

Short Tour of the Wisconsin Flora

Introduction to course

Numbers of families, genera and species within major groupings in Wisconsin

Group	Families	Genera	Species Native	Species Introduced	Total
Seed-free vascular plants	13	31	112	0	112
Gymnosperms	3	8	15	2	17
Angiosperms	142	746	1762	679	2441
TOTAL	158	785	1889	681	2570

Largest families (50 or more taxa) and genera (15 or more taxa) in the Wisconsin flora [Source: Wisconsin State Herbarium (<http://www.botany.wisc.edu/herbarium/>)]

Family	No. of Taxa	Genus	No. of Taxa
Asteraceae (asters)	373	<i>Carex</i> (sedge)	168
Poaceae (grasses)	254	" <i>Aster</i> " (aster)	80
Cyperaceae (sedges)	251	<i>Rubus</i> (raspberry)	55
Rosaceae (roses)	187	<i>Crateagus</i> (hawthorn)	47
Fabaceae (legumes)	88	<i>Viola</i> (violet)	33
Brassicaceae (mustard)	87	<i>Panicum</i> (panic grass)	32
"Scrophulariaceae" (snapdragons)	75	<i>Potamogeton</i> (pondweed)	32
Lamiaceae (mints)	72	<i>Salix</i> (willow)	31
Caryophyllaceae (pinks)	63	" <i>Polygonum</i> " (smartweed)	30
Orchidaceae (orchids)	57	<i>Solidago</i> (goldenrod)	30
Ranunculaceae (buttercups)	53	<i>Juncus</i> (rush)	29
		<i>Helianthus</i> (sunflower)	20
		<i>Ranunculus</i> (buttercup)	20
		<i>Chenopodium</i> (chenopod)	19
		<i>Eleocharis</i> (spikerush)	19
		<i>Lonicera</i> (honeysuckle)	18
		<i>Veronica</i> (veronica)	18
		<i>Rosa</i> (rose)	16
		<i>Galium</i> (bedstraw)	15



Major floristic elements in the Wisconsin flora

Alleghenian
Ozarkian
Prairie
Boreal
Western
Coastal Plain

Two floristic provinces

Northern hardwood
Prairie forests

Tension Zone

Border of two floristic provinces

Major plant communities

Southern mesic (basswood/maple) forest
Southern xeric (oak/hickory) forest
Southern hydric (floodplain) forest
Northern mesic (northern hardwood) forest
Northern xeric (pine/oak) forest
Northern hydric (conifer swamp) forest
Prairie
Bog
Fen
Sedge meadow
Aquatic
Weed

Nomenclature and Seed-free Vascular Plants I

Nomenclature vs. Classification

Nomenclature – producing names

Classification – placing named taxa into a hierarchical system

Rank	Ending	Example
genus	no standard	<i>Rosa</i>
family	-aceae	Rosaceae
order	-ales	Rosales
subclass	-idae	Rosidae
class	-opsida	Magnoliopsida
phylum (division)	-phyta	Magnoliophyta

Species names (common and scientific)

Common names versus scientific names

Binomial nomenclature

species name = genus + specific epithet

scientific name = genus + specific epithet + authority

General rules

Latin: italic in print and underline in writing

Generic name must always be capitalized

Specific epithet may always be in lower case

Specific epithet may never be used alone

Rules of priority

specific epithet has priority and is retained

oldest validly published name is the “correct” name

Synonyms – duplicate scientific names

Three examples of name changes producing synonyms

- *Carex buxbaumii* Wahlenb. and *Carex polygama* Schkuhr
- *Senecio aureus* L. and *Packera aurea* (L.) Löve and Löve
- *Aster*

Seed-free Vascular Plants

Overview of alternation of generations

sporophyte vs. gametophyte
spores vs. gametes
homosporous vs. heterosporous
microphylls vs. megaphylls

2 phyla of seed-free plants or cryptogams (not considered a natural group)

Lycopodiophyta: lycopods

Polypodiophyta: ferns (including now horsetails and whisk ferns)

Lycopodiophyta – lycopods: the first diverging vascular plants

Lycopodiaceae — clubmosses, groundpines, groundcedars

Lycopodium obscurum, groundpine [*Dendrolycopodium obscurum*]

Huperzia lucidula, shining clubmoss [*Lycopodium lucidulum*]

Lycopodium digitatum, crowfoot clubmoss, southern running-pine, southern ground-cedar [*Diphasiastrum digitatum*]

Lycopodiella inundata, bog clubmoss [*Lycopodium inundatum*]

Sellaginellaceae — spikemosses

Selaginella rupestris - rock spikemoss

S. selaginoides - northern spikemoss

Isoetaceae — quillworts

Isoetes, quillwort

Polypodiophyta – Part 1: the unusual “ferns”

Equisetaceae — horsetails

Equisetum arvense, common horsetail, field horsetail

E. hyemale, common scouring rush, pipes, scouring rush

E. laevigatum, smooth horsetail or scouring rush

E. scirpoides, dwarf scouring rush, sedge horsetail

E. sylvaticum, wood horsetail, woodland horsetail

CHECK LIST OF COMMON SPECIFIC NAMES

the Meaning of Which is Not Easily Apparent

Name	Meaning	Name	Meaning	Name	Meaning	Name	Meaning
acaulis	stemless	caeruleus	dark blue	dumosus	bushy	intumescens	tumid
acicularis	needles	caesius	bluish gray	eburneus	ivory-white	juncceus	rush-like
aduncus	hooked	calvus	bald-hairless	echinatus	prickly	lactatus	milky
aestivalis	summer	calycinus	calyz-like	edulis	edible	laevigatus	smooth
affinis	related	candicans	white, hoary	effusus	loose-spreading	laevipes	smooth-footed
alatus	winged	caninus	cutting	elator	taller	laevis	smooth
alba	white	candidus	white, shining	elatus	tall	lanuginosus	wooly
albicans	whitish	capillaris	hair-like	ensifolius	sword-leaved	leiocarpus	smooth-fruited
albissimus	very tall	carinatus	keeled	ericarpus	wooly fruit	leptocladus	thir-stemmed
amabilis	lovely	caudatus	tailed	erubescens	burning	leptophyllus	thin-leaved
amoenus	charming stems	cerifera	wax-bearing	exiguus	little, poor	leucanthus	white flowered
amplexicaulis	clasping	cernuus	drooping	fallax	deceptive	longipes	long-footed
anceps	two headed or edged	chloranthus	green-flowered	farinosus	mealy	lucidus	bright, clear
angustatus	narrow	chrysohyllus	golden leaved	fasiculatus	fasciated	lupulinus	hop-like
annotinus	year-old	chryso stomus	golden leaved	fastigiatus	erect and close	luteolus	yellowish
aphyllus	leafless	cinctus	girdled	filipes	together	macilentus	lean
apiculatus	tipped with a point	clandestinus	concealed	fistulosus	thread-like	maculatus	spotted
appendiculatus	appendaged	coarctatus	ascending, appressed	flagellatus	hollow	majalis	Maytime
applanatus	flattened	coccineus	scarlet	flagellaris	cylindrical	maritimus	of the sea
arcuatus	bow-like	comatus	with hair	flavescens	fan-like parts	megarrhizus	large-rooted
areolatus	areolate, pitted	comosus	long haired	flavus	whip-like	micranthus	small-flowered
argenteus	silvery	communis	gregarious	flexilis	yellowish	macrocarpus	large-fruited
argutus	sharp-toothed	commutatus	changing	floribundus	free flowering	macrophyllus	large-leaved
argyreus	silvery	cocinnus	neat	floridus	flowering	medius	intermediate
aridus	arid	concolor	colored similar	fluitans	floating	millefolius	very much leaved
arundinaceus	arrow-leaved	confertus	crowded	foliosus	leafy	mirabilis	wonderful
asper	reed-like	confinis	bordered	formosus	beautiful	modestus	modest
atratus	blackened	conoides	cone-like	fontanus	fringed	mollis	soft
atropurpureus	dark purple	contortus	contorted	fulgens	shining	moniliformus	constricted at regular intervals
atrosaguiueus	dark blood red	corniculatus	horned	fulgens	forked	monoccephala	single-headed
atrovirens	dark green	coronarius	used with garlands	gemiculatus	jointed	monocleucus	monoecious
aurantiacus	orange red	crassifolius	thick-leaved	gracilis	slender	monostachys	single-spiked
aureus	golden	crassipes	thick-footed	gramineus	Greekish	montanus	of mountains
australis	southern	crinatus	hairy	graveolens	grassy	multifidus	many times parted
azureus	sky blue	cyanous	crested	hebecarpus	heavy-scented	mutabilis	variable
baccatus	berried	dasycaucus	blue	helveolus	pubescent-fruited	nanus	dwarf
bicolor	two-colored	dasytachys	thick-fruited	hirta	pale yellow	natans	floating
bidentata	two-toothed	debilis	thick-spiked	holosericeus	wooly, silky	neoticica	nearly dioecious
bifidus	twice-cut	decapetalus	weak	humifusus	sprawling	neotitans	blinking
biflorus	two-flowered	decipiens	ten-petalled	humilis	dwarf	nigricans	black
borrealis	northern	decorus	elegant	huemalis	of winter	nitens	shining
brachycarpus	short fruited	decumbens	reclining	hyperboreus	far northern	nitidus	shining
brivipes	short-footed	deflexus	bent downward	hypogaeus	underground	nivalis	snowy
brunneus	deep brown	demissus	low, weak	hypoglaucus	glauous beneath	niveus	snowy
bufonius	pertaining to toad	dimidiatus	halved	lystrix	bristly	novae-angiae	of New England
		discolor	different colors	incanus	hoary	novaeboracensis	of New York
		dulcis	sweet	inermis	unarmed	nudicaulis	naked stemmed
						novae-belgii	of New York
						nutans	nodding

Name	Meaning	Name	Meaning	Name	Meaning
occidentale	western	rostratus	rostrate, beaked	validus	strong
ochroleucus	yellowish-white	rubellus	reddish, red	velutinus	velvety
officinalis	official	rusticus	rustic	venosus	veiny
oliganthus	few-flowered	saccharinus	saccharine	vernus	of spring
oligocarpus	few fruited	salinus	salty	vernalis	vernal
oligopermus	few seeded	sanguineus	blood-red	versicolor	variously colored
operculatus	with a lid	sapientus	of the wise man	vespertinus	western
orientalis	eastern	sativus	cultivated	vestitus	covered
ornatus	adorned	scandens	climbing	vimineus	of osiers or wickerwork
orthocarpus	straight-fruited	sclerophyllus	hard-leaved	vinealis	of vineyards
orthopteris	straight-winged	scoparius	broom-like	virens	green
ovinus	of sheep	sensibilis	sensitive	vulgaris	common
oxycanthus	sharp-spined	septentrionalis	northern	xanthocarpus	yellow-fruited
parviflora	small-flowered	serotinus	late-flowering	virgatus	twiggy
parvifolius	small-leaved	serpens	creeping, crawling	viridis	green
parvulus	very small	serpyllifolius	thyme-leaved		
patens	spreading	setaceus	bristle-like		
pauciflorus	few-flowered	spectosus	showy, good-looking		
pauperculus	poor	spectabilis	spectacular, worth seeing		
pectinatus	comb-like				
pentandrus	5 stamens	squarrosus	with parts recurved at the ends		
perennans	perennial	stans	erect, standing, upright		
peregrinus	exotic	stenophyllus	narrow-leaved		
plataninus	platanin-like	strictus	strict, upright, erect		
platycarpus	broad-fruited	tectorum	of roofs or houses		
platycladus	broad-branched	tenellus	slender, tender, soft		
platyphyllus	broad-tongued	tenarum	slender, tender, soft		
plumarius	plumed	tenuis	slender, thin		
pedecarpus	with stalked fruit	teres	terete, circular in x section		
polyanthus	many-flowered	ternatus	in threes, ternate		
polystachyus	many-spiked	tetrapteris	four-winged		
porcinus	pertaining to swine	tetrastachyus	four-spiked		
praecox	precocious, very early	thyrsiflorus	thyrsiflower		
prasinus	grass green	tinctorius	of dyes		
procera	tall	triccoccus	three-lobed		
psilostachys	naked spike	tridens	with 3 teeth		
pulchellus	pretty, beautiful	trifidus	three-parted		
pulchra	pretty, beautiful	tripatiata	3-winged		
pumila	dwarf	tristis	sad, dull at point		
pungens	piercing, sharp-pointed	uncinatus	hooked		
pusillus	very small, insignificant	uniflorus	one-flowered		
pycnanthus	densely flowered	unguiculatus	clawed		
quadrifolius	four-leaved	urens	burning		
ramosus	branched	ursinus	of bears		
repens	creeping	usitatissimus	most useful		
retroflexus	reflexed	vaginatus	sheathed		
ringens	gaping, open-mouthed				

Botany 401
 Life Cycle of a Fern
 [Judd et al. (1999) Plant Systematics: A Phylogentic Approach]

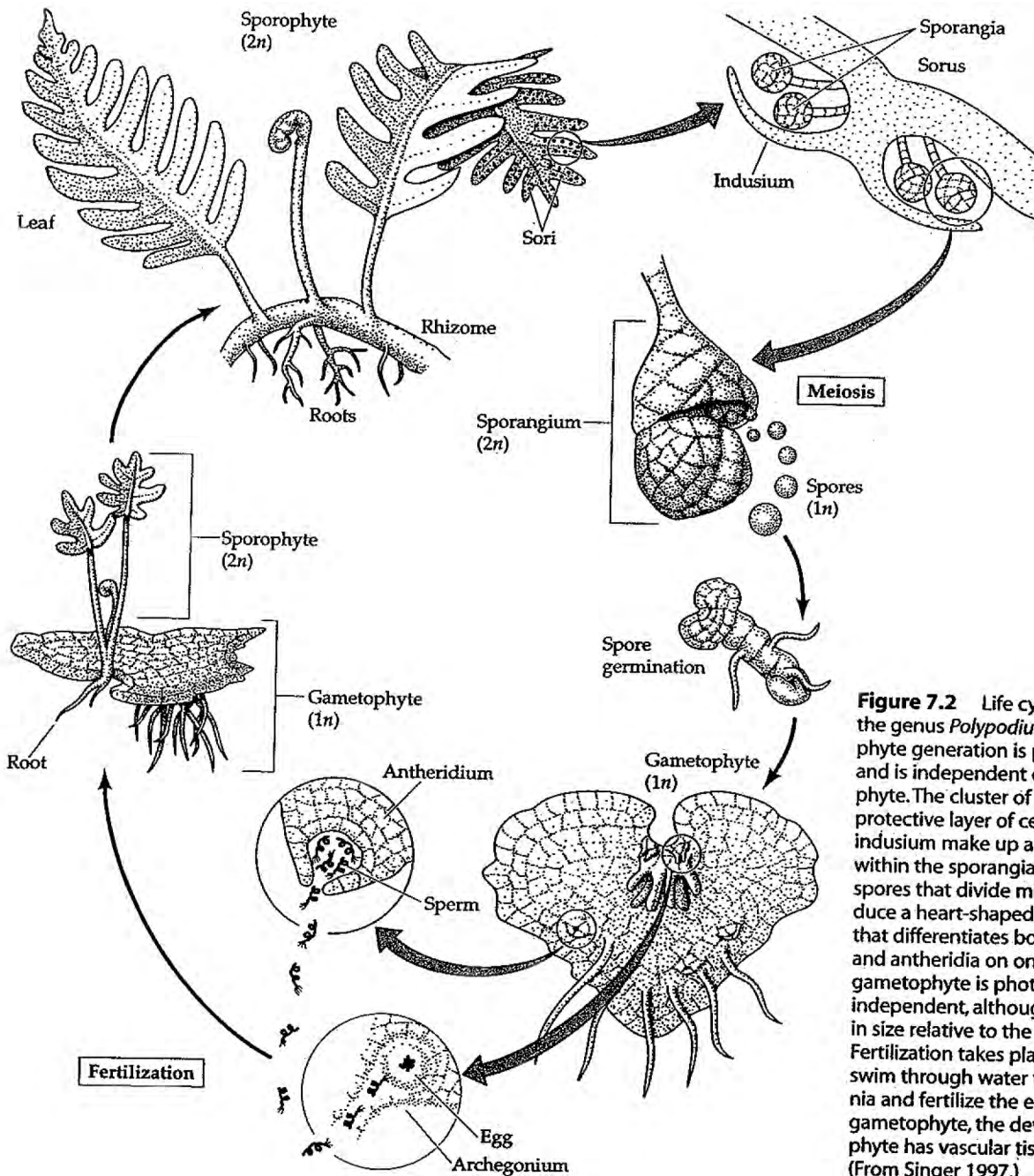
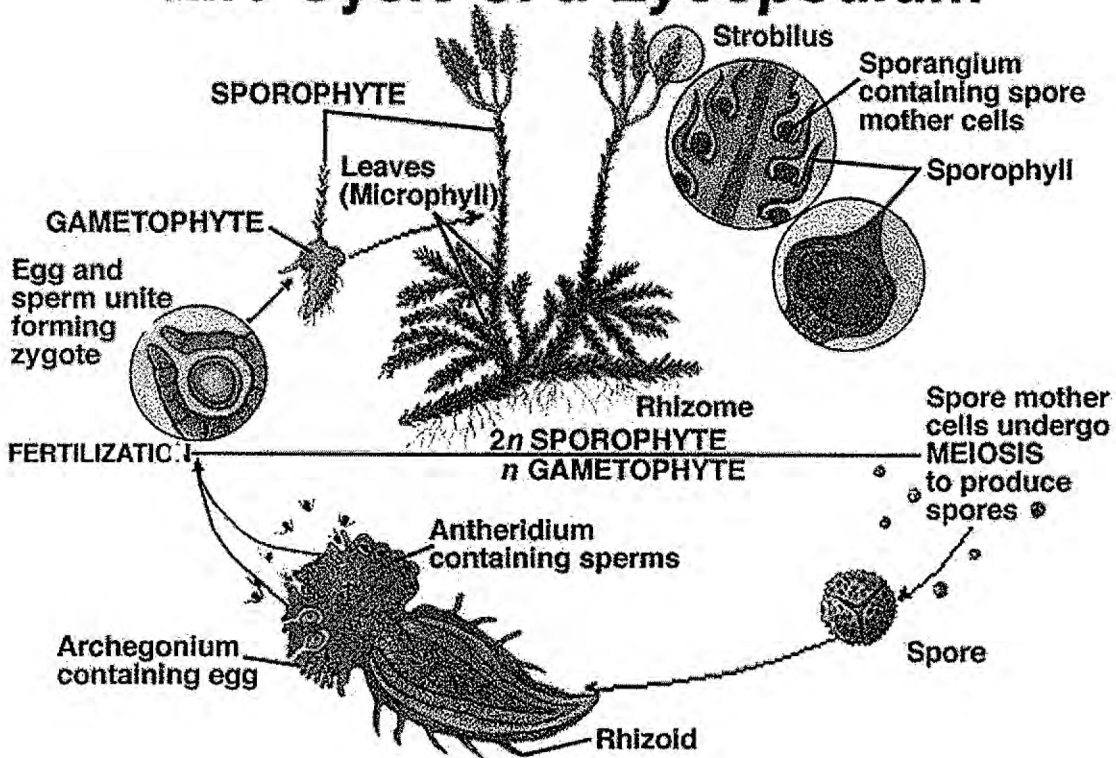
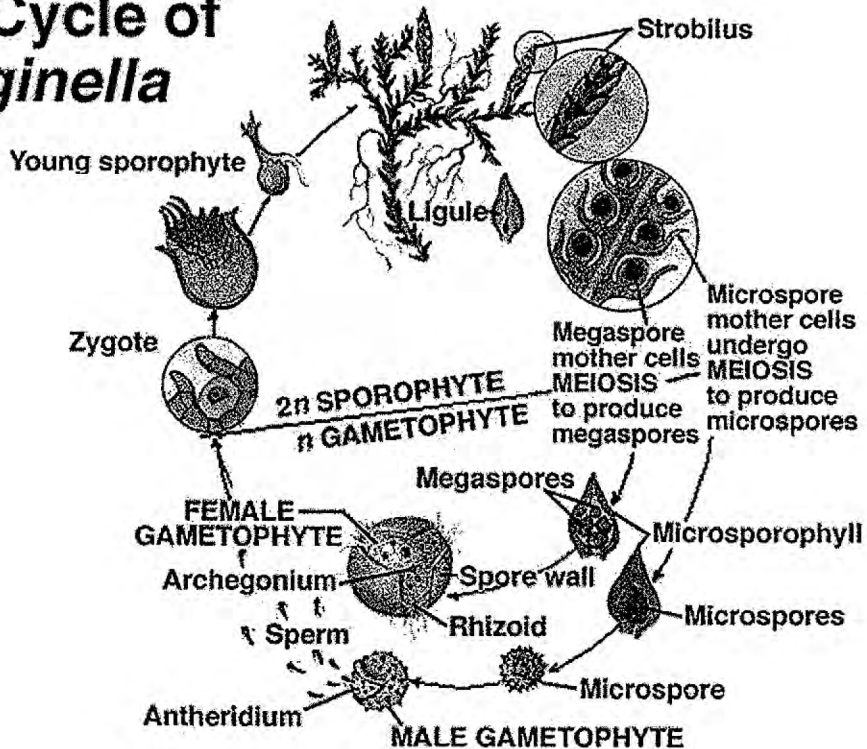


Figure 7.2 Life cycle of a fern of the genus *Polypodium*. The sporophyte generation is photosynthetic and is independent of the gametophyte. The cluster of sporangia plus a protective layer of cells called the indusium make up a sorus. Meiosis within the sporangia yields haploid spores that divide mitotically to produce a heart-shaped gametophyte that differentiates both archegonia and antheridia on one individual. The gametophyte is photosynthetic and independent, although it is reduced in size relative to the sporophyte. Fertilization takes place when sperm swim through water to the archegonia and fertilize the eggs. Unlike the gametophyte, the developing sporophyte has vascular tissue and roots. (From Singer 1997.)

Life Cycle of a *Lycopodium*



Life Cycle of *Selaginella*



Seed-free Vascular Plants II and Gymnosperms

Polypodiophyta — Part 2: true ferns

General characteristics: homosporous or heterosporous, fronds, stipe, circinnate venation, sorus, indusium

Classification: problematic for families!; leptosporangiate or eusporangiate ferns; horsetails and whisk fern phyla now part of ferns!

Ferns in Wisconsin [see http://www.uwgb.edu/biodiversity/herbarium/pteridophytes/pteridophytes_of_wisconsin01.htm]

9-14 families, 24 genera, 68 species

Ophioglossaceae (4 genera / 14 species)

Botrypus virginianum - rattlesnake fern

Botrychium lunaria - moonwort

Ophioglossum pusillum – adder’s-tongue

Osmundaceae (1 genus / 3 species)

Osmunda cinnamomea - cinnamon fern

Osmunda claytoniana - interrupted fern

Osmunda regalis - American royal fern

Dennstaedtiaceae (2 genera / 2 species)

Pteridium aquilinum - bracken fern

Pteridaceae (4 genera / 7 species)

Adiantum pedatum - northern maidenhair fern

Cryptogramma stelleri - slender cliff-brake fern

Aspleniaceae (1 genus / 5 species)

Asplenium platyneuron - ebony spleenwort

Asplenium viride - green spleenwort

Thelypteridaceae (2 genera / 4 species)

Thelypteris palustris - marsh fern

Onocleaceae (2 genera / 2 species)

Onoclea sensibilis - sensitive fern

Athyriaceae (2 genera / 2 species)

Athyrium angustum - northeastern lady fern

Dryopteridaceae (2 genera / 12 species)

Dryopteris intermedia - glandular wood fern

Polystichum acrostichoides - Christmas fern

Polypodiaceae (1 genus / 1 species)

Polypodium virginianum - common polypody, rock-cap fern

Salviniaceae (1 genus / 2 species)

Azolla caroliniana - mosquito fern

Pinophyta — Gymnosperms

Classification: Four major groups: cycads, ginkgo, conifers, gnetophytes — these sometimes each considered their own phylum

General characteristics: no vessel elements, needle or scale-like leaves, cones or strobili, no flowers (therefore “naked seeds”), pollination

Gymnosperms in Wisconsin: 3 families, 8 genera, 13 species

Cupressaceae (2 genera / 4 species)

Juniperus communis - common juniper, oldfield juniper

Juniperus horizontalis - creeping juniper

Juniperus virginiana - eastern red-cedar

Thuja occidentalis - eastern arborvitae, northern white cedar

Taxaceae (1 genus / 1 species)

Taxus canadensis - American yew, ground hemlock

Taxus cuspidata – Japanese yew **[not native, but widely planted]**

Pinaceae (5 genera / 8 species)

Abies balsamea - balsam fir

Larix laricina - tamarack, American larch

Picea glauca - white spruce

Picea mariana - black spruce

Pinus banksiana - jack pine

Pinus resinosa - red pine, Norway pine

Pinus strobus - eastern white pine

Tsuga canadensis - eastern hemlock

Ginkgoaceae [not native, but widely planted]

Ginkgo biloba (ginkgo)

Floral and Fruit Structure — Angiosperms

Floral structure of Angiosperms (see lab 4 for illustrations of flower parts)

Flowers as modified shoots with 4 sets of modified “leaves”

Floral parts (terms & illustrations)

Peduncle, pedicel

Receptacle

Sepals / calyx

Petals / corolla

Stamens (androecium): anthers, filaments

Nectaries

Carpels (gynoecium): ovary & ovules, style, stigma

Placentation: marginal, axile, parietal, free-central, basal

Arrangement of floral parts

Numerical plan: spiral, 3-merous, 4-merous, 5-merous

Symmetry

actinomorphic / radial

zygomorphic / bilateral

Fusion of floral parts

connation - fusion of similar parts

adnation - fusion of different parts

hypogynous ovary - superior ovary

perigynous ovary - superior ovary, separate hypanthium

epigynous ovary - inferior ovary, fused hypanthium

Floral formulas

Fruits – mature ovary (examined in lab)

Inflorescences – collection of flowers (examined in lab)

Indeterminate inflorescences

Raceme

Panicle

Spike

Umbel

Head

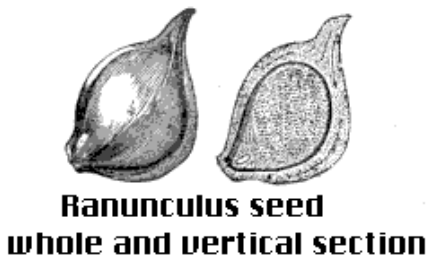
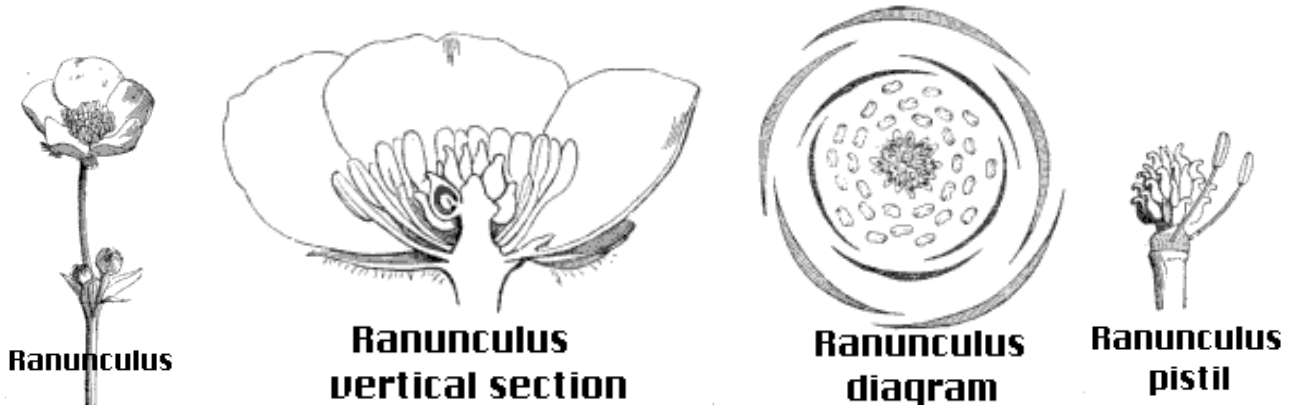
Ament/Catkin

Determinate

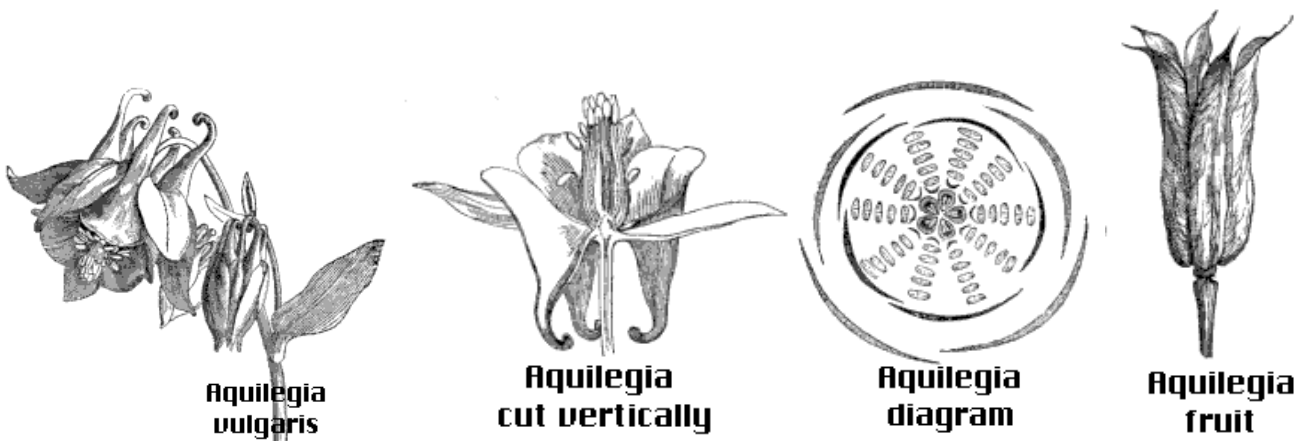
Dichasium, cyme, & monochasium

Important flower and fruit types seen in early primitive flowering plants:

Ranunculus – buttercup: showing apocarpic gynoecium and many one-seeded achene fruits



Aquilegia – columbine: showing apocarpic gynoecium and many multi-seeded follicle fruits



Water Lilies, Buttercups, and Mayapples

[orders – ending in *ales* – are given only to provide a way to keep related families – ending in *aceae* – together]

Magnoliales

Magnoliaceae (magnolia family) [**not native**]

Magnolia (magnolia)

Liriodendron tulipifera (tulip tree, yellow poplar)

Aristolochiales

Aristolochiaceae (birthwort family)

Asarum canadense (wild ginger)

Nymphaeales

Nymphaeaceae (water lily family)

Nymphaea odorata (= *N. tuberosa*) (water lily)

Nuphar variegata (= *N. lutea*) (yellow water-lily, pond-lily, cow-lily, spatterdock)

Cabombaceae (water shield family) [recently placed in Nymphaeaceae]

Brasenia schreberi (water shield)

Cabomba (fanwort, cabomba) [**not native**]

Ceratophyllales

Ceratophyllaceae (hornwort family)

Ceratophyllum demersum (coon's-tail, hornwort)

Ranunculales

Ranunculaceae (buttercup family)

Aconitum columbianum (= *A. noveboracense*) (monks'hood)

Actaea rubra (red baneberry)

Anemone patens (pasque flower)

A. quinquefolia (wood anemone)

A. americana (= *Hepatica americana*) (round-lobed hepatica)

A. acutiloba (= *Hepatica acutiloba*) (sharp-lobed hepatica)

Aquilegia canadensis (wild columbine)

Caltha palustris (marsh marigold)

Enemion biternatum (= *Isopyrum biternatum*) (false rue anemone)

Ranunculus abortivus (small flowered buttercup)

R. hispidus (= *R. septentrionalis*) (bristly buttercup)

Thalictrum dasycarpum (purple meadow-rue)

Th. dioicum (early meadow-rue)

Th. thalictroides (= *Anemonella thalictroides*) (rue anemone)

Berberidaceae (barberry family)

Berberis thunbergii (Japanese barberry)

Berberis vulgaris (European barberry)

Podophyllum peltatum (May-apple, mandrake)

Caulophyllum thalictroides (blue cohosh)

Jeffersonia diphylla (twinleaf, rheumatism root)

Menispermaceae (moonseed family)

Menispermum canadense (moonseed)

Papaveraceae (poppy family) [includes old family Fumriaceae]

Sanguinaria canadensis (bloodroot)

Chelidonium majus (celadine) — invasive weed from Europe

Dicentra cucullaria (Dutchman's-breeches)

D. canadensis (squirrel corn)

Corydalis sempervirens (pink corydalis)

Proteales

Nelumbonaceae

Nelumbo lutea (American lotus, lotus lily)

Platanaceae (sycamore family)

Platanus occidentalis (sycamore)

Spring Beauty, Smartweeds, and Sundews

Caryophyllales

Caryophyllaceae (pink or carnation family)

- Minuartia michauxii* (= *Arenaria stricta*) (sand rockwort)
- Cerastium fontanum* (= *C. vulgatum*) (mouse-ear chickweed)
- Dianthus armeria* (deptford pink)
- Lychnis coronaria* (mullein pink)
- Saponaria officinalis* (bouncing bet)
- Silene latifolia* (white campion) [formerly *Lychnis alba*]
- Silene vulgaris* (= *S. cucubalus*) (bladder campion)
- Silene dichotoma* (forked catchfly)
- Stellaria longifolia* (long-leaved stitchwort)
- Stellaria media* (common stitchwort)

Phytolaccaceae (pokeweed family)

- Phytolacca americana* (pokeweed)

Portulacaceae (purslane family)

- Portulaca oleracea* (purslane)

Montiaceae (spring-beauty family) [formerly in Portulacaceae]

- Claytonia caroliniana* (spring-beauty)
- Claytonia virginica* (spring-beauty)
- Phemeranthus rugospermus* (= *Talinum rugospermum*) (fame flower)

Cactaceae (cactus family)

- Opuntia humifusa* (eastern prickly pear)
- Opuntia macrorhiza* (plains prickly pear)
- Opuntia fragilis* (brittle or little prickly pear)

Amaranthaceae (amaranth family) [includes old Chenopodiaceae]

- Amaranthus retroflexus* (rough amaranth)
- Bassia scoparia* (summer cypress)
- Chenopodium album* (lamb's quarter, goosefoot)
- Chenopodium ambrosioides* (Mexican tea)
- Cycloloma atriplicifolium* (winged pigweed)
- Froelichia floridana* (cottonweed)

Polygonaceae (smartweed family)

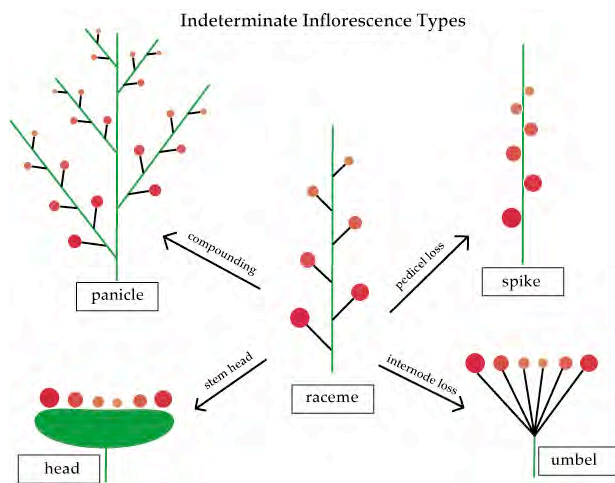
- Fallopia japonicum* (Mexican bamboo, Japanese smartweed)
- Persicaria natans* (water smartweed)
- Persicaria pennsylvanicum* (smartweed)
- Persicaria hydropiper* (water pepper)
- Polygonella articulata* (jointweed)
- Polygonum aviculare* (knotweed)
- Rheum rhabarbarum* (rhubarb)
- Rumex acetosella* (sour dock, red sorrel)

Rumex orbiculatus (great water dock)
Rumex crispus (curly dock)

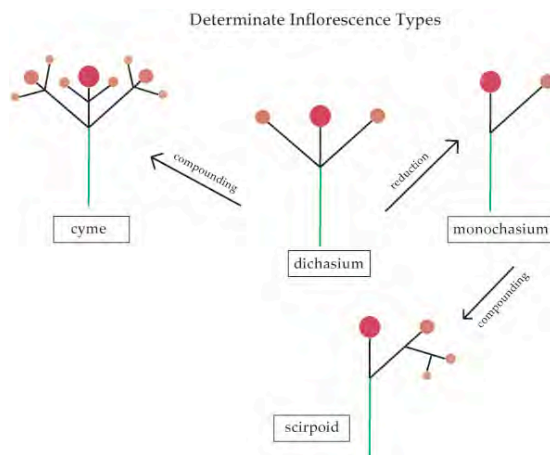
Droseraceae (sundew family)
Drosera rotundifolia (round-leaved sundew)
Drosera anglica (English sundew)
Drosera intermedia (narrow-leaved sundew)

Inflorescence types seen in families of Caryophyllales

1. Raceme (e.g., Phytolaccaceae – pokeweed)



2. Dichasium or cyme (e.g., Caryophyllaceae)



Currants and Raspberries

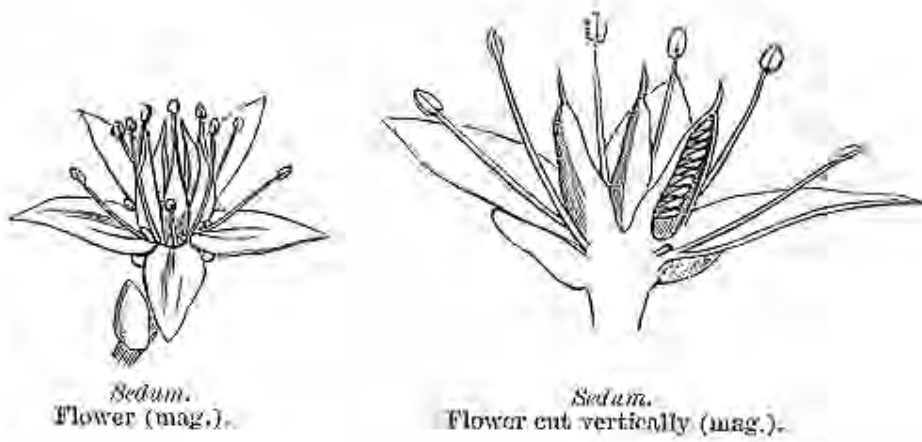
Saxifragales [also includes Paeoniaceae – peonies]

Hamamelidaceae (witch hazel family)

Hamamelis virginiana (witch hazel)

Crassulaceae (sedum family)

Sedum acre (gold-moss stonecrop, yellow sedum) [naturalized]



Saxifragaceae (saxifrage family – some like *Parnassia* are removed now)

Heuchera richardsonii (prairie alumroot)

Mitella diphylla (Bishop's-cap, miterwort)

Mitella nuda (small Bishop's-cap)

Micranthes (*Saxifraga*) *pennsylvanica* (swamp saxifrage)

Sullivantia sullivantii (Sullivant's coolwort)

Tiarella cordifolia (foamflower) [endangered]

Grossulariaceae

Ribes missouriense (Missouri gooseberry)

Ribes cynosbati (prickly gooseberry, dogberry)

Ribes americanum (American black currant)

Ribes rubrum [= *R. sativum*] (cultivated red currant)

Ribes triste (swamp currant)

Rosales (part I)

Rosaceae (rose family)

subfamily Spiraeoideae

Spiraea alba (meadow-sweet)

Spiraea tomentosa (hard hack)

Physocarpus opulifolius (ninebark)

Subfamily Spiraeoideae



Spiraea

**gynoecium = apocarpic
fruit = follicles**

subfamily Rosoideae

Agrimonia gryposepala (common agrimony)

Filipendula rubra (Queen of the prairie)

Fragaria virginiana (wild strawberry)

Fragaria vesca var. *americana* (wild strawberry)

Geum triflorum (prairie smoke)

Geum canadense (white avens)

Dasiphora fruticosa [= *Pentaphylloides floribunda*] (shrubby cinquefoil)

Potentilla simplex (common cinquefoil)

Potentilla anserina [= *Argentina argentea*] (silverweed)

Rosa rugosa (beach rose)

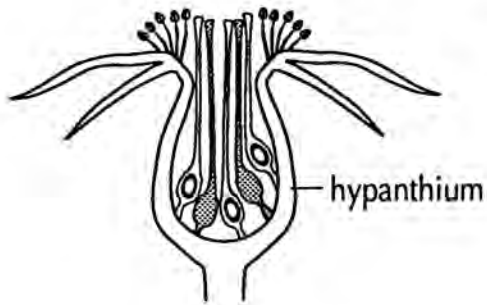
Rosa multiflora (multiflora rose)

Rosa palustris (swamp rose)

Rubus hispidus (swamp dewberry)

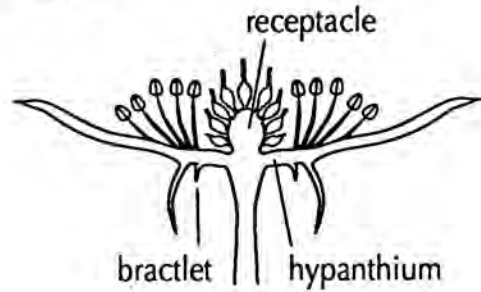
common blackberry (*R. allegheniensis*), the black raspberry (*R. occidentalis*), and the American raspberry (*R. idaeus strigosus*)

Subfamily Rosoideae



Rosa
(rose)

gynoecium = apocarpic
fruit = achenes



Fragaria
(strawberry)

gynoecium = apocarpic
fruit = aggregate of achenes

subfamily Prunoideae

Prunus serotina (wild black cherry)

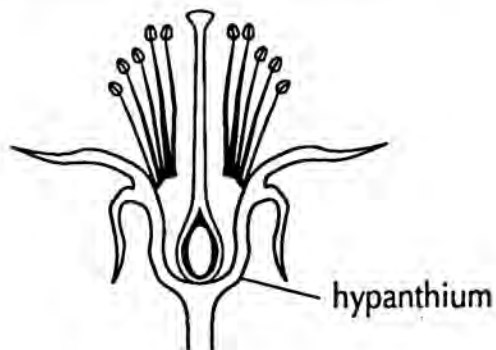
Prunus virginiana (choke cherry)

Prunus pensylvanica (pin cherry)

Prunus pumila (sand cherry)

Prunus americana (wild plum)

Subfamily Prunoideae



Prunus
(cherry)

gynoecium = monocarpic
fruit = drupe

subfamily Maloideae or Pomoideae

Amelanchier laevis (shadbush, serviceberry, Juneberry)

Aronia prunifolia (black chokeberry)

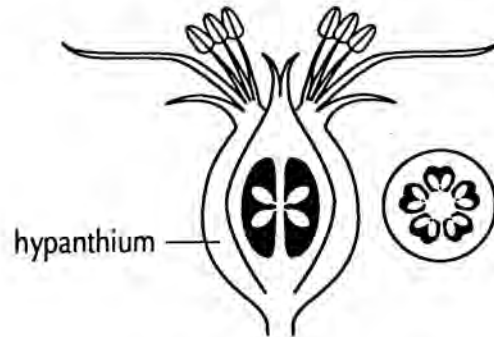
Crataegus spp. (hawthorn, thornapple)

Malus coronaria (American crabapple)

Malus pumila [= *Pyrus malus*] (apple)

Pyrus communis (pear)

Subfamily Maloideae



***Pyrus* [Malus]**
(apple)

gynoecium = syncarpic
fruit = pome

Elms, Mulberries, and Legumes

Order Rosales (part II)

Rhamnaceae (buckthorn family)

- Rhamnus alnifolia* (alder buckthorn)
- Rhamnus cathartica* (European buckthorn) [invasive]
- Frangula alnus* (= *Rhamnus frangula*) (glossy buckthorn) [invasive]
- Ceanothus americanus* (New Jersey tea)

Elaeagnaceae (Russian olive family)

- Elaeagnus angustifolia* (Russian olive) [invasive]
- Elaeagnus umbellata* (autumn olive) [invasive]
- Shepherdia canadensis* (buffalo-berry)

Ulmaceae (elm family)

- Ulmus americana* (american elm)
- U. rubra* (slippery or red elm)
- U. thomasi* (rock or cork elm)
- U. pumila* (Siberian elm) [invasive]

Cannabaceae (hemp or marijuana family)

- Humulus lupulus* (hops)
- Humulus japonicus* (Japanese hops)
- Cannabis sativa* (hemp, marijuana)
- Celtis occidentalis* (hackberry)

Urticaceae (nettle family)

- Boehmeria cylindrica* (false nettle)
- Laportea canadensis* (wood nettle)
- Parietaria pensylvanica* (pellitory)
- Pilea pumila* (clearweed)
- Urtica dioica* (stinging nettle)

Moraceae (mulberry or fig family)

- Morus alba* (white mulberry)
- Morus rubra* (red mulberry)
- Maclura pomifera* (osage orange)

Order Fabales

Fabaceae or Leguminosae (legume family)

Caesalpinoid group

- Cercis canadensis* (redbud)
- Chamaecrista fasciculata* (golden cassia, locust-weed)
- Gleditsia triacanthos* (honey locust)

Gymnocladus dioica (Kentucky coffee tree)
Senna hebecarpa (wild senna)

Faboid group

Amorpha canescens (leadplant)
Apios americana (groundnut)
Baptisia lactea [= *B. alba* or *B. leucantha*] (white false indigo)
Baptisia leucophaea [= *B. bracteata*] (creamy false indigo)
Coronilla varia (crown vetch)
Dalea purpurea [= *Petalostemum purpureum*] (prairie-clover)
Desmodium canadense (tick-trefoil)
Lathyrus japonicus [= *L. maritimus*] (beach pea)
Lespedeza capitata (bush-clover)
Lupinus perennis (lupine)
Medicago sativa (alfalfa)
Melilotus alba (white sweet clover)
Melilotus officinalis (yellow sweet clover)
Robinia pseudoacacia (black locust)
Tephrosia virginiana (goats-rue)
Trifolium pratense (red clover)
Vicia villosa (vetch)

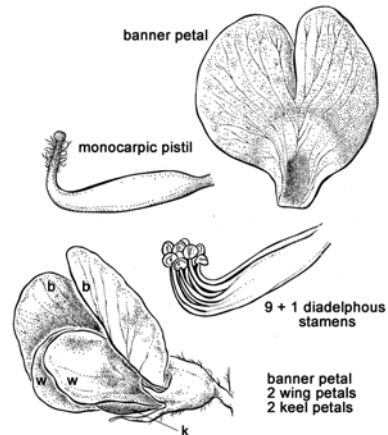
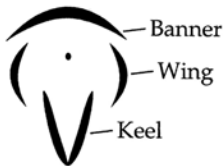
Caesalpinoids

Imbricate, with upper petal usually innermost



Faboids

Imbricate, with upper petal outermost, two basal petals connate or coherent at apex



Polygalaceae (milkwort family)

Polygala paucifolia (gaywings, flowering wintergreen)
Polygala polygama (bitter milkwort)
Polygala sanguinea (purple milkwort)

Violets, Aspens, and Gourds

Malpighiales

Violaceae (violet family)

Hybanthus concolor (green violet) [**special concern**]

Viola canadensis (Canada white violet)

Viola macloskeyi (wild white violet) = *V. pallens*

Viola pedata (bird's-foot violet)

Viola pedatifida (prairie violet) = *V. palmata*

Viola pubescens (downy yellow violet) = *V. eriocarpa*

Viola sororia (dooryard or common blue or wood violet) **State Flower**

Viola tricolor (Jonny-jump-up, garden pansy)

Hypericaceae [often called Clusiaceae or Guttiferae] (St. John's wort family)

Hypericum canadense (St. John's wort)

Hypericum perforatum (common St. John's wort, Klamath weed)

Hypericum punctatum (spotted St. John's wort)

Hypericum pyramidatum (great St. John's wort)

Triadenum virginicum (marsh St. John's wort)

Salicaceae (willow family)

Populus deltoides (American cottonwood)

Populus balsamifera (balsam poplar)

Populus tremuloides (trembling aspen)

Populus grandidentata (big tooth aspen)

Populus alba (white poplar)

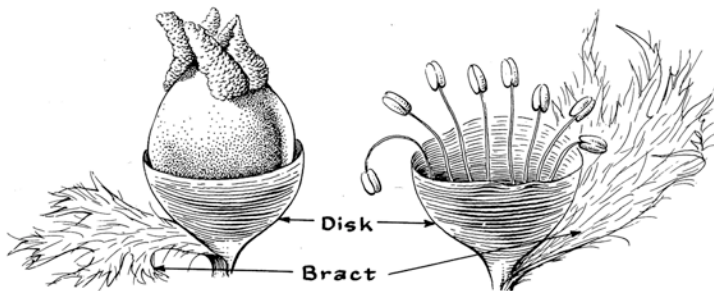
Populus nigra (black and lombardy poplar)

Salix pedicellaris (bog willow)

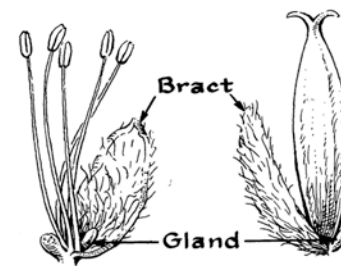
Salix fragilis (crack willow)

Salix humilis (prairie willow)

Salix discolor (pussy willow)



Populus, (left) female flower, (right) male flower.



Salix, (left) male flower, (right) female flower

Euphorbiaceae (spurge family)

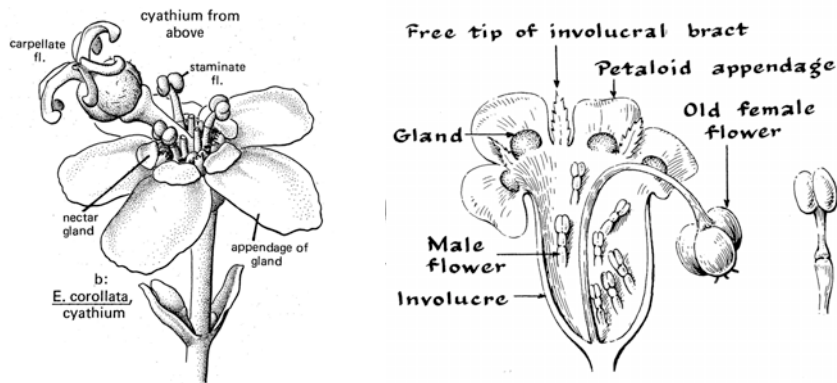
Euphorbia corollata (flowering spurge)

Euphorbia virgata (*E. esula*) (leafy spurge)

Euphorbia cyparissias (cypress spurge)

Euphorbia (*Chamaesyce*) *polygonifolia* (seaside spurge)

Acalypha rhomboidea (mercury, copper leaf)
Croton glandulosus (croton)



Celastrales

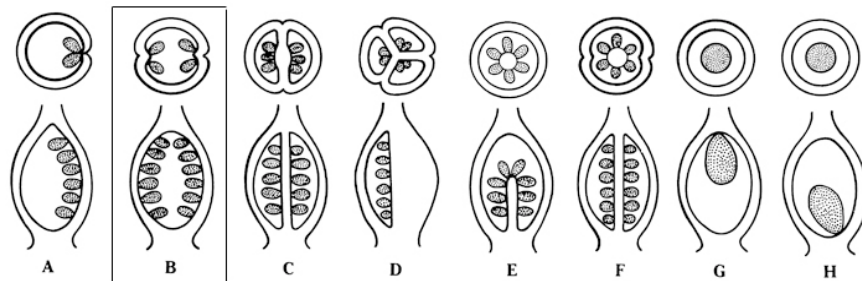
Celastraceae (bittersweet family)

- Celastrus scandens* (American bittersweet)
- Euonymus atropurpurea* (eastern wahoo, burning-bush)
- Parnassia glauca* (grass-of-parnassus)

Cucurbitales

Cucurbitaceae (melon family)

- Echinocystis lobata* (wild cucumber, balsam cucumber)
- Sicyos angulata* (bur cucumber)



Ovary Placentation: A, marginal; **B, parietal**; C, axile, ovary with 2 loculi; D, axile, ovary with 3 loculi; E, free-central; F, free-central; G, apical; H, basal

Vitales

Vitaceae (grape family)

- Parthenocissus quinquefolia* (Virginia creeper)
- Parthenocissus inserta* [= *P. vitacea*] (grape woodbine)
- Parthenocissus tricuspidata* (Boston ivy) [introduced]
- Vitis riparia* (riverbank grape) [includes *V. vulpina*, frost grape]
- Vitis aestivalis* (summer grape)

Endangered and Threatened Great Lakes Flora

1. The value of biodiversity
 - a. What is "biodiversity"?
 - b. How is biodiversity valued and problems with these approaches?
 - i.
 - ii.
 - iii.
 - iv.
2. The Endangered Species Act
 - a. Endangered vs. threatened species
 - b. Mandated habitat protection
 - c. How do you define "species"?
3. Wisconsin lists
 - a. State listed "endangered" or "threatened"
 - b. 7 Federally listed "threatened" species (common names - know these)
 - i.
 - ii.
 - iii.
 - iv.
 - v.
 - vi.
 - vii.
4. How do species become "endangered" in Great Lakes?
 - a.
 - b.
 - c.
 - d.
5. What can / should be done
 - a.
 - b.
 - c.

Oaks, Birches, and Evening Primroses

Order Fagales – the wind pollinated trees with nut fruits

Juglandaceae (walnut family)

Juglans cinerea (butternut, white walnut)

Juglans nigra (black walnut)

Carya cordiformis (bitternut hickory)

Carya ovata (shagbark hickory)

Fagaceae (beech and oak family)

Fagus grandifolia (American beech, beechnut)

Castanea dentata (chestnut)

Quercus rubra (northern red oak)

Quercus velutina (black oak)

Quercus ellipsoidalis (northern pin oak, Hill's oak)

Quercus coccinea (scarlet oak) **[special concern]**

Quercus alba (white oak)

Quercus macrocarpa (bur oak)

Quercus muhlenbergii (chinquapin oak) **[special concern]**

Quercus bicolor (swamp white oak)

Betulaceae (birch family)

Alnus glutinosa (European black alder) **[invasive]**

Alnus incana [= *A. rugosa*] (speckled alder)

Alnus viridis [= *A. crispa*] (green or mountain alder)

Betula alleghaniensis (yellow birch)

Betula nigra (river birch)

Betula papyrifera (paper birch)

Betula pumila (dwarf birch)

Carpinus caroliniana (bluebeech, hornbeam, muscle-wood)

Ostrya virginiana (ironwood, hop hornbeam)

Corylus americana (hazelnut, filbert) [=Corylaceae]

Corylus cornuta (beaked hazelnut) [=Corylaceae]

Myricaceae (bayberry family)

Comptonia peregrina (sweet fern)

Myrica gale (sweet gale)



walnut: 2b - female flowers; 3a - male inflorescence;
4 - one seeded nut

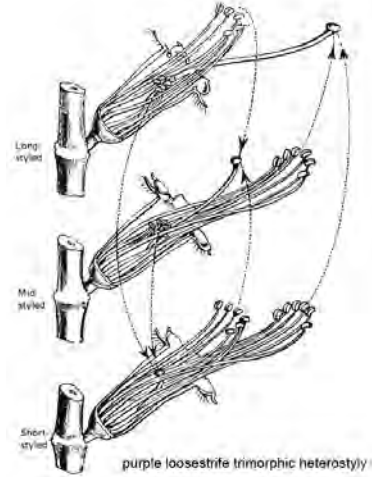
Order Myrtales

Onagraceae (evening primrose family)

- Oenothera biennis* (common evening primrose)
- Oenothera parviflora* (small-flowered primrose)
- Oenothera biennis* [= *Gaura*] (gaura)
- Chamerion angustifolium* [= *Epilobium*] (fireweed, willow-herb)
- Epilobium strictum* (downy willow-herb)
- Circaea canadensis* (= *C. lutetiana*) (common enchanter's-nightshade)
- Circaea alpina* (northern enchanter's-nightshade)
- Ludwigia palustris* (false loosestrife, water primrose, seed-box)

Lythraceae (loosestrife family)

- Lythrum salicaria* (purple loosestrife)
[invasive]
- Lythrum alatum* (winged loosestrife)
- Decodon verticillatus* (swamp loosestrife, whorled loosestrife)



Order Geraniales

Geraniaceae (geranium family)

- Geranium maculatum* (wild geranium, crane's-bill)
- Geranium bicknellii* (northern crane's-bill)
- Geranium robertianum* (herb robert)
- Geranium sibiricum* (Siberian crane's-bill) [adventive]
- Erodium cicutarium* (stork's-bill)

Order Oxalidales

Oxalidaceae (wood-sorrel family)

- Oxalis stricta* [= *O. europea*] (tall wood-sorrel)
- Oxalis dillenii* (southern yellow wood-sorrel)
- Oxalis corniculata* (creeping yellow wood-sorrel)
- Oxalis violacea* (violet wood-sorrel)

Order Crossosomatales

Staphyleaceae

- Staphylea trifolia* (American bladdernut)

Mustards, Mallows, and Maples

Order Brassicales

Brassicaceae (Cruciferae) - mustard family

Alliaria petiolata (garlic-mustard) **[invasive]**

Arabidopsis (*Arabis*) *lyrata* (rock or sand cress)

Boechea (*Arabis*) *laevigata* (smooth rock cress)

Boechea (*Arabis*) *canadensis* (sickle-pod)

Barbarea vulgaris (yellow rocket, winter cress) **[introduced]**

Berteroa incana (hoary alyssum) **[introduced]**

Cakile edentula (sea rocket)

Capsella bursa-pastoris (shepherd's purse) **[introduced]**

Cardamine douglassii (purple spring cress)

Cardamine pratensis (cuckoo flower)

Cardamine concatenata (cut-leaf toothwort) = *Dentaria laciniata*

Cardamine diphylla (broad-leaved toothwort) = *Dentaria diphylla*

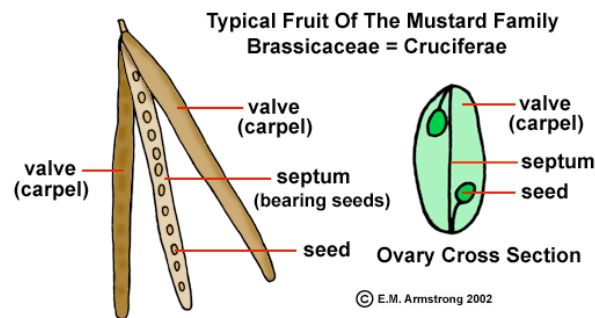
Draba reptans (whitlow-grass)

Hesperis matronalis (Dame's rocket) **[introduced]**

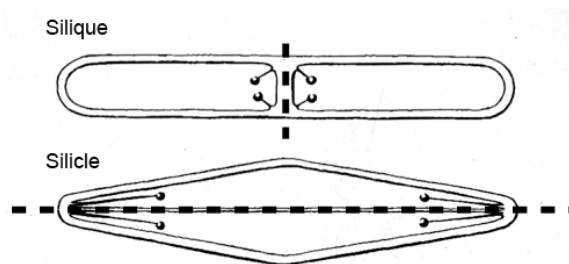
Lepidium virginicum (common peppergrass)

Nasturtium officinale (water-cress) = *Rorippa nasturtium-aquaticum*

Thlaspi arvense (field penny cress) **[introduced]**



Silique (composed of two carpels)



Two kinds of specialized capsules in Brassicaceae.
Siliques flattened perpendicular to septum (dotted line),
Silicles flattened parallel to septum

Cleomaceae (Capparidaceae before) - spider plant family
Polanisia dodecandra (clammy weed)

Trapaeolaceae - nasturtium family
Trapaeoleum majus (garden nasturtium) -- cultivar from South America
[introduced]

Order Malvales

Malvaceae - mallow family [includes old Tiliaceae - basswood family]
Hibiscus trionum (flower of an hour) **[naturalized]**
Abutilon theophrasti (velvet leaf) **[naturalized]**
Alcea rosea (hollyhock) = *Althaea rosea* **[introduced]**
Malva neglecta (mallow or cheeses) **[naturalized]**
Napaea dioica (glade mallow) **[special concern]**
Tilia americana (American basswood) [previously in Tiliaceae]
Tilia cordata & *petiolaris* (European basswoods) **[introduced]**

Cistaceae - rockrose family
Crocanthemum (Helianthemum) canadense (rockrose or frostweed)
Hudsonia tomentosa (false heather)
Lechea stricta (prairie pinweed)

Order Sapindales

Anacardiaceae - sumac and cashew family
Rhus aromatica (fragrant sumac)
Rhus glabra (smooth sumac)
Rhus typhina (staghorn sumac) (= *Rhus hirta*)
Toxicodendron radicans, *T. rydbergii* (eastern & western poison ivy)
Toxicodendron vernix (poison or swamp sumac)

Sapindaceae - maple family [includes old Aceraceae and Hippocastanaceae]
Acer rubrum (red maple)
Acer saccharum (sugar maple)
Acer nigrum (black maple)
Acer saccharinum (silver maple)
Acer negundo (boxelder)
Acer pensylvanicum (striped maple, moosewood) **[special concern]**
Acer platanoides (Norway maple) **[introduced]**
Acer spicatum (mountain maple)
Aesculus hippocastanum (horse chestnut) **[introduced]**
Aesculus glabra (Ohio buckeye) **[introduced]**

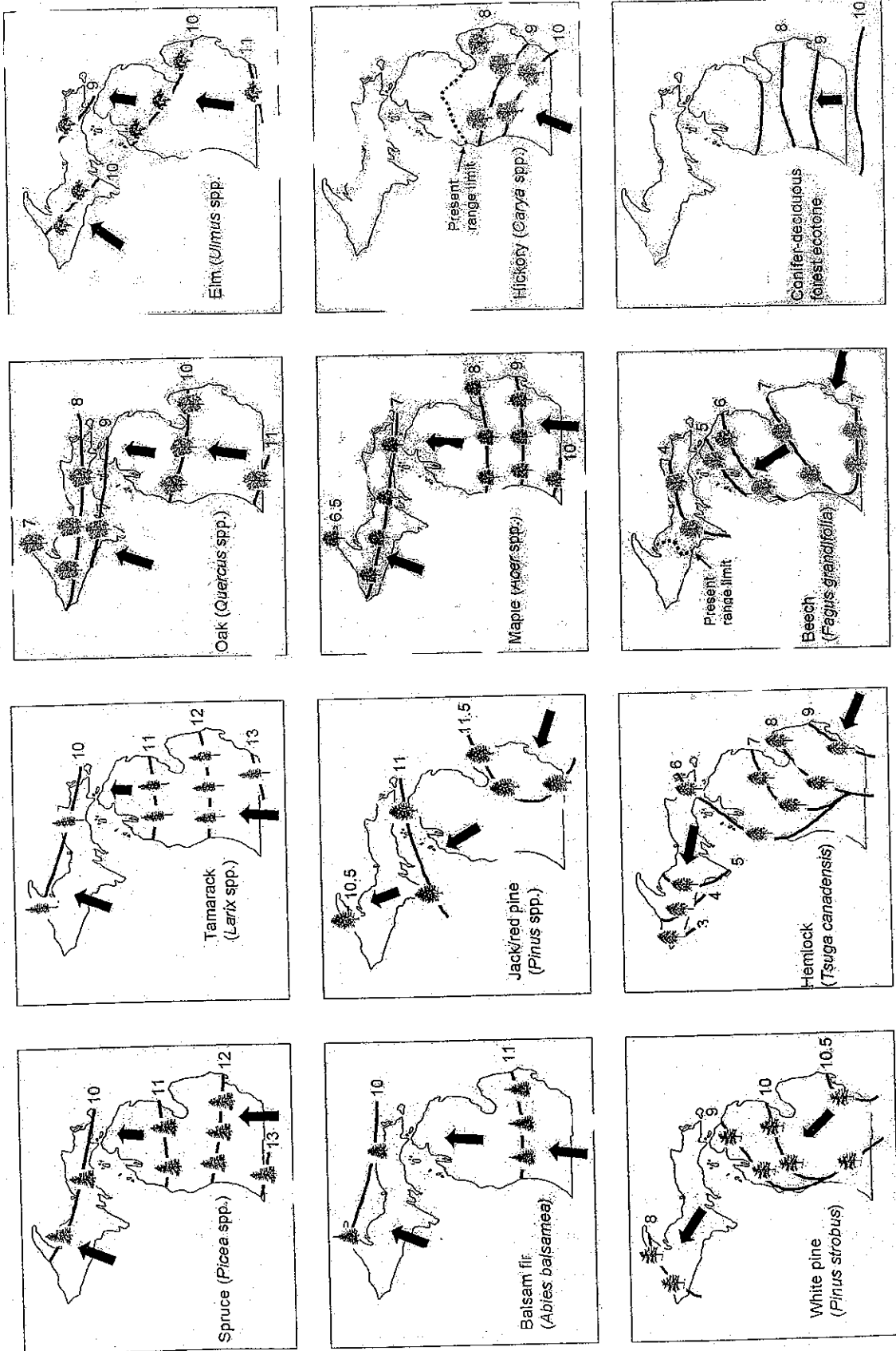
Simaroubaceae - quassia family
Ailanthus altissima (tree-of-heaven) **[introduced, spreading]**

Rutaceae - citrus family
Ptelea trifoliata (hop-tree, wafer-ash)
Zanthoxylum americanum (prickly-ash) **[native, invasive]**

(Dis)Assembly of the Great Lakes Forests

1. Vegetation vs. Flora
 - a. **Vegetation** refers to the physical appearance (physiognomy) of the forest type ecology driven
 - b. **Flora** refers to the species (genus, family) composition of any given forest - history driven
2. Arcto-Tertiary forest biome
 - a. wide-spread across Northern Hemisphere
 - b. warm and moderate temperatures followed by world-wide cooling
 - c. forest fragmentation during late Tertiary ca. 25-5 Mya
3. Pleistocene ice ages
 - a. Wisconsin glaciation reached height at 18,000 ya
 - b. Great Lakes forest history begins late Pleistocene at 14,000 ya
 - c. Ice-free areas: possible refugia for Great Lakes flora
 - i. south of ice sheet
 - ii. Beringia
 - iii. coastal plains of eastern and northwestern North America
 - iv. Driftless Area of SW Wisconsin, NE Iowa, SE Minnesota, NW Illinois
 - d. Vegetation and flora south of ice
 - i. Pollen records
 - ii. Boreal - spruce/fir - south to 33°N
 - iii. Tundra only near ice front
4. Migration of forests into Great Lakes region
 - a. Time sequence
 - i. Ice begins retreat at 14,000 ya in late Pleistocene
 - ii. Ice gone by start of Holocene at 10,000 ya
 - iii. Hypsithermal at 8,500-6,000 ya
 - b. Vegetation/flora sequence
 - i. 13,000 ya: tundra
 - ii. 12,500 ya: spruce/fir
 - iii. 11,000 ya: pine / oak / elms
 - iv. 10,000 ya: maples
 - v. 9,000 ya: hemlock
 - vi. 7,000 ya: beech
 - c. Rates of species migration
 - d. Refugia and floristic elements (covered in first lecture as well)
5. Dis-assembly of Great Lakes forests
 - a. Pre-settlement forests: General Land Office and surveyors' records
 - b. Global climate change
 - i. [CO₂] in Antarctic ice cores and on summit of Mauna Loa, Hawaii
 - ii. Vegetation shifts predicted in Great Lakes
 - iii. Species ecological niche envelopes - flora shifts?
 - iv. *Fagus grandifolia* - American beech example - can it migrate fast enough? will its ecosystem (biome and soil) migrate with it?

Figures from "The Forests of Michigan" (Dickmann and Leefer, 2003) showing ages in thousands of year BP of occurrences in Great Lake Region of various conifer and hardwood species

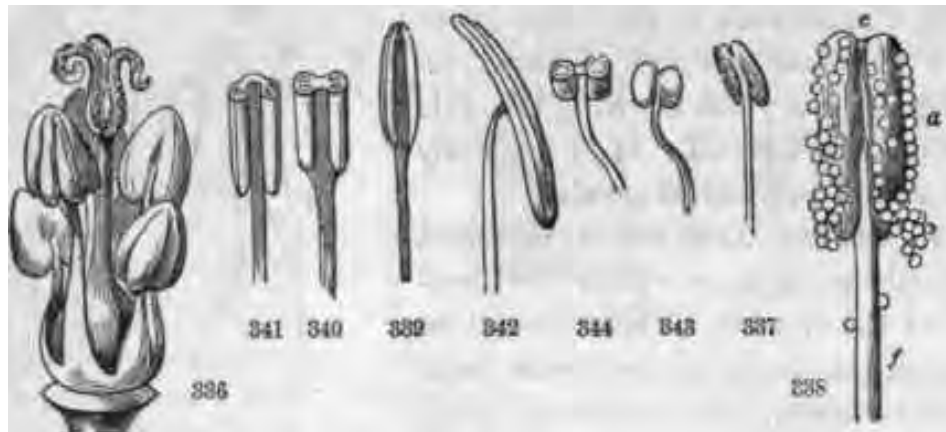


Blueberries and Dogwoods

Order Ericales

Ericaceae - blueberry family

- Andromeda glaucophylla* (bog rosemary)
- Arctostaphylos uva-ursi* (bearberry)
- Chamaedaphne calyculata* (leatherleaf)
- Epigaea repens* (trailing arbutus)
- Gaultheria procumbens* (wintergreen)
- Gaultheria hispidula* (creeping snowberry)
- Gaylussacia baccata* (huckleberry)
- Kalmia polifolia* (pale or swamp laurel)
- Rhododendron (Ledum) groenlandicum* (labrador tea)
- Rhododendron lapponicum* (lapland rosebay, "rock rose") **[endangered]**
- Vaccinium angustifolium* (common lowbush blueberry)
- Vaccinium macrocarpon* (large cranberry)
- Vaccinium myrtilloides* (velvet leaf blueberry)
- Vaccinium vitis-idaea* var. *minus* (mountain cranberry) **[endangered]**



Figs. 340-341: poricidal anthers (buzz pollination) in many Ericaceae

[old Pyrolaceae - shinleaf family]

- Chimaphila umbellata* (pipsissewa, prince's pine)
- Pyrola rotundifolia* (round-leaved shinleaf)
- Moneses uniflora* (one-flowered shinleaf)

[old Monotropaceae - Indian pipe family]

- Monotropa uniflora* (Indian pipe)
- Hypopitys monotropa (Monotropa hypopithys)* (false beech drops, pinesap)
- Pterospora andromedea* (giant pinedrops) **[endangered]**

Primulaceae - primrose family [*Michigan Flora places these into Myrsinaceae]

**Lysimachia ciliata* (fringed loosestrife)

**Lysimachia nummularia* (money-wort, Creeping Charlie)

**Lysimachia quadriflora* (narrowed-leaved loosestrife)

**Lysimachia quadrifolia* (whorled loosestrife)

**Lysimachia terrestris* (swamp-candles)

**Lysimachia thyrsiflora* (tufted or swamp loosestrife)

Primula (Dodecatheon) meadii (shooting star)

Primula (Dodecatheon) amethystinum (jeweled shooting star) [= *P. radicum*] [**special concern**]

Primula mistassinica (bird's-eye primrose) [**special concern**]

**Trientalis borealis* (starflower)

Sarraceniaceae - pitcher plant family

Sarracenia purpurea (pitcher plant)

Polemoniaceae - phlox family

Phlox pilosa (prairie phlox)

Phlox divaricata (blue phlox)

Phlox glaberrima (smooth phlox) [**endangered**]

Polemonium reptans (Jacob's ladder)

Polemonium occidentale (western polemonium)

Balsaminaceae - jewelweed family

Impatiens capensis [= *I. biflora*] (orange jewelweed, touch-me-not)

Impatiens pallida (yellow jewelweed)

Order Cornales

Cornaceae - dogwood family

Cornus alternifolia (alternate-leaved dogwood, pagoda tree)

Cornus amomum (silky leaved dogwood)

Cornus foemina (*C. racemosa*) (grey dogwood)

Cornus sericea (*C. stolonifera*) (red-osier dogwood)

Cornus rugosa (round-leaved dogwood)

Cornus canadensis (bunchberry, dwarf colonel)

Cornus florida (flowering dogwood) [not native to Wisconsin]

Order Gentianales (in part)

Gentianaceae - gentian family

Bartonia virginica (screwstem)

Gentiana alba (yellowish gentian) [= *G. flavida*]

Gentiana andrewsii (bottle gentian)

Gentianella quinquefolia (stiff gentian)

Gentianopsis crinita (fringed gentian)

Gentianopsis virgata (small fringed gentian) [= *G. procera*]

Milkweeds, Madders, and Nightshades

Order Gentianales (continued)

Apocynaceae - dogbane family [includes old Asclepiadaceae]

Apocynum androsaemifolium (spreading dogbane)

Apocynum cannabinum (Indian hemp)

Vinca minor (periwinkle) - cultivated

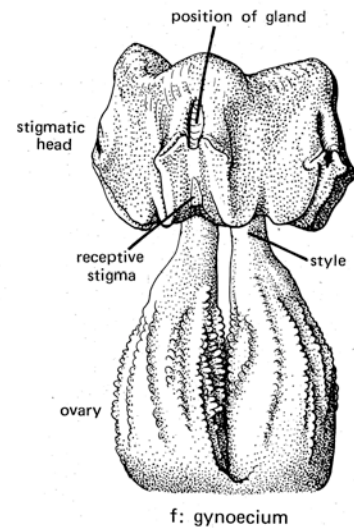
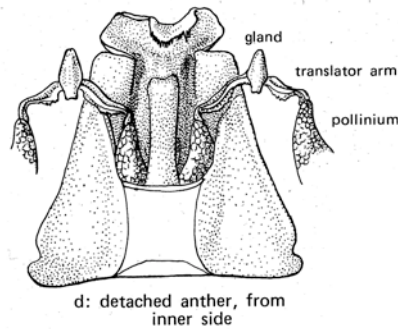
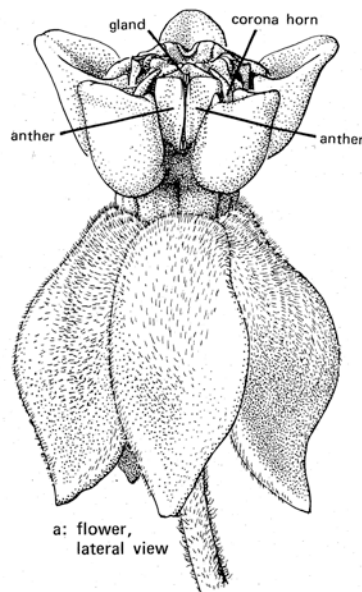
Asclepias amplexicaulis (clasping-leaved milkweed)

Asclepias incarnata (swamp milkweed)

Asclepias syriaca (common milkweed)

Asclepias tuberosa (butterfly weed)

Asclepias verticillata (whorled milkweed)



Rubiaceae - madder or coffee family

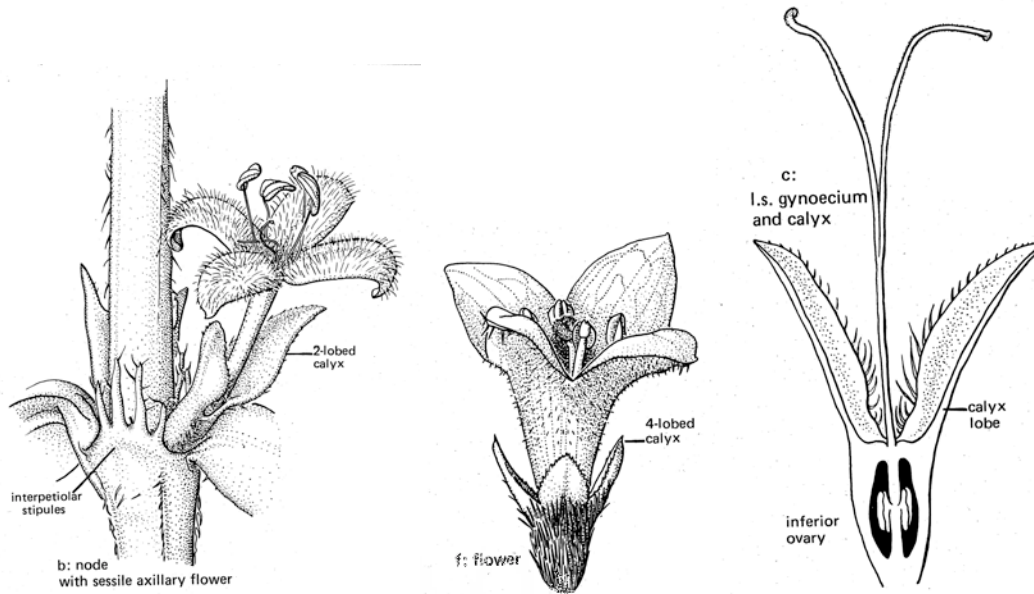
Cephalanthus occidentalis (buttonbush)

Galium boreale (northern bedstraw, cleavers)

Galium lanceolatum (wild licorice)

Houstonia longifolia (blueets)

Mitchella repens (twin-berry, partridge-berry)



Order Solanales

Solanaceae - nightshade family

Datura stramonium (jimson-weed)

Physalis heterophylla (clammy ground cherry)

Physalis virginiana (ground cherry)

Solanum dulcamara (bittersweet)

Solanum carolinense (horse nettle)

Convolvulaceae - morning glory family [including old Cuscutaceae]

Convolvulus arvensis (field bindweed)

Calystegia sepium (hedge bindweed)

Ipomoea purpurea (common morning glory) - naturalized

Cuscuta glomerata (rope dodder)

Cuscuta gronovii (common dodder)

Puccoons, Mints, and Ashes

Order Boraginales

Boraginaceae - borage family [including Hydrophyllaceae]

- Mertensia virginica* (eastern bluebell)
- Lithospermum carolinense* (plains puccoon)
- Lithospermum canescens* (hoary puccoon)
- Echium vulgare* (blueweed, vipers bugloss)
- Hackelia virginiana* (beggars'-lice)
- Myosotis scorpioides* (forget-me-nots)
- Hydrophyllum virginianum* (common waterleaf)
- Hydrophyllum appendiculatum* (great waterleaf)

Order Lamiales

Oleaceae - ash family

- Fraxinus americana* (white ash)
- Fraxinus nigra* (black ash)
- Fraxinus pennsylvanica* (red ash, green ash)
- Syringa vulgaris* (lilac) **[cultivated]**
- Forsythia intermedia/suspensa* (forsythia, golden bells) **[cultivated]**

Lamiaceae or Labiatae - mint family

- Glechoma hederacea* (creeping charlie) **[introduced]**
- Monarda fistulosa* (wild bergamot)
- Monarda punctata* (horsemint)
- Leonurus cardiaca* (motherwort) **[introduced]**
- Nepeta cataria* (catnip) **[introduced]**
- Prunella vulgaris* (self heal)
- Scutellaria parvula* (skullcap)
- Salvia* (sage) **[cultivated]**



Verbenaceae - vervain family

Verbena hastata (blue vervain)

Verbena stricta (hoary vervain)

Phyla lanceolata (fogfruit)

Phrymaceae

Phryma leptostachya (lopseed)

Mimulus ringens (monkey-flower)

Scrophulariaceae - figwort family

Scrophularia marilandica (eastern figwort, Carpenter's-square)

Verbascum thapsus (common mullein)

Verbascum blattaria (moth mullein)

Plantaginaceae - plantain family

Plantago lanceolata (English plantain, ribgrass) [**introduced**]

Plantago major (common plantain) [**introduced**]

Plantago patagonica (wooly plantain) [**introduced**]

Antirrhinum majus (snapdragon) [**cultivated**]

Besseyia bullii (kittens' tails) [**threatened**]

Chelone glabra (white turtlehead)

Linaria vulgaris (butter-and-eggs, toadflax) [**introduced**]

Veronica catenata (water speedwell)

Veronica persica (bird'-eye speedwell)

Veronicastrum virginicum (culver's root)

Orobanchaceae - broomrape family

"hemiparasites"

Agalinis purpurea (purple gerardia) [= *Gerardia purpurea*]

Aureolaria flava (smooth false foxglove)

Aureolaria pedicularia (clammy false foxglove)

Castilleja coccinea (Indian paintbrush, painted cup)

Meleampyrum lineare (cow-wheat)

Pedicularis canadensis (lousewort, wood betony)

Pedicularis lanceolata (swamp lousewort)

"holoparasites"

Orobanche fasciculata (clustered broomrape) [**threatened**]

Orobanche uniflora (one-flowered broomrape)

Conopholis americana (squaw root)

Epifagus virginiana (beech drops)

Lentibulariaceae - bladderwort family

Utricularia cornuta (naked bladderwort)

Utricularia gibba (creeping bladderwort)

Pinguicula vulgaris (butterwort) [**endangered**]

Acanthaceae

Ruellia humilis (hairy ruellia) [**endangered**]

Bignoniaceae - trumpet-creeper family

Catalpa speciosa (catalpa) [**cultivated**]

Campsis radicans (trumpet creeper) [**cultivated**]

Viburnums, Honeysuckles, and Ginsengs

Order Dipsacales

Adoxaceae - moschatel family

Adoxa moschatellina (moschatel, muskroot) **[threatened]**

Sambucus canadensis (common elder)

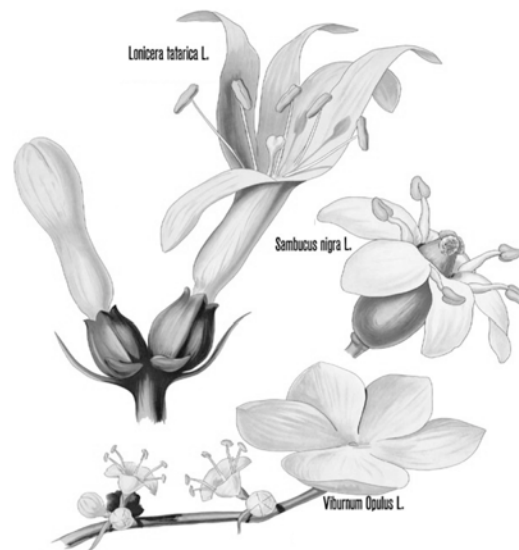
Sambucus racemosa [= *S. pubens*] (red-berried elder)

Viburnum acerifolium (maple-leaved viburnum)

Viburnum lentago (sheepberry, nannyberry)

Viburnum opulus [= *V. trilobum*] (highbush cranberry)

Viburnum rafinesquianum (downy arrow-wood)



Long-styled flowers (e.g., honeysuckle) now placed in Caprifoliaceae
Short-styled flowers (e.g. elderberry, viburnum) now in Adoxaceae

Caprifoliaceae - honeysuckle family (Note: Michigan Flora also recognizes Diervillaceae, Linnaeaceae, Valerianaceae & Dipsacaceae)

Lonicera canadensis (American fly honeysuckle)

Lonicera dioica (red honeysuckle)

Lonicera morrowii (& *X bella* hybrid swarm) **[invasive]**

Lonicera oblongifolia (swamp fly honeysuckle)

Lonicera reticulata [= *L. prolifera*] (wild or grape honeysuckle)

Lonicera tartarica (Tartarian honeysuckle) **[invasive]**

Diervilla lonicera (bush honeysuckle)

Linnaea borealis (twinflinger)

Triosteum perfoliatum (horse gentian)

Valeriana edulis var. *ciliata* (edible valerian)

Valeriana uliginosa (marsh valerian) **[threatened]**

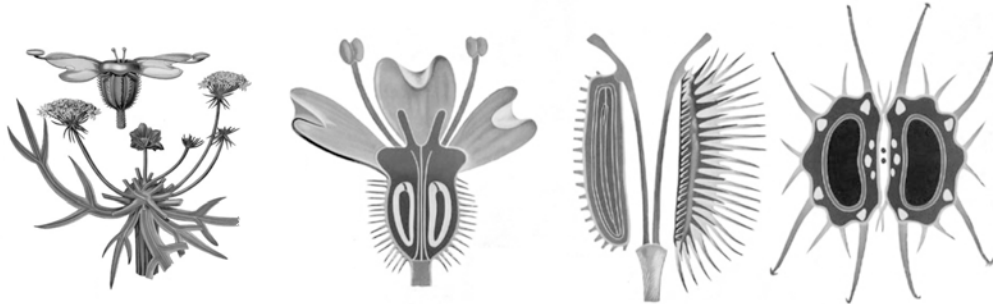
Valerianella chenopodiifolia (corn-salad)

Dipsacus fullonum (common teasel) [= *D. sylvestris*]
Knautia arvensis (blue-buttons) - locally established weed

Order Apiales

Apiaceae or Umbelliferae - carrot family

Angelica atropurpurea (great angelica)
Berula erecta [= *B. pusilla*] (water parsnip)
Cicuta bulbifera (bulblet water hemlock)
Cicuta maculata (spotted water hemlock)
Conium maculatum (poison hemlock, spotted hemlock) **[naturalized]**
Cryptotaenia canadensis (honestwort)
Daucus carota (Queen Annes lace, wild carrot) **[naturalized]**
Eriogonum bulbosum (Harbinger-of-spring) **[endangered]**
Eryngium yuccifolium (rattlesnake master)
Heracleum lanatum (American cow-parsnip)
Osmorhiza claytonii (hairy sweet cicely)
Osmorhiza longistylis (smooth sweet cicely)
Pastinaca sativa (wild parsnip) **[naturalized]**
Sanicula marilandica (snakeroot)
Sium suave (water parsnip)
Thaspium barbinode (hairy meadow parsnip) **[endangered]**
Zizia aurea (golden Alexanders)



Umbel inflorescences, inferior bicarpellate gynoecium, one-seeded schizocarps

Araliaceae - ginseng family

Aralia hispida (bristly sarsaparilla)
Aralia nudicaulis (wild sarsaparilla)
Aralia racemosa (spikenard, life-of-man)
Aralia elata (Hercule's-club, Devil's walking stick) - **adventive**
Panax quinquefolius (ginseng) **[special concern]**
Panax trifolius (dwarf ginseng)
Hedera helix (English ivy) **[potentially invasive]**

Bellflowers and Asters

Order Asterales

Campanulaceae - bellflower family (including Lobeliaceae)

- Campanula americana* (tall bellflower)
- Campanula rapunculoides* (European bellflower)
- Campanula rotundifolia* (harebell)
- Triodanis perfoliata* (= *Specularia*) (Venus looking glass)
- Lobelia cardinalis* (cardinal flower)
- Lobelia inflata* (indian tobacco)
- Lobelia siphilitica* (great blue lobelia)

Menyanthaceae - buckbean family

- Menyanthes trifoliata* (bogbean, common buckbean)

Asteraceae or Compositae - aster or composite family

- Floret types: actinomorphic (tubular or disk), ray, ligulate
- Head types: radiate, discoid, ligulate

tribe Lactuceae or Cichorieae: *Lactuca* (lettuce), *Cichorium* (chicory), *Prenanthes* (lion's foot), *Hieracium* (hawkweed), *Taraxacum* (dandelion), *Tragopogon* (goat's beard)

tribe Cardueae or Cynareae: *Centaurea* (knapweed), *Cirsium* (thistle), *Carduus* (plumeless thistle), *Arctium* (burdock)

tribe Vernonieae: *Vernonia* (ironweed)

tribe Heliantheae: *Helianthus* (sunflowers), *Echinacea* (purple coneflower), *Heliopsis* (false sunflower), *Silphium* (rosinweed, compass plant, prairie dock), *Rudbeckia* (blackeyed Susan), *Ratibida* (coneflowers), *Coreopsis* (coreopsis), *Bidens* (beggars tick), *Parthenium* (wild quinone), *Galinsoga* (quickweed)

subtribe Ambrosieae: *Ambrosia* (ragweed), *Iva* (burweed), *Xanthium* (cocklebur)

subtribe Eupatorieae: *Eupatorium* (boneset), *Eutrochium* (Joe Pye weed), *Liatris* (blazing star)

tribe Astereae: *Symphotrichum/Eurybia* (asters), *Euthamia/Solidago* (goldenrod), *Erigeron* (fleabane)

tribe Anthemideae: *Achillea* (yarrow), *Leucanthemum* (ox-eye daisy), *Artemisia* (wormwood), *Anthemis* (dog fennel), *Tanacetum* (tansy)

tribe Gnaphalieae (Inuleae): *Antennaria* (pussy toes), *Gnaphalium* (cudweed)

tribe Senecioneae: *Arnoglossum* (Indian plantain), *Packera/Senecio* (ragwort)

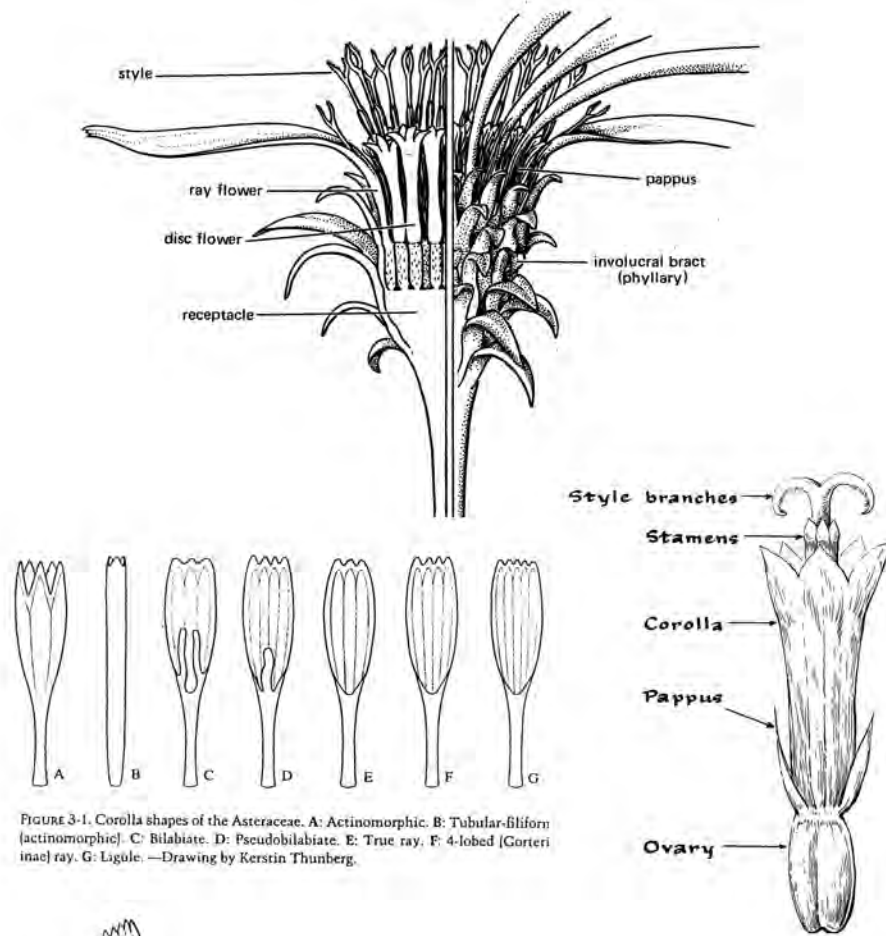
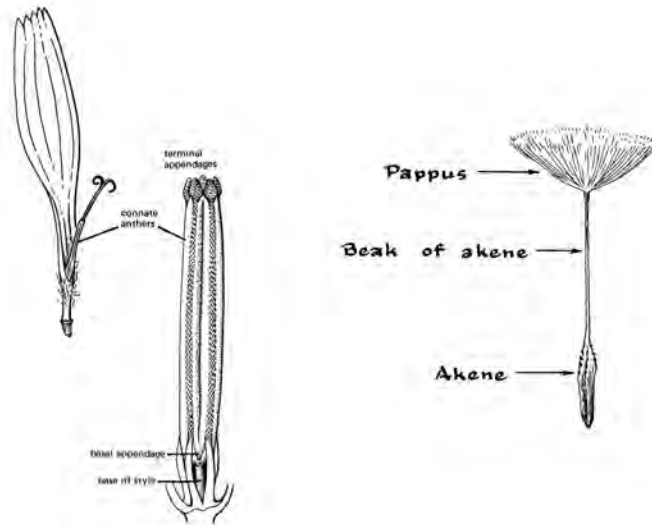


FIGURE 3-1. Corolla shapes of the Asteraceae. A: Actinomorphic. B: Tubular-filiform (actinomorphic). C: Bilabiate. D: Pseudobilabiate. E: True ray. F: 4-lobed (Gorteria) ray. G: Ligule. —Drawing by Kerstin Thunberg.



Diagrams of a radiate head (top), possible floret types – Wisconsin has types A, E, & G only (middle left), parts of an actinomorphic or tubular/disk floret (middle right), connate staminal tube (bottom left), and one-seeded achene with pappus

Arums, Lilies, and Orchids

Aquatic monocots

Alismataceae (water plantain or arrowhead family)

Alisma triviale (water plantain)

Sagittaria latifolia (arrow head, swamp potato)

Potamogetonaceae (pondweed family)

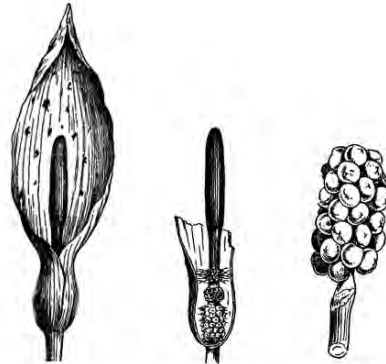
Potamogeton nodosus (pondweed)

Araceae (jack-in-the-pulpit family)

Arisaema triphyllum (jack-in-the-pulpit)

Symplocarpus foetidus (skunk cabbage)

Calla palustris (water arum)



Typical spadix inflorescence surrounded by spathe bract (left), opened spathe with (from bottom to top) female, then male, then sterile flowers (middle), and cluster of berries (right)

Lemna minor (small duckweed)

Spirodela polyrhiza (great duckweed)

Wolffia columbiana (common water meal)

Petaloid monocots

Liliaceae (lily family)

Lilium michiganense (Turk's cap lily)

Medeola virginiana (Indian cucumber root)

Clintonia borealis (bead-lily)

Erythronium americanum (yellow trout lily, fawn lily)

Erythronium albidum (white trout lily, fawn lily)

Tulipa (tulip) - cultivated

Melanthiaceae

Trillium flexipes (declined trillium)

Trillium grandiflorum (large-flowered trillium)

Colchicaceae

Uvularia grandiflora (bellwort, merrybells)

Asparagaceae

- Asparagus officinalis* (wild asparagus)
- Maianthemum canadense* (wild lily of the valley)
- Maianthemum stellatum* (starry false Solomon's seal)
- Maianthemum racemosum* (false Solomon's seal)
- Polygonatum pubescens* (Solomon's seal)
- Scilla sibirica* (English bluebells) - cultivated

Amaryllidaceae

- Allium cernuum* (nodding wild onion)
- Allium trococcum* (wild leek)
- Narcissus* (daffodil) - cultivated
- Hymenocallis* (spider lily) - cultivated

Xanthorrhoeaceae

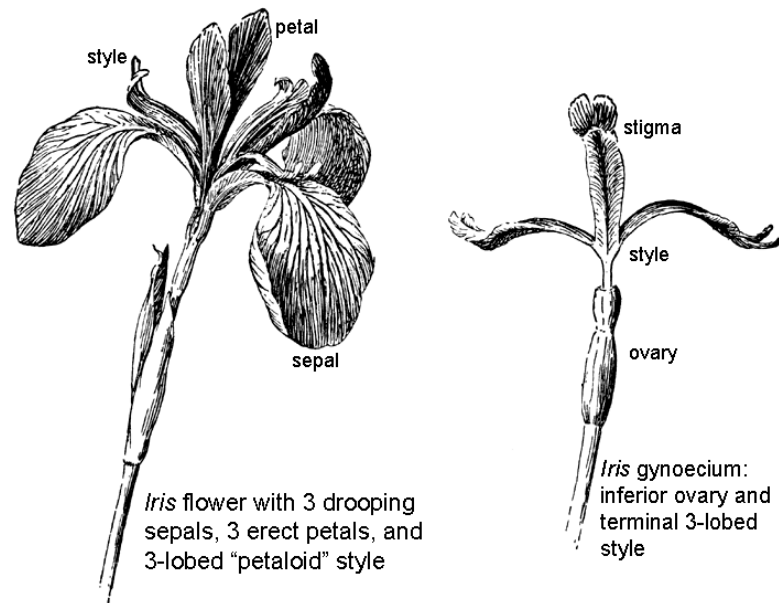
- Hemerocallis fulva* (day lily) - cultivated

Smilacaceae (carrion flower or catbriar family)

- Smilax herbacea* (carrion flower)
- S. hispida* (bristly catbriar or green briar)

Iridaceae - iris family

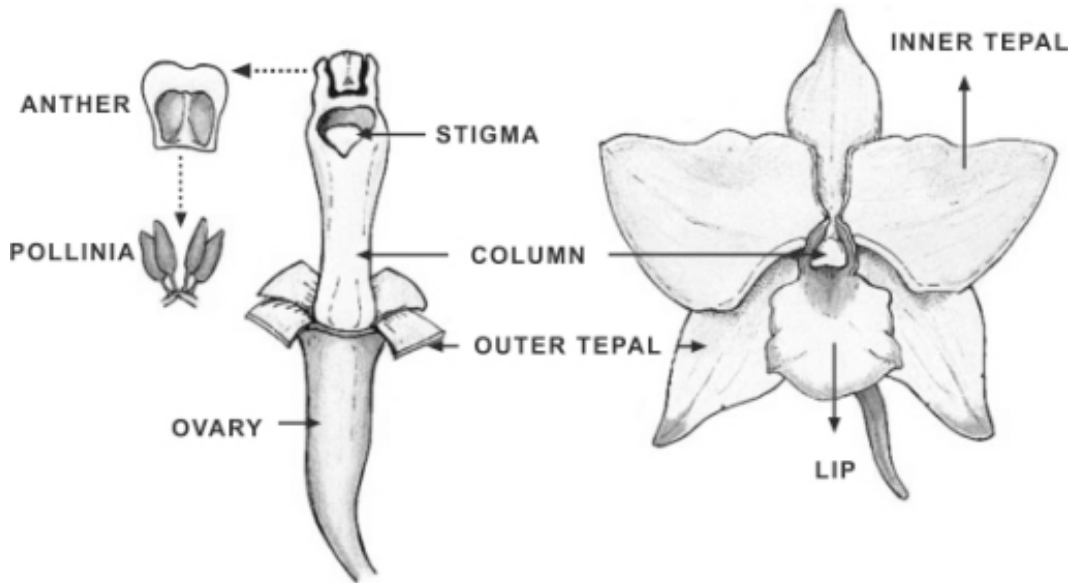
- Iris virginica* (= *I. shrevei*) (blue flag, iris)
- Iris versicolor* (blue flag)
- Iris lacustris* (dwarf lake iris) **[threatened]**
- Iris pseudacorus* (yellow flag) [escaped invasive]
- Sisyrinchium campestre* (blue-eyed grass)
- Crocus vernuus* (spring crocus) – cultivated



Orchidaceae - orchid family

- Cypripedium reginae* (showy lady's-slipper) **[special concern]**
- Aplectrum hyemale* (putty root, Adam-and-Eve) **[special concern]**
- Arethusa bulbosa* (dragon's mouth) **[special concern]**

Calopogon tuberosus (grass pink)
Calypso bulbosa (calypso orchid) **[threatened]**
Corallorhiza trifida (early coral root)
Epipactis helleborine (helleborine) [introduced/invasive]
Galearis spectabilis (showy orchis)
Goodyera pubescens (rattlesnake plantain)
Malaxis monophylla (white adder's mouth) **[special concern]**
Platanthera leucophaea (prairie white fringed orchid) **[endangered]**
Pogonia ophioglossoides (snake mouth orchid)
Spiranthes cernua (nodding ladies' tresses)



Dioscoreaceae - yam family
Dioscorea villosa (wild yam)

NOTE:

A chart showing how the families of petaloid monocots are correctly placed into families in the Student Herbarium is provided here. Both the *Field Manual of Michigan Flora* (and its website) and the University of Wisconsin *Wisflora* are outdated and incorrect. You should follow this chart and the Student Herbarium for correct identification and label making of any petaloid monocot you collect.

Petaloid monocot genera in Wisconsin and their correct family placements relative to various keying sources
(exclusive of the Dioscoreaceae, Iridaceae, Orchidaceae, and Smilacaceae)

Genus	APG family - use!	WI Flora book	Wisflora online	MI Flora	Gleason/Cronquist
	Student Herbarium				
<i>Aletris</i>	Nartheciaceae	Liliaceae	Liliaceae	Melanthiaceae	Liliaceae
<i>Allium</i>	Amaryllidaceae	Liliaceae	Liliaceae	Alliaceae	Liliaceae
<i>Anticlea</i>	(= <i>Zigadenus</i>)	(as <i>Zigadenus</i>)	(as <i>Zigadenus</i>)	Melanthiaceae	(as <i>Zigadenus</i>)
<i>Asparagus</i>	Asparagaceae	Liliaceae	Liliaceae	Asparagaceae	Liliaceae
<i>Camassia</i>	Asparagaceae	Liliaceae	Liliaceae	Hyacinthaceae	Liliaceae
<i>Clintonia</i>	Liliaceae	Liliaceae	Liliaceae	Convallariaceae	Liliaceae
<i>Convallaria</i>	Asparagaceae	Liliaceae	Liliaceae	Convallariaceae	Liliaceae
<i>Erythronium</i>	Liliaceae	Liliaceae	Liliaceae	Liliaceae	Liliaceae
<i>Hemerocallis</i>	Xanthorrhoeaceae	Liliaceae	Liliaceae	Hemerocallidaceae	Liliaceae
<i>Hypoxis</i>	Hypoxidaceae	Hypoxidaceae	Liliaceae	Hypoxidaceae	Liliaceae
<i>Lilium</i>	Liliaceae	Liliaceae	Liliaceae	Liliaceae	Liliaceae
<i>Maianthemum</i>	Asparagaceae	Liliaceae	Liliaceae	Convallariaceae	Liliaceae
<i>Medeola</i>	Liliaceae	Liliaceae	Liliaceae	Convallariaceae	Liliaceae
<i>Muscari</i>	Asparagaceae	Liliaceae	Liliaceae	Hyacinthaceae	Liliaceae
<i>Narcissus</i>	Amaryllidaceae	Liliaceae	Liliaceae	Amaryllidaceae	Liliaceae
<i>Ornithogalum</i>	Asparagaceae	Liliaceae	Liliaceae	Hyacinthaceae	Liliaceae
<i>Polygonatum</i>	Asparagaceae	Liliaceae	Liliaceae	Convallariaceae	Liliaceae
<i>Scilla</i>	Asparagaceae	Liliaceae	Liliaceae	Hyacinthaceae	Liliaceae
<i>Smilacina</i>	(= <i>Maianthemum</i>)	(as <i>Maianthemum</i>)	(as <i>Maianthemum</i>)	(as <i>Maianthemum</i>)	Liliaceae
<i>Streptopus</i>	Liliaceae	Liliaceae	Liliaceae	Convallariaceae	Liliaceae
<i>Tofieldia</i>	(= <i>Triantha</i>)	(as <i>Triantha</i>)	(as <i>Triantha</i>)	(as <i>Triantha</i>)	Liliaceae
<i>Triantha</i>	Tofieldiaceae	Liliaceae	Liliaceae	Melanthiaceae	Liliaceae
<i>Trillium</i>	Melanthiaceae	Liliaceae	Liliaceae	Trilliaceae	Liliaceae
<i>Uvularia</i>	Colchicaceae	Liliaceae	Liliaceae	Convallariaceae	Liliaceae
<i>Yucca</i>	Asparagaceae	Liliaceae	Agavaceae	Agavaceae	Agavaceae
<i>Zigadenus</i>	Melanthiaceae	Liliaceae	Liliaceae	(as <i>Anticlea</i>)	Liliaceae

Spiderworts, Cattails, Sedges, and Grasses

Order Commelinales

Commelinaceae - spiderwort family

Tradescantia ohiensis (common spiderwort)

Commelina erecta (erect day flower)

Commelina communis (common day flower) [introduced]

Pontederiaceae - pickerel weed family

Pontederia cordata (pickerel weed)

Order Poales

Typhaceae (cat-tail family)

Typha latifolia (common cat-tail)

Typha angustifolia (narrow-leaved cat-tail)

Typha X glauca (hybrid cat-tail)

Sparganium eurycarpum (bur-reed)

Xyridaceae (yellow-eyed grass family)

Xyris torta (yellow-eyed grass)

Eriocaulaceae (pipewort family)

Eriocaulon aquaticum [= *E. septangulare*] (pipewort, white buttons)

Juncaceae (rush family)

Juncus balticus [= *J. arcticus*] (northern green rush)

Juncus tenuis (path rush, poverty rush)

Luzula multiflora (wood rush)

Cyperaceae (sedge family)

Carex buxbaumii (Buxbaum's sedge)

Carex hystericina (bottlebrush)

Carex intumescens (bladder sedge)

Carex lacustris (lake sedge)

Carex plantaginea (plantain-leaved sedge)

Carex pennsylvanica (Pennsylvania sedge)

Carex stricta (tussock sedge)

Cyperus lupulinus (nut grass, umbrella sedge, flat sedge)

Eleocharis obtusa (spike rush)

Eriophorum angustifolia (cotton grass)

Scirpus atrovirens (dark green bulrush)

Scirpus cyperinus (woolgrass)

Schoenoplectus tabernaemontani [= *Scirpus validus*] soft-stem bulrush

Poaceae or Gramineae (grass family)

subf. Ehrhartoideae: *Zizania aquatica* (wild rice)

subf. Pooideae: *Poa annua* (bluegrass), *Bromus* (bromegrass), *Dactylis glomerata* (orchard grass), *Agrostis gigantea* (redtop), *Stipa spartea* (porcupine grass), *Ammophila breviligulata* (marram grass, beach grass), *Calamagrostis canadensis* (blue joint grass), *Phalaris arundinacea* (reed canary grass), *Phalaris canariensis* (canary grass), *Hierochloe hirta* (sweet grass), *Avena sativa* (oats), *Elymus repens* (quack grass), *Elymus trachycaulus* (wheat grass), *Elymus canadensis* (wild rye), *Elymus hystrix* (bottlebrush), *Triticum aestivum* (wheat)

subf. Arundinoideae: *Phragmites australis* (giant reed)

subf. Aristidoideae: *Aristida tuberculosa* (3 awned grass)

subf. Chloridoideae: *Bouteloua curtipendula* (sideoats grass, grama grass), *Spartina pectinata* (prairie cord grass), *Eragrostis cilianensis* (stinkgrass), *Muhlenbergia glomerata* (marsh wild timothy), *Sporobolus heterolepis* (dropseed)

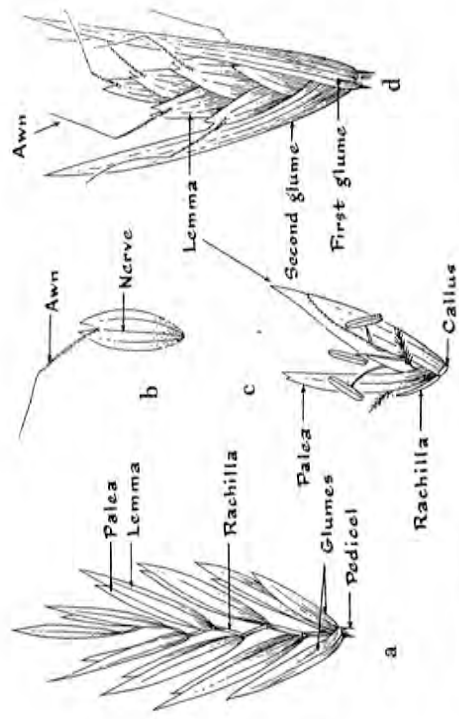
subf. Panicoideae

Tribe Paniceae: *Panicum virgatum* (switch grass), *Setaria viridis* (foxtail), *Digitaria* (crabgrass)

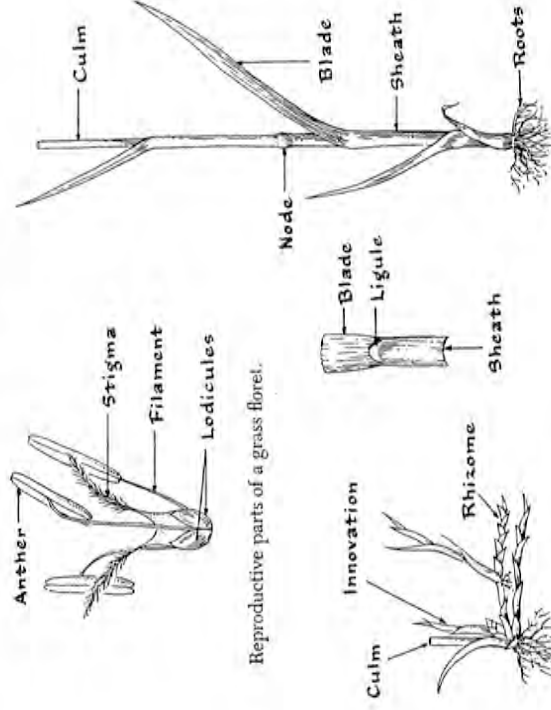
Tribe Andropogoneae: *Andropogon gerardii* (big bluestem), *Schizachyrium scoparium* (little bluestem), *Sorghastrum nutans* (Indian grass)

Graminoids: How to tell them apart

	<i>Juncaceae (Rushes)</i>	<i>Cyperaceae (Sedges)</i>	<i>Poaceae (Grasses)</i>
Leaves	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
Sheaths	Margins overlapping	Margins fused	Margins overlapping or (less often) fused
Ligules	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
Floral scales	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)
Flowers	Usually bisexual Three(six)-merous	Bisexual or unisexual	Bisexual
Fruits	Capsule filled with 3 to many seeds	Achene (a hard nutlet)	Grain



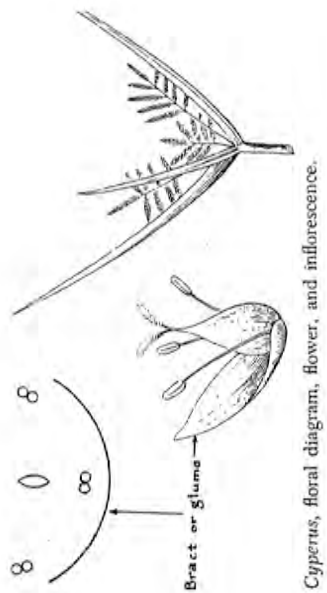
(a) Spikelet of bromegrass. (b) Single floret of oat grass. (c) Single floret of a grass at blooming time. (d) Spikelet of oat grass.



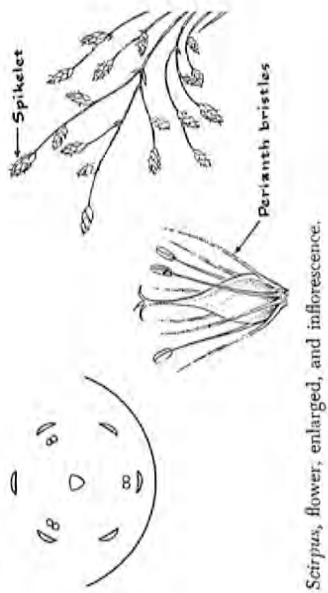
Reproductive parts of a grass floret.

Vegetative parts of grasses.

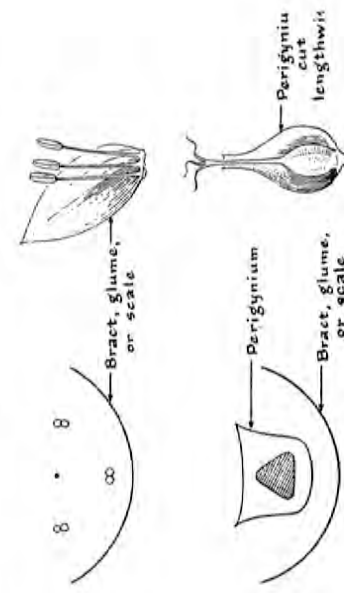
Poaceae spikelets and florets



Cyperus, floral diagram, flower, and inflorescence.



Scirpus, flower, enlarged, and inflorescence.



(Left) Floral diagrams of male (above) and female (below) flowers of Carex. (Right) Male (above) and female (below) flowers of Carex.

Cyperaceae spikelets and florets