

White Clover - Bluegrass Pastures

Management Highlights

- Target pH: 6.5
- Monitor soil P and K levels. It is more cost-effective to maintain soil fertility than to re-establish the stand.

Yield Goals

Forage yield of white clover-bluegrass pasture is dependent upon many factors: the cultivars selected, seeding date, age of the stand and degree of establishment, stand composition, soil type and water-holding capacity, nutrient and water availability, weed, insect and disease pressure and crop management practices. *On Delaware soils, 2.0 tons/ac hay or equivalent is a realistic forage yield for an established white clover-bluegrass pasture in a good to average year.* When field history supports the use of a different yield goal, growers should adjust management decisions accordingly.

Soil pH and Liming

The target pH for white clover-bluegrass pastures on most Delaware soils is 6.5. If the soil pH is 5.3 or lower, the soil is too acidic for good growth of white clover and bluegrass. Apply the recommended rate of lime and allow the soil pH to increase before attempting to plant.

When seeding or re-seeding a pasture, thorough incorporation of the recommended rate of lime is most effective in correcting soil pH problems. On established pastures, lime can be topdressed although results may be somewhat less effective than those achieved by incorporation of the limestone.

The lime recommendation for a specific white clover/bluegrass pasture is calculated from the soil pH and buffer pH measurements using the steps outlined in *Calculating the Lime Requirement -- Chapter 3, Section 3.4.* Avoid overliming in order to prevent micronutrient deficiencies.

In most cases, the lime requirement can be met by either calcitic or dolomitic limestone.

Dolomitic limestone is recommended if:

- soil test Mg is less than 50 FIVs, or
- soil test Mg is between 50 and 100 FIVs *and less than soil test Ca.*

Calcitic limestone is recommended if:

- soil test Mg is greater than 100 FIVs, or
- soil test Mg is between 50 and 100 FIVs *and greater than soil test Ca.*

Nitrogen Management

The nitrogen (N) requirement of white clover/bluegrass pastures is dependent upon stand age and composition. Clover is a leguminous plant and, once established, capable of fixing sufficient N to meet crop needs. All stands should receive an application of N at seeding to aid in establishment. Seed mixes containing clover should be treated with a suitable inoculum to ensure that N fixation will occur. In subsequent years, stands containing high percentages of white clover require less N than those dominated by bluegrass. Over-application of N to stands high in clover increases the competitiveness of the bluegrass and will result in loss of the clover.

Table 1 gives a summary of recommended N rates for white clover-bluegrass pastures as a function of stand age and composition. At planting, the higher N rate should be used on sandier soils to compensate for greater leaching losses. That rate can be reduced or eliminated when planting into a legume cover or when manure has been applied prior to planting. To adjust N rates, see *Nitrogen Rate Adjustments -- Chapter 3, Section 3.5.1.2.* On established stands, N should be applied after each grazing period to encourage stand recovery and subsequent growth.

Forage Crops

Table 1. Recommended N rates for white clover-bluegrass pastures.

Stand Status	N Rate
	----- lbs / ac -----
Seeding - grass/clover mix	0 - 30
Established stand :	
0 - 25% clover	50/grazing period
25 - 50% clover	25/grazing period
>50% clover	0/grazing period

Phosphorus Management

Yield-limiting phosphorus (P) deficiency is rarely a concern on Delaware soils. Long-term applications of fertilizers and manures have resulted in P accumulations in many soils that are capable of supplying crop needs for many years with no further additions.

Adequate concentrations of soil test P are important to white clover-bluegrass pastures for forage production and stand longevity. To determine whether P fertilization is necessary for a specific field, conduct a routine soil test. University of Delaware P recommendations for white clover-bluegrass pastures are dependent upon stand age and soil test P value. A summary of P recommendations for Delaware white clover-bluegrass pastures are given in Table 2.

Table 2. Phosphorus recommendations for white clover-bluegrass pastures.

Stand Status	P Index Value						
	0	10	20	30	50	70	90
	----- lbs P ₂ O ₅ / ac -----						
Seeding	120	109	97	86	63	40	13
Subsequent years	120	104	88	74	50	17	0

Seeding

When soil test P is *Low* or *Medium* (50 FIVs or less), P should be broadcast and plowed down prior to seeding. When soil test P is *Optimum* (51 FIVs or greater), P can either be broadcast and incorporated prior to planting or topdressed prior to or

shortly after planting..

Topdressing Established Stands

If soil test P is Low (less than 25 FIVs), satisfactory growth on white clover-bluegrass pastures is unlikely. Few, if any, legumes will survive. Grass yield and longevity will be poor. *Do not attempt to correct the problem by topdressing P. Instead, broadcast the recommended rate of P, plow down and re-seed to obtain optimum yields.*

When soil test P is *Medium* or *Optimum* (greater than 25 FIVs), topdressing the recommended rate of P should be effective in meeting crop needs.

Potassium Management

Potassium (K) is very important to white clover-bluegrass pasture forage growth and stand longevity. The need for K fertilization of white clover-bluegrass pastures is best determined by the use of a routine soil test. Potassium recommendations are based on crop status (new seeding or established crop) and the soil test K index value. A summary of University of Delaware K recommendations for white clover-bluegrass pastures is given in Table 3.

Table 3. Potassium recommendations for white clover-bluegrass pastures.

Stand Status	K Index Value						
	0	10	20	30	50	70	90
	----- lbs K ₂ O / ac -----						
Seeding	180	163	146	129	94	60	20
Subsequent years	180	165	150	135	105	75	45

Seeding

When establishing a new field, K should be broadcast before or immediately after planting. Incorporating K by disking or plowing down will decrease potential salt effects from higher application rates.

Topdressing Established Stands

If the recommended K rate is *90 lbs K₂O/ac or less*,

potash can be broadcast in a single application in the early spring. When the recommended rate is **greater than 90 lbs K₂O/ac**, apply K in two applications: one in early spring and one in August or early September after the late summer grazing period.

To decrease the potential for grass tetany, avoid K overfertilization on pastures that are predominantly grass species. Waiting until after the first grazing period to apply K helps to reduce the potential danger.

Calcium and Magnesium Management

Calcium (Ca) and magnesium (Mg) needs of white clover-bluegrass pastures are usually met through routine liming. **Magnesium application is recommended if the soil test Mg value is less than 38 FIVs.** If liming has been recommended, use dolomitic limestone to raise soil pH and increase soil Mg. If, however, liming is not necessary but Mg is still indicated, apply Mg as Mg sulfate or Mg chloride to increase soil Mg. Appropriate application rates are given below in Table 4.

Table 4. Application rates for soluble Mg as a function of Mg fertility index value.

Mg Index Value									
0	5	10	15	20	25	30	35	40	
----- lbs soluble Mg / ac -----									
80	70	60	50	40	30	20	10	0	

Boron Management

Pastures containing legumes such as clover should be fertilized with **0.5 to 1.0 lbs boron (B)/ac** each year. Prior to seeding, apply B in a blended, broadcast fertilizer or as a soil spray and incorporate into the soil. On established stands, B can be topdressed in a blended, broadcast fertilizer or applied as a foliar spray, generally in late May or June.

Caution: *Although B is required for maximum productivity of pastures, even slight over-application of B can be toxic to the crop. When applied as a foliar spray, be certain to apply the correct rate.*

Manganese Management

Manganese (Mn) deficiency may occur in white-clover-bluegrass pastures on Delaware soils, most often as a result of overliming soils that are naturally low in Mn. The University of Delaware Soil Testing Program uses an availability index based on the soil test Mn value and soil pH to predict the likelihood of Mn deficiency. That availability index is calculated using the equation:

$$MNAI = 101.7 - (15.2 \times pH) + (2.11 \times ST-Mn)$$

where:

- MNAI = Mn availability index
- pH = water pH of the soil
- ST-Mn = soil test Mn in lbs/ac.

Table 3-14 in **Chapter 3, Section 3.5.5.2 (Manganese Management)** gives a summary of MNAI values for various soil pH-soil test Mn combinations. Interpretations of the Mn availability index for white clover-bluegrass pastures are given in Table 5.

Table 5. Interpretation of the Mn availability index for white clover-bluegrass pastures.

MnAI Value	Interpretation
Less than 12	Mn deficiency is likely at this soil pH and Mn concentration.
12 or greater	Mn deficiency is unlikely.

Suspected Mn deficiency can be confirmed by tissue analysis. Confirmed deficiency situations can be corrected in season by foliar applications of Mn of 1-2 lbs/ac of actual Mn as Mn sulfate, Mn oxide or Mn chelate. If deficiency is predicted by the availability index or was observed during the previous growing season, it can be prevented by a broadcast application of 20-30 lbs/ac of actual Mn in the fertilizer band. Broadcast applications of acid-forming fertilizer, which lower soil pH in the area of plant roots, may correct Mn deficiency without the addition of Mn fertilizer but may be less effective than applications of Mn.

Other Nutrients

No other nutrients are known to be limiting to white clover-bluegrass pasture production in

Forage Crops

Delaware.

Additional Information

See Soil Test Notes 1, 3, and 4 (Appendix 7) for additional information concerning fertilization of white clover-bluegrass pastures.