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Province of British Columbia

Ministry of Environment, Lands and Parks
VICTORIA, B.C.

MEMORANDUM

To: Jeff Such
Vancouver District

30 June 1992
File: 6-7-6-119-50

Re: Pitt Polder Ecological Reserve: Management

At our recent meeting on June 2, 1992, with staff from your office, Jack Evans, Wilma Robertson and myself, Jack indicated that he wanted review comments regarding their draft Management Plan for the Pitt/Addington Wildlife Management Area.

I have reviewed the plan only with regard to the Ecological Reserve and would suggest that the following points should go in a BC Parks reply, probably under the District Manager's signature:

* The existence of the ecological reserve is not evident from the table of contents (in contrast to that of all the other designations such as regional parks, UBC Forest, etc.) It is obviously treated as part of the WMA.

* The ecological reserve is, however, mentioned as point 'k' under the heading "4.3.1 Habitat Enhancement", which in turn is a sub-heading of "4.3 Management Prescriptions and Policies", which again is part of "4.0 Proposed Management Plan". It is not appropriate under any of these headings since it is not part of the WMA.

* The logical place where the Ecological Reserve section should be placed is following 3.8.4 or 3.8.7 because it is clerly an "Adjacent Land Use".

* The conclusions re water management from our recent meeting and field inspection should appear in this section or in conjunction with '4.3.1, i Crane Reserve', e.g. "Management objective is to protect an undisturbed peat-sedge pine bog and surrounding representative community types..". "In the long run this objective can only be accomplished through the maintenance of near-natural watertables. To this end, a double drainage ditch and a natural slough, both exiting the ecological reserve along Rennie Rd., and a slough exiting the crane reserve at its northern-most point will be blocked with earth plugs.

There may also be points that you or Ray (or Mel Turner's group?) will want to make about the hook-up with Golden Ears Park or about the overall recreational issues in this area.

H. Roemer
Conservation Ecologist

hlr/dskD

PITT/ADDINGTON WILDLIFE MANAGEMENT AREA

MANAGEMENT PLAN

February 1992

Approved: _____ _____
Regional Manager
Fish and wildlife Branch
Lower Mainland Region

Date

_____ _____
Regional Director
Ministry of Environment,
Lands and Parks
Lower Mainland Region

Date

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this plan is to summarize information on the biophysical features of the Pitt/Addington Wildlife Management Area (P/AWMA) (Figure 1), to outline management objectives and practices that will be applied to protect and enhance habitat and maintain biological productivity, and to outline policies governing recreational use of the Wildlife Management Area (WMA). Also addressed are existing land uses and conflicts, legal arrangements and agreements with third parties as they apply to these lands.

1.2 Effective Period of Plan

This plan will be in effect from the date of acceptance for the balance of the 30 years term (beginning 11 June, 1987), at which time there is a compulsory review of the WMA status. It will be subject to review and revision every five years to reflect changing management objectives for the Wildlife Management Area.

1.3 Background

1.3.1 Regional Importance

The Fraser River estuary and adjacent tributary marshes of the lower Fraser Valley are the most important single area of aquatic bird habitat in British Columbia. The fresh water marshes and rainwater flooded farm fields of the Pitt Valley and Pitt River are within a short flight of the estuarine areas are integral parts of this system. They provide wintering, migration and/or breeding habitats for waterfowl, shorebirds, raptors, passerine and upland species.

Historically, more than 70 percent of the natural habitat in the estuary has been lost to dyking for various purposes (Butler et al. 1987). As farm and other upland habitats of the delta continue to be eroded by urban development, areas such as the Pitt/Addington Wildlife Management Area become increasingly more important as wildlife habitat.

1.3.2 History of Land Tenure and Use

Pitt Unit

Prior to 1909, the area was undyked flood plain and was vacant Crown land. In that year, a conditional sale of 2752 ha (6800 acres), including the currently dyked 1459 ha (3605 acre) portion of the Wildlife Management Area, was made to Mr. W.A. Rannie. Farming and wild hay cutting were attempted on a limited scale but was eventually abandoned due to continued flooding. At some time, the area was extensively ditched for drainage. The quarter mile grid formed by these ditches is still visible. The land was sold for taxes after World War I and further unsuccessful attempts at farming were made. The area was then acquired by a group of wealthy sportsmen who founded the Sturgeon Slough

Game Club. From then until the early 1950's, land use was primarily waterfowl hunting, with a limited amount of lessee farming adjacent to the major roads.

In 1951, the Pitt Polder Company purchased the land and undertook extensive dyking, including the building of the Pitt Lake dyke. Extensive agricultural development of areas south of the present Koerner Rd (Figure 2) immediately followed. The land-use area of the present Wildlife Management Area, north of the Koerner Rd, remained recreational.

Addington Unit

Addington Point (Figures 2 and 5) is historically part of the Pitt River floodplain. Until it was dyked sometime before 1897 (Fish and Wildlife Branch, 1979) it was subject to daily tidal fluctuations. Addington Point has changed ownership at least 10 times since it was originally dyked. Although probably dyked for agriculture, due to continued poor drainage and lack of dyke maintenance, wetland conditions persisted. The only attempts at agriculture appear to have been grazing cattle and growing wild rice, neither of which were successful (Fish & Wildlife Branch, 1979). Since the 1930's, and until its purchase by The Nature Trust, the area was managed as a private shooting marsh. For a more complete history see the account in the Addington Point Marsh report by the Fish and wildlife Branch (1979).

1.3.3 Land Assembly

The 2882 ha (7121 ac) within the P/AWMA was assembled over a period of years and came into the administration of the Wildlife Branch through a variety of Orders in Council and agreements. The history of this assembly, and the current status of ownership and agreements with nongovernment organizations are outlined in Appendix 1. Copies of documents, pertaining to the current status and existing agreements are also located in Appendix 1. These documents also give the legal and meets-and-bounds descriptions of the Wildlife Management Area.

Through legislation (1958) and purchase (1973), the Provincial Government acquired portions of the original Pitt Polder wetlands for which it had proven uneconomical to complete development for agriculture. Addington Point was purchased by The Nature Trust in 1977 and subsequently leased to the Ministry of Environment, Lands and Parks (B.C. Environment, Wildlife Branch) for 99 years. On June 11, 1987, the Addington and Pitt Units, plus the undyked Pitt Lake Marshes, became the Pitt/Addington Wildlife Management Area under OIC No. 1154.

1.3.4 History of Habitat and Wildlife Management Activities

Several private and government organizations have participated in planning and discussions throughout the land assembly and management process. These include the Dewdney Alouette Regional District, North Pitt Polder Improvement District, The Nature Trust of B.C. and the P/AWMA Public Advisory Committee. The advisory committee has been composed of such groups as the B.C. Wildlife Federation, Federation of B.C. Naturalists, Alouette Field Naturalists, Pitt Waterfowl Society plus the groups named previously. In addition, the Canadian Wildlife Service (CWS), federal Harbour Commission, provincial Inland Waters Branch, Inspector of Dykes (provincial Water Management Branch), provincial

Department of Highways and Ducks Unlimited Canada (DU) have been involved in the area.

Based on the Wildlife Branch's initial draft management plan for the Pitt Unit (1976), Ducks Unlimited, between 1977 and 1979, constructed nesting islands, and dykes and water control structures which divided the Pitt marsh into four compartments (Figure 3). In 1980-81, DU built another 1800 m dyke, creating a new compartment (Homilk'um Marsh). Thirty six nesting islands were built in the new compartment. Four new water control structures were added at this time. These activities are outlined in Table 1. Their total expenditures to date in the Pitt Unit equal $,$$$,$$$ 1992 dollars.

Table 1. Waterfowl Habitat Management Structures Constructed by Ducks Unlimited Canada in the Pitt Unit of the Wildlife Management Area.

	Description of Works	Works & Location
PHASE I: (1976 - 1979)		
a. Dykes	12.2 km of new or upgraded dykes creating four compartments encompassing an area of 1027 ha. (Crane Reserve, Pitt Marsh, Munmunta Basin, Osprey Basin).	Crane dyke, Snake Rock dyke, Mountain dyke, Waterfowl dyke, Osprey dyke.
b. Water Control Structures	6 new structures plus 2 modifications of existing culverts.	Controls 1 & 2 modified Controls 3-8 new
c. Islands	34 nesting islands in Katzie Marsh	Katzie Islands
PHASE II: (1980 - 1981)		
a. Dykes	1800 m of new dyke creating a new compartment. (Homilk'um Marsh).	Homilk'um Dyke
b. Water Control Structures	4 new structures plus 1 modification of an existing culvert.	Control 11 modified Controls 9,10,13 new
c. Islands	36 nesting islands in Homilk'um	Homilk'um Islands Marsh.

In addition to the capital works, The Wildlife Branch and DU have jointly carried out a variety of habitat management activities, which have evolved and are evolving as experience is gained over the years. These have included managing water levels within the various compartments at optimum levels for breeding and wintering waterfowl. Dykes and islands were all seeded. Islands

have received periodic vegetation manipulation, generally cutting and burning, in an attempt to control woody species. Dykes have been mowed regularly both to control dense, relatively unproductive woody species and to provide graze for Canada geese and to discourage beaver and muskrat activity. Low vegetation on the dykes also has benefits for dyke access for maintenance and for viewing. Undesirable, dense hardhack in the Homilk'um marsh have been subjected to flooding in an attempt to control it.

Low nutrient levels have been the subject of management efforts in the Homilk'um Marsh. Agricultural runoff was pumped into the area for several years, and pig effluent was also added experimentally. Neither of these methods proved successful.

In 1984, Ducks Unlimited constructed a new outlet dyke and control structure at Addington Point and has annually patched weak spots in the old dyke. Water is taken in during the freshet and held during the summer. Their total expenditures to date have equalled

Ducks Unlimited Canada's total direct expenditures (excluding staff time), on construction and management, indexed to 1992 dollars, equal 2.3 million. This includes 1.9 million on the Pitt Unit, over $400,000 on the Addington Unit and almost $12,500 on the Pitt Lake Marsh Unit.

Several moist soil vegetation enhancement projects have been carried out since 1984. In the Pitt Unit, these have involved vegetation enhancement (mowing, disking, seeding) and subcompartment construction (involving berms, ditches and control structures), using Habitat Conservation Fund (HCF) monies. At Addington, vegetation enhancements have been limited to mowing, disking and seeding by DU, and by BCE using regional and HCF monies. These habitat management activities are listed in Table 2. The purpose was to set back the natural succession to unproductive species and create conditions which would allow pioneer plants, especially the smartweed *Polygonum persicaria* to germinate to provide food for migratory waterfowl.

Table 2: Moist soil vegetation enhancement activities at the P/AWMA 1984 - 1988.

Compartment	Area*	Treatment
Pitt Marsh N. One	19.0 Ha	Dyking Water control structure (weir) Vegetation mulching, soil turning, disk & seed w *Polygonum* sp.
Pitt Marsh N. Two	34.0 Ha	Dyking Water control structure (weir)
continued... Crane Reserve South	34.0 Ha	Dyking Water control structures (2 weirs)

			Vegetation mulching, soil turning, disk and seed
Addington Point marsh	25	Ha	Vegetation mulching, soil turning, disk & seed with *Polygonum*.

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* Total areas were calculated from the uncorrected 1:10,000 infrared air photos. The treatments listed were not necessarily done to the whole area.

2.0 GENERAL DESCRIPTION OF THE WILDLIFE MANAGEMENT AREA

2.1 Location and Jurisdictions

The Pitt/Addington Wildlife Management Area is located within Fish and Wildlife Management Unit 2-8, and lies at the south end of Pitt Lake, about 8 km north of the Haney.

The Pitt Unit lies in the unorganized Provincial Electoral district "A" of the Dewdney Alouette Regional District. It occurs at 49 deg 20 min N Latitude and 122 deg 37 min W Longitude and on the UTM coordinates 10.5280.54640.

The Regional District zoning of the Pitt Unit is Lowland Rural (RRL3). It is also within the agricultural Land Reserve.

The Addington Unit lies at 49 deg 18 min N Latitude and 122 41 min W Longitude and on the UTM coordinates 10.5225.54600. It is in Coquitlam District Municipality and the Greater Vancouver Regional District. The municipal zoning is P5, a special park use designation for undeveloped open space areas. It is included in the Agricultural Land Reserve.

The Pitt River is under Vancouver Harbours Board jurisdiction, while Pitt Lake is administered by Inland Waters and the Fraser Harbour Commission.

2.2 Physiography and Geology

The Pitt/Addington WMA falls within the Fraser Lowlands Ecosection of the Lower Mainland Ecoregion of the Georgia Depression Ecoprovince (Campbell et al 1990).

The Pitt Valley, if not covered with ice, may well have been a fiord at the close of the Pleistocene period. Therefore, though differing in origin, texture and nature, the soil-forming materials of the management area have a common trait in that they were transported, by either glacial or alluvial action, to their present location (Fish and Wildlife Branch, 1976).

The Pitt/Addington Wildlife Management Area is a maximum of 1.5 m (5 ft) above sea level. The land form is flat to gently undulating. It covers 2882 ha (7121 ac) of dyked and undyked alluvial floodplain which formed in conjunction

with the development of the Fraser Delta during the last 8000 years (Ashley 1977). The material is Fraser River silt, which was carried through the main Pitt River channel, into the Pitt Lake and the now dyked areas to the north, when rapidly flooding tides dam the main Fraser River outflow. This silt was, and is, deposited during the lower velocity, dispersed ebb flow, creating, at the lake outlet, a unique reverse delta which has few counterparts world wide. (Pitt Lake itself is the largest tidal freshwater lake in the world). While northward accretion appears to have occurred at a rate of 1.28 m/year over much of the last 6000 years, it is currently a little more than 1 cm/year. The Alouette River also contributed to development in the southern part of the Pitt Unit of the WMA.

Dyking of the flood plain delta at the south end of Pitt Lake began in 1911 for agricultural purposes and was completed to its current extent by construction of the lake dyke in 1951. The undyked tidal delta flats currently extend almost 6 km into the lake and cover about 1200 ha (Ashley 1977).

The Pitt Unit surrounds Pit Polder Ecological Reserve, and area of sedge bog and two forested granitic outcrop (the Pine Mountains) rising 114 m (375 feet) above the floodplain.

2.3 Soils

The soils of the area have been described by Luttmerding (1980, 1981). The soils of the undyked areas are called "Recent Alluvium". The dyked Pitt Unit soils are "Addington" or combinations of "Addington" and "Sturgeon". The Addington Unit has, in addition, some "Alouette" and "Pitt" soils. All of these soils are classified as a humic phase of Orthic Gleysols or Rego Gleysols, or, in the case of "Pitt" soils they are classified as Orthic Humic Gleysols. These soils are all comprised of about 100 cm of medium-textured (silty loam or occasionally loam), mixed floodplain deposits, except that "Pitt" soils have higher portions of fine textured materials. Below 100 cm fine to medium sands and sandy loams occur. The characteristics which distinguish these soils are differences in organic deposits and drainage. Some of the soils have 15-40 cm of overlying, variously decomposed, organic deposits. Drainage is poor to very poor for all types, most being subject to flooding or having water tables at or above the surface for much of the year. As a result of the high water tables, rooting depths are restricted to 60 cm throughout most of the area.

2.4 Climate

The Fraser Estuary experiences warm, sunny summers and relatively mild, wet winters. Freezing temperatures and snow are of short duration (an average of 8 days of snow per year) due to the marine effects of the Strait of Georgia. The adjacent mountains cause prevailing air currents to rise rapidly over the area, causing overcast and rainy weather in all months (mean annual precipitation is almost 230 cm). Gale winds and abundant precipitation are common during late fall and winter (October to March) when 70% of the precipitation falls. Mean annual temperature is 9.4 deg. C at the Pitt Polder station (Env. Can., 1980), ranging from a mean of 1.6 deg. C in January to a mean of 17.2 deg. C in July.

2.5 Water

2.5.1 Drainage and Watershed Characteristics

The watershed influencing the dyked portions of the Pitt unit consists of the dyked 1459 ha, plus more than 600 ha of forested mountainside to the east and southeast. The latter area supplies the bulk of the water. The annual 230 cm of precipitation results in a potential 46.9 cubic meters (38,000 acre feet) of through flow. Drainage from the area is towards the west and north-west, down the 45 to 60 deg. mountain-side via numerous intermittent watercourses. From the 1459 ha dyked area, water enters the Pitt River and Lake through two flap gate structures. During river freshet period (mid-May to mid-July) water backs up inside the dyke. Figure 3 shows the water control structures and the direction of flow. High nutrient waters from the Fraser have not been able to flow over this area since the construction of the dykes in 1912 (Nature Dyke) and 1951 (Lake Dyke).

The Addington Unit is historically part of the Pitt River floodplain and until dyking in 1897 was subject to daily tidal fluctuations. Flooding during the freshet resulted in annual inundation during the spring and early summer. Currently its dykes are maintained for wetland management purposes and water sources include direct rainfall, run-off from adjacent granitic hills and back-flooding through culverts from the Pitt River during the freshet. Ground water remains high throughout most of the year.

2.5.2 Water Quality

The water quality of the Pitt area has been described as oligotrophic (Barnard, 1975). Its relatively low nutrient content can be attributed to several factors. The bulk of the water originates as rainfall and enters the floodplain as run-off from the local mountains. These latter, being granitic in nature, contribute little in the way of nutrients. The periodic flushing which occurs via the high rainfall and gravity flow outlets, undoubtedly results in losses of nutrients. Also, large amounts of nutrients in these areas may be held in undecomposed vegetation due to retardation of the oxidative process under the acidic conditions which occur. Further amounts of nutrients are bound in woody species, especially hardhack and sweet gale which occur extensively throughout the area. Similar conditions occur at Addington Point (B.C. Fish & Wildlife Branch 1979).

Water quality analyses have been done in this area by several groups and individuals. The pH within the Pitt Unit ranges between 5.5 and 7.1, with most readings between 6.0 and 6.9. The specific conductivity measurements range between 0.014 and 0.332 mmhos/cm, reflecting the "softness" of the water. Similarly, total hardness and total alkalinity are very low, most being below 50 ml/l. Water samples (16) analyzed by the Wildlife Branch for various measures of nitrogen and phosphorous showed very low levels of these nutrients (all < 0.7 mg/l and most < 0.01 mg/l).

2.6 Vegetation

2.6.1 Pitt Unit

There is virtually no evidence in the literature pertaining to the vegetation in the vicinity of the Pitt Unit prior to the dyking which starting in 1911 (Barnard, 1975, p 62). Anecdotal observation suggest that substantial areas of the flood plain consisted of grass-rush meadows, aquatic plant (wapato) and low aquatic shrubs (including bogs with blueberries and cranberries) (Suttles 1955). Taking many uncertainties into account, Barnard (1975) postulated that much of the study area, prior to dyking, saw a gradual encroachment of shrub over both the meadow and marsh areas during years of low or normal spring flooding. The trend might have been reversed or impeded during the periodic years of exceptionally heavy run-off and flooding.

The most significant post dyking change affecting the vegetation was the water regime. Aerial photos taken 17 years after the completion of dyking portray the area as a mosaic of dense shrub (mainly hardhack), grassy meadows (primarily bluejoint) and sedges. The northeast area was a fresh water marsh, predominantly exhibiting a softstem bulrush community. The wetter conditions, with drying for only three months of the year, favoured the spread of the hardhack stands (Barnard 1975). In more recent times, some hardhack was planted in the northern part of the Pitt Marsh compartment to provide blinds for duck hunting (Don Wheatly pers. comm.).

Barnard lists 211 plant species which occur in the Pitt-Alouette Polder and Robinson and Robinson (1976) of the Alouette Field Naturalists compiled a list of 243 species of plants occurring in the lower Pitt Valley, many of which occur in the P/AWMA. Of these, a list of the commonly occurring aquatic and moist soil are listed in Appendix 2. Pringle and Jury (1980) recorded 26 species of aquatic plants within the Pitt Marsh and Katzie Marsh compartments of the Pitt Unit. The major vegetation communities of the Pitt Unit are mapped in Figure 4.

2.6.2 Addington Unit

Vegetation development and community structure in the Addington Unit (Figure 5) is similar to that of the Pitt area. Higher areas are dominated by *Spiraea douglasii*, *Scirpus cyperinus*, *Calamagrostis* sp., *Phalaris arundinacea*, and *Carex* spp. Lower, wetter areas and slough margins are characterized by *Dulichium* sp. (three-way sedge), *Juncus* spp. and *Isoetes* sp. (quillworts). Open water areas are overgrown seasonally with two species of water lilies, bladderwort, milfoil, burreeds, pondweeds and other aquatic plants. The B.C. Fish & Wildlife Branch report (1979) lists 50 plant species which occur at Addington Point, about 40 of which are moist soil, marsh and aquatic species.

2.6.3 Pitt Lake Marsh Unit

The mudflats of the Pitt Lake Marsh contain submergent vegetation communities which are unique on the south coast (Figure 6) (Envirowest 1991). The freshwater species occurring here are found throughout the lower Fraser system, but the community associations and phenology are very different on the Pitt Lake delta (Table 3). Most plants here mature very late in the season and are available to migrating waterfowl during low tides between August and October. [&&& expand re Mark Adam's report.]

Table 3. Preliminary descriptions for habitat types within Pitt Lake Mudflats, 1991.

Substitute edited Table 3 from envirowest report.

2.7 Land Capability

The Canada Land Inventory (CLI) has rated the suitability of this area for Agriculture, waterfowl, outdoor recreation, ungulates and forestry.

CLI Agricultural Rating:
The Agricultural capability of the dyked units of the P/AWMA is moderate. Limitations are due to excessively wet soils, and to relatively cool temperatures in the spring and early fall. The need for expensive dykes and dyke maintenance, plus pumping costs, limits the profit to be made from agricultural pursuits. Temperature limitations - apparently the result of cool air "ponding" inside the dykes - restrict the growth of standard "truck" vegetable crops like beans, peas and carrots in areas south of the WMA. Most success has been made with pasture and cereal grains. Most of the land has traditionally been used for either forage or cattle grazing. In recent years, cranberries, blueberries and nursery crops have been increasing, as have other changes (e.g. golf courses) from the kinds of farming practices which have benefit water birds.

CLI Waterfowl Rating:
The CLI designates the area as 3M for Waterfowl. This designation is given to land which has importance as migration habitat, but has limitations for waterfowl production. Historically, the limitations to production in all units has been a lack of nesting habitat, fluctuating water levels and lack of high-protein invertebrate food for young waterfowl. These features have been the result of the limited fertility of the water and organic soils. More recently, the provision of control over water fluctuations (via dyking), and nesting areas (islands and dykes) has overcome these two factors, but at the expense of fertility, as the annual silt load from the Fraser is no longer available. The overall trend in vegetational succession is from a marsh-wet meadow complex to a shrub-swamp-bog environment (Barnard 1975, p 74) which are less attractive to waterfowl.

CLI Outdoor Recreation Rating:
The CLI designates the Pitt Unit as a shore-land having high capability (Class 2S) for outdoor recreational activities associated with wetland wildlife, angling and canoeing. Development of the area has created some additional capability for hiking and nature interpretation. The area is approximately 50 km from Vancouver and 15 km from major populations in neighbouring municipalities, making it an ideal day-trip recreational site for residents of Greater Vancouver.

In addition to the high on-site recreational capability, the Wildlife Management Area serves as an access point for both Widgeon Creek and the upper reaches of Pitt Lake. The Widgeon Creek delta has a recreation capability classification equal to that of the P/AWMA, and accommodates considerable canoe and kayak use originating from the boat launching site at the end of Rannie Road.

Upland Wildlife (furbearers, small mammals, carnivores, raptors, passerines, grouse, etc):
These categories are not included in the CLI inventory. It is certain, however, that individual wetland species in these wildlife groups have been

affected (whether positively or negatively) by the basic nutrient deficiency, water level regime, provision of "uplands" (islands) and vegetation changes. The most common wildlife species are listed in Appendix 3.

Of special note are Greater Sandhill Cranes, which nested more abundantly in the area before dyking first took place, and which appear to now prefer the dyked but otherwise "unmanaged" areas for nesting, while feeding in open fields. Another noteworthy group found here is the raptors.

Black Bears are also common here, particularly along the forested hillside of the Pitt Unit. In this unit they can also be found on the dyke tops and on the periphery of agricultural areas.

CLI Ungulate and Forestry Rating:
Low ratings are given for both of these resources in dyked the lowland areas of the P/AWMA. However, moderately productive forests and deer habitat exist in the forested areas adjacent to the UBC Malcom Knapp Research Forest, the Pitt Polder Ecological Reserve and Minnekhada Regional Park. Deer do venture into the lowlands from these adjacent habitats.

Fisheries:
Only limited data exists on fish species occurrence and distribution (Appendix 3.4). Angler use and catch success in the area are poorly known. Although the physical/chemical nature of the waterbodies has not been studied from a Fisheries point of view, it is known that all areas (both tidal and dyked) are potentially good habitat for several species of fish, including salmonids. For example, recent investigations have shown that Coho Salmon fingerlings are using the Munmunta/Osprey Basin area, which is open to Pitt Lake through a culvert.

Other Ratings:
Benn et al (1977), in a natural areas inventory done for the GVRD, gave the dyked Addington Unit "high" and the Pitt Unit "high" to "moderate" rankings for the presence of their wildlife, terrestrial vegetation and aquatic biota.

3.0 HISTORICAL AND PRESENT RESOURCE VALUES AND LAND USE

3.1 Wildlife

The Pitt, Pitt Lake and Addington units of the study area provide a variety of habitats which support a wide range of herptile, avian and mammalian species either as permanent residents or migrants. Robinson and Robinson (1976) list over 200 bird and 29 mammal species which occur in the Lower Pitt Valley.

3.1.1 Bird Use

Similar species are found in the Addington and Pitt Units. The most common birds in the wetland habitats of the Pitt Unit are listed in Table 4 (Runyan, 1978). The most abundant nesting species observed include marsh wrens and red-winged blackbirds. Species recorded by Runyan (1978) in nesting plots are given in Table 5. Appendix 3.1 lists all of the most common bird species recorded by Runyan (1978) in marsh and open water habitats. The diversity of habitats here have also resulted in sightings, over time, of several species

which are uncommon or rare in the Lower Mainland, such as Catbirds and Eastern Kingbirds.

Table 4. Ranked abundance of most common birds in marsh censuses for all seasons.

SPECIES	HABITAT TYPE			
	A	B	C	D
	Rank			
Marsh Wren	2	1	2	2
Red-winged Blackbird	3	2	1	1
Common Yellowthroat	1	3	10	
Northern Harrier	5	8	8	6
Great Blue Heron	6	5	4	4
Common Snipe	6	7	6	5
American Bittern	5	9	12	
Mallard	8	4	3	3
Virginia Rail	4	12	13	
American Robin	6	12	7	5
Song Sparrow	7	6		5
Ring-necked Pheasant	12	11		
American Goldfinch	9			
Black-capped Chickadee	9			
Cinnamon Teal		10	12	
American Coot			5	
Blue-winged Teal		12	9	
Brown-headed Cowbird	10			
Savannah Sparrow	11			
Yellow-headed Blackbird			14	
Sora Rail		12		

Species are listed in overall order of abundance. For each habitat type covered, the species abundance is ranked with 1 being the most abundant.

Habitat Type		Descriptions	Km of transect
A	-	Hardhack greater than 50% total ground cover	1.62
B	-	Hardhack less than 50% total ground cover	.60
C	-	Pure soft-stemmed bulrush	.76
D	-	Pure hairy-seeded bulrush	.22
E	-	Pure low sedge (*Carex* spp.)	.08

Derived from Runyan 1978, Tables 11, 13-20.

Table 5. Nesting birds recorded in nest plots in the Pitt Unit of the Pitt/Addington Wildlife Management Area. Shown in decreasing order of frequency of nest discoveries.

Species	Habitat
Marsh Wren	all habitats
Red-winged Blackbird	all habitats
Mallard	Low Sedge Hairy-seeded bulrush
Blue-winged Teal	Hairy-seeded bulrush
Cinnamon Teal	Hairy-seeded bulrush
Pied-billed Grebe	Soft-stemmed bulrush
Common Snipe	Hairy-seeded bulrush
Virginia Rail	Hairy-seeded bulrush
Sora Rail	Low sedge
Song Sparrow	Hardhack
Common Yellowthroat	Hardhack
Yellow-headed Blackbird (localized in 1978 & currently absent)	Hard-stemmed bulrush

From Runyan 1978.

The most common birds using the Pitt Lake Marsh Unit are waterfowl, which are most abundant during the fall and winter when the lake level is lowest and the vegetated mudflats are exposed. One or two pairs of Ospreys often nest on the pilings along the outside of the Pitt Lake Dyke.

3.1.2 Sandhill Cranes

One noteworthy species which occurs in low numbers is the Greater Sandhill Crane. A remnant population nests in the lower Fraser Valley in Burns bog, Langley bog and the bogs and marshes of the Pitt-Alouette Polder area. These birds can usually be seen feeding in adjacent agricultural fields.

In 1977 Runyan (1978) estimated between 8 and 14 cranes and 2 or 3 nests in and adjacent to the Pitt Unit. The number of suspected nests within the Pitt

Unit for the three previous years ranged from 4 to 7. For more recent years no detailed information is readily available, but the number of wild birds is thought to be about 7, with 1 or 2 nesting pairs (W. Robinson, D. Dunbar pers. comm., 1988)

In 1980 and 1983 several government and private groups attempted to reintroduce sandhill cranes to the area. A total of 22 young cranes were raised and released just south of the Pitt WMA. A few of these birds still remain in the area and there is at least one pair between a wild and a released bird, which was reported to have raised at least one young in 1990 (Charlie Boras, pers. comm.).

Within the P/AWMA, cranes occur in the western part of the Pitt Marsh, in the Crane Reserve, in the marsh west of Rannie Road and on the Pitt River Marshes. They have also been heard calling from Addington Point (Brownlow, 1982). Sandhill Cranes were observed in the Crane Reserve South Compartment by BCE staff following scarification in 1988.

3.1.3 Waterfowl

The Fraser River Estuary provides the largest wintering areas for waterfowl and shorebirds in B.C. Over 4 million birds migrate through the area in spring and fall and over 250,000 ducks winter along the foreshore, river islands and agricultural lands (Butler et al. 1987). The estuary has been identified as one of the most important wintering areas for waterfowl along the entire west coast of North America. Forty-one species of ducks, swans and geese have been identified in the estuary.

Between 1982 and 1987, 20 aerial surveys were flown over the Pitt and Pitt Lake Marsh Units (Table 6) during the migration and wintering period. The greatest use of the area is during the fall. Much of the attraction at this time is the food resources available after the growing season. Also, at this time the lake is at its lowest level, resulting in the exposure of the mud flats which are covered with low growing submergent plants and abundant invertebrates (caddis fly and mayfly larvae and leeches). Use of the Addington Unit has been much lower. While several hundred migrant waterfowl have been observed, fewer than 200 is normal due to the dense vegetation.

Table 6. Mean numbers of waterfowl observed on aerial surveys of the Pitt and Pitt Lake Marsh Units of the P/AWMA, 1982-1987.

SEASON	PITT Mean (No. Surveys)		PITT LAKE MARSH Mean (No. Surveys)	
Fall (Sep-Nov)	1379	(11)	1199	(9)
Winter (Dec-Feb)	340	(6)	522	(6)
Spring (Mar)	1436	(3)	125	(3)

Nonbreeding waterfowl use in the Pitt Unit has been the subject of two studies. In January and February 1976, P. Jones (1976) censused the waterfowl

of Pitt and Katzie marshes. He found that the distribution of birds was determined by the relative proportions of water and vegetation. Examples of the species composition of the waterfowl recorded in the Pitt are given in Table 7.

Since the time that these surveys were done, Canada geese have been introduced into the Pitt Valley and have become established in the P/AWMA as breeding residents.

In recent years swan have become regular winter visitors in the P/AWMA. The Pitt and Pitt Lake Marsh units together with Siwash-Widgeon Slough area, with ### birds is one of the three most heavily used areas in the Lower Mainland.

Table 7. Species composition of wintering waterfowl recorded in the Pitt Unit.

	1975 census	Hunter Bag, Pitt Marsh, 1973
American Wigeon	39%	45%
Mallard	29%	33%
Green-winged Teal	23%	14%
Unidentified	4%	-
Gadwall	3%	2.7%
Pintail	2%	4.5%
Wood Duck	-	.6%

After the removal of the hardhack and turning of the soil in the Pitt Marsh North One and North Two Compartments, BCE staff noted that waterfowl use showed a dramatic increase. Because the area was not considered to be waterfowl habitat, no records were made before the work was done, however Barnard (1975) recorded comparatively low use in similar open and dense hardhack areas west of Neaves (Rannie) Road (within and south of the P/AWMA) on a census done in late February 1973.

Species of breeding waterfowl observed as breeding pairs or with broods include Canada Geese, Mallards, Gadwalls, the three teal species, Wood Ducks, Hooded Mergansers and Common Mergansers. Due in part to the dense vegetation, only small numbers of duck broods have been observed.

3.1.4 Raptors

Most of the fourteen species of hawks and eagles and more than half of the eight species of owls recorded in the Fraser Fiver Delta (Butler et al, 1987) would be expected to occur in the P/AWMA at some time. Of these, Northern Harriers, Red-tailed Hawks, Bald Eagles, Kestrels, Turkey Vultures and Ospreys are the most commonly observed. Raptors occur in the largest numbers during the winter months, when Bald Eagles are the most numerous species. The most common nesting species are likely Ospreys, Kestrels, Red-tailed Hawks and Sharp-shinned Hawks.

3.1.5 Other Species

Mammals and herptiles which are known to occur in the Pitt and Addington Units of the P/AWMA are listed in Appendices 3.2 and 3.3.

Black bears and black-tailed deer have been seen regularly throughout The Pitt and Addington Units. Following the vegetation mowing in the Crane Reserve South Compartment and in the Pitt Marsh North One Compartment, BCE staff observed these two species here more frequently, either because they were attracted to the area or were more visible. Coyotes are also common, and cougars have been reported.

3.2 Fish

No major studies have been done of the fish populations but a number of species have been recorded in the dyked portions of the Pitt and Addington Units (B.C. Fish & Wildlife Branch 1979, Coquitlam Mountain Study 1980, Fletcher, 1987). These are listed in Appendix 3.4. Coho fry have recently been recorded in Osprey/Munmunta Basins. This appears to be a rearing area for this species. It is not known whether adults breed here or whether the fry enter the dyked area through the culvert at the lake. While no searches have been done, the Addington Unit and other compartments of the Pitt Unit would afford good Coho rearing habitat.

The most productive fish habitats are the mudflats of the Pitt Lake Marsh Unit and the Pitt River Marshes. All five salmon species occur here as well as trout and char. Sturgeon are also present.

3.3 Agriculture in the P/AWMA

Although areas of the P/AWMA were originally dyked for agriculture, their wetness has precluded any serious agricultural use (Section 1.3.2). Soil turning has been done in an effort to grow native moist soil annuals for the seeds which can be valuable to migrating and wintering ducks. This activity has been tried in three subcompartments in the higher parts of the Crane Reserve and Pitt Marsh, and in the Addington Unit. With proper water control, periodic soil scarification and initial seeding, this activity may hold some promise in both the Pitt and Addington Units (Summers, 1988).

3.4 Water

Water licenses are held for conservation purposes at both the Pitt and Addington Units. At the Pitt, License No. 56204 (effective July, 1981) authorizes the diversion via ditching and pumping of 1.73 million gallons/day on each day of the year from "Quarry Slough". License 61657 (effective January, 1984) permits the diversion of 37.81 cu ft per sec from Munmunta/Osprey Basin (called "Pitt Marsh Slough" on the license), using dykes, and water diversion and control structures. The Addington licence, No. C06054100A (dated May 1984), permits the diversion and storage of 1,350,000 acre feed/year from the Pitt River via controls at the downstream and upstream ends of the dyked area.

3.5 Recreation

Visitor use has been encouraged in the P/AWMA and has been recently estimated at 15,000 person days per year in the Pitt Unit (BCE evaluation based on DARD study). There is no estimate of the Visitor use to Addington Point, but the Minnekhada Regional Park, through which Addington Point is accessed, receives an estimated @@@ visitor days per year.

Originally, the primary public use of all parts of the P/AWMA was by hunters. Hunting is currently restricted to about 2/3 of the Pitt Unit, the Pitt Lake Unit and outside the Addington dykes. Hunting within the Pitt Unit occurs in the Pitt and Homilk'um Marshes, Munmunta Basin and the West Compartment. Hunting is currently permitted only on Wednesdays and weekends.

Within the last 20 years, and especially since interior dyke construction in the Pitt Unit and improvement to the Addington dykes, day walks and nature study have become popular. To augment the trail system along the dykes of both the Pitt and Addington Units, BCE has, through the HCF program, constructed three viewing towers at the Pitt and two towers and a viewing pavilion at Addington (Figures 3 and 5). Through other funding sources, a trail and three pavilions have been constructed along the Malcom Knapp UBC Research Forest mountainside at the Pitt.

Other users include cyclists and canoeists. Cycling also occurs along the Pitt Lake Dyke. Canoeing is popular on Pitt Lake and, in particular, just outside the WMA in Wigeon Slough. A small amount of canoeing occurs in the Pitt Unit.

3.6 North Pitt Polder Improvement District

The North Pitt Polder Improvement District (NPPID) has jurisdiction over the exterior dykes of the Pitt Unit. These include the dykes along the river, lake and mountain side. In accordance with the "FIRST TAXATION BYLAW, 1983", BCE pays taxes to help with the dyke maintenance. Since the mid 1980s, major maintenance activities to the Pitt Lake dyke have included cutting the large deciduous trees which had grown up along the south side, and dyke repair along the south side. The repairs were required, in 1990 and 1991, in an area which had eroded badly after a combination of high rainfall and strong southerly winds.

3.7 Grant Narrows Regional Park

The Grand Narrows Regional Park, is a cooperative venture, with the DARD operating the park under an agreement with the Wildlife Branch within the P/AWMA boundaries, at Grant Narrows. The park also includes a recreational reserve granted by the Fraser River Harbour Commission (Figure 3).

To date, no guidelines have been in place to outline both expectations regarding services provided by, and limitations to commercial developments within the park. Any allowances for or restrictions to changes of the current lease area boundaries need addressing to help prevent potential expansion of the park beyond predetermined, desirable limits.

3.8 Adjacent Land Use

3.8.1 Residential

There is currently no high density residential zoning adjacent to this area. Cottages spaced along the west shore of the Pitt Lake Unit are on leased Indian Reserve land.

3.8.2 Golf Courses

The Swan-E-Set Bay Resort and Country Club is located just south of the Pitt Unit, west of Neaves (Rannie) Road. It is scheduled to open in the summer of 1993. Its presence is not expected to significantly influence the habitat within the WMA. Another golf course, Golden Eagle Estates, has also recently been approved for the area along the mountain side south of the Pitt Unit. The potential environmental effects of this proposal have not yet been fully assessed. The resulting increased public use of the area for active recreational activities will create incompatible demands on the P/AWMA, which will have to be addressed.

3.8.3 Malcom Knapp U.B.C. Research Forest

The forested mountainside on the east of the Pitt Unit is mostly owned by U.B.C. The primary use of this forest is for forestry research projects. It does, however provide visitor use of its roads and trails. None of the trails currently connects with those built by BCE, which traverse its lower slopes adjacent to the P/AWMA. An interconnected trail system would be desirable to both parties. One major concern which the research forest has regarding the BCE trails is public use during seasons of high forest fire hazard.

The research forest also owns a wood lot license (No. 037)...

3.8.4 Golden Ears Provincial Park

Golden Ears Provincial Park lies to the north of the Malcom Knapp UBC Research Forest and east of the Pitt Lake Marsh unit. There are many hiking trails in the park but none descend to the edge of Pitt Lake. There is potential, and interest by both parties, for trail systems from the park and P/AWMA to interconnect.

3.8.5 Minnekhada Regional Park

Minnekhada Regional Park already has a parking lot and trail system which is linked to the Addington Point mountainside trail system. To date, cooperation between BCE and the Municipality of Coquitlam has been good.

3.8.6 Widgeon Valley Reserve Regional Park

The Greater Vancouver Regional Parks, together with the Nature Trust of B.C. recently acquired Siwash Island and has incorporated this and the Widgeon Slough area [??? boundaries] into a regional Park. The park lies midway between the P/AWMA and Grant Narrows Regional Park to the southeast, and the

Widgeon Valley National Wildlife Area to the north. This relatively small, sensitive area would not withstand intensive land based use.

3.8.7 Wigeon Valley National Wildlife Area

The Wigeon Valley National Wildlife Area lies across the Pitt River from the P/AWMA. It is operated by the Canadian Wildlife Service and was established "primarily for migrating and wintering waterfowl." One of the stated goals of the management plan is "to liaise and to co-operate with other resource agencies ... in order to avoid duplication of effort and to strive collectively for the conservation of the habitat, its wildlife and for the recreational/educational opportunity it provides." The BCE is a member of the Wigeon Valley NWA Management Advisory Committee.

3.8.8 Agriculture

Other dyked lands adjacent to the Addington and Pitt Units are used primarily for agriculture (see Section 2.7). Their historical use as forage has recently been giving way to berry farming and nursery trees.

The P/AWMA is separated from these surrounding agricultural areas by Koerner Rd. The pastures in the vicinity are compatible with waterfowl and other wildlife use of the Wildlife Management Area. The BCE has an obligation to the NPPID to ensure that their water management activities do not impede drainage of adjacent farm lands. On the other hand, if the WMA is to receive runoff water from the farmlands, it must be assured that the water is not polluted with pesticides or other undesirable substances.

Another area of possible conflict between the P/AWMA and local farmers would be if wildlife originating from the WMA caused depredation of crops. Except for Canada Geese, it is unlikely that the management of the WMA has changes the nature of wildlife use or degree to which wildlife using this area would interact with local farmlands.

3.9 Mining

The WMA status does not include subsurface mineral rights. No existing mining leases occur within the P/AWMA. There are currently four mining claims, bordering on the Pitt Lake Marsh Unit. They are located on the east shore of Pitt Lake, just north of the east end of the Pitt Lake Dyke (Figure 2). These claims expire on 30 March 1998 and are in the name of Brazil Gold Inc., Vancouver, B.C. The claims are on Lots 5578 to 5581, and include record numbers 2408 to 2410 and 2421.

3.10 Fletcher Challenge

Fletcher Challenge Canada Ltd. maintains a base at the east end of the Pitt Lake Dyke. The site is used as a boat landing for ferrying forestry workers to the north end of the lake. The site is also used for vehicle parking and a watchman's cabin. The area covers about 0.1 ha of UBC property, some highway right-of-way and both land and water areas of the P/AWMA. North of the Pitt Lake dyke, an area of 780 ha includes perhaps 500 m2 of BCE upland plus Grant

Channel. South of the dyke, approximately 50 m2 of BCE property is being used. To date BCE has not required that the company have a formal license of occupation, however lease/license options are currently being reviewed.

3.11 Heritage

The Archaeology Branch do not have any Archaeological sites recorded within the dyked boundaries of the P/AWMA. There are, however, eight sites along the Pitt River between Grant Narrows and the mouth of Sturgeon Slough, opposite Addington Point. A map of these sites and a site description are found in Appendix 4.

4.0 PROPOSED MANAGEMENT PLAN

4.1 Goals

1) To maintain and/or enhance wildlife and their habitats.

2) Subject to maintenance of the wildlife resource, to provide the widest possible range of wildlife oriented public recreation and education opportunities.

4.1.1 Preservation Requirements

The lower Fraser valley and estuary has been shown to be an important staging and wintering area for a wide range of wildlife species, including waterfowl, raptors and shorebirds. Dyking for agriculture and subsequent urban and industrial development have resulted in the loss of much of the former floodplain habitats along the Fraser River and its tributaries. The protected complex of dyked and undyked habitats found within the P/AWMA contributes significantly to the wildlife resource and biological diversity of the Fraser Delta area. As such, it is essential that the area be preserved, and managed effectively as a Wildlife Management Area.

4.1.2 Management Principles

The following principles are to guide activities taking place within the Pitt/Addington Wildlife Management Area.

1. Management prescriptions are to be cost effective.
2. Wildlife will be used in the broadest sense to include birds, mammals, fish, herptiles, invertebrates and plants.
3. Management will emphasize natural features and habitats: some areas will remain unaltered while others will be managed to maintain desired natural successional stages.
4. Vegetation plantings, if any, will only involve native or locally adapted species.
5. Wildlife introductions, if any, will only involve native or locally adapted species.
6. Management will be primarily for native or locally adapted species. Special management for threatened, endangered, casual or other species

of concern will be accommodated only where the impact on existing wildlife and habitats is low.

7. Plant or animal species having a negative or undesirable impact on management objectives may be controlled.
8. User facilities will be minimal, low-impact, low maintenance, intended for use by major user groups and compatible with management objectives.
9. Contemporary, local native culture is to be accommodated only where the impact on wildlife and habitats is low.
10. Commercial activities, if any, are to be minimal, localized, low impact and servicing primary users in a manner which is compatible with management objectives.
11. The public are to have an opportunity to provide input into broad management decisions.
12. Conflicting public uses are to be resolved through public consultation and regulation.

4.1.3 Management Objectives

The Pitt/Addington Wildlife Management Area will be managed to maintain and enhance a variety of fresh water, moist soil and upland habitats primarily for staging and wintering migratory waterfowl, but also for breeding and resident populations of a wide variety of wetland wildlife and fish.

a) Habitat Management Objectives

1. Provide wintering habitats for waterfowl and raptors.

2. Provide habitats for breeding and resident wetland birds.

3. Provide year round habitats (including mudflats, riverine marshes and dyked) for other resident wildlife and fish.

b) Public Use Objectives

4. Provide opportunities for wildlife and wetland oriented recreation, education and research where they are consistent with the habitat management objectives.

5. Promote public awareness of the importance of wildlife habitat with particular reference to wetland habitats within the Fraser River Delta.

A number of activities are compatible with conservation objective, subject to scheduling and zoning. Others may be identified as management planning proceeds. Some of these activities are as follows:

1. Nature observation, and interpretation, hiking, photography, artistry, berry picking, canoeing	-subject to use limitations during wildlife reproductive periods, and hunting seasons.
2. Intensive Nature Interpretation	-subject to the provision of adequate interpretation and associated facilities, plus interpretation staff.

3. Waterfowl Hunting and related activities	-subject to: the need to provide secure habitat during the fall migration and wintering period; the possible need to lure waterfowl away from adjacent croplands; and satisfactory resolution of problems with non-hunters.
4. Fishing	-subject to: use limitations during sensitive wildlife periods; the needs for water level controls to adequately manage wetlands for wildlife; and fishing regulations.
5. Scientific Studies of wildlife, soils, hydrology and archaeological remains	-subject to approval by BCE.
6. Picnicking and Day Use	-subject to: the provision of adequate waste, toilet, parking and other required facilities, plus administrative staff.
7. Commercial uses	-subject to compatibility with other objectives

4.1.4 Relationship to Provincial/Regional Objectives

Regional Objectives

Given the high biological values and public interest associated with wetlands, regional wildlife management objectives for the south coast are to designate wildlife management area status to significant wetlands. In decreasing order of priority, the habitats of greatest concern are:

1) all Fraser River estuarine habitats
2) other estuarine habitats identified as threatened
3) riverine marshlands along the Fraser, Pitt and Harrison Rivers
4) riparian forest
5) major interior wetlands
6) less valuable wetlands
7) privately owned forest lands
8) crown forest lands

As the P/AWMA is an integral part of the flood plain/riparian habitat complex of the Fraser estuary, protecting it is a high priority.

Provincial Wildlife Management Objectives (B.C. Environment 1991)

1) maintain and enhance wildlife and their habitats, and thus ensure an abundant, diverse and self-sustaining wildlife resource throughout British Columbia

2) maintain, enhance and promote opportunities to appreciate, study and view wildlife in their habitats

3) maintain, enhance and promote recreational opportunities to hunt game species in their habitats.

4) facilitate commercial uses of wildlife

5) protect people and their property from intolerable levels of danger, damage or harassment by wildlife

Aspects of the all five goals are embodied in the concept of the Pitt/-Addington Wildlife Management Area.

4.2 Potential Land and Resource Use Conflicts

4.2.1 Public Use

Most known conflicts involve aspects of public use and are addressed in Appendix 5, which deals with Public Use Policies. Potential conflicts occur in the areas of:

-modes of transport (motorized vehicles, bicycles, horses)
-power boats on lake and river marshes
-powered and nonpowered boating within dyked areas
-dogs
-overnight use
-garbage/litter
-aircraft
-overlaps in hunting/nonhunting use
-commercial operations

4.2.2 Mosquito Control

Mosquito control is becoming increasingly more of an issue as human populations encroach into this wild area. Mosquito control has been practised for a few years already at Addington Point, and there is pressure to spray the Pitt Unit. BCE should explore other options (e.g. swallows) and should insist on sampling first to verify the need to spray.

4.3 Management Prescriptions or Policies

Major management decisions for the P/AWMA are made by BCE in consultation with the Pitt Public Advisory Committee and Ducks Unlimited Canada.

4.3.1 Habitat Enhancement

Habitat objectives have been identified for each of 12 subunits within the Wildlife Management Area. Operation and maintenance of the dykes and water control structures is done jointly by BCE and DU according to an operations plan which is reviewed and adjusted annually. Habitat management is generally done by BCE, although DU sometimes helps.

Habitat management involves a variety of techniques including water management, soil turning, mowing/haying, burning and brush clearing. These are discussed in relation to each of the following compartments and areas. Compartments, water control structures, and direction of water movement are shown on Figure 3.

a) Addington Point - dyked

Management Objective: To produce food for migrating waterfowl.

Rational: This former floodplain area was once a productive intertidal marsh, perhaps similar to other riverine marshes. Since dyking, it has begun to revert to monotypic stands of unproductive species.

Description: The area is characterized by monotypic stands of wool-grass (*Scirpus cyperinus*), hardhack (*Spiraea douglasii*), night shade (*Solanum* sp.) sedges (*Carex* spp.), grasses etc. Interspersed throughout are channels and ponds, all connected to a perimeter ditch and an outlet control. The most abundant aquatic vegetation in these open water areas is the common water lily (*Nuphar luteum*.

Management Activities: Several areas were scarified, as BCE and DU projects, to produce smartweed and other annuals. Experience has demonstrated that a spring (prefreshet) drawdown results in many plants germinating early (although not smartweed). When flooded with cold freshet water, most desirable species die, while *Scirpus* and *Spiraea* thrive. On the other hand, high spring water levels have resulted in duckpotato (*Sagittaria*) and other desirable aquatics growing in the scarified areas. The advantages of high spring water levels are that it retards the growth of the two predominant emergent species, and encourages the growth of more desirable aquatics. It is also necessary to equalize the pressure of the high freshet waters to prevent damage to the old, narrow dykes. A post freshet drawdown, except in years after a late freshet, will still give time for smartweed to germinate and mature.

The area has been kept flooded as much as possible between fall and early spring to attract migrating birds. The summer low water permits equipment access for dyke maintenance and soil scarification. Water control is achieved by a two way screw gate/stoplog structure at the down stream end (Figure 5).

Future Management: Future management will involve experimenting with the above and other methods, within the limitations imposed by the dyke condition and the freshet, in an effort to produce food for fall migrants. Potential activities include level ditching, creating islands and internal dyking to create impoundments for management purposes.

b) Addington Point and Pitt River Marshes

Management Objective: To allow the river marshes to function in a natural condition for wildlife.

Rational: Remnant, undyked riverine marshes are productive habitats, providing food and living space for a variety of birds, mammals and fish. Such areas are very important to rearing salmonids.

Description: Intertidal, fresh water, riverine marsh consisting largely of *Carex* sp.

Management Activities:

Management will be passive, being limited to encouraging wildlife viewing from the dykes and permitting canoeing, fishing and hunting activities.

Future Management:

No change is proposed at this time, but future activities could include measures to increase edge and productivity. Such measures, subject to DFO approval, could include ditching or weirs. Tree plantings along the upland edges for osprey nests or raptor perches is another option.

c) Pitt Lake Marsh

Management Objective: To maintain and encourage use by waterfowl, fish and other wildlife. To protect an unique natural physical and botanical phenomenon.

Rational: The reverse delta at the mouth of Pitt Lake is one of very few examples of its kind in the world. In addition, recent studies indicate that the plant associations phenology are very unusual. The area is known to be an important feeding area in the fall and early winter for migrating ducks, and for swans. It is also very productive salmon rearing habitat.

Description: This mud/sand flat lies just above and below the "0" tide level. The vegetation is predominantly pondweeds, quillworts and other submergent species, with a few rings of emergent softstem bulrush (*Scirpus validus*).

Management Activities: Pitt Lake Marsh has no management tradition.

Future Management: Its unique vegetation communities, structure and phenology make it an ideal site for study. Two management options remain viable, pending further study. One is management activities to encourage those plant communities which are demonstrated to be most valuable to fish and waterfowl. What such techniques might be are currently the object of study. The second, and perhaps more desirable, option is to protect the area as it is.

d) Osprey/Munmunta Basin

Management Objective: This area is designed primarily as a catchment basin to divert the high volume of nutrient poor water coming from the Malcom Knapp UBC Research Forest mountainside. It is also used to supply water to the Pitt and Homilk'um Marshes and Crane Reserve South Compartment when they require recharging.

Rational: This area is required by the NPPID who have jurisdiction over the dykes separating it from the rest of the management area.

Description: The vegetation here is largely *Spiraea douglasii*, *Myrica gale*, and *Scirpus cyprinus*. Water levels are subject to wide fluctuations. It is used extensively by Wood Ducks.

Management Activities: There have been no habitat management activities here within the wetland areas. Stop logs exiting to Pitt Lake (Control number 5) are all removed for the late fall to early spring period. The water level at other times depends on the current management in adjacent compartments. The grassed dyke slopes are mowed annually for vegetation control and goose graze. Hunting occurs in Munmunta Basin.

Future Management: Potential future management here includes management of the dense stands of vegetation, and fish enhancement, possibly through edge creation.

e) Katzie Marsh

Management Objective: To maintain a good mix of emergent vegetation and open water for year round use by wildlife. To encourage the reestablishment of formerly more dense stands of bulrush (*Scirpus validus*), and to discourage the encroachment of dense shrubby species.

Rational: As the lowest compartment in the Pitt Unit, this could be most easily managed for pre-dyking, marsh vegetation communities. While some plant species are less abundant than historically, or have disappeared, the area has not seen encroachment of *Spiraea* and *Scirpus cyprinis* and other undesirable species to the same extent as other compartments.

Description: This subunit has the most open water. Its shallows have abundant pondweeds and a stand of *Scirpus validus*. Some of the higher areas are characterized by *Spiraea* sp., *Myrica* sp. and purple loostrife *Lythrum salicaria* (purple loostrife). It contains 35 nesting islands (Figure 3).

Management Activities: The construction of the nesting islands, and water level management have been the primary habitat management activities here. The water level has changed from year to year depending on management objectives. The water level is lowered during the winter to prevent erosion of the inside of the lake dyke during winter storms. The levels are regulated at control number 4. There is no hunting in this subunit because of the popularity of the lake dyke with the public.

To discourage beavers, many of the large cottonwoods along the Nature and Waterfall Dykes have been ringed with chicken wire. For walking and nature study, a trail has been constructed along the forested Nature Dyke, to complete a circuit with the more open Waterfall, Osprey and Pitt Lake Dykes. Two viewing towers have been placed along these dykes.

Future Management: Future management activities will focus on reestablishment of native wetland species. This will require lower water levels in the open water areas, which will then encourage undesirable species in the higher areas. Therefore some vegetation management, such as cutting and burning, may be required. Carp control may also be an asset.

Since the cottonwoods were removed from the Lake Dyke for dyke management purposes, this part of the marsh has been both without cover and without raptor perches. For both wildlife management and dyke erosion purposes, a berm may be built inside the dyke and planted with trees.

f) Pitt Marsh

Management Objective: To improve productivity by maximizing diversity and maintaining a good interspersion of channels and open water areas.

Rational: The channels in this compartment receive much use by wintering and breeding water birds, and this should be encouraged. Many areas have a tendency to form monotypic stands of less productive species, thus requiring some management to increase habitat diversity.

Description: Pitt Marsh is higher than Katzie marsh, and exhibits denser, more extensive stands of *Spiraea douglasii* and *Scirpus cyperinus* and less open water. The water is usually kept highest (5 feet) during the spring and summer.

Management Activities: Except for the smaller "subcompartments" of this area (dealt with in the next section), there has not been any vegetation management here. All management has been done via water level control. During fall and early winter water has generally been kept at an intermediate level to both benefit migrant waterfowl and enable boat access for hunters. The water level has been lowered to the invert elevation of control 3 for winter drainage. Stop logs at outlet control 7, into Katzie Marsh have been set so as to prevent excessive levels in Katzie Marsh, because high winter water levels in that subunit can result in erosion of the lake dyke.

Dykes have been mowed for vegetation control and to provide goose graze. In particular, the Homilk'um Dyke is managed for its waterfowl benefits.

Future Management: Management throughout most of this compartment will concentrate on controlling *Spiraea douglasii* and encouraging emergent aquatics, through water level control and possibly through cutting and burning.

g) Pitt Marsh North One, Pitt Marsh North Two and Crane Reserve South Subcompartments

Management Objective: These three units (Figure 3) have similar habitats and management objectives. The objectives are to create diversity by maintaining early successional plant communities, especially smartweeds which are more productive than the existing ones, primarily to benefit migrating waterfowl and shorebirds.

Rational: There are an abundance of *Spiraea douglasii* and *Ciprus cyperinis* communities, both of which have low values for wintering waterfowl and other marsh birds. The presence of dyking has eliminated natural water level fluctuations and other natural disturbances which create habitat diversity by restoring earlier successional communities.

Description: These areas consist of dense monotypic stands of hardhack and wool-grass growing on higher elevation, wet to moist soil which dries out over the summer.

Management Activities: Through low berms and water controls, these subcompartments have been managed independently from the compartments in which they exist. The vegetation was cut and the soil turned, and in some cases disked.

Future Management: To be effective, soil scarification will have to be done biannually until the existing vegetation is under control. After this, prescribed burning and flooding will likely be adequate. Initially, the addition of additional smartweed seed may also be necessary.

To operate the North One and North Two subunits without affecting the Pitt Marsh water levels, pumping to and from Katzie Marsh may be necessary. Some refinement of the ditching will also be necessary. Similarly, water transfer to the Crane Reserve South from Homilk'um Marsh will enable operation independent of the remainder of the Crane Reserve.

h) Homilk'um Marsh

Management Objective: To maximize the diversity of habitat types and maintain a good interspersion of open water areas and by controlling undesirable species, primarily for the benefit of migrating and breeding waterfowl and water birds.

Rational: Many areas have a tendency to form monotypic stands of less productive species, thus requiring some management to increase habitat diversity.

Description: This area is characterized by dense stands of *Spiraea douglasii* interspersed by areas of open water and/or grass. Thirty five islands were built in the largest area of open water. The Homlik'um Dyke was designed with 5:1 side slopes specifically to create a large surface area and to accommodate mowing, to manage for goose grazing.

Management Activities: Spring levels were kept as high as possible for several years in an attempt to control *Spiraea*. The plants were greatly stressed, but continued to grow. More recently, maintaining lower summer levels, combined with burning appears to have encouraged more desirable grass and moist soil plants in the shallows along the dykes. As with other dyked compartments, stoplogs are removed (control number 10) for the winter to accommodate the heavy rainfall.

Dykes have been mowed annually for vegetation control and goose graze. Beavers have been a chronic problem, often requiring the clearing of plugged culverts.

In an effort to increase the productivity of this area, agricultural run-off was pumped into here for several years. Likewise, pig effluent was dumped experimentally. Neither was effective.

Future Management: Future management will continue to address the control of dense stands of *Spiraea*.

i) Crane Reserve

Management Objective: To manage primarily to maintain the naturally occurring bog ecosystem in and adjacent to the Ecological Reserve, and for Greater Sandhill Crane nesting habitat. Peripheral areas to be managed for diversity.

Rational: The Pitt Polder Ecological Reserve was established to preserve the remnant bog habitat. Sandhill cranes nest in this area, and in other lower mainland locations, have traditionally nested in remote bog habitats which are now uncommon.

Description: The vegetation is spiraea and other shrubs interspersed with mossy openings. Around the base of the Pitt Polder Ecological Reserve is a pine bog community. This area also includes a portion of hillside forested by hemlock, cedar and birch. Cottonwoods grow along the berms of old drainage ditches.

Management Activities:
The water level is set high throughout the year.

Future Management: Refinement is needed to the water regime to prevent the encroachment of nonbog vegetation. This will require higher summer water levels, which may be achieved by the blocking of drainages along the northwest part of the reserve. A trail may be built up the east side of the mountain.

j) West Compartment

Management Objective: To maximize the diversity of habitat types and maintain a good interspersion of open water areas, and to retard the succession of upland species.

Rational: Some habitats occur here which are not found in the rest of the P/AWMA, however open water areas are being overgrown and some dense monotypic stands of common species are forming.

Description: The vegetation is largely grasses and sedges with willow, crabapple and other shrubs. Old channels divide the area with sloughs and ponds. Water sources are rainfall and underground seepage from the Pitt River. The water empties through a floodgate at the north end into the Pitt River. Thus, the water level is influenced by the river level, being highest during the freshet.

Management Activities: This former flood plain marsh is surrounded on all sides by dykes and roads, however, it has received no management, other than the filling with sand of a small ditch in the northeast corner in preparation for a parking lot.

Future Management: Management options have yet to be confirmed for this area. Eventual management will draw upon the experience gained in other parts of the P/AWMA. One possibility is to leave the area as is. Another is to do ditching both to maintain existing channels which have tended to grow over since direct flooding from the river was cut off by the dyke, and to create additional openings. Another potential activity is vegetation control,

especially for the purpose of moist soil farming. This would require the creation of subcompartments.

Before any of these activities are pursued, a contour survey will be done by Ducks Unlimited Canada. All of these options, and perhaps others, will have to be weighed against: the values of the existing vegetation; the difficulty of establishing any effective water control; and the management desires of all interested user groups.

k) Pitt Polder Ecological Reserve

Management Objective: The objective of the Ecological Reserves Program for this site is to "protect an undisturbed peat-sedge relic bog in the Fraser Valley."

Rational: Such sites are now rare

Description: This 88 ha site is a peat-sedge pine bog surrounding a two peaked granitic outcrop (Pine Mountains) forested with hemlock, cedar and birch.

Management Activities: None. Unofficial trails lead to the top of the bluffs.

Future Management: None. No management toward maintaining/restoring natural water levels

4.3.2 Public Access and Day Use Facilities

Foot access to the Pitt Unit is provided at two locations. Grant Narrows Park is the point from which most day users proceed to the Lake and Nature Dykes and the north end of the trail long the mountain side. These are the most heavily used areas. The Lake Dyke is also a gated, gazetted road which receives additional daily use by Fletcher Challenge vehicles communing to and from their boat launch at the east end. On the south side of the Pit Unit, at the corner of Koerner and DeKoster Roads, is a small parking lot from which entry can be gained to the Crane and Snake Rock (Koerner Rd) dykes and to the south end of the mountain trail. The West Compartment can be viewed via the Pitt River Dyke, Koerner Road and Rannie Road.

There is a boat launch at Grant Narrows and canoe access is possible from both of the above locations, plus from Catbird Slough, just west of Pitt Marsh North Two Compartment (Figure 3).

At the Addington Unit, foot access is possible from the Minnekhada Regional Park parking lot and requires a walk in excess of two kilometre, and via De Boville Slough. Canoeists may reach the undyked marshes from De Boville Slough, about five kilometres downstream, or from Grant Narrows, about seven kilometres upstream.

The only other facilities are a barge slip and chemical toilets at Grant Narrows Park. Commercial canoe rentals are also available at Grant Narrows.

4.3.3 Viewing, Interpretation Public Involvement

Wildlife Viewing Development Plan is being done for the P/AWMA will propose additional observation towers, pavilions and blinds, likely to be situated along the Nature, Crane and Rannie Dykes and at Heron Cove (Figure 3). These will supplement those already in existence (Section 3.5). Some seasonal restrictions will apply to the use of trails, and access to viewing structures located on restricted trails, particularly during the Sandhill Crane nesting season. This is discussed further in the public use regulations presented in Appendix 5.

This study will also outline the content and locations of signage which is desirable for both informational and interpretive purposes.

There has been a long standing interest in the provision of an interpretation centre. This will likely be located northeast of the corner of Rannie and Koerner Roads. So far this facility has been approved in principle but no design has been drawn or construction schedule proposed. The actual implementation of this concept will await the proper combination of financial commitment and community interest and involvement.

4.3.4 Public Use Regulations

Public use regulations are provided in Appendix 5. The high degree and variety of public use of and interest in this area, require an extensive set of regulations. The regulations provided in the appendix are designed to address concerns raised by members of the Pitt Public Advisory Committee in 1988. The changing nature of public demand may require periodic (annual) review and revision of the regulations as necessary.

4.3.5 Agriculture

All agricultural activity proposed for the P/AWMA has been discussed in section 4.3.1 a and g. No other agricultural activities are proposed for the site.

4.3.6 Trapping

Commercial trapping of beaver and muskrat has been permitted here only as a dyke protection measure. All future trapping would be done under similar permit. If bears became a serious threat to human safety at either Addington Point of along the Malcom Knapp UBC Research Forest trail, trapping and relocation would be considered.

4.3.7 Wildlife

a) Wood Ducks: Boxes have been placed in the cottonwoods, particularly at the south end of the Nature Dyke and on the Waterfall Dyke, and on posts along the Homilk'um Dyke. These are used by Wood Ducks, Hooded Mergansers and other species. They were initially placed by private clubs, in particular the Pitt Waterfowl Management Association. More recently, BCE has been placing and maintaining the boxes with summer work crews. This program will continue.

b) Canada Geese: This site is used as a drop-off site for Canada Geese rounded up at various locations in Greater Vancouver. It was used annually for several years and still receives occasional use. Such opportunity to place geese will probably continue until as long as it remains in favour with the local community.

c) Greater Sandhill Cranes: In the 1980 and 1983 a Sandhill Crane reintroduction program was conducted for two years. This program saw the hand rearing and release of 22 birds. A few of these birds still remain in the area. As mentioned in earlier sections, habitat management activities and visitor use regulations in the Crane Reserve are intended to encourage nesting by this species.

d) Tundra/Trumpeter Swans: The number of swans wintering in the Pitt and Pitt Lake Marsh Units have increased dramatically in recent years. Future management activities may specifically address their presence.

e) Osprey: The osprey is another species of potential management interest. While there are currently numerous nest sites for these birds, the provision of artificial sites would be considered if the need arose. The preferred management would be to assure an adequate supply of deciduous snags.

4.3.8 Research & Education

A wealth of opportunities exist for wetland, waterfowl and related education and research in the Pitt/Addington Wildlife Management Area. Many students from the B.C. Institute of Technology's wildlife program have used the P/AWMA as a site for studies on waterfowl, vegetation, bio-physical parameters of wetlands and other subjects. The area has also been the subject of at least two Master's Degree theses and one Doctoral thesis.

4.3.9 Water

The water licenses applicable to the P/AWMA give adequate security of and control over water levels for wildlife management.

4.3.10 Mining

BCE has no surface mineral rights within the P/AWMA. The existing mineral claims on the east side of Pitt Lake are surrounded by the Malcom Knapp UBC Research Forest. The research forest has an existing staking and placer reserve and have denied any right-of-way through their property to the Pitt Lake Dyke, the only potential road access. Use of the Pitt Lake Dyke for access purposes is unlikely in any event, because the local roads and bridges are not capable of supporting heavy equipment.

The only other route for any equipment and/or ore to be transported to these sites would be by ship or barge. This would not impact directly on the Pitt Lake Marsh, but there would be concerns regarding changes in river/lake hydrology resulting from any docking structures constructed, and concerning erosion from the wash of deep hulled vessels moving through Grant Channel. The Wildlife Branch's position regarding any potential development of these claims is one of caution, at best.

4.3.11 Forestry

No forestry is practised in the P/AWMA. Forests within the P/AWMA include the uplands at Addington Point, east side of Pine mountain and the lower mountain slopes southeast of Munmunta Basin. The trail system along the Pitt Unit hillside is largely on Malcom Knapp UBC Research Forest property and as such is subject to U.B.C. policy. There is occasionally selective logging within the research forest by methods which are visually unobtrusive.

4.3.12 Land Alienation

It would be desirable to acquire any adjacent parcels of land which would complement the Wildlife Management Area. Three such parcels have already been placed on a list of desirable acquisition.

Land within the P/AWMA which is currently dedicated for purposes other than wildlife and habitat management include DARD's Grant Narrows Regional Park, the site used by Fletcher Challenge as a boat launch and for equipment storage at the east end of the Lake Dyke, and the care takers residence at Addington Point.

4.3.13 North Pitt Polder Improvement District

An agreement is desirable with the NPPID to accommodate the greatest possible flexibility in managing water levels in the Munmunta-Osprey Basin area so as to ensure the greatest water control possible of the Katzie, Pitt and Homilk'um Marshes. There is no existing understanding in writing which outlines the responsibilities and obligations of both parties under both foreseen and unforseen circumstances. Such an agreement would help prevent decisions (such as who paid for the 1990 and 1991 flood damage) being made on an ad-hock basis.

4.3.14 Cooperation with Other Agencies

In section 3 several agencies were listed with which it would be desirable to work cooperatively to achieve common goals, particularly regarding visitor use.

Given the public interest in canoeing from Grant Narrows to Widgeon Creek, cooperative wildlife/habitat management or visitor use programs/facilities would be desirable between BCE (P/AWMA), DARD (Grant Narrows Regional Park), GVRD (Widgeon Valley Reserve Regional Park) and CWS (Widgeon Valley National Wildlife Area).

There is potential further enhance the integration of Minnekhada Park (Municipality of Coquitlam) and Addington Point Marsh (BCE) visitor use features through information brochures, etc. and by cooperative planning of access control and use facilities or programs.

The greatest opportunity for expanding recreational opportunities into adjacent areas lie with the Malcom Knapp U.B.C. Research Forest and Golden Ears Provincial Park. As both are eager to connect with the P/AWMA trail systems, discussions to work on the details of a cooperative venture should

prove to be fruitful. These discussions would also include a policy to restrict use during times of high fire hazard.

5.0 LEGAL ARRANGEMENTS

Ducks Unlimited Canada has two 30 year legal agreements with the Ministry of Environment, Lands and Parks. One, dated 6 September, 1984 covers the lands at Addington Point and one dated 7 September, 1984 covers the Pitt Unit (Appendix 1). Under these agreements DU is required to construct and maintain all dams and other works to improve and preserve the lands as suitable habitat for waterfowl and other wildlife. This activity is to include all design, surveys and licensing.

A 99 year lease agreement from the Nature Trust of B.C. (Formerly the National Second Century Fund) to the Ministry of Environment, Lands and Parks (Formerly Ministry of Environment) was effective starting 1 June, 1978 (Appendix 1).

The DARD operates Grant Narrows Regional Park under a 20 year lease (expiring 31 December 2009) with BCE.

At Addington Point, a letter of agreement permits a live-in warden to occupy the caretaker's house on the dyke southwest of the control structure. The license is dated 1 August, 1981 and contains a termination clause which provides for cancellation on one months written notice by either party (Appendix 1).

No legal arrangement currently exists between BCE and Fletcher Challenge Canada Ltd. Such an agreement is being perused.

6.0 PROVISIONS FOR REVIEW

The management plan will be reviewed and amended as required. This would probably be every five years, or at the discretion of the Regional Director of Environment, or based on considerations deemed important to both BC Environment and BC Lands as defined in the protocol agreement between them.

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Appendix 1. Pitt Wildlife Management Area, Land Status and Private Agreements.

DESCRIPTION	DATE	STATUS	COMMENTS
Pitt Unit			
1) 1192 ha of Pitt Polder lands (all except Katzie Marsh, Figure 2)	1973	Green Belt Fund Act	Purchased from Pitt Polder Co. Ltd. & Administered by the Land Mgt. Branch
	Mar 16 1984	Order-in-Council No. 495	Transfer of Admin. to Min. of Environment for 60 years
	Sept 7 1984	Ducks Unlimited Canada Conservation Agreement	Gives DU permission to construct & maintain water control structures & manage water levels
	June 11 1987	Order-in-Council No. 1154	Became the Pitt Wildlife Management Area under the authority of the Wildlife Act, section 4
2) 267 ha of dyked crown foreshore marsh Katzie Marsh in Figure 2	1958	Order-in-Council	Crown foreshore established as a game reserve
	1974	Crown Reserve under sec. 93 of the Land Act	Public Shooting Marsh (crown foreshore) came under administration of the Land Mgt. Branch
	Apr 17 1985	Order-in-Council No. 713	Transfer of Admin. to Min. of Environment for 60 years
	Sept 7 1984	Ducks Unlimited Canada Conservation Agreement	Gives DU permission to construct & maintain water control structures & manage water levels

continued...

	June 11 1987	Order-in-Council No. 1154	Included in Pitt WMA under the authority of the Wildlife Act, section 4
Addington Unit 283 ha	June 1 1978	Lease	99 year lease to Min. of Environment from Nature Trust of B.C.
	Sept 6 1984	Ducks Unlimited Canada Conservation Agreement	Gives DU permission to construct & maintain water control structures & manage water levels
	June 11 1987	Order-in-Council No. 1154	Included in Pitt-Addington WMA under the authority of the Wildlife Act, section 4
Pitt Lake Unit 1140 ha of tidal flats at S. end of Pitt Lake	June 11 1987	Order-in-Council No. 1154	Included in Pitt WMA under the Wildlife Act, section 4

Appendix 2.1. Dominant wetland, moist soil and aquatic plant species occurring in the Pitt and Addington Units of the Pitt/Addington Wildlife Management Area.

LATIN NAME	COMMON NAME
Wetland and moist soil species	
BRYOPHYTES	
Sphagnum capillaceum (Weiss) Schrank	Sphagnum moss
VASCULAR PLANTS	
EQUISETACEAE	
Equisetum arvense (L)	Horse tail
CYPERACEAE	
Carex rostra Stokes	Sedge
Eriophorum chamissonis C.A. Mey	
Scirpus validis	Hard stem bulrush
S. cyperinus (L) Kunth	Hairy seeded bulrush
GRAMINEAE	
Calamagrostis canadensis (Michx.) Beauv.	
Phalaris arundinacea (L)	Reed canary grass
TYPHACEAE	
Typha latifolia (L)	Cattail
MYRICACEAE	
Myrica gale (L)	Sweet gale
ROSACEAE	
Spiraea douglasii (L)	Hardhack
ERICACEAE	
Ledum groenlandicum Oeder	Labrador tea
Underwater and Floating Leafed Species	
ALGAE	
CHARACEAE	
Chara spp.	Muskgrass
VASCULAR PLANTS	
NYMPHAEACEAE	
Brasenia schreberi Gmel.	Water shield

Nuphar polysepalum	Yellow Water Lily

continued...

CERATOPHYLLACEAE	
Ceratophyllum demersum	Coontail
CALLITRICHACEAE	
Callitriche spp.	Water Starwort
POLYGONACEAE	
Polygonum persicaria (L)	Water smartweed
LENTIBULARIACEAE	
Utricularia vulgaris (L)	Common bladderwort
Utricularia intermedia	Flatleaf Bladderwort
HALORAGIDACEAE	
Myriophyllum hippuroides	Variable Water Milfoil
Myriophyllum exalbescens	Northern Water Milfoil
JUNCACEAE	
Juncus supiniformes	
CYPERACEAE	
Scirpus subterminalis	Water Bulrush
HYDROCHARITACEAE	
Elodea nuttallii	Common Elodea
POTAMOGETONACEAE	
Potamogeton gramineus (L)	Variable pondweed
Potamogeton 7 spp. none individually common	Pondweeds
SPARGANIACEAE	
Sparganium spp.	Burreed

Additional AQUATIC SPECIES recorded as abundant or common by Pringle and Jury (1980)

Appendix 2.2. Plant species and biomass of sampled quadrats within Pitt Lake Mudflats, 1991

Substitute Table (same name) on page 9 of envirowest report.

Appendix 3. Wildlife of the Pitt/Addington Wildlife Management Area.

Appendix 3.1. Bird species recorded in the Pitt Unit.

Most common species in Pitt Unit census in relative order of abundance

Marsh Wren
Red-winged Blackbird
Common Yellowthroat
Northern Harrier
Great Blue Heron
Common Snipe
American Bittern
Mallard
Virginia Rail
American Robin
Song Sparrow
Ring-necked Pheasant
American Goldfinch
Black-capped Chickadee
Cinnamon Teal
American Coot
Blue-winged Teal
Brown-headed Cowbird
Savannah Sparrow
Yellow-headed Blackbird
Sora Rail

Less abundant species

Common Loon
Pied-billed Grebe
Trumpeter Swan
Sandhill Crane*
Canada Goose
Pintail
Gadwall
American Wigeon
Shoveler
Green-winged Teal
Wood Duck
Ring-necked Duck
Common Goldeneye
Bufflehead
Common Merganser
Hooded Merganser
Turkey Vulture
Sharp-shinned Hawk
Rough-legged Hawk
Bald Eagle
Red-tailed Hawk
Osprey
Gyrfalcon
American Kestrel
Killdeer
Spotted Sandpiper*
Greater Yellowlegs
Western Sandpiper*
Sandpiper sp.
Glaucous-winged Gull
Band-tailed Pigeon
Short-eared Owl*
Vaux's Swift
Rufous Hummingbird
Belted Kingfisher
Common Flicker
Hairy Woodpecker*
Downy Woodpecker*
Eastern Kingbird
Willow Flycatcher
Barn Swallow
Tree Swallow
Violet-green Swallow
Northwestern Crow
Common Raven
Bushtit
Varied Thrush*
Swainson's Thrush
Water Pipit
Cedar Waxwing
Northern Shrike
Starling
Yellow Warbler*
Yellow-rumped Warbler
Western Meadowlark
Black-headed Grosbeak
Tree Sparrow (uncommon)

Many other species occur but most are less common than those listed.

From Runyan (1978) Table 21.
* Additional species listed in the PWMA Draft Management Plan (1976) which could be expected to occur regularly within the P/AWMA dykes.

Appendix 3.2. Mammals observed in the Pitt/Addington Wildlife Management Area.

Wandering Shrew	*Sorex vagrans*
Bat species	*Eptesicus, Myotis*
Eastern Cottontail	*Sylvilagus floridanus*
Varying Hare (pine forest)	*Lepus americanus*
Chipmunk (pine forest)	*Eutamias townsendii*
Beaver	*Castor canadensis*
White Footed Deer Mouse	*Peromyscus maniculatus*
Meadow Vole	*Microtus townsendii*
Muskrat	*Odatra zebethicus*
Coyote	*Canis latrans*
Black Bear	*Ursus americanus*
Raccoon	*Procyon lotor*
Short-tailed Weasel	*Mustela erminea*
Long-tailed Weasel	*Mustela rixosa*
Mink	*Mustela vison*
Wolverine	*Lulo luscus*
Striped Skunk	*Mephitis mephitis*
River Otter	*Lutra canadensis*
Cougar	*Felis concolor*
Harbour Seal (river & lake)	*Phoca vitulina*
Black-tail Deer	*Odocoileus hemionus*

Other species also occur.

From Robinson & Robinson (1976), Wildlife Branch (1976), Runyan (1978).

Appendix 3.3. Herptiles observed in the Pitt Unit of the P/AWMA.

Northwestern salamander	*Ambystoma gracile*
Green frog	*Rana clamitans*
Bull frog	*Rana catesbeiana*
Tree frog	*Hyla regilla*
Western Toad	*Bufo boreas*
Northern Aligator lizard	*Gerrhonotus principis*
Common garter snake	*Thamnophis sirtalis*

From Runyan (1978), BCE staff pers. obs.

Appendix 3.4. Fish observed in the Pitt/Addington Wildlife Management Area.

Addington Unit (Wildlife Branch, 1979)

Brown Catfish	*Ictalurus nebulosus*
Squawfish	*Ptychocheilus oregonensis*
Black Crappie	*Pomoxis nigromaculatus*
Large-scaled Sucker	*Catostomus macrocheilus*
Carp	*Cyprinus carpio*
Mirror Carp (1 specimen)	
3-spined Stickleback	*Gasterosteus aculeatus*

Pitt or Addington Units (Coquitlam Area Mountain Study, 1981)

Coho Salmon	*Oncorhynchus kisutch*
Chum Salmon (Addington)	*O. keta*
Sockeye Salmon (Addington)	*O. nerka*
Steelhead (Addington)	*Salmo gairdneri*
Cutthroat Trout	*S. clarki*
Brown Catfish	
Squawfish	
Black Crappie	
Largescale Sucker	
Carp	
Sculpin	Cottidae

Katzie Marsh, Pitt Unit (Fletcher 1987)

Carp	
Brown Bullhead	*Ameiurus nebulosus*
Black Crappie	
Catfish	

Pitt Lake -additional species (Coquitlam Area Mountain Study, 1981)

Sturgeon	*Acipenser* sp.
Eulachon	*Thaleichthys pacificus*

Pitt Lagoon and Sturgeon Slough (Tera et al, 1991)

Black Crappie	
Prickly Sculpin	*Cottus asper*
Peamouth Chub	*Mylocheilus caurinus*
Northern Squawfish	
Stickleback	
Brown Bullhead	
Red-sided Shiner	*Richardsonius balteatus*

Appendix 4. Heritage Sites in the vicinity of the P/AWMA.

-Map

-Site descriptions

Appendix 5. Public use policies for the Pitt/Addington Wildlife Management Area.

These policies will be reviewed regularly and may be revised from time to time to reflect changing needs and public demands. They will be enacted in legislation, and become the basis for public use regulations.

1.0 Modes of Overland Transportation

Policies for the control of access into the WMA so that there will be a minimum of disturbance to wildlife, minimum impact on the habitat and low requirement for maintenance of works and facilities.

1.1 Pedestrian Access

Public access is permitted to all trails and dykes with the exception of:

-Addington caretaker's residence (dyke house)

-Fletcher Challenge site at the east end of the Pitt Lake Dyke

-Dykes which are closed during the crane breeding season between April 1 and June 15, namely: Crane Dyke, Crane Reserve South Dyke, Homilk'um Dyke, such other dykes as may be posted from time to time

-The U.B.C. forest trail when there is a fire closure. Announcement of such a closure will be the responsibility of the U.B.C. Research Forest, and posting of the closure will be the responsibility of the Wildlife Branch, B.C. Environment, Surrey.

Pitt Bog Ecological Reserve: The public must adhere to the Ecological Reserves regulations.

Grant Narrows Regional Park: The public must adhere to such regulations as the DARD establish.

1.2 Motorized Vehicles

Authorized access only. There will be no vehicle access to the general public except on gazetted, ungated roadways.

1.3 Bicycles

Bicycles will be permitted only on the Pitt Lake and Pitt River Dykes of the Pitt Unit, and to the extension of DeKoster road west of Rannie Road.

1.4 Equestrian

Equestrian traffic will be permitted only the Pitt Lake and Pitt River Dykes and to the extension of DeKoster road west of Rannie Road, in the Pitt Unit.

2.0 Water Craft

[Tom, Jack: you will have to decide who you want, when, where and by what mode of transport. How do you allow anglers in, yet restrict recreational boating? Would angling and hunting be compatible? When would motor boats be permitted but not canoes, or vice versa? (The existence of a hunting season makes it easier to give them exclusive motor boat access during that period). Some of the changes suggested in the edit conflicted with each other and with some of the decisions made at our earlier meeting.]

2.1 Jet Skiis and Similar Recreational Craft

Use of these craft within the WMA will be prohibited due to concerns regarding:

-disturbance to wildlife
-potential damage to the vegetation communities of the Pitt Lake Marsh
-disruption of quiet public enjoyment

the use of these craft will be prohibited and, in so much as regulations (via DARD and Fraser Port) can be enacted, they will be disallowed from using Grant Narrows boat launch and Grant Channel.

2.2 Motor Boats

Addington Unit:
By permit only inside the dykes. There will be no motor boat access to the general public.

Pitt Unit:
By permit only. There will be no motor boat access to the general public to
-the West Compartment
-the Crane Reserve

For the purposes of hunting access and associated activities, trapping and angling, seasonal access will be permitted to:
-Katzie Marsh (not hunting in this compartment)
-Pitt Marsh
-Homilk'um Marsh
-Munmunta basin, south of Katzie Marsh

The season and areas of use will differ for the different user groups. Between October and January, motor boat access will be only for hunting or trapping. For angling, motors will be permitted in September (?) Registered trappers will also be permitted between November and March.

Pitt Lake Marsh Unit:
There are currently no restrictions.

2.3 Canoes & Row Boats

Addington Unit:
By permit only inside the dykes. There will be no canoe access to the general public.

Pitt Unit:
Except as indicated below, recreational canoeing is permitted between April 1 and September 30 only in:

-Katzie Marsh
-Pitt Marsh
-Homilk'um Marsh
-Munmunta/Osprey basin
-West Compartment

In the Pitt Marsh compartment, access will confined to the main channels only between April 1 and June 15. During this period the side channels will be closed.

By permit only to the Crane Reserve. There will be no canoe access at any time to the general public.

For the purposes of hunting access and associated activities, trapping and angling, seasonal access will be permitted to:
-Katzie Marsh (not hunting in this compartment)
-Pitt Marsh
-Homilk'um Marsh
-Munmunta basin, south of Katzie Marsh
-West Compartment

The season and areas of use will differ for the different user groups. Between October and January, canoe access will be only for hunting or trapping. For angling, canoes will be permitted in September (?) Registered trappers will also be permitted between November and March.

Pitt Lake Marsh Unit:
There are currently no restrictions.

3.0 Aircraft

There will be no aircraft use of any area within the P/AWMA except under permit and except for emergency landings.

The minimum elevation over all parts of the P/AWMA will be 1000' (305 m) except for:
-emergency use
-permitted surveys, etc., by management agencies

4.0 Hunting

In keeping with traditional use of the P/AWMA, and in fulfilment of part of the WMA mandate, waterfowl hunting will continue to be permitted in certain areas, subject to conservation needs and public safety. The increasing non-hunter use of the area has been, and will likely continue to be recognized through spacial separation during the four month hunting period.

Addington Unit:

Waterfowl hunting only is permitted on the river marsh. There is discharge of firearms permitted from or within the dyke.

Pitt Unit:

Waterfowl hunting will be permitted during the legal hunting season in the Pitt Marsh compartment, Homilk'um Marsh, the West compartment and Munmunta Basin south of Katzie Marsh.

Pitt Lake Marsh Unit and Pitt River Marshes:

Waterfowl hunting is permitted here.

5.0 Fishing

The only restrictions on fishing will be those imposed by the Provincial Fresh Water Fishing Regulations and by pedestrian and water craft access regulations discussed above.

6.0 Trapping

Trapping will be allowed under permit for species which cause damage to water control structures (i.e. beaver, muskrat).

7.0 Releasing Animals

No animals shall be introduced or released into the P/AWMA except as part of a permitted wildlife management program.

8.0 Dogs

Dogs will be confined to the Lake Dyke only except for
-guide dogs for the visually impaired
-hunting dogs used for hunting during the legal waterfowl hunting season in areas which are open to hunting.

Dogs must be on a leash at all times except when being used for hunting.

9.0 Vegetation Alteration

There shall be no cutting, picking, introduction or altering of the vegetation within the P/AWMA except by authorized personnel for habitat management purposes.

10.0 Garbage Disposal

The dumping of garbage constitutes an act of damaging wildlife habitat and offenders are liable to prosecution.

11.0 Overnight Use

There shall be no camping, overnight parking or other overnight use of the P/AWMA.

12.0 Fires

Except for habitat management purposes, no fires will be allowed within the P/AWMA except under permit.

13.0 Commercial Activities

Commercial activities will not be permitted within the P/AWMA except:

-Under permit for endeavors which are deemed not to interfere with public safety or with wildlife, their habitat or the public enjoyment of the same.
-The existing Fletcher Challenge Canada Ltd. operation.
-Uses permitted at the DARD in Grant Narrows Regional Park
-Under permit for services considered to be complementary to a future nature centre (e.g. snack bar or book store).

14.0 Other Jurisdictions

The regulations of other adjacent jurisdictions will apply where appropriate, such as in:

-Grant Narrows Regional Park
-U.B.C. Research Forest
-Fletcher Challenge license of occupation site

FOR INFORMATION ONLY - NOT PART OF PLAN

Summary of subjects covered in the license granted to Fletcher Challenge Canada Ltd. by U.B.C.

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1. Site description, permitted use, accompanying map.

2. Site preparation, operation and maintenance costs to be sole responsibility of FCCL.

3. No leans to be filed against site.

4. Only land access is via Lake Dyke. Must obtain necessary access permits, permissions, etc.

5. Site to be kept clean and tidy and comply to all government laws, directions, rules and regulations.

6. Site use restricted to specific functions.

7. Restriction on any activities which may cause damage to site or surrounding properties.

8. Non interference by license grantor guaranteed, but right retained to otherwise access site.

9. Agreement to indemnify, hold harmless and defend license grantor, etc., against all claims arising out of the use or occupancy of the site.

10. Obligations of FCCL and fees to be paid in consideration of license being granted.

11. Term and renewal conditions.

12. Conditions of terminations and responsibilities re vacating site.

13. License grantors rights re termination in the event of FCCL insolvency or failure to comply with terms of license.

14. Regulation concerning signs.

15. Regulation re assigning the agreement.

P/AWMA Mgt. Plan
30 May 1992

I have be unable to get the following information yet:

	SEARCH
The number of swans using the Pitt area from Rick McKelvey	###
A copy of Mark Adams PLM report for veg. info. & References	&&&
Minnekhada user days/yr re estimate of Addington use > 932-6352	@@@
Widgeon Valley Res. Reg. Pk boundaries > Brian Farquar 520-6440	???
Wood lot license plans > Peter Saunders @ Res. Forest 463-8148	...