2013-2015 Controlling Lespedeza on Reclaimed Mining Land Trial

Sericea lespedeza (*Lespedeza cuneata*) has been used in mine reclamation for many years in the past. It is no longer recommended as it can be aggressive in growth and dominate an area interfering with establishment of other species and regeneration of trees and shrubs. One of the objectives of land managers is to reduce the competitiveness of lespedeza to allow the establishment of a more diverse range of species including native forbs and grasses. A key objective on military bases with lespedeza is to provide a safe site for infantry training as well as habitat for quail / pheasant for hunting. Good habitat for quail is also good for maneuvers. The base land managers use fire to manage the landscape and increase the proportion of desirable prairie species while reducing the amount of lespedeza. The use of herbicides can be effective and cost effective as well. We established this trial to test the use and timing of some herbicides to control lespedeza to facilitate establishment of native grasses and forbs. Another objective was to collect data on the tolerance of these forbs to these herbicides.

Materials and Methods

The trial was established at the Wendell H. Ford Regional Training Center, Greenville Kentucky on an area with a mix of lespedeza and Indian grass with a 6 x 2 factorial set of treatments and 4 replications arranged in a randomized complete block design. The six herbicide treatments also had either dormant seeding done or not. Plots were 10 ft by 30 ft with running unsprayed checks (10 ft) between each of the plots. All applications were at 20 gallons per acre and included a non-ionic surfactant (Activator 90) at 0.25% v/v.

Table 1 lists the herbicide treatments with their active ingredients, application rates, and application dates. The application rates were set for an anticipated cost of approximately $15-16 per acre and may not have been optimal for control of lespedeza. Opensight was applied at 3.3 oz per acre (Trt. 1, 2, 7, and 8) and the label recommended 2.5 to 3 oz applied at the beginning of flower initiation through full bloom. Milestone was applied at 3 fl oz per acre in combination with PastureGard and Garlon 4 while the label recommends 5 to 7 fl oz when applied by itself to control annual lespedeza. PastureGard was applied at 12 fl oz per acre in combination with Milestone while the label recommends 12 to 24 fl oz when applied by itself. The 12 fl oz rate is recommended when the lespedeza plants are 12 to 15 inches tall in the late spring to early summer prior to bloom. The 24 fl oz rate is recommended for dense stands and later stages of growth. Garlon 4 Ultra was applied at 1 pt per acre in combination with Milestone and the label recommends 1.5 pt when applied by itself.

The first applications of Opensight, PastureGard + Milestone, and Garlon + Milestone were in the early fall on September 26, 2013 (treatments 1 to 6), with the lespedeza at 36 inches height, marestail at 50 inches, common ragweed at 45 inches, annual marsh elder at 42 inches and Indian grass at 70 inches. The second application of Opensight was on October 21, 2013 (treatments 7 and 8). There was no distinct visual difference between the previously sprayed plots and

unsprayed strips. Dormant seeded plots were sown March 18, 2014 by mixing the seed mix with vermiculite to increase the volume and then broadcasting it over the plot areas. The rate and composition of the seed mix is listed in Table 2. We waited until the snow had melted to ensure more even distribution of seed as we did not want the seed washing away with the melting snow. However, the seed may not have had good contact with the soil and a dry period in the spring may have reduced the establishment of any seedlings. The trial area was not burned while the surrounding area was part of the scheduled prescribed burn in the early spring. The last set of applications of Opensight, PastureGard + Milestone, and Garlon + Milestone were in the spring on June 8, 2014 (treatments 9 to 12) with the lespedeza at 24-36 inches height and the common ragweed at 12 inches.

Lespedeza control (%) was assessed at the time of the last application on June 6, 2014 for treatments 1-6 (253 Days after Treatment) (DAT) and 228 DAT for treatments 7-8. Lespedeza control (%) was assessed on October 23, 2014 as well as % cover of lespedeza, grasses, other broadleaves, and bare ground (Table 3). Percent cover of lespedeza, grasses, other broadleaves, and bare ground was assessed on October 7, 2015 (Table 4). Data were analyzed using ARM software and treatment means were compared using Fisher's Protected LSD at p = 0.05. Data columns in Tables 3 and 4 with *ns* have treatment means compared using Fisher's LSD where the overall P was greater than 0.05.

Results and Discussion

The spring following the fall applications of Opensight had good control (94%) of lespedeza but less control when applied later in the season (83 to 89%) (Table 3). The fall applications of PastureGard + Milestone and Garlon + Milestone were less effective. Application in late summer on smaller plants may have been more effective.

A year after our fall application (392 DAT) the first Opensight treatment (Trt. 1-2) still had good control (73 to 81%) (Table 3) while the late fall application (367 DAT) (Trt. 7-8) had lower control (32 to 43%). The spring applications of PastureGard + Milestone and Garlon + Milestone had good control of lespedeza (94 to 98%) 139 DAT. These treatments, along with the early Opensight treatment, had 3 to 27% lespedeza cover and 78 to 52% grasses as vegetative cover. The grasses were predominantly previously established Indian grass. There was a mix of other broadleaf species but most of the cover was from common ragweed. No plants from the dormant seeding were observed at any of the assessments. Perhaps we would have had better results if had sown the seed mix on the snow so it had good moisture availability early in the season.

By fall in 2015 (741 DAT), lespedeza was dominant in many plots (Table 4). We still had good control with the early Opensight (55 to 65% cover) and spring applications (14 to 31% cover). These treatments had 31 to 84% grasses as cover. There were not many other broadleaf species

at this end of season rating. We had a wet July with 4.6 inches more precipitation than the long-term average that may have resulted in good growth of the lespedeza and Indian grass plants.

An early fall application of Opensight was effective for lespedeza control while a very late application was not. Fall applications of PastureGard + Milestone and Garlon + Milestone were not very effective but spring applications were more effective. This is when the plants were smaller and actively growing. Controlling lespedeza resulted in more growth of already established grasses like Indian grass. Herbicides can be effective management tools in promoting desirable prairie species.

Brooke, J.M., and Harper, C.A. 2016. Herbicides are Effective for Reducing Dense Native Warm-season Grass and Controlling a Common Invasive Species, Sericea Lespedeza. Journal of the Southeastern Association of Fish and Wildlife Agencies 3:178–184

Dow Agrosciences, 2012. Invasive Plant Management with Milestone® and Other Herbicides: A Practical And Technical Guide For Natural Area Managers

Table 1. Treatments and Active Ingredients for Lespedeza Control Trial

Trt. No.	Product	Rate per Acre	Active Ingredient(s)	ai Rate (per Ha)	Dormant Seeding	Application Date
1	Opensight	3.3 oz	aminopyralid + metsulfuron	121 g ae + 22 g	No	September 26, 2013
2	Opensight	3.3 oz			Yes	
3	PastureGard HL Milestone	12 fl oz 3 fl oz	triclopyr + fluroxypyr aminopyralid	315 g ae + 105 g ae 53 g ae	No	
4	PastureGard HL Milestone	12 fl oz 3 fl oz			Yes	
5	Garlon 4 Ultra Milestone	1 pt 3 fl oz	triclopyr aminopyralid	560 g ae 53 g ae	No	
6	Garlon 4 Ultra Milestone	1 pt 3 fl oz			Yes	
7	Opensight	3.3 oz	aminopyralid + metsulfuron	121 g ae + 22 g	No	October 21, 2013
8	Opensight	3.3 oz			Yes	
9	PastureGard HL Milestone	12 fl oz 3 fl oz	triclopyr + fluroxypyr aminopyralid	315 g ae + 105 g ae 53 g ae	No	June 6, 2014
10	PastureGard HL Milestone	12 fl oz 3 fl oz			Yes	
11	Garlon 4 Ultra Milestone	1 pt 3 fl oz	triclopyr aminopyralid	560 g ae 53 g ae	No	
12	Garlon 4 Ultra Milestone	1 pt 3 fl oz			Yes	

All treatments included Activator 90 @ 0.25% v/v
Dormant seeded plots were sown March 18, 2014. However no plants from this were observed at any of the assessments.

Table 2. Species composition of IL CP33 Seed Mix

IL CP33 Tall-Grass Pheasant Habitat Mix

Seeding Rate: 3.24 lb/ac (19.8 seeds/ft^2)

Notes: Habitat Buffers for Upland Birds

Scientific Name	Common Name	% of Mix	Seeds/ft^2	Rate/Acre	Units	Tolerance to Milestone
GRASSES						
Andropogon gerardii	Big Bluestem	15.41	1.8	0.50	PLS lb	
Bouteloua curtipendula	Sideoas Grama	15.41	1.1	0.50	PLS lb	
Schizachyrium scoparium	Little Bluestem	30.83	5.5	1.00	PLS lb	
Sorghastrum nutans	Indiangrass	15.41	2.2	0.50	PLS lb	
FORBS						
Chamaecrista fasciculata	Partridge Pea	3.85	0.1	2.00	PLS oz	
Dalea candidum	White Prairie Clover	3.85	0.9	2.00	PLS oz	
Dalea purpurea	Purple Prairie Clover	3.85	0.7	2.00	PLS oz	T
Desmanthus illinoensis	Illinois Bundle Flower	3.85	0.2	2.00	PLS oz	
Echinacea pallida	Pale Purple Coneflower	1.93	0.1	1.00	PLS oz	
Lespedeza capitata	Round-headed Bush Clover	0.96	0.1	0.50	PLS oz	MS
Penstemon digitalis	Foxglove Beardtongue	0.39	0.6	0.20	PLS oz	
Ratibida pinnata	Yellow Coneflower	1.39	0.7	1.00	PLS oz	S
Rudbeckia hirta	Black-eyed Susan	1.39	2.1	1.00	PLS oz	MT
Veronicastrum virginicum	Culver's Root	0.39	3.7	0.20	PLS oz	

T = Tolerant
MT = Moderately Tolerant
MS = Moderately Susceptible
S = Susceptible

Table 3: Results for Lespedeza Control Trial (2014)

					Rated June 6, 2014		Rated October 23, 2014					
Trt. No.	**Product**	**Rate per Acre**	**Dormant Seeding**	**Application Date**	**Days After Application**	**Lespedeza Control (%)**	**Days After Application**	**Lespedeza Control (%)**	**Lespedeza (% cover)**	**Grasses (% cover)**	**Other Broadleaf (% cover)**	**Bare Ground (%)**
1	Opensight	3.3 oz	No	September 26, 2013	253	94 *a*[1]	392	73 *b*	27 *d*	62 *ab*	12 *abc*	0 *b*
2	Opensight	3.3 oz	Yes		253	94 *a*	392	81 *b*	19 *de*	51 *bc*	20 *ab*	10 *ab*
3	PastureGard HL Milestone	12 fl oz 3 fl oz	No		253	54 *d*	392	38 *c*	60 *bc*	11 *e*	21 *a*	9 *ab*
4	PastureGard HL Milestone	12 fl oz 3 fl oz	Yes		253	58 *d*	392	40 *c*	49 *c*	20 *de*	19 *ab*	14 *ab*
5	Garlon 4 Ultra Milestone	1 pt 3 fl oz	No		253	38 *f*	392	19 *e*	81 *a*	10 *e*	9 *bc*	1 *b*
6	Garlon 4 Ultra Milestone	1 pt 3 fl oz	Yes		253	43 *e*	392	25 *de*	75 *ab*	8 *e*	11 *abc*	4 *b*
7	Opensight	3.3 oz	No	October 21, 2013	228	83 *c*	367	32 *cd*	66 *abc*	26 *de*	3 *c*	5 *b*
8	Opensight	3.3 oz	Yes		228	89 *b*	367	43 *c*	58 *bc*	39 *cd*	4 *c*	0 *b*
9	PastureGard HL Milestone	12 fl oz 3 fl oz	No	June 6, 2014	0	0 *g*	139	94 *a*	6 *e*	58 *abc*	19 *ab*	15 *ab*
10	PastureGard HL Milestone	12 fl oz 3 fl oz	Yes		0	0 *g*	139	96 *a*	5 *e*	52 *bc*	16 *ab*	25 *a*
11	Garlon 4 Ultra Milestone	1 pt 3 fl oz	No		0	0 *g*	139	98 *a*	3 *e*	77 *a*	14 *abc*	6 *b*
12	Garlon 4 Ultra Milestone	1 pt 3 fl oz	Yes		0	0 *g*	139	97 *a*	3 *e*	78 *a*	9 *bc*	11 *ab*
										ns		

All treatments included Activator 90 @ 0.25% v/v

Dormant seeded plots were sown March 18, 2014. However no plants from this were observed at any of the assessments.

[1]Means followed by the same letter are not different according to Fisher's LSD at P < 0.05. Data columns with ns have treatment means compared using Fisher's LSD where the overall P was greater than 0.05

Table 4: Results for Lespedeza Control Trial (2015)

					Rated October 7, 2015				
Trt. No.	**Product**	**Rate per Acre**	**Dormant Seeding**	**Application Date**	**Days After Application**	**Lespedeza (% cover)**	**Grasses (% cover)**	**Other Broadleaf (% cover)**	**Bare ground (%)**
1	Opensight	3.3 oz	No	September 26, 2013	741	55 c[1]	43 b	3 ab	0 b
2	Opensight	3.3 oz	Yes		741	65 bc	31 bc	4 ab	0 b
3	PastureGard HL Milestone	12 fl oz 3 fl oz	No		741	96 a	3 d	1 ab	0 b
4	PastureGard HL Milestone	12 fl oz 3 fl oz	Yes		741	84 ab	15 cd	1 ab	0 b
5	Garlon 4 Ultra Milestone	1 pt 3 fl oz	No		741	99 a	1 d	0 b	0 b
6	Garlon 4 Ultra Milestone	1 pt 3 fl oz	Yes		741	96 a	2 d	1 ab	1 a
7	Opensight	3.3 oz	No	October 21, 2013	716	94 a	6 d	1 ab	0 b
8	Opensight	3.3 oz	Yes		716	97 a	2 d	1 ab	0 b
9	PastureGard HL Milestone	12 fl oz 3 fl oz	No	June 6, 2014	488	31 d	65 a	4 ab	0 b
10	PastureGard HL Milestone	12 fl oz 3 fl oz	Yes		488	25 d	70 a	5 a	0 b
11	Garlon 4 Ultra Milestone	1 pt 3 fl oz	No		488	17 d	81 a	3 ab	0 b
12	Garlon 4 Ultra Milestone	1 pt 3 fl oz	Yes		488	14 d	84 a	3 ab	0 b
								ns	ns

All treatments included Activator 90 @ 0.25% v/v

Dormant seeded plots were sown March 18, 2014. However no plants from this were observed at any of the assessments.

[1]*Means followed by the same letter are not different according to Fisher's LSD at P < 0.05. Data columns with ns have treatment means compared using Fisher's LSD where the overall P was greater than 0.05*