

***CACHE CREEK  
TO THE  
ROCKIES PROGRAM***

**Trans Canada Highway  
Existing Conditions Report**

**APPENDIX 6  
WILDLIFE**

**Fall, 1998**



**BRITISH  
COLUMBIA**

**Ministry of Transportation  
and Highways**

# **Existing Conditions Report – Wildlife**

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## **Introduction**

Donald A. Blood and Associates Ltd., LGL Environmental Research Associates Ltd., and Manning, Cooper and Associates were retained by the Ministry of Transportation and Highways to provide wildlife assessment services on the following respective segments of the Cache Creek to the Rockies program: Cache Creek to Canoe; Canoe to Mount Revelstoke National Park West Gate; and Mount Revelstoke National Park West Gate to Yoho National Park West Boundary. Their first task was to provide an overview of the existing wildlife sensitivities and habitat conditions along this Trans Canada Highway corridor. This appendix is a compilation of the three reports that the above consultants prepared in fulfillment of this task. The information contained herein is supplemental to the wildlife information presented in the main existing conditions photo-mosaic report.

In this appendix the wildlife consultants have ranked the wildlife sensitivities along the highway as high, medium, low or nil. They consulted with each other and generally used similar criteria to establish a wildlife sensitivity ranking system that would provide consistent results when applied across the program area. Any variation in the criteria used to establish a ranking level is attributable to the differing regional wildlife issues and habitats that are evident as one moves from one program segment to the next.

## **Section A: Cache Creek to Canoe**

Prepared by Donald A Blood and Associates Ltd.

### **1 Introduction**

The Cache Creek to the Rockies Program (CCRP) has been established with the overall goal of improving the performance of the Trans Canada Highway (TCH). A number of improvements are under currently consideration by the Project Management Team including highway realignment, new interchanges, frontage roads, and climbing lanes. A major objective of the existing conditions report is to highlight areas of geotechnical and environmental sensitivity. The environmental component is comprised of archeological, agricultural, fisheries, and wildlife specialists. D. A. Blood and Associates Ltd. were retained as wildlife consultants for the section between Cache Creek and Canoe (Salmon Arm) in September of 1998.

### **2 Study Area/Background**

The study area encompasses approximately 200 km of highway and spans three Biogeoclimatic zones: Bunchgrass (BG), Ponderosa pine (PP), and Interior Douglas-fir (IDF). Elevations along this section of the TCH range from approximately 350 m to 680 m, with the majority of the route under 450 m. Throughout this section, annual snowfall is typically in the light to moderate range of values (e.g. 75- 100 cm). The western part of the study area has one of the driest climates in the province. Precipitation and tree cover increases in the eastern part of the study area, which forms a transitional area to the interior "wet belt" (in the vicinity of Revelstoke).

The majority of this section is found within the South Thompson River Valley, which is accessed from the west through a tributary valley, the Semlin Valley. The TCH crosses the South Thompson River near Savona, following the south shore of Kamloops Lake before entering into the Cherry Creek Valley. From this point, the highway traverses a plateau on the western outskirts of Kamloops and descends to the valley bottom within the city. The route closely parallels the middle reaches of the South Thompson River from Kamloops to Blind Bay on Shuswap Lake. The highway then heads south along the White Creek Valley and contours around western and southern shores of Salmon Arm before entering Canoe.

Ten general habitat types occur within, or immediately adjacent to, right-of-way habitats the along this section, as follows: coniferous forest, deciduous forest, mixed deciduous-coniferous forest, grass-forb/shrub, agricultural, shrub-steppe, grassland, riparian/wetland, and rock outcrop. Much of the land adjacent to the TCH corridor in this section has been converted to various agricultural, commercial, industrial and residential uses. In spite of the fact that pristine ecosystems are of uncommon occurrence, the region supports a diverse wildlife assemblage. This stems largely from the extension of dry-adapted vegetation into a forested matrix, and is reflected in the faunal assemblage of the

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#### **Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

region, which contains species near the southern extremes of their distribution and others near their northern distributional limits (Meidinger and Pojar 1991). A number of species dependent on natural grassland/shrub-steppe ecosystems have been negatively impacted by overgrazing, the proliferation of noxious weeds and agricultural/residential land development. These species currently appear on Conservation Data Centre (CDC) lists of vertebrates considered "at risk."

### 3 Methods

The preliminary assessment of wildlife sensitivities in the vicinity of the TCH is based on two site visits, contact with personnel from the Ministry of Environment Lands and Parks (MoELP) and Ministry of Transportation and Highways (MoTH), as well as a review of reasonably accessible existing information.

#### Field Investigation

Reconnaissance-level field surveys conducted in late October and mid-November, 1998. October fieldwork focused on the identification/distribution of general habitat types in proximity to the TCH and windshield surveys for raptor nests. The November field program involved reconnaissance of wetlands, refinement of key habitat area boundaries, and additional searches for raptor nests.

#### Interviews

Personnel from government agencies interviewed included the following:

- Mr. Douglas Jury, Ungulate Biologist, MoELP Kamloops Regional Headquarters,
- Mr. John Surgenor, Rare and Endangered Species Specialist, MoELP Kamloops Regional Headquarters, and;
- Mr. Brent Purcello, Environmental Co-ordinator, MoTH Region 3.

#### Existing Wildlife Information

Other sources of information consulted in the course of preparing this assessment were as follows:

Source	Information Provided
▪ Conservation Data Centre	- rare element database search, tracking lists of vertebrates, plants, and plant communities.
▪ Canada Land Inventory Maps	- waterfowl & ungulate capability



- MoELP Ungulate Distribution Maps - estimated density of selected cervids and bovids.
- MoELP Wildlife Working Reports (WR-63, 72, 77, 85, 91, 92) - status reports of various dry-adapted vertebrates of conservation interest.
- Mr. Len Sielecki, MoTH - Wildlife Accident Reporting System (WARS) database

For the purposes of this assignment, wildlife collision mortality (i.e. WARS) data were analyzed for the years 1988 to 1997. Individual ungulate and bear records were plotted on 1:10,000 scale maps and summarized by 1 km intervals in an attempt to highlight areas with a high potential for frequent wildlife-vehicle collisions (in kills/km/year, Tables 6 through 10). However, users of this report are cautioned that any conclusions drawn from such analyses are limited by the period of data collection and the accuracy in reporting. For this reason, WARS information was coupled with an analysis of topographic features, potential attractants (e.g. dumps, orchards, alfalfa fields), and knowledge of wildlife activity patterns to provide an indication of likely problem areas.

### **Wildlife Sensitivity Ratings**

Habitats/habitat elements in the vicinity of the TCH were rated on a continuum ranging from low sensitivity to high sensitivity. Individual habitats were assessed using the criteria below.

*High* sensitivity ratings were assigned primarily to habitats/habitat elements associated with *reproduction and residency*, more specifically:

- known breeding areas of Red/Blue-Listed vertebrates,
- bird nests of species protected under Section 35 of the B.C. Wildlife Act (e.g. Bald Eagle, Osprey, Great Blue Heron),
- habitats with a significant potential for waterfowl breeding (and/or staging),
- active beaver or muskrat houses,
- important ungulate winter ranges (CLI Class 2W or 3W), and;
- documented occurrence of a Red/Blue-Listed vascular plants and/or plant communities.

*Moderate-to-high* sensitivity ratings were assigned to habitats/habitat elements possessing one or more of the following characteristics:

- relatively high structural complexity (i.e. high biodiversity potential), and;
- high potential to provide habitat connectivity/wildlife movement corridor through substantial areas of low-suitability habitat or non-habitat.

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### **Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

*Moderate* sensitivity ratings were assigned largely on the basis of actual or potential *forage production*, including the following:

- areas with high berry, browse or palatable herbage production,
- disturbed habitats with potential for higher-than-average wildlife use through enhancement activities, and;
- locations with a potential for frequent wildlife-vehicle collisions.

*Low-to-moderate* sensitivity ratings were assigned to habitats in the vicinity of riparian zones associated with major lake and/or river systems.

*Low* sensitivity ratings were assigned to all other habitats, most commonly areas converted to intensive agricultural, commercial, and industrial uses. Human activity, low structural diversity and the proliferation of introduced “weedy” species combine to limit the attractiveness of these habitats to most forms of wildlife. Residential areas were also included in this category.

#### **4 Results / Discussion**

Wildlife sensitivities for each design section are provided in Tables 1 through 5. This information is summarized in the strip maps below the photomosaics in the accompanying atlas.

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#### **Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

**Table 1      Cache Creek to Afton – Environmental Sensitivities: Wildlife**

<b>LKI Segment</b>	<b>Start km</b>	<b>Stop km</b>	<b>Hwy Side<sup>1</sup></b>	<b>Approx. Offset fm TCH (m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level<sup>2</sup></b>	<b>Comments/Rationale</b>
0920	0.23	0.54	E	10	1. threatened plant community	H	undisturbed Rough fescue - Bluebunch wheatgrass association.
	0.2	0.5	W	30	2. riparian cottonwood habitat	H	documented occurrence of Blue-Listed plant. CDC lists as a threatened ecosystem type.
	1.4	1.6	E, W	0	3. wildlife-vehicle collision area	M	adjacent to Cache Cr. riparian zone.
	1.6	2.0	W	10	4. beaver pond	H	off Cache Cr. mainstem. Provides nesting/security cover for waterfowl, shorebirds and foraging habitat for beaver, muskrat and other small wildlife.
	3.6	3.8	E, W	0	5. wildlife-vehicle collision area	H	refer to WARS Table A1.
	7.6	7.9	E	0	6. threatened plant community	H	undisturbed Big sage – Bluebunch wheatgrass association.
	9.30	9.40	E,W	0	7. marsh	M – H	high values for plant/animal biodiversity. May provide nesting habitat for waterfowl, upland game birds. Presumed wildlife movement corridor

<b>LKI Segment</b>	<b>Start km</b>	<b>Stop km</b>	<b>Hwy Side<sup>1</sup></b>	<b>Approx. Offset fm TCH (m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level<sup>2</sup></b>	<b>Comments/Rationale</b>
	9.7	10.6	E	10 – 100	8. marsh	H	moderately large marsh complex. If required, blasting rock outcrop adjacent to westbound lane has potential to cause nest abandonment.
	11.4	12.7	W	150 – 200	9. rock cliffs	M	potential raptor nesting habitat (e.g. golden eagle prairie falcon, red-tailed hawk)
	12.6	12.8	W	0	10. threatened plant community	H	undisturbed Big sage – Bluebunch wheatgrass association.
	15.30	15.35	W	0	11. riparian cottonwood habitat	H	Battle Cr. Threatened ecosystem . Proximity to South Thompson suggests high potential for wildlife movement corridor.
	16.2	16.5	W	10	12. threatened plant community	M – H	largely undisturbed Big sage – Bluebunch wheatgrass association.
	20.2	20.4	E	60	13. riparian habitat	M – H	South Thompson R. Rationale as per Feature No. 5
	23.0	23.2	W	10	14. threatened plant community	M – H	Rationale as per Feature No.10
	32.50	32.55	E, W	0	15. riparian cottonwood habitat	H	Deadman R. Threatened ecosystem. Likely wildlife movement corridor. Bear, moose, and beaver sign.

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**Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

LKI	Start	Stop	Hwy	Approx.			
Segment	km	km	Side 1	Offset fm TCH (m)	Environmental Constraint/ No.	Level <sup>2</sup>	Comments/Rationale
0920	35.95	36.14	E,W	0	16. riparian habitat	H	South Thompson R. high value habitat for waterfowl, shorebirds and other riparian-associated wildlife. Presumed movement corridor.
0920	40.90	40.95	E, W	0	17. riparian cottonwood habitat	M	Durrand Cr. Disturbed on north side (lumber yard).
	42.0	44.0	W	15	18. threatened plant community	H	undisturbed Big sage – Bluebunch wheatgrass association.
	44.0	49.0	E, W	0	19. important ungulate winter range	H	CLI range class 2W for deer.
	55.21	55.29	W	0	20. riparian cottonwood habitat	M	Duffy Cr. Disturbed on south side
	55.59	55.74	E, W	0	21. riparian cottonwood habitat	H	Cherry Cr. Natural habitat present on both sides, beaver pond on south side.
	56.8	57.0	W	0	22. threatened plant community	H	undisturbed Big sage – Bluebunch wheatgrass association.
	60.2	60.3	W	0	23. threatened plant community	H	undisturbed Big sage Bluebunch wheatgrass association.
	62.15	62.35	E	10	24. riparian cottonwood habitat	H	Cherry Cr. mainstem. High plant/animal biodiversity values. Presumed wildlife movement corridor.
	62.2	72.0	E, W	0	25. important ungulate winter range	H	CLI range class 3W for deer.

Appendix 6, Section A: Wildlife – Cache Creek to Canoe

<b>LKI</b>	<b>Start</b>	<b>Stop</b>	<b>Hwy</b>	<b>Approx.</b>			
<b>Segment</b>	<b>km</b>	<b>km</b>	<b>Side</b> <sup>1</sup>	<b>Offset</b> <b>fm TCH</b> <b>(m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level<sup>2</sup></b>	<b>Comments/Rationale</b>
	64.00	64.20	E	5	26. beaver pond	H	Alkali Cr. Waterfowl staging/production, active beaver house. attractive to numerous riparian-associated wildlife.
	64.9	65.0	E	60	27. seasonal wetland	M	potential waterfowl breeding/staging area.
	66.05	66.25	W	10	28. permanent wetland	H	Alga Pond. Waterfowl and shorebird staging/production. Probable use by mustelids and other small mammals
	67.65	67.94	E, W	0	29. permanent wetland	H	Rest Area. High use by staging waterfowl, documented use by muskrat High potential for waterfowl production.
	69.05	69.27	W	10 –20	30. permanent wetland	H	opposite exit to Afton mines. Documented habitat of Great Basin spadefoot toad (Blue-Listed). High documented use by staging waterfowl (esp. Northern shoveller), high potential for waterfowl production. Moose tracks observed.

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**Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

<b>LKI</b>	<b>Start</b>	<b>Stop</b>	<b>Hwy</b>	<b>Approx.</b>			
<b>Segment</b>	<b>Km</b>	<b>km</b>	<b>Side</b> <sup>1</sup>	<b>Offset</b> <b>fm TCH</b> <b>(m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level</b> <sup>2</sup>	<b>Comments/Rationale</b>
	69.85	70.16	E	30 – 50	31. permanent wetland	H	documented habitat of Great Basin spadefoot toad (Blue-Listed), high potential for waterfowl production/staging.
	71.00	71.43	E	30 – 50	32. permanent wetland	H	Polygon Pond. Documented habitat of Great Basin spadefoot toad (Blue-Listed), high potential for waterfowl production/staging.

Notes:

<sup>1</sup> Highway side codes: E = eastbound lane, W = westbound lane

<sup>2</sup> Sensitivity Ratings: M = Moderate Sensitivity  
H = High Sensitivity



**Table 2 Afton to Monte Creek – Environmental Sensitivities: Wildlife**

<b>LKI</b>	<b>Start</b>	<b>Stop</b>	<b>Hwy</b>	<b>Approx.</b>			
<b>Segment</b>	<b>km</b>	<b>km</b>	<b>Side 1</b>	<b>Offset fm TCH (m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level<sup>2</sup></b>	<b>Comments/Rationale</b>
2050	0.0	2.0	E, W	0	1. important ungulate winter range	H	CLI range class 3W for deer.
	0.2	0.6	E	50	2. wetland	H	Ironmask Lake. Waterfowl production and staging habitat.
	1.4	2.0	E	50 – 120	3. wetland	H	Bowers Lake. Waterfowl production and staging habitat. Closest to highway at east end of lake.
2060	2.50	2.65	E	20	4. threatened plant community	H	undisturbed Ponderosa pine – Bluebunch wheatgrass plant community.
	3.05	3.30	E	0	5. threatened plant community	H	rationale as per Feature No. 4.
	3.18	3.20	E	0	6. riparian habitat	H	Peterson Cr. High plant/animal biodiversity values, provides habitat connectivity.
0925	0.5	1.1	W	40 – 60	7. riparian habitat	H	South Thompson R. Waterfowl production, staging, and wintering habitat Presumed wildlife movement corridor.
	0.5	1.1	E, W	0	8. wildlife-vehicle collision area	H	refer to WARS Table A2.
	2.5	4.0	W	50 – 90	9. riparian habitat	H	South Thompson R. Rationale as per Feature No. 6

**Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

<b>LKI</b>	<b>Start</b>	<b>Stop</b>	<b>Hwy</b>	<b>Approx.</b>			
<b>Segment</b>	<b>km</b>	<b>km</b>	<b>Side</b> <sup>1</sup>	<b>Offset</b> <b>fm TCH</b> <b>(m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level</b> <sup>2</sup>	<b>Comments/Rationale</b>
	3.6	4.8	E	500	10. threatened plant community	H	Valleyview silt cliffs. Well beyond highway right-of-way. Identified as Rough-fescue – Bluebunch wheatgrass association by CDC.
	9.05	9.05	W	90	11. raptor nest	M	may be sensitive to construction-related disturbances.
	9.8	10.2	E, W	0	12. wildlife-vehicle collision area	M	orchard nearby to southeast. Refer to WARS Table A2.
	12.9	13.2	E, W	0	13. wildlife-vehicle collision area	M	refer to WARS Table A2.
	15.0	15.5	E, W	0	14. wildlife-vehicle collision area	M	refer to WARS Table A2.
	23.6	24.2	W	130	15. sandbar	M	wintering/staging waterfowl loafing site (esp. tundra swan), shorebird foraging area.
	25.05	25.10	E, W	0	16. riparian cottonwood habitat	H	threatened ecosystem (CDC). Rationale as per Feature No. 5

Notes:

<sup>1</sup> Highway side codes: E = eastbound lane, W = westbound lane

<sup>2</sup> Sensitivity Ratings: M = Moderate Sensitivity  
H = High Sensitivity

**Table 3 Monte Creek to Sorrento West – Environmental Sensitivities: Wildlife**

<b>LKI Segment</b>	<b>Start km</b>	<b>Stop km</b>	<b>Hwy Side<sup>1</sup></b>	<b>Approx. Offset fm TCH (m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level<sup>2,3</sup></b>	<b>Comments/Rationale</b>
0935	6.30	6.35	E	0	1. riparian habitat	M	higher than average plant diversity, security cover for a variety of wildlife.
	8.05	8.10	E, W	0	2. riparian habitat	M	provides habitat continuity, rationale much as per Feature No. 1, with greater potential as a wildlife movement corridor.
	11.05	11.05	W	150	3. red-tailed hawk nest	H	well away from existing right-of-way, however, may be sensitive to construction-related disturbances.
	11.15	11.15	W	150	4. red-tailed hawk nest	H	rationale as per Feature No. 3
	12.25	12.25	W	60	5. osprey nest	M	may be more tolerant of disturbance than other raptors.
	15.20	15.20	W	180	6. raptor nest (eagle/hawk)	H	rationale as per Feature No. 3
	15.5	15.6	W	60	7. marsh	M – H	high biodiversity values for plants and wildlife. Potential to support waterfowl/shorebird nesting.
	16.25	16.25	W	60	8. osprey nest	M	rationale as per Feature No. 5

LKI	Start	Stop	Hwy	Approx.			
Segment	km	km	Side 1	Offset fm TCH (m)	Environmental Constraint/ No.	Level <sup>2,3</sup>	Comments/Rationale
	16.2	16.9	W	30 - 40	9. riparian	H	South Thompson R. riparian area. Wintering waterfowl present (esp. tundra swans), presumed wildlife movement corridor. Sandbar island potential ungulate calving area.
	21.55	21.55	W	30	10. osprey nest	H	close proximity to highway, on telegraph pole.
	21.58	21.58	W	5	11. osprey nest	H	adjacent to highway. Protected under Section 35 of B.C. Wildlife Act
	29.0	38.0	E, W	0	12. important ungulate winter range	H	CLI Range Class 3W for mule deer and bighorn sheep. Attractiveness to sheep declining with forest succession.
	29.36	29.40	E, W	0	13. riparian Cw – cottonwood	M	rationale as per Feature No. 2
	33.8 (?)	34.2 (?)	E	?	14. potential occurrence of rare plants	M – H	CDC records of 1 Red- and 1 Blue-Listed plant in sandy open forest near this area
	38.6	38.9	W	0	15. riparian cottonwood habitat	H	rationale as per Feature No. 9
	39.95	40.15	W	0	16. riparian cottonwood habitat	H	rationale as per Feature No. 9
	40.42	40.59	W	0	17. riparian cottonwood habitat	H	rationale as per Feature No. 9

Appendix 6, Section A: Wildlife – Cache Creek to Canoe

<b>LKI</b>	<b>Start</b>	<b>Stop</b>	<b>Hwy</b>	<b>Approx.</b>			
<b>Segment</b>	<b>km</b>	<b>km</b>	<b>Side</b> <sup>1</sup>	<b>Offset</b> <b>fm TCH</b> <b>(m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level</b> <sup>2,3</sup>	<b>Comments/Rationale</b>
	40.82	40.95	W	0	18. riparian cottonwood habitat	H	rationale as per Feature No. 9
	44.27	44.43	W	0	19. riparian cottonwood habitat	H	rationale as per Feature No. 9
	46.61	46.64	E, W	0	20. riparian Cw-cottonwood habitat	M	rationale as per Feature No. 2
	46.81	46.84	E, W	0	21. riparian Cw- cottonwood habitat	M	rationale as per Feature No. 2

Notes:

<sup>1</sup> Lane codes: E = eastbound lane, W = westbound lane

<sup>2</sup> Sensitivity Ratings: M = Moderate Sensitivity  
H = High Sensitivity

<sup>3</sup> Parts of the TCH where there is a generalized concern for its proximity to shorelines received a low-moderate sensitivity rating.

**Table 4 Sorrento to Balmoral – Environmental Sensitivities: Wildlife**

<b>LKI Segment</b>	<b>Start km</b>	<b>Stop km</b>	<b>Hwy Side<sup>1</sup></b>	<b>Approx. Offset fm TCH (m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level<sup>2</sup></b>	<b>Comments/Rationale</b>
0935	49.0	50.0	E,W	0	1. wildlife-vehicle collision area	M	1-2 kills/km/year. Refer to WARS Summary Table C1, Appendix 7.
	53.8	54.1	E,W	0	2. wildlife-vehicle collision area	M	1-2 kills/km/year. Refer to WARS Summary Table C1, Appendix 7.
	55.6	56.0	E,W	0	3. wildlife-vehicle collision area	H	> 2 kills/km/year. Refer to WARS Summary Table C1, Appendix 7.
	55.6	56.2	E	80	4. cattail marsh	M – H	Santabin Lake. Waterfowl/shorebird production and staging habitat. Beaver and muskrat foraging habitat.
	56.85	56.95	W	0	5. cottonwood – cedar lowland habitat	M	drainage to swamp south of Loftus Lake. High browse, berry and herbage production, provides habitat for numerous small wildlife.
	56.8	57.1	E,W	0	6. wildlife-vehicle collision area	M	1-2 kills/km/year. Refer to WARS Summary Table C1, Appendix 7.
	61.0	61.4	E, W	0	7. riparian habitat wildlife-vehicle collision area	M	disturbed by farming operations. Valued for small wildlife use, high herbage values. Movement corridor for small mammals. 1-2 kills/km/year. Refer to WARS Summary Table C1, Appendix 7.

<b>LKI Segment</b>	<b>Start km</b>	<b>Stop km</b>	<b>Hwy Side<sup>1</sup></b>	<b>Approx. Offset fm TCH (m)</b>	<b>Environmental Constraint/ No.</b>	<b>Level<sup>2</sup></b>	<b>Comments/Rationale</b>
	62.0	62.5	E,W	0	8. wildlife-vehicle collision area	H	> 2 kills/km/year. Refer to WARS Summary Table C1, Appendix 7.
	63.8	64.0	E, W	0	9. wildlife-vehicle collision area	M	1-2 kills/km/year. Refer to WARS Summary Table C1, Appendix 7.

Notes:

<sup>1</sup> Highway side codes: E = eastbound lane, W = westbound lane

<sup>2</sup> Sensitivity Ratings: M = Moderate Sensitivity  
H = High Sensitivity

**Table 5      Balmoral to Canoe – Environmental Sensitivities: Wildlife**

<b>LKI Segment</b>	<b>Start km</b>	<b>Stop km</b>	<b>Hwy Side<sup>1</sup></b>	<b>Approx. Offset fm TCH (m)</b>	<b>Environmental Constraint /No.</b>	<b>Level<sup>2,3</sup></b>	<b>Comments/Rationale</b>
0935	61.1	61.4	E,W	0	1. riparian habitat	M	disturbed by farm operations, valued for small wildlife use, high herbage values, small mammal movement corridor.
	64.4	65.0	E, W	0	2. wildlife-vehicle collision area	M	orchard 80 m east of highway likely attracts deer and bears.
	66.1	66.5	E, W	0	3. wildlife-vehicle collision area	M	high potential for collisions due to proximity of highway to lowland/riparian habitats.
	66.15	66.25	W	0	4. deciduous lowland habitat	M	high browse, berry, and herbage production, provides habitat for numerous small wildlife.
	66.40	66.40	W	0	5. documented rare plant (CDC)	H	White Cr. crossing,
	66.40	66.45	E	0	6. riparian habitat	M	White Cr. crossing, rationale as per Feature No. 1
	67.8	68.4	E,W	0	7. wildlife-vehicle collision area	M	high potential for collisions due to proximity of highway to lowland/riparian habitats.
	67.8	68.0	W	0	8. deciduous lowland habitat	M	rationale as per Feature No. 4



<b>LKI Segment</b>	<b>Start km</b>	<b>Stop km</b>	<b>Hwy Side<sup>1</sup></b>	<b>Approx. Offset fm TCH (m)</b>	<b>Environmental Constraint /No.</b>	<b>Level<sup>2,3</sup></b>	<b>Comments/Rationale</b>
	68.1	68.1	E, W	0	9. riparian habitat	M	Tappen Cr. mainstem, largely undisturbed.
	68.4	71.6	W	0	10. riparian habitat	L-M	highway in proximity to riparian habitats along Shushwap Lake in this area.
	71.6	72.8	E, W	0	11. wildlife-vehicle collision area	M	records of deer, moose and bear road kills in WARS database.
	71.7	71.7	W	40	12. osprey nest	H	protected under Section 35 of B.C. Wildlife Act.
	73.4	73.8	E	0	13. deciduous lowland habitat	M	rationale as per Feature No. 4
	73.4	73.5	W	0	14. deciduous lowland habitat	M	rationale as per Feature No. 4
	73.7	75.2	W	0	15. riparian cottonwood habitat	M – H	Shushwap Lake riparian area, high plant/animal biodiversity values, provides habitat connectivity to Salmon River system.
	75.0	75.2	E, W	0	16. wildlife-vehicle collision area	M	high potential for collisions due to proximity of highway to lowland/riparian habitats.
	76.25	76.50	W	0	17. deciduous lowland habitat	M	rationale as per Feature No. 4
	76.95	77.05	W	0	18. deciduous lowland habitat	M	rationale as per Feature No. 4
	78.00	78.05	E, W	0	19. riparian cottonwood habitat	H	Salmon R. crossing., rare plants documented at mouth of river (CDC), presumed wildlife movement corridor.

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**Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

LKI Segment	Start km	Stop km	Hwy Side <sup>1</sup>	Approx. Offset fm TCH (m)	Environmental Constraint/ No.	Level <sup>2,3</sup>	Comments/Rationale
	79.64	79.70	W	0	20. riparian shrub habitat	M	rationale as per Feature No. 1
	84.67	84.90	W	0	21. wetland – permanent	H	Hucul Pond. waterfowl production and staging habitat, high bird and mammal use (esp. semi-aquatic mammals), Ducks Unlimited site.
	85.45	85.50	E, W	0	22. riparian cottonwood habitat	M – H	South fork of Canoe Cr., rationale as per Feature No. 15
0950	0.64	0.82	W	0	23. riparian cottonwood- cedar habitat	M - H	East fork of Canoe Cr., rationale as per Feature No. 15
	0.70	0.75	E	0	24. riparian cottonwood – cedar habitat	M – H	East fork of Canoe Cr., rationale as per Feature No. 15
	1.9	2.1	W	0	25. cattail marsh	M	cover for waterfowl, shorebirds and other riparian-associated wildlife. Foraging habitat for muskrat and beaver.
	2.10	2.15	E, W	0	26. riparian cottonwood habitat	M – H	Canoe Cr. mainstem, rationale as per Feature No. 10
	3.2	3.5	E, W	0	27. wildlife-vehicle collision area	M	high potential for collisions due to proximity of highway to riparian habitats
	4.95	5.00	E	0	28. riparian habitat	M – H	rationale as per Feature No. 15. Potential wildlife movement corridor between Shushwap Lake and upland areas.

Appendix 6, Section A: Wildlife – Cache Creek to Canoe

Notes:

<sup>1</sup> Highway Side codes: E = eastbound lane, W = westbound lane

<sup>2</sup> Sensitivity Ratings: M = Moderate Sensitivity  
H = High Sensitivity

**Table 6 Wildlife Accident Reporting System (WARS) summary, Cache Creek to Afton (1988 – 1997)<sup>1</sup>.**

Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
		No.	Years	No.	Years		/km/year	/km/year
0920	0.0	2	92, 94	0		2	0.2	1.0
	1.0	4	89, 97	0		4	0.4	2.0
	2.0	1	90	0		1	0.1	0.5
	3.0	7	94 - 97	0		7	0.7	3.5
	4.0	2	91, 95	0		2	0.2	1.0
	5.0	4	90,95,96	0		4	0.4	2.0
	6.0	3	95, 97	0		3	0.3	1.5
	7.0	2	89, 97	0		2	0.2	1.0
	8.0	0		0		0	0	0
	9.0	3	90, 94	0		3	0.3	1.5
	10.0	1	94	0		1	0.1	0.5
	11.0	0		0		0	0	0
	12.0	1	89	0		1	0.1	0.5
	13.0	0		0		0	0	0
	14.0	0		0		0	0	0
	15.0	1	94	0		1	0.1	0.5
	16.0	0		0		0	0	0
	17.0	0		0		0	0	0
	18.0	0		0		0	0	0
	19.0	1	91	0		0	0.1	0.5
	20.0	0		0		0	0	0
	21.0	0		0		0	0	0

Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year
	22.0	0		0		0	0	0
	23.0	0		0		0	0	0
	24.0	0		0		0	0	0
	25.0	1	93	0		1	0.1	0.5
	26.0	0		0		0	0	0
	27.0	0		0		0	0	0
	28.0	1	91	0		1	0.1	0.5
	29.0	0		0		0	0	0
0920	30.0	0		0		0	0	0
	31.0	1	93	0		1	0.1	0.5
	32.0	1	89	0		1	0.1	0.5
	33.0	0		0		0	0	0
	34.0	1	89	0		1	0.1	0.5
	35.0	2	90, 91	0		2	0.2	1.0
	36.0	1	89	0		1	0.1	0.5
	37.0	0		0		0	0	0
	38.0	0		0		0	0	0
	39.0	0		0		0	0	0
	40.0	3	89,90,94	0		3	0.3	1.5
	41.0	1	89	0		1	0.1	0.5
	42.0	3	88, 90,91	0		3	0.3	1.5
	43.0	0		0		0	0	0
	44.0	0		0		0	0	0

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**Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year <sup>3</sup>
	45.0	0		0		0	0	0
	46.0	0		0		0	0	0
	47.0	0		0		0	0	0
	48.0	0		0		0	0	0
	49.0	0		0		0	0	0
	50.0	1	88	0		1	0.1	0.5
	51.0	0		0		0	0	0
	52.0	0		0		0	0	0
	53.0	0		0		0	0	0
	54.0	3	88,91,94	0		3	0.3	1.5
	55.0	0		0		0	0	0
	56.0	1	93	0		1	0.1	0.5
	57.0	0		0		0	0	0
	58.0	1	88	0		1	0.1	0.5
	59.0	2	91, 93	0		2	0.2	1.0
	60.0	1	90	1	89	2	0.2	1.0
	61.0	1	93	0		1	0.1	0.5
	62.0	0		0		0	0	0
	63.0	1	93	0		1	0.1	0.5
	64.0	1	89	0		1	0.1	0.5
	65.0	0		0		0	0	0
	66.0	2	89,93	0		2	0.2	1.0
	67.0	0		0		0	0	0

Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year
	68.0	1	94	0		1	0.1	0.5
	69.0	2	92	0		2	0.2	1.0
	70.0	1 <sup>3</sup>	94	0		1	0.1	0.5
	71.0	0		0		0	0	0
	72.0	0		0		0	0	0
<b>Totals</b>		<b>65</b>		<b>1</b>		<b>66</b>		
<b>Mean</b>							<b>0.09</b>	<b>0.45</b>

Notes:

<sup>1</sup> includes only records where kilometreage was provided.

<sup>2</sup> values recorded are assumed to represent 20 % of actual kills (L. Sielecki, pers. comm.). Under-reporting is related to the following:

- i) animals dying outside the right-of-way,
- ii) animals being removed by predators,
- iii) animals obscured by debris, and
- iv) lost reports.

<sup>3</sup> moose road kill.

**Table 7 Wildlife Accident Reporting System (WARS) summary, Afton to Monte Creek (1988 – 1997)<sup>1</sup>.**

Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year <sup>2</sup>
2050	0.0							no records listed
	1.0							
	2.0							
	3.0							
	4.0							
	5.0							
	6.0							
2060	0.0							no records listed
	1.0							
	2.0							
	3.0							
	4.0							
	5.0							
0925	0.0	4	88,89,93, 94	0		4	0.4	2.0
	1.0	0		0		0	0	0
	2.0	1	93	0		1	0.1	0.5
	3.0	1	88	0		1	0.1	0.5
	4.0	0		0		0	0	0
	5.0	0		0		0	0	0



Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year <sup>2</sup>
	6.0	0		0		0	0	0
	7.0	0		0		0	0	0
	8.0	1	88	0		1	0.1	0.5
	9.0	1	88	0		1	0.1	0.5
	10.0	5 <sup>3</sup>	88,89,92, 93,94	0		5	0.5	2.5
	11.0	0		0		0	0	0
	12.0	1	89	0		1	0.1	0.5
	13.0	4	88, 89, 90	0		4	0.4	2.0
	14.0	0		0		0	0	0
	15.0	5	88, 89, 94	0		5	0.5	2.5
	16.0	0		0		0	0	0
	17.0	1	93	0		1	0.1	0.5
0925	18.0	0		0		0	0	0
	19.0	0		0		0	0	0
	20.0	2	88,94	0		2	0.2	1.0
	21.0	0		0		0	0	0
	22.0	1	90	0		1	0.1	0.5
	23.0	0		0		0	0	0
	24.0	0		0		0	0	0
	25.0	0		0		0	0	0

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**Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

<b>Totals</b>		<b>27</b>		<b>0</b>		<b>27</b>		
<b>Means</b>							<b>0.10</b>	<b>0.50</b>

Notes:

<sup>1</sup> includes only records where kilometreage was provided.

<sup>2</sup> values recorded are assumed to represent 20 % of actual kills (L. Sielecki, pers. comm.). Under-reporting is related to the following:

- i) animals dying outside the right-of-way,
- ii) animals being removed by predators,
- iii) animals obscured by debris, and
- iv) lost reports.

<sup>3</sup> includes one moose road kill.

**Table 8 Wildlife Accident Reporting System (WARS) summary, Monte Creek to Sorrento West (1988 – 1997)<sup>1</sup>.**

Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year <sup>2</sup>
0925	0.0	0		0		0	0	0
	1.0	0		0		0	0	0
	2.0	0		0		0	0	0
	3.0	0		0		0	0	0
	4.0	0		0		0	0	0
	5.0	0		0		0	0	0
	6.0	0		0		0	0	0
	7.0	0		0		0	0	0
	8.0	0		0		0	0	0
	9.0	0		0		0	0	0
	10.0	0		0		0	0	0
	11.0	0		0		0	0	0
	12.0	0		0		0	0	0
	13.0	0		0		0	0	0
	14.0	0		0		0	0	0
	15.0	0		0		0	0	0
	16.0	0		0		0	0	0
	17.0	0		0		0	0	0
	18.0	2	89	0		2	0.2	1.0
	19.0	0		0		0	0	0
	20.0	0		0		0	0	0

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Appendix 6, Section A: Wildlife – Cache Creek to Canoe

Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year <sup>2</sup>
	21.0	0		0		0	0	0
	22.0	0		0		0	0	0
	23.0	0		0		0	0	0
	24.0	0		0		0	0	0
	25.0	0		0		0	0	0
	26.0	2	89, 91	0		2	0.2	1.0
	27.0	0		0		0	0	0
	28.0	0		0		0	0	0
	29.0	1	91	0		1	0.1	0.5
0920	30.0	1	91	0		1	0.1	0.5
	31.0	2	91	0		2	0.2	1.0
	32.0	2	89, 90	0		2	0.2	1.0
	33.0	2	91, 92	0		2	0.2	1.0
	34.0	0	0	0		0	0	0
	35.0	1	90	0		1	0.1	0.5
	36.0	1	92	0		1	0.1	0.5
	37.0	1	90	0		1	0.1	0.5
	38.0	1	90	0		1	0.1	0.5
	39.0	2	90	0		2	0.2	1.0
	40.0	1	90	0		1	0.1	0.5
	41.0	0		0		0	0	0
	42.0	0		0		0	0	0
	43.0	1	91	0		1	0.1	0.5

Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year <sup>2</sup>
	44.0	1	95	0		1	0.1	.5
	45.0	1	89	1	91	2	0.2	1.0
	46.0	0		0		0	0	0
	47.0	0		0		0	0	0
	48.0	1	95	0		1	0.1	0.5
<b>Totals</b>		<b>23</b>		<b>1</b>		<b>24</b>		
<b>Mean</b>							<b>0.05</b>	<b>0.25</b>

Notes:

<sup>1</sup> includes only records where kilometreage was provided.

<sup>2</sup> values recorded are assumed to represent 20 % of actual kills (L. Sielecki, pers. comm.). Under-reporting is related to the following:

- i) animals dying outside the right-of-way,
- ii) animals being removed by predators,
- iii) animals obscured by debris, and
- iv) lost reports.

**Table 9 Wildlife Accident Reporting System (WARS) summary, Sorrento to Balmoral (1988 – 1997)<sup>1</sup>.**

Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year <sup>2</sup>
0935	47.0	0		0		0	0	0
	48.0	0		0		0	0	0
	49.0	4	88, 93	0		4	0.4	2.0
	50.0	2	89, 91	0		2	0.2	1.0
	51.0	1	92	0		1	0.1	0.5
	52.0	0		0		0	0	0
	53.0	3	89, 90, 94	1	90	4	0.4	2.0
	54.0	5	88,90,95, 97	0		5	0.5	2.5
	55.0	4	89, 91, 95	2	92, 95	6	0.6	3.0
	56.0	2	89	0		2	0.2	1.0
	57.0	3	89, 91, 95	0		3	0.3	1.5
	58.0	0		0		0	0	0
	59.0	0		0		0	0	0
	60.0	1	95	0		1	0.1	0.5
	61.0	2	90, 94	0		2	0.2	1.0
	62.0	5	88, 90, 95	1	88	6	0.6	3.0
	63.0	2	94, 95	0		2	0.2	1.0
<b>Totals</b>		<b>34</b>		<b>4</b>		<b>38</b>		
<b>Means</b>							<b>0.22</b>	<b>1.12</b>

Notes:

<sup>1</sup> includes only records where kilometreage was provided.

<sup>2</sup> values recorded are assumed to represent 20 % of actual kills (L. Sielecki, pers. comm.). Under-reporting is related to the following:

- i) animals dying outside the right-of-way,
- ii) animals being removed by predators,
- iii) animals obscured by debris, and
- iv) lost reports.

**Table 10 Wildlife Accident Reporting System (WARS) summary, Balmoral to Canoe (1988 – 1997)<sup>1</sup>.**

<b>Segment</b>	<b>LKI</b>	<b>Deer Records</b>		<b>Bear Records</b>		<b>Total Records</b>	<b>Reported Kills</b>	<b>Estimated Kills</b>
	<b>Start</b>	<b>No.</b>	<b>Years</b>	<b>No.</b>	<b>Years</b>		<b>/km/year</b>	<b>/km/year<sup>2</sup></b>
0935	64.0	1	89	0		1	<b>0.1</b>	0.5
	65.0	3	89, 91	2	95	5	<b>0.5</b>	2.5
	66.0	1	95	1	93	2	<b>0.2</b>	1.0
	67.0	2	88	0		2	<b>0.2</b>	1.0
	68.0	5	88, 91, 93	0		5	<b>0.5</b>	2.5
	69.0	2	89, 97	0		2	<b>0.2</b>	1.0
	70.0	3	90, 91, 93	0		3	<b>0.3</b>	1.5
	71.0	3	92	0		3	<b>0.3</b>	1.5
	72.0	5 <sup>3</sup>	88, 96, 97	1	91	6	<b>0.6</b>	3.0
	73.0	1	94	0		1	<b>0.1</b>	0.5
	74.0	0		0		0	<b>0</b>	0
	75.0	3	90, 89	1	95	4	<b>0.4</b>	2.0
	76.0	0		0		0	<b>0</b>	0
	77.0	4	88, 91, 95	0		4	<b>0.4</b>	2.0
	78.0	1	94	0		1	<b>0.1</b>	0.5
	79.0	1	88	0		1	<b>0.1</b>	0.5
	80.0	0		0		0	<b>0</b>	0
	81.0	0		0		0	<b>0</b>	0
	82.0	0		0		0	<b>0</b>	0
	83.0	1	89	0		1	<b>0.1</b>	0.5



Segment	LKI	Deer Records		Bear Records		Total Records	Reported Kills	Estimated Kills
	Start	No.	Years	No.	Years		/km/year	/km/year <sup>2</sup>
	84.0	3	89, 95	0		3	0.3	1.5
	85.0	0		0		0	0	0
0950	0.0	0		1	95	1	0.1	0.5
	1.0	3	88, 91	0		3	0.3	1.5
	2.0	1	90	0		1	0.1	0.5
	3.0	6	91,94,95, 97	0		6	0.6	3.0
	4.0	1	94	0		1	0.1	0.5
	5.0	4	88,92,94, 97	1	94	5	0.5	2.5
	6.0	0		0		0	0	0
<b>Totals</b>		<b>54</b>		<b>7</b>		<b>61</b>		
<b>Means</b>							<b>0.21</b>	<b>1.05</b>

Notes:

<sup>1</sup> includes only records where kilometreage was provided.

<sup>2</sup> values recorded are assumed to represent 20 % of actual kills (L. Sielecki, pers. comm.). Under-reporting is related to the following:

- i) animals dying outside the right-of-way,
- ii) animals being removed by predators,
- iii) animals obscured by debris, and
- iv) lost reports.

<sup>3</sup> includes one moose road kill.

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**Appendix 6, Section A: Wildlife – Cache Creek to Canoe**

## **Section B: Canoe to Mount Revelstoke National Park West Gate**

Prepared by LGL Environmental Research Associates Ltd.

### **B1 Canoe to Taft Road**

#### **1 Introduction**

The B.C. Ministry of Transportation and Highways is planning to upgrade various sections of the Trans Canada Highway between Cache Creek and the Alberta Border. Upgrades and their locations have not yet been defined, but will include adding passing or climbing lanes, improving highway alignment and design to reduce advisory speed zones and, in some cases, improving the highway to four lanes. The nature of the highway improvements that are contemplated may have environmental implications including effects on wildlife, their habitats and on rare or endangered plants. In order to facilitate future impact assessment and highway upgrade planning and design, it is necessary to determine the existing state of the highway and the current resource issues that may affect highway development. This report describes the existing conditions along the Trans Canada Highway from Canoe to Taft Road that are considered to be environmentally sensitive for vegetation and wildlife. As such, the focus was on the existing highway and a narrow corridor on either side of the highway.

#### **2 Study Area / Background**

The study area extends from the Salmon Arm Corporate Limits at the eastern boundary of Canoe to Taft Road east of the Perry River. The area extends along the southeastern edge of Shuswap Lake and continues up the lower reaches of the Eagle River valley. Along the edge of Shuswap Lake the highway bisects a second-growth mixed forest. East of the lake, highway runs through the centre of the broad, relatively flat, Eagle River valley. The forested valley sides of this valley are often several kilometres away from the highway. The valley contains the town of Sicamous and a significant amount of agriculture and residential properties have altered a considerable amount of the natural vegetation. The entire area is within two biogeoclimatic zones, the Interior Cedar-Hemlock Zone (ICH) and the Engelmann Spruce-Subalpine Fir Zone (ESSF), but the highway lies exclusively in the ICH Zone.

Because the highway shares the valley bottoms with rivers and lakes, much of the habitat traversed by the highway is riparian and represents some of the best and rarest wildlife habitat in the region.

### **3 Methods**

Vegetation, wildlife and wildlife habitat conditions described in this report are based on very limited existing information, a 1.5 day site reconnaissance survey conducted mid-October 1998, and preliminary results from habitat surveys carried out during late October 1998. Much of the existing information was not available at the time of this writing. For example, the regional habitat protection biologists were not prepared to comment until they had a chance to review the material sent to them by the B.C. Ministry of Transportation and Highways (BC MoTH). Furthermore, field work was conducted at perhaps the worst possible time of the year, after vegetation had died back and herbaceous material had largely disappeared, after many of the migrant birds had left, and before wildlife tracks and much other sign was visible in the snow. Therefore, this report needs to be interpreted with extreme caution and considered as preliminary pending continued field studies and information review.

Habitat assessment field studies were based on forest cover maps. Each forest cover type was sampled and nearly every forest cover polygon adjacent to the road was visited in order to document the habitat suitability for various animals. Although the broad cover data and observational data collected during the field survey forms the basis of this report, formal analysis of the habitat data has not been completed and will be reported on separately.

The primary existing sources of existing information were the Conservation Data Centre for information on rare and endangered organisms and habitats, the B.C. Ministry of Transportation and Highways (Mr. Len Sielecki) for data from the Wildlife Accident Reporting System (WARS), and unpublished reports.

In order to rank the environmental sensitivity of each habitat or biological feature identified as being of concern during highway upgrading, it was necessary to develop criteria for determination of environmental sensitivity. The following table lists the major criteria used to assess sensitivity levels. Note that the sensitivity rating of any area could be reduced by the presence of other factors such as human disturbance, buffering from the highway corridor, or present deteriorated conditions.

High	Medium	Low
red/blue listed species known to occur in area		
known movement corridor	Suspected/potential movement corridor	
wetland with waterbird breeding habitat and few constraints	wetland with limited or constrained breeding habitat	
riparian forest with few limitations as general habitat for selected species of wildlife	riparian forest with some limitations	riparian forest with considerable limitations
ungulate winter habitat		
presence of "special" <sup>1</sup> habitat sites		

<sup>1</sup>special habitat sites include, but are not limited to, "permanent" (i.e., reusable) nest sites, mineral licks, wildlife trees, and staging areas.

#### 4 Results / Discussion

Table 11 identifies the known wildlife and wildlife habitat features that may be of concern during highway upgrades between LKI 950-7.3 (Canoe) to LKI 960-32.0 (Taft Road). The purpose of this section is to briefly describe those concerns and assess the likely need for mitigation or the problems inherent in attempting mitigation. Each concern in the table has been referenced with an Item Number which relates to the following numbered paragraphs.

1. The Conservation Data Centre has reported the presence of thyme-leaved spurge (*Euphorbia serpyllifolia*) along the rocky shoreline of Shuswap Lake. The shoreline lies north of the railway tracks and is unlikely to be affected by highway upgrading.
2. During October 1998 reconnaissance surveys evidence of deer movement across the highway was noted in this location. The extent of the movement is not known and it is premature to suggest mitigation at this time.
3. Similar to Item 2.
4. A small patch of riparian forest lies along the Eagle River and is used by deer and likely by many species of birds, small mammals, and other species. The habitat is within the town of Sicamous. If possible, the habitat should be avoided.

5. Collision reports in the WARS database indicate that a significant number of deer cross the highway in this location. Mitigation may be necessary in the form of wider shoulders and possibly overhead lighting.
6. A stand of cottonwood occupies the area between the highway and the meander channel of the Eagle River. This stand of trees provides valuable habitat for a variety of wildlife and should be avoided.
7. Collision reports in the WARS database indicate that a significant number of deer cross the highway in this location. Note that this area of concern overlaps with Items 6, 8 and 9. Mitigation actions have not been defined at this time.
8. The highway bisects an open riparian forest that provides good quality habitat for deer and many other species. Because the habitat lies on both sides of the highway, it will not be possible to avoid further disturbance to this habitat during highway widening. Compensation may be the only alternative if highway upgrades affect this habitat.
9. A stand of mixed wood forest occupies the area between the highway and a meander of the Eagle River. This stand of trees provides valuable habitat for a variety of wildlife and should be avoided.
10. Similar to Item 6.
11. A shrub wetland exists on the south side of the highway opposite the riparian cottonwood forest across the highway. The wetland has already been affected by logging in habitats adjacent to it and by the current highway alignment. It is unlikely that this wetland can be avoided by highway upgrading, and compensation may be required by wetland creation in nearby areas.
12. This wetland oxbow meander channel lies between the highway and the railway tracks, and in fact is bisected by the railway tracks. It has high value as a wetland for breeding birds and amphibians and is likely used by a variety of vertebrate species. The value of this habitat is increased by the presence of mature cottonwood trees that surround the wetland. The habitat should be avoided.
13. Similar to Item 12.
14. Similar to Item 6.
15. This small sedge wetland is surrounded with large black cottonwood trees. The Mexican mosquito fern (*Azolla mexicana* Presl), a provincially red-listed aquatic fern, is abundant in the wetland. This habitat must be avoided. Avoidance of the area is complicated by the fact that the highway is currently adjacent to the railway

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**Appendix 6, Section B1: Wildlife –Canoe to Taft Road**

tracks which abut the Eagle River. It may be necessary to bridge highway upgrades over the wetland in order to protect the vegetation of this pond.

16. This small shrub wetland is located north of the railway tracks between the tracks and the Eagle River and connects two stands of riparian forest. The wetland likely used by breeding birds, furbearers and ungulates. This habitat is unlikely to be affected by highway upgrading because it lies across the railway tracks and among the meanders of the Eagle River.
17. Acres International (1998) reported the presence of great blue heron rookeries near an old Chevron gas station near Cambie citing Sandy MacDonald (MELP) as the information source. He also noted that introduced hyacinths grew in an oxbow lake nearby. This area should be avoided.
18. This small shrub wetland is located north of the highway between the highway and a meander of the Eagle River. It is bordered on the west by a logged area and connects with another shrub wetland to the east. The wetland is of moderate concern because of its likely use by breeding birds, furbearers and ungulates. It is unlikely that this wetland will be affected by highway upgrading because the highway would likely be located away from the Eagle River.
19. Similar to Item 18.
20. Collision reports in the WARS database indicate that a significant number of ungulates cross the highway in this location. Mitigation actions have not been defined at this time.
21. A large (over 200 ha) complex of wetlands and riparian forest occurs north of the Eagle River. It is unlikely that any highway upgrading will occur in this area. If relocation of the highway to the north side of the Eagle River were to occur, this area should be avoided.
22. This open riparian forest with scattered mature trees is located north of the highway between the highway and a meander of the Eagle River. Some of the mature trees may be wildlife trees. Riparian forests are some of the most productive wildlife habitats in the province and contain a diversity of wildlife species. They should be protected from a biodiversity perspective. Therefore, this habitat should be avoided if possible.
23. Similar to Item 22.
24. This is a continuation of Item 23 on the south side of the highway, and contains more shrubs and snags than Item 22. Similar to Item 22.

25. Similar to Item 24, but without wildlife trees.
26. This open water and sedge wetland was bisected by the highway and railway tracks. It contains good habitat for waterbirds and other marsh-dwelling wildlife. Although it will not be feasible to avoid the area during highway upgrading, consideration should be given to bridging the upgrade over the wetland.
27. A small oxbow containing open water and sedge is similar in habitat value to Item 26. The wetland lies along the south side of the highway just before the highway crosses to the north side of the railway line. This habitat should be avoided.
28. The small oxbow described in Item 27 lies within a larger shrub/sedge wetland that is surrounded with a riparian forest. The entire wetland complex provides breeding, nesting and wintering habitat for a host of wildlife species and should be avoided.
29. The banks of Craigellachie Creek contain old growth forest which is significant both in its habitat value for wildlife and because of the fact that much of the old growth forest in the area has been logged. Loss of mature trees should be minimized if the highway is upgraded in this area.
30. The highway currently runs through a narrow strip of young black cottonwood forest with an diversity of ungulate browse species. Although this narrow band of trees has limited value in itself, its location among the larger riparian forest of the Eagle River valley elevates the suitability of this habitat. Nevertheless, the forest to the south of the highway lies between the highway and the railway tracks and a significant amount of logging has occurred to the north of the highway. Highway upgrading in this area should attempt to minimize the amount of this habitat disturbed.
31. Similar to Item 24.
32. A small sedge-cattail wetland is present on the north side of the highway. This wetland provides breeding and nesting habitat for marsh waterbirds and possibly amphibians and should be avoided.
33. Similar to Item 32.
34. Similar to Item 32.
35. This mature black cottonwood forest has high wildlife values primarily because of the high wildlife diversity supported by this forest type. The area lies north of the highway behind a frontage road with the railway tracks located south of the

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**Appendix 6, Section B1: Wildlife –Canoe to Taft Road**

highway. The forest should be avoided if possible by using the land occupied by the frontage road to the maximum extent.

36. A young black cottonwood forest with an diversity of ungulate browse species lies north of the highway. Because the railway tracks are located immediately south of the existing highway, it will be probably be necessary to impinge upon this habitat if the highway is upgraded in this area. Highway upgrading in this area should attempt to minimize the amount of this habitat that is disturbed.
37. South of the Eagle River, and well south of the highway, is a riparian forest and shrub wetland with high capability for wildlife diversity. This area is unlikely to be affected by highway upgrading unless the alignment of the highway is changed to lie south of the Eagle River. In this event, these habitats should be avoided.
38. Similar to Item 37, but north of the Eagle River. Highway upgrading in this area should avoid these habitats which lie along the south side of the highway.



Table 11 Summary of wildlife, wildlife habitat and vegetation concerns and sensitivity ratings

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
1	950	8.8	9.2	n	rare plant	h	shoreline of Shuswap Lake has been noted to provide habitat for thyme-leaved spurge ( <i>Euphorbia seryllifolia</i> ) a blue-listed plant.
2	950	20.0		n,s	deer crossing	m	evidence of deer movement across highway at this location during October 1998
3	950	20.7		n,s	deer crossing	m	evidence of deer movement across highway at this location during October 1998
4	950	26.5	27.2	n	riparian forest	m	an isolated patch of black cottonwood/aspen riparian forest with abundant shrub understory that includes forage species
5	950	26.8	27.0	n,s	deer crossing	h	deer movement across highway apparent from WARS data
6	960	2.1	2.7	n	riparian	m	scattered large black cottonwood trees
7	960	2.3	3.6	n,s	deer crossing	h	deer movement across highway apparent from WARS data
8	960	2.7	2.8	n, s	riparian forest	m	narrow strip of open riparian forest with abundant shrub understory that includes forage species near the mouth of a creek
9	960	3.4	3.7	n	riparian forest	m	mixed riparian forest with abundant shrub understory that includes forage species
10	960	3.9	4.3	n	riparian	m	scattered large black cottonwood trees
11	960	4.1	4.3	s	wetland	m	shrub wetland and open riparian forest

**Appendix 6, Section B1: Wildlife –Canoe to Taft Road**

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
12	960	5.9	6.4	n	wetland	h	oxbow channel, graminoid wetland surrounded by large black cottonwood trees
13	960	6.7	7.1	n, s	wetland	h	oxbow channel, graminoid wetland surrounded by large black cottonwood trees
14	960	7.6	8.0	n	riparian	m	veteran scattered black cottonwood trees
15	960	7.7	8.2	s	wetland	h	small sedge wetland surrounded with large black cottonwood trees: mexican mosquito fern ( <i>Azolla mexicana</i> Presl), provincially red-listed aquatic fern, is abundant in the wetland
16	960	9.1	9.3	n	wetland	l	shrub/sedge wetland surrounded with large trees N of railway tracks
17	960	10.3	10.5	n	heron rookery	h	Acres International (1998) reported a heron rookery and an oxbow lake with introduced freshwater hyacinths
17	960	10.9	11.1	n	wetland	m	small shrub/sedge wetland surrounded with large trees
18	960	11.4	11.6	n	wetland	m	shrub/sedge wetland surrounded with large trees
19	960	11.7	33.5	n,s	ungulate crossing	h	big game movement across highway apparent from WARS data
20	960	17.1	17.9	n	wetland	l	large (over 200 ha) complex of wetlands and riparian forest N of the Eagle River
21	960	17.9	18.0	n	riparian forest	m	open riparian forest (veteran trees)
22	960	20.6	20.9	n	riparian forest	h	open riparian forest (veteran trees)
23	960	20.6	21.3	s	riparian	h	combination of open riparian forest (veteran trees and snags) and shrubby areas

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
24	960	22.4	22.5	s	riparian	l	combination of open riparian forest and shrubby areas
25	960	22.9	22.9	n, s	wetland	m	open water and sedge wetland
26	960	24.4	24.5	s	wetland	h	small oxbow open water and sedge wetland
27	960	24.4	24.9	s	wetland	h	shrub/sedge wetland surrounded with large trees
28	960	25.4	25.5	n	old-growth	h	banks of Craigellachie Creek: old-growth Douglas-fir/redcedar/western hemlock forest
29	960	25.8	26.7	s	riparian forest	l	young black cottonwood dominated forest with shrub understory that includes forage species; narrow strip, so has limited value
30	960	26.2	27.5	n	riparian	m	combination of open riparian forest and shrubby areas
31	960	26.3	26.4	n	wetland	h	small sedge/cattail wetland
32	960	26.6	26.8	n	wetland	h	small sedge/cattail wetland
33	960	27.3	27.3	n	wetland	h	small sedge/cattail wetland
34	960	27.7	27.8	n	riparian forest	h	large-tree black cottonwood dominated forest
35	960	28.2	28.3	n	riparian forest	m	young black cottonwood with shrub understory that includes forage species
36	960	29.0	30.3	s	riparian	m	combination of open riparian forest and shrub/sedge wetlands on S side of Eagle River
37	960	30.3	32.1	s	riparian	h	combination of open riparian forest and shrub/sedge wetlands

#### Appendix 6, Section B1: Wildlife –Canoe to Taft Road

Table 12 presents a summary of the numbers of ungulates and bears that have been reported killed on the highway since 1988. These data do not represent the actual numbers killed because many of the animals killed do not end up on or near the road and, therefore, are not likely to be reported. The data may be considered to be a rough index of the extent of ungulate and bear mortality caused by automobile traffic, but because of occasional approximations in locations of kill sites the data should be examined over several to many kilometres rather than a single kilometre. Furthermore, differences in the detectability of animal carcasses along the highway due to steep terrain or dense vegetation may result in an uneven index along the highway route. Nevertheless, when interpreted with topographic features and field sign, useful conclusions can be drawn regarding highway sections prone to wildlife-related accidents. The interpretation of these has been presented above.

Table 12 Number of ungulates and bears reported killed per kilometre of highway per year from 1988 - 1997

Segment	LKI	Number of ungulates and bears killed per year
950	7	0.1
950	8	0.1
950	9	0.1
950	10	0.1
950	11	0.0
950	12	0.0
950	13	0.0
950	14	0.1
950	15	0.2
950	16	0.0
950	17	0.2
950	18	0.1
950	19	0.0
950	20	0.0
950	21	0.0
950	22	0.0
950	23	0.0
950	24	0.1
950	25	0.1
950	26	0.6
950	27	0.1
960	0	0.1
960	1	0.0

Segment	LKI	Number of ungulates and bears killed per year
960	2	0.2
960	3	1.1
960	4	0.4
960	5	0.1
960	6	0.2
960	7	0.0
960	8	0.3
960	9	0.1
960	10	0.1
960	11	0.2
960	12	0.0
960	13	0.2
960	14	0.2
960	15	0.3
960	16	0.3
960	17	0.0
960	18	0.4
960	19	0.1
960	20	0.4
960	21	0.0
960	22	0.1
960	23	0.2
960	24	0.7
960	25	0.9
960	26	0.2
960	27	0.3
960	28	0.5
960	29	0.0
960	30	0.6
960	31	0.1

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**Appendix 6, Section B1: Wildlife –Canoe to Taft Road**

Table 13 lists the species that occur in or near the study area that are considered to be vulnerable, threatened or endangered in British Columbia.

**Table 13      Red and Blue Listed Vertebrates and Plants in the Conservation Data Centre Data Base for Canoe to Perry River.**

Species	Location	Comments
<b>Mammals</b>		
<b>Blue List</b>		
Euderma Maculatum, (Spotted Bat)	Bastion Mountain, Sunnybrae	1995: seen "all summer" until 1995-10-16. They fly from the cliff and use the dry forest and farmland towards the lake from the bluff.
<b>Vascular Plants</b>		
<b>Red List</b>		
Azolla Mexicana, (Mosquito Fern)	Cambie: 2.7 km W along Trans- Canada highway opposite Solsqua Road intersection	In shallow water of oxbow lake. Approximately 3119 plants/square metre.
	Sicamous: Three hundred metres W of Silver Sands Road on S side of Trans-Canada highway.	In shallow water of oxbow lake. Approximately 3119 plants/square metre.
<b>Blue List</b>		
Euphorbia Serpyllifolia (Thyme-Leaved Spurge)	1.6 Km East Of Canoe On Shuswap Lake.	Common in moist rocky area along shoreline.
Stellaria Obtusa (Blunt- Sepaled Starwort)	Mount Mara	

## **5 References**

Acres International. 1998. Trans Canada Highway Corridor (Kamloops to Alberta Border) environmental overview assessment. Report prepared for B.C. Ministry of Transportation and Highways by Acres International Limited, Vancouver, B.C.

## **B2 Taft Road to Victor Lake**

### **1 Introduction**

The B.C. Ministry of Transportation and Highways is planning to upgrade various sections of the Trans Canada Highway between Cache Creek and the Alberta Border. Upgrades and their locations have not yet been defined, but will include adding passing or climbing lanes, improving highway alignment and design to reduce advisory speed zones and, in some cases, improving the highway to four lanes. The nature of the highway improvements that are contemplated may have environmental implications including effects on wildlife, their habitats and on rare or endangered plants. In order to facilitate future impact assessment and highway upgrade planning and design, it is necessary to determine the existing state of the highway and the current resource issues that may affect highway development. This report describes the existing conditions along the Trans Canada Highway from Taft Road to Victor Lake that are considered to be environmentally sensitive for vegetation and wildlife. As such, the focus was on the existing highway and a narrow corridor on either side of the highway.

### **2 Study Area / Background**

The study area extends from the intersection of the Trans Canada Highway with Taft Road to Victor Lake. The highway is located in a "U-shaped" valley with forested slopes and a rich riparian valley bottom. The entire length of this segment of highway parallels the Eagle River with extensive sedge wetlands, shrub wetlands, and hardwood and mixedwood riparian forests. Two lakes, Griffen Lake and Three Valley Lake also occupy the valley bottom. The entire area is within two biogeoclimatic zones, the Interior Cedar-Hemlock Zone (ICH) and the Engelmann Spruce-Subalpine Fir Zone (ESSF), but the highway lies exclusively in the ICH Zone.

Because the highway shares the valley bottoms with rivers and lakes, much of the habitat traversed by the highway is riparian and represents some of the best and rarest wildlife habitat in the region. Although the eastern portion of this segment is likely limited as ungulate winter habitat, the lower reaches of the Eagle River valley provide year-round habitat for ungulates and a wide variety of other wildlife species.

### **3 Methods**

Vegetation, wildlife and wildlife habitat conditions described in this report are based on very limited existing information, a 1.5 day site reconnaissance survey conducted mid-October 1998, and preliminary results from habitat surveys carried out during late October 1998. Much of the existing information was not available at the time of this writing. For example, the regional habitat protection biologists were not prepared to comment until they had a chance to review the material sent to them by the B.C. Ministry



of Transportation and Highways (BC MoTH). Furthermore, field work was conducted at perhaps the worst possible time of the year, after vegetation had died back and herbaceous material had largely disappeared, after many of the migrant birds had left, and before wildlife tracks and much other sign was visible in the snow. Therefore, this report needs to be interpreted with extreme caution and considered as preliminary pending continued field studies and information review.

Habitat assessment field studies were based on forest cover maps. Each forest cover type was sampled and nearly every forest cover polygon adjacent to the road was visited in order to document the habitat suitability for various animals. Although the broad cover data and observational data collected during the field survey forms the basis of this report, formal analysis of the habitat data has not been completed and will be reported on separately.

The primary existing sources of existing information were the Conservation Data Centre for information on rare and endangered organisms and habitats, the B.C. Ministry of Transportation and Highways (Mr. Len Sielecki) for data from the Wildlife Accident Reporting System (WARS), and unpublished reports.

In order to rank the environmental sensitivity of each habitat or biological feature identified as being of concern during highway upgrading, it was necessary to develop criteria for determination of environmental sensitivity. The following table lists the major criteria used to assess sensitivity levels. Note that the sensitivity rating of any area could be reduced by the presence of other factors such as human disturbance, buffering from the highway corridor, or present deteriorated conditions.

High	Medium	Low
red/blue listed species known to occur in area		
known movement corridor	Suspected/potential movement corridor	
wetland with waterbird breeding habitat and few constraints	wetland with limited or constrained breeding habitat	
riparian forest with few limitations as general habitat for selected species of wildlife	riparian forest with some limitations	riparian forest with considerable limitations
ungulate winter habitat		
presence of "special" habitat sites		

-special habitat sites include, but are not limited to, "permanent" (i.e., reusable) nest sites, mineral licks, wildlife trees, and staging areas.

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#### **Appendix 6, Section B2: Wildlife –Taft Road to Victor Lake**

#### **4 Results / Discussion**

Table 14 identifies the known wildlife and wildlife habitat features that may be of concern during highway upgrades between LKI 960-32.0 (Taft Road) and LKI 960-53.3 (Woods railroad overpass). The purpose of this section is to briefly describe those concerns and assess the likely need for mitigation or the problems inherent in attempting mitigation. Each concern in the table has been referenced with an Item Number which relates to the following numbered paragraphs.

1. This mature black cottonwood forest has high wildlife values primarily because of the high wildlife diversity supported by this forest type. The area lies north of the Eagle River. Highway upgrading in this area should avoid these habitats which lie along the south side of the highway.
2. This mature black cottonwood and coniferous forest contains a number of snags, some of which are likely to be used as wildlife trees. There is also an abundance of browse and other forage species for ungulates and other wildlife. This habitat lies between the highway and the railway tracks and should be avoided during highway upgrading.
3. These wetlands are likely used by a wide variety of wildlife and are enhanced by their proximity to adjacent wetlands and riparian forests. This is a high value wildlife area and is likely used for breeding by waterfowl and marsh birds and also used by a variety of other birds, furbearers, bears, moose and deer. These wetlands should be avoided.
4. This large wetland lies across the channel of the Eagle River from the highway. It is likely used extensively by moose, deer, bears, furbearers and a variety of nesting birds. This area is not likely to be affected unless the highway is realigned to the south side of the Eagle River. The area should be avoided.
5. The existing highway was built through a stand of riparian cottonwood forest and isolated a small wetland and the tall cottonwood trees from the river channel lying south of the highway. This small wetland is enhanced by its proximity to adjacent wetlands and riparian forests. This is a high value wildlife area and is likely used for breeding by waterfowl and marsh birds and also used by a variety of other birds, furbearers, bears, moose and deer. Because the current highway runs between the Eagle River channel and this marsh with railroad track to the north, it may not be possible to avoid this marsh during highway upgrades. If this is the case, creation of additional marsh elsewhere would likely be adequate.

6. This mixed riparian forest is likely used by a variety of breeding birds, furbearers and by ungulates. The large, veteran trees are potential wildlife trees. Because of the diversity of use of this habitat, it is rated as a moderate concern. The only viable mitigation is avoidance, which may not be possible.
7. South of the Eagle River and about 200 m south of the highway lies a small sedge wetland with open water likely used by waterfowl and nesting marsh birds. It will not be affected unless the highway is realigned south of the Eagle River.
8. This small shrub wetland is located between the highway and the Eagle River and connects two stands of riparian forest. The wetland is high concern because of its likely use by breeding birds, furbearers and ungulates. The only viable mitigation is avoidance which may not be possible.
9. This open mixed riparian forest with extensive shrub cover is likely used by breeding birds, furbearers and by ungulates. The large, veteran trees are potential wildlife trees. Because this habitat occupies only a very narrow strip as the valley narrows, it is rated as a low concern. Mitigation is unlikely to be necessary, but additional investigation of the area should be conducted.
10. This shrub wetland is part of a large wetland complex that forms the Eagle River floodplain. It is high priority wildlife habitat because of its use by many species including moose, deer, bear, furbearers, and nesting birds, among others. A small, shrub-lined oxbow north of the Eagle River channel is likely used by a few waterfowl and nesting marsh birds. This high priority area should be avoided during highway upgrading.
11. Similar to Item 10 without the oxbow channel.
12. Along this meandering portion of the Eagle River, thick shrub cover provides cover and security for grizzly and black bears while feeding on sockeye salmon moving up the river during fall. There are likely also spring feeding opportunities for bears in this area. This high concern area is unlikely to be affected by highway upgrading because of the high value fish habitat present in the Eagle River. The highway should not encroach upon the shrub wetland as well.
13. A small sedge oxbow is present near the highway with open water that is likely used by waterfowl and marsh-nesting birds. Three hooded mergansers were observed on this oxbow during late October 1998. These high priority wetlands should be avoided.
14. Similar to Item 13. Three mallards mergansers were observed on this oxbow during late October 1998.

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**Appendix 6, Section B2: Wildlife –Taft Road to Victor Lake**

15. The Eagle River is nearly adjacent to the highway at this location. Two dippers, a mallard and two common ravens were observed here during late October 1998. Many other species of birds and mammals are also likely to use this habitat. Highway upgrading should not encroach upon this high priority habitat.
16. A small sedge oxbow is present about 200 m south of the highway with open water that is likely used by waterfowl and marsh-nesting birds. Unless the highway corridor is realigned to the south, this wetland should not be affected by highway upgrading.
17. This mixed riparian forest is likely used by a variety of breeding birds, furbearers and by ungulates. The large, veteran trees are potential wildlife trees. Because of the diversity of use of this habitat, it is rated as a moderate concern. The only viable mitigation is avoidance.
18. Similar to Item 17 except the forest is located on the south side of the railroad tracks and, therefore, is less likely to be affected by highway upgrading.
19. Similar to item 17.
20. There is a sedge-cattail marsh with open water south of the river and about 300 m south of the highway which is likely to be good breeding habitat for marsh-nesting birds. This habitat will not be affected unless the highway alignment is changed in this location.
21. Similar to item 17 except the habitat value is somewhat limited by being isolated between the lake and the highway and there did not appear to be any wildlife trees present.
22. A sedge marsh at the western edge of Griffin Lake provides habitat for some waterbirds that use the lake. This area should be avoided during highway upgrading.
23. Similar to Item 17.
24. A small, shallow waterbody with shorelines consisting of sedge and cattail lies south of the highway. This is one area that may support nesting by American bittern which is on the provincial blue list (Bennett et al. 1996). This is a high concern area and should be avoided.
25. Similar to Item 17.

26. There is a sedge-cattail-shrub wetland with open water north of the river but about 200 m south of the highway which is likely to be good breeding habitat for marsh-nesting birds. This habitat will not be affected unless the highway alignment is changed in this location.
27. Smith (1990) reported that deer and moose move from South Pass Creek down the Eagle River valley in winter to avoid the deep snow that accumulates in the upper creek valley. If this is so, then seasonal movement during spring and early winter should be expected through this area. The timing and extent of this movement needs to be documented before mitigation measures are considered.
28. A small herd of mountain goats has been reported to occupy the hills above the lodge at Three Valley Lake at least during parts of some years (Smith 1990). The occasional goat has even been seen on the highway. While mountain goats are not expected to be a major concern, if blasting is conducted along the cliffs to the north of the existing highway, it should not occur during the spring kidding period.
29. A shrub and sedge wetland with open water occurs north of the Eagle River and is likely to be used by waterfowl, marsh-nesting birds, bears and other species at various times of year. This area would likely be affected by a highway route north of Three Valley Lake. The only likely mitigation would be reconstruction of a similar wetland elsewhere.
30. Avalanche chutes along the highway are likely used during spring by black and grizzly bears scavenging carcasses of winter-killed animals and feeding on early green-up of vegetation. The valley bottom is likely used by black and grizzly bears during fall when they would likely feed on coho salmon. Bears have been reported on the highway in this area, and would be expected to cross the highway periodically. This is a high priority concern because of the blue-listed status of grizzly bears in the province, the potential hazard to human safety, and the significance of this area to bears. The only mitigation would involve avoiding disturbance to the shrub wetland and riparian forest habitats in this area, and ensuring that all garbage facilities are bear proof.
31. Similar to Item 29.
32. A shrub wetland with a wet meadow area lies between the highway and the railroad tracks. This area is likely used during spring by bears as well as a variety of other species. It is of high concern because of the limited amount of meadows in this area. The area should be avoided.
33. Similar to Item 29.
34. Similar to Item 17.

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**Appendix 6, Section B2: Wildlife – Taft Road to Victor Lake**

Table 14 Summary of wildlife, wildlife habitat and vegetation concerns and sensitivity ratings

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
1	960	30.3	32.1	s	riparian	h	combination of open riparian forest and shrub/sedge wetlands
2	960	32.8	33.5	s	riparian forest	h	old black cottonwood dominated and coniferous riparian forest with snags and abundant shrub understory that includes forage species
3	960	33.5	34.0	s	wetland	h	shrub wetland surrounded with large trees; a cutoff part of a large wetland system in the floodplain of Eagle River. The system includes shrub, sedge and open water wetlands
4	960	34.0	34.4	s	wetland	h	large shrub riparian wetland surrounded by trees
5	960	34.1	34.2	n	wetland	h	shrub wetland surrounded with large trees
6	960	34.2	35.3	s	riparian forest	m	open mixed riparian forest and shrubs; large trees present
7	960	34.8	34.8	s	wetland	m	sedge wetland, open water 200 m S of hwy
8	960	35.3	35.6	s	wetland	h	shrub wetland
9	960	35.6	36.2	s	riparian forest	l	young mixed riparian forest with abundant shrub understory
10	960	36.8	39.5	n	wetland	h	large shrub/sedge/cattail wetland; willows, spiraea, alder; open water in oxbow channels
11	960	39.6	40.5	s	wetland	h	shrub/sedge wetland; willows, spiraea, alder
12	960	39.6	40.9	s	bear habitat	h	potential spring and fall foraging area for black and grizzly bears

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
13	960	39.8	39.8	s	wetland	h	sedge oxbow wetland, open water
14	960	39.9	39.9	s	wetland	h	sedge oxbow wetland, open water
15	960	40.0	40.2	s	river	h	riverbank adjacent to hwy
16	960	40.0	40.1	s	wetland	h	sedge oxbow wetland, open water 200 m S of hwy
17	960	40.5	41.0	s	riparian forest	m	open mixed riparian forest and shrubs; veteran trees present
18	960	41.0	41.4	s	riparian forest	m	open mixed riparian forest S of the railway; veteran trees present
19	960	41.5	43.1	s	riparian forest	h	open mixed riparian forest/shrub understory that includes forage species; veteran trees present
20	960	42.2	42.3	s	wetland	h	sedge/cattail/shrub wetland and open water S of the river, 300 m S of Hwy. It is surrounded by large trees
21	960	43.4	43.6	s	riparian forest	m	open mixed riparian forest/shrub understory that includes forage species; veteran trees present
22	960	43.5	43.6	s	lake	m	shallow coastline at the western end of Griffin Lake, sedges
23	960	44.6	45.1	s	riparian	m	open mixed riparian forest/shrub understory that includes forage species; shallow coastline; veteran trees present
24	960	45.3	45.5	s	wetland	h	sedge/cattail wetland and open water, ca. 12 ha, at the eastern end of Griffin Lake
25	960	46.0	46.7	s	riparian forest	m	open mixed riparian forest/shrub understory that includes forage species; veteran trees present

#### Appendix 6, Section B2: Wildlife –Taft Road to Victor Lake

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
26	960	46.7	47.0	s	wetland	h	sedge/cattail/shrub wetland and open water, ca. 15 ha, N of the river, 200 m S of Hwy. It is surrounded by large trees
27	960	47.5	49.5	n,s	ungulate crossing	h	seasonal movements of moose and deer may pass through this area
28	960	51.0	53.0	n	mountain goats	h	a small herd of mountain goats have been seen on the cliffs above the lodge and there are reports of goats on the highway
29	960	51.7	51.8	n	wetland	h	sedge/shrub wetland and open water N of the river
30	960	52.0	53.6	n,s	bear crossing	h	seasonal use of this area by black and grizzly bears
31	960	52.3	52.3	n	wetland	h	sedge/shrub wetland and open water N of the river
32	960	52.3	52.9	n	wetland	h	shrub wetland and meadows
33	960	52.7	53.0	n	wetland	h	sedge/shrub wetland and open water S and N of the river
34	960	52.7	53.3	n	riparian forest	m	open mixed riparian forest/shrub understory that includes forage species; veteran trees present



Table 15 presents a summary of the numbers of ungulates and bears that have been reported killed on the highway since 1988. These data do not represent the actual numbers killed because many of the animals killed do not end up on or near the road and, therefore, are not likely to be reported. The data may be considered to be a rough index of the extent of ungulate and bear mortality caused by automobile traffic, but because of occasional approximations in locations of kill sites the data should be examined over several to many kilometres rather than a single kilometre. Furthermore, differences in the detectability of animal carcasses along the highway due to steep terrain or dense vegetation may result in an uneven index along the highway route. Nevertheless, when interpreted with topographic features and field sign, useful conclusions can be drawn regarding highway sections prone to wildlife-related accidents. The interpretation of these has been presented above.

Table 15 Number of ungulates and bears reported killed per kilometre of highway per year from 1988 - 1997

Segment	LKI	Number of ungulates and bears killed per year
960	32	0.1
960	33	0.0
960	34	0.1
960	35	0.2
960	36	0.0
960	37	0.0
960	38	0.0
960	39	0.2
960	40	0.2
960	41	0.0
960	42	0.1
960	43	0.2
960	44	0.1
960	45	0.2
960	46	0.1
960	47	0.1
960	48	0.0
960	49	0.0
960	50	0.1
960	51	0.1
960	52	0.2
960	53	0.1

## Appendix 6, Section B2: Wildlife –Taft Road to Victor Lake

Table 16 lists the species that occur in or near the study area that are considered to be vulnerable, threatened or endangered in British Columbia.

**Table 16 Red and Blue Listed Vertebrates and Plants in the Conservation Data Centre Data Base for Perry River to Victor Lake.**

Species	Location	Comments
<b>Mammals</b>		
none		
<b>Vascular Plants</b>		
<b>Blue List</b>		
Impatiens Aurella (Orange Touch-Me-Not)	Eagle River Canyon	

## 5 References

Smith, G. 1990. Wildlife concerns associated with proposed development of Highway No. 1 in the Three Valley Lake area. Report prepared for B.C. Ministry of Transportation and Highways by Glen Smith Wildlife Resource Consultant Ltd. 15 pages.

## **B3 Victor Lake to Mount Revelstoke National Park West Gate**

### **1 Introduction**

The B.C. Ministry of Transportation and Highways is planning to upgrade various sections of the Trans Canada Highway between Cache Creek and the Alberta Border. Upgrades and their locations have not yet been defined, but will include adding passing or climbing lanes, improving highway alignment and design to reduce advisory speed zones and, in some cases, improving the highway to four lanes. The nature of the highway improvements that are contemplated may have environmental implications including effects on wildlife, their habitats and on rare or endangered plants. In order to facilitate future impact assessment and highway upgrade planning and design, it is necessary to determine the existing state of the highway and the current resource issues that may affect highway development. This report describes the existing conditions along the Trans Canada Highway from Victor Lake to Mount Revelstoke National Park that are considered to be environmentally sensitive for vegetation and wildlife. As such, the focus was on the existing highway and a narrow corridor on either side of the highway.

### **2 Study Area / Background**

The study area extends from the Woods railroad overpass west of Victor Lake and the west gate of Revelstoke National Park. The area encompasses the headwaters of the Eagle River, the entire Tonkawatla River system, and the lower Illecillewaet River Valley. For the most part, the highway runs through the bottom of deeply incised valleys although at times climbing the south-facing in the broader Illecillewaet River valley. The entire area is within two biogeoclimatic zones, the Interior Cedar-Hemlock Zone (ICH) and the Engelmann Spruce-Subalpine Fir Zone (ESSF), but the highway lies exclusively in the ICH Zone.

Because the highway shares the valley bottoms with rivers and lakes, much of the habitat traversed by the highway is riparian and represents some of the best and rarest wildlife habitat in the region. Both the Tonkawatla River valley, and the lower Illecillewaet River valley are side valleys of the Columbia River which contains some of the best wildlife habitat in the province. Much of the very best habitat along the Columbia River was lost when dams were constructed for hydro-electric power, but significant wildlife populations remain in the area.

### **3 Methods**

Vegetation, wildlife and wildlife habitat conditions described in this report are based on very limited existing information, a 1.5 day site reconnaissance survey conducted mid-October 1998, and preliminary results from habitat surveys carried out during late October 1998. Much of the existing information was not available at the time of this writing. For example, the regional habitat protection biologists were not prepared to

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#### **Appendix 6, Section B3: Victor Lake to Mt. Revelstoke National Park**

comment until they had a chance to review the material sent to them by the B.C. Ministry of Transportation and Highways (BC MoTH). Furthermore, field work was conducted at perhaps the worst possible time of the year, after vegetation had died back and herbaceous material had largely disappeared, after many of the migrant birds had left, and before wildlife tracks and much other sign was visible in the snow. Therefore, this report needs to be interpreted with extreme caution and considered as preliminary pending continued field studies and information review.

Habitat assessment field studies were based on forest cover maps. Each forest cover type was sampled and nearly every forest cover polygon adjacent to the road was visited in order to document the habitat suitability for various animals. Although the broad cover data and observational data collected during the field survey forms the basis of this report, formal analysis of the habitat data has not been completed and will be reported on separately.

The primary existing sources of existing information were the Conservation Data Centre for information on rare and endangered organisms and habitats, the B.C. Ministry of Transportation and Highways (Mr. Len Sielecki) for data from the Wildlife Accident Reporting System (WARS), and unpublished reports.

In order to rank the environmental sensitivity of each habitat or biological feature identified as being of concern during highway upgrading, it was necessary to develop criteria for determination of environmental sensitivity. The following table lists the major criteria used to assess sensitivity levels. Note that the sensitivity rating of any area could be reduced by the presence of other factors such as human disturbance, buffering from the highway corridor, or present deteriorated conditions.

High	Medium	Low
red/blue listed species known to occur in area		
known movement corridor	Suspected/potential movement corridor	
wetland with waterbird breeding habitat and few constraints	wetland with limited or constrained breeding habitat	
riparian forest with few limitations as general habitat for selected species of wildlife	riparian forest with some limitations	riparian forest with considerable limitations
ungulate winter habitat		
presence of "special" <sup>1</sup> habitat sites		

<sup>1</sup>special habitat sites include, but are not limited to, “permanent” (i.e., reusable) nest sites, mineral licks, wildlife trees, and staging areas.

#### **4 Results**

Table 17 identifies the known wildlife and wildlife habitat features that may be of concern during highway upgrades between LKI 960-53.3 (Woods railroad overpass) and LKI 975-18.3 (the west gate of Revelstoke National Park). The purpose of this section is to briefly describe those concerns and assess the likely need for mitigation or the problems inherent in attempting mitigation. Each concern in the table has been referenced with an Item Number which relates to the following numbered paragraphs.

1. Avalanche chutes along the highway are likely used during spring by black and grizzly bears scavenging carcasses of winter-killed animals and feeding on early green-up of vegetation. The valley bottom is likely used by black and grizzly bears during fall when they would likely feed on coho salmon. Bears have been reported on the highway in this area, and would be expected to cross the highway periodically. This is a high priority concern because of the blue-listed status of grizzly bears in the province, the potential hazard to human safety, and the significance of this area to bears. The only mitigation would involve avoiding disturbance to the shrub wetland and riparian forest habitats in this area, and ensuring that all garbage facilities are bear proof.
2. The shrub wetlands and open forest in this area lies south of the railroad tracks and, therefore, is not likely to be affected by highway upgrades. As a result, it is identified as a moderate concern. The habitat is likely to be used by a variety of wildlife including breeding birds, furbearers and ungulates.
3. This mixed riparian forest is likely used by a variety of breeding birds, furbearers and by ungulates. The large, veteran trees are potential wildlife trees. Because of the diversity of use of this habitat, it is rated as a moderate concern. The only viable mitigation is avoidance.
4. Similar to Item 3 without the veteran trees.
5. This area was previously identified by Smith (1990) as an ungulate crossing area. Because of the presence of Victor Lake, there is little in the way of mitigation that is likely to be practical. Signage is, perhaps, the only option. Highway barriers in this portion of the highway should be avoided.
6. The sedge wetlands on both ends of Victor Lake are likely used by breeding waterbirds. They should be avoided if possible.
7. Similar to Item 4.

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#### **Appendix 6, Section B3: Victor Lake to Mt. Revelstoke National Park**

8. A shrub wetland with a small shallow lake lies between the highway and the railroad tracks. This area is likely used extensively by breeding birds and furbearers as well as a variety of other species including ungulates. It is of high concern because of the limited amount of wetlands in this area and the high degree of use made of wetlands, especially for breeding. The area should be avoided.
9. Similar to Item 4.
- 10 Small-flowered willowherb (*Epilobium leptocarpum*), a blue-listed plant species, has been reported in the Conservation Data Centre data base from the shady rock ledges on the perpendicular cliffs above Clanwilliam Lake on the south side of the highway. Site visits were conducted too late to check for the presence of this species near the highway. A thorough examination of the highway area should be conducted before any highway upgrading takes place in this area.
11. This very small shrub wetland is located on the north side of the highway. Although small, it is enhanced by its adjacency to a riparian mixed forest. It is likely to have high animal diversity and should be avoided.
12. Similar to Item 4.
13. Similar to Item 2, but of higher concern because of the potential for the need to relocate the railroad tracks to allow highway upgrades in this area.
14. Wetask Lake occurs on the south side of the railroad tracks, but in an area where these tracks may need to be relocated to allow highway upgrades. Wetask Lake is a shallow waterbody with shorelines consisting of sedge and cattail. This is one area that may support nesting by American bittern which is on the provincial blue list (Bennett et al. 1996). This is a high concern area and should be avoided.
15. This small wetland area is located next to a logged forest which has reduced the attractiveness of the marsh to wildlife. As a result, it was assigned a medium concern rating and should be avoided during highway upgrades.
16. This area was identified by Bennett et al. (1996) as a movement corridor for ungulates. However, because of the number of private properties in the area, mitigation will be difficult. Further field studies are required to determine the extent of crossing in this area and the need for fencing and crossing structures.
17. This riparian forest is likely used by a wide variety of wildlife including breeding birds, furbearers, small mammals and ungulates. It is of moderate concern and should be avoided if possible.

18. Preliminary field observations indicated movement by deer and moose across the highway at this location following Bridge Creek. The extent of the movement is not known and it is premature to suggest mitigation.
19. Bridge Creek consists of young mixed riparian forest used by ungulates and likely also used by a variety of birds and furbearers. It is likely used as a corridor connecting riparian habitats along the Illecillewaet River with upland habitats through a growing urban environment. Because of its potential importance as a corridor, consideration should be given to the nature and extent of passage under the highway at this creek crossing.
20. Preliminary field observations indicated movement by moose and bear across the highway in this area. The extent of the movement is not known and it is premature to suggest mitigation.
21. This young, mixed riparian forest lies in a narrow strip between the highway and the Illecillewaet River. The major concern with potential removal of this strip of forest is the removal of a corridor connecting habitats in Items 22 and 23, below, with forests to the west. In doing so, more animals using those habitats may be forced to cross the highway.
22. This patch of willow along the shore of the Illecillewaet River is excellent habitat for moose, especially considering its juxtaposition with the neighbouring cottonwood stand (Item 24, below) and the upland, south-facing mixed forests across the highway. This willow stand is also important because it stabilizes the depositional bank of the Illecillewaet River. This riparian area should be avoided.
23. This stand of cottonwood contains some large trees and is likely to support a diversity of wildlife. It contains a large, burned, hollow, cottonwood snag used as a wildlife tree by woodpeckers. Highway upgrading should avoid or at least minimize loss of this forest stand.
24. This small shrub and sedge wetland was apparently either created or isolated by construction of the existing highway. It contains an abundance of dead trees, some of which are used as wildlife trees. Mitigation is likely to be implemented through wetland creation elsewhere.
25. At the base of the embankment on which the current highway is perched extends a long, narrow shrub wetland with scattered trees and snags. The wetland lies along a road which runs adjacent to the Illecillewaet River. Several of the snags show use by wildlife including woodpecker nests and feeding sign. This area should be avoided.

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**Appendix 6, Section B3: Victor Lake to Mt. Revelstoke National Park**

26. In the same area as Item 26, preliminary field observations indicated movement by moose and possibly caribou across the highway in this area. The extent of the movement is not known and it is premature to suggest mitigation.
27. A series of wildlife trees are present within 50 m south of the highway and scattered along 2 kilometres. These trees, and a buffer area around them, should be retained. If this is not possible, new snags should be created by girdling for potential use in the future.
28. A willow and sedge wetland lies about 200 m south of the highway and is unlikely to be affected by highway upgrading. The wetland contains valuable habitat, but because it is removed from the highway, it is considered to be only a moderate concern.
29. This wetland complex contains some wildlife trees and a diversity of riparian conditions suitable for a variety of wildlife. The wildlife trees should be preserved (or replaced) and the biodiversity values of the habitat kept intact.
30. Similar to Item 21 with the connection being to Hanner Lake.
31. Hanner Lake is an extensive wetland with an abundance of dead trees of low wildlife value. The area is likely used by moose, furbearers and breeding birds. The wetland has already been affected by a large fill for the existing highway which has already been upgraded to four lanes. It is unlikely that further upgrading would be necessary in this area.
32. Similar to item 30.



Table 17 Summary of wildlife, wildlife habitat and vegetation concerns and sensitivity ratings

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
1	960	53.3	56.1	n,s	bear crossing	h	seasonal use of this area by black and grizzly bears
2	960	53.4	54.6	s	riparian	m	shrub wetlands and open forest S of railway tracks
3	960	54.6	55.9	s	riparian forest	m	open mixed riparian forest/shrub understory that includes forage species; veteran trees present
4	960	55.9	56.4	s	riparian forest	m	open mixed riparian forest/shrub understory that includes forage species
5	960	56.1	57.4	n,s	ungulate crossing	m	previously identified ungulate crossing location
6	960	56.4	56.8	s	wetland	m	Victor Lake: steep artificial bank; shallow eastern and western ends with small sedge wetlands
7	960	56.6	57.0	n	riparian forest	m	open mixed riparian forest/shrub understory that includes forage species, abundant dogwood
8	960	56.8	57.4	s	wetland	h	shrub wetland; shallow lake littoral on the western end
9	960	57.4	57.6	s	riparian forest	m	mixed riparian forest

**Appendix 6, Section B3: Victor Lake to Mt. Revelstoke National Park**

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
10		58.1	59.0	s	rare plant	h	shady rock ledges on perpendicular cliffs above Clanwilliam Lake have been noted to provide habitat for small-flowered willowherb ( <i>Epilobium leptocarpum</i> ) a blue-listed plant.
11	960	59.2	59.2	n	wetland	h	shrub wetland
12	960	59.2	59.5	n	riparian forest	m	riparian mixed forest
13	960	60.0	61.4	s	wetland	h	shrub wetland with willows, hardhack and alder S of railway tracks, at times >50m from the Hwy
14	960	61.4	61.8	s	wetland	h	Wetask Lake: sedge/cattail wetland, shallow coastline: potential for nesting of American Bittern
15	960	64.9	65.0	s	wetland	m	small shrub/sedge wetland
16	960	67.3	69.3	n,s	ungulate crossing	h	previously identified ungulate crossing location
17	960	70.1	70.3	n	riparian forest	m	black cottonwood dominated open forest; signs of browsing by ungulates
18	975	4.2		n,s	ungulate crossing	m	evidence of ungulate movement across highway at this location during October 1998
19	975	4.2	4.5	n,s	riparian forest	m	narrow strip of mixed young riparian forest at Bridge Cr. (aspen, redcedar, and hemlock) with abundant shrubs

Appendix 6, Section B3: Wildlife – Victor Lake to Mt. Revelstoke National Park

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
20	975	5.0	7.2	n,s	big game crossing	m	evidence of ungulate and bear movement across highway at this location during October 1998
21	975	8.3	9.1	s	riparian forest	l	narrow strip of mixed young riparian forest with patches of shrubs
22	975	9.1	9.4	s	wetland	h	willow wetland
23	975	9.4	9.9	s	riparian forest	h	black cottonwood dominated forest
24	975	10.1	10.5	n	wetland	h	small shrub and sedge wetland, abundant dogwood, snags
25	975	10.3	11.3	s	wetland	h	shrub wetland with scattered trees and snags, mainly redcedar and black cottonwood; abundant dogwood
26	975	10.5	11.4	n,s	ungulate crossing	m	evidence of ungulate movement across highway at this location during October 1998
27	975	11.1	13.0	s	wildlife trees	h	several wildlife trees interspersed amongst the mixture of young hemlock-redcedar forest and remnant old-growth conifers, mainly hemlock
28	975	12.9	13.2	s	wetland	m	willow and sedge wetland with scattered black cottonwood trees 200 m S of Hwy
29	975	14.0	15.3	s	riparian	h	a large complex of shrub and sedge wetlands, and riparian black cottonwood dominated or mixed forest with veteran trees and snags
30	975	15.3	15.7	s	riparian forest	m	young mixed riparian forest

#### Appendix 6, Section B3: Victor Lake to Mt. Revelstoke National Park

Item	Segment	LKI Start	LKI Stop	Hwy side	Concern	Priority	Comments
31	975	16.2	16.5	s	wetland	h	Hanner Lake: a shrub and sedge wetland and a lake ca. 10 ha surrounded by trees and snags
32	975	16.0	17.1	s	riparian forest	h	young mixed riparian forest

Table 18 presents a summary of the numbers of ungulates and bears that have been reported killed on the highway since 1988. These data do not represent the actual numbers killed because many of the animals killed do not end up on or near the road and, therefore, are not likely to be reported. The data may be considered to be a rough index of the extent of ungulate and bear mortality caused by automobile traffic, but because of occasional approximations in locations of kill sites the data should be examined over several to many kilometres rather than a single kilometre. Furthermore, differences in the detectability of animal carcasses along the highway due to steep terrain or dense vegetation may result in an uneven index along the highway route. Nevertheless, when interpreted with topographic features and field sign, useful conclusions can be drawn regarding highway sections prone to wildlife-related accidents. The interpretation of these has been presented above.

Table 18 Number of ungulates and bears reported killed per kilometre of highway per year from 1988 - 1997.

Segment	LKI	Number of ungulates and bears killed per year
960	53	0.1
960	54	0.0
960	55	0.0
960	56	0.2
960	57	0.0
960	58	0.0
960	59	0.1
960	60	0.0
960	61	0.1
960	62	0.0
960	63	0.0
960	64	0.0
960	65	0.1
960	66	0.0
960	67	0.2
960	68	0.3
960	69	0.1
960	70	0.1
960	71	0.0
975	0	0.0
975	1	0.2
975	2	0.4
975	3	0.5
975	4	0.0

#### Appendix 6, Section B3: Victor Lake to Mt. Revelstoke National Park

Segment	LKI	Number of ungulates and bears killed per year
975	5	0.4
975	6	0.0
975	7	0.0
975	8	0.1
975	9	0.0
975	10	0.0
975	11	0.0
975	12	0.0
975	13	0.1
975	14	0.0
975	15	0.1
975	16	0.1
975	17	0.2
975	18	0.0

Table 19 lists the species that occur in or near the study area that are considered to be vulnerable, threatened or endangered in British Columbia.

**Table 19 Red and Blue Listed Vertebrates and Plants in the Conservation Data Centre Data Base for Victor Lake to Mt. Revelstoke Park.**

Species	Location	Comments
<b>Mammals</b>		
<b>Blue List</b>		
Myotis Septentrionalis (Northern Long-Eared Myotis)	Revelstoke Dam	1980: 1 adult female found dead in powerhouse, there was 1 embryo
<b>Vascular Plants</b>		
<b>Blue List</b>		
Epilobium Leptocarpum (Small- Flowered Willowherb)	Clanwilliam Lake, South Side	Moist, shady rock ledge on almost perpendicular cliffs

## 5 References

- Bennett, S., P. Corbett and T. Ehlers. 1996. Fisheries/wildlife habitat assessment of the Trans Canada Highway upgrade west of Revelstoke. Report prepared for B.C. Ministry of Transportation and Highways by Mirkwood Ecological Consultants Ltd., Winlaw, B.C. 40 pages.
- Smith, G. 1990. Wildlife concerns associated with proposed development of Highway No. 1 in the Three Valley Lake area. Report prepared for B.C. Ministry of Transportation and Highways by Glen Smith Wildlife Resource Consultant Ltd. 15 pages.

## **Section C: Mount Revelstoke National Park West Gate to Yoho National Park West Boundary**

Prepared by Manning, Cooper and Associates

### **C1: Mount Revelstoke National Park West Gate to Donald**

#### **1 Introduction**

Manning, Cooper and Associates (MCA) was retained by the Ministry of Transportation and Highways (MOTH) to provide ongoing assessments of wildlife and wildlife habitat sensitivities along the Trans Canada Highway corridor from Mt. Revelstoke National Park to Yoho National Park. The first phase of this project includes provision of an overview of wildlife and wildlife habitat sensitivities that will assist the early planning and design phase of potential highway upgrades. This report provides an overview of existing wildlife and wildlife habitat conditions for the Trans Canada Highway corridor from Mount Revelstoke National Park to Donald.

#### **2 Study Area / Background**

The study area included the Trans Canada Highway corridor from Mount Revelstoke National Park East Gate to Donald, but excluding Glacier National Park. Highway segments included in the study area were as defined in the MOTH's Corridor Management Plan and included Segment 0975 (LKI range 30.55-48.35) and Segment 0985 (LKI range 0.0 – about 31.5). MOTH instructed us to confine our assessments to a 100 m wide corridor centred on the existing highway, unless new alignments were proposed by MOTH or UMA.

#### **3 Methods**

##### **3.1 General**

We assessed wildlife and wildlife habitat sensitivities through a combination of :

- Reviews of existing literature and data
- Site visits
- Reviews of existing mapping (TRIM, NTS topographical, airphotos) provided by the design engineers or MOTH.
- Discussions with approved government agency personnel

Reviews of existing information revealed that little information exists for wildlife or wildlife-related issues along this part of the TCH corridor. Conversely, substantial amounts of information is available for the two national parks (Mount Revelstoke and Glacier) that are adjacent to the study area. Consequently, discussions with national park



biologists and extrapolations of information from reports which confine their findings to the national parks were required to provide an overview of some wildlife-related issues.

Site visits were conducted on 8-11 November 1998, and 15 December 1998. During site visits we drove the highway and documented noteworthy wildlife habitat features, assessed the landscape for potential movement corridors for large mammals such as ungulates and carnivores, recorded all wildlife observed, and mapped the extent of wetlands, riparian areas, and wildlife trees. We also walked certain areas that were thought to be ungulate crossing sites and checked for signs of ungulates and presence of game trails. In addition, we rated the proposed new passing or climbing lanes for their impact on wildlife or wildlife habitat.

MOTH had indicated to us that the potential for collision with large mammals was a major concern along this section of the TCH. We therefore, assessed MOTH's Wildlife Accident Reporting System (WARS) database to help identify "roadkill" hotspots along the TCH. The WARS database includes records of road-killed animals reported to MOTH by highways maintenance contractors or MOTH personnel. Data from 1988-1997 were included in the analysis. Animals reported tend to be large and conspicuous (moose, elk, deer, bears, bighorn sheep, mountain goats, coyotes, porcupines). Smaller animals and birds are seldom reported. Since roadkill hotspots became evident during a preliminary analysis, during site visits we attempted to correlate the WARS database with landscape features such as side valleys, wetlands, cliffs, winter range, river crossings, slope etc. that would help identify the boundaries of movement corridors.

WARS data are presented on the photomosaics as the number of animals estimated to be killed/km/year, e.g. (3) means that an estimated 3 large mammals are killed along that particular km of the TCH each year. Since the precise location of road-killed animals is not reported (usually the nearest km mark or significant landmark is used as a location reference), the number reported for each km of the TCH may or may not be accurate. In addition, we had to correlate the LKI system to the km noted on the record, and numerous records contained no locality reference so were discarded.

### **3.2 Criteria for wildlife/wildlife habitat sensitivity ratings**

In general, highway sections (within defined LKI ranges) for which WARS data indicated an estimated kill rate for large mammals of >2 kills/km/yr were rated *high*; sections with an estimated kill rate of 1-2 kills/km/yr were rated *moderate*, and sections with an estimated kill rate of < 1 kill/km/yr were rated low. Estimated kill rates were determined by counting the number of reported kills for a highway segment during the period 1988 to 1997, multiplying by a standardized factor of 5 (as estimated by MOTH), and dividing by the number of km (variable) and the number of years for which data were assessed (10).

However, in all cases we tried to correlate WARS data with topography and existing information on locations of movement corridors, specific crossing sites, and winter

ranges. If a landscape feature was present that suggested a higher (e.g., a side valley) or lower (e.g., very steep, unstable slope) potential we may have raised or lowered a rating accordingly. In addition, if previous reports, other data or personal communications suggested a higher or lower rating was warranted, we would modify the rating.

If moose, elk, or bears were killed relatively often compared to deer then we may give the section a higher rating. This factor was considered to be especially important in the UMA study area, as a relatively high proportion of roadkills involved moose and bears compared to other parts of the TCH (Donald to Yoho National Park) studied by MCA. We therefore gave some sections a high or moderate sensitivity rating for potential vehicle/large mammal collisions with relatively lower rates of kills based on WARS data than for those other parts of the TCH.

In most cases we thought we could reasonably predict the boundaries of the subsections which had low/mod/high potential collision potential, although more data would be helpful in some areas. Therefore we rated subsections of each corridor segment for wildlife collision potentials. These subsections were not predetermined (such as every km or every 10 km), but were subjectively established based on a combination of WARS data, other data and literature, assessment of topography, known usage by large mammals, and general habitat quality. These ratings may or may not correlate well with the notations of animals killed/km/year which are on the photomosaics.

Wildlife habitat sensitivity was rated after considering the habitat type, the extent of the habitat, the general quality of the habitat, the habitat's relative rarity within the study area and Region 3, and the species of wildlife known or thought likely to occur there. In general, *high* sensitivity ratings were given to large and/or productive wetlands, significant riparian areas (very rare along the TCH corridor in this study area), known critical habitats for Red and Blue-listed wildlife, sites used for nesting by raptors (e.g., Bald Eagle, Osprey) and Great Blue Heron, ungulate mineral licks, important ungulate winter range, or documented sites for rare plants or plant communities.

A *moderate* rating was given to small, fragmented, or less productive wetlands, small groups of wildlife trees, and potential habitat for Red and Blue-listed wildlife. A *low* rating was given to very small and unproductive wetlands and relatively poor quality wildlife trees.

Since a split bar format for environmental sensitivities on the photomosaic is not used, overlapping sensitivities (such as low for wildlife collision potential and high for wildlife habitat) are impossible to show on the photomosaic. Therefore, in all cases the highest rating will be mapped. Details on limits of various sensitivities along the corridor, with stated LKI ranges, are presented in the text.

## 4 Results / Discussion

### 4.1 Results

#### Site specific conditions (for mapping), Segment 0975

Item	LKI Range	Hwy Side	Environmental Constraint	Level
A	30.5 to 32.8	Both	Potential for ungulate-vehicle collision	Low
B	31.1 to 33.0	N	Potential mountain goat winter range	Nil
C	33.0 to 33.4	N	Mature riparian habitat	High
D	32.8 to 33.6	S	Mature riparian habitat	High
E	32.8 to 36.5	Both	Poten. for black bear-vehicle collision	High
F	35.0 to 36.5	Both	Potential for ungulate vehicle collision	Low
G	35.5 to 48.35	N	Mountain Caribou year round range but potential for ungulate-vehicle collision low	Low
H	44.0 to 48.35	Both	Poten. for grizzly bear-vehicle collision	Low

#### Description of site specific conditions, Segment 0975

- A. (30.5 to 32.8) Data are scant but topography of the Woolsey Creek drainage suggests a possible movement corridor for ungulates during spring and fall migration. WARS data suggest a low potential for ungulate/vehicle collisions.
- B. (31.1 to 33.0) Preliminary reviews of existing data suggested that there may be Mountain Goat winter range along steep rocky bluffs on the north side of Albert Canyon, just west of Canyon. These bluffs run along the TCH for about 2 km. During a site visit, it appeared that the cliffs could be used by goats, but none were observed. However, discussions with national parks biologists revealed that these cliffs are apparently not used by goats (John Woods pers. comm.). Important goat winter habitat does occur nearby along the south-flowing Tangier River (Acres 1998; John Woods pers. comm.). Goats use the south facing cliffs west of the Tangier River, but these goats are blocked from the TCH by the Illecillewaet River, north of about LKI 34.5; apparently goats do not cross the TCH in this area (John Woods pers. comm.). Therefore, the cliffs were judged to have nil value as potential mountain goat habitat.
- C. D. (33.0 to 33.4 N, 32.8 to 33.6 S) High value riparian habitat on both sides of the TCH. Mixed black cottonwood, trembling aspen, and paper birch stand. The north side is better quality wildlife habitat, as trees seem larger and the stand is wider, than on the south side. Numerous woodpecker nest cavities noted including those of the Pileated Woodpecker. Potential for cavity-nesting owls such as Northern Pygmy Owl

or Barred Owl. Also probable high nesting songbird diversity, and good spring foraging habitat for ungulates and bears. This localized riparian habitat is also associated with a stretch of the TCH which has a relatively high rate of bear road kills (see below).

This stand is by far the best riparian habitat within a 100 m wide corridor adjacent to the TCH within the UMA working area between MRNP East Gate and Donald, and is also the highest quality riparian habitat within the MCA working area east to Yoho National Park. As riparian habitat is quite rare along the TCH corridor in this region retention is advisable.

- E. (32.8 to 36.5) Four black bears reported killed between LKI 31 and 34 (approx., WARS 1998), roughly corresponding to Canyon Hotsprings area and the high quality riparian stand mentioned above. Disturbed habitats near Canyon, garbage associated with Canyon, and roadside attractants may correlate with bear road kills. In addition, John Woods (Parks Canada) confirmed that the area near the mouth of the Tangier River is a hotspot for black bear road kills, although the entire TCH from MRNP to GNP apparently has significant black bear road-kill mortality.
- F. (35.0 to 36.5) Topography of north/south Tangier River drainage suggests a possible ungulate movement corridor during spring and fall migration, but data are lacking to confirm.
- G. (35.5 to 48.35) Mountain Caribou reside year round to the north of the TCH from the MRNP East Gate to Glacier National Park West Gate, but especially east of the Tangier River (LKI 35.5). The Mountain Caribou is a Blue-listed ungulate which has several significant conservation concerns attached to most populations. These include 1) fragmentation and reduction of old-growth coniferous forest through logging which reduces the amount and quality of foraging, thermal, and escape habitat; 2) increased predation rates related to habitat fragmentation of habitat; and 3) barriers to migration posed by highways, railways, or other human development. Individuals in this resident herd are known to come down to the highway from the north side, but apparently rarely cross the TCH (John Woods, pers. comm.). Crossings of the TCH, when they do occur, usually occur near Rogers Pass in Glacier National Park (John Woods, pers. comm.). Although potential for vehicle/caribou collision is low, additional barriers to passage may negatively impact long term population dynamics for this population. As the issue is very complex, a multi-agency approach to managing impacts on the caribou population, of a future 4 lane highway that runs the length of the UMA study area, may be required.
- H. (44.0 to 48.35) Slides on mountain sides on both sides of TCH provide moderately good grizzly bear habitat near the TCH, suggesting that crossings may occur along this stretch adjacent to the west gate of Glacier National Park. However, relative

numbers of grizzly bears compared to other large mammals are low so the potential for vehicle/grizzly bear collisions is low.

**Site specific conditions (for mapping), Segment 0985**

Item	LKI Range	Hwy Side	Environmental Constraint	Level
I	0.0 to 5.4	Both	Potential for ungulate-vehicle collision	Low
J	3.85	N	Wildlife tree	Low
K	4.9	S	Wildlife tree	Low
L	5.4 to 11.0	Both	Potential for ungulate/bear-vehicle collision	Moderate
M	11.0 to 16.0	Both	Potential for ungulate-vehicle collision	High
N	16.0 to 21.0	Both	Potential for ungulate-vehicle collision	Moderate
O	21.0 to 26.3	Both	Potential for ungulate-vehicle collision	High
P	23.9	Both	Sedge wetland, moose crossing	High
Q	26.3 to 29.66	Both	Potential for ungulate-vehicle collision	Moderate
R	25.4 to 25.6	S	Sedge, scrub birch wetland	Moderate
S	29.66	Both	Columbia River bridge crossing	Low
T	30.3	S	Cattail wetland	Moderate
U	30.0 to 31.6	Both	Potential for ungulate-vehicle collisions	High

**Description of site specific conditions, Segment 0985**

- I. (0.0 to 5.4) Relatively low potential for ungulate-vehicle collisions. WARS (1998) data indicate about 0.2 roadkills/km/year for the first 5 LKI km east of Glacier National Park. However, within GNP, from the East Gate west to about 11 km, the TCH parallels the Beaver River and many moose (Reid Crowther 1994) and black bears (Munro 1997) are killed. For moose, it is thought that most of the individuals that winter there are eventually killed by vehicles (J. Woods pers. comm.). The part of TCH segment 0985 discussed here which is out of the park seems to have much lower mortality rates, probably because the TCH moves upslope as it leaves the GNP, leaving the valley floor of the Beaver River Valley.
- J. (3.85) Significant Class 2 wildlife tree on north side beside TCH. A large, old black cottonwood with a broken top. Woodpecker feeding sign and potential for cavity-nesting birds or cavity-using furbearers.
- K. (4.9) Significant Class 2 wildlife tree on south side beside TCH. A large, old black cottonwood with a broken top. Woodpecker nesting cavity and potential for other cavity-nesting birds or cavity-using furbearers.

- L. (5.4 to 11.0) Moderate potential for ungulate/bear-vehicle collisions. WARS (1998) data indicate about 0.4 roadkills/km/year, about twice the rate as the previous section, and most of the kills are expected to be moose or elk. We expect road kills to increase as the TCH approaches the Quartz Creek drainage, which is likely a major ungulate movement corridor.
- M. (11.0 to 16.0) High potential for ungulate-vehicle collisions. WARS (1998) data indicate about 0.8 roadkills/km/year over the last 10 years. The topography and habitat characteristics of the Quartz Creek (LKI 13.3) drainage suggests a major ungulate movement corridor, especially for moose. Several small drainages to the west of Quartz Creek, more gentle slopes, and swampy areas east to Wiseman Creek include relatively good moose habitat. Relatively good ungulate foraging habitat exist on the south side between Quartz Creek and Wiseman Creek, related to forestry activities. John Woods (Parks Canada) confirmed that moose road kills were relatively high from Quartz Creek east towards Donald.
- N. (16.0 to 21.0) Moderate potential for ungulate-vehicle collisions, mainly deer and elk. WARS (1998) data indicate about 0.5 roadkills/km/year over the last 10 years. This section is steeper south of the TCH with little swampy ground compared to the Quartz Creek area, which partly explains the lower numbers of moose road kill, and higher numbers of elk road kill.
- O. (21.0 to 26.3) High potential for ungulate-vehicle collisions. WARS (1998) data indicate about 0.8 roadkills/km/year over the last 10 years. Topography suggests that the TCH crosses through relatively gentle east facing slopes along this stretch that provide an easy north/south travel corridor between Kinbasket Lake and ungulate wintering habitat south of Donald on the west side of the Columbia River (Blood 1982).
- P. (23.9) Sedge wetland/creek crosses TCH. Probable natural pathway for moose crossings. A site visit on 15 December 1998 confirmed that moose cross the TCH here as 5 sets of tracks were found in snow within 200 m either side of the creek. A proposed passing lane at this site will likely increase the potential for vehicle/moose collisions. The wetland is also likely a good localized amphibian habitat.
- Q. (26.3 to 29.66) Moderate potential for ungulate-vehicle collisions, mainly moose. WARS (1998) data indicate about 0.5 roadkills/km/year over the last 10 years.
- R. (25.4-25.6) Nice but small sedge wetland on South side of TCH, below filled area. Probable good localized amphibian habitat, and likely used by ungulates and bears.
- S. (29.7) Columbia River Bridge. Significant open areas under the bridge span along the banks of the Columbia River provide an excellent movement corridor for wildlife. No

significant wildlife issues related to the bridge structure itself or possible construction of a new bridge.

- T. (30.0 to 31.6) High potential for ungulate-vehicle collisions near the crossing of the Columbia River. This low elevation area serves as both a migration corridor along the river, as well as habitat for seasonally resident animals. Large ungulates (moose, elk) and smaller ungulates (white-tailed deer and mule deer) are equally represented in the roadkill statistics (WARS data 1988 to 1997). Snow tracking in December 1996 identified an area of concentrated deer crossings under the CPR (LKI 30.3) overpass (Enkon Env. Ltd. 1997). A site visit on 14-15 December 1998 confirmed that deer and elk cross the TCH at this point, with many tracks found under the CPR overpass.
- U. (30.3) Small cattail wetland on south side of TCH, very close to TCH. Limited potential for marsh birds and amphibians because of small size, but likely used by ungulates at night in early spring for foraging

## **4.2 Discussion**

### **General considerations**

Documented wildlife information for this segment is quite limited outside of MRNP and GNP, mainly consisting of WARS data, recollections of informed persons, and a quick analysis of topography. More data on interactions between ungulates and other large mammals and the TCH between MRNP and GNP, and GNP to the Donald Bridge would be of great use in identifying hotspots for crossings. Also the presence or absence of rare and endangered plant and animal species that could be affected by highway construction (Acres Int. Ltd. 1998).need to be assessed during the spring/summer season. Enkon (1997) summarizes existing wildlife data for the UMA section from the Donald Bridge to near the Big Bend Highway entrance.

One special issue is that Mountain Caribou (a Blue-list mammal) resides year round near the TCH from MRNP to GNP, which is a unique situation along the TCH in BC/Alberta (John Woods pers. comm.). The TCH appears to act as a barrier to caribou crossings along this stretch, including the part of segment 0975 between MRNP East Gate and GNP West Gate. An historically used caribou travel corridor exists near Flat Creek (Woods 1990; Acres 1998), which is within GNP near the GNP West Gate. Highway designs near this area may impact on the future use of this corridor and designs which do not deter caribou movements should be considered (Woods 1990).

### **Wildlife-vehicle collisions**

Wildlife-vehicle collisions along the MRNP to Donald (UMA) section are lower than for the Donald to Kicking Horse Pass (SNC), but are still significant. Note that the Donald to

Kicking Horse Pass section has one of the highest wildlife-vehicle collision rates along the Trans Canada Highway (TCH) from Kamloops to Alberta.

WARS data indicate that segment 0985 has a much higher wildlife-vehicle collision problem than that part of segment 0975 between MRNP and GNP. For example, Acres (1998) reports 42 ungulates killed from GNP East Gate to the Columbia River Bridge (30 km) between 1991-1996 compared to 2 ungulates from MRNP East Gate to GNP West Gate (18 km). Note that Acres may have used a different data subset than we have acquired from MOTH. The data we have (WARS 1998) indicate that 31 large animals were killed on segment 0985 between GNP East Gate and Columbia River Bridge from 1988 to 1997. Of these, most were deer (50%), followed by moose (25%), bears (16%), and elk (10%). However, black bears are killed relatively frequently along segment 0975 between MRNP and GNP (WARS 1998; J. Woods pers. comm.).

Additional evidence for generally high potential for wildlife-vehicle collisions is provided by Wells (1997) who has documented kills along the CPR railway from Revelstoke to Field (198 km) from 1994-1996. In the 30 km of railway east of Rogers Pass (Beaver River valley to approx. the Columbia River), 25 ungulates (23% of total ungulate kills), and 14 bears (67% of total bear kills) were killed.

### **Habitat Impacts**

Direct loss of wetland habitat, ungulate winter ranges, and wildlife tree areas to highway widening can have local effects on wildlife populations. There are no significant wetlands immediately adjacent to the TCH between MRNP and Donald. Small wetlands noted above (Segment 0985 LKI 23.8 and 26.3) are rare habitat features along this stretch and likely provide useful seasonal habitat for small numbers of wildlife. The riparian stand in Albert Canyon (Segment 0975 LKI 32.8-33.6) is unique along the TCH corridor from MRNP to Donald, and should be carefully considered during highway design.

There are some nice stands of mature coniferous trees along the edges of the TCH in some parts of Segments 0975 and 0985. Although forest birds, small mammals, furbearers and amphibians that are expected to occur in the ICH biogeoclimatic zone obviously use these roadside habitats, no stands with rare or special attributes were identified as being of special concern. A small number of wildlife trees (large and decayed black cottonwood), which are very rare along the TCH corridor, were identified.

Along this section of the TCH, moose winter range is mainly in the Beaver River valley, and along the west side of the Rocky Mountain Trench from about Quartz Creek to Columbia River Bridge. The TCH is directly adjacent to the Beaver River only in GNP, then significantly diverges upslope going eastward shortly before the GNP East Gate. Therefore direct loss of relatively good winter habitat through upgrades east of GNP should be minimal. From Quartz Creek to Columbia River bridge the TCH traverses dense coniferous forest and upgrades will not significantly impact moose winter habitat.



The habitats of threatened and endangered plant species could also be impacted by highway widening. Only 1 species at risk (Red- and Blue-listed by the Ministry of Environment, Lands and Parks) is known to have occurred near the TCH between MRNP and Donald. The giant-hyssop a Red-listed plant has been found on the Big Bend Highway and could occur in the vicinity of the Columbia River Bridge. This plant is potentially impacted by highway widening, and further surveys are required to confirm its presence or absence, if construction impacts are to be mitigated. Given the fact it is very rare, however, the probability of actually finding populations near the highway is considered low.

## **5 References**

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- Wells, P. 1997. Wildlife mortality on the Canadian Pacific Railway between Field and Revelstoke, British Columbia. Unpubl. report, Canadian Pacific Railways Ltd., Revelstoke, BC. 6 pp.
- Woods, J. 1990. Effectiveness of fences and underpasses on the Trans Canada Highway and their impact on ungulate populations project, Parks Canada, Revelstoke, BC.

## **C2 Donald to Roth Creek**

### **1 Introduction**

Manning, Cooper and Associates (MCA) was retained by the Ministry of Transportation and Highways (MOTH) to provide ongoing assessments of wildlife and wildlife habitat sensitivities along the Trans Canada Highway corridor from Mt. Revelstoke National Park to Yoho National Park. The first phase of this project includes provision of an overview of wildlife and wildlife habitat sensitivities that will assist the early planning and design phase of potential highway upgrades. This report provides an overview of existing wildlife and wildlife habitat conditions for the Trans Canada Highway corridor from Donald to Kicking Horse Pass.

### **2 Study Area / Background**

The study area included the Trans Canada Highway corridor from Donald to Kicking Horse Pass. Highway segments included in the study area were as defined in the MOTH's Corridor Management Plan and included Segment 0985 (LKI range 30.6-56.06) and Segment 0990 (LKI range 0.0 – about 13.0). MOTH instructed us to confine our assessments to about a 100 m wide corridor centred on the existing highway, except when new proposed alignments were brought to our attention by MOTH or SNC-Lavalin.

### **3 Methods**

#### **3.1 General**

We assessed wildlife and wildlife habitat sensitivities through a combination of :

- Reviews of existing literature and data
- Site visits
- Reviews of existing mapping (TRIM, NTS topographical, airphotos) provided by the design engineers or MOTH.
- Discussions with approved government agency personnel

Reviews of existing information revealed that several studies on wildlife or wildlife-related issues had been previously conducted along this part of the Trans Canada Highway. These reports contained invaluable information for our assessments.

Site visits were conducted on 17 October 1998, 8-11 November 1998, and 27 November 1998. During site visits we drove the highway and documented noteworthy wildlife habitat features, assessed the landscape for potential movement corridors for large mammals such as ungulates and carnivores, recorded all wildlife observed, and mapped the extent of wetlands, riparian areas, and wildlife trees. We also walked certain areas that

were thought to be ungulate crossing sites and checked for signs of ungulates and presence of game trails.

MOTH had indicated to us that the potential for collision with large mammals was a major concern along this section of the TCH. We therefore, assessed MOTH's Wildlife Accident Reporting System (WARS) database to help identify "roadkill" hotspots along the TCH. The WARS database includes records of road-killed animals reported to MOTH by highways maintenance contractors or MOTH personnel. Data from 1988-1997 were included in the analysis. Animals reported tend to be large and conspicuous (moose, elk, deer, bears, bighorn sheep, mountain goats, coyotes, porcupines). Smaller animals and birds are seldom reported. Since roadkill hotspots became evident during a preliminary analysis, during site visits we attempted to correlate the WARS database with landscape features such as side valleys, wetlands, cliffs, winter range, river crossings, slope etc. that would help identify the boundaries of movement corridors.

WARS data are presented on the photomosaics as the number of animals estimated to be killed/km/year, e.g. (3) means that an estimated 3 large mammals are killed along that particular km of the TCH each year. Since the precise location of roadkilled animals is not reported (usually the nearest km mark or significant landmark is used as a location reference), the number reported for each km of the TCH may or may not be accurate. In addition, we had to correlate the LKI system to the km noted on the record, and numerous records contained no locality reference so were discarded.

### **3.2 Criteria for wildlife/wildlife habitat sensitivity ratings**

In general, highway sections (within defined LKI ranges) for which WARS data indicated an estimated kill rate for large mammals of >2 kills/km/yr were rated *high*; sections with an estimated kill rate of 1-2 kills/km/yr were rated *moderate*, and sections with an estimated kill rate of < 1 kill/km/yr were rated low. Estimated kill rates were determined by counting the number of reported kills for a highway segment during the period 1988 to 1997, multiplying by a standardized factor of 5 (as estimated by MOTH), and dividing by the number of km (variable) and the number of years for which data were assessed (10).

However, in all cases we tried to correlate WARS data with topography and existing information on locations of movement corridors, specific crossing sites, and winter ranges. If a landscape feature was present that suggested a higher (e.g., a side valley) or lower (e.g., very steep, unstable slope) potential we may have raised or lowered a rating accordingly. In addition, if previous reports, other data or personal communications suggested a higher or lower rating was warranted, we would modify the rating. Also if moose, elk, or bears were killed relatively often compared to deer then we may give the section a higher rating.

In most cases we thought we could reasonably predict the boundaries of the subsections which had low/mod/high potential collision potential, although more data would be

helpful in some areas. Therefore we rated subsections of each corridor segment for wildlife collision potentials. These subsections were not predetermined (such as every km or every 10 km), but were subjectively established based on a combination of WARS data, other data and literature, assessment of topography, known usage by large mammals, and general habitat quality. These ratings may or may not correlate well with the notations of animals killed/km/year which are on the photomosaics.

Wildlife habitat sensitivity was rated after considering the habitat type, the extent of the habitat, the general quality of the habitat, the habitat's relative rarity within the study area and Region 3, and the species of wildlife known or thought likely to occur there. In general, *high* sensitivity ratings were given to large and/or productive wetlands, significant riparian areas (very rare along the TCH corridor in this study area), known critical habitats for Red and Blue-listed wildlife, sites used for nesting by raptors (e.g., Bald Eagle, Osprey) and Great Blue Heron, ungulate mineral licks, or documented sites for rare plants or plant communities.

A *moderate* rating was given to small, fragmented, or less productive wetlands, small groups of wildlife trees, and potential habitat for Red and Blue-listed wildlife. A *low* rating was given to very small and unproductive wetlands and relatively poor quality wildlife trees.

Since a split bar format for environmental sensitivities on the photomosaic is not used, overlapping sensitivities (such as low for wildlife collision potential and high for wildlife habitat) are impossible to show on the photomosaic. Therefore, in all cases the highest rating will be mapped. Details on limits of various sensitivities along the corridor, with stated LKI ranges, are presented in the text.

## 4 Results / Discussion

### 4.1 Results

**Site specific conditions (for mapping), Segment 0985 from Donald to Golden.**

Item	LKI Range	Hwy Side	Environmental Constraint	Sensitivity Rating
A	30.6 to 31.6	both	Potential for ungulate-vehicle collisions	High
B	31.6 to 33.6	both	Potential for ungulate-vehicle collisions	Low
C	31.85	S	Wildlife tree	Low
D	31.9 to 32.05	N	Wildlife tree area	Low

Item	LKI Range	Hwy Side	Environmental Constraint	Sensitivity Rating
E	33.6 to 35.4	both	Potential for ungulate-vehicle collisions	High
F	35.4 to 38.0	both	Potential for ungulate-vehicle collisions	Low
G	38.0 to 40.6	both	Potential for ungulate-vehicle collisions	High
H	40.6 to 44.6	both	Potential for ungulate-vehicle collisions	Low
I	43.2 to 44.35	N	Wildlife tree area	High
J	43.2 to 44.25	S	Wetland	Low
K	43.25 to 44.3	N	Wetland	High
L	44.6 to 53.0	both	Potential for ungulate-vehicle collisions	Moderate
M	46.9 to 47.3	S	Wetland	Moderate
N	52.6 to 54.5	S	Wetland	High
O	53.0 to 56.06	both	Potential for ungulate-vehicle collisions	High

#### **Description of site specific conditions, Segment 0985 from Donald to Golden**

- A. (30.6 to 31.6) High potential for ungulate-vehicle collisions near the crossing of the Columbia River. This low elevation area serves as both a migration corridor along the river, as well as habitat for seasonally resident animals. Large ungulates (moose, elk) and small ungulates (white-tailed deer and mule deer) are equally represented in the roadkill statistics (WARS data 1988 to 1997). WARS data suggest the rate of ungulate collisions over the past 10 years was approximately 3 per km per year. Snow tracking in December 1996 identified an area of concentrated deer crossings near the CPR overpass (Enkon Env. Ltd. 1997).
- B. (31.6 to 33.6) Relatively low potential for collisions with migratory and seasonally resident deer, elk, and moose. WARS data suggest the rate of ungulate collisions over the past 10 years was less than 1 per km per year.
- C. (31.85) Low value wildlife tree (aspen) approximately 9 m high and 40 cm dbh south of the highway alignment.
- D. (31.9 to 32.05) Moderate value wildlife tree area north of the highway alignment. Several trees provide nesting and feeding habitat for a variety of bird species.
- E. (33.6 to 35.4) Very high potential for collisions with migratory and seasonally resident deer, elk, and moose. WARS data suggest the rate of ungulate collisions over the past 10 years was approximately 4 per km per year.

- F. (35.4 to 38.0) Relatively low potential for ungulate-vehicle collisions because of less migratory and local movement of ungulates. WARS data suggest the rate of ungulate collisions over the past 10 years was less than 1 per km per year.
- G. (38.0 to 40.6) High potential for collisions with migratory and seasonally resident deer, elk, and moose. WARS data suggest the rate of ungulate collisions over the past 10 years was over 2 per km per year. Snow tracking in December 1996 identified an area of concentrated deer crossings between the Blaeberry River and the Blaeberry School Road (Enkon Env. Ltd. 1997). Slopes along the Blaeberry River support concentrations of mule and white-tailed deer (Acres Int. Ltd. 1998). Several well-used ungulate game trails were identified near the west end of the Blaeberry River bridge in November 1998.
- H. (40.6 to 44.6) Relatively low potential for collisions with migratory and seasonally resident deer, elk, and moose. WARS data suggest the rate of ungulate collisions over the past 10 years was less than 1 per km per year.
- I. (43.2 to 44.35) High value wildlife tree area north of the highway alignment. A large riparian copse of mature aspen surrounding a wetland (K), provides nesting and feeding habitat for high diversity of bird species.
- J. (43.2 to 44.25) Low value wetland located south of the highway alignment. This narrow strip of cattail marsh (*Typha latifolia*) between the highway and railway right-of-ways is of limited direct value as wildlife habitat. However, it is likely effective as "biofilter" in preventing highway run-off pollutants from entering the very high value Moberly Marsh in Burges and James Gadsden Provincial Park immediately south of the railway right-of-way.
- K. (43.25 to 44.3) High value wetland north of the highway alignment. This relatively large cattail marsh was once part of Moberly Marsh, before it was cut off by the highway. Provides breeding habitat for marshbirds and potential habitat for the Northern Leopard Frog. Surrounded mature aspen in wildlife tree area (I).
- L. (44.6 to 53.0) Moderate potential for collisions with migratory and seasonally resident deer and elk. WARS data suggest the rate of ungulate collisions over the past 10 years was between 1 and 2 per km per year. The Bergenham Wildlife Management Area protects ungulate winter range immediately north of the highway right-of-way between LKI 44.2 and 46. Early green-up of high vegetated slope cuts along this section likely provide early spring forage for elk and deer and may increase the frequency of ungulate-vehicle collisions in spring.
- M. (46.9 to 47.3) Moderate value wetland located south of the highway alignment. Open water surrounded by a cattail marsh is important for waterfowl migration and marshbird nesting. Potential habitat for Northern Leopard Frog and Painted Turtle.
- N. (52.6 to 54.5) High value wetland south of the highway alignment. A mosaic of slough, marsh, birch, and cottonwood riparian provides breeding habitat for waterfowl, songbirds, beaver, and muskrat, and staging areas for migrating waterfowl. Potential habitat for Northern Leopard Frog and Painted Turtle. A representative of the rare scrub birch - horsetail plant community may occur just west of Anderson Road (Enkon Env. Ltd. 1997).

- O. (53.0 to 56.06) High potential for collisions with migratory and seasonally resident white-tailed deer and mule deer. Smaller numbers of moose and elk are also involved in collisions with vehicles. WARS data suggest the rate of ungulate collisions over the past 10 years was approximately 2 per km per year. Other reports estimate the rate of animal collisions even higher (Acres Int. Ltd. 1998). Along with the area east of the Highway 95 junction, this is the highest rate of animal-vehicle collisions on the TCH between Kamloops and Alberta. Snow tracking in December 1996 identified two areas of concentrated deer crossings near LKI 53 and 54 (Enkon Env. Ltd. 1997).

**Site specific conditions (for mapping), Segment 0990 from Golden to Kicking Horse Canyon.**

Item	LKI Range	Hwy Side	Environmental Constraint	Sensitivity Rating
P	0.0 to 9.7	Both	Bighorn sheep range	Moderate
Q	0.0 to 4.0	Both	Potential ungulate-vehicle collision	High
R	4.0 to 5.8	Both	Potential ungulate-vehicle collision	Low
S	5.8 to 6.4	Both	Potential ungulate-vehicle collision	Moderate
T	6.4 to 7.2	Both	Potential ungulate-vehicle collision	Low
U	7.2 to 7.8	Both	Potential ungulate-vehicle collision	Moderate
V	7.8 to 11.7	Both	Potential ungulate-vehicle collision	Low
W	9.3	N	Mountain goat mineral lick (5 Mile)	High
X	9.45	S	Mountain goat mineral lick (5 Mile)	High
Y	11.7 to 13.0	Both	Potential ungulate-vehicle collision	Moderate

**Description of site specific conditions, Segment 0990 from Golden to Kicking Horse Canyon**

- P. (0.0 to 9.7) Bighorn sheep winter range along TCH. A small herd of sheep (about 30 animals) has become reestablished in the Golden area, after being eradicated by winter kill in the early 1970s (Demarchi and Searing 1998). Relatively few sheep are roadkilled along this stretch (WARS 1998, Demarchi and Searing 1998), probably because of relatively low speed limits near the town of Golden and because sheep are not usually active at night. However, twinning and probable increased speeds would likely increase the rate of road kill. We observed 1 road-killed ewe on November 11, 1998. The rock bluffs from LKI 6.5 to 9.5 are used for lambing grounds in the spring (Demarchi and Searing 1998).
- Q. (0.0 to 4.0) Very high potential for collisions with resident and wintering deer and elk. We have estimated that this section of the TCH has an annual kill of over 3 animals/km, which is probably the highest kill rate along the TCH from Kamloops to Alberta. Using WARS data we estimate that 120 large mammals have been killed along this section from 1988-1997. Over 90% of the kills were identified as deer, with

only 3 elk, 2 moose, and 1 bear. The high kill rate is likely associated with the good ungulate winter range that exists immediately northeast of Golden (MELP biophysical mapping), and possible movement to/from good winter range across the KHR to the south. The high kill zone likely ends as steep bluffs meet the TCH on the north side at about LKI 4.0.

- R. (4.0 to 5.8) Low potential for collisions with resident and wintering ungulates. WARS data show relatively low kill rates and topography which is quite steep precludes much movement across the TCH.
- S. (5.8 to 6.4) Moderate potential for collisions with migratory and seasonally resident ungulates. We rated this section higher than the previous based mainly on topography as it seems likely that ungulates would move along the draw occupied by Dart Creek Forest Service Road, and would more likely cross the TCH there than from LKI 4.0 to 5.8.
- T. (6.4 to 7.2) Relatively low potential for ungulate-vehicle collisions because of very steep terrain, along where rock fencing has been installed.
- U. (7.2 to 7.8) A short section with moderate potential for collisions with ungulates. This section was thought to have higher potential than the previous section because 3 creeks cross the TCH and appear to provide reasonable passageways for mule deer.
- V. (7.8 to 11.7) Relatively low potential for collisions with ungulates and black bear. WARS data suggest extremely low relative kill rates along this stretch, but including 2 or 3 deer, 1 elk, and 1 black bear.
- W. (9.3) Mountain goat mineral lick within 100 m of the west end of 5 Mile Bridge. The lick is used seasonally in late spring and early summer by small numbers of goats. The lick is on the rocky bluffs above the TCH, centred approximately on UTM 510250 E and 5682550 N (Demarchi and Searing 1998). Licks are critical sources of minerals for goats after the harsh winter season.
- X. (9.45) Mountain goat mineral lick within 100 m of the east end of 5 Mile Bridge. The lick is used seasonally in late spring and early summer by small numbers of goats. The lick is on the rocky and talus bluffs above the TCH, centred approximately on UTM 510400 E and 5682200 N (Demarchi and Searing 1998). Licks are critical sources of minerals for goats after the harsh winter season. This lick would appear to be severely impacted by the southern crossing option, which ties into the existing TCH corridor at the east end of the 5 Mile Bridge..
- Y. (11.7 to 13.0) Relatively moderate potential for collisions with ungulates and bears, mainly deer and elk. The topography is much gentler here between 5 Mile and 10 Mile Bridges; and Roth Creek drainage enters the KHR from the north along this section; therefore crossings by large mammals are assumed to occur more frequently.

## **4.2 Discussion**

Documented wildlife information for this segment is more substantial than for the MRNP to Donald and Kicking Horse Canyon to Yoho National Park segments. More data on specific locations of ungulate crossing would be very useful for designing mitigations.



More data are also required on the presence or absence of rare and endangered plant and animal species that could be affected by highway construction (Acres Int. Ltd. 1998).

### **Wildlife-vehicle collisions**

Wildlife-vehicle collisions along the Donald to Golden section are among the highest along Trans Canada Highway (TCH) from Kamloops to Alberta. There 132 WARS documented roadkills of deer, elk, moose, and bear from 1988 to 1997. Using the standard 5:1 ratio of actual kills to reported kills (L. Sielecki pers. comm.) this translates to an average of 66 large ungulates and bears killed on segment 0985 each year. In some "hotspots" areas (e.g. Donald and the outskirts of Golden) rate of ungulate-vehicle collisions exceed 3 per km per year. Most collisions in segment 0985 (1988-1997) are with deer (50%), followed by moose (20%), elk (12%), porcupine (7%), bear (6%), and coyote (5%). Elk concentrate on the benches north of the highway in spring and during mild winters, particularly between the Blaeberry River and Ford Station Road (Enkon Env. Ltd. 1997). Mule deer and white-tailed deer winter all along the benches north and east of the highway right-of-way, with major concentrations occur in the vicinity of Golden. Moose winter primarily away from the highway, on the southwest side of the Columbia River floodplain (Enkon Env. Ltd. 1997), but are vulnerable to collisions with vehicles during seasonal migrations. Black bears are also killed on the TCH, but in lesser numbers than ungulates. An estimated 20 were involved in collisions with vehicles along this section of the TCH from 1988 to 1997.

Bald eagles are numerous in the fall along the Columbia River, feeding on fish and waterfowl. Since they also scavenge carrion, they can be involved in collisions with vehicles when feeding on road-killed animals. The Canadian Pacific Railway documented five bald eagles killed by trains between Field and Revelstoke from 1994 to 1996 (Wells 1997). All the eagle-train collisions occurred from January through April.

Wildlife-vehicle collisions along the Golden to Kicking Horse Canyon area of segment 0990 are among the highest along Trans Canada Highway (TCH) from Kamloops to Alberta. There 32 WARS documented roadkills of deer, elk, moose, and bear from 1988 to 1997. Using the standard 5:1 ratio of actual kills to reported kills (L. Sielecki pers. comm.) this translates to an average of 160 large ungulates and bears killed on segment 990 from LKI 0.0 to 10.0 each year.

An analysis of WARS data from 1988-1997 for Golden to Yoho National Park west gate suggest the following percentages of an estimated 300 road-killed mammals: deer (65%), coyote (11%), elk (8%), moose (7%), bear (5%), and porcupine (4%). Coyotes are likely attracted to road-killed ungulates and also frequently use the TCH for travelling (Demarchi and Searing 1998); therefore relative kill rates are higher than for the Donald to Golden section.

## **Habitat Impacts**

Direct loss of wetland habitat, ungulate winter ranges, and wildlife tree areas to highway widening can have local effects on wildlife populations. Wetland habitats in the Columbia River valley near the highway are heavily used by migrating waterfowl. South of the CPR railway, wetlands are protected in Burges and James Gadsden Provincial Park (1965) and the recently established Columbia Wetland Wildlife Management Area (1997). Many of these wetlands are also subject to active habitat enhancement activities sponsored by Ducks Unlimited and various government agencies. There are no wetland habitats adjacent to the TCH from Golden to Kicking Horse Canyon. Ungulate winter ranges are protected along Segment 0985, immediately north of the TCH in the Bergenham Wildlife Management Area between LKI 44.2 to 47.6.

The habitats of threatened and endangered species could also be impacted by highway widening. Five species at risk (Red- and Blue-listed by the Ministry of Environment, Lands and Parks) are known to have occurred near the TCH Segment 0985 between Golden and Donald: giant-hyssop, Crawe's sedge, dark lamb's-quarters, northern leopard frog, and painted turtle (Table 20). The dark lamb's-quarters has also been found 23 km west of Field in Segment 0990. There is also a site near Anderson Road that may represent a rare ecosystem type, the Blue-listed scrub birch - horsetail plant community (Table 20). These are all potentially impacted by highway widening, and further surveys are required to confirm their presence or absence, if construction impacts are to be mitigated. Given the fact these species are very rare, the probability of actually finding populations near the highway is considered low.

**Table 20 Species at risk near the TCH Segment 0985, LKI 30.06 to 56.06, and TCH Segment 0990, LKI 0.0 to 25.93.**

List	Species at Risk	Scientific Name	Locations	Habitat
Red-listed Plant	Giant-hyssop	<i>Agastache foeniculum</i>	Lined both side of Big Bend Hwy for 500 m the intersection with the Dejordie Road (1947) <sup>2</sup> . UTM 4861m. E. 57040m. N. There are two other historic sites in BC <sup>1</sup> .	Dry, open woods and clearings <sup>1</sup> .
Red-listed Plant	Crawe's sedge	<i>Carex crawei</i>	Clay wetland by side of TCH 2.4 km west of Golden (1948) <sup>2</sup> . UTM 5014m. E. 56858m. N. There are two other historic sites in BC <sup>1</sup> .	Moist meadows <sup>1</sup> .
Red-listed Plant	Dark lamb's-quarters	<i>Chenopodium atrovirens</i>	Outskirts of Golden along TCH west of junction with Highway 95, and 23 miles W. of Field (1958) <sup>2</sup> . UTM 5023m. E. 56838m. N. & 5179m. E. 56793m. N. Three other BC sites exist in the Fraser canyon and Okanagan <sup>1</sup> .	Mountainside scree, scree of built up road, and dry roadside <sup>2</sup> . Saline or alkaline sites <sup>1</sup> .
Red-listed Amphibian	Northern Leopard Frog	<i>Rana pipiens</i>	Formerly native to wetlands adjacent to the TCH in the Columbia Valley <sup>3</sup> . This species is undergoing declines throughout North America.	Ponds, swamps, grassy fields, and meadows <sup>3</sup> .
Blue-listed Reptile	Painted Turtle	<i>Chrysemys picta</i>	Relatively abundant in the southern Kootenays, it reaches the northern limit of its range in wetlands adjacent to the TCH in the Columbia Valley <sup>4</sup> .	Ponds, lakes, and streams with muddy bottoms, slow-moving water, and emergent aquatic vegetation <sup>4</sup> .

List	Species at Risk	Scientific Name	Locations	Habitat
Blue-listed Plant Community	Scrub birch – horsetail.	<i>Betula glandulosa</i> - <i>Equisetum arvense</i>	A small area of this plant community may occur immediately west of Anderson Road at LKI 53.6 to 53.8 <sup>5</sup> . Confirmation by a qualified plant ecologist of this is required.	Riparian areas near ponds, lakes, and streams.

1-Douglas et al. 1998, 2-Acres Int. Ltd. 1998, 3-Green and Campbell 1984, 4-Gregory and Campbell 1984, 5-Enkon Env. Ltd. 1997.

## 5 References

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## **C3: Roth Creek to Brake Check**

### **1 Introduction**

Manning, Cooper and Associates (MCA) was retained by the Ministry of Transportation and Highways (MOTH) to provide ongoing assessments of wildlife and wildlife habitat sensitivities along the Trans Canada Highway corridor from Mt. Revelstoke National Park to Yoho National Park. The first phase of this project includes provision of an overview of wildlife and wildlife habitat sensitivities that will assist the early planning and design phase of potential highway upgrades. This report provides an overview of existing wildlife and wildlife habitat conditions for the Trans Canada Highway corridor from Roth Creek to the Brake Check at the east end of Kicking Horse Canyon.

### **2 Study Area / Background**

The study area included the Trans Canada Highway corridor from Roth Creek to the Brake Check at the east end of Kicking Horse Canyon. Highway segments included in the study area were as defined in the MOTH's Corridor Management Plan and included Segment 0990 (LKI range approx. 12.0– 17.0). MOTH instructed us to confine our assessments to about a 100 m wide corridor centred on the existing highway, except when new proposed alignments were brought to our attention by MOTH or ND Lea.

### **3 Methods**

#### **3.1 General**

We assessed wildlife and wildlife habitat sensitivities through a combination of :

- Reviews of existing literature and data
- Site visits
- Reviews of existing mapping (TRIM, NTS topographical, airphotos) provided by the design engineers or MOTH.
- Discussions with approved government agency personnel

Reviews of existing information revealed that several studies on wildlife or wildlife-related issues had been previously conducted along this part of the Trans Canada Highway (Harvey 1994; Acres 1998; Callaghan et al. 1998; Demarchi and Searing 1998). These reports contained invaluable information for our assessments.

Site visits were conducted on 17 October 1998, 8-11 November 1998, and 27 November 1998. During site visits we drove the highway and documented noteworthy wildlife habitat features, assessed the landscape for potential movement corridors for large mammals such as ungulates and carnivores, recorded all wildlife observed, and mapped the extent of wetlands, riparian areas, and wildlife trees. We also walked certain areas that

were thought to be ungulate crossing sites and checked for signs of ungulates and presence of game trails.

Considerable time was spent at 10 Mile (Park) Bridge assessing the impact of drilling, blasting, and construction of a new bridge on the mineral lick near the west end of the bridge; the lick is used by Mountain Goats.

MOTH had indicated to us that the potential for collision with large mammals was a major concern along this section of the TCH. We therefore, assessed MOTH's Wildlife Accident Reporting System (WARS) database to help identify "roadkill" hotspots along the TCH. The WARS database includes records of road-killed animals reported to MOTH by highways maintenance contractors or MOTH personnel. Data from 1988-1997 were included in the analysis. Animals reported tend to be large and conspicuous (moose, elk, deer, bears, bighorn sheep, mountain goats, coyotes, porcupines). Smaller animals and birds are seldom reported. Since roadkill hotspots became evident during a preliminary analysis, during site visits we attempted to correlate the WARS database with landscape features such as side valleys, wetlands, cliffs, winter range, river crossings, slope etc. that would help identify the boundaries of movement corridors.

WARS data are presented on the photomosaics as the number of animals estimated to be killed/km/year, e.g. (3) means that an estimated 3 large mammals are killed along that particular km of the TCH each year. Since the precise location of roadkilled animals is not reported (usually the nearest km mark or significant landmark is used as a location reference), the number reported for each km of the TCH may or may not be accurate. In addition, we had to correlate the LKI system to the km noted on the record, and numerous records contained no locality reference so were discarded.

### **3.2 Criteria for wildlife/wildlife habitat sensitivity ratings**

In general, highway sections (within defined LKI ranges) for which WARS data indicated an estimated kill rate for large mammals of >2 kills/km/yr were rated *high*; sections with an estimated kill rate of 1-2 kills/km/yr were rated *moderate*, and sections with an estimated kill rate of < 1 kill/km/yr were rated low. Estimated kill rates were determined by counting the number of reported kills for a highway segment during the period 1988 to 1997, multiplying by a standardized factor of 5 (as estimated by MOTH), and dividing by the number of km (variable) and the number of years for which data were assessed (10).

However, in all cases we tried to correlate WARS data with topography and existing information on locations of movement corridors, specific crossing sites, and winter ranges. If a landscape feature was present that suggested a higher (e.g., a side valley) or lower (e.g., very steep, unstable slope) potential we may have raised or lowered a rating accordingly. In addition, if previous reports, other data or personal communications suggested a higher or lower rating was warranted, we would modify the rating. Also if

moose, elk, or bears were killed relatively often compared to deer then we may give the section a higher rating.

In most cases we thought we could reasonably predict the boundaries of the subsections which had low/mod/high potential collision potential, although more data would be helpful in some areas. Therefore we rated subsections of each corridor segment for wildlife collision potentials. These subsections were not predetermined (such as every km or every 10 km), but were subjectively established based on a combination of WARS data, other data and literature, assessment of topography, known usage by large mammals, and general habitat quality. These ratings may or may not correlate well with the notations of animals killed/km/year which are on the photomosaics.

Wildlife habitat sensitivity was rated after considering the habitat type, the extent of the habitat, the general quality of the habitat, the habitat's relative rarity within the study area and Region 3, and the species of wildlife known or thought likely to occur there. In general, *high* sensitivity ratings were given to large and/or productive wetlands, significant riparian areas (very rare along the TCH corridor in this study area), known critical habitats for Red and Blue-listed wildlife, sites used for nesting by raptors (e.g., Bald Eagle, Osprey) and Great Blue Heron, ungulate mineral licks, or documented sites for rare plants or plant communities.

A *moderate* rating was given to small, fragmented, or less productive wetlands, small groups of wildlife trees, and potential habitat for Red and Blue-listed wildlife. A *low* rating was given to very small and unproductive wetlands and relatively poor quality wildlife trees.

Since a split bar format for environmental sensitivities on the photomosaic is not used, overlapping sensitivities (such as low for wildlife collision potential and high for wildlife habitat) are impossible to show on the photomosaic. Therefore, in all cases the highest rating will be mapped. Details on limits of various sensitivities along the corridor, with stated LKI ranges, are presented in the text.

## **4 Results / Discussion**

### **4.1 Results**

#### **Site specific conditions (for mapping)**

<b>Item</b>	<b>LKI Range</b>	<b>Hwy side</b>	<b>Environmental constraint</b>	<b>Level</b>
A	11.7 to 13.3	Both	Potential ungulate-vehicle collision	Moderate
B	13.3 to 14.4	Both	Potential ungulate-vehicle collision	Low
C	14.3	Both	Mammal movement corridor	High

Item	LKI Range	Hwy side	Environmental constraint	Level
D	14.4	S	Mountain goat mineral lick (10 Mile)	High
E	14.4 to 14.8	Both	Potential ungulate-vehicle collision	Moderate
F	14.8 to 16.5	Both	Potential ungulate-vehicle collision	Low
G	16.5 to 17.1	Both	Potential ungulate-vehicle collision	Moderate
H	17.1 to 18.0	Both	Potential ungulate-vehicle collision	Low

### Description of site specific conditions

- A. (11.7 to 13.3) Relatively moderate potential for collisions with ungulates and bears, mainly deer and elk. The topography is much gentler here between 5 Mile and 10 Mile Bridges; and Roth Creek drainage enters the KHR from the north along this section; therefore crossings by large mammals are assumed to occur more frequently. Confirmation comes from a spike in roadkills close to the 12 km mark (WARS 1998; Demarchi and Searing 1998). Elk occur more frequently than a few km to the west (Demarchi and Searing 1998).
- B. (13.3 to 14.4) Relatively low potential for collisions with ungulates and bears as terrain becomes much steeper leading up to the 10 Mile Bridge. Roadkills are almost absent from this section (WARS 1998).
- C. (14.3) The gorge at 10 Mile Bridge is the narrowest constriction in the KHR valley. It has been suggested by one study that the river bottom under the bridge is the easiest pathway for wolves and elk travelling up and down the valley (Callaghan et al. 1998). Wolverines are thought to prefer to cross valleys at narrowings and probably do so at this location (Demarchi and Searing 1998).
- D. (14.4) Mountain goat mineral lick within 200 m of the east end of 10 Mile Bridge. The lick is used seasonally in late spring and early summer by small numbers of goats. The lick is on the rocky bluffs above the KHR, centred approximately on UTM 514500 E and 5680500 N (Demarchi and Searing 1998). Licks are critical sources of minerals for goats after the harsh winter season.
- E. (14.4 to 14.8) Relatively moderate potential for collisions with ungulates and bears as a draw leads down to the TCH on the north side, and there is a more level bench on the south side which suggests more crossings. There is also a short spike in roadkilled mammals (WARS 1998).
- F. (14.8 to 16.5) Steep topography and low roadkills suggests a low potential for collisions with ungulates and bears.
- G. (16.5 to 17.1) A spike in roadkills during the period 1978-1995 (Demarchi and Searing 1998; WARS 1998) combined with more gentle topography suggest a higher potential for collisions with ungulates and bears. However, WARS data for 1988-1997 do not support this contention. This section includes a treed slope on the south side of the TCH that was identified by MOTH and ND Lea personnel as a possible site to dump large quantities of fill. This treed slope provides a natural pathway from the KHR upslope across the TCH, and we judged it a likely place for ungulates to cross the



KHR valley. Further data on wildlife crossings at this site would help us understand the importance of this slope for travelling ungulates. Note that Demarchi and Searing (1998) did not survey that particular site.

- H. (17.1 to 18.0) Relatively low potential for collisions with ungulates and bears as terrain becomes very steep leading up to the brake check. WARS data from 1978 to 1995 suggest very few roadkills in this section, with a sudden increase in roadkills just east of the brake check as a vehicles pick up speed on a level straight-away (Demarchi and Searing 1998).

## **4.2 Discussion**

More data on specific locations of ungulate crossing would be very useful for designing mitigations. More data are also required on the presence or absence of rare and endangered plant and animal species that could be affected by highway construction (Acres Int. Ltd. 1998).

### **Wildlife-vehicle collisions**

Wildlife-vehicle collisions along the Golden to Kicking Horse Canyon area of segment 0990 are among the highest along Trans Canada Highway (TCH) from Kamloops to Alberta. There were 32 WARS documented roadkills of deer, elk, moose, and bear from 1988 to 1997. Using the standard 5:1 ratio of actual kills to reported kills (L. Sielecki pers. comm.) this translates to an average of 16 large ungulates and bears killed on segment 990 from LKI 0.0 to 10.0 each year, or 1.6/km; most of those being in the first 4 km east of Golden. From Roth Creek to the Brake Check the rate of road kills drops considerably, to an estimated 3.5 annually, or about 0.7/km. There is one apparent hotspot at about LKI 16.5 – 17.0.

### **Habitat Impacts**

Direct loss of wetland habitat, ungulate winter ranges, and wildlife tree areas to highway widening can have local effects on wildlife populations. There are no wetland habitats adjacent to the TCH from Roth Creek to the Brake Check. The north side of the Kicking Horse River valley, from LKI 12-17, includes relatively poor winter range for elk and mule deer (Harvey 1994). Widening of the corridor should therefore result in minimal loss of winter range habitat. No significant wildlife trees were noted along this section of the TCH.

There seem to be relatively few direct concerns for habitat except for the mineral lick at 10 Mile Bridge and the slope below the TCH at LKI 16.5. The main lick is upstream of the current bridge and runs along where the talus slope meets the more vertical rock face, at the east end of the face. The lick is about 200m from the bridge area. Small numbers of goats, mainly nannies and kids, use the lick seasonally from about March to July, but the odd goat may appear through the autumn. Access to the lick is mainly from forested areas

to the east. It is likely that goats use the entire face of the cliff, including areas that will be affected by removal of rock for the new alignment. Apparently, goats do not cross the Kicking Horse River at this site, even though the gorge area seems to be a natural pathway for crossing. Apparently, during the season when goats are present, late spring through early summer, the KHR is a raging torrent and is generally impassable to goats.

The proposed new bridge structure appears to require the removal of a large part of the forested shoulder that abuts the existing highway near the existing bridge. Removal of that shoulder will not directly impact the primary lick. However, depending on how high the cut reaches, some goat habitat along the cliff and talus at the west end of the rock face may be lost. Since goats probably use the top of the forested shoulder at times, it would be better for wildlife to retain as much of that forested shoulder as possible.

As the main lick is at the eastern end of the rock face, we judge that the potential loss of cliff and forested shoulder at the west end to have a relatively low direct impact on mountain goats. Temporary disturbance of goats using the lick may occur during construction, especially when rock is being blasted. As the lick is critical for replenishing minerals lost during the harsh winter season, it would be advisable to avoid severe disturbances (through blasting for example) during the late spring through early summer period (1 April-30 June). In the future, we expect goats to habituate to the new alignment and continue to use the lick as in the past.

It seems unlikely that the new alignment, which will be marginally closer to the lick, will increase the rate of goat mortality at 10 Mile Bridge. There have been no reports of goat mortality on the TCH at the 10 Mile Bridge area, probably because goats are not crossing the TCH, and we do not expect that to change.

The habitats of threatened and endangered plant species could also be impacted by highway widening. The dark lamb's-quarters has also been found 23 km west of Field in Segment 0990. This plant is potentially impacted by highway widening, and further surveys are required to confirm its presence or absence, if construction impacts are to be mitigated. Given the fact it is very rare, the probability of actually finding populations near the highway is considered low.

**Table 21 Species at risk near the TCH Segment 0990, LKI 0.0 to 18.0**

List	Species at Risk	Scientific Name	Locations	Habitat
Red-listed Plant	Dark lamb's-quarters	<i>Chenopodium atrovirens</i>	Outskirts of Golden along TCH west of junction with Highway 95, and 23 miles W. of Field (1958) <sup>2</sup> . UTM 5023m. E. 56838m. N. & 5179m. E. 56793m. N. Three other BC sites exist in the Fraser canyon and Okanagan <sup>1</sup> .	Mountainside scree, scree of built up road, and dry roadside <sup>2</sup> . Saline or alkaline sites <sup>1</sup> .

<sup>1</sup>-Douglas et al. 1998, 2-Acres Int. Ltd. 1998,

## 5 References

- Acres International Limited. 1998. Environmental overview assessment: Trans Canada Highway corridor (Kamloops to Alberta border). Report prepared for the Ministry of Transportation and Highways, Kamloops. Acres International Limited, Vancouver, BC. 240+ pp.
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- Harvey, M. 1994. Wildlife habitat mapping, Trans Canada Highway Corridor Golden to Yoho National Park, BC. MOTh unpub report, Victoria, BC. 54 pp..
- WARS 1998. Wildlife Accident Reporting System database. B.C. Ministry of Transportation and Highways, Victoria, BC.

## **C4: Brake Check to Yoho Park**

### **1 Introduction**

Manning, Cooper and Associates (MCA) was retained by the Ministry of Transportation and Highways (MOTH) to provide ongoing assessments of wildlife and wildlife habitat sensitivities along the Trans Canada Highway corridor from Mt. Revelstoke National Park to Yoho National Park. The first phase of this project includes provision of an overview of wildlife and wildlife habitat sensitivities that will assist the early planning and design phase of potential highway upgrades. This report provides an overview of existing wildlife and wildlife habitat conditions for the Trans Canada Highway corridor from the Brake Check in Kicking Horse Canyon to the west boundary of Yoho National Park..

### **2 Study Area/Background**

The study area included the Trans Canada Highway corridor from the Brake Check in Kicking Horse Canyon to the west boundary of Yoho National Park. Highway segments included in the study area were as defined in the MOTH's Corridor Management Plan and included Segment 0990 (LKI range approx. 17.0– 26.0). MOTH instructed us to confine our assessments to about a 100 m wide corridor centred on the existing highway, except when new proposed alignments were brought to our attention by MOTH or ND Lea.

### **3 Methods**

#### **3.1 General**

We assessed wildlife and wildlife habitat sensitivities through a combination of :

- Reviews of existing literature and data
- Site visits
- Reviews of existing mapping (TRIM, NTS topographical, airphotos) provided by the design engineers or MOTH.
- Discussions with approved government agency personnel

Reviews of existing information revealed that several studies on wildlife or wildlife-related issues had been previously conducted along this part of the Trans Canada Highway (Harvey 1994; Acres 1998; Callaghan et al. 1998; Demarchi and Searing 1998). These reports contained invaluable information for our assessments.

Site visits were conducted on 17 October 1998, 8-11 November 1998, 27 November, and 16 December, 1998. During site visits we drove the highway and documented noteworthy wildlife habitat features, assessed the landscape for potential movement corridors for

large mammals such as ungulates and carnivores, recorded all wildlife observed, and mapped the extent of wetlands, riparian areas, and wildlife trees. We also walked certain areas that were thought to be ungulate crossing sites and checked for signs of ungulates and presence of game trails.

MOTH had indicated to us that the potential for collision with large mammals was a major concern along this section of the TCH. We therefore, assessed MOTH's Wildlife Accident Reporting System (WARS) database to help identify "roadkill" hotspots along the TCH. The WARS database includes records of road-killed animals reported to MOTH by highways maintenance contractors or MOTH personnel. Data from 1988-1997 were included in the analysis. Animals reported tend to be large and conspicuous (moose, elk, deer, bears, bighorn sheep, mountain goats, coyotes, porcupines). Smaller animals and birds are seldom reported. Since roadkill hotspots became evident during a preliminary analysis, during site visits we attempted to correlate the WARS database with landscape features such as side valleys, wetlands, cliffs, winter range, river crossings, slope etc. that would help identify the boundaries of movement corridors.

WARS data are presented on the photomosaics as the number of animals estimated to be killed/km/year, e.g. (3) means that an estimated 3 large mammals are killed along that particular km of the TCH each year. Since the precise location of roadkilled animals is not reported (usually the nearest km mark or significant landmark is used as a location reference), the number reported for each km of the TCH may or may not be accurate. In addition, we had to correlate the LKI system to the km noted on the record, and numerous records contained no locality reference so were discarded.

### **3.2 Criteria for wildlife/wildlife habitat sensitivity ratings**

In general, highway sections (within defined LKI ranges) for which WARS data indicated an estimated kill rate for large mammals of  $>2$  kills/km/yr were rated *high*; sections with an estimated kill rate of 1-2 kills/km/yr were rated *moderate*, and sections with an estimated kill rate of  $< 1$  kill/km/yr were rated low. Estimated kill rates were determined by counting the number of reported kills for a highway segment during the period 1988 to 1997, multiplying by a standardized factor of 5 (as estimated by MOTH), and dividing by the number of km (variable) and the number of years for which data were assessed (10).

However, in all cases we tried to correlate WARS data with topography and existing information on locations of movement corridors, specific crossing sites, and winter ranges. If a landscape feature was present that suggested a higher (e.g., a side valley) or lower (e.g., very steep, unstable slope) potential we may have raised or lowered a rating accordingly. In addition, if previous reports, other data or personal communications suggested a higher or lower rating was warranted, we would modify the rating. Also if moose, elk, or bears were killed relatively often compared to deer then we may give the section a higher rating.

In most cases we thought we could reasonably predict the boundaries of the subsections which had low/mod/high potential collision potential, although more data would be helpful in some areas. Therefore we rated subsections of each corridor segment for wildlife collision potentials. These subsections were not predetermined (such as every km or every 10 km), but were subjectively established based on a combination of WARS data, other data and literature, assessment of topography, known usage by large mammals, and general habitat quality. These ratings may or may not correlate well with the notations of animals killed/km/year which are on the photomosaics.

Wildlife habitat sensitivity was rated after considering the habitat type, the extent of the habitat, the general quality of the habitat, the habitat's relative rarity within the study area and Region 3, and the species of wildlife known or thought likely to occur there. In general, *high* sensitivity ratings were given to large and/or productive wetlands, significant riparian areas (very rare along the TCH corridor in this study area), known critical habitats for Red and Blue-listed wildlife, sites used for nesting by raptors (e.g., Bald Eagle, Osprey) and Great Blue Heron, ungulate mineral licks, or documented sites for rare plants or plant communities.

A *moderate* rating was given to small, fragmented, or less productive wetlands, small groups of wildlife trees, and potential habitat for Red and Blue-listed wildlife. A *low* rating was given to very small and unproductive wetlands and relatively poor quality wildlife trees.

Since a split bar format for environmental sensitivities on the photomosaic is not used, overlapping sensitivities (such as low for wildlife collision potential and high for wildlife habitat) are impossible to show on the photomosaic. Therefore, in all cases the highest rating will be mapped. Details on limits of various sensitivities along the corridor, with stated LKI ranges, are presented in the text.

## 4 Results/Discussion

### 4.1 Site specific conditions (for mapping)

Item	LKI Range	Hwy side	Environmental constraint	Level
A	17.0 to 17.5	Both	Potential ungulate-vehicle collision	Low
B	17.5 to 19.6	Both	Potential ungulate-vehicle collision	Moderate
C	19.6	Both	Mt. Hunter Creek	Low
D	19.6 to 25.0	Both	Potential ungulate-vehicle collision	High
E	19.6 to 25.0	N	Ungulate winter range	Moderate
F	21.95	Both	Vacation Creek	Low
G	25.0 to 26.0	Both	Potential ungulate-vehicle collision	Moderate

### **Description of site specific conditions**

- A. (17.0 to 17.5) Relatively low potential for collisions with ungulates and bears as westbound vehicles slow down before the Brake Check and steep hill, and eastbound vehicles regain speed. WARS data from 1978 to 1995 suggest very few roadkills in this section.
- B. (17.5-19.6) Relatively moderate potential for large mammal/vehicle collisions. Although WARS roadkill data from 1988-1997 show few kills along this stretch, a sharp spike in roadkills occurred near LKI 18 from 1978-1995 (Demarchi and Searing 1998). Our site-visits suggested that vehicle speeds could be relatively high along this level straight-away stretch and increased roadkills leading eastward seemed likely.
- C. (19.6) Mt. Hunter Creek crosses the TCH and although it has a low wildlife sensitivity rating it would be the prime location for an underpass wildlife crossing structure if the TCH were fenced for large mammals along this stretch.
- D. (19.7-25.0) Relatively high potential for large mammal/vehicle collisions. Previous tracking studies have shown that a herd of Elk occurs here year round, Mule Deer and bears occur seasonally, and wolves occur intermittently year round (Demarchi and Searing 1998). This area contains the best ungulate and bear habitat in the Roth Creek to Yoho National Park section of the TCH (Harvey 1994). A large area on the south-facing slopes on the north side of the highway between about LKI 21-23 was burned by MELP as a prescribed burn to enhance ungulate habitat.
- E. (19.7-25.0) This area is thought to be the core of the local Elk herd's winter range (Demarchi and Searing 1998). If 4 km of TCH are twinned in the vicinity of Mt. Hunter Creek Bridge, and a 50 m-wide swath is required for the new lanes, an estimated 20 ha of locally important elk winter range would be lost.
- F. (21.95) Vacation Creek has a low wildlife sensitivity but would be a good site for a wildlife underpass crossing structure if this part of the TCH was fenced for large mammals.
- G. (25.0-26.0) Relatively moderate potential for large mammal/vehicle collisions as the quality of ungulate habitat declines noticeably from the previous few kms.

### **4.2 Discussion**

More data on specific locations of ungulate crossing would be very useful for designing mitigations. More data are also required on the presence or absence of rare and endangered plant and animal species that could be affected by highway construction (Acres Int. Ltd. 1998).

### **Wildlife-vehicle collisions**

Wildlife-vehicle collisions along the Golden to Kicking Horse Canyon area of segment 0990 are among the highest along Trans Canada Highway (TCH) from Kamloops to

Alberta. WARS data indicated that there were 1.6 large mammals killed per km per year from 1988 to 1987 on Segment 990 from LKI 0.0 to 10.0 each year, most of those being in the first 4 km east of Golden. From Roth Creek to the Brake Check the rate of road kills drops considerably, to an estimated 3.5 annually, or about 0.7/km. There is one apparent hotspot at about LKI 16.5 – 17.0.

From the Brake Check to Yoho National Park there are 12 WARS documented roadkills from 1988-1997. Using the standard 5:1 ratio of actual kills to reported kills (L. Sielecki pers. comm.) this translates to an average of 6 large mammals killed on Segment 990 from LKI 17.0 to 26.0 each year, or 0.7/km/year. There is one hotspot, however, from the Brake Check to Yoho National Park between LKI 21-23, roughly along the stretch TCH below the prescribed burn an estimated 1.6 large mammals/km/yr. This is part of the area that is being considered for highway twinning.

### **Habitat Impacts**

Direct loss of wetland habitat, ungulate winter ranges, and wildlife tree areas to highway widening can have local effects on wildlife populations. There are no wetland habitats or significant stands of or individual wildlife trees adjacent to the TCH from the Brake Check to Yoho National Park.

A new bridge has been proposed for Mt. Hunter Creek with adjoining highway twinning for about 2 km on either side of the bridge. As this area includes locally important elk winter range, loss of habitat may be an issue. For example, if we assume 4 km of twinning and a 50 m-wide swath then about 20 ha of winter range would be lost. There are no significant wildlife values associated with Mt. Hunter Creek itself, but the creek would be a natural site for a wildlife crossing structure if fencing for large mammals was considered.

The habitats of threatened and endangered plant species could also be impacted by highway widening. The dark lamb's-quarters has also been found 23 km west of Field in Segment 0990. This plant is potentially impacted by highway widening, and further surveys are required to confirm its presence or absence, if construction impacts are to be mitigated. Given the fact it is very rare, the probability of actually finding populations near the highway is considered low.



Table 22. Species at risk near the TCH Segment 0990, LKI 17.0 to 25.93.

List	Species at Risk	Scientific Name	Locations	Habitat
Red-listed Plant	Dark lamb's-quarters	<i>Chenopodium atrovirens</i>	Outskirts of Golden along TCH west of junction with Highway 95, and 23 miles W. of Field (1958) <sup>2</sup> . UTM 5023m. E. 56838m. N. & 5179m. E. 56793m. N. Three other BC sites exist in the Fraser canyon and Okanagan <sup>1</sup> .	Mountainside scree, scree of built up road, and dry roadside <sup>2</sup> . Saline or alkaline sites <sup>1</sup> .

<sup>1</sup>-Douglas et al. 1998, <sup>2</sup>-Acres Int. Ltd. 1998,

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- Acres International Limited. 1998. Environmental overview assessment: Trans Canada Highway corridor (Kamloops to Alberta border). Report prepared for the Ministry of Transportation and Highways, Kamloops. Acres International Limited, Vancouver, BC. 240+ pp.
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