

KINGFISHER CREEK ECOLOGICAL RESERVE # 49

REPORT OF SURVEY - 1937

Malcolm E. Martin,
North Okanagan Naturalists' Club,
Vernon, B.C.
February 1938

KINGFISHER CREEK ECOLOGICAL RESERVE #49

The following report is the result of several reconnaissance visits during 1987 and gives only a preliminary study of the area. A more detailed investigation is not practicable until either access becomes easier or means for staying in or close to the reserve are arranged.

INTRODUCTION

Because of its proximity, Kingfisher Creek duplicates many of the conditions pertaining at Griffin Mountain, E.R. #43, less than 20km to the north-east. The presence of two similar units so close together is unusual and reflects earlier history of the area.

In the early 1970s a group of Enderby residents were extremely active in promoting the exclusive use of Hunter's Range for non-consumptive recreation under park or other protective status from Enderby Cliffs in the west to Griffin Mountain in the east. Due consideration by Department of Lands, Forests and Water Resources ruled against these proposals in their larger aspect, however, initiation of the ecological reserve programme at that time offered a means for responding to local requests and the two reserves were established before mid-summer 1973. In a sense, therefore, they were presented to the E.R. Unit rather than having been actively chosen by it.

Before finalization of location, E.R. #49 was proposed by naturalist club interests for the area surrounding Mount Mara where flower meadows were considered to be at their best but potential conflict with existing livestock grazing and Forest Service look-out and possible timber sales weighed in favour of removal to its present location. In the event, both parties to this disagreement have been proved right - floral diversity and quantity does appear less than at the

Mount Mara site, effects of human and cattle use are noticeably less also.

LOCATION

On map S2 L/15 (Malakwa) the mid-point of E.R. #49 falls roughly at grid reference 750280, putting it just over 14km east-south-east of Sicamous. Its 144lha (3,560 acres) cover the headwaters of Kingfisher Creek, towards the west end of Hunter's Range, a part of Shuswap Highland.

ACCESS

Four possible approaches offer themselves for reaching this reserve, none without problems (see Map 1, page 3).

Route 1. A low-level route up Kingfisher Creek valley may be taken from the Mabel Lake Road running east out of Enderby.

30.3 km from Enderby take left turn on to Kingfisher Creek Forestry Access Road;

11.7 km to left turn (marked "Laforge" at time of writing);

0.6 km to right turn (where continuation marked "Riverside Channel" and "MM Lookout" currently);

4.1 km to left turn (where continuation marked "East Fork" currently). Undermining of a creek crossing may soon prevent use of this section.

Continue, to park by the 20 km sign. 4-wheel drive is preferable for this route although a small car of sufficient clearance can just make it under favourable conditions. Road bed slumping prevents vehicles beyond the 20 km mark from which point a hike of approximately one hour is required to reach the end of the logging road in the last of three clear cuts. Another quarter of an hour brings into sight "Boundary Creek", an unnamed tributary to Kingfisher Creek which forms roughly the reserve's southern edge. During run-off in early summer a windfall of felicitous location is necessary to cross this creek.

Route 2. Mount Mara Lookout Road - from the point on the previous route sign-posted "Riverside Channel" and Mt. Mara Lookout" the road continues in increasingly poor condition until sub-alpine meadows are reached. 4-wheeled drive is essential. From parking near the base of the final rise of the mountain a one hour hike of about 4 km leads to the south-west corner of the reserve.

Route 3. Owlhead Creek Road - continuation of McLean-McPherson Road in Sicamous becomes Owlhead Creek Road and leads eventually to Cummings Lake at about 1700m. The middle section of this route is deteriorating rapidly necessitating 4-wheel drive. From parking at the end of the road a cross-country course can be plotted to the west boundary of the reserve which, although only about 4km away can take several hours.

Route 4. Yard Creek - This means of access was not investigated. It leaves the Trans Canada Highway at the first hard-topped turn east of the Yard Creek Provincial Park junction. Proceed 8 or 9km on a gravel road as though going to the upper part of Griffin Mountain Reserve; at this point a creek crossing can be made and a forestry road doubles back on the other side of the valley, rising up the mountain to within about 2½ or 3km of the north end of Reserve #49. Logging has not taken place along this road for 10 years and its condition probably leaves much to be desired.

From Vernon as base of operations, time spent travelling to and returning from the boundaries of Kingfisher Creek E.R. amounted to 7 hours out of each day using route 1. For route 2 the figure was close to 8 hours and via route 3 exceeded 9 hours leaving little time for moving around within the reserve and detailed study once there. For this reason data collected have tended to be superficial. This unprofitable use of time out of each visit day created a psychological barrier to going and cut into the number of visits that should have been made.

PHYSIOGRAPHY

The Shuswap Highlands forms one of several raised blocks between the Thompson-Fraser Plateaux and the Columbian Mountains. Although no peaks are present comparable with those of the Monashee Range to the east, elevation has caused re-juvenation of rivers and deep erosion of their upper reaches resulting in quite rugged relief, later added to by glacial sculpting. Kingfisher Creek is a typical example of incised valley leading to a more rounded upland surface.

Source of the Kingfisher is shown on topographical maps on the northern boundary of the reserve at about 1585m (5,200 ft.) from where it flows almost due south close to the eastern edge

passing out of the reserve at 1190m (3,900 ft.). Much of the centre portion is trough-like, in places carrying no timber due to instability, and in other places with little room for development of any valley floor. Photograph 1 (page 8) is a view from outside the reserve looking north up the valley (see Map 5 for approximate location of photographs). Travel is difficult under these conditions and even where the slopes are treed the angle makes progress slow, in fact only that portion of the valley each side of "West Fork" and the far northern $1\frac{1}{2}$ km of the river where contours lessen, are negotiable with any ease.

Once across "Boundary Creek", the only sizeable tributary is "West Fork" of slightly larger volume and considerably larger valley size. This may have been enlarged by ice action. Beyond its head across the west boundary the ridge drops to a small lake in what appears to be an ice-carved corrie. Each side of upper "West Fork" are rolling uplands rising to sub-alpine meadows around the south-west corner of the reserve that top out at over 2135m (7,000 ft.).

Small ponds provide the only standing water (apart from various marshy areas), one in the upper valley of Kingfisher Creek, one at mid-height near the south boundary, and the other in a wet valley below the high point. Generally sub-surface drainage must be good and the scarcity of surface streams is noticeable.

GEOLOGY

Rocks underlying Hunter's Range form a rather monotonous succession of gneiss of the Shuswap Metamorphic Complex. At Kingfisher Creek they have not been examined in detail and are mapped as "undivided gneiss", however, the lithology is probably the same or similar to that at Mount Mara which is classed as granodiorite gneiss, diorite gneiss and augen gneiss implying a plutonic origin prior to metamorphism. Regionally, age and derivation remain contentious but are biased towards a former area of sediments, possibly Cambrian, into which these bodies were later intruded, all subsequently subjected to high intensity alteration.

Structural deformation is noted (Jones: Vernon Map Area, Memoir 296) although is not significant except for an inferred fault of probable mid-Tertiary age. This lineation, running from the upper part of Shuswap Lake, crosses the Trans-Canada Highway, traverses the south fork of Yard Creek, runs down

the length of Kingfisher Creek and into the valley of Mabel Lake where it controls the straight line of the south half of this body.

Mineralization is infrequent throughout the Shuswap Metamorphic Complex. Some minor values were staked on lower Kingfisher Creek a number of years ago, apparently fracture fillings connected with the fault mentioned above. Any showings of greater potential on Hunter's Range have been within bands of impure marble that lace infrequently through the gneiss. One band is mapped just up-slope from the reserve's eastern edge but the nearest known mineralization in this unit is about 6km south-east on Kingfisher Creek east fork. None of this marble is known to occur within the reserve.

SURFICIAL MATERIALS

Time constraints prevented more than casual attention to soils and humus composition and much of the comment on these subjects under Plant Associations is extrapolated from "Vegetation Resources of the Vernon Map Sheet Area" by Clement. E.R. Report #79 (Drs. Revel and Beamish) listed soil types at the time of the first official visit.

Apart from the immediate creek bed, fluvial deposits have very little development along Kingfisher Creek due to narrowness of its valley. Only in the area of the pond does there appear to be any continuous flood plain and even there it has little width. From the south boundary to a short distance past the valley of "West Fork" a certain amount of narrow terracing can be interpreted as being of glaciofluvial origin, possibly from when upland melt water was flowing over or along side ice remaining in the valley bottom.

Elsewhere a veneer of glacial drift covers the surface, thin on the steep valley sides, thicker higher ^{except} where rock outcrop occurs. Under acidic conditions Humo-ferric podzols have developed in all these situations apart from the last mentioned where Regosols predominate.

CLIMATE

Reporting stations at Sicamous (to the north-west) and

Malakwa (directly north) are both about 14km from Reserve #49. Of these, Malakwa is more similarly located in relation to regional climatic boundaries, however it provides only precipitation figures and no temperatures. The lowest point of the reserve is more than half a mile higher than either Malakwa or Sicamous and the highest altitude reached is over half a mile higher still, so actual temperature and precipitation would differ considerably from the following:

	J	F	M	A	M	J	J	A	S	O	N	D	Av./ Total
--	---	---	---	---	---	---	---	---	---	---	---	---	---------------

Mean daily temperature (C°)

Sicamous

-4.4	-1.3	2.4	7.7	13.3	17.4	20.2	19.1	14.0	7.8	1.6	-2.3	7.9
------	------	-----	-----	------	------	------	------	------	-----	-----	------	-----

Mean total precipitation (mm)

Sicamous

65.3	45.5	24.9	33.6	43.2	59.4	48.0	47.0	55.9	54.4	54.1	72.1	604
------	------	------	------	------	------	------	------	------	------	------	------	-----

Malakwa

99.8	70.4	44.2	47.8	54.4	71.9	53.6	63.5	71.6	31.5	78.5	103.9	841
------	------	------	------	------	------	------	------	------	------	------	-------	-----

Mean snowfall (cm) (included above)

Sicamous

55.1	31.7	11.2	1.8					25.7	59.4	135.7
------	------	------	-----	--	--	--	--	------	------	-------

Malakwa

87.1	49.5	14.7	1.3				1.27	33.3	84.4	272.5
------	------	------	-----	--	--	--	------	------	------	-------

An increase of more than one third in total moisture (50% in the case of snow alone) is very evident in the short distance eastwards from Sicamous to Malakwa, i.e. from Moist Interior Forest towards Wet Interior Forest.

Even though the 1986/87 winter had been one of below average snowfall at most Interior locations there were still a few snow patches remaining close to the creek at the south boundary on 5th June. Frost-free days (169 at Sicamous) must be less than 100 at this elevation and fewer in the sub-alpine.

PLANT ASSOCIATIONS

With an altitudinal range of from approximately 1135m (3,900 ft.) to 2135m (7,000 ft.) Kingfisher Creek E.R. takes in three biogeoclimatic zones -

Interior Cedar-Western Hemlock (ICHb)
Montane Spruce (MS)
Englemann Spruce-Alpine Fir (ESSFb and ESSFbp)

The open sub-alpine meadows of the latter are really integral enough themselves to justify inclusion in their own right as a reflection of Alpine Tundra (ATg) a short distance higher, as at Mount Mara. Normally each zone would be divided into sub-zones to give substance to their ecosystem associations but insufficient coverage due to the logistics of visiting this reserve has prevented this being done with confidence, however, 26 divisions have been treated based on observation. In the commentary following, field examination is supplemented with inferences from forest coverage maps, from extrapolation of Ministry of Forests interpretations of vegetation in the Nelson region, and from the Ministry of Environment and Parks publication Vegetation Resources of the Vernon Map Sheet Area.

Map 2 outlines the approximate extent of each zone and is supplemented by additional maps showing in greater detail distribution of the individual tree species distinguishing each. Additionally, Map 3 shows those areas not timbered. Those across the middle portion of that map were not visited but are more likely to be areas of outcrop and shallow soil over rock than meadow which does not occur at this elevation.

INTERIOR CEDAR-HEMLOCK (ICHb)

On the maps it is noticeable how the influence of cold air flowing in the creek bottom has an inhibiting effect on both major tree species. In reality this is even more pronounced than shown by forest coverage maps as hemlock continues somewhat farther along the hillsides than mapped. Beyond the reserve to the north both species can be found several hundred feet higher in less constricted valleys. In early June herb growth along the Kingfisher was only just sprouting among remnant snow patches whereas a short distance higher on the hillside it was already well advanced at that time.

In zonal sites (type 1) forest canopy runs 70 - 80% with lush herb cover of 90% or more in most places. Western hemlock increases in drier locations (type 2) almost to the exclusion of cedar, with a dense shade that can deter smaller plants so that the ground is often largely bare and moss layer hardly developed.

Generally the lower slopes are surprisingly dry and receiving sites few, characterized where they occur by Devil's club and an increase in Lady fern. Most are too small to contain other tree species although a few spruce may start coming in close to the river towards the north. Of these wetter sites, type 3 represents valley slope damp patches and type 4 the limited development of creek-side flats.

Type 1. Zonal (Rosy twistedstalk -Star-flowered false solomon's seal)

Tsuga heterophylla	Taxus brevifolia	Streptopus roseus
Thuja plicata		Smilacina stellata
	Vaccinium ovalifolium	Tiarella unifoliata
Pinus monticola	Lonicera utahensis	Gymnocarpium dryopteris
		Athyrium filix-femina

Terrain: morainal blanket	Position: lower slopes
Slope: 20 - 40°	Moisture: mesic to sub-hygic
Drainage: good	Soil: orthic humo-ferric podzol

Type 2. Dry sites (Falsebox - Creeping raspberry)

Tsuga heterophylla	Paxistema myrsinites	Rubus pedatus
	Taxus brevifolia	Clintonia uniflora
Thuja plicata	Vaccinium ovalifolium	Chimaphila umbellata
Acer glabrum var.		Goodyera oblongifolia
douglasii	Vaccinium	Viola orbiculata
	membranaceum	
		Pleurozium schreberi
		Hylocomium splendens
		Rhytidiopsis robusta

Terrain: morainal blanket/ fluvioglacial terrace	Position: lower slopes
Slope: 15 - 40°	Moisture: sub-mesic to mesic
Drainage: rapid	Soil: orthic humo-ferric podzol, maybe some dystic brunisol

Type 5 (ungeneralized)

<i>Picea engelmannii</i>	<i>Alnus viridis</i>	<i>Athyrium filix-femina</i>
<i>Thuja plicata</i>	<i>Oplopanax horrida</i>	<i>Smilacina racemosa</i>
	<i>Vaccinium membranaceum</i>	<i>Epilobium angustifolium</i>
	<i>Rhododendron albiflorum</i>	<i>Valeriana sitchensis</i>
	<i>Taxus brevifolia</i>	<i>Tiarella unifoliata</i>

ENGELMANN SPRUCE - SUB-ALPINE FIR (ESSFb,ESSFbp)

As will be seen on Map 2, this zone in all its various permutations covers the greater part of Reserve #49. At its lowest, fir appears as an associate of the dominant spruce, becomes an equal partner higher in valleys and drainage channels (photograph 2, page 8), then assumes the predominant position with greater exposure over much of the upland. At its highest, fir might be considered as itself becoming a subordinate as increasing tundra-like conditions result in parkland coverage of widely spaced trees or alternatively, clumped trees interspersed by small meadows. Photograph 3 shows the park-like setting of the rolling uplands.



Photograph
3

Precipitation rises with increasing altitude and lower temperatures lead to a shorter growing season than for the zones below. Exposure to drying winds on the highest ridges is probably even more important than reduced temperature in thinning out growth.

Wet Forested Engelmann Spruce - Sub-alpine Fir (ESSFb)

Type 6. Zonal (White azalea - Oak fern) (Photograph 2)

Abies lasiocarpa	Rhododendron	Gymnocarpium dryopteris
Picea engelmannii	albiflorum	Tiarella unifoliata
	Vaccinium	Streptopus roseus
	membranaceum	Athyrium filix-femina
	Taxus brevifolia	Valeriana sitchensis

Terrain: morainal blanket	Position: mid-slope, upper
Slope: 10 - 30°	valleys
Drainage: moderate to good	Moisture: sub-hygric to hygric
	Soil: humo-ferric podzol

Type 7. Dry sites (Broad-leaved arnica - Lupine)

Abies lasiocarpa	Vaccinium	Arnica latifolia
	membranaceum	Valeriana sitchensis
Picea engelmannii	Rhododendron	Lupinus arcticus
	albiflorum	Luzula hitchcockii
	Sorbus sitchensis	

Terrain: morainal blanket/ vener over rock	Position: middle and upper slopes
Slope: 10 - 30°	Moisture: mesic to sub-hygric
Drainage: good	Soil: humo-ferric podzol

Type 8. Wet sites (Black blueberry - Sitka valerian)

Picea engelmannii	Vaccinium	Valeriana sitchensis
Abies lasiocarpa	membranaceum	Tiarella unifoliata
		Veratrum viride
	Ribes lacustre	Arnica latifolia
	Taxus brevifolia	Gymnocarpium dryopteris
		Athyrium filix-femina

Rhizomnium spp.

Terrain: morainal blanket	Position: upper, middle slopes/ secondary valleys
Slope: 5 - 20°	Moisture: sub-hygric to hygric
Drainage: moderate to imperfect	

Wet Parkland Engelmann Spruce - Sub-alpine Fir (ESSFbp)

Type 9. Zonal (Broad-leaved arnica - Sitka valerian) (Photograph 3)

Abies lasiocarpa	Vaccinium	Valeriana sitchensis
	membranaceum	Arnica latifolia
	Sorbus sitchensis	Pedicularis bracteosa
		Lupinus arcticus

Terrain: morainal blanket	Position: upper, middle slopes
Slope: 10 - 30°	Moisture: sub-hygric
Drainage: good to moderate	Soil: humo-ferric podzol

Type 10. Dry sites (Red mountain-heather - Smooth woodrush)

Abies lasiocarpa	Phyllodoce/empetriformis	Luetkea pectinata
	Vaccinium membranaceum	Arnica latifolia
		Hieracium gracile
		Juncus douglasii
		Luzula hitchcockii

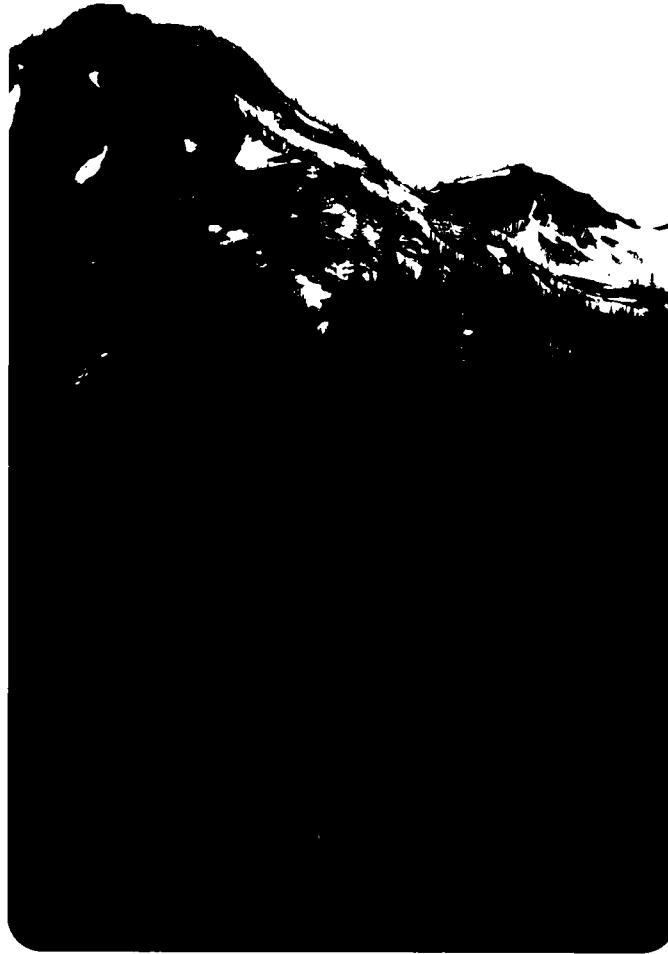
Terrain: morainal blanket/ veneer over rock	Position: upper slopes
Slope: 10 - 35°	Moisture: mesic to sub-hygric
Drainage: good	Soil: humo-ferric podzol

Type 11. Wet sites (Senecio - Bracted lousewort) (Photograph 4)

Abies lasiocarpa		Pedicularis bracteosa
		Senecio triangularis
Picea engelmannii	Rhododendron	Lupinus arcticus
	albiflorum	Mitella breweri
		Pulsatilla occidentalis
		Arnica latifolia
		Veratrum viride
		Valeriana sitchensis

Terrain: morainal blanket	Position: upper slopes
Slope: 10 - 25°	Moisture: sub-hygric
Drainage: moderate	Soil: humo-ferric podzol

Although Photograph 4 was taken outside the reserve (1km south-west looking towards a rocky outlier of Mount Mara), it gives an indication of this assemblage in the foreground.



Photograph 4

Type 12. Sub-alpine Fir Clumps (Krumholtz)

Abies lasiocarpa	Cassiope mertensiana	Luetkea pectinata
	Phyllodoce	
	emmetrifomis	
	Vaccinium membranaceum	

Terrain: colluvial blanket/ venger over rock	Position: upper slopes/ ridge tops
Slope: 0 - 20°	Moisture: mesic to sub-hygric
Drainage: good to moderate	Soil: sombric humo-ferric podzol/ lithic regosol

Several other minor yet distinct associations within the limits of the ESSF zone occur but are not readily connected with any of the foregoing. For convenience they are dealt with here.

Creek valley bottom

Except in its upper reaches where contours ease, Kingfisher Creek has developed little width at valley floor level. Through the ICH zone section, tree and herb growth come to its edges more or less unchanged, apart from slight drying due to winds being more easily able to circulate there. Farther north the creek bed rises more steeply with alder-covered plunging walls too steep for trees. Occasional creek-level patches of vegetation can be categorized as wet or dry, in which the following species were noted:

Type 13. Wet Creek Vegetation

-	Alnus viridis	Rubus parviflorus
	Salix sitchensis	Aruncus dioicus
		Cardamine pensylvanica
		Geum macrophylla
		Senecio triangularis

Type 14. Dry Creek Vegetation

-	Alnus viridis	Arnica latifolia
	Symphoricarpos	Lupinus arcticus
	albus	Catilleja hispida
		Aquilegia formosa

Higher still, the angle lessens again past the pond allowing development of a narrow strip of bottomland mapped as ESSFb, no doubt with the addition of alder close to the water, and some of the herbs previously listed. The highest 2km of creek at the north end of the reserve is similarly mapped, and as one strip is annotated "brush" presumably alder and probably sitka willow commonly occur along its course.

Type 15. Valley Slides

That section of Kingfisher Creek immediately above the ICH zone becomes trough-like with plunging sides that are too unstable for tree growth. Even the next easier section is similar on its west side as far as the pond, and then on both sides of the valley, reaching as high on the east as the reserve boundary. These highest slopes can be seen in the background of Photographs 1 and 2, but not the lower ones dropping into the creek.

Vegetation over these slides depends on how recently soil wastage took place and how much stability there is now. At one extreme are slopes still largely bare, others where a limited cover is developing (one completely blue from a distance with lupine in flower), to those completely green and stabilized. These appear to have a large complement of alder. Although it was not possible to examine these slides, an interesting project would be to study the sequence of recovery that takes place at this altitude.

Type 16. Ponds

Standing water is a rarity in this reserve, the largest body appearing to be a pond about two thirds of the way along Kingfisher Creek from the south. An attempt to reach it was abandoned due to slowness of progress up the creek bottom. Air photographs show it as having a wide marsh border or, alternatively, an edge of emergent reed growth, and undoubtedly an examination would add many additional species to the list of plants found in the reserve.

Similarly, a smaller pond (half a kilometre north of the mid-point along the south boundary) was not reached. Although going is good in this area poor weather caused the effort to be aborted. This pond can be identified near the left edge of Photograph 3.

The remaining body of water falls within the Sub-alpine meadow area and is dealt with in that section.

Type 17. Soil over Rock

Forest coverage maps mark with the symbol for "alpine" anything with little or no development of trees. Thus the slides along Kingfisher Creek are so marked, and so are several areas across the narrowest point of the reserve. These are unlikely to be meadow at this height in the sub-alpine fir sub-zone and are more probably areas of thin soil over rock. Composition may vary but would be similar to the following:

	Vaccinium membranaceum	Luetkea pectinata
	Phyllodoce empetriformis	Juncus douglasii
Abies lasiocarpa	Juniperus communis	Hieracium gracile
		Luzula hitchcockii
		Saxifraga ferruginea
		Arnica latifolia

Terrain: colluvial veneer over rock	Position: upper and middle slopes
Slope: 10 - 30°	Moisture: sub-hygric
Drainage: good to moderate	Soil: lithic and orthic regosols

WET INTERIOR ALPINE TUNDRA (ATg)

As explained previously, the areas of alpine meadow are not strictly above timber line (there are Alpine fir clumps on the highest points in the south-west corner of the reserve), however they are formed by the same physical conditions and composed of the same plant associations so do not differ in any material way.

Climate is at its most severe at this elevation due mainly to strong wind. Snow patches were still present in the second week of July. With less exposure it is likely that Alpine fir would be able to colonize the greater part and in several places seedlings were seen that have been able to germinate out in the meadow but had made little progress since.

Within each sub-zone differences in variables such as soil depth, drainage, exposure, longevity of snow patches etc. produce slightly different ecosystems that seem more obvious in this open country than under tree cover.

Zonal sites are depicted in the foreground of Photograph 5 with the light herbage of Woolly pussytoes very much in evidence. Some indian paintbrush can be seen; practically all else is sedge. Farther back the site becomes drier where rocks break the surface encouraging an increase in dwarf woody species. As can be seen, the clumps of Alpine fir are not really krummholtz. Certainly reduced in size, most of the trees are able to reach above the protection of winter snow level and only occasionally are the clumps surrounded by a fringe of dwarfed individuals that are covered in winter.

Type 18. Dry Meadow (Sedge - Woolly pussytoes) (Photograph 5)

-	-	Carex nigricans
		Antennaria lanata
		Castilleja miniata
		Claytonia lanceolata
		Carex macrochaeta
Terrain: morainal/colluvial blanket		
Slope: 0 - 25°	Position: upper slopes	
Drainage: good	Moisture: mesic to sub-hygric	



Photograph
5

Type 19. Dry Sites - Rocky Meadow (Mountain heathers - Luetkea)

	Cassiope mertensiana	Luetkea pectinata
	Phyllodoce glandulifera	Luzula hitchcockii
Abies lasiocarpa	Juniperus communis	Hieracium gracile

Terrain: colluvial blanket/ colluvial veneer over rock	Position: upper slope
Slope: 0 - 20°	Moisture: mesic
Drainage: rapid	

Type 20. Wet Sites - Snowpatch Meadow (Sedge - Western anemone)

-	-	Carex nigricans
		Luzula hitchcockii
		Pulsatilla occidentalis
		Arnica latifolia
		Erigeron peregrinus
		Valeriana sitchensis
		Erythronium grandiflorum
		Vahlodia atropurpura

Terrain: Morainal blanket	Position: upper slope
Slope: 0 - 25°	Moisture: sub-hygic
Drainage: moderate	

Type 21. Dry Slope (Sedge - Alpine bluegrass)

-
Phyllodoce mertensiana Carex nigricans
Phyllodoce empetrifomis Poa alpina
Epilobium sp.
Arnica latifolia
Saxifraga ferruginea...
Vahlodia atropurpurea
Antennaria lanata

Terrain: morainal blanket/
colluvial blanket Position: upper slope
Slope: 20 - 40% Moisture: sub-hygric
Drainage: good to moderate

Type 22. Wet Slope (Barclay willow - Sedge)

-
Salix barclayi Carex spp.
Rhododendron albiflorum Ranunculus eschescholtzii
Mitella breweri
Senecio triangularis

Terrain: morainal blanket Position: upper slope
Slope: 15 - 35° Moisture: hygic to sub-hygric
Drainage: poor

Type 23. Seeps

-
-
Salix barclayi Aulacomnium palustre
Philonotis fontana
Mitella breweri
Trollius laxus
Caltha leptosepala
Valeriana sitchensis
Senecio triangularis

Type 24. Wet Valley Bottom (Sedge - Marsh marigold) Photographs
6 and 7

-
Salix barclayi Caltha leptosepala
Trollius laxus
Pulsatilla occidentalis
Juncus mertensianus
Leptarrhena pyrolifolia
Ranunculus eschescholtzii
Veratrum viride
Kalmia microphylla
Carex macrochaeta
Carex nigricans

that time. Snow would not long ago have left the flats and is still present among the farthest trees. Last year's dead sedge leaves give a general brownish cast but where drainage improves on slight rises the greener appearance indicates a trend towards Type 20 and gradually where the angle steepens, to Type 11 out of sight to the left.

Less than a month later on 7th August the appearance is considerably changed. Photograph 7 was taken from right of centre of the previous photograph. Cottongrass covers wetter areas and alpine forbs tend to concentrate along edges of water and slight rises in preference to the mainly sedge flats. Indian paintbrush (mainly *C. miniata* but possibly some *C. rhexifolia*) are evident in the foreground along with Western anemone, Alpine fleabane, Triangular ragweed and Sitka valerian. Yellowish patches along the water's edge are moss. Not obvious in this view is the pool (Type 25), one end of which is visible with imagination by the left margin.

Type 25. Pool Edge (Cottongrass - Sedge)

-

-

Eriophyllum angustifolium
Carex limosa
Carex kelloggii
Tofieldia glutinosa

Slope: negligible
 Drainage: none

Position: depression
 Moisture: hydric

Type 26. Pool

-

-

Callitriche heterophylla
Sparganium minimum
Drepanocladus fluitans

List of Vascular Plants recorded during 1937

The numbers following each specific name refer to the ecosystem type (1 to 26) of the preceding section in which that species was found.

Asplenaceae	Athyrium distentifolium 19 Athyrium filix-femina 1,3,5,6,8 Gymnocarpium dryopteris 1,2,3,5,6,8 Polystichum lonchitis 2
Equisetaceae	Equisetum variegatum 24
Lycopodiaceae	Huperzia selago 22 Lycopodium annotinum 3
Cupressaceae	Juniperus communis 17,19 Thuja plicata 1,2,3,4,5
Pinaceae	Abies lasiocarpa 6,7,8,9,10,11,12,18,18,19 Picea engelmannii 3,4,5,6,7,8 Pinus monticola 1 Taxus brevifolia 1,2,5,6,8 Tsuga heterophylla 1,2,3
Aceraceae	Acer glabrum var. douglasii 1,2
Apiaceae	Heracleum sphondylium 3 Osmorhiza sp. (probably chilensis but very like purpurea) 1
Araliaceae	Oplopanax horridus 3,5
Asteraceae	Antennaria lanata 18,21 Arnica latifolia 6,7,8,9,10,11,14,17,18,20,21 Erigeron perigrinus 13,20 Hieracium albiflorum 1 Hieracium gracile 10,17,18,19,21 Senecio triangularis 3,4,11,13,22,23,24 Taraxacum officinale 14
Betulaceae	Alnus viridis ssp. sinuata 4,5,13,14,15
Brassicaceae	Cardamine pensylvanica 13
Callitrichaceae	Callitriche heterophylla 26
Caprifoliaceae	Lonicera utahensis 1,4,13 Sambucus racemosa 3 Symphoricarpos albus

Celastraceae	Paxistema myrsinites 1,2
Cornaceae	Cornus canadensis 1,3,5,8
Ericaceae	Cassiope mertensiana 12,18,19,21 Chimaphila umbellata 2,5 Gaultheria ovatifolia 2 Kalmia microphylla 24 Phyllodoce empetrififormis 10,17,21 Phyllodoce glandulifera 19 Rhododendron albiflorum 3,5,6,7,8,11,22 Vaccinium membranaceum 1,2,5,6,7,8,9,10,17 Vaccinium ovalifolium 1,2,5
Fabaceae	Lupinus arcticus 6,7,8,9,10,11,14,15
Grossulariaceae	Ribes lacustre 3,8,10
Monotropaceae	Hypopitys monotropa 2
Onagraceae	Epilobium angustifolium 5,10 Epilobium brevistylum 3 Epilobium glanduliferum 21
Parnassiaceae	Parnassia fimbriata 13,22
Polygonaceae	Oxyria digyna 14,21
Portulacaceae	Claytonia lanceolata 19,20 Sagina saginoides 11
Pyrolaceae	Orthilia secunda 1,2 Pyrola asarifolia 1,3
Ranunculaceae	Actaea rubra 3,13 Aquilegia formosa 14 Caltha leptosepala 23,24 Delphinium nuttallianum Fulsatilla occidentalis 11,13,20,23,24 Ranunculus eschscholtzii 21,22,23,24 Ranunculus uncinatus 3 Thalictrum occidentale 1,5,13 Trollius laxus 4,13,23,24
Rosaceae	Aruncus dioicus 13 Geum macrophyllum 13 Luetkea pectinata 10,12,17,13,19,21 Rubus parviflorus 4,13 Rubus pedatus 1,2,5 Sibbaldia procumbens 18 Sorbus sitchensis 6,7,9

Rubiaceae Galium triflorum 3

Salicaceae Salix barclayi 21,22,23,24
Salix sitchensis 13

Saxifragaceae Leptarrhyna pyrolifolia 23,24
Mitella breweri 11,22,23,24
Mitella pentandra 3,4,5,13
Saxifraga ferruginea 17,21
Saxifraga lyallii 24
Tiarella unifoliata 1,2,3,5,6,8

Scrophulariaceae Castilleja hispida 14
Castilleja miniata 18
Castilleja rhexifolia 21
Pedicularis bracteosa 9,11
Veronica americana 13
Veronica wormskjoldii 11,13,21,24

Urticaceae Urtica dioica 3

Valerianaceae Valeriana sitchensis 3,4,5,6,7,8,9,11,13,18,
20,21,23

Violaceae Viola glabella 3,11,13
Viola orbiculata 2
Viola palustris 3

Cyperaceae Carex aenea 3
Carex deweyana 3
Carex illota 21
Carex kelloggii 25
Carex limosa 25
Carex macrochaeta 3,13,24
Carex nigricans 18,20,21,24
Eriophorum angustifolium 25

Juncaceae Juncus douglasii 10,17,23
Juncus mertensianus 24
Luzula hitchcockii 7,10,17,18,19,20
Luzula narviflora 1

Orchidaceae Goodyera oblongifolia 1,2,5
Listera cordata 1
Listera caurina 3
Platanthera hyperborea 3

Lilaceae Clintonia uniflora 1,2
Disporum hookeri 1
Erythronium grandiflorum 11,18,20,23
Smilacina racemosa 1,2,5
Smilacina stellata 1,3
Streptopus amplexifolius 3
Streptopus roseus 1,3,5,6,8
Tofieldia glutinosa 25
Veratrum viride 3,4,8,11,13,23,24

Poaceae Phleum alpinum 10,11
 Poa alpina 21
 Vahlodia atropurpurea 17,18,20,21

Sparganaceae Sparganum miniatum 26

The order and taxonomy of the foregoing list follows Taylor and MacBryde. Insufficient data was obtained over enough of the reserve for an assessment of abundance to be useful; similarly, phenology of flowering has been omitted as, covering 1000m of elevation, it would entail excessive explanation to be meaningful.

In total, 119 species for this reserve is not outstanding. It compares with twice as many at Griffin Mountain which is able to include wider diversity of habitats at lower elevations, particularly the productive Wap Valley marshes and roadside.

Additional visits over a wider area may have added to the Kingfisher list but probably not to any great extent. That the originally proposed location around Mount Mara would have included areas of greater variety is evident from casual observation in passage. Species noted there include Arabis hirsuta, Aquilegia flavescens, Draba stenoloba, Epilobium lactiflorum, Poa gracillima, Saxifraga mertensiana and Arenaria capillaris and these could conceivably be present in suitable locations at this height in Reserve #49, along with Hippuris montana found just north of the reserve boundary. Outside at the lowest level Asarum caudatum, Aster brachyactis, Aster ciliolatus, Gnaphalium microcephalum and Stellaria crispa were collected.

None of the species listed in this report is of particular significance although Athyrium distentifolium is not all that common.

LIVERWORTS

Barbilophozia floerkei	AT grass
Barbilophozia sp.(?hatcheri)	damp soil,AT,MS
Cephalozia catenulata	ESSF,decaying wood
Cephalozia lunulifolia	AT,wet rock
?Cephaloziella sp.	AT,soil
Lephozia excisa	AT,grass
Lephozia ventricosa	AT,wet rock
Marchantia polymorpha	ICH, wet soil
Ptilidium pulcherrimum,	all zones, bark
Radula ?bolanderi	AT, wet rock
Scapania curta	ICH, soil,rock
Scapania ?undulata	ICH, soil

MOSSES

<i>Aulacomnium palustre</i>	AT, wet soil
<i>Amblystegium ?polygamum</i>	ICH, wet soil
<i>Blinda acuta</i>	ICH, wet rock
<i>Brachythecium collinum</i>	AT, soil
<i>Brachythecium ?nelsonii</i>	ICH, litter
<i>Bryum pallens</i>	ICH, wet soil
<i>Bryum weigeli</i>	AT, wet rock
<i>Bryum sp.</i>	ICH, wet rock
<i>Camyllum stellatum</i>	ICH, wet silt
<i>Dicranella ?pacifica</i>	AT, soil
<i>Dicranella sp.</i>	ESSF, soil
<i>Dicranum elongatum</i>	ESSF, soil over rock
<i>Dicranum montanum</i>	ESSF, litter
<i>Dicranum scoparium</i>	ICH, litter
<i>Dicranum tauricum</i>	ICH, bark
<i>Drepanocladus fluitans</i>	AT, immersed
<i>Drepanocladus uncinatus</i>	ICH, litter
<i>Grimmia alpicola</i>	ESSF, rock
<i>Grimmia alpicola var.</i> <i>rivularis</i>	ICH, wet rock
<i>Grimmia torquata</i>	ESSF, rock
<i>Grimmia hartmanii var.</i> <i>anomala</i>	AT, wet rock
<i>Grimmia ?trichophylla</i>	At, rock
<i>Grimmia anodon?</i>	ESSF, soil over rock
<i>Hygrohypnum norvegicum</i>	AT, wet rock
<i>Hygrohypnum smithii</i>	ICH, wet silt
<i>Hylocomium splendens</i>	ICH, litter
<i>Hypnum circinale</i>	ICH, bark, decaying wood
<i>Kiaeria blytii</i>	AT, soil over rock
<i>Leptodictium riparium</i>	AT, wet rock
<i>Oligotrichum aligerum</i>	ESSF, soil
<i>Oligotrichum hircanicum</i>	ESSF, soil
<i>Philonotis fontana</i>	AT, wet soil
<i>Plagiothecium cavifolium</i>	ESSF, decaying wood
<i>Plagiothecium laetum</i>	ICH, litter
<i>Pleurozium schreberi</i>	ICH, litter
<i>Pohlia cardoti</i>	ESSF, soil
<i>Pohlia erecta</i>	ESSF, decaying wood
<i>Pohlia nutans</i>	ICH, ESSF, soil
<i>Pogonatum urnigerum</i>	ICH, soil
<i>Polytrichadelphus lyallii</i>	AT, soil
<i>Polytrichum formosum</i>	ICH, litter
<i>Polytrichum juniperinum</i>	ICH, soil
<i>Polytrichum piliferum</i>	ESSF, soil
<i>Pseudoleskeella nervosa</i>	ICH, bark
<i>Ptilium crista-castrensis</i>	ICH, litter

Rhacomitrium aquaticum	AT,wet rock
Rhacomitrium canescens	ESSF,soil over rock
Rhacomitrium varium	ICH,soil
Rhizomnium glabrescens	ICH,litter
Rhizomnium magnifolium	ICH,damp soil
Rhizomnium nudum	ICH,litter
Rhytidiadelphus loreus	ICH,litter
Rhytidiopsis robusta	ICH,litter
Sohagnum girgensohnii	AT,damp soil
Sohagnum sp.(?nemeorum)	AT,seep
Tetraphis pellucida	ICH,damp silt
Timmia austriaca	ICH,soil

The two lists above, not examined by an authority on bryophytes, were made from collections mainly at the lowest and highest elevations in the reserve leaving a gap between that may or may not produce others. The lower pond areas also remain to be sampled.

Hygrohypnum norvegicum, on wet rock at the edge of an alpine stream, was an uncommon species collected.

LICHENS

As with mosses, the collection made during 1937 is listed showing zone in which found and the type of substrate. This is not to say that specimens may not be present in other zones, as additional examination might reveal. Neither list nor specimens have been vetted by a lichen authority. An attempt has been made to include more crustose lichens, some of which serve an important function in stabilizing bare alpine soil.

Acarospora flava	AT,rock
Alectoria sarmentosa	ICH,twigs
?Bacidia sp.	ESSF,soil
Bryoria fremontii	ESSF,twig
Bryoria fuscescens	ICH,twig
Bryoria pseudofuscescens	ESSF,bark
Buellia ?disciformis	ESSF,decayed wood
?Buellia ?stellulata	AT,rock
Cetraria arenaria	AT,soil
Cetraria islandica	AT,soil
Cetraria orbata	ICH,twig

Cladina rangiferina	ICH,litter
Cladonia bacillaris	ICH,decayed wood
Cladonia bellidiflora	ESSF,litter
Cladonia carneola	ESSF, soil,humus
Cladonia cenotea	ICH,litter
Cladonia chlorophaea	AT,ESSF,soil,soil over rock
	ICH,litter
Cladonia coniocraea	ICH,decayed wood
Cladonia ecmocyna	
ssp.ecmocyna	AT,soil
ssp.intermedia	AT,humus
Cladonia fimbriata	ESSF,soil
Cladonia gracilis	AT,soil
Cladonia ?turgida	AT,soil
Dermatocarpon miniatum	AT,rock
Hypogymnia enteromorpha	ICH,bark
Icmadophila ericetorum	ICH,ESSF,decayed wood
?Lecania cyrtella	ICH,bark
Lecidea granulosa	AT,soil
Letharia vulpina	ESSF,bark
Lobaria pulmonaria	ICH,bark
Nephroma bellum	ICH,moss
?Ochrolechia sp.	AT,soil
Parmeliopsis ambigua	ESSF,bark
Parmeliopsis hyperoptera	ESSF,twig
Peltigera canina	ESSF,litter
Peltigera ?degenii	ICH,soil
Peltigera sp.	ICH,soil
Platismatia glauca	ICH,twig
Rhizocarpon geographicum	AT,rock
Solorina crocea	AT,soil
Sphaerophorus globosus	ICH,bark
Stereocaulon paschale	AT,soil
Umbilicaria deusta	ESSF,moss

FUNGI

1987 was an extremely dry year with detrimental effects of fungus production. Even so it was noticeable that the upper part of the reserve (ESSFbp and ATg) maintains a partial independence from weather conditions due to the plentiful snow cover and late melt which keeps soil moist.

No doubt the species listed below constitute only a small fraction of the actual species present that might be expected from more detailed observation under optimum conditions.

Russulaceae	Russula aeruginea Russula ?fragilis (?fallax) Russula xerampelina
Hygrophoraceae	Hygrocybe miniata Hygrophoropsis inocybiformis
Tricholomataceae	Clitocybe ?subalbina Clitocybe sp. Laccaria lacata Tricholoma ?virgatum Collybia acervata Omphalina sp. Mycena eipterigia Mycena sp.
Entomolaceae	Entomola ?sericeum Rhodophyllus ?griseus
Strophariaceae	Naematoloma capnoides Stropharia hornemannii
Cortinariaceae	Cortinarius ?pinetorum Cortinarius violaceus
Gomphidiaceae	Gomphidius glutinosa
Boletaceae	Leccinium aurantiacum
Polyporaceae	Fomitopsis pinicola
Tremellales	Guepiniopsis alpinus Phlogiotis helvelloides
Lycoperdales	Calvatia subcretacea
Morchellaceae	Morchella sp.
Helvellaceae	Discina perlata

BIRDS

The absence of several species usual at the heights and in the zones covered at Kingfisher Creek are probably due more to limited observation than anything else.

Speed of production by Vaux swift was very obvious. These arrived in the ICH zone in early June and before the beginning of August had completed their cycle and left the area. Hummingbird, by contrast, dallied much longer than expected and one was seen still at about 6,000 ft. on 7th August by which time in lowland regions like the north Okanagan emigration is well underway.

The numbers after each name refer to date of observations (day/month).

Red-tailed hawk 7/8, 29/8
Solitary sandpiper 7/3
Vaux swift 5/6, 29/6, gone 1/8
Calliope hummingbird 10/7
Hummingbird sp. 7/8
Northern flicker 5/6, 29/6
Steller jay 1/8
Raven 5/6, 7/3
White-breasted nuthatch 29/6
Dipper 29/6
Winter wren 5/6, 29/6
American robin 10/7
Varied thrush 5/6, 29/6, 10/7
Water pinit 28/8
Pine siskin 29/6, 28/3
Dark-eyed junco 10/7
White-crowned sparrow 28/8

MAMMALS

Steep sides to Kingfisher Creek and limited development of valley floor leaves little reason for deer to favour this area. Wintering would take place in the more expansive conditions of lower Kingfisher Valley towards Mabel Lake, however, evidence of use in the summer was generally, if thinly, scattered throughout the reserve. The one individual encountered was a male White-tailed deer (July) in the high wet valley near the south-west corner.

Denser forest of the northern third is more suitable moose territory but the only one seen was a short distance beyond the reserve on the west side. This area, named on maps as Cariboo Plateau, is rather dank, old growth fir-spruce forest and may have carried Mountain cariboo at one time although few seem to stray south of the Trans-Canada Highway these days. Two were picked off by shooters in 1987 on the north side of Greenbush Lake which would put them about 25km due north of Upper Shuswap River E.R. and 18km south-east of Griffin Mountain E.R. Elk, too, might stray occasionally into the Kingfisher area from upper Sicamous Creek where a small herd of around a dozen animals has been quite stable in numbers and range in recent years.

Most Black bear trace was on the forest access road up Kingfisher Creek and the cut blocks there, but this would be due to their convenience for travel and undoubtedly animals do not exclude themselves from E.R. property. Ranchers with grazing rights each side of the reserve profess to lose stock in the summer to Grizzly bear from time to time. How much fact there is behind these assertions and how much is surmising to account for lost animals might be asked as no sign of grizzly diggings, old or new, were seen in the sub-alpine. Few small mammals seemed present to attract them. No marmots were recorded in the reserve and only one colony of Columbian ground squirrel in the areas traversed (at the rocky base of a steep slope below the heights of the south-west corner).

Smaller mammals were Red squirrel at the lowest levels and Pine chipmunk in sub-alpine fir parkland. Holes and earth "ropes" of an unidentified rodent that seemed hardly large enough for pocket gopher showed up on high elevation sedge meadows. In the ICH zone, Varying hare scat was present except in dry sites where ground cover was thin, and scratching on trees up to one metre high suggest one of the fur-bearing mammals.

OTHER ANIMALS

Spotted frogs live up to their reputation for tolerating cold water by living in the sub-alpine pool at an altitude of about 1900m (6,250 ft.) near the south-west corner. Several individuals were active on 7th August in what must be a very short season of open water. Lower, in the ICH zone, Western toad was encountered in the forest.

SPIDERS

Time constraints for seeking spiders and problems of returning to locations to retrieve traps limited the examination of spider fauna, even so, one new record for British Columbia was recorded. Determination of species was carried out by Dr.C.D.Dondale of Biosystemics Research Centre, Agriculture Canada, Ottawa with his usual willingness.

Lepthyphantes zebra (Emerton) ICH wet, 4,000 ft.
Cryphoeca peckhami Simon ICH zonal, 4,000 ft.
Pardosa dorsuncata Lowrie & Dondale ICH zonal, 4,000 ft.
and ATg, 6,250 ft.
Pardosa mackenziana (Keyserling) ICH zonal, 4,000 ft.
**Ceraticelus rowensis* Levl & Levi ATg, 6,250 ft.
Pardosa anomela Gertsch ATg, 6,250 ft.
Araneus sp. (juvenile, probably *A.nordmannii* (Thorell)
ESSFb, 4,500 ft.

*New B.C. record; previously known only from Waterton, Jasper and Cypress Hills, Alberta.

MANAGEMENT

Although access to this reserve raises problems, the other side of the coin is that it reduces casual intrusion. No evidence of hunting was seen, even outside, indeed no normal shooter would willingly consider the logistics when easier hunting areas exist elsewhere.

Stands of marketable cedar are present in Kingfisher Valley on the east side of the creek and it would not be surprising if licenses are eventually issued for their extraction. With time this could lead to closer access from the south. Similarly, to the north the existing Owlhead Creek Road has been used for removing timber from better drained parts of Cariboo Plateau. Mature (?over mature) spruce and fir closer to the reserve is within reach of this road and an extension is possible. Some route markers and trail cutting were noted in this area off the north-west side of the reserve and it is believed this has been done by snowmobile parties from Sicamous or nearby.

One of the problems foreseen by Enderby residents when originally promoting Hunter's Range for park status was degradation through snowmobile use. Certainly mis-use by riding through bush and low growth can have an effect but

snow depth at this altitude provides good cover and if any intrusion of the reserve by riders does take place it is not evident at the present time.

Potentially more hazardous are trail bikes. ATV damage on parts of Hunter's Range is said to be bad. No bike use was seen on the reserve and only one lone set of tracks was crossed on the Cariboo Plateau side.

Another problem raised by the Enderby group was from cattle grazing and this did play a part in removal of the proposed reserve location away from Mount Mara. Grazing licenses are held to the east of Kingfisher Creek (headwaters of Danforth Creek) by Eldon Robertson and Mervyn Foster and although nothing prevents cattle from wandering on to the north end of the reserve it is unlikely that they ever find good reason for leaving the extensive open meadows farther east.

To the west, where licenses are held at this time by Jesse Schweb and Ronald Mitchell, most of the grazing is around Mount Mara and its outliers, however, the holders have cut a rough track in one steep place which allows stock to move to the south-west corner of the reserve; indeed, it is not improbable that the herd is driven over in that direction. In late summer animals were using the upper part of the ridge which forms the south boundary and, as no surveyed line exists, were just as likely to have been within the reserve as outside. In this direction a line of cliffs prevents further intrusion and the amount of invasion is limited. Cattle are also driven up Kingfisher Creek forestry road and use the cut blocks there. No self-respecting cow would see any point in straying from there through steep forest towards the reserve.

Comment was made earlier of the apparent duplication of ecosystem coverage by Kingfisher and Griffin Mountain reserves being so close together. Duplication does have the advantage of providing a back-up in the event of catastrophic loss of a unit to the Agency so that benchmark and genetic bank functions continue unimpaired, but apart from this Reserve #49 seems to serve little purpose. Access will limit research and education uses and no unique species are known to enjoy its protection. If policy ever led management to consider exchanging forest land for other property with more easily identifiable values elsewhere, this reserve could be one possible sacrifice.

Were there ever to be good reason for it, the amount of machine work and cost to repair access route 1 from the

20km point to its end near the reserve would not be large. Foot access on the west side of the creek to just north of "West Fork" is adequate, from where a creek crossing could be made and a foot trail cut of the east side into the uppermost part of Kingfisher Valley. Failing this, there is unlikely to be any use made of the reserve. Warden visits will probably continue to be via the Mount Mara route and barely intrude within the boundary.

No hazards are foreseen to disturb the reserve's somnolent state and no special management actions seem called for.

M. E. Martin
M.E.Martin,
Vernon, B.C.
February 1988