

FORESTRY FACTS



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Growing Wisconsin Trees From Seed

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Growing trees directly from seed can be more rewarding than planting two- or three-year-old seedlings purchased from a nursery-- especially if you collect and prepare the seed yourself. It is, however, more difficult and time consuming to cultivate trees from seed than from seedlings, and planting failures are frequent. This publication is a guide to successful collecting, storing, preparing and planting of seed from many of the common forest trees of Wisconsin.

COLLECTING SEED

Choosing appropriate seed is important for a successful planting effort. Always try to collect seed from trees within 100 miles north or south of the eventual planting site (and within 90 feet of elevation, if possible). While the range of a given species may be much larger than this, genetic variations within the species make an individual tree's potential for success optimal within a 100-mile range of its parents. Trees moved too far north may not enter dormancy early enough to endure fall frosts or may break dormancy before the threat of spring frosts is gone. Trees moved too far south will enter dormancy early and break it late--wasting valuable growing time every season.

Choose seed from trees that are healthy and successful (dominant) on a site similar to the intended planting site. Seeds collected from a dominant hemlock on a north-facing, moist site may not do very well at all on a well-drained, sandy, south-facing, open site--regardless of the similarities in latitude between the two sites.

The tables in this publication give approximate dates for collecting seed from Wisconsin trees. As a rule of thumb, seeds are mature and ready for harvest when they begin dispersing from the parent tree. Collect seeds immediately after or just before they fall.

Underripe seeds may not germinate at all, while a high percentage of overripe seeds will be rotten or damaged by insects. Check the tables for ripeness indicators--the most reliable method for determining when to collect seed.

PROCESSING AND STORING SEED

Seeds come in a variety of packages--from cones to berries--and most must be removed before seeds are sown or stored. The tables in this publication list the best method for extracting seed (if necessary) for each species.

Because seeds are often collected in the fall and not planted until spring, storing seeds correctly is important. Improper storage will reduce viability or kill seeds. Seeds should be stored cool and dry until they are sown. Air dry seeds for at least one day and then keep sealed in airtight containers at 33 to 36°F.

PREPARING SEEDS FOR PLANTING

Seeds may either be planted immediately after they are ripe (as happens when they fall naturally from the tree) or some time later. Most fall-ripening seed will not germinate until the following spring, so

planting in autumn subjects the seeds to predation by insects and small mammals. To reduce the risk, spring planting is often recommended.

Physiologically, however, seeds often require an extended, damp, cold period (winter) to trigger germination. When seeds are stored indoors through the winter, then, winter must be simulated--a process called "stratification." To stratify seeds, keep them in a moist medium (wet sand or peat), at near-freezing temperatures for several weeks to several months. The tables note stratification requirements, if any, for each species. If no stratification is required, seeds can be planted directly from cold (dry) storage.

Some seeds have a hard covering, or pericarp, that needs to be scratched to break dormancy and germinate. This "scarification" can be done mechanically, with a file or sandpaper, or by soaking the seeds in sulfuric acid. Scarification requirements are noted in the tables.

SOWING SEED

While seed can be sown directly in the field, much better success is realized when seeds are first sown in a seedbed and later transplanted out in the field. Seedbeds provide a more controlled atmosphere for new seedlings. The tables in this publication provide the basic seedbed conditions required for different species. Best results will be seen when the optimal light intensity, spacing and sowing depth is provided.

A sandy loam is the best soil for seedbeds. It has good drainage and allows for rapid root growth. Add sand or organic matter to heavy or waterlogged soils. For deciduous species, a soil pH of 6 to 8 (neutral) is ideal, although this pH also encourages fungal growth. Conifers do best in a slightly acidic soil (5.0 to 5.5), which also reduces the fungal problem of "damping off." Adding peat to a soil will lower the pH. Seeds sown directly in the field should be provided similar conditions. Field-sown seeds will also need protection from predation. Several methods can be used, including commercially available tree shelters, but none are fool-proof.

All references listed to the right were used in developing these tables. Where no information could be found, the space was left blank.

ADDITIONAL SOURCES OF INFORMATION

Preparing a seedbed:

Stoeckeler, J. H. and G. W. Jones. 1957. *Forest nursery practice in the Lake States*. USDA Handbook No. 110. Washington, D.C.: U.S. Govt. Printing Office.

Hooper, C. A. and T. W. Curtin. 1983. *Growing Illinois trees from seed*. University of Illinois at Urbana, Cooperative Extension. Circular 1219.

Information about species not listed:

Schopmeyer, C. S., ed. 1974. *Seeds of woody plants in the United States*. USDA Handbook No. 450. Washington, D.C.: U.S. Govt. Printing Office.

Nursery diseases:

Peterson, G. W. and R. S. Smith, Jr. 1975. *Forest nursery diseases in the United States*. USDA Handbook No. 470. Washington, D.C.: U.S. Govt. Printing Office.

Stoeckeler, J. H. and G. W. Jones. 1957. *Forest nursery practice in the Lake States*. USDA Handbook No. 110. Washington, D.C.: U.S. Govt. Printing Office.

Tree shelters:

Meyer, Dan A. 1992. *Tree shelters for seedling protection and increased growth*. Forestry Facts No. 59. University of Wisconsin-Madison, Department of Forestry, Cooperative Extension.

Table 1.

Deciduous Species	SEED COLLECTION		SEED SOWING	
	Dates For Collection	Ripeness Indicators	Optimal Times	Seed Sowing Density/Depth To Sow
Ash, Green & White <i>Fraxinus pennsylvanica & F. americana</i>	September – 1 - November	Fruit color turns yellow or brown	Fall (before Nov. 1)	25 seeds/ft in rows 6-12" apart sow ¼ - ¾" deep
Basswood, American <i>Tilia americana</i>	September - October	Fruit turns to a greenish brown	Fall or Spring	Scatter 175-200/square foot sow ¼ - ½" deep
Beech, American <i>Fagus grandifolia</i>	Mid-Sept - November	Husks turn brown & begin to open	After collection*	Scatter 50-80 seeds/square ft sow ½" deep
Birch, Paper & Yellow <i>Betula papyrifera & B. alleghaniensis</i>	August - September	Strobiles become brown & woody	Late summer or fall (after collect.)	Scatter 200 seeds/square ft sow 1/16" deep

Black Cherry <i>Prunus serotina</i>	Late August - September	Fruit Black, 7-10 mm in diam.	Early Sept. or by mid - October	Scatter 10-20 seeds/sq. ft sow ½ - 2" deep
Black Walnut & Butternut <i>Juglans nigra & J. cinerea</i>	September - October	Fruit turns yellowish green	Fall or stratified in spring*	8 (walnut), 15 (butternut) seeds/sq. ft** 1-2" deep
Chestnut, American <i>Castanea dentata</i>	September - October	Burs begin to split open	Fall (immediately after collect.)	4 seeds/ft in rows 3-6" apart sow 1-2" deep
Elm, American <i>Ulmus americana</i>	Late Feb - June	Fruite greenish-brown when ripe	Sow after collection in spring	Scatter 25 seeds/sq ft sow ¼" deep

Elm, Slippery (Red) <i>Ulmus rubra</i>	April - June	Fruit green when ripe	Sow after collection in spring	Scatter 25 seeds/square ft sow ¼" deep
Hickory, Bitternut & Shagbark <i>Carya cordiformis & C. ovata</i>	September - October	Husks turn to brown or black	Spring	6-8 seeds/ft in rows 8-12" apart sow ¾ to 1-1/2" deep
Honeylocust <i>Gleditsia triacanthos</i>	September - October	Pods are orange or reddish-brown		10 seeds/ft in rows 6-10" apart cover with ¼" of soil or sand
Locust, Black <i>Robinia pseudoacacia</i>	September - October	Pods turn brown to black and open	March - May	25 seeds/ft in rows 6-8" apart cover with ¼" of soil or sand

Maple, Red <i>Acer rubrum</i>	April - June	Seeds turn red, yellow or brown	Late spring, after collection*	Scatter 15-30 seeds/square ft sow ¼ - 1" deep
Maple, Sugar <i>Acer saccharum</i>	September - October	Seeds turn red, yellow or brown	Fall or spring*	Scatter 15-30 seeds/square ft sow ¼ - 1" deep
Oak, Black & Red <i>Quercus velutina & Q. rubra</i>	August - November	Acorns brown, cap easily removed	Fall*	Scatter 10-35 seeds/square ft sow ¼ - 1" deep, pack firmly
Oak, White & Bur <i>Quercus alba & Q. macrocarpa</i>	August - November	Acorns brown, cap easily removed	Fall*	Scatter 10-35 seeds/square ft sow ¼ - 1" deep, pack firmly

Seedling Care		Stratification	Remarks
Light Conditions	Years Before Transplanting	(See text for explanation) (Days, Temp., Medium)	
Shade for a short time after germ'tion	Usually 1, sometimes 2	*Green: 2 mos. Warm/3 mos. cold White: 3 mos. cold, or 1 warm/2 cold	*For spring sowing only.
	1-2	90 days, at 34-38°F. (after acid treatments)	Before sowing, soak seeds 1 hr. in nitric acid. Rinse, dry and soak for 15 min. in sulfuric acid. Seeds will germinate in 1-3 yrs.
50% shade until mid summer of 1 st year	1-2	For spring sowing only: 90 days at 37-41°F then 60 days at 68°F.	*Spring sowing is possible, but requires stratification. After one year, thin to a density of 45 stems per square foot.
Light shade for 2-3 mos. in 1 st summer	1-2	Can be sown in spring with 4-8 wks. cold stratification*	*Best results when sown in fall. Stratify paper birch seeds below 32°F. After one year, thin to 25-45 stems per square ft.

	1-2	Can be sown in spring w/120 days cold stratification	
	1	For spring sowing only: BW: 3-5 mos.; B'nut: 1-3 mos.; both at 37-41°F	*Protect fall-sown seeds from rodents. ** If sown in spring, sow 8 seeds per foot in rows 5 feet apart
	1	3 months cold stratification for spring sowing	* If seeds cannot be sown immediately after harvest, put into cold storage.
Full sun	1	None	Some seeds will not germinate until the second season after sowing.

Full sun	1	None	
Full sun		3 months cold stratification	
Full sun	1	3 months at 36°F	Prior to sowing, soak seed in sulfuric acid for 2.5 hrs. An acid bath prior to stratification will also improve germination results
	1	None	Prior to sowing, soak seed in sulfuric acid for 2.5 hrs. Then, soak 24 hours in water.

Shade during seeding establishment	Sometimes 1, usually 2**		Prior to sowing, soak seed in cold, running water. *Germination may not occur until the next spring. ** Bigger stock, better survival.
Shade during seeding establishment	Sometimes 1, usually 2**		*Stratified, spring-sown (2 mos./33-41°F) do poorer than fall-sown. **The bigger the planting stock, the better is survival.
Partial shade to establish germination	Usually 1, but 2 will give heartier seedling	Natural stratification occurs in the ground when fall-sown	*Acorns will germinate in spring. Two to three months cold stratification can be used w/spring sowing to avoid predation.
Partial shade to establish germination	Usually 1, but 2 will give heartier seedling	None	*Acorns should germinate before predation becomes a problem.

Table 2.
Coniferous Species

	SEED COLLECTION			SOWING		SEEDLING CARE		Remarks
	Time To Collect Cones	Cone Ripeness Indicators	Best Seed Extraction Method	Best Time To Sow	Seeds/ft ² & Depth To Sow	Best Light Condition	Years Before Transplant	
Balsam Fir <i>Abies balsamea</i>	Late Aug-early Sept	Cones turn brown	Air dry 20-30 days	Fall	55-80	Shade after germination		2-4 weeks stratification at 40°F prior to planting will give best germination.
Cedar, Northern White- <i>Thuja occidentalis</i>	August-September	Cones turn brown	Kiln dry 24-36 hrs at 110°F; or sun dry 'til cones open	Fall*	65 1/8"	50% shade 1 st year	2 to 3	*Spring-sown with 2 mos. cold start. Gives more uniform germination.
Hemlock, Eastern <i>Tsuga canadensis</i>	September-October	Cones turn to a purplish-brown*	Kiln dry 48 hours at 100°F, wet and repeat if needed	Spring**	30-50 seed width	Full sun	1 to 3	*Collect cones when tan and unopened. **Cold stratify 2-4 months.
Larch (Tamarack) <i>Larix laricina</i>	August-September	Cones turn brown	Sun dry; or kiln dry 8 hours at 120°F	Fall	25 1/4"	Full sun	2	Will grow in most soils, but does best in open, moist, well-drained soils.
Pine, Jack <i>Pinus banksiana</i>	September	Cones turn tawny yellow or brown	Boil 10 to 30 seconds; or air dry 3-10 days	Fall*	30 1/4"	Full sun	1 to 2	*Sow late enough to avoid fall germination, stratify 7 days before sowing.
Pine, Red (Norway) <i>Pinus resinosa</i>	August-October	Cones turn purple 2/ red-brown scale tips	Kiln dry 9 hours at 130°F	Fall*	30-50 1/4-3/8"	Full sun	2 to 3	*Sow late enough to avoid fall germination. Stored seed must be stratified 2 mos.
Pine, Scotch <i>Pinus sylvestris</i>	September - October	Cones turn yellow, grayish or dull brown	Kiln dry 10-16 hrs at 120°F; or air dry 3-7 days	Fall*	30-60 1/8-1/2"	Full sun	1 to 2	*Sow late enough to avoid fall germination. Stored seed must be stratified 2 mos.
Pine, White <i>Pinus strobus</i>	August-September	Cones turn yellow-green or light brown	Kiln dry 4-12 hrs at 130°F	Late Oct-early Nov.	20-50 1/8"	Full sun	1 to 3	*Cold stratify 2 months prior to sowing.
Spruce, Black <i>Picea mariana</i>	September	Cones turn from purple to brown	Cold water 3 hrs, dry 20 hrs, 130°F 8 hrs, repeat twice	Late fall	30 1/8"	Partial shade 1 st year*	3	*Unless overhead irrigated.
Spruce, Colorado Blue <i>Picea pungens</i>	Fall	Cones turn to pale shining brown	Air dry 2 weeks; or kiln dry 6-24 hrs at 100-120°F	Spring*	100 3/8"	Partial shade 1 st year**	2 to 3	*Cold stratify 1-2 months. **Unless overhead irrigated.
Spruce, Norway <i>Picea abies</i>	September-November	Cones turn brown	Air dry 2 weeks; or kiln dry 6-24 hrs at 100-120°F	Spring*	1/4"	Partial shade 1 st year**	2	*No stratification required. **Unless overhead irrigated.
Spruce, White <i>Picea glauca</i>	Mid August	Cones turn from green to pale brown	Air dry 2 weeks; or kiln dry 6-24 hrs at 100-120°F	Late fall	1/4"	Partial shade 1 st year**	2	*Unless overhead irrigated. No stratification required.