

Chapter 13. **Poaceae: The grass family**

The grass family:

Poaceae

POACEAE (Grass Family)

General physiognomy. Grasslike plants with blade-like leaves and round, hollow stems; tiny, mostly bisexual flowers without petals and arranged in turn into spikelets; the fruits are dry, hard caryopses called “grains.”

Vegetative morphology. Herbaceous annuals or perennials with densely fibrous roots and often showing stolons or rhizomes for vegetative propagation. Leaves consist of a flat (sometimes rolled) blade with a base that forms a sheath around the stem. The top of the leaf sheath often has a membranous or hairy projection at the union with the blade called a **ligule**. The leaf blades usually have pairs of tiny, earlobe-shaped appendages called auricles. A single grass stem with its leaves is called a **culm** or **tiller** (Fig.1). During the early stages of culm development the leaves are basal, with a very short shoot at the base and the sheaths forming a stem-like structure from where the blades radiate. As the culm matures, it eventually produces a shoot with a round, hollow stem that elongates inside the bundle of sheaths and emerges in the upper part of the culm to produce the inflorescence.

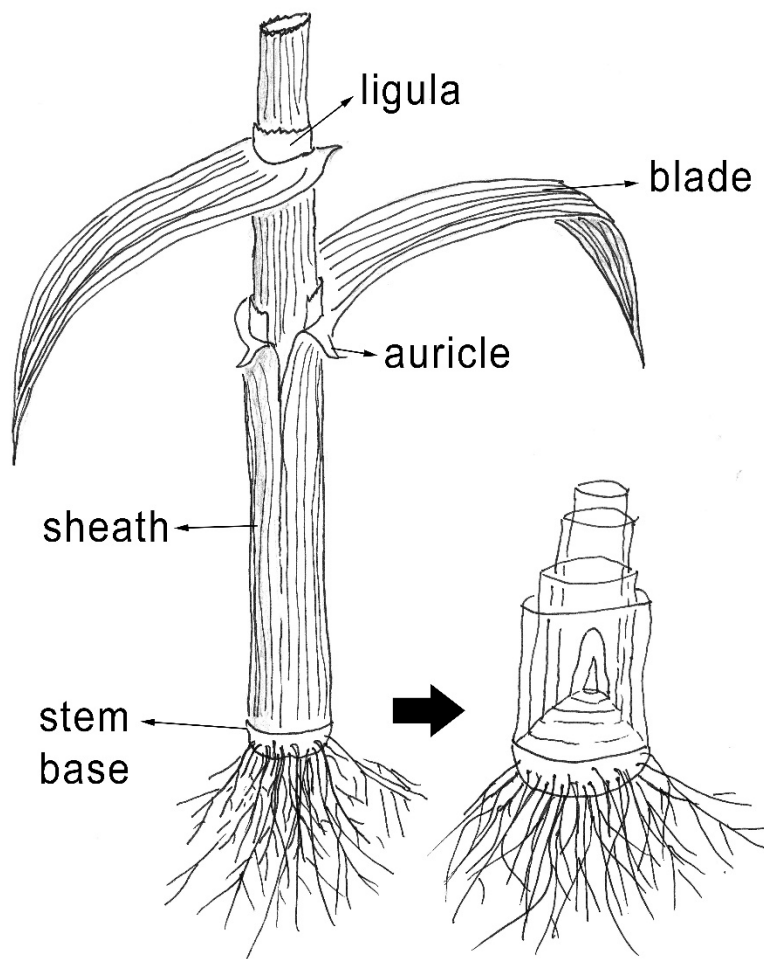


Figure 1. The grass culm.

Reproductive morphology. The tiny, wind-pollinated flowers —called **florets**— are inconspicuous, greenish, usually bisexual, wind-pollinated, and petal-less. Each floret consists of a pair of bracts: the largest one, away from the flowering stalk or rachis, is called the **lemma** and the smaller or the two, next to the rachis, is called the **palea**. The androecium is composed of three stamens; and the gynoecium has single pistil with a superior, one-seeded ovary and two **plumose** (feathery) **stigmas**. Two rounded structures at the base of the flower, called the **lodicules**, are anatomical vestiges of the perianth (petals + sepals). The lodicules swell when the flower matures, and open the palea and the lemma to allow the emergence of the anthers, first, and of the plumose stigmas, later. Glumes, lemmas, and paleas often have spear-like extensions called **awns**.

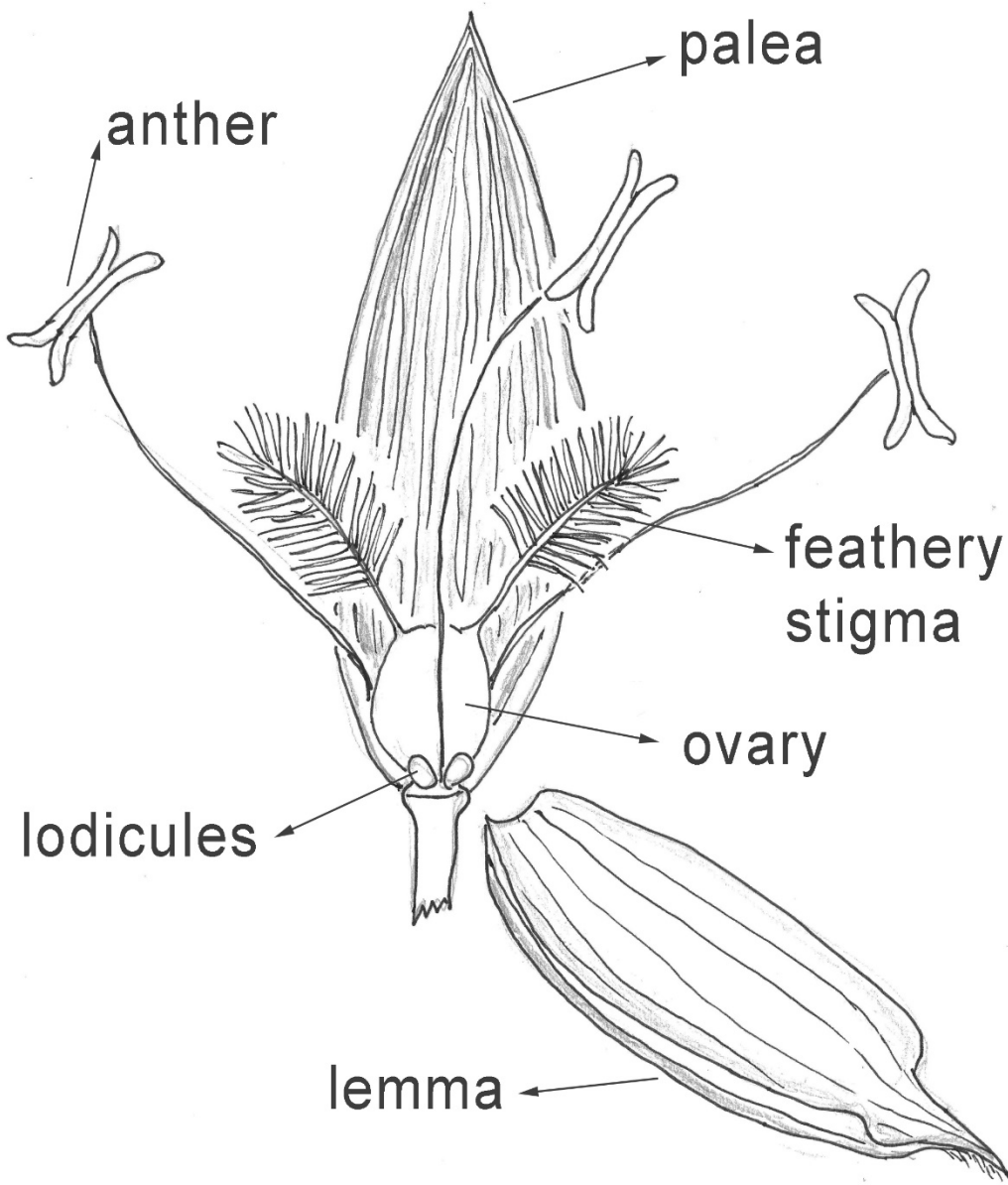


Figure 2. Parts of the grass floret.

The florets, in turn, cluster into tiny spikelets with two bracts at the base called **glumes**. The spikelets themselves are arranged in heads, panicles, spikes, or racemes. Spikelets may have several flowers (florets), a single floret, or some fertile florets and some sterile florets with no stamens or pistil.

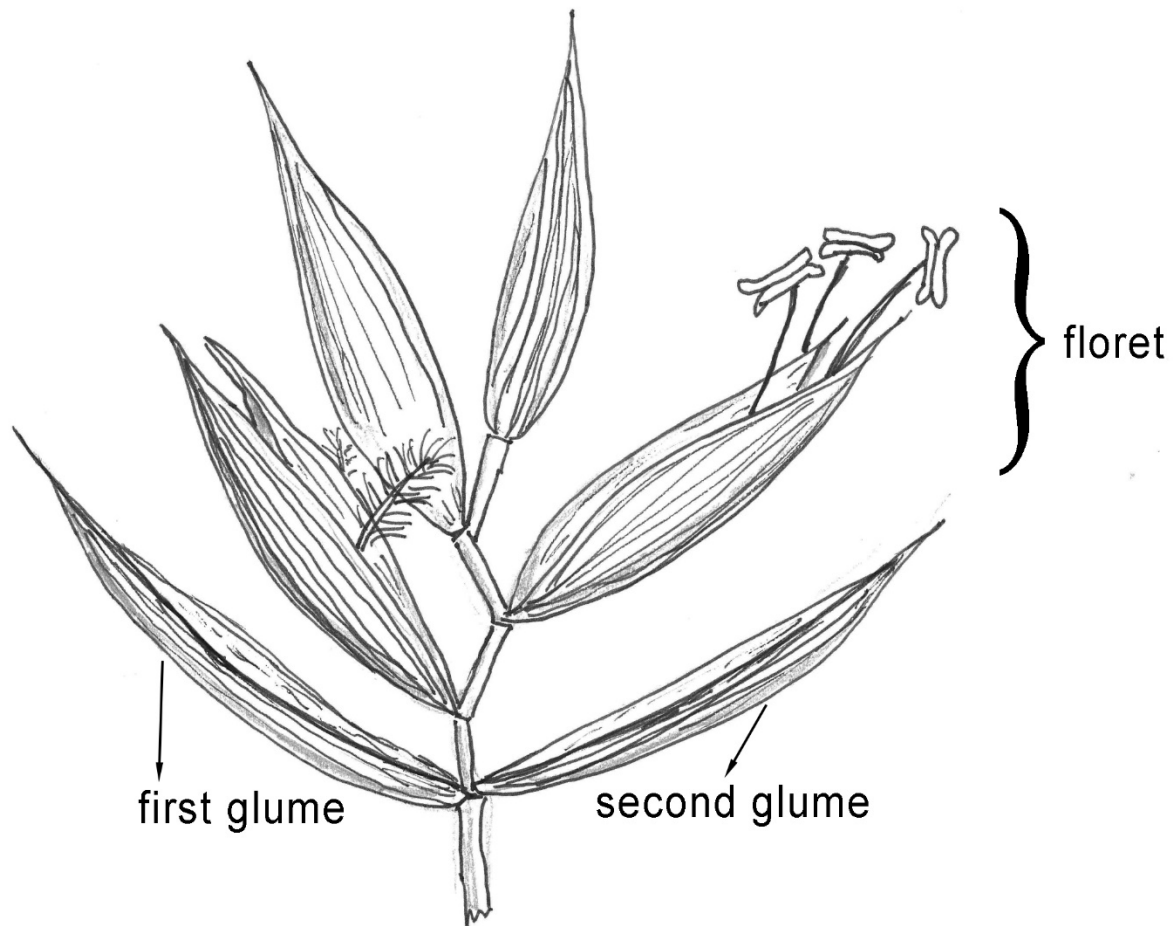


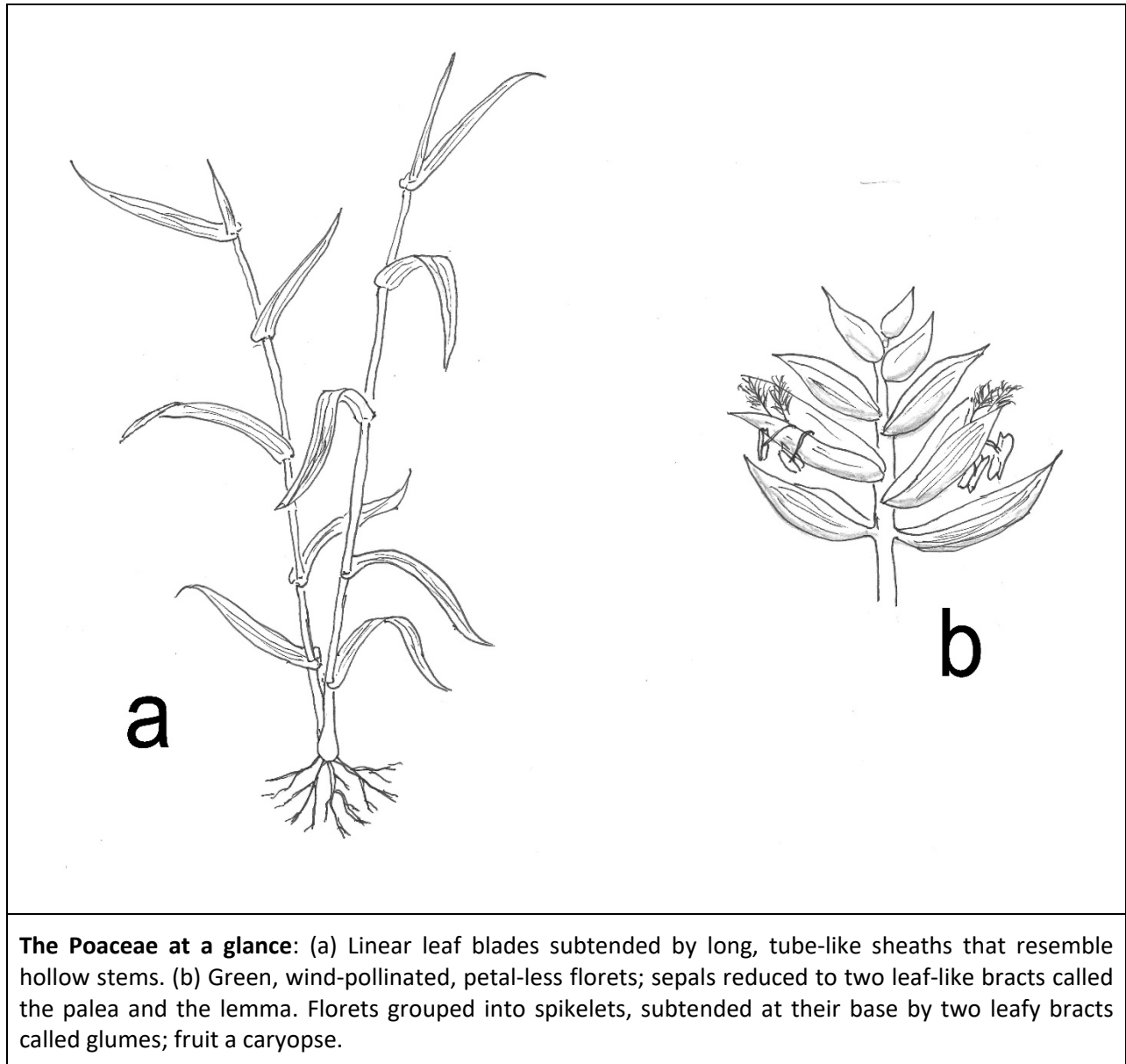
Figure 3. The grass spikelet.

The fruits are small, one-seeded, dry indehiscent fruits with a thin pericarp adhering so closely to the seed that fruit and seed are incorporated in one single structure: the grass “grain” or **caryopsis**.

Taxonomic relationships. Grasses look superficially like several other monocot families with green, inconspicuous flowers, the most prominent of which are the sedges (Cyperaceae) and rushes (Juncaceae). They can be told apart on the basis of both their vegetative traits (leaves and stems) and their reproductive morphology (flowers and fruits). The long leaf sheath, the ligule and the auricles are distinctive traits of grasses. Sedges usually have triangular, solid stems; rushes have round, pithy stems and varied leaves but no auricles. Sedge flowers are often unisexual and often have bristles; rush flowers are bisexual but have a perianth of six clearly visible tepals.

Biodiversity and distributions. With some 10,000 or more species worldwide, the grasses are the second largest monocot family after the orchids (Orchidaceae). Grasses are a relatively new family,

having evolved some 40 million years ago, well after the extinction of the dinosaurs, that expanded dramatically in the last 7 million years as the parts of the earth got drier and a life-form adapted for life in savanna-type ecosystems became advantageous. The basal organization of the short shoots in the grass culm makes the family particularly adapted to survive grazing and re-sprout even after all the aerial part of the plant has been chopped-off by large herbivores. For this reason, grasses are particularly abundant in sub-humid or semiarid open woodlands, savannas, prairies, and steppes throughout the globe.



The Poaceae at a glance: (a) Linear leaf blades subtended by long, tube-like sheaths that resemble hollow stems. (b) Green, wind-pollinated, petal-less florets; sepals reduced to two leaf-like bracts called the palea and the lemma. Florets grouped into spikelets, subtended at their base by two leafy bracts called glumes; fruit a caryopse.

Economic uses and ethnobotany. Besides dominating vast areas of grassland, prairie, and meadow, the grasses have numerous important economic uses not surpassed by any other family. All of the major grain crops belong to this family, including corn, barley, wheat, rye, millet, rice, sorghum, and oats. The

origin of agriculture in different continents, and the ensuing civilizations that evolved from the organization of agricultural societies, hinged around the domestication of grass cereals. Woody grasses, known as bamboos, have numerous uses in eastern Asia, and are popular ornamentals throughout the world. Sugar is extracted from the tropical sugar cane as well as from corn. Because of their ability to withstand being clipped close to the ground, many grass genera are used in gardens to create the low turf, or grass mats, we call lawns. Finally, grasses provide the basic food for grazing animals such as cows and sheep and are at the base of husbandry products, such as dairy and meat.

California genera and species. The region has over 100 native or partly native genera. Many locally-common species, such as the red brome (*Bromus rubens*) or the wild oats (*Avena fatua*) are weedy invaders, especially in disturbed plains and abandoned agricultural areas. Among the native species, the giant needlegrass (*Stipa coronatum*) stands-out conspicuously in low rocky slopes and sandy washes of the transversal ranges.

Avena fatua (wild oats) – Introduced to California from Europe, this species is the wild form of the cultivated oats (*Avena sativa*) and commonly grows in agricultural plots, roadsides, and disturbed soils.



Bromus rubens (red brome) – Introduced into Southern California almost a century ago, the red brome is now the most abundant grass species in the region, particularly abundant in abandoned agricultural plots and in disturbed areas.



Stipa coronatum (giant needlegrass) – Large, coarse perennial bunchgrass, frequent on rocky slopes, shrubby hillsides, and chaparral. Common in Swarthout Canyon.

