

ANATOMY AND MORPHOLOGY OF THE JUNCACEAE – RUSH FAMILY

Slide 2 – A quick family description as found with all family files on this site.

Slide 3 – A brief comparison of Graminoids (grasses, sedges and rushes)

Slide 4 to 14 – Anatomy and Morphology of the 2 Rush Genera

SOME HINTS, HELPS, AND THOUGHTS ON WORKING WITH RUSHES

1. –Although most are **perennial**, one should examine the roots of a rush to determine the size and type of **rhizomes** present. I carry a long Philips-head screwdriver for digging purposes (easier to carry than a small digging tool)
2. -In most cases one must examine a rush in the **fruiting stage** to best be able to key it out (occasionally the flowering stage is important)
3. -Although some can ID rushes in the field using a **hand lens** and a key, an amateur (and sometimes the expert) must see the perianth and seed shape and size, etc. under a binocular microscope (often with a little dissecting). Once thoroughly familiar with a species they can usually then be ID in the field.
4. -To keep samples fresh for 1 or 2 weeks or more I use Ziplock bags (usually gallon size) and in the field I mist them using a small plastic pump bottle with water and then keep the bags in the refrigerator at home.
5. -The point-and-shoot cameras of today makes recording a plant easy. I try to take pictures (weather I use them or not) if it may be a new species (for my database) of all features using the close-up mode (often the light is better in the field than at home). At home I can also take pictures (with patience) through the eyepiece of my old binocular microscope (this works amazing well without having expensive lab instruments).
6. -At first it was very difficult using the keys (and occasionally it still is) but with experience in seeing and describing the array of rush structures, it gets easier especially as one can often determine the Genus with a glance and work the keys from there.

JUNCACEAE – RUSH FAMILY

Plant: annual or more often perennial

Stem: solid or hollow, mostly round, a few flat, rhizomes common

Root: fibrous

Leaves: mostly linear, sessile, parallel veins, flat or more often round and wiry, usually basal, sheath either closed or overlapping, auricles (ears) often present at leaf-stem junction

Flowers: small, 3 sepals and 3 petals (usually dull), in single flowers or clusters in many complex types of inflorescences, a leaf-like bract often subtends each cluster or head; mostly perfect, regular (actinomorphic); 3 or 6 stamens; 1 pistil, ovary superior

Fruit: capsule with 3 to many seeds

Other: Monocotyledons Group

Genera: 9+ genera

GRASSES, SEDGES AND RUSHES (sometimes termed Graminoids)

[V. Max Brown]

Grasses (Gramineae or **Poaceae**), **Sedges** (**Cyperaceae**) and **Rushes** (**Juncaceae**) are monocotyledon plants that at first glance may seem to look alike but are mostly separated fairly easily. However, exceptions do occur for many characteristics below so **beware!!!** All three families have leaves with parallel veins, one seed leaf and the vascular bundles are scattered within the pith of the stem.

Grasses – **Plants** annual or perennial, herbaceous to rarely woody, caespitose (forming dense tufts) or not, perennials usually with rhizomes and sometimes stolons; **Roots** fibrous; **Leaves** basal and/or cauline, 2-ranked (vertical rows), alternate, mostly flat (may curl or be folded), leaf sheaths usually open or split (but often overlapping), sometimes sheaths are partially to mostly closed or fused, Ligules often present, auricles sometimes present; **Stems (culms)** are usually round (may be oval or somewhat flattened), nodes solid and usually swollen, internodes hollow or solid; **Inflorescence** of small Florets (flowers) within Spikelets (subtended by 2 empty bracts termed Glumes) forming Spikes, Racemes, or Panicles or some combination thereof; **Florets (flowers)** usually enclosed in 2 bracts (Lemma and Palea), petals and sepals absent, with usually 3 stamens, 1 pistil; **Fruit** usually a Caryopse (Grain), seed fused to pericarp.

Sedges – **Plants** annual or mostly perennial, herbaceous, caespitose (forming dense tufts) or not, perennials usually with rhizomes and sometimes with stolons; **Roots** fibrous; **Leaves** basal and/or cauline, alternate, mostly 3-ranked (vertical rows) but not always, blades sometimes flat or V- or M-shaped, rarely round or reduced, midvein usually large, leaf sheaths usually closed or fused, blades may be absent in basal leaves, ligules often present but may be reduced; **Stems (culms)** most often triangular but some are round (terete), sometimes flattened, rarely 4- or 5-angled, nodes lacking, interior usually solid (Pith); **Inflorescence** of one to many terminal and/or axillary (rarely basal) spikelets in panicles, umbels, racemes, spikes or head-like clusters (capitulum) which may be subtended by bracts; **Flowers** mostly bisexual (some unisexual), perianth absent (naked) or reduced to bristles or scales, 1 to 3 stamens, 1 pistil (enclosed in a sac-like structure (perigynium) in the genus *Carex*), ovary superior; **Fruit** a biconvex or trigonous achene, 1 seed free of pericarp.

Rushes – **Plants** mostly perennial, occasionally annual, herbaceous, caespitose (forming dense tufts) or not, mostly with rhizomes; **Roots** fibrous; **Leaves** 3-ranked (vertical rows) but rarely 2-ranked, mostly basal, often round (terete) but sometimes grass-like (flat) or reduced, leaf sheaths usually open or split, many with auricles; **Stems (culms)** are usually round (terete), sometimes flat, rarely angled, nodes lacking, interior solid; **Inflorescence** of spikelets in compound panicles and racemes of cymes, umbels or spikes of head-like clusters to single terminal spikelets, often subtended by bracts; **Flowers** perfect, mostly bisexual, rarely unisexual, perianth present usually as greenish to brownish tepals (3+3), 3 or 6 stamens, compound superior ovary, 3 stigmas; **Fruit** a capsule with 3 to many seeds.

****A common saying (but user beware) – “sedges have edges, rushes are round, grasses are hollow right up from the ground”**

**** A variation – “Sedges have edges and rushes are round, grasses have joints when the cops are not around”**

RUSH ANATOMY – Typical Rush

[V. Max Brown]

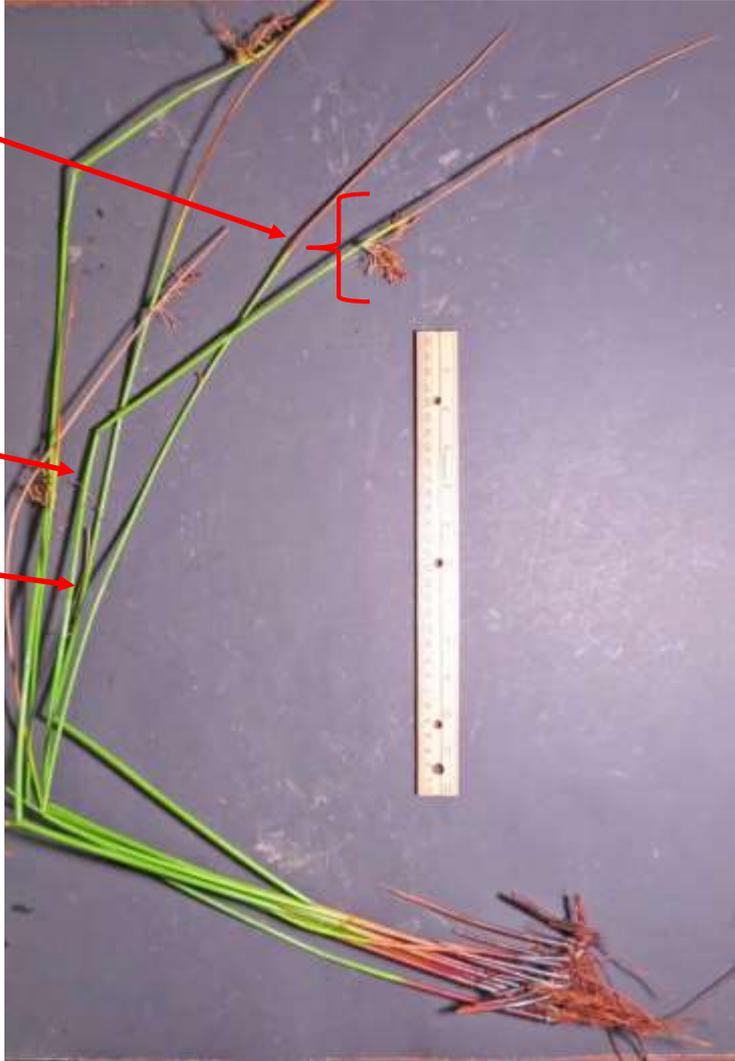


Inflorescence – the flowering and achene forming (reproduction) part of a rush plant (a variety of structures)

Culm - (stem of rush below the inflorescence)

Leaf - leaves mostly basal, often **3-ranked**, with or without blades

Roots – **Fibrous** roots, **caespitose** (clumping or in dense tufts) or not, most with **Rhizomes**



Although many terms will be defined, knowledge of some basic botanical terminology is expected

RUSH ANATOMY – Culms (Stems)

[V. Max Brown]

Culms (stems) are erect or at least ascending, mostly terete (round) or sometimes compressed or flat. They are usually not branched below the inflorescence.



Culms above glabrous

Culms above with striations (number of striations may be used in ID)

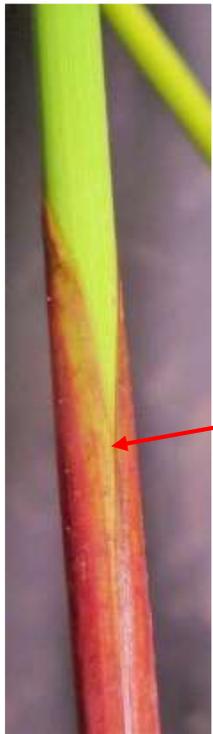
RUSH ANATOMY – Leaves

[V. Max Brown]

The **Leaves** of rushes are usually terete (round) or round-curved but may also be flat.



Flat leaves, glabrous mostly but some with hairs on margins – important in ID



Overlapping (open) leaf sheath without a leaf blade.



The presence or absence of cross partitions in round leaves is used in many ID keys. Some round leaves may become somewhat C-shaped distally

RUSH ANATOMY – Leaf sheaths and Auricles

[V. Max Brown]

Leaf sheaths may be overlapping or closed (fused). Auricles (ear-like projections at culm and leaf blade junction) are often present and important in ID



Leaf sheaths may be overlapping (left above) or closed (right above).



Auricles at leaf–culm junction. On the right the culm has been pulled out to show the auricle better.

RUSH ANATOMY – Fibrous Roots and Rhizomes

[V. Max Brown]

The size and shape of Rhizomes may be important in ID of some species.



Small and very stout scaly rhizomes



Rhizomes and fibrous roots – note reddish coloration at base of leaf sheaths on right



Rhizomes and fibrous roots – note basal leaves pressed nearly flat

RUSH ANATOMY – Bracts and Bracteoles

[V. Max Brown]

Bracts, reduced bracts and bracteoles are usually found at the base of the inflorescence, at base of branches of the inflorescence and at the base of individual flowers.



Leaf-like bracts subtending inflorescence



Stem-like bracts extending vertically above inflorescence – gives a false impression of a lateral inflorescence (resembles some sedges)



Reduced bracts at base of branches of inflorescence



Hyaline bracteoles at base of individual flowers

RUSH ANATOMY – Inflorescences

[V. Max Brown]

Inflorescences consist of single (solitary) flowers or clusters of flowers (open to dense) arranged in various branched structures. Some examples are shown below – for further descriptions, see the individual specie descriptions. The lower right photos is an example of a species in which some reproduction is by asexual plantlets



RUSH ANATOMY – Flowers

[V. Max Brown]

A rush flower is bisexual, has a radially symmetrical perianth consisting of 3 sepals and 3 petals (3+3) that are green to brown to black (or purplish). Hyaline bracteoles are usually present at flower base. There are 3 or 6 stamens, 1 pistil, and the ovary is superior. Since ID is normally done at the fruiting stage, the seed capsule is present below rather than the sexual structures. The capsules dehisce by 3 valves with 3 to many seeds.

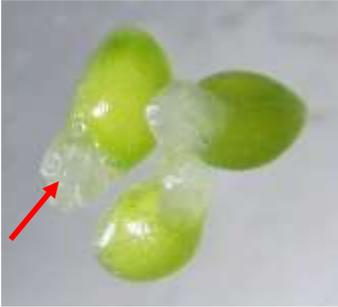


The size and shape of the sepals and petals and their size compared to the seed capsule is important in ID of rush species. In addition, the size, coloration, and shape of the seeds is also important.

RUSH ANATOMY – Seeds

[V. Max Brown]

There are 3 to many seeds within the capsule. Some have white caruncles attached.



3 seeds from each capsule (immature (green) here turning brown) with conspicuous white Caruncle (nutritive appendage attached) – here seeds are about 1.0+ mm, caruncle about 0.6 mm)



Seeds (< 0.5 mm)



Seeds to 0.4-0.5 mm, no tails, yellowish brown



Seeds 0.4 to 0.7 mm long, tapering to a point at both ends with dark spots, no tails, color a yellow-brown

RUSHES – Genera and Species

[V. Max Brown]

The *Flora of North America*, Volume 23, lists 2 genera and 118 species in North America (North of Mexico) – for comparison sake, *The Flora of Missouri*, Volume 1, lists 2 genera and 24 species. 9+ genera and 350+ species are estimated worldwide.

<u>Genera</u>	<u>F of NA</u>	<u>F of MO</u>	<u>(Species)</u>
Juncus	100	23	
Luzula	18	1 (with varieties)	
Totals	118	24	

Comparison of number of species in the 2 genera of rushes

RUSHES – 2 Genera (in North America)

[V. Max Brown]

Genus Juncus

- many seeds present in capsule
- plant glabrous (no hairs)
- leaf sheaths open (usually overlapping)
- fruits 1- or 3-chambered



Genus Luzula

- 3 seeds present in capsule
- plant with hairs particularly on leaf edges or margins
- leaf sheaths closed
- fruits 1-chambered

