
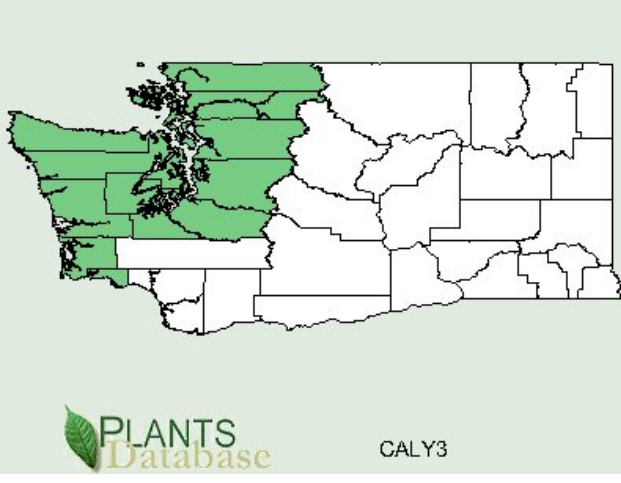


Plant Propagation Protocol for *Carex lyngbyei*
ESRM 412 – Native Plant Production

North American Distribution	Distribution in Washington
	
<p align="center">Source of map images: USDA PLANTS Database¹</p>	

TAXONOMY

Family Names	
Family Scientific Name:	Cyperaceae
Family Common Name:	Sedge family
Scientific Names	
Genus:	<i>Carex</i>
Species:	<i>lyngbyei</i>
Species Authority:	Hornem.
Variety:	
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common Synonym(s) (include full scientific names (e.g., <i>Elymus glaucus</i> Buckley), including variety or subspecies information)	<i>Carex cryptocarpa</i> C.A. Meyer <i>Carex cryptochlaena</i> T. Holm <i>Carex lyngbyei</i> Hornem. var. <i>robusta</i> (L.H. Bailey) Cronquist, <i>Carex salina</i> Wahlenberg var. <i>robusta</i> (L. H. Bailey), <i>Carex lyngbei</i> Hornem. var. <i>cryptocarpa</i> (C. A. Meyer) Hultén
Common Name(s):	Lyngbye's sedge
Species Code (as per USDA Plants database):	CALY3
GENERAL INFORMATION	
Geographical range (distribution maps for North America and Washington state)	Dominant sedge in Pacific coastal salt marshes; range extends along the west coast of North America from Alaska to California and includes Greenland (see distribution maps above); species is also reported to occur in Korea and Japan, however there are often

	significant morphological differences between North American and Asian populations. ²
Ecological distribution (ecosystems it occurs in, etc):	Occurs most commonly along coastlines in estuaries, tidal marshes and tide flats and on gravel/cobble beaches; occurs predominantly in high marsh ³ ; pH requirements are from 5.0 to 6.0 ¹ ; tolerates salinity levels from 0 ppt to 20 ppt ⁴
Climate and elevation range	Maritime climate at a range of elevations ⁵ but most common along coastlines; optimum elevation is between mean lower high water and mean higher high water ⁴
Local habitat and abundance; may include commonly associated species	Obligate wetland species (i.e., high tolerance for anaerobic conditions) of coastal marshes and tidal flats ^{1,2} ; shade intolerant. ¹ Occurs with <i>Eleocharis palustris</i> , <i>Schoenoplectus acutus</i> , <i>Scirpus americanus</i> and <i>Juncus</i> spp. ^{3,5}
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	A pioneer colonizer in tidal mudflats, <i>C. lyngbyei</i> often grows in dense, nearly pure stands; as it becomes established it promotes rapid sediment accretion in marshes
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)	Perennial graminoid; clonal. Stems erect, arising singly or in small clumps from rhizomes. ⁶ Has abruptly pointed flat leaves, brown seeds, yellow-brown perigynia, and large, distinct pendent pedunculate spikes. One foot (ft) to 30 inches (in.) tall at maturity; rooting depth 1 ft maximum. ^{1,4}

PROPAGATION DETAILS

Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):	
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	
Propagation Method (Options: Seed or Vegetative):	Seed and sod (vegetative) ¹
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	
Stock Type:	
Time to Grow (from seeding until plants are ready to be outplanted):	No information found.
Target Specifications (size or characteristics of target plants to be	Young plants reported to be best for transplanting ⁴ ; no other information found.

produced):	
Propagule Collection (how, when, etc):	Seed is produced only in the summer and does not persist ¹ (so collect seed in summer). Harvest plugs from the leading edge of the donor marsh using a shovel. ⁴
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	823,186 seeds per pound ¹
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	<p>Cold stratification is required.¹</p> <p>In experimental trials conducted with seed collected from various sites in British Columbia, seeds were cleaned by rinsing in undiluted bleach for approximately one minute and were then stored dry for two to three days.⁵ Seeds that were pre-treated by soaking in 0 ppt salinity water while stored in the dark at 5°C ± 2°C for 100 days yielded germination rates of approximately 10% to 15%. Seeds collected from the field site with the highest salinity germinated at approximately 35% after being soaked in 20 ppt water under the same temperature and light regime for 100 days. Seeds that were not pre-treated did not germinate. After pre-treatment soaking, seeds were germinated in growth cabinets; cool-white fluorescent light was supplied on a 12-hour photoperiod and 17°C/8°C thermoperiod.⁵ Germination tests were then conducted at varying salinity levels (0, 10 and 20 ppt). Seeds did not germinate at salinities above 10 ppt.</p> <p>In another experiment, <i>C. lyngbyei</i> seeds were germinated at room temperature in peat moss after cold-moist stratification.³ Cool-white fluorescent light was supplied at a 16-hr photoperiod; lights were placed approximately 75 cm above the seeds.</p>
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Fertility requirement is high ¹ ; grows best in fine-grained silt or sand but can also grow in silt/gravel mix ⁴
Establishment Phase (from seeding to germination):	No information found.
Length of Establishment Phase:	No information found.
Active Growth Phase (from germination until plants are no longer actively growing):	No information found.
Length of Active Growth Phase:	No information found.
Hardening Phase (from end of active growth phase to end of growing	No information found.

season; primarily related to the development of cold-hardiness and preparation for winter):	
Length of Hardening Phase:	No information found.
Harvesting, Storage and Shipping (of seedlings):	After 2 weeks (possibly less), seedlings can be transplanted into pots. ³
Length of Storage (of seedlings, between nursery and outplanting):	No information found.
Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter growth, elapsed time before flowering):	Plant at density of 5,120 to 20,000 per acre. ¹ Spring is the best season in which to plant <i>Carex</i> spp. (personal communication from Kern Ewing, April 20, 2011). Outplant during overcast weather conditions to reduce the risk of dessication (May is a good month to plant <i>C. lyngbyei</i>). ⁴ To plant, create a wedge-shaped hole using a shovel and install the transplant. Recommendations are to transplant sprigs containing no more than three stems unless risk of herbivory is high in which case larger plugs may better survive outplanting. High transplant survival was observed at a site in Tacoma, WA when <i>C. lyngbyei</i> culms were planted at a density of 20-in and 30-in centers (using 2 or 3 culms per hole). ⁴ Transplants should not be installed in areas with higher salinity than the donor site.
Other Comments (including collection restrictions or guidelines, if available):	Seedlings must be watered often but <i>C. lyngbyei</i> will not grow in standing water. ⁴
INFORMATION SOURCES	
References (full citations):	See below
Other Sources Consulted (but that contained no pertinent information) (full citations):	See below
Protocol Author (First and last name):	Jenny Buening
Date Protocol Created or Updated (MM/DD/YY):	04/20/2011

Note: This template was modified by J.D. Bakker from that available at:
<http://www.nativeplantnetwork.org/network/SampleBlankForm.asp>

References Cited:

1. USDA, NRCS. 2011. The PLANTS Database (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA. Accessed on April 19 2011.
2. University of Washington Herbarium. 2010. Washington Flora Checklist: Checklist of the Vascular Plants of Washington State (<http://biology.burke.washington.edu/herbarium/waflora/checklist.php>). Burke Museum of Natural History and Culture, Seattle, WA. Accessed on April 20, 2011.

3. Pidwirny, M. 1994. Competitive Interactions and the Spatial Distribution of *Carex Lyngbyei* and *Scirpus americanus* in a Pacific Northwest Brackish Tidal Marsh. PhD thesis, Simon Fraser University, Canada.
4. Stevens, M. and Vanbianchi, R. 1993. *Restoring Wetlands in Washington: A Guidebook for Wetland Restoration Planning and Implementation*. Washington State Department of Ecology Publication #93-17.
5. Hutchinson, I. and Smythe, S. 1986. The Effect of Antecedent and Ambient Salinity Levels on Seed Germination in Populations of *Carex lyngbyei* Hornem. *Northwest Science*. Vol. 60, No. 1: pp. 36 – 41.
6. Pojar, J. and MacKinnon, A., eds. 1994. *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia and Alaska*. British Columbia, Canada: B.C. Ministry of Forests and Lone Pine Publishing.

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Attachment 1. Propagation Protocol for *Carex lyngbyei* from 2003

***Carex lyngbyei*; Lyngbyei's sedge**

Range

Greenland; B.C.; Alaska, California, Oregon, Washington; Europe (Iceland).

Climate, elevation

Regularly flooded and drained coastal sedge areas; Optimum elevation is MLHW to MHHW; May be competitively dominant in the high marsh because its greater biomass and height make it a superior competitor for light.

Local occurrence (where, how common)

Most common shoreline sedge in PNW

Habitat preferences

Coastal salt marshes, brackish marshes; Salinity 0-20 ppt.; Best when planted in fine-grained sand to silt, but does well on cobble and gravel beaches.

Plant strategy type/successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)

Pioneer colonizer of tidal mudflats; dense, nearly pure stands.

Associated species

Eleocharis kamtschatica, *E. palustris*, *Iris setosa*, *Juncus balticus*, *Potentilla pacifica*, *Deschampsia caespitosa*.

May be collected as: (seed, layered, divisions, etc.)

Division (optimal method). Also, seeds and rhizome cuttings.

Collection restrictions or guidelines

Flowers April-July. Do not transplant in soils with higher salinity than that of donor site.

Seed germination (needs dormancy breaking?)

Germination only occurred in low-salinity conditions following after-ripening. Germination time varies with salinity.

Seed life (can be stored, short shelf-life, long shelf-life)

No information found.

Recommended seed storage conditions

No information found.

Propagation recommendations (plant seeds, vegetative parts, cuttings, etc.)

Planting bare rootstock is the most successful means of propagating these plants. Young plants are the best transplanting candidates. Plant on overcast days to minimize desiccation. Can be grown from seed, either planted directly or grown in pots and transplanted. However, neither of these methods is recommended. Rising water levels and heavy rains often wash seeds away. Plants grown from seed in pots tend to remain small and stunted for extended periods of time and are difficult to establish.

Soil or medium requirements (inoculum necessary?)

No requirements, but responds well to fertilizer.

Installation form (form, potential for successful outcomes, cost)

Large plugs may be better able to survive predation from geese than transplanted sprigs.

Recommended planting density

3 stems per hole on 0.5m (20") centers.

Care requirements after installed (water weekly, water once etc.)

Plants are best planted in the fall when the rains begin. This will enable them to spend the dormant season developing a healthy root system to sustain them through the summer dry season.

Normal rate of growth or spread; lifespan

Mature size to 0.75m (30"). Will spread to become monotypic species.

Sources cited

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<http://www.nwplants.com/plants/wetlands/cyperaceae/>

Data compiled by Mike Cooksey; 7 April 2003