FISHERIES PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF LOGGING PLANS WITHIN THE MORICE RIVER DRAINAGE SYSTEM

DEPARTMENT OF FISHERIES OF CANADA

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INTRODUCTION

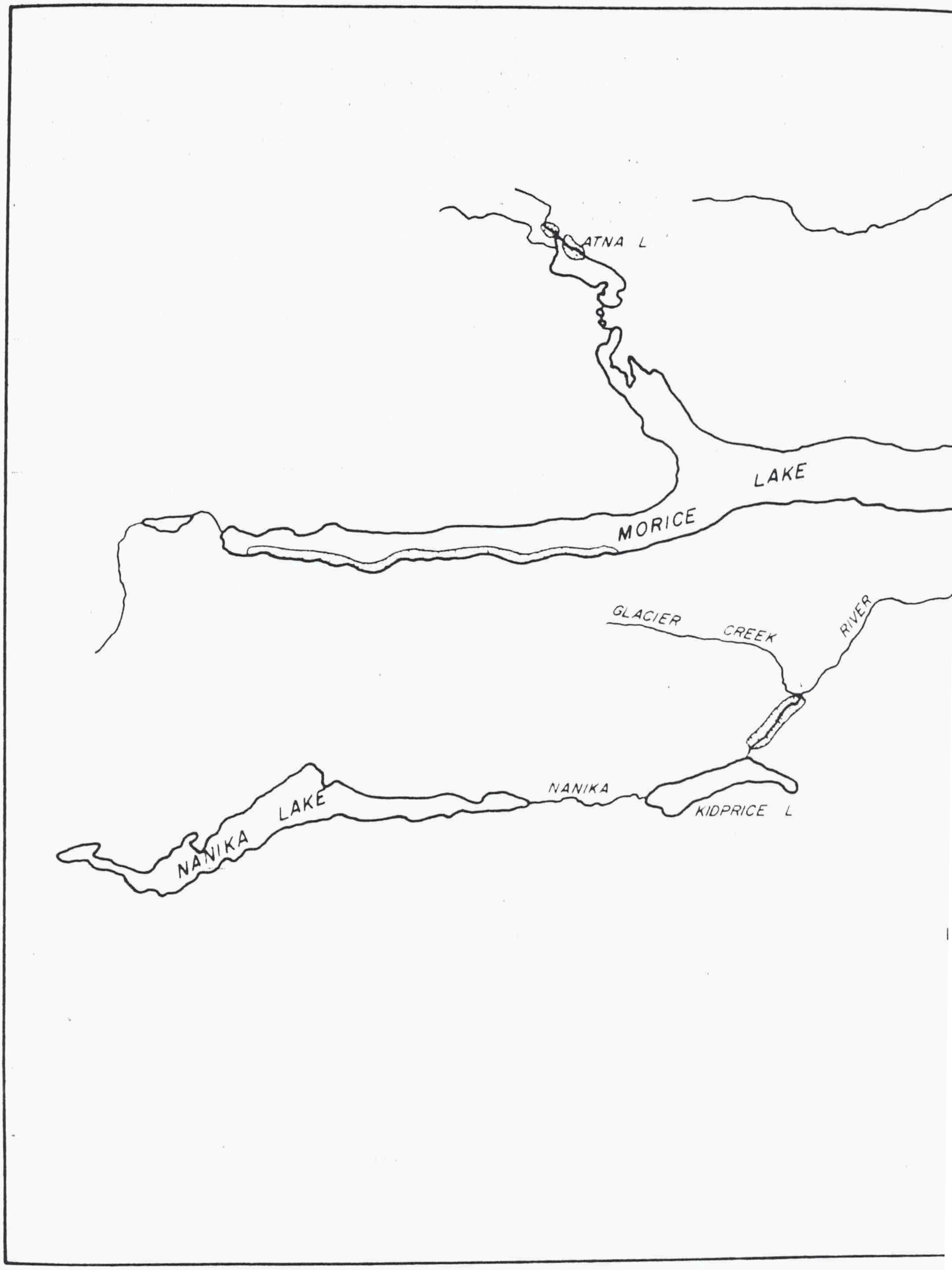
The Morice River drainage area, including the Morice River, Morice Lake, Nanika River, Atna River and a number of smaller tributary streams, provides spawning ground for all five species of Pacific salmon and rearing area for the three species whose life cycle includes a freshwater residence period. Additionally, the system supports a major population of steelhead trout. The drainage area (Figure 1) also provides potential transport and access routes from logging areas in the watershed to mill site: Morice Lake for transport and log booming; the Morice River for log driving; and the streams tributary to Morice Lake and the Morice River for access through river valleys to timber tracts.

This report has been prepared primarily to describe the fisheries problems associated with a large scale logging operation proposed for the system and to outline certain proposals which are considered necessary for the protection of the salmon resource of the area.

CHARACTERISTICS OF THE SPECIES

A. Life History.

The five species of Pacific salmon and steelhead trout are characterized by an anadromous form of life cycle which includes a marine period of growth and maturation followed by a freshwater spawning and incubation period. The various species are quite different in many aspects of their life history and before examining any fisheries problem



[illegible] River system show[illegible]

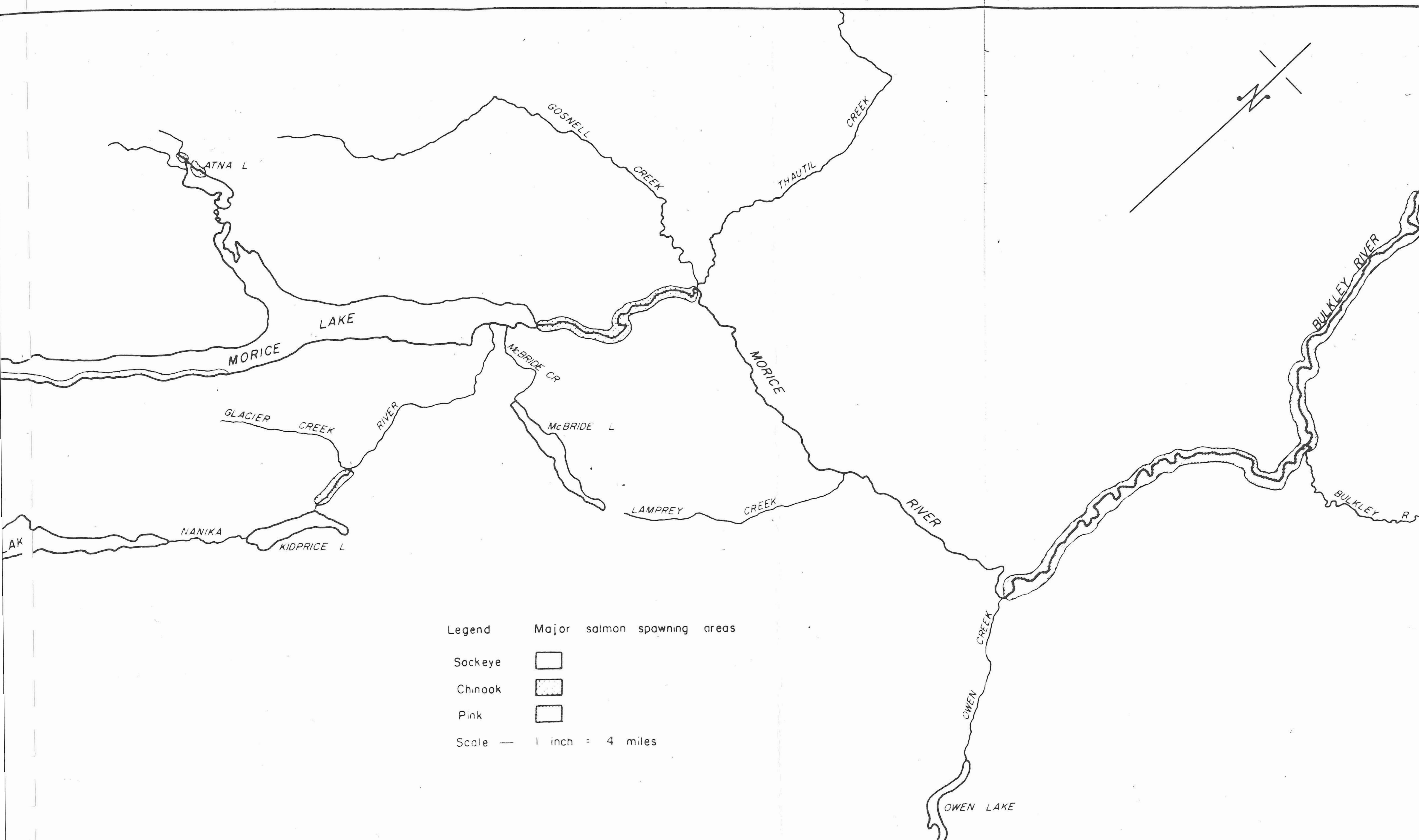


FIGURE 1 The Morice River system showing the major sockeye, chinook and pink salmon spawning areas

it is necessary to describe the basic characteristics of the life history for each species indigenous to the system.

1. Sockeye Salmon -

Adult sockeye salmon destined for the Morice River system migrate through the Skeena River during late June and July and enter Morice Lake during July, August and September. Spawning takes place during the period late August to early October in streams tributary to Morice Lake and in certain areas of the lake shore. The eggs incubate in the gravel during the winter period and the following spring free-swimming fry emerge. The fry spend one to two years in Morice Lake before migrating to sea as smolts. This downstream emigration extends from early April until mid-June. Morice River sockeye salmon reside in the ocean for one to three years before returning to fresh water to spawn.

2. Chinook Salmon -

The Morice River chinook salmon pass through the Skeena River during June and July and spawn in the Morice River and tributary streams during late August and September. The young emerge from the gravel as free-swimming fry during April, May and June and many fry migrate directly seaward at this time. A certain proportion of the fry remain in fresh water for one year and migrate seaward the following spring. Chinook salmon, the largest species of Pacific salmon, generally exhibit a three to five year life cycle.

3. Pink Salmon -

The adult pink salmon destined for the

Morice River system migrate through the Skeena River during July and August, and spawn in the Morice River during late August and September. The following spring the fry migrate directly to sea and remain there for the balance of their two year life cycle.

4. Coho Salmon -

Adult coho salmon destined for the Morice River system migrate through the Skeena River during August and September. They distribute throughout the Morice River system during late August and September and spawn during October and November. The life cycle of this species includes a one-year freshwater residence period. Sampling has shown that juvenile coho are found in Morice Lake, Morice River and all of the accessible tributary streams. The life cycle is generally completed in three years.

5. Chum Salmon -

Chum salmon enter the Skeena River during August and September and commence spawning on their arrival in the Morice River. The following spring the fry migrate directly to sea. The age of returning adults ranges from three to five years.

6. Steelhead Trout -

Adult steelhead are present in the Morice River throughout the period August to June and spawning takes place during the winter and early spring. The fry remain in freshwater for a period of from one to three years before migrating seaward. The age of returning adults ranges from three to five years. Unlike the Pacific salmon, steelhead trout are capable of spawning more than once.

B. Spawning Distribution.

The major spawning areas for the salmon and steelhead trout are the objects of annual surveys by Departmental personnel. A map of the system and the spawning distribution of sockeye, chinook and pink salmon are shown in Figure 1.

1. Sockeye Salmon -

Sockeye salmon utilize spawning areas located in Nanika River; Atna Lake and tributary streams; certain areas of Morice Lake and in the Morice River near the lake outlet. In the Nanika River, spawning is restricted primarily to the area lying between Glacier Creek and Kidprice Lake. The spawning areas on the beaches of Atna and Morice Lakes are depicted in Figure 1. In certain years, small numbers of sockeye salmon have been observed spawning in the Morice River near the lake outlet.

2. Chinook Salmon -

Chinook salmon spawn in the ten miles of the Morice River lying between the outlet of Morice Lake and Gosnell Creek. The spawning is more dense in the first two miles below the lake outlet. A small number also spawn in the Nanika River.

3. Pink Salmon -

Since 1959, following the removal of obstructions at Hagwilget and Moricetown Falls, a marked increase has been recorded in the number of pink salmon spawning in the lower twenty miles of the Morice River. The approximate upstream limit of the major spawning area is the confluence of Owen Creek and the Morice River (Figure 1) although a few individuals have been observed as far upstream as Morice Lake. A wider distribution of spawners can be expected along with the anticipated increase in the size of this population.

4. Coho Salmon -

The spawning distribution of coho salmon is not precisely defined, however they are known to spawn in the Morice River and in nearly all accessible tributary streams of the system.

5. Chum Salmon -

Very little is known regarding the distribution of chum salmon within the Morice River system. A few individuals are observed each year at Moricetown Falls on the Bulkley River and a small number utilize the lower Morice River.

6. Steelhead Trout -

Steelhead trout spawn throughout the entire Morice River but the greatest concentration have been observed upstream from Lamprey Creek (Figure 1).

STATUS OF THE STOCKS

1. Sockeye Salmon

The annual sockeye salmon escapement to the Nanika River, the principal spawning stream for that species in the Morice River system, averaged approximately 50,000 during the period 1945-53. Following that period, however, the escapement abruptly declined to a level of between 1,000 and 6,000 fish annually. In order to rectify this situation the Department implemented several measures designed to rehabilitate the stock to its former level of abundance. These measures include:

(a) the construction of fishways at Moricetown Falls on the Bulkley River in 1951;

(b) the removal of a rock obstruction at Hagwilget Canyon on the Bulkley River in 1959;

(c) the construction of a 12.5 million egg capacity hatchery on the Nanika River in 1960.

The first two items listed above are of direct benefit to all anadromous species within the Bulkley-Morice River system while the hatchery installation is directed specifically to the rehabilitation of the Nanika River sockeye population.

The projects listed above plus the continuing engineering and biological studies which have been conducted to date on the system, have been carried out at an approximate cost of $500,000.

2. Chinook Salmon

The Morice River since 1951 has supported an average of 9,100 spawners annually, and remains one of the top ten producers of chinook salmon in British Columbia.

3. Pink Salmon

Prior to 1951 a few hundred pink salmon utilized the Bulkley and Morice Rivers above Moricetown Falls. Since that year, however, and especially since the removal of the obstruction from Hagwilget Canyon in 1959, increasing numbers of pink salmon have been recorded spawning in the Bulkley and Morice Rivers. In 1961 a tagging study indicated that the escapement above Moricetown Falls totalled 21,500 and the 1963 return of this stock has been estimated at 35,000.

The failure of the pink salmon to establish in the Bulkley-Morice system before stream improvement work was completed is attributed to the inability of this species, the smallest and weakest of the Pacific salmon, to negotiate points of difficult passage. All species were obstructed at Hagwilget Canyon and Moricetown Falls, but pink salmon were most seriously affected. The tremendous pink salmon producing potential of the Bulkley and Morice Rivers was one of the prime factors which influenced the decision to eliminate obstructions to migration on the Bulkley River. The potential spawning capacity of this system is estimated at well in excess of 500,000 pink salmon annually.

4. Coho Salmon

Tagging studies indicate that the annual coho salmon escapement to the Bulkley River system is in the general magnitude of 25,000. Since the majority of these salmon spawn in the Morice River system, it constitutes one of the major coho salmon producing areas in British Columbia.

5. Chum Salmon

The chum salmon escapement to the Bulkley River system has never been enumerated, but observations indicate that the population numbers only a few hundred fish. An increase in chum salmon escapement as a result of stream improvement on the migration route is anticipated.

6. Steelhead Trout

Although no complete estimates of steelhead trout escapement to the Morice River system are available, observations throughout the watershed clearly indicate that the Morice River is one of the major producers of steelhead trout in British Columbia.

COMMERCIAL FISHERY

The salmon stocks of the Morice River system are exploited by intensive commercial net fisheries both at the mouth and along the approaches to the Skeena River.

1. Sockeye Salmon -

The annual yield of Skeena River sockeye salmon to the commercial fishery has averaged 953,000 pieces over a 50 year period (Shepard and Withler, 1958).* At the 1962 average price to the fishermen, the mean landed value totals approximately 1.97 million dollars. It has been calculated on the basis of past racial analysis that ten percent of the Skeena River sockeye salmon stock, prior to the mid 1950s, originated in the Morice River system. On the basis of past catches the demonstrated commercial value of the Morice River sockeye population, at the mid-1950 population level and at 1962 prices, would therefore approximate $200,000.

*Shepard, M.P. and F.C. Withler. Spawning Stock Size and Resultant Production for Skeena Sockeye. J.Fish. Res. Bd. Canada, 15(5), PP 1007-1025, 1958.

2. Chinook Salmon -

The chinook salmon escapement to the Morice River has averaged four percent of the total British Columbia escapement since 1951. Assuming that this stock produces four percent of the total annual catch, the landed value of which since 1951 has averaged 5.17 million dollars at 1962 prices, an annual value of $210,000 is calculated.

3. Pink Salmon -

Since significant escapements of pink salmon to the Morice River are a relatively recent occurrence, the present monetary value cannot be clearly expressed. Considering the extensive spawning areas on the Morice and Bulkley Rivers which have now been made available as the result of the removal of obstructions to migration from the Bulkley River, the pink salmon production of this system is expected to increase manyfold. The spawning potential for this species would indicate, in fact, that their commercial value may, in the near future, contribute significantly to the value of pink salmon in the Skeena River system.

4. Coho Salmon -

Tagging studies indicate that the annual coho salmon escapement to the Bulkley River system is in the general magnitude of 25,000. On the basis of a catch to escapement ratio of 3:1 and a calculated average value of $1.90 per fish, a population of this size has a landed value of approximately $140,000. annually.

5. Other Species -

Both chum salmon and steelhead trout destined for the Morice River are exploited to some extent in the commercial fishery, but by comparison to the other species, their commercial importance is not significant.

THE INDIAN FOOD FISHERY

The salmon of the Morice River system support an important native food fishery on the Bulkley River. The principal fishery is located at Moricetown Falls where as many as 19,000 salmon have been taken annually for domestic use. The mean annual catch by species for the years 1945-1963 includes 3500 sockeye salmon, 1700 chinook salmon, 1600 coho salmon, 300 pink salmon and 300 steelhead trout; a total of 7400 fish annually. These fish and those caught at other points on the Bulkley River represent a major food source for many of the native Indians of the Bulkley River Valley.

THE SPORT FISHERY

The Morice River, one of the top steelhead trout streams in British Columbia, provides a major tourist attraction to the northern area of the province and as well, provides an important source of recreation for many local sportsmen. While the steelhead trout is the most prized game fish taken in the Morice River, chinook and coho salmon and resident trout and char also attract many sportsmen. Chinook and coho salmon and steelhead trout are also caught by anglers at many points along the migration route in the Skeena and Bulkely Rivers. Additionally, chinook and coho salmon of the Morice River system contribute to an extensive tidal sport fishery. Chinook salmon which distribute north and south along the coast are fished throughout almost their entire period of ocean residence while coho which tend to range farther off shore are fished primarily during the spring, summer and autumn as they migrate towards the spawning rivers.

For the purpose of this report no attempt has been made to assess the economic value of the sport fishing aspect of the Morice salmon and trout populations.

FISHERY PROBLEMS ASSOCIATED WITH LOGGING

During the complex life cycle of both Pacific salmon and steelhead trout a number of factors, both independent and interdependent, contribute to the population dynamics of survival to the adult stage. The largest degree of mortality occurs during the freshwater stage of the life cycle, predominantly during the incubation period, but also significantly during the rearing interval when the juveniles of coho and chinook salmon and steelhead trout are residing in streams and the young sockeye are present in the lake.

During the initial period of incubation, an average of less than ten percent of the eggs deposited develop to the free-swimming fry stage. Obviously, this is a critical period of the life cycle and the addition of adverse conditions during this period can reduce production very drastically in terms of adult return. The stream residence period inherent to the life cycle of coho and chinook salmon and steelhead trout is also a time of extreme vulnerability to changes of stream conditions. This is because of the relatively low production from the fry to downstream migration stage. The survival during this period averages not more than 10 percent so that the average overall survival from egg to seaward smolt migrant is in the magnitude of one percent. The possible effects of a disruption in stream ecology on the production of these species are obvious. Juvenile sockeye during the lake residence period are less susceptible to direct effects from other than natural factors.

The freshwater phase of the life cycle of both the Pacific salmon and steelhead trout then, is sustained in delicate balance. Overall survival is very susceptible to harm from even small additions to the natural mortality rate. Certain factors imposed by logging that affect the abundance of salmon populations during this phase are described below.

A. Changes in Runoff Pattern

The basic result of decreasing the forest cover in a watershed is a change in the flow regime resulting in increased peak discharges and decreased minimum flows because of the reduced capacity of the forest mantle to retain water. This change in flow regime can affect freshwater survival in several ways.

1. The degree of scouring or shifting of gravel in the stream bed is increased during periods of high discharge and a consequent loss of eggs can occur.

2. The reduction in flows during low water periods can increase the loss of eggs by dessication and freezing; can

decrease the rearing potential of the stream through reduction of wetted area and can alter the temperature regime of the stream. The latter results from an increase in the exposed stream surface area in relation to the volume of flow and from an attendant reduction in velocity which allows greater time for heating and cooling. In extreme cases, summer stream temperatures have actually been known to rise above the lethal level for salmon as a direct result of deforestation.

3. An increase in the degree of stream siltation can often be traced to removal of forests by logging. The reduction in storage and filtration capacity of the forest mantle, a direct result of deforestation, increases surface flow and thereby increases erosion and the degree of siltation within the stream bed. The effect of siltation on the survival of juvenile salmon is twofold. Silt deposition on and within the gravel beds reduces sub-surface percolation, thereby reducing the quantity of oxygen being carried through the gravel and therefore lowering the total egg capacity of the stream. Secondly, siltation reduces the food carrying capacity of the stream and as a consequence reduces the rearing potential.

B. <u>Effects of Log Driving</u>

Log driving on salmon spawning streams or migration routes can adversely affect the fish populations in a number of ways.

1. The most obvious direct detrimental effect of log

driving is the possibility of physical damage to spawning beds caused by logs gouging shallow areas. This action has the effect of dislodging eggs and fry, and by shifting gravel, of burying others to the extent that they cannot emerge.

2. A problem closely associated with gouging of spawning gravel is the deposition of bark and other material on the stream bed. This material can reduce the physical suitability of both the spawning gravel and rearing area and additionally, during the decomposition process, can reduce the availability of oxygen to the incubating eggs and food organisms to the extent that smothering occurs. Vladykov, 1959,* presents the following comments with respect to log driving in the province of Quebec: "Pulpwood in this part of the country is river driven, arriving at the mills about 60 percent bark. Considering bark at approximately 600 pounds to the cord, bark deposition on some rivers amounts to several tons each year. Spawning areas may be reduced and rich food production areas may be completely smothered".

3. Past experience has shown that log driving programs, except those proposed for very large rivers, invariably require so called "river improvements". A number of stream preparation techniques which fall in this category are outlined below along with their effects on the salmon environment.

(a) Channelization

This involves general deepening and straightening of the channel, elimination of back eddies,

*Vladykov, Vadim D. The Effects on Fisheries of Man-Made Change in Fresh Water in the Province of Quebec. Canadian Fish Cultur No. 25, 1959.

bypassing of side channels and removal of rocks, gravel bars and other obstructions. Detrimental effects which may be associated with channelization include reduction of spawning area, increase of velocity in spawning and rearing areas, increased scouring of gravel on the stream bed and elimination of resting and feeding areas. Also involved is the damage to eggs caused by heavy equipment during actual preparation of the channel. In addition, it is evident that in order to retain a clear channel, constant maintenance is necessary. In this regard the Fishery Officer charged with the inspection of log driving on the Kitsumgallum River reported the following with respect to that river: "Channeling did not stabilize the bed of the river because as the river was directed from one place it scoured others"; and "during this log driving, that has now been discontinued, the company was continually making requests for further river improvements and had in some instances to repair and renew old improvements".

(b) Dyke Construction

Dyke construction is usually carried out in connection with channelization in an effort to restrict the river to a single confined channel. Dyking and other channelization work has the effect of eliminating side channels and these often represent vital spawning and rearing areas.

(c) Installation of Fender Structures

Control of floating logs in a river is often maintained by the use of fendering structures known as finn or shear booms. The change of flow pattern brought about by the use of these, causes scouring both at the point of boom installation and in mid channel, and additionally, results in silt deposition in the area of reduced velocity behind the booms.

4. In spite of elaborate stream improvement programs, stranding of logs on shallow areas has proven to be both a major and an unavoidable problem in log driving operations of the type proposed for the Morice River. The stranding of logs on spawning grounds causes serious scouring of gravel and can result in mortality to eggs and alevins contained therein. With reference to the Kitsumgallum River, the Fishery Officer reports: "Stranded logs that piled up on spawning riffles changed the river flow and velocity on these bars with resulting scouring in some places and sanding in others". This could be a serious problem in sections of the river where the spawning salmon create shallow areas while preparing redds.

5. Experience has demonstrated that salvaging of stranded logs is a prominent feature of log driving. The physical damage that results from operating the type of equipment necessary within the stream bed includes compaction of gravel, shifting

and gouging of spawning areas and, during the incubation period, loss of eggs and fry.

6. Transportation of logs in the quantity and at the timing outlined by the proposed log-driving scheme would undoubtedly cause a gross disruption of spawning activity and would certainly cause a reduction in rate of migration. The end result would be a loss in production brought about by reduced spawning success.

C. <u>Effects of Log Booming</u>

The most damaging factor which can result from log booming from a fisheries point of view is the accumulation of bark and debris over spawning and rearing areas. Since sockeye salmon utilize both stream and lake areas for spawning, the location of booming grounds at any point in the watershed must be carefully chosen if damage to valuable spawning or rearing areas is to be avoided.

D. <u>Effects of Road Building</u>

Road building has two major effects on stream condition.

1. Siltation -

A very large portion of the watershed erosion and consequent siltation within stream beds can result from road building near streams. Apart from material which enters the stream during the course of road construction, the amount of material carried into watercourses by erosion of road cuts, fills, and overcast, can have a devastating effect on stream ecology.

2. Gravel Removal -

The major effects of gravel removal can be:

(a) loss of incubating eggs or alevins if gravel is removed during the period from August to June inclusive;

(b) loss of spawning area. This is dependent upon the degree of gravel removal but often reaches very serious proportions.

DISCUSSION

The general problems that logging practices exert on fish and fish food populations have been reviewed. The following discussion is directed to a description of the specific fisheries problems associated with the development of logging in the Morice River drainage system.

1. Log Driving -

Log driving in the Morice River is the operation which constitutes the most immediate and specific danger to the salmon runs to this system. The proposed log driving operation for the pulp mill at Houston involves the transport of 12,000,000 cu.ft. of timber per year at the rate of 20,000 logs per day during August, September and October.

The Morice River throughout its entire course is characterized by innumerable sharp bends, shallow gravel bars and areas of channel division. It is obvious, therefore, that the success of a log driving operation would depend on extensive river improvement work throughout that entire area. River improvement work along with the other attendant factors associated with log driving constitutes a very real danger to all species of salmon utilizing the Morice River. The anticipated possible effects of log driving in the Morice River include:

(a) gouging of spawning areas by floating logs;

(b) bark deposition in spawning gravel;

(c) scouring and silting caused by stranded logs;

(d) compaction of gravel and shifting and gouging of spawning areas during log recovery operations;

(e) disruption of spawning activity and migration by the large number of floating logs.

The chinook, coho, pink and chum salmon and steelhead trout all utilize the Morice River for spawning and chinook and coho salmon and steelhead trout make use of the extensive rearing area provided by the river. Each of these species would be affected by the full hazards of log driving. Sockeye salmon, since they do not spawn in the Morice River, are subjected to the hazards of log driving only during the period of migration. The effects of a large volume of logs on the behaviour of this species could, however, seriously impede their movement into Morice Lake. Delay during migration has been shown to result in reduced spawning efficiency.

From the description of the life histories of the various species presented previously, it is evident that the month of July is the only period when the spawning beds of the Morice River are not being extensively utilized either for incubation or spawning. Even that month, however, is not clear of problems in that late emerging fry and early arriving chinook and sockeye adults are in the river. In addition, rearing chinook, coho and steelhead juveniles are present in the river at all times.

There is, therefore, no period of the year when salmon and steelhead trout, at some stage in the life cycle, are not utilizing the facilities of the Morice River.

There can be no possible doubt that salmon production in the Morice River and log driving on the Morice River are completely incompatible.

2. Log Booming -

Any proposed log booming in Morice Lake would offer potential danger to lake spawning sockeye salmon. The known areas of lake spawning are outlined in Figure 1. Log booming will not become a serious factor in the maintenance of the fisheries resource provided that booming sites are carefully selected in collaboration with personnel of the Department of Fisheries.

3. Change in Runoff Pattern -

This is a very general and basic result of extensive deforestation. Sustained yield and patch logging policies, however, offer a good degree of protection and undoubtedly an effective watershed management program would provide a significant degree of control.

4. Road Building -

As described previously, road building can be one of the greatest causes of siltation within the stream bed. This can be controlled to a large extent but requires the conscientious application of several measures described as follows:

(a) locating roads at least 50 feet away from stream banks;
(b) removing the ridge on the outside edge of roads so that water will not collect;
(c) outsloping roads so that water will not collect;
(d) avoiding steep gradients;
(e) avoiding long sustained slopes;
(f) implementing and maintaining a good culvert and ditch system;
(g) constructing periodic dips with adequate drainage on roads where water would ordinarily run down the road;
(h) avoiding the complete removal of streamside vegetation;
(i) keeping stream crossings to a minimum;
(j) seeding or mulching fill slopes.

Removal of gravel from stream beds for road construction could become a very real problem if conducted indiscriminately. This situation can be met successfully if there is co-operation between the Department of Fisheries and the logging companies. There are usually gravel deposits in the area which can be removed without damage to the fisheries resource. Co-operation should therefore take the form of consultation with the Department of Fisheries before any gravel is removed from any stream bed in the area.

5. Direct Physical Damage -

Direct physical damage to stream beds results from dropping of trees into streams and the accumulation of slash and general logging and road building debris within the stream bed. This is a source of potential damage to salmon stocks. This factor is being controlled satisfactorily, however, by the existing use of protection clauses, inserted in specific timber sale licences and cutting permits by the B.C. Forest Service, to protect the indigenous fish population.

The Federal Fisheries Act 1932 contains certain sections related to protection of the fishery from effects of logging operations. Pertinent sections are quoted below:

(a) "The eggs or fry of fish on the spawning grounds, shall not at any time be destroyed". 1932, C.42, S.30.

(b) "No person shall cause or knowingly permit to pass into or put or knowingly permit to be put, lime, chemical substances or drugs, poisonous matter, dead or decaying fish, or remnants thereof, mill rubbish or sawdust or any other deleterious substance or thing, whether the same is of a like character to the substances named in this section or not, in any water frequented by fish, or that flows into such water, nor on ice over either such waters". 1932, C.42, S.33(2).

(c) "No person engaging in logging, lumbering, land clearing or other operations, shall put or knowingly permit to be put, any slash, stumps or other debris into any water frequented by fish or that flows into such water, or on the ice over either such water, or at a place from which it is likely to be carried into either such water." 1932, C.42, S.33(3).

SUMMARY

The life history of the Pacific salmon and steelhead trout, the known spawning distribution within the Morice River system, the value of the Morice River stocks to the commercial, Indian food and sport fisheries and certain problems anticipated from logging within the Morice River drainage have been outlined.

The salmon and steelhead trout stocks indigenous to the Morice River drainage contribute to one of the most valuable commercial salmon fisheries in British Columbia. Additionally these stocks support both a major native food fishery and a valuable sport fishery. Although the watercourse requirements of the logging industry within that area are recognized, it is felt that the present and potential value of the indigenous

salmon and steelhead trout stocks requires that particular effort be made to maintain the productive capacity of the system. The means to this end would include rejection of log driving on the Morice River; implementation of an effective watershed management program to control abnormal runoff and siltation, both from deforestation and road building; agreement on the location of sources of gravel for road building; continuation of the use of fisheries protective clauses in timber sale licences and cutting permits; and agreement on location of booming grounds.

While all of these are important, the dangers of log driving in the Morice River are of the most concern at present, because of the threat to the valuable runs of those species which utilize the spawning, incubation and rearing facilities of this river.