THE ASSESSMENT OF THREE ELK WINTER RANGES IN ALBERTA: AN APPRAISAL.


ELDON BRUNS, Alberta Fish and Wildlife Division, P.O. Box 388, Rocky Mountain House, Alberta TOM 1T0.

Abstract: In 1982, the Alberta Fish and Wildlife Division supported a detailed study of three elk (Cervus elaphus) winter ranges in the eastern slopes of the Rocky Mountains. The project involved classification of vegetation at a plant community level, elk distribution and plant community utilization, food habits, forage quality, range and soil condition, and fire history. Grasses, particularly fescue species, were found to be a major component of elk winter diets. The contribution of willow species was marginal. Forage was found to be phosphorus, nitrogen and selenium deficient. Elk selected for dry grassland communities that represented less than 30% of the apparently available ranges. The utilization of plant communities was found to be related not only to their foraging or cover value, but also to their proximity to other plant communities or site-specific features (mineral licks, game trails, etc.). Pellet group counts were not adequate to detect local distribution patterns. The absence of baseline information on range plant composition and trends limited the assessment of range condition and potential productivity. Several management recommendations were submitted. Even though such detailed studies can provide valuable information, their value for management is limited when ecology, behavior and movements of regional elk populations are not known.

INTRODUCTION

In Alberta, in the Eastern Slopes Region north of Calgary, there are several grass-shrubland ranges that traditionally overwintered large herds of elk (Alberta Fish and Wildlife files). At the present time, in spite of restrictions on elk hunting for the last 13 years, most of these ranges appear to support fewer animals than in the past. In order to provide insight into the factors affecting elk distribution in winter and to evaluate the need for range improvement, in 1982 the Alberta Fish and Wildlife Division retained Wildland Resources Consultants Limited to assess the value of three selected elk winter ranges along the east slopes of the Rocky Mountains. The main objectives of the study were to assess range utilization, to evaluate the need for range improvement, and to determine the potential of the areas to support higher elk densities. The results of the study were summarized in an extensive report submitted to the Alberta Fish and Wildlife Division in the fall of 1983 (Morgantini and Russell 1983) (copies available from E. Bruns). The objective of this
paper is to outline some major findings and to relate them to the management of elk and their habitats throughout the province.

STUDY AREAS AND METHODS

The three study areas (Figure 1) are open, predominantly treeless valleys surrounded by continuous forest.

Harrison Flats, located along the Clearwater River approximately 10 km east of Banff National Park, extends over 156.4 hectares (386.5 acres) of rolling ground, of which about 30% is covered by forest, 23% by shrubs and 47% by native grassland (Figure 2). Its elevation ranges between 1680 m and 1720 m.

The area enjoys relatively mild winter conditions. Prevailing westerly airflows and frequent warm chinook winds that funnel along the Clearwater River valley limit snow accumulation and maintain the open grassland largely snowfree.

The second study area, Ribbon Flats, is located within the Red Deer River drainage, 2 km south of the Ya Ha Tinda Ranch, one of the most important elk winter ranges in Alberta. The study area extends over 171.4 hectares (423.5 acres) of which 17.9% is covered by forest, 39.1% by shrubs, 27.3% by muskegs and wetland, and 14.8% by grassland (Figure 3). Elevation ranges between 1700 m and 1740 m.

The third study area is located along George Creek, a tributary to the Blackstone River (Figure 4). The area consists of 82.7 hectares (204.4 acres) of which 75% is covered by birch-salix shrubland, 15% by a vegetational complex on river alluvium, and 10% by open meadows.

Ribbon Flats and George Creek have a cordilleran climate, with warm chinook winds ameliorating colder, continental winter temperatures. Due to their north-south orientation, the two areas are not significantly affected by strong westerly winds. Hence, snow tends to persist and accumulate through the winter.

The vegetation of each winter range was classified into plant communities, i.e., plant assemblages of similar species composition, physiognomy and habitat. Elk use of plant communities was determined by pellet group counts along transects established in representative sites within each community type. In view of the limitations of the pellet group count technique (Collins and Urness 1979), numerous, long (50-200 m) and wide (3 m) transects were used. Pellet counts were then interpreted on the basis of the location of each and every transect within the study area, and compared to field observations of animal movements and distribution and herbage removal data.
Figure 1. Location of the 3 study areas, Alberta.
Figure 2. Harrison Flats along the Clearwater River.

Figure 3. Ribbon Flats. The Ya Ha Tinda Ranch elk winter range can be seen in the background (upper right).
Forage availability in late fall was assessed by clipping 10 plots randomly established within each plant community. Overwinter herbage removal was determined by late spring clipping of 10 additional plots randomly established within each plant community and by subtracting spring standing biomass from the standing biomass in the fall.

Elk monthly food habits were determined by identification of plant cuticular fragments in the feces (Todd and Hansen 1973).

Major forage species were collected in the fall and analyzed for crude protein, phosphorus, calcium and selenium according to procedures described by A.O.A.C. (1965). Acid Detergent Fibers (ADF) were determined by the procedures summarized by Bailey and Ulyatt (1970).

RESULTS AND DISCUSSION

The three study areas differed in environmental conditions, in level and patterns of elk utilization (Table 1), and in their value to regional elk populations.

Thirteen plant communities were classified on Harrison Flats, 16 on Ribbon Flats and 7 along George Creek. Based on pellet group counts, elk selected for fescue and wheat grass communities. The Potentilla/Festuca/Geum, Festuca/Helictotrichon/Oxytropis and the Agropyron/forb grassland communities on Harrison Flats recorded the
highest average pellet group densities (.299 pellet groups [pg]/m², .232 pg/m², and .202 pg/m²). On Ribbon Flats, the highest average densities were recorded in the Festuca-Agropyron x Elymus (.186 pg/m²) and in the Deschampsia/Agropyron (.182 pg/m²) communities. The use of George Creek meadows was marginal and largely restricted to the Agropyron community (.022 pg/m²) located on a small ridge.

Table 1. Number of transects, total length, and number of pellet groups covered in the study areas (1982-83).

<table>
<thead>
<tr>
<th>Transects</th>
<th>Pellet Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>Harrison Flats</td>
<td>59</td>
</tr>
<tr>
<td>Ribbon Flats</td>
<td>47</td>
</tr>
<tr>
<td>George Creek</td>
<td>31</td>
</tr>
</tbody>
</table>

Pellet counts along individual transects within each plant community showed widely ranging values (e.g. between .113 and .513 pg/m² in the Potentilla/Festuca/Geum community on Harrison Flats). This variation reflected the position of each transect within the study area, irrespective of the plant community in which it had been established and its location in relation to other plant communities. The utilization of plant communities was found to be related not only to their foraging or cover value, but also to their position within the vegetational mosaic, their proximity to other plant communities or to site-specific features (mineral licks, game trails, etc.).

Overall, the preference by elk for fescue and wheat grass communities, as apparently indicated by pellet group counts, was consistent with overwinter herbage removal and food habits data. However, in spite of a high sampling intensity, pellet group counts were not adequate to detect local distribution patterns and habitat use for the purpose of habitat management. In this study, pellet group count results were verified and compared to herbage removal and food habits data. These data, and field observations of animal behavior, helped interpreting local variations of pellet counts within each plant community. The absence of such data and/or any longer sampling intensity would have led to erroneous conclusions.

Grasses were the dominant component of the winter diet in all three study areas. Consumption of fescue species averaged 69.5% of the diet on Harrison Flats and 57.5% on Ribbon Flats. Sedge and browse species contributed to 14.2% and 7.1% of diet on Harrison Flats, and 20.6% and 11.2% on Ribbon Flats. The marginal use of the George Creek study area by elk restricted the collection of fecal samples. Based on only two months
data, December and March, winter diet averaged 37.5% grasses, 27.4% sedges and 25.4% browse. In view of the limited use of this area, these values are believed to reflect elk diet in the surrounding ranges.

Forage quality was similar in all the study areas. Major plant species were found to be nitrogen, phosphorus and selenium deficient. From the cured stage through winter, native grasses of the rough fescue association are known to contain levels of crude protein and phosphorus below maintenance requirements for livestock (Bezeau and Johnston 1962). Crude protein of willow was above maintenance requirements. However, willow species contributed only a minor portion of the diet. Elk preference for grasses, mostly rough fescue (Festuca scabrella), in spite of their low nitrogen content, has been explained as due to higher digestible energy content (65% in grasses vs. 48% in willow; Morgantini and Hudson 1985).

In view of the importance of phosphorus intake for the reproductive performance of livestock (Maynard et al. 1979), phosphorus deficiency on winter ranges was considered a factor affecting the productivity of elk populations in the study areas.

On the basis of fall standing biomass and overwinter herbage removals, an attempt was made to assess the carrying capacity of the study areas and the level of utilization overwinter.

Three different winter carrying capacity values were obtained. The first assumed a 65% uniform utilization of all grass and sedge species. The second was based on a 65% utilization of only the plant communities that were used by elk during the winter of study. The third carrying capacity value was obtained by removing from the second carrying capacity the contribution of some plant communities whose utilization was site specific and could not be generalized to the entire study area. With regard to Harrison Flats, for instance, it was estimated that the area could support about 161 adult elk cows (average weight 236 kg) for a 5 month period (Table 2). This figure assumed an average monthly intake of 173 kg of forage (22.9 g daily/kg body weight) (Thorne et al. 1976, Mereszczak et al. 1981). However, such a stocking rate did not allow for the differential use of plant communities based on their forage palatability and value. For example, it was highly unlikely that 77 elk could overwinter within the Deschampsia community (H11) on a diet of tufted hairgrass (Deschampsia caespitosa). If that had been their only choice on Harrison Flats, it is reasonable to assume that the animals would have searched for more palatable forage on other ranges. A more correct estimate of the potential stocking rate of Harrison Flats was obtained by considering only the plant communities that received some use during the winter of 1982-83. Based on herbage removal data, the area supported about 74 animals a month for 5 months. Increasing the utilization of the same communities up to 65% of their total winter forage biomass, and including the highly palatable fescue forage available in the Betula/Fescue community whose utilization was not detected by grazing exclusion cages and clip plots, the stocking rate increased to approximately 98 elk a month for 5 months. In this estimate, herbage removal from the Deschampsia community (H11) was arbitrarily left to the same percentage observed during the study since the utilization of the
community was site specific and related to human harassment. However, in view of the minimal contribution of tufted hairgrass to elk diet (X=1.0%), it is also questionable whether the heavy grazing observed around three grazing exclosures in the hairgrass community in one location should be used to estimate the elk utilization of that community wherever it occurs. Removing the contribution of the Deschampsia community (H11), the potential stocking rate decreases to some 63 animals a month for 5 months. Although this figure is significantly less than the stocking rate initially calculated, it is still based on two assumptions: 1. uniform grazing of plant communities throughout the area; 2. availability of palatable forage in all the plant communities considered, up to 65% of the total forage biomass.

The same reasoning was applied to estimate the carrying capacity of Ribbon Flats and George Creek study areas.

Assessment of range condition involves determining site-specific climax vegetation, which is difficult and requires long term studies. With regard to species composition, the same species that may be an increaser ("undesirable") as a result of heavy grazing in one area, can be a decreaser ("desirable") in another. Further, it should be noted that, on native ranges not grazed by livestock, climax condition may not be preferable. Vegetation in subclimax condition may be more productive of palatable wildlife forage than it would be at its climax stage. In this study, because we did not know climax vegetation of the winter ranges and its response to grazing, range condition analysis was restricted to a mostly subjective assessment of plant communities. On the basis of plant vigour, height and cover, and standing biomass, all study areas were considered in good-to-excellent condition.

Based on 1982 forage production, all of the study areas could have supported higher elk densities. The low utilization of Harrison Flats was related to regional movement patterns and a low density of elk along the Clearwater River. Differently, the limited use of Ribbon Flats was explained in terms of its proximity to a major winter range, the Ya Ha Tinda Ranch, with good forage, milder winter weather and less snow cover. Ribbon Flats was considered a secondary winter range. In contrast, no conclusion could be reached about the study area along George Creek. In the absence of some understanding of elk movement, behavior and range availability in the region, the factors underlying the low use of George Creek could not be determined.

As a result of the project several management recommendations were submitted, such as experimental phosphorus supplementation, prescribed burning and road closures.
Table 2. AUM and stocking rates for Harrison Flats.

<table>
<thead>
<tr>
<th>Plant Comm.</th>
<th>Hectares Per AUM&lt;sup&gt;1&lt;/sup&gt;</th>
<th>5 months stocking rate&lt;sup&gt;2&lt;/sup&gt;</th>
<th>1982-83 stocking rate&lt;sup&gt;3&lt;/sup&gt; (5 months)</th>
<th>Potential stocking rate (5 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>.64</td>
<td>1.9</td>
<td>2.3</td>
<td>1.9</td>
</tr>
<tr>
<td>H2</td>
<td>.43</td>
<td>7.7</td>
<td>0.0</td>
<td>7.7</td>
</tr>
<tr>
<td>H3</td>
<td>.20</td>
<td>7.9</td>
<td>4.6</td>
<td>7.9</td>
</tr>
<tr>
<td>H4</td>
<td>.16</td>
<td>22.0</td>
<td>16.4</td>
<td>22.0</td>
</tr>
<tr>
<td>H5</td>
<td>.09</td>
<td>9.6</td>
<td>7.1</td>
<td>9.6</td>
</tr>
<tr>
<td>H6</td>
<td>1.08</td>
<td>8.6</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>H7</td>
<td>.13</td>
<td>13.5</td>
<td>9.0</td>
<td>13.5</td>
</tr>
<tr>
<td>H8</td>
<td>.36</td>
<td>5.2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>H9</td>
<td>.58</td>
<td>3.3</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>H10</td>
<td>.13</td>
<td>1.4</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>H11</td>
<td>.07</td>
<td>77.1</td>
<td>35.3</td>
<td>35.3</td>
</tr>
<tr>
<td>H12-H13</td>
<td>.09</td>
<td>3.3</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>161.5</td>
<td>74.6 (39.3)</td>
<td>97.9 (62.6)</td>
</tr>
</tbody>
</table>

<sup>1</sup> = Average monthly forage intake by elk
Available forage per hectare X .65

<sup>2</sup> = Total # of hectares per community
AUM x 5 months

<sup>3</sup> = Forage utilization per hectare X # of hectares
Average monthly forage intake X 5 months

() = Stocking rate when the contribution of the Deschampsia community (H11) is removed.

H1  Festuca scabrella - Helictotrichon hookeri/Oxytropis campestris
H2  Betula glandulosa/Festuca scabrella - Kobresia bellardii
H3  Potentilla fruticosa/Festuca scabrella/Geum triflorum
H4  Potentilla fruticosa/Agropyron subsecundum/Geum triflorum
H5  Agropyron Elymus/forb
H6  Pinus contorta/Shepherdia canadensis/Elymus innovatus
H7  Agropyron subsecundum/forb complex
H8  Salix spp. - Betula glandulosa shrubland complex
H9  Salix spp. - Betula glandulosa thicket complex
H10  Salix spp./Juncus balticus/moss
H11  Deschampsia caespitosa - Carex aquatilis - Poa pratensis
H12  Carex pseudo-cyperus - Deschampsia caespitosa
H13  Carex aquatilis - Calamagrostis neglecta/moss
CONCLUSIONS

This elk winter range assessment study, the first ever carried to such a detailed level in the province of Alberta, provided valuable information on vegetation composition and nutritional quality, and on elk ecology, food habits and movements. It also underlined the limitations of directly applying range management concepts and practices, largely developed in the livestock industry, to wildlife and habitat management.

The results of this study have several implications for the management of elk populations and their habitat. Often, wildlife biologists refer to open meadows along the foothills of the Rocky Mountains as potential elk winter ranges. The presence of some elk activity is taken as an indication that the range could support higher elk densities, when the low animal density may simply reflect limited resource availability. The recent development and application of an ecosystem approach to wildlife habitat assessment further confound the issue, insofar that an entire open meadow may be erroneously considered a single land unit potentially available to elk. As shown in this study, dry grasslands supporting fescue and wheat grass communities, selected by elk, represented only 28.7%, 30.6% and 9.6% of the total range apparently available on Harrison Flats, Ribbon Flats and George Creek, respectively.

The results of this study and the management conclusions cannot be taken out of context and applied to other elk ranges.

Proper elk management requires an understanding of individual elk populations, their movements, behavior, habitat availability, forage preference and availability, and a knowledge of the impact of weather conditions, human activities and other land uses. As stated by Skovlin (1982): "To plan for habitat alterations to benefit elk, the specific habitat requirements must be recognized...Inadequate habitat assessment or worse - no assessment at all - requires that vital decisions be made without adequate information, to the possible detriment of elk and their habitats".

Future assessments of elk winter ranges in similar detail may not be financially or practically feasible. Nonetheless, if such assessments were possible, they should be conducted as part of more extensive studies on regional elk populations. With regard to this project, it should be noted that the value of range assessment on Harrison and Ribbon Flats was greatly enhanced by the available knowledge of elk populations along the Clearwater and Red Deer River valleys. In contrast, the absence of regional information on elk limited the value of range assessment along George Creek, even though the study provided previously unavailable data.

LITERATURE CITED


