CALCULATION OF FOREST INGROWTH AND RESULTING FORAGE IMPACT IN BC's ROCKY MOUNTAIN TRENCH.

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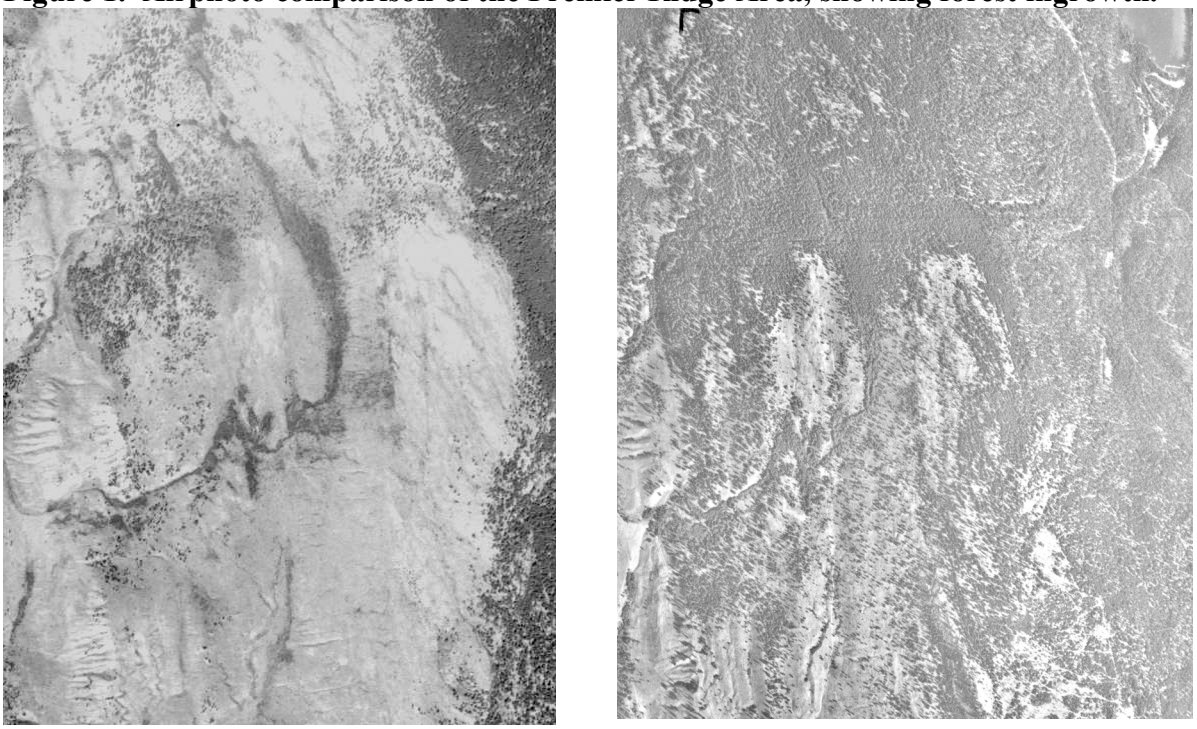
BACKGROUND

In the dry, low elevation forests and grasslands of the Rocky Mountain Trench of southeastern British Columbia, shortages of ungulate (livestock, elk and deer) forage are becoming evident. Since total ungulate numbers in the Trench have remained relatively constant over time, attention has turned to forest ingrowth resulting from long-term fire suppression, and how it has affected forage availability. This is an attempt to calculate the impact of forest ingrowth on forage production, using available data. Further research is necessary for definitive calculations.

SUSCEPTIBLE AREA

The Interior Douglas fir (IDF) and Ponderosa Pine (PP) Biogeoclimatic Zones of the Trench provide the bulk of critical spring/fall ungulate forage, and are most susceptible to ingrowth. These two Zones are found on the floor, the benches and lower slopes of the Trench, from the Montana border to Golden. Both Zones form part of Natural Disturbance Type 4, and are characterized historically by "frequent, stand-maintaining fires"(Ministry of Forests, 1995). There are approximately 250,000 hectares of Crown NDT4 land in the Trench, with 157,000 hectares in the Cranbrook District and 93,000 hectares in the Invermere District.[1]

Figure 1. Airphoto comparison of the Premier Ridge Area, showing forest ingrowth.



1954 **1994**

[1] From Nelson Region GIS info. Figures exclude urban, lakes, rivers and swamps.

INGROWTH INTO THE SUSCEPTIBLE AREA

Forest Sciences, Nelson Forest Region completed a project that examined airphotos of three representative Trench sites, Columbia Lake East, the Old Kimberley Airport and Baynes Lake. All three sites were entirely within either IDF or PP zones. Airphotos of the areas were obtained from 1952 and from 1990. Each set of photos was visually stratified into polygons representing four crown closure classes. The polygons were then digitized and area calculations were performed. Areas where timber harvesting was apparent in either the 1952 or 1990 photos were excluded from the calculation.

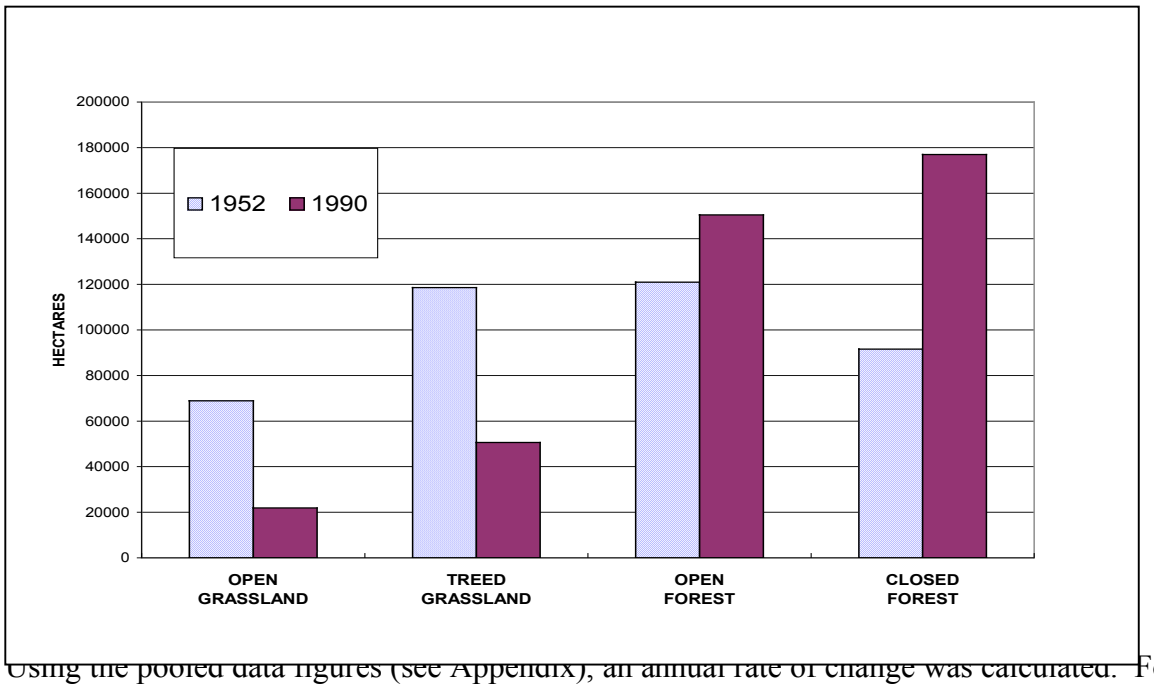
Fig. 2 Crown Closure Distribution at Three Sites in the Rocky Mtn. Trench.

AREA	BAYNES LK 82G 14-25		OLD KIMBERLEY AIRPORT 82G 71, 72		COLUMBIA LAKE EAST 82J 21	
CLOSURE CLASS	1952 %	1990 %	1952 %	1990 %	1952 %	1990 %
0 Open Grassland (0-5% cover)	8.28	2.25	22.09	2.14	21.29	12.03
1 Treed Grassland (6-15%)	40.77	10.46	29.28	8.74	18.88	18.76
2 Open Forest (16-40%)	27.14	21.63	37.97	58.44	25.62	32.77
3 Closed Forest (> 40%)	23.78	65.64	10.64	30.66	34.25	36.41

DOCUMENTATION OF INGROWTH

Data from the three sites was then pooled together. The 29,500 ha in the pooled data set represents twelve percent of the area under study. Figure 3 shows the change in the four cover classes over the 38 year period. The “Open Grassland” and “Treed Grassland” areas have declined dramatically, with a corresponding increase in the “Open Forest” and especially the “Closed Forest” cateogries.

Fig. 3. Pooled Data From Baynes Lake, Old Kimberley Airport, and Columbia Lake East



Using the pooled data figures (see Appendix), an annual rate of change was calculated. For this exercise, Open Grassland and Open Forest were lumped together to represent the grassland community; Open Forest and Closed Forest were lumped to represent the forest community. Assuming a linear rate of change,[2] grassland communities in the Rocky Mountain Trench disappeared at the rate of 3000 ha per year, between 1952 and 1990.

CORRELATION OF OVERSTORY COVER TO FORAGE PRODUCTION

Forage production clips were performed under each of the four crown closure classes at the Old Kimberley Airport site. Three 1 meter^2 plots were clipped for each class, and averaged. Shrub biomass (primarily *Arctostaphylos uva-ursi*) was included at 50% of actual weight, to account for perennial stems. Since the Airport site is acknowledged to have deep, nearly stone-free chernozemic soils, production figures for the Open Grassland and Treed Grassland were subsequently reduced by 50%, to bring them more in line with values obtained from more typical Trench sites.

Fig. 4 Understory Forage Production at Old Kimberley Airport Site

CLASS	AVERAGE PRODUCTION G/M^2	KG/HA	RANGE, KG/HA
O Open Grassland	50	500	250 - 750
1 Treed Grassland	100	1000	750 - 1250
2 Open Forest	25	250	150 - 350
3 Closed Forest	10	100	75 - 125

FORAGE LOSS CALCULATION

[2] Rate of change is actually not linear, but tends to accelerate as new tree seedlings grow into the sapling stage.

For Animal Unit Month (AUM) calculations, the two upper and two lower cover classes were averaged together;

	Classes 0 and 1:	500 + 1000 = 750 kg/ha
	Classes 2 and 3:	250 + 100 = 175 kg/ha
	Difference:	750 - 175 = 575 kg/ha

Thus approximately 575 kg of forage is lost when a hectare shifts from grassland to forest. According to the airphoto calculations above, 3025 hectares move from the Open Grassland/Treed Grassland classes to the Open Forest/Closed Forest classes every year. Thus:

3025ha x 575 kg/ha = 1739375 kg forage lost every year (1920 imperial tons).

1739375 kg / 360 kg per AUM[3] = 4825 AUM per year.

Using the standard value of a 1200 lb cow consuming 430 kg air-dry forage per month, and a mature cow elk consuming 135 kg per month, this is the equivalent of:

1739375/430 = 810 beef cows grazing for five months

or,

1739375/135 = 4290 elk grazing for three months.

CONCLUSIONS

Of the 250,000 hectares of PP and IDF in the Rocky Mountain Trench, 3000 hectares shift from grassland to forest per year, as a result of forest ingrowth and encroachment. The accompanying loss of forage production amounts to 4825 AUMs per year, which translates to 810 cows grazing for five months, or 4290 elk grazing for three months. As ungulate numbers have remained fairly steady over time, overgrazing of the remaining grasslands is the obvious outcome of forest ingrowth in the Trench.

Dietary studies in the Trench (Ross, 1997) have shown that both elk and livestock exhibit a high degree of dietary preference for three bunchgrass species in particular, rough fescue (Festuca scabrella), Idaho fescue (Festuca idahoensis) and bluebunch wheatgrass (Elymus spicatum), all species of grassland and open, mature forest habitats. As grassland and forest stands close in from ingrowth, these three species tend to be replaced by the less-preferred, shade-tolerant pinegrass (Calamagrostis rubescens), which typically has half to two-thirds the nutritional (protein) value of the bunchgrasses. Thus forage losses to ingrowth cannot be calculated on the basis of forage production alone.

It is important to realize that the forest-grassland interface is dynamic over time, and is affected by not only by anthropogenic fire/fire suppression, but by other biotic and abiotic factors. This 38-year “time-slice”can show short-term trends, but additional research is required to document long-term ecosystem states and processes in the Rocky Mountain Trench.

Ministry of Forests, 1995. **Biodiversity Guidebook**

Ross, Tim (1997) **Vegetation Monitoring Final Report**, Ministry of Forests, Nelson

Dec. 29, 1997

Appendix

[3]AUM = Animal Unit Month, one 1000-lb animal grazing for one month. Elk are rated at .38 AUM.

Pooled Data From Baynes Lake, Old Kimberley Airport, and Columbia Lake East

COVER CLASS	1952 %, Ha	1990 %, Ha	CHANGE 1952-1990 %, Ha	CHANGE PER YEAR %, Ha	LUMPED CHANGE PER YEAR
0 Open Grassland (0-5% cover)	17.22 68880ha	5.47 21880 ha	- 68.23 - 47000ha	- 0.31% - 1237 Ha	- 0.76%
1 Treed Grassland (6-15%)	29.64 118560	12.65 50610	- 57.32 - 67950	- 0.45% - 1788 Ha	3025 Ha
2 Open Forest (16-40%)	30.24 120960	37.62 150480	+ 124.43 + 29520	+ 0.19% + 777 Ha	+ 0.75%
3 Closed Forest (> 40%)	22.89 91560	44.24 176960	+ 193.27 + 85400	+ 0.56 + 2247 Ha	3025 Ha