



## Developing a Bee-Friendly Pasture System

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For years, farmers have recognized the benefits of including forage legumes such as clovers, birdsfoot trefoil or alfalfa in pasture mixtures. Forage legumes enhance the livestock nutritional value of the feed since they generally have a higher crude protein and mineral content compared to grasses. They also convert atmospheric nitrogen into plant protein satisfying their nitrogen (N) fertility requirements. In fact, the whole pasture can have adequate nitrogen without the need for N fertilizer when there is at least 30 percent of the plant composition made up of legumes. A mixed stand of grasses and legumes also reduces the risks of stand failure due to harsh environmental conditions or pests.

Although less recognized, another important contribution of forage legumes is as a floral resource of nectar and pollen for bees and other pollinating insects. A decline in honeybee and bumble bee populations over the past few decades have been attributed to many factors including pests, diseases, pesticide exposure, and loss of nectar and pollen resources. Historically, an important food resource for honeybees and bumble bees in Vermont has been from forage legumes growing in hay and pasture fields. In the past few decades, a steady decline in pasture and hay crop acreage as well as a change in hay cutting practices has greatly limited forage legume bloom periods, thus limiting their contribution of nectar flows for bees.

More recently, pasture usage has begun to increase in Vermont due to an increase in certified organic dairies and a recent emergence of small, diversified livestock farms. Therefore, the potential use of forage legumes could also increase and regain its importance as a floral resource for pollinators.

### Managing Pastures for Enhancing Flowering Legumes

Maintaining an abundance of legume flowers throughout the season does require some thought and planning. Below are some ideas:

1. **Choose the best legume species and cultivars** - There are many forage legumes that can be used in pasture and almost all of them can be attractive to bees. However, *varieties and/or cultivars can vary quite a bit in their abundance and period of flower production, so it is important to make legume selections carefully.* Below is a brief description of each of the major legumes suited for pasture in the Northeast with a few suggestions on cultivar selection.

**White clover** (*Trifolium repens* L.) is the most common legume found in pasture. Its low growth habit allows it to tolerate close grazing and its creeping pattern via stolons helps it to fill in void spaces and persist over several years. Its shallow root system is not as tolerant to dry periods and it is prone to winter injury; therefore, levels of white clover can be somewhat inconsistent from one year to the next.

There are three types of white clover based on their relative size – small (often times called “Dutch white clover”), intermediate, and large (also called “Ladino clover” derived from an original ecotype that was introduced in the 1800's). Generally, the small to intermediate types are most tolerant in

pastures. They also tend to flower more than the large types but that can vary by cultivar. There is limited data in Vermont on cultivar flower abundance. In a pasture mixture trial conducted in Randolph, VT, three cultivars were found to produce an abundance of flowers later in the season (Table 1). ‘Pinnacle’ white clover was the most abundant. In a recent clover/alfalfa hay trial, ‘Pinnacle’ had a more abundant and wider period of flower production compared ‘Crusade’ white clover or alsike clover (Figure 1). There is little information on other abundant flowering cultivars that may be on the market, so it is important to talk to your seed supplier.

Table 1. Visual rating of white clover flower head abundance of commercial pasture mixtures, Randolph Center, VT, Sept. 9, 2009

Variety	Abundance	
	Rating*	Interpretation
Pinnacle	4.4	Very abundant
Jumbo	3.7	Somewhat abundant
Ivory	3.3	Moderately abundant
Alice	2.3	Low abundance
Kopu2	2.3	Low abundance
none**	1.6	Baseline

\*1= none; 2=seldom; 3 = few; 4 = several; 5 - full head

\*\*rating of mixtures containing no white clover seed

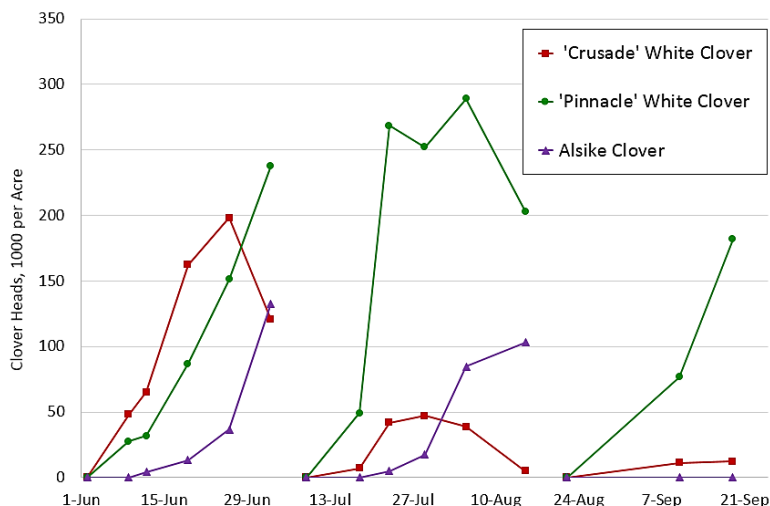


Figure 1. Seasonal clover flower head production when grown with alfalfa cut for hay, UVM Horticultural Farm, 2014

**Alsike clover** (*Trifolium hybridum* L.) is usually seeded with other clovers especially red or white clover. It is more tolerant to wet conditions filling in the low spots. Flowers are white but will turn pinkish as they mature. Unlike white clover, alsike clover has a more upright morphology similar to red clover but not as tall. After defoliation, it takes longer to develop flowers compared to white clover (Figure 1); however, it is considered an excellent nectar source for bees. Most of the seed you can buy is “common” with no cultivar information. **Warning** - It should *not* be grown in pastures or hayfields that will be used by light colored animals, particularly horses, which are sensitive to photoreactions caused by a chemical found in alsike clover.

**Red clover** (*Trifolium pretense* L.) is a larger clover and is quite commonly used in pasture and hay. It is short lived often only lasting 2 to 3 years. However, it is quick to establish and grows well under shady conditions and, therefore, makes a good pasture “frost seeding” species. Because of its large corolla, it is not as desirable by honeybees; however, bumble bees work it quite readily. There is no information on the best cultivars for flower production but it is recommended to use a medium type. These are better suited for pasture and are most likely to bloom more often.

**Birdsfoot trefoil** (*Lotus corniculatus* L.) is a perennial legume that produces yellow flowers in an umbel. It is slower to establish than the clovers. Cultivars range from low growing types suited for permanent pasture (called *Empire types*) to upright types suited for rotational grazing, hay or silage. There is no information on the best cultivars for flower production but it is recommended to use low to intermediate types. Generally, birdsfoot trefoil will sustain some bloom throughout the summer and one strategy for maintaining a stand is to allow it to reseed during the summer months.

2. **Over-seed periodically** - Reseeding pasture with legumes is a practical and relatively simple way to maintain legume persistence. Usually, the best time to over seed is in late winter/early spring, referred to as “frost seeding”, when the soils are prone to heaving during diurnal freeze/thaw cycles. The most successful stands usually occur when the pasture has been grazed hard the previous fall and there are open spots in which the legume seed can reach the soil. After seeding, timely grazing is important in order to reduce the competition of the existing vegetation as the new legume seedlings develop. Below are some recommended seeding rates:

Table 2. Recommended seeding rates when over seeding into existing pasture

Legume Species	Seeded Alone Lbs/acre	Seeded in Mixture Lbs/acre
White clover	2 - 3	1 - 2
Red clover	4 - 6	2 - 4
Alsike clover	4 - 5	2 - 3
Birdsfoot trefoil	6 - 8	2 - 6

3. **Maintain adequate soil fertility and pH** - Forage legumes will be more competitive in a pasture mixture if soil fertility and pH are at an adequate to optimum levels. In addition, flower and nectar production can be greatly diminished if key nutrients are lacking in the soil, particularly phosphorus, potassium and boron. A soil test is the best means to determine nutrient and liming needs.
4. **Rotate pastures and avoid over grazing** – Rotational grazing at a proper stocking rate is recommended for many reasons but in terms of flower and nectar production, rotation grazing allows the pasture plants to have time to regrow and recover after being grazed. This improves overall photosynthesis which improves nectar production. With rotational grazing, you also end up with paddocks that vary in their stage of regrowth, so there are almost always flowers available for pollinators somewhere within the system. With continuous stocking, animals may be inclined to selectively graze the legumes before they ever have a chance to flower. Over grazing is not good for livestock nor pollinators since it weakens plants, reduces pasture productivity, and reduces flower and nectar production. *Overall, good grazing management for livestock is compatible with good grazing for pollinators.*

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