

Evaluation of Alfalfa Stand

- Optimization of stand establishment techniques is critical to ensure the long-term success of alfalfa production.
- Alfalfa stand evaluation in the spring can help determine management practices required to help maintain yield potential and stand establishment.
- Assessment involves counting number of plants per square foot in randomly selected sites throughout the field, counting the total number of stems, and assessing the viability of the crowns and roots.

Assessment of the condition of alfalfa stands and yield potential in the spring should occur after plants break dormancy and when there is three to four inches of growth. Evaluation is important to help determine the best management practices to be applied throughout the growing season.

Stand assessment should include:

- **Individual plant damage** - Evaluate the turgidity of the taproot. Look for brown, dehydrated, and ropey roots (Figure 1).
- **Plant injury** - Alfalfa buds may be killed during the winter. Consequently, bud regrowth in the spring can be delayed, causing uneven growth and reduced yield potential of the first cut.
- **Areas with thin stands** - A high yield potential field, seeded last year, should have 20 plants/ft². Stands seeded last fall or spring should be destroyed and reseeded if there are less than 12 plants/ft².¹ A healthy, established stand should have 55 stems/ft². As an alfalfa stand ages, the number of plants/ft² declines but the plant compensates by producing multiple stems per plant.

Winter Damage

Winter conditions including cold temperatures, ice sheeting, and heaving can injure or kill alfalfa plants. Planting a variety with a good winter hardiness rating can reduce cold temperature damage but does not help prevent ice sheeting damage. If fields are slower to green-up than surrounding fields, it's a signal to evaluate stands for injury. If parts of an alfalfa root are killed along with damaging the buds for spring growth, then only the living part of the crown will sprout new shoots (asymmetrical growth). Some buds on a plant may be killed, while others remain undamaged. Uninjured buds will initiate early spring growth, while killed buds must be replaced by new buds formed in the spring. Consequently, uneven shoot height on the same plant is likely to occur.

As soon as the ground is thawed, plants should be dug up to assess crown and root system health. Dig up plants, four to six

inches deep, in multiple random locations in the field to examine the roots. Healthy roots will be firm and white, while winter damaged roots will have a gray, water-soaked appearance (Figure 1). Plants with only minor rot may produce this year, but if more than 50% of the root is damaged it is more likely that the plant may be susceptible to injury or death.



Figure 1. Healthy alfalfa crown and root (left) and alfalfa roots with symptoms of winter injury and poor root health (center and right). Photo courtesy of Dan Undersander, University of Wisconsin.

The most cold-tolerant underground structures of alfalfa are the crown buds. Crowns should be examined for size, symmetry, and the number of shoots present. If these appear gray, water-soaked, or withered, the plant may be dead.² Washing roots in a bucket of water can make it easier to better assess root color.

Buds for spring growth are formed in the fall. If a portion of the crown is killed, then only buds from the living section of the plant will give rise to new shoots in the spring. Buds that are killed during the winter may be replaced by new buds in the spring. Growth of these buds will lag behind growth of the uninjured buds. Delayed growth results in shoots of different heights on the same plant with taller shoots from buds formed in the fall. Shorter shoots from buds formed in the spring can lead to reduced yield potential, especially during the first cutting.

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Table 1. Suggested alfalfa plants per square foot.

Production Year	Plants/ft ²
1	>12
2	>8
3	>5

Source: Morrison, J. 2009. Assessing alfalfa stands. University of Illinois Extension.

Table 2. Average stem count and estimated yield potential per square foot.

Stems/ft ²	Estimated yield potential
>56	100%
50	90%
45	81%
40	72%
35	62%
30	53%
25	44%

Source: Undersander, D., Grau, C., Cosgrove, D. 1991. Alfalfa stand assessment: is it good enough to keep? A3620. University of Wisconsin Extension.

Later roots will be brown, dehydrated and stringy. If 50% or more of the root is black from root rot, it is most likely the plant may be susceptible to injury or death during green-up or later in the season.

New Stands Evaluation

Plant counts have the most utility when used to evaluate new stands. Before stems are visible, a sampling frame of one square foot can be tossed in the field at random to take counts. Plan on taking 10 to 20 samples per 10 acres. The more variability in your field, the more samples you should take. High-yielding alfalfa stands seeded last year should ideally have 20 plants per square foot, but may still yield well with as few as 12 plants. The minimum number of healthy plants per square foot for a desirable alfalfa stand ranges from 5 to 12 (Table 1).

Established Stands Evaluation

Because alfalfa has the ability to yield well over a range of plant stand densities, a more accurate method to assess established alfalfa stands and estimate yield potential is to count the stems. This can be done once stems have begun to grow. Older stands tend to have fewer individual plants, but more stems per plant. For this method, use a sampling frame 17 inches by 17 inches or about 2 square feet². Count the stems within the frame at several locations in the field. Divide this number by 2 to get average stems per square foot. Use this number to estimate the yield potential of the stand (Table 2). A rating system to characterize the health of crowns and roots has been developed to aid decision-making (Table 3).

Management Practices

If stands have symptoms of winter injury, consider allowing alfalfa plants to mature longer before cutting. This can help plants restore carbohydrates for future production. Because the first cutting is generally the highest yielding, stands with mild winter injury could be cut at 10 to 25% bloom at the second or third cutting. Increasing cutting height is an important management consideration when plants are allowed to flower

Table 3. Rating alfalfa crown and roots winter survival condition.

Rating	Condition	Winter Survival
0	Healthy	Excellent
1	Some discoloration	Excellent
2	Moderate discoloration/rot	Good
3	Significant discoloration/rot	Good for mild winter; poor for hard winter
4	Greater than 50% discoloration	poor
5	Dead	NA

Source: Undersander, D., Grau, C., Cosgrove, D. 2011. 1991. Alfalfa stand assessment: is it good enough to keep? A3620. University of Wisconsin Extension.

before cutting. In order to avoid further weakening plants, it is important not to remove the new shoots forming at the base of plants during this time.



Figure 2. Poor stand (left) and good alfalfa stand (right).

If stands are thin and estimated yield potential is below a desirable level, a decision needs to be made as to whether to keep the stand or not (Figure 2).

Autotoxicity can be a problem in alfalfa stands that are two or more years old. Autotoxic compounds produced by alfalfa may reduce the stand or negatively impact future yield potential. In cases where alfalfa stands are thin, but it is not practical to destroy the stand, consider interseeding grasses or clover to meet forage needs.

A damaged stand can be harvested at first cutting, removed followed by planting corn for silage or high moisture corn. This method offers a way to maximize forage quality by utilizing the alfalfa and planting another quality forage crop in the same season.

Sources:

¹Undersander, D. Assessing alfalfa stand condition in the spring. <http://www.uwex.edu>. University of Wisconsin Extension.

²Cosgrove, D. and Undersander, D. 2003. Evaluating and managing alfalfa stands for winter injury. Focus on Forage vol. 5 no. 8. University of Wisconsin. Web sources verified 2/11/15.

For additional agronomic information, please contact your local seed representative.

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