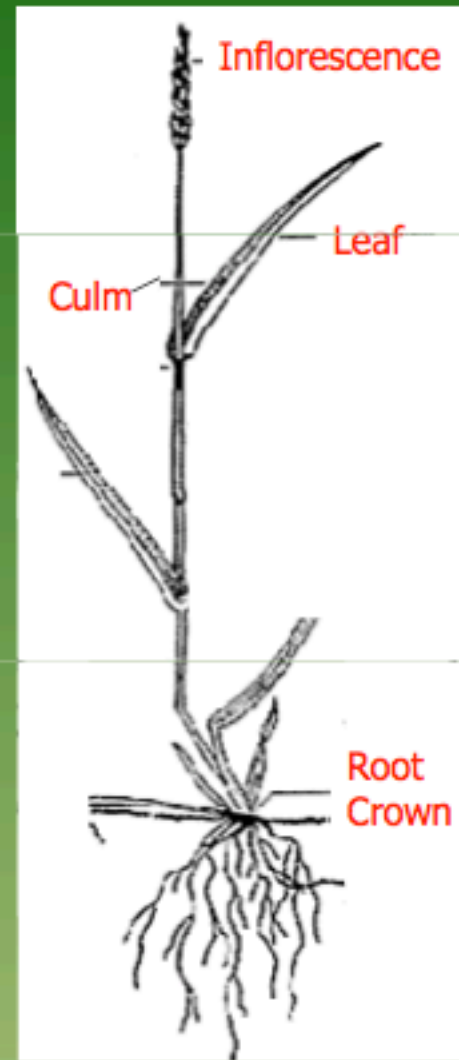


Lab 6: Graminoids

Review of Grasses, + Sedges and
Rushes

Basic grass morphology

- **Inflorescence**
or seedhead
- **Leaf** *or lamina*
- **Culm** *or stem*
- **Root crown and roots**



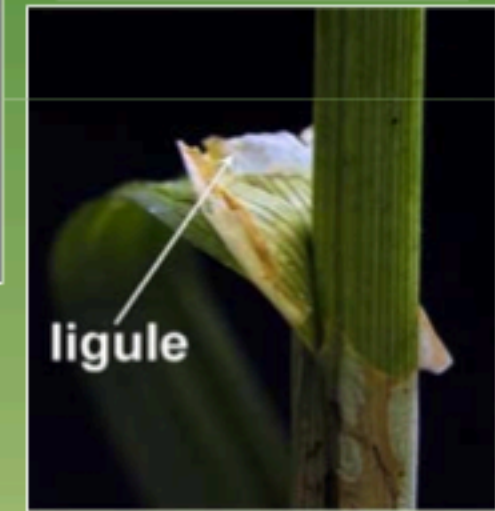
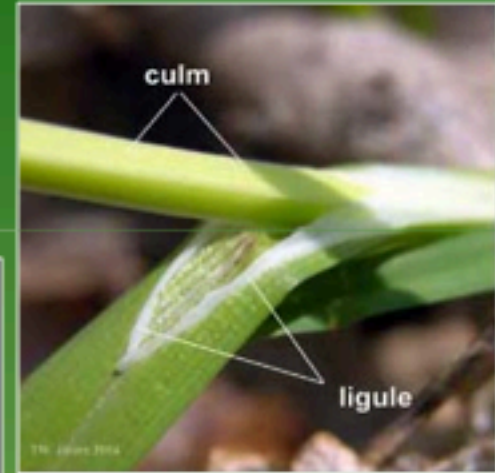
Modified Stems

- **Adventitious stems**
 - either rhizomes or stolons
- **Stolons (runners)**
 - above ground, horizontal stems with nodes, internodes and leaves
- **Rhizomes**
 - underground, horizontal stems; will grow a plant and roots at a node



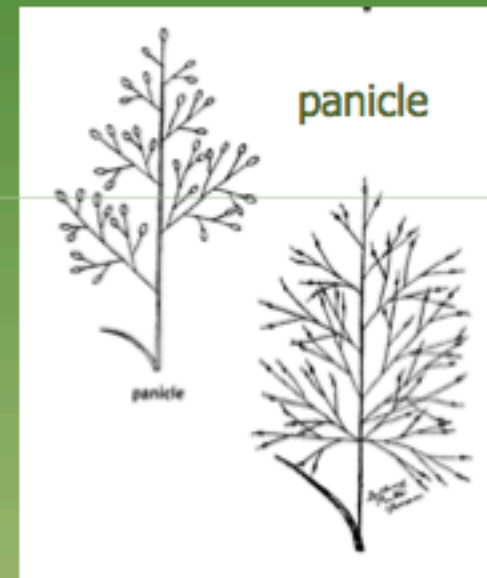
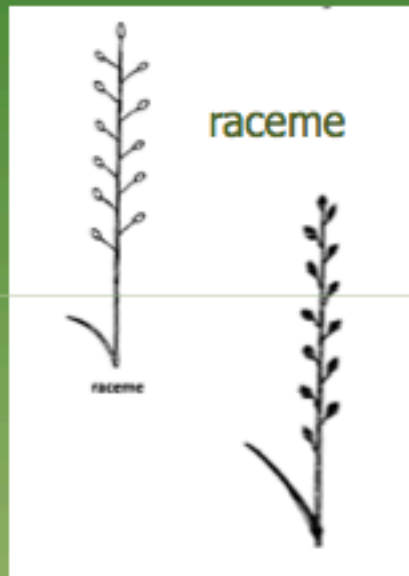
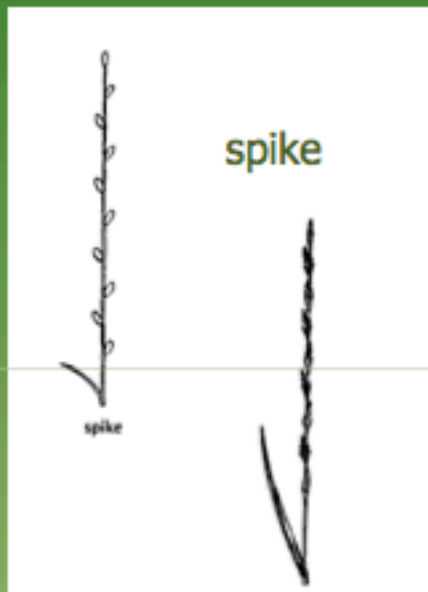
Leaf

Ligules can be:



Inflorescence

- The group of flowers or seeds in a grass.
- Arranged on the stem: spike, raceme or panicle



Inflorescence

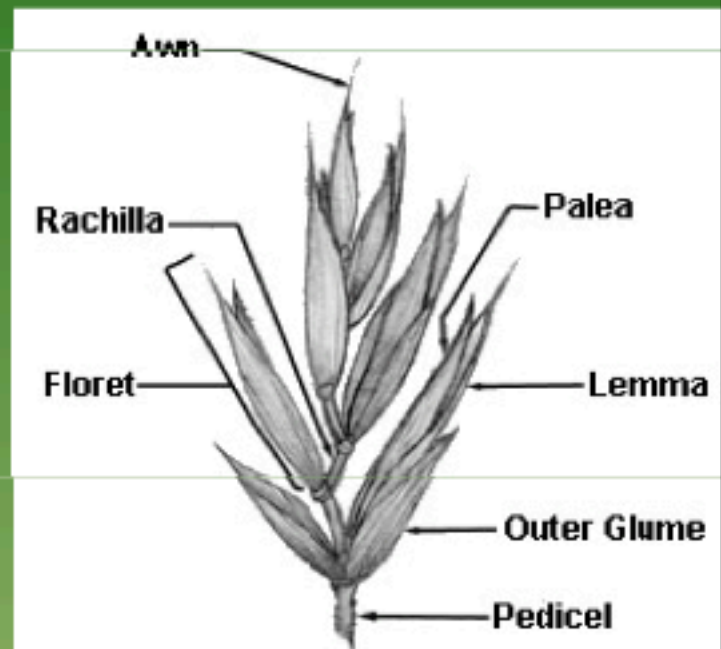
Made up of spikelets which are groups of flowers, called florets

- **Spikelet**

basic unit of inflorescence usually consisting of:

- 2 glumes
- 1 or more florets
 - Made of palea & lemma

- The branch at the base of the spikelet is a pedicel and any branches inside the spikelet are called rachilla



Spikelet

Inflorescence

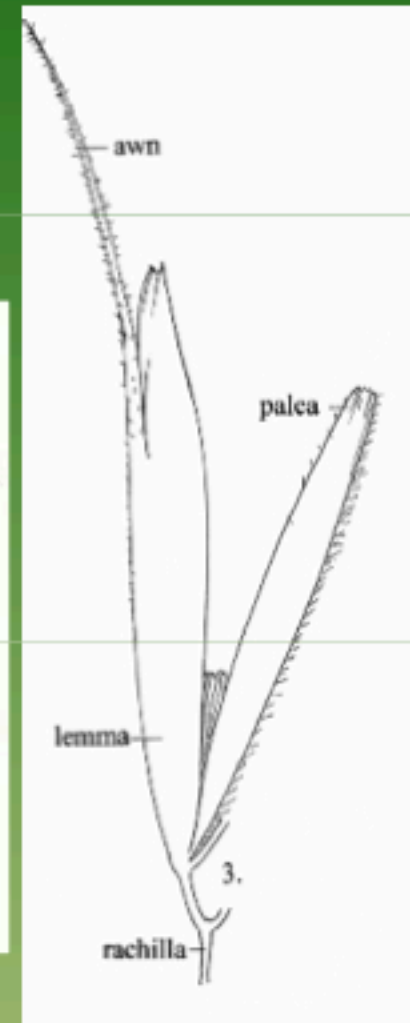
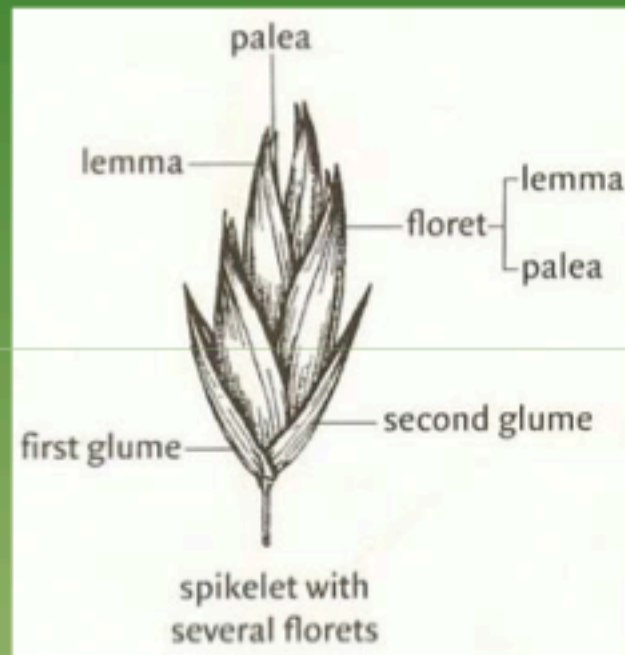
Floret = Palea + Lemma

- **Palea**

- Inside bract of floret (above lemma)

- **Lemma**

- Outer bract of floret (subtends flower & palea)

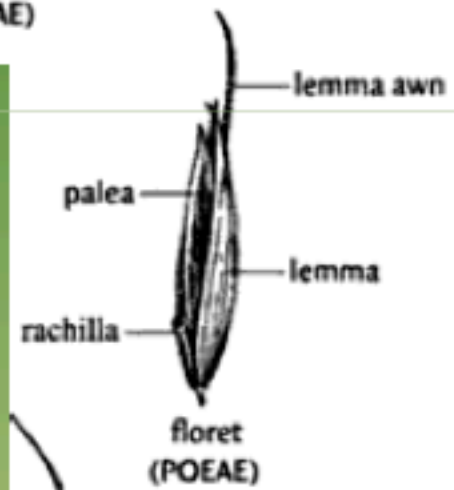
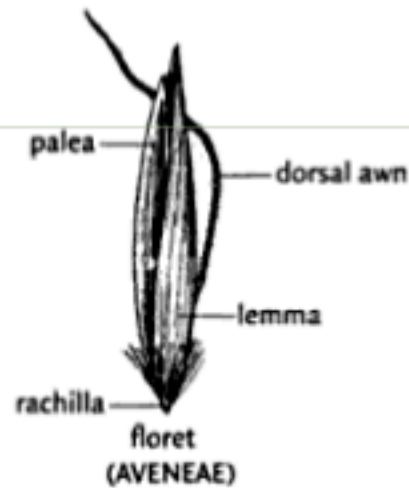
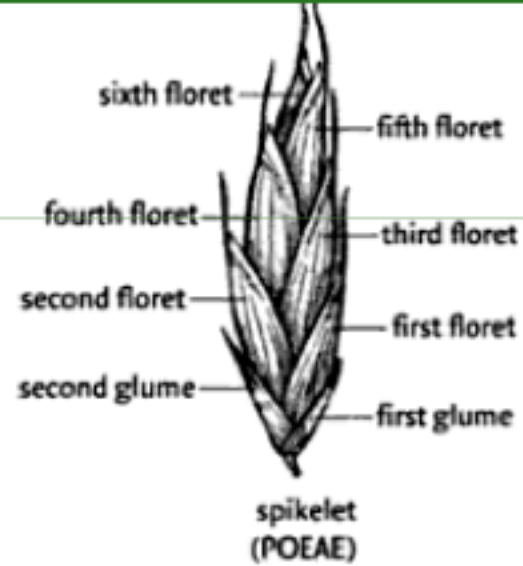
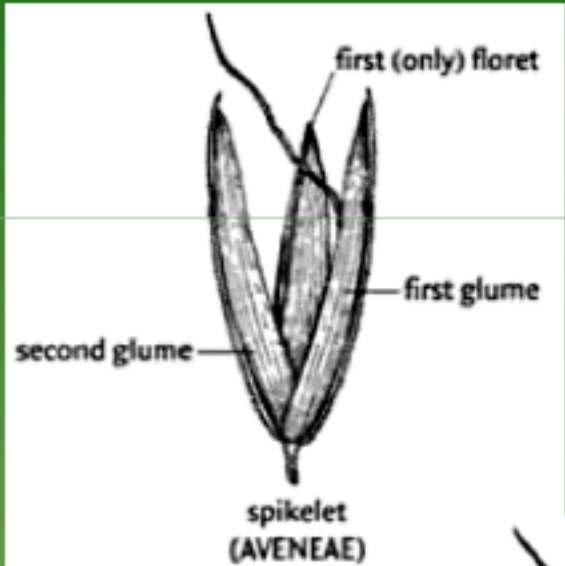


Inflorescence

- **Awn**
 - slender bristle
 - extension of lemma



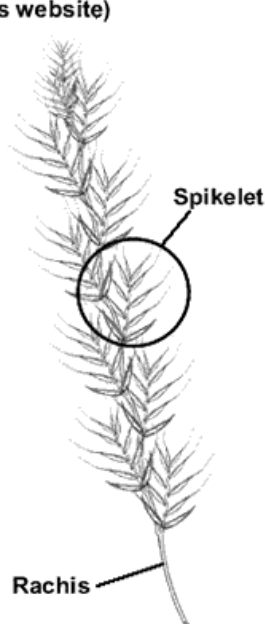
Inflorescence



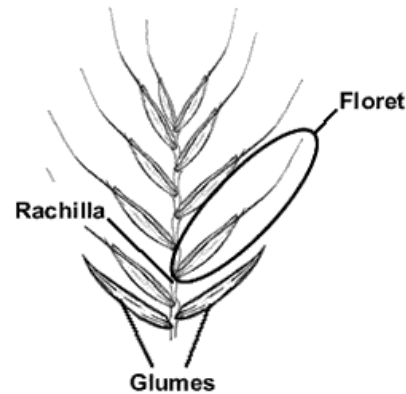
The grass seed (*cariopsis*) (2)

Inflorescence

(For simplification, this is referred to as the seed head in this website)

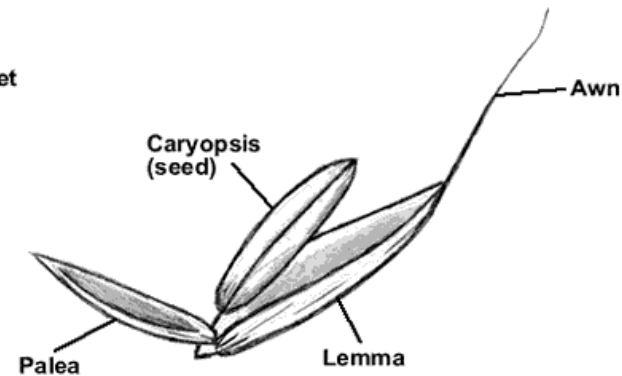


Spikelet



Floret

(For simplification, the floret is sometimes referred to as the seed in this website)



Awn: A narrow, stiff appendage usually extending from the tip of the lemma or glumes. Not present in all grasses.

Caryopsis: The seed of a grass.

Floret: A small flower within a cluster of flowers. In a grass, it is comprised of the lemma, palea, and reproductive parts.

Glumes: Paired bracts at the base of a spikelet.

Lemma: The lower of two bracts subtending the grass floret, often partially surrounding the palea.

Palea: The upper of two bracts subtending the grass floret.

Rachilla: The axis of a grass spikelet to which the florets are attached.

Rachis: The main axis (stem) within the grass inflorescence to which the spikelets are attached.

Spikelet: A small cluster of 1 to many florets, subtended by the glumes.

- Each branch of the inflorescence can have numerous spikelets.
- Each spikelet is subtended by two glumes.
- Each spikelet can contain many florets.
- Each floret has a lemma, a palea, and a caryopsis (seed).

<http://cnrit.tamu.edu/rlem/textbook/Chapter4.htm#index6>
www.lucidcentral.org/.../Grass_morphology.htm

Growth Habits

Caespitose

- growing in a dense clump
- bunchgrass

Rhizomatous

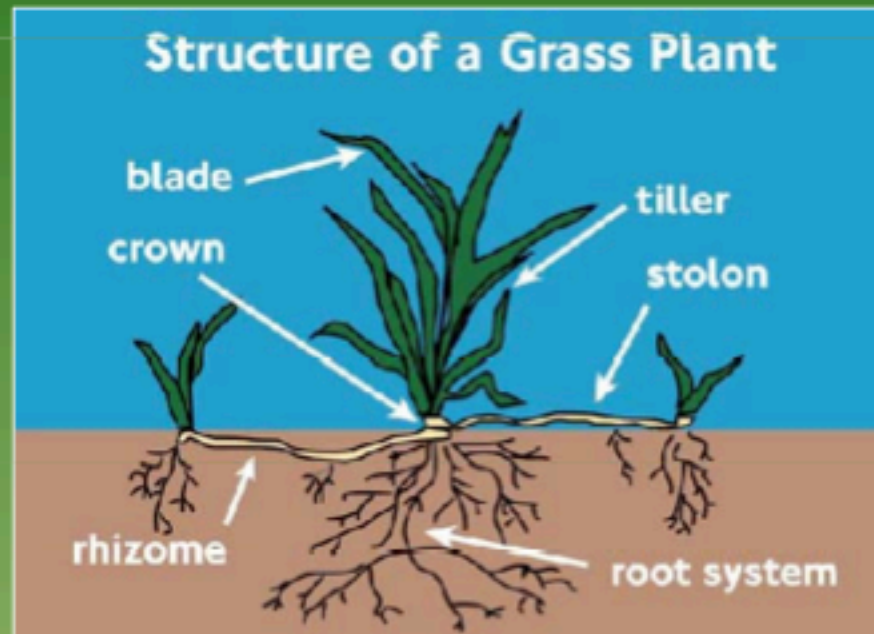
- Spreads by rhizomes
- Sod forming

Stoloniferous

- Spreads by stolons
- sod-forming

- **Crown**

– persistent base of perennials



List of grasses (Poaceae) for lab

- *Alopecurus alpinus*
- *Arctophila fulva*
- *Arctagrostis latifolia*
- *Calamagrostis canadensis*
- *Festuca brachyphylla*
- *Hordeum jubatum*
- *Poa arctica*
- *Trisetum spicatum*



Muscivora affinis?
Muscivora affinis
Muscivora affinis
Muscivora affinis
Muscivora affinis
Muscivora affinis

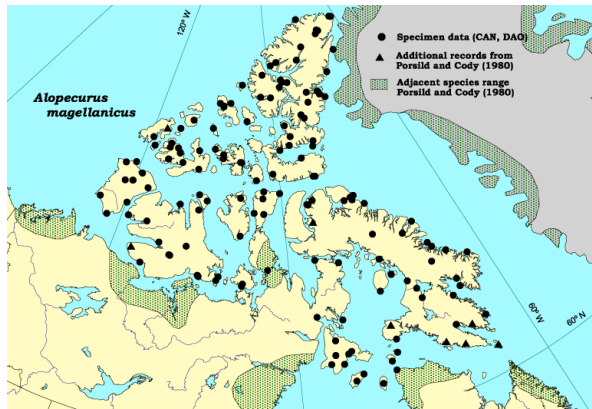
Muscivora affinis?
Muscivora affinis
Muscivora affinis
Muscivora affinis
Muscivora affinis
Muscivora affinis
Muscivora affinis
Muscivora affinis
Muscivora affinis
Muscivora affinis

Muscivora affinis, L.

Alopecurus alpinus

Family: Graminae (Poaceae)

Common Name: Alpine Foxtail



[.mpiz-koeln.mpg.de/.../high/IMG_9467.html](http://mpiz-koeln.mpg.de/.../high/IMG_9467.html)



1177. *Alopecurus alpinus* Sm.
Alpine Foxtail.



- Inflorescence very compact spike (into a “foxtail”)
- Leaf sheaths inflated.
- 1 floret per spikelet.
- No palea.
- Rhizomatous.



www.mun.ca/.../delta/arcticf/poa/www/poalal.htm



Arctagrostis latifolia

Family: Poaceae
Common Name:
Polar Grass



Photograph by Mollie MacCormac

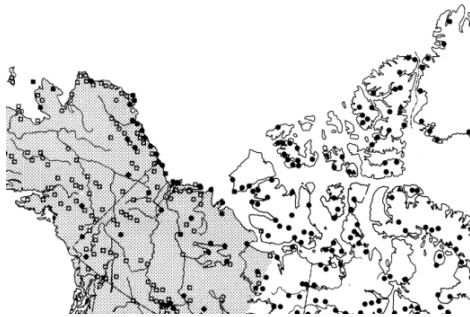


Figure from S.G. Aiken et al 1995

- **Loose inflorescence (panicle) with many branches, and many spikelets per branch.**
- **1 floret per spikelet.**
- **Rhizomatous**



Photograph by K. Clarkin



Arctophila fulva (slide 1 / 2)

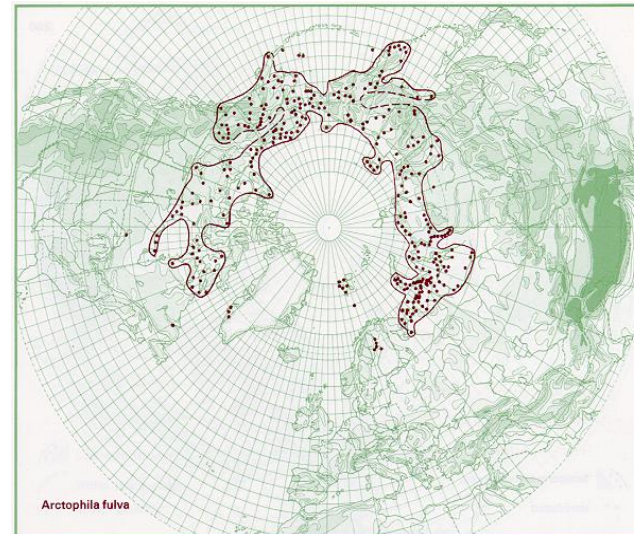
Family: Poaceae

Common Name: Pendant Grass



HABITAT : Photo from Swedish Museum of Natural History

- Aquatic grass, often red color late in summer.
- Upper leaf blades much longer than lower.
- 3-5 florets per spikelet.
- Favorite food and habitat of tundra swans.



RANGE : Figure from Swedish Museum of Natural History's Den virtuella floran database

www.mun.ca/.../delta/arcticf/poa/www/poalal.htm



©2002, Gary Fewless

Calamagrostis Canadensis (slide 1 / 2)

Family: Graminae (Poaceae)

Common Name: Bluejoint



Photo from Seth Price, Univ. of Wisconsin

- **Many branches, and many spikelets per branch.**
- **1 floret per spikelet.**
- **Tuft of hairs at the base of the lemma.**



Photo from Seth Price, Univ. of Wisconsin

Calamagrostis Canadensis (slide 2 / 2)

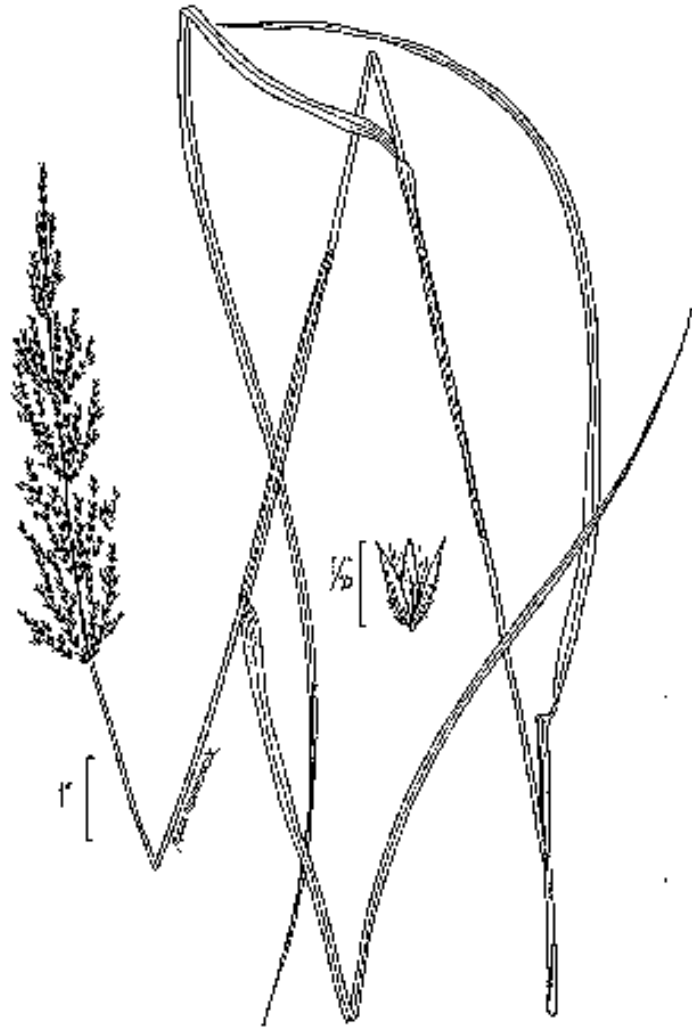


Figure from USGS Northern Prairie Wildlife Research Center website

Photos from USGS Northern Prairie Wildlife Research Center website

Deschampsia caespitosa (*D. brevifolius*) (slide 1 /2)

Family: Poaceae

Common Name: Arctic
Hairgrass



Copyright 1998, by UC Davis



Photo from El Nativo Growers, Inc website

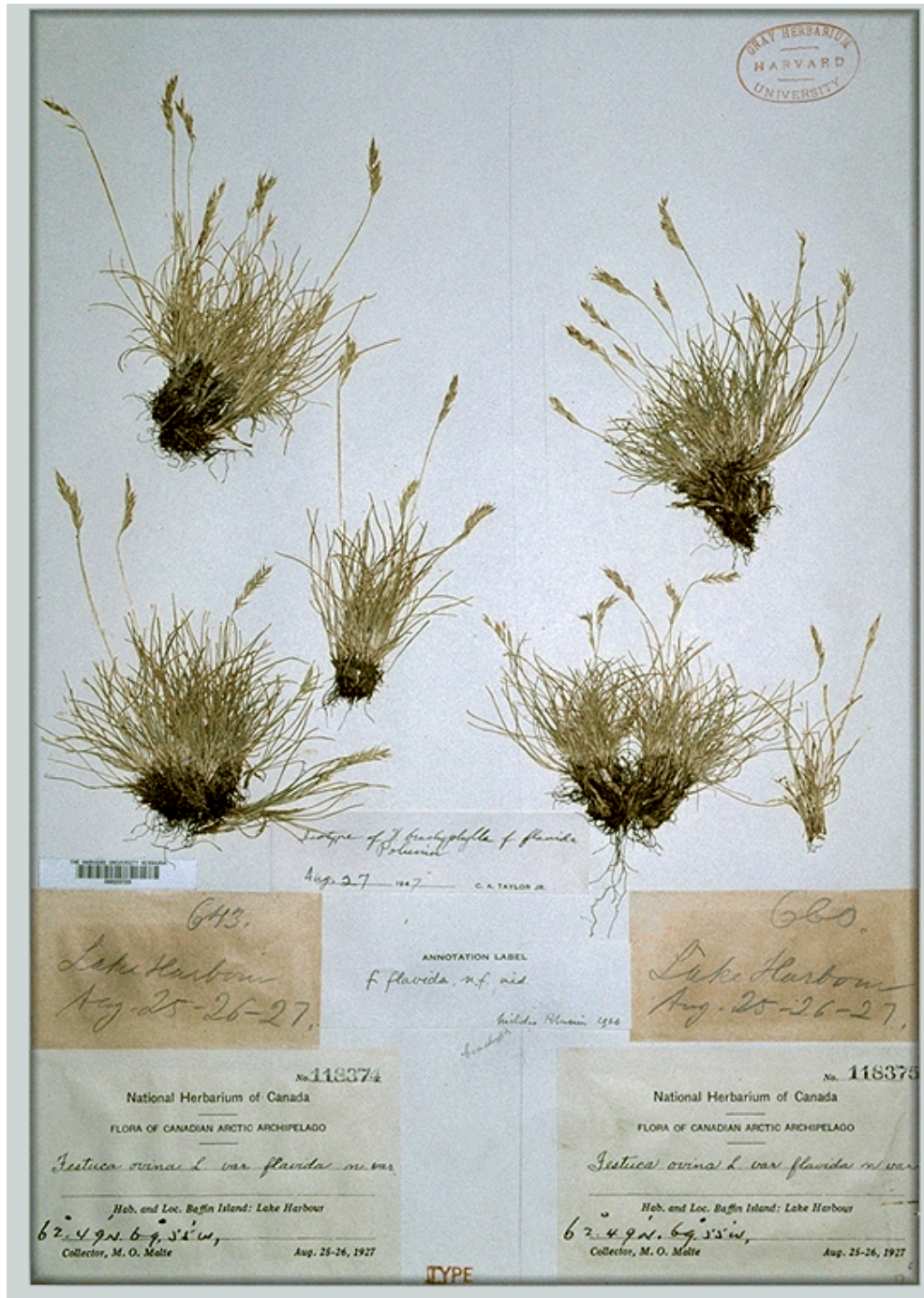
- **Caespitose (bunch-forming).**
- **Disturbed silts and clays, sand dunes, flood plains, wet areas, mostly mineral soils.**
- **Inflorescence spreading with appressed secondary branches.**
- **2-3 florets per spikelet.**



Copyright 1998, by UC Davis



Photo from El Natio Growers, Inc website



<http://botany.natur.cuni.cz/stancik/festuca/types/www-type-ost/Tost-F.brachyphylla.gif>

Festuca brachyphylla

Family: Poaceae

Common Name: ?

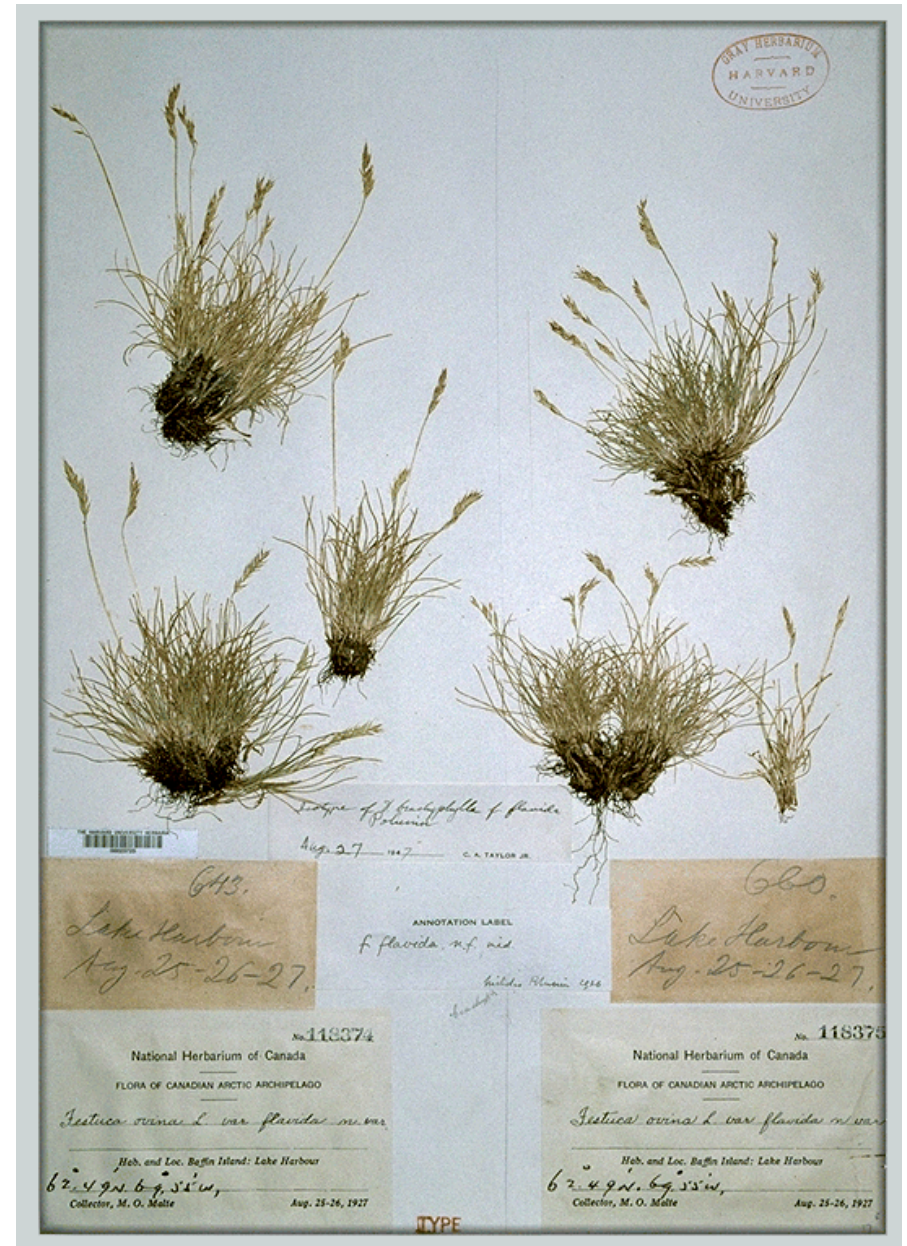


Photo from Poaceae of the Canadian Arctic Archipelago website



Figure from livinglandscapes.bc.ca

- **Short (<15 cm), caespitose,**
- **Narrow 0.3-1 mm leaves**
- **Reddish in nitrogen-rich habitats, often around animal dens, owl perches, dry habitats**
- **Laterally compressed (often one-sided) spike. Branches 1-9 mm long**
- **2-4 florets per spikelet**
- **Festuca is differentiated from Poa by awn at the tip of the lemma, and generally narrower (not canoe-shaped) leaves.**



<http://botany.natur.cuni.cz/stancik/festuca/types/www-type-ost/Tost-F.brachyphylla.gif>



Photo by Clay Baldwin

Photo by Dr Jochen Wegner

Hordeum jubatum (slide 1 / 2)

Family: Poaceae

Common Name: Squirrel-tail Grass, Foxtail Barley



Photo by Dr Jochen Wegner

- **Introduced plant, often along roads, dry meadows, widespread.**
- **Inflorescence spicate (the spikelets forming a triad at each node with the central one fertile and usually sessile, the lateral ones pedicellate, and usually sterile).**
- **1 floret per spikelet.**
- **Very long awn from tip of lemma, 10-60 mm long.**



Photo by Clay Baldwin



Foto: Arne Anderberg



Photo by C. Totterdell

Trisetum spicatum

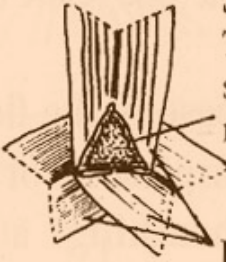





Family: Graminae

Common Name: Spiked Trisetum, Narrow False-oat

- Inflorescence, dense cylindrical or ovoid, often deep purple brown
- Prominent twisted awns arising from above the middle of the back of the lemma
- Culm, strongly pubescent with soft downward pointing hairs
- Nitrophilous habitats, disturbed areas, mineral soils, generally dry habitats.



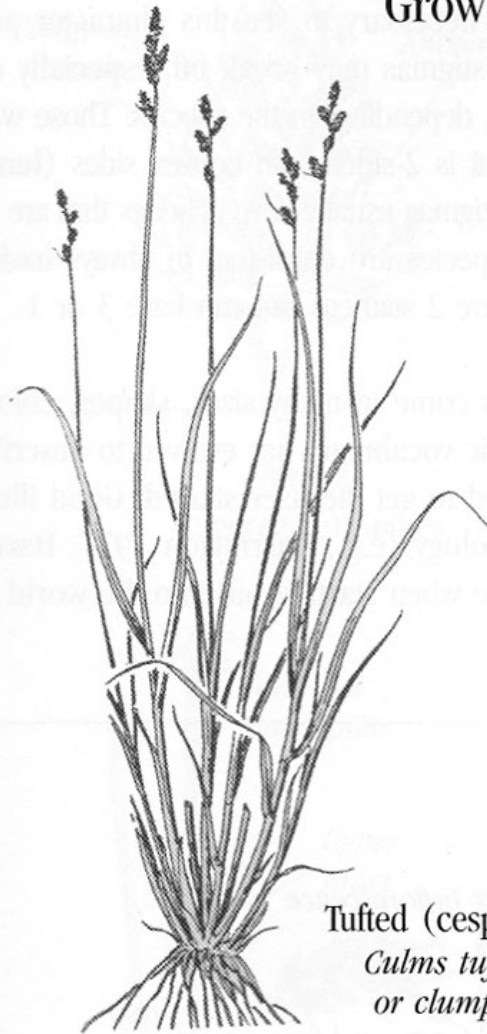
SEDGES

	<i>Sedges</i>	<i>Grasses</i>	<i>Rushes, Woodrushes</i>
<i>Simplified Cross Section of Stem, Leaves</i>	 <p>Stem Triangular solid not jointed</p> <p>Leaves 3-ranked</p>	 <p>Stem round hollow jointed</p> <p>Leaves 2-ranked</p>	 <p>Stem round solid not jointed</p> <p>Leafless or 2- ranked</p>
<i>Flower, Fruit</i>	 <p>Perigynium</p> <p>Achene 1-seeded</p> <p>Scale</p>	 <p>Glumes</p> <p>Lemma</p> <p>Grain 1-seeded</p>	 <p>Capsule 3 to many seeded</p> <p>Bract-like segments</p>

(Adapted from Roberts 1983)

Sedges

Growth Habits

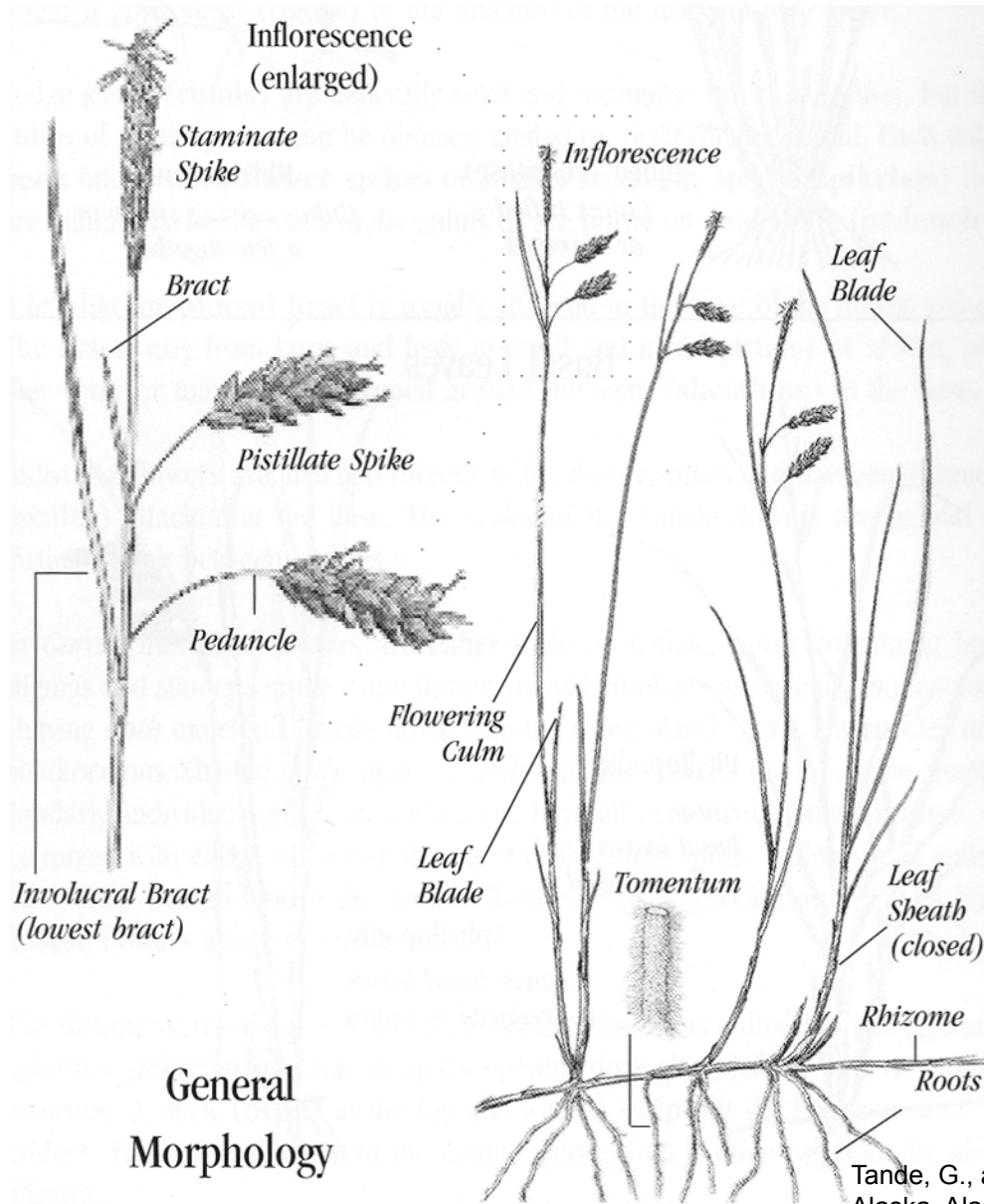


Tufted (cespitose)
*Culms tufted
or clumped*



Rhizomatous
*Culms arising singly or
a few together*

Sedges

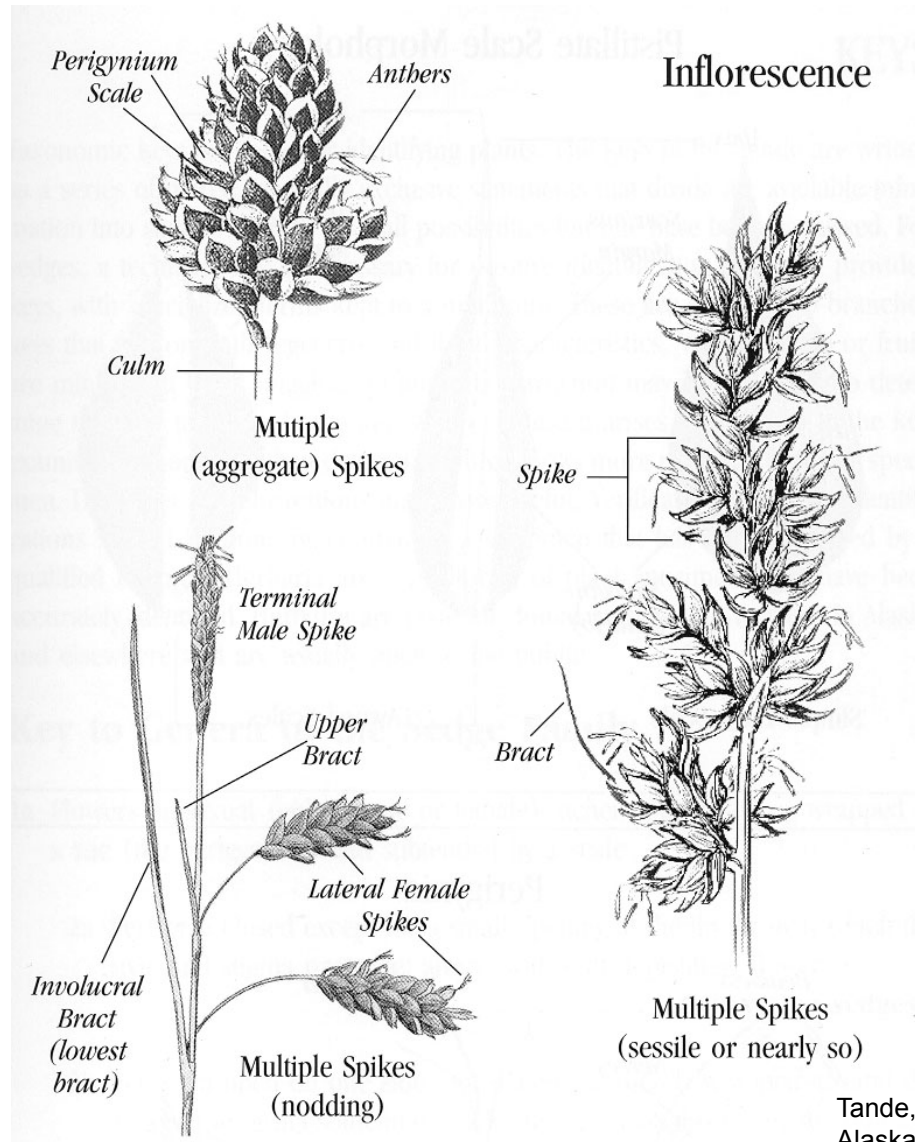


General
Morphology

Tande, G., and Lipkin, R. 2003. Wetland Sedges of Alaska. Alaska Natural Heritage Program, Anchorage

Sedges

Morphology of the Spikes

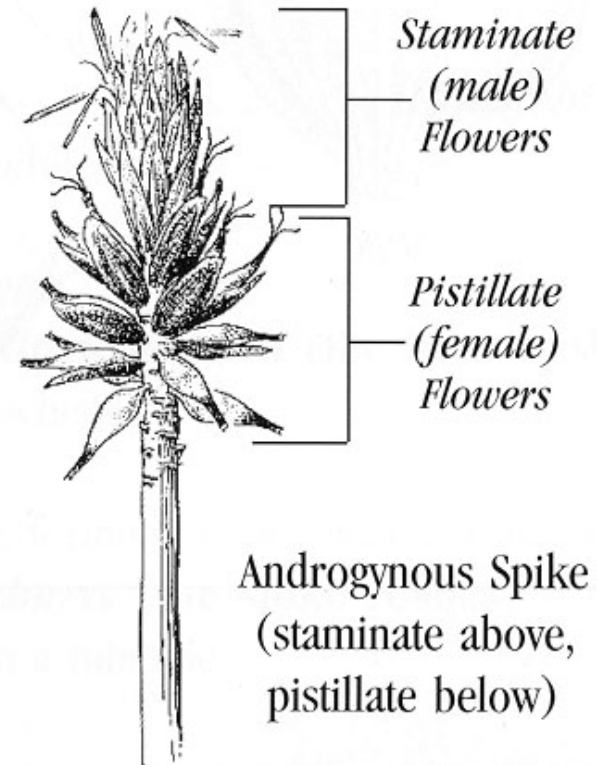
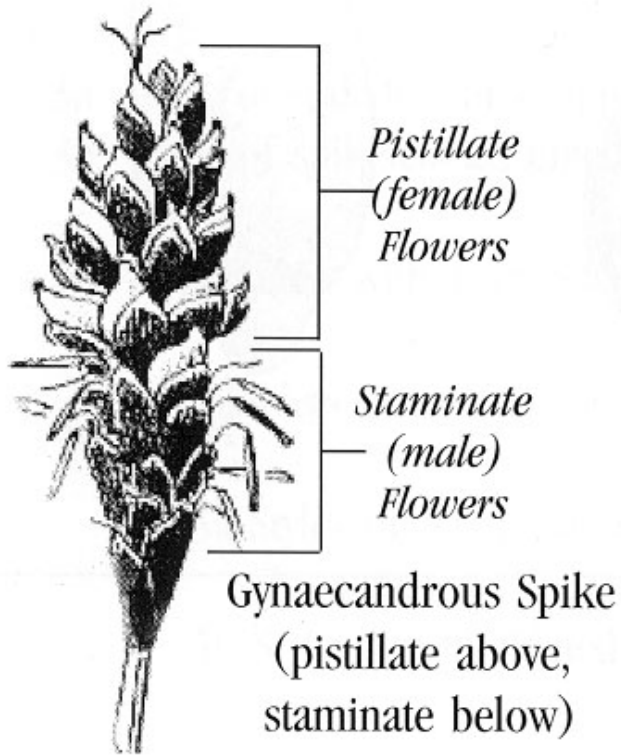


Tande, G., and Lipkin, R. 2003. Wetland Sedges of Alaska. Alaska Natural Heritage Program, Anchorage

Sedges

Morphology of the Spikes

Solitary Bisexual Spikes

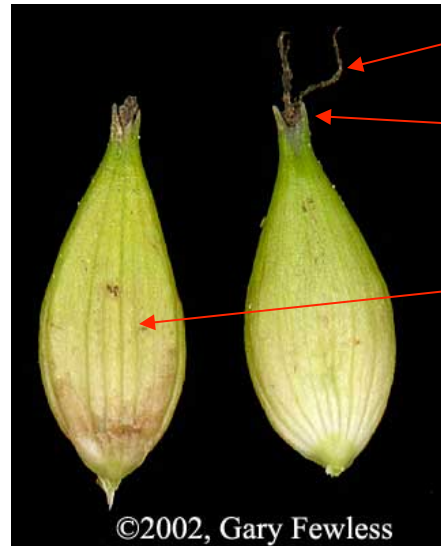


Morphology of *Carex* (Cyperaceae) Pistillate Spike



Perigynium (sac enclosing the female flower, and eventually the achene or seed)

Pistillate bract or scale



Stigmas

Bidentate beak

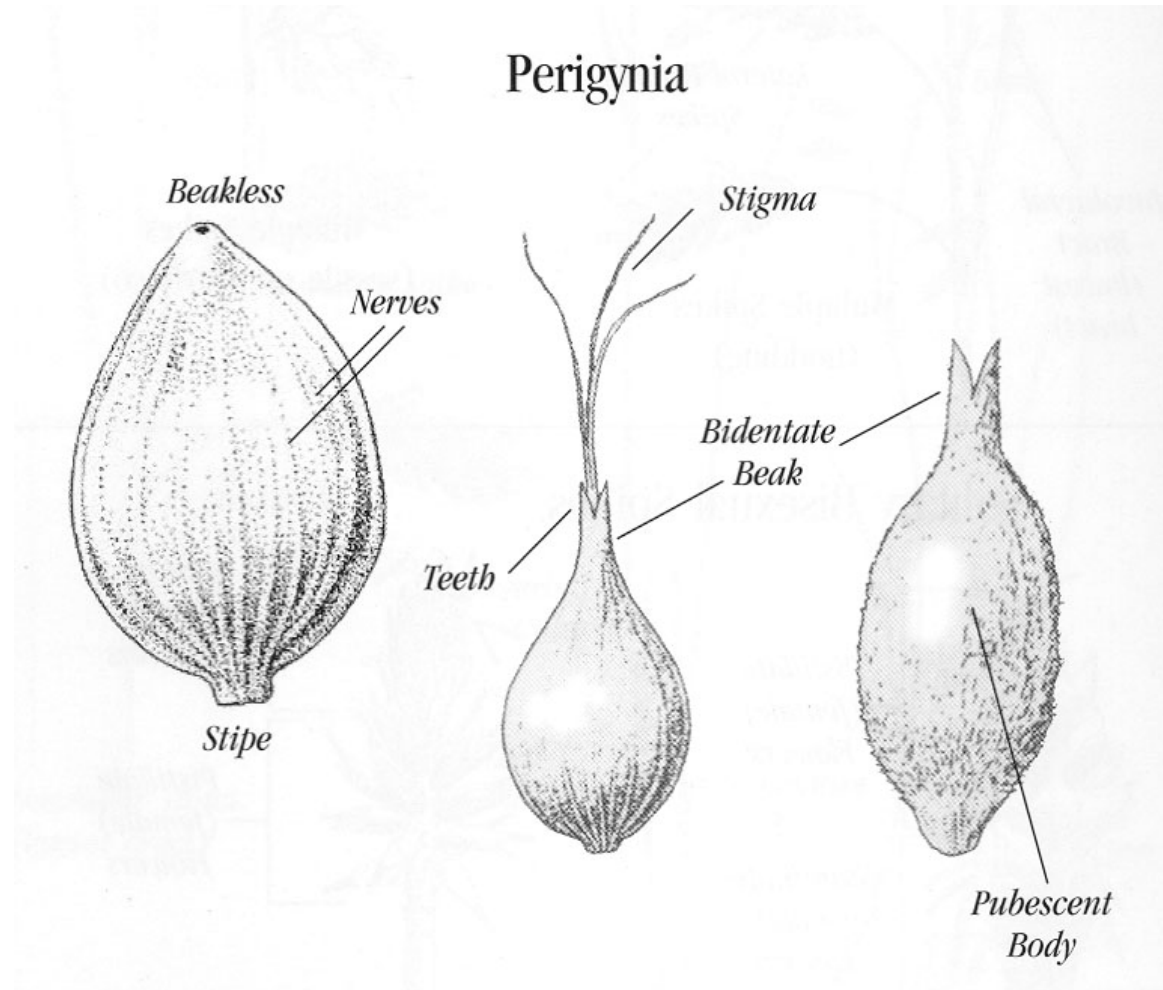
Nerves on perigynium

©2002, Gary Fewless

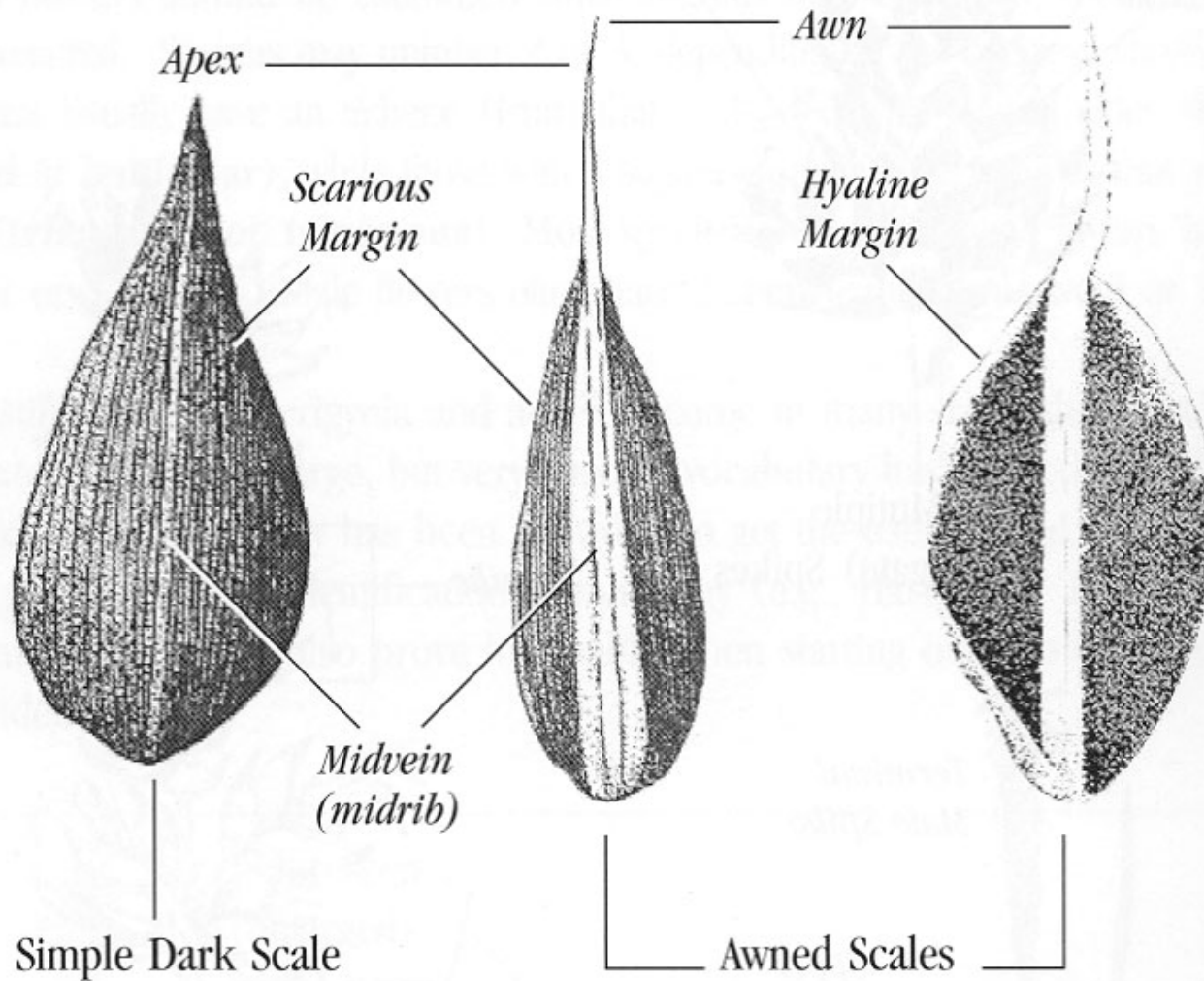
Perigynia

Sedges

Morphology of the Perigynium



Pistillate Scale Morphology



List of sedges (Cyperaceae) for lab

- *Carex aquatilis*
- *C. atrofusca*
- *C. bigelowii*
- *C. chordorrhiza*
- *C. saxatilis*
- *Eriophorum angustifolium*
- *E. scheuchzeri*
- *E. vaginatum*
- *Kobresia myosuroides*

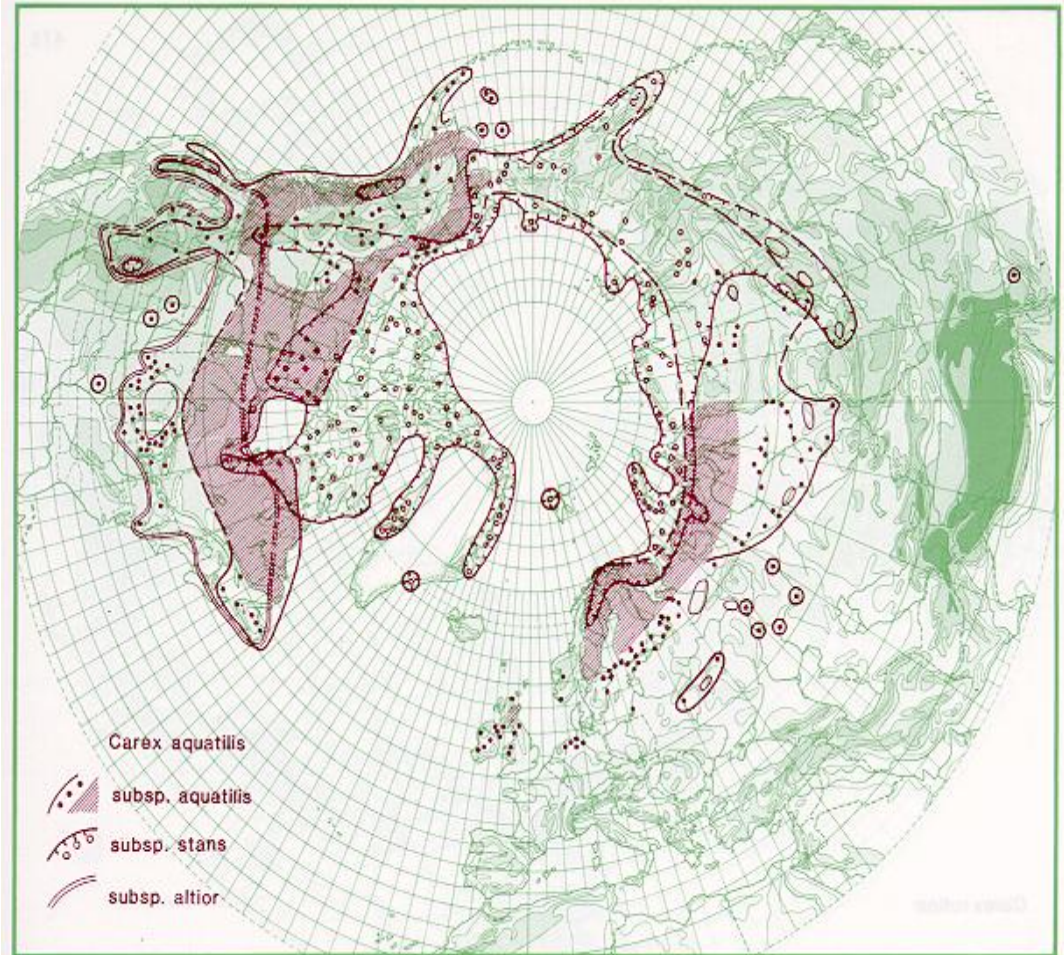
Carex aquatilis (slide 1 / 2)

Family: Cyperaceae

Common Name: Water or Aquatic Sedge



Photo from Alaska Geobotany Center, UAF



RANGE : Figure from Den virtuella floran website

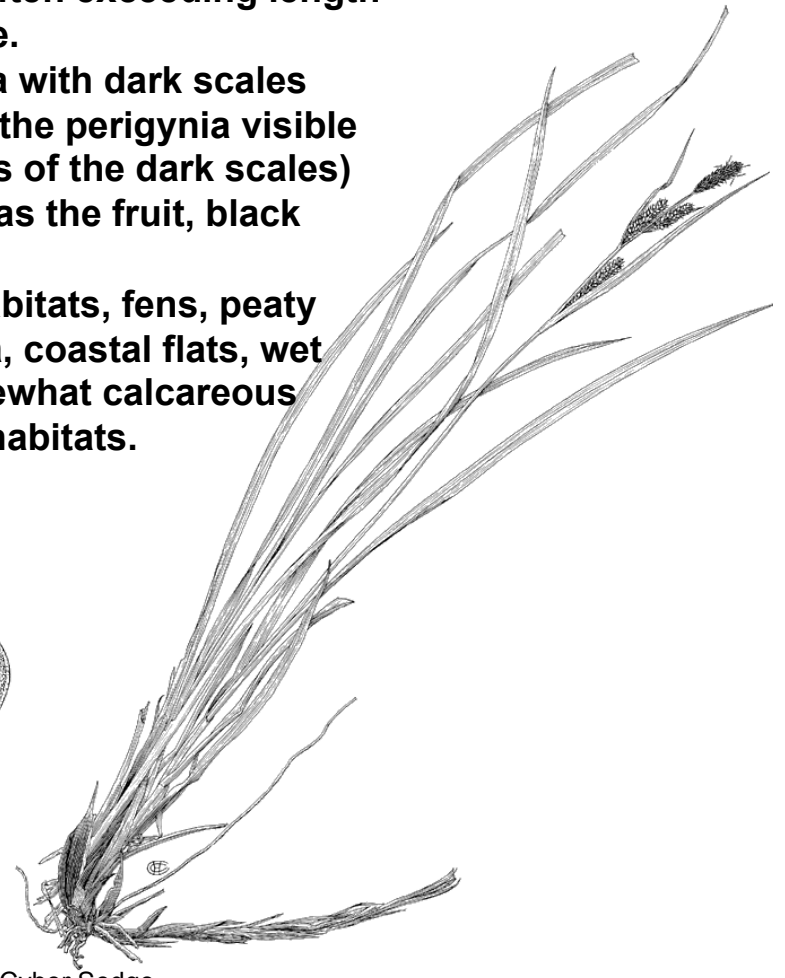
Carex aquatilis (slide 2 / 2)



- Rhizomatous
- Conspicuous leaf-like bract at base of inflorescence often exceeding length of inflorescence.
- Green perigynia with dark scales (green sides of the perigynia visible around the edges of the dark scales)
- Scales as long as the fruit, black (purplish).
- Wet to moist habitats, fens, peaty habitats, tundra, coastal flats, wet polygons, somewhat calcareous minerotrophic habitats.



a

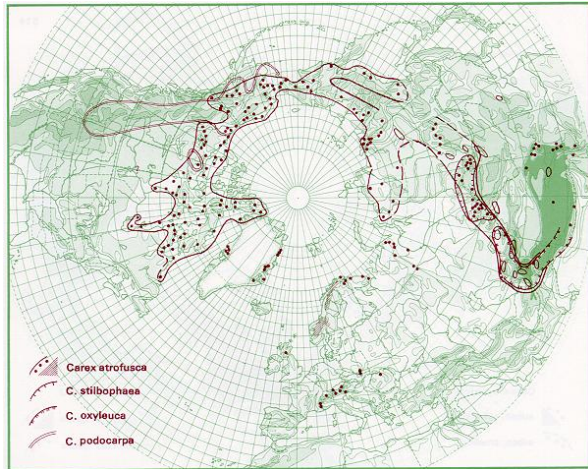


Figures from TAMU Cyber Sedge

Carex atrofusca (slide 1 / 2)

Family: Cyperaceae

Common Name: Dark-brown Sedge



Carex atrofusca (slide 2 / 2)



- 2-4 spikes
- Lateral spikes on pedicels
- Terminal spike staminate, lateral spikes pistillate
- Perigynia with a long bidentate beak, flattened, dull
- Scales as long as the perigynia, black



Figures from TAMU Cyber Sedge

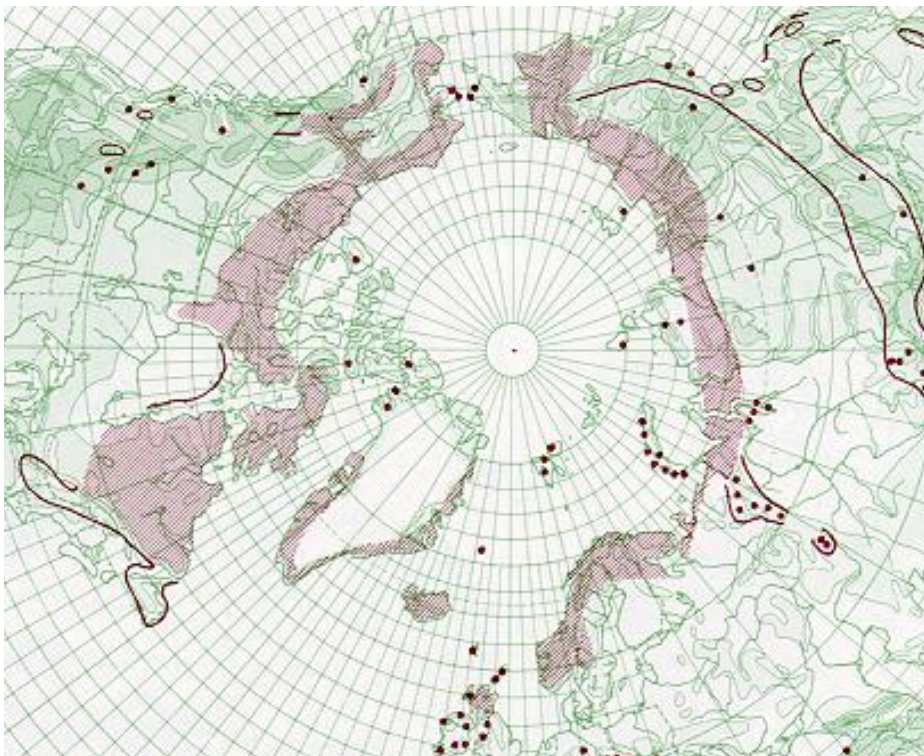
Perigyna



Carex bigelowii (slide 1 / 3)

Family: Cyperaceae

Common Name:
Rigid, Stiff or
Bigelow's Sedge



RANGE : Figure from Den virtuellan floran website



Photo from www.sci.muni.cz

Carex bigelowii (slide 2 / 3)



- Rhizomatous
- Culms triangular, scabrous
- Leaf or reduced bract at base of inflorescence, two lack auricles at the base of the bract
- Terminal spike staminate, lateral spikes mostly pistillate
- Perigynia green sometimes with purple spots at apex
- Scales shorter than the perigynia, with light brown or green midvein

Carex bigelowii (slide 3 / 3)

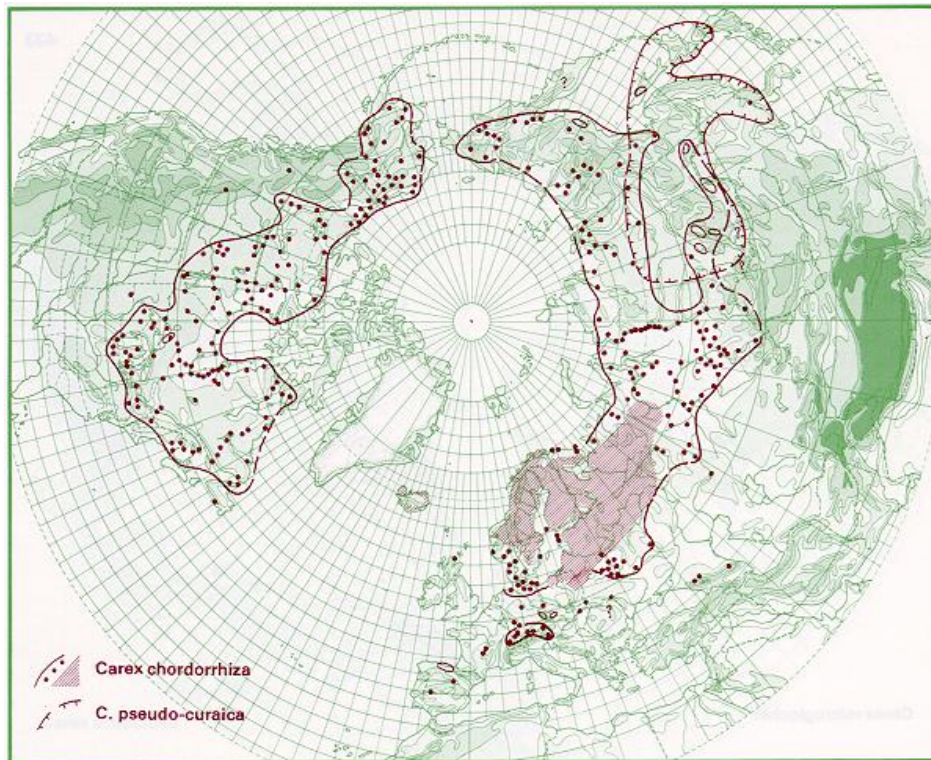


Photo from Provincial Museum of Newfoundland and Labrador website

Carex chordorrhiza (slide 1 / 2)

Family: Cyperaceae

Common Name:
Creeping Sedge or
Cordroot Sedge



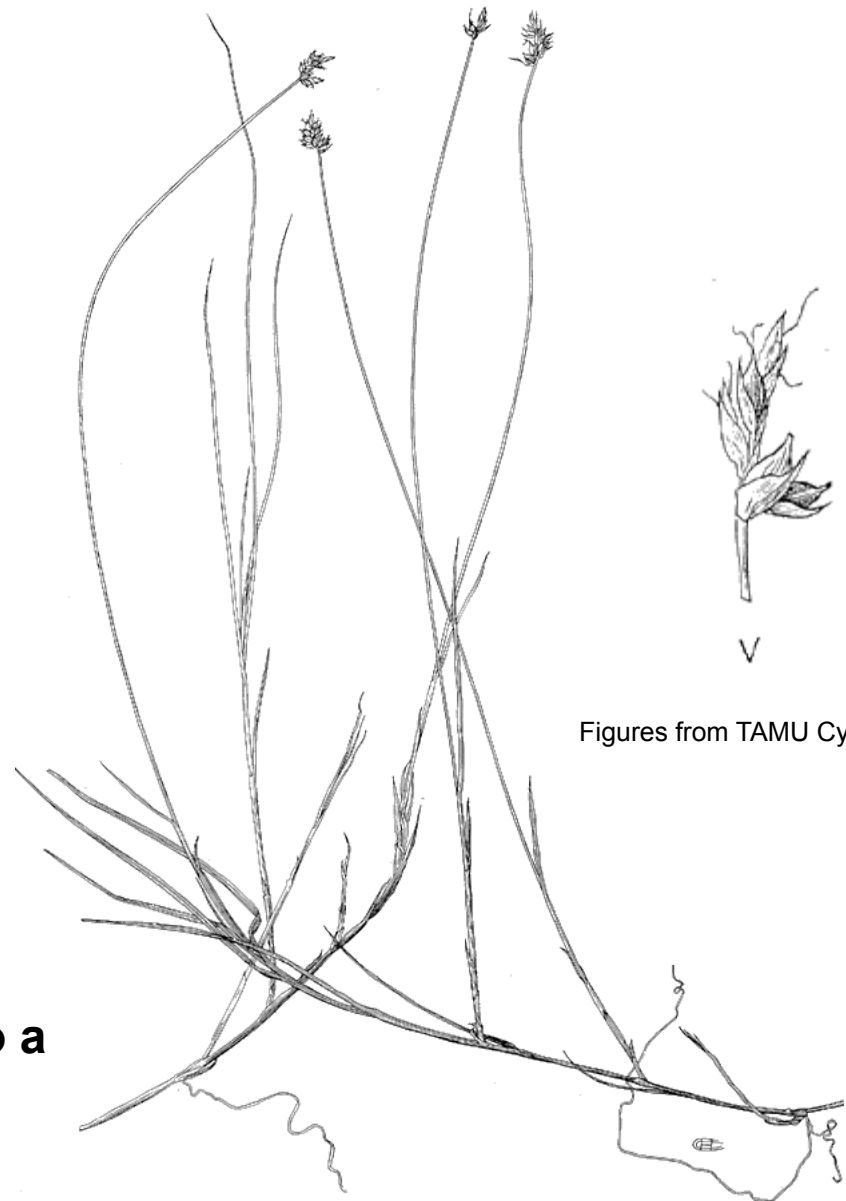
RANGE : Figure from Den virtuella floran website



Carex chordorrhiza (slide 2 / 2)



- **Wet habitats**
- **Cord-like stolons**
- **2-8 spikes closely aggregated into a small ovoid head**



Figures from TAMU Cyber Sedge

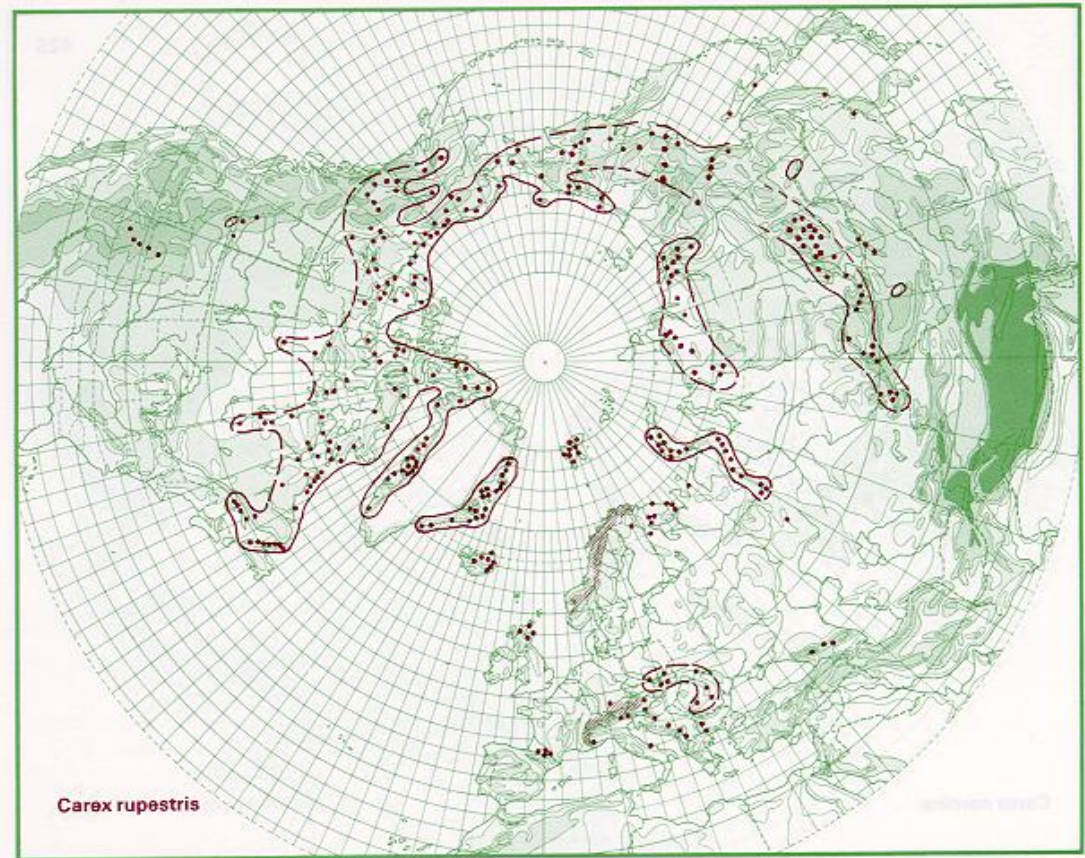
Carex rupestris (slide 1 / 3)

Family: Cyperaceae

Common Name:
Rock Sedge



Photo by Olaf I. ROENNING



RANGE : Figure from Den virtuella floran website

Carex rupestris (slide 2 / 3)



Carex rupestris (slide 3 / 3)



Figures from TAMU Cyber Sedge

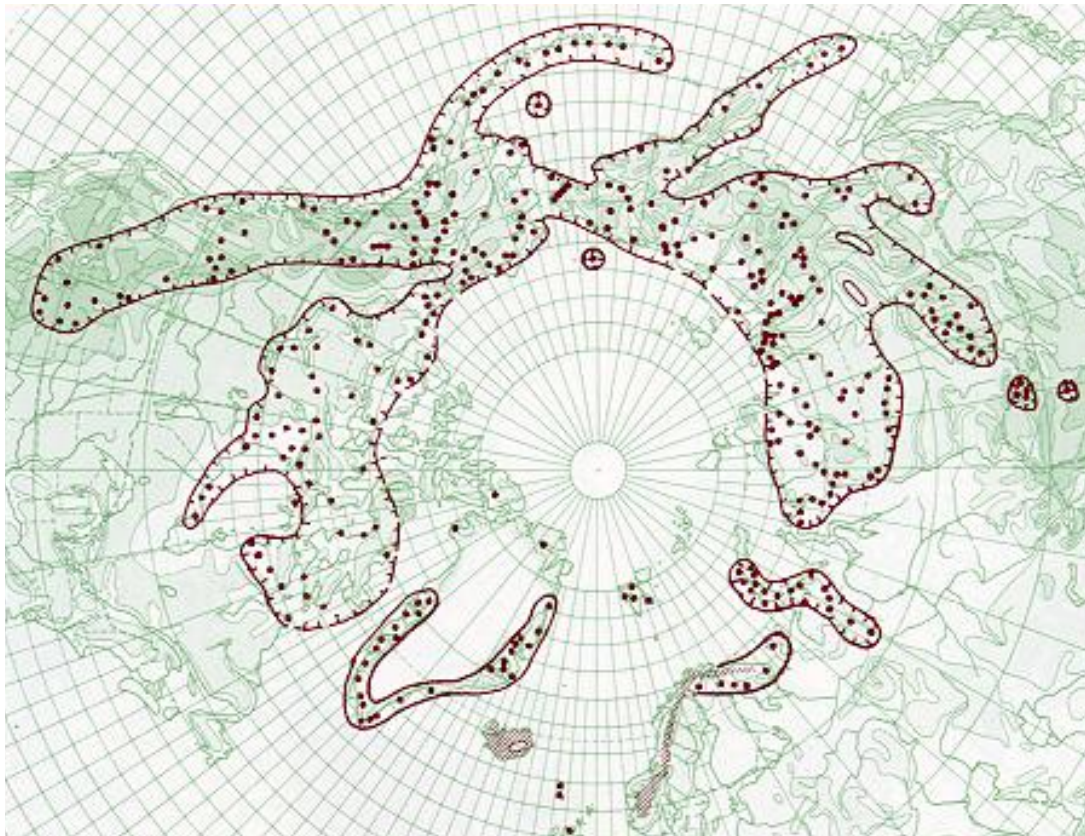
An Illustrated Flora of the Northern United States, Canada
and the British Possessions: From...by Nathaniel Lord
Britton, Addison Brown

- **Dry habitats**
- **3 stigmas**
- **Curly leaves**
- **Single androgynous spike (males at the top)**
- **Few pistillate flowers at base**

Carex saxatilis (slide 1 / 3)

Family: Cyperaceae

Common Name: Russet or Rocky Sedge



RANGE : Figure from Den virtuella floran website



Foto: NRM
Photo from Den virtuella floran website

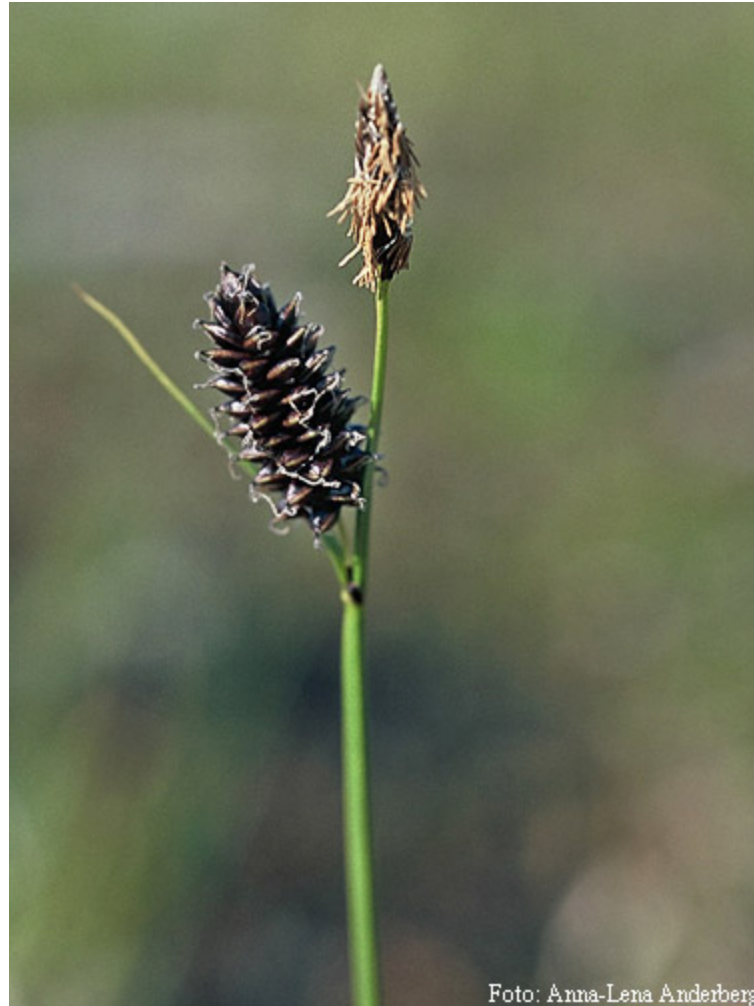
Carex saxatilis (slide 2 / 3)

- Plants caespitose, rhizomatous
- Terminal spike staminate, with leaves sweeping upward from the base
- Lateral spikes on pedicels, pendate (drooping in maturity)
- Perigynium is shiny dark brown or black broadly ovate or nearly spherical
- 2 stigmas
- Floral scales shorter than perigynia



Figures from TAMU Cyber Sedge

Carex saxatilis (slide 3 / 3)



Carex subspathacea (slide 1 / 2)

Family: Cyperaceae
Common Name: ?



Photo from Flora of the Canadian Arctic Archipelago



Figure from USDA Plants Database



Photo from Flora of the Canadian Arctic Archipelago

Carex subspathacea (slide 2 / 3)

- Saline habitats
- Turf forming, low growing (2-15 cm), ground level stems, rhizomatous
- Spikes often hidden among the leaves
- Perigynium with pale midvein
- Multispicate, terminal spike staminate
- Preferred forage for snow geese along with *Puccinellia phytanodes*



All figures from TAMU Cyber Sedge



Eriophorum angustifolium (slide 1 / 3)

Family: Cyperaceae

Common Name:
Common, Tall or
Narrow-leaf Cottongrass



RANGE : Figure from Den virtuella floran website

Eriophorum angustifolium (slide 2 / 3)



Eriophorum angustifolium (slide 3 / 3)

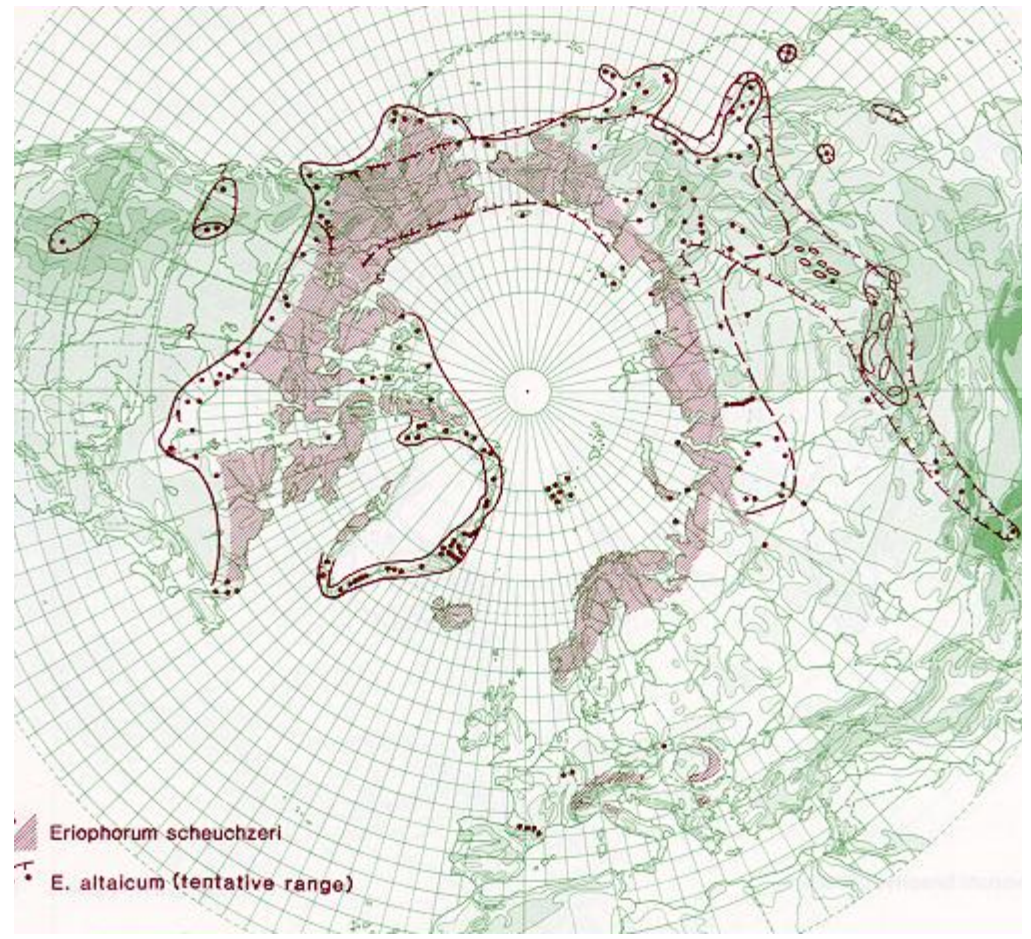
- **Cottongrass with white bristles (the perianth) in maturity**
- **Several pendant spikes**
- **Leaf margins fused at the apex**



Eriophorum scheuchzeri (slide 1 / 2)

Family: Cyperaceae

Common Name: Scheuchzer's or Arctic Cottongrass



RANGE : Figure from Den virtuella floran website

Eriophorum scheuchzeri (slide 2 / 2)

- Single stem with single terminal ovoid spike
- Anthers 0.5-1mm long
- Wet meadows, calcareous mineral sites, also in fens

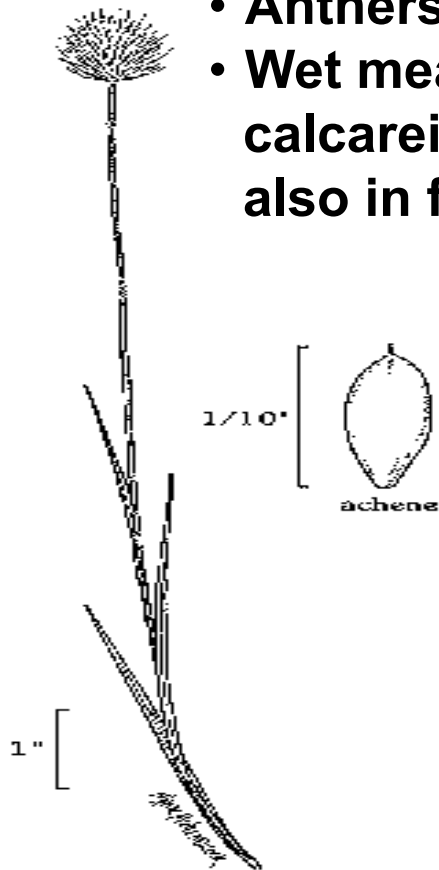


Figure from USGS Northern Prairie Wildlife Research Center website



Photo from Den virtuella floran website

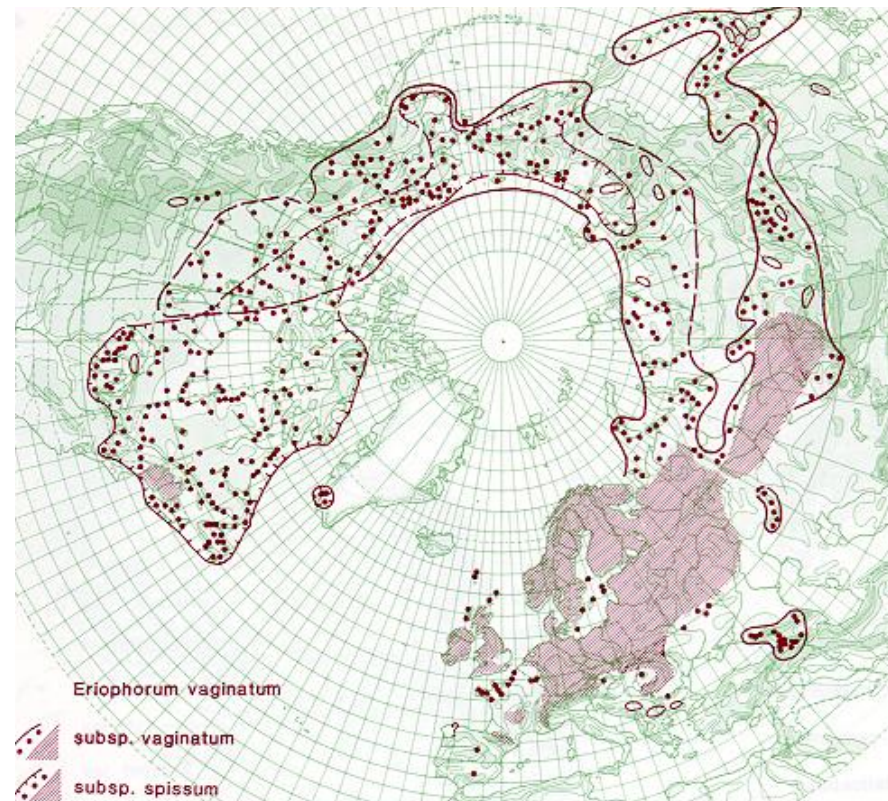
Eriophorum vaginatum (slide 1 / 2)

Family: Cyperaceae

Common Name:

Sheathed Cottongrass, tussock cottongrass

Hare's Tail



RANGE : Figure from Den virtuella floran website

Eriophorum vaginatum (slide 2 / 2)

- Plants caespitose, tussock forming
- Single spike

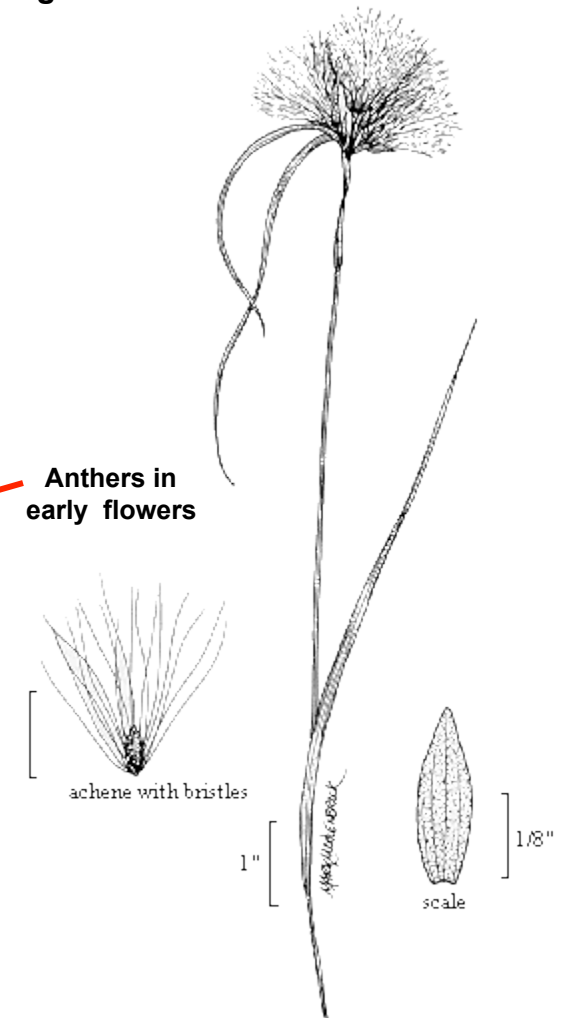


Figure from USGS Northern Prairie Wildlife Research Center website

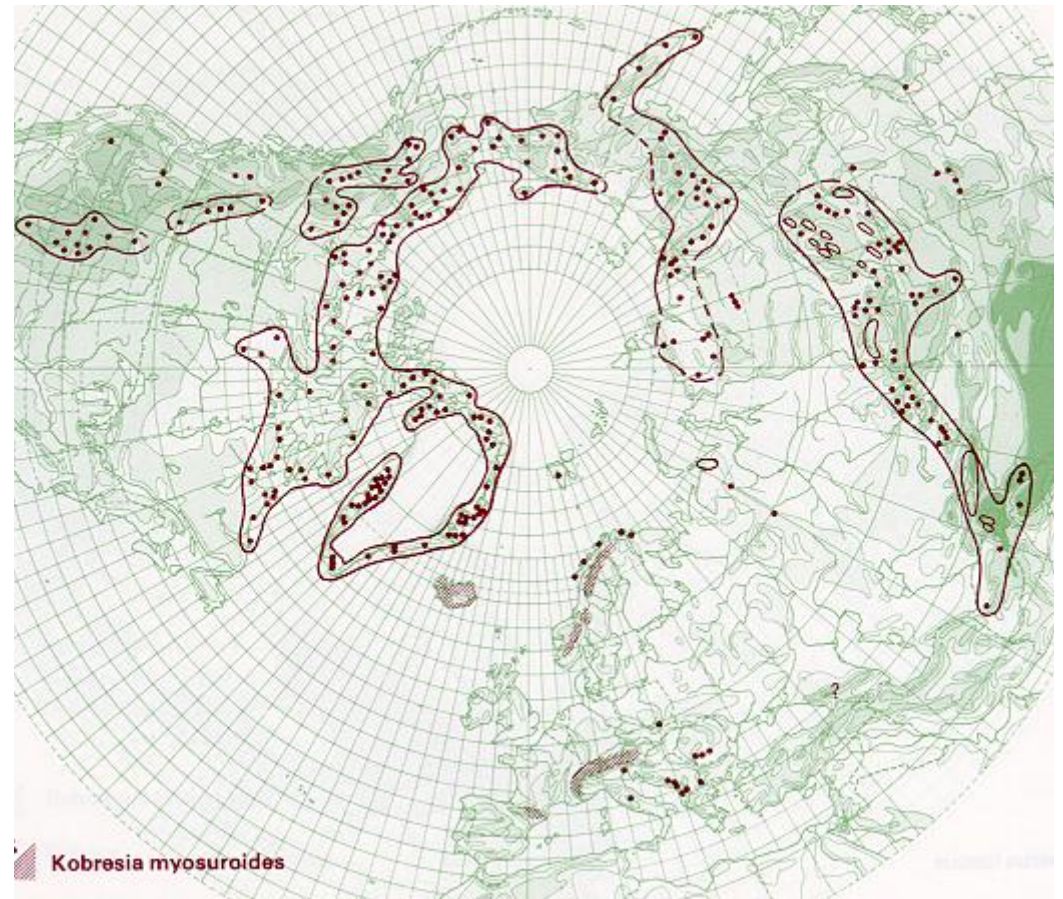
Kobresia myosuroides (slide 1 / 2)

Family: Cyperaceae

Common Name: Bellard's Kobresia



Photo from Den virtuella floran website



RANGE : Figure from Den virtuella floran website

Kobresia myosuroides (slide 2 / 2)



Foto: Arne Anderberg



USDA Plants Database

- *Kobresia* is very similar to *Carex* except that the perigynium is open on one side (the primordial leaf is not fully fused to form the bottle-shaped perigynium as in *Carex*).
- Single spike
- Low growing (3-20 cm tall)
- Tightly caespitose
- Dry calcareous habitats with *Dryas*, but also sands, and in somewhat wet sites, fens

Juncaceae (Rushes)

- Round solid stems
- Flowers concentrated in terminal inflorescence
- Flowers lily-like: 3 sepals, 3 petals, 2-6 stamens, pistil with 3 styles
 - *Juncus* (Rush)
 - Continuation of “stem” above the inflorescence is a bract
 - Flowers very lilly-like
 - Smooth stem
 - Narrow, linear leaves
 - Flowers with many seeds
 - *Luzula* (Woodrush)
 - Leaves broader, flat, with widely spaced hairs
 - Flowers have 3 seeds

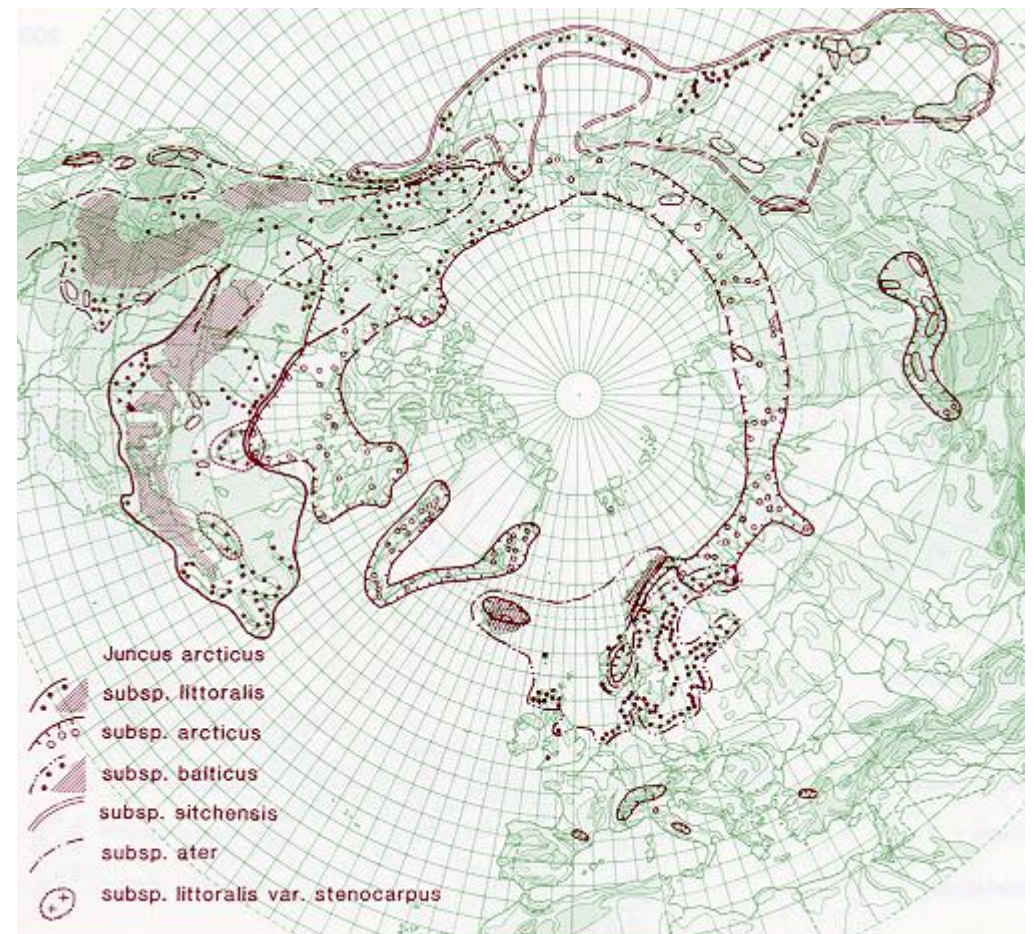
Juncus arcticus (slide 1 / 2)

Family: Juncaceae

Common Name:
Arctic Rush



Photo from Den virtuella floran website



RANGE : Figure from Den virtuella floran website

Juncus arcticus (slide 2 / 2)



Photo from Flora of the Canadian Arctic Archipelago



Foto: Anders Jacobson

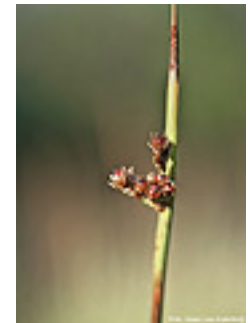
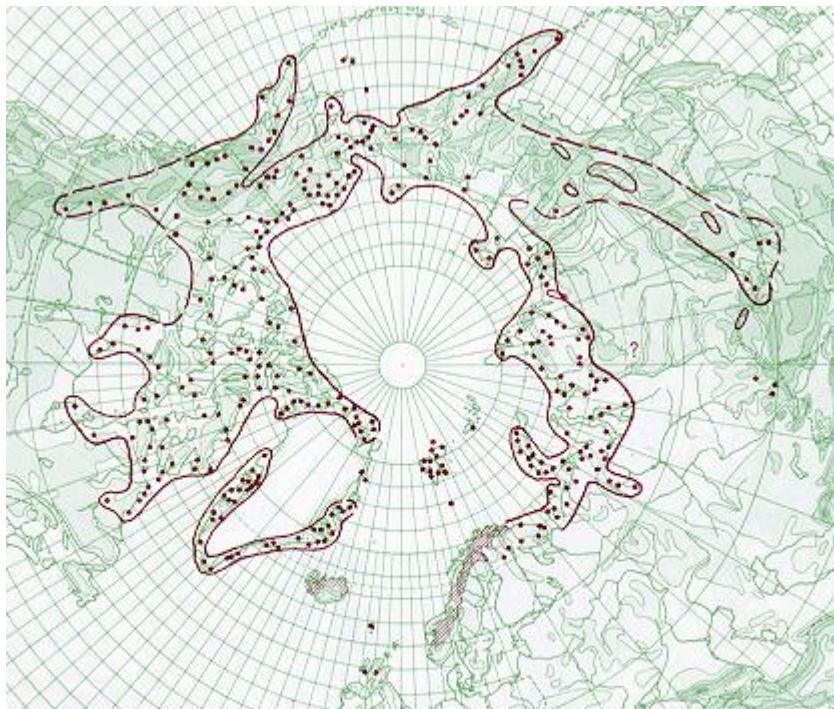


Photo: Den virtuella floran

Juncus biglumis (slide 1 / 2)

Family: Juncaceae

Common Name:
Two-flowered Rush

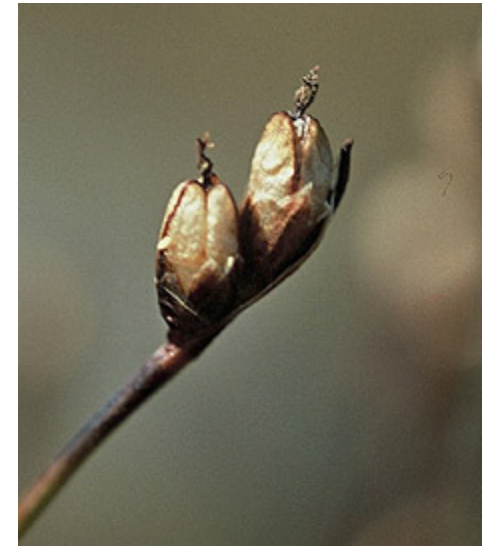
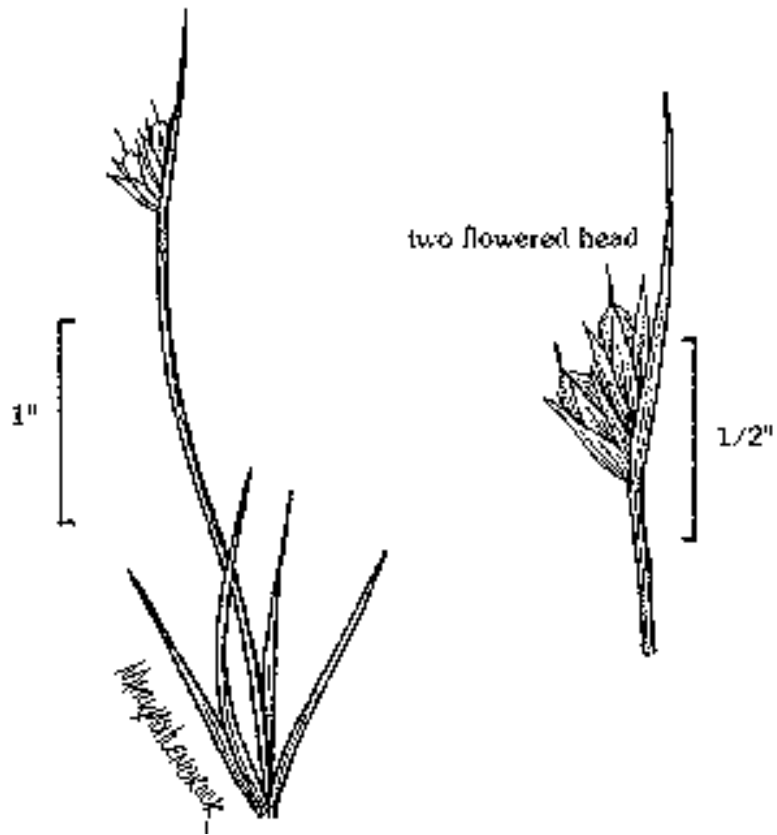


RANGE : Figure from Den virtuella floran website



Foto: Anna-Lena Anderberg

Juncus biglumis (slide 2 / 2)



Photos from Den virtuella floran website

Figure from USGS Northern Prairie Wildlife Research Center website

Luzula arctica

Family: Juncaceae

Common Name:
Snow or Arctic Wood Rush

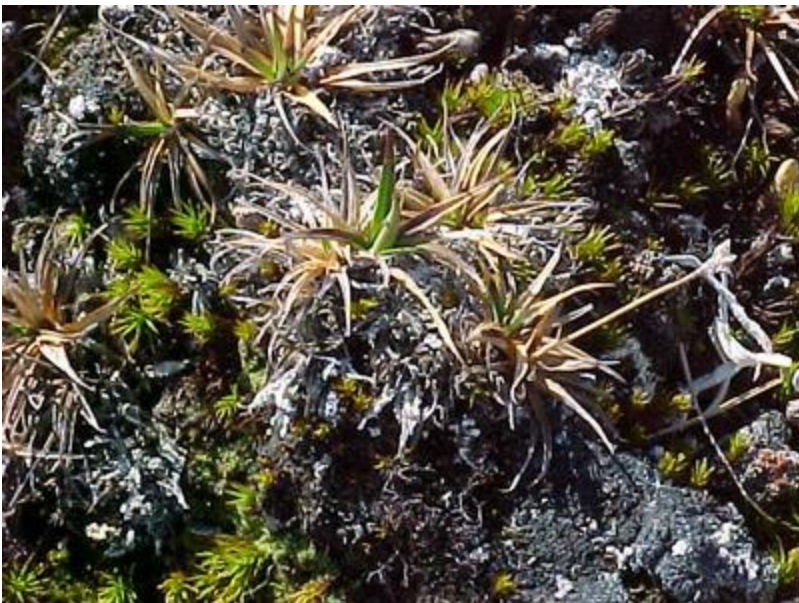
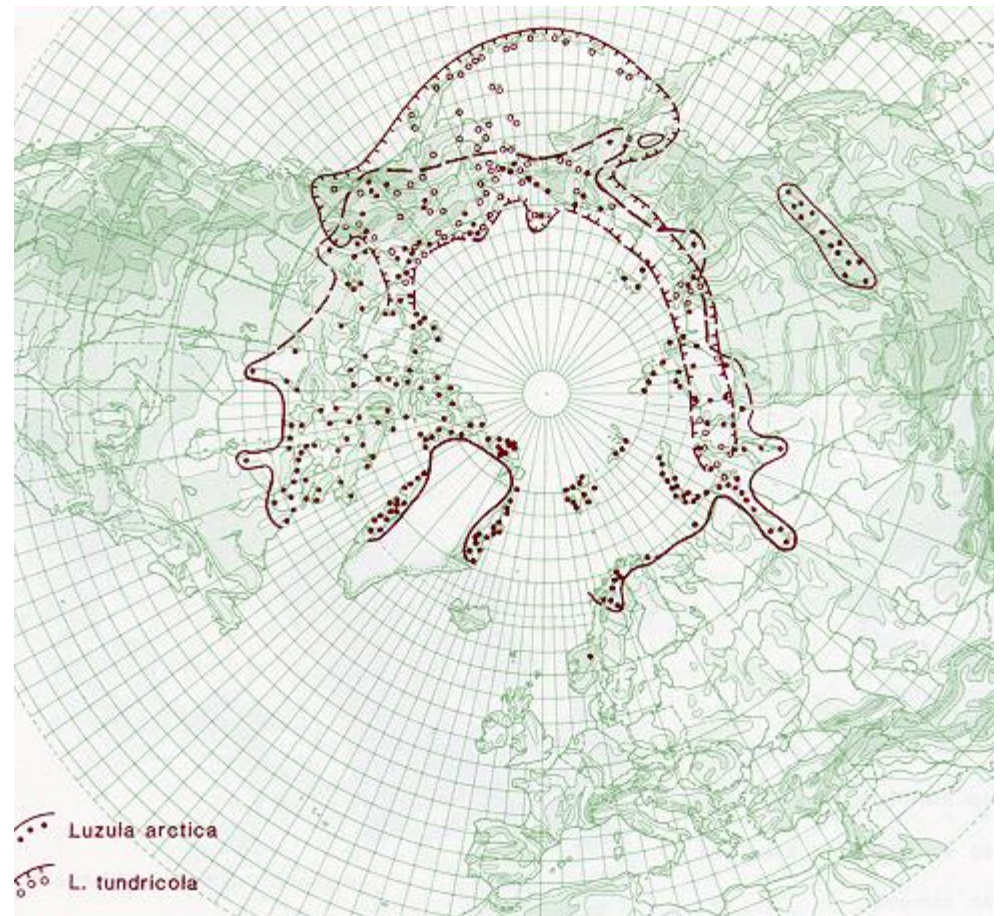


Photo from Den virtuella floran website

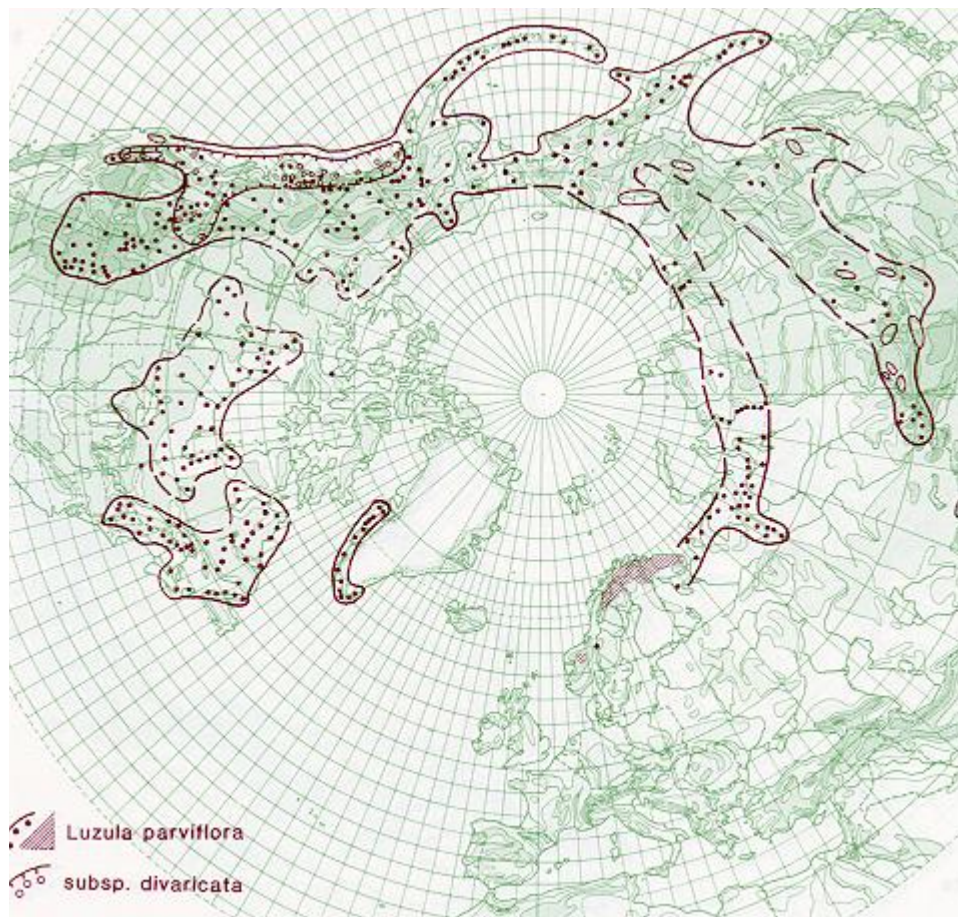


RANGE : Figure from Den virtuella floran website

Luzula parviflora (slide 1 / 2)

Family: Juncaceae

Common Name:
Small-flowered Wood Rush



RANGE : Figure from Den virtuella floran website



COPYRIGHT J.R. MANHART

Luzula parviflora (slide 2 / 2)



Photo from Provincial Museum of Newfoundland and Labrador

Luzula confusa

Family: Juncaceae

Common Name: Small-flowered Wood Rush



Photo from www.rolv.no