Diversity and Floristics of Monocots... aroids, lilies, orchids...
We will finish our survey of angiosperms by going back to the basal angiosperms and take a look at the monocotyledons - those possessing one seed leaf.

The other main features of the monocots separating them from all other flowering plants are:

1. 3-merous flowers
The Monocots

We will finish our survey of angiosperms by going back to the basal angiosperms and take a look at the **monocotyledons** - those possessing one seed leaf.

The other main features of the monocots separating them from all other flowering plants are:

1. 3-merous flowers

2. Parallel-veined leaves
The Monocots

We will finish our survey of angiosperms by going back to the basal angiosperms and take a look at the **monocotyledons** - those possessing one seed leaf.

The other main features of the monocots separating them from all other flowering plants are:

1. 3-merous flowers
2. Parallel-veined leaves
3. Absence of woody tissue
The Aquatic Monocots

Emergent, floating, or submerged aquatic group of monocots

These are the first diverging monocots
The Aquatic Monocots

Associated with the aquatic habit is the trend from insect-pollinated, showy flowers to water-pollinated, reduced flowers.

The group shows increasing effort to vegetative reproduction over sexual reproduction.
*Alismataceae - water plantain family

Aquatic or wetland family, especially in north temperate regions

Leaves long petioled, often with sagittate-shaped leaves

Tubers starchy, often edible

*Sagittaria - arrowhead*
*Alismataceae - water plantain family

Calyx of 3 green sepals, corolla of 3 white petals

Carpels apocarpic

1-seeded achenes

Flowers can be unisexual

Sagittaria - arrowhead

CA 3    CO 3    A 6-∞    G 6-∞

Head of achenes
*Alismataceae - water plantain family

Similar to *Sagittaria*, but with carpels in one ring rather than globose head

*Alisma subcordatum* - water plantain
*Potamogetonaceae - pondweed family*

Aquatic plants with **dimorphic** leaves

**Wind** (and water) pollination

25 species in Wisconsin difficult to identify, hybridize, and some are troublesome weeds

*Potamogeton sp.* - pondweed
*Potamogetonaceae - pondweed family

Perianth of 4 clawed segments if present
Gynoecium typically of 4 free, 1-ovuled carpels
Fruit drupe-like
*Potamogetonaceae - pondweed family

Potamogeton nodosus - pondweed

Flowers (top) and fruits (bottom)
**Araceae - jack-in-the-pulpit family**

Large family primarily of the tropics
Mainly epiphytic, others terrestrial, a few aquatic

Vegetative parts often containing *raphides* in the vacuoles with mucilage; raphides often *calcium oxalate* - an irritant

Inflorescence a fleshy *spadix*, surrounded by bract called the *spathe*

Flowers unisexual or perfect
Fruits berries clustered on spadix

*Symlocarpus foetidus* - skunk cabbage

*Arisaema triphyllum* - jack-in-the-pulpit
**Araceae - jack-in-the-pulpit family**

Rotting flesh odor, mottled purple and yellow-green coloration indicate specialized pollination syndrome.

*Symlocarpus foetidus* - skunk cabbage

Flesh flies - *Sarcophagidae*

Carrion flies - *Calliphoridae*

Gnats - *Mycetophilidae*
**Araceae - jack-in-the-pulpit family

*Arisaema triphyllum* - jack-in-the-pulpit
[or jill-in-the-pulpit ?]
**Araceae - jack-in-the-pulpit family**

Cabbage-like leaves emerge later in the spring

Foetid smelling inflorescence emerges early in spring or late winter; attracts carrion flies by heating up and volatizing off the odor

*Symplocarpus foetidus* - skunk cabbage
Endogenous heating of skunk cabbage (S. renifolius) spadix
Endogenous heating of skunk cabbage (*S. renifolius*) spadix

Cyclical heating of the skunk cabbage spadix in the male phase
**Araceae - jack-in-the-pulpit family**

*Calla palustris* - water arum

Our emergent aquatic member of the family
**Araceae - jack-in-the-pulpit family**

Floating or submersed aquatics derived from within jack-in-the-pulpit family

Vegetative reproduction primarily

*Lemna minor* - small duckweed

Includes the smallest angiosperm, and the smallest flower

Inflorescence reduced to 1 female and 1-2 male flowers

*Lemna turionifera* - perennial duckweed
**Araceae - jack-in-the-pulpit family**

*Spirodela polyrhiza*
great duckweed

Largest of the aquatics

Smallest member of the family and the angiosperms

*Wolffia columbiana* - water meal
Petaloid Monocots (Liliales + Asparagales)

The petaloid monocots represent two orders and contain most of the showy monocots such as lilies, tulips, blue flags, and orchids.

They are defined by 3 features:

1. **Geophytes**: herbaceous above ground with bulbs, corms, rhizomes, tubers as modified, perennial stems below ground.
Petaloid Monocots (Liliales + Asparagales)

The petaloid monocots represent two orders and contain most of the showy monocots such as lilies, tulips, blue flags, and orchids.

They are defined by 3 features:

1. Geophytes: herbaceous above ground with bulbs, corms, rhizomes, tubers as modified, perennial stems below ground.

2. Tepals: showy perianth in 2 series of 3 each; usually all petaloid, or outer series not green and sepal-like.
Petaloid Monocots (Liliales + Asparagales)

The petaloid monocots represent two orders and contain most of the showy monocots such as lilies, tulips, blue flags, and orchids.

They are defined by 3 features:

1. Geophytes: herbaceous above ground with bulbs, corms, rhizomes, tubers as modified, perennial stems below ground.

2. Tepals: showy perianth in 2 series of 3 each; usually all petaloid, or outer series not green and sepal-like.

3. Nectaries: usually well-developed nectar tissue at the base of ovary or stamens; insect or bird-pollinated.
Petaloid Monocots (Liliales + Asparagales)

The orders of Liliales and Asparagales contain 15 families in the new classification system, but these are not well demarcated based on morphological features.

Warning! The families used and placement of genera in the Field Manual of the Michigan Flora are often wrong (but correct in Wisflora). See the handout provided and on the Student Herbarium cabinets for correct naming and placements.

“Liliaceae” is often used to house many of these unrelated plants

Crow-poison, false garlic

*Nothoscordum bivalve*

Amaryllidaceae

NOT Liliaceae
### Petaloid Monocots (Liliales + Asparagales)

<table>
<thead>
<tr>
<th>Genus</th>
<th>APG family - use!</th>
<th>Wisflora online</th>
<th>WI Flora book</th>
<th>MI Flora</th>
<th>Gleason/Cronquist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aletris</td>
<td>Nartheciaceae</td>
<td>Nartheciaceae</td>
<td>Liliaceae</td>
<td>Melanthiaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Allium</td>
<td>Amaryllidaceae</td>
<td>Amaryllidaceae</td>
<td>Liliaceae</td>
<td>Alliaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Anticlea</td>
<td>Melanthiaceae</td>
<td>Melanthiaceae</td>
<td>(as Zigadenus)</td>
<td>Melanthiaceae</td>
<td>(as Zigadenus)</td>
</tr>
<tr>
<td>Asparagus</td>
<td>Asparagaceae</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Camassia</td>
<td>Asparagaceae</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
<td>Hyacinthaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Clintonia</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Convallariaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Convallaria</td>
<td>Asparagaceae</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
<td>Convallariaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Erythronium</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Hemerocallis</td>
<td>Asphodelaceae</td>
<td>Xanthorrhoeaceae</td>
<td>Liliaceae</td>
<td>Hemerocallisace</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Hypoxis</td>
<td>Hypoxidaceae</td>
<td>Hypoxidaceae</td>
<td>Hypoxidaceae</td>
<td>Hypoxidaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Lilium</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Maianthemum</td>
<td>Asparagaceae</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
<td>Convallariaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Medeola</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Convallariaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Muscari</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Hyacinthaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Narcissus</td>
<td>Amaryllidaceae</td>
<td>Amaryllidaceae</td>
<td>Liliaceae</td>
<td>Amaryllidaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Ornithogalum</td>
<td>Asparagaceae</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
<td>Hyacinthaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Polygonatum</td>
<td>Asparagaceae</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
<td>Convallariaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Scilla</td>
<td>Asparagaceae</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
<td>Hyacinthaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Smilacina</td>
<td>(as Maianthemum)</td>
<td>(as Maianthemum)</td>
<td>(as Maianthemum)</td>
<td>(as Maianthemum)</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Streptopus</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Convallariaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Tofieldia</td>
<td>(as Triantha)</td>
<td>(as Triantha)</td>
<td>(as Triantha)</td>
<td>(as Triantha)</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Triantha</td>
<td>Tofieldiaceae</td>
<td>Liliaceae</td>
<td>Liliaceae</td>
<td>Melanthiaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Trillium</td>
<td>Melanthiaceae</td>
<td>Melanthiaceae</td>
<td>Liliaceae</td>
<td>Trilliaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Uvularia</td>
<td>Colchicaceae</td>
<td>Colchicaceae</td>
<td>Liliaceae</td>
<td>Convallariaceae</td>
<td>Liliaceae</td>
</tr>
<tr>
<td>Yucca</td>
<td>Asparagaceae</td>
<td>Asparagaceae</td>
<td>Liliaceae</td>
<td>Agavaceae</td>
<td>Agavaceae</td>
</tr>
<tr>
<td>Zigadenus</td>
<td>(as Anticlea)</td>
<td>(as Anticlea)</td>
<td>Liliaceae</td>
<td>(as Anticlea)</td>
<td>Liliaceae</td>
</tr>
</tbody>
</table>
**Liliaceae s.s. - lily family**

The family comprises herbaceous perennials common in the north temperate forests.

Leaves usually do not have a well-developed petioles and leaves are either sessile or basal.
**Liliaceae s.s. - lily family**

Flowers are showy and 3 merous with 6 tepals

3 fused carpels (superior) form capsule or berry with numerous seeds
**Liliaceae s.s. - lily family**

*Lilium michiganense* - Turk’s cap lily

*Medeola virginica* - Indian cucumber root

[special concern]
**Liliaceae s.s. - lily family

*Clintonia borealis* - Yellow bead lily
**Liliaceae s.s. - lily family

*Erythronium americanum*
- yellow trout lily

*Tulipa sp.* - tulip
*Melanthiaceae – trillium family

Trillium grandiflorum
- large flowered trillium

Trillium recurvatum
- prairie trillium
*Colchicaceae – bellwort family

*Uvularia grandiflora* - bellwort
*Asparagaceae – asparagus family

Asparagus officinalis – asparagus
adventive, cultivated
Maianthemum canadense - wild lily of the valley
Maianthemum stellatum -
Starry false Solomon’s-seal

Maianthemum racemosum -
False Solomon’s-seal

*Asparagaceae – asparagus family
*Asparagaceae – asparagus family

*Polygonatum pubescens - Solomon’s-seal*
Amaryllidaceae – amaryllis family

*Allium tricoccum* - Wild leak
some common cultivated species

Scilla sibirica - English bluebell
[Asparagaceae]
cultivated

Narcissus sp. - daffodil
[Amaryllidaceae]
Cultivated, note corona
some common cultivated species

Hemerocallis fulva - day lily
[Asphodelaceae]
cultivated
*Smilacaceae - catbriar family*

Small family, mainly of South Hemisphere
Climbing via **tendrils** (modified stipules)
Starchy tubers, edible

Distinctive with large, net-veined leaves and definite petioles

**Smilax herbacea** - bristly greenbriar
*Smilacaceae - catbriar family*

Flowers unisexual, dioecious plants; carrion flowers are foetid

*Smilax herbacea* - common carrion-flower

- Male umbel
- Female umbel

Fruit an umbel of black berries (red berries are from jack-in-the pulpit)
**Iridaceae - iris family**

A family primarily of Mediterranean climate geophytes. Leaves are basal and **equitant** - folded and overlapping.

*Iris virginica* - Blue flag, iris
**Iridaceae - iris family**

CA 3  CO 3  A 3  G (3)

Tepals 6, the 3 inner (petals) forming the “flags or standards”

The 3 outer (sepals) forming the “falls”
Note the nectar guides for insects

The 3 stamens are positioned under the 3 petal-like styles

The gynoecium is inferior and forms a 3-parted capsule

*Iris virginica* - Blue flag, iris
**Iridaceae - iris family**

*Iris versicolor* - Blue flag

*Iris pseudacorus* - Yellow flag
Introduced and potentially invasive
**Iridaceae - iris family**

*Irish lacustris*
Dwarf lake iris

Endangered species restricted to fringe areas of northern Great Lakes; clonal growth
**Iridaceae - iris family**

*Sisyrinchium campestre* - blue-eyed grass  
*Sisyrinchium* found in drier areas than *Iris*
**Iridaceae - iris family**

*Crocus vernalis* - Crocus cultivated

Crocuses are all introduced but are some of the earliest flowering plants in the spring. The dried styles of *C. sativus* yields the expensive saffron.
**Orchidaceae - orchid family**

Orchids are mycotrophic (= fungi dependent) lilioids; some are mycotrophic parasites

The family is diverse with about 800 genera and over 19,000 species, mainly of the tropics

Main features of the family:

- Pollen masses or pollinia
- Specialized floral structure and pollination biology
- Reduced stamen number
- Many, minute, dust-like seeds in capsules

Remember the Ericaceae!
**Orchidaceae - orchid family**

The lower petal is elaborated into the **labellum/lip** - the landing platform.

*Cypripedium acaule* - stemless lady’s-slipper
**Orchidaceae - orchid family**

The lower petal is elaborated into the **labellum/lip** - the landing platform.

Lady’s-slippers have two functional stamens with pollen masses.

*Cypripedium acaule* - stemless lady’s-slipper
**Orchidaceae - orchid family**

*Other lady’s slippers*

*Cypripedium arietinum*  
Ram’s-head lady’s-slipper  
threatened

*Cypripedium calceolus*  
Yellow lady’s-slipper
**Orchidaceae - orchid family**

*Cypripedium reginae*
showy lady’s-slipper
**Orchidaceae - orchid family**

*Cypripedium candidum*
white lady’s-slipper
Threatened, fen or calcareous soils
**Orchidaceae - orchid family**

All our other orchids have only 1 functional stamen with one or two pollinia.

The stamen is situated on a **column** formed by fusion with the top of the inferior gynoecium.
**Orchidaceae - orchid family**

- 2 pollinia sacs
- Style/stigmatic region
- Enlarged column
**Orchidaceae - orchid family**

*Aplectrum hyemale*
Putty root, Adam and eve
[Special concern]
**Orchidaceae - orchid family**

*Arethusa bulbosa* - Dragon’s mouth  
[Special concern]

*Calypso bulbosa* - calypso orchid  
[threatened]
**Orchidaceae - orchid family**

*Calopogon tuberosus* - grass pink: note the labellum on top!
**Orchidaceae - orchid family**

*Goodyera pubescens*
Rattlesnake plantain

*Goodyera tesselata*
Rattlesnake plantain
**Orchidaceae - orchid family**

*Corallorhiza trifida* - Early coral root

*Corallorhiza striata* - Striped coral root
**Orchidaceae - orchid family**

- *Galearis spectabilis* - showy orchid
- *Malaxis monophyllos* - adder’s mouth
**Orchidaceae - orchid family

*Platanthera leucophaea*

Prairie fringed orchid

State endangered, Federally threatened
**Orchidaceae - orchid family**

*Pogonia ophioglossoides* - snake mouth

*Spiranthes cernua* - nodding ladies’ tresses
*Dioscoreaceae - yam family*

Small family, mostly of the tropics, with viney stems and net-veined leaves. Fruits are 3-winged.

Source of edible yam; sources of steroids, cortisones, first oral contraceptives (diosgenin, progesterone)