

GOAT BROWSING AS AN INVASIVE SPECIES CONTROL METHOD IN THE YELLOWTAIL WILDLIFE HABITAT MANAGEMENT AREA

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Introduction

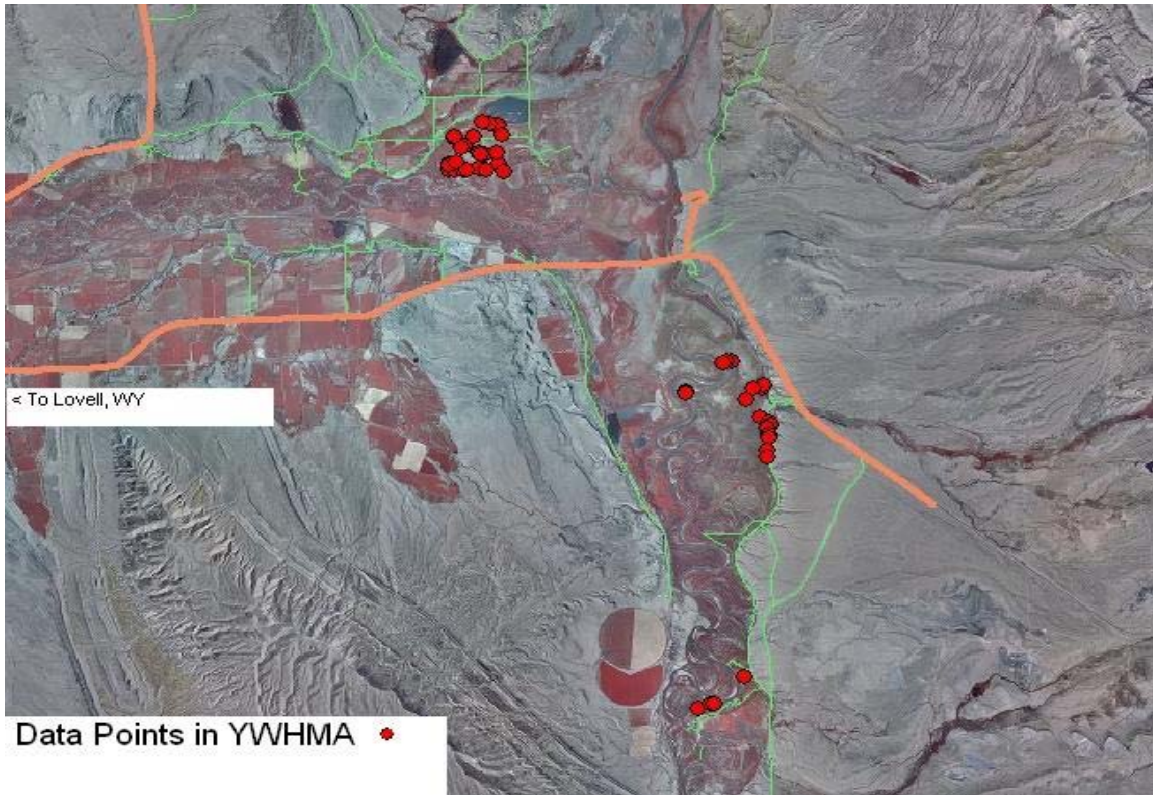
The Yellowtail Wildlife Habitat Management Area (YWHMA) is a riparian ecosystem with areas of intense noxious weed infestations. Located at the confluence of the Bighorn and Shoshone rivers in north-central Wyoming on the southern edge of Bighorn Canyon NRA, the 20,000+ acre area is managed by the Wyoming Game and Fish Department under the Cooperative Resource Management group, primarily for wildlife, especially upland and water game species. Invasive plant species in the YWHMA include Russian olive (*Elaeagnus angustifolia*), Saltcedar (*Tamarix ramosissima*), Russian knapweed (*Actropilon repens*), Whitetop (*Cardaria pubescens*) and Kochia (*Kochia scoparia*). As part of an integrated pest control program, a herd of 1000+ goats was introduced into the habitat during the growing seasons of 2005, 2006, and 2007. The goats, owned by Ken and Eileen Pike of Bighorn Basin Boers, are predominantly Boer and Boer-cross goats, a breed originating in South Africa. These goats are a mid-level browsing species, known for their ability to consume a large variety of plants and plant materials, especially weed species. The herd is tended by one goat herder, using two border collies as herding dogs and three Great Pyrenees as guard dogs. This three month study was initiated in May of 2007 in an effort to observe and assess the goat herd as a weed control tool. As an initial assessment of this project, the objective was to determine plant species, quantity and preferences of goat browsing in the YWHMA.

Methods

Individual goats were observed for a period ranging from 7 to 19 minutes each. Generally this occurred between sunrise and mid-day, when goats are most actively feeding. A “focal” goat was randomly chosen by use of a random number generator to select the subject by the number on its ear tag. Each bite taken by the “focal” goat during the observation period was then tallied and plant species recorded. Following the bite-count observation, plant community composition was determined by using the point-intercept method. A 50-meter transect was set up in the general direction of goat movement, at the point of observation. Plant species intercepts were obtained at each 30 cm along the transect, for a total of 167 points. Each different species making contact at least once was recorded. This sampling was then paired with its bite-count data in order to compare plant species available to plant species selected by the “focal” goat. For each trial, each plant species present is represented as a percentage of total bites taken and as a percentage of total vegetation available. Percent vegetation subtracted from percent of bites produces either a positive or negative difference, indicating relative preference or avoidance of each species.

Results

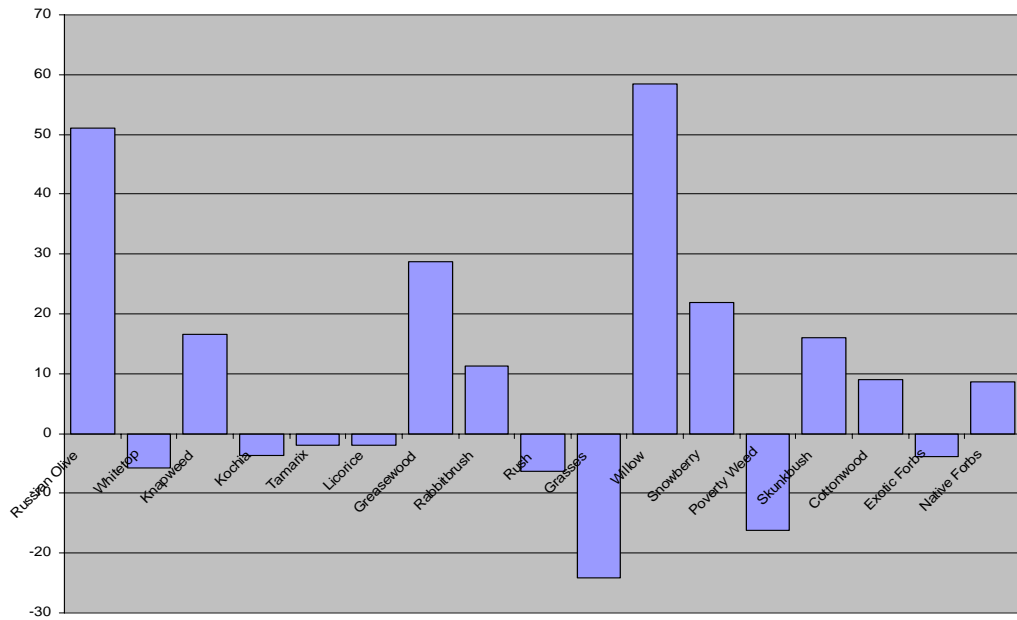
A paired-t test (two-tailed) was used in order to determine statistical significance of data sets, sorted by plant species. A p-value of higher than .05 was not considered statistically significant. 58 separate goat-transect pairs were analyzed. Strong preference trends are shown for both Russian olive and Russian knapweed, two of the most invasive and widespread weed species in the YWHMA. Rabbitbrush and Snowberry are two native shrubs that are preferred and had statistical significance. Greasewood, Skunkbush, Willow, and Cottonwood are four native species that showed preference trends, but had p-values above the .05 level. The remaining species and species groups, excluding grass species, showed small differences and/or high p-values, indicating neutral selectivity or inconclusive data. Goats exhibited a strong trend towards avoidance of grass species.



Data Summary:

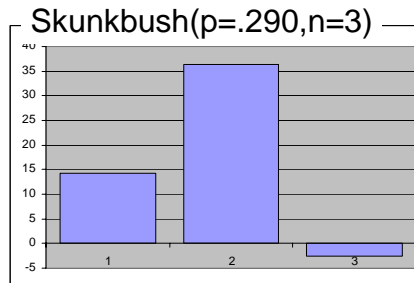
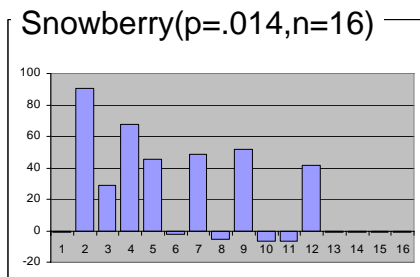
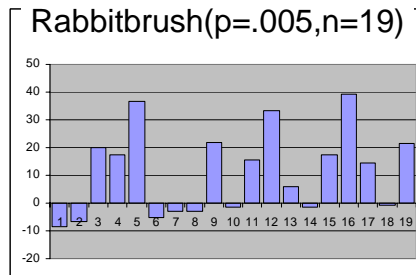
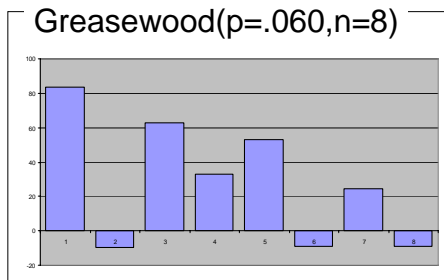
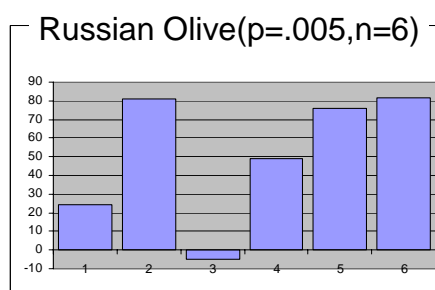
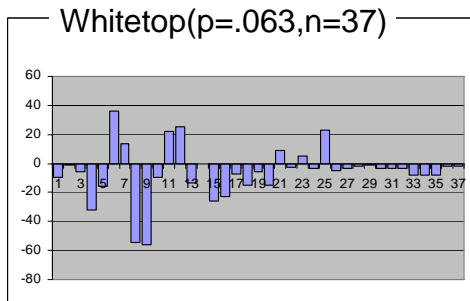
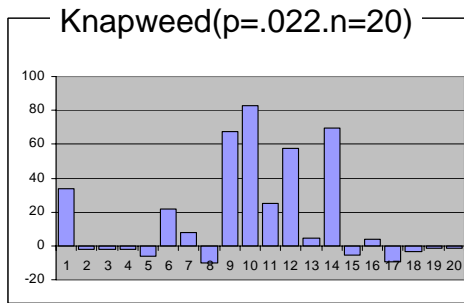
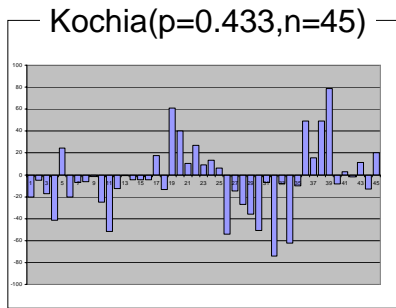
<u>SPECIES</u>	<u>p-value</u>	<u>n (sample size)</u>	<u>Trend</u>
Kochia	0.433	45	inconclusive
Russian knapweed	0.022	20	strong preference
Whitetop	0.63	37	slight avoidance
Russian olive	0.005	6	strong preference
Greasewood	0.06	8	strong preference
Rabbitbrush	0.005	19	strong preference
Snowberry	0.014	16	strong preference
Skunkbush sumac	0.29	3	strong preference
Grass sp.	0.001	47	strong avoidance
Willow	0.108	3	strong preference
Cottonwood	0.179	7	slight preference
Native forbs	0.024	26	slight preference
Tamarix	0.334	19	neutral
Licorice	0.023	19	neutral
Povertyweed	0.002	16	strong avoidance
Exotic forbs	0.158	32	slight avoidance

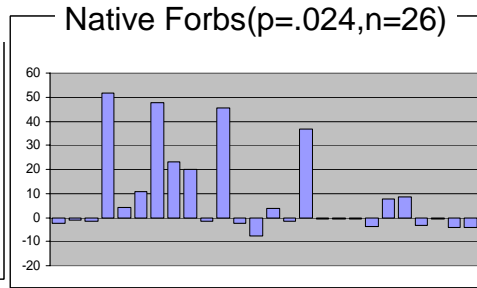
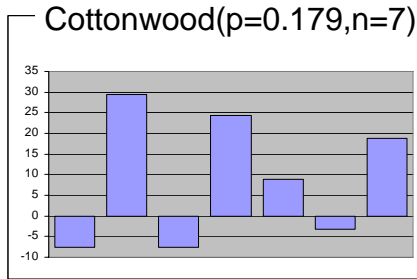
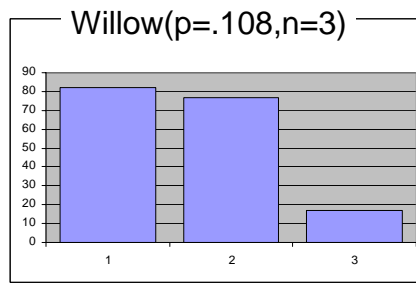
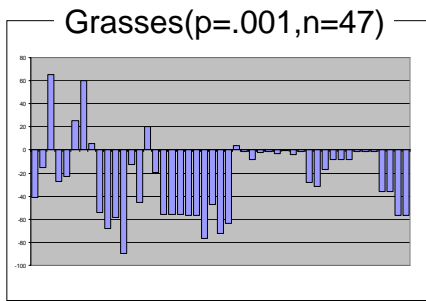
Note: The following tables represent the difference between percentage of total bites and percentage of total vegetation. Positive difference indicates probable preference, negative difference indicates probable avoidance, small values indicate neutrality (goats consuming plants at a level comparable to the percentage availability). Please note difference in scale among individual species.



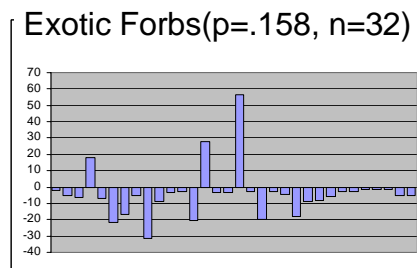
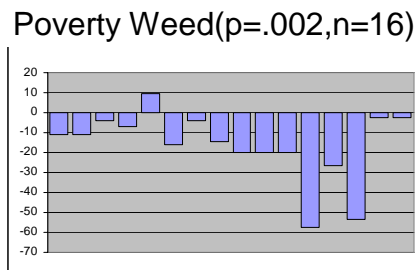
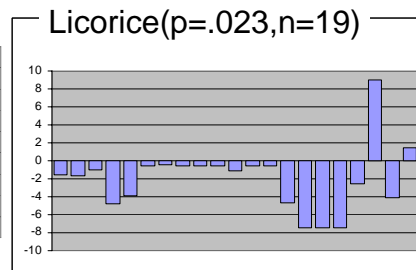
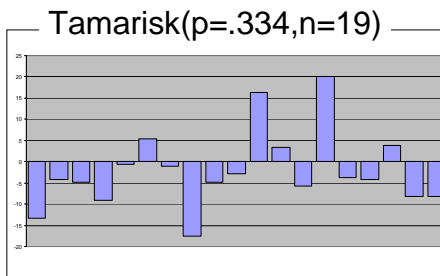
Average of %bites-%available for all species

Individual Species:





(Chenopodium sp.(2), Lepidium, Curlycup Gumweed, Milkweed)



(Canadian Thistle, Russian Thistle, Swainsonpea, Halogeton, Flixweed, Curly Dock)

Discussion

The data collected in this study is fairly concurrent with observations of this goat herd: they exhibit definite preferences for certain weed species and avoidance of grass species. They also, however, exhibit high preference for important native species, such as young cottonwood and willow species. During this study, the goats were not actively herded onto areas of weed infestation only, but instead allowed to roam and browse freely throughout whichever area of the habitat they were located on at that time. This is an issue of concern, especially along the rivers, where over-utilization of willows can create an opening for invading tamarix to take hold of a riverbank.

Another issue of concern is the impact of the goat herd on the weed communities. For the duration of this study, goats were observed actively consuming weeds everyday. In general, however, virtually no impact has been made on areas of weed infestation. Typically the herd was moved through an area, browsing as they moved, but not held on areas long enough or run through for enough days in order to significantly decrease weed species cover.

One of the main inquiries of this study was concerned with the effect of the goats on Russian olive. Over the past few years, large tracts of Russian olive in the YWHMA have been treated by mechanical clearing and stump-spraying methods. Because of the nature of Russian olive as a prolific sprouting species, an important part of the goat project is to browse these areas intensively, in an effort to curtail the re-sprout of new plants. While the goats demonstrated a high preference for mid-level and mature Russian olive plants, this study did not observe goat browsing on young, first-year re-sprout. This could possibly be due to the height range of the new plants or an allelopathic characteristic of the re-sprout.

In order to alleviate these problems, the goat herd will need to be managed more intensively. By containing the herd mainly on areas of dense weed infestation, the goats would be forced to consume the vegetation in that area, instead of being free to select for certain preferred species. This would also keep the herd off of delicate willow and cottonwood communities near the rivers, where possible damage could occur. Two goat herders should be able to contain the herd effectively, but temporary fencing may also need to be considered.

Along with more intensive herd management, a grazing plan will need to be developed. Due to the sheer size of the YWHMA, not all areas of noxious weeds will be able to be grazed at an effective level

by the current goat herd. Areas of high importance or extremely severe weed infestation should be selected, and then heavily grazed for a period of time that yields an acceptable result in regards to weed vegetation cover. An increase in herd size is another viable option to increase weed consumption, but only under intensive management.

Overall, the goat herd exhibits the preferences and abilities to be part of an effective integrated pest control program in the YWHMA. Their ability to consume weed species should translate into a reduction in weed cover over a number of seasons of continued, intense grazing. Effective herding and a predetermined grazing strategy are paramount to the future success of the goat herd as an invasive species control method in the YWHMA.