

Unit I – Grasslands and Grassland Plants

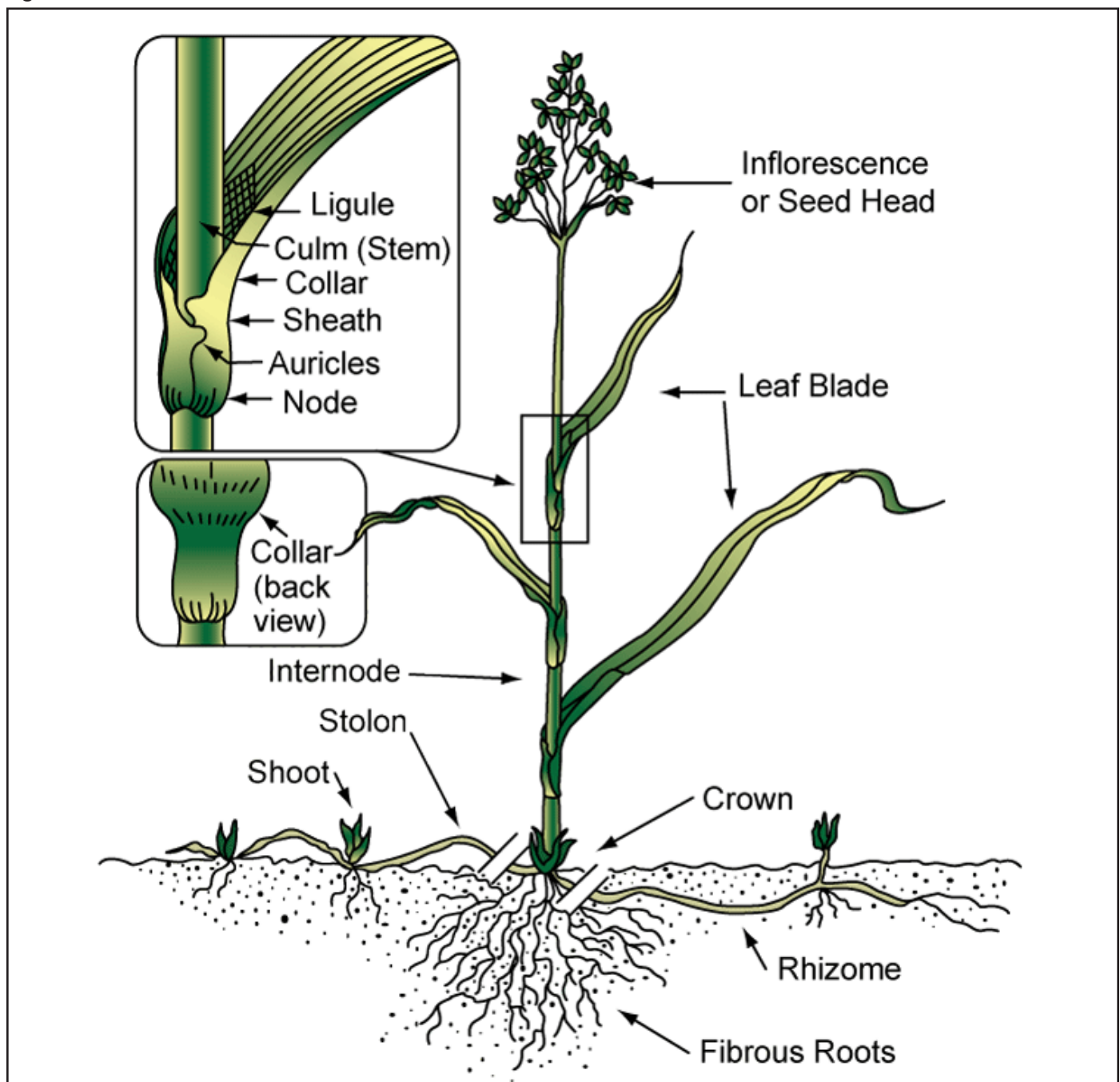
Lesson 3: Botanical Characteristics

The last lesson showed how plants can be similar, but the focus in this lesson is on the characteristics that can be used to distinguish between different plants. These characteristics will help in the identification of all grassland plants. Managing a grassland is easier if the plants growing in the area are identified.

Structural Parts of a Grass

The parts of a grass plant include the roots, culm, node (solid portion of the culm), internode, leaf sheath, leaf blade, collar, auricle, ligule, and inflorescence. See Figure 3.1.

Figure 3.1 – Parts of a Grass Plant

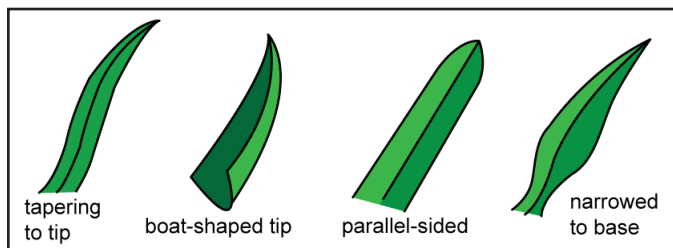


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Identifying Characteristics of Grasses

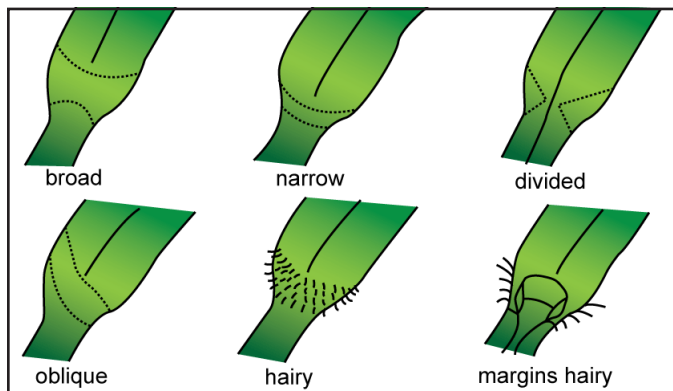
Leaf blade shape – The leaf offers several identifying characteristics. The width, length, and hairiness of the blade differ in each species; they also vary with the environment. The leaf blade and tip shape is a more distinctive identifying characteristic. The blade may be tapering to the tip, boat-shaped, parallel-sided, or narrowed to the base. See Figure 3.2 for examples of these shapes.

Figure 3.2 – Leaf Blade Shapes



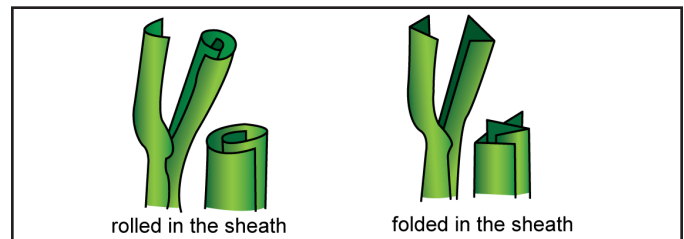
Collar – The collar on a grass blade is the external narrow band found where the blade and the sheath join. It can have different shapes (broad, narrow, divided, oblique) and different colors. The collar may also be found with hair or with a hairy margin. Figure 3.3 shows different collars.

Figure 3.3 – Collars



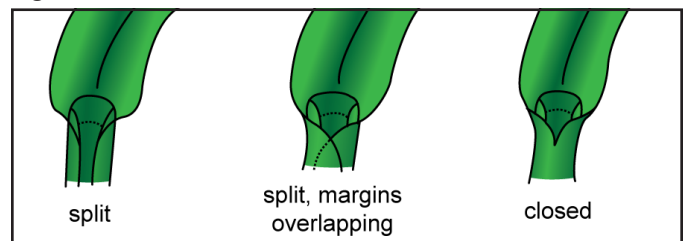
Leaf blade arrangement – Leaves may be arranged in the sheath in two ways—folded or rolled. To determine which arrangement exists, look at the way a new leaf naturally emerges from the sheath or find the last fully emerged leaf and cut the sheath just below the collar. See Figure 3.4 for leaf blade arrangements.

Figure 3.4 – Leaf Blade Arrangements



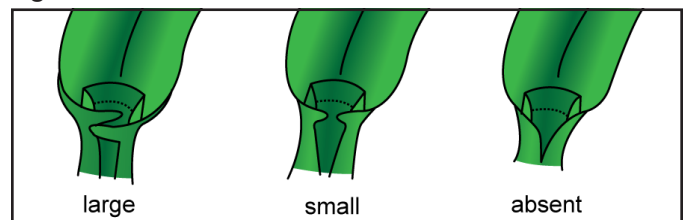
Sheath – The sheath is the part that encircles the stem and the bud shoot. In a cross section, the sheath will usually be round (or nearly round) if the bud shoot is rolled and flat if the bud shoot is folded. The sheath may be split, closed, or split with overlapping margins, as shown in Figure 3.5.

Figure 3.5 – Sheaths



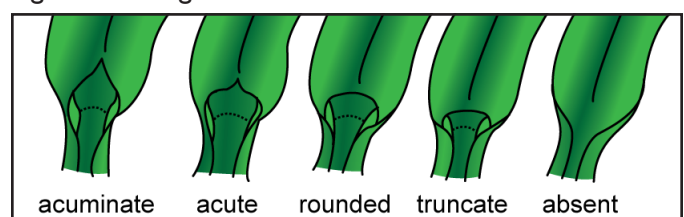
Auricles – The auricles are flaplike appendages that clasp the stem at the top of the sheath. They may be large, small, or absent entirely. See Figure 3.6 for examples.

Figure 3.6 – Auricles



Ligule – The ligule is the upright projection of tissue at the internal junction of the blade and the sheath. The shape, texture, and length are usually the same within each species. The shape of the ligule may be acuminate, acute, rounded, truncate, or absent, as illustrated in Figure 3.7.

Figure 3.7 – Ligules



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Roots and Modified Stems

Root systems found in grassland plants differ. The two basic root structures that can be found in grassland plants are tap and fibrous roots. An annual usually has a weak fibrous root system that pulls out of the ground easily without tearing the top from the roots. Figure 3.8 shows the different root structures.

Rhizomes and stolons are modified stems. Rhizomes branch off from the main plant underground. Stolons are stems that grow horizontally along the ground's surface. They both root and send up shoots at nodes along the stem. The two types of modified stems are illustrated in Figure 3.9.

Inflorescence of Grassland Plants

The inflorescence, or arrangement of flowers, of a grassland plant can help in its identification. Grassland plants have six basic arrangements of flowers—spike, raceme, panicle, terminal, axillary, and umbel. On specific plants, slight variations of the inflorescence from the basic structure may appear. See Figure 3.10 for drawings of each type of inflorescence.

Figure 3.9 – Modified Stems

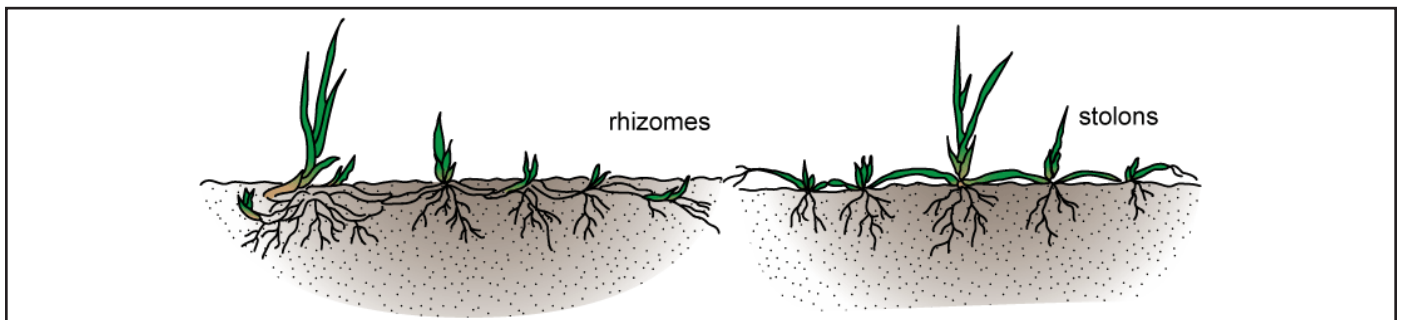


Figure 3.10 – Inflorescence

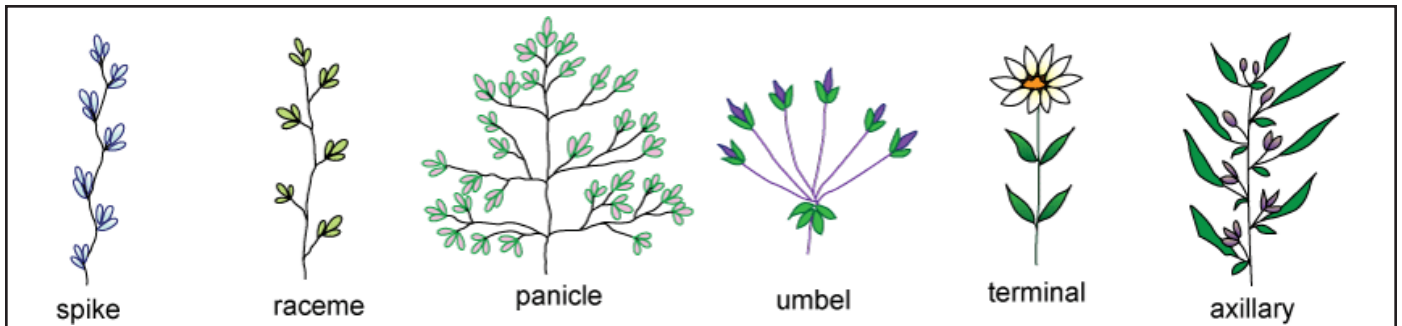
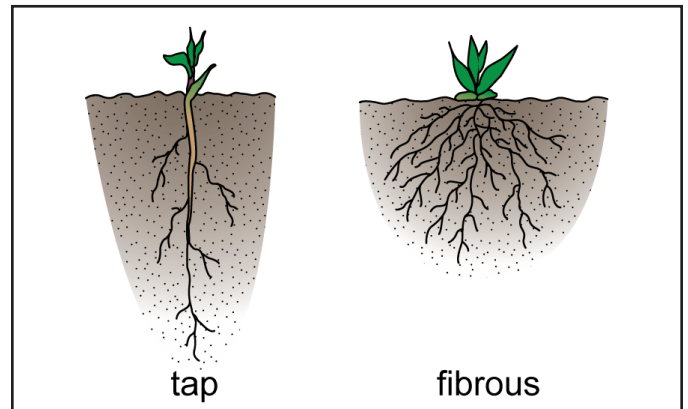


Figure 3.8 – Root Structures

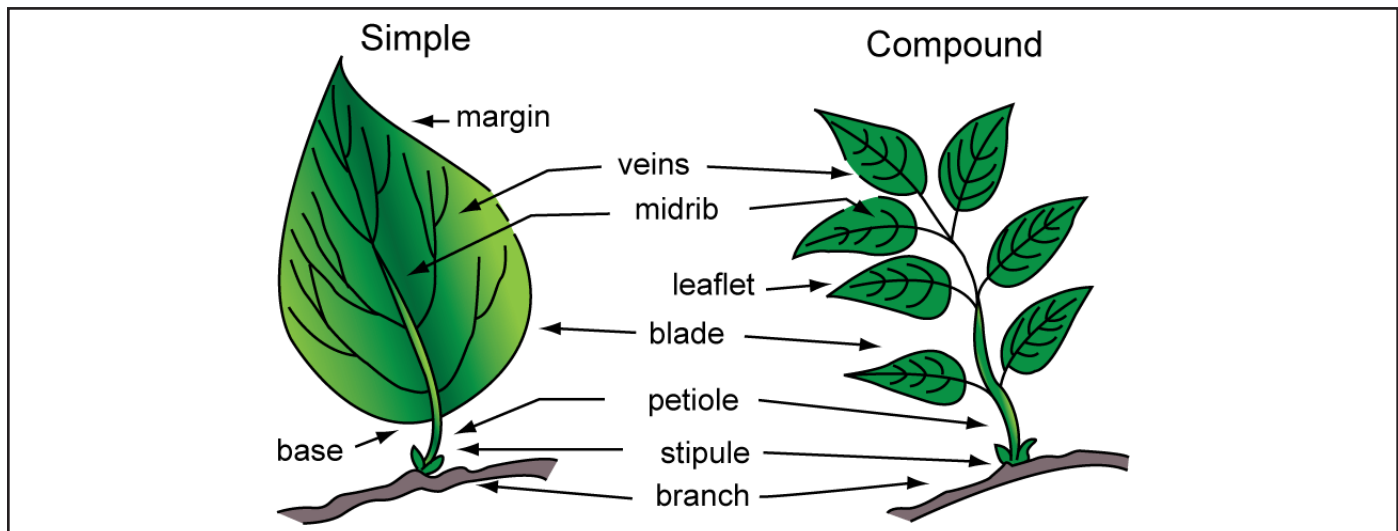


Leaf Structure and Arrangement

Leaf parts – The basic parts of a leaf on legumes, forbs, and woody plants are the petiole, stipules, base, and blade. See Figure 3.11. The petiole is the stalk that connects the leaf to the stem. Stipules are small leaf-like structures sometimes found at the base of the petiole. They usually occur in pairs. The base is the bottom area of the leaf where the petiole connects to the blade. The blade is the flat, large part of the leaf, containing leaf tissue, a midrib (the large central vein from which all other veins branch), and veins. Photosynthesis and respiration occur in the leaves.

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Figure 3.11 – Leaf Parts



The blade surface texture may be described in one of three ways:

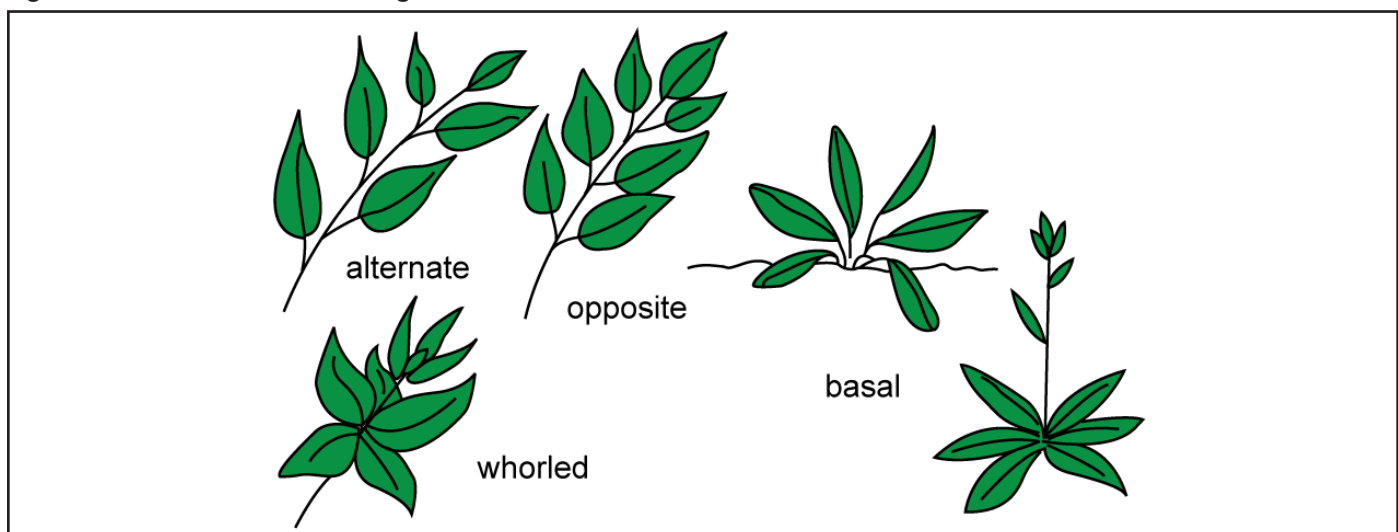
- ◇ Glabrous – Smooth and shiny
- ◇ Pubescent – Covered with hair
- ◇ Glaucous – Covered with fine, waxy, whitish bloom

Leaf and bud arrangement – Leaves and buds can be attached to the stem in different arrangements. They may be alternate, opposite, whorled, or basal. In the alternate arrangement, the leaf or bud is located singly at different heights alternating from side to side along the length of the stem. In contrast, the leaves are located

directly opposite each other in pairs along the stem in the opposite arrangement. The whorled arrangement consists of three or more leaves or buds arranged in a circle at one point on the stem. Finally, the leaves are located at the base of the stem in a plant with a basal arrangement. See Figure 3.12.

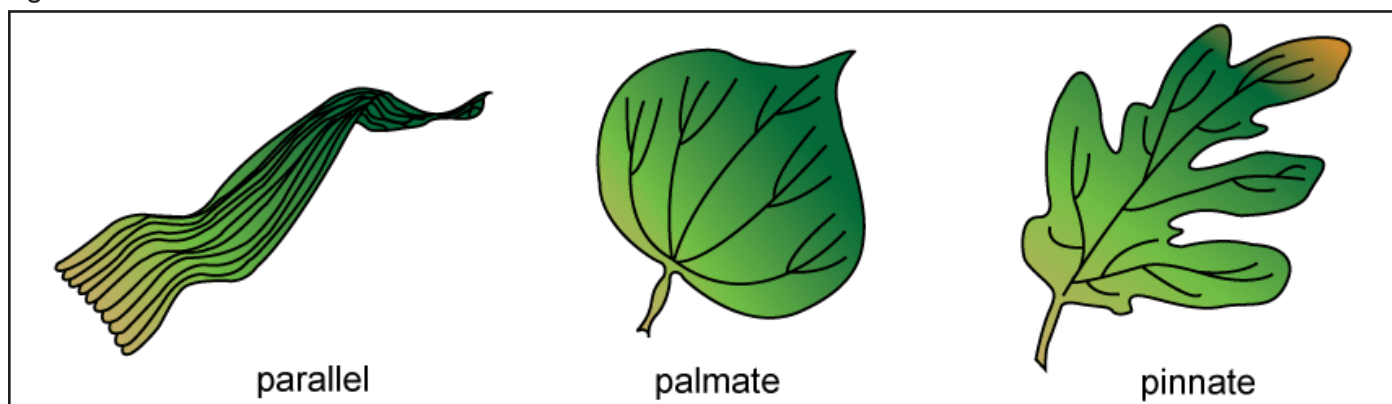
Venation – Leaf venation, or the arrangement of veins in a leaf, is another identifying feature of legumes, forbs, and woody plants. Plants may have two types of venation—parallel (as found on grasses) and netted. Netted venation can be either palmate or pinnate in structure. In palmate venation, all of the main veins fan out from the same point

Figure 3.12 – Leaf and Bud Arrangements



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Figure 3.13 – Leaf Venation



at the base of the blade. Leaves with pinnate venation have a midrib running the length of the blade and smaller veins branching out from it. See Figure 3.13.

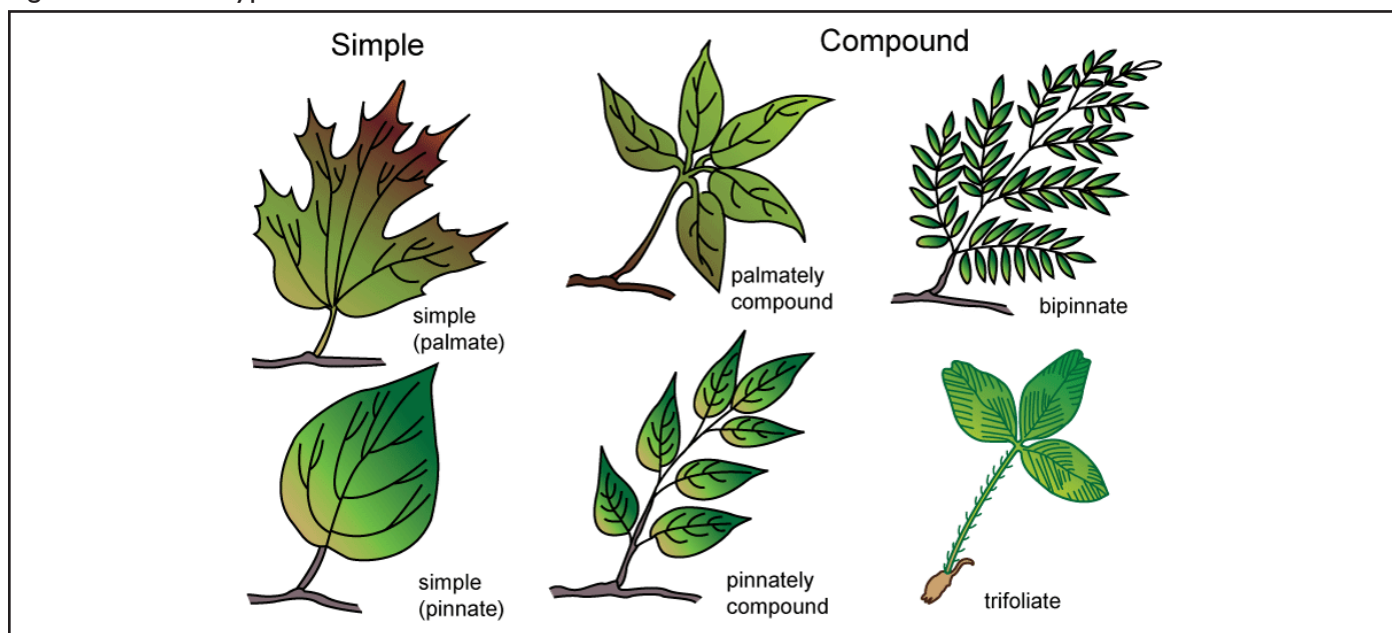
Leaf type – Figure 3.14 diagrams different types of leaves. Leaf structure may be characterized as one of the following:

- ◇ Simple – One blade rises from the petiole. It may have lobes.
- ◇ Compound – More than one small leaf, or leaflet, rises from the same petiole.
 - Palmate: All the leaflets attached to the same point at the tip of the petiole.

- Pinnate: Pinnately compound leaves have a long stem, or rachis, to which the smaller leaflets are attached on both sides.
- Bipinnate: Bipinnately compound leaves are divided twice, with the primary leaflet being divided into secondary leaflets.
- Trifoliate: Trifoliate leaves have three leaflets. They can be palmate or pinnate.

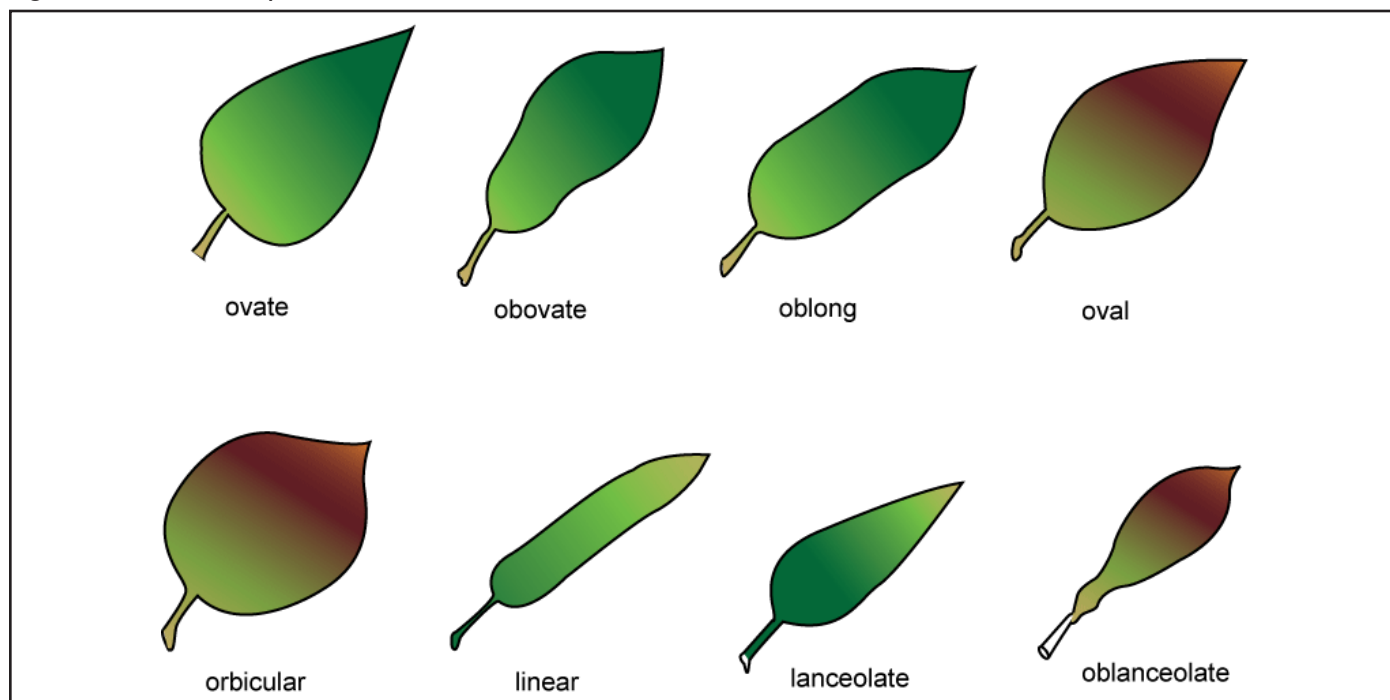
Leaf anatomy – Leaf shapes, margins, bases, and tips can all be used in identifying plants. Leaf shape is the overall silhouette of the leaf. A leaf may be long and thin, fat at one end and thin on the other, or round or oval. Some of the more common shapes are shown in Figure 3.15.

Figure 3.14 – Leaf Types



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Figure 3.15 – Leaf Shapes



Leaves have differently shaped margins. The margin is the outside edge of the leaf blade. Some of the more common leaf margins are shown in Figure 3.16.

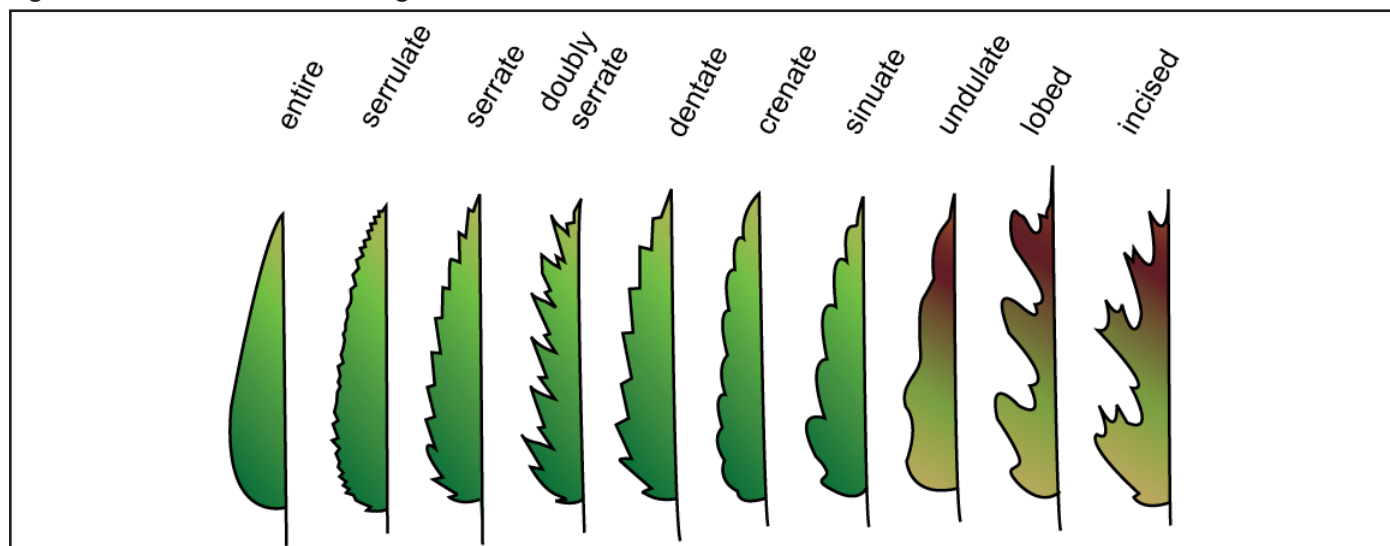
The base of a leaf has a distinctive shape where the blade intersects with the petiole. The tip, or apex, of a leaf also varies in shape. Some of the more common base shapes

are shown in Figure 3.17. Figure 3.18 illustrates some of the more common leaf tip shapes.

Stem Shape

Stem shape may also be used in the identification process. When examined in cross section, stems may be square,

Figure 3.16 – Common Leaf Margins



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Figure 3.17 – Common Base Shapes

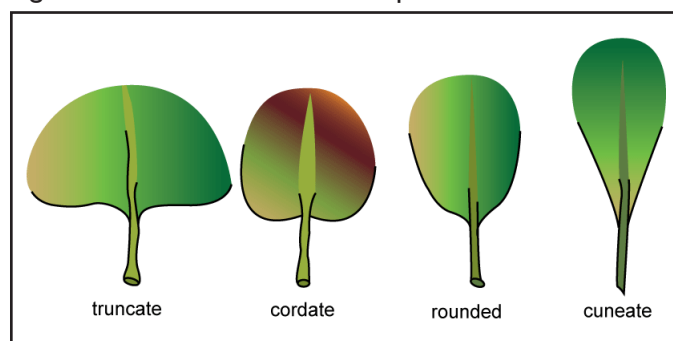
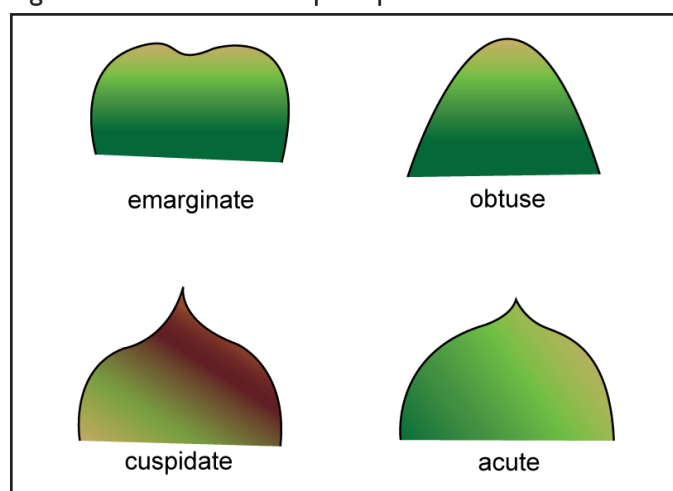


Figure 3.18 – Common Tip Shapes

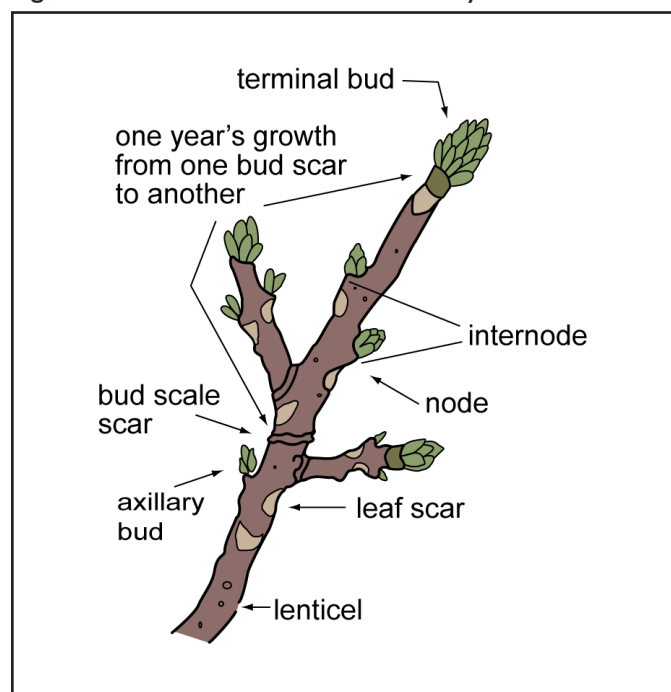


round, oval, or triangular in shape. For example, sedges have triangular stems, while mints have square stems. Stem shape can be used to differentiate between two species that are similar to each other, such as Canada bluegrass, which has a flat stem, and Kentucky bluegrass, which has a round stem.

Stem Structure of Woody Plants

Woody plants can be identified by the external structure of the stems. A typical stem has a terminal bud and axillary, or lateral, buds. The terminal bud is the point where the new season's growth starts; it is usually larger than a lateral bud and is found at the stem tip. Terminal buds may be flowering buds, which can be distinguished by their large, round appearance, or vegetative buds, which are thin and narrow and give rise to new leaves or stems. Axillary buds are found on the side of the stem and may

Figure 3.19 – Stem Structure of Woody Plants



be flowering or vegetative. All buds grow out of nodes, which are joints from which leaves or branches grow. The distance between adjacent nodes is the internode. A terminal bud scar is found where the previous year's terminal bud was located. The distance between two terminal bud scars shows one year's growth. Lenticels are breathing pores found scattered on the stem. A leaf scar is found where a leaf was attached to the stem. See Figure 3.19 for an illustration of the different parts of a woody plant stem.

Summary

The basic characteristics by which grassland plants can be identified are presented in this lesson. Grasses generally need to be identified in their vegetative state because they do not flower until late in the season. The structural parts of grasses are used to identify the vegetative plant. Each forb, legume, and woody plant has its own stem structure, bud shape and size, leaf structure, and leaf arrangement that makes it unique. All of the variations in plant parts between different species do not necessarily need to be memorized, however. In working with grassland plants, an individual gradually learns which plant has which characteristics.

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Credits

Barnes, Robert F., Darrell A. Miller, and C. Jerry Nelson. *Forages, Volume 1: An Introduction to Grassland Agriculture*. 5th ed. Ames: Iowa State University Press, 1995.

Lab 2: Vegetative Characters. <http://csdl.tamu.edu/FLORA/tfplab/vegchar.htm> (3 July 1997).

Mackenzie, Betsy, and John Frett. *Glossary of Taxonomic Terms Commonly Employed in the Identification of Woody Plants*. http://bluehen.ags.udel.edu/gopher-data2/botanic_garden/glossary.txt (3 July 1997).

Rodekohr, Sherie, and Debi Waeckerle. *Landscaping and Turf Management*. University of Missouri-Columbia: Instructional Materials Laboratory, 1990.