

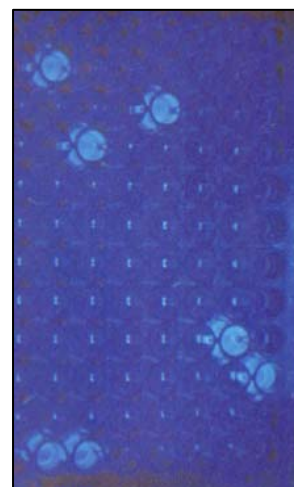


# Cox Bay Stream Monitoring Report

## March 2009

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## **Background**

Cox Bay is the southern-most area of Lake Joseph. The southern part of the lake, including Cox Bay, is located in the District of Muskoka (DMM), and the northern part of the lake is in Seguin Township. In 2007, DMM designated Cox Bay ‘over-threshold’ (OT) with respect to total phosphorus concentration. This means that the lake’s nutrient level exceeds what is ecologically acceptable due to anthropogenic causes. The bay is at risk of accelerated eutrophication with symptoms including algae blooms and excessive plant growth.

Muskoka’s Official Plan specifies that a Remedial Action Plan (RAP) should be undertaken by DMM and involving all stakeholders, in order to lower the TP levels to a level that is acceptable. As of yet, DMM has not initiated a RAP. Recognizing that Cox Bay had a nutrient level in excess of the acceptable threshold, the Cox Bay community began mobilizing a Community Action Plan (CAP) in 2006. The CAP is the community-led remediation plan (counterpart to the RAP) designed to

- a. Identify significant sources of phosphorus loading;
- b. Mitigate anthropogenic sources; and ultimately
- c. Lower phosphorus levels in Cox Bay to an acceptable level.

Community members suspected that phosphorus may be entering Cox Bay via the many streams that lead into the water body, and therefore prioritized the study of these streams.

## **Stream Documentation**

In 2007, volunteers documented 37 streams leading into Cox Bay as described in Section 4.7 of the Cox Bay Remedial Community Action Plan Interim Report (January 3, 2008). 27 of these streams are intermittent and a further ten are permanent. Volunteers identified three more intermittent streams in 2008. Updated documentation is found in Appendix A.

## **Stream Monitoring**

Volunteers collected water samples from several of the streams on four occasions over the 2008 spring and summer seasons. The four sampling occasions were scheduled to be spread out over the season; specific dates were chosen to fall soon after heavy rainfalls. These samples were delivered to the Dorset Environmental Science Centre and analyzed by the lab for total phosphorus concentration. Sample dates were:

- a. April 26
- b. June 13
- c. August 6
- d. October 2

Two identical samples were taken at each stream on each date. These two results were averaged to give a more accurate reading of the phosphorus level in each stream. The two results were also used as a form of quality control; if the two results were extremely different, it is likely that one was contaminated with sediment as a conservative estimate, the lower of the two results was taken to be true.

Results are shown in the graph in Appendix B. Appendix C contains results collected late in the fall of 2007. While it is prudent to focus on the results collected in 2008, the results from 2007 can be used to confirm the conclusions drawn in 2008.

## Results

In all, 12<sup>1</sup> of the 40 streams identified as leading into the bay were never monitored by the volunteers. The reason for not monitoring these streams is not clear at this time. If these streams were not flowing during any of the sampling occasions, it is best to assume that they do not contribute any phosphorus loading to Cox Bay, and remove them from the list of streams.

Of the remaining 28 streams, nine of them had phosphorus concentrations that exceeded 50µg/L on at least one occasion. While 50µg/L is not objectively determined to be an acceptable threshold of phosphorus concentration in these streams, it is a useful benchmark (or 'functional' threshold) by which to enumerate the streams that have a higher load impact than others leading into Cox Bay.

Table 1 discusses the results for each of these streams.

Stream	Discussion
#3	Three out of four <sup>2</sup> measurements exceeded 50µg/L. This stream runs from the lake across residential property through buried piping (extremely close to a septic bed) and drains a larger area that includes tennis courts and open grassy areas near the Lake Joseph Club. While it is identified as an intermittent stream, it was flowing during all four sampling occasions, so may be a significant source of TP loading.
#4	One out of four (August) measurements exceeded 50µg/L for this stream which drains road ditches near the Lake Joseph Club. This single result may have been caused by an isolated event and should be confirmed by further monitoring. This intermittent stream was flowing during all four sampling occasions.

<sup>1</sup> Stream numbers 13, 15, 16, 19, 20, 21, 22, 23, 24, 25, 32 and 33.

<sup>2</sup> The average measurement in June exceeded 50µg/L, however one measurement was only 21.3µg/L while the duplicate was 82.3µg/L. If this was the only measurement that exceeded our functional threshold, it may not be significant. However, two out of the remaining three samples also exceeded 50µg/L.

#5	This stream was only sampled once (June) but significantly exceeded the benchmark of 50µg/L. This suggests that the stream may be a significant source of TP loading when it flows. This should be confirmed by re-sampling.
#7	One out of four (August) measurements exceeded 50µg/L for this stream which drains part of the Lake Joseph Club golf course before crossing residential property. It is identified as a permanent stream, and therefore could represent a significant TP loading. The fall 2007 measurement was also well above 50µg/L.
#7A	This stream was only sampled once (April) but exceeded the benchmark of 50µg/L. This suggests that the stream, which drains parts of the Lake Joseph Club golf course, may be a significant source of TP loading when it flows during the spring run-off period. This should be confirmed by re-sampling.
#7C	Two out of four (April and August) measurements exceeded 50µg/L for this stream which drains a residential property. While it is identified as an intermittent stream, it was flowing during all four sampling occasions, so may be a significant source of TP loading.
#8	One out of four (October) measurements exceeded 50µg/L for this stream which drains road ditches near the Lake Joseph Club. While the October 2 measurement significantly exceeded the benchmark, other measurements were quite low, so this result may have been caused by an isolated event and should be confirmed by further monitoring. This intermittent stream was flowing during all four sampling occasions.
#28	This stream was only sampled once (June) but significantly exceeded the benchmark of 50µg/L. This suggests that the stream may be a significant source of TP loading when it flows. This should be confirmed by re-sampling. The stream is near Henshaw Creek, and drains an area on residential property.
#36	One out of three (August) measurements exceeded 50µg/L for this stream which drains a wetland upstream from Orgill's Bay. Since this area drains a wetland, high TP concentrations are likely natural and to be expected. For this reason, it is probably not necessary to continue monitoring in this location.

## Recommendations

A review of the monitoring results suggests that three of the streams leading into Cox Bay should be investigated for sources of TP loading which could be mitigated. These streams are #3, #7 and #7C.

Investigation should include 'walking the stream' with the property owner(s) while the stream is flowing, preferably during the spring run-off. Apparent sources of TP loading, such as proximity to applications of fertilizer, proximity to septic tanks and/or beds, leaching pits, etc. should be documented with photos and notes. Once these sources are documented, a plan for mitigating these sources should be worked out with the property owner(s). Monitoring the streams for phosphorus concentration should continue until

after the mitigative measures, so that the effect of actions can be observed and/or quantified.

The review further suggests that a five more streams may have a significant impact; future monitoring should be used to confirm this conclusion while mitigative strategies focus on the above mentioned streams. These streams are #4, #5, #7A, #8 and #28. Note that streams #5, #7A and #28 were each flowing during only one monitoring occasion, so it is important to sample these streams during the heaviest period of spring run-off or after a very heavy rainfall.

Review of results also suggest that stream #36 does not represent a significant anthropogenic source of phosphorus loading.

In general, all streams sampled in 2008 should be re-sampled during 2009's spring run-off period in order to confirm the results captured in 2008. The exact dates will depend on the weather during the spring of 2009. If TP concentration is extremely high for some additional streams, it will be prudent to continue sampling them throughout the 2009 season in a fashion similar to that followed in 2008.

Prepared by

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Logan Environmental Consulting

## **Appendix A**

### *Stream Documentation*

New Master

April 26/08 Mike

3 new w/s streams added

## LOCATIONS OF CREEKS/STREAMS – COX AND PINELANDS BAYS

Charting of the following creeks/streams was done in July and August 2007 by Bill Boughner, Keith and Gayle Shantz. (April 26, 2008 – italicized descriptions are of NEWLY IDENTIFIED streams.)

Legend: AY – all year WS – wet season or after heavy rains

### Accessible from Hemlock Point Road, south branch:

- 1 1315 Hemlock Point Road Rob and Laura Diamond  
WS Lake entry location: northwest of boathouse  
Sampling area: in front of house  
Drainage: open ditch; run-off originates on Lake Joseph Club and includes Diamond property; joined by 4" house foundation drain.

### Accessible from Elgin House Road:

- 2 1173 Elgin House Road, Unit 2 Bill and Sandy Boughner  
WS Lake entry location: beside dock for number 3 cottage  
Sampling area: 4" pipe at water's edge  
Drainage: from north side of tennis courts and includes three catch basins joined by underground pipes
- 3 1173 Elgin House Road, Unit 6 Richard and Gloria Cole  
WS Lake entry location: south side of tile bed at water's edge  
Sampling area: same location  
Drainage: from south side of tennis courts through culverts and open ditches to a catch basin on north-west side of tile bed with underground piping to water's edge
- 4 1173 Elgin House Road Lake Joseph Club  
WS Lake entry location: about 50' south of the Cole property.  
Sampling area: same location (walk across from Cole property)  
Drainage: an open ditch lined with rocks connects to two culverts under Elgin House Road; drains the golf course and road ditches
- 4a 1173 Elgin House Road Lake Joseph Club*  
*WS Lake entry location: 15' south east of #4*  
*Sampling area: 8" culvert*  
*Drainage: drains golf course*
- 5 Helen Island Road Lake Joseph Club  
WS Lake entry location: by pump house  
Sampling area: same  
Drainage: a series of culverts and open ditches draining Helen Island Road ditches
- 6 1117 Elgin House Road Lake Joseph Club  
WS Lake entry location: northeast side of property  
Sampling area: same  
Drainage: series of open ditches and 12" culverts that drain the Lake Joseph Villas from both sides of Elgin House Road.
- 7 1107 Elgin House Road (Brookmere) Dan and Joan Hauserman  
AY Lake entry location: northeast side of property  
Sampling area: same  
Drainage: an open ditch to a culvert under Elgin House Road drains large area of golf course; headed by a spring on the golf course



- 7a Empty lot between 1089 and 1079 Elgin House Road, near telephone pole #1595  
 WS Lake entry location: east side of property  
 Sampling area: culvert near road  
 Drainage: golf course
- 7b 1063 Elgin House Road ???  
 WS Lake entry location: behind boathouse  
 Sampling area: 20' from shoreline  
 Drainage: 16" galvanized culvert drains golf course and ditch on north side of Elgin House Rd; water runs in open ditch and through underground tiles to lakeshore
- 7c 1053 Elgin House Road Marino D'Alessandro  
 WS Lake entry location: far west side of property  
 Sampling area: 8" plastic culvert 50' behind garage  
 Drainage: north and west sides of property ; drains D'Alessandro property only
- 8 1053 Elgin House Road Marino D'Alessandro  
 WS Lake entry location: east side of property  
 Sampling area: same  
 Drainage: open ditch to an 18" culvert under Elgin House Road; drains run-off from golf course and road ditches
- 9 1017 Elgin House Road Gary Berscht  
 WS Lake entry location: west side of cottage dock.  
 Sampling area: same  
 Drainage: run-off from this property and adjacent property

**Accessible from Peninsula Road:**

- 10 1431 Peninsula Road Owen and Joanne Phillips  
 AY Lake entry location: creek/stream on southwest side of house  
 Sampling area: beside the house  
 Drainage: consists of open ditches and culverts combination. One culvert under Elgin House Road drains marine storage property. A second culvert under Elgin House Road drains road ditch on west side of Peninsula Road. A third culvert under Peninsula Road drains the road ditch on the east side of Peninsula Road.
- 11 1415 Peninsula Road David Rogers  
 AY Lake entry location: right in front of the house  
 Sampling area: at 6" plastic pipe at water's edge.  
 Drainage: an underground spring of fresh water is captured and funnelled into the house foundation footing drain. In wet seasons some run-off water may be blended with the spring water.
- 12 1415 Peninsula Road David Rogers  
 WS Lake entry location: south side of property.  
 Sampling area: at water's edge  
 Drainage: large culvert under Peninsula Road drains road ditch on east side of road. An open ditch drains the run-off on west side of road. Both drains join at water's edge.



**13** 1370 Peninsula Road (new owners)  
WS Lake entry location: south side of boathouse  
Sampling area: same  
Drainage: consists of a culvert under Peninsula Road that drains the run-off from road ditch on east side of road.

**14** 1353 Peninsula Road Gary and Nancy Gilbert  
WS Lake entry location: beach area.  
Sampling area: west end of culvert that runs under Peninsula Road  
Drainage: culvert drains ditch on east side of road.

**15** 1321 Peninsula Road Alf Mortimer  
WS Lake entry location: between house and marina  
Sampling area: west end of culvert that runs under Peninsula Road  
Drainage: drains ditch on east side of road.

**Accessible from Peninsula Road – 1289 (footpath)**

**16** 1289 Peninsula Road, #1 Stewart Robinson  
WS Lake entry location: through culvert under footpath on south side of property  
Sampling area: same  
Drainage: drains property behind house and hill.

**17** 1191 Peninsula Road, #2 Peter Rogers  
AY Note: either drive in at 1191 from Peninsula Road or walk along footpath to the south end  
Lake entry location: Creek/stream enters the lake at north side of property  
Sampling area: wooden bridge  
Drainage: large wet area and is beaver-friendly.

**18** 1191 Peninsula Road, #1 Moores  
WS Lake entry location: on west side of property (walk across from Roger's property)  
Sampling area: same  
Drainage: open ditch drains hills behind house and the adjacent property.

**Accessible from 3838 Highway 118: [Spring sampling must be done as snow is melting; all streams are dry at other times of year.]**

**19** 3838 Hwy. 118 – #54 Rob McLennan  
WS Lake entry location: east side of property  
Sampling area: at plastic culvert  
Drainage: large plastic culvert under road to alter natural hill drainage away from the house.

**20** 3838 Hwy. 118 – #50 Dave Burrows  
WS Lake entry location: north side of property  
Sampling area: rock hillside at end of 4" drainage tiles  
Drainage: drains road ditch and hill behind property

**21** 3838 Hwy. 118 – #44 R. C. Firstbrook  
WS Lake entry location: south side of sleeping cabin  
Sampling area: by yellow stake marking culvert out-flow on west side of road  
Drainage: 12" steel culvert angled under road to alter drainage away from house. Drains hill behind property.

- 22 3838 Hwy. 118 - #38 Burgess  
WS Lake entry location: in front of house, off sloping rock  
Sampling area: same  
Drainage: 4" plastic culvert draining rock face behind house and garden between two sections of house
- 23 3838 Hwy. 118 - #32 Jonathon Blair (notify day before sampling – 705-765-3147)  
WS Lake entry location: north side of property  
Sampling area: where open metal conduit joins plastic drain  
Drainage: drains hill and road ditch from east side of road
- 24 3838 Hwy. 118 - #32 Jonathon Blair (see above note)  
WS Lake entry location: beach area between house and boathouse  
Sampling area: beside the tile bed  
Drainage: open ditch on south side of tile bed drains back property and road ditch through culvert under road
- 25 3838 Hwy. 118 - #22 Alison Smith (new owner)  
WS Lake entry location: south side of house  
Sampling area: same  
Drainage: Open ditch running down beside driveway and cottage; culvert under road to drain road ditch and back property

**Accessible from 3864 Highway 118, to Jones Bay Road:**

- 26 3864 to Jones Bay Road, #11 Lloyd Koutsaris  
WS Lake entry location: west side of property  
Sampling area: behind garage  
Drainage: 8" metal culvert under road to divert drainage from hillside; runs west of garage
- 27 3864 to Jones Bay Road, #9 K. W. Mariani  
AY Lake entry location: Henshaw Creek on west side of driveway by wooden bridge  
Sampling area: same  
Drainage: Henshaw Creek drains Henshaw Lake into Lake Joseph in high water season; it also channels spring water all year
- 28 3864 to Jones Bay Road, #7 S. Weir  
WS Lake entry location: east side of property, approx. 30' west of Henshaw Creek  
Sampling area: from Mariani property/Henshaw Creek, walk approx. 30' west  
Drainage: open ditch draining back hill
- 29 3864 to Jones Bay Road, #5 Hil and Ellen Bolley  
AY Lake entry location: north-east side of property  
Sampling area: water's edge  
Drainage: spring fed creek from back of property
- 30 3864 to Jones Bay Road, #5 Hil and Ellen Bolley  
AY Lake entry location: southwest side of property  
Sampling area: water's edge  
Drainage: spring fed creek from back of property



### Accessible from Highway 118

- 31** 3876 Hwy. 118 The Muskokan Manager (765-1992)  
**AY** **Note: report to manager or director of sales – Krista Havenaar**  
Lake entry location: mid-front property  
Sampling area: water's edge  
Drainage: run-off in back of property (WS) blends with spring fed creek in middle of property.
- 32** 3876 Hwy. 118 The Muskokan Manager (765-1992)  
**WS** **Note: report to manager or director of sales – Krista Havenaar**  
Lake entry location: west side of property  
Sampling area: from 4" plastic pipes at water's edge  
Drainage: drain-off from behind housing units and run-off from steep rock formation
- 33** 1015 Pine Glen Road - #2 W. R. Carruthers/Hilton  
**WS** Lake entry location: south side of property  
Sampling area: behind sleeping cabin  
Drainage: run-off water from back of property is channelled away from building with square timbers to open ditch down hillside to lake
- 34** 1011 Pine Glen Road - #1 Roger and Denise Crawford (owner: Mardi Witzel)  
**AY** Lake entry location: by wooden bridge at water's edge on west side of property  
Sampling area: at wooden bridge  
Drainage: spring fed creek beside driveway blends with run-off from adjacent properties during wet season
- 35** 1024 Appian Way Marygrove  
**AY** Lake entry location: between Marygrove property and public access ramp  
Sampling area: same  
Drainage: creek at north side of property runs along Appian Way. Drains marshland on southwest side of Hwy. 118
- 36** 1025 Appian Way, #7 Owner ???  
**WS** Lake entry location: shallow marshy end of Orgills Bay on southwest side of Lake Joseph  
Sampling area: 1<sup>st</sup> culvert under laneway  
Drainage: wetlands on west side of Appian Way
- 37** 1025 Appian Way, #7 Owner ???  
**WS** Lake entry location: shallow marshy end of Orgills Bay on southwest side of Lake Joseph  
Sampling area: 2<sup>nd</sup> culvert under laneway (closest to house)  
Drainage: wetlands on west side of Appian Way

Updated April 26, 2008

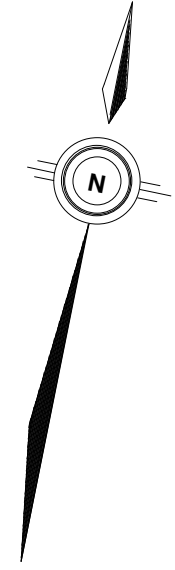


# Lake Joseph

## Cox Bay Land Use Survey, June 2007



0 50 100  
meters



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### Legend

### Shoreline Length and Percentages

shorelineCoxBayMAP by Shoreline	
NR	(19)
NS	(30)
OMMB	(8)
RC	(2)
SWC	(1)
SWS	(30)
SWW	(5)
YLU	(8)

Shoreline	Type	Length_m	Percent
NR	Natural Rock	2,621.66	37.61
NS	Natural Shrub	2,274.29	32.63
OMMB	Man Made Beach	254.04	3.64
RC	Concrete Ramp	9.96	0.14
SWC	Concrete Shore Wall	38.97	0.56
SWS	Stone Shore Wall	902.65	12.95
SWW	Wooden Shore Wall	361.07	5.18
YLU	Unbuffered Lawn	507.76	7.28
Total		6,970.40	100.00
	Natural	4,895.95	70.24
	Altered	2,074.45	29.76
	Structures	1,194.50	17.14

### Legend

### Structure Count

structuresCoxBayMAP by Structure	
BHC1	(6)
BHC2	(25)
BHC3	(13)
BHP2	(1)
DC	(59)
DC1	(8)
DC2	(2)
DC3	(2)
DF	(1)
DPL	(1)
DP	(6)
OSB	(6)
OSD	(3)
OSOTH	(1)
RW	(2)

Structure	Type	Count
BHC1	1 Slip Crib Boathouse	6
BHC2	2 Slip Crib Boathouse	25
BHC3	3 Slip Crib Boathouse	13
BHP2	2 Slip Pole Boathouse	1
DC	Crib Dock	59
DC1	1 Slip Crib Dock	8
DC2	2 Slip Crib Dock	2
DC3	3 Slip Crib Dock	2
DF	Fill Dock	1
DPL	Floating Dock	1
DP	Pole Dock	6
OSB	Bridge	6
OSD	Deck	3
OSOTH	Other Structure	1
RW	Wooden Ramp	2
Total		136

### Legend

### Backlot Area and Percentages

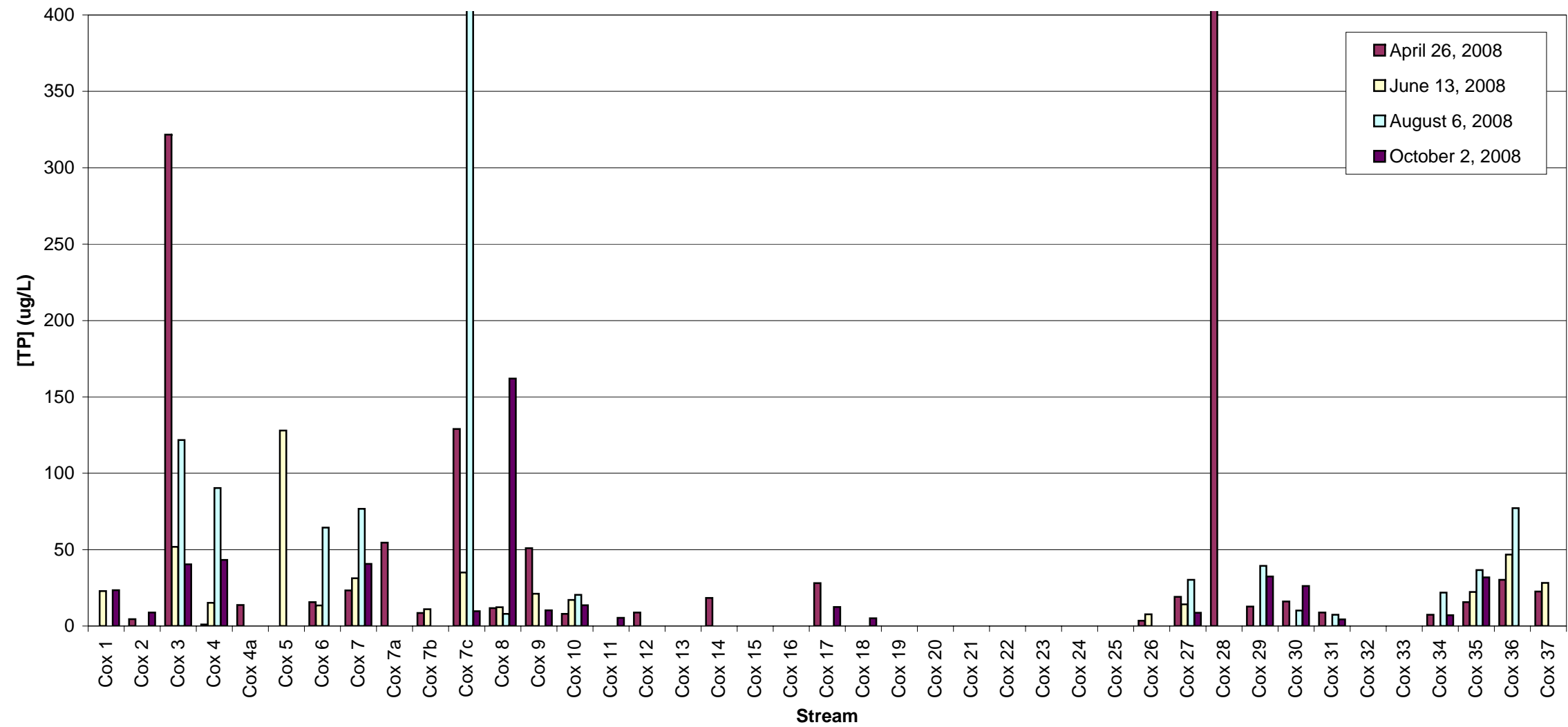
backlotCoxBayMAP by Backlot	
LUC	(2)
LUM	(1)
NFM	(24)
NFT	(13)
NO	(4)
OR	(3)
OSCO	(1)
YL	(9)
YLB	(9)
YLU	(17)

Backlot	Type	Area_m2	Percent
LUC	Commercial Land Use	9,423.71	6.88
LUM	Marina	4,513.54	3.30
NFM	Mixed Forest	46,948.60	34.30
NFT	Thinned Forest	26,663.98	19.48
NO	Natural Overgrowth	3,795.09	2.77
OR	Road	5,418.69	3.96
OSCO	Cottage	594.78	0.43
YL	Landscaped Yard	8,177.50	5.97
YLB	Buffered Lawn	10,277.82	7.51
YLU	Unbuffered Lawn	21,062.62	15.40
Total		136,986.33	100.00
	Natural	46,948.60	34.30
	Altered	89,947.73	65.70

**Appendix B**  
*2008 Results*



[TP] in Cox Bay Streams, 2008



**Appendix C**  
*2007 Results*

[TP] in Cox Bay Streams, 2007

