

Fish and Fish Habitat Component Study Supplementary Addendum

Cartwright Junction to Happy Valley - Goose Bay Trans Labrador Highway



**JACQUES WHITFORD ENVIRONMENT LIMITED
AND
MINASKUAT LIMITED PARTNERSHIP**

**JW Project No.: NFS09308-0010
Minaskuat Project No.: M6-0010**

March 2004

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**FISH AND FISH HABITAT
COMPONENT STUDY
SUPPLEMENTARY ADDENDUM
CARTWRIGHT JUNCTION TO
HAPPY VALLEY-GOOSE BAY
TRANS LABRADOR HIGHWAY**

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TRANS LABRADOR HIGHWAY**

PREPARED FOR:

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MARCH 12, 2004



EXECUTIVE SUMMARY

The Department of Transportation and Works is proposing to construct a two-lane, all-season gravel surface highway from Cartwright Junction to Happy Valley-Goose Bay. This highway is Phase III of the Trans Labrador Highway (TLH) and will link the existing TLH highway sections to the east (Phase II) and west (Phase I).

The TLH-Phase III is currently undergoing an environmental assessment under both the Newfoundland and Labrador *Environmental Protection Act* and *Canadian Environmental Assessment Act*. A Fish and Fish Habitat Component Study was prepared in conjunction with the environmental assessment.

This report provides follow-up information and clarification on items identified in the supplementary deficiency statement for the Fish and Fish Habitat Component Study that was prepared in conjunction with the environmental assessment for the TLH-Phase III. Aspects covered in the report are:

- fish and fisheries in each watershed;
- comparison and contrast of resident, non-resident and aboriginal fisheries;
- life history and population characteristics of fish;
- comparison of fish populations in affected watersheds with those of the Labrador region;
- populations and sustainable yield in each watershed;
- key features of the angling experience;
- comparison of water quality between sampling campaigns;
- seasonal differences in water quality and flow; and
- brook trout size and growth rates.



KATAKUAPEKASHT TIPATSHIMUN MASHINEIKAN

Ne meshkinanu kanakituapatak (Department of Transportation and Works) natuenitamuat tshetshi tutakinit meshkinanu aitu kapimipanitshi utapana. Apu tshikut uapinekaut ne meshkinau. Ne meshkinau tshika itimu nete Nutapineuanit nuash nete Apipani.

Ne meshkinau kaishinikatet TLH-(Phase III) nanitussenitakanu tshetshi ma minuakue nete meshkinau tshetutakanit ne Tshisheutshimat kaishinikatet *Environmental Protection Act* mak *Canadian Environmental Assessment Act*. Shash ne tshi nanitussenimakanut nameshat kie nete nameshat etat miam neta kananitussenitakanit assi ekuta nanitussenimakanipanit nameshat.

Ume mashineikan tshika uitamakunau kaishinanitussenimakanit nameshat nete tshe pimimut meshkinau. Ne mashineikan katutakanit kauauinakanit nameshat miam neta kanitussenitakanit iat assi nete meshkinau kaishinikatet TLH-(Phase III). Ekuan umue tshekuan eshiuauitakanit:

- nameshat nete katat nipay kie shipit
- nanitussenimakanipanit Akinishauat kie Innuat tshekunamesha nepat
- tanite tapanit kie tan eshpish tiat nameshat nete shipit (nipay)
- tan eshi matenitak ne nameshit nete pessish tshetakunit meshkinanu maka nete iat assit nete Labrador
- tanitat nameshit kueshkatakanit eshku eka nutam messinakanit
- tan tshipa ishinitusseniten kushkatitau nameshat kusskanashkua eiapishtain
- nanitussenitakanipan nipa tan eshpish tatshikumaniku miam mate tatipan tshishuk
- nanitussenitakanipan shipua tan eshpish pimuaputenit (tshishipanua kie ma nekatshipinua) miam tatipan tshishuk
- tan eshpishtit matimekuat kie tan eshpish nitaushit



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1.0 INTRODUCTION

The Department of Transportation and Works is proposing to construct a two-lane, all-season gravel surface highway from Cartwright Junction to Happy Valley-Goose Bay. This highway is Phase III of the Trans Labrador Highway (TLH) and will link the existing TLH highway sections to the east (Phase II) and west (Phase I).

The TLH-Phase III is currently undergoing an environmental assessment under both the Newfoundland and Labrador *Environmental Protection Act* and *Canadian Environmental Assessment Act*. A Fish and Fish Habitat Component Study was prepared in conjunction with the environmental assessment. An addendum to the study was submitted to the Minister of Environment in October 2003.

The following information is provided in response to the supplementary deficiency statement issued for the Fish and Fish Habitat Component Study by the Minister of Environment on March 4, 2004. The supplementary deficiency statement is provided in Appendix A. The document provides information and/or clarification on the following aspects:

- fish and fisheries in each watershed;
- comparison and contrast of resident, non-resident and aboriginal fisheries;
- life history and population characteristics of fish;
- comparison of fish populations in affected watersheds with those of the Labrador region;
- populations and sustainable yield in each watershed;
- key features of the angling experience;
- comparison of water quality between sampling campaigns;
- seasonal differences in water quality and flow; and
- brook trout size and growth rates.

Methods describing the follow-up consultation with outfitting lodge operators are presented in Section 2.0. Comments from the supplementary deficiency statement are presented in Section 3.0, with each being followed by the respective response.

Note that reference to the two proposed routes for the TLH-Phase II acknowledges a northern and southern route. The northern route is the route previously referenced as the preferred route, while the southern route is the route previously referenced to as the alternative (outfitter) or A13 route.



2.0 METHODS

2.1 Outfitters/Cooperatives

There are 23 lodges located in the study area for the TLH-Phase III environmental assessment (Figure 2.1). Nineteen of these are commercially licensed outfitting operations and four operate as cooperatives. The distribution of the lodges is shown in Table 2.1, which also indicates the watershed, lodge name, commercial status, and distance from the two proposed highway routes.

Table 2.1 Summary of Outfitter Operations in TLH-Phase III Study Area

Watershed / Lodge	Status	Contacted	Proximity to TLH (km)		
			Northern Route	Southern Route	
Paradise River No lodges near TLH-Phase III					
Eagle River					
Crooks Lake Lodge	Outfitter	Yes	8	26	
Camp 1155	Cooperative	Yes	12	20	
DND (No Name Lake)	Cooperative	Yes	23	13	
Eagle Lake Lodge	Outfitter	Yes	19	15	
Lower Eagle River Lodge	Outfitter	Yes	53	53	
Igloo Lake Lodge	Outfitter	Yes	18	32	
Eagle's Nest Lodge	Outfitter	Yes	36	36	
Osprey Lake Lodge	Outfitter	Yes	14	5	
Park Lake Lodge	Outfitter	Yes	20	49	
Rifflin' Hitch Lodge	Outfitter	Yes	39	39	
Tamalik Lodge	Outfitter	Yes	11	11	
Byrne Lake	Cooperative	Yes	13	35	
Cloud Nine Salmon Lodge	Outfitter	Yes	55	55	
Spirit Wind Lodge	Outfitter	Yes	58	58	
Eagle River Salmon Club	Cooperative	No	56	56	
St. Augustine River No lodges near TLH-Phase III					
Kenamu River	Six North Fishing lodge	Outfitter	Yes	21	21
Traverspine River	No Lodges				
English River	Awesome Lake Lodge	Outfitter	Yes	93	93
Minipi River					
Minipi Lake Lodge	Outfitter	Yes	67	67	
Minonipi Lake Lodge	Outfitter	Yes	44	44	
Anne Marie Lake Lodge	Outfitter	Yes	53	53	
Little Minipi Lake Lodge	Outfitter	Yes	49	49	
St. Paul's River	St. Paul's Lodge	Outfitter	Yes	59	24
	Birchy Lake Lodge	Outfitter	Yes	43	26
Note: No portions of the proposed routes enter English River, Minipi River, or St. Paul's River watersheds.					



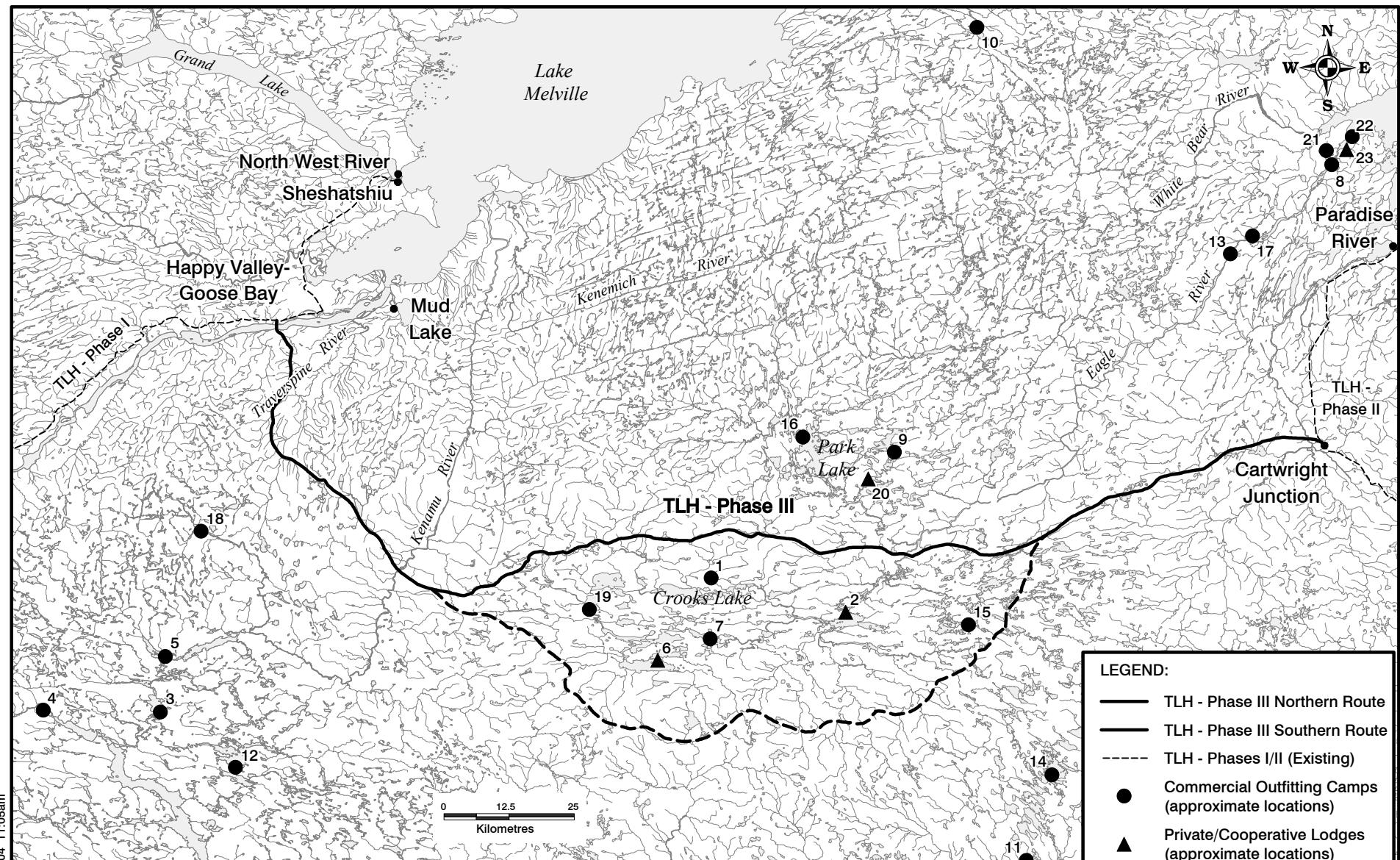


Figure 2.1

Outfitting Camp Locations in Central and Southern Labrador

2.2 Private Cabins/Cottages

The Labrador Regional Lands Office, Happy Valley-Goose Bay was contacted to identify numbers and locations of private cabins in the study area. The following summary is provided from the information gathered:

- No cabins were identified in the affected portion of the Paradise River watershed.
- There are 15-20 cabins near the mouth of the Eagle River and six more within 50 km of the mouth.
- On the Eagle River Plateau, there is one cabin located near Osprey Lake and one near Park Lake.
- There are 30-40 cabins near the mouth of the Kenamu River.
- There is one cabin in the Kenamu watershed near the highway route.
- There are no cabins identified in the Traverspine River watershed.

This information does not include trappers cabins or any structures or camps used by the Innu. The information from the Lands Office does not include unlicensed or illegal cabins and cottages.

2.3 Data Collection

An interview form was composed to cover the information required to respond to issues raised by the Environmental Assessment Committee. This interview form was circulated for review to Environmental Assessment Division and to personnel at the Department of Tourism, Culture and Recreation.

The interview form was distributed to outfitting lodge operators and follow-up phone calls were made to document responses. Two of the outfitters returned completed questionnaires. The remaining outfitting lodge operators were contacted by telephone, with interviews being conducted with 19 of the lodge owners.

2.4 Data Compilation and Interpretation

The information that was gathered was reviewed and used in responses to the comments contained in this report. Most of the information is amalgamated from several sources and individual interviewees are not included in the text. A list of people interviewed or otherwise contacted is provided in Section 4.1. Information drawn from other sources, such as published literature and assessment documents, is referenced in the text and the sources are listed in the Section 4.2.



3.0 RESPONSE TO COMMENTS

The following text provides the comments in *ITALICS* followed by responses in normal text.

Comment 1:

The Guidelines required that a discussion of fish species and fisheries (e.g., recreational, commercial and subsistence) be provided. The Guidelines further required that a qualitative description of fish populations, including abundance and life history parameters, be provided for each of the watersheds traversed by the highway. The Deficiency Statement reflected the absence of this information in the Component Study. While information is provided on fish species known, suspected and unconfirmed in the watersheds there is no recognition of qualitative differences of species from watershed to watershed. The Addendum refers the reader to the EIS for some information on angling, identifies there is no commercial fishery in the study area and refers the reader to the land and resource use component study for some information on aboriginal fisheries. The Addendum continues to rely on the assumption, advanced in the Component Study, that there is one fish population of each species distributed in the study area, and in the wider region. The proponent is advised that there is a fishery in the Eagle River watershed that warrants the investment of infrastructure to provide what is considered to be a unique fishing experience, enticing out-of-province and out-of country anglers. The proponent is therefore directed to consult with the outfitting industry and access traditional ecological knowledge to provide a meaningful discussion of fish species and fisheries as they exist separately in each watershed using the assumption that all watersheds differ unless otherwise demonstrated. The proponent must compare and contrast the fishery exercised by resident and non-resident anglers, aborigines and the outfitting industry.

Response 1:

Fish and Fisheries in Each Watershed

The fish found in each watershed were listed in Table 3.9 of the Fish and Fish Habitat Component Study Addendum (JW/MLP 2003a). Interviews with outfitters have not changed the species composition except for unconfirmed reports of land-locked Arctic charr in the Eagle River watershed. A list of fish species in each watershed is provided in Table 3.1.



Table 3.1 Summary of Fish Species in the Watersheds Crossed by TLH - Phase III

Species	Paradise River	Eagle River	Kenamu River	Traverspine River	St. Augustin River	Churchill River
Atlantic salmon - <i>Salmo salar</i> ^{1 2}	✓	✓	✓	✓	✓	✓
Brook trout - <i>Salvelinus fontinalis</i> ^{1 2}	✓	✓	✓	✓	✓	✓
Threespine stickleback - <i>Gasterosteus aculeatus</i>		Sus	✓			✓
Burbot - <i>Lota lota</i>			Rare	✓		✓
Lake trout - <i>Salvelinus namaycush</i>						✓
Arctic charr - <i>Salvelinus alpinus</i>		U				✓
Lake whitefish - <i>Coregonus clupeaformis</i>			✓			✓
Round whitefish - <i>Prosopium cylindraceum</i>			✓			✓
White sucker - <i>Catostomus commersoni</i>	✓	✓	✓		✓	✓
Longnose sucker - <i>Catostomus catostomus</i>		✓	✓		✓	✓
Rainbow smelt - <i>Osmerus mordax</i> ¹	✓	Sus	✓	✓		✓
Atlantic sturgeon - <i>Acipenser oxyrinchus</i> ¹			Rare			✓
American eel - <i>Anguilla rostrata</i> ¹	✓	Sus				✓
Ninespine stickleback - <i>Pungitius pungitius</i>	✓	Sus				✓
Northern pike - <i>Esox lucius</i>	✓	✓			✓	✓
Lake chub - <i>Couesius plumbeus</i>				U		✓
Mottled sculpin - <i>Cottus bairdi</i>						✓
Slimy sculpin - <i>Cottus cognatus</i>						✓
Pearl dace - <i>Semotilus margarita</i>						✓
Longnose dace - <i>Rhinichthys cataractae</i>						✓
Legend:						
1. sea run						
2. resident						
✓ reported						
Sus suspected						
U unconfirmed						

Based on the result of the interviews, there is no new information concerning Paradise River, St. Augustine, Traverspine River and Lower Churchill River fisheries. Therefore, the assumption of differences between these and Eagle River and Kenamu River cannot be supported.

The fisheries in the one lodge on the Kenamu River headwaters and the five outfitting lodges on the Eagle River plateau are much the same – by virtue of one outfitter operating lodges on both watersheds. Details of the fisheries conducted at the angling lodges are provided in the response to Comment 2.



Compare and Contrast Resident, Non-resident and Aboriginal Fisheries

A summary comparing different aspects of the resident, non-resident and aboriginal fisheries is presented as Table 3.2. Descriptors are used to illustrate the magnitude of some factors, as there is little or no statistical data available.

Table 3.2 **Summary of Resident, Non-Resident and Aboriginal Fisheries**

Factor	Resident	Non-Resident	Aboriginal
Regulation	<ul style="list-style-type: none"> Angling season 	<ul style="list-style-type: none"> Angling season Require a guide 	<ul style="list-style-type: none"> Subsistence fishery
Season	<ul style="list-style-type: none"> Mainly summer season Some winter ice fishing 	<ul style="list-style-type: none"> All summer season No winter activity 	<ul style="list-style-type: none"> Mainly spring season
Fish	<ul style="list-style-type: none"> Primarily brook trout Atlantic salmon where available Some northern pike Some Arctic charr (Minipi) 	<ul style="list-style-type: none"> Primarily brook trout Atlantic salmon where available Some northern pike Some Arctic charr (Minipi) 	<ul style="list-style-type: none"> Lake trout Whitefish Brook trout Northern pike Sucker Burbot
Fishery	<ul style="list-style-type: none"> Some catch and release Some bag limit Trophy and food fishery 	<ul style="list-style-type: none"> Primarily catch and release Few retained Primarily trophy fishery 	<ul style="list-style-type: none"> Primarily food fishery
Method	<ul style="list-style-type: none"> Angling (fly and lure) 	<ul style="list-style-type: none"> Angling (primarily fly) 	<ul style="list-style-type: none"> Gillnet, setline, and spear
Location	<ul style="list-style-type: none"> Mainly lodges Some cooperatives Little opportunistic Rivers and lakes 	<ul style="list-style-type: none"> Primarily lodges River and lakes 	<ul style="list-style-type: none"> Traditional areas Lakes and estuaries
Outfitting Operations	<ul style="list-style-type: none"> Primarily catch & release Some retained Only summer operation 	<ul style="list-style-type: none"> Primarily catch & release Few retained Only summer operation 	
<p>Note: Descriptors are based on interviews, no numeric data is available</p> <p>Source: Armitage and Stopp 2003; JW 2003; JW/IELP 2003b; JW/MLP 2003b; Interviews with outfitters September-October 2002 and February-March 2004.</p>			

Resident, non-resident, and aboriginal fisheries are conducted under three regulatory frameworks as described by JW (2003) in the Land and Resource Use Component Study. The aboriginal fishery has been described by Armitage and Stopp (2003) in the Innu land use component study report. A summary in Appendix B of that report states:



Lake Fish

Fish, which are found in large quantities in all of the lakes and many of the streams in the region, are of great importance in both summer and winter. The most important species are lake trout, whitefish, speckled trout, pike, sucker, and burbot. Fishing throughout the region, in all seasons, may be done with either a set line or a gill net. In winter, lines and nets are set in lakes under the ice. Generally, the largest lakes are the most productive, and the Indians know for each important lake which part of it is most productive in a given season.

Salmon

Salmon migrate up many of the rivers that drain into Hamilton Inlet and Sandwich Bay. When the Indians spent the summer in the interior, they caught salmon in Eagle River and its tributaries and in Kenamich River and its tributaries. Along Hamilton Inlet and Sandwich Bay, Settlers and fishing regulations have limited the take of salmon by Indians from the major rivers, although they have continued to fish as best they can in the Kenamu, Kenamich, and English rivers, and they have also made use of many of the small streams that flow into Hamilton Inlet. As well as nets, they have used a technique of spearing them at night by the light of torches attached to the front of the canoes. (Tanner 1977 in Armitage and Stopp 2003)

Both the resident and non-resident fisheries are limited to open seasons, bag limits and retention limits. Non-residents must use a guide under most conditions. It is this aspect that the outfitting industry caters to at the fishing lodges identified in the EIS/CSR (JW/IELP 2003a; 2003b) and JW (2003). Eight of these lodges are located in watersheds that are on the proposed TLH-Phase III routes. Lodge packages provide transportation to isolated locations that provide excellent fishing opportunities, accommodation, amenities, guide services, and other services necessary for a medium- to high-end tourism package. Except where Atlantic salmon are numerous, trophy brook trout are the draw to the lodges. The preservation (i.e., perpetuation) of resident brook trout populations is critical to the continued success of the lodges and all follow a practice of catch and release to minimize removals and mortalities. The lodge clientele is a combination of resident and non-resident anglers, usually with non-resident being the majority. There are four non-commercial lodges or cooperatives located in the Eagle River watershed. These operate mainly for resident anglers and practice mainly catch and release for trophy brook trout.

Comment 2:

The proponent must consult with the outfitting industry and access traditional ecological knowledge to propose some information on life history parameters and population characteristics of fish species, comparing and contrasting those life history parameters and population characteristics among affected watersheds. The proponent must compare the information gathered through consultation with available



information and literature of life history parameters and population characteristics for fish species to provide a comparison of those parameters and population characteristics of fish species in the watersheds affected by the highway and for fish species in the broader Labrador region. The proponent must evaluate the fish species and fisheries information gathered from the outfitting industry and any preliminary results of fish sampling by Inland Fish and Wildlife Division to provide projections for the carrying capacity of each watershed, the population composition in each watershed and the sustainable yield of fish species in each watershed.

Response 2:

Life History and Population Characteristics of Fish

Generally speaking the outfitters and others consulted on this matter could not provide information on life history parameters that vary from those commonly published for brook trout. Information on the affected watersheds was mainly on the Eagle River watershed, as all but one lodge are on the Eagle River system. None of the outfitters contacted reported regular activity on the affected section of Paradise River, any portion of St. Augustine River, Traverspine River or the lower Churchill River. One lodge operates on the Kenamu River headwaters.

The information on the affected watersheds was limited to an opinion that some lakes had brook trout that were numerous, but limited in size to 4 to 6 lbs (1.8 to 2.7 kg) maximum. While other lakes had larger brook trout (i.e., 8 to 10 lbs (3.6 to 4.5 kg) maximum), but few numbers of fish. No statistical data have been provided to verify this impression.

Brook trout in Minipi Lake are thought to be heavier for their lengths (i.e., greater condition factor), than those in adjacent watersheds. This is believed to be a consequence of unusually large insect (mayfly) hatches, but again no formal studies have been conducted to qualify these reports.

Brook trout in Awesome Lake may be unique from other stocks based on different dentition observed in the fish.

Comparison of Fish Populations in Affected Watersheds with Labrador Region

The data to make this comparison are lacking for all species in the affected watersheds. There is virtually no literature on the populations in the affected watersheds. The outfitters that were interviewed were unable to provide population data suitable for such a comparison, particularly on a watershed basis, as much of the angling activity is limited to localized areas within a single watershed. The outfitters had limited (or no) experience in the other watersheds. Three of the watersheds (Traverspine, Kenamu and



St. Augustine) have no outfitting operations in the vicinity of the proposed route. A single lodge on the Kenamu River is located in the river headwaters, some distance from the road route.

Populations and Sustainable Yield in Each Watershed

No preliminary results are available from the field studies conducted by Inland Fish and Wildlife Division in 2003 (C. Doucet, pers. comm.).

The existing data, and any inferred data, are much too sparse to provide any projections relevant to entire watersheds. Some of the Eagle River outfitters feel that current activities are working on a stable or recovering population. Recovery is in reference to past angling practices, where many more fish were retained. The general feeling appears to be that the local stocks cannot take many removals without a resulting drop in catch rates. These same lakes may be subject to removals by a winter fishery, which tends not to use catch and release methods. Snowmobilers originating from the south coast of Labrador, the Happy Valley-Goose Bay area or the Quebec north shore largely pursues the winter fishery. Those involved in the aboriginal spring fishery also retain catches.

Most of the information provided by outfitters is focussed on the areas near the lodge locations. The lodges are situated on good fishing lakes and rivers and there is little incentive to fly to remote areas to pursue the other fish. Atlantic salmon comprise over 90 percent of the fishery in the lower Eagle River. Sea-run brook trout are a small proportion of the catch. Brook trout are the most numerous game fish in the lakes, and in the rivers of the Eagle plateau area. Some Atlantic salmon are taken in the plateau. northern pike are fished in some of the lakes.

Comment 3:

The Guidelines required that a discussion of fish species and fisheries (recreational, commercial and subsistence) be provided. While the term 'trophy' brook trout may not normally be used in biological or ecological descriptions of fish populations it is commonly used in angling circles. Trophy brook trout in the Eagle River watershed support a unique existing lodge based fishery. The Deficiency Statement required a description of the key features of the existing lodge based fishery, which was not provided. Such a fishery is sensitive to the fish resources it depends upon and the quality of the fishing experience it provides. Consult with outfitters to describe the key features of the existing lodge based fishery and consult with outfitters to describe the sensitivity of market demand for this fishery, based on lodge packages, to the management of these key features. Compare and contrast the lodge based fishery and its key features with the fishery exercised by resident and non-resident anglers and aboriginals. Based on the description of the fishery and the sensitive features of that fishery developed from consultation with outfitters indicate how the precautionary principle has been applied to consider effects of the preferred and alternate routes for the highway on the fishery and its key features.



Response 3:

Key Features to the Angling Experience

A list of key relevant features to the angling experience was drawn from past Department of Fisheries and Oceans (DFO) surveys and suggestions from D. Stewart (pers. comm.) of the Department of Tourism, Culture and Recreation. Outfitters were asked to rank the relative importance of water quality, angler crowding, pollutants in fish, natural beauty of the area, isolation, places to fish from shore, size of fish, catch rate, quality of guide service, and quality of lodge service. Not surprisingly some said that all factors were extremely important. Some others thought that if the fishing is good some other factors may be less important. All thought that isolation was essential to the quality of the fishing experience offered.

Market demand for tourism packages is influenced by a legion of factors, not the least of which has been the events in the United States on September 11, 2001, SARS, overall global security, and the exchange rate on the US dollar. All of these have affected the lodge angling industry and tourism in general in the province. The lodge industry is based on a short season of 10-14 weeks and is competing on a global scale with others that offer extended seasons or year-round opportunities. The outfitters feel that any deterioration (real or perceived) in the key features of the industry may tip the balance irrevocably towards a permanent decline in market demand. They also see a potential for a domino effect that will affect the more stable businesses after marginal ones falter.

The answer for many of the outfitters is to properly manage the key features, even on a case specific basis to prevent a reduction in market demand.

Compare Key Features of the Different Fisheries

Please see the response to Comment 1.

Effects Analysis and Precautionary Approach

Effects analysis and the application of the precautionary principle are more appropriately addressed in the EIS/CSR.

Comment 4:

The surveys for the preferred route were conducted in late September while those conducted for the alternate route were conducted in mid-July. Factors such as precipitation and water flow are expected to differ between those seasons. Explain how the water quality, water chemistry, water flow, surface



velocity and water depth variables differ between July and September and compare and contrast the results of the mid-July survey to the late September survey. Provide an evaluation of the seasonal differences that could be expected between July and September and extrapolate the results to provide an explanation of how those seasonal differences can be used for comparison to contribute to an assessment of effects and stream passage devices.

Response 4:

Comparison of Water Quality between Sampling Campaigns

During the water sampling programs in 2002 and 2003, no discharge measurements were obtained. Surface velocity was measured at several sites, but never more than once at any site. Therefore, temporal comparisons at any single site cannot be made.

A review of the water quality results of 2002 (JW/IELP 2003a) and 2003 (JW/MLP 2003a) reveal differences in the ranges of some parameters. These are tabulated in Table 3.3. Other parameters displayed similar ranges in 2002 and 2003 or else they did not have enough quantified levels to permit a meaningful comparison.

Generally, the temperatures were much higher in July 2003, but the water appears to be more dilute, presumably due to the recent spring run-off. The September 2002 waters were colder, but had higher ranges of some parameters, perhaps resulting from the earlier summer low flow and higher temperatures that would enhance chemical reactions and biological activity.

Table 3.3 Summary of Some Water Quality Parameters Sampled in 2002-2003

Parameter	Late September 2002	Mid-July 2003
Number of stations sampled	35	25
Water temperature (°C)	2.8 – 11.4	9.4 – 22.1
Dissolved oxygen (mg/L)	8.9 – 12.9	5.3 – 9.2
Turbidity (NTU)	0.1 – 9.7	0.7 – 2.8
Alkalinity (mg/L)	<5 – 34	<5 – 9
Aluminium (mg/L)	80 – 350	70 – 160
Iron (mg/L)	110 – 3200	160 – 810
Manganese (mg/L)	2 – 100	2 – 44
Surface velocity (m/s)	0.1 – 0.58	0.2 – 0.49

Source: JW/IELP 2003a; JW/MLP 2003a



Seasonal Differences in Water Quality and Flow

Water quality (including water chemistry) can be greatly influenced by discharge (flow). Typically, the Labrador region hydrographs show a low winter flow in January-March. Thaw from snowmelt starting in April-May produces spring high flow that peaks in June and quickly subsides through July-August to summer low flow that extends from August into the fall. Summer low flows, in September, are not as low as those that occur in winter. Increased fall flows due to rain occur in October and freeze-up usually occurs in early November (NDOEL 1992).

As shown in Table 3.3 above, water chemistry would be expected to be more dilute following spring thaw as compared to that at the end of summer.

Assessment of effects is more appropriately addressed in the EIS/CSR. However, the following is provided in response to the comment.

Culverts are designed on the anticipated peak flows from the upstream catchment area. This should allow the structure to accommodate maximum flows providing no obstructions occur to the culvert (i.e., woody debris, ice build-up or beaver dams). Low flows are not a problem for the culvert's capacity. A velocity barrier during high flow may temporarily obstruct fish passage and this happens under natural conditions. Design and installation should not exacerbate high flow velocity barriers. Low flow obstructions through culverts can be addressed by: installing the pipe at the appropriate gradient; setting the ends of the pipe into the substrate; and providing baffles to facilitate fish passage. With these provisions properly in place, the effects of the stream passage devices should not change significantly from natural conditions.

Comment 5:

Trophy brook trout in the Eagle River Plateau have not yet been aged but are commonly believed to be long lived and slow growing. The Addendum states that these are more likely fast-growing brook trout that have achieved larger size as a result of feeding ecology. The differing views of how a brook trout becomes large carries important implications for an assessment of the potential effects of the highway on brook trout species, the outfitting industry and the fishery upon which the outfitting industry is based. Provide the scientific evidence that trophy brook trout in the Eagle River Plateau are fast-growing as opposed to long lived and slow growing.



Response 5:

Brook trout

Brook trout occur in two basic ecological forms. One form of small trout (20 to 25 cm) are relatively short lived (3 to 4 years) and distributed over the southern portion of the range (i.e., south of the Great lakes). These fish inhabit mainly small cold streams and lake habitat. A large form (4 to 6 kg) is relatively long-lived (eight to ten years) and distributed in the northern portion of the range. The life histories of the two forms vary because they are adapted to different environmental conditions (from Pennell and Barton 1996). This would account for the larger Labrador brook trout as compared to those in New England and elsewhere in the United States. This size differential is what makes the Labrador trout so appealing to the United States anglers.

Growth of Trophy Trout

Contact with DFO confirmed that trophy brook trout are most likely initially fast growing. When fish can exploit the food resources, it is a good strategy to grow fast to reduce your predators (i.e., larger fish). Once a large size (and corresponding safety) is attained, growth may slow as food requirements for maintenance are less than those required for further growth. This growth pattern has been reported in populations with available food resources that are not restrained by competition for the food. Some representative growth rates are compared in Figure 3.1.

Published length-weight data can be used to indicate growth rates in brook trout. The weight at age for brook trout from Matamek Lake in Quebec (Scott and Scott 1988) and Cat Arm Reservoir on the island of Newfoundland (JW 1993) are shown in Figure 3.1 (upper). These are compared to recent data from Star Lake (unpublished data). The relative rates of growth are shown for the three lakes with emphasis on the fastest growth by some of the larger Star Lake brook trout.

There is an active fishery for brook trout in Star Lake. The brook trout grow to a maximum age of six years and the mean weight at age shows significantly faster growth than in either Matamek Lake or Cat Arm Reservoir (Figure 3.1 upper).



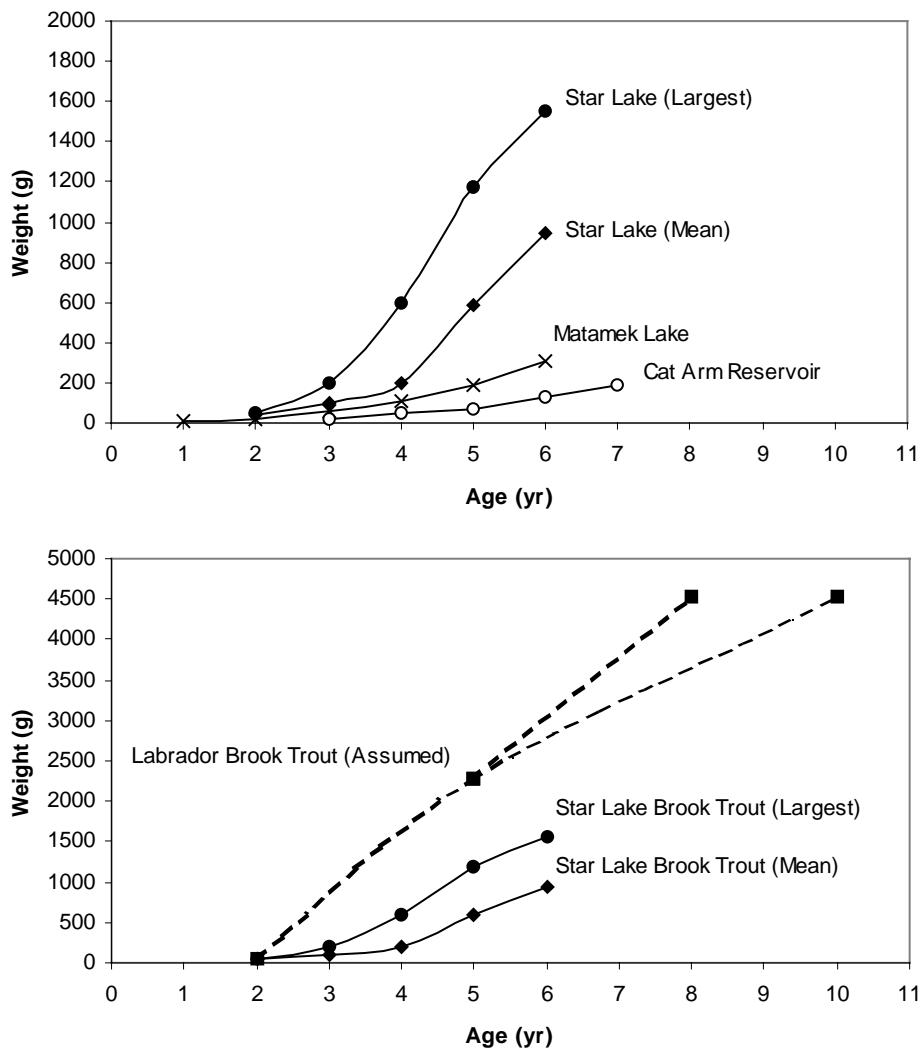


Figure 3.1 Examples of Growth Rates in Brook Trout

Information from outfitters indicates that Minipi Lake trophy trout may attain a weight of 5 lbs (2.3 kg) by the time they reach age five years. If this assumption is true, then the trophy trout grow faster than those at Star Lake (Figure 3.1 lower). If the 10 lb (4.5 kg) trophy trout are assumed to be 10 years old, then the growth rate in later years may be slower than in early life (Figure 3.1 lower). If the 10 lb (4.5 kg) fish are only eight years old, then the overall growth rate remained relatively high (Figure 3.1 lower).

As for long-lived, there are few ageing data available to support the contention that Labrador trophy trout are older than the largest from other regions. The literature lists eight to ten years as being the upper range of brook trout ages (Scott and Scott 1988). One outfitter who operates a lodge on the Eagle River plateau reported that brook trout in the 10 lb (4.5 kg) range were determined to be 9-10 years old.



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APPENDIX A

Fish and Fish Habitat Component Study Supplementary Deficiency Statement

**CARTWRIGHT JUNCTION TO HAPPY VALLEY-GOOSE BAY
TRANS LABRADOR HIGHWAY
FISH AND FISH HABITAT COMPONENT STUDY ADDENDUM
SUPPLEMENTARY DEFICIENCY STATEMENT**

Issued February 2004

- The Guidelines required that a discussion of fish species and fisheries (e.g., recreational, commercial and subsistence) be provided. The Guidelines further required that a qualitative description of fish populations, including abundance and life history parameters, be provided for each of the watersheds traversed by the highway. The Deficiency Statement reflected the absence of this information in the Component Study. While information is provided on fish species known, suspected and unconfirmed in the watersheds there is no recognition of qualitative differences of species from watershed to watershed. The Addendum refers the reader to the EIS for some information on angling, identifies there is no commercial fishery in the study area and refers the reader to the land and resource use component study for some information on aboriginal fisheries. The Addendum continues to rely on the assumption, advanced in the Component Study, that there is one fish population of each species distributed in the study area, and in the wider region. The proponent is advised that there is a fishery in the Eagle River watershed that warrants the investment of infrastructure to provide what is considered to be a unique fishing experience, enticing out-of-province and out-of country anglers. The proponent is therefore directed to consult with the outfitting industry and access traditional ecological knowledge to provide a meaningful discussion of fish species and fisheries as they exist separately in each watershed using the assumption that all watersheds differ unless otherwise demonstrated. The proponent must compare and contrast the fishery exercised by resident and non-resident anglers, aborigines and the outfitting industry.
- The proponent must consult with the outfitting industry and access traditional ecological knowledge to propose some information on life history parameters and population characteristics of fish species, comparing and contrasting those life history parameters and population characteristics among affected watersheds. The proponent must compare the information gathered through consultation with available information and literature of life history parameters and population characteristics for fish species to provide a comparison of those parameters and population characteristics of fish species in the watersheds affected by the highway and for fish species in the broader Labrador region. The proponent must evaluate the fish species and fisheries information gathered from the outfitting industry and any preliminary results of fish sampling by Inland Fish and Wildlife Division to provide projections for the carrying capacity of each watershed, the population composition in each watershed and the sustainable yield of fish species in each watershed.
- The Guidelines required that a discussion of fish species and fisheries (recreational, commercial and subsistence) be provided. While the term 'trophy' brook trout may not normally be used in biological or ecological descriptions of fish populations it is commonly used in angling circles. Trophy brook trout in the Eagle River watershed support a unique existing lodge based fishery. The Deficiency Statement required a description of the key features of the existing lodge based

fishery, which was not provided. Such a fishery is sensitive to the fish resources it depends upon and the quality of the fishing experience it provides. Consult with outfitters to describe the key features of the existing lodge based fishery and consult with outfitters to describe the sensitivity of market demand for this fishery, based on lodge packages, to the management of these key features. Compare and contrast the lodge based fishery and its key features with the fishery exercised by resident and non-resident anglers and aboriginals. Based on the description of the fishery and the sensitive features of that fishery developed from consultation with outfitters indicate how the precautionary principle has been applied to consider effects of the preferred and alternate routes for the highway on the fishery and its key features.

- The surveys for the preferred route were conducted in late September while those conducted for the alternate route were conducted in mid-July. Factors such as precipitation and water flow are expected to differ between those seasons. Explain how the water quality, water chemistry, water flow, surface velocity and water depth variables differ between July and September and compare and contrast the results of the mid-July survey to the late September survey. Provide an evaluation of the seasonal differences that could be expected between July and September and extrapolate the results to provide an explanation of how those seasonal differences can be used for comparison to contribute to an assessment of effects and stream passage devices.
- Trophy brook trout in the Eagle River Plateau have not yet been aged but are commonly believed to be long lived and slow growing. The Addendum states that these are more likely fast-growing brook trout that have achieved larger size as a result of feeding ecology. The differing views of how a brook trout becomes large carries important implications for an assessment of the potential effects of the highway on brook trout species, the outfitting industry and the fishery upon which the outfitting industry is based. Provide the scientific evidence that trophy brook trout in the Eagle River Plateau are fast-growing as opposed to long lived and slow growing.