

# PRAIRIE SEED & PLANT PROPAGATION

A prairie meadow is a long-term investment in your landscape, which requires careful planning. Since a variety of site conditions will be encountered when planting an area with plants or seeds, it is difficult to write a standard "recipe" for site preparation and planting procedures. What follows are *guidelines* based on our experience. If you have any questions, please call or fax us your concerns. We will do our best to help ensure the success of your prairie planting.

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## I. SITE PREPARATION METHODS

To prepare your site for planting, you must first remove the existing perennial vegetation. In most cases, the existing vegetation on your site will consist of perennial and annual weeds unless you are fortunate to have a native prairie remnant in your yard! Existing weeds will compete with prairie seeds and plants for nutrients, moisture, and sunlight. Although it is nearly impossible to remove all annual weed seeds from the seed bank (Ragweed, Lamb's Quarters, Pigweed, Velvetleaf), it is crucial to kill and/or remove perennial weeds and rhizomes before planting. Perennial weeds such as Quack grass, Bromegrass, and Red Clover will inhibit the growth of your prairie. Site preparation options vary according to the vegetation type that you are converting to a prairie planting.

### A. Lawns

#### 1. Smothering

- a) Cover the site with either black plastic, old carpet, plywood or a thick layer of leaves or newspapers
- b) Leave in place for a full growing season
- c) Remove the "smother cover" in fall or the following spring
- d) Plant into a prepared bed (see the specifics in section II)

#### 2. Sod cutting

- a) Remove the top two to three inches of grass and soil using a sod-cutter
- b) Till lightly and plant into a prepared bed

#### 3. Cultivating

- a) Cultivate two to three times at one week intervals
- b) If perennial weeds are present, cultivate all growing season every two to three weeks and plant into a prepared bed

#### 4. Herbiciding

- a) Apply Round-up herbicide when the lawn is actively growing (in fall or spring)
- b) Till lightly when the grass has turned brown and plant into a prepared bed

### B. Old fields

#### 1. Herbiciding

- a) Mow and rake or burn the existing vegetation to the ground in late fall or early spring
- b) Apply Round-up herbicide three times (mid-spring, mid-summer, early fall)
- c) When all the vegetation is dead, plant into a prepared bed

#### 2. Cultivating

- a) Mow and rake or burn the existing vegetation to the ground in late fall or early spring
- b) Cultivate to a depth of four to five inches every two to three weeks from spring through fall
- c) Before planting, make sure all the existing weeds have been killed
- d) Plant in fall or the following spring into a prepared bed

### C. Existing fields of corn, soybeans, or small grains

Before planting, test the soil for agrochemical such as Atrazine, which, if present, will kill germinating prairie wildflower seedlings.

### **1. Herbiciding**

- a) **Spring:** Spray once in mid to late spring, wait 10 days and plant into a prepared seedbed
- b) **Fall:** Spray once after the crop is removed. If weedy vegetation is still actively growing, wait 10 days and plant into a prepared bed

### **2. Cultivating**

- a) If perennial weeds are present, cultivate at a depth of four to five inches every two to three weeks from spring through fall
- b) Plant in fall or the following spring into a prepared bed

## **II. FINAL SEED AND PLANT BED PREPARATION**

Just prior to planting, the soil should be prepared according to the type of planting method used. This is also a good time to improve the fertility of sandy soils and the fertility and porosity of heavy clays.

### **A. Soil improvements**

A dark brown or black soil generally indicates the presence of organic materials and soil fertility. Sand and heavy clay soils with low organic levels benefit from the addition of large quantities of well-composted material (manure, leaves, organic refuse) to the top one to two feet of soil. Organic matter increases the water holding capacity of sandy soils and improves the water and air circulation of heavy clays. This increased "porosity" enhances root development, plant growth, and ultimately seedling and plant survival. In addition, heavy clay soils are much easier to work.

### **B. Transplanting**

Requires a relatively weed-free area and close proximity to a water source to establish transplants during the first growing season. Tilling, although not necessary, will make transplanting easier. To help prevent erosion, tilling is not recommended for steep slopes.

### **C. Seeding by hand (hand broadcasting) or mechanically with a Brillion drop seeder**

Requires a well-tilled, finely graded surface

### **D. No-till or slit seeders (Tye, Truax, John Deere):**

Requires a smooth, level soil surface, but little or no tilling

### **E. A final pre-planting tip**

If planting in late spring or early summer, you will reduce the weed density by applying Round-up to the site when the majority of the weeds are two to three inches tall. Wait 10 days, till the soil only one inch down (tilling deeper will only bring up more weed seeds) and plant immediately. If you would like to avoid using herbicides, till the soil down one inch five to seven days after the first heavy spring rain (before green-up) and plant immediately. This will kill the weeds after they germinate but before they emerge.

## **III. SEED/PLANT MIX DESIGN & SELECTION**

### **A. Site selection**

Whether you wish to plant a 10 square foot raised bed, a 2,500 square foot mound system, or a 50 acre old pasture, choose sunny, open areas which receive at least one half day of full sun. Although some prairie plants flower in areas which receive three to four hours of sun, the majority require very sunny conditions to thrive and bloom. Try to stay clear of weedy areas, such as "old-fields" when determining the location of your prairie planting. Old fields contain

perennial weeds such as Quack grass, Brome Grass, Canada Goldenrod, and Canada Thistle, which can spread into your newly planted area with their rhizomatous root systems. To help prevent this incursion, maintain a 10 foot wide mown “buffer” between your new planting and the old field and mow the adjacent field (if possible) every summer in late July *before* the weeds set seed.

If you are planning to use fire as a long term management tool, position the planting to utilize natural fire-breaks such as driveways, sidewalks, lawns, or streams and keep the planting clear of conifers and other trees that are easily damaged by fire. If natural fire breaks are unavailable, plant a five to 10 foot bluegrass and/or fescue turf buffer around your planting. If you have a large area, divide your planting into three or four smaller management units that you could burn on a rotational basis (i.e. burn different units every year).

## **B. Soil type/soil moisture determination**

Prairie wildflowers and grasses will tolerate a variety of soils and moisture levels. It is important, however, to determine the general soil type and soil moisture of each area that you intend to plant to select the prairie wildflowers and grasses most adapted to your soil conditions.

### **1. Soil type**

Soils can be generally classified as sands, clays, and loams. **Sandy** or “light” soils are comprised of large, loosely packed, soil particles that drain easily and are easy to work. Sandy soils also tend to be low in nutrients and slightly acidic. **Clays** or “heavy” soils consist of small, tightly packed, soil particles that drain poorly and are difficult to work. They can, however, be rich in nutrients and very productive. **Loams**, the intermediate soil type between sand and clays, are usually very fertile and are composed of a variety of different sized soil particles. This particle diversity provides good moisture holding capacity and drainage, which is an excellent medium for most prairie plants.

### **2. Determining your soil type**

Rub a small amount of moist soil between your thumb and fingers. A clay soil will be slick and smooth and a sandy soil will be gritty and fall apart easily. A loamy soil will feel gritty, although not as gritty as sand, and stick together easier than sand but not as tenaciously as clay. In addition, as a loamy soil dries, it will have the texture of flour.

### **3. Soil moisture**

The soil moisture content varies according to the soil type and location of the soil relative to the groundwater level. Moist soils occur relatively close to groundwater levels and dry and medium are relatively far from them. **Moist soils** could be sands, clays, or loams, which hold water throughout the growing season. **Dry soils** include sandy soils, or soils mixed with gravel which rarely accumulate standing water, even after a heavy rain.

**Medium, or mesic, soils** include clays and loams, which, unlike the dry soils, may accumulate standing water following a heavy rain for one to three days depending on the amount and intensity of the rainfall.

## **C. Plants versus seeds**

Transplants are recommended for relatively small areas and/or if you want an “instant gratification” garden. Given adequate soil moisture and fertility, most transplants will bloom the first year. Prairie seed, although slow to mature, is significantly less expensive than transplants and is recommended for areas greater than 500 square feet. Plants grown from seed will typically bloom in three to four years. In general, prairie seed will cost between \$0.03 and \$0.09 per square foot and transplants will cost between \$1.25 and \$5.00 per square foot. Seed and plant prices vary according to the amount and diversity of wildflower types used and the scale of the project (i.e. the larger the area, the less expensive the square foot price).

## **D. Prairie wildflower and grass selection**

## 1. A note about prairie grasses

Prairie Nursery seed and plant mixes are designed to match your soil conditions and provide you with color from spring until late fall. The grasses give their strongest showing in fall and into the winter turning golden yellow and orange hues. Prairie grasses, in addition to their beauty, keep the planting relatively maintenance free by structurally supporting the wildflowers and keeping out competing weeds with their fibrous root systems.

We define our prairie mixes as Shortgrass and Tallgrass, which describes the height of the grasses. In September, at the end of the growing season the grasses in the tallgrass mixes (Big Bluestem, Indiangrass, Switchgrass, Canada Wild Rye) are four to six feet tall and the short grasses (Little Bluestem, Sideoats Grama, Prairie Dropseed) are two to three feet. Although several wildflower species are specifically short (Nodding Pink Onion, Butterflyweed) or tall (Yellow Coneflower, New England Aster), many occur in both tall and short mixes. Historically, tall grasses and wildflowers occurred on the richer, moister soils and the short grasses and forbs on less fertile, drier soils. We keep the tall and short grasses separate since tall grasses tend to be more aggressive, especially on a fertile soil, and may out-compete the shorter grasses. If you decide to use both a tall and short mix, keep the tall mix to the east or south of your short mix (i.e. downwind) to prevent an infiltration and possible take over of tall grasses over short.

Prairie grasses may be purchased as **pure live seed (PLS)** or as bulk seed. Pure live seed refers to the amount of live or germinable seed in a lot of bulk seed. Pure live seed percentages are determined by multiplying the percentage purity of each seed lot with the percentage germination rate and dividing by 100. For example, if a bulk lot of Indiangrass is 89% pure with a 92% germination rate, the percentage of pure live seed is  $89 \times 92 / 100$  or 82% (rounded up). For this Indiangrass example, one pound of bulk seed is equal to 0.82 PLS pounds. This means that 1.2 pounds ( $1/0.82$ ) of bulk seed are needed to equal one pound of pure live seed.

## 2. Creating a seed or plant mix

If you would like to create your own seed or plant mix, use the wildflower selection guide on pages 40 and 41 to select the species which match the soil type and moisture conditions of each area that you intend to plant. For a transplant garden, plan on one plant per square foot and choose wildflower species with a variety of blooming times so you will have landscape color throughout the growing season. In addition, try to keep the grass to wildflower ratio at least 50/50 to reduce your weeding and to help avoid staking your wildflowers.

If the seed and plant mixes described in our catalog do not quite meet your landscaping goals, the consultants at Prairie Nursery will custom design a seed or plant mix to match your landscaping needs. We will also review and make recommendations on your own design if you wish.

## E. Nurse crops

A "nurse-crop" is generally an annual such as annual rye or oats which, when seeded with your prairie mix, will quickly germinate and establish on the site before the perennial and biennial prairie seeds. This annual crop will help protect erosion-prone sites and help to keep out competing weeds. For a spring seeding, a nurse crop should be planted with your prairie seed at a rate of five pounds per acre (annual rye), or 64 pounds per acre (oats) and for a fall planting at 15 pounds per acre (annual rye), or 128 pounds per acre (oats). In order for a nurse crop to establish in fall, it should be planted with your prairie seed no later than September 15.

## IV. SEED PREPARATION

### A. Breaking seed dormancy

Many seeds have internal dormancy mechanisms, which keep them from germinating in fall and being killed over the winter before reaching a sufficient size to survive. *Stratification* is a treatment that breaks seed dormancy and increases the germination rates of prairie seeds. If seeds are planted in fall, they undergo a natural stratification by overwintering in the cold, damp, soil over the winter and early spring. This process can be mimicked, however, for seeds planted in spring using one or both of the following techniques.

1. **Dry Stratification**-Store seed in a rodent and waterproof container outdoors over the winter, or in a freezer for two to six months. Prairie Nursery seeds are all stratified this way, unless purchased prior to mid-January. Most prairie grasses require only dry stratification for good germination.
2. **Moist Stratification** (Wildflower seed only)-In general, prairie grasses generally exhibit little or no increase in germination with moist stratification. Do not let wet stratified seed dry out after planting as the germination process has already been initiated. For best results, water seed daily after planting.

**The Moist Stratification Process:**

- a) Mix wildflower seed with two to three times its volume of *damp* (not wet) sawdust or sand
- b) Store in a refrigerator (34°-38°F) for four to eight weeks prior to planting (do not freeze!!!)
- c) **Exceptions:**
  - Store *legume* seeds for 10-15 days
  - Store White and Cream False Indigo and Spiderwort for two to three months
  - Double dormant species, which require two winters in the soil (Roses and woodland wildflowers) will not benefit by moist stratification

## B. Legume inoculation

Members of the legume or bean family benefit from an inoculation with a Rhizobium bacterium prior to planting. This bacterium works with the plant to form nodules, which are capable of “fixing” or taking nitrogen from the atmosphere and incorporating it into the plant. **We include the inoculant packet in the legume seed package.** If you do not need to use your seed immediately, inoculum can be stored in an airtight container in the refrigerator for six months. The inoculum may be mixed before or after moist stratification.

**The Legume Inoculation Process:**

1. Place seed in bowl
2. Add just enough water to moisten the seed (Pour off any excess)
3. Add inoculum and mix thoroughly
4. Mix inoculated seed with the other prairie seed

## V. PLANTING

### A. When to plant

1. **Fall** (Sept. 1-soil freeze-up) Fall plantings are “dormant seedlings” in which the seed over-winters in the soil and germinates the following spring. *In general*, wildflower seeds have increased germination rates during the spring after a fall planting than when planted in the spring. Fall planting takes advantage of cold, moist winter conditions, breaking seed dormancies and promoting earlier germination and faster seedling establishment the following spring. This early seedling establishment is especially critical on sand, which heats up and dries out quickly in spring and on clay, which gets rock-hard when it dries out and restricts root development. Wet clay soils are also difficult to work and plant during moist spring conditions. Fall planting is also

recommended for spring blooming plants such as Shooting Stars, Trilliums, and Jack-in-the-Pulpit.

2. **Spring** (March-June 30) *In general*, warm season grasses (grasses such as Little Bluestem, Big Bluestem, and Indiangrass which do most of their growing during the warm summer months) show higher germination rates when planted in late spring/early summer, compared to fall seedings. Spring planting is also generally recommended for prairie wildflower and grass transplants to avoid "frost heaving" (i.e. when the plant is pushed out of the ground with the freezing and thawing fall conditions). Transplanting in spring also allows substantial time for root establishment before the cold winter months.

## **B. Planting methods**

### **1. Hand broadcasting seed**

- a) Start with a freshly-tilled seed bed free of rocks or dirt clumps greater than two inches in diameter
- b) Mix all seed (including nurse crop if you are using one) with slightly dampened sawdust, peat moss, or vermiculite (approximately one pound seed to four bushel baskets of inert material)
- c) Divide the mixture in half
- d) Hand broadcast one half of the seed evenly over your site
- e) Hand broadcast the second half of the seed over the site walking perpendicular to the direction walked in step four. This ensures an even distribution.
- f) Cover the seed with one eighth to one fourth inch of soil with a rake, drag, or piece of chain link fence
- g) Firm seed in the soil by rolling the site with a cultipacker, roller, truck or tractor tires
- h) Mulch the designated planting area with approximately one inch of weed free straw such as winter wheat or marsh hay. This mulch will help to control erosion on steep slopes and will help to keep sand or clay soils moist for a longer period. If working on a very steep slope, cover the mulched area with a photo-degradable mesh with a one half inch openings to allow for unimpeded wildflower seedling development. Secure the mesh with staples placed at one to two foot intervals.

### **2. Transplanting prairie plants**

- a) Till the proposed planting area down 12-16 inches to create an easy-to-work planting bed which will accommodate the root length of each species. In order to prevent erosion on steep slopes, plant directly into untilled soil.
- b) Plant the transplants approximately one-foot intervals according to your planting plan. Dig a hole large enough to spread out the root structure of each plant and firm the soil around the roots to prevent air pockets. Planting instructions specific to each root type will be included with your order. Keep the unplanted roots or potted plants in the shade and out of the wind to prevent them from drying out.
- c) Mulch around each transplant (not over it) with three to four inches of weed free straw such as winter wheat or marsh hay. This mulch will help to control erosion on steep slopes and will help to keep sand or clay soils moist for a longer period. Mulch will also help to keep out competing weeds.
- d) Place a marker, such as a popsicle stick, with the name of the transplant next to the plant to avoid accidentally pulling out the plant during weeding and to help you identify it in the future.

### **3. Mechanical planting of prairie seed**

On areas greater than one acre, it is more efficient to plant using a broadcast or a no-till seeder. The broadcast planter spreads the seed over the soil whereas the no-till seeders plant the seed in rows by opening slits in the soil. The broadcast seeder we recommend is the "Brillion" double box agricultural model, typically used to seed alfalfa and grass mixtures but equipped with native grass bristle brushes in the larger front box rather than the standard steel wire agitators. No-till seeders commonly used for prairie plantings include the Truax drill, the Tye wildflower and native grass seeder, and the John Deere seeder.

## VI. POST PLANTING MAINTENANCE

Although prairie plantings are relatively maintenance-free, a few management techniques are necessary for prairie plant establishment.

### A. Year one

#### 1. Watering

Watering is essential to establish the root systems of newly planted transplants and will increase the germination rate and seedling survival of first year seedlings. Seeds and transplants should be watered every other morning for 15 to 30 minutes during the first four to six weeks after planting, especially if planted in late spring, or in sand or clay soils. Watering should be continued after six weeks only if prolonged dry periods occur. Be careful not to over water or water at night as fungus could attack seedlings and transplants under cool, damp, conditions. When watering is not possible (i.e. on large seeded areas) expect the germination to occur over two to three years.

#### 2. Weed control

First year weed control is required to reduce the competition between weeds and prairie seedlings and plants for water, light, and space. In areas planted with transplants, pull out or cut back annual weeds before they go to seed. Perennial weeds such as Quack Grass or Canada Thistle may need to be spot-treated with Round-up to prevent them from re-sprouting.

Seeded areas should be mowed approximately three times during the first growing season to a height of four to six inches when the majority of weeds are in flower or when weeds reach a height of 10 to 12 inches. As a general rule of thumb, anything taller than 10 inches or in flower is a weed. Mowing this high will cut off the taller weeds while missing the shorter prairie perennials. Use a string trimmer or weed eater on small areas and an off set flail mower on larger areas. Flail mowers, as opposed to rotary mowers, will chop up the weeds as they are cut instead of laying the cut weeds on top of, and possibly smothering, the prairie seedlings. Mow **before** the weeds set seed to prevent further soil contamination. Do not pull weeds in a first year seeded area as this will disturb the developing seedlings and un-germinated seed. In the fall of the first growing season, maintain the vegetation at eight to 10 inches through the winter to insulate the developing prairie seedlings and to help prevent frost heaving.

### B. Year two

For a second year seeding, mow to the ground in early spring and rake off the cuttings. If **biennial weeds** such as Sweet Clover are a problem, mow again to approximately 12 inches when the majority of weeds are in full flower but before they make seed. For a second year planting, you may need to control weeds as specified in the "first year weed control" section. Watering is not recommended for seedlings or plantings as it will only encourage the roots to develop near the surface of the soil. Deep root development is necessary to keep the plant alive during periods of drought.

### C. Year three and beyond

On both seeded and planted areas, preventing a build-up of dead vegetation known as "thatch" will keep your prairie diverse and healthy by encouraging new growth and promoting

soil warmup in the spring. Depending on the rate of thatch build-up, burn or mow to the ground and rake off the residual vegetation before spring green-up (April), every three to five years. Burning, or mowing and raking should be completed on one fourth to one third of your prairie on a rotational basis to preserve refugia for birds, small mammals, and overwintering butterfly, moth, and other invertebrate pupae and eggs.

## **VII. GROWTH PATTERNS DURING THE FIRST THREE YEARS**

### **A. Prairie seeding**

Although a few species will germinate in early spring, the majority of prairie seeds wait until the soil warms up in mid to late spring and throughout the summer. Some seed may also remain dormant in the soil the first year and come up in the following year. Patience is virtuous during the first year “ugly duckling” stage as you will see more weeds than prairie plants.

Perennial plants devote all of their energy into developing their root systems the first year, therefore they show little above-ground growth. By the time the seedlings emerge from the soil, their roots are already one to three inches long. Growth increases rapidly during the second year and some plants, such as Black-Eyed Susans, may bloom. In the third year, the majority of species should flower.

### **B. Prairie transplants**

Given adequate soil moisture, soil fertility, and weed control, the majority of transplants will bloom the first year they are planted. During the second and third years, each transplant will become more robust and fill into its one square foot area. You may need to cut back species such as Ox-Eye Sunflower or New England Aster if they crowd out other plants in your prairie garden. Cutting them back in early summer will promote a “bushier” growth structure and help to prevent them from towering over your other plants.

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