

HQ0506

FISH AND WILDLIFE VALUES:  
HOWE SOUND AREA

Robert Leatt  
Habitat Protection Section  
Region II

B.C. Fish and Wildlife Branch  
January, 1979



Province of  
British Columbia

Ministry of the Environment

~~REPRODUCTION~~  
~~FORN~~

FISH AND WILDLIFE BRANCH

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YOUR FILE .....

OUR FILE 0953/1 .....

February 7, 1979

Mrs. Cecilia Strong  
Environment and Land Use Committee  
Secretariat  
Ministry of the Environment  
Parliament Buildings  
Victoria, B.C.

Re: Howe Sound Study

Dear Mrs. Strong:

Enclosed for your information and use on the above study is a copy of the report entitled "Fish and Wildlife Values: Howe Sound Area", written by Alan Peatt, Habitat Protection Technician, B.C. Fish and Wildlife Branch.

I hope you will find the report satisfactory to your needs. If you require any further information, please do not hesitate to contact Bruce Cox (435-4137).

Sincerely,

G. A. West  
REGIONAL DIRECTOR

AP:cd

FISH AND WILDLIFE VALUES:

HOWE SOUND AREA

HABITAT PROTECTION SECTION

REGION II

B.C. FISH AND WILDLIFE BRANCH

January 1979

## PREFACE

This report serves as the Fish and Wildlife Branch input into an inter-agency task group on Howe Sound coordinated by the Environment and Land Use Committee (ELUC) Secretariat. Its purpose is to provide the ELUC Secretariat with base information regarding the fish and wildlife resources of the Howe Sound area. From this data, compiled with data from other agencies concerned with the development of Howe Sound, the ELUC Secretariat will propose a plan of acceptable land use and resource management activities for the Howe Sound Area.

This report, and its accompanying map, will provide the user with information regarding species, species distribution, habitat quality, known wildlife ranges, management objectives, resource concerns, and recommendations for the protection of the fish and wildlife values of the area. The report and map complement one another, they are not meant to stand alone. The user will find generalized data and management information in the text, but will have to use the map to find detailed information regarding a creek or specific area. For example, the user will find the relative value of the creeks between Gibsons and Port Mellon in the text, but to determine the habitat type, quality, and species present in Dakota Creek, he will have to refer to the map. In this way, needless repetition of data is avoided.

## ACKNOWLEDGEMENTS

The report and study map was compiled by A. Peatt, Habitat Protection Technician under the direction of B. Cox, Regional Habitat Protection Biologist, Region II, B.C. Fish and Wildlife Branch. The following agencies contributed to the data base from which this study was compiled:

**B.C. Ministry of the Environment**

- Fish and Wildlife Branch
- Resource Analysis Branch
- Ecological Reserves Unit

**Environment Canada**

- Canadian Wildlife Service
- Fisheries and Marine Service
- Environmental Protection Service

**The Nature Conservancy of Canada**

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SUMMARY

The Howe Sound study area encompasses Howe Sound to the height of land, with the northern boundary located approximately two kilometers north of the confluence of the Squamish and Mamquam Rivers. The area supports diverse fish and wildlife types. This report is concerned with freshwater and anadromous sport fish, terrestrial mammals, birds, salmon of commercial importance, and marine mammals.

There are nine salmonid species that occur in the Howe Sound area. Principal among these are steelhead trout, cutthroat trout, coho salmon, chinook salmon, and chum salmon. Habitat quality for salmonids is varied throughout the study area. The creeks on the west side of the Sound and of the islands are fair to moderate salmonid producers, while those of the east side tend to be of low value. The estuary of the Squamish and those of the smaller creeks are perhaps the most important habitat type in regards to the salmonid resources of Howe Sound. The creek and river estuaries are very productive of salmonids, and yet they are rapidly dwindling due to encroachment by industrial use.

Only a few lakes are found in the study area, with most having poor access. Grafton Lake, on Bowen Island, supports the most viable population of cutthroat trout for a sport fishery on that island. Browning Lake near Squamish presently supports an age-restricted fishery in an area of easy access and high use.

The Howe Sound area supports many wildlife types, however, little is known about them beyond species types and basic areas of occurrence. Mountain goat, Columbian blacktail deer, cougar, American black bear, bobcat, coyote, as well as a host of other furbearers, waterfowl, shorebirds, waders, raptors, upland game birds, passerine birds, and marine mammals inhabit the study area.

There are several areas of special importance to the fish and wildlife resources of Howe Sound. The Squamish estuary, which supports many fish and wildlife forms, as well as recreational use in the form of hunting, birdwatching, and nature study, is of major concern in view of the possibility of future developments occurring in this area. Christie Islet is an established bird sanctuary, and as such cannot be developed, but disturbance of the islet by recreationists or other resource users must be avoided. Other areas of interest are Passage Island, Eagle Harbour to Point Atkinson, and the ecological reserve on Bowen Island.

Future management of the fisheries resources of the Howe Sound area will be a general policy of maintaining present resources, coupled with reconnaissance of these resources for the feasibility of future enhancement techniques such as

hatchery stocking, habitat improvement, or construction of artificial spawning and rearing channels.

Future management of wildlife in the area will be directed towards maintaining present populations. This will be accomplished through control of hunting seasons and harvest limits. No definite plans for future wildlife enhancement are being considered at the present time.

The fish and wildlife populations of the Howe Sound area can be maintained through careful consideration of their habitat needs. Protective zones of undisturbed vegetative cover along streamsides, protection of productive estuarine areas, and maintenance of ungulate wintering areas are some of the ways of achieving this end. Protection of habitat will ensure that the fish and wildlife populations using the area will continue to do so.



## I. INTRODUCTION

The Howe Sound Study area encompasses Howe Sound to the height of land, with the northern boundary located approximately two kilometers north of the confluence of the Mamquam and Squamish Rivers. The area supports a variety of wildlife and fish species which fall under the management jurisdiction of the Fish and Wildlife Branch. This inventory is concerned with freshwater and anadromous sport fishes, terrestrial mammals, gamebirds, and some protected bird species. For the sake of completeness, salmon of commercial importance, and marine mammals have been included, though they fall under the jurisdiction of Federal agencies.

An inventory of this type cannot be considered complete. It is compiled strictly from available information and from personal interviews with field experts. The report is, therefore, subject to some limitations regarding its use.

1. This is a base information study only, and should be treated as such. Little detailed information is available for the area and no new inventory work was undertaken other than the occasional cursory examination of habitat quality.

2. For some areas no information was available. A lack of information does not indicate an area of no concern, rather it indicates an area where future study is required.

3. Indicated wildlife ranges depict known animal concentrations, however, boundaries of these ranges have been arbitrarily located considering species habits and habitat preferences. Little information is available on actual range boundaries, which may differ from those shown.

This inventory, besides providing the available resource information for the ELUC Secretariat Study, will hopefully provide background data to Fish and Wildlife Branch staff as inventory needs arise in the Howe Sound area.

## II. DISCUSSION

### A. FISH

There are nine fish species of interest to this inventory that occur within the study area. They are:

Coastal Cutthroat trout; Sea-run Coastal Cutthroat trout (Salmo Clarki clarki)

Rainbow trout; Steelhead trout (Salmo gairdneri)

Eastern brook trout (Salvelinus fontinalis)

Coho salmon (Oncorhynchus kisutch)

Chinook salmon (Oncorhynchus tshawytscha)

Chum salmon\* (Oncorhynchus keta)

Sockeye salmon\* Kokanee salmon (Oncorhynchus nerka)

Pink salmon\* (Oncorhynchus gorbuscha)

Dolly Varden char (Salvelinus malma)

All of these fish depend upon the freshwater systems of Howe Sound for completion of some portion of their life cycle. Coastal cutthroat trout, rainbow trout, dolly varden char, eastern brook trout and kokanee salmon spawn, rear, and reside in many of the creeks and lakes of the study area. Sea-run coastal cutthroat trout and steelhead trout will incubate and rear in creeks for an average of 2 to 3 years, before migrating to estuaries and then to the sea to reside, eventually returning to the creeks to spawn. All of the species of salmon use the creeks for spawning. Coho and chinook salmon will rear in the creeks and estuaries before entering the sea, while chum and pink salmon migrate directly to the sea. Sockeye move to lakes to rear, prior to migrating to the sea.

It is clear that protection of freshwater habitat is the key to protection of the fish species dependent upon those habitats. The following sections will discuss the general quality of fish habitats in the Howe Sound study area.

#### 1. Fish Habitat

##### a) Creeks

##### 1) West Side

Most of the creeks on the west side of Howe Sound increase in gradient very quickly and it is only the flatter, bottom sections that are of any real productive value (Harding & Erickson, 1975). The larger streams such as Rainy, McNab, and Potlatch are exceptions to this generalization, as they have more gentle overall gradients. Harding and Erickson (1975) point out that most of the streams in this area have similar substrates, that being mainly boulder and rubble with scattered pockets of

\* Not a game species.

gravel. The same source indicates that almost all of the creeks along the west side of Howe Sound have some capability for trout and salmon production, though only a few of the creeks are better than fair producers.

The true fisheries capability of this area lies behind the collective production of each seemingly minor stream. Poorly planned developments that result in a loss of productivity in even a few of these streams could result in a large net loss to the overall productivity of the area.

ii) East Side

Virtually no inventory information is available for the creeks on the east side of Howe Sound. cursory examinations revealed that almost all the creeks are very precipitous in nature, and most have barriers to upstream movement very near their mouths. It appears that the majority of creeks in this area have little or no fish value. Possible exceptions are Deeks Creek, the Furry Creek system, the lower reaches of Shannon Creek, and with future rehabilitation, Brittainia Creek. These creeks, because of their headwater lakes, or flatter bottom reaches, have some capability for trout and salmon production. These creeks presently support some fish use, but information beyond the species types present is not available.

iii) The Islands

Of the four major islands (Gambier, Bowen, Anvil and Keats) in Howe Sound, fish habitat information is available only for Gambier and Bowen Islands. Very little data is available for Gambier, whereas considerable aquatic inventory work has been done on Bowen Island by the Resource Analysis Branch (RAB), B.C. Ministry of the Environment.

Most of the creeks on Bowen Island support resident fish populations over their entire lengths, however, access to sea-run fish is severely limited by barriers at or near the creek mouths. The available spawning and rearing habitat for sea-run populations is limited to the lowest reaches of Grafton (50m), Explosives (100m), Lee (200m), and Snug Cove (200m) creeks (RAB, 1978). The RAB has concluded that these reaches are critical to sea-run fish populations. Upper Killarney creek and the lowest reaches of the inlet creeks to Killarney Lake form the only available spawning and rearing habitat for the cutthroat population of Killarney Lake (RAB, 1978). These reaches are considered critical to the Killarney Lake fish.

Josephine Creek is unique in that it supports a population of eastern brook trout, the only stream in the study area known to do so. Eastern brook trout may have been incidentally introduced into Josephine Lake (and thus into Josephine Creek) during the stocking of the lake with rainbow trout in the 1930's and early 1940's (Fish and Wildlife Branch, no date).

iv) Squamish

Fish habitat in the vicinity of Squamish is centred primarily around the Squamish River estuary. Because of the great importance of the Squamish estuary to trout and salmon production in Howe Sound, this area will be discussed in detail in a later section of this report.

b) Estuaries

Estuarine areas have long been established as being amongst the most productive of all habitat types. Juvenile salmon and anadromous trout use estuaries as rearing areas, taking advantage of high nutrient levels and abundant food supplies. The brackish waters of estuarine areas serves to acclimatize sea-going salmonids to the high salt levels of the ocean. It cannot be disputed that estuarine areas are of vital importance to the fisheries resource.

There are very few estuarine areas in Howe Sound. Of these, the greatest concern revolves around the Squamish, however, the importance of the smaller creek estuaries is not to be ignored.

1) Creek Estuaries

Some form of development has already occurred on most of the smaller estuaries in Howe Sound. Log storage occurs in most of the estuarine areas and this is of great concern because of its effect on these important habitats. Bark and other debris from log booms tends to accumulate on the estuary floor, smothering bottom organisms and thus breaking an important link in the estuarine food chain. In addition to smothering benthic life, accumulations of wood debris in areas of log storage can lead to an increase in the oxygen demand of the area. Dissolved oxygen levels in the overlying waters may be depressed below levels necessary for the maintenance of productive biological communities (Pacific Northwest Pollution Control Council (PNPCC), 1971). Even if the bulk of the overlying water is not significantly affected, the demand may be sufficient to create an anaerobic layer near the bottom, which, particularly in brackish and marine waters, can eliminate the area as habitat for desirable biological forms (PNPCC, 1971). Other developments such as gravel extraction and industrial and residential developments, can pose particular problems in terms of loss of important habitat through damage caused by dredging, waste disposal, landfilling, and flood protection works. The great value of the limited estuarine habitat available to the salmon and anadromous trout of Howe Sound cannot be overemphasized. There are very few remaining estuarine habitats suitable for salmonid production in Howe Sound, and these are considered critical to the maintenance of the fisheries resource.

11) The Squamish Estuary

Proposals for major industrial development in the Squamish estuary has led to numerous reports and studies outlining the great importance of this area to the fisheries resources of Howe Sound. Perhaps foremost among these reports is "The Squamish River Estuary: Status of Knowledge to 1974" by Hoos and Vold, Environment Canada, 1975. The reader is referred to this report for specific details concerning the estuary.

The importance of the Squamish estuary to the fisheries resource is highlighted by the policy of the Fisheries and Marine Service, Environment Canada, on future development in the delta area. On the basis of the findings of a task-force study on the effects of existing and proposed development on the Squamish estuary, the Fisheries and Marine Service has adopted a policy that will confine future development to those areas of the Squamish delta that do not contribute to estuarine productivity (Bell-Irving, Pers. Comm., 1979).

The areas that do not contribute significantly to estuarine productivity, and are, therefore, considered as acceptable areas for controlled development, have been described (Bell-Irving, Pers. Comm., 1979) as:

1. Mamquam channel north of the public docking site.
2. All areas enclosed by flood control dykes.
3. All areas where dykes are present above high tide and separated from this demarcation by an adequate site specific green belt area.
4. Shoreline areas on the east and west sides of Howe Sound south of the Squamish delta.

The great importance of the estuary is further realized when one considers that the anadromous fish populations of six river systems (the Squamish, Mamquam, Cheakamus, Elaho, Ashlu, and Stawamus) depend upon the Squamish estuary for estuarine habitat during fish migration (Reynolds, Pers. Comm., 1978).

The Squamish estuary contains valuable habitat for rearing salmonids. Reynolds (Pers. Comm., 1978) stated that the middle arm, or central basin of the estuary, is the most productive for juvenile salmonids. Clark (Unpub. Rpt., 1978) reports that the Squamish River, from Howe Sound to the Cheakamus River, has major tributary input and abundant side channels, with estuarine influence occurring downstream from the Mamquam River. These factors contribute to the productivity of the area by providing juvenile salmonids with calm water areas during freshets, and abundant food and nutrient supplies throughout the year.

The Squamish and Cheakamus Rivers presently support a large steelhead sport fishery. These rivers are among the most heavily fished steelhead rivers in the Lower Mainland area (Caverly, Pers.Comm.,1979). Up to 150 anglers per day have been checked by enforcement personnel on the Squamish and Cheakamus Rivers (Reynolds, Pers.Comm.,1978). Elliot (Pers.Comm.,1979) estimated that the average annual escapement of steelhead in the Squamish system (Squamish, Cheakamus, Mamquam, Ashlu, and mainstem Squamish tributaries) ranges between 2000 and 3000 fish. This is based on river floats, harvest analysis, and creel censuses. (Data on cutthroat trout and dolly varden char escapement is not available). It is conceivable that juvenile steelhead descended from spawning populations may well depend on the Squamish estuary for rearing habitat. If so, loss of this habitat would have damaging effects on the Squamish system steelhead population, and, in turn, on a large and important sport fishery.

Salmon escapements for the Squamish system, adapted from Hoos and Vold (1975, p.89), are given in Table I.

TABLE I. Average Annual Escapement (1962-1971)

<u>Species</u>	<u>Squamish R.</u>	<u>Cheakamus R.</u>	<u>Mamquam R.</u>	<u>Ashlu R.</u>	<u>Total</u>
Chinook	14,200	2,040	475	665	17,380
Coho	11,200	5,050	2,230	720	19,200
Pink (odd year)*	28,000	123,840	21,200	4,900	177,940
Chum	21,600	23,750	4,855	400	<u>50,605</u>
Total					265,125

Hoos and Vold (1975), have provided an estimate of the economic value of the Squamish estuary fishery based on commercial, sport, and native food fish catches. The total estimated catch amounts to 210,840 anadromous salmonids per year, with a value of approximately \$7,134,500 (at 1972 prices, not including processing).

Approximately one-third of the Squamish estuary has been lost to industrial development, and further development in biologically productive areas is undesirable from an environmental standpoint (Reynolds, Pers.Comm.,1978). This view is supported by Hoos and Vold (1975, pg.5) whose findings indicated that further development "would destroy biotic populations of the estuary, and result in irreversible losses of vital floral and faunal habitats."

\* Pink salmon spawn every odd-numbered year (eg. 1979, 1981, 1983)

c) Lakes

Little data, other than species and stocking information, is available for the lakes in the study area. Many of the lakes are surrounded by private land, or have poor access. No information is available on many of the lakes that have difficult or privately owned access.

Browning Lake is of particular interest to the Fish and Wildlife Branch as it is a readily accessible lake suitable for an age-restricted fishery (only those people up to 15 years of age, or 65 and over shall angle for fish). The lake is regularly stocked with rainbow trout to provide a recreational opportunity for young and senior anglers.

Several lakes on Bowen Island are of importance to this study. Grafton Lake is the only lake in the study area known to support a population of kokanee salmon. Grafton Lake also supports the most viable population of cutthroat trout on Bowen Island for a sport fishery (RAB, 1978). Josephine and Killarney Lakes are reported to support eastern brook trout populations, the only lakes in the study area known to do so.

B. WILDLIFE

The wildlife groups of interest to this study are; ungulates, large carnivores, small furbearers, waterfowl, shorebirds, waders, passerines, upland game birds, and raptors.

Marine mammals, and other waterfowl not under the jurisdiction of the Fish and Wildlife Branch, have been included for completeness of this study. It is not within the scope of this report to list all of the wildlife species present in the Howe Sound area. The reader is referred to Hoos and Vold (1975), for information of this type.

The Howe Sound area provides diverse habitat types which are capable of supporting various wildlife forms. Mountain goats are found on many of the rugged ridges and mountain peaks. The steep, timbered slopes and flat bottomland support populations of blacktail deer. Cougar, black bear, and an occasional bobcat can be found throughout the study area. Many species of waterfowl use the estuaries, shoals, and bay areas of the Sound. Small furbearers and raptors can be seen virtually anywhere in the study area.

The available data on wildlife use in the Howe Sound area is limited mainly to species types and known range areas. This discussion will generalize the distribution of the various wildlife species found in the study area. The reader

is referred to the study map for specific locations of the known range areas of mountain goat and blacktail deer, and for areas of importance to waterfowl and marine mammals.

1. Wildlife Distributions

a) Ungulates

i) Mountain Goat (*Oreamnos americanus*)

Mountain goats are found on many of the high ridges and mountain peaks in the Howe Sound area. They generally inhabit very steep, rocky terrain where they are safe from predators, although they may occasionally be found on the steep, timbered slopes. Winter snows may force them to lower elevations. The survival of the mountain goat depends upon the availability of wintering areas, generally slopes of southern or western exposure, where snow conditions are not that severe (McT. Cowan and Guiguet, 1973). Known areas frequented by mountain goats are marked on the study map. Developments, such as timber harvesting and road construction near areas inhabited by goats must be carefully planned so as to provide mountain goat populations with maximum protection.

Besides the outright destruction of vital winter habitat by timber harvesting, road construction can lead to increased accessibility by hunters, with the result of over-harvesting and herd decimation. Currently there is no open season for the harvest of mountain goats on the east side of Howe Sound. There is a shortened season on the west side, but little hunting pressure is evident, probably because of poor access to goat areas (Forbes, Pers.Comm., 1979).

Productivity in most mountain goat herds is low, with little interchange between herds (Wright, no date). Maintenance of the goat populations in the Howe Sound area would therefore depend on protection of habitat, and careful control of hunter harvesting.

ii) Columbian Blacktail Deer (*Odocoileus hemionus columbianus*)

Columbian blacktail deer can be found throughout the study area. Known concentrations and important range areas are indicated on the study map. Actual population sizes and harvest figures are not available because the study area intersects several management units, on which these figures are based. Blacktail deer are abundant on the mainland of the study area, and good numbers are reported on Bowen, Gambier, and Keats Islands. A few deer have been reported on Anvil Island (Adolph, Pers.Comm., 1978).



Gates (Corres., 1972) indicates that the deer generally winter on steep timbered hillsides and in rock out-crop communities. He states that it is in these areas that their major foods are most available, and snow depths are least limiting. Gates also states that the deer normally move down onto the river flats in the early spring.

Logging activities in the study area will generally create good spring and general range areas for the deer population. However, wintering areas must be protected if the deer population is to be maintained.

iii) Rocky Mountain Elk (Cervus canadensis nelsoni)

An introduction of Rocky Mountain elk was made at the mouth of McNab Creek on the west side of Howe Sound in 1933. For many years sightings of elk were made in the McNab Creek drainage. In recent years, however, no elk have been reported within the study area.

b) Large Predators

i) Cougar (Felis concolor oregonensis)

Cougars are regularly observed over the mainland portion of the study area. It is unlikely that cougar occur on the islands as the only known sighting of this type was in the 1950's, at which time one cat was recorded on Bowen Island (West, Pers.Comm., 1979). The main prey of cougar is believed to be deer, though Stephen (Pers.Comm., 1978) feels that they might also prey on young mountain goats in the upper Rainy River. Concentrations of cougar are unlikely, though in areas of concentrated deer, or domestic animals, cougar may occur more regularly.

As development increases in the study area, occasional conflicts with cougars can be expected. Attacks on man are rare, but domestic animals are, at times, preyed upon.

ii) American Black Bear (Ursa americanus altifrontalis)

The black bear is plentiful throughout the study area, with the exception of the islands. Bears have been reported on Gambier and Keats Islands, but it is believed that these bears were transient, and not resident (Stephen, Pers.Comm., 1978). There are no bears on Bowen Island (Adolph, Pers.Comm., 1978).

The black bear will generally be found in wooded areas, concentrating on berry patches and spawning streams in season (McT. Cowan and Guiguet, 1973). Concentrations of black bear can also be found near refuse dumps, and this must be considered when waste disposal plans for settlements are drafted.

c) Birds

1) Waterfowl, Shorebirds, and Waders

Howe Sound, with its deep water areas and steep shorelines is not ideally suited to use by waterfowl. However, the small creek estuaries, the Squamish estuary, sheltered bays, and shoal areas do support a surprising number of birds. The Environmental Protection Service (EPS) of Environment Canada has prepared a sensitivity map of areas of primary concern for waterfowl and marine mammals in the event of an oil or chemical spill (EPS, 1976). This information has been transcribed onto the study map.

Many types of waterfowl (eg. dabbling ducks, diving ducks, geese, swans, gulls, and seabirds), as well as other water-related birds such as shorebirds and waders, inhabit the study area. Within these types, many different species occur. It is not within the scope of this report to list all of the species occurring in the Howe Sound area. The more noticeable species are:

Dabbling Ducks:

Mallard (Anas platyrhynchos)  
American Wigeon (Anas americana)  
Pintail (Anas acuta)

Diving Ducks:

Scaup (Aythya sp.)  
Goldeneye (Bucephala sp.)  
Scoter (Melanitta sp.)  
Merganser (Merginae)  
Bufflehead (Bucephala albeola)

Geese and Swans:

Canada Geese (Branta canadensis)  
Whistling Swan (Olor columbianus)  
Trumpeter Swan (Olor buccinator)

Gulls:

Glaucous-winged Gull (Larus glaucescens)  
Mew Gull (Larus canus)  
Herring Gull (Larus argentatus)  
Bonaparte's Gull (Larus philadelphia)

Seabirds:

Common Murre (Uria aalge)  
Marbled Murrelet (Brachyramphus marmoratum)  
Pigeon Guillemot (Cepphus Columba)  
Grebe (Podicipedidae)  
Cormorant (Phalacrocorax sp.)  
Loon (Gavia sp.)

Shorebirds:

Long-billed Dowitcher (Limnodromus scolopaceus)  
Western Sandpiper (Calidris mauri)  
Killdeer (Charadrius vociferus)  
Yellowlegs (Tringa sp.)

Waders:

Great Blue Heron (Ardea herodias)  
Green Heron (Butorides virescens)

The estuaries of Howe Sound are probably not that important for waterfowl production because of fluctuating water levels. However, most of the creek estuaries support a few dabbling ducks and a few divers over the fall and winter months. Stephen (Pers.Comm., 1978) reports that the occasional flock of geese may be seen in some of the estuarine areas, presumably there to rest and feed. The smaller estuaries may seem insignificant in regards to the number of waterfowl in each, but collectively they can support a fair population of birds over the winter months.

Harris and Taylor (1973), state that the Squamish estuary is subject to water fluctuations, and is, therefore, not considered to be very important as a waterfowl production area. They maintain that the estuary is, however, of importance to waterfowl as a staging and wintering area. Reynolds (Pers. Comm., 1978) has stated that over an average winter, approximately 1000 mallard, 300-400 pintail, a few hundred each of wigeon and bluebills (scaup), 30 swans and the odd goose flock can be seen in the delta area. The population of diving ducks wintering on the Squamish delta is composed primarily of scaup, goldeneye, and bufflehead, as well as merganser, scoter, ruddy duck (Oxyura jamaicensis), canvasback (Aythya valisineria), and oldsquaw (Clangula hyemalis) (Land and Vaudry in Hoos & Vold, 1975, pg.116). Various other water-related birds are known to occur in the Squamish estuary. These would include divers other than diving ducks (eg. grebe, loon, or cormorant), gulls, shorebirds, and herons.

The sheltered bays and shoal areas of Howe Sound support large numbers of gulls, divers, and diving ducks throughout the year. Areas of primary concern, species types, seasons of use, and population sizes are indicated on the map of the study area. Virtually no information is available on shorebirds and wader distribution in Howe Sound, but these bird types can be expected to occur on beach and estuarine areas.

ii) Upland Birds

Grouse are the only upland birds of interest to this study. Two species are known to occur within the study area: blue grouse (Dendragapus obscurus), and ruffed grouse (Bonasa umbellus).

Although no precise numbers are available, the abundance of grouse on the west side of Howe Sound appears to be low (Stephen, Pers.Comm.,1978), whereas a moderate population is indicated on the east side (Adolph, Pers.Comm.,1978). Both Stephen and Adolph agree that there are good grouse populations on Gambier, Bowen and Keats Islands.

iii) Raptors

Several species of raptors occur within the study area. Wilson (Pers.Comm.,1979) indicated the following species have been reported in the Howe Sound area:

Bald Eagle (Haliaeetus leucocephalus)  
Golden Eagle (Aquila chrysaetos)  
Red-tailed Hawk (Buteo jamaicensis)  
Sharp Shinned Hawk (Accipiter striatus)  
Goshawk (Accipiter gentilis)  
Cooper's Hawk (Accipiter cooperii)  
Peregrine Falcon (Falco peregrinus)  
Merlin (Falco columbarius)

Osprey (Pandion haliaetus), is considered a probable species in the study area (Wilson, Pers.Comm.,1979). Hoos and Vold (1975) have listed marsh hawks (Circus cyaneus), sparrow hawks or kestrels (Falco sparverius), and owls (Tytonidae and Strigidae) as occurring within the Squamish estuary.

Raptors do not generally occur in concentrated numbers, however, large numbers of eagles do gather along the lower Squamish River each winter, apparently to feed on dead salmon. This unique occurrence provides an ideal opportunity for the public to observe these magnificent birds at relatively close range. However, disturbance of these birds by overzealous observers should be avoided at all costs. Developments, such as future road, railway or building construction should be carefully planned so as to avoid areas of importance to the eagle population.

d) Small Furbearers

Many species of small furbearers are found in the Howe Sound area. They tend to be scattered throughout the mainland portion of the study area and some are suspected to occur on the larger islands. Among the more notable species are bobcat (Lynx rufus), coyote (Canis latrans), and mink (Mustela vison). Beaver (Castor canadensis), river otter (Lutra canadensis), red squirrel (Tamiasciurus hudsonicus), muskrat (Ondrata zibethica), and raccoon (Procyon lotor) have been indicated on or near the Squamish estuary by various sources, as listed in Hoos and Vold (1975, pg.126).

e) Marine Mammals

Marine mammals do not come under the jurisdiction of the Fish and Wildlife Branch, but they are included here for the sake of completeness. Areas of importance to marine mammals in Howe Sound (derived from EPS, 1976) have been recorded on the study map.

Various species of marine mammals have been reported, or are thought to occur, in the study area. Harbour seals (Phoca vitulina richardi) occur year round in Howe Sound while California (Zalophus californianus) and Steller's (Eumetopias jubatus) sealions are generally fall, winter and spring residents (EPS, 1976). Harbour porpoise (Phocaena vomerina) and killer whale (Orcinus orca) occasionally occur in Howe Sound (Environment Canada, 1973).

C. SPECIAL AREAS

1. The Squamish Estuary

It has been shown that the Squamish estuary is of vital importance as rearing habitat to the anadromous salmonid populations of the Squamish River system, and thus to the sports and commercial fisheries dependent on stock from this source. It has also been shown to be important as a wintering area for waterfowl, though it does not appear to have importance for waterfowl production.

The Squamish estuary also finds importance in a recreational sense. Some waterfowl hunting occurs on the estuary in the fall and winter months, and, throughout the year, birdwatchers and naturalists use the area in pursuit of their interests. The remaining undeveloped portion of the estuary provides, and can continue to provide, a year round outlet for recreation in the Squamish area.

2. Christie Islet

Christie Islet, located south of Anvil Island, was established as a formal bird sanctuary by Order-In-Council in 1962. It is administered by the Canadian Wildlife Service. Sea birds, specifically, pelagic cormorant (Phalacrocorax pelagicus) glaucous-winged gull, and pigeon guillemot, nest on the islet. The sanctuary has high aesthetic and educational value because of its proximity to the Vancouver populace.

3. Passage Island

Passage Island, located midway between south Bowen Island and Point Atkinson, is considered a natural area of high priority for protection by The Nature Conservancy of Canada (Benn and McLean, 1977). According to Benn and McLean (1977), a small area of steep cliffs on the west side of the island supports a breeding population of seabirds. The island is entirely privately owned, and the nesting area is presently unprotected. Benn and McLean have, in their report, recommended acquisition of the rookery area for establishment of a formal bird sanctuary.

4. Eagle Harbour to Point Atkinson

The area between Eagle Harbour and Point Atkinson (refer to map) is very significant in that it supports wintering populations of up to 1400 common goldeneye (Bucephala clangula) and 3000 Barrow's goldeneye (Bucephala islandica) which is considered to be the world's largest wintering populations of these species (EPS, 1976). The same source indicates that populations of up to 15,000 western grebes (Aechmophorus occidentalis) can be supported in this area over the winter months.

5. Ecological Reserve No. 48

In 1973, 980 acres near Apodaca Provincial Park on Bowen Island was declared an ecological reserve (Krajina et al, 1978). While the eco-reserve is not of primary interest for its fish and wildlife values, it is included in this discussion because of its special status - it being the only ecological reserve in the study area. The eco-reserve is considered an excellent area for the study of plant succession, and for the autecology of the following trees (Krajina et al, 1978):

Grand Fir (Abies grandis)  
Bigleaf Maple (Acer macrophyllum)  
Red Alder (Alnus rubra)  
Arbutus (Arbutus menziesii)  
Western Flowering Dogwood (Cornus nuttallii)  
Sitka Spruce (Picea sitchensis)  
Lodgepole Pine (Pinus contorta)  
Bitter Cherry (Prunus emarginata)  
Douglas-fir (Pseudotsuga menziesii)  
Cascara (Rhamnus purshiana)  
Western Red Cedar (Thuja plicata)  
Western Hemlock (Tsuga heterophylla)

#### D. FUTURE MANAGEMENT

##### 1. Fish

(This discussion is based on an interview with V. Swiatkiewicz, and P. Caverhill, Fisheries Biologists, Region II, B.C. Fish and Wildlife Branch, January, 1979).

The objective of fisheries management by the B.C. Fish and Wildlife Branch is to provide the greatest possible degree of recreational opportunities related to given fisheries resources. By "recreational opportunities" the emphasis is placed on angling, although other forms of recreation such as observation of spawning fish, or other fisheries related activities, are included. Angling opportunities in the Howe Sound area exist in many forms. The area is used extensively by streamside anglers, beach anglers, and tidal sports fishermen.

Perhaps the best known streamside angling opportunities exist on the Squamish River system, however, many of the creeks of the study area support some form of streamside fishery. Rainy River, McNab Creek, and Potlatch Creek receive use by steelheaders, though access to these systems is difficult.

Beach angling for sea-run cutthroat trout is a popular pastime, and many areas of Howe Sound support this type of angling use. Virtually any beach area near a creek outlet has the capability to support a beach-angling fishery. The best known areas are the beaches and creek mouths of the west side, notably Hutchinson, Oulette, Twin and Dakota Creeks. The estuarine areas of McNab and Potlatch Creeks have good capability for beach-angling, and do receive some use, though access would appear to be a major problem. Furry Creek on the ~~west~~<sup>east</sup> side of Howe Sound is a popular beach-angling location, and most of the beaches on Gambier and Bowen Islands show good potential, although problems of access are presently limiting use.

Beach-angling has long conflicted with industrial uses of intertidal areas. Because of its proximity to the population of the Vancouver area, the sea-run cutthroat fishery of Howe Sound assumes a high degree of angling importance. Careful consideration to beach-angling in the planning stages of future development will allow this important angling opportunity to be maintained.

Howe Sound supports a large tidal sports fishery, with the major species caught being chinook and coho salmon. Sea-run cutthroat trout are also known to be fished by sport trolling in the Langdale/Hopkins Landing area. Most of the fish taken are Howe Sound stock (primarily from the Squamish River), therefore, future developments that damage spawning and rearing habitat could lead to declines in this fishery. This is a major concern, and should be considered during the planning stages of development.

Angling is an important recreational resource in the Howe Sound area. The objective of future fisheries management in Howe Sound will be to maintain and enhance as many angling opportunities as possible. Some fisheries management activities are presently underway and others are planned for the Howe Sound area.

Two studies are currently underway which involve the Howe Sound area. One is an investigation of steelhead use in the Squamish River system, the other is a lake cataloguing process, which will lead to a regional (Region II) lake management plan. Through the lake study, lakes that lend themselves to intensive management practices will be identified, and these lakes will assume high priority for future fisheries management.

The future course of fisheries management in the Howe Sound area will be a general approach to resource inventory, as opportunities arise. Reconnaissance of the streams on the west side of Howe Sound may take place over the next few years with the outlook of possible "on stream enhancement" such as improvements to existing habitat, or construction of rearing ponds or spawning channels.

On a regional basis, the emphasis for fisheries management will be towards lake resource management because it is the lakes that have the highest capability for providing recreational opportunities to the public. As access to the lakes of the study area improves, intensive management will become more feasible, and more detailed inventory and management plans may be warranted.



## 2. Wildlife

(This discussion is based on an interview with T. Burgess, Regional Wildlife Biologist, B.C. Fish and Wildlife Branch, Region II, January, 1979).

The study area is not considered an area of high priority for intensive wildlife management. On a regional basis, other areas which have better access to harvestable game species receive greater hunting pressure and thus greater management attention. Howe Sound, with its limited degree of access, receives, at present, only light hunting pressure, and is, therefore, not considered in need of special management activities.

Management of game species in the study area is presently based on regulation of hunting seasons. As access improves, and as further inventory data is compiled, a limited entry hunt system for the goat harvest on the west side of Howe Sound may be warranted. More liberal deer seasons may be warranted in the Howe Sound area if future inventory information dictates this need.

No detailed plans for future programs have been drafted, but several possibilities exist. Canada geese may be introduced into the upper Elaho River drainage (outside the study area). It is hypothesized that these birds would winter in the Squamish delta area. Preservation of this and other estuarine habitat is therefore of major concern to future management programs. Another project may be to take advantage of the high educational and aesthetic value of the eagle concentrations in the Squamish area via an interpretative program directed towards interesting the public in the natural history and habits of this magnificent bird.

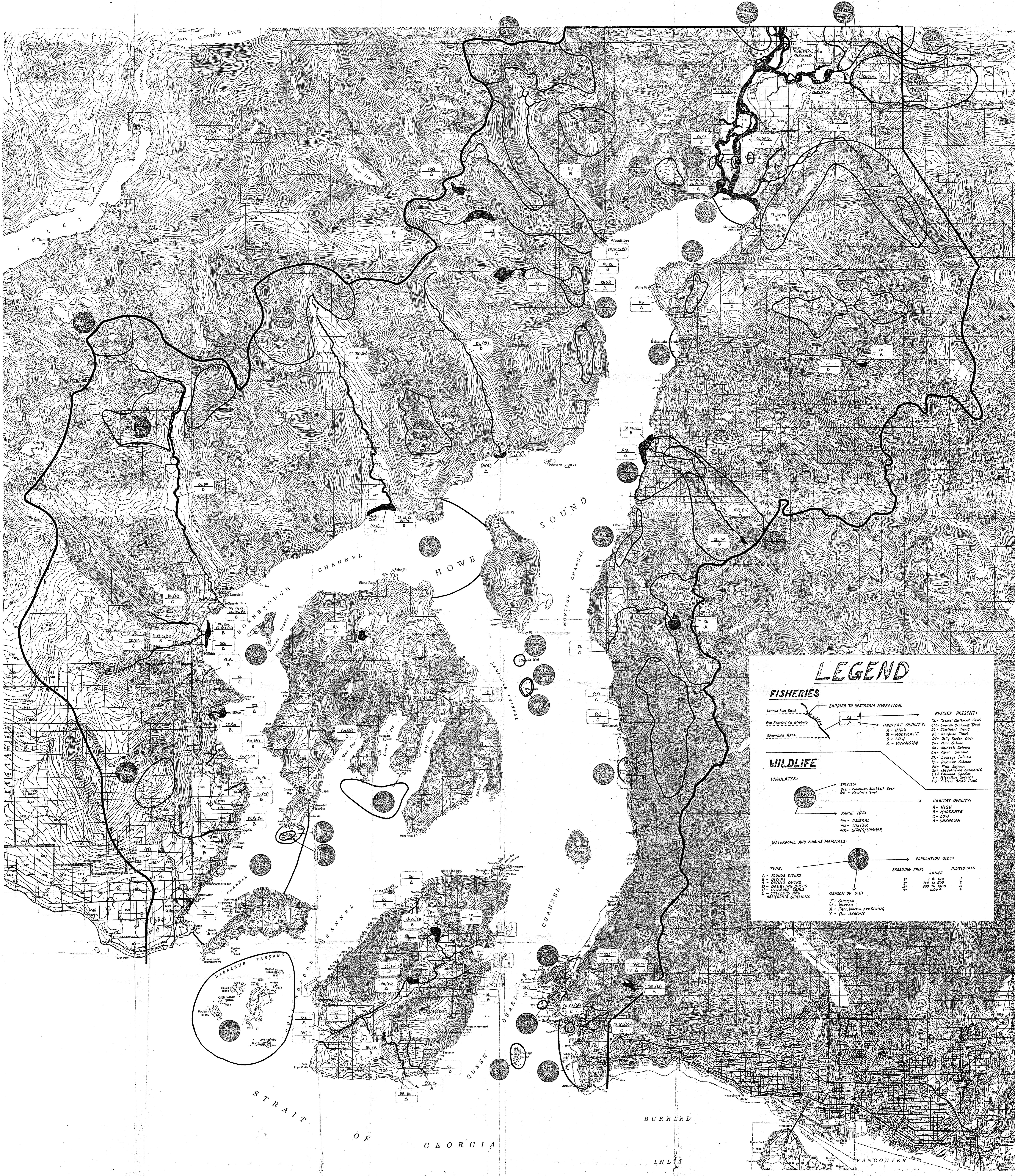
The future course of wildlife management in the Howe Sound area will be to continue present management policies through the application of hunting and harvest regulations, and to compile as much inventory information as possible as opportunities arise.

### III. CONCLUSIONS

The key to maintaining the fish and wildlife resources of the Howe Sound area lies in the protection of freshwater and estuarine habitat for fish use, and in the maintenance of wintering areas for ungulate and waterfowl populations. Undeveloped streamside green strips on streams that support resident, rearing, spawning, or migrating fish populations, or on streams where water quality is important to downstream fish populations, would result in protection of the fisheries resources. Green strips would also provide suitable habitat for many riparian wildlife species such as raccoon, mink, and river otter. The ungulate species of the study area require steep slopes, generally of southern or western exposure, with mature coniferous vegetative cover as wintering areas. These areas are vital to the survival of the ungulate populations and should be maintained in as natural a state as possible.

Estuarine areas in Howe Sound are, to some degree, already developed. Those estuarine areas of importance to wintering waterfowl, as well as those areas that support recreational opportunities for the public, should remain as undisturbed as possible. Wherever feasible, estuarine areas that have been supporting industrial use (eg. log storage) should be recovered and permitted to return to sites of natural productivity.

As accessibility into the Howe Sound area improves, and recreational use broadens, the value of the fish and wildlife resources in the area will increase. Consideration of the fish and wildlife resources in the planning stages of development will help to maintain the inherent qualities of the area. No one knows what effect past development has had on the fish and wildlife populations of the Howe Sound study area. The effects of future development can be speculated, however, and consideration to fish and wildlife values must be given in the planning stages of development in order to ensure that the fish and wildlife populations using the area will continue to do so.



### LEGEND

**FISHERIES**

Little Fish Weir → BARRIER TO UPSTREAM MIGRATION

Full Present or Rebuilding → HABITAT QUALITY: A = HIGH, B = MODERATE, C = LOW, D = UNKNOWN

Spawning Area →

**WILDLIFE**

UNGLATES: SPECIES: B12 - Columbian Blackfoot Deer, G2 - Mountain Goat

RANGE TYPE: G2 - GENERAL, W2 - WINTER, S/A - SPRING/SUMMER

WATERFOUL AND MARINE MAMMALS: POPULATION SIZE: BREEDING PAIRS, RANGE, INDIVIDUALS

TYPE: A - PLUNGE DIVERS, B - DIVING DUCKS, C - DIVING BIRDS, D - WADERS, E - WADERS, F - CALIFORNIA SEALIONS

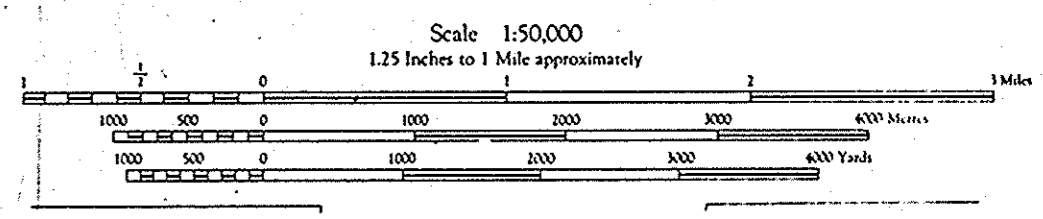
SEASON OF USE: T - SUMMER, W - WINTER, S - FALL/WINTER AND SPRING, Y - ALL SEASONS

**SPECIES PRESENT:**  
 CL - Coastal Cutthroat Trout  
 SC - Sawin Cutthroat Trout  
 ST - Steelhead Trout  
 RB - Rainbow Trout  
 DV - Dolly Varden Char  
 CA - Chinook Salmon  
 CS - Coho Salmon  
 SK - Sockeye Salmon  
 KO - Kokanee Salmon  
 PK - Pink Salmon  
 SO - Unidentified Salmonid  
 L1 - Lutescent Sculpin  
 E - Herring  
 G2 - Golden Shiner Trout

STUDY BOUNDARY

# HOWE SOUND STUDY

## FISH AND WILDLIFE VALUES



SOURCES: B.C. MINISTRY OF THE ENVIRONMENT AND WILDLIFE BRANCH, ENVIRONMENTAL PROTECTION SERVICE, FISHERIES AND MARINE SERVICE

IV. RECOMMENDATIONS

- (1) That protective zones of undeveloped vegetative cover be maintained along watercourses, which, at any time, may contain resident, rearing, spawning, or migrating fish populations, and along those watercourses in which water quality is of importance to downstream fish populations.
- (2) That the "Guidelines for Land Development and Protection of the Aquatic Environment" (Fisheries and Marine Service Technical Report No. 807) be adopted as the criteria used in establishing appropriate protective measures along the watercourses defined in (1) above.
- (3) That the reduction of industrial use (eg. log storage and sorting) be encouraged in Howe Sound, particularly in estuarine, intertidal, and shoal areas, and that such recovered areas be permitted to return to a state of natural productivity.
- (4) That future development in estuarine areas be confined to those areas that do not contribute to estuarine productivity.
- (5) That, in accordance with (4), future development in the Squamish estuary be confined to:
  - a) Mamquam Channel north of the public docking site.
  - b) All areas enclosed by flood control dykes.
  - c) All areas where dykes are present above high tide and separated from this demarcation by an adequate site specific green belt area.
  - d) Shoreline areas on the east and west sides of Howe Sound south of the Squamish delta.
- (6) That all developments be carefully planned and monitored in cooperation with the B.C. Fish and Wildlife Branch in order to maintain water quality and ungulate wintering areas.
- (7) That plans for refuse dumps be carefully considered and monitored in order to reduce the possibility of bear/human conflicts.
- (8) That, as opportunities arise, more inventory work be done so as to obtain more precise data on the fish and wildlife resources of the Howe Sound area.

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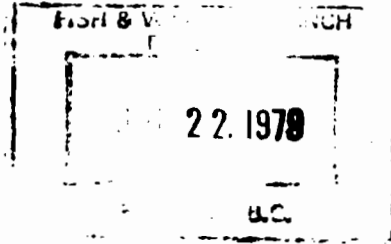


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Your file    Votre référence

Our file    Notre référence

5903-85-H190  
1000-5

June 15, 1979.

Mr. G. West,  
Regional Director,  
Fish and Wildlife Branch,  
4240 Manor Street,  
Burnaby, B.C.  
V5G 1B2

Dear Mr. West:

Re: "Fish and Wildlife Values: Howe Sound Area" -  
Report by the B.C. Fish and Wildlife Branch  
for ELUC Secretariat - Howe Sound Study

Reference is made to your letter of March 15, 1979 to R. Bell-Irving requesting comments on the subject report. I have reviewed the document and have the following comments to offer.

In this regard, I have partitioned my comments into the following categories:

- 1) Clarification of the Squamish River Task Force Recommendations
- 2) The Average Salmon Escapements to Howe Sound (by watershed and specie)
- 3) The (1977) Gross Wholesale Value of Commercially Caught Salmon Associated with Howe Sound

Section 1 - Clarification of the Squamish River Task Force Recommendations.

As there would appear to be need for some minor clarification in the section dealing with the 1972 Report to the Squamish Estuary Task Force, I have taken the liberty of suggesting that the entire 2nd paragraph on page 5 should read as follows:

"As detailed in a 1972 report to the Squamish Estuary Task Force, entitled "Effects of Existing and Proposed Industrial Developments on the Aquatic Ecosystem of the Squamish River ", the Fisheries and Marine Service recommended that port or other industrial development be confined to those portions of the Squamish delta which do not contribute significantly to estuarine productivity.

Later the general geographic areas of the Squamish delta which conform to this constraint were identified by F&MS as:

- (a) that portion of the Mamquam Channel north-easterly of the public docking site
- (b) all areas enclosed by flood control dykes
- (c) where dykes are not present, all areas above extreme high tide mark and to be separated from this demarcation by an adequate site-specific green belt area
- (d) shoreline areas on both east and west sides of Howe Sound south of the Squamish delta."

It should be noted that since the report was published and the Task Force Recommendations made, this Department has annually conducted studies which confirm that the most productive habitat and preferred fish rearing and feeding areas are found within the remaining portions of the Squamish delta.



June 15, 1979  
Mr. G. West  
Page 3

Section 2 - The Average Salmon Escapements to Howe Sound.

May I suggest that the fisheries data base be expanded to incorporate the most recent trends in escapement data for all of Howe Sound salmon bearing watersheds and not just the Squamish River and its tributaries. In addition the values for this resource base should reflect the most recent values and not 1972 values reported by (Hoos and Vold) in 1975.

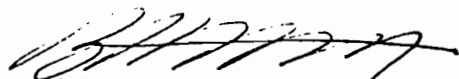
I have submitted a table (Table 1) indicating salmon escapements for Howe Sound, not just the Squamish River as reported in Hoos and Vold, 1975, together with updated (1977 dollar) figures for gross wholesale value of estimated Canadian-caught fish.

Section 3 - The 1977 Gross Wholesale Value of Commercially Caught Salmon.

Table 2 indicates the wholesale (1977) values associated with the escapement levels indicated in Table 1. The assumptions used in this table are based on coastwide averages and are designed to reflect a conservative value.

I believe this information will provide you with the most up-to-date summary of the values of the fishery resources in Howe Sound. I hope it will assist your submission to the study undertaken by the Environment and Land Use Secretariat. Please do not hesitate to contact me if you have further points you wish to discuss concerning this matter.

Yours very truly,



B.D. Tutty, Biologist,  
Foreshore Management Section,  
Habitat Protection Division,  
Resource Services Branch.

BDT/tc

cc: T. Bird  
W.J. Schouwenburg  
M. Harrison  
G.E. Scott, A/Dist. Supervisor,  
New Westminster  
C. Strong, ELUC Secretariat

TABLE 1: AVERAGE ANNUAL ESCAPEMENT -  
RIVERS EMPTYING INTO HOWE SOUND

(# of fish)

	<u>Sockeye</u>	<u>Chinook</u>	<u>Coho*</u>	<u>Chum*</u>	<u>Pink</u>	<u>Total</u>
Ashlu Cr.		685	1,345	2,460	1,750	6,240
Shovelnose Cr.		71	660	868	297	1,896
Pillchuk Cr.			525	235		760
Mamquam R.		528	2,500	17,830	4,120	24,978
Squamish R.		10,250	19,400	67,300	14,575	111,525
Cheakamus R.		1,070	5,850	26,700	6,270	39,890
Langdale Cr.				75		75
Twin Cr.				75		75
McNair Cr.			4	6		10
Rainy R.			38	21	4	63
McNab Cr.			83	240	10	333
Stawamus R.			329	18		347
Nelson Cr.				35		35
Eagle Harb. Cr.				14		14
Williamson Cr.				1,380		1,380
Oulette Cr.				1,473		1,473
Mannion Cr.				300		300
West Bay Cr.				1,205		1,205
Long Bay Cr.				1,440		1,440
		<u>12,604</u>	<u>30,734</u>	<u>121,675</u>	<u>27,026</u>	<u>192,039</u>

Marshall, D.E. et al. Preliminary Catalogue of Salmon Streams and Spawning Escapements of Statistical Area #28 (Howe Sound-Burrard Inlet)  
PAC/D-76-4 Environment Canada, Fisheries and Marine Service.

- escapement figures are 10-year averages, 1967-1976, except for: Mannion Creek - 8 year average 1969-1976; Langdale Creek, McNair Creek, Nelson Creek, Eagle Harbour Creek - 7 year averages 1970-1976; Rainy River - 6 year average 1971-1976 and Twin Creek - 5 year average 1971-1976.

\*Fury and Potlach Creeks maintain an unknown number of coho but is considered to be less than 50. Potlach Creek has a run of less than 100 chum salmon whereas Gambier Creek also has a similar chum run. (Pers. Comm., F. Wheeler, Fisheries Officer, Squamish, B.C.).

TABLE 2: 1977 GROSS VALUE AT WHOLESALE OF:  
SALMON ASSOCIATED WITH STREAMS  
EMPTYING INTO HOWE SOUND

Species*	Average Annual Escapement (1)	Catch: Escapement Ratio (2)	Estimated Annual Catch	Wholesale Value Per Fish \$1977 (3)	1977 Wholesale Value of Salmon Associated with Howe Sound Streams
Chinook	12,604	3:1	37,812	24.64	931,688
Coho	30,734	1.25:1	38,418	10.60	407,231
Chum	121,675	.8:1	97,340	15.13	1,472,754
Pink	27,026	1.3:1	35,134	5.72	200,966
					3,012,639

\*Sockeye salmon do not utilize any watersheds in the Howe Sound area

- (1) Marshall, D.E. et al. Preliminary Catalogue of Salmon Streams and Spawning Escapements of Statistical Area #28 (Howe Sound - Burrard Inlet) PAC/D-76-4 Environment Canada, Fisheries and Marine Service.

Escapement figures are ten year averages, 1967-1976, except where indicated in parentheses. Rivers included are: Ashlu Cr., Shovelnose Cr., Pillchuck Cr., Mamquam R., Squamish R., Cheakamus R., Langdale Cr. (7 year av.), Twin Cr. (5), McNair Cr. (7), Rainy R. (6), McNab Cr., Stawamus R., Nelson Cr. (7), Eagle Harbour Cr. (7), Williamson Cr., Oulette Cr., Mannion Cr. (8), West Bay Cr., Long Bay Cr.

- (2) Catch:Escapement ratios are coastwide general averages, and are designed to be conservative.

Source:

Wood, F.E.A. and Lill, A.F., Design Standards - Chinook Survival Rate. Internal memo from Program and Project Planning and Co-ordination Group, S.E.P. and Chief Engineer, S.E.P. to Distribution, November 23, 1978.

- (3) Wholesale Value Per Fish - Gross Value at Wholesale.

Source:

Fisheries and Environment Canada, Fisheries Statistics of British Columbia 1977.  
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