

**Okanagan Innovative Forestry Society
Mule Deer Winter Range Habitat Assessment
and Use Project:**

Year 6 (2006-07) Annual Progress Report

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Executive Summary

The Okanagan IFPA initiated a mule deer (*Odocoileus hemionus hemionus*) winter range research project in 2001 to identify winter forage and cover features required specifically by Okanagan TSA populations. Current management guidelines, developed elsewhere in the province (Nyberg and Janz 1990; Armleder et al. 1986), are not directly applicable to the climate and variable terrain characteristics of the Okanagan. The relative importance of forage to cover should be determined for Okanagan Valley populations, where terrain may already provide thermal and escape features. Retention management for snow interception and thermal cover may be unnecessary in steep, low snowpack, and mild climatic regions, at the expense of forage quality. Furthermore, Douglas-fir needle diet composition may be higher than quality browse due to fire suppression. Prescriptions that combine variable retention with burning are planned to test the effects on forage abundance and quality. Treatment effects will be determined by assessing forage versus cover use and diet composition at a large cutblock level; in future, results could be applied to a landscape context to develop and investigate experimental mosaics.

Study areas were selected from an original proposed list of 8 potential sites to 3 dry forest ecosystems at Trout Creek, near Penticton, Paxton, near Westwold, and Lambly on TFL49. Pre-treatment sampling has been completed at these sites with Trout Creek being the first site scheduled for experimental harvest by Gorman Bros. Lumber Ltd., upon completion of Mountain Pine Beetle salvage, which has temporarily put the three original treatment sites on hold.

The Southern Interior of British Columbia experienced an extreme wildfire season in the summer of 2003. In total, 37,000 ha of Crown forest burned in a catastrophic fire. In particular, the Okanagan Mtn Fire and the Cedar Hills fire occurred in areas identified in the Mule Deer winter range boundary and within the same moderate snow pack zones as the other study areas in the project. Reconnaissance results in Year 3, 2003-04, led to both areas being included in the study. Cedar Hills was salvaged at variable levels of retention in winter 2003-2004, and Okanagan Mt Park has provided a control since it will not be salvaged. In project year 4, 2004-05, the first year of post-treatment habitat assessment (summer and winter sampling) and winter use were completed at the Cedar Hills and Okanagan Mt Park burn sites. Pellet group plots were completed during May 2004 at Paxton, Lambly, and Trout Creek, as well as preliminary plots at Cedar Hills and Okanagan Mt Park. In Project year 5, 2005-06, habitat assessments (summer and winter sampling) were only conducted in Cedar Hills and Okanagan Mt Park. **In Project year 6, 2006-07, winter sampling was only conducted in Cedar Hills.**

Further post-treatment sampling is recommended for Cedar Hills and Okanagan Mt Park to adequately test the effects of fire and variable levels of retention applied during salvage; further regeneration of browse will be necessary to test burn and salvage effects on deer use patterns. As well, Okanagan Mt Park may have been more severely burnt, however if possible, additional transects that stratify all canopy closure classes should be established; currently closed canopy classes are not represented which could hinder the effectiveness of Okanagan Mt Park as a control.

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1.0 Introduction

1.1 Background and Rationale

The Okanagan Innovative Forestry Society initiated a long-term mule deer winter range research project in the Okanagan Timber Supply Area (TSA). The goal is to identify critical winter forage and cover features that are specific to mule deer in the Okanagan Valley.

Management guidelines currently available for mule deer (*Odocoileus hemionus hemionus*) winter range are not directly applicable to the dry forest ecosystems and variable terrain that characterize the Okanagan Valley. Mule deer can be observed in a variety of habitats that are non-characteristic of “classic” or typical deer winter range documented elsewhere in the province (Nyberg and Janz 1990; Armleder et al. 1986).

Mule deer winter range research conducted in the Cariboo Forest Region applies to dry Douglas fir forests in plateau landscapes (Armleder et al. 1986) and has been most often applied to mule deer management in the Kamloops Forest Region, including the Okanagan. Armleder et al. (1986) identified thermal cover as a primary management requirement and recommended retaining the majority of the volume of mature Douglas fir to maintain canopy closure. The geological differences between the Kamloops and Cariboo Forest Regions have resulted in dramatic differences in terrain, where the Okanagan, in particular, is considerably steeper overall and lacks the flat, broad plateaus characteristic of mule deer winter range in the Cariboo. In addition, the combination of low winter temperatures and snow accumulations that occur in the central interior of the province are not comparable with the climate in the Okanagan TSA.

Furthermore, shorter winter seasons in the Okanagan, with moderate temperatures, suggest that forest cover and terrain features, alternative to current mule deer winter range guidelines, may be critical for mule deer winter survival. For example, mule deer in dry forest ecosystems in the Okanagan may take advantage of topographic features and various elevations for habitat needs at different periods during the winter, under varying conditions (i.e.: forage versus security habitats; early forage versus late winter forage habitats). In addition, mule deer likely exhibit different habitat use patterns in mild winter conditions than in severe winter weather. As a result of several successive mild winters, areas of critical mule deer winter range, extensively utilized only during severe winter events, may be overlooked in management plans. In the event of a severe winter, mortality could be significant if key habitat components are not suitably managed.

Therefore, critical forage and cover features for mule deer in dry forest ecosystems, specific to the Okanagan, warrants investigation so that the most appropriate management regimes for long-term sustainability of Okanagan populations can be determined. In particular, the relative importance of forage to cover for wintering mule deer must be determined, where the diversity of terrain may already provide thermal cover and escape features. Forest cover managed as per guidelines developed for snow interception, security, and thermal suitability, may be unnecessary and at the expense of quality forage. Active fire suppression since the turn of the last century may have altered the abundance and condition of browse species. Douglas fir needle composition of mule deer diets may be relatively higher today than in historic populations, which are believed to be higher than current deer numbers (D. Low,

RPBio and D. Hebert, PhD, RPBio, retired Ministry of Environment, Lands and Parks biologists, pers. comm.). Quality forage production is likely key to mule deer productivity.

Silviculture treatments, including variable retention harvest with mechanical site preparation intended to mimic fire effects as well as salvage operations in areas burned in 2003, are planned to test the effects on forage productivity (abundance and quality) and cover features, with resultant mule deer response. Treatment effects will be determined by identifying significant associations between mule deer abundance and activities with vegetation and topographic features. Vegetation response to treatments will be evaluated by assessing forage versus cover use by mule deer, as well as diet composition. Treatment prescriptions testing variable retention levels will be applied at a large cutblock level (up to 200ha) to assess forage and cover requisites. The results could be applied in future experiments to test landscape mosaics suitable for mule deer winter range.

1.2 Predictive Hypotheses

There are two main hypotheses that will be tested to meet the objectives of this project:

H1: Quality and quantity of mule deer winter range forage will *increase* with reduced canopy cover, or lower tree retention, particularly in burned versus unburned blocks.

H2: Mule deer use will increase with reduced canopy cover, or lower tree retention, particularly in burned versus unburned blocks.

1.3 Project History

Specific site selection was necessary for treatment application. The 2001-02 fiscal year originally included an evaluation of 9 areas. Stratification of sites in the dry IDF resulted in the immediate elimination of three sites that occurred in the wetbelt of the Okanagan TSA. A field reconnaissance of the remaining 6 candidate areas to assess their suitability as long-term project study areas led to elimination of two more sites. Candidate areas were evaluated for mule deer winter habitat suitability and capability, including current vegetation as well as terrain and topographic characteristics, existing access and any limitations, snow zones, any adjacency issues and potential confounding effects, potential for treatment replications, and candidacy as treatment controls.

Potential treatment and control units were finally delineated at Trout Creek, Bear Creek, and Paxton for detailed sampling. Broad potential treatment areas were selected in each site of the 3 areas at a coarse level using reconnaissance data, 1995 (Penticton Forest District) and 1997 (Vernon Forest District) orthophotos, and current air photos (September 2001) by stratifying polygons with similar forest cover (species, age class, crown closure) and terrain features (slope, aspect, and elevation). Field sampling using quantitative habitat variables for statistical comparison was necessary so that potential treatment pairs and replicates could be recommended based on similar forest cover and terrain features. Permanent transects with plots were used for sampling.

The quantitative results were then used to recommend replicates of potential paired treatment sites for comparative analysis of 10% and 50% variable retention and controls within the 3 remaining study areas. Final treatment boundary locations will be finalized in 2003-04 with forest licensees prior to harvest treatment application. Trout Creek is the first study area of

the 3 scheduled for harvest as soon as the licensee is able to after salvage operations for Mountain Pine Beetle.

Pre-treatment field sampling in the first 3 years of the project has included 3 winters of mule deer activity recorded along permanent track transects. During the snow free period, pellet group plots were completed for the first time in 2003 at the original sites, Paxton, Lambly, and Trout. Furthermore, three seasons of shrub and soil plots have also been completed over the snow free season, including two years at the original sites, and 2004-05 being the first year for completion at Cedar Hills and Okanagan Mountain Park.

A field reconnaissance of the Okanagan Mt Park and Cedars Hills burn areas was made in 2003-04 to assess the feasibility of developing salvaged burn treatments. Some mule deer sampling was completed, and in Cedar Hills a salvage operation that approximated 10% retention was completed. Further development of these areas as study sites was pursued in 2004-05, with the layout and sampling of permanent transects at both Cedar Hills and Okanagan Mt Park. Shrub and soil plots were completed in the summer, as well as pellet plot clearance in the fall, followed by early and late winter mule deer winter range sampling. As well, pellet counts were made along the preliminary transects laid out for reconnaissance in May 2004, and pellet counts for the past winter were completed at all transects at the original unburnt sites (Paxton, Trout, Lambly). In 2006-07, standard mule deer winter range transect and plot sampling was completed at the Cedar Hills study site.

1.4 Treatment Description

There are two levels of retention planned for testing, 10 and 50%, the latter intended to test the LRMP guideline for mule deer winter range. Salvage operations have been completed at the Cedar Hills area. Variable levels of retention were used to achieve landscape areas with desired levels of cover. The Okanagan Mt Park burn will not be salvaged and has been used as a control, for comparison with the effects of variable retention levels as well as the impacts to mule deer of fire salvage.

For the original unburnt sites, the treatment includes a harvest prescription applying variable retention to large blocks, as much as 200 ha. There are two levels of retention planned for testing, 10 and 50%, the latter intended to test the LRMP guideline for mule deer winter range. Replicates are planned for harvesting only, and harvesting with site preparation/browse planting to test forage enhancement effects. Rates of treatment retention are expected to be achieved by retaining the largest, veteran Douglas fir trees first, prioritizing trees in xeric and sub-hygic sites, with least retention in mesic sites. Any residual retention will be made up by leaving some healthy crowned, rotation trees for old-growth recruitment.

1.5 Progress to Project Year 6, Fiscal 2006-7

In the second year of the project, potential treatment units were delineated within each study area, Paxton, Lambly, and Trout. Potential treatment units were field sampled to statistically assess their similarity in terrain (capability) and forest cover (current suitability). The overall results were that treatment units within each study area were similar, as were the study areas. A full report of the methods and results was prepared in the spring: *Quantitative Treatment Unit Selection* (vanWoudenberg 2003).

Pre-treatment sampling to assess current suitability for mule deer forage and cover was completed in potential treatment units of study areas Paxton, Lambly, and Trout in 2003-04. Pre-treatment sampling included shrubs and soils in the snow-free season and mule deer winter use during the winter. Shrub and soil information should provide pre-treatment conditions regarding forage quality, abundance, and may provide capability information for specific site characteristics. Mule deer winter use of canopy closure classes indicating pre-treatment cover and browse use trends will be compared with post-treatment use patterns. All sampling was completed as per RIC standards, where applicable, or with Ministry of Sustainable Resource Management approval where RIC standards are not available.

To date, harvest treatments have been on hold by Gorman Brothers Ltd. for treatment application at Trout Creek and BC Timber Sales at the Vernon Forest Service Office has permitted salvage for the Paxton area, more than likely negating its value as a treatment. Once Mountain Pine Beetle harvest priorities are addressed, licensees are expected to return to harvesting Douglas-fir for this project. However, as of 2006-07, only sampling at Cedar Hills has been completed, where the only harvest treatment has been applied in the form of post-burn salvage.

2.0 Study Area Description

There are 5 study areas in the Okanagan TSA, shown in Fig. 1.

Study Sites
Okanagan IFPA Mule Deer Winter Range Habitat Assessment and Use Project 2001-2003

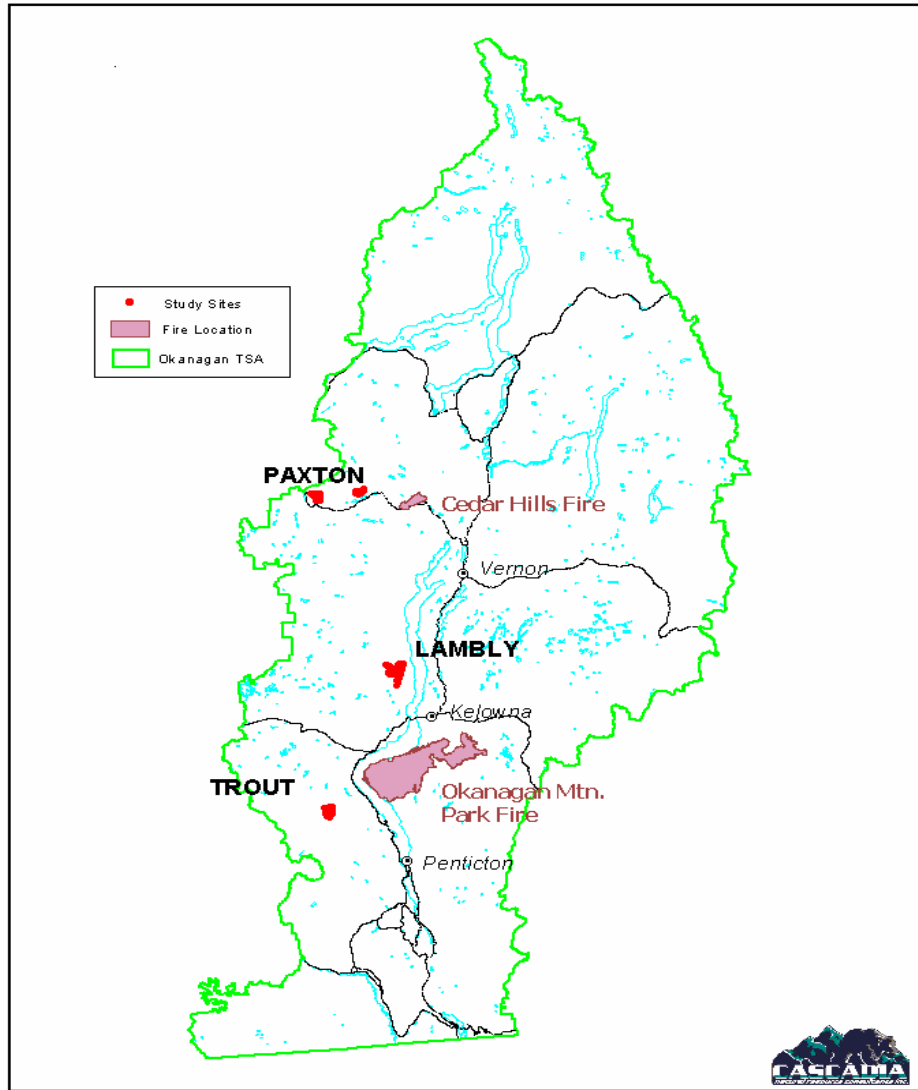


Figure 1. Map of short-listed dry forest ecosystem sites, including, from north to south, Paxton, Cedar Hills, Bear Creek or Lambly, Okanagan Mtn. Park and Trout Creek.

2.1 Paxton

Paxton study area is within the Vernon Forest District and is Crown Land scheduled for harvest within the Ministry of Forests Small Business Forest Enterprise Program. The site is in the IDFxh2/dk2 (Lloyd et. al. 1990) and is characterized by mature to old-growth dry Douglas fir dominated forest cover, with Ponderosa pine sub-dominating on south aspect slopes. Forest cover is generally closed canopy with remnant browse species and slopes are often steep, with an overall south aspect that tends to plateau at the north end of the study

area. There were 2 main sites that were sampled, the largest being the west site (see attached Paxton ortho photo). The west site had a major drainage through the centre.

2.2 Lambly (Bear Creek)

Lambly falls within by the IDFdk2/xh1 (Lloyd et al. 1990), with variable terrain (slopes and aspect). Forest cover was dominated by Douglas fir, with lodgepole pine, spruce, aspen or Ponderosa pine sub-dominating depending on the aspect and moisture regime. Forest cover is characterized by closed canopy mature to old-growth stands with remnant browse species. The Lambly site has a large main drainage that bisects the landscape, and thereby provides several opportunities for treatment pairs on either side.

2.3 Trout Creek

The Trout Creek study site lies within the IDFdk2/xh1 variant (Lloyd et al. 1990). The area is generally south facing with at least 2 potential treatment units naturally separated by drainages (see attached ortho photo). Similar to each of the other 2 sites, Trout is characterized by mature to old-growth forest cover dominated mostly by Douglas fir, with remnant browse species in the understory. Lodgepole pine tends to be the most common sub-species. Root disease (*Armellaria* and *Phellinus*) is prevalent on the west side of the study area.

2.4 Cedar Hills

The Cedar Hills study site is Crown Land located within the Okanagan Shuswap Forest District. The site falls within the IDF mw2/xh1 (Lloyd et al, 1990). The study site is located within the area affected by the Cedar Hills wildfire that began in August 2003 and reached 1,620 ha in size (Ministry of Forests, Protection Branch data). Pre-fire forest cover consisted of Douglas fir, with Lodgepole and Ponderosa pine as the major co-dominant species.

2.5 Okanagan Mountain Park

The Okanagan Park study site is Crown Land located within the over 10,000ha Okanagan Mountain Provincial Park in the Okanagan Shuswap Forest District. The site falls within the IDFdm1/xh1 (Lloyd et al, 1990). The study site is located within the area affected by the Okanagan Mountain Park wildfire that began in August 2003 and reached 25,912 ha in size (Ministry of Forests, Protection Branch data). Pre-fire forest cover consisted of Douglas fir, with Lodgepole and Ponderosa pine as the major co-dominant species.

3.0 Methods

3.1 Experimental Design

The project will be a randomized block design, comprising 4 treatments and 1 control. Each study area will be a block, with the following treatments to be applied to selected treatment units:

Treatment 1: 10% retention, with burn

Treatment 2: 10% retention, unburned

Treatment 3: 50% retention, with burn

Treatment 4: 50% retention, unburned

Treatment 5: Unharvested, unburned

3.2 Field Methods

3.2.1 Mule Deer Winter Range Sampling / Track Transects

Mule deer sampling was completed in both early (late November to early January) and late (late January to mid February) periods for Cedar Hills.

Mule deer use was documented by recording sign, including beds, pellets groups, and tracks along permanent transects within canopy closure classes. Alternative transects within the same stratified units were established in the second round of sampling to avoid recording observer effects. Methods used were similar to those described in D'eon (2001) and approved by Dave Low SRM (2001) at the outset of the project.

3.2.2 Shrub Utilization / Pellet Group Plots

Shrub utilization / pellet group plots were completed along transects with an interstation distance of 150 m. Nested plots of 1.22 m radius were located at 3 m from centre at 45, 135, 225 and 315 degrees. Deer pellets as well as other animal signs were recorded.

Shrub characteristics such as species, percent cover and percent utilization were recorded. Methods used follow those described in RIC 1998. *Ground Based Inventory Methods for Selected Ungulates: Moose, Elk and Deer; Procedures for Habitat Monitoring in Range and Wildlife Habitat Management* (1996).

4.0 Results

4.1 Mule Deer Early and Late Winter Range Sampling

In the 2006-07 fiscal year, a total of 10,209m of transect were sampled at Cedar Hills, 4213m in early winter and 5996m in late winter.

4.1.1 Transect Sampling: Deer Activity by Canopy Closure

4.1.1.1 Cedar Hills

Figure 2 shows the results of fresh (<24hrs) mule deer activity recorded within the 4 canopy closure classes. The lowest canopy closure class (0-15%) showed the highest number of tracks and pellets and the highest class (>60%) showed the highest number of bed; there was only one bed recorded.

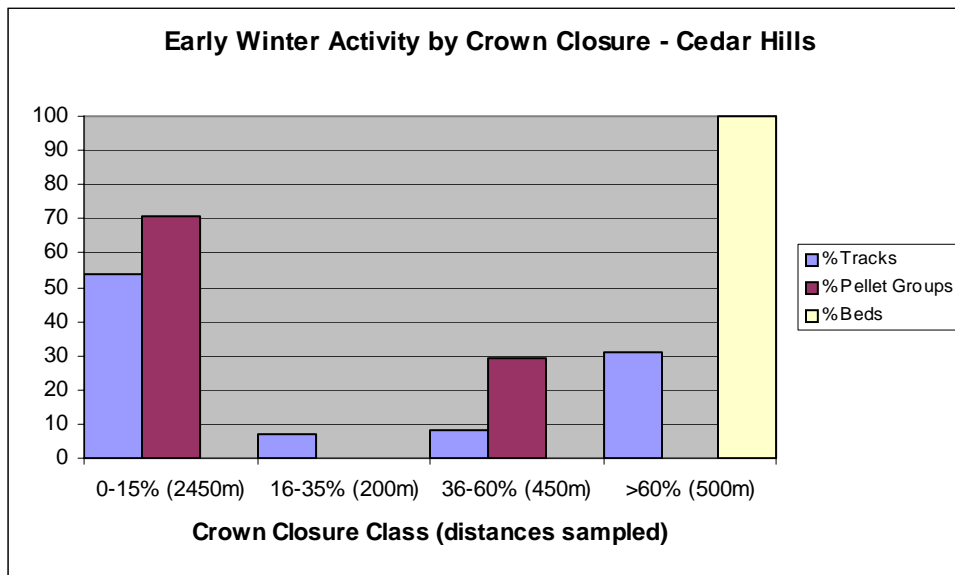


Figure 2. Early winter deer activity by canopy closure at Cedar Hills Burn.

Table 1 shows that the highest average snow depth was under Class 2 canopy closure; snow conditions were fluffy and dense and the crust was between 0 and 1cm.

Table 1. Mean snow depth recorded at Cedar Hills in early winter sampling.

Canopy Closure Class	Mean Snow Depth (cm)	Range (cm)
Class 1 (0-15%)	28.1	5-50
Class 2 (16-35%)	37.3	34-41
Class 3 (36-60%)	35.8	18-43
Class 4 (>60%)	21.8	20-40

Figure 3 shows that the highest activity by mule deer in the late winter was in crown closure class 1, closely followed by classes 2 and 3. Deer activity is in proportion with the number of meters sampled.

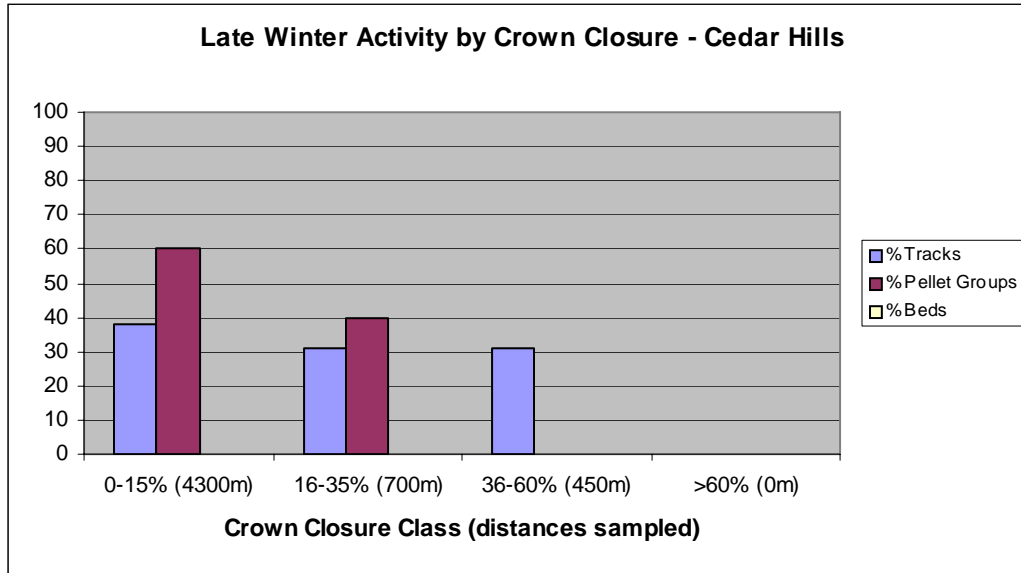


Figure 3. Late winter deer activity by canopy closure at Cedar Hills Burn.

In late winter at Cedar Hills, the deepest snow was recorded in canopy closure class 1, while the lowest average snow depth was recorded in Class 3, as seen in Table 2. The snow was denser than in the early sample and the crust measured between 0 and 2cm.

Table 2. Mean snow depth recorded at Cedar Hills in late winter sampling.

Canopy Closure Class	Mean Snow Depth (cm)	Range (cm)
Class 1 (0-15%)	51.7	23-79
Class 2 (16-35%)	49.6	17-73
Class 3 (36-60%)	35.1	11-73
Class 4 (>60%)	n/a	n/a

4.2.2 Deer Plot Data: Browse Availability and Use

4.2.2.1 Cedar Hills

Figure 4 shows the types of browse available to mule deer in early winter recorded in deer plots at Cedar Hills (n=26 deer plots, 104 quadrants). The highest proportion of plots had no browse; where browse was present, saskatoon, red-stem ceanothus and snowberry were most commonly observed.

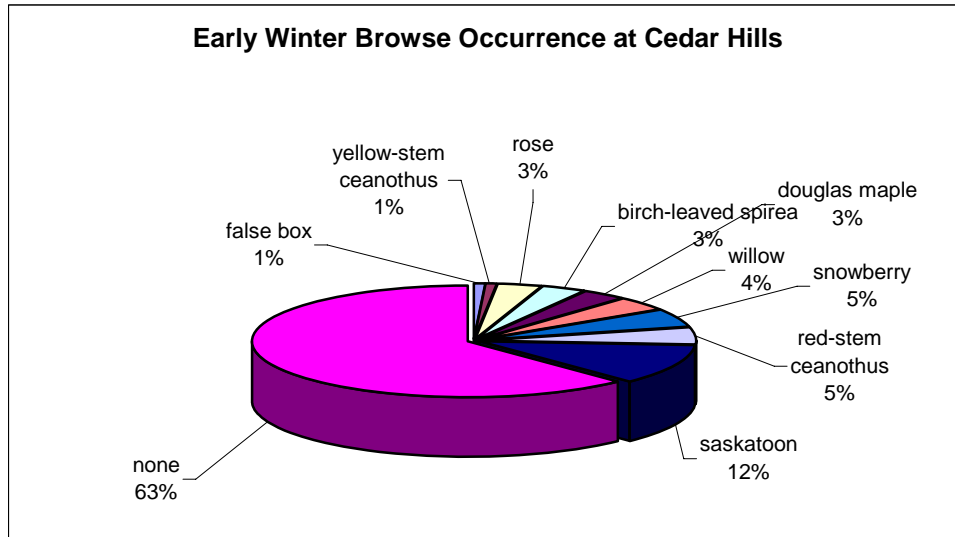


Figure 4. Early winter browse availability at Cedar Hills.

The relative amount of browse cover and average percent cover recorded per plot in early winter are shown in Figure 5. Rose was the highest relative percent cover for Cedar Hills.

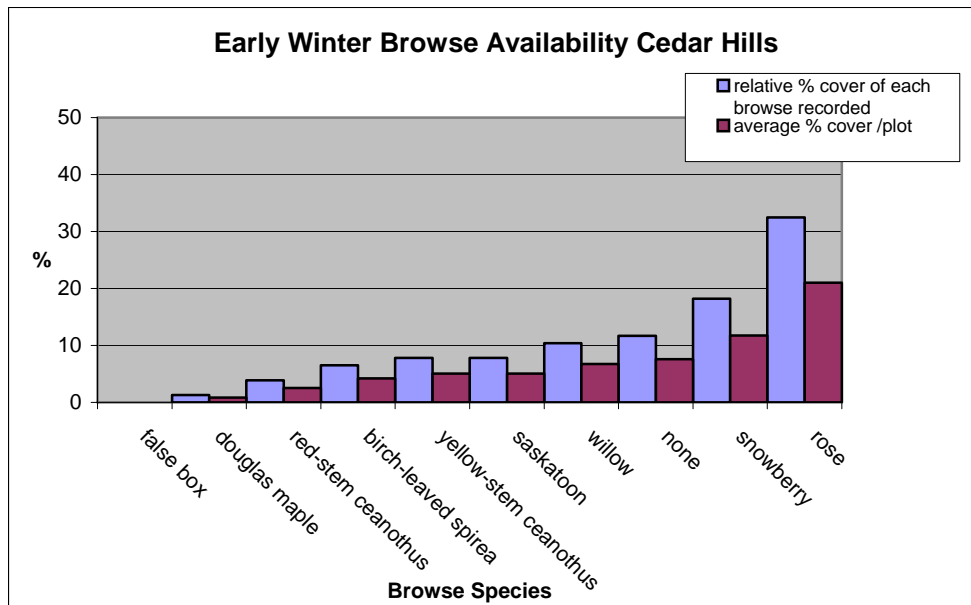


Figure 5. Early winter browse composition at Cedar Hills.

Figure 6 shows that false box and red-stem ceanothus received the highest browse utilization. Red-stem ceanothus was proportionately used to its availability indicated in Figure 5 however, false box was disproportionately used considering that it had a relative percent cover of <1%.

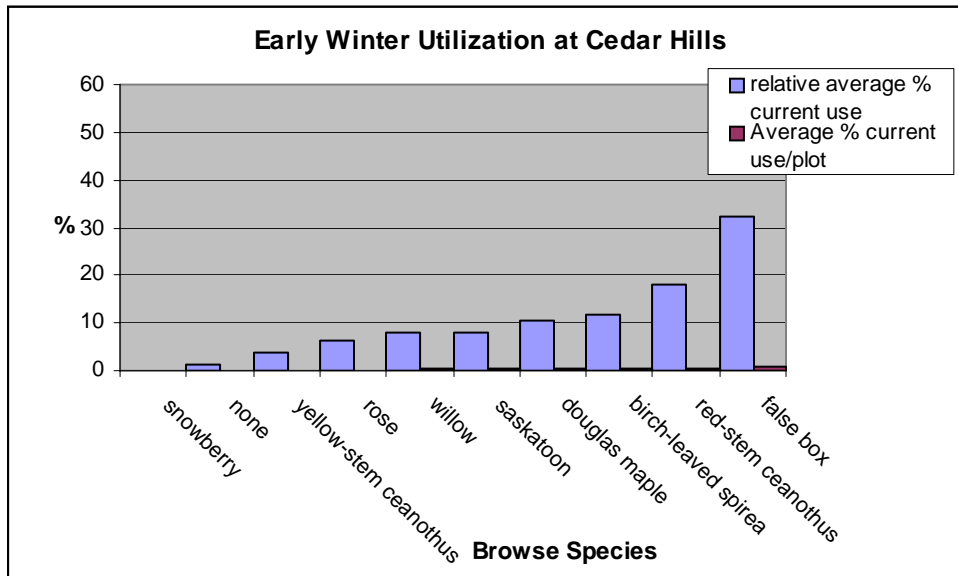


Figure 6. Early winter browse use at Cedar Hills.

Figure 7 shows the types of browse available to mule deer in late winter recorded in deer plots at Cedar Hills (n=35 plots, 140 quadrants). Similar to early winter results, the highest proportion of plots had no browse. Where browse was present, red-stem ceanothus was the most common, followed by willow and saskatoon.

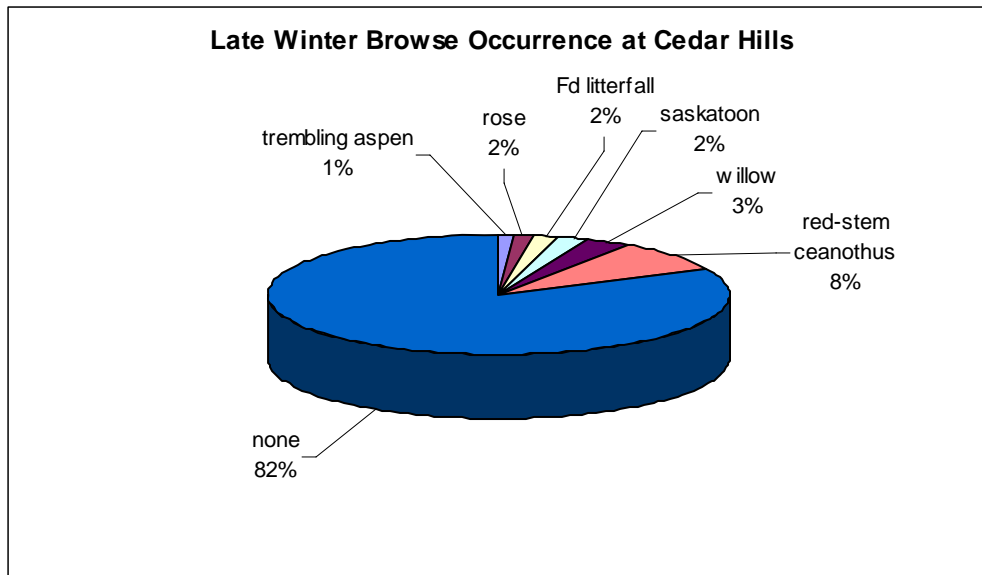


Figure 7. Late winter browse composition at Cedar Hills.

The relative amount of browse cover and average percent cover recorded per plot in late winter are shown below in Figure 8. Saskatoon and snowberry occupied most of the browse cover observed in plots.

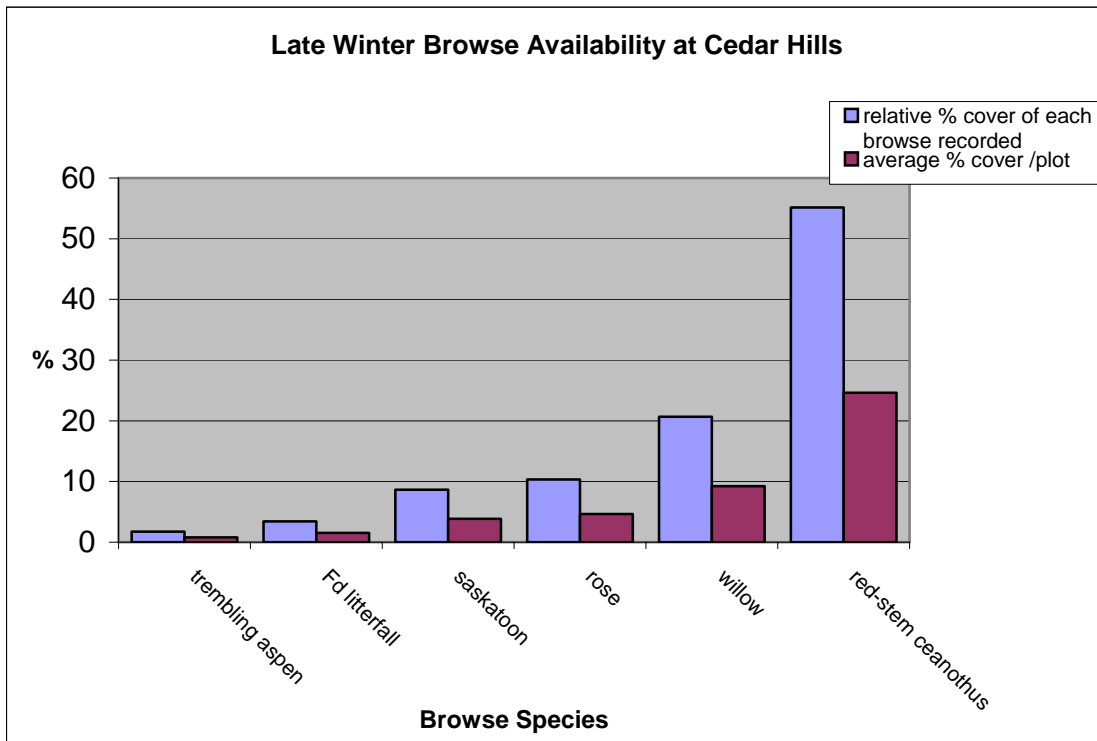


Figure 8. Late winter browse availability at Cedar Hills.

Figure 9 shows that red-stem ceanothus followed by willow received the highest browse utilization. The relative utilization is consistent with the availability of both browse species.

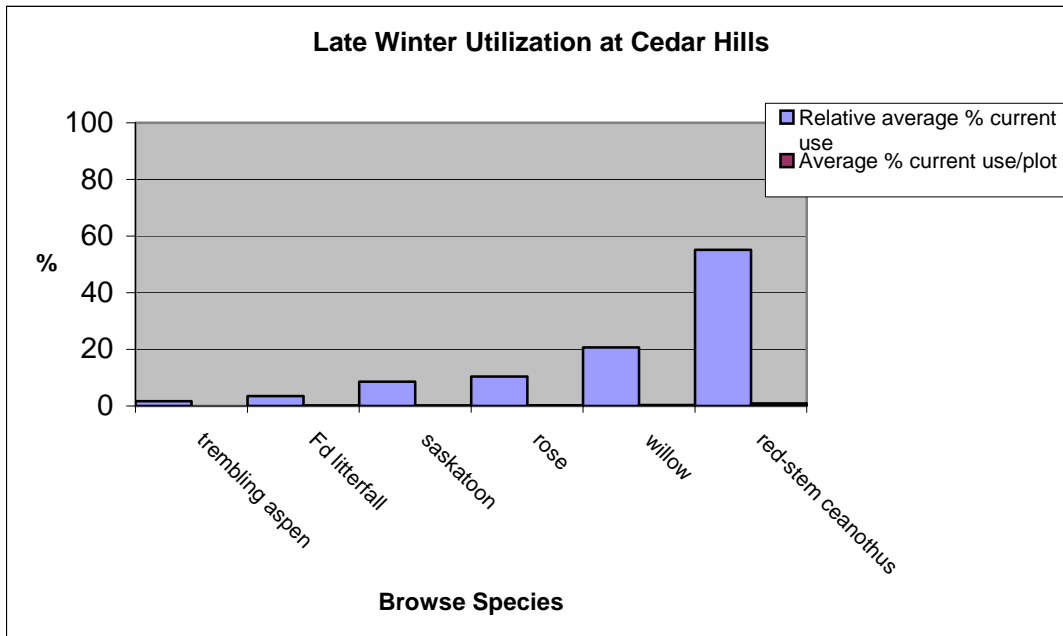


Figure 9. Late winter browse use at Cedar Hills.

5.0 Literature Cited

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