GNWT Responses to WRRB September 8th TASR Questions

Topic: Fisheries Yield & Harvest Pressure

Question 1

In the Adequacy Statement, walleye is identified as a species present in Lac La Martre. Is there a yield model estimate available for walleye that could be applied to Lac La Martre?

GNWT Response

The Adequacy Statement Response (ASR) includes Walleye as a species present in Lac la Martre given available Traditional Knowledge (PR#74). However, Walleye is not a focal species in the lake for subsistence fishing, and the size of the Walleye fishery may be relatively small compared to other species (e.g., Lake Whitefish, Lake Trout). There are few records of Walleye in the lake based on previous investigations (Bond 1973; Libosvarsky 1970; reviewed in Yaremchuk et al. 1989; reviewed in Stewart 1997), and there is only one year on record of Walleye captured as by-catch (1972) during the years of the commercial and test fisheries between 1969 and 1972, and between 1984 and 1987 (Yaremchuk et al. 1989). Therefore, it may not be necessary to apply a yield model in this case as the lake is unlikely to be a destination for Walleye fishing.

Where there are Walleye fisheries of interest in the region (e.g., James Lake), models or equations could be applied by those that manage the fishery as an initial step in management planning. For example, one approach is to apply a life history-based model for estimating fishing mortality rates at maximum equilibrium yield, such as that done for Lake Trout using Shuter et al. (1998). However, it is unknown whether such a model is available for application to a Walleye stock in the North. Another approach is to consider a synopsis of harvest characteristics from North American lakes to describe the empirical relationship between sustainable fishing yield and lake area. For Walleye, Baccante and Colby (1996) regressed 168 observations of yield against lake area to obtain the following significant relationship: Yield (kg/yr) = $1.81 * \text{Area}^{0.931}$. Using this equation and a lake area of 1,818 ha, a fisheries manager could consider a potential angling yield of up to 1,960 kg. Further confidence in the estimation of sustainable yields for those that manage the fishery can

be achieved as more data on species life history, densities, and harvesting trends are obtained and analyzed.

Question 2
Is the population (or yield) of walleye in Lac La Martre likely to be lower than the yield of lake trout currently estimated by Golder as ranging between 23,108 - 63,000 kg?

GNWT Response
As stated above in the response to Question 1, Lac la Martre may not support a large Walleye fishery based on previous investigations in the lake (e.g., Bond 1973; Libosvarsky 1970). The lake is unlikely to be a destination for Walleye fishing because the potential yield may be much less relative to Lake Trout and Lake Whitefish.

Also, for the purposes of clarification, the two estimates of biomass are not comparable as they are from different models, each of which is used for calculating a specific fisheries statistic. For example, the Lake Trout biomass estimate of 23,108 kg provided in the ASR (Section 3.3.2) is the calculated sustainable harvest for the Lac la Martre fishery as per the fishing yield model by Evans et al. (1991); whereas the biomass estimate of 63,000 kg provided during the technical session in Behchokǫ̀ is the maximum equilibrium yield for the fishery as per the life history-based model by Shuter et al. (1998).

Question 3
Could difference in population size (or yield) between lake trout and walleye mean one species might be more sensitive to fishing pressure?

GNWT Response
Lac La Martre currently supports a relatively pristine fishery, where present population sizes of species in the lake should be linked to natural biological processes such as competition and predation, and the carrying capacity of habitat to support a species. It is agreed that smaller populations are potentially more at risk of overharvest (as discussed on Page 3-58, Section 3.3.2 of the ASR; PR#110). A population's sensitivity or resiliency to fishing pressure can also be influenced by life history characteristics such as age at maturity, asymptoptic length/weight, early growth rate, and natural

mortality rate (Shuter et al. 1998). For example, a less resilient population would be characterized by an older age at maturity, a slower growth rate, or a higher natural mortality rate. As noted in the ASR, Lake Trout may be the most vulnerable species to overharvest in the region due to relatively slow growth and late maturity characteristics, and therefore, it is expected that the estimated angling effort potential for the Lake Trout fishery will also maintain the productivity of other species in the lake.

Question 4

In the technical sessions of 16 August, 2017, Golder provided an estimate that an additional 14,000 recreational anglers could be supported on Lac La Martre. This was estimated, the WRRB assumes, using the Payne et al (1990) model for lake trout of 63,000 kg. Is there an estimate of additional recreational anglers that could be supported on Lac La Martre using a walleye yield model?

GNWT Response

The estimated number of anglers (or angler hours) for Lac la Martre provided at the technical session in Behchokǫ̀ was calculated using the life history-based model for the management of Lake Trout stocks in Ontario (Shuter et al. 1998). Results from the application of that model are provided over a range of fishing mortalities in Table 1, where the maximum equilibrium yield equaled 0.352 kg/ha/yr. Based on a reduced yield that considers both a 'safety' factor and baseline subsistence harvests, and the catchability of Lake Trout, angling effort that may be supported by the fishery was calculated as 2.27 angler-hrs/ha, or 405,000 hrs for the area of Lac la Martre. Therefore, the lake may support up 13,500 anglers assuming each angler fishes for 30 hours.

Since Lake Trout may be the most vulnerable species to overharvest due to their slow growth and late maturity, it is expected that the estimated number of sustainable angling hours will also maintain the productivity of other species in the lake. It is also important to note that Lac La Martre may not support a large Walleye fishery based on the results of previous investigations in the lake (e.g., Bond 1973; Libosvarsky 1970). The lake is unlikely to be a destination for Walleye fishing because the potential yield would be much less relative to Lake Trout and Lake Whitefish. Similar to the

response provided for Question 3, a Lake Trout model may be the most appropriate model for estimating the capacity of the lake to support recreational and subsistence fishing pressure.

Table 1. Results for Estimation of Lake Trout Harvest Potential in Lac la Martre using Shuter et al. (1998).

Fish mortality (F)	Yield (kg/ha/yr)	Total yield (kg)	# of adult fish	Effort (angler-hr/ha)	Effort (total angling hrs)
0.20	0.18118	32,323	22,711	1.49223	266,214
0.22	0.19499	34,788	24,443	1.64678	293,786
0.24	0.20842	37,182	26,125	1.80215	321,504
0.26	0.22147	39,511	27,762	1.95829	349,359
0.28	0.23417	41,777	29,353	2.11518	377,348
0.30	0.24650	43,976	30,898	2.27276[1]	405,461[1]
0.32	0.25845	46,108	32,397	2.43099	433,689
0.34	0.27005	48,169	33,845	2.58980	462,020
0.36	0.28112	50,152	35,238	2.74920	490,457
0.38	0.29176	52,050	36,572	2.90904	518,973
0.40	0.30186	53,853	37,838	3.06924	547,552
0.42	0.31136	55,548	39,029	3.22972	576,182
0.44	0.32018	57,121	40,135	3.39033	604,835
0.46	0.32822	58,555	41,142	3.55093	633,486
0.48	0.33536	59,828	42,037	3.71134	662,103
0.50	0.34146	60,918	42,803	3.87134	690,647
0.52	0.34638	61,794	43,418	4.03068	719,073
0.54	0.34989	62,422	43,860	4.18904	747,325
0.56[2]	0.35178[2]	62,759[2]	44,096	4.34605	775,335
0.58	0.35176	62,754	44,093	4.50124	803,021

[1] estimated recreational fishing effort potential was determined by first multiplying the fishing mortality rate at the maximum equilibrium yield by a 0.8 safety factor, which is 0.46; the yield at this fishing mortality rate was then reduced by 13,725 kg for subsistence fishing to determine the fishing mortality rate for recreational fishing;

[2] maximum equilibrium yield for commercial, recreational, and aboriginal (CRA) fishery; fishing mortalities beyond this threshold may impact the on-going productivity of the fishery;

Notes:

Model inputs include: Lake Area = 178,400 ha; and Total Dissolved Solids (TDS) = 165 mg/L.

Model assumptions include: asymptotic length (L_∞) = 87.7 cm; asymptotic weight (W_∞) = 8.85 kg; length at maturity (L_m) = 58.8 cm; natural mortality (M) = 0.169; early growth rate (ω) = 12.5 cm/yr; length at capture (L_c) = 49.8 cm, and catchability (q) = 0.14 / (1+ 0.36 N), where N = fish abundance per ha.

Question 5
Should the Evans et al (1991) model yield estimate for lake trout be used instead, how many additional lake trout recreational anglers are estimated that could be supported on Lac La Martre?

GNWT Response
Fisheries managers should consider the results from both models (Evans et al. 1991; Shuter et al. 1998) to guide the management of local fisheries. However, it is expected that the model in Shuter et al. (1998) may prove more reliable and useful to resource managers upon further analysis of existing catch data for Lac La Martre (e.g., Bond 1973) and verification of model assumptions. The reliability of fishing yield estimation would also be expected to improve as new data on the fishery are collected and analyzed in the future.

It is also important to note that both models produce similar sustainable harvest yield estimates. For example, the Evans et al. (1991) predicts a sustainable harvest yield of 23,108 kg, whereas Shuter et al. (1998) predicts a sustainable harvest of 26,935 kg (0.46 fishing mortality x 58,555 kg; see Table 1 in the response to Question 4).

Question 6
Golder has estimated yield of lake trout in Lac La Martre using two models, namely that of Evans et al (1991) - 23,108 kg, and Payne et al (1990) - 63,000 kg. Golder has further estimated that harvest of lake trout on Lac La Martre, could sustain an additional 14,000 fishers. Do you believe that uncertainty around yield, recreational fishing harvest pressure, and reaction of fish stocks to increased fishing may require monitoring fish yield, fish harvest, or fishing effort in Lac La Martre after construction of TASR?

GNWT Response
Based on the environmental assessment, there is a reasonable level of certainty that the access created by the all-season road will not pose a risk to the ongoing productivity of local fisheries. However, additional information on harvesting statistics may be useful for the management of local fisheries (where that responsibility currently lies with Fisheries and Oceans Canada). Specifically, a creel survey is a survey method that fisheries managers could

consider in the future. With this method, interviewers are often stationed at boat access points (e.g., marinas, boat ramps) and boating parties are interviewed at the end of their completed fishing trips. Prior to the surveys, a list of all potential landing sites is required, and the sampling day is broken into time blocks representing potential interviewing shifts. The sampling shifts are then determined by randomizing with respect to access points and interviewing periods. All boating parties returning are counted and interviewed when possible. Collected information may include hour of arrival, trip length, number of people in the party, time of fishing, fishing gear used, and catches realized (kept and released). Estimates of total fishing effort and total catch over all access points and over all landing time blocks can be provided to guide fisheries management. There are many examples in the literature on creel survey designs, and on how creel survey data can be used to manage a recreational fishery.

Topic: Fish & Fish Habitat Monitoring

Question 1

TG's traditional knowledge (TK) report "K'àgòò tı̨lıì Deè Traditional Knowledge Study for the Proposed All-Season Road to Whatì" was completed in 2014, the year of the large intense wildfires around Whatì. The report identifies the importance of fish to the people of Whatì– both in rivers and in lakes along the route of TASR. Given the possibility and proposed plans to increase tourism in the area, how will TK information about fish and low water levels since the fires be updated?

GNWT Response

As stated in the K'àgòò tı̨lıì Deè Traditional Knowledge Study, the proposed development area has been a hunting and trapping area for the Tłı̨chǫ since time immemorial. Forest fires are part of the baseline environmental setting described in the Study. While the impact of the 2014 fires is mentioned in the Study, fires are also a natural part of the landscape and an important part of forest succession. Forest fires can lead to a short-term influx of nutrients and silt into waterbodies, which can lead to short-term changes to the aquatic ecosystem. While this may cause temporary stress to fish populations, Lac La Martre has experienced fires before and the recent fires are unlikely to have a lasting effect on fish populations.

While water levels have not been collected on Lac La Martre since 1990, real-time discharge data is available for the La Martre River (Canada 2017). This data indicates that the La Martre River was below average but above the lower quartile in 2016 (for 1975 to 2016, data for 2017 has not yet been summarized), which indicates that water levels in the Lac La Martre basin are within historic means.

The Tłı̨chǫ Aquatic Ecosystem Monitoring Program (TAEMP) has led to a number of reports (WRRB 2011; WRRB 2012; WRRB 2013). The TAEMP is run and coordinated by the WRRB. The Tłı̨chǫ Government anticipates that the team for this program will continue the visiting program, every fourth year. The Tłı̨chǫ Government anticpates this work will continue and welcomes the WRRB approach, and continued partnership in delivering this important community-based monitoring program.

In addition to the TAEMP/Fishcamps, the Tłı̨chǫ Government runs the Marian Watershed Stewardship Program (MWSP) as a separate and distinct aquatic ecosystem monitoring program, which is intended to continue traditional knowledge and scientific monitoring in the area surrounding and near the proposed NICO Project. The research was funded through the GNWT's Cumulative Impact Monitoring Program for three years. This project was developed to answer Tłı̨chǫ people's questions about the region, and is aimed to develop a baseline for the area. The program is very strongly oriented to Traditional Knowledge collection and it is a program in which Tłı̨chǫ people's questions are answered, because they originate the research questions. It is a responsive and continually adapting research program. More specifically, this program targets one of the main areas of concern for community members: the Marian River system from Hislop Lake to Marian Lake, which is not monitored for aquatic health by industry or other organizations.

Both western and Aboriginal science will be drawn on to obtain a clear picture of baseline conditions in the Marian Watershed and potential changes over time. Results contribute to characterization of background conditions and the range of natural variability in water chemistry in the Marian River, which is crucial to the implementation of the legal requirement for water on Tłı̨chǫ lands to remain substantially unaltered.

The Tłı̨chǫ Government has continued to dedicate its own resources to deliver the project over the past five years, even in the context of uncertain funding sources. The Marian Watershed Stewardship Program will compliment and add further data collection and analysis to Fortune's Aquatic Effects Monitoring Program, using comparative methodology and approaches in order to ensure that results are comparable over time. This is the start of Stewardship - an overall watershed monitoring program with the intention of increasing capacity to engage community members throughout the entire watershed - as future development on Tłı̨chǫ lands occurs.

Both the TAEMP (Fishcamps) and the MWSP are important cornerstones of the Tłı̨chǫ Government's Strategic Intention #1 – Sustaining our Lands and Environment. Both programs emphasize building the capacity of Tłı̨chǫ people to monitor and manage Tłı̨chǫ lands in the face of increasing development and change. It is also a critical part to helping Tłı̨chǫ citizens maintain confidence in their water, fish and country foods, in turn ensuring that their traditional way of life continues to be practiced today and into the future.

The Tłı̨chǫ Government commits, subject to the availability of additional resources, to the design and implementation of a program that uses Tłı̨chǫ harvesters' traditional knowledge and methods to monitor, during construction and operation of the road:

1) The state of barren-ground caribou (ʔekwǫ̀) winter habitat;
2) The health of boreal caribou (tǫdzı) and the state of their habitat; and
3) The health of fisheries and the state of their habitat in rivers and lakes along the route of TASR.

Further details of the program, including any additional baseline information required, monitoring questions and approach, will be determined following discussion with traditional harvesters and elders. The expertise and advice of the WRRB, GNWT and other responsible government parties will be sought in the design of the program.

Question 2
How will monitoring be conducted using Tłı̨chǫ harvesters' traditional methods to monitor the health of fish and the state of their habitat during and after the completion of the TASR?

GNWT Response
The Information Request response to MVEIRB IR#6 states:

> The GNWT does not plan to conduct any monitoring associated with fisheries harvest in the Project area. The results of the effects analysis for the Tłı̨chǫ All-Season Road (TASR) concluded that the magnitude of effects on fish abundance from harvest pressure was considered to be negligible to low, and likely non-measurable. The watercourses and lakes likely to attract the greatest number of fishers due to the TASR (i.e., Lac La Martre, La Martre River, and Boyer Lake) are large water bodies with abundant valued component populations that can support an increase in fishing pressure. The GNWT will ensure DFO and the Tłı̨chǫ Government are aware of the changing access and that a review of how fisheries will be managed in the area, including monitoring, may be required.

To this response, it can be added that the Wek'èezhìı Renewable Resources Board will be consulted in any changes to fisheries management that may be proposed by DFO and the Tłı̨chǫ Government.

Fish and fish habitat in the Tłı̨chǫ region are currently monitored through the Tłı̨chǫ Aquatic Ecosystem Monitoring Program (WRRB 2013). It was initiated to draft, test and implement scientific and traditional knowledge protocols for monitoring water quality, sediment quality and fish health at the community level in the Tłı̨chǫ region. A main objective of the program is to engage youth, elders and scientists in long term environmental monitoring. In this way, the scientific and Tłı̨chǫ knowledge systems are utilized in community based monitoring and contribute to the overall development and implementation of the Marian Lake Watershed Stewardship program.

While the TASR is not expected to lead to measurable changes to fish populations, The Tłı̨chǫ Aquatic Ecosystem Monitoring Program provides a

mechanism by which monitoring may be conducted using Tłı̨chǫ harvesters' traditional methods after the construction of the TASR.

The Tłı̨chǫ Government runs the Marian Watershed Stewardship Program (referred to above), which is intended to continue traditional knowledge and scientific monitoring in the area. This project was developed to answer Tłı̨chǫ people's questions about the region, and is aimed to develop a baseline for the area. The program emphasizes building the capacity of Tłı̨chǫ people to monitor and manage Tłı̨chǫ lands in the face of increasing development and change. It is also a critical part to helping Tłı̨chǫ citizens maintain confidence in their water, fish and country foods, in turn ensuring that their traditional way of life continues to be practiced today and into the future.

The Marian Watershed Stewardship Program is a program in which Tłı̨chǫ people's questions are answered, because they originate the research questions. It is a responsive and continually adapting research program.

Topic: Fish Management Responsibilities

Question 1

In response to MVERIB IR#8, the GNWT highlights that it will continue to enforce the sport fishing regulations in the Northwest Territories, and that GNWT is cross- appointed to enforce sport fishing regulations. GNWT describes that "*The Department of Fisheries and Oceans Canada (DFO) is the management authority for fish in the NWT*". Also, GNWT indicates that "*It is also anticipated that the Tłı̨chǫ Government (TG) will further manage the fisheries on Tłı̨chǫ lands*". Should DFO and TG wish to change the management of fisheries in the waterscapes near TASR (i.e. special management areas, catch limits, size slots, seasons, closures, etc.), would the GNWT wish to be party to fisheries management discussions with DFO and TG, or would GNWT simply wish to be informed of resulting regulation changes in order to adjust GNWT licenses, fees, and enforcement criteria as prescribed by DFO and TG?

GNWT Response

The GNWT would welcome an invitation from the Department of Fisheries and Oceans or the Tłı̨chǫ Government to discuss fisheries management near the Tłı̨chǫ All-season Road (TASR). The GNWT expects that there would be

consultation with the GNWT and other interested parties on any proposed changes to fisheries management near the TASR.

The Tłı̨chǫ Government fully expects that these types of conversations will have to occur in the licensing phase for this project.

Topic: Wildlife – Tǫdzı (Boreal Caribou) & ʔekwǫ̀ (Barren-ground Caribou)

Question 1

As reported in the WRRB's *"Boreal Caribou Habitat and Habitat Use in Wek'èezhìı"* (2012), and *"Boreal Caribou Habitat and Disturbance in Wek'èezhìı"* (2013), the Tłı̨chǫ elders' main concern in relation to tǫdzı is protection of their range, as there are a variety of habitat types tǫdzı use daily and seasonally. These habitat types are associated with topography as well as vegetation. Since the mid-nineties, Tłı̨chǫ elders and harvesters have focused their concerns on the loss of habitat from forest fire, noting tǫdzı move to find appropriate forage and the habitat types they use for calving, rutting, avoiding predators and insects, etc. Similarly, indigenous people in southern Canada have emphasized the movement of boreal caribou to areas with continuous thick bush following forest fires, and industrial and infrastructure developments. How will monitoring be conducted using Tłı̨chǫ harvesters' traditional methods to monitor the health of tǫdzı and the state of their habitat during and after the completion of the TASR?

Question 2

As reported in *"Caribou Migration and the State of Their Habitat"* (2001) between 1925 and 1998, ʔekwǫ̀ harvest was reported in the vicinity of the TASR during the winters of 1946, 1948, 1949, 1965, 1967, 1970, and 1971, with more than 40 years of ʔekwǫ̀ harvest being reported in the vicinity of Fortune Mineral's proposed NICO mine site. As such, Tłı̨chǫ harvester and elders are concerned for the winter range of ʔekwǫ̀. Given the importance of long term monitoring of ʔekwǫ̀ winter habitat, how will monitoring be conducted using Tłı̨chǫ harvesters' traditional methods to monitor the state of ʔekwǫ̀ winter habitat?

GNWT Response

The GNWT is committed to supporting, subject to availability of additional resources, the Tłı̨chǫ Government (TG) in the design and implementation of a program that uses Tłı̨chǫ harvesters' traditional knowledge and methods to monitor the health of boreal caribou (tǫdzı) and the state of their habitat, and the state of barren-ground caribou (ʔekwǫ̀) winter habitat, during and after the completion of the TASR project. Further details of the program, including monitoring questions and approach, will be determined following discussion with traditional harvesters and elders through engagement with TG, with a view it be included as a component of the Wildlife Management and Monitoring Plan (WMMP) to be finalized and approved during the regulatory phase for this project. The expertise and advice of the WRRB will also be sought in the design of the program.

The commitment above is recorded in section 5.2.3 and section 5.2.4 of the draft WMMP that was posted to the Review Board's public registry on September 22, 2017 (PR#192).

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