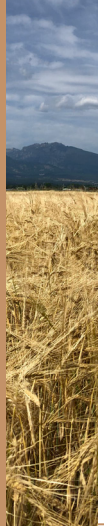
MONTANA STATE UNIVERSITY EXTENSION

MontGuide



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AGRICULTURE AND NATURAL RESOURCES

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Grass Identification Basics

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This publication covers basic grass anatomy, including terms commonly used for grass identification, and guides you through seven questions to ask about the species you are trying to identify. It will not identify specific grasses but is intended to be used with your favorite field guide, dichotomous key, or app.

GRASSES ARE A UBIQUITOUS FEATURE OF THE MONTANA landscape. In fact, over two thirds of Montana is dominated by grasses, and over 230 grass species have been documented in Montana. World-wide there are about 10,000 species and nearly 700 genera of grasses, making it one of the largest flowering plant families. Grasses are one of the most economically important families of plants; they are grown as major crops, provide forage and shelter for livestock and wildlife, and serve as turf and ornamentals. In spite of their prevalence, differentiating one species of grass from another is difficult because they tend to all look very similar. However, grass identification is critical for assessing the condition of range, pasture, and crops and for judging the progress of restoration of degraded grasslands. Grass identification requires you to look at vegetative characteristics along with flowering or seed head features, all of which can be small and usually are not very showy. This publication covers basic grass anatomy, including terms commonly used for grass identification, and guides you through seven questions to ask about the species you are trying to identify. It will not identify specific grasses but is designed to be used in conjunction with your favorite field guide, dichotomous key, or the mobile device app "Montana Grasses." Keep a hand lens nearby to see smaller, detailed diagnostic features of your species of interest.

Grass anatomy

Growth in most Montana grasses occurs close to the ground, which is why most grasses can be grazed at their tips without destroying the ground-level growth tissue (or meristem). The leaf comprises the sheath and the blade (**Figure 1**). The sheath arises from a node. The blade diverges from the plant at the upper end of the sheath. Features associated with the sheath and blade often distinguish grass species and will be described in more detail. Stem growth has been described as a series of cylinders or tubes, one nested within the next. The stem (also known as culm) elongates and the grass matures as new cylinders emerge from inside the existing cylinders. The last and innermost cylinder is a flowering stem, which gives rise to the seed head. Prior to emergence of the inflorescence (which matures to become the seed head), leaves and associated structures are used for identification, as well as overall appearance of the grass plant.

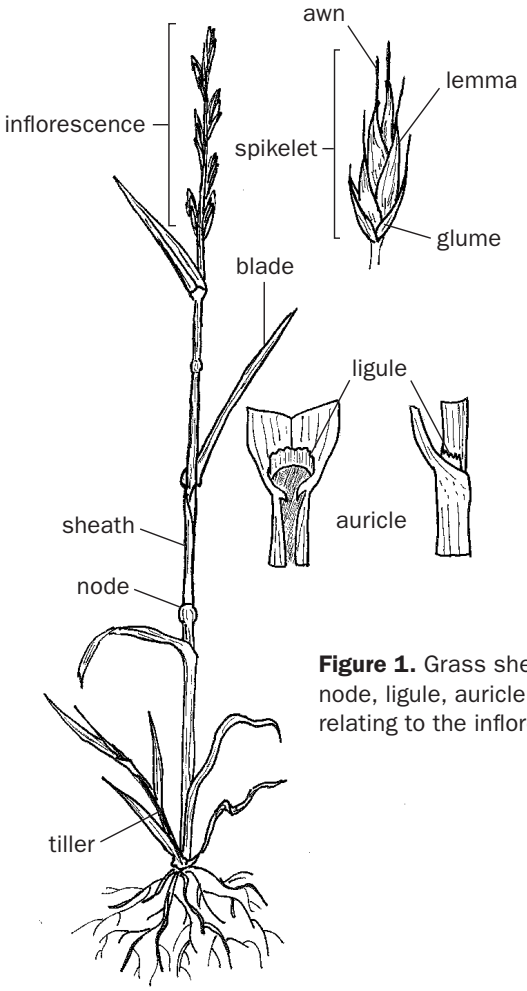
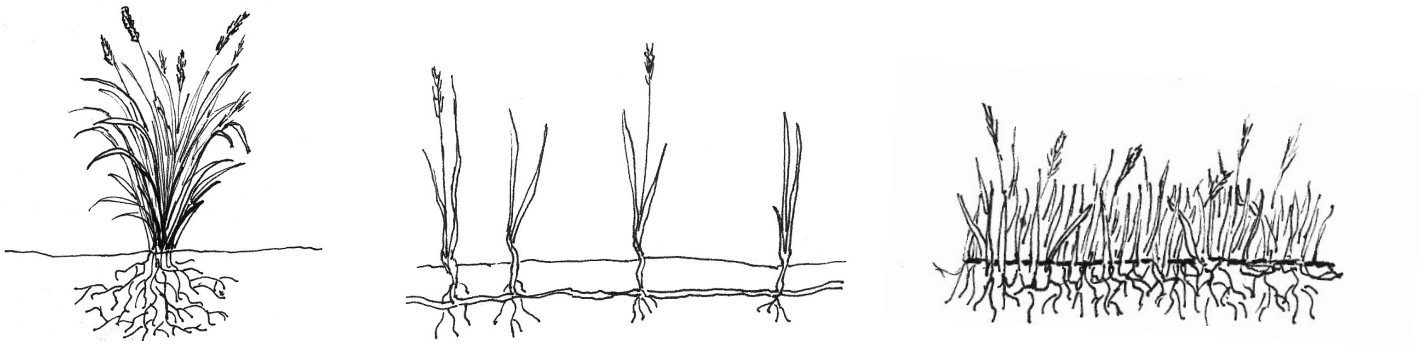


Figure 1. Grass sheath, node, ligule, auricle and parts relating to the inflorescence.

Figure 2. Grass appearance



Bunchgrass Rhizomatous Sodgrass

After the inflorescence or seed head develops, grass identification becomes easier. The shape of the inflorescence is one diagnostic feature that is useful for identification. When observing the inflorescence more closely, anatomical features to focus on include the spikelets, glumes, florets, lemmas, paleas, and awns (**Figure 1**). The presence or absence of awns and the length and shape of awns, if present, are especially helpful. Awns will be further discussed, but this publication emphasizes vegetative characteristics in general. Other field guides and more technical keys will likely include terms related to inflorescence anatomy, so becoming familiar with these terms is helpful.

What is the overall appearance of the grass?

The overall appearance of a grass can be described as a bunch (also sometimes referred to as caespitose), rhizomatous, or sod (**Figure 2**). Bunchgrasses are tufted grasses that form a clump of basal leaves and stems. Examples of bunchgrasses include bluebunch wheatgrass (*Agropyron spicatum*) and Great Basin wildrye (*Elymus cinereus*). Bunchgrasses reproduce by seed and produce tillers (**Figure 1**) but only immediately adjacent to the existing bunch. Rhizomatous grasses do not typically form clumps but instead grow laterally from rhizomes which give the grass a spreading appearance. Rhizomatous grasses can reproduce by seeds and vegetatively. Examples of rhizomatous grasses are western wheatgrass (*Agropyron smithii*) and smooth brome (*Bromus inermis*). Sodgrasses form a mat or mass of individuals by means of rhizomes or stolons. Blue grama (*Bouteloua gracilis*) and Kentucky bluegrass (*Poa pratensis*) are examples of sodgrasses. Sodgrasses can reproduce by seeds and vegetatively.

What is the shape of the inflorescence or seed head?

The inflorescence or seed head can take on a variety of shapes, but it is convenient to group them into three general categories: spike, tightly branched, or loosely branched/diffuse (**Figure 3**). A spike is unbranched, and the spikelets are attached directly to the stem, each lacking a stalk. Timothy (*Phleum* spp.) and bluebunch wheatgrass have spike inflorescences, for example. Tightly branched inflorescences can sometimes look like a spike, but upon closer inspection you will notice that spikelets are attached to the stem by a short stalk or pedicel. The needlegrasses (*Stipa* spp.) and fescues (*Festuca* spp.) have tightly branched inflorescences. Loosely branched or diffuse inflorescences have stalks or pedicels that are long such that each spikelet is well-separated from the others, which gives the top of the grass an open or airy appearance. An example of a grass with a loosely branched inflorescence is switchgrass (*Panicum virgatum*).

Figure 3. Seed head shapes

spiked tightly branched loosely branched or diffuse

What is the texture of the leaf blade?

Leaf blades can be smooth, rough or ridged, or hairy. A good way to determine leaf blade texture is to run your fingers along the length of the leaf blade from the tip to the base. The leaf

blade may feel smooth. In contrast, you may find that the leaf blade feels rough and somewhat sharp or ridged; sometimes ridges are even visible. Some leaf blades have hairs on them which may or may not be visible to the naked eye. Sometimes the entire leaf blade may be covered by hairs and sometimes only the margins or edges will have hairs. The number and length of hairs can vary greatly from grass to grass and are often used as a diagnostic feature. Witchgrass (*Panicum capillare*) is an example of a grass with distinctly hairy leaves.

What is the sheath like?

Remember that the sheath (lower part of the grass leaf) can be thought of as the outermost cylinder in the series of cylinders that make up a grass stem (**Figure 1**). Sheaths can be closed or fused, where the margins are attached in a manner similar to the margins of a zip-up shirt when being worn (**Figure 4**). Sheaths can also be open or overlapping, much like how the margins of a button-down shirt overlap. In a closed or fused sheath, the edge of the cylinder does not separate to reveal the underlying cylinder. In an open or overlapping sheath, there is a length-wise slit in the cylinder which can reveal the underlying cylinder. Another feature of the sheath is whether or not it is hairy. If hairs are present, they may occur along the overlapping margins of the sheath or all over the outer surface of the sheath.

Figure 4. Sheaths

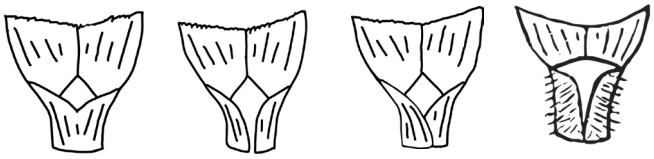


Figure 5. Auricles

Figure 6. Ligules

Are there auricles? If so, what do they look like?

Auricles are small outgrowths or ear-like lobes that occur on either side of the leaf sheath-blade junction (**Figure 5**). If auricles are present, they can be clasping/claw-like, rounded/lobed, or absent. Auricles are easily broken off or may dry up quickly, so a fresh plant specimen is helpful when observing this feature.

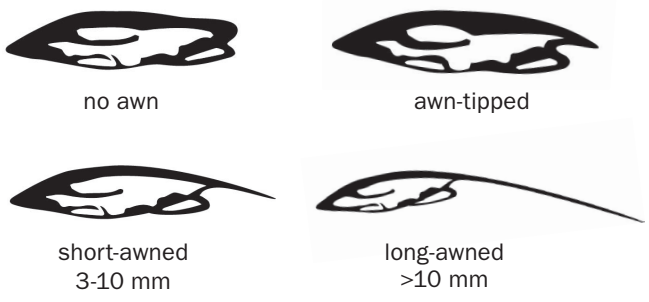
Are there ligules? If so, what do they look like?

Ligules are a thin membrane or a line of hairs on the inside of the leaf blade at the junction of the sheath and blade (**Figure 6**). If present, ligules are described as either membranous or hairy. The ligule is sometimes absent, as in barnyard grass (*Echinochloa crus-galli*), or very short and inconspicuous. The length of the ligule is sometimes diagnostic for a species. For example, green needlegrass (*Stipa viridula*) has an inconspicuous or very short ligule whereas needle-and-thread grass (*Stipa comata*) has a conspicuous ligule (i.e., 2-4 mm long).

Are there awns? If so, what do they look like?

An awn is a slender bristle that is attached to some portion of the floret, usually the tip or the back of the floret or lemma (**Figure 1**). Awns often remain attached to the seed and aid in dispersal. For example, cheatgrass (*Bromus tectorum*) and needle-and-thread grass (*Stipa comata*) have long conspicuous awns that stick to animal fur and human socks and shoes. Species can be divided into those that have awns and those that do not, as well as the length of the awns, if present (**Figure 7**). For example, the florets of bluegrasses (*Poa*) are never awned, those of fescue grasses (*Festuca*) are mostly awn-tipped (awn <3mm long), and those of many brome grasses are short-awned (awn 3-10mm long). Whether awns are bent or straight will lend further clues to grass species identity.

Figure 7. Seeds with/without awns.



Summary

Grass identification is challenging, but once you get the hang of it, it can be fun and will certainly deepen your appreciation for grass diversity. After all, grasses, especially agronomic grasses, are the one family of plants whose abundance and diversity often prospers because of humans, and the kind of grasses that follow human activity can be revealing of the historical degree and intensity of human-mediated disturbance. By asking the questions listed above, you will hopefully be on your way to successfully identifying grasses of interest. For further assistance, though, visit your local county Extension office for more information or access Extension publications at store.msuextension.org.

As noted above, you'll be especially well-prepared to use the "Montana Grasses" app after becoming familiar with the terms described here. This app contains nearly 300 of the more commonly encountered grasses of Montana and was developed by High Country Apps (www.highcountryapps.com) in collaboration with the authors of this publication. You can also receive grass identification assistance from the MSU Schutter Diagnostic Laboratory (montana.edu/extension/diagnostics).

Additional resources

Dorn, R.D. 1984. *Vascular Plants of Montana*. Mountain West Publishing: Cheyenne, WY. 276 pages.

Lesica, P. 2022. *Manual of Montana Vascular Plants, Second Edition*. Botanical Research Institute of Texas: Fort Worth, TX. 785 pages.

Taylor, J. and J. Lacey. 1994. *Range Plants of Montana*. EB122. Montana State University Extension, Bozeman, MT. 124 pages.

Acknowledgments

All illustrations provided by Hilary Parkinson, former MSU Plant Identification Diagnostician

Glossary

Awn: a slender bristle frequently attached to the end or back of a glume or lemma

Diagnostic feature: distinguishing characteristic that provides evidence of a species' identity

Dichotomous key: a reference tool used for the identification of organisms where a series of choices between alternative characters progressively leads to the correct organism; "dichotomous" means "divided into two parts," therefore dichotomous keys always give two, mutually-exclusive choices in each step

Floret: a single, small, inconspicuous reproductive unit that includes the lemma, palea, and flower parts; a spikelet usually includes at least one floret, if not several to many

Glume: a pair of bracts, or scales, at the base of a spikelet

Inflorescence: the arrangement of a group of flowers borne on a single stem; in grasses an inflorescence can be a spike, panicle, or raceme, and such arrangements are in reference to the spikelets (rather than flowers)

Lemma: lowermost bract or scale on a floret which encloses stamens and pistil in a grass flower, usually immediately above the pair of glumes

Node: a joint on a stem where leaves or branches arise; these are mostly ground-level in Montana grasses, except for the flowering stem

Palea: uppermost bract or scale on a floret which encloses stamens and pistil in a grass flower

Rhizome: a horizontal underground stem that usually sprouts new shoots at the nodes

Spikelet: the basic unit of the inflorescence, comprised of two glumes and one or more florets

Stolon: a horizontal above-ground stem that can produce new shoots and roots at the nodes

Tillers: erect or upwardly ascending shoots growing from the base of a bunchgrass which add to the size of the tuft

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