Results of a Broad-scale Monitoring Survey Conducted on Upper Fry Lake in 2011

File Report

Trevor Drennan
Ontario Ministry of Natural Resources
Bracebridge

2011

Upper Fry Lake is part of the Seguin River watershed and is located in Monteith Township, Parry Sound District. The lake has an approximate surface area of 52 hectares with a mean depth of 1.1 meters. The maximum depth of the lake is 6.4 meters. Water clarity is low with a mean secchi disk reading of 1.3 meters. The lake is accessed via the Upper Fry Lake dam which is located at the end of Strange Point Road. To reach Strange Point road, follow Highway 518 towards Parry Sound turning left onto Old Nipissing Road West and turn left again onto Strange Point Road.

Historically, Upper Fry Lake was managed as a northern pike fishery; however, only one fisheries survey was completed. In 1978, the survey indicated populations of northern pike, white sucker, golden shiner, brown bullhead, yellow perch and pumpkinseed present in the lake (Rettie, 1978). There is no record of stocking in the lake.

The water level in the lake is controlled by a dam at the outlet that is owned and operated by the Parry Sound PowerGen Corporation. There is very little information available on how the dam is operated or on water levels in the lake. The Seguin River Water Management Plan Scoping Report (AMEC 2005) states:

> "Three stop logs are pulled in early February lowering the water level by about 0.9 m. In late February one additional log is pulled and the water level is lowered another 0.3 m± for a total of about 1.2 m. The stop logs are reinstalled in March and are not pulled again until the fall at the earliest – (October, November) depending on rainfall and associated storage considerations. Logs are reinstalled before lake freeze up. The target summer water level is at the spillway crest".

The water level rule curve in the final water management plan was classed as 'preliminary' and non-enforceable due to the lack on information on historic water levels and their impact on the lake environment (AMEC 2010). The intent is to finalize an enforceable rule curve for Upper Fry Lake when the Plan is reviewed in five years.

As a large portion of the lake area is very shallow and the reported drawdown (1.2 m) is similar to the mean depth (1.1 m) it was speculated that dam operations may be impacting the fish community and wetland communities of the lake. A fish community assessment was completed in the fall of 2011. The purpose was to describe the current composition of the fish community and examine potential impacts of water level fluctuations on the lakes' current fish populations. The results will be used to contribute to the decision making process for the finalized rule curve.

Methods

The Broad-scale Monitoring protocol was followed according to gear, sampling and data collection (Sandstrom et al., 2010). Gear consisted of large mesh (NA-1) and small mesh (ON-2) gill-nets. The large mesh gillnets target fish larger than 20cm in length, typically the size range of interest to anglers. The net is comprised of eight, 3.1 m panels per gang which are 1.8 meters high. Single gangs were used instead of the typical two-gang straps because of the small size of the lake. The mesh sizes, in inches, are 1.50", 2.00", 2.50", 3.00", 3.50", 4.00", 4.50" and 5.00". The small mesh gillnets target smaller fish. Its stretch measure, also in inches, is 0.50", 0.75", 1.00", 1.25" and 1.50" and panels are 2.5 m long.

Nets were set between September 19, 2011 and September 20, 2011. Net placement followed Broad-scale protocol by being set 250 meters apart in order to limit competition between the nets. Efforts were allocated over the depth strata 1-3 and 3-6 meters. Nets were set overnight for duration of 16-22 hours.

The fork length was measured for all captured fish and any sport fish captured were submitted to full analysis including: fork length, total length, round weight, sex, gonad condition, stomach contents and ageing structures (scales and otoliths).

A temperature-dissolved oxygen profile was collected to determine how the lake was thermally stratified and the availability of oxygen.

Finally, lake bathymetric data was collected using a Garmin 430 GPSMap depth sounder.

Results

Netting occurred on September 19th and 20th, 2011. Weather was fair with high winds on both days. A total of ten sets were completed of which 5 were set in the 1-3 meter strata and 5 set in the 3-6 meter strata. Overall, 6 large mesh gillnets and 4 small mesh gillnets were set as indicated by Table 1. Net set locations are shown in Figure 1.

A total of 161 fish were caught of which 69 were out of large mesh and 92 out of small mesh (Table 2). The sum of the catch, as indicated by Table 2, is as follows: 14 northern pike, 22 white sucker, 14 golden shiner, 34 brown bullhead, 13 rock bass, 4 pumpkinseed, 1 smallmouth bass, 2 largemouth bass, 54 yellow perch and 3 walleye. Two of the three walleye that were caught were released.

The northern pike ranged in fork length from 420 mm to 625 mm (Table 3) with a variety of sizes present in the catch (Figure 2).

Dissolved oxygen and temperature levels, shown in Table 4, indicate no presence of a thermocline; with only a slight decline in temperature and oxygen at the very deepest point of the lake.

An updated bathymetric map is attached as Figure 1.

A reconnaissance of the Seguin River, upstream of the Lake was done. It was found that there was a beaver dam a short distance upstream from the lake that is currently the upstream extent of dam influence. Further upstream, at the first crossing of the Seguin Trail, there is a riffle which would be the ultimate upstream point of influence, though it was not clear if the dam would influence that far if the beaver dam was not present.

AGE STRUCTURE

Discussion

The amount of netting effort was less than the standard described in the Broad-scale Monitoring manual. All nets had only one gang, instead of two and only 6 large mesh nets were set, instead of eight. The reduced effort was done to limit mortality. It was felt that sufficient netting effort had occurred to describe the fish community composition and that additional netting would not have substantially improved the quality of the data or the conclusions that could be drawn with it.

This netting survey found populations of walleye, smallmouth, largemouth and rock bass in the lake which were not previously found in the past assessment. It is suspected that smallmouth, largemouth and rock bass were likely introduced by either fisherman or cottagers on the lake or possibly emigrated from Bear Lake via the Seguin River. The introduction of walleye is thought to have occurred from walleye emigrating out of Bear Lake. All these species, with the possible exception of walleye, probably maintain reproducing populations in the lake.

Northern pike continue to be the dominant large fish species in the lake. The survey indicated a healthy population of northern pike as 14 pike were caught with a relatively small amount of effort, with a range of sizes between 420 mm to 625 mm fork length. Large areas of shallow water with aquatic vegetation appear to provide good habitat for all life stages of pike. Water level fluctuations could directly affect pike if levels change during the spring spawning, incubation and early nursery periods. The description of dam operations available indicates that this does not happen and is supported by the observation of a robust population structure. Fluctuations could impact the population indirectly by changing the habitat; that is the type and amount of aquatic vegetation. There are large areas of vegetation; the amount does not seem to be impacted. How the fluctuations may be influencing the type of vegetation present is not clear. A reconnaissance was done by wetlands staff to obtain a preliminary impression of the impacts on wetland vegetation communities. A summary is provided in the Appendix. It suggests that the open water wetland communities are resilient to water level changes. More detailed information on the types of vegetation present, water depths and magnitude of fluctuations would be required to predict how vegetation communities would change, if at all, under different dam management scenarios.

The three bass species would be most likely to be affected if water levels changed greatly during their spawning and incubation periods in late spring. Apparently this does not happen; therefore these species are probably not directly impacted. Reduced productivity of shallow water areas that are dewatered could affect them indirectly. Largemouth bass may be more common than the netting indicated as the lake has large areas of very shallow water wetland where largemouth may reside that were not netted.

Walleye would be most likely to spawn in the Seguin River, upstream of the lake, possibly at the fast water area identified as the upstream most possibly point of influence of the dam. Walleye spawn in the spring when river flows are relatively high and it would be unlikely that dam operations would affect spawning activity.

There are no fall-spawning fish species in the lake, therefore, loss of incubating eggs or larval due to over-winter de-watering is not a concern. The loss of water volume could potentially impact over-wintering habitat of juvenile and adult fish, particularly if low oxygen levels occur. There are no records of direct winter-kill occurring; however, there is little human development on the lake and some winterkill could go un-noticed. The Seguin River flowing into the lake may keep the oxygen levels at adequate levels. Because they may be very transient, it may be difficult to determine with confidence whether low oxygen levels are impacting the fish community and whether the effect is a result of the water management regime. A reduced drawdown would ameliorate concerns in this regard.

It was noted that there are significant areas of wetland vegetation associated with the lake. It was The upstream influence of the dam was determined to be at the first bridge upstream, which is the first major elevation change. To determine the amount of wetland degradation that occurs from management of the dam a separate formal survey would have to be completed

In summary, the current management plan proposed by the Seguin River Simplified Water Management Plan should not cause any significant impact to the lakes fish populations. To examine the potential impacts on wetlands, however, another assessment should be performed.

In summary, several new species have become established in Upper Fry Lake. Northern pike, the species perhaps most likely to be affected by water level fluctuations continues to be the dominant sport fish species, due to the habitat suitability for this species. It is possible that water level management is having impacts on the fish community but extensive data collection would have to be done to quantify the degree with any certainty. It is recommended that the amount of draw down be rationalized in terms of the benefits versus the possible ecological impacts.

References Cited

AMEC Earth & Environmental. 2005. Seguin River Simplified Water Management Plan Scoping Report. AMEC Earth & Environmental, Mississauga.

AMEC Earth & Environmental. 2010. Seguin River Simplified Water Management Plan. AMEC Earth & Environmental, Mississauga.

Rettie, C. 1978. Aquatic Resource Information Data Sheet. Ministry of Natural Resources, Parry Sound.

Sandstrom, S, M. Rawson and N. Lester. 2010. Manual of Instructions for Broad-scale Fish Community Monitoring; using Large Mesh Gillnets and Small Mesh Gillnets.Ontario Ministry of Natural Resources. Peterborough, Ontario. Version 2010.1-34 p. + appendices.

Table 1 Allocation of large mesh and small mesh gillnets, by depth stratum, Upper Fry Lake, 2011.

			Stratum		
Gear	Effort	. Gangs	01 - 03 m	03 - 06 m	Grand Total
Large Mesh Gillnet	3	1		1	1
	4	1	1		1
	5	1	1		1
	6	1		1	1
	7	1	1		1
	8	1		1	1
Total			3	3	6
Small Mesh Gillnet	1	1	1		1
	2	1		1	1
	9	1	1		1
	10	1		1	1
Total			2	2	4
Grand Total			5	5	10

Table 2 Summary of catch, by effort, gear, depth stratum and species, Upper Fry Lake, 2011.

Effort	Gear	Stratum	Northern Pike	White Sucker	Golden Shiner	Brown Bullhead	Rock Bass	Pumpkin-seed	Small-mouth Bass	Large-mouth Bass	Yellow Perch	Walleye
3	large	03 - 06 m	3	3			1			1		1
4	large	01 - 03 m	1	1		2	3		1	1	3	
5	large	01 - 03 m	1	1		8	2					1
6	large	03 - 06 m	2	8		4	3					1
7	large	01 - 03 m	1	2		3					2	
8	large	03 - 06 m	1	6		1	1					
Total			9	21	0	18	10	0	1	2	5	3
1	small	01 - 03 m	2		8	12	1	2			30	
2	small	03 - 06 m									1	
9	small	01 - 03 m	1		6	1	2				6	
10	small	03 - 06 m	1	1		3		2			12	
Total			4	1	14	16	3	4	0	0	49	0

Table 3 Descriptive statistics of the fork length of captured fish, by gear type, Upper Fry Lake, 2011.

Large Mesh	Northern Pike	White Sucker	Brown Bullhead	Rock Bass	Smallmouth Bass	Largemouth Bass	Yellow Perch	Walleye
n	9	21	18	10	1	2	5	3
mean	507	407	201	208	233	420	151	420
min.	420	148	177	124	233	420	138	360
max.	625	511	229	280	233	421	168	472
std. dev.	60	102	18	57	0	0.7	12	56

Small Mesh	White Sucker	Golden Shiner	Brown Bullhead	Rock Bass	Pumpkin-seed	Yellow Perch	Northern Pike
n	1	14	16	1	4	49	5
mean	240	82	191	260	83	112	521
min.	240	70	160	260	70	60	432
max.	240	100	220	260	100	180	620
std. dev.	0	11	20	0	15	33	75

Table 4 Age frequency distribution and mean fork length-at-age for northern pike, Upper Fry Lake, 2011.

Age	n	Mean Fork Length (mm)	S.D.
2	1	435	
3	4	524	11
4	1	620	
5	1	625	

Table 4 Temperature and dissolved oxygen profile, Upper Fry Lake, September 19, 2011.

Depth (m)	Dissolved Oxygen (ppm)	Temperature (C)
0.5	7.0	16.1
1	7.1	15.6
2	6.9	15.5
3	6.9	15.3
4	6.7	15.3
5	6.7	15.2
6	0.7	12.2

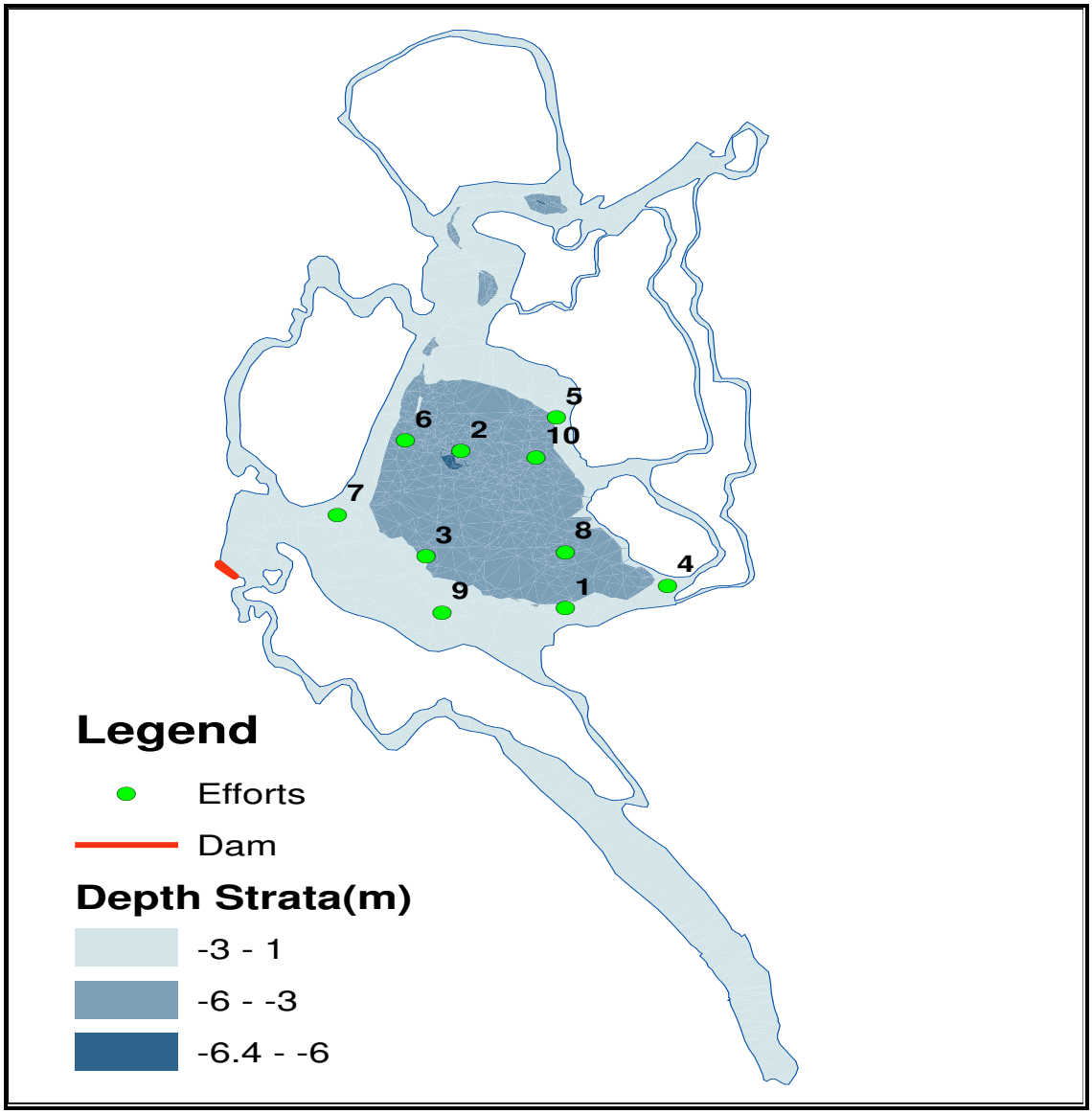


Figure 1 Updated bathymetric map of Upper Fry Lake indicating net efforts and dam location, September 19th and 20th, 2011.

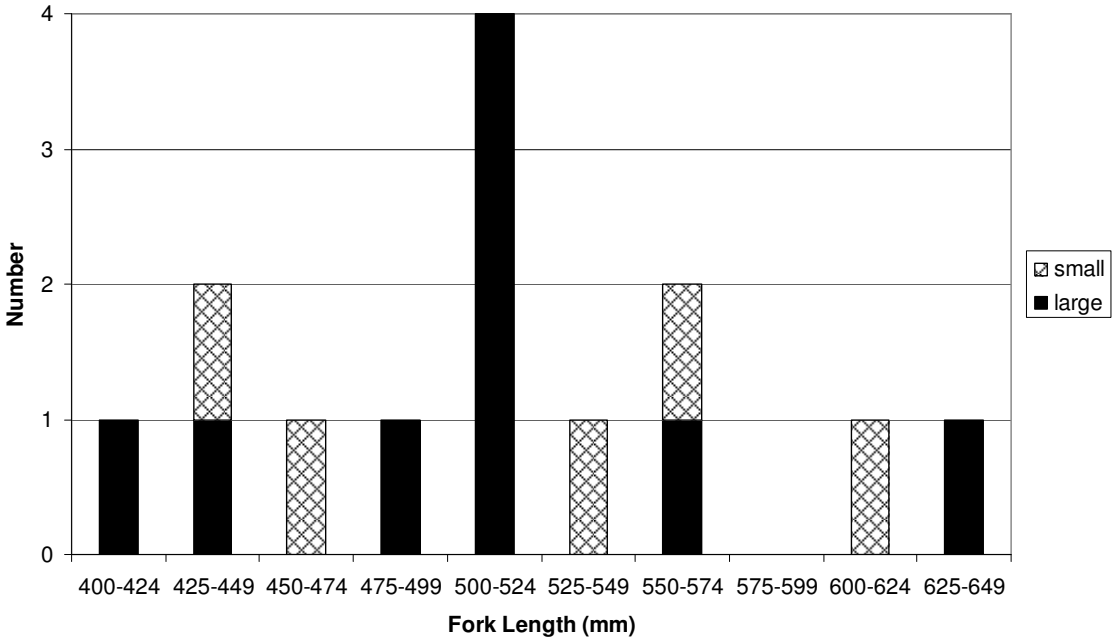


Figure 2 Northern pike fork length frequency distribution, by gear type, Upper Fry Lake, 2011.

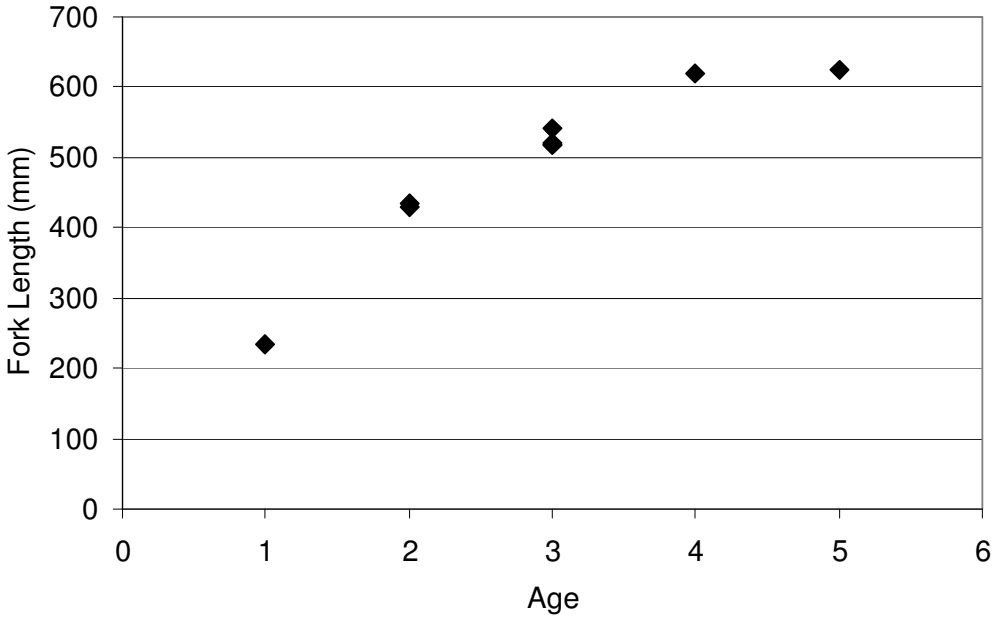


Figure 3 Northern pike age-fork length relationship, Upper Fry Lake, 2011.

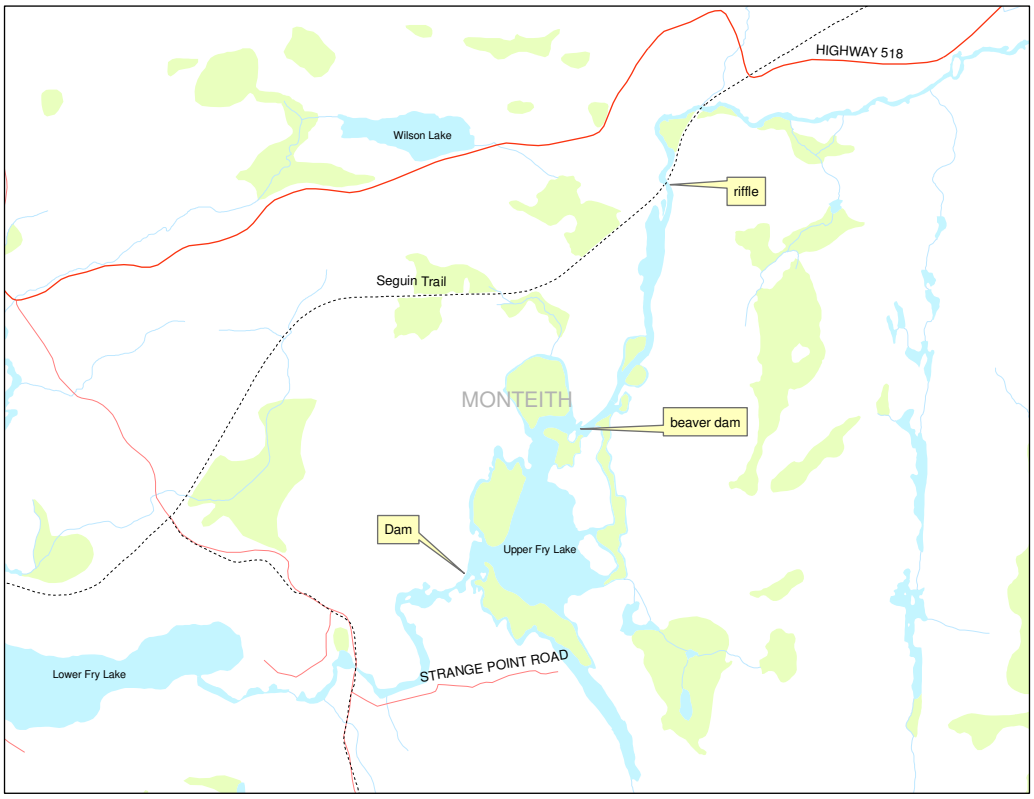


Figure 4 Map showing location of features marking the upstream extent of the influence of the dam on Upper Fry Lake, 2011.

Appendix A Individual fish data, Upper Fry Lake, 2011.

Effort	GEAR	GANG	PANEL	SEL	SPC	FISH	FATE	FLEN	TLEN	RWT	SEX	GON	CLIP_C	AST	AGE	TIS
1	2	1	000	0	131	1	R	432								
1	2	1	000	0	131	2	R	465								
3	1	0	000	0	163	3	R	485								
3	1	0	000	0	163	4	R	480								
3	1	0	000	0	163	5	R	330								
3	1	0	000	0	317	6	R	420								
3	1	0	000	0	334	8	R	360								
3	1	0	000	0	311	9	R	280								
3	1	0	000	0	131	7	R	500								
3	1	0	000	0	131	1	D	520	553	1150	1	22	0	D	3	1
3	1	0	000	0	131	2	D	625	658	1820	1	22	0	D	5	1
4	1	0	000	0	311	1	R	235								
4	1	0	000	0	311	2	R	190								
4	1	0	000	0	311	3	R	270								
4	1	0	000	0	233	4	R	180								
4	1	0	000	0	233	5	R	177								
4	1	0	000	0	331	6	R	143								
4	1	0	000	0	331	7	R	148								
4	1	0	000	0	331	8	R	157								
4	1	0	000	0	163	9	R	423								
4	1	0	000	0	317	11	R	421								
4	1	0	000	0	316	12	D	233	243	184	2	10	0	27	1	1
4	1	0	000	0	131	10	D	540	576	1265	2	22	0	D	3	1
5	1	0	000	0	131	1	D	518	543	1140	1	22	0	D	3	1
5	1	1	000	0	163	2	D	486								
5	1	1	000	0	311	3	D	222								
5	1	1	000	0	311	4	D	130								
5	1	1	000	0	233	5	D	194								
5	1	1	000	0	233	6	D	216								
5	1	1	000	0	233	7	D	178								
5	1	0	000	0	233	8	D	199								
5	1	0	000	0	233	9	D	208								
5	1	0	000	0	233	10	D	194								
5	1	0	000	0	233	11	D	229								
5	1	0	000	0	233	12	D	178								
5	1	0	000	0	334	13	R	472								
6	1	0	000	0	131	1	R	420								
6	1	0	000	0	131	2	R	486								
6	1	0	000	0	163	3	R	458								
6	1	0	000	0	311	4	R	148								
6	1	0	000	0	233	5	R	185								
6	1	0	000	0	233	6	R	198								
6	1	0	000	0	311	7	R	124								
6	1	0	000	0	311	8	R	255								
6	1	0	000	0	163	9	R	284								
6	1	0	000	0	163	10	R	375								

Effort	GEAR	GANG	PANEL	SEL	SPC	FISH	FATE	FLEN	TLEN	RWT	SEX	GON	CLIP_C	AST	AGE	TIS
6	1	0	000	0	163	11	R	422								
6	1	0	000	0	233	12	R	220								
6	1	0	000	0	233	13	R	222								
6	1	0	000	0	163	14	R	475								
6	1	0	000	0	163	15	D	385								
6	1	0	000	0	163	16	D	402								
6	1	0	000	0	163	17	D	450								
6	1	0	000	0	334	18	D	429	456	900	1	22	0	7A	2	1
7	1	0	000	0	131	8	D	435	474	720	1	22	0	2	2	1
7	1	0	000	0	331	1	R	138								
7	1	0	000	0	331	2	R	168								
7	1	0	000	0	233	3	R	190								
7	1	0	000	0	233	4	R	219								
7	1	0	000	0	233	5	R	198								
7	1	0	000	0	163	6	R	486								
7	1	0	000	0	163	7	D	450								
8	1	0	000	0	131	7	D	519	550	990	1	22	0	D	3	1
8	1	0	000	0	311	1	R	228								
8	1	0	000	0	163	2	R	455								
8	1	0	000	0	163	3	R	511								
8	1	0	000	0	163	4	R	151								
8	1	0	000	0	163	5	R	148								
8	1	0	000	0	233	6	R	228								
8	1	0	000	0	163	8	D	465								
8	1	0	000	0	163	9	D	425								
9	2	1	000	0	131	1	R	530								
9	2	1	000	0	131	2	R	560								
10	2	1	000	0	131	1	D	620	659	1770	2	22	0	D	4	1

Appendix B Size tally of fish caught in small mesh gear, Upper Fry Lake, 2011.

Fork Length (mm)	White Sucker	Golden Shiner	Brown Bullhead	Rock Bass	Pumpkin-seed	Yellow Perch
60						1
70		3			1	
80		9			1	6
90		1				4
100		1			2	5
110						6
120						8
130						6
140						3
150						4
160			4			3
170			2			1
180			4			2
190			2			
200			1			
210			2			
220			1			
230						
240	1					
250						
260				1		

Appendix C

A site visit by canoe occurred to Upper Fry Lake by Jan McDonnell and Leeanne Leduc on October 4, 2011. Purpose was to get a sense of amount of wetland present on this lake and to provide comments regarding the operation of the dam at outlet of lake which controls water levels in the lake.

The canoe was put into the water at first bridge off Highway 518 on the Seguin Trail, about 50 m off the highway. There was a small beaver dam on the upstream side of the second bridge (Photo 1) and immediately below the bridge was some rocky rapids; the water drops 20 to 30 cm over these rocks. We portaged the canoe over the bridge and around this area. There is a second beaver dam near the outlet of the river where it empties into Upper Fry Lake. This dam holds back about 30 cm of water.

Much of the floodplain of the river and the lake is wetland, with several wetland communities being obvious:

- Thicket swamp, with winterberry holly, speckled alder and other shrubs
- Open water wetland with floating and submerged aquatics including water shield, white water lily, and others (Photo 3)
- A poor fen floating wetland area on the east side of the lake with Sphagnum moss, low shrubs, and some tree cover including black spruce, tamarack and some deciduous trees such as red maple (Photo 4). We walked on this area and it was spongy and quaking, so therefore not anchored to the bottom but probably floating in response to fluctuating water levels.
- There is no known information on wildlife inhabitants but it is possible that SAR turtles are present in this lake as they have been spotted on the highway close by.

We noted that at the time of our visit, the water level in Upper Fry Lake had dropped by about 30 cm, as evidenced by exposed mud and rock at the edge of the lake.

Dam operations at Upper Fry Lake are described by Parry Sound PowerGen Corp as follows:

- 3 stop logs are pulled out in early February to lower water about 0.9 m
- Another log is pulled out in late February to lower water level another 0.3 m
- Logs replaced in March
- Logs pulled in fall (Oct or Nov) and reinstalled before freeze-up

No wetland evaluation has been done on the wetlands of Upper Fry Lake. The wetland community is extensive here, however, and a wetland evaluation would be warranted.

Water level drawdowns that occur in the dead of winter (especially when they are of a magnitude of 1.2 m or so) are detrimental to hibernating wildlife such as amphibians and reptiles because freezing penetrates the mud where these animals are burrowed. It is also harmful to semi-aquatic furbearers such as muskrats and beaver, which build their overwintering structures based on fall water levels. Fall drawdown cause problems when they occur after wildlife, especially amphibians and reptiles, have entered hibernation in the soft mud at the bottom of the lake as these areas could freeze or be damaged by ice or freeze/thaw actions that would occur in the late fall.

The vegetation of some wetland communities are not impacted by water level manipulations but some, such as the poor fen mat occurring on the east side of the lake, are impacted. Water level changes of a magnitude of 1.2 m would rarely or never occur in nature in the winter months.

Recommendations:

- The most natural regime would be one that would occur with non-regulated system with fixed logs or a low flow weir in place, whereby the water levels would be maintained at some minimal level and otherwise would fluctuate according to natural events. Drastic changes in water levels would no longer occur and wildlife populations and the wetland would benefit.

- If a low flow weir was not possible, then:
  a) a water level regime that no longer allows large drawdowns of 1.2 m in the February with log replacement in March would be preferable.
  b) The adjustment of fall draw downs should occur so that they are complete by mid to late September and no longer be permitted to occur in October and November.