Ranunculaceae - buttercup family

- perennial herbs, sometimes woody or herbaceous climbers or low shrubs


baneberry


clematis


anemone

Ranunculaceae - buttercup family

CA 3+ CO (0)5+ A ∞ G (1)3+

- floral diversity enormous except ∞ stamens and ∞ separate carpels
- insect (bird) pollination! nectar or pollen reward, radial or bilateral symmetry


columbine


anemone

Ranunculaceae - buttercup family

Caltha palustris - marsh marigold

Ranunculaceae - buttercup family

Sepals + petals, achenes

Ranunculus - buttercup, crowfoot

Ranunculaceae - buttercup family

Fruits:

Follicles = ∞ seeded dehiscent fruit

Caltha - marsh marigold

Berries = ∞ seeded fleshy fruit

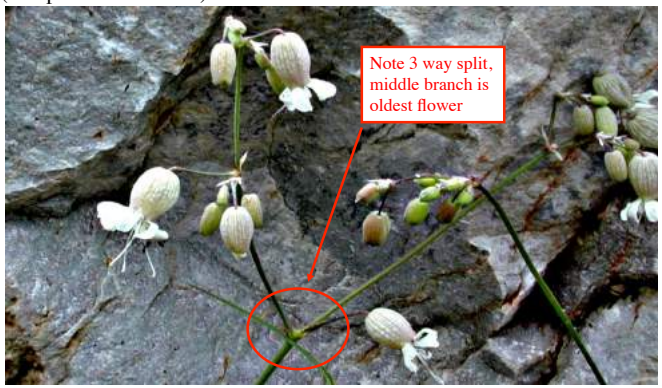
Actaea - baneberry

Achenes = 1 seeded indehiscent, dry fruit

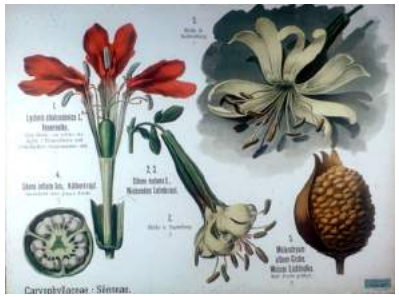
Ranunculus - buttercup

Caryophyllaceae - pink family

- Mostly herbs with simple, opposite, entire leaves; nodes usually swollen
- Inflorescence a **dichasium** - determinate inflorescence - or **cyme** (compound dichasium)



Caryophyllaceae - pink family



CA 5, (5) CO 5 A 5, 10 G (2-5)

- Important diagnostic character in the family is whether or not the sepals are fused
- Petals often differentiate into a limb and claw, the apex is often notched or deeply cut, producing more or less bilobed petals

- Capsule fruit

Rosaceae - rose family

Rosaceae is a large family of nearly 100 genera and almost 3000 species distributed worldwide but most common in the north temperate regions - important fruit family

Comprise herbs, shrubs, or trees and with simple, pinnately compound or palmately compound leaves

Stipules well developed in compound leaves

Rosaceae - rose family

CA 5 CO 5 A ∞ G [variable!]

Flowers are showy, 5 merous, with numerous stamens

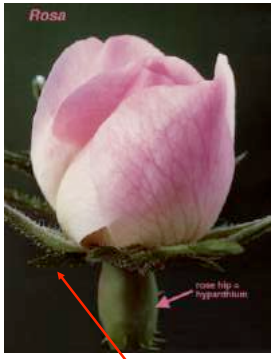
Gynoecium is variable and used to define subfamilies

Rosaceae - rose family

CA 5 CO 5 AG [variable!]

Flowers are showy, 5 merous, with numerous stamens

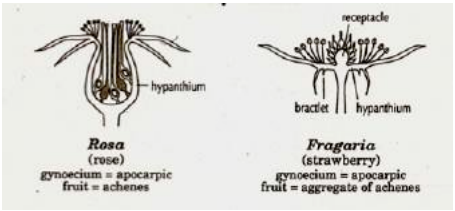
Gynoecium is variable and used to define subfamilies



Hypanthium is present to some degree in all these forms

Bracts on calyx (**epicalyx**) often present

Rosaceae - **Rosoideae** subfamily

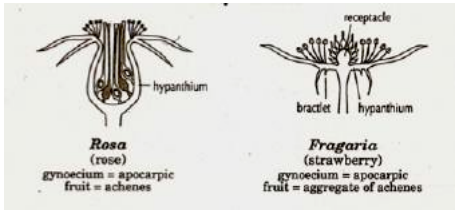


CA 5 CO 5 A ∞ G ∞

Herbs mostly with compound leaves

Plants with **stolons** (running stems above ground) or running rhizomes

Rosaceae - **Rosoideae** subfamily



CA 5 CO 5 A ∞ G ∞

Herbs mostly with compound leaves

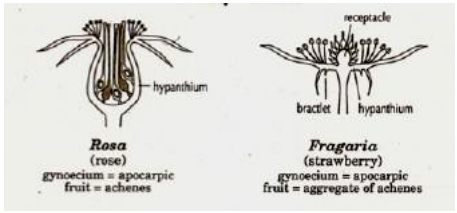
Plants with **stolons** (running stems above ground) or running rhizomes

Flowers apocarpic with many carpels

Hypanthium well-developed or **receptacle elongated**

One-seeded **achenes**

Rosaceae - **Rosoideae** subfamily



CA 5 CO 5 A ∞ G ∞

Achenes often modified into **aggregate** of achenes (from one flower) as in the strawberry or fleshy **drupelets** as in raspberry, dewberry

Rubus idaeus - American raspberry

Fragaria sp. - strawberry

Euphorbiaceae - spurge family

A large cosmopolitan family of trees, shrubs, and herbs of 300 genera and 5000 species. Latex bearing and filled with nasty chemicals (source of rubber, castor oil, tapioca, poinsettia).

Leaves alternate, simple (often palmately lobed) or palmately compound.

CA 5 CO 0 A ∞ G 0
CA 5 CO 0 A 0 G (3)

Majority of the family has unisexual flowers, 5 sepals, no petals, numerous stamens, 3 fused carpels, and capsules

Ricinus - castor oil bean

Euphorbiaceae - spurge family

A quite different arrangement of unisexual flowers is seen in many of our spurges of the genera *Euphorbia* and *Chamaesyce*. The "flower" of our flowering spurge is actually a highly modified inflorescence = **cyathium**

Euphorbia corollata - flowering spurge

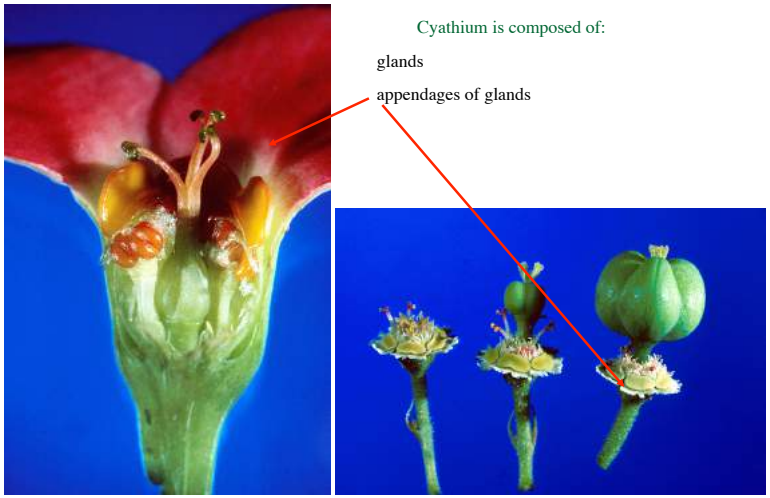
Shown here are 3 cyathia; the whole unit here is one **cyathium**

Euphorbiaceae - spurge family

Cyathium is composed of:

glands

Euphorbiaceae - spurge family

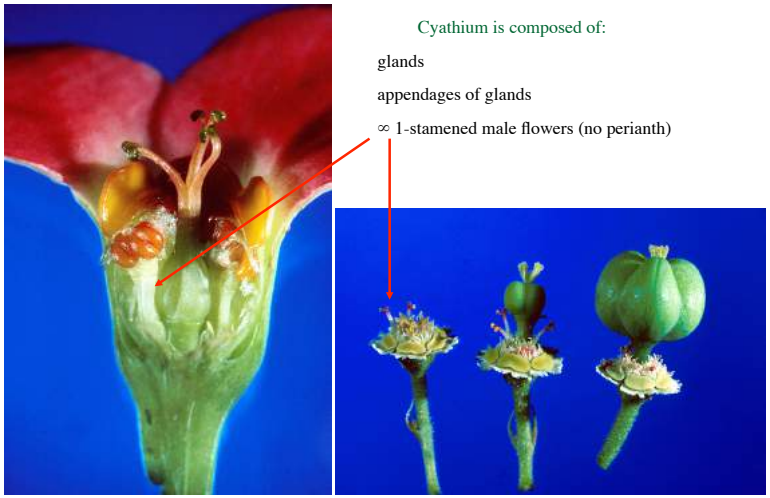


Cyathium is composed of:

glands

appendages of glands

Euphorbiaceae - spurge family



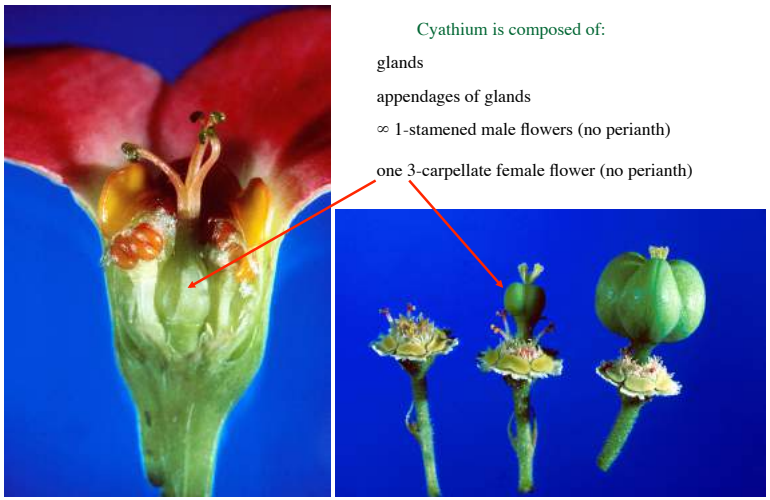
Cyathium is composed of:

glands

appendages of glands

∞ 1-stamened male flowers (no perianth)

Euphorbiaceae - spurge family



Cyathium is composed of:

glands

appendages of glands

∞ 1-stamened male flowers (no perianth)

one 3-carpellate female flower (no perianth)

Euphorbiaceae - spurge family

Euphorbia virgata - leafy spurge

One of several species labelled "obnoxious weed" by state law

Clonal growth, out-competes range plants as it spreads westward, and avoided by cattle and other animals

Ericaceae - blueberry family

Worldwide family of subshrubs, shrubs, epiphytes, and small trees. Characteristic of nutrient poor soils; in Great Lakes common in bogs, acidic pine dominated forests, or sandy soils. Symbiotic relationship with **mycorrhizal** relationship, forming **haustoria** - root to fungus connection, permits nutrient uptake by plants, carbon uptake by fungus.

Ericaceae now includes the totally fungus dependent **saprotrophs** - non chlorophyllous, all food and water from fungi

Leatherleaf in bog

Pinesap in pine forest

Ericaceae - blueberry family

Plants are generally evergreen, with tough, leathery leaves often **revolute** or inrolled along edge of leaf, with sunken stomata, and bottom of leaves often covered with protective hairs

Rhododendron (Ledum)
Labrador tea
Note revolute leaves

Arctostaphylos
bearberry

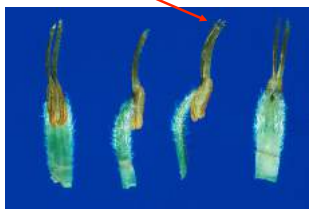
Chimaphila
shinleaf

Ericaceae - blueberry family

CA (4-5) CO (4-5) A 8-10 $\underline{\overline{G}}$ (4-5)

Calyx and corolla are fused, the **corolla tube** bell or vase shaped - most of our species are 5 merous

Stamens are 2X the number of petals; they often exhibit **terminal pores** for pollen release - rather than slits - for **buzz pollination** by bees



Ericaceae - blueberry family

CA (4-5) CO (4-5) A 8-10 $\underline{\overline{G}}$ (4-5)

Superior pistil

Inferior pistil

Pistil is superior in most genera, but inferior in blueberries and relatives

Fruit a berry or capsule with 4-5 partitions and many seeds

Cornaceae - dogwood family

CA 4 CO 4 A 4 $\underline{\overline{G}}$ (2)

Opposite (except for one) leaved shrubs or subshrubs; Flowers small, grouped in tight inflorescences often with 4 inflorescence bracts; 4 merous and with a 2 carpellate inferior ovary; fruit a 1-seeded drupe

Orobanchaceae – broomrape family

Large family of herbs and small shrubs. Many are **hemi-parasitic** = green and photosynthetic but parasitize roots of other plants. Some are holo-parasites = nongreen and parasitic on plants. Leaves opposite or alternate.

Castilleja – Indian paintbrush

Flowers generally zygomorphic and can be confused with mints; sometimes with fusion of two upper petals and appearing 4-petaled.

Orobanche fascicularis – broomrape

Orobanchaceae – broomrape family

CA (4-5) $\underline{\text{CO (2+3)}}$ $\underline{\text{A}}$ 5, 2+2, 2 $\underline{\text{G}}$ (2)

Stamens 5, or 2 sets of 2, or reduced to 2. Gynoecium bi-carpellate, axile placentation, and usually producing many seeded capsules.

Asteraceae - aster family

One of the most successful of all flowering plant families with over 1500 genera and 23,000 species.

Family has 3 specialized features important in this radiation:

1. Special inflorescence "head"
2. Pollen presentation
3. Diverse secondary chemistry

Asteraceae - aster family

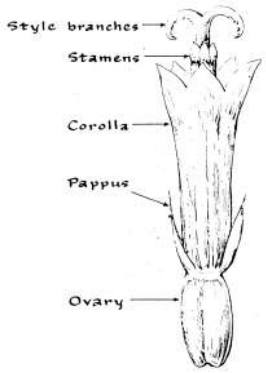
The **head** or **capitulum** is a cluster of 1 or 2 distinct flower types. The family is also called "Compositae" referring to this clustering.

The head is surrounded by special bracts called the **involucre** or **phyllaries**.

The involucre is important in the classification and identification within the family.

Asteraceae - aster family

CA X CO (5) A (5) $\underline{\overline{G}}$ (2)



Calyx is reduced to a **pappus** of scales, awns, bristles, or absent

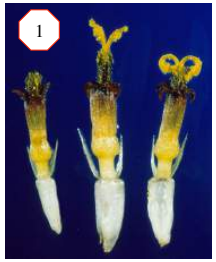
Corolla has 5 petals but variously fused or zygomorphic

Asteraceae - aster family

Main floret types:

1. **Disk** or **tubular** florets are actinomorphic

Asteraceae - aster family



Main floret types:

1. **Disk** or **tubular** florets are actinomorphic

2. **Ray** florets are usually 3 long fused petals + 2 short petals

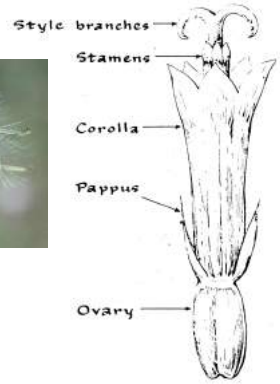
Asteraceae - aster family

Main floret types:

1. **Disk** or **tubular** florets are actinomorphic
2. **Ray** florets are usually 3 long fused petals + 2 short petals
3. **Ligulate** florets are 5 fused petals but split open

Asteraceae - aster family

CA X CO (5) A (5) $\underline{\overline{G}}$ (2)



The fruit is a one-seeded **achene** with the pappus serving as the fruit disperser (e.g., barbs for animal dispersal, hairs for wind dispersal)

Asteraceae - aster family

These various types of florets come together to form a number of different looking heads. The 3 most important ones are:

Radiate head: disk or tubular florets in the center, ray florets along the edge (these usually pistillate only)

Discoid head: only disk or tubular florets comprise the entire head

Ligulate head: only ligulate florets comprise the entire head (note 5 lobed florets)

Aster - aster

Asteraceae - aster family

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Liatris - blazing star

Asteraceae - aster family

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Taraxacum - dandelion

Liliaceae - lily family

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

The family Liliaceae s.l. (sensu lato or "in the broad sense") is now broken up into many smaller families belonging to these two orders.

The Liliaceae s.s. comprises herbaceous perennials common in the north temperate forests

Leaves usually do not have a well-developed petiold and leaves are either sessile or basal

Liliaceae - lily family

CA 3 CO 3 A 6 $\underline{\underline{G}}$(3)

Flowers are showy and 3 merous with 6 tepals

3 fused carpels (either superior or inferior) form capsule or berry with numerous seeds

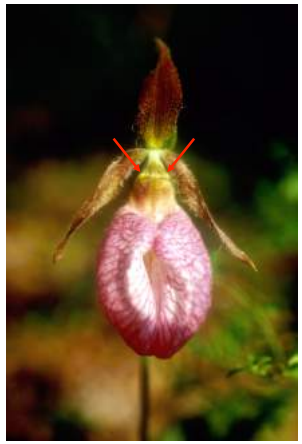
Orchidaceae - orchid family

CA 3 COZ 2+1 A 3,2,1 $\overline{\underline{G}}$(3)

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

Cypripedium acaule - stemless lady's-slipper

Orchidaceae - orchid family



CA 3 COZ 2+1 A 3,2,1 $\underline{G}$(3)

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

Lady's-slippers have two functional stamens with pollen masses

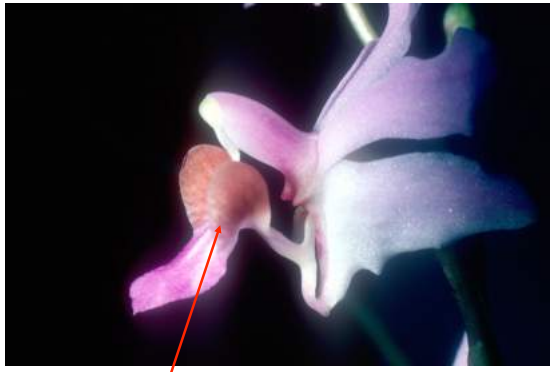
Cypripedium acaule - stemless lady's-slipper

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



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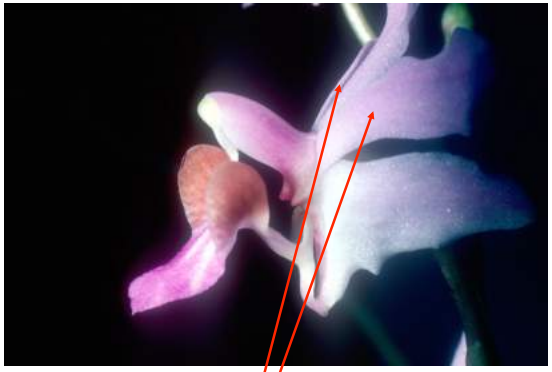
labellum | Other petals | sepals (one behind)

Other floral parts . . .

Orchidaceae - orchid family



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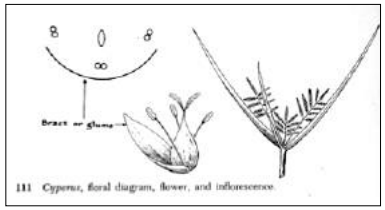
labellum | Other petals | sepals (one behind)

Other floral parts . . .

Cyperaceae - sedge family

A graminoid family of about 100 genera and 4,500 species primarily of moist habitats. *Carex* with 2,000 species is one of the largest of all angiosperm genera. Most species have triangular stems in cross section - "sedges have edges" - and thus leaves are 3-ranked.

Cyperaceae - sedge family

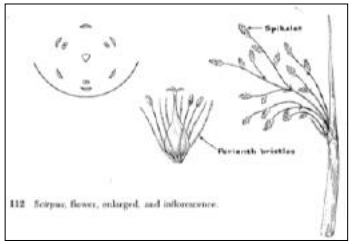


111 *Cyperus*, floral diagram, flower, and inflorescence.

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

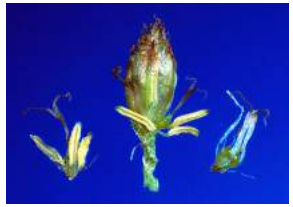
Cyperus lupulinus- Sand cyperus, sand sedge

Cyperaceae - sedge family



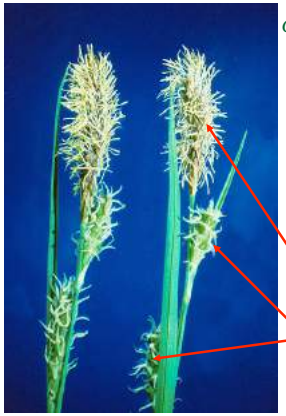
112 *Scirpus*, flower, enlarged, and inflorescence.

Scirpus and relatives (bulrushes) often have roundish stems. Florets are bisexual with 3 stamens, 3 fused carpels, 6 perianth bristles, and 1 subtending bract. Florets are generally whorled in the spikelet.



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

Cyperaceae - sedge family



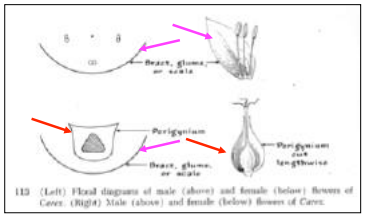
Carex pensylvanica
Pennsylvania sedge

Carex (sedge) is a large, complex, and difficult to key out genus.

Sedges have unisexual flowers with the male and female florets usually arranged in discrete portions of the spikelets.

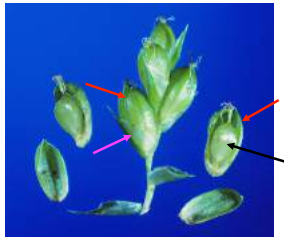
Carex buxbaumii
Buxbaum's sedge

Cyperaceae - sedge family



Both male and female florets are subtended by a **floret bract**.

Female florets are further enclosed by a sac-like bract called the **perigynium** - the achene forms within.



Carex blanda - Wood sedge

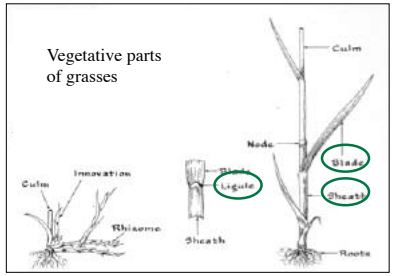
Carex intumescens - Bladder sedge

Poaceae - grass family

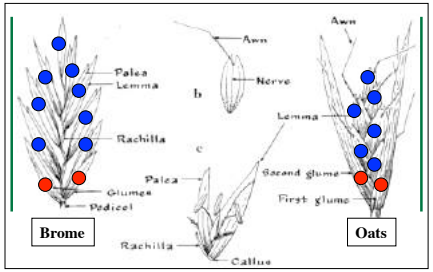
Lolium perenne - Rye-grass

The most important plant family - with about 650 genera and nearly 10,000 species - represents the ultimate in floret reduction and spikelet evolution for wind pollination.

Herbs, often rhizomatous, with 2-ranked leaves on generally hollow stems. The leaves consisting of **sheath**, **ligule**, and **blade**.



Poaceae - grass family

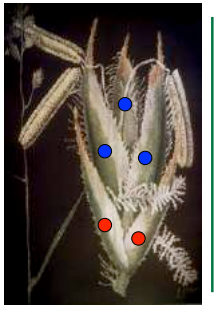


The main unit of the inflorescence is the **spikelet** which is composed of 2 **glumes** (spikelet bracts) and 1 or more **florets**

spikelet

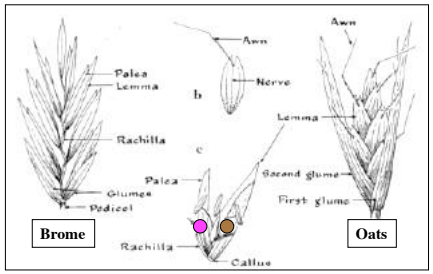
glumes

florets



Dactylis glomerata
Orchard grass

Poaceae - grass family



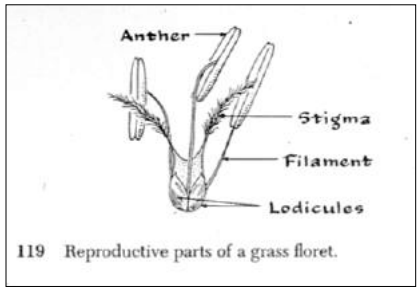
Each **floret** is additionally surrounded by two floret bracts - the outer **lemma** and the inner **palea** (usually not seen until anthesis - when florets open)

lemma

palea

Dactylis glomerata
Orchard grass

Poaceae - grass family



119 Reproductive parts of a grass floret.

Although considerable variation occurs in florets (among species or within a spikelet), most of our species have the following floret structure:

Perianth represented by 2 **lodicules**
Stamens 3
Superior gynoecium of 2-3 fused carpels
One ovuled fruits called a **grain** or **caryopsis** = seed fused to ovary wall

Dactylis glomerata
Orchard grass