Quail Food Plot Recommendations on Regenerated Sites in South Carolina

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Abstract: Quail food plots established on regenerated pine sites in South Carolina were evaluated in relation to planting dates, seeding rates, and site preparation methods for pines. Stem count data indicated Piedmont food plot establishment should involve broadcasting a mixture of 0.14 kg of bicolor lespedeza (*Lespedeza bicolor*) and 0.34 kg of Kobe lespedeza (*Lespedeza striata*) seeds per 0.04 ha plot in March on either disked or burned sites. Sandhill data indicated that broadcasting 0.14 kg of bicolor and 1.36 kg of Kobe seeds per 0.04 ha plot in March on disked soils would effectively establish food plots in that region.

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Recent silvicultural trends emphasize short pine rotations for pulpwood production as opposed to longer rotations used for saw-timber production. Regenerated pine sites created on clearcut areas or farm land provide excellent habitat for quail for 3 to 7 years after planting (Scott 1964, Arner 1972, and Byrd and Holbrook 1974).

Sorrow (1978) and Still (1980) studied several known quail foods in food plots on regenerated pine sites in South Carolina. Sorrow's (1978) recommendation for the Sandhill Region included broadcasting a mixture of 0.27 kg of bicolor lespedeza and 0.68 kg of Kobe lespedeza seed to effectively establish 0.04-ha (0.10 acre) food plots. Still (1980) recommended seeding rates of 0.05 and 1.14 kg of bicolor and Kobe lespedeza, respectively,

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for 0.04-ha plots in the Piedmont Region. This annual(Kobe)/perennial(bicolor) mixture was proposed due to the 2-year maturation period of bicolor. All plots studied by Sorrow (1978) and Still (1980) were established in March.

This study was designed to test the best dates and seeding rates for establishing bicolor and Kobe lespedeza food plots for quail and to investigate their relationship to site preparation methods (disked or burned) in the Sandhill and Piedmont regions of South Carolina.

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Methods

Study Areas

The Sandhill portion of this study included 4 sites located in Aiken and Barnwell counties. Two areas were cleared, K/G bladed, disked, and planted to pine by January, 1979. Another site was cleared, K/G bladed, and site prepared by disking ½ of the site and burning the remaining ½ before pine planting in February, 1979. The remaining site was prepared, as was the previous site, and planted to pine by November, 1979.

Five study sites were utilized in the Piedmont Region involving areas in Abbeville, Greenwood, and Newberry counties. Four sites were cleared, site prepared, and planted to pine by March, 1979. Three of these sites were K/G bladed and disked, whereas the remaining site, which was aerially sprayed with a herbicide and burned, was excluded from the results. The fifth site was cleared, K/G bladed, ½ the site disked and the other ½ burned, and the site then planted to pine in December, 1979.

Regenerated pine sites in the study ranged in size from 43–169 ha. Annual precipitation averages for both soil regions in 1979 (118 cm) and 1980 (122 cm) were approximately equal to the 30-year normal (118 cm), whereas the 1981 average (99 cm) was much lower.

Planting Techniques

A total of 102 quail food plots were established on Piedmont and Sandhill regenerated pine sites by broadcasting varying amounts of premixed bicolor and Kobe lespedeza seeds. Thirty-six food plots (18/region) were established in March, 1979, at Sorrow's (1978) recommended seeding rates. Thirty-one plots were planted on disked sites and 5 were planted on burned

sites. Two burned plots were in the Piedmont where herbicide was used and were excluded from the study. Twenty-five of 36 food plots were 0.04 ha (0.10 acre) in size whereas 9 were 0.10 ha (0.25 acre).

Seventy-two 0.04-ha food plots (36/region) were established in 1980 on varied planting dates with different seeding rates on sites prepared by either disking or burning. Twelve food plots were established in each soil region at each of the following dates: 14 December 1979; 24 January 1980; and 14 March 1980. Within each set of 12 plots, ½ were planted on disked sites and ½ were planted on burned sites. Each set of 6 plots included 3, 2-plot sets using each of the following seeding rates per 0.04 ha: low–0.14 kg bicolor, 0.34 kg Kobe; medium–0.27 kg bicolor, 0.68 kg Kobe; and high–0.54 kg bicolor, 1.36 kg Kobe.

Evaluation Techniques

Stem counts were taken during late July and early August of 1979, 1980, and 1981. Five randomly selected sample points situated along the centerline of each plot were marked with stakes to allow replication of sampling each year. A steel rod with a 38.1-cm, free-swinging arm was used to delineate a 0.458-m^2 (0.544-yd^2) study plot at each stake. All test and native plants rooted within the defined circle were counted.

Data from the 5 samples were combined to obtain the average number of bicolor and Kobe stems per 0.04-ha plot, which was then averaged with other plots of the same treatment (date, seeding rate, site preparation). Treatment means were compared with an Analysis of Variance test. Only significant ($P < 0.05$) treatments are presented in the results.

Dibbling bicolor lespedeza (1 seedling/0.56 m) in 0.04-ha plots along rows of pine seedlings would result in the planting of approximately 675 plants. Any treatment which produced close to or greater than 675 bicolor seedlings was considered adequate. In regards to Kobe lespedeza, Sorrow's (1978) recommendation was set with the intention that it produce 17,500 stems/0.04-ha, a density that would likely create too much intraspecific competition. Therefore, recommended seeding rates from this study were based on second-year production of Kobe stems as an indication of its ability to replace itself by seed production. Whenever results from seeding rates analyses were not statistically significant ($P > 0.05$), the lowest rate was recommended to reduce the cost of the food plot.

The initial 36 food plots were included in a 3-year longevity study to determine changes in test plant densities. Stem count averages from these plots were evaluated by comparing the means for each soil region over the study period.

Results and Discussion

Stem count averages for the 72 food plots established from December 1979, until March 1980, were analyzed statistically in relation to soil region in 1980 and 1981. Kobe stem count averages were significantly different ($P < 0.05$) regionally for each sample year whereas bicolor averages were not statistically different ($P > 0.05$) either year. Subsequently, stem count analyses of both species within each soil region were made to obtain recommendations for proper food plot establishment.

Sandhill Region-Bicolor Lespedeza

Stem count data relative to different planting dates and site preparation methods showed significant differences ($P < 0.05$) for each sampling period (Table 1). Stem averages indicated March was the only test date found to be suitable for bicolor establishment. Colder climatic conditions were thought to cause this difference. Davison (1945) declared that bicolor lespedeza food plots established by seeding should always be planted after the threat of a killing frost. Disked sites planted in March produced approximately 8 times more bicolor seedlings than burned sites. Observations by the author (Bryan 1981) and a report by Triner and Klimstra (1965) indicated greater native plant densities were found on burned sites as compared to fallowed sites. High native plant densities on burned sites resulted in greater competition for test plant species. Bicolor stem count averages on burned sites were far below the desired density of 675.

Stem counts of the different seeding rates of bicolor were not statistically significant ($P > 0.05$) in 1980 or 1981. Total averages indicated that the low

Table 1. Comparison of Bicolor Lespedeza Stem Count Averages (1980–1981) in Relation to Planting Dates and Site Preparation Methods in Quail Food Plots on Regenerated Pine Sites in the Sandhill Region of South Carolina

	Average Stems Per Site Preparation Method[a] (per 0.04-ha plot)				Average Stems Per Planting Date[b]	
	1980		1981			
Planting Dates	Disked	Burned	Disked	Burned	1980	1981
10 Dec 1979	296	30	386	0	163	193
25 Jan 1980	267	178	178	89	222	134
14 Mar 1980	1,216	148	1,394	178	682	786
Avg. Stems Per Site Preparation	593	119	653	89		

[a] Site preparation was significantly different ($P < 0.05$) in 1980 and 1981.
[b] Planting dates were significantly different ($P < 0.05$) in 1980 and 1981.

rate produced only ½ as many bicolor stems as the other 2 rates. However, the average (not shown) for March food plots on disked sites at the low seeding rate (623 stems) was sufficiently close to the desired density of 675 to be acceptable.

Recommendations for bicolor establishment in the Sandhill Region consisted of broadcasting 0.14 kg/0.04 ha of seed in March in disked soils. Burned sites utilized in this study were unsuitable for the establishment of bicolor by direct seeding.

Sandhill Region-Kobe Lespedeza

Seeding rates and site preparation methods resulted in significantly different ($P < 0.05$) Kobe stem count averages in 1980 and 1981 (Table 2). Kobe produced many more stems on disked sites than burned, as a result of greater competition from native plants on the burned sites. Plots utilizing the low seeding rate were outproduced by the medium and high rates by a large margin in 1980 and also produced a low number of stems in 1981. In 1981, medium and high seeding rates produced similar total averages. However, high seeding rate plots on disked sites produced 9,000 more Kobe stems than medium rate plots on diked sites.

Planting dates did not result in significantly different Kobe stem count averages for either sampling period.

Data analyses indicated that 1.36 kg/0.04 ha of Kobe seed should be broadcast on disked sites to effectively establish quail food plots in the Sandhill Region. A March planting date is recommended in that these seeds are to be premixed with bicolor lespedeza seeds. Broadcasting Kobe lespedeza on burned study sites was not sufficiently effective to be recommended.

Table 2. Comparison of Kobe Lespedeza Stem Count Averages (1980–1981) in Relation to Seeding Rates and Site Preparation Methods in Quail Food Plots on Regenerated Pine Sites in the Sandhill Region of South Carolina

	Average Stems Per Site Preparation[a] (per 0.04-ha plot)					
	1980		1981		Average Stems Per Seeding Rate[b]	
Seeding Rates (per 0.04-ha)	Disked	Burned	Disked	Burned	1980	1981
Low (0.34 kg)	2,432	1,186	13,464	2,847	1,809	8,156
Medium (0.68 kg)	5,873	1,601	21,709	6,168	3,737	13,939
High (1.36 kg)	6,584	1,986	30,068	1,068	4,285	15,867
Avg. Stems Per Site Preparation	4,962	1,588	21,946	3,361		

[a] Site preparation was significantly different ($P < 0.05$) in 1980 and 1981.
[b] Seeding rates were significantly different ($P < 0.05$) in 1980 and 1981.

Piedmont Region-Bicolor Lespedeza

Planting dates were the only treatments to result in significant differences ($P < 0.05$) for bicolor stem averages in the Piedmont Region (Table 3). March plantings greatly outproduced those of December and January and were the only plantings to equal or surpass the desired density of 675 stems/0.04 ha. Unfavorable climatic conditions probably resulted in poor development of the plots established in December and January.

Insomuch as neither seeding rates nor site preparation methods resulted in statistical differences, recommendations for bicolor establishment consist of broadcasting 0.14 kg/0.04 ha of seed in March on either disked or burned regenerated sites.

Piedmont Region-Kobe Lespedeza

Planting dates, seeding rates, and site preparation methods resulted in significant differences ($P < 0.05$) in relation to Kobe stem averages in 1980 (Tables 4, 5). In 1981, planting dates and site preparation methods resulted in significant differences ($P < 0.05$).

Data from the first sample (1980) indicated Kobe established in January and March produced twice the stem density of Kobe planted in December. The following year, plots established in March produced almost twice the Kobe density of plots established on other planting dates. The consistently more favorable climatic conditions present in March probably resulted in greater Kobe production the second year. Disked sites produced more Kobe stems per plot than burned sites. However, food plots established in March on both disked and burned sites produced greater than 40,000 stems/0.04 ha in 1981.

Table 3. Comparison of Bicolor Lespedeza Stem Count Averages (1980–1981) in Relation to Planting Dates and Site Preparation Methods in Quail Food Plots on Regenerated Pine Sites in the Piedmont Region of South Carolina

	Average Stems Per Site Preparation (per 0.04-ha plot)					
	1980		1981		Average Stems Per Planting Date[a]	
Planting Dates	Disked	Burned	Disked	Burned	1980	1981
10 Dec 1979	119	0	267	30	59	148
25 Jan 1980	0	0	30	30	0	30
14 Mar 1980	2,758	1,008	3,529	1,305	1,883	2,417
Avg. Stems Per Site Preparation	959	336	1,275	445		

[a] Planting dates were significantly different ($P < 0.05$) in 1980 and 1981.

Table 4. Comparison of Kobe Lespedeza Stem Count Averages (1980–1981) in Relation to Planting Dates and Site Preparation Methods in Quail Food Plots on Regenerated Pine Sites in the Piedmont Region of South Carolina

	Average Stems Per Site Preparation[a] (per 0.04-ha plot)				Average Stems Per Planting Date[b]	
	1980		1981			
Planting Dates	Disked	Burned	Disked	Burned	1980	1981
10 Dec 1979	2,373	3,232	42,646	13,761	2,803	28,204
25 Jan 1980	8,246	4,568	16,519	21,709	6,406	19,114
14 Mar 1980	8,393	5,427	65,602	40,600	6,910	53,101
Avg. Stems/ Site Preparation	6,337	4,409	41,589	25,357		

[a] Site preparation was significantly different ($P < 0.05$) in 1980 and 1981.
[b] Planting dates were significantly different ($P < 0.05$) in 1980 and 1981.

In that seeding rate averages were not statistically significant ($P > 0.05$) in 1981, 0.34 kg/0.04 ha of seed broadcast in March on either disked or burned sites should produce a sufficient density of Kobe to provide adequate food for quail.

Longevity Evaluation

Bicolor lespedeza stem count averages from the 15 initial (1979) food plots on disked sites in the Sandhill Region ranged from 593/0.04 ha in 1979 to 712/0.04 ha in 1981. This indicated a reasonably stable bicolor population throughout the 3-year study, although these averages were slightly lower

Table 5. Comparison of Kobe Lespedeza Stem Count Averages (1980–1981) in Relation to Planting Dates and Seeding Rates in Quail Food Plots on Regenerated Pine Sites in the Piedmont Region of South Carolina

	Average Stems Per Seeding Rate[a] (per 0.04-ha plot)						Average Stems Per Planting Date[b]	
	1980			1981				
Planting Date	0.34 kg	0.68 kg	1.36 kg	0.34 kg	0.68 kg	1.36 kg	1980	1981
10 Dec 1979	1,780	4,537	2,091	30,873	38,391	15,347	2,803	28,204
24 Jan 1980	4,003	9,254	5,961	11,833	11,077	34,432	6,406	19,114
14 Mar 1980	5,787	8,318	6,628	52,092	66,016	41,194	6,910	53,101
Avg. Stems/ Seeding Rate	3,855	7,730	4,893	31,599	38,495	30,324		

[a] Seeding rates were significantly different ($P < 0.05$) in 1980.
[b] Planting dates were significantly different ($P < 0.05$) in 1980 and 1981.

Table 6. Recommended Seeding Rates For Bicolor and Kobe Lespedeza for March[a] Establishment of Quail Food Plots on Disked and Burned Regenerated Pine Sites in the Sandhill and Piedmont Regions of South Carolina

Soil Region	Site Preparation	Seeding Rate Per 0.04-ha Plot	
		Bicolor Lespedeza	Kobe Lespedeza
Sandhill	Disked	0.14 kg(0.30 lb)	1.36 kg(3.00 lb)
	Burned	[b]	[b]
Piedmont	Disked	0.14 kg(0.30 lb)	0.34 kg(0.75 lb)
	Burned	0.14 kg(0.30 lb)	0.34 kg(0.75 lb)

[a] Planting dates may vary slightly for various soil types, topographic situations, etc.
[b] Establishing bicolor and Kobe lespedeza food plots by direct seeding on burned regenerated pine sites in the Sandhill Region was not advisable.

than those of similar treatments (March, medium rate) established the following year. Sandhill Region burned sites produced erratic densities (445; 1,127; 890) over the 3-year period which was thought to be a result of counting error or stem sprouts. Poor climatic and soil conditions probably caused the poor Kobe establishment on both disked (3,808; 6,323; 2,313) and burned (4,033; 23,666; 2,966) sites.

Biclor lespedeza in disked area food plots established initially in the Piedmont maintained a constant stem count average (2,224; 2,191; 2,536) from 1979–1981 which was consistent with averages from similar treatments (March, medium rate) in the 1980 food plots. In 1979, Kobe lespedeza averaged 17,327 stems/0.04 ha, which was greater than the average from the 1980 plots with similar treatments (March, medium rate) after their first growing season. Second-year stem production in the 1979 plots was high (36,333/0.04 ha), but not as great as the second-year output of the 1980 food plots. Increasing stem count averages for Kobe in the 1979 plots indicated that it was able to reestablish itself and compete with the native vegetation of the Piedmont.

Summary

Recommendations for seeding rates for the establishment of bicolor and Kobe lespedeza food plots on various site prepared soils in the Sandhill and Piedmont regions of South Carolina are shown in Table 6. Burned study sites in the Sandhill Region did not support an acceptable stand of bicolor or Kobe lespedeza and seeding of these sites is not recommended.

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