# B. C. HYDRO PROPOSED 287 kV TRANSMISSION LINE

# KITIMAT TO TERRACE

## Preliminary Environmental Assessment

## of

## Fish and Wildlife Values

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## EXECUTIVE SUMMARY

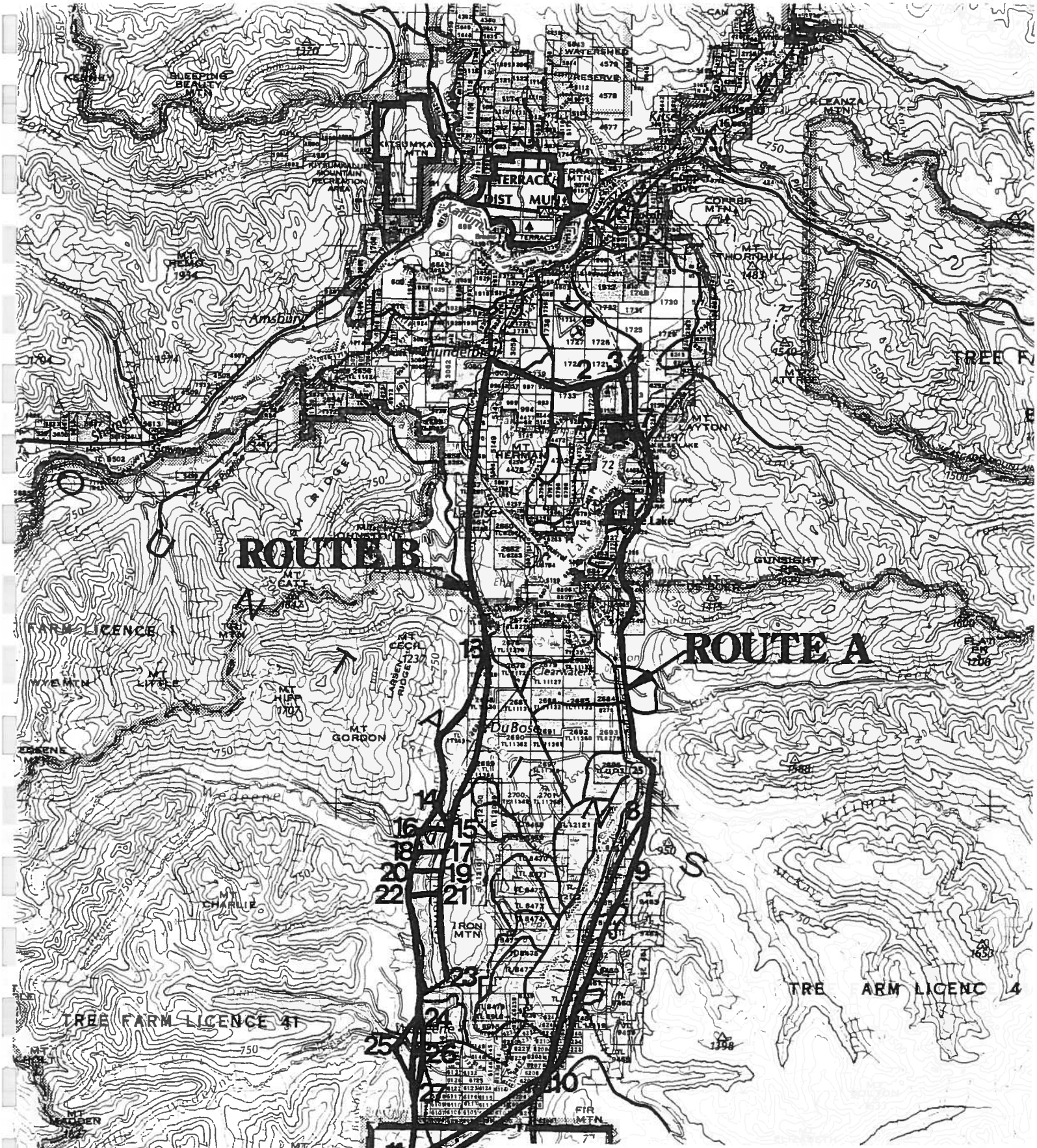
The proposed two corridors for another 287KV transmission line from B. C. Hydro's Skeena Substation at Terrace to Alcan's Substation at Kitimat, are referenced for fisheries and wildlife sensitivity and impact. Route "A" parallels the existing powerline down the Eastern edge of the Kitimat Valley. Route "B" is proposed as a new Corridor down the Western edge of the Kitimat Valley. It is more direct and is thus approximately 12 kilometres shorter.

Fisheries values are paramount in the study area with populations of steelhead, pink, coho, chinook, chum and sockeye in both the Lakelse and the Kitimat drainages. Recreational species; such as steelhead, coho, chinook, cutthroat and Dolly Varden are of strong secondary importance and support viable tourist industries in the Region.

Wildlife values are presently best represented by moose, bear, fur-bearers and waterfowl. Clearcut logging has depressed populations in the study area but regrowth of essential habitat and cover is allowing some species to increase in numbers. Trumpeter swans utilize the valley as a migration route in Spring and Fall while some remain as residents in warmer winters. The Kermode bear is a local subspecies of black bear and occasionally their recessive genes produce white individuals in the population. Terrace has made the Kermode bear the mascot of the city and it is valued and protected accordingly.

Line agency data was gathered from Department of Fisheries and Oceans in Terrace, Kitimat and Prince Rupert; Ministry of Environment - Fisheries Branch in Terrace and Smithers; Wildlife Branch in Terrace and Smithers and Habitat Protection in Terrace. Local groups, such as Northwest Section of the Steelhead Society, Skeena Valley Naturalists and various knowledgeable individuals also provided input. Limited field work provided a frame work on which to evaluate data pertinent to the project.

The two proposed Corridors were evaluated on a resource basis to determine the least impactive and sensitive route from several options internal to each Corridor. A general rating was evolved with common criteria and applied in an impartial and unbiased format. The rating of Route "B", being shorter and drier, was significantly less sensitive than Route "A" which is much longer and much wetter.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# INTRODUCTION

This report is designed to draw together available information regarding fish and wildlife values in the area of the Kitimat Valley so that route alternatives of a proposed 287K/V Transmission Line from Kitimat to Terrace can be evaluated in the best light of available environmental information. A general overview is presented for both fish and wildlife. More detailed information is provided specifically to the proposed route corridors. The timing is not opportune for additional field investigations to take place in November, December and January so data is sketchy in places. A winter survey of moose was carried out in January and it is included in the appendices at the end of the Report.

Commercial species of salmon are of proven value from a financial perspective but the recreational values of the sport fishery is an enormous tourism potential that is yet to be realized in the northwest portion of British Columbia. Both of these demands on the same resource along with the environmental awareness of the 1990's makes managing these species a very important responsibility. Other resource users that create an impact on the aquatic environment must carry out studies and provide data for possible mitigation and compensation to the fisheries in question.

Other resources such as commercial traplines are treated with equal care and attention when impacted by transmission line corridors. Wildlife populations, especially those perceived as valuable to the public for recreation or profit, are watched very closely by line agencies and an aware media-oriented human population.

Rare and endangered species and their habitats deserve and get special attention from both governments and industry whenever a new project becomes necessary. This study is no different in that regard. This preliminary Report will be augmented by a deeper and more intensive study once the consultants studies, public input and other agencies recommendations help to determine the correct corridor for the proposed transmission line. This Report is but the first step in that program to determine environmentally the safest and least impactive route through the Kitimat Valley.

## AQUATIC RESOURCES

The most important aquatic resources from a social and economic standpoint are the anadromous salmonid fishes. All of the waterbodies in the study area that connect to the sea via the Lakelse or Kitimat Rivers almost certainly have one or more of these species resident for some part of their life cycle. Only a barrier would cause an exception to this statement. It is proper that anadromous salmonids become the focus of this report. They are important to commercial, sport and native food fisheries and they are extremely sensitive to environmental change acting as a barometer to the health of their resident streams.

The resident freshwater species are just as important in a lesser, supporting role to the ecology of a healthy stream or waterbody. They each have their niche in the aquatic environment as predator or as prey, as a buffering agent or as a living lesson in piscatorial co-existence. The following is an evaluation of those that exist within the study area.

### Salmonid Life Histories - A Brief Outline

**Pink Salmon**

Pink Salmon are the most abundant salmonid returning to the streams of the study area. They are also the poorest swimmers and utilize the lower reaches of many streams if the gradient is too steep or barriers block them from further access. In the case of the Lakelse River they utilize the mainstem river below the lake in large numbers; often well over a million fish. They are the economic reason why the Lakelse system is the most valuable tributary of the entire Skeena in terms of its size compared to production.

Pink spawning is fairly well divided over even and odd years. There is no overlap since the fish reaches spawning maturity at two years of age and returns to its natal stream in August and September. Juvenile Pink Salmon have no freshwater rearing requirement and usually migrate seaward as soon as they emerge from the gravel in March, April and May. Crustaceans, squid and fish are their main diet at sea. Average weight at maturity is 3 to 8 pounds. The net commercial fishery benefits most although they can be taken on the troll. They are found from Northern California to the Bering Sea along our coast.

## Chum Salmon

The chum salmon is also a relatively weak swimmer and thus spawns below barriers in streams, often selecting upwelling ground water sites in side channels or cut-off channels. Chum spawn during August and September. The young fry emerge in April or May from the gravel, migrating directly to salt water. They stay 6 weeks longer in the estuary than do pinks. The fry are recognisable by narrow vertical parr marks extending just below the lateral line and they have a characteristic green iridescence on the back. Maturity is reached in the third or fourth ocean year. Many Skeena fish return as five year olds.

Their chief food at sea are crustaceans and on this base they grow from 8 to 18 pounds and occasionally to 30 pounds. Commercial fish harvesting is by purse seines and gill nets. The species range from Northern California to the Bering Sea similar to pink salmon.

## Chinook Salmon

Chinook are the largest of our Pacific salmon and are very strong swimmers and jumpers. They require deep fast water for spawning which takes place from early August through September. Chinook fry in the Skeena system are equally represented by those that migrate directly to the estuary and those that stay in freshwater to rear for one year before they migrate. It is not known if Kitimat River populations are as evenly split as those in the Lakelse system. Populations of at least 400 chinook salmon do spawn in the Lakelse River and some of its tributaries. Over-wintering for chinook fry has been documented in tributaries of the Kitimat and also in the side channels and sloughs of the lower Skeena River. The majority of returning fish are four to six year olds. A few precocious males called "jacks" return as two or three year olds and their participation in the spawning ensures a cross-fertilization of year classes and a broadening of the gene pool.

The ocean food consists of herring, sandlance, crustaceans and squid. Weights of mature fish usually range from 10 to 60 pounds but several over 100 pounds have been recorded. Commercial fishing is by troll and purse seine. A large sport fishing industry is also based on this species both on salt water and on the rivers. Long distances are recorded for California

populations that migrate to the Bering Sea and then return to their natal stream again.

**Coho Salmon**

This is the most widely distributed of all the Pacific salmon. It may spawn close to the sea or far up in headwater tributaries. They have an uncanny ability to surpass barriers either as adults or as fry seeking rearing habitats. They can also residulize in land-locked lakes or ponds. Spawning takes place during October to December, generally to the upper reaches of study area streams. The life history of coho indicates that they mature at age 3 or 4 after either one or two years in freshwater and two in the ocean. Precocious males often return in their 2nd year as "jacks". The saltwater food supply consists of herring, sandlance, crustaceans and squid. Their average weight at maturity is 6 to 12 pounds but may go as heavy as 30 pounds. The Kitimat and Lakelse rivers have some heavier fish known as "Northerns" and they probably average closer to 8 or 9 pounds. The commercial fishery harvests this fish mainly by troll but incidentally as well in seine and gill net fisheries. Sport fishing for coho in study area rivers is a popular recreation in September as they readily take bait, lures and flies. Their range is from California to Bering Sea and also South on the Asiatic coast to Japan.

**Sockeye Salmon**

This species is the most commercially valuable species, famous for its rich, red flesh. Usually lake-headed systems are required for spawning as the fry require a lake or slough environment during their first year of life. The streams above Lakelse Lake such as Williams, Sockeye and Scully are all documented producers. The warm waters of the lake and its associated marshes enhance a ready food supply for the growing fry. The outlet of the lake is also utilized for spawning as the fry swim up to the lake environs to rear. Sockeye spawn in September and the fry emerge from the gravel in April or May. Yearling seaward migrations occur in May of most years. This species readily residualizes in landlocked lakes and sloughs.

The Kitimat river has small populations of sockeye since it has few lakes on its tributaries. Upwelling groundwater in back channels sometimes can substitute for small populations to successfully spawn in marginal situations.

Anadromous sockeye usually mature in their 4th or 5th year; some taking six or seven years before returning to spawn (Clemens & Wilby 1961). Their saltwater food

is crustaceans; of which euphausids is the main component. Their weight at maturity is 5 to 7 pounds and occasionally up to 16 pounds has been recorded. They are taken mainly by the gill net industry or by purse seines. They range from Southern Oregon to Bering Sea.

**Steelhead Trout**

This species is B. C. 's most famous game fish; either as its anadromous form or as the residualized "rainbow" trout. Steelhead spawn and rear in many of the study area streams. They spend three for four years in freshwater, another two or three years in the ocean before returning to spawn as five or six year olds. Males seem to mature a year sooner than females. A small percentage of the population succeed in spawning more than once, returning from salt water each time.

The timing of their spawning runs are almost continuous but generally the "summer run" fish arrive in July and the "winter run" fish in November or later. Both runs spawn in May. Their involvement on the spawning beds is but poorly understood. Recreationally, the summer fish are much more valuable, being available to catch for longer in better weather conditions. The commercial fishery takes a considerable number of summer run steelhead in their gill net fishery as they travel in with sockeye and pink migrations. The food in saltwater is mainly crustaceans, squid, herring, etc. Individuals have been taken to 52 pounds (Rainbow) in freshwater and 42 pounds in saltwater Alaska. The saltwater range of steelhead is from Southern California to Gulf of Alaska.

Recreational sport-fishing for steelhead in the Lakelse River makes up a large part of the total catch of this species in the lower Skeena. Enhanced runs on the Kitimat is also fast becoming its number one recreation as well. Catch and release regulations are having a dampening effect on the sport at present as the resident angler is weaned from what has been historically a food fishery as much as it is a recreation.

**Cutthroat Trout**

The cutthroat trout in its anadromous form is a sought-after species in southern coastal B. C. The study area does have these fish in from the sea but the resident fish are just as large and much more abundant. Lakelse Lake in particular has a popular fishery for cutthroat trout in the Spring prior to their spawning in April or May.

The cutthroat spends two or three years in fresh water before descending to the estuary and grow up to 4 pounds in size. They often return to the lower river to feed on migrating fry or follow salmon to steal eggs during spawning. In salt water their food is sandlance, salmonids, rockfishes, sculpins and crustaceans. Their range is from California to Alaska.

In the study area cutthroat are often a family fishery. Steelhead are sought but the angler settles for incidental catches of this "take-home" species. They are found throughout the tributaries of both the Kitimat and the Lakelse systems.

**Dolly Varden**

The Dolly Varden char is another incidental take-home catch in the study area; taken while trying for salmon, steelhead or cutthroat. They are like the cutthroat, an ubiquitous species found in all of the tributaries. They are an efficient predator taking everything from eggs in redds to mice and voles when opportunities arise.

The marine fish are more abundant in Northern waters than they are farther South. These sea-runs when caught in the Lakelse River are distinguished by a smaller mouth then resident fish. They are a Fall spawner and are the most widespread of all salmonids. Their range in the ocean is from California to Japan in the North Pacific. They feed on fish, molluscs and larval insects.

**Resource Enhancement**

Within the study area, salmonid resource enhancement activity has largely been that of the Kitimat Fish Hatchery. Their history of releases in the area is in Appendix _II_. They have an annual capacity of about 16 million eggs and have been in operation since 1981 with pilot projects. The Terrace Salmonid Enhancement Society with their half million egg capacity hatchery at Deep Creek has released chinook fry into the Coldwater tributary of Lakelse River. Over two years about 50, 000 fry have been released in what is currently an ongoing program. The Eby Street Hatchery in Terrace under the Public Involvement Program (Department of Fisheries and Oceans supervision) have released coho fry in the Lakelse tributaries. Department of Fisheries and Oceans has also orchestrated stream habitat programs involving clearing barriers and initiating studies on capability and possible enhancement in the future. The student component was utilized to educate and train young people in fisheries management and environmental awareness.

Big Game Species:

**MOOSE**

Moose are present throughout the study area. They were first seen in the Terrace-Kitimat area about 40 years ago as part of a general province-wide South and Westerly range expansion in the 20th Century. The spread of this large ungulate was likely helped by wildfires and the advent of logging as our primary industry; promoting edge areas and better mixed forest habitats as they harvested the old growth forests.

The Canada Land Inventory aerial surveys in the winter of 1969-70 covered the Kitimat Valley and although some tracks were seen, no moose were observed in the area. Since that time only random sample surveys have been carried out on small areas at Lakelse. An intensive winter survey is clearly required to establish numbers, critical winter ranges and the population dynamics of moose in this area. The valley has completely changed from the mature forests of 1970 to large clearcut areas that are just now returning to second growth cover that will accommodate moose.

The habitat requirements are generally thought to be food and climate. Franzmann (1978) in "Big Game of North America" discusses a variety of habitat types for moose in summer, such as swamps, open forests etc. Cool forests and wet areas are utilized as thermo-regulators in July and August. Winter snow can be limiting but the wet maritime climate at Kitimat often removes it before it can be a problem; as was the case in 1989-90. In 1969-70 snow was up the eves of houses in Kitimat in February so extremes can occur. Only a closed canopy forest can help in bad winters. Snow reduces the food supply and limits travel so populations in the clearcut Kitimat Valley may now be migratory to South-facing slopes and forested adjacent valleys in order to survive.

The Canada Land Inventory classifies the area as Class 4 and 5 with moderate to severe limiting factors cited as climate, snow depth and possibly flooding. Spring allows Moose to utilize riparian habitats to calve near water in late May through June. The rich early growth of succulent plants and defensive locations allow cow moose advantages not found in other habitats for reproduction and security.

Human presence and activities in industrial outdoor situations and in hunting season probably serve as limiting factors, as would poaching as an impact that is not easily measured. Certainly the large clearcuts and lack of cover are detrimental to moose in the short term of 20 years after logging. A January 1990 aerial survey (Appendix VIII) by the author indicates an existing winter population of 50-85 moose are in the study area.

**DEER**

Deer are of lesser importance as a big game species in the study area. Sitka black-tail deer are uncommon and likely hybridize with mule deer in the Thunderbird area near Terrace. Small bodied animals are seen in the Skeena regularly. A doe and fawn were reported on Ferry Island in 1989. Loggers report small sized deer in Chist Creek near where Canada Land Inventory surveys found tracks of deer at 3500' elevation in 1969-70 winter. This species may wander through the regenerating clearcuts of the Kitimat Valley but there is no closed canopy forest winter range to rely on for critical situations as there was historically.

The coastal habitats and tidal areas at Kitimat may allow a small population to survive deep snow winters. Human hunting pressures near this population centre make their continued existence uncertain. In 1981 the Fish and Wildlife Branch suspected the coastal population of being in decline; due to heavy snow winters and predation by wolves. Along the coastline shallow bays and stream estuaries combined with mature coniferous forests provide a fringe along the foreshore that allows survival. The intertidal zone and litterfall provide an adequate food supply but it also concentrates deer populations for predators.

**BEARS**

Both the grizzly and the black bear occur in the study area. Grizzly populations are down from historic levels to only a few in the Kitimat Valley through loss of mature forest habitat, hunting pressure, poaching and human development. Complaints in January 1990 of a grizzly sow and 2 cubs in Kitimat were received by Ministry of Environment .Their abundance is still moderate in the Lakelse River drainage as old growth forest still exists near salmon spawning streams. As a general observation grizzlies are said to be intolerant of man's activities and continued close proximity usually results in the bear's removal. Strong populations still exist in the upper reaches of the Kitimat River but active logging is now invading this area as well. Some bears may migrate seasonally down the drainage for localized food sources such as salmon or berry crops in burned areas.

Black Bears are common in the Kitimat Valley. The classification of the bears locally are as a subspecies Ursus americanus kermodei where the white phase is relatively common particularly in the Terrace area. In 1988 a blue phase individual was shot at Kitimat and the cinnamon or brown phase is common in the study area. These recessive colour genes are probably closer to parity with the dominant black genes in two particular areas of the Northwest, namely Princess Royal Island the type locality for Kermode Bears and in the Terrace area. The white bears have become a mascot animal for the area and they are valued accordingly. Bears are omnivorous, eating a wide variety of plants and animal foods. They are opportunistic scroungers making the most out of carrion, garbage, dying salmon, insects or even newly born ungulates. They are not efficient predators. In Spring slide areas and valley bottoms attract them. Avalanche lily, skunk cabbage and horsetails are sought out. By May and June newborn moose calves offer a change of diet and in July to September berries and salmon dominate their food supply so bears tend to concentrate along rivers and in burned areas. The winter months are mostly spent in dens where, as semi-hibernators they sleep until Spring starts another annual cycle.

**Wolf**

Wolves are common to the Lakelse-Kitimat area under study. The Wildlife Branch rates this species as moderate to plentiful in the Skeena drainage. Their numbers have increased locally over the last 30 years and they are most obvious in cold, deep snow years when food is less available. The arrival of moose in the area likely improved the capability of the Kitimat Valley to support wolves as moose are one of their major prey species in the Interior of B. C.

Individuals shot in this area seem to be larger in size as they consistently rate high in the B. C. Records Book. The abundant food supply of alternate prey such as beaver, salmon, deer, dogs, etc. as well as carrion will support wolf packs in the absence of moose. In the winter of 1969-70 as mentioned elsewhere in this report, wolves regularly ate the insulation off of runway lights at the Terrace Airport. It was a very cold, deep snow year.

**Cougar**

The study area is at the extreme northern limits of the known range of this feline predator in B.C. It's principle prey is deer and an inadequate prey base locally explains its rarity. In 1987 a two year old

male was trapped in the Copper drainage nearby. Occasional sightings are reported from time to time.

**Fur-Bearers**

Habitat preferences vary widely among the fur-bearers found in the Kitimat Valley. The marten inhabits mature coniferous forests and tends to avoid cleared or burned areas. The local trappers feel that regeneration in some areas of the Valley now offers enough cover that marten may start scavenging for salmon carcasses along some of the streams where they had been extirpated by clearcut logging practices.

The fisher often prefers coniferous-deciduous mixes in forest habitats. Like the marten, red squirrels are a preferred prey and it helps to have trees for them to live in. In November 1989 a fisher attempted to cross a logging road in snow during our field survey at Coldwater Creek.

The short-tailed weasel or "Ermine" utilizes low-elevation habitats and also scavenges through riparian habitats or hunts for voles and mice. It prefers deciduous forests. The wolverine is uncommon but most active traplines harvest one or two a year in the study area. The experts say it prefers subalpine forest and alpine tundra but it may only be more visible there as it is a prodigious traveller with large territories. They too, prefer salmon carcasses to scavenge in season.

The mink, a semi-aquatic mustelid, prefers streams, marshes, seacoast and adjacent forests. Fish are it's preferred prey as well as molluscs and aquatic insects. The otter is a fish-eater like the mink. They live almost entirely in streams or wetlands and along the coast. Sighting of this animal is uncommon but not unexpected in the Kitimat and Lakelse drainages. Traplines along proposed routes average about one a year in their traps.

Canada lynx is rare in the area but it's principal prey, the snowshoe hare, is common. Since both are cyclic likely peaks in the cycle would increase their presence here. The coyote is also rare but occasionally their yapping is heard in the area near the airport. Clearcuts may simulate its historic habitats of open prairie, farmland and riparian habitats, often in close proximity to humans.

The red fox is fairly common and most reporting

trappers listed several in their recent harvest figures. The cross-fox and silver fox are genetic colour recessive genes of the red fox and only a few are trapped each year. In 1986 a den was located on the proposed Right of Way of Route A beside the Kitimat Highway. Four pups were present in the den located under an old spruce stump. They hunt wetlands, riparian habitats and like the coyote, adapt well to civilization.

Beaver are the most obvious fur-bearer, creating their own microhabitats by damming waters and erecting large den houses. They can be a nuisance where culverts are concerned and highways personnel regularly requests help in removing problem beaver along the Kitimat Highway and its route along the wetlands of Humphrey and Nalbeelah Creeks. They are often killed by traffic here as well. The muskrat like the beaver inhabits ponds, wetlands, marshes or lakes and usually benefits by the liaison. They are not as common as beaver and their push-ups of reeds and aquatic vegetation are much smaller in size as well.

Finally, the red squirrel is common to any coniferous forest left from logging. They are prey to marten and fisher as well as some of the raptors. Their fur is less valuable so they are seldom selectively trapped but are taken in sets meant for other species of fur-bearer.

**Small Mammals**

These smaller animals are often overlooked in local ecological evaluations. There are three shrews, five bats and nine rodents listed as indigenous to the area. Some of these mammals are an important part of the ecosystem and an integral part of the food chain that supports predatory mammals and birds.

**Marine Mammals**

The harbour seal finds its way up the Lakelse River and into the lake occasionally, following the salmon runs. It has also been reported up to the transmission line in the Kitimat River. Otters and mink often reverse this process and leave the fresh water for saline foreshore areas to feed or in transit to other streams. Even beaver have been seen in Douglas Channel once in a while.

**Waterfowl**

Many portions of the study area, namely wetlands and riparian areas, are important as Spring, Fall or even

Winter habitat for geese, ducks and swans. The Canada Land Inventory rated the Kitimat Valley for severe limitations such as adverse topography or excessive water flow or even innundation. Two areas at each end of the study area, Lakelse Lake and Minette Bay on Douglas Channel, are classified as migration or wintering areas without restrictive subclasses. It is the highest rating in the study area.

Canada geese are present as Spring and Fall migrants in many wetlands. Some, in smaller numbers, nest in sloughs or back channels. Estuarine mudflats at Kitimat support wintering geese and in less severe winters such as 1989-90, geese utilize gravel bars of the Kitimat River and become carrion eaters on salmon carcasses.

Dabbling ducks (subfamily Anatinae) utilize seasonal habitats and feed in shallow waters; bay ducks (subfamily Aythyinae) utilize deeper waters where they dive for food. Sea ducks (subfamily Aythyinae) are seasonally found on ocean waters and are only occasionally found in the study area. Another class (subfamily Merginae) are the fish-eating Mergansers which are common in the Kitimat Valley.

Dabblers recorded in the study area are mallards; pintail; cinnamon, blue-winged and green-winged teal; and American widgeon. Mallards in particular are often resident, nesting and wintering locally in less severe winters. A marginal dabbler, wood duck is rare but a specimen has been collected at Lakelse Lake in 1989 by a hunter. It was an immature female and may have been from a brood brought off a local nest in old growth timber nearby.

Bay ducks are also found in the area in Winter. Lesser scaup, Barrow's goldeneye, common goldeneye, bufflehead, redhead and ring-necked duck have all been recorded at Lakelse Lake. The bufflehead and goldeneye spend the warmer winters on open rivers, feeding on migrating fry, sculpins, etc. Flocks are seen on Lakelse Lake during winter ice free periods.

Sea ducks are mainly represented by the Harlequin duck which nests inland from the sea and readily utilizes many of the mountain headed streams. Surf scoters have been observed on Lakelse Lake in the Summer and Fall.

Mergansers are well represented in the area. Common mergansers are resident on larger waterways. Hooded and red-breasted mergansers are much less observed but are recorded at Lakelse Lake. Common mergansers in particular, rear large broods successfully.

Trumpeter swans winter in specific localities depending on ice-up and available food. Lakelse Lake is one of these areas. Occasional nesting occurs at the South end of the lake. In November, six were observed at a small marsh at Lone Wolf Creek and Wedeene River on a perched water table marsh. Provincially the species has recovered in recent years in spite of its low reproductive potential. In the Northwest they are doing well as marginal residents. Whistling swans are also occasional migrants through the Kitimat Valley.

**Upland Game Birds**

Upland game birds are not numerous in the study area. Species found here are blue grouse, spruce grouse, ruffed grouse, white-tailed ptarmigan and ring-neck pheasant. The only common occurrence is the ruffed grouse which is hunted regularly. The rest are uncommon to rare. White-tailed ptarmigan descend in Fall and Winter usually after heavy snowfalls. Flocks are seen on riparian habitats for brief periods at Lakelse Lake and along the Skeena Islands and sloughs. Pheasant are rarely seen in the Lakelse River area having escaped from a commercial operation near Terrace. A female was reported in 1988 but their continued survival is doubtful.

On Vancouver Island blue grouse numbers usually increase following logging due to the creation of breeding habitat. It is not known if northern populations respond in a similar fashion. Another game bird that is present but not hunted is the common snipe due in part to the small numbers along local riparian habitats.

**Non-Game Birds**

Very probably there are less than 100 species that utilize the study area on a regular basis. Skeena Valley Naturalists Club conducts Christmas Bird Counts on a given date each year in winter and their high total has been 63 species with an average of about 43. Lakelse Lake is within their survey area. Migratory species swell these numbers in Spring and Fall.

Bald Eagles are common year round. They increase dramatically during and after salmon runs along with flocks of gulls, crows and ravens. They are all scavengers so garbage dumps are great concentration sites and regular daily migrations occur to riparian or

coastal areas nearby. Kitimat and Thornhill municipal dumps are adjacent to the study area.

More intensive work is needed on bird species lists and the habitats they utilize. Included elsewhere in this report is a partial Parks Branch list and observations by local naturalists on the Lakelse Lake area (Appendix V). The geothermal warming likely attracts more birds to the enhanced food supply and habitats and also keeps them there longer during migration.

**Reptiles and Amphibians**

Garter snakes are the only reptile found locally and they are uncommon. They become more active in higher temperatures and can be found in riparian habitats as well as open sunny slopes.

Amphibians are little better represented but they too rely on ambient high temperatures to stay active in damp habitats near water. The spotted frog lives in lakes, ponds and streams. Other species such as the boreal toad, brown salamander and northern roughskin Newt utilize moist terrestrial habitats and return to water for breeding. Rare species locally, tailed frogs and red-legged frogs have been documented in the Study area near Kitimat and are likely at the northern extremes of their range. More and better seasonal inventory is clearly required to document local populations and their critical habitats.

## THE OPERATION PHASE

The physical presence of towers and cables on the landscape guarantee that there will be collisions and accidents to birds but almost all studies done on the subject indicate that casualties are low in number. Groundwires overhead for lightning protection and guywires were thought to be largely responsible for the majority of collisions (Meyer - 1978), indicated "Height change was the most common flight reaction to the transmission lines with most birds preferring to cross above the lines. Directional change and aborts were the next most common reactions followed by flares." His report then went on to say: "The high speed and low altitude flights of teal are believed to increase their susceptibility to collisions with transmission lines. The apparent reason for the susceptibility of starlings and red-winged blackbirds to collisions is that they commonly fly in large tight flocks at low flight altitudes. Shorebirds have the same susceptibility traits, ie: low tight flocking practices."

Transmission lines have properties that are non-visual and it is possible that audible noise, electric field and magnetic field can forewarn birds as to its proximal location. During night flights, in reduced light situations such as fog or low cloud or even blizzards these cues may help avoid collisions. Others have also noted the prevalence of wire strikes and inclement weather, particularly fog (Stout-Cornwell-1976). The study area is well known for its share of bad weather in the winter months so this factor must be considered, particularly where lines are strung perpendicular across low altitude flyways of waterfowl.

The frequency of waterfowl collisions with power lines can be attributed to the number of birds present, visibility at the time, species composition which dictates the behavior of birds, disturbance and familiarity of birds with the area (Avery-1978). The use of self-supporting towers at river crossings or on wetlands and eliminating static wires from wetlands towers are two possible ways to reduce flight hazards to birds. Keeping lines on a horizontal plane and thus reducing the vertical dimension is yet another mitigation factor as is a coating of reflective or luminous paint and plastic balls over river crossings.

A BC Hydro report, (Ess-20-Vol#1-1983) states: "Swan (trumpeter) mortality due to wire strikes has been reported near Kitimat, about 50km south of Terrace (Crack-pers-comm). Because of their high susceptibility to collisions, small population size and low reproductive potential, the impact of wire strikes on trumpeter swans could be severe." During January-1990 surveys of moose, three swans were also observed resting at the mouth of Goose Creek just below the present river crossing of the existing power line. Nine others were seen on Lakelse Lake near the North end at Williams Creek; another major wetlands crossing of the present power line along proposed Route A.

Collision hazard is considered a moderately important factor in establishing areas of sensitivity, particularly in areas used regularly by trumpeter swans. The above two areas on Route A are certainly high risk sites as in the Lakelse River and Wedeene River crossings on Route B which are less extensive but have perhaps a more concentrated flyway in the case of the Lakelse River.

Transmission towers have been used as supports for raptor nests in the Prince George area where osprey were common. In the study area there is no evidence of nesting attempts on the existing transmission line by either eagles or ospreys which are both resident in the area.

## ACCESS AND VISIBILITY

The transmission line may provide access to areas, previously unavailable to vehicles. In the Kitimat Valley this will be a minimal problem in the open cut blocks as access is available from the logging. In the future, however, it is expected that the regeneration will close off secondary roads as the forests grow back and Nature will also put many roads to bed. At this juncture the right of way access may become the only maintained roads into some areas. Regulatory management may have to be considered at that time if access is a problem.

Visibility of animals for hunters along transmission lines will be increased in the future as other areas adjacent grow in and the manicured or controlled vegetation under the wires is maintained at low levels. Sitka blacktail could take advantage,on a seasonal basis, of any seeding or planting of grasses to retain slope stability and erosion. Grouse are also another species that benefit from planting clover and grasses. Bird hunters could learn to key on these accessible populations in the future.

Some species, like the red fox, are especially adapted to forest edges. Other species, such as mice and voles, that consume seeds of grasses, herbs and shrubs are likely to increase and they become the prey base for foxes and coyotes. Snowshoe hares also prefer edge areas and their presence attracts many other predators into the area.

Birds, such as the kinglets that forage in the forest canopy will be adversely affected by right of way clearing. Others, such as flycatchers, will benefit from opening up the forest. Numerous studies suggest that a high level of bird species diversity is probable in a right of way maintained in an early successional stage (Bunnell and Eastman-1976).

Wetland areas present special problems for endemic species when rights of way are imposed on these habitats. In small sites the loss of habitat could be complete through ill-considered access roads, equipment landings and placement of tower pads. Usually coarse gravel or shot rock is utilized as land fill and then left behind as an inert entity in a viable ecosystem. The displacement of productivity is often permanent. Additionally, these features may act as dams; causing changes in the water levels and flow regimes. This, in turn, can force long term effects on emergent vegetation. Species such as muskrat, beaver, mink otter, moose, waterfowl, smaller mammals, birds and amphibians are all dependent upon wetlands to some degree; and all could be impacted adversely by changes in water levels or vegetation shifts in wetlands.

Most of the potential loss of habitat for moose in clearing a right of way cannot be mitigated as the clear-cut logging has already removed the mature forest canopy over the last 20 years. The winter moose survey carried out in 1990 by the Author, found that moose were beginning to utilize old regenerated cut blocks in mild winters. Lack of snow allowed moose to range widely so critical winter range parameters could not be established. It is likely a population of 50 to 85 animals are in the study area and they should increase with the recovery of their habitats and general canopy closure of the second growth forest.

Wetlands are the critical habital type for both fish and wildlife. They should be spanned or avoided wherever possible. If they cannot be avoided then a strategy to minimize disturbance to both soils and vegetation should be implemented. If access roads must be maintained then cross-drainage must be facilitated. Wetlands are considered to be highly sensitive and the impacts of disturbance can only be partially mitigated.

Subsistence hunting is believed to be minimal in the study area. Aboriginal fishing for food was once carried out on the Hirsch Creek drainage but the traditional area has been abandoned in favor of salt-water harvesting nearby.

Trapping may require mitigation and compensation as species such as beaver, muskrat, otter, marten, bear, etc; as well as fish require maintenance of habitat and the ongoing presence of a transmission line will reduce their habitat over the long term. As in the case of moose wintering, the logging of the Kitimat Valley negates immediate mitigation since that resource extraction process had harsh and long term effects on the local fur harvests. Once a route is established the trappers whose areas are involved should be given the opportunity to comment as there could be significant impacts on individual traplines.

Big game guiding in the study area should not be further impacted by construction of a power line as they rely heavily on a wilderness experience and the forest industry has largely wiped out that potential. Sports fish guiding is just becoming a viable profession in the study area and with the adjunct of enhanced stocks of sport fish in the Kitimat River will increase rapidly in the near future.

## IMPACTS ON SENSITIVITIES

A decision to construct a new transmission line and Right of Way Corridor can have far reaching effects on local wildlife populations. They can be of immediate impact or long term and insidious depending on location, species involved and timing. During construction the disruption is caused by machines and people affecting the physical parameters of the site. During operation the transmission line which has modified the natural habitat will maintain its standards while the surrounding area evolves and changes. This altered status will be a constant in a linear and manicured environment with towers, lines, conductors, associated electromagnetic fields and access roads all added to the local environment. These changes will affect wildlife use patterns in a positive or negative manner and may even have a benign effect. Where adverse effects are anticipated mitigation can often reduce the impacts to ecosystems. Artificial changes can often lead to unexpected and complex results but with the adjustability and flex of power lines, these consequences can hopefully be kept to a minimum.

Transmission lines can also affect human use of the natural resources in the area. Hunters gain access, linear viewing for crossing or moving animals and many are quick to take advantage of such opportunities. Fishermen gain access to stretches of river that enjoyed isolation from fishing pressure prior to construction. The physical intrusion of commercial artificiality is often disturbing to those seeking solace in natural environments.

The proposed routes and alternate locations within those routes were rated for sensitivity with respect to fish and wildlife values. These ratings considered the importance of the resource and severity of damage that could result from the transmission line in the absence of mitigation. The criteria is based on wetlands and riparian habitats and their related use by fish and wildlife being ecologically more valuable to the environment than higher, drier, rocky areas of limited use or importance to local populations of animals. The very nature of human evaluation dictates that our use or appreciation weigh heavily in the conclusions reached.

Logging, clearing and road building accessing the transmission line right of way can be expected to cause soil erosion and the input of silt to nearby waterbodies. In wetlands, shot rock or coarse gravel used as fill to access tower sites removes habitat leaving inert strips without any natural productivity potential. Improperly placed culverts can create barriers on access roads to salmonid migrations; especially with the added help from the local beaver population.

Transmission line corridors are now mechanically or manually controlled vegetation zones. The need for control is often dictated by the height of the overhead transmission lines and the type of vegetation involved on a site specific basis. Herbicides are no longer considered to be a viable means of vegetation control on transmission line corridors. Leakage and accidental spills of fuels, oil and other chemicals into watercourses during construction, also remains as a constant concern.

Because of the delay in route selection and the lack of data in line agency files for some drainages and poor timing for field evaluations (November-January); recommendations are of a general scope in this report. Site specific decisions, regarding alignment and construction, should be made with an Environmental Inspector employed full time to be on site for consultation and advice as the work proceeds.

Timing is particularly important for construction in critical areas where waterfowl or other birds nest, maternity areas for ungulates, fish holding or spawning and ungulate wintering. With eggs in the gravel of streams siltation can also be a threat if erodable areas at streamside or upstream are disturbed.

In areas like the Kitimat Valley where heavy snowfall is a constant winter threat, wild ungulates are most vulnerable to disturbances. Forage intake is usually reduced and movement costs energy so animals like moose and deer lose weight. Displacement and stress often occur, driving ungulates to more marginal winter ranges where their chances of survival are poor.

This particular winter, 1989-90, appears to be a very mild one. Constraints on moose winter range could be modified if the aforementioned Environment Inspector were in place to evaluate site specifics and to consult with regional Wildlife Branch authorities. Ungulates also utilize riparian and wetlands habitats for late pregnancy and parturition; seeking seclusion and security from predators during late May through June. Deer are scarce in the study area and probably widely dispersed at fawning time so mitigation may not be considered for this species.

Waterfowl are vulnerable to disturbance during Spring migration and the breeding season. Migrating waterfowl are usually concentrated both in flight and at rest in suitable habitat with ice free water. Disturbances force them into marginal habitat. Possible disturbance of migrating birds during construction is a definite factor in rating sensitivities and should be eliminated from mid-March to mid-May. There is always the likelihood of individual destruction of nests or dens. Some species, such as eagles, will tolerate having their nest moved. Most will not!

Much of the transmission line route traverses habitats preferred by black and grizzly bears. While bear problems are not considered in sensitivity or impact ratings; routes over berry patch or fishing site locations definitely are a considerable impact to seasonal food sources.

One of the aims of avoiding fish sensitivity areas was set in the planning sessions by offering the best environmental route location possible. After a route is chosen, the generalities should then become specifics. As stream conditions, terrain and seasonal scheduling requirements differ greatly from one segment to another, Federal and Provincial agencies must be consulted before detailed construction plans are developed for each area. In adjusting the route alignment to avoid small streams that are potentially salmonid spawning or rearing areas, it is also essential to maintain a "leave strip" of vegetation between the right of way and the stream; where the route closely parallels a stream.

The two proposed routes "A" and "B" are presented on 1:50,000 mapsheets for convenience. Route "A" is on the East side of the Kitimat Valley and parallels the existing transmission line. Route "B" is a new proposal on the West side of the Kitimat Valley. It is approximately 12 kilometers shorter in length than is Route "A". Directional changes or nodes are numbered in each proposed route to tie the descriptive report to the 1:50,000 mapsheet coverage. Wildlife values will be discussed in a separate section from that of fisheries in each segment of the route proposals.

**Route "A" Proposal - Fisheries Values**

Some of the most critical habitats for fisheries exist on route "A" streams draining into Lakelse Lake. The North end of Lakelse Lake in particular has had about 30 % of its fisheries potential negated by the placement of the highway and original transmission line down the middle of a very valuable wetlands complex. The detrimental effects of any further development in this corridor through the wetlands will be additive.

Drainages to be discussed are as follows: Sockeye Creek, Williams Creek, Blackwater Creek, Furlong Creek, Granite Creek, Mountain Creek, Hotsprings Creek, Scully (Schulbuckhand) Creek, Clearwater Creek, Andalas Creek and Ena Creek. Lakelse Lake with its various geothermal sources will also be included.

**Sockeye Creek**

Tributary to Williams Creek, flows Southerly to parallel closely the present transmission line to Kitimat. Drains extensive wetlands and marsh areas. Utilizes alluvial fan gravels from Williams Creek in lower reaches to support large sockeye escapement from July to October peaking in August. The chronology of salmon escapement are as follows:

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | 2000 | 50 | 175 | 125 | 100 | 600 | 150 |
| Coho | 1000 | 300 | - | 1000 | 1500 | - | 300 |
| Pink | 100 | - | - | - | - | - | - |
| Chinook | 50 | - | - | - | - | - | - |

Pink and sockeye utilize the lower stream areas, coho the mid and upper reaches. Resident fish are cutthroat, rainbow trout, Dolly Varden, rocky mountain whitefish, stickleback and sculpins. Cutthroat, rocky mountain whitefish and Dolly Varden that are residents of Lakelse Lake also are likely to follow spawning fish up into natal streams to prey on loose eggs during spawning. Sockeye spawn upstream for 4.0 kilometers, coho - 8.5 kilometers, cutthroat - 7.5 kilometers and Dolly Varden to 7.0 kilometers.

**Possible Locations within Corridor for Additional Right of Way**

There is no good route through the wetlands of Sockeye Creek. The least impactive route would be to put both circuits on the same structures and use the present (#1, 2, 3, 6, 7) Right of Way. This would contain the construction to edges and side channels of Sockeye Creek already under the present transmission line. Salmonid rearing, witnering and some spawning would be impacted.

Proper planning of construction timing can minimize impacts to some degree by avoiding spawning periods and times of egg development in particular. Alternate possibilities were examined but the problems grow as construction and environmental impacts esculate accordingly. A route on the dry slopes (#1, 2, 3, 6, 7) of the West side of the wetlands and then across Eastward to parallel segment 6, 7 was also examined. It has lesser impacts for fisheries values as the slow drainage and acidic standing water areas that have been cut off from Sockeye Creek are of less value to the anadromous fish runs. Spawning potential no longer exists West of the highway. Some resident fisheries values such as cutthroat, stickleback, Dolly Varden still exist but the area has lost much of its potential productivity in being cut off from its major source streams of Sockeye and Williams Creek.

Other possible routes that could be engineered, were rejected as the environmental concerns are exceptionally high. One such route would parallel the original Right of Way down Sockeye Creek through riparian habitat to the East-West (1, 2, 3, 6, 7,) leg. Another would take a new Right of Way North through the upper marshes of Sockeye Creek, cross Williams Creek, returning to the present Right of Way via the East side of the Wetlands complex (1, 2, 3, 4, 7). The threat of clay slumping and ongoing siltation in addition to the impacts of construction and access make this route encironmentally untenable as well.

**Williams Creek**

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | 15000 | 3000 | 1600 | 500 | 2000 | 12000 | 3000 |
| Coho | 1500 | 800 | 30 | - | 1000 | - | 700 |
| Pink | 100 | - | - | - | - | - | - |
| Chinook | 25 | - | - | - | - | - | - |

Williams Creek is the major drainage entering Lakelse Lake at the Northern end and picking up Sockeye Creek as a tributary. It's alluvial fan spreads out to provide gravel to both streams for salmonid spawning at the North end of the lake. The construction of the highway constricts the gravel deposition to the East side of the wetlands and keeps spawning potential to less than optimal distribution in the wetted

width of the valley. On almost an annual basis the highway surface is under water at the North end of the lake and deposition will increase the height of future flooding levels. Likely an increase in acidity will occur in standing stagnant waters west of the highway as well.

In Williams Creek sockeye spawn in the lower 5 kilometers, coho below 14 km., steelhead up to 7 km., cutthroat trout, Dolly Varden and rainbow trout can be observed to 11 km. Hatchery coho have been released into the system in Sockeye Creek in the past. The fisheries values combine largely with those of Sockeye Creek as steeper gradients increase gravel movement from a large drainage basin in the mountains. Minnow trapping produced less coho and rainbow but more sculpins in the mainstem Williams Creek than in the waters of Sockeye Creek.

The impacts to the fishery can be reduced if the present transmission line is combined with the new transmission line on the same structures. The entire wetlands complex is sensitive to alteration and the greatest threat would occur if the least attractive choice of risking the clay deposits slumping into the stream from the east were seriously considered.

**Blackwater Creek**

This stream is actually an overflow route of Williams Creek and should be considered in composite with the previous two drainages. Nutrient values are extremely high as it is a deposition area for soil and silts flushed out of Williams Creek. This is dammed up by the highway and its two large culverts blocking drainage into Lakelse Lake.

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | 500 | 200 | 250 | 100 | 200 | 150 | 200 |
| Coho | 500 | - | - | - | 500 | - | 200 |

Sockeye were observed spawning in this sluggish overflow stream from the lake to 2.3 km., coho at 2.4 km. It contains optimum habitat for sculpins and stickleback.

The last stream to be mentioned is an unnamed one flowing south into Muller Bay from the western marshes, cut off from the active streams by the highway berm. This sluggish stream has coho spawning in its lower reaches to 0.3 km. This entire marsh complex is the most dynamic of all ecosystems encountered on Route A and should be treated as an integral unit of biological productivity.

**Furlong Creek**

This small stream flows west through Lakelse Park and has coho and cutthroat trout in it. Only cutthroat have been sampled from the lower reaches. As the Right of Way (#7-8) is above the zone of blue clay no impact of construction or maintainance are anticipated.

**Granite Creek**

This stream also flows into the lake at Furlong Bay. It has a large alluvial fan building out into the lake due to channalization upstream. Coho are found to the highway bridge at 1.2 km. Target escapements for salmon in this stream are 25 coho and 250 pinks. As many as 500 pinks have been observed here previously. In 1981 electroshocking produced 11 cutthroat, 5 Dolly Varden and 93 sculpins so a good resident fishery exists in the lower reaches of the stream. No problems exist to parallel the existing crossing (#7, 8) east of the highway from a biological view point.

**Mountain Creek**

This small westward flowing stream has a man-made drainage channel on the lower reaches. Sockeye spawn to 0.8 km. on the north fork, coho to 0.8 km. on both forks. Pink salmon spawn near the mouth and cutthroat and Dolly Varden have been observed in this stream as well.

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | 50 | - | - | - | - | - | - |
| Coho | 100 | - | -* | 40 | 300 | - | - |
| Pink | - | - | - | - | - | - | - |

* enhanced by release of 50,000 coho fry from Hatchery; other releases were in 1982 and 1984

There should be no impacts on fish that are measurable as the steep gradient at the crossing site negates habitat requirements of most species. The highway causes disruptions that tend to obscure any new impacts from doubling the adjacent Right of Way (#7, 8).

**Hotsprings Creek** (Mountain Creek, Refuge Creek)

As tributaries of Mountain Creek, these local geothermal springs create year around stream habitats for fish. Optimum insect growth in a modified and buffered environment of warm waters lead to enhanced populations of fish, with an abundant food supply available.

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Coho | 50 | - | 20 | - | 100 | - | 15 |

Electroshocking in 1981 produced 38 cutthroat and 101 coho fry. In 1979 angling produced 12 cutthroat (1 kelt) and 5 coho while minnow trapping sampled 3 coho fry, 1 cutthroat as well as sticklebacks and sculpins.

**Scully (Schulbuckhand) Creek**

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | 5000 | 460 | 3000 | 1800 | 2000 | 4000 | 1200 |
| Coho | 500 | - | - | - | 800 | 150 | 700 |
| Pink | 100 | - | - | 100 | 100 | 300 | 20 |

Sockeye spawn upstream from the lake 2.5 km., coho to 3.5 km., pink to 1.5 km. with cutthroat and Dolly Varden, 28 coho fry and 3 sculpins. Other studies in 1983 used minnow traps which collected 9 coho, 3 cutthroat and 3 Dolly Varden.

A barrier exists above the present transmission line where a small canyon forms. The location of Route "A" Right of Way (#7, 8) is to the east on solid rock away from the problem areas on the present line. Impacts should be minimal for fish in this important stream.

The lower reaches of Scully Creek pass through exceptionally important fisheries habitats which extend around the south end of Lakelse Lake. The geothermal warming of marshes here keeps many areas ice-free for most winters. Insect life is prolific providing a year round food supply for resident fish.

The entire Lakelse Lake area is a dynamic and concentrated biophysical unit unique in the Northwest. It is the only warm water lake in the Northwest. A quote from a 1986 report "Lakelse Lake - Water Quality Assessment and Objectives" by C. J. P. McKean states "The Lake serves as an important recreational centre for residents of the Terrace-Kitimat-Prince Rupert area. The most popular recreational uses in decreasing order of importance are swimming, picnics, sunbathing, camping and fishing. In 1973 a total of 1.8 million recreational activity days were spent at the lake. The majority occurred in June through September. The annual benefit to residents of the Terrace-Kitimat-Prince Rupert area was estimated in 1973 to be $6.7 million. Assuming a similar volume of use, the recreational value was estimated at $17 million in 1984."

Again on the fishery itself the report states: "Cutthroat trout are the main catch of the lake's recreational fishery. Winter-run steelhead overwinter in Lakelse Lake prior to spawning downstream from the lake. Both the summer-run and winter-run steelhead fishery are important but fishing is restricted to fly fishermen in the Lakelse River downstream from the Lake.

The Lakelse watershed is also important for anadromous salmonids. A majority of the returning pink and chinook adults spawn below Lakelse Lake, and their fry do not use the lake for rearing. The coho spawn above and below the lake, and coho fry will utilize the lake for up to 2 years. The sockeye exclusively use the tributaries of the lake for spawning and their fry utilize the lake for 1 year. The numbers of salmonids annually caught by the commercial fishery which are attributable to the Lakelse watershed, average 1.1 million pink, 300 chinook and 25,000 coho.

In total the Lakelse watershed represents 35 % of the total Skeena River fishery for all species. In 1984 the value of this fishery was estimated to be $1.8 million." With the enhancement at Babine Lake the percentage in 1990 represented by the Lakelse watershed is likely reduced from 35%.

In the interests of completeness Clearwater and Andalas drainages will be included here as well.

**Clearwater Lake**

This is a spring-fed north flowing stream with two small lakes on its headwaters. The stream is approximately 8 kilometers long.

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | 200 | - | - | - | - | - | - |
| Coho | 1000 | 150 | - | 1000 | 600 | 250 | 800 |

Other species are cutthroat, Dolly Varden, kokanee and rainbow trout, Rocky Mountain whitefish have also been observed in the Clearwater Lakes. Sampling on this system by minnow trap produced in 1979 - 12 coho and 3 sculpins, in 1983 - by angling, 10 cutthroat and 1 Dolly Varden. In the lakes in 1979 - 39 coho, 9 cutthroat, 1 rainbow, sticklebacks. In 1983 - 37 coho and by angling 7 cutthroat averaging 20 cm. in length, 1 coho and 1 rainbow. Also in 1981 electroshocking produced 74 cutthroat, 15 Dolly Varden and 166 coho from the stream. Spawning steelhead were also documented in the Clearwater in 1981.

A tributary of the Clearwater is a small intermittent stream from Onion Lake, located parallel to the highway. Kokanee are found in the lake and rainbow trout were stocked there as well. In 1986 1,014 steelhead fry were released into the lake.

**Andalas Creek**

Andalas Creek is the last of the major drainages that serve to make Lakelse Lake and its environs the biological hotspot of the Northwest. It flows into the lake through extensive marshlands from the south and is spring fed.

Andalas Creek

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | 50 | - | - | - | - | - | 10 |
| Coho | 500 | 50 | 50 | 800 | 600 | 75 | 400* |

*Grizzly predation very heavy in 1984 - estimate that bears took 300 coho spawners and left 400 (D.F.O. files, Terrace)

Sockeye were observed spawning at 2 km. as were coho. Cutthroat trout were also observed at 2 km. Other incidental species, such as suckers and squawfish, are known to frequent the muddy lower reaches of Andalas Creek although the main lake is where they usually reside.

A last little tributary to Lakelse Lake is Ena Creek which originates in Ena Lake above the railway grade. The lower 1 km. is utilized by coho for spawning but no hard data has been collected on the rest of the fishery here other than cutthroat in the lake itself. There is no expected impact from an expanded Right of Way in this area of the proposed corridor.

**Route "A" Proposal - Kitimat River Drainage**

This mapsheet continues southward from Onion Flats on the height of land between the Lakelse and Kitimat drainages to Humphreys Creek which is tributary to the Kitimat River. The proposed Right of Way (#7, 8) closely parallels the present transmission line and the natural gas line for most of this mapsheet. The major deviation occurs south of the Kitimat River crossing where Route "A" climbs up to a higher elevation on the rocky ridge for 3 km. east of the present Right of Way (#8, 9, 10). This short section (#7, 8, 9) is through mature forest habitat. It is found on this proposed route and at Scully Creek-Onion Lakes flats. The rest of the Right of Way is through cleared areas.

Two routes are proposed for the corridor located on the Kitimat flood plain. One is to twin the present Right of Way and pipeline (#8, 10) through the wetlands of McNeill Creek, Humphreys Creek and Nalbeelah Creek. The other is a higher and drier route (#8, 9, 10) along the base of the slopes to the east avoiding the threat of potential flooding and also keeping out of the rich biological wetlands and riparian habitats located below the hillsides. Biologically there is little question that staying up on the drier hillsides is the better route selection. It will be another kilometer longer but will be much less disruptive in an ecological sense. Further on-site studies will be required if this route is chosen for construction.

**Chist Creek**

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | - | 50 | 10 | - | - | - | - |
| Coho | 5000 | 500 | 150 | 100 | 300 | 300 | 50 |
| Pink | 5000 | - | 300 | - | 450 | 100 | 10 |
| Chum | 5000 | 2500 | 4000 | 350 | 200 | 750 | 250 |
| Chinook | 1000 | 1100 | 700 | 500 | 250 | 350 | 100 |

Chist Creek is a large tributary flowing west and joining the Kitimat River from the north just upstream of the proposed Right of Way (#7, 8) crossing. It is a major producer for salmonids as the above table indicates. In 1971, 400 steelhead were observed in Chist Creek as well. Many side channels in the lower reaches offer optimum spawning habitat for chum to 11.8 km. Pink salmon spawn to 3.8 km., steelhead, chinook and coho to a falls at 13.0 km. above the mouth.

Cutthroat trout are present in the system and resident Dolly Varden have been observed at 26.6 km.

Chinook are the earliest migrant into Chist Creek in June and coho are there until December. Pink and chum dominate in July and August. Tree removal and extreme floods have caused significant erosion on steep slopes in lower reaches in 1988 as well as considerable bed load movement.

**Kitimat River**

The Kitimat River is the major drainage of the Kitimat Valley. It has coho spawning up to 80 km. from tidewater, pinks to 46 km., chum to 66.4 km., chinook to 66.4 km. and steelhead to 64.8 km. Other species recorded are Dolly Varden, cutthroat, rainbow, Rocky Mountain whitefish, sculpins, stickleback and oolichans (spawning up to the Hatchery site). One rare sighting was of an American shad caught by the Kitimat Hatchery crew in August of 1982. This is a herring-like fish introduced to the Sacramento River in California in the 1870's and first reaching B. C. waters in 1891.

Fisheries data for the Kitimat River was taken primarily from Department of Fisheries files. The records of the Kitimat Fish Hatchery also contributed enhancement figures from their inception in 1981. Rather than fragment the data base, all of the watershed totals will be treated together in the following table.

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | 2500 | 8595 | 6000 | 5000 | 2500 | 5000 | 1000 |
| Coho | 40000 | 16870 | 5775 | 15000 | 12000 | 10000 | 2000 |
| Pink | 150000 | 41125 | 30000 | - | 20000 | - | 5000 |
| Chum | 100000 | 45000 | 86000 | 8450 | 4000 | 20000 | 12500 |
| Chinook | 2000 | 31610 | 13500 | 13900 | 5000 | 3300 | 2000 |

The last major anadromous species is steelhead and in 1970 an escapement of 15,000 was estimated. The sport fishing kill recorded in 1971 was only 18, 1972 - 33, 1973 - 59, 1974 - 202, 1975 - 294. Angling pressure likely increased at the same rate in this period to the present time. April is usually the steelheading start, peaking in early May.

The Annual Sport Fishing Report by M. Hertzberg in 1986 estimated 1,000 anglers in 1984, 5,940 in 1985 and 15,037 in 1986 fished for all species. Twenty one percent of all steelhead recorded were caught in the "Powerlines Run". This was the most popular spot on the river and raises the question of whether good access or good fishing attracts fishermen?

The Kitimat Hatchery under the Salmonid Enhancement Program has been a major enhancing factor to commercial species of salmon. They have also contributed to a lesser degree in sports species such as steelhead and cutthroat trout as part of a cooperative program with Provincial Fisheries Branch staff in Smithers.

Other work carried on by Hatchery staff is the inclined plane trapping of fry and minnow trapping programs. They are less intensive in their data collection and are included in Appendices II, III and IV. The information is species specific and gives local use and timing parameters of migrations but little on densities or total populations. Much of the minnow trapping was carried out on tributaries of the Kitimat River and they will be discussed in conjunction with those streams in the rest of this report.

**Deception Creek**

This stream is located on the West side of the Kitimat River and is discussed here for the sake of completeness in the study corridor as it is not encountered by the transmission route (#8, 10). It has a barrier falls at 1.9 km. and has coho spawning to that point. Pink salmon spawn up to 9.2 km. Chum are also recorded in this stream.

There is a strong possibility that a resident fishery of cutthroat and Dolly Varden exist in the stream above the barrier. Small lakes on the east side of Iron Mountain that are drained by Deception Creek may also have kokanee present although this has not yet been verified.

**Humphreys Creek**

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | - | 20 | - | - | - | - | - |
| Coho | 1000 | 250 | 150 | 200 | 800 | 500 | 100 |
| Pink | 5000 | 1800 | 250 | 3000 | 2000 | 5000 | 300 |
| Chum | 2000 | 2000 | 2600 | 150 | 150 | 200 | 700 |
| Chinook | 100 | 1010 | 200 | - | 1 | - | - |

This stream is an important producer of salmonids in the Kitimat system in spite of the barrier falls located 2.5 km. upstream from the mouth. Sculpins, cutthroat, coho and Pacific lamprey have all been sampled in this stream. There is almost unlimited rearing habitat in the floodplain with beaver ponds, marshes and seepage areas prevalent. In 1988 excessive erosion occurred during fall floods and stream bed movement was accelerated.

In 1971 there were 75 steelhead spawners observed in Humphreys creek. 200 were observed in 1972. These were the only two years that steelhead redds were counted up to the present transmission line.

Enhancement first took place in 1984, with 2,400 steelhead released from the Hatchery; 1985 - 7,014; 1986 - 7,938; 1987 - 4,932 and 1988 - 10,710 released. From reports of fisherman the steelhead enchancement of the Kitimat River and its tributaries has been an outstanding success.

**Nalbeelah Creek**

Nalbeelah Creek drainage would be impacted by either twining the present transmission line (#8, 10) or by crossing further up the drainage on drier slopes (#8, 9, 10).

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | - | - | - | - | - | - | - |
| Coho | 500 | 350 | 300 | 500 | 1100 | 200 | 150 |
| Pink | 5000 | 600 | 3300 | 2100 | 1500 | 600 | - |
| Chum | 500 | 600 | 170 | 75 | 20 | 25 | - |
| Chinook | 25 | - | 150 | - | 50 | - | - |

Coho spawn up to a falls at 6.8 km. Chum have been observed spawning to 4.2 km. and pinks to 3.5 km. Lack of stream flow likely stops chinook spawning beyond 3.1 km. where they were observed in 1986. Excessive silting, mudslides and windfalls are a problem for salmonid production in this highly productive stream. In 1989 an inclined plane smolt trap captured 50 steelhead, 36 Dolly Varden, 33 coho, 4 chinook and 16 sculpins.

In 1971 and 1972, the only two years of intensive study for steelhead spawners, an escapement of 200 steelhead was counted each year according to Department of Fisheries and Oceans records. Stickleback and Pacific lamprey ammocoetes have also been observed in this stream.

The Kitimat Hatchery also released salmonids into Nalbeelah Creek. Steelhead releases were 2,400 in 1984 and 2,934 in 1985. Cutthroat and Dolly Varden are both found in the stream and the confluence of the creek with the Kitimat River is a popular sports fishery.

Three other small streams enter the Kitimat River downstream of Nalbeelah Creek. One is locally called Crown Zellerbach Creek and coho have been observed spawning at 0.5 km. above the mouth. Another is called Powerlines Creek, located on the west side of Fire mountain. Pink salmon spawn up to 0.2 km. and coho to 1.9 km. Little else is known about these streams other than 2,466 steelhead fry were released there in 1982. The third is called Cablecar Creek and it enters the Kitimat just above Hirsch Creek confluence. It has pink salmon spawning to 0.9 km. and coho to 2.9 km.

In 1986 the Kitimat Hatchery released 5,292 steelhead fry into this small stream. Again in 1988 there were 4,932 fry released and in 1989, 7,950 were released so there must be potential for survival of these species.

**Hirsh Creek**

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | 50 | 100 | 20 | - | - | 10 | - |
| Coho | 3000 | 1100 | 300 | 600 | 1500 | 2000 | 500 |
| Pink | 25000 | 7000 | 5000 | 8000 | 3000 | 600 | 1000 |
| Chum | 10000 | 4500 | 4500 | 1500 | 1000 | 2500 | 600 |
| Chinook | 4500 | 2500 | 1800 | 1500 | 1500 | 1500 | 300 |

There is a barrier falls on Hirsh Creek at 8.1 km. that affects all anadromous species. Resident Dolly Varden have been observed to 22.4 km. upstream.

Historically there used to be an Indian food fishery on Hirsch Creek. There is also a continuing extensive sport fishery at the mouth. Sampling in 1981 with an inclined plane trap produced 49 chinook fry. 25 coho, 2,402 chum, 734 pink and 2 sockeye fry. 3 coho smolts were also collected. In 1984 smolt trapping produced 23 steelhead, 1 cutthroat, 17 Dolly Varden, 32 coho, 3 chinook and 53 sculpins. The fishery in this tributary is one of the most productive and diverse in the entire Kitimat watershed.

The last portion of the Route "A" Proposal extends to nodes 11 and 12 where a common Right of Way continues on into Kitimat Substation. The proposed location of #10 - 11 is to the north of the present transmission line in order to avoid the critical and vulnerable crossing of the Kitimat River. The location of # 10 - 12 is paralleling the present line or perhaps to double the line at the metal tower on the present river crossing. This diagonal leg across the Kitimat River flood plain first spans a changing river channel and then traverses wetlands over Goose Creek and Duck Creek. This entire area is slow draining and extremely productive for the fisheries resources.

The cover and security offered to salmonids is also beneficial to resident predators such as larger Dolly Varden and cutthroat as they lie in wait for the migrant fry of sockeye, pink and chum in the spring. Some spawning by steelhead occurs upstream of the crossing but little is known. Chinook also utilize the deeper, stronger mainstem waters in which to spawn around the proposed Right of Way crossing and the existing one.

The remainder of the segment traverses a large area of slow-draining wetlands exceptionally good for rearing salmonids. It will be covered by "AB" the Common Corridor and its discussion later in this report.

The general wetlands areas around Lakelse Lake are also extremely important for wildlife just as it is for fish. Local predators of fish are bears, wolves and eagles. Beaver dams are an annual nuisance for fish passage, as well as forming beneficial rearing areas for smaller sizes of resident fish. Other aquatic fish predators such as mink and otter are trapped along with beaver on traplines (see map of local traplines in Land Use Section).

The presence of a highway and a transmission line through the middle of a valuable wetlands complex is detrimental to wildlife use of productive habitat and any further alienation of the wetlands will be additive.

Drainages will be discussed in the same sequence as provided in the Fisheries Values section. The uplands section of the proposed Route "A" from the B. C. Hydro Skeena substation to Sockeye Creek has some value to moose in the poorly drained areas. Beaver also have migrated up into the areas south of the Terrace Airport in what is mostly marginal habitats for aquatic mammals.

**Sockeye Creek**

The marsh areas West of the highway are part of the Sockeye Creek wetlands historically and along with marshes upstream are prime waterfowl habitat for nesting and rearing ducks and geese. Feeding puddle ducks such as mallards and teal are common during the summer as well.

Aquatic mammals such as moose, beaver, muskrat, mink and otter also utilize these wetlands on a year round basis. Moose in particular, due to a lack of hunter access, utilize this wetlands area in the fall and during calving in the spring in order to avoid predators. The Nature Trust of B. C. acquired 134 acres of this habitat in District Lot 3982 to save and perpetuate these natural resource areas and to help buffer the critical wetlands in Lakelse Provincial Park that were included therein for the same protective reasons.

The extensive marsh areas of Sockeye Creek are contained in one trapline area, #0609T044, which has only been trapped in 1986 in recent years. The harvest included 24 beaver, 1 martin, 8 muskrat and 1 otter in 1986.

**Possible Locations within the Corridor for Additional Right of Way**

No environmentally feasible route through the wetlands of Sockeye Creek that would minimize wildlife impacts could be found. The least impactive route would be to put both circuits on the same structures and use the present (#1, 2, 3, 6, 7) Right of Way.

This would contain construction impacts to edges and side channels of Sockeye Creek already under the present transmission line. Little impact on aquatic mammals should occur other than on beaver or muskrat which utilize the side channels. Waterfowl such as teal or mallard would be displaced in the short term as long as the construction was contained to present pole sites and no new access roads were constructed. The East-West leg (#6-7) would parallel the present Right of Way with loss of moose and furbearer habitats doubled.

Alternate possibilities were examined but the problems grow as construction and environmental impacts escalate accordingly. A route on the dry slopes (#1, 2, 5, 6, 7) of the West side of the wetlands and then across to parallel the East-West leg was also examined. Unfortunately this would bisect the Nature Trust property on District Lot 3982 as well as provide access to prime moose habitat that would be impactive. Mitigation would certainly have to be negotiated with the Nature Trust if this route were to be seriously considered.

Other possible routes that could be engineered were rejected for environmental concerns. The rejected routes were to parallel the original Right of Way down Sockeye Creek through riparian habitat to the East-West (#1, 2, 3, 6, 7) leg or alternatively to take the new Right of Way North through the upper marshes of Sockeye Creek and cross Williams Creek returning to the present Right of Way via the East side of the wetlands (#1, 2, 3, 4, 7). The threat of clay slumping and ongoing siltation makes this unacceptable from a fisheries and wildlife perspective. While there is no satisfactory location for the transmission line in this area, the least impactive location for another Right of Way is to utilize the existing Right of Way by placing both circuits on single structures in the Sockeye Creek - Williams Creek - Blackwater Creek wetlands area of Route "A" (#1, 2, 3, 6, 7).

**Williams Creek**

Williams Creek is the major drainage entering Lakelse Lake from the Northwest and absorbing Sockeye Creek as its major tributary. Moose live in this wetland complex the whole year through. Summer trails can be readily seen from the air indicating long term use. The bird and mammal species endemic to the area make these wetlands and the riparian habitats involved with the source streams some of the most critical concerns along the entire Route "A".

Impacts of a second Right of Way should be minimal to Williams Creek if the present transmission line is doubled. The greatest threat would occur if the least attractive choice of risking the clay deposits slumping into the stream from the East were seriously considered. The mixed age and species on the riparian forest habitats would be jeopardized as well if this canopy was opened up by a Right of Way (#1, 2, 3, 4, 7).

**Blackwater Creek**

This stream is actually now an overflow route of Williams Creek and is part of the wetlands and marsh complex created by the previous two drainages. Its sluggish drainage is due to the damming effect of the highway berm and the elevation of the two large culverts there.

Beaver dams are common as are debris accumulations. Muskrat and mink are also seen in close proximity to the highway. Waterfowl make extensive use of this marsh area particularly common mergansers. Sport fishing is common from the roadside for the recreationalist. It is a visible and usually effective source of family enjoyment with the Lakelse Park picnic area adjacent to the marshy stream. Bird life is extremely abundant here, from winter wrens and dippers, to osprey and eagles during spawning salmon runs in late summer to fall.

**Furlong Creek**

This drainage is in Lakelse Lake Provincial Park and heavy human traffic keeps most of the larger mammals away from this area. Heavy bird use is common in the riparian habitats and marshes adjacent to the stream. Beaver activity is common on the lower end near the lake. Sharp angular substrate and steeper gradients eliminate use of the stream above the highway.

**Granite Creek**

Similar values to Furlong Creek are found with emphasis on bird life and small mammals. Steep gradients quickly negate riparian values upstream. The proposed Right of Way parallels the highway and any new impacts would be observed by the present state of disturbance.

**Mountain Creek**

Disturbances by ditching and flood control measures negate any strong wildlife values other than for birds and small mammals. Doubling the Right of Way should pose no new problems for wildlife as the highway disturbances obscures new impacts (#7, 8).

**Hotsprings Creek** (Mountain Creek, Refuge Creek)

This small creek has been degraded into a ditch in its lower reaches by the developers of the geothermal area. Historic open marshes have brushed in as the water levels dropped. Many bird species winter in the warmth of this area, including waterfowl and passerines. Muskrat, beaver and mink also reside in such areas. Moose winter nearby and females calve here in the Spring.

Trapline #0609T043 is located on the east side of Lakelse Lake over several of these small drainages. The line has been active

only in 1986 (36 beaver, 1 fisher, 2 fox, 8 martin, 2 mink, 3 otter and 6 weasel and 1 wolverine). Nuisance beaver are likely part of harvest as highways crews with plugged culverts and local residents losing trees register requests for control. The foreshore areas of Lakelse Lake are mostly privatized with cottaging a major growth industry. Nutrient values and thus aquatic insect values, both are increased by this use.

**Scully (Schulbuckhand) Creek**

The proposed Right of Way is up on the rocky hillside above the present transmission line which crosses a wet riparian area with standing water present. This beaver habitat which will be avoided is confined to the flood plain in this localized marsh area. The marshy areas below the highway along Scully Creek are the most valuable for wildlife. Waterfowl stay late into winter and nest in the area. Along with the common species of waterfowl is the wood duck which is locally rare here on the Northern edge of its range. They were known to nest on the south end of Lakelse Lake in 1988 and an immature female was collected later that year by a local hunter. Trumpeter swans winter here annually and occasional nesting occurs.

The extensive marshes also provide excellent habitat for muskrat, beaver and other furbearers as well as a local moose population in the areas of Clearwater and Andalas drainages at the end of the lake.

**Clearwater Creek**

This is a spring-fed north-flowing stream with two small lakes on its headwaters. Its length is approximately 8 kilometers. The drainage area is locally important to moose as it is only partially logged of mature forest. Moose utilize the mature forest in winter and also for thermal regulation in hot summer periods. Both grizzly and black bear frequent the area, particularly when salmon return to the Clearwater to spawn in the fall.

The lake at the mouth of the Clearwater has many channeled areas where ducks, geese and swans are known to nest and rear their young. Passerine bird populations are common in this mixed forest wetlands area as are frogs, toads and salamanders. It is a special area for biological diversity enhanced by the geothermal moderation of the local micro climate for species survival.

Several proposals have been put forward to preserve these habitats including a wildlife preserve. The Ministry of Environment has also documented strong fisheries and wildlife values worthy of preservation around the south end of Lakelse Lake.

**Andalas Creek**

This is the last major drainage entering Lakelse Lake. The same wildlife values accrue in this area as in the Clearwater drainage as they together compose the wetlands adjacent to Lakelse Lake on its south shore. Beaver dams are common and moose utilize the old growth forest remnants in and around the swampy areas. Department of Fisheries and Oceans stream surveys for coho in late fall estimate that grizzlies took 300 out of 700 coho in Andalas Creek in 1984.

The Nature Trust of B. C. has acquired over 100 acres of critical habitat and wetland near the mouth of Andalas Creek, once again documenting the critical values of natural systems adjacent to Lakelse Lake. Waterfowl utilize the entire area for nesting and rearing as well as keeping a low profile during their flightless moulting period. Trumpeter swans are known to winter on the south end of the lake as long as the water remains open and food remains available. The sloughs and channels are particularly attractive to these large birds along the lake's southern margin and any nesting that occurs would be in this area.

The last little tributary to Lakelse Lake is Ena Creek. It flows eastward out of Ena Lake with a steep gradient. Moderate use by wildlife such as bears and moose would be expected seasonally.

**Route "A" Proposal - Kitimat River Drainage**

Onion Flats which forms the drainage divide is a large gravel bench with no fisheries habitat present except on the periphery. Wildlife values are relatively low as well. Snowshoe hare and moose utilize the mature timber stands and regeneration on the clearcut areas where the Right of Way (#7, 8) is proposed. As grasses and shrubs pioneer the open areas of the Right of Way, then the local values to small wildlife would be enhanced rather than impacted after construction.

The rocky burned area on the slopes above Chist Creek and the Kitimat River has berry crops attractive to bears and birds in season but is otherwise of low value to wildlife. Seepage areas are found along the edge of Chist Creek and the Kitimat River which drain the southeastern corner of Onion Flats. Wildlife values increase around and along these spring-fed feeder streams.

**Chist Creek**

This drainage has experienced almost complete tree removal in its lower reaches through logging and forest fire. Present values for wildlife are consequently low at present.

Wildlife values relate to the berry crops and to salmon runs and the food supply they offer in the form of loose eggs and carcasses. Bird life such as seagulls, ravens, crows, eagles,

dippers, mergansers, etc. probably benefit from deforested shoreline but grizzly and black bears, wolves and foxes, etc. are inhibited by exposure in open clearcuts and may switch to night feeding only, to compensate for the loss of forest cover security.

Trapline #0603T103 covers the corridor down almost to Humphreys Creek. No records have been filed with the Wildlife Branch as to the fur harvest on this area and it is not known if the trapline has been active or not.

**Kitimat River**

The main wildlife values along the Kitimat River are those of moose wintering in riparian habitats. It is the major area of winter use along with similar habitats on the Wedeene and Little Wedeene Rivers (Appendix VII). Salmon runs attract bears, wolves, coyotes, fox and martin seasonally. Birds such as bald eagles are also dependent upon spawning salmon and the resulting carrion. Waterfowl such as common mergansers, goldeneye and bufflehead actively feed on migrating fry as does the belted kingfisher. Mallards and Canada geese feed on carcasses of salmon in order to supplement their fall diet.

Another rare species collected in the Kitimat River in 1989 was the tailed frog (Ascaphus). The Kitimat Hatchery crew caught a tadpole of this species in their inclined plane fry trap while monitoring downstream migrations at the hatchery site. One other tailed frog tadpole was collected near Hirsch Creek in 1966 by timber cruisers for Eurocan Pulp and Paper Ltd. This species had previously only been found in the Lower Mainland of B. C. and requires a mature forest habitat for survival suggesting that its continued existence in the Kitimat Valley is threatened. Climatic conditions for both reptiles and amphibians are a limiting factor for survival in the Kitimat Valley.

The riparian habitats along the Kitimat River are likely increasing in importance as other mature forests are systematically removed. Moose need this critical habitat in heavy snow winters unless they move out of the main logged areas onto unlogged slopes prior to winter's onset. Not enough is known about moose abundance, location or use patterns in the Kitimat Valley to do more than speculate until further studies are conducted on seasonal use. With no data available from trapping records, importance of Right of Way (#7, 8, 9, 10) location has to be inferred rather than documented.

With transmission lines close by the river there is some potential for bird strikes from waterfowl or eagles which concentrate on the waterways. However the parallel location will lessen the potential somewhat since the valley is a fairly major north-south flyway for waterfowl migrants in spring and fall.

**Deception Creek**

The lower reaches of Deception Creek are good moose winter range as mature cottonwood stands predominate along the Kitimat River floodplain. The swamps and wetlands form good habitat for beaver and muskrat as well as for moose in spring, summer and fall. Dabbling ducks and passerine birds are also common in these aquatic habitats. Fall spawning of salmonids brings black bears to the streamside followed by other scavengers such as wolves, coyotes and foxes.

**Humphreys Creek**

The poorly drained areas of the floodplain in the Humphreys Creek drainage promotes use by waterfowl, moose, mink, otter and beaver. Beaver in particular create many dams and inhibit drainage as well.

Bird species are abundant in the Humphreys Creek lowlands and along the riparian habitats of the various feeder streams and ponds. Waterfowl in particular flourish in these wetlands. Puddle ducks such as mallards and teal are common. Mergansers benefit from the abundance of fish, aquatic insects and tadpoles in the ponds and poor drainage areas. Kingfishers are abundant here as well because of the aquatic food chain abundance.

Beaver, muskrat, mink and otter are a strong species base for a trapline in this section of the corridor. Lack of coniferous forest cover limits marten and red squirrel but the abundance of deciduous growth promotes snowshoe hare populations and the fox that prey on them. The present trapline 0603T085 takes in Humphreys Creek and Nalbeelah Creek. In 1986 it harvested 8 beaver and 4 marten. In 1987 the owner took 6 beaver, 4 marten, 1 mink and 1 otter. Headwaters sets likely accounted for the marten totals.

**Nalbeelah Creek**

Similar in nature to Humphreys Creek since they basically share the same floodplain, the area is excellent habitat for beaver, mink, otter and moose. Puddle ducks are abundant here and the close proximity of overmature timber to the south may provide bufflehead and goldeneye with cavity nesting potential as well. Mergansers are commonly seen on Nalbeelah Creek. The present trapline 0603T085 covers both Nalbeelah and Humphreys Creeks with beaver, marten, otter and mink being taken over the 1986-87 period.

Three other small streams flow out of mature forest habitats downstream of Nalbeelah Creek on the Kitimat River. The rare tailed frog requires this type of habitat and this may well be where a remnant population still exists in the Kitimat Valley.

Mammals are probably best represented by black bears on these small forested drainages. The close proximity of the Kitimat dump, spawning salmon and dense cover is ideal for this species to proliferate. Close proximity to humans is not a deterrent as it is to grizzlies or other wilderness species of a shyer nature.

**Hirsch Creek**

This stream still retains its mature timber stands on its lower reaches. Moose and blacktail deer, although few in number use the mature forest in winter and again in late summer for therma regulation.

The Hirsch Creek trapline #0603T080 produced 4 beaver, 1 fox, 2 marten, 1 mink and 2 otter in 1987, the only year of recorded catch. Again the comments about black bear populations apply directly as Kitimat is famous for its dense bear populations and their nuisance value. A grizzly sow and 2 cubs was reported in Cablecar subdivison several times in January 1990. The implications of a new Right of Way will have no bearing on Hirsch Creek directly nor on the many species that utilize it but it serves to complete the resource picture of the Kitimat Valley for this report.

The oblique crossing of the Kitimat River and its floodplain increases the probability of waterfowl strikes by upstream and downstream migrants. The present road access in these wetlands is impactive and it will increase with a new Right of Way. This proposed Route "A" segment will be most impactive in the Kitimat floodplain and the Goose Creek area, since the remainder of the segment traverses a large area of slow-draining wetlands exceptionally good for waterfowl and aquatic mammals. It will be covered by the discussion of **"AB" the Common Corridor** later in this report.

Route "B" is a new Right of Way proposal that is approximately 12 km. shorter in length than proposed Route "A". The distance is reduced by traversing the west side of the Kitimat Valley in a fairly straight line south to Kitimat Substation from Skeena Substation near Terrace. A 1:50,000 mapsheet covers the proposed route from Skeena Substation to Node 13 near Coldwater Creek and End Lake. It shows mostly a clearcut logged route as presently proposed. As in Route "A" all numbered nodes indicate a radical change of direction or different local route selections or possibilities.

**Route Proposal "B" - Fisheries Values**

This section discusses the following drainages on the leg #1 - 13: Alwyn Creek, Mink Creek, Lakelse River, Herman Creek, White Creek and Coldwater Creek. It also contains small standing water bodies such as Hai Lake, Ena Lake and End Lake that support recreational fisheries with limited access.

**Alwyn Creek**

This stream drains the area northwest of Skeena Substation and flows west into the Skeena River. Pink salmon spawn in the lower 0.5 km. and coho have been observed spawning to 3.0 km. Several chinook have also been observed in the lower section below beaver dams.

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Coho | 75 | - | - | - | 100 | 75 | 100 |
| Pink | - | - | - | - | - | - | - |
| Chinook | 10 | - | - | - | - | - | - |

In 1986 a cutthroat trapping program included this stream, recording cutthroat ranging from 66 mm. to 175 mm. Coho fry from 66 mm. to 95 mm. were also caught. An enhancement program involving coho fry from the Eby Street Hatchery were also released into the stream in 1986. The bottom reaches are fairly silty and spawning habitat quality is marginal. A series of beaver dams serves to trap silt and provide rearing habitat for salmonids in the upper reaches to 8.0 km.

**Mink Creek**

Directly south on the proposed route corridor is a multi-tributarial slow stream that drains southwest into the Lakelse River from the Skeena Substation area. Scattered beaver dams are common on Mink Creek and the timber mix is conducive to fairly good moose habitat with scrub spruce and hemlock mixed with deciduous patches. Patch logging is also common in the area as the swampy ground often excludes all but winter logging.

Coho have been observed spawning to 3.0 km., pinks to 0.6 km. and Dolly Varden and cutthroat trout are also present to 3.0 km. In 1986 there were 200 coho spawning in this small stream. It is seldom checked on a regular basis so no annual records are on file. Construction and current logging activities are expected to increase the access and the negative impacts of siltation and blockages of small tributaries and seepage areas.

**Herman Creek**

Herman Creek is a small stream flowing south into the Lakelse River and creates a gravel fan that provides spawning gravels to the prolific downstream reaches of the river. It is headed by Herman Lake just outside of the Corridor area which is a recreation destination where local residents fish, swim or picnic.

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Coho | 200 | 200 | - | 100 | 400 | - | 15 |
| Pink | 1000 | - | 2500 | 1000 | 600 | 200 | 3000 |
| Steelhead | - | - | - | - | - | - | - |

Coho have been released in Herman Lake and now reside there. Cutthroat and Dolly Varden are also to be found in the lake. Pink salmon spawn upstream to 3.0 km. except when low water (1988) or ice jam obstructions (1984) prevent access. Steelhead trout have been observed spawning at 2.0 km.

In 1979 minnow traps collected 14 coho fry, 8 cutthroat and 2 Dolly Varden. In 1981 electroshocking produced 59 cutthroat, 39 coho fry, 7 Dolly Varden and 2 chinook fry. The 1983 program sampled 31 coho fry, 16 cutthroat and 6 Dolly Varden. In 1986 during the cutthroat tagging program coho and cutthroat were caught in Herman Creek. It is a productive little fishery that should not be impacted by construction of a Right of Way that won't cross its drainage area directly but may be influenced by changes in access and use patterns.

**Lakelse River**

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Coho | 35000 | 150000 | 4000 | 8000 | 15000 | 4000 | 10000 |
| Pink | 500000 | 1500000 | 500000 | 1000000 | 1000000 | 600000 | 750000 |
| Chum | 1000 | - | - | - | - | - | - |
| Chinook | 400 | 400 | 400 | 250 | 200 | 300 | 30 |

The Lakelse River spawning distribution for sockeye, coho, pink, chum, chinook, steelhead and cutthroat can be described as "throughout" its length. Similarly other species less migratory and non-anadromous such as Dolly Varden (some are anadramous similar to sea-run cutthroat trout), rainbow trout and Rocky Mountain whitefish, suckers, squawfish, sculpin and stickleback all are found throughout the river.

Steelhead were counted in a snorkle survey in May 1978 and 259 259 were tallied. Approximately 33 were seen in the area where the Right of Way crossing is proposed. In the recorded period from 1963 to 1984 the mean number of steelhead spawners was estimated at 251 and the maximum recorded in any one year was 858. Biologically it is the single most important tributary of the Skeena watershed, draining the only warmwater lake and hotsprings on the system. Its dynamic food chain diversity and productivity within its riparian habitats cannot be overemphasized.

The recreational fishing for trout, coho and steelhead is a year-round activity. Together with the productivity of the lake and its tributaries the river is exceptionally rich in fisheries values. The commercial values on the ocean that result from its annual production of salmon make it very important for that economic sector of society as well.

Recreational fishing pressure is very high on the Lakelse River and may be the highest of any river in the Northwest annually. Access is already present but will be enhanced by Right of Way road development. The highest use areas are downstream near the mouth and existing (500 Kv) transmission line to Prince Rupert and above the Canadian National Railway bridge to the lake. Winter and spring cutthroat and steelhead fishing is followed by salmon fishing on a calendar basis.

**White Creek**

This major tributary flows north into the Lakelse River downstream on the periphery of the proposed Corridor. Coho have been observed to 2.6 km., pinks to 0.5 km., chinook to 2.0 km., steelhead to 2.6 km. and cutthroat, Dolly Varden and rainbow have been observed to 3.0 km. Optimum target escapements are 50 coho, 100 pinks and 25 chinook.

**Coldwater Creek**

Coldwater Creek is a major tributary flowing East and then North into the Lakelse River. It is a cold temperature stream at 8$^{o}$C in most summers, moderating the warm waters of thermal sources on the lake itself as they flow down the river. It is a variegated system with several small lakes on its Eastern tributaries in the main valley.

**Coldwater Creek**

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Coho | 100 | 500 | - | - | 100 | - | 50 |
| Pink | 5000 | 3000 | 30 | 7000 | 3000 | 4500 | 6000 |
| Chinook | 250 | 20 | 20 | 50 | 75 | 35 | 75 |

The fisheries is not as productive as some warmer streams or the Lakelse River itself but its colder temperature regime plays an important role in regulating the main river temperature. The loss of mature forest along this watercourse due to clearcut logging practices will have a detrimental effect on the Lakelse River productivity. The leg of Route "B" from #1 to #13 follows clearcut areas where possible to avoid impacts on the remaining mature stands of old growth forest. It is expected that the proposed Right of Way will stay on dry rocky knolls and slopes West of Coldwater Creek. Some belts of mature forest left on small streams may be impacted in traversing the clearcut blocks.

Coho have been observed spawning to 9.5 km., pink to 5.0 km., chum to 6.0 km., and chinook to 8.0 km. Steelhead and cutthroat trout have been observed in the tributaries spawning; Dolly Varden and rainbow trout were observed at 12 km. on the mainstem creek.

Enhancement of chinook stock was carried out in 1986 when the Terrace Salmonid Enhancement Society's Deep Creek Hatchery released 10,464 fry and again in 1989 with a release of 26,100 fry. These were releases from the upper bridge just below the proposed Right of Way crossing for Route "B".

Steelhead readily utilize this stream for spawning, Several kelts have been found at the chinook brood stock fence in August which make it one of the latest spawning systems for steelhead in the Northwest. In 1974 two steelhead were caught and this is the only record of harvest on file.

Whitefish school below the fence in August. They are likely waiting for the large chinook to arrive and spawn so they can prey on the loose eggs just as they do in the Lakelse River with pinks in September.

The lakes of the Coldwater are small and productive where stream access for salmonids is provided. Kokanee, cutthroat and Dolly Varden are found in these small water bodies. Some angling recreation is provided along with limited picnicking and swimming. Most are spring-fed so maintaining cool temperatures of 8$^{o}$C is not a problem. Logging roads provide access for vehicles and End Lake has had one side logged.

Other lakes that should be mentioned briefly are Hai Lake, End Lake and Ena Lake. Hai Lake has subsurface drainage but is stocked with cutthroat, coho and Dolly Varden. It is still largely in an unlogged area but is only a short hike from road access. Ena Lake was touched on when dealing with the Ena Creek values but the lake is inside the Route "B" Corridor proposal. It has kokanee, cutthroat and Dolly Varden present. It is also an accessible lake but little is known about its recreational use. Old logging roads are nearby and it is logged to the North end. No information exists on other small lakes adjacent to End Lake. It is probable that fish populations in End Lake colonized upstream through stream access.

The next section proceeds from the height of land between Coldwater Creek and West Lake, South to Iron Mountain. At Node #13 a split occurs into two proposed Right of Way routes each with variations at the critical crossings of the Wedeene River. At Node #24 the two routes join again at the South end of the mapsheet.

The Kitimat River tributaries encountered from North to South (Nodes 13 - 14 ) are Cecil Creek including West Lake, a small unnamed lake, Lone Wolf Creek, Wedeene River, Raley Creek and Iron Mine Creek.

**Internode #13 - 15**

This proposed route crosses Coldwater Creek in a southerly direction staying East of the timbered rock hills on Onion Flats. The gravel soils and lack of surface drainage features continue until the railway crossing of Cecil Creek. Continuing in the same general direction the proposed Right of Way would cross the east slopes of a rocky knoll, avoiding a wetlands marsh area to the East and then across gravelly, well drained soils to Node #15.

On the North side of Coldwater Creek are logged areas bordering on a small canyon. This narrow channel allows a relatively safe and easy crossing of the Coldwater drainage onto the height of land in the Kitimat Valley. Immediately north of the major rock hills east of Cecil Creek lies an unnamed lake of indeterminate drainage. This lake is marshy at the north end where road access exists through clearcut areas. Recreational angling for cutthroat trout is common here. A small dock and walk has been constructed so likely cartop boats and rubber rafts, canoes, etc. are launched here.

**Cecil Creek**

Cecil Creek is proposed to be crossed just South of Du Bose on the C. N. R. line where it in turn crosses this highly productive stream. It flows southeast to the Kitimat River.

Cecil Creek

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | - | 150 | - | - | - | - | - |
| Coho | - | 4000 | 2200 | 5000 | 5000 | 300 | 300 |
| Pink | - | 3000 | 5000 | 10000 | 5000 | 2000 | 400 |
| Chum | - | 5000 | 600 | 450 | 100 | 200 | 50 |
| Chinook | - | 300 | 250 | 900 | 25 | 20 | - |

The distribution of salmon spawning is as follows: coho - to West Lake at 16.5 km., pink - 4.4 km., chum - 4.4 km., chinook - 0.4 km., steelhead have been observed spawning at 2.8 km. but likely have colonized more of the stream (6 km.) then is recorded. Cutthroat, rainbow and Dolly Varden are found throughout. Two tributaries, one from Larsen Ridge have coho spawning 1.9 km. up from its confluence and the other with coho spawning 0.8 km. up from its confluence. Another, flowing South, has Coho spawning 3.4 km. up from the confluence with the main creek.

In 1975 a survey documented coho smolts and fry, cutthroat, Dolly Varden, rainbow and steelhead in Cecil Creek. They also found pink and chum spawners up to 6 km., considerably more than the official 4.4 km. in Department of Fisheries and Oceans records. Barriers such as falls, chutes, or jams and beaver dams are all subject to flow volumes as to whether they remain barriers or not. Enhancement potential may be indicated by the drop in upstream distance by poor swimming migrants since 1975. Kitimat Hatchery has released chum and steelhead fry into Cecil Creek as part of their annual program.

**Internode #13, 14, 15**

Proposed Right of Way #13, 14, 15 takes a route further West crossing Coldwater immediately above its sharp Northern bend. It immediately climbs across the short gravel flat onto the lower slopes of Larsen Ridge which are all clearcut with shattered rock outcrops and scree slopes. At no point does the Right of Way have to cross Cecil Creek on the flood plain. It then spans the common headwaters of Cecil Creek and Lone Wolf Creek to the West rocky slope of a steep isolated hill between Lone Wolf and the C. N. R. It proceeds around this hill to its South end and then links up with Node #15. If located properly it is an alternate route that completely avoids Onion Flats and the riparian wetlands and their high productivity in Cecil and Lone Wolf headwaters.

Cecil Creek is a tremendously important fish producing tributary of the Kitimat River. As a ratio of size to value it may be the most important stream to both fish and wildlife values in the Kitimat valley. It is lake headed with West Lake at its Northern source.

West Lake is accessible to coho adult spawners and also to steelhead if they ascend that far. There are good spawning gravels along its entire length of 16. 5 km. Cutthroat, Dolly Varden, rainbow, Rocky Mountain whitefish and sculpins live in its upper reaches. Residualized sockeye or kokanee may also be present in West Lake although this not been documented. The lake itself is a shallow, productive, but small water body about 0.7 km. long by 0.4 km. wide. It has emergent vegetation along its shallow edges. There is a logging road along its West shore so access is available along the upper creek and its associated wetlands to the head of Lone Wolf Creek. The stream flow in Cecil Creek is extremely stable and productive as evidenced by aquatic grasses which grow in the stream bed itself.

**Lone Wolf Creek**

This productive little stream flows Southwest into the Wedeene River where it bends South out of the mountains. Its spawning totals are part of the total for the Kitimat system in escapement records. In 1988, however, 100 coho spawners and 150 chum spawners were observed in Lone Wolf Creek. In November of 1989 bald eagles were monitoring coho spawners in lower Lone Wolf Creek as well. There is a barrier falls at 2.3 km. on this stream. Coho, chum and Dolly Varden have been recorded to the falls.

In 1987 enhancement efforts included a release of 1000 coho fry below the falls and 2500 fry above the falls in September. Likely more releases occured here as well in 1988 but the records show only releases "throughout Kitimat system".

The Right of Way proposal again should cause minimal impact if it stays up on the rocky slopes of the Easterly hill. It does however have old growth forest on part of the slope facing West. South to Node #15 the map does not accurately show the least impactive location for the Right of Way. If, as depicted, the proposed Route B were to cross Lone Wolf Creek then it would do so on riparian habitat and in old growth forest. It would then continue down Lone Wolf Creek, crossing again to achieve Node #15. This is not as environmentally acceptable as the more reasonable alternative, discussed previously, so accessible and close.

The third option is to stay West of Lone Wolf Creek through old growth forest to Node #16 immediately North of the Wedeene River.

**Viability of Wedeene River Crossings**

The segment #15, 17, 19, 21, 23, 24 is the best Right of Way location and has the least environmental risk associated with it. It is located East of Lone Wolf Creek mainstem crossing an Eastern tributary between #15 and 17. A patch of mature timber exists between #19 and 21 but it is scheduled for

logging in 1992. Another narrow belt must be crossed between #21 and 23 on a steep gradient stream from Iron Mountain. The rest of the segment of this proposed route has all been clearcut and bedrock shows clearly through the thin disturbed soils. The last segment #23 to 24 involves crossing both the C. N. R. and the Wedeene River. One tower will be required in the riparian or wetland habitat West of the river.

The fisheries values of the Wedeene drainage are as follows:

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | - | - | - | - | - | - | - |
| Coho | 5000 | 1820 | 600 | 1500 | 5000 | 750 | 500 |
| Pink | 20000 | 1525 | 2000 | 2000 | 2500 | 1200 | 106 |
| Chum | 10000 | 4300 | 3000 | 400 | 500 | 1500 | 200 |
| Chinook | 1500 | 4550 | 800 | 400 | 800 | 750 | 100 |

The tributaries of Lone Wolf Creek, Raley Creek, Eleven Mile Creek, Aveling Creek and Iron Mine Creek are also included in the above table. Coho spawn to 32.2 km., pink to 15.5 km., chum to 29.4 km., chinook and steelhead to 3.4 km. in Aveling Creek. Viable populations of resident fish such as sculpin, Dolly Varden, rainbow and cutthroat trout are also present in the system. Other tributaries for which information exists is Iron Mine Creek where coho spawn 1.6 km. up from the mainstem river and Raley Creek which had 25 coho and 30 chinook spawning there in 1988 along with chum salmon observed 1.9 km. upstream from the Wedeene River.

Records from Provincial Fisheries are incomplete for sports fishing in the Wedeene but 3 steelhead in 1975 and one in 1977 were reported taken from the river by angling. Department of Fisheries and Oceans records for 1971 - 72 show 750 steelhead in the river. There are good gravels and spawning potential for salmonids in the stretch of the river that flows due South.

Siltation is a major problem with glacial flows brought down from the headwaters, runoff from current clearcut logging on the slopes of the main valley and erosion and slippage of marine clays and lacustrine deposits where the present logging road cuts into the unstable toe of the Western slopes at streamside. Siltation is undoubtedly one of the limiting factors to successful spawning in the Wedeene River and its tributaries.

To the South beyond the Wedeene River there are three proposed locations for crossing the Little Wedeene River. Node #24, 25, 27 stays up on the slopes crossing at a rock canyon. Segment #24, 26, 27 crosses the wider floodplain and the last location #24, 27 stays just West of the Eurocan haul road to Kitimat.

Other drainages encountered are Bowbyes Creek, Goose Creek and Duck Creek. The last two will be discussed in the "AB" segment as the two Routes "A" and "B" take a common route from Nodes #11 and 12 South to termination at Node #28 near Anderson Creek.

**Little Wedeene River**

This stream is another important producer for the fishery. It is at times rather flashy but tends to dissipate its spate in the wetlands around Goose Creek and the Kitimat River.

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Sockeye | - | 75 | - | - | - | - | - |
| Coho | 3500 | 700 | 500 | 500 | 1000 | 300 | 400 |
| Pink | 10000 | 3500 | 600 | 4000 | 3000 | 3000 | 500 |
| Chum | 10000 | 1000 | 450 | 1500 | 200 | 200 | 100 |
| Chinook | 2000 | 700 | 350 | 100 | 250 | 100 | 100 |

Coho, pink, chum, chinook and steelhead all spawn between the mouth and an impassable cascade at 8.9 km. Bowbyes Creek, a tributary, also has a waterfall 0.4 km. up from its confluence with the Little Wedeene. It has some reported steelhead spawning to the falls. In 1975 the Little Wedeene was electro-shocked producing coho fry and smolts, cutthroat and sculpins.

The proposed segment of the Right of Way #24 to 27 is the least impactive of the Little Wedeene River crossings. It appears to follow a dry esker-like gravel ridge formation between marshes and wet areas. Both #24, 25, 27 and #24, 26, 27 must cross fens that are locally important to wildlife and, being longer, are more disruptive to endemic wildlife and natural habitats that support them.

Segment #27 to 11 and 12 is less environmentally sensitive as it is located on the rocky skree slopes along the base of the mountain. Much of Goose Creek and Duck Creek can be avoided by staying as high as possible.

Local beaver populations could be impacted with increased control trapping. This in turn could help the coho spawners gain access to the headwaters of Goose and Duck Creeks. These are to be discussed in the "Common Alignment" section.

The drainages initially discussed in this section of the report are Alwyn Creek, Mink Creek, Lakelse River, Herman Creek, White Creek and Coldwater Creek in that order.

**Alwyn Creek**

This drainage flows directly West into the Skeena River. The mixed forest species are beneficial to wildlife generally providing diverse and varied habitats. Moose winter in the remaining areas of mature forest cover as do the low numbers of blacktail deer in the area.

Beaver is a common mammal in this area. Trapline #0610T014 covers Alwyn Creek.

Trapline #0610T014

| Species Harvested | 1986 | 1987 | 1988 |
|---|---|---|---|
| Beaver | 32 | 4 | 2 |
| Fox | 2 | 2 | 1 |
| Marten | 5 | 26 | 60 |
| Otter | 2 | | |
| Squirrel | 1 | 3 | |
| Bear | | 1 | |
| Mink | | 3 | 6 |
| Weasel | | 1 | |
| Fisher | | | 3 |

Other mammals such as black bear and grizzly are often observed in this area as the mature timber and proximity of seasonal food combine for security and food. Wolves and coyotes have been observed in this area. In 1970 when Canada Land Inventory winter flights were conducted from the airport nearby, it was noted wolves regularly ate the insulation off runway lights in heavy snows and subzero temperatures.

Many deciduous areas also support good populations of passerine birds. Puddle ducks utilize the beaver enhanced habitats and eagles and osprey regularly nest in snags of the mature forest. The impacts of construction of a new transmission line Right of Way should not impact on this drainage area except in a peripheral sense.

**Mink Creek**

Many small seepage areas gradually come together over the area South of Skeena Substation to eventually form a stream called Mink Creek. Trapline #0610T001 covers this area as well as part of the Lakelse River.

Trapline 0610T001

| Species Harvested | 1986 | 1987 | 1988 |
|---|---|---|---|
| Beaver | 6 | 8 | 10 |
| Marten | 11 | 26 | 32 |
| Mink | 1 | 9 | 8 |
| Otter | 2 | 1 | 1 |
| Weasel | 5 | 3 | 1 |
| Fisher | | 1 | |
| Muskrat | | 1 | |
| Wolverine | | | 2 |

Again the harvest is reflected in a larger marten harvest where mature forest still exists. An advantage of following a route through recent clearcuts is that impacts on fur harvest are reduced for the next 20 years until second growth forests succeed the original old growth.

Bear and moose are commonly found in this area. Large raptors such as eagles and ospreys nest in some of the remaining large snags or old growth. Small forest birds are common and migratory birds are seasonally common as well.

**Herman Creek**

Active clear-cut logging is taking place on this drainage so the wildlife values are changing quickly. Moose, deer and bear will lose the mature forest habitat they require whereas some small birds will benefit by opening up the forest.

The fur-bearers of Herman Creek are harvested on trapline #0610T001 which has been discussed earlier and the same relative values of mammals and birds still apply. The main value lies in being adjacent to the Lakelse River with its wetland habitats and its heavily used bird migration corridor.

**Lakelse River**

This is the most productive river system for its size in the entire Northwest. The return of millions of fish annually attracts thousands of birds, either to feed on carrion or eggs in the Fall and then to intercept the emerging and migrating fry in late Winter and Spring.

Mammals take advantage of this easily accessible food supply and both grizzly and black bear seasonally rely on the annual salmon runs and the carrion left after spawning. The remaining mature forest provides cover and shelter along the river. Moose and a few deer are to be found in the river's riparian habitats and on the gentle sidehills. As mentioned for Mink Creek, trapline #0610T001 covers this area as well and yields a profitable fur harvest.

Birds are most prolific along the river itself. Hundreds of waterfowl utilize the corridor from the Skeena River to the Lakelse Lake area and the Kitimat Valley. Seagulls follow the spawning runs upstream to feed on carrion; they follow the fry downstream to feed on them in the Spring. Raptors are especially common with bald eagles in the hundreds, ospreys and the ever present Northern and carrion crows and the larger raven. Kingfishers, mergansers, bufflehead, goldeneye are all abundant along the river.

The possibility of bird strikes on transmission lines crossing the river is inevitable, particularly for fast flying waterfowl that fly at tree-top level or along the river. To avoid damage to the riparian habitats the engineers intend to establish a longer than usual span from one rock outcrop to another over the railway, river and old growth vegetation in the river bottom. Both elevated outcrops are in recent clearcuts from logging. If this can be achieved then physical impacts to the Lakelse River habitat should be minimized. A lone cottonwood in the corner of the Southern clearcut has been left by loggers because of a huge eagle or osprey nest in its branches. Further study is required to determine if the nest has remained active now that the logging is finished. It is not likely that any dominant trees will be an obstruction or too close to the wires but if this happens then the tree will be topped rather than completely removed. The key to an environmentally safe crossing of the Lakelse River lies in the engineering expertise and physical construction capability of spanning the cables by helicopter or other aerial means. Painting the cables can lessen bird strikes and plastic balls can mark its position for both low flying birds and aircraft.

**White Creek**

This creek is located in the study area corridor West of the Lakelse River and downstream of the proposed Right of Way. It is extremely productive for fur-bearers, particularly beaver, mink and otter. Moose, black bear and grizzly are also relatively common in the area although logging has removed some of their habitat nearby. Waterfowl, such as mallard and teal are common in the beaver ponds while mergansers utilize the mainstem creek lower down the drainage. Amphibians utilize these productive wetlands as well. The impacts of a proposed nearby transmission line construction and presence are not expected to extend to the White Creek drainage.

**Coldwater Creek**

Clearcut logging blocks are checkered on the landscape at Coldwater Creek but some areas of mature forest are still left for ungulate winter habitat and cover for grizzly and black bears. Huckleberry, a mammal food source, grows under

some of these remaining forests. The eagles prey on spawned out fish along Coldwater Creek and kingfishers search out fry as well.

Other predators on this system are both black and grizzly bears. At least 6 to 8 blacks habituated to the chinook fence in 1987 and took about 10 chinook from the enclosure. Fresh tracks of an adult grizzly in November 1989 led from mature timber on Coldwater Creek through 15 cm. of fresh snow when the coho were in and spawning. Tracks of a sow and cub were also seen by hunters in the same snowfall.

Moose are utilizing the edges of clearcuts on the Coldwater but they are heavily hunted due to good access and the open areas that allow them to be seen. Tracks of Blacktail deer have also been reported in this area. Critical winter habitat under mature forest and on Southern slopes and aspects is decreasing rapidly with the logging of large clearcuts.

Eagles are common in the large trees over spawning coho in November. Crows and raven regularly patrol the roads and cut blocks looking for food while thrushes and other forest birds are found in uncut areas. Great horned owls regularly patrol these areas for the common ruffed grouse and snowshoe hare which it preys upon regularly.

Large migrations of thousands of toads have been encountered crossing roads in August to nearby watercourses on Coldwater Creek. Marshes and local wetlands take on a magnified and concentrated importance when surrounded by rocky shallow-soiled hills and slopes. Mallards with young are regularly observed in a narrow marsh along the main haul road down the Coldwater along with abundant bear sign in the berry patch areas and swamp edges. In hot weather these local wet areas in old growth likely serve as thermo-regulators for bears as well as a food source of skunk cabbage and other succulents.

If the proposed Right of Way keeps largely to clear-cut areas and rocky well-drained substrates then impacts to locally important habitats can be minimized. The emphasis must be maintained on avoiding bottom wetlands and riparian habitats and in seeking out a higher and drier route for both access and pole location sites.

As mentioned with respect to previous drainages Trapline #0610T001 takes in the Coldwater in its entirety. The maintenance of a cleared Right of Way could impact the fur-bearer resource with such a long distance involved.

**Internode #13 - 15**

The height of land between the Lakelse and the Kitimat systems is very low in this area. It has all been clearcut

years ago and the regenerated hemlock forest can again provide cover for large animals such as moose and bears. Riparian habitats and the occasional small lake provide feeding areas seasonally. Common loons and goldeneyes have been seen on some of these small lakes as well. Evidence of moose and bear as well as passerine bird usage indicates a locally important concentration area for wildlife as well as for recreationalists.

Trapline #0611T001 covers this area down to the C. N. R. Crossing on Cecil Creek and including the headwaters of Cecil Creek.

Trapline #0611T001

| Species Harvested | 1986 | 1987 | 1988 |
|---|---|---|---|
| Bear | 2 | - | - |
| Beaver | 7 | 6 | 7 |
| Fox | 2 | - | - |
| Marten | 4 | 7 | 9 |
| Muskrat | 11 | 9 | 11 |
| Otter | 2 | 2 | 4 |

Other mammals are present in the area. Some like the snowshoe hare are common in the new regeneration after logging, others like the moose and grizzly, become very rare.

Bird species most evident are passerines in these drier sites and if lodgepole pine is the major species of regeneration then it can be a veritable desert to avian species. Streams and wetlands form concentration areas and generate most of the local biological productivity.

**Cecil Creek**

The wetlands associated with the upper reaches of Cecil Creek have for the most part been all logged off. The lack of cover reduces use by moose and bears and most fur-bearers. Removal of the forest cover should enhance use by waterfowl and passerine birds. Beaver should benefit from an increased food supply as deciduous growth replaces the old forest at steamside.

The watershed above the C. N. R. crossing has already been discussed under trapline #0611T001 harvest totals. Since the lower portion of Cecil Creek forms the trapline boundary to the South it will be more appropriately discussed as part of the Wedeene River data. Other large mammals such as moose and bear find the exposed clearcuts too dangerous and climatically harsh without mature forest cover. The hunting population, other recreationalists, forest industry, etc. all travel the many access roads year round so harassment is unavoidable.

Birds are found along the spawning streams particularly the scavengers such as dippers, seagulls, eagles, crows. ravens, etc. Smaller passerines utilize open expanses much more after regeneration has reached 2 - 3 metres in height. Juncos, chickadees, sparrows then begin to utilize the many microhabitats that were previously too exposed for up to 10 years after timber harvest, burning, planting etc.

Biologically this segment #13 to 15 is the least disruptive route. It is all in a massive clearcut: it avoids all wetlands and the riparian habitats encountered can be spanned easily at narrow crossings or avoided. Present road access is available due to recent logging operations providing new Right of Way access as needed.

**Intermode #13, 14, 15**

This proposed route follows the headwaters of Cecil Creek along the base of the mountain. It is possible to avoid placing towers in the wetlands or riparian habitat and to stay in clearcut areas as well.

The stream flows in upper Cecil Creek appear to be extremely stable. Beavers may be the only destabilizing influence and since the three year total of 20 beaver harvested likely came from this area of Trapline #0611T001 it appears to be managed well. The threat to this area will be from logging the steep slopes above and having debris torrents similar to those in Lone Wolf Creek fill in these productive areas through erosion.

Eagles were in old snags along the upper stream in November waiting patiently for the coho to die. Ravens were also present. The capability of this wet area for birds is excellent. Brush species are recovering after recent logging and before long both food and cover will be back in place for many small species of birds.

Construction of a Right of Way on the rocky substrate above the wetlands should cause no direct impact. Small access roads off the present road to tower sites should be carefully considered between Cecil and Lone Wolf Creeks.

**Lone Wolf Creek**

The headwaters of Lone Wolf Creek are part of the same wetland complex as the tributaries of upper Cecil Creek so most of the same value stays constant. One advantage is that old growth forest still remains on part of this wetland. Moose still utilize this area and beaver dams are common on the flood plain. A debris torrent has wiped out some valuable riparian habitat at the base of the mountain.

Beaver are the most obvious inhabitant of the headwaters as the road is flooded out in several places and their fresh dams are commonplace. Not all of the timber is gone on the riparian areas and several fresh moose tracks were seen here. Bird habitat is also plentiful and bald eagles were certainly in attendance during the November coho run.

**Wedeene River**

This is the largest tributary of the Kitimat River. The proposed areas for crossing are all over moose winter range and important riparian habitats for other wildlife as well. As indicated in the fisheries section the segment #15, 17, 19, 21, 23, 24 is the best Right of Way location for wildlife as well as fisheries, having the least amount of environmental risk associated with it. The last segment #23 to 24 crosses the Wedeene River and the Canadian National Railway line and requires at least one tower in riparian habitat.

The other proposed locations for Route "B" river crossings are from Node #15 to 16, from #17 to 18, from #19 to 20 and #20 to 21. These are all less appealing environmentally for the same sets of conditions. The routes must cross wetlands that are very productive for fish rearing, waterfowl production and limited mammal wet habitats that are as yet only partly compromised by forest harvesting.

On segments #15 to 16 and #16 to 18 there are open terraces with fens or marshes that in November 1989 still had six trumpeter swans feeding and resting there. The potential for bird strikes is higher on crossings at right angles to the North-South valley. Only #16 to 18 which is parallel to the flyway axis and #23 to 24 which trends Southwest, avoid becoming a direct obstruction over the river in a constricted corridor.

As mentioned previously the entire lower slopes along the West side of the Wedeene River are unstable and eroding. Raley Creek will likely cut through a gravel ridge directly to the river in the near future and lose about one kilometer of its present spawning potential. Access roads and construction impacts will all be additive to the siltation threat if a Right of Way is constructed along the West side slopes.

This entire area is under trapline 30611T004. At present it is only trapped part time in the Winter. It is a very productive area for fur-bearers.

Trapline #30611T004

| Species Harvested | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|
| Beaver | 3 | 3 | 13 | 12 |
| Marten | 8 | 1 | - | 61 |
| Mink | 1 | - | 1 | 0 |
| Wolverine | 3 | 2 | 3 | 3 |
| Fox | - | 1 | 1 | 4 |
| Squirrel | - | 1 | 1 | 2 |
| Weasel/Ermine | - | 1 | 6 | 9 |
| Otter | - | - | 1 | 1 |

There is good riparian moose habitat downstream on the Wedeene River to the Kitimat River. Black bear and the occasional grizzly are still to be found seasonally feeding on berries or salmons.

Bird activities would be confined to the riparian and valley bottom habitats. Mergansers, goldeneye and bufflehead commonly nest and feed in such productive rivers as the Wedeene. Dippers and spotted sandpipers as well as harlequins frequent the steeper gradients into the headwaters. Scavengers such as seagulls, eagles, raven and crows are common in salmon season on the lower reaches.

**Little Wedeene River**

The proposed route for crossing the Little Wedeene River has three possible sites for consideration. Node #24, 25, 27 stays up on the slopes crossing at a rock canyon. Node #24, 25, 27 stays up on the slopes crossing at a rock canyon. Segment #24, 26, 27 crosses the broader floodplain and the last location #4, 27 is just upstream of the Eurocan haul road to Kitimat. Wildlife habitats are least impacted by segment #24, 27 as its route follows a dry gravel ridge and avoids marshes on the North bank that the other two routes must traverse. This local wetlands habitat is important for waterfowl such as mallards and teal, as well as passerine bird species and amphibians.

These floodplain areas are potentially some of the best for trapping as much mature spruce, hemlock and cedar was left in these swamps due to inaccessibility leaving mixed forest cover and lots of standing water. It is also important rearing habitat for fish providing mink and otter with a ready food supply. Black bear utilize this habitat much more than grizzly would, due to the human activity nearby in Kitimat. There is probably some use by Sitka blacktail deer and wintering moose may migrate down the river to this area utilizing mature cottonwood stands along old river meanders and cut-off sloughs.

Trapline #0611T003 (on Bowbyes Creek)

| Species Harvested | 1987 | 1988 |
|---|---|---|
| Marten | 13 | 31 |
| Mink | 1 | |
| Squirrel | 6 | 4 |
| Weasel | 1 | 1 |
| Beaver | - | 3 |
| Fox | - | 1 |
| Otter | - | 1 |
| Bear | | 1 |

Trapline #09611T005 (on lower Little Wedeene)

| Species Harvested | 1986 | 1987* | 1988 |
|---|---|---|---|
| Beaver | 25 | | |
| Marten | 18 | | 1 |
| Mink | 2 | | |
| Otter | 4 | | |
| Weasel | 4 | | |

* Not trapped in 1987

Birds are especially common on the river and in the air during salmon season. The open arm of the ocean is only 6 km. away. Passerines are not nearly so obvious as the scavengers. Predators such as osprey and bald eagles are common.

The remnant mature forest wetlands on the floodplain may also be the last remaining habitat for the tailed frog in the Kitimat area. As mentioned earlier in mainstem Kitimat River discussions two tadpoles of this elusive species have been collected in 1965 and again in 1989.

The common corridor is from Node #12 to the terminus at Node 28. Because of common overlapping resources and converging routes Goose and Duck Creek areas will be discussed in this section. The proposed Right of Way will twin the present one to Kitimat Station and then move higher up the slope to avoid the large sandhill and unstable slopes and stay on solid rock. The only major stream other than Goose and Duck Creeks is Anderson Creek at the South end of the Corridor.

The Department of Fisheries records consolidate these wetlands and streams into their Kitimat River totals. They record some incidental minnow trapping but access is a problem with the extensive areas of standing water, marshes and beaver ponds. A mainline road parallels the stream and interrupts drainage in the area.

**Goose Creek**

This stream flows Southeast into the Kitimat River draining low lying terraces and poor drainage areas in the main valley. Coho have been observed spawning to 2.1 km. and pinks to 0.8 km. Coho are evenly distributed up the stream and many small tributaries likely also support coho spawners late in the year. Excellent rearing habitats for salmonids is provided here for Kitimat River fry populations dropping down the system.

**Duck Creek**

This small system is also locally productive and enters the Kitimat River just upstream of the highway bridge. The following fish species spawn and rear within the drainage.

Coho have been observed spawning to 1.5 km. as have pink salmon. Chum salmon also spawn upstream to 0.5 km. In November of 1986 there were 75 adult coho spawning in this stream. Cutthroat and stickleback are resident in Duck Creek marshes and ponds.

As in the Williams Creek area and in the Humphreys-Nalbeelah Creek wetlands there isn't a desirable route through this valuable fisheries production area. There is no "dry" route available and any new cleared Right of Way and access features will cause impacts to the environment. Mitigation will be necessary for fish, traplines and bird life in the impacted habitats.

**Anderson Creek**

| SPECIES | Optimum Escapement | 1989 | 1988 | 1987 | 1986 | 1985 | 1984 |
|---|---|---|---|---|---|---|---|
| Chum | - | - | - | - | 15 | - | - |
| Pink | 5000 | - | - | 20 | 100 | 50 | - |
| Coho | 60 | 120 | 75 | 25 | 70 | - | 10 |

Anderson Creek runs through the Alcan site, emerging out of the mountain in a large picturesque waterfall about 1.0 km. from the Kitimat River. A small viewpoint and some recreational angling occur at the falls pool. Dolly Varden and cutthroat trout are also present here. Fisheries reports indicate poor productivity.

The major enhancement facility for the valley is the Kitimat Hatchery located on the river bank. Their capacity is about 16 million eggs annually. They utilize extraneous hot water from Eurocan's facility as well as ground water wells to mix with river water and and control temperature regimes. After 10 years they are now generating enough enhanced salmon stocks to support a commercial fishery in Kitimat Arm to go with the sports fishery in the river and off the estuary. Questions of mitigation concerning salmonids may involve this facility in provision of new stocks or of local information and data.

The proposed Right of Way will twin the existing one to Kitimat Station and then be located further upslope on solid rock, avoiding the large sandhill and unstable slopes lower down. The only major stream other than Goose and Duck Creeks is Anderson Creek at the end of the Corridor. Trapline #0611T003 covers this portion of the Corridor.

Trapline #0611T003

| Species Harvested | 1987 | 1988 |
|---|---|---|
| Marten | 13 | 31 |
| Mink | 1 | - |
| Squirrel | 6 | 4 |
| Weasel | 1 | 1 |
| Beaver | - | 3 |
| Fox | - | 1 |
| Otter | - | 1 |
| Bear | - | 1 |

Beaver are very common here as their dams, ponds and houses were numerous in 1989. Several bufflehead, goldeneye and common mergansers were seen here. Bald eagles were seen perching along the riparian edges of the stream watching the coho migration.

**Goose Creek**

Much of the drier portions of the Goose Creek Drainage area have been logged years ago. Deciduous growth is tall and dense enough to provide security and cover for larger animals such as moose and black bear. Moose winter along the Kitimat River edge of this area in mature deciduous stands of timber and along old river channels.

Standing cattail marshes and long grasses make much of these lower Goose Creek wetlands valuable to waterfowl in particular. Canada goose nesting also occurs in the area along with mallard and merganser nesting. Eagles utilize spawning runs for food, scavenging carcasses of both pink and coho salmon during and after spawning. Seagulls utilize this food supply as well. One impact of this segment of the Right of Way would be its interception of the North-South migration routes of waterfowl and other large birds, causing strikes in fog, low cloud or by night. Trumpeter swans, geese, loons and other less maneuverable birds are most susceptible to sudden obstacles in their flight path.

**Duck Creek**

This Southeast flowing stream is located at Node #12 at the South end of proposed Route A. It is a low-lying marshy

drainage area with much evidence of heavy beaver populations. The same trapline #0611T003 covers this drainage as well as Goose Creek so the same values to aquatic mammals will apply.

Waterfowl utilize this area for nesting and rearing on a regular basis. The high incidence of small rearing fish populations offers a good food supply for avian predators such as mergansers and kingfishers as well as mammals like mink and otter.

**Anderson Creek**

This stream flows from a steep mountainside and the gradient eliminates most aquatic mammal habitat in the headwaters. The lower reach travels through the Alcan smelter grounds where terrestrial wildlife is extirpated.

Trapline #0611T007 covers the Corridor from Kitimat Station to Node #28 and no harvest was reported in 1986, 1987 or 1988. If the trapline is an active aboriginal livelihood then its holder is not required to report the harvest. Upper reaches of the Anderson drainage are better fur-bearer (marten) habitat. Other mammals are only acccasionally present here. Harbour seals follow salmon migrations up the Kitimat River and beaver or otter have also been sighted in the river mouth.

This then completes proposed route "B" and Common Route "AB". It is 12 km. shorter than Route "A" and "AB" and it is a much drier route, following rock and well drained gravel soils most of the way. It creates very little new access as logging roads proliferate and clearcuts predominate. As these areas grow back and roads are put to bed or deteriorate, then access management may be required. It is a new environmentally responsible route that is worth serious consideration because of much lesser ecological and biological impacts over time.

## CRITERIA FOR WILDLIFE/FISHERIES SENSITIVITY RATINGS

### LOW SENSITIVITY

Potential calving habitat for moose;
mild-winter range for moose;
slight collision hazard for waterfowl and other birds;
deer habitat without existing access;
fish migration or access, scattered wetlands.

### MODERATE SENSITIVITY

Mild-Winter range for moose with especially good cover, or severe-winter range with little cover;
areas where changes in access or visibility would significantly increase hunting pressure on moose;
moderate collision hazard for waterfowl and other birds;
significant wetlands adjacent to right of way;
drainages crossing right of way.

### HIGH SENSITIVITY

Critical winter range for moose, calving areas;
trumpeter swan, waterfowl habitat, nesting, migration route;
high collision hazard for waterfowl and other birds;
major wetlands, rearing, spawning areas, holding areas.

### LOW IMPACT

Winter range for moose with little cover;
moderate or low collision hazard for waterfowl and other birds;
low collision hazard for trumpeter swans and waterfowl;
deer habitat without existing access;
scattered wetlands.

### MODERATE IMPACT

Areas where changes in access or visibility would significantly increase hunting pressure on moose;
patches of good cover in mild-winter range;
high collision hazard for waterfowl and other birds;
through wetlands of significance, loss of fish cover at streamside;
holding and spawning.

### HIGH IMPACT

Critical winter range for moose with good cover, calving areas;
high collision hazard for trumpeter swans and waterfowl;
migration route, nesting;
major loss of fish habitat, rearing, spawning and loss of cover area;
potential erosion sites above spawning areas.

## ASSESSMENTS OF SENSITIVITY AND IMPACT BY ROUTE COMPARISONS

The potential locations within Route A will be discussed in a comparative format with a brief analysis of the degree of sensitivity and potential impact. General evaluations of low, moderate and high are used. Extreme may be used as a red flag term * to avoid at all costs.

### Proposed Route "A"

| Area | Comments |
|---|---|
| Segment: 1,2<br>Analysis: low,low | Relatively well drained bench of spruce and lodgepole pine; low sensitivity, low impacts, no extensive wetlands, small headwaters and beaver ponds. |
| Segment: 2,3,6<br>Analysis: moderate,high | Option (a)<br>Segment 2-3 is low for wildlife, fish. Segment 3-6 is doubling of present line on same ROW. Moderate wildlife sensitivity waterfowl-nesting, rearing, migration, beaver, muskrat use. High for fish spawning, rearing, holding. Impacts moderate for wildlife, high for fish. |
| Analysis: high,extreme | Option (b)<br>Segment 2-3 is low for wildlife, fish. Segment 3-6 to parallel present ROW down Sockeye Creek or on East side of stream. High wildlife sensitivity, waterfowl nesting, rearing, collisions, moose winter, calving riparian. Fisheries high spawning, rearing, holding. Impacts extreme for fish and high for wildlife. |
| Segment: 2,5,6<br>Analysis: high,moderate | Segment 2-5 across east facing logged slope: moose early winter; low, fish, low. Segment 5-6 marsh area: high for swans, waterfowl, moose moderate, calving, winter. Fish moderate rearing resident species. Impact moderate for fishery. |
| Segment: 2,3,4,7<br>Analysis: high,extreme | Segment 2-3-4 low wildlife, low fishing sensitivity. Segment 4-7 high waterfowl winter, nesting, collisions; high moose, moderate bear, high fur-bearer-beaver, muskrat; fish - extreme spawning, rearing, holding erosion, silt. Impact: high, extreme. |

| | |
|---|---|
| Segment: 6,7<br>Analysis: high,moderate | Segment 6-7 parallel present line, wetlands, creek crossing, waterfowl rearing, nesting, moose summer, winter high, fish rearing, migration high. Impact: moderate, high. |
| Segment: 7,8<br>Analysis: moderate,high | Proposal to parallel existing ROW on East side sensitivity is on average moderate for wildlife-moose; some beaver use mature forest habitat-dry, marten. Fish cross Furlong, Hatchery, Scully and Kitimat River. Moderate sensitivity. Impacts: for wildlife are low, fish moderate to high. |
| Segment: 8,10<br>Analysis: high,extreme | This section is proposed to parallel the existing ROW on the East side. Wetlands and riparian habitats predominate high for bear, beaver, otter, mink, moose, small mammals. High for waterfowl, nesting, collisions, passerines, raptors. High to extreme sensitivity for salmonids, spawning, rearing. Impact: high for wildlife, high for fisheries. |
| Segment: 8,9,10<br>Analysis: moderate,moderate | Alternate route location stays East of wetlands on lower slopes of clearcuts. Moderate sensitivity for moose, bear, beaver, mink, small mammals - high. Waterfowl-low passerines-high, raptors-moderate. Fisheries sensitivity is moderate, crossings of Humphreys, Nalbeelah Creek erosion, siltation downstream from access, etc; wetlands adjacent. |
| Segment: 10,11<br>Analysis: high,extreme | Location stays North of existing ROW. Floodplain, wetlands, major crossing of Kitimat River armoring riprap required, downstream effects. Sensitivity high for moose, beaver, mink, bear, small mammals; waterfowl extreme, swans, collisions, nesting, rearing, passerines, raptors-high, fisheries sensitivity extreme, spawning, rearing, holding, erosion, siltation. |

Segment: 10,12

Analysis: high,extreme

Location parallels on South side of existing ROW Floodplain, wetlands, major crossing of Kitimat River armoring, riprap required; downstream effects may be major. Sensitivity high for moose, bear, beaver, mink, small mammals. Waterfowl-extreme, swans, collisions, nesting, rearing passerines, raptors-high. Fisheries sensitivities-extreme; spawning, rearing, holding, subject to erosion and siltation. Impacts: wildlife high, fish high.

Results of tabulated analyses for Route "A"

The best route selection on an environmental basis would be 1,2,3,6,7,8,9,10,11 with: three lows, five moderates, three highs and one extreme. The "Red Flag Extreme" cannot be avoided on either option offered on this Route "A" proposal.

## Proposed Route "B"

| Area | Comments |
|---|---|
| Segment: 1,13<br>Analysis: high,high | Located from Thunderbird Southerly onto the Coldwater drainage. Sensitivity for wildlife is moderate, moose winter, beaver on small streams, mink, waterfowl collisions on Lakelse River Crossing, bears, grizzly, Fisheries impacts and sensitivity are access, erosion, spawning, holding parallels Coldwater - high. Impacts for wildlife are high due to grizzlies, access, waterfowl collisions. No report of swan use of route. |
| Segment: 13,14,15<br>Analysis: moderate,high | This segment crosses Coldwater Creek; moves to the West side of West Lake on the logged slope of Larsen Ridge. It moves South along the upslopes of Cecil Creek, crossing to the partially logged rock hill on the headwaters of Lone Wolf Creek, then down the East side to Node 15. Sensitivity is moderate for moose, calving, beaver, mink, muskrat are moderate - access, waterfowl is moderate. Fisheries sensitivity is moderate, crossing drainage and adjacent to marsh; to high for access, rearing. Impacts: moderate for wildlife, high for fisheries, erosion and silt. |
| Segment: 13,15<br>Analysis: low,low | Crosses Coldwater Creek, proceeds down Onion Flats crosses Cecil Creek at DuBose, adjacent to small marsh, to Node 15. Moose low, bear low, waterfowl low, fisheries (two narrow crossings otherwise dry) low. Impacts: wildlife low, fisheries low. |
| Segment: 14,16<br>Analysis: moderate,moderate | This short segment crosses Lone Wolf Creek through mature timber. Moose moderate for calving, winter, marten high, mink moderate, beaver moderate, waterfowl low, fisheries moderate. Impacts: Wildlife moderate - access, fisheries moderate. |
| Segment: 15,16<br>Analysis: high,moderate | Crosses Lone Wolf Creek - East to West. Moose moderate, beaver, mink, marten, bear moderate, waterfowl high, swans, collision high. Fisheries moderate. Impacts: wildlife high, fish moderate. |

| | |
|---|---|
| Segment: 15,17<br>Analysis: low,low | Stays up on dry bench, crosses small tributary of Lone Wolf Creek - logged. Moose low, bear moderate, fur-bearers low, waterfowl low, fisheries low. Impacts: wildlife low, fish low. |
| Segment: 16,18<br>Analysis: moderate,moderate | Major crossing for Wedeene River on West side of valley and flyway. Moose moderate, bear moderate, crosses marsh, waterfowl high, collision moderate for swans; early winter area adjacent. Fish moderate for Wedeene Crossing. Impacts: wildlife moderate, fisheries moderate for erosion, silt, spawning, holding. |
| Segment: 17,18<br>Analysis: high,high | East-West Crossing of Wedeene River. Moose winter calving, bears concentrate on the river. Waterfowl migration route North-South; swans, collisions, beaver, mink. Fish spawning, holding, rearing, erosion high, silt high; sensitivity for wildlife high, fish high. Impacts: moderate for wildlife, high for fish. |
| Segment: 17,19<br>Analysis: low,low | Continuance of 15,17 in a Southern direction. No crossings or impacts moose, bear, fur-bearers low, waterfowl low, fish low. Impacts: wildlife low, fish low. |
| Segment: 18,20<br>Analysis: moderate,extreme | Continuance of 16,18 segment in Southern direction on West side. Sidehill erosion problems extreme, silt high; moose and bear moderate in logged areas, waterfowl low, fish extreme, spawning, rearing, holding. Impacts: wildlife moderate, fish extreme. |
| Segment: 19,20<br>Analysis: moderate,extreme | Crossing Wedeene River extreme erosion problems on West side access. Swan, waterfowl collision perpendicular to flyway. Moose, bear, fur-bearers, calving, winter moderate. Waterfowl high. fish extreme, erosion, silt, spawning, holding, rearing. Impacts: wildlife moderate, fish extreme. |

| | |
|---|---|
| Segment: 19,21<br>Analysis: high,high | continuance of 15,19 in a Southern direction East side of Wedeene. Logged rocky benches, cross small stream. Moose, bear, fur-bearers low, waterfowl low, fish low. Impacts: wildlife low, fish low. |
| Segment: 20,22,<br>Analysis: moderate,extreme | Continuance of 16,18,20 South on West side of Wedeene River. Extreme erosion, siltation, access problems. Moose, bear, fur-bearers moderate, waterfowl low, fish extreme, spawning, holding and rearing. Impacts: wildlife moderate, fish extreme. |
| Segment: 21,22<br>Analysis: moderate,extreme | Crossing Wedeene River perpendicular to flyway, erosion, siltation on West side, moose, bear, wildlife calving, winter in riparian. Waterfowl high, collisions, swans, fish extreme erosion, siltation, spawning, holding and rearing. Impacts: wildlife moderate, fish extreme. |
| Segment: 21,23<br>Analysis: low,low | Continuance of 15,17,19,21 South on East side of Wedeene River, dry rocky bench. Small stream crossing logged except for narrow belt along stream. Wildlife sensitivity, moose, bear, fur-bearers low, waterfowl low, fish low. |
| Segment: 22,24<br>Analysis: moderate,extreme | Continuance of 16,18,20,22 South on West side of Wedeene River. Crosses Raley Creek, small tributaries of unnamed creek (3). Extreme erosion on Raley Creek and near Wedeene at North end. Wildlife, moose, bear, fur-bearers moderate, waterfowl low, fish siltation, erosion in both Wedeene and Raley spawning, holding in both extreme sensitivity. Impacts: wildlife moderate, fish extreme. |
| Segment: 23,24<br>Analysis: moderate,moderate | Diagonal crossing of Wedeene River at South end of Iron Mountain. Likely tower will be in wetlands on West side. Sensitivity moose moderate, bear moderate, fur-bearers moderate, waterfowl collisions, swans high, fish moderate, spawning. Impacts: wildlife moderate, fish moderate. |

Segment: 24,25,27
Analysis: moderate,low

Western crossing of Little Wedeene River longer, crosses perched marsh; may require tower in wetland. Canyon crossing rock, some erosion on South side to flood plain. Sensitivity moose moderate, bear moderate, waterfowl moderate, fish low. Impacts: wildlife moderate, fish low.

Segment: 24,26,27
Analysis: low,moderate

Middle route across Little Wedeene. Crosses flood plain and edge of large perched marsh. Shorter than previous crossing (24,25,27). Wildlife sensitivity low, moose, bear, fur-bearers moderate, waterfowl, collision, fish moderate erosion. Impacts: wildlife low, fish moderate.

Segment: 24,27
Analysis: low,low

Shortest most direct and dry route across Little Wedeene River. Well drained terraces. Sensitivity moose low, bear low, access beside road low, waterfowl low, fish low. Impacts: wildlife low, fish low.

Segment: 27,11,12
Analysis: moderate,low

Route due South on scree rock and lower slope rock until terminus with 11,12 nodes, crosses small tributaries of Goose Creek headwaters. Sensitivity for moose low, bears moderate, fur-bearers, beaver, mink moderate at South end only low in North. Waterfowl low, passerines, raptors low, fish low. Impact: Wildlife moderate, fish low.

Results of tabulated analyses for Route "B"

The best route selection on an ecological and environmental basis would be segments 1,13,15,17,19,21,23,24,27,11,12; with eleven lows, three moderates, and two highs. Much of the lower impacts lie in the clear-cut route chosen rather than clearing through mature forest and almost no new access is required, only maintenance and upgrading of present road systems.

Common Route "A-B"

Segment 12,28
Analysis: moderate,low

Traverses Duck Creek tributaries and wetlands. Climbs on steep slopes of mountain West of Kitimat Station paralleling existing ROW on West side. Crosses Anderson Creek above Falls and terminates at the Substation at Alcan. History of chemical damage to vegetation in downwind plume areas along West Mountain. Sensitivity moose low, except in Duck Creek, bear moderate, fur-bearers low, waterfowl moderate in Duck Creek, low elsewhere, fish high in Duck Creek, low in Anderson. Impacts: wildlife low, fish low overall.

Conclusions:

The analyses compiled on both proposed Route "A" and Route "B" were assessed as follows, in Table format, for the Biologically safest route based on available data.

| | EXTREME | HIGH | MODERATE | LOW |
|---|---|---|---|---|
| Route "A" | 1 | 3 | 5 | 3 |
| Route "B" | 0 | 2 | 3 | 11 |
| Route "A-B" | 0 | 0 | 1 | 1 |

It is clear that Route "B" is the environmentally safest route. In addition, it is 12 kilometers shorter. The subjective weighing of biological values, their sensitivity and impact in a linear dimension, is all subject to change over time. As the Kitimat Valley becomes reforested it is expected that the local moose population will rebuild in response to environmental changes. The maintained habitat under the power line, will however, not change from an early seral stage.

## APPENDICES

I - Scientific Names of Wildlife Species.

II - Kitimat Hatchery - Summary of Release.

III - Chronological Fry tagging by Kitimat Hatchery.

IV - Steelhead Releases - Kitimat Drainage - 1984-1987.

V - Bird Sightings - Lakelse Lake Area.

VI - Mammal Sightings - Lakelse Lake Area.

VII - Kitimat Valley Moose Survey - January 11, 1990.

VIII - Sources of Information.

IX - Information Sources and Contacts.

X - Fisheries Bibliography.

XI - Wildlife Bibliography.

SCIENTIFIC NAMES OF WILDLIFE SPECIES APPENDIX - I

MAMMALS (Cowan and Guiget 1965)

| | |
|---|---|
| Beaver | Castor canadensis |
| Black Bear | Ursus americanus |
| Cougar | Felis concolor |
| Coyote | Canis latrans |
| Fisher | Martes pennanti |
| Flying Squirrel | Glaucomys sabrinus |
| Grizzly Bear | Ursus arctos |
| Hair (harbour) Seal | Phoca vitulina |
| Little Brown Bat | Myotis myotis |
| Lynx | Lynx canadensis |
| Marten | Martes americana |
| Mink | Mustela vision |
| Moose | Alces alces |
| Muskrat | Ondatra zibethica |
| Otter | Lutra canadensis |
| Red Fox | Vulpes fulva |
| Red Squirrel | Tamiasciurrus hudsonicus |
| Short-tailed Weasel (ermine) | Mustela erminea |
| Sitka Black-tailed Deer | Odocoileus hemionus sitkensis |
| Wolf | Canis lupus |
| Wolverine | Gulo luscus |

BIRDS (Robbins et al 1966)

| | |
|---|---|
| American Widgeon | Mareca americana |
| Bald Eagle | Haliaeetus leucocephalus |
| Blue Grouse | Dendragapus obscurus |
| Blue Winged Teal | Anas discors |
| Bufflehead | Bucephala albeola |
| Canada Goose | Branta canadensis |
| Common Loon | Gavia immer |
| Common Merganser | Mergus merganser |
| Common Snipe | Capella gallinago |
| Goldeneye | Bucuphala spp |
| Great Blue Heron | Ardea Herodias |
| Green Winged Teal | Anas carolinensis |
| Harlequin | Histroinicus histroinicus |
| Mallard | Anas platyrhynchos |
| Merlin | Falco columbarius |
| Osprey | Pandion haliaetus |
| Pintail | Anas acuta |
| Ptarmigan | Lagopus spp |
| Red-breasted Merganser | Mergus serrator |
| Rock Dove | Columba livia |
| Ruffed Grouse | Bonasa umbellus |
| Scaup | Aythya ssp |
| Spruce Grouse | Canachites canadensis |
| Trumpeter Swan | Olor buccinator |
| Wood Duck | Aix sponsa |

REPTILES (BC Fish and Wildlife Branch 1979g) and
AMPHIBIANS (BC Fish and Wildlife Branch 1980a)

| | |
|---|---|
| Boreal Toad | Bufo boreas |
| Brown Salamander | Ambystoma gracile |
| Common Garter Snake | Thamnophis sirtalis |
| Northern Roughskin Newt | Taricha granulosa |
| Red-legged Frog | Rana aurura |
| Spotted Frog | Rana pretiosa |
| Tailed Frog | Ascaphus truei |
| Western Terrestrial Garter Snake | Thamnophis elegans |

FISH of the Kitimat and Lakelse Drainages

Anadromous

| | |
|---|---|
| American Shad | Alosa sapidissima |
| Coho Salmon | Onchorhynchus kisutch |
| Chinook Salmon | Onchorhynchus tshawytscha |
| Chum Salmon | Onchorhynchus keta |
| Cutthroat Trout | Salmo clarki clarki |
| Dolly Varden Char | Salvelinus malmo |
| Eulachon | Thaleichthys pacificus |
| Pink Salmon | Onchorhynchus gorbuscha |
| Sockeye Salmon | Onchorhynchus nerka |
| Steelhead Trout | Onchorhynchus mykiss |
| Pacific Lamprey | Entosphenus tridentatus |

Fresh Water Residents

| | |
|---|---|
| Coho Salmon | Onchorhynchus kisutch |
| Cutthroat Trout | Salmo clarki clarki |
| Dolly Varden Char | Salvelinus malmo |
| Northern Squawfish | Ptychocheilus oregonensis |
| Peamouth Chub | Mylocheilus caurinus |
| Prickly Sculpin | Cottus asper |
| Rainbow Trout | Onchorhynchus mykiss |
| Redside Shiner | Richardsonius balteatus |
| Rocky Mountain Whitefish | Prosopium williamsoni |
| Sockeye Salmon (Kokanee) | Onchorhynchus nerka |
| Three-spine Stickleback | Gasterosteus acuteatus |

# APPENDIX II

## KITIMAT HATCHERY - SUMMARY OF RELEASES

| BROOD YEAR | SPECIES | STOCK | TAG CODE (Fin clip) | RELEASE DATES | NUMBER RELEASED Tagged | Ad-only | Untagged | TOTAL RELEASED | SIZE (gms) | RELEASE SITE/COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1976 | CO(W) | Kitimat | 20/02/51 | 15/05/78 -02/06/78 | 17,460 | 540 | 0 | 18,000 | 6-10 | 17-mile bridge |
| 1976 | CO(W) | Kitimat | 20/02/49 | 15/05/78 -02/06/78 | 8,245 | 255 | 0 | 8,500 | 6-10 | 17-mile bridge |
| 1976? | CN(W) | Kitimat | 20/02/50 | 20/05/78 -02/06/78 | 1,532 | 46 | 0 | 1,578 | 6-8 | Released at capture sites |
| 1977 | CN | Kitimat | 20/02/48 | 20/05/78 -14/07/78 | 66,773 | 2,065 | 459 | 69,297 | 5.4 | 17-mile bridge |
| 1977 | CN | Kitimat | 20/02/34 | 20/07/78 -21/07/78 | 5,973 | 185 | 41 | 6,199 | 5.4 | 17-mile bridge |
| 1978 | CN | Kitimat | 16/02/14 | 20/05/79 -27/05/79 | 73,437 | 2,014 | 76,320 | 151,771 | 5.2 | 17-mile bridge |
| 1979 | CN | Kitimat | 20/02/01 | 07/05/80 -09/05/80 | 35,203 | 3,911 | 85 | 39,199 | 5.0 | Eurocan pumphouse |
| 1980 | CN | Kitimat | 18/02/44 | 04/05/81 -05/05/81 | 25,676 | 1,210 | 59 | 26,945 | 5.4 | Crown Z #1 |
| 1980 | CN | Kitimat | | 04/05/81 -05/05/81 | 0 | 0 | 56,635 | 56,635 | 3.8 | Eurocan Borrow Pit |
| 1980 | CN | Hirsch | 17/02/56 | 06/05/81 | 34,000 | 0 | 0 | 34,000 | 6.0 | Hirsch creek park |
| 1980 | CM | Kitimat | Ad. clip | 26/03/81 | | | | 3,455 | 2.8 | Cecil creek |
| 1981 | CN | Kitimat | 22/02/22 | 10/05/82 -13/05/82 | 42,110 | 8,390 | 9,990 | 60,490 | 6.5 | Crown Z #2 |
| 1981 | CN | Kitimat | 19/02/61 | 04/06/82 -07/06/82 | 10,205 | 155 | 68,000 | 78,360 | 4.4 | Pilot II outfall |
| 1981 | CN | Hirsch | 21/02/37 | 13/05/82 -14/05/82 | 19,313 | 1,307 | 0 | 20,620 | 5.4 | Hirsch creek park |
| 1981 | CM | Kitimat | | 28/03/82 -18/04/82 | | | 30,345 | 30,345 | 2.7 | Pilot II outfall |
| 1981 | CO | Kitimat | | 18/05/82 -21/05/82 | | | 54,000 | 54,000 | 1.6 | Kitimat - spread out |
| 1982 | ST | Kitimat | Rt. max clip | 07/10/82 -08/10/82 | | | | 26,650 | 1.6 | Chist creek |
| 1982 | CN | Kitimat | 25/02/27 | 03/05/83 | 43,192 | 1,567 | 0 | 44,759 | 5.6 | 7000 each: McKay, 17-mile above Humphrey's. 24,000 Crown Z #2 |
| 1982 | CN | Hirsch | 24/02/36 | 02/05/85 | 46,032 | 278 | 0 | 46,310 | 4.7 | Hirsch creek park |
| 1982 | CN | Kitimat | | 02/05/83 -06/05/83 | 0 | 0 | 198,500 | 198,500 | 3.9 | Pilot II outfall |

Note: some pilot numbers vary slightly from the numbers which Vancouver has (rounded off in most cases).

| BROOD YEAR | SPECIES | STOCK | TAG CODE (Fin clip) | RELEASE DATES | NUMBER RELEASED Tagged | Ad-only | Untagged | TOTAL RELEASED | SIZE (gms) | RELEASE SITE/COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1983 | CN | Hirsch | 27/02/43 | 11/05/84 -13/05/84 | 53,590 | 1,374 | 3,031 | 57,995 | 5.2 | Hirsch creek park |
| 1983 | CN | Lo. Kit. | 27/02/42 | 08/05/84 -13/05/84 | 42,762 | 1,052 | 828,276 | 872,090 | 6.4 | 17-mile bridge, Crown Z bridge, Humphreys creek sidechannel. |
| 1983 | CN | Up. Kit. | 27/02/45 | 07/05/84 -09/05/84 | 39,294 | 843 | 2,053 | 42,190 | 6.25 | McKay creek area. |
| 1983 | CN | Kildala | 27/02/44 | 14/05/84 -15/05/84 | 48,130 | 1,387 | 62,083 | 111,600 | 6.00 | Kildala river |
| 1983 | CN | Dala | | 14/05/84 | | | 53,295 | 53,295 | 6.10 | Dala river |
| 1983 | CO | Kitimat | 29/02/52 | 29/04/85 | 20,448 | 567 | 27,990 | 49,005 | 20.20 | Cecil ck. - Early release group. |
| 1983 | CO | Kitimat | 29/02/10 | 06/05/85 -13/05/85 | 10,324 | 287 | 43,401 | 54,012 | 22.50 | Hatchery outfall |
| 1983 | CO | Kitimat | 29/02/11 | 06/05/85 -13/05/85 | 10,658 | 296 | 43,401 | 54,355 | 22.50 | Hatchery outfall |
| 1983 | CO | Kitimat | 29/02/55 | 08/05/85 -14/05/85 | 19,992 | 555 | 257,813 | 278,360 | 22.50 | Throughout Lower Kitimat system. |
| 1983 | CO | Kitimat | 29/02/53 | 15/05/85 | 20,626 | 572 | 37,864 | 59,062 | 20.20 | Cecil ck. - Middle timing release group. |
| 1983 | CO | Kitimat | 29/02/54 | 07/06/85 | 20,049 | 557 | 86,622 | 107,228 | 23.00 | Cecil ck. - Late timing release group. |
| 1984 | ST | Kitimat | Ad. clip | 13/05/85 -06/06/85 | | 65,143 | | 65,143 | 68.00 | Throughout Kitimat system. |
| 1984 | CN | Up. Kit | | 06/05/85 -07/05/85 | | | 112,484 | 112,484 | 10.10 | McKay creek area |
| 1984 | CN | Lo. Kit | 32/02/54 | 13/05/85 | 49,712 | 2,344 | 50,000 | 102,056 | 10.2 | Hatchery outfall |
| 1984 | CN | Lo. Kit | 32/02/53 | 07/05/85 -22/05/85 | 49,003 | 2,310 | 1,462,403 | 1,513,716 | 11.1 | Crown Z and 17-mile bridge |
| 1984 | CN | Hirsch | 32/02/55 | 22/05/85 | 49,765 | 2,345 | 8,112 | 60,222 | 8.3 | Hirsch creek park |
| 1984 | CN | Kildala | 32/02/56 | 09/05/85 -10/05/85 | 49,445 | 2,331 | 93,815 | 145,591 | 9.3 | Kildala river |
| 1984 | CN | Dala | | 09/05/85 | | | 42,069 | 42,069 | 9.3 | Dala river |
| 1984 | CM | Kitimat | L. Vent. | 14/03/85 | 75,243 | | 79,610 | 154,853 | 2.00 | Hatchery outfall |
| 1984 | CM | Kitimat | R. Vent. | 26/03/85 | 75,711 | | 352,219 | 427,930 | 2.03 | 17-mile and Crown Z |
| 1984 | CM | Humph. | Ad/LV | 18/03/85 | 25,567 | | 158,080 | 183,647 | 2.06 | Humphry's creek - early |
| 1984 | CM | Humph. | Ad/RV | 01/04/85 | 25,000 | | 176,362 | 201,362 | 2.21 | Humphry's creek -late |
| 1984 | CM | Hirsch | | 14/03/85 | | | 312,745 | 312,745 | 2.22 | Hirsch creek park |
| 1984 | CM | Dala | | 02/04/85 | | | 420,000 | 420,000 | 2.00 | Dala river |
| 1984 | CM | Kildala | | 04/04/85 | | | 295,000 | 295,000 | 1.73 | Kildala river |
| 1984 | CO | Kitimat | 35/02/15 | 01/05/86 | 15,963 | 129 | 112,486 | 128,578 | 18.10 | Cecil creek - early release group. |
| 1984 | CO | Kitimat | 35/02/16 | 15/05/86 | 16,125 | 32 | 94,718 | 110,875 | 19.5 | Cecil creek - mid release group. |

| BROOD YEAR | SPECIES | STOCK | TAG CODE (Fin clip) | RELEASE DATES | NUMBER RELEASED Tagged | Ad-only | Untagged | TOTAL RELEASED | SIZE (gm) | RELEASE SITE/COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1984 | CO | Kitimat | 35/02/17 | 29/05/86 | 15,121 | 153 | 96,806 | 112,080 | 20.4 | Cecil creek - late release group. |
| 1984 | CO | Kitimat | Unmk. | 07/05/86 -22/05/86 | | | 445,349 | 445,349 | 20.5 | Throughout Kitimat system. |
| 1985 | ST | Kitimat | Ad-only | 30/04/86 -14/05/86 | 54,667 | | | 54,667 | 61.2 | Throughout Kitimat system. |
| 1985 | ST | Kitimat | Ad-only | 05/05/86 | 1,014 | | | 1,014 | 58.9 | Onion lake. |
| 1985 | CT | Kitimat | Ad-only | 12/05/86 | 2,680 | | | 2,680 | 37.8 | Throughout Kitimat system. |
| 1985 | CN | Up. Kit. | Unmk. | 12/05/86 -13/05/86 | | | 163,168 | 163,168 | 10.8 | McKay creek area. |
| 1985 | CN | Lo. Kit. | 36/02/28 | 13/05/86 -17/05/86 | 25,368 | 360 | 298,380 | 324,108 | 11.2 | Crown Z and 17-mile bridge. |
| 1985 | CN | Lo. Kit. | 36/02/29 | 13/05/86 -17/05/86 | 27,791 | 395 | 298,380 | 326,566 | 11.2 | Crown Z and 17-mile bridge. |
| 1985 | CN | Lo. Kit. | 36/02/30 | 13/05/86 -17/05/86 | 26,539 | 377 | 298,380 | 325,296 | 11.2 | Crown Z and 17-mile bridge. |
| 1985 | CN | Hirsch | 36/02/31 | 20/05/86 | 26,821 | 325 | 30,373 | 57,519 | 10.2 | Hirsch creek park. |
| 1985 | CN | Hirsch | 36/02/32 | 20/05/86 | 26,651 | 324 | 30,373 | 57,348 | 10.2 | Hirsch creek park. |
| 1985 | CN | Hirsch | 36/02/33 | 20/05/86 | 26,428 | 321 | 30,373 | 57,122 | 10.2 | Hirsch creek park. |
| 1985 | CN | Kildala | 36/02/34 | 05/05/86 -06/05/86 | 25,305 | 891 | 101,484 | 127,680 | 7.8 | Kildala river. |
| 1985 | CN | Kildala | 36/02/35 | 05/05/86 -06/05/86 | 25,356 | 893 | 101,484 | 127,733 | 7.8 | Kildala river. |
| 1985 | CM | Dala | Unmk. | 05/05/86 | | | 39,801 | 39,801 | 8.7 | Dala river. |
| 1985 | CM | Lo. Kit. -Cecil | 36/02/60 | 02/04/86 | 36,062 | 1,699 | 221,270 | 259,031 | 1.4 | Cecil creek. |
| 1985 | CM | Lo. Kit. -Cecil | L. Vent. | 02/04/86 | 35,829 | | 221,270 | 259,816 | 1.4 | Cecil creek. |
| 1985 | CM | Lo. Kit. -Cecil | Adipose-R. Vent. | 02/04/86 | 35,435 | | 221,270 | 261,915 | 1.4 | Cecil creek. |
| 1985 | CM | Lo. Kit -Cecil | Unmk. | 27/03/86 -01/04/86 | | | 546.860 | 546,860 | 1.4 | Throughout Kitimat system. |
| 1985 | CM | Humph. | Unmk. | 18/03/86 -19/03/86 | | | 436,207 | 436,207 | 1.3 | Humphry's creek. |
| 1985 | CM | Hirsch | Unmk. | 20/03/86 | | | 833,333 | 833,333 | 1.1 | Hirsch creek. |
| 1985 | CM | Kildala | R. Vent. | 25/03/86 -26/03/86 | 75,152 | | 741,826 | 825,260 | 0.9 | Kildala river |
| 1985 | CM | Dala | Unmk. | 24/03/86 -25/03/86 | | | 793,548 | 793,548 | 1.4 | Dala river. |
| 1985 | CM | Bish | Unmk. | 24/03/86 | | | 712,921 | 712,921 | 1.2 | Bish creek. |

| BROOD YEAR | SPECIES | STOCK | TAG CODE (fin clip) | RELEASE DATES | NUMBER RELEASED Tagged | Ad-only | Untagged | TOTAL RELEASED | SIZE (gm) | RELEASE SITE/COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1985 | CO | Kitimat | 41/02/09 | 20/04/87 | 10,383 | 95 | 96,893 | 107,371 | 20.2 | Cecil ck. early |
| 1985 | CO | Kitimat | 41/02/10 | 30/04/87 | 9,523 | 338 | 49,834 | 59,695 | 21.4 | Cecil ck. mid |
| 1985 | CO | Kitimat | 41/02/11 | 12/05/87 | 9,474 | 850 | 58,369 | 68,693 | 20.0 | Cecil ck. late |
| 1985 | CO | Kitimat | 41/02/12 | 29/04/87 -04/05/87 | 10,077 | 185 | 69,914 | 80,176 | 21.6 | Throughout system. |
| 1985 | CO | Kitimat | 41/02/13 | 29/04/87 -04/05/87 | 10,334 | 190 | 69,915 | 80,439 | 21.6 | Throughout system. |
| 1985 | CO | Kitimat | 41/02/14 | 29/04/87 -04/05/87 | 10,405 | 191 | 69,915 | 80,511 | 21.6 | Throughout system. |
| 1985 | CO | Kitimat | 41/02/15 | 28/04/87 -07/05/87 | 10,728 | 54 | 106,829 | 117,611 | 21.7 | Hatchery outfall. |
| 1986 | ST | Kitimat | Ad-only | 04/05/87 -12/05/87 | | 54,035 | | 54,035 | 68.0 | Throughout kitimat system. |
| 1986 | CT | Kitimat | Ad-only | 12/05/87 | | 716 | | 716 | 37.2 | Big Wedeene |
| 1986 | CN | Up. Kit. | Unmk. | 05/05/87 -06/05/87 | | | 175,713 | 175,713 | 11.7 | McKay area and Chist ck. |
| 1986 | CN | Lo. Kit. | 42/02/17 | 13/05/87 -14/05/87 | 26,889 | 0 | 611,507 | 638,396 | 10.4 | Crown Z, 17-mile, Humph., Cablecar. |
| 1986 | CN | Lo. Kit. | 42/02/18 | 10/05/87 -11/05/87 | 26,078 | 267 | 626,486 | 652,831 | 10.4 | Crown Z, Humphries. |
| 1986 | CN | Lo. Kit. | 42/02/19 | 07/05/87 -08/05/87 | 25,817 | 185 | 638,753 | 664,755 | 10.8 | Crown Z, 17-mile, Humphries. |
| 1986 | CN | Hirsch | 42/02/20 | 21/04/87 | 26,490 | 160 | 25,000 | 51,650 | 7.4 | Hirsch ck. early |
| 1986 | CN | Hirsch | 42/02/21 | 30/04/87 | 26,390 | 213 | 24,950 | 51,553 | 8.3 | Hirsch ck. mid |
| 1986 | CN | Hirsch | 42/02/22 | 11/05/87 | 26,198 | 53 | 102,005 | 128,256 | 9.7 | Hirsch ck. late |
| 1986 | CN | Kildala | 45/02/39 | 04/05/87 -06/05/87 | 27,031 | 136 | 123,456 | 150,623 | 8.8 | Kildala river. |
| 1986 | CN | Kildala | 45/02/40 | 04/05/87 -06/05/87 | 26,407 | 133 | 123,457 | 149,997 | 8.8 | Kildala river. |
| 1986 | CN | Dala | Unmk. | 06/05/87 | | | 7,230 | 7,230 | 7.5 | Dala river. |
| 1986 | CM | Kitimat | L. Vent. | 16/03/87 | 50,173 | 4,566 | 301,990 | 356,729 | 1.3 | Cecil early. |
| 1986 | CM | Kitimat | R. Vent. | 30/03/87 | 50,018 | 1,700 | 301,991 | 353,709 | 1.6 | Cecil late. |
| 1986 | CM | Kildala | Adipose-L. Vent. | 25/03/87 | 47,000 | 3,901 | | 50,901 | 1.8 | Kildala. |
| 1986 | CM | Kildala | Adipose-R. Vent. | 25/03/87 | 49,966 | 4,519 | | 54,485 | 1.8 | Kildala. |
| 1986 | CM | Bish | Unmk. | 25/03/87 | | | 232,122 | 232,122 | 1.5 | Bish ck. |

| BROOD YEAR | SPECIES | STOCK | TAG CODE (fin clip) | RELEASE DATES | NUMBER RELEASED Tagged | Ad-only | Untagged | TOTAL RELEASED | SIZE (gm) | RELEASE SITE/COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1986 | CO | Kitimat | 46/02/51 | 02/05/88 -10/05/88 | 20,678 | 728 | 97,155 | 118,561 | 21.2 | Hatchery outfall. |
| 1986 | CO | Kitimat | 50/02/62 | 20/04/88 | 11,227 | 68 | 48,273 | 59,568 | 20.1 | Cecil ck. early. |
| 1986 | CO | Kitimat | 50/02/63 | 26/04/88 -27/04/88 | 11,006 | 179 | 107,846 | 119,031 | 19.6 | Cecil ck. mid. |
| 1986 | CO | Kitimat | 51/02/01 | 10/05/88 | 10,800 | 164 | 48,411 | 59,375 | 20.4 | Cecil ck. late. |
| 1986 | CO | Kitimat | 46/02/05 | 27/04/88 -29/04/88 | 31,471 | 350 | 216,455 | 248,276 | 21.6 | Throughout system. |
| 1987 | ST | Kitimat | Ad-only | 03/05/88 -10/05/88 | | 48,328 | | 48,328 | 73.0 | Throughout system. |
| 1987 | CT | Kitimat | Ad-only | 10/05/88 -11/05/88 | | 8,740 | | 8,740 | 65.0 | Big Wedeene system. |
| 1987 | CN | Up. Kit. | Unmk. | 28/04/88 -29/04/88 | | | 174,000 | 174,000 | 8.0 | McKay area and Chist ck |
| 1987 | CN | Lo. Kit. | 51/02/51 | 25/04/88 -26/04/88 | 25,755 | 1,185 | 588,089 | 615,029 | 9.5 | Throughout system. |
| 1987 | CN | Lo. Kit. | 51/02/52 | 04/05/88 -06/05/88 | 26,262 | 618 | 602,197 | 629,077 | 11.2 | Throughout system. |
| 1987 | CN | Lo. Kit. | 51/02/53 | 09/05/88 -10/05/88 | 25,474 | 546 | 582,863 | 608,883 | 9.9 | Throughout system. |
| 1987 | CN | Hirsch | 51/02/54 | 27/04/88 | 23,985 | 1,889 | 24,985 | 50,859 | 6.3 | Hirsch ck. early. |
| 1987 | CN | Hirsch | 51/02/55 | 04/05/88 | 25,541 | 817 | 24,923 | 51,281 | 7.2 | Hirsch ck. mid. |
| 1987 | CN | Hirsch | 51/02/56 | 10/05/88 | 26,194 | 265 | 64,864 | 91,323 | 9.6 | Hirsch ck. late. |
| 1987 | CN | Dala | 51/02/09 | 03/05/88 | 24,516 | 2,634 | 15,411 | 42,561 | 6.7 | Dala river. |
| 1987 | CN | Kildala | 51/02/10 | 02/05/88 -03/05/88 | 26,614 | 908 | 268,463 | 295,985 | 10.0 | Kildala river. |
| 1987 | CM | Bish | Unmk. | 22/03/88 | | | 315,184 | 315,184 | 2.3 | Bish ck. |
| 1987 | CM | Dala | Unmk. | 29/03/88 | | | 408,770 | 408,770 | 1.4 | Dala river. |
| 1987 | CM | Hirsch | Unmk. | 29/03/88 | | | 972,533 | 972,533 | 1.5 | Hirsch creek park. |
| 1987 | CM | Kildala | AdLV | 30/03/88 | 50,213 | 3,681 | 367,263 | 421,157 | 1.4 | Kildala river. |
| 1987 | CM | Lo. Kit. | LV | 24/03/88 | 100,055 | 5,263 | 901,863 | 1,007,181 | 1.3 | Outfall release. |
| 1987 | CM | Lo. Kit. | AdRV | 01/04/88 | 45,654 | 1,211 | 1,158,683 | 1,205,548 | 1.6 | Crown Z, Humphry's ck. |

| BROOD YEAR | SPECIES | STOCK | TAG CODE (fin clip) | RELEASE DATES | NUMBER RELEASED Tagged | Ad-only | Untagged | TOTAL RELEASED | SIZE (gm) | RELEASE SITE/COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1987 | CO | Kitimat | 51/02/42 | 02/05/89 | 10,383 | 605 | 112,519 | 123,507 | 22.5 | Cecil ck. early. |
| 1987 | CO | Kitimat | 51/02/43 | 11/05/89 -12/05/89 | 10,929 | 254 | 112,132 | 123,315 | 23.7 | Cecil ck. late. |
| 1987 | CO | kitimat | 46/02/55 | 05/05/89 -10/05/89 | 20,003 | 1,277 | 101,163 | 122,443 | 22.3 | Hatchery outfall. |
| 1987 | CO | Kitimat | 48/02/11 | 04/05/89 -05/05/89 | 37,336 | 381 | 196,214 | 233,931 | 22.1 | Throughout system. |
| 1988 | ST | Kitimat | Ad-only | 09/05/89 -10/05/89 | | 51,355 | | 51,355 | 78.2 | Throughout system. |
| 1988 | CT | Kitimat | Ad-only | 03/05/89 | | 6,872 | | 6,872 | 52.0 | Throughout system. |
| 1988 | CN | Dala | 55/02/33 | 09/05/89 | 27,272 | 88 | 19,584 | 46,944 | 7.1 | Dala river. |
| 1988 | CN | Kildala | 55/02/34 | 08/05/89 -09/05/89 | 27,306 | 257 | 236,331 | 263,894 | 9.1 | Kildala river. |
| 1988 | CN | Hirsch | 55/02/30 | 01/05/89 | 28,706 | 0 | 44,990 | 73,696 | 6.8 | Hirsch ck. early. |
| 1988 | CN | Hirsch | 55/02/31 | 10/05/89 | 27,106 | 134 | 44,965 | 72,205 | 8.0 | Hirsch ck. mid. |
| 1988 | CN | Hirsch | 55/02/32 | 16/05/89 | 26,812 | 252 | 44,077 | 71,141 | 9.0 | Hirsch ck. late. |
| 1988 | CN | Up.Kit | 55/02/29 | 03/05/89 -11/05/89 | 25,160 | 173 | 614,980 | 640,313 | 11.6 | McKay area and Chist ck |
| 1988 | CN | Lo.Kit | 54/02/09 | 09/05/89 -16/05/89 | 52,828 | 502 | 1,546,933 | 1,600,263 | 10.9 | Throughout system. |
| 1988 | CM | Bish | Unmk. | 29/03/89 | | | 647,806 | 647,806 | 1.3 | Bish ck. |
| 1988 | CM | Dala | Unmk. | 04/04/89 | | | 503,095 | 503,095 | 1.4 | Dala river. |
| 1988 | CM | Humphry | Unmk. | 28/03/89 | | | 864,053 | 864,053 | 1.2 | Humphry's ck. |
| 1988 | CM | Kildala | AdLV. | 03/04/89 | 50,033 | 2,628 | 691,603 | 744,261 | 1.7 | Kildala river. |
| 1988 | CM | Hirsch | AdRV. | 29/03/89 | 50,138 | 2,929 | 801,401 | 854,468 | 1.3 | Hirsch creek park. |
| 1988 | CM | Lo.Kit | LV. | 27/03/89 -31/03/89 | 100,021 | 2,864 | 3,041,829 | 3,144,714 | 1.3 | Crown z,17 Mile,Outfall |

## APPENDIX III

## CHRONOLOGICAL FRY TRAPPING BY KITIMAT HATCHERY

1981 - 1989

1981
KITIMAT RIVER:

Kitimat Hatchery 2x3m inclined plane fry trap, in Kitimat River, at site from February 17, to June 8, 1981.

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 117 | 40 |
| Coho | 80 | 84 |
| Chum | 2,816 | |
| Pink | 1,630 | |
| Sockeye | 257 | |

OTHERS: Lamprey, Sculpin, Steelhead, Sucker, Eulachon and Stickleback.

HIRSCH CREEK: March 6, to May 11, 1981

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 49 | |
| Coho | 25 | 3 |
| Chum | 2,402 | |
| Pink | 734 | |
| Sockeye | 2 | |

LITTLE WEDEENE RIVER: March 15, to May 11, 1981

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 2 | |
| Coho | 4 | 3 |
| Chum | 9 | |
| Pink | 71 | |
| Sockeye | 0 | |

WEDEENE RIVER: February 27, to May 19, 1981

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 85 | 2 |
| Coho | 86 | 21 |
| Chum | 2,658 | |
| Pink | 152 | |
| Sockeye | 0 | |

17 MILE: March 4, to May 4, 1981

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 296 | 2 |
| Coho | 132 | 57 |
| Chum | 9,389 | |
| Pink | 89 | |
| Sockeye | 3,265 | |

OTHERS: Lamprey and Sculpin.

SCHIST CREEK: March 4, to May 13, 1981
(2x3m Incline Plane Trap)

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 49 | 2 |
| Coho | 41 | 18 |
| Chum | 118 | |
| Pink | 22 | |
| Sockeye | 0 | |

OTHERS: Sculpins

1981 - GEE TRAPPING
Set traps from March 8, to June 24, 1981

| SALMONID | KITIMAT RIVER | TRIBUTARIES |
|---|---|---|
| Chinook | 166 smolt | 118 smolt |
| Coho | 1,600 smolt | 1,939 smolt |
| Steelhead | 133 smolt | 276 smolt |

OTHERS: Dolly Varden, Cutthroat, Sculpins and Stickleback.

1982 - 2x3 INCLINE PLANE TRAP - KITIMAT HATCHERY
March 16, to May 17, 1982

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 244 | 3 |
| Coho | 69 | 25 |
| Chum | 1,552 | |
| Pink | 356 | |
| Sockeye | 1,035 | |

1982 - GEE TRAPPING: March 16, to April 15, 1982

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 1 | |
| Coho | 8 | |
| Chum | 4 | |
| Pink | 0 | |
| Sockeye | 0 | |
| Steelhead | 1 | |
| Cutthroat | 0 | |

1983 - 2x3 INCLINE PLANE TRAP - KITIMAT HATCHERY
March 15, to April 20, 1983

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 245 | |
| Coho | 79 | 1 |
| Chum | 3,612 | |
| Pink | 755 | |
| Sockeye | 95 | |

OTHERS: Lampreys and Ammoecetes.

1983 - GEE TRAPPING: March 22, to April 20, 1983

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 3 | 3 |
| Coho | 100 | |
| Chum | 0 | |
| Pink | 0 | |
| Sockeye | 0 | |
| Steelhead | 4 | |
| Cutthroat | 0 | |
| Dolly Varden | 1 | |

1983 - 2x3 INCLINE PLANE TRAP - 17 MILE - CROWN Z BRIDGE
March 15, to April 21, 1983

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 32 | |
| Coho | 7 | |
| Chum | 472 | |
| Pink | 2 | |
| Sockeye | 50 | |

OTHERS: Lampreys, Ammoecetes and Sculpin.

1984 - No Records in Hatchery Files.

1985 - 2x3 INCLINE PLANE TRAP - KITIMAT HATCHERY

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 70 | |
| Coho | 76 | |
| Chum | 19,940 | |
| Pink | 951 | |
| Sockeye | 1,649 | |

OTHERS: Lampreys, Ammoecetes, Sculpin, Dolly Varden, Stickleback and Cutthroat.

1986 - 2x3 INCLINE PLANE TRAP - KITIMAT HATCHERY

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 114 | |
| Coho | 5 | |
| Chum | 14,789 | |
| Pink | 5,993 | |
| Sockeye | 689 | |

OTHERS: Lampreys, Ammoecetes, Sculpin, Dolly Varden, Stickleback, Rainbow, Steelhead and Cutthroat.

1987 - 2x3 INCLINE PLANE TRAP - KITIMAT HATCHERY

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 3,662 | |
| Coho | 217 | |
| Chum | 7,903 | |
| Pink | 8,191 | |
| Sockeye | 433 | |

OTHERS: Lampreys, Ammoecetes and Stickleback.

1988 - 2x3 INCLINE PLANE TRAP - KITIMAT HATCHERY

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 77 | |
| Coho | 9 | |
| Chum | 1,586 | |
| Pink | 1,066 | |
| Sockeye | 368 | |

OTHERS: Lampreys, Ammoecetes, Sculpin and Stickleback.

1989 - 2x3 INCLINE PLANE TRAP - KITIMAT HATCHERY

| SALMONID | FRY | SMOLT |
|---|---|---|
| Chinook | 49 | |
| Coho | 35 | 29 |
| Chum | 5,380 | |
| Pink | 1,018 | |
| Sockeye | 366 | |

OTHERS: Lampreys, Ammoecetes, Sculpin, Steelhead, Eulachon, Rainbow and Stickleback.

## SMOLT TRAPPING

## INCLINE PLANE TRAP

1989:

| | ST | CT | DV | CO | CN | SC | OTHER |
|---|---|---|---|---|---|---|---|
| HATCHERY | 24 | 1 | 162 | 13 | 3 | 113 | Stickleback/Rainbow |
| HIRSCH CREEK | 73 | 1 | 17 | 32 | 3 | 53 | |
| CROWN Z BRIDGE 17-MILE | 110 | 4 | 73 | 67 | 9 | 272 | Lamprey/Stickleback |
| NALABEELAH CREEK | 50 | 0 | 36 | 33 | 4 | 16 | |
| HUMPHRY CREEK | 27 | 0 | 12 | 54 | 2 | 26 | Stickleback |

## APPENDIX IV

The Kitimat Hatchery under the Salmonid Enhancement Program has been a major enhancing factor to commercial species of salmon. They have also contributed to a lesser degree in sports species such as Steelhead and Cutthroat Trout as part of a cooperative program with Provincial Fisheries Branch staff in Smithers. The following table incorporates the "Summary of Releases" from Kitimat Hatchery.

**STEELHEAD - 1984**

| Release Site | Date of Release | Number Released |
|---|---|---|
| Hirsch Creek | 13/05/85 | 3,520 |
| Humphries Creek | 13/05/85 | 2,400 |
| McKay Pool | 13 - 30/05/85 | 29,520 |
| 17 Mile Bridge | 13/05/85 | 3,520 |
| Cecil Creek | 13/05/85 | 2,880 |
| Lone Wolf Creek | 22/05/85 | 3,200 |
| Big Wekene River | 22/05/85 | 3,200 |
| Crown Z #1 Bridge | 30/05/85 | 2,880 |
| Crown Z #2 Bridge | 30/05/85 | 2,983 |
| Nalbeelah Creek | 30/05/85 | 2,400 |
| Hatchery Outfall | 30/05/85 - 06/06/85 | 8,640 |
| **Total Release** (Average Size 68.0 grams) | | 65,143 |

**STEELHEAD - 1985**

| Release Site | Date of Release | Number Released |
|---|---|---|
| Humphreys Creek | 30/04/86 | 7,014 |
| Crown Z #2 Bridge | 02/05/86 | 3,056 |
| Onion Lake | 05/05/86 | 1,014 |
| Hirsch Creek | 12/05/86 | 2,934 |
| Big Wedeene | 13/05/86 | 2,934 |
| Lone Wolf Creek | 13/05/86 | 2,934 |
| 17 Mile Bridge | 13/05/86 | 5,868 |
| McKay Creek Pool | 13/05/86 | 11,736 |
| Nalbeelah Creek | 14/05/86 | 2,934 |
| McKay Creek Pool | 14/05/86 | 12,323 |
| **Total Release** (Average Size 61.2 grams) | | 55,681 |

**STEELHEAD - 1986**

| | | |
|---|---|---|
| 17 Mile Bridge | 04/05/87 | 13,818 |
| Crown Z #2 Bridge | 04/05/87 | 13,818 |
| Cablecar | 05/05/87 | 5,292 |
| Cablecar | 11/05/87 | 5,292 |
| Humphreys Creek | 12/05/87 | 7,938 |
| Crown Z #1 | 12/05/87 | 5,292 |
| Hatchery Outfall | 12/05/87 | 2,585 |
| **Total Release** (Average Size 68.1 grams) | | 54,035 |

**Kitimat Hatchery - 1987**

**Brood Steelhead Releases**

| Release Site | Date of Release | Number Released |
|---|---|---|
| Crown Z Bridge #1 | 03/05/88 | 4,932 |
| 17 Mile Bridge | 05/05/88 | 4,932 |
| Cablecar | 05/05/88 | 4,932 |
| Hirsch Creek | 05/05/88 | 2,466 |
| Humphries Creek | 06/05/88 | 4,932 |
| Powerline | 06/05/88 | 2,466 |
| Access above Crown Z | 06/05/88 | 4,932 |
| Cablecar | 09/05/88 | 4,932 |
| Crown Z Bridge #1 | 09/05/88 | 4,932 |
| Powerline | 09/05/88 | 4,932 |
| Cablecar | 10/05/88 | 2,466 |
| Outfall | 10/05/88 | 1,474 |
| **Total Release** (Average Size 73.0 grams) | | 48,328 |

## 1988 Brood Year Steelhead Releases

| Release Site | Date of Release | Number Released |
|---|---|---|
| 17 Mile Bridge | 09/05/89 | 13,005 |
| Kitimat Mainstem (above Crown Z Bridge) | 09/05/89 | 6,500 |
| Humphreys Creek | 09/05/89 | 6,500 |
| Hirsch Creek | 09/05/89 | 6,500 |
| Cablecar | 10/05/89 | 7,395 |
| Hirsch Creek | 10/05/89 | 1,910 |
| Kitimat Mainstem (Crown Z Bridge) | 10/05/89 | 4,210 |
| Humphreys Creek | 10/05/89 | 4,210 |
| Hatchery | 10/05/89 | 1,125 |
| **Total** (Average Size at Release 73.0 grams) | | 51,355 |

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## Cutthroat - 1986

Released 716 smolts in Lower Kitimat River (average 37.3 grams) from 1157 eggs.

Brood stock - 6 males, 2 females.

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## Cutthroat 1987

Released 8,740 Cutthroat fry (65.0 grams) to Big Wedeene system

Smolt releases - May 10, 11, 1987

15 females & 10 males caught from throughout lower Kitimat system for brood stock - 14,851 green eggs taken.

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## Cutthroat - 1988

Released 6,872 smolts to Kitimat system (Average 52.0 grams) May 3, 1989

Brood stock - 12 females caught from Lower Kitimat system.

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## APPENDIX V

### BIRD SIGHTINGS - LAKELSE LAKE AREA

KEY

S = Spring

S = Summer

F = Fall

W = Winter

| SPECIES | COMMON | OCCASIONAL | RARE |
|---|---|---|---|
| Common Loon | SSFW | | |
| Arctic Loon | | S | |
| Horned Grebe | | SS | |
| Red-Necked Grebe | | SS | |
| Western Grebe | | SSFW | |
| Trumpeter Swan | SSFW | | |
| Black Brant | | | FW |
| Mallard | SSFW | | |
| Pintail | | SSF | |
| Cinnamon Teal | | | SF |
| Blue-Winged Teal | | SSF | |
| Green-Winged Teal | | SSF | |
| Redhead Duck | | | F |
| Ring-Necked Duck | | | F |
| Lesser Scaup | FW | | |
| Barrow's Goldeneye | | SFW | |
| Common Goldeneye | SSFW | | |
| Bufflehead | SSFW | | |
| Harlequin | | SSF | |

| SPECIES | COMMON | OCCASIONAL | RARE |
|---|---|---|---|
| Surf Scoters | | SF | |
| Hooded Mergansers | | SSF | |
| Common Merganser | SSFW | | |
| Red-Breasted Merganser | | | SSF |
| Herring Gull | SSFW | | |
| Glaucous-Winged Gull | SSFW | | |
| Great Blue Heron | SSFW | | |
| Water Ouzel | SSFW | | |
| Least Sandpiper | | SSF | |
| Spotted Sandpiper | SSF | SSF | |
| Western Sandpiper | | | SS |
| Greater Yellowlegs | | SSF | |
| Kingfisher | SSFW | | |
| Bald Eagle | SSFW | | |
| Golden Eagle | | | W |
| Great Horned Owl | SSFW | | |
| Pygmy Owl | | SSFW | |
| Saw-Whet Owl | | SSFW | |
| Short-Eared Owl | | S-F | |
| Osprey | SSFW | | |
| Sharp-Shinned Hawk | | | SSF |
| Northern Harrier | | SSF | |
| Red-Tailed Hawk | | SSF | |
| Goshawk | | SSFW | |
| Coopers Hawk | | SSF | |
| Rough Legged Hawk | | SSF | |

| SPECIES | COMMON | OCCASIONAL | RARE |
|---|---|---|---|
| Northern Shrike | | | SF |
| Peregrine Falcon | | SSF | |
| Merlin | | SSF | |
| Kestral | | SSF | |
| Ruffed Grouse | SSFW | | |
| Spruce Grouse | | SSFW | |
| White-Tailed Ptarmigan | | | FW |
| Black Swifts | | | S |
| Anna's Hummingbird | | | SS |
| Rufus Hummingbird | SSF | | |
| Violet-Green Swallow | SSF | | |
| Barn Swallow | | SSF | |
| Rough-Winged Swallow | | SSF | |
| Tree Swallow | | SSF | |
| Black-Capped Chickadee | SSFW | | |
| Mountain Chickadee | | SSFW | |
| Boreal Chickadee | | | FWS |
| Chestnut-Backed Chickadee | | SSFW | |
| Winter Wren | SSFW | | |
| Robin | SSF | | |
| Varied Thrush | SSFW | | |
| Hermit Thrush | | SSF | |
| Golden Crowned Kinglet | SSFW | | |
| Bohemian Waxwing | SSFW | | |
| Cedar Waxwing | | SSF | |
| Yellow Warbler | | SS | |

| SPECIES | COMMON | OCCASIONAL | RARE |
|---|---|---|---|
| Yellow-Rumped Warbler | SSF | | |
| House Sparrow | SSFW | | |
| Chipping Sparrow | | SS | |
| Tree Sparrow | | SS | |
| White-Crowned Sparrow | | S-F | |
| Golden-Crowned Sparrow | | | SS |
| Song Sparrow | | SSF | |
| Fox Sparrow | | SSF | |
| Pine Sisken | SSFW | | |
| Junco | SSFW | | |
| Townsend's Warbler | | SSF | |
| McGillvrey's Warbler | | | SS |
| Red Crossbill | | FW | |
| White Winged Crossbill | | FW | |
| Western Tanager | | SSFW | |
| Red-Winged Blackbird | | SSF | |
| Western Wood Peewee | | | SSF |
| Common Flicker | SSFW | | |
| Yellow-bellied Sapsucker | SSFW | | |
| Downy Woodpecker | | SSFW | |
| Piliated Woodpecker | | | SSFW |
| Stellar's Jay | SSFW | | |
| Raven | SSFW | | |
| American Crow | SSF | | |
| Northwestern Crow | SSF | | |

## MAMMAL SIGHTINGS - LAKELSE LAKE AREA

| | |
|---|---|
| **Moose** | Common in area, hunters favourite species in area. |
| **Beaver** | Common to point of being a nuisance. Large areas of standing water due to their activities. |
| **Muskrat** | Less common, found in beaver areas. |
| **Mink** | Common fur-bearer of wet areas. |
| **Marten** | Staple species for trappers in mature forest ecosystems. |
| **Red Squirrel** | Common prey species for marten. |
| **Black Bear** | Common, nuisance around people. |
| **Grizzly** | Rare in area due to habitat destruction from logging. Salmon attracts them to streams in fall. |
| **Red Fox** | Resident fur-bearer. |
| **Coyote** | Less common but adaptable to human change. |
| **Porcupine** | Bane of forestry, common in area. |
| **Cougar** | Rare. |
| **Blacktail Deer** | Rare due to lack of winter habitat away from beaches. |
| **Least Weasel** | Occasional, preys on mice, voles. |
| **Wandering Shrew** | Common little predator. |
| **Microtus Species** | Common in wetlands and riparian habitats. |
| **Voles, Lemming** | Also common in lowland, wetland and riparian habitats. Food chain base for many predators, raptors, etc. |
| **Harbour Seal** | Seen in Lakelse Lake occasionally when salmon are spawning. |
| **Little Brown Bat** | Common in summer. |

## APPENDIX VII

### KITIMAT VALLEY MOOSE SURVEY

January 11, 1990

A 2.3 hour helicopter survey was conducted in the Kitimat Valley on January 11, 1990. The Northern Mountain Helicopter pilot was Ian Swan, observers were: Grant Hazelwood, Don Norstrom and Ken Hoffman. The weather was a high overcast sky with winds gusting to 30km/hr. The temperature was 1 degree Celsius.

Conditions on the ground were less than optimum for the survey. Only a skiff of snow was present from the past 24 hours. In wetlands there was no snow and no ice on water surfaces. Tracks were hard to see unless they had melted out to bare ground. Almost all moose were lying down when encountered. The full moon, of the the previous night, may have allowed nocturnal feeding under cooling temperature.

Since the survey was part of the B. C. Hydro evaluation of possible routes for another transmission line from Terrace to Kitimat, all emphasis for the two hours allotted was directed on or adjacent to these corridors. Thus, known moose areas such as the South end of Lakelse Lake were not examined. The Lower Lakelse River and Thunderbird areas were also omitted due to time constraints.

There was a total of twenty-three moose recorded: 4 bulls, 15 cows and 4 calves. The ratio of 1 to 4 bulls to cows probably reflects the selectivity of local hunters and Ministry of Environment to harvest males. All animals appeared healthy with the exception of one male calf with hairless front shoulders; possibly because of a tick infection. He was very thin and angular. The calf ratios in the population are low; about half of what they should be at 21 per 100 cows. Caution should be used with these survey results; due to the low numbers involved.

Similarly, the sightability, coverage, distribution due to the lack of snow, areas left unsurveyed and efficiency of observers leads to a rating of 40% for the surveyed areas. It is professionally estimated that there is at present a moose population of between 50 and 85 animals in the Kitimat Valley.

Tracks of predators were observed, one track of four to six wolves was seen on the Little Wedeene River flats. Other wolf tracks were seen on the Kitimat River. Coyote and fox tracks were numerous in almost all riparian areas but the Wedeene - Little Wedeene floodplain was especially tracked up.

Nine swans were seen on Lakelse Lake as well as three on the Kitimat River near Goose Creek. There is no freeze up to hinder their activities in this exceptionally warm winter, so far. Mallard flocks were seen in Sockeye Creek as well. Only three eagles were observed during the flight and two ravens.

Conclusions resulting from this survey are that there is a sparse population of moose wintering in the Valley. The regeneration on many of the cutover areas is allowing utilization during low snow winters; such as this one. Cottonwood stands along the Kitimat floodplain are likely critical for harsh, heavy snow winters. Wet areas such as Goose Creek and West of the Kitimat River near Cecil Creek are of use as wintering areas only when the water freezes over in cold winter periods. Old trails indicate heavy Spring calving and Summer use potential. An estimated 50 to 85 moose form the resident population; at this time. Increasing forest regeneration should result in an increasing moose population in the future.

W.G. Hazelwood

WG Hazelwood,
RP Bio
Alpenglow Resources

TABLE I

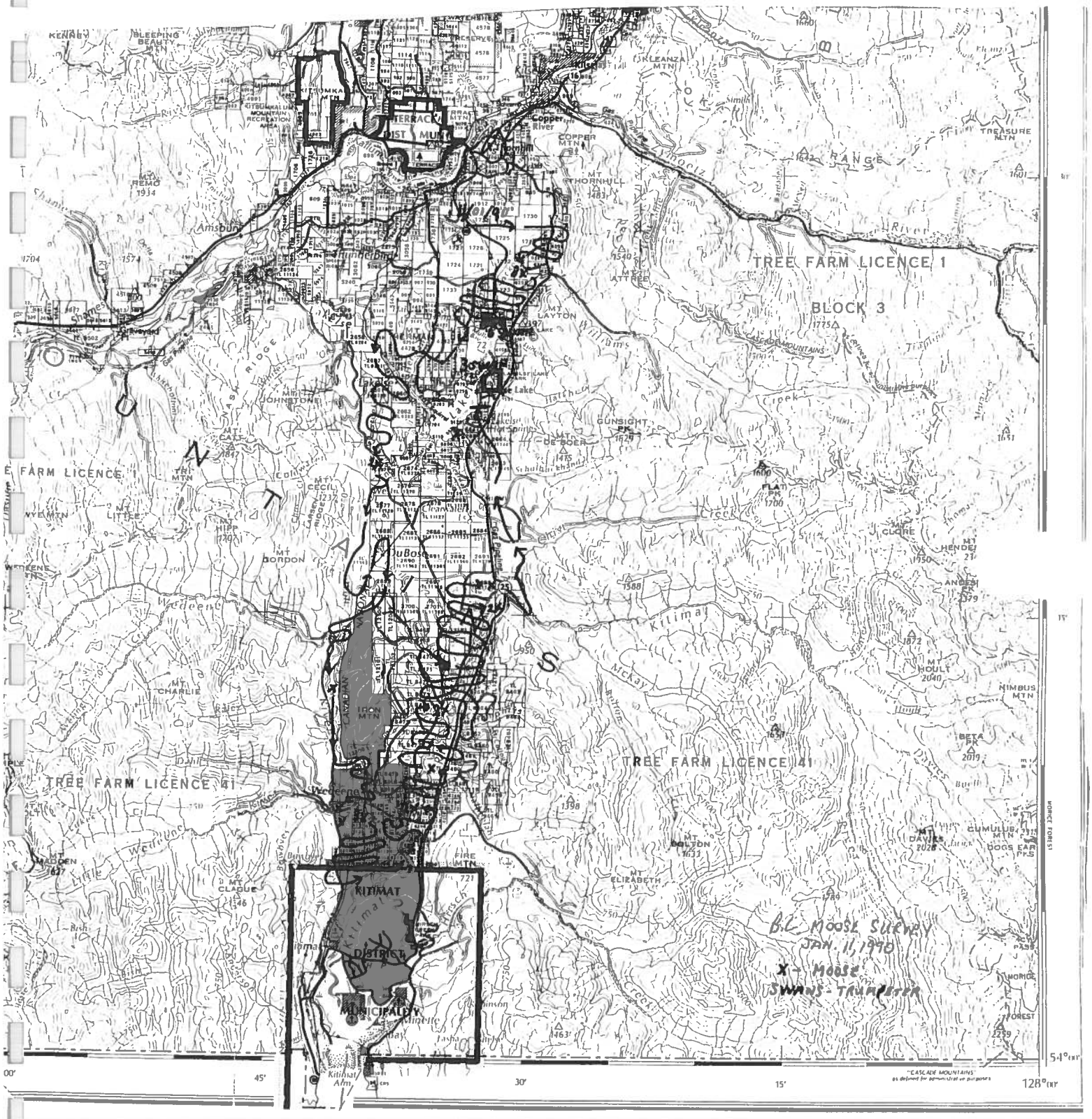
| MALES | FEMALES | CALVES | COMMENTS |
|---|---|---|---|
| | 2 | 1 | including 1-2yr old female - Sockeye Crk |
| | 1 | 1 | Coldwater Creek |
| | 1 | | Wedeene Rvr-Cot Flat |
| | 1 | | Little Wedeene Rvr |
| 1 | 1 | | Little Wedeene Rvr - on road - calf lost hair on front shoulders |
| | 2 | 1 | CN Crossing of Little Wedeene Rvr |
| | 1 | | Kitimat Rvr - Cot Std |
| | 1 | 1 | Kitimat Rvr - Cot Std |
| 1 | 1 | | Bull still had one Antler - 3 yr old |
| 1 | | | |
| 1 | | | |
| | 1 | | Across Kitimat Rvr from Humphrey's Crk |
| | 2 | | Near Upper Kitimat Rvr Bridge |
| | 1 | | West of bridge on South Slope |
| 4 | 15 | 4 | |

Calves per 100 cows .....27
Calves per 100 adults .....21
Bulls per 100 cows .....27

Calves percentage in population ..... 17.4%
Bulls percentage in population ..... 17.4%
Sightability and coverage of available habitats ..... 40.0%

Miscellaneous Sightings:

Nine swans on north end of Lakelse Lake - Three on Kitimat River
Twenty plus Mallards on Sockeye and Williams Creeks' wetlands
One large unidentifiable Hawk
Three Bald Eagles - one immature
Two Ravens
Tracks of four to six Wolves - Little Wedeene River
Numerous Fox and Coyote tracks along Kitimat River - west side


TREE FARM LICENCE 1
BLOCK 3
TREE FARM LICENCE 41
TREE FARM LICENCE 41
KITIMAT
DISTRICT
MUNICIPALITY
B.C. MOOSE SURVEY
JAN. 11, 1970
X - MOOSE
SWANS - TRUMPETER
128°

## APPENDIX VIII

### Sources of Information

1. Field surveys conducted in November and December of 1989. Limited evaluation of specifics due to poor timing but overflight and general inspections by road and on foot were carried out.

2. Contacts with government resource agency staff.

3. Unpublished resource information from the files of Department of fisheries and Oceans and provincial Fisheries and Wildlife Branches.

4. Maps and unpublished reports from files of B. C. Hydro in Terrace.

   Mark Walmsley and Bob Bradley report sources of published data in B. C. Hydro, Vancouver.

5. Published scientific literature.

6. Kitimat Hatchery files and records.

7. Personal contacts with non-government groups and individuals with local knowledge of resources involved.

8. Attendance at Public Meetings called by B. C. Hydro in Terrace and Kitimat.

9. Primary emphasis in data collection was towards species with commercial values, sensitive to environmental change or disturbance and rare/endangered species. Less is known locally about small mammals and birds or reptiles and amphibians and emphasis is accordingly of a lower level of intensity than for game animals and fur-bearers. Studies of value to environmental decision-making dominated information gathering strategies.

   Scientific names of species are included elsewhere.

## APPENDIX IX

### Information Sources and Contacts

| | | |
|---|---|---|
| B. C. HYDRO | Terrace | M. Myers<br>Manager<br>North Coast Area Production |
| | | Gordon Hansen<br>Assistant |
| | Vancouver | Gary Barnett<br>Technician for Project |
| | | Dr. Bob Bradley<br>Senior Biologist<br>663 2222 |
| CANADIAN HELICOPTERS | Terrace | Gary Thompsen<br>Pilot<br>635 2430 |
| | | Dave Newman<br>Base Manager<br>635 2430 |
| DUCKS UNLIMITED CANADA | Prince George | Rory Brown<br>Biologist<br>561 0008 |
| FISHERIES & OCEANS | Kitimat | Randy Dolighan<br>315-450 City Centre<br>632 4884 |
| | Kitimat (Hatchery) | Dave McNeil<br>Manager<br>639 9888 |
| | | Mark Westcott<br>Biologist<br>639 9888 |
| | Prince Rupert<br>Habitat Section | Tom Pendray<br>Biologist<br>624 0449 |
| | | Les Janz<br>Skeena Biologist<br>624 0455 |
| | Terrace | John Hipp<br>Fisheries Officer<br>635 2206 |

| | | |
|---|---|---|
| FISHERIES AND OCEANS | Terrace | George Kofed<br>Temporary Fisheries<br>Officer/Trapper<br>638 1874 |
| | | Barry Peters<br>CEDP Stream Surveys<br>635 2206 |
| MINISTRY OF FORESTS | Terrace | John Parras<br>Forester<br>638 3290 |
| | Smithers | Jim Pojar<br>Regional Ecologist<br>847 9784 |
| NORTHERN MOUNTAIN HELICOPTERS | Terrace | Ian Swan<br>Base Manager<br>638 1955 |
| NORTHWEST CHAPTER STEELHEAD SOCIETY | Terrace | Rob Brown<br>President<br>635 9351 |
| | | Jim Culp<br>635 2540 |
| | | Mike Whelpley<br>638 1389 |
| | | Doug Webb<br>635 5405 |
| PROVINCIAL FISHERIES | Smithers | Bob Hooton<br>Regional Biologist<br>847 7295 |
| | | Ron Tetrow<br>Steelhead Technician |
| | Terrace | Dionys de Leeuw<br>Cutthroat Technician<br>638 3279 |
| PROVINCIAL PARKS | Smithers | Hugh Markaides<br>Regional Manager<br>847 7321 |
| | Terrace | Gordon McDonald<br>798 2277 |

| | | |
|---|---|---|
| PROVINCIAL WILDLIFE | Smithers | Allan Edie<br>Regional Biologist<br>847 7288 |
| | | Doug Steventon<br>Biologist<br>847 7303 |
| | | Rick Marshall<br>Technician<br>847 7303 |
| PROVINCIAL WILDLIFE (Enforcement) | Terrace | Ken Hoffman<br>Conservation Officer<br>638 3279 |
| | | Phil Belliveau<br>Habitat Protection<br>638 3279 |
| ROYAL PROVINCIAL MUSEUM | Victoria | Wayne Campbell<br>Curator of Ornithology<br>387 3649 |
| SKEENA VALLEY NATURALIST CLUB | Terrace | G. Hazelwood<br>President<br>635 2317 |
| TRAPPERS' ASSOCIATION | Terrace | Don Norstrom<br>#0611T004<br>635 2974 |
| | | Frank Norstrom<br>638 1574 |
| | | George Kofoed<br>638 1874 |
| B. C. WILDLIFE FEDERATION | Terrace | Gil Payne<br>Regional President<br>635 3955 |

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