

Haley Lake

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ECOLOGICAL RESERVES COLLECTION
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Program
Recreation Division

Victoria, B.C. V8V 1X4

VANCOUVER ISLAND MARMOT INVENTORY - 1986



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Introduction

The Vancouver Island marmot (Marmota vancouverensis) was identified as an "endangered" species in 1979 by the Committee on the Status of Endangered Wildlife in Canada (Munro, 1979). This species is endemic to Vancouver Island and was officially designated endangered by the Provincial Cabinet in 1980.

The distribution and population of the species across Vancouver Island has been under intensive investigation in recent years, with many of the results incorporated into a status and management plan by the BC Ministry of Environment (Munro et al, 1985). New areas are being investigated, reported sightings verified, and known populations monitored on a regular basis. This study is part of these ongoing inventories and was conducted by the BC Conservation Foundation, with funding supplied from the Habitat Conservation Fund and project orientation and supervision by the Ministry of Environment (MOE) in Nanaimo.

MOE management concerns focus on: distribution; reproductive success; stability of known marmot populations; and the viability of the species (ie. whether there is an adequate population sufficiently distributed to be able to withstand some local losses and yet maintain itself over the long term). Eventually, it may be necessary to expand marmot numbers and distribution by transplanting captive or wild marmots.

The 1986 study had two main objectives. The first objective was to monitor numbers and age classes in known marmot areas. The second objective was to identify suitable habitat for transplant programs by defining habitat characteristics of known areas of use, and assessing other areas for their similarity.

It should be stressed that marmots have proven highly adaptable in their choice of habitat, and, judging from the sporadic reports of sightings, they are also capable of existing for years in some localities without ever being detected. Views on the necessity for transplants and the suitability of habitats are constantly changing as investigations continue to unearth more marmots in different areas.

Acknowledgements

This study was carried out by two Conservation Foundation employees with the assistance and guidance of MOE's "marmoteer" G.W.(Bud) Smith. Doug Janz, the Regional Wildlife Biologist and HCF project monitor, directed the project and helped with logistics. Rick Davies regularly reported marmot sightings and provided the photo on the front cover.

Methods

Counts were done on 37 known areas of marmot use between May 22 and September 4. Each site was visited at least 3 times, with at least 2 visits after the emergence of young marmots in late June. The emphasis was on obtaining comparable early morning counts in good visibility, and except for a few weeks of low cloud and rain in July, surveys were possible for most of the study period.

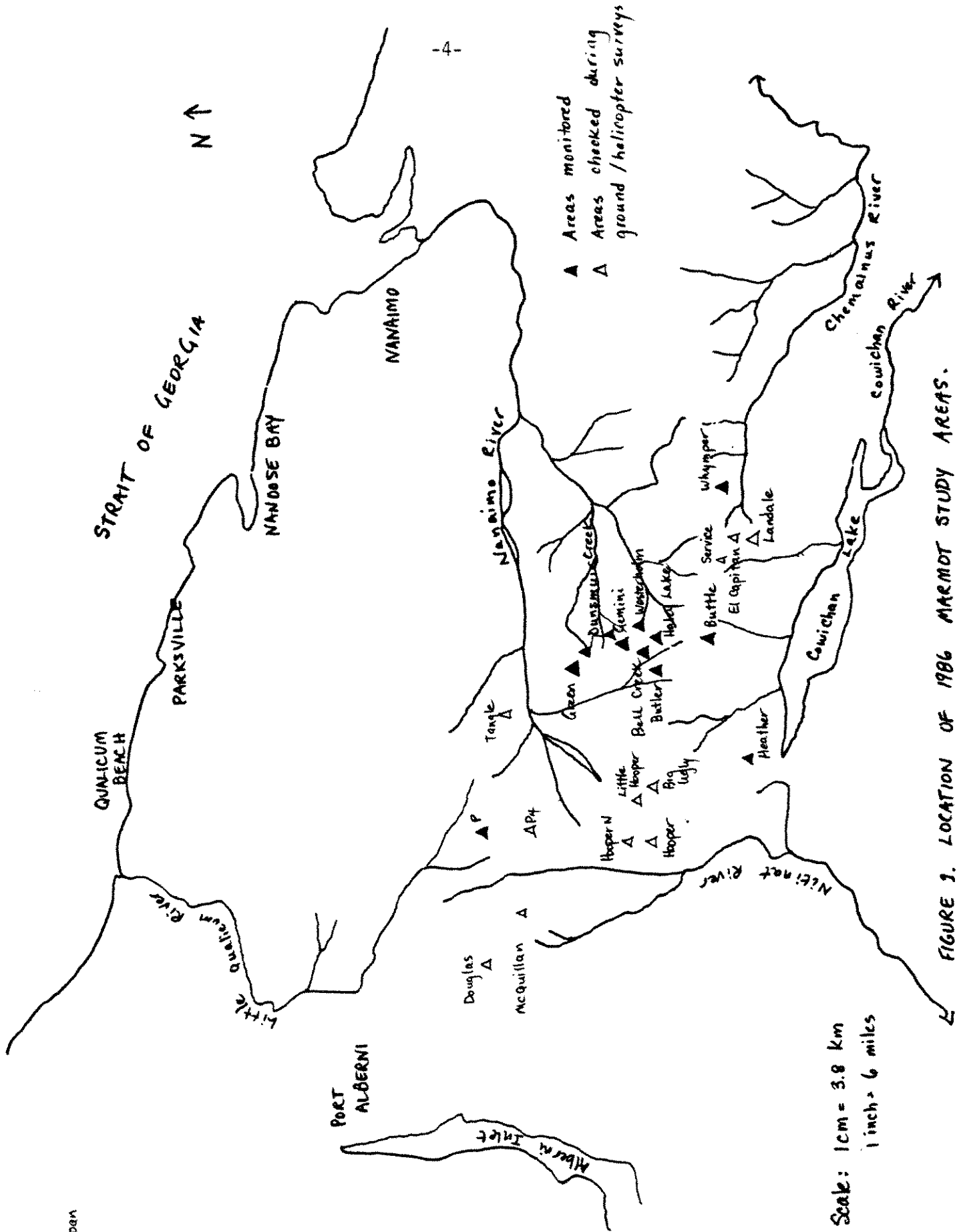
The marmot areas surveyed are located on 10 main mountain and ridge top areas in the south central part of Vancouver Island (see Figure 1), with the exception of Mount Washington, which is located west of Courtenay. Most of the sites lie in the Nanaimo and Chemainus River drainage areas, north of Lake Cowichan. Although the majority of areas are on alpine and subalpine slopes, several clearcut areas were also included.

Areas were surveyed in the same manner as in past years, with observers establishing themselves at vantage points and scanning areas with (10 X 50) binoculars. In past years, a dog was used to further search areas, but in 1986, this technique was only employed until the young appeared (late June). The number, location and age class (when identifiable) of marmots were noted, as were any indications of predators or other disturbances (ie. helicopters).

Habitat characteristics of areas were also described. As details on the slope, aspect, and altitude of marmot areas are already recorded (Heinsalu & Smith, 1982, 1983; Smith et al, 1984; Smith, 1985), this study attempted to define plant community types in areas. Vegetation of some sites such as Haley Lake Bowl was previously investigated and related to marmot use (Milko, 1984), and an attempt was made to derive a similar classification for other areas. The general layout of each site was sketched and plant community types outlined using the most obvious plant species apparent in communities. After an initial investigation, these indicator species proved constant from area to area.

Wildflowers and shrubs known or suspected to be eaten by marmots were also recorded.

Other areas were also investigated, partly to determine whether they were recently used by marmots, and partly to assess their suitability as transplant sites. Three areas were searched in late summer (Mt. Joan, Tangle Mtn., and the Eric Lake area north of Butler peak), and a series of peaks was surveyed from helicopter from the Mt. Whympet area west towards the Nitinat River in early September.



▲ Jean

Results

1. Census

Count results were amalgamated for each area using the same technique as for past MOE inventories. Totals for each area were derived by combining the minimum number of adults (most seen at one time) with the minimum number of young, giving the most conservative population estimate for an area. Table 1 shows the 1986 results compared to the 1984 and 1985 information available for those areas.

Although observers also tried to identify mature and yearling age-groups, the distinction was difficult in late summer, and marmots classed as such in the field were treated as adults in the inventory results.

General findings include:

a) A minimum of 188 marmots were observed over the study areas, with 40 (21 %) of these being young of the year. 1984 surveys in these particular areas found 217 individuals, including 64 young (Smith et al, 1984). In 1985, some of these areas were not visited (Smith, 1985).

b) Marmot counts in subpopulations identified in the MOE management plan were:

Green Mtn -	33
Haley L-Bell-Dunsmuir-Gemini-	79
Butler Mountain-	47
P Mountain-	8
Heather Mountain-	4
Mount Whympere-(& Pat Lake)	12
Mount Buttle-	3
Mount Hooper-	active, but not surveyed
Mount Washington-	2

c) Clearcuts were surveyed on seven sites, with 70 (37%) of the total marmots and 15 (38%) of the total young observed in these cutovers.

d) The 40 young represent 17 family groups, and the first to emerge were seen June 26.

Some changes in distribution and numbers were evident from those recorded last year (Smith, 1985):

- Butler Peak clearcut colony seems to be expanding in numbers and distribution down the slope;
- Green Mountain counts on south slope were slightly low, but the clearcut colony appears to have expanded southward and down the slope;

- Haley Lake clearcut counts expanded dramatically from 1 individual sighted in 1985 to a total of 10 (3 young) in 1986;

- Mount Heather and Mount Buttle counts were slightly lower than in past years, but visibility was poor, as marmots were using areas in or near dense shrubbery and timber.

-P Mountain counts were low but signs of use were seen in all areas.

-Mount Washington mine site had no sign of 1986 use. The ski hill count was low (2), but workers clearing ski runs thought more were present, and the abundant sign would also seem to verify this.

-Pat Lake colony (discovered 1985) seems stable, and the 2 young seen in 1985 were easily identified as yearlings this year.

-Counts in Westerholm Basin have been as high as 17 in the past (1984), and the 1986 count of 5 seems very low, but individuals spotted and heard were very dispersed along the rim of ravines in the area. Mount Whymper and Westerholm Basin both had burrows well into the timbered ravines along the sides of basins. Several burrows at Mount Whymper were concentrated in a small patch of lupine in a timbered gully, and may even have produced a litter, as at least one young was seen on a nearby rocky outcropping in late August.

The apparent increased distribution in the clearcut areas may be due to the patchy location of burrow sites. Burrows in these areas seem to be mainly situated along road embankments and shoulders of creek gullies, and sites might be somewhat limited. Smith (1985) reported 5 litters along a short stretch of road last year at the Butler clearcut colony, and in 1986, this was one of the areas where marmots seem to have dispersed to use more of the road habitat lower down. Similarly, the apparent extension of the Green Mountain clearcut includes more of the ravine near the southern timber line and the landing at the end of the lower road (K47).

Counts in some areas may have been adversely affected by disturbances (ie. predators, helicopters; see Table 2). Wolf scats were abundant, and although most of them seemed to be full of ungulate hair, one very fresh scat was found just in front of the entrance to a marmot burrow at Butler. Bears were abundant on slopes in August (Vaccinium bushes in full berry), and their presence may have kept marmots out of sight (eliciting avoidance behavior rather than alarm calls).

Golden eagles were seen regularly flying over areas and always elicited alarm calls from the marmots. One eagle was observed attacking marmots on Green Mountain, and on P Mountain, ravens were seen chasing an eagle for the length of

the NW ridge area (a few kilometers). It was interesting to note the regular sightings of eagles during nesting season, particularly around Green Mountain and the Butler-Haley Lake-Bell creek area, where marmot colonies are relatively concentrated. Beebe (1974) suggests that golden eagles generally nest in areas which support one or more species of hare or large diurnal rodent species (such as Marmota), which often make up the bulk of their diet during the summer.

Counts may have been affected somewhat by the extremely hot weather throughout August, when temperatures in Nanaimo ranged from about 25 to 34 degrees C. Temperatures in study areas were similar, with hot and dry conditions prevailing for almost 7 weeks. Heard (1977) indicated a reduction in daytime marmot activity when temperatures exceeded 20 degrees C. Although counts were done early in the morning, it was often very warm long before areas were thoroughly searched.

Other areas searched on ground and by helicopter showed some sign of 1986 marmot use. Areas included known colonies and areas of past marmot use, as well as sites suspected to support marmot populations. Results are included in Table 1, and are discussed later on.

2. Habitat Study

Habitat characteristics of each study area are outlined in the Appendices. Generally, all sites had patches of similar communities in different combinations, depending upon exposure and the underlying terrain. Some sites are in more active cliff-slide terrain, whereas others are in more eroded gentler terrain. Patches of meadow are available in all areas, but range from early successional stages on talus slopes to well-developed communities such as Carex-Vaccinium meadows and wildflower meadows.

Community types identified, their more dominant plant species, and examples of each type are outlined in Table 3. With the exception of the clearcut areas, types seem to correspond to those community types described by Milko (1984) for the Haley Lake- Bell Creek area. Some areas were difficult to describe because of the patchy nature of cover, and others were typed slightly different in August when Vaccinium bushes and bracken fern (Pteridium aquilinum) became more obvious. In late spring, types are probably less distinguishable but this was not investigated.

Previous studies of marmot food habits in Haley Lake bowl (Milko, 1984) showed a spring preference for grasses, sedges, phlox (Phlox sp.) and lupine (Lupinus sp.), and a summer preference for wildflowers, with marmots regularly foraging in wildflower meadow areas (Anaphalis-Aster community). This type of meadow, although extensive in Haley Lake, was rare in other areas, and Carex-Vaccinium meadows were more common. Clearcuts and other man-made habitats, although appearing quite different from the higher slopes, seem to have the rough equivalents of slide areas (road embankments), meadows (clearcuts, ski runs) and similar rocky outcroppings.

Plants seen eaten by marmots or browsed in areas of heavy marmot use were considered to be food plants and are listed in the Appendices. Lupine (Lupinus sp), penstemons (Penstemon spp), mountain valerian (Valeriana sitchensis) and giant ragwort (Senecio triangularis) were regularly eaten in meadow areas and it was interesting to note their use in clearcuts when available. At Pat Lake, marmots were observed moving down the slope to the only patch of Senecio in the area. Pearly everlasting (Anaphalis margaritacea) and wild lettuce (Lactuca muralis) were also heavily used along road edges. Both species are characteristic of disturbed sites, and pearly everlasting is also abundant in wildflower meadows. A large sedge common to roadsides (Carex mertenzii) was also heavily browsed, and may have been used for burrow linings, as a marmot was seen carrying a large "bale" of it into a roadside burrow in the Butler clearcut.

Spring forage available in these areas was not investigated, but may be an important factor.

3. Other areas

Several other areas were checked for signs of recent marmot use and assessed for their suitability as transplant sites.

Recent marmot sign was seen at Heart Lake Basin, Mount Hooper, Hooper North, (possibly) Mount Landale, Mount Service, and the Eric Lake area north of Butler Peak (see Table 1). Old burrows were tentatively identified at Little Hooper and Tangle Mountain. Most of the above were known areas of past marmot use, with two exceptions: Mount Service, which lies close to Mount Landale; and the Eric Lake area, which could be considered an extension the Butler Peak colony area. Marmot sign could also have been missed in some areas surveyed only by helicopter, and some of these should be further investigated.

The Landale-El Capitan-Service-Lomas Lake area should be searched further for signs of marmot use and could be a suitable transplant site. The area contains at least two sites of recent marmot use (Mount Landale and Mount Service), and consists of a complex of slides and meadow areas down from a ridge connecting peaks in the area. A similar arrangement exists in the P Mountain-P4 area.

The Hooper-Hooper North-Little Hooper-Big Ugly(W) area has had reports of marmots in all sites in recent years, and future inventories may establish there is already widespread marmot use in the area.

No signs of use were seen in the McQuillan-Douglas Peak area, where the species was first described. Potential habitat was available along the southern ascent to McQuillan, the talus areas east of the peak, and along the southern slope of Douglas Peak.

Tangle Mountain habitat consisted of a patchy arrangement of meadows and bluffs. Meadows have abundant forage and potential burrow sites, but are also invaded by extensive bracken stands. Milko (1984) suggests marmots avoid using bracken areas and this area could be a good site to experiment with habitat enhancement techniques.

Part of Mount Joan was also investigated, but very few patches of potential habitat were seen. Comments on areas explored are in Appendices.

Table 1. Marmot survey results 1984-86 for 1986 study areas
(Total numbers, with number of young in brackets).

Areas surveyed 1986:	Colony No.	(Smith)	(Smith)	
		1984	1985	1986
	(1)			
Butler- Clearcut(K43E)	18	9(4Y)	18(11Y)	21(4Y)
(K43F)	19	6(2Y)	4(2Y)	3
(K43E1C)	35	3	2	2
Above V7	34	2	1	2
SE slide	16	6(3Y)		12(6Y)
West	17	13(4Y)		7(2Y)
Buttle	24	7(2Y)	7(2Y)	3
Dunsmuir- Clearcut(D)	15	5(3Y)	1	5(2Y)
(D13E)	14	15(7Y)	22(12Y)	11(2Y)
(W4)	43			1
Gemini Peak- North	23	11(3Y)	7	8(2Y)
1st divide	44			2
2nd divide	37	4	3	2
Green Mtn- Elk meadow	04	6(4Y)	2	1 (+2)*
Ski hill top	01	5	2	9(1Y)
SE talus	02	2	1	2
NW ridge	03	5	3(2Y)	5(4Y)
West peak	05	2	1	3
South slope	06	5	1	2
Clearcut(K44A)	07	11(5Y)	5	9(4Y)
Haley Lake-Clearcut	45		1	10(3Y)
Bowl	08	18(6Y)	10	22(6Y)
Bell Cr.	09	16(4Y)	12	10(3Y)
Heather Mtn	25	7(3Y)		4
P Mtn -SE bowl	20	5		2
North areas	21	7(4Y)		2
West	22	5(2Y)		1
Northwest ridge	36			3
Washington- Ski hill	40	2		2
Mine quarry	29	4(1Y)	2	0
Westerholm- Clearcut (G2C)	10	5(4Y)	3	1
Basin	11	17(3Y)	7	5
Meadow 1	12	3	1	1
Meadow 2	32	0	0	0
Bell Cr. N.	13	2		1
Whymper- South burn	28	8		4(1Y)
West	39	1		1
Clearcut (Pat L.)	46		8(2Y)	7
Totals:		217(64Y)	124(31Y)	188(40Y)

* 2 Adults seen along old access road to ski lodge (below Elk meadow)

(1) as per Munro et al (1985). Numbers 43 and up designated since 1985.

Table 1. (Continued) Marmot survey results 1984-86.

Other areas investigated:

Helicopter flight Sept. 4/86:

	1984	1985	1986
	(1)		
	Colony		
	No.		
Heart Lake basin	47	2	lookout spots
Hooper	26	7(4Y)	abundant sign
Hooper North	27	1	burrows, lkouts
Little Mount Hooper			old burrows *
Landale	42	2	(old ?) scats *
Copper Creek			no sign *
El Capitan			no sign *
Lomas Lake			no sign
Service	48		lookout spots
Big Ugly			no sign *
McQuillan			no sign *
Douglas			no sign *
P4			no sign *

* promising terrain, possible further ground exploration would have determined some signs 1986 use.

(1) see previous page

Ground Searches:

Tangle Mountain (July 17/86)	possible old burrow
Eric Lake Area (Sept. 2/86)	burrows
Mount Joan (July 19/86)	no sign

Table 2. Potential predators and other disturbances noted in marmot areas surveyed 1986.

	Wolf	Bear	Eagle	Other
<u>Areas surveyed:</u>				
(H= by helicopter)				
Butler- clearcut	(scat)	-	-	2 sharp-shinned h
peak	(scat)*	3	1	-
Haley Lake-clearcut	-	-	1	-
-Bowl	-	-	1	helicopter over
D13E (clearcut)	-	2	-	-
Gemini	(scat)	-	-	-
D (clearcut)	-	-	-	goshawk
Green-clearcut	(scat)	-	-	-
slopes	-	2	-	marsh h.
peak	-	1(killed fawn)	1(attack marmot)	sharp-shinned h
Pat Lake (clearcut)	-	-	1	-
Whymper	(deer kill)	1	1	-
Landale (H)	-	-	feather found	-
El Capitan (H)	-	-	1	-
Buttle	(scat)	-	-	-
Heather	(deer Kill)	5**	-	-
Hooper (H)	-	-	-	Red-tailed h
P Mtn	(scat)	2	1(raven chasing)	marten scat

* scats observed on two occasions- one in front of burrow entrance in rock face of V7 marmot area.

** total of 5 includes 1 sow with two cubs at edge of timber over the ridge from main basin of Heather Mountain.

Table 3. Habitat types observed in marmot areas 1986.
 (* most similar plant community type described by
 Milko (1984))

Habitat Type	Plant Community Type*	Dominant Plants & Comments
ROCK (cliffs, bluffs outcroppings)	PHLOX-MOSS	<u>spreading phlox-moss-lichens- juniper-kinnikinnick</u> -generally unvegetated except for patches of shrub mats, moss and wildflowers -highly variable terrain -examples in all areas
TALUS/MEADOW (alongside loose talus)	(ANAPHALIS- ASTER) **	<u>pearly everlasting-lupines- penstemons-wooly sunflower- indian paintbrush</u> -virtually no soil, patches of flowers -example: P Mtn, along slides & outcroppings
MEADOW	CAREX- -VACCINIUM	<u>low vacciniums-sedge-grasses mountain valerian-lupine</u> -continuous cover, sod development -abund. wildflowers scattered -example: Gemini Peak
WILDFLOWER MEADOW (open S slopes)	ANAPHALIS- ASTER	<u>wildflower-grass-sedge (mountain daisy-harebells- pearly everlasting-wooly sunflowers)</u> -continuous cover, noticeable zones of different flowers -example: Haley Lake Bowl
WET MEADOW (gullies & shady areas)	SENECIO- VERATRUM	<u>giant ragwort(Senecio)- false(indian) hellebore- cow parsnip</u> -bracken invasion common -dense zones very apparent -example: lower meadows of P (south basin)
WET TALUS (large stable mossy boulder groups)	RIBES- HEUCHERA	<u>currants-small flowered alumroot-red elderberry</u> -patches of shrubs and wet meadow types scattered through boulders -example: Buttle

(continued)

Table 3. (Continued) Habitat Types Observed in Marmot Areas.

WET SOILS (seepage areas & ravines)	***	<u>yellow willow-herb</u> <u>ferns- white rhododendron-</u> <u>bog orchids-monkey flower-</u> <u>mountain valerian</u> -examples: ravine & seepage area of Green (south slope)
TALL SHRUB (edges)	***	<u>tall vacciniums-alder-white</u> <u>rhododendron- red elderberry</u> -variable dominant spp -successional stage sometimes invading meadows -example: vacciniums and alder in lower slopes Heather
BRACKEN ****	PTERIDIUM AQUILINUM	<u>bracken fern</u> -invasion into meadows and clearcut -example: Westerholm slash & lower Haley lake meadows
TIMBER	***	variable density and spp. -all areas with some nearby -example: patches alpine fir at Gemini Peak North
DRY CLEARCUT	***	<u>fireweed-vaccinium (red</u> <u>huckleberry)-grasses- pearly</u> <u>everlasting</u> -slopes patchy small shrubs -examples: D, D13E
WET CLEARCUT	***	<u>fireweed- red elderberry-</u> <u>vacciniums- hellebore</u> -majority of slopes with continuous cover -example: Haley Lake clearcut
ROADS	***	<u>pearly everlasting-sedges-</u> <u>grass-wild lettuce(Lactuca)</u> -patches of small plants along embankments - example: all logging roads

** Milko (1984) mentions a disturbed variant of the
Anaphalis-Aster community type which may be similar to this.

*** No equivalent type discussed by Milko (1984).

****Bracken was listed as one of co-dominant species whenever
it was found extensively in meadows, wet meadows, and shrub
areas.

Recommendations:

1. Investigations of reports, ground searches of potential or suspected marmot areas and monitoring of known colonies should be continued.
2. Marmot use of clearcut slopes should be closely monitored, particularly those which seem to be increasing in numbers and distribution across the slopes.
3. Clearcut areas close to known marmot areas should be periodically investigated for signs of use -ie. Marmot areas on Heather, Buttle, Heart Lake, and the northwest ridge of the P Mountain area are all very close to clearcuts.
4. The feasibility of establishing a long-term marking study should be investigated. Such a project may give a clearer picture of movement behavior, colony dynamics and mortality factors. Butler Peak or Green Mountain could be good sites, as these areas have adequate marmot numbers and apparent ongoing dispersal.
5. Intensive ground investigations of possible transplant sites identified in this report should be pursued.

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Appendix I. 1986 Marmot Counts by Area.

(m= large mature adults, ad= unclassified adults,
j= juvenile/ yearlings, y= young of the year,
uc= heard, not seen)

Butler:

Clearcut	May 28	Jun. 24	Aug. 5	Aug. 21	Tally
-K43E	2ad	17ad	10ad	10ad, 4j, 4y, 1uc	17ad, 4y
-K43F		3ad	3ad	2ad	3ad
-K43E1C		1ad	2ad	2ad	2ad
Total:					22ad, 4y

Peak	Jun. 4	Jul. 24	Aug. 14	Tally
-Above V7	1ad	2uc	1uc	1ad, 1uc
-West	1ad	1m, 4ad, 2y	1m, 3ad 1y	5ad, 2y
-SE slide	0	3m, 6y, 2ad	4ad, 2j, 2y	6ad, 6y
Total:				12ad, 1uc, 8y

Buttle:	Jun. 18	Jul. 28	Aug. 11	Tally
-Peak	1ad, 1uc	2ad, 1uc	1ad, 1uc	3ad
Total:				3ad

Dunsmuir Creek:

Clearcut	May 22	Jul. 3	Aug. 8	Aug. 25	Tally
-D road	0	3ad, 2y	1ad	1ad	3ad, 2y
-D13E (&W4)	3m, 1ad, 2j	10ad, 2y	3ad, 2j	1m, 2ad, 3j	10ad, 2y
Total:					13ad, 4y

Gemini:	Jun. 6	Jul. 14	Jul. 25	Aug. 22	Tally
-Peak	4ad	5ad, 1y	4ad, 2y, 2uc	2ad, 1y 1uc	5ad, 2y
-1st divide	1ad	(fog)	2ad	0	2ad
-2nd divide	-	(fog)	2ad	0	2ad
Total:					1uc, 9ad, 2y

Green:	May 27-29	Jun. 25-6	Jul. 29-30	Aug. 19-20	Tally
-Elk meadow	1m	1ad	0	1ad	1ad
-NW ridge	1ad	1ad	1ad, 4y	1ad, 1y	1ad, 4y
-Ski hill	3ad	8ad	4ad	2ad, 2m, 1y	8ad, 1y
-SE talus	1ad	2ad	2ad	0	2ad
-S. slope	0	2m	1ad	1ad	2ad
-West peak	2ads	1ad	3ad	2ad	3ad
Clearcut					
-K44A	3ad	5ad, 3y		4m, 1ad, 4y	5ad, 4y
(ski hill access rd)				2ad	2ad
				Total:	24ad, 9y

Haley Lake:	Jun. 2	Jun. 27	Jul. 23	Aug. 15	Tally
Clearcut					
-Access rd	1ad	5ad	2m, 3ad, 2j, 3y	1m, 3ad, 2j, 3y	7ad, 3y
Alpine	Jun. 2	Jun. 27	Jul. 31	Aug. 18	Tally
-Bowl	10ad	1m, 13ad 6y	2m, 8ad, 4j, 4y	16ad, 4y 1uc	16ad, 6y
-Bell Creek	3ad	7ad	1m, 5ad 2y	3m, 2ad, 3y	7ad, 3y
				Total:	30ad, 12y

Heather:	Jun. 12	Jul. 22	Aug. 13	Tally
-Bowl	4ad	3ad	1uc	4ad
			Total:	4ad

P:	Jun. 9	Jul. 21	Aug. 12	Tally
-South basin	0	0	2ad	2ad
-North area	0	0	1ad, 1uc	1ad, 1uc
-West area	1ad	1uc	0	1ad
-Northwest ridge	-	-	3ad	3ad
			Total:	7ad, 1uc

<u>Pat Lake:</u>	<u>Jul.4</u>	<u>Aug.1</u>	<u>Aug.28</u>	<u>Tally</u>
-Clearcut	7ad	1m,4ad, 2j	7ad	7ad
Total:				7ad

<u>Washington:</u>	<u>Jun.16</u>	<u>Jul.7</u>	<u>Aug.9/17</u>	<u>Tally</u>
-Mine	0	0	0 (9th)	0
-Ski Hill	-	1ad,1uc	1ad(17th)	1ad,1uc
Total:				1ad,1uc

<u>Westerholm:</u>	<u>Jun.3</u>	<u>Jul.8</u>	<u>Aug.7</u>	<u>Aug.26</u>	<u>Tally</u>
Clearcut					
-G2C	0	1ad	1ad	0	1ad
Slopes:					
-Meadow 1	1ad	0	1ad	0	1ad
-Meadow 2	0	0	0	0	0
-Basin	5ad	4ad,1uc	2ad	2ad,2uc	5ad
-Bell Cr.N.	0	1uc	0	0	1uc
Total:					7ad,1uc

<u>Whymper:</u>	<u>Jun.10</u>	<u>Aug.6</u>	<u>Aug.27</u>	<u>Tally</u>
-South burn	1m,1ad	1uc	3ad,1y	3ad,1y
-West burn	1ad	0	-	1ad
Total:				4ad,1y

1986 TOTAL: 188 (40Y)

Appendix II. Habitat Descriptions of Marmot Areas Surveyed
July-August 1986.

NOTE: For the sake of text brevity, mostly common names of plant species were used and were often abbreviated. For example, kinnickinnick, or Arctostaphylos uva-ursi, was referred to as "kinnick" in the text. Other common abbreviations used include:

mtn	mountain
t blackberry	trailing blackberry
b raspberry	black raspberry
cat's ear	hairy cat's ear (<u>Hypochaeris</u> sp.)
arnica	broad-leafed arnica
leutkia	partridge foot (<u>Leutkia pectinata</u>)
y willow herb	yellow willow herb (<u>Epilobium luteum</u>)
hellebore	indian or false hellebore
p everlasting	pearly everlasting
senecio	giant ragwort (<u>Senecio triangularis</u>)
w rhododendron	white rhododendron
thistles	mainly edible thistle (<u>Cirsium edule</u>)
lactuca	wild lettuce (<u>Lactuca muralis</u>)
m valerian	mountain valerian
w sunflower	wooly sunflower
vacciniums	unspecified <u>Vaccinium</u> spp.

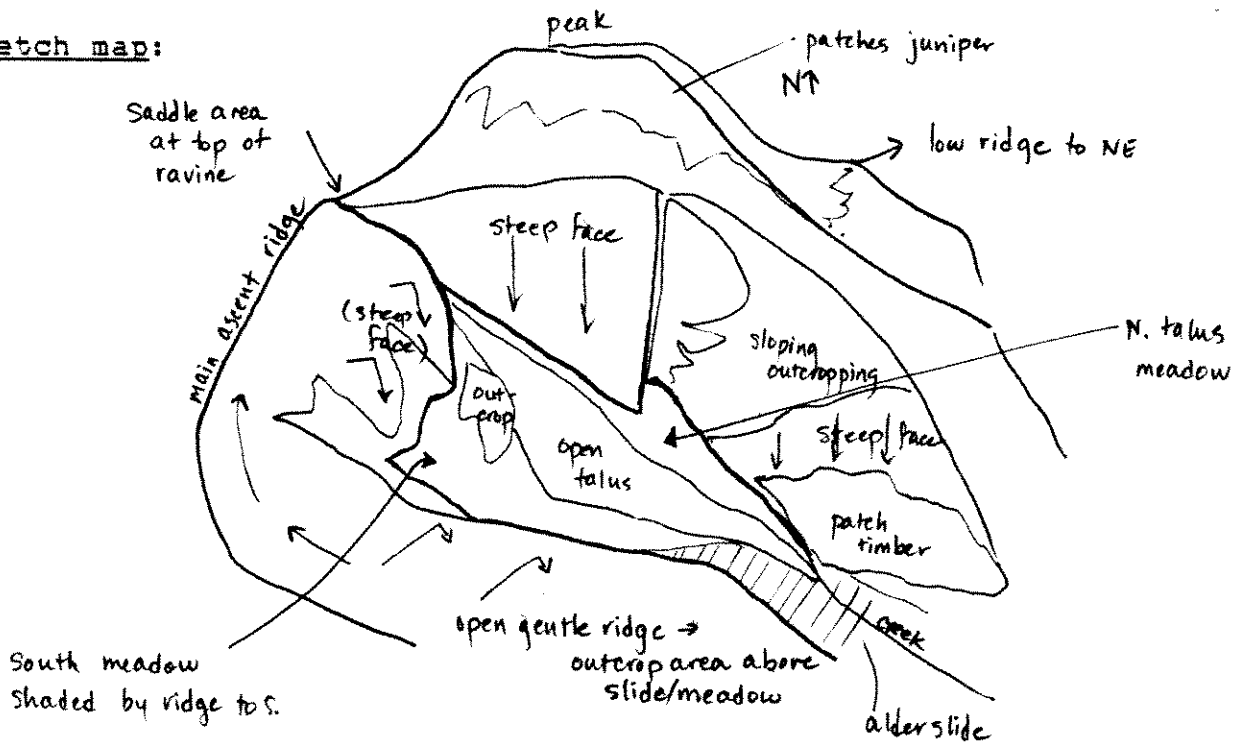
Vancouver Island Marmot Habitat Assessment

Code name of site: Butler Peak- SE slide area

General location: On SE face of peak, encompassing creek gully from edge of timber up to peak. Faces SE.

General layout of known marmot areas: Extensive slide area stretches from access ridge below peak, down to alder slide area. Vertical rock faces overlook the area from the peak and ridge side. Open talus down center of slide, dense vaccinium meadows mid-way down on more shaded south side, and patches of talus wildflowers on northern side, against backdrop of cliff face.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
talus /meadow	-patches of p. everlasting/lupines/penstemon -vacciniums and bracken more abundant lower down near edge of alder slide
meadow	-vaccinium/hellebore/bracken - much wetter area dominated by shrubs on southern more shaded side -very similar area in narrow crevice at top of slide -cow parsnip/yarrow/ sedges /valerian also present

cliffs

- mainly unvegetated, series of ledges descending down into slide area
- patches of vegetation on peak slopes (juniper/kinnick/phlox/saxifrages)
 - patches of wildflowers present in early summer(lupines/tiger lilies/paintbrush), but very dry by late summer
 - areas very dry by August

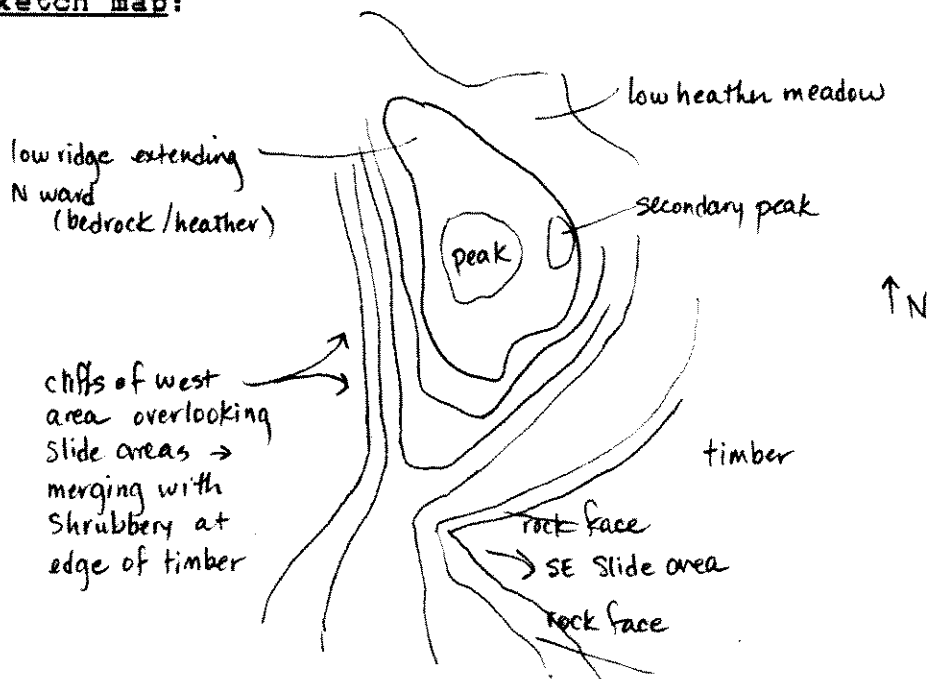
Vancouver Island Marmot Habitat Assessment

Code name of site: Butler Peak- West

General location: To NW of ascending ridge just S of Peak

General layout of known marmot areas: Rock face down from ridge overlooks meadow and open talus area.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
meadow	-vaccinium/grasses/sedges with hellebore/senecio in wetter areas -tiger lily/ valerian/ paintbrush abundant and copperbush noticed August -slide areas with patches wooly sunflowers
bluff/cliffs	-mix of Phlox/juniper/hemlock/kinnick/and many wildflower spp. - more shaded than SE slide area.

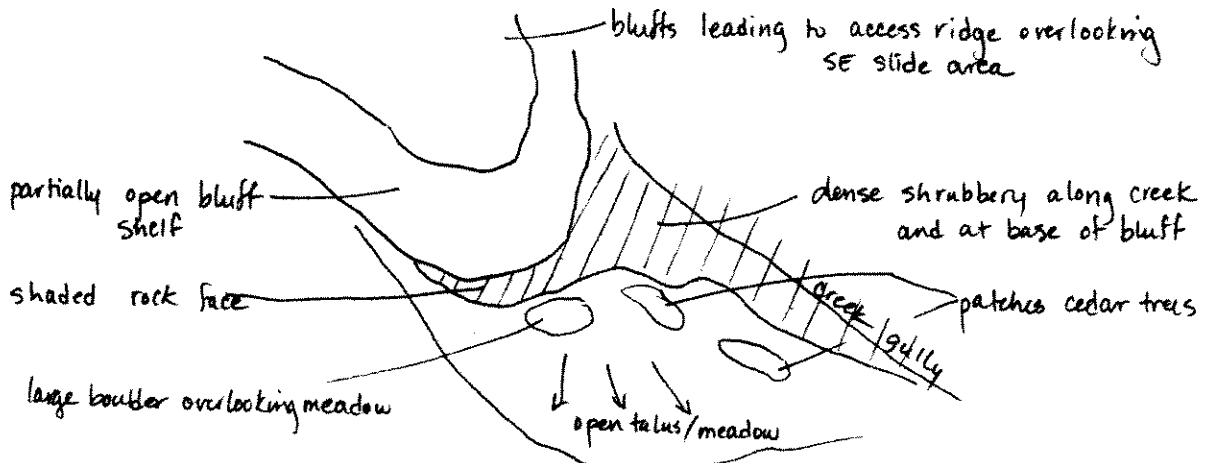
Vancouver Island Marmot Habitat Assessment

Code name of site: Butler Peak- Above V7

General location: Below timbered bluffs to SE of peak. Access through timber up to main access ridge crosses area. Faces SE.

General layout of known marmot areas: Small dry talus/ meadow lies below low timbered outcroppings at base of main bluff areas. Area merges with alder/bracken area downhill, and has patches cedars throughout.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
talus/meadow	-partially open small talus, irregular patches of p. everlasting/ lupines/ thistles -bracken downhill into alders -strawberry/pussytoes at base of bluff
bluffs	-bottom of bluffs shaded with many deciduous shrubs (maple/currants/alder), tops exposed and typical of bluffs in area.

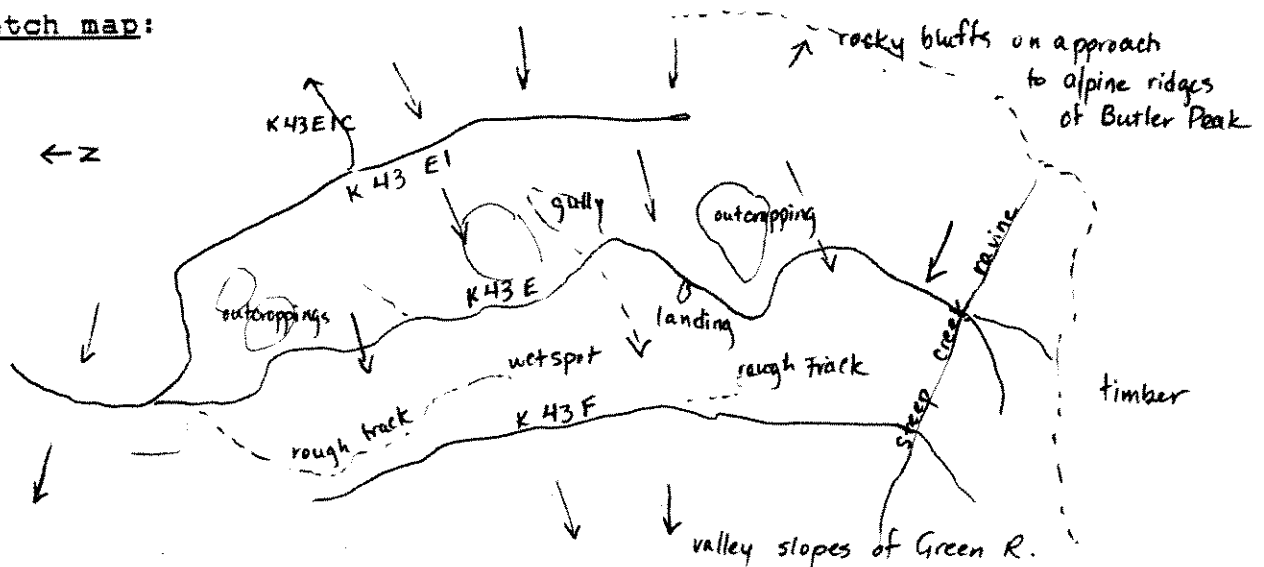
Vancouver Island Marmot Habitat Assessment

Code name of site: Butler Mountain- Clearcut area

General location: To NNW of Butler Peak, W of Eric Lake, and overlooking the valley sides of Green River. Faces W.

General layout of known marmot areas: Area includes logging roads and slash in vicinity of roads K43E1, K43E1C, K43E and K43F towards their S end. Majority of slash with some understory cover.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
dry clearcut	-fireweed/b.fir/m.hemlock/vaccinium -west-facing slopes logged between 1976-83 -lot of slash still present on slopes -many patches sedges/p.everlasting/lactuca in dry areas (ie. along roads) -some patches currants/elderberries/indian hellebore in wetter areas (ie gullies) -steep creek ravine intersects roads at S end

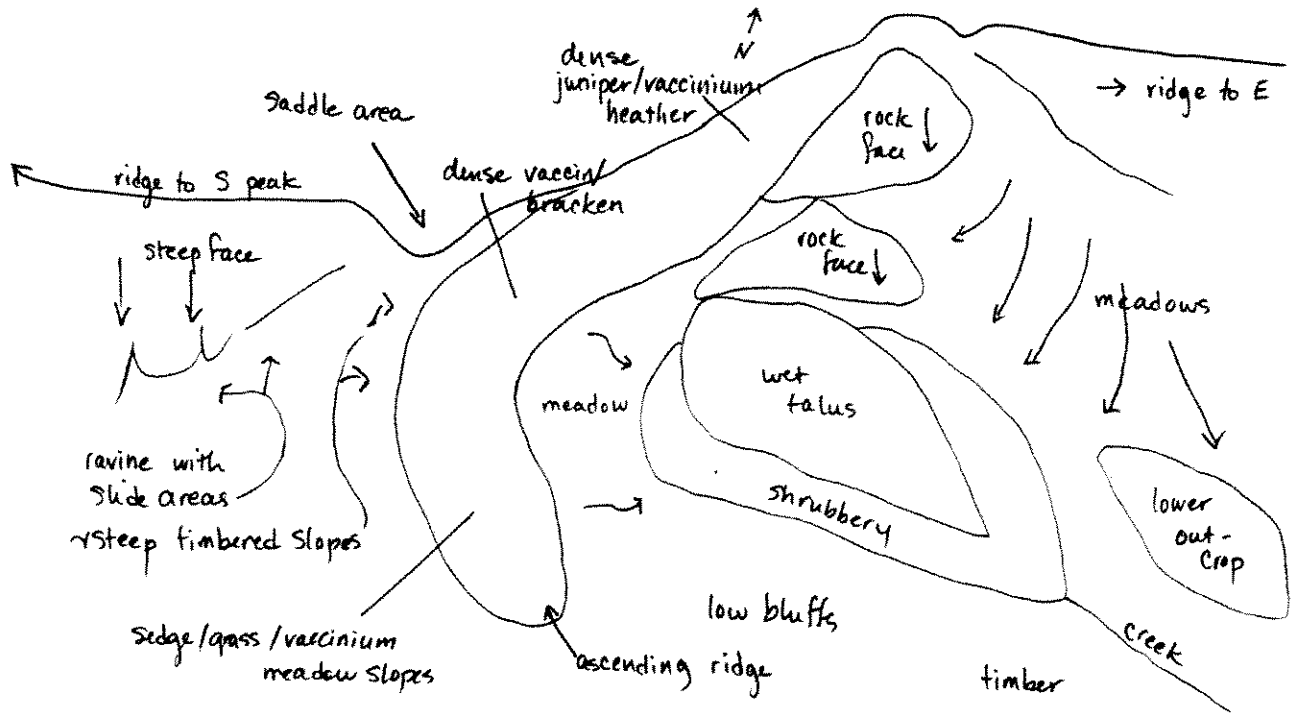
Vancouver Island Marmot Habitat Assessment

Code name of site: Mount Buttle

General location: Areas to S and SE of peak ridge of Mount Buttle.

General layout of known marmot areas: Top of Mount Buttle consists of a S peak and E peak, connected by an E-W saddle area. Marmot areas consist of wet talus and meadows located just below SE face of the E peak, and talus slides down below the E-W saddle area. Almost all open slope areas except wet talus area covered in dense meadows.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
meadow / bracken	<ul style="list-style-type: none"> -grass/sedge/vaccinium/bracken mix on slopes down from ridge and around talus area -vaccinium more dominant further down slope, and more obvious throughout the area in August -also patches of hellebore/senecio and many wdflwrs (ie.mtn valerian/thisles/mtn daisy) - meadows to north of talus extend far downhill into outcropping area, scattered boulders

- wet talus -mainly moss/lichen-covered large boulders with patches shrubs and leafy vegetation in hollows
-currant/elderberry/hellebore/senecio/m valerian/ferns
-probably only 30% cover, but plant spp. similar to wet meadow spp, and merges with dense shrubbery at edge of trees (heather/vaccinium/ rhododendron)
- rock face -vertical, unvegetated rockface overlooking talus/meadow area.
-ascending ridges either side of above densely covered with shrubs (vaccinium/bracken mix lower down; juniper/heather/vaccinium higher up at peak)
-many wildflwrs in shrub areas (paintbrush/lupine/penstemons/tiger lily)
- talus/meadow -slide areas down (SW) from saddle area consist of large boulder talus slope with associated patches of greenery, but area not typed
- other areas -top of saddle area is open and slopes gently up to S peak. Many large boulders, snow melt areas scattered throughout.

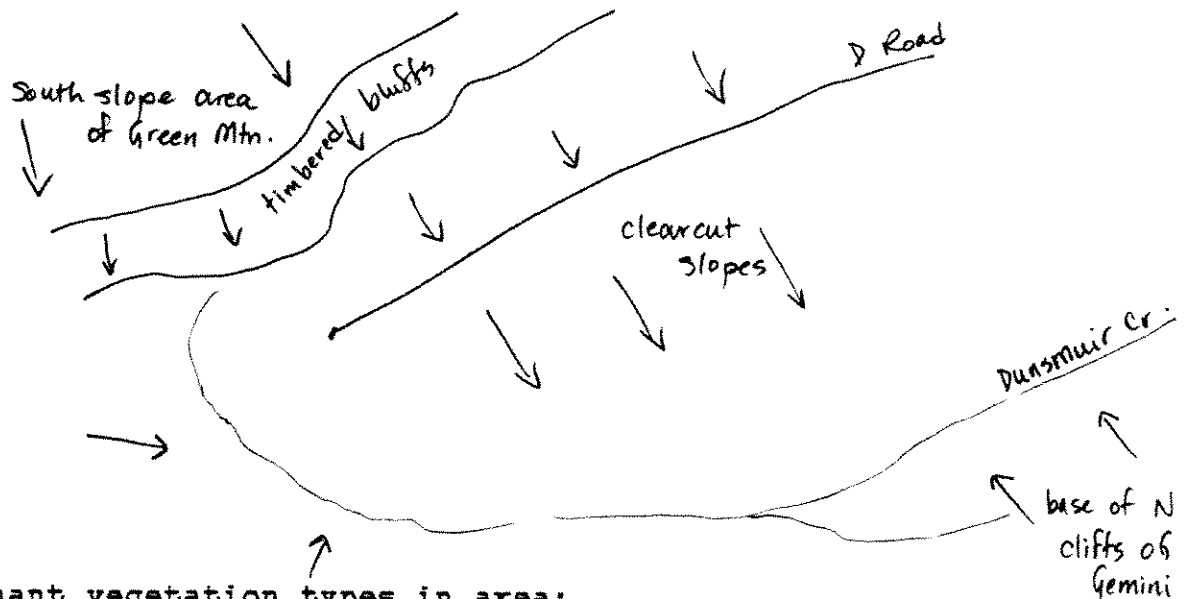
Vancouver Island Marmot Habitat Assessment

Code name of site: Dunsmuir Creek- D Road clearcut area

General location: Logging slash along N branch of Dunsmuir Creek between Green Mountain and Gemini Peak. Faces SE.

General layout of known marmot areas: Timbered bluffs below Green Mtn-south slope area overlook clearcut above end of D Road. Slopes with very little cover.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
dry clearcut	-generally uniform dry slash-covered slopes logged 1967-68 -sparse covering of plants -tree sp present: w.hemlock/ y.cedar/r.alder/d.maple -shrubs:vaccinium/t.blackberry/b.raspberry elderberry -forbs: cats ear/ p.everlasting/fireweed/ grasses -grasses lush in May, fireweed full bloom in August

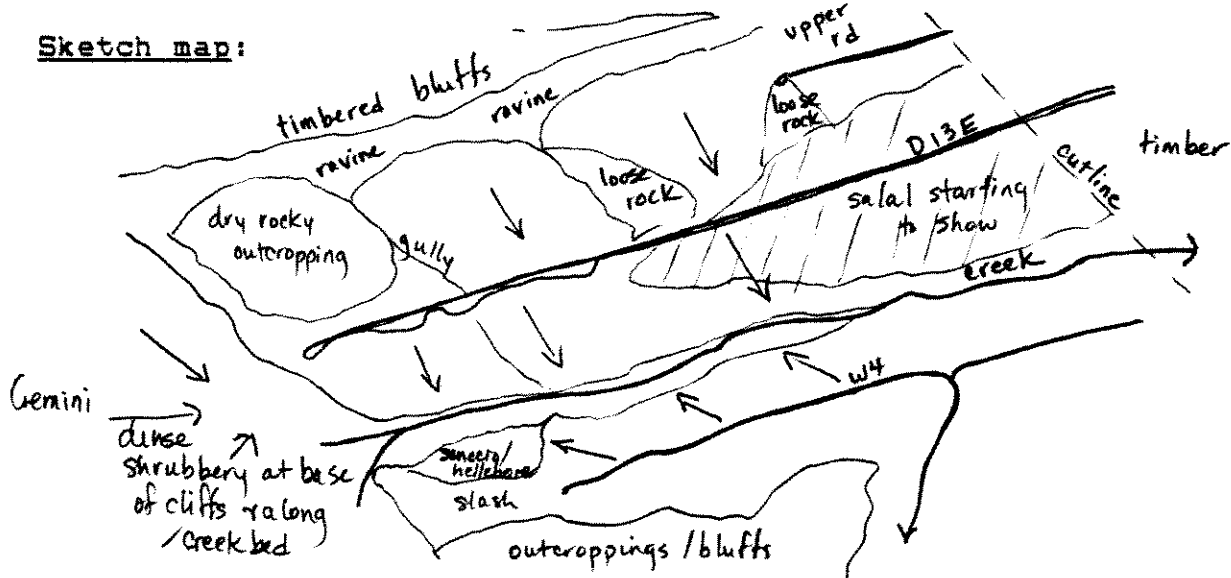
Vancouver Island Marmot Habitat Assessment

Code name of site: Dunsmuir Creek- D13E Clearcut area

General location: Logging slash along the middle branch of Dunsmuir creek, E of Gemini N peak.

General layout of known marmot areas: End of D13E road extends out from timber cut lines to E to timbered slopes of Gemini ridge tops to W. Timbered bluff/ravine area uphill is part of ridge which extends NE from Gemini peak. Area faces SE. Road W4 lies across creek and parrallel to D13E. Majority of slopes with patchy cover.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
dry clearcut	- dry slash-covered slopes logged 1979-80, still sparsely vegetated -fireweed/grass/vaccinium, with patches wildflwrs p.everlasting/lupines/lactuca/thistles and grasses -red huckleberry most dominant shrub -salal beginning to grow in on the easternmost sections of slash area -rocky outcroppings/talus in some areas
riverine	-r.alder/maple/devil's club/some remnant timber - wet areas on south side of embankment with patches salmonberry/hellebore/senecio

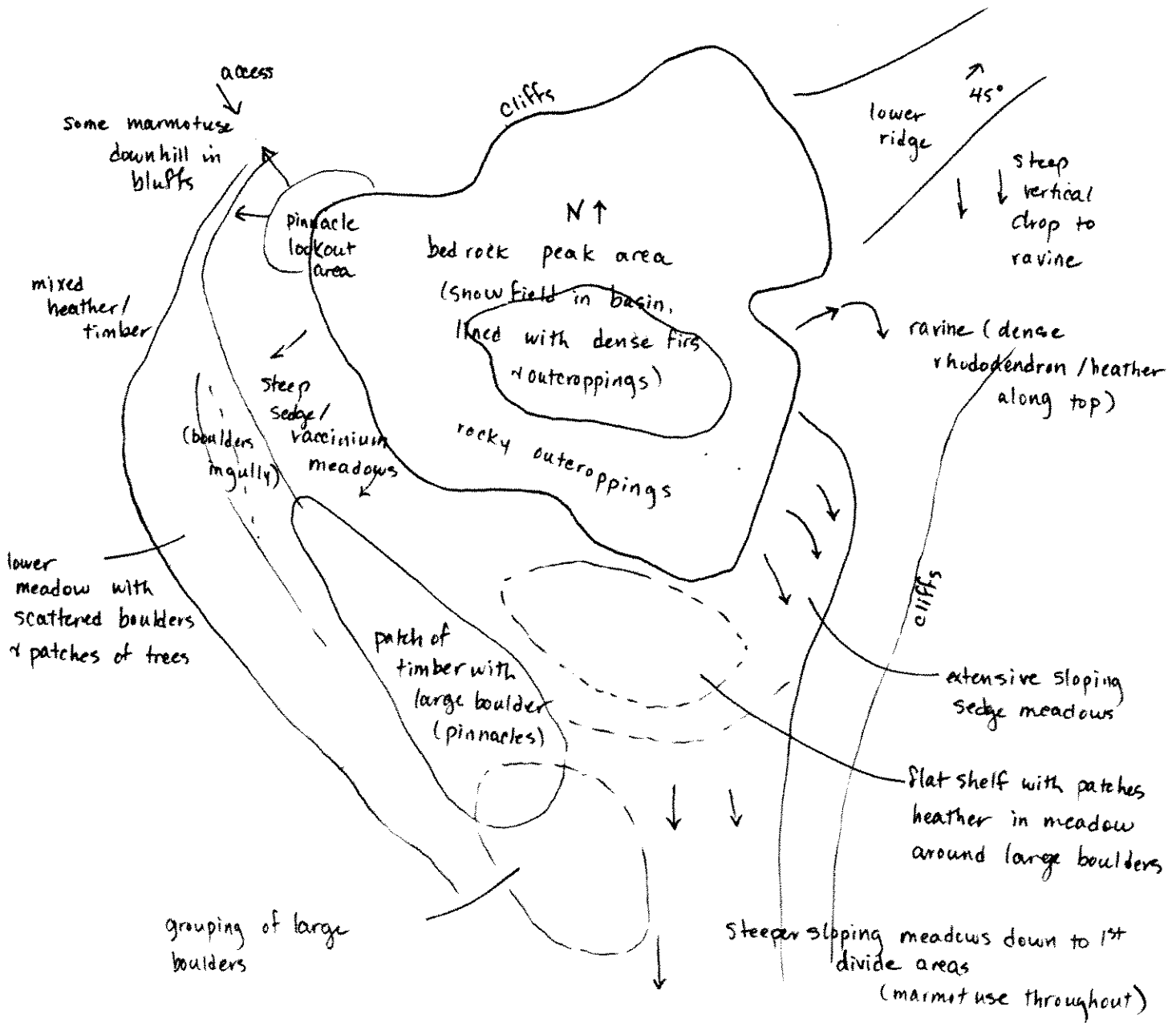
Vancouver Island Marmot Habitat Assessment

Code name of site: Gemini Peak- North

General location: N peak of Gemini and slopes southwards to area of first divide (towards secondary peak)

General layout of known marmot areas: Extensive meadows stretch from partially-timbered outcroppings surrounding the peak down to the SW, S & SE and are partly divided by patches of timber and large boulder groupings. Wet meadows found in lower SW slopes and shaded areas around outcroppings. Terrain lower down towards first divide is irregular.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
meadow	-sedge/vaccinium/grass/ m valerian -abundant wildflowers throughout (lupines/paintbrush/tiger lily/mtn dandelion/arnica/penstemons/strawberry) -predominate type in "motherlode" area with some variations : patches of red heather in flatter areas, pure sedge stands to SE, more of a juniper/vaccinium mix on steeper slopes near outcroppings, and dense patches of m.valerian rosettes (July/August) -boulders scattered throughout meadows and in irregular groupings throughout mixed timber/meadow slopes down to divide
wet meadow/ bracken	-hellebore/bracken/senecio -same general mix wldflwrs as above -in areas shaded by timber/outcroppings from direct south exposures (ie. in lower SW meadow, N side patches of timber, shaded gullies around rocky outcroppings)
outcroppings	-generally unvegetated in NW pinnacle area, mats of kinnick/juniper/lupines in open areas overlooking "motherlode" area, and dense rim of alpine fir/juniper/rhododendron/heather rimming peak bedrock area higher up -many wildflowers dotted throughout open juniper/kinnick areas also in meadows nearby
bedrock	-peak area exposed bedrock, with patches white heather/leutkia/red heather/sedges around snowmelt areas and gullies -gully on E side (marmot seen) with patches sedge/hellebore/heathers/lupine/paintbrush
lower slopes	-not typed, highly variable (some small rock face/talus areas to SE,mixed timber/ heather/vaccinium/meadow to S, mainly timber to SW
timber	-alpine fir/mtn hemlock

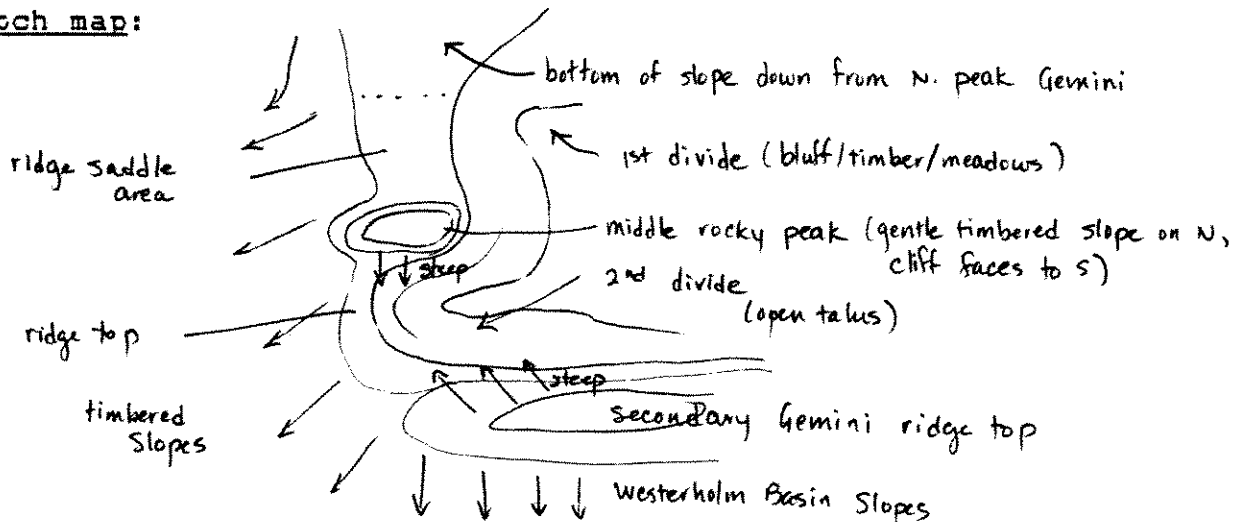
Vancouver Island Marmot Habitat Assessment

Code name of site: Gemini Peak- south divides

General location: South of main peak of Gemini, along ridge towards secondary peak.

General layout of known marmot areas: Ridge extends S from N peak through saddle area (1st divide) over a small timbered rise and into 2nd divide at N end of secondary peak ridges extending SE. Areas face S, SE and E.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
First divide (bluff areas interspersed with trees/meadows on N side; on S side, terrain much more broken, with scattered boulders and bluffs; saddle area to W with snow melt areas, sedges, patches heather)	
bluffs	-better forage on N side -juniper/kinnick
timber	-alpine fir/mtn hemlock/yellow cedar
meadows	-grass/vaccinium with some lupines/hellebore/ & tiger lily
Second divide (extensive talus slope/large boulder slide areas on E side of ridge, slightly more shrubbery on saddle area and steeper divide, similar vegetation to 1st divide)	
	-vertical faces on N overlooking extensive talus slide with direct S exposure
	-similar vertical drop from southern ridge overlooking more shaded large boulder talus to N

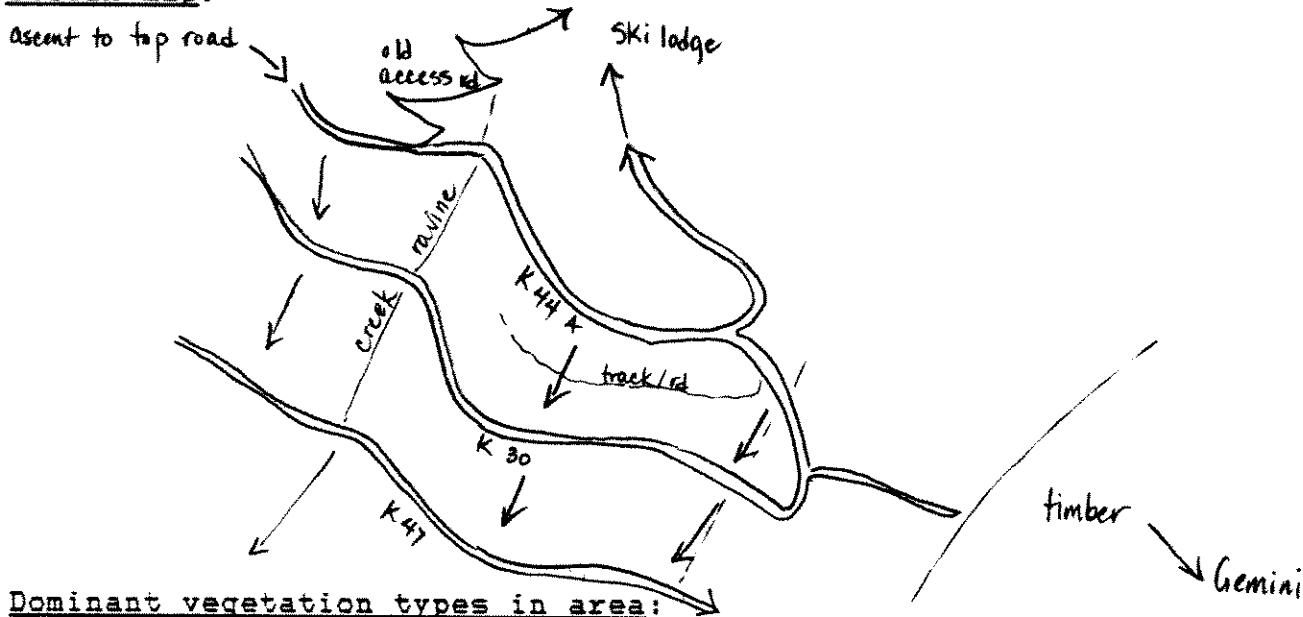
Vancouver Island Marmot Habitat Assessment

Code name of site: Green Mountain -Clearcut area

General location: Access roads to Green Mountain ski lodge, just at top of clearcut area.

General layout of known marmot areas: Area includes clearcut slopes below the ski lodge around roads K44A, K30, and K47. Majority of slash with some partial cover, with more lush areas associated with creek gullies (ie at NW end of area and along S edge of clearcut). Area faces S & SW and overlooks valley of Bell Creek .

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
clearcut (dry)	<ul style="list-style-type: none"> -lower slopes logged in 1977 (below K47), higher slopes cut 1980-85 , lot of wood debris still on site -predominately fireweed/ small firs/ vaccinium -similar to other clearcut slopes of area -steep ravines with dense y willow herb/ ferns/monkey flower -patches hellebore/grass in gullies -ski lodge and old access rd separated from slash by patch of timber -area very dry by August

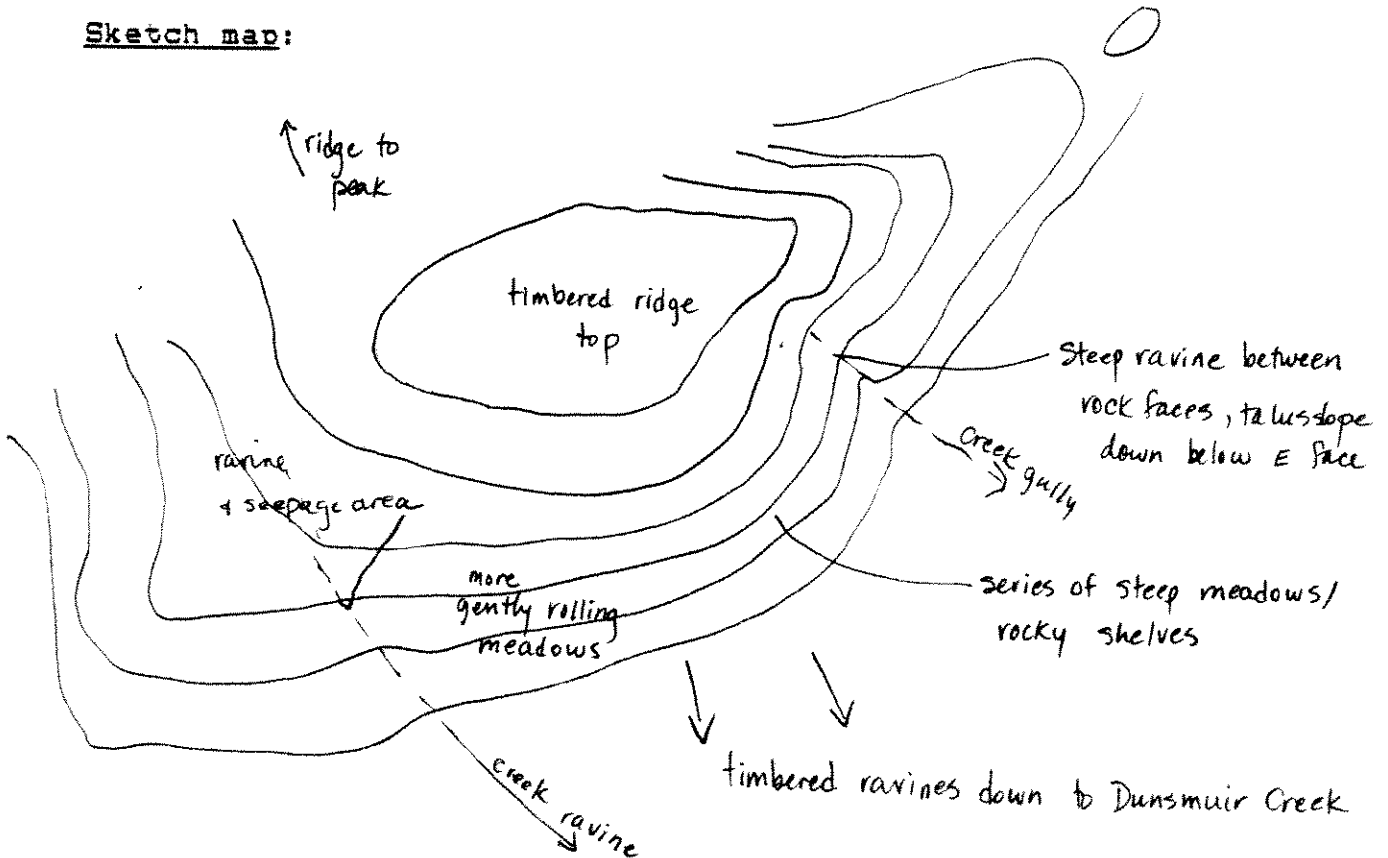
Vancouver Island Marmot Habitat Assessment

Code name of site: Green Mountain- South slope

General location: SSE of peak and downhill of secondary ridge that leads SE then E from SE talus area. Faces SE.

General layout of known marmot areas: Open area extensive and highly variable. Area includes : (at NE end of ridge), steep rock faces and slide areas down in ravine; (open slopes just to W) a series of steep rocky outcroppings/meadows ; (open slopes further W facing S) gently rolling meadows; and (furthest W), a creek ravine leading down into wet meadows. Generally all open slopes covered in dense meadows.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
NE end	-rock faces either side of ravine, talus slide at bottom, further ravine down into timber
(meadow)	-majority of talus covered with lush growth (vaccinium/cow parsnip/sedges) with patches p everlasting/paintbrush/penstemons/lupine/hellebore, etc
	-shelves of rockface to E also covered

- E end meadows -series of rocky shelves covered with dense mats
juniper/kinnick higher up and vaccinium /sedge /
juniper/bracken further down
(meadow/bracken) -wldflwrs abundant in rocky areas (leafy
lousewort/ penstemon/w sunflowers/
harebells)
-fewer flowers in bracken/vaccinium areas
- Mid-meadows -gentle sloping terrain
-same general type veg. on outcropping
areas, but meadow areas more grass/sedge/
wildflowers, sparse scattered boulders
(wildflower meadow/
bracken) -thistles/mtn daisy/harebells dominant in
August
- W creek basin -ravine very shady and lush vegetation
with dense clumps y willow herb/rhododendron
along creekbed, and ferns/horsetails along sides
(wet soils) -seepage area consists of mossy meadow with
abundant patches wet meadow flowers
-senecio/hellebore/bog orchids/miner's
lettuce/ y willow herb/ monkey flower

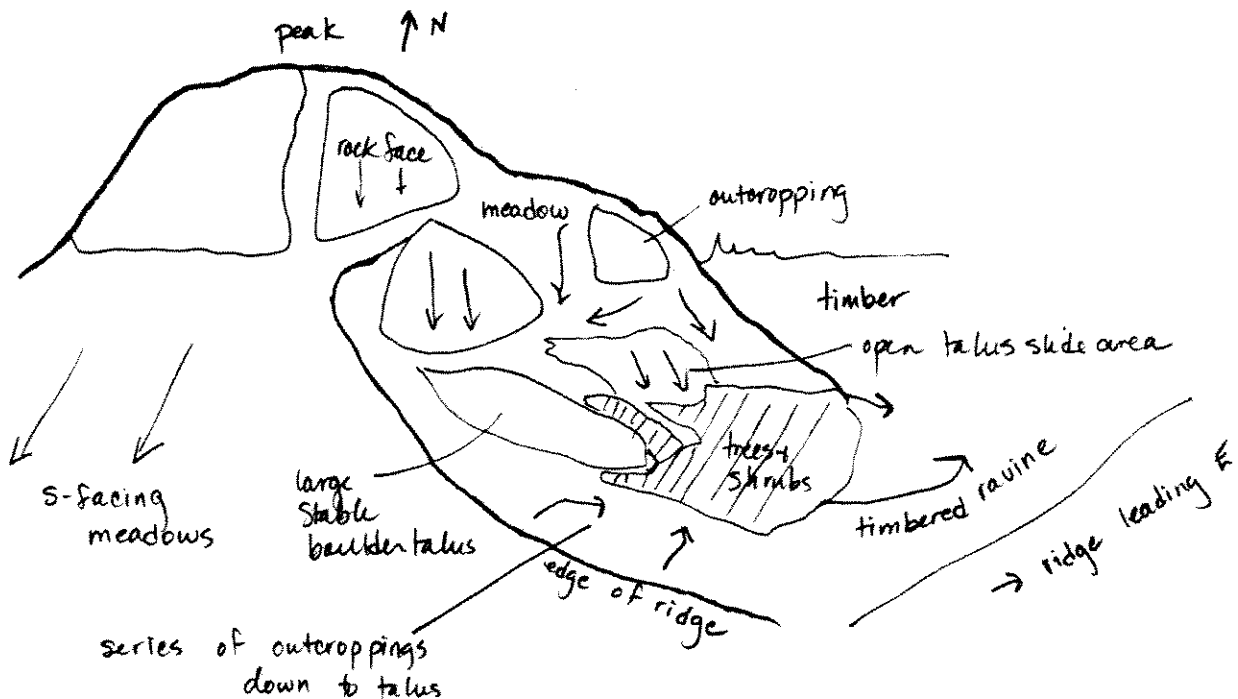
Vancouver Island Marmot Habitat Assessment

Code name of site: Green Mountain- SE talus

General location: Immediately down from SE side of peak.

General layout of known marmot areas: Rock faces just down from peak facing SE overlook talus slide area. Most southerly areas consist of stable large boulder talus area, and to E, area consists of partly covered talus lower down and sloping meadows higher up around the base of rock face. Shrubby gully bottom leads into timbered ravine.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
rock face	-kinnick/juniper/with some patches fir and vaccinium -all over peak area except vertical faces
outcroppings	-along SW and E edges of whole area -mixed patches meadow/rock types
meadows /bracken	-grass/sedge/vaccinium with harebells/lupine/ yarrow/penstemons -some bracken obvious in Aug.

talus -large- boulder talus on S side of gully
 (wet talus) -some vaccinium/elders/sm firs in patches
 up to rock face
 (talus/
 meadow) -open talus slide generally unvegetated in early
 summer, large patches of wildflowers (pearly
 everlasting/paintbrush) and vacciniums in August

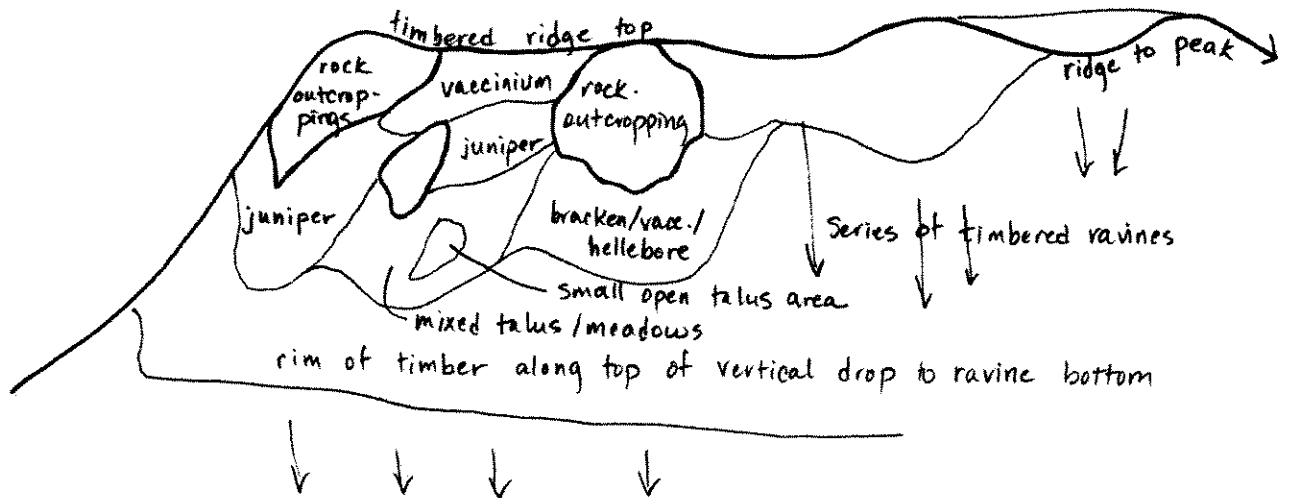
Vancouver Island Marmot Habitat Assessment

Code name of site: Green Mountain- NW ridge

General location: Ridge NW of peak and top of ski hill, visible from low ridge leading W from peak.

General layout of known marmot areas: Ridge leads N and W from peak. Vegetated steep talus slopes lie just down from partially treed ridge top and above vertical face falling off into steep gully. Faces W.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
Area only tentatively typed (viewed from great distance)	-open "meadow" delineated by rim of trees above, and below, and steep ravine system to S
	-veg. to far NW of open area and just down from timbered ridge top seem to be mainly mats of vaccinium/juniper,
(mixed)	-areas to the SE seem more talus/meadow type with mix of p. everlasting/juniper?/vaccinium/hellebore
	-small open talus area (noticeable burrow)
	-most S meadow seems to be bracken/vaccinium/hellebore and is more shaded by timber of ravine areas between ridge area and peak area

Vancouver Island Marmot Habitat Assessment

Code name of site: Green Mountain - Peak area

General location: Areas in immediate vicinity of peak (at top of ski hill) on S and W slopes.

General layout of known marmot areas: Rock face and associated bottom talus down from peak on W side, more gradual bluffs to S, merging with extensive sloping meadows to S. Gully extends westward and downhill into timber below cliffs of NW ridge area. All open slopes to S and around peak rock areas are covered in dense meadow growth.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
talus (wet talus)	-stable large boulders at head of gully -generally unvegetated, some patches leutkia/valerian/hellebore
outcroppings	- mainly unvegetated with variable patches juniper/kinnick/lupine mats, dense stands fir on ledges.
wet meadows (mixed wet/mead. types)	- senecio/hellebore/vaccinium with many wildflowers -lush vegetation in shaded/ seepage areas in N area and throughout S meadows

meadows -grass/sedge/wildflower
(wildflower meadow) -covers majority of extensive S meadows
with direct S exposure
-wldflwrs varied and abundant- mtn
valerian/mtn daisy/lupine/strawberry/
yarrow/harebells
- several grass spp. reaching 2 ft height

gully bottom -sloping side exposed dirt, rim of rock out-
croppings to S
-bottom of gully filled in with dense shrub
growth of rhododendron/sm firs/ some patches of
grass/ leutkia and heather

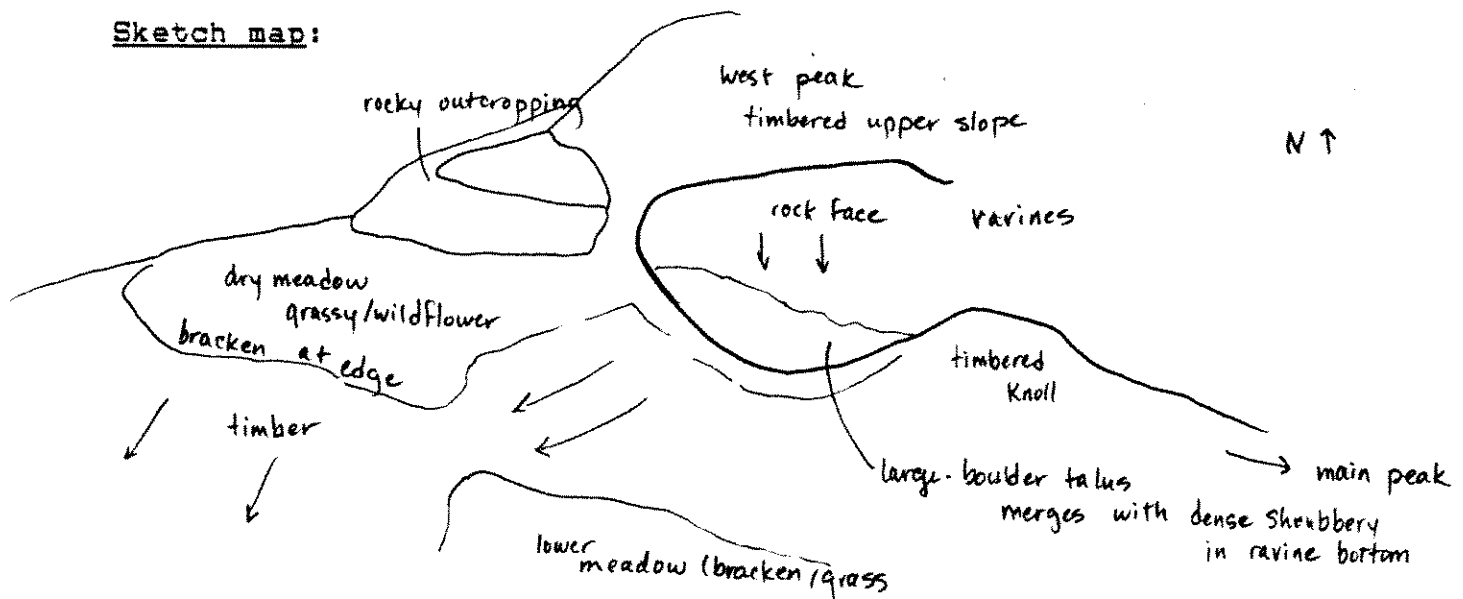
Vancouver Island Marmot Habitat Assessment

Code name of site: Green Mountain - West area

General location: Ridge extending W from peak circles N through timber to secondary peak.

General layout of known marmot areas: Area includes a N-facing ravine at base of W peak ridge, and nearby meadow/outcropping areas facing S.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
meadow/ outcroppings (wildflower/bracken)	- same general typing as elk meadow - predominately bracken/grass/wildflower
talus slope (wet talus)	- large boulder talus area at base of vertical rock face of western peak ridge -shaded by knoll to SE -dense shrubbery on adjacent slopes and downhill

Vancouver Island Marmot Habitat Assessment

Code name of site: Green Mountain -Elk meadow

General location: W of peak, N of old road up to ski lodge

General layout of known marmot areas: Extensive grassy meadows,
with intermittent outcroppings.

Sketch map:

Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
meadow	-bracken /wildflwr/grass/sedge
(wildflower meadow/ bracken)	-many wildflowers spp (hellebore/harebell/paintbrush/larkspur/yarrow/ penstemon/lupine/thistles)
outcroppings	-predominately kinnick/juniper with patches wldflwrs/firs -many flowers also found in meadow

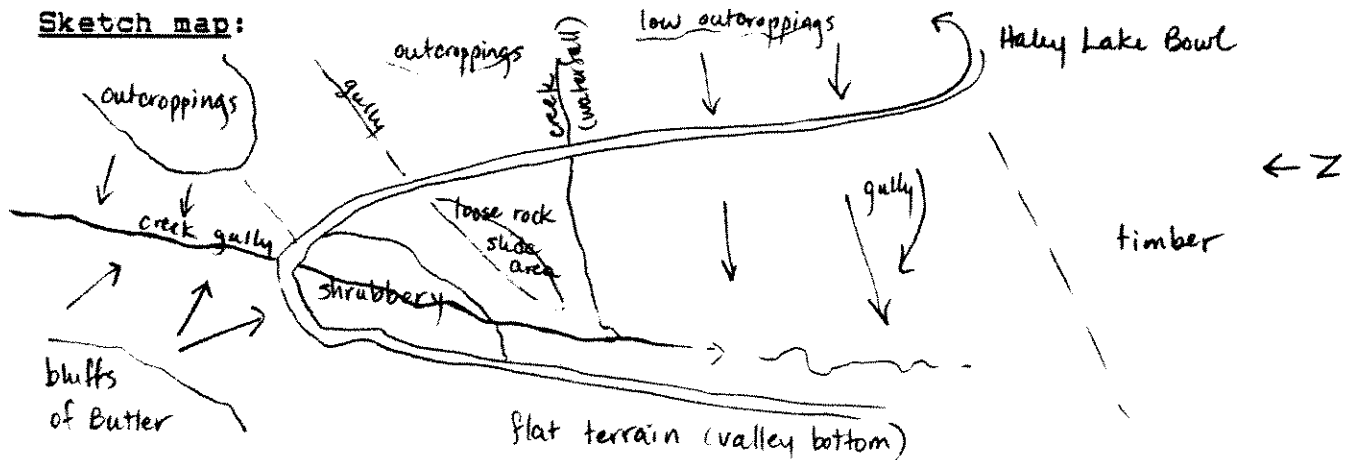
Vancouver Island Marmot Habitat Assessment

Code name of site: Haley Lake- Clearcut area

General location: Just W of Haley Lake bowl along access road (Vaughn Road).

General layout of known marmot areas: Area lies along last hairpin turn before ascent to ridge along W side of Haley Lake bowl. Small gully extends northward along Bell Creek, but most of area lies between bend in road. Majority of slope covered in dense understory vegetation, with some outcroppings uphill of road, and some area of loose rock/slash down from the road embankment.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
clearcut (wet)	<ul style="list-style-type: none"> -logged between 1974-78, burned 1979 -fireweed dominant , with dense patches of elderberry/hellebore throughout lower areas -patches p everlasting/sedges/ lactuca/ cats ear all along road -grassy knolls up above road very dry in August -slide area of loose rock/slash below creek waterfall area -dense shrubbery (elderberry/currants/ salmonberry) in gully at bend - in waterfall area, lush growth of wildflowers along creekbed and rock face (penstemons/monkey flower/ y willow herb)

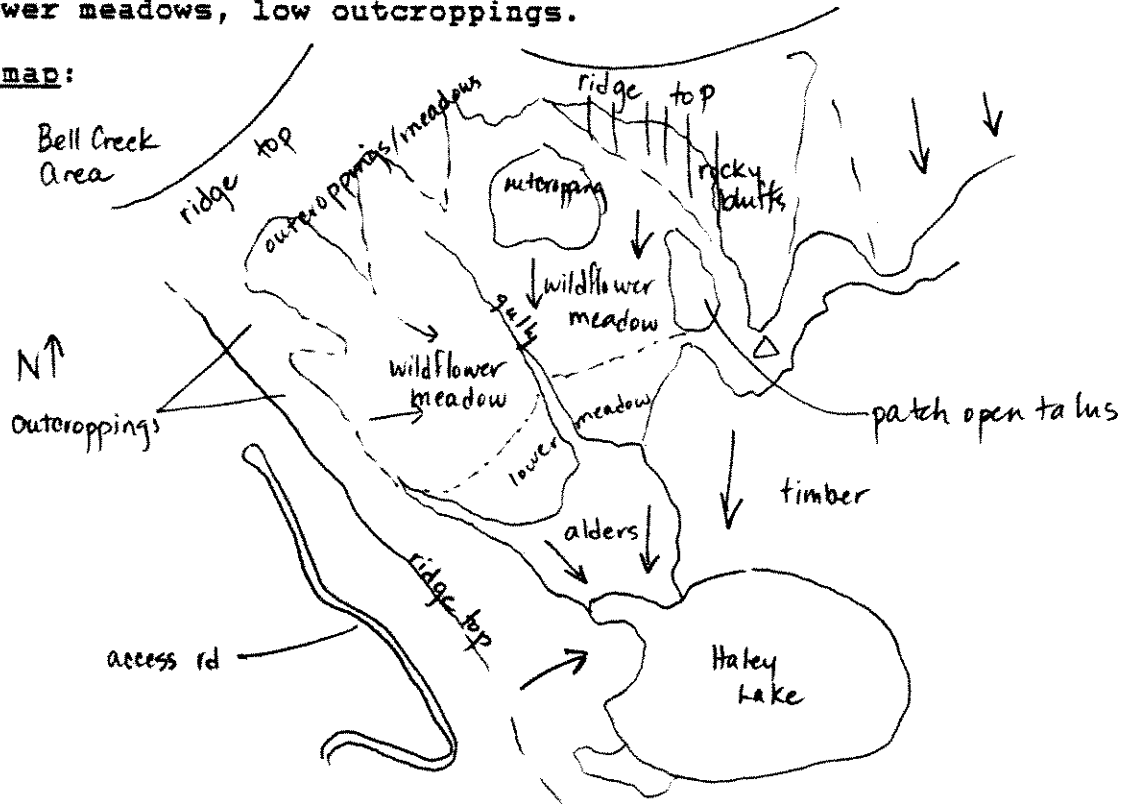
Vancouver Island Marmot Habitat Assessment

Code name of site: Haley Lake Bowl

General location: North of Haley Lake, SW of ridge separating from Bell Creek area, and just E of Haley Lake clearcut area (all along same access).

General layout of known marmot areas: Basin slopes down to lake in Se from gentle open ridge top encircling area to W,N, & E. Majority of open slope areas are covered in meadows. On E side, rocky bluffs overlook talus slope with some open patches, some small stands timber above tree line. Western part of basin (with gully running down center) slopes down into alders through open wildflower meadows, low outcroppings.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
ridge top	-rim of sloping rock outcroppings and exposed bedrock -main patches of veg. are kinnick/juniper/lupine/alumroot mats. -many patches wildflowers in crevices
meadows (wild flower meadow)	-wildflower/grass/sedge covering all of slope -main flwrs- mtn daisy/ p everlasting/harebells/w sunflower/penstemons -flowers dense and bands of colour apparent in August

lower meadow -bracken/hellebore/alders
(wet meadow/bracken/
shrub) -generally confined to lower third of
meadow , some vaccinium patches
-appearance of low rolling hummocks down at
bottom of meadow where gullies converge

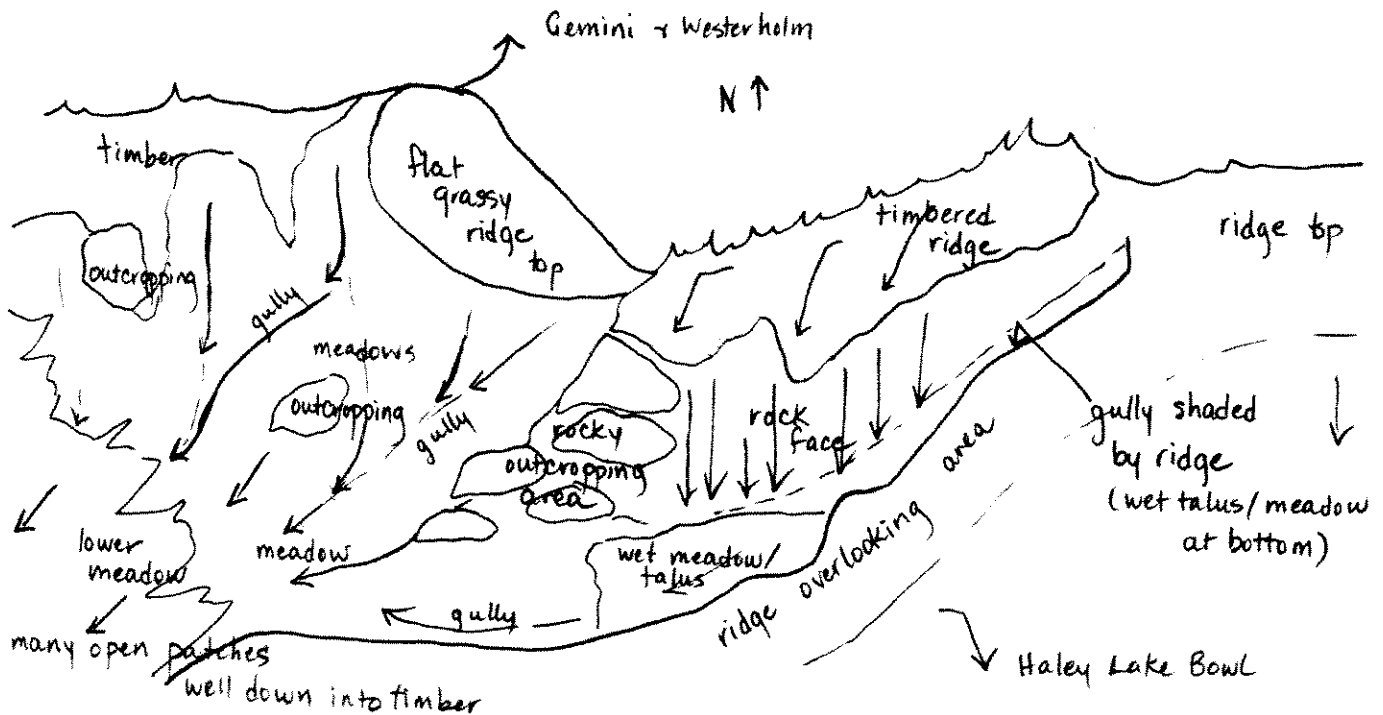
Vancouver Island Marmot Habitat Assessment

Code name of site: Bell Creek

General location: Just over ridge to NW of Haley Lake bowl (access up along W bowl ridge) .Slopes facing W over Bell Creek valley.

General layout of known marmot areas: Almost all of slope covered in dense meadows with some small patches of fir, small outcroppings and small patches of open talus dotted throughout. Ridge top densely timbered to S, with vertical rock face overlooking rocky outcroppings and shaded gully areas. To N, ridge top is flat and grassy, and slope meadows more open. Lower and northernmost slopes with irregular mix of meadow/timber along edges.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
meadow (mixed)	-patchy mix of wildflowers/sm firs/wet meadows/ bracken areas -p. everlasting/hellebore/w. sunflowers/ thistles/valerian/senecio obvious in Aug. -generally more hellebore/vaccinium/senecio in southern area partly shaded by ridge
wet talus	-large mossy boulders just down from S ridge dense patches grass/hellebore/senecio along gully bottom nearby

lower meadow -bracken/hellebore/shrubs(vaccinium/rhododendron)
(mixed wet meadow/ -virtually no wldflwrs obvious here in Aug.
bracken /shrub) -type seems to dominate "alleyways" (open
patches within timber) also.

ridge top -dense alpine fir/juniper/vaccinium on slopes
from ridge peak down to edge of outcroppings,
vertical rock faces
-grass/juniper/yarrow most obvious on knoll to N

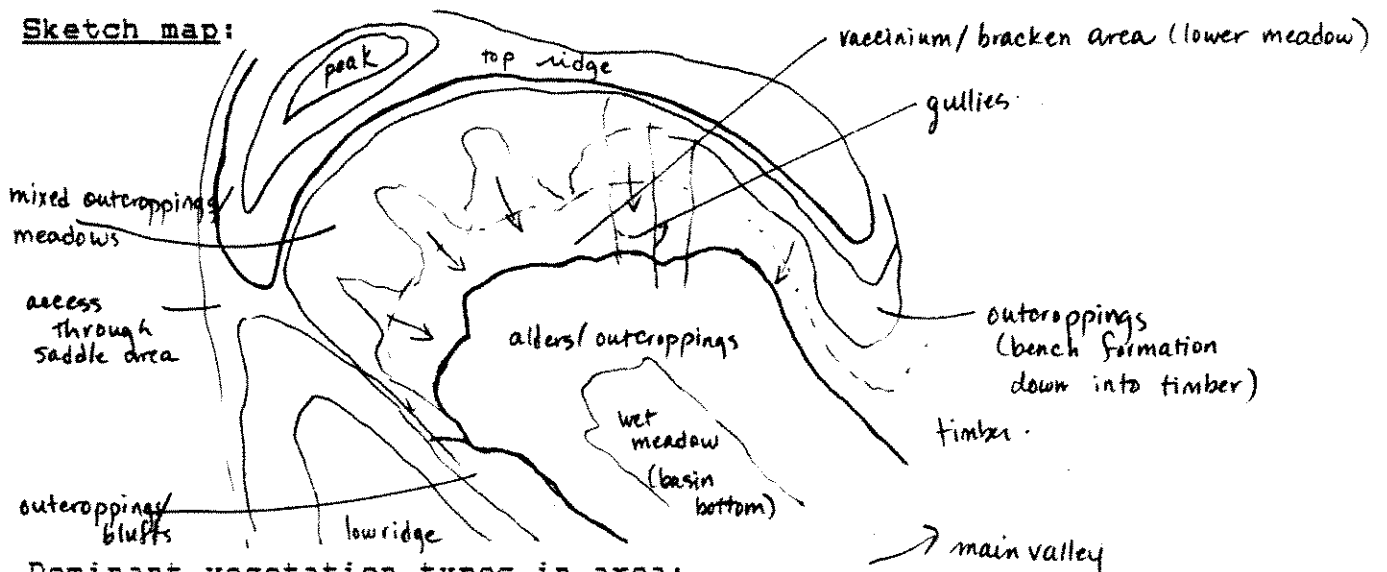
Vancouver Island Marmot Habitat Assessment

Code name of site: Heather Mountain

General location: Bowl on SE side of peak.

General layout of known marmot areas: Peak ridge top encompasses Se-facing bowl leading down into NE-oriented valley bottom of creek. Rocky outcroppings just down from ridge on W,N, and NW sides and alder slide area to SE surround densely covered meadow slope.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
ridge top	-mainly open and expose up near peak -patches kinnick/juniper/w heather/grass/ low vaccinium -dense heather/vaccinium/firs on approach slope to SW
outcroppings	-similar to ridge top with some drier meadow wildflowers (w sunflower/lupine/saxifrage)
meadow (wildflower meadow)	-grass/wildflower/sedge -lupine/penstemon/arnica/p everlasting/ mtn daisy/yarrow/w sunflower -wetter areas with cow parsnip/ hellebore/senecio
lower meadow (shrub/bracken)	-vacciniums/bracken, merges into alder slide at bottom and extends up gully areas to E almost up to ridge top

Area below meadow not typed but alders with many irregular outcroppings and patches of timber throughout. Bottom of gully wet seepage meadow.

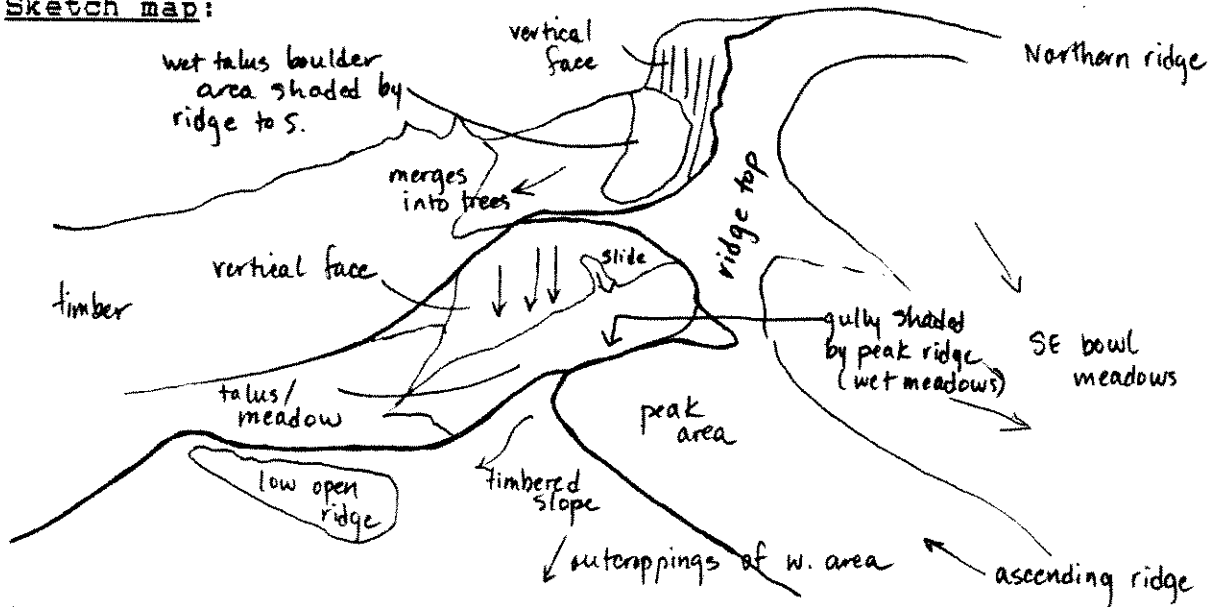
Vancouver Island Marmot Habitat Assessment

Code name of site: P Mountain- North area

General location: Areas over the ridge top from the main meadow area (SE bowl) and north of the peak. Includes areas to either side of a rocky knoll which extends down into the SE bowl .

General layout of known marmot areas: More southerly area includes a large partially-covered talus & meadow just down from a vertical rock face. Northern area (on other side of rock face) consists of wet talus area below rock face of main ridge. Low ridge extending westward from the peak encircles the area.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
talus/meadow	-extensive open slide area with patches pearly everlasting/wooly sunflower along edges, and merging with sedge/vaccinium mix towards more gentle southern slope
wet meadow	-indian hellebore/ Senecio dominant spp in gully to south (shaded by peak ridge)
wet talus	-large mossy boulders, stabilized talus area -patches of currants, sm flw alumroot -merges into timber below -partially shaded by central rock face
rock face	-generally unvegetated , dense clumps firs at top some kinnickinnick /juniper cover on rock shelves

(Central rock area has vertical drop on south side and extends westward into gently sloping ridge - not typed)

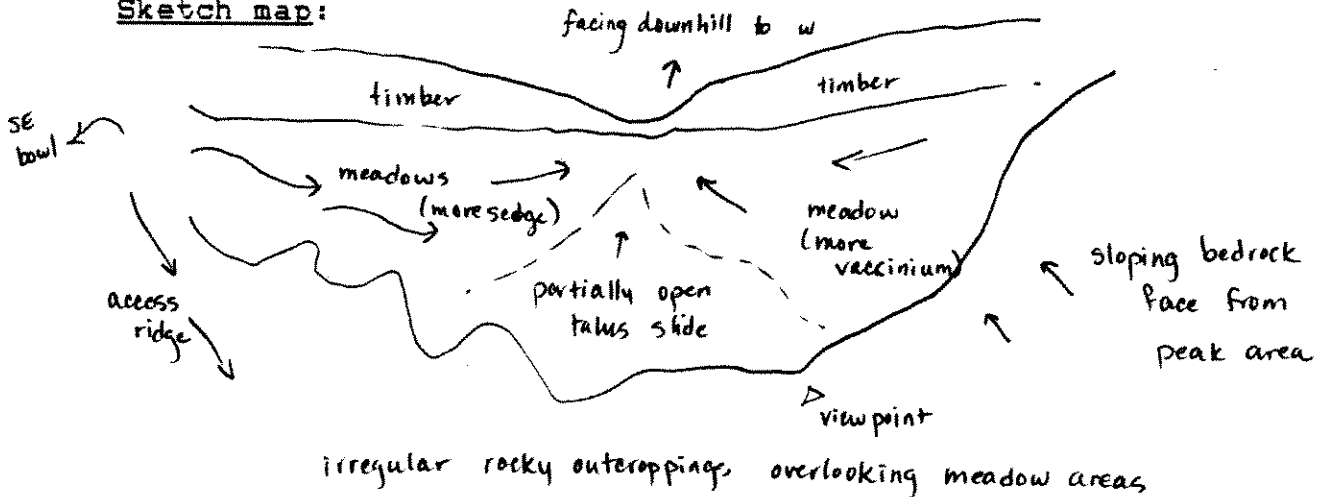
Vancouver Island Marmot Habitat Assessment

Code name of site: P Mountain- West area

General location: SW of peak and below outcroppings of access ridge south of SE bowl area. Faces SW.

General layout of known marmot areas: Sloping meadow to E mixes irregularly with small talus areas below outcroppings of peak area to N. Timbered slopes to south and extensive sloping bedrock to W.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
talus/meadow/ bracken	-mix of indian hellebore/vaccinium/valerian/ sedges/ pearly everlasting -bracken fern along lower edges -in July, hellebore/sedges/ valerian dominant in meadows, along with cow parsnip and some senecio; talus area with patches of penstemons, lupines, etc. -by August, vacciniums dominating meadows, bracken more obvious, and pearly everlasting/ paintbrush dominating talus
outcroppings	- mainly unvegetated & similar to other rocky areas -juniper/phlox/patches of alpine fir & wildflws - in July, many patches of penstemons and lupines in crevices, and carpets of small flwrs ie. Montia, blue-eyed Mary - by August, all rocky areas dried up
nearby timber	- untyped, but timber on ascent to peak consisted of hemlock/cedar/ fir with little understory.

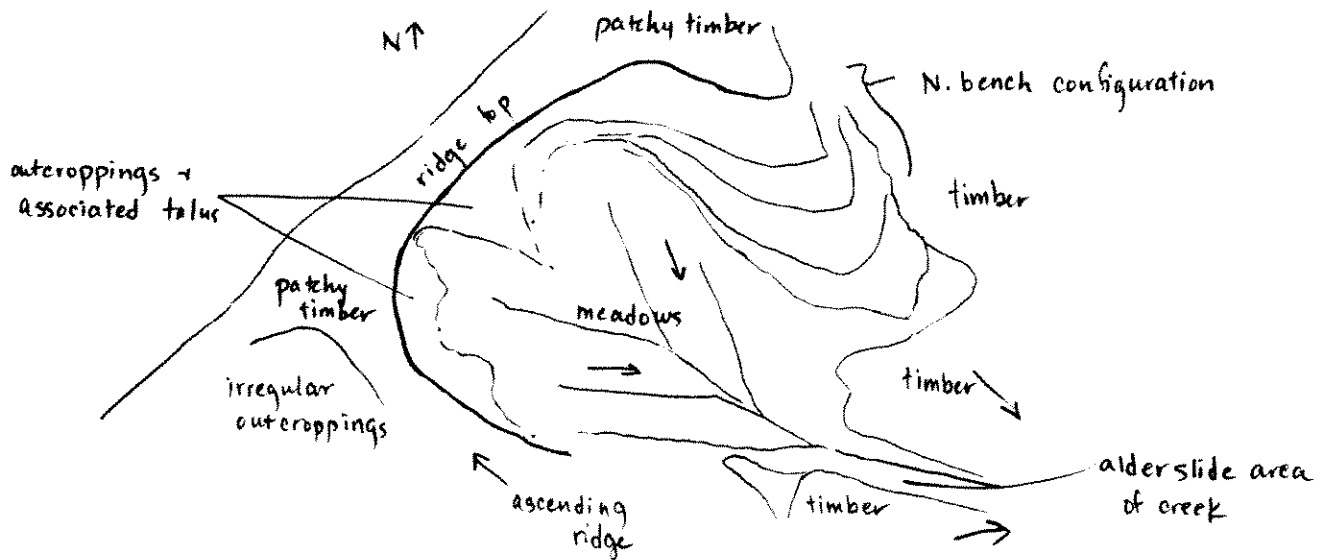
Vancouver Island Marmot Habitat Assessment

Code name of site: P Mountain- South

General location: Main bowl on eastern slope of peak. Faces SE.

General layout of known marmot areas: Extensive meadows of slope are densely vegetated and enclosed by upper ridge/rocky outcroppings and lower alder slide along major creekbed. One outcropping extends partway down the center of the bowl, and northern ridge has bench-type configuration above meadow.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
wet meadow	-indian hellebore/Senecio/bracken fern -merges with alder slide of creekbed -lush vegetation, many wldflwrs spp (cow parsnip/ mtn daisy/ mountain dandelion/ valerian/ tiger lily)
meadow	-sedges/grasses/vaccinium -in July, m. valerian dominant flower here but many spp seen lower down also present - in August, vacciniums predominate -found at mid-level up bowl slope
talus/meadow	-patches of penstemons/lupines/p. everlasting/ w.sunflowers etc on exposed talus alongside rocky outcroppings -penstemons/ lupines most obvious July, p. everlasting dominant in August

outcroppings -mainly unvegetated & similar to ridge areas
-patches of phlox/juniper/moss/ sm alpine firs
etc with many wildflwrs -saxifrages, onions,
sunflowers, penstemons

(shelves to N of bowl not typed but patches of bracken and
pearly everlasting observed and area generally well-covered
with veg.)

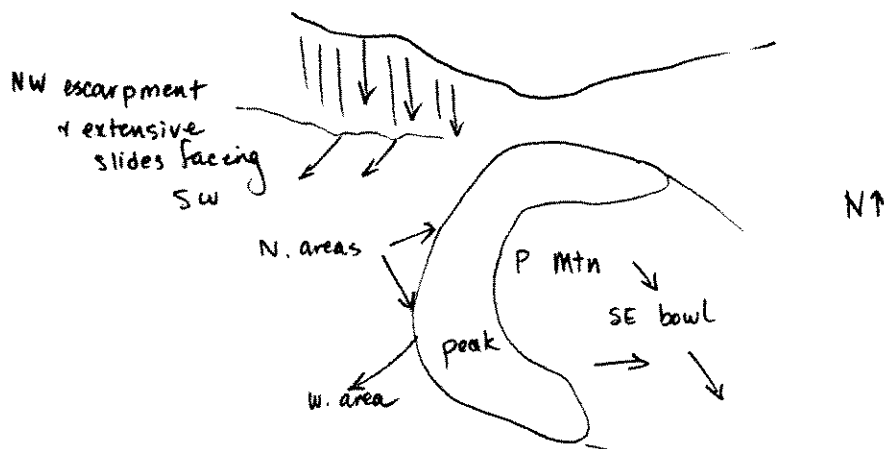
Vancouver Island Marmot Habitat Assessment

Code name of site: P Mountain- Northwest area

General location: NW of P Mountain proper, (visible from the main ridge overlooking P North), at base of escarpment .

General layout of known marmot areas: Slide areas come down from the ridge top to extensive talus area, filled in either slide with talus meadows

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
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(not typed, as only viewed from a great distance, but probably similar vegetation to P Mtn-North areas, as slides appear very similar in configuration and orientation)

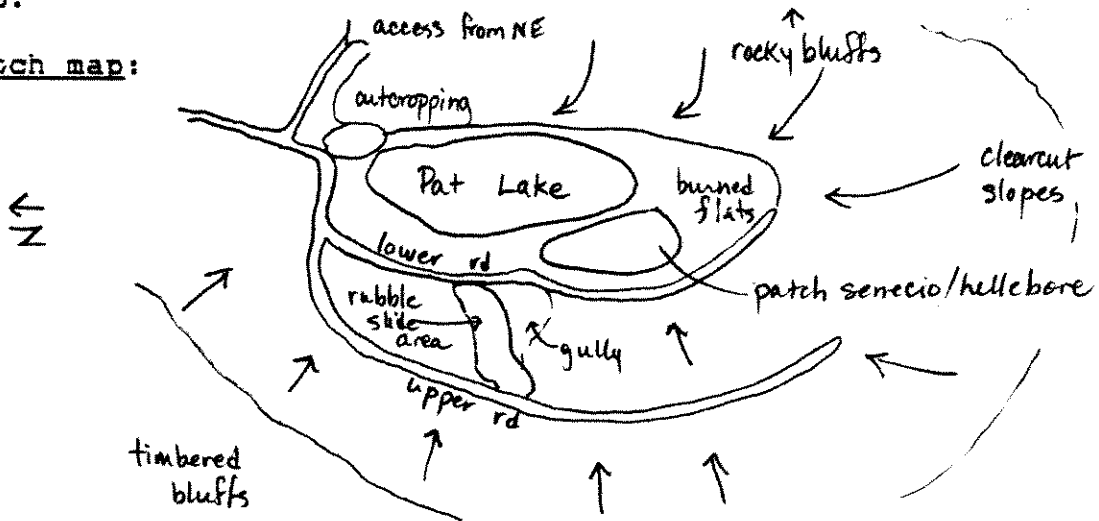
Vancouver Island Marmot Habitat Assessment

Code name of site: Pat Lake- Clearcut area

General location: NE of Mount Whympers ,at headwaters of tributary creek of South fork of Nanaimo River, W of Reinhart Lake.

General layout of known marmot areas: Slash areas on slopes facing SE over lake. Majority of slopes well-covered with slash and dense vegetation, except for rubble slide area between upper and lower road. Area partially shaded by outcroppings of slope to S.

Sketch map:



Dominant vegetation types in area:

type	dominant plant spp and comments
clearcut (mixed)	-logged 1977-79, some lower areas burned 1980 -predominately fireweed/elderberry/p everlasting/ sedges/ vacciniums -higher areas drier, lower areas much more cover -hellebore/senecio/valerian/ferns in gully areas
lake edge (wet meadow)	-patch of senecio/hellebore along N end of lake

Ridge top not typed, consists of series of densely timbered bluffs/ravines.

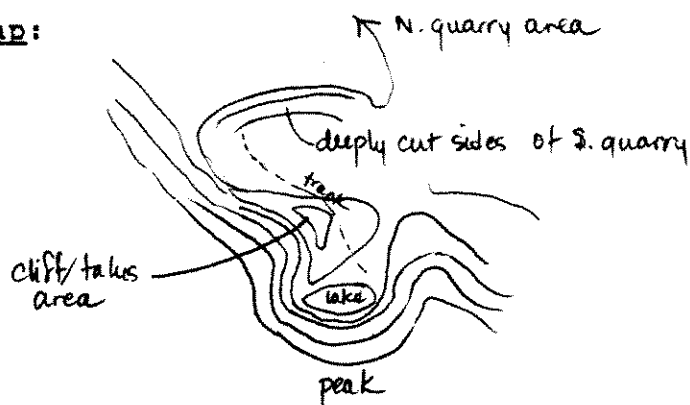
Vancouver Island Marmot Habitat Assessment

Code name of site: Mount Washington -Mine quarry

General location: N side of Mt Washington in old mine quarry

General layout of known marmot areas: Southern quarry is deeply cut into slopes just N of Mt Washington peak. Access road leads around to secondary less-excavated northern quarry. Extensive talus slopes immediately down from peak on N side encircle small lake at bottom of bowl.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
timber	- open stands of mtn hemlock/y cedar/ rhododendron with patches heathers and sedges
quarry	-unvegetated except for sparse cover along edges -lupine/sedge/willow/vaccinium
cliff/talus	-hellebore/sedge/heathers/wildflowers -valerian/mtn daisy/lousewort

Vancouver Island Marmot Habitat Assessment

Code name of site: Mount Washington - Ski hill

General location: S face of Mount Washington ski hill.

General layout of known marmot areas: Area extends S down ski slopes from peak to bottom of red chair, and E & W the extent of the run development area. Open areas near the peak are mainly exposed rock and talus slides, ski slopes below are mixed timber, brushy cleared runs and meadows.

Sketch map:

Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
peak area	-alpine fir/mtn hemlock/heathers with patches grass/vaccinium/rhododendron and wildflowers -lupine/paintbrush/elephant head/ mtn daisy/ arnica/saxifrages/ leutkia
ski runs (mixed)	-brushy but vegetation not lush -talus slope just S of peak in Tyee/Western runs -areas further down have some fireweed/hellebore in among slash -further down slopes, some seepage areas with lush wet meadow vegetation (bog orchids/tiger lilies/valerian/senecio)

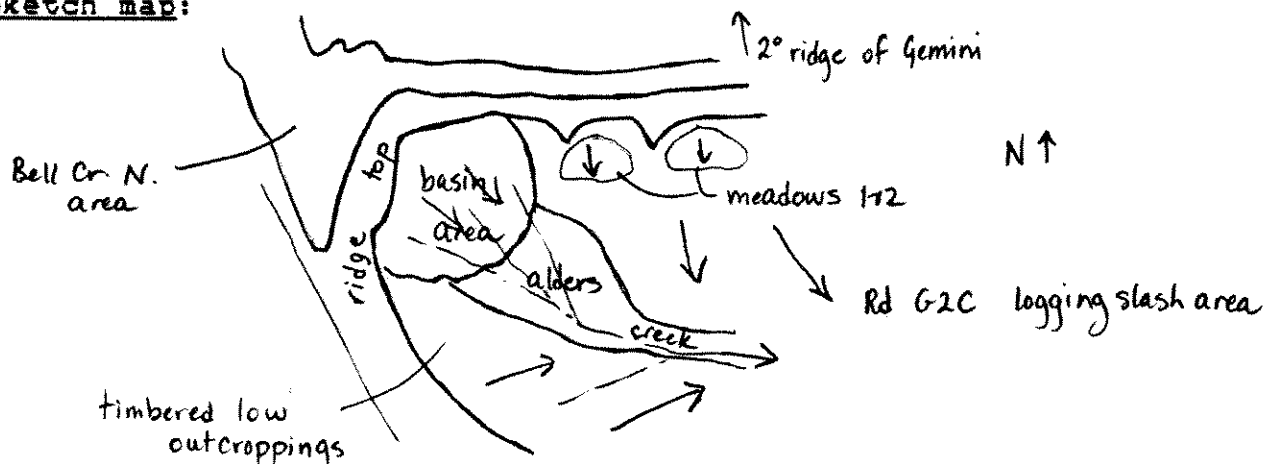
Vancouver Island Marmot Habitat Assessment

Code name of site: Westerholm Basin

General location: Slopes N of S fork of Dunsmuir Creek and above end of Road G2C. Faces SE.

General layout of known marmot areas: Basin areas lies just down from ridge at base of secondary ridge of Gemini. Basin slopes SE and is a patchy mosaic of grassy wildflower meadows, rocky outcroppings and patches of timber and small open talus all way from alder slide area at base of gully up into timbered ridge top. Edges of meadow/timber very indefinite. Meadows 1 & 2 further east below timbered ridge top are mainly open talus slopes.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
meadow	-predominately p everlasting/mtn daisy/grass
(mixed)	-with many other spp-
	-penstemons/thistles/harebells/lupines/fireweed/
	leafy lousewort in drier, rocky areas
	-patches senecio/hellebore in shaded wetter areas
	and vaccinium patches throughout.
outcroppings	-not typed (many same flowers as meadow)

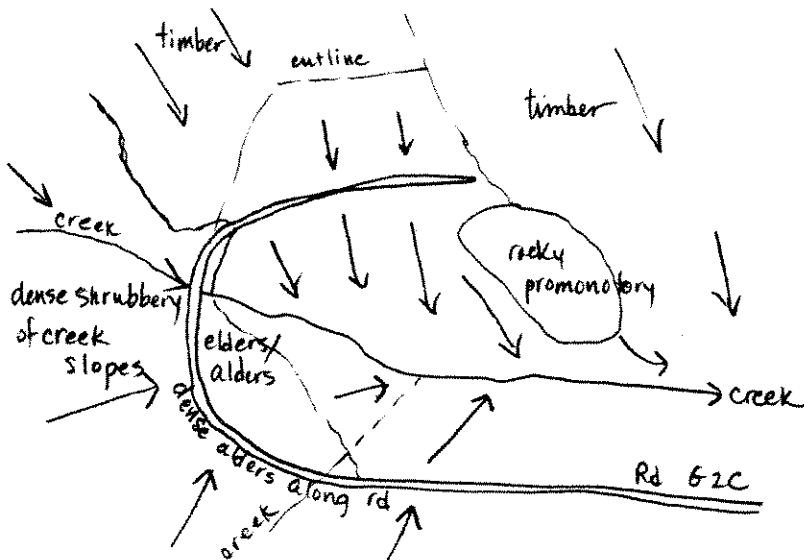
Vancouver Island Marmot Habitat Assessment

Code name of site: Westerholm- Clearcut area

General location: Either side of end of Road G2C above the S fork of Dunsmuir Creek.

General layout of known marmot areas: Slash extends from W cutline to E end of road, and downhill into creek ravine. Faces S & SE. Slopes well-covered in dense understory except for rocky promontory to SE and dense shrubbery along creekbed.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
clearcut (wet)	- fireweed/vaccinium/bracken with some small cedar shrubs, logged 1968, burned 1969 -also some currants/wldflwrs such as paintbrush/thistle/cow parsnip/lupine/p everlasting -area of upper treeline mainly vaccinium/bracken -patches below road are wetter with patches hellebore throughout.

Creekbed not typed, but dense elderberry dominating.

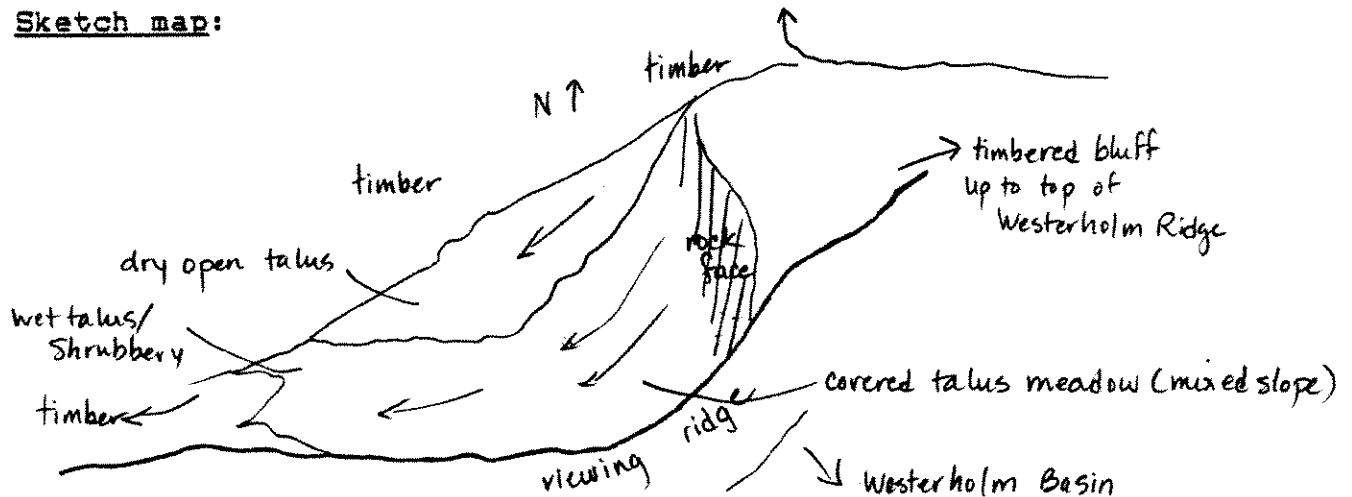
Vancouver Island Marmot Habitat Assessment

Code name of site: Bell Creek- North

General location: Just over ridge to NW from Westerholm Basin (access through basin).

General layout of known marmot areas: Area includes open talus slope and larger meadow-covered slope enclosed by ridge N of Westerholm basin and timbered ridge top to E (leading towards Gemini). Downhill (W) slopes timbered.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
open talus	-unvegetated boulder talus -more S exposure than rest of slope
wet talus	-at lower edge of open talus, merging into trees -large mossy boulders with patches firs/ huckleberry/ferns
ridge tops	-vertical face to E, more gradual slopes to S covered in w rhododendron/vaccinium/firs
mixed slope	-stands of fir/rhododendron and dense patches vaccinium/hellebore/wldflwrs -flwrs include valerian/paintbrush/p everlasting /pussytoes/thistles/lupine/yarrow/senecio/ penstemons

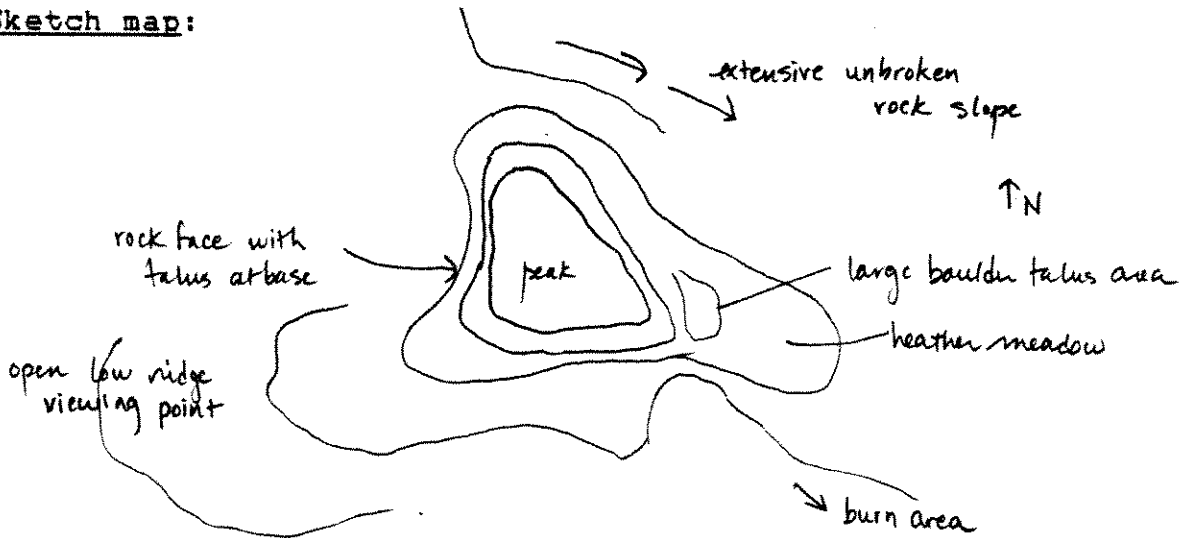
Vancouver Island Marmot Habitat Assessment

Code name of site: Mount Whympere- West area

General location: Immediately W of peak.

General layout of known marmot areas: W side of peak drops sharply down through series of timbered ledges down into talus area at bottom.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
cliff area	-series of timbered shelves -lookout spots up almost to top -alpine fir/y cedar/ mtn hemlock
talus (wet talus)	-various shrubs/forbs -senecio/hellebore/cow parsnip -area shaded by ridge leading SW of peak down to low heather ridge to W -many vacciniums/ mtn spirea in area

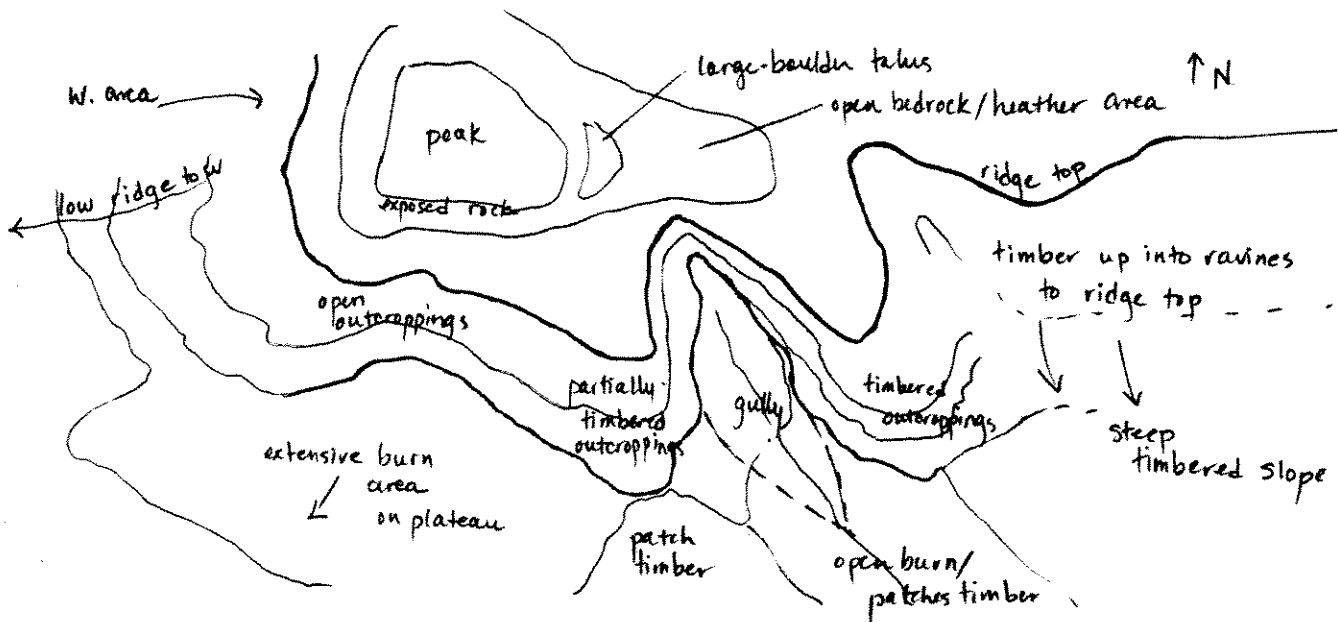
Vancouver Island Marmot Habitat Assessment

Code name of site: Mount Whympere- Burn area

General location: SE of peak and in transition area between steep timbered slopes and higher peak ridge area.

General layout of known marmot areas: Area includes a gully, vertical rock faces at N end of gully, outcroppings to S on either side, and timbered/old burn area at base of ridge. Slopes of burn area patchily covered.

Sketch map:



Dominant vegetation types in area:

<u>type</u>	<u>dominant plant spp and comments</u>
open burn area	- snags with patches p everlasting/grass/fireweed -dense vaccinium to W at base of bluffs
gully area (mixed)	- dry sloping meadow with patches sm firs all way up into head of ravine -variety of wldflwrs similar to down in burn (penstemons/lupine/thistle/harebells), some exposed dirt banks along central ditch -grass/vaccinium/sedge higher up in shaded portion of gully
ridge top	-open area with heathers/ some sm firs/ and some patches leutkia/lupine/saxifrages/leafy lousewort
outcroppings	-similar to ridge top -patches of w sunflower/onion/lousewort abundant

timber

-alpine fir/y cedar/ red huckleberry

-partially open timber on E edge of E ridge
with dense lupine/wildflwrs understory

Appendix III. Comments on Other Known and Potential Marmot Areas Investigated 1986.

Ground searches:

Tangle Mountain

- July 17/86 explored south-facing meadows just above clearcut up to peak bluffs in intermittent rain/fog
- lower meadows dense hellebore/bracken with understory of wildflowers (bracken already 3 feet high)
- higher meadows less dense hellebore and more scattered boulders, many small outcroppings
- meadow further west has many groupings of large boulders along lower edge with possible signs of digging.
- bluff areas with dense shrub growth above and below, many small clearings

Mount Joan

- July 19 & 20 explored area from peak north along ridge and northeast down into basin
- ridge generally devoid of forage (heathers, leutkia, some timber)
- some small areas of forage: small wet talus area (large boulders, hellebore) west of northern peak, small grass/sedge meadows on east side benches of north peak, and additional slide areas to NW not explored

Eric Lake Area

- explored Sept. 2/86, going in from Butler clearcut colony, through timber to lake and exploring knolls to north and south of lake.
- Knoll to south is visible from Butler Peak, and recent diggings were spotted from there in August. Area faces SE and consists of rocky outcroppings and small cliff face overlooking small pocket of shrub/meadow/slide area right at edge of steep timbered slopes. Reddish clay visible at burrow sites, small patches wildflowers nearby, most of area covered with low vacciniums/bracken or dense shrubbery (alders/ mountain ash/white rhododendron), no lookout signs observed on bluffs. This area is not too far in distance/elevation from the end of the gently sloping ridge extending north from the peak of Butler, and this area could be considered an extension of an existing marmot area.
- Knoll to north is much drier, consists of series of exposed outcroppings and trees. Some old burrows in crevices and under boulders up at bedrock top, area to NE of top drops off into similar terrain to burrow area at south knoll (steep timber ravines).

Helicopter Flight Sept. 4/86: (G.W. Smith, MOE; J.A. Morgan & K.S. Fry)

Departed from Cassidy Airport 0750 hrs.

Copper Creek Area

-logging slash ridge investigated, some potential (open slash, patches pearly everlasting, loose soil areas), but no definite signs

Pat Lake

-1 Ad, one young? tentatively identified sitting on large boulder at north end of lake

Mount Landale

-landed helicopter just SE of peak at 0830 hrs
-explored pile of large boulders just E of peak (eagle feather found) then investigated slide areas and meadows of first major gully on east side of ridge connecting peak with El Capitan
-many small slide areas down from ridge top lead into major gully and have potential (exposed soil, rocks, small talus meadows), and old scats found there.
-next gully also promising (from the air), has extensive open slide, talus, large boulders at bottom and meadows to the side.
-north (shaded) face of peak has many patches of wet meadow vegetation and overlooks Lomas Lake

El Capitan

-potential marmot area on E side of peak and very noticeable slide area just to SE of peak (reddish)
-eagle soaring over peak
-steep ravines on north side and heavy timber

Lomas Lake

-landed helicopter 1000 hrs, remains of campsite nearby
-large stable boulder area right along lakeshore not very promising, but there are patches of talus/timber/outcroppings further up on north side of Landale

Mount Service

- slide areas on east side of peak investigated
-first slide- large talus area, extensive grassy meadow cover
-second slide- talus, meadows alongside with large boulders with sign of marmot use (lookout spots)
-patch of snow on in gully just to north, steep timbered ravines on north side of peak

Big Ugly

-most areas on east side of south face look very dry
-areas to west (slide areas with bracken/meadows) look better, particularly along lower levels near timberline, where there are more scattered boulders, but no sign seen.

Little Mount Hooper

- landed helicopter on ridge between two lake basins 1100 hrs
- large marshy meadow, old lake basin with some old burrows in among large boulders at south end of lake
- some potential forage here -large patches of senecio/monkey flower/ mountain valerian in meadow areas
- red-tailed hawk overhead

Mount Hooper

- landed helicopter 1200 hrs
- area known marmot colony, abundant scats and lookout spots on south-facing benches overlooking gully; also abundant sign seen in south-west-facing cliff/talus area

Hooper North

- burrows seen on east slopes of north end of peak in talus/ big boulder area
- burn at south end

Mount McQuillan

- started at ridge to south
- very green lush valley bottom, heather/meadow higher slopes
- some sign on scattered boulders throughout meadow areas but hard to define any lookout spots
- flew over prospecting camp (much garbage) and landed helicopter in grassy meadow in cirque basin to southeast of peak. Basin is surrounded by large boulder slide, but no marmot sign seen.
- flew over and around King Solomon's basin (to north of McQuillan), back to north side of peak (old mine shaft visible at head of steep ravine, then on to Douglas Peak.

Douglas Peak

- meadows along south face at mid-level look promising (bracken/vaccinium just down from outcroppings) but no sign detected. Areas to southwest look easily accessible, as clearcut area extends almost up into meadow.

P4

- face to north of P4 very steep timber/rock faces, steep ravines, few slide areas visible
- P4 similar to Douglas in meadow types (bracken/wildflowers), but no signs

Heart Lake Basin

- lookout spots visible on large boulders downhill of basin meadow

Return to Cassidy Airport after 1500 hrs.

Appendix IV. Marmot Food Plants Observed Browsed in Marmot Areas Surveyed 1986.

Observed 1986
(M= alpine slopes
C= clearcuts)

Food plants recorded in literature :
(as per Milko, 1984; Heard, 1977)

Bracken fern	(<i>Pteridium aquilinum</i>)	M	
Tiger lily	(<i>Lilium columbianum</i>)	MC	*
Glacier (fawn) lily	(<i>Erythronium grandiflorum</i>)		
Avalanche lily	(<i>Erythronium montanum</i>)		
Spreading phlox	(<i>Phlox diffusa</i>)	M	
Broad-leafed lupine	(<i>Lupinus latifolius</i>)	MC	*
Mountain valerian	(<i>Valeriana sitchensis</i>)	MC	*
Meadow rue	(<i>Thalictrum occidentale</i>)		
Columbine	(<i>Aquilegia formosa</i>)	M	
Purple pea	(<i>Lathyrus nevadensis</i>)		
Cow parsnip	(<i>Heracleum lanatum</i>)	M	*
Indian paintbrush	(<i>Castilleja</i> spp.)	M	
Sandwort	(<i>Arenaria macrophylla</i>)		
Wooly sunflower	(<i>Eriophyllum lanatum</i>)	M	*
Small-flowered alumroot	(<i>Heuchera micrantha</i>)	MC	
Harebell	(<i>Campanula rotundifolia</i>)		
Indian thistle	(<i>Cirsium edule</i>)	MC	
Huckleberry	(<i>Vaccinium</i> spp)		
Mountain daisy	(<i>Erigeron peregrinus</i>)	M	
Broad-leaf arnica	(<i>Arnica latifolia</i>)	M	*
Yellow hawkweed	(<i>Hieracium gracile</i>)		
Yarrow	(<i>Achillea millefolium</i>)		
Unid. sedges	(<i>Carex</i> spp)	MC	
Unid. grasses	(GRAMINAEA)	MC	
Oat grass	(<i>Danthonia</i> spp)		
Blue grass	(<i>Poa</i> spp)		
Woodrush	(<i>Luzula</i> spp)	C	*
Cascade penstemon (blue)	(<i>Penstemon serrulatus</i>)	MC	*
Purple aster	(<i>Aster foliaceus</i>)		
False (Indian) hellebore	(<i>Veratrum viride</i>)	M	* (1)
Yellow cedar	(<i>Chaemacyparis nootkatensis</i>)		
Kinnikinnick	(<i>Arctostaphylos uva-ursi</i>)		
Red heather	(<i>Phyllodoce empetriformis</i>)		
Red elderberry	(<i>Sambucus racemosa</i>)	C	(f,s)
Rock tripe	(Bryophyte)		
Lichens			
Juniper	(<i>Juniperus</i> spp)		

* marmots seen browsing these plants
l= leaves, f= flowers, s= shoots, b= berries

Additional spp recorded 1986:

Giant ragwort	(<i>Senecio triangularis</i>)	MC *
Speargrass	(<i>Elymus</i> spp)	C
Mountain ash	(<i>Sorbus sitchensis</i>)	M (f,s)
Rock penstemon	(<i>Penstemon davidsonii</i>)	M
Pearly everlasting	(<i>Anaphalis margaritacea</i>)	MC *
Woodland penstemon	(<i>Penstemon nemorosus</i>)	M
White pussytoes	(<i>Antennaria</i> spp)	M
Leafy lousewort	(<i>Pedicularis</i> spp)	M
Night-flowering catchfly	(<i>Silene</i> spp)	M
Elephanthead	(<i>Pedicularis groenlandica</i>)	M
Olympic onion	(<i>Allium crenulatum</i>)	M
Fireweed	(<i>Epilobium angustifolium</i>)	MC * (l,f)
Red huckleberry	(<i>Vaccinium parvifolium</i>)	C * (b)
Nodding sedge	(<i>Carex mertenzii</i>)	C *
Black raspberry	(<i>Rubus leucodermis</i>)	C * (b)
Currants	(<i>Ribes</i> spp)	C (b)
Alder	(<i>Alnus</i> spp)	C (s)
Wild lettuce	(<i>Lactuca muralis</i>)	C *
Hairy cat's ear	(<i>Hypochaeris</i> spp)	C *

* marmots seen browsing these plants

l= leaves, f= flowers, s= shoots, b= berries

