WAPITI SELECTION OF FORAGES THAT HAVE POTENTIAL USE IN RECLAMATION

by

Pat Fargey[1] and Alex Hawley[2]

[1]Animal Science Department, University of Alberta Edmonton, Alberta T6G 2P5.

[2]Alberta Environmental Centre, Vegreville, Alberta TOB 4LO.

ABSTRACT

Time spent foraging on 18 different plant species was estimated for 4 wapiti during winter (February 14-27), spring (June 12-18) and late summer (August 20-September 2). Creeping red fescue and hard sheep fescue were selected frequently during the winter trial and infrequently during the spring and summer trials. Russian wild ryegrass was used extensively only during the late summer trial. The legumes as a group received the greatest attention in the late summer trial and were selected less frequently in other seasons. Sanfoin was the exception and was selected frequently in all trials. Timothy and bromegrass were also used heavily in all seasons with the greatest use occuring in the spring trial. The other nine species were infrequently selected in all trials. The implication of these results on reclamation strategies designed to provide range forage for wapiti was discussed.

INTRODUCTION

The exploitation of natural resources has been an important component of Alberta's economy. Environmental disruption resulting from the use of these resources frequently requires reclamation of land in areas containing big game populations. A common goal of this reclamation activity is to provide forage for wild ungulate populations. However, there is little quantitative information available on animal preference of plant species used in reclamation. Watson et al (1980) compiled a comprehensive review of the reclamation literature relevant to Alberta which included reference to the "palatability" or acceptability of plant species to wild herbivores. These appraisals were based on either a field worker's personal experiences or on the occurence of the plant species on general lists of food habits. No literature was found that measured animal forage selection under controlled experimental conditions designed to assess relative preference of a wide variety of potential reclamation plant species. It was with these deficiencies in mind that this research project was initiated. Our objectives were to estimate quantitatively seasonal diet selection when wapiti were given free access to 18 plant species and to assess the relative forage quality of these plant species.

METHODS AND MATERIALS

The project was initiated in 1982 by the Alberta Fish and Wildlife Division which contracted the work to Walker and Associates. Phase I of the project was to study the establishment and productivity of 22 plant

species (Walker and Associates 1983; 1984). The second phase was to evaluate preferences for these plant species by allowing wild wapiti to graze on the study site. Wild wapiti failed to use the site and, at the request of Fish and Wildlife personnel, the present project was developed by the Alberta Environmental Centre using confined research animals.

Study Site

Vegetation plots were established on the Athabasca Ranch near Hinton, Alberta. The site consisted of 3 adjacent and contiguous replicates totalling 0.5 hectares. Each replicate contained 22 plots measuring 3m by 25m (Figure 1) and every plot was individually seeded with 1 of 22 plant species (Table 1). The assignment of plant species to plots within the replicates was random. Four of the original 22 plant species were removed from the experiment because of poor establishment or productivity. These plots were cleared using a rotovator to physically remove the vegetaion or by spraying with a herbicide. The plots are surrounded on 3 sides by a 2.5m buffer zone while on the south side the buffer zone was extended to 10m to encompass an animal restraint system and handling pen. An alley led from the animal restraint system to an adjacent holding pen where salt and water were provided ad libitum. The entire area was enclosed by a 2m high page wire fence and all vegetation within the fence or holding pen, but not on the plots, was removed by application of herbicide or rotovation. The plots were rigorously weeded immediately before every trial.

Trial Dates

Dates for the forage selection trials were selected to represent major seasonal differences in animal behavior, physiology, climate and plant

phenology. Animals were placed on the plots during winter (February 14-27) 1986, spring (June 12-18) 1986 and late summer (August 20-September 2) 1986. Trial duration was designed to maximize the time on the plots without seriously depleting the preferred species. The spring trial was limited to 7 days in order to minimize the impact of grazing on plant production for the trial later in the summer.

Animals

Two male and 2 female adult wapiti, fitted with either a 7.6 or 10cm ruminal cannula, were used in the forage selection trials. The animals were kept on tame grass pasture at the Alberta Enviromental Center in Vegreville between trials. Their diets were supplemented with alfalfa-grass hay and alfalfa-barley pellets as required. The animals were transported to the Athabasca Ranch study site on the day before a trial was to begin. Plot vegetation was the only source of food for the animals during each trial.

Determing Plant Selection

Two approaches were employed to quantify relative plant use. The first involved estimating the relative biomass of each plant species consumed by microhistological analysis of rumen content samples. The second involved the measurement of the effort expended on, or attention given to, each plant species by the grazing wapiti.

Rumen content analysis frequently under-estimate legumes relative to grasses (Rice et al 1969; Anthony and Smith 1974; Kessler et al 1981; McInnis et al 1983), likely due to differences in rumen retention time (Thorton and Minson 1973). Fragments recently eaten are much larger on

average than particles that have been ruminated (Chai et al 1984). Preliminary work with fistulated wapiti demonstrated that 60-70% of the particles from previous meals were removed from a rumen sample by wet sieving with a 4mm screen, provided that 6-8 hours had elapsed since the previous meal and the sample was taken immediately following ingestion (Fargey and Hawley, unpublished data). Therefore, wet sieving with a 4mm screen was used in this study to improve the diet estimate provided by the rumen sample technique.

Animals were allowed to forage as a herd in 2 distinct foraging bouts (morning and evening) that were at least 6 hours apart. This approximated the crepuscular foraging patterns of free-ranging wapiti (Gates 1980). A foraging bout ended when the first animal bedded down or all the animals discontinued foraging for at least 8 minutes. The animals were then removed from the plots and 5 samples of rumen contents, each 100ml, were taken from each animal (see Figure 2 for locations). The 5 samples were pooled, frozen, later sieved and sent to Colorado State University Diet Composition Lab for microhistological analysis.

The amount of foraging effort or attention paid to each plant species was measured by two observers. The time each animal spent foraging on each vegetation plot was estimated by one observer using an instantaneous scan with a 2 minute time interval between scans (Hull et al 1960; Jacobsen and Wiggins 1982). The plot number each animals' head was in and the activity it was engaged in were recorded at each scan for the entire feeding bout. The second observer conducted bite counts over intervals ranging from 30 seconds to 2 minutes attempting to obtain data for each animal in every plot used during the foraging bout.

Determining Plant Quality and Yield

Biomass estimates were made before and after each trial by randomly locating and clipping to a height of 1 cm, 3 quadrats ($0.2m^2$) from each plot. Samples were immediately frozen and then oven dried at 60 C and weighed at a later date. Material taken immediately before the trial was analysed for chemical composition and *in situ* nylon bag dry matter disappearance. It was impossible to estimate biomass under the snow pack so clipping for the winter trial was conducted in October, 1985. Vegetation samples used for assessing diet quality were dug from under the snow pack 1 month prior to the winter trial.

RESULTS AND DISCUSSION

Field work for this project was completed in September 1986. Consequently, many analyses are still on-going. Measurements of feeding based on the 2-min time interval activity scans were readily summarized and are presented herein. Statistical analysis of these data is in progress.

The animals distributed themselves evenly when released onto the plots. Fenceline pacing occured, but was not confined to a particular replicate and did not appear to affect animal selection. The fescues were the most frequently consumed species in the winter (Figure 3), with creeping red fescue used more frequently than hard sheep fescue. The legume selected most often was sanfoin. The animals appeared to be eating the green leaves near the base of the sanfoin but were also observed eating the old coarse stems. Smooth bromegrass and timothy were also consumed frequently.

The winter season at Athabasca Ranch is characterized by low total snowfall and frequent freezing and thawing. These were the conditions during the winter trial and this type of weather results in a great deal of nutrient leaching. Differential leaching can have a marked effect on plant quality and may have influenced animal selection of plants in the winter. Similarily, winter plant selection patterns might be different in areas in which persistent snow cover would minimize nutrient leaching.

Both timothy and brome received considerable use during the spring trial (Figure 4). The estimate of sanfoin use is misleadingly low because 2 of the 3 plots had extensive winter-kill. Consequently, the animals were able to remove most of the sanfoin within the first 3 days of the trial. Other plant species received little grazing attention.

The use of legumes exceeded that of grasses in late summer (Figure 5). Sanfoin and clover plots were depleted half way through the trial thus, the values reported in Figure 5 are likely under-estimates. Russian wild ryegrass was the third most often eaten species. The use of timothy and bromegrass in late summer was lower than in the spring.

Seasonal differences in plant use were quite distinct for several plant species. The fescues were used frequently in the winter trial and infrequently during the spring and summer trials. Russian wild ryegrass was used heavily only during the late summer trial. The legumes as a group were selected most often in late summer. The exception to this was sanfoin which was used extensively in all seasons.

Some comparisons can be made between the plant selection patterns of wapiti and cattle. For example creeping red fescue is considered a good fall grazing species for cattle (Smoliak et al 1980) analagous to the heavy winter use observed in this study. Wapiti used russian wild

ryegrass extensively in the late summer trial. Cattle also select this species in late summer although they also use it in the spring (Gesshe 1978). Cattle are known to avoid sanfoin throughout the spring and summer (Gesshe 1978). This is in contrast to the results observed in this study and underscores the variability in foraging preferences between animal species.

Management Implications

Land reclamation can be viewed as a positive force for the improvement of wildlife habitat and not just a means of ameliorating the original disturbance. It is well known that wild ungulates in our northern temperate climate suffer seasonal shortfalls in forage of reasonable quality which is often an important constraint on overall productivity of wild ungulate populations. When viewed from this perspective, 2 reclamation strategies can be added to the overall reclamation scheme:

1) use plant species that are of relatively high forage quality and that are selected by animals during the winter, but are not used extensively during the growing season;
2) use plant species that would extend the productive growing season by displaying early spring growth or by remaining productive well into the fall and that are selected for by animals in the appropriate season.

The first approach attempts to enhance winter nutrition by increasing the availability of forage of the highest possible quality. The second approach attempts to reduce the length of the period of nutritional duress during winter and to provide additional nutrition in the key spring and

fall seasons. Spring is a particularly critical time because females are in their last trimester of pregnancy and will soon be lactating. These approaches are not mutually exclusive. A variety of plant species could be selected based on site characteristics and the nutritional regime of the animals whose range is to be enhanced. While the data generated from this study are only partially compiled, some of the observed plant selection patterns suggest that several of the examined plant species might have roles in the enhancement of wapiti range. The fescues were highly selected in the winter but were virtually ignored in spring and summer, suggesting a role for them in the first strategy. Timothy starts to grow quite early in the spring and was heavily selected during this period, making it amenable to the second strategy. Russian wild ryegrass may have a role in the extention of the productive fall grazing period.

Knowledge of differential plant selection might be applied in other novel and imaginative revegetation strategies. Species like streambank wheatgrass, which was rarely selected in any season, might be appropriately seeded in areas sensitive to erosion in an attempt to minimize the number of animals using the area. Also, a highly selected species like sanfoin might be used in conjunction with less desirable species to lure animals away from roadsides or agricultural crops.

There has been considerable interest in using more native plants in land reclamation and seed sources will soon be available. Virtually nothing is known about animal preferences for many of these species. This research needs to be done to ensure that the animal perspective is adequately represented when future reclamation decisions are made.

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TABLE 1. The grass and legume species used in the wapiti forage selection study.

SCIENTIFIC NAME	COMMON NAME
Onobrychis viciaefolia	sanfoin
Astragalus cicer	cicer milkvetch
Trifolium hybridum	alsike clover
Medicago sativa	alfalfa
Agropyron dasystachyum	northern wheatgrass
Agropyron intermedium	intermediate wheatgrass
Agropyron cristatum	crested wheatgrass
Agropyron smithii	western wheatgrass
Agropyron riparium	streambank wheatgrass
Agropyron trachycaulum	slender wheatgrass
Festuca ovina	hard sheep fescue
Festuca rubra	creeping red fescue
Poa pratensis	Kentucky bluegrass
Poa compressa	Canada bluegrass
Alopecurus pratensis	meadow foxtail
Elymus junceus	Russian wild ryegrass
Phleum pratense	timothy
Bromus inermus	smooth bromegrass

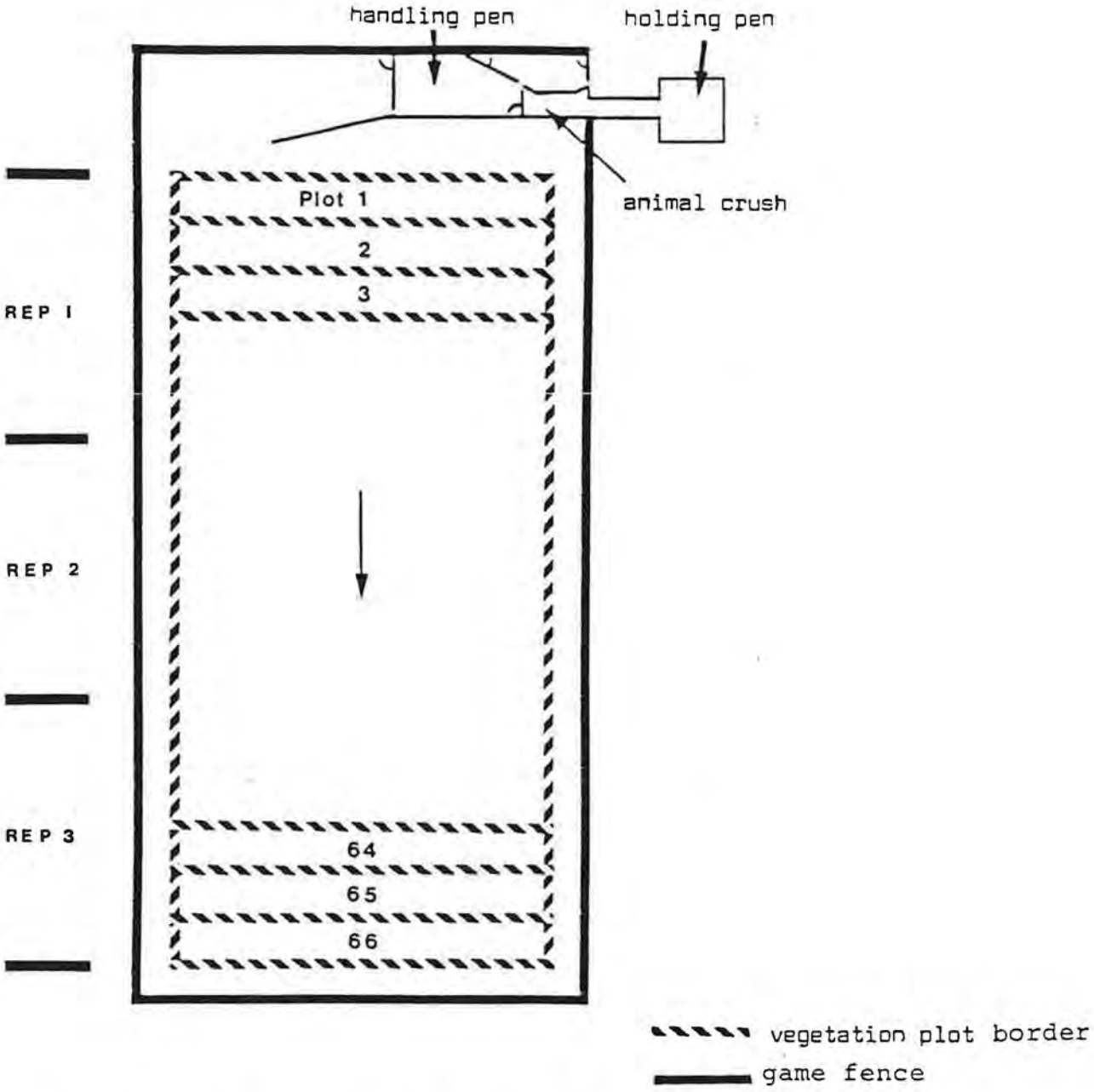

Figure 1. Diagram of the wapiti forage selection study site.

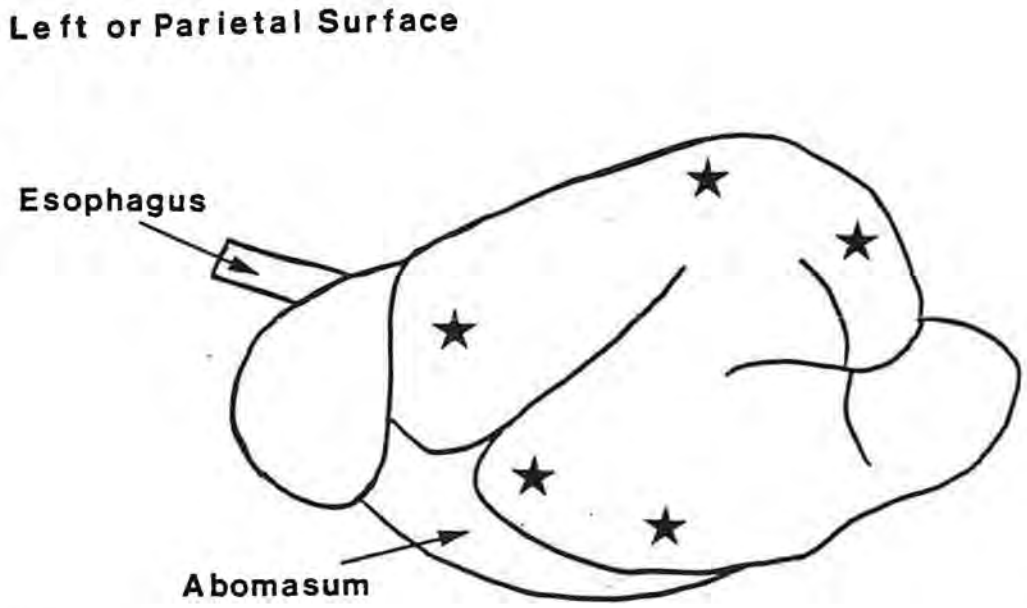

Figure 2. Diagramatic representation of a rumen. Stars (★) approximate locations where 100 mL sub-samples of rumen contents were taken.

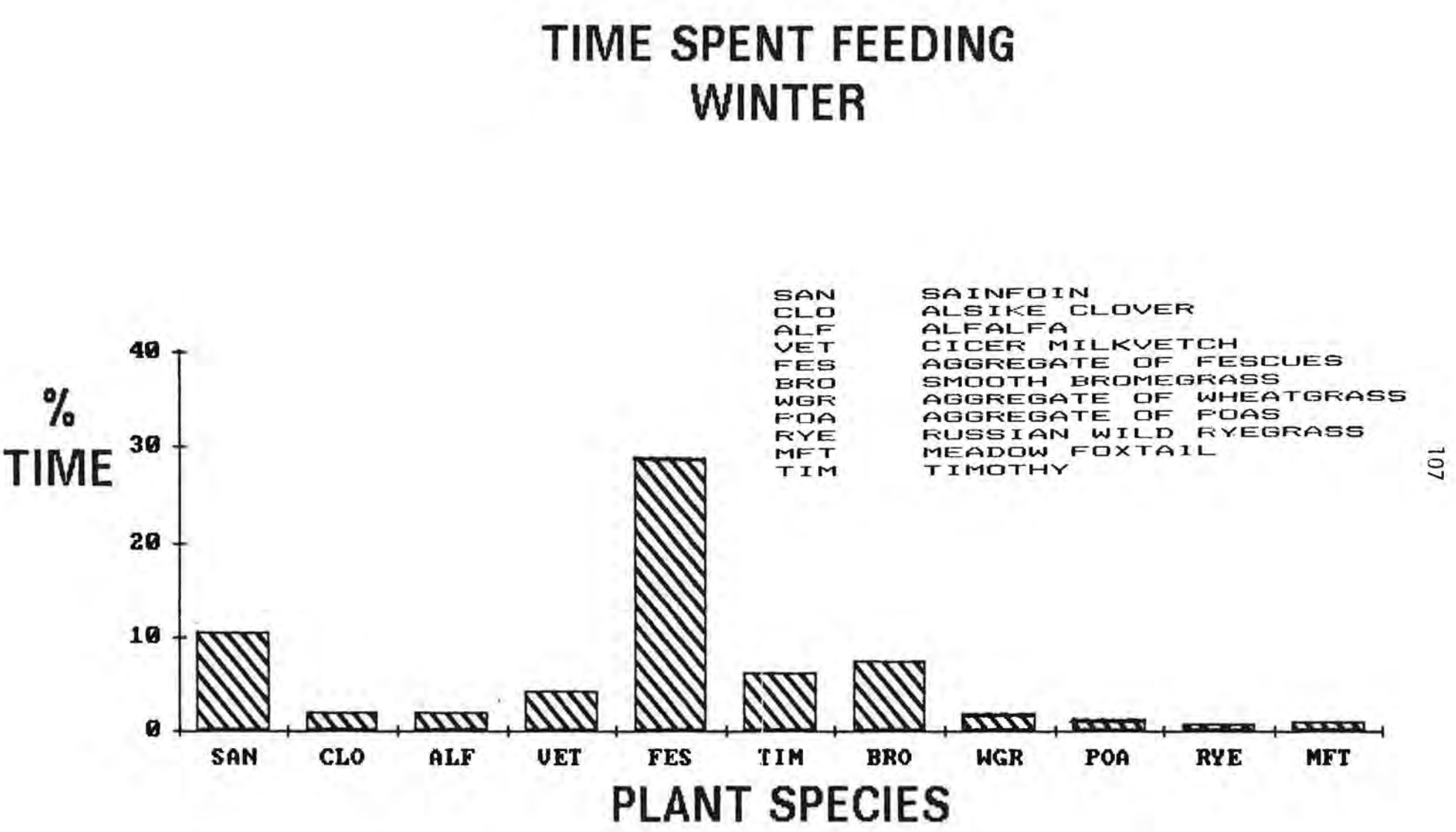

Figure 3. The percentage time spent foraging on each plant species or group during the winter trial as estimated by the instataneous scan sampling technique. A value designated as an aggregate is the mean value of that group.

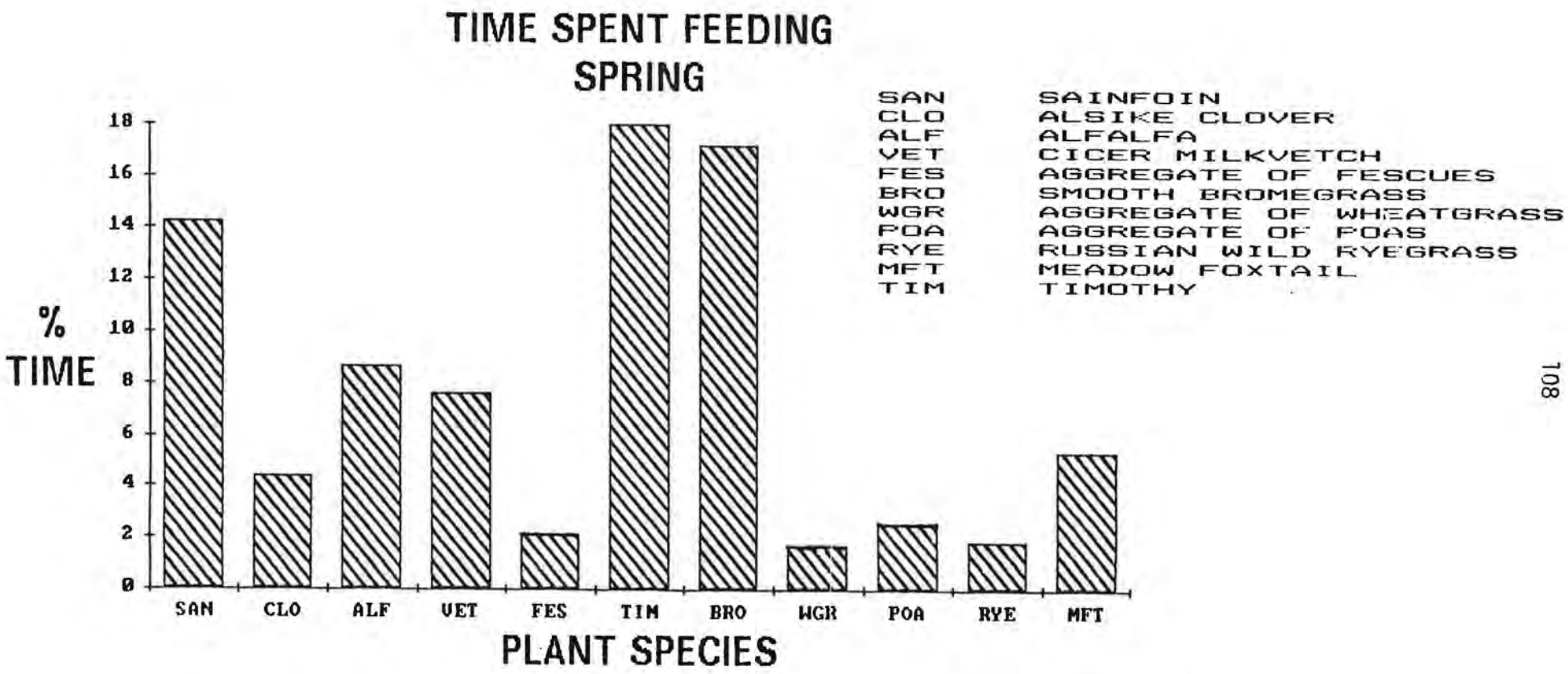

Figure 4. The percentage of time spent foraging on each plant species or group during the spring trial as estimated by the instataneous scan sampling technique. A value designated as an aggregate is the mean value of that group.

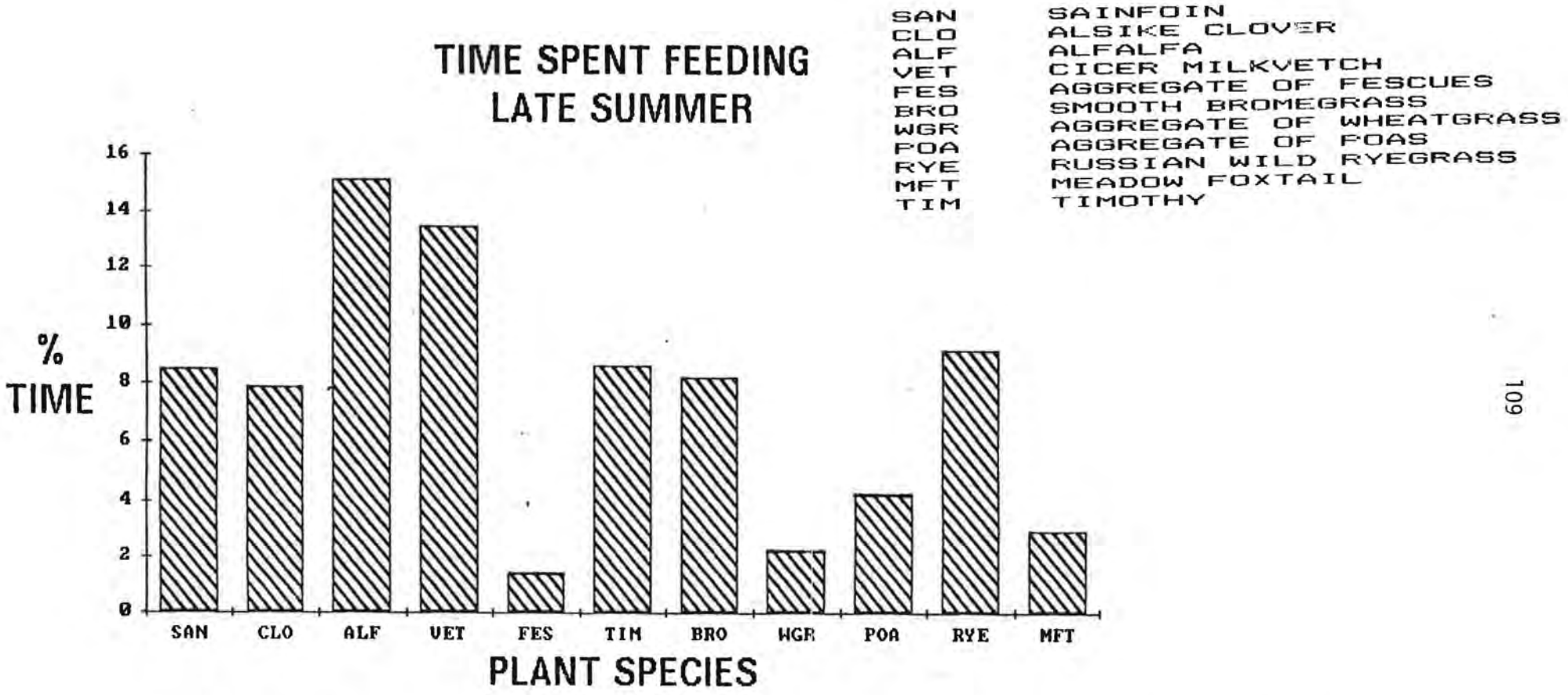

Figure 5. The percentage time spent foraging on each plant species or group during the late summer trial as estimated by the instataneous scan sampling technique. A value designated as an aggregate is the mean value of that group.

PROCEEDINGS

ALBERTA RECLAMATION CONFERENCES

1985
Planning and Certification
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April 16-17, 1985
Edmonton Inn, Edmonton

1986
Reclamation in the
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Overlander Lodge, Hinton

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1985: Planning and Certification of Land Reclamation, April 16-17, 1985, Edmonton Inn, Edmonton

1986: Reclamation in the Eastern Slopes of Alberta, September 25-26, 1986, Overlander Lodge, Hinton, Alberta

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For more information on the Alberta Chapter of the Canadian Land Reclamation Association please write to CLRA, Box 682, Guelph, Ontario, Canada N1H 6L3.

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