Assessing Alfalfa Stands After Winter Injury, Freeze Damage, or Any Time Renovation Is Considered in New Mexico

Circular 644

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Alfalfa growers often become concerned over winterkill, when in fact the injury they are observing is the result of freeze damage from which the alfalfa can recover. This publication addresses the reality that winterkill of alfalfa should be rare in New Mexico, how to prevent winterkill, how to assess stands for replacement, and recommendations for stand replacement.

Figure 1. **The effect of alfalfa fall dormancy (FD) category six weeks after harvest in early November at Tucumcari, NM. The density of green leaves indicates the level of dormancy, with more dormant varieties having less green throughout the winter.**

What is winter hardiness?

Alfalfa's winter hardiness is determined by its ability to survive cold temperatures. In the past, winter hardiness was estimated by the fall dormancy (FD) rating, which indicates the variety's tendency to stop growing in the fall (Figure 1); the lower the rating, the more dormant the variety. Some varieties are more capable of withstanding lower temperatures than their FD category indicates. The North American Alfalfa Improvement Conference (NAAIC; http://www.naaic.org) has developed a classification specifically for winter survival that is being included in the alfalfa leaflet published by the National Alfalfa and Forage Alliance (http://www.alfalfa.org/pdf/0809varietyLeaflet.pdf). For this system, varieties are rated from 1 to 6, where a rating of 1 indicates little or no winter damage and 6 indicates plant death. See Figure 2 for typical symptoms of freeze damage on alfalfa. Ratings are made after the first winter for spring seedings. At least two location years are required for the standard test. Because these tests are conducted in areas that have colder winters than most of New Mexico, few varieties in FD 7 or higher have been rated for winter survival, but that is changing. When using the winter survival data, producers should keep in mind that these tests usually are conducted in the northern states for spring seedings—varieties that will not survive more severe winters up north might survive in New Mexico. Conversely, alfalfa sown in late summer to early autumn, which is recommended for New Mexico, may not survive if not sufficiently established before the onset of an early winter.

Figure 2. **Typical symptoms of freeze damage on alfalfa: Stems die, but regrowth occurs as temperatures permit.**

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How do I select the right alfalfa variety for my farm?

Consistently high yields over a number of years and locations within a region are the best indication of varietal adaptation and persistence. New Mexico State University Alfalfa Variety Test Reports (http://aces.nmsu.edu/pubs/variety_trials/welcome.html#alfalfa) provide unbiased information collected from multi-year trials conducted throughout the state, and are valuable tools for determining the winter survivability of any tested alfalfa variety. High yields at the nearest agricultural science center(s) indicate which fall dormancy categories can survive winter conditions at that location while optimizing forage production during the growing season.

Courtesy of Dan Undersander, Wisconsin Cooperative Extension Service (www.uwex.edu/ces/forage)

Figure 3. **Healthy alfalfa crowns (left) have multiple branches and little or no evidence of splitting. Crowns weakened by splitting (right) are more susceptible to winter injury.**

How can I tell if it's time to renovate my alfalfa?

Producers should wait until spring before considering stand replacement so they can determine what their stand looks like when actively growing. If the plants are present and appear productive, the alfalfa should be managed as usual. Ideally, winter damage is best assessed when temperatures cool in late summer after plants have experienced drought due to root system damage caused during the previous winter. This also will allow plants that have been injured a chance to restock root energy and become more productive than they would be if evaluated in the spring.

To evaluate an alfalfa stand, take stem or plant counts in several places in the field. **Alfalfa yields may be reduced at stand densities of 40 to 55 stems per square foot, and stands should be replaced when plant density drops to less than 5 plants (or 40 stems) per square foot.** Dig a random plant at each location (not selecting for healthy or injured plants) to extract the top 1 foot of taproot. Healthy crowns will have multiple branches and little or no evidence of

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Figure 4. **Healthy alfalfa roots (left) will be uniformly off-white or have less than one-third of their diameter discolored. Roots of weakened alfalfa plants (right) will have more than one-third of their diameter discolored and will likely not survive the next winter.**

splitting (Figure 3). Split crowns also could be due to equipment damage. Look for evidence of external feeding by insects, or the presence of insects (grubs) that would indicate a problem with white-fringed beetle. If the crown and root exterior looks healthy, slice the crown and root from top to bottom. A healthy root will be uniformly off-white (Figure 4). If more than five plants (or 40 stems) per square foot are present, but more than 30% of plants have more than about one-third of their taproot discolored, stand replacement should be considered. Before that decision is made, though, whole plant samples should be submitted for diagnosis of possible diseases.

How should I renovate my alfalfa?

When renovating an alfalfa field, producers should rotate to another irrigated crop for at least one year, and preferably two years, to avoid autotoxicity from the previous alfalfa crop that might limit establishment or productivity of the new alfalfa stand. Deep plow the alfalfa to destroy the original stand and to begin seedbed preparation for the next crop. The second crop can be a single-cut haygrazer or some other very short season crop harvested in mid-July, followed immediately by deep plowing and seedbed preparation for replanting alfalfa in late summer or early autumn of that same year. Recent research at Tucumcari indicated that fields rotated into haygrazer for two years before being replanted into alfalfa subsequently yielded as much as 0.9 ton alfalfa/acre more, annually, than fields immediately replanted in alfalfa.

Wheat should be avoided in the rotation unless the producer has successfully used that wheat variety in alfalfa rotations in the past with no problems. In the same study cited above, when wheat was the first rotation crop and haygrazer the second, annual alfalfa yields were 0.9 ton/acre less than when only a single haygrazer crop was used, 1.2 tons/acre less than when alfalfa was replanted immediately, and 1.8 tons/acre less than when alfalfa was replanted after two seasons of haygrazer. Still, data from Utah suggest a difference among wheat varieties in their effect on reseeded alfalfa. No such response has been associated with other small grain species. At any rate, this study indicates that any time alfalfa is rotated, at least two crops should be planted into a conventionally tilled seedbed without using wheat.

When replanting the alfalfa, companion crops (e.g., any winter small grain) should only be used in extremely sandy soils or other soils that have at least a moderate wind erosion hazard. Even then, it is best to plant the alfalfa as early as possible in the recommended window to allow establishment before winter, as protection against late winter/early spring winds. Using wheat as a companion crop when the alfalfa is replanted may not have the detrimental effect that is sometimes observed when wheat is used as a rotation crop.

What can I do to avoid winter injury?

Persistence is the ability of individual plants to survive field conditions over time, and it extends the time during which establishment costs can be recovered. Persistence and consistent production of high alfalfa yields is strongly influenced by selecting well-adapted, pest-resistant, high-yielding varieties and implementing good management techniques. Having selected a good variety, producers should maintain soil fertility at recommended levels based on soil tests taken pre-planting and at least every three years during the life of the stand. Pay particular attention to proper phosphorus and potassium nutrition. These plant nutrients are important for winter survival. Plant tissue analysis should be used to verify the need to apply potassium. Irrigation also should be applied properly, and weeds and insects should be controlled. Dry winters are advantageous for less dormant varieties in semiarid regions. Irrigating the alfalfa well after the last harvest will help the alfalfa during spring regrowth; however, allowing the soil to remain dry throughout winter also enhances alfalfa's ability to tolerate temperatures of 15°F or less through biochemical mechanisms.

Late summer and autumn harvests should be scheduled to allow sufficient time to restock root energy prior to winter because winterkill in alfalfa is linked to poor fall harvest management. For FD 1 to 6 alfalfa varieties, a 6- to 7-week rest period before a dormancy-inducing freeze (27°F) or between the last two harvests is recommended to allow plants to cold harden and replenish root reserves for winter survival and to initiate spring growth. Non-dormant (FD 7 to 9) varieties also might benefit from this rest period, though they minimize depletion of root energy in our environment by maintaining green leaves throughout winter.

Producers can and should swath and bale (if balable), or graze, any alfalfa that has had 6 weeks since the last fall harvest. If, at any time, freezing temperatures (less than 27°F) are forecast and there is enough standing alfalfa to bale, it should be harvested before the freeze. This will preserve the forage quality even if it gets frozen after it is cut, although it should be baled as soon as it is cured. Frozen alfalfa acts like it has been cut anyway. Harvesting fall growth will not only give economic return and reduce the incidence of alfalfa weevils in the spring, it also will keep the dead stems from reducing the quality of the first harvest in the next year and will lessen the likelihood that producers see dead stems in winter, causing them to wonder if their alfalfa is dead. To help the stand recover after winter injury or freeze damage, producers will need to harvest the alfalfa at 25% bloom if it did not get at least 6 weeks of fall rest.

If a hard freeze occurs in spring after the alfalfa has begun to grow and the alfalfa is < 6 inches tall, not much can be done, and not much needs to be done. Dead material will not greatly impact forage quality of the first harvest. For taller alfalfa, producers should watch the stem tips. If they are wilted but they stand back up and the alfalfa continues to grow, the growing point was not damaged and nothing needs to be done. If the stem tips remain wilted and turn brown, it is likely that the growing point has died and the stem will also dry out (Figure 2). If this hay can be sold for beef cows or horses, nothing needs to be done. It is wise for alfalfa and other hay growers to have multiple outlets for their product so they can market hay of a broad range of forage quality. If dairy cows are the target market, the standing forage should be removed as hay, if balable, or grazed or shredded, so that it does not negatively impact forage quality of the first cutting. In any case, the first harvest will probably be delayed. Even if harvest maturity occurs at the same time as in a normal year, harvest should be delayed until the alfalfa reaches 25% bloom to allow full recovery before being cut.

What are the symptoms of winter damage?

Ice sheets that cover the soil surface and frost heave, factors that lead to **winterkill** in other areas, are not often a problem in New Mexico. In fact, New Mexico conditions, namely high soil potassium levels, high soil pH, generally well-drained soils, and dry winters, are ideal for reducing the likelihood of winterkill. **Freeze damage**, on the other hand, often occurs at air temperatures of 27°F and below. Typical symptoms of freeze damage include anything from minor leaf burn to completely dead stems that dry down over time (Figure 2). After severe freeze damage the growing point at the top of the stem dies, triggering regrowth from the crown (whenever temperatures are warm enough, > 36°F or so). As long as this happens infrequently during winter, it is likely that the alfalfa will survive, just as it does during summer when it is harvested, which has the same effect as a freeze in initiating regrowth.

For further information about alfalfa management contact your county Cooperative Extension office or visit the NMSU Cooperative Extension Service publications website (http://aces.nmsu.edu/pubs/).

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