site conditions. In planning, consider soils, aspect, slope, wetness, extent and frequency of flooding or ponding, and other site conditions to determine which species to plant. Most of this information is in the species reference sheets.

Bottomland Species

Listed and grouped from species appropriate for *highest, best drained sites to those adapted to the lowest, most poorly drained sites*. Shaded boxes indicate groups that have similar requirements and can be planted together.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Planting Zone</u> *
Black walnut	Juglans nigra	ALL
Shellbark hickory	Carya laciniosa	ALL
Shumard oak	Quercus shumardii	II, III
Cherrybark oak	Quercus pagoda	II, III
Swamp chestnut oak	Quercus michauxii	II, III
Pecan	Carya illinoensis	ALL
Persimmon	Diospyros virginiana	ALL
Bur oak	Quercus macrocarpa	ALL
Bitternut hickory	Carya cordiformis	ALL
Shingle oak	Quercus imbricaria	ALL
Nuttall oak	Quercus texana	III
Green ash	Fraxinus pennsylvanica	ALL
Swamp white oak	Quercus bicolor	ALL
American sycamore	Platanus occidentalis	ALL
Pin oak	Quercus palustris	ALL
Willow oak	Quercus phellos	III
Water hickory	Carya aquatica	III

<u>Common Name</u>	<u>Scientific Name</u>	<u>Planting Zone</u> *
Overcup oak	Quercus lyrata	II, III
Baldcypress	Taxodium distichum	II, III

* See planting zone map on page 3-3.

Upland Species

<u>Common Name</u>	<u>Scientific Name</u>	<u>Planting Zone</u> *
Black walnut	Juglans nigra	ALL
White oak	Quercus alba	ALL
Black oak	Quercus velutina	ALL
Red oak	Quercus rubra	ALL
Bur oak	Quercus macrocarpa	ALL
Shingle oak	Quercus imbricaria	ALL
Chinkapin oak	Quercus muehlenbergii	ALL
Bitternut hickory	Carya cordiformis	ALL
Mockernut hickory	Carya tomentosa	ALL
Pignut hickory	Carya glabra	ALL
Shagbark hickory	Carya ovata	ALL
Persimmon	Diospyros virginiana	ALL
White ash	Fraxinus americana	ALL
Black cherry	Prunus serotina	ALL
Tuliptree	Liriodendron tulipifera	ALL

* See planting zone map on page 3-3.

SPECIES REFERENCE SHEETS

This section contains a species reference sheet for each of the species listed on pages 3-4 through 3-5. These references are intended primarily for the purpose of tree identification. For more detailed information on seed maturity, collection, extraction, handling, storage and germination, refer to Chapters 5 and 6.

This section is arranged alphabetically by genus and then alphabetically by species according to common name rather than scientific name since many users may not know scientific names.

Handbook users may add locally important species, but new reference sheets should follow the current format to achieve consistency.

Planners might want to copy the appropriate sheets for landowner use.

Readers of this handbook are urged to acquire copies of listed references to glean more detailed data about a given genus or species. For more tree identification information and images, visit the USDA PLANTS database at <http://plants.usda.gov/plants>.

REFERENCES

- Missouri's Oaks and Hickories.** Reprint 994. Edgar Denison and Bruce Palmer. Missouri Department of Conservation. Images reprinted with permission, Missouri Conservation Commission. Available on the Web at: www.conservation.state.mo.us/forest/IandE/oak_hickory.
- Seed Collection Manual.** Circa 1980. Illinois Department of Natural Resources, Division of Forest Resources. 23 pp.
- Seeds of Woody Plants in the United States.** 1974. Agricultural Handbook No. 450. USDA-Forest Service. 883 pp. Available on the Web at: <http://wpsm.net/>.
- Seeds of Woody Plants in North America.** 1992. Young, J.A. and C.G. Young. Dioscorides Press. 407 pp.
- Silvics of North America,** Vol. 1, Conifers and Vol. 2, Hardwoods. 1990. Agricultural Handbook 654. USDA Forest Service. Vol. 1, 675 pp. Vol. 2, 877 pp. Available on the Web at: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm.
- Trees of Missouri.** Reprint June 1979. Settergren, Carl and McDermott, R.E., University of Missouri-Columbia, Agricultural Experiment Station. Available on the Web at: <http://www.conservation.state.mo.us/nathis/plantpage/flora/motrees/index.htm>.
- USDA PLANTS database.** USDA, NRCS 1999. National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Available on the Web at: <http://plants.usda.gov/plants>.

Photographs and Illustrations:

Unless otherwise referenced, all tree identification photos included in the Species Reference Sheets are provided courtesy of John M. Edgington, Dendrologist, Department of Natural Resources and Environmental Sciences, University of Illinois Urbana-Champaign.

Photographs were also provided courtesy of Iowa DNR-Bureau of Forestry and the Missouri Department of Conservation.

Line drawings courtesy of Dr. Edward F. Gilman, University of Florida, Gainesville.

NOTE: *Copies of all of the above are available for up to a 2-week loan from the NRCS State Agroforester. Some references may also be available from IDNR District Foresters, the IDNR Forest Management Staff Forester, and the State Cooperative Extension Forester.*



CHAPTER 4

ORGANIZING FOR LOCAL COLLECTION

◆ Introduction	4-2
◆ Potential Local Collectors	4-2
◆ Local Tree Experts	4-4
◆ Collectors outside the County	4-5
◆ Seed Needs	4-5
◆ Forecasting the Potential Seed Crop	4-8
◆ References	4-9



INTRODUCTION

This chapter is developed to assist the local direct seeding coordinator in organizing the collection of nuts and seeds. With careful, early preparations there will be a cadre of individuals identified who will expertly identify seed trees by genus, species, and location. Another equally important step is to identify a cadre of individuals or groups who can be called upon to collect the species and amounts needed according to quality criteria established for purchase.

Additional information may be found in the following chapters: Chapter 5, Seed Collection and Chapter 6, Buying, Handling, Storage and Distribution. The important thing to keep in mind is **QUALITY SEED**. As you organize for future collection, think of quality not quantity.

POTENTIAL LOCAL COLLECTORS

The goal in organizing for local seed collection is to be able to purchase quality seed in a timely manner. Develop a list of reliable individuals or groups of collectors. Consider some of the following groups when assembling a cadre of potential collectors:

Girl or Boy Scout Troops (Leaders)	Lawn and Ground Maintenance Companies
4-H Groups (Leaders)	Senior Citizen Groups
FFA Chapters (Leaders)	Various Outdoor or Sportsmen Clubs
Science Clubs (Through Teachers)	(eg. Bird Watchers, Sportsmen, Gardeners, etc.)
Isaac Walton League	College Groups
Park District Employees	Farm Families
Forest Preserve District	Wild Turkey Federation
Landscapers and Nursery Employees	Whitetails Unlimited
Pheasants Forever	

It is important to identify collectors in all important seed source locales in the county. Recognize that mowed or grassed areas (parks, cemeteries, schools, church lots, urban areas, yards, pastures, etc.) are key potential collection sites. Try to get a scattering of collectors in all parts of the county. Have seed collector guidelines and requirements clearly established before making contacts so collectors will know what to expect. Put this information in writing and distribute to collectors.

LOCAL COLLECTORS

The following space is reserved to record local collectors.

Collector List for _____ County, Illinois

Copy this form and keep the original in your binder.

Name (individual or group)

Address

Telephone, E-mail

_____	_____	_____
_____	_____	_____
_____	_____	_____
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LOCAL TREE EXPERTS

This section is important for identification and location of trees and shrubs for future seed collection.

Record in the space below those individuals who are:

- 1) technically capable;
- 2) willing to help;
- 3) able to verify genus, species, and location; and
- 4) capable of determining seed quality.

These persons may work in more than one county. Often they will be employees of local, state or federal agencies. They may be private consultants or contractors, or they may work in other fields but have sound forestry or botany knowledge and skills. These persons are needed to assure quality seed collection.

Name (individual or group)	Address	Telephone, E-mail
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COLLECTORS OUTSIDE THE COUNTY

This section stresses the need to “cover your bases” for collection of seeds not available every year, but needed for planting in your county.

One of the key features of this handbook is that it provides an outreach opportunity described in Chapter 1. The list of Direct Seeding Coordinators on page 1-6 is a first level of contact outside the county. Coordinators should have established a parallel procedure for collecting and may be fully able to supply needs at a reasonable cost. (A website, www.directseeding.org, has been developed, as described in Chapter 9 of this Handbook, to facilitate seed information exchange.)

Many individuals, other than the district contacts listed in Chapter 1, are interested in tree seed collection and are issued seed collection permits by IDNR. IDNR District Foresters can help acquire needed seeds and nuts from individuals on an “as needed” and “if available” basis after the state quota of seeds and nuts is met for the State Forest Nurseries. The purchase price will be negotiated on a case by case basis.

Finally, another avenue is to purchase the needed seeds or nuts from commercial vendors. This cost would normally be the highest of any source, but quality should also be high.

SEED NEEDS

This section is the “driver” for the collection of seeds and nuts. Many direct seeding projects will be planted in the fall since this is the season to harvest most nuts and seeds. Also, seed quality will be highest at this time. Some species, particularly the white oak group, are difficult to store since initial sprouting begins in the fall.

In order to be prepared to plant the species needed, one must know well in advance the number of pounds of seed that will be needed. Reforestation plans MUST be completed before collection starts (see Appendix page A-21 for Example Direct Seeding Plan). Properly completed and signed plans document the species and amount of seed needed for the area to be planted. It is then possible to plan seed collection for fall planting and seed storage for spring planting. The following form headed “Seed Needs” can be used to determine needs.

SEED NEEDS

Copy this form and keep the original in your handbook.

Seed Needs for Fall or Spring Direct Seeding - _____ County, Illinois

Cooperator Name	Address	Telephone	E-mail	Farm and Tract Number	Acres	Species	Pounds
_____	_____	_____	_____	_____	_____	_____	_____
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SEED NEEDS

Copy this form and keep the original in your handbook.

Seed Needs for Fall or Spring Direct Seeding - _____ County, Illinois

Cooperator Name	Address	Telephone	E-mail	Farm and Tract Number	Acres	Species	Pounds
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FORECASTING THE POTENTIAL SEED CROP

This section explains what to look for when forecasting local seed crops and determining whether the local crop will meet local needs. Spring weather sets the tone of what might be expected relative to seed set and normal development.

Most tree species do not develop and drop abundant seed crops each year. Most species produce good seed crops every other or every third year, some less often if temperature and moisture conditions are not favorable.

Early in the spring, look for the flower set on the desired tree species. If there are few flowers, do not expect much seed. If weather conditions are cold and dry at flower set, poor seed set due to freezing or poor pollination will reduce seed production.

Continue to observe throughout the growing period to note development and abundance of nuts or seeds. Expect to see a potential seed crop on trees by August. Rely on feedback of technical experts working throughout the county to verify estimated local seed crops and seed crops from other parts of the state that may have had better growing conditions. Keep in mind that a very few counties may have the only source for a particular species to be collected statewide in a particular year.

REFERENCES

- Conservation Trees and Shrubs.** Pocket ID Guide. National Association of Conservation Districts. Available at (800) 825-5547 x 32 or www.nacdnet.org.
- Forest Trees of Illinois.** Illinois Department of Natural Resources, Division of Forest Resources.
- Missouri's Oaks and Hickories.** Reprint 994. Edgar Denison and Bruce Palmer. Missouri Department of Conservation. Images reprinted with permission, Missouri Conservation Commission. Available on the Web at: www.conservation.state.mo.us/forest/landE/oak_hickory.
- Summer Tree Finder.** May Watts. Available from the Nature Study Guild, Box 10849, Rochester, NY 14610 or phone 1-800-954-2984. Cost is \$3.00 Order from the Tree Farm Committee by sending an email to: mseiernert@dnrmail.state.il.us. Also available on the Web at: <http://home.att.net/~naturebooks/index.html>.
- University of Illinois Tree ID website.**
<http://ilvirtualforest.nres.uiuc.edu>.
- USDA PLANTS Database.** USDA, NRCS 1999. National Plant Data Center, Baton Rouge, LA 70874-4490, USA. Available on the Web at: <http://plants.usda.gov>.
- What Tree is That?** A guide to the more common trees found in the Eastern and Central U.S. The National Arbor Day Foundation. Available on the Web at: www.arborday.org.

NOTE: *Copies of all of the above are available for up to a 2-week loan from the NRCS State Agroforester. Some references may also be available from IDNR District Foresters, the IDNR Forest Management Staff Forester, and the State Cooperative Extension Forester.*



CHAPTER 5

COLLECTING THE SEEDS

◆ Introduction	5-2
◆ Quality Criteria for Collecting	5-2
◆ When, Where and How of Woody Seed and Nut Collection: <i>Sites, and Methods of Collection</i>	5-3
◆ Assuring Seed Quality	5-7
◆ References	5-10



INTRODUCTION

This chapter is written to provide overall guidance to achieving regular collections of high quality, viable seeds and nuts. Some of the information will be general and some will be specific.

The preceding chapter set the stage for collection by assembling information about seed availability and seed needs. Good notes and maps will need to be provided to collectors.

A key point not mentioned until now is **GET PERMISSION TO COLLECT SEED** on private and on public property. Very few, if any, individuals will refuse permission, and it will help keep the door open for future collections.

Make collections where seed is abundant. Whether hand or machine collecting, it is not likely that more than half of what a particular tree produces can be collected. The other half of the seed will be available for wildlife. Be assured that tree seed collection will have a minimal and very localized impact on seed-eating wildlife. Seed collection will simply harvest the surplus of a bumper crop.

QUALITY CRITERIA FOR COLLECTING

This section is provided to give overview and guidance on collecting high quality seed. It is best to collect from healthy, robust trees. If the seed tree has a large, premature seed or nut drop, the seeds are less desirable. Also if the seed tree appears stressed, chances are the later drop may be less desirable as well.

Before collecting, pick up a sample of seeds or nuts randomly around the tree and open them to assure a high percentage of viable seed. If not, do not waste time collecting.

A good indicator of quality seeds will be wildlife activity. Normally, if squirrels are feeding in the tree, the seeds or nuts will be viable.

Look for evidence of excessive insect (weevil) boreholes in the seeds or nuts. Normally, a poor or mediocre crop is infested with insects. Pass these trees by for trees that are less infested. Those with a heavy nut-fall have less insect damage.

There is some evidence that large seeds produce larger, more vigorous seedlings. The larger the nut for the species, the more likely it will survive the early establishment stresses. If a tree or its limbs can be shaken at the time when seed is just reaching maturity, the largest quantity of high quality seed can be obtained.

In summary, make collections from healthy, robust trees that have healthy, relatively insect-free nuts or seeds.

WHEN, WHERE AND HOW OF WOODY SEED AND NUT COLLECTION

This section will attempt to cover all the key information needed to successfully collect high quality seed and nuts. Species are listed in the order they appear in Chapter 3.

Green Ash

Normal Seed Maturity

Fruit ripening occurs late September to late October. Ash fruits are elongated, winged, single-seeded samaras that are borne in clusters. Seeds are ripe when their color has faded from green to yellow or brown. Another index of maturity is a firm, crisp, white, fully elongated seed within the samara. Seed is naturally dispersed from October through spring.

Quality Collection Sites

Since green ash makes an excellent landscaping tree, look in parks, yards, and any other similarly mowed or kept areas in residential or commercial settings. Seed crops are normally heavy every other year. Green ash and white ash are seldom abundant the same year in a given locale.

Methods of Collection

Seed clusters may be picked by hand or with pruners and seed hooks. Fully dried samaras may be shaken or whipped from limbs of standing trees onto ground sheets or tarps. Samaras can also be swept or blown from paved streets or other hard surfaces after they fall.

White Ash

Normal Seed Maturity

Fruit ripening normally occurs from October into November. Seed dispersal dates range from late September through December. See ripeness characteristics as listed under Green Ash.

Quality Collection Sites

Same as Green Ash. Seed crops are only heavy every 3 to 5 years.

Methods of Collection

Same as Green Ash.

Baldcypress

Normal Seed Maturity

The globose cones turn from green to brownish purple as they mature in October to December. The cones are composed of a few four-sided scales that break away irregularly after maturity. Each scale bears two irregularly shaped seeds that have thick, horny, warty coats and projecting flanges. Cones contain 18 to 30 seeds each, which fall apart when fully ripe.

Quality Collection Sites

Collect seeds only in the southern two-thirds of the state as cones in northern sites often will not fully mature. Collections can be in or near standing water or along roadways or other dry sites. Seed crops normally occur every other year.

Methods of Collection

Collect cones by picking them by hand. Flailing sticks can be used to knock cones from trees. If over water bodies, lash 2 "john boats" together to catch falling cones. If over dry land, catch cones on netting or tarps spread under the trees.

Black Cherry

Normal Seed Maturity

Fruit ripening occurs in late June and July. Fruit is nearly black when ripe.

Quality Collection Sites

Collect seed throughout the state, but quality sites are more common north than south. Look in old pastures, fencerows, and other wooded areas.

Methods of Collection

Collect fruit by hand, stripping from the tree or by shaking from the tree onto a tarp laid under the tree.

Hickories

Including mockernut, shellbark, shagbark, pignut, bitternut and water hickory.

Normal Seed Maturity

All species mature during September and October. Seed is dispersed from September through November. Husks turn color (green to brown or brownish black) and begin to split at maturity.

Quality Collection Sites

Collect seed in wooded areas, along creeks, in parks, along roadways, and in subdivisions. Most species have heavy nut crops every 1 to 3 years, with the exception of bitternut hickories, which have heavy crops every 3 to 5 years.

Methods of Collection

The most common method is to hand collect under trees with heavy nut fall. Gather nuts after wind storms shake trees in areas regularly mowed and relatively free of leaf litter.

Oaks

Including white oak group (white, swamp white, bur, swamp chestnut, overcup, and chinquapin) and red oak group (black, cherrybark, nuttall, pin, red, shingle, shumard and willow).

Normal Seed Maturity

Full range of maturity is August through November. Typically, late September through early November for most species. The white oak group falls earlier than the red oak group.

Quality Collection Sites

Find specimen trees in parks, lawns, pastures, along roads, or adjacent to creeks in areas not heavily insect infested or destroyed by squirrels. Mowed and maintained areas are best.

Methods of Collection

If in a mowed and maintained area, rake or use the bag-a-nut machine to rapidly gather acorns. Bag-a-nut collected acorns will need to be cleaned and sorted. If area is littered, use a leaf blower to remove most lighter debris before collection. Hand collection is always possible and allows for initial separation of damaged acorns and other debris from good acorns. Time collection to occur before mower damage.



bag-a-nut device for seed collection

Pecan

Normal Seed Maturity

Fruit ripening occurs from September to October.

Once husks change color and begin to split, seed is mature.

Quality Collection Sites

Collect seed in bottomland areas where mowing occurs, generally near levees, in fencerows, in cropped fields, in parks, or along roads where specimen trees are accessible.

Methods of Collection

Nuts can be collected from the ground using a bag-a-nut after natural seed fall or after shaking or flailing limbs. Catch nuts on ground cloths.

Persimmon

Normal Seed Maturity

The fruits ripen from September to November.

Mature fruit is yellow, orange or yellowish-brown in color and slightly soft to firm to the touch.

Quality Collection Sites

Collect seed any place that specimen trees or groves of trees develop plump, full fruits, typically at woodland edges, in fencerows, along crop fields, and in odd, densely shaded areas. Look on sandy, dry soil sites or bottomlands.

Methods of Collection

Gather fruits from the ground when soft or pick directly from trees when fruit is orange and becomes soft. If local individuals process fruit into pulp, arrange to have the seed saved. Spreading a net or tarp on the ground and shaking limbs can be very effective.

Sycamore

Normal Seed Maturity

Fruiting heads of American sycamore mature after they turn brown, usually mid to late October. Seed balls (fruiting heads) occur heavily every other year, with some occurrence every year.

Quality Collection Sites

Look for open-grown trees planted as ornamentals in lawns, parks and other maintained areas. Also try field-woodland interface areas, in pastures, and along creek banks.

Methods of Collection

Balls can be collected from mid-October until spring. Seed collected from trees or ground in late winter has been stratified naturally, but many seed balls may have shattered and make collection impossible. Collect from the ground or directly from the trees.

Tuliptree

yellow-poplar

Normal Seed Maturity

Cones ripen in September and should be collected while they are slightly green to tan in color.

Quality Collection Sites

Look for specimen trees in lawns, parks, and open woodlands with little understory. Look for opportunities to collect after recent logging operations in woods where yellow poplar has been cut.

Methods of Collection

Lay a drop cloth under the tree to collect mature seeds as cones dry and break apart. Flailing branches will also shatter cones. Collect cones from cut trees during logging operations. Collect cones by climbing trees or using an extension pruner to cut off seed cones. Collection of cones from upper branches normally has a higher yield of viable seed than from lower branches.

Black Walnut

Normal Seed Maturity

Fruit ripens by late August to early October. Nut shells that are hardened and cannot be cut with a knife are mature.

Quality Collection Sites

Collect from groves or single specimen trees that have good sized, viable nuts.

Methods of Collection

Hand collect, rake, or use the bag-a-nut machine in maintained locations after nut fall is heavy and outer hulls are still moist and intact. Best collection areas are in lawns, parks, in fencerows of crop fields, and other semi-maintained locations.



ASSURING SEED QUALITY

This subsection is provided to help assure that any seed collected is properly handled before planting. The points stressed here will help maintain and/or improve the quality and viability of the seed collected or purchased for immediate planting or for later planting after storage and stratification.

The first opportunity to assure high seed quality occurs at collection. Careful scouting will eliminate collecting from sites that yield poor quality seed. This section will provide the essentials for processing collected seed.

Cleaning, processing, bagging, handling, storage, and tagging lots will be covered. All the species discussed in the previous subsection will be covered. Some repetition will be noted in Chapter 6, which covers in more detail some of these same subjects.

Key Points

1. Early seed drop is suspect and often has low viability compared to later collections.
2. If a variety of species are to be planted, be advised that all the species are not likely to fall and be available at the same time.
3. Do not delay or postpone these activities.
4. Keep nuts and fruits collected in a cool, protected place, out of direct light.
5. Organize seed processing area for efficient use.
6. Do not let seeds and nuts dry out or heat up before processing.
7. Watch out for excessive heat generation and mold formation. Avoid tall stacks.
8. Tag or label all bags of species and lots individually and maintain separation.

Specific Points

Ash

Place in shallow trays in ventilated areas to dry. When dry, crush and separate seed from debris. Sow about ½ inch deep before the end of October, if possible. If storing, place in dry closed containers and place in cooler at 40°F until planted.

Baldcypress

Collection should be complete by early November. Place cones in an area that is protected with good air flow and let cones thoroughly dry. Shred or break cones by trampling. Remove coarse debris. Seed and remaining fine debris can be scattered where desired if the soil is loose enough to accept seed. Store any seed to be planted later as uncrushed dry cones in boxes or burlap bags at low temperatures but above freezing until planting. Crush, separate and seed as described above.

Black Cherry

Immediately after collection, crush and mash fruits through a wire mesh to separate seeds from skins and pulp. Wash seed into a shallow box. Rub as you wash. Seed to be used within a few weeks or months should only be surface dried (a few hours), then bagged in sealable plastic bags and placed in a cooler until planted.

Seed to be stored over winter should be dried at room temperature only about 1 day. Place in 4 mil sealable bags and lay flat in a cooler at about 40°F. Check and rotate bags occasionally to be assured seeds are not molding. Seed can be surface spread fall or spring in areas with loose soil. If mechanically seeded, plant only ½ to ¾ inch deep.

Hickories *all species*

After collection, keep nuts in an area that is protected from squirrels and where drying will be slow. Remove hulls, other debris, and insect damaged nuts by hand. Fall plant as soon as possible at about 2 inches deep with good soil contact. Any nuts to be stored should be air dried, placed in airtight containers, and placed in a cooler at 36° to 40°F. Pit stratification is an alternative storage method if space and conditions permit. Soak for 2 to 4 days, then bury at least 2 feet deep. Obtain specifics for this method from the references listed.

Oaks *all species*

After collection keep in a cool, shady area in burlap or loose weave onion bags until separation from debris and inferior seed. It is best to process acorns of the white oak group right after collection due to their tendency to sprout. To restore normal moisture content, soak acorns in a large tank or tub for at least 4 hours within 24 hours of collection. Plastic children's wading pools are inexpensive containers for soaking acorns. "Float off" inferior seed, caps and other debris. Note that bur oak and overcup oak acorns will float. These species must be hand sorted. Hand sorting of floated acorns greatly increases seed quality. Plant seeds as soon as possible or bag in burlap or fine weave onion sacks and store in a cooler at about 40°F. Check condition regularly, particularly for moisture and sprouting. Sprouted acorns are okay, but more susceptible to dehydration.

Any acorns to be stored over winter must be moist. Soak about 12 to 24 hours, drain, place in sealed bags (1.75 mil for white oaks group; 4 mil for red oak group) and place in a cooler at about 34°F. Inspect and rotate bags periodically to drain off excess condensation. If no condensation occurs, add moisture to the bags. Plant as soon as possible after removal from the cooler. Plant white oak group within 6 months. Discard any acorns of the red oak

group not planted the next spring or early summer unless you can store the acorns in carefully controlled temperature and moisture conditions.

Pecan

As soon as collected, place in a cool, shady area to grade, sort, and remove unwanted nuts, hulls, and other debris. Fall plant as soon as possible at about 2 inches deep with good soil contact. Any stored nuts should be air-dried, placed in a sealed container, and then place in a cooler at about 40°F.

Persimmon

As soon as possible after collection, remove the seed from the skin and pulp. Do not let fruit heat and ferment or become moldy. Place in a shallow tray with wire mesh bottoms that will let pulp sift through but not seeds. Wash and rub fruits to remove most of the pulp and skins. Once clean, spread seeds in shallow trays to dry. Plant in fall or store dry in sealed containers at about 40°F.

Sycamore

After collection, whether late fall or late winter, the seed balls should be placed in shallow trays and dried until they can be easily broken apart. Rub over a fine screen to remove the fine hairs attached to individual seeds. This is a dusty job, so wear gloves, goggles, and a dust mask.

If seeds are to be sown soon after collection, they may be stored in a cool, dry, well ventilated place in open mesh bags or in shallow trays. Crush fruit heads (balls) and rub out seeds for planting.

Tuliptree *Yellow-Poplar*

Complete cones or seed collected by shaking will not be completely dry and should be placed in shallow trays to finish drying. Rub cones after completely dry to break apart. Fall seed or store dry in sealed bags or cans at about 40°F.

Black Walnut

After collection, place seed in burlap or onion sacks to transport. Keep cool and out of sun. If the nuts will be hulled, be sure to complete before the hulls dry. Old corn shellers or mechanical hullers can be used. Float and wash hulled nuts. Spread to dry or fall plant 2 to 4 inches deep. Stored walnuts should be treated the same as the hickories (see above). Be advised that unhulled nuts will eventually decompose and produce a black liquid that will stain anything it contacts.

REFERENCES

Growing Illinois Trees From Seed. 1983. Circular 1219. C.E.S., College of Agriculture, University of Illinois, Urbana-Champaign. 32 pp.

Seed Collection Manual. Circa 1980. Illinois Department of Natural Resources, Division of Forestry Resources. 23 pp.

Seeds of Woody Plants in the United States. 1974. Agricultural Handbook No. 450. USDA-Forest Service. 883 pp. Available on the Web at: <http://wpsm.net/>

OR

Seeds of Woody Plants in North America. 1992. Young, J.A. and C.G. Young. Dioscorides Press. 407 pp.

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CHAPTER 6

BUYING, HANDLING, STORING AND DISTRIBUTING

- ◆ Introduction 6-2
- ◆ Establishing Price Lists 6-3
- ◆ Handling and Storage Requirements by Species 6-4
- ◆ Simple Tests to Assure Quality 6-8
- ◆ Transportation and Delivery Requirements 6-8
- ◆ References 6-9



*Bags of acorns recently removed from cold storage.
Woven bags are preferred for short-term storage.*



INTRODUCTION

Regardless of the source of seeds or nuts—local collections, another District, other in-state collector, or an out-of-state supplier—a local plan will be needed for buying (and selling), handling, storing, and transportation.

This chapter will provide the basics for addressing these issues on a statewide basis. It is hoped that SWCD's will view direct seeding as a way to help cooperators complete their conservation plans and provide an opportunity for the SWCD's to gain additional income for their overall program.

As SWCD's develop their seed collection programs, it is hoped that a networking arrangement can be set up. Eventually, a single statewide price list could be developed annually. Storage facilities could be located and shared regionally.

Handling, transportation and storage must be carried out under a set of uniform guidelines to assure that the quality of seed collected and purchased remains high until it is planted. Subsections that follow will expand on these issues. This chapter will include a section on quick tests to assure seed quality. Included are several key references. The Appendix will include price lists to guide purchase of nuts and seeds (updated annually), lists of collectors (whether local, in-state, or out-of-state) and, if available, lists of storage locations with cost of rental.

ESTABLISHING PRICE LISTS

Price lists for buying and selling should be developed or assembled annually. The Direct Seeding Coordinator will lead this activity and assure that county lists are developed and shared statewide. Normally prices will vary depending upon whether seed is purchased from sources that are local; within state, but out of county; or from commercial vendors.

It is the intent of this section to cover all seed purchase opportunities because each SWCD may operate differently. The expectation is that at least some of the needed nuts or seeds will be locally collected for local use or resale to other Districts. All price lists developed should be exhibited as part of the Appendix.

Three types of price lists could be developed:

1) Local County Price List for _____ County, Illinois.

This list should include all the species that the SWCD will buy during the year for local use or for resale to other Districts or to contractors. This list will include a “price paid” column per pound of seed and a “resale price” column. Quality expectations will be developed and provided to collectors. However, the purchaser is advised to apply the simple tests that follow to assure quality before purchase is completed.

2) Out-of-County Price List for _____ County, Illinois.

Since local needs cannot always be met by local collections, it will be necessary to determine a fair price to pay another SWCD to collect, handle, store, and transport tree seed. Ideally, this list will be accepted by SWCD’s statewide.

The out-of-county list will include all of the species listed in Chapter 3 and contain a price per pound for each. Prices may be only 10 to 25 percent higher than the average price paid to local collectors. This would promote collection and provide the collecting SWCD with an income opportunity. The SWCD buying the nuts or seeds would need to pay for or provide transportation of seed.

3) Commercial Vendors Price List.

A list of commercial seed vendors is provided in the Appendix. Commercial sources will generally charge the highest prices and will always include additional costs for shipping and handling. All price lists should be updated on an annual basis.

HANDLING AND STORAGE REQUIREMENTS BY SPECIES

Proper handling and storage is essential for keeping high quality seed viable, whether for a short time or an extended period. This section is developed for the species that are listed in Chapter 3. Other locally important species may be added. The references listed may be used to help you obtain any pertinent information needed for additional species.

Determine how seed was handled and stored before purchase. An advantage to local seed collection is the ability to control handling and storage.



General Rules of Thumb

- 1) Tag or label all seed bags to indicate date, location of collection, species of seed, weight, and name of collector.
- 2) Plant as soon after collection as possible, particularly the white oak family.
- 3) Most nuts and seeds should be kept cool and moist.
- 4) Float, sort and cull to reduce volume immediately after collection.
- 5) Dry or soak and bag as directed by the following species criteria.
- 6) Most species will need a period of “stratification” (covered later) to cause seed to break dormancy if not fall seeded.
- 7) The longer stored, the greater the loss of viability.

HANDLING AND STORAGE SPECIFICS

Green Ash

Handling

Air dry in shallow, screen-bottomed boxes or trays. Stir every few days until dry. Rub dried clusters or flail sacks of clusters to separate stems and trash to prepare for seeding or storage, screen or air separate seed from trash (optional).

Storage

After air drying, place seed in sealed containers at a controlled temperature of about 40°F.

Stratification

When not fall seeded, the seed must undergo pregermination treatment of warm-cold temperatures to overcome internal dormancy and seedcoat effects. Pre-chill seeds at 32 to 40°F for 90 to 120 days then let warm to about 70°F for 60 days before planting.

White Ash

Handling

Same as green ash, but leave seed in trays longer for embryos to grow.

Storage

Same as green ash.

Stratification

Same as green ash, except: pre-chill seeds at 40°F for 60 days and warm stratify at 70 to 80°F for 30 days.

Baldcypress

Handling

Spread cones in trays to dry. Once dry, break cones apart by flailing or trampling. Separation of cone fragments from seeds is very difficult, and they are usually sown together.

Storage

Store dry at about 40°F if not fall seeded.

Stratification

Spring seeded baldcypress needs pregermination treatment. Soak the seeds in water at about 40°F for 90 days or use 90 days of cold stratification preceded by a 5 minutes soak in ethyl alcohol.

Black Cherry

Handling

Place in shallow trays. Rub and wash to separate skins and pulp from seeds as soon after collection as possible to avoid heating and molding. Do not dry excessively.

Storage

If not fall seeded, store dry in sealed containers at about 40°F.

Stratification

Place seeds in a moist medium (mixture of sand and peat) at a temperature of 37 to 40°F for 120 days prior to spring planting.

Hickories *all*

Handling

Separate husks from the nut. Allow to air dry then plant or store.

Storage

Place all hickory species except shagbark in closed containers in a cooler at about 40°F and low humidity. Shagbark should be stored at about 36°F.

Stratification

Since all hickories exhibit embryo dormancy, they must be pre-chilled in a moist medium at 36 to 40°F for 30 to 150 days.

- *Water and bitternut for 90 days*
- *Pignut and Shellbark for 120 days*
- *Mockernut and shagbark for 150 days*

In lieu of the above, use pit stratification over winter. Soak nuts in cold water at room temperature for 2 to 4 days with 1 or 2 water changes per day. Place in a pit and cover with soil compost or leaf litter about 2 feet thick. Protect from predators over winter. In spring, dig and plant.



HANDLING AND STORAGE SPECIFICS (CONTINUED)

Oaks *White oak group*

Handling

Discard caps and other debris. (Note that bur and overcup caps will not normally separate from the acorns. Process with caps on.) Soak acorns in water for 4 to 24 hours. With the exception of bur and overcup, keep the seeds that sink, and discard the floaters. (Expect all bur and overcup acorns to float, and sort by hand.) Plant as soon as possible or bag and keep in a cool, moist place until planted or stored.

Storage

Note: The white oak family does not store well since they begin to germinate almost as soon as they mature. This includes: swamp white, white, bur, swamp chestnut, overcup, and chinkapin oaks. Moisture content must be maintained during storage. Soak seed for 4 to 24 hours then place in sealed 1.75 mil plastic bags at about 35°F.

Stratification

Stratification is not needed as the embryo has little or no dormancy and germinates almost immediately after seed drop.

Oaks *Red Oak Group*

Handling

See same comments as for white oaks.

Storage

Storage is possible. Make sure moisture does not fall below 20 to 30 percent. Place in 4 to 10 mil bags and seal. Keep in cooler or refrigerator at about 34 to 40°F.

Stratification

Fall planting at the same time white oaks are planted is best. The conditions recommended above will suffice or place in a moist sand mix for 30 to 90 days.

Pecan

Handling

Same as for hickories.

Storage

Place in a closed container in a cooler at about 36°F.

Stratification

Pre-chill in cooler in a moist medium for 30 to 60 days or use pit stratification as described for hickories.

Persimmon

Handling

Place collected fruit in shallow trays that have a ¼ inch mesh hardware cloth bottom. Rub or mash fruit to separate from seed. Wash out pulp and retain seeds. Spread to dry for a couple of days.

Storage

Dry seed should be stored in sealed, dry containers at about 40°F.

Stratification

Natural germination occurs in April or May, but the hard seedcoat may delay germination 2 to 3 years. Seed dormancy treatment may be broken by pre-chilling 60 to 90 days.

HANDLING AND STORAGE SPECIFICS (CONTINUED)

Sycamore

Handling

The seed balls should be placed in trays to dry, after which the seed may be easily rubbed from the heads. Removal of the tawny hairs, accomplished by rubbing over screen, will facilitate sowing. Always wear a mask when separating and cleaning.

Storing

Leave balls intact when collecting and store in onion sacks in a cool, well-ventilated place or spread out on shelves. For long term storage (more than 1 year) dry seeds to 10 to 15 percent moisture, seal in airtight containers at 20 to 38°F.

Stratification

None needed.

Tuliptree *Yellow-Poplar*

Handling

Cones should be placed in shallow trays to dry 7 to 20 days. Once dry, use any practical method to break apart the cones and separate the seed from debris.

Storage

Seal dry seed and store in the refrigerator at about 40°F or store in moist sand at 36°F.

Stratification

Cold moist stratification in plastic bags at 36°F for about 140 days works well to break dormancy.

Black Walnut

Handling

If hulls are to be removed, do so before they dry. Remove by hand, foot, corn sheller, or other safe mechanical method. Place in container, pressure wash, float off bad nuts, and then spread to dry. Nuts can be planted with hulls on but are more bulky and difficult to work with. Keep in a cool area protected from rodents.

Storage

It is best to fall plant because of bulk. If storage is necessary, use an outdoor pit where nuts can be spread, buried under about 2 feet of soil and straw, and stored over winter. Protect stored area from predators by enclosing with wire mesh. Cover the wire mesh with a paper or cloth barrier to facilitate retrieval in spring. Walnuts can also be stored for at least a year by soaking, placing in sealed plastic bags, and refrigerating at approximately 35° F.

Stratification

It is necessary to provide 90 to 120 days at about 37°F to break seed dormancy. Small lots can be pre-chilled in plastic bags in sand or peat in a cooler for the 90 to 120 day period.

SIMPLE TESTS TO ASSURE QUALITY

Inspect all seed to be sure that it meets or exceeds the standards set in the IL-NRCS Woodland Direct Seeding standard (652). Never accept or sell poor quality seed.

You should inspect each species individually for:

- 1) Documentation sheet by lot completed and signed by seller.
- 2) Appearance: clean, insect free, undamaged, proper color, moist or dry, etc. Acorns may often have 1 insect hole and up to ¼ of the acorn consumed by insects and still be viable.
- 3) Condition: crack or cut at least 10 nuts to determine freshness, color, moisture, viability, and presence of mold or insects. Acorn color should be white or creamy yellow, except for pin, cherrybark, and willow oaks, which will be dark yellow to orange. Record percent failing inspection and the reason. See the references listed for this chapter for more information.

TRANSPORTATION AND DELIVERY REQUIREMENTS

This section addresses the issue of transport and delivery of fresh and/or stored seed to the client who is buying it to plant or to resell. Locally collected seed is advantageous because handling and storage can be readily monitored. Always buy high quality. Anyone selling seed must be able to provide:

- 1) Date seed was collected
- 2) Name of the party who collected the seed
- 3) Location of the seed trees (county, state)
- 4) Information on how the seed has been handled since collection (storage conditions and whether seed is stratified).
- 5) Description of general seed condition and appearance
- 6) Cost of seed when delivered or picked up
- 7) Right of return if misrepresented
- 8) A written sheet that provides the above documentation.

If you are selling seed to a client you will need to sell high quality, viable seed that has been properly cared for during and after collection. Provide complete documentation to all buyers as described in items 1 through 7; this is a statement of quality.

REFERENCES

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

Seed Collection Manual. Circa 1980. Illinois Department of Natural Resources, Division of Forest Resources. 23 pp.

Seeds of Woody Plants in the United States. 1974. Agricultural Handbook No. 450. USDA-Forest Service. 883 pp. Available on the Web at: <http://wpsm.net/>

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Seeds of Woody Plants in North America. 1992. Young, J.A. and C.G. Young. Dioscorides Press. 407 pp.

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CHAPTER 7

ILLINOIS STANDARDS AND SPECIFICATIONS FOR DIRECT SEEDING

◆ Introduction	7-2
◆ NRCS Illinois Woodland Direct Seeding Standard	7-2
◆ References	7-6



INTRODUCTION

USDA-NRCS conservation practice standards are reviewed periodically, and updated when needed. To obtain the current version of this standard, contact the nearest USDA-NRCS office or log on to the NRCS-IL webpage at <http://www.il.nrcs.usda.gov/fotg/index.html> and click on Section IV, Index of Conservation Practice Standards, Woodland Direct Seeding.

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

MAY 2000

WOODLAND DIRECT SEEDING *

(Acre)
652

DEFINITION

Planting tree seed by hand or by mechanical means.

PURPOSES

This practice may be applied as part of a conservation system to support one or more of the following purposes:

- Reduce water pollution through uptake of soil and water borne chemicals and nutrients
- Provide erosion control
- Provide wildlife habitat
- Protect a watershed
- Establish woody plants for forest products
- Energy conservation
- Beautify an area
- Sequester atmospheric carbon to reduce greenhouse gases and reverse global warming

CONDITIONS WHERE PRACTICE APPLIES

Any areas where woody plants are suited, except under existing forest cover or any other sites determined to have an unacceptable risk of seed predation. On these sites see Tree/Shrub Establishment, 612.

GENERAL CRITERIA

General criteria applicable to all purposes:

Species will be adapted to soil-site conditions.

Species will be suitable for the planned purpose.

Seeding rates will be adequate to accomplish the planned purpose. Seeding dates and care in handling and planting will ensure that planted seed will have an acceptable rate of survival.

Only viable, high quality, and adapted planting stock or seed will be used.

Site preparation shall be sufficient for establishment and growth of selected species.

NRCS CONSERVATION PRACTICE STANDARD: WOODLAND DIRECT SEEDING

Timing and use of equipment will be appropriate for the site and soil conditions.

The planting will be protected from adverse impacts such as livestock damage or fire.

ADDITIONAL CRITERIA

Criteria to reduce water pollution

Use species that are native to the region.

If in a riparian area use species adapted to local flooding depth, duration and frequency.

Criteria to Provide Erosion Control

Use non-competitive cover crops between planted rows where soil erosion is anticipated, see Conservation Cover, 327.

Seed will be drilled or row planted on the contour or across the slope. Competing vegetation will be controlled with an herbicide rather than tillage.

Criteria to provide wildlife habitat

Use several native species to accomplish the intended purpose.

Select species that best meet wildlife needs.

CONSIDERATIONS

The seed sources should be within 200 miles north or south of the planting site.

Consideration will be given to plant materials that have been selected and tested in tree improvement programs, or that display superior qualities.

All seed should be collected locally, or purchased from nurseries or other sources that are known to be using locally adapted seed.

Where multiple species are available to accomplish the establishment objectives, consideration should be given to selecting the species which best meet wildlife needs.

Tree arrangement and spacing should allow for access lanes.

Residual chemical carryover should be considered prior to planting.

Increase the seeding rate as much as possible above the minimum with low cost or locally available woody seeds, which serve as a woody cover crop or nurse crop. Woody plants are usually less competitive than grasses or forbs and are the best companion crops for trees. Potential nurse crop species include the light seeded tree species listed under “Species to Use.” Other potential trees and shrubs to use include redbud, sumac, dogwood, paw paw, chokecherry, and plum. Limit the use of fast growing species such as ash, silver maple, sycamore, black cherry and walnut in plantations that include oak to avoid overtopping and suppressing the slower growing oaks.

Consider using tube tree shelters to mark rows in row plantings. Use as many tree shelters as feasible, especially if rabbit or deer damage is likely. Place the shelters over the seedlings as soon as they appear and secure with a decay resistant stake.

Seeding by hand is usually not feasible for areas larger than approximately 5 acres. Many kinds of existing machinery can be adapted to plant tree seed. Much more efficient, precise and economical equipment has recently been developed, however, that will sow more seed at a faster rate, allowing up to 20 acres to be planted per day with a small crew.

A snap trap survey of rodent populations shortly before seeding the site will allow an opportunity to manage damaging populations before they eat or damage tree seed.

Small, light seed, such as ash, is cheap and can be viewed as a woody cover crop. Use larger, more expensive seed, such as walnut and bur oak, more sparingly to keep costs down.

Test soils and/or consult soil survey report before planting to determine whether soil fertility, pH, or species mix need to be adjusted. Some species, such as pin oak (pH < 6.8) and black walnut (high fertility), have very specific requirements.

NRCS CONSERVATION PRACTICE STANDARD: WOODLAND DIRECT SEEDING

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, narrative statements in the conservation plan or other acceptable documentation.

Site Preparation

Planting sites will be prepared by destroying competing vegetation by either herbicide, or cultivation or both. If soil erosion potential exists, strips of existing vegetation will remain undisturbed of minimum width and minimum number to reduce soil erosion (see Contour Buffer Strips, 332, for guidance). On clean tilled sites with soil erosion potential that are row planted a cover crop of non-competitive grasses or legumes will be sown, (see Conservation Cover, 327, for recommendations for tree/shrub plantings or temporary cover). If a cover crop is needed in a row planting, strip cultivation or herbicide spray will be used with a minimum strip width of 4 feet to create a seedbed for direct seeding.

Species to Use

For species selection refer to the appropriate section of the FOTG, Section II, Forestland Interpretations or Windbreak Interpretations or the standard for the practice being planned. The following species have been successfully established using direct seeding:

Heavy seeded species

Black walnut
Oak
Hickory
Pecan
Persimmon
Kentucky coffeetree

Light seeded species

ash
maple
basswood
sycamore
sweetgum
hackberry/sugarberry
black cherry
tuliptree
bald cypress
water tupelo

Seed Inspection, Care, and Storage

Only undamaged, viable, mature seed will be used. Inspect by species at least 10 randomly selected seed per bushel. Crack or cut open seed and to be sure all seed is filled, moist, normal colored and not destroyed by insects. For more information on how to inspect seed see [Seeds of Woody Plants of the United States](#) or [Seed Biology and Technology of Quercus](#) (for oaks) or the [Illinois Direct Seeding Handbook](#). 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 be increased by the percentage of non-viable seed.

If possible, seed should be planted immediately after collection. If planting is delayed more than a few days seed will be placed in porous bags, such as onion bags, and in cold storage, no more than 50 degrees and preferably 35-40 degrees. All light seeded species, as well as persimmon and Kentucky coffeetree, will be kept dry; most heavy seeded species will be kept moist but not wet. Do not allow to mold. Acorns will be rehydrated by soaking in cold water for not less than 4 and not more than 24 hours as soon as possible after collection or delivery and not allowed to dry out. Do not allow seed to heat up, avoid storing in large quantities unless well ventilated and refrigerated. Never leave tree seed in the sun. For further information by species see references cited in previous paragraph.

If seed will be stored for more than a few weeks transfer to sealed plastic bags: 1.75 mil for white oak; 4 mil for all other species. Store at 35-40 degrees. Inspect bags periodically and if no condensation is visible on the inside of bags rehydrate by soaking. Inspect seed, as described in the previous section, when removing from storage before planting. Acorns in the white oak group should be planted as soon as possible in fall, do not try to store more than 6 months. Other species can be stored up to 3 years.

Seed may be planted whenever soil is unfrozen and moisture is adequate. Planting in July, August or early September, however, may result in lower survival due to high soil temperatures and potential for rapid loss of soil moisture. If sprouting of seed begins seed can still be successfully planted but risk of dehydration is increased.

NRCS CONSERVATION PRACTICE STANDARD: WOODLAND DIRECT SEEDING

Seeding Rate

Plant at least 3,000 seed per acre of heavy seeded species if row planting; 4,800 if broadcast seeding. If there is no source of light seeded species within 500 feet of any portion of the planting site that portion will receive an additional 1,000 seed per acre of either heavy or light seeded species. To overcome predation double the seeding rate for the first 100 feet beyond a forest edge.

Seeding Methods

Seed may be planted mechanically or by hand, in rows or broadcast. Depth of planting for heavy seeded species will be approximately 2 times the seed diameter, or 2 to 5 inches deep depending upon species. Plant all species at 2 inches or more if seed predation and/or low soil moisture are anticipated. Light seeded species will be sown on the surface of the soil. Seed that is broadcast will be disked in and cultipacked or rolled. The following chart shows row spacing and seed spacing combinations that will result in 3000 seed per acre:

6' row spacing	= 2.4'/seed
7' row spacing	= 2.0'/seed
8' row spacing	= 1.8'/seed
9' row spacing	= 1.6'/seed
10' row spacing	= 1.5'/seed
11' row spacing	= 1.3'/seed
12' row spacing	= 1.2'/seed
13' row spacing	= 1.1'/seed
14' row spacing	= 1.0'/seed
15' row spacing	= 1.0'/seed
16' row spacing	= 0.9'/seed
17' row spacing	= 0.9'/seed
18' row spacing	= 0.8'/seed

OPERATION AND MAINTENANCE

Competing vegetation will be controlled in at least a 2 foot radius until the woody plants are established. The establishment period will be at least 3 years and will be extended if site conditions warrant.

Replanting will be required when survival is less than 1,000 desirable woody stems per acre at the end of 3 growing seasons. Replant to 1,000 seedlings per acre.

Trees and shrubs will be protected against fire, insects, disease, and animals until established.

Damaging pests will be monitored and controlled, specifically insects, diseases, rodents and herbivores, including deer and beaver.



REFERENCES

Seeds of Woody Plants in the United States. 1974. Agricultural Handbook No. 450. USDA-Forest Service. 883 pp. Available on the Web at: <http://wpsm.net/>

OR

Seeds of Woody Plants in North America. 1992. Young, J.A. and C.G. Young. Dioscorides Press. 407 pp.

Silvics of North America, Vol. 1, Conifers and Vol. 2, Hardwoods. 1990. Agricultural Handbook 654. USDA Forest Service. Vol. 1, 675 pp. Vol. 2, 877 pp. Available on the Web at: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm.

Growing Illinois Trees From Seed. 1983. Circular 1219. C.E.S., College of Agriculture, University of Illinois, Urbana-Champaign. 32 pp.

Seed Collection Manual. Circa 1980. Illinois Department of Natural Resources, Division of Forestry Resources. 23 pp.

Direct Seeding Hardwoods on the Cache River Joint Venture. 1997. Maginel, D. and M.D. Hutchison. The Nature Conservancy, Ullin, IL. 3 pp.

Oak Regeneration: Serious Problems, Practical Solutions. 1993. GTR-SE-84, USDA-Forest Service, SE For. Exp. Sta., Asheville, NC. 319 pp.

Guide to Regeneration of Bottomland Hardwoods. 1992. GTR-SE-76. USDA-Forest Service, SE For. Exp. Sta., Asheville, NC. 35 pp.

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

Regeneration of Oaks by Direct Seeding. Johnson, R.L. and R.M. Krinard, USDA-Forest Service, So. For. Exp. Sta., New Orleans, LA. In: Proceedings, Third Symposium of Southeastern Hardwoods. 1985. pp 56-65.

NOTE: Copies of all of the above are available for up to a 2-week loan from the NRCS State Agroforester. Some references may also be available from IDNR District Foresters, the IDNR Forest Management Staff Forester, and the State Cooperative Extension Forester.



CHAPTER 8

PLANTATION ESTABLISHMENT

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INTRODUCTION

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

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

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

CHEMICAL VEGETATION CONTROL*

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

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

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

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

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

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

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

CHEMICAL VEGETATION CONTROL

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

“Maintenance: At least one other advantage of direct seedings is the shortened period of maintenance required to control competing grasses and broadleaf weeds. Ten thousand seedlings per acre will shade out the competition much sooner than 700, often within a period of three years. We have yet to settle on an exact prescription for chemical weed control but we feel we’re getting close. Currently, 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 ½ to ¾ pint/acre to control broadleaves and Envoy at 1 pint/acre for grasses. Best results will be seen when spraying weeds less than 12” tall.

“The second years’ application will depend on the competition observed after the first growing season. Typically we are applying, in the fall or early spring, a solution of ½ oz/acre of Oust and 2 qts/acre Princep. Another alternative may be to repeat the Transline and/or Envoy treatment at the beginning of the second growing season. The need for chemical weed control after the second growing season should become more of a spot spraying concern. By the end of 3 growing seasons, many of the seedlings should be 6’ or more in height and 1” caliper. At this point, the planting is on its own until the first thinning after year 9 or 10.”

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

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

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

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

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

CHEMICAL VEGETATION CONTROL

Table 1
Herbicides for First Year Preemergent Weed Control

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

Table 2
Postemergent Weed Control

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

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

Points to keep in mind

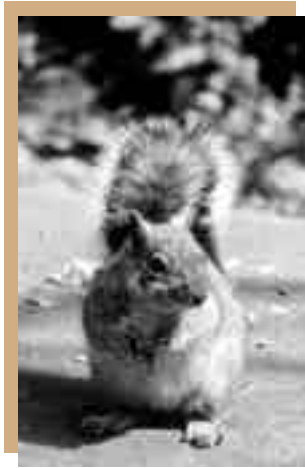
- ö Know and calibrate all spray equipment and properly apply the lowest effective dose.
- ö If trees are in rows and a band treatment is applied instead of broadcast, use a minimum 4' band the first growing season. Increase the band width to 5' to 6' for the 2nd year. Tree roots grow in length more than the tree top grows in height during the first few years.
- ö Take the training for general standards and the pesticide applicator test. Contact any county Cooperative Extension service for the schedule.
- ö Alternative herbicides to check out:
 - ◆ Goal 2XL - Rohm and Hass - labeled for conifers and conifer seedbeds (nurseries)
 - ◆ Envoy - Valent Corp. - a post emergent grass herbicide. Lists Reed Canary grass as susceptible.
 - ◆ Scepter ODG - Cyanimid (BASF) - labelled now for cottonwood & hybrid poplar which are extremely sensitive to most herbicides. Both pre-emergent & postemergent activity.
 - ◆ Oust DF - Dupont - black walnut and white oak are sensitive. Use lowest dose on black walnut, use less than 1 oz rate and avoid high pH sites.
- ö **Bottom Line:** more reforestation practices have failed in Illinois due to heavy grass competition than for any other reason.

MECHANICAL VEGETATION CONTROL

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

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

WILDLIFE DAMAGE MANAGEMENT



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

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

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

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

ANNUAL INSPECTION

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

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

Example

50 seedlings are counted in a 100 foot length of row.

The distance between rows is 8 feet.

$$100' \times 8' = 800 \text{ sq. ft.}$$

$$800 \text{ sq. ft.} / 43,560 \text{ sq. ft. per acre} = 0.018 \text{ acres}$$

$$50 \text{ seedlings} / 0.018 \text{ acres} = 2,722 \text{ seedlings/acre}$$



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

DIRECT SEEDING INSPECTION DATA SHEET

Copy this form and keep the original in your binder.

Landowner _____ Farm No. _____ Tract No. _____

Sec. _____ TWN _____ RGE _____ Acres _____

Species Planted _____

Condition of Site Prep or Annual Weed Control _____

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

Planted by _____ Planting Dates _____

Inspected by _____ Inspection date _____

Risk of Wildlife Damage _____

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

DIRECT SEEDING SUMMARY DATA SHEET

Copy this form and keep the original in your binder.

Plot No. Species	No./ac	Approximate Average Height and Condition	Plot No. Species	No./ac	Approximate Average Height and Condition
Plot No. Species	No./ac	Approximate Average Height and Condition	Plot No. Species	No./ac	Approximate Average Height and Condition
Plot No. Species	No./ac	Approximate Average Height and Condition	Plot No. Species	No./ac	Approximate Average Height and Condition
Plot No. Species	No./ac	Approximate Average Height and Condition	Plot No. Species	No./ac	Approximate Average Height and Condition
Species	Avg No./ac	Average Height	Average Condition		
Grand Total		Average No./Acre _____	Average Condition _____	Average Height _____	

SUBTOTALS

REFERENCES

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

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

www.greenbook.net/free.asp.

www.ilvirtualforest.nres.uiuc.edu. Select the icon “Herbicides” for Forest Herbicides, A Reference Manual for Herbicide use in...

www.townsendchemical.com. Provides direct links to manufacturers and current labels.

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

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



APPENDIX

◆ Summary Table of Seed Data and Average Prices for Bottomland Species	A-2
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◆ List of Seed Brokers (buyers, sellers)	A-4
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◆ “Nuts to Forestry: New Technology for New Forests,” by Stan Tate, Iowa DNR	A-8
◆ Seven Rules for Direct Seeding Success, by Stan Tate, Iowa DNR	A-12
◆ Direct Seeding Hardwoods on the Cache River Joint Venture, by Dave Maginel and Max D. Hutchinson, The Nature Conservancy	A-13
◆ Collection and Care of Acorns, F. T. Bonner, U. S. Forest Service	A-15
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◆ Iowa State University Forestry Extension Notes: Direct Seeding	A-19
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◆ IDNR Seed Price List, October 2000	A-34

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 Petrzalka
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 - 18th 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)

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

Cruz Enterprises

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

Truax Co.

4821 Xerxes Avenue North
Minneapolis, MN 55430
(612)537-6639
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

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.

Selected Bibliography

- Bonner, F. T. 1973. Storing Red Oak Acorns. *Tree Plant. Notes* 24(3):12, 13.
- Haynes, R. J. and Moore, L. 1987. Reestablishment of Bottomland Hardwoods within National Wildlife Refuges in the Southeast. Draft.
- Johnson, R. L. 1981. Oak Seeding--It Can Work. *South. J. Appl. For.* 5(1):28-33.
- Johnson, R. L. 1984. Direct-Seeded Cherrybark and Shumard Oaks Battle Natural Regeneration Through 10 Years. *South. J. Appl. For.* 8(4):226-231.
- Johnson, R. L., and Krinard, R. M. 1987. Direct Seeding of Southern Oaks--A Progress Report. In Proceedings fifteenth annual hardwood symposium of the hardwood research council: applying the latest research to hardwood problems; 1987 May 10-12; Memphis, TN. Broomball, PA: USDA, Forest Service, Northeastern Area State and Private Forestry; 10-16.
- Johnson, R. L. 1983. Nuttall Oak Direct Seeding Still Successful After 11 Years. *USDA For. Serv. Res. Note SO-301*, 3 p. *South. For. Exp. Stn.*, New Orleans, LA.
- Johnson, R. L., and Krinard, R. M. 1985. Oak Regeneration by Direct Seeding. *Alabama's Treasured Forests.* Summer 1985, 12-15.
- Johnson, R. L., and Krinard, R. M. 1985. Oak Seeding on an Adverse Field Site. *USDA For. Serv. Res. Note SO-319.* 4 p. *South. For. Exp. Stn.*, New Orleans, LA.

For further information, please contact the authors at The Nature Conservancy, Southern Illinois Field Office, Rt. 1, Box 53E, Ullin, IL 62992. (618)634-2542.

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.*



One-Stop Forestry
P.O. Box 916
101 E. Greene
Postville, Iowa 52162-0916
(319) 864-3586
or 864-7112

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

... and justice for all

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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
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June 8, 2001

Prepared By:

**Jay C. Hayek, District Forester
Illinois Department of Natural Resources
Division of Forest Resources
301 S. Date Street
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(217) 784-4730**



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

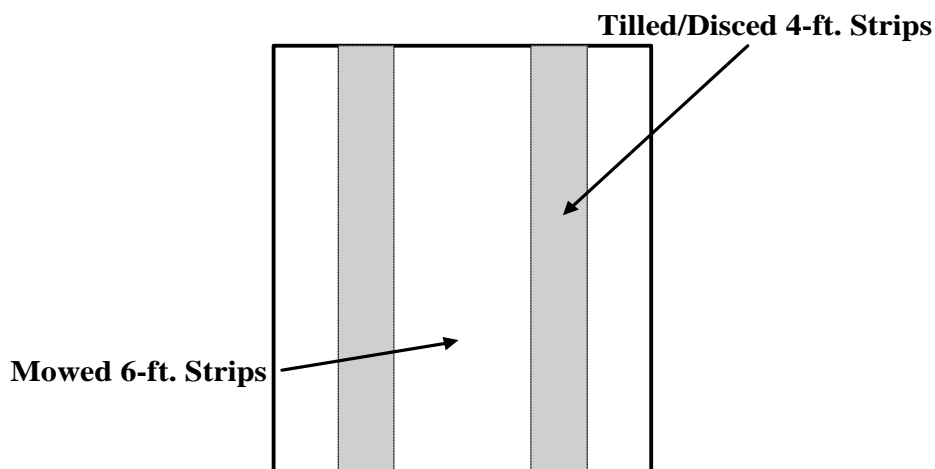
All direct seedings must meet the standards as set forth in **Appendix 2 - Section 1536.30**. Approval and allocation of cost share monies will be contingent upon meeting these standards.

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 1st – June 15th. 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
<u>TOTALS</u>		<u>60</u>	<u>5,010**</u>	<u>661</u>

*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 1st to avoid affecting ground-nesting birds and to identify rows.
3. Mow only half of your plantation after September 30th
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.

YEAR	PRACTICE	STAND	ACRES
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 only if necessary)	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.

Contract	Federal C/S	50% C/S rate/acre¹	State C/S²	IFDA C/S³	Max C/S rate/acre⁴
Non CRP – IFDA only	N/A	N/A	N/A	Up to 75%	Variable
CRP – 15 yr.	50%	\$214 ⁵	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 ⁵	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 1st 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 by¹:

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¹ 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

Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

Green ash is a fast growing, medium-sized tree that grows well on moist bottomland and moist upland soils. It is used for handle stock, furniture, and interior trim. It is also a good landscape and windbreak tree.

Special notes

There are, on average, 17,000 cleaned seeds per pound and approximately 100,000 seeds per bushel. The seed keeps well.

It is best to store the seed at low moisture (about 7%) and low temperature (about 40°F) in sealed containers.

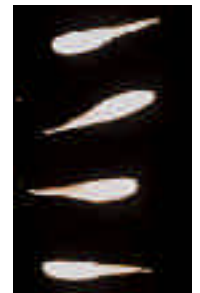
Description: Green ash is a medium-sized tree that will grow best on high moisture sites on bottomlands or uplands.



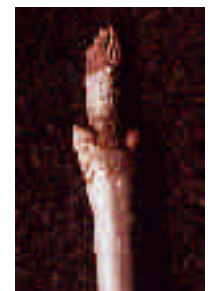
Leaves: Opposite, compound with 7 to 9 spear shaped leaflets. Leaflets 3 to 6 inches long; short stalked. Finely toothed edges, except near the base. Dark green and smooth above; paler green and slightly hairy beneath. **Leaves turn bright yellow in the fall.**



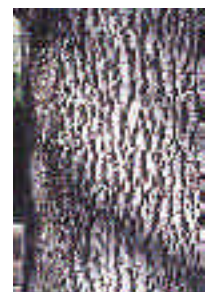
Fruit: Clustered on hairy stalks. Winged seeds; narrow and paddle shaped.



Twigs: Stout. Velvety when mature. **Shield shaped leaf scars.** Small buds; rusty brown.



Bark: Gray with ridges crossing frequently to form a diamond pattern. Green ash bark is almost identical to that of white ash.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

White ash is planted extensively as a park and shade tree. Its fine, straight trunk and large crown make it an excellent choice for these purposes. The wood varies in quality from one site to another. It is usually difficult to break, yet it is comparatively light. White ash makes some of the best handles obtainable for striking tools. In addition, it is used for boat oars, sporting goods (baseball bats), furniture and interior trim.

Special Notes

On average, there are 13,000 cleaned seeds per pound and approximately 139,000 seeds per bushel. Seed should be air dried to a moisture content of less than 7%, placed in a sealed container, and stored at 35° to 40° F to maintain viability.

Description: White ash is a tall, stately tree often reaching a height of 100 feet. It grows best on upland sites with deep, moist soils. White ash often grows in woods with northern red oak, chinkapin oak, white oak, black oak, sugar maple, basswood and other species.



Leaves: Opposite, compound usually with 7 egg shaped leaflets. Smooth or remotely toothed leaflets. Dark green on the upper surface; paler beneath. **Leaves turn purple in the fall.**



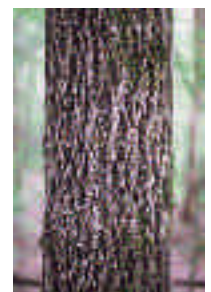
Fruit: Occurs in many-seeded, persistent clusters. Paddle shaped seeds; winged at the tip.



Twigs: Stout with large, pale lenticels and blunt buds. **Horseshoe shaped leaf scars.**



Bark: Gray with many close ridges crossing to form a diamond pattern.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

Baldcypress trees develop knees and a swollen, fluted trunk where the root system is permanently submerged. The wood is oily and resistant to decay. Baldcypress is often planted as an ornamental tree. The wood has historically been used for railroad ties, mine timbers, barrels, and fenceposts.

Special Notes

100 pounds of fresh cones yield approximately 50 pounds of cleaned seeds. On average, there are 5,200 cleaned seeds per pound.

Cones should be spread in a thin layer for drying. Separation of seeds from cones can be labor-intensive. Seeds should be kept in dry storage at 40° F.

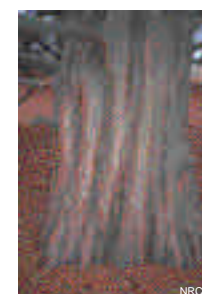
Description: Baldcypress is large, often over 100 feet tall, and grows best in swamps and low, wet areas in southern Illinois. However, it has been planted on both wet and dry sites throughout the state. **Distinguished by feathery leaves and spherical, wrinkled cones.**

Leaves: Delicate, feathery, yellow-green needles. Borne singly; pointed at the tip; up to 3/4 inches long. **Needles and small branches turn reddish-brown and fall away in the autumn.**

Fruit: Spherical cones. Up to 1 inch in diameter with thick, irregular scales. Each scale bears 2 seeds when the mature cone disintegrates. Each cone bears 18 to 30 seeds. Pale green in early stage, becoming reddish-brown in maturity.

Twigs: Slender, reddish-brown. Numerous thin scales. Small green buds; globe shaped.

Bark: Pale reddish-brown. Broken into thin fibrous scales. Baldcypress “knees” occur when growing in standing water.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

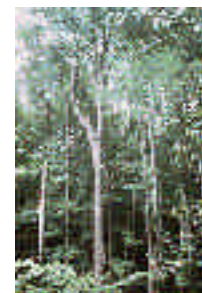
The beautiful, light reddish-brown wood is strong, lightweight, and popular in cabinet and furniture making. The leaves of this tree are toxic to livestock and can be fatal if consumed.

Special Notes

Expect large seed crops every 2 to 6 years. 100 pounds of fruit yield an average of 20 pounds of cleaned seed. On average, there are 4,200 cleaned seeds per pound. Seeds are eaten by birds and readily spread to adjacent areas.

Clean the pulp and juice from the seeds by soaking and rubbing the seeds over a screen. On a larger scale, macerators or low speed hammer mills are used with water to float off pulp. Dry the cleaned seeds at 90° for 3 hours until seed moisture content is reduced to about 5%. Seed stored in plastic bags at 33° to 41° F will remain viable for at least 3 years.

Description: Black cherry is a medium-sized tree, growing up to 75 feet tall with a rounded crown. **Black cherry is similar to choke cherry, but is usually larger and has thicker leaves with inwardly curved teeth.** It occurs in most well drained upland woods.



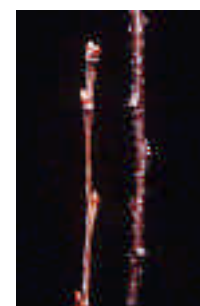
Leaves: Alternate, simple. Narrowly oblong with a sharply pointed tip. Base tapers to a point. Up to 6 inches long and 2 inches wide. Finely toothed edges. Smooth, shiny, dark green upper surface. Duller, with rusty orange hair lining veins on the lower surface. Leafstalk has 1 or more reddish glands near the base of the leaf.



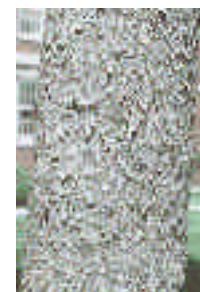
Fruit: Dark purple, round berries with juicy, fleshy fruit. Up to ½ inch in diameter. Appearing in late summer.



Twigs: Smooth, slender, shiny. Dark brown with light colored lenticels. Oval buds with pointed tips. Up to ¼ inch long.



Bark: Smooth, shiny, with prominent lenticels. Reddish-brown in younger trees. Later becoming dark brown, almost black. Deeply furrowed. Scaly plates.



Carya cordiformis **Bitternut Hickory****Distribution
& Adaptability****Neighboring States****Illinois****Represented****Not Represented****General Comments**

The dark brown wood is heavy and strong and is used for handles of striking tools and for fuel. The wood is often burned for the smoke curing of meats.

Seedlings and small saplings grow quickly and are tolerant of shade.

Special Notes

Large seed crops can be expected every 4 to 6 years. On average, 100 pounds of fruit yield 60 to 85 pounds of cleaned seed. There are approximately 156 cleaned seeds per pound.

If stored for an extended period, seeds should be kept in closed containers at 40° F and 90% relative humidity.

Description: Bitternut hickory is a medium-sized tree with an irregularly rounded crown and a **slender, straight trunk**. This tree typically grows along streams, in bottomland woods, and in rich upland forests..



Leaves: Alternate, compound. **Usually 7 to 9 spear shaped leaflets**. Up to 6 inches long and 3 inches wide, with the widest part just above the center. **Toothed edges. Pointed at the tip**. Dark yellow-green, smooth upper surface. Paler and hairy lower surface.



Fruit: **Spherical. Up to 1¼ inch in diameter**. Thin husk; yellowish-green, turning brownish-black. **Husk splits away at 4 distinct breaks extending halfway down the sphere but does not readily separate from the nut**. The nut is somewhat flattened and very bitter.



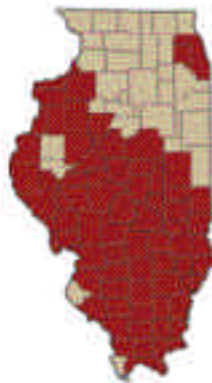
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Twigs: Smooth, slender. Usually gray-brown or orange-brown. **Slender buds; mustard yellow**.



Bark: Gray to brown. **Thin with a smooth appearance**. Separates into small, plate-like scales with shallow ridges.



Carya tomentosa **Mockernut Hickory****Distribution
& Adaptability****Neighboring States****Represented****Not Represented****Illinois****General Comments**

Wood from mockernut hickory is very strong and is often used for hammer and axe handles as well as sporting equipment.

Special Notes

Large seed crops can be expected every 3 to 4 years. On average, 100 pounds of fruit yield 50 to 80 pounds of cleaned seed. There are approximately 90 cleaned seeds per pound.

Seeds may be stored in closed containers at 40° F and 90% relative humidity for 3 to 5 years.

Description: Mockernut hickory is also known as white hickory. This medium to tall tree grows to heights of up to 90 feet mainly in upland woods.



Leaves: Alternate, compound with 7 to 9 leaflets on hairy leaf stalks and twigs. Spear shaped leaflets, rounded at the base. Toothed edges. Top leaflets are widest just above the middle. Up to 8 inches long and 4 inches wide. Smooth and dark yellow-green above. Paler and finely hairy below. **Leaves have a strong aroma when crushed.**



Fruit: Thick husk with a relatively small nut inside. Spherical, egg, or pear shaped nut; up to 2 inches across. Shell is hard, thick; reddish-brown in color. The kernel is small, dark and sweet in flavor.



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Twigs: Slender or stout. Gray, hairy. **Buds are large, egg shaped; reddish-brown outer scales fall away soon after formation; yellow or tan, silky inner scales.**



Bark: Dark gray. Shallowly furrowed, often in a diamond shaped pattern. Does *not* appear scaly.

Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

The heavy, strong wood is used for tool handles and athletic equipment as well as fuel. Early pioneers used pignut hickory to construct the hubs and spokes of wagon wheels.

Special Notes

Large seed crops can be expected every 2 to 3 years. On average, 100 pounds of fruit yield 65 to 85 pounds of cleaned seed. There are approximately 200 cleaned seeds per pound.

Seeds may be stored in closed containers at 40° F and 90% relative humidity for 3 to 5 years.

Description: Pignut hickory is a medium-sized tree, up to 75 feet tall. The crown is often oblong or egg shaped with the widest part at the top. **Pignut hickory grows best on dry upland soils.**



Leaves: Alternate, compound, usually with **5 spear shaped leaflets**. Leaflets up to 5 inches long and 2 inches wide. Upper 3 leaflets are largest. Finely toothed. Smooth, dark yellow-green above. Paler and hairy below.



Fruit: Usually pear shaped. **Thin, greenish and slightly hairy husk**; splits away at 4 distinct breaks extending approximately halfway to the base. Long, smooth nut; 1 to 2 inches long; 4 slight angles; very hard shell.



Twigs: Stout, smooth. Shiny brown or gray. **Rounded buds with a short point at the tip**; reddish-brown outer scales shed early in the winter; downy tan or gray inner scales. **Buds on the sides of twigs protrude at nearly right angles.**



Bark: Light gray to black. Smooth on younger trees, later separating into furrowed ridges.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

Shagbark hickory can sprout easily and quickly overtake open fields. The heavy, strong and flexible wood is used for tool handles and athletic equipment. Also used as fuel for barbecue grills.

Special Notes

Large seed crops can be expected every 2 to 3 years. On average, 100 pounds of fruit yield 25 to 38 pounds of cleaned seed. There are approximately 100 cleaned seeds per pound.

Seeds may be stored in closed containers at 40° F and 90% relative humidity for 3 to 5 years.

Description: Shagbark hickory is a medium to large tree, up to 80 feet tall. The rounded crown turns a rusty, golden brown in the fall. **Shagbark hickory typically grows best on well drained bottomland soils, but more commonly occurs throughout upland woods.**

Leaves: **Alternate, compound, usually with 5 leaflets.** Oval or egg shaped leaflets, with the widest part near the pointed tip. **Up to 10 inches long and 5 inches wide.** Toothed edges; **minute hairs grow from each tooth.** Dark yellow-green above; paler and lightly hairy below. Stout leafstalks.

Fruit: Appear singly or in pairs. 1 to 2½ inches in diameter. **Thick husk; up to ½ inch thick, splitting to the base. Spherical or pear shaped nut;** pale tan; 4 prominent ridges. The meat is very pale in color; sweet. Wildlife consumes shagbark hickory nuts in great quantity.

Twigs: **Stout.** Reddish-brown to gray. Smooth or somewhat hairy. **Large, egg shaped buds up to 1 inch long;** round or short-pointed outer scales; inner scales are light in color and downy.

Bark: Smooth, gray on younger trees. **Becoming shaggy on mature trees.** Strips of bark curve away from the tree at ends; attached to tree in the center of strips.



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Carya laciniosa **Shellbark Hickory****Distribution
& Adaptability****Neighboring States****Illinois****Represented****Not Represented****General Comments**

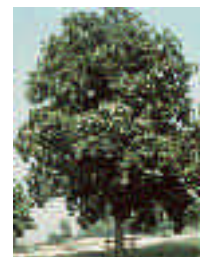
Like other hickories, this wood is heavy and strong, often used for tool handles and athletic equipment. Early settlers perceived the occurrence of shellbark as an indicator of fertile cropland.

Special Notes

Large seed crops can be expected every 2 to 3 years. On average, 100 pounds of fruit yield 15 to 25 pounds of cleaned seed. There are approximately 30 cleaned seeds per pound.

Seeds may be stored in closed containers at 40° F and 90% relative humidity for 3 to 5 years.

Description: Shellbark hickory is also known as kingnut hickory. The largest of the hickories, shellbark also has the largest leaves and fruit. This tree can grow to heights of over 100 feet and most often grows in better drained parts of bottomlands.



Iowa DNR- Bureau of Forestry

Leaves: Alternate, compound. Usually with 7, occasionally 9, spear shaped leaflets each up to 10 inches long and 5 inches wide. Pointed at the tip and tapering to the base. The top leaf in each cluster is widest. Smooth and dark yellow-green above. Paler and downy below.



Fruit: Appear singly or in pairs. 1 to 2½ inches in diameter. Husk up to ½ inch thick. **Large nut; oblong; somewhat flattened;** 4 to 6 ridges. Sweet in flavor, the shellbark hickory nut is popular with both humans and wildlife.

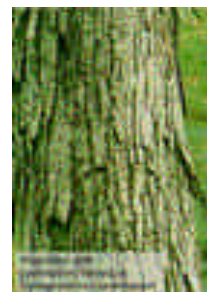


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Twigs: Stout. Orange-brown with orange dots. Covered with fine hairs. Egg shaped buds; dark, loose-fitting scales. **Outer scales with a long, stiff point.** Large terminal buds, up to ¾ inch long.



Bark: Gray. Similar in appearance to that of shagbark hickory, with a loose, shaggy appearance.



Carya aquatica

Water Hickory**Distribution
& Adaptability****Neighboring States****Illinois****Represented****Not Represented****General Comments**

Although heavy and strong, the wood of the water hickory is inferior to other hickories and is most often used for fuel and fenceposts.

Special Notes

Large seed crops can be expected every 2 to 3 years. There are approximately 164 cleaned seeds per pound.

Seeds may be stored in closed containers at 40° F and 90% relative humidity for 3 to 5 years.

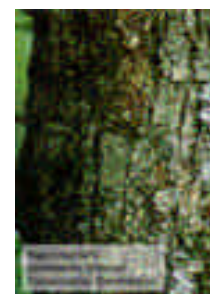
Description: This medium-sized tree grows up to 75 feet tall on wet soils, swampy areas, or drained floodplains. Water hickory is similar to both the pecan and bitternut hickory.



Leaves: Alternate, compound usually with 7 to 17 spear shaped leaflets. Leaflets grow up to 5 inches long and 2 inches wide. Pointed tips. Finely toothed edges. Tapering to the base. Dark green, smooth upper surface. Brownish, smooth to lightly hairy lower surface.



Fruit: Dark brown husk with yellow scales; divided in 4 sections separating 1/2 way to the base. **Oblong, flattened nut; thin, reddish-brown shell;** up to 1 1/2 inch long; 4 angles. Kernel is bitter in flavor.



Twigs: Slender. Reddish-brown or gray. Usually smooth, but occasionally lightly hairy. **Pointed, hairy buds; reddish-brown with yellow scales;** up to 1/4 inch long.

Bark: Reddish-brown. Furrowed, becoming shaggy in mature trees.

Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

Black oak is used for general construction and fuel.

Special Notes

Expect seed crops every 3 to 4 years. On average, 100 pounds of fruit yield 40 pounds of cleaned seed. There are approximately 245 cleaned seeds per pound.

Remove defective acorns from viable acorns by floating off the bad nuts. It is not advisable to store the acorns for more than one winter.

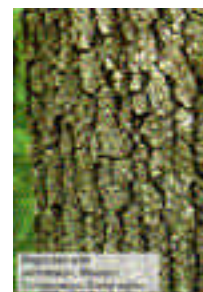
Description: Black oak is a medium to large tree with a straight trunk and a broad, rounded or oval crown. It mainly grows in well drained upland soils.

Leaves: Alternate, borne simply with 7 to 9 deep to shallow lobes in leaves 10 inches long and 8 inches wide. Tips of lobes separate into smaller lobes with bristled tips. Widest above the middle. Leaves are dark green and shiny above. Pale green and smooth or often hairy along veins below. Leafstalk up to 5 inches long, stout; smooth to finely hairy.

Fruit: Appear singly or in pairs. Reddish-brown acorn; oval and pointed at the tip. Up to $\frac{3}{4}$ inch long. Scaly cap with ragged edges; covers approximately $\frac{1}{2}$ of the nut.

Twigs: Slender to stout. Reddish-brown to dark brown. Long buds, up to $\frac{1}{2}$ inch; angular and hairy; usually gray to gray-brown.

Bark: Black, rough, and deeply furrowed. The bright orange to yellow inner bark distinguishes the black oak from red oak and Shumard oak.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

Often used for cabinet making, shipbuilding, fuel, and fenceposts.

Special Notes

Expect seed crops every 3 to 4 years. On average, 100 pounds of fruit yield 65 to 75 pounds of cleaned seed. There are approximately 75 cleaned seeds per pound.

In general, bur oak acorns should not be stored, because acorns in the white oak group begin to germinate soon after falling. However, with proper handling, seeds can be stored until the following spring if soaked for 12 hours, sealed in 4 mil plastic bags and placed in a cooler at 32° to 36° F.

Description: One of the largest, most long-lived trees in the central United States, **the bur oak has the largest leaves and acorns of all native oaks.** Macrocarpa is Greek for “big-fruited.” The bur oak can grow up to 120 feet tall and has a rounded crown, straight trunk, and a slightly buttressed base. This tree grows on dry upland sites, but prefers rich, moist lowland soils.

Leaves: Alternate, simply borne with 5 to 7 coarsely rounded lobes. **Lobes below the middle cut nearly to the midvein. Up to 14 inches long and 7 inches wide. Broadest at the top.** Dark green and smooth or lightly hairy above. Paler and slightly downy below. Short, stout leafstalks, up to 1 inch long; smooth to finely hairy.

Fruit: Up to 1¼ inch in diameter. **Scaly cap; long, hairy fringe; covers over ½, sometimes nearly all, of the acorn.** (Much smaller in the northern third of Illinois.)

Twigs: Dark brown. Stout. **Often have ridges with a cork-like texture.** Downy buds; yellowish-brown to reddish-brown; rounded or slightly pointed.

Bark: Dark brown to yellow-brown. Rough with loose scales and deep furrows.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

Cherrybark oak produces high quality lumber and is often used for cabinet making, interior finishing and furniture. Though not widely planted, cherrybark oak makes a fine shade and windbreak tree.

Special Notes

Cherrybark oak acorns are small (580 per pound) and are eaten by a wide variety of wild-life species. Few mature trees can be found in areas where collecting is easy or efficient, such as parks, cemeteries, etc. For the above reasons, cherrybark oak acorns are among the highest priced and most difficult to obtain. Good acorn crops tend to be frequent, at 1 to 2 year intervals.

Description: Cherrybark oak is named for the bark's similarity to that of black cherry. This fast growing tree may reach heights in excess of 100 feet. The crown is broadly rounded and the trunk is straight. Most often grows in bottomlands and riverbanks on deep, well drained soils.



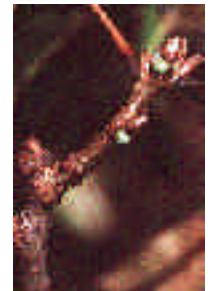
Leaves: Alternate, borne simply with 5 to 11 pointed lobes at nearly right angles to the midrib. Lobes cut almost 1/2 way to the midrib. Widest above the middle. Up to 10 inches long and 7 inches wide. Dark green, smooth and shiny upper surface. Pale, hairy lower surface. Stout, hairy leafstalks; 1 to 2 inches long.



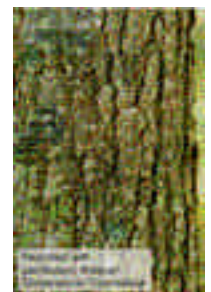
Fruit: Appear singly or in pairs. Brown. Oval. Up to 1/2 inch long. **Finely hairy cap; covers less than 1/3 of the length of the acorn. Bright orange nut when cut.**



Twigs: Stout. Gray to reddish-brown. Oval buds; up to 1/4 inch in length; angular, hairy; chestnut brown.



Bark: Dark gray. Small scales with narrow ridges.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

A widely distributed but uncommon forest tree. Wood quality is similar to white oak. Tolerates a wide variety of sites, including thin, poor soils. Makes a good street or yard tree, particularly on neutral to basic soils commonly found near concrete.

Special Notes

Good seed crops are relatively frequent, every 2 to 4 years, and can be very heavy, up to 400+ pounds from a mature tree.

Approximately 400 acorns per pound of seed. Chinkapin oak acorns are sweet and readily eaten by a wide variety of wildlife.

Acorns have no dormancy and are similar to white oak in their tendency to sprout as soon as they are soaked or come in contact with moist soil. Seed should be planted as soon as possible or stored for short periods only at 40°F or less.

Description: Chinkapin oak is a long lived, medium-sized tree capable of reaching 300+ years of age and 60 to 80 feet in height at maturity. Growth rate is moderate and compares to white oak. Limestone-derived soils and upland sites are preferred, but may be found on well-drained, floodplain terraces with **soil pH near or above 7.0**.

Leaves: **Saw toothed margins, widening toward a pointed tip.** Smooth, yellow-green above, white below. Leaf size variable, but up to 8 inches long and 5 inches wide with a stalk up to 1.5 inches long.

Fruit: **Small, shiny, up to ¾ inch, oval-shaped, dark brown or black acorn** borne on a short stalk. Cup encloses about 1/3 of the acorn, with a fine fringe.

Twigs: Slender, smooth, orange-brown to gray or even purplish, with 1/8 inch reddish-brown or gray buds.

Bark: **Ashy gray, mottled white, shallowly furrowed, rough and flaky.**



Quercus muehlenbergii
Chinkapin Oak



Quercus muehlenbergii
Chinkapin Oak



Quercus muehlenbergii
Chinkapin Oak



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

A valuable timber species, producing lumber that is marketed with red oak. One of the few commercially important species found on poorly drained clay flats of first river bottoms. Also a highly valued wildlife species due to heavy, consistent mast production. It is often confused with pin oak because the leaves and bark are very similar.

Special Notes

Nuttall oak is a heavy seed producer with particularly good seed crops every 3 or 4 years. There are approximately 95 seeds per pound and an average of 52 pounds of seed per bushel of fruit.

Description: Also known as Texas red oak. In many ways similar to pin oak in appearance, best distinguished by the acorns. A fast growing tree capable of reaching 100 feet in height. Typically grows on poorly drained clay bottomland sites along the Mississippi River, mainly in extreme southwestern Illinois.



Leaves: Similar to pin oak. **4 to 8 inches long; 2 to 5 inches wide; 5 to 7 deeply divided and bristle tipped lobes.** Dull, dark green above; paler below.



Fruit: Solitary or clustered, reddish brown, often with dark stripes. **Oblong, 3/4 to 1 1/2 inches long; 1/4 to 1/2 enclosed in a deep, thick cup.**



Twigs: Reddish brown to gray-brown, moderately slender, smooth. Terminal buds nearly 1/4 inch long, slightly angled, **with numerous gray-brown scales.**



Bark: Very similar to pin oak, **dark gray-brown, smooth on younger trees. On older trees, bark is broken into broad flat ridges divided by narrow lighter colored fissures.**



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

The strong wood is often used to construct barrels.

Special Notes

Expect seed crops every 4 to 5 years. There are approximately 140 cleaned seeds per pound. The seed is commonly sold in the cap because it is almost enclosed by the cap and not readily separated. Unlike other acorns in the white oak group, overcup oak stores well. Viability of up to 98% after 1 year has been achieved when stored in sealed bags at 33° to 36° F and 30 to 50 percent moisture content.

Description: Overcup oak is a large tree, up to 100 feet tall, with a very broad crown and relatively short, thick trunk. **This tree grows on the lowest, wettest bottomland sites.**



Photo by
Timothy S. Springer

Leaves: Alternate, borne simply with **5 to 7 bluntly rounded lobes, with shallow to deep gaps between lobes.** Leaves on a single tree may vary in appearance. Widest above the middle. Up to 10 inches long and 5 inches wide. Dark green and smooth upper surface. Paler and smooth lower surface. Stout, smooth leafstalks; up to 1 inch long.



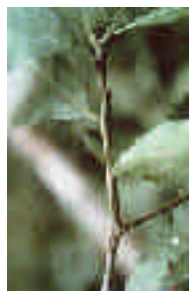
Photo by
Timothy S. Springer

Fruit: Appear singly or in pairs. Brown acorn; shiny; round, up to 1 inch in diameter. Finely hairy cap; yellow-brown; **encloses nearly the entire acorn.**

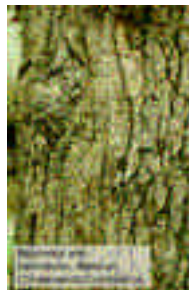


Photo by
Timothy S. Springer

Twigs: May be gray, whitish or purplish and rather shiny. Slender. Smooth. Rounded buds are gray or reddish-brown, up to 1/8 inch long.



Bark: Gray to whitish gray with gray patches. Shallow furrows.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

Used in general construction, fuel and fenceposts. Used as a common landscape tree. Pin oak grows faster than other oaks and is resistant to smoke fumes and ice glaze damage. However, growth is stunted and leaves become yellowish if planted in soils with pH above 6.8.

Special Notes

Expect seed crops every 2 to 3 years. There are approximately 50 to 70 pounds of cleaned seed per 100 pounds of fruit. Expect an average of 410 cleaned seeds per pound.

Description: Pin oak is a medium-sized tree, up to 75 feet tall, with an oblong or narrowly rounded crown and a straight trunk. Pin-like stubs can be found on the lower portion of the trunk, and dead branches are persistent. This tree grows best in the moist soils of bottomland woods or along bodies of water, but also occurs in some upland forests..



Leaves: Alternate, borne simply. Up to 7 inches long and 4 inches wide with **5 to 7 angular, deeply divided lobes with bristled tips**. Dark green, smooth, and shiny upper surface. Paler with tufts of hair lining the veins of the lower surface. Leafstalks up to 2 inches long; slender, smooth.



Fruit: Appear singly or in groups of 2 to 4. **Pale brown**, often with darker brown lines. **Small, rounded acorn; up to 1/2 inch across**. Reddish-brown, finely hairy cap; **thin and saucer shaped; covers up to 1/4 of the length of the acorn**.



Twigs: Reddish-brown to dark gray, smooth and slender. Smooth, egg-shaped buds; pointed at the tip; reddish-brown or dark gray; up to 1/8 inch long. **Lowest branches point downward; middle branches point straight out; upper branches point upward.**



Bark: Light or dark brown. **Smooth or shallowly furrowed**. Rougher on more mature tree.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

The heavy wood of the red oak is used for flooring, interior finishing, furniture, fence posts, barrels, and fuel. Given ample space, this fast-growing tree makes a great shade tree.

Special Notes

Expect seed crops every 4 to 6 years. On average, there are 42 to 80 pounds of cleaned seeds per 100 pounds of fruit and an average of 125 cleaned seeds per pound. Remove defective acorns from healthy acorns by floating off the bad nuts.

Description: Red oak is a medium to tall tree, up to 90 feet tall, with a broadly rounded crown and straight trunk, often buttressed at the base. Red oak grows best in rich upland woods.



Leaves: Alternate, borne simply with 7 to 11 bristle-tipped and shallowly divided lobes. Dark green and smooth or lightly hairy above. Paler and smooth or hairy along veins on the back. Up to 10 inches long and 6 inches wide. Stout, usually smooth leafstalks; up to 2 inches long.



Fruit: Appear singly or in pairs. Pale brown; oblong; up to 1½ inch long. **Reddish-brown cap; flat or very shallow; covers less than ¼ of the length of the acorn.**



Twigs: **Reddish-brown. Slender, smooth, and shiny.** Pointed buds; reddish-brown; up to ¼ inch long; smooth and shiny.



Bark: Grayish-brown, reddish-brown, or gray with dark stripes. Smooth on younger trees, **later forming wide, flat ridges. Pinkish inner bark.**



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

The coarse-grained wood is heavy and strong and is used in general construction. Shingle oak was historically used for shingles and siding. It does not self-prune readily, causing poorer quality lumber.

Special Notes

Expect seed crops every 2 to 4 years. On average, 100 pounds of cleaned fruit yield 40 to 55 pounds of cleaned seed. There are approximately 415 cleaned nuts per pound.

Description: Shingle oak is a medium-sized tree, growing up to 90 feet tall with a rounded or oblong crown and a straight trunk. It grows best in upland woods, but also occurs on bottomland sites.



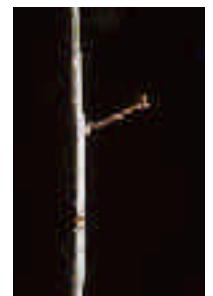
Leaves: Alternate, borne singly. **Oblong and narrow in shape, tapering to a bristled tip. Smooth edges without lobes or teeth.** Dark green, smooth, and shiny above. Paler and hairy below. Stout leafstalks; up to 1/2 inch long; hairy.



Fruit: Appear singly or in pairs. **Dark brown. Almost round.** Approximately 3/4 inch long. Reddish-brown cap; lightly hairy with thin scales; covers less than 1/2 of nut.



Twigs: Reddish-brown. Slender, smooth. Egg shaped buds; pointed at the tip; brown, and smooth. Up to 1/8 inch long.



Bark: Dark brown. **Flat plates with deep furrows. Dead branches on lower stem are retained.**



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

This light, strong and durable wood is used for interior finishing and furniture. Shumard oak makes a handsome shade tree. Acorns are readily consumed by white-tailed deer, birds and squirrels.

Special Notes

Expect seed crops every 2 to 3 years. On average, there are 50 pounds of cleaned seeds per bushel of fruit and an average of 100 cleaned seeds per pound.

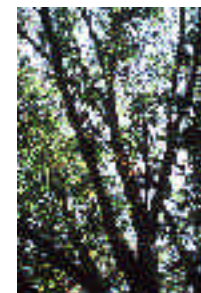
Description: Shumard oak is a large tree, growing up to 120 feet tall, with a broad crown and buttressed trunk on older trees. This tree grows best in bottomland woods and along streambanks on better drained sites. Shumard oak is also known as southern red oak and Schneck's oak.

Leaves: Alternate, simple with **7 to 9 deeply divided lobes, which cut over 2/3 of the way to the midvein. Broadly rounded indentations. Center lobes at nearly right angles to the midvein. Lobe tips divide further, with several bristled tips.** Dark green and shiny above. Paler with tufts of hair at vein intersections below. Up to 8 inches long. Slender, smooth leafstalks grow up to 2½ inches long.

Fruit: Usually appear singly. Light brown, sometimes with dark stripes. Egg shaped; **short, blunt point at the base; flat top. Up to 1¼ inch long. Shallow cap; short, tight scales; covers approximately ¼ to 1/3 of the length of the acorn.**

Twigs: Reddish-brown or light brown. Stout, smooth. Reddish-brown buds are smooth. Approximately 1/3 inch long.

Bark: **Dark brownish-black. Rough and ridged bark.** Deep fissures on older trees.



Quercus michauxii **Swamp Chestnut Oak**

Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

This high quality, hard, heavy wood is used for general construction, furniture and cabinetry. This is also an excellent landscape tree. Acorns are sweet and highly favored by many wildlife species.

Special Notes

Expect seed crops every 3 to 5 years. On average, there are 40 to 50 pounds of cleaned seeds per 100 pounds of fruit and an average of 85 cleaned seeds per pound.

In general, swamp chestnut oak acorns should not be stored, because acorns in the white oak group begin to germinate soon after falling.

Description: Also known as basket oak, swamp chestnut oak is a medium to large tree, up to 100 feet tall, with a rounded crown. This tree generally occurs in the moist soils of lowland woods.



Leaves: Alternate, simple. **Oval leaves, pointed at the tip and tapering to the base. Short, rounded teeth give the effect of scalloped edges.** Up to 10 inches long and 6 inches wide. Widest above the middle. Leaves are thick. Green and lightly hairy above. Whitish and hairy below.



Fruit: Appear singly or in groups of 2. Turning from green to **bright canary yellow** to brown after dropping. **Oval. Up to 1½ inch long. Bowl shaped cap;** thick and hairy; short fringe around the rim; **pointed scales;** covers roughly 1/3 of the length of the acorn.



Twigs: Stout, smooth. Reddish-brown to gray. Reddish-brown buds; pointed and lightly hairy. Up to ¼ inch long.



Bark: Gray to silvery-white. Irregular furrows. Scaly.



Quercus bicolor **Swamp White Oak**

Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

The hard, heavy, strong wood is used for interior finishing, cabinets, fuel, and fenceposts.

Special Notes

Expect seed crops every 3 to 5 years. On average, there are 60 to 75 pounds of cleaned seeds per 100 pounds of fruit and an average of 120 cleaned seeds per pound. The acorns are favored by wildlife.

In general, swamp white oak acorns should not be stored, because acorns in the white oak group begin to germinate soon after falling.

Description: Swamp white oak is a medium to large tree, growing up to 70 to 90 feet tall, with a broad, rounded crown. This tree occurs mainly in the moist soils of bottomland woods.

Leaves: Alternate, simple with **very shallow, rounded lobes**. Egg shaped leaves, widest at or just above center. Up to 6 inches long and 4 inches wide. Dark green upper surface; smooth to lightly hairy. **Whitish and downy lower surface**. Leafstalks up to 1 inch long; smooth to lightly hairy.

Fruit: Appear **singly or in pairs on stalks 1 inch or longer**. Pale brown. Oval; approximately 1 inch long. Light brown cap; thick, hairy, and scaly; covers approximately $\frac{1}{3}$ of the length of the acorn.

Twigs: Stout. Grayish-brown to yellowish-brown. **Bark on twigs peels back in papery sheets**. Yellow-brown buds; clustered at tips of twigs; oblong to round; up to $\frac{1}{8}$ inch long; smooth to lightly hairy at the tip.

Bark: Grayish-brown. Deeply furrowed. Loose, shaggy plates on old trees.



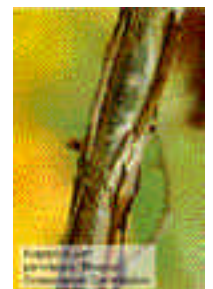
Photo courtesy of Iowa DNR, Bureau of Forestry



Swamp White Oak
Quercus bicolor
Illinois Department of Natural Resources



Swamp White Oak
Quercus bicolor
Illinois Department of Natural Resources



Swamp White Oak
Quercus bicolor
Illinois Department of Natural Resources



Swamp White Oak
Quercus bicolor
Illinois Department of Natural Resources

Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

This high quality wood is hard, strong, and durable. It is used for lumber, veneer, furniture, cabinets, barrels, interior finishing, and general construction. The sweet acorns are highly favored by wildlife.

Special Notes

Expect seed crops every 4 to 10 years. On average, there are 60 to 90 pounds of cleaned seeds per 100 pounds of fruit and an average of 120 cleaned seeds per pound.

White oak acorns sprout readily and store very poorly. Plant promptly after collection or place in a cooler at 35° to 37° F as soon as possible after cleaning and floating until planted in the fall.

Description: White oak is a long-lived and large tree, up to 100 feet tall, with a very broad crown and relatively short trunk when open grown. This tree grows in dry or moist soils, but prefers loamy, well-drained upland soils.



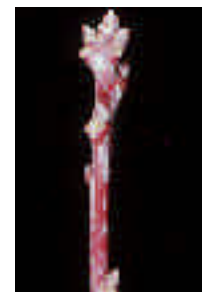
Leaves: Alternate, simple with **7 to 9 rounded lobes**. Shallow or deep indentations. Green, smooth upper surface. Paler and smooth lower surface. Up to 10 inches long and 5 inches wide. Leaves on a single tree may vary considerably. **Leaves turn purple to deep red in autumn.** Leafstalks up to 1 inch long; stout, smooth.



Fruit: Appear singly or in groups of 2. **Chocolate brown and shiny, as if polished.** Oblong. **Up to 3/4 inch long.** Yellow-brown cap; lightly hairy; **covers up to 1/4 of the length of the acorn.** Cap scales are “wart-like” in appearance.



Twigs: Slender, smooth. Shiny. Gray, whitish, or purplish in color. Rounded buds; reddish-brown or gray; up to 1/8 inch long.



Bark: Gray or white with patches of gray. Shallow furrows. Long, loose plates.



Distribution & Adaptability

Neighboring States



Represented



Not Represented

Illinois



General Comments

This heavy, strong, and relatively soft wood dries slowly. It is used for general construction. A good shade tree. The bitter acorns are important food for ducks.

Special Notes

Expect seed crops every 2 years. On average, there are 46 to 47 pounds of cleaned seeds per bushel of fruit and an average of 462 cleaned seeds per pound.

Description: Willow oak is a medium-sized tree, up to 75 feet tall, with a narrowly rounded crown. This tree generally grows best in poorly drained soils in swampy woods.



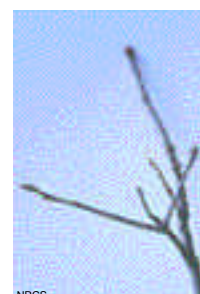
Leaves: Alternate, simple, “willowlike.” No lobes or teeth. Narrowly oblong or spear shaped. Bristled tip and narrow base. Up to 5 inches long and 1 inch wide. Similar to shingle oak, but narrower. Light green and smooth above and paler and smooth below. Leafstalks up to ½ inch long; smooth to lightly hairy.



Fruit: Appear singly or in groups of 2. Pale yellow-brown, often striped. Rounded. Up to ½ inch long. Reddish-brown cap; finely hairy; covers less than ¼ of the length of the acorn.



Twigs: Slender, smooth. Reddish-brown. Oblong buds; pointed and smooth; up to 1/8 inch long.



NRCS

Bark: Light in color and smooth on younger trees. Becoming reddish-brown with irregular, shallow furrows on older trees.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

The light reddish-brown wood is hard and heavy and is used for interior finishing, furniture, and tool handles. Often cultivated for the sweet nuts. Pecan is a good choice for agroforestry projects because of the combination of valuable nuts and timber.

Special Notes

Large seed crops can be expected every 2 to 3 years. On average, 100 pounds of fruit yield 50 to 75 pounds of seed. There are approximately 100 cleaned seeds per pound.

If stored for an extended period, seeds should be kept in closed containers at 40° F and 90% relative humidity.

Description: Pecan is a large tree, up to more than 120 feet tall with a widely spreading crown and a relatively short, stout and straight trunk. Pecan grows best in moist woods and along rivers.



Leaves: Alternate, compound with 9 to 19 spear shaped leaflets which curve to a long, pointed tip. Rounded or tapered base. Finely toothed edges. **Yellow-green and smooth upper surface. Paler and smooth or hairy lower surface.** Up to 8 inches long and 3 inches wide.



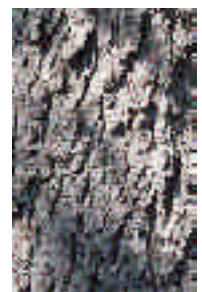
Fruit: Clusters of 3 to 12. **Smooth, oblong nut; pointed at the tip;** up to 2 inches long and 1 inch wide; **reddish-brown with black markings; thin shell. Thin husk;** 4-winged; dark brown with pale yellow scales; splits nearly to the base. Sweet kernel.



Twigs: Stout, brown twigs. Hairy when young, later becoming smooth. **Buds have long points; up to 1/2 inch long with yellow glandular dots; lightly hairy.**



Bark: Thick. Reddish-brown. Plate-like scales.



Distribution & Adaptability

Neighboring States



Represented



Not Represented

Illinois



General Comments

The heavy, hard wood of the persimmon tree is resistant to splitting. The heartwood is nearly black and is used for flooring, golf club heads and billiard cues. Persimmons are a source of food for a variety of wildlife and are sold commercially as well. It is a good choice for agroforestry projects since both the fruit and the wood have value.

Special Notes

Large seed crops can be expected every 2 years. On average, 100 pounds of fruit yield 10 to 30 pounds of cleaned seed. There are approximately 1,200 cleaned seeds per pound.

Run the fruit through a macerator with water and float off pulp. There is a market for canned pulp. It is also possible to rub and wash the fruit through $\frac{1}{4}$ inch mesh hardware cloth. Dry seeds for 1 to 2 days. Store thoroughly dried seeds in dry, sealed containers at 40° F.

Description: The persimmon is a medium-sized tree, up to 75 feet tall with a broad, rounded or flattened crown. This tree grows best in rich bottomland woods, but occurs widely in upland woods as well.



Leaves: Alternate, simple. **Oval to elliptical with a pointed tip. Smooth edges.** Tapered or rounded base. Up to 5 inches long and 2½ inches wide. **Dark green, smooth, shiny upper surface.** Paler, smooth lower surface. Stout leafstalks; smooth or lightly hairy; up to 1 inch long. The persimmon leaf is often confused with sour gum, but persimmon leaves are more abruptly pointed at the tips.



Fruit: **Fleshy, round berry.** Up to 2 inches in diameter. **Yellow-orange to orange as it ripens. Wrinkled and sweet when fully ripe.** Contains 1 to 8 flattened seeds.



Twigs: Slender, brown. Smooth or hairy. Rounded buds; smooth; dark reddish-brown; up to $\frac{1}{8}$ inch long; **covered by two dark scales.**



Bark: Dark gray to black. **Separates into thick, blocks at maturity. Resembles alligator skin.**



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

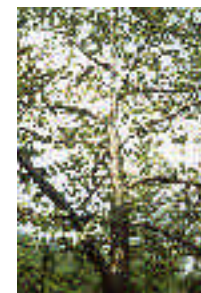
General Comments

The heavy, strong wood is occasionally used for interior finishing, furniture, and pulpwood. The American sycamore grows quickly.

Special Notes

On average, 100 pounds of fruit yield 56 to 66 pounds of cleaned seed. There are approximately 150,000 cleaned seeds per pound. Collect after leaf fall and into the next spring. Dry on ventilated trays. **Wear a dust mask when separating seeds.** Crush to remove dust and fine hairs, then rub through hardware cloth using a fan to blow away debris. Macerators or hammer mills are also used to separate the seeds. Store short-term in a cool, well-ventilated place. For extended storage, dry to 10 to 15% moisture content and store in airtight containers at 20° to 38° F.

Description: Sycamore is a large tree, which can grow over 100 feet tall with a broad, irregular crown. It grows best in bottomland woods.



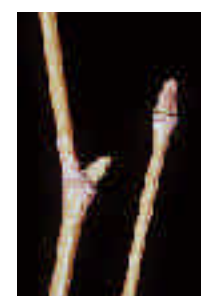
Leaves: Alternate, simple with 3 to 5 shallow, coarsely toothed lobes. Heart shaped or straight base. **Large leaves, up to 7 inches long and 7 inches wide.** Bright green, smooth upper surface. Paler and smooth with some hairs along the veins of the lower surface. Leafstalks up to 5 inches long; lightly hairy.



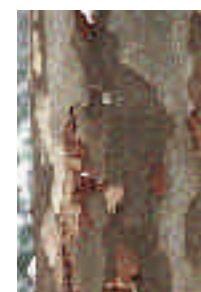
Fruit: Round. Light brown. Approximately 1 inch in diameter. Long stalks. Many small seeds surrounded by hairs.



Twigs: Smooth, light brown. **Crooked or “zig-zagging.”** Light brown buds; pointed; up to ¼ inch long; one scale. Buds are covered completely by the leafstalk during the growing season.



Bark: Reddish brown on young trees. **Later breaking away into thin, rounded, flat scales giving a brown and gray and white mottled appearance.**



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

The soft, durable wood is very workable and is used for furniture, frames and canoes. The tuliptree can grow rapidly in rich soils. It makes an attractive shade tree.

Special Notes

There is much variation in seed yields. Seed viability is characteristically low, averaging 10 to 35 percent. The quantity of seeds per bushel of cones ranges from 5 to 13 pounds. The average number of cleaned seeds per pound is about 10,000.

Shake or pick seed cones from trees in dry weather. Dry immediately. Drying may take 7 to 20 days. Separate seeds by flailing, hand-shucking, treading, or using a hammermill or macerator. Dried seeds may be stored in sealed containers at 36° to 40° F for several years.

Description: Also known as yellow poplar, the tuliptree can grow up to 200 feet tall with an oblong or pyramid shaped crown. This tree thrives in rich upland soils.



Leaves: Alternate, simple. **Large, with 4 wide lobes. Upper two lobes are broadly separated, giving the leaf a “saddle” shape.** Smooth edges, indented base. Approximately 4 to 6 inches long and wide. Bright green upper surface. Paler lower surface. Long, slender leafstalks.



Fruit: Seed cones. **Approximately 2½ inches long. Overlapping seeds; winged and angled.**



Twigs: Smooth, reddish-brown. **Leaf scars nearly spherical. Flattened buds with 2 large scales; shaped like duckbills; up to 1 inch long.**



Bark: Smooth and grayish on young trees. Later becoming dark gray with some white showing between furrows.



Distribution & Adaptability

Neighboring States



Illinois



Represented



Not Represented

General Comments

Black walnut is consistently among the highest value and most sought after of all North American woods. The wood is used for veneer, interior finishing and furniture. Black walnut is frequently cultivated for nut crops as well as timber. It is an excellent agroforestry species because it produces nut and timber crops.

Special Notes

Large seed crops can be expected every 3 to 4 years. On average, 100 pounds of fruit yield 30 to 65 pounds of cleaned seed. There are approximately 40 cleaned seeds per pound.

It is advisable to remove the husks when they first begin to soften. Cleaned seeds with a 20 to 40% moisture content at 37° F can be stored for up to 1 year in plastic bags.

Description: The black walnut is a large tree, growing to 150 feet tall with a straight trunk and a rounded crown. This tree grows best in rich, well drained soils on stream terraces and uplands.



Leaves: Alternate, pinnately compound with **15 to 23 leaflets**, each as large as 3½ inches long and 1½ inch wide. Spear shaped; long, pointed tips; finely toothed edges. Rounded at the base. Yellow-green and smooth upper surface. Paler and downy lower surface.



Fruit: Appear singly or in groups of 2. **Round, up to 2 inches in diameter. Yellow-green to green husk; rough, thick. Nut is dark brown; very hard with deep ridges. Seed is sweet.**



Twigs: Stout. Greenish to orange-brown. Hairy at first. **Pith is brown and chambered with white diaphragm. Buds are pale brown and downy with rounded tips; up to ½ inch long.**



Bark: Dark brown to black with deep furrows. Thick, sometimes with crossing ridges forming diamond shapes; sometimes blocky.

