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LOWER ENGLISHMAN RIVER
ENVIRONMENTAL - SOCIAL ASSESSMENT

Environmental Impact Study

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ECOLOGICAL RESEARCH AND CONSULTING SERVICES

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ABSTRACT

This report is an overview of environmental implications of two proposed subdivisions on the Englishman River near Parksville. Physical and biological features of the watershed and the two development sites are briefly reviewed.

The watershed is about 110 square miles in size and occupies the Insular Mountains and Nanaimo Lowland physiographic regions. Its lower reaches are underlain by sedimentary rocks of Upper Cretaceous age. Soils above the 1,000 foot elevation have no capability for agriculture, and those at lower elevations are largely Class 5 (very severe limitations). Three broad elevation bands of vegetation are present in the watershed - Coastal Douglas Fir Zone; Coastal Western Hemlock Zone; and Mountain Hemlock Zone. Minimum and maximum flows of 3 and 3,680 CFS have been recorded. The river is an important producer of chum and coho salmon and steelhead. Key spawning areas are described and mapped, and enhancement possibilities are discussed. The river estuary has high wildlife values, particularly for water-oriented birds. Major land uses within the watershed are forest harvesting, outdoor recreation, and residential use. Possible impacts of these activities are discussed.

The Allton property has two distinct physiographic units, an upper plain and a valley complex. These units vary greatly in their ecological and esthetic qualities. Possible effects of sewage disposal, groundwater removal, impervious surfaces, vegetation removal, channel modification, restricted access and altered esthetic characteristics are briefly considered, and measures to control impacts are recommended.

For this subdivision, the long term interests of both future residents of the property and the public at large is felt to be best served by a liberal setback which will preserve the river and river valley in a near-natural state. Environmental protection arguments are presented to support this view. The recommended setback line is 200 feet inland from the top of the valley slope where bank slopes exceed 50%, and 100 feet inland where the slope is less than 50%. Additional recommendations are made concerning lot size and needs for additional geotechnical information.

The Aldergrove property contains or borders many unique and sensitive landforms, plant communities and wildlife habitats. The proponents have recognized and attempted to accommodate most of these features in their development design. Nevertheless it is felt that a development of the magnitude planned could not help but have a severe disruptive effect on the natural features of the site. In view of this site sensitivity, and projected future needs for prime greenbelt and outdoor recreation space in the Parksville region, it is recommended that this site be acquired for purposes of conservation and public use. Some recommendations are included for environmental protection in the event that the public acquisition option is not feasible, and the development is initiated.

Environmental arguments supporting the establishment of an Englishman River Riparian Greenbelt from the estuary to Englishman River Falls Provincial Park are presented, and preliminary boundaries suggested. Lastly, comments are made on biophysical information needs with regard to selection of environmentally suitable subdivision sites in the region.

LOWER ENGLISHMAN RIVER SOCIAL - ENVIRONMENTAL ASSESSMENT

Environmental Impact Report

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INTRODUCTION

The Englishman is at first glance a rather unspectacular little river, but like many objects lacking notable grandeur, is full of surprises for those willing to take a closer look. This lifeline of cool sparkling water, home to every species of Pacific salmon plus cutthroat and rainbow trout, has cascading falls, deep dark pools, sinuous gorges, broad riffles, and a productive estuary regularly used by 25 or more species of water-oriented birds, including the rare trumpeter swan. In spring, seepage areas along its bank known only to a few local naturalists, provide a glimpse of the delicate trillium, curly lily, and pink ladyslipper. In the heat of summer, "secret" pools are the frolicking place of local youth, an experience surely not measurable in the marketplace. And in fall, the perceptive observer cannot fail to note bald eagles in the tall snags overhead, and tracks of black bears on the sandy bars below, both species attracted by the dying salmon, which having completed the task for which they entered the river, fight feebly against the overpowering current. Nor is the river lifeless in winter. The energetic little dipper and larger merganser are frequent visitors to its rapids and pools, and sleek steelhead ply the cool curving world beneath.

Native man undoubtedly knew the Englishman, and had encampments near its mouth. He (or she) left signatures in the form of petroglyphs carved into sandstone bluffs. But today, the persistent angler undoubtedly knows the river and its moods better than anyone, for he must visit it frequently, walk its banks, and study its ever changing characteristics, as well as those of its finny inhabitants, if he is to be successful. One cannot really "know" the river by dispationately recording its flow, studying aerial photographs, or tabulating fishermans questionaire returns. Neither can one place a value on its resources by coldly listing them, nor even come close to assessing the importance of just being alone on the river, feeling its presence and being revitalized by its intangible qualities.

Obviously, many local people value the river in its present state, and feel that no cause is great enough to justify any deterioration in its quality. Conservation groups of more widespread occurrence, and government officials charged with various aspects of resource management and conservation have also expressed strong desires to preserve the river in its present state, and even to improve it if possible.

It is no wonder then that proposals for development of two extensive parcels of land fronting key sections of the river have been met with some alarm. Thick files of correspondence, several one-day inspections of the river, and numerous and varied recommendations for protective measures have resulted, but the matter is not yet resolved to the satisfaction of the public, the development proponents or governmental control agencies.

The purpose of this report is to bring together all available environmental information relative to the two proposed developments, temper this with field inspection, review of pertinent general reports, and previous experience with similar environmental protection problems, and to make recommendations regarding environmental protection requirements at the specific sites and for the river generally. This study is being paralleled by one of potential social impact carried out by Dr. Bentley LeBaron. More specific terms of reference for the environmental study are attached as Appendix I. Location of the Englishman watershed and the two proposed land developments of immediate concern are indicated in Figure 1. Briefly, the Alton Properties

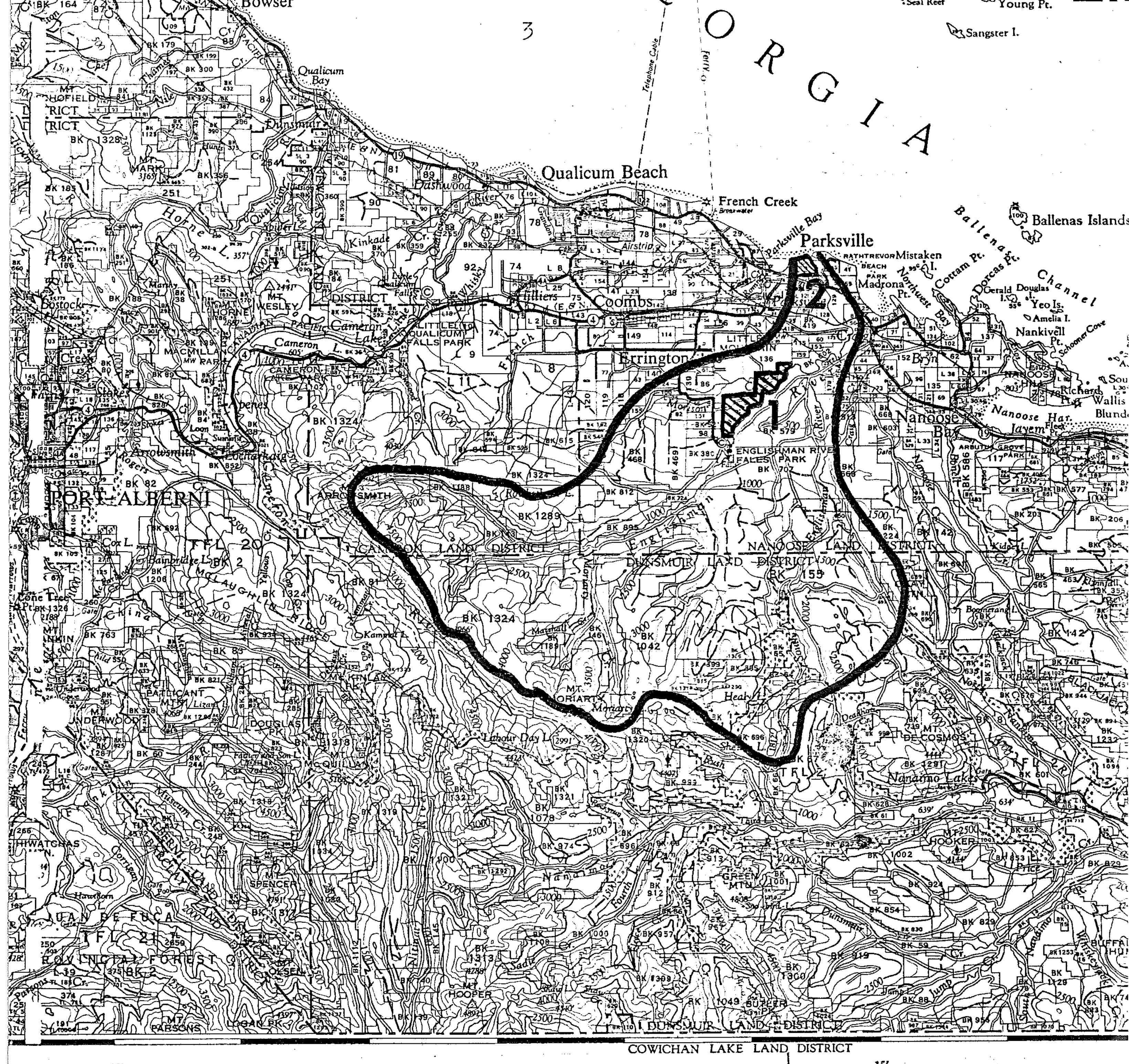
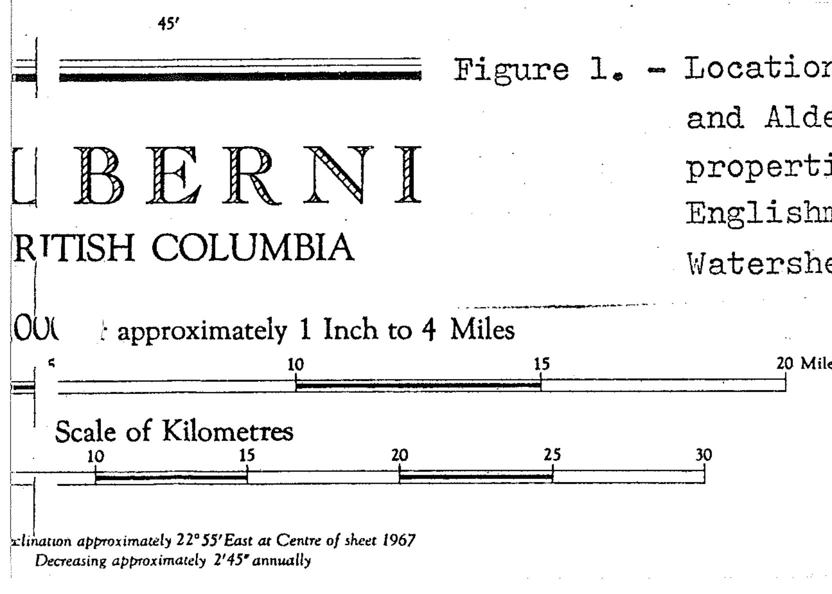
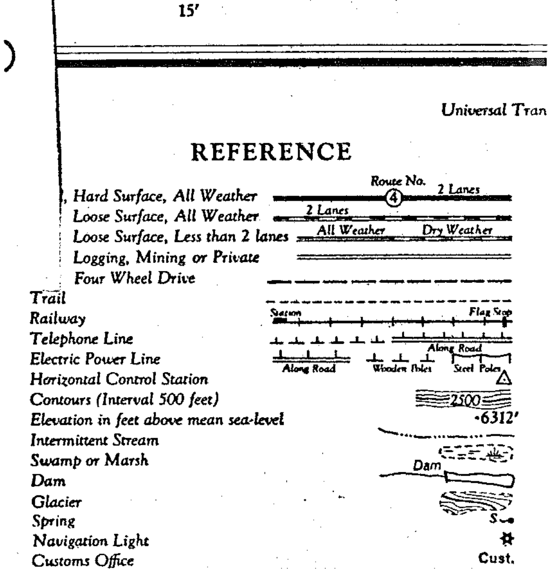


Figure 1. - Location of Allton (1) and Aldergrove (2) properties in the Englishman River Watershed





proposal involves subdivision of an 1,189 acre tract known as the Kirk Tree Farm, immediately downstream from Englishman River Falls Provincial Park. A Regional District bylaw presently restricts lot size in that area to 12 acres. The second proposal involves development of a strata title multiple housing and resort complex by Aldergrove Holdings on a 220 acre parcel at the river mouth. An environmental study of the latter proposal was commissioned by the proponents and completed in 1975, but Allton Properties have carried out no environmental investigations in support of their development.

It should be noted at this point that the present "study" is an environmental overview only, carried out over a short time period in mid-winter. It was not the purpose of this evaluation to gather new field data of a detailed nature.

In the report I have tried to describe the environmental setting firstly in terms of the entire watershed, and point out the significant and unique ecological features and values which are present, and changes which have been wrought by man. These features are generally known, but were only available in many scattered sources. Secondly, the more restricted environments of the proposed developments are discussed, primarily from the point of view of their sensitivity to development. I have not generally been concerned with the other side of the coin, i.e. the effect that the environment might have on land "improvements". This is followed by treatment of the potential environmental impacts which the developments could bring about, and means of controlling such impacts. Lastly, recommendations for environmental protection at the two sites, and for the river as a whole are put forth.

ACKNOWLEDGEMENTS

Thanks are extended to Jon Secter for providing guidance and background materials during planning stages of the study, and to Dr. Bentley LeBaron for considerable additional information. Other agencies and individuals who provided valuable information or comments were: B.C. Fish and Wildlife Branch (Doug Morrison, George Reid, Dr. D. Narver, Gordon Smith); B.C. Provincial Parks Branch (Joe Gillings, Dave Creed, Bruce Hawkes); Pacific Biological Station (Dr. K. Groot); Inland Waters Directorate, Nanaimo; Fisheries and Marine Service, Nanaimo; Canadian Wildlife Service (Mr. D.E.C. Trethewey); Regional District of Nanaimo (Keith Brown); Water Rights Branch, Victoria; and last but not least, many Parksville and area residents who attended the public meeting on January 8.

THE ENGLISHMAN WATERSHED

When evaluating the possible environmental impact of land developments adjacent to the river, we cannot escape the fact that these lands and the river course are part of a total watershed. The major proposed developments would primarily affect the watershed below them, but even downstream impacts can affect upstream ecology, i.e. the movement of fish into upper reaches. Similarly, land uses in other parts of the watershed, e.g. upstream logging, can affect the environment of the lower development areas. It is important to realize that the watershed has already been subjected to a certain amount of alteration. A general appreciation of the level of modification that has gone on to date, and of current land uses in the watershed, is needed in order to judge the significance of possible incremental impacts due to the proposed land developments.

a). Physical Features

Geography: The Englishman River discharge area is 111 square miles (Water Survey of Canada, 1971), and elevations vary from sea level to 5,962 feet (the peak of Mt. Arrowsmith). The peaks forming the southwestern boundary of the watershed (Mt. Arrowsmith; Mt. Moriarity - 5,283 ft.) are part of the Vancouver Island Ranges physiographic area, and that portion of the watershed below 2,000 ft. in elevation falls within the Nanaimo Lowland region of the Georgia Depression (Holland, 1964). In straight line distance, the watershed extends only about 16 miles inland from the coast. General slope orientation is toward the north and northeast.

Significant tributaries entering the lower reaches of the main stem of the Englishman are Morison Creek and the South Fork of the Englishman. The system contains no lakes of size sufficient to influence flow characteristics, and has no control structures.

Geology: That portion of the watershed in the Nanaimo Lowland is underlain by sedimentary rocks of the Nanaimo Group of Upper Cretaceous age. The lowland consists of many low cuesta-like ridges underlain by hard sandstones and conglomerate beds, and the intervening valleys are eroded in shales and softer rocks, or along fault zones. Pleistocene glaciation resulted in further reduction of the already low relief, and in deposition of glacial and glacio-fluvial surficial deposits. These are mostly well-drained, bouldery deposits of fairly low productivity. Uplift of the land since the ice retreat has led to rejuvination of streams and in many instances to the cutting of narrow box canyons in the lower courses of streams approaching the sea (Fyles, 1963).

Mountainous parts of the watershed (generally above 2,000' in elevation) are composed of a heterogeneous group of pre-Cretaceous sedimentary and volcanic rocks intruded by numerous granitic botholiths. The mountains are the result of the mature dissection of a Tertiary erosion surface of low relief. The rugged topography was modified by glaciation during the Pleistocene, at which time the higher serrate peaks (e.g. Mt. Arrowsmith) were sculptured by alpine glaciers, surfaces below 4,000 ft. were modified by the continental ice-sheet, and lower valleys were deepened and modified by the erosion of valley glaciers.

The important geological point to consider is that while the bedrock formations may have been gradually formed and modified over millions of years, the surface and micro-relief features of importance to human settlement (soils; flood plains; river banks; terraces; deltas; shorelines) have developed over a relatively short geological period (15,000 years or less) and are still actively evolving. Land development anywhere in the watershed must take these processes into consideration.

Soils: General soil characteristics associated with Douglas fir, Western hemlock and mountain hemlock zones are given by Krajina (1965) and will not be repeated here. Broad soil mapping in the area has been carried out by Day et. al. (1959), and the C.L.I. has mapped soil capacity for agriculture.

Where soil profiles have developed in the estuary-Parksville Flats area, they are described as Cowichan Clay Loam. These soils are on moist, poorly drained sites of fairly level topography. The parent materials are fine-textured marine sediments.

The most prominent soil series within the district is the Qualicum loamy sand and gravelly-loamy sand. This is a coarse textured soil lying over a pale brown or gray sand or gravel. This soil type is described as submarginal for agriculture, but is extremely permeable, and therefore considered suitable for developments requiring the disposal of wastes.

C.L.I. mapping indicates that most of the Englishman area up to 1,000 feet in elevation is rated as Class 5 for agricultural production (very severe limitations), the major limitations being stoniness and moisture deficiency. Apparently these soils could be improved to 70%

Class 4 and 30% Class 3 (but this seems doubtful to me). Most of the existing pockets of farmland and undeveloped swampland below 1,000 ft. in elevation are rated as Class 3, the major limitations being excessive soil moisture and adverse soil structure or permeability. Above the 1,000 foot contour (most of the watershed) soils are assigned to Class 7, that is they have no agricultural potential whatsoever.

Climate: Climate in the watershed is typically West Coast Marine, but varies considerably with elevation and proximity to the seacoast. Winters are wet and summers relatively dry. Total annual precipitation varies from about 40 inches at sea level to 60 inches or more inland. Snowfall is normally infrequent at sea level, but increases markedly with elevation. The average annual temperature at lower elevations is about 50° F, and the July average about 64° F.

The most significant climatic factor related to both land development and environmental protection is the seasonal precipitation pattern. Excessive water in late fall, winter, or spring can result in streambank erosion, high water tables, and surface ponding. The summer drouth can be just as striking, and result in problems for fish production and domestic or other water supply.

Hydrology: The seasonal flow regime of the Englishman River is typical of streams on the east Coast of Vancouver, and reflects the seasonal rainfall pattern i.e., low in the summer and high in winter. However, there is a dearth of available flow information for the river from which to compute mean and extreme flows or on which to base historical comparisons.

Year-round flow data for the river are only available for 1915 and 1916 (Appendix 2). Partial year data are also available for 1913, 1914, 1917, 1970, and 1971. Flows in the latter two years were recorded for the summer period only, in order to relate low flows to water licensing requests (Appendices 3 and 4).

In 1915 the flow varied from 3,620 (Dec. 8) to 23 CFS (Sept. 20), and the mean flow was 450 CFS. The 1916 flow varied from 3,680 (Dec. 15) to 15 CFS (Oct. 17), and the mean flow was 478 CFS. An all time low of 3 CFS was recorded on September 4, 1914. The lowest flow recorded in 1970 was 6.0 CFS (Sept. 1 and 2), and in 1971 was 40.8 CFS (Aug. 29 and 30, and Sept. 24).

Mean monthly flows for 1915, 1916, 1970, and 1971 are plotted in Figure 2. This provides a good indication of the seasonal flow pattern, but masks the daily extremes. Maximum daily flows have been about three times greater than the highest mean monthly flow (1,200 CFS). The graph also illustrates the great variations that can occur in the same month between dry years and wet years, e.g. October 1915 and 1916. Because of year-to-year variability, a run of ten or more years would probably be needed to compare historical (pre-logging) and recent flows.

The river gradient is under 0.25% in its lowermost reaches (below the Island Highway), and averaged about 0.33% between its mouth and the 100 ft. contour about 5½ miles upstream. Between this point and the Englishman River Falls, the gradient is about 50 ft. per mile, or approximately 1%. Gradients in the headwater areas are generally much greater, but there are local exceptions.

In addition to the obvious streams, some water enters the system from small springs and lateral seepage along the river bank, particularly during the wet winter

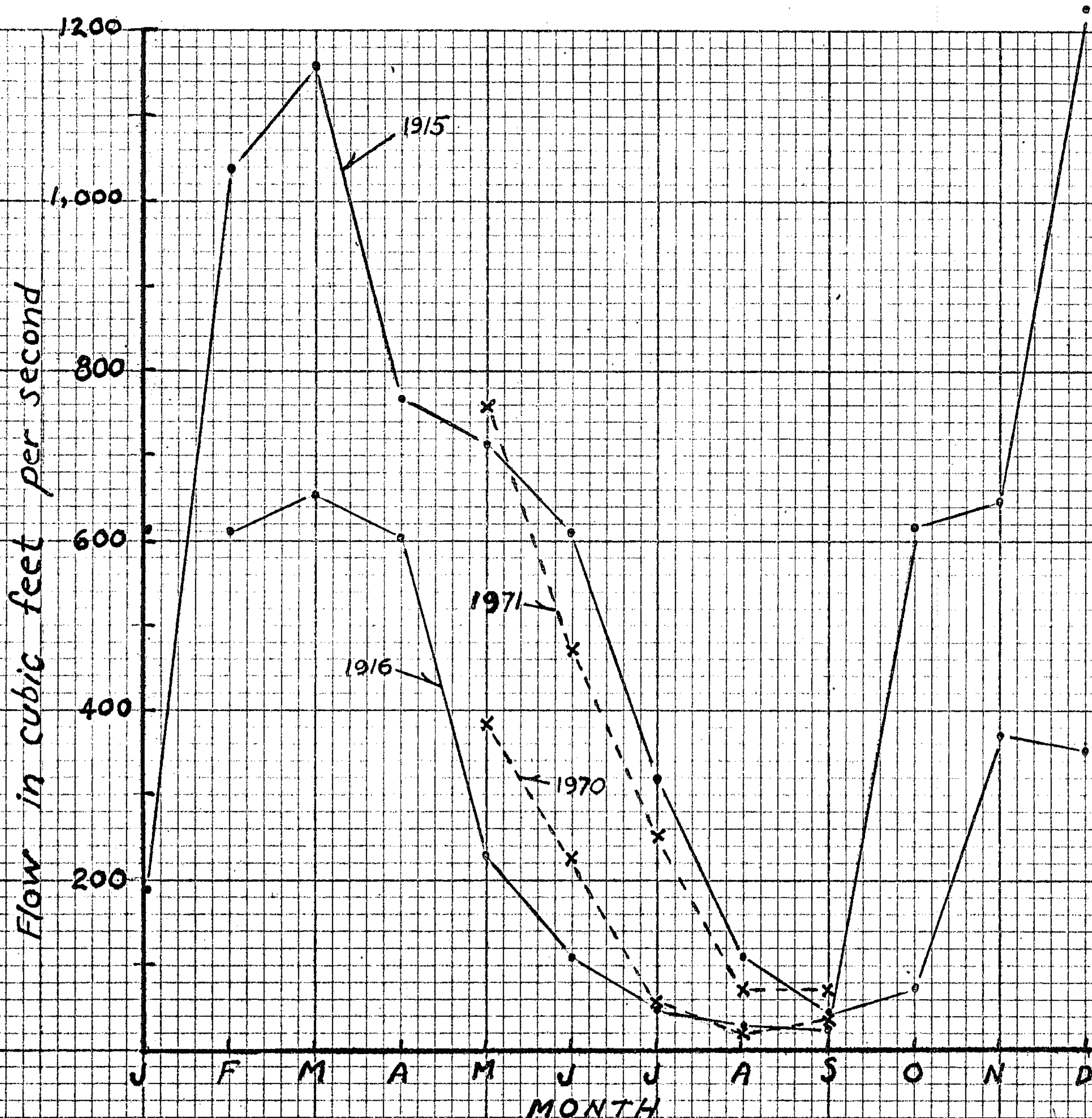


Figure 2. Mean monthly flows in the Englishman River.

period. Springs form the source of a number of small streams in the area, for example "7 springs" on upper Craig Creek.

b). Biological Features

Vegetation: The Englishman watershed is primarily a forested area, and the dominant trees are coniferous. Vegetation patterns reflect variations in climate and landform within the area and are typical of the east slope of Vancouver Island.

According to the classification of Rowe (1972), the lowermost elevations (probably below 500') fall into the Strait of Georgia Section of the Coast Forest Region, most of the remainder into the Southern Pacific Coast Section. Krajina (1965) has proposed three similar elevational zones called Coastal Douglas Fir, Coastal Western Hemlock, and Mountain Hemlock.

The dominant tree at low elevations is Douglas fir. On very dry or exposed sites, arbutus, Rocky Mountain juniper or shore pine may occur. Other low-elevation trees include grand fir, yew, flowering dogwood, and Pacific crabapple. Western hemlock is the dominant tree at intermediate elevations, often in association with red cedar or western white pine. Red alder is the most abundant deciduous tree in wet or disturbed sites in both zones, but black cottonwood and broadleaf maple may also occur in riparian situations. At the highest forested elevations, mountain hemlock is the dominant tree, and some yellow cyperus may also occur.

Salal is the dominant shrubby vegetation throughout most of the area, but gives way to other species in the subalpine zone, moist seepage areas, or gravelly flats. Sword fern and bearberry are often abundant in the latter two habitats respectively.

Logging, slash burning and forest fires have resulted in considerable modification of the original plant cover. Seral stages in the Douglas fir zone in the Englishman watershed have been described by Gates (1970), and their relationship to deer production evaluated by Smith (1968).

Localized plant communities in the estuary area have been described in more detail by Tera Consultants (1975) and Waters and Kennedy (1974).

Wildlife: With the exception of the estuary area, the Englishman watershed is not particularly rich in wildlife, but is typical of the coniferous forests of the east coast of Vancouver Island. The black tailed deer is the dominant game animal. Other game species include cougar, ruffed grouse, and blue grouse.

Under the Canada Land Inventory (C.L.I.) most of the watershed has been assigned to Class 3 or 4 for deer, and the major limitations to production is excessive snowfall. An approximate breakdown for the watershed is as follows:

Class	Description	% of Watershed Area	Elevation Range
3	Slight limitations	10	0-500'
-2W	60% Class 3; 40% Class 2W (winter range with very slight limitations)	40	500-2,000'
3W	Winter range-slight limitations	10	1500-2,500'
4	Moderate limitations	35	2000-4,000'
or 6	Moderately severe or severe limitations	5	above 4,000'

According to C.L.I. mapping for waterfowl capability, the estuary and a few small wetlands in the Errington-Parksville area are rated as Class 3M (Migration habitat having slight limitations); small lakes in the headwater area are in Class 6 (severe limitations); and the remainder of the watershed is Class 7 (no waterfowl production). I feel that the estuary area should have rated at least Class 2M, since it is certainly more important that the general coastline, which was also rated Class 3M.

Ratings for other groups of wildlife have not been carried out. Cougars are considered to be as abundant as anywhere on the Island. Ruffed grouse occur sporadically at low elevations, mostly in deciduous or mixed riparian habitat. Blue grouse are widespread but much reduced in numbers compared to earlier years when logging and fire created many low elevation openings for breeding.

Deer harvests in the Northwest Bay logging division of MacMillan and Bloedel, which makes up the bulk of the Englishman watershed, reached a peak of over 600 in 1962 and 1963 (nearly 5 per square mile), but have since declined due to successional changes to less than half that figure.

There is little or no active trapping of fur-bearing animals in the watershed, although mink, raccoons, marten, and a few beavers do occur there.

Fisheries: The Englishman River is an important producer of sport and commercial fish, considering its relatively small size. Estimated spawning escapements are presented in Appendix 5 . Data for 1947-1968 are from Walker and McLeod (1970), and figures for 1969-1974 were obtained from the Nanaimo Office, Federal Department of Fisheries. Steelhead catch statistics derived from B.C. Fish and Wildlife Branch questionaire surveys are given in Appendix 6 .

Anadromous fish are confined to about the lower ten miles of the system. Walker and McLeod (1970) estimated that the streambed of the main river downstream from the falls consisted of 69% boulders; 12% course gravel; 8% bedrock; 6% pools, and 5% fine gravel. At "normal" levels, about 763,000 square yards of the stream bed are wetted in this stretch, and there are about 130,000 square yards of substrate suitable for spawning. It is estimated that this reach can support up to 7,000 coho spawners, or 700 per mile.

Spawning areas and major blockages are shown in Figure 3 . Fish produced by the river contribute not only to the local catch, but also to sport and commercial harvests in the Gulf of Georgia.

The Englishman is primarily a chum (dog salmon), coho, and steelhead stream. Numbers of springs, pinks, and sockeye entering the river are normally under 100 of each, although larger pink runs occurred in the 1950's. The chum salmon is the major spawner in east coast Vancouver Island streams, and estimated Englishman runs have been as high as 35,000, but more often in the range of 2,000 to 15,000. Chums spawn primarily in the lower reaches, from October to December. Coho escapements are usually in the 500 to 2,000 range. This species spawns throughout the accessible reaches of the river, but shows some preferences for upper reaches and tributary streams. The species also spawns from October to December, with a peak in November.

The steelhead is the most important gamefish, an average of about 750 being caught by anglers each winter (but an estimated 25 - 30% are released again). These are mostly taken in major pools along the main stem of the river from the mouth to the falls, although spawn-

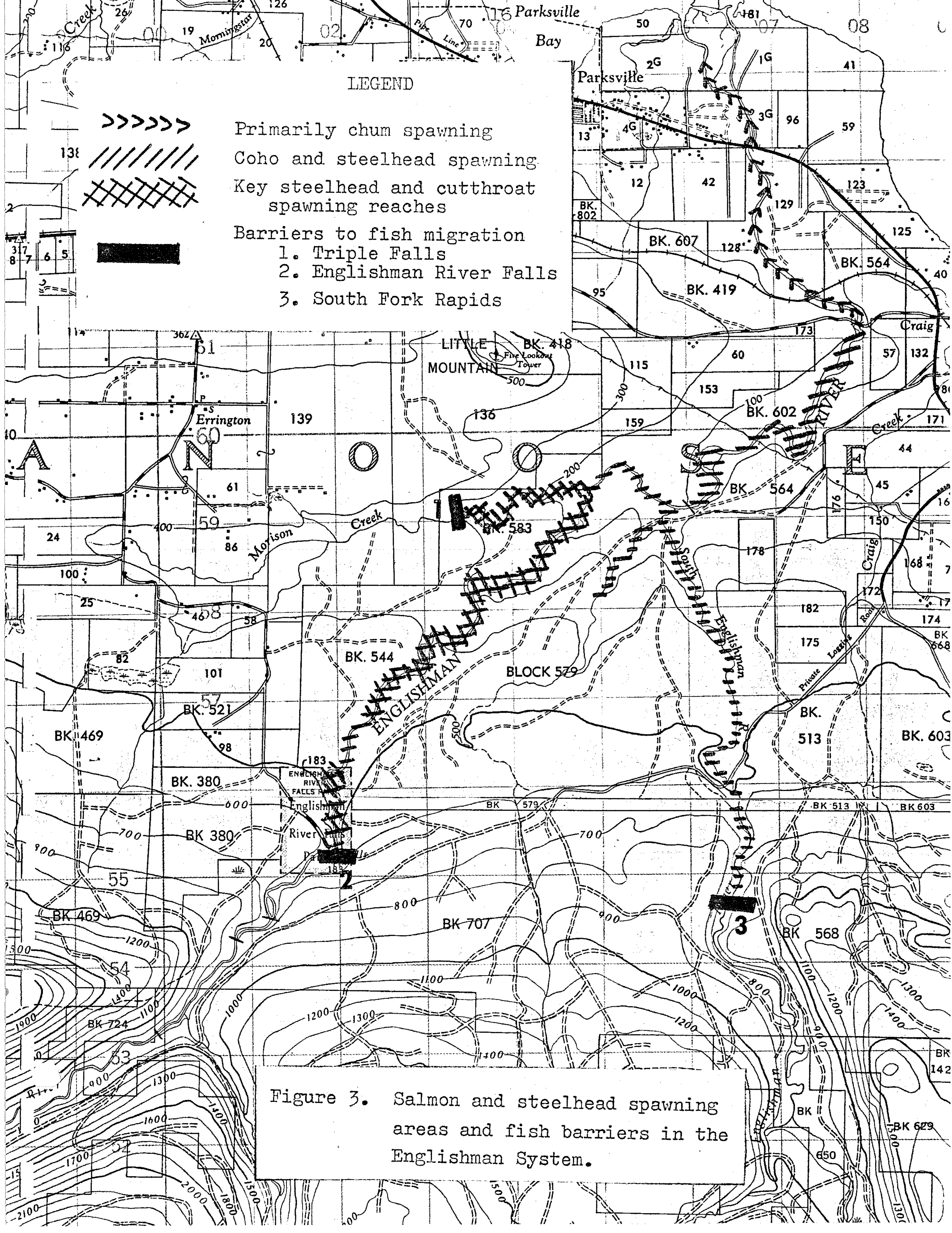


Figure 3. Salmon and steelhead spawning areas and fish barriers in the Englishman System.

ing occurs in tributary streams as well (Morison Cr. and South Fork). Steelhead occur in the river from about November to May, with largest angler catches usually being from February to early April. Spawning mostly occurs in the upper reaches of that portion of the river accessible to anadromous fish, including the major tributaries.

The Englishman ranks as one of the top 30 steelhead streams in B.C. (based on angler catch), and ranks about 10th on Vancouver Island. In addition, sea-run cutthroat trout enter the system to spawn, and smaller resident trout provide angling upstream from the anadromous fish barriers in stream courses and in small headwater lakes (e.g. Rowbotham, Arrowsmith, Marshall, Shelton, Healy). Probably about 200 to 300 sea-run cutthroat trout enter the system (G. Reid, personal communication), and these spawn in Morison Creek and in the main river between the falls and Morison Creek. These two areas are considered by Mr. Reid to be the key areas for game fish production, since they contain the best over-wintering gravel.

In addition to its present fish production, the Englishman system also has potential for increased production through various methods of enhancement. The B.C. Fish and Wildlife has recently involved the Parksville Rod and Gun Club in the planning stage of projects to remove or by-pass blockages on the South Fork and Morison Creek. Engineering inspections are to be made this winter, and it is hoped that blasting will be sufficient to remove a log jam and small chute in the South Fork this summer. The site is four miles up the tributary, and its improvement would make four additional miles of stream available to steelhead and coho. A similar program of local participation is planned for Morison Creek.

In addition, the Federal Government recently announced a 10-year, 300 to 400 million dollar salmon enhancement program for the Pacific Coast, which will consider a wide variety of potential enhancement techniques, including spawning channels, rearing areas, hatcheries, removal of stream blockages, fish ladders, flow control and stocking. The program which is still in the early planning stages, will apply to both salmon and anadromous game fish. Apparently no projects have yet been planned specifically for the Englishman, but one general study, that of evaluating the feasibility of overcoming all barriers to steelhead movement up Vancouver Island rivers, will include the Englishman. This project is being given high priority (Dr. D. Narver, personal communication), and would presumably be followed up by remedial action on rivers showing high feasibility. Morison Creek, the South Fork and main Englishman River all have suitable spawning water above the present barriers for at least Coho and Steelhead, and perhaps other species. Walker and McLeod (1970) estimated that there is potential spawning habitat for 5,600 coho above the Englishman River Falls. Estimates for other species or other tributaries have not been made, but it is apparent that the Englishman system has potential for a sizable increase in production of some anadromous species of fish.

No attempt will be made to place economic value on the Englishman River fishery. Suffice it to say that studies of the economics of both saltwater and freshwater sport fisheries in B.C. have shown the dollar value per fish landed to be high, and that a large percentage of Vancouver Island's tourist revenue is based on sport fishing. Rivers like the Englishman are an integral component of the natural system which supports this industry.

Land Use

A very high percentage of the land in the total watershed is in private ownership. This stems from inclusion of the area in the Esquimalt and Nanaimo Railroad land grant of 1886. The bulk of this two million acre area, including the Englishman watershed, was subsequently sold to forest companies. As noted by Land Use Services (1971) "The effect of this rather unique land tenure system is that most forested lands within the region are privately owned by large logging companies ..." Most forest land in this watershed is owned by MacMillian Bloedel Co. Ltd., and smaller tracts along the lower reaches by B.C. Forest Products. A small portion of Tree Farm License No. 2 (Crown Zellerbach) extends into the upper reaches of the South Fork in the vicinity of Shelton and Healy Lakes. Most settlement and development within the watershed occurs below the 500 foot level, and west of the main rivercourse.

Logging: Areas near the river mouth were probably logged before W.W.I., but extensive logging in the watershed did not begin until 1939. By 1966, about 50% of the original forest in the Northwest Bay Logging Division was cut (most of the timber below the 2,500 ft. elevation), and succession on cut and slash-burned area had progressed to the stage when 20% of the area contained trees over 14 years old. Most of the current logging is at quite high elevations while most lower elevation are now restocked with second growth stands of ages up to 35 years.

Logging in the watershed has been suggested to have resulted in more violent fluctuations in flow of the river, i.e. to have reduced its water retention capacity. This in turn has been blamed for deterioration of salmon spawning habitat and lowered runs of some species into the river.

Walker and M^c^Leod (1970) stated that in Statistical Area 14 (Craig Cr. to Oyster River), pink salmon "have been reduced to almost negligeable numbers ..." They attributed this to streambed deterioration, reduction in minimum flow, increased maximum flows, and direct harassment by man. Crouter (1975) stated that the Englishman "... already is subjected to high flows due in part to deforestation within the upper watershed."

Experimental studies in other watershedshave demonstrated that removal of vegetation cover does indeed increase downstream flows, since less water is lost via. transpiration. The ability of a watershed to hold water and release it slowly is probably also reduced through loss of mulch and litter to slash burning. However, there are insufficient flow data to prove that this has happened in the Englishman watershed. It is interesting that the lowest recorded summer flow (3CFS) was recorded in 1914. Logging may have had little effect on low summer flows, but has probably increased the rapidity with which heavy rainfall and snowmelt is released in winter, resulting in higher peak flows for short periods from late fall to spring. This can result in accelerated bank erosion, scouring of spawning beds, deposition of debri, and removal of finer materials from the streambed.

Dr. D. Narver (personal communication) has suggested that high freshets have deposited considerable course gravel in the lower reaches of the river, with the result that much of the low summer flow is sub-surface. This reduces the ability of species such as pink salmon to enter the river.

Biologists tend to feel that in terms of logging damage to the watershed, the worst is probably over. As second growth timber advances in age on cut-over lands, the flow regime should stabilize somewhat.

Settlement: Since most settlement activity is near the river mouth, effects are believed to have been slight. The amount of vegetation removed to date for such purposes has probably had no effect on the water regime. Septic tank effluents appear to have reduced water quality in the lower two miles of the river. Present bridge crossings do not appear to be a problem. Some dyking in the estuary area has probably influenced natural evolution of the rivercourse in that area. Back yards of some homes on the east side of the estuary extend onto the floodplain and could alter it.

It is not known whether the current level of water removal for agricultural or domestic purposes has an effect on low summer flows. Currently, 32 water licenses exist on the Englishman system (15 on the main river and 17 on tributaries), and while the permits set maximum limits, the actual amount of water removed is not known. According to officials of the Water Rights Branch, the river is not fully subscribed.

East Parksville obtains all its water directly from the river, and the Village supplements its supply in summer from the river. One motel, and a tank truck delivery service are also known to take water directly from the lower river. (B. LeBaron, personal communication). In all cases this water is chlorinated before human use.

Recreation: Outdoor recreation is a very significant activity in the watershed and its vicinity. One Provincial Park (Englishman River Falls) occurs within the watershed, and another (Rathtrevor Beach) lies adjacent to the estuary on the delta plain formed by the river. Visitation at the parks indicates a high and rapidly increasing demand for such amenities in this area (Figure 4).

According to Parks Branch officials, an average of 80 to 100 vehicles of prospective campers are turned away at the Rathtrevor campground each day in the summer. That campground runs at full capacity from mid-June until early September, and many weekends in the spring. Englishman River Falls is somewhat less popular, but still recorded an impressive total of 30,000 camper nights in 1974. Park use statistics are presented in Appendix 7.

Trends in day use of the two parks for the period 1968-1974 (Figure 4) indicate a rapidly increasing demand for public open space in the Parksville region. Rathtrevor Park in particular is starting to show signs of overuse, and additional lands are badly needed to expand this kind of recreational activity.

Recreational activity along the main river largely involves fishing. Steelhead angling on the river is estimated to produce about 2,000 man days of recreation per season. Well over 1,000 man-days of recreation per season are generated by deer hunting in upper parts of the watershed. Additional recreational pursuits include hiking, bird watching, and nature study, sight-seeing, picnicing, swimming, and related activities. These can all be expected to increase in the future.

Other uses: A gravel pit formerly operated in the estuary but no longer does so. In addition, the estuary was used for log dumping and storage as late as 1965. Both uses have undoubtedly modified the estuary, but perhaps have not significantly lowered its productivity.

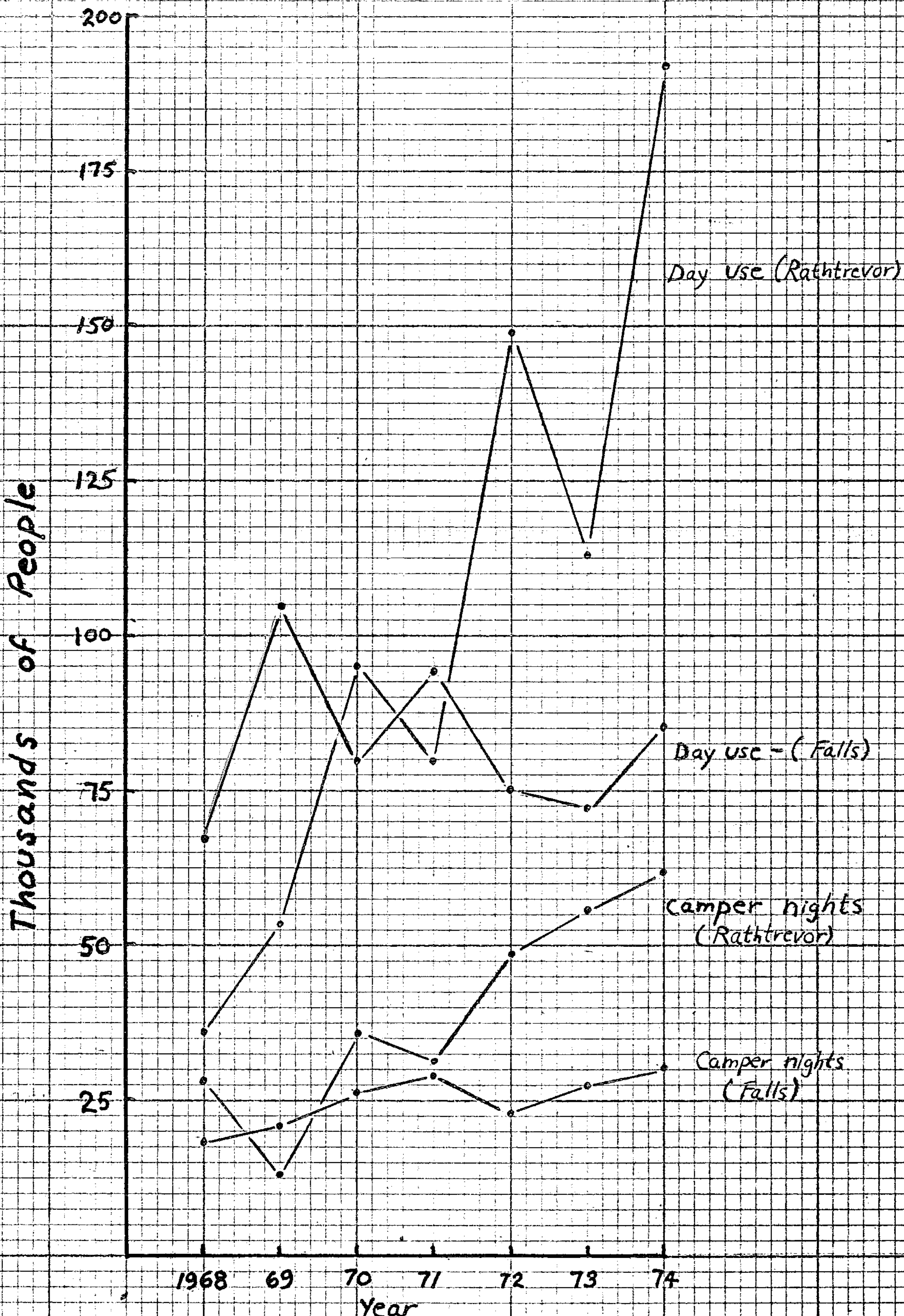


Figure 4. Park use trends, Rathtrevor Beach and Englishman River Falls Provincial Parks.

THE ALLTON PROPERTY

Environmental characteristics

It is not the purpose of this report to provide the environmental background needed for successful development of the Allton property, but rather to point out some of the environmental features which may be subject to damage.

Physical features: The 1,189 acre property has two rather distinct physiographic features - a fairly level till plain and the deeply eroded valleys of Englishman River and Morison Creek. The plain surface is quite smooth, but dips gently to the northeast at an average slope of about 1.3% over the two mile distance from the 420 ft. to 280 ft. contours. Surface deposits consist of very coarse, well drained glacial till, particularly on the southwest end of the property. Development of organic soil on the plain surface is scant, and productivity appears to be quite low. Surface stream development on the plain surface is almost non existant. Some overland flow was noted during periods of very high rainfall or snowmelt, but stream channels on the plain are not well developed. It appears that drainage of much of the precipitation falling on the upper plain is sub-surface, emerging as seepage or springs along the river banks.

The Englishman River valley is characterized by steep banks (varying from almost vertical cliffs to more gentle slopes of 25-40%), small elevated terraces, treed flood-plain terraces, and narrow banks of active floodplain. These features are indicated on Map No. 1. Slope steepness was calculated approximately, using the 20 ft. contour intervals on the map. Other features are based on air photo interpretation and field inspection.

The river surface drops from an elevation of about 300 feet at the Park Boundary to 140 feet at the junction of Morison Creek, an average gradient of 0.8% over the 3.6 river miles. The height of the upper plain above the river averages 100 to 120 vertical feet, except near the confluence of Morison Creek, where it is slightly lower. Bedrock exposures are evident at many places along the river, which is well entrenched in this section and has little opportunity for lateral wandering.

For the most part the river banks are vegetated, but three very steep areas (see Map No. 1) have little or no plant cover and serve to illustrate the sequence of materials. These consist of 6 to 10 feet of very bouldery till underlaid by "boulder clay" and then bedrock (shale in some areas and sandstone in others). These exposed banks are actively eroding, but at a very slow rate. While they have obviously been formed by undercutting of the river, the bank furthest downstream is now separated from the river by about 200 feet of treed floodplain. Gradual erosion of these banks appears to be due to small rivulets during wet weather, and freeze-thaw processess. Considering their steepness, these banks are actually quite stable.

No evidence of slumping, land sliding or mass movement were noted during fairly extensive reconnaissance of this area. Extensive lateral seepage was noted coming from exposed banks at the interface of boulder till and lower, less permeable deposits. Numerous springs and boggy places occur near the botton of vegetated banks, particularly where these are separated from the river by an area of floodplain.

Morison Creek is also well entrenched within rather steep, but heavily vegetated banks. Where it enters the property it is entrenched about 40 feet below the plain surface, and about half way from here to its confluence with the Englishman it is 60-70 feet below. Over its 1.6 miles through the property, this stream descends from 290 to 140 feet above sea level, an average gradient of about 1.7%.

While lower than the banks along the Englishman, those along Morison Creek are also quite steep, probably averaging 40 to 60%. There are a few exposed banks of till and bedrock on the immediate banks of the creek, but these are low and generally screened from view by dense tree cover. These appear to be quite resistant to normal erosion. Some seepage also occurs out of banks along this creek. No slumping or landsliding was noted along Morison Creek. Triple falls on this creek is considered to be an area of high recreational-scenic importance.

Biological features: The upper plain is a Douglas fir site, but growth appears to be very poor due to stoniness and summer drouth. Bearberry is the dominant ground cover on the stoniest areas (southwest part of property), and some lodgepole (shore) pine also occurs here. To the northeast, salal becomes increasingly common in the shrub stratum, and some cedar and hemlock occur with the fir. Deer and mink tracks were noted along muddy roads and one ruffed grouse was flushed, but this rather monotonous flat is generally poor wildlife habitat, except at its edges.

The two major stream valleys exhibit a much greater biotic diversity than the upper plain. This is related to topographic and hydrologic variability, and edge effect. A few arbutus trees occur near the scarp, but they are generally rare. Alders are common in seepage areas on moderately sloping banks and floodplains. Red cedar, hemlock and grand fir are additional coniferous species on slopes or floodplains. A band of black poplar occurs in level riparian situations. A richer understory of sword fern, salmonberry and other species occurs due to better moisture conditions. A generalized cross-section of vegetation types in the Englishman valley is given in Figure 5.

Wildlife use of the river valley adjacent to this property is undoubtedly much greater than on the flat plain above, due to superior habitat diversity and food availability. However, the reconnaissance nature of this study did not allow delineation of critical sites within the valley. Those portions of the Englishman River and Morison Creek immediately adjacent to this property are the most important game fish spawning reaches in the entire watershed.

Potential development impact

The kind of development which is proposed, and the inherent characteristics of the site will both determine the kind and magnitude of potential development impacts. Thus these impacts can be expected to be quite different in the two areas being considered by this study, since site characteristics are dissimilar, and one development (Allton) involves low density subdivision without sewer or water services, and the other (Aldergrove) anticipates strata title owernership and full services. This section will consider the environmental effects which could arise as a result of full development of the Allton lands as proposed by the current owners or their agents.

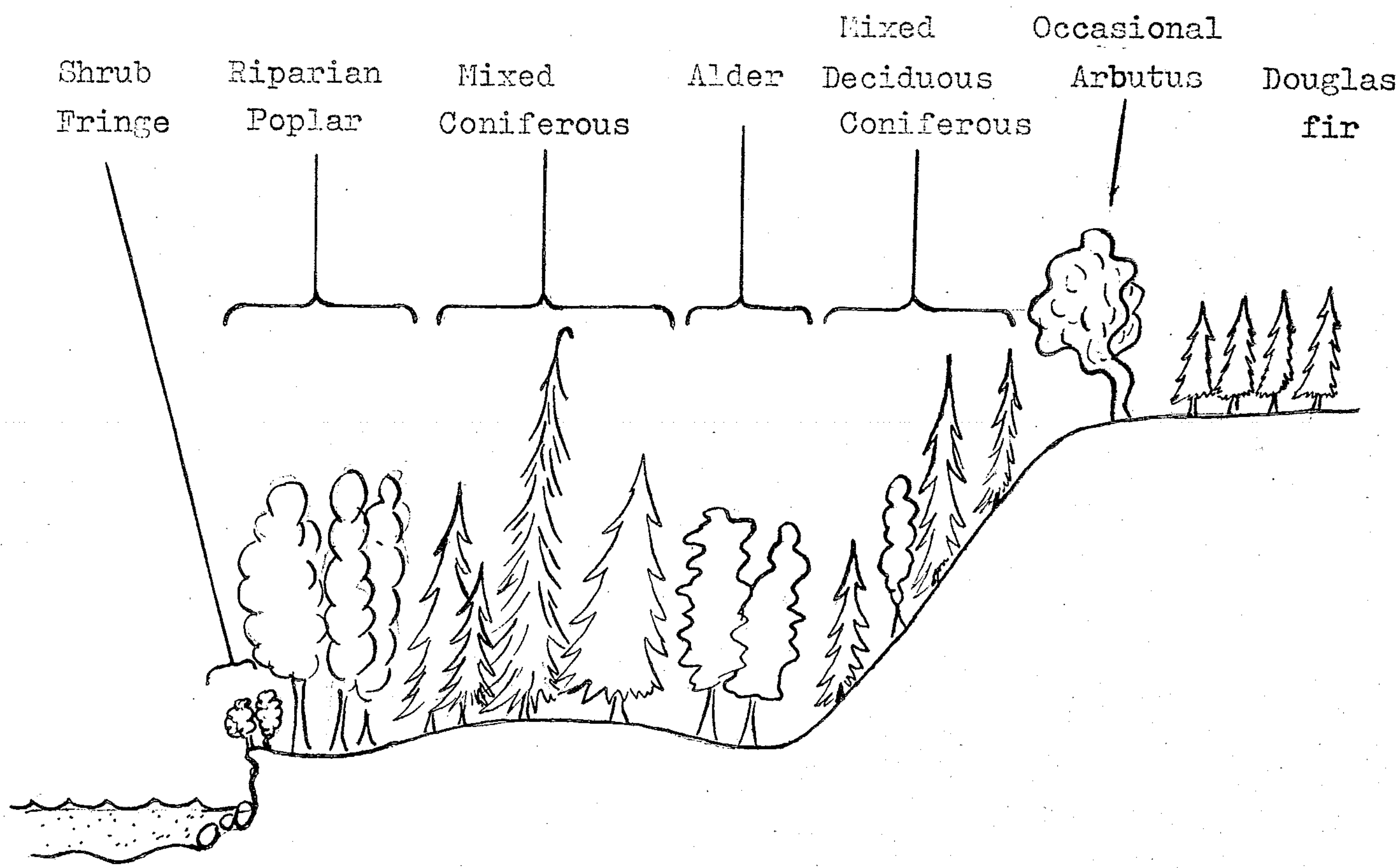


Figure 5. Generalized cross-section of Englishman Valley in vicinity of Allton property.

Sewage contamination: Disposal field conditions on the upper plain appear to be quite good, and even a 5 acre lot size seems adequate to handle wastes from a single dwelling. However, current requirements of four feet of natural soil, adequate percolation, and height above the winter water table might not be met in all areas, and some testing seems in order.

The situation might be quite different on land adjacent to the valley slopes, on the slopes themselves, on intermediate terraces, and on the floodplain. Due to lateral seepage of water into the valley, and seasonally high water tables on some of the floodplain areas, septic systems within this area could cause contamination of ground or surface water. Particularly at the five acre lot size (or any smaller unit), there would be a grave danger of some contamination of the river system. In view of the present situation of very low summer flows and virtually absolute purity of the water, the best course of action seems to be to avoid this possibility.

Water supply: Concern has been expressed that removal of groundwater for domestic and related purposes might adversely affect other users in the district, or agravate the summer low-flow condition of the river. Local topographic features suggest that wells on this property would not affect water supply in the Errington area. It is likely that groundwater under the property percolates in a downslope direction, eventually entering the Englishman River via seepage or springs.

Based on a liberal domestic consumption of 100 gallons per capita per day and four persons per household, a total of 31,200 gallons would be used at a 12 acre lot size, and 52,400 gallons with 5 acre lots. This amounts to about 0.1 CFS with 12 acre development, and about 0.2 CFS with 5 acre development. Even if entirely drawn from waters contributing to the Englishman River flow, the rates of removal would have an insignificant effect on the river. However, allowance of water licenses for agricultural or other purposes could change this picture considerably.

Permeability and erosion: Urban and suburban land uses can cause local changes in the hydrologic cycle. The streets, roofs, driveways etc. of a developed area greatly increase the percentage of the land's surface which is impervious to water (Leopold 1968; Scheidt 1971). This results in overland movement of water which may cause erosion and siltation, and carry urban pollutants into clean streams. Problems are generally considered to begin when 10% or more of the land surface becomes impervious. Normally, this level of imperviousness is not reached until lot sizes reach 2 acres or less.

Calculations based on the 5 acre and 12 acre subdivision plans indicate that, at most, one could expect impervious areas of about 8 and 5% respectively. Nevertheless , sedimentation during the construction phase is a very real possibility, since there is bound to be water flow down ditches paralleling newly constructed roads. Internal roadways on private lots, particularly if they descended the banks to gain access to floodplain portions of lots, would undoubtedly result in some back erosion and stream siltation. On the 5 acre plan, at least 15 lots have half or more of their area on the river side of the Top of the bank, and these owners would almost certainly want to develop road access to the floodplain part of the property.

Vegetation removal: Removal of trees and other plant cover along the edges of streams is well known to be detrimental to water quality and fish populations (Burns 1970; Fish and Wildlife Branch n.d.) and has frequently resulted from subdivision development, even when prohibited by restrictive covenants. Major adverse effects are increased water temperature, decreased fish cover, decreased nutrient and fish food supply, increased bank erosion, and decreased interception of overland flow carrying deleterious materials toward the river. Development of lots to the river bank, whether 5 or 12 acres in size, could result in impacts such as this over a period of years, even if this was forbidden by a covenant.

Removal of vegetation on the steep valley slopes could also initiate accelerated erosion. While it was previously noted that mass movement or slumping does not presently appear to be a problem on this property, land clearing by residents could easily change that situation, particularly in moist seepage areas. Even in the absence of mass movement, the combined effects of altered surface drainage due to roads and other improvements and cover removal on steep slopes would probably result in some erosion of the thin soil layer on these slopes. Any such impacts would adversely affect the esthetic attractiveness of the valley, as well as its biological productivity and water quality.

As noted earlier in this report, those sections of Morison Creek and the Englishman River immediately adjacent to this property are the most important spawning reaches in the entire system.

Channel modification: Channelization (channeling, channel modification, channel improvement) is the term used to describe realignment, relocation, leveling, and deepening of water courses. Flood protection, erosion control, land reclamation, and development are commonly cited motives (Hooton and Reid, 1975). Experience has shown that owners of river-bank land frequently attempt to modify the course or characteristics of the river at the edge of their property, despite restrictive covenants.

While the river adjacent to this property is quite well entrenched, there is a certain amount of natural erosion and scouring during freshets, and some local overland flow on the lowest parts of the floodplain. Landowners often attempt to prevent such happenings, and in the process reduce the quality of stream edge habitat and/or divert the erosion or flooding problem to another area.

The proposed subidivision design does not appear adequate to guard against such adverse river-edge impacts over the long term.

Recreational access: The subdivision proposal in its present form could have adverse effects on future opportunities for public enjoyment of the river and its immediate environment. Even a 50 or 100 foot easment for public access would not allow free upstream or downstream movement by anglers, since in some areas the steep banks extend that far inland, which would force public users to trespass on private land above the bank in order to move from one stretch of the river to another.

In addition, an increasing number of people using the riparian environment are non-anglers. These individuals are more concerned about the quality of their hiking or nature study experience than in catching a fish. Such users gain little comfort from the knowledge that the private property line, and perhaps a fence or other appurtenance of civilization, are a mere 50 or 100 feet from the waters edge. As well, adjacent landowners tend to utilize these narrow strips as if they owned them, further reducing whatever "pocket-wilderness" values the strip may have.

A narrow riparian strip then, may satisfy the needs of protection of the immediate streambank and access for the angler, but falls far short of providing suitable environment for more broadly based outdoor recreational activities. The angler is only one segment of the total public wishing to use the riverine corridor, and, since the resource base on which his sport is based is constant, the anglers contribution to total corridor use can be expected to become relatively less significant in the years ahead.

The Allton development as proposed would physically restrict access to some reaches of the river, would result in a poor recreational experience for non-angling users, and would greatly restrict future options for more broadly based recreational use and public appreciation of the Englishman River valley.

Aesthetics: Subdivision development can have a very significant effect on what Leopold (1969) calls "hydrologic amenities," or the appearance or the impression which the river, its channel and its valley, leaves with the observer. This can result from some of the previously mentioned factors (erosion, cover removal, water pollution) but can also occur in their absence. Despite the possibility of restrictive covenants, there is really very little control over what a landowner does on his private property. Since the entire valley slope and floodplain of both Morison Creek and the Englishman are included in the proposed subdivision design, and several lots are largely composed of these landform units, it is inevitable that the present scenic qualities of the valley would eventually be altered. Barns, sheds, horse pastures and similar improvements would be probable uses of the more productive floodplain areas.

Development of the upper plain will allow access to a number of strategic viewpoints from which the scenic panorama of the river valley, and glimpses of the river itself can be obtained. The present Allton proposal would allow development within the valley and thus provide a view of whatever kind of civilization the individual land-owner wishes to present. The long term public interest is considered to be better served by maintaining the present scienic character of the entire valley, than by allowing a few private landowners to control and alter it.

Control of development impact

Should this subidivision be developed according to plans of the proponents, a host of protective measures should be attached to the approval in the form of covenants. This is deemed necessary by the inclusion of 3.6 miles of the Englishman river-bank, steep valley slopes, springs and seepage areas, flood-plains probably subject to 200 year interval flooding, and entire portions of Morison Creek within the lot structure.

For this subdivision, the long term interests of both future residents of the property and the public at large is felt to be best served by a liberal setback which will preserve the river and its associated features in a near-natural state. To adequately safeguard the river and river valley from potential sewage pollution, vegetation removal, surface erosion, land slipage, scenic degredation, channel modification and access restriction, this setback should be in the vicinity of the edge of the upper plain.

The river, its active and treed floodplains, intermediate terraces and valley slopes are considered a bio-physical whole of common origin, and to be gemorphologically, biologically, and aesthetically quite distinct from the plain above. The landform integrity of the valley unit stems from its fluvial origin, i.e. all landform units below the brink of the upper plain were created by the river, and all are oriented toward the river. Ecological "wholeness" of the valley is a result of its biotic diversity (Figure 5) which contrasts markedly with the upper plain, and which is in turn a result of its landform and hydrologic variability (slope steepness; aspect; seepage; water table etc.). Aesthetic unity of the valley complex becomes apparent upon viewing it from the scarp. Particularly in the upper reaches of relatively small rivers such as the Englishman, and in streams such as Morison Creek, the valley forms a complete visual unit, distinct from the surrounding uplands.

Bauer (unpublished lecture notes) has classified rivers in Washington State into boulder-cobble, gravel beach, pastoral and estuarine zones based on channel type, gradient, and bed materials. This section of the Englishman falls into the boulder-cobble zone (gradient over 25 feet per mile) and has a typically narrow cross section. Land development within the valley is usually not recommended in this zone, which has much higher values for conservation, outdoor recreation, and scenic backdrop purposes.

The desirable setback line in the vicinity of the valley scarp is a matter of some conjecture. Setback criteria adjacent to steep slopes have usually been based on providing safety for structures. However, general protection of the stream-valley environment is of prime concern here. Vertical elevation between Englishman river level and the upper plain is mostly within the range of 80 to 120 feet. Thus a 2 to 1 setback would be about 200 feet back from the top of the bank. This seems desirable where slopes are steep, but might not be necessary where they are more gentle. Where bank slopes are less than 50% (22.5° angle), a 100 foot setback is probably adequate. Morison Creek valley is not quite as deep, but the banks are quite steep, therefore the same criteria should be applied there.

The valley banks are not well defined in the area of the confluence of Morison Creek and Englishman River. Here, the recommended setback location (Map No. 1) has been based on ecological distinctness of the vegetation of the plain and valley physiographic units.

Development of land behind the setback line also has implications for environmental protection. To provide optimum protection for the river valley environment, lots adjacent to the setback line should be as large as possible - hopefully 12 acres. Smaller lots behind this tier might be environmentally acceptable, but a decision on this matter should be based upon more detailed geotechnical investigations by the proponents. Such studies should include depth of natural soil, percolation rates, winter water table level, and summer groundwater availability.

Environmental considerations during construction should include settling ponds to control siltation from new roadways, ditches, and building sites. Longer term provisions should control commercial or industrial land uses which could accidentally or otherwise result in the introduction of pollutants into local waters.

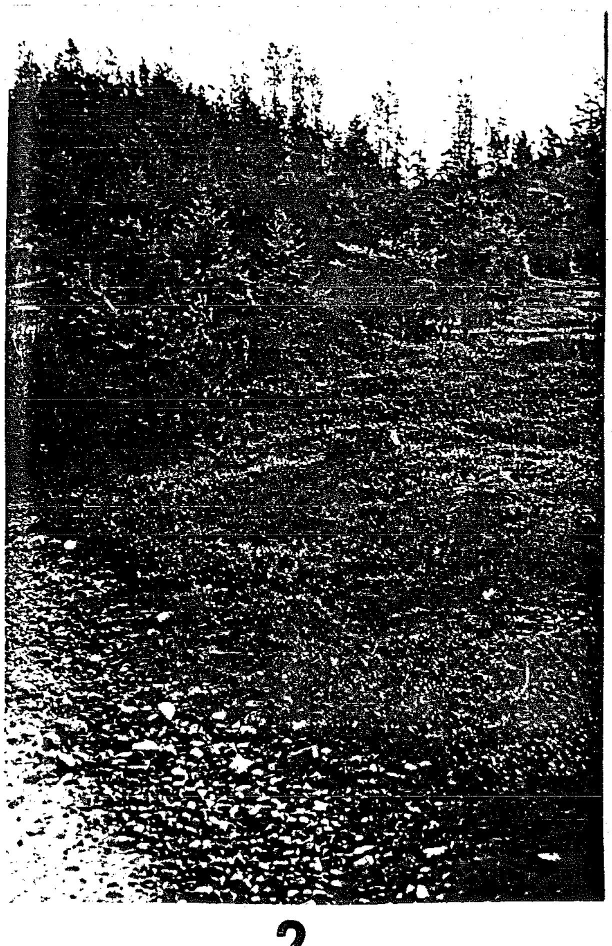
Plates (Allton Area)

1. Depicts level nature of upper part of Allton property, and early coniferous growth

2. Bearberry - Douglas fir association is common on southwest part of property, and contains lodgepole pine as well. Note gravelly ground surface.

3. Uppermost cliff area, about 1/3 below the Provincial Park. Note bedrock exposures near water level (shale) and fairly high river gradient.

1



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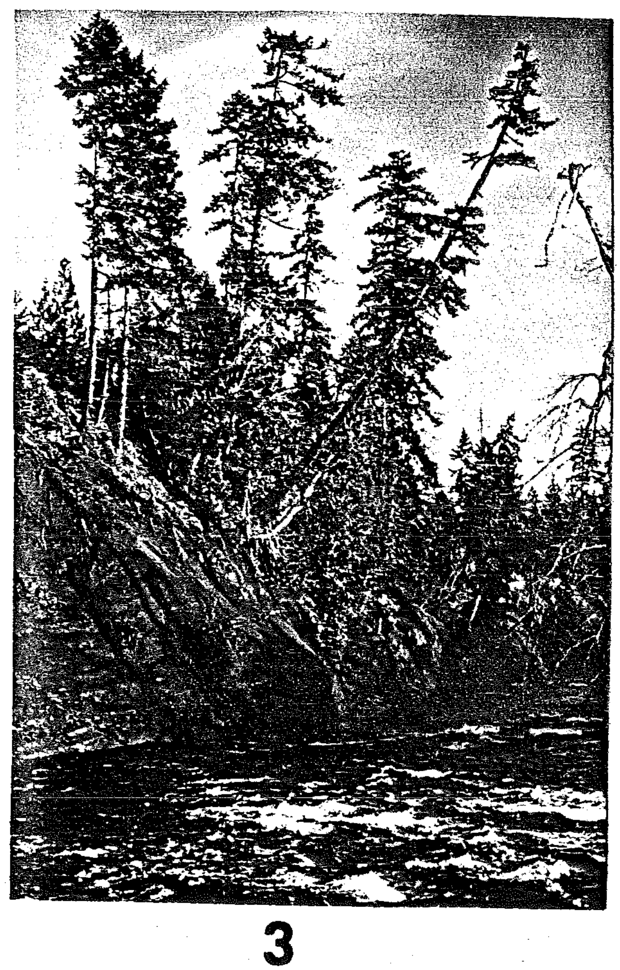


3

Plates (Allton Area - same region as Plate 3)

4. Note bouldery glacial till at top of bank, impervious gray coloured "boulder clay" immediately beneath till, and shale exposures lower down which are partly obscured by slopewash deposits.

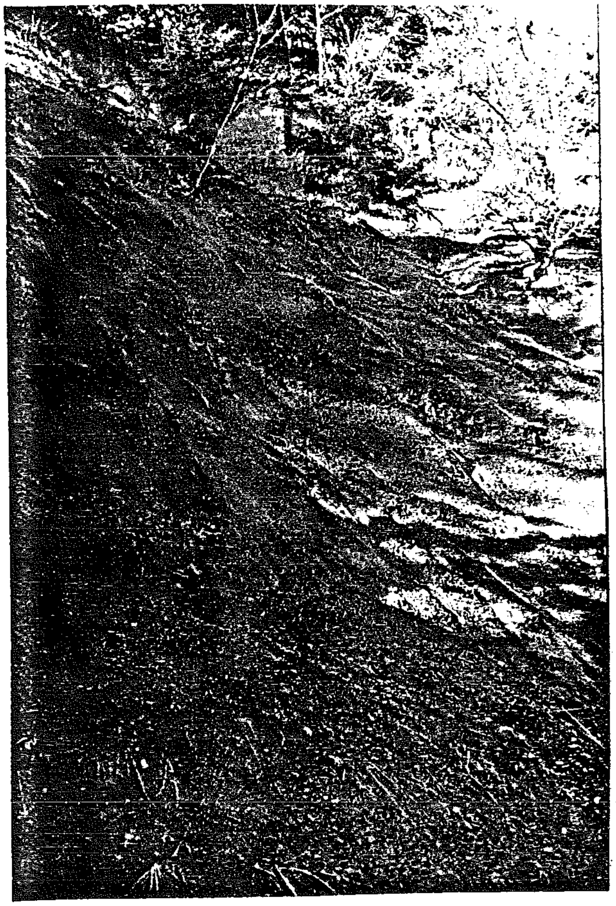
5. Eroded materials washed down the bank by springs and rivulets. Note ballpoint pen for scale.

6. Depicts extensive nature of banks in this area

7. The river is well entrenched along upper reaches of Allton property. Note lack of floodplain, relatively rapid flow, and scenic qualities of the river.

Plates (Allton Area, middle reaches of property)

8-9. Predominantly bedrock cliff about 1¼ river miles below Provincial Park. These cliffs are quite stable, but there is some erosion of the glacial till above them.



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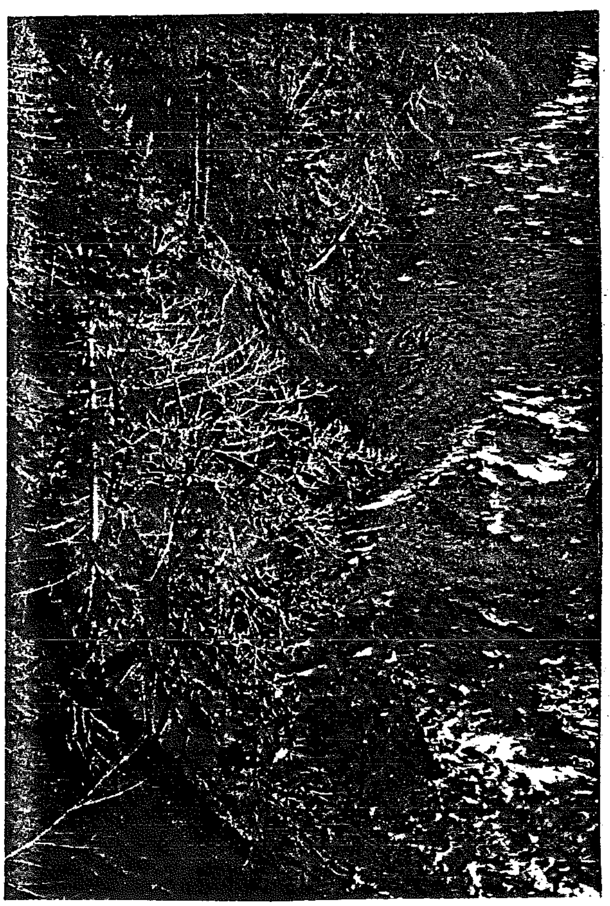

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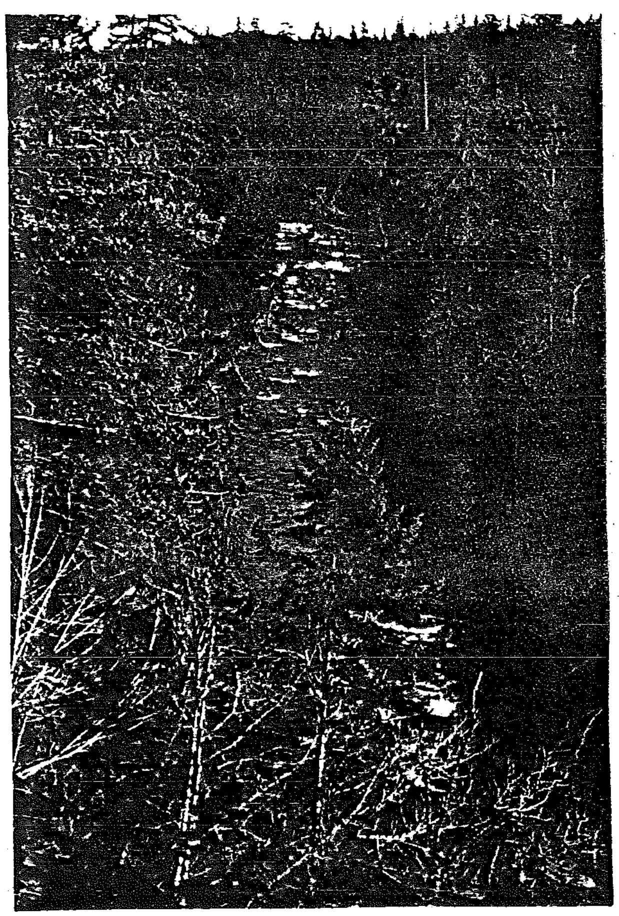

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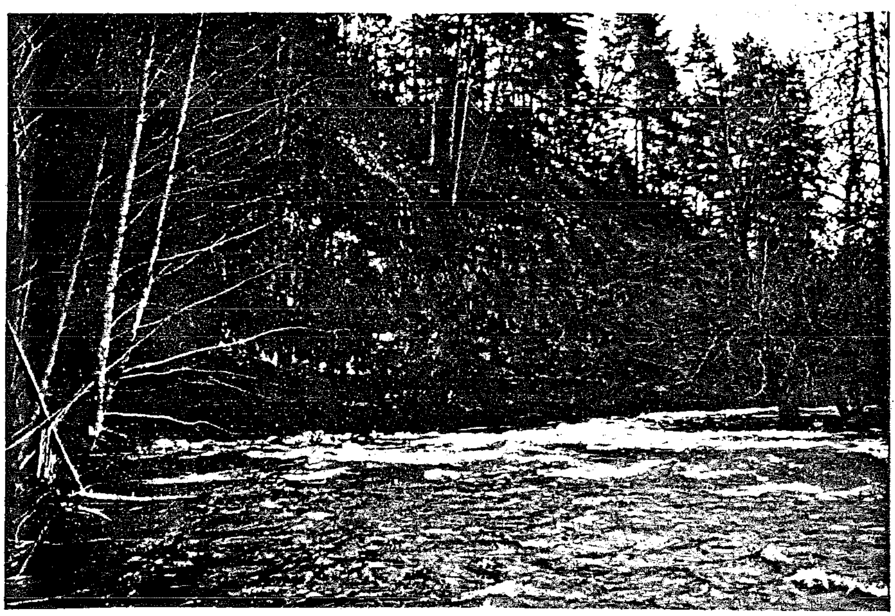


9

Plates (Allton Property, 1¼ miles below Park)

10. The island in this stretch is gradually being eroded away due to change in river course

11. Erosion and scouring of the banks is a natural process, but one which landowners would probably try to prevent.

12. Scenic stretch of the river immediately below cliffs shown in Plates 8 and 9. Note low bedrock exposures on both sides, and riparian growth of deciduous trees. Rafting and kayaking could become popular on this and other reaches of the river.

10

11

12

Plates (Allton property, about 2½ river miles below Provincial Park)

13. High eroded banks. Tree growth in foreground is on floodplain separating river from bottom of bank.

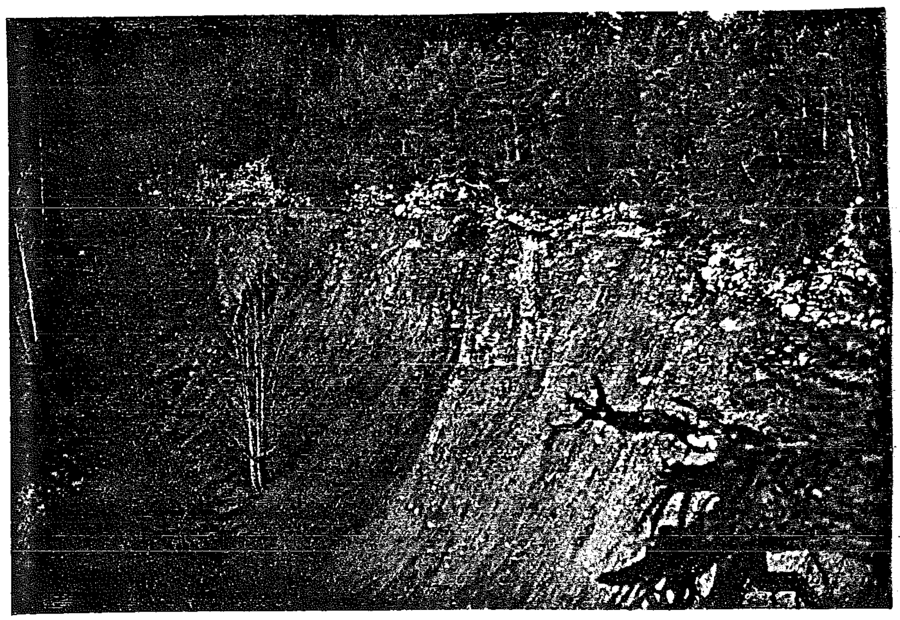
14. Closer view of same bank. Note glacial till surface and consolidated material below. Despite steep and active slope, some trees have gained a foothold.

15. View of river from same banks. Note deciduous riparian fringe along opposite bank (MacMillan Bloedel holdings) and gravel bar. Bars like this become more common from here to Allsbrook Road area.

16. Alder-sword fern association in seepage area near above cliffs.

17. Evidence of overland flow of the river on lower part of floodplain just downstream from cliffs in Plates 13 and 14. Driftwood and silt were deposited during November - December 1975.

13



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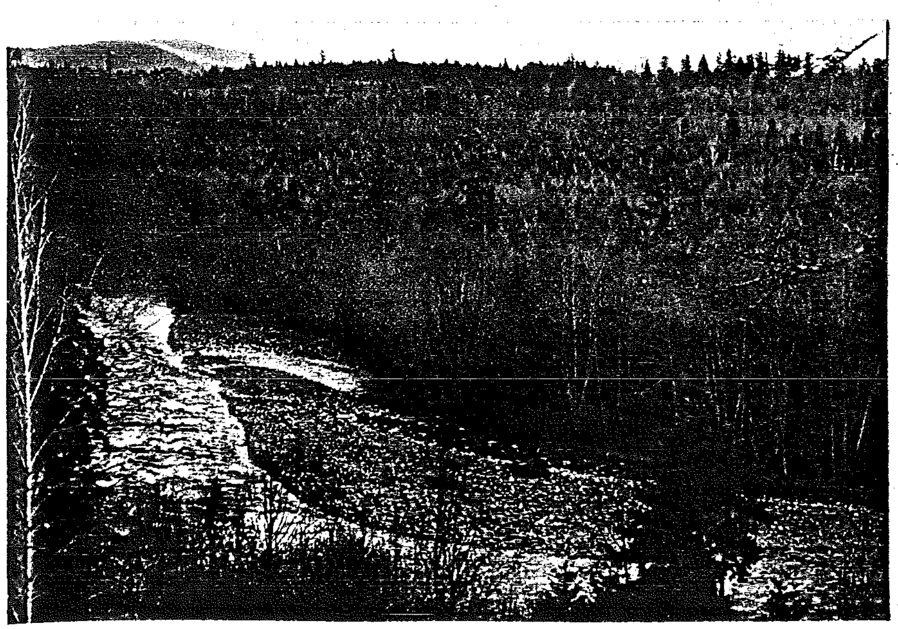

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17

Plates (Morison Creek Area)

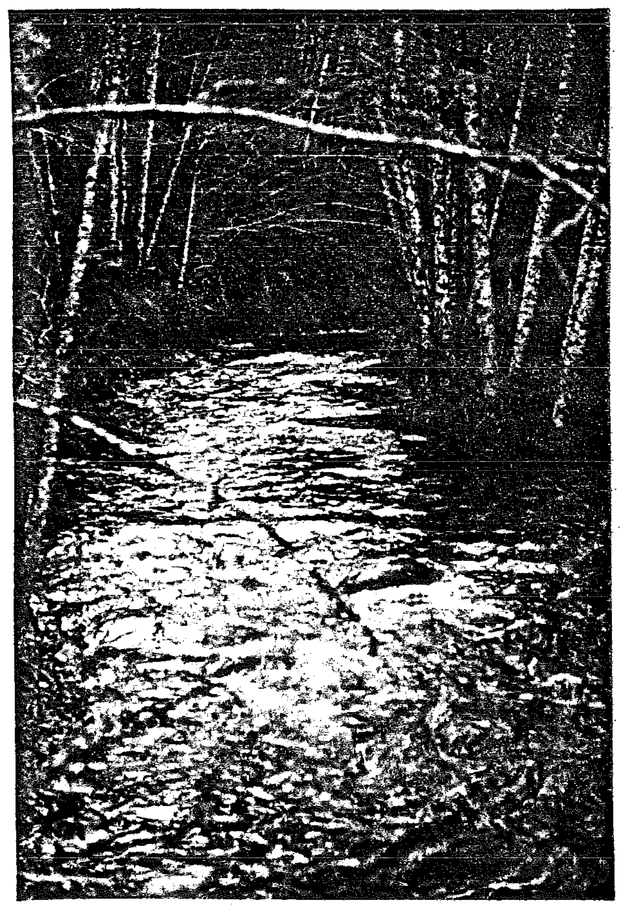
18. Englishman at confluence of Morison Creek, which enters on left

19. Attractive floodplain community on opposite bank near confluence of Morison Creek and Englishman River.

20. Morison Creek about one mile above its confluence with the Englishman. Note dense, overhanging deciduous growth, and bedrock exposure in background.

18

19



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THE ALDERGROVE PROPERTY

Environmental characteristics

A quite complete environmental description of this 216 acre parcel was carried out by Tera Consultants in late 1974, and no attempt will be made to duplicate that extensive material here. The following summary of environmentally significant features of the site is based on the Tera report, additional information obtained from the Canadian Wildlife Service, and several field inspections.

(1) The site is low and flat. Slopes are well below 10%. 50% of the site is less than 5 feet above the high water mark, and only 10% is more than 10 feet above that level.

(2) Surficial deposits are primarily sands, gravel and cobbles of marine and riverine origin. Depth to bedrock is several hundred feet.

(3) Active geomorphic process at the present time include erosion and deposition by the Englishman River, and littoral drift along the shoreline.

(4) Soils are shallow, and developed over shore and river-washed sands, gravels and stones. They have little or no agricultural capability other than small areas suited to seasonal pasturage.

(5) Roughly 30% of the area is forested. The remaining acreage is open and vegetated by tidal marsh, grassland, and scattered shrub thickets.

(6) Most of the natural ecological systems and plant communities are rare to very rare in terms of areal distribution on Vancouver Island.

<u>The estuary</u>: Estuaries are among the most productive but least extensive of coastal ecological systems, and have suffered much modification at the hands of man. This 166 acre estuary is one of the most significant on the east coast of Vancouver Island.

<u>Eelgrass beds</u>: These marine communities are restricted to suitable substrates and water depths, and are important feeding areas for species such as brant.

<u>Brakish marsh</u>: Brakish marsh communities such as that on this property are <u>very</u> restricted on Vancouver Island.

<u>Sand dune communities</u>: These contain sand-loving plant species of quite limited occurrence.

<u>Grass-forb meadows</u>: Since Vancouver Island is largely forested, open meadow communities of native plants are very rare indeed. These are also quite rich in species.

<u>Douglas fir forest</u>: Even parts of the forested area are quite unique, not so much in terms of species composition, but because of growth form. The edges of the forest support large, old, knarled firs in semi-open savannah-like stands. These "beach forests" occur in only a few other sites such as at Rathtrevor Park.

(7) Due to its unique combination of landforms and marine, freshwater and upland ecological systems, the site supports an abundance and diversity of wildlife which is much greater than in most surrounding habitats. Tera Consultants list 107 species of birds which probably occur, at least seasonally, in the general area. Nine winter visits to the west side of the estuary by Canadian Wildlife Service personnel in 1973 resulted in a tally of 3,574 birds of at least 36 species (Trethewey, 1976). A list of those species is attached as Appendix 7. Four trumpeter swans were regularly using the estuary during December, 1975 and as noted by Smith and Blood (1972), the future of this species on Vancouver Island is threatened "by the accelerating process of estuarine deterioration." Twenty or more species of mammals can also be expected, but they are normally much less observable than the birds.

(8) As a result of its biotic diversity, varied scenic attributes, accessibility, and proximity to population centers, the site receives considerable nature-oriented recreational use, and has a very high potential for such use. In a short walk one can regularly see spawning salmon, bald eagles, trumpeter swans, and a variety of waterfowl; an opportunity not available to many B.C. residents.

(9) The site contains some potentially significant archaelogical sites, but has not been fully explored. (B. LeBaron, personal communication).

(10) Some modification of the original ecological systems, or esthetic impairment of the present scene, has been brought about by:

- use of the estuary as a gravel source and for log dumping and storage
- partial filling of the estuary, and some other parts of the property
- partial dyking and tidal control
- vehicular destruction of sensitive plant cover
- littering
- drainage of poor quality urban storm water onto the site
- vandalism, Wildlife Act violations etc.

Potential development impact

The proponents of this development have shown considerable concern for protection of the sites' unique physical, biological and aesthetic characteristics. However, there is no doubt that development of the magnitude suggested by them would vastly alter those features. While careful development of the site need not result in environmental degredation, it would certainly result in considerable ecological alteration of the sites' existing natural qualities.

It is assumed that the development would be fully serviced, and that sewage and stormwater disposal and water supply would not result in environmental problems. In addition, the strata title kind of ownership would allow residents less opportunity to modify those parts of the property not actually built upon, than in the case of subdivided land. Nevertheless, development of the site could have some or all of the following consequences:

1. Considerable fill will be required due to high water tables and possible innundation due to floods of 100 to 200 year periodicity. This in itself will physically obliterate much of the natural plant cover.

2. Provision of services such as streets, drainage, sewers and water system will result in considerable site disruption during construction. There is no way to re-create natural plant communities once they have been radically disturbed.
3. Protection of the development would require structures to prevent further erosion of the adjacent riverbank, and to prevent flooding. This would probably involve riprapping presently eroding sections of the riverbank, and set-back dyking for flood control. These improvements would restrict the natural development and formation of the river course, estuary and floodplain, and probably divert problems to other localities. This would lead to the need for still more control. Some loss of streamside vegetation could also result, particularly during construction. Adverse effects of such measures are well documented (Hooton and Reid 1975; Burns 1970).
4. Removal of some tree cover will be necessary to accommodate buildings, streets, and various services. This can result in wind-throw of remaining trees, and possibly a rise in local water tables due to decreased transpiration.
5. Human population pressure on the entire Parksville Flats - Estuary area will be increased greatly, and difficult to control. Although use of the area will continue to increase even in the absence of the Aldergrove development, local use would certainly be greater if the development goes ahead.

Protection of the sensitive sand dune or boggy areas from this level of use would itself require some facilities such as paved trails, walkways, and fences. Many of the plant communities are sensitive to trampling damage, consequently the objective of natural landscaping might be very difficult to attain at the human population densities that are anticipated.

6. Some discussion has arisen concerning enhancement of the wildlife potential of those parts of the property not used for development. Construction of ponds and water control structures, the establishment of wildlife food plants, and similar measures can themselves result in considerable alteration of the natural environment, and benefit only a few species considered desirable at the expense of many others. The present uniqueness of the site is a result of the restricted distribution of the existing habitats on Vancouver Island. To significantly modify those plant communities would go counter to good conservation practice.
7. Potential outdoor recreation space for the total community would be lost on the developed portion of the land.
8. The scenic backdrop to the present community and existing beachfront park area would be significantly altered. Whether the view would be <u>adversely</u> affected by a tasteful development is undoubtedly a matter of opinion. There can be no doubt however that Parksvilles' greatest asset is its waterfront, and that a scenic and natural waterfront vista will become more and more valuable as the upper part of the community becomes increasingly developed, and as the local tourist industry grows.

Control of development impact

Considering the unique ecological attributes of this site; the inherent sensitivity of much of it; the increasing demand for accessible, scenic, outdoor recreation space in the region; and the importance of preserving the natural scenic backdrop upon which the future tourist trade of Parksville depends, the best long term use of this land is considered to be as natural open space for public recreational use and scenic greenbelt. This would completely avoid development impact, but of course, some management would be necessary to protect the area from further degredation.

It is not the purpose of this report to suggest how return of this land to public use might be accomplished. Presumably this would be a justified expenditure from the public purse, but if not, some or all funding might be obtained from private trusts such as the Second Century Fund. At any rate, the ultimate management agency or level of government controlling the land would need to have the capability for continual maintenance and protection of the area.

Should the above course of action not prove possible and the development or some modification of it be allowed to proceed, then little can be added here that has not already been pointed out in the Tera Consultants report. However, the following factors are worth emphacizing.

1. A green strip at least 100 feet wide should be left in a completely natural state along the bank of the Englishman River and its estuary.
2. If possible, there should be no modification of the river bank by riprapping or dyking. Some accelerated

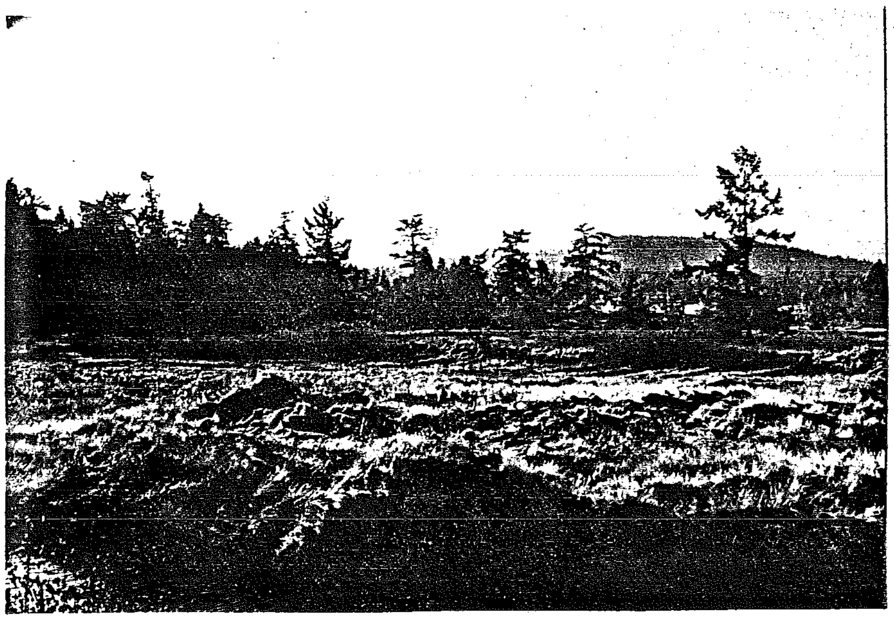
bank erosion has been noted beside the forested part of the property, and long time observers of the local situation feel this is due to excessive gravel build-up in the river immediately upstream, thus diverting the flow toward the bank. In past years this problem was evidently alleviated by removal of gravel under supervision of the Department of Fisheries. This course of action may be preferrable to that of modifying the bank.

3. Fill should be obtained off-site
4. Storm water from roofs, streets etc. is often of poor quality and should be adequately controlled, and possibly treated before it is released. Surface water movement from the impervious surfaces created by the development, toward and into the river, could cause greater bank erosion problems than the river itself does.
5. Commercial or industrial activities which involve storage or use of large volumes of potential pollutants (e.g. service stations) should not be allowed on the site.
6. Movement of machinery during construction phases must be rigidly controlled to prevent damage to adjoining plant communities.

Plates (Aldergrove Enterprises Area)

21. Forest cover on the higher ground which would be most intensively developed
22. Forest edge, shrub, and open meadow communities
23. The brakish slough which meanders through the open meadows. View is west toward Parksville Arena.
24. Private property immediately below Island Highway which is subject to frequent flooding (not on Aldergrove lands)
25. Depicts scouring and deposition of debri during November - December 1975 adjacent to Aldergrove property, just upstream from the estuary.
26. Accelerated erosion is taking place at this bend in the river (same location as Plate 25). River level had recently reached within 2 to 3 feet of top of bank.
27. Erosion at the upper edge of the estuary, believed to be caused by surface water movement into the river.
28. Soil profile created by erosion shown in Plate 27. Distance from water to ground surface is about 4 feet.


21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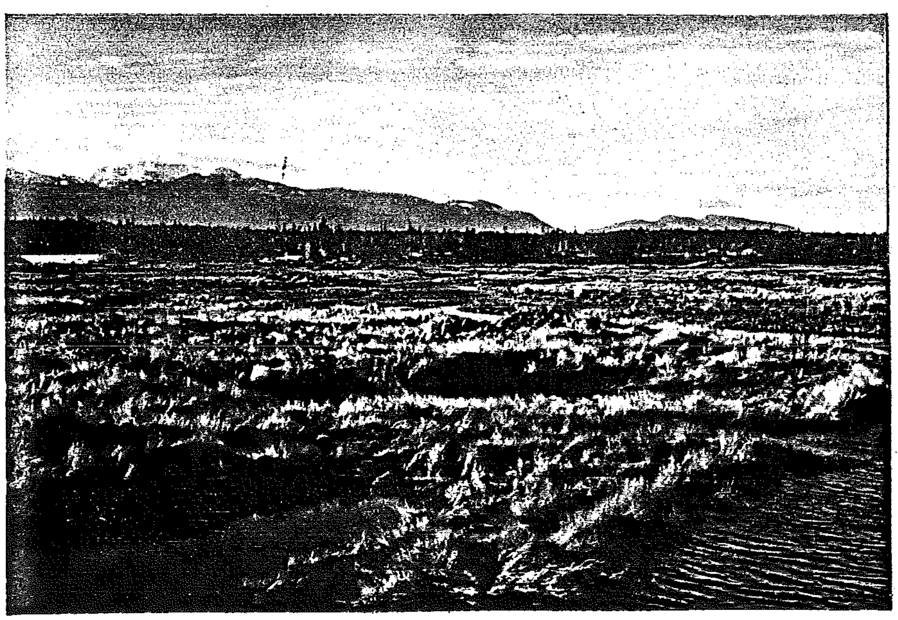
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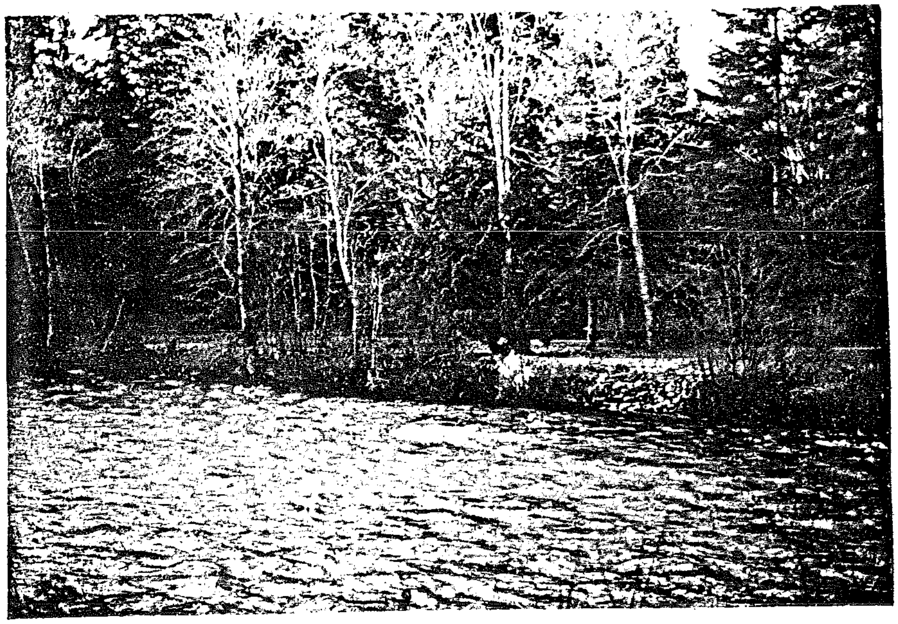

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28

Plates (Estuary area)

29. Looking across estuary from Aldergrove property to housing development on the spit. Estuaries such as this are rare and irreplaceable.

30. Looking from the spit across the mouth of Englishman River to the Aldergrove property and Mt. Arrowsmith. Beach grass communities such as this are also very limited in extent on Vancouver Island.

31. This area at the tip of the spit has high public recreation and conservation values and is barely above high tide level, yet is advertised for sale by a realty company (see Plate 33).

29

30

31

Plates (Parksville Beach - Aldergrove - Estuary Area)

Present uses and abuses of the area suggest that neither local residents nor local government are adequately concerned about Parksvilles' most precious ecological and scenic ammenities.

32. Vegetation and terrain damage due to unrestricted vehicles on Aldergrove lands.

33. This spit forms the precious barrier between open ocean and estuary. Further modification of it is not recommended.

34. Litter at edge of the Parksville Beach.

35. Housing development on the spit between estuary and ocean. This is not only an ecologically sensitive and recreationally desirable site, but would appear to be at hazard in terms of one year in 100 or 200 ocean storms and river floods.

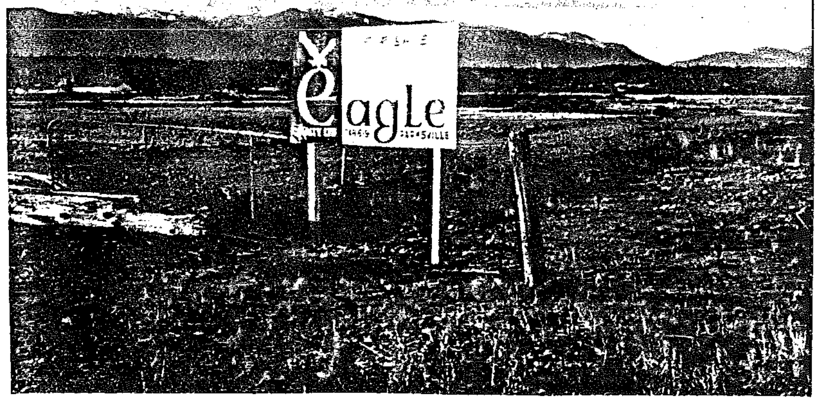
36. Houses near Arena

37. Abandoned dragline. A historic site?

38. A suitable foreground for one of B.C.'s most attractive beaches?

39. Land filling near the Parksville beach

33



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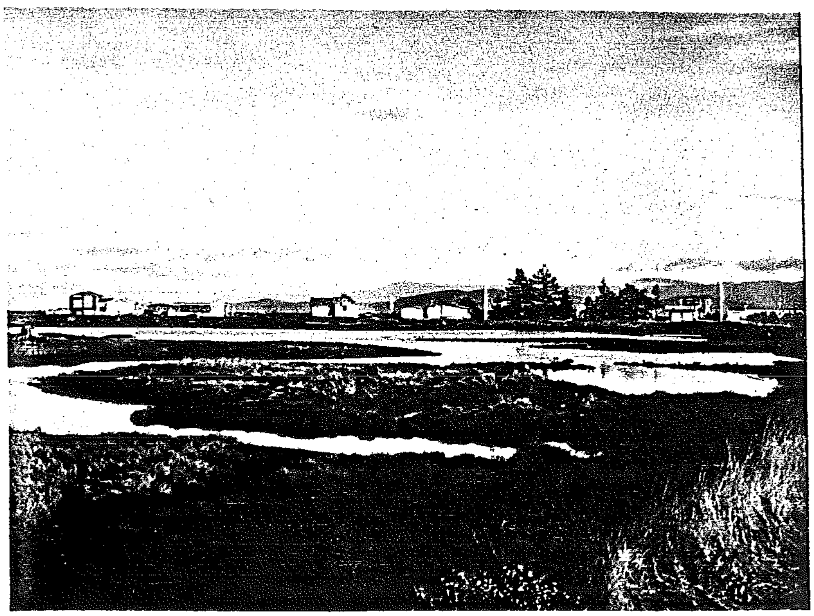

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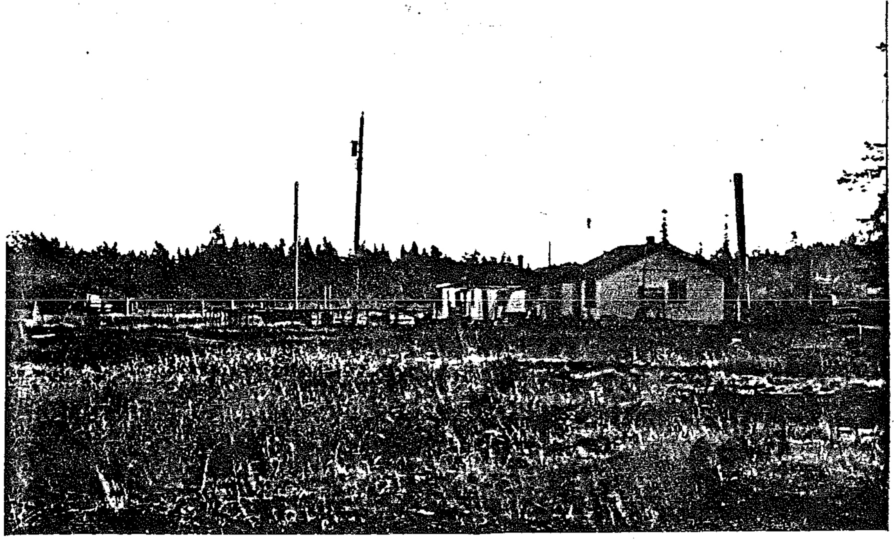

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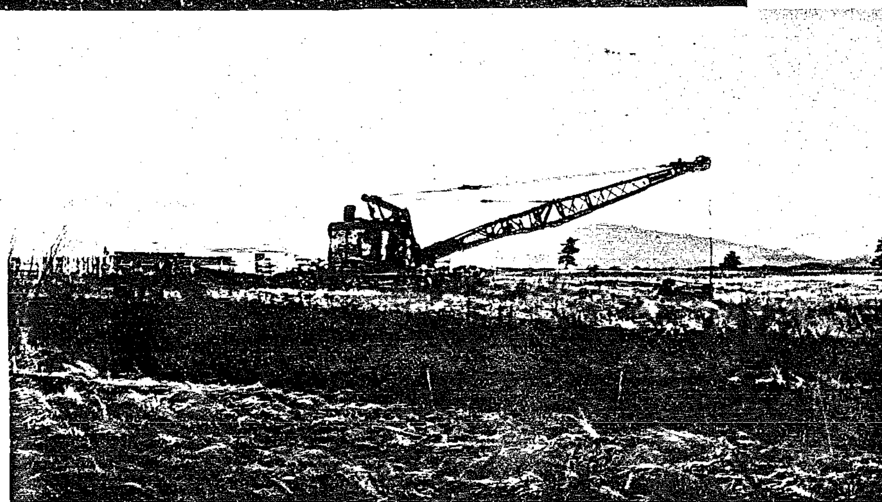

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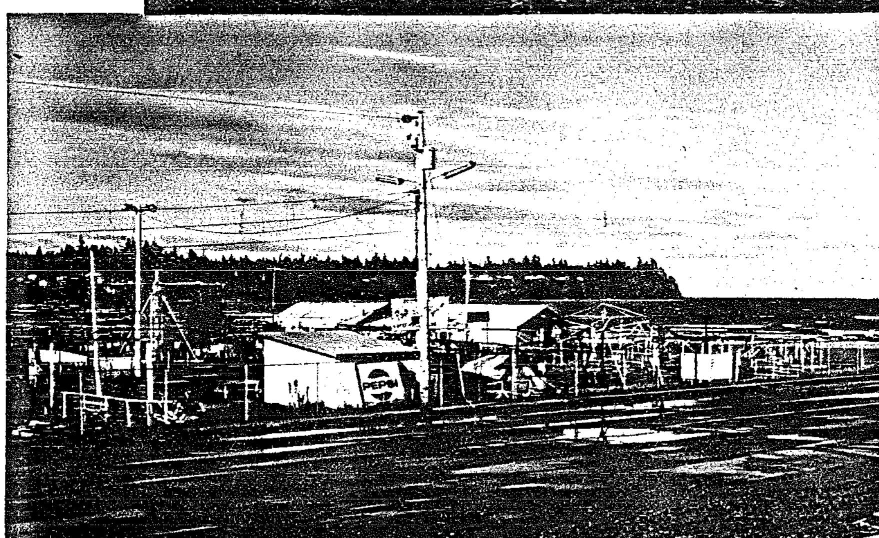

39

OTHER RIVERFRONT PROPERTIES

Development and use of other properties bordering the river can also result in adverse environmental effects. Recent logging by B.C. Forest Products on Block 602 just south of Allsbrook Road left a narrow greenstrip which is considered less than adequate for protection of a river of this importance.

Allsbrook Holdings have agreed to relinquish for the greenbelt purposes the one lot in their subdivision which borders on the river, and thus this development should not have adverse effects on the river. Subdivision in the Martindale Road area has more potential for damage, and has already limited the possibilities for greenbelt establishment in this area. Most of this area is on old floodplain, but does not seem to be particularly prone to flooding. However, septic effluents from this area, and from a ditch along Stafford Avenue, are known to enter the river (B. LeBaron, personal communication). Development of a Parksville sewer system should give early consideration to this area.

The Parksville Industrial area east of the river seems poorly located with respect to the river, but further study is needed to determine if present and potential uses pose a serious threat. The sanitary landfill in particular, is badly located, being in a boggy area at the edge of the floodplain. While the dump is some distance from the actual river, leachates can be expected to become a problem here (if they have not already). If landfilling is to continue as the means of Parksville solid waste disposal, an alternative site should be located. It is anticipated that the Village of Parksville will also donate a strip of this property for riparian greenbelt purposes, and this should buffer the industrial park from the river.

AN ENGLISHMAN RIVER GREENBELT

Riparian protection needs at the two proposed subdivisions lead logically to the concept of a riparian greenbelt extending from Englishman River Falls Provincial Park to the estuary and Rathtrevor Beach Provincial Park. Such a corridor would serve equally for environmental protection, outdoor recreation, and aesthetics. Only in this way can the integrity of the lower river be protected.

The necessity for such a greenbelt is made evident by existing and anticipated subdivision applications, the growth rate of the Parksville area, the rapidly increasing demand for outdoor recreation open space, and the biological importance of this stretch of the river, particularly for spawning fish. As a result of the E. and N. Land Grant, there is a great lack of public outdoor recreation space on southeastern Vancouver Island. A few very small Provincial Parks do not entirely satisfy this need. There is a growing need to take into account the trends toward individual and family group recreation, such a simple walking and hiking, rather than toward more organized group activities and sports. Development of parklands on southeastern Vancouver Island has emphasized the seasonal vacation goals of non-residents more than the daily and weekend needs of local people. As noted by Bauer (1970), "... the open space market does not always require special - attraction or people-concentrated government parks in the present mold, but also a carefully located network of original land and water corridors that becomes a diffused pattern of natural living space to buffer the harsh impacts of population pressure."

This will be a particularly difficult task in our region due to the predominantly private land tenure, but it is also critical to get on with the job now since increased population pressure will make it even more difficult. Like the land speculators and developers are already beginning to do, park planners and land management agencies must begin to look inland. Population levels and coastal land development are now at the stage where the seashore can no longer satisfy the outdoor recreation needs of all the people.

Many small areas exist which are suitable for such greenbelt networks. Again, Wolf Bauer has aptly described them as "... close-in potential buffer zones represented by floodplains and natural river channels and islands; the pocket wilderness of creeks, ravines, and steep hillsides; the hydrologic balance wheels of ponds, bogs lakes and marshes; the littoral and submarine life zones of undeveloped spits, hooks, lagoons saltchucks, estuaries and sea-bluff beaches along the tidal shore."

The lower Englishman is particularly well suited for this purpose, since its narrow valley is little developed to date, it is an important sport fishing river, and has two very scenic Provincial Parks to serve as focal points at each end of the corridor. In addition, an intermediate area known as the "Top Bridge" has many attributes (good angling water, swimming holes, scenic gorge, Indian petroglyphs) and has been promoted as a park site for several years by the Parksville Chamber of Commerce.

The means of achieving such a greenstrip are not of major concern here, but would probably involve several approaches such as return-to-crown leave strips, easements across private property, use of existing Crown land, land trades etc. Management and protection of the corridor would be best assigned to a single angency or level of government having a capability for wildland management. Development within that section of the corridor above Allsbrook Road should probably be limited to hiking trails, although picnic tables and a primitive campsite might also be in order.

There is presently very limited opportunity for the overnight hike-in camping experience near urban centers on Vancouver Island.

How should the boundaries of the corridor be determined? A little more field study of this matter is warranted, but some approximations can be made at this point. The boundaries will obviously have to vary according to local topography and probably according to landownerwishes as well. In the upper reaches (of the "lower river"), the corridor boundary has been suggested with regard to the Allton evaluation, and the same criteria can be applied to the opposite bank. Review of air photos suggests that very similar criteria could be used as far downstream as the sandstone constriction at Allsbrook Road, however deviations might have to be made where the river makes wide bends and the floodplain is wide. The river does have well defined banks in this region, but tends to wander more on its floodplain and has large active areas of exposed gravel in contrast to its more entrenched bedrock position upstream from the South Fork. River banks are still present below Allsbrook road, but they tend to be further back from the river, and thus the corridor boundary would have to be more arbitrary, perhaps depending more upon negotiations with local landowners than on landform characteristics.

ALTERNATIVE SUBDIVISIONS

Project time frame and level of investigation were insufficient to allow the environmental comparison of potential alternative rural subdivision sites in the general area. Three Crown parcels in the region (D.L. 136, Bellevue Road; property at Martindale Road in the Whiskey Creek area; and Baylis Road at Dashwood) all have potential, but parts of the D.L. 136 land have high ecological values as a result of unique tree stands and proximity to Morison Creek. These and possibly other features should be rated and mapped before a final subdivision plan is approved.

Adequate assessment of environmental characteristics of the above Crown parcels plus the many private subdivisions in the Nanoose - Qualicum area would require air photo interpretation plus at least a half day inspection of each, thus I do not wish to go out on a limb and discuss their environmental attributes or limitations at this time.

It is apparent that many unserviced or partially serviced subdivisions in the region have been developed on sites which have higher values for conservation and outdoor recreation (e.g. spits at Englishman and Little Qualicum Rivers), or which do not have sufficient soil cover to handle septic systems (e.g. Dolphin Beach and Garry Oaks at Nanoose). The long term safety of structures on the spit sites might also be questioned. Current distribution of subdivisions outside of corporate limits indicates that the development pattern has been based largely on the desires of the developers, plus some related socio-economic factors (e.g. future costs of providing services; resistance of local people to "suburbanization"), rather than on the biophysical capability of the land to support this kind of use, and its value for alternative uses now and in the future.

Planners are presently hindered by a lack of good biophysical information in map form. Information that is available relates primarily to safety of structures (e.g. foundation materials; danger of flooding or landsliding) or to potential for waste disposal. Information on natural values is largely lacking.

Improved zoning, optimum location of subdivisions within zones, and optimum development of individual parcels all require a better biophysical basis. Cataloging and mapping of all important natural features in the District 69 Planning Area (and Nanaimo Regional District as a whole) should rate high priority. The present study has demonstrated that a great deal of digging is required to properly assess even one subdivision proposal. Proper planning is made more difficult by this piecemeal approach. Some of the natural features which should be included in such an inventory include:

- estuaries, classified according to their size, productivity and uniqueness
- shoreline landforms on the coast, lakes and rivers, including their derivation and significance
- marshes, swamps, springs and related wetlands
- unique plant communities and plant associations
- forest stands of outstanding significance due to their rarity, age, growth-form or other factors
- outstanding wildflower localities
- key wildlife habitat
- spawning areas on all creeks and rivers, classified according to their relative importance and species use
- archaelogical sites and petroglyths rated according to relative significance

- scienic features such as waterfalls, gorges, pools, and viewpoints
- sites of current and potential outdoor recreation significance

The above are essentially places to be avoided by, or adequately incorporated into subdivisions. Proper subdivision location and design must recognize these factors, as well as the traditional site suitability criteria.

Much of the above information could be obtained from public sources (Natural history clubs; Rod and Gun Clubs; Historical Societies; old-time residents) and government agencies (Federal Fisheries; Canadian Wildlife Service; Fish and Wildlife Branch; Provincial Museum; Pacific Biological Station; E.L.U.C. Resource Analysis Unit). Additional field data plus compilation of information from existing sources could be accomplished by knowledgeable consultants.

RECOMMENDATIONS

1. At the Allton property it is recommended that the entire streamcourse, floodplain and valley slopes or cliffs of both Morison Creek and the Englishman River be excluded from subdivision, obtained by the Crown for conservation and recreation purposes, and maintained in their natural state.
2. A recommended setback line at the Allton property is 200 feet beyond the Top of the valley slope where the slope exceeds 50%, and 100 feet where the slope is less than 50%. This applies to frontage on the Englishman and both sides of Morison Creek.
3. Lots bordering on the setback line should be 12 acres in size.
4. Lot sizes on the remainder of the Allton property should be based on further geotechnical investigations of depth of natural soil, percolation rates, winter water table, groundwater availability, and social acceptability.
5. There should be no road crossings of Morison Creek on the Allton holdings.
6. Due to its inherent sensitivity and many unique features, and in view of anticipated future demands for aesthetic greenbelts and public outdoor recreation space in the Parksville area, the Aldergrove Enterprises property should be acquired by the Crown for conservation and recreation purposes.
7. If acquisition of the Aldergrove property is not feasible, then the development should accommodate a 100 foot natural green strip along the Englishman River and should avoid modifying the riverbank with riprap or dykes. Other recommendations involve obtaining fill off-site, control of machinery during construction, and adequate storm

water control.

8. If approval is granted for the Aldergrove development, consideration should be given to a reduced number of housing units in order to control excessive population pressure on the site.
9. A riparian corridor should be established along the lower Englishman River from the estuary to Englishman River Falls, and should include walking access to Rathtrevor Beach. Boundaries of the corridor in its upper reaches should coincide with the setback line recommended for the Allton property.
10. Further field study is recommended to properly locate corridor boundaries in the lower reaches on the basis of social and biophysical criteria, and to site a trail which will not result in environmental degredation.
11. Development within that portion of the proposed Englishman River Greenbelt between Allsbrook Road and Englishman River Falls Provincial Park should be restricted to a corridor trail, occassional picnic tables, and possibly one primitive campsite.
12. Management responsibility for lands acquired for the greenbelt should fall to an agency or level of government having the capability for continual maintenance and protection of the lands, but public participation should be encouraged.

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Appendix 1. TERMS OF REFERENCE FOR D. BLOOD

Re: Lower Englishman River Environmental - Social Assessment

- Overview examination of Kirk Tree Farm Subdivision proposal.
- Overview examination of Parksville Flats Subdivision proposal.
- Preliminary assessment of environmental attributes of Lower Englishman River including general recommendations for further conservation of the riverine system.
- Review & synthesize existing pertinent environmental information pertaining to the Lower Englishman River & the Aldergrove and Allton subdivision proposals.
- Identification of appropriate biophysical boundaries for a Lower Englishman River Riparian Conservation Zone.
- Advise Dr. B. LeBaron on each of the above in relation to the former's social investigations.
- Comment on the environmental suitability of alternative proposed subdivision sites in the Errington - Parksville area.
- Participate in 1 local public meeting as the team environmental expert.

Appendix 2. ENGLISHMAN RIVER NEAR PARKSVILLE - STATION NO. 08HB002

MONTHLY AND ANNUAL MEAN DISCHARGES IN CUBIC FEET PER SECOND FOR THE PERIOD OF RECORD

YEAR	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT	OCT	NOV	DEC	MEAN
1913	-	-	271	-	-	327	192	35.5	-	280	-	-	-
1914	-	-	-	-	-	256	85.5	22.1	-	-	-	-	-
1915	613	609	657	604	230	107	43.9	27.6	24.0	618	644	1230	450
1916	190	1040	1160	767	736	611	321	107	40.6	76.9	368	355	478
1917	360	412	213	515	673	415	162	44.0	50.0	-	-	-	-
1970	-	-	-	-	382	225	50.6	23.0	31.2	-	-	-	-
1971	-	-	-	623	759	471	251	72.7	72.1	-	-	-	-
MEAN	388	687	575	627	556	345	158	47.4	43.6	325	506	793	464

LOCATION - LATITUDE 49 19 00 N
LONG. 124 16 58 W

DRAINAGE AREA 111 SQ. MILES
NATURAL FLOW

ENGLISHMAN RIVER NEAR PARKSVILLE - STATION NO. 08HB002

ANNUAL EXTREMES OF DISCHARGE IN CFS AND ANNUAL TOTAL DISCHARGE IN AC-FT FOR THE PERIOD OF RECORD

YEAR	MAXIMUM INSTANTANEOUS DISCHARGE	MAXIMUM DAILY DISCHARGE	MINIMUM DAILY DISCHARGE	TOTAL DISCHARGE
1913	---	---	10.0 CFS ON SEPT 1	---
1914	---	---	3.0 CFS ON SEPT 4*	---
1915	---	3620 CFS ON DEC 8	23.0 CFS ON SEPT 20	326000 AC-FT
1916	---	3680 CFS ON DEC 15*	15.0 CFS ON OCT. 17	347000 AC-FT
1917	---	---	39.0 CFS ON AUG 11	---
1970	---	---	6.0 CFS ON SEPT 1	---
1971	---	---	40.8 CFS ON AUG 29	---
				337000 AC-FT MEAN

* - EXTREME RECORDED FOR THE PERIOD OF RECORD

Appendix 3.

ENGLISHMAN RIVER NEAR PARKSVILLE - STATION NO. 08HB002

DAILY DISCHARGE IN CUBIC FEET PER SECOND FOR 1970

DAY	APRIL	MAY	JUNE	JULY	AUG.	SEPT.
1	-	319	425 E	81.8	54.0	6.0
2	-	327	608 E	72.8	44.4	6.0
3	-	367	652 E	74.6	43.1	9.6
4	-	506 E	566 E	85.4	31.5	9.6
5	-	566 E	375	80.0	27.6	11.4
6	-	425 E	375	72.8	34.1	18.0
7	-	351	359	64.2	25.0	21.0
8	-	279	272	60.8	38.0	19.0
9	-	434 E	199	65.9	39.6	21.0
10	2830 E	343	226	54.0	28.9	19.0
11	1740 E	292	170	64.2	31.5	17.0
12	1180 E	252	160	44.4	24.0	13.2
13	829 E	236	143	46.0	27.6	9.6
14	619 E	215	175	35.4	26.3	8.7
15	460 E	252	194	34.1	24.0	6.9
16	483 E	674 E	165	34.1	14.1	9.6
17	359	732 E	137	32.8	15.0	15.0
18	319	451 E	132	32.8	20.0	15.0
19	343	343	148	31.5	19.0	49.2
20	399	335	148	30.2	19.0	74.6
21	367	327	155	30.2	18.0	52.4
22	319	351	148	31.5 E	9.6	55.7
23	299	399	135	32.8	12.3	108
24	425 E	408 E	118	31.5	14.1	78.2
25	460 E	516 E	102	31.5	10.5	65.9
26	408 E	652 E	102	35.4	14.1	60.8
27	416 E	367	98.9	31.5	10.5	46.0
28	359	299	96.6	49.2	12.3	41.2
29	335	241	90.9	50.8	12.3	35.4
30	327	312	89.0	67.6	12.3	31.5
31		272		80.0	8.7	
TOTAL		11843	6764.4	1569.8	712.4	934.5
MEAN		382	225	50.6	23.0	31.2
AC-FT		23500	13400	3110	1410	1850
MAX.		732	652	85.4	54	108
MIN.		215	89.0	30.2	8.7	6.0

SUMMARY FOR THE MONTHS MAY TO SEPT.

MEAN DISCHARGE, 143 CFS
TOTAL DISCHARGE, 43300 AC-FT
MAXIMUM DAILY DISCHARGE, 732 CFS ON MAY 17
MINIMUM DAILY DISCHARGE, 6.0 CFS ON SEPT 1

E - ESTIMATED NATURAL FLOW
TYPE OF GAUGE - MANUAL
LOCATION - LAT. 49 19 00 N
LONG 124 16 58 W

DRAINAGE AREA - 111 SQ. MILES

Appendix 4.

ENGLISHMAN RIVER NEAR PARKSVILLE - STATION NO. 08HB002

DAILY DISCHARGE IN CUBIC FEET PER SECOND FOR 1971

DAY	APRIL	MAY	JUNE	JULY	AUG.	SEPT.
1	650 E	934	529	314	160	43.6
2	607	1100	565	285	128	47.8
3	571	1230	595	295	106	47.8
4	523	1310	535	285	106	46.4
5	541	823	493	275	104	64.6
6	680	815	481	227	92.2	92.6
7	725	1030	571	227	82.0	72.0
8	748	915	499	238	68.0	72.0
9	902	854	422	250	68.0	72.0
10	763	748	395	246	68.0	70.0
11	629	870	481	299	68.0	188
12	541	1120	427	285	66.0	164
13	511	926	373	238	63.2	154
14	529	748	346	270	63.2	119
15	644	577	346	280	64.6	99.2
16	541	614	357	290	57.6	82.0
17	439	559	319	258	53.4	66.0
18	439	469	373	280	50.6	59.0
19	433	463	400	330	47.8	53.4
20	439	445	445	309	47.8	49.2
21	457	422	493	290	56.2	42.2
22	445	523	577	266	130	42.2
23	439	703	553	254	99.2	42.2
24	378	800	439	220	72.0	40.8
25	373	718	793	199	61.8	45.0
26	800	636	740	202	56.2	43.6
27	1120	695	517	199	47.8	43.6
28	1060	703	400	178	43.6	43.6
29	894	703	351	178	40.8	74.8
30	854	577	319	160	40.8	84.0
31		481			42.2	
TOTAL	18675	23514	14134	7784	2255.0	2163.8
MEAN	623	759	471	251	72.7	72.1
AC-FT	37000	46600	28000	15400	4470	4290
MAX	1120	1310	793	330	160	188
MIN	373	422	319	157	40.8	40.8

SUMMARY FOR THE MONTHS APRIL TO SEPT.

MEAN DISCHARGE, 374 CFS
TOTAL DISCHARGE, 136000 AC-FT
MAXIMUM DAILY DISCHARGE, 1310 CFS ON MAY 4
MINIMUM DAILY DISCHARGE, 40.8 CFS ON MAY 29

E - ESTIMATED NATURAL FLOW
TYPE OF GAUGE - MANUAL
LOCATION - LAT 49 19 00 N
LONG 124 16 58 W
DRAINAGE AREA - 111 SQ. MILES

Appendix 5. - Estimated spawning escapement of salmon in the Englishman River, 1947 - 1974.

YEAR	Sockeye	Chinook	Coho	Chum	Pink	Steelhead
1947			1500	35,000		3,500
1948			500	10,000		1,000
1949			1200	7,000		800
1950			1500	7,500	3,500	750
1951			750	7,500	75	750
1952			1500	7,500	1,500	1,500
1953			750	15,000	200	1,500
1954			1500	15,000	750	1,500
1955	25		750	1,500	750	
1956	25		1500	750	400	1,500
1957	25		3500	7,500	3,500	1,500
1958	25		750	15,000	400	1,500
1959	1		750	3,500	1	1,500
1960	25	25	400	3,500	200	1,500
1961	25	25	750	3,500	25	750
1962			750	3,500		750
1963		25	750	750	25	1,500
1964	25	25	1500	1,500		
1965	64	75	1500	1,500		750
1966	25	25	1500	7,500	200	
1967	20	75	285	500		
1968	75	115	1000	6,000	100	
1969	< 50	50-100	50-100	5000-10,000	< 50	
1970	< 50	50-100	100-300	2000-5,000	50-100	
1971	< 50	50-100	1000-2000	2000-5,000	< 50	
1972	< 50	50-100	50-100	10000-20,000	< 50	
1973	50-100	50-100	500-1000	5000-10,000	< 50	
1974	< 50	< 50	1000-2000	2000-5,000	< 50	

Appendix 6 . - Estimated catch of steelhead from the Englishman River, 1967 - 1975.

Year	Estimated Catch*	Fisherman Days	Catch/ Day
1967-68	1,009	911	1.11
1968-69	770	1,685	0.46
1969-70	847	2,077	0.41
1970-71	809	3,858	0.21
1971-72	862	3,085	0.28
1972-73	539	2,422	0.22
1973-74	501	2,076	0.18
1974-75	610	1,837	0.33
MEAN	743	2,244	0.33

* fish killed plus those caught and released

Appendix 7 . - Day use and camper nights at Englishman River Falls and Rathtrevor Beach Provincial Park, 1968-1974

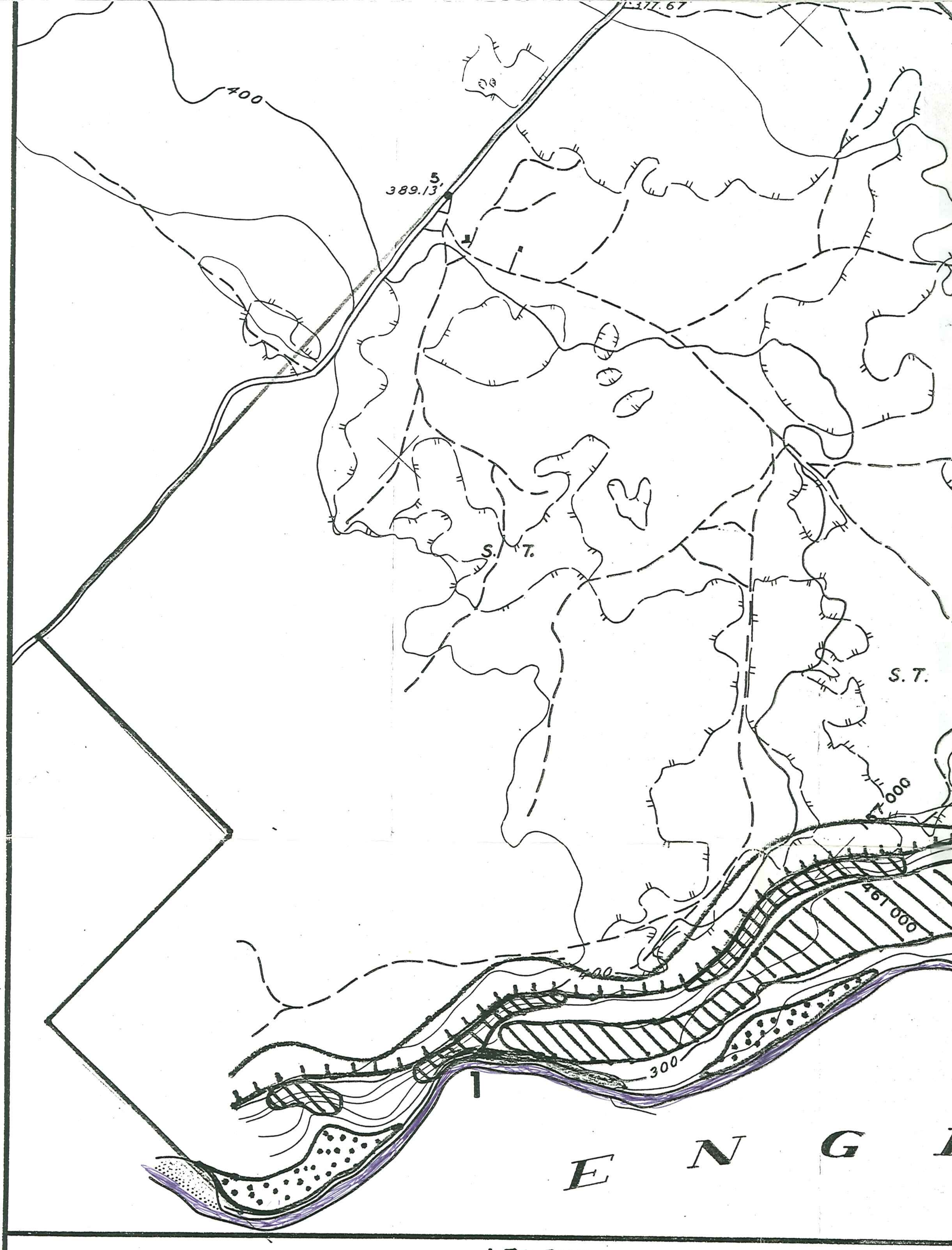
	Englishman River			Rathtrevor Beach		
	D.U.	C.N.	Total	D.U.	C.N.	Total
1968	67,180	18,380	85,560	35,916	27,816	63,732
1969	105,648	21,048	126,696	53,904	13,060	66,964
1970	79,068	25,776	104,844	94,584	36,136	130,720
1971	94,302	28,676	122,978	80,148	31,004	111,152
1972	74,864	23,232	98,096	149,064	48,472	197,536
1973	71,884	27,284	99,168	113,556	56,720	170,276
1974	86,348	30,196	116,544	192,660	62,704	255,364
TOTAL	579,294	174,592	753,886	719,832	275,912	995,744

D.U. - Day Use
C.N. - Camper Nights

Appendix 8. MAXIMUM NUMBERS OF EACH SPECIES OF BIRD OBSERVED AND THE MONTHS BIRDS OF EACH SPECIES WERE OBSERVED AT THE ESTUARY OF THE ENGLISHMAN RIVER JANUARY - MARCH 1973 *

Species	Max. No. seen at one time	Months observed January	February	March
Common Loon	5	--	X	X
Red-throated Loon	1	--	X	--
Red-necked Grebe	3	--	--	X
Horned Grebe	7	X	X	X
Great Blue Heron	1	X	--	--
Black Brant	237	--	--	X
Mallard	1	--	X	X
Am. Wigeon	36	--	X	X
Wood Duck	2	X	--	--
Greater Scaup	17	X	X	X
Common Goldeneye	63	X	X	X
Bufflehead	41	X	X	X
Oldsquaw	21	--	X	--
Harlequin	9	--	--	X
White-winged Scoter	43	--	X	X
Surf Scoter	62	X	X	X
Black Scoter	14	--	X	--
Hooded Merganser	6	--	X	X
Red-breasted Merganser	2	X	--	--
Unidentified ducks	50	--	X	--
Bald Eagle	2	X	X	X
Killdeer	2	X	X	X
Rock Sandpiper	12	--	--	X
Glaucous-winged Gull	500+	X	X	X
Mew Gull	300+	--	X	X
Unidentified Gull	400+	--	--	X
Short-eared Owl	1	--	X	--
Northwestern Crow	100+	X	X	X
American Robin	12	--	X	--
Meadowlark	1	X	X	X
Evening Grosbeak	150+	--	X	--
Song Sparrow	3	--	X	--
Bewick's Wren	1	--	X	--
Pileated Woodpecker	1	X	X	--
Hairy Woodpecker	1	--	X	--
Common Flicker	1	--	X	--

* These data are preliminary and not to be quoted without permission of the Canadian Wildlife Service.



LEGEND

Approx. boundary of Allton Property

Approx. boundary between Till Plain and Valley Complex physiographic units.

Intermediate terraces

Treed Floodplain terraces. (small portions flooded in 1975, and expect that 200-year flood would innundate 50% + of area).

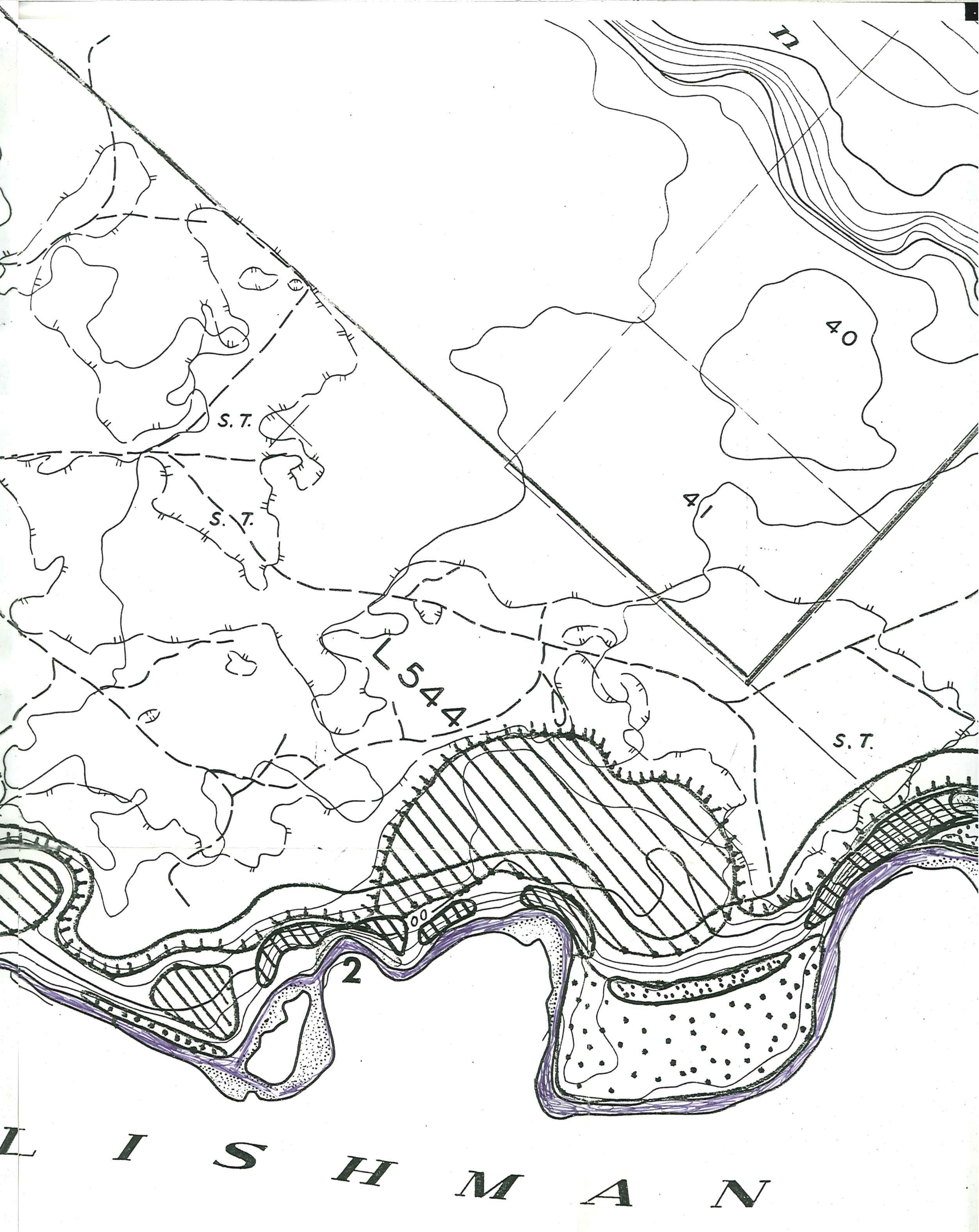
Steep, unvegetated banks or

1. Plates 3-7.
2. Plates 8-9.
3. Plates 13-14.

Bank slopes of approx. 5

Seepage areas with hig

Approx. location of recon



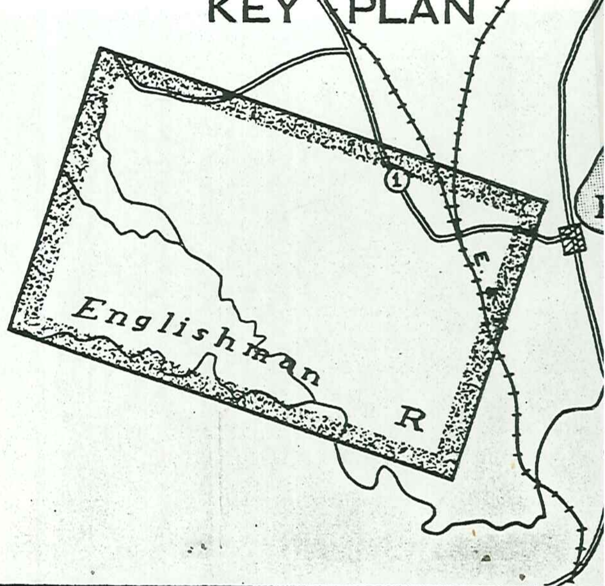
cliffs

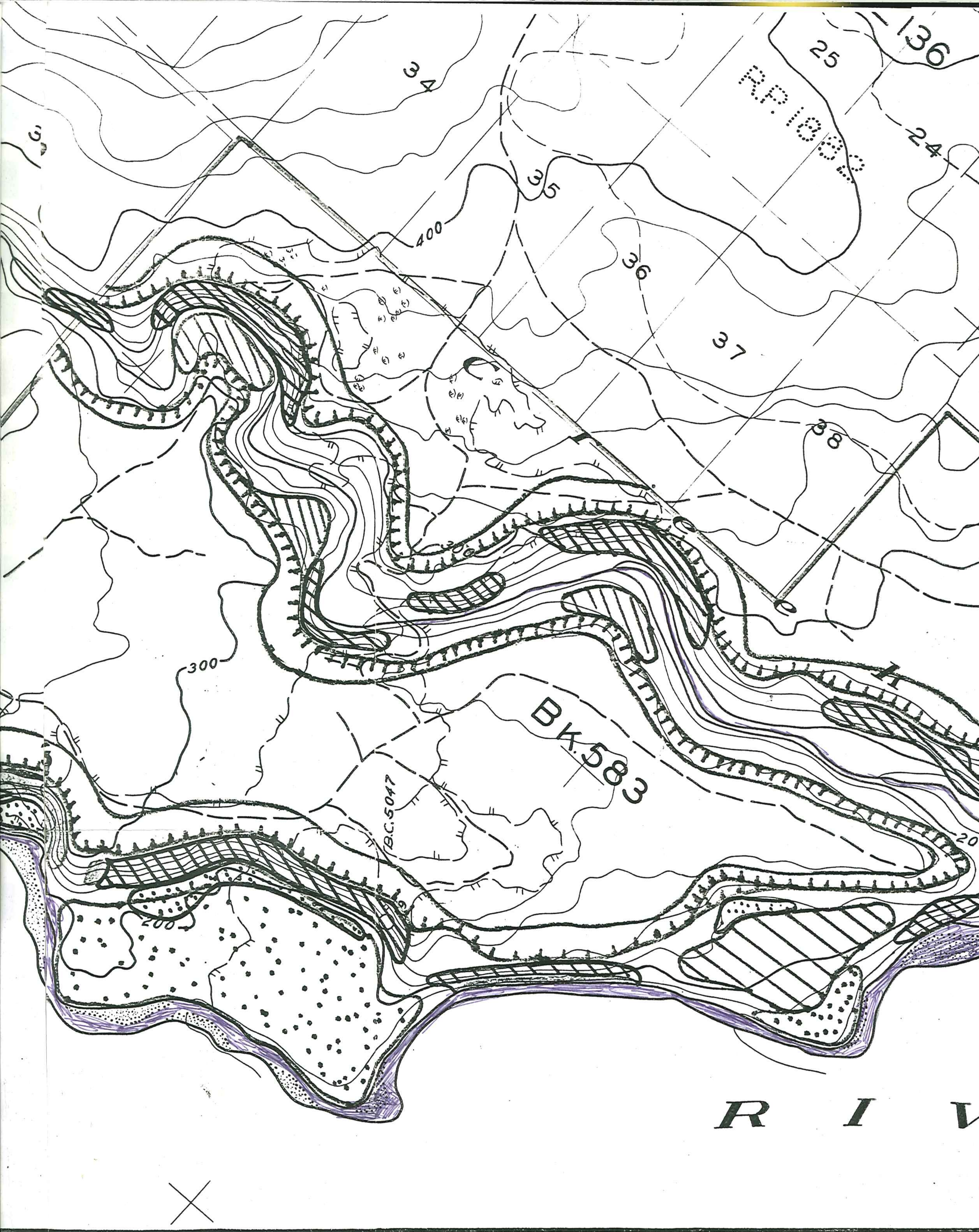
50% slope or greater

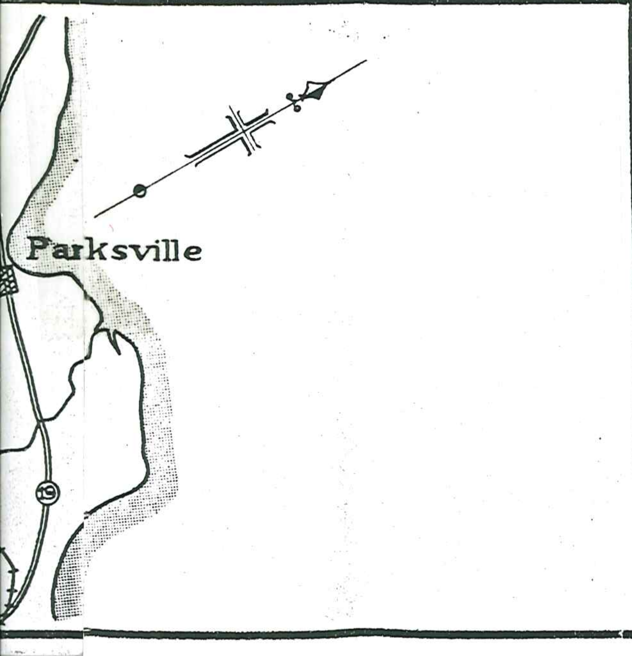
gh water table (winter)

mmended set-back line

KEY PLAN

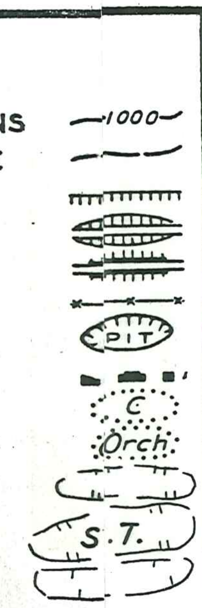






LEGEND

TRIANGULATION STATION	△	CONTOURS & ELEVATION
BENCH MARK	↑	CONTOURS INDEFINITE
GROUND CONTROL POINT	⊡ H 232.7′	CLIFF
AIR PHOTO POINT	• 5 389.13′	CUT
AIR PHOTO CENTRE & FL. NO.	39 ○ B.C.5047	FILL
ROAD MAIN — HARD TOP		FENCES
ROAD SECONDARY HARD TOP		GRAVEL PIT
ROAD OTHER		BUILDINGS
TRAIL		CULTIVATED
POWER LINE		ORCHARD
CREEK		TREES
CREEK INTERMITTENT		SCATTERED TREES
CREEK INDEFINITE		SCRUB
SWAMP		



NOTES

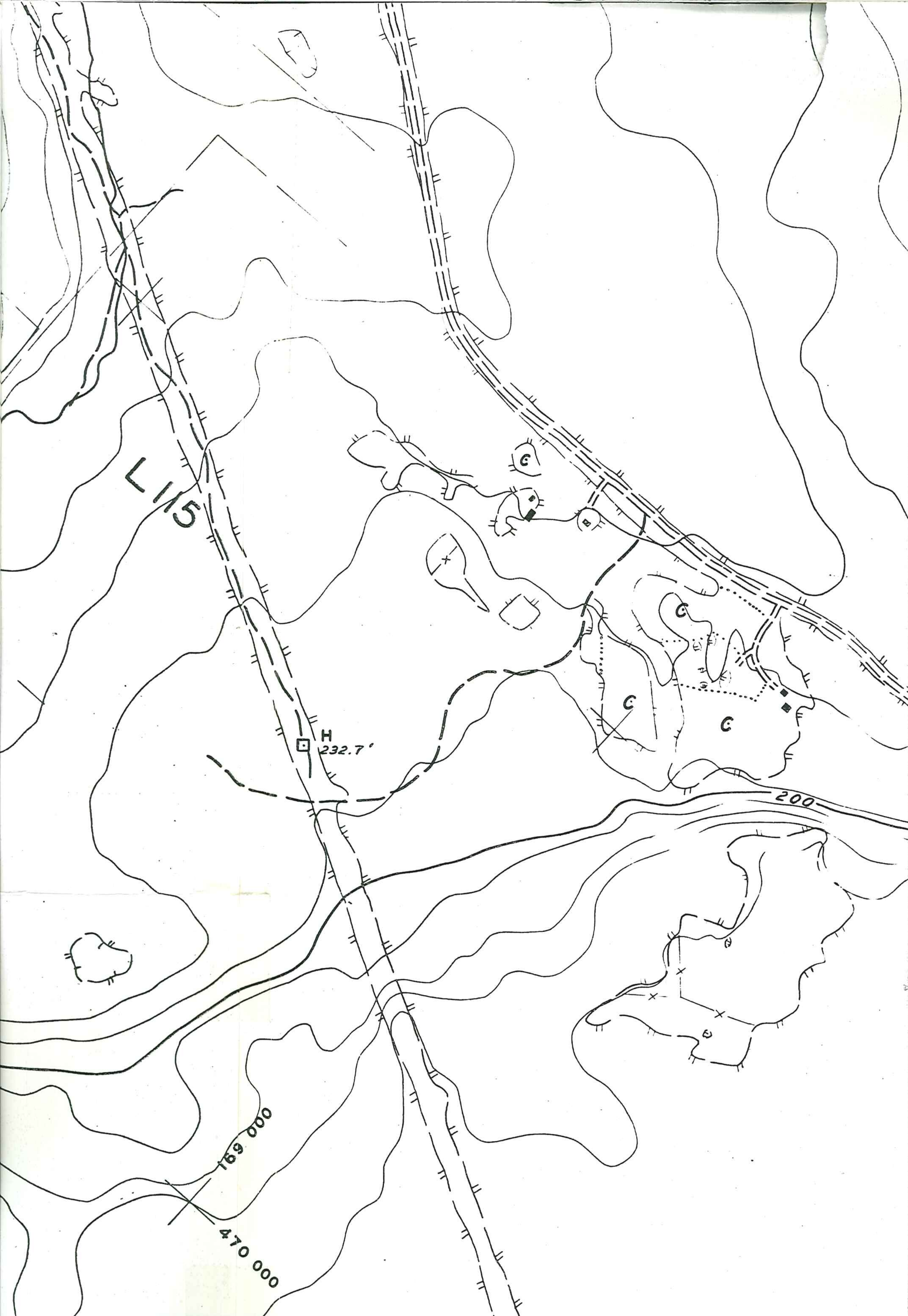
GRID ORIGIN :- REFERRED TO 48°00′ 125°00′
DATUM OF ELEVATIONS :- GEODETIC B.M'S.
CONTOUR INTERVAL 20′
AIR PHOTOS :- B.C.GOV'T. 1962
GROUND CONTROL BY :- K.M.BRIDGE, B.C.L.S.

COMPILED BY: KELSH	CHECKED BY: S.L.C.
TRACED BY: R.A.P.	REVISED :

DEPART

PARI

DATE: M



25°00'
B.M'S.

.S.

C.

BRITISH COLUMBIA
DEPARTMENT OF LANDS AND FORESTS
SURVEYS & MAPPING BRANCH
TOPOGRAPHIC DIVISION

PARKSVILLE BUILDING SITE

Scale: 1 Inch = 600 Feet

DATE: MARCH 1964	DRAWING NO. M158