

ROCKY MOUNTAIN HERBARIUM



Plant Identification



GUIDE TO FIVE FAMILIES
COMMONLY ENCOUNTERED IN WYOMING



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Rocky Mountain Herbarium, University of Wyoming, 2023.
www.rockymountainherbarium.org

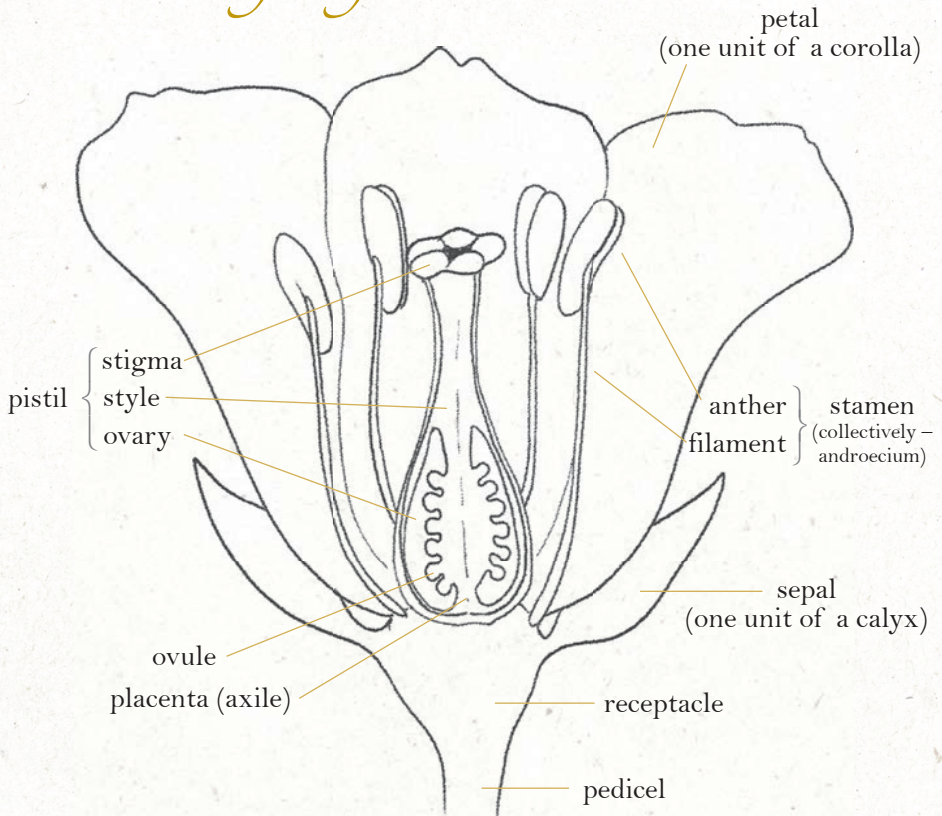
Written by Greg Brown, David Tank, Ben Legler, and Bonnie Heidel.

Design and illustrations by Inna Willis.

Photos on the top of the pages are from the Rocky Mountain Herbarium Specimen Database. Photos (in order): Harebell, Indian Paintbrush, Prairie Thistle, Few-Seed Draba, Purple Locoweed, Western Wheatgrass, Wild Rose.

The booklet was made in collaboration with the Biodiversity Institute, University of Wyoming.

Parts of a flower



FLOWER SYMMETRY



Radially symmetric
(actinomorphic / regular)

- ♦ Flower parts radiate out from the center of the flower, resulting in multiple lines of symmetry.



Bilaterally symmetric
(zygomorphic / irregular)

- ♦ Flower parts are unequally or irregularly arranged and only have a single line of symmetry.

The Flora of Wyoming

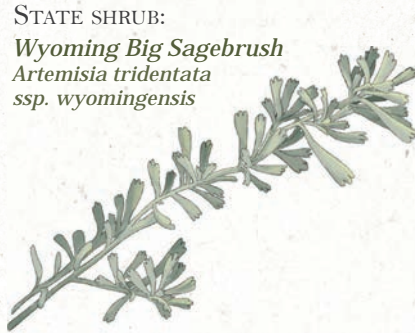
- ✦ Wyoming has 134 families and 2,988 species of vascular plants.
- ✦ The largest six families (Asteraceae, Poaceae, Fabaceae, Brassicaceae, Cyperaceae, and Rosaceae) contain 49% of the total plant species in Wyoming.
- ✦ 35 plant species are endemic to (only occur in) Wyoming.
- ✦ 13% of Wyoming's plants are introduced to the state.
- ✦ Wyoming is the 9th largest state in the U.S. but ranks 26th out of the 50 states in terms of number of plant species.



STATE GRASS:
Western Wheatgrass
Pascopyrum smithii
or *Elymus smithii*



STATE TREE:
Plains Cottonwood
Populus deltoides



STATE SHRUB:
Wyoming Big Sagebrush
Artemisia tridentata
ssp. wyomingensis



STATE FLOWER:
Wyoming Indian Paintbrush
Castilleja linariifolia

Asteraceae | Sunflower Family

THE LARGEST FAMILY IN WYOMING, 503 SPECIES.

VEGETATIVE CHARACTERISTICS

- ✦ Herbs or shrubs
- ✦ Leaves alternate, opposite, or all at base of plant, no stipules.



FLOWERS

- ✦ Individual flowers are small, generally less than ½ inch long. Each flower is called a *floret*.
- ✦ A modified calyx, called a *pappus*, may be present (see p.5)
- ✦ The anthers are fused to form a tube. The style pushes up through the tube as the flower matures, acting as a plunger to push out pollen.
- ✦ Florets are arranged in *heads* with many florets crowded on a common receptacle, with the youngest florets in the center of the head.
- ✦ Each head is surrounded by an organized group of *bracts* called an *involucre*, and each bract is called a *phyllary*.

FRUITS

- ✦ An *achene* – dry and indehiscent at maturity, contains 1 seed.
Example: sunflower “seeds”



Heart-Leaf Arnica
Arnica cordifolia

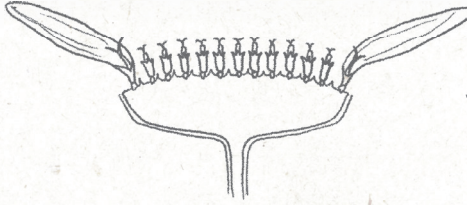
INFLORESCENCE

Floral heads (the inflorescence) come in three types based on the type, or types, of florets in the head.



Discoid Head

- ◆ Disk florets only.
Examples:
thistles, knapweed.



Radiate Head

- ◆ Central group of disk florets surrounded by one outer ring of ray florets.
Examples:
sunflowers, daisies



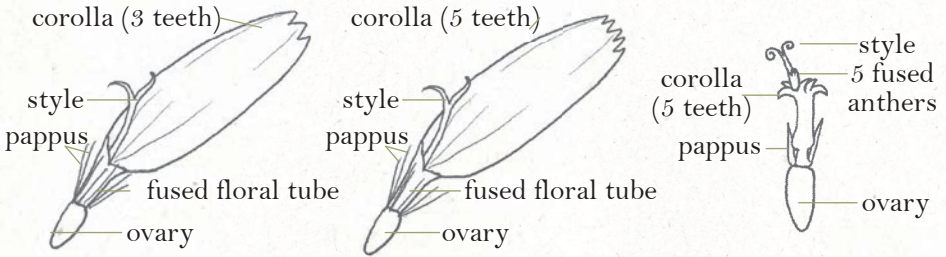
Ligulate Head

- ◆ Ligulate florets only.
◆ Have milky sap in leaves and stems.
Examples: *chicory, dandelions, lettuce.*



Prairie Thistle
Cirsium canescens

FLORETS



Ray Floret

- ♦ Elongated corolla of 5 fused petals, bilateral symmetry, 3 teeth at the tip.
- ♦ Neuter (sterile, not producing achenes) or pistillate (female, producing achenes).
- ♦ Always in heads with disk florets.

Ligulate Floret

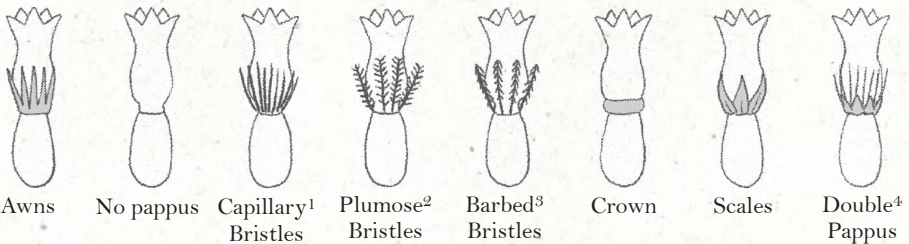
- ♦ Elongated corolla of 5 fused petals, bilateral symmetry, 5 teeth at the tip.
- ♦ Bisexual, with both a pistil and 5 stamens, and produce viable achenes.
- ♦ Never in heads with disk florets.

Disk (or Disc) Floret

- ♦ Elongated corolla of 5 fused petals, radial symmetry, 5 teeth at the tip.
- ♦ Bisexual, with both a pistil and 5 stamens, and produce viable achenes.

PAPPUS

Florets generally have a *pappus* – a highly modified calyx (collection of sepals, green leaf-like parts). The types of pappus are important in the identification of genera within a family.



1. Hair-like and soft.

2. Feather-like and soft, serving to increase buoyancy of the achene for wind dispersal.

3. Downward-pointing barbs easily attach to feathers, fur, clothing for achene dispersal.

4. Double pappus of outer scales and inner capillary bristles.

Brassicaceae | Mustard Family

THE 4TH LARGEST FAMILY IN WYOMING, 179 SPECIES.

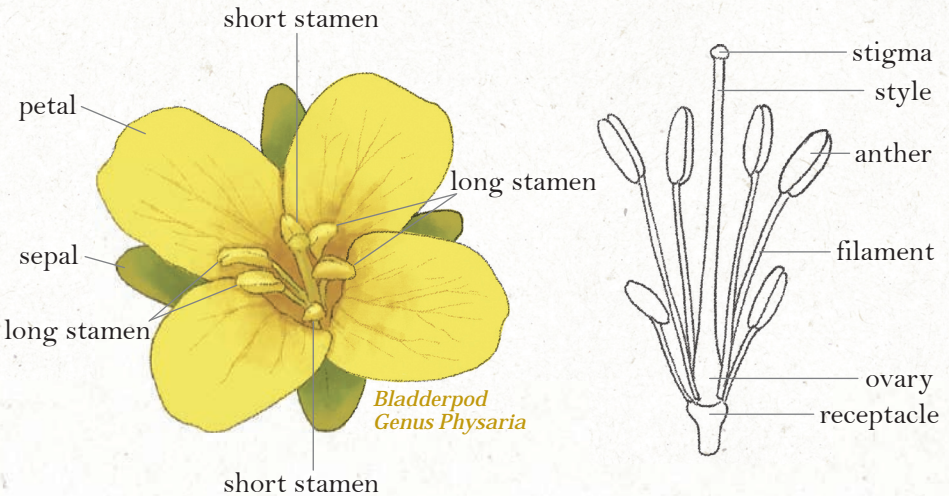
VEGETATIVE CHARACTERISTICS

- ✦ Herbs
- ✦ Leaves simple, alternate, often with a basal rosette, no stipules.
- ✦ Leaves often odorous when crushed due to characteristic glucosinolate chemistry.
- ✦ Hairs (*trichomes*), if present, range from simple to forked or stellate.



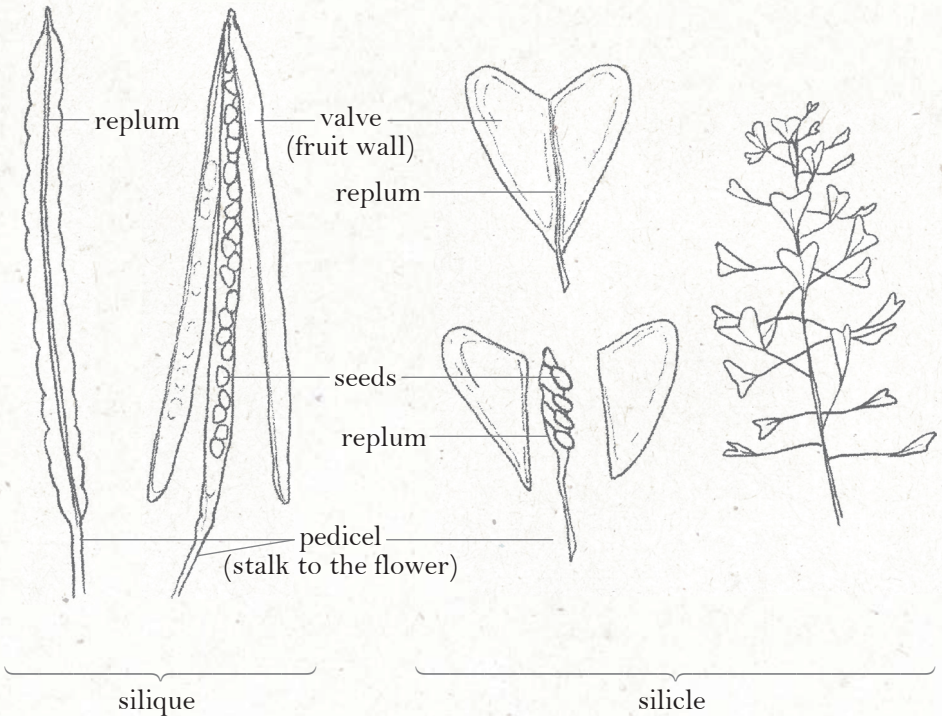
FLOWERS

- ✦ Petals mostly white, yellow, pink, or purple.
- ✦ 4 free sepals that alternate with 4 free petals.
- ✦ Petals are usually arranged in an X or cross shape (*cruciform*).
- ✦ 6 stamens, with 2 shorter than the other 4 (*tetradynamous*).



FRUITS

- ❖ Fruit shape and size are very important for Brassicaceae identification & classification.
- ❖ Fruits in this family contain a *replum*, a thin partition that internally separates the fruit into halves.
- ❖ A dry fruit that opens when mature is called a *capsule*. After the capsule splits open to release seeds, the replum persists.
- ❖ Capsule categories (based on the length:width ratio):
 - ◆ *Silicle*: capsule is less than 2 times as long as wide
 - ◆ *Siliqua*: capsule is at least 2 times longer than wide (usually much longer)



Fabaceae | Bean Family

THE 3RD LARGEST FAMILY IN WYOMING, 197 SPECIES. CONTAINS THE 2ND LARGEST PLANT GENUS IN WYOMING, *ASTRAGALUS*, WITH 79 SPECIES.

VEGETATIVE CHARACTERISTICS



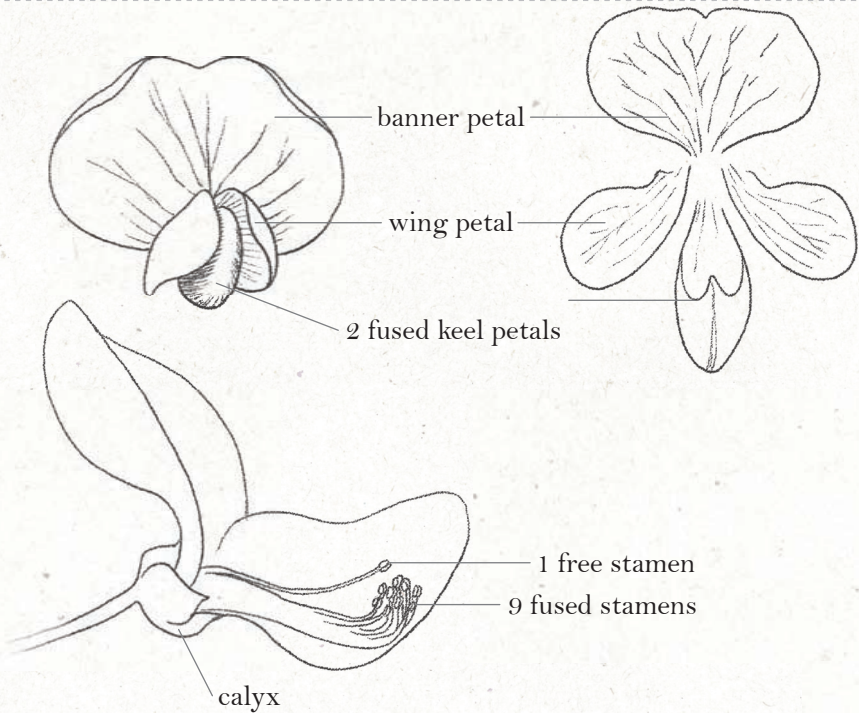
- ✦ Mostly herbs in Wyoming; shrubs & trees are more common in warmer biomes.
- ✦ Leaves usually pinnately or palmately compound, or trifoliate.
- ✦ *Stipules* usually present at base of leaf petiole.



White Locoweed
Oxytropis sericea

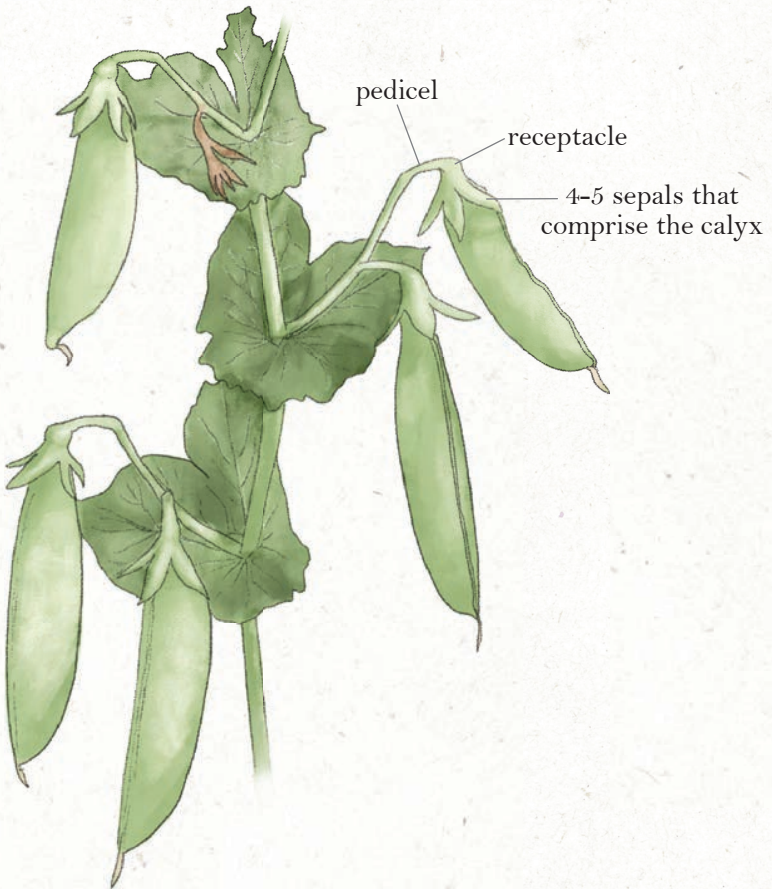
FLOWERS

- ✦ 5 fused sepals (calyx)
- ✦ 5 petals with bilateral symmetry. The distinctive morphology of a pea flower is termed *papilionaceous* and consists of:
 - ◆ *Standard* or *banner* petal — the upper-most and outer-most petal surrounding the other petals when the flower is in bud;
 - ◆ Two *wing* petals, one on each side of the flower;
 - ◆ Two fused petals that form the *keel*, comprising the lower-most part of the corolla. It is called the keel because it looks very much like the bow of a boat.
- ✦ Usually 10 stamens in a *diadelphous* arrangement (9 stamens fused together for most of the filament length + 1 free stamen).



FRUITS

- ❖ A *legume* (e.g., a bean or pea pod). The legume is a special type of fruit found only in the Fabaceae. At maturity, a legume is dry and splits open (dehisces) along two lines to release the seeds.



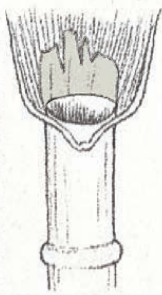
Note: Traditionally, the Fabaceae includes 3 well-defined subfamilies each with a distinctly different floral morphology. All species of Fabaceae in Wyoming, except for one, belong to the subfamily Faboideae (with papilionaceous flowers). The other two subfamilies, the Caesalpinioideae and Mimosoideae, are primarily subtropical and tropical. The only species in Wyoming not belonging to Faboideae is *Gleditsia triacanthos* (honey locust), an introduced tree in the Caesalpinioideae.

Poaceae | Grass Family

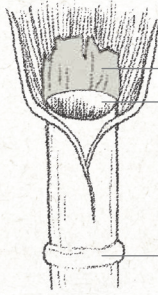
THE 2ND LARGEST FAMILY IN WYOMING, 293 SPECIES.

VEGETATIVE CHARACTERISTICS

- ✦ Herbs.
- ✦ Stems are round, usually hollow between the nodes.
- ✦ Leaves are arranged in 2 rows or ranks up the stem.
- ✦ The base of the leaf forms a *sheath* around the stem. A *ligule* is usually present at the junction of the leaf sheath and leaf blade.



closed sheath



open sheath

ligule
round, hollow stem
node (point of leaf attachment)

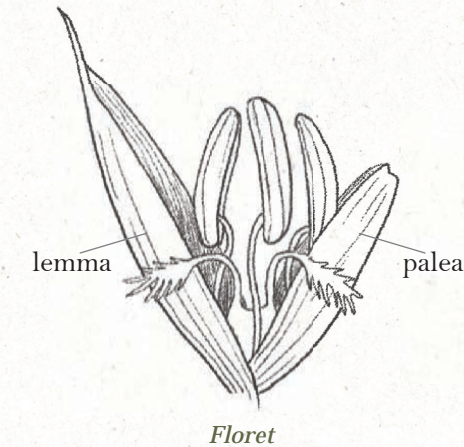
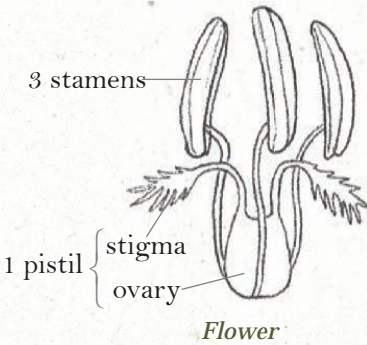


Blue Grama
Bouteloua gracilis

FLOWERS

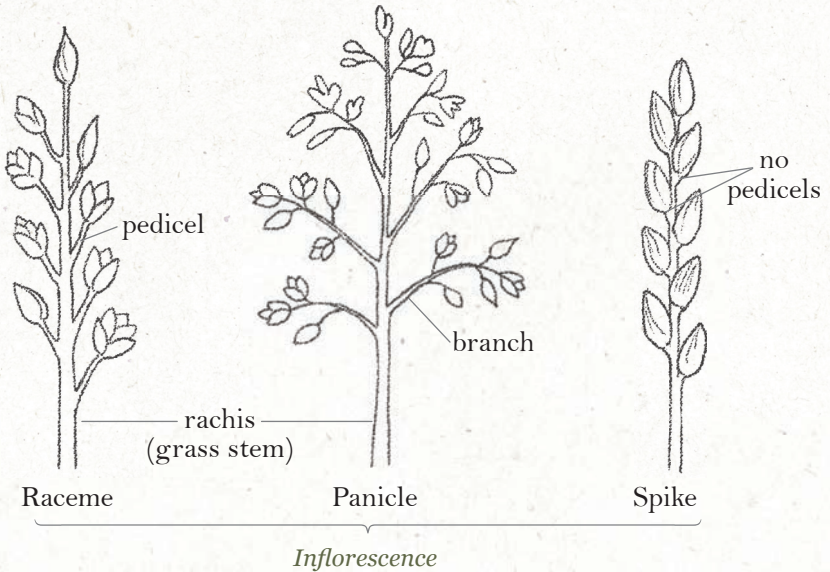
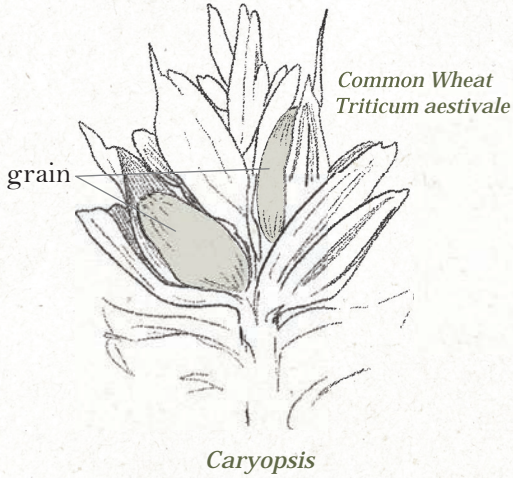
- ❖ Small, highly modified, and lack sepals and petals.
- ❖ Typically have 3 stamens and one pistil.
- ❖ Individual flowers are called florets. Each floret is subtended by 2 special bracts (modified leaves):
 - ◆ *Lemma* — the outer and larger bract
 - ◆ *Palea* — the inner and smaller bract
- ❖ Florets are arranged into units called *spikelets*. A spikelet has 2 additional bracts at its base (*glumes*).
- ❖ The number of florets within a spikelet ranges from 1 to many.
- ❖ An inflorescence is composed of 1 or more spikelets.

Note: the terms glume, lemma, and palea are only used in the Poaceae.






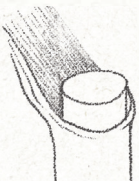








FRUITS

- ❖ Fruit is called a *caryopsis* (grain) and is unique to the Poaceae. The caryopsis has a single seed and the seed coat is completely fused to the inside of the fruit wall. Rice, corn, and wheat grains are examples of a caryopsis.



COMPARISON OF POACEAE AND GRASS-LIKE FAMILIES

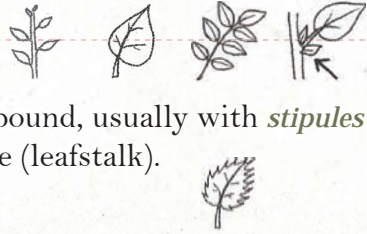
	POACEAE / GRASSES	CYPERACEAE / SEDGES	JUNCACEAE / RUSHES
stems	<p>round and hollow</p> 	<p>solid and triangular ("sedges have edges")</p> 	<p>round and solid (some exceptions)</p> 
leaves	<p>2-ranked (rows) Ligule usually present Sheaths usually open</p> 	<p>3-ranked (rows) Ligule rare Sheaths closed</p> 	<p>3-ranked (rows) No ligule Sheaths open (Juncus) or closed (Luzula)</p> 
floral bracts	<p>One palea, one lemma</p> 	<p>One bract</p> 	<p>Six bracts</p> 
pair of glumes	<p>Yes</p> 	<p>No</p> 	<p>No</p> 

Rosaceae | Rose Family

THE 6TH LARGEST FAMILY IN WYOMING, 116 SPECIES.

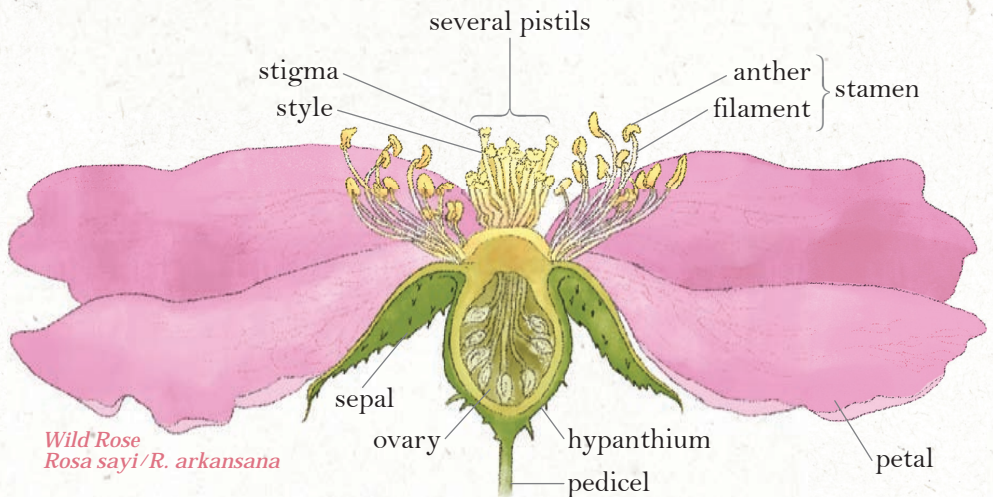
VEGETATIVE CHARACTERISTICS

- ✦ Herbs, shrubs, or trees.
- ✦ Leaves alternate, simple or compound, usually with *stipules* that are often fused to the petiole (leafstalk).
- ✦ Leaf margins usually *serrate*.



FLOWERS

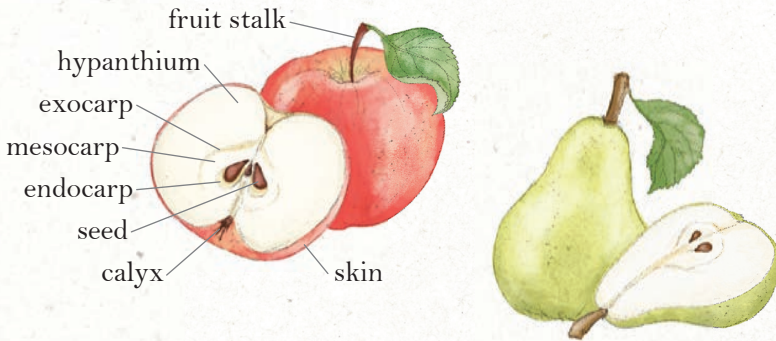
- ✦ Radial symmetry.
- ✦ 5 sepals, 5 petals, 10 to many stamens.
- ✦ *Hypanthium* is present and varies in shape (e.g., flat, cup-shaped, or tubular). The sepals, petals, and stamens are all attached to the top rim of the hypanthium.



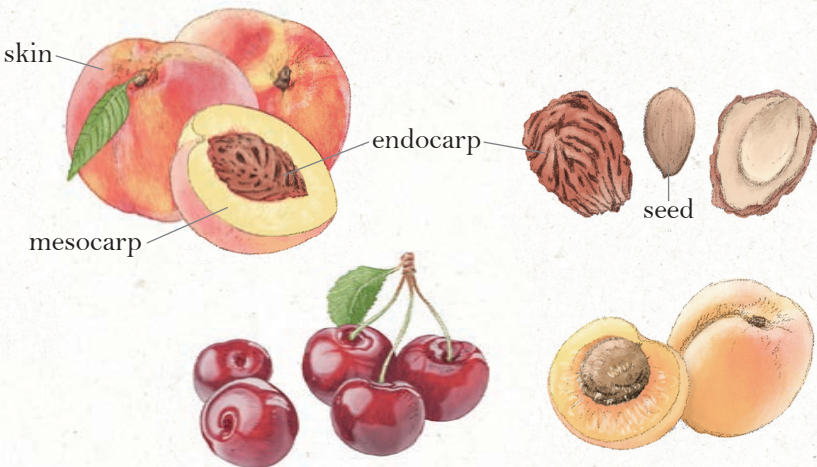
FRUITS

- ✦ Highly variable, used to help define subfamilies and genera.
- ✦ Fruit types: *pomes* (apples, pears), *drupes* (cherries, peaches, apricots), *drupelets* (raspberries, blackberries), *achenes* (strawberries, rose hips), and *follicles* (white meadowsweet).

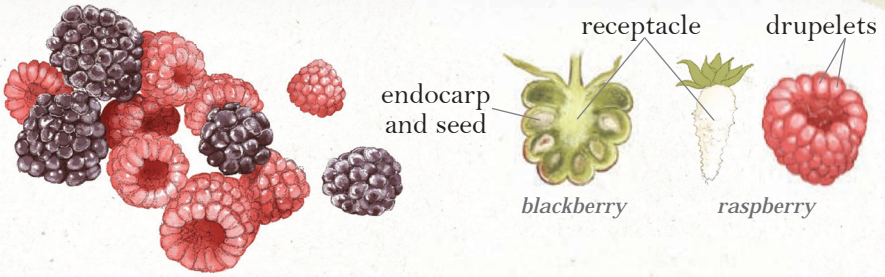
Pomes - fleshy fruits that have an outer fleshy layer and a central core with usually five seeds enclosed in a capsule.



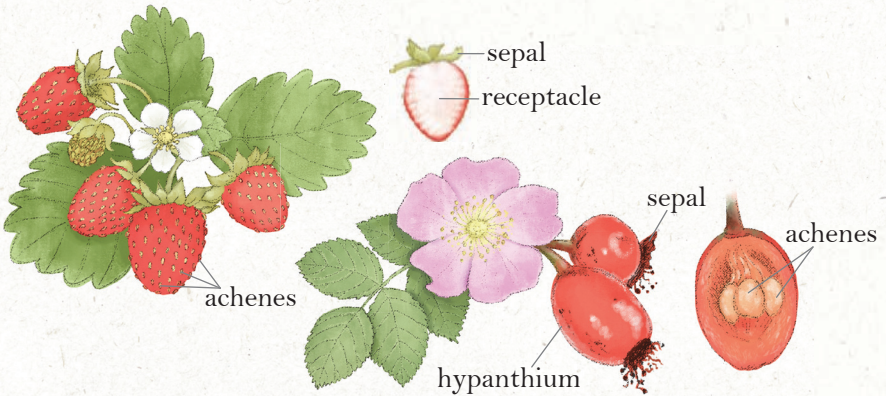
Drupes - fleshy fruits with thin skin and a central stone containing the seed.



Drupeletes - many small individual drupe-like fruits attached to a common receptacle.



Achenes - individual dry fruits on a sweet fleshy receptacle. Each achene contains one seed.



Follicles - dry fruits that open on one side.



The Rocky Mountain Herbarium (RM) is the largest facility of its kind between Saint Louis and the West Coast. Rich in material from throughout US, Canada, and northern Europe, it is the largest collection of Wyoming and Rocky Mountain plants in the world and reflects the region's biological diversity and natural history. With more than 895,000 databased specimens and more than 300,000 images, it is second only to the New York Botanic Garden in the number of specimens available online.

The RM was established in 1893 by Aven Nelson, a charter member of the UW faculty, who served as president of the American Society of Plant Taxonomists and Botanical Society of America, and as president of the University of Wyoming (1918-1922). Over the past 45 years, under the supervision of Curator Dr. Ronald Hartman, the RM has been enriched by an inventory program involving 50 floristics graduate students, as well as Herculean collecting feats by Curators Hartman and Burrell "Ernie" Nelson.



Aven Nelson carrying his vasculum of plant specimens for pressing, and several of his students, 1937. Image: American Heritage Center.



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