CHAPTER FIFTEEN

MANAGEMENT AND REPLACEMENT OF DEPLETED STANDS

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The rate of decline of an existing stand can be slowed by selecting an adapted variety with persistence and by practicing good management. Inevitably, however, the stand will thin due to diseases, winter injury, and other factors, including mismanagement. Yield, quality, and profit will fall to a point where a decision regarding the fate of an older stand must be made.

This decision is greatly influenced by the profitability of available rotation crops. Unfortunately, the short growing season and cool climate in the Intermountain Region limit rotation crop options. For most of the region, rotation crops (primarily cereals) are less profitable than alfalfa. Furthermore, establishing a new stand of alfalfa is expensive—cash costs for establishing a stand are over $200 per acre. This chapter will discuss methods to evaluate old stands, management options for thin stands, and techniques for removing old alfalfa stands.

EVALUATING OLD STANDS

Calculate Stand Density

Both forage yield and quality are directly related to stand density. Traditionally, alfalfa stands are evaluated by using plant counts to determine the number of plants per square foot (Table 15.1). Based on this method, stand densities below three to five plants per square foot should be replaced (Figure 15.1) because these stands usually yield less than 4 tons per acre (actual yield varies depending on production area). Furthermore, forage quality declines as weeds invade open spaces between plants.

The problem with using plant counts to assess stands is that all crowns are counted equally. However, a small weakened plant is not nearly as productive as a large healthy plant. Research in Wisconsin has demonstrated that the number of stems per square foot is a better reflection of productivity than is the number of plants. Results showed that fields with 55 or more stems per square foot (measured at 6 inches of regrowth) produced maximum yields and that fields with fewer than 40 stems per square foot were not profitable and warranted replacement.

Analyze the Economics of Stand Removal

The matter of when to remove an alfalfa field is primarily an economic decision. The anticipated yield, quality, and price of alfalfa produced from a new field must be compared with that of the existing stand. Remove a stand when its productivity has declined to such a degree that net profits would be greater if the alfalfa were removed and a new crop established.

Unfortunately, the economics of stand removal are not simple; a grower must consider several factors in addition to productivity and forage quality (Figure 15.2). Rotation requirements, the income or loss that occurs with rotation crops, the amount of forage needed, the strength of the alfalfa market, and the opportunity cost of money spent on stand establishment (that is, what else could you do with the money) all enter into the decision. Any of these factors can reverse a decision based on production alone. In addition, pest pressures may dictate that an alfalfa stand be replaced before its production level indicates it is necessary. Diseased fields may need to be removed early due to rapid stand decline or to prevent diseases (such as verticillium wilt) from spreading to healthy fields. Severe infestations of unpalatable or perennial weeds may require that an alfalfa field be plowed out. Similarly, stand removal may be the only economical means of dealing with serious outbreaks of rodent pests.

Table 15.1. Minimum stand densities for different production years.

END OF PRODUCTION YEAR	STAND DENSITY (NO. OF PLANTS/ FT²)
1	10–20
2	8–12
3	6–9
Any year	3–5—Replace stand

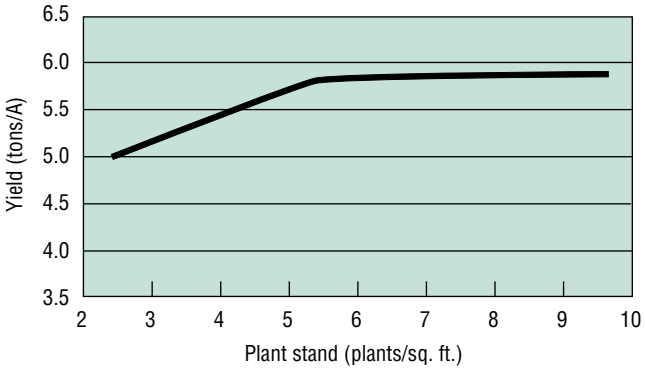

Figure 15.1. Alfalfa stands below five plants per square foot result in lost yield. (Data obtained from fifth-year stands in a 1985 variety trial, Tulelake, California.)

UNDERSTANDING MANAGEMENT OPTIONS

When faced with a depleted alfalfa stand, growers have two options: stand extension and stand replacement. The next two lists present the alternatives associated with each choice.

Stand extension

- Continue to harvest a poor alfalfa stand.
- Interseed another forage plant.
- Overseed with alfalfa.

Stand replacement

- Replant alfalfa after removing old stand (produce back-to-back alfalfa).
- Remove stand and rotate to another crop.

Factors to be considered when deciding which option to pursue include pressure from diseases, pests, and weeds; rotation requirements; total acreage and type of forage desired; and the projected status of the alfalfa hay market. Prolonging stand life is unwise if disease pressure is severe. Likewise, if fields are heavily infested with rodents or difficult-to-control perennial

weeds, remove the stand. If you have insufficient forage acreage, consider interseeding, overseeding, or replanting alfalfa after alfalfa. High hay prices are another incentive for extending stand life. However, continuing to harvest a poor alfalfa stand is not usually a viable option. In general, intermountain alfalfa stands remain in production for too many years rather than too few.

STAND EXTENSION

Interseeding

The costs of interseeding poor stands with grasses are comparable to those of herbicide application. Interseeding may preclude the need for an herbicide and alfalfa weevil treatment. Also, yields of mixed alfalfa-grass fields are frequently over 1 ton higher than those of older, pure-alfalfa stands. The economics of interseeding are market related and depend on the price differential between pure alfalfa and an alfalfa-grass mixture. The market for mixed hay is primarily for horses, but mixed hay is also fed to cattle and dry cows. The price difference between pure alfalfa and alfalfa-grass mixtures depends on the visual appearance of the hay and the strength of the horse hay or stock hay market. Alfalfa-grass hay sometimes sells for as much as pure alfalfa hay in areas that have developed a strong horse hay market.

Figure 15.2. Factors to consider when deciding whether to replace an alfalfa stand.

- Estimated annual yield of old versus new stand
- Production costs of old versus new stand
- Comparison of quality, marketability, and price of hay from old and new stands
- Anticipated strength of hay market
- New stand establishment expenses
- Expected new stand life
- Profitability of rotation crops
- Rotation crop requirements
- Quantity of forage desired
- Pest problems (diseases, weeds, rodents)
- Opportunity for other investments

Stand densities below three to five plants per square foot should be replaced.

Many alfalfa growers target the dairy market and strive to produce top-quality "high-test" hay. However, with a large acreage, maintaining dairy quality on all fields is difficult because of the time required to swath, cure, and bale numerous fields. To maximize quality when growing several fields, cut young high-producing fields first and manage them to produce hay of high nutritional quality. Interseed fields of older, thinner alfalfa stands to prolong stand life and maintain yields. Cut these fields last with the goal of maximum yield in mind, and market the hay for horse and other nondairy use.

Interseeding annuals

It is a common practice in some areas to interseed oats or, less frequently, awnless (beardless) barley or wheat into a thin stand of alfalfa. This usually improves first cutting yield—a 4-ton yield is common. Herbicides are not needed, and interseeding often reduces the alfalfa weevil population. To interseed, first cultivate with a harrow or disc in late winter or early spring. This kills emerged weeds and prepares a suitable seedbed. The interseeded species is usually planted by drilling, but it could be broadcast and harrowed (Figure 15.3). The preferred seeding rate depends on the alfalfa stand density (higher seeding rates for thinner stands), but 50 to 75 pounds of oat seed per acre has produced maximum yields in most research trials. The amount of nitrogen fertilizer to apply varies depending on soil type and fertility. Most tests have indicated that 40 to 60 pounds of nitrogen per acre is adequate to supplement the nitrogen that is supplied by the alfalfa crop. The forage produced is not suitable for milking dairy cows, but it is widely accepted for other classes of livestock, particularly horses. Researchers continue to search for alternative annuals for interseeding, such as beseem clover, which has forage quality nearly equal to that of alfalfa.

The drawback of interseeding oats or other cereals is that they are usually headed-out when harvested and do not recover after cutting. Therefore, they do not contribute to increased yields in subsequent cuttings. In fact, second cutting yields from fields interseeded with oats are often slightly lower than fields not interseeded. This is most likely the result of damage to the alfalfa during cultivation for interseeding and of competition from the interseeded crop. The alfalfa usually recovers, and yields of later cuttings are comparable to those of pure alfalfa stands. Nonetheless, most growers harvest only one cutting when interseeding cereals into alfalfa. After one harvest, they remove the alfalfa and rotate to a different crop.

Interseeding perennials

Perennial grasses interseeded in alfalfa contribute forage beyond the first cutting and may extend stand life for several years (Figure 15.4). Researchers have evaluated the suitability of several grass species for interseeding. These include perennial ryegrass, tall fescue, kemal festulolium (ryegrass x tall fescue), orchardgrass, timothy, and matua prairiegrass. Orchardgrass appears to be the species best suited for interseeding. It is high yielding, very palatable, and compatible with alfalfa. Some dairies accept alfalfa-orchardgrass, and it is highly desired by many retail feed stores for pleasure-horse hay. Tall fescue is high yielding but extremely aggressive; over time, it chokes out alfalfa. Ryegrass is high yielding for the first cutting, but it also tends to be very competitive with alfalfa. Also, ryegrass has not persisted well in some parts of the Intermountain Region. Matua prairiegrass, like orchardgrass, is highly palatable, but it is less competitive; unfortunately, yields of fields interseeded with matua grass were lower than those with orchardgrass in initial tests. Alfalfa-timothy interseedings are highly desirable because of their potential marketability to the horse industry, but to date alfalfa-timothy hay has not received a premium higher than that for other alfalfa-grass hays. Timothy does not compete well, so stand establishment can be slow and difficult, particularly when interseeding. Nevada growers have had success killing alfalfa in strips by using glyphosate (Roundup) prior to interseeding timothy. Tests have shown that timothy does not yield well the first year after seeding, but it performs well in later years if planted on proper soil types (medium- to fine-textured soils).

Methods for interseeding perennial grasses are similar to those for interseeding cereals. Fields are cultivated with a harrow or disc in the late winter or early spring (this kills emerged weeds and prepares a seedbed). Fall seedings, after the last alfalfa cutting of the season, are possible, but weed infestations may be severe. Winter annual weeds emerge with the interseeded crop, and most available herbicides cannot control them.

The interseeded perennial grass is usually drilled using the small-seed attachment of a grain drill. No-till drills can be used for seeding, but tillage is usually beneficial to control emerged weeds. Seed can be broadcast and incorporated with a ringroller or culti-

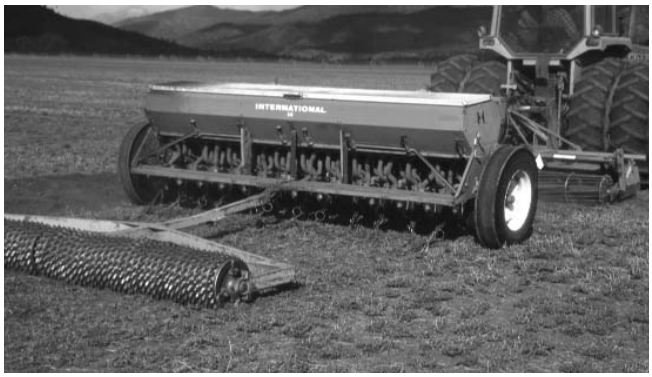

Figure 15.3. Use of a stand grain drill to interseed forage grasses into a thin alfalfa stand.

Figure 15.4. Timothy interseeded into a depleted alfalfa stand.

packer; if you do so, increase seeding rates slightly. Seeding rates, per acre, depend on the seed size of the interseeded species: 5 pounds timothy; 10 to 12 pounds orchardgrass, ryegrass, or tall fescue; or 30 pounds matua grass. Perennial grasses are slow to become established and should be interseeded before the alfalfa stand becomes too thin (this is especially true for timothy). Perennial grasses can be interseeded along with a low rate of oats (50 pounds per acre or less) to improve yields in the first cutting after interseeding. This practice may slow the growth of the perennial grasses, however. Unlike pure-alfalfa stands, apply nitrogen to alfalfa-grass mixtures annually (approximately 50 to 75 pounds nitrogen per acre is sufficient).

Overseeding with Alfalfa

It is tempting to thicken an old stand by overseeding with alfalfa. Conceptually, overseeding should substantially reduce the costs associated with establishing a new stand. Unfortunately, successful overseeding is difficult at best. Seedling emergence following overseeding is often adequate, but most seedlings fail to survive. As a result, only the original stand remains.

Several explanations account for overseeding failures. First, diseases, and insect and nematode populations frequently increase in established stands. The older plants can withstand them, but they destroy vulnerable seedlings. The second reason involves competition. Alfalfa seedlings grow slowly and are not very competitive. They have to compete for light, water, and nutrients with other alfalfa plants and weeds that may be hundreds of times their size. Competition for light and water is usually the most severe. After surface water is depleted, seedlings may succumb to drought stress, whereas deeper-rooted older plants thrive. Large, vigorously growing plants shade seedlings, further reducing top and root growth and water uptake. Third, germinating alfalfa seeds may be exposed to autotoxic compounds. Autotoxic compounds are naturally occurring chemicals that are released from leaves, stems, and roots of older alfalfa plants (but are concentrated in leaves). These compounds reduce germination and retard seedling development. Lastly, after many years of producing a perennial crop under irrigation, the seedbed surface is not usually ideal.

Orchardgrass appears to be the species best suited for interseeding.

Despite these obstacles, some growers claim success at thickening alfalfa fields by overseeding. These successes may be highly specific to site—especially to soil and weather conditions. At best, consider overseeding a risky practice. Growers who attempt overseeding should pay particular attention to these factors:

- **Weed and insect control:** Many insects feed on young plants.
- **Irrigation:** Seedlings compete poorly for moisture, so you should irrigate frequently. Consider a 4-day irrigation cycle to provide adequate moisture for germination and establishment.
- **Time of seeding:** Seed when competition from established plants is minimal—perhaps in early fall or between second and third cuttings.
- **Seeding technique:** Plant ¼ to ⅜ inch deep. Planting too deep will increase the probability of failure.

STAND REPLACEMENT

Stand Removal Practices

Alfalfa can be remarkably difficult to kill. Both mechanical and chemical methods are employed to remove old stands. Mechanical techniques include plowing, rototilling, multiple discings, and undercutting with wide sweeps. A rotary tiller is the most effective implement for removing alfalfa, but it is expensive and time-consuming to operate. Plowing is perhaps the most common method of stand removal, but plowing is often undesirable in rocky or shallow soils. Several passes are normally required when ripping or discing an old stand.

Herbicides are useful to remove alfalfa on rocky or erodable soils. Roundup (glyphosate) is the most fre-

quently used product for this purpose. However, high rates or retreatment may be needed because alfalfa is comparatively tolerant to Roundup. Dicamba (Banvel) or 2,4-D (several products) can be used alone or in combination with Roundup, provided no crops sensitive to growth regulator-type herbicides are near treated fields. Herbicides may need to be combined with tillage for complete control. Regardless of the method used, alfalfa crowns must be desiccated (completely dried) to reduce the possibility of regrowing.

Back-to-Back Alfalfa

In areas where rotation crops are more profitable than alfalfa, these rotation crops often dictate when and how often fields are planted to alfalfa. However, as stated earlier, few profitable rotation crops exist for much of the Intermountain Region. Growers who do not have alternative crop options or who are experiencing extreme market forces or on-farm needs generally plant alfalfa directly after alfalfa.

Planting alfalfa back to back is fraught with many of the problems associated with overseeding alfalfa into an existing stand. Even if chemicals or tillage creates a noncompetitive environment for young seedlings, the seedlings must still contend with autotoxic compounds, diseases, and pests. The effect of autotoxic compounds probably dissipates within 2 to 3 weeks following stand removal, but diseases and pests persist much longer. Rotation to another crop for one year usually allows enough time for diseases and pests to dissipate.

Crop Rotation

The many benefits of crop rotation are well established, and most agronomists recommend crop rotation, rather than continuous cropping, for almost all species. Alfalfa is highly valued for its contribution to other crop species in a rotation. Benefits derived by subsequent crops include nitrogen (which is biologically fixed by the bacteria associated with alfalfa), greater water infiltration, and improved tilth. In turn, crop rotation benefits alfalfa. Rotation can break disease and insect cycles and improve weed control and soil fertility.

ADDITIONAL READING

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