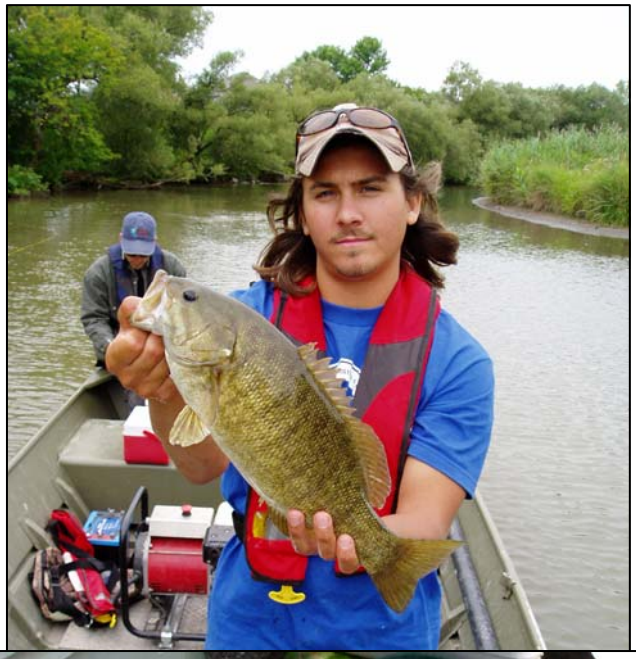
AQUATIC MONITORING PROGRAM
2007 Annual REPORT

Central Lake Ontario Conservation Authority



DURHAM REGION

Central Lake Ontario Conservation

"What we do on the land is mirrored in the water."

2007 AQUATIC MONITORING PROGRAM REPORT

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1.0 Introduction

In order to make sound, science-based management decisions about local **watersheds**, the Central Lake Ontario Conservation Authority (CLOCA) conducts long-term watershed health monitoring. This information helps CLOCA understand current conditions, identify ecological trends, provides a strong basis to measure the effectiveness of stewardship activities and also provides guidance in making informed land-use decisions. Typical components of the watershed are monitored: aquatic habitat (e.g. habitat assessments and temperature monitoring); fish and benthic macroinvertebrates (benthos); terrestrial habitat (e.g. riparian and tableland vegetation , wildlife); and, water quality and quantity of both surface water and groundwater. This report focuses on the Aquatic Monitoring Program, specifically Fisheries, Biological Water Quality and Stream Temperature.

To ensure that monitoring is done using standardized protocols, whenever possible, CLOCA participates in national, provincial or municipal networks. Our partners include Environment Canada (EC), Fisheries and Oceans Canada (DFO), Ministry of Environment (MOE), Ministry of Natural Resources (MNR) and other Conservation Authorities.

Located east of Toronto within the Region of Durham (Figure 1), the Authority's jurisdiction encompasses 638 square kilometres and is defined by the area drained by fifteen watersheds (Figure 2). Local municipalities located within the jurisdiction, in whole or in part, include the cities of Oshawa and Pickering, the towns of Ajax and Whitby, the Municipality of Clarington, the townships of Scugog and Uxbridge.

Figure 1. Location of CLOCA jurisdiction (highlighted in green).

A **watershed** is defined as an area drained by a river or creek and its tributaries.

Figure 2. CLOCA jurisdiction.

2.0 Fisheries - Streams

2.1 Introduction

Fish are one of our most valued natural resources from ecological, economic, social and cultural perspectives. Healthy fish and environments result from protecting and/or restoring aquatic ecosystems (Draft Terms of Reference, 2005). In order to help determine aquatic ecosystem health and monitor it over time CLOCA conducts fisheries assessments in various watersheds each season. Ongoing annual aquatic monitoring is recommended in the Central Lake Ontario Fisheries Management Plan (CLOFMP; CLOCA/MNR 2007). Information collected during these programs supports the goals and objectives of the CLOFMP and allows for an adaptive management approach.

Historically, watersheds within the Central Lake Ontario Conservation Authority supported healthy cold-water fish communities and a strong brook trout and Atlantic salmon fishery. With increasing urbanization and changing land-use patterns, many of the cold water streams have become cool or warm-water systems. The Atlantic salmon fishery has since collapsed and has been supplemented by stocking of Pacific salmon and trout species. The distribution of brook trout in many areas has been reduced to the undeveloped headwater reaches where natural cover is still present (CLOCA/MNR 2007).

While there have been many changes to the fisheries, the Central Lake Ontario watersheds are still home to a diverse array of fishes including cold-, cool- and warm-water species. Some of these watersheds, most notably Oshawa Creek, support healthy populations of sport fishes and as such are popular destinations for anglers. Angling opportunities include Chinook salmon and rainbow trout during the spring and fall spawning runs, and brook trout and brown trout fishing during the regular season. Anglers also take advantage of fishing popular warm-water species like bass, sunfish and carp in the coastal areas (CLOCA/MNR, 2007).

Generally, CLOCA conducts fisheries sampling in streams using a common sampling method called **electrofishing** (see photo). On occasion, when electrofishing is not a suitable technique, other sampling methods, such as seine nets, fyke nets and minnow traps, are utilized. Backpack electrofishing, is conducted, for the most part, according to the Ontario Stream Assessment Protocol (OSAP) published by the MNR (Stanfield, 2005).

Electrofishing is a sampling method that temporarily immobilizes fish in water using electricity. Once immobilized, they can be captured with nets and fisheries staff can collect biological information (e.g., species, length, weight) before releasing them.

2.2 Monitoring Results and Fisheries Management

The draft Central Lake Ontario Fisheries Management Plan (MNR/CLOCA 2007) outlines watershed and subwatershed-based goals and objectives for the fisheries resource and habitat within Oshawa Creek, and identifies target species and fish communities for management. CLOCA's annual aquatic monitoring helps to assess these goals and objectives and is consistent with the management recommendations made within the Plan. Further, it allows for an adaptive management approach.

During 2007, 31 OSAP sites were sampled (four of which were dry) by CLOCA as part of the annual aquatic monitoring program and six were sampled through the OSAP Training Course in the Oshawa Creek watershed (Figure 3). Fish species that were captured are listed in Table 1.

The results of the 2007 CLOCA Aquatic Monitoring are consistent with the goals and objectives of the FMP. The main branches of Oshawa Creek are still dominated by migratory salmonids and should remain managed as such. Upstream of impassable barriers to fish migration, streams remain dominated by resident coldwater fish communities including brook trout, brown trout and sculpin species. These headwaters should continue to be managed for these sustainable and diverse fish communities.

Round goby, a highly invasive fish from eastern Europe, is widely distributed throughout Lake Ontario (Figure 4) and is rapidly expanding it's distribution into connecting waterbodies (Ontario Federation of Anglers and Hunters, 2007). In 2007, CLOCA, in partnership with the Ontario Federation of Anglers and Hunters (OFAH), began monitoring the spread of round goby into tributaries along the north shore of Lake Ontario, including Oshawa Creek. Some of the objectives of this project were to assess the efficacy of instream barriers to control the spread of round goby into Lake Ontario tributaries, and to track the distribution of this invasive species into stream habitats. This project supports the recommendations in the CLOFMP to: 1) Continue ongoing annual aquatic monitoring throughout the watershed, particularly targeting the lower reaches, for invasive species; 2) participate in public outreach and education programs to raise awareness about the threat of invasive of nuisance species; and, 3) investigate measures to control the introduction and spread of invasive species.

Four watersheds were sampled as part of the 2007 Round Goby Monitoring Program (Figure 5). These watersheds included two creeks with instream barriers to fish migration (Bowmanville Creek and Cobourg Creek) and two without (Oshawa Creek and Soper Creek). Sampling included single and multiple pass backpack electrofishing to assess the fish community, biomass, and the ability of sampling methods at detecting round goby. In addition to electrofishing, beach seining was employed to sample fish along the Lake Ontario shoreline in close proximity to the creek mouths. The results of this sampling indicated that the barriers to migration, in this case dams, were effective at restricting the spread of round goby. A summary of catch can be found in Table 2.

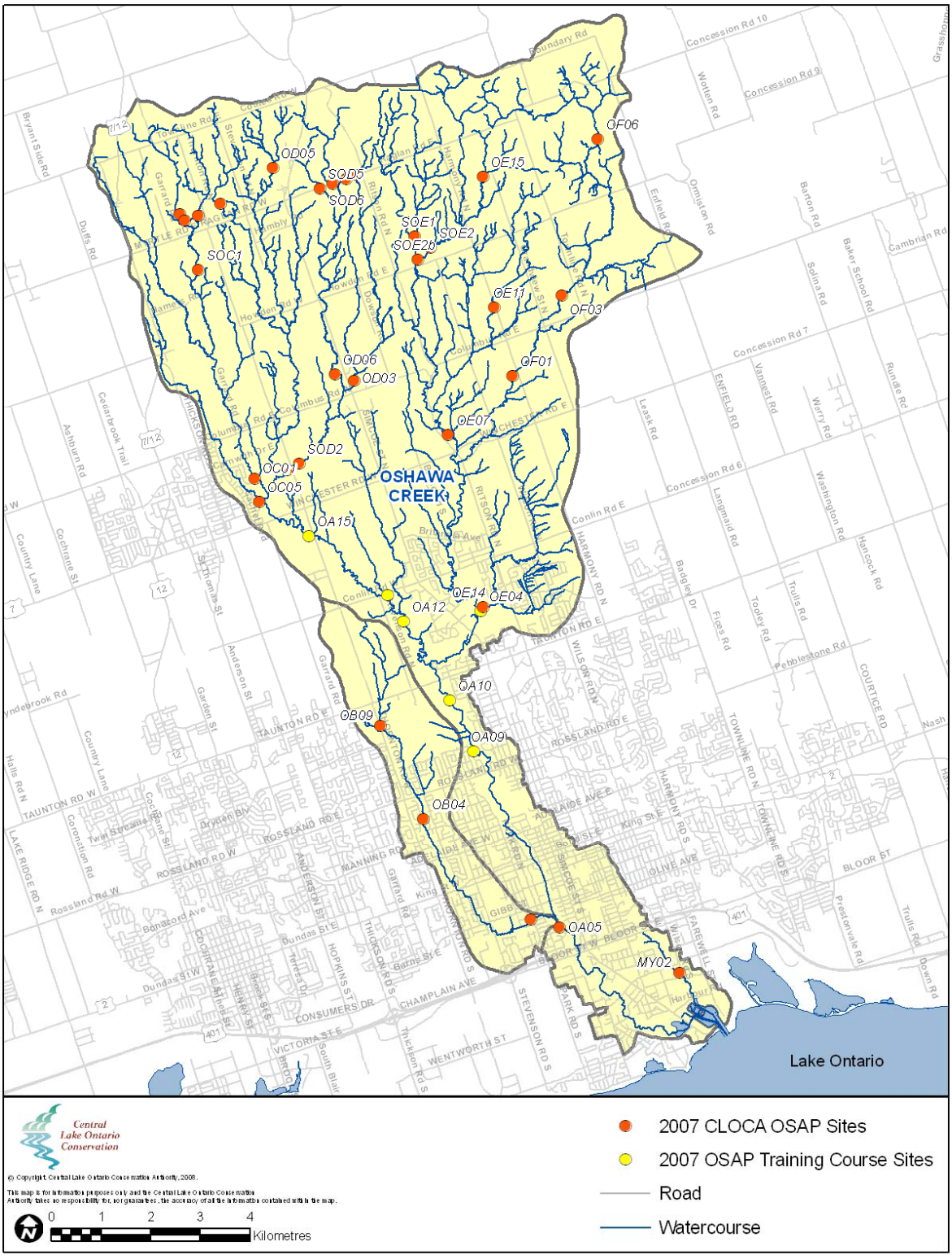

Figure 3. 2007 stream fisheries sites.

Table 1. Number of fish species and individuals caught at OSAP sites within the Oshawa Creek watershed during 2007 sampling compared to historical sampling results (where available).

	Sites																							
	OA05		OA09*		OA10*		OA12*		OA13*		OA15*		OB01		OB04		OB09		OC01		OC03		OC05	OC06
Fish Species (common name)	2000	2007	2000	2007	2000	2007	2000	2007	2000	2007	2000	2007	2000	2007	2000	2007	2000	2007	2000	2007	2000	2007	2007	2007
brook trout (YOY)												Fish Not Sampled									No Catch	No Catch		No Catch
brook trout																								
rainbow trout (YOY)	1	1	3		1	✓	56	✓	30	✓	19									14			4	
rainbow trout	1	4	5	✓	20	✓	30	✓	10	✓	3								1	2				
brown trout (YOY)		2						✓											4	1				
brown trout		1	3	✓				✓		✓									15	9				
Chinook salmon (YOY)	2	4	2	✓?																				
creek chub			3	✓	3	✓	6		2	✓	29			3	166	66	10	65						
western blacknose dace	10	30		✓	4	✓	65	✓	64	✓	93		49	75	200	45	22	48					5	
longnose dace	31	162	13	✓	67	✓	58	✓	15	✓	5			8										
fathead minnow					1						7													
common shiner		20	1							✓	6													
bluntnose minnow																								
northern redbelly dace											1							7						
white sucker	2	35	9	✓	19	✓	5	✓	6	✓	24				1	11			1					
sculpin sp.																								
mottled sculpin	1	1	7	✓	9	✓	45	✓	50	✓	40								11	5				
slimy sculpin																								
rock bass			2	✓		✓																		
pumpkinseed			1			✓	1			✓														
johnny darter	41	14	17	✓	57	✓				✓	18					2								
brook stickleback																8								
smallmouth bass	1		7	✓	1																			
sea lamprey (adult)								✓																
Grand Total	90	274	73	--	182	--	266	--	177	--	245	--	49	86	367	132	32	120	32	31	0	0	9	0
Species Total	8	9	12	11	9	9	7	7	6	10	10	--	1	3	3	5	2	3	4	3	0	0	2	0

Note: YOY or young of year refers to fish that are in their first year of life i.e. < 100mm.

* represents OSAP sites that were sampled through the 2007 OSAP Training Course.

✓ - site was not sampled with consistent effort therefore only presence information is reported.

Con'd - Table 1. Number of fish species and individuals caught at OSAP sites within the Oshawa Creek watershed during 2007 sampling compared to historical sampling results (where available).

	Sites																							
	OD03		OD04		OD05		OD06	OE04*		OE07		OE11		OE14	OE15	OF01		OF03		OF06		SOC1		SOC3	
Fish Species (common name)	2000	2007	2000	2007	2000	2007	2007	2000	2007	2000	2007	2000	2007	2007	2007	2000	2007	2000	2007	2000	2007	2000	2007	2000	2007
brook trout (YOY)			No Catch	No Catch	45	19						21	13		No Catch					2	1		22	No Catch	No Catch
brook trout					2	5						2								6		17	10		
rainbow trout (YOY)					1			2	✓	3	33			2			1								
rainbow trout					1			5	✓	9	4														
brown trout (YOY)								1		5															
brown trout								1		1	1														
Chinook salmon (YOY)																									
creek chub	33	3					40	9	✓					32		2	5	45	112						
western blacknose dace	71	4					53	35	✓	2				13		14	28	91	157	5	2				
longnose dace								3	✓									3							
fathead minnow	27																		24		2				
common shiner																									
bluntnose minnow																	4								
northern redbelly dace																		1	22						
white sucker	5						1	7	✓	2				1		2	3	1	6						
sculpin sp.																									
mottled sculpin								27	✓	47	40											2	4		
slimy sculpin					2	3																			
rock bass																1									
pumpkinseed																									
johnny darter																									
brook stickleback																									
smallmouth bass																									
Grand Total	136	7	0	0	51	27	94	90	--	69	78	23	13	48	0	19	41	141	321	13	5	19	36	0	0
Species Total	4	2	0	0	3	2	3	7	6	5	3	1	1	4	0	4	5	5	5	2	3	2	2	0	0

Note: YOY or young of year refers to fish that are in their first year of life i.e. < 100mm.

* represents OSAP sites that were sampled through the 2007 OSAP Training Course.

✓ - site was not sampled with consistent effort therefore only presence information is reported.

Con'd - Table 1. Number of fish species and individuals caught at OSAP sites within the Oshawa Creek watershed during 2007 sampling compared to historical sampling results (where available).

	Sites													
	SOD1		SOD2		SOD5	SOD6	SOD7	SOD8	SOE1		SOE2		SOE2b (SOE3)	
Fish Species (common name)	2000	2007	2000	2007	2007	2007	2007	2007	2000	2007	2000	2007	2000	2007
brook trout (YOY)					Dry, Not Sampled	Dry, Not Sampled	Dry, Not Sampled	Dry, Not Sampled	6	28	51	172	1	8
brook trout									38	12	12	5	8	
rainbow trout (YOY)														
rainbow trout	1												4	8
brown trout (YOY)	1										73	6	2	8
brown trout	5										8		4	11
Chinook salmon (YOY)														
creek chub	44	37	86	152										
western blacknose dace	68	89	42	79										
longnose dace														
fathead minnow	7	2	28	3										
common shiner	2													
bluntnose minnow	1		45											
northern redbelly dace	2	1		1										
white sucker	37	7	4	27										
sculpin sp.										7				
mottled sculpin									2	2	36	4	1	10
slimy sculpin										2				
rock bass														
pumpkinseed	2													
johnny darter	5	13	1	18										
brook stickleback														
smallmouth bass														
Grand Total	175	149	206	280					46	51	180	187	20	45
Species Total	11	6	6	6					2	4	3	3	4	4

Note: YOY or young of year refers to fish that are in their first year of life i.e. < 100mm.

* represents OSAP sites that were sampled through the 2007 OSAP Training Course.

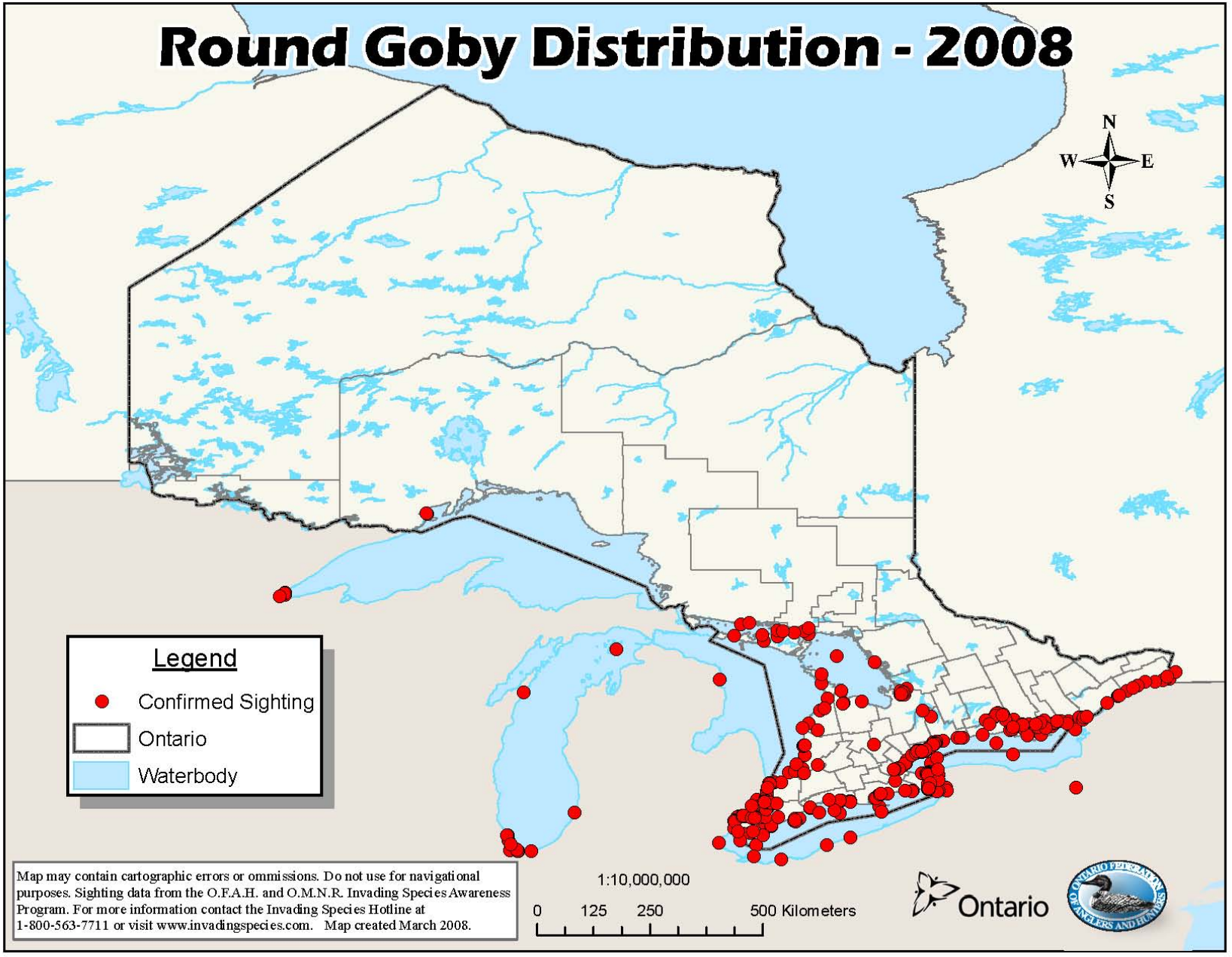

Figure 4. Round goby distribution in Ontario as of 2008.

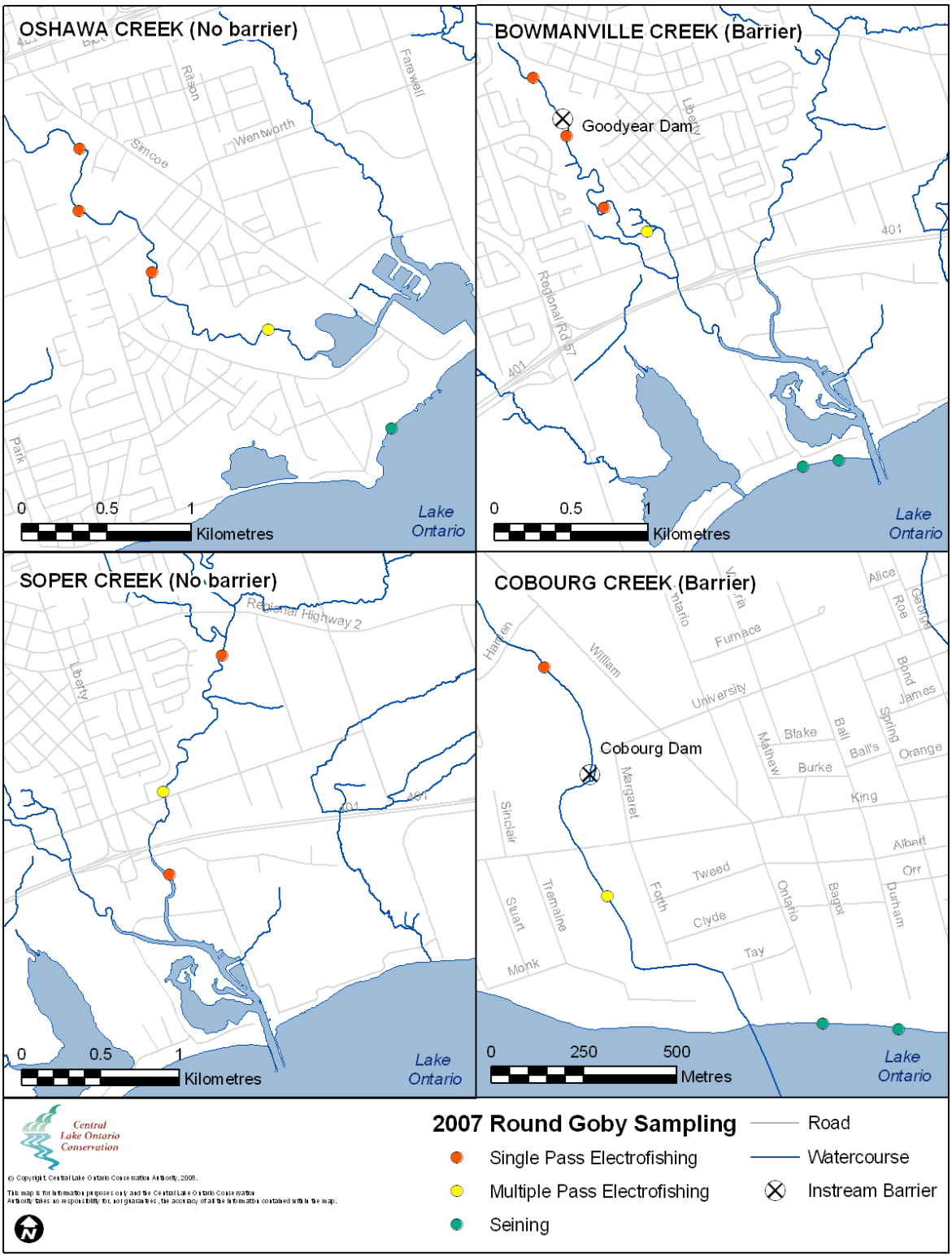

Figure 5. 2007 Round Goby Monitoring Program sampling locations.

Table 2. 2007 Round Goby Monitoring Program sampling results.

		Sites																	
		Oshawa Creek					Bowmanville Creek						Soper Creek			Cobourg Creek			
	Fish Species (common name)	OSH01**	OSH02	OSH03	OSH04	Oshawa Seine*	BOW01**	BOW02	BOW03	BOW04	Bowmanville Seine 1*	Bowmanville Seine 2*	SOP01	SOP02**	SOP03	CB01**	CB02	Cobourg East Seine*	Cobourg West Seine*
1	alewife										7/5/0	0/1/2/0/0						0/2/1/1/1	31/0/0/0/0
2	rainbow smelt											0/0/0/0/5						0/0/0/0/32	
3	rock bass	3	12	2	4		1						1	1					
4	goldfish									2									
5	white sucker	9	33	48	19		7	21	1	25			16	1	3		4	0/0/0/0/3	0/1/0/0/0
6	mottled sculpin		6	9	10			7	2	13			8	1	32	22	91		
7	brook stickleback													3					
8	Cypinid sp_													6					
9	rainbow darter						49	35	23				7	7	38				
10	fantail darter															2	4		
11	johnny darter	1	66	96	27		13	18	13	62			5	20	48	6	45		
12	green sunfish			1															
13	pumpkinseed	1	2	4	2			1	2	2									
14	emerald shiner					51/0/48					335/33/28	428/9/32/85/1						8/2/1/0/29	238/15/0/0/1
15	common shiner				1		5	17					2		1		11		
16	mimic shiner										4/0/0								
17	sand shiner					1/0/0					0/2/1	0/0/7/0/1						0/0/0/1/0	
18	smallmouth bass		19	21	10			5											
19	round goby	58	1	1		0/4/0	37	23	1		0/1/0	2/4/0/9/21	1	34		42		176/97/57/6/1	17/27/18/1/1
20	spottail shiner	1									5/11/2	2/2/0/0/3	3	1				0/0/0/0/7	1/0/0/0/0
21	coho salmon						1					2/3/1/1/0	1						
22	rainbow trout	5	10	9	6		14	24	21	136		0/1/1/0/1	4		21	37	84	1/0/0/1/0	
23	chinook salmon					4/5/5				7	208/70/105					1	1		0/0/0/2/0
24	yellow perch																	2/6/1/1/0	1/0/0/0/0
25	logperch	5		1				2					1						
26	sea lamprey	1					1												
27	bluntnose minnow							22	5	2									
28	fathead minnow						2		1										
29	blacknose dace	4					7						1	6		15			
30	longnose dace	13	136	138	423	0/0/2	114	127	102	295		5/0/5/6/3	16		190	141	279	11/1/3/5/4	3/0/0/1/0
31	Atlantic salmon															4	1		
32	brown trout	11	2	2	2		1			4			1		1		1		
33	Salmonid sp.		2																
34	creek chub			3	4		7	3	1	44						2	1		
	Grand Total	112	289	335	508	56/9/55	259	305	172	592	559/122/136	439/20/48/101/35	67	80	334	272	522	198/108/63/15/77	293/43/18/3/2
	Species Total	12	11	13	11	5	14	13	11	11	7	9	14	10	8	10	11	10	8

Note: * denotes seining sites
** denotes multiple pass electrofishing sites to assess biomass
/ separates catch from seine net hauls 1, 2, 3, 4 and 5 (where applicable) respectively

3.0 Fisheries - Wetlands

Great Lakes coastal wetlands are a unique wetland type that have formed at the mouths of streams and rivers where they empty into the lakes, or in open or protected bays along the shoreline. Lake Ontario's water level has been regulated since 1960 to accommodate increased demand for shipping and hydroelectric power. Natural water level variability has been diminished, reducing the biological diversity of coastal wetlands that depend on water level fluctuations to maintain diverse vegetation communities (Environment Canada and Central Lake Ontario Conservation Authority, 2004a).

The Durham Region Coastal Wetland Monitoring Program (DRCWMP) is designed to be a long-term monitoring program that enables reporting on the condition of coastal wetlands in the Region. The project was initiated in 1999 and monitoring began in 2002. Partners involved include Environment Canada, Central Lake Ontario Conservation Authority, Toronto Region Conservation Authority (TRCA) and Ganaraska Region Conservation Authority (GRCA) (Environment Canada and Central Lake Ontario Conservation Authority, 2004b).

As part of the DRCWMP, fish communities in wetlands are assessed using a sampling method called boat electrofishing (see photo on right; see page 3 for a definition of electrofishing). In order to have consistent sampling effort, fish are sampled within the DRCWMP wetlands using the same electrofishing boat, owned and operated by CLOCA. Boat electrofishing is conducted according to DRCWMP fish sampling protocol (Environment Canada and Central Lake Ontario Conservation Authority, 2003).

The relative condition of the fish community at each wetland and over multiple years is compared using an Index of Biotic Integrity (IBI). IBIs, which are multi-metric indices, were first developed for use with stream fish communities by James Karr in central Illinois and Indiana (Karr, 1981). Metrics, or attributes, appropriate to Lake Ontario coastal wetland fish communities were selected and tested for suitability in the IBI based on a significant ($p<0.05$) or moderate ($p<0.20$) response to disturbances of the wetland. Six metrics were found to correlate either negatively or positively with disturbance and were, thus, retained for use in this IBI: number of native species, number of centrarchid species, percent piscivore biomass, number of native individuals (metric was corrected for site-specific interaction) and biomass (g) of yellow perch. Each wetland receives an IBI score between 0 and 100 each year/time that it is sampled (see Table 4) (Environment Canada and Central Lake Ontario Conservation Authority, 2004b).

In 2006, for the first time since the project began, round goby (see photo on right) were captured in Frenchman's Bay Marsh and Port Newcastle Marsh (see Table 4 and 5). Round goby are an invasive species from eastern Europe that were first discovered in the St. Clair River in 1990. It is believed that they were introduced through ballast water from ships (Ontario Federation of Anglers and Hunters, 2007). Round goby distribution in Ontario, as of 2008, is shown in Figure 4.

In Frenchman's Bay Marsh, six round goby were caught in 2006 on the same sampling transect along the barrier beach that separates the marsh from Lake Ontario. In 2007, 12 round goby were captured throughout the marsh and were not localized to one area e.g., barrier beach. Although more goby were captured in 2007, more data is needed to determine if the population is increasing.

While preparing equipment for 2006 sampling, CLOCA staff were informed by children fishing with their father at the public boat launch (Bond Head Park) that they were catching countless round goby. Consequently numerous round goby were captured near the outlet through a qualitative supplemental sample. This was the first time round goby has been officially documented at this location. During both 2006 and 2007 sampling, no round goby were caught on official DRCWMP transects within Port Newcastle Marsh.

Since monitoring began in 2002, the barrier beach that isolates McLaughlin Bay Marsh from Lake Ontario has only completely opened once (see photo on right). In the spring of 2005 (~April 8) it is likely that high water levels within the marsh caused the barrier beach to break open for an extended period (end of July) until Lake Ontario wave action closed the outlet with beach material. During the 2005 fish sampling in August it was noted that many new species were caught compared to 2003 sampling (see Table 3). Some of these new species such as freshwater drum and common species such as brown bullhead (see photo on left) were showing signs of stress. During 2006

and 2007 sampling, the numbers of species captured were similar to 2003 results, which were almost half of 2005 results. This drastic change was likely due to poor water quality (e.g., turbid water) and habitat requirements (e.g., closed barrier beach prevented seasonal and diurnal fish movement).

Goldfish (see photo on right) have been captured in Rouge River Marsh, Corbett Creek Marsh, Pumphouse Marsh and Oshawa Second Marsh. Indigenous to eastern Asia they are a non-native species that has been introduced by the release of aquarium pets. This is an ongoing problem as goldfish compete with native species for food and habitat, contribute to turbidity and damage vegetation (Richardson et al., 1995). Goldfish often find suitable conditions in various wetlands and ponds.

The summer of 2007 had very little precipitation and as a result, Pumphouse Marsh was completely dry by August (see photo on left). It is unlikely that any fish survived this event as no refuge pools were observed by CLOCA staff. Sampling results during 2008 will be interesting considering the impact of the 2007 dry marsh condition.

For the first time as part of the DRCWMP, fish sampling was conducted within the Whitby Harbour Wetland Complex (see photos below). Results were poor with fish being captured only in a few location within the marsh. Since this is the first time that the marsh has been sampled, next years results will be interesting.

Table 3. Number of fish and species caught at CLOCA coastal wetlands from 2002 - 2007.

	Lynde Creek Marsh						Whitby Harbour Wetland Complex	Corbett Creek Marsh				Pumphouse Marsh			Oshawa Second Marsh				McLaughlin Bay Marsh				Westside Marsh			Bowmanville Marsh					
Fish Species Common Name	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2007**	**2003**	**2005**	**2006**	**2007**	**2003**	**2006**	**2007**	**2002**	**2005**	**2006**	**2007**	**2003**	**2005**	**2006**	**2007**	**2005**	**2006**	**2007**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
alewife		1	2		12															1						6	1	2			1
banded killifish								1			2					28	1	2													
black crappie	4		1		4	1							3					1	13	2	12	7	1		1					
bluegill									5				6											1						
bluntnose minnow		3	7		1	1	2													3				2			4	1	9		2
bowfin	1																														
brook silverside																															
brook stickleback									1							4															
brown bullhead	12	18	129	19	9	56		6	55	32	4	5	5		3	22	49	67	17	16	4	8	23	5	99	2	13	7	24	1	16
central mudminnow												32																			
common carp	2		4	5	1	1	5	3	6	2									1	2	3	4	3	1				1		3	
common shiner				1		5																									
emerald shiner			33		11	2	2																					24			
fathead minnow	46	24	3		4	4	1	21	3	15	9	484	10		154	167	12	1					17	7				1	3		15
freshwater drum																				3											
gizzard shad		10	6	30	4	1	19													212	36	19	37	5	11	1			8	1	13
golden shiner		6	3		1	2			17														1			2	16	4	33		12
goldfish										1		37	60		10	69	30	67													
johnny darter			2				1																				1				
largemouth bass			1																			1		1	1						
logperch			9				1																								
northern pike				3	1				1	1																				1	
pumpkinseed	92	38	32	45	11	7		8	23	3	13		36			50	97	24	6	24	4	6	7	18	24	11	28	36	42		88
rock bass																															
round goby[†]																															
smallmouth bass	2				1																							1			
spotfin shiner																															
spottail shiner	23	18	1	1	6															1			1				7	19	2	1	31
walleye		1	1																									1			
white perch																				4		1									
white sucker			5		1	5	3									1				1					1			1			
yellow perch	1		1	9	3	13			1		2				20		4	1	5	11	5	5	2	4	7		5		1	1	1
Grand Total	**183**	**119**	**240**	**113**	**70**	**98**	**34**	**39**	**112**	**54**	**30**	**558**	**120**	**--**	**187**	**341**	**193**	**163**	**42**	**280**	**64**	**51**	**92**	**44**	**144**	**22**	**75**	**98**	**122**	**8**	**179**
Species Total	**9**	**9**	**17**	**8**	**15**	**12**	**8**	**5**	**9**	**6**	**5**	**4**	**6**	**--**	**4**	**7**	**6**	**7**	**5**	**12**	**6**	**8**	**9**	**9**	**7**	**5**	**8**	**12**	**8**	**6**	**9**
IBI Score	**--**	**41**	**34**	**60**	**48**	**50**	**9**	**27**	**66**	**31**	**40**	**27**	**34**	**--**	**--**	**46**	**41**	**27**	**36**	**57**	**30**	**35**	**30**	**35**	**52**	**--**	**44**	**36**	**49**	**26**	**60**

Marsh Completely Dry

Table 4. Number of fish and species caught at TRCA coastal wetlands from 2002 - 2007.

	Rouge River Marsh				Frenchman's Bay Marsh				Hydro Marsh				Duffins Creek Marsh						Carruthers Creek Marsh			
Fish Species Common Name	**2003**	**2005**	**2006**	**2007**	**2003**	**2005**	**2006**	**2007**	**2003**	**2005**	**2006**	**2007**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2002**	**2003**	**2006**	**2007**
alewife					11			41	4		3				5							
banded killifish																						
black crappie									1			1			1				5		3	1
bluegill					4															2		
bluntnose minnow	2		2		7	6		4		2			31	6	10		5	1	37	6	3	
bowfin			2																			
brook silverside																						
brook stickleback																						
brown bullhead	64	21	14	33	2		9		66			33	38	1	5			1	12	8	1	31
central mudminnow																						
common carp	3	1	5	1	5	1	1		3	3		6		3	1		2		7	7	1	12
common shiner	1	1	18	3						2			41	14	1	4	1		32			
emerald shiner	5	1			35	9	1	20			4			1	8			4		1		
fathead minnow	2		3	2			6		22		18			13	17		29			37	12	48
freshwater drum					1																	
gizzard shad	3	10	7	3	1	23	6		1	3	24		59	12	5	13	20	24	87	6	1	158
golden shiner				2				28	5	18	7	1			3							
goldfish			1																			
johnny darter					1								5	1				1	6			
largemouth bass		2			5	4	4	12		1	1	7	4						4			1
logperch														5	1							
northern pike			1												1			1				
pumpkinseed	8	58	22	16	57	36	3	12	4	15	20	54	45	8	7		5	3	66	31	12	16
rock bass								2					91	1								
round goby†							6	12														
smallmouth bass					2					1												
spotfin shiner					5																	
spottail shiner			1			1							36	2	24			17				
walleye																						
white perch								2														
white sucker			1		1		1	2			1	1		1	25		2					
yellow perch	9	6	3		2	50		6		4	2	5	2	5	2	6	2	7	5		1	6
Grand Total	**97**	**100**	**80**	**60**	**139**	**130**	**37**	**141**	**106**	**49**	**80**	**108**	**352**	**73**	**116**	**26**	**66**	**59**	**270**	**98**	**34**	**273**
Species Total	**9**	**8**	**13**	**7**	**15**	**8**	**9**	**11**	**8**	**9**	**9**	**8**	**10**	**14**	**16**	**3**	**8**	**9**	**10**	**8**	**8**	**8**
IBI Score	**32**	**50**	**49**	**25**	**45**	**56**	**30**	**49**	**17**	**47**	**48**	**52**	**--**	**26**	**32**	**38**	**23**	**49**	**--**	**30**	**33**	**47**

† - invasive species

Table 5. Number of fish and species caught at GRCA coastal wetlands from 2002 - 2007.

	Wilmot Creek Marsh				Port Newcastle Marsh			
Fish Species Common Name	**2003**	**2004**	**2006**	**2007**	**2003**	**2005**	**2006**	**2007**
alewife								16
banded killifish								
black crappie								
bluegill								
bluntnose minnow	2	36	1	1		8	1	3
bowfin				1				
brook silverside								
brook stickleback								
brown bullhead	12	13	26	1		2	16	102
central mudminnow								
common carp	5	13	37	3	1	9	2	1
common shiner				2		3	14	2
emerald shiner		51	1					3
fathead minnow		1	5			3	1	
freshwater drum								
gizzard shad						4	3	3
golden shiner	2		6	2		97	1	
goldfish								
johnny darter	19	4	8		4	1	3	
largemouth bass	1	1				1		
logperch								1
northern pike	4	2		1				
pumpkinseed	31	4	11	25	24	85	12	46
rock bass	1			1		5		2
round goby†							✓	
smallmouth bass								2
spotfin shiner								
spottail shiner	1	2		1			3	3
walleye								
white perch								
white sucker	2	57	11	6	1	1	1	3
yellow perch	3	5	9	1	3	6	8	4
Grand Total	**85**	**195**	**115**	**45**	**33**	**225**	**65**	**191**
Species Total	**12**	**12**	**10**	**12**	**5**	**13**	**12**	**14**
IBI Score	**56**	**45**	**36**	**47**	**26**	**52**	**31**	**56**

† - invasive species, ✓ - observed through a qualitative supplemental sample

4.0 Biological Water Quality

CLOCA monitors surface water quality through both chemical and biological sampling. In general, sampling for chemical and physical parameters measures stressors (e.g., environmental contamination), whereas biological sampling measures ecological effects. Biological surveys involve sampling creatures, such as benthic macroinvertebrates ("aquatic bugs"; see photos below) and fish, found living within the aquatic environment. Benthic macroinvertebrates or benthos, make good health indicators of aquatic ecosystems for a number of reasons:

- they generally have limited mobility that makes them vulnerable to many creek stresses that may occur;
- they have short life cycles;
- they are easily collected and identified;
- they are relatively inexpensive to sample;
- and they exist almost everywhere (Ontario Benthos Biomonitoring Network, 2005).

Similar to other biological communities, certain species of invertebrates have specific tolerances to various stresses and are referred to as indicator species. Therefore, the presence or absence of these indicator species can be related to the quality of the water.

In the past, CLOCA sampled benthos following two separate protocols. The primary protocol for assessing water quality was through BioMAP (Griffiths, 1998). The second protocol is part of the OSAP and is a coarse measure of water quality, which uses the Hilsenhoff Index. In order to coordinate long-term monitoring efforts, CLOCA is now a partner in the Ontario Benthos Biomonitoring Network (OBBN) coordinated by the MOE and EC. This provincial network allows practitioners to follow a standardized methodology, share resources and receive technical support.

To test whether an aquatic system has been impaired by human activity, a reference condition approach is used to compare benthos at "test sites" (where biological

condition is in question) to benthos from multiple, minimally impacted “reference sites”. A portion of sampling effort each season should focus on collecting reference sites (OBBN, 2005).

During May CLOCA staff sampled 25 OBBN sites in total throughout 4 watersheds (Figure 6). Four of the sites sampled were reference sites and the remaining 21 sites were test sites, generally at long-term monitoring sites. This was the third season that CLOCA has sampled benthos using the recently developed OBBN protocol.

Photo Above: Summer staff collecting benthos using a kick net.

At the time of this report the results from 2007 sampling had not been analyzed. The online database warehoused by MOE has been undergoing upgrades and analysis tools are not yet functional. Currently, site information (i.e., identified species) has been entered into the provincial database and the results, i.e. whether a site is impaired or not, will be available once this upgrade is complete.

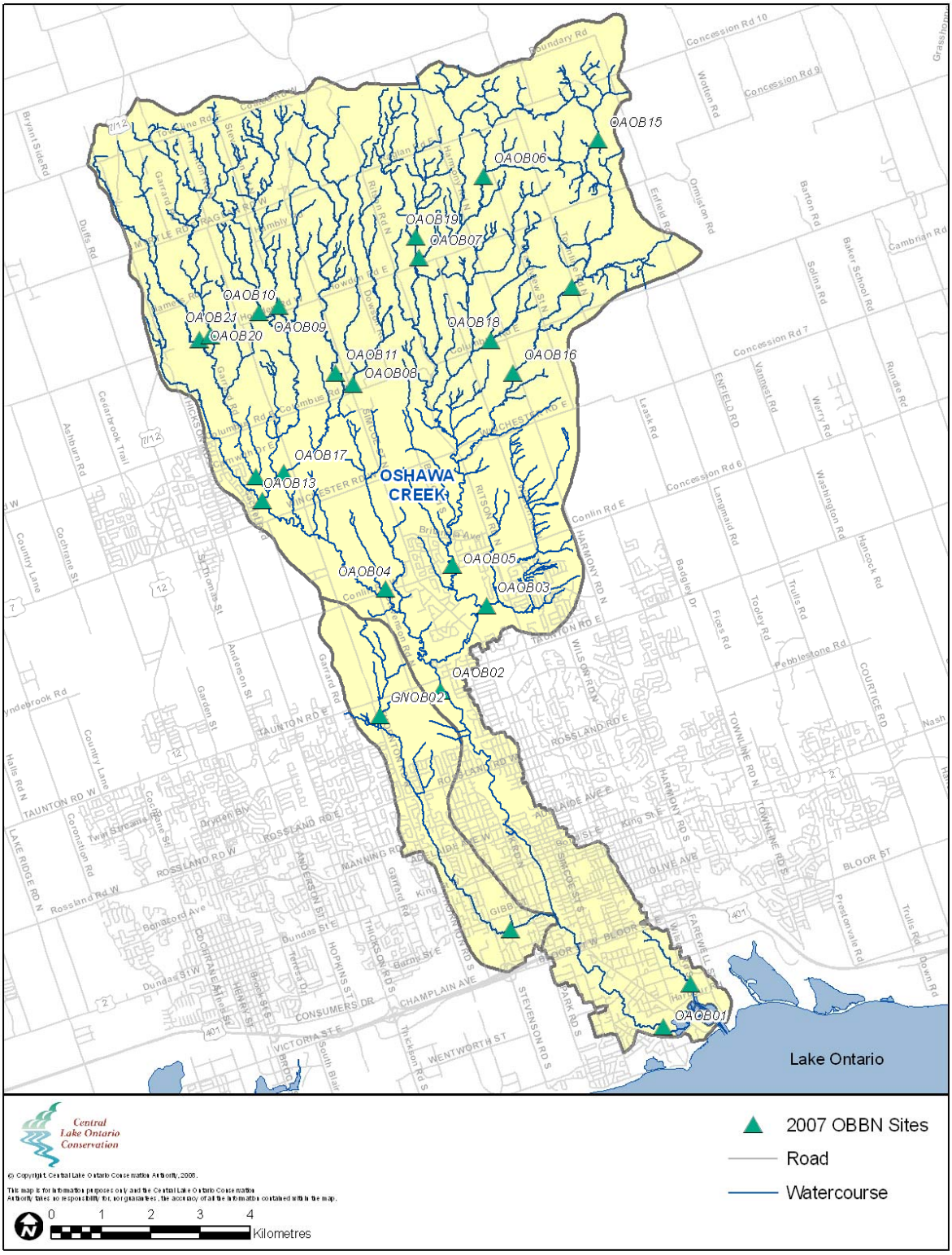

Figure 6. Biological water quality sites sampled in the CLOCA jurisdiction during 2007.

5.0 Stream Temperature

Temperature is considered a controlling factor with respect to habitat suitability for fish. For species such as brook trout, summer stream temperature is considered the single most important factor influencing distributions (MacCrimmon and Campbell, 1969). CLOCA relies on quality stream temperature data for use in plan review, Watershed Management Plans, Aquatic Resource Management Plans, Fisheries Management Plans, etc.

In total, 66 portable temperature loggers (Figure 7) were installed throughout the CLOCA jurisdiction in 2007 (Figure 8). Of the 66 loggers, 11 were part of Les Stanfield's Headwater Project. CLOCA acquired an additional 30 temperature loggers from the MOE. All of the loggers, with the exception of the Headwater Project loggers, were programmed to collect water temperature every half-hour generally between May and December.

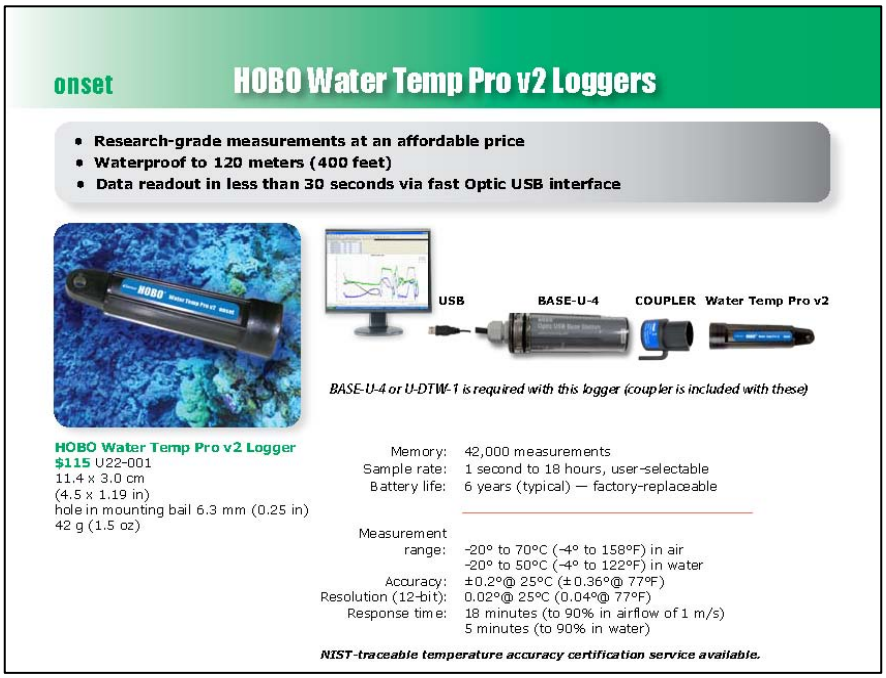

Figure 7. Attributes of one of the temperature logger models used by CLOCA.

Classification of stream temperature was divided into three categories: coldwater, coolwater and warmwater (Coker et al., 2001). The thermal classification for each site was determined by analyzing data summarized through the Stream Temperature Analysis Tool and Exchange (STATE) (Table 6; Jones and Chu, 2007). It should be noted that stream temperature classification can be confusing. Historically in Ontario only two thermal classification categories were used, coldwater and warmwater. Coldwater fishes such as trout and salmon can be found in both coldwater and coolwater temperature zones and so these zones represent coldwater streams in the traditional sense (Bowlby, 2003).

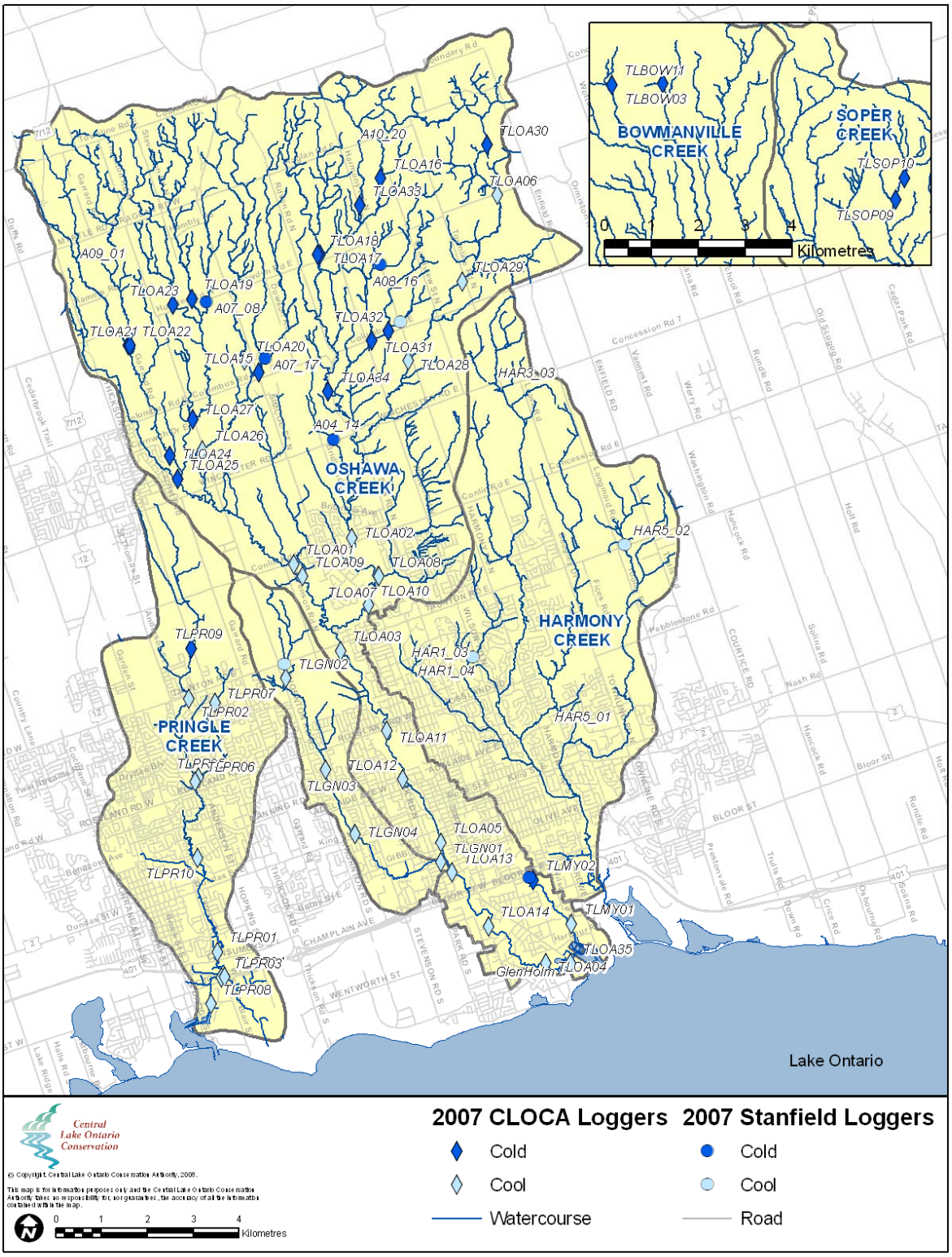

Figure 8. Location and thermal classification of stream temperature loggers during 2007.

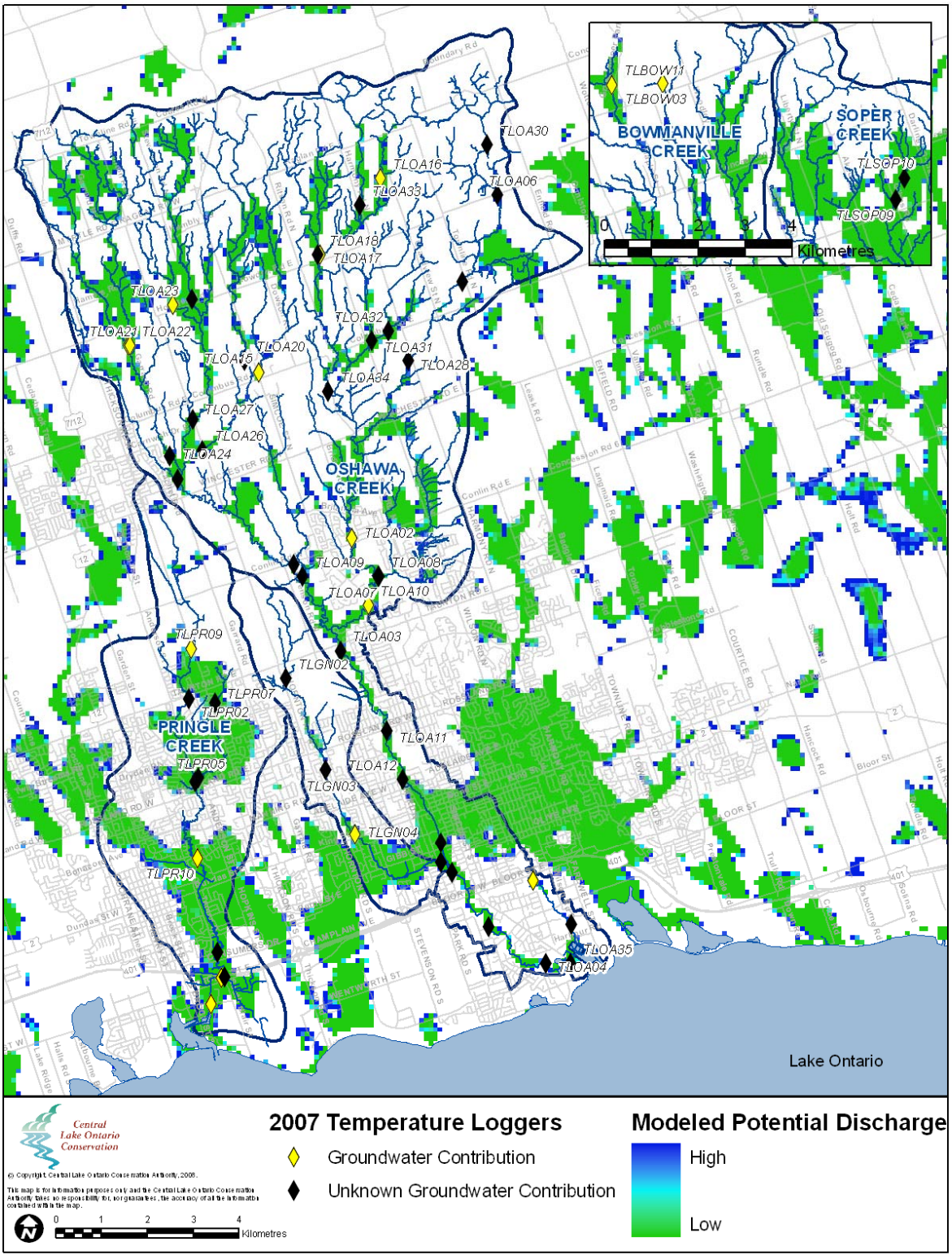

Figure 9. 2007 stream temperature sites compared to modeled potential discharge.

Table 6. Summary of temperature logger data collected from CLOCA jurisdiction during 2007 with comparison to some 2005 and 2006 data.

	Site Code	Year	Logger Serial No.	Period of Record	Cold	Cool	Warm	Max. (°C)	Min. (°C)	Days Above Upper Lethal					Classification
									Entire Data Set	Atlantic salmon (> 23 °C)	brook trout (> 24 °C)	brown trout (> 24 °C)	Chinook salmon (> 25 °C)	rainbow trout (> 26 °C)	
1	TLOA01	2007	842236	July 1, 2007 to August 31, 2007	43	19	0	24.05	0	0	0	0	0	0	Coolwater
2	TLOA02	2007	905539	July 1, 2007 to August 31, 2007	56	6	0	23.184	0.52	0	0	0	0	0	Coolwater
3	TLOA03	2007	905537	July 1, 2007 to August 31, 2007	33	29	0	25.55	0	0	0	0	0	0	Coolwater
4	TLOA04	2007	787475	July 1, 2007 to August 31, 2007	15	47	0	28.12	0	5	2	2	0	0	Coolwater
5	TLOA05	2007	877052	July 1, 2007 to August 31, 2007	18	44	0	27.01	0	3	0	0	0	0	Coolwater
6	TLOA06	2007	842229	July 1, 2007 to August 31, 2007	55	7	0	26.35	0	0	0	0	0	0	Coolwater
7	TLOA07	2007	842238	July 1, 2007 to August 31, 2007	34	28	0	22.92	0	0	0	0	0	0	Coolwater
8	TLOA08	2007	842239	July 1, 2007 to August 31, 2007	27	35	0	25.3	0	0	0	0	0	0	Coolwater
9	TLOA09	2007	905540	July 1, 2007 to August 31, 2007	56	6	0	23.9	0	0	0	0	0	0	Coolwater
10	TLOA10	2007	787473	July 1, 2007 to August 31, 2007	49	13	0	23.376	1.07	0	0	0	0	0	Coolwater
11	TLOA11	2007	877050	July 1, 2007 to August 31, 2007	23	39	0	26.646	0	1	0	0	0	0	Coolwater
12	TLOA12	2007	1019280	July 1, 2007 to August 31, 2007	21	41	0	26.965	0	2	0	0	0	0	Coolwater
13	TLOA13	2007	1019281	July 1, 2007 to August 31, 2007	18	44	0	26.695	0	3	0	0	0	0	Coolwater
14	TLOA14	2007	1019261	July 1, 2007 to August 31, 2007	16	46	0	28.048	0	4	1	1	0	0	Coolwater
15	TLOA15	2007	818797	July 1, 2007 to August 31, 2007	62	0	0	22.944	1.017	0	0	0	0	0	**Coldwater**
16	TLOA16	2007	1134277	July 1, 2007 to August 31, 2007	62	0	0	13.112	6.102	0	0	0	0	0	**Coldwater**
17	TLOA17	2007	1134285	July 1, 2007 to August 31, 2007	62	0	0	19.389	0.825	0	0	0	0	0	**Coldwater**
18	TLOA18	2007	1019277	July 1, 2007 to August 31, 2007	62	0	0	22.274	0	0	0	0	0	0	**Coldwater**
19	TLOA19	2007	905535	July 1, 2007 to August 31, 2007	62	0	0	19.865	0	0	0	0	0	0	**Coldwater**
20	TLOA20	2007	1020772	July 1, 2007 to August 31, 2007	56	6	0	23.737	0.107	0	0	0	0	0	Coolwater
21	TLOA21	2007	1134276	July 1, 2007 to August 31, 2007	62	0	0	17.534	0.632	0	0	0	0	0	**Coldwater**
22	TLOA22	2007	1134286	July 1, 2007 to August 31, 2007	62	0	0	20.15	0.522	0	0	0	0	0	**Coldwater**
23	TLOA23	2007	1134291	July 1, 2007 to August 31, 2007	60	2	0	23.713	1.615	0	0	0	0	0	**Coldwater**
24	TLOA24	2007	1134273	July 1, 2007 to August 31, 2007	62	0	0	19.08	0	0	0	0	0	0	**Coldwater**
25	TLOA25	2007	1134284	July 1, 2007 to August 31, 2007	61	1	0	20.198	0.079	0	0	0	0	0	**Coldwater**
26	TLOA26	2007	1134288	July 1, 2007 to August 31, 2007	14	48	0	29.015	0	5	0	0	0	0	Coolwater
27	TLOA27	2007	1134282	July 1, 2007 to August 31, 2007	61	1	0	20.531	0	0	0	0	0	0	**Coldwater**
28	TLOA28	2007	1134289	July 1, 2007 to August 31, 2007	35	27	0	24.557	0	0	0	0	0	0	Coolwater

29	TLOA29	2007	1134287	July 1, 2007 to August 31, 2007	20	42	0	28.221	0.024	1	0	0	0	0	Coolwater
30	TLOA30	2007	1134293	July 1, 2007 to August 31, 2007	62	0	0	17.153	0	0	0	0	0	0	**Coldwater**
31	TLOA31	2007	1134295	July 1, 2007 to August 31, 2007	62	0	0	21.461	0	0	0	0	0	0	**Coldwater**
32	TLOA32	2007	1134278	July 1, 2007 to August 31, 2007	62	0	0	20.388	0.107	0	0	0	0	0	**Coldwater**
33	TLOA33	2007	1134271	July 1, 2007 to August 31, 2007	62	0	0	20.841	0	0	0	0	0	0	**Coldwater**
34	TLOA34	2007	1134274	July 1, 2007 to August 31, 2007	62	0	0	19.318	0	0	0	0	0	0	**Coldwater**
35	TLOA35	2007	787477	July 1, 2007 to August 31, 2007	13	48	1	28.147	0	5	3	3	1	0	Coolwater
36	TLGN01	2007	842237	July 1, 2007 to August 31, 2007	23	39	0	25.4	0	0	0	0	0	0	Coolwater
37	TLGN02	2007	905538	July 1, 2007 to August 31, 2007	53	9	0	24.339	0	0	0	0	0	0	Coolwater
38	TLGN03	2007	877053	July 1, 2007 to August 31, 2007	39	23	0	24.29	0	0	0	0	0	0	Coolwater
39	TLGN04	2007	905536	July 1, 2007 to August 31, 2007	17	45	0	25.744	0.63	0	0	0	0	0	Coolwater
40	TLMY01	2007	818793	July 1, 2007 to August 31, 2007	17	45	0	29.69	0	4	1	1	0	0	Coolwater
41	TLMY02	2007	877051	July 1, 2007 to August 31, 2007	62	0	0	23.689	2.58	0	0	0	0	0	**Coldwater**
42	TLPR01	2005	842230	No Data - Logger Missing											
43	TLPR01	2006	842229	May 24, 2006 to Jan 4, 2007	154	72	0	25.647	0.384	7	3	3	0	0	Coolwater
44	TLPR01	2007	1134283	July 1, 2007 to August 31, 2007	14	47	1	28.468	0	7	4	4	1	0	Coolwater
45	TLPR02	2005	818794	June 23, 2005 to Dec 24, 2005	163	22	0	22.489	0.246	0	0	0	0	0	Coolwater
46	TLPR02	2006	842228	No Data - Malfunction											
47	TLPR02	2007	1134292	July 1, 2007 to August 31, 2007	52	10	0	25.137	0.19	0	0	0	0	0	Coolwater
48	TLPR03	2007	1134279	July 1, 2007 to August 31, 2007	13	49	0	26.965	0.467	7	3	3	0	0	Coolwater
49	TLPR04	2007	1134281	July 1, 2007 to August 31, 2007	11	51	0	28.692	0	13	6	6	0	0	Coolwater
50	TLPR05	2007	1134280	July 1, 2007 to August 31, 2007	23	39	0	26.989	0	1	0	0	0	0	Coolwater
51	TLPR06	2007	1134294	July 1, 2007 to August 31, 2007	26	36	0	26.867	0	0	0	0	0	0	Coolwater
52	TLPR07	2007	1134275	July 1, 2007 to August 31, 2007	31	31	0	32.484	0.163	0	0	0	0	0	Coolwater
53	TLPR08	2007	1134272	July 1, 2007 to August 31, 2007	12	50	0	26.818	0.797	4	1	1	0	0	Coolwater
54	TLPR09	2007	1134290	July 1, 2007 to August 31, 2007	61	1	0	21.27	2.423	0	0	0	0	0	**Coldwater**
55	TLPR10	2007	818794	July 1, 2007 to August 31, 2007	30	32	0	24.67	2.34	0	0	0	0	0	Coolwater
56	TLBOW11	2006	1019270	July 21, 2006 to August 31, 2006	42	0	0	15.724	2.236	0	0	0	0	0	**Coldwater**
57	TLBOW11	2007	1019270	July 1, 2007 to August 31, 2007	62	0	0	14.936	2.236	0	0	0	0	0	**Coldwater**
58	TLBOW03	2005	842229	July 1, 2005 to August 31, 2005	62	0	0	14.697	5.231	0	0	0	0	0	**Coldwater**
59	TLBOW03	2006	877051	May 31, 2006 to Jan 4, 2007	219	0	0	16.368	4.506	0	0	0	0	0	**Coldwater**
60	TLBOW03	2007	842228	July 1, 2007 to August 31, 2007	62	0	0	14.91	3.8	0	0	0	0	0	**Coldwater**
61	TLSOP09	2005	739513	July 1, 2005 to August 31, 2005	62	0	0	17.520	2.890†	0	0	0	0	0	**Coldwater**
62	TLSOP09	2006	739513	June 1, 2006 to Nov 13, 2006	166	0	0	16.000	4.570†	0	0	0	0	0	**Coldwater**
63	TLSOP09	2007	739513	July 1, 2007 to August 31, 2007	62	0	0	15.62	1.170†	0	0	0	0	0	**Coldwater**
64	TLSOP10	2005	739517	July 1, 2005 to August 31, 2005	62	0	0	17.9	3.740†	0	0	0	0	0	**Coldwater**
65	TLSOP10	2006	739517	June 10, 2006 to Nov 22, 2006	166	0	0	16.760	4.150†	0	0	0	0	0	**Coldwater**
66	TLSOP10	2007	739517	July 1, 2007 to August 31, 2007	62	0	0	16	2.460†	0	0	0	0	0	**Coldwater**

67	A01_01	2007	1135957	July 6, 2007 to August 31, 2007	57	0	0	26.378	9.854*	0	0	0	0	0	**Coldwater**
68	A02_14	2007	1135964	July 4, 2007 to August 31, 2007	22	37	0	28.394	8.145*	0	0	0	0	0	Coolwater
69	A04_14	2007	1135930	July 6, 2007 to August 31, 2007	57	0	0	25.355	8.195*	0	0	0	0	0	**Coldwater**
70	A07_08	2007	1135963	July 1, 2007 to August 31, 2007	61	1	0	22.321	8.444*	0	0	0	0	0	**Coldwater**
71	A07_17	2007	1135966	July 1, 2007 to August 31, 2007	62	0	0	17.915	8.568*	0	0	0	0	0	**Coldwater**
72	A08_16	2007	1134504	July 6, 2007 to August 31, 2007	57	0	0	15.963	8.070*	0	0	0	0	0	**Coldwater**
73	A06_09	2007	1135950	July 6, 2007 to August 31, 2007	30	27	0	24.388	13.233*	0	0	0	0	0	Coolwater
74	HAR1_05	2007	1135932	Lost During Rain Event											
75	HAR2_01	2007	1135941	August 14, 2007 to August 31, 2007	13	5	0	22.633	10.198*	0	0	0	0	0	Coolwater
76	HAR1_02	2007	1135956	Vandalized											
77	HAR5_02	2007	1135946	August 14, 2007 to August 31, 2007	8	10	0	22.345	11.443*	0	0	0	0	0	Coolwater

Maximum temperature generally occurs during July or August but is reported from entire data set
Minimum temperature is reported from entire data set which generally also includes cold-weather conditions i.e., sampling period in December
†Minimum temperature does not completely reflect cold-weather conditions since the Period of Record ended mid-November
*Minimum temperature does not reflect cold-weather conditions since the Period of Record ended mid-Fall

In the Oshawa Creek watershed, data indicates that coldwater habitat exists from the headwaters in the north to Winchester Rd. Coolwater habitat occupies the remainder of the watershed south to Simcoe St.

Ten loggers were deployed within Pringle Creek watershed. Data indicates that coldwater habitat exists from the headwaters in the north to Taunton Rd. Coolwater habitat occupies the remainder of the watershed to just south of Watson St.

Four loggers were deployed within Goodman Creek watershed. Data indicates that coolwater habitat exists within the entire watershed.

Two loggers were deployed within Montgomery Creek watershed. Data indicates that coldwater habitat exists at Bloor St. where the creek outlets from a stormsewer pipe. Coolwater habitat occupies the location of the second logger just north of Harbour Rd.

Site TLBOW03 is located within Long Sault Conservation Area in a section of headwater stream. This site was selected because it is a long-term reference site for various CLOCA monitoring activities, e.g., surface water quality, fisheries, temperature, etc. Groundwater temperature is moderated by the sub-surface ground temperature. Depending on the amount of groundwater entering a stream it has the ability to moderate the stream temperature. If enough groundwater enters a stream it will have more of an influence than the air temperature and prevent the stream from freezing. The minimum temperature for 2005, 2006 and 2007 was approximately 4°C indicating that this coldwater location has a substantial amount of groundwater entering the stream.

Site TLBOW11 was installed July 21, 2006 and was not retrieved until January 7, 2008. Since CLOCA started collecting temperature data with portable loggers in 2005, this coldwater site is the second data set that includes an entire season. The first was from TLBOW03 collected in 2005. Both sites are cold-headwater locations.

In 2005 two loggers were purchased by Irv Harrell for his stewardship property (Hawkridge Farm) located within Soper Creek watershed (Gibb Rd./Con. Rd. 7). A section of Soper Creek flows through Hawkridge Farm and data from 2005 to 2007 indicates that it is coldwater. No cool or warmwater days have been recorded during this time. Brook trout have been captured through recent fisheries sampling conducted in 2006 through the OSAP Training Course. Trout are known to require good water quality; brook trout, also known as speckled trout (a cold-water species) in particular occur in clear, cool, well-oxygenated waters (Scott and Crossman, 1973).

As mentioned above, the presence of groundwater moderating stream temperature can be detected through temperature logger data. This data can be used to help validate modeling of potential groundwater discharge that CLOCA has recently produced (Figure 9).

Data from the loggers involved with Les Stanfield's Headwater Project, were classified as Coolwater and Coldwater. These results are consistent with CLOCA sampling. Unfortunately, the data do not include cold-weather conditions and therefore can not be used to detect the presence of groundwater.

6.0 Recommendations

Section		Results	Recommendations
2.0	Fisheries - Streams	During 2007, 31 OSAP sites were sampled (four of which were dry) by CLOCA as part of the annual aquatic monitoring program and six were sampled through the OSAP Training Course in the Oshawa Creek watershed (Figure 3). The results of the 2007 CLOCA Aquatic Monitoring are consistent with the goals and objectives of the FMP. The main branches of Oshawa Creek are still dominated by migratory salmonids and should remain managed as such. Upstream of impassable barriers to fish migration, streams remain dominated by resident coldwater fish communities including brook trout, brown trout and sculpin species. These headwaters should continue to be managed for these sustainable and diverse fish communities. Four watersheds were sampled as part of the 2007 Round Goby Monitoring Program (Figure 5). These watersheds included two creeks with instream barriers to fish migration (Bowmanville Creek and Cobourg Creek) and two without (Oshawa Creek and Soper Creek). The results of this sampling indicated that the barriers to migration, in this case dams, were effective at restricting the spread of round goby. A summary of catch can be found in Table 2.	Overall stream monitoring efforts during the 2008 season will be focused in the Black, Harmony, Farewell Creek watershed. It is recommended that a selection of Aquatic Resource Management Plan fisheries sites (OSAP) first sampled in 2002 be re-sampled. In addition, continued monitoring for the spread of round goby into CLOCA watersheds is recommended for 2008, repeating sampling effort at the 2007 sites. It is also recommended that supplemental sites be conducted to further explore slimy sculpin range within the BHF Creek watershed.

3.0	Fisheries - Wetlands	In 2006, for the first time since the project began, round goby (see photo on right) were captured in Frenchman's Bay Marsh and Port Newcastle Marsh (see Table 4 and 5). In Frenchman's Bay Marsh, six round goby were caught in 2006 on the same sampling transect along the barrier beach that separates the marsh from Lake Ontario. In 2007, 12 round goby were captured throughout the marsh and were not localized to one area e.g., barrier beach. Although more goby were captured in 2007, more data is needed to determine if the population is increasing. During both 2006 and 2007 sampling, no round goby were caught on official DRCWMP transects within Port Newcastle Marsh. During 2006 and 2007 sampling, the numbers of species captured were similar to 2003 results, which were almost half of 2005 results. This drastic change was likely due to poor water quality (e.g., turbid water) and habitat requirements (e.g., closed barrier beach prevented seasonal and diurnal fish movement). Goldfish have been captured in Rouge River Marsh, Corbett Creek Marsh, Pumphouse Marsh and Oshawa Second Marsh. Indigenous to eastern Asia they are a non-native species that has been introduced by the release of aquarium pets. This is an ongoing problem as goldfish compete with native species for food and habitat, contribute to turbidity and damage vegetation (Richardson et al., 1995). The summer of 2007 had very little precipitation and as a result, Pumphouse Marsh was completely dry by	It is recommended that currently known round goby locations (i.e., Frenchman's Bay Marsh and Port Newcastle Marsh) continue to be monitored to track any changing population trends. It is also recommended that the barrier beach at McLaughlin Bay Marsh continue to be monitored for breakages to help better understand fish utilization of the marsh. It is also recommended that currently known goldfish locations (i.e., Rouge River Marsh, Corbett Creek Marsh, Pumphouse Marsh and Oshawa Second Marsh) continue to be monitored to track any changing population trends. Public education regarding the harmful effects of releasing non-native species into waterways should continue through the DRCWMP and public outreach events in which CLOCA is involved. It is also recommended that the Oshawa Creek Coastal Wetland Complex (Oshawa Harbour) be added to the DRCWMP fish sampling component in 2008.

		August. It is unlikely that any fish survived this event as no refuge pools were observed by CLOCA staff. Sampling results during 2008 will be interesting considering the impact of the 2007 dry marsh condition. For the first time as part of the DRCWMP, fish sampling was conducted within the Whitby Harbour Wetland Complex. Results were poor with fish being captured only in a few location within the marsh. Since this is the first time that the marsh has been sampled, next years results will be interesting.	
4.0	Biological Water Quality	During May CLOCA staff sampled 25 OBBN sites in total throughout 4 watersheds (Figure 6). Four of the sites sampled were reference sites and the remaining 21 sites were test sites, generally at long-term monitoring sites. This was the third season that CLOCA has sampled benthos using the recently developed OBBN protocol.	In order to complement 2008 stream monitoring efforts it is recommended that the majority of OBBN test site sampling effort occur at or near OSAP site locations.
5.0	Stream Temperature	In total, 66 portable temperature loggers (Figure 7) were installed throughout the CLOCA jurisdiction in 2007 (Figure 8). Of the 66 loggers, 11 were part of Les Stanfield's Headwater Project. CLOCA acquired an additional 30 temperature loggers from the MOE.	In order to complement 2008 stream monitoring efforts it is recommended that the majority of stream temperature loggers that are not dedicated to long-term sites be installed at or near OSAP site locations. It is also recommended that additional temperature loggers be acquired. It is also recommended that temperature loggers continue to collect minimum temperature data in order to validate groundwater modeling.

7.0 References

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