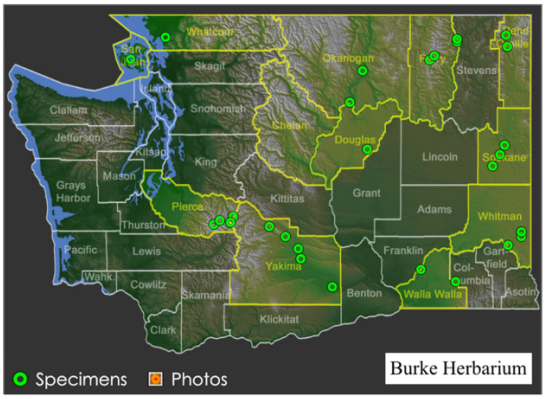
Plant Propagation Protocol for *Elymus canadensis*
ESRM 412 – Native Plant Production
URL: https://courses.washington.edu/esrm412/protocols/2023/ELCA4.pdf



TAXONOMY	
Plant Family	
Scientific Name	Poaceae
Common Name	Grass
Species Scientific Name	
Scientific Name	*Elymus canadensis* L.
Varieties	*Elymus canadensis* L. var. *canadensis*[1] *Elymus canadensis* var. *brachystachys* (Scribn. & C.R. Ball) Farw. Nebraska to Mexico[1] *Elymus canadensis* var. *robustus* (Scribn. & J.G. Sm.) Mack. & Bush. Illinois and Ohio to Oklahoma and Nebraska[1] Varieties due to hybridization[1].
Sub-species	
Cultivar	
Common Synonym(s)	*Elymus philadelphicus* L. [1] *Elymus brachystachys* Scribn. & C.R. Ball [1] *Elymus crescendus* L.C. Wheeler[1] *Elymus robustus* Scribn. & J.G. Sm[1]
Common Name(s)	Nodding wild rye[5] Great plains wild rye[1] Élyme du canada[1]
Species Code (as per USDA Plants database)	ELCA4
GENERAL INFORMATION	

Geographical range	Occurring east of the Cascades crest in Washington state, Alaska to California, east to Quebec, south to North Carolina and Texas[5]. Is widespread in most of temperate North America, extending from the southwestern Northwest Territories to Coahuila, Mexico[1]. Most abundant within the Great Plains, Pacific Northwest, and the Rocky Mountain states[12].
Ecological distribution	Occurs in **prairies** (mid-west, Rocky Mountains), **forested areas** (California), **riparian/ wetlands** (Canada)[12]. **Sandy shores** and **dunes** in the northeast[8]. Streambanks and thickets on sandy, dry to moist soil, and in disturbed areas[5]. Dry to moist or damp, often sandy or gravelly soil on prairies, dunes, stream banks, ditches, roadsides, and disturbed ground, or, especially to the south, in thickets and open woods near streams[1].
Climate and elevation range	USDA hardiness Zone[14] 3a -40 to -35 °F / -40 to -37.2 °C to 8b 15 to 20 °F / -9.4 to -6.7 °C Cool-season grass; actively growing during the spring and fall when soil temperatures are cool and/or in shady areas[8]. Lowland prairies are preferred, but widely scattered bunches infrequently occur in upland prairie[12].
Local habitat and abundance	From Simonin 2000 **Prairie:** In **Kansas,** is a component of **tallgrass prairie** along with big bluestem (*Andropogon gerardii* var. *gerardii*), little bluestem, Indiangrass, (*Sorghastrum nutans*), switchgrass, prairie Junegrass (*Koeleria macrantha*), Kentucky bluegrass (*Poa pratensis*), and smooth brome (*Bromus inermis*). Found in **mixed grass prairie** along with buffalo grass (*Buchloe dactyloides*), blue grama (*Bouteloua gracilis*), western wheatgrass (*Pascopyrum smithii*), big bluestem and rough dropseed (*Sporobolus asper*). Within **Nebraska tallgrass prairies**, occurs in **isolated clumps** commonly associated with switchgrass, prairie dropseed, little bluestem, prairie Junegrass, and western wheatgrass. In true **prairie lowlands** where big bluestem is dominant, is a principal associate along with Indiangrass and switchgrass. Dominant species of the **Lake Huron dune system** along with prairie sandreed (*Calamovilfa longifolia*),

	switchgrass (*Panicum virgatum*), and little bluestem (*Schizachyrium scoparium*). **Forested:** In **California**, is found in the **North Coast Range mixed evergreen and mixed hardwood forests**. In **Wisconsin** occurs in elm (*Ulmus* spp.)-ash (*Fraxinus* spp.)-cottonwood (*Populus* spp.) habitats along with switchgrass, prairie cordgrass (*Spartina pectinata*), Canada bluegrass (*Poa compressa*), pearl millet (*Pennisetum glaucum*), and common cocklebur (*Xanthium strumarium*) [9]. In **southern Illinois** it occurs in post oak (*Quercus stellata*)-Hickory (*Carya* spp.) barrens. Commonly found within **east-central Minnesota oak savannas** with bur oak (*Quercus macrocarpa*), and northern pin *oak (Quercus ellipsoidalis*). It is found in **ponderosa pine** habitats of the southwest. **Riparian:** Occurs in **prairie fens** of the **southeastern Missouri Ozarks**. Is an understory component of **eastern cottonwood** (*Populus deltoides*) riparian habitats of **northeastern Colorado**. Canada wildrye inhabits incised channel banks of **ephemeral streams** within north-**central Wyoming**. In **Montana** Canada wildrye is found in association with eastern cottonwood along the **Missouri River flood plain**. It is a component of green ash (*Fraxinus pennsylvanica*) communities along with young and mature eastern cottonwood communities adjacent to the **Yellowstone River**. Common component of riparian communities in association with red-osier dogwood (*Cornus sericea*), Virginia creeper (*Parthenocissus quinquefolia*), golden currant (*Ribes aureum*), Wood's rose (*Rosa woodsii*), and western snowberry (*Symphoricarpos occidentalis*). Riparian grass associates include smooth brome, and green muhly (*Muhlenbergia racemosa*).
Plant strategy type/ successional stage	Adapted to a wide variety of soils including coarse textured sandy, gravelly, rocky, silty, or clayey soils and areas of relatively low soil fertility especially the soil nutrient phosphorous[12]. Tolerant of heavy metals from abandoned tailings[3,6] and has been found to germinate and/or grow successfully on mine tailings in Wyoming[6] and BC Canada[12], and on a

	mine reclamation in northeastern Minnesota[10]. Researchers found amending revegetation sites with 5cm of topsoil allowed for the greatest persistence of Canada wildrye which achieved 5% cover at 5 years post seeding, outperforming all other grass species used in the seed mixture[11]. It also appears to have moderate salinity tolerance[12]. Shade, cold, drought intolerant, and can be used as a cool-season component in native seed mixtures for range restoration[8]. Because of its shade tolerance, may be best suited for use in shaded areas or riparian zones. Early seral species that increases with disturbance[11]. Establishes easily and is relatively short lived for a perennial bunch grass. Exceptional seedling vigor and rapid establishment provide quick initial cover, making it an excellent species for use in erosion control[8].
Plant characteristics   	Perennial bunchgrass that grows 2.50-5 ft (0.8-1.5m) tall[8], forming small clumps, the hollow culms up to 3.2 ft (1.5 m) tall[5]. Sheaths open, usually glabrous; ligules 0.5-1.5 mm long, up to 7-15 mm wide, fine marginal hairs, blades flat, coarse, usually scabrous[8]. Auricles well-developed, claw-like and clasping, arising from a broad, yellowish or light green collar[1,8]. Flower from March to August with seed maturing in July[8]. The seedhead is a thick and bristly spike which can be either erect or nodding and can reach 10 inches in length[1]. Spikelet are mostly 3-5 flowered[5]. Glumes are about equal to its awns and not bowed out at the base. Lemmas mostly 0.5 inch long with a flexuous awn 0.5 to 2 inches long with a slight outward curve at maturity. Awns of lemmas curved at maturity (straight when young)[8]. Rhizomatous species, rhizomes inclined/vertical, average length 1 inch, diameter 2mm, found in upper 1.5 inch of soil[9]. Roots are noncoarse and fibrous forming a wide fine branching network[12] Typically establishes during the 1st year, reaches peak production the 2nd or 3rd year, and then rapidly thins out[8]. Sprouts in spring and early fall[9].
PROPAGATION DETAILS	

Ecotype	From Lloyd-Reilley 2010 'Manadan' (ND) was released in 1946 by the ARS Northern Great Plains Research Laboratory at Mandan, North Dakota for use in the northern Great Plains states. The variety is superior to common Canada wildrye in several characteristics. The plants are finer, lower in height, and more leafy with the leaves being softer in texture. It is also longer lived than many strains and has the ability to withstand grazing over a period of several years. The Agricultural Research Service (Northern Great Plains Research Laboratory, Mandan, North Dakota) maintains the breeder seed of Mandan Canada wildrye. Foundation seed is grown and available from the Bismarck Plant Materials Center. Canada wildrye was released in 2000 by the USDA-NRCS. Southern ecotype of Canada wildrye: Lavaca Germplasm (Hallettsville, Lavaca County, Texas). The main attributes of Lavaca Germplasm Canada wildrye are its ease of establishment, rapid growth, and high seed and forage yields. Breeder seed is maintained by the E. "Kika" de la Garza Plant Materials Center in conjunction with Texas Foundation Seed Service.
Propagation Goal	Plants
Propagation Method	Seeds
Product Type	Plug + Seeds
Stock Type	
Time to Grow	Sow January until late July[13]. Planting can be scheduled for early spring or early fall[8]. Canada wildrye produces seed once a year in the late spring or early summer. Flowers May-June. Seed is harvested from September to October and persist through winter[13].
Target Specifications	
Propagule Collection Instructions	Riper seed is yellow, no longer greenish[13]. Seed is harvested with a combine[8]. The use of slow travel and RPM speeds while harvesting results in relatively clean seed, needing little cleaning or processing.

Propagule Processing/Propagule Characteristics	Dry seeds one to two weeks in open paper bags or open Rubbermaid-style bins[13]. Seed is not cleaned. Once seeds have dried, store in sealed Ziploc-style bags or Rubbermaid-style containers. Keep in a cool dry place (refrigerator or cold garage) until planted. Cold store up and over 3 years. Debearding of the seed has been accomplished through the use of a Westrup brush machine[8]. To clean stems and chaff from harvests, a clipper seed cleaner has been used following the debearding treatment. Canada wildrye has a very short shelf life[8]. In humidity and temperature controlled facilities the expected viability of the seed is only 2-3 years. Well managed seed fields have produced from 150- 500 bulk pounds per acre of clean seed[8]. Purity of the seed is usually around 95% and germination rates are about 85%. Dry storage of spring germinating seeds resulted in 66% germination[2]. 85-115,000 seeds per pound[8]. A seeding rate of 10 pounds of pure live seed (PLS) per acre is recommended. In planting mixtures reduce the rate according to the percent of Canada wildrye in the mixture.
Pre-Planting Propagule Treatments	Benefits from cold-moist stratification for two weeks[13]. Seeds are placed in cold moist stratification during winter months[8]. Germination occurs the following spring[2]. Debearding the seed or seed coatings (talc based) can also be used to increase the flowability of the seed through standard seed drills[8].
Growing Area Preparation / Annual Practices for Perennial Crops	**Outdoor[8]:** Seedbed preparation should begin well in advance of planting. Establish a clean, weed-free seedbed by either tillage or herbicides. Prior to planting, the site should be firm and have accumulated soil moisture. **Greenhouse[2]:** *Propagation Environment:* Greenhouse made of Standard U.V. 3HL Clear 6 mil from (J.R. Johnson's Greenhouse Supply Inc.). Fans run continuously to circulate the air. Vents open during the summer months to allow for

	cooling. *Container Type:* Grows best in deep cell plug trays; 100 cell (1-1/2" diameter), 18"x12"x6.5" deep. *Growing Media:* Scotts Redi-earth Plug and Seedling Mix. Contains vermiculite, and sphagnum peat moss. Soil is sterile. (Schultz) *Establishing seeds:* Add enough water to the soil to saturate. Mix soil with a trowel. Cover the holes in the bottom/sides of the plug tray cells with newspaper, as the soil will fall through. Fill cells with damp soil and press soil down with a spoon. Refill the cell plugs with soil to the top, this time not pressing it down. Thoroughly moisten soil in the plug cells, but do not saturate. Sow seeds by hand at a rate of about 3 seeds in each cell. Cover the seeds with a thin layer of soil or gently press seeds into the dirt. (Schultz)
Establishment Phase Details	**Outdoor[8]:** Canada wildrye is best seeded using a native-grass drill with picker wheels to ensure a good planting of the seed. Seed should be planted 1/4 to 1/2 inch deep. Broadcast seeding may be used in areas not easily planted with a drill, but some type of additional coverage such as culti-packing or light dragging will be beneficial to ensure good seed to soil contact. Seed increase plots have been planted on 36" bedded rows, however flat plantings may be possible with frequent weeding. (LR) **Greenhouse[2]:** From Jan. until Aug. set the greenhouse thermostat to 65 degrees F both day and night. From Sept. thru Dec. set the greenhouse thermostat to 55 degrees F. Soil is kept consistently damp during germination. Water using a fine mist or light hose setting only. Can move newly planted trays are placed on the south side of the greenhouse. No artificial light is used. (Schultz)
Length of Establishment Phase	
Active Growth Phase	**Greenhouse[2]:** The soil does not need to be consistently moist. Move trays to cooler north greenhouse tables. No fertilizers are used.
Length of Active Growth Phase	
Hardening Phase	In early-late spring, mature plants can be moved into a cold frame with a cover of material that diffuses sunlight to prevent scorching of the plants[2]. When danger of frost has passes leave plants outside. Water less frequently.
Length of Hardening Phase	
Harvesting, Storage and Shipping	These materials are readily available from commercial sources[8].

Length of Storage	
Guidelines for Outplanting / Performance on Typical Sites	Flats of plus are transplanted into the field from late May to early October[13]. Flats that are not planted in the summer remain in the greenhouse for another season. Transplant if needed.
Other Comments	
INFORMATION SOURCES	
References	
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Protocol Author	Maya Kahn-Abrams
Date Protocol Created or Updated	05/28/2023

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