Connecticut Department of Energy & Environmental Protection
Bureau of Natural Resources
Fisheries Division

To: Ms. Kim Welch
From: Christopher McDowell, Fisheries Biologist 1
Re: Fall 2017 summary of the CT DEEP Fisheries Division's sampling at Lower Bolton Lake, Bolton/Vernon
Date: April 30, 2018

This report provides a summary of our findings during our night boat electrofishing and hoop netting samples carried out at Lower Bolton Lake during the fall 2017.

Background and Key Concepts

- The Fisheries Division (FD) samples lake fish populations using a boat electrofisher at night, following standardized sampling protocols. The electrofishing boat is deployed at night in the nearshore areas of the lake. The boat is driven at slow speed (typically < 2 mph) and DC current is pulsed into the water. Stunned fish are netted, counted and measured, then released back into the lake (electrofishing is non-lethal).

- Relative abundances of each species are expressed as catch-per-hour (CPH) of electrofishing time (including only time during which the electrofisher is "on" and generating current). CPH provides a standardized index of abundance that facilitates comparison of species abundance among lakes or over time within a lake.

- For most fish species, FD calculates CPH for two size-classes: fish that are "stock size" or larger (stock size is defined as the smallest size commonly caught by anglers in public lakes), and fish that are "quality size" or larger (quality size is defined as the smallest size which most anglers consider desirable to catch). Definitions of stock and quality size for various fish species pertinent to Lower Bolton Lake are shown in Appendix A.

- Proportional size density (PSD) is an index of size structure that describes the percentage of stock-size fish that are also quality-size or greater. This can be thought of as an index of the percentage of "big" fish within a population.

- In various tables throughout this document, fish species are sorted into three categories that roughly correspond to their trophic level (i.e. their position within the "food chain"):
  - "Top-Level": predatory fish that reach large sizes and prey primarily on other fish.
  - "Mid-Level": fish species that reach intermediate sizes and may consume fish prey.
  - "Low-Level": smaller fish species that prey primarily on invertebrates.
- State averages of stock-size CPH and PSD referenced throughout the document refer to averages from "typical" Connecticut public lakes sampled during 2005-11.
- Appendix B shows stock-size CPH and PSD for all fish species collected using night boat electrofishing at Lower Bolton Lake from 1996 through 2017, as well as the State averages for stock, quality and PSD from "typical" Connecticut public lakes sampled during 2005-11 where applicable.
- Appendix C contains the results of the FD's 2017 hoop netting and night boat electrofishing for Channel Catfish. Though this information has already been submitted separately on March 22, 2018 via email to Ms. Welch, it has been included here to provide all information relative to the FD's sampling carried out at Lower Bolton Lake during fall 2017 within one document.

Key Findings 2017

- FD sampled Lower Bolton Lake on the night of October 31, 2017 using our boat electrofishing unit (Appendix B). Though air temperature was cold, the weather conditions were overall ideal for capturing fish.
- The species composition in Lower Bolton Lake was consistent with past samples and is typical of most Connecticut lakes, in that Lower Bolton Lake contains a diversity of warm water fish species. Of note:
  - All **stock-size** fish species sampled in Lower Bolton Lake during the October 31,

2017 sample, when compared against the applicable statewide average for public lakes, are considered "Below" average, except for Yellow Perch, which were considered "Above" average (Table 1).

o All **quality-size** fish species sampled in Lower Bolton Lake during the October 31, 2017 sample, when compared against the applicable statewide average for public lakes, are considered "Below" average, except for Yellow Bullhead, which were considered "Average" (Table 1).

o The **proportion of quality size individuals (PSD)** within Lower Bolton Lake during the October 31, 2017 sample were all considered "Below" average when compared against the applicable statewide average for public lakes, except for Pumpkinseed, which were considered "Average" (Table 1).

o The diversity and abundance (CPH) of "Top-Level" predatory fish species sampled at Lower Bolton Lake is low (Appendix B).

  ▪ The only "Top-Level" fish species sampled during the October 31, 2017 sample was the Largemouth Bass.

  ▪ Smallmouth Bass, which had been sampled at low levels up until 2011 were again not captured during the October 31, 2017 sample. This does not mean this species is not present in the lake, it just means that our sampling gear did not capture them on that night, which could be due to a number of factors, such as sampling location, timing, water temperature, etc. This species had been recorded as still being present during our 2014-15 open water fishing season angler survey, but in lower numbers than our previous other two angler surveys conducted in 2005-06 and 2010-11. We have found a statewide trend in declining abundance of this species, which is possibly due to warming water temperatures and changing lake and watershed ecosystems.

  ▪ Chain Pickerel, which had been consistently sampled at low levels within the lake since 1996 were not found during the October 31, 2017 sample. This does not mean this species is not present in the lake, it just means

that our sampling gear did not capture them on that night, which could be due to a number of factors, such as sampling location, timing, water temperature, etc. This species had been recorded as still being present during our 2014-15 open water fishing season angler survey, and was within the range of our previous other two angler surveys conducted in 2005-06 and 2010-11.

- o Bluegills and Yellow Perch dominated the "Mid-Level" fish species category for this lake during the October 31, 2017 sample (Appendix B).

- o Golden Shiners, an important "Low-Level" species that is considered a forage fish, which had been consistently sampled in the lake since 1996, though at fluctuating levels, were for the first time not collected during the October 31, 2017 sample (Appendix B). This does not mean this species is not present in the lake, it just means that our sampling gear did not capture them on that night, which could be due to a number of factors, such as sampling location, timing, water temperature, etc.

- Lower Bolton Lake has not been stocked with Channel Catfish since 2012. In response to recent reports from lake shore residents suggesting the possibility of natural reproduction of Channel Catfish in the lake (i.e., reports that small catfish are still evident in the lake), the FD conducted sampling during the fall of 2017 in order to help answer some questions about the population. We deployed a series of baited small mesh hoop nets (4 gang sets of 2 nets in tandem and 1 gang of 3 tandem nets; 11 total individual nets) in September of 2017. In addition, we conducted one night of electrofishing on October 31, 2017.

  - o The nets fished for a total of 7 days capturing a total of 88 catfish (1.14 fish/net-day [length range was 35 – 59 cm]). This catch rate (1.14 fish/net-day) compares well with baited hoop netting data for lake populations in other sections of the country. Of the 88 catfish captured, eight were less than 40 cm in length and could potentially be within the size range of fish naturally spawned in the lake. As a result, these eight catfish were retained for age and growth analysis. During

the October 31, 2017 night boat electrofishing sample the FD captured
seventeen catfish (length range was 39 – 57 cm). No fish from this sampling were
retained for age and growth analysis. Appendix C contains the length frequency
graph for the Channel Catfish captured by method during the fall 2017
samplings.

Table 1. Stock-size catch-per-hour (CPH), Quality-size CPH and proportional size density (PSD) of selected fish species in Lower Bolton Lake during the October 31, 2017 night boat electrofishing sample relative to the State average for public lakes. Entries of "Average" indicate CPH was within ± 10% or PSD was within ± 5 percentage points of State average. Note that Channel Catfish are not included in this table because we do not yet have a statewide CPH or PSD average for this species to compare to. For "Low-Level" species, CPH values represent all fish captured regardless of size (FD does not typically employ stock- and quality-size cutoffs for these species, and therefore does not calculate PSD for these species).

Species	Stock-Size CPH	Quality-Size CPH	PSD
Top-Level			
Largemouth Bass	Below	Below	Below
Mid-Level			
Black Crappie	Below	Below	[1]TF
Yellow Perch	Above	Below	Below
Yellow Bullhead	Below	Average	TF
Bluegill	Below	Below	Above
Pumpkinseed	Below	Below	Average
Low-Level			
Golden Shiner	Below	[2]NC	NC
White Sucker	Below	NC	NC

[1]TF = Too few individuals were caught to calculate a meaningful PSD.
[2]NC = FD does not typically employ stock- and quality-size cutoffs for these species, and therefore does not calculate PSD for these species.

Summary

From the FD's night boat electrofishing sample it was found that the fish community of
Lower Bolton Lake contains a similar species assemblage of what is found in other Connecticut
public lakes. The abundance (CPH) and proportion of quality size individuals (PSD) of most of
these species captured during the October 31, 2017 sample were below the State average for
other Connecticut public lakes. The low abundance of "Top-Level" fish species is concerning, as
is the lack of the "Low-Level" forage fish species Golden Shiner. These factors warrant future
follow-up samples to see if this decline was just an anomaly or a consistent pattern. Lakes are
dynamic systems; however, and fish populations can fluctuate in abundance and growth from
year to year due to changes in habitat and/or climate conditions. It is not unusual for fish to

experience strong year-classes when conditions are favorable and conversely weak year-classes when conditions are less than favorable.

The preparation and processing of the eight retained Channel Catfish for aging work has not yet been initiated. Unlike most fish species, catfish lack scales, which can easily be prepared and aged, which in simplistic terms is akin to reading the rings off of a tree stump. Instead, preparing spines and otoliths (a small ear bone), that are required for aging of this fish species, must be extracted and processed. The preparation of these hard structures (spines and otoliths) is a very labor intensive activity. We will contact you and other members of the Town of Bolton and Bolton Lakes community when we have some definitive results to share with respect to the age of these Channel Catfish that were retained for aging. In the context of our overall priorities and current staffing levels, this will be a few months off.

Appendix A. Stock-size and quality-size cutoffs for various fish species pertinent to Lower Bolton Lake.

Species	Metric (cm)			English (inches)	
	Stock Size	Quality Size		Stock Size	Quality Size
Top-Level					
Largemouth Bass	20	30		8	12
Smallmouth Bass	20	30		8	12
Chain Pickerel	25	38		10	15
Mid-Level					
Black Crappie	13	20		5	8
Yellow Perch	13	20		5	8
Brown Bullhead	15	22		6	9
Yellow Bullhead	15	22		6	9
Channel Catfish	20	30		8	12
Bluegill	8	15		3	6
Pumpkinseed	8	15		3	6
Green Sunfish	8	15		3	6

Appendix B. Current and historic abundance of stock-size and quality size fish (expressed as catch-per-hour [CPH] of electrofishing time) and proportional size density (PSD) in Lower Bolton Lake. Columns labeled "**Stock**" show CPH of stock-size fish, values in parentheses within the "Stock" columns are "**Quality**"-size fish CPH with the exception of "Low-Level" species, for which CPH values represent all fish captured regardless of size (FD does not typically employ stock- and quality-size cutoffs for these species, and therefore does not calculate PSD for these species). The row labeled "**Effort**" represents the hours of electrofisher "on" time (i.e. the amount of time during which the electrofisher is generating electrical current and actively sampling). This effort value is used to calculate CPH. A "-"in a cell indicates the species was not collected in that year, so no values could be calculated.

Year	1996		2000		2001		2005		2006		2007		2007		State Averages	
Sample Dates	10/23		11/01		10/15		10/31		10/24		5/17		10/24		2005-11	
Effort (hrs.)	.59		1.09		1.10		1.01		1.01		.84		1.03			
Species	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD
Top-Level																
Largemouth Bass	79.2 (47.2)	59.6	53.1 (13.7)	25.8	26.3 (14.5)	55.1	38.5 (7.9)	20.5	56.6 (22.8)	40.3	82.6 (18.0)	21.8	59.2 (33.0)	55.7	57.9 (29.4)	54.8
Smallmouth Bass	- (-)	-	7.3 (-)	-	16.4 (1.8)	11.0	2.0 (-)	-	2.0 (1.0)	50	6.0 (1.2)	20	1.0 (1.0)	TF	26.0 (10.4)	39.6
Chain Pickerel	6.7 (1.7)	25.4	27.4 (3.7)	13.5	3.6 (2.7)	75	5.9 (4.0)	67.8	6.9 (5.0)	72.5	7.2 (4.8)	66.7	5.8 (4.9)	84.5	20.6 (6.3)	35.8
Mid-Level																
Black crappie	23.6 (10.1)	42.8	16.5 (16.5)	[2]TF	18.2 (18.2)	TF	28.6 (28.6)	TF	11.9 (11.9)	TF	- (-)	-	18.4 (18.4)	TF	21.3 (17.1)	77.2
Yellow Perch	82.5 (75.8)	91.8	179.3 (160.1)	82.3	89.0 (63.6)	71.5	378.4 (287.5)	76.0	462.5 (442.7)	95.7	111.3 (101.7)	91.4	161.0 (128.1)	79.6	102.1 (48.2)	53.5
Brown Bullhead	- (-)	-	- (-)	-	- (-)	-	- (-)	-	- (-)	-	1.2 (1.2)	TF	- (-)	-	11.7 (10.6)	91.1
Yellow Bullhead	- (-)	-	0.9 (-)	TF	14.5 (10.0)	69.0	6.9 (1.0)	14.5	4.0 (3.0)	75	26.3 (18.0)	68.4	5.8 (2.9)	50	9.8 (6.5)	72.1
Channel Catfish	- (-)	-	- (-)	-	- (-)	-	- (-)	-	- (-)	-	- (-)	-	9.7 (9.7)	TF	[3]NV	NV
Bluegill	304.7 (141.7)	46.5	206.8 (172.9)	83.6	479.3 (413.9)	86.3	374.3 (302.7)	80.9	227.0 (219.0)	96.5	173.3 (95.6)	55.2	368.5 (309.9)	84.1	343.3 (142.3)	47.9
Pumpkinseed	99.2 (11.8)	11.9	18.3 (7.3)	39.8	20.0 (9.1)	45.5	39.8 (4.0)	10.0	21.9 (10.0)	45.7	83.7 (51.8)	61.9	22.7 (1.9)	8.4	59.3 (23.5)	42.3
Green Sunfish	21.3 (7.1)	33.3	16.5 (4.6)	27.9	25.4 (3.6)	14.2	111.5 (21.9)	19.6	73.7 (8.0)	10.8	125.5 (4.0)	3.2	77.5 (3.8)	4.9	NV	NC
Bluegill x Pumpkinseed hybrid	2.4 (2.4)	[1]NC	- (-)	NC	- (-)	NC	- (-)	NC	- (-)	NC	2.0 (2.0)	NC	1.9 (-)	NC	NV	NC
Pumpkinseed x Green Sunfish hybrid	- (-)	NC	- (-)	NC	1.8 (-)	NC	8.0 (4.0)	NC	15.9 (2.0)	NC	2.0 (-)	NC	3.8 (1.9)	NC	NV	NC
Green Sunfish x Bluegill hybrid	- (-)	NC	- (-)	NC	1.8 (1.8)	NC	2.0 (2.0)	NC	2.0 (2.0)	NC	- (-)	NC	1.9 (1.9)	NC	NV	NC
Low-Level																
Golden Shiner	10.1	NC	15.6	NC	0.9	NC	10.9	NC	3.0	NC	26.3	NC	35.9	NC	20.9	NC
Banded Killifish	91.0	NC	-	NC	30.9	NC	42.5	NC	2.0	NC	62.2	NC	92.6	NC	NV	NC
White Sucker	33.7	NC	71.4	NC	31.8	NC	14.8	NC	5.0	NC	2.4	NC	12.6	NC	31.2	NC

[1]NC = FD does not typically employ stock- and quality-size cutoffs for these species, and therefore does not calculate PSD for these species. In the case of hybrids of certain species, though stock and quality size values are calculated, no PSD values are determined because hybrids are typically caught in very low abundances.
[2]TF = Too few individuals were caught to calculate a meaningful PSD.
[3]NV = No value is calculated because not enough public lakes contain this species in sufficient enough abundances to create a statewide average.

Appendix B (Continued). Current and historic abundance of stock-size and quality size fish (expressed as catch-per-hour [CPH] of electrofishing time) and proportional size density (PSD) in Lower Bolton Lake. Columns labeled "**Stock**" show CPH of stock-size fish, values in parentheses within the "Stock" columns are "**Quality**"-size fish CPH with the exception of "Low-Level" species, for which CPH values represent all fish captured regardless of size (FD does not typically employ stock- and quality-size cutoffs for these species, and therefore does not calculate PSD for these species). The row labeled "**Effort**" represents the hours of electrofisher "on" time (i.e. the amount of time during which the electrofisher is generating electrical current and actively sampling). This effort value is used to calculate CPH. A "-"in a cell indicates the species was not collected in that year, so no values could be calculated.

Year	2008		2009		2011		2013		2014		2015		2017		State Averages	
Sample Dates	10/27		11/02		11/03		10/17		10/30		10/21		10/31		2005-11	
Effort (hrs.)	.60		0.51		1.00		1.01		1.03		0.95		1.01			
Species	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD	Stock (Quality)	PSD
Top-Level																
Largemouth Bass	30.1 (20.1)	66.8	17.7 (11.8)	66.7	14.0 (7.0)	50	96.4 (27.8)	28.8	30.1 (18.5)	61.5	39.0 (19.0)	48.7	30.8 (8.9)	28.9	57.9 (29.4)	54.8
Smallmouth Bass	1.7 (-)	-	2.0 (2.0)	TF	- (-)	-	- (-)	-	- (-)	-	- (-)	-	- (-)	-	26.0 (10.4)	39.6
Chain Pickerel	6.7 (6.7)	[1]TF	3.9 (3.9)	TF	17.0 (5.0)	29.4	60.6 (5.0)	8.2	5.8 (2.9)	50	2.1 (2.1)	TF	- (-)	-	20.6 (6.3)	35.8
Mid-Level																
Black crappie	8.4 (8.4)	TF	- (-)	-	4.0 (3.0)	75	8.0 (7.0)	87.5	13.6 (13.6)	TF	6.3 (6.3)	TF	12.9 (12.9)	TF	21.3 (17.1)	77.2
Yellow Perch	195.5 (177.2)	90.6	303.6 (222.8)	73.4	85.2 (38.1)	44.7	84.5 (49.7)	58.8	153.6 (71.0)	46.2	39.0 (26.4)	67.7	117.4 (37.8)	32.2	102.1 (48.2)	53.5
Brown Bullhead	- (-)	-	- (-)	-	- (-)	-	- (-)	-	- (-)	-	- (-)	-	- (-)	-	11.7 (10.6)	91.1
Yellow Bullhead	13.4 (8.4)	62.7	3.9 (3.9)	TF	2.0 (1.0)	50	12.9 (4.0)	31.0	21.4 (10.7)	50	4.2 (2.1)	50	6.9 (6.0)	86.9	9.8 (6.5)	72.1
Channel Catfish	3.3 (1.7)	51.5	3.9 (3.9)	TF	5.0 (4.0)	80	7.0 (7.0)	TF	6.8 (6.8)	TF	19.0 (19.0)	TF	16.9 (16.9)	TF	[3]NV	NV
Bluegill	249.0 (193.9)	77.9	309.5 (209.0)	67.5	685.6 (199.1)	29.0	614.9 (75.4)	12.2	378.3 (310.2)	82.0	161.4 (130.8)	81.0	165.8 (127.0)	76.6	343.3 (142.3)	47.9
Pumpkinseed	18.4 (6.7)	36.4	39.4 (3.9)	9.9	12.0 (4.5)	37.5	154.7 (47.6)	30.8	78.8 (56.4)	71.6	30.6 (13.7)	44.8	24.8 (10.9)	43.9	59.3 (23.5)	42.3
Green Sunfish	55.2 (6.7)	12.1	21.7 (5.9)	27.2	18.0 (1.5)	8.3	138.8 (4.0)	2.9	25.3 (7.8)	30.8	13.7 (3.2)	23.3	60.5 (5.0)	8.3	NV	NC
Bluegill x Pumpkinseed hybrid	6.7 (5.0)	[2]NC	2.0 (-)	NC	1.5 (1.5)	NC	7.9 (7.9)	NC	3.9 (1.9)	NC	7.4 (4.2)	NC	4.0 (3.0)	NC	NV	NC
Pumpkinseed x Green Sunfish hybrid	5.0 (1.7)	NC	17.7 (11.8)	NC	1.5 (-)	NC	7.9 (-)	NC	13.6 (5.8)	NC	20.0 (4.2)	NC	12.9 (6.0)	NC	NV	NC
Green Sunfish x Bluegill hybrid	1.7 (1.7)	NC	2.0 (2.0)	NC	7.5 (6.0)	NC	2.0 (-)	NC	4.9 (1.0)	NC	1.1 (1.1)	NC	3.0 (3.0)	NC	NV	NC
Low-Level																
Golden Shiner	23.4	NC	9.9	NC	10.0	NC	22.9	NC	24.3	NC	3.2	NC	-	NC	20.9	NC
Banded Killifish	71.9	NC	5.9	NC	-	NC	2.0	NC	9.7	NC	3.2	NC	29.8	NC	NV	NC
White Sucker	23.4	NC	25.6	NC	15.0	NC	22.9	NC	40.8	NC	44.3	NC	6.0	NC	31.2	NC

[1]TF = Too few individuals were caught to calculate a meaningful PSD.
[2]NC = FD does not typically employ stock- and quality-size cutoffs for these species, and therefore does not calculate PSD for these species. In the case of hybrids of certain species, though stock and quality size values are calculated, no PSD values are determined because hybrids are typically caught in very low abundances.
[3]NV = No value is calculated because not enough public lakes contain this species in sufficient enough abundances to create a statewide average.

Appendix C. Length frequency for Channel Catfish sampled at Lower Bolton Lake during fall 2017 using both baited hoop nets and night boat electrofishing.

Length Frequency of Channel Catfish Caught at Lower Bolton Lake During Fall 2017 Using Hoop Netting and Night Electrofishing