

Grizzly Bear Habitat Mapping for Parks and Conservancies for the North and Central Coast

B.C. Ministry of Environment
Williams Lake BC

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Summary

Grizzly bear habitat mapping for the GAP GBH project followed the methodologies set out in: **MacHutchon, A.G. 2007. Coastal grizzly bear habitat mapping methods, draft 2. B.C. Ministry of Environment, Victoria and Black Creek, B.C. 35 pp.**

The objectives for the project were to develop a database and map product through the use of aerial photographs by identifying critical grizzly bear habitat for early spring, late spring, summer and fall (see Table 1). Winter habitats such as denning areas were not within the scope of this project. The focus of the mapping was on important seasonal feeding habitat with a secondary focus on security habitat for bedding and travel within and adjacent to important feeding habitats. The goal was on identifying and classifying where possible, ecosystem units as per MacHutchon (2001) such as: non-forested wetlands, forested wetlands, estuaries, ocean and foreshore areas with sedges, avalanche chutes, and berry producing areas such as riparian floodplain forests and alluvial fan forests. The relative suitability of the polygons was based on the potential forage availability and distribution within the polygon, ecological characteristics of the seasons and terrain features.

Introduction

The Central Coast LRMP process began in 1996. A conditional agreement was ratified by the table in June 2004 and final recommendations were presented to the Province and First Nations in February 2005.

The South Central table recommendations informed government-to-government discussions between the Province and First Nations with interests in the North and Central Coast. Those discussions resulted in a First Nation and Provincial government *land use decision* announced February 2006, which was followed by the signing of government-to-government agreements. Included in this agreement was a commitment to protect critical Grizzly Bear habitat for occupied habitats.

The minister of Agriculture and Lands formally signed off the South Central Coast order establishing EBM objectives on July 29th, 2007 and shortly thereafter the legal objectives were put into effect.

Included in the July 29th order were specific sections dealing with critical Grizzly Bear habitat under section 17 as follows::

17. Objectives for sensitive grizzly bear habitat

Subject to section 18(2):

(1). Maintain sensitive grizzly bear habitat.

(2). Before altering or harvesting sensitive grizzly bear habitat:

- (a) obtain from a registered professional biologist confirmation that the disturbance will not cause a material adverse impact to the suitability of the sensitive grizzly bear habitat;
- (b) to the extent practicable, prepare and implement an adaptive management plan and monitor the ecological impacts of the proposed forest development; and
- (c) engage in information-sharing or consultation with the applicable First Nation.

Section 18(2), objective 17 of the legal land-use objectives takes effect on or after September 30th, 2007 when a map of sensitive grizzly bear habitat has been completed to the Minister's satisfaction, as demonstrated by the Minister making this map publicly available for the application with objective 17 of this order.

To complete the new critical habitat mapping layer for the South and Central Coast and the North and Central Coast Orders, the project area incorporated the following Landscape Units: Middle and Upper Klinaklini, Smokehouse, Atnarko, Young, Crag, Klekane, Aaltanash, Khutze, Green, Kynoch and Sheep Passage. See Figure 1: Landscape Units for Parks and Conservancy Areas Mapped in the GAPGBH Project and Figure 2: 1:20,000 Map Sheet Grids used in mapping the Upper and Middle Klinaklini Landscape Units below.

Ken Dunsworth, Forest Ecosystem Specialist, WLAP, was the contract monitor of the project.

Parks and Conservancy Landscape Units for the GAP GBH project as seen below:

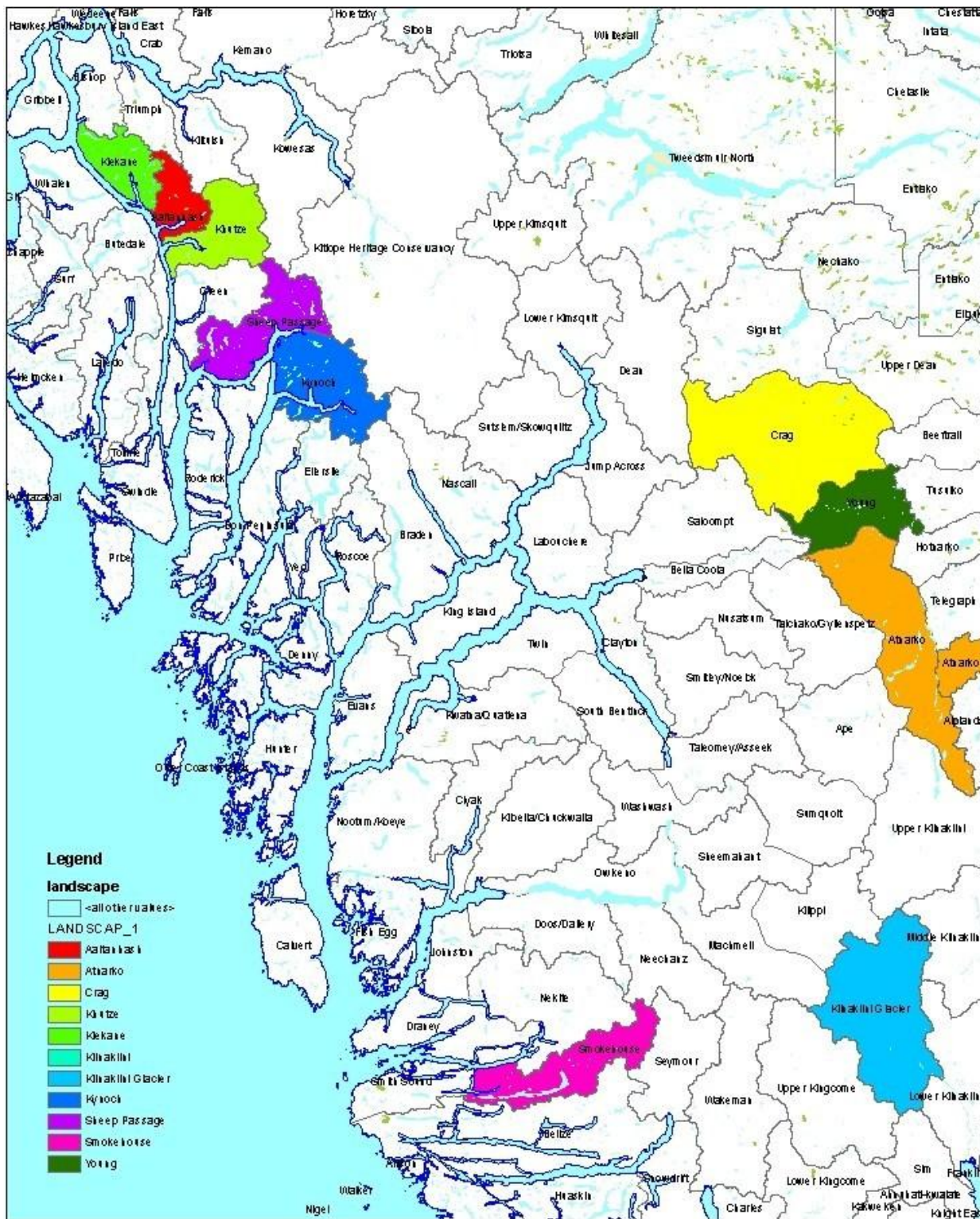


Figure 1. Landscape Units for Parks and Conservancy Areas Mapped in the GAPGBH Project

Methodology

Grizzly Bear Habitat Mapping Objectives

The objectives of this grizzly bear habitat mapping project were:

- to map polygons of critical grizzly bear habitat for early spring, spring, summer and fall (see table 1);
- to delineate ecosystem units within polygons (e.g., site series, wetland site class, non-forested map code) whenever possible;
- to qualitatively evaluate a polygon and rate the suitability on a six-class scale from 1 (high) to 6 (nil);
- to digitize polygon line-work through GIS and link polygon attribute data to the spatial data; and
- to identify post-logging second-growth forests that are candidates for spacing to improve grizzly bear forage quality.

Polygon Mapping

Table 1. Monthly life requisites and general activity of grizzly bears for the Coast and Mountains Ecoprovince (Mapping Methodologies for Important Coastal Grizzly Bear Habitat, MacHutchon 2007).

Month	Season	Life Requisite (RIC 1999)	Grizzly Bear Activity
January	Winter	Hibernating	Denning
February	Winter	Hibernating	Denning
March	Winter	Hibernating	Denning
April	Early Spring	Feeding/ Security & Thermal	Den emergence to valley floor leaf flush to avalanche chute green-up
May	Late Spring	Feeding/ Security & Thermal	Avalanche chute green-up to berry availability
June	Summer	Feeding/ Security & Thermal	Berry availability
July	Summer	Feeding/ Security & Thermal	Berry availability to salmon availability
August	Summer	Feeding/ Security & Thermal	Berry availability to salmon availability
September	Fall	Feeding/ Security & Thermal	Salmon availability
October	Fall	Feeding/ Security & Thermal	Salmon availability to den entrance
November	Winter	Hibernating	Denning
December	Winter	Hibernating	Denning

One thousand, four hundred and seventy-three polygons of class 1 and 2 (See table 2) Grizzly Bear habitat was identified, drawn and rated on aerial photos using methods set by MacHutchon in *MacHutchon, A.G. 2007. Coastal Grizzly Bear Habitat Mapping Methods, Draft 2*. Only polygons that were rated high (1) or moderately high (2) in at least one season were drawn. Up to three habitat types or site series were identified within each polygon for ease of rating determination. A database was created to contain the information obtained from within each habitat polygon as described in table 4. Easily identifiable terrain features and changes to vegetative type determined polygon boundaries. Because grizzly bears use the forests adjacent to feeding habitats for bedding, travel, security and thermal cover (MacHutchon 2000) buffers were included within those polygons around non-forested and forested feeding habitats (eg. Non-forested or forested wetland).

Polygon Line work (on the aerial photos) were sent in Victoria to be digitized by HR GISolutions.

Seasonal Habitat Evaluation

The habitat was analysed for its suitability. Suitability is defined as the ability of a habitat in its current condition to provide the life requisites of a species (RIC 1999). The relative suitability of the polygons was based on their seasonal ecological characteristics, the potential forage availability and distribution within the polygon, and identifiable terrain features. Although the main focus of this project was on foraging habitat, the proximity of human influences was also considered, which may have a negative influence on the seasonal ratings (Stefan Himmer pers. comm.). Seasonal habitat ratings or classes were checked against Grant MacHutchon's generic ratings of habitat suitability for grizzly bears assigned to

ecosystem classes and site series assessed in drainages of the South Coast of B.C. during 1999 and 2000 (MacHutchon 2000). Relative suitability classes are labelled below in table 2.

Table 2. Relative suitability classes for assessing a grizzly bear habitat polygons (RIC 1999).

Class	Suitability	Lower Limit (%)	Upper Limit (%)	Relative Quality
1	High	>75	≤100	Equivalent
2	Mod. High	>50	≤75	Slightly less
3	Moderate	>25	≤50	Moderately less
4	Low	>5	≤25	Substantially less
5	Very Low	>0	≤5	Much less
6	Nil	0	0	Habitat or attribute is absent

Table 3 below describes wetland and estuarine ecosystem units used in the GAP GBH project.

Table 3. Non-forested and forested wetland and estuary ecosystem units for the Coastal Western Hemlock biogeoclimatic zone (taken from MacHutchon 2000).

Ecosystem Realm	Ecosystem Group	Ecosystem Class	Code	Structural Stages
Wetland	Peatland	Bog	Wb	2-7
		Fen	Wf	2-3
	Mineral	Swamp	Ws	2-7
		Marsh	Wm	2-3
Wetland	Peatland & Mineral	Non-forested wetland complex	Wc	1-3
Estuarine	Low	Estuarine marsh	Em	2
		Estuarine tidal flat	Et	
	High	Estuarine meadow	Ed	2
		Estuarine swamp	Es	2-7

Polygon Database

A database was created to record the information collected from the air photo interpretation, refer to table 4 below for all the database fields.

Table 4. Database fields for data capture in the mapping of important grizzly bear habitat. Provincial digital data capture standards are used whenever possible (adapted from RIC 2000).

Name	Description	Database Field
Project Polygon Number	A unique identifying number for each mapped polygon	Poly_Nbr
Early Spring Suitability for Grizzly Bears	Polygon suitability for early spring (April) (see Table 5 or section 5, Table 5.5 in BC MELP & BC MOF 1998).	MURAR_PE
Late Spring Suitability for Grizzly Bears	Polygon suitability for late spring (May) (see Table 5 or section 5, Table 5.5 in BC MELP & BC MOF 1998).	MURAR_PL
Summer Suitability for Grizzly Bears	Polygon suitability for summer (June, July, August) (see Table 5 or section 5, Table 5.5 in BC MELP & BC MOF 1998).	MURAR_S

Name	Description	Database Field
Fall Suitability for Grizzly Bears	Polygon suitability for fall (September, October) (see Table 5 or section 5, Table 5.5 in BC MELP & BC MOF 1998).	MURAR_F
Ecosection	A component of the hierarchical Ecoregion Classification System of British Columbia (see section 1, pg. 38 in BC MELP & BC MOF 1998).	Eco_Sec
Landscape Unit	A three letter code for the Landscape Unit	Land_Unit
Photo Line	The identifying number assigned to flight lines	Pho_Line
Photo number	The arial photo number	Pho_Num
Unit Line	The number assigned North to South in the Landscape Units for each flight line	Unit_Line
Map sheet Number	The number of the TRIM map sheet. If the polygon does not fall entirely within the bounds of one map sheet, then give the number for the map sheet containing the majority of the polygon.	Mapsh_Nbr
Biogeoclimatic Zone	First-rank unit in the hierarchical Biogeoclimatic Ecosystem Classification (BEC) system of British Columbia (see section 1, pg. 31 in BC MELP & BC MOF 1998).	Bgc_Zone
Biogeoclimatic Subzone	Second-rank unit in the BEC system (see section 1, pg. 31 in BC MELP & BC MOF 1998).	Bgc_Subzon
Biogeoclimatic Variant	Third-rank unit in the BEC system (see section 1, pg. 31 in BC MELP & BC MOF 1998).	Bgc_Vrt
Total for Ecosystem Decile	The sum of the deciles within the polygon, should equal 10, or 100% of the polygon.	Sdec_Sum
Ecosystem Decile, Components 1 - 3	The proportion of the polygon covered by components 1 to 3 in deciles.	Sdec_1 to Sdec_3
Site Realm 1 - 3	The Realm is the broadest level of distinction within the ecosystem component and it delineates major biotic types that reflect gross differences in water abundance, quality, and source (see MacKenzie and Moran 2004 or section 1, pg. 19 in BC MELP & BC MOF 1998).	Realm_1 to Realm_3
Site Group 1 - 3	The group designates a broad association of functionally similar ecosystems within a Realm. Ecologically relevant environmental features that have a dominant influence on ecosystem structure are used to differentiate between groups (see MacKenzie and Banner 1999).	Group_1 to Group_3
Site Class 1 - 3	The Class is a more refined division of the Group reflecting ecosystems that have broadly similar vegetation physiognomy, hydrology, and water quality (see MacKenzie and Moran 2004 or section 1, pg. 19 in BC MELP & BC MOF 1998).	Class_1 to Class_3
Site Series Number, Components 1 - 3	Categorises a site based on its ability to produce specific climax vegetation within a particular Biogeoclimatic variant (see Green and Klinka 1994, Banner et al. 1993).	Site_S1 to Site_S3
Site Series Map Code, Components 1 - 3	Categorises a site based on its ability to produce the same mature or climax plant communities within a particular Biogeoclimatic variant.	SiteMC_S1 to SiteMC_S3
Site Modifier, Components 1 - 3	Describes atypical occurrences of the site series in the landscape, including variations in topography, moisture, and site characteristics (see Table 3.2 in RIC 1998).	Site_M1a to Site_M3a
Structural Stage, Components 1 - 3	Structure of the vegetation cover at the time of mapping. The structure of a plant community changes over time, progressing from a pioneer stage to a climax stage (see Table 3.3 in RIC 1998 or section 1, page 16 in BC MELP	Strct_S1 to Strct_S3

Name	Description	Database Field
	& BC MOF 1998)	
Structural Stage Substage, Components 1 - 3	Substages are used to further differentiate structural stages 1 through 3 according to life form, layers and relative cover of individual strata (see Table 3.3 in RIC 1998 or section 1, pg. 16 in BC MELP & BC MOF 1998).	Strct_M1 to Strct_M3
Stand Composition, Components 1 - 3	Differentiates forest stands based on coniferous (C), broadleaf (B) or mixed (M) stand composition.	Stand_A1 to Stand_A3
Site Disturbance Class, Components 1 - 3	The history of a particular site or ecological unit based on the processes leading to the current successional stage (see section 1, pg. 22 in BC MELP & BC MOF 1998).	Distcls_1 to Distcls_3
Site Disturbance Subclass	Modifiers for site disturbance class (see section 1, pg. 22 in BC MELP & BC MOF 1998).	Distcls_1 to Distcls_3
Space	"X" marks the recommendation that the logged area in the polygon needs to be re-stocked to Grizzly Bear stocking standards.	Space
Field check	"X" marks the recommendation that the polygon should be field checked.	Field_Chk
Salmon	"X" marks the presence of salmon in the waterbody.	Salmon
Polygon Specific Comments	Pertinent information regarding the polygon.	Poly_Com
Wetland Complex	The wetland class components of the wetland complex ordered by their abundance within the polygon.	Wet_Comple

Problems and Recommendations

There were several problems in designating the correct site series number and code within the subzone and variant in the BGC zones of the ESSF and IDF. An assumption was made that these BGC's need further research and updated into the Mapcodes of BC. Within these BGC's, floodplains were identified on the aerial photos and polygons drawn. I was not able to label as such, as the ESSF (mw) and IDF (ww) have no site series classification for floodplains. They were consistently labeled as RD or FO, and will have to be re-evaluated in the future. A note was made into the database under the "Polygon Specific Comments" column. A list of BEC variants within the project area is included below in table 5.

Table 5: BEC variants within the GAP Grizzly Bear Habitat Mapping Project area and the map units they occur in. (Adapted from MacHutchon, 2007) .

Bgc_Zone	Bgc_Subzon	Bgc_Vrt	SubzVarPh_Description	Field Guide	Bgc_Zone_Name
CWH	ds	2	Central Very Wet Hypermaritime	PR, Van	Coastal Western Hemlock
CWH	vm	1	Submontane Very Wet Maritime	PR, Van	Coastal Western Hemlock
CWH	vm	2	Montane Very Wet Maritime	PR, Van	Coastal Western Hemlock
CWH	wm	2	Wet Maritime	PR	Coastal Western Hemlock
CWH	ws	2	Montane Wet Submaritime	PR, Van	Coastal Western Hemlock
IDF	ww		Wet Warm	Van	Interior Douglas Fir
MH	mm	1	Windward Moist Maritime	PR, Van	Mountain Hemlock
MH	mm	2	Leeward Moist Maritime	PR, Van	Mountain Hemlock
ESSF	mw		Moist Warm	Van	Engleman Spruce Sub-alpine Fir
CMA	un		Undifferentiated	n/a	Coastal Mountain-

			Parkland		heather Alpine
MS	un		Undifferentiated Parkland	n/a	Coastal Mountain-heather Alpine

Another potential problem exists where polygons may overlap private land boundaries, as may occur in the Atnarko LU.

There is the need for future assessments and ground surveys to verify seasonal habitat polygon composition and ratings.

References

- Banner, A., W. MacKenzie, S. Haeussler, S. Thomson, J. Pojar, and R. Trowbridge. 1993. A field guide to site identification and interpretation for the Prince Rupert Forest Region. B.C. Ministry of Forests, Land Management Handbook No. 26, Smithers, B.C.
- BC MELP and BC MOF. 1998. Field manual for describing terrestrial ecosystems. Land Management Handbook Number 25, B.C. Ministry of Environment, Lands and Parks and B.C. Ministry of Forests, Victoria, B.C.
- BC WLAP. 2004a. Procedures for managing identified wildlife: version 2004. B.C. Ministry of Water, Land and Air Protection, Victoria, British Columbia. 52 pp.
- BC WLAP. 2004b. Accounts and measures for managing identified wildlife: version 2004. B.C. Ministry of Water, Land and Air Protection, Victoria, British Columbia.
- Green, R.N., and K. Klinka. 1994. A field guide to site identification and interpretation for the Vancouver Forest Region. B.C. Ministry of Forests, Victoria, B.C. 285 pp.
- Himmer, S., and D. Power. 2003. A guidebook for grizzly bear wildlife habitat features in coastal British Columbia. B.C. Ministry of Water, Land, and Air Protection and B.C. Ministry of Sustainable Resource Management, Hagensborg and Williams Lake, British Columbia. 37 pp.
http://wlapwww.gov.bc.ca/car/env_stewardship/ecosystems/central_coast/
- MacHutchon, A.G. 2000. Grizzly bear habitat mapping, Central Coast, B.C. B.C. Ministry of Environment, Lands and Parks, Nanaimo, B.C. 94 pp.
- MacHutchon, A.G. 2001. Grizzly bear habitat mapping, Central Coast, B.C. – 2000. B.C. Ministry of Environment, Lands and Parks, Nanaimo, B.C. 100 pp.
- MacHutchon, A.G. 2007. South Central Coast grizzly bear habitat mapping 2007. B.C. Ministry of Environment, Black Creek & B.C. Ministry of Agriculture and Lands, Nanaimo, B.C. 32 pp.
- MacHutchon, A.G., S. Himmer, and C.A. Bryden. 1993. Khutzeymateen Valley grizzly bear study: final report. B.C. Ministry of Forests, Wildlife Habitat Research Report WHR-31 and B.C. Ministry of Environment, Lands and Parks, Wildlife Report R-25, Victoria, B.C. 107 pp.
- MacKenzie, W.H., and A. Banner. 2001. A classification framework for wetlands and related ecosystems in British Columbia: third approximation. Research Branch, B.C. Ministry of Forests, Victoria, B.C. Web document.
<http://www.for.gov.bc.ca/hre/becweb/resources/classificationreports/wetlands/>
- MacKenzie, W.H., and J.R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Research Branch, B.C. Ministry of Forests, Land Management Handbook 52, Victoria, B.C.
- Palfrey, N. 2003. Grizzly bear habitat mapping, Central Coast, B.C., 2003. B.C. Ministry of Environment, Lands and Parks, Williams Lake, B.C. 17 pp.
- Province of British Columbia. 1999. Forest Practices Code of British Columbia, managing identified wildlife: procedures and measures guidebook. Volume I. Province of British Columbia, Victoria, B.C. 180 pp.

- RIC, Resources Inventory Committee. 1998. Standard for Terrestrial Ecosystem Mapping in British Columbia. Terrestrial Ecosystems Task Force, Resources Inventory Committee, Victoria, B.C. 100 pp.
- RIC, Resources Inventory Committee. 1999. British Columbia wildlife habitat rating standards. Version 2.0. Terrestrial Ecosystems Task Force, Resources Inventory Committee, Victoria, B.C. 97 pp.
- RIC, Resources Inventory Committee. 2000. Standard for Terrestrial Ecosystem Mapping (TEM) – digital data capture in British Columbia. Ecosystem technical standards and database manual. Version 3.0. Ecological Data Committee, Terrestrial Ecosystems Task Force, Resources Inventory Committee, Victoria, B.C. 69 pp.
- RIC, Resources Inventory Committee. 2004. Standard for Terrestrial Ecosystem Mapping (TEM) digital data capture in British Columbia. Version 3.0 (2000), Errata No. 1.0. Ministry of Sustainable Resource Management, Resource Information Branch & Resources Information Standards Committee, Victoria, B.C. 9 pp.