Lesson 1: An Introduction to Grasslands

Grasslands cover much of the earth. On every continent, various types of grasslands spread over vast areas wherever environmental conditions favor these plant communities over forest and desert. Much of the best cropland, pasture, and range used for agricultural production was originally native grassland. As a natural resource, grasslands are priceless.

Grasslands play an important role in Missouri. Agriculture is Missouri's largest industry, and livestock accounts for more than half of Missouri's total agricultural production. Grasslands contribute more than half of the total amount of feed used by this industry. Besides forage for livestock, grasslands provide other benefits, including wildlife, recreation, and conservation of soil and water. The key to providing these benefits at the highest sustainable level is good management.

What is a Grassland?

Ecologically, a grassland is any plant community dominated by grasses, whether they exist naturally or because of management practices. In this sense, pastures, golf courses, and front lawns can all be considered grasslands.

Agriculturally, grasslands are areas managed to grow grass, legumes, or other pasture or range plants. Most agricultural grasslands are artificially established plant communities planted for forage production, though some are established for soil and water conservation and wildlife habitat. These uses usually can be combined successfully with proper planning.

What is a Forage?

Forages are plants, primarily grasses and legumes, grown as feed for livestock. In contrast to feed grains, the soft vegetative parts of forages—mainly the leaves and stems—become feed. Thousands of species of grasses and legumes exist worldwide, and most have value as forage. They are harvested by grazing and by mechanical mowing. While feed grain is not normally considered forage, the vegetative parts of grain plants are sometimes used as forages after harvest.

Natural Factors Affecting Grasslands

Climate, soil, plants, grazing animals, and fire all interact to determine what vegetation occupies a given area and how well it grows. Humans also have a huge impact on grasslands. By changing how these factors interact, grasslands can be improved or abused, created or destroyed. Understanding the natural system is necessary to manage grasslands for greater productivity.

Climate – Grasslands compete with other types of vegetation for growing space. They usually dominate in areas averaging 10 to 30 inches of rainfall annually. The local environment can have a great effect, however. For example, grasses may dominate in a forest region with rainfall exceeding 30 inches if other factors create a harsh environment for trees. Most of Missouri receives 35 inches or more, which is at the transition point between grassland and forest. Trees and shrubs will invade most Missouri grasslands if they are not managed properly.

Soil – Since Missouri is at a transition point between grassland and forest, soils play an important role in determining the type of vegetation found in a particular area. Some soils, such as those that do not hold moisture because they are shallow or coarsely textured or have hardpan (a dense layer of soil) close to the surface, may discourage tree growth even when enough rainfall exists. Soils with high water tables inhibiting the root systems of trees may also favor grasses.

Plants – Grasses may make up the bulk of the vegetation found in a grassland community, but a rich diversity of broadleaf plants may also be present. These plants can be nutritionally valuable for livestock. Relatively few are problem species that require control, and most of these species only become a problem in pastures that have been abused. A mixture of grasses and broadleaf plants is especially important to wildlife, which depend on them for a variety of foods and cover. Pure stands of legumes like alfalfa are sometimes planted on grasslands. They are usually used for hay or silage rationed to livestock along with other feed.

Many grassland plants have adapted to their environment by becoming dormant when conditions are harsh and

producing new growth when conditions improve. Healthy plants can usually survive losing the current year's growth if allowed time to grow back. This process allows grassland species to survive damage from fire, grazing/browsing, drought, and high winds, all of which can kill or limit the growth of trees and shrubs.

Because most forage plants are perennials, the long-term health of the plants must always be a management priority. Excessive harvesting may yield more income one year, but overusing the plants year after year will cause the grassland to deteriorate and future productivity to decline.

Grazing – Grazing is natural to grassland communities. Before European settlement in Missouri, buffalo, deer, and elk grazed and then moved on as they depleted the forage, allowing plants to grow back. Unlike trees and shrubs, which can be severely damaged by grazing and browsing, grassland plants adapted to this cycle. The adaptation of grassland plants to grazing makes forages an important part of a productive farming operation. Grassland plants can produce an abundant crop for harvest while surviving to repeat the process. With good management, this harvest and renewal can go on indefinitely.

Fire – Grassland plants tolerate fire better than trees and shrubs and often depend on fire to maintain their dominance. With their most important parts insulated underground, they are better able to recover even if fire destroys living tissue. Grasslands are so well adapted to burning, they actually create dry conditions that favor fire at just the right time. Where fire occurs often enough to limit tree growth, grasslands usually dominate. If fire is excluded and not compensated for through practices like grazing, haying, disking, seeding, or prescribed burning, grasslands deteriorate in quality and productivity and begin to be replaced by forest.

Native Grasslands

Native grasslands are those that existed in America before the arrival of European settlers. For example the prairies of the Great Plains were originally one vast native grassland. These grasslands are sometimes called natural grasslands, but Native Americans are believed to have used fire extensively for thousands of years in ways that extended the natural range of grasslands. Therefore, human actions may have caused many of Missouri's original grasslands.

The trend toward conservation farming has led to new interest in native grasslands and their plants. Native plants and plant communities are well-adapted to Missouri's environments. When included in a farm plan and properly managed, native species can provide forage that is nutritious and palatable. The forage may be available for grazing when traditional pasture species are dormant. They can also provide better wildlife habitat and ground cover that is more effective in building soil and conserving water.

Missouri's native grasslands include several different plant communities. Most of them are prairies, glades, or savannas.

Prairies

Prairies are large, continuous native grasslands in which trees and shrubs are nearly absent. While grasses dominate, prairies support a rich diversity of grasses, legumes, and forbs. Before European settlement, more than 250 species of native grasses, legumes, forbs, and wild flowers thrived on prairies. Wildlife depended on these plants for survival. The prairies of the Great Plains reached well into Missouri and in some areas mingled extensively with forests, depending on local conditions. Prairies originally dominated nearly 27 percent of the state.

Different kinds of prairies develop on different sites. Drier sites support shorter grass species, such as little bluestem and sideoats grama. Most of these drier prairies have been converted to pasture, and much of it is improperly grazed. Wetter sites support taller species like big bluestem and indiangrass, which can reach 6 feet or more in height. Most moister prairies have been converted to cropland.

Overgrazing, invasion by woody plants, and conversion to cropland and other uses have made native prairies very rare. The result has been the loss and endangerment of many species of native plants and wildlife. However, native prairies are receiving new appreciation for their plant diversity and their production of summer forage when cool-season grasses are dormant.

Glades

Glades are relatively small, isolated native grasslands that form on hilltops and southwest-facing slopes where rocky outcrops, exposure to sunlight, and thin, dry soils create harsh, desert-like conditions during the summer. Dry conditions and fire keep them mostly clear of trees. Prairie grasses and forbs dominate, but plants and animals from western prairies and deserts like yuccas, cacti, tarantulas, and scorpions can be found.

Glades are rare environments found only in the central Midwest. They occur in prairie regions but are more obvious when found in forests. Different types of glades develop over different bedrock. Each of these communities is unique. The precise balance of environmental factors that create a glade also makes them fragile and easily disturbed by overgrazing, total exclusion of fire, and the introduction of nonnative plants.

Savanna

Savanna is a specialized community intermediate between grassland and forest with widely spaced trees, a noticeable absence of small trees and shrubs, and grasses as the main ground cover. Early settlers described parts of Missouri as park-like expanses of trees with grasses beneath them that were easily traveled on horseback. They were native savannas, once common along the edges of prairies and glades where grassland and forest met.

Savannas result from site conditions and a fire history that keeps many woody plants from reproducing while others manage to reach a size resistant to fire damage. They have become rare due to overgrazing, logging, replacement by true forest, and conversion to pasture, cropland, and other uses. If recognized and managed properly, savannas can provide wood and valuable wildlife habitat as well as forages for livestock.

Managed Grassland

Managed grassland is any area currently managed for forage, pasture, or grassland habitat. Most grassland in Missouri today can be considered managed, whether it consists of native grassland or an artificially established community. Even areas identified as "wild" grasslands must be intensively managed because human actions have altered the natural forces and cycles that created them.

More than 95 percent of grasslands in Missouri are privately owned. Most of them are used for forage; pasture is the most common type of grassland. Very little is managed as native grassland. However, because of improvements in management practices, native grasslands and pastures with native species can increase productivity.

Grassland Management and Conservation

Grassland management is the use and care of grasslands. As with any agricultural crop, grasslands must be cared for to keep them productive. Grassland management involves managing the plants, animals, equipment, and practices needed for the successful use of grasslands in an agricultural operation.

All grasslands are natural resources and require good conservation practices. Grassland conservation is the wise use of grasslands and other natural resources found on them to ensure long-term productivity and sustainability. Good management seeks to achieve the highest productivity while maintaining the system that provides it. Pushing that system beyond sustainable limits will cause the system to break down. Plants and soil will not suddenly disappear, but grasslands overgrazed or otherwise abused will decline in productivity over time. Properly managed grasslands maintain their productivity and even increase it by helping to build healthy plant communities. In addition, well-managed grasslands conserve soil, water, and wildlife.

Research and development into improved practices is a continuing effort, and grassland managers need to remain informed about new techniques that can improve their operations. Special grazing systems for livestock have been developed that protect grassland while improving production. Research is also showing how native species can increase production while protecting natural resources.

Introduction to Grassland Management

Summary

In agriculture, a grassland is an area managed to grow grass, legumes, or other pasture or range plants for forage production. Forages are primarily grasses and legumes used as feed for livestock. Several basic environmental factors—climate, soil, plants, grazing, and fire—influence the growth of grasslands. Native grasslands, including prairies, glades, and savannas, once covered much of the state, but most have been converted to other uses. Most of Missouri's grasslands now consist of pastures of nonnative plants, although native grasslands and native plants are showing new promise in livestock operations. The key to success in grassland farming is proper management, which focuses on sustaining the productivity of forage plants.

Credits

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Lesson 2: Plant Classification

Grasslands are useful due in part to the wide variety of plants that are found in them. The main feature of grassland agriculture is its dependence on grassland plants. By understanding the different plant types, increasing the benefits to livestock and wildlife from the grassland is possible. A thorough knowledge of the various types and life cycles of these plants is important to grassland management.

Grassland Plant Classification

A grassland may include a great variety of different plant species. All grassland plants can be classified according to two different criteria—life cycle and plant type.

Classification by life cycle divides plants based on their yearly growth and seeding characteristics. Each plant grows in stages which, from beginning to end, comprise its life cycle. A plant's life cycle is closely related to its productivity and is therefore extremely important. Plants can be divided by their life cycles into three categories: annuals, biennials, and perennials.

Annual plants complete their life cycle within one year or growing season. They die after producing seed and will not grow again the next year unless self-seeded or planted again. Corn, cheat, and crabgrass are examples of annual plants.

Biennial plants require two years to complete their life cycle. Generally, the plant produces mainly vegetative growth, including leaves, stems, and roots, in the first year after germination. The plant produces flowers, fruits, and seeds the second year. At the end of the second year, the plant dies. Red clover is an example of a biennial plant.

Perennial plants grow year after year. Perennials produce flowers, fruit, and seeds each year. After they produce seeds, they go into a resting period called dormancy. This process is more noticeable in regions that have cold winter seasons, where perennials may stop growing completely for the winter. During the period of dormancy, the perennial slows down all its natural processes to protect itself from colder temperatures. When spring comes, its pattern of growth begins again. Many forages and pasture crops are perennials. Trees and shrubs are also perennials.

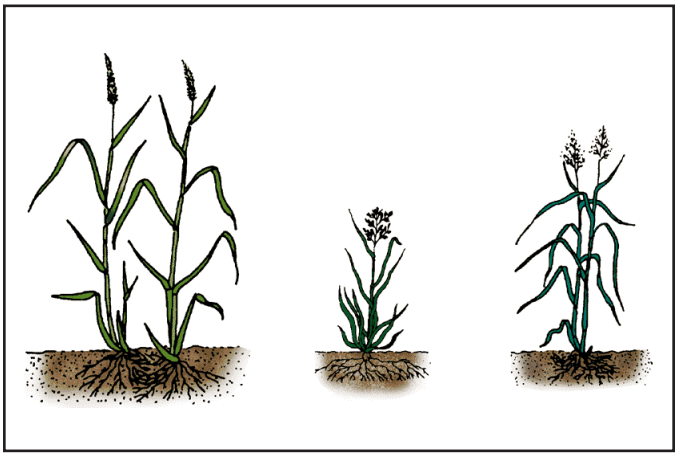
In classification by plant type, plants are categorized according to the physical characteristics of the plant. Each species within a plant type has characteristics that are similar to all other species of the same plant type. Four different plant types are found in grasslands—grasses, legumes, forbs, and woody plants.

Grasses of the Grassland

Grasses are one of the four dominant plant types found in a grassland. They serve many purposes, such as food for livestock and wildlife (orchardgrass, fescue, and alfalfa), food for humans (cereals and grain sorghum), and erosion prevention.

The grasses of the Great Plains are herbaceous, or without woody stems. The stems, or culms, of grasses are usually hollow and therefore resist compaction. Leaves or blades connect directly to the culm at a sheath, which surrounds the stem. All leaf blades have a distinctive parallel venation in which the veins run side by side along the length of the blade of grass. These visual characteristics make it possible to separate the grasses from all other plant species. Notice the characteristics of the grasses pictured in Figure 2.1.

Figure 2.1 – Characteristic Grasses: Indiangrass, Orchardgrass, Switchgrass



The two major groups of grasses are cool-season and warm-season grasses. Cool-season grasses tend to grow best during the spring and fall. These plants begin their growing season when the soil temperature reaches 40° F, but optimum growth occurs when air temperatures fall in the 59° to 77° F range. They may remain green all winter, but during the summer months they tend to become brown and dormant. They may be annuals or perennials. Examples of cool-season grasses include Kentucky bluegrass, orchardgrass, and smooth bromegrass.

Warm-season grasses are just the opposite, in that they grow best during periods of warm temperatures. These grasses are much more tolerant of heat and drought than cool-season grasses. Their growing season begins when soil temperature reaches 60° F, and they grow best during the summer when temperatures are in the 77° to 104° F range. They are dormant in the winter and do not begin to turn green until early summer. They also may be annuals or perennials, Some examples of warm-season grasses are indiangrass, big bluestem, and switchgrass.

Missouri has the right climate and amount of annual rainfall for both cool-season and warm-season grasses. Figure 2.2 shows how the growth periods of these two grass types complement each other and extend the length of green pasture production in Missouri.

Legumes

Legumes and grasses together make up the dominant plant types found in grasslands. Both are used as forage crops and therefore are beneficial to agricultural production. Figure 2.3 shows characteristic legumes. Examples of legumes include soybeans, alfalfa, clovers, and birdsfoot trefoil.

Legumes have several identifying characteristics. One characteristic of legumes is the fruit or pod that they produce. This pod has one chamber, with seeds lined in a single row. The seed number and size varies for different plants. All legumes have leaves that are alternate in arrangement on the stem and are connected to the stem

Figure 2.2 – Cool- and Warm-Season Grass Growth

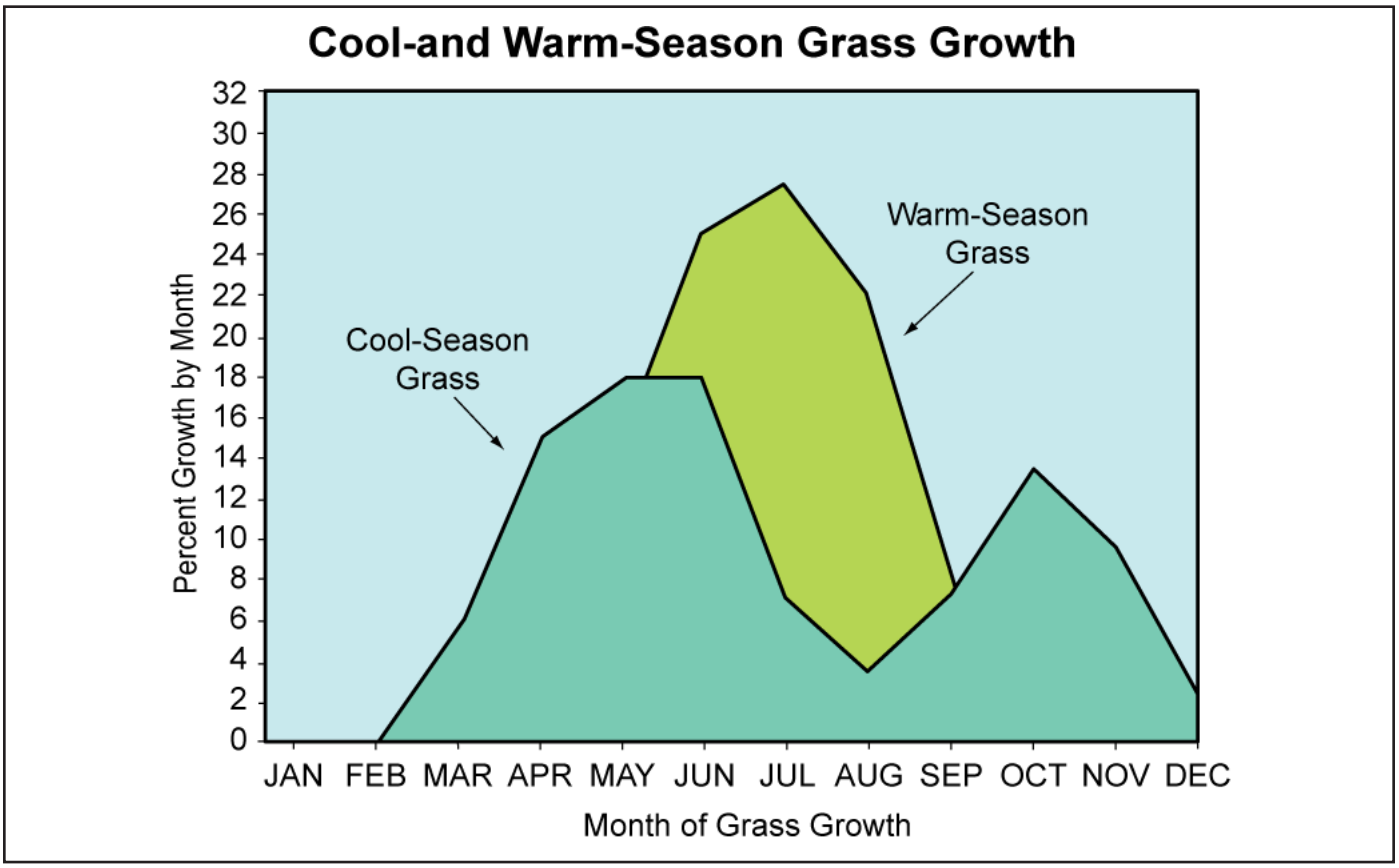
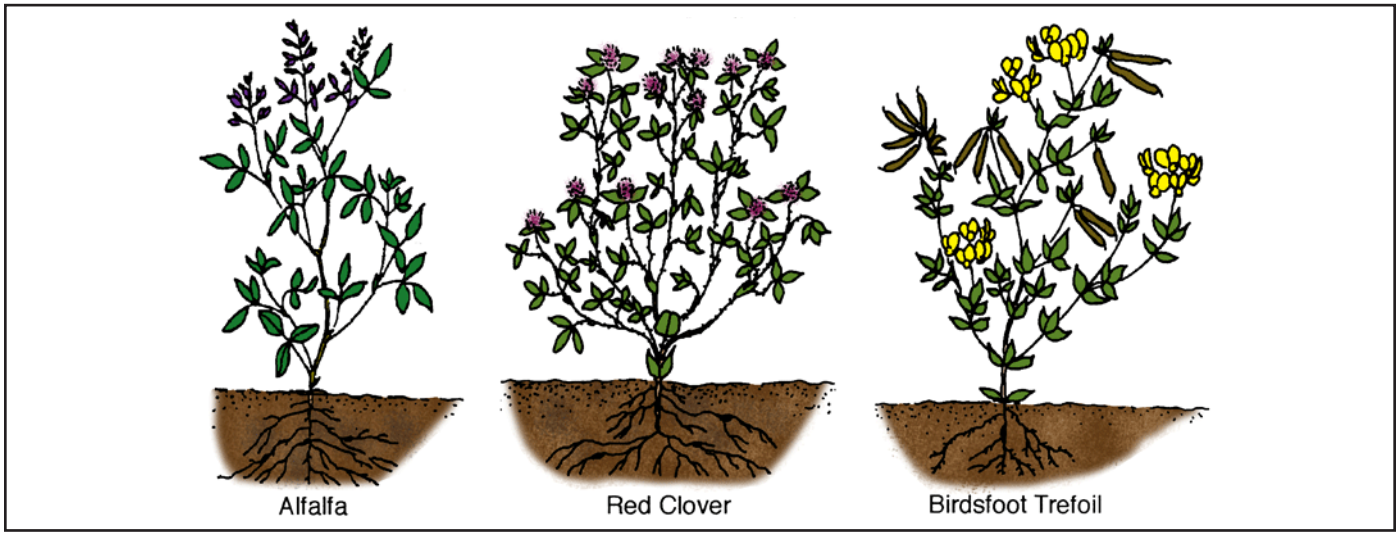


Figure 2.3 – Characteristic Legumes



by a stalk called a petiole. Unlike the grasses, venation in a legume consists of a network of veins rather than veins that run parallel to each other. Legumes may be annuals, perennials, or biennials.

Most legumes have the unique ability to take nitrogen from the air between soil particles and change it into a form of nitrogen that plants can use. This process is known as nitrogen fixation and is carried out by symbiotic bacteria found in nodules on the roots. This nitrogen helps decrease fertilizer needs, reduce costs, increase yields, and enrich the soil.

Forbs

Herbaceous (or not woody) plants that are neither grasses or legumes are called forbs. Most forbs are broad-leafed, making it possible to distinguish them from grasses or grasslike plants. Forbs are not usually cultivated for agricultural production, but they commonly appear in both pastures and native plant habitats. Many forbs have value as wildlife food and cover or for prevention of soil erosion. Others are considered to be noxious weeds. Forbs may be annuals, perennials, or biennials. Some examples of forbs are sunflowers, thistle, and ragweed, which are pictured in Figure 2.4.

Figure 2.4 – Characteristic Forbs

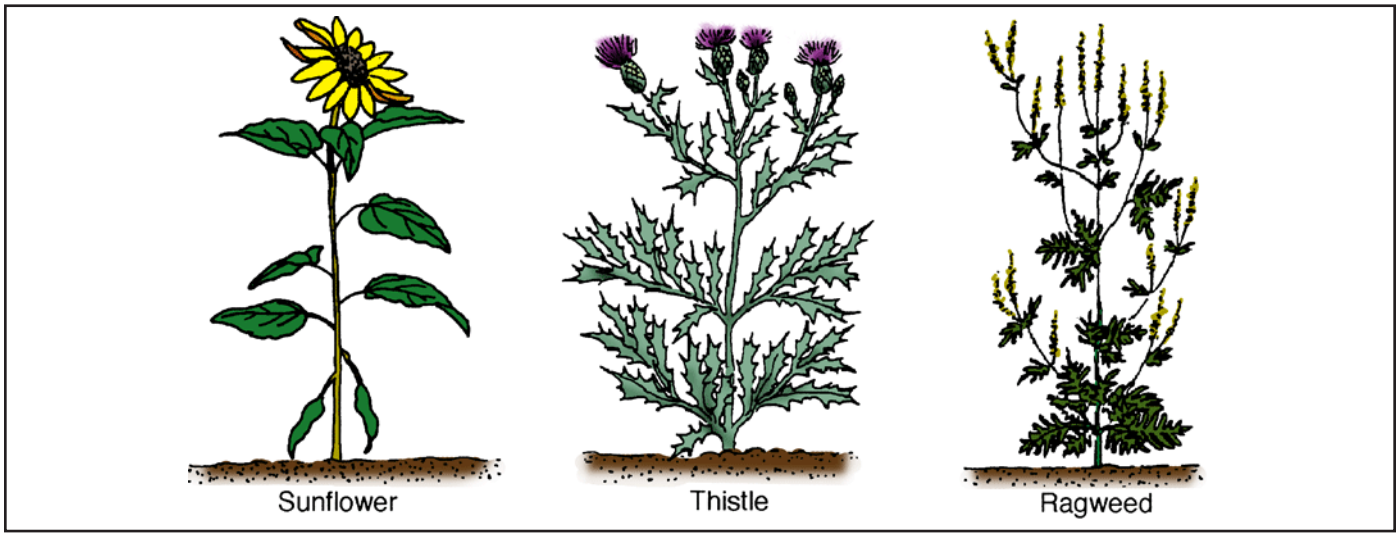
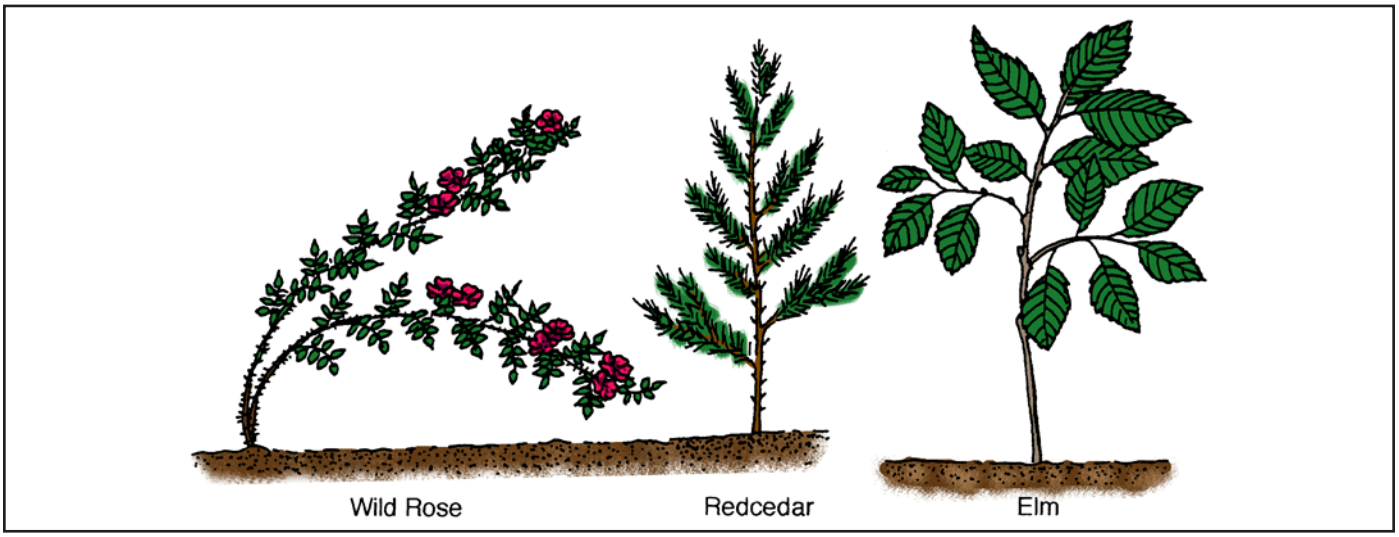


Figure 2.5 – Characteristic Woody Plants



Woody Plants

Woody plants are probably the easiest plants to identify in the grassland because of their tough, woody (nonherbaceous) stems. They are either shrubs, vines, or trees. Woody trees found in grasslands are almost always immature due to the nature and use of the grassland. They are kept small by animals that graze on terminal branches, by fires that stunt growth, by mechanical cutting, or by chemical treatments carried out to maintain the grassland. Woody plants are perennials. Examples of woody plants found in grasslands include wild rose, redcedar, and elm, shown in Figure 2.5.

Summary

Understanding plant types and life cycles will help in managing a grassland for many purposes. Grassland plants may be annuals, biennials, or perennials; they may also be grasses, legumes, forbs, or woody plants. They are important for the whole grassland habitat and its many uses.

Credits

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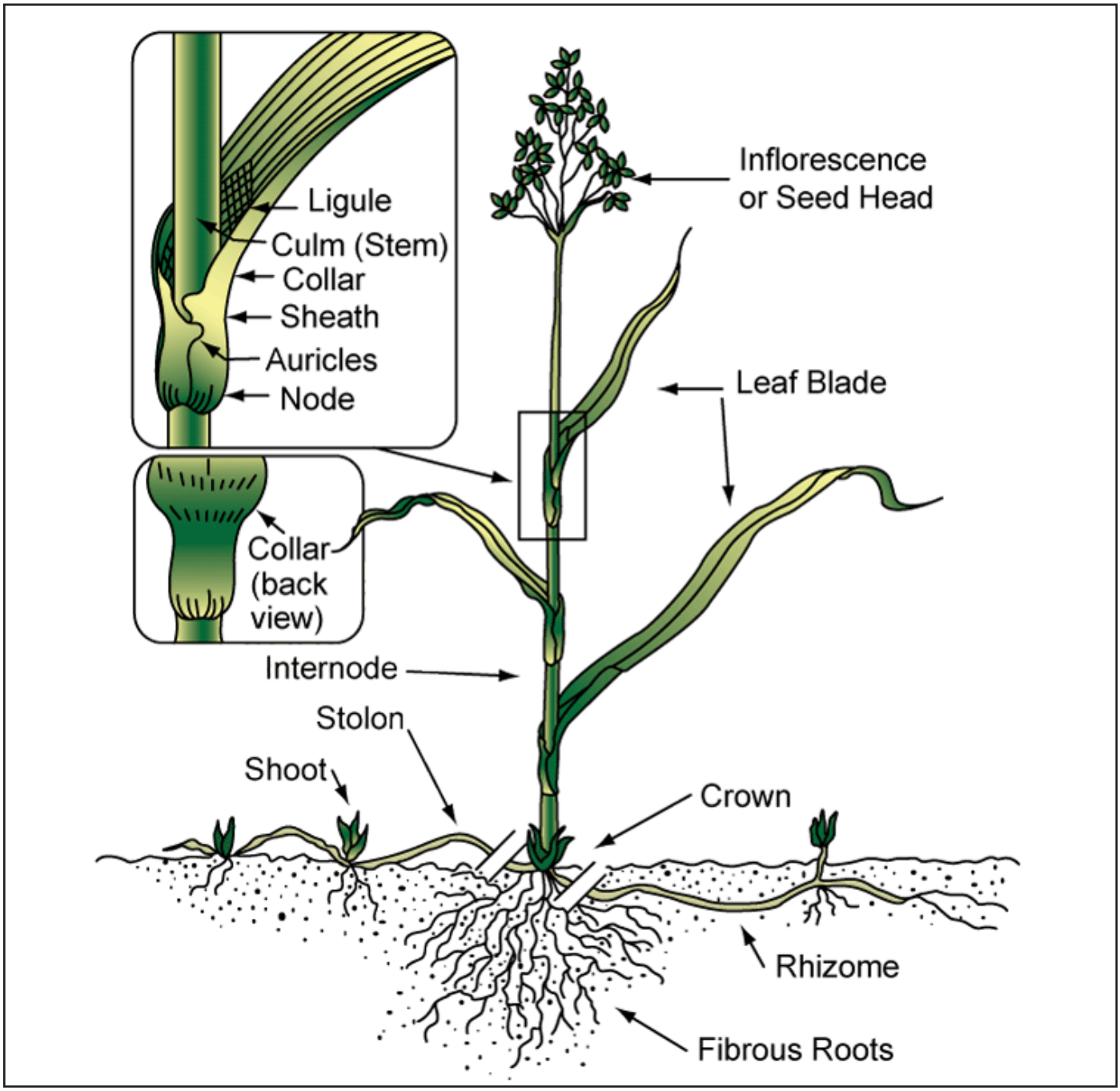
Lesson 3: Botanical Characteristics

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.

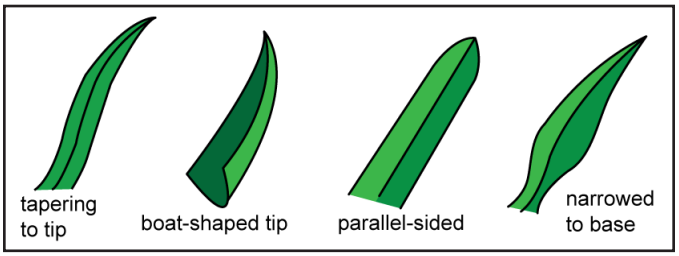
Figure 3.1 – Parts of a Grass Plant



Identifying Characteristics of Grasses

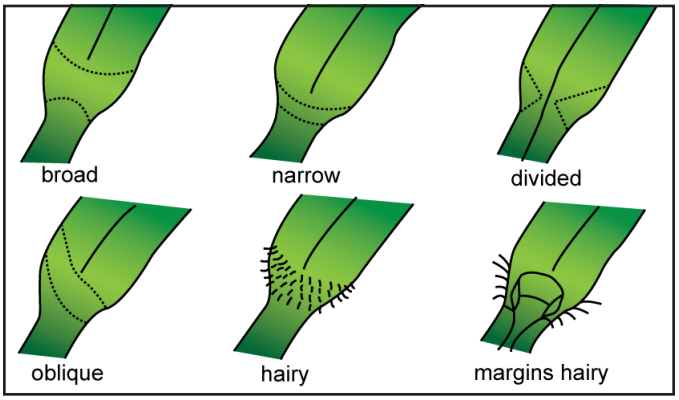
Leaf blade shape – The leaf offers several identifying characteristics. The width, length, and hairiness of the blade differ in each species; they also vary with the environment. The leaf blade and tip shape is a more distinctive identifying characteristic. The blade may be tapering to the tip, boat-shaped,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

Figure 3.2 – Leaf Blade Shapes



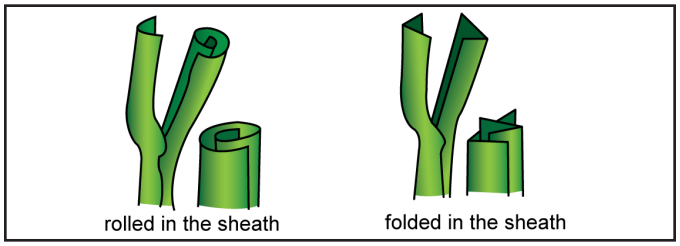
Collar – The collar on a grass blade is the external narrow band found where the blade and the sheath join. It can have different shapes (broad, narrow, divided, oblique) and different colors. The collar may also be found with hair or with a hairy margin. Figure 3.3 shows different collars.

Figure 3.3 – Collars



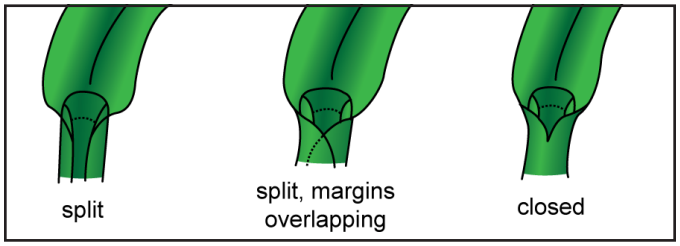
Leaf blade arrangement – Leaves may be arranged in the sheath in two ways—folded or rolled. To determine which arrangement exists, look at the way a new leaf naturally emerges from the sheath or find the last fully emerged leaf and cut the sheath just below the collar. See Figure 3.4 for leaf blade arrangements.

Figure 3.4 – Leaf Blade Arrangements



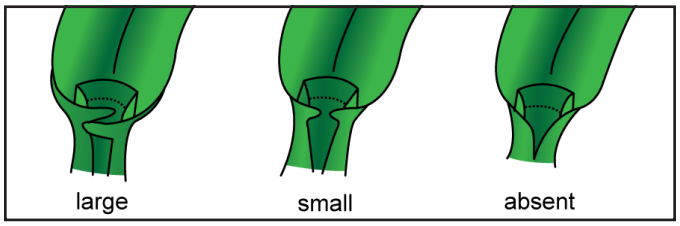
Sheath – The sheath is the part that encircles the stem and the bud shoot. In a cross section, the sheath will usually be round (or nearly round) if the bud shoot is rolled and flat if the bud shoot is folded. The sheath may be split, closed, or split with overlapping margins, as shown in Figure 3.5.

Figure 3.5 – Sheaths



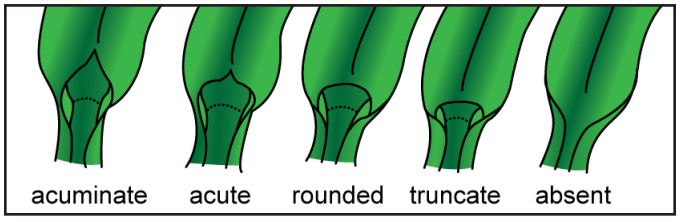
Auricles – The auricles are flaplike appendages that clasp the stem at the top of the sheath. They may be large, small, or absent entirely. See Figure 3.6 for examples.

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



Roots and Modified Stems

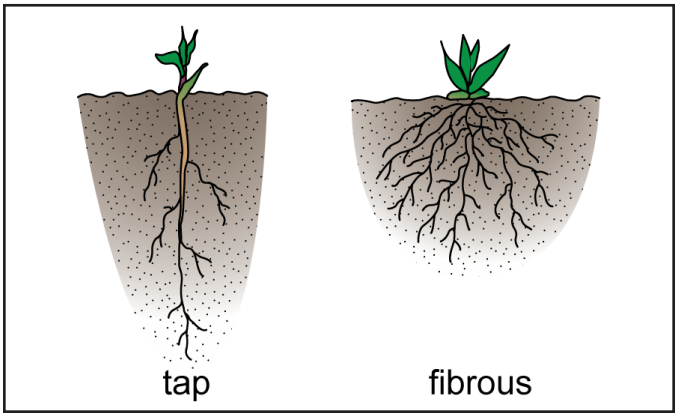
Root systems found in grassland plants differ. The two basic root structures that can be found in grassland plants are tap and fibrous roots. An annual usually has a weak fibrous root system that pulls out of the ground easily without tearing the top from the roots. Figure 3.8 shows the different root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

Figure 3.9 – Modified Stems

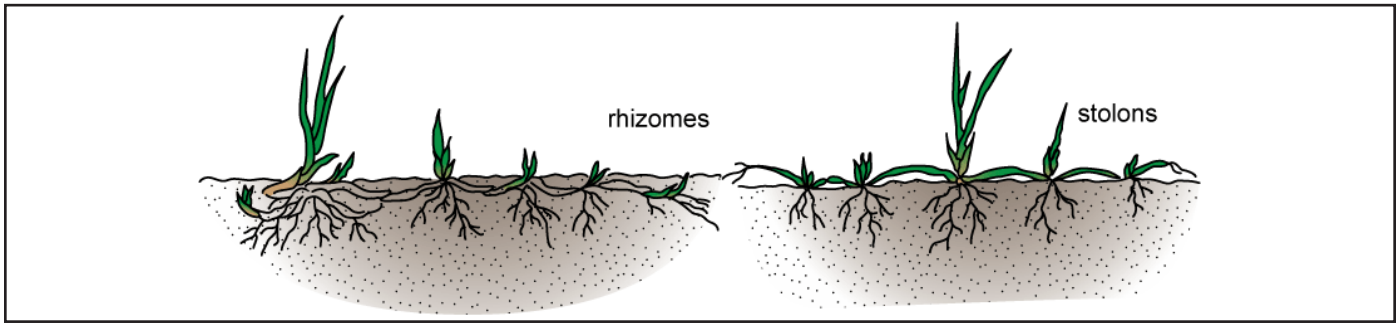


Figure 3.10 – Inflorescence

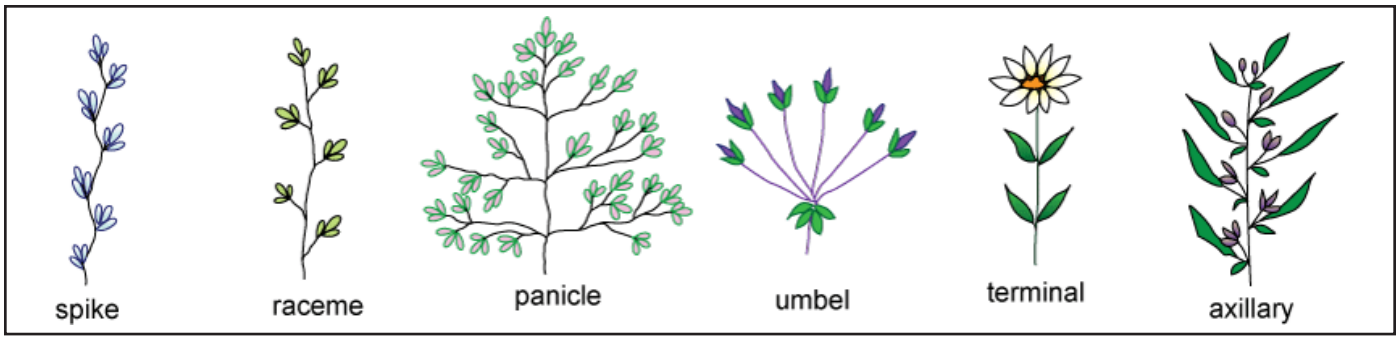
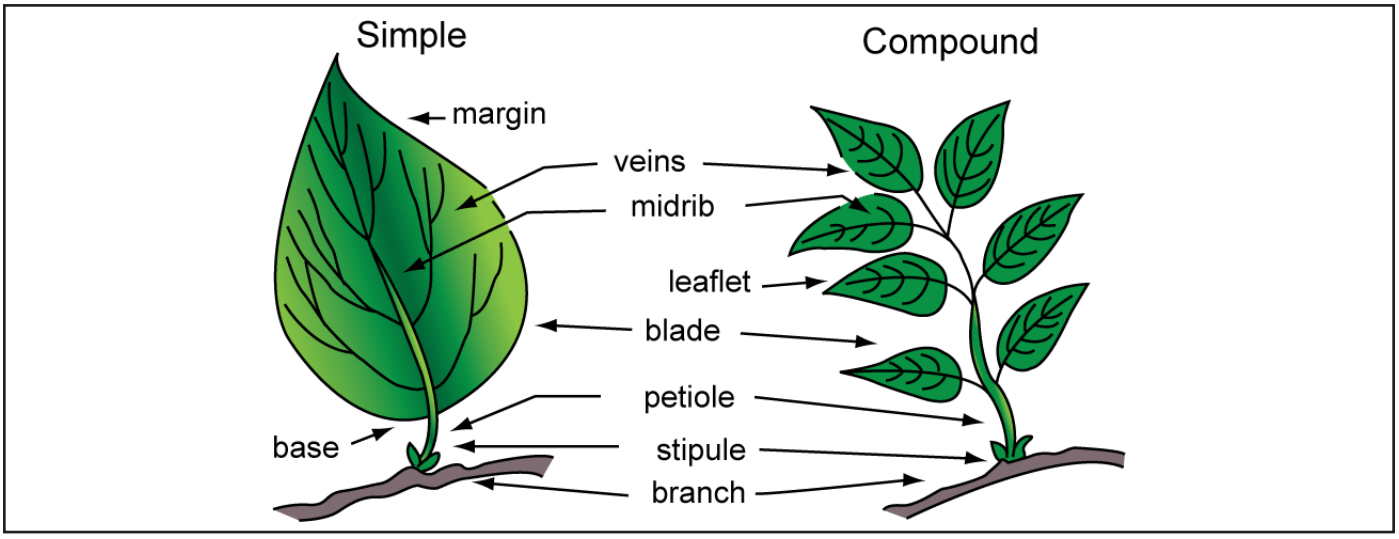


Figure 3.11 – Leaf Parts



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

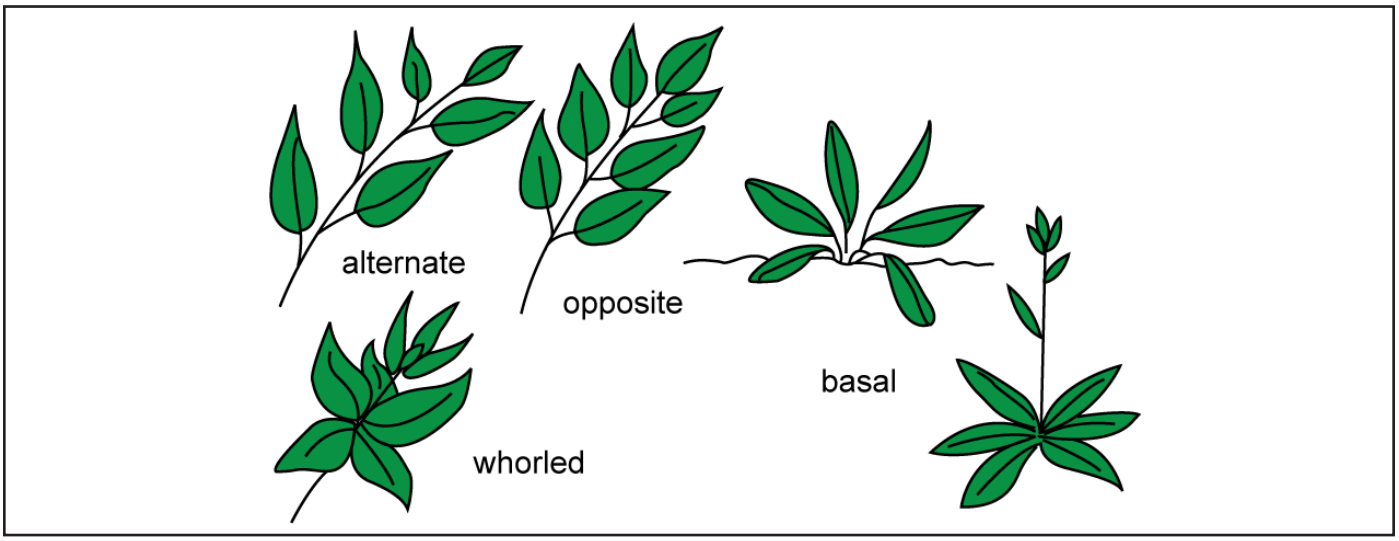
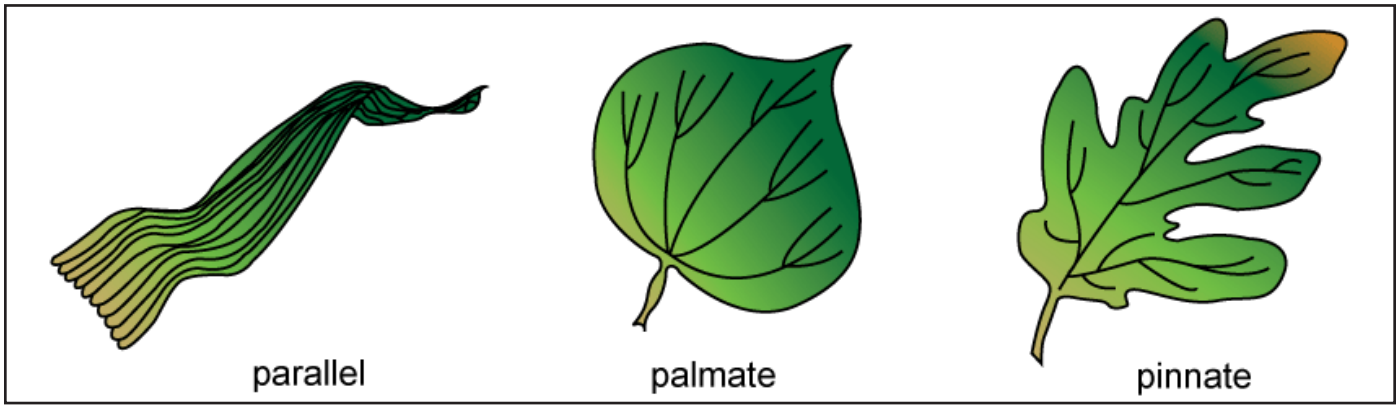


Figure 3.13 – Leaf Venation



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

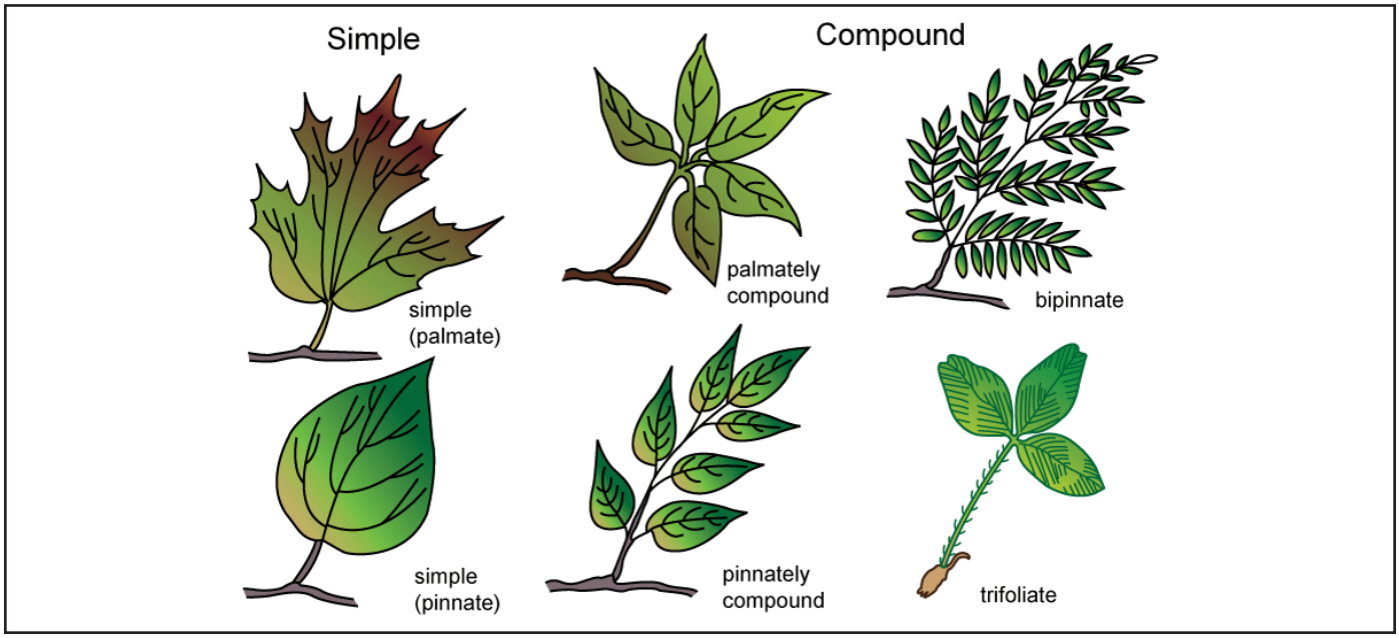
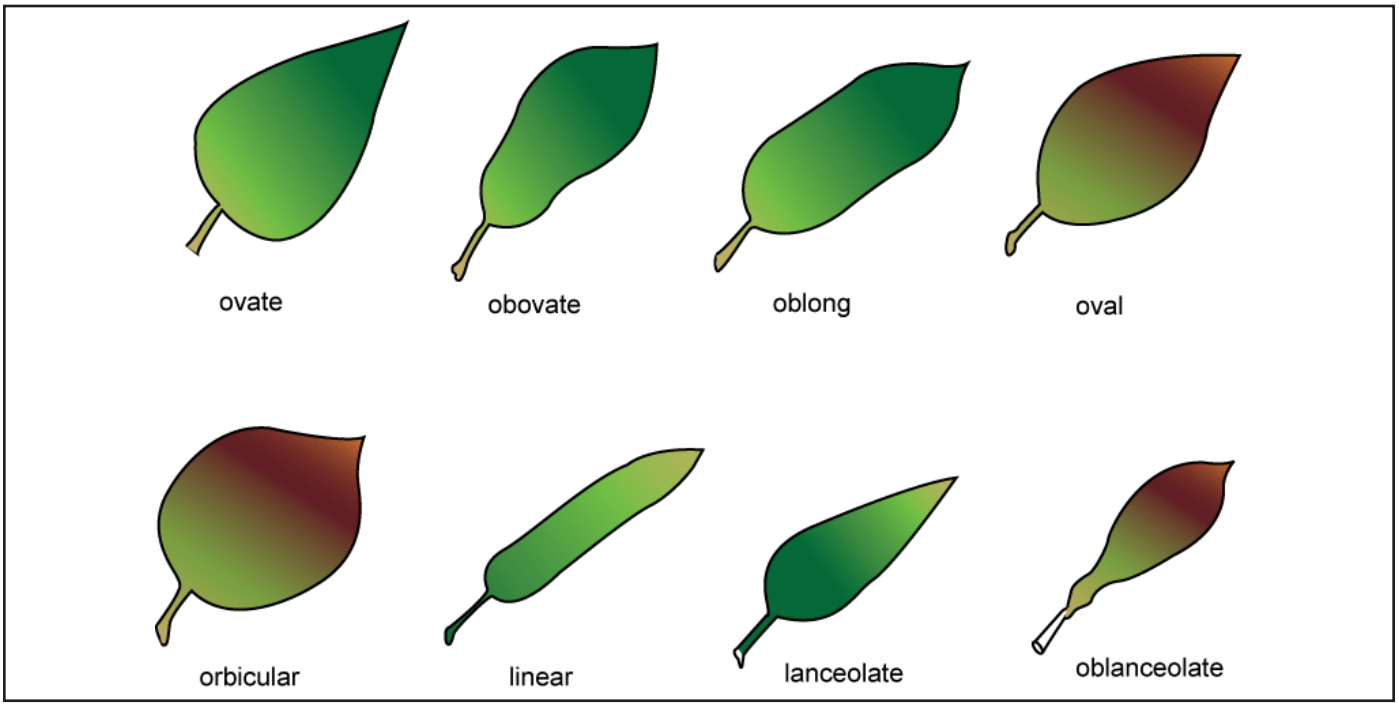


Figure 3.15 – Leaf Shapes



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

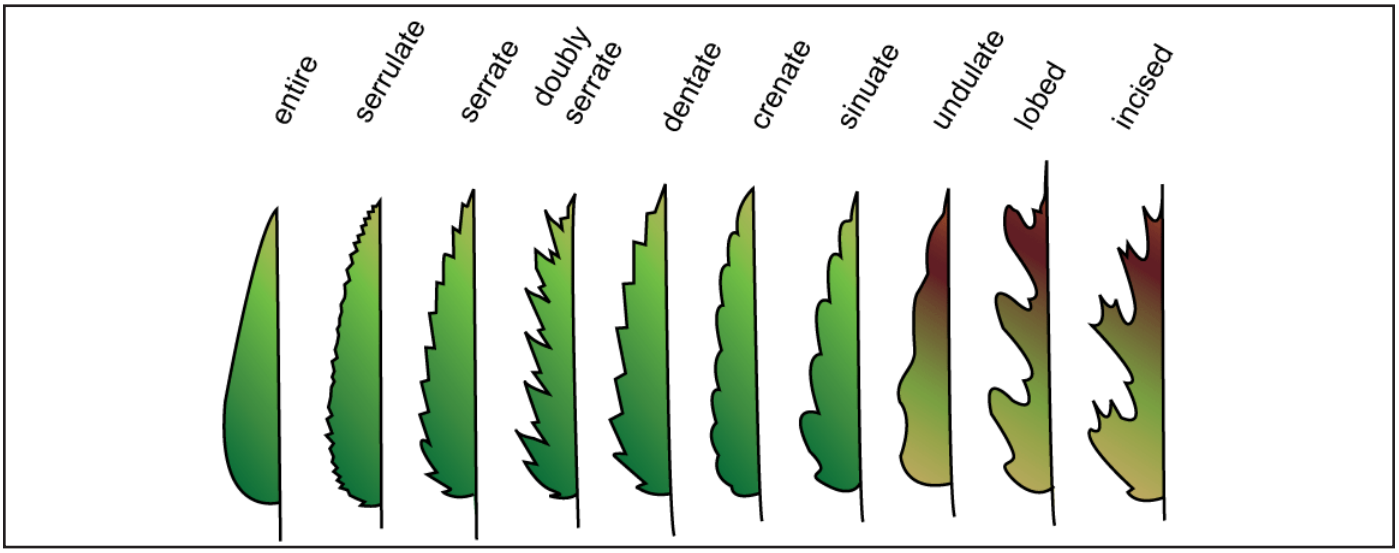


Figure 3.17 – Common Base Shapes

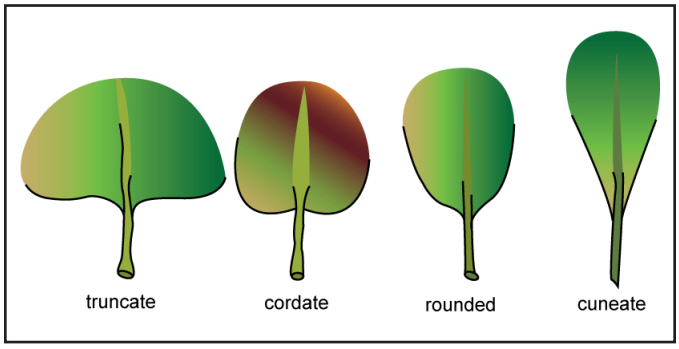
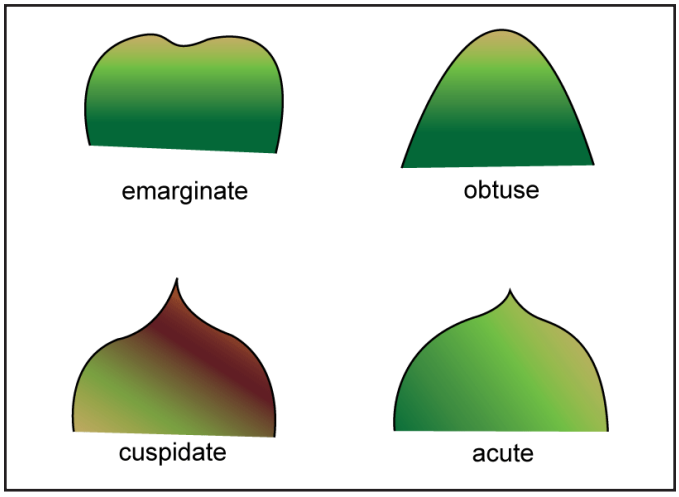


Figure 3.18 – Common Tip Shapes

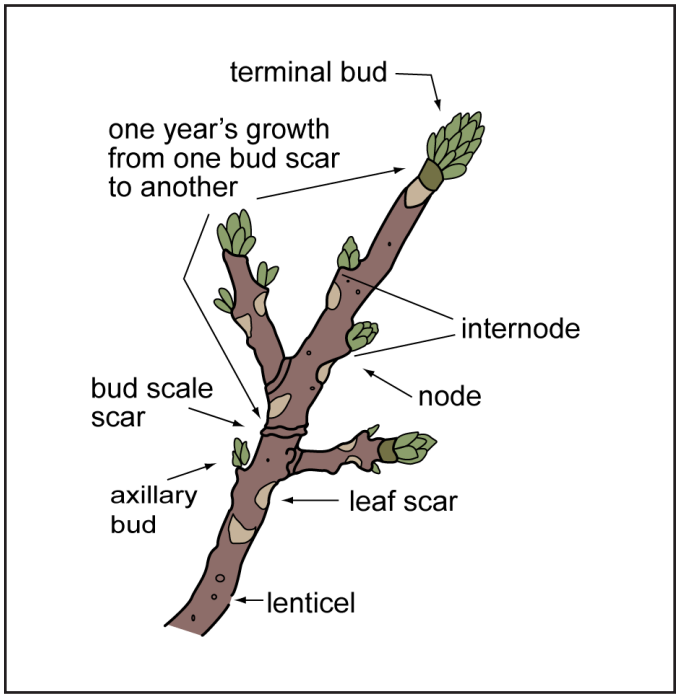


round, oval, or triangular in shape. For example, sedges have triangular stems, while mints have square stems. Stem shape can be used to differentiate between two species that are similar to each other, such as Canada bluegrass, which has a flat stem, and Kentucky bluegrass, which has a round stem.

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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Lesson 4: Grassland Composition

Grassland composition and forage quality are two ways in which an area can be evaluated for production. In combination with soil and land evaluation (covered in Unit II), they form the evaluation process used in grassland management.

Importance of Grassland Composition

Grassland composition refers to the quality and variety of plants that grow in the grassland. Determining grassland composition is important because understanding the current condition of the grassland helps a producer estimate its potential for livestock production and wildlife management. The quality of the plants that make up a pasture affects the quality of the livestock produced and the wildlife found in the area. Many economic benefits may be gained from maintaining high quality pastures, while nonmonetary benefits may result from providing a good habitat for wildlife.

Knowing the plant composition of the grassland also has other benefits. Examining grassland composition allows the grassland manager to determine the length of the grazing season based on the seasonal growth of the plants. The grassland manager can also use his or her knowledge of grassland composition to adjust the plant composition of pastures to reach the optimum economic yield from production and achieve the most successful wildlife management. This adjustment involves modifying the current composition to match the ideal composition. Improving the composition to improve the quality of the plants and lengthen the grazing season can improve the use of the land.

Components of Grassland Composition

Determining grassland composition can be done by making a visual appraisal of a given area of land. Overall, the more leafy the stand, the higher the quality.

A more specific method of making an appraisal of grassland composition is to use a stick to find the percentages of different plants in the grassland. The person doing the evaluation takes 10 steps in a random direction at a representative spot in the grassland. The stick is then placed on the ground on end. Whatever plant the tip lands on should be recorded, and the total number of each of the plants the stick touches should be tallied in a systematic way. At least 10 to 20 determinations should be made. The percentage of each plant in the grassland can then be calculated.

The dominant plants in grasslands are usually grasses and legumes. These plants are the main forage crops. They may be grown in single stands or in mixtures in which two or more forage crops dominate the grassland. Stands composed of only one plant species are of less value to livestock and wildlife. Cool-season and warm-season grasses are not often mixed in the same stand because this combination is difficult to maintain.

Grassland plants not beneficial to livestock production goals are considered to be weeds. Weeds may be any type of plant that is not desired for production. It is important to remember, however, that wildlife may have uses for the plants many people think of as weeds; some of these plants may also have nutritive value for livestock.

Grassland Viability

The needs of livestock and wildlife in the grassland are very similar. They share the same basic needs for food, shelter, and water, although the specific kinds of food and shelter required by livestock may differ from that required by wildlife.

Quality food – A grassland must provide quality food to sustain a population of animals. Nearly all the different parts of plants are eaten by one animal species or another. Livestock need a quality stand of forages, including warm-season grasses, cool-season grasses, and legumes, to sustain the herd. Wildlife usually require a greater mixture of plants, since different animals may feed on leaves, stems, twigs, bark, roots, fruits, seeds, insects, or small mammals supported by these plants

Shelter – In grasslands, shelter provides protection from harm. Livestock use shelter to reduce the effects of sun, heat, wind, and cold. In addition, wildlife need shelter for nesting and protection from predators. The terrain of the

land and large plants like trees provide shelter. Wildlife also find safety in brush piles and nearby woods and among tall grasses.

Water – Clean, uncontaminated water is necessary for sustaining all animals in the grassland. Water quality in ponds, streams, and groundwater is influenced by the surrounding vegetation. Proper grassland management helps maintain quality water in these sources by preventing erosion, limiting runoff, and filtering nutrients and wastes.

Livestock require a source of surface water. The best source is from a freeze-proof water tank located below a pond or at a water hydrant. Some species of wildlife, such as deer, can drink from streams or ponds, while others, like quail and rabbits, obtain most of their moisture from berries, plants, or even dew.

Forage Quality

Forage quality refers to the nutritive value of the forage needed to produce a desired level of animal performance. The type of performance will depend on the use of the animal. It could be milk production (lactation) for dairy cattle, gain for beef cattle, or work for horses.

A detailed chemical analysis can be run on a forage to measure its quality. This test measures several items.

- ◊ Moisture – Testing can reveal the amount of water present in the forage.
- ◊ Crude protein (CP) – Crude protein includes both true protein and non-protein nitrogen. The percentage of crude protein indicates the ability of the forage to meet an animal's requirements for protein.
- ◊ Acid detergent fiber (ADF) – Acid detergent fiber indicates the percentage of plant material that is indigestible. A low ADF is preferred, because as it increases, the forage becomes less digestible and contains less energy.
- ◊ Neutral detergent fiber (NDF) – Neutral detergent fiber refers to the percentage of structural or cell wall material in the forage. A low NDF is preferable, since it correlates to increased food intake.
- ◊ Total digestible nutrients (TDN) – Total digestible nutrients represent the percentage of digestible material in the forage. The higher the ADF is, the lower the TDN will be.
- ◊ Net energy for lactation (NE_l) – This measurement indicates the energy available in a forage to meet the requirements of lactating cows.
- ◊ Net energy for maintenance (NE_m) – Net energy for maintenance indicates the energy available in a forage to meet the requirements for maintenance in meat-producing livestock.
- ◊ Net energy for gain (NE_g) – This measurement indicates the amount of energy available in a forage to produce growth or gain.

These levels will vary according to a number of factors that affect forage quality. The plant's stage of growth is the most important factor. Plants that are young are of higher quality than older, more mature plants. As plants mature, they produce more stem than leaves. The nutritive value of the forage crop decreases with increased maturity because the plants have more indigestible material due to their higher fiber content.

Another important factor is the type of forage. Plant species differ in their digestibility and energy content. For example, legumes tend to be higher in digestibility than grasses.

A third factor affecting quality is the growing conditions for the forage. The surrounding environment plays a role in determining the value of the plants for forage. The temperature, amount of sunlight, and amount of rainfall all have an effect.

The presence of noxious weeds also has an effect on forage quality. Weeds affect intake by livestock because they are less palatable. They are also less nutritious than desired forages.

Summary

The evaluation of grassland composition allows a producer to estimate the potential for livestock production and wildlife management, determine the length of the grazing season, and modify the plant composition. Determining

grassland composition can be done by making a visual appraisal of the land. Grassland viability is also important; livestock and wildlife require food, shelter, and water from the grassland. The quality of the forage on the grassland is vital, since it affects the level of performance of livestock. Factors that influence forage quality include stage of growth, plant type, growing conditions, and the presence of noxious weeds.

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