

NATIVE PLANT PROPAGATION			OUTDOOR PROPAGATION			GREENHOUSE SEEDLING PROPAGATION					
FAMILY	SPECIES		Propagation Methods	Sowing Time Outdoor/Flats	Division/Transplant	SCARIFICATION	STRATIFICATION		SOWING DEPTH	OUT-PLANTING TIME	
	Common Name	Scientific Name					COLD	# Weeks			
WILDFLOWERS											
APIACEAE	Rattlesnake master	<i>Eryngium yuccifolium</i>	SEED	Dormant	Spring	-	Moist	8-12	1/4"	Spring	
(Parsley)	Golden Alexander	<i>Zizia aurea</i>	SEED, DIV	Dormant	Spring/Fall	Scarify?	Moist	12-16	1/4"	Spring	
ASCLEPIADACEAE (Milkweed)	Butterfly milkweed	<i>Asclepias tuberosa</i>	SEED	Dormant	-	-	Moist	4-8	1/4"	Spring	
ASTERACEAE (Composite)	Prairie sage	<i>Artemisia ludoviciana</i>	SEED, DIV	Dormant	Spring/Fall	-	Dry	12	SURFACE	Spring	
	Sky blue aster	<i>Aster azureus</i>	SEED	Dormant	-	-	Moist	8	1/4"	Spring	
	Smooth blue aster	<i>Aster laevis</i>	SEED	Dormant	-	-	Moist	8	1/4"	Spring	
	New England aster	<i>Aster novae-angliae</i>	SEED, DIV	Dormant	Spring/Fall	-	Moist	8	1/4"	Spring	
	Prairie coreopsis	<i>Coreopsis palmata</i>	SEED, DIV	Dormant	Spring/Fall	-	Moist	12	1/4"	Spring	
	Pale purple coneflower	<i>Echinacea pallida</i>	SEED	Dormant	-	-	Moist	12	1/4"	Spring	
	Oxeye false-sunflower	<i>Helioopsis helianthoides</i>	SEED	Dormant	-	-	Moist	12	1/4"	Spring	
	Rough blazing-star	<i>Liatris aspera</i>	SEED, CORM	Dormant	Fall	-	Moist	8-12	1/4"	Spring	
	Prairie blazing-star	<i>Liatris pycnostachya</i>	SEED, CORM	Dormant	Fall	-	Moist	8-12	1/4"	Spring	
	Wild quinine	<i>Parthenium integrifolium</i>	SEED	Dormant	-	-	Moist	8-12	1/4"	Spring	
	Greyhead coneflower	<i>Ratibida pinnata</i>	SEED	Dormant	-	-	Moist	8-12	1/4"	Spring	
	Sweet coneflower	<i>Rudbeckia subtomentosa</i>	SEED	Dormant	-	-	Moist	8-12	1/4"	Spring	
	Rosinweed	<i>Silphium integrifolium</i>	SEED, DIV	Dormant	Spring/Fall	-	Moist	8-12	1/4-1/2"	Spring	
	Compass plant	<i>Silphium laciniatum</i>	SEED	Dormant	-	-	Moist	8-12	1/4-1/2"	Spring	
	Stiff goldenrod	<i>Solidago rigida</i>	SEED, DIV	Dormant	Spring/Fall	-	Moist	8-12	1/4"	Spring	
Showy goldenrod	<i>Solidago speciosa</i>	SEED, DIV	Dormant	Spring/Fall	-	Moist	8-12	1/4"	Spring		
CAMPANULACEAE (Bell Flower)	Great blue lobelia	<i>Lobelia siphilitica</i>	SEED	Dormant	-	-	Dry	12	SURFACE	Spring	
COMMELINACEAE (Day Flower)	Prairie spiderwort	<i>Tradescantia bracteata</i>	SEED, DIV	Dormant	Spring/Fall	Scarify	Moist	12	1/4"	Spring	
	Ohio spiderwort	<i>Tradescantia ohioensis</i>	SEED, DIV	Dormant	Spring/Fall	Scarify	Moist	12	1/4"	Spring	
GENTIANACEAE	Bottle gentian	<i>Gentiana andrewsii</i>	SEED	Dormant	-	-	Moist	12	SURFACE	Spring	
IRIDACEAE (Iris)	Blueflag iris	<i>Iris shrevei</i>	SEED, DIV	Dormant	Spring/Fall	-	Moist	12	1/2"	Spring	
	Blue-eyed grass	<i>Sisyrinchium campestre</i>	SEED, DIV	Dormant	Spring/Fall	-	Moist	16	SURFACE	Spring	
LAMIACEAE (Mint)	Wild bergamot	<i>Monarda fistulosa</i>	SEED, DIV	Dormant	Spring/Fall	-	Dry	8-12	SURFACE	Spring	
	Hairy Mt. mint	<i>Pycnanthemum pilosum</i>	SEED, DIV	Dormant	Spring/Fall	-	Dry	12	SURFACE	Spring	
	Narrowleaved Mt. mint	<i>Pycnanthemum tenuifolium</i>	SEED, DIV	Dormant	Spring/Fall	-	Dry	12	SURFACE	Spring	
	Virginia Mt. mint	<i>Pycnanthemum virginianum</i>	SEED, DIV	Dormant	Spring/Fall	-	Dry	12	SURFACE	Spring	
LILIACEAE (Lily)	Wild garlic	<i>Allium canadense</i>	BULBLETS	Fresh	Fall	-	-	-	-	Spring	
	Turk's cap lily	<i>Lilium michiganense</i>	SEED, BULB	Dormant	Late Fall	-	4wk wam/4wk cold	-	1/4"	Spring	
RANUNCULACEAE (Buttercup)	Canada anemone*	<i>Anemone canadensis</i>	SEED, DIV	Dormant	Spring/Fall	Scarify	Moist	16	1/4"	Spring	
	Thimbleweed	<i>Anemone cylindrica</i>	SEED	Dormant	-	Scarify	Moist	12	1/4"	Spring	
RHAMNACEAE (Buckthorn)	New Jersey tea	<i>Ceanothus americana</i>	SEED	Dormant	-	Wet/Heat	Moist	12	1/4"	After last frost	
SCROPHULARIACEAE	Culver's root	<i>Veronicastrum virginicum</i>	SEED, DIV	Dormant	Spring/Fall	-	Dry	12	SURFACE	Spring	
POACEAE (Grass)	GRASSES-WARM										
	Big bluestem	<i>Andropogon gerardii</i>	SEED, DIV	Late Spring	Spring	-	Dry	-	1/4"-1/2"	Late Spring	
	Side-oats grama	<i>Bouteloua curtipendula</i>	SEED, DIV	Late Spring	Spring	-	Dry	-	1/4"-1/2"	Late Spring	
	Switchgrass	<i>Panicum virgatum</i>	SEED, DIV	Late Spring	Spring	-	Moist	4	1/4"	Late Spring	
	Little bluestem	<i>Schizachyrium scoparium</i>	SEED, DIV	Late Spring	Spring	-	Dry	-	1/4"	Late Spring	
	Indian grass	<i>Sorghastrum nutans</i>	SEED, DIV	Late Spring	Spring	-	Dry	-	1/4"	Late Spring	
	Prairie cordgrass	<i>Spartina pectinata</i>	SEED, DIV	Late Spring	Spring	-	Moist	4	1/4"	Late Spring	
	Tall dropseed	<i>Sporobolus asper</i>	SEED, DIV	Late Spring	Spring	-	Dry	-	1/4"	Late Spring	
	Prairie dropseed	<i>Sporobolus heterolepis</i>	SEED, DIV	Late Spring	Spring	-	Moist	4	1/4"	Late Spring	
	GRASSES-COOL										
	Bluejoint grass	<i>Calamagrostis canadensis</i>	SEED, DIV	Early Spring	Spring/Fall	-	Dry	-	1/4"	Spring	
	Woodland reedgrass	<i>Cinna arundinacea</i>	SEED	Early Spring	-	-	Dry	-	1/8"	Spring	
	Canada wildrye	<i>Elymus canadensis</i>	SEED	Fall	-	-	Dry	-	1/4"	Spring	
	Virginia wildrye	<i>Elymus virginicus</i>	SEED	Fall	-	-	Dry	-	1/4"	Spring	
	Junegrass	<i>Koeleria macanthra</i>	SEED	Early Spring	-	-	Dry	-	1/8"	Spring	
	Upland wild timothy	<i>Muhlenbergia racemosa</i>	SEED	Early Spring	-	-	Dry	-	1/8"	Spring	
	Porcupine grass*	<i>Stipa spartea</i>	SEED	Fall	-	-	Moist	16	1/4"	Spring	
CYPERACEAE (Sedge)	SEDGES										
	Prairie sedge	<i>Carex bicknellii</i>	SEED, DIV	Fall	Early Spring	-	Moist	8	SURFACE	Spring	
	Plains Oval Sedge	<i>Carex brevior</i>	SEED, DIV	Fall	Early Spring	-	Moist	8	SURFACE	Spring	
	Heavy sedge	<i>Carex gravida</i>	SEED, DIV	Fall	Early Spring	-	Moist	8	SURFACE	Spring	
FABACEAE (Legume)	LEGUMES										
	Leadplant	<i>Amorpha canescens</i>	SEED	Dormant	-	Scarify	Moist	12	1/4"	After last frost	
	Canada milkvetch	<i>Astragalus canadensis</i>	SEED	Dormant	-	Scarify	Moist	2	1/4"	After last frost	
	White wild indigo	<i>Baptisia alba</i>	SEED	Dormant	-	Scarify	Moist	2	1/4"	After last frost	
	Cream Wild Indigo	<i>Baptisia bracteata</i>	SEED	Dormant	-	Scarify	Moist	2	1/4"	After last frost	
	White prairie clover	<i>Dalea camdida</i>	SEED	Dormant	-	Scarify	Dry	-	1/4"	After last frost	
	Purple prairie clover	<i>Dalea purpurea</i>	SEED	Dormant	-	Scarify	Dry	-	1/4"	After last frost	
	Showy tick-trefoil	<i>Desmodium canadense</i>	SEED	Dormant	-	-	Dry	-	1/4"	After last frost	
	Roundhead bush clover	<i>Lespedeza capitata</i>	SEED	Dormant	-	Scarify	Moist	2	1/4"	After last frost	

* Species with an asterisk have double dormancy, requiring 2 yrs, or two stratification cycles, to break dormancy.

Preventing 'Damping Off'

If otherwise healthy seedlings suddenly fall over, appearing to be cut off at soil level, then "damping off" fungus is present. Legumes are particularly susceptible, but other species can be affected if planted too densely. Maintain good air circulation to evaporate excess water from stems and the soil surface. A box fan set on low facing the seedlings will help. Thinning may be necessary. Sprinkling a layer of perlite over the top of the soil surface after seeding or on infected seedlings will prevent or stop infection from spreading. Washing and sterilizing containers, benches, and equipment and using sterile potting medium will also help reduce the risk of damping off.

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To request copies, or for more information, call the Tallgrass Prairie Center at 319.273.3836.

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Roots

Almost any plant with fibrous roots and multiple stems can be propagated by division. Dig up or un-pot plant and use a sharp knife or trowel to cut into the root mass. Some damage will occur, but be sure to include intact root and shoot portions for re-potting/transplanting. Divide in half for two large plants, or multiple times for maximum number of smaller plants. Fall or early spring are the best times for division, depending on the species (see table).

Corms



Rough blazingstar corms dug in fall for transplant. Large corms can be cut in half.

A corm is a short, fleshy, vertical underground stem. The blazingstars (*Liatris* spp.) grow from corms. In the fall these can be dug up and divided in a way similar to potatoes, and transplanted for mature flowering plants the next growing season. Small corms (cormels) can be broken off the main corm, or cut larger corms (2-inch diameter or more) in half.

Bulbs



Michigan lily scaly bulbs (left), dug in fall, all from a single plant. Side bulbs or individual scales can be broken off and transplanted. Bulb scale (right) growing new leaves and rootlet.

A bulb is a thickened, underground bud with fleshy scales. Species like prairie onion and wild garlic (*Allium* spp.) and Michigan and Wood lily (*Lilium* spp.) have bulbs. In vigorous plants smaller side bulbs (bulbels) may develop that can be removed and re-planted. Lilies have scaly bulbs, and each scale can grow into a separate plant. Under good growing conditions, lilies will send out one or two short rhizomes a short distance (2-3") and a new bulb will form which can be carefully dug up and transplanted for mature flowering plants the next season.

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3 PROPAGATING NATIVE PLANTS

Content by Greg Houseal

PRAIRIE RESTORATION SERIES

Propagating native plants is hands-on learning at its best. Gain experience with individual species' life cycles, growth habits, and natural history...and bring important biodiversity to your outdoor living space at the same time!

Equipment Needed

This is a basic list of equipment needed for propagating native plants:

Native plant materials (seeds and/or plants)	Clean sand/vermiculite	Containers/labels
Ziploc bags/permanent marker	Refrigerator	Pruning shears, knife
	Sterile potting soil	Trowels, shovel

Starting from Seed

Propagating native plants from seed is a great learning experience, and a great way to grow a large number of plants from diverse genetic sources. It is the best way to develop seedling identification skills for assessing new restoration plantings. Be sure the seed you're planting is viable, either from seed test results or from an experienced collector. It is important to know a bit about seed dormancy and how to overcome it to successfully germinate native seed.

Seed Dormancy and Germination

Dormancy is an important trait of native species, especially forbs, allowing germination to occur over time and in the proper season in nature. If starting seedlings in the greenhouse, it's best to break dormancy artificially using various techniques as described below.



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Adding wet sand to an equal amount of seed in preparation for stratification.



Scarification

Species with a hard or waxy seed coat require scarification. Scarification is a technique that simulates the natural disintegration (such as weathering, abrasion, or partial digestion) of the seed coat to allow water uptake for timely germination. Species in the Sumac, Legume, Geranium, and Buckthorn families may require scarification (Baskin and Baskin 1998). A simple scarification technique is to rub a single layer of seed between two sandpaper-covered boards for a minute or so until the seed coat begins to appear dull. Percussion scarification involves shaking seeds vigorously inside a heavy glass bottle for a few minutes. Commercial scarifiers are also available from seed equipment manufacturers, such as a Forsberg scarifier. In all cases, care is necessary to avoid breaking or damaging seeds.

Special Case: Wet-Heat Scarification

New Jersey tea (*Ceanothus americana*) and false gromwell (*Onosmodium molle*) require wet-heat treatment. Pour boiling water (212°F, 100°C) over the seeds just enough to cover them all and allow to cool to room temperature, or immerse seeds in boiling hot water for five to twenty seconds and remove to rinse and cool. Be sure not to boil the seed! Germination of these species will improve with stratification after wet-heat treatment.



Stratification

Most prairie species require a winter treatment, i.e. cold, moist conditions known as stratification to break dormancy. Mix seed with an equal amount of moist sterile sand, sawdust, or vermiculite and place in a Ziploc bag. Avoid excessive moisture; water should not be pooled anywhere in the bag. Use vermiculite if working with species adapted to drier conditions to minimize the risk of rot. Place seeds in the refrigerator (32 to 45°F or 0 to 10°C) for the recommended period of time (see table on back). Check bags weekly for mildew or dryness. A few species, among them American vetch (*Vicia americana*) and butterfly milkweed (*Asclepias tuberosa*), will germinate at these temperatures, so plant immediately if this occurs.

Some species may germinate best when stratified under natural winter temperature fluctuations. If sowing seeds in flats for outdoor stratification, cover with screen mesh to protect seeds from being displaced by animals or heavy rains. Sow seeds in early March in cold frames for stratification and extending the growing season in the spring. A few species may require warm (68 to 94°F or 20 to 35°C), moist conditions, or warm-moist followed by cold-moist stratification, such as Michigan lily (*Lilium michiganense*). Other species requiring this treatment are found in the Parsley, Buttercup, Arum, Lily, and Iris families (Baskin and Baskin 1998).



Ready, Get Set, Sow...

Seeds are primed and ready to grow! Critical to successful propagation of native seedlings are using suitable containers and potting medium, and proper watering, soil temperature, light, and air.

Containers

Containers should provide good drainage, space for strong root development, and yet be small enough to provide efficient use of potting medium and bench space. Deeper containers aren't necessarily better, but they will help accommodate tap-rooted species. It's important to allow roots to 'air-prune' (can't grow any further) as they reach the bottom of the soil column so lateral root development will occur within the container. This is accomplished with good drainage around and away from the container (no water puddling under pots). Good lateral root development will aid later in transplanting (and survival!) of seedlings.

Potting Medium

A good potting medium should be light enough to allow for good root development, provide adequate drainage, and have enough fertility for seedlings to grow quickly for timely transplanting. It should also be sterile, meaning weed seed- and disease-free. A soil-less mix (less than 20% soil) is a good choice, and pre-mixed and packaged sterile potting soil is available commercially. Just be sure it's well-moistened before filling containers and sowing seed.

Soil-less Mix Recipe

This recipe makes about 1 cubic yard of potting medium:

Peat moss (4 cu. ft./bag)	2 bags (8 cu. ft)
Vermiculite (medium 4 cu. ft./bag)	1/2 bag (2 cu. ft)
Perlite (4 cu. ft./bag)	1/2 bag (2 cu. ft)
Sterile soil	two 5-gal buckets
Composted (sterile) manure	40-lb bag
Osmocote® Plus fertilizer 15-9-12 (180 days)	8 lb

For best consistency, screen peat moss, soil, and composted cow manure through a 1/2-inch mesh hardware cloth. Add remaining ingredients and mix with shovels on clean floor. Caution: All of these materials are extremely dusty in their dry form. Wear a high-quality dust mask and moisten materials thoroughly with water as they are mixed to reduce dust and aid water uptake of the finished medium. Store unused medium in plastic tubs with tight-fitting lids to prevent drying out.

Sowing

Sow several seeds in each container. Thin later if necessary. Cover with no more than 1/4 inch of soil for most species. Caution: Very tiny seeds should not be covered! Species such as Culver's root (*Veronicastrum virginicum*), mountain mint (*Pycnanthemum* spp.), grass-leaved goldenrod (*Euthamia graminifolia*), Joe-pye weed (*Eupatorium* spp.), great blue lobelia (*Lobelia siphilitica*), and prairie sage (*Artemisia ludoviciana*) do best if sprinkled on top of the soil surface and kept continually moist until the seed leaves (cotyledons) are evident.

Growing

Prairie seedlings need full sunlight for normal development. Sow seeds in early February in a greenhouse environment (mid-March in cold frames). Keep the soil surface moist until germination has occurred. Use a gentle spray wand so seed isn't dislodged, forced deeper into the soil, or splattered out of the containers. Expect germination and emergence to occur over a 2-6 week period. Warm-season grasses and legumes germinate best in warm soils greater than 70°F (21°C). Cool-season grasses and many forbs germinate more readily in cool soil temperatures 40 to 50°F (5 to 10°C) and may cease germination at temperatures above 77°F (25°C). If sowing seed in flats, precise regulation of soil temperature can be achieved with propagation mats. These are commercially available at reasonable cost from nursery or greenhouse supply companies. Water established seedlings thoroughly at least once a day, moistening the entire soil column. Allow the soil to drain and surface soil to begin to dry somewhat between waterings.

Transplanting Seedlings

Strong root development is the key to successful transplants. Roots should fully occupy the entire soil column, forming an intact root "plug" (retains the shape of the container when removed for transplanting). The ideal time for transplanting is in the spring after the last frost-free date for your region. Acclimate seedlings gradually to outdoor conditions of sun and wind through a process call "hardening off." Set flats or trays outside (sheltered from strong winds and full sun) for a few hours each day from mid-morning to mid-afternoon about a week before transplanting. If transplanting in summer, be prepared to water regularly and deeply until plants are established. Transplanting in the fall (early to mid-September) is an option if strong root development is present to survive the winter months.

