Soil & Water Conservation Society of Metro Halifax (SWCSMH)
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Master Homepage: http://lakes.chebucto.org

Ref.: HWCC_Stressors_1 (4 pages)
To: **Chair & Members, Halifax and West Community Council, HRM**
From: S. M. Mandaville Post-Grad Dip., Professional Lake Manage.
Chairman and Scientific Director
Date: February 06, 2013
Subject: Stressors and selective removals: Part-1

Please feel free to ask me any questions, and I will endeavour my level best to respond either via emails and/or in person at one of your meetings, if invited to do so.

Appendix-A: Typical stressors in stormwater runoff (representative North American data from Government and other relevant sources. While some of it is dated, periodic sampling at the end of select storm sewers in HRM has shown concurrence of the ranges.)

(USEPA, 1976 [Source: Sartor and Boyd, 1972])

Measured Pollutant	Particle size				
	<43µ		43µ - 246µ		>246µ
	(% by weight)				
TS	5.9		37.5		56.5
BOD_5	24.3		32.5		43.2
COD	22.7		57.4		19.9
VS	25.6		34.0		40.4
Phosphates	56.2		36.0		7.8
Nitrates	31.9		45.1		23.0
Kjeldahl Nitrogen	18.7		39.8		41.5
All heavy metals		51.2		48.7	
All pesticides		73		27	
PCB		34		66	

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(Vokey, J. 1998. Development of Unit Urban Phosphorus Export Coefficients in the local watersheds of 2 Mesotrophic Lakes within the Halifax Regional Municipality (HRM), NS, Canada. Project-C. (2 Lakes: Settle and Bissett). Soil & Water Conservation Society of Metro Halifax. viii, 51p.)

Local watershed	**Storm sewer catchment area (ha)**	**TP Export Coefficient (kg/ha.yr)**
Settle Lake	7.3	0.53
Bissett Lake	57.6	0.57

(USEPA. 1976. Areawide Assessment Procedures Manuals. Vols. I-III. Municipal Environ. Res. Lab., Cincinnati, Ohio. EPA-600/9-76-014.)

	Average (Kg/ha/yr)			**Range (Kg/ha/yr)**		
	TN	**TP**	**TSS**	**TN**	**TP**	**TSS**
Forest	2.5	0.2	250	1-10	0.005-1	40-400
Range/Pasture	5	0.3	400	2-10	0.2-0.6	10-1,000
Cropland	10	0.6	1,600	1-40	0.03-0.7	300-4,000
Urban	5	0.8	2,000	2-20	0.25-5	200-5,000
Feedlots	1,000	250	---	700-1,500	100-400	---
Precipitation	10	0.25	---	1-100	0.05-1	---
Lake Sediments Aerobic Conditions Anaerobic Conditions	 --- ---	 20 150	 --- ---	 --- ---	 5-40 100-200	 --- ---

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(Herr and Harper [Source: Harper, H.H. 1988. Effects of Stormwater Management Systems on Groundwater Quality. Final Report for Project SM 190, submitted to the Florida Department of Environmental Regulation.])

Parameter	Typical Distribution (%)	
	Dissolved	Particulate
Total N	40	60
Total P	50	50
TSS	0	100
BOD	60	40
Total Cd	70	30
Total Cr	65	35
Total Cu	70	30
Total Ni	70	30
Total Pb	25	75
Total Zn	35	65

(Drapper *et al* [Source: Driscoll, E., Shelley, P.E., and Strecker, E.W. 1990. Pollutant Loadings and Impacts from Highway Stormwater Runoff. Volumes I-IV. FHWA/RD-88-006-9, Federal Highway Administration, Woodward-Clyde Consultants, Oakland, CA])

Pollutant	Urban (ADT> 30,000)	Rural (ADT< 30,000)
	(µg/l)	(µg/l)
TSS (Total Suspended Solids)	142,000	41,000
VSS (Volatile Suspended Solids)	39,000	12,000
TOC (Total Organic Carbon)	25,000	8,000
COD (Chemical Oxygen Demand)	114,000	49,000
NO_3/NO_2 (Nitrate + Nitrite)	760	570
TKN (Total Kjeldahl Nitrogen)	1,830	870
Phosphorus as PO_4	400	160
Cu (Total Copper)	54	22
Pb (Total Lead)	400	80
Zn (Total Zinc)	329	80

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Estimated Net Mass Reduction in Stormwater Constituents Achieved Based on 70% TSS Removal (*cf.* Herr and Harper)

Parameter	Estimated Annual Mass Load Reduction (%)
Total N	30
Total P	25
TSS	70
BOD	20
Cadmium	15
Chromium	18
Copper	15
Lead	38
Nickel	15
Zinc	33

Rate of settling in pure, still water (temp=10oC, sp. gravity of particles=2.65, shape of particles=spherical) (Welch, 1935)

Material	Diameter (mm)	Hydraulic subsiding value (mm/sec)	Time required to settle 1 ft.
Gravel	10.0	1000.0	0.3 sec
Coarse sand	1.0	100.0	3.0 sec
Fine sand	0.1	8.0	38.0 sec
Silt	0.01	0.154	33.0 min
Bacteria	0.001	0.00154	55.0 hr
Clay	0.0001	0.0000154	230.0 days
colloidal particles	0.00001	0.000000154	63 years

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Ref.:	HWCC_Stressors_2	(1 page)
To:	**Chair & Members, Halifax and West Community Council, HRM**	
From:	S. M. Mandaville Post-Grad Dip., Professional Lake Manage. Chairman and Scientific Director	
Date:	February 12, 2013	
Subject:	Stewardship practices-Stressors and selective removals: Part-2	

Please feel free to ask me any questions, and I will endeavour my level best to respond either via emails and/or in person at one of your meetings, if invited to do so.

We request that you promote stewardship practices to your constituents by distributing and/or viewing our half hour video titled "Environmental Impact on Water Courses" with the web URL of **http://www.youtube.com/watch?v=DCEquMvuAto**

This video is 3rd/4th generation conversion to MS wmv format from the original SVHS tape of the Tv show produced on Shaw Cable at Lower Sackville several years ago.

In the video, John Sheppard PEng, the stormwater engineer with Halifax County at that time (now a Director with Halifax Water), explains to our representative, Capt.(retd.) Mike Shacklock, at the time of the Town of Bedford, on some of the stressors that can enter a freshwater course via storm sewers, and on what individuals could do to minimize them, not necessarily eliminate them totally though. While this deals with urban areas with catch basins, it can apply equally to unserviced areas where drainage ditches empty into freshwaters, i.e., lakes/ponds and rivers/streams.

This is not about end-of-the-pipe stormwater treatment but is on stewardship practices!