

# **Introducing Clovers in Grazing Systems in Coastal Plain Regions of the South**

Period Covered by Report: October 1, 2007 – September 30, 2011

## **EXECUTIVE SUMMARY**

The potential to expand cool-season forage opportunities in Coastal Plain Grazing systems increased tremendously when new white, intermediate clovers were introduced into the marketplace. Understanding how these clovers, compared to traditional clovers, fit into grazing systems in the Coastal Plain Regions of the South is imperative for future success.

This clover project was designed to include as many grazing situations as possible in Alabama, Mississippi and Georgia for a thorough evaluation and understanding. Reports from each of the states are included later in this report.

The project started slowly as drought delayed planting for a full year. As a result the project was extended a full year to gain three years experience with the clovers. It was well worth the extension as a much better understanding of the perenniation potential of the intermediate clovers was gained.

As a result of the project better guidance on the use of the intermediate clovers in Coastal Plain Grazing Systems of the South will be available. These clovers do not fit in all situations and they cannot be mismanaged and expect success. Those producers that have suitable conditions for use of the intermediate clovers will benefit with improved forage quality, increased forage productions, extended grazing, reduced nitrogen fertilizer needs and a reduction in the need to annually plant cool-season legumes. All of these are economically beneficial.

Difficulties were experienced in getting funding to the producers in a timely manner. Improved communications between headquarters and the Project Coordinator's office would have helped this situation. Personnel changes and high workloads in headquarters were the main reasons for communications difficulties.

Recommendations include the following:

- Include intermediate white clovers such as Durana in Coastal Plain grazing systems where good soil moisture is expected and on heavier surface soils. Expect perenniation and suitable coverage within a field to take more than a year. Expect the first year's growth to be slow and coverage to be limited.
- Utilize well managed grazing to assist with intermediate white clover stand perenniation and longevity.
- Do not include intermediate white clovers in hay situations.
- Do not plant intermediate white clovers when soil moisture is marginal.
- Reseeding clovers like AU Robin Crimson clover and ball clover reseed well and should be utilized in many grazing systems, particularly those not suited for the intermediate white clovers.

## **Introducing Clovers in Grazing Systems in Coastal Plain Regions of the South**

### **Introduction**

Pastures in the Coastal Plain region of the Deep South are dominated by warm-season perennial grasses, especially bahiagrass and bermudagrass. They produce well during warm weather, but are dormant during cool weather and typically provide grazing for only 6 to 8 months during the year. In order for bahiagrass and bermudagrass pastures to provide reasonably high quality forage, nitrogen and other nutrients must be applied at least annually. Even so, their forage quality is lower than cool season forages.

In order to extend the grazing season of warm-season pastures, overseeding them with winter annual grasses is widely practiced in the lower South. By far, annual ryegrass is the winter annual grass that is most often overseeded because it is easy to plant and grow, seed cost is low, and spring production is excellent. In some cases one or more small grains (especially rye, wheat, or oats) may be overseeded on warm season sods, as these species provide more autumn and winter growth than ryegrass, but even when this occurs, ryegrass is often planted with the small grains in order to enhance spring forage growth. Despite the excellent forage quality and significant extension of the grazing season that overseeded winter annual grasses provide, the nitrogen fertilizer cost associated with growing these grasses is problematic.

Cool season forage legumes have much to offer, but are overseeded on warm season perennial grass sods much less frequently. Clovers can fix significant amounts of nitrogen (50 to 150 pounds per acre or more). In addition, depending on the situation and grass companion crops, they have the potential of extending the grazing season, improving forage quality, and increasing dry matter production per acre. Given the increases in the cost of nitrogen fertilizer that have occurred in recent years, the nitrogen fixation trait of clovers is of particular interest and importance to livestock producers.

Historically, relatively small percentages of the warm season perennial grass pastures in Coastal Plain soil regions have been overseeded with clovers. Furthermore, when such fields have been overseeded, annual clovers have been used almost exclusively. The reason is that perennial clovers generally produce less forage during the establishment year than annuals produce, and perennial clovers usually won't perennialize on Coastal Plain soils.

There is a need for use of more clovers in Coastal Plain soils. Use of a perennial clover that would be hardy enough for plants to live for more than one year would be ideal. Otherwise, use of an annual clover that will dependably reseed would be of great benefit. Fortunately, in recent years plant breeders have developed a number of new clover varieties that may offer potential. Of particular interest are some recently-developed perennial white clover cultivars that are more hardy, stress

tolerant, and persistent than white clover varieties that have typically been available. Most white clover varieties on the market are “ladino” (or giant) types, but several intermediate white clover varieties bred for persistence are now available. A variety named ‘Durana’ was the first such hardy variety made commercially available, and some producers in Coastal Plain soil areas have reported success in growing it.

The time seemed to be right to evaluate clovers in multiple on-farm situations in Coastal Plain soil areas. Availability of new persistent intermediate white clover varieties provided an especially good reason to do this. There are also new varieties of certain annual clovers, and some of these may perform better than other annual clover varieties available. In addition, some clover species that have been in existence for a considerable length of time but used relatively little for overseeding in Coastal Plain soil areas need to be re-evaluated in comparison with newer clover varieties.

This Conservation Innovation Grant (CIG) was proposed and funded to evaluate and demonstrate the effective use of clovers in perennial warm-season Coastal Plain pastures in Alabama, Georgia and Mississippi. Demonstration sites were planted in the fall of 2008 with different clovers that were chosen for each specific soil and site conditions

## **Objectives**

1. Demonstrate the effective establishment methods, as well as the use and management of clovers
2. Demonstrate viable clover species and/or variety options
2. Demonstrate ways to improve overall forage quality for livestock
4. Demonstrate ways to reduce fertilizer nitrogen needs and thus potentially subsequently improve water quality.

## **Methods and Results**

### **Alabama Final Report:**

Eight clovers were chosen for the demonstrations: ‘Advantage’ ladino white clover; ‘Allied 9601’ red clover, ‘Apache’ arrowleaf clover; ‘Bigbee’ berseem clover; ‘AU Robin’ crimson clover; “common” ball clover; ‘Denmark’ subterranean clover; and ‘Durana’ white clover.

Potential cooperators were identified in Coastal Plain soils areas in South Alabama with assistance from County Extension Agents and Natural Resources Conservation Service District Conservationists. Visits to all of the proposed sites were made by Dr. Don Ball (Extension Agronomist/Professor, Auburn University) and Eddie Jolley (NRCS State Conservation Agronomist). For various reasons, some farms nominated were not selected. Ultimately suitable overseeding sites on eight farms in four counties were selected.

Assessment of soil types in the sites available for overseeding on their farms allowed determination of which clovers would be planted on each farm. The soil and site criteria used for various clovers were as follows.

**CLOVER SOIL AND SITE CONSIDERATIONS**

Deep Sands	Sandy Loam Surface	Loam, Clay Loam, Clay Surfaces	Shallow Top Soil	Rich Bottom Land	Wet Soils	Droughty Soils (hilltops)
Arrowleaf	Arrowleaf	Arrowleaf	Arrowleaf	Arrowleaf		Arrowleaf
	Ball	Ball	Ball	Ball	Ball	Ball
				Berseem	Berseem	
Crimson	Crimson	Crimson	Crimson	Crimson		Crimson
	Red	Red	Red	Red		Red
	Ladino white	Ladino white		Ladino white	Ladino white	Ladino white
Intermediate white	Intermediate white	Intermediate white	Intermediate white	Intermediate white	Intermediate white	Intermediate white
	Subterranean	Subterranean		Subterranean		

Based on these criteria, the clovers were overseeded on either bahiagrass or bermudagrass pastures on the various farms selected. Pastures were limed and fertilized according to soil test recommendations. Plantings were completed either by broadcasting seed after light tillage, or drilling seed with a grain drill (7-inch rows) with no tillage. No more than 20 acres of clover (all species) were overseeded on a given farm. Clover species overseeded on the various farms were as follows.

- Farm 1 (Monroe) - ball, berseem, crimson, red, Durana White (moist loamy/sandy loam soils).
- Farm 2 (Coffee) - arrowleaf, ball, crimson, red, and Durana White (sandy loam surface)
- Farm 3 (Coffee) - arrowleaf, ball, crimson, and Durana White (heavier sandy loam and loamy sand sites)
- Farm 4 (Henry) - arrowleaf, ball, crimson, and Durana White (loamy sand)
- Farm 5 (Barbour) - arrowleaf, ball, crimson, and Durana White (sandy loam)
- Farm 6 (Coffee) - arrowleaf, ball, berseem, crimson, ladino, red, subterranean, and Durana White (sandy loam)
- Farm 7 (Coffee) - arrowleaf, ball, crimson, and Duran White (loamy sand)
- Farm 8 (Dale) - arrowleaf, ball, crimson, Durana White (loamy sand)

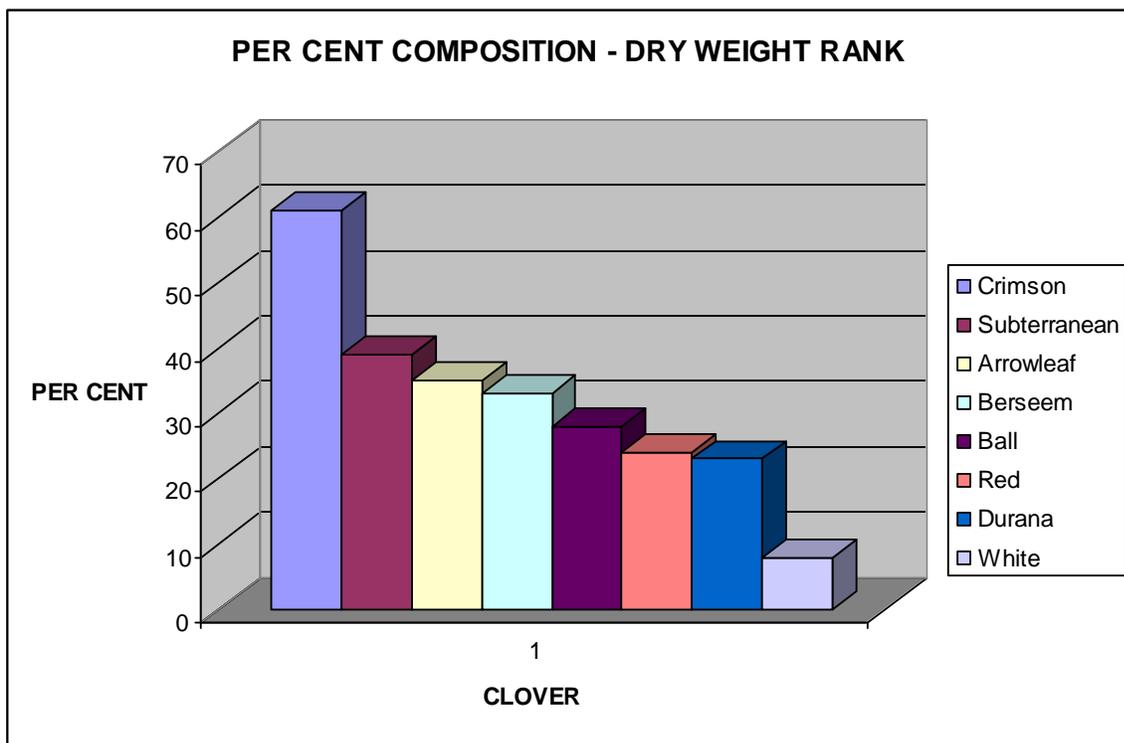
**Initial Results**

The weather in autumn 2008 was excellent for planting and growing clovers in the demonstration plots in all locations, except for one location. In Dale County, surface soil moisture was lacking after the

'Durana' clover was planted, which resulted in a very poor stand of this clover. In all other sites, the clovers established and grew very well. Producers allowed clovers to grow to recommended heights before initiating grazing. Producers implemented grazing management to maintain healthy stands of both clovers and perennial grasses.

During the first year after planting, growth of 'Durana' clover seemed slow. It has been noted by company representatives that 'Durana' clover develops a good root system during the first year of establishment. Where 'Durana' clover established, the foliar growth and spread was improved during the second year.

During the establishment year (2008-2009), plantings were evaluated for composition using the Dry-Weight Rank method. The results were averaged for all plantings in Alabama and are reported in the below graph.



### Third Year Results

While plantings were monitored each year, the focus of this project was on long-term clover persistence, either via perenniation or reseedling. Thus, each site was visited in spring, 2011 to determine survival of the various clovers that had been overseeded. Visual observations were made and the results were as follows:

### **Farm 1**

The demonstration site on this farm was some of the best land on the farm and was a relatively wet-natured spot. Due to drought and labor problems on the farm in autumn 2008, the clover was planted between Christmas and New Year, which was about six weeks later than the normal recommended planting date. Despite this, decent clover stands were obtained. There was an excellent berseem clover stand obtained and there was excellent growth of this clover the first year, but there was no reseeding. By spring, 2011 there was a mixture of volunteer crimson clover, ball clover, and ryegrass in the demonstration area. There was more grazing pressure in this field than any area on the farm during the three years of this project. There was an excellent stand of Durana white clover in the field in spring, 2011. Durana white clover was providing about seventy-five percent coverage. As with Farm 3, the stand was actually thicker than it had been in spring, 2010.

### **Farm 2**

This was primarily a bahiagrass pasture. While there was an excellent reseeded stand of ball clover and crimson clover present the first year, dry weather and associated heavy grazing took it out during winter and early spring. The producer did not obtain a stand of Durana clover. He had some red clover present in spring 2010, but none in 2011.

### **Farm 3**

There was a good stand of Durana Clover present over much of the overseeded bahiagrass field. The stand appeared to be even thicker on the lower part of field than was the case in 2010. The lower part of the field was shaded from the sun beginning mid-afternoon. This is a very encouraging sign as it indicates there must have been some combination of spreading of perenniating plants via stolons and/or new plants appearing due to reseeding. This field had some of the heavier soils of all the demonstration sites. This field received heavy grazing pressure during much of each year. Durana that was present in another field on this farm in spring 2010 was gone in spring 2011. This site had much sandier surface soils.

### **Farm 4**

In bermudagrass there were only scattered plants of Durana white clover present, although there was one spot in a low area by a tree line in which a good stand of Durana was present. It is likely that bermudagrass competition resulted in loss of the Durana stand in much of the field. There was also more moisture and almost no bermudagrass the in lower area, which no doubt favored the presence of clover. The producer cut hay in 2009 and 2010, which probably hurt the Durana clover stand due to shading by bermudagrass.

The area in which annual clovers were planted is quite drought-prone. There was about a 40 % ground coverage of crimson clover in spring of 2011, and about 30% ground cover of ball clover. The producer

said that the first year the best clover grazing was from arrowleaf clover. However, there was only a sparse stand of arrowleaf clover present in spring 2011. Cows were removed in the first year when clover started to bloom, so there is probably arrowleaf clover seed in the soil (however, arrowleaf clover doesn't usually reseed well without light tillage in autumn).

### **Farm 5**

No clover remaining. Thus, there was neither perenniation of Durana white clover nor reseeding of crimson clover or ball clover at this site by the third year. This was not expected and there are not any logical explanations for the results.

### **Farm 6**

This site was primarily a bahiagrass pasture in a pecan orchard. There were some ladino white clover present in the second year, but there was no ladino white clover present by spring, 2011, and only pockets of Durana white clover, mainly in shady areas. Drought years greatly reduced clover performance. There was a smattering of both arrowleaf clover and crimson clover present. There was a smattering of crimson clover present. There was a reasonably good stand of reseeded ball clover in the second year, but not in the third year. There were only a few subterranean clover plants present in spring, 2011, even though there were a substantial number in some areas in spring of 2010.

### **Farm 8**

There were a few plants of arrowleaf clover present. There were a few spots in which there were good populations of reseeded crimson clover. Ball clover reseeding was quite good in this bermudagrass field. There was no Durana clover present in spring of 2011. There were only few plants present even after the first year. Marginal moisture conditions existed when the Durana clover was planted. This field is sandy and fairly steep and is cut for hay each year.

### **Conclusions**

- Dry weather during the fall can be a problem with establishment of clovers on Coastal Plain soils. Dry weather in summer can reduce or eliminate stands of white clover.
- Each of the eight clover species can be successfully overseeded on warm-season perennial grass pastures on Coastal Plain soil and result in good stands and production for at least one year.
- On some sites and soils, respectable stands of some clover species may be present after three years. Soils with relatively high amounts of silt and clay on the surface had better stands of Durana white clover.

- Cutting hay on a site overseeded with clover is detrimental to perenniation of white clover due to shading by the grass.
- With regard to reseeding, crimson clover is a particularly dependable legume to use in overseeding warm season grasses in central and south Alabama. Overall, the A.U. Robin crimson clover had the highest percent of reseeding compared to other clovers. This was expected due to its growth characteristics.
- Ball clover is also a dependable reseeder on many soils and sites in Coastal Plain soil areas.
- Berseem clover, red clover, and ladino clover did not perennialize or reseed well.
- Subterranean clover, which was seeded only at one location, reseeded reasonably well one year but there were few plants remaining by the third year and these were only in shady areas.
- White clover can be established successfully on Coastal Plain soil when soil moisture is adequate. Growth of white clover (both the Advantage ladino and the Durana intermediate white clover) was slower than the other evaluated clovers during the establishment year.
- Durana intermediate white clover is more persistent on Coastal Plain soil than is Advantage ladino white clover. On two farms there were good stands of Durana white clover present in the third year. In fact, on these two farms the stand of this clover actually increased during the duration of this project. This is significant because prior to breeding of white clover specifically for persistence there would likely have been no white clover present on a Coastal Plain soil site after three years. On both farms, the area in which this clover persisted well received heavy grazing pressure. Durana white clover is most likely to persist on heavier Coastal Plain soils. A particularly important statement that can be made is that Durana (or presumably other intermediate white clover varieties selected for persistence) can perennialize on some sites on some Coastal Plain soils. It should be obvious that any producer who has Coastal Plain soil who sees white clover plants volunteering should give serious consideration to planting a white clover variety that was bred for persistence.

### **Educational Events**

One field day was held in April in Coffee County where all eight clovers had been planted. A poster depicting current results was displayed at the 4<sup>th</sup> National Conference on Grazing Lands in Sparks, NV and at the American Forage and Grassland Council Conference in Springfield, MO.

**Acknowledgements:**

**The Alabama Cattlemen's Association, Alabama Cooperative Extension System, Alabama NRCS staff, local producers and the Alabama Farmers Cooperative provided excellent guidance, assistance and support in the implementation of this project.**

**Georgia Final Report****Georgia Clover CIG Project Final Report**

Ten farmers in Georgia participated in the Conservation Innovation Grant-funded project, "Introducing Clovers in Grazing Systems in Coastal Plain Regions of the South." Clover species or varieties planted included crimson, arrowleaf, 'Durana' white, and 'Patriot' white. All fields were planted into existing dormant bermudagrass or bahiagrass sod using a drill during the fall 2008. Soils on the sites are sandy to sandy loam.

A drought that began in South Georgia and most of the Southeast at least as early as 2007 still existed at the time of planting. Drought conditions did not ease until late in 2008. Some participants attributed poor stand establishment in the fall and early winter to the dry conditions.

Adequate stands of the two annual species were reported by all participants the spring after planting, and all fields were grazed. The white clover varieties were slower to establish, and all those that planted them reported poorer than expected performance. This is likely due in part to comparison to the growth of the annuals. However, some participants were surprised that the white clover persisted longer in the spring and early summer. Several reported decreased nitrogen fertilizer requirements on their warm-season perennial grasses the summer after planting.

By winter 2010, half of the annual plantings either had not reestablished, or clover occurred at significantly lower density than the previous winter and spring leading to those stands being declared "failure" by participants. It is probable that the farmer's unfamiliarity with managing clover in pastures contributed to decreased stand density the second year. Based on conversations with cooperators, most of them likely did not remove stock for an appropriate time to allow end of season flowering and seed production by the annuals.

No reports have been received that any of the plantings persisted into the third year at densities high enough to be considered an important component of the pasture system.

**Observations and Conclusions:**

- Lingering, severe drought in the Coastal Plain of Georgia in 2008 likely reduced the rate of establishment at some sites.
- Several participants reported an apparent nitrogen benefit to their warm season perennial grasses the year after planting in the fields where the clovers were established.

- Shading and competition from warm-season grasses, and the cooperators lack of experiencing with management techniques that could have reduced the competitive advantage of the sods, likely contributed to progressive stand decline over the three years of the project.
- Results, both establishment success and persistence, appeared positively related to the cooperator's management skill and experience with diverse forages and somewhat management intensive grazing systems.
- The annual clovers were typically not managed appropriately to allow reseeding. This observation and the two previous points argue for a need for agency personnel and other professionals to do a more thorough job educating livestock farmers on proper management of clovers.
- Although soils at all the planting sites were either sandy or loamy, persistence of the white clover varieties was better on the relatively heavier soils.
- Plantings did not persist on exposed sites.
- Most of the participants indicated a willingness to consider use of clovers in the future, particularly in light of higher fuel, feed, and fertilizer prices.

### **Mississippi Final Report**

Fall of 2008, plantings were initiated after the 2007 drought. Of the 5 producers originally committed to the project, 3 did not complete it. Weather prevented the planting of some or all of their pastures and one had such a poor stand that he did not follow through. The two remaining cattlemen were successful with their planting and forage production was good.

Progress was reported to local county cattlemen's meetings.

# On-Farm Demonstrations of Overseeding of Improved Cool-Season Legumes

, E. R. Jolley<sup>1\*</sup> D.M. Ball<sup>2</sup>

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## Introduction

Pastures in the Coastal Plain region of the Deep South are dominated by warm-season perennial grasses, especially bahiagrass and bermudagrass. They produce well but are dormant much of the year. Overseeding of these grass pastures with winter annual grasses is widely practiced in the lower South. Cool season forage legumes have much to offer but are overseeded much less frequently. Clovers can fix significant amounts of nitrogen, extend the grazing season, and improve forage quality and quantity.

A Conservation Innovation Grant (CIG) was proposed and funded to demonstrate the effective use of clovers in perennial warm-season Coastal Plain pastures in Alabama, Georgia and Mississippi. Demonstration sites were planted in the fall of 2008 with different clovers that were chosen for each specific soil and site conditions. This poster represents the demonstrations planted in Alabama.

## Objectives

1. Demonstrate viable clover options;
2. Demonstrate effective establishment methods, use and management of clovers;
3. Demonstrate that clovers can improve overall forage quality for livestock;
4. Demonstrate that clovers can reduce fertilizer nitrogen needs and subsequently improve water quality.

Livestock grazing crimson clover nearing maturity.



Dr. Don Ball and Mr. R. E. Adams evaluate success of clover plantings in Bullock County.

## Methods

- Forage legume cultivars were planted in individual stands as part of the demonstrations on eight different Alabama farms in the fall of 2008. The cultivars planted on each farm were chosen according to soil and site conditions.
- Pastures demonstration sites in Bullock, Coffee, Dale and Monroe Counties, all located in South Alabama, were limed and fertilized according to soil test recommendations.
- Established bermudagrass or bahiagrass pastures were used. Clovers were planted in mid- to late- fall after warm season grass growth slowed. After the pastures were grazed or mowed close, plantings were completed by either:
  - a. Broadcasting seed after light tillage, or
  - b. Drilling seed with grain drill (7-inch rows) with no tillage
- Plantings of each clover ranged from one-half to 5 acres in size.
- Eight legumes were planted: 'Apache' arrowleaf clover (*Trifolium vesiculatum* Sw.), 'Bigbee' berseem clover (*Trifolium alexandrinum* L.), 'AU Robin' crimson clover (*Trifolium incarnatum* L.), 'common' ball clover (*Trifolium nigrescens* Viv.), 'Allied 9601' red clover (*Trifolium pratense* L.), 'Mount Baker' subterranean clover (*Trifolium subterraneum* L.), 'Advantage' white clover and 'Durana' white clover (*Trifolium repens* L.). Each clover was planted at the recommended rate, time and depth, and treated with the appropriate inoculant.
- Clover composition was rated using the dry-weight rank method during the spring following planting.
- One field day was held in April in Coffee County where eight clovers were planted.

Coffee County Clover Field Day, April, 2009

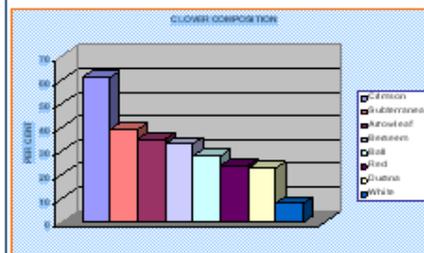


## Results

The weather in autumn 2008 was excellent for planting and growing clovers in the demonstration plots in all locations, except one in Dale County. After 'Durana' clover was planted at this location, poor surface soil moisture resulted in a very poor stand.

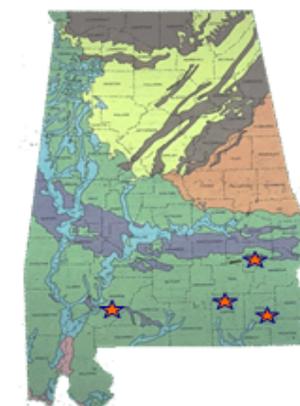
In all other sites, the clovers established and grew very well. Producers allowed clovers to grow to recommended heights before initiating grazing. Producers implemented grazing management to maintain healthy stands of both clovers and perennial grasses.

Figure 1. Percent Clover Composition



## Conclusions

- These eight clovers can be successfully overseeded on warm-season perennial grass pastures on Coastal Plain soil.
- Crimson clover is a particularly dependable legume to use in overseeding warm season grasses in central and south Alabama.
- 'A.U. Robin' crimson clover had the highest per cent stand composition compared to other clovers. This was expected due to its growth characteristics.
- 'Durana' white clover was able to establish successfully when soil moisture was adequate. Growth during the first year was slower than the other evaluated clovers.
- Dry weather during the fall continues to cause problems with clover establishment.



Locations of Clover Demonstrations

## Future Activities

- The annual clover plantings will continue to be monitored two more years for stand persistence and performance via reseeding.
- Evaluations will also continue to have a better understanding of the ability of 'Durana' and 'Advantage' white clovers to perennialize and persist on these Coastal Plain, perennial warm-season pastures.
- Additional field days will be scheduled when needed.

## Acknowledgements:

The Alabama Cattlemen's Association, Alabama Cooperative Extension System, Alabama NRCS staff, local producers and the Alabama Farmers Cooperative provided excellent guidance, assistance and support in the implementation of this project.