Cornell University
Cooperative Extension

Agronomy Fact Sheet Series **Fact Sheet #109**

Restoring Perennial Hayfields

Introduction

Grass and grass-legume hayfields can make an important contribution to forage inventories on livestock farms. While crop rotation is often desired, long-term perennial hayfields may be necessary when soil characteristics, field location, and equipment availability limit implementation of rotations. Productivity decline over time in long-term hayfields is not uncommon and can be addressed by terminating the stand, tilling the soil, and reseeding. However, such practices can be expensive, are not always feasible, and could negatively impact soil health. The purpose of this factsheet is to present ways to restore long-term perennial hayfields without terminating the existing stand, focusing on: (1) soil health and fertility management; (2) weed control; and (3) introduction of new species (Figure 1).

Figure 1: Tall fescue field two years after being frost seeded with red clover.

Soil Health and Fertility

Soil fertility management is important for crop production. A good soil sampling program is necessary to support sound fertility management decisions. For grass and clover production, the target minimum soil pH is 6.2. For optimal nutrient cycling and crop growth, liming should be considered when the pH drops below 6.0.

The three macronutrients that are critical for the production of grass forages are nitrogen (N), phosphorus (P), and potassium (K).

Leguminous crops add N to the soil, but legume stands decline over time with grass taking over. For grasses, N is often the most limiting plant nutrient. Insufficient N can lead to low yields and low crude protein levels in the forage. As a result of the low legume concentration of long-term perennial hay stands, N management is important. The amount of N fertilizer to apply depends on the number of cuttings per year (Table 1). Splitting the application of N over multiple cuttings is more efficient for N utilization compared to a single application. For example, N application at spring dormancy break ("green-up") and after first cutting typically results in higher yields than a single application at green-up in a three-harvest system. There is no advantage to a three-way split of N.

Table 1: Cornell nitrogen guidelines for grass hay fields.

Management	N rate (lbs/acre)
Establishment of grass sod	50
Topdressing 1-2 cut system	75
Topdressing 3-4 cut system	225
Topdressing intensively managed (4-5 cuts)	275

Phosphorus is important for photosynthesis, respiration, N fixation (when legumes are included in the stand), and root development. Adequate P is needed early in a plant's life for development of reproductive structures. Potassium activates enzymes needed for energy metabolism, photosynthesis, N fixation, and sugar degradation for winter survival. Application of P and K should be based on soil test results; see the Cornell Guide for Integrated Field Crop Management for guidelines on P and K management.

Hay fields respond well to manure. While legumes can be injured from application of manure either due to smothering or salt injury,

grasses are considerably more tolerant. Manure application rates should be based on the N, P, and K composition of the manure and crop needs. Also, manure needs to be spread right after grazing or mowing to avoid Johne's disease if grazing and high butyric acid levels associated with ensiling hay contaminated with manure.

Controlling Weeds

The presence of weeds often indicates over-grazing, improper mowing, poor fertility, and/or compaction that limit forage competitiveness against weeds. In addition**,** weeds reduce the nutrient value of feed and can potentially be poisonous to livestock. Frequent cutting can disrupt many weed species; however, harvesting sooner than the recommended harvest interval and mowing too low can have detrimental effects on the stand as well. If weeds persist, there are several herbicide options available to aid with weed control.

Weed management and introduction of new forage species will only be successful if the underlying issues are addressed. Avoid spreading weeds by cleaning all equipment before moving to another field.

Introduction of New, Desirable Species

If improving soil fertility and controlling weeds does not result in a marked improvement on stand productivity, it may be necessary to seed new species. This can be done by frost seeding or interseeding. Before seeding with either method, it is important to remove as much plant residue as possible for good seed to soil contact. This can be done by mowing or grazing close to the soil surface.

Frost seeding is a fast and relatively inexpensive method that involves broadcasting seed in late winter or early spring while the ground is experiencing freeze-thaw cycles. While not always successful, the idea is that shrinking and swelling of the soil will work the seed into the ground. Red clover is the most popular choice for frost seeding because it is the most aggressive seedling with the best chance of establishment (Figure 1). Red clover works well for haylage and baleage but can make dry hay production difficult.

Interseeding involves using a no-till drill to sow seed during the growing season. Owning this type of drill might not be practical for occasional use, but rentals may be an economical solution. Interseeding has a higher degree of success compared to frost seeding because a properly adjusted drill should ensure good soil to seed contact. See Table 2 for seeding rates.

Table 2: Seeding rate guidelines for frost seeding or interseeding into a thin existing stand.

	Frost seeding	Interseeding
Species	Seeding rate (lbs/acre)	
Red Clover	8	4
Tall Fescue	8	6
Orchardgrass	6	4
Meadow Fescue	8	6
Timothy	Not recommended	
Reed Canarygrass	Not recommended	

General Summary

Perennial hayfields are important to many livestock producers. As these fields age, productivity often declines. The productivity of low-producing perennial hay fields can be increased by paying attention to soil fertility and soil health, controlling weeds, and introducing new desirable species into the field, while keeping costs and soil disturbance to a minimum.

Additional Resources

- Cornell University Nutrient Management Spear Program Fact Sheet Series: nmsp.cals.cornell.edu/guidelines/factsheets.html.
- Cornell University Nutrient Management Spear Program Field Crops Nutrient Guidelines: nmsp.cals.cornell.edu/guidelines/nutrientguide.html.
- Cornell University Extension, Crop and Pest Management Guidelines: cropandpestguides.cce.cornell.edu/.
- Cornell University Website for Forage Production: www.Forages.org.

Disclaimer

This fact sheet reflects the current (and past) authors' best effort to interpret a complex body of scientific research, and to translate this into practical management options. Following the guidance provided in this fact sheet does not assure compliance with any applicable law, rule, regulation or standard, or the achievement of discharge levels from agricultural land.

For more information

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Nutrient Management Spear Program
http://nmsp.cals.cornell.edu

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