MEETING REPORT

Main Issue: Impacts of Reduced Flow on Fish and Fish Habitat in Trudel Creek (DFO IR 15.02 and 15.03)

Meeting Date: October 06, 2009.

Attendees:

1. Bruce Hanna, DFO (person)
2. Nicola Johnson, DFO (phone)
3. Rick Gervais, DFO (phone)
4. Barry Chilibeck, DFO consultant, (phone)
5. Linda Zurkirchen, Dezé consultant (person)
6. Jason Cote, Dezé consultant (phone)

Summary of Discussion:

> **<u>Assess the potential for a change in fish species composition within the Trudel system due to the rise in temperature in Trudel Creek resulting form lowered water levels.</u>**
>
> **<u>That Dezé clarify whether it is expected that areas of sufficient depth will remain to provide overwintering habitat in Trudel Creek</u>**

[Note that DFO IR 15.01 was raised at the Oct 01 – 05th, 2009 Technical Session and is identified in the transcripts as Commitment #24. At the time of the Oct. 06th, 2009 meeting with DFO, Deze was still conducting the assessment of IR 15.01, therefore, provides that response in their report to the MVEIRB under Commitment 24.]

<u>Trudel Water Temperatures</u>

Depth conditions within the Trudel Creek system are relatively shallow with a maximum depth of 17 m occurring in Gertrude Lake. Water temperature profiles conducted in each lake system and within select riverine sections of Trudel Creek indicate that there is no temperature shift from surface waters to deep water habitats and a marginal difference between lacustrine and riverine habitat water temperatures (refer to Figure 14.4.3 of the DAR). Therefore, a reduction of cooler habitat within Trudel Creek is not anticipated as there is no definable thermocline.

As stated in Section 14.4.3.4.5 of the DAR, "The degree of temperature change would be seasonally dependant. In spring and summer months, lower water levels may result in slight increases in water temperatures from an average of 17˚C to 18˚C to an average of 19˚C to 20˚C. In winter months, water temperatures can not decrease below the freezing point; however, the thickness and duration of winter ice cover may increase because of lower water levels". Uncertainty exists in the modeled output, specifically when using average values, as opposed to maximum or minimum values, as maximum daily values could approach or exceed thresholds, which could cause a sub-lethal or lethal effect to fish.

The increase of temperature requires an examination of temperature thresholds and optimum growth temperatures for the three identified indicator species, (northern pike, walleye and lake whitefish). Juvenile and adult northern pike can tolerate a broad range of temperatures. Numerous authors have reported differing optimum growth temperatures, ranging from 19.8˚C to 25.8˚C (Bevelhimer et al. 1985, Margenau et al. 1998). These temperatures may be largely related to size or age of northern pike, as it is apparent that the optimum temperature for growth of northern pike decreases with age (Casselman and Lewis 1996), and very warm temperature conditions (30˚C) may cause stunting (Diana 1987). The upper incipient lethal temperature of sub-adult northern pike has been shown to be 29.4°C in the laboratory and over 30°C in the natural environment (Casselman and Lewis 1996).

The thermal optimum for adult and young walleye growth and feeding has been documented as 22 ± 1˚C (Kelso 1972; Huh et al. 1976). Results of laboratory studies and field observation suggest that walleye stop foraging actively and seek thermal refuge at temperatures higher than this optimum (e.g., Kelso 1972; Kocovsky and Carline 2001). Northern populations of walleye exposed to temperatures between 5 and 25˚C had lower metabolic rates and higher growth at cooler temperatures relative to southern populations (Galarowicz 2003).

Temperature thresholds for lake whitefish have also been tested in the laboratory setting. Groups of test fish exposed to temperatures between 5 and 24.8˚C increased in length and weight at all of the test temperatures and at the end of the study were heaviest and longest at 18.18˚C. A curve fitted to the specific growth rate data indicated that the optimum temperature for growth was 18.58˚C and, that the thermal niche for juvenile lake whitefish is 15.5 to 19.58˚C (Edsall 1999). The ultimate upper lethal temperature for lake whitefish has been found to be 26.8˚C (Edsall and Rottiers 1976).

The increase of 2˚C in the summer months remains well below the lethal temperature limits and within the optimum temperature regimes documented in the literature for the identified indicator species. Therefore, no change in fish species composition within Trudel Creek is anticipated as a result of temperature increases associated with lower water levels.

Bevelhimer, M.S., Stein, R.A., and Carline, R.F. 1985. Assessing significance of physiological differences among three esocids with a bioenergetics model. Can. J. Fish. Aquat. Sci. 42: 57–69.

Casselman, John J. and C. A. Lewis. 1994. Habitat requirements of northern pike (Esox lucius). Can. J. Fish. Aquat. Sci. 53(Suppll):161-174.

Diana, James S. 1987. Simulations of Mechanisms Causing Stunting in Northern Pike Populations. Trans. Am. Fish Soc. 116:612-617.

Edsall, T. A., and D. V. Rottiers. 1976. The temperature tolerance of young-of-the-year lake whitefish, *Coregonusclupeaformis.* Journal of the Fisheries Research Board of Canada 33:177–180.

Edsall, Thomas A. 1999. The Growth-Temperature Relation of Juvenile Lake Whitefish. Trans. Amer. Fish Soc. 128:962-964.

Galarowicz, Tracy L. and D. Wahl. 2003. Differences in Growth, Consumption, and Metabolism among Walleyes from Different Latitudes. Trans. Am. Fish Soc. 132:425-437.

Huh, H. T., H. E. Calbert and D. A. Struiber. 1976. Effect of Temperature and Light on Growth of Yellow Perch and Walleye using Formulated Feed. Trans. Am. Fish. Soc. (2):254-259.

Kelso, J. R. M. 1972. Conversion, maintenance, and assimilation for walleye *Stizostedion vitreum vitreum*,as affected by size, diet, and temperature. Journal of the Fisheries Research Board of Canada 29:1181–1192.

Kocovsky, Patrick M. and Robert F. Carline. 2001. Influence of Extreme Temperatures on Consumption and Condition of Walleyes in Pymatuning Sanctuary, Pennsylvania. N. Amer. J. Fish. Mgmt. 21:198-207.

Margenau, Terry L., Paul W. Rasmussen, and Jeffrey M. Kampa. 1998. Factors Affecting Growth of Northern Pike in Small Northern Wisconsin Lakes. N. Am. J. Fish. Mgmt. 18:625-639.

Overwintering Depths

As indicated by DFO, overwintering fish habitat is primarily a condition of sufficient water depth and dissolved oxygen levels under the ice cover. Based on the slow moving nature of Trudel Creek, it is assumed that a water depth of 1.0 m under the ice cover layer would be sufficient for overwintering fish. Also, a conservatory thick ice layer of 1.5 meters was assumed. The following table highlights the average channel depths associated with Trudel Creek for the riverine habitats during the 36 MW and 56 MW operation scenarios and the anticipated depth available under the ice cover layer. Lake information is discussed below. This information is also presented in Tables 14.3.6 and 14.3.7 of the DAR.

Transect	Water Depths			
	36 MW		56 MW	
	Transect depth	Water depth below 1.5 m ice cover	Transect depth	Water depth below 1.5 m ice cover
TDL1	4.72	3.22	4.5	3.0
TDL2	2.20	1.20	2.0	0.5
Trudel 1	2.84	1.34	2.7	1.2
TDL3	6.51	5.01	6.3	4.8
TDL4	16.3	14.8	16.2	14.7
TDL5	6.41	4.91	6.3	4.8

TDL6	4.00	2.50	3.8	2.3
TDL7	2.75	1.25	2.6	1.1
TDL8	4.20	2.70	4.1	2.6
TDL9	3.09	1.59	3.0	1.5
TDL11	4.14	2.64	4.0	2.5
TDL13	3.03	1.53	2.9	1.4
TDL14	4.04	2.54	3.9	2.4
TDL16	5.11	3.61	5.0	3.5
TDL17	4.96	3.46	5.0	3.5
TDL18	6.30	4.80	6.3	4.8

As the table indicates, the average channel widths for all but one transect (TDL2) would support sufficient water depths under the ice cover layer for overwintering fish.

Within the Trudel Creek lake systems, the lowest average depth conditions are summarized below:

- Gertrude Lake – 9.73 m in April
- Trudel Lake – 9.73 m in March and April
- Un-named Lake – 7.52 m in April

Assuming an ice thickness of 1.5 m, there would be sufficient depth on average in each of the lake systems to support overwintering habitat for fish.

Developer Commitments

Dezé continue to maintain existing tidbit temperature loggers in Trudel Creek pre-construction and during operations to test assumptions and confirm predictions.

In addition, Dezé will:

- Set additional tidbit temperature loggers in Trudel at specific locations that may experience localized temperatures (eg: still lake water; outlets, riverine sections, refuge areas, etc.),
- Review literature for sub-lethal temperature thresholds and effects from a northern perspective for the species in Trudel Creek,
- Review literature for additional information on causes of temperature increases and/or temperature changes from other projects with flow reductions,
- Review predictions based on outcome of literature reviews and discuss with DFO, and
- Adapting the temperature monitoring plan to reflect the revised hydrology of Trudel Creek based on lower flows if an expansion scenario is approved

- Monitor temperature loggers pre-construction to gain better understanding of the natural temperature regime at these locations, and during operations to obtain adequate information to verify or refine the model.
- Discuss monitored temperatures with DFO and identify if temperature change is acceptable for fish species in Trudel. Based on outcome of monitoring, identify with DFO if additional monitoring, operational changes, mitigation/ adaptive management is required to protect fish populations.

Outstanding Issues:

None

Signature of Party Representative:

Signature of Developer Representative: L.ZURKIRCHEN

Date: October 30, 2009