

Forage Production in Relation to Red Cedar Removal

Lynn/Six Mile Creek WRAPS

Wakarusa WRAPS

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Background: Eastern redcedar is an important invasive weed in Kansas, transforming open prairie into closed woodland. According to a Kansas Forest Service estimate, eastern redcedar volume increased by 23,000% between 1965 and 2005.¹

In a recently completed project, a predictable relationship between canopy diameter size and forage reduction under the canopy was determined. (Miller, Blocksome, and Barden. 2010, unpublished data).

The objectives of this demonstration were: 1) Measure biomass production both under and outside the canopy; 2) Determine the percentage of production from 3 forage classes (cool-season grasses, warm-season grasses, and forbs); and 3) Determine if redcedar removal results in increased biomass production the year following removal.

Materials and Methods: The demonstration site was located on privately owned rangeland in Shawnee Co., Kansas with about 5% cover of eastern redcedar. Soils were silty clay loams, with rocks visible on the surface. The project extended for 2 years (2008-2009).

Prior to large-scale redcedar removal (by cutting trees off at ground level), three groups consisting of three trees were identified and marked. In each group, the trees were selected for independent growth (no intermingled branches), similar size, and proximity to each other.

Two of the three trees in each group were cut off and stumps marked; one tree in each group remained standing. This allowed for comparison of vegetative response under cut and uncut trees.

The pasture was grazed by cows, but cows were excluded from grazing the area around the un-cut tree and one of the cut trees. This allowed for comparison of vegetative response with and without grazing.

A transect was laid on the north side of each tree, and quadrat frames were used to sample vegetation. Each transect had two parts: the first part was under the canopy, and the second part was outside the canopy. This allowed for comparison of under canopy to outside canopy vegetative response.

The vegetation inside each quadrat was clipped and separated into warm season grasses, cool season grasses, and forbs. The presence of noxious weeds was determined. Clipped forage was dried and weighed.

¹ Moser, W.K. et al. 2008. Kansas Forests 2005. Resource Bull. NRS-26. USDA NFS. p. 7, 19

Results:*Biomass Production*

There were no significant differences in warm season grass, cool season grass, forb, or total biomass production. There were no significant differences in production with tree removal (Charts 1, 2, and 3).

Forage biomass production did not differ statistically under the canopy or outside the canopy in this demonstration (Charts 4 and 5). In other studies, redcedar canopy reduced forage biomass production in a predictable manner (Graph 1).

There was no significant difference in biomass production around trees that had been cut and those that had not been cut.

There were non-significant differences. Warm season grass production was greater outside the canopy in all cases except under the uncut tree on Site 3 in year 1. Cool season grass production was more varied in relationship to the canopy, with some sites and years showing greatest biomass production under the canopy and others outside the canopy. Forb production was lowest outside the canopy. Forb production decreased as warm season grass increased. No noxious weeds were found. Total biomass production was higher on two sites outside the canopy.

Biomass Class

Biomass production was about 50% warm-season grasses, 30% cool-season grasses, and 20% forbs.

Discussion:

Significant differences would be difficult to distinguish in this project due to the small number of replications and the short duration of the project. Year-to-year differences were greater than differences between treatments, which would be less important if the project had extended over more years.

On one site, the only available trees that fit the criteria outlined had been trimmed up from the bottom at some point in time, allowing sunlight to reach the vegetation under the tree. Thus, removing the tree would not have had much effect on vegetative production.

On another site, vegetative production was extremely low both under cut and uncut trees. This may reflect inherent poor fertility of the soil (it was very rocky).

Some biomass would have been removed by grazing and this would not have been included in the grazed biomass production. Highest biomass production was recorded around the cut and ungrazed trees. Lowest biomass production was recorded under the canopy of uncut trees.

Failure to control redcedar will lead to increasing forage losses. Non-chemical methods such as cutting and burning can substantially reduce redcedar populations and restore forage production.

Charts and Graph

Warm Season Grass						
	Redcedar cut + graze		Redcedar cut no graze		Redcedar not cut	
	under canopy	outside canopy	under canopy	outside canopy	under canopy	outside canopy
Year 1 (pre-tree removal)	3.0	13.3	11.0	31.8	14.3	12.0
Year 2 (post-tree removal)	25.9	46.7	25.9	31.4	14.9	38.8
Total	28.9	60.0	36.9	63.3	29.2	50.8

Chart 1. Warm Season Grass Biomass Production in Relation to Redcedar Canopy Cover and Grazing.

There were no significant differences in warm season grass production among the various treatments, but total warm season grass biomass production across years was greater outside the redcedar canopy area. This was true even on sites where the redcedar was removed by cutting prior to sampling.

Cool Season Grass						
	Redcedar cut + graze		Redcedar cut no graze		Redcedar not cut	
	under canopy	outside canopy	under canopy	outside canopy	under canopy	outside canopy
Year 1 (pre-tree removal)	14.9	1.4	9.7	0.2	12.8	31.7
Year 2 (post-tree removal)	0.7	0.7	1.7	8.0	1.0	0.8
Total	15.6	2.1	11.4	8.2	13.8	32.6

Chart 2. Cool Season Grass Biomass Production in Relation to Redcedar Canopy Cover and Grazing.

There were no significant differences in cool season grass production among the various treatments, but total cool season grass biomass production across years was greater under the redcedar canopy area on trees that were cut down. Cool season grass biomass production was lower the second year except outside the canopy where the tree was removed. Cool season grass production was higher under the canopy area when the redcedar was removed.

Forb						
	Redcedar cut + graze		Redcedar cut no graze		Redcedar not cut	
	under canopy	outside canopy	under canopy	outside canopy	under canopy	outside canopy
Year 1 (pre-tree removal)	16.0	13.9	34.8	37.6		
Year 2 (post-tree removal)	5.5	3.2	25.3	12.3	3.6	1.2
Total	21.5	17.1	60.0	49.9	3.6	1.2

Chart 3. Forb Biomass Production in Relation to Redcedar Canopy Cover and Grazing.

There were no significant differences in forb production among the various treatments, but total forb biomass production across years was greatest outside the redcedar canopy area.

Total Biomass	Redcedar cut + graze		Redcedar cut no graze		Redcedar not cut	
	under canopy	outside canopy	under canopy	outside canopy	under canopy	outside canopy
Year 1 (pre-tree removal)	39.4	13.2	55.5	69.6	26.6	43.7
Year 2 (post-tree removal)	32.1	50.6	52.9	51.7	19.5	40.9
Total	71.5	63.8	108.3	121.3	46.1	84.6

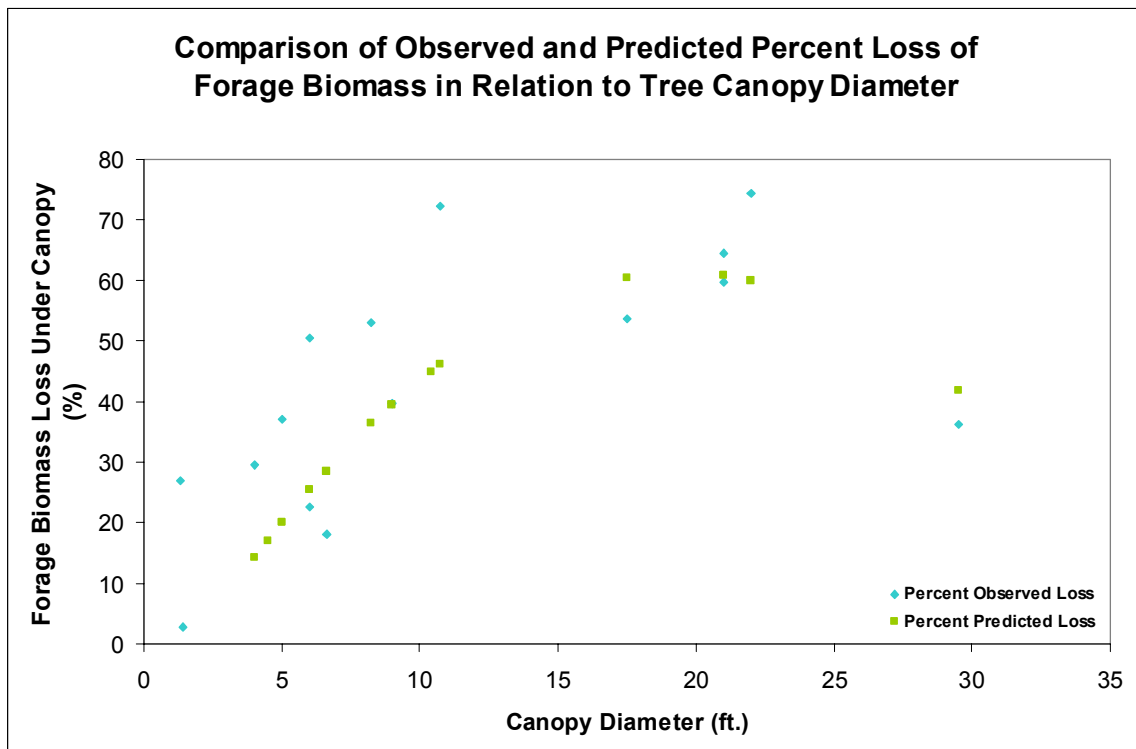
Chart 4. Total Biomass Production in Relation to Redcedar Canopy Cover and Grazing.

There were no significant differences in biomass production among the various treatments. Total harvested biomass production was greatest when the trees were cut down and no biomass was removed by grazing.

Total Biomass (average)	Redcedar cut + graze		Redcedar cut no graze		Redcedar not cut	
	under canopy	outside canopy	under canopy	outside canopy	under canopy	outside canopy
	35.7	31.9	54.2	60.7	23.0	42.3

Chart 5. Average Biomass Production in Relation to Redcedar Canopy Cover and Grazing.

There were no significant differences in average biomass production among the various treatments. Total average biomass production was greatest when the trees were cut down and no biomass was removed by grazing.



Graph 1. Relationship of Observed to Predicted Percent Loss of Forage Biomass in Relation to Tree Canopy Diameter.

In a review of various canopy sizes, a predictable relationship was found between the size of the redcedar canopy and biomass production. With an 18 ft. diameter canopy diameter, there was an estimated 60% reduction in biomass production under the canopy.