CARING FOR THE ENGLISHMAN RIVER ESTUARY

a Bio-Inventory and Volunteer Monitoring Project
(draft)

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Introduction

Goals of the Project

In 2007 and 2008 an investigation of the Englishman River Estuary was undertaken with two goals in mind. One was to increase understanding of this unique and biologically important place. The Mid Vancouver Island Habitat Enhancement Society undertook to:

- compile what is known about the estuary
- identify gaps in baseline data and help to fill them
- develop methods suitable for long-term monitoring by an informed public
- continue comparison studies of patterns in the ecosystem over time and space
- involve public in the process of research and planning, as well as in management activities
- enhance connections between the public at large, the landowners in and around the estuary, and various volunteers, staff, professionals and elected officials working to protect the estuary
- increase a feeling of 'ownership' of the estuary and its management by the local population
- shift human behaviour patterns that affect the estuary so that what is normal and acceptable moves toward understanding, respect and protection of the estuary
- The other goal was to increase involvement of local citizens, professionals, landowners, and decision-makers, in the ongoing process of monitoring, protecting the estuary and its related nearshore areas. It was decided to involve as many people as possible in order to:
- compile what is known about the estuary
- elevate interest and responsibility for the estuary among the community as a whole
- get individual people looking closely and learning about the estuary, especially those living adjacent
- give long term continuity to the various monitoring projects
- incorporate local citizens knowledge in the planning process
- create a broad level of public acceptance and support for management recommendations

Estuary management planning requires data about plant and animal communities in order to manage for protection of remaining intact ecosystems and endangered species, as well as to rebuild all communities to their historic state. We believe there is positive correlation between the number of people informed *and* involved, and the potential for long-term success of any component of a management plan.

Estuary Location and Study Area

The Englishman River Estuary (49o 20' N, 124o 17'; UTM Zone 10: 406100 5464500) is located on the northeast side of Vancouver Island, British Columbia, entirely within the Regional District of Nanaimo. The western portion is within the City of Parksville and the eastern portion is in Electoral Area G of the Regional District. The estuary is at the mouth or delta of the Englishman River where it flows northwards into the tidal saltwater of the Strait of Georgia.

An estuary is a low-lying flat area where one or more rivers and streams enter tidal waters and where tidal saltwater enters the river mouth(s). The word estuary often refers to a semi-enclosed body of water. As such, the Englishman River Estuary is affected by the flows of the river and by the tides and currents of the strait, which has limited connections to the Pacific Ocean through Johnstone Strait to the northwest and the Strait of Juan de Fuca to the south.

The study area of this report is the delta of the Englishman River and it includes all the river channels, their streambeds, banks, bars, and islands; the tidal flats, marshes, foreshores, beaches, spits and dykes; and all of the forested floodplain downstream from the point where river water during a flood may overtop the banks and enter tidal water without returning to the river channels. All of the areas on the river that are likely to be influenced by flooding, currents, waves, accretion, erosion, or salt from the tidal waters of the strait are within the study area. For convenience, the study area was defined as spanning the area from just below the Island Highway Bridge down to the subtidal limits of where vascular plants like eelgrass grow.

In addition, shorelines, eelgrass beds and forage fish habitat that interact with the Englishman River estuary go far beyond the delta of the river, so it was decided that, for these parts of the inventory, the study area would include the nearshore area between Little Qualicum River and Craig Creek. Use of the term *nearshore* captures the backshore, intertidal and the subtidal zone out to 20-30 metres below datum, and so includes more than the word *foreshore.* It reflects an ecosystem approach to discussing shorelines and their interactions with life in the estuary.

Topography, Surficial Geology and Hydrology of the River System

The Englishman River system drains the northeastern slopes of a ridge from Mount Arrowsmith (1817 metres elevation) to Mount Moriarty; this ridge is approximately 27 kilometres from the Strait of Georgia. The watershed catchment area is approximately 324 square kilometres which includes the following tributaries and their catchment areas: the Englishman River mainstem 179 sq km), Morison Creek (36 sq km), the South Englishman River (83 sq km) plus Centre Creek (21 sq km), and Shelly Creek (5 sq km). The mean annual discharge of the river is 13.7 cubic metres per second. Flows vary from mean monthly summertime flows as low as 1.26 cubic metres per second (August) to mean monthly flows as high as 29.25 cubic metres per second in the cold and rainy season (December).

The river "displays large changes in flow, and maximum daily discharges can reach three times the highest mean monthly flow" (Blood, 1976). Clermont (1995) reports "an extreme high of 393 cubic metres per second" recorded on 26 December 1980. In November 2007, the authors noted the reverse side of this hydrological 'flashiness' when the water depth at the upstream end of the estuary dropped more than one vertical meter in the 16 hours following a rainfall event that may have been coupled with snowmelt at higher elevations. Plummer Road, where this anecdotal measurement was made, was just above the peak water level that was observed on that day. Upstream, in an almost annual event, fast moving floodwaters can make parts of Martindale Road unsafe to walk or drive.

The largest 7 lakes within the watershed have a combined total of 6.3 square kilometres which allows only limited regulation of flows between rainfall events and between wet and dry seasons. The largest tributaries of the system are described under Fish Use below.

In addition to surface water inputs from rain and snowmelt, the river is connected year round with groundwater, especially where it crosses unconsolidated glacial gravels and sands. Water that enters the river through springs and seepage is cooler than the river water in summer and warmer in winter, an effect that is important to fish. In other areas water is likely moving from the river into the ground (Blood, 1976; Fyles, 1963).

To understand why the river is intimately connected to groundwater requires some understanding of the contribution of glaciation to the surficial geology of the area. At the time of the most recent glaciation (the Fraser glaciation), ice covered the entire Englishman River area, except perhaps the summit of Mount Arrowsmith (Fyles, 1963) and an active glacier flowed down the Englishman River Valley (Holden, 1989). This ice laid down the Vachon Till and the Capilano Sediments, in many areas on top of the Quadra Sands which had been laid down earlier. The Englishman River valley now has roughly 30 m of glacial, marine, and fluvial deposits which are being eroded and transported to the coastal zone by the river (Fyles, 1963 cited by Holden, 1989). Some of these layers are permeable to water and others are less so. As the river moves to the coast, it cuts across these layers and, depending on the permeability, slope and hydrological pressures at each location, groundwater may enter the river as springs in one area and leave the river as groundwater recharge in another area.

During summer drought, which is common on the estuary, many plants are likely relying on groundwater. The water table over much of the estuary fluctuates, probably affected by rainfall, river flows and tides. A map of water table patterns on the estuary is included in the Tera report (1990). Recent mapping and modeling of aquifers indicate that complexity of aquifers increases closer to the estuary, and that there are three levels of aquifer at the estuary (Wendling, 2009. pers. comm.)

The gradient on the Englishman River averages under 1% slope from the tide line to the falls. Above that, the slope is often much steeper.

"It is possible that the Englishman River has been transporting greater volumes of material to the coastline. Increased logging activities in the watershed area will increase the runoff volumes and the rate of runoff; hence greater land erosion and greater volumes of material will be transported to the coastal zone. The offshore bars (that have developed or grown) may be an accumulation of extra river material which has not yet been relocated by the littoral process." (Holden, 1989)

At the estuary, inundation period and salinity regimes have significant effects on estuarine life including plants and fish. Water levels at any point on the river can change, mostly due to the river's response to the weather. Fluvial processes, such as flooding, erosion, and deposition, affect the volume of water flowing through any of the channels on the estuary. A side channel one day can be the main channel the next day. Changes can be gradual such as when gravel deposits build up and block one channel, or the change can be sudden, such as when the start of rapid erosion is triggered by a weather event.

Abandoned river channels can best be identified on older air photos because the channels have not yet been obscured by urban development. In 1949, the channel immediately below and east of the tower was the main river channel. In the period since then, the main channel of the river has been moving primarily east, away from what is now the viewing tower. In 1962, the large channel further east, which now bisects the central marsh, was at that time, the main river channel. In 1975, parts of the river were continuing to erode and meander east from that channel. By 1984, the main river channel appears to be split and in the process of switching channels again. Sometime after that, the switch occurred and, ever since then, the main channel has been near its present location in line with the tip of the present day spit on the east side of the river mouth. Meanwhile, erosion continues eastward from the new channel, carving at the estuarine marshes of the Big Island. (see photo)

Marine water levels, like river levels, are affected by meteorological factors. Atmospheric pressure and wind, rather than precipitation, cause increases in the marine water levels in the form of storm surges and wind setup. Marine water levels are also affected by the positions of the sun and the moon which can create exceptionally high "spring" tides. In addition, marine water levels can be affected by large climatic cycles such as El Nino events. For example, a temporary water level increase of about 20 centimeters lasted for several months on the north Pacific coast during the 1982 - 1983 El Nino event (Holden, 1989).

Some archeological evidence suggests that Vancouver Island may be rotating on its long axis. This large scale geological process might be creating a total change between west and east coasts of approximately 1 mm per year (Holden, 1989). Global warming might already be creating a difference of 1 mm of higher water per year through the associated rise in sea levels, although no reference was found to confirm this as a measurement . On any location which is flat and near sea level, such as the Englishman River Estuary, an increase of only 1 mm in the marine water level relative to the adjacent lands can, at times, mean longer inundation over a large area of mud flats and marsh.

Regional Climate

The climate is characterized by wet winters that are warm for this latitude and dry summers that are relatively cool because of the heat moderating influence of the Pacific Ocean. The mean annual temperature is 9.9°C. The mean temperature for January is 2.6°C and for July the mean is 17.8ºC. The average total bright sunshine is 1,913 hours annually. There are, on average, 295 frost-free days annually.

The actual temperature and rainfall measurements for any date and the average for any month can vary as frontal pressure systems move into this region from different directions. The mean annual precipitation totals 926.6mm (Anonymous, 1977). Boom and Bryden (1994) and Barnard (1990) used higher precipitation figures (963.9mm and 952.5mm respectively) but none of these figures are specific to the estuary. On average, approximately 8% of the precipitation falls as snow (from Barnard, 1990) but it does not usually stay on the ground at the estuary for more than a few days. Precipitation occurs on an average of 168 days each year.

As a result of global climate trends, the study area is likely to become drier in the summer for decades or centuries into the future (Hebda, pers com, 2005). This would be expected to put stresses and limits on the growth of some native plant species, especially trees.

Oceanography

Because of the shape of the Straight of Georgia, "the prevailing winds over open water at Parksville are from the east and southeast; therefore, the dominant wave direction and resulting net littoral drift is toward the west and northwest" (Holden, 1989). Wind, waves and the resulting littoral drift also occur in other directions, but the net movement of material on the beaches and spits on both sides of the estuary is from the east and southeast to the west and northwest.

The ongoing river erosion of roughly 30 metres of glacial deposits (described in Topography
above) is important to the formation and maintenance of the substrates of the estuary (the Englishman River fan). The Englishman River and its fan are now the principle source of littoral material that maintain the famous broad sandy beaches of Parksville Bay to the west of the estuary, states Holden (1989), but that littoral transport processes are sometimes relatively slow and the complete cycle of erosion and accretion which directs the movements of gravel bars and beach sand may take longer than a lifetime. In other words, as material moves down the river and into the tidal parts of the fan, it may take many years before the littoral transport processes of the strait can move it away.

Severe storms are infrequent at the estuary. The most likely period for them to occur is November to January. Storms that occur in December have the highest likelihood of causing coastal erosion because of the certainty of high "spring" tides for a few days every two weeks in December.

Vegetation

The Englishman River estuary is entirely within the Coastal Douglas Fir moist maritime (CDFmm) biogeoclimatic zone (Green and Kinka, 1994). As the estuary receives material from the watershed, the land surface there is expected to be slowly elevated and the land area to be expanded into what was once tidal water through the process of accretion. It appears likely that the vegetation continuously undergoes a natural succession of plant communities moving northward towards the straight over hundreds and perhaps thousands of years. This create bands of vegetation, the forest, shrub, and estuarine marsh, which can be further subdivided into high, mid and low marshes, with a subtidal zone below that. Each band or zone can be described and mapped separately.

The climax plant community on the floodplain/upland is coniferous forest with Douglas-fir (*Pseudotsuga menziesii*), Grand Fir (*Abies grandis*), Western Redcedar (*Thuja plicata*) and some Sitka Spruce (*Picea sitchensis*) dominant in the forest canopy. However, the forest canopy also includes Bigleaf Maple (*Acer macrophyllum*) and Black Cottonwood (*Populus balsamifera ssp trichocarpa*) and it will likely continue to do so as part of the disclimax (or possibly edaphic) climax plant community that is created on the floodplain by disturbances from the river, from wind, and from ocean storms. Since the estuary is within the Coastal Douglas-fir Biogeoclimatic Zone, it can be assumed that disturbance by fire is another important process that has prevented succession in the flood plain forest from moving towards a climatic climax.

The shrub layer within the forest zone is dominated by one or more of Salal (*Gaultheria shallon*), Oregon Grape (*Mahonia nervosa*), Oceanspray (*Holodiscus discolor*), and Snowberry (*Symphoricarpos albus*). Near the river channels, Pacific Ninebark (*Physocarpos capitatus*) and Red-osier Dogwood (*Cornus stolonifera*) are common shrubs. Some early seral forest stands on the Englishman River Estuary are dominated by Red Alder (*Alnus rubra*) and Salmonberry (*Rubus spectabilis*).

A distinct shrub zone (or shrub/graminoid mosaic) exists between the forest and the marsh, where there is no canopy of full size trees. This area is dominated by Pacific Crabapple (*Malus fusca*) and Nootka Rose (*Rosa nutkana*), often growing side by side.

As one moves north towards the strait, the shrubs give way to patches of graminoids and forbs which coalesce into the treeless, shrubless, open areas of the estuarine marsh. The zones of marsh vegetation on the Englishman River Estuary can be described as High, Mid, and Low Salt Marsh, categories which primarily reflect elevation and salinity, based on the classification of MacKenzie and Moran (2004). For details about the plants and plant communities on the estuary, refer to the *Vascular Plants, Plant Communities and Ecosystems* section in this report.

As one moves east or west along the shoreline from the river mouth, the observed vegetation changes. The backshore continues to be Coastal Douglas Fir moist maritime biogeoclimatic zone with forests and native shrubs that overhang and provide shade and organic material to intertidal species.

On the beach itself, Dune Grass (*Leymus mollis*) and other grasses, and forbs such as Gumweed (*Grindelia integrifolia*) or Silver Burweed (*Ambrosia chamissonis*) are present which are adapted to, and stabilize the often well drained, dry and sandy soils above the intertidal zone.

The intertidal areas support plants adapted to a life spent in and out of salt water. The estuary and coastline areas within a few kilometres include Strait of Georgia beach habitat types from mud and sand to gravel and bedrock adjacent to deep water. Common forbs include American Saltwort (*Salicornia virginica,* knas sea asparagus when it is harvested for human consumption), and marine intertidal algae such as Rockweed (*Fucus spp.).*Common Eelgrass (*Zostera marina*) can be found on sand/mud substrates within the intertidal zone, and more so in the subtidal areas of the Strait. *Zostera japonica*is an introduced species of eelgrass that was not observed on the estuary but was found in nearby intertidal areas.

Fish Use

Fish species are termed anadromous if their life cycle includes migration from the tidal saltwater of the ocean into the freshwater of rivers, streams and lakes to spawn. To complete the migration, different species of fish depend on the estuary to varying degrees. Many anadromous fish species need the estuary to be accessible, clean and populated with food and also to provide opportunities for a gradual transition from fresh to salt and salt to fresh.

The Englishman River provides accessible habitat to anadromous fish up to the lower falls at Englishman River Falls Provincial Park, a distance of approximately 15 kilometres. Each of the larger tributaries also have their own fish barriers (Morison Creek has Triple Falls at 0.8 km) Englishman River South fork has South Fork Rapids at 1.5 km; Centre Creek has a falls at 3.0 km, Shelly Creek has the falls on Shelly Farm at 0.6km) thereby offering 5.9 km of tributary habitat. (Bravender et al. 1996). There have also been off channel habitat additions by Fisheries and Oceans since 1988. These channels represent approximately 4.0 km of lineal habitat (D.R. Clough pers comm.). The Englishman River system supports all seven native anadromous species of salmonid (Coho, Pink, Chum, Chinook, Sockeye, Cutthroat and Rainbow) as well as Dolly Varden Char. There are resident populations of Trout and/or Char above and below the migration barriers.

In the last 30 years, there have been significant changes in the use of the river by salmonids, including Steelhead (*Oncorhynchus mykiss*). Blood (1976) stated that, "The Englishman ranks as one of the top 30 steelhead streams in B.C. (based on angler catch)." Today, Steelhead numbers are very low, and of "extreme conservation concern" (Lill, 2002, cited by Lanarc, 2003). An evaluation of the changes in fish use of the West Marsh Lagoon was done by Tutty et al. (1983). Salmonid enhancement projects have also affected the numbers and species proportions of other salmonid fish using the river and the estuary. There have been hatchery introductions of Pink, Chum, Chinook and Coho over the years. Currently there are annual introductions of Pink eggs (200-500k) and Chinook pre-smolt transplants (250k) from Quinsam and Big Qualicum Rivers respectively.

Most of the shoreline near the estuary provides excellent spawning areas for Pacific Herring (*Clupea pallassi*). Fisheries and Oceans Canada have been conducting annual surveys regarding herring populations and spawning locations. The annual herring spawn plays a significant role in the ecosystem of the region. The spawn is a major seasonal food source for gulls, waterfowl, seabirds and marine mammals. Juvenile and adult herring provide food for larger birds and marine mammals.

Pacific Sand Lance (*Ammodytes hexapterus*), and other forage fish use the nearshore areas for living and spawning. Because there has not been a commercial fishery, little information was available on these species in general, especially habitat and seasonal use within the study area.

For details about the use of the estuary by salmonid and other fish species, refer to the chapters of this report entitled *Fish Survey and Water Sampling Reports 2007/2008* and *Nearshore Studies*.

Terrestrial Fauna

A variety of land animals use the Englishman River estuary. One group, the birds, has been listed and counted on the estuary study area; the numbers give an indication of the diversity of all animals present. Dawe et al. (1994) found 113 species of birds and made reference an additional 49 species recorded on the Englishman River Estuary from other sources, including the authors' field notes, a study of passerine use by Martin and Fortune (1993), and Christmas Bird Counts by local naturalists up to that time.

In the latest management plan for the PQBWMA (Lanarc, 2003), the list of other species is mostly hypothetical based on data from the Little Qualicum River Estuary. Almost no information about terrestrial invertebrates on the Englishman River Estuary was found in the literature.

For a list of the species of invertebrates, amphibians, reptiles, birds and mammals (including slug, frog, snake, shrew, bat (unknown species), mouse, vole, beaver, rabbit, deer, otter, bear, domestic dog, domestic cat, human) observed during this study period, see the section on Terrestrial Fauna in the body of this report.

Dawe et al (1994) noted, "Domestic animals, particularly dogs and cats running free are invariably a significant threat to wildlife."

Some of the larger mammals such as beavers, otters, deer and bears are unlikely to remain on the estuary throughout their lives. Those with larger territories, such as bears, would likely enter and leave the study area more than once in a season; their place on the estuary dependent on their ability to move along wildlife corridors. The river bed itself remains available to animals but the riparian strip in some areas is narrow, unvegetated and close to human activity. East of the river, there are nearly contiguous forest areas stretching upstream to the Regional Park and beyond, but a potential barrier exists when wildlife moves from this defacto corridor and tries to cross the highway or moves under the highway bridge.

History of Estuary

Before written records, the natural boundaries of the estuary appear to have changed as the river changed its course many times over the millennia since the glaciers. Fluvial or glacio-fluvial deposits seem to be present from Parksville Bay to Craig Bay. "The active channel of the Englishman River has meandered over time from Rathtrevor Park to Parksville Bay" (Holden, 1989).

First Nations use of the estuary is recorded by the documented presence of an archeological site (DhSb-004), which is a midden in the vicinity of Shelly Road and Mills Road in Parksville. LeBaron also mentions an archeological site near the dyke. Although this study was not looking for signs of first nations use, there appears to be evidence of what might be another midden exposed by erosion in the estuary forest. The estuary of the Englishman River and all the major estuaries in the area were likely important to the inhabitants of that time (Dawe, 2004, pers.comm; Lanarc, 2003 sites Dawe, 1977).

At the time of first European settlement, approximately 150 years ago, the estuarine floodplain would likely have extended from somewhere in what is now the Parksville Community Park to somewhere in San Pareil or Rathtrevor Provincial Park. The first major efforts to alter the natural state of the estuary began in 1870 when 64.75 ha in the west half of the estuary were pre-empted for the purpose of agriculture. A farm house was build on the Flats in 1874. Fencelines from later farming efforts are still visible on the Big Island of the estuary.

The Community Park was conceived in 1925 and, through a grand cooperative effort, the period from 1947 to 1952 saw the clearing and development for the Community Centre and ball park (Parksville Museum, 2009) at the western edge of the estuary. These developments were early steps towards alteration and alienation of the western parts of the marsh, beach and spit habitats of the estuary, but at the same time, they were forerunners of the trend towards a broad public recognition and interest in the public values embodied in the privately owned waterfront properties of the area.

The Dogleg Slough separates the access road to the western spit from the natural estuary. Construction on it continued over a period starting around 1954 for the purpose of creating a Venice-like housing development (Ryan, 1991. pers.comm.). By 1962, it is obvious on an air photo (B.C. 5047 No.95, 1962). However, work on it must have continued. The Dogleg Slough appears to be in its present form on a 1975 air photo (B.C. 7760 No. 175, 1975) but the tidal connection from the Dogleg Slough to the big western tidal channel appears to be still changing.

The construction of the dyke that isolated the western portion of the estuary occurred in 1969, apparently to prevent tidal intrusion and reclaim the land from the sea. In 1979, that dyke was breached and the gap was spanned by a bridge. This reopened the entire western part of the estuary to the influences of tide and salt water and with them came the fish (Tutty, et al., 1983) and the estuarine marsh plants (Dawe and McIntosh, 1993). The bridge has since been removed and the gap widened.

The construction of the Mine Road Dyke, which started the process of alienating the eastern side of the estuary, was apparently done to facilitate the dumping and booming of logs, with all the associated habitat disturbance and debris on the estuary. The road/dyke and adjacent log booms are visible in airphotos of 1949 and 1962 (B.C. 814, No. 95 1949 & B.C. 5047 No. 95 1962). The dyke also has kept tidal and river water from entering 8.3 ha of shrub land that was once estuarine marsh. A study by Summers and McKenzie (1990) proposed that this dyke could be breached to increase habitat values but this has never been done.

The start date of the subdivision and development of San Pareil and Shorewood neighbourhoods on the western part of the estuary is not known but the marks of the present road network are visible in a 1962 airphoto (B.C. 5047 No.95) and a line of houses on the beach at the junction of San Malo Road and Mariner Way is apparent on the 1975 airphoto (B.C. 7760 No. 175, 1975).

The central forest area of the estuary appears to have been logged before 1900. Regrowth of a mixed deciduous/coniferous forest appears to have been well under way by 1949. Already at that time, the Shelly Road access through the forest was present, perhaps as a driveway to what appears to be building sites near the present location of the viewing tower; the exact location of the Hirst homestead and the fate of the buildings is not known to the authors. The forest area was operated as a campground for many years; a few camping stalls and the fire hydrants are still obvious among the regrowth.

The area of the estuary is now approximately 164 hectares of undeveloped land. The size before European settlement would likely have been closer to 275 hectares. Dyking and other human changes started reducing its size in around 1870 when it became one of the first parts in the entire region to be settled for agriculture. A line of fenceposts of unknown age is still conspicuous on Big Island in the estuary. A portion of the Parksville Community Park would likely have been the western part of the estuary at one time. Today the intact estuary is separated from the alienated lands to the west (the community park) by the "Dogleg Slough" (4.5 metres in depth) which was dug in preparation for a Venice-like housing development planned for the 1950's or 1960's and by a filled area that was reported as 3.9 ha by Clermont (1995).

As a result of these developments, the sandy spit and beach habitat that once occupied both sides of the river mouth is now largely occupied by permanent houses and RV yards. This plant community has the least total area of any of the sensitive ecosystems in the Regional District of Nanaimo (Ward et al., 1998). In the forested part of the estuary, a campground was operated; the roads, fire hydrants and camping stalls can still be seen among the trees and shrubs.

Legal Descriptions, Ownerships and Tenures

The Englishman Estuary is known affectionately as the Parksville Flats, and thought of by many as the 'Stanley Park of Parksville', even though most of the land is not publicly owned. A comprehensive explanation of the legal details of the remaining intact Englishman River Estuary properties can be found in Clermont (1995) and earlier in Barnard (1990) and LeBaron (1976).

The Parksville - Qualicum Beach Wildlife Management Area "is managed by the Wildlife Program (Vancouver Island Region) of BC Environment." "Under the Wildlife Act, BC Environment has legal authority to use WMA's to protect critical fish and wildlife habitat." (Clermont, 1995).

Disclaimer

In this report, descriptions of activities undertaken and places visited are for information only. The recommendations made are the opinion of MVIHES and need further discussion with land owners/managers before action can take place. It does not constitute any kind of permission to enter private land or recommend that anyone else do these things. The reader is entirely responsible for obtaining permission to enter private property even to do research or control invasive species on the estuary lands. The reader is entirely responsible for his own safety.

Overview of Project Methodology

The goals of the project were to increase understanding of the estuary and to increase local community involvement. The rationale for these two goals is outlined in the *Introduction* section under *Goals of the Project*. Towards these goals, MVIHES decided to undertake an ecological inventory of the Englishman River estuary and some aspects of the related nearshore, in cooperation with volunteers. A report would present what was learned in a way that would be easily accessible to a variety of people. The report would consider changes that have occurred up to now, and expand the baseline of data for comparison with monitoring efforts in the future. This information would give practical ideas for managing human impacts on the estuary.

A planning meeting was held on 8th June 2007 for the purpose of discussing the proposed project with the major agencies and the Nature Trust of BC, the landowner organization. The usefulness of inventory work to add to the baseline data on the estuary and the possibility of long-term volunteer-based studies was discussed. Various methodologies were considered.

Gaps were identified in the baseline data that had been collected up to that point and plans were made to fill some of these. A priority was also given to any opportunities for collection of data that would allow scientific comparisons with the past. For example, an attempt was made to locate various vegetation transect lines that had been used 20 years earlier (Dawe and McIntosh, 1993). A copy of the relevant parts of the Kennedy thesis (1982) were obtained. Other data that might have been useful was not available such as vegetation data reportedly collected on the Englishman River by students in connection with the Pacific Biological Station.

Mid Vancouver Island Habitat Enhancement Society (MVIHES) decided to focus the estuary inventory work on the following: the quality of freshwater inputs, fish use, forage fish habitat, native vascular plants and plant communities, invasive plants and animals, eelgrass distribution, bird use, and special places on the estuary. Work was to be done mostly by volunteers guided by paid MVIHES staff/contractors. The project was overseen by a project coordinator. Separate sections in this report include rationale, methods, results and discussion for each of the following sections:

Section 1 Fish Survey and Water Sampling Reports 2007/2008
Section 2 Vascular Plants, Plant Communities and Ecosystems
Section 3 Terrestrial Fauna
Section 4 Mapping Special Places and Features on the Estuary
Section 5 Invasive Species
Section 6 Nearshore Studies - Shoreline Inventory, Forage Fish and Eel Grass Mapping
Section 7 Public Involvement

Inventory work that began through literature review, consultations with experts, and field work in the summer of 2007, increased through early 2008 and reached a climax of field work in the summer of 2008. By October 2008, most of the data was in and the process of data entry, mapping and writing was foremost.