AN ASSESSMENT OF CARRYING CAPACITY IN THE FINDLAY BASIN RANGE UNIT

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Abstract

A range vegetation survey was conducted in the Findlay Basin Range Unit near Canal Flats, British Columbia. Forty-four transects were established, 21 of which had production cages. Based on field surveys conducted in late June and July, 1995, five broad range types were delineated including improved range, native grassland, wetlands, mature forest, and cutblocks. Within these range types, 10 vegetation community types were classified and mapped within the range unit. Productivity estimates indicated that the carrying capacity for livestock was 531 AUMs for Lavington Pasture, 334 AUMs for Saddle Pasture, and 1480 AUMs for Stinky Slough Pasture.

Table of Contents

List of Tables

List of Figures

List of Photos

1.0 INTRODUCTION

Rangelands are an important resource in British Columbia, particularly for the ranching industry. In 1989/1990, almost one million animal unit months (AUMs) or 60% of the total forage requirement for beef production in the province, were produced on Crown lands (Meidinger and Pojar 1991). Aside from providing grazeable forage for domestic livestock and wildlife, rangelands are also important in providing habitat for fish and wildlife, and various recreational opportunities and aesthetic benefits for residents and visitors. Although rangeland includes natural grasslands, shrublands, alpine communities, and wet meadows, forested lands contribute significantly to the forage base, accounting for almost 80% of the rangelands in British Columbia (Meidinger and Pojar 1991). Logging activities and fire are important factors in the conversion of forest into rangelands.

Management of rangelands is primarily under the jurisdiction of the Ministry of Forests. Because of the importance of rangeland for wildlife, the Ministry of Environment is also involved in rangeland management and planning (MOF 1989). Within the Ministry of Forests, technical expertise in managing Crown rangelands is provided by the Range Section which issues grazing tenures and hay cutting permits for domestic livestock, monitors tenure and permit compliance and conducts forage inventories.

Rangeland management and planning activities of the Range Section are based on the guidelines and policies outlined in the Range Program. The program, which was reviewed in 1989 by the Range Program Review Task Force (MOF 1989), is administered through six regions and 43 districts located throughout British Columbia. One of the recommendations of the program was to implement a range inventory process designed to document the carrying capacities of rangelands in these areas.

As part of its on-going range management program in the Invermere Forest District, the Range Section identified a need to conduct a forage assessment of the Findlay Basin Range Unit. The following report, which was prepared by D.A. Westworth & Associates Ltd., presents the results of this forage assessment. The information should assist resource managers in developing and implementing management plans that will ensure sustained forage yields for domestic livestock and wildlife while ensuring compatibility with other land uses in the region.

1.1 Objectives

The overall objective of this study was to determine forage production levels and carrying capacity for the Findlay Basin Range Unit. Specific objectives of the range inventory were to:

- Identify and map primary and secondary ranges;
- Identify and sample major vegetation communities within primary and secondary ranges; and
- Collect forage productivity data to determine carrying capacity within each vegetation community.

1.2 Regional and Biophysical Setting

The Findlay Basin Range Unit is located in the Rocky Mountain Trench west of Canal Flats, B.C., and for the most part, extends north and west along Findlay Creek (Figure 1). The range unit is comprised of five pastures, including Findlay, Lavington, Saddle, Stinky, and Whitetail. This report describes the range inventory only for Lavington, Saddle, and Stinky Slough pastures. A range inventory for Findlay and Whitetail pastures is described in an earlier report (Irving and Brusnyk, 1994). Each pasture, which contains different proportions of Crown and private lands, range in size from 1414 ha to 3377 ha (Table 1). The range unit can be accessed by road from Highway 93/95. An unimproved road, known as the Findlay Basin Road and located near the southwest end of Columbia Lake, provides access to all five pastures. Major land uses in the area consist of livestock grazing, timber harvesting, fishing and hunting. The Findlay Basin Range Unit is presently being grazed by livestock from the J2 Ranch under a permit to Maurice McCaig. J2 Ranch is presently managed by Gerard Breton who is assisted by his wife Chris and brother-in-law Blake Taylor.

The Findlay Basin Range Unit is both geographically and ecologically diverse. Four biogeoclimatic zones are represented in the range unit including the Englemann Spruce-Subalpine Fir, Montane Spruce, Interior Douglas-fir, and Ponderosa Pine zones (Meidinger and Pojar 1991). However, Crown grazing lands, the focal point of this study, are primarily located in the Interior Douglas-fir zone. Although plant species composition of these biogeoclimatic zones is relatively well known, population estimates and in the case of wildlife, patterns of habitat use and seasonal movements have not been well documented. Based on discussions with local individuals and Ministry of Forests personnel, lower

Figure 1. Location of the Findlay Basin Range Unit study area.

elevations of the Findlay Basin Range Unit appear to be used extensively by wintering elk herds. During the summer, elk move to higher elevations. Whitetail deer and mule deer are also common at lower elevations while moose prefer riparian and cutblock habitats adjacent to forest cover.

Table 1. Area (ha) of private and Crown lands in the Findlay Basin Range Unit.

Pasture	Total Area (ha)	Private Lands (ha)	Crown Lands	
			Utilized[1] (ha)	Unutilized[2] (ha)
Lavington	1414	250	500	664
Saddle	2026	0	1080	945
Stinky Slough	3377	175	1794	1408

[1] Livestock use focused primarily on these areas, also used by wildlife.
[2] Areas largely unused by livestock.

1.3 Pastures of the Findlay Basin Range Unit

Lavington Pasture is located at the west end of Stinky Pasture, south of Findlay Creek. Lavington Pasture is characterized by low relief and is the least topographically diverse of the three pastures. West of Lavington Creek, Lavington Pasture is relatively flat with elevations ranging from 1080 to 1150 m. Extensive alkali flats along Lavington Creek are the most distinctive feature of this pasture. The west end of Lavington Pasture is gently rolling with high forest cover. Forest areas adjacent to the alkali flats have been selectively logged and are now in the early stages of forest succession. Forest encroachment on to adjacent native grasslands is widespread.

East of Lavington Creek, steep, west-facing slopes with elevations ranging from 1080 to 1300 m predominate. More than half of these slopes are covered by dense, mixed forests of Douglas-fir, lodgepole pine and western larch. However, an extensive area of lower slope benchlands has been selectively logged and area now provides good forage for livestock. A narrow strip of native grassland borders the southern portion of Lavington Creek road and riparian areas are well developed along both sides of Lavington Creek. Ducks Unlimited has constructed a dyke at the south end of the creek to improve habitat for waterfowl.

Saddle Pasture is located on the east side of the range unit. It is roughly bounded on the northwest by Findlay Creek Road, on the southwest by Findlay Creek, and on the northeast by cliffs above the CPR right-of-way. Saddle Pasture is topographically diverse with high

relief. Elevations range from 820 m on the east side near the CPR right-of-way, to 1000 m in
the west, near the B.C. Hydro transmission line right-of-way. Saddle Pasture is quite rugged with many north-south ridges, especially at the west end of the pasture. A network of stream-connected sloughs and small waterbodies are frequently found in depressions between these ridges. Ridge tops and slopes are usually dominated by bunchgrasses with low growing shrubs although scattered trees are also present. Aspen is often a characteristic tree species immediately adjacent to stream channels and lakeshores. Saddle Pasture has extensive forest cover with lodgepole pine and Douglas-fir as the dominant tree species. Remnant tree stumps found throughout the pasture, indicate that much of Saddle Pasture had been previously logged. Many of these logged areas, especially along the old haul road that runs the length of Saddle Pasture, have been planted with yellow pine. Numerous plantations of yellow pine are now scattered throughout the pasture east of the road. A large terraced area near the junction of Findlay Creek and the Kootenay River supports an open forest of Douglas-fir.

Fire (i.e., wildfire and prescribed burns) has played an important role in the ecology of Saddle Pasture. Natural forest regeneration requires fire to remove vegetation and help prepare a suitable bed for seed germination and seedling establishment. The post-fire flush of nutrients, created by leaching of minerals from ash residue, promotes vigorous new growth of understory shrubs, grasses, and forbs. This flush of new growth produces high quality forage and browse for wildlife, especially for ungulates such as elk, deer, and moose. Fire, therefore, also performs an important function in maintaining suitable wildlife habitat. As a management tool light, ground fires can be used to enhance wildlife habitat by promoting growth of desirable forage and browse species. Saddle Pasture has not been grazed by livestock for two years. The Ministry of Forests intends to conduct prescribed burns in this pasture in the near future to open the canopy, promote shrub growth and rejuvenate grasslands and to improve habitat for wildlife.

Stinky Slough Pasture is a very large and diverse pasture that covers approximately 3377 hectares (Table 1). It is located north of Findlay Creek and extends west from Highway 93/95 almost to the junction of the Findlay Creek and Whitetail Lake roads. Stinky Slough Pasture also includes the south-facing slope of Fir Mountain. Elevations range from 820 m in the east, near Highway 93/95, to over 2100 m near the top of Fir Mountain in the west. An extensive fire in 1985 burned most of Stinky Slough Pasture, including almost all of Fir Mountain, with the exception of the east end.

Stinky Slough Pasture has diverse patterns of topography and vegetation. East of Fir Mountain, vegetation cover is predominantly open forest and grassland. Much of this area has been logged and some areas have been replanted with yellow pine. Aspen, Douglas-fir, yellow pine, and lodgepole pine are the leading tree species on this part of the pasture. Closed aspen forest is not widespread in the pasture although it can be found along stream channels and around Stinky Slough. More open aspen communities that intergrade with grassland communities are widespread throughout the area. Small patches of open Douglas-fir and yellow pine stands are also present. Mixed stands of lodgepole pine, yellow pine, and to a lesser extent Douglas-fir are found along Findlay Road and the transmission line right-of-way near Stinky Slough. Upland native grasslands are well developed and widespread east of Fir Mountain.

Prior to the 1985, fire Fir Mountain was covered with dense forest and was not used extensively by livestock (G. Breton, pers. comm.). In 1986, an extensive network of roads was constructed to provide access into the burned area for a post-fire salvage logging operations. Following the fire, the burned area was seeded by airplane with orchard grass and alfalfa; species that are highly palatable for wildlife and livestock. In addition to having high palatability, orchard grass remains palatable late into the growing season after other species have dried and cured. Fir Mountain now has extensive areas of good forage that are accessible to both wildlife and livestock. Tree seedlings were planted throughout the Fir Mountain area in 1990.

2.0 METHODS

2.1 Preliminary Investigations

Prior to the initiation of the field survey, preliminary range types were mapped using 1:20,000 colour or black-and-white aerial photographs and 1:20,000 forest cover maps. A reconnaissance-level field trip of Lavington, Saddle and Stinky pastures was undertaken with the Resource Officer Range to obtain an overview of community types and grazing practices. Sampling effort for the vegetation and range survey was then stratified on the basis of the preliminary range type map and information obtained during the field trip. This sampling approach resulted in the establishment of 44 transects within Lavington, Saddle and Stinky pastures. Transect locations were marked on aerial photographs to facilitate classification and delineation of community types. In addition, an overview of current and past management practices and issues or concerns was obtained by undertaking interviews with the rancher who currently holds tenure in the range unit.

2.2 Vegetation Survey

A vegetation survey designed to document species composition and percentage cover was conducted between June 28 - July 19, 1995 using sampling methods described in Alberta Forest Service's Range Survey Manual (Alberta Forest Service 1990). Vegetation was sampled on 15 microplots placed at 2 m intervals along 44 - 30 m transects. Cover (%) of grass and forb species was estimated using 20 cm x 50 cm quadrats and, when present, shrub species (stems << 2.5 m) cover was estimated on 1 m x 1 m quadrats. A 20 m x 20 m plot was used to determine cover estimates for trees and tall shrubs (stems > 2.5 m). Cover estimates for all species found within the microplots were recorded to the nearest 5% when cover exceeded 5% cover. Cover estimates for species with cover values between 0 and 5% were estimated to the nearest 1%. Cover estimates for trees and tall shrubs in the macroplot were recorded to the nearest 5%. All information was recorded on specifically-designed grazing inventory forms provided by the B.C. Ministry of Forests. A 35 mm colour photograph was also taken along each transect to document existing vegetation conditions. To assist in future range monitoring programs, coordinates (latitude and longitude) for all transect locations were determined using a hand held Global Positioning System unit.

2.3 Forage Production

A major objective of the study was to collect forage production data for use in calculating carrying capacities for the Findlay Basin Range Unit. Herbage production and forage use levels within a range type are typically determined by harvesting vegetation from protected (e.g. range cages) and unprotected quadrats at each transect. In the present study, exclosure cages were constructed from 2.54 cm^2 wire mesh and were used to exclude herbivore grazing from an area of approximately 1.25 m^2.

The assessment of forage production in the Findlay Basin Range Unit was undertaken between July 26-31, 1995. Vegetation was hand harvested from 3, 50 cm x 100 cm, quadrats at 22 transects which contained exclosure cages (one from beneath the exclosure cage and two outside). In the case of transects where there were no exclosure cages, only 2 quadrats were harvested. In these cases, vegetation was hand harvested from a 50 cm x 100 cm quadrat randomly placed near the beginning and end of each transect. Harvested material was field sorted into grasses (and grass-like vegetation), forbs, and shrubs and placed into appropriately labelled paper bags for drying.

2.4 Laboratory Methods and Data Analysis

Upon completion of the field work, herbage production clips were submitted to the Ministry of Forests where they were oven-dried and weighed to the nearest 0.1 gm. Production (kg/ha) was calculated from raw data (g/0.5m^2) using a conversion factor (x20). Herbage production on each community type was then calculated as the average of all clipped plots within each range type. For domestic livestock, forage was defined as that portion of the herbage that is palatable to the grazing animal in question. Since livestock are primarily grazers, the forb portion of all range types was considered to be mostly unpalatable. However, some forbs such as black medic were considered to be palatable, which would provide additional forage for domestic livestock.

Species composition and foliar cover estimates for each quadrat were input into digital files for analysis. Data entry accuracy was verified using the Data Entry II module of SPSS for Windows statistical software, which involved entering the field data twice. Following data entry, average species cover values were calculated for each transect. Transect data were then classified using TWINSPAN (Two-way Indicator Species Analysis), a computer program that produces an ordered two-way table in which similar transects are grouped together. The groups established by TWINSPAN were then inspected to determine the appropriate level for division into preliminary community types. Final classification of

transects into community types was based on TWINSPAN divisions and modifications based on variations in dominant plant species. As a result, some community types may exhibit variants based on dominant species among the three range units (Table 2).

Table 2. Vegetation community types found in the Dutch-Findlay, Findlay Basin and Torrent Range Units.

Community Type	Range Unit		
	Dutch-Findlay	Findlay Basin	Torrent
1. Bog birch/needle spike-rush	X		
Bog birch/ Baltic rush		X	
2. Prairie rose-snowberry-saskatoon/Kentucky bluegrass	X		
Saskatoon-soopalie-kinnikinnick/pinegrass		X	
Prairie rose-snowberry-saskatoon/pinegrass			X
3. Douglas-fir/pinegrass	X		X
Trembling aspen-Douglas-fir/pinegrass		X	
4. Kinnikinnick/Richardson's needlegrass	X	X	
5. Black medic/Canada bluegrass		X	X
6. Columbian needlegrass-Canada bluegrass	X	X	
7. Columbian needlegrass/shaggy fleabane-bristly stickseed	X	X	
8. Nuttall's alkaligrass - foxtail barley		X	
9. Shrubby cinquefoil - silverberry		X	
10. Kentucky bluegrass/black medic-common dandelion	X		
11. Antelope brush/bluegrass			X
12. Creeping bentgrass/black medic	X		
13. Orchard grass-pinegrass/dandelion		X	X

Data collected from 93 transects in 3 adjoining range units (Dutch-Findlay, Findlay Basin, and Torrent) were jointly analyzed with TWINSPAN. Therefore, some community types derived from the classification process occur in each of the three range units while other community types are restricted to one or two range units. The distribution of community types within each range unit is summarized in Table 2.

2.5 Calculating Carrying Capacity

Stratification of the study area into primary, secondary, and non-use (tertiary) ranges is the first step in calculating carrying capacity. Primary range can be defined as those areas that livestock prefer to use under very little management (Maduram 1979). Secondary range is characterized as having some feature(s) that restricts livestock grazing and may include steep slopes, barriers to grazing such as thick brush, long distances to water, or a plant community that does not contain palatable forage species. Carrying capacity for livestock should not include forage growing on secondary range since this could result in overstocking

the primary range, particularly if there is no range rider. Non-use areas or tertiary range were those areas that contained significant barriers to movement such as excessive amounts of deadfall, steep slopes, and/ or the absence of palatable forage.

Primary and secondary ranges were further subdivided into vegetation community types. Vegetation community types were characterized by as areas exhibiting uniform species composition and herbage production levels. Productivity was then estimated for each community type, and a weighted mean (weighted by area) of herbage production of primary and secondary range was calculated. Unpalatable herbage was subtracted from total herbage to calculate forage available for domestic livestock. A safe use factor was also applied to available forage and was defined as the level of grazing that vegetation can withstand indefinitely without lasting detrimental effects. A safe use factor typically applied in grazing inventories of native rangelands reflects 50% of use of available forage during the growing season. For example, 50% of herbage is allocated for plant recovery while use of the remaining fifty percent is allocated between wildlife and livestock. Tame grass re-seedings can generally withstand a higher level of use of growing season herbivory (60%) than native grass swards. However, considerably higher utilization levels can be accommodated during the dormant season (Stoddart et. al. 1975).

In the present study, therefore, available forage for domestic livestock for each community type in the range units was estimated using the following relationship:

Herbage Production (Primary Range) - Unpalatable herbage - 50% Safe Use Factor.

Since 1 AUM is equal to 450 kg of forage (Basarab 1987), carrying capacity (in AUMs for livestock) can be calculated. All AUMs in this report refer to cow/calf pairs only. Since calculations of wildlife carrying capacity were beyond the scope of the present study, no adjustments for wildlife species in AUM values and primary and secondary range map units were made.

3.0 RESULTS AND DISCUSSION

3.1 Community Type Descriptions

Ten vegetation community types characterized by 142 vascular plant species (Appendix 2) were identified in the Findlay Basin Range Unit. To provide summary descriptions of each community type identified in the range unit, a checksheet format was used. Each checksheet contains information on site location, important biophysical features, and plant species cover data. The carrying capacity of each community type along with a representative photograph of each transect also accompanies each checksheet.

Community Type 1 (N = 1). Bog birch/baltic rush (Photo 1).

This community type is a wetland community found only adjacent to Lavington Creek in Lavington Pasture. Seaside arrow-grass may be poisonous to livestock if it has been injured or it has been repeatedly grazed. If it has not been injured, seaside arrow-grass appears to be quite palatable to livestock (B. Irving, pers. comm.). Although this site may be used by wildlife, it is also likely used by livestock because of it's close proximity to water.

Representative Site: LAV2
Landscape Position: Bottomland (B)
Elevation: 1080 m
Slope: 0%
Aspect: Level

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Carex aquatilis	water sedge	2
Calamagrostis canadensis	bluejoint	1
Poa palustris	fowl bluegrass	1
Forbs		
Juncus balticus	baltic rush	9
Crepis runcinata	dandelion hawksbeard	3
Dodecatheon pulchellum	shooting star	2
Potentilla anserina	silverweed	1
Triglochin maritima	seaside arrow-grass	1
Shrubs		
Salix glauca	grey-leaved willow	5
Betula glandulosa	bog birch	2
Potentilla fruticosa	shrubby cinquefoil	2

Production (kg/ha):		
	Grasses	2675
	Forbs	39
	Shrubs	0
	Total	2714

Stocking Rate: 2675 kg/ha / 450 kg/ha x 50% stocking rate = **3.0 AUMs per hectare**

Community Type 2 (N = 1). Saskatoon-soopolallie-kinnikinnick/pinegrass (Photo 2).

This community type is characteristic of open forest areas that have high site moisture, high grass cover and high shrub cover. It is closely related to the somewhat drier trembling aspen-Douglas-fir/pinegrass-needlegrass community type. This community type was found only in Saddle Pasture.

Representative Site: SAD4
Landscape Position: Upland (P)
Elevation: 880
Slope: 0%
Aspect: Level

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Calamagrostis rubescens	pinegrass	14
Forbs		
Fragaria virginiana	wild strawberry	3
Medicago lupulina	black medic	2
Taraxacum officinalis	dandelion	2
Achillea millefolium	yarrow	1
Viola adunca	early blue violet	t
Shrubs		
Amelanchier alnifolia	saskatoon	12
Shepherdia canadensis	soopolallie	7
Arctostaphylos uva-ursi	kinnikinnick	6
Symphoricarpos occidentalis	western snowberry	4
Spiraea betulifolia	birch-leaved spirea	4
Symphoricaropos albus	common snowberry	3
Mahonia repens	creeping Oregon-grape	3
Vaccinium caespitosum	dwarf blueberry	3
Trees		
Pseudotsuga menziesii	Douglas-fir	25
Populus tremuloides	trembling aspen	5

Production(kg/ha):	Grasses	674	
	Forbs	461	
	Shrubs	35	
	Total	1170	Estimate

Stocking Rate: 674 kg/ha / 450 kg/ha x 50% stocking rate = **0.7 AUMs per hectare**

Photo 1. Community Type 1, Bog birch/baltic rush.

Photo 2. Community Type 2, Saskatoon-soopolallie-Kinnikinnick/pinegrass.

Community Type 3 (N = 15). Trembling aspen-Douglas-fir/pinegrass (Photo 3).

This community type, which is widespread in Stinky Slough and Saddle pastures, is characteristic of open treed areas. Grass cover is usually well developed. Shrub cover may be moderately-well developed on some sites, with shrubs dispersed in widely spaced clumps. This community type is highly variable with open patches dominated by bunchgrasses and scattered low-growing shrubs, and treed patches dominated by pinegrass. Characteristic tree species also varies and may include aspen, Douglas-fir, yellow pine or western larch.

Representative Sites: SAD1, SAD2, SAD3, SAD5, SAD6, SAD7, SAD8, SAD9, ST1, ST4, ST7, ST11, ST12, ST16, ST18
Landscape Position: Upland (P)
Elevation: 860-1180 (980) m
Slope: 0-15%
Aspect: 90-315°

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Calamagrostis rubescens	pinegrass	5
Stipa richardsonii	spreading needlegrass	2
Festuca idahoensis	Idaho fescue	2
Stipa nelsonii	Columbian needlegrass	1
Poa compressa	Canada bluegrass	1
Poa pratensis	Kentucky bluegrass	1
Elymus spicata	bluebunch wheatgrass	1
Koeleria macrantha	junegrass	1
Forbs		
Astragalus miser	timber milk-vetch	2
Achillea millefolium	common yarrow	1
Antennaria parvifolia	Nuttall's pussytoes	1
Penstemon confertus	yellow penstemon	t
Shrubs		
Arctostaphylos uva-ursi	kinnikinnick	5
Amelanchier alnifolia	saskatoon	4

Shepherdia canadensis	soopolallie	1
Spiraea betulifolia	birch-leaved spirea	1
Trees		
Populus tremuloides	trembling aspen	8
Pinus ponderosa	yellow pine	5
Pseudotsuga menziesii	Douglas-fir	4
Larix occidentalis	western larch	2

Production (kg/ha):	Grasses	723
	Forbs	77
	Shrubs	178
	Total	978

Stocking Rate: 723 kg/ha / 450 kg/ha x 50% stocking rate = **0.8 AUMs per hectare**

Community Type 4 (N = 7). Kinnikinnick/Richardson's needlegrass-pinegrass (Photo 4).

This community type has some floristic similarities with both CT3 and CT6. in that it may represent a grassland that is being altered by tree encroachment. Distinguishing characteristics of this community type, which is found in Lavington and Stinky Slough pastures, are high cover of kinnikinnick and the presence of lodgepole pine on most sites.

Representative Sites: LAV6, LAV7, LAV8, LAV9, LAV11, ST19, ST20
Landscape Position: Upland (P)
Elevation: 1020-1120 m
Slope: 0-10%
Aspect: Primarily level, 135-270°

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Calamagrostis rubescens	pinegrass	4
Stipa richardsonii	spreading needlegrass	3
Poa pratensis	Kentucky bluegrass	2
Stipa nelsonii	Columbian needlegrass	1
Festuca campestris	rough fescue	1
Forbs		
Astragalus miser	timber milk-vetch	4
Antennaria parvifolia	Nuttall's pussytoes	1
Taraxacum officinale	common dandelion	1
Shrubs		
Arctostaphylos uva-ursi	kinnikinnick	19
Trees		
Pinus contorta	lodgepole pine	7
Populus tremuloides	trembling aspen	4

Production (kg/ha):		
	Grasses	1016
	Forbs	103
	Shrubs	81
	Total	1200

Stocking Rate: 1016 kg/ha / 450 kg/ha x 50% stocking rate = **1.1 AUMs per hectare**

Photo 3. Community Type 3, Trembling aspen-Douglas-fir/pinegrass.

Photo 4. Community Type 4, Kinnikinnick/Richardson's needlegrass-pinegrass.

Community Type 5 (N = 4). Canada bluegrass/black medic(Photo 5).

This community type is not widespread in the range unit and was found only at the east end of Stinky Slough Pasture and the north end of Saddle Pasture. High cover of Canada bluegrass may reflect difference attributable to soil type, increased grazing pressure or a combination of these two factors. Prominence of common dandelion suggests that these sites have been moderately to heavily grazed in the past.

Representative Sites: SAD10, SAD11, ST3, ST5
Landscape Position: Upland (P)
Elevation: 940-960 m
Slope: 3-12%
Aspect: 70-315°

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Poa compressa	Canada bluegrass	15
Stipa richardsonii	spreading needlegrass	2
Stipa nelsonii	Columbian needlegrass	1
Forbs		
Medicago lupulina	black medic	4
Antennaria parvifolia	Nuttall's pussytoes	3
Taraxacum officinale	common dandelion	2
Shrubs		
Amelanchier alnifolia	saskatoon	1
Spiraea betulifolia	birch-leaved spiraea	1
Trees		
Pinus ponderosa	yellow pine	4

Production (kg/ha):		
	Grasses	699
	Forbs	118
	Shrubs	0
	Total	817

Stocking Rate: 699 kg/ha / 450 kg/ha x 50% stocking rate = **0.9 AUMs per hectare**

Community Type 6 (N = 8). Columbian needlegrass-Canada bluegrass (Photo 6).

This community type represents typical upland grasslands found in all pastures of the range unit. It is particularly extensive in Stinky Slough Pasture where it is found on dry, open ridge tops. Trees are usually absent or if present, have generally low cover values. This community type is often found adjacent to CT3 (trembling aspen-Douglas-fir/pinegrass-needlegrass) which is characterized by slightly moister site conditions.

On most sites of this community type, native grasses such as Columbian needlegrass, spreading needlegrass and Idaho fescue, are frequently found mixed with tame grasses such as Kentucky bluegrass and Canada bluegrass. Sites that have higher cover of tame grasses relative to native grasses probably reflect either increased grazing pressure or differences in site soil conditions. Willoughby (1992) found that increased grazing pressure caused a decline in native species and an increase in Kentucky bluegrass cover in fescue grasslands in Alberta.

Representative Sites: LAV4, SAD12, ST2, ST6, ST9, ST10, ST15, ST17
Landscape Position: Upland (P)
Elevation: 940-1100 m
Slope: 0-15%
Aspect: Level, 90-180°

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Stipa nelsonii	Columbian needlegrass	4
Poa pratensis	Kentucky bluegrass	4
Poa compressa	Canada bluegrass	2
Stipa richardsonii	spreading needlegrass	1
Festuca idahoensis	Idaho fescue	1
Forbs		
Antennaria parvifolia	Nuttall's pussytoes	4
Heterotheca villosa	golden-aster	1
Oxytropis sericea	silky locoweed	1
Filago arvensis	field filago	1

Astragalus miser	timber milk-vetch	1
Shrubs		
Rosa woodsii	prairie rose	3
Spiraea betulifolia	birch-leaved spiraea	1

Production (kg/ha):	Grasses	625
	Forbs	90
	Shrubs	124
	Total	839

Stocking Rate: 625 kg/ha / 450 kg/ha x 50% stocking rate = **0.9 AUMs per hectare**

Photo 5. Community Type 5, Canada bluegrass/black medic.

Photo 6. Community Type 6, Columbian needlegrass-Canada bluegrass.

Community Type 7 (N = 1). Columbian needlegrass/shaggy fleabane-bristly stickseed (Photo 7).

This community type has some characteristics of the Columbian needlegrass-Canada bluegrass community type, however lower grass and higher forb cover values suggests that this community type experiences higher grazing pressure. Increased presence and cover of such forb species as junegrass, shaggy fleabane, bristly stickseed, and field filago are generally indicative of higher grazing pressure. This CT was only found at the west end of Stinky Slough Pasture on private land and as a result, the polygon containing this CT was not mapped.

Representative Site: ST8
Landscape Position: Upland (P)
Elevation: 1060 m
Slope : 0%
Aspect: Level

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Stipa nelsonii	Columbian needlegrass	4
Stipa richardsonii	spreading needlegrass	2
Festuca idahoensis	Idaho fescue	2
Koeleria macrantha	junegrass	5
Forbs		
Erigeron pumilus	shaggy fleabane	6
Antennaria parvifolia	Nuttall's pussytoes	4
Achillea millefolium	common yarrow	1
Lappula squarrosa	bristly stickseed	1
Geum triflorum	old man's whiskers	1
Filago arvensis	field filago	t
Lepidium densiflorum	prairie pepper-grass	t

Production (kg/ha):	Grasses	170
	Forbs	128
	Shrubs	0
	Total	306

Stocking Rate: 170 kg/ha / 450 kg/ha x 50% stocking rate= **0.2 AUMs per hectare**

Community Type 8 (N = 3). Foxtail barley-Nuttall's saltgrass (Photo 8).

This community type is characteristic of the vegetation on the alkali flats in Lavington Pasture and slough margins in Saddle Pasture. Alkaline soil conditions are reflected in the flora and vegetation by such species as foxtail barley, Nuttall's alkali grass, alkali saltgrass and seablite. Tall (1.5 m) clumps of introduced giant wildrye (*Leymus cinerus*) form a distinctive feature of this community type in Lavington Pasture but are absent from the slough margins in Saddle Pasture. (i.e. SAD13).

Representative Sites: LAV3, LAV5, SAD13
Landscape Position: Plain (F)
Elevation: 920-1100 m
Slope: 0-2%
Aspect: Primarily level, 360°

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Hordeum jubatum	foxtail barley	4
Puccinellia nuttalliana	Nuttall's alkaligrass	4
Distichlis spicata	alkali saltgrass	3
Koeleria macrantha	junegrass	2
Poa pratensis	Kentucky bluegrass	1
Spartina gracilis	alkali cordgrass	1
Forbs		
Suaeda calceoliformis	seablite	2
Aster ericoides	tufted white prairie aster	1
Lepidium densiflorum	prairie pepper-grass	t

Production (kg/ha):	Grasses	1423*	
	Forbs	181*	
	Shrubs	17*	
	Total	1621*	Estimate

Stocking Rate: 1423 kg/ha / 450 kg/ha x 50% stocking rate = 1.6 AUMs per hectare

* Production cages are not present in this community type. Production values are based on utilization plots only.

Photo 7. Community Type 7, Columbian needlegrass/shaggy fleabane-bristly stickseed.

Photo 8. Community Type 8, Foxtail barley-Nuttall's saltgrass.

Community Type 9 (N = 1). Kinnikinnick-shrubby cinquefoil/Canada bluegrass (Photo 9).

This community type is restricted to a narrow band adjacent to the east side of Lavington Creek. High shrub cover in this CT probably reflects better soil moisture conditions present on lower slope positions. Soil moisture conditions are moister than CT1 but drier than the water saturated soils of CT4.

Representative Site: LAV1
Landscape Position: Lower Slope (L)
Elevation: 1100 m
Slope: 2%
Aspect: 315°

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Poa compressa	Canada bluegrass	4
Poa pratensis	Kentucky bluegrass	3
Forbs		
Crepis sp.	hawksbeard	4
Antennaria parvifolia	Nuttall's pussytoes	3
Shrubs		
Arctostaphylos uva-ursi	kinnikinnick	16
Potentilla fruticosa	shrubby cinquefoil	10
Salix glauca	grey-leaved willow	3
Eleagnus commutata	silverberry	3

Production (kg/ha):	Grasses	1167*
	Forbs	233*
	Shrubs	99*
	Total	1499* Estimate

Stocking Rate: 1167 kg/ha / 450 kg/ha x 50% stocking rate = 1.3 AUMs per hectare

* Production cages are not present in this community type. Production values are based on utilization plots only.

Community Type 13 (N = 3). Orchard grass-pinegrass/dandelion (Photo 10).

This community type occurs extensively on re-seeded burned and logged areas of the south face of Fir Mountain and along the steep slopes east of Lavington Creek. These areas were seeded with orchard grass and alfalfa after the 1985 fire. Both these species are highly palatable for livestock and wildlife, as a result, this community type provides extensive areas of high quality forage. CT13 is also preferred range for elk during the winter because of its aspect and plant species composition.

Representative Sites: LAV10, ST13, ST14
Landscape Position: Upper Slope (U)
Elevation: 1110-1520 m
Slope: 15-35%
Aspect: 180-315°

Scientific Name	Common Name	Foliar Cover (%)
Grasses		
Dactylis glomerata	orchard grass	14
Calamagrostis rubescens	pinegrass	3
Poa pratensis	Kentucky bluegrass	3
Elymus repens	quackgrass	1
Forbs		
Taraxacum officinale	dandelion	4
Epilobium angustifolium	fireweed	2
Agoseris glauca	short-beaked agoseris	1
Lactuca tatarica	blue lettuce	1
Medicago lupulina	black medic	1
Medicago sativa	alfalfa	1
Shrubs		
Arctostaphylos uva-ursi	kinnikinnick	2
Rosa woodsii	prairie rose	2

Production (kg/ha):	Grasses	1413
	Forbs	1267
	Shrubs	0
	Total	3099

Stocking Rate: 1413 kg/ha / 450 kg/ha x 50% stocking rate = **1.6 AUMs per hectare**

Photo 9. Community Type 9, Kinnikinnick-shrubby cinquefoil/Canada bluegrass.

Photo 10. Community Type 13, Orchard grass-pinegrass/dandelion.

3.2 Primary and Secondary Ranges

Four broad range types are present in the Findlay Basin Range Unit and include improved range, native grasslands, cutblocks, and mature forests. Mature forest and improved range types are the two largest range types within the range unit, followed closely by native grasslands and cutblocks.

Herbage and forage production levels and carrying capacities for vegetation community types and primary and secondary ranges in Lavington, Saddle, and Stinky Slough pastures are summarized in Table 3. A list of individual map polygon sizes for the primary and secondary ranges of the range unit are presented in Appendix 3. Primary range in Lavington Pasture is composed primarily of native grasslands on extensive alkali flats adjacent to Lavington Creek. Benchlands east of Lavington Creek that were burned and then logged, also provide good range for livestock. Secondary range includes selectively logged areas adjacent to alkali flats and native grasslands. Mineral blocks are placed in these open forest areas to minimize over grazing of native grasslands. Forest encroachment, if it continues, will gradually reduce the size of primary range in this pasture. Unutilized range includes steep, densely forested areas east of Lavington Creek and closed, mature forests on the west side of the pasture. Access to water is good throughout Lavington Pasture (G. Breton, pers. comm.).

Primary range in Saddle Pasture consists of a mosaic of open forest areas interspersed with small areas of native grassland and open shrubland found on rugged ridge tops. The widespread availability of primary range reflects, in part, the fact that water sources for livestock are well distributed throughout most of this pasture. Secondary range includes more closed forest areas such as mixed Douglas-fir-aspen dominated communities. These closed forested communities are generally found in depressional inter-ridge areas and near small lakes and sloughs that have better site moisture conditions than surrounding pine and Douglas-fir communities. As a result of better site moisture conditions, shrub cover is often well developed in the understory. Shrub dominated communities often provide valuable wildlife habitat, especially if preferred browse species such as saskatoon and aspen are present.

Other secondary range areas include high elevation, open ridge sites in the northeast which lack good access to water. This northeast area would be used more extensively by livestock if water were more readily available (G. Breton, pers. comm.). Plans to improve water access to this area are under consideration for 1996 by J2 Ranch. A large tract of land in the

east side of Saddle Pasture is considered to be unutilized because of steep slopes and rugged topography.

Table 3. Herbage and forage productivity (kg/ha) and carrying capacities for Lavington, Saddle and Stinky pastures.

Pasture	Range	Comm. Type	Area (ha)	Grass (kg/ha)	Forbs (kg/ha)	Palatable Forbs[1] (kg/ha)	Forage (kg/ha)	Total Forage (kg/ha)	AUMs[2]
Lavington	Primary	CT1	21	2675	39	0	2675	56175	62
		CT4	85	1016	103	0	1016	86360	96
		CT6	26	625	90	0	625	16250	18
		CT8	144	1423	181	0	1423	204912	228
		CT9	4	1167	233	0	1167	4668	5
		CT13	78	1413	1267	0	1413	110214	122
		Total	358					478579	531
	Secondary	CT4	71	1016	103	21	1016	721136	80
		CT13	72	1413	1267	253	1413	101736	112
		Total	143					173872	192
Saddle	Primary	CT3	279	723	77	0	723	201717	224
		CT5	37	699	118	24	723	26751	30
		CT6	106	625	90	0	625	66250	74
		CT8	4	1423	181	0	1423	5692	6
		Total	426					300410	334
	Secondary	CT2	94	674	461	0	674	63356	70
		CT3	537	723	77	0	723	388251	431
		CT6	22	625	90	0	625	13750	15
		Total	653					765357	516
Stinky	Primary	CT3	680	723	77	0	723	491640	546
		CT5	78	699	118	24	723	56394	62
		CT6	313	625	90	0	625	195625	218
		CT13	417	1413	1267	0	1413	589221	654
		Total	1488					1332880	1480
	Secondary	CT3	241	723	77	0	723	174243	194
		CT4	70	1016	103	0	1016	71120	65
		Total	311					245363	259

[1] Palatable forb is black medic.
[2] AUM = (Total forage x 0.5) / 450 kg.

Primary range in Stinky Slough Pasture is extensive. Upland native grasslands and open forest areas on the east side of the pasture provide good range for livestock. If water levels in Stinky Slough are high, it provides a good water source for livestock. However, if water levels are low, Stinky Slough is less desirable and livestock graze elsewhere. Accessible water sources for livestock are more abundant towards the west end of Stinky Slough Pasture, including Fir Mountain (G. Breton, pers. comm.).

Presently, most of the area burned on Fir Mountain is considered to be primary range. Livestock access is good along an existing haul road and palatable forage is widespread. Eventually, as burned areas regenerate, livestock movement away from the haul road will be impeded by increased tree cover. Decreased access will result in an overall reduction in the size of primary range and an increase in the size of secondary and tertiary ranges.

Secondary range in Stinky Slough Pasture is characterized by semi-open forests along Findlay Creek Road near Stinky Slough.

3.3 Herbage and Forage Productivity

Forage production (kg/ha) for each community type is summarized in Table 4. Community types that have high levels of forage production (e.g., > 1000 kg/ha) include CT1 (bog birch/Baltic rush), CT8 (foxtail barley-Nuttall's saltgrass), CT13 (orchard grass-pinegrass/dandelion), CT9 (kinnikinnick-shrubby cinquefoil/Canada bluegrass), and CT4 (kinnikinnick/Richardson's needlegrass-pinegrass).

Table 4. Forage production (kg/ha) for community types found in the Findlay Basin Range Unit.

Community Type	Forage Production (kg/ha)
1. Bog birch/ Baltic rush	2675
2. Saskatoon-soopalie-kinnikinnick/pinegrass	674
3. Trembling aspen-Douglas-fir/pinegrass-needlegrass	723
4. Kinnikinnick/Richardson's needlegrass-pinegrass	1016
5. Black medic/Canada bluegrass	723
6. Columbian needlegrass-Canada bluegrass	625
7. Columbian needlegrass/shaggy fleabane-bristly	170
8. Nuttall's alkaligrass - foxtail barley	1423
9. Kinnikinnick-shrubby cinquefoil/Canada bluegrass	1167
13. Orchard grass-pinegrass/dandelion	1413

Moderate levels of forage production (e.g., 500 - 1000 kg) were recorded in CT3 (trembling aspen-Douglas-fir/pinegrass-needlegrass), CT5 (Canada bluegrass/black medic), CT6 (Columbian needlegrass-Canada bluegrass), and CT2 (saskatoon-soopolallie-kinnikinnick/pinegrass). In comparison, CT7 (Columbian needlegrass/shaggy fleabane-bristly stickseed) exhibited the lowest amount of forage production (e.g., < 500 kg/ha) in the Findlay Basin Range Unit.

An important consideration in any range inventory is the effect of variations in annual precipitation on herbage production, particularly with respect to rainfall. Researchers in Canada and the United States have reported vegetation is sensitive to variations in rainfall during the growing season (Smoliak 1956, Bennett et al. 1987, Rosiere 1987). Graminoids, and to a lesser extent forbs, respond to increased rainfall between May and July by exhibiting higher growth rates. In mountainous areas, however, the effects of variations in annual rainfall are less clear, particularly as it relates to amount of snow melt, landscape

position and presence of seepage areas. During the present study, the Dutch-Findlay Range Unit received above-normal amounts of rainfall in 1995. During June and July, 1995, the amount of rainfall was almost 2 - 3 times the 30-year normals recorded at Cranbrook (Figure 2). As a result, herbage production levels were likely higher than normal, which indicates that herbage production measurements obtained in 1995 may not reflect average levels that can be expected in the region over the long-term.

Figure 2. Monthly comparisons of 1995 rainfall with 30 year long-term normals, Cranbrook meterological station.

Because this range inventory represents an initial assessment of forage and herbage production on the Findlay Basin Range Unit there is a need to continue monitoring herbage production in future years to account for effects due to variations in annual precipitation. Establishment of reference areas that are clipped annually will assist in providing more accurate, long-term average production data for the Findlay Basin Range Unit. At present, Ministry of Forests personnel have been conducting annual clips of production cages for the last three years. Production data from these three years were then averaged to determine a base production level for use in establishing carrying capacities in the Findlay Basin Range Unit. The Ministry of Forests plans to reassess herbage production levels within the range unit with follow-up clippings in 3-5 years time.

3.4 Range Management Considerations

3.4.1 Limiting Landscape Features

Domestic livestock use of the Findlay Basin Range Unit is strongly influenced by topography, vegetation, and available stock water. Access to stock water for domestic livestock is generally good throughout most of Lavington, Saddle, and Stinky Slough pastures. One notable exception is the northeast corner of Saddle Pasture where there is accessible water. This area is characterized by open forest and native upland grassland communities that have the potential to provide good forage for livestock if water was supplied. Steep slopes and/or dense forest cover are limiting features along the east side adjacent to the Kootenay River and along Findlay Creek on the west side of Saddle Pasture. Dense forest cover and steep slopes are also limiting features on unburned sections of Fir Mountain and Lavington Pasture, east of Lavington Creek. Scattered areas of dense forest and steep terrain at the east end of Stinky Slough limit livestock movement in these areas.

3.4.2 Patterns of Grazing Use

Since the early 1980's, a herd of approximately 250 cows and 7-15 bulls has been grazing the Findlay Basin Range Unit from early May until mid-October. Table 5 shows the total AUMs allocated to each pasture and the annual sequence of pasture rotation since 1983. Grazing rotation usually commences in Stinky Slough or Saddle pastures. Saddle Pasture has not been grazed for the last two years, so Stinky Slough Pasture has been used as the turn-out pasture. Stinky Slough Pasture, although not divided with fences, is usually run as three separate pastures (G. Breton, pers. comm.). The herd is moved from east to west with the pasture being grazed in three separate sections. Efforts are made to prevent livestock from getting on to Fir Mountain because it is used for grazing in fall. Gordon Cook, the range rider for J-2 Ranch, will drive livestock back down if they do start to move up the mountain to graze.

Livestock are turned out on Fir Mountain for only a short period in the fall. Water access is good and abundant forage is available for the short period livestock graze on Fir Mountain. Livestock range widely over the mountain, grazing almost to its peak. On occasion, snow may force them to lower elevations. While on Fir Mountain, livestock are generally kept west of Emily Creek by range riding to prevent the herd from being widely scattered (G. Breton, pers. comm.).

Based on the AUMs generated in 1995 (refer to Table 5) it would appear that grazing patterns for Lavington, Stinky Slough and Saddle pastures fall within the current carrying capacities for these pastures. Based on 1995 field surveys, the carrying capacities for Lavington and Stinky Slough pastures are significantly higher than the AUMs recently allocated to these pastures. A large proportion of increased carrying capacity in Stinky Slough Pasture may be attributable to large, re-seeded burned and logged, areas on Fir Mountain. Similarly, much of the preferred grazing areas in Lavington Pasture, east of Lavington Creek, are associated with re-seeded burned and logged areas. As forest cover gradually becomes re-established on these sites, grass and forb production will decrease and access for livestock will become more difficult, decreasing the overall area of primary range. Thus, over the next 10-20 years, carrying capacities on these pastures are expected to change as vegetation succession on recently burned areas proceeds to a climax forest community.

If AUMs calculated for Fir Mountain areas are discounted, carrying capacity for the remainder of Stinky Slough Pasture is estimated to be approximately 800 AUMs. A carrying

Table 5. See Additional File FNTABLE5.doc (Landscape table)

capacity of 800 AUMs still remains well above current grazing levels for this pasture. Since current grazing levels are much lower than calculated carrying capacity, it is expected that few, if any areas will show signs of heavy grazing pressure. In general, this appears to be true except for open exposed native grassland areas on the mid-benches, which are likely used extensively by livestock when flies are bad. Weedy species, such as common dandelion, frequently have high cover on these sites (Photo 11). Only one transect (ST8, see Photo 7) which was located on private land showed signs of heavy grazing.

3.4.3 Ungrazed Sites For Potential Monitoring

All primary ranges within the Findlay Basin Range Unit appear to have been grazed by livestock to some extent and no native grassland areas present could be considered pristine. However, a small native grassland area located at the south end of Lavington Pasture, along Lavington Creek near transect LAV6, appears to have been only lightly grazed (Photo 12) by domestic livestock.

3.4.4 Damaged Trails or Watering Areas

Trails throughout the Findlay Basin Range Unit appear to be in relatively good condition. No damaged trails or water holes attributable to domestic livestock were noted during the study. In addition, no serious erosion problems were noted along existing trails or adjacent to watering areas.

3.4.5 Interaction of Alternate Use(rs) with Livestock Management

Abundant wildlife populations, including Rocky Mountain elk, mule deer, white-tailed deer, and moose provide good opportunities for recreational hunters in the Findlay Basin Range Unit. In general, conflicts between hunters and livestock have been minimal. The most frequently encountered problem appears to be that gates between pastures are left open, allowing livestock to move into other pastures to graze. Livestock must then be located and herded back to the appropriate pasture which involves expenditure of extra time and effort on the part of the rancher. There is also the potential that scattered livestock may create additional grazing pressures in closed pastures. Because there are fewer gates in the Findlay Basin Range Unit (G. Breton, pers. comm.), the number of problems experienced with hunters leaving gates open is generally less than in other range units in the region.

3.4.6 Current Management Practices

Use of mineral blocks to encourage livestock to use underutilized areas is one of the main management practices in the Findlay Basin Range Unit. Mineral blocks, which contain trace

Photo 11. High dandelion cover near ST15 suggests moderate grazing pressure.

Photo 12. Very lightly grazed, needlegrass-dominated grassland beneath scattered yellow pine along Lavington Creek.

minerals and 20% crude protein, aid in the digestion of cellulose, especially when grass is very dry (G. Breton, pers. comm.). Very dry grass generally has low digestibility when cured. Mineral blocks are placed in less preferred areas to encourage livestock movement away from primary grazing areas. However, if mineral blocks are placed in areas that have a completely different vegetation type, livestock will typically walk into the area, use the mineral block and then return to primary ranges without actually grazing the secondary range.

To prevent localized overuse by livestock, mineral block locations are moved each year. As a general practice, mineral blocks are located away from riparian areas and waterbodies which are easily disturbed and sensitive to livestock use.

Range riding by Mr. G. Cook is also a major management activity in this range unit. Range riding helps maintain a good distribution of livestock over the range and decreases the potential for overuse of primary range. Livestock use of sensitive areas such as wetlands and areas adjacent to watering holes, can also be reduced by judicious range riding.

3.4.7 Access Problems

Access for domestic livestock within the Findlay Basin Range Unit is generally good. All pastures can be accessed from Findlay Creek Road. Most of Saddle Pasture is accessible via a secondary road that runs the length of the pasture. On the west side of Saddle Pasture, a truck trail that leads to the B.C. Hydro's transmission line right-of-way, provides additional access. However, rugged terrain and numerous water bodies in Saddle Pasture makes livestock round-up difficult. Stinky Pasture is accessible at its east end by a network of rough roads and by B.C. Hydro's transmission line right-of-way. The middle portion of the pasture is comprised of relatively open range that can be accessed from Findlay Creek Road. Fir Mountain is easily accessible along a haul road that climbs, in a series of long switch backs, from Findlay Creek Road to the top of the mountain. Lavington Pasture is located on generally open, level terrain and as a result, has good road access.

3.4.8 Wildlife Use

Based on observations of fecal groups during the range inventory, ungulate activity is widespread throughout Findlay Basin Range Unit. Saddle Pasture, in particular, has extensive areas that have high value as wildlife habitat. Open areas around small lakes appear to be especially preferred by wildlife. Photo 13 shows an exposed mineral lick adjacent to a small lake, near the centre of Saddle Pasture that is frequented by deer and elk.

Aspen is frequently found around the edges of these small lakes and sloughs. Aspen bark that had been extensively chewed by elk was observed near these waterbodies. Because of its importance as winter range for elk, motorized vehicle use is prohibited in Saddle Pasture from late fall until late spring. In Saddle Pasture, the mosaic of exposed, open grassland-dominated areas and open forests with significant shrub cover provides ideal habitat for elk during the winter. Important winter browse species such as saskatoon and aspen are prominent over much of Saddle Pasture. Stinky Slough Pasture also shows widespread use by elk. Open treed areas, especially aspen-dominated sites appear to have high use. Saskatoon are often extensively browsed, by deer and moose. On Fir Mountain, south-facing slopes are generally used by elk in spring.

Photo 13. Mineral lick near small lake in Saddle Pasture.

The degree of forage competition between wildlife (e.g., moose, deer and elk) and livestock on primary range was beyond the scope of the present study and was not assessed. Maintaining levels of cattle grazing on primary range and leaving forage on secondary range for elk will reduce forage competition, but it is unlikely to eliminate it completely. Moose and deer do not usually conflict with livestock because they tend to use different types of forage and different habitats. Management practices such as salting away from water should be continued to evenly distribute cattle grazing pressure within the pastures of the range

unit. Limiting stocking rates to carrying capacity provided by primary ranges will also ensure moderate levels of livestock use and will minimize wildlife competition with cattle.

4.0 RECOMMENDATIONS

Based on the range inventory conducted in 1995, a number of recommendations regarding range management in the Findlay Basin Range Unit can be made:

1. Primary range could be increased in Saddle Pasture if water was available for livestock in the northeast corner of the pasture.

2. Because of the above-normal rainfall experienced in 1995, levels of herbage production beneath the exclosure cages should be monitored for at least an additional three or four years. Appropriate adjustments to carrying capacities within the primary ranges of Lavington, Saddle, and Stinky Slough pastures can then be made.

3. Controlled burns may be required to control tree encroachment on grazing areas of Lavington Pasture.

4. As a result of the 1985 fire, grazing conditions were improved considerably on the Fir Mountain area of Stinky Slough Pasture. Over time, Fir Mountain will gradually revert to higher forest cover, and as a result, carrying capacity for domestic livestock and wildlife will be gradually reduced as post-fire succession continues. Therefore, burned areas should continue to be monitored and carrying capacities altered, as necessary, to reflect changes in forage availability.

5. Presently, use of mineral blocks and range riding are the preferred management techniques to evenly distribute livestock on primary and secondary ranges. These practices should be continued to effectively use and maintain rangeland forage within the range unit.

6. Open, exposed native grassland areas in Stinky Slough are beginning to show signs of over grazing. Efforts should be made to draw livestock away from these areas.

7. The number of AUMs in the Findlay Basin Range Unit has remained relatively constant for the last 17 years. Overall range conditions are good, indicating that this level of domestic livestock use is sustainable.

8. An on-going program for monitoring range productivity and carrying capacity should be maintained and continued on a regular basis. Production and utilization plots should be clipped and assessed on a biennial basis to account for variations in annual precipitation levels.

5.0 LITERATURE CITED

Alberta Forest Service. 1990. Range Survey Manual. Alberta Forest Service, Forest Land Use Section, Edmonton, Alberta.

Basarab, J. 1987. Understanding the Animal Unit Months (AUMs). Alberta Agriculture Agdex 420/16-1/3 pp.

Bennett, D.L., G.D. Lemme and P.D. Evenson. 1987. Understory herbage production of major soils within the Black Hills of south Dakota. J. Range. Manage. 40(2):166-170.

Irving, B. and L. Brusnyk. 1994. An assessment of grazing capacity in Findlay and Whitetail Pastures. Prep. by D.A. Westworth & Associates Ltd. for the B.C. Ministry of Forests, Invermere, B.C. 72 pp.

Maduram, G.H. 1979. Range Management. Unpubl. Rept. Alberta Energy and Natural Resources, Edmonton, Alberta. 106 pp.

Meidinger, D. and J. Pojar (eds.). 1991. Ecosystems of British Columbia. B.C. Ministry of Forests, Victoria, B.C. 330 pp.

MOF. 1989. Range Program Review: Final report of the Review Task Force. B.C. Ministry of Forests, Victoria, B.C. 61 pp.

Rosiere, R.E. 1987. An evaluation of grazing intensity influences on California annual range. J. Range. Manage. 40(2):160-165.

Smoliak, S. 1956. Influence of climatic conditions of forage production of shortgrass rangeland. J. Range. Manage. 9:89-91.

Stoddart, L.A., A.D. Smith and T.W. Box. 1975. Range Management. McGraw Hill, Toronto.

Willoughby, M.G. 1992. Rangeland Reference Areas, Plant communities, ecology and response to grazing in Division 1. Forestry, Lands and Wildlife, Alberta Forest Service, Edmonton, Alberta. T/266, 46 pp.

APPENDIX 1. Locations of sample transects in the Findlay Basin Range Unit.

Transect	Latitude °N	Longitude °W
LAV1	50°06.026'	115°59.321'
LAV2	50°06.301'	115°59.294'
LAV3	50°06.321'	115°59.923'
LAV4	50°06.225'	116°00.475'
LAV5	50°06.601'	116°00.912'
LAV6	50°06.850'	115°59.282'
LAV7	50°06.610'	116°00.490'
LAV8	50°06.713'	115°59.610'
LAV9	50°06.775'	115°59.378'
LAV10	50°07.037'	115°58.961'
LAV11	50°07.074'	115°59.921'
SAD1	50°05.955'	115°47.984'
SAD2	50°06.183'	115°49.331'
SAD3	50°06.276'	115°48.960'
SAD4	50°06.584'	115°49.246'
SAD5	50°06.913'	115°49.375'
SAD6	50°07.165'	115°49.863'
SAD7	50°06.215'	115°49.783'
SAD8	50°08.397'	115°50.024'
SAD9	50°08.552'	115°50.802'
SAD10	50°08.734'	115°50.732'
SAD11	50°07.534'	115°49.465'
SAD12	50°07.932'	115°51.058'
SAD13	50°07.107'	115°49.228'

Transect	Latitude °N	Longitude °W
ST1	50°09.357'	115°51.128'
ST2	50°08.673'	115°51.231'
ST3	50°08.633'	115°51.372'
ST4	50°08.810'	115°54.236'
ST5	50°08.803'	115°51.706'
ST6	50°09.468'	115°52.163'
ST7	50°08.123'	115°54.183'
ST8	50°08.192'	115°57.659'
ST9	50°09.119'	115°54.149'
ST10	50°08.866'	115°53.738'
ST11	50°08.712'	115°56.272'
ST12	50°09.113'	115°55.556'
ST13	50°09.465'	115°55.231'
ST14	50°09.660'	115°55.873'
ST15	50°09.181'	115°53.367'
ST16	50°08.273'	115°51.920'
ST17	50°08.318'	115°52.061'
ST18	50°08.273'	115°53.689'
ST19	50°08.935'	115°53.759'
ST20	50°08.290'	115°58.428'

APPENDIX 2. Species list of plants recorded in the Findlay Basin Range Unit, June, 1995.

Scientific Name	Common Name	Acronym
Achillea millefolium	yarrow	achimil
Agropyron cristatum	crested wheatgrass	agrocri
Agoseris glauca	pale agoseris	agosgla
Agrostis scabra	hair or winter bentgrass	agrosca
Agrostis stolonifera	creeping bentgrass	agrosto
Allium cernuum	nodding onion	allicer
Alnus viridis	green alder	alnuvir
Amelanchier alnifolia	saskatoon	amelaln
Anaphalis margaritacea	pearly everlasting	anapmar
Anemone sp.	anemone	anem sp
Anemone multifida	cut-leaved anemone	anemmul
Antennaria sp.	pussytoes	ante sp
Antennaria neglecta	field pussytoes	anteneg
Antennaria parviflora	Nuttall's pussytoes	antepar
Apocynum androsaemifolium	spreading dogbane	apocand
Arabis holboelii	Holboell's rockcress	arabhol
Aralia nudicaulis	wild sarsaparilla	aralnud
Arctostaphylos uva-ursi	kinnikinnick	arctuva
Arnica cordifolia	heart-leaved arnica	arnicor
Artemisia frigida	pasture sage	artefri
Aster sp.	aster	aste sp
Aster campestris	meadow aster	astecam
Aster ciliolatus	fringed aster	astecil
Aster conspicuus	showy aster	astecon
Aster ericoides	tufted white prairie aster	asteeri
Aster hesperius	western willow aster	astehes
Aster laevis	smooth aster	astelae
Astragalus sp.	milk-vetch	astr sp
Astragalus miser	timber milk-vetch	astrmis
Balsamorhiza sagittata	arrow-leaved balsamroot	balssag
Betula glandulosa	scrub birch	betugla
Betula papyrifera	paper birch	betupap
Betula pumila	low glandular birch	betupum
Bromus inermis	smooth brome	bromine
Bromus tectorum	cheatgrass	bromtec
Calamagrostis canadensis	bluejoint	calacan
Calamagrostis rubescens	pinegrass	calarub
Calochortus apiculatus	threespot mariposa lily	caloapi
Campanula rotundifolia	common harebell	camprot

Scientific Name	Common Name	Acronym
Carex sp.	sedge	care sp
Carex aquatilis	water sedge	careaqu
Castilleja lutescens	yellowish paintbrush	castlut
Castilleja miniata	common red paintbrush	castmin
Chenopodium sp.		chen sp
Chenopodium album	lamb's-quarters	chenalb
Cirsium sp.	thistle	cirs sp
Cirsium arvense	Canada thistle	cirsarv
Collinsia parviflora	small-flowered blue-eyed Mary	colpar
Comandra umbellata	pale comandra	comaumb
Conyza canadensis	horseweed	conycan
Crepis sp.	hawksbeard	crep sp
Crepis atrabarba	slender hawksbeard	crepatr
Crepis runcinata	dandelion hawksbeard	creprun
Dactylis glomerata	orchardgrass	dactglo
Descurainia pinnata	western tansymustard	descpin
Descurainia sophia	flixweed	descsop
Distichlis stricta	alkali saltgrass	diststr
Dodecatheon conjugens	slimpod shootingstar	dodecon
Dodecatheon pulchellum	few-flowered shootingstar	dodepul
Dracocephalum parviflorum	American dragonhead	dracpar
Dracocephalum thymiflorum	Eurasian dragonhead	dracthy
Elaeagnus commutata	wolf-willow	elaecom
Eleocharis acicularis	needle spike-rush	eleoaci
Eleocharis palustris	common spike-rush	eleopal
Elymus hispidus	intermediate wheatgrass	elymhis
Elymus lanceolatus	thickspike wildrye	elymlan
Elymus repens	quackgrass	elymrep
Elymus smithii	western wheatgrass	elymsmi
Elymus spicata	bluebunch wheatgrass	elymspi
Elymus trachycaulus	slender wheatgrass	elymtra
Epilobium angustifolium	fireweed	epilang
Epilobium brachycarpum	tall annual willow	epilbra
Erigeron compositus	cut-leaved daisy	erigcom
Erigeron pumilus	shaggy fleabane	erigpum
Eriogonum flavum	yellow buckwheat	eriofla
Festuca sp.	fescue	fest sp
Festuca campestris	rough fescue	festcam
Festuca idahoensis	Idaho fescue	festida
Festuca rubra	red fescue	festrub
Filago arvensis	field filago	filaarv
Fragaria virginiana	wild strawberry	fragvir
Galium boreale	northern bedstraw	galibor

Scientific Name	Common Name	Acronym
Geranium bicknellii	bicknell's geranium	gerabic
Geum triflorum	old man's whiskers	geumtri
Hedysarum sulphurescens	yellow hedysarum	hedysul
Heterotheca villosa	hairy golden-aster	hetevil
Heuchera sp.	alumroot	heuc sp
Heuchera chlorantha	meadow alumroot	heucchl
Heuchera cylindrica	round-leaved alumroot	heuccyl
Hieracium sp.	hawkweed	hier sp
Hieracium umbellatum	narrow-leaved hawkweed	hierumb
Hordeum jubatum	foxtail barley	hordjub
Juncus balticus	Baltic rush	juncbal
Juniperus communis	common juniper	junicom
Koeleria macrantha	junegrass	koelmac
Lactuca tatarica	blue lettuce	lacttat
Lappula squarrosa	bristly stickseed	lappsqu
Larix occidentalis	western larch	lariocc
Lepidium densiflorum	prairie pepper-grass	lepiden
Leucanthemum vulgare	oxeye daisy	leucvul
Leymus Cinereus	giant wildrye	leymcin
Leymus innovatus	fuzzy-spiked wildrye	leyminn
Linnaea borealis	twinflower	linnbor
Linum lewisii	wild blue flax	linulew
Lithospermum ruderale	lemonweed	lithrud
Lomatium triternatum	narrow-leaved desert-parsley	lomatri
Mahonia repens	creeping Oregon-grape	mahorep
Matricaria discoidea	pineapple weed	matrdis
Medicago lupulina	black medic	medilup
Medicago sativa	alfalfa	medisat
Muhlenbergia glomerata	marsh muhly	muhlglo
Orthilia secunda	one-sided wintergreen	orthsec
Orthocarpus luteus	yellow owl-clover	orthlut
Oryzopsis asperifolia	rough-leaved ricegrass	oryzasp
Oxytropis sericea	silky locoweed	oxytser
Parnassia sp.	grass-of-Parnassus	parn sp
Penstemon confertus	yellow penstemon	penscon
Phalaris arundinacea	reed canarygrass	phalaru
Phleum pratense	timothy	phlepra
Phlox hoodii	Hood's phlox	phlohoo
Pinus contorta	lodgepole pine	pinucon
Pinus ponderosa	ponderosa pine	pinupon
Plantago major	common plantain	planmaj
Poa sp.	bluegrass	poa sp

Scientific Name	Common Name	Acronym
Poa compressa	Canada bluegress	poa com
Poa palustris	fowl bluegrass	poa pal
Poa pratensis	Kentucky bluegrass	poa pra
Poa secunda	Sandberg or Nevada bluegrass	poasan
Polygonum douglasii	Douglas' knotweed	polydou
Populus tremuloides	trembling aspen	poputre
Potentilla anserina	silverweed	poteans
Potentilla fruticosa	shrubby cinquefoil	potefru
Potentilla recta	sulphur cinquefoil	poterec
Prunus pensylvanica	pin cherry	prunpen
Pseudotsuga menziesii	Douglas-fir	pseumen
Puccinellia nuttalliana	Nuttall's	alkaligrass
Purshia tridentata	antelope-brush	purstri
Ranunculus sp.	buttercup	ranu sp
Ribe sp.	gooseberry	ribe sp
Ribes oxyacanthoides	northern gooseberry	ribeoxy
Rosa woodsii	prairie rose	rosawoo
Rubus idaeus	red raspberry	rubuida
Rubus pubescens	trailing raspberry	rubupub
Salix sp.	willow	sali sp
Salix candida	hoary willow	salican
Salix glauca	grey-leaved willow	saligla
Schizachne purpurascens	false melic	schipur
Sedum sp.	stonecrop	sedu sp
Senecio streptanthifolius	Rocky Mountain butterweed	senestr
Shepherdia canadensis	soopolallie	shepcan
Silene menziesii	Menzies' campion	silemen
Sisymbrium altissimum	tall tumble-mustard	sisyalt
Sisyrinchium montanum	mountain blue-eyed-grass	sisymon
Smilacina stellata	star-flowered false Solomon's-seal	smilste
Solidago missouriensis	Missouri goldenrod	solimis
Solidago spathulata	spike-like goldenrod	solispa
Sonchus arvensis	perennial sow-thistle	soncarv
Spartina gracilis	alkali cordgrass	spargra
Spiraea betulifolia	birch-leaved spiraea	spirbet
Stellaria sp.	starwort	stel sp
Stellaria crispa	crisp starwort	stelcri
Stellaria longifolia	long-leaved	starwort
Stipa nelsonii	Columbia needlegrass	stipnel
Stipa richardsonii	spreading needlegrass	stipric
Suaeda depressa	seablite	suaedep
Symphoricarpos albus	common snowberry	sympalb

Scientific Name	Common Name	Acronym
Symphoricarpos occidentalis	western snowberry	sympocc
Taraxacum officinale	common dandelion	taraoff
Thalictrum venulosum	veiny meadowrue	thalven
Tragopogon dubius	yellow salsify	tragdub
Trifolium aureum	yellow clover	trifaur
Trifolium hybridum	alsike clover	trifhyb
Trifolium pratense	red clover	trifpra
Trifolium repens	white clover	trifrep
Triglochin maritimum	seaside arrowgrass	trigmar
Utricularia vulgaris	greater bladderwort	utrivul
Vaccinium caespitosum	dwarf blueberry	vacccae
Verbascum thapsis	great mullein	verbtha
Vicia americana	American vetch	viciame
Viola adunca	early blue violet	violadu
Viola canadensis	Canada violet	violcan
Zigadenus elegans	mountain death-camas	zigaele
Zigadenus venenosus	meadow death-camas	zigaven

APPENDIX 3. Findlay Basin Range Unit. Map polygons of primary and secondary ranges in the Findlay Basin Range Unit.

Pasture	Polygon	Range Type	Community Type	Area (ha)
Lavington	1	1°	CT4	8.7
Lavington	2	1°	CT1	20.8
Lavington	3	1°	CT8	116.2
Lavington	4	2°	CT4	29.2
Lavington	5	1°	CT8	28.5
Lavington	6	1°	CT4	76.7
Lavington	7	2°	CT4	41.5
Lavington	8	1°	CT10	77.5
Lavington	9	1°	CT6	26.0
Lavington	10	2°	CT10	71.5
Lavington	11	1°	CT9	3.6
Saddle	1	1°	CT5	19.8
Saddle	2	1°	CT5	11.5
Saddle	3	1°	CT6	9.0
Saddle	4	1°	CT6	12.3
Saddle	5	1°	CT5	6.0
Saddle	6	2°	CT3	47.4
Saddle	7	1°	CT3	29.8
Saddle	8	1°	CT6	85.0
Saddle	9	2°	CT3	4.7
Saddle	10	2°	CT3	4.3
Saddle	11	1°	CT8	4.0
Saddle	12	1°	CT3	23.2
Saddle	13	2°	CT2	17.1
Saddle	14	2°	CT3	27.7
Saddle	15	1°	CT3	5.1
Saddle	16	2°	CT6	14.2
Saddle	17	2°	CT2	76.5
Saddle	18	1°	CT3	28.2
Saddle	19	1°	CT3	134.1
Saddle	20	2°	CT3	11.3
Saddle	21	2°	CT3	17.4
Saddle	22	2°	CT3	48.5
Saddle	23	2°	CT3	41.4
Saddle	24	1°	CT3	3.4
Saddle	25	2°	CT3	102.9
Saddle	26	2°	CT3	60.3
Saddle	27	1°	CT3	55.6
Saddle	28	2°	CT6	7.9
Saddle	29	2°	CT3	70.6
Saddle	30	2°	CT3	100.8

Pasture	Polygon	Range Type	Community Type	Area (ha)
Stinky	1	2°	CT4	69.6
Stinky	2	1°	CT10	309.2
Stinky	3	1°	CT3	136.4
Stinky	4	1°	CT3	104.7
Stinky	5	1°	CT10	107.5
Stinky	6	1°	CT3	131.9
Stinky	7	1°	CT6	35.3
Stinky	8	1°	CT3	55.7
Stinky	9	1°	CT3	19.8
Stinky	10	1°	CT6	90.3
Stinky	11	1°	CT3	64.8
Stinky	12	1°	CT6	10.3
Stinky	13	1°	CT6	9.5
Stinky	14	1°	CT3	9.5
Stinky	15	2°	CT3	3.2
Stinky	16	1°	CT6	142.7
Stinky	17	1°	CT6	13.0
Stinky	18	2°	CT3	37.5
Stinky	19	1°	CT3	10.3
Stinky	20	2°	CT3	4.3
Stinky	21	1°	CT3	84.4
Stinky	22	1°	CT5	18.2
Stinky	23	2°	CT3	73.6
Stinky	24	1°	CT6	12.2
Stinky	25	1°	CT3	62.2
Stinky	26	2°	CT3	103.8
Stinky	27	2°	CT3	8.7
Stinky	28	1°	CT5	12.5
Stinky	29	1°	CT5	4.7
Stinky	30	2°	CT3	9.9
Stinky	31	1°	CT5	29.6
Stinky	32	1°	CT5	13.1