What is the Great Lakes WATER Institute?

The Great Lakes WATER Institute is a University of Wisconsin System research facility administered by the Graduate School of the University of Wisconsin at Milwaukee. The mission of the WATER Institute is to provide the State of Wisconsin with a focal point for research, education and outreach aimed at a thorough understanding of the Great Lakes and other aquatic and environmental resources of local, state, national and international importance. To achieve its mission, the WATER Institute promotes a broad spectrum of multidisciplinary, interactive aquatic and environmental research. The Institute also promotes education and outreach through the University and in cooperation with other educational institutions. The WATER Institute is home to University of Wisconsin-Milwaukee Center for Great Lakes Studies, a UWM and UW System Center for Excellence, the Aquaculture and Fisheries Research Center and the NIEHS Freshwater Biomedical Sciences Center.

From its dockside site in the port of Milwaukee, the WATER Institute represents the only major aquatic research institution located on Lake Michigan and the largest U.S. institution of its kind in the Great Lakes region. Under the auspices of the institution, the UWM Center for Great Lakes Studies, a UW System "Center of Excellence", conducts multidisciplinary research throughout the lakes utilizing the Institute's research vessel R/V Neeskay. The ship provides year-round access to the lakes and a fully functional research platform and floating laboratory. The Aquaculture and Fisheries Research Center is a leader in developing new methods of producing high quality seafood for the dinner table and new entrepreneurial opportunities for Wisconsin citizens. The Wisconsin Department of Natural Resources Southeast District Lake Michigan Fisheries Management and Enforcement units operate out of the Facility to manage and protect commercial and recreational fish harvest; and the NIEHS Marine and Freshwater Biomedical Core Center is conducting critical research on the toxicological impacts and linkages between contaminants and the health of humans and aquatic organisms.
What is a Green Roof?

A Green Roof is a layer of living vegetation that is installed on the top of a conventional flat or sloping roof.

- **Conserve energy** by moderating temperature on roof and surrounding areas
- **Dramatically reduce** storm runoff volume and peak flow rate
- **Restore** the ecological and aesthetic value of urban open space
- **Protect** conventional roofing systems, typically doubling the service life of the underlying waterproofing membrane.

There is direct and immediate benefits to the environment, both inside and outside the building

A Green Roof reduces temperature extremes inside the building - This chart shows how a Green Roof helps to stabilize the temperature inside the building. The soil and vegetation absorb the worst of the heat during the day, cooling the building underneath. In addition, daytime heat is retained after sunset, keeping the building warm at night.

A Green Roof absorbs stormwater runoff - Control of stormwater runoff is achieved by mimicking the processes that occur in nature, intercepting and delaying rainfall runoff by:

- **Capturing and holding** precipitation in the plant foliage
- **sowater** in the root zone
- **Slowing runoff** as it infiltrates through the layers
Extensive Green Roofs

- Influenced by Kurdish and Scandinavian grass (sod) roofs These green roofs were built because of the environmental benefits they provide.
- **Soil Depth:** (Shallow depth) 0.8 – 6 inches
- **Weight load on structure:** (low weight) 15 – 50 lbs/sf (depending on the soil depth and type of substrate used)
- **Maintenance:** minimal (usually 1-2 times a year)
  1. Irrigate (simple system) a few times a year Weed invasive plants
  2. Safety and roof inspections

*Usually not meant to be publicly accessible except for maintenance purposes.

**Plant selection and diversity:** based on hardiness and climate adaptability. Plants often are chosen because of their shallow root systems. The variety of plants that can be used is limited compared to an intensive green roof.

**Growing medium:** mineral-based mixture includes:

1. gravel sand crushed brick a little bit of soil L.E.C.A. (lightweight expanded clay aggregate)
   Peat
2. Organic matter

**Costs:** low capital costs because the building does not usually require structural reinforcements due to low soil depth.

Intensive Green Roofs

- Traditionally, intensive green roofs have been common in Europe, especially in France and Germany. More permanent and similar to a traditional garden or manicured landscape Intensive green roofs are meant to be accessible or showcased for public use.
- **Soil Depth:** 6 inches or more (typically 8 – 24 inches)
- **Weight load on structure:** (heavy) 80-150 lbs/sf
- **Maintenance:** regular watering and landscaping. This green roof requires a complex irrigation and drainage system
- **Plant selection and diversity:** usually includes shrubs and trees with deeper root systems. Plant choices are unlimited due to increased soil depth. Therefore, more variety of vegetation creates a more complex ecosystem.
- **Growing medium:** primarily soil-based
- **Costs:** Higher capital and maintenance costs due to additional structural reinforcements and landscaping. An experienced green roof installation company, architectural, structural, and horticultural consultants are recommended.
**Allium Cernuum**  (Nodding Wild Onion)

**Sources:**
*http://plants.usda.gov*
*http://www.illinoiswildflowers.info/prairie/plantx/nod_onionx.htm*

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**Description:** This native perennial plant consists of a vase-like rosette of basal leaves. The leaves are about 12" long and up to ¼" across. They are linear in shape, with smooth margins and parallel venation. Unlike many onions from the Old World, the leaves are solid and flat, and there is a small ridge running along their length. They are rather soft and tend to bend outward or downward. From the center of the rosette, a single flowering scape may appear that is about 1½' tall. This scape terminates in an umbel of flowers. This umbel faces toward the ground because the scape bends downward at its apex. The flowers are individually about ¼" long, and may be white, light lavender, or pink. A flower consists of 3 petals and 3 sepals (i.e., tepals) with a similar appearance, and has 6 white stamens with yellow anthers. The pedicels are about ¾" long. At the base of the umbel are two membranous bracts that soon fall off. The blooming season is usually mid-summer and lasts about a month. There is no floral scent. The flowers are replaced by seed capsules containing small black seeds that are light in weight and rather flat. They are distributed to a limited extent by the wind. The root system consists of a bulb that is longer than it is wide. Both the bulb and foliage have a typical onion-like scent. Offsets frequently form, creating small clumps of plants.

**Cultivation:** The preference is full or partial sun, and moist to mesic conditions. The soil can consist of black loam, or contain either rocky or sandy material. This plant resents hot, dry summers. It usually isn't bothered by foliar disease. This plant is easy to grow, and will spread gradually under suitable conditions. It is easier to establish plants by transplants from offsets, rather than by attempting to germinate the seeds.

**Range & Habitat:** Nodding Onion is an uncommon plant. Habitats include moist to mesic black soil prairies, sandy pannes near dunes, and rocky bluffs. Much of the prairie habitat where this plant once occurred has been destroyed by development. It is more likely to be observed in high quality habitats than disturbed areas.

**Faunal Associations:** The flowers are pollinated by small short-tongued bees, such as Halictid bees. Syrphid flies may visit the flowers as well, but they are feeding on the pollen and are non-pollinating. Mammalian herbivores usually don't eat *Allium spp.*, although livestock may consume the foliage along with the grass in pastures, which can provide milk with an off-flavor.

**Comments:** This plant is easy to identify because of the nodding habit of the flowers. Nodding umbels of flowers are an evolutionary adaptation that tends to restrict insect visitors to bees. Other insects are more reluctant to hang upside down while attempting to feed on nectar or pollen. The nodding habit may also protect the nectar from rain. The Nodding Onion is available in the nursery trade, which often features cultivars with rosy pink flowers.
**Campanula Carpatica** (Harebell)

**Description:** This native perennial plant is about $\frac{1}{2} - 1\frac{1}{2}'$ and unbranched, except for some upper side stems near the inflorescence. Often, several stems will emerge from the same rootstock; they remain reasonably erect. The basal leaves have long petioles, and are about 1" across. They are usually cordate or orbicular, and have dentate margins. The basal leaves typically wither away by flowering time. Along the slender central stem are alternate leaves. These leaves are linear and about $\frac{1}{2} - 2$" long. They usually angle upward from the stem, and then curve outward. Usually the foliage and stems are without hairs, although sometimes they are slightly pubescent. The central stem (and some of the side stems) terminates in either a solitary flower, or a short raceme of 2-3 flowers. These flowers are violet and bell-shaped. A typical flower is about $\frac{3}{4}$" long, and tends to hang toward from a slender pedicel. The corolla has 5 short lobes that curve outward. The interior of a flower is white or pale violet near the base, while a long violet style projects slightly beyond the outer rim of the corolla. This style terminates into a tripartite white stigma. The green calyx divides into 5 slender segments that are slightly recurved. The blooming period occurs from early to late summer, and lasts about 2-3 months. There is no noticeable floral scent. The flowers are replaced by ovoid capsules that contain numerous tiny seeds. These seeds are easily dispersed by gusts of wind. The root system consists of a taproot.

**Cultivation:** This little plant prefers full sunlight and moist to dry conditions. It typically grows in shallow rocky soil, but will flourish in ordinary garden soil if taller, more aggressive plants are kept away. Harebell is surprisingly easy to grow, notwithstanding its delicate appearance. It tolerates alkaline soil.

**Range & Habitat:** Harebell is an uncommon plant that occurs primarily in northern Illinois. It is more common in areas to the north and east of Illinois. Habitats include sandy Black Oak savannas, hill prairies, crevices of sandstone, limestone, or dolomite cliffs, and shallow rocky soil along streams. It also occurs along roadsides in neighboring states. Generally, Harebell is found in high quality habitats where there are rocky slopes.

**Faunal Associations:** Small bees often visit the flowers, where they seek nectar. While the slender foliage is potentially edible to mammalian herbivores, it is insubstantial and possesses low food value. The seeds are too small to be of any interest to birds.
Geum Triflorum (Prairie Smoke)

General Culture:
Best grown in dry, well-drained soils in full sun. Tolerates light shade and prefers some afternoon shade in hot summers. Prefers cool summer climates. May be grown in medium moisture, well-drained soils, but often will die out if subjected to wet winter soil conditions.

Noteworthy Characteristics:
Perhaps the most distinguishing feature of this North American native prairie plant is not the reddish pink to purplish, nodding, globular flowers that bloom in late spring, but the fruiting heads which follow. As the flower fades and the seeds begin to form, the styles elongate (to 2" long) to form upright, feathery gray tails which collectively resemble a plume or feather duster, all of which has given rise to a large number of regional descriptive common names for this plant such as torch flower, long-plumed purple avens, prairie smoke, lion's beard and old man's whiskers. The feathery seed tails act as sails in aiding dispersal of the seeds. A soft, hairy plant growing typically to 16" tall with fern-like, innately divided, green leaves (7-19 leaflets). Spreads by rhizomes and can be naturalized to form an interesting ground cover. Native Americans once boiled the roots to produce a root tea that was used medicinally for a variety of purposes such as wound applications and sore throat treatments.

Problems:
No serious insect or disease problems. Root rot can be a problem in poorly drained soils, particularly in winter.

Uses:
Mass on a prairie, meadow, native plant garden or naturalized area. Also can be grown in the border front.

Sources:
* http://plants.usda.gov/java/profile?symbol=GETRT
* http://www.mobot.org/gardeninghelp/plantfinder/Plant.asp?code=H920

Symbol: GETRT
Group: Dicot
Family: Rosaceae
Duration: Perennial
Growth Habit: Forb/herb
U.S. Nativity: Native

Common Name: Purple Avens
Zone: 3 to 7
Plant Type: Herbaceous perennial
Family: Rosaceae
Missouri Native: No
Native Range: North America
Height: 0.5 to 1.5 feet
Spread: 0.5 to 1 foot
Bloom Time: May - July
Bloom Color: Reddish pink to purple
Sun: Full sun
Water: Dry
Maintenance: Low
Description: This native perennial grass forms a tight tuft of culms and leaves about ½–1½' tall. The culms are light green, terete, and glabrous to finely pubescent. The alternate leaves are located mostly along the lower half of each culm. The leaf blades are up to 1/8" across (3 mm.) and 6" long; they are medium green to grayish blue, flat to somewhat involute (rolled inward), and slightly pubescent to hairless. The leaf sheaths are similar in color to the leaf blades and usually pubescent. There are remnants of dried leaves surrounding the base of each tufted plant; these dried leaves are light grey or straw-colored. Each culm terminates in a spike-like panicle of florets about 3-6" long. This panicle is initially light to medium green, but it later becomes light tan to brown. The branches of this panicle are up to 1" long and appressed to ascending; they subdivide into branchlets with terminal spikelets. Each spikelet is 5-6 mm. long and flattened; it consists of a pair of glumes at the bottom and 1 or 2 pairs of lemmas. Each lemma has a palea that encloses a single perfect floret. The glumes and lemmas are ovate-lanceolate, keeled, and hairless. The lemmas and larger glume are 4-5 mm. long, while the smaller glume is 3-4 mm. long. The blooming period occurs during the late spring or early summer (hence the common name of the species). The florets are wind-pollinated. After the grains ripen, disarticulation is above the glumes. The root system is fibrous. June Grass normally occurs in scattered clumps.

Cultivation: In Illinois, this grass is typically found on dry sandy ground where it is sunny. It will tolerate more fertile soil if competition from taller plants is reduced or eliminated. Under the preceding conditions, either level ground or slopes provide acceptable locations. Because of the C3 metabolism of this cool-season grass, most vegetative growth and development occurs during the spring and early summer.

Range & Habitat: June Grass occurs occasionally in sandy areas of Illinois (particularly in the northern and western sections of the state); it is uncommon or absent elsewhere. Habitats include dry sand prairies, hill prairies, sandy savannas, and limestone glades. This conservative species is typically found in higher quality natural areas. Sometimes it is used in prairie restorations.

Faunal Associations: June Grass is one of the food plants of several grass-eating grasshoppers (particularly Koeleria Cristata (June Grass))

Sources:
* http://plants.usda.gov
* http://www.illinoiswildflowers.info/grasses/plants/june_grass.htm

Symbol: KOMA
Group: Monocot
Family: Poaceae
Duration: Perennial
Growth Habit: Graminoid
U.S. Nativity: Native

Koeleria Cristata (June Grass)
those species that prefer dry habitats with sparse vegetation). These species include Arphia pseudonietana (Red-Winged Grasshopper), Eritettix simplex (Velvet-Striped Grasshopper), Orphuella speciosa (Slantfaced Pasture Grasshopper), Phoetaliotes nebrascensis (Large-Headed Grasshopper), and Spharagemon collare (Mottled Sand Grasshopper). Leafhoppers that use June Grass as a food plant include Auridius helvus, Balclutha neglecta, Laevicephalus pravus, and Rosenus cruciatus. The oligophagous weevil Apion perforicolle also feeds on this grass. Among vertebrate animals, the foliage of June Grass is palatable to hoofed mammalian herbivores, including elk, deer, horses, and cattle. However, because this grass is short in stature and rarely forms dense stands, it can provide only a minor component of the diet of these animals.

Comments: If other prairie grasses are too tall for your tastes, this is one grass species to consider. It isn't very aggressive and greens up earlier in the year than Schizachyrium scoparium (Little Bluestem) and other warm-season prairie grasses. June Grass is the only species in its genus that occurs in the Midwest and it is fairly unique. Considering the size of this grass, its inflorescence is rather large and stout. There is some variability across local populations in the color and hairiness of the foliage; the color of the inflorescence can be variable as well. June Grass is more typical of the mixed-grass prairie of the Northern Plains than the tall-grass prairie in Illinois. An older scientific name of this species is Koeleria cristata.
**Penstemon Digitalis** (Beardtongue)

Sources:
* http://plants.usda.gov
* http://www.illinoiswildflowers.info/prairie/plantx/fx_penstemonx.htm

Symbol: PEDI
Group: Dicot
Family: Scrophulariaceae
Duration: Perennial
Growth Habit: Forb/herb
U.S. Nativity: Native

**Description:** Prior to developing an inflorescence, this native perennial plant consists of one or more rosettes of basal leaves that are clustered together. They are medium green, sometimes with reddish tints. They are variable in shape, but tend to be ovate, obovate, or broadly lanceolate, and are up to 6" long and 2½" wide. Their margins are usually smooth. One or more flowering stalks emerge from the clustered rosettes during the spring, which are about 3' tall. They are hairless and light green, while the opposite leaves on these stalks are more lanceolate in shape than the basal leaves. Their edges often have tiny teeth, and the leaf surface is often shiny. The white flowers occur in a panicle at the top of each flowering stem, and bloom during late spring or early summer for about a month. They are tubular in shape and about 1" long, with the corolla divided into a lower lip with 3 lobes and an upper lip with 2 lobes. Sometimes there are fine lines of violet within the corolla, which function as nectar guides to visiting insects. There is no floral scent. The entire plant is hairless, except on the outer surface of the flowers. The flowering stalk eventually turns dark brown, developing numerous oval seed capsules, each containing numerous seeds. These seeds are gray, finely pitted, and irregularly angled. This inflorescence eventually falls over as the seeds have formed, helping to distribute them, but the basal leaves remain. The small seeds can also be carried aloft by the wind for short distances. The root system has short rhizomes, which often produce new plantlets around the base.

**Cultivation:** The preference is full or partial sun, average levels of moisture, and loamy soil. This plant matures quickly during the spring, and the flowering stalks often ascend above neighboring plants. It adapts well to cultivation, is not bothered by disease, and is easy to grow. Under severe drought conditions, however, the leaves may turn yellow and the plant will wilt.

**Range & Habitat:** Foxglove Penstemon occurs occasionally, except in some counties of central and NW Illinois, where it is uncommon or absent. However, in other areas, it may be locally common. Habitats include mesic black soil prairies, openings in upland and floodplain forests, woodland borders, thickets, savannas, acid gravel seeps, pastures, and abandoned fields.

**Faunal Associations:** The tubular flowers of this plant attract long-tongued bees, including honeybees, bumblebees, Anthophorine bees, Miner bees, Mason bees, and large Leaf-Cutting bees. To a lesser extent, Halictid bees, butterflies, Sphinx moths, and hummingbirds may
visit the flowers, but they are not effective pollinators. The caterpillars of the moth *Elaphria chalcedonia* (Chalcedony Midget) feed on the foliage of this and other beardtongues. There have been reports that the caterpillars of the butterfly *Euphydryes phaeton* (Baltimore) feed on the foliage of various beardtongues, but this does not appear to be the case in Illinois. The seeds are not often eaten by birds nor are the foliage, an attractive source of food to mammalian herbivores, although they may browse on it when little else is available.

**Comments:** This is probably the easiest *Penstemon* sp. to grow in areas that lie east of the Mississippi river. The flowers are quite showy, and the plant is large enough to compete against many kinds of weeds. Another desirable feature is that the blooming period is rather long for an early season plant. Foxglove Penstemon can be distinguished from other members of the genus by the absence of hairs on the leaves and stems, a corolla that is primarily white on the outer surface (but sometimes with violet tints), the presence of tiny white hairs on the anthers (resembling small combs), and an absence of ridges on the lower inner surface of the corolla. The small hairs on the anthers can lodge against the hairs of a visiting bee, causing the stamens to bend downward to deposit pollen on the back of the insect, if it is sufficiently large in size.
**Sedum Acre** (Gold moss stonecrop)

### General Culture:

This plant grows as a creeping ground cover, often in dry sandy soil, but also in the cracks of masonry. It grows well in poor soils, sand, rock gardens, and rich dirt; and in a variety of light conditions. It does not thrive in dense shade with limited water.

The leaves are simple, smooth-margined, and succulent. The flowers are yellow, Spring-blooming, in sprays held above the foliage. It spreads when allowed to do so, but is easily removed as it has shallow roots. It is lovely in hanging baskets and container gardens as a trailing accent, as borders, or as groundcover.

### Noteworthy Characteristics:

Its key threats are poorly draining soil or larger groundcovers. Even other small sedums are comparatively large & can displace it over time. If tucked between rocks where nothing can grow too close around or right over it, it'll be much happier; or it can be used as a potted sedum underneath an airy dwarf shrub that won't shade the Gold moss overmuch.

A peculiarity of so many creeping sedums is they are very bad at climbing upward, but will happily spill over stone ledges or down the sides of planter boxes. If planted in just the right location, it can create a marvelous "spilling" appearance.
**Sedum Kamtschaticum** (stonecrop)

**Sources:**
*http://www.greenroofplans.com/Catalogweb/sedum_kamtschaticum.htm
*http://www.mobot.org/gardeninghelp/plantfinder/Plant.asp?code=F550

**Symbol:** SEKA  
**Group:** Dicot  
**Family:** Crassulaceae  
**Duration:** Perennial  
**Growth Habit:** Forb/herb  
**U.S. Nativity:** Introduced

**General Culture:**
Easily grown in average (including somewhat poor), dry to medium moisture, well-drained soils in full sun. Prefers moist soils with good drainage.

**Noteworthy Characteristics:**
This stonecrop is a compact, low-growing, spreading perennial. Features fleshy, succulent-like, triangular, scalloped, pale lime-green leaves (to 1.5" long) which form a loose, open mat of foliage about 4" off the ground. Foliage turns varying shades of red in autumn and can be attractive. Clusters of star-shaped yellow flowers (to 1/2" wide) appear in late spring on arching stems rising above the foliage to 6" tall.

**Problems:** No serious insect or disease problems.

**Uses:** Border fronts, rock gardens, banks and slopes. Can be used as a small scale ground cover, but some consider its habit to be too open for this purpose.

**Notes:**
- **Hardiness Zone:** 4
- **Heat Zone:** 3-8
- **Flower Color:** Yellow
- **Bloom Time:** June-July
- **Foliage Color:** Green
- **Winter Interest:** No
- **Height:** 6”
- **Spread:** 10”
- **Drought Tolerance:** Very High
- **Moisture Tolerance:** Yes
**Sedum Rupestre** (stonecrop)

**General Culture:**

Easily grown in average, dry to medium, well-drained soils in full sun. Tolerates some light shade. Also tolerates drought and heat. Thrives in sandy to gravelly soils of moderate to low fertility. Needs good soil drainage to perform well. Plants will naturalize over time and may spread out of the garden. Site starter plants 8-12” apart for rapid massing as a ground cover.

**Noteworthy Characteristics:**

Sedum rupestre (synonymous with S. reflexum) is a mat-forming stonecrop that is native to mountain areas in central and western Europe. It is an evergreen plant that grows to only 4” tall but spreads to 24” wide. Pointed, cylindrical, gray-green leaves (to 3/4” long) are fleshy. In cold winter climates, leaves may acquire reddish tones in autumn. Star-shaped yellow flowers (1/2” wide) appear in terminal cymes in summer (June – August). Sedums are commonly called stonecrops in reference to the fact that many of the sedum species plants are typically found in the wild growing on rocky or stony ledges. This species is sometimes commonly called rocky stonecrop. Specific epithet means “rock loving” in reference to the mountainous native habit of this plant.

**Problems:** No serious insect or disease problems. Watch for slugs and snails. Scale may occur.

**Uses:** Excellent ground cover. Border fronts or rock gardens. Best massed or in groups. Site in areas where both the foliage and flowers may be appreciated. Will drape over
**Sedum Spurium ‘Bailey’s Gold’**

(stonecrop)

**Sources:**
* http://plants.usda.gov

**Symbol:** SESP2  
**Group:** Dicot  
**Family:** Crassulaceae  
**Duration:** Perennial  
**Growth Habit:** Forb/herb  
**U.S. Nativity:** Non-Native

**Growing and Maintenance Tips:** S. floriferum prefers average to dry, well-drained soil in full sun. Intolerant of wet soils. Propagate by seed and cuttings, although division seems to be the easiest for most. Excellent as a perennial border, rock gardens, or groundcover. Characteristics & Attributes

**Characteristics & Attributes:**

**Attributes**
- Ground cover
- Dry shade
- Rock garden
- Edging
- Drought tolerant

**Critter Resistance**
- Deer Resistant

**Exposure**
- Sun

**Growth Rate**
- Medium

**Nature Attraction**
- Butterflies

**Season of Flowering**
- Late Spring/Early Summer

**Soil Moisture Needs**
- Average
- Good Drainage
- Dry

**Botanical Name:** Sedum floriferum ‘Weihenstephaner Gold’

**Hardiness Zone:** 3

**Heat Zone:** 3-7

**Flower Color:** Yellow

**Bloom Time:** July-August

**Foliage Color:** Green

**Winter Interest:** Yes

**Height:** 4”

**Spread:** 10”

**Drought Tolerance:** Very High

**Moisture Tolerance:** No

**Shade Tolerance:** No

**N. American Native:** No
Sedum spurium var coccineum is a red-flowering sedum often sold under the name 'Dragon's Blood' Sedum, or by its German name 'Schorbuser Blut.'

Suitable to zones 3 through 9, well drained soil is an absolute must. It thrives & spreads in droughty rockery edges. It tolerates a bit of shade but prefers lots of sun if it is to bloom well; it may not bloom at all in partial shade though its succulent leaves will still grow & spread. in the right location it spreads rapidly, & is mostly evergreen through winter.

Bronze-tipped green leaves can turn rusty red in chilly autumns. There are varieties like 'Red Carpet' with bright red leaves, 'Fulda Glow' ('Fuldaglut') with pinker bronze-red leaves, 'Voodoo' with mahagony leaves, 'Tricolor' with white-edged pink-tinged green leaves, & 'Atropurpurea' with purple leaves. 'Dragon's Blood' with regular bronze & green leaves is the most robust for creeping spread & for floriferousness.

There are also other flower colors, 'Bronze Carpet' & 'Tricolor' with pink flowers, 'Album Superbum' with white flowers, & 'Fulda Glow' as well as 'Dragon's Blood' with deep red blooms.

The crunchy leaves are regarded as edible raw. They loose their tart or bitter edge & crispness when stirfried or otherwise cooked. Their natural bitterness when raw is an acquired taste, the flavor being one that deer & rabbits tend not to want to experience. Although some yellow-flowering sedums can cause stomach upsets if eaten in large quanties, the leaves of red-flowering S. spurium are easy on the stomach.

Usually about three to four inches tall, areas of the fast-spreading mats can hump up higher at times, & the flower stems raise three or four inches above the leaves. In a good year the July flowering can be so dense that the leaves are completely hidden.

When the flowers & stems go brown, they will linger quite some while & for tidiness sake may need to be removed. If left, the sedum will self-seed in August or September, though it reproduces more swiftly from leaf segments which easily root.
Description: The alpine selections of Stonecrop are excellent edging or rock garden plants, particularly for hot, dry sites with poor soil. This variety forms a medium-height, non-spreading clump of powdery, mahogany-purple leaves. Dusky-pink starry flowers appear in late summer, clustered at the ends of each stem. Also well-suited to growing in tubs or alpine trough gardens. Deciduous in winter, the stems should be trimmed back in early spring. This selection seems to resent wet feet, so care should be taken to provide a very well-drained site.

Geographic Origin: Garden.
Plant Group: Perennials.
Mature size: Height 8-12 inches (20-30 cm). Width: 12 inches (30 cm).

Flowering period: Late summer to early fall.

Flowering attributes: Round cymes of rose pink, star-shaped flowers.
Leaf attributes: Succulent, purple leaves that begin in spring as blue-green, changing to a purple-burgundy color as the season progresses.
Growth habit: Clump-forming.
Light: Full sun.
Soil: Any well-drained soil.
Feeding: S. 'Vera Jameson' is not a heavy feeder. Give it a complete organic fertilizer in spring and side dress with compost or manure.

Comments: In 1970, Vera Jameson from Gloucestershire, England, discovered this sedum as a chance seedling. A cross between S. telephium maximum 'Atropurpureum' and S. 'Ruby Glow', this beautiful plant adds color to the garden even when not in bloom. New growth shows blue-green leaves that slowly turn deep burgundy purple. In winter, the flower heads add winter interest even though the plant dies down to the ground. This sedum is clump-forming; it is so beautiful you wish it would creep around the garden. All these attributes make it a garden gem I would not be without it in my garden. Mine grows on a rock wall above the pond next to sedges and small rhododendrons. The flowers are suitable for drying. It also makes a wonderful container plant placed at the base of a taller plant, perhaps with something with golden foliage. S. 'Vera Jameson' is a great bee and butterfly plant.
**Phlox Paniculata**  (Garden/Summer Phlox)

**Sources:**
* http://plants.usda.gov
* http://www.illinoiswildflowers.info/savanna/plants/sm_phlox.htm

**Symbol:** PHPA9  
**Group:** Dicot  
**Family:** Polemoniaceae  
**Duration:** Perennial  
**Growth Habit:** Forb/herb  
**U.S. Nativity:** Native

**Description:** This native perennial plant is 2-4' tall and usually unbranched, except near the apex where the flowers occur. The central stem is light green, round, and usually hairless. Sometimes fine purple streaks occur along the stem. The opposite leaves are up to 6" long and 1" across. They are narrowly ovate or ovate-oblong, with smooth margins and conspicuous pinnate and secondary venation. The margins are slightly ciliate, otherwise the leaves are hairless. The lower leaves have short petioles, while some of the upper leaves may be sessile and rounded at the base. The central stem and a few secondary stems near the apex of the plant terminate in rather flat-headed or gently rounded panicles of flowers. These flowering stems (peduncles) are often finely pubescent. The individual flowers are about 1" long and $\frac{1}{2}$–$\frac{3}{4}$" across, and can occur in a variety of colors, including bright rosy pink, lavender, and white. Each flower has a long tubular corolla with 5 spreading petals that are well-rounded and overlap slightly. The tubular calyx is green (sometimes with purplish tints) and much smaller than the corolla. The teeth of this calyx are long and narrow. Sometimes the calyx is pubescent or hairy. The blooming period occurs from mid- to late summer and lasts about 1½ months. The flowers are quite fragrant. The small seed capsules have 3-cells and are oval in shape. Each cell usually contains 2 small seeds. The root system consists of a taproot. Small clumps of plants are often formed.

**Cultivation:** The preference is partial sun, moist conditions, and fertile loamy soil. Light shade is tolerated, but flowers will be produced less abundantly. In full sun, the leaves have a tendency to turn yellowish green and the plants are in greater danger of drying out. Sometimes the leaves are attacked by various kinds of foliar disease, such as powdery mildew. This appears to occur less often among plants growing in the wild than among the cultivated strains that are typically grown in flower gardens.

**Range & Habitat:** While this plant is widely distributed here and there, it is rather uncommon in natural habitats, occurring as isolated clumps of plants. Some populations are undoubtedly derived from cultivated forms of the plant that have escaped. Habitats include openings in moist to mesic woodlands, woodland borders, thickets, and semi-shaded areas along rivers. Because of the attractive flowers, Summer Phlox is quite common in flower gardens.

**Faunal Associations:** The nectar of the flowers attracts butterflies, skippers, and moths, including...
Hummingbird moths and Sphinx moths. Other insects don't have long enough mouthparts to extract the nectar from the base of the corolla. Small flower flies may feed on the pollen, but are not effective pollinators. Some insects suck juices from Phlox spp., including *Lopidea davisi* (Phlox Scarlet Plant Bug) and *Poecilocapsus lineatus* (Four-Lined Plant Bug), while the adults of *Epicauta pensylvanica* (Black Blister Beetle) eat the flowers or foliage. The caterpillars of some moth species feed on the foliage or flowers as well, including *Lacinipolia olivacea* (Olive Arches) and *Heliothis phloxiphagus* (Spotted Straw). Mammalian herbivores occasionally eat the foliage of this and other Phlox spp., including deer, rabbits, and livestock.

**Comments:** Summer Phlox is the largest of the *Phlox spp.* in Illinois. This plant is easy to identify because of its leaves, which have conspicuous secondary veins on their upper surface. In other *Phlox spp.*, only the central vein is prominent. A mature specimen of Summer Phlox will have some leaves that easily exceed ½" in width, while the leaves of other *Phlox spp.* are less than ½" in width. Summer Phlox usually blooms later than other species in this genus, although its blooming period may overlap with *Phlox glaberrima* (Smooth Phlox) to a limited extent. Another common name for *Phlox paniculata* is Garden Phlox.
**Rudbeckia Fulgida** (Black-Eyed Susan)

**Sources:**
*http://plants.usda.gov*
*http://www.illinoiswildflowers.info/prairie/plantx/b_e_susanx.htm*

**Symbol:** RUH12  
**Group:** Dicot  
**Family:** Asteraceae  
**Duration:** Perennial  
**Growth Habit:** Forb/Herb  
**U.S. Nativity:** Native

**Description:** This is a native biennial or short-lived perennial plant that is about 1-2½' tall. It occasionally branches near the base, with each stem producing a single composite flower. The stems have long white hairs. The alternate leaves are grayish green and covered with small stiff hairs, providing them with a rough texture. The leaves are up to 7" long and 2" across, and lanceolate, oblanceolate, or ovate. Their margins are ciliate and rather smooth, with or without a few blunt teeth. The basal leaves have long hairy petioles, while the middle and upper leaves have short petioles or clasp the stem. The upper stems are long and devoid of leaves, each producing a single composite flower. This flower consists of many dark brown disk florets, forming a flattened cone, surrounded by 8-20 ray florets that are bright yellow (rarely with patches of maroon near the base). The style-tips of the disk florets are slender and pointed. Each composite flower is about 2-3" across, and has no noticeable scent. Black-Eyed Susan blooms primarily from early to mid-summer for about a month, although some plants will bloom during the late summer or fall. The achenes are black, oblong, finely nerved, and without tufts of hair. The root system consists of a central taproot and is without rhizomes – this plant reproduces entirely by seed.

**Cultivation:** The preference is full sun, and slightly moist to moderately dry soil conditions. Any reasonably fertile soil will be satisfactory. This plant is fast to mature and easy to grow, although short-lived. Occasionally, there may be outbreaks of powdery mildew on the leaves in moist environments, particularly during the fall.

**Range & Habitat:** In native habitats, it occurs in mesic to dry prairies, mesic to dry upland forests, particularly in open rocky areas, as well as savannas and limestone glades. In developed areas, it can be found in pastures and abandoned fields, areas along railroads and roadsides, on eroded clay slopes, and miscellaneous waste areas. Black-Eyed Susan colonizes disturbed areas readily, and recovers moderately well from fires.

**Faunal Associations:** The composite flowers appeal to a wide range of insects, particularly bees and flies, as well as some wasps, butterflies, and beetles. The bees collect pollen or suck nectar, and include Little...
Carpenter bees, Leaf-Cutting bees, Green Metallic and other Halictine bees, Andrenid bees, and others. Some Andrenid bees, such as *Andrena rudbeckiae* and *Heterosarus rudbeckiae*, prefer visiting the flowers of Black-Eyed Susan and closely related plants. Among the flies that visit the flowers, Syrphid flies, Bee flies, and Tachinid flies are well represented. The caterpillars of *Chlosyne nycteis* (Silvery Checkerspot) feed on the leaves. Many mammalian herbivores are not particularly fond of the coarse leaves – they have low food value, and there have been occasional reports of this plant poisoning cattle and pigs. The seeds are eaten occasionally by goldfinches.

**Comments:** Black-Eyed Susan is an excellent choice for prairie restorations, or the first-year planting of a wildflower garden, as it may bloom during the first year from seed. Sometimes, this plant will reseed itself with such abandon it can become aggressive, but it will lose ground to the longer-lived perennial plants as they mature. Black-Eyed Susan can be distinguished from other *Rudbeckia* spp. by its lanceolate hairy leaves and the long hairs on the stems; most of the leaves occur toward the base of each stem, and never have lobes. The species *Rudbeckia fulgida* (Orange Coneflower) is quite similar in appearance, but usually blooms later, and has style-tips that are shorter and more rounded.
**Description:** This native perennial grass is 2-3' tall and tufted at the base. The culms are tan or reddish brown, hairless, and terete; the base of each culm is erect, rather than decumbent across the ground. Alternate leaves are produced primarily along the lower half of each culm. The leaf blades are up to 10" long and ¼" across, light green or light blue, hairless or slightly pubescent and curling outward. The leaf sheaths are light green or light blue, hairless or slightly pubescent, and finely ribbed. Each Culm terminates in several ascending racemes of spikelets. Each raceme is about 1½–3" long and it has a peduncle (or flowering stalk) of variable length underneath. Several pairs of spikelets occur on opposite sides of the raceme's rachis (central stem); this rachis is covered with long white hairs and it tends to zigzag between the spikelets as they become mature. For each pair, there is a fertile spikelet that is sessile and a sterile spikelet on a slender pedicel. The fertile spikelet is about ¼" (6 mm.) in length (excluding any awns); it consists of a pair of outer glumes and a pair of inner lemmas. The narrow glumes are light green to tan and hairless or slightly hairy. The fertile lemma is tan to reddish brown and it has a slender white awn about 1/3" (10 mm.) at its apex; this awn can be straight to strongly curved. The sterile spikelet is about one-half the length of the fertile spikelet and it also has a slender white awn. The florets have anthers that are brown or reddish brown and plumose stigmas that are pale purple. The blooming period occurs from late summer into the fall. Each fertile spikelet produces a single elongated grain. The root system is fibrous and rhizomatous. Tight bunches of culms and leaves are produced from the short rhizomes. The culms and leaves become various shades of tan, brown, or wine-red during the fall and winter.

**Cultivation:** The preference is full sun and mesic to dry conditions. Different kinds of soil are tolerated, including those that contain clay-loam, gravel, or sand. Less fertile soil is preferred because of the reduced competition from taller vegetation. Because of its C4 metabolism, Little Bluestem develops primarily during the warm weather of summer and early fall, and it has excellent drought resistance.
Range & Habitat: Habitats include hill prairies, gravel prairies, sand prairies, black soil prairies, clay prairies, scrubby barrens, rocky slopes of thinly wooded bluffs, sandy savannas, hilltop glades (limestone, sandstone, or shale), sand dunes, gravelly areas along railroads, and abandoned fields. Little Bluestem is often used in prairie restorations and it is occasionally found in gardens as an ornamental grass. In Illinois, this is one of the dominant grasses of hill prairies.

Faunal Associations: The caterpillars of several skippers feed on the leaves, including *Atrytonopsis hianna* (Dusted Skipper), *Hesperia leonardus* (Leonard's Skipper), *Hesperia metea* (Cobweb Skipper), *Hesperia ottoe* (Ottoe Skipper), *Hesperia sassaucus* (Indian Skipper), *Nastra herminier* (Swarthy Skipper), and *Polites origenes* (Crossline Skipper). A skipper looks like a cross between a small moth and a small butterfly. This insect is common in prairies where Little Bluestem and other grasses occur. Other insects that feed on Little Bluestem and closely related *Andropogon spp.* (Beard Grasses) include spittlebugs and various oligolectic leafhoppers. The Field Sparrow, Tree Sparrow, Slate-Colored Junco, and other small songbirds eat the seeds, particularly during the winter. The foliage of Little Bluestem is quite palatable to bison, cattle, and other hoofed mammalian herbivores.

Comments: Little Bluestem is an attractive prairie grass, particularly during the fall. While the stems of other grasses become matted during the winter, the stems of Little Bluestem remain conspicuously upright. This species is somewhat variable in the appearance of its foliage and the hairiness of its floral racemes. Glaucous forms with blue summer foliage can be found in dry gravelly areas along railroads, while forms with reddish fall foliage are often cultivated. An older scientific name for this species is *Andropogon scoparius*. However, the floral racemes of Little Bluestem occur individually on slender stalks, while the floral racemes of *Andropogon spp.* (Beard Grasses) occur in groups (often in finger-like clusters from the same stalk). This is the only *Schizachyrium sp.* in Illinois, although other species in this genus can be found in southeastern or southwestern areas of the United States. They differ from Little Bluestem in having racemes with longer hairs (at least ½” in length) and culms that are partially decumbent on the ground.
**Solidago Speciosa** (Showy Goldenrod)

**Sources:**
* http://plants.usda.gov
* http://www.illinoiswildflowers.info/prairie/plantx/showy_goldenrodx.htm

**Symbol:** SOSP2  
**Group:** Dicot  
**Family:** Asteraceae  
**Duration:** Perennial  
**Growth Habit:** Forb/herb  
**U.S. Nativity:** Native

**Description:** This native perennial plant is usually unbranched and up to 4' tall. The smooth central stem can be green or reddish. The alternate leaves are up to 6" long and 1½" wide, becoming slightly smaller as they ascend up the stem. They are lanceolate or narrowly ovate, with smooth margins, and largely devoid of hairs. In the upper half of the plant, there are small leaves that develop from the upper axils of the primary leaves; they have a wing-like appearance. The showy inflorescence is up to 1' long, consisting of an erect panicle of small yellow compound flowers. The flowering stems don't flare outward and downward like many other goldenrods, but are held erect or curve upward. Each compound flower is about ¼" across, consisting of 4-10 ray florets surrounding the disk florets. The spacing of the ray florets tends to be irregular, and they may not open at the same time. These flowers occasionally have a mild fragrance. The blooming period occurs during late summer or early fall, and lasts about a month. Later, the achenes develop small tufts of hairs, and are dispersed by the wind. The root system is fibrous and rhizomatous, occasionally forming vegetative offsets. In older mature plants, a woody caudex develops.

**Cultivation:** The preference is full or partial sun, and slightly moist to slight dry conditions. The soil can contain significant amounts of loam, sand, or rocky material. Occasionally, the leaves succumb to powdery mildew and other kinds of foliar disease, particularly after the blooming period is over in the fall. This plant is easy to grow, but can topple over if it is spoiled by excessive moisture or fertilizer.

**Habitat & Range:** Habitats include mesic to slightly dry black soil prairies, sand prairies, openings in rocky upland forests, Black Oak savannas, thickets, woodland borders, and abandoned fields.

**Faunal Associations:** The flowers attract honeybees, bumblebees, ants, beetles, and the occasional moth or butterfly. Among the beetles are visitors such as *Chauliognathus pennsylvanicus* (Goldenrod Soldier Beetle) and *Epicauta pensylvanica* (Black Blister Beetle). These insects seek nectar primarily. The caterpillars of many moths feed on various parts of this goldenrod and others. Other insect feeders include various leafhoppers, lace bugs, plant bugs, and beetles. To a limited extent, the seeds are eaten by the Eastern Goldfinch and the Greater Prairie Chicken. Mammalian herbivores occasionally eat the leaves, stems, and
flowers, including deer, rabbits, groundhogs, and livestock. When this plant is infected by a fungus (Coleosporium sp.) it can cause sickness and death in cattle and horses. Like other goldenrods, it may contain a hemolytic agent that is mildly poisonous to some herbivores.

Comments: As the common and scientific names imply, this plant is very showy while in bloom. Showy Goldenrod can be distinguished from other goldenrods that occur in Illinois prairies by the following characteristics, when they are considered together: 1) the flowering stems of the inflorescence are held erect or curve upward, rather than outward and downward; 2) both the stems and leaves are hairless, or nearly so; 3) there are smaller wing-like leaves in the upper axils of the primary leaves, particularly in the upper half of the central stem.
**Sporobolus Heterolepis** (Prairie Dropseed)

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**General Culture:**

Easily grown in average, dry to medium, well-drained soils in full sun. Tolerates wide range of soils, including heavy clays. Prefers dry, rocky soils. Good drought tolerance. Slow-growing and slow to establish. May be grown from seed but does not freely self-seed in the garden.

**Noteworthy Characteristics:**

Prairie dropseed is a clump-forming, warm season, Missouri native perennial grass which occurs in prairies, glades, open ground and along railroads throughout much of the State. Fine-textured, hair-like, medium green leaves (to 20" long and 1/16" wide) typically form an arching foliage mound to 15" tall and 18" wide. Foliage turns golden with orange hues in fall, fading to light bronze in winter. Open, branching flower panicles appear on slender stems which rise well above the foliage clump in late summer to 30-36" tall. Flowers have pink and brown tints, but are perhaps most noted for their unique fragrance (hints of coriander). Tiny rounded mature seeds drop to the ground from their hulls in autumn giving rise to the descriptive common name.

**Problems:** No serious insect or disease problems.

**Uses:** Ground cover for hot, dry areas. Prairies, meadows, native plant gardens, wild areas or slopes. Also effective in large rock gardens. Accent for foundation plantings or borders.

**Common Name:** Prairie Dropseed  
**Zone:** 3 to 9  
**Plant Type:** Ornamental grass  
**Family:** Poaceae  
**Native Range:** Canada to Texas  
**Height:** 2 to 3 feet  
**Spread:** 2 to 3 feet  
**Bloom Time:** August - October  
**Bloom Color:** Pink and brown-tinted  
**Sun:** Full sun  
**Water:** Dry to medium  
**Maintenance:** Low
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