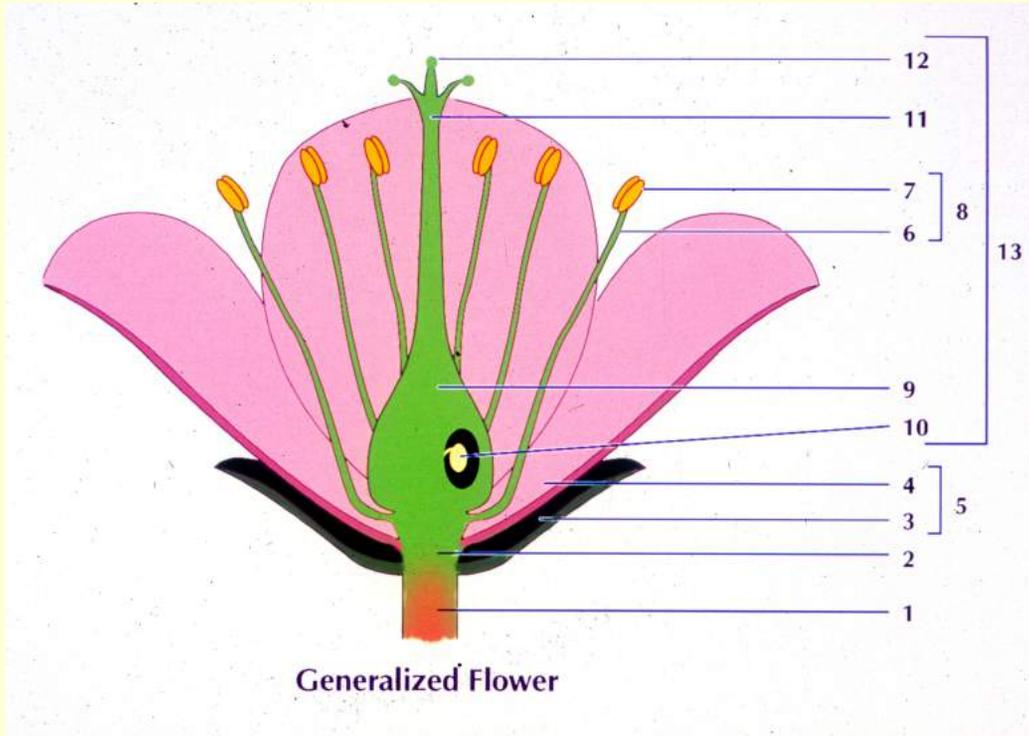


A close-up photograph of a white flower with a yellow center. A coin is placed on the flower's surface for scale. The text "The 'Early-Diverging' Flowering Plants" is overlaid in yellow.

The “Early-Diverging”
Flowering Plants

The Flower – 4 Basic Whorls



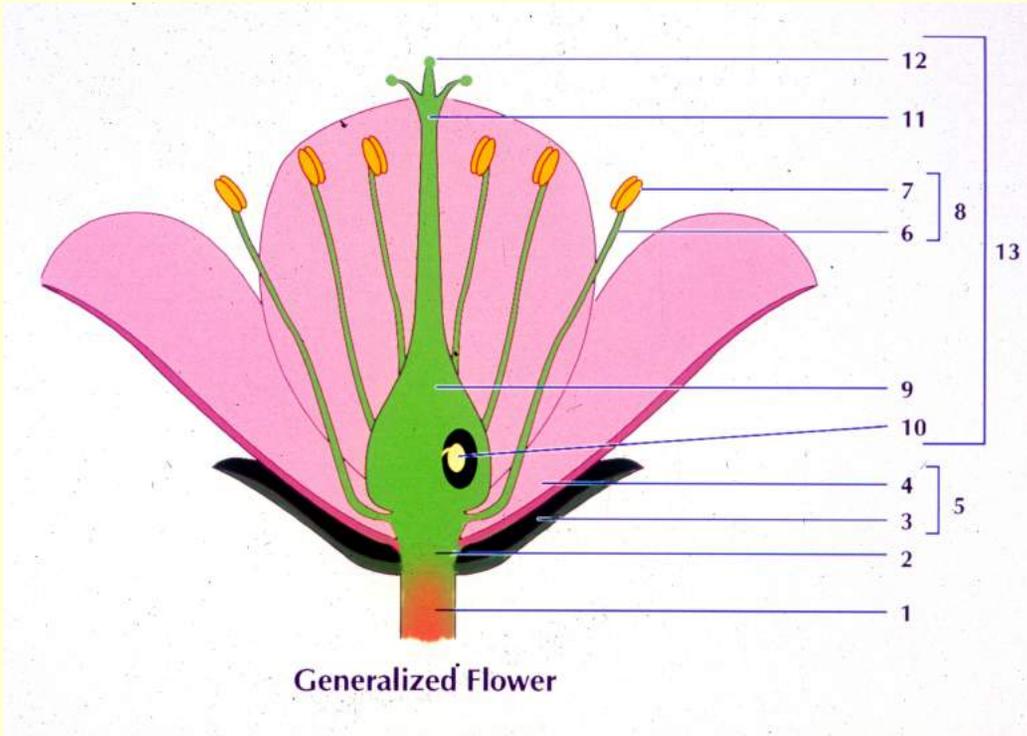
Calyx [CA]: the green sepals (#3)

Corolla [CO]: the showy petals (#4)

Androecium [A]: the stamens or male structures (#6-8)

Gynoecium [G]: the carpels or pistils or female structures that contain an ovary (#9-12)

The Flower – 4 Basic Whorls



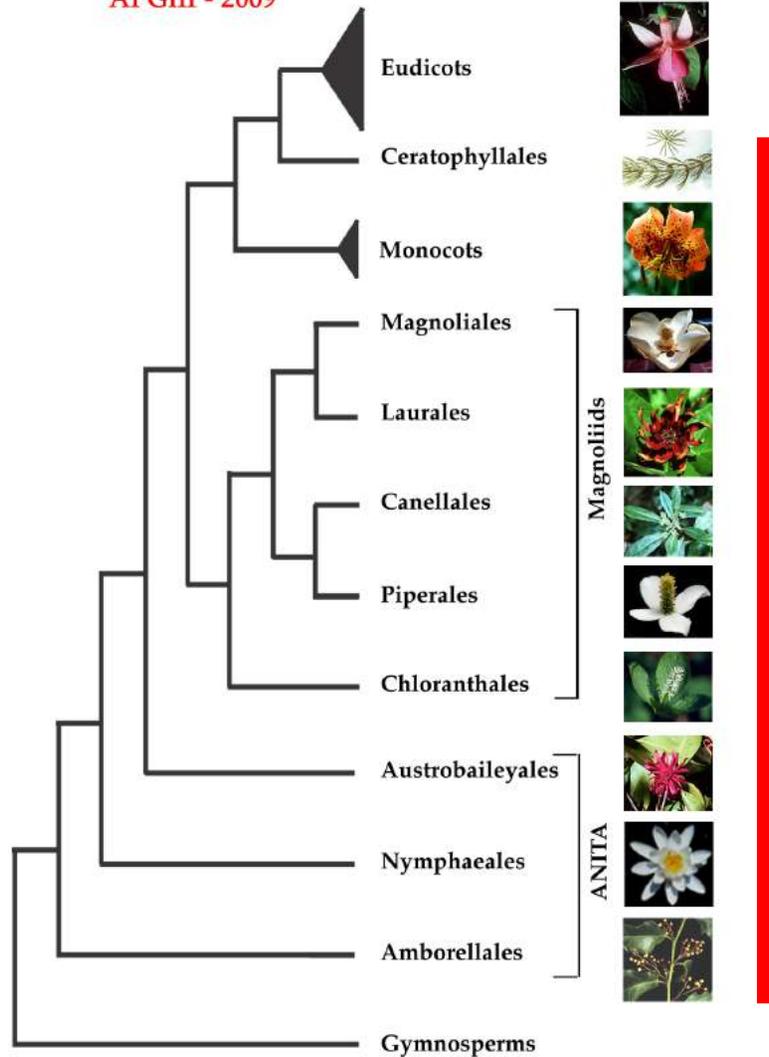
Variation in flowers –
immense and what makes
them successful!

- number of parts
- symmetry
- fusion of like parts
- fusion of unlike parts
- placentation
- position of ovary
- inflorescence type

will use **floral formulas** as shorthand

Magnoliophyta - Flowering Plants

Basal Angiosperm Phylogeny
APGIII - 2009

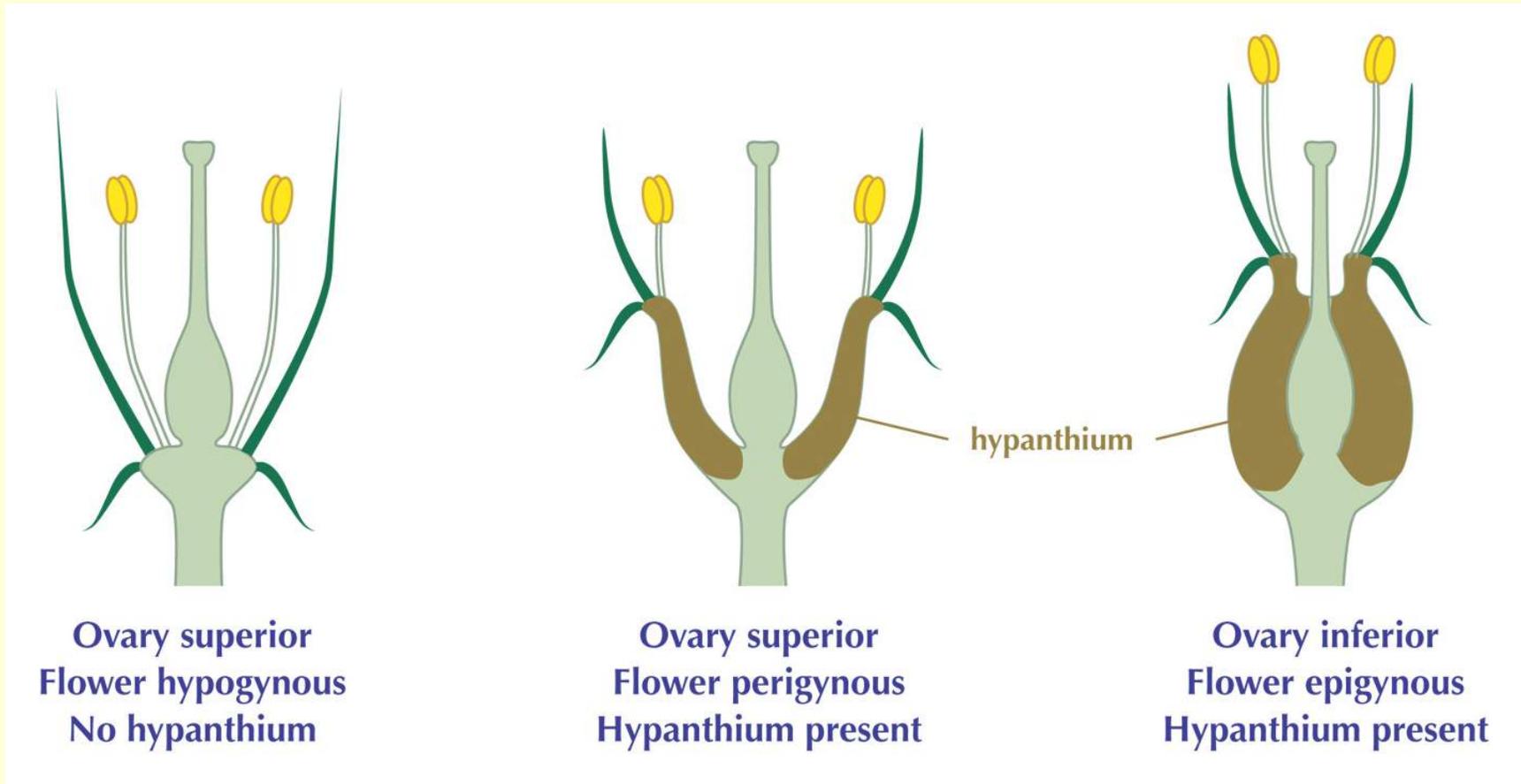


Early Diverging Angiosperms

We will begin our survey of Great Lakes' flowering plants by examining the “early diverging angiosperms”

The Flower

Early diverging angiosperms tend to have floral parts **not** fused

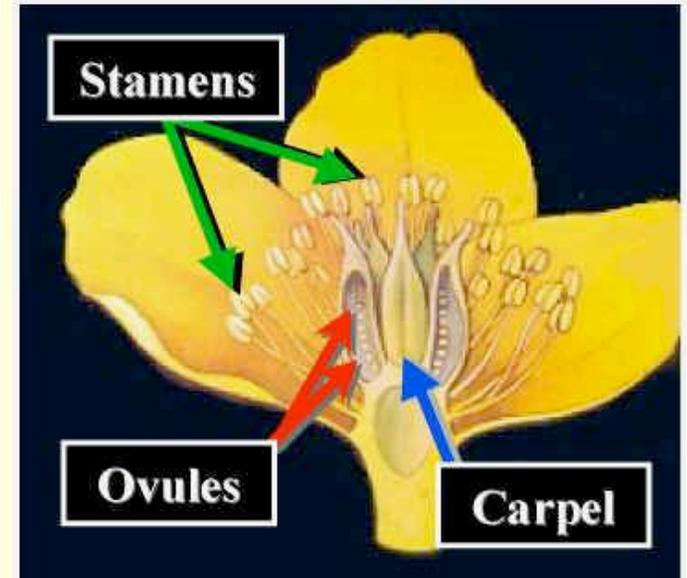
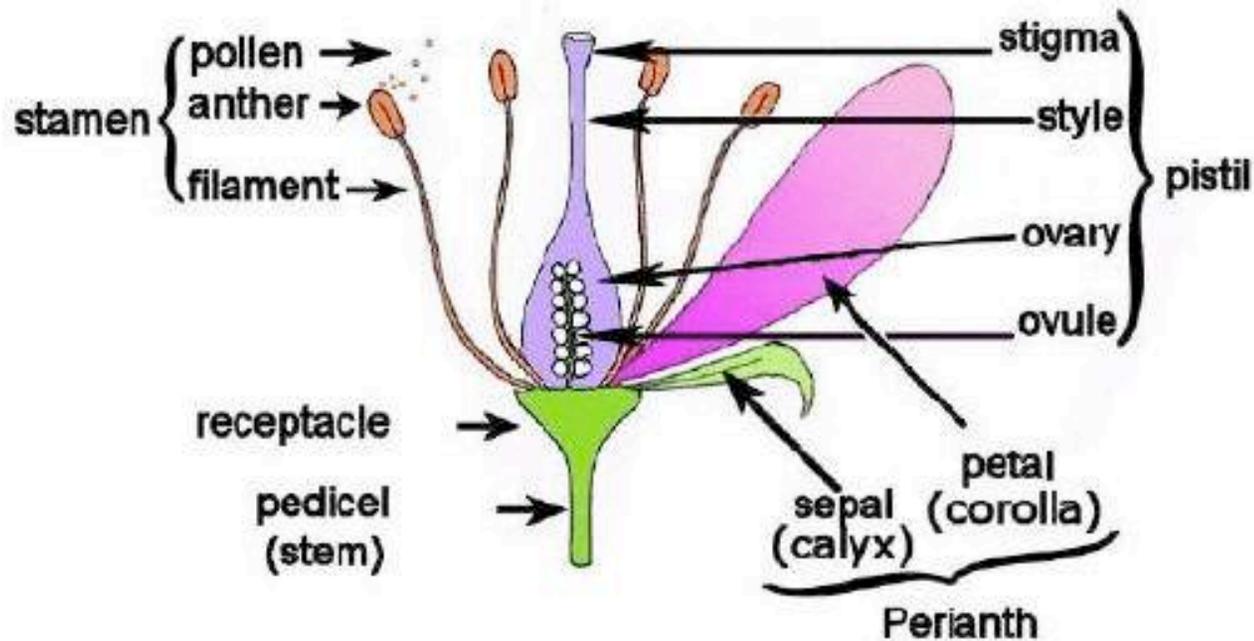


Connation: fusion of floral parts from same whorl

Adnation: fusion of floral parts from different whorls

The Flower

Early diverging angiosperms tend to have floral parts **not fused** . . . and have **many parts** at each whorl



Magnoliaceae - magnolia family

Not found in Wisconsin, but part of the Alleghenian flora. Sub-tropical and warm temperate trees



$P \infty$ $A \infty$ $\underline{G} \infty$

Tepals, laminar stamens,
apocarpic



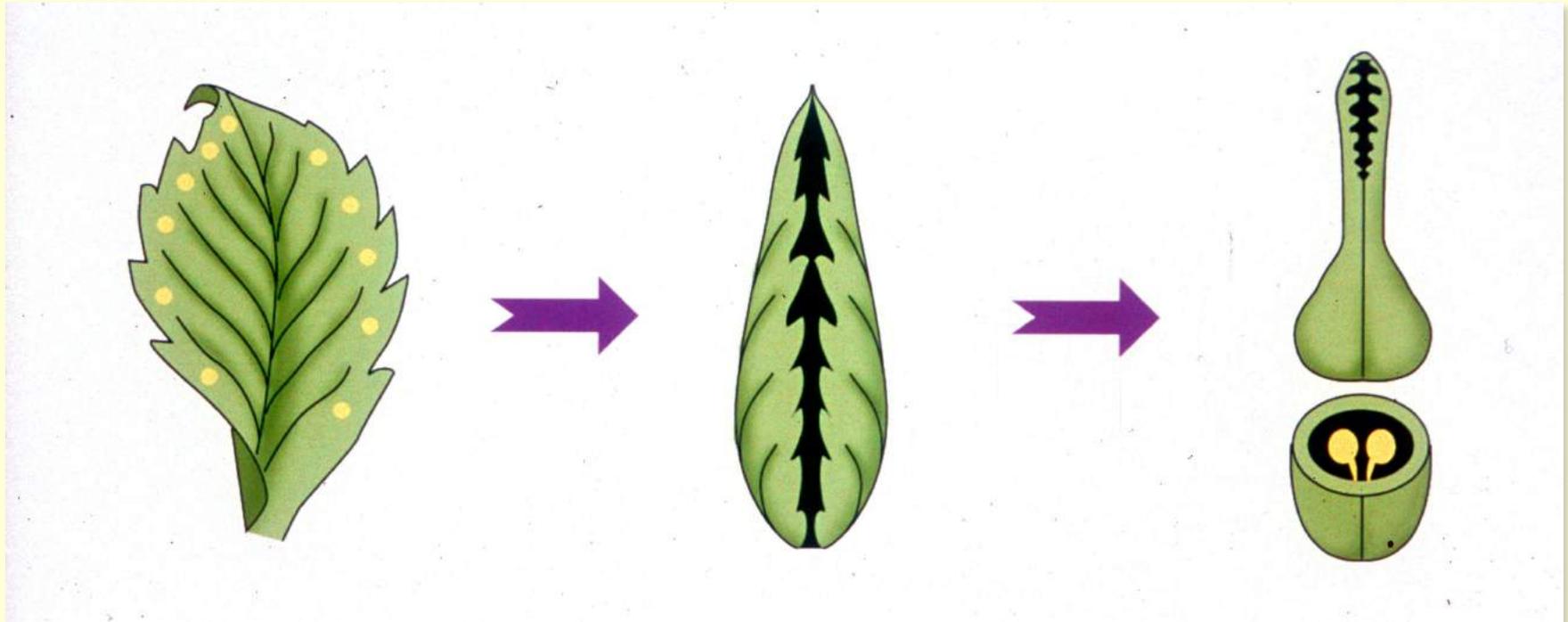
Magnolia



Fruit = “cone” of **follicles**

Dehiscent fruit with one
suture, derived from one
carpel

Derivation of the follicle fruit



1 floral 'leaf' or carpel
with ovules

Folded carpel

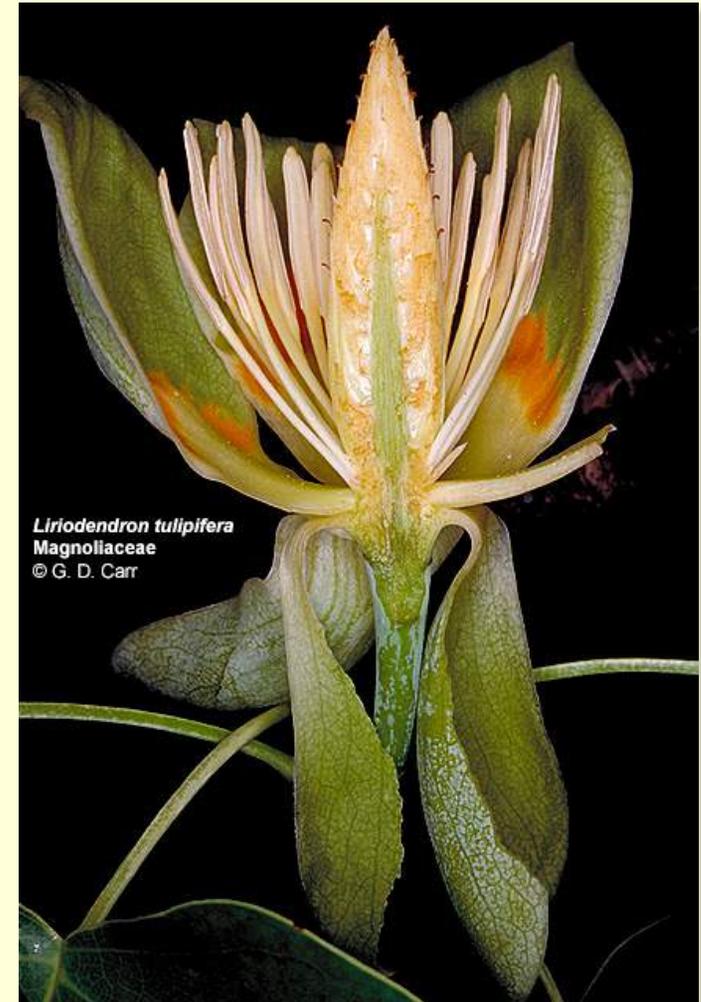
1 carpel with 2
rows of seeds;
the fruit opens
along the 1 line
of suture

Magnoliaceae - magnolia family

Tulip tree (*Liriodendron*) is also not native, but commonly planted.
Pollinated by beetles



Liriodendron - tulip tree,
yellow poplar



Aristolochiaceae - birthwort family

8-10 genera and about 600 species worldwide; 1 species in Wisconsin. Mostly vines in the tropical regions, but herbs in temperate regions.



Aristolochia - birthwort

Aristolochia clematis: doctrine of signatures
- birthwort, "well born", aristocrat

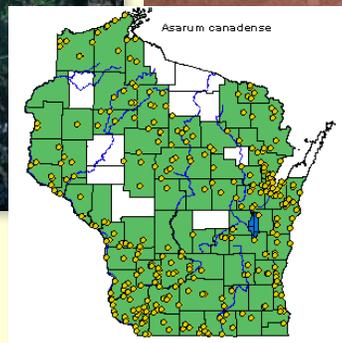
cordate or heart-shaped leaves.



Asarum – wild
ginger

Aristolochiaceae - birthwort family

Asarum canadense - wild ginger



Used by eastern native Americans as a contraceptive, thick rhizome root can be cut up, boiled, and cooked in heavy sugar syrup to make candied ginger.

Aristolochiaceae - birthwort family

Asarum canadense - wild ginger



Rare pipevine
swallowtail in WI –
does shift from host
pipevine
(*Aristolochia*) to wild
ginger (*Asarum*)

Aristolochiaceae - birthwort family

Asarum canadense - wild ginger



fly or beetle pollinated.

CA 3 CO 0 A 12 \bar{G} (6)

Inferior ovary with 3 sepals and the stamens arising from top.

The **petals** are almost absent.

Seeds are dispersed by ants; these seeds possess an **aril**-like structure.

Nymphaeaceae - water lily family



These are aquatic herbs and have an obvious ecological niche - they inhabit still waters

Many of their characteristics reflect adaptations to this habitat.

- Floating or submersed leaves
- Air cavities in tissue
- Mucilaginous coverings
- Lack of vessels

Nymphaeaceae - water lily family



Nymphaea - water lily



Nelumbo - lotus lily

Convergence [*unrelated plants with similar adaptations*] common

Check out Birge Hall lobby “Aquatic Plants” display!

For **extra credit** on first exam, find one of two aquatic invasive genera in Great Lakes Region that have leaves just like *Nymphaea* – one is an Eudicot and the other is a Monocot:

N_____ and **H**_____



Nymphaeaceae - water lily family



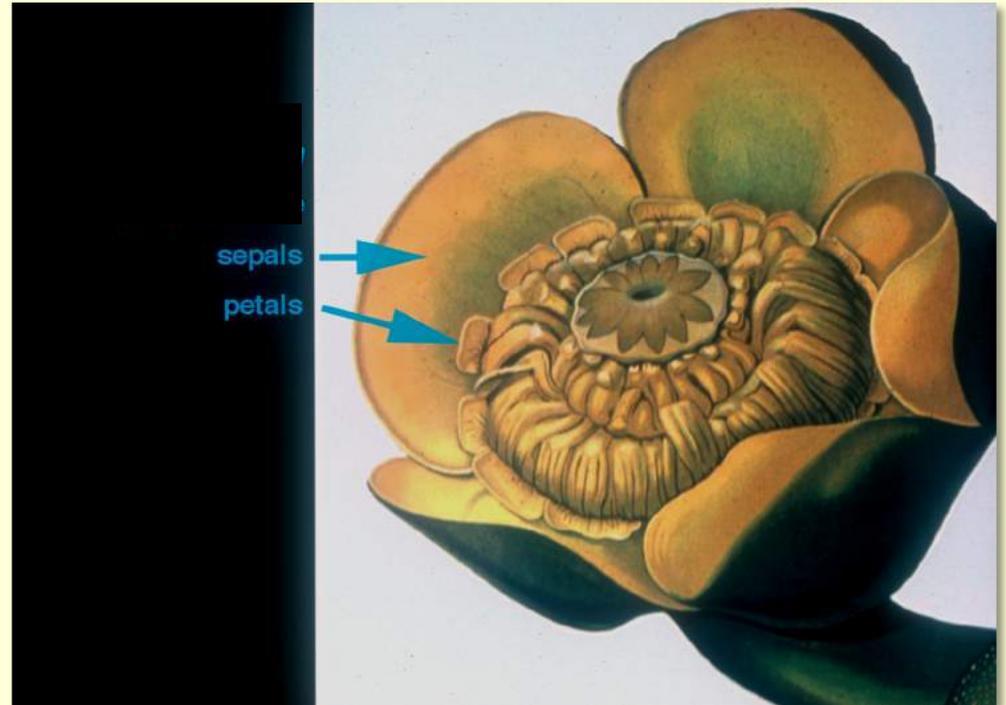
CA 3+ CO ∞ A ∞ G (∞)

- Showy flowers with strong scent
- Many parts at each whorl
- Flat, leaf-like stamens
- Superior, **syncarpic** pistil

Nymphaea odorata - water lily



Nymphaeaceae - water lily family

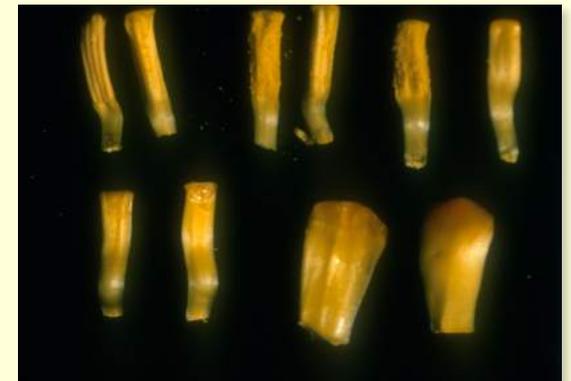


Nuphar variegata - yellow pond lily



Petaloid sepals &
reduced petals

Leaf-like stamens
grading from
petals to pistils



Nymphaeaceae - water lily family



Nuphar variegata - yellow pond lily

Superior pistil of many carpels

Beetle pollination

Cabombaceae - water shield family



Brasenia shreberi - water shield

Small clonal floating aquatic

Peltate leaves

Wind pollinated



Protogynous – female phase first,
then male phase



Ceratophyllaceae – coon's-tail family

Submersed aquatic recognized
by whorled leaves
dichotomously forked

Reduced! and Unisexual flowers
on same plant = monoecious



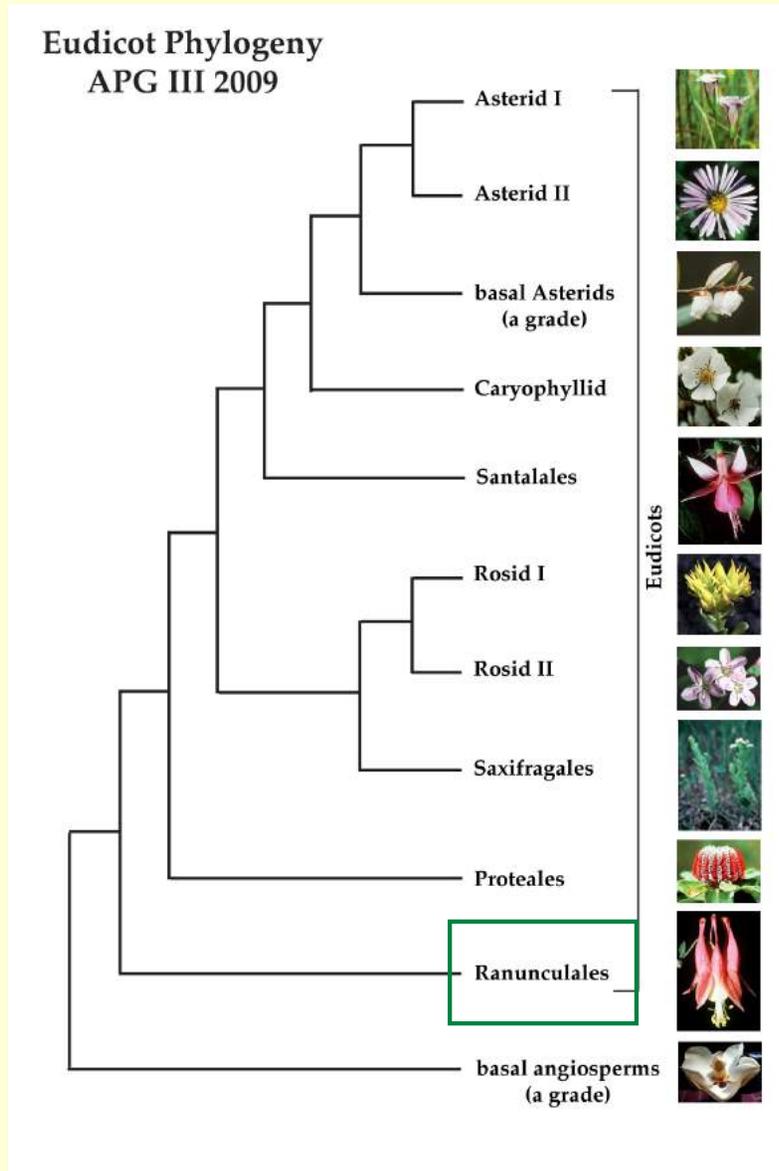
Ceratophyllum demersum -
hornwort, coon's-tail





The Primitive Eudicots

Ranunculaceae - buttercup family



Largest family of the ranunculid lineage which is the first diverging group of true dicots = **eudicots**

Worldwide but is centered in temperate and cold regions of the northern and southern hemispheres. 13 native genera, 53 species in WI, 20 of these in *Ranunculus*

Important family of our Wisconsin “**Spring Flora**” – **you will see these species!**

Ranunculaceae - buttercup family

- Herbs, sometimes woody or herbaceous climbers or low shrubs - often poisonous



Ranunculaceae - buttercup family



Frank Cook – UK botanist

EATWEEDS.co.uk
presents...

Ranunculaceae - buttercup family

- Herbs, sometimes woody or herbaceous climbers or low shrubs - often poisonous



Golden-seal



Black cohosh



Monk's-hood



Ranunculaceae - buttercup family



- *Nigella sativa* (& *N. damascena*)
- Black seed tea (e.g., Egyptian tea)
- Condiments, Black seed bread
- Middle Eastern, Bengali cuisine
- flavor wines and snuff



Nigella

Love-in-a-mist

Black seed

Black cumin

Fennel flower

Roman coriander





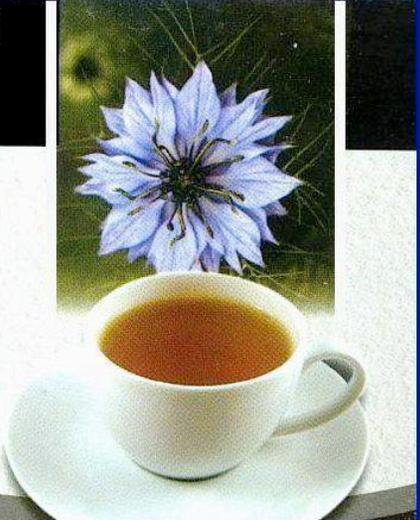
Other uses for *Nigella*

**THE NATURAL SLIMMING
HERBAL TEA**

TEH HERBA PREMIUM

**NIGELLA
SATIVA**

PURE PREMIUM
HABBATUS SAUDA TEA

A white cup filled with a golden-brown liquid, likely tea, sits on a white saucer. In the background, a large, vibrant blue flower with many petals is visible against a dark green background.

<http://barakahgroup.blogspot.com>

**BLACK
CUMIN**

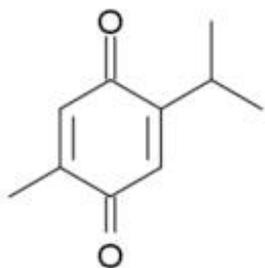
LOOK
INSIDE

THE MAGICAL EGYPTIAN HERB
for Allergies, Asthma,
and Immune Disorders

A close-up photograph of a white flower with a dark center, possibly a Nigella flower, set against a background of repeating small icons of the same flower.

Peter Schleicher, M.D., and
Mohamed Saleh, M.D.





thymoquinone

Other uses for *Nigella*

Is Nestlé trying to patent the fennel flower?

Q Is Nestlé patenting the fennel flower?

No. We're not claiming to 'own' the fennel flower, nor are we trying to patent it. Our patent application relates only to the specific way that thymoquinone - a compound that can be extracted from the seed of the fennel flower - interacts with opioid receptors in the body and helps to reduce allergic reactions to food.

The fennel flower (also known as *Nigella sativa*, black seed and black cumin) is a natural species, and nobody could, or should, benefit from ownership over it. In accordance with the Convention on Biological Diversity, we fully support the principle of fair access and benefit-sharing when it comes to the raw materials we use.



FENNEL FLOWER: Also known as *Nigella sativa*, black seed and black cumin.

Ranunculaceae - buttercup family



- Herbs, sometimes woody or herbaceous climbers or low shrubs - often poisonous
- Leaves, alternate, usually basal and cauline, often divided or compound, or palmately lobed.
- No stipules.



Ranunculaceae - buttercup family

- Flowers very variable: except many stamens and many free carpels (apocarpic)

CA 3+ CO (0) 5+ A ∞ G 3+



Ranunculaceae - buttercup family

Fruit
Diversity!

Follicles = ∞ seeded
dehiscent fruit

Berries = ∞ seeded
fleshy fruit



Caltha - marsh marigold



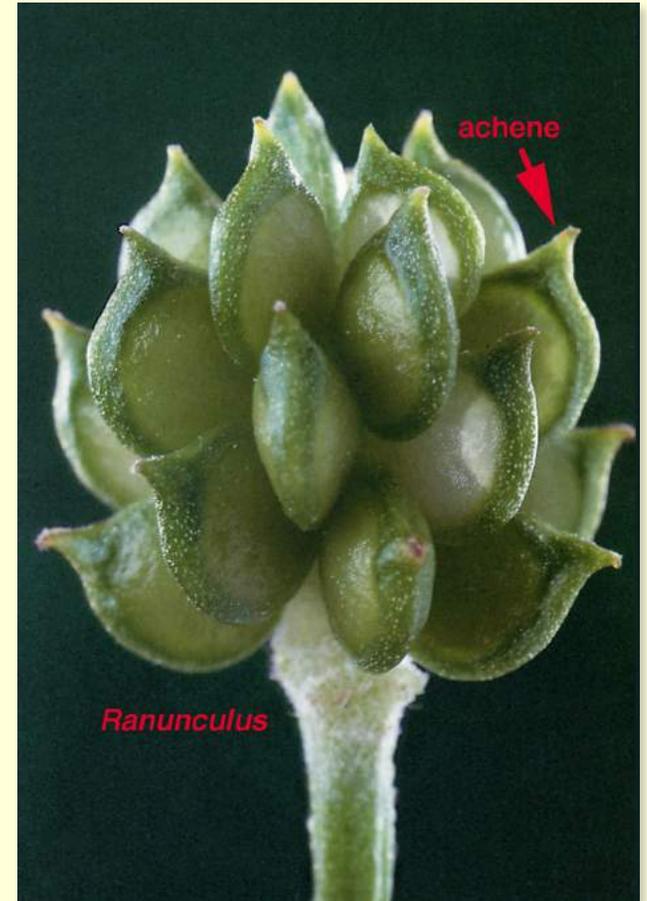
Actaea - baneberry

Ranunculaceae - buttercup family



Anemone - thimbleweed with wind dispersed achenes

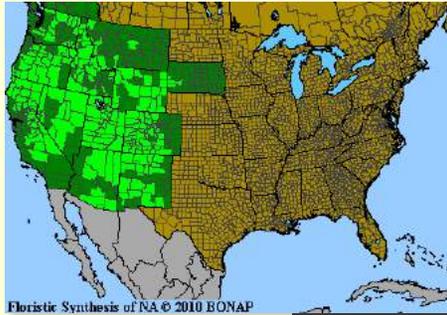
Fruit
Diversity!



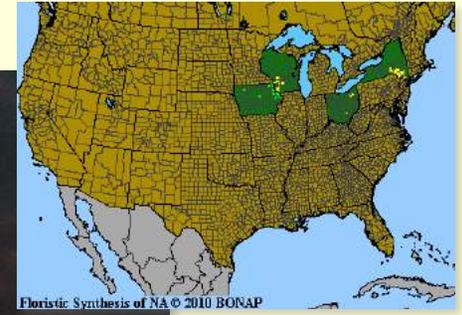
Achenes = 1 seeded
indehiscent, dry fruit

Ranunculus –
buttercup with
animal dispersed
achenes

Ranunculaceae - buttercup family



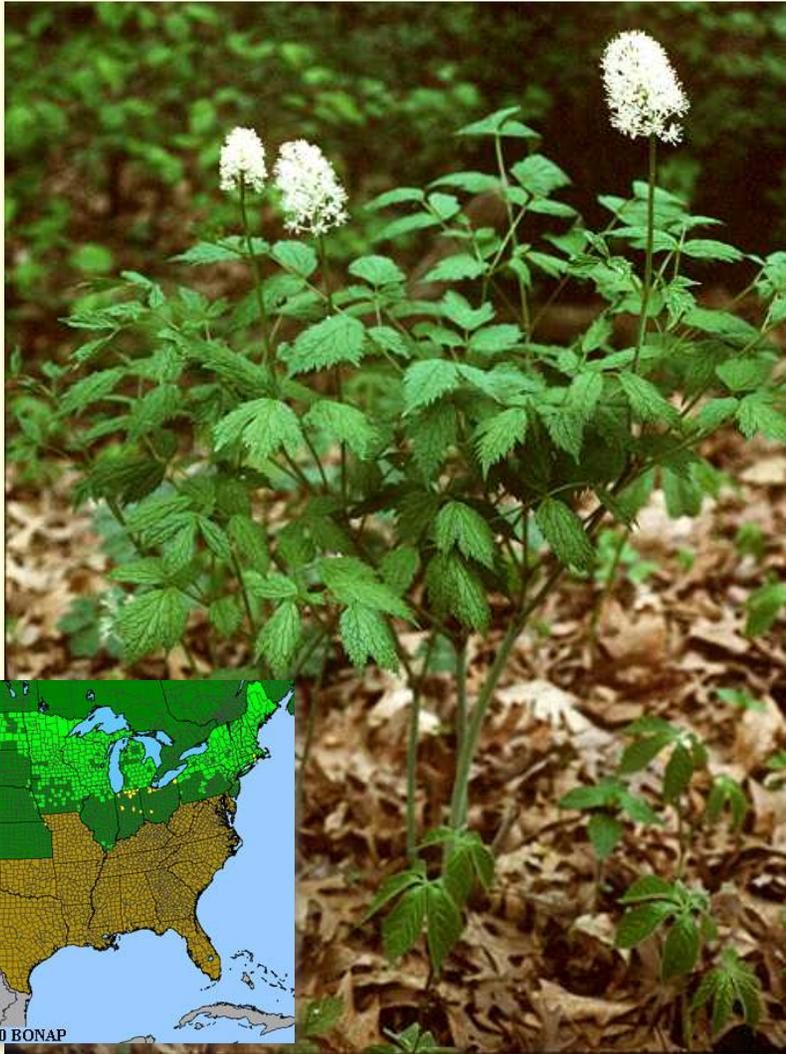
Aconitum columbianum - monks' hood



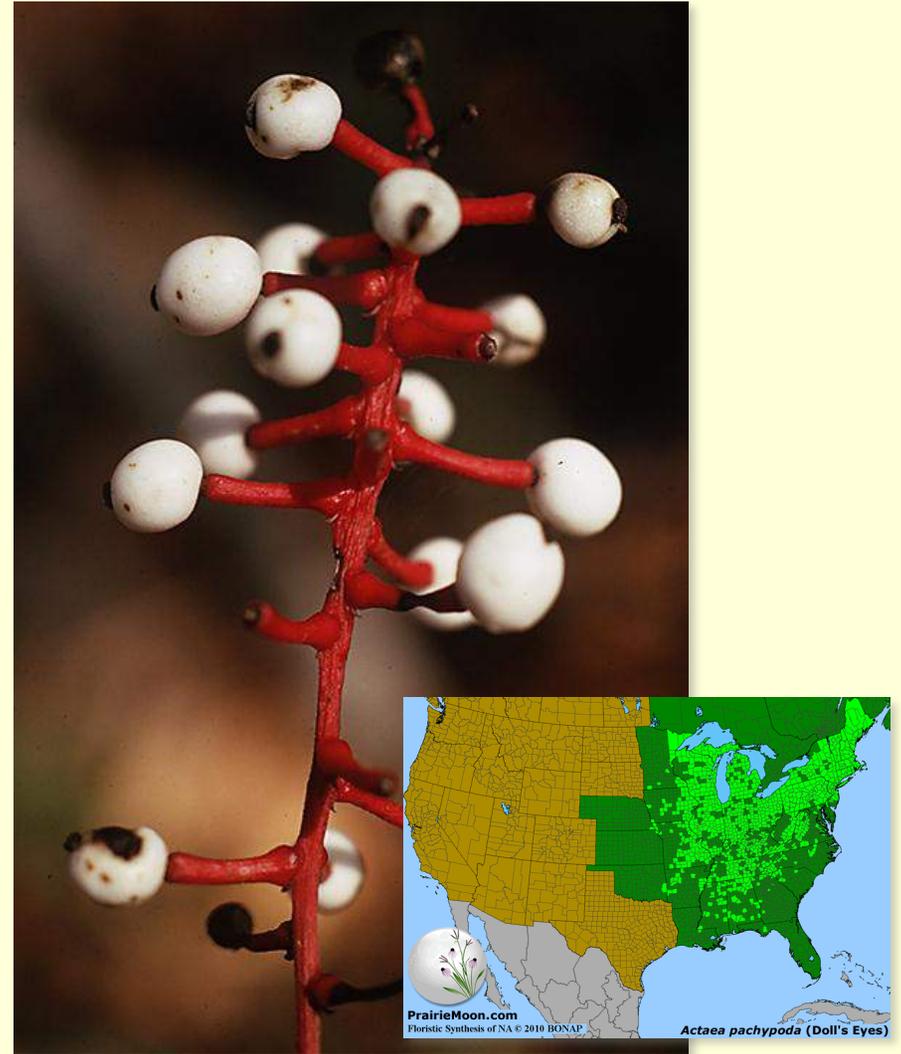
Aconitum noveboracense - monks' hood

Great Lakes – western North American disjunct pattern

Ranunculaceae - buttercup family



Actaea rubra - red baneberry



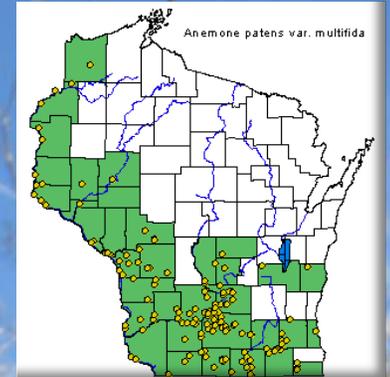
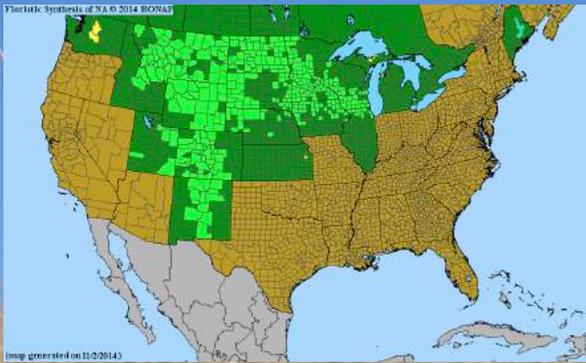
Actaea alba - white baneberry

Ranunculaceae - buttercup family



Anemone patens - pasque flower

Anemone canadensis
- Canada anemone



EXTRA CREDIT – digital image of pasque flower

Photo: John Zaborsky

Ranunculaceae - buttercup family



Anemone quinquefolia
- wood anemone



Anemone acutiloba (*Hepatica acutiloba*) - sharp-lobed liverleaf



Ranunculaceae - buttercup family



Aquilegia canadensis - American columbine

Ranunculaceae - buttercup family



Caltha palustris - marsh marigold

No petals – only sepals
Follicle fruits



Ranunculaceae - buttercup family



Enemion biternatum [*Isopyrum biternatum*]

- false rue anemone

One of most abundant spring ephemerals forming large colonies

No petals; 3-5 follicle fruits



Ranunculaceae - buttercup family



Ranunculus abortivus - cursed crowfoot



Ranunculus acris - tall buttercup



sepals + petals
achenes

Ranunculus hispidus - bristly buttercup



Ranunculaceae - buttercup family



Thalictrum dioicum - early meadow-rue



Large herbs of more open habitats;
wind pollinated

Dioecious; with separate male and
female plants

Ranunculaceae - buttercup family



Anemonella thalictroides - rue anemone

Original name after *Thalictrum* because the leaves were so similar, although showy, insect-pollinated flowers



Now called *Thalictrum thalictroides*

. . . and so it is “the thalictrum with the thalictrum-like leaves” !

Good example of the re-evolution of insect pollination within a wind pollinated group