APPENDIX A

Glossary of Terms

APPENDIX A Glossary of Terms

TERM	DEFINITION
Aerial photo mosaics	A series of aerial mosaic maps delineating the powerline routes, the forest cover and terrain encountered along the route, and the proposed protection measures to be implemented to address project related impacts
Allochthonous	Freshwater nutrient inputs from decomposing vegetation, which provide an important source of food for invertebrates living in the water
Argo	A small, compact 6 or 8 wheel drive all terrain vehicle
Barehand	Technique of working on energized powerlines by energizing the worker at the same voltage as the powerline
Blow down	Trees that are blown down by the wind
Brushing	Vegetation and weed species removal- typically woody stemmed shrub or tree species, removed by mechanical means (vs. herbicide control)
Butt ends	The bottom (thick end) of poles or trees
Chipper	Mechanical device used to shred vegetation, typically branches and small trees for distribution on to the ROW
Cold Trail	A recognized method of evaluating a burn area and surrounding combustible ground vegetation to ensure no ‘re-starts’ create a wildfire (utilized by trained forestry workers)
Compatible trees	Low growing trees and shrubs that won’t interfere with the powerline
Critical wildlife area	An area or region that is seasonally important to the habitat life cycle of the animals inhabiting that area
Decked	A stack of cut timber
Flashover distance	The ability of the energy (electricity) inside the conductor (wire) to overcome the electric resistance of the air and "jumping" to an object near the conductor, i.e., electricity reaching a tree branch near the conductor.
Ford	To drive equipment through a stream

Foremost	A six wheel drive tandem truck, this is a low impact ATV
Gallinaceous	Heavy-bodied largely terrestrial birds including pheasants, turkeys, and grouse
Groundline	Refers to the part of a pole that intersects the ground surface
Groundline treatment	Field application of wood preservatives to utility poles at the groundline of wooden poles
Hazardous trees	Trees that have a high degree of risk to fall over
Hotstick	A long reaching insulated tool to work on energized lines
Hyperphagia	When bears start to feed on their most important fattening foods that are essential to get through the winter, usually berries and/or salmon
Hypophagia	When the bears are hungry and weak after a winter of hibernation and in need of protein, which they can get from early green vegetation in wetlands and on avalanche slopes
Incompatible trees	Trees that are capable of growing to a height to interfere with a powerline
Inflow	Is where water or other fluids flow into an area
Line-to-tree clearances	The distance from a tree to a powerline
Live line maintenance	Performance of maintenance work on an energized line
Mitigative measures	Procedural, locational, and timing constraints and methods employed to address project related impacts. Mitigative measures can address both positive and negative impacts
Mowing	A mechanical method of vegetation and tree removal (similar to a lawn mower at an exponential scale)
Peak demand	The time(s) of highest electricity consumption
Penta	Common term for the wood preservative “pentachlorophenol”
Prescribe burn	Purposefully setting fire to an area as an ecological management or fire management technique
Rehabilitation	The procedure of returning disturbed land to a productive and self sustaining vegetation community similar in production to prior to disturbance

TERM	DEFINITION
Right-of-way (RoW)	The strip of land over which a linear facility i.e.: powerline, railway, road, etc. extends
Rip-rap	Large rocks laid on an embankment surface to prevent soil erosion
Slashing	Cutting trees and brush by hand using a chainsaw or brushsaw
Spill	The release of dangerous goods in quantities greater than those specified in the Dangerous Goods Compliance Guidelines (Alberta Safety and Public Services 1986) and which represent a danger to health, life, property, and the environment
Staggered removal	Removing trees selectively over a period of time
Staging area	A field site where materials or equipment is temporarily stored
Substation	A subsidiary station in which electric current is transformed
Tidy tank	Portable fuel tank
Tracked digger	A tracked vehicle designed for digging
Trim lift	A truck with a lift which elevates workers to trim trees
Zone of influence	The area the activities of the project will influence

APPENDIX B

Public Consultation Documentation

Table B.1 Environmental Non-Governmental Organizations Contacted Regarding Utilicorp Model Class Screening

ENGO	Contact Name	Address	Contact numbers
Canadian Parks and Wilderness Society	Dave Poulton	319 10th Ave. S.W. Suite 306 Calgary, Alberta	(403) 232-6686 Fax (403) 232-6988 poultond@cadvision.com
UTSB	Ed Wittingham	Box 1477 Banff, Alberta T0l 0C0	(403) 762-0361 Fax (403) 652-0351 edo@bearsociety.org
Bear Society	Ed Wittingham	Box 853 Banff, Alberta T0l 0C0	(403) 762-0361 Fax (403) 652-0351 information@bearsociety.org
Association for Mountain Parks Protection and Enjoyment	Heather Anderson Julie Canning	Box 219, Suite 6016 Banff, Alberta T0l 0C0	(403) 762-3800 Fax (403) 762-3828 info@ampee.org
Alberta Wilderness Association	Ava Morach	Box 6398, station D Calgary, Alberta T2P 2E1	(403) 283-2025 Fax (403) 270-2743 awa.ava@home.com a.w.a@home.com
The Friends of Banff National Park		Box 900 Banff, Alberta T0l 0C0	(403) 762-8918 Fax (403) 762-2933 ldebie@telusplanet.net

Utilicorp Networks Class Screening for Routine Maintenance Operations in Banff National Park

As requested at our Public Meeting of March 27, Highwood Environmental is making these Draft Constraint Maps and Best Management Practices available for interested parties to review before the final draft of the Class Screening Report is submitted.

These materials will be available for review at the Parks Administration building for 14 days beginning on **Friday May 4** and closing on **Friday May 18**, 2001. Please make any comments to Highwood Environmental at the following address before **Wednesday May 23rd** so we can incorporate your comments into the Draft report which is to be completed by May 31.

Please note, this is not a completed report but portions of a Draft for public comment.

Attached for your information are both the Notification of Public Meeting Notice and brief Project Description, which were circulated at the Public Meeting held in Banff on March 27.

Additional opportunities for public comment will occur after the report is filed with Parks Canada and the Canadian Environmental Assessment Agency. We look forward to incorporating your comments into the final report to be submitted in May, 2001. The local perspective of your group provides valuable insight into the issues in Banff National Park.

Please send comments to:

Highwood Environmental Management Ltd.
877 Coachside Cres. S.W.
Calgary, AB T3H 1A9
Ph: (403) 685-1411
Fax: (403) 240-0847
email: highwoodem@home.com

UTILICORP NETWORKS CANADA

A UtiliCorp United Company

Public Information Meeting – March 27, 2001

MODEL CLASS SCREENING REPORT FOR ROUTINE MAINTENANCE OPERATIONS OF ELECTRICAL DISTRIBUTION FACILITIES IN BANFF NATIONAL PARK

UtiliCorp Networks Canada (UtiliCorp) operates and maintains power distribution facilities in Banff National Park. The *Canadian Environmental Assessment Act (CEAA)* requires that operations requiring permits in National Parks undergo environmental screening before those permits are issued. UtiliCorp operations in Banff National Park that require permits are extensive; many of these are routine, repetitive operations with highly predictable and mitigable impacts. As such, these operations fit within the *CEAA* mandate for Class Screenings.

In order to meet the requirements of the *Canadian Environmental Assessment Act,* UtiliCorp Networks Canada has prepared a Model Class Screening Report (MCSR). The screening covers the *CEAA* requirements pursuant to the ongoing operational, maintenance and decommissioning activities associated with the safe operation of their distribution facilities in Banff National Park. The MCSR has been designed to ensure that the potential environmental effects and mitigation measures of projects within the class are considered in a consistent and efficient manner during project planning, screening, approval and implementation.

Pursuant to Section 19 of *CEAA*, the Canadian Environmental Assessment Agency and Parks Canada will take into consideration any public comments brought forward with respect to the Model Class Screening Report prior to declaration.

UtiliCorp Networks Canada will be holding a public information meeting on the Model Class Screening Report on March 27, 2001 at the Banff Park Lodge. Doors open at 6:30 pm, presentation at 7:00 pm, questions from 7:30 to 8:30 pm.

Additional opportunities for public comment will occur after the report is filed with the Canadian Environmental Assessment Agency.

MODEL CLASS SCREENING REPORT FOR ROUTINE MAINTENANCE OPERATIONS OF ELECTRICAL DISTRIBUTION FACILITIES IN BANFF NATIONAL PARK

PROJECT DESCRIPTION

UtiliCorp Networks Canada (UtiliCorp) operates, maintains, and decommissions power distribution facilities in Banff National Park. The *Canadian Environmental Assessment Act (CEAA)* requires that operations requiring permits in National Parks undergo environmental screening before those permits are issued. UtiliCorp operations in Banff National Park that require permits are extensive, however, many of these are routine, repetitive operations with highly predictable and mitigable impacts. As such, these type of operations fit within the *CEAA* mandate for Class Screenings (Section 19 of the Act).

In order to meet the requirements of the *Canadian Environmental Assessment Act,* UtiliCorp has prepared a Class Screening Report which addresses all *CEAA* requirements pursuant to the ongoing operation, maintenance and decommissioning activities associated with the safe operation of their distribution facilities in Banff National Park. Parks Canada is the Responsible Authority (RA) for *CEAA* screenings in BNP.

The UtiliCorp Class Screening examines the potential environmental effects associated with this class of projects; important site-specific effects are addressed through the preparation of individual Class Screening Project Reports.

The Class Screening defines the process to be followed by the Responsible Authority (Parks Canada) and project proponent (UtiliCorp) in preparing a Class Screening Project Report for each activity. This planning process ensures that the potential environmental effects of projects within the class are considered in a consistent and efficient manner during project planning and implementation and that appropriate mitigation measures are used. Regulatory standards (both provincial and federal) and the experience of current governments with the operation, maintenance and decommissioning of distribution facility projects in Banff National Park have been used to identify potential environmental impacts and mitigation measures.

The Class Screening Report presents information on distribution line maintenance in Banff National Park and includes the following information:

- Environmental conditions including detailed constraint mapping;
- Activities involved in the operation, maintenance, and decommissioning of distribution facilities;
- The range of typical environmental effects;
- The range of best management practices which provide environmental mitigation practices;
- Residual and cumulative impacts that may result;
- Follow-up and monitoring that may be required; and
- Screening process for each project.

APPENDIX C

Equipment List

APPENDIX C Equipment List

Activity	Equipment
Aboveground Lines	
General	• The type of vehicles used to access sites is dependant on the sensitivity of terrain. • ATV's are typically used during ground patrols on the ROWs to carry the small tools and equipment involved in minor repairs (lines and poles). • For sites accessible by road, a typical ½ or ¾ ton service truck, or a tandem digger (Telec) is used. • In the sensitive areas identified on the maps, wide tracked or soft tired equipment (i.e. Foremost or tracked digger, argo, quad,) is used. • Where either marshlands or excessively steep terrain prohibit access, a helicopter is used to transport tools, equipment, men, and the poles to the site. • Limitations for safety, weight capacity, wind, and cost must be considered in all cases.
Aerial Patrols ***Helicopter Permit required***	• Staging areas are required; the helicopter re-fuels once every hour (approximately). Typically the Sunshine and Lake Louise substation areas are used.
Ground Patrols	• ATV's are utilized for access to allow the equipment required to effect minor repairs to lines and poles.
Pole Test	• ATV's are used to carry men and equipment.
Pole Replacement	• • to change poles however, there are limitations where either marsh lands or excessively steep terrain prohibit access. In these extreme cases, a helicopter is used to transport tools, equipment, men, and the poles to the site. Limitations for safety, weight capacity, wind, and cost must be considered in all cases
Crossarm Replacement	• Limitations for safety weight capacity, wind, and cost must be considered when determining the mode of transportation for access on the ROW. • equipment. Men may also access the sites by foot. • Access permitting, a Telec or service truck is used for this work.
Re-anchoring or new anchor Installation; Rod Grounding	• Telec trucks are used for this work.

Activity	Equipment
Aboveground Lines – Continued	
Conductor Repair, Replacement and Salvage	• Telecs or Foremosts with insulated and rated boom and buckets.
Pole Top Equipment Repair or Replacement (i.e. Transformer, OCR, Insulator)	• The Telec or Foremost is used to carry out the work.
Insulator Washing	• This is done from a bucket truck, or from a helicopter, depending on terrain.
Streetlight Repair	• All Urban and Highway lighting is roadside accessible. Service vehicles and Telecs are used for repair and maintenance.
Underground Lines	
Cubicle (transformer) Inspection/ Repair/ Replacement	• Cubicle transformers may be re-leveled with the use of a backhoe and Telec truck.
Line Repair	• This is typically done with a backhoe and hand digging.
Vegetation Maintenance on the RoW	
Ground Patrols	• ATV's are used for patrols to allow for maintenance equipment
Mowers	• A brush mower head (similar to a large heavy duty lawnmower) can be mounted on soft tracked or rubber tire tractors and can remove trees up to 15cm diameter. Debris is mulched and scattered behind the mower.
Manual Brushing (Slashing)	• A three ton closed box truck and chipper is used.
Trimming	• Tree trimmers for utility work are specialized with trim lifts that are specially equipped to work within close proximity to energized lines. As the trucks are large and heavy, they are used only along roads or trails in good condition. In sensitive areas trees are climbed and hand trimmed. • Brush chippers are pulled by the lifts. Debris is blown into the back of the lift box.
Herbicide Brush Control	• One ton trucks equipped with hand sprayers or backpack sprayers.

APPENDIX D

Chemicals Approved for Use
and
Non-Native Species Priority List

APPENDIX D

Chemicals Approved for Use

Type	Chemical	Common Name	Active ingredient	Application
Wood Pole preservative	Pentachlorophenol	Penta	Pentachlorophenol	fungicide, pole treatment
	Chromated copper arsenate	CCA	Arsenic, Chromium, Copper	fungicide, insecticide, pole treatment[(a)]
Wood Pole retreatment	Pole Fume	Wood fume	Metam Sodium	fungicide, insecticide, pole treatment[(a)]
	CuRap 20	Pole wrap	Copper Naphthanate, Borax	fungicide, pole treatment
	Ficam D	Ficam/BendioCarb	BendioCarb	insect control, pole treatment
	Boradust	Boradust	Boric Acid	insect control, pole treatment
	Boron Rods	Boron Rods	Boric Acid	fungicide, pole treatment
	Cobra Rods	Cobra Rods	Copper and Boric Acid	fungicide, pole treatment
	CuNap Wrap	Pole wrap	Copper Naphthanate	fungicide, pole treatment[(b)]
	CopperNap		Liquid Copper Naphthanate	pole cavity
	Cobra Wrap	Pole wrap	Copper Naphthanate, Borax	fungicide, pole treatment
	Flourods	Flourods	Sodium Flouride	fungicide, pole treatment
	Flouride Wrap	Flouride wrap	Sodium Flouride	fungicide, pole treatment
Hydrocarbon	Diesel			fuel
	Gas			fuel
	Lube oil			fuel
	Jet B fuel			fuel
	Mineral oil			electrical insulating oil
Herbicides	Garlon 4	Garlon 4	Triclopyr	herbicide for control of weeds and brush
	Glyphosate	Round Up	Glyphosate	herbicide for control of weeds and brush
	Imazapyr	Arsenal	Imazapyr	herbicide for control of weeds and brush
	2,4-D	2,4-D	2,4-D (as amine salt)	herbicide for broadleaf weeds

(a) Toxic to fish. Do not apply in wetlands or in water. Use on Douglas Fir and Western Red Cedar poles only.
(b) Toxic to fish. Do not apply directly to water.

Non-Native Species Priority List

Category 1	**Very High Priority for Control**
Leafy Spurge	*Euphorbia esula*
Nodding Thistle	*Carduus nutans L.*
Scentless Camomile	*Matricaria perforata*
Spotted knapweed	*Centaurea maculosa*
Tansy	*Tanecetum vulgare*
Dalmation Toadflax	*Linaria dalmatica*
Category 2	**High Priority for Control**
Bladder campion	*Silene cucubalis*
Canada thistle	*Cirsium arvense*
Common Toadflax	*Linaria vulgaris*
Annual sowthistle	*Sonchus asper*
Perennial sowthistle	*Sonchus arvensis, Sonchus uliginisus*
Tall buttercup	*Ranuncluls acris*
Blueweed	*Echium vulgare*
Wooley Mullein	*Verbascum thapsus*
White cockle	*Silene pratensis*
Category 3	**Moderate Priority for Control**
White sweet clover	*Melilotus alba*
Yellow sweet clover	*Melilotus officinalis*
Oxeye Daisy)	*Chrysanthemum leucanthemum*
Bluebur	*Lappula squarrosa*
Bull thistle	*Cirsium vulgare*
Caragana	*Caragana arborescens*
Quack grass	*Agropyron repens*

* Source: Banff National Park (April 2000) *Screening for control of thistle through IPM methods*

APPENDIX E

Ecosite Characteristics

APPENDIX E Ecosite Characteristics

Ecosite	Soils and Terrain	Vegetation	Wildlife				
			Ungulates	Carnivores	Small Mammals	Breeding Birds	Amphibians
Montane Ecoregion							
AT1 3c AT1 5c	Slope: 3 (0-5%) complex 5 (5-15%) complex Landform: Fluvial, calcareous, Texture: coarse, Soils: Orthic and Eluviated Eutric Brunisols	(C3) Lodgepole pine/juniper/ bearberry, (C6) Lodgepole pine/ buffaloberry/ showy aster, (C19) Lodgepole pine/buffalo berry/ twin flower	Highly important at all times of the year, especially deer and elk.	Highly important to wolf, coyote, and cougar and mustielids.	Highly important especially to bat survival in the park. High density and diversity of small mammals make ecosite important.	Medium density and diversity of species. Western Tananger, *prefers old coniferous forest and mixed-wood*	
FR1 3 FR1[B] 5	Slope: 3 (0-5%) 5 (5-15%) Landform: Fluvial fans and aprons, calcareous, Texture: coarse stratified, Soils: well drained Orthic and Eluviated Eutric Brunisols	(C6) Lodgepole pine/buffalo berry/ showy aster, (C19) Lodgepole pine/ buffaloberry/ twin flower [(C9) Lodgepole pine/dwarf bilberry between Banff and Johnston Canyon]	Highly important, especially to deer, moose and elk in the winter used as a bedding area.	Highly important, especially to wolf, coyote, cougar and lynx because of high density of prey species- especially in the winter.	High density and diversity of small mammals; the presence of the little brown bat and the bushy tailed wood rat make ecosite important.	High number of species at high densities Cooper's hawk, *clearing of parkland aspen bluffs threatens nesting habitat*	
GA1 6c	Slope: 6 (15-30%) Landform: hummocky colluvial landslide, calcareous, Texture: medium, Soils: rapidly/well drained Orthic Eutric Brunisols, Orthic Regosol	(C6) Lodgepole pine/buffalo berry/ showy aster (C9) Lodgepole pine/ buffalo berry/twin flower (C3) Lodgepole pine/ juniper/ bearberry [(C1)Douglas fir/hairy wild rye, (C16) Aspen/hairy wild rye – peavine] *Steep exposed slopes* – (H19)Bluebunch wheatgrass – hairy wild rye – showy aster	Highly important year round – very highly important to deer year round, and elk in the summer. Varied topography provides a mosaic of open south facing slopes with coniferous cover	Highly important to wolf, coyote and cougar in the summer	Low number of species here. Flying squirrels know to occur – *dependant on old-growth forest cavities*	High diversity and density of species. Pileated Woodpecker *require up to 40 hectares for foraging, preferring undisturbed mature conifer or mixed wood forests* Western Tananger, *prefers old coniferous forest and mixed-wood*	
HD1 3 HD1 5 HD1 6	Slope: 3 (0-5%) 5 (5-15%) 6 (15-30%) Landform: Fluvial fans and aprons, material B, calcareous, Texture: coarse, stratified, Soils: Orthic and Cumulic Regosols	(C16) Aspen/hairy wild rye – peavine (C17) Balsam poplar/ buffalo berry	Highly important especially to elk and deer in the winter – snow accumulation is low	Highly important especially coyote, wolf, cougar, and marten. Moderately important to lynx.	High number of species, high density of Columbian ground squirrels, red squirrels, and meadow voles	Very high diversity and density of species. Cooper's Hawk *clearing of parkland aspen bluffs threatens nesting habitat* Clay-coloured sparrow, *declining numbers* Pileated Woodpecker *require up to 40 hectares for foraging, preferring undisturbed mature conifer or mixed wood forests* Western Tananger, *prefers old coniferous forest and mixed-wood*	Ponds are important breeding sites for wood frogs and long-toed salamander in this ecosite. Long toed salamander *vulnerable to habitat destruction/alteration associated with industrial, recreational and transportation development.*

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				
			Ungulates	Carnivores	Small Mammals	Breeding Birds	Amphibians
HD2 3c (and 3)	Slope: 3 (0-5%) Landform: level fluvial fans or aprons, floodplains, material B, calcareous, Texture: coarse, stratified, Soils: Orthic and Cumulic Regosols	(O3) White spruce/shrubby cinquefoil/ bearberry [(O17) White spruce/juniper/ bearberry, (H8) Yellow dryad – willow herb]	Highly important to ungulates year round, especially deer and elk.	Highly important to wolf, coyote, cougar, and lynx	High diversity of species – only record of northern pocket gopher at Ghost Lakes area in Banff	High diversity and density of species Northern Goshawk, *require maintenance of mature forest breeding habitat.* Western Tananger *prefers old coniferous forest and mixed-wood.*	
HD3 3	Slope: 3 (0-5%) Landform: fluvial fans and aprons, calcareous, often channelled Texture: coarse, stratified, Soils: Orthic and Cumulic Regosols	(C2) white spruce/fern moss (C27) White Spruce/prickly rose/ fern moss (C5) white spruce-Douglas fir/ feather moss (C26) white spruce/buffalo berry/ fern moss	Highly important in autumn and winter	Highly important in autumn and winter to wolf, cougar, coyote and lynx	Moderate number of species	Medium number of species at high densities. Pileated Woodpecker *require up to 40 hectares for foraging, preferring undisturbed mature conifer or mixed wood forests*	
HD4 3	Slope: 3 (0-5%) Landform: Fluvial fans or aprons, material B, calcareous, Texture: coarse, stratified, Soils: Orthic and Cumulic Regosols	*Grassland>subxeric pine* (H6) Junegrass pasture – sage – wild blue flax [(C3) Lodgepole pine/juniper/ bearberry]	Highly important, especially to deer and elk all year round, snow accumulation is low and forage and cover are abundant.	Highly important to wolf and coyote	Moderate number of species including the little brown bat – high densities of red squirrels and deer mouse	Medium number of species at medium densities. Western Tananger, *prefers old coniferous forest and mixed-wood* Clay-coloured sparrow, *declining numbers*	
NY1 7c NY1 8	Slope: 7 (30-45%) complex 8 (45-70%) Landform: Morainal, calcareous, Texture: medium, till C Soils: Orthic Eutric Brunisol > Orthic Regosol	(C1) Douglas fir/hairy wild rye, (C6) Lodgepole pine/buffalo berry/ showy aster	Highly important to deer, elk and bighorn sheep. Provides valuable early spring forage in April and May	High importance especially coyote, wolf and cougar which prey on ungulates	Moderate diversity of species – bushy tailed woodrat recorded here	Low number of species at low densities Western Tananger, *prefers old coniferous forest and mixed-wood*	

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				
			Ungulates	Carnivores	Small Mammals	Breeding Birds	Amphibians
NY3 6c NY3 8	Inclined, gullied, hummocky terrain. Southern Aspects are the warmest and driest in Banff, free of snow most of the year. Slope: 6 (15-30%)complex 8 (45-70%) Landform: stratified drift material B, calcareous, Texture: varied Soils: Northerly – Brunisol Southerly - Regosol	*Strongly influenced by aspect* Northerly: *Spruce – Douglas Fir, pine/buffaloberry* (C5) White spruce/Douglas fir/feather moss, (C19) Lodgepole pine/ buffalo berry/twin flower [(C6) Lodgepole pine/buffalo berry/ showy aster, (C1)Douglas fir/hairy wild rye] Southerly: *open Douglas fir, low shrub-herb meadow, Douglas fir* (O5) Douglas fir/juniper/bearberry, (L1) Shrubby cinquefoil/bearberry – northern bedstraw [(C1)Douglas fir/hairy wild rye, (C3)Lodgepole pine/juniper/bearberry, (O2) Limber pine – Douglas fir juniper/bearberry]	Highly important particularly to deer, elk and bighorn sheep. Valuable winter range (low snow accumulation, abundant forage and cover) and critical early spring forage.	Highly important to cougar, coyote, wolf and marten	High number of species at high densities	Very high number of species at high densities Northern Goshawk, *require maintenance of mature forest breeding habitat.* Western Tananger *prefers old coniferous forest and mixed-wood.*	
PT1 5c PT1 6c	Common on broad valley floors and benchlands and sometimes on lower slopes of valley walls. Ridged or hummocky moraine blankets Slope: 5 (5-15%) complex 6 (15-30%) complex Landform: Morainal, calcareous, Texture: medium till C, Soils: Brunisol, Luvisol	(C6) Lodgepole pine/buffalo berry/ showy aster, (C19) Lodgepole pine/ buffalo berry/twin flower (C1) Douglas fir/ hairy wild rye (C5) White Spruce/ Douglas fir/feather moss (C3) Lodgepole pine/juniper/ bearberry, (C10) Lodgepole pine – white spruce/green alder/ feather moss	Moderately important in the summer and highly important in the winter. Low snow accumulation and abundant forage make it important to elk and deer year round	Very highly important to coyote and cougar in the summer – highly important to coyote and cougar in the winter and to wolf year round. All other species of carnivores have been recorded here.	High number of species occur here including the bushy tailed woodrat, and bats	High number of species in high numbers common raven.	Wandering garter snake (uncommon) has been recorded near Vermillion lakes and the cave and basin; ponds are important breeding areas for long-toed salamander and wood frog. Long toed salamander *vulnerable to habitat destruction/alteration associated with industrial, recreational and transportation development.* Wandering garter snake *require, stable populations dependant on habitat protection and public education.*
PT3 5c PT3 6c	Slope: 5 (5-15%) Landform: ridged moraine, calcarous Texture: medium till and exposed bedrock segments Soil: (dry) Lithic phase Orthic and Eluviated Eutric Brunisols (Wet) Orthic and rego gleysols and terric mesisols	*Dry* (C6) Lodgepole pine/buffalo berry/showy aster (C11) Lodgepole pine/feather moss (C19) Lodgepole pine/ buffaloberry/twin flower *Wet* (C8) Black spruce – Lodgepole pine/willow/sedge (O11) Spruce/Labrador tea/brown moss	Highly important in the winter and of low importance in the summer	Highly important to carnivores, particularly wolf, coyote and cougar. Moderately important to martin and lynx.	Moderate number of species	High number of species at high densities	

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				
			Ungulates	Carnivores	Small Mammals	Breeding Birds	Amphibians
PT5 5c	Common on Broad benchlands throughout montane. 60% well drained mesic, 40% wet (poorly drained hygric) Slope: 5 (5-15%) Landform: ridged moraine, calcarous Texture: medium till (interridge depressions frequently mantled in organic deposits (horizontal fens) Soil: (dry) Orthic and eluviate Eutric Brunisols and Brunisolic Grey Luvisols (Wet) Rego gleysols and terric mesisols	*Dry* (C6) Lodgepole pine/buffalo berry/showy aster (C11) Lodgepole pine/feather moss (C19) Lodgepole pine/ buffaloberry/twin flower *Wet* (C8) Black spruce – Lodgepole pine/willow/sedge (O11) Spruce/Labrador tea/brown moss	Highly important in the winter and moderately important in the summer	Highly important to carnivores, particularly coyote, cougar and lynx	Moderate number of species	High number of species at high densities American Bittern *relies on permanent/semi-permanent wetlands with well developed emergent vegetation* Western Tananger *prefers old coniferous forest and mixed-wood.*	
R + T	(R) Rockland is comprised of consolidated bedrock of all lithologies and in all ecoregions (T) Encompasses areas of a loose, angular, coarse fragment phase of either Colluvium A, B, or C.						
VL1 3	Pools and ponds dot the landscape, poorly to very poorly drained Slope: 3 (0-5%) Landform: ponded fluvial lacustrine, Fluvial, fen, backwater floodplains, calcareous, Texture: fine, stratified fluvialacustrine material B Soils: Gleysol, Organic	*Sedge fen > wet shrubby meadow, wet shrub thicket* (S1) Dwarf birch – shrubby cinquefoil – willow/brown moss, (S7) Willow/horsetail [(O6) Engelmann spruce – subalpine fir/willow/ribbed bog moss, (O11) Spruce/Labrador tea/brown moss] *S1 – surface peat layers* *S7 – active depositional localities*	Highly important especially in winter to elk and moose, in summer its of low importance	Moderately important (highly important to weasels) and in winter to wolf and coyotes	Highly important because of density of species, the presence of bats, muskrats and beavers. Moderate diversity of species – Beaver found in high densities, wetlands areas (like this ecosite) are critical to muskrat survival in the mountains)	Very high diversity and density. Many wetland species. Including the American bittern *relies on permanent/semi-permanent wetlands with well-developed emergent vegetation.* Clay-coloured sparrow, *declining numbers* Pileated Woodpecker *require up to 40 hectares for foraging, preferring undisturbed mature conifer or mixed wood forests* Osprey *require protection of site-specific nests*	Highly important breeding sites for wood frogs, long-toed salamander and western toad. Long toed salamander *vulnerable to habitat destruction/alteration associated with industrial, recreational and transportation development.*
VL3 3c	Wet level floodplains forest and shrub vegetation Slope: 3 (0-5%) complex Landform: Fluvial, calcareous, Texture: fine, fluvialacustrine and coarse stratified, Soils: Poorly drained Regogleysol	*White spruce > wet shrubby meadow, wet shrub thicket* (C4) White spruce/prickly rose/ horsetail, (S1) Dwarf birch – shrubby cinquefoil – willow/ brown moss, (S7) Willow/horsetail	High importance in winter, medium importance in summer	Highly important especially to wolf, coyote, cougar, weasel and lynx.	One of the most important ecosites for small mammals given the density and diversity of species, the presence of bats, beaver and muskrat	Very high diversity and density including the American bittern *relies on permanent/semi-permanent wetlands with well-developed emergent vegetation.* Clay-coloured sparrow, *declining numbers* Pileated Woodpecker *require up to 40 hectares for foraging, preferring undisturbed mature conifer or mixed wood forests* Osprey *require protection of site-specific nests*	Highly important breeding sites for wood frogs, long-toed salamander and western toad. Long toed salamander *vulnerable to habitat destruction/alteration associated with industrial, recreational and transportation development.*

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				
			Ungulates	Carnivores	Small Mammals	Breeding Birds	Amphibians
VL4 3c	Encompasses wet level/gently sloping floodplains, aprons, and fans dominated by forest vegetation. Floodplain surfaces are often eroded (channelled) with slightly elevated gently sloping levees bordering the channels. Slope: 3 (0-5%) complex Landform: stratified fluviolacustrine material B, calcarous Texture: fine Soils: imperfectly to poorly drained Rego Gleysols with surface peat layers	(C4) White spruce/prickly rose/ horsetail, (C28) Balsam Poplar/horsetail (O3) White spruce/shrubby cinquefoil/bearberry accessory	Highly important in the winter and moderately important in the summer – provides important cover (dense spruce stands) for wintering ungulates	Highly important to carnivores, especially to wolf, coyotes, cougar and lynx	High density of small mammals, including muskrats and pygmy shrew, moderate number of species	High number of species at very high densities	
Lower Subalpine Ecoregion							
AL1 3 AL1 5	Slope: 3 (0-5%) 5 (5-15%) Landform: glaciofluvial material B, calcareous, Texture: stratified, Soils: well drained Orthic and Eluviated Eutric Brunisols	(C19) Lodgepole pine/buffalo berry/twin flower accessory vegetation types: (C6) Lodgepole pine/buffalo berry/showy aster (C18) Lodgepole pine/buffalo berry/ grouseberry [(C11)Lodgepole pine/feather moss, (C20) Lodgepole pine/false azalea/grouseberry, (C29) Lodgepole pine/Labrador tea (C9) Lodgepole pine/dwarf bilberry is in southern Banff]	Highly important year round especially to deer and elk in the summer	Highly important to wolf, coyote and cougar in the summer, and to lynx and wolverine year round	Moderate number of species occur at moderate densities	High number of species occur at medium densities	
BK1 5c BK1 6c	Slope: 5 (5-15%) complex 6 (15-30%) complex Landform: Till (C) morainal, calcareous, Texture: medium, Soils: Dry - Brunisol > well drained mesic Luvisol Wet – Gleysol, organic poorly drained	(70% dry) *Pine/buffalo berry complexes* (C18) Lodgepole pine/buffalo berry/ grouseberry, (C19) Lodgepole pine/ buffalo berry/twin flower [(C6)Lodgepole pine/buffalo berry/showy aster, (C20) Lodgepole pine/false azalea/grouseberry] (30% wet*) open spruce, wet shrubby meadow, birch fen* (S1) Dwarf birch – shrubby cinquefoil – willow/brown moss, (O11) Spruce/Labrador tea/ brown moss, (S3) Dwarf birch – shrubby cinquefoil/needlerush	Highly important in the summer, especially to deer, moose and elk. Winter snow depth is too deep for most ungulates except moose in the winter – wet areas especially are highly important to moose in the winter	Highly important to large carnivores especially in the summer – also high number of small mammals make the site important to small carnivores	High number of species	High number of species at high densities American Bittern *relies on permanent/semi-permanent wetlands with well-developed emergent vegetation*. Osprey *require protection of site-specific nests* Clay-coloured sparrow, *declining numbers*	Important to western toad for foraging and breeding (ponds)

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				
			Ungulates	Carnivores	Small Mammals	Breeding Birds	Amphibians
BK4 5c BK4 6c	Slope: 5 (5-15%) complex 6 (15-30%) complex Landform: Hummocky ridged moraine-like glacial landform - ice contact stratified drift B, calcareous, Texture: variable Soils: Dry - Brunisol > Luvisol Wet – Gleysol, organic	(70% dry) *Pine /buffalo berry*, (C18) Lodgepole pine/buffalo berry/ grouseberry, (C19) Lodgepole pine/ buffalo berry/ twin flower ((C3) Lodgepole pine/juniper/ bearberry, (C6) Lodgepole pine/ buffalo berry/ showy aster, (C20) Lodgepole pine/false azalea/ grouseberry, (C29) Lodgepole pine/ Labrador tea *are common accessory vegetation types*) (30% wet) *open spruce, wet shrubby meadow, birch fen* (S1)Dwarf birch – shrubby cinquefoil – willow/brown moss, (O11) Spruce/Labrador tea/ brown moss, (S3)Dwarf birch – shrubby cinquefoil/needlerush	Overall, highly important year round. Very highly important to elk in the summer, highly important to deer in the summer and to moose in the winter (especially wet depressions) winter snow depths limit movement for smaller ungulates.	Very highly important – high densities of lynx, marten, coyote, wolf and cougar.	Moderate number of species but high densities of various hares, and red-backed voles. Flying squirrels (*dependant on old-growth forest cavities)* and bushy-tailed woodrats noted.	High number of species at high densities. American Bittern *relies on permanent/semi-permanent wetlands with well-developed emergent vegetation*. Osprey *require protection of site-specific nests* Clay-coloured sparrow, *declining numbers*	Important breeding for the spotted frog and western toad Spotted frog, *extremely limited in distribution*.
BV1 3c	Common on floors, lower benchlands of broad valleys Slope: 3 (0-5%) complex Landform: occurs on terraces of glaciofluvial, calcareous, Texture: coarse, Soils: Orthic and Eluviated Eutric Brunisols	(C18) Lodgepole pine/buffalo berry/ grouseberry, (C19) Lodgepole pine/ buffalo berry/twin flower [(C9) Lodgepole pine/dwarf bilberry]	Moderately important to deer, elk and moose primarily because of low elevation and association with other more open habitats.	High importance to carnivores although only coyote and lynx are expected to occur in high densities.	Moderate number of species, red squirrel, varying hares, meadow vole and porcupine occur in high densities	Medium number of species at high densities	
BV2 5c	Common on floors, lower benchlands of broad valleys that accommodate large volumes of glacial meltwater. Slope: 3 (0-5%) complex Landform: occurs on terraces of glaciofluvial, calcareous, Texture: coarse, Soils: Orthic and Eluviated Eutric Brunisols	(C20) Lodgepole pine/false azalea/grouse berry (C29) Lodgepole pine/Labrador tea	Low importance despite low snow accumulation – dense forest offers little forage	Moderate importance overall. Highly important to marten.	High number of species, but not at high densities	Low number of species at high densities	

[ ] - accessory vegetation types
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R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				
			Ungulates	Carnivores	Small Mammals	Breeding Birds	Amphibians
BY1 6c	Occurs in valley walls, shoulders and floors. Slope: 6 (15-30%) Landform: Ice contact stratified drift Texture: coarse textured till C Soils: Moderately developed Eutric Brunisols	*Dry* (C14) Engelmann spruce-subalpine fir/false azalea (C21) Engelmann spruce-subalpine fir/tall bilberry/liverwort (C13) Engelmann spruce-subalpine fir/feathermoss *Wet* (O14) Engelmann spruce-subalpine fir/rock willow/bracted lousewort	Low importance due to prevalence of spruce-fir forest and deep winter snow	Moderate importance to most species	Moderate density of species. Red-backed voles and porcupines found at high densities.	High number of species at high densities.	
HC1 3c	Slope: 3 (0-5%) complex Landform: wet Fluvial material B >fen, variable calcareousness, Texture: coarse stratified, Soils: Gleysol>Regosol, Organic Rego Gleysols are dominant Gleyed Cumulic Regosols and Terric Mesisols are subdominant	*Engelmann spruce, open spruce, > wet shrubby meadow, birch fen, sedge fen* Dominant vegetation types: (C32) Engelmann spruce/horsetail/ feather moss, (O6) Engelmann spruce – subalpine fir/willow/ ribbed bog moss Subdominant vegetation types: (S1) Dwarf birch – shrubby cinquefoil – willow/brown moss, (S3) Dwarf birch – shrubby cinquefoil/ needlerush [(O11) Spruce/Labrador tea/brown moss, (H11) Water sedge – beaked sedge]	*(open spruce &birch willow bogs, some ponds and springs)* moderate importance overall, but high importance to moose – shrub lands offer ample forage *(sedge meadow, willow)* low importance – elk graze meadows in all seasons, winter use depends on snow depth	*(sedge meadow, willow)* moderately important to mustelid species but low importance to other carnivores	*(open spruce &birch willow bogs, some ponds and springs)* high number of species at high numbers including the rare water shrew *(sedge meadow, willow)* few species at low to moderate densities	medium number of species at high densities	Bog/pond areas are important breeding habitat for wood frogs and Western toad. Sedge meadow areas important breeding habitat for spotted frog and western toad. Spotted frog, *extremely limited in distribution*
HC4 3	These ecosites are usually mantled in thin fen peat deposits < 1.2 m thick) with gentle linear slopes on level floodplains, aprons and fans Slope: 3 (0-5%) Landform: wet Fluvial material B>fen, variable calcareousness, Texture: coarse stratified, Soils: imperfectly, poorly to very poorly drained soils Gleysol>Regosol, Organic	*Wet shrubby meadow, birch fen, wet shrub thicket, sedge fen* (S1) Dwarf birch – shrubby cinquefoil – willow/brown moss (S3) Dwarf birch – shrubby cinquefoil/needlerush (S11) Willow/timber oat grass, (H11) Water sedge – beaked sedge *In ponded locations*: (S4) Willow – dwarf birch/ fleabane, (S8) Willow/cinquefoil, (S9)Dwarf birch – willow/ Kobresia, (H3) Sedge – saxifrage	Highly important to ungulates especially moose, elk – winter use depends on snow depth	Highly important to carnivores, especially wolf, coyote, cougar and weasels. Moderately important to marten and lynx	High diversity and density of small mammals – Beaver, northern bog lemming, meadow vole and porcupine are important	Very high density of species at high densities. American Bittern *relies on permanent/semi-permanent wetlands with well-developed emergent vegetation*. Osprey *require protection of site-specific nests* Clay-coloured Sparrow *breeding bird surveys indicate sharp population declines* Pileated Woodpecker *require up to 40 hectares for foraging, preferring undisturbed mature conifer or mixed wood forests* Harlequin duck *habitat degradation on breeding streams is a significant threat long-term survival*	Important breeding habitat for the wood and spotted frogs and western toad. Spotted frog, *extremely limited in distribution*

[ ] - accessory vegetation types
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R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				
			Ungulates	Carnivores	Small Mammals	Breeding Birds	Amphibians
ML1 6c	Slope: 6 (15-30%) complex Landform: Morainal blankets overlying bedrock Texture: coarse textured till C Soils: Strongly Eluviated Drystric Brunisols	*Englemann spruce, subalpine fir* (C13) Engelmann spruce subalpine fir/feather moss, (C14) Engelmann spruce – subalpine fir/false azalea (C21) Engelmann spruce – subalpine fir/tall bilberry/liverwort	Low importance to ungulates.	Moderately important to marten, weasels and lynx	High number of species occurs, some in high densities.	High number of species at high densities.	
PP1 3 PP1 3c	Slope: 3 (0-5%) (complex) Landform: Fluvial fans and aprons Material (B), calcareous, Texture: coarse, stratified, Soils: well drained but subject to some flooding - Orthic and Cumulic Regosol	*Pine/buffalo berry, subxeric pine* (C19) Lodgepole pine/buffalo berry/ twin flower, (C3) Lodgepole pine/ juniper/bearberry, (C6) Lodgepole pine/buffalo berry/showy aster	Moderately important to elk, deer and moose.	Highly important to wolf, coyote, cougar and lynx	High number of species occurs, some in high densities.	Medium number of species at medium densities.	
PR2 6c PR2 F 7c PR2[B] 8	Slope: 6 (15-30%) complex 7 (30-45%) complex Landform: Fluvial fans and aprons, calcareous, Texture: coarse stratified material B Soils: Orthic and Cumulic Regosols	(C17) Balsam poplar/buffalo berry, (C16) Aspen/hairy wild rye – peavine	Moderately important year round although snow can limit winter use. All ungulate species have been reported in this ecosite – elk and bighorn sheep most frequent.	Very highly important to carnivores, highly important to marten, weasel and lynx – less important to larger species in the winter because deep snow can limit ungulate use.	High number of species occurs, including the rare pygmy shrew.	Very high number of species at high densities Western Tananger *prefers old coniferous forest and mixed-wood.*	
PR3 7c	Slope: 7 (30-45%) complex Landform: morainal, calcareous, Texture: medium, till C Soils: imperfectly drained Brunisol > Luvisol, (gleyed) Gleyed Eutric and gleyed Eluviated Eutric Brunisols dominate, Gleyed Brunisolic grey Luvisols subdominate. Seeps common	(C18) Lodgepole pine/buffalo berry/ grouseberry, (C19) Lodgepole pine/ buffalo berry/twin flower, [(C10) Lodgepole pine – white spruce/green alder/feather moss, (C11) Lodgepole pine/feather moss, (C13) Engelmann spruce subalpine fir/feather moss, (C14) Engelmann spruce – subalpine fir/false azalea]	Low importance to ungulates, but some tracts may be highly important to moose in the winter.	Moderately important to carnivores, particularly marten and lynx.	Diversity of species including the flying squirrel (*dependant on old-growth forest cavities)* make this site important	Medium number of species at medium densities.	
PR6 R 7c	Found on lower valley floors ro benchlands or lower valley wall slopes - hummocky Slope: 7 (30-45%) complex Landform: ice contact stratified drift B, calcareous, Texture: variable, Soils: Eluviated Eutric Brunisol > Luvisol	(C11) Lodgepole pine/feather moss, (C18) Lodgepole pine/buffalo berry/ grouseberry, (C19) Lodgepole pine/ buffalo berry/ twin flower, (C29) Lodgepole pine/ Labrador tea	Low importance overall, highly important to deer in the summer	Highly important to marten and lynx and to wolf, coyote and cougar in the summer.	Moderate number of species found	High number of species at low densities	

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				
			Ungulates	Carnivores	Small Mammals	Breeding Birds	Amphibians
SB3 8	Slope: 8 (45-80%) Landform: Colluvial slopes, calcareous Texture: medium Soils: Orthicd Eutric Brunisos	*Pine forest* (C3) Lodgepole pine/juniper/bearberry (C6) Lodgepole pine/buffalo berry/showy aster (C20) Lodgepole pine/ false azalea/ grouseberry	Moderately important in winter, especially for moose and bighorn sheep and low importance in summer.	Highly important in winter especially to marten, coyote and wolverine. Moderately important to wolf, cougar, and lynx	Moderate number of species and high densities of varying hares and yellow pie chipmunks.	Low number of species occurring at low densities.	
VD1 5	Relatively stable fluvial fans and aprons. Slope: 5 (5-15%) Landform: noncalcareous, stratified fluvial material Texture: coarse, Fluvial A Soils: Orthic and Eluviated Dystric Brunisols	(C13) Engelmann spruce subalpine fir/feather moss (C14) Engelmann spruce – subalpine fir/false azalea	Low importance to ungulates due to deep snow in winter and little forage.	Highly important, especially to weasel and lynx. Moderately important to wolf, coyote, martin and wolverine.	Moderate number of species on this ecosite. Varying hares, red squirrels and red-backed voles occur in high densities.	Low number of species occurs at low densities.	
VD2 3 VD2 5	Slope: 3 (0-5%) 5 (5-15%) Landform: Fluvial fans and aprons, fluvial material A, non-calcareous, Texture: coarse, stratified, Soils: Orthic, Eluviated Dystric Brunisols	(C19) Lodgepole pine/buffalo berry/ twin flower, (C20) Lodgepole pine/ false azalea/ grouseberry, (C9) Lodgepole pine/dwarf bilberry – *Bow river valley between Lake Louise and Eisenhower Junction)*	Low importance overall, but some tracts are highly important to moose	Highly important to carnivores, especially weasel, marten and wolverine. Moderately important to wolf, cougar, and lynx	High number of species, but none occur at high densities.	Medium number of species occur at low densities	

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				Sensitivities
			Ungulates	Carnivores	Small Mammals	Breeding Birds	
Upper Subalpine Ecoregion							
EG1 6c EG1 8c	Slope: 6 (15-30%) Slope: 8 (45-80%) Landform: Morainal blankets overlying bedrock Texture: coarse textured till C Soils: Strongly Eluviated Drystric Brunisols	*Spruce-fir forest* (C15) Engelmann spruce – subalpine fir/grouseberry (C21) Engelmann spruce – subalpine fir/tall bilberry/liverwort (O10) Engelmann spruce – subalpine fir/heather	Moderately important in summer, especially moose and elk. Low importance in winter due to snow	Highly important, especially for martin. Moderately important for large carnivores.	Moderate number of species with high densities of varying species.	High number of species at low densities.	
PL1 7	Slope: 7 (30-45%) Landform: morainal C, calcareous, Texture: medium, Soils: well drained Orthic and Eluviated Eutric Brunisols	(O10) Engelmann spruce – subalpine fir/heather (C15) Engelmann spruce – subalpine fir/grouseberry (C21) Engelmann spruce – subalpine fir/tall bilberry/liverwort	Moderately important to ungulates, notably elk except in the winter when deep snow restricts use.	Moderately important to carnivores except in the winter when deep snow restricts use.	Moderate number of species occur at high densities	High number of species occur at high densities	
PL5 7c	Slope: 7 (30-45%) complex Landform: morainal C, calcareous, Texture: medium, Soils: well drained Orthic and Eluviated Eutric Brunisols	(O10) Engelmann spruce – subalpine fir/heather (C15) Engelmann spruce – subalpine fir/grouseberry	Moderately important to ungulates, notably deer except in the winter when deep snow restricts use.	Moderate importance to carnivores, which exist in low densities here.	Moderate number of species occur at high densities	High number of species occur at medium densities Harlequin duck *habitat degradation on breeding streams is a significant threat long-term survival*	

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
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X Lithic

Additional Ecosites within the 500 m Buffer

Ecosite	Soils and Terrain	Vegetation	Wildlife				Sensitivities
			Ungulates	Carnivores	Small Mammals	Breeding Birds	
CV1 5c CV1 8	Wet (80%) > dry (20%) landscape Slope: 5 (5-15%) Landform: Dominantly wet seepage affected morainal landforms, ridged or hummocky, non-calcareous, Texture: medium textured till, Soils: Orthic, gleysol, Rego Gleyed Ferro-Humic Podzol,	*Vegetation pattern governed by drainage* (O11) spruce/Labrador tea/ brown moss (O14) Engelmann spruce-sub alpine fir/rock willow/bracted lousewort (S1) Dwarf birch shrubby cinquefoil-willow/brown moss (S3) Dwarf birch shrubby cinquefoil/needlerush	Moderately important in the summer especially to moose – Winter snow depths limit winter use except for moose. All species but bighorn sheep have been recorded here	Very highly important to carnivores, highly important to coyote, marten, weasel and wolverine, moderately important to wolf, cougar, and lynx	High number of species occur, high densities for yellow pine chipmunks, meadow voles and porcupines	High number of species at high densities American Bittern *relies on permanent/semi-permanent wetlands with well-developed emergent vegetation.* Osprey *require protection of site-specific nests* Clay-coloured Sparrow *breeding bird surveys indicate sharp population declines*	Important breeding habitat for Wood frog, spotted frog and western toad. Spotted frog, *extremely limited in distribution*
GT1 F 8c	Valley walls, benchlands, narrow valley floors. Long steep linear slopes are characterised by erosional processes including surface erosion (gullying, sheet erosion and colluviation) and undercutting by streams control the landscape features Slope: 8 (45-80%) Landform: morainal blankets, calcareous, Texture: medium till C, Soils: Orthic Eutric Brunisols > Orthic Regosolic	*Usually open forest* (C3) Lodgepole pine/ juniper/bearberry (O4) Engelmann spruce- subalpine fir – white bark pine –Lodgepole pine (O17) white spruce/juniper/ bearberry	Highly important all year round – elk and bighorn sheep use the site most heavily	Highly important to carnivores, especially to wolf, coyote, cougar – moderately important to marten, lynx.	Moderate numbers of species,	Low number of species at low densities Northern Goshawk, *require maintenance of mature forest breeding habitat.*	
GT2 8	Landscape patterns are strongly influenced by aspect, steepness of slopes, exposure and erosional processes Valley walls, benchlands, narrow valley floors Slope: 8 (45-80%) Landform: inclined and ridged morainal blankets, calcareous, Texture: medium till C, Soils: Orthic Eutric Brunisols > Orthic Regosolic	*Northern Aspect* (C19) Lodgepole pine/ buffaloberry/ twinflower (C6) Lodgepole pine/ buffaloberry/ showy aster *Southern aspect steep slopes* (H14) hairy wild rye-junegrass – bearberry (L1) shrubby cinqfoil/ bearberry-northern bedstraw (O17) white spruce/juniper /bearberry	Very highly important to ungulates year round. Southerly aspects have few trees, but various palatable forage species. Elk and deer are most common, but mountain goat and bighorn sheep occur on some tracts adjacent to exposed rock.	Very highly important to wolf, coyote, cougar and lynx. Low importance to marten, weasel and wolverine	High number of species, some in high densities	Medium number of species at medium densities Northern Goshawk, *require maintenance of mature forest breeding habitat.*	
IB1 5c	Slope: 5(5-15%) complex Landform: Hummocky colluvial landslide deposits, very stony and bouldery Texture: variable calcareous or non-calcareous Soils: well drained Orthic and Eluviated Eutric Brunisols and Eluviated Dystric Brunisols	(C18) Lodgepole pine/buffalo berry/ grouseberry (C19) Lodgepole pine/buffalo berry/ twin flower (C29) Lodgepole pine/ Labrador tea minor amounts of (C1) Douglas Fir hairy wild rye between Johnson creek and Hillsdale	In autumn and winter this ecosite is highly important to deer, moose and elk.	Moderately important to wolf, cougar, wolverine and weasels	High number of species but not at high densities	Low number of species at medium densities	

[ ] - accessory vegetation types
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X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				Sensitivities
			Ungulates	Carnivores	Small Mammals	Breeding Birds	
PP3 5	Slope: 5 (5-15%) Landform: fluvial fans and aprons, calcarerous, Texture: coarse stratified fluvial material Soils: Orthic and Cumulic Regosols	(C13) Engelmann spruce subalpine fir/feather moss - most frequent (C31) Engelmann spruce – subalpine fir/hairy wild rye – heart leaf arnica – twin flower/feather moss – some tracts dominated by this vegetation type. (C26) White spruce/buffalo berry/fern moss (C32) Engelmann spruce/horsetail/feather moss	Moderately important, especially to moose, elk and deer	Highly important, especially to lynx, moderately important to wolf, coyote, marten, weasels, wolverine and cougar	High number of species and high densities of varying hare, golden mantled ground squirrels, deer mice and porcupines	High number of species at medium densities	
PR1 5c	Inclined bedrock on valley walls Slope: 5 (5-15%) Landform: Morainal blanket calcareous, Texture: medium till, Soils: Orthic & Eluviated Eutric Brunisols > Brunisolic gray luvisols	(C11) Lodgepole pine/feather moss (C20) Lodgepole pine/ false azalea/ grouseberry (C29) Lodgepole pine/ Labrador tea	Low importance overall, but of high importance to deer in the winter	Highly important overall since all carnivore species occur here and high densities of wolverine tracks were recorded	High diversity of species including the bushy tailed wood rat and the flying squirrel (*dependant on old-growth forest cavities)*	Medium number of species occur at high densities	
PR4 8 (and c)	Linear inclined slopes Slope: 8 (45-70%) Landform: Slopes are erosional and were formed by the down and side cutting action of creeks and rivers following glacial deposits, calcareous, Texture: medium texture till or varied ice contact stratified drift Soils: Orthic, Eluviated Dystric Brunisols	*Northerly aspects* (C13) Engelmann spruce subalpine fir/feather moss (C14) Engelmann spruce – subalpine fir/false azalea (C21) Engelmann spruce – subalpine fir/tall bilberry/liverwort (C30) Engelmann spruce – subalpine fir/Labrador tea/crowberry (C31) Engelmann spruce – subalpine fir/hairy wild rye – heart leaf arnica – twin flower/feather moss *Southerly aspects* (C3) Lodgepole pine/juniper/bearberry – drier, less stable (C6) Lodgepole pine/buffalo berry/showy aster (C19) Lodgepole pine/buffaloberry/twin flower – drier, less stable (C18) Lodgepole pine/buffaloberry/grouseberry (O4) Engelmann spruce-subalpine fir – whitebark pine – lodgeole pine	Moderately important in winter, low importance in the summer	Highly important to carnivores overall, especially to marten and wolverine	Important diversity of species including the bushy tailed wood rat and flying squirrel (*dependant on old-growth forest cavities)*.	Medium number of species at medium densities.	

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
A Snow Avalanched
X Lithic

Ecosite	Soils and Terrain	Vegetation	Wildlife				Sensitivities
			Ungulates	Carnivores	Small Mammals	Breeding Birds	
SB2A+R 8 SB2 + R 8	Inclined bedrock on steep valley walls and aprons at major slope breaks Slope: 8 (45-70%) Landform: colluvial material blankets, calcareous, Texture: medium textured colluvium C, Soils: Orthic, Eluviated Eutric Brunisols and Orthic Regosols	(C13) Engelmann spruce subalpine fir/feather moss (C14) Engelmann spruce – subalpine fir/false azalea (C21) Engelmann spruce – subalpine fir/tall bilberry/liverwort (C30) Engelmann spruce – subalpine fir/Labrador tea/crowberry (C31) Engelmann spruce – subalpine fir/hairy wild rye – heart leaf arnica – twin flower/feather moss	Moderately important – coniferous forest offers limited forage opportunities, but valuable cover where tracts are adjacent to unforested slopes. Moose and elk most abundant.	Low importance	Low number of species, only the western jumping mouse is in high densities	Medium number of species in medium densities	
SB4 9 SB4X 9	Slope: 9 (>70%) Landform: Discontinuous colluvial blankets and veneers overlying inclined bedrock, calcareous, Texture: medium textured colluvium C, Soils: Orthic, Eutric Brunisols, Orthic Regosols and orthic humic Rogosols	Vegetation types reflect exposed bedrock and unstable soils (O4) Engelmann spruce-subalpine fir – whitebark pine – lodgeole pine (O17) White spruce/juniper /bearberry (C3) Lodgepole pine/juniper/bearberry (L1) Shrubby cinquefoil/bearberry – northern bedstraw	Highly important in fall and winter, but in summer – low importance	Low importance	High number of species, high densities of pika, least chipmunk – bushy tailed wood rat present	Medium number of species at medium densities Northern Goshawk, *require maintenance of mature forest breeding habitat.*	

Source: Holland and Coen (1982) and Holroyd and Van Tighem; Alberta Environment (AENV). 2000. The General Status of Alberta Wild Species 2000. Alberta Environment/Alberta Sustainable Resource Development. Edmonton. Available at www.gov.ab.ca/env./fw/status (Accessed April 5th, 2002); COSEWIC, 2002. Canadian Species at Risk, May 2002. Committee on the Status of Endangered Wildlife in Canada. Available at: http://www.cosepac.gc.ca/pdf/English/Species_at_risk_may_02_e.pdf (Accessed July, 2002)

According to The General Status of Alberta Wild Species 2000:
Species listed blue "May be at risk".
Species listed in gold are "Sensitive".
Species listed in purple are "Secure", however, are considered a valued ecosystem component in the river valleys of the montane ecoregion as the grasslands it prefers are rare in BNP.

Slope Classes	
% Slope	Symbol
0-5	3
5-15	5
15-30	6
30-45	7
45-70	8
>70	9

[ ] - accessory vegetation types
B only within 500 m buffer
R exposed bedrock
A Snow Avalanched
X Lithic

APPENDIX F

Maps