MANAGEMENT PLAN:

Englishman River Estuary

by

T. BARNARD

Prepared for

Ministry of Environment

March, 1990

TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

The Englishman River estuary is located in and adjacent to the City of Parksville on the east coast of Vancouver Island. Approximately 25% of the 170 ha area is owned and/or administered by Crown or private conservation organizations, 25% is unalienated Crown land, and the remaining 50% is privately owned. Recent development proposals for the latter could result in a significant loss of the existing estuarine habitats. These diverse and productive areas support fish and wildlife resources of regional importance.

Accordingly, the Ministry of Environment (M.O.E.) has developed a strategy to conserve and manage the existing estuarine lands. This goal would be achieved by attaining four objectives:

Objective 1: Acquisition of the privately held lands not presently owned by conservation organizations. (Accomplishment of this objective is critical to the successful attainment of the remaining objectives.)

Objective 2: Maintenance, enhancement, and where necessary, rehabilitation of the area's natural resources.

Objective 3: Provision of recreational and educational opportunities for the public.

Objective 4: Operation of compatible commercial activities in support of on-going maintenance costs on the management area.

The Ministry of Environment would exercise administrative control of the management area and undertake the activities associated with achieving objective 2. To achieve Objectives 3 and 4, M.O.E. would seek an agreement with a non-profit society to undertake management of public utilization and commercial activities on the area.

Due to the conceptual nature of possible capital development and habitat enhancement works, no estimates of construction costs and subsequent maintenance are presently available. Current estimates of the Ministry's manpower requirements to manage and administer the area totals a minimum of forty-one days annually.

1.0 INTRODUCTION

It is the working policy of the Ministry of Environment to address land management activities as follows:

> "To influence the land use practices of other parties where they significantly affect wildlife and its habitat, to secure appropriate forms of land tenure for wildlife, and to enhance, restore, and maintain land to assist in achieving the objectives of the Wildlife Management Program."

The purpose of this report is to develop a management strategy for the estuarine area of the Englishman River. These lands have been identified regionally as requiring priority land management action. This designation has been prompted by recent development proposals that could significantly impact on the natural character of the area. Realization of the management goals and objectives detailed within this plan would result in retention of the area in a near-natural estuarine system within an urban environment. In addition to conserving a highly productive ecosystem, it would also provide for the opportunity to develop both recreational and educational opportunities for the public. However, it should be noted that the area encompassed by this plan includes both public and privately tenured lands. Consequently, implementation of many of the specific actions to attain the various objectives outlined in this plan are dependent on the acquisition of the land parcels currently in private ownership.

The effective period of this plan is five years at which time it will be updated. If deemed necessary, revisions to the plan may occur during the five year period.

2.0 PHYSICAL DESCRIPTION OF AREA

2.1 Location

The management area is located on the east coast of Vancouver Island approximately 35 km north of the city of Nanaimo (Fig. 1). It encompasses approximately 170.6 ha of which some 126.6 ha (74%) are within the municipal boundaries of the City of Parksville. The remaining 44.0 ha (26%) fall within the jurisdiction of the Regional District of Nanaimo. With isolated exceptions, the entire management area is within the floodplain of the Englishman River.

2.2 Physiography

The management area is situated within the Nanaimo lowlands, an area below 600 m elevation which extends along the east coast of Vancouver Island from Sayward to Jordan River (Jungen, 1985). The limited relief of the lowlands reflects the erosional processes of glaciers during the Pleistocene Period (Holland, 1976). With the advent of glacial retreat, some areas of the lowlands underwent an uplifting. However, the management area itself has little relief, reflecting its floodplain characteristics.

2.3 Geology

The bedrock geology is predominately sedimentary (mainly sandstone and conglomerate). The surficial deposits are cobbles, coarse gravel, sands and silts derived from the sediment load of the Englishman River. These have been resorted by wave action of the Strait of Georgia to form a modified alluvial fan (Tera, 1975). This constant interaction of river and ocean has, over time, resulted in the development of the sand spit - sand bar - river channel complex characteristic of the northern portion of the management area.

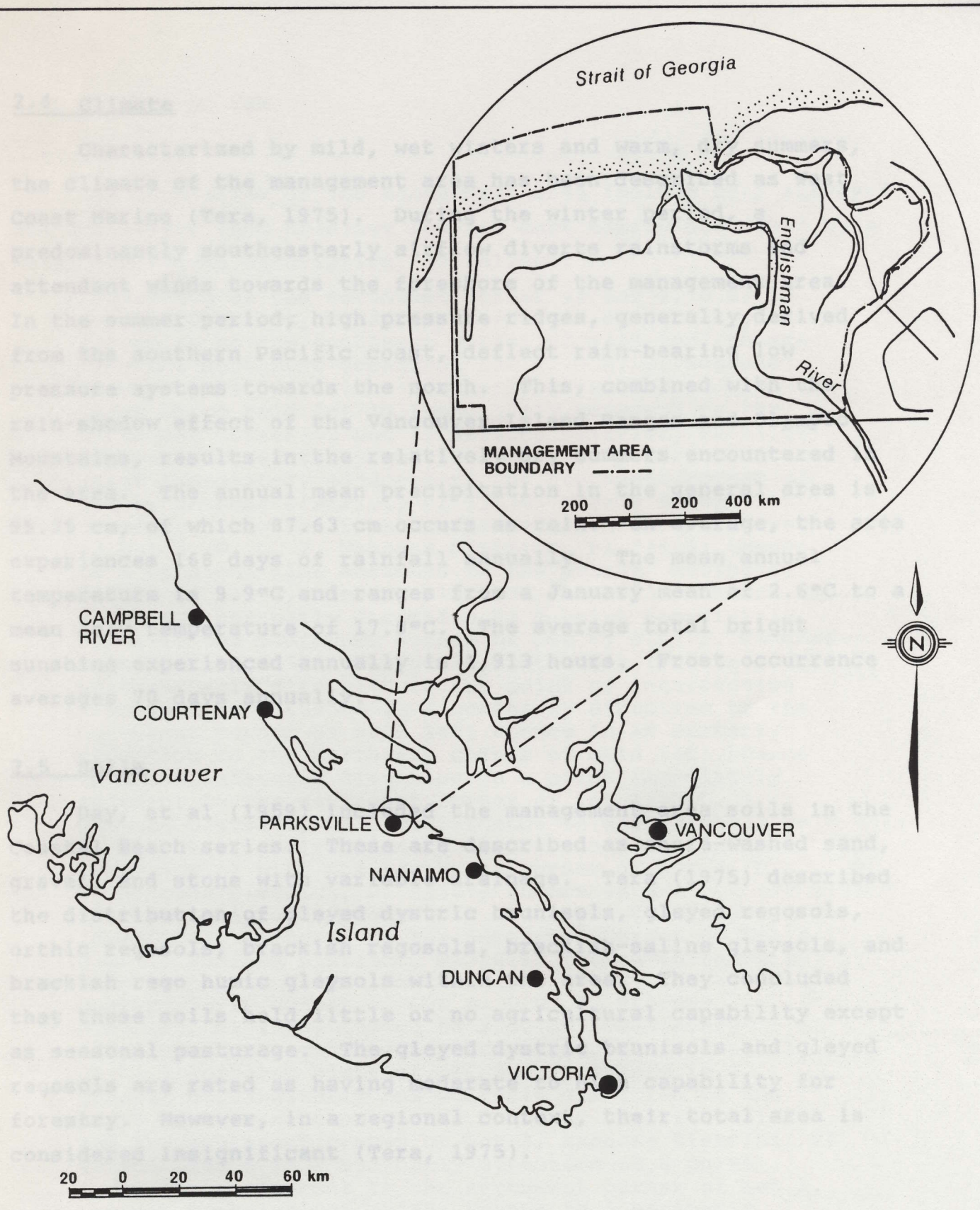

Figure 1. Location of the Englishman River estuary management area, Vancouver Island, 1989

2.4 Climate

Characterized by mild, wet winters and warm, dry summers, the climate of the management area has been described as West Coast Marine (Tera, 1975). During the winter period, a predominantly southeasterly airflow diverts rainstorms and attendant winds towards the foreshore of the management area. In the summer period, high pressure ridges, generally derived from the southern Pacific coast, deflect rain-bearing low pressure systems towards the north. This, combined with the rain-shadow effect of the Vancouver Island Ranges and Olympic Mountains, results in the relatively dry summers encountered in the area. The annual mean precipitation in the general area is 95.25 cm, of which 87.63 cm occurs as rain. On average, the area experiences 168 days of rainfall annually. The mean annual temperature is 9.9°C and ranges from a January mean of 2.6°C to a mean July temperature of 17.8°C. The average total bright sunshine experienced annually is 1,913 hours. Frost occurrence averages 70 days annually.

2.5 Soils

Day, et al (1959) included the management area soils in the Coastal Beach series. These are described as shore-washed sand, gravel, and stone with variable drainage. Tera (1975) described the distribution of gleyed dystric brunisols, gleyed regosols, orthic regosols, brackish regosols, brackish-saline gleysols, and brackish rego humic gleysols within the area. They concluded that these soils held little or no agricultural capability except as seasonal pasturage. The gleyed dystric brunisols and gleyed regosols are rated as having moderate to high capability for forestry. However, in a regional context, their total area is considered insignificant (Tera, 1975).

3.0 LAND STATUS AND USE

3.1 Legal

The boundaries of the management area include both surveyed and unsurveyed land holdings and are most easily described by a Metes and Bounds description, as follows:

> Commencing at the northwest corner of Lot 1, D.L. 50, Nanoose District, Pl 24629; thence in a southerly direction to the southwest corner of said lot; thence from the northwest corner of Lot 2, D.L. 2, Nanoose District, Pl 24629 in a southerly direction to the point where said lot is immediately adjacent to the northwest corner of Lot 1, Nanoose District, Pl 11138; thence in an easterly and then southerly direction to a point immediately adjacent to the southeast corner of Lot 1, Nanoose District, Pl 11138; thence in an easterly direction to the extreme southeastern corner of Lot 2, D. L. 2, Nanoose District, Pl 24629; thence in a straight line eastward to the extreme southeast corner of Lot 2, Nanoose District, Pl 10257; thence in a general northerly direction to a point immediately opposite the southwest corner of Lot 6, D.L. 1, Nanoose District, Pl 21387; thence in a straight line in a northeasterly direction to the point of intersection with said lot; thence in a northerly direction to the northwest corner of said lot; thence in an easterly direction to the northeast corner of said lot; thence in a southeasterly direction to a point immediately adjacent to the southeast corner of Lot 1, D.L. 1, Nanoose District, Pl 14755; thence in a straight line in a northerly direction to a point on said line intersecting with the southwest corner of Lot 4, D.L. 1, Nanoose District, Pl 21387; thence in a northeasterly and a northerly direction to the point immediately adjacent to the northwest corner of Lot A, D.L. 1, Nanoose District, Pl 1866; thence in easterly direction to a point immediately adjacent to the northeasterly corner of Lot A, D.L. 1, Nanoose District, Pl 1866; thence to a point immediately adjacent to the extreme northeastern corner of Lot 1, D. L. 1, Nanoose District, Pl 36317; thence in a general northwesterly and westerly direction to the point of intersection of the boundary of O.I.C. #1276 and the southeast corner of Lot 3, Nanoose District, Pl 45190; thence in a northerly direction to a point immediately adjacent to the northwest corner of Lot 1, Nanoose District, Pl 45190; thence in a northerly direction to a point at the extreme northeastern corner of the boundary of O.I.C. #1276; thence in a westerly direction to the southwesterly corner of the right-of-way of Mariner Way; thence in a straight line southward

to a point immediately adjacent to the southeastern corner of Lot 9, Nanoose District, Pl 19158; thence in a westerly direction to the northwest corner of Lot A, Nanoose District, Pl 17062; thence in a southerly direction to the point of intersection of the southwest corner of said lot and the boundary of Lot 9, Nanoose District, Pl 19158; thence in a westerly direction to the most westerly point on the boundary of Lot 9, Nanoose District, Pl 19158; thence in a generally northerly direction to the point of intersection with a line drawn parallel to and 300 metres perpendicularly distant northerly from the natural highwater mark of the Strait of Georgia on the southerly shore thereof; thence in a general westerly direction parallel to and 300 metres perpendicularly distant northerly from the natural highwater mark of the Strait of Georgia on the southerly shore thereof; to the point of intersection with a straight line drawn 300 metres perpendicularly distant northerly from the point of commencement.

3.2 Tenure

Tenure in the management area is a combination of private and Crown land holdings (Table 1, Fig. 2). The latter consists of both vacant and alienated Crown lands.

3.3 Management History

The first recorded management activity occurred in 1870 when 64.75 ha in the west half of the management area was pre-empted and subsequently farmed. Since then, a wide range of management activities have been undertaken within the area. These have included the illegal dyking of intertidal lands, the return of some of these wetlands to tidal circulation, utilization as tidewater log dump and booming ground, attempts at securing approval for commercial/residential development and development of a commercial campground.

Since the early 1970's a growing environmental awareness by the public, coupled with recurrent development proposals, led to a number of requests by local conservation groups that the area be acquired and retained in its natural state. Consequently, in 1981, a reserve for wildlife conservation was established, via O.I.C. #845, on approximately 30.3 ha of unsurveyed Crown land

Table 1: Status of land tenure within the Englishman River estuary management area - Vancouver Island, 1989.

Legal Description	Area (ha)	Owner
Lot 1, D.L. 50, Nanoose Dist., Pl. 24629	23.44	Cascade Development Corp.
Lot 2, D.L. 2, Nanoose Dist., Pl. 24629	64.23	Cascade Development Corp.
Pt. 2, D.L. 1, 8 & 181, Nanoose Dist., Pl. 10257	5.38	The Nature Trust of B.C.
Lot 1, D.L. 1, Nanoose Dist., Pl. 14755	1.98	The Nature Trust of B.C.
Lot 1, D.L. 1, Nanoose Dist., Pl. 36317	3.60	The Nature Trust of B.C.
Lot A, D.L. 181, Nanoose Dist., Pl. 17062	.64	The Nature Trust of B.C.
O.I.C. #1276 (unsurveyed)	Approx. 30.03	Crown *
Intertidal foreshore (unsurveyed)	Approx. 33.00	Crown **
Metes & Bounds Description - see Appendix	Approx. 8.0	Crown ***

* under administrative control of Ministry of Environment
** vacant Crown Land (see Fig. 2)
*** map reserve application in favour of Ministry of Environment(see Fig. 2)

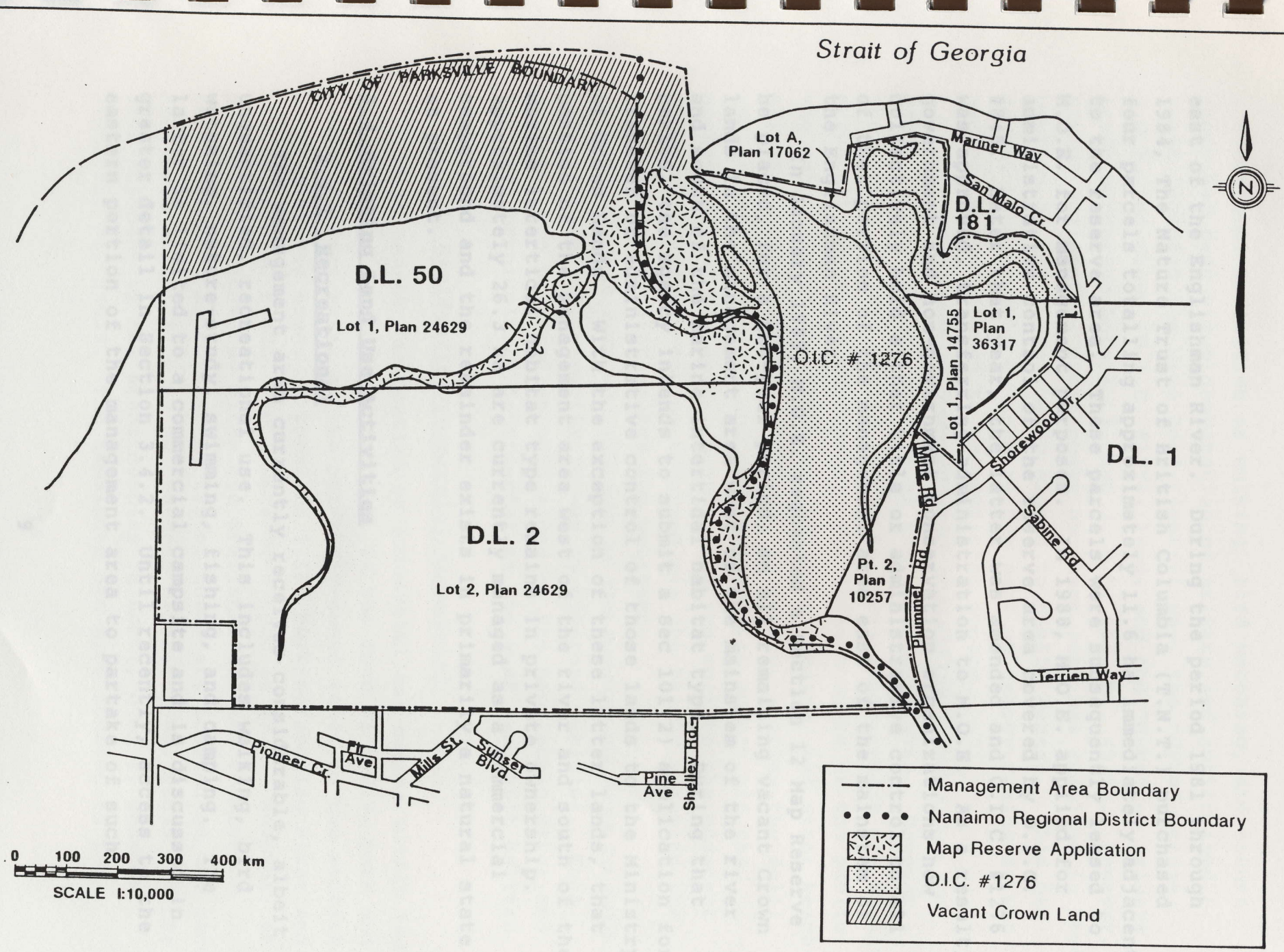

Figure 2. Location of various land parcels within the Englishman River estuary management area Vancouver Island, B.C.

east of the Englishman River. During the period 1981 through 1984, The Nature Trust of British Columbia (T.N.T.) purchased four parcels totalling approximately 11.6 ha immediately adjacent to the reserve area. These parcels were subsequently leased to M.O.E. for management purposes. In 1988, M.O.E. applied for administrative control of the reserve area covered by O.I.C. #845. Later that year, the latter was amended and O.I.C. #1276 was approved, transferring administration to M.O.E. As a result, government and non-government conservation organizations now collectively hold either title or administrative control to all of that portion of the management area east of the mainstem of the Englishman River.

In January 1989, M.O.E. requested a Section 12 Map Reserve be placed, for a two-year period, on all remaining vacant Crown lands in the management area west of the mainstem of the river and south of the marine intertidal habitat type. During that period, the agency intends to submit a Sec 101(2) application for transfer of administrative control of those lands to the Ministry of Crown Lands. With the exception of these latter lands, that portion of the management area west of the river and south of the marine intertidal habitat type remains in private ownership. Approximately 26.3 ha are currently managed as a commercial campground and the remainder exists in primarily a natural state at present.

3.4 Existing Land Use Activities

3.4.1 Recreational

The management area currently receives considerable, albeit unquantified, recreational use. This includes walking, bird watching, nature-study, swimming, fishing, and camping. The latter is limited to a commercial campsite and is discussed in greater detail in Section 3.4.2. Until recently, access to the eastern portion of the management area to partake of such

recreational activities as walking, bird watching, and nature study had been via a combination of private and public land. These included the Mine Road right-of-way, the "dyke" across T.N.T. and Crown (O.I.C. #1276) lands and the "dyke" on private lands bordering Lots 1, 2, and 3, D.L. 181, Pl. 45190. However, recent residential development on these lots has resulted in that portion of the "dyke" being closed to public access. This has caused considerable concern on the part of nearby residents who had become accustomed to unrestricted access.

The full range of recreational activities noted above can occur in the western portion of the management area. However, the status of free public access to these lands, which are mostly privately owned, is uncertain. For those members of the public who pay to enter the campsite, swimming, wading, and other beach-oriented activities are available in season. During the fall, shore-casting for coho and chum salmon also occurs off the eastern tip of the spit. Access from the spit to the adjacent forested backshore can be attained via the bridge spanning the tidal slough seperating the two habitats.

Undesirable recreational use of the management area to date has been limited primarily to use by off-road vehicles. This activity has occurred on both sides of the Englishman River and has been particularly detrimental to the west sand spit habitat.

3.4.2 Residential/Commercial/Industrial

No permanent residential or industrial use occurs within the management area. Commercial use, in the form of a R.V. park and campsite, does exist on the privately-owned lands in the western portion of the area. A total of 1,100 parking/camping sites and the associated roads, etc., were developed in 1979. However, at present only some 300 sites are available for use (Pearson - pers. comm.). Approximately 225 of these are located on the sand spit area of Lot 1, D.L. 50, Nanoose District, Pl. 24629 and the area adjacent to the arena complex in Lot 2, D.L. 2, Nanoose District, Pl. 24629. The remainder are also located in the

latter lot, but are situated within the forested backshore adjacent to the river. Most public utilization of these sites occurs annually between the second week of March and the second week of October.

4.0 RESOURCE VALUES

4.1 Habitats

4.1.1 Uplands

4.1.1.1 Forest and Shrub Carr

A mixed coniferous forest-shrub carr occupies approximately 43.7 ha in the southeastern portion of the management area (Fig. 3). Dominant conifer species include western redcedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii*) and grand fir (*Abies grandis*) with western white pine (*Pinus monticola*) and western hemlock (*Tsuga heterophylla*) occasionally present (Tera, 1975). The more common deciduous tree species include bigleaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), bitter cherry (*Prunus emarginata*), and western flowering dogwood (*Cornus nuttallii*). Stumps and other decaying wood support the occasional salal (*Gaultheria shallon*) and red huckleberry (*Vaccinium parvifolium*) (Tera, 1975). The herb layer of the more open canopy is dominated by sword fern (*Polystichum munitum*); other common ferns include bracken (*Pteridium aquilinum*) and fragrant shield fern (*Dryopteris fragrans*). A variety of forbs occur within the forested area including western trillium (*Trillium ovatum*), vanilla-leaf (*Achlys triphylla*), coltsfoot (*Petasites sp.*), and creeping buttercup (*Ranunculus repens*).

A well developed shrub carr can be found adjacent to the forest at several sites. Common species encountered include Pacific crab-apple (*Malus fusca*), hawthorn (*Crataegus sp.*), Scotch broom (*Cytisus scoparius*), and Nootka rose (*Rose nutkana*). In addition to these species, salmonberry (*Rubus spectablis*), red-osier dogwood (*Cornus sericea*), and thimbleberry (*Rubus parviflorus*) occur as an understorey shrub layer where the forest canopy is open.

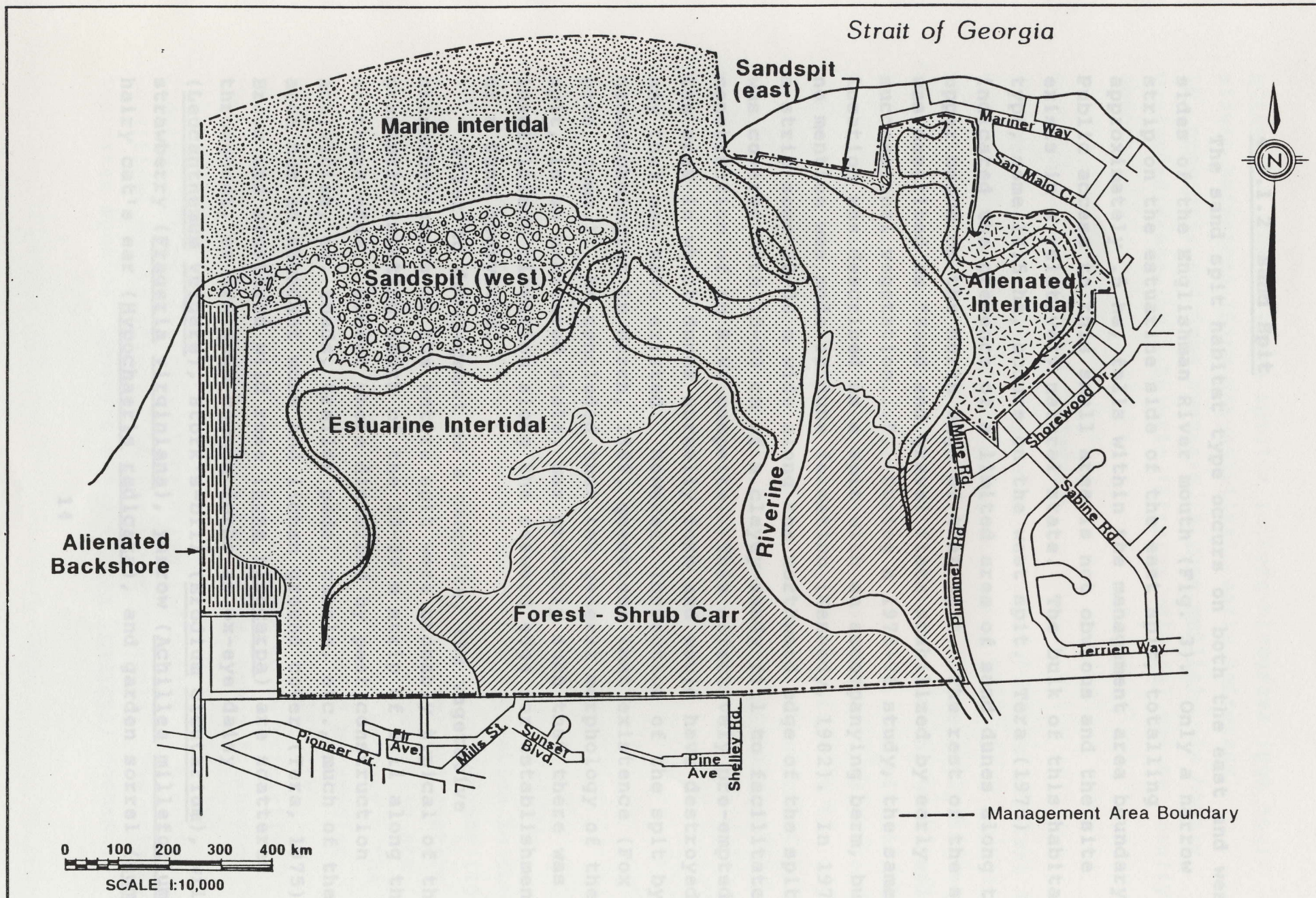

Figure 3. Habitat types of the Englishman River estuary management area - Vancouver Island, 1989

4.1.1.2 Sand Spit

The sand spit habitat type occurs on both the east and west sides of the Englishman River mouth (Fig. 3). Only a narrow strip on the estuarine side of the east spit, totalling approximately .5 ha, falls within the management area boundary. Public access to this small area is not obvious and the site exists in a relatively natural state. The bulk of this habitat type, some 14.5 ha, occurs on the west spit. Tera (1975) indicated the presence of a limited area of sand dunes along the upper beach on the north edge of that spit. The rest of the spit was described as "Sand and gravel flats stabilized by early successional vegetation...". During a 1975-76 study, the same location was described as a spit with an accompanying berm, but no mention was made of dune formation (Kennedy, 1982). In 1979, a strip some 20-30 m wide along the northward edge of the spit was covered with 25-30 cm of a clayey-sandy fill to facilitate construction of an R.V. campsite. This effectively pre-empted the area in which dunes normally form and would have destroyed any that may have existed. However, inspection of the spit by a geomorphologist in March, 1989, questions that existence (Fox - pers. comm.). He concluded that the general morphology of the spit, in an unaltered state, was probably such that there was insufficient elevation along the seaward edge for establishment of a dune ecosystem.

Prior to development as a campsite, the vegetative characteristics of the entire spit were probably typical of that presently existing south of the 20-30 m strip of fill along the northern edge. Except where disturbed by past construction activities, eg. roads, trailer pads, canals, etc., much of the area has an abundant moss and lichen ground cover (Tera, 1975). Broom and clustered wild rose (Rosa pisocarpa) are scattered throughout, as are such common forbs as ox-eye daisy (Leucanthemum vulgare), Stork's-bill (Erodium cicutarium), wild strawberry (Fragaria virginiana), yarrow (Achillea millefolium), hairy cat's ear (Hypochaeris radicata), and garden sorrel (Rumex

acetosa). Common grass species include bluegrass (Poa sp.), silver hairgrass (Aira caryophyllea), early hairgrass (P. praecox), and dune ryegrass (Elymus mollis). In highly disturbed areas, bull thistle (Cirsium vulgare) can be locally abundant.

4.1.1.3 Alienated Backshore

This habitat type occupies approximately 3.9 ha adjacent to the western boundary of the management area (Fig. 3). Most of the site has been filled and levelled, and it presently serves as the primary access route to the R.V. campsite on the west sand spit (Sec. 4.1.1.2). In addition to a roadway, the site is also utilized as a campsite and winter storage site for recreational vehicles. Due primarily to its current use, little in the way of established plant communities are in evidence. The occasional broom plant has gained a foothold as have some pioneering grass species and scattered forbs such as hairy cat's ear and wild strawberry.

4.1.2 Wetlands

4.1.2.1 Estuarine Intertidal

Wetland plant communities of the estuarine intertidal habitat type are the most commonly occurring vegetation in the management area, occupying some 66.5 ha (Fig. 3). Kennedy (1982) identified 19 such communities within the central and eastern portions of the estuary in 1975-76. Similar communities are believed to occur in the western segment of the estuary. The various emergent plant communities are dominated by species indicative of brackish, saline and physiologically dry conditions. Distribution of these appears to be primarily influenced by two factors: 1) stream flow, hence freshwater distribution; and 2) human activities, i.e. dredging, log dumping, dyking, filling. Vegetation indicative of brackish conditions occurs adjacent to the river channels. The primary indicator species, Lyngby's sedge (Carex lyngybei) occurs at

lower elevations. As elevation increases, rush (Juncus sp.) and cinqueoil (Potentilla sp.) become more prevalent.

As distance from fresh water increases, species tolerant of saline conditions become more common. At lower elevations, the indicator species is saltwort (Salicornia virginica) and as elevations increase, seashore saltgrass (Distichlis spicata) dominates. Other salt-tolerant forb species found in higher elevation communities include orach (Atriplex patula) and gumweed (Grindelia sp.). Grass species include mouse barley (Hordeum murinum) and meadow barley (H. brachyantherum). Where fresh water and saline conditions overlap, Lyngby's sedge and saltwort are co-dominant.

Physiologically drier conditions are found in the high marsh adjacent to backshore areas. Typically these areas tend to be relatively species diverse and vegetated primarily to grasses and forbs. Tera (1975) described such areas in the western portion of the management area as "grass-forb meadows" and provided a substantial species list. However, at the time of that study the western portion of the estuary had been dyked and was not subject to regular tidal influence. Kennedy (1982) described the same area in 1975-76 as "...entering mesic seral stages.". In 1979 the Department of Fisheries and Oceans restored tidal circulation to that portion of the estuary. Subsequently, many of the invading upland species were eliminated and replaced by those tolerant of the more saline conditions (Dawe - pers. comm.).

4.1.2.2 Marine Intertidal

The sand-gravel-cobble substrate of this habitat type supports limited vegetation. Filamentous green algae (Enteromorpha intestinalis), fucus (Fucus gardneri), and sea lettuce (Ulva lactuca) are occasionally present (Tera, 1975). Burns (1977) documented the red algae Iridea and Gigartina in the intertidal zone immediately east of the management area; occurrence of the same species within the latter is also probable. The upper intertidal portion of this habitat type is

generally unvegetated or sparsely vegetated by annual plants such as sea plantain (Plantago maritima), sea rocket (Cakile endentula), and orach.

4.1.2.3 Alienated Intertidal

This habitat type consists of approximately 8.3 ha of dyked floodplain on the eastern periphery of the management area (Fig. 3). At one time it was subject to the same daily and annual water regime that occurred elsewhere in the estuary. However, construction of an illegal dyke in 1969 subsequently removed that influence. Prior to dyking, the vegetation characteristics of the area were probably similar to that of the present day high intertidal "meadows" of the estuary (Sec. 4.1.2.1). However, the ensuing drying trend, coupled with a reduction in soil salinity levels due to precipitation and upland run-off flushing, has resulted in the establishment of a variety of upland vegetative species. Initially these consisted primarily of various grass species and forbs typical of an "old field" community. Reflecting the on-going successional process, tree and shrub species such as crab-apple, red alder, broom, and Himalayan blackberry (Rubus discolor) are now well established.

4.1.2.4 Riverine

This habitat type consists of the mainstem of the Englishman River immediately upstream of its discharge in the braided channel system of the estuary proper (Fig. 3). It encompasses some 762 m of river channel with a bank-to-bank area of approximately 5.5 ha The wetted area varies with flow, but averages 15-23 m during normal conditions. Tera (1975) noted that the stream bed in the lower 16 km of the river, which would include this site, consisted of the following: boulders (69%), coarse gravel - 5-25 cm dia. (12%), bedrock (8%), fine gravel (5%), and sands (6%). Gradients in the lower reaches were under 0.25%. Approximately 305 m of the west bank has been rip-rapped to reduce erosion adjacent to the existing campsite. The river itself consists of alternating pools, riffles and runs, and is

used by all anadromous fish species in the system at various stages in their respective life cycles, albeit to a varying extent.

4.2 Fisheries

4.2.1 Anadromous

Each of the six species of Pacific salmon have been recorded in the Englishman River system (Tera, 1975). Chum (Oncorhynchus keta), coho (O. kisutch), and chinook (O. tshawytscha) salmon continue to occur in recreationally and/or economically important numbers. Pink (O. gorbuscha) salmon runs are now just a remnant of former years and sockeye (O. nerka) occur only as stragglers. Chum runs of 35,000 fish have been estimated to have occurred; however, 2,000 to 15,000 appear to be a more normal range (Blood & Associates, 1976). Chums spawn during the October through December period, and primarily use the lower river including that portion within the management area. Although some coho and chinook spawning may occur within the management area, most is thought to occur further upstream. The sloughs and marshes of the management area play a vital role in the life cycle of immature salmon, particularly chum, coho, and chinook (Hillaby - pers. comm.). Although the entire estuary may be utilized, preliminary indications are that the slough and associated marsh in the western partion of the management area are of particular importance.

Steelhead trout (O. mykiss) are also present in the Englishman River system and provide important recreational opportunities to anglers. Regionally, the river ranks as one of the top ten steelhead streams on Vancouver Island (Wightman - pers. comm.). In 1987, an estimated 2,000 steelhead were caught for an effort-expenditure of 2,500 angler-days. To maintain a recreational harvest while rebuilding wild stocks, the Ministry of Environment releases 20,000 steelhead smolts into the river annually. In addition, 20-60,000 fry are released annually into the headwaters of the system. The surviving smolts from these

releases subsequently migrate downstream and are dependent, albeit for a short period, on the estuarine marshes and sloughs of the manamement area during their acclimatization to the more saline, marine environment.

At present,, the Englishman River experiences an annual coastal cutthroat trout (O. clarki) escapement of approximately 100 fish (Law - pers.comm.). Like the steelhead, this species tends to spawn upstream of the management area, utilizing both the Englishman and its tributary streams. After 1-2 years of freshwater rearing, the smolts migrate to the marshes and sloughs of the management area, utilizing those habitats more extensively than any of the other salmonid species. The area already supports a cutthroat fishery and is ranked regionally as one of the top 10-12 streams in that regard. Ministry of Environment personnel indicate that the management area has a high potential for development of a children's fishery using cutthroat trout as the target species (Wightman - pers.comm.). It is anticipated such a fishery could generate 1,000 - 1,500 angler-days annually, the bulk of which would occur within the management area.

4.2.2 Pelagic

A number of fin fish are found in the marine intertidal including yellow shiner (Cymatogaster arregata), surf smelt (Hypomesus pretiosus), herring (Clupea pallasii), English sole (Parophrys ventulus), rock sole (Lepidopsetta bilineata), eight to ten species of sculpins, sticklebacks and gobies (Hillaby - pers.comm.). Several of these species also utilize the more brackish waters of the estuary during pre-adult life stages. Both larval and post-larval herring rear in the lower reaches of the estuary for a few weeks whereas juvenile flatfish of several species rear in upper estuarine conditions.

4.2.3 Shellfish

Both Dungeness (Cancer magister) and rock (C. productus) crabs utilize the marine intertidal during higher tide ranges

(Hillaby - pers.comm.). Shrimp (Pandalus spp.) and prawn (Pandalus platyceros) also utilize this habitat on occasion.

4.3 Wildlife

4.3.1 Mammals

Relative to bird species and numbers, little has been documented of mammalian presence in the management area. Tera (1975) suggested 20 species as likely occurring based on distribution maps and habitat preferences. Three additional species have since been reported (Dawe - pers.comm.) (Appendix 2). Approximately half of the management area is subject to tidal influence and therefore likely provides only a foraging function for most land-based mammals. Most mammalian activity is probably associated with the drier conditions of the backshore habitat. As this habitat is limited in extent within the management area, neither species occurrence nor numbers of mammals is likely to attain the significance accorded avian species of wildlife.

4.3.2 Aves

A number of studies documenting both numbers and species of birds have been conducted within the management area. In 1973, Canadian Wildlife Service (C.W.S.) personnel undertook nine counts on the western side of the estuary (Trethewey, 1976). These resulted in 3,574 bird sightings representing 34 species. Tera (1975) compiled a species list based on bird sightings recorded in the vicinity of the area and on file at the Royal British Columbia Museum. From these, it was suggested 106 spp. of birds utilized the area. It was further determined, from the nest record files at the same source, that 48 of those species have been observed nesting in the area.

Further systematic surveys by C.W.S. personnel in 1979-80 and 1988-89 resulted in a revised total of 112 bird species documented on the management area to date (C.W.S. - unpublished data) (Appendix 3). Greatest species diversity occurs during the

fall (October) migration period and again during the spring (April) migration (C.W.S. - unpublished data). However, the largest numbers of individuals occurs during the period November through April.

Several bird species of note have been recorded on the management area. Trumpeter swans, designated as rare in Canada, occur regularly during the period November through April, albeit not in large numbers. Small numbers of Western Meadowlarks are often encountered during the fall-winter-spring period, but this species rarely nests in a coastal environment. However, an active nest was recorded on the management area in July, 1977 (Dawe - pers.comm.). The same source also recorded a singing male Vesper Sparrow on the management area during the spring-summer period of both 1979 and 1980. Normal breeding distribution of this species is "...mainly east of the coast" (Godfrey, 1966).

4.3.3 Herpetiles

Although reptiles and amphibians undoubtedly occur on the management area no such documentation of species was located. However, an inventory of herpetiles has been undertaken on the Marshall-Stevenson Unit of the Qualicum National Wildlife Area approximately 15 km north of the management area. A number of those species are also likely to occur on the management area (Dawe - pers.comm.). These are listed in Appendix 4.

5.0 MANAGEMENT STRATEGY

5.1 Goal and Objectives

The goal of the land management strategy will be to sustain the natural resources of the Englishman River estuary while providing for compatible recreational and commercial opportunities. This goal will be achieved by attaining four objectives:

i acquisition by conservation organization(s) of those lands within the management area that are currently in private tenure.

ii maintain, enhance and/or rehabilitate the natural integrity of the various habitats and their component floral and faunal communities in a manner consistent with sound ecological principles and responsible land management practices.

iii within the constraints imposed by (ii) above, provide the public with the opportunity to experience the recreational and educational attributes provided by the diversity and uniqueness of a near-natural estuarine system within an urban environment.

iv within the constraints provided by (ii) above, permit the operation of selected commercial activities in support of ongoing maintenance costs on the management area.

To attain these objectives, various activities will be undertaken to facilitate the management of the natural resources of the area (Sec 5.2 through 5.5).

5.2 Land Acquisition

Two land parcels (Lot 1, D.L. 50, Nanoose District, Pl. 24629 and Lot 2, D.L. 2, Nanoose District, Pl 24629) on the western portion of the management area are currently privately owned (Table 1; Fig. 2). Totaling some 87.67 ha, these parcels include over 50% of the intertidal marsh and most of the sand spit habitat types within the management area. A major segment of the proposed trail system would be located on these parcels as would a significant proportion of the suggested management

activities to maintain and/or enhance the natural resources of the area. Acquisition of these land parcels by government and/or non-government resource agencies is critical to the development of the management area as a near-natural estuarine system.

5.3 Habitats

5.3.1 Uplands

5.3.1.1 Forest and Shrub Carr

The portion of this habitat type east of the Englishman River will be left in a natural state. Debris, etc., deposited during freshet and/or storm tides will only be addressed if its presence constitutes a potential threat to life or property, i.e. log jams, fire hazard, etc., in and adjacent to the management area. Existing 4-wheel and off-road vehicular access points will be rendered impassable with appropriate barriers. Where this habitat type constitutes the eastern boundary of the management area, i.e., adjacent to Plummer and Mine Roads, appropriate signage will be posted and maintained.

West of the Englishman River, the level of management of the forest and shrub carr will vary according to the designated use (Sec. 5.5.1 and 5.5.2). Within and adjacent to the area of the proposed campsite, deadfall and blowdown will be removed as necessary to maintain public safety and minimize fire hazard. Standing trees and snags will be removed only if deemed a public safety hazard. Campsites, picnic areas, connecting trails and roads, and sites from which the public can view salmon and raptors will be kept sufficiently free of trees, shrubs and grass to permit their intended use while at the same time minimizing the hazard of fire.

Portions of the forest and shrub carr will be bisected by, or adjacent to, the management area trail system (Sec. 5.5.1). Trees and shrubs adjacent to the trail will be periodically inspected to determine the potential for deadfall and/or blowdown. Where these are deemed a possible hazard to public safety, they will be removed, as will deadfall and blowdown that is actually deposited onto the trail. Removal should consist of

depositing the downed material into the adjacent forest/shrub and permitting natural decomposition processes to take place. Where this is inconsistent with standard fire hazard practices, the material should be removed from the site. The trail system should be kept sufficiently free of encroaching trees and shrubs to enable it to perform its intended function. If future public utilization levels dictate, a secondary access point and parking area could be situated in this habitat type adjacent to the northern terminus of Shelley Road.

Except where specified above, the forest-shrub carr west of the Englishman River will be managed to maintain a natural state. This will consist primarily of providing adequate monitoring of fire hazard and subsequent suppression if required. Existing trails and roads not incorporated into the management area trial system, or the campsite and viewing sites, will be permitted to return to a natural state via normal successional process. Where this habitat type is bisected by the southern boundary of the management area, appropriate signage will be posted and maintained.

5.3.1.2 Sand Spit

Management of the small area of this habitat type on the east spit will consist primarily of maintaining the area in its existing state. This will be accomplished by limiting, and if necessary, preventing public access. The management approach on the west spit will be two-fold:

1) allow natural processes to rehabilitate and restore this habitat to its natural state where possible and

2) protect the fragility of the system from uncontrolled public access.

To allow the natural processes to operate unhindered, existing campsite infrastructure, i.e. buildings, posts, picnic tables, asphalt, parking bays and hook-ups, etc., should be removed. Any existing piles of excavated or dumped material that is unlikely to weather in a short time period should be leveled or removed. All service roads, or portions thereof, that will

not be incorporated into the management area trail system should be allowed to revert to a natural state. Where such roads are compacted, they should be mechanically disturbed and the material removed from the site or incorporated into the trail system. Removal of non-native vegetation and/or noxious weeds should be undertaken on disturbed sites as is necessary, or until a natural spit environment is re-established.

Public access through this habitat type will be restricted to designated trails that will form part of the management area trail system (Sec 5.5.1). Where deemed necessary to minimize disturbance to various fauna, natural visual barriers will be developed adjacent to the trail. These will consist of a native tree and shrub species compatible with the sand spit environment. Annual maintenance of such plantings may be necessary until they become fully established.

5.3.1.3 Alienated Backshore

Whenever possible, infrastructure required to facilitate public utilization and to provide servicing to the management area will be located in this habitat type. Public parking and any future buildings to house picnic areas, rest facilities, administrative/interpretation centre, equipment, etc., should be restricted to the approximately 2 ha area immediately north of the private trailer park. Appropriate native trees and shrubs should be used to screen this area from the adjacent intertidal area and trailer park. Signage informing the reader of the history and purpose of the management area and depicting the trail system and various points of interest should be prominently displayed and maintained in good order. Boundary signage should be erected and maintained where this habitat type forms the western boundary of the management area. Existing roadways proceeding northward from the service area should be incorporated into the management area trail system wherever possible. Roads and/or trails not required for that purpose should be returned to a natural state. Much of this habitat type is devoid of vegetation attractive to most wildlife species. Extensive

plantings of native trees and shrubs should be undertaken and maintained on either side of the trail to encourage wildlife utilization. These would also provide a natural screen to minimize disturbance of more wary wildlife on the adjacent intertidal habitat.

5.3.2 Wetlands

5.3.2.1 Estuarine Intertidal

The impact of the causeway interconnecting the sand spit and forest-shrub carr habitats on the freshwater flow into the western intertidal area should be determined. If pre-causeway flows were sufficient to maintain more brackish plant communities and/or effect more efficient detrital circulation within the estuary, the desirability of returning to those conditions via breaching the causeway should be examined. The steep-sided and linear nature of the man-made "canal" on the western periphery reduces its utilization by waterfowl and is aesthetically "out of place". The cost:benefit of creating a more meandering configuration and a sloping shoreline to facilitate establishment of a littoral zone should be determined. Use of spoil to create loafing mounds within the "canal" would also increase waterfowl use of a high visibility area adjacent to the proposed trail system.

Both waterfowl and fish utilization of the western upper intertidal zone would be enhanced by level-ditching side channels off the main slough. These should be of a meandering configuration, have shallow-sloped sides and be of sufficient depth to provide habitat for fish during lower tide levels. The construction of additional "channels" should only proceed if it can be satisfactorily determined beforehand that they will not alter existing run-off patterns to the detriment of adjacent floral communities. Quality of the stormwater run-off discharged at the foot of Mill Street into the newly constructed drainage ditch, and subsequently into the west slough, should be regularly monitored. The spoil piles resulting from the ditch construction should be incorporated into the management area trail system.

This would provide a continuation of the system from the forest shrub-carr portion to the west parking area. A small foot bridge will be required to provide access across the southern tip of the slough. Boundary signage should be erected and maintained where applicable.

The eastern half of this habitat type is more dynamic due to the influences of the Englishman River. No "hands-on" management of the intertidal area per se is anticipated at this time. The exact location of public access to this portion of the habitat type is dependent on which management option is adopted for the alienated intertidal habitat (Sec. 5.3.2.3). Appropriate signage should be erected and maintained wherever the edge of this habitat type and the management area boundary coincide.

5.3.2.2 Marine Intertidal

Little or no active management is proposed for this habitat type. Due to its exposed nature, boundary signage will not be erected in this area.

5.3.2.3 Alienated Intertidal

The management objective is to restore tidal circulation to the area presently occupied by this habitat type. This should result in the re-establishment of the estuarine intertidal habitat type that occurred at the site prior to dyking. In addition, utilization of the area by waterfowl and fish would be enhanced by expanding the existing channel system and creating shallow ponds. However, prior to breaching of the existing dyke, adequate flood protection must be provided to adjacent private property. Regional M.O.E. staff are currently proposing a Habitat Conservation Fund (H.C.F.) project to determine the feasibility of incorporating both habitat rehabilitation and enhancement works with a flood protection project proposed by the Provincial flood control program for the area. The H.C.F. project is scheduled for completion on or before March 31, 1990. Ministry staff will then determine the next course of action required to achieve the management objective. Provision of various public use facilities, eg. location and maintenance of

trails, vegetation screen/barriers, viewing blinds and/or towers, various signage etc., should be addressed at that time.

5.3.2.4 Riverine

A section of the west bank upstream of the existing riprap is subject to erosion. The substrate is of a sandy nature and this is being carried in suspension downstream where it precipitates. Fisheries and Oceans Canada (D.F.O.) personnel have expressed some concern over the impact this may have on downstream chum spawning areas. Current and projected erosion rates should be determined and, if considered significant, remedial steps should be undertaken.

5.4 Faunal

5.4.1 Fisheries

Basic inventory data for non-anadromous, pelagic and shellfish occurrence and distribution within the management area is required preparatory to determining future management direction.

5.4.1.1 Anadromous

Development of a proposed children's fishery targeted primarily on cutthroat trout in the management area may necessitate specific angling regulations. Waters within the management area are primarily tidal and fall under Federal jurisdiction with respect to angling regulations. Consultation between the Ministry of Environment and D.F.O. will be required to ensure that adequate regulations governing the fishery are in place.

5.4.2 Wildlife

Documentation of seasonal numbers and distribution of wildlife species within the management area are required if effective habitat management and public utilization of the management area is to occur. In some cases, much of the

inventory data may already exist and simply need to be assembled and integrated. For other species/species groups, collection of basic inventory data will first be required.

5.4.2.1 Mammals

Limited winter feeding of deer by local residents during periods of severe weather occurs along the southern periphery of the management area. This should be discouraged to reduce the likelihood of deer then straying into the adjacent residential area where they could be subject to harassment, pose a traffic hazard, or damage gardens and/or orchards.

5.4.2.2 Aves

A number of opportunities exist to provide artificial structures that may be utilized by certain bird species. Such structures serve a variety of functions including: 1) to increase bird utilization of certain habitats by providing requirements that are naturally limited; 2) to demonstrate obvious wildlife management techniques to the public; and 3) to provide the opportunity for the public to participate in "hands-on" management. On the western portion of the management area, swallow nesting boxes on poles could be erected at a number of sites including the parking lot area, along the trail system, and adjacent to intertidal habitat. Judicious placement of small loafing logs in deeper areas of the "canal" would increase use by waterfowl and these, in turn, would be easily observable from the adjacent trail. Some duck nesting boxes could also be erected at suitable sites in the hope of attracting the occasional pair of transient wood ducks and/or hooded mergansers to nest in the area. Both swallow and duck nesting boxes could also be erected within viewing distance of public trails on the eastern portion of the management area.

5.4.2.3 Herpetiles

Basic inventory data as to species occurrence and distribution of herpetiles within the management area is required.

5.5 Land Use

5.5.1 Recreational

Use by the public will be permitted and encouraged where such use is compatible with maintaining the natural integrity of the management area (Sec. 5.1). A key element in attaining this objective will be to restrict most public use to a management area trail system that provides access to natural features while localizing the impact of such access.

The most extensive segment of the trail system would be situated west of the Englishman River. This reflects a variety of factors including accessibility, potential parking opportunity, and diversity of natural features. It would also be well situated for incorporation into the pedestrian park corridor that could link the Englishman River with French Creek via the Parksville Bay waterfront, as outlined in the City of Parksville's Official Community Plan. A number of roadways and trails associated with previous campsite development presently exist in this portion of the management area. Wherever possible, these should be incorporated into the proposed trail system to reduce further environmental disturbance.

Signage and vegetative plantings adjacent to the trails will be used to "contain" and direct public use. Plantings will also be employed as a natural screen to reduce the impact of human disturbance on area wildlife. Actual trail layout will be dependent upon further on-site investigation to ensure compatibility with wildlife use of the area. Similarly, placement of viewing blinds, towers and visual screens will only occur where they do not detrimentally impact upon both the natural integrity and wildlife utilization of the management area (Sec. 5.1). Conceptually, the trail system might be located as indicated in Fig. 4.

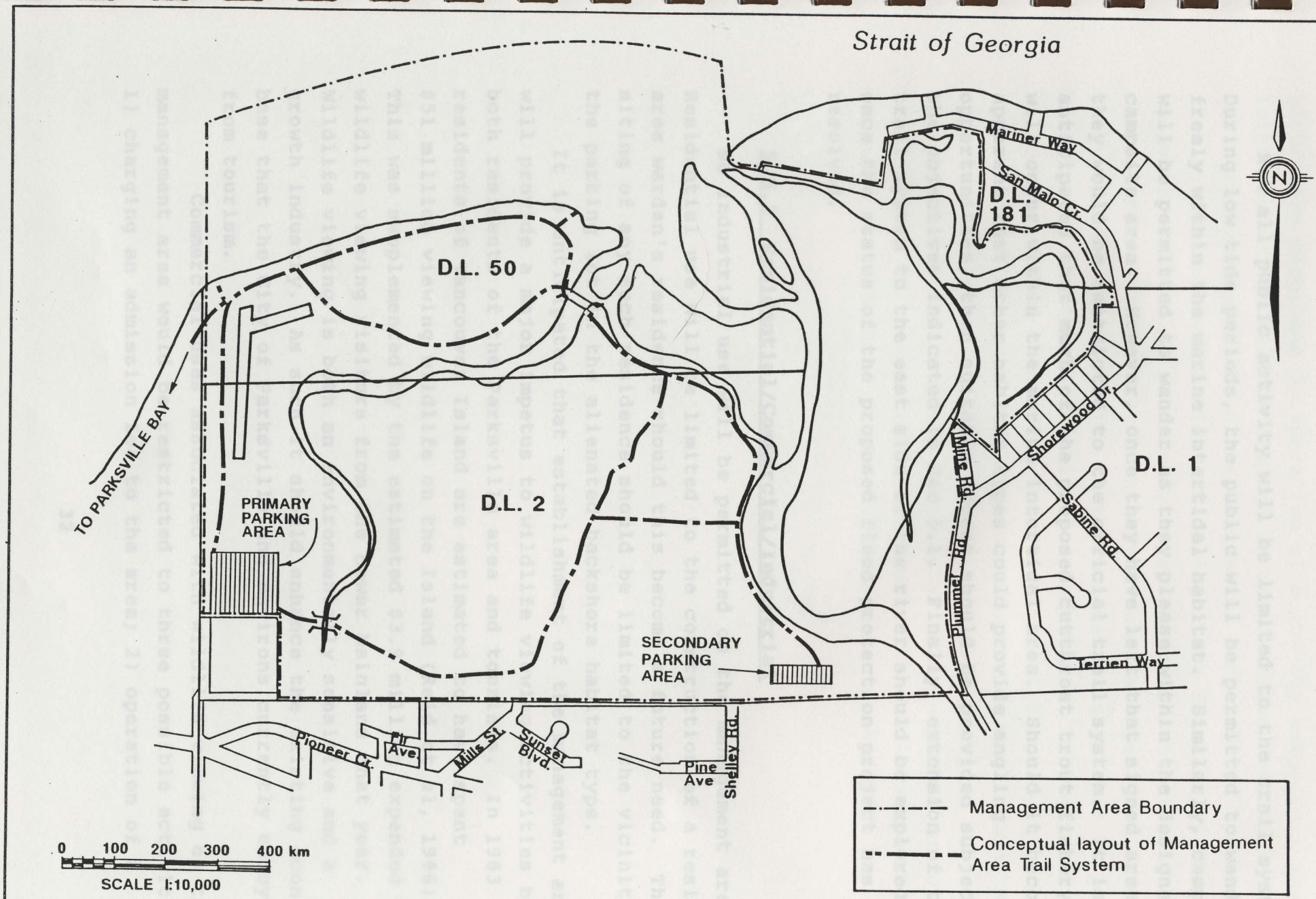

Figure 4. Conceptual layout of proposed trail system on the western portion of the Englishman River estuary management area - Vancouver Island, 1989

Not all public activity will be limited to the trail system. During low tide periods, the public will be permitted to wander freely within the marine intertidal habitat. Similarly, campers will be permitted to wander as they please within the designated campsite area. However, once they have left that signed area, they would be restricted to the official trail system. It is anticipated that much of the proposed cutthroat trout fishery will occur within the marine intertidal area. Should it become apparent that other habitat types could provide angling opportunities, then suitable access should be provided subject to the objectives indicated in Sec 5.1. Finally, extension of the trail system to the east side of the river should be explored once the status of the proposed flood protection project has been resolved.

5.5.2 Residential/Commercial/Industrial

No industrial use will be permitted on the management area. Residential use will be limited to the construction of a resident area warden's residence should this become a future need. The siting of any such residence should be limited to the vicinity of the parking lot in the alienated backshore habitat type.

It is anticipated that establishment of the management area will provide a major impetus to wildlife viewing activities by both residents of the Parksville area and tourists. In 1983 residents of Vancouver Island are estimated to have spent $51 million viewing wildlife on the Island (Reid et al, 1986). This was supplemented by the estimated $3.9 million expended by wildlife viewing visitors from the Lower Mainland that year. Wildlife viewing is both an environmentally sensitive and a growth industry. As such it should enhance the existing economic base that the City of Parksville and environs currently enjoy from tourism.

Commercial uses associated with wildlife viewing on the management area would be restricted to three possible activities: 1) charging an admission fee to the area; 2) operation of a

gift/curio shop; and 3) operation of a low-key campsite. The latter activity would be limited to the existing camping area in the northeast corner of the forest-shrub carr habitat type in Lot 2, D.L. 2, Nanoose District, Pl. 24629. The function of the campsite would be to provide overnight camping facilities for those members of the public who have travelled specifically to enjoy the natural amenities of the management area. It is not intended to serve as a facility for the general recreationalist, ie. overflow from Rathtrevor Beach Provincial campsite etc.

No commercial activity will be initiated without first being subjected to a rigorous cost:benefit analysis. Any or all of the commercial activities would be operated by an organization other than M.O.E., eg. non-profit society etc. Excess income over expenses would be used to maintain the management area.

6.0 M.O.E IMPLEMENTATION AND MANAGEMENT ROLE

6.1 Administrative

Overall administration of the management area should rest with M.O.E. Currently, M.O.E. holds administrative responsibility for that portion of the management area east of the Englishman River. The Ministry has also applied to the Ministry of Crown Land for a Section 12 Map Reserve on the remaining vacant Crown lands within the estuarine intertidal habitat of the management area. This management plan will serve as a rationale for a subsequent Section 101 Transfer of Administration of the map reserve lands to M.O.E. Acquisition of the private land holdings west of the river for conservation purposes is included as part of the management objectives of this plan (Sec. 5.1). Should this occur, M.O.E.'s existing administrative presence would presumably make that agency the logical choice to assume a similar role with respect to those acquisitions.

The Ministry of Environment should retain the lead role in managing fish, wildlife, and their associated habitats within the management area. Where other agencies, eg. C.W.S., D.F.O., have regulatory responsibility for certain species, M.O.E. will consult and cooperate with such agencies in the best interest of those elements of the resource. The Ministry should enter into an agreement with a non-profit organization or society to undertake the day-to-day administration and operation pertaining to public utilization of the area. Until such arrangements are satisfactorily concluded, public access to, and utilization of, the management area should not be encouraged. Annual Ministry manpower requirements to administer the area would vary with the intensity of management undertaken. Current estimates suggest a minimum of ten (10) mandays annually.

6.2 Property Taxes

Payment of property taxes on lands within the management area would be limited to the two privately owned parcels for

which acquisition is proposed as an objective of this plan (Sec. 5.2). Assuming acquisition of these parcels and their subsequent administration and/or management by M.O.E. the latter would bear responsibility for property taxes. Utilization of these lands for conservation purposes would result in a re-assessment and probable reduction in property taxes from the current level of approximately $25,000 annually. Manpower requirements associated with this item are estimated at a minimum of two (2) mandays annually.

6.3 Capital Development and Maintenance

Most capital development and subsequent maintenance would be associated with providing for public utilization of the area. As the location, number and extent of various facilities, eg. trails, viewing towers/blinds, is presently conceptual, no estimate of construction costs is possible at this time. It is anticipated that M.O.E. will be involved, in conjunction with a non-profit society, in the initial planning and construction of the various public use facilities. Subsequent annual maintenance of those facilities should become the responsibility of the organization or group undertaking the administration and operation of public use on the area. Maintenance activities on the area, such as boundary signage, would remain with the Ministry. If no suitable arrangement with a non-profit society re public utilization of the area is forthcoming, the Ministry will also be responsible for maintaining barriers on access roads. Ministry manpower requirements to provide basic area maintenance in the absence of organized public utilization are estimated at five (5) mandays annually.

6.4 Habitat Maintenance/Enhancement

Reshaping of the "canal" to create a littoral zone, and level-ditching of the intertidal marsh adjacent to the existing tidal channel in the western portion of the area, have both waterfowl and fisheries benefits (Sec. 5.3.2.1). Ducks Unlimited Canada and D.F.O. should be approached to determine their

interest in funding the construction of these works. Similar works have also been proposed for the alienated intertidal habitat type on the eastern side of the estuary (Sec. 5.3.2.3). Feasibility and cost estimates should be available on or before March 31, 1990. Limited subsequent annual maintenance of these types of works is anticipated. Cost to remove existing campsite infrastructure from the west sand spit has yet to be determined. Once those works have been undertaken, some annual maintenance to remove noxious weeds from the disturbed areas may be required until these areas have stabilized. Where identified, annual maintenance of habitat works will primarily be undertaken via employment programs and public interest groups. Ministry staffing requirements to plan, implement, and maintain these works are estimated to average ten (10) mandays annually.

6.5 Wildlife/Fish Population Enchancement

Numbers of artificial nesting structures required for swallows and cavity-nesting species of waterfowl has yet to be determined. It is anticipated that the construction, erection, and annual maintenance of these structures will primarily be undertaken by employment programs and public interest groups. Ministry manpower requirements to administer and/or organize these activities is estimated at a minimum of three (3) mandays annually.

6.6 Public Liaison

Given the urban setting of the management area and the strong local public interest in conserving it as a natural area, a Public Advisory Committee should be struck. The primary function of this committee would be to enable various public interest groups to have input into management decisions concerning the area. There should also be an opportunity for the public to actively participate in certain management activities on the area, eg. bird census, maintaining nest boxes, litter patrols, vegetation planting, etc. This public participation should be coordinated locally and could be accomplished via three

mechanisms: 1) as part of the non-profit society's activities; 2) via a volunteer warden program; and 3) a combination of both. The warden program, which is currently being revised, will involve an interested member of the community acting as M.O.E.'s "eyes and ears" concerning the area. Current plans are to expand that program to include coordinating local public involvement. It is estimated that Ministry involvement in public liaison activities could require a minimum of ten (10) mandays annually.

6.7 Revenue Generation

Three potential sources of revenue exist: 1) an admission charge; 2) operation of an on-site gift/supplies shop; and 3) operation of a low-key campsite in the northeast corner of the forest-shrub carr habitat type in Lot 2, D.L. 2, Nanoose District, Pl. 24629. Revenue generation should only be undertaken through the auspices of an organization other than M.O.E., eg. non-profit society etc. All revenue generated, after expenses, would be utilized in subsequent management of the area. Ministry involvement would be primarily consultative and is estimated at no more than one (1) manday annually.

7.0 SUMMARY

1) The management area encompasses approximately 170.6 ha of which 25% is administered by Crown or private conservation organizations, 25% is unalienated Crown land, and the remaining 50% is privately owned.

2) Recent development proposals for the privately held lands could significantly impact upon the natural character of the Englishman River estuary. These have prompted the development of a management strategy for the area by the Ministry of Environment.

3) Seven habitat types have been identified of which three, the sand spit, the alienated intertidal, and the alienated backshore, have been significantly modified by human activity.

4) The area contributes an important habitat component to the life cycle of eight species of anadromous salmonids that utilize the Englishman River system. At least five of those species contribute to the commercial and recreational fisheries of the Strait of Georgia.

5) The management area provides an important link in the chain of estuarine marshes utilized by migratory birds along the east coast of Vancouver Island. One hundred and twelve avian species have been documented on the area and 48 of these have been recorded as using the site for nesting.

6) Twenty-three species of mammals have been reported as occurring within the management area.

7) The management goal is to sustain the natural resources of the Englishman River estuary. Management activities to achieve that goal would include maintenance, enhancement and restoration of the area's natural resources.

8) Recreation and educational use of the management area by the public will be encouraged <u>provided</u> such use is compatible with the management goal.

9) Overall administrative responsibility for the area should rest with the Ministry of Environment.

10) Day-to-day administration and operation pertaining to public utilization of the area should be undertaken, via a written agreement with M.O.E., by a non-profit organization.

11) That organization could, with the Ministry's approval, generate certain revenues from public utilization of the area with net proceeds to be utilized <u>solely</u> for funding maintenance and/or management activities on the site.

REFERENCES

Blood, D. & Associates. 1976. Lower Englishman River environmental-social assessment: Environmental Impact Study. Ministry of Environment library, Nanaimo, B.C. 72 pp.

Burns, T. 1977. Coastal system of southeast Vancouver Island from Departure Bay to Englishman River: An ecological description with management suggestions. Unpubl. report. Ministry of Environment library, Nanaimo. B.C. 70 pp.

Clague, J.J. & B.D. Bornhold. 1980. Morphology & littoral processes of the Pacific coast of Canada. In The coastline of Canada: Littoral processes and shore morphology. Ed. by S.B. McCann. Geological Survey Paper 80-10. 439 pp.

Dawe, N.K. 1976. Ecological inventories of National Wildlife Areas in British Columbia. Flora and fauna of the Marshall - Stevenson Unit, Qualicum National Wildlife Area. August, 1976. Canadian Wildlife Service, Pacific and Yukon Region. Delta, B.C.

Dawe, N.K. 1980. Ecological inventories of National Wildlife Areas in British Columbia. Flora and fauna of the Marshall - Stevenson Unit, Qualicum National Wildlife Area (update to June, 1979), April, 1980. Canadian Wildlife Service, Pacific & Yukon Region. Delta, B.C.

Dawe, N.K. - personal communication.

Day, J.H., L. Farstad and D.G. Laird. 1959. Soil Survey of Southeast Vancouver Island and Gulf Islands. Report No. 6 Reasearch Branch, Canada Department of Agriculture.

Eamer, J. 1985. Winter habitat for dabbling ducks of southeastern Vancouver Island, British Columbia. Unpublished M.Sc. University of British Columbia. 103 pp.

Environment Canada. 1986. Management Plan: Qualicum National Wildlife Area. Canadian Wildlife Service, Pacific & Yukon Region, Delta, B.C. 28 pp.

Environment Canada. 1989. Unpublished data. Canadian Wildlife Service, Pacific & Yukon Region, Qualicum, B.C.

Fox, J. - personal communication

Frankton, C. 1955. Weeds of Canada. Public No. 948 Canada. Department of Agriculture, Ottawa, Ont. 196 pp.

Godfrey, W.E. 1966. The birds of Canada. National Museums of Canada Bull. No. 203. Biol. Series No. 73. Ottawa, Ontario. 428 pp.

Hillaby, B. - personal communication.

Holland, S.S. 1976. Land forms of British Columbia: A physiographic outline. Bulletin 48, British Columbia Department of Mines and Petroleum Resources. 148 pp.

Hunter, R.A., L.E. Jones, M.M. Wayne and B.A. Pendergast. 1983. Estuarine habitat mapping & classification system manual. Ministry of Environment Manual 3. Ministry of Environment, Victoria, B.C. 33 pp.

Jungen, J.R. 1985. Soils of Southern Vancouver Island. Report No. 44. British Columbia Soil Survey. Surveys & Resource Mapping Branch, Ministry of Environment Tech. Rept. 17. Victoria, B.C. 198 pp.

Kennedy, K.A. & B.R. Waters. 1974. Englishman River Estuary. Unpubl. rept. Ministry of Environment library, Nanaimo, B.C. 26 pp.

Kennedy, K.A. 1982 Plant communities and their standing crops on estuaries of the east coast of Vancouver Island. Unpublished M.Sc. thesis. University of British Columbia. 412 pp.

Law, P. - personal communication.

LeBaron, B. 1976. Lower Englishman River environmental-social assessment: Social Report. Ministry of Environment library, Nanaimo, B.C. 58 pp.

Lyons, C.P. 1952. Trees, shrubs & flowers to know in British Columbia. J.M. Dent & Sons (Canada) Limited. 194 pp.

Pearson, S. - personal communication.

Reid, R., M. Stone & F. Rossman. 1986. Report on the British Columbia Survey of Non-Hunting & Other Wildlife Activities for 1983. British Columbia Ministry of Environment, Economic & Social Analysis Section. Victoria, B.C.

Rosen, M. Planning Consultant. 1987. City of Parksville Official Community Plan: Bylaw No. 915 and Amendment Bylaw, 1988, No. 937. City of Parksville. 66 pp.

Tera Environmental Resource Analyst Ltd. 1975. Parksville - Englishman River: Resource inventory and development options for District Lot 2 and District Lot 50. Unpublished report. Ministry of Environment files. Nanaimo, B.C. 37 pp.

Trethewey, D. 1976. Unpublished Data. Canadian Wildlife Service, Pacific & Yukon Region. In Ministry of Environment files, Nanaimo, B.C.

Wiedemann, A.M. 1984. The ecology of Pacific Northwest Coastal sand dunes: A community profile. U.S. Fish Wildl. Serv. FWS/OBS-84/04. 130 pp.

Wightman, C. - personal communication.

APPENDICES

Appendix 1: Metes and Bounds description of unalienated Crown land subject to a Ministry of Environment Section 12 map reserve application - Englishman River estuary, 1989.

Commencing at the north-eastern corner of Lot 1, D.L. 50, Nanoose District, Plan 24629, thence in s south-westerly direction along the natural boundary of said lot, thence in a south-westerly direction along the high water mark on the left bank of the tidal slough situated in the western half of Lot 2, D.L. 2, Nanoose District, Plan 24629 to the southernmost point of said slough, then in a northerly and then easterly direction along the high water mark on the right bank of said slough to the point of intersection of the boundaries of Lot 2, D.L. 2, Nanoose District, Plan 24629, thence in north-easterly and then a south-easterly direction along the boundary of Lot, 1 D.L. 50, Nanoose District, Plan 24629, thence in a southerly direction to a point immediately south of the extreme south-west corner of Lot 2, Nanoose district, Plan 10257 thence in a straight line in a northerly direction to said corner, thence in a northerly direction along the western boundary of O.I.C. #1276 to the western corner of Lot 9, Nanoose District, Plan 19158, thence in a straight line south-easterly to the point of commencement.

Appendix 2: Mammalian species likely occurring within the Englishman River estuary management area (based on distribution maps and habitat preferences of species)

Common Name	Scientific Name
Wandering Shrew	Sorex vagrans
Navigator Shrew	Sorex palustris
Western Big-eared Bat	Plecotus townsendi
California Myotis	Myotis californicus
Long-eared Myotis	Myotis evotis
Keen Myotis	Myotis keeni
Little Brown Myotis	Myotis lucifugus
Yuma Myotis	Myotis yumanensis
Red Squirrel	Tamiasciurus hudsonicus
American Beaver	Castor canadensis
White-footed Deermouse	Peromyscus maniculatus
Townsend Vole	Microtus townsendii
Muskrat	Ondatra zibethicus
Pacific Killer Whale	Orcinus orca
Harbour Porpoise	Phocoena phocoena
Raccoon	Procyon lotor
Short-tailed Weasel	Mustela erminea
Mink	Mustela vison
River Otter	Lutra canadensis
Northern Sea Lion	Eumetopias jubata
California Sea Lion	Zalophus californianus
Harbour Seal	Phoca vitulina
Black-tailed Deer	Odocoileus hemionus columbianus

- updated form Tera, 1975

Appendix 3: Avian species identified within the Englishman River estuary management area during Canadian Wildlife Service surveys - Vancouver Island, 1975, 1979-80, and 1988-89.

Common Name	Scientific Name
Common Loon	Gavia immer
Pacific Loon	Gavia pacifica
Red-throated Loon	Gavia stellata
Horned Grebe	Podiceps auritus
Red-necked Grebe	Podiceps grisegena
Eared Grebe	Podiceps caspicus
Western Grebe	Aechmophorus occidentalis
Pelagic Cormorant	Phalacrocorax pelagicus
Great Blue Heron	Ardea herodias
Trumpeter Swan	Olor buccinator
Snow Goose	Chen caerulescens
Brant	Branta bernicla
Canada Goose	Branta canadensis
Wood Duck	Aix sponsa
Green-winged Teal	Anas crecca
Mallard	Anas platyrhynchos
Northern Pintail	Anas acuta
Blue-winged Teal	Anas discors
Northern Shoveler	Anas clypeata
Eurasian Wigeon	Anas penelope
American Wigeon	Anas americana
Canvasback	Aythya valisineria
Greater Scaup	Aythya marila
Harlequin Duck	Histrionicus histrionicus
Oldsquaw	Clangula hyemalis
Black Scoter	Melanitta nigra
Surf Scoter	Melanitta perspicillata
Whitewinged Scoter	Melanitta fusca
Common Goldneye	Bucephala clangula
Barrow's Goldeneye	Bucephala islandica
Bufflehead	Bucephala albeola
Hooded Merganser	Lophodytes cucullatus
Common Merganser	Mergus merganser
Red-breasted Merganser	Mergus serrator
Bald Eagle	Haliaeetus leucocephalus
Northern Harrier	Circus cyaneus
Cooper's Hawk	Accipiter cooperii
Northern Goshawk	Accipiter gentilis
Red-tailed Hawk	Buteo jamaicensis
American Kestrel	Falco sparverius
Peregrine Falcon	Falco peregrinus
Ring-necked Pheasant	Phasianus colchicus
Black-bellied Plover	Pluvialis squatarola
Semipalmated Plover	Charadrius semipalmatus
Killdeer	Charadrius vociferus
Greater Yellowlegs	Tringa melanoleuca
Lesser Yellowlegs	Tringa flavipes

Spotted Sandpiper	Acititis macularia
Black Turnstone	Arenaria melanocephala
Sanderling	Calidris alba
Western Sandpiper	Calidris mauri
Least Sandpiper	Calidris minutilla
Pectoral Sandpiper	Calidris melanotos
Rock Sandpiper	Calidris ptilocnemis
Dunlin	Calidris alpina
Long-billed Dowitcher	Limnodromus scolopaceus
Common Snipe	Gallinago gallinago
Bonaparte's Gull	Larus philadelphia
Mew Gull	Larus canus
Herring Gull	Larus argentatus
Glaucous-winged Gull	Larus glaucescens
Pigeon Guillomont	Cepphus columba
Marbled Murrelet	Brachyramphus marmoratus
Rock Dove	Columba livia
Band-tailed Pigeon	Columba fasciata
Short-eared Owl	Asio flammeus
Common Nighthawk	Chordeiles minor
Rufous Hummingbird	Selasphorous rufus
Belted Kingfisher	Ceryle alcyon
Hairy Woodpecker	Picoides villosus
Northern Flicker	Colaptes auratus
Pileated Woodpecker	Dryocopus pileatus
Willow Flycatcher	Empidonax traillii
Tree Swallow	Tachycineta bicolor
Violet-green Swallow	Tachycineta thalassina
Northern Rough-winged Swallow	Stelgidopteryx serripennis
Barn Swallow	Hirundo rustica
Northwestern Crow	Corvus caurinus
Common Raven	Corvus corax
Chesnut-backed Chickadee	Parus rufescens
Bushtit	Psaltriparus minimus
Red-breasted Nuthatch	Sitta canadensis
Brown Creeper	Certhia americana
Bewick's Wren	Thryomanes bewickii
Winter Wren	Troglodytes trogoldytes
Golden-crowned Kinglet	Regulus satrapa
Swainson's Thrush	Catharus ustulatus
American Robin	Turdus migratorius
Water Pipit	Anthus spinoletta
Cedar Waxwing	Bombycilla cedorum
Northern Shrike	Lanius excubitor
European Starling	Sturnus vulgaris
Orange-crowned Warbler	Vermivora celata
Yellow Warbler	Dendroica petechia
Evening Grosbeak	Coccothraustes vespertinus
Rufous-sided Towhee	Pipilo erythrophthalmus
Vesper Sparrow	Pooecetes gramineus
Savannah Sparrow	Passerculus sandwhichensis
Fox Sparrow	Passerella iliaca
Song Sparrow	Melospiza melodia
Lincoln's Sparrow	Melospiza lincolnii
White-throated Sparrow	Zonotrichia albicollis
Golden-crowned Sparrow	Zonotrichia atricapilla
White-crowned Sparrow	Zonotrichia leucophrys

Dark-eyed Junco	*Junco hyemalis*
Red-winged Blackbird	*Agelaius phoeniceus*
Western Meadowlark	*Sturnella neglecta*
Brewer's Blackbird	*Euphagus cyanocephalus*
Purple Finch	*Carpodacus purpureus*
House Finch	*Carpodacus mexicanus*
Pine Siskin	*Carduelis pinus*
American Goldfinch	*Carduelis tristis*

Appendix 4: A partial list of herptilian species likely to occur on the management area based on an inventory of amphibians and reptiles found on the Marshall - Stevenson Unit, Qualicum National Wildlife Area.

AMPHIBIA - AMPHIBIANS

Common Name	Scientific Name
Long-toed Salamander	Ambystoma macrodactylum
Ensatina	Ensatina eschscholtzi (Gray)
Clouded Salamander	Aneides ferreus
Northwestern Toad	Bufo boreas
Pacific Tree Frog	Hyla regila (Baird & Girard)
Red-legged Frog	Rana aurora (Baird & Girard)

REPTILIA - REPTILES

Common Name	Scientific Name
Puget Red-sided Garter Snake	Thamnophis sirtalis (Pickeringi)
Northwestern Garter Snake	Thamnophis ordinoides (Baird & Girard)
Wandering Garter Snake	Thamnophis elegans vagrana (Baird & Girard)

- modified from Dawe, 1976 & 1979.