Manage for Winterkill

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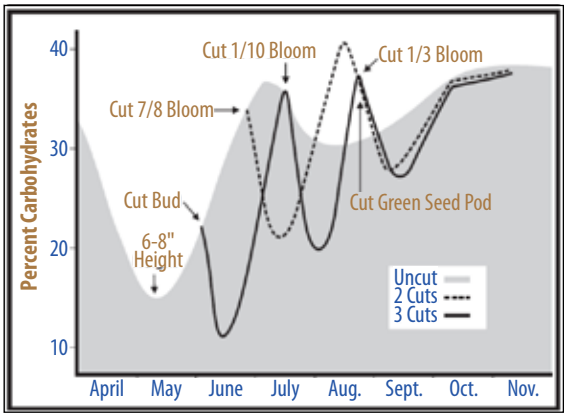
Alfalfa is often not harvested in the Upper Midwest during the fall since farmers fear winterkill and stand reduction. The most common recommendation is to do the final cut by the end of August. Another recommendation is to cut after the first frost when temperatures are cool enough to prevent new regrowth, typically after October 15, but this varies by location and seasonal temperatures.

After each cut, alfalfa root reserves decrease until new regrowth is self-sufficient, providing enough carbohydrates to replenish reserves for successful overwintering (Figure 1). If cutting the end of August, root reserves are almost the same at the end of the season regardless of the number of cuts. If cutting in mid-September, reserves will be lower than if the last cut was prior to September 1.

Figure 1. Alfalfa root reserves evolution.



Adapted from Forage Management in the North, by Dale Smith, 1962.

If cutting when temperatures allow some regrowth, but not enough to replenish root reserves, probability of winterkill and forage yield reduction the following season increases. A harvest after September 1 reduces root growth and ability to accumulate organic reserves to aid in acclimation and winter survival. Fall-harvested stands have shorter stubble, reducing the ability to catch snow and provide insulation for overwintering crowns, increasing winterkill and winter injury risk.

However, studies indicate a fall harvest in October (although lowest yielding of the season) will increase seasonal dry matter yield in spite of a reduced yield on the first harvest the following year. A fall harvest, if done timely, will not kill alfalfa, although it is likely it will delay the first cut next season and may decrease forage yield.

Alfalfa crowns can survive temperatures of 10-15°F. Only 4" of snow cover will maintain soil temperature >15°F despite air temperature. In most winters, it is difficult for soil temperature to drop <15°F at 2" depth due to insulation provided by soil and snow cover. So, what kills alfalfa?

Alfalfa plants start preparing for winter the end of summer as days become shorter. Plants start hardening at <40°F temperatures. Alfalfa varieties have different fall dormancy (FD) levels. Those with high levels (FD 1-2) will stop growing late summer and remain short. Those with lower levels (FD 4-5) will resume growth after the last cut, growing until first frost. The main mechanism of freezing tolerance is cell dehydration. Cells lose water during hardening. Water in cell walls (outside the cell) freezes, protecting cells from freezing while pulling even more water from inside. Also, some cell compounds can absorb free water, preventing it from freezing. If there is free water in the cell, it will form ice crystals which will puncture cell membranes, killing it.

A main cause of winterkill is ice sheeting. It prevents proper air exchange, forming toxic compounds (i.e., ethanol, methanol, lactic acid). It occurs when snow melts rapidly during thawing-freezing cycles. Alfalfa can tolerate ~3 weeks of ice sheeting.

Other than fall harvest management, a number of factors contribute to winterkill (i.e., stand age, variety, soil moisture, fertility, snow cover). Older stands are more likely to winterkill. Well-drained soils prevent ice sheeting. Excess fall moisture interferes with the hardening process (drier falls allow cells to lose water faster, reducing winterkill). Wetter falls increase spring winterkill. Good soil fertility, especially potassium, reduces winter injury. Snow prevents soil temperature from dropping below the crown's freezing temperature (10-15°F), reducing winter injury. Stubble >6" will catch more snow, increasing the insulation and reducing the probability of winterkill.

This year's cool spring conditions delayed cuttings. In addition to winterkill, this resulted in low hay reserves – which will encourage fall alfalfa harvest to increase reserves for winter feeding.

In summary, if you are in need of extra forage, fall harvest of alfalfa is possible if necessary precautions are taken to avoid increasing winterkill risk. Just avoid the critical period after September 1 and harvest when the temperature has dropped enough to inhibit alfalfa regrowth, typically after October 15. Remember, leaving more stubble (>6") will help catch more snow as well.