ANGLER HARVEST SURVEY

KLUANE LAKE 2004

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Key Findings

- We estimated that in summer 2004 2,024 hours of angler effort were expended by 734 anglers, for an average of 2.8 hours per angler.

- Angler efforts were low for such a large lake and much lower than the most recent survey in 2000. Decreased lodge operation on Kluane Lake and reduced effort out of Destruction Bay account for the decline.

- Anglers fished for lake trout and Northern pike, but only lake trout were reported caught through the survey. Angler success (number of fish caught per hour of angling) was near average for Yukon fisheries and relatively stable from past surveys.

- An estimated 607 lake trout were caught and 345 lake trout were harvested. These numbers were much lower than in the 2000 survey. The decrease in catch and harvest is consistent with the decreased effort.

- Kluane Lake anglers continue to keep a higher percentage of their catch than other Yukon fisheries.

- We estimate that 634 kg of lake trout were harvested over the summer by anglers.

- All known harvest on Kluane Lake is within reasonable limits and should maintain a quality fishery into the future.

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Introduction

Kluane Lake is located in southwestern Yukon within the traditional territories of the Kluane and White River First Nations. At 392.8 km^2 surface area it is the largest lake located entirely within the Yukon. It is deep (average depth 31.1 m) and has a reputation of being windy and dangerous. The Alaska Highway runs along the west shore for much of the lake's length, providing access for anglers in many locations. There are 2 communities, Destruction Bay and Burwash Landing on its shores, along with a Yukon Government campground at Congdon Creek and several other public and private camping areas. Kluane National Park is immediately adjacent to much of the lake on the east side of the highway and a National Park day use area is located at Tachal Dhal (Sheep Mountain) near the south end of the lake. Maintained boat launching areas are available near the south end of the lake and in both communities. A small marina is located in Burwash Landing.

Fish species targeted in Kluane Lake include lake trout, Arctic grayling, Northern pike, inconnu, and lake whitefish.

Kluane Lake receives a moderate amount of angler effort for such a large lake (Fish and Wildlife Branch unpublished data). It also supports a commercial fishing quota and domestic fisheries, which has led to Kluane Lake being identified as a priority by management agencies and advisory bodies. As a result, the fishery was assessed in 1991 and 2000. Kluane Lake was scheduled to be surveyed in 2005, but the survey was moved up a year because of concerns raised by the Kluane First Nation over increasing levels of angler activity on Kluane Lake. These concerns were partially based on the presence of temporary construction camps along the lake in support of the Alaska Highway reconstruction. Many staff of these camps were rumoured to be taking the opportunity of Kluane Lake's proximity and angling in their time off.

Ice fishing occurs on the lake, but has never been formally monitored.

The 2004 survey was done to monitor

- effort by both resident and tourist anglers;
- characteristics of the fishery and patterns of use;
- success rate of anglers for all species of fish; and
- levels of harvest in relation to productive capacity.

In addition to collecting information about the fishery, contractors

- provided anglers with information about new regulations in place for 2004; and
- established a fisheries management presence.

Harvest Regulations

In 2004/2005 Kluane Lake was added to the list of the larger, more heavily fished Yukon lakes where *conservation water* angling regulations are in place. In conservation waters barbless hooks are required, catch and possession limits are reduced and lake trout, Northern pike and Arctic grayling over a maximum size must be released. These regulations encourage the harvest of smaller fish and protect the large spawning fish from harvest. Lake trout catch is limited to 2 fish per day and in possession; all fish longer than 65 cm must be released. Arctic grayling catch is limited to 4 fish per day and in possession; all fish longer than 40 cm must be released. Northern pike catch is limited to 4 fish per day and in possession; all fish longer than 75 cm must be released. The catch and possession limits for other species remained unchanged.

The regulation history for Kluane Lake is detailed in Appendix 1.

Survey Methods

Angler harvest surveys, also called creel surveys, are conducted on various Yukon recreational fisheries each year. These surveys, in combination with other fish and fishery related assessments are used to determine if the angler effort and harvest are sustainable under the existing regulation regime.

In 1990 Environment Yukon adopted survey methodology and related analysis software developed by the Ontario Ministry of Natural Resources (Lester and Trippel, 1985). Environment Yukon endeavors to conduct this type of survey on key Yukon fisheries every 5 years or as angler patterns and management concerns dictate. This frequency allows for the detection of significant changes in either harvest or effort and enables any necessary management actions in a timely manner.

Surveys consist of a field worker conducting face to face interviews with anglers on selected sample days throughout the summer. Anglers are asked a standard set of questions used to characterize the social and biological aspects of the fishery. Data gathered includes:

- 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 additional information offered by anglers relating to any aspect of their experience is also recorded.

Results of the survey directly contribute to management decisions that ensure that fisheries are sustainable.

The field worker also collects biological data from the catch of cooperative anglers. Biological data gathered includes: length (mm), mass (g), sex, maturity, the collection of an ageing structure appropriate to the species, as well as the collection of stomachs for diet analysis. Any additional information as to general health and condition of the fish is recorded by the field worker (e.g., abnormalities, disease, lesions).

Weather over the entire sample day is subjectively assessed by the field worker as to its effect on angling activity (no possible adverse effect, possible adverse effect, definite adverse effect).

Survey timing varies depending on management objectives, key species and the fishery, but typically runs from ice out in the spring until either just after Labour Day or to the end of September. The survey is subdivided into several related subsets or periods, rather than pooling across the entire survey, to allow more detailed assessment of the data. For example, data are typically subdivided into several seasonal periods (usually 3 or 4) which are further partitioned into weekends and weekdays. Sample days are selected from the total number of available days within the survey period to ensure that sample size in each period is sufficient to allow analysis and to weight sampling toward the periods with the greatest angler use based on previous surveys and knowledge of the fishery. We attempt to sample at least 20% of the survey days.

Sample days are 14 hours long, 8:00 a.m. to 10:00 p.m. On sample days, all agreeable angling parties are interviewed by the field worker and angling parties observed but not interviewed are recorded.

Analysis

At the completion of the survey, the data is entered and analyzed utilizing the computer program CREESYS (1985) developed by the Ontario Ministry of Natural Resources. Laboratory analyses are done on samples to determine stomach contents and ages.

Lake Productivity

Waterbody productivity estimates are calculated using physical characteristics of the lake; average depth and total dissolved solids, along with average annual air temperature at the lake. Ryder's morphoedaphic index (1974) is used and incorporated into Schlesinger and Regier's (1982) equation for calculation of maximum sustained yield (MSY) for all species. Calculation of MSY for individual species is based on partitioning the biomass by species based on the most recent population survey data. Following O'Connor (1982), 15% of MSY provides an "optimum" sustained yield which maintains high quality fisheries on light to moderately exploited lakes.

2004 Kluane Lake Survey

The survey began shortly after ice out on June 1 and concluded September 30, 2004.

The survey covered all portions of the lake accessible from the Alaska Highway (Figure 1). Activity originating from camps, lodges and cabins on the east side of the lake was not surveyed because local knowledge and informal monitoring determined use to be minimal.

The survey was initially broken into 2 concurrent portions. *Access surveys* were done at both Destruction Bay and Congdon Creek Campground. The survey technician was located onsite for the entire day, observing angler activity and conducting interviews with anglers at the end of their visit. There was also a *roving survey* portion that covered all other angling areas along the Alaska Highway from the Sheep Mountain boat launch north to Burwash Landing. The roving portion of the survey involved the survey technician travelling back and forth the entire length of the survey area several times throughout the day investigating all possible areas of angling activity (excluding access survey locations) and conducting interviews with anglers as they were encountered.

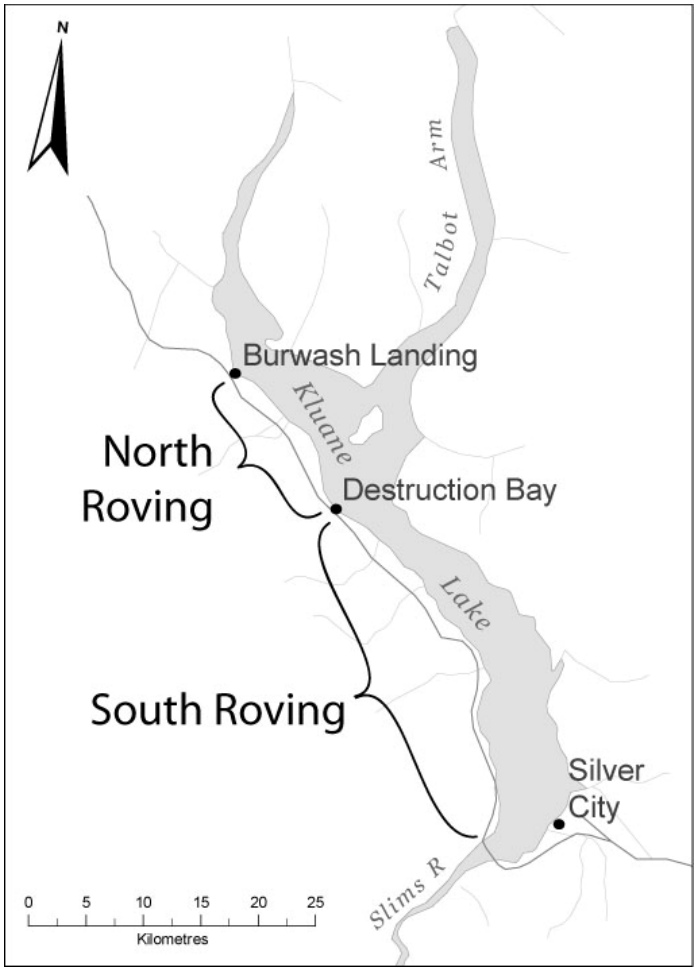

Figure 1. Location of 2004 Kluane Lake angler harvest survey.

No angling activity originating from the Congdon Creek Campground was observed in June, so this location was dropped as an access survey location and added to the roving survey. We reallocated the Congdon Creek sample days to the roving portion of the survey and divided it into a north roving portion and a south roving portion split at Destruction Bay. This change allowed for better coverage of angling areas in the roving days as less distance needed to be travelled by the survey technician.

The access survey portion was partitioned into 2 temporal periods (weekend days and weekdays) over the entire summer, and 1 spatial period (Destruction Bay) for a total of 2 periods. The roving survey was partitioned into weekend days and weekdays over the entire summer, and north and south spatial periods (total of 4 periods) and was analyzed separately due to the differing data format.

Data analysis was divided into 2 parts. In the first part, data were combined across all time periods, and in the second part results were compared between time periods. All data were analyzed at the party level.

2004 Results: Destruction Bay Access Portion

Eighteen days were sampled at Destruction Bay in the 122 day period from June 1 to September 30, resulting in a local sampling effort of 15%.

Effort

We estimated a total of 1,002 hours of angler effort were expended by 267 anglers out of Destruction Bay over the 2004 survey period. This worked out to an average of 8.2 angler hours per day over the entire survey, or an average of 3.8 hours per angler. These estimates were based on the field worker observing 165 hours of angler effort expended by 44 anglers in 19 groups.

Fishing Methods

Trolling was by far the most dominant method of angling out of Destruction Bay over the summer (Table 1).

Table 1. Angling Methods, Destruction Bay Angler Harvest Survey 2004.

Method of Angling	Percent of Parties
Trolling	75%
Spin casting	14%
Fly casting	7%
Drift fishing	5%

Methods of Access

Most anglers (84%) fished from boats out of Destruction Bay while the remaining 16% fished from shore.

Guided Anglers

Five percent of angling parties out of Destruction Bay were guided.

Angler Origin

Most anglers out of Destruction Bay over the summer were local (Table 2).

Table 2. Angler Origin, Destruction Bay Angler Harvest Survey 2004.

Origin	Percent of Parties
Local	48%
Whitehorse	23%
U.S	14%
Non-resident Canadians	9%
Yukon	7%
Other (usually Europeans)	0%

User Type

All anglers out of Destruction Bay were day users.

Weather

Weather at Destruction Bay in 2004 was reasonably nice and had little adverse effect on fishing activity (Table 3).

Table 3. Sample Day Weather, Destruction Bay Angler Harvest Survey 2004.

Did Weather Effect Angling?	Percent of Parties
No possible adverse effect	67%
Possible adverse effect	28%
Definite adverse effect	6%

Targeted Species

Anglers targeting a particular species were more successful than those that did not. Most (80%) of the anglers out of Destruction Bay were targeting lake trout and these anglers were responsible for 96% of the catch and all of the harvest. There were a few anglers (5%) targeting Northern pike but no pike were reported caught through this survey. No other species were targeted in this portion of the survey.

Catch and Harvest

Lake trout were the only catch reported through the survey at Destruction Bay (Table 4). Retention rates were very high as most fish caught were harvested.

Table 4. Angler Catch and Harvest, Destruction Bay Angler Harvest Survey 2004.

	# Caught		# Kept		Retention Rate (Observed)
	Observed	Estimated	Observed	Estimated	
Lake trout	28	159	25	148	89%

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) and species anglers (those targeting a specific species) in Table 5. Since almost all anglers were targeting lake trout, the CPUE for both groups is the same. Results are low relative to Yukon averages.

Table 5. Estimated Catch per Unit of Effort (Fish/Hour), Destruction Bay Angler Harvest Survey 2004.

	All Anglers CPUE	Species Anglers CPUE
Lake trout	0.16	0.16
Northern pike	0.00	0.00

2004 Destruction Bay Results: Comparisons between Periods

Effort

Estimated mean daily angler effort out of Destruction Bay was 10.9 hours/day during the weekend periods and 7.0 hours/day during weekday periods.

Fishing Methods

Fishing methods were dominated by trolling in both periods, with spin casting taking place only on weekends and drift fishing only on weekdays.

Methods of Access

Methods angler used to access the fishery were not analyzed by period.

Guided Anglers

All guided parties occurred on weekends.

Angler Origin

Anglers of all origins were present on weekends, with heaviest use by locals followed by Americans. Whitehorse users were as abundant as locals on weekdays, with non-resident Canadians the only other anglers present.

User Type

Day users were the only visitor type in both periods.

Weather

The influence of weather on angling activity was not analyzed by period.

Catch

Estimated number of fish caught per hour of angling (CPUE) was slightly higher for lake trout on the weekends (0.18 fish/hour) compared to weekdays (0.14 fish/hour). No Northern pike were caught on weekends, the only period in which they were angled for.

2004 Results: Congdon Creek Access Portion

Four days were sampled at the Congdon Creek Campground in June resulting in a local sampling effort of 13%.

There was no angling effort observed, which resulted in Congdon Creek Campground being dropped as an access survey point and being added as a location in the roving portion of the survey for the remainder of the summer.

2004 Results: Kluane Lake/Alaska Highway Roving Portion

Although the roving survey covered the entire length of the survey area throughout June before being split into a North and South portion for the rest of the summer, we were able to subset the June data and analyzed the entire summer in two portions.

The roving survey routinely visited sites where anglers access Kluane Lake along the Alaska Highway. Each site was visited by the technician a minimum of 4 times throughout each sample day to determine activity levels and monitor anglers' catches.

Sampling was done along Kluane Lake for 33 days in the 122-day period from June 1 to September 30, resulting in an overall sampling effort of 27%.

Effort

We estimate a total of 1,022 hours of angler effort were expended by 467 anglers along the Alaska Highway portion of Kluane Lake over the 2004 survey period. This works out to an average of 8.4 angler hours per day over the entire survey, or an average of 2.2 hours per angler. These estimates are based on the field worker observing 70 hours of angler effort expended by 32 anglers in 17 groups.

Fishing Methods

Spin casting was by far the dominant method of angling encountered in the roving portion of the Kluane Lake survey over the summer (Table 6).

Table 6. Angling Methods, Kluane Lake Roving Angler Harvest Survey 2004.

Method of Angling	Percent of Parties
Spin casting	81%
Trolling	9%
Combinations	6%
Fly casting	3%

Methods of Access

Most (88%) of parties encountered during the roving portion of the survey fished Kluane Lake from shore while the remaining 12% fished from a motorboat.

Guided Anglers

There were no guided angling parties encountered in the roving portion of the Kluane Lake survey.

Angler Origin

Whitehorse origin anglers were most abundant on Kluane Lake over the summer in this portion of the survey followed by non-resident Canadians

(Table 7). The local angler category includes residents in any of the communities adjacent to Kluane Lake.

Table 7. Angler Origin, Kluane Lake Roving Angler Harvest Survey 2004.	
Origin	**Percent of Parties**
Whitehorse	44%
Non-resident Canadians	25%
U.S	13%
Local	13%
Yukon	3%
Other (usually Europeans)	1%

Visitor Type

Most Kluane Lake anglers were day users, with campers in the government campgrounds the next most common visitor type (Table 8).

Table 8. Angler Visitor Type, Kluane Lake Roving Angler Harvest Survey 2004.	
User Type	**Percent of Parties**
Day users	72%
Camper – Government campground	19%
Camper – Crown Land	6%
Camper – Private campground	3%

Weather

Weather at Kluane Lake in 2004 was poor on roving sample days (Table 9).

Table 9. Sample Day Weather, Kluane Lake Roving Angler Harvest Survey 2004.	
Did Weather Effect Angling?	**Percent of Parties**
No possible adverse effect	39%
Possible adverse effect	52%
Definite adverse effect	9%

Targeted Species

All anglers surveyed through the roving portion of the Kluane Lake creel were targeting lake trout, so they were responsible for all lake trout catch and harvest. No other species were targeted or caught.

Catch and Harvest

Lake trout were the only species recorded caught and harvested through the roving portion of the Kluane Lake creel (Table 10). Retention rate was much lower than in the access portion of the survey and closer to Yukon averages. This retention rate probably reflects the influence of non-local anglers, who are more likely to be interested in recreation than harvesting.

Table 10. Angler Catch and Harvest, Kluane Lake Roving Angler Harvest Survey 2004.

	# Caught		# Kept		Retention Rate (Observed)
	Observed	Estimated	Observed	Estimated	
Lake trout	20	448	8	197	40%

Estimated angler success rates, calculated over the entire survey as numbers of fish caught per hour of angling effort (CPUE) was 0.44 fish/hour. Because lake trout was the only species targeted, this rate is the same for both *all anglers* (regardless of target species) and *species anglers* (those targeting a specific species). Lake trout CPUE results were good compared to other Yukon fisheries.

2004 Kluane Lake/Alaska Highway Roving Results: Comparisons between Periods

Of the 33 sample days in the roving portion of the survey, 16 were in the South area and 17 in the North area. These sample days contributed 13% and 14% respectively of the overall sampling effort of 27% in the roving portion.

Effort

In the South portion of the roving survey 466 hours of angler effort were estimated, based on observation of 29 hours of effort. In the North portion of the roving survey 557 hours of angler effort were estimated, based on observation of 29 hours of effort.

Mean daily angler effort was relatively low in all periods. The South and North roving portions showed very similar trends, with slightly more effort being expended in the North portion. Both portions experienced highest effort on weekend days with half to one third of that effort expended on weekdays (Figure 3).

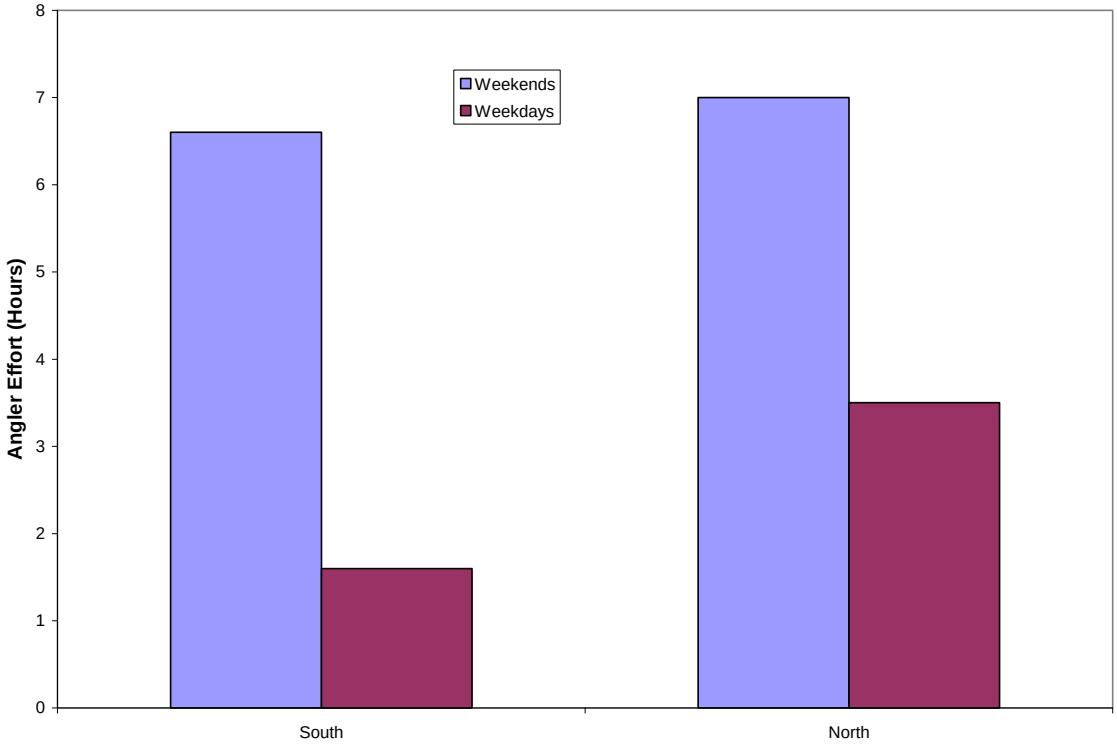

Figure 3. Estimated angler effort per day, Kluane Lake Roving Angler Harvest Survey 2004.

Fishing Methods

Spin casting was the dominant method observed in all portions of the survey. Trolling was observed only on weekends in the South portion, and fly casting was observed only on weekends in the North portion.

Methods of Access

Methods angler used to access the fishery were not analyzed by period.

Guided Anglers

There were no guided parties surveyed in the roving portion of the survey.

Angler Origin

Whitehorse origin anglers were present in all periods of the summer, with locals and non-resident Canadians only appearing on North weekends, and Americans and Europeans only appearing in the South portion.

User Type

Almost all weekend parties in both South and North portions were day users. Almost all weekday parties were campers in both portions.

Weather

The influence of weather on angling activity was not analyzed by period.

Catch

Estimated CPUE for lake trout, the only species encountered in the roving portion of the survey, was inconsistent in this portion of the survey because some sample sizes were small and success was variable. Angling success was far better for lake trout in the North portion of the survey than in the South portion (Table 11).

Table 11. Estimated Catch per Unit of Effort (Fish/Hour) by Period, Kluane Lake Roving Angler Harvest Survey 2004.

	Lake Trout
South weekends	0.15
South weekdays	0.04
North weekends	0.41
North weekdays	1.00

2004 Overall Results: All Portions, All Periods

Estimates from all portions of the survey are combined to estimate total effort and catch for Kluane Lake in 2004. Additional parameters are not combined here as they are specific to survey location.

Fifty-five days were sampled in the 122 day period from June 1 to September 30, resulting in a sampling intensity of 45%.

Effort

We estimate 2,024 angler hours were expended over the entire Kluane Lake system in summer 2004.

Catch and Harvest

Lake trout were the only catch reported through the survey although There were 48 lake trout observed caught (607 estimated) of which 33 were kept (345 estimated), for an observed retention rate of 69%. Northern pike were angled for but none were caught.

Estimated angler success rates, or CPUE, calculated for lake trout over the entire survey was 0.30, which is slightly above Yukon averages.

Biological Data

Lake trout were the only species sampled in this survey. We did not differentiate between portions of the survey or catch locations as sample sizes were too small.

Thirty lake trout were sampled for biological data. Mean fork length was 536 mm, and mean weight was 1,838 g, for a mean condition factor of 1.20. This is a very good condition factor (relationship between length and weight) for lake trout in Yukon and indicates "fat" fish. The majority of lake trout sampled were large fish between 525 and 600 mm (Figure 4). The new *conservation water* regulations for the lake which require the release of lake trout over 65cm total length was likely effective in protecting many of the larger lake trout that may have been caught (Figure 4). Note that there was a small amount of First Nation harvest over the 65 cm length regulation. Estimated weight of lake trout harvested by anglers over the summer (harvest estimate *x* mean weight) was 634 kg.

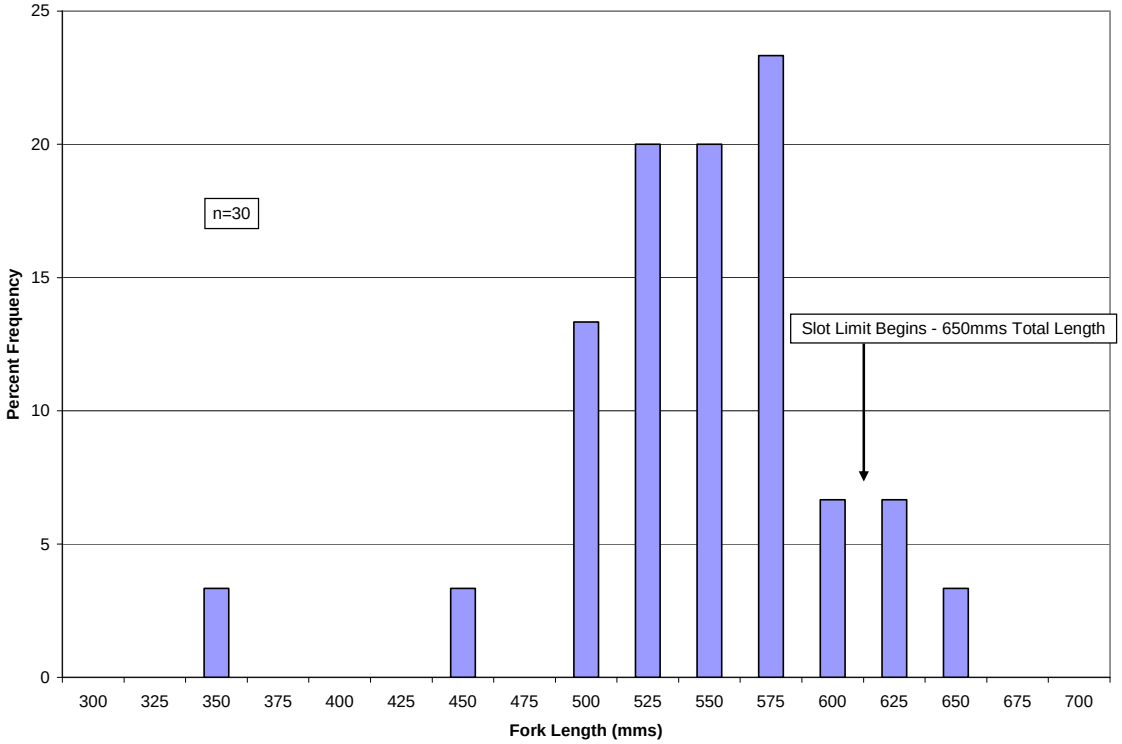

Figure 4. Sampled lake trout fork length frequency distribution, Kluane Lake Angler Harvest Survey 2004.

Ages were available from only 18 of the sampled lake trout. Mean and most common age was 19 years, with a range from 6 to 40 years (Figure 5). These ages are older than typical results, although the sample size is small. Note that young fish (less than 6 years in this lake) are not vulnerable to

angling gear and regulation does not allow harvest of larger fish. These portions of the population are therefore under represented in the sample.

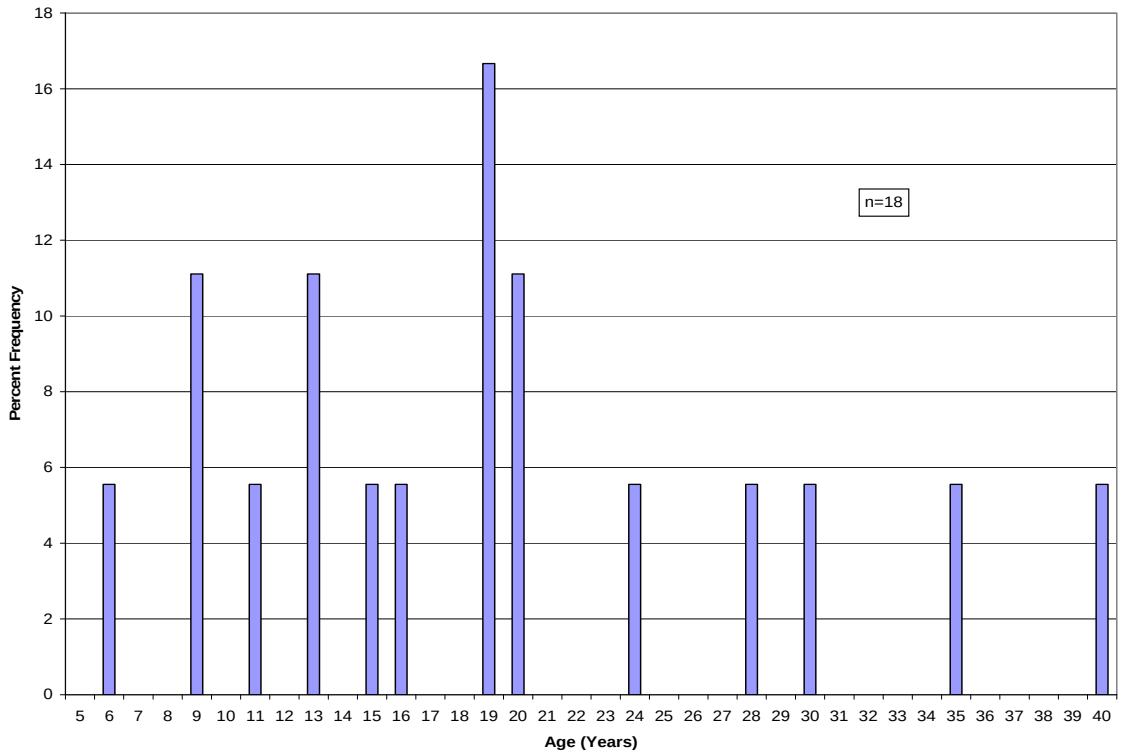

Figure 5. Sampled lake trout age frequency distribution, Kluane Lake Angler Harvest Survey 2004.

Diet analysis was done on 11 lake trout stomachs, which averaged 56% full. Snails were the most common diet item identified (Table 12). Of particular interest is that none of the sampled lake trout were eating fish – only snails and aquatic stages of insects. This is consistent with results from the 1990 index netting survey (de Graff, 1992) where 72% of the diet was invertebrates and 28% was fish.

Table 12. Sampled Lake Trout Stomach Contents, Kluane Lake Angler Harvest Survey 2004.

	Percent Volume
Snails (*Limnaea spp*.)	52%
Midges (*Chironimidae spp*.)	31%
Snails (*Fossaria spp*.)	10%
Caddis flies (*Tricoptera spp*.)	5%
Unidentified invertebrates	2%
Unidentified vegetation	trace

Comparison with Previous Surveys

Angler harvest surveys were previously done on Kluane Lake in 1991 and 2000. Surveys were of similar methodology but different design, using different sampling intensities to document the state of the fishery at the time. The only major difference was that in the 2000 survey two technicians monitored 6 access locations, including Talbot Arm and the east side of the lake.

Effort

Estimated angling effort (number of hours) over the summer of 2004 dropped dramatically to less than half of the 2000 results and slightly lower than 1991 results (Table 13). Much of the difference can be explained by the 2000 survey including Talbot Arm and the eastern side of Kluane Lake, which accounted for 49% of the total 2000 effort, or 2,300 hours. Activity levels for this portion of the lake were monitored in 2004 and there was minimal angling effort expended. "The Cove" lodging was not operational for angling, and the lodge at the north end of Talbot Arm was minimally active with only one party fishing. This party reportedly caught and released about 70 lake trout over 5 days in June, although this data is anecdotal and was not included in the analysis. The only other activity was possibly a bit of effort by Tincup Lodge in Brooks Arm and possible effort from cabin users, although none was recorded.

Table 13. Total Estimated Angler Hours, Kluane Lake Angler Harvest Surveys.

Year	Hours
2004	2,024
2000	4,694
1991	2,273

Fishing Methods

Fishing methods utilized throughout surveys shifted from trolling to spin casting in 2004 (Table 14). This finding was influenced by the shore fishery in the roving portion and the absence of lodge activity in Talbot Arm in 2004. Trolling remains the choice method of fishing on Kluane Lake, with few anglers using other methods or combinations of methods. These data are not available from 1991.

Table 14. Angling Methods (Percent of Parties), Kluane Lake Angler Harvest Surveys.			
	2004	**2000**	**1991**
Still fishing	0%	0%	n/a
Jigging	0%	4%	n/a
Drift fishing	3%	2%	n/a
Trolling	47%	71%	n/a
Spin casting	42%	23%	n/a
Fly casting	5%	0%	n/a
Combinations	3%	0%	n/a

Guided Anglers

Formally guided parties comprised 3% of parties in 2004, compared with 21% in 2000. This difference is related to lack of lodge activity in 2004. These data are not available from 1991.

Angler Origin

Angler origin over all surveys has been roughly a 3-way split between local, Whitehorse, and all other anglers (Table 15). The absence of activity by the lodges caused a decrease in the number of U.S. and European anglers in 2004 and a corresponding increase in local and Whitehorse anglers. In 1991 all Yukon anglers were lumped together, but constituted a similar percentage.

Table 15. Origin of Anglers (Percent of Parties), Kluane Lake Angler Harvest Surveys.			
	2004	**2000**	**1991**
Local	33%	23%	n/a
Whitehorse	32%	19%	n/a
Yukon	5%	5%	54% (all)
Non-resident Canadians	16%	11%	15%
U.S.	13%	23%	0%
Other (usually Europeans)	1%	17%	32%

Visitor Type

Visitor types did not vary much between the 2004 and 2000 surveys (Table 16). These data are not available from 1991.

Table 16. Angler Visitor Type (Percent of Parties), Kluane Lake Angler Harvest Surveys.

	2004	2000	1991
Day users	88%	72%	
Camper – Government campground	8%	12%	
Camper – Private campground	3%	3%	
Camper – Crown Land	1%	5%	

Weather

The field worker's subjective assessment of weather effects on angling activity over entire sample days indicates that weather (mostly wind) had an effect on angling activity in both 2004 and 2000 (Table 17). Sample day weather data was not collected in 1991.

Table 17. Weather Effects on Angling Activity (Percent of Parties), Kluane Lake Harvest Surveys.

	2004	2000	1991
No possible adverse effect	51%	56%	
Possible adverse effect	42%	29%	
Definite adverse effect	7%	15%	

Catch and Harvest

Lake trout is the primary fish species of interest on Kluane Lake. Limited survey data and anecdotal evidence suggest that a few anglers target Northern pike, inconnu and Arctic grayling in select areas of the lake, but effort and catches are extremely low. Other than a few Arctic grayling in 2000, the catch and harvest of these species have not been documented in angler surveys.

Numbers of lake trout caught and harvested have been variable, and declined by nearly two-thirds from 2000 to 2004 (Table 18). This reduction is largely due to the lack of angling from lodges in 2004 which also affected an increase in retention rate. Most anglers on Kluane Lake fish for food and this is reflected in the low numbers of lake trout released. Lodge anglers often release a large percentage of their catch and this likely contributed heavily to the lower retention rate in 2000. The 2004 result is still the highest retention rate to date

and well above Yukon averages in spite of the new regulation regime which required the release of large lake trout. Although the retention rate was increased, it did not affect the harvest too much as there was about a 40% decline in harvest from 2000 to 2004.

Table 18. Angler Catch and Harvest, Kluane Lake Angler Harvest Surveys

	Estimated Number Caught			Estimated Number Kept			Estimated Retention Rate		
	2004	**2000**	**1991**	**2004**	**2000**	**1991**	**2004**	**2000**	**1991**
Lake trout	607	1,782	502	345	849	277	59%	48%	57%
Arctic grayling	0	13	0	0	0	0	n/a	0%	n/a
Northern pike	0	0	0	0	0	0	n/a	n/a	n/a

Estimated CPUE (number of fish per angler hour) over the entire survey is the statistic that most truly reflects the changes in the fishery. Dramatic decreases in CPUE for a particular species could indicate problems in terms of the health or status of the fish species in question.

CPUE results for lake trout varied between surveys but do not indicate a decline in catchability over the years (Table 19). The high result in 2000 was likely because that year's survey included a large portion of guided lodge anglers in Talbot Arm, where lake trout angling success is generally better. The 2004 result is down somewhat from 2000, but still above Yukon averages for lake trout fisheries surveyed to date. The lower result in 1991 may have been related to the higher levels of commercial harvest that were taking place in the 1980s and early 1990s.

The CPUE for other species is inconsistent and very low due to minimal effort being expended for these species on Kluane Lake.

Table 19. Estimated Catch per Unit of Effort (Fish/Hour), Kluane Lake Angler Harvest Surveys.

	2004	**2000**	**1991**
Lake trout	0.30	0.38	0.22
Arctic grayling	n/a	0.003	n/a
Northern pike	0.00	0.00	n/a

Comparison with Previous Surveys: Subset Portions

Although the surveys were of slightly different design, we are able to subset some specific sampling locations from 2004 and 2000 for comparison.

Angler use along the west shore areas accessible from the Alaska Highway varied between surveys. Several highway lodges were closed down and government campgrounds contributed little to the overall angling effort. Effort out of Destruction Bay was substantially lower in 2004 than in 2000. Much of this drop in effort from traditional use points was picked up by the activity at various other access points, a portion of which was related to activity from the highway construction camps. The cancellation of the Kluane Lake Fishing Derby in 2004 also contributed to the lower effort.

Destruction Bay 2004 and 2000

Destruction Bay was surveyed using access methodology in both years, the surveyor was the same, and comparable sampling intensity was utilized (15% in 2004 and 10% in 2000).

Effort

Estimated angler effort out of Destruction Bay in 2004 (1,002 hours) was only 61% of what it had been in 2000 (1,636 hours).

Catch and Harvest

Lake trout were the only catch reported in both surveys although Northern pike were angled for but not caught (Table 20). Lake trout catches were substantially reduced in 2004 to less than one quarter of the 2000 catches. Harvest was also reduced, but not as significantly (one third), because anglers in 2004 retained nearly all the lake trout they caught.

Table 20. Angler Catch and Harvest, Destruction Bay subset, Kluane Lake Angler Harvest Survey 2004.

	Estimated Number Caught		Estimated Number Kept		Retention Rate (Estimated)	
	2004	2000	2004	2000	2004	2000
Lake trout	159	755	148	449	93%	60%

Lake trout CPUE for the Destruction Bay sampling location was 0.16 fish/hour, considerably lower than the 0.46 fish/hour estimated in 2004.

Of note, the long-running Kluane Lake Fish Derby was cancelled in 2004. This event traditionally increases effort from Destruction Bay over the Canada Day long weekend, however not significantly enough to account for all the differences in estimates. Data we are able to glean from the 2000 and 1991

surveys indicates that the derby typically generated between 150 and 300 angler hours.

Roving Portion 2004 Compared with Burwash/Congdon/Bayshore 2000

Burwash Landing, Congdon Creek Campground and the Bayshore Motel and RV Park were all access survey locations in 2000. Based on the closure of Bayshore, minimal effort observed at the other two survey locations in 2000, and the presence of the Alaska Highway reconstruction camps that were rumoured to be fishing when not working, we chose to use roving survey methodology for the above locations and all other possible areas of angling activity along the Alaska Highway and Kluane Lake in 2004.

Comparisons are possible with the recognition that many of the smaller access points to Kluane Lake such as Lewes Point and Dutch Harbour were not included in the 2000 survey. Sampling intensity was similar between years with 27% sampling effort expended in 2004 and 22% in 2000.

Effort

There were 1,022 hours angler effort estimated in this portion of the survey in 2004 compared to 669 hours in 2000, largely because more access points and fishing areas were sampled. The Bayshore Motel and RV Park was closed in 2004, and very little angling effort originated from Congdon Creek Campground, so a significant portion of effort was picked up in other areas in 2004.

Catch and Harvest

Lake trout were again the only catch reported through the angler harvest survey (Table 21). Arctic grayling and Northern pike were both fished for in 2000, but none were caught in this portion of the survey. These species were not fished for in this portion of the survey in 2004.

Lake trout catches were ten times higher in 2004 than in 2000. Harvest was also increased, but only four times, as anglers in 2004 released more than half of lake trout caught.

Table 21. Angler Catch and Harvest, Roving subset, Kluane Lake Angler Harvest Survey 2004.

	Estimated Number Caught		Estimated Number Kept		Retention Rate (Estimated)	
	2004	2000	2004	2000	2004	2000
Lake trout	448	46	197	46	44%	100%

The lake trout CPUE of 0.44 fish/hour for this portion of the survey in 2004 was also much better than the 0.07 estimated in 2000, and above Yukon wide averages.

Fishery Sustainability

Kluane Lake harvest regulations became more restrictive in 2004. New regulations were put in place in response to concerns brought forward by the Kluane First Nation focused around increasing angler use and fishing effort largely originating from temporary highway construction camps along the Alaska Highway. These new angling regulations also bring Kluane Lake into line with other large waterbodies in the Yukon with the required release of large spawning fish and the encouraged harvest of smaller fish.

It is not clear if the reduced catch and possession limits in 2004 for lake trout, Arctic grayling, and Northern pike affected the harvest. Harvest was down from the most recent survey in 2000, but CPUE for lake trout was also down and retention rates were up. This means fishing was poorer, and when anglers caught fish, they kept them. We are unable to determine from the survey data why anglers released fish, but the increased retention rate indicates that it was not likely due to the new regulations requiring the release of many large lake trout. We did see possible effects of the new regulations in the smaller average size of retained lake trout (Table 22).

Productivity estimates (see Methods section) for Kluane Lake predict that the lake could sustain a total annual lake trout harvest of about 2,900 kg while maintaining a high quality angling fishery.

The commercial lake trout harvest quota for Kluane Lake is allocated among 7 individuals and has its maximum limit set at 3,050 kg, although this level of commercial harvest does not take place (Environment Yukon internal files). de Graff (1992) recommended that the commercial lake trout quota be adjusted to 2,775 kg, but this recommendation has not been adopted. The commercial lake trout harvest has varied widely over the years, but from 1973 to 2004 averaged 727 kg per year, ranging from a high of 1,919 kg in 1989 to no harvest in 2002 or 2004. There was no commercial fishing activity in 2004.

The estimated lake trout harvest from this summer's angling was 634 kg (Table 22). This is two thirds less than the estimated harvest in 2000 and slightly below the 1991 estimate.

Ice fishing also occurs on Kluane Lake but has never been formally monitored. Anecdotal information suggests that effort and harvest is minimal. Levels of subsistence harvest on Kluane Lake are also unknown and assumed to be low.

Total known lake trout harvest from Kluane Lake for 2004 (634 kg) was below levels that would cause concern and should maintain a quality fishery

into the future. Harvest levels should remain within reasonable limits even when the historic average commercial harvest occurs.

Table 22. Estimated Summer Lake Trout Harvest by Anglers, Kluane Lake Angler Harvest Surveys.

	Number of Lake Trout	Mean Wt (kg)	Harvest Estimate (kg)
2004	345	1.84	634
2000	849	2.20	1,869
1991	277	2.73	756

There seems to have been acceptance of the new Conservation Water regulations on Kluane Lake in 2004. Although the angler harvest survey contractor received some complaints (including new regulations given as reason for the cancellation of the annual fishing derby), there were also many anglers who supported the more conservative limits, and as we see in the length data of sampled lake trout (Figure 4) the regulations are protecting larger fish.

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Appendix 1. Kluane Lake angling regulation changes 1989 to 2004.

Year	Species	Catch limit	Possession limit	Size restrictions
1989/90*	Lake trout	5	10	none
	Arctic grayling	5	10	none
	Northern pike	5	10	none
	Whitefish	5	10	none
1990/91	Lake trout	3 (1 only over 80cm)	6	Only one fish over 80cm
1991/92	Lake trout	3 (1 only over 65cm)	6	Only one fish over 65cm
	Arctic grayling	5 (1 only over 40cm)	10	Only one fish over 40cm
	Northern pike	5 (1 only over 75cm)	10	Only one fish over 75cm
2004/05	Lake trout	2	2	Release all fish over 65cm
	Arctic grayling	4	4	Release all fish over 40cm
	Northern pike	4	4	Release all fish over 75cm

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