

Ecological Reserves Program
Parks & Outdoor Recreation Division
Victoria, B.C. V8V 1X4

UPPER SHUSWAP RIVER ECOLOGICAL RESERVE #61

REPORT OF SURVEY - 1986

Malcolm E. Martin,
North Okanagan Naturalists' Club,
Vernon, B.C.
February 1987

UPPER SHUSWAP RIVER ECOLOGICAL RESERVE #61

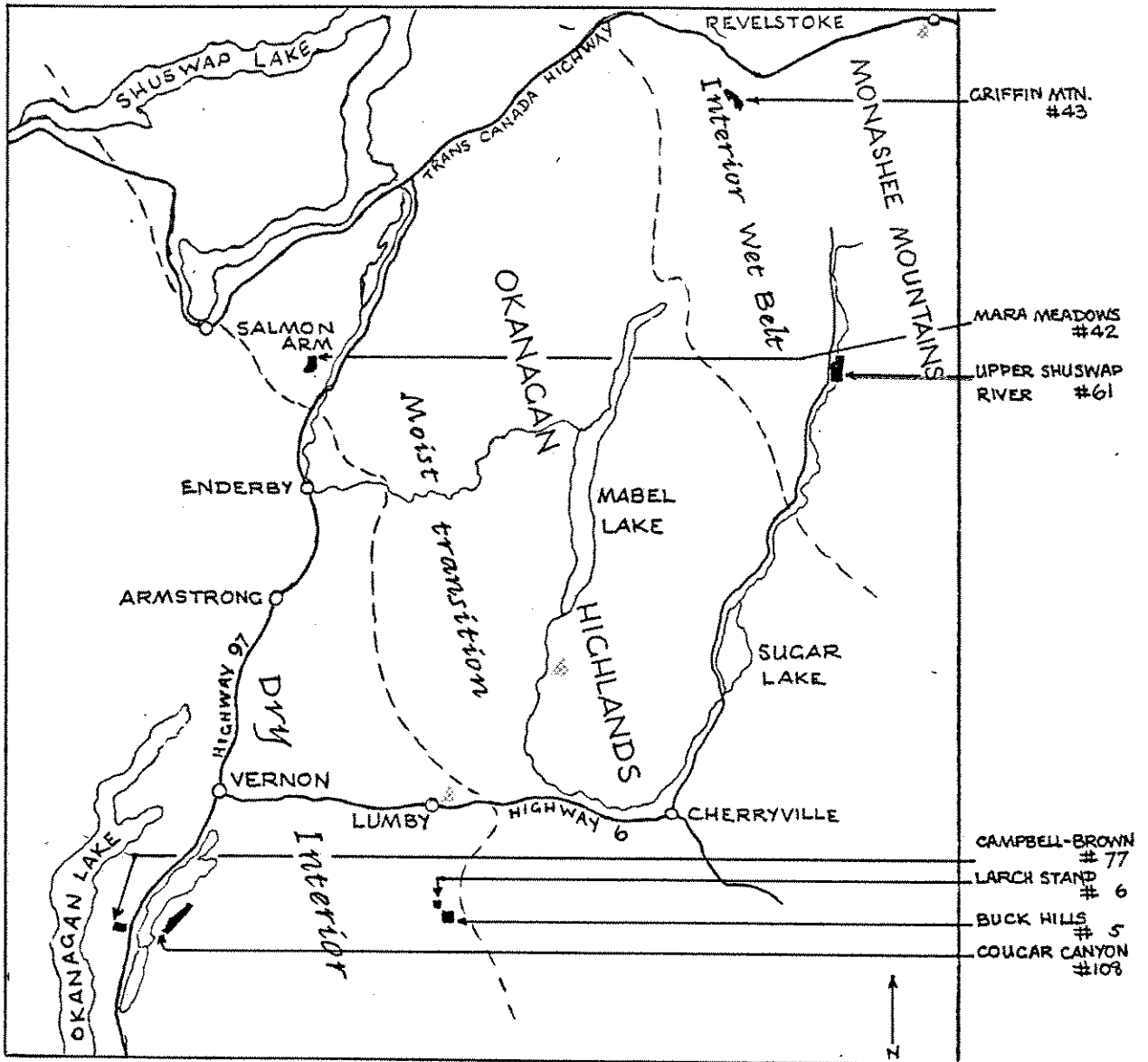
INTRODUCTION

This property of 95.2ha (235.2 acres) was established in 1975 to provide secure coverage of an example of mature Cedar-Hemlock forest in the Interior Wet Belt for the Ecological Reserve Programme.

It falls in the valley of Shuswap River where this river forms the demarkation between the Monashee Mountains to the east and the Sawtooth Range section of the Shuswap Highlands to the west. From the village of Cherryville on Highway 6 it is some 50km (30 miles) in a straight line north, with access first by provincial road (Frank's Store junction) to Sugar Lake at which point it becomes a Forest Service road. The reserve is roughly between the 40 and 42km markers along this road. Map 1 sets the location and relationship with other regional ecological reserves. Topographical map 82 L/9 covers the subject area on which the reserve may be found at approximately 50°40'N, 118°21'W.

PHYSIOGRAPHY

Although the reserve is almost rectangular in straddling the river it has greater length and area on the east than the west side. A narrow, fairly flat-floored valley bottom along this length is included together with the lower mountain slopes enclosing it so that the gross profile is very similar at all points along the long axis. The main disturbance to this symmetry is provided by discontinuous terraces found in some but not all places. An approximation of the most pronounced of these is indicated on Map 2, though it must be stressed that no surveying for height was done so it is by no means clear that "lowest bench" and "second bench" levels are necessarily the same throughout the property.



MAP 1 - LOCATION

This terracing would represent former valley floor levels, cut either by high water-flow during post-glacial melting or, less anciently, by river meanders at successively lower valley levels.

Vertical height from river level to upper boundary of the reserve is only about 45m divided almost equally each side of the 760m (2500 ft.) contour above sea level.

GEOLOGY

From the Interior Plateau of southern B.C. eastwards large blocks of crust were thrust successively higher, first the Okanagan-Shuswap Highlands, next the Monashee Mountains, thirdly the Selkirk Mountain range. Major faults divide each block from its neighbour, one of which faults is inferred to run north-south along the Shuswap River Valley. From a practical stand point this has the effect of orienting the valley in the same direction and subjecting the reserve to slightly more extreme climatic conditions than an east-west valley might be expected to have.





No bedrock was seen to outcrop anywhere on the reserve. Mapping (B.C. Department of Mines Open Files) shows it as falling within the Shuswap Metamorphic Complex, a large regional feature of highly altered composition. Clastic material of glacial and fluvial origin present concur with this interpretation.

Surficial Materials Road cuts and banks along the west side of the reserve expose a coarse sandy loam or loamy sand, weathered reddish, irregularly containing stones and cobbles. Two small exposed sections within the west forested slope indicate only slight bedding of coarser particles, and the whole is taken to be a thick blanket (greater than 1m) of morainal deposit. At these locations there is some leaching from the uppermost zone with a basal red layer classifying the resulting soil as a Ferro-Humic Podzol. Damper locations may have Humo-Ferric Podzol. The combination of parent material, cool perhumic to subhumic soil and coniferous cover encourages podzol development.

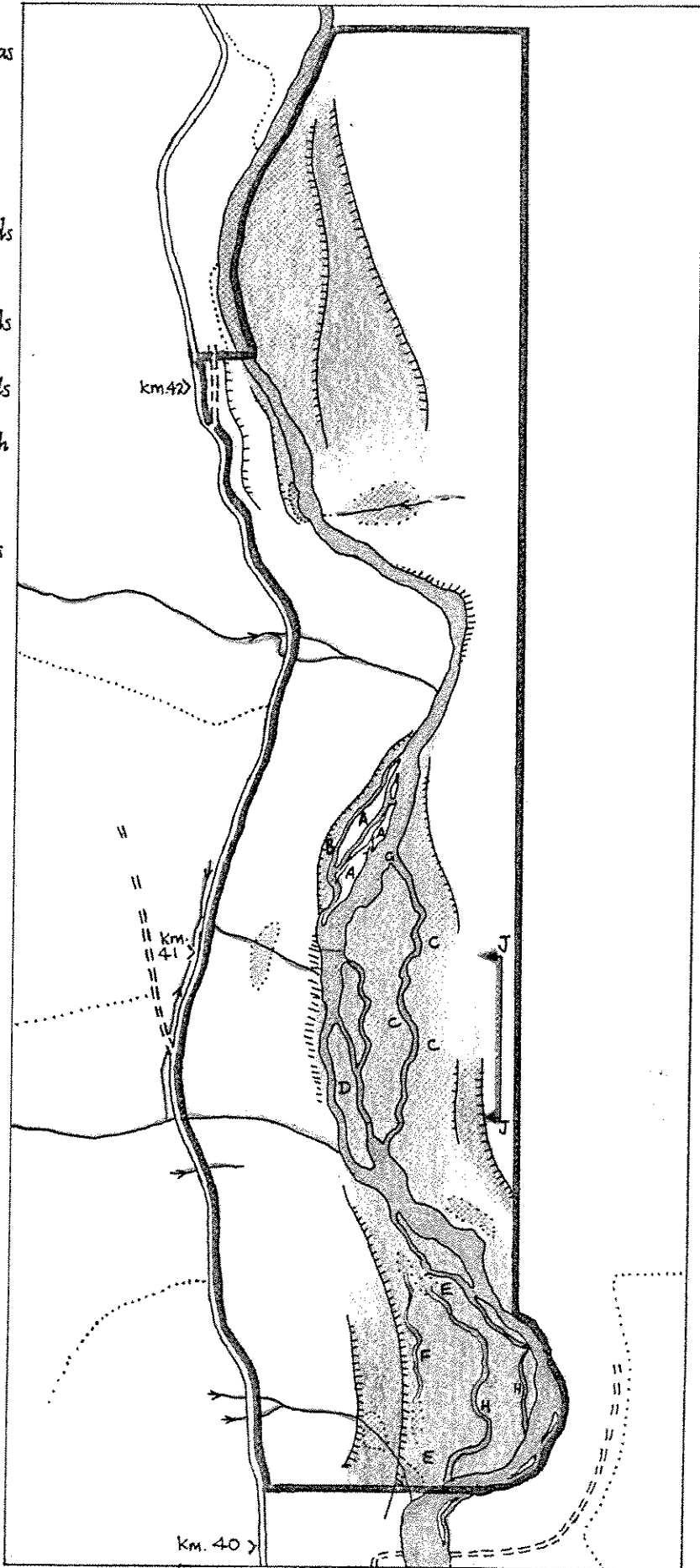
At the lowest slope level, river erosion exposes fluvial deposits of coarser pebbly to cobbly layering interspersed with sandy and silty partings. In the soil formed above these exposures translocation of minerals does not appear and accordingly a narrow strip of Brunisol may be inferred paralleling the river.

At water level active gravel bars are present, particularly at "A" on Map 2 and elsewhere in slack water of bends in the channel. No real soil development occurs there. Older bars are veneered by sand and silt allowing an Orthic Regosol to develop. These are most common in the areas marked "C" and "D" on Map 2.

Gleyed soils do not form a major part of the soil inventory as permanently damp areas are few. That marked "E" at the southern end, and the west-side area near km41 are probably somewhat artificial, as explained later, and very likely have had insufficient time for alteration to occur.

-  permanently damp areas
-  lowest bench level
-  second bench level
-  scarps

- A recent gravel islands
- B inundated forest
- C area of confused channels
- D sand island
- E wet depressions or channels
- F seepage and old channel
- G most recent branch
- H over-flow courses
- I log jams between these points



MAP 2 - PHYSICAL FEATURES

The channels at "E" and "F" receive fine silt from annual high water inundation and never dry out, and the small damp patch at the north end seems to be compacted fine silt backed by minor seepage. Soil of the two east side wet areas was not examined.

Humus Forms Organic residues are commonly present throughout the reserve and decomposition does not appear to be fast. This is especially true on the valley floor Regosol built up on sand and silt and also through much of the Hemlock-Cedar forest drier phases. Humus in these areas would be Mor. Where Cedar predominates and in damp sites there may be Moder forms but this was not specifically tested.

HYDROLOGY

Shuswap River practically bisects the reserve in its southward course before making a 180° turn to flow north into Mabel Lake and, eventually, Shuswap Lake. Its flow is typical of mountainous areas with an early summer peak, falling off through the remainder of the year to a low after freeze-up. Although it was not seen at its lowest in 1936 (an unexceptional year) the difference between high and low water levels from May to October was in the order of 0.6m (2 ft.). Periodic major floods take place washing out bridges and undermining trees and evidence of this can be seen in the log-jam area (between J - J on Map 2).

Debris of several floods is here piled up in great confusion and has led to a complex channel history. Originally most water volume probably passed along its west side. Island "D" would have been a forested part of the bottom flats but devastated during one flood, loosing all its soil and leaving only three or four mature trees on its present edges. Channels opened slightly upstream and to the east as part of this episode due to backing up of water. One or more similar episodes of flooding has caused further upstream and easterly migration of new channels with the latest shown on the map as the "C" channel complex. This has been the result of further backing up of flood water and the cause of inundation of the low strip of forest at "B" on the west side and the large bars of coarse gravel ("A"). At present the "C" channel complex is very confused with flood deposits of silt and sand being actively laid down outside the incised channels.

Confusion is also the word for side streams flowing into the Shuswap from the west, but here the cause is human. Construction of Sugar Lake road is to a high standard with an adequate ditch on the up-slope side of the road and culverts under the road at low points. The result of this has been

in some cases to divert water away from its normal channel down through the reserve and to increase it in others where little or no flow previously took place. The deep gully debouching near the south end of Island "D" now carries a meagre trickle for its size whereas the culvert near km 41 collects most of this water and more and delivers it on to a small flat below causing an area of bog. This in turn is causing slumping on its down-hill side. Another stream apparently receiving more than its original share of water is that at the southern end of the reserve and its wet areas below are also probably artificially produced as a consequence. This is the result of channel disturbance by forestry equipment during logging in 1982. The central cut block above km 41 was logged in 1976 additionally confusing flow pattern and resulting in water passing across the road in places where culverts are not located.

On the east valley slope, surface water is much less, a surprising fact for a steep hillside that would intercept westerly winds. That it is consistently drier is shown by the presence of Douglas-fir higher above the reserve. Only a modest flow was found towards the north end of the reserve, dissipating into a damp area, and a similar amount in the south entering the Shuswap on the bend outside the reserve.

Channels "H" in the south carry river water at annual run-off but are stagnant or reduced to pools later. So long as the main river current continues directed away from their mouths little change is likely. Channel "F" is probably of older vintage and except at its north end is no longer affected by annual high water. Following the base of one of the bench scarps, some of its stagnant water may be due to seepage.

Small seepages also seem to be the cause of limited damp areas marked on Map 2, on the east side in the south, and another on the west side in the north.

CLIMATE

Data from three reporting stations make useful comparisons for Upper Shuswap River Reserve. These are Revelstoke A (at a height of 456m or 1,497 ft.), Lumby, Sigalet Road (549m or 1,800 ft.) and partial figures from Mabel Lake (399m or 1,310 ft). Approximate locations of these stations are shown on Map 1 as green triangles.

J F M A M J J A S O N D Annual

Mean Daily Temperature (C°)

Rev.	-5.9	-1.8	1.9	7.2	12.8	16.4	19.4	18.2	13.7	7.0	0.8	-3.6	7.2
Lum.	-6.4	-2.3	1.8	7.4	12.1	15.6	13.3	17.1	12.4	6.4	0.6	-3.7	6.6

Mean Total Precipitation (mm)

Rev.	152	109	71	56	51	74	58	63	76	107	122	157	1097
Mabel	53	38	28	28	41	56	38	36	41	43	41	53	485
Lum.	48	25	20	25	43	56	33	41	41	36	30	36	437

Mean Snowfall (cm) (included in above totals)

Rev.	132	79	24								51	119	412
Lum.	43	22	7								14	36	122

Annual totals are also available for Malakwa, west of Revelstoke, showing 841mm Mean Total Precipitation of which 272cm was in the form of snowfall.

For the period utilized (1941 - 1970) Revelstoke reported on average 140 frost free days (usually from 14th May to 2nd. October).

None of the reporting stations used is a perfect match for the reserve so certain generalised qualifications would serve to give a better comparison. As indicated on Map 1, the Dry Interior Climatic zone does not pass abruptly into the Interior Wet Belt and an intermediate transition has been shown of which the boundaries are somewhat subjective. Although not following height exactly, it is taken that the Okanagan-Shuswap Highlands are moister than the Dry Interior but less so than the Interior Wet Belt of the Monashee and eastward ranges.

From Map 1 it is clear that Reserve # 61 would be wetter than Lumby or Mabel Lake and not show their summer secondary peak in precipitation to the same degree. It should not be as wet as Revelstoke which, apart from being closer to the mountain divide, is also further north and east, in which directions precipitation increases. It would also be cooler than any of the three stations from a height factor alone but being in a narrow valley would have the addition of cold air ponding. The north-south orientation would expose the reserve to incursions of cold northern winds in winter, and tend to funnel warmer and drier air from the south in summer. Snow-

fall may not reach Revelstoke's prodigious amount but is probably considerable. Patches were still present in 1986 among trees at river level around the middle of May.

VEGETATION

Upper Shuswap River Reserve falls in the Interior Cedar-Hemlock Zone (ICH), with aspects of one of its drier sub-zones. It is obviously less wet than Griffin Mountain Reserve where, for example, Red huckleberry occurs commonly but the moss Drepanocladus uncinatus does not.

Western Red Cedar and Western Hemlock are co-dominant over most of the area with Englemann Spruce occasionally successional at river level and scattered Western White Pine throughout. An age of plus 251 years is given for the mature old forest trees on Ministry of Forests coverage maps, and height of between 126 and 155 ft. Practically all of the cedars have broken and misformed crowns from age; in diameter they range up to 6½m DBH.

Shrub layer within the forest is generally poorly developed being scattered Oval-leaved huckleberry, with the only dense stands those of Devil's club in damp draws. The only exception to this comes in more open areas along flood channels and on some of the gravel bars where willow and Redstem osier are plentiful. Lady fern and Unifoliate Foamflower can be found in practically all habitats and must be the commonest herbs along with Canadian bunchberry. Except on Regosols and along seasonally flooded channels the moss layer is well developed and characterized by Hylocomium splendens, Pleurozium schreberi, Ptilium crista-castrensis and various Rhytidiadelphus species.

Insufficient literature is on hand to allocate this reserve to any of the specific sub-zones used by Ministry of Forestry (ICH a, ICH b etc.) so this has not been attempted. Sub-division has been made directly to what might be regarded as ecological units, these being eight in the case of the forested area; wetlands, although a very small proportion of the whole, are sufficiently varied to provide five units, and disturbed land two. Roman numerals are used for designation.

As elevational range is very slight some conditions are unchanged over all plant associations and therefore are not specifically mentioned under each description. These include special atmospheric conditions (all are subject to cold air ponding and drainage), soil temperature (all fall

in the cool range), and bedrock composition and form (all overlie bedrock as inferred in that section). Insufficient examination was made of humus to differentiate satisfactorily for each unit; nutrition characteristics are not well enough understood to be included although it seems probable that the whole area would fall into submesotrophic to mesotrophic categories with perhaps permesotrophic in damper areas.















ICH ZONE, UNIT I (shorter growth forest)

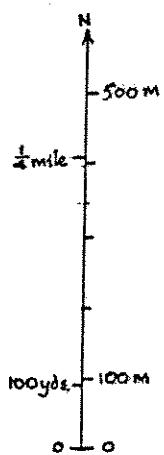
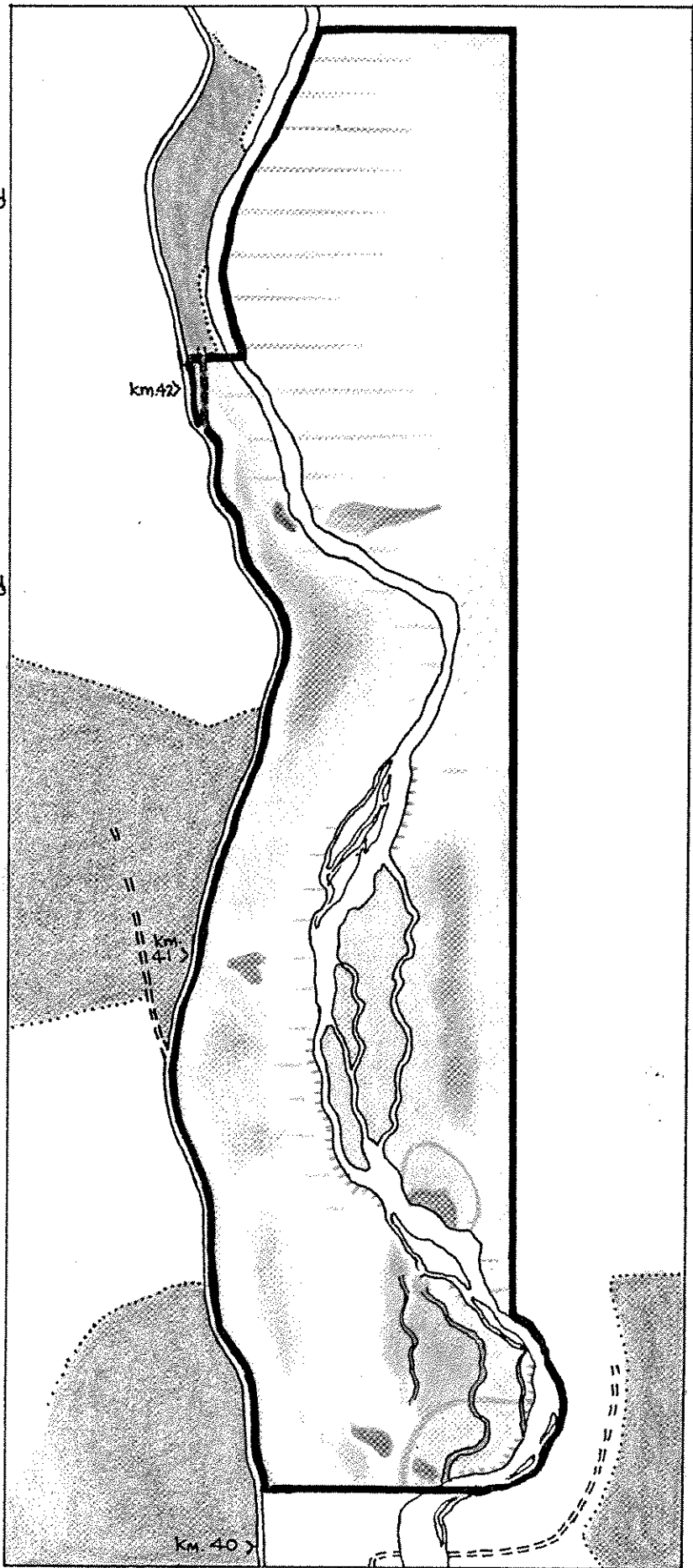
Hemlock-Cedar (White pine)
 Oval-leaved huckleberry (Pacific yew)
 Oak fern-Creeping raspberry
 Hylocomium splendens-Rhytidiadelphus spp.-Pleurozium schreberi

Terrain: morainal blanket and fluvial deposits	Position: lower slope and terraces
Slope: 5° - 25°	Moisture: mesic to subhygric, humid
Aspect: slight	Drainage: well

Tsuga heterophylla	Tsuga heterophylla
Thuja plicata	Thuja plicata
-	-
Vaccinium ovalifolium	Vaccinium ovalifolium
Taxus brevifolia	
Sorbus scopulina	
-	-
Athyrium filix-femina	Gymnocarpum dryopteris
Gymnocarpum dryopteris	Smilacina stellata
Oplopanax horridus	Cornus canadensis
Rubus pedatus	Tiarella unifoliata
Clintonia uniflora	Rubus pedatus
Cornus canadensis	Linnaea borealis
Trisetum cernuum	
-	-
Hylocomium splendens	Hylocomium splendens
Rhytidiadelphus loreus	Pleurozium schreberi
Pleurozium schreberi	Rhytidiadelphus triquetrus

This category might be taken as the standard for the forested area over the reserve as it covers the greatest extent. Although the property was acquired to protect an example of over-mature cedar, it is actually Western Hemlock that is in the majority. Both seem to be of roughly the same age and it is noticeable how little regeneration has taken place of either species, recently or in the past, so that there is no even age distribution. As a result natural

- UNIT I (shorter growth forest) 
- UNIT II (taller growth forest) 
- UNIT III (Devil's club gutties) *not mapped*
- UNIT IV (Bottom flats) 
- UNIT V (dry river edge) 
- UNIT VI (Hemlock forest) 
- UNIT VII (Moister river edge) 
- UNIT VIII (sand island) 
- UNIT IX (Gravel bars) *not mapped*
- UNIT X (old channels) 
- UNIT XI (Wet spots) 
- UNIT XII (forest edge) 
- UNIT XIII (Roadside) 
- Willow or alder scrub 
- Main areas of spruce 
- Logged 



MAP 3 - VEGETATION

removal of old trees in time will result in a radically different forest. Close to the road where clearing has increased light intensity young seedlings can be found, dense in places, and this is indicative of what could take place in openings where fallen trees provide large enough spaces in the canopy.

Understories are sparse making walking in this phase a pleasure. Shrubs are widely spaced and, judging distribution at berry time, Oval-leaved huckleberry outnumbers Black blueberry about ten to one. In the herb layer, Lady fern and Devil's club are plentiful but being no more than knee high in this Unit are not an impediment as they are in damper associations. Moss is abundant throughout.

In a way this Unit best characterises the melding of dry area plants with those more common in wetter areas as, on the one hand, One-sided wintergreen, False solomon's seal, Saskatoon and Bracken are present along with, on the other hand, Yellow wood violet and Sitka valerian.

ICH ZONE, UNIT II (taller growth forest)

Cedar-Hemlock
(Pacific yew)
Lady fern - Star-flowered false solomon's seal
Ptilium crista-castrensis - Mnium spp.

Terrain: moraine blanket
Slope: 10° -40°
Aspect: east

Position: lower slope
Moisture: subhygric, perhumid
Drainage: moderate to well

Thuja plicata
Tsuga heterophylla

Thuja plicata
Tsuga heterophylla

Taxus brevifolia

Taxus brevifolia

Athyrium filix-femina
Smilacina stellata
Oplopanax horridus
Gymnocarpium dryopteris
Tiarella unifoliata

Athyrium filix-femina
Smilacina stellata
Streptopus amplexicaulis
Streptopus roseus
Circaea alpina

Ptilium crista-castrensis
Mnium spp.
Lobaria pulmonaria

Ptilium crista-castrensis
Mnium spp.
Lobaria pulmonaria

This Unit becomes well defined as the season develops due to its ranker growth with Lady fern often almost shoulder-high. Cedar exceeds Hemlock and Yew increases in amount compared with Unit I. Distribution, though, is patchy, making it difficult to plot and much intergrading can be found. Whether any occurs at all on the east side of the valley facing west is questionable except perhaps in some of the more enclosed draws.

Herbs show a decided bias towards those preferring denser shade and damper conditions with Twisted stalks and Fairybells, Meadowrue and Enchanter's nightshade that are mostly absent from Unit I. It is here that Maidenhair fern and the uncommon Long beech fern grow, the former usually along a bank or sharper slope. Generally the whole of this division is at a greater angle than the preceding one especially at the southern end of the reserve and this may encourage greater seepage from up-slope.

ICH UNIT III, (Devil's club gullies)

Cedar - Hemlock
Devil's club
Star-flowered false solomon's seal
Ptilium crista-castrensis - Mnium spp.

Terrain: moraine blanket and fluvial terrace	Position: lower slope and depression
Slope: 5° - 25°	Moisture: subhygric to hygric,
Aspect: east (level, see comments)	subaquic
	Drainage: moderate to poor

Thuja plicata
Tsuga heterophylla

Taxus brevifolia
Ribes lacustre

Oplopanax horridus
Smilacina stellata
Athyrium filix-femina
Tiarella unifoliata
Cornus canadensis

Mnium spp.
Ptilium crista-castrensis

This unit continues the progression towards dampness by one more step. It is quite limited being restricted to broad stream-eroded gullies on the west side where sub-surface

moisture increases. The exceptions are a number of patches of tall Devil's club east of the river where the river flats run up against the valley slope; here, too, a certain amount of sub-surface seepage is probable.

ICH ZONE, UNIT IV (Bottom flats)

Cedar (Hemlock)
 Devil's club (Pacific yew)
 Lady fern - Thimbleberry - Unifoliolate foam flower

Terrain: fluvial level, Position: level
 fluvial terrace Moisture: mesic to subhygric,
 Slope: 0° - 10° perhumid to humid
 Aspect: insignificant Drainage: well to moderate
 Flood hazard: frequent to rare

(a)	(b)	(c)
Thuja plicata	Thuja plicata	Thuja plicata
Tsuga heterophylla		Tsuga heterophylla
Picea engelmannii		
<i>Oplopanax horridus</i>	<i>Alnus sinuata</i>	<i>Taxus brevifolia</i>
<i>Taxus brevifolia</i>		
<i>Athyrium filix-femina</i>	<i>Athyrium filix-femina</i>	<i>A. filix-femina</i>
<i>Gymnocarpium dryopteris</i>	<i>Calamagrostis canadensis</i>	
<i>Tiarella unifoliata</i>	<i>Agrostis scabra</i>	<i>Gymnocarpium dryopteris</i>
<i>Rubus parviflorus</i>	<i>Aster modestus</i>	<i>Tiarella unifoliata</i>
	<i>Senecio triangularis</i>	<i>Osmorhiza chilensis</i>
		<i>Adenocaulon bicolor</i>

This unit is more heterogeneous than any of the foregoing. It comprises a patchwork of slightly varying composition that can conveniently be dealt with together. It makes up much of the lowland in the south half of the reserve, the islands (except Sand Island "D") and adjacent channel complex "C" plus part of the eastern bulge above the south boundary. Silt and sand overbank deposits are being laid down and reworked in the channel complex area, effectively covering vegetation in the depressions. Further changes to the water flow pattern are probably going to take place in this area.

The islands themselves tend to be more open than the remainder and their edges approximate (b) above in vegetation. List (a) is the more general composition and a feature is the presence of Englemann spruce which is regenerating freely where

fallen cedars allow light through the canopy. Thimbleberry also takes advantage of these conditions. The two areas outlined in orange on Map 3 carry significant amounts of spruce. Southerly winds following the river course are unable to make so abrupt a direction change as the water and direct their strength on to the exposed bend by the southern reserve boundary and cause considerable wind-blow in that area. Succession on these bottom flats will therefore be a predominantly spruce seral forest before Cedar and Hemlock are able to produce another cyclical climax.

Undisturbed forest on slight rises has thick canopy and vegetation as shown under (c). Damper sections merge gradually into Units II or III.

ICH ZONE UNIT V (Dry river edge)

Hemlock (Cedar)
 Oval-leaved huckleberry
 Oak fern - Star-flowered false solomon's seal
 Rhytidiadelphus spp. - Pleurozium schreberi

Terrain: fluvial terrace	Position: level and slope toe
Slope: 0° - 10°	Moisture: submesic to mesic, humid to subhumid
Aspect: insignificant	Drainage: well drained

Tsuga heterophylla
Thuja plicata

Vaccinium ovalifolium
Paxistema myrsinites

Gymnocarpium dryopteris
Smilacina stellata
Linnaea borealis
Gaultheria ovatifolia

Rhytidiadelphus triquetrus
Pleurozium schreberi

The previous units treated forest damper by varying degrees than Unit I, which is taken as the standard. The following three cover those drier than standard.

Air movement, and therefore the ability to promote transpiration and evaporation of moisture, is greater in an open area than within enclosed forest, so the closer to the

air channel provided by the river's course the drier conditions become. Additionally, solar heating of gravels during the summer must cause a considerable temperature gradient. Naturally, the changes are gradual but in the main a well defined strip of Unit V borders the river along much of its length, particularly in the north half of the reserve. Not surprisingly, it is wider on the drier east side of the river where wider tree spacing also allows more drying air movement. It may be that an even greater area should be allocated there than suggested on Map 3.

One noticeable feature is the predominance of Hemlock over Cedar; another is the open, sparse undergrowth. Quite a number of the herbs in addition to those listed above are ericaceous, arguing for greater acidity.

ICH UNIT VI (Hemlock forest)

Hemlock
Oval-leaved huckleberry

Rhytidiadelphus triquetrus-Pleurozium schreberi

Terrain: fluvial terrace	Position: slope toe
Slope: 5° - 20°	Moisture: subxeric, subhumid
Aspect: south	Drainage: fast

Tsuga heterophylla

Vaccinium ovalifolium

Paxistema myrsinites

Linnaea borealis

Rhytidiadelphus triquetrus

Pleurozium schreberi

Dicranum spp.

Taken to its conclusion, the previous unit becomes widely spaced hemlock forest with very little else in abundance. In actual size the area given over to Unit VI is small, comprising only the elevation on the east side of the river where the Shuswap makes a sharp turn roughly half-way down the reserve. In appearance this raised knoll might be suspected of harbouring bedrock but no outcrop is seen and the eroded river edge is of coarse river gravels which must encourage the rapid drainage.

ICH ZONE UNIT VII (Moister river edge)

Hemlock - Cedar (Englemann spruce)
Mountain alder
Bluejoint small reedgrass - Self-heal

Terrain: fluvial level Position: level
Slope: 0° - 10° Moisture: submesic, perhumid
Aspect: insignificant Drainage: good
Flood hazard: may be expected

Tsuga heterophylla
Thuja plicata
Picea engelmannii

Alnus incana
Symphoricarpos albus

Calamagrostis canadensis
Prunella vulgaris
Tellima grandiflora

Whereas Dry river edge, Unit V, occurs at some height above river level from about one metre at the north end to as much as 10m in other places, Moister river edge, Unit VII, is more or less right at river level. It occurs in a thin strip intermittently around the curve at the south end and below Unit V where that overlooks the river from on high. In the latter event it tends to be without trees.

Apart from the grass, herbs are scattered rather than concentrated making them difficult to characterize. A few immature Douglas-fir have established themselves along the south side of the bend in the river.

ICH ZONE, UNIT VIII (Sand island)

Sitka willow (Mountain alder)
Blue joint small reedgrass - Creeping bent grass

Terrain: fluvial hummocky Position: level
Slope: 0° - 15° Moisture: submesic to subhygric,
Aspect: insignificant perhumid
Flood hazard: irregular Drainage: moderate to rapid

Salix sitchensis
Alnus incana
Thuja plicata
Picea engelmannii

Calamagrostis canadensis
Glyceria striata
Agrostis stolonifera
Athyrium filix-femina
Equisetum sp.
Aster modestus
Senecio triangularis .

The various islands outlined on Maps 2 and 3 were at one time part of the "mainland" and have gradually been divided off as new channels developed during times of flood. More actually exist in the area "C" than are shown but great complexity makes rough mapping a matter of guesswork. Sand island ("D" on Map 2) would have been forested like the rest of the present islands and bottom flats (Unit IV), and a few small isolated groups of trees still remain at either end, the rest having been stripped off in a catastrophic episode of flood scouring. A number of massive old trunk segments show this to have been some time ago. Either this flood or subsequent ones have left the surface covered with sand and only slight humus development has taken place to colour its surface.

Succession to the removed forest has been provided by Sitka willow which now forms a tangled thicket over much of the island along with a lesser amount of Mountain alder. In turn these will give way to a resumption of forest as scattered seedlings of Cedar, Englemann spruce, Douglas-fir and Balsam poplar take over. In a way the poplar is not a natural successional member and does not seem normally to occur along the river. It is present, though, in places around Sugar Lake 40km south. Road construction and forestry access over the years has provided locations along damp verges for this species to extend its range into unfamiliar territory where it makes use of variously disturbed habitats.

In this respect the river acts somewhat like the road above in providing a conduit for invading plants and weed introductions, as will also be seen in the section on Gravel Bars. Here on Sand Island probable introductions such as Arctic pearlwort, Common chickweed, Rough cinquefoil and Canada thistle have taken advantage of the access provided. None is characteristic of the natural vegetation association which is more realistically provided by herbs that appreciate the high water table such as the grasses Creeping bent and Fowl manna grass, horsetail, Great northern aster and Arrow-leaved ragwort. Lady fern, abundant everywhere in the dense forest, is here not uncommon under high light intensity.

ICH ZONE, UNIT IX (Gravel bars)

(Mountain alder)
Common rush - Lewis monkeyflower

Terrain: fluvial flood deposit Position: level
Slope: 0° - 5° Moisture: subhydric
Aspect: insignificant Drainage: rapid
Flood hazard: frequent

Alnus incana

Juncus effusus
Mimulus lewisii
Agoseris aequivallis

Pohlia wahlenbergii

Whereas the river islands were carved off from existing bottom land, the gravel bars were built up from river-borne material in areas of slack water. They occur along the inner curve of most bends in the river and are not specifically mapped. Those shown at "A" on Map 2 are relatively recent, coarse and unstable, free of vegetation and formed as a result of impoundment of water by the latest additions to the log-jam. The adjacent river bank (marked "B") has also been inundated and covered with gravel, killing most of the trees.

Annual immersion renders gravel bars unfavourable to vegetation and the list is short. A few small Mountain alder and Sitka willow can sometimes be found on the landward side and plants of Common rush, Lewis monkeyflower and Alaska bent grass are usually present. Protected locations along-side rocks produced a number of mosses of which *Pohlia wahlenbergii* and *Racomitrium aciculare* were the most frequent. Although not strictly on gravel bars, *Scouleria aquatica* and *Grimmia alpicola* are commonly on stabilized riverside rocks.

In two places gravel bars produced specimens of Alpine timothy. Its natural habitat would normally be alpine grassland considerably higher than the reserve and it is assumed that the river has acted as a vector in introducing this uncharacteristic species.

South of Sand Island alder and willow form a thicker cover on an old bar, along part of the shoreline and along some of the seasonally active channels.

ICH ZONE, UNIT X (Old channels)

Mountain alder - Red-stem osier
Thimbleberry - Great northern aster

Terrain: fluvial deposits	Position: level
Slope: 0° - 5°	Moisture: subhygric to hygric, aquic to perhumid
Aspect: south	Drainage: moderate to rapid

Alnus incana
Cornus sericeus
Salix sitchensis
Lonicera involucrata

Rubus parviflorus
Aster modestus
Mitella pentandra
Senecio triangularis

On Map 2 the easternmost channel, "H", falls under the description in the last paragraph of Unit IX. The longer "H" next to it is an active overflow channel of the river during high water but not all year, and channel "F", farthest from the river, probably acted so at one time though not now. Its disconnected waters are stagnant and appear partly due to seepage from the slope above.

Vegetation is rather variable and patchy with shrubby sections interspersed with bare sand gravel, and elsewhere by damp boggy spots. The latter might well be included in the following section but as the latter is more allied with forest than are these fairly open channel courses they are better considered here.

Sedges which might have been expected in greater variety are restricted to two - *C. aquatilis* and *C. deweyana*. The only location for White rein orchid occurs here with the more frequent Green-flowered rein orchid, and two saxifrages. Something of a surprise was Leatherleaf saxifrage which is more usually in damp, exposed sites in the mountains than hemmed in by taller vegetation in forested areas.

Periodic major floods could well scour out these channels at long intervals before allowing them to resume their backwater existence.

ICH ZONE, UNIT XI (Wet spots)

(Cedar - Hemlock)
Mountain alder
Small-flowered bulrush - Lady fern

Terrain: fluvial terrace Position: lower slope and level
 and flats Moisture: subhydryc to hygric,
Slope: 0° - 5° paraquic to subaquic
Aspect: insignificant Drainage: poor

(a)

(b)

Alnus incana

Thuja plicata
Tsuga heterophylla

Taxus brevifolia

Scirpus microcarpus
Senecio triangularis
Montia parvifolia
Platanthera hyperborea
Aster modestus
Veronica americana
Carex mertensii
Saxifraga ferruginea

Scirpus microcarpus
Athyrium filix-femina
Glyceria striata
Equisetum arvense
Epilobium ciliolatum

(c)

(d)

Tsuga heterophylla
Thuja plicata
Picea engelmannii

Thuja plicata
Picea engelmannii

Alnus incana
Lonicera involucrata

Athyrium filix-femina
Smilacina stellata

Athyrium filix-femina
Glyceria striata
Trisetum cernuum
Pubus parviflorus
Senecio triangularis

Mnium spp.

In extent wetlands make up a very minor part of the reserve area; in content they add considerably to variety. Each location is in its own way unique so that rather than one discrete unit they tend to form a number of sub-units which, for convenience, are dealt with together.

The small area in the north, virtually on the east

river bank, is covered in (a) above. Its surface is fine, poorly drained packed silt and receives most of its moisture from a narrow strip of seepage along the base of a small terrace scarp rather than from the river.

Almost opposite but unrelated is an area of alder scrub with diffuse drainage from a small stream. This site was not studied and is considered probably similar to that on the same side farther south, without the addition of spruce. The latter, (d) above, was not as varied as (a) in number of species and the source of its moisture is not clear.

Mid-way down the reserve on the west side a flat area in the forest is the recipient of diverted water from road-side ditching. This small flat may always have been damp because a pronounced gully runs down to the river from this point. Since road construction, and particularly since logging up-slope, abnormal amounts of water have been inundating it as indicated by deposits of sand and silt below the road, and slumping at the head of the gully. As this has taken place in a period of only a few years vegetation changes are probably still underway. As seen in (b) above, members of the normal forest community are still present with a limited number of boggy herbs adding to them.

At the southern extremity is an area, (c), also modified by artificially increased water, though more seasonally, and its vegetation has been little altered.

ICH ZONE, UNIT XII (Forest edge)

Hemlock - Cedar (Douglas maple)

Red elder

Thimbleberry - Lady fern - Foamflower

Terrain: moraine blanket

Position: lower slope

Slope: 10° - 20°

Moisture: mesic to subhygric,
perhumid

Aspect: east

Drainage: good

Tsuga heterophylla

Thuja plicata

Acer glabra

Sambucus racemosa

Sorbus scopulina

Salix bebbii

Rubus parviflorus
Athyrum filix-femina
Tiarella unifoliata
Gymnocarpium dryopteris
Galium triflorum

The remaining two units are of altered habitats caused by road building along the west boundary of the reserve.

Below the road verge a band of forest was destroyed and along it and the adjoining standing forest increased light availability has preferentially encouraged growth of several woody species only sparsely scattered in the undisturbed forest gloom. Thimbleberry, too, has taken advantage of these conditions and makes dense stands. It is here that in places both Hemlock and Cedar are regenerating vigorously.

ICH ZONE, UNIT XIII (Roadside)

(Balsam poplar - Hemlock - Cedar)
Thyme-leaved speedwell - Common willowherb

Populus balsamifera var. trichocarpa
Tsuga heterophylla
Thuja plicata

Veronica serpyllifolia
Epilobum leptocarpum var. macounii
Trifolium repens
Juncus ensifolius
Epilobum angustifolium
Anaphalis margaritacea
Carex mertensii
Agrostis stolonifera

The characteristic of roadsides seems to be the large number of species introduced along their length, few of which here occur in large or extensive stands. How much of the variable width roadside is within the reserve boundary is questionable, however, as many of the same species can be found along the short forest access road at the north-west corner the question is immaterial in this case.

Again, seedlings of Hemlock and Cedar are often present in quantity and Balsam poplar is establishing itself. Surprisingly, White pine, which elsewhere along Sugar Lake Road has formed dense new growth, is not to be found. Few of the herb species warrant special discussion although a group of Subalpine fleabane should be mentioned as being way out of its normal range, and plants of Wall-lettuce show that this coastal introduction is becoming established in the interior.

CHECKLIST OF VASCULAR PLANTS

The following list of species located during 1986 follows Taylor and MacBryde in name and order. It indicates which unit or units carried each species and attempts to give a subjective assessment of relative abundance using these symbols;

- (*) = present (one or two individuals only)
- (1) = rare (few and scattered)
- (2) = frequent (generally present)
- (3) = abundant (always present in large numbers)

Dr. A. Ceska identified or confirmed a number of samples.

<i>Adiantum pedatum</i>	Northern maidenhair fern II(1)
<i>Athyrium filix-femina</i>	Common lady fern I(3).II(3).III(3).IV(3).
<i>Dryopteris assimilis</i>	Spring shield fern IV(2) /VIII(2).XI(2)
<i>Gymnocarpium dryopteris</i>	Oak fern I(3).II(3).III(2).IV(3).V(2).VI(2)
<i>Polystichum braunii</i>	Braun's holly fern I(1) /XI(1).XII(3)
<i>Pteridium aquilinum</i>	Western bracken I(2)
<i>Equisetum arvense</i>	Common horsetail VIII(1).XI(2).XIII(3)
" <i>pratense</i>	Meadow horsetail I(1)
<i>Lycopodium annotinum</i>	Stiff club-moss I(*)
<i>Botrychium virginianum</i>	Rattlesnake fern IV(1).VII(2) 1/8
<i>Thelypteris phegopteris</i>	Long beech fern II(1).IV(1)
<i>Thuja plicata</i>	Western red cedar I(3).II(3).III(3).IV(3) V(1).VII(1).VIII(2).XI(2).XII(2).XIII(2)
<i>Picea engelmannii</i>	Engelmann spruce IV(2).VIII(2).XI(2)
<i>Pinus monticola</i>	Western white pine I(1)
<i>Pseudotsuga menziesii</i>	Rocky Mountain douglas-fir VII(1).VIII(2)
<i>Taxus brevifolia</i>	Western yew II(2). III(2).IV(2)
<i>Tsuga heterophylla</i>	Western hemlock I(3).II(3).III(1).IV(2). V(3).VI(3).VII(2).VIII(2).XI(3).XII(3)
<i>Acer glabrum v. douglasii</i>	Rocky Mountain maple I(2).XII(2)
<i>Cicuta douglasii</i>	Douglas water-hemlock XI(2) 1/3.1/9
<i>Heracleum sphondylium</i>	Common cow-parasnip IV(1).14/7
<i>Osmorhiza chilensis</i>	Mountain sweetcicely I(1).IV(2)

Aralia nudicaulis	Wild sarsparilla II(1).6/6.27/6
Oplopanax horridus	Devil's club I(2).II(3).III(3).IV(2).27/6
Asarum caudatum	Western wild ginger II(*) 6/6
Adenocaulon bicolor	Trailplant I(2).IV(2).14/7.1/8
Anaphalis margaritacea	Common pearly everlasting VIII(1).XIII(2). 1/7.14/7.1/8
Arnica latifolia	Broad-leaved arnica IV(1).VIII(2).XIa(2). 27/6.14/7.1/8
Aster modestus	Great northern aster IV(2).VIII(2).X(2). XI(2).XIII(2).1/8.1/9
Chamomilla suaveolens	Pineapple weed XIII(1).1/9
Cirsium arvense	Canada thistle VIII(1).XIII(2).1/9
" vulgare	Bull thistle XIII(1).1/9
Conyza canadensis	Canadian fleabane XIII(1).1/9
Erigeron peregrinus	Subalpine fleabane XIII(*).27/6
" philadelphicus	Philadelphia fleabane IV(1).X(1).14/7.1/8
Hieracium albiflorum	White hawkweed XII(1).XIII(2).27/6. to 1/9
" aurantiacum	Orange hawkweed XIII(1).14/7 to 1/9
Lactuca biennis	Tall blue lettuce XIII(1).1/8
Leucanthemum vulgare	Oxeye daisy XIII(2). 14/7 to 7/10
Mycelis muralis	Wall-lettuce XIII(2). 14/7 to 1/9
Senecio indecorus	Rayless mountain ragwort XIII(*).27/6.14/7
" triangularis	Arrow-leaved ragwort IV(2).VIII(2).X(2). XI(2).27/6 to 1/8
Solidago canadensis	Creek goldenrod XIII(1).1/9
Sonchus arvensis	Smooth perennial sow-thistle XIII(1).1/9
Taraxacum officinale	Common dandelion VII(1).XIII(2).30/5 to 1/9
Tragopogon dubius	Yellow salsify XIII(1).14/7 yo 1/9
Alnus incana v. tenuifolia	Thin-leaved mountain alder VII(1).VIII(2).IX(1).X(1).XI(2)
Arabis lyrata	Lyre-leaved rock cress VIII(2) 14/7 to 7/10
Cordamine pensylvanica	Pennsylvania bittercress XI d(1).27/6
Linnaea borealis	Northern twinflower I(2).IV(1).V(3).27/6 to 1/8
Lonicera involucrata	Twinberry honeysuckle X(2).6/6
" utahensis	Utah honeysuckle I(*).30/5
Sambucus racemosa	American red elder XII(2).
Symphoricarpus albus	Common snowberry VII(1)
Viburnum edule	High bush cranberry X(1)
Cerastium fontanum	Common chickweed VIII(1).XIa(1).XIII(2). 27/6 to 1/9
Sagina saginoides	Arctic pearlwort VIII(1).XIII(2).27/6
Spergularia rubra	Ped sand spurry XIII(2).27/6.14/7
Stellaria calycantha	Northern starwort XII(2).27/6
" longipes	Long-stalked starwort XIII(2).14/7
" obtusa	Blunt-sealed starwort XIII(2).27/6

<i>Paxistema myrsinites</i>	Oregon boxwood V(2).30/5
<i>Cornus canadensis</i>	Canadian bunchberry I(2).II(2).III(2)
" <i>sericea</i>	XII(2).XIII(1).30/5 to 14/7 Red-osier dogwood X(2)
<i>Gaultheria ovatifolia</i>	Oregon wintergreen V(2)
<i>Vaccinium membranaceum</i>	Black blueberry I(2).II(1).IV(1).
" <i>ovalifolium</i>	Oval-leaved blueberry I(3).II(1).IV(3). V(3).VI(2).16/5
<i>Medicago lupulina</i>	Black medic XIII(1).1/9
<i>Melilotus alba</i>	White sweet-clover XIII(1).1/9
<i>Trifolium pratense</i>	Red clover XIII(2).27/6.14/7
" <i>repens</i>	White clover XIII(3). 6/6 to 7/10
<i>Ribes lacustre</i>	Black swamp gooseberry III(1).XI(1).6/6
<i>Prunella vulgaris</i>	Common self-heal VII(2).VIII(2).XIa(2). XIII(2).27/6.14/7.1/9
<i>Circaea alpina</i>	Alpine enchanter's nightshade I(2).II(3) IV(2).VIII(1).27/6.14/7.1/3
<i>Epilobium angustifolium</i>	Fireweed VIII(2).XIII(2).27/6 to 1/9
" <i>ciliatum</i>	Purple-leaved williwherb X(1).XI(2).27/6.14/7
" <i>leptocarum</i> v. <i>macounii</i>	XIII(3).30/5.27/6.14/7
<i>Parnassia fimbriata</i>	Fringed grass-of-parnassus IV(*).1/3
<i>Plantago lanceolata</i>	Ribwort plantain XIII(1).14/7
" <i>major</i>	Greater plantain XIII(1).14/7.1/3
<i>Rumex acetosella</i>	Sheep sorrel XIII(*).27/6
<i>Montia parvifolia</i>	Small leaved-montia VII(2).VIII(1).XIa(2). 27/6 to 1/3
<i>Chimaphila umbellata</i>	Common western pipsissewa V(1)
<i>Moneses uniflora</i>	One-flowered wintergreen V(*).27/6
<i>Orthilia secunda</i>	One-sided wintergreen I(1).14/7
<i>Pyrola asarifolia</i>	Common pink pyrola V(1).27/6
<i>Actaea rubra</i>	Red baneberry XIc(1).30/5
<i>Ranunculus uncinatus</i>	Little-flowered buttercup XI(2).XIII(2).27/6
<i>Thalictrum occidentale</i>	Western meadow-rue II(1).IV(1)
<i>Amelanchier alnifolia</i>	Saskatoon I(1).30/5
<i>Aruncus dioicus</i>	Sylvan goat's beard VII(1).XIa(1).27/6
<i>Fragaria virginiana</i>	Broad-petaled wild strawberry XIII(1).30/5
<i>Geum macrophyllum</i>	Large-leaved avens XI(1).XIII(2).6/6 to 1/9
<i>Potentilla norvegica</i>	Rough cinquefoil VIII(*).XIII(*).14/7
<i>Rosa gymnocarpa</i>	Baldhip rose I(1).XII(2).27/6.14/7
<i>Rubus idaeus</i>	American re raspberry VII(1).XIII(2).27/6
" <i>pedatus</i>	Five-leaved creeping raspberry I(3).II(1). 6/6.27/6

Rubus parviflorus	Western thimbleberry II(1).IV(2).VIII(2). X(1).XId(2).XII(3).XIII(2).30/5 to 14/7
Sorbus scopulina	Western mountain-ash I(2).XII(2)
Spiraea betulifolia	Birchleaved spirea V(1)
Galium triflorum	Sweet-scented bedstraw III(2).IV(2).VIII(1). XII(2).XIII(1).27/6 to 1/8
Populus balsamifera var. trichocarpa	Black cottonwood VIII(1).XIII(2)
Salix bebbii	Bebb's willow XII(1).XIII(1).30/5
" sitchensis	Sitka willow VIII(3).IX(1).X(2)
Leptarrhena pyrolifolia	Leatherleaf saxifrage X(1).27/6
Mitella pentandra	Five-stamened mitrewort II(2).X(2).XI(2).6/6
Saxifraga ferruginea	Alaska saxifrage VIII(2).X(1).XI(1).27/6.14/7
" occidentalis	Western saxifrage X(1).6/6
Tellima grandiflora	Tall fringecup VII(1).XIa(1).27/6
Tiarella unifoliata	Unifoliolate-leaved foamflower I(3).II(3).III(2) IV(3).XII(3).XIII(2).6/6 to 1/9
Castilleja hispida	Harsh indian paintbrush VII(*).27/6
Mimulus floribundus	Purple-stemmed monkeyflower XId(1).
" guttatus	Common monkeyflower IV(1).1/8
" lewisii	Lewis monkeyflower VII(2).VIII(2).IX(2). XI(1).27/6.14/7
Pedicularis bracteosa	Bracted lousewort I(1).14/7
Verbascum thapsus	Great mullein XIII(1).1/9
Veronica americana	American speedwell II(1).XI(2).27/6.14/7
" serpyllifolia	Thyme-leaved speedwell XIII(3).30/5 to 7/10
Urtica dioica	American stinging nettle II(1)
Valeriana sitchensis	Sitka valerian I(1).VII(1).XIII(1).6/6.14/7
Viola glabella	Yellow wood violet I(1).II(2).XI(2).16/5 to 6/6
" orbiculata	Evergreen yellow violet I(*).16/5
" palustris	Marsh violet X(1).XIa(1).6/6.27/6
Carex aquatilis	Water sedge X(1) 27/6
" deweyana	Dewey's sedge X(2).XIII(1).30/5
" desperma	Soft-leaved sedge V(1)
" macloviana	Thick-headed sedge XIII(2)
" mertensii	Merten's sedge VIII(2).XIa(2).XIII(2).30/5.27/6
Scirpus microcarpus	Small-flowered bulrush X(2).XI(2)
Juncus ensifolius	Sword-leaved rush VIII(2).IX(2).XIII(2).27/6
" tenuis	Slender rush XIII(2).27/6
Luzula parviflora	Small-flowered wood-rush V(*).27/6

<i>Clintonia uniflora</i>	Blue-bead clintonia I(2).II(1).27/6
<i>Disporum trachycarpum</i>	Rough-fruited fairybells II(1).27/6
<i>Smilacina racemosa</i>	False solomon's seal I(1).XII(2).XIII(1). 30/5.6/6
" <i>stellata</i>	Star-flowered false solomon's seal I(3). II(3).III(3).IV(3).VI(2).XI(1).30/5.6/6
<i>Streptopus amplexifolius</i>	Cucumber root twistedstalk II(2).30/5.6/6
" <i>roseus</i>	Simple-stemmed twistedstalk II(2).30/5.6/6
<i>Veratrum viride</i>	Green false hellebore IV(1).X(1).XI(2).14/7
<i>Corallorhiza maculata</i>	Western coralroot I(*).27/6
ssp. <i>mertensiana</i>	
<i>Goodyera oblongifolia</i>	Large-leaved rattlesnake orchid I(2).V(2)
<i>Platanthera hyperborea</i>	Green-flowered rein orchid II(2).X(2). XI(2).XIII(1).30/5 to 14/7
" <i>dilatata</i>	Fragrant white rein orchid X(1).27/6
<i>Agrostis aequivalvis</i>	Alaska bent grass IX(2)
" <i>exarata</i>	Spike bent grass XIII(2)
" <i>scabra</i>	Hair bent grass VIII(2)
" <i>stolonifera</i>	Creeping bent grass VIII(2).XIII(2)
<i>Bromus vulgaris</i>	Columbia brome grass IV(1).X(1).14/7
<i>Calamagrostis canadensis</i>	Bluejoint small reed grass VII(3).VIII(2)
<i>Cinna latifolia</i>	Wood reed grass IV(1)
<i>Elymus glaucus</i>	Blue wild rye grass V(1).27/6
<i>Glyceria striata</i>	Fowl manna grass VIII(2).XI(2)
<i>Phleum alpinum</i>	Alpine timothy IX(1)
" <i>pratense</i>	Common timothy XIII(2).14/7.1/8
<i>Trisetum cernuum</i>	Nodding trisetum I(2).IV(2).XI(2).XIII(2)

MOSESSES

Upper Shuswap River Ecological Reserve is well supplied with a varied moss flora worthy of study in its own right. Although mapped within the Interior Wet Belt and therefore showing many of the humid coastal species that recur in that zone (*Antitrichia curtispindula*, *Cladodium bolanderi*, *Kindbergia praelonga*, *Phytidiadelphus loreus*, *Phytidiopsis robusta*), it is also exposed to drier influences from the south-west and includes species more attuned to arid areas (*Dicranum scoparium*, *Drepanocladus uncinatus*). One small patch of sphagnum occurs, not in a pronounced wet area but anomalously on the forest floor (Unit I).

In "Bryophytes of B.C. III, Habitat and Distributional Information on Selected Mosses", Dr. W.B. Schofield remarks that *Antitrichia curtispindula* in the Interior is confined

to rock. No large rock faces are exposed on the reserve and all of this species present was found growing in typical tufted fashion from Western hemlock.

The dominant ground mosses Hylocomium splendens, Rhytidiadelphus loreus, R. triquetrus and Pleurozium schreberi, together with Ptilium crista-castrensis all occur widely in combination or separately throughout the forest. It would make an interesting study to see whether a quantitative assessment of their permutations would confirm division of the reserve into units as used in this report or would suggest different boundaries.

Dr. Schofield was good enough to identify several species, other than which the following were not seen by any expert in the field.

An indication of habitat is shown by the use of the following symbols-

A - bark or wood	E - dry rocks
B - damp forest floor	F - silt and gravel bars
C - drier soil	G - emergent, stream frings, seep
D - damp rocks	

<i>Antitrichia curtispindula</i> (Hedw) Brid.	A
<i>Brachythecium albicans</i> (Hedw) BSG	B
" <i>plumosum</i> (Hedw) BSG	D (river)
" <i>salebrosum</i> (Web & Mohr) BSG	B
<i>Bryum ?pallens</i> Sw	D (forest)
" <i>pallescens</i> Schleich ex Schwaegr.	B
<i>Calliergon giganteum</i> (Schimp) Kindb	G
? <i>Campylium chrystophyllum</i> (Brid) J.Lange	B,D (river)
<i>Ceratodon purpureus</i> (Hedw) Brid	C
<i>Claopodium bolanderi</i> Best	E
<i>Dicranum fuscescens</i> Turn	A
" <i>montanum</i> Hedw	A
" ? <i>scoparium</i> Hedw	C
" <i>tauricum</i> Sapel	A
<i>Drepanocladus aduncus</i> (Hedw) Warnst	D (river)
" <i>uncinatus</i> (Hedw) Warnst	A,B
<i>Eurynchium pulchellum</i> (Hedw) Jenn	A
<i>Grimmia alpicola</i> Hedw	D (river)
<i>Hylocomium splendens</i> (Hedw) BSG	A,B,E
<i>Hypnum circinale</i> Hook	A
" sp.	A
? <i>Isopterygium pulchellum</i> (Hedw) Jaeg & San	F
<i>Kindbergia praelonga</i> (Hedw)	G
<i>Lescraea radicata</i> (Mitt) Moenk	A
<i>Mnium drummondii</i> Bruch & Schimp	G
" <i>spinulosum</i> BSG	A

<i>Oligotrichum algerum</i> Mitt	B
<i>Onchophorus virens</i> Brid	
<i>Philonotis fontana</i> (Hedw) Brid	G
<i>Plagiomnium medium</i> (BSG) Kop	B
<i>Pleurozium schreberi</i> (Brid) Mitt	B,C
<i>Pogonatum contortum</i> (Brid) Lesq	B
" <i>urnigerum</i> (Hedw) Beauv	C
<i>Pohlia cruda</i> (Hedw) Lindb	A,B
" <i>nutans</i> (Hedw) Lindb	A
" <i>wahlenbergii</i> (Web & Mohr) Andr	F
<i>Polytrichum formosum</i> Hedw	B
" <i>juniperinum</i> Hedw	C
<i>Ptilium crista-castrensis</i> (Hedw) De Not	A,B
<i>Rhacomitrium aciculare</i> (Hedw) Brid	F
" <i>canescens</i> (Hedw) Brid	C
" <i>fasciculare</i> (Hedw) Brid	A
<i>Rhizomnium magnifolium</i> (Horik) Kop	G
" <i>nudum</i> (Britt & William) Kop	G
<i>Rhytidiadelphus loreus</i> (Hedw) Warnst	B
" <i>squarrosus</i> (Hedw) Warnst	A,B
" <i>triquetrus</i> (Hedw) Warnst	B,C
<i>Rhytidiopsis robusta</i> (Hook) Engl & Prantl	B
<i>Scouleri aquatica</i> Hook	D (river)
<i>Sphagnum girgensohni</i> Russ	B
<i>Tetraphis bellucida</i> Hedw	A

LIVERWORTS

Apart from the Riccardia, none of the following have been authenticated by an expert.

<i>Blepharostoma trichophyllum</i> (L) Dum	A
<i>Cephalozia lunulifolia</i> (Dum) Dum	D
<i>Cephaloziella divaricata</i> (Sm) Schiffn	A
<i>Chiloscyphus polyanthus</i> (L) Corda	B
<i>Harpanthus scutatus</i> (Web & Mohr) Sorce	D
<i>Marchantia polymorpha</i> L	B
<i>Pellia endiviifolia</i> (Dicks) Dum	B
<i>Plagiochila asplenioides</i> (L) Dum	A
<i>Pressia quadrata</i> (Scop) Nees	B
<i>Riccardia multifida</i> (L) S Gray	B

LICHENS

Covering a limited range of habitats, it is not too surprising that Upper Shuswap River Ecological Reserve produces a relatively moderate number of lichens. Two were of some interest; a species of Calicium was found on decorticated wood (cedar), its presence revealed by its tiny stalked fruiting bodies: the other was Cladonia botrytes, not a common member of this group in the southern Interior.

With Cedar and Hemlock in roughly equal quantities it was noticeable how greater preference was given by corticolous lichens to the rough bark of the latter. It may be due to the tendency for Cedar to shed fibres and so disturb its surface, or its smoother bark may hold less moisture providing fewer opportunities for germination, or even that aromatics contained in the wood are a deterrent. Only Lobularia pulmonaria and Sphaerophorus globosus were in any great number on Cedar, the latter often strangely reddened in colour.

Alectoria sarmentosa (Ach) Ach
Bacidia rubella (Ehrh) Rabh
Bryoria fuscescens (Gyel) Brodo & Hawk
Calicium sp.
Cladonia botrytes (Hag) Willd
" cenotea (Ach) Schaer
" conocraea (Flk) Spreng
" cornuta (L) Hoffm
" deformis (L) Hoffm
" fimbriata (L) Fr
" gracilis (L) Willd
" ochrochlora Flk
" phyllophora (Ehrh) Hoffm
" pleurota (Flk) Schaer
" pixidata (L) Hoffm
" squamosa (Scop) Hoffm
Hypogymnia enteromorpha (Ach) Nyl
" tubulosa (Schaer) Har .
Icmadophila ericetorum (L) Zahlbr
Lobaria pulmonaria (L) Hoffm
Nephroma parile (Ach) Ach
Parneliosis hyperoptera (Ach) Arn
Peltigera apthosa (L) Willd
" canina (L) Willd
" polydactyla (Neck) Hoffm
" venosa (L) Baumg
Pertusaria multipunctata (Turn) Nyl
Platismatia glauca (L) Culb & Culb
Sphaerophorus globosus (Huds) Vain

FUNGI

In an area of forest, particularly over-mature forest, it is only to be expected that wood-digesting fungi should be plentiful and this is in fact the case, ranging from small bird's-nest fungi (Crucibulum laeve and Nidularia candida) on twigs and dead stalks to large bracket fungi of most types except those specific to hardwoods. Again, Hemlock was favoured over Cedar, indeed it is sometimes to be wondered what causes the latter to be broken down. One Red belt fungus of 52cm in width was seen on Hemlock.

Moisture during 1936 was normal to above average through early summer until mid-July allowing an ample flush of fungi to develop. Dryness then took over until early October by which time night chill was a hinderance to a full fall display. One very productive habitat that might not at first sight seem to have high potential was the sands of islands in the logjam where plentiful buried wood in a coarse, damp medium after spring snow melt and water level decline produces a highly varied collection.

On a more esoteric level was a yellow stalked slime-fungus (Stemonitus sp.?) and what was taken to be a slime bacteria of the Myxobacteriaceae on dead Cedar wood. Some of the alga Cladophora develops in stagnant water of the old back-water channel at the south end.

<u>Armillariella mellea</u> (Fr) Karstén	Hemlock	Aug.
<u>Agaricus</u> sp.		Oct.
<u>Boletus zelleri</u> Murril	forest floor	Aug.
<u>Clavaria ?mucida</u> Fries		
<u>Clitocybe dilatata</u> Pers ex Karsten		Oct.
" <u>gibba</u> (Fr) Kummer	forest floor	July
" sp. (? <u>sinopica</u> (Fr) Kummer)	forest floor	July
<u>Conocybe tenera</u> (Schaeff) Fayod	forest floor	Oct.
<u>Collybia butyracea</u> (Fr) Quelet		July
" sp.		July
<u>Coprinus lagopus</u> Fries	dead wood	Oct.
<u>Crucibulum laeve</u> (DC) Kambly & Lee	dead Cedar	
<u>Cystoderma cinnebarinum</u> (Secr) Fayod	forest floor	
<u>Discina perlata</u> Fries	forest floor	May
<u>Fomes pini</u> (Thor ex Fr) Karsten	dead conifer	
" sp.	dead conifer	
<u>Fomitopsis pinicola</u> (Fr) Cooke	dead conifer	
<u>Ganoderma applanatum</u> (Pers) Patonillard	dead conifer	
<u>Gloeophyllum saepiarium</u> (Wolf) Karsten	dead conifer	
<u>Gyromitra</u> sp. (? <u>infula</u> Fries)	wood in sand	July

Heterobasidium annosum (Fr) Bref	dead conifer	
Hygrocybe conica (Fr) Kummer	forest floor	Oct.
" miniata (Fr) Kummer	"	
" sp. (?parvula (Pk) Murrill)	"	Aug.
Hygrophoropsis aurantiaca (Fr) Maire	"	Oct.
Inocybe sp. (?geophyllia (Fr) Kummer)	"	Oct.
Laccaria amethystina (Hooker) Murrill	"	Aug.
" laccata (Fr) Berk & Br	"	Sept.
Lentinellus omphalodes (Fr) Karsten	dead conifer	July
Lactarius deliciosus	forest floor	July
Lycoperdon pyriforme Persoon	buried wood	July
?Lyophyllum sp. (?montana Smith)	forest floor	May
Marasmius umbilicatus Kauffman	"	Oct.
" spp.	"	July
Mycena alcalina (Fr) Kummer	dead conifer	June
" ?aurantioides Murrill	forest floor	July
" galopus (Fr) Quel var. candida	"	Oct.
" maculata Karsten	"	Oct.
" murina Murrill	"	Oct.
" osmundicola Lange	fallen leaves	Oct.
Melanoleuca meloleuca (Fr) Murrill	forest floor	Oct.
Naematoloma capnoides (Fr) Karsten	dead wood	Oct.
Nidularia candida Peck	dead conifer	July
Paxillus involutus (Fr) Fr	forest floor	Aug.
Peziza sp. (?badia)		Oct.
Pholiota aurea (Fr) Kummer	roadside soil	Oct.
" sp. (?hyemalis Smith & Heston)	dead conifer	
Pleurotellus porrigens (Fr) Kummer	forest floor	Oct.
Ramaria botrytes (Fr) Ricken	"	Aug.
Russula brevipes Shaffer	"	Aug.
" sp. (?crassotunicata Singer)	"	Aug.
" sp. (?xerampelina (Secr) Fries	"	Aug.
Sarcoscypha coccinea Saccardo	buried wood	July
Stereum sp. (?rugosum (Pers ex Fr) Fries	dead conifer	
Stropharia semiglobata (Fr) Quelet	forest floor	Oct.
" sp. (?ambigua (Pk) Zeller)		Oct.
Suillus sp.	roadside soil	Oct.
Tremiscus helvelloides (Fr) Martin	forest floor	Aug.
Tremella mesenterica (SF Gray) Persoon	dead wood	
Tricholoma sp.	wood in sand	Oct.
Xeromphalina campanella (Fr) Kuh & Maire	dead wood	June/ Sept.

BIRDS

A list of a bare 21 bird species is rather a paltry number and must be taken as a partial inventory of only the most obvious inhabitants. Thick forest is not the most popular environment for birds but the river flats should have produced more than they did. For example, absent were nut-hatches, other chickadees than those recorded, forest thrushes, predatory birds, vireos, crossbills, Cassin's finch etc. There were holes of Pileated woodpecker and this certainly is one species that should appreciate large old trees, so its non-appearance was probably a matter of chance.

Most frequent, or at least most obvious, was Vaux swift. As a nester in the upper parts of mature trees this species certainly has much scope in a forest such as that along Shuswap river and was noisy overhead for most of the season. Another regular sighting was Varied thrush could be relied on during most visits.

American kestrel is thought of as more attuned to open fields and rangeland but a niche occurs in forested areas where broken and exposed terrain like that around the islands and logjam provides hunting opportunities. A pair nested in trees overlooking this area.

McGillivray's was the only warbler seen during the nesting season, fairly large numbers of Yellow-rumped warblers having passed up river but not staying. Migrating in the opposite direction in September were a few White-crowned sparrows.

American kestrel 27/6.14/7	American robin 1/8
Ruffed grouse (nearby on road)	Varied thrush 16/5.to 9/9
Vaux swift 16/5 to 1/8	Golden-crowned kinglet 16/5.14/7
Northern flicker 30/5.27/6	McGillivray's warbler 27/6
Yellow-bellied sapsucker 27/6	Yellow-rumped warbler 16/5
Western wood pewee 6/6.27/6.14/7	Siskin 16/5.9/9
Gray jay 9/9	Dark-eyed junco 27/6.1/3
Steller's jay 16/5.27/6.14/7.1/8	White-crowned sparrow 9/9
Raven 1/8	
Black-capped chickadee 9/9	
Boreal chickadee 14/7	
Dipper 16/5	
House wren 16/5 to 9/9	

MAMMALS

From the number of tracks on remaining snow patches, droppings and evidence of browsing it is clear that all the lower benches and bottom land are well used by deer as winter range. Although grass is nowhere thick except in damp places along the river, deciduous shrubs are plentiful and reasonably varied. Sleeping sites and worn trails through more open forest shows that some, at least, remain at this elevation throughout the year. All the individuals seen along Sugar Lake road were Mule deer, even in summer, and it seems that these predominate. Many Interior forests are reported as having a gradual increase of White-tailed deer as their more secretive habits lead to Mule deer being selectively taken by hunters, so much so that open seasons are being adjusted to emphasise the one and lessen pressure on the other.

Tracks of Moose could be seen in spring and a few traverses were made through the bottom flats by single animals from time to time throughout the summer. Black bear, too, were occasional as judged by tracks and droppings and careful examination could usually find evidence of their presence each visit to the reserve. Only one small (sub-adult ?) bear was actually seen and this on two occasions just outside the boundary. Wildlife officials seen on Sugar Lake Road were patrolling the area following reports of illegal bear shooting.

Marmots, presumably Yellow-bellied, were encountered running across the road a kilometre or so south of the reserve though none nearer, but Pine chipmunk and Red squirrel were recorded on most visits. Varying hare is also in good number offering sufficient reason for Coyote to patrol river flats and gravels intermittently.

Tracks of another predator were seen on damp river sand in two places, once showing tail drag marks; possibly larger than mink they may point to Marten active in the area. On the bank of channel "H" at the south end were a few very old gnawed shrub stumps. Certainly nothing now is in place that could hold much attraction for any realistic beaver but there may have been a time when changed conditions made the channel temporarily into more of a backwater.

No trapping for small mammals was carried out.

OTHER ANIMALS

Insufficient investigation produced little evidence of other groupings. One Spotted frog was on the flooded bench early in the season and once river floodwaters subsided salmonid fish fry could be seen in shallows, presumably Rainbow trout. Later in the season a residual pool on Sand Island was still inhabited by a sculpin (either Cottus cognatus or C. rhothens) living a rather tenuous existence in its diminishing sphere.

Although insects were not examined the large numbers of angling butterflies in May and June were particularly noticeable, and at the same time sand bars along the river carried considerable numbers of tiger beetles that appeared to be Cicindela punctulata.

SPIDERS

Established to cover a specific ecological association, Upper Shuswap River Ecological Reserve does not sample as broad a range of habitats as some other reserves. This limited variety expresses its self in a fairly limited fauna of spiders although, being remote from collecting locations of arachnologists in the past, it might be expected to produce a few finds of note. This proved true in 1936. All identifications but one were made by Dr. C. D. Dondale of Biosystematic Research Institute, Ottawa.

Of greatest interest was Theridula emertoni. No members of this genus have been reported previously in B.C., indeed one reference maintains the range of this particular species as being no further west than Wisconsin.

Two minute Erigonid spiders (Oreonetides sp. and Walckenaeria cornuella) also appear to be new records for this province while several others are essentially west coast residents with disjunct presence in the Interior Wet Belt. These include Callionlus wabritaskus (second Interior report), Bathypantes brevines, Pachygnatha sp. (juvenile; not known before away from the coast) and Cryphoeca neckhami.

The species determined as Lenthypantes zebra is noted as differing from typical forms and with revision of the genus may belong under the name L. zelata or L. ziba. The closely related Aphileta sp. also awaits a monograph for more exact naming.

Amaurobiidae		
Callioplus wabritaskus	Leech	damp spot in forest
Theridiidae		
Theridion murarium	Emerton	forest shrubs
Theridula emertoni	Levi	shrubs at forest edge
Linyphiidae		
Aphileta	sp.	damp spot in forest
Bathyphantes brevipes	(Emerton)	" "
Centromerus longibulbus	(Emerton)	forested damp area by river
Lepthyphantes intricatus	(Emerton)	" "
" zebra	(Emerton)	" "
Pityohyphantes	sp.	andshrubs at forest edge
		" "
Erigonidae		
Oreonetides	sp.	drier forest
Sisicottus orites	(Chamberlin)	forested damp area by river
Symmigma minimum	(Emerton)	damp and dry forest
Walckenaeria cornuella	(Ch. & Ivie)	riverbank
Araneidae		
Araneus gemma	(McCook)	forest shrubs
" nordmanni	(Thorell)	"
Araniella displicata	(Hentz)	shrubs at forest edge
Cyclosa	sp.	forest shrubs
Tetragnathidae		
Pachygnatha	sp.	low vegetation
Tetragnatha	sp.	vegetation in wet forest
Agelenidae		
Cryphoeca peckhami	Simon	drier forest
Lycosidae		
Pardosa dorsuncata	Lowrie & Dondale	drier forest and sand bars
" groenlandica	(Thorell)	forested damp area by river
Thomisidae		
Misumena vatia	(Clerk)	low vegetation
Philodromidae		
Philodromus alascensis	Keyserling	boulder at forest edge
" rufus	pacificus Banks	low vegetation

MANAGEMENT

In the approximately 50km of road from Sugar Lake to its termination north of the reserve there is nothing to impress on the passer-by that here exists anything different from anywhere else. Hunters could use the small forest access road at the north end but it leads to a very restricted area between road and river and far better means of access either side of the road exist at other locations along Sugar Lake Road especially where logging has taken place.

Several Ecological Reserve signs are placed along the road boundary but unless one is aware of the reserve's presence and is actively looking for the signs they will be passed unnoticed. For this reason the brown signs with white lettering are far preferable in cases such as this for not unnecessarily attracting attention from casual travellers, rather than the more obvious white signs with dark lettering. These could well have use elsewhere at sites where entry is common and possibly a problem.

No good reason now exists for the presence of the north end forest access and it might be blocked off with rocks or by ditching.

No shotgun shells were seen in the reserve. There were, however, both at river and road levels, slots cut in trees to hold traps for fur-bearing animals. These were of some antiquity and trapping has not taken place in recent years. As Wildlife officers spoken to were not aware of the presence of the reserve it is unclear whether those issuing trapping licenses are any better informed, or whether contact should be made to assure Fish and Wildlife is aware of the location of all reserves.

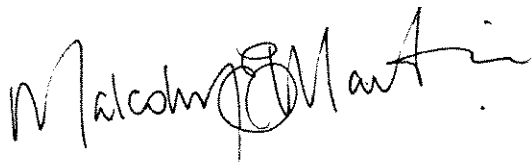
Clear-cut logging abuts the reserve at several points and with mature timber along much of the east boundary more will probably take place in future years. Forestry officials are well aware of the reserve and survey cut-blocks accurately to prevent encroachment so there should be no concern on this score. Large open areas could, though, expose over-mature trees on the reserve to wind hazard depending on location, but none is now apparent. In the event of additional adjacent logging the opportunity might be taken to check this possibility and to outline a few survey blocks to measure to what extent drying and alteration of vegetation occurs.

Mention was made earlier to disruption of streams entering the reserve from the west side by road making and logging operations. In places they have been eliminated, in others augmented by diversion with siltation still occurring.

There is no good reason why this should have happened except from lack of care and concern. While not a major event it does introduce a note of artificiality into the reserve and from this point of view is undesirable. Where future developments are noticed it would be a positive move to provide some input into planning to diminish the possibility of damage.

For education purposes the reserve is not conveniently placed for visits, is not near population centres and, apart from giving generalizations on this type of forest which are also available elsewhere, has no particularly unique features to offer.

Upper Shuswap River Ecological Reserve is in good condition and not threatened by any problems or hazards. Other than periodic warden visits, no additional management is called for at this time.

A handwritten signature in black ink that reads "Malcolm E. Martin". The signature is written in a cursive style with a large, stylized initial "M".

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