ANGLER HARVEST SURVEY

NARES RIVER 2009

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Environment

January 2012

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Yukon Fish and Wildlife Branch
TR-12-09

Acknowledgements

Catherine Pinard conducted the field work and Rory Masters compiled the report, both under contract to Yukon Department of Environment. Jean Carey and Rob Florkiewicz reviewed the report

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Suggested citation:

MILLAR, N., O. BARKER, AND L. JESSUP. (2012). Angler Harvest Survey: Nares River 2009 Yukon Fish and Wildlife Branch Report TR-12-09 Whitehorse, Yukon, Canada.

Key Findings

- Anglers spent 2,041 hours angling in Nares River in the summer of 2009. This was the first angler harvest survey on Nares River.
- Angler success, as measured by the number of lake trout caught per hour of angling, was below average compared to other Yukon fisheries surveyed to date.
- Anglers caught 107 lake trout and released only 4%, because the Carcross footbridge is not a good place to release fish. The total estimated harvest was 195 kg of lake trout.
- Arctic grayling were the most frequently caught species (402 fish). Retention was high with 70% of caught fish being harvested, resulting in a moderate harvest (279 fish).
- It is not possible to assess the sustainability of the Nares River fishery without an understanding of the migration patterns of its lake trout in the Southern Lakes system. We recommend studies to address this information gap.

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Introduction

We conduct angler harvest surveys, also called creel surveys, on a number of Yukon recreational fisheries each year. We use these surveys, together with other fish and fishery-related assessments, to find out if the harvest of fish from the lake is sustainable. Environment Yukon's goal is to conduct angler harvest surveys on key fisheries either every 5 years or according to angler patterns and management concerns. The results of the surveys directly contribute to management decisions that make sure fisheries are sustainable over the long term.

The Nares (Natasaheeni) River is located along the Village of Carcross in southwest Yukon, within the traditional territory of the Carcross/Tagish First Nation. The Nares River is a short river that runs parallel to the village and connects Bennett and Nares lakes. The river is primarily accessed by the Carcross footbridge, which crosses the west end of the river near Bennett Lake.

Anglers fish from the bridge for species that migrate between Bennett and Nares lakes. Arctic grayling and lake trout are the 2 most sought-after species, but there have also been reported catches of lake whitefish, longnose sucker, and burbot. The majority of fishing is done by locals and Whitehorse residents. The proportion of fish released is low, as the bridge is not a good place to practice live release techniques.

Ease of access and high success rates are some of the reasons the bridge is a popular spot for locals, especially when high winds and rough water keep boats off Bennett and other nearby lakes.

Harvest on the Nares River has never been previously assessed. The local importance of the area, suspected high amount of use, and lack of harvest information made the Nares River a priority for assessment in 2009.

The 2009 survey was done to:

- determine how much time anglers spent fishing (effort);
- understand the characteristics of the fishery and patterns of use;
- measure success rate of anglers;
- record biological information on harvested fish;
- provide anglers with information about regulations; and
- establish a fisheries management presence.

Harvest Regulations

Nares River, although part of the Southern Lakes system, has been under General Regulations since they were first put into place in 1989. This is unusual, as surrounding lakes such as Bennett, Marsh, and Tagish all have Conservation Waters designations. The catch limit for lake trout in Nares River is 3 fish per day with 6 in possession. Only one lake trout in possession may be longer than 65 cm. The catch limit for Arctic grayling is 5 fish per day with 10 in possession. Only one grayling in possession may be longer than 40 cm. The catch limit for northern pike is 5 fish per day with 10 in possession. Only one pike in possession may be longer than 75 cm. General catch and possession limits also apply to all other species.

The regulation history for Nares River is detailed in Appendix 1.

Methods

Survey

In 1990 the Yukon Government adopted survey methodology developed by the Ontario Ministry of Natural Resources (Lester and Trippel 1985). A field worker conducts face-to-face interviews with anglers on selected sample days throughout the summer. The worker asks a standard set of questions about the social and biological aspects of the fishery. Data gathered include:

- How much time did anglers spend fishing?
- What fishing methods did anglers use?
- How did anglers fish (boat, shore, etc…)?
- Were anglers guided?
- Where were anglers from?
- What type of visitor were anglers (day users, campers, etc…)?
- What kinds of fish were anglers trying to catch?
- How many fish did anglers catch?
- How many fish did anglers release?

Any other information offered by anglers about their fishing experience is also recorded.

The field worker also collects biological data on the catch of cooperative anglers. Biological data gathered include: length (mm), mass (g), sex, maturity, an aging structure, as well as the collection of stomachs for content analysis in the lab. Any other information about general health and condition of the fish is recorded by the field worker (e.g., abnormalities, disease, lesions).

The field worker subjectively assesses the weather's effect on fishing over the entire sample day (no possible adverse effect, possible adverse effect, definite adverse effect).

The timing of the survey depends on management objectives, key species, and the nature of the fishery. It typically runs from ice out in the spring until either just after Labour Day or the end of September. The goal is to sample at least 20% of the total survey days. The survey is subdivided into several seasonal periods (usually 3 or 4) to better understand changes in angler activity. These periods are further divided into weekends and weekdays. Sample days are allocated to each period while considering both a higher weighting for those periods with the higher projected angler use and a minimum number of samples for each period.

Sample days are 14 hours long, 8:00AM to 10:00PM. On sample days, the field worker interviews all willing anglers. The field worker also records anglers who are observed but not interviewed.

Analysis

When the survey is finished, we enter the data into an Access database and analyze it using standard statistical methods. We determine the age of sampled fish by counting growth rings on the otolith. Diet is determined by examining the stomach contents.

Fisheries Productivity

The productivity of a waterbody determines the amount of fish produced annually and can guide how much harvest can be sustained. Estimates of lake productivity are calculated using average lake depth, the concentration of total dissolved solids, and the average annual air temperature at the lake. Ryder's morphoedaphic index (1974) is used and incorporated into Schlesinger and Regier's equation (1982) for calculation of maximum sustained yield (MSY) for all species. Calculation of MSY for lake trout assumes a biomass of 30% lake trout; where appropriate this may be replaced by the most recent survey data. Following O'Connor (1982) and others, 15% of MSY provides an "optimum" sustained yield (OSY), which maintains high quality fisheries on light to moderately fished lakes.

As a river, lake-based productivity calculation methods cannot be applied to Nares River. Estimates of system-wide productivity, incorporating information from Bennett, Nares, Tagish and Marsh lakes, however, can provide insight into sustainability of system-wide harvest, including harvest at Nares River.

2009 Nares River Survey

The survey began May 15 and concluded September 9, 2009.

We used an access survey, meaning the field worker was stationed for the entire sample day at the Carcross footbridge and boat launch at the northeast end of Bennett Lake where it enters the Nares River (Figure. 1) and interviewed angling parties at the end of their fishing trip.

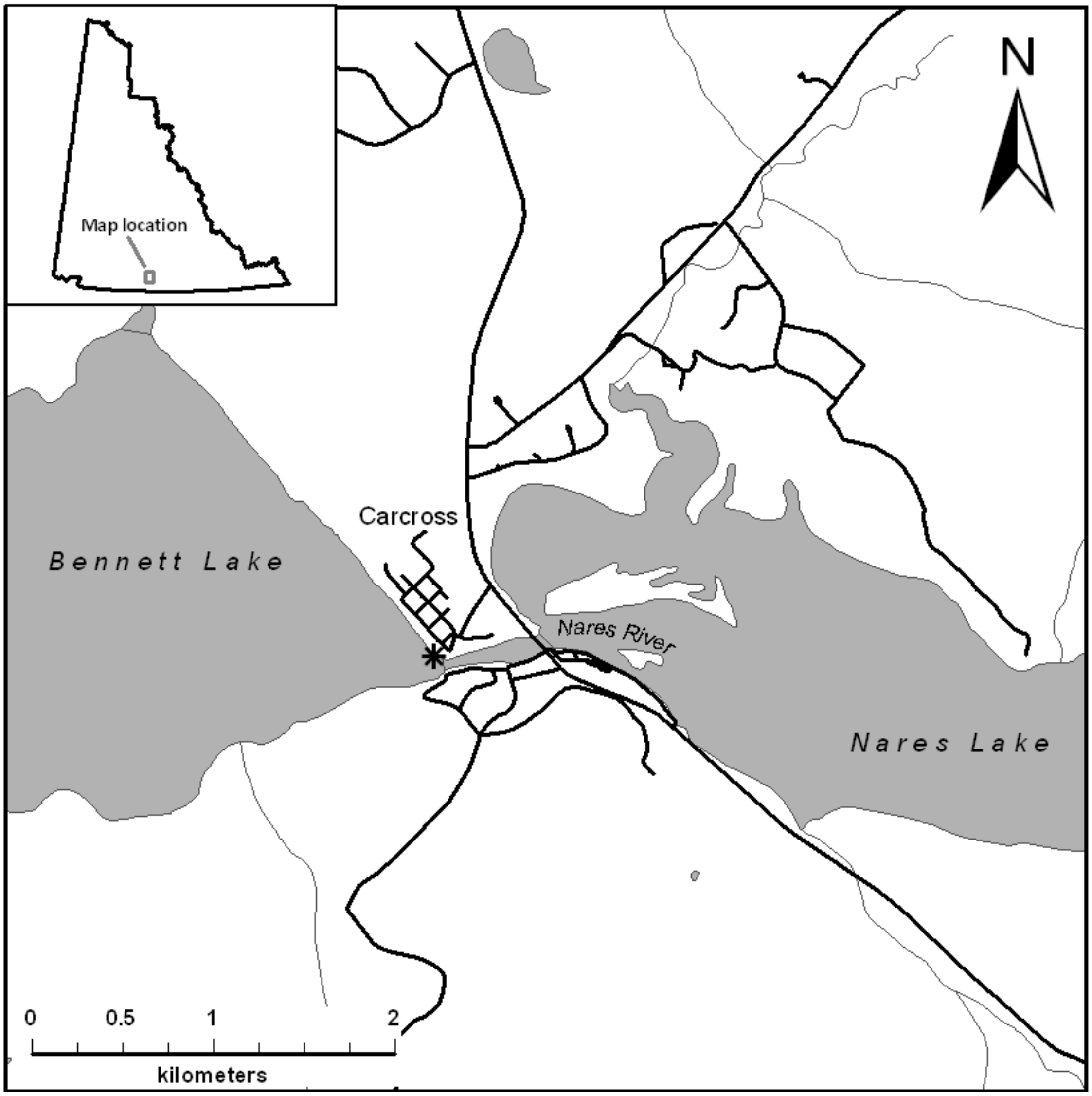

Figure 1. Nares River, showing location of 2009 Angler Harvest Survey (*).

The survey period was partitioned into 6 time periods, weekends and weekdays in May/June, July and August/September. Of the 118 day survey period, 38 days were sampled, resulting in a sampling effort of 32%.

We analyzed the data 2 ways. In the first, we combined data across all 6 time periods, and in the second part we compared results between time periods (see Appendix 2). We analyzed all data at the party level.

Results of 2009 Survey

Effort

Anglers spent 2,041 hours fishing at Nares River over the 2009 survey period. There were a total of 1,565 anglers in 915 parties. On average, there were 17.3 hours of angler effort per day over the entire survey, and each angler fished for 1.3 hours.

Fishing Methods

Still fishing was the most popular method (Table 1). Spin casting and a combination of methods were the only other methods that were commonly observed.

Table 1. Fishing methods.

Method of Fishing	Angling Parties (%)
Still	70
Jig	
Drift	
Troll	<1
Spin Cast	18
Fly Cast	2
Other or Combination	10

Methods of Access

Almost all anglers (94%) accessed the fishery from the Carcross footbridge (other) A few anglers (6%) accessed the river from shore.

Guided Anglers

There was only one guided group. This amounted to less than 1 percent of the total groups.

Angler Origin

Local anglers were the most frequent fishers, followed by Whitehorse residents (Table 2). The local angler category includes only immediate residents of Carcross, and not those from Tagish or Mount Lorne. There were few anglers from other parts of Canada, and a minimal number from the United States and other regions of the world.

Table 2. Angler origin.

Origin	Angling Parties (%)
Local	53
Whitehorse	37
Yukon	<1
Canada	6
U.S.	2
Other	2

Visitor Type

All (100%) of visitors were day users.

Weather

Weather had little adverse effect on fishing activity (Table 3). Because this is a shore fishery, fishing is not affected by wind and waves like many lake fisheries are.

Table 3. Sample day weather.

Did weather affect angling?	Angling Parties (%)
No Possible Adverse Effect	66
Possible Adverse Effect	16
Definite Adverse Effect	18

Catch and Harvest

Arctic grayling were the most frequently caught and harvested fish, despite having a lower retention rate than lake trout (Table 4). A moderate number of lake trout were caught, with over 95% being retained. Burbot, lake whitefish, and longnose suckers were caught in small numbers, likely incidentally caught by anglers targeting Arctic grayling or lake trout.

Table 4. Estimated angler catch and harvest.

	# Caught	# Kept	Retention Rate (%)
Lake trout	107	103	96
Arctic grayling	402	268	67
Longnose sucker	7	0	0
Lake whitefish	6	6	100
Burbot	2	2	100

Estimated angler success rates, calculated over the entire survey as numbers of fish caught per hour of angling effort (CPUE), is presented for all anglers (regardless of target species) in Table 5.

Table 5. Estimated catch per unit of effort (fish/hour).

	CPUE
Lake trout	0.05
Arctic grayling	0.20
Lake whitefish	0.003
Longnose sucker	0.003
Burbot	0.001

Biological Data

Relatively few lake trout were available for biological sampling from the 2009 survey. Such a small sample may not accurately reflect biological data for the catch as a whole, and should be interpreted with caution. No previous data were available to see if the harvest from this fishery has changed.

We sampled 25 lake trout for fork length (mean 529 mm) and weight (mean 1,886 g). These fish had a mean condition factor of 1.27, which is above average for lake trout in Yukon and indicates “fat” fish (condition factor is the relationship between length and weight).

The sex ratio was 0.79 males per female. The majority of trout caught were between 450 and 600 mm, although several much larger fish were also caught (Figure. 2).

We aged 22 of the sampled lake trout. These fish ranged from 7 to 33 years old (Figure. 3). Note that young fish (less than 5 years) are not vulnerable to angling gear. This portion of the population is therefore under represented in the sample.

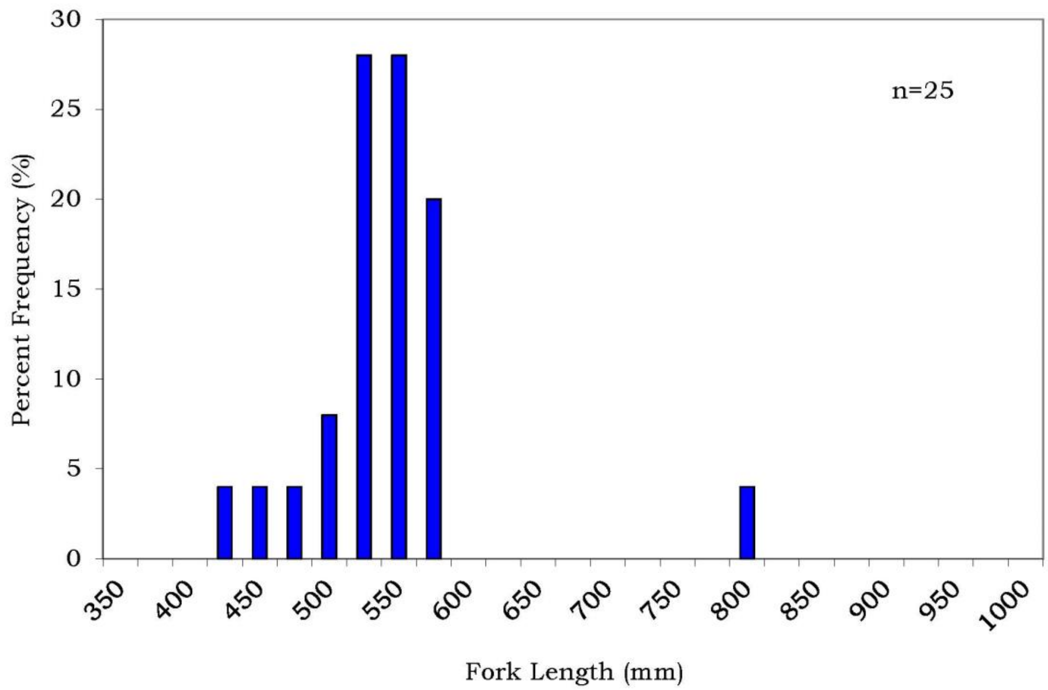

Figure 2. Lengths of lake trout caught by anglers.

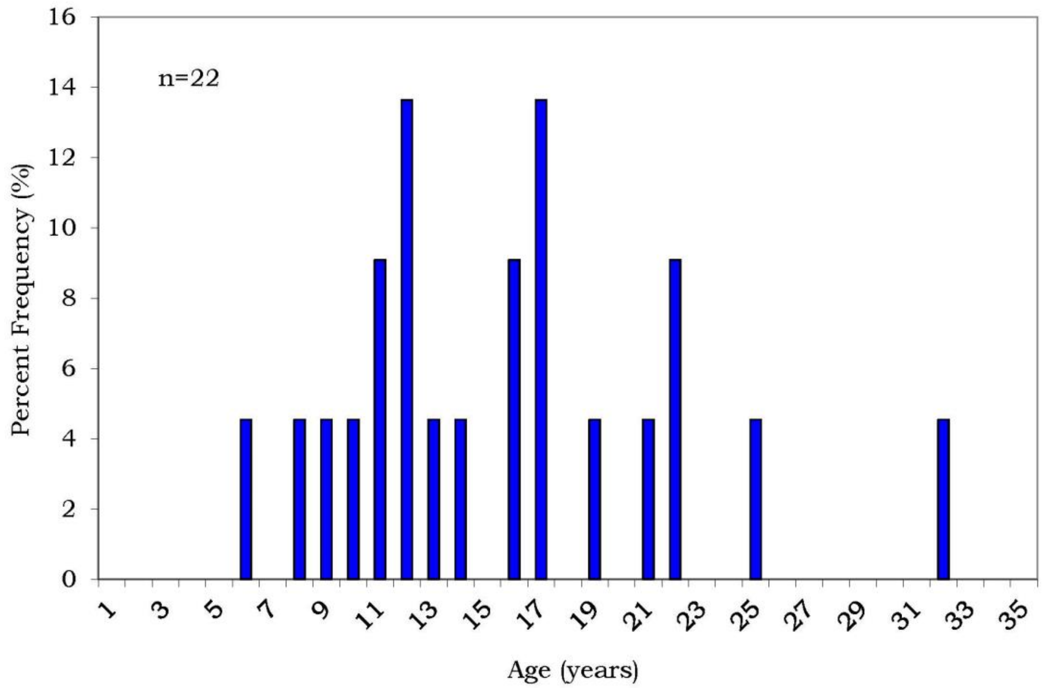

Figure 3. Ages of lake trout caught by anglers.

We examined the stomachs of 24 lake trout. Of these, 15 were empty and the remaining 9 averaged 69% full. Unidentified fish were the most common diet item (Table 6).

Table 6. Stomach contents of sampled lake trout.

	Volume (%)
Unidentified fish	76
Least cisco	13
Unknown	3
Unidentified vegetation	2
Beetles	2
Stoneflies	1
Copepods	1
Non-biting midges	1
Caddisflies	1

We examined the stomachs of 90 Arctic grayling. Of these, 2 were empty, and the remaining 88 averaged 74 % full. Caddisflies were the most common diet item (Table 7).

Table 7. Stomach contents of sampled Arctic grayling.

	Volume (%)
Caddisflies	62
Non-biting midges	16
Unidentified invertebrates	16
Water fleas	4
Unidentified vegetation	<1
Unknown	<1
Beetles	<1
Copepods	<1
Orb snails	<1
Ants	<1
Wasps, bees	<1
Copepods	<1
Unidentified fish	<1
Scuds, sideswimmers	<1
Bugs	<1
Moths and butterflies	<1
Dragonflies, damselflies	<1
Roundworms	<1
Arachnids	Traces
Flies (two-winged)	Traces
Stoneflies	Traces
Pond snails	Traces

Fishery Sustainability

Assessing the sustainability of the fishery in Nares River cannot be done with typical methods that use lake productivity to estimate sustainable yield. Lake trout caught in Nares River are not resident there, but are caught when moving between Bennett and Nares/Tagish lakes. We do not known to which of these lakes these trout ‘belong’, or if the migratory fish are from both lakes. To fully understand the impact of this fishery, it will be necessary to determine the origin (i.e., where they spawn) and migration patterns of these fish (how much time they spend in the river, in the lakes, and in which lakes). Until then, assessing the harvest of trout against a sustainable yield is not possible.

Anglers harvested 103 lake trout over the summer (Table 8). Total fish mortality (death) includes the unintentional mortality of any released fish. Catch and release at Nares River, however, was negligible (4% of lake trout caught were released). Based on the average size of harvested fish, the weight of total lake trout mortality in the recreational fishery was 195 kg.

Our estimate of 195 kg harvest is a minimum. It does not include harvests from the open water fishery outside of the period of this survey, from the ice fishery, or from the First Nations subsistence fishery. The Carcross First Nation uses Nares River for subsistence fishing but no data on this harvest are available. The ice fishery on the Nares River has never been formally monitored, but anecdotal information suggests that effort and harvest are minimal.

Table 8. Estimated summer lake trout harvest by anglers.

	2009
Lake trout harvested	103
Mean Weight (kg)	1.89
Harvest Estimate (kg)	195

The Nares River fishery is similar to that at Tagish Bridge; both locations provide easy access to fish concentrated in a narrow waterway. The harvest of lake trout from Nares River is part of the harvest from either Bennett and/or Tagish lakes, or even Marsh Lake. Consequently, this harvest should be considered in the larger, system-wide lake trout harvest.

Productivity calculations predict that the Southern Lakes system (Bennett, Nares, Tagish, and Marsh lakes) could collectively sustain an annual lake trout harvest of 4,002 kg and maintain fishing quality (unpublished data; Table 9). We estimate current harvest at 3,043 kg (76%). These harvest numbers should be considered a minimum, however, as they do not include open water harvest from outside of the survey periods, harvests from ice fisheries, or First Nation subsistence harvest. Nor do these productivity estimates consider that some lakes, such as Marsh Lake, may have experienced past overharvest (Millar et al. 2012). A lake trout population reduced by overharvest may not be able to sustain harvests even at the predicted OSY.

Table 9. Productivity and lake trout harvest estimates for the Southern Lakes system.

	OSY (kg)	Lake Trout Harvest (kg)		
		Summer Recreational	Commercial	Total
Bennett Lake	535	112	354	466
Nares River		195	n/a	195
Tagish Lake (includes Nares Lake)	2,457	1,505	n/a	1,505
Tagish Bridge		567	n/a	567
Marsh Lake	1,010	310	n/a	310
Total	**4,002**	**2,689**	**354**	**3,043**

Without further knowledge about the origin, movement, and population size and structure within these lakes, we cannot assign the Nares River lake trout harvest to lake-specific production within this system. In the interim, it is important to continue monitoring the Nares River harvest. Studies to determine the migration of lake trout between the Southern Lakes are needed to make robust conclusions about the sustainability of the Nares River fishery.

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APPENDIX 1. Nares River angling regulation changes 1989 to 2009.

Year	Species	Catch limit	Possession limit	Size restrictions
1989/90*		General Regulations		
	Lake trout	3	6	Only one fish over 80cm
	Arctic grayling	5	10	none
	Northern pike	5	10	none
	Whitefish	5	10	none
1991/92		General Regulations		
	Lake trout	3	6	Only one fish over 65cm
	Arctic grayling	5	10	Only one fish over 40cm
	Northern pike	5	10	Only one fish over 75cm
	Whitefish	5	10	none

* Yukon Government obtained responsibility for freshwater fisheries management from the federal government in 1989.

APPENDIX 2. Comparisons Between Periods

Effort

Mean daily angler effort was lowest in May/June. Effort levels increased substantially in July but dropped off again in August/September. Mean daily angler effort on weekends was much higher than weekdays over the entire survey period (Figure. 2.1).

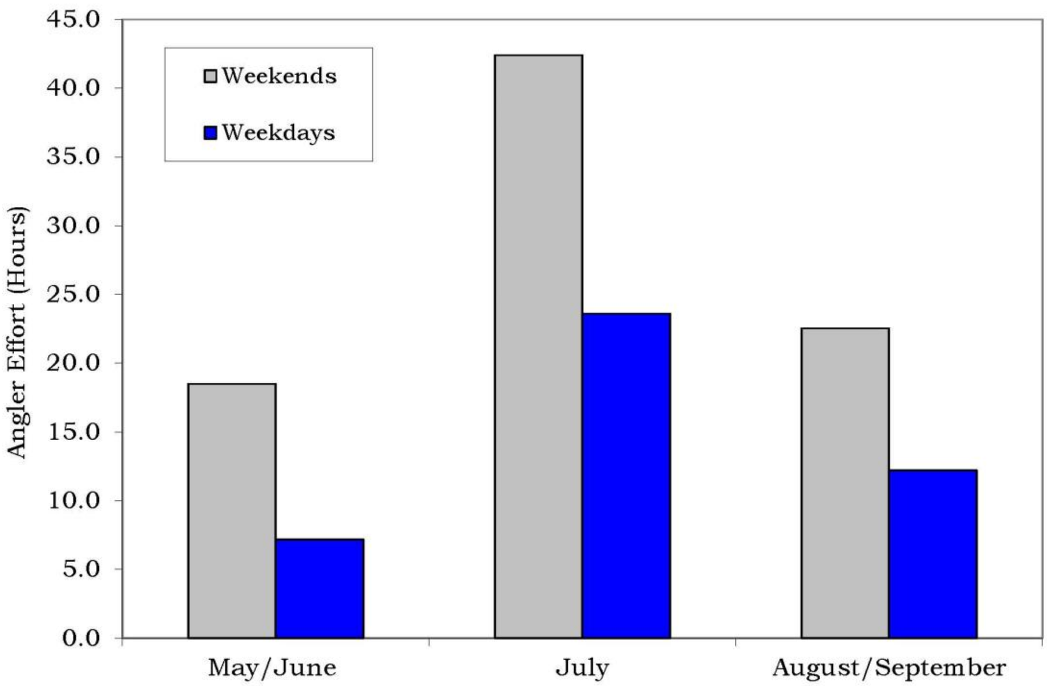

Figure 2.1. Estimated angler effort per day.

Catch

Lake trout CPUE was poor over the summer; highest on July weekdays and consistently low on all weekend periods (Table 2.1). Arctic grayling CPUE was very high in most periods, except July weekdays. Lake whitefish, longnose sucker, and burbot were caught only incidentally (Table 2.1).

Catch per unit effort patterns for lake trout were inconsistent with typical Yukon summer patterns. Usually success is high in the spring following ice out and then drops as water temperature rises. Fall increases are usually related to onset of spawning and cooling water temperatures.

These fluctuations were not evident on Nares River as CPUE remained fairly low over the summer, with an increase in July.

Table 2.1. Estimated catch per unit of effort (fish/hour) by period.

	Lake Trout	Arctic grayling	Longnose sucker	Lake Whitefish	Burbot
May/June weekends	0.006	0.281			0.006
May/June weekdays	0.018	0.311			
July weekends	0.037	0.141			
July weekdays	0.101	0.034	0.011	0.011	
August/September weekends	0.039	0.521			
August/September weekdays	0.075	0.089			