Growth and Development of Grasses

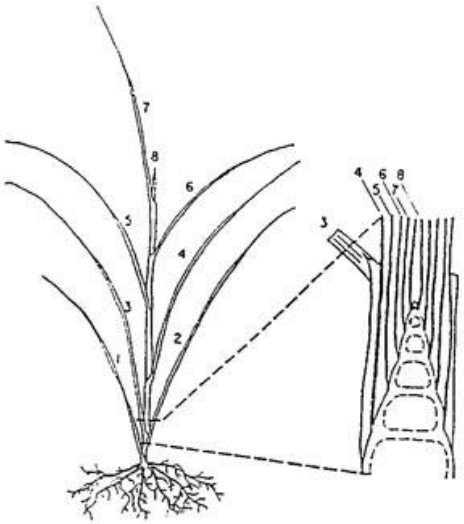
By John McGregor, MFGA Extension Support

A grass plant is a collection of plant parts, made up of growth units called tillers. Each tiller produces roots and leaves. Vegetative tillers consist primarily of leaves, whereas reproductive tillers produce a stem, seed head, roots and leaves. The basal area of the stem, where roots often arise, is the crown.

The crown usually has a number of buds (growing points) that produce new tillers and roots. New tillers are anatomically and physiologically connected to older tillers. Therefore, several connected tillers may all live and share water, carbohydrates and nutrients. If one tiller dies, an adjacent tiller with established roots and leaves usually lives.

In the fall, if there is adequate moisture new tillers start from auxiliary buds. These tillers overwinter in the 1-3 leaf stage. Grass growth begins in spring when air temperatures increase (growing degree days) and the soil warms.

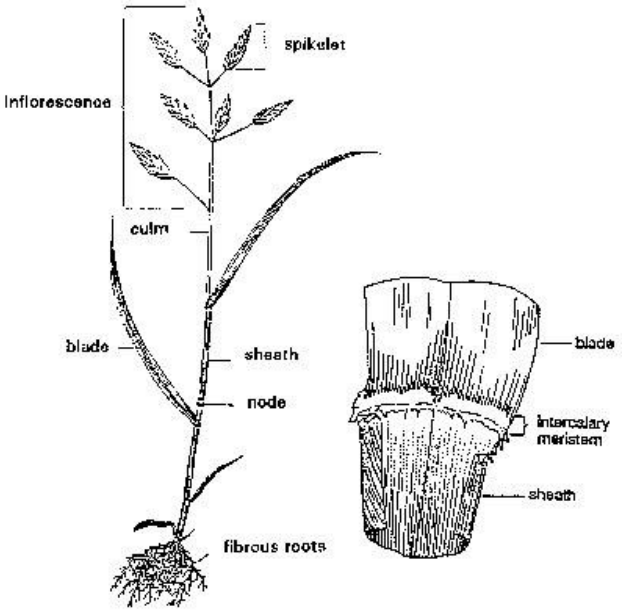
Early in the growing season, because the growing point is located at the or close to the soil surface it is protected from large grazing animals. Grazing removes leaf tissue but in most cases will not harm the growing point that produces new leaves. As spring growth begins, the apical meristem (growing point) which is inside the stem, near the base of the plant is responsible for leaf formation. Each leaf is rolled into a tube like formation and as new leaves push up from the center of the tube they unfurl and expand. At the base of each leaf and sheath is the intercalary meristem that is responsible for this expansion. The apical meristem on the tiller continues to grow and produce more intercalary meristem (leaves) as long as it remains in the vegetative state.



A vegetative grass tiller. Leaf 1 is oldest and leaf 8 is just being exerted. The enlarged area of the crown shows the apical meristem that produces the leaves.

Some tillers stay vegetative, while others become reproductive and produce seedheads. Whether a tiller becomes reproductive depends on environment and hormones produced in the plant. The apical meristem produces the seedhead which is triggered by increasing day length. As seed heads develop they produce plant hormones that retard the development of the other vegetative tillers. Once the plant becomes reproductive (boot stage) it is committed to reproduction and its ability to produce new leaves starts to decline.

The reproductive apical meristem elevates during growth of reproductive structures. This is different from the vegetative meristem, where leaves form at the base of the plant and the apical meristem remains at or near the soil surface. Grazing can remove the reproductive apical meristem and halt seedhead production. For seed production, avoid grazing during this period. However, you can manage grazing to reduce the seed crop and stimulate future tiller production. Seed production is not always essential for stand maintenance, as many grasses reproduce by vegetative means such as tillering, rhizomes or stolons.



A reproductive grass tiller. This tiller has a stem (or culm) and seedhead that differs from the tiller in Figure 1. Intercalary meristematic tissue at the base of the leaf blade, near the ligule (insert), allows for leaf expansion.

The type of grass determines when the apical meristem is elevated. Once the apical meristem is elevated, it is susceptible to removal by grazing or mowing. If the growing point is removed, that tiller cannot grow and new growth must come from auxiliary buds on the crown. Similarly, if it becomes reproductive, vegetative growth can only occur from the immature intercalary meristem or from auxiliary buds. Removing the seed head by grazing or clipping will promote development of vegetative tillers Because most cool season grasses require cool temperatures and long nights to once again develop reproductive tillers, after seed heads are removed, vegetative growth is produced for the remainder of the year.

When grazing, ideally you would like to have within 3 days following grazing, photosynthesis provided from 88% to 99% of the regrowth, the remainder supplied from carbohydrate pools (stored food). The carbohydrate pools should be considered small buffers for regrowth, not a large reserve. The most critical factor affecting regrowth is the amount of green leaf and stem tissue remaining after grazing. The greater the green leaf area remaining after a grazing period, the greater the potential for regrowth. Remember it takes leaves to produce leaves therefore a good rule of thumb is to take half and leave half. Favorable growing conditions are required for continued growth. Under certain range conditions there may not be enough moisture for auxiliary buds to initiate new tillers therefore the quickest regrowth comes from leaves and stems on existing tillers.

Sources

http://www.animalchange.eu/Docs/Pretoria2014/S07.pdf
http://www.agf.gov.bc.ca/range/publications/documents/grass_growth.htm
http://onpasture.com/2015/10/12/grass-growth-and-response-to-grazing/