Targeted grazing with small ruminants to suppress rangeland weeds

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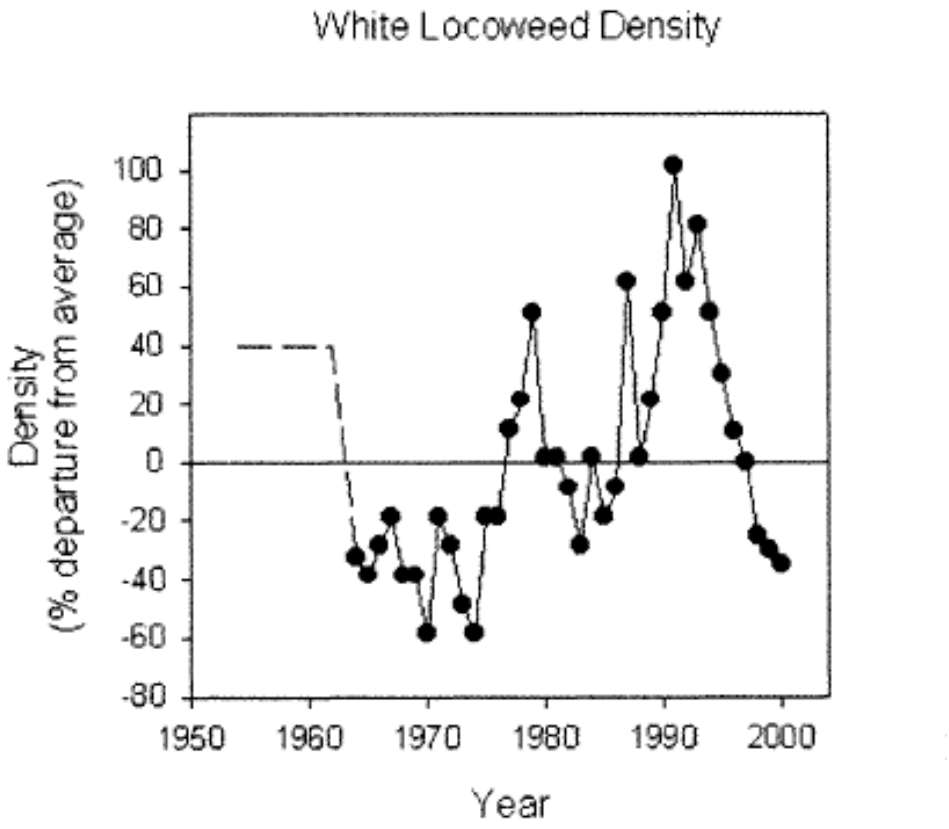

Figure 3. *Change in density of white locoweed associated with spring precipitation in north eastern New Mexico. Data taken from Purvines and Graham (6).*

Ralphs et al. Rangelands (2003) 25(5) p.16

Weed:

(1) Any plant growing where unwanted.

(2) A plant having a negative value within a management system.

SRM. 1998. Glossary of Terms Used in Range Management. 4th Edition.

Jordan Friedman, USA TODAY 2:19 p.m. EDT August 15, 2013

Across the nation, cities are turning to goats as a sustainable way to clear overgrown, woody areas.

(Photo: Saul Loeb, AFP/Getty Images)

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Goats are helping the USA go green

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Weeds got yer goat? Try, uh, a goat

By Valerie Alvord, Special for, USA TODAY

ESCONDIDO, Calif. — The perennial pepperweed is an attractive plant with dainty white flowers. But it chokes everything in its path, even trees. And in California, it everywhere. It may have one natural enemy —

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More use grazing sheep, goats against invasive weeds, vines

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By Greg Latshaw, USA TODAY

In between rows of grapevines at a Mendocino County farm in California, dozens of sheep are milling about, munching on the grass and weeds.

Sarah Cahn Bennett, co-owner of the family-owned Navarro Vineyards in Philo, Calif., says they began using the flock of 70 in June to keep the vineyard trimmed and minimize the work of tractors and manual labor.

Grazing vineyards is just one application of a

Navarro Vineyards

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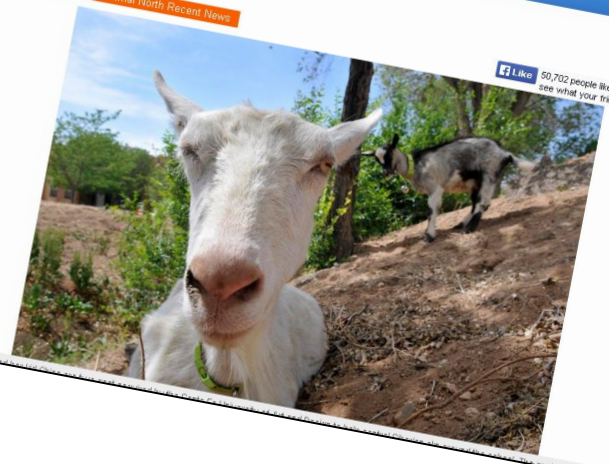

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Targeted grazing:

Application of a specific kind of livestock at a determined season, duration, and intensity to accomplish vegetation or landscape goals.

Launchbaugh and Walker, 2006. Targeted Grazing Handbook. ASI. Centennial CO. p.2

http://www.jantoo.com/cartoons/keywords/living-targets

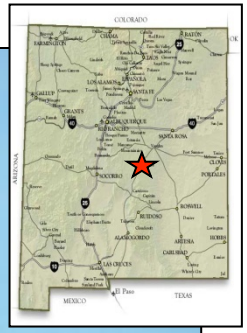
Roadmap

Targeted grazing to suppress :

1. **One seed juniper** (*Juniperus monosperma*) in central New Mexico.

2. **White locoweed** (*Oxytropis sericea*) in NE New Mexico.

One seed juniper



1. What's in it?
2. When is it most vulnerable?
3. How do we boost voluntary intake?
4. How do we maximize sapling control?

What? When? How?

What's in it?

Table 3
Forage quality and secondary compounds of juniper leaves across seasons.

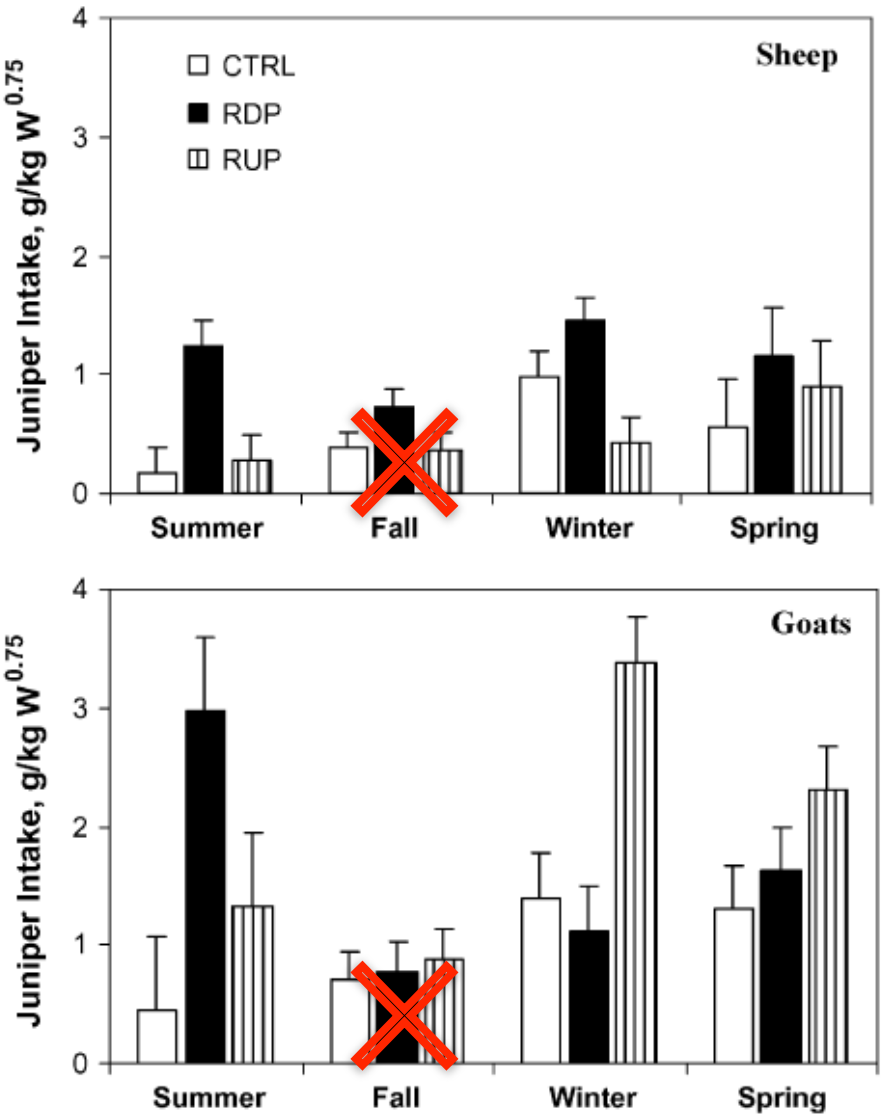
Parameter*	Seasons				*P*-value
	Summer	Fall	Winter	Spring	
DM (%)	51.16 ± 0.98^{b}	47.16 ± 1.48^{c}	53.60 ± 0.63^{b}	61.37 ± 0.84^{a}	<0.001
CP (%)	7.01 ± 0.19^{a}	7.84 ± 0.31^{a}	7.34 ± 0.33^{a}	5.87 ± 0.56^{b}	0.029
NDF (%)	37.24 ± 0.71	37.63 ± 1.26	35.01 ± 0.96	34.33 ± 0.93	0.113
ADF (%)	32.96 ± 0.43	33.39 ± 1.69	29.88 ± 1.68	29.96 ± 0.50	0.153
DMD (%)	62.57 ± 0.35	62.22 ± 1.45	65.03 ± 1.35	64.96 ± 0.40	0.153
ME (Mcal/kg)	2.21 ± 0.01	2.20 ± 0.05	2.29 ± 0.05	2.29 ± 0.02	0.153
Total phenolics (mg/g)	63.48 ± 0.86^{c}	78.73 ± 1.61^{a}	72.28 ± 1.75^{b}	78.67 ± 0.95^{a}	<0.001
Condensed tannins (mg/g)	42.68 ± 2.37^{b}	59.18 ± 1.63^{a}	42.76 ± 2.49^{b}	46.87 ± 1.60^{b}	<0.001
Total terpenes (mg/g)	16.95 ± 1.13^{b}	23.64 ± 0.77^{a}	20.04 ± 1.82^{ab}	21.15 ± 1.21^{a}	0.008

Values within rows with the same superscripts (a–c) do not differ significantly ($LSD_{0.05}$).
* Values are mean ± SE values of 3 and 10 samples for forage quality and secondary compounds, respectively.

Utsumi et al. Small Rumin. Res. (2009) 81: 152-162

When is it most vulnerable?

How do we boost voluntary intake?



Utsumi et al. Small Rumin. Res. (2009) 81: 152-162

How do we maximize sapling control?

How do we maximize sapling control?

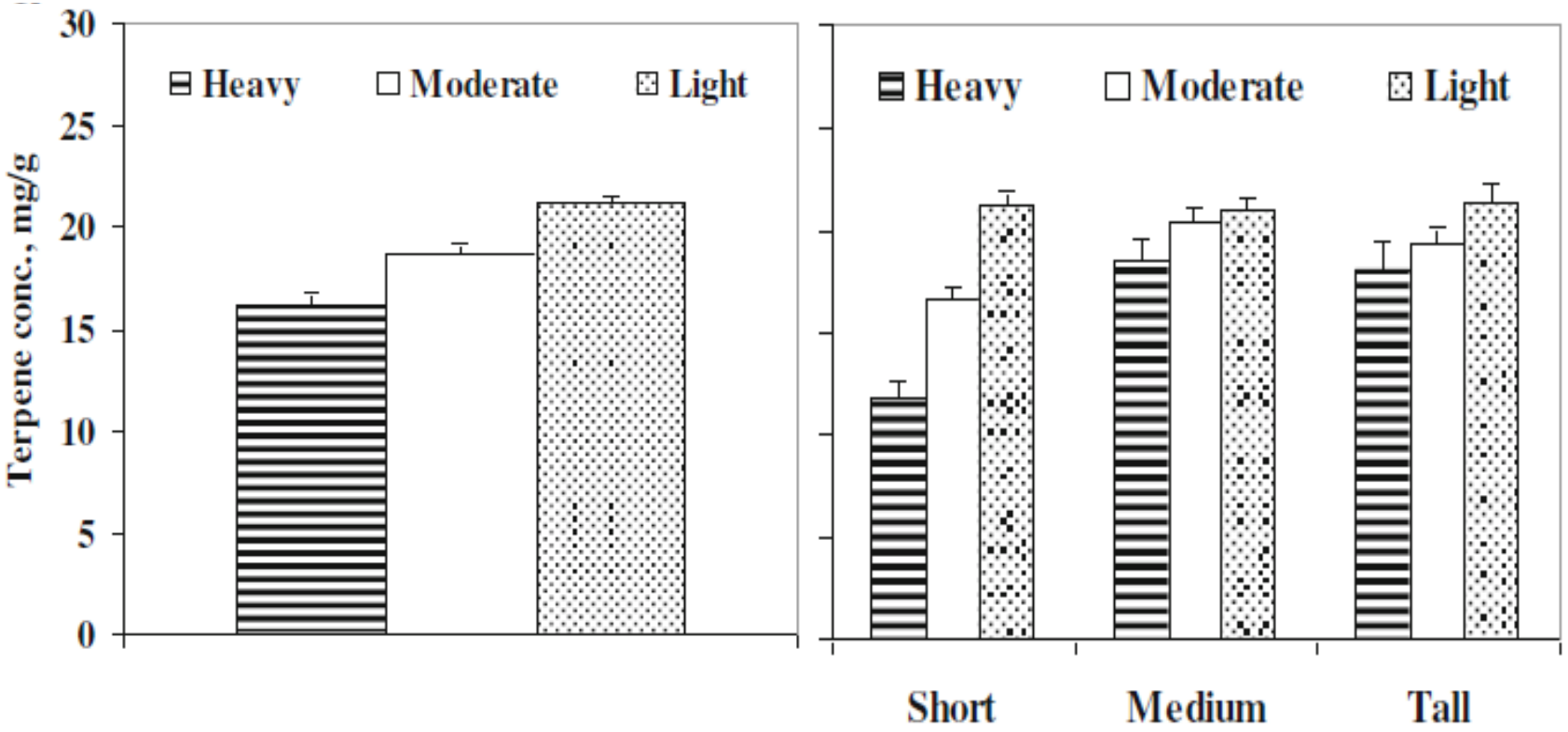
Table 7. Structural change and mortality of one-seed juniper saplings as a result of grazing treatments (Trt) that resulted from a factorial combination of two herbivores (goats only or goats mixed with sheep) and two stocking densities (high or low), or no grazing (control) in summer and spring. The *P* values are from the analysis of variance testing the effect of grazing treatments. Values are means ± standard error. Different letters within rows indicate detectable differences at $P < 0.05$.

		Goats only		Goats mixed		*P* value
Level of use	Control	High	Low	High	Low	Trt
Saplings						
Height change (m)	0.08 ± 0.01 a	− 0.10 ± 0.04 b	− 0.10 ± 0.04 b	− 0.16 ± 0.05 b	− 0.12 ± 0.04 b	0.002
Diameter change (m)	0.07 ± 0.02 a	− 0.03 ± 0.04 b	− 0.03 ± 0.05 b	− 0.06 ± 0.03 b	− 0.06 ± 0.03 b	0.005
Volume change (m^3)	0.25 ± 0.06 a	− 0.09 ± 0.05 b	− 0.12 ± 0.15 b	− 0.16 ± 0.10 b	− 0.20 ± 0.11 b	0.006
Mortality (%)	0 ± 0.0 b	4 ± 2.9 ab	1 ± 0.8 b	6 ± 2.6 a	3 ± 2.0 ab	0.048
Branches						
Debarked (%)	0 ± 0.0 b	19.1 ± 0.8 a	15.5 ± 4.1 a	24.8 ± 7.8 a	27.6 ± 5.8 a	0.004
Mortality (%)	0 ± 0.0 b	16.6 ± 1.6 a	12.6 ± 3.0 a	21.7 ± 6.4 a	21.5 ± 3.2 a	0.002

Utsumi et al. Range. Ecol. Manage. (2010) 63: 373-386

How do we maximize sapling control?

How do we maximize sapling control?



Estell et al. J. Chem. Ecol.(2014) 40: 285-293

One seed juniper: What we learned

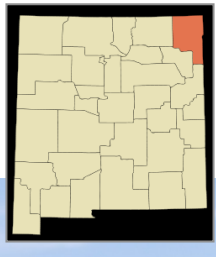
1. Overall, juniper intake of goats was 2.5 fold higher than that of sheep.

2. Overall, protein supplements increased juniper intake of sheep and goats by 50% and 100%, respectively.

3. Mixed grazing with goats and sheep (approximately 50% of each) at a rate of 1 animal/100 square feet/day produced the highest levels of juniper sapling utilization.

4. In summer, animals mainly consumed thin branches of short saplings (< 1.5 feet tall), whereas in spring, animals primarily debarked branches of tall saplings (> 3 feet tall).

White locoweed



1. Can spring patch grazing suppress it?
2. Can ewe intoxication be avoided?

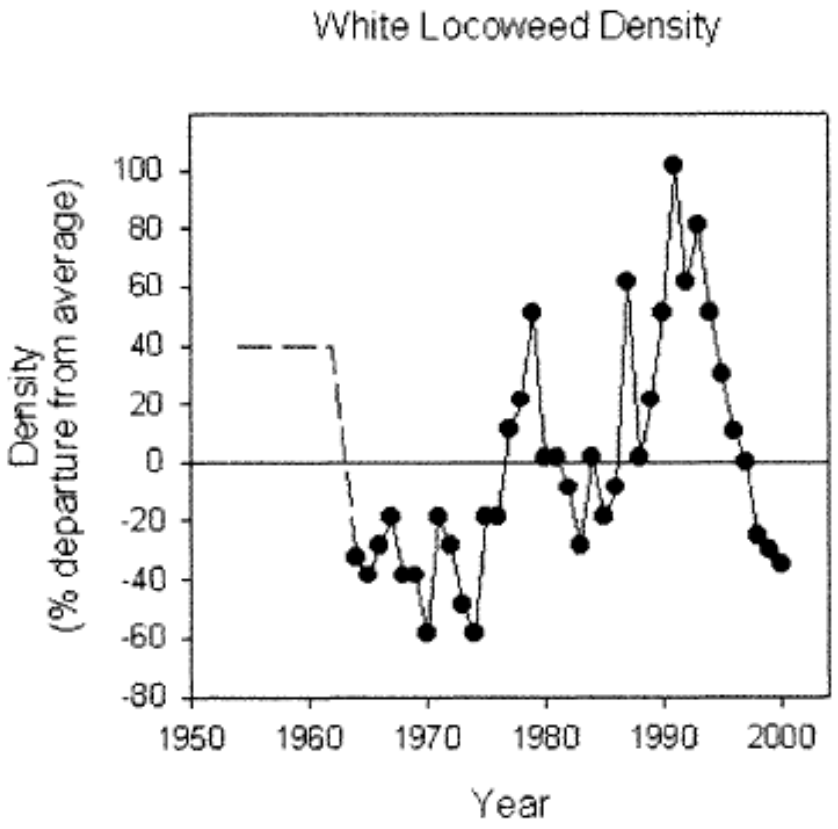


Figure 3. *Change in density of white locoweed associated with spring precipitation in north eastern New Mexico. Data taken from Purvines and Graham (6).*

Ralphs et al. Rangelands (2003) 25(5) p.16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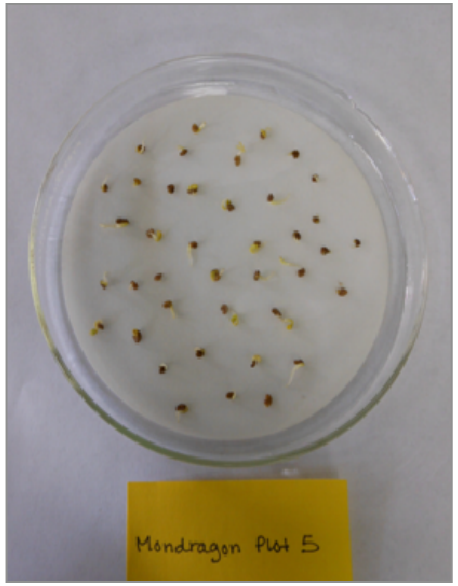

Mondragon Plot 5

Can spring patch grazing suppress locoweed?

Table 1. Date × treatment comparisons of locoweed (*Oxytropis sericea*) responses to two seasons of intermittent or continuous grazing with sheep (IGZ or CGZ), one application of Grazon® P+D (HER), or no treatment (CON) at three sites in northern New Mexico. Option pdiff was used on a subset of preplanned comparisons. Values are least square means.

	Variable[2]							
	Locoweed density[3] (plants · m^{-2})				Locoweed canopy[4] cover (%)			
Date[1]	CON	IGZ	CGZ	HER	CON	IGZ	CGZ	HER
Pregrazing 2009	1.17a d	1.45a d	1.56a d	1.59a d	4.39a d	4.56a d	5.48a d	5.66a d
Fall 2009	0.98	1.05	1.38	0.10	2.46	0.61	0.79	0.39
Pregrazing 2010	0.86	1.04	1.27	0.32	3.46	3.46	3.51	0.39
Fall 2010	0.78a d	0.44b d	0.69b d	0.32b d	2.63a d	0.09b e	0.39b e	0.75b de
Spring 2013	0.01c d	0.03c d	0.08c d	0.01b d	—	—	—	—

Goodman et al. Range. Ecol. Manage. (2014) 67: 680-692

Can spring patch grazing suppress locoweed?

Table 3. A) Number of black (presumed old), brown (presumed recent) and total white locoweed (*Oxytropis sericea*) seeds recovered from soil cores of experiment plots that received either no treatment (control), targeted grazing with sheep, or herbicide application. Germination rates for seeds in each treatment group are also shown. B) Number and germination rates of white locoweed seeds recovered from the soil seed bank from all sites and treatments and digested locoweed seeds recovered from sheep fecal pellets. C) Results of contingency analysis determining whether treatments and a) proportion of black vs. brown seeds recovered, b) total number of seeds recovered, and c) seed germination rates were associated.

	Seed count (no. seeds)					
	Black	Brown	Total	Germination rate (%)	χ^2	*P*
A						
Control	23	9	32	87.50		
Targeted grazing	47	23	70	88.57		
Herbicide	19	41	60	76.67		
B						
Soil seed bank			162	83.95		
Digested seeds			23	0.00		
C						
a. Black and brown seed count vs. treatment					21.05	<0.01
b. Total seed count vs. treatment					14.37	<0.01
c. Germination rate vs. treatment					3.77	0.15

Goodman et al. Range. Ecol. Manage. (2014) 67: 680-692

Can ewe intoxication be avoided?

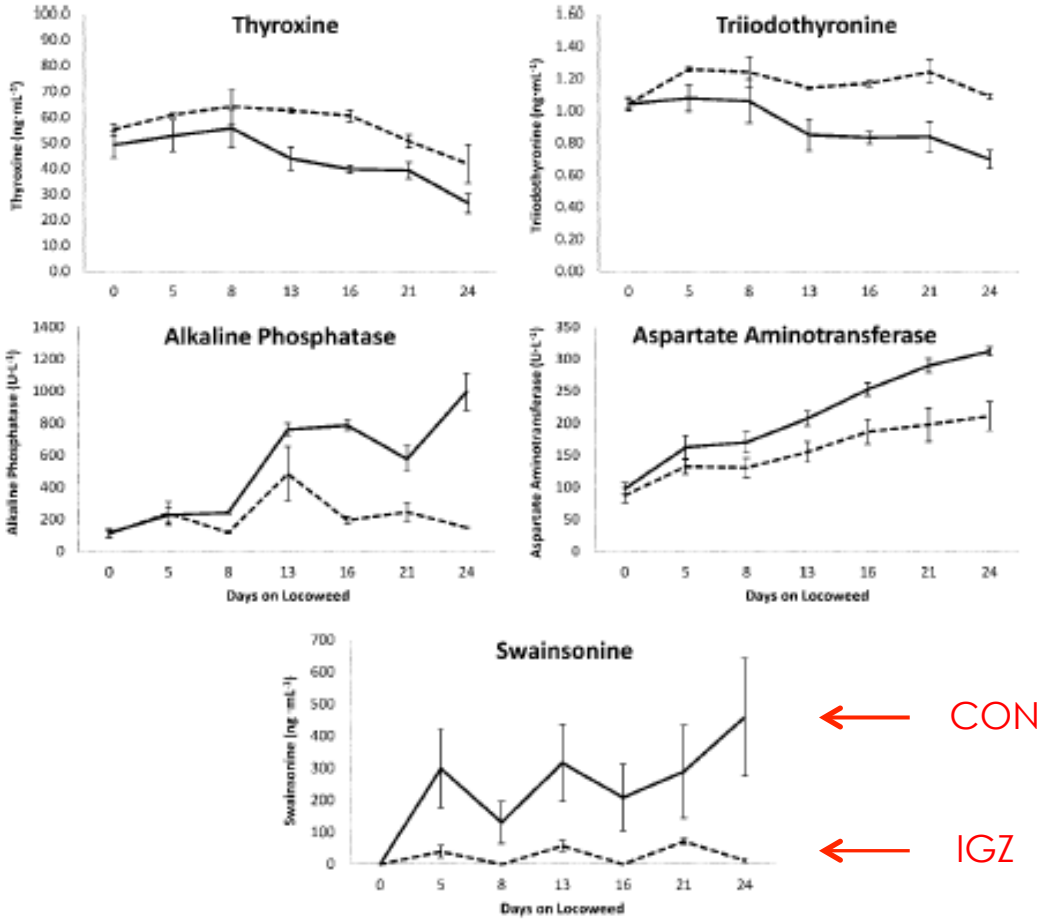


Figure 1. Mean serum concentration of thyroxine (T3), triiodothyronine (T4), alkaline phosphatase (ALKP), aspartate aminotransferase (AST), and swainsonine in ewes assigned to the intermittent (IGZ, dashed line) and continuous (CGZ, solid line) locoweed (*Oxytropis sericea*) targeted grazing treatments. Means for 2009 and 2010 grazing seasons are shown. Bars indicate standard error of means.

Goodman et al. Range. Ecol. Manage. (2014) 67: 680-692

White locoweed: What we learned

1. Spring targeted grazing of locoweed patches with sheep may be a viable way to achieve short term reduction of locoweed density .

2. Our seed bank/germination data suggest that targeted grazing effects are likely short-lived but that sheep are unlikely to spread viable seed.

3. On-and-off grazing of locoweed patches may be a safe method of using sheep in locoweed targeted grazing programs.

Important footnotes

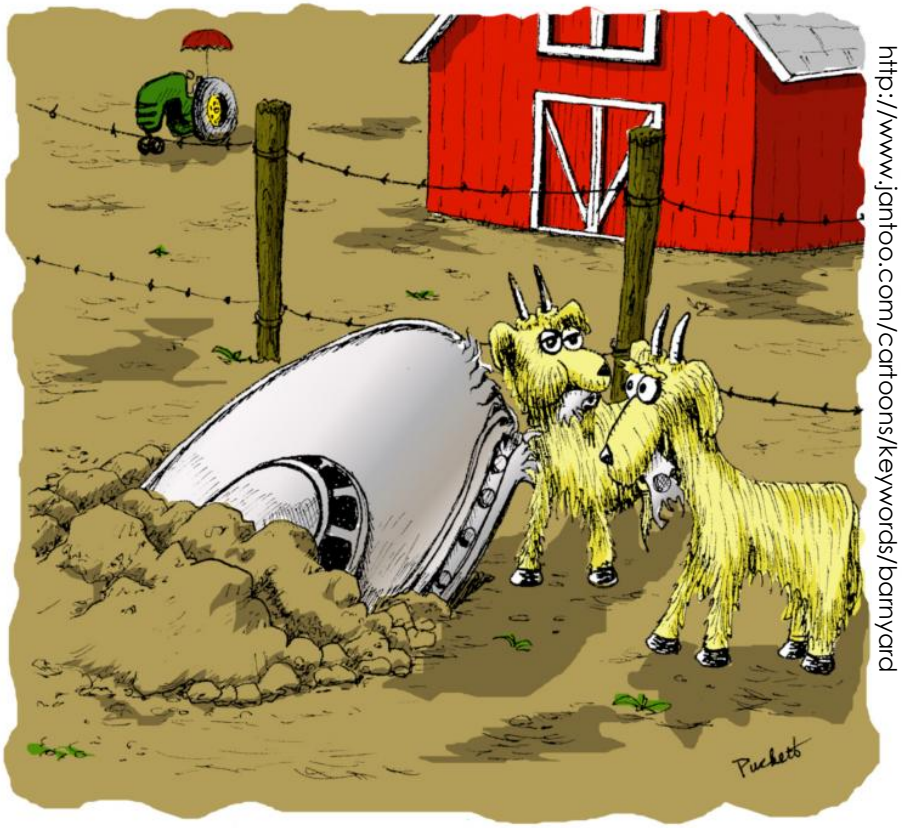
1. No adverse effects on non-target vegetation were observed.

2. Animals gained weight regardless of treatment.

Final thought

Targeted grazing with small ruminants to control rangeland weeds will possibly be most effective if used to extend the life of other more traditional weed control methods (fire, herbicides, mechanical)

Thank you!



" This foreign food is outta this world!! "

http://www.jantoo.com/cartoons/keywords/barnyard

Acknowledgements

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