

A close-up photograph of several green, unripe plant heads (likely sedges or rushes) with long, narrow, blade-like leaves. The plant heads are arranged in a cluster, showing individual spikelets. The background is dark and out of focus.

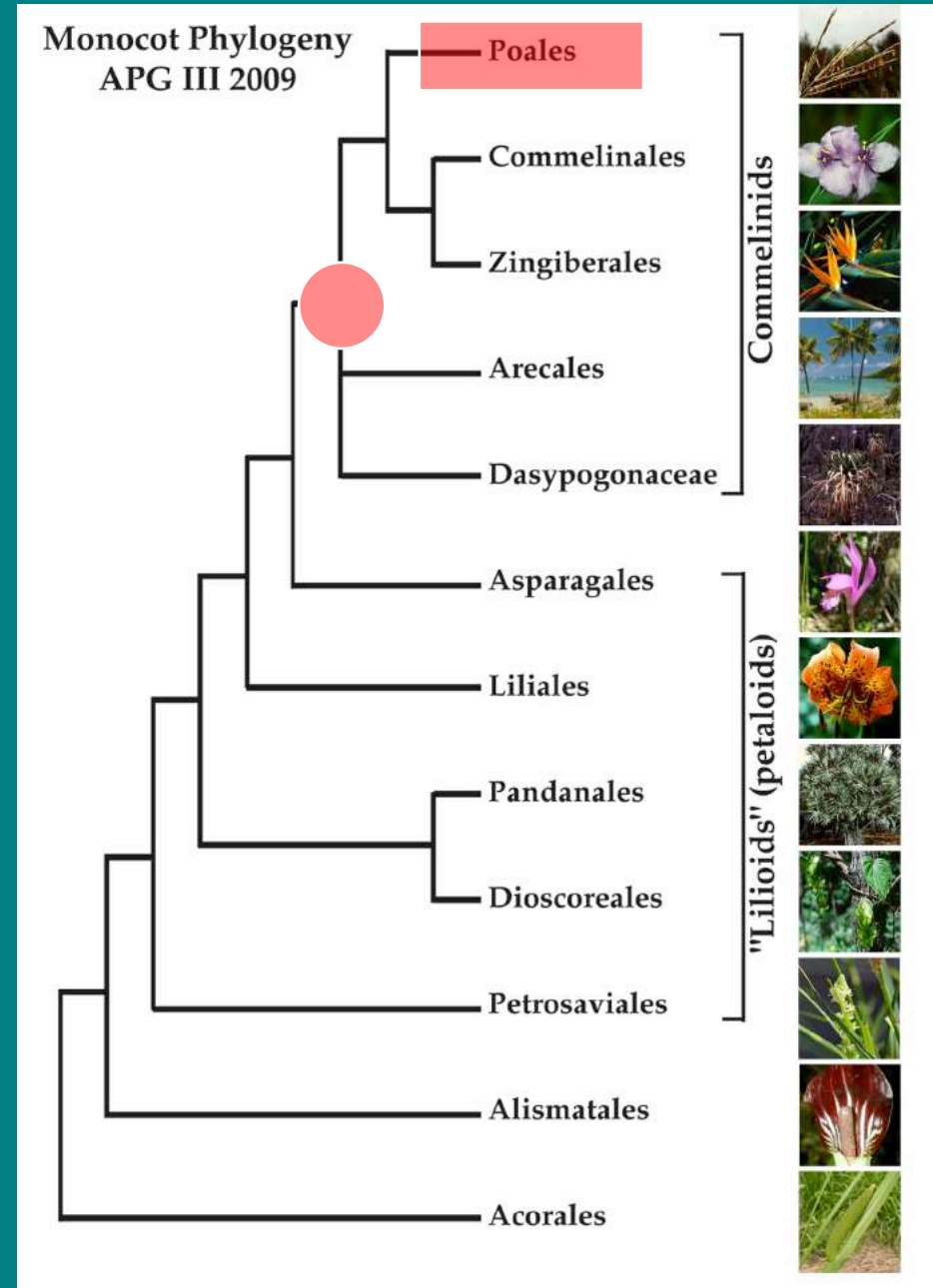
# Poales

cattails, rushes, sedges

# Poales

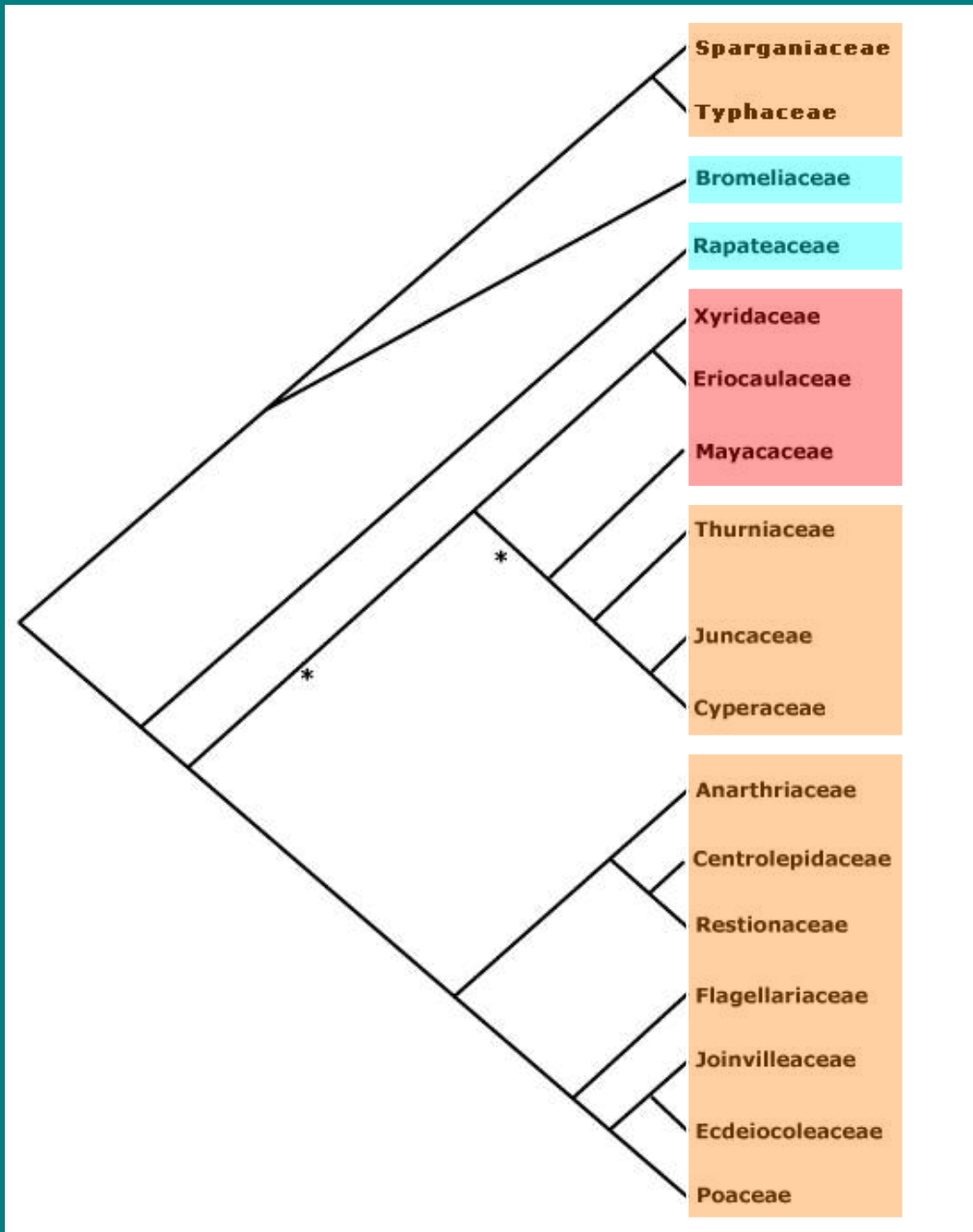
## 4 main groups:

- Acorales - sister to all monocots
- Alismatales
  - inc. Aroids - jack in the pulpit
- “Lilioids” (lilies, orchids, yams)
  - non-monophyletic
  - petaloid
- **Commelinids**
  - Arecales – palms
  - Commelinales – spiderwort
  - Zingiberales – banana
  - **Poales**
    - pineapple
    - **grasses & sedges**





# Poales



- showy flowers, insect or bird pollinated



- +/- reduced flowers, insect or wind pollinated



- reduced flowers, wind pollinated



# Poales

## Evolutionary trends:

- nectar to pollen gathering to **wind pollination**
- **reduced flowers** - loss of perianth
- **unisexuality** sometimes
- **bracts** become important
- flowers to **florets in spikelets**

- **showy flowers, insect or bird pollinated**



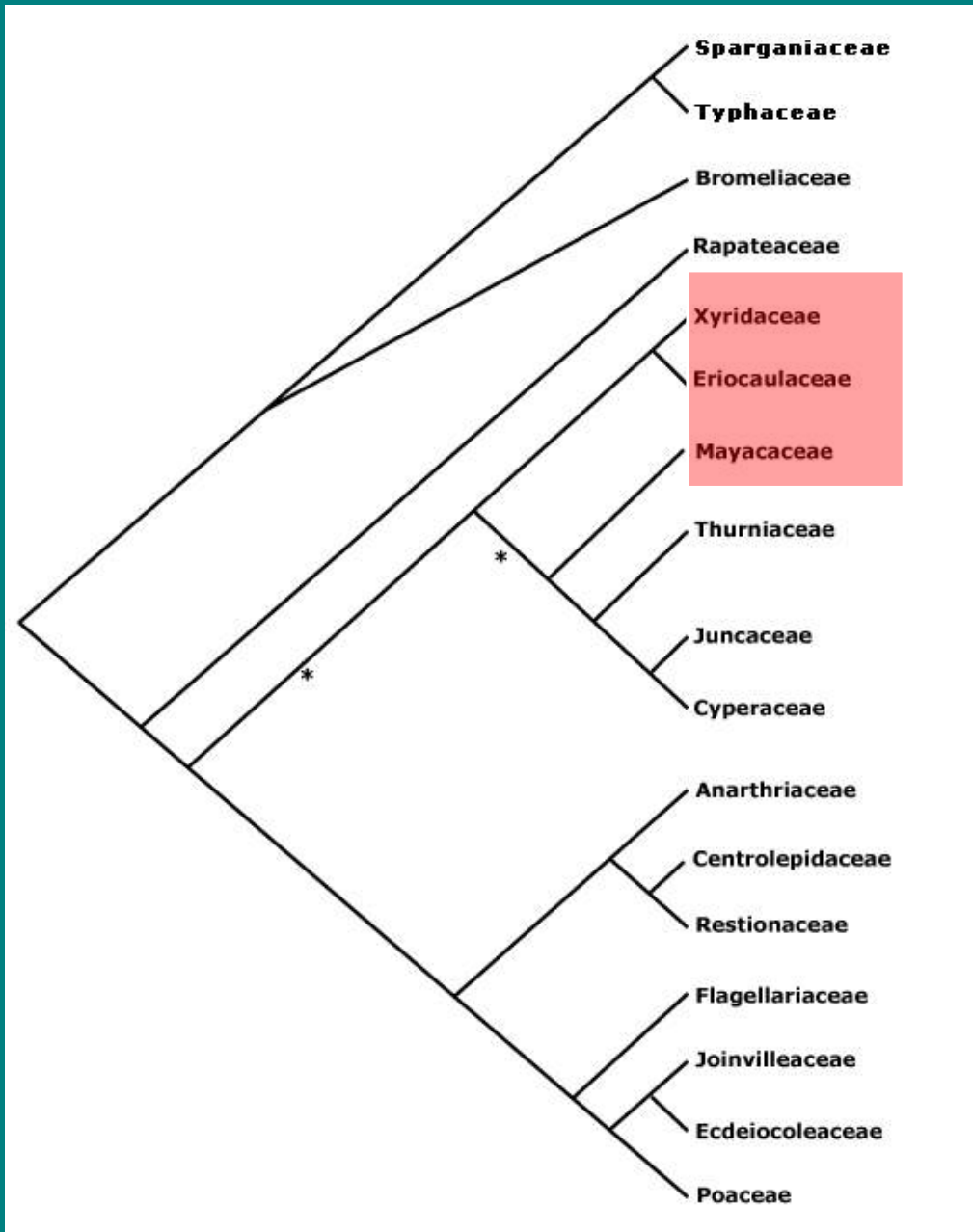
- **+/- reduced flowers, insect or wind pollinated**



- **reduced flowers, wind pollinated**



# Poales II: wind pollinated families



- “grade” centered in the Guayana Shield and distinctive in tepui-top flora

- +/- reduced flowers, insect or wind pollinated





# Xyridaceae - yellow eye grass

Small family (5/260) of rush-like leaves with terminal spike of small but **showy** yellow (or blue) petalled-flowers with **no nectar**.  
Inflorescence with spirally arranged **bracts**.



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*Xyris difformis*



*Xyris torta* - yellow-eyed grass

# Xyridaceae - yellow eye grass

Subfamily with *Xyris* is widespread and includes northern hemisphere species.



© 2004 Janet Novak

*Xyris difformis*



Xyridoideae (*Xyris*) distribution



# Xyridaceae - yellow eye grass

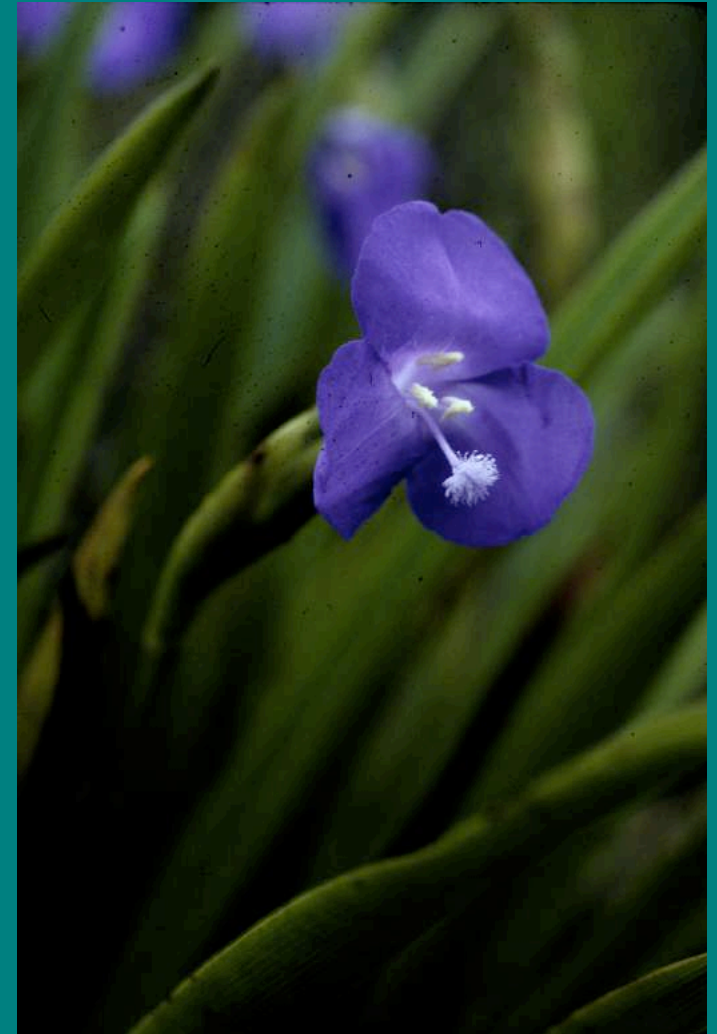
Other subfamily is diverse only on Guayana Shield and Brazilian cerrados



Abolboideae  
distribution



*Orectanthe*



*Abolboda*



# Eriocaulaceae - pipewort

Small family (10/1400) of aquatic emergents, often rosette leaved.

Primarily pantropical, centered in Guayana Shield and Brazilian cerrados, with 1 species in Great Lakes.



*Eriocaulon* -  
pipewort

# Eriocaulaceae - pipewort

Flowers dimerous, unisexual, but crowded together on a bracted, whitish terminal head of an elongated scape - “**pipebrush**” inflorescence



Various *Eriocaulon* -  
pipeworts

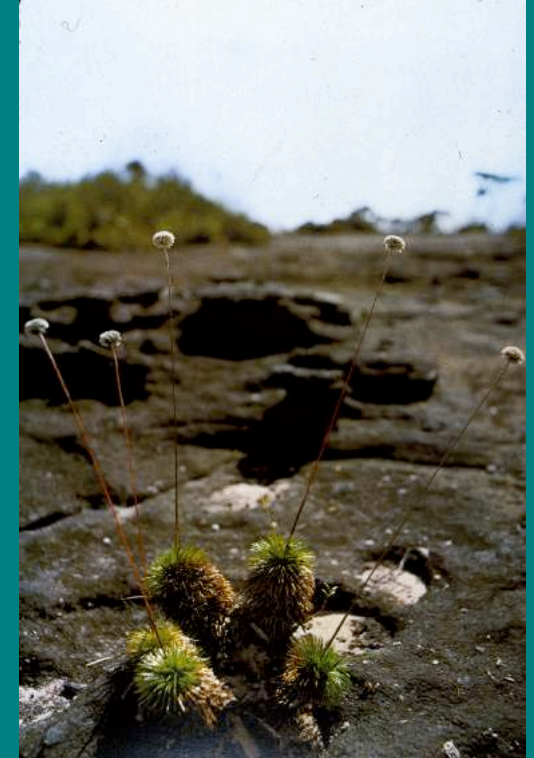




# Eriocaulaceae - pipewort

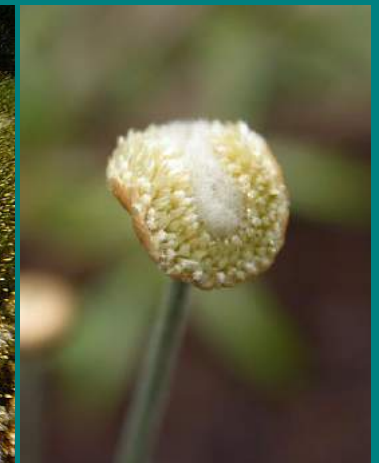


*Paepalanthus*  
Brazilian cerrados



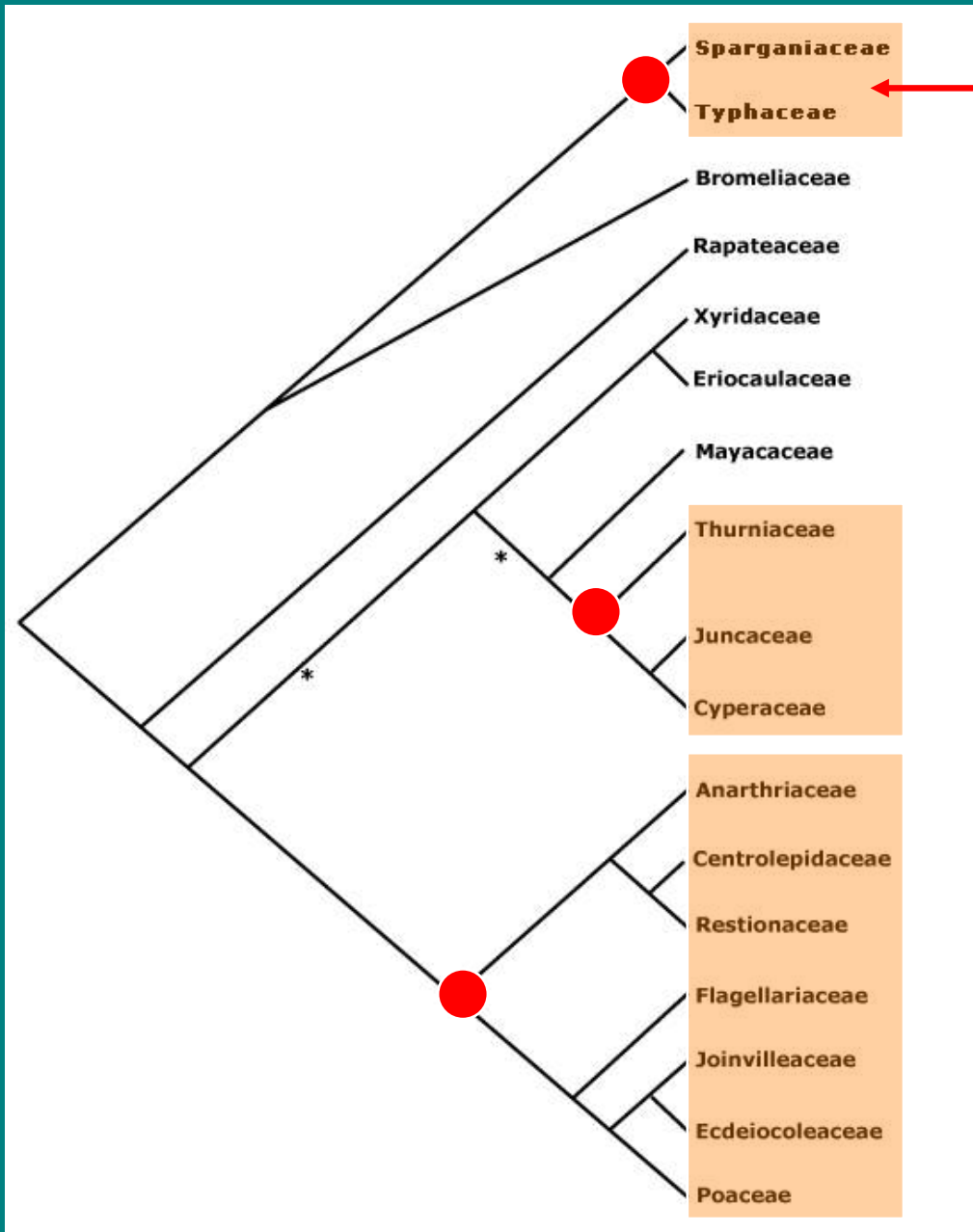
*Rhodonanthus*  
Roraima tepui

*Syngonanthus* Florida  
sand wetland





# Poales II: wind pollinated families



- look at cattails and bur-reeds - one of 3 separate shifts to reduced flowers and wind pollination

- one family now (Typhaceae)

- reduced flowers, wind pollinated



# Typhaceae - cattails

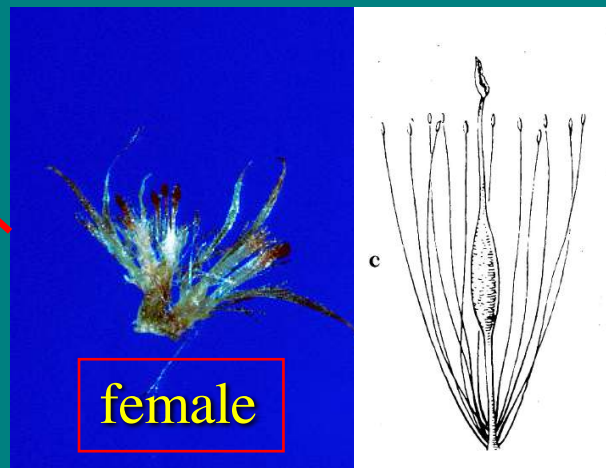
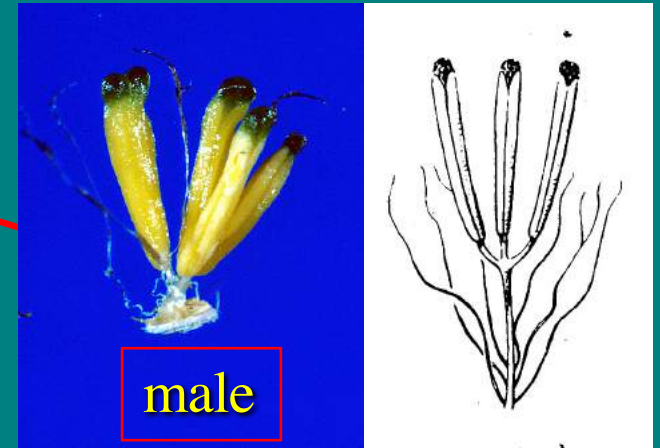
- Typhaceae are robust, **rhizomatous herbs** that like damp conditions and have **erect, linear leaves**
- **terminal cylindrical spike** with distinct female flowers below and male flowers above





# Typhaceae - cattails

- male flowers essentially 3 stamens
- female flowers of one carpel with a single seed
- wind pollinated





# Typhaceae - cattails

Achenes with copious amounts of **white hairs** near the base of each; **wind dispersed**



*Typha* - cattail





# Typhaceae - cattails

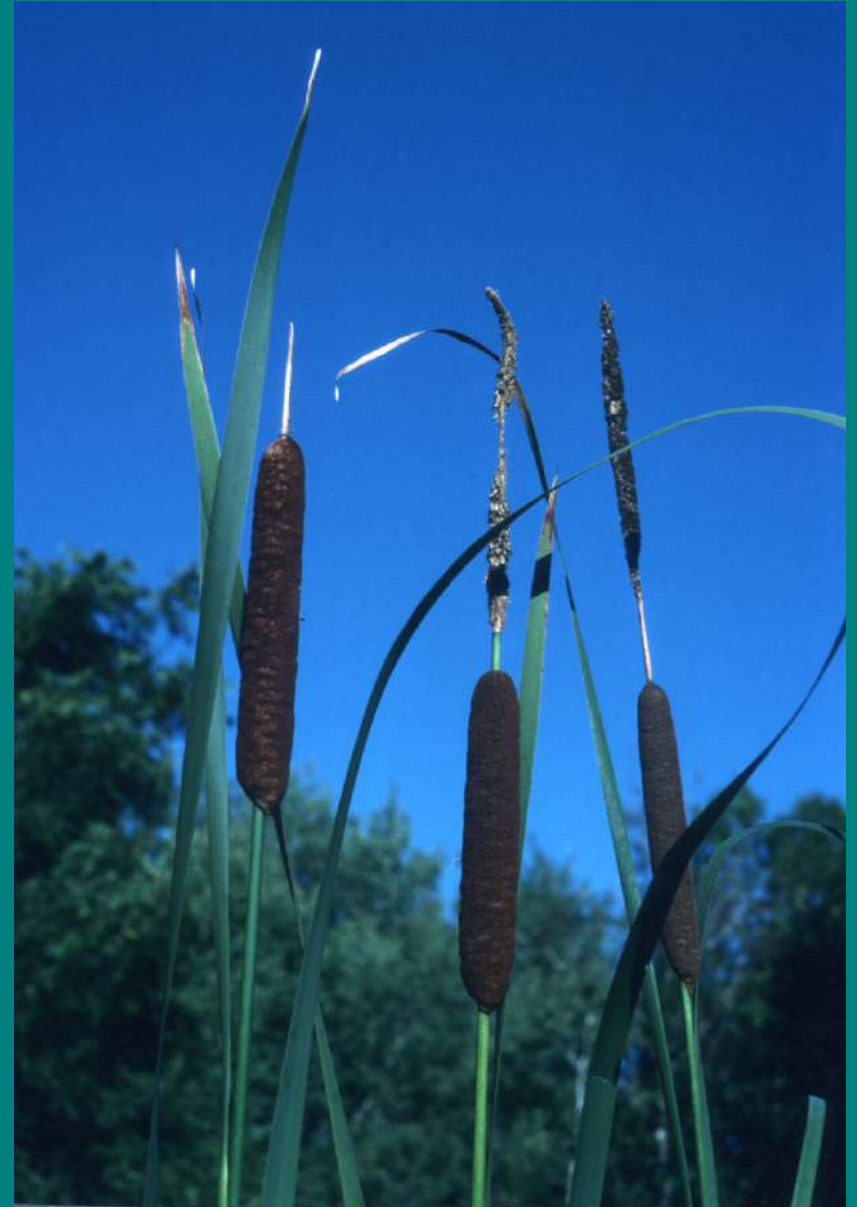


*T. latifolia* X *T. angustifolia*



*Typha X glauca* - hybrid cattail

- the hybrid is invasive and replaces other cattails and other emergent aquatic plants



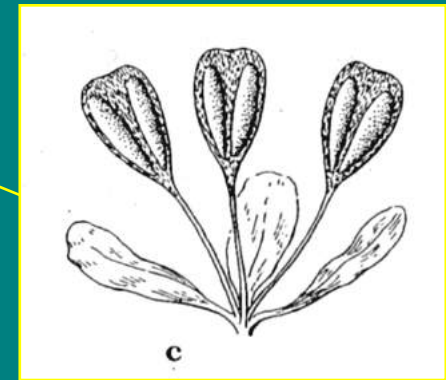
# Typhaceae - bur reeds

- rhizomatous, short statured, perennial emergent aquatics
- unisexual heads



male

female



Male flowers essentially 3 stamens plus 3 tepals

Female flowers of one-ovuled 3-carpellate gynoecium plus 3 tepals.

*Sparganium americanum* - bur-reed



# Typhaceae - bur reeds

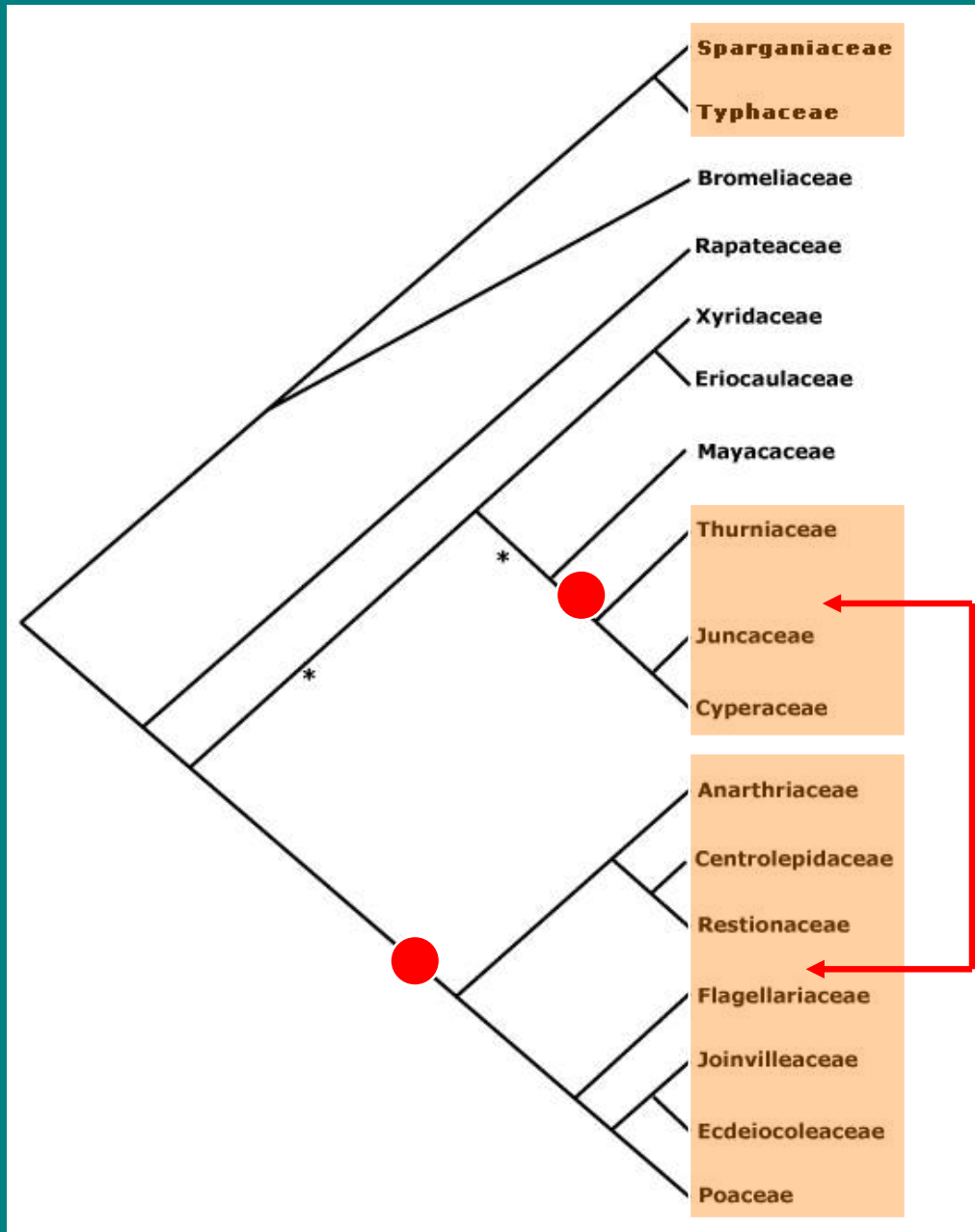


- fruits a head of 1-seeded achenes



*Sparganium americanum* - bur-reed    *Sparganium eurycarpum* - giant bur-reed

# Poales II: wind pollinated families



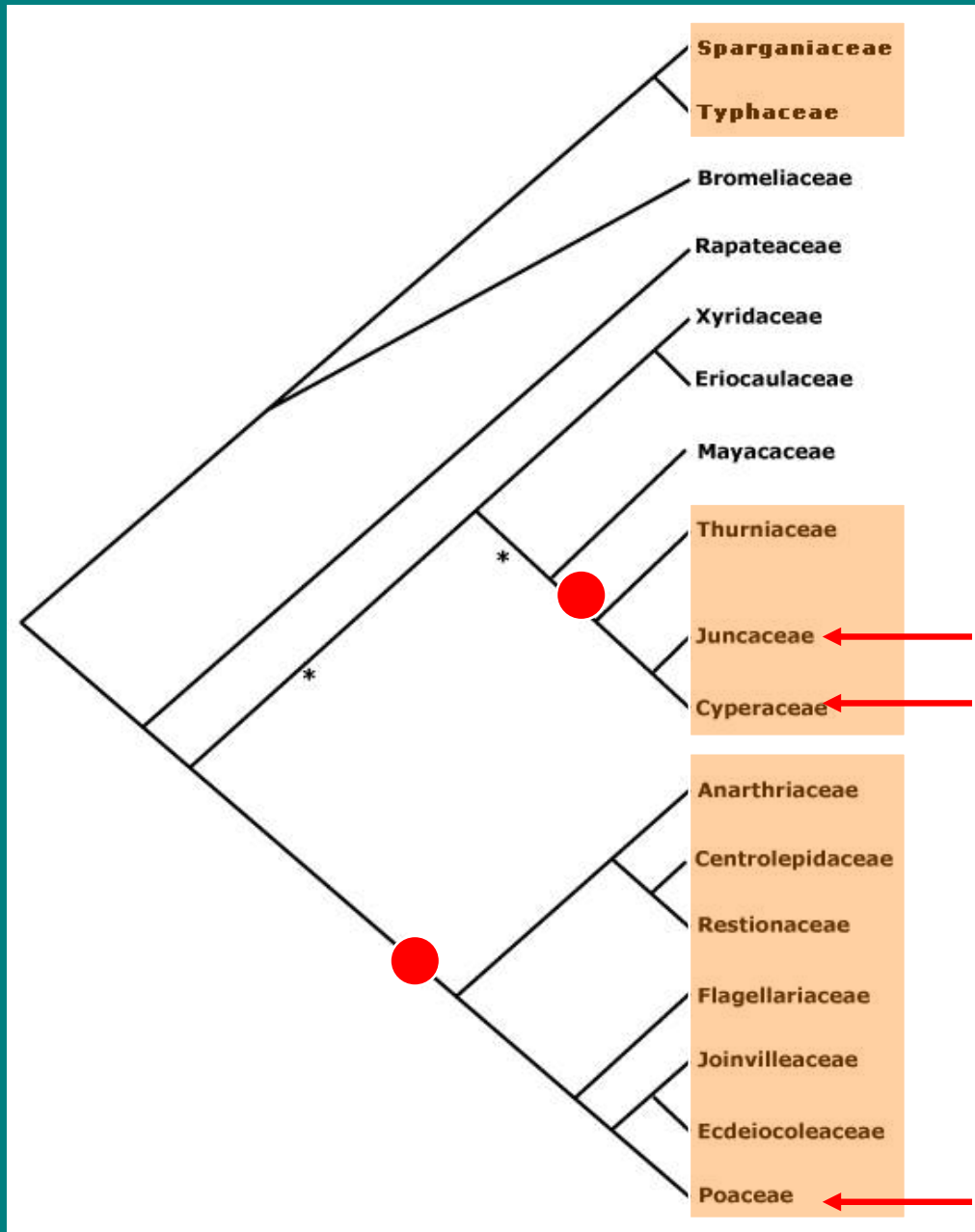
- look at 2 independent evolutions of “**graminoid**” habit, reduced flowers, and wind pollination

- reduced flowers, wind pollinated





# Poales II: wind pollinated families



- look at 2 independent evolutions of “**graminoid**” habit, reduced flowers, and wind pollination
- 3 families (rush, sedge, grass)
- reduced flowers, wind pollinated



# Graminoids: grasses, sedges, rushes

	<i>Juncaceae</i> (Rushes)	<i>Cyperaceae</i> (Sedges)	<i>Poaceae</i> (Grasses)
<b>Leaves</b>	Generally inrolled or round in cross-section; hollow or with cross-partitions (you can feel these with your fingernail)	3-ranked (in 3 rows): Flat, W-shaped in cross-section, or apparently lacking (e.g. in <i>Eleocharis</i> , <i>Schoenoplectus</i> )	2-ranked (in 2 rows), sometimes appearing leafless
<b>Sheaths</b>	Margins overlapping	Margins fused	Margins overlapping or (less often) fused
<b>Ligules</b>	None	A flap of tissue at the junction of the sheath and blade, partly fused to the blade	A flap of tissue at the junction of the sheath and blade, not at all fused to the blade
<b>Floral scales</b>	No scales beneath flowers. 6-merous perianth (looks a little like a lily flower)	1 below each flower	2 surrounding each flower (palea and lemma)
<b>Flowers</b>	Usually bisexual Three(six)-merous	Bisexual or unisexual	Bisexual
<b>Fruits</b>	Capsule filled with 3 to many seeds	Achene (a hard nutlet)	Grain



# \*Juncaceae - rushes

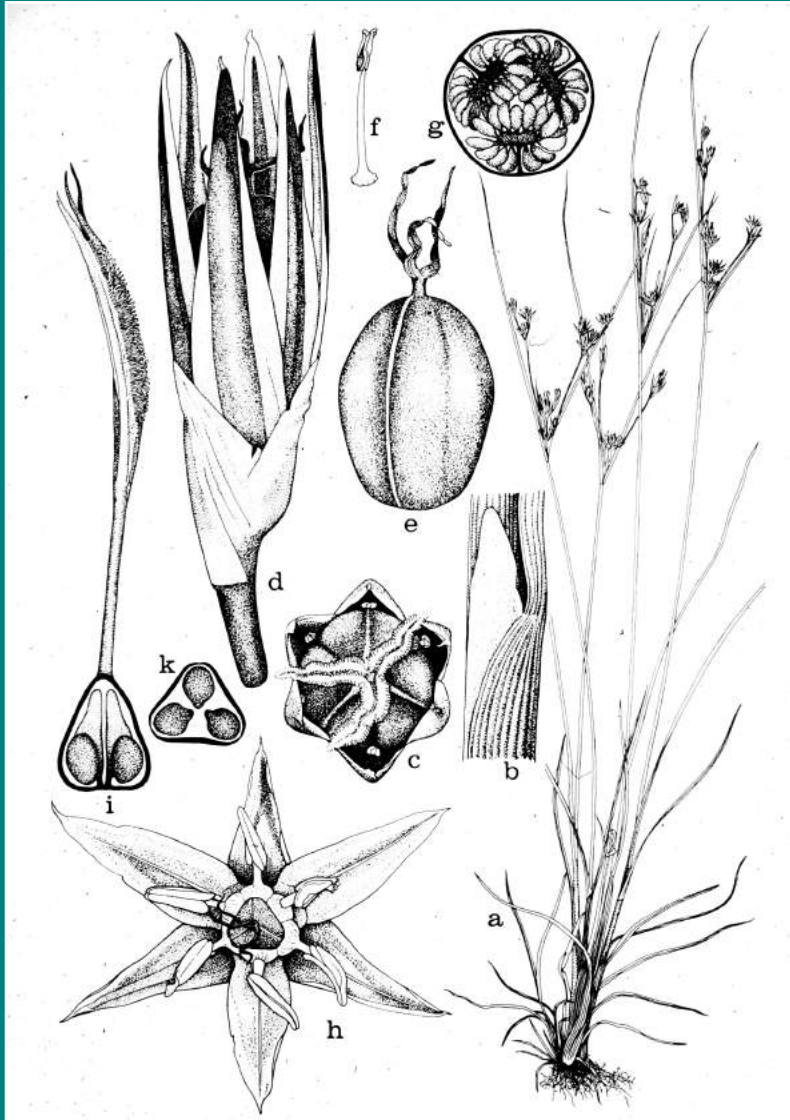
- largely two genera - *Juncus* (rush) and *Luzula* (wood rush)
- often **tussock** forming, leaves usually **3-ranked** on round, often partitioned stems
- inflorescence congested, often terminal or appearing lateral





# \*Juncaceae - rushes

- flowers mainly **bisexual**, **reduced** and wind pollinated
- **6 brownish tepals** (lilioid!) surround 6 stamens and superior 3-carpellate ovary



*Juncus greenei* - Green's rush

Fruit is a 3 to many-seeded **capsule**.



*Luzula acuminata*  
Wood rush



# \*Juncaceae - rushes



*Juncus arcticus* - Baltic  
rush

Note rhizome with  
vertical stems



*Juncus effusus* - Common  
rush

*Juncus  
tenuis*  
Path rush



# \*Juncaceae - rushes



*Luzula acuminata* - Wood  
rush



*Luzula multiflora* - Common  
wood rush

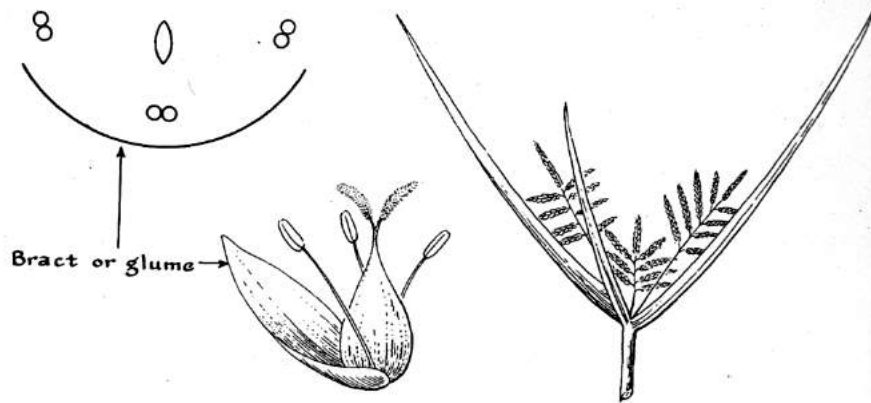


# \*Cyperaceae - sedges

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.



# \*Cyperaceae - sedges



111 *Cyperus*, floral diagram, flower, and inflorescence.

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

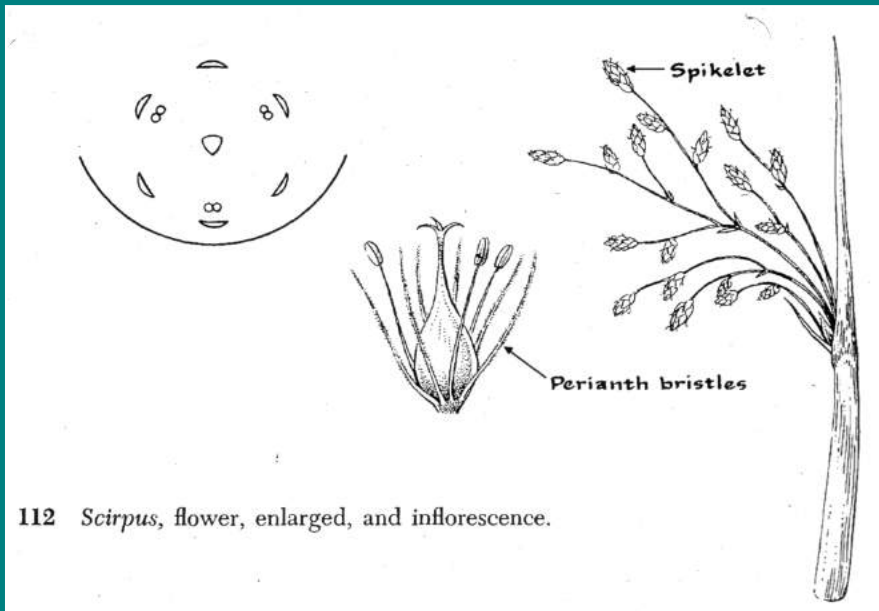


*Cyperus lupulinus*-  
Sand cyperus or sedge



# \*Cyperaceae - sedges

*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.



*Schoenoplectus tabernaemontani* (*Scirpus validus*)  
Soft-stem bulrush



# \*Cyperaceae - sedges



*Scirpus* sp.



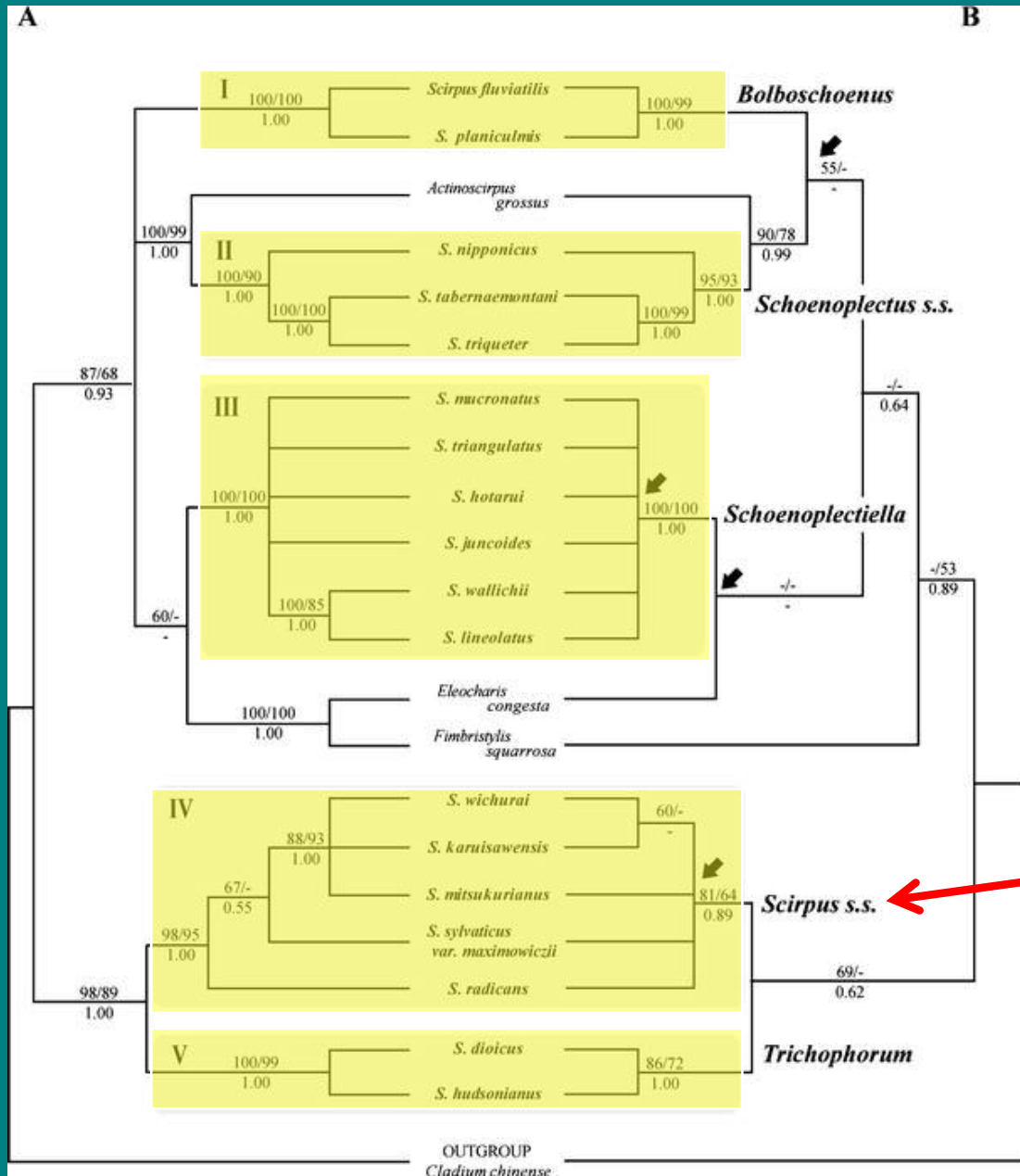
*Scirpus cyperinus*  
Wool-grass



*Scirpus atrovirens*  
Dark green bulrush



# \*Cyperaceae - sedges



## *Scirpus* (bulrushes)

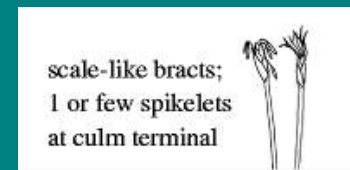
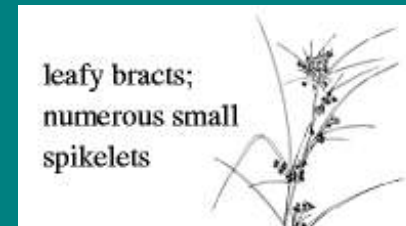
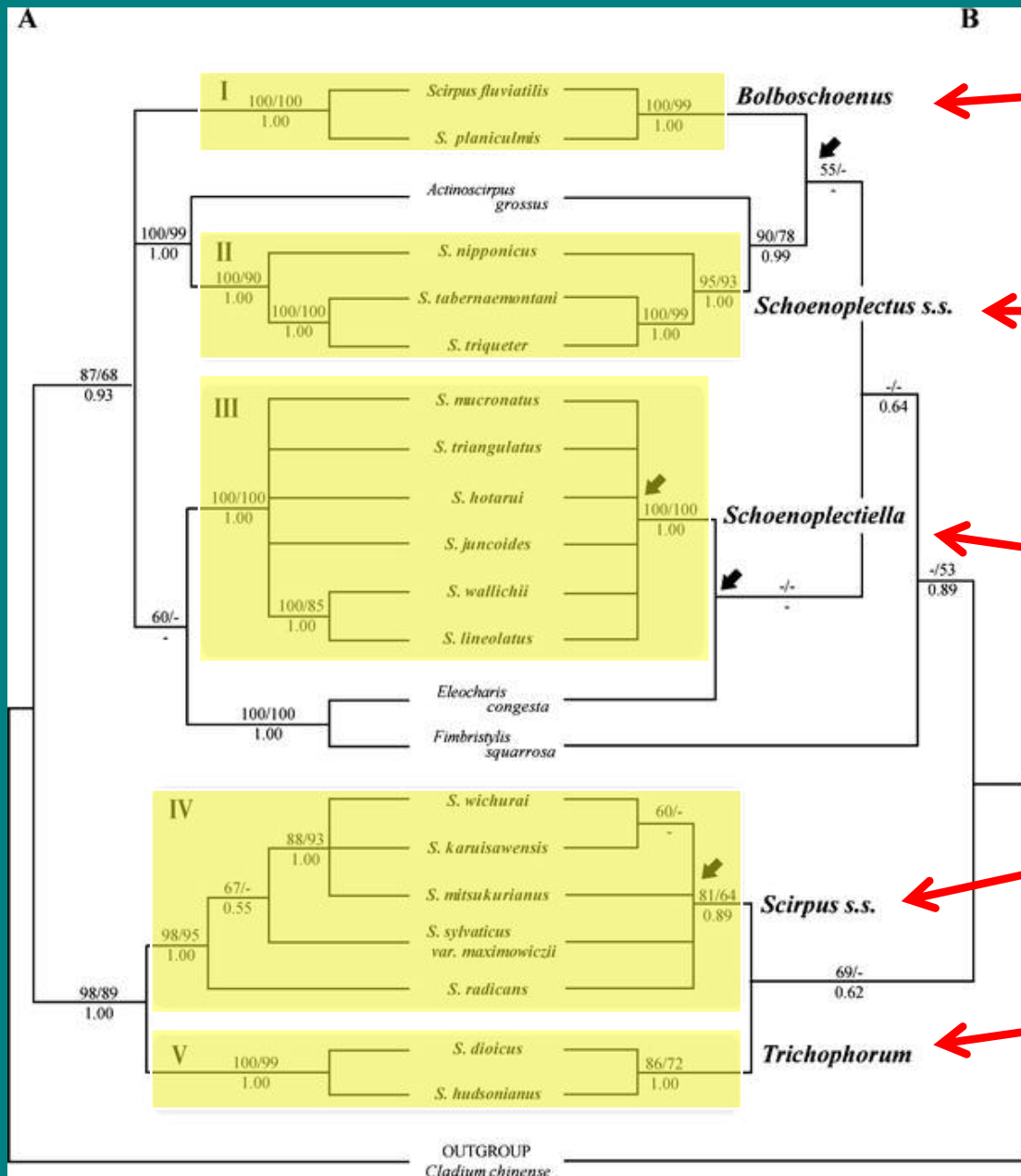
- a mess - polyphyletic!
- different species related to other genera (incl. *Carex* – sedges)



Daniel Spalink – former Botany grad – works on this group

Jung & Choi 2010

# \*Cyperaceae - sedges



morphological features!



# \*Cyperaceae - sedges

*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.

Male florets

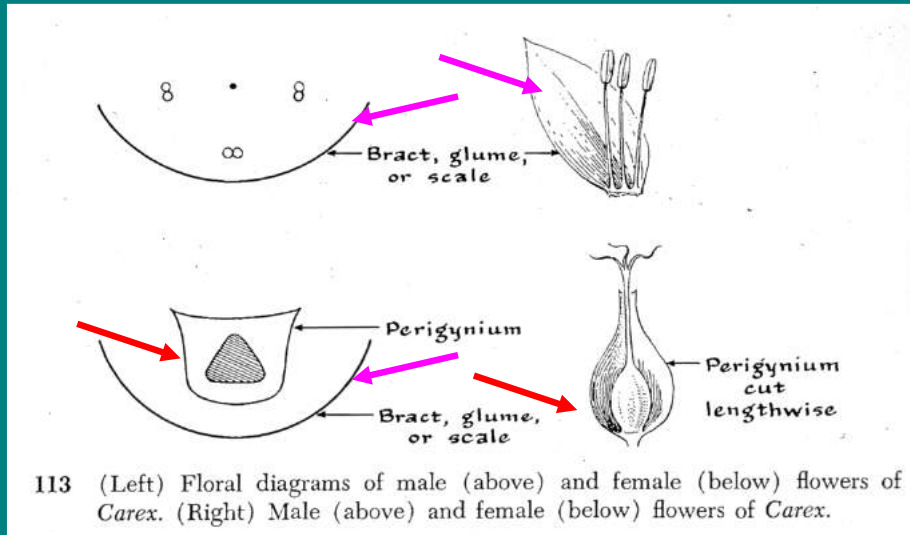
Female florets



*Carex pensylvanica*  
Pennsylvania sedge

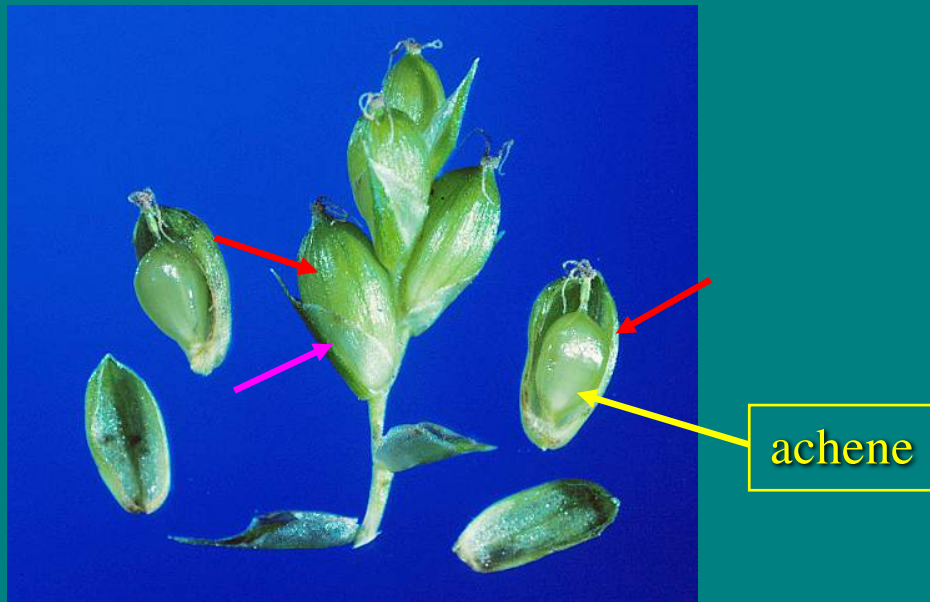


# \*Cyperaceae - sedges



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.



*Carex blanda* - Wood sedge



*Carex intumescens* - Bladder sedge

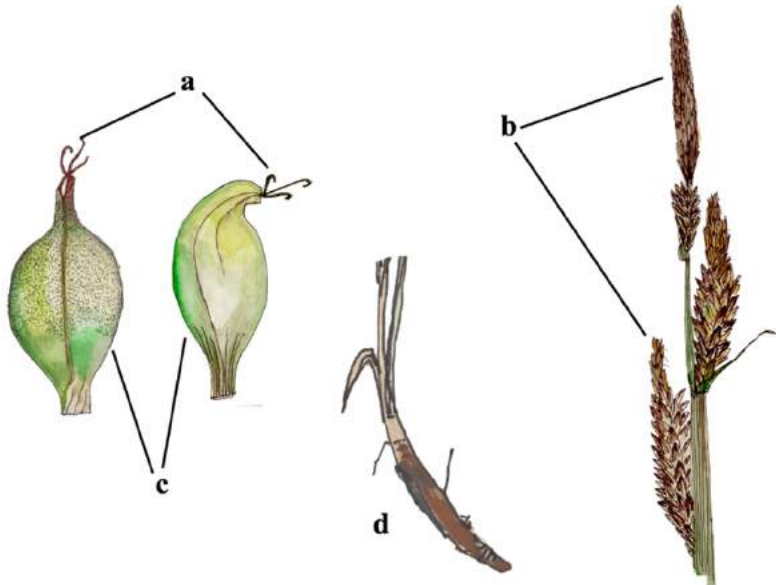


# \*Cyperaceae - sedges

*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:

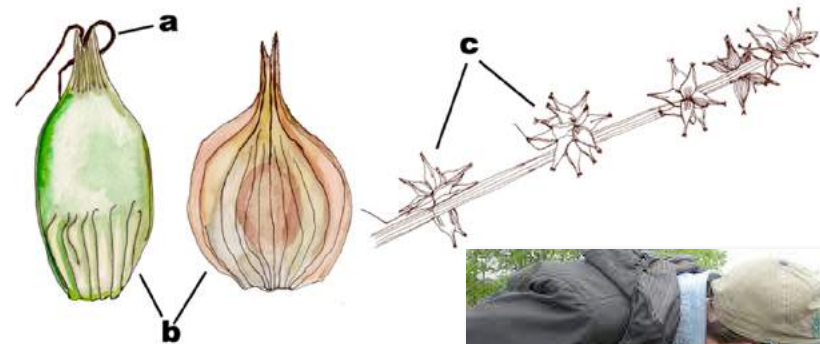
## **Carex subgenus *Carex***

- 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**



Andrew Hipp

# \*Cyperaceae - sedges



*Carex stricta*  
Tussock sedge



A common woodland species

*Carex pensylvanica*  
Pennsylvania sedge





# \*Cyperaceae - sedges

Other genera . . .



*Eriophorum angustifolium*  
cottongrass



# \*Cyperaceae - sedges



Other genera . . .



*Eleocharis ovata* - spikerush