Diversity and Floristics of Monocots

... rushes, sedges, grasses ...
Commelinid Monocots

The last group of monocots that start with spiderworts with showy flowers but no nectar and ends with grasses and sedges with reduced florets for wind pollination.

The group shows trends in **reduced flowers**, **bracted inflorescences**, **loss of perianth**, and **shift to wind pollination**

*Tradescantia ohiensis* - spiderwort

*Carex pensylvanica* - Pennsylvania sedge
*Commelinaceae - spiderwort family*

Family of small herbs with succulent stems, stems jointed; leaves sheathing. Family does not produce nectar, but showy flowers for insect pollen gathering.

*Tradescantia ohiensis* - spiderwort
*Commelinaceae - spiderwort family

Inflorescence often bracted

Flowers actinomorphic or zygomorphic

Commelina communis - day flower

Tradescantia ohiensis - spiderwort
*Commelinaceae - spiderwort family

Tradescantia bracteata
Bracted spiderwort

Tradescantia occidentalis
Prairie spiderwort
*Commelinaceae - spiderwort family

Commelina communis
Common dayflower
Introduced from Asia

Commelina erecta - Erect dayflower
Special concern native of cliffs of Driftless Region
*Pontederiaceae - pickerel weed family*

Pickerel weed has glossy heart-shaped leaves, superficially like *Sagittaria* but without net venation. Flowers are in congested showy purple inflorescences.

*Pontederia cordata* - Pickerel weed
*Pontederiaceae - pickerel weed family*

Flowers are showy, insect pollinated, often with trimorphic heterostyly

*Pontederia* has somewhat fused perianth

*Pontederia cordata* - Pickerel weed
*Typhaceae - cattail family*

Family of 2 genera - the cattails and burreeds. Rhizomatous and glabrous-leaved perennial emergent aquatics. Terminal spike with distinct female flowers below and male flowers above.

Male flowers essentially 3 stamens; female flowers of one carpel with a single seed; wind pollinated.

*Typha - cattail*
*Typhaceae - cattail family

Achenes with copious amounts of white hairs near the base of each; wind dispersed.
*Typhaceae - cattail family*

Our two species of cattails: the narrow-leaved cattail apparently moved in from the east coast and is more tolerant of salt and disturbed areas.

They can be separated based on wider female inflorescence in the common cattail and the physical separation of male and female parts in the narrow-leaved cattail.
*Typhaceae - cattail family

\[ T. \text{latifolia} \times T. \text{angustifolia} \]

\[ \downarrow \]

\[ \text{Typha X glauca - hybrid cattail} \]

The hybrid is invasive and replaces other cattails and other emergent aquatic plants.
The second genus - the bur-reeds. Rhizomatous and glabrous-leaved perennial emergent aquatics related to cattails but shorter in stature. Inflorescence of male and female heads; male heads near the apex. Wind pollinated.

Male flowers essentially 3 stamens plus 3 tepals;
Female flowers of one-ovuled 3-carpellate gynoecium plus 3 tepals.

*Typhaceae - cattail family*
*Typhaceae - cattail family*

The second genus - the bur-reeds. Rhizomatous and glabrous-leaved perennial emergent aquatics related to cattails but shorter in stature. Inflorescence of male and female heads; male heads near the apex. Wind pollinated.

Fruits a head of 1-seeded achenes.

*Sparganium americanum* - bur-reed

*Sparganium eurycarpum* - giant bur-reed
# Graminoids: Grasses, sedges, rushes

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leaf arrangement differences among the three families
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Graminoids: Grasses, sedges, rushes

- rushes – split
- sedges - fused
- grasses - split

leaf sheath differences among the three families
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*Cyperus* - nutsedge
*Cyperaceae* – ligule fused to blade

*Carex* - sedge

*Bromus* - brome grass
*Poaceae* – ligule not fused to blade

**ligule** differences among the three families
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**Juncaceae - rush family**

A family largely of two genera - *Juncus* (rush) and *Luzula* (wood rush); often tussock forming. Leaves are usually 3-ranked (like sedge family), but stems mainly round or inrolled. No ligule at junction of blade and sheath. Inflorescence congested, often terminal or appearing lateral.
**Juncaceae - rush family**

Flowers mainly bisexual. Although reduced and wind pollinated, 6 brownish or reddish-green tepals surround 6 stamens and superior 3-carpellate ovary.

Fruit is a many-seeded capsule.

*Luzula acuminata*
Wood rush

*Juncus greenei* - Green’s rush
**Juncaceae - rush family**

*Juncus arcticus* - Baltic rush

Note rhizome with vertical stems

*Juncus effusus* - Common rush

*Juncus tenuis*

Path rush
**Juncaceae - rush family**

*Luzula acuminata* - Wood rush

*Luzula multiflora* - Common wood rush
**Cyperaceae - sedge family**

A graminoid family of about 100 genera and 4,500 species primarily of moist habitats. *Carex* with 2,000 species is one of the largest of all angiosperm genera. Most species have triangular stems in cross section - “sedges have edges” - and thus leaves are 3-ranked.

*Cyperus rotundus*
*Cyperaceae*
G. D. Carr
**Cyperaceae - sedge family**

*Cyperus* has bisexual flowers: 3 stamens and 2 fused carpels. A single bract sits below each floret. The spikelets are generally symmetrically arranged.

*Cyperus lupulinus* - Sand cyperus, sand sedge
**Cyperaceae - sedge family**

*Scirpus* and relatives (bulrushes) often have roundish stems. Florets are bisexual with 3 stamens, 3 fused carpels, 6 perianth bristles, and 1 subtending bract. Florets are generally whorled in the spikelet.
**Cyperaceae - sedge family**

*Scirpus atrovirens*
Dark green bulrush

*Scirpus cyperinus*
Wool-grass

*Scirpus sp.*
**Cyperaceae - sedge family**

*Carex* (sedge) is a large, complex, and difficult to key out genus.

Sedges have unisexual flowers with the male and female florets usually arranged in discrete portions of the spikelets.

*Carex pensylvanica*  
Pennsylvania sedge

*Carex buxbaumii*  
Buxbaum’s sedge
**Cyperaceae - sedge family**

Both male and female florets are subtended by a **floret bract**.

Female florets are further enclosed by a sac-like bract called the **perigynium** - the achene forms within.

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Carex blanda - Wood sedge

Carex intumescens - Bladder sedge
**Cyperaceae - sedge family**

*Carex* is a genus of roughly 2000 species worldwide, over 150 in Wisconsin alone. It becomes easier to understand if you think of it in terms of two smaller subgenera:

**Carex subgenus Carex**
- a. Stigmas usually 3, sometimes 2
- b. Spikes almost always elongate or stalked
- c. Perigynia round or triangular in cross section, sometimes flattened (only if stigmas 2)
- d. Plants sometimes strongly reddish at base

**Carex subgenus Vignea**
- a. Stigmas always 2
- b. Perigynia usually flattened or plano-convex in cross section
- c. Spikes sessile, short; inflorescence may be elongated
**Cyperaceae - sedge family**

*Carex stricta*
Tussock sedge

A common woodland species
*Carex pensylvanica*
Pennsylvania sedge
**Cyperaceae - sedge family**

Other genera . . .

*Eriophorum angustifolium*

cottongrass
**Cyperaceae - sedge family**

*Eleocharis ovata* - spikerush

Other genera . . .
Poaceae - the grasses

• the second large independent shift to reduced flowers and spikelets for wind pollination in the monocots

• 4th largest family - 620 genera, 10,000 species

• most important family (ethnobotanically)
crop plant rank?

1. maize
2. wheat
3. rice
4. potato
5. cassava
6. soybean
7. sweet potato
8. sorghum

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**Poaceae - grass family**

The most important plant family - with about 650 genera and nearly 10,000 species -

*Lolium perenne* - Rye-grass

Eco-nomize your wardrobe
**Poaceae - grass family**

The most important plant family - with about 650 genera and nearly 10,000 species -

Interesting co-evolution of grasses and endophytic fungi

*Lolium perenne* - Rye-grass

*Lolium temulentum* – darnel ("tare") mimicry with wheat

*Neotyphodium* and loline alkaloids
**Poaceae - grass family**

The most important plant family - with about 650 genera and nearly 10,000 species -

Interesting co-evolution of grasses and endophytic fungi

*Claviceps purpurea* on Rye

Salem “witches”
**Poaceae - grass family**

The most important plant family - with about 650 genera and nearly 10,000 species - represents the ultimate in floret reduction and spikelet evolution for wind pollination.

Herbs, often rhizomatous, with 2-ranked leaves on generally hollow stems. The leaves consisting of **sheath**, **ligule**, and **blade**.

*Vegetative parts of grasses*

*Lolium perenne* - Rye-grass
**Poaceae - grass family

The main unit of the inflorescence is the **spikelet** which is composed of 2 **glumes** (spikelet bracts) and 1 or more **florets**

**spikelet**

**glumes**

**florets**

_Dactylis glomerata_

Orchard grass
**Poaceae - grass family**

Each floret is additionally surrounded by two floret bracts - the outer lemma and the inner palea (usually not seen until anthesis - when florets open).

Dactylis glomerata
Orchard grass
**Poaceae - grass family**

Although considerable variation occurs in florets (among species or within a spikelet), most of our species have the following floret structure:

Perianth represented by 2 lodicules
Stamens 3
Superior gynoecium of 2 fused carpels
One ovuled fruits called a **grain** or **caryopsis** =
seed fused to ovary wall

**Dactylis glomerata**
Orchard grass
Poaceae - grass family

Subfamily Ehrhartoideae
(stamens more than 3)

Ziziana aquatica - wild rice

Important native American food; unisexual spikelets
Poaceae - grass family

Poa annua - bluegrass

**Subfamily Pooideae**
(Spikelets with more than one grain forming floret; Spikelets not compressed, or compressed in plane of glumes and florets)

Dactylis glomerata - orchard grass
Poaceae - grass family

Ammophila breviligulata - marram grass

Subfamily Pooideae
Poaceae - grass family

Subfamily Pooideae

*Avena sativa* - oats
Poaceae - grass family

Subfamily Pooideae

*Phalaris arundinacea*
Reed canary grass

*Calamagrostis canadensis* - bluejoint grass

Invasive species of wetlands
Poaceae - grass family

Subfamily Pooideae

*Elymus canadensis*
Wild rye
Poaceae - grass family

*Elymus hystrix* - bottlebrush

*Subfamily Pooideae*

*Triticum aestivum* - wheat
Poaceae - grass family

Subfamily Arundinoideae

*Phragmites australis* - common reed

Circumboreal species; non-native populations have become invasive and displaced native populations
Poaceae - grass family

Subfamily Aristidoideae
(Awns of lemma divided into 3 parts)

Aristida tuberculosa - 3-awned grass
Poaceae - grass family

Subfamily Chloridoideae
(Spikelets arranged often one-sided)

*Spartina pectinata*
Prairie cord grass

*Bouteloua curtipendula*
Sideoats grass
Poaceae - grass family

**Sporolobus heterolepis** - Prairie dropseed

*Eragrostis cilianensis*
Stinkgrass

Subfamily Chloridoideae
Poaceae - grass family

Subfamily Panicoideae
(spikelets with 1 floret forming grain)
Tribe Paniceae

Panicum sp. - panic grass

Panicum virgatum - switchgrass
Poaceae - grass family

Subfamily Panicoideae
(spikelets with 1 floret forming grain)

Tribe Andropogoneae
(spikelets paired on linear inflorescence)

Andropogon gerardii - big bluestem
Poaceae - grass family

Subfamily Panicoideae
Tribe Andropogoneae

*Sorghastrum nutans* - Indian grass