Table 2-1. Characteristics of Lovers Lake and Stillwater Pond, Chatham, MA

	Lovers Lake	Stillwater Pond
Lake Surface Area (SA)(ac)	37.7	18.7
Mean depth (ft)	15.1	21.8
Maximum depth (ft)	36	51
Lake Classification	Temperature dimictic	Temperature dimictic
Watershed area (WA) without lake (ac)	86.3	128.3
WA:SA Ratio	2.3	6.9
Hydrologic Connections	Stillwater Pond and formerly Frost Fish Creek	Lovers Lake and Ryders Cove
Recreational Uses	Swimming, boating, fishing	Swimming, boating, fishing

Table 2-2a. Lovers Lake Hypsographic Relationships - Area and Volume.

Interval (m)	Strata mid-point depth	Surface Area (m2)	% of SA* (%)	Depth Interval (m)	Volume in strata (m3)	% Volume in strata (%)
	0	152566	100.0			
0-1	0.5	143412	94.0	1	143412	20.6
	1	134259	88.0			
1-2	1.5	125867	82.5	1	125867	18.1
	2	117476	77.0			
2-3	2.5	110611	72.5	1	110611	15.9
	3	103745	68.0			
3-4	3.5	95354	62.5	1	95354	13.7
	4	86963	57.0			
4-5	4.5	77046	50.5	1	77046	11.1
	5	67129	44.0			
5-6	5.5	58738	38.5	1	58738	8.4
	6	50347	33.0			
6-7	6.5	41193	27.0	1	41193	5.9
	7	32039	21.0			
7-8	7.5	25173	16.5	1	25173	3.6
	8	18308	12.0			
8-9	8.5	13731	9.0	1	13731	2.0
	9	9154	6.0			
9-10	9.5	4577	3.0	1	4577	0.7
	10	0	0.0			

Total Volume = 695703 m^3

Mean depth = 4.56 m^3

Table 2-2b. Stillwater Pond Hypsographic Relationships - Area and Volume.

Interval (m)	Strata mid-point depth	Surface Area (m2)	% of SA* (%)	Depth Interval (m)	Volume in strata (m3)	% Volume in strata (%)
	0	75676	100.0			
0-1	0.5	73784	97.5	1	73784	14.8
	1	71892	95.0			
1-2	1.5	68487	90.5	1	68487	13.7
	2	65082	86.0			
2-3	2.5	60919	80.5	1	60919	12.2
	3	56757	75.0			
3-4	3.5	54108	71.5	1	54108	10.8
	4	51460	68.0			
4-5	4.5	48811	64.5	1	48811	9.8
	5	46162	61.0			
5-6	5.5	43892	58.0	1	43892	8.8
	6	41622	55.0			
6-7	6.5	37838	50.0	1	37838	7.6
	7	34054	45.0			
7-8	7.5	30649	40.5	1	30649	6.1
	8	27243	36.0			
8-9	8.5	24216	32.0	1	24216	4.8
	9	21189	28.0			
9-10	9.5	18541	24.5	1	18541	3.7
	10	15892	21.0			
10-11	10.5	13622	18.0	1	13622	2.7
	11	11351	15.0			
11-12	11.5	9649	12.8	1	9649	1.9
	12	7946	10.5			
12-13	12.5	6622	8.8	1	6622	1.3
	13	5297	7.0			
13-14	13.5	4541	6.0	1	4541	0.9
	14	3784	5.0			
14-15	14.5	3027	4.0	1	3027	0.6
	15	2270	3.0			
15-16	15.5	1135	1.5	1	1135	0.2
	16	0	0.0			

Total Volume = 499841 m^3

Mean depth = 6.6 m^3

Table 2-3. Land Use Characteristics in Lovers Lake and Stillwater Pond Watershed

Lovers Lake	Current Conditions				Build-out Conditions			
LAND USE CATEGORY	Area in Watershed (ha)	% Watershed Area	Area in 300 ft Buffer (ha)	% Area in Buffer	Area in Watershed (ha)	% Watershed Area	Area in 300 ft Buffer (ha)	% Area in Buffer
Residential	13.81	39	8.68	61	15.92	45	8.98	63
Roads	2.69	8	0.96	7	2.69	8	0.96	7
Open Land	2.20	6	0.00	0	2.14	6	0	0
Cranberry Bog	1.65	5	0.00	0	1.65	5	0	0
Forest	12.08	34	4.66	33	10.04	28	4.36	30
Water/Wetlands	3.20	9	0.00	0	3.20	9	0	0
# of Residences	62		40		66		41	
Total	**35.64**		**14.29**		**35.64**		**14.29**	

Stillwater Pond	Current Conditions				Build-out Conditions			
LAND USE CATEGORY	Area in Watershed (ha)	% Watershed Area	Area in 300 ft Buffer (ha)	% Area in Buffer	Area in Watershed (ha)	% Watershed Area	Area in 300 ft Buffer (ha)	% Area in Buffer
Residential	17.77	34	3.16	57	18.66	36	3.16	57
Roads	3.71	7	0.94	17	3.71	7	0.94	17
Forest	28.77	55	1.41	26	27.22	52	0.74	13
Water/Wetlands	1.85	4	0	0	1.85	4	0.00	0
Municipal Developed	0.00	0	0	0	0.66	1	0.67	12
# of Residences	58		23		61		23	
Total	**52.10**		**5.50**		**52.10**		**5.50**	

Table 2-4. Historic water quality data for Lovers Lake from PALS monitoring (2001-2006)

		Shallow (0.5 m)			Max Depth (9-9.5m)		
Parameter	Units	Average	Minimum	Maximum	Average	Minimum	Maximum
Temperature	(^{o}C)	23.10	22.03	24.66	12.85	10.20	20.90
Diss. Oxygen	(mg/L)	8.79	7.33	10.24	1.06	0.13	5.37
pH	(S.U.)	8.12	6.95	9.27	6.71	6.47	7.01
Alkalinity	(mg/L as $CaCO_3$)	25.92	1.86	42.18	81.34	5.40	150.95
TP ug/L	(ug/L)	32.20	23.87	46.50	116.62	50.60	173.60
TN ug/L	(ug/L)	781.70	435.66	1546.65	2634.98	1934.80	3974.10
Chlorophyll a	(ug/l)	25.34	5.42	68.25	4.68	1.93	9.35
Phaeophytin	(ug/l)	2.84	0.00	5.97	9.55	0.41	18.96

Parameter	Units	Average	Minimum	Maximum
Total Depth	(m)	9.97	9.60	10.47
Secchi Depth	(m)	1.14	0.44	1.69

Table 2-5. Historic water quality data for Stillwater Pond from PALS monitoring (2001-2006)

		Shallow (0.5 m)			Max Depth (9-9.5m)		
Parameter	Units	Average	Minimum	Maximum	Average	Minimum	Maximum
Temperature	(^{o}C)	23.08	21.48	24.76	8.25	6.44	15.35
Diss. Oxygen	(mg/L)	9.13	7.74	10.10	0.23	0.16	0.29
pH	(S.U.)	7.79	6.92	8.92	6.50	5.94	6.68
Alkalinity	(mg/L as $CaCO_3$)	24.66	1.84	39.35	62.86	4.87	102.31
TP ug/L	(ug/L)	27.53	13.95	44.64	289.45	176.70	426.87
TN ug/L	(ug/L)	765.51	371.24	1241.80	2973.52	2270.80	3720.88
Chlorophyll a	(ug/l)	22.96	4.84	56.10	3.94	0.05	7.49
Phaeophytin	(ug/l)	3.87	0.05	14.57	12.51	1.37	22.16

Parameter	Units	Average	Minimum	Maximum
Total Depth	(m)	14.19	13.80	15.06
Secchi Depth	(m)	1.58	0.56	3.03

Table 2-6. Historical Fish Community of Lovers Lake and Stillwater Pond.

Fish		Lovers Lake (8/25/52)[a]		Stillwater Pond (5/4/67)[b]	
Common Name	**Scientific Name**	**#**	**%**	**#**	**%**
American eel	*Anguilla rostrata*	3	0.4	-	-
Chain pickerel	*Esox niger*	20	2.7	1	2.0
Smallmouth bass	*Micropterus dolomieui*	2	0.3	-	-
Largemouth bass	*Micropterus salmoides*	-	-	2	4.1
Yellow perch	*Perca flavescens*	50	6.7	12	24.5
White perch	*Morone americana*	81	10.9	2	4.1
Brown bullhead	*Ameiurus nebulosus*	16	2.1	-	-
Alewife	*Alosa spp.*	-	-	7	14.3
Bridle shiner	*Notropis bifrenatus*	172	23.1	20	40.8
Golden shiner	*Notemigonus crysoleucas*	207	27.7	4	8.2
Killifish	*Fundulus diaphanus*	193	25.9	-	-
Sticklebacks	*Gasterosteus spp.*	2	0.3	1	2.0
	Totals:	**746**	**100.0**	**49**	**100.0**

Sources: a = Tompkins, 1958.
b = unpublished fish survey data (Hurley 2007)

Table 3-1. Field Survey and Water Quality Sampling Locations on Lovers Lake and Stillwater Pond (5/11/07)

Waterbody	Station ID	Description	GPS Coordinates	
			Northing	Westing
Lovers Lake	CPLL-SW01S	Deep hole, surface	41°41.974'	-69°59.079'
	CPLL-SW01D	Deep hole, bottom		
	CPLL-SW02S	SE basin, surface	41°41.390'	-69°58.992'
	CPLL-SW02D	SE basin, bottom		
Stillwater Pond	CPSP-SW01S	Deep hole, surface	41°42.219'	-69°59.212'
	CPSP-SW01D	Deep hole, bottom		
	CPSP-SW02S	SE corner, surface	41°42.167'	-69°59.159'
	CPSP-SW02D	SE corner, bottom		

Table 3-2. Summary of Lovers Lake Water Quality Parameters- 2007 Results

Summary of Lovers Lake Water Quality-CPLL-SW-01.

Date	Sample Name	NH3	NO3	NO2	TKN	TN	DP	TP	TN:TP	DIN:DP	pH	Alk	Hardness	Cl	SO4	Fe	TSS
Surface		**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**SU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/9/2007	SW01S	60	<10	<10	500	510	22	38	29.6	7.0	6.9	14	28	34.0	7.7	0.1	<1
6/5/2007	SW01S	120	10	<10	1200	1215	13	13	206.5	22.9	7.1	18	32	32.3	7.6	0.1	<1
7/2/2007*	SW01S	48	10	<10	145	160	52	56	6.9	2.4	7.3	18	38	35.5	7.2	0.2	1
8/1/2007*	SW01S	<10	10	<10	635	650	36	59	24.6	1.3	9.6	18	32	33.8	7.0	0.1	3
8/29/2007	SW01S	30	10	<10	900	915	21	26	77.7	4.7	9.1	15	34	34.0	7.0	0.1	8
	Min	***<10***	***<10***	***<10***	***145***	***160***	***13***	***13***	***7***	***1***	***6.9***	***14***	***28***	***32.3***	***7.0***	***0.1***	***<1***
	Mean	***52.5***	***9***	***<10***	***676***	***690***	***29***	***38***	***69***	***8***	***8.0***	***16***	***33***	***33.9***	***7.3***	***0.1***	***3***
	Max	***120***	***10***	***<10***	***1200***	***1215***	***60***	***63***	***206***	***23***	***9.6***	***19***	***44***	***36.0***	***7.7***	***0.2***	***8***

Date	Sample Name	NH3	NO3	NO2	TKN	TN	DP	TP	TN:TP	DIN:DP	pH	Alk	Hardness	Cl	SO4	Fe	TSS
Bottom		**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**SU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/9/2007	SW01D	300	10	<10	500	515	30	49	23.2	23.2	6.4	18	32	33.0	7.6	0.1	<1
6/5/2007	SW01D	710	10	<10	2100	2115	27	29	161.1	59.3	6.5	22	56	32.2	6.9	0.7	3.0
7/2/2007	SW01D	890	10	<10	1100	1115	44	107	23.0	45.4	6.4	36	52	35.0	3.6	4.7	11.0
8/1/2007	SW01D	430	10	<10	660	675	54	54	27.6	18.2	6.7	36	52	35.3	4.5	0.7	8.0
8/29/2007	SW01D	1140	20	<10	1900	1925	37	79	53.8	69.6	6.6	46	48	32.0	2.2	8.6	20.0
	Min	***300***	***10***	***<10***	***500***	***515***	***27***	***29***	***23.0***	***18.2***	***6.4***	***18***	***32***	***32.0***	***2.2***	***0.1***	***<1***
	Mean	***694***	***12***	***<10***	***1252***	***1269***	***38***	***64***	***57.8***	***43.1***	***6.5***	***32***	***48***	***33.5***	***5.0***	***3.0***	***8.5***
	Max	***1140***	***20***	***<10***	***2100***	***2115***	***54***	***107***	***161.1***	***69.6***	***6.7***	***46***	***56***	***35.3***	***7.6***	***8.6***	***20.0***

Note: If concentration below reporting limit, the stats were calculated using half the reporting limit

*Average of Duplicates

Summary of Lovers Lake Water Quality-CPLL-SW-02.

Date	Sample Name	NH3	NO3	NO2	TKN	TN	DP	TP	TN:TP	DIN:DP	pH	Alk	Hardness	Cl	SO4	Fe	TSS
Surface		**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**SU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/9/2007	SW-02S	70	<10	<10	500	510	19	49	23.0	9.3	6.9	18	28	34.0	7.8	0.1	<1
6/5/2007	SW-02S	100	10	<10	900	915	<10	<10	404.2	50.8	7.1	16	40	32.2	7.5	0.2	1.0
7/2/2007	SW-02S	<10	10	<10	240	255	44	31	18.2	1.0	7.7	20	40	36.0	7.3	0.2	1.0
8/1/2007	SW-02S	<10	10	<10	580	595	39	44	29.9	1.1	9.6	20	40	33.8	6.9	0.1	1.0
8/29/2007	SW-02S	50	20	<10	1200	1225	18	29	93.3	9.2	9.8	16	2	34.0	6.8	0.2	11.0
	Min	***<10***	***<10***	***<10***	***240***	***255***	***<10***	***<10***	***18.2***	***1.0***	***6.9***	***16***	***2***	***32.2***	***6.8***	***0.1***	***<1***
	Mean	***46***	***11***	***<10***	***684***	***700***	***25***	***32***	***113.7***	***14.3***	***8.2***	***18***	***30***	***34.0***	***7.3***	***0.1***	***2.9***
	Max	***100***	***20***	***<10***	***1200***	***1225***	***44***	***49***	***404.2***	***50.8***	***9.8***	***20***	***40***	***36.0***	***7.8***	***0.2***	***11.0***

Date	Sample Name	NH3	NO3	NO2	TKN	TN	DP	TP	TN:TP	DIN:DP	pH	Alk	Hardness	Cl	SO4	Fe	TSS
Bottom		**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**SU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/9/2007	SW-02D	10	<10	<10	500	510	32	46	24.5	1.4	6.7	16	28	33.0	7.8	0.2	1.0
6/5/2007	SW-02D	440	<10	<10	1000	1010	19	21	106.2	52.3	6.6	22	40	32.1	7.1	0.7	2.0
7/2/2007	SW-02D	<10	10	<10	570	585	55	83	15.6	0.8	6.5	26	40	40.0	5.8	0.5	5.0
8/1/2007	SW-02D	190	10	<10	620	635	37	83	16.9	12.2	6.5	34	44	32.7	4.4	0.4	9.0
8/29/2007	SW-02D	280	10	<10	1100	1115	31	81	30.4	21.0	6.4	28	40	32.0	4.6	2.5	11.0
	Min	***5***	***5***	***5***	***500***	***510***	***19***	***21***	***15.6***	***0.8***	***6.4***	***16***	***28***	***32.0***	***4.4***	***0.2***	***1.0***
	Mean	***185***	***8***	***5***	***758***	***771***	***35***	***63***	***38.7***	***17.6***	***6.6***	***25***	***38***	***34.0***	***5.9***	***0.8***	***5.6***
	Max	***440***	***10***	***5***	***1100***	***1115***	***55***	***83***	***106.2***	***52.3***	***6.7***	***34***	***44***	***40.0***	***7.8***	***2.5***	***11.0***

Note: If concentration below reporting limit, the stats were calculated using half the reporting limit

*Average of Duplicates

J:\Water\ProjectFiles\P120\12249 Chatham Ponds\Water Quality Data\2007 Data\Water Quality Data\Chatham Ponds Water Quality Summary.xls

Table 3-3. Summary of Stillwater Pond Water Quality Parameters- 2007 Results

Summary of Stillwater Pond Water Quality-CPSP-SW-01

Date	Sample Name	NH3	NO3	NO2	TKN	TN	DP	TP	TN:TP	DIN:DP	pH	Alk	Hardness	Cl	SO4	Fe	TSS
Surface		**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**SU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/9/2007	SW-01S	130	80	<10	700	785	<10	35	49.5	95.0	7.4	14	36	33.0	6.4	0.1	1
6/5/2007*	SW-01S	125	<10	<10	1350	1360	14.5	25.5	122.5	20.9	7.1	16.0	38.0	33.0	6.6	0.2	<1
7/2/2007	SW-01S	10	10	<10	350	365	36	68	11.9	1.5	7.3	20	40	35.0	6.7	0.1	<1
8/1/2007	SW-01S	<10	10	<10	440	455	<10	34	29.6	8.8	8.9	18	36	34.7	6.4	0.1	3
8/29/2007	SW-01S	60	20	<10	1300	1325	29	37	79.1	6.5	8.8	32	22	35.0	6.3	0.2	10
	Min	***<10***	***<10***	***<10***	***350***	***365***	***<10***	***26***	***11.9***	***1.5***	***7.1***	***14***	***22***	***33.0***	***6.3***	***0.1***	***<1***
	Mean	***66***	***25***	***<10***	***828***	***858***	***18***	***40***	***58.5***	***26.5***	***7.9***	***20***	***34***	***34.1***	***6.5***	***0.1***	***3***
	Max	***130***	***80***	***<10***	***1350***	***1360***	***36***	***68***	***122.5***	***95.0***	***8.9***	***32***	***40***	***35.0***	***6.7***	***0.2***	***10***

Date	Sample Name	NH3	NO3	NO2	TKN	TN	DP	TP	TN:TP	DIN:DP	pH	Alk	Hardness	Cl	SO4	Fe	TSS
Bottom		**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**SU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/9/2007	SW-01D	1050	130	<10	1100	1235	7	54	50.5	373.9	6.2	18	32	34.0	5.9	1.1	2
6/5/2007	SW-01D	2490	<10	<10	3200	3210	46	123	57.6	120.1	6.5	29	32	33.2	4.5	4.6	4
7/2/2007	SW-01D	1680	10	<10	2500	2515	250	327	17.0	15.0	6.5	34	56	35.0	3.1	10.4	11
8/1/2007	SW-01D	840	10	<10	2400	2415	231	371	14.4	8.2	6.7	50	40	33.9	2.0	0.6	12
8/29/2007*	SW-01D	2430	7.5	<10	8700	8713	233	565.5	35.9	23.0	6.5	46	40	17.6	5.0	13.3	42
	Min	***840***	***<10***	***<10***	***1100***	***1235***	***7***	***54***	***14.4***	***8.2***	***6.2***	***18***	***32***	***17.6***	***2.0***	***0.6***	***2***
	Mean	***1698***	***33***	***<10***	***3580***	***3618***	***153***	***288***	***35.1***	***108.0***	***6.5***	***35***	***40***	***30.7***	***4.1***	***6.0***	***14***
	Max	***2490***	***130***	***<10***	***8700***	***8713***	***250***	***566***	***57.6***	***373.9***	***6.7***	***50***	***56***	***35.0***	***5.9***	***13.3***	***42***

Note: If concentration below reporting limit, the stats were calculated using half the reporting limit

*Average of Duplicates

Summary of Stillwater Pond Water Quality - CPSP-SW-02

Date	Sample Name	NH3	NO3	NO2	TKN	TN	DP	TP	TN:TP	DIN:DP	pH	Alk	Hardness	Cl	SO4	Fe	TSS
Surface		**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**SU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/9/2007	SW-02S	140	80	<10	600	685	<10	41	36.9	99.4	7.4	16	32	34.0	6.4	0.1	1
6/5/2007	SW-02S	180	<10	<10	2500	2510	24	27	205.4	17.5	7.1	18	32	32.9	6.6	0.2	1
7/2/2007	SW-02S	<10	10	<10	330	345	39	44	17.3	1.1	7.1	18	36	39.0	6.7	0.2	<1
8/1/2007	SW-02S	<10	10	<10	590	605	16	60	22.3	2.8	8.7	20	32	34.7	6.4	0.1	4
8/29/2007*	SW-02S	45	10	<10	1950	1965	31	41	107.4	4.3	8.5	19	28	0.1	35.5	6.4	13
	Min	***<10***	***<10***	***<10***	***330***	***345***	***<10***	***27***	***17.3***	***1.1***	***7.1***	***16***	***28***	***32.9***	***6.4***	***0.1***	***<1***
	Mean	***75***	***23***	***<10***	***1194***	***1222***	***23***	***43***	***77.9***	***25.0***	***7.8***	***18***	***32***	***35.2***	***6.5***	***0.1***	***4***
	Max	***180***	***80***	***<10***	***2500***	***2510***	***39***	***60***	***205.4***	***99.4***	***8.7***	***20***	***36***	***39.0***	***6.7***	***0.2***	***13***

Date	Sample Name	NH3	NO3	NO2	TKN	TN	DP	TP	TN:TP	DIN:DP	pH	Alk	Hardness	Cl	SO4	Fe	TSS
Bottom		**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**			**SU**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
5/9/2007*	SW-02D	235	150	<10	800	955	13	72	29.5	70.9	6.8	17	30	0.2	31.5	6.0	2
6/5/2007	SW-02D	0.12	<10	<10	1600	1610	11	29	122.6	26.1	7.2	18	32	32.7	6.4	0.3	3
7/2/2007	SW-02D	<10	10	<10	360	375	34	60	13.8	1.3	6.6	18	36	34.0	5.9	0.3	2
8/1/2007	SW-02D	140	10	<10	630	645	23	93	15.3	14.9	6.6	18	32	33.6	5.4	0.2	5
8/29/2007	SW-02D	50	10	<10	1400	1415	42	76	41.1	3.4	6.5	12	32	35.0	5.7	0.1	11
	Min	***<10***	***<10***	***<10***	***360***	***375***	***11***	***29***	***13.8***	***1.3***	***6.5***	***12***	***30***	***31.5***	***5.4***	***0.1***	***2***
	Mean	***110***	***37***	***<10***	***958***	***1000***	***25***	***66***	***44.5***	***23.3***	***6.8***	***17***	***32***	***33.4***	***5.9***	***0.2***	***5***
	Max	***235***	***150***	***<10***	***1600***	***1610***	***42***	***93***	***122.6***	***70.9***	***7.2***	***18***	***36***	***35.0***	***6.4***	***0.3***	***11***

Note: If concentration below reporting limit, the stats were calculated using half the reporting limit

*Average of Duplicates

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Table 3-4. Sediment sampling locations on Lovers Lake and Stillwater Pond and composites (5/07)

			GPS Coordinates	
Waterbody	**Station ID**	**Description**	**Northing**	**Westing**
Lovers Lake	CPLL-SD01	Deep hole; N.basin	41°41.974’	-69°59.079’
	CPLL-SD02	SE basin	41°41.390’	-69°58.992’
	CPLL-SD03	SW area; N.basin	41°41.928’	-69°59.135’
	CPLL-SD04	Between 2 basins	41°41.827’	-69°59.155’
	CPLL-SD05	S. of peninsula	41°41.757’	-69°59.131’
	CPLL-SDP	Composite of SD-01; SD-02, SD-04	NA	NA
Stillwater Pond	CPSP-SD01	Deep hole; central	41°42.219’	-69°59.212’
	CPSP-SD02	Near big house	41°42.167’	-69°59.159’
	CPSP-SD02D	Duplicate; SD-02	41°42.167’	-69°59.159’
	CPSP-SD03	NE area	41°42.218’	-69°59.124’
	CPSP-SDP	Composite of SD-01; SD-02, SD-03	NA	NA

Note: GPS coordinates in Degrees Minutes

Table 3-5. Sediment Chemical and Physical Characteristics - Chatham Ponds, May 2007.

2007 Lovers Lake Sediment Data

Station	% Solids	Iron (mg/kg)	Total Phosphorus (mg/kg)	Iron Bound Phosphorus (mg/kg)	Loosely Sorbed Phosphorus (mg/kg)	Total Available Phosphorus (mg/kg)*	Minimum Available Phosphorus (g/m2)**	Maximum Available Phosphorus (g/m2)**
CPLL-SD-01	14.7	88,200	3,260	1810.0	BRL	1,811	43.5	86.9
CPLL-SD-02	15.5	123,000	6,360	1490.0	BRL	1,491	35.8	71.5
CPLL-SD-03	17.0	71,700	3,520	1380.0	BRL	1,381	33.1	66.3
CPLL-SD-04	28.9	31,700	587	116.0	BRL	117	2.8	5.6
CPLL-SD-05	13.8	68,700	2,740	1750.0	5.28	1,755	42.1	84.3

2007 Stillwater Pond Sediment Data

Station	% Solids	Iron (mg/kg)	Total Phosphorus (mg/kg)	Iron Bound Phosphorus (mg/kg)	Loosely Sorbed Phosphorus (mg/kg)	Total Available Phosphorus (mg/kg)*	Minimum Available Phosphorus (g/m2)**	Maximum Available Phosphorus (g/m2)**
CPSP-SD-01	11.1	65,300	4060.0	1,490	3.79	1494	35.9	71.7
CPSP-SD-02	19.3	43,100	976.0	179	BRL	180	4.3	8.6
CPSP-SD-02D	23.0	38,900	919.0	219	BRL	220	5.3	10.5
CPSP-SD-03	12.8	38,100	1570.0	1,070	BRL	1071	25.7	51.4

BRL- Below Reporting Limit

* = Reporting limits ranged from 0.8 to 2.25 mg/kg depending on the solids content. For purposes of calculation, a RL = 1.5 mg/kg was assumed with 1/2 RL (0.5 mg/kg) used to estimate LSP concentration.

** = Minimum available P based on active contributing sediment depth of 1 cm, maximum P based on a 4 cm depth.

Grain Size	CPLL-SDP1	CPLL-SDP2	CPSP-SDP
Fractional % Sieve #4 (>4750 um)	0	0	0
Fractional % Sieve #10	1.9	0.6	0.4
Fractional % Sieve #20 (2000-850 um)	15.6	10.5	10.9
Fractional % Sieve #40 (850-425 um)	16.1	21.1	22.8
Fractional % Sieve #60 (425-250 um)	9.3	14.4	15.1
Fractional % Sieve #100 (250-150 um)	11.4	15	11.9
Fractional % Sieve #200 (150-75 um)	22.6	21.1	20
Fractional % Sieve #230 (less than)	23.1	17.4	18.8

Table 4-1. Lovers Lake hydrologic budget

Input Source	Water (Million ft^3/yr)	% of Total water
Groundwater in-seepage	8.46	55
Direct Precipitation	6.06	39
Riparian Zone Runoff	0.76	5
Septic Discharge	0.13	1
Total	15.41	100
Output Source		
Surface Water Outflow	13.9	78
Evaporation	3.83	22
Groundwater Out-seepage	0	0
Total	17.7	100

Table 4-2. Stillwater Pond hydrologic budget

Input Source	Water (Million ft^3/yr)	% of Total water
Surface Water Tributary	13.9	60
Groundwater in-seepage	5.82	25
Direct Precipitation	3.01	13
Riparian Zone Runoff	0.41	2
Septic Discharge	0.07	<1
Total	23.2	100
Output Source		
Surface Water Outflow	11	48
Evaporation	1.9	8
Groundwater Out-seepage	10.3	44
Total	23.2	100

Table 5-1a. Water Column Oxygen Totals in Lovers Lake - North Basin

Date	Hypolimnetic Dissolved Oxygen (kg)	Upper Hypolimnetic Surface Area (ha)	Hypolimnetic Dissolved Oxygen (kg/ha)	Change in Hypolimnetic Oxygen (kg/ha)	Days	Rate of Hypolimnetic Oxygen Depletion ($mg/m^2/day$)
Deep Spot, North Basin-CPLL-SW-01						
4/15/2007	5913.65	9.07	651.93			
5/3/2007	4912.96	9.07	541.61	-110.32	18	-612.87
5/9/2007	4651.65	9.07	512.80	-28.81	6	-480.12
5/23/2007	3877.55	9.07	427.47	-85.34	14	-609.55
6/5/2007	3890.39	9.07	428.88	1.41	12	11.79
6/18/2007	3700.83	9.07	407.98	-20.90	13	-160.75
7/2/2007	3358.11	9.07	370.20	-37.78	14	-269.87
7/16/2007	2912.68	9.07	321.10	-49.11	14	-350.75
8/1/2007	2997.82	9.07	330.48	9.39	15	62.57
8/29/2007	3582.40	9.07	394.93	64.44	28	230.16
9/10/2007	2833.11	9.07	312.33	-82.60	11	-750.93
9/25/2007	3127.23	9.07	344.75	32.42	15	216.16
10/11/2007	2705.66	9.07	298.28	-46.47	16	-290.46
10/22/2007	4302.94	9.07	474.36	176.09	11	1600.78

Table 5-1b. Hypolimnetic Oxygen Totals in Lovers Lake - North Basin

Date	Hypolimnetic Dissolved Oxygen (kg)	Upper Hypolimnetic Surface Area (ha)	Hypolimnetic Dissolved Oxygen (kg/ha)	Change in Hypolimnetic Oxygen (kg/ha)	Days	Rate of Hypolimnetic Oxygen Depletion ($mg/m^2/day$)
Deep Spot, North Basin-CPLL-SW-01						
4/15/2007	963.58	3.67	262.28			
5/3/2007	508.49	3.67	138.41	-123.87	18	-688.19
5/9/2007	459.99	3.67	125.21	-13.20	6	**-220.02**
5/23/2007	360.60	3.67	98.15	-27.05	14	**-193.25**
6/5/2007	253.36	3.67	68.96	-29.19	12	**-243.26**
6/18/2007	147.99	3.67	40.28	-28.68	13	**-220.62**
7/2/2007	51.42	3.67	14.00	-26.29	14	-187.75
7/16/2007	32.16	3.67	8.75	-5.24	14	-37.45
8/1/2007	1.65	3.67	0.45	-8.30	15	-55.37
8/29/2007	7.06	3.67	1.92	1.47	28	5.26
9/10/2007	15.98	3.67	4.35	2.43	11	22.07
9/25/2007	22.79	3.67	6.20	1.85	15	12.35
10/11/2007	33.99	3.67	9.25	3.05	16	19.05
10/22/2007	236.08	3.67	64.26	55.01	11	500.08

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Table 5-2a. Water Column Oxygen Totals in Lovers Lake - South Basin

Date	Hypolimnetic Dissolved Oxygen (kg)	Upper Hypolimnetic Surface Area (ha)	Hypolimnetic Dissolved Oxygen (kg/ha)	Change in Hypolimnetic Oxygen (kg/ha)	Days	Rate of Hypolimnetic Oxygen Depletion ($mg/m^2/day$)
South Basin-CPLL-SW-02						
4/15/2007	2538.11	6.19	410.33			
5/3/2007	2183.56	6.19	353.01	-57.32	18	-318.44
5/9/2007	2088.81	6.19	337.69	-15.32	6	-255.30
5/23/2007	1818.63	6.19	294.01	-43.68	14	-311.99
6/5/2007	1728.84	6.19	279.50	-14.52	12	-120.97
6/18/2007	1747.62	6.19	282.53	3.04	13	23.36
7/2/2007	1617.38	6.19	261.48	-21.06	14	-150.40
7/16/2007	914.39	6.19	147.83	-113.65	14	-811.79
8/1/2007	1587.72	6.19	256.68	108.86	15	725.70
8/29/2007	1884.92	6.19	304.73	48.05	28	171.60
9/10/2007	1470.87	6.19	237.79	-66.94	11	-608.54
9/25/2007	1622.71	6.19	262.34	24.55	15	163.66
10/11/2007	1311.51	6.19	212.03	-50.31	16	-314.44
10/22/2007	1567.63	6.19	253.44	41.41	11	376.42

Table 5-2b. Hypolimnetic Oxygen Totals in Lovers Lake - South Basin

Date	Hypolimnetic Dissolved Oxygen (kg)	Upper Hypolimnetic Surface Area (ha)	Hypolimnetic Dissolved Oxygen (kg/ha)	Change in Hypolimnetic Oxygen (kg/ha)	Days	Rate of Hypolimnetic Oxygen Depletion ($mg/m^2/day$)
South Basin-CPLL-SW-02						
4/15/2007	48.81	0.40	121.23			
5/3/2007	10.86	0.40	26.96	-94.27	18	-523.72
5/9/2007	14.19	0.40	35.25	8.29	6	138.14
5/23/2007	6.11	0.40	15.18	-20.07	14	-143.37
6/5/2007	1.29	0.40	3.20	-11.98	12	-99.86
6/18/2007	11.50	0.40	28.56	25.36	13	195.11
7/2/2007	1.09	0.40	2.70	-25.86	14	-184.74
7/16/2007	0.16	0.40	0.40	-2.30	14	-16.41
8/1/2007	0.08	0.40	0.20	-0.20	15	-1.33
8/29/2007	0.72	0.40	1.80	1.60	28	5.71
9/10/2007	0.68	0.40	1.70	-0.10	11	-0.91
9/25/2007	0.32	0.40	0.80	-0.90	15	-5.99
10/11/2007	0.44	0.40	1.10	0.30	16	1.87
10/22/2007	2.25	0.00	5.59	4.49	11	40.85

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Table 5-3a. Total Oxygen Content in Stillwater Pond

Date	Pond Total Dissolved Oxygen (kg)	Pond Surface Area (hectares)	Pond Total Dissolved Oxygen (kg/ha)	Change in Pond Dissolved Oxygen (kg/ha)	Days	Rate of Total Oxygen Change (mg/m2/day)
4/15/2007	6009.09	7.57	794.12			
5/3/2007	5215.97	7.57	689.30	-104.81	18.00	-582.30
5/9/2007	4925.52	7.57	650.92	-38.38	6.00	-639.72
5/23/2007	3655.25	7.57	483.05	-167.87	14.00	-1199.07
6/5/2007	3063.54	7.57	404.86	-78.20	12.00	-651.63
6/18/2007	2698.39	7.57	356.60	-48.26	13.00	-371.20
7/2/2007	2371.33	7.57	313.38	-43.22	14.00	-308.73
7/16/2007	2536.95	7.57	335.27	21.89	14.00	156.34
8/1/2007	2656.81	7.57	351.10	15.84	15.00	105.60
8/29/2007	2058.25	7.57	272.00	-79.10	28.00	-282.50
9/10/2007	2099.83	7.57	277.50	5.49	11.00	49.95
9/25/2007	2457.98	7.57	324.83	47.33	15.00	315.54
10/11/2007	2435.83	7.57	321.90	-2.93	16.00	-18.30
10/22/2007	2948.72	7.57	389.68	67.78	11.00	616.19
11/7/2007	3707.24	7.57	489.92	100.24	15.00	668.27

Table 5-3b. Hypolimnetic Oxygen Totals in Stillwater Pond

Date	Hypolimnetic Dissolved Oxygen (kg)	Upper Hypolimnetic Surface Area (hectares)	Hypolimnetic Dissolved Oxygen (kg/ha)	Change in Hypolimnetic Dissolved Oxygen (kg/ha)	Days	Rate of Hypolimnetic Oxygen Change (mg/m2/day)
4/15/2007	1801.36	3.75	480.74			
5/3/2007	1195.13	3.75	318.95	-161.79	18.00	**-898.83**
5/9/2007	928.72	3.75	247.86	-71.10	6.00	**-1184.99**
5/23/2007	479.23	3.75	127.90	-119.96	14.00	**-856.85**
6/5/2007	145.58	3.75	38.85	-89.04	12.00	**-742.03**
6/18/2007	17.19	3.75	4.59	-34.27	13.00	-263.58
7/2/2007	40.92	3.75	10.92	6.33	14.00	45.24
7/16/2007	39.35	3.75	10.50	-0.42	14.00	-2.99
8/1/2007	21.59	3.75	5.76	-4.74	15.00	-31.60
8/29/2007	5.90	3.75	1.57	-4.19	28.00	-14.95
9/10/2007	9.52	3.75	2.54	0.97	11.00	8.78
9/25/2007	14.10	3.75	3.76	1.22	15.00	8.16
10/11/2007	27.32	3.75	7.29	3.53	16.00	22.05
10/22/2007	25.40	3.75	6.78	-0.51	11.00	-4.67
11/7/2007	733.08	3.75	195.64	188.87	15.00	1259.10

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Table 5-4. Epilimnetic and Hypolimnetic TP in Stillwater Pond.

ENSR

Epilimnetic Total Phosphorus Load in Stillwater Pond

Date	Julian Date	Epilimnetic TP (kg)	Upper Epi SA (m^2)	Upper Epi SA (ha)	Epi TP (kg/ha)	Epi TP (mg/m^2)	Interval (days)	Change in Epi TP (kg)	Epi TP Release (mg/m2/day)
5/9/2007	129	12.13	74940.62	7.49	1.62	161.875	-	-	-
6/5/2007	156	9.01	74940.62	7.49	1.20	120.250	27.00	-3.12	-1.54
7/2/2007	183	23.57	74940.62	7.49	3.15	314.500	27.00	14.56	7.19
8/1/2007	213	11.78	74940.62	7.49	1.57	157.250	30.00	-11.78	-5.24
8/29/2007	241	12.82	74940.62	7.49	1.71	171.125	28.00	1.04	0.50
						Over summer:	**112.00**	**0.69**	**0.08**

Hypolimnetic Total Phosphorus Load in Stillwater Pond

Date	Julian Date	Hypolimnetic TP (kg)	Upper Hypo SA (m2)	Upper Hypo SA (ha)	HypoTP (kg/ha)	Hypo TP (mg/m2)	Interval (days)	Change in Hypo TP (kg)	Hypo TP Release (mg/m2/day)
5/9/2007	129	8.01	37470	3.75	2.14	213.769	-	-	-
6/5/2007	156	18.25	37470	3.75	4.87	487.080	27.00	10.24	10.12
7/2/2007	183	48.52	37470	3.75	12.95	1294.920	27.00	30.27	29.92
8/1/2007	213	55.05	37470	3.75	14.69	1469.160	30.00	6.53	5.81
8/29/2007	241	83.84	37470	3.75	22.37	2237.400	28.00	28.79	27.44
						Over summer:	**112.00**	**75.83**	**18.07**

Combined Total Phopshorus Load in Stillwater Pond

Date	Julian Date	Combined TP (kg)	Pond SA (m2)	Pond SA (ha)	Combined TP (kg/ha)	Combined TP (mg/m2)	Interval (days)	Change in Total TP (kg)	Total TP Release (mg/m2/day)
5/9/2007	129	20.14	112411	11.24	1.79	179.173	-	-	-
6/5/2007	156	27.26	112411	11.24	2.43	242.527	27.00	7.12	2.35
7/2/2007	183	72.09	112411	11.24	6.41	641.307	27.00	44.83	14.77
8/1/2007	213	66.83	112411	11.24	5.95	594.553	30.00	-5.26	-1.56
8/29/2007	241	96.66	112411	11.24	8.60	859.883	28.00	29.83	9.48
						Over summer:	**112.00**	**76.52**	**6.08**

Table 5-5. Epilimnetic and Hypolimnetic TP - Lovers Lake North Basin.

ENSR

Epilimnetic Total Phosphorus Increase in Lovers Lake-North Basin

Date	Julian Date	Epi TP (kg)	Upper Epi SA (m2)	Upper Epi SA (ha)	Epi TP (kg/ha)	Epi TP (mg/m2)	Interval (days)	Change in Epi TP (kg)	Epi TP Release (mg/m2/day)
5/9/2007	129	15.49	90711.52	9.07	1.7081	170.81	-	-	-
6/5/2007	156	5.30	90711.52	9.07	0.58435	58.44	27.00	-10.19	-4.16
7/2/2007	183	22.83	90711.52	9.07	2.5172	251.72	27.00	17.53	7.16
8/1/2007	213	23.65	90711.52	9.07	2.6071	260.71	30.00	0.82	0.30
8/29/2007	241	10.60	90711.52	9.07	1.1687	116.87	28.00	-13.05	-5.14
						Over summer:	**112.00**	**-4.89**	**-0.48**

Hypolimnetic Total Phosphorus for Lovers Lake- North Basin

Date	Julian Date	Hypo TP (kg)	Upper Hypo SA (m2)	Upper HypoSA (ha)	Hypo TP (kg/ha)	Hypo TP(mg/m2)	Interval (days)	Change in Hypo TP (kg)	Hypo TP Release (mg/m2/day)
5/9/2007	129	3.89	36738	3.67	1.06	105.86	-	-	-
6/5/2007	156	2.30	36738	3.67	0.63	62.65	27.00	-1.59	-1.60
7/2/2007	183	8.49	36738	3.67	2.31	231.17	27.00	6.19	6.24
8/1/2007	213	4.29	36738	3.67	1.17	116.67	30.00	-4.21	-3.82
8/29/2007	241	6.27	36738	3.67	1.71	170.68	28.00	1.98	1.93
						Over summer:	**112.00**	**2.38**	**0.58**

Combined Total Phosphorus Load for Lovers Lake- North Basin

Date	Julian Date	Combined TP (kg)	Pond SA (m2)	Pond SA (ha)	Combined TP (kg/ha)	Combined TP (mg/m2)	Interval (days)	Change in Total TP (kg)	Total TP Release (mg/m2/day)
5/9/2007	129	19.38	127449.52	12.74	1.52	152.09	-	-	-
6/5/2007	156	7.60	127449.52	12.74	0.60	59.65	27.00	-11.78	-3.42
7/2/2007	183	31.33	127449.52	12.74	2.46	245.80	27.00	23.72	6.89
8/1/2007	213	27.94	127449.52	12.74	2.19	219.19	30.00	-3.39	-0.89
8/29/2007	241	16.87	127449.52	12.74	1.32	132.38	28.00	-11.06	-3.10
						Over summer:	**112.00**	**-2.51**	**-0.18**

Table 5-6. Epilimnetic and Hypolimnetic TP in Lovers Lake South Basin.

ENSR

Epilimnetic Total Phosphorus Increase in Lovers Lake-South Basin

Date	Julian Date	Epi TP (kg)	Upper Epi SA (m2)	Upper Epi SA (ha)	Epi TP (kg/ha)	Epi TP (mg/m2)	Interval (days)	Change in Epi TP (kg)	Epi TP Release (mg/m2/day)
5/9/2007	129	10.05	61854.97	6.19	1.62	162.44	-	-	-
6/5/2007	156	1.03	61854.97	6.19	0.17	16.58	27.00	-9.02	-5.40
7/2/2007	183	6.36	61854.97	6.19	1.03	102.77	27.00	5.33	3.19
8/1/2007	213	9.02	61854.97	6.19	1.46	145.86	30.00	2.67	1.44
8/29/2007	241	5.95	61854.97	6.19	0.96	96.14	28.00	-3.08	-1.78
						Over summer:	**112.00**	**-4.10**	**-0.59**

Hypolimnetic Total Phosphorus Increase in Lovers Lake-South Basin

Date	Julian Date	Hypo TP (kg)	Upper Hypo SA (m2)	Upper Hypo SA (ha)	Hypo TP (kg/ha)	Hypo TP (mg/m2)	Interval (days)	Change in Hypo TP (kg)	Hypo TP Release (mg/m2/day)
5/9/2007	129	0.18	4020.57	0.40	0.46	46.00	-	-	-
6/5/2007	156	0.08	4020.57	0.40	0.21	21.00	27.00	-0.10	-0.93
7/2/2007	183	0.33	4020.57	0.40	0.83	83.00	27.00	0.25	2.30
8/1/2007	213	0.33	4020.57	0.40	0.83	83.00	30.00	0.00	0.00
8/29/2007	241	0.33	4020.57	0.40	0.81	81.00	28.00	-0.01	-0.07
						Over summer:	**112.00**	**0.14**	**0.31**

Combined Total Phosphorus Load for Lovers Lake- South Basin

Date	Julian Date	Combined TP (kg)	Pond SA (m2)	Pond SA (ha)	Combined TP (kg/ha)	Combined TP (mg/m2)	Interval (days)	Change in Total TP (kg)	Total TP Release (mg/m2/day)
5/9/2007	129	10.23	65875.54	6.59	1.55	155.33	-	-	-
6/5/2007	156	1.11	65875.54	6.59	0.17	16.85	27.00	-9.12	-5.13
7/2/2007	183	6.69	65875.54	6.59	1.02	101.56	27.00	5.58	3.14
8/1/2007	213	9.36	65875.54	6.59	1.42	142.02	30.00	2.67	1.35
8/29/2007	241	6.27	65875.54	6.59	0.95	95.21	28.00	-3.08	-1.67
						Over summer:	**112.00**	**-0.60**	**-0.08**

Table 5-7. Lovers Lake phosphorous budget

Input Source	TP Load (kg/yr)	% of TP
Atmospheric	3.8	9
Internal Recycling	18.3	43
Waterfowl	4	9
Septic Systems	4.6	11
Watershed GW Load	0.3	1
Watershed Runoff Load	11.5	27
Total	42.5	100
Output Source		
Surface Water Outflow	15	35
Out-seepage (assumed)	0	0
Storage	27.5	65
Total	42.5	100

Table 5-8. Stillwater Pond phosphorous budget

Input Source	TP Load (kg/yr)	% of TP
Inlet (LL Outlet)	15	31
Atmospheric	1.9	4
Internal Recycling	27	55
Waterfowl	2	4
Septic Systems	2.6	5
Watershed GW Load	0.002	<.01
Watershed Runoff Load	0.4	1
Total	48.5	100
Output Source		
Surface Water Outflow	12.5	26
Out-seepage (assumed)	0	0
Storage	36	74
Total	48.5	100

Table 6 - 1. Lovers Lake Current Trophic Conditions and Potential Restoration Objectives.

Description	Total P Load (kg/yr)	Mean In-lake P (ug/L)	Mean In-lake chl a (ug/L)	Mean SDT (m)	Probability of bloom> 10 ug/L (%)
Observed Conditions (2007):	-	38.0	-	3.0	-
Current Modeled Conditions:	42.5	38.2	17.1	1.4	79.5
Build-out Conditions	42.8	38.5	17.3	1.4	80.0
Hypothetical Critical Load:	53.0	46.4	21.9	1.2	90.7
Modeled Permissible Load:	26.0	23.4	9.1	2.1	33.3
Modeled CCC Criteria:	11.0	9.9	2.9	4.0	0.3

Table 6 - 2. Stillwater Pond Current Trophic Conditions and Potential Restoration Objectives.

Description	Total P Load (kg/yr)	Mean In-lake P (ug/L)	Mean In-lake chl a (ug/L)	Mean SDT (m)	Probability of bloom> 10 ug/L (%)
Observed Conditions (2007):	-	40.0	-	1.8	-
Current Modeled Conditions:	48.5	40.4	18.4	1.4	83.3
Build-out Conditions:	48.8	40.4	18.4	1.4	83.4
Hypothetical Critical Load:	44.0	36.9	16.4	1.5	76.9
Modeled Permissible Load:	22.0	18.4	6.7	2.5	14.5
Modeled CCC Criteria:	12.0	10.0	3.0	3.9	0.4

Table 8.1. Review of Potential Pond Restoration Options for Lovers Lake and Stillwater Pond, Chatham, MA.

#	Category	Specific Restoration Tasks	Est.($)	Rationale for Selection
1.	No Action	No in-pond restoration.	$0	Current conditions are impaired, but the Ponds are presumed to provide minimal ecological and recreational function. Conditions will not improve but should not degrade significantly over the next decade. Watershed & shoreline phosphorus source reduction where possible.
2.	Maintenance Approach	**LL**: install artificial circulation. **SP**: no in-pond restoration.	$180,000	Destratification in Lovers Lake will provide least costly means of reducing internal P recycling. Pond still very productive, but less BGA and fishery/benthic habitat is improved and expanded. Modest water quality improvements will extend into Stillwater Pond epilimnion. Watershed & shoreline phosphorus source reduction where possible.
3a.	Phased Approach Alternative 1	**LL**: "expanded" hypolimnetic pond alum treatment and monitoring. **SP**: hypolimnetic alum treatment and monitoring.	$214,000	Large reduction in both deeper epilimnetic and hypolimnetic sediment P-recycling. Significant improvement in water quality expected with respect to DO and SDT. A 2-3 year delay allows evaluation of the positive WQ impact on Stillwater Pond. If needed, alum treatment in SP will greatly reduce P-budget. Watershed & shoreline phosphorus source reduction where possible.
3b.	Phased Approach Alternative 2	**LL**: "expanded" hypolimnetic pond alum treatment and monitoring. **SP**: delayed (3 yr) installation of hypolimnetic aeration.	$297,000	Large reduction in both deeper epilimnetic and hypolimnetic sediment P-recycling. Significant improvement in water quality expected with respect to DO and SDT. A 2-3 year delay allows evaluation of the positive WQ impact on Stillwater Pond. If needed, install hypolimnetic aerator in SP central basin. Watershed & shoreline phosphorus source reduction where possible.
4	Aggressive Approach	**LL**: "expanded" hypolimnetic alum treatment and monitoring; followed by artificial circulation. **SP**: hypolimnetic alum treatment and monitoring.	$474,000	Large reduction in sediment P-recycling for both ponds. Significant improvement in water quality in entire system expected with respect to DO and SDT and shift of N:P ratios. Destratification in LL to keep basin oxic and reduce organic build-up, good water quality is exported to epilimnion of SP where herring fishery resources benefit. Alum treatment in SP will greatly reduce P-budget. Watershed & shoreline phosphorus source reduction where possible.

Table 8-2. Lovers Lake and Stillwater Pond - Restoration Option Phosphorus Reduction

Lovers Lake

	Scenario 1: Modeled Current Conditons	Option #2		Option#3a		Option #3b		Option #4	
Phosphorus Inputs	TP Load (kg/yr)	% TP Reduction	TP Load (kg/yr)	% TP Reduction	TP Load (kg/yr)	% TP Reduction	TP Load (kg/yr)	% TP Reduction	TP Load (kg/yr)
ATMOSPHERIC	3.8	0	3.8	0	3.8	0	3.8	0	3.8
INTERNAL	18.3	60	7.3	75	4.6	75	4.6	90	1.8
WATERFOWL	4.0	0	4.0	0	4.0	0	4.0	0	4.0
SEPTIC SYSTEM	4.6	50	2.3	50	2.3	50	2.3	50	2.3
GROUNDWATER LOAD	0.3	0	0.3	0	0.3	0	0.3	0	0.3
WATERSHED RUNOFF	11.5	60	4.6	60	4.6	60	4.6	60	4.6
TP Total Load:	**42.5**		**22.3**		**19.6**		**19.6**		**16.8**

Stillwater Pond

	Scenario 1: Modeled Current Conditons	Option #2		Option#3a		Option #3b		Option #4	
Phosphorus Inputs	TP Load (kg/yr)	% TP Reduction	TP Load (kg/yr)	% TP Reduction	TP Load (kg/yr)	% TP Reduction	TP Load (kg/yr)	% TP Reduction	TP Load (kg/yr)
ATMOSPHERIC	1.9	0	1.9	0	1.9	0	1.9	0	1.9
INTERNAL	26.6	0	26.6	75	6.7	70	8.0	75	6.7
WATERFOWL	2.0	0	2.0	0	2.0	0	2.0	0	2.0
SEPTIC SYSTEM	2.6	50	1.3	50	1.3	50	1.3	50	1.3
TRIBUTARY FROM LL	15.0	48	7.9	54	6.9	54	6.9	60	5.9
GROUNDWATER LOAD	0.0	0	0.0	0	0.0	0	0.0	0	0.0
WATERSHED RUNOFF	0.4	60	0.2	60	0.2	60	0.2	60	0.2
TP Total Load:	**48.5**		**39.8**		**18.9**		**20.2**		**17.9**

Table 8 - 3. Current Trophic Conditions and Potential Restoration Objectives.

Lover's Lake

Description	Total P Load (kg/yr)	Mean In-lake P (ug/L)	Mean In-lake chl a (ug/L)	Mean SDT (m)
Scenario 1: Current Modeled Conditions:	42.5	38.2	17.1	1.4
Modeled Permissible Load:	26.0	23.4	9.1	2.1
Modeled with Town Sewering:	38.0	34.0	15.0	1.6
Option #2	22.3	21.5	8.2	2.2
Option #3a	19.6	19.1	7.0	2.4
Option #3b	19.6	19.1	7.0	2.4
Option #4	16.8	16.5	5.8	2.7

Stillwater Pond

Description	Total P Load (kg/yr)	Mean In-lake P (ug/L)	Mean In-lake chl a (ug/L)	Mean SDT (m)
Scenario 1: Current Modeled Conditions:	48.5	40.0	18.0	1.4
Modeled Permissible Load:	22.0	18.4	6.7	2.5
Modeled with Town Sewering:	46.0	38.0	17.2	1.4
Option #2	39.8	33.1	14.3	1.6
Option #3a	18.9	15.7	5.4	2.8
Option #3b	20.2	16.8	5.9	2.7
Option #4	17.9	14.9	5.1	2.9