Rocky Mountain Elk (*Cervus elaphus nelsoni*)

SPECIES NAME: Rocky mountain elk
SCIENTIFIC NAME: C*ervus elaphus nelsoni*
SPECIES CODES: M-CEEL
STATUS: Not at risk (MELP, 1997; COSEWIC, 1998)

DISTRIBUTION

Provincial Range

Rocky Mountain elk primarily occur in the Kootenays, the lower Peace River area and the Muskwa-Prophet River drainages on the eastern slope of the Rocky Mountains. Although Rocky Mountain elk were historically abundant and widely distributed in the Cariboo-Chilcotin and Thompson-Nicola areas, elk declined for unknown reasons and today only small, widely scattered herds remain in these areas.

Provincial Benchmark

Ecoprovince: Northern Boreal Mountains
Ecoregion: Northern Mountains and Plateaus and Northern Canadian Rocky Mountains
Ecosection: Muskwa Foothills (MUF)
Biogeoclimatic zone: SWBmk
Broad Ecosystem Units: SM - Subalpine Meadow

Project Study Area

Ecoprovince: Northern Boreal Mountains
Ecoregion: Northern Canadian Rocky Mountains
Ecosection: Muskwa Foothills (MUF), Eastern Muskwa Ranges (EMR)
Biogeoclimatic zone: BWBSmw2, SWBmk, SWBmks, and AT.
Elevational range: Valley bottom to alpine tundra (~ 900m to 2000m in elevation).

The Besa-Prophet Study Area provides some of the best elk habitat in the province and elk are widespread and abundant. Population numbers have increased in recent years due to prescribed burning. Aerial surveys in the 1960s (e.g. Resource Analysis Branch, 1968a, 1968b, 1969a and 1969b) report no elk in the Study Area while recent surveys report large numbers (e.g. Wildlife Branch, 1995 and section 4.1 in this document).

ECOLOGY AND HABITAT REQUIREMENTS

Elk are habitat and diet generalists. They are good dispersers and rapidly exploit newly created habitats (Geist, 1982 in Singer and Norland, 1994). Elk require areas for food and cover, winter and summer and winter ranges (containing suitable food and cover), rutting, calving, migration routes and mineral licks (Fish and Wildlife Branch, 1981). Early successional stages and forest openings provide feeding habitat while forest cover provides security and thermal protection. They are often associated with the boundaries or ecotones between forest and non-forest ecosystems as this provide great abundance and diversity of forage with close proximity to cover (Skovlin, 1982).

Elk are often migratory, spending winters in low elevation ranges and summers in higher elevation upland areas. The migration movements are primarily a function of vegetation availability in relation to snow depth. In the growing season, elk are grazers, preferring early successional stages, including grasslands, parkland, avalanche tracts, clear-cuts, burns, roadsides and forest openings. Grasses and sedges are eaten

extensively and will be used year-round, if available. Broad-leaved herbaceous plants are also used extensively (Nietfeld *et al.*, 1985). Browse may be an important part of the summer diet, depending on the availability of grasses and forbs. (Fish and Wildlife Branch, 1981).

In winter, snow cover limits ground level forage and elk are forced to browse on deciduous trees and shrubs. Preferred winter browse species include Saskatoon (*Amalanchier alnifolia*), water birch (*Betula occidentalis*) and trembling aspen (*Betula tremuloides*) (Nietfeld *et al.*, 1985). Conifers, with the exception of spruce, are also utilised. Snow-free areas associated with southerly aspects and periodic chinook weather provide the greatest access to forage in winter and spring (Carr, 1972).
In agricultural areas, cultivated crops may provide significant amounts of forage in fall and winter.

Snow depth is the factor most limiting to elk distribution and movement. Elk movements apparently begin to be restricted by snow depths in excess of 46 cm (Beall, 1974). Snow depth limits forage availability in winter, and at depths > 61 cm, browsing will replace grazing (Skovlin, 1982).

Seasonal use of aspect is determined largely by forage availability, thermal comfort factors, and cover type. Thermal forest cover on upper north-facing slopes provides the coolest habitat during the summer and the most succulent, high quality forage into autumn months (Skovlin, 1982; Nietfeld, *et al.*, 1985). Skovlin (1982) states that many investigators have reported that elk prefer southern to southwestern exposures in winter and spring. South-facing aspects are seldom selected in summer. Sites which are protected by topography or dense vegetation are often sought out during the winter or early spring because these areas provide a refuge from strong winds, crusting or drifting snow.

Forest cover provides both cover and thermal protection. McNamee *et al.* (1981) characterised escape cover for elk as vegetation over 2 m with a stem density of between 50 and 2000 stems/ha while Black *et al.* (1976) states that vegetation capable of hiding 90% of an elk from a human at 61m as preferred. In winter, elk require thermal protection from low temperatures and is provided best in conifer stands with continuous closed canopies (Skovlin, 1982). Closely stocked stands of coniferous forest, 12 m or greater with high stem densities and an average canopy closure exceeding 70%, are used in winters characterised by very deep snow cover (Black *et al.* 1979; Skovlin, 1982).

Good interspersion and juxtaposition of food and cover components is important and is provided by irregular topography and parkland or forest/meadow vegetation cover (*Black et. al.*, 1979). Valley and riparian habitats are important as travel corridors between high elevation summer range and low elevation winter range; stringer forest stands also provide protected travel lanes during migration (Black *et. al.*, 1979).

Elk use gradually increases with increasing slope, to a maximum of 30-40%. The most frequently used slopes appear to be in the 15-30% class (Skovlin, 1982). A threshold in slope use appears between about 40-50%, after which elk use tends to diminish sharply (Nietfeld *et al.*, 1985).

Rutting occurs in September through October and calves are generally born in late May or June (Fish and Wildlife Branch, 1981). Calving sites usually occur on transitional spring or fall ranges or even on upper elevation winter ranges. Site selection is extremely variable: some cows will select a very secluded area with high cover while others are much less selective (Skovlin, 1982).

Elk have a greater digestive capacity (larger rumen to body size ratio) than the smaller North American ungulates (such as mule deer and bighorn sheep) suggesting that elk may compete more successfully in poor range conditions (Collins and Urness, 1983 in Singer and Norland, 1994).

LIFE REQUISITES/SEASONAL USE PATTERNS

In this model, elk life requisites are divided into food, security/thermal and living (Table 5.5.1).

Table 5.5.1 Elk seasonal life requisites.

Rank	Life Requisite	Season	Months
1.	Food	Winter	October to May
2.	Security/Thermal	Winter	October to May
3.	Food	Growing	June to September
4.	Security/Thermal	Growing	June to September
5.	Living	Winter	October to May
6.	Living	Growing	June to September

Food

In winter, food availability in relation to snow is the most important factor limiting elk distribution. Snow-free areas associated with southerly aspects and periodic Chinook weather provide the greatest access to forage in the winter and spring. Winter feeding habitats are primarily low elevation grassy or shrubby openings in open stands of various timber types on warm south and west aspects. Low-elevation, recent burns provide particularly good food.

In the growing season, optimal feeding habitats are early successional stages, including grasslands, parkland, avalanche tracts, clear-cuts, burns, wetlands, riparian habitats, roadsides and forest openings, primarily at higher elevations.

Security/Thermal

Security and thermal protection are both provided by forested habitats. Security may be satisfied by vegetation over 2 m. This may occur in a variety of structural stages but those with a dense understory are optimal. Security may also be provided by concealing topography, such as that provided in gullied, ridged and hummocky terrain. Closed canopy coniferous stands provide thermal cover in winter. Dense vegetation over 12m in height with a canopy closure of greater than 70% is assumed to provide optimal thermal protection.

Living

Habitat that provides living in the growing season and in the winter are those areas containing food and security/thermal in close proximity. Black *et al.* (1979) reports that most elk occur within 183 m of cover. Areas that provide living habitat year-round have suitable summer and winter ranges.

HABITAT USE AND ECOSYSTEM ATTRIBUTES

Ecosection

Elk are found in both the EMR and MUF Ecosections. The MUF is one of the two provincial benchmarks for this species (RIC, 1998a). Greater snow depths in the EMR results in poor winter habitat and thus fewer elk.

Biogeoclimatic Zone

Elk habitat may be found in all BGC Zones in the Study Area. The BWBSmw2 and SWBmk potentially provide the best habitat year-round. The SWBmks and AT provide habitat in the growing season provided there is adequate security nearby (forest cover or topography).

Site Series

A variety of site series with a range of soil moisture regimes produce good forage, however, moister areas (sub-mesic to mesic) tend to produce better forb diversity and quantity during the growing season and optimal thermal protection in winter. Both drier and wetter sites have lower canopy closure than the mesic sites and therefore provide poorer thermal protection.

Structural Stage

Younger structural stages generally provide the best feeding habitat where older, forested stages provide security and thermal habitat. Logged areas such as clearcuts increase forage production and species diversity.

Structural stages 02 (herbaceous) to 3a (herbaceous to low shrub) provide optimal food year-round. Structural stage 02 is rated lower in winter (because forbs and grasses may be inaccessible under the snowpack) unless located on a warm aspect slope. Structural stage 3b (tall shrub) provides moderate food habitat in both growing and winter. Structural stages 04 to 07 (pole sapling to old forest) provide no food in the growing season and low to moderate food in the winter.

Security habitat is provided in stages 04 (pole/sapling) to 07 (old forest). Optimal thermal habitat is provided in stages 05 (young forest) to 07 (old forest).

Fire areas encourage the development of favoured edge habitat and recently burned areas are often very productive.

Stand Composition

Conifer dominated canopies (>75%) provide optimal thermal protection in winter. Mixedwood and broadleaf habitats provide moderate and low levels of thermal habitat respectively and are thus rated lower.

Aspect

Estimated snowpacks for areas directly adjacent to the north of the Study Area report lowest snow depths on south-facing aspects, which is a function of Chinook winds and solar radiation (Chilton, 1990). Warm southerly and westerly aspects (135-285°) are rated higher for food in winter.

Terrain

Terrain that provides concealment, such as that provided by gullied, ridged or undulating topography, provides security. Therefore, non-forested areas that would normally provide no security, are rated higher than similar polygons lacking concealing topography.

Proximity

Habitats that provide food must be within 200m of habitats that provide security/thermal.

HABITAT RATINGS

Rating Scheme/Modelling Theme

A 6-class rating scheme is used to rate elk habitat. Food (FD), security/thermal (ST) and living (LI) are rated for use in the growing and winter seasons. LI encompasses all of the requirements necessary for survival and is a function of the spatial arrangement of FD and ST in the landscape.

Food (FD) and Security/Thermal (ST) Habitat Assumptions

The ratings table assigns a suitability rating for FD and ST to each ecosystem unit. An ecosystem unit is a combination of site series and structural stage. The relationship between elk life requisites and the ecosystem attributes are defined by a degrading score relative to the optimal value for the attribute (Table 5.5.2). For example, the optimal structural stage for food (low shrub) has a degrading score of "0"– no degrading effect. However, a sub-optimal structural stage (such as pole-sapling) has a degrading score of 4, which would result in a maximum rating of 5 on a scale of 1 to 6. By summing the degrading scores over all of the ecosystem attributes, a final rating is calculated. See Section 3.5 and Appendix F for a full description of the methodology used to generate the ratings table.

Food (FD) and Security/Thermal (ST) Habitat Adjustments

Adjustments are used to modify the ratings in order to account for elk habitat attributes that are not inherent features of the ecosystem unit.

Table 5.5.2 Elk food and security/thermal habitat use assumptions. Each number represents a degradation score. A rating for an ecosystem unit is generated by summing the degradation scores over all attributes. See Section 3.5 and Appendix F for a full description of the ratings approach.

Attribute		Value	Degrading Score			
			G_FD	G_ST	W_FD	W_ST
1. BEC Unit	**EMR**	SWBmk	0	0	-1	-1
		SWBmks	0	-1	-2	-2
		AT	-1	-5	-4	-5
	MUF	BWBSmw2	0	0	0	0
		SWBmk	0	0	0	-1
		SWBmks	0	-1	-2	-2
		AT	-1	-5	-3	-5
2a. Site Series (SMR)		Xeric	-2	-2	-2	-2
		Subxeric	-1	-1	-1	-1
		Submesic	0	0	0	0
		Mesic	0	0	0	0
		Subhygric	0	0	0	0
		Hygric	-1	-1	-1	-1
		Subhydric	-2	-2	-2	-2
		Hydric	-2	-2	-2	-2
2b. Site Series (SNR)		Very poor- poor	-1	-1	-1	-1
		Medium-very rich	0	0	0	0
3. Structural Stage		Sparse/Bryoid (1)	-5	-5	-5	-5
		Sparse (1a)	-5	-5	-5	-5
		Bryoid (1b)	-5	-5	-5	-5
		Herb (2)	0	-5	0	-5
		Forb-dominated (2a)	0	-5	0	-5
		Graminoid dom. (2b)	0	-5	0	-5
		Dwarf shrub (2d)	1	-5	-1	-5
		Low shrub (3a)	0	-5	0	-5
		Tall shrub (3b)	-2	-3	-2	-4
		Pole/sapling (4)	-4	-2	-4	-4
		Young forest (5)	-4	-1	-4	-2
		Mature forest (6)	-3	0	-2	0
		Old forest (7)	-3	0	-2	0
4. Stand Composition		Coniferous (C)	0	0	0	0
		Mixed (M)	0	0	0	-1
		Broadleaf (B)	0	0	0	-3

Table 5.6.3 Polygon-specific food and security/thermal ratings adjustments for elk.

Topic	Description
A. Aspect	Rate cool aspects (285-1135°) down 1 FD in winter.
B. Terrain surface expression	Polygons lacking forest cover (structural stages 1a, 1b, 2, 3a and 3b) are rated up 2 ST for growing and winter if the surface expression is ridged (r), undulating (u) or hummocky (h).

Living (LI) Habitat Assumptions

Elk require habitat for both food and security/thermal. The LI rating incorporates the FD and ST ratings within the target polygon and the ratings in adjacent polygons. They are also adjusted depending on the primary use of the polygon:

- Habitats used primarily for food may only be rated as good as the best security/thermal in or adjacent to the target polygon.
- Habitats used primarily for security/thermal may only be rated as good as the best food in or adjacent to the target polygon.

Specifically:

- If the FD rating is better than the ST rating, LI is equal to the best ST in all polygons directly adjacent to the target polygon (including any decile of the target polygon) but not exceeding the FD rating of the target polygon.
- If the ST rating is better than the FD rating, LI is equal to the best FD in all polygons directly adjacent to the target polygon (including any decile of the target polygon) but not exceeding the ST rating of the target polygon.

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