4.0 SPECIES-HABITAT MODEL FOR ROOSEVELT ELK

Common Name:	**Roosevelt Elk**
Scientific Name:	*Cervus elaphus roosevelti*
Species Code:	M-CEEL
B.C. Status:	Blue-listed (B.C. MOELP, 1996, B.C. CDC, 1997)
Identified Wildlife Status:	None
COSEWIC Status:	Not applicable

4.1 Introduction

On Vancouver Island, Roosevelt elk inhabit west coast rainforest and river valley habitat during the winter and may move to higher elevation habitat during the summer months (McTaggart and Guiguet, 1965). Local information was utilized as much as possible in developing this account and was supplemented with additional data where required and/or applicable.

4.2 Distribution

4.2.1 Provincial Range and Context

Roosevelt elk (*Cervus elaphus roosevelti*) is one of two subspecies of elk that occur in British Columbia. It is confined to Vancouver Island and parts of the Sunshine Coast (RIC, 1997b). In 1996, the Roosevelt elk population for Vancouver Island was estimated at approximately 3,200 animals (Brunt, *cited in* Ross, 1996) with highest densities located on eastern Vancouver Island in the Leeward Island Mountains (LIM) ecosection. The other subspecies of elk, Rocky Mountain elk (*Cervus elaphus nelsoni*), occurs on the mainland and achieves higher densities, especially in the East Kootenay and Muskwa/Kechika areas (RIC, 1997a).

4.2.2 Project Area

Ecoprovince:	Coast and Mountains
Ecoregions:	Western Vancouver Island
Ecosections:	Northern Island Mountains (NIM) (N & Z) and Windward Island Mountains (WIM) (Q)
Biogeoclimatic Zones:	CWHvm1, vm2, and xm2, MHmm1 and mmp1, AT

Distribution in Gold River: Roosevelt elk occur in varying intensities within the three compartments of the study area. The majority of the area has very infrequent elk occurrence with only occasional sightings and/or sign recorded throughout most of the region (Ross, 1996). On a provincial basis, elk have a low (one animal per 10 km^2 to 250 km^2) to moderate (one animal per 2.5 km^2 to 10 km^2) relative abundance within this area (Fish, Wildlife and Habitat Protection Department, 1994). Roosevelt elk are expected to occur within the CWH vm1, vm2, xm2, and MHmm1 BEC variants. However, they are unlikely to occur in the AT biogeoclimatic zone and will have limited use in the MHmmp1 subzone.

Elevational Range in Gold River: Within the area, Roosevelt elk are not generally found in habitat in the higher elevation AT and MHmmp zones of the area. Snowpack and lack of vegetation decreases the usefulness of these areas.

Elk are expected to be most abundant within the low elevation subzones CWHvm1, vm2, and xm2. Low elevation valley bottoms will receive the greatest use by this species all year long and especially during the winter months.

4.3 Ecology and Habitat Requirements

Most Roosevelt elk on Vancouver Island are migratory, usually frequenting high elevation summer ranges and retreating down to river valleys in the fall. Non-migrating populations also exist in certain low elevation habitats where all seasonal habitat requirements can be met (Nyberg and Janz, 1990). Key yearlong feeding habitats include open conifer stands, deciduous-dominated stands, and non-forested units including marshy meadows, wetlands, seepage sites, and estuaries (Nyberg and Janz, 1990). Riparian areas adjacent to lakes, streams, and floodplains of major river valleys also have very high value (Nyberg and Janz, 1990). In summer, vegetated slides become important foraging areas.

Suitable winter range for elk on Vancouver Island is generally found in "low elevation river valleys and the lower part of watersheds" (Ross, 1996). During mild winters or in the low snowpack zone, elk use wetlands, clearcuts, and open forests to forage, generally in rich, moist sites (Nyberg and Janz, 1990). When snow conditions preclude feeding in more open areas (snow depth >30 cm or snow crusted), elk will move into densely canopied forests or onto moderately steep southerly slopes with rock outcrops where snow packs are lower (Nyberg and Janz, 1990). Snow depths of more than 60 cm reduce mobility, forcing elk to move to lower elevation forested habitats (RIC, 1997b). In winter and spring, borders of south aspect rock outcrops are high value due to warming effects and early vegetation green up. Ideal landforms range from floodplain areas with adjacent river breaks to steep avalanche tracks with >100% slope (Luttmerding *et al.,* 1990).

4.4 Habitat Use (Life Requisites and Seasons)

Roosevelt elk habitat use for the study area is broken down into two seasons—growing and winter. Life requisites that are rated for the Roosevelt elk include feeding and combined security/thermal, as summarized in Table 12.

Table 12: Summary of Life Requisites and Seasons of Use for Roosevelt Elk in the Gold River Study Area (Compartments N, Q, and Z).

Season	Code	Habitat Use	Months*	Comments
Growing	**G**	Feeding and Security/ Thermal Habitat (FD/ST)	April-October	
Spring	P	FD/ST	April-May	
Summer	S	FD/ST	June-August	Birthing: late May, early June (Nyberg and Janz, 1990).
Fall	F	FD/ST	September-October	Rutting: September
Winter	**W**	FD/ST	November-March	Low elevation sites.

4.4.1 Feeding Habitat – Growing Season

(Feeding account synthesized from Nyberg and Janz, 1990). The diet of Roosevelt elk consists primarily of grasses, ferns, shrubs, forbs, and conifers in varying seasonal proportions. During spring, the diet consists mainly of shrubs, ferns, and grasses. Deer fern is a very important forage species at this time, in addition to salmonberry, bunchberry, sword fern, grasses and sedges, and young skunk cabbage. In summer, shrubs and herbs are more heavily used, including salmonberry, red elderberry, and bunchberry with ferns and moderate amounts of grasses and sedges also taken. In fall, deer fern is a significant food, and more conifers are consumed. Table 13 summarizes the important forage species for Roosevelt elk.

Table 13: Important Forage Plants for Roosevelt Elk on Vancouver Island.

(Taken from Nyberg and Janz (1990). The most important or preferred species are printed in bold type.)

	Winter forage	Spring forage	Summer forage
TREES:	amabilis fir Douglas-fir **western hemlock** western redcedar	**amabilis fir** Douglas-fir **western hemlock**	**amabilis fir** western hemlock western redcedar
SHRUBS:	devil's club **dull Oregon-grape** **Pacific ninebark** **red elderberry** *Rubus* spp. (salmonberry, blackberry, thimbleberry, raspberry, bramble) salal twinflower ***Vaccinium* spp.** (blueberry, huckleberry, cranberry) **willow spp.**	devil's club hardhack Pacific ninebark **salmonberry**	**bunchberry** devil's club dull Oregon-grape Pacific ninebark red elderberry **salmonberry** **twinflower**
FERNS:	**deer fern** lady fern **sword fern**	**deer fern** **sword fern**	**deer fern** lady fern **sword fern**
HERBS:	**grass spp.** **sedge spp.** skunk cabbage	bunchberry **grass spp.** **sedge spp.** skunk cabbage	**grass spp.** **sedge spp.** skunk cabbage wall lettuce

4.4.1 Security- Thermal Habitat – Growing Season

Good interspersion of feeding areas and cover is important to elk. Optimal habitat consists of open areas interspersed with patches of trees or dense shrubs. In summer, elk will bed wherever they are finished feeding, but always in close proximity to cover (Collins and Urness, 1983). Minimum security cover for elk has been defined as vegetation capable of concealing 90% of a standing elk from view at a distance of 61 m or less (Thomas *et al.,* 1979). The stand's density and diameter of trees and the density of understorey vegetation, determine its value as security cover; topographical features may also enhance security cover for elk (Nyberg and Janz, 1990; Thomas *et al*., 1979). Roosevelt elk will generally not forage farther than 200 m from security cover, preferring the edges between open foraging areas and densely forested cover (Nyberg and Janz, 1990).

During the growing season, thermal habitat is not usually thought to be a limiting life requisite. Nevertheless, microhabitats that provide shade and thermal relief during warm periods are important for elk during the late summer months. Important features may include patches of trees with high crown closure, permanent snow patches, and cool aspect slopes. Cool microsites in summer can also afford some relief from insects.

4.4.2 Feeding Habitat - Winter

During mild winters, important forage species include grasses, sedges, deer fern, twinflower, willows, devil's club, salal, dull Oregon-grape, red huckleberry, and oval-leaved blueberry. Under heavy snow conditions when many species of plants are not accessible, elk will shift to include more browse in their diet. Western hemlock and western redcedar are consumed at this time in addition to other available forage.

4.4.3 Security-Thermal Habitat and Snow Interception Cover – Winter

In the winter, thermal cover and snow interception are the key attributes which influence elk use of various habitat types and often confine elk to lower elevation subzones. Stands with good canopy closure and some accessible forage become especially important. Mature and old forests on floodplains and on warm aspects slopes are usually high value winter habitat. Habitat complexes of forests and rock outcrops on warm slopes provide important thermal attributes for elk and are also often important in early spring.

4.4.5 Seasons of Use

Food and security are required throughout the year for the Roosevelt elk in the Northern Island Mountains (NIM) and Windward Island Mountains (WIM) ecosections. In the growing season, elk require feeding and security habitat. In the winter season, elk have specific feeding requirements and some security/thermal habitat requirements. Table 14 summarizes the rated life requisites for the Roosevelt elk for each month of the year.

Table 14: Monthly Rated Life Requisites for Roosevelt elk in the Gold River Study Area (Compartments N, Q and Z).

Month	Season	Rated Life Requisites (as per RIC 1998)
January	Winter	Feeding, Thermal/Security
February	Winter	Feeding, Thermal/Security
March	Winter	Feeding, Thermal/Security
April	Growing (early spring)	Feeding, Security/Thermal
May	Growing (late spring)	Feeding, Security/Thermal
June	Growing (summer)	Feeding, Security/Thermal
July	Growing (summer)	Feeding, Security/Thermal
August	Growing (summer)	Feeding, Security/Thermal
September	Growing (fall)	Feeding, Security/Thermal
October	Growing (fall)	Feeding, Security/Thermal
November	Winter	Feeding, Thermal/Security
December	Winter	Feeding, Thermal/Security

*Seasons defined for the Coast and Mountains Ecoprovince as per the Chart of Seasons by Ecoprovince (RIC, 1998; Appendix B).

4.5 Habitat Use and Ecosystem Attributes

Table 15 outlines how each rated life requisite relates to specific terrestrial ecosystem mapping (TEM) attributes (e.g., site series/ecosystem unit, plant species, canopy closure, age structure, slope, aspect, terrain characteristics). Further details are provided in the assumption section on how the ecosystem attributes relate to habitat ratings.

Table 15: Terrestrial Ecosystem Mapping (TEM) Relationships for each Life Requisite for Roosevelt Elk.

Life Requisite	TEM Attributes
Feeding Habitat	• Site: site disturbance – roads, logging, development, elevation – plant phenology, slope, aspect, structural stage • Vegetation: % cover of low shrub, herb cover, herb species composition, shrub species composition
Security/Thermal Habitat	• Site: human/site disturbance, elevation, slope – cool slopes in summer, aspect, structural stage • Vegetation: % cover trees and shrubs, height of shrubs, microtopography, riparian or water substrate

4.6 Rating Scheme and Seasons

4.6.1 Rating Scheme

A 6-class rating scheme of high (1), moderately high (2), moderate (3), low (4), very low (5), and nil (6) is employed due to the detailed level of knowledge on habitat use of Roosevelt elk (RIC, 1998). The used ratings scheme is defined in Table 4. Ecosystem units are rated for general habitat values for living for two seasons: the Growing season (G) and Winter (W), as defined in the "Seasons of Use" section.

4.6.2 Provincial Benchmark

The provincial standard (best in B.C.) for the coastal Roosevelt elk is the Leeward Island Mountains (LIM) ecosection (RIC, 1998). Most of the Gold River study area is located within the NIM and WIM ecosections, which have a high value (100-76%) and moderately high (75-51%) value capability respectively, compared to the standard (RIC, 1998). Overall, the Gold River study area is expected to have a moderately high to high capability for Roosevelt elk.

Table 16 lists the provincial benchmark habitat for this species (shaded rows). Habitat units located within the study area that have been rated to par with the best habitat (a rating of 1) have also been included. This additional information is based on field assessments by Madrone Consultants Ltd. (*Clayoquot Sound Year 3 Wildlife Report Addenda,* 1999), as well as information from the Ministry of Environment's provincial database of best habitat ratings.

Table 16: Provincial benchmark and high value study area habitat for Roosevelt Elk.

Ecoprovince	Ecosection		BGC	Broad Ecosystem Unit/Seral Stage	Rating
	Unit	Rating	Subzone		
Roosevelt Elk					
Winter					
	WIM	1	CWHvm1	AS/7 – Amabilis fir-Western redcedar-Salmonberry	1
Georgia Depression	LIM	B	CWHvm	CR/6 - Black Cottonwood Riparian	1
Coast and Mountains	NIM	1	CWHxm	CR/6 – Black Cottonwood Riparian	1
	NIM	1	CWHxm2	RF/7 – Western redcedar-Foamflower	1
	WIM	1	CWHvh1	SL/6 & 7 – Sitka spruce – Lily-of-the-valley	1
	WIM/ NIM	1	CWHvm1, vm2, xm2	SS/7 - Sitka spruce-Salmonberry	1
Growing Season					
Coast and Mountains	NIM	1	CWHvm1, vm2	AS/6 & 7 – Amabilis fir-Western redcedar-Salmonberry	1
	WIM/ NIM	1	CWHvh1, vm1, vm2	CG/3 – Cultivated garden	1
Georgia Depression	LIM	B	CWHvm	CR/6 - Black Cottonwood Riparian	1
Coast and Mountains	NIM	1	CWHxm	CR/6 – Black Cottonwood Riparian	1
	WIM/ NIM	1	CWHvm1	CW/3 & 4 – Cottonwood-Willow	1
	WIM/ NIM	1	CWHvm1, vm2	IF/2 – Indian hellebore-Fern	1
	NIM	1	CWHxm2	RF/6 & 7 – Western redcedar-Foamflower	1
	WIM/ NIM	1	CWHvm1, vm2	SA/3 and 3m – Salmonberry-Sitka alder	1
	WIM/ NIM	1	MHmm1, mmp	SA/3 – Salmonberry-Sitka alder	1
	WIM/ NIM	1	CWHvm1	SC/2b – Sphagnum-Cottongrass fen	1
	WIM/ NIM	1	MHmm1, mmp	SC/2b – Sphagnum-Cottongrass fen	1
	WIM/ NIM	1	CWHvm1, vm2	SS/3, 6 & 7 - Sitka spruce-Salmonberry	1

*Note – The Gold River Study areas do not contain the CWHvh subzone. The CR unit has not been mapped within the Gold River study areas (Compartments N, Q, and Z).

4.6.3 Ratings Assumptions

A first approximation of general habitat ratings is presented in Appendix I. In developing habitat interpretations, assumptions were based on information found in published and unpublished literature supplemented with personal knowledge and field data (see Table 17).

Table 17: Habitat Ratings Assumptions for Roosevelt elk.

Rated Life Requisite and Season	Assumptions
Feeding Requirements in the Growing Season FD_G	**Structural Stage:** • Clearcuts should provide moderate summer forage, yet elk will likely not forage in the middle of large clearcuts due to the lack of adjacent cover. • Structural stages 2 to 3 should provide abundant forage and have good spring and summer values for elk if adjacent to cover. • Structural stage 4 forests generally have poor year round foraging value as these stands are typically dense, and forage has been shaded out. • Generally, food availability increases with the age of the stand. Therefore, where forest cover is established, stage 7 forests are rated as highest value, with mature stage 6 forests having slightly less value, and young stage 5 forests moderate foraging values. **Vegetation Characteristics:** • Open sites such as wetlands, riparian forest, deciduous-dominated stands, and vegetated slides around rock outcrops are favoured spring sites and are therefore rated highly. **Other:** • High elevation sites are favoured feeding areas in summer due to delayed phenology. • Wetlands, riparian areas, open deciduous stands, and clearcuts are also significant in the summer.
Security/Thermal Requirements in the Growing Season ST_G	**Structural Stage:** • Structural stages 5 to 7 should all provide adequate security cover for Roosevelt elk during spring through fall. • Stage 4 forests should provide adequate thermal and security cover and increase the value of more open feeding areas adjacent to them.
Feeding Requirements in the Winter Season FD_W	**Structural Stage:** • If they are accessible, open wetlands and cutblocks are likely important winter feeding areas. • Structural stages 1 to 4 have low winter values. When snow accumulations are low, they may be available to elk, but during more severe winters, snow will preclude access to these sites. • Structural stage 4 forests generally have poor year round foraging value as these stands are typically dense, and forage has been shaded out. **Vegetation Characteristics:** • Dense, mature conifer stands with a high western hemlock and western redcedar component will likely become very important in severe winters when snow depths preclude use of most other habitats. • The MHmm subzone has deep snowpacks in the winter, and units are therefore usually inaccessible to elk in winter and early spring. They may have some value in mild winters, yet are generally rated as of nil value in winter and spring **Other:** • Low-lying areas with reduced snow depth along floodplains become important for foraging in mild winters. • Warm aspect, generally south-facing slopes are important winter range for elk under heavy snow conditions.
Security/Thermal Requirements in the Winter Season ST_W	**Structural Stage:** • Stage 4 forests should provide adequate thermal and security cover and increase the value of more open feeding areas adjacent to them. **Site:** • Warm aspects and rock outcrops provide high thermal value.

4.6.4 Ratings Table

Preliminary habitat ratings are presented in Appendix I.

4.6.5 Rating Adjustment Considerations

Adjustments (e.g. warm versus cool aspect slopes) typically increase or decrease the suitability value of a site by a single class. This has already been incorporated into the ratings. However, further refinement of aspect is possible. Habitat ratings refinement/adjustment requires field verification.

4.7 References

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