Kansas State University

Bressner Pasture Field Day

Wednesday, September 14, 2005
Yates Center, Kansas

Kansas State University
Bressner Pasture Field Day
September 14, 2005

BRESSNER PASTURE FIELD DAY

Effects of Grazing Systems on Cattle and Grass
(2000-2004)
Wednesday, September 14, 2005
4-H Building
Woodson County Fairgrounds, Yates Center, Kansas
(Two blocks south of Hwy 54/75 intersection)

8:00 a.m. to 8:45 a.m. — On-site Registration — Refreshments — View Exhibits

Program	Speaker
Bressner Pasture Grazing System Animal Performance 2000 - 2004	Dr. Frank Brazle
Effects of Grazing System on Grass Composition and Production	Gary Kilgore
Economics of Grazing Systems on Livestock Returns	Dr. Rodney Jones & Sarah Fogleman
Electric Fencing: Update	Herschel George
Livestock Water: Tank vs Ponds	Warren Bell
Technology Tools for Individual Animal I.D.	Dr. Dale Blasi
Lease Hunting	Charles Lee
Sericea Lespedeza: Update	Jeff Davidson

Sponsored Lunch

Pre-registration is necessary for lunch count.
Please call the Woodson County Extension Office, 620-625-3113, by Friday, September 9.

Short program to follow lunch — will conclude by 2 p.m.

Who's Who

Dr. Frank Brazle	Retired Extension Specialist, Livestock Production, SE
Gary Kilgore	Extension Specialist, Crops & Soils, SE
Dr. Rodney Jones	Livestock Production/Marketing Specialist, KSU
Sarah Fogleman	Extension Agricultural Economist, SE
Herschel Geroge	Watershed Specialist, Marais des Cygnes River
Warren Bell	Watershed Specialist, Lower Neosho River
Dr. Dale Blasi	Beef, Forage, Nutrition Specialist, KSU
Charles Lee	Wildlife Damage Control Specialist, KSU
Jeff Davidson	Greenwood County Agent, ANR

K-State Research & Extension

Bressner Range Research Project

by Dale L. Lanham

The Bressner Range Project involves adjacent half-sections of native grass near Yates Center. The KSU Foundation received this land valued at over $128,000 through the Willie J. Bressner estate in 1988. This property was donated without restrictions, but Mr. Bressner requested that it be utilized as an experimental project to study the preservation and the use of native grasses.

The Bressner Pasture committee was formed in the fall of 1988 to determine the feasibility of running a research pasture in southeastern Kansas. After securing a five-year lease from the Kansas State University Foundation, the committee started the process of making this land a research pasture. We agreed to study the effects on the range composition, stocking at typical stocking rates for our area. Half of the pastures were stocked until July 15 and the other half were stocked until August 15. We wanted to know if we were changing the range over time with these systems. Cattle gains, as well as cattle economics, would be important, but the main emphasis would be the effects on the native grass.

In 1989, the pasture was run as a complete unit to try to make the pasture more uniform. During the prior year, the cattle had over-grazed the east side but had very little grazing pressure on the west half section. Income from the rent in 1989 was used to start the cross fencing into the eight pastures as they are currently being used. The pasture was leased to the highest bidder which was Pringle Ranch.

The 1990 pasture contract allowed for 241 head of 500 to 600 weight steers to be grazed from April 20 until July 15 (146 head) and August 15 (95 head). All cattle were individually weighed in and individually weighed out. Different colored ear tags were used for the eight pastures. The first range survey was taken this year.

The 1991 pasture contract allowed for 241 head of steers, with the same dates for removal as in 1990. However, in early May, there was a hail storm that completely eliminated the grass in the southwest pasture on the west half section. Due to the hail storm, 15 head of cattle were removed from this pasture for this season. Again, Pringle Ranch was the high bidder for this year's contract.

1n 1992, the pasture contract was the same as the past two years. We started planning for our first field day. In July, Ron Wells, local stockman and committee member, was killed in an accident. In August, Clyde Hill, a committee member and the person most responsible for Kansas State University receiving this land from Bill Bressner's estate died suddenly at his home in Yates Center. The first field day was a success with over 350 people in attendance. Sericea lespedeza was sprayed for the first time.

Pringle Ranch was the high bidder for the 1993 pasture season. No changes were made in the contract this year. We spot sprayed several pastures for sericea lespedeza this year.

1994 brought several changes to the contract: Increase the head count to 261 head, change the beginning date from April 20 back to April 25, and agree that we will not allow any cattle to be fed hay in these pastures. It appeared that some of the sericea lespedeza problems were coming into the pasture with hay. On March 10, 1994, a truck going east on 54 Highway lost the emergency brake which started a fire that burned approximately 80 acres on the west half section. The rest of the pasture was burned as usual around the second week of April. Again Pringle Ranch was the high bidder for this year. We also looked at the nutrient value of the standing dormant native grass; and when all the results were in, there was no difference between the ungrazed grass, or the aftermath from the ½ season grazing or the aftermath from the 3/4 grazing. The second range survey was completed in June of 1994.

Hay Capital Feeders was the highest bidder for the 1995 contract. Contracts for this pasture are sent out to prospective bidders, and the results are sent to all the bidders by mid-February each year. We did not spray for sericea lespedeza this fall due to the dry weather.

Hay Capital Feeders was awarded the contract again in 1996. In the spring of 1996, there was a burning ban in Woodson County due to extremely dry conditions. On April 24, we received a light shower, so on the morning of the 25th we did burn the east ½ section but not the west ½ section. During the first four years, the cattle gains have been the best on the west ½ section. By burning the east ½ section and not the west, we changed cattle gains by 24 pounds due to the burn. The cattle were turned out the afternoon that we burned, and no additional forage was provided. Surprisingly, the steers appeared to be more content with less running the fence on the burned grass compared to the unburned pastures.

Edgar Beecher was the high bidder for the 1997 and 1998 grazing seasons. This research project is very unique in that it is self supporting and receives no tax funds. Each year, we have been able to continue to build new fences which add up to 4 ½ miles of barbed wire fences, and about 3 miles of electric fences, add several new water sources, gravel roads into the corrals, built two corral systems, and attempt to keep the sericea lespedeza in check. Approximately 400 people attended the 1998 field day.

Kimbell Ranch was the high bidder for the 1999 Bressner Pasture for 313 head. We doubled stocked all eight pastures until July 15, to even out the pastures from the previous years. As we were working the cattle at Kimbell Ranch, we had the misfortune to kill a steer in the head gate. We were very fortunate to have a great group of cooperators who have furnished cattle to be used on the Bressner Pasture Research project. Bressner committee did pay for the dead steer.

2000 brought about a new study for the Bressner Pasture in which all pastures were double stocked until July 15 and four pastures were fall grazed for approximately 75 days. Kimbell Ranch was again the successful bidder for the grass for 313 head. The old corrals were made of very light weight portable panels, so we rented a good set of portable corrals from the Yates Center Elevator to help at weigh in and weigh out. The Bressner Pasture Committee purchased 79 head of steers in late September to be put on 4 of the pastures for the fall grazing trial. Gary

Kilgore had measured the standing forage and with Frank Brazle's calculation we stocked the following pastures: 1-43 head, 3-4 head, 6-15 head, and 8-12 head. Yes, I did add right and it doesn't equal 79 head that we purchased. As with a lot of cattle that was being purchased at that time of year we had some major health problems and we did lose several! Left cattle on Bressner pasture until November 30 and sent them to Pratt Feeders in Pratt. Sold ½ interest to the feedlot to "protect" our money. Right decision, just too much death lost early.

Kimbell Ranch was the successful bidder for the 2001 season. Piqua Coop spot sprayed over 200 acres in late August of sericea lespedeza. Bressner Pasture Committee purchased 68 steers for the fall grazing trail. We purchased bigger-older steers and had less health problems.

In 2002, local welder Jerry Steinforth and his crew replaced the old light temporary panels with two new corrals. These 100 X 100 foot corrals have a runway, head gate, and 5 pens inside with lots of gates which makes it possible to pen all four of the pastures and still keep them separate by pasture. We spent over $1,000 spot spraying for sericea lespedeza. Reed Ranch was the high bidder for this years grass. Purchased heifers for the fall grazing trial. Used the news corrals to work the cattle and kept them penned for 4 days before turning out to the 4 pastures. Had less health problems than previous years.

2003 contract was awarded to Eldon & Scott Lanham for 313 head of double stocked steers. New for this year was the option of having the pasture for two years. Added anti-backups in the alley way and a couple of new quick latches. Also added a short walk-way near the head gate. Again purchased heifers for the fall study, cattle feeding was finally profitable.

In 2004 Eldon and Scott Lanham retained the pasture from the 2003 contract. Had a chance to lease the fall grass to Ronnie Reynolds and did so. Dale fed and took care of them and Ronnie furnished the feed and heifers. This did save the Bressner Pasture Committee some money.

2005 Ronnie Reynolds had the lease. New this year was the use of mico-chip ID's and it was definitely a learning experience. We worked on the solar water pump that supplies water for pastures 1 & 5. Cattle also have access to the pond and several springs in the pasture which kept water in the sloughs most of the spring. Warren Bell will report on this project during this field day. Gary Kilgore did another range survey this year.

We have had excellent cooperation from the cattle owners who have allowed the Bressner Pasture to work as a research pasture. I would like to personally thank the many County Agents who have helped by weighing cattle over the years. That group would include: Darren Hibdon-Franklin Co, Warren Bell-Retired Coffey Co, Rod Schaub-Osage Co, Jeff Davidson-Greenwood, Jim Mengarelli-Crawford Co, David Kehler-Butler Co, Mark Schuler-Linn Co, Brian Creager-Retired Lyon Co, Joe Smith-Retired Montgomery Co, and Mike Holder-Chase Co.

The KSU Foundation has extended the lease to the Bressner Pasture Committee until December, 2010, and we are eagerly looking forward to a new study on "Patch-burning".

Bressner Pasture KSU Scholarships

Bill Bressner Estate gave this section of grassland to Kansas State University Foundation with the request that the pasture be used for research. Along with this request, was that some of the income from the rent of this pasture be used for scholarships for students from Woodson County to attend Kansas State University. In keeping with this request, the following scholarships have been given.

1993 $500 - Wade Collins
1995 $500 - Chris Stockebrand
1996 $500 - Cheri Adams
1997 $500 - Quentin Stoll
1998 $500 - Erin Solomon
1998 $300 - Josh Troyer
1998 $200 - Josh Stockebrand
1999 $500 - Justin Weseolh
1999 $500 - Nathan Weber
2000 $500 - Tara Solomon
2001 $500 - Jeff Barney
2003 $500 - Terryl Mueller
2004 $500 - Garrett Eggers
2005 $500 - Zack Morrison

Bressner Pasture Grazing Report
5-year Data
Effect of Fall Grazing on Following Summer's Gains

Frank Brazle, Dale Lanham, Twig Marston

Introduction

Many Flint Hills stocker operations utilize Intensive Early Stocking management. This management scheme grazes native-grass pastures with stocker cattle during the first months of summer (late April to mid-July) and takes advantage of high quality forage growth. After cattle are removed from pastures, the grass plants are allowed to rest, complete their life cycles, and establish carbohydrate reserves. Oftentimes weather conditions will allow abundant plant regrowth during the last half of the summer. During late summer, the plant matures and its nutritive value declines. Many cattle producers would like to graze this low-quality forage if no harm would be done to the desirable pasture grasses or the next year's cattle performance. Typically, the cattle used to graze this dormant native grass would be calves started in the fall, cows, and/or yearlings. Fall grazing has the potential to reduce the amount and cost associated with feeding mechanically harvested forages. However, concerns about animal performance and range conditions persist. With these facts in mind, the objective of this study was to determine if fall grazing following intensive early stocking would have an effect on the subsequent summer stocker cattle gains.

Material and Methods

Eight native grass pastures located near Yates Center, Kansas were randomly allotted to treatments. Treatments consisted of: 1)stocker cattle grazed following the guidelines of a normal Intensive Early Stocking program, or 2)stocker cattle grazed following the same guidelines as Treatment 1 plus pastures were grazed in the fall. The intended outcome of treatment 2 was to have about 800 lb of forage per acre left after fall grazing for spring pasture burning. Therefore, the methods used to determine stocking rate for fall grazing on native grass were as follows:

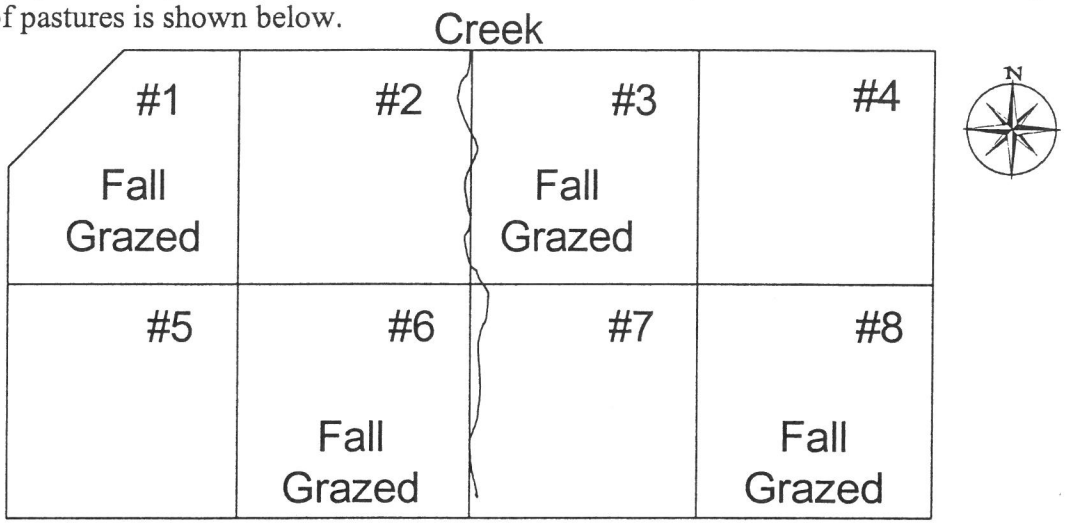
Lb of D.M. of available forage/acre - 800 lb = lb of forage × .33 = (harvest efficiency) = lb of forage to be consumed by cattle/acre

Stocking rate = acres × lb of forage consumed ÷ 2% of body weight of cattle × days = number of cattle/pasture

Example: 80 acre pasture with 1,100 lb of available forage per acre to be grazed by 500 lb steers for 60 days (October 1 to December 1).

1,100 lb - 800 = 300 lb × .33 = 99 lb available forage for consumption
Available forage = 80 acres × 99 lb = 7,920 lb
Predicted animal consumption = 500 lb × 2% = 10 lb × 60 days = 600 lb/head
Stocking rate = 7,920 ÷ 600 = 13 head per 80 acres (500 lb steers for 60 days)

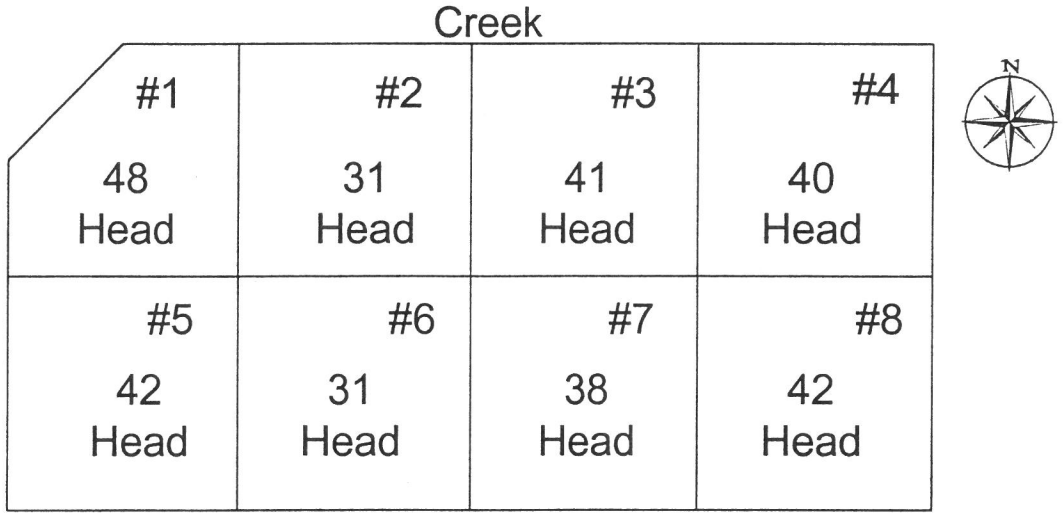
Fall grazing was completed in October and November. Pastures 1, 6, 3, and 8 were fall grazed. A map of pastures is shown below.



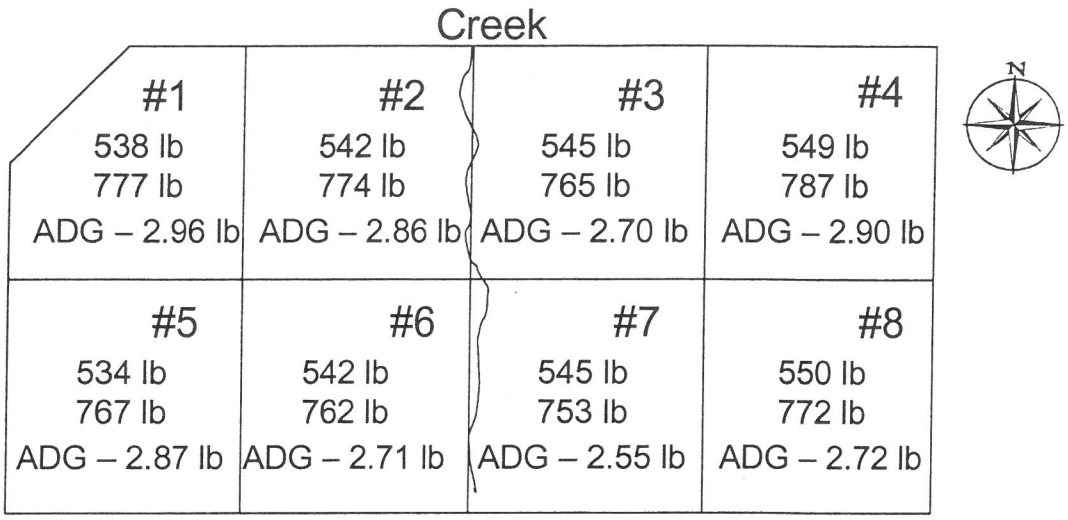
The fall grazing periods varied from 44 to 67 days. Fall grazing was accomplished in years 2001, 2002, 2003, and 2004 with 500 to 600 lb steers or heifers. Fall-grazing cattle were supplemented with 5 lb of corn gluten feed/head/day. The following spring, each pasture was stocked by predicting the AUM carrying capacity of the individual pastures.

Summer Grazing pastures Stocking Rates

The pastures were grazed with 500 to 600 lb steers for the summers of 2001, 2002, 2003, 2004, and 2005. For years 2001 to 2004, the 625 acres (8 pastures) wee stocked with 313 hd steers (500 - 600 lb) and grazed from April 22 to July 15 (84 days) — resulting in an average stocking rate of one steer per 1.99 acres.



Results of 5 Years of Research (spring grazed) Shown by Pasture



*First number represents average starting weight; second number = out weight.

Results of Intensive Early Stocking

Table 1. Summer stocker cattle performance

	Starting & Fall Grazing	Summer Grazed Only	P-Value
Starting wt, lb	544	543	
Ending wt, lb	769	770	0.665
ADG, lb	2.77	2.79	0.665

This table clearly shows no difference in the average daily gain of stocker cattle regardless if pastures were fall grazed or rested.

The data collected for the fall grazed cattle (with 5 lb supplemental corn gluten feed/head/day) is shown in Table 2.

Table 2. Summary of the fall grazing periods.

	Year				
	2000	2001	2002	2003	2004
No. of cattle	74	62	74	77	91
No. of grazing days	62	55	67	52	44
In wt, lb	512	541	599	564	534
ADG, lb	1.41	1.44	1.39	1.47	1.36

It appears from these data that cattle producers can take advantage of fall grazing to increase the production of beef per acre of pasture without compromising normal summer animal performance.

Summary

Native grass can be fall grazed (in October and November) following normal half-season grazed pasture (Intensive Early Stocking) when regrowth occurs without negative impact on the following year's summer animal performance. However, guidelines must be used in determining fall grazing stocking rates to ensure desired amount of grass so that native grass pastures can be burned in the spring.

Bressner Pasture Grazing Report

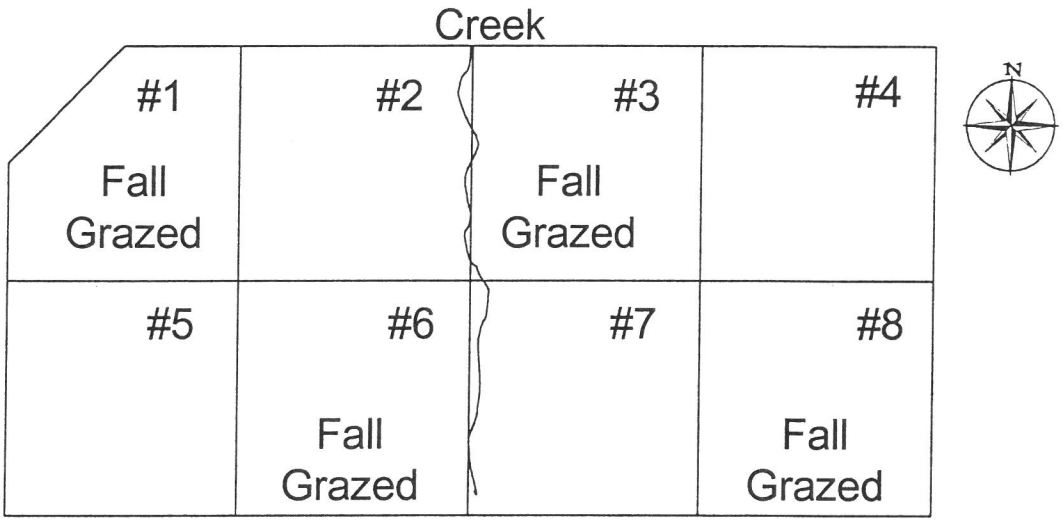
Effect of Fall Grazing on Early Intensive Grazed Pastures: Plant Changes

Gary L. Kilgore
K-State Research & Extension
Crops and Soils Specialist, Southeast

Introduction

The effect of any grazing system on plant growth is very important. Ranchers wish to maximize animal performance and not reduce the composition or production of the grazed unit. So animals must be stocked with the number of animals based upon unit size, animal size, grass production, and length of grazing system.

Method and Materials



This study, conducted on the Bressner pasture, 2001 - 2004, involved stocking all 8 pastures with yearling steers from late April to July 15 (Early Intensive Grazing System). Four pastures were then restocked with yearlings each fall and grazed from 44 - 67 days completed in late October or November. The method to determine fall stocking rate is discussed in the preceding report by Dr. Frank Brazle. It had previously been determined that 800 pounds of forage dry matter per acre must be left after fall grazing to have enough fuel for a complete spring burn. *This stocking rate calculation is very important for this study*. One could stock too heavy and not get a complete burn the following spring. That would affect how cattle grazed and distribution of grazing the next year.

The amount of forage dry matter was determined by measurements in each pasture in early September of each year. Calculations were made and animals stocked accordingly each fall.

Range plant composition data was taken before the grazing trial began and again in June, 2005. The Step Point method was used to determine plant frequency in the clay upland range sites in each pasture. Over 1,000 points were used to evaluate plant makeup.

All data is presented in Tables 1, 2, and 3.

Table 1. Range plant inventory, Bressner Pasture, 1998 and 2005

	Pasture Number - Year															
Plant	1*		2		3*		4		5		6*		7		8*	
	98	05	98	05	98	05	98	05	98	05	98	05	98	05	98	05
Big Bluestem	33	36	32	38	45	40	38	38	40	45	37	29	40	43	49	39
Little Bluestem	19	14	16	11	11	12	20	14	17	14	18	15	16	19	8	10
Indiangrass	9	13	22	21	8	14	17	20	20	18	25	21	13	10	14	24
Switchgrass	29	31	14	17	18	20	13	19	10	12	8	16	8	10	13	20
Side Oats Grama	1	0	2	0.02	2	4	1	0	2	1	1	1	5	5	2	0
Sedges	2	0	1	.009	4	3	2	1	2	0	4	4	2	4	5	2
Total Perennial Grass	93	94	89	87	85	93	90	92	90	90	91	86	85	91	88	95
Total Perennial Forbs	3.1	2.9	6.8	0.9	7.5	3.4	3.0	2.0	6.4	5.0	3.6	9.5	8.7	5.0	1.0	2.0
Total Annual Forbs	1.8	1.0	1.8	1	3.6	1.5	4.5	1.5	1.6	2.0	1.8	2.4	3.8	2.1	4.5	3.9
	% Basal Cover															
Perennial Grass	18.4	23	16.1	18.0	27.6	25.1	20.2	21.0	17.7	19.4	21.2	18.1	18.6	18.0	18.1	19.1
Perennial Forbs	1.1	1.0	0.7	1.0	2.2	2.0	0.5	0.1	1.6	2.0	0.6	3.3	8.7	4.1	1.0	2.4
*Fall grazed, in addition to spring grazing																

Table 2. Change in percentage composition - 1998 to 2005

	Pasture Number							
	1*	2	3*	4	5	6*	7	8*
Plant	**Change in %**							
Big Bluestem	3	6	-5	0	5	- 8	3	- 10
Little Bluestem	- 5	- 5	1	- 6	- 3	- 3	3	2
Indiangrass	4	- 1	6	3	- 2	- 4	- 3	10
Switchgrass	4	3	2	6	2	8	2	7
Side Oats Grama	- 1	- 1	2	- 1	- 1	0	0	- 2
Total Perennial Grass	1	- 2	8	2	0	- 5	6	7
Total Perennial Forbs	- 0.2	- 5.9	- 4.1	- 1.0	- 1.4	5.9	- 3.7	1
	% Basal Cover Change							
Perennial Grass	4.6	2	-2.5	.8	1.7	-3.1	- 0.6	1.0
Perennial Forbs	- 0.1	0.3	- 0.2	- 0.4	0.4	2.7	- 4.6	1.4
*Fall grazed, in addition to April - mid-July, 2001 - 2005								

Table 3. Effect of grazing system in grass change, 1998 - 2005

Fall Grazed	Total Perennial Grass	Total Perennial Forbs
1	4.6	- 0.1
3	- 2.5	- 0.2
6	- 3.1	2.7
8	1.0	1.4
Av	0.0	1.1
Not Fall Grazed		
2	2.0	0.3
4	0.8	- 0.4
5	1.7	0.4
7	- 0.6	- 4.6
Av	3.9	- 4.3

Results

1. Stocking rate calculations proved accurate to provide forage for fall grazing and have enough fuel left for successful spring burn.

2. Fall grazing did not result in lower grass production the following year.

3. Total perennial grass composition did not change during the trial on the fall grazed pastures. However, there was a 3.9% increase in plant numbers in pastures not fall grazed.

4. Total perennial forbs increased by 1.1% in the fall grazed pastures and decreased 4.3% in the pastures not fall grazed.

5. Big bluestem grass decreased in 3 of the 4 pastures fall grazed. But switchgrass increased in all 8 pastures.

6. Pasture number 6 showed a 2.7% increase in perennial forbs (goldenrod and ironweed) when fall grazed. The other fall grazed pastures 1, 3, and 8 showed very little change.

7. There was some difference between pastures with same grazing treatment, but when averaged by grazing treatment, very little change in plant composition occurred.

8. Based upon this research and all the methods and materials used in this study, results indicate that ranchers in this region of Kansas can double-stock their pastures and follow up with limited fall grazing and not damage their rangeland.

9. However, guidelines must be used in determining fall stocking rates to ensure that the desired amount of fuel (native grass) is present for a successful burn the following spring.

DIVIDING PASTURES BY USING ELECTRIC FENCES

Dale Lanham, Herschel George

Electric fences were installed on the Bressner Pastures in the spring of 1990 to separate pastures and have not been changed much over the past 15 years.

On the east side of the creek, Insultimber (ironwood) posts were used which require no insulators. These 5 foot posts cost $3.25 and were driven approximately 30 feet apart. A three wire fence was used, with the top and bottom wires being hot and the middle wire a ground wire with porcelain insulators on the corners. These pastures are burned every year and the posts have held up very well. However if a steer runs straight into a post, it will snap! But the high tensile wire has never broken.

On the west side, 5 ½ foot fiberglass rod posts were used. These posts are very easy to install and cost $1.87 each. These were also driven approximately 30 feet apart. Over the past 15 years, there have been problems with the posts pulling up in the draws, and needing to be reset at least a couple of times a year in these areas. On the flat land, the posts have settled several inches lower than they were originally driven. The three clips that hold the high tensile wire do have a tendency to give, and we have had more problems with the wires wrapping together when deer hit the fence. Sunlight and weather appear to have made the fiberglass posts deteriorate. Leather gloves are required when working with posts that have been here for several years. Black polyethylene insulators were used on this side; however, there are very few of them left as they have split and are being replaced with the porcelain insulators.

The corrals were rebuilt in 2002, and placement of the electric fence around them was improved at that time. The new system encloses the electric wire in 3/4 inch plastic pipe along the pipe fences. The electric wire is run up and over the gates rather than being buried. The old corrals had the electric wire elevated above the corral pipes a few inches and several times, as workers were rushing to get out of the way of a contrary steer, they would end up touching the electric wire for a shocking experience. Not good for worker retention!

Lightning arresters helped protect the fence chargers, and have been changed several times. Most problems with an electric fence can be solved with a good grounding system. Both sides of the creek still run separate fence chargers, so that if one goes down, a wire can be run a few feet and connect the two sides together. The deep cycle marine batteries which power the fence chargers are kept charged by solar panels. Batteries have lasted 3 to 5 years.

Many livestock producers worry about the effectiveness of electric fences, and most of the cattle owners question if a three wire fence would keep their cattle separated. As individual calves are weighed, 2 to 3 are turned out together and problems are few. However, if only one calf is turned out at a time and they see another calf in the next pasture running away, the single calf would

sometimes not slow down and would go through the fence. A 5 wire barb wire fence is used on the west pastures between the corral and the pond, and calves go through it almost as much as through the electric fence. When driving parallel to these fences, several holes in the ground can be seen (about 2 feet long, 2 feet wide and about 8 inches deep). These were dug by some late cut steers that stood across the electric fence and pawed and bellowed at each other all summer, but never did cross the fence to fight.

Electric Fences can work very well with very little maintenance.
A few suggestions to consider:

1. Use high tensile wire
2. Use porcelain insulators to hold tension in the corners in pastures that will be burned.
3. Consider using larger diameter posts in the bottom of draws where the posts tend to pull out of the ground.
4. An adequate grounding system is essential for dry weather operation and lightning protection.
5. Inline lightning arresters help protect the system from lightning burning out the charger.
6. Use deep cycle "marine" batteries rather than automobile batteries.
7. Consider how you will introduce the cattle to the electric fence.
8. Protect the electric wire from accidental personal contact.

Cattle Drinking Preference - Pond vs. Trough

Warren W. Bell, Watershed Specialist, Lower Neosho River

Allowing cattle to drink water directly from ponds and streams is historically the common livestock watering method in Eastern Kansas. Water quality is significantly degraded when cattle are allowed to wade into a pond. Fecal bacteria and suspended sediment levels are particularly increased and may actually reduce the palatability of the water.

Recent research and increased awareness of the importance of water quality has resulted in new emphasis in looking at ways to provide cattle with cleaner drinking water. Research by Montana State University indicates 75% of cows and calves prefer to drink form a watering tank rather than a pond (Gordon 2000). Research in Alberta Canada show that weight gains are improved by cattle drinking from troughs compared to drinking from ponds. (PAMI, 1999).

In 2005, a research trial on the Bressner pasture was designed to evaluate whether cattle would prefer to drink, when offered the same water, from a tank (with a well graveled approach), over drinking from the pond.

Cattle behavior would be observed to determine if this might subsequently reduce the time cattle stand loafing in the pond.

Two 72 acre native bluestem pastures were early intensively grazed with 40 head of 580 lb. steers. Cattle were allowed access to a common pond and stock tank. A 3-gpm submersible pump was used to pump water to a 600 gallon concrete tank located 50 feet up-slope from the approximately 3/4 acre pond. Two 53 watt solar panels were used to power the pump. A water meter was installed inline so volume of water consumed by the cattle could be measured. Cattle were observed at least once daily.

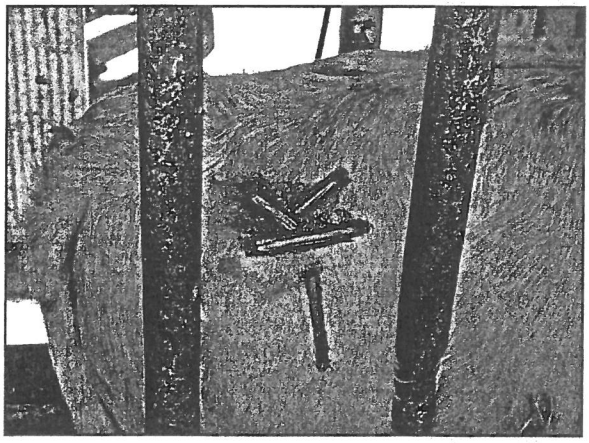
Results:

With frequent rainfall received from May 1-July 4 the sloughs, ditches, and depressions etc. had water in them most of the time. These competing watering opportunities undoubtedly influences our results. Some days no water was consumed from the tank. During the driest time July 7-12, water consumption from the tank averaged 2.35 gal/hd/day. The greatest daily consumption was July 11-12 at 3.5 gal/hd/day.

The south pasture had abundant water available in the slough, but the small surface water supplies in the north pasture had dried up by the conclusion of the trial.
One or two individual animals in each pasture were often found standing in the pond. Large numbers of cattle were never observed in the pond.

RFID Technology

Dale A. Blasi
Kansas State University

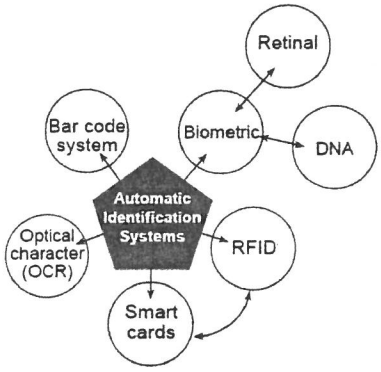


Why is Visual ID not Sufficient by Itself?

- Does not identify animals as unique individuals that correlate back to a single herd
- Does not indicate herd of origin
- Does not meet the international requirements as a valid form of identification
- Does not facilitate the recall or collection of information in an accurate and timely manner

Why Electronic ID? (eID)

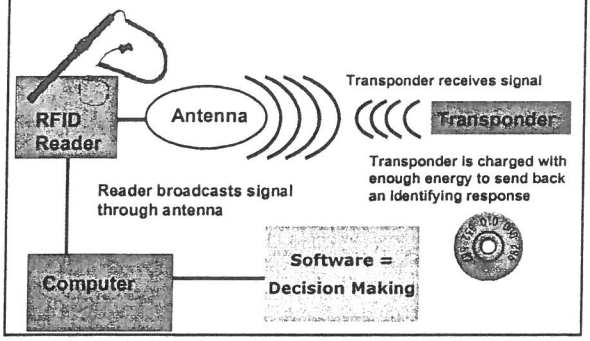
- Provides the linkage necessary for converting data into accessible and useable information with greater accuracy and timeliness

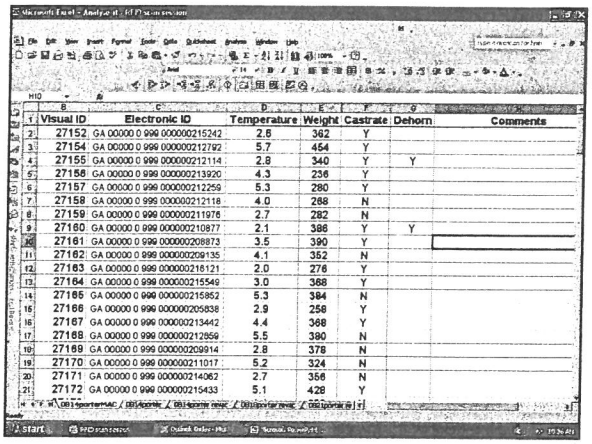


What is Radio Frequency ID?

- Sister technology to barcodes
- Radio waves vs light waves
- Reads through non-metallic materials
- Does not require line-of-sight
- Withstand harsh environments

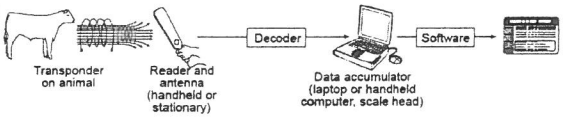
Components of an Electronic ID System





	Visual ID	Electronic ID	Temperature	Weight	Castrate	Dehorn	Comments
2	27152	GA 00000 0 999 000000215242	2.6	362	Y		
3	27154	GA 00000 0 999 000000212792	5.7	454	Y		
4	27155	GA 00000 0 999 000000212114	2.8	340	Y	Y	
5	27156	GA 00000 0 999 000000213920	4.3	236	Y		
6	27157	GA 00000 0 999 000000212259	5.3	280	Y		
7	27158	GA 00000 0 999 000000212118	4.0	288	N		
8	27159	GA 00000 0 999 000000211976	2.7	282	N		
9	27160	GA 00000 0 999 000000210877	2.1	386	Y	Y	
10	27161	GA 00000 0 999 000000208873	3.5	390	Y		
11	27162	GA 00000 0 999 000000209135	4.1	352	N		
12	27163	GA 00000 0 999 000000216121	2.0	276	Y		
13	27164	GA 00000 0 999 000000215549	3.0	368	Y		
14	27165	GA 00000 0 999 000000215852	5.3	384	N		
15	27166	GA 00000 0 999 000000205838	2.9	258	Y		
16	27167	GA 00000 0 999 000000213442	4.4	368	Y		
17	27168	GA 00000 0 999 000000212859	5.5	380	N		
18	27169	GA 00000 0 999 000000209914	2.8	378	N		
19	27170	GA 00000 0 999 000000211017	5.2	324	N		
20	27171	GA 00000 0 999 000000214062	2.7	356	N		
21	27172	GA 00000 0 999 000000215433	5.1	428	Y		

Components of an Electronic Identification (RFID) System



TRANSmitter/resPONDER

- Passive vs active
- Data carrying options
- Data read rates
  - Programming options
- Physical form
- Costs

Passive vs Active Transponders

- Passive
  - No internal battery
  - Lighter
  - Less expensive
  - Virtual unlimited operational life
- Active
  - Internal battery- finite lifetime
  - Read/write devices
  - Greater size/cost
  - Greater communication range
  - Higher data transmission rates

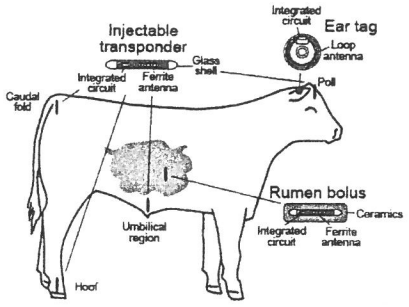
Data Carrying Options

- Identifier
  - Numeric/alpha-numeric string for ID purposes
  - Simple "lookup" number
- Portable data files
  - Decentralized database
  - Increased tag complexity usually accompanied by an increase in the data memory of the device which, in turn, generally reflects an increase in cost

Data Read Rates

- **The higher the frequency, the higher the data transfer rates**

Physical form



ISO Standards

- **ISO 11784** = Represents the data numeric structure of the 64 bit (character code for electronic animal transponders)
- **ISO 11785** = Describes the accepted protocol for transmission between the reader/scanner and the transponder (tag). The standard consists of two transmission protocols, half-duplex (HDX) and full-duplex (FDX-B)

Challenges/Issues RFID

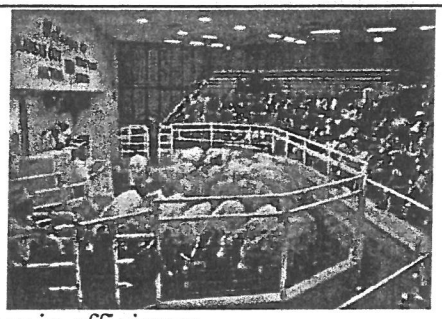
- **Environment**
- **Read range**
- **Contention**

Factors that affect Reader Range

- **Power available to the reader**
- **Power available within the tag to respond**
- **Antenna characteristics and size**
- **Competition from other devices emitting electric signals**

Dielectric Materials

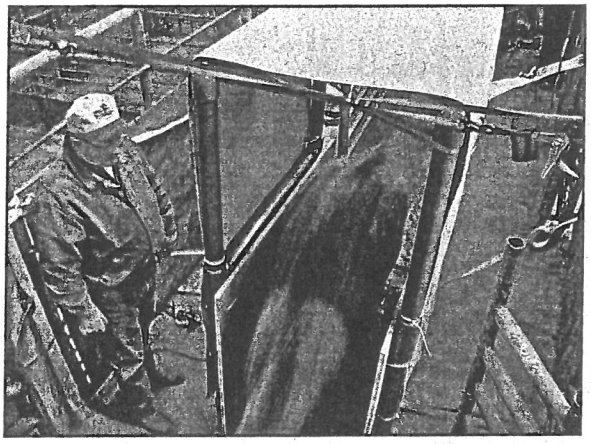
- Materials that freely:
  - Conduct radio energy
  - Absorb it
  - Detune it
  - Reflect it
- Liquids and metals present the biggest challenges



- Loss in efficiency
  - Added costs – Equipment/labor
  - Excessive handling

Anti-contention/collision: Defined...

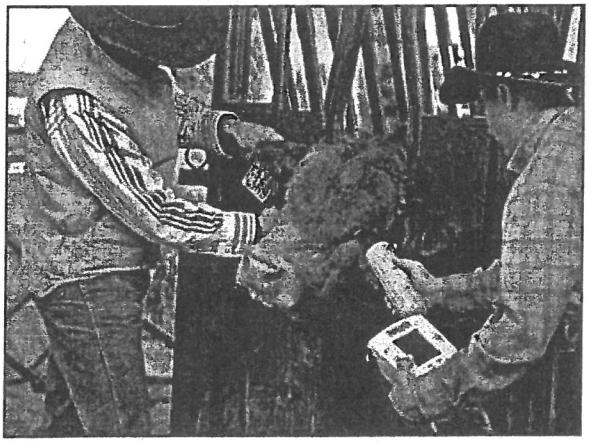
Term(s) used to denote an event when two or more transponders compete for attention from the reader at the same time resulting in potential misreading.



Technology Neutral

The Federal Government is indifferent:

"The right information to the right people at the right time"



Dale A. Blasi
Professor/Beef Specialist
Kansas State University

dblasi@ksu.edu

An Overview of Lease Hunting in Kansas

Charles Lee
Extension Specialist, Wildlife

Alternative sources of income from natural resources are being looked at more frequently as producers continue diversification. One increasingly popular enterprise is lease hunting. Lease hunting is defined as the practice of selling property access rights to harvest wild game populations on private land during established seasons. This type of operation differs from the hunting preserve concept or controlled shooting area as it is called in Kansas. A controlled shooting area is defined as acreage owned or leased upon which pen raised birds are released for hunting with extended seasons. A permit is required to operate a controlled shooting area from the Kansas Department of Wildlife and Parks.

The rest of this discussion will deal with lease hunting. There is a growing market for lease hunting. Although hunting has declined somewhat over the last decade, it is still tremendously popular. Increasing human populations and decreasing work time are two logical reasons hunting is still popular. Private land in Kansas produces about 95 percent of the game taken by hunting and contains 85% of the wildlife habitat that is economically feasible to improve. Since two-thirds of all hunters do not own land there is increasing use of public lands. Hunters may be dissatisfied with activity on public lands and prefer to hunt private lands, primarily due to overcrowding on public areas.

There are many types of lease hunting arrangements. The simplest type of lease hunting is a fee agreement with no services provided. This type of arrangement requires minimal work but may not maximize income. Some producers prefer to lease directly to an outfitter who then finds clients to hunt. This type arrangement avoids some of the people problems that some lease hunting operators dislike. Again, this type arrangement is easy to begin but does not maximize income. More elaborate lease hunting operations may include such services as providing guides, lodging, meals and game preparation for many different species throughout the year. This arrangement is more work, requires more beginning capital but provides the highest returns. Lease arrangements can generally be summarized as day leases, season leases, yearlong leases or leases to outfitters.

Kansans also have the opportunity to lease land for hunting to the Department of Wildlife and Parks. Their Walk-in Hunter Access Program is very popular with both hunters and participating landowners. Landowners receive a varying fee based on habitat conditions, amount of acreage enrolled and the length of the lease. The statewide average fee paid to landowners is about $1.30. Participation in that particular program does not allow the landowner to control hunter numbers but his capital outlay is almost nothing. The state does the signage and tries to increase enforcement efforts on leased properties.

Successful lease hunting enterprises have several things in common. Perhaps, most importantly is to deliver what the sportsmen want. Sportsmen want less competition from other hunters and abundant game densities. Sportsmen want to recreate in an atmosphere in which they feel welcome and safe. In these days of increasing

commitments on time, they want convenience and locations to hunt that are close to home. If they are staying overnight, sportsmen want comfortable and dependable lodging. And finally, most sportsmen want the opportunity to see and perhaps harvest potential trophies. Space and hunter density are easy to control on private land. Convenience and comfort are personal value judgments and may require good public relations skills to match your facilities with the needs of your clients.

A landowner must answer several difficult questions before developing a successful lease hunting operation. Two important questions are: 1) is the goal increased profits and 2) what do you have to offer? Assessing your farm or ranch potential is relatively easy but determining how to generate more income without greatly increasing costs can be more difficult. Review your resources. Use a prepared checklist to insure all resources are considered. Do not overlook species that you may consider unimportant or nuisance species. Consider all enterprises available. Economic returns from wildlife are the main reason people get involved in lease hunting. Other returns are the protection or improvement of property and personal satisfaction. Remember to use more intensively and efficiently what you already have before committing additional resources to the project.

Your location and amount of land available can be a critical factor in developing a lease hunting operation. Land close to major population centers with good road access generally meets the convenience needs of many hunters. However, remote locations can be marketed to appeal to a particular kind of guest. Usually the larger tract of land available the more desirable it is to hunters. Remember hunters may be thinking the hunting is always better just across the fence. The facilities you provide may not need to be elaborate, but they should be clean, comfortable and convenient. The services that will be provided are largely a function of time and capital available but many producers already have such things as dogs, horses, deer-stands or vehicles for transportation to the hunting location. The personnel needed to operate the enterprise will depend upon the facilities and services you provide. Remember lease hunting is a people oriented business. Your success can depend how well you and your personnel interact with people. Your privacy and independence will be challenged when you deal with the public. Do a market analysis before investing any large amount of funds into a lease hunting enterprise. Are there enough clients to provide capital funds for startup, operating and most importantly, cash flow for the new enterprise?

All relevant federal, state, and county legal constraints must be considered. These include things such as fish and game laws, zoning and land use and health standards. Involve an attorney early on in this enterprise. Local customs may have as much influence on the success of a recreational operation such as lease hunting as legal constraints. If "free" hunting is the tradition in a certain community and one person starts charging, disruption of community relations and bad feelings among neighbors and friends may result. Game management and local cooperation may be improved if several neighboring farms and ranches are involved in the leasing enterprise. Small tracts of land can be over harvested if hunting pressure is intense.

The disadvantages of lease hunting can be grouped into 3 broad categories: 1) costs, 2) liability, and 3) people problems. Costs will vary tremendously depending upon the services offered. Advertising should be targeted to your potential clients and all ads should include the species available, location, length of lease, services available, quality of animals, price and your phone number. However, a successful recreational experience is the best advertisement.

Liability insurance rates and property taxes may increase if land use is changed from agricultural to recreational. Other costs may include posting the property, clean up of the area after the guests leave and advertising expenses. Liability has been a major deterrent to landowners who want to start a lease hunting enterprise. Kansas has a recreational user statute that relieves the landowner from any extra duty of care when the property is used for recreational purposes and no fee or benefit is received by the landowner. That statue was modified in 1988 to exempt landowners of agricultural land from liability even though they charge a fee for the recreational use of their land. The purpose of this law is to encourage landowners to open their land to public recreation. This law has yet to be tested in the courts but should be a major deterrent to any liability lawsuits by recreationalists on private land.

A landowner can protect himself from liability loss by purchasing insurance. The liability insurance for lease hunting operations is available and the rate is based upon if it is leased to groups on a daily, weekly or seasonal basis. The cost is fairly moderate but it can be obtained through specialty insurance carriers. Involve your attorney and local insurance agent when discussing manners to reduce your liabilities. Anyone who leases land will have to deal with people problems. In addition to meeting with hunters to arrange leases and collect fees, a landowner may have to contend with hunters on the land at odd hours, and frequent calls to request information about prices and game populations. Occasionally personality conflicts will result with hunters.

Good business practices suggest all types of hunting leases should have written agreements signed by both the lessors and the lessees. A written agreement delineates the rules of the lease and helps protect the interests of both the landowner and the hunters. A well written lease will avoid most misunderstandings that could develop. Although there are numerous sample written leases, we suggest that each agreement be reviewed by legal counsel. Perhaps the most important and best liability insurance is the careful selection of good lessees.

A major question asked by most landowners is how much to charge for a lease. The landowner must find a price that will produce acceptable income yet remain acceptable to an adequate number of hunters. The price will depend on a variety of factors, including but not limited to the size and location of the property, the type of game, quality of hunting, reputation of the operation, how many people are involved in the lease, the length of the lease and any services and facilities provided by the landowner. Leases with the poorest quality of game habitat tend to make the least amount of money, while good quality hunting can generate the highest prices. Waterfowl leases tend to bring the highest amount of money per acre followed by deer, quail and turkey leases. It's

generally thought that income from hunting leases should be comparable to the property taxes but a majority of leases gross less than $2.50 per acre.
Hunters want a recreational experience. Don't use your values when describing trophies. What you consider trophy deer may be entirely different than your clients. Remember that there is a market for hunting of some species such as prairie dogs, crows and predators.

Set goals for the property. Goals must be realistic and based on the capabilities of the land and an inventory of the wildlife. Wildlife populations should be monitored and landowners need to keep records of game harvested. Accurate records are necessary to detect changes in populations when compared to hunter effort. When populations seem to be declining it is time to consider habitat enhancements in order to stabilize or improve populations. Enhancing habitat will improve populations but it may be a slow process. Small acreages in particular can be over harvested and number and quality of wildlife can be reduced.

Hunting leases are becoming more common. It must be acceptable to both hunters and landowners because it is increasing. It is not necessarily easy to properly manage a hunting lease. It will require work and inputs from the landowner to solve challenges presented. Make sure you evaluate all the pros and cons before committing to this new enterprise.

In summary generally:

- Highest quality of wildlife habitat makes the most amount of money.
- Waterfowl tends to return the highest amount per acre.
- Majority of deer, turkey and quail leases are under $2.50 per acre.
- Working hard is not enough. You must be able to deal with the public!
- You MUST have a detailed written contract!
- You should approach the enterprise in a business-like manner.
- Use all resources available to you to learn about lease hunting and what it takes to be successful.
- Deliver what you promised!

SERICEA LESPEDEZA
BIOLOGY AND CONTROL

Jeff Davidson, K-State Research & Extension, Greenwood County Agent
Gary Kilgore, K-State Research & Extension, SE Area Extension Specialist, Crops & Soil

HISTORY

Sericea lespedeza (*Lespedeza cuneata*) is an introduced perennial legume that was first recognized as a potential weed problem in Southeast Kansas in the early 1980's. Since that time it has spread profusely throughout southeast Kansas and beyond, now occurring in most counties of the State. Southeast Kansas counties began declaring it a "county option" noxious weed in the late 1980's, and in the year 2000 it became a statewide noxious weed in Kansas. This is the first time that a federally listed crop has been declared noxious

VEGETATIVE AND REPRODUCTIVE CHARACTERISTICS

Sericea lespedeza is a perennial legume with erect stems up to 5 ft. tall and small hairs laying flat along the ridges on the stem. The leaves, with 3 leaflets, are less than 1 inch to 11/2 inches long and one fourth to ½ inch wide with the larger leaflets on the lower portion of the stem. The leaves are flattened on the outer end with small flat hairs on the lower surface. The plant makes most of its vegetative growth in April through July. Flowering occurs from mid or late July to October and may be tinged with purple but always dry to yellow. It is a short-day plant with a critical photo period of less than 14 hours. It is mostly self-pollinated but 2-13% of the flowers may be open pollinated (the latter is favored by long days and high temperatures).

Sericea lespedeza reproduces primarily by seed, and typically will begin seed production in the 2nd year. Seeds move with water, infested hay, birds, livestock and wildlife. It is a prolific seeder producing as many as 1500 seeds per ramet, or stem, and is a multi-stemmed plant. Seed yields of 200 to 400 pounds per acre can be expected. Only 10 to 15% of the seed produced will germinate the following year. The remainder are "hard" and contribute to establishment of a seed bank in the soil. Dormancy of seeds may be broken by freeze/thaw cycles, ingestion by animals, or fire. Ideal germination conditions require temperatures above 70°F. Although total seed set will be reduced, plants under severe stress may still set some seed.

COMPETITIVE CHARACTERISTICS

Sericea lespedeza, once established, will reduce or eliminate competing vegetation. However, it is relatively slow to establish, having a rather weak and vulnerable seedling stage. On the other hand, it is opportunistic, and will establish itself in full sun or shade.

It perhaps establishes best where competing vegetation is very short and light is allowed to reach the germinating seedlings. Many legumes need good exposure to sunlight during the seedling stage. However, Sericea seedlings will also germinate and survive where ground cover and other plant competition is quite dense. It has established in fence rows, brushy and grassy

areas, where fire and grazing have been excluded for years.

Once established, it restricts the amount of light reaching other plants because it is tall with multiple branches and dense foliage. It requires more water to produce foliage than other warm season plants, creating a "drought" for competing vegetation. It also produces allelopathic chemicals that inhibit seed germination and growth of other plants. Some of these chemicals are produced by the roots, while others come from plant residue, chiefly leaves. Root extracts from Sericea have been shown to reduce germination of bermudagrass by 9 percent and forage production of bahiagrass, bermudagrass, rye, ryegrass and tall fescue by as much as 15, 24, 7, 11, and 15 percent respectively.

Although Sericea is a legume, it furnishes very little nitrogen to surrounding plants, and that amount is negated by the effects of the allelopathic toxins it produces. Rather than providing nitrogen for other plants, it actually makes it necessary to add nitrogen to maintain production of introduced forages. The shoots of grass exposed to the toxins of Sericea residue have lower nitrogen content, and overcoming the loss of production caused by the toxins requires nitrogen fertilization.

Sericea has a large tap root system with well-developed fibrous roots near the surface. A study of carbohydrate storage in the root/crown region showed a dramatic decrease in late summer coincident with the onset of flowering. During the early, vegetative growing season, carbohydrate accumulation varied with environmental conditions, especially moisture. With the onset of flowering, there is sustained increase in storage reserved until first frost. It is also at the late stage of the growing season that new buds are formed on the crown of the plant. These developments provide storage reserves to support new bud break from the crown the following spring. These data suggest that the mature plant may be most susceptible to a variety of treatments just before the onset of flowering.

CONTROL

As with any weed problem, early detection and treatment is paramount to controlling this biological pollutant. Investing the time to control scattered plants and isolated patches must be done. Remedy, Escort, and PastureGard are the chemicals of choice at the present time for controlling Sericea lespedeza. Once it becomes established over a wide area, an integrated approach to control is necessary. Conventional management practices such as prescribed grazing and fire have been less than effective in preventing the spread of Sericea in rangelands. However, use of fire will result in old forage removal and increase exposure of target to herbicide during a June treatment.

Some suppression of Sericea has been observed after mowing or burning followed by intensive early stocking with stocker cattle. It is advisable to not graze Sericea infested range in the fall when the plants are flowering and producing seeds, because livestock will consume the seeds and deposit them elsewhere in manure. Intensive early stocking puts grazing pressure on the plants early in the season, but cattle are not there during seed set. On the other hand, it is defoliation of Sericea in late summer or fall that will set it back. Goats will provide some control as they do eat Sericea much better than cattle. However, any grazing control program must be closely monitored and continued once begun. Grazing the Sericea plant will increase the number of tillers of each individual plant, leaving a larger, "bushier" plant if grazing is ceased.

Mowing will reduce the vigor of sericea plants if they are cut closely multiple times each year. When mowed, Sericea regrows within 7 weeks. Plants should be mowed each time they reach a height of 12-18 inches. The most damaging time to cut sericea is late in the growing season when the plants are trying to build root reserves. However, mowing will not kill Sericea, and may damage desirable grasses. Mowing should eliminate or greatly reduce seed production.

Fire is an important grassland management tool. Burning native bluestem grass increases cattle gains, and maintains the desirable, fire tolerant plants, while eliminating many of the unwanted, non-native plant species. Sericea, however, is not affected by fire and germination of Sericea seed and seedling establishment is actually enhanced by fire. However, timing of the burn is apparently most critical on pastures infested with Sericea. Preliminary study indicates that late spring burning, May 1 to May 5, will retard the growth and seeding rate of Sericea, while maintaining good grass production. Late spring burn will also kill early emerged Sericea seedlings. This management practice, of simply burning Sericea infested pastures late, pushing the May 1 date as much as possible, may reduce the vigor and seed production of Sericea.

Chemical control includes three options.

* metsulfuron methyl (common name is Escort XP, but generic formulations of metsulfuron are available) applied in the fall when sericea is in bloom at the rate of ½ ounce per acre.
* trichlopyr (common name is Remedy) applied in June or early July at the rate of 11/2 pint per acre.
* Pasturegard (trichlopyr + fluroxypyr) apply at rate of 2 pint per acre.

Soil moisture should be adequate to allow for good growth of Sericea plants at time of application. The decision of which chemical to use should include the following factors:

A. **Other targeted weed species.**
If other weeds are present with Sericea, Remedy or Pasturegard applied in June is more likely to reduce other weeds, such as ragweed, broomweed and goldenrod. Escort applied in late September does minimal damage to native forbs or "other weed" populations. This may be an advantage of the Escort, if you want to maintain the native forb population.

B. **Carryover seedling suppression.**
Escort applied in late September through early October could have some carryover affect the following spring to seed germination.

C. **Importance of preventing current year seed set.**
Remedy applied in June will kill the plant, preventing current year seed production. Escort applied in late September will likely prevent most seed, but some may be set by that time and remain viable. If the Sericea stand is established and been there for several years, the seed bank in the soil is large and current year seed production is of minimal importance. Conversely, if the problem is a recent infestation, eliminating current year seed is very important.

D. **Convenience of timing.**
When is it more convenient to treat, June or late September? The grazing system or season will have an influence on this decision.

CONTROL (Application)

Ground applications of either Remedy, Escort, or PastureGard - should apply a volume of at least 15 and preferably 20 gal of solution per acre. Flat fan nozzle tips are recommended. Flood nozzles distribute too large of droplet, diminishing coverage of the target weed..

Aircraft applications should be with 5 gallons of water. Applications using 3 gallons or less do not seem to get adequate coverage or penetration in thick stands of Sericea.

Chemical control should be approached with at least two applications planned, and some spot spraying in addition. The initial application may well need an additional application two or three years later. Spot treatment of skips, fence rows and under trees are needed to complete a control application.

Remedy and PastureGard applications work best when the new growth is 12 to 15 inches tall, which usually occurs in June. The broadcast application rate for Remedy is 1.5 pt/a. The rate for PastureGard is 2.0 pts/a.

Escort XP works best when applied in the fall when the sericea lespedeza plants are flowering. Depending on moisture, that could be as early as mid-August, but generally occurs in September. If fall weather is dry, delay application until flowers open. Dry weather will result in poor herbicide uptake and poor control. Apply Escort XP at the broadcast rate of 0.5 fl oz/a. Add a non-ionic surfactant to Escort XP.

Spot Treatment. The above herbicides can also be used for spot treating individual plants or scattered infestations. Timing is the same for spot treatments as broadcast treatments.

Table 3 gives mix rates for different size sprayers. Remember non-ionic surfactants need to be used with Escort XP.

Table 3. Small quantity herbicide mixtures for spot spraying sericea lespedeza.

Volume	Remedy[1]	PastureGard[2]	Escort XP[3]	NIS[4]
1 gallon	1.33 fl oz (2.66 tbsp.)	1.0 fl oz (2.0 Tbsp)	0.3 gm	0.3 oz (2 tsp.)
5 gallon	6.5 fl oz (13 tbsp)	5.0 fl oz (10 Tbsp)	1.5 gm	1.5 oz (3 tbsp)
15 gallon	19.5 fl oz (1 pt + 7 tbsp)	15.0 fl oz	4.5 gm	4.5 oz (9 tbsp)
25 gallon	1 qt	1.5 pt	7.5 gm	7.5 oz (1 cup)

[1]Equal to 1% solution of Remedy.

[2]Equal to 1.0 fl oz PastureGard per gallon

[3]Equal to 1.0 ounce per 100 gallons of water, or equivalent to applying 100 to 200 gallons per acre. Chemical supplier can supply a measuring cylinder to measure small amounts of Escort XP.

[4]Non-Ionic Surfactant (NIS) equal to 0.25% volume to volume, or 1 qt/100 gallons of solution. Use only wi Escort XP.

All chemicals are subject to label statements. Those who apply chemicals are responsible for correct use. **Always read the label before purchase and/or use.** Be sure you know how to apply, rate to apply, time o year to apply and use restrictions. **The User is Responsible.**

K-State Research & Extension
Dedicated to a safe, sustainable, competitive food and fiber system and to strong, healthy communities, families and youth through integrated research, analysis and education.