STORMWATER RETROFIT PLANNING AND DESIGN



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STORMWATER RETROFIT PLANNING AND DESIGN

PLANNING PROCESS

- 1. IDENTIFY / QUANTIFY WATERSHED PROBLEMS
- 2. PRIORITIZE RETROFIT **SITES**
- 3. DEVELOP **SITE SPECIFIC** STORMWATER BMP'S

EXAMPLE PROJECTS

- 1. RESIDENTIAL
- 2. STREETS
- 3. PARKING LOTS
- 4. COMMERCIAL-DOWNTOWN VICTORIA



IDENTIFY / QUANTIFY WATERSHED PROBLEMS

DOUGLAS CREEK WATERSHED







LAND USE CHANGE



UNCLEARED LAND

AGRICULTURE

SUBURBAN

URBAN DEVELOPMENT

MURDOCH DE GREEFF INC.

CHANGES IN IMPERVIOUS COVER







CHANGES IN CHANNEL DENSITY





HABITAT QUALITY CHANGES



UNCLEARED LAND

AGRICULTURE

SUBURBAN

URBAN DEVELOPMENT

MARSH W.M. 1997. LANDSCAPE PLANNING AND ENVIRONMENTAL APPLICATIONS 3RD ED.



WATERSHED HEALTH





SUB-BASIN ANALYSIS







SUB-BASIN HEALTH





SUB-BASIN ANALYSIS







SUB-BASIN RANKING

Sub-Basin	sup Basi	nstatis	ites	Beriou Paris	A REA HUN	and use	ela)	IN SPIRIT	A net cit	a)	Pollution	al phose	otential	Hallan	MA DNIGET DE	nand overalls	up. Basin Ranking Laponest health	2
Ash	49	37	16.7	3		99	0	0	6	Í	1.3	0.4	34.2	3		3		
Tyndall	79	33	19.7	4		82	8	0	4	1	1.4	0.4	33.1	5		5		
Lambrick	96	32	16.6	5		70	16	0	3		1.3	0.4	33.7	4		4		
Blair	93	36	18.4	2		58	28	4	1		1.5	0.6	42.6	1		1		
Parkside	47	25	13.0	6		71	0	0	5		1.0	0.3	27.1	6		6		
Mt. Douglas	68	5	4.7	8		1	0	0	8		0.1	0.0	9.2	8		*7		
Shelbourne	102	38	20.1	1		87	9	3	2]	1.4	0.5	41.9	2		2		
Ravine	22	6	5.2	7		2	0	0	7		0.1	0.0	9.5	7		*8		
Watershed	557	32	15.8	n/a		64	10	1			n/a	n/a	n/a			n/a		

* Even though the Mt. Douglas sub-basin had the lowest sub-basin ranking it has more retrofit opportunities than the Ravine sub-basin. Channel density in the Ravine sub-basin is due mostly to natural stream channel while that of the Mt. Douglas sub-basin is due to road related infrastructure. Instream retrofits are beyond the scope of this study and would not contribute to stormwater management objectives in the watershed.



SELECT RETROFIT SITES





DEVELOP SITE SPECIFIC STORMWATER BMP'S

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Retrofit Type	land Ow	hership	hand la	se med and med ac	eschool solution	the city	eness uitable	ST FLOW	ondition of the o	s Jency Jency	in Nati	sed mar	onentati	on Ben	stite esthetic offic all	hing http:	estuciul conomi	e Life e Life co co co co co co co co co co co co co	intenan	SP DE	P ^{REFICED STATES}	/
Rain Garden	-	ĺ √	?	ĺ √	Í	√	ĺ√	ĺ √	√	ĺ√	Í √		ĺ √	?	ĺ√	Í	M	M	Ĥ	Ĺ	2	1
Rain Swale	-	\checkmark	?	✓		\checkmark	✓	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	?	\checkmark		L	Μ	Н	L	1	
Stormwater Bulges	-	\checkmark	-	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark		Н	Μ	Н	L	3	
Detention Ponds	-	\checkmark	?	-		\checkmark	✓	\checkmark	?	?	-		-	-	\checkmark		Н	Н	L	Μ	7	
nfiltration Trenches	-	\checkmark	?	\checkmark		-	\checkmark	\checkmark	\checkmark	\checkmark	?		-	-	\checkmark		Н	L	L	Н	6	
Street Tree Planting	-	\checkmark	-	\checkmark		\checkmark	-	-	?	?	\checkmark		\checkmark	\checkmark	?		L	L	Н	L	4	
Road Diet's	-	\checkmark	-	\checkmark		\checkmark	\checkmark	?	-	-	?		\checkmark	\checkmark	\checkmark		VH	-	Н	-	5	
Catch Basins/Pipes	-	\checkmark	?	\checkmark		\checkmark	-	-	-	-	-		-	-	-		Η	L	L	VH	8	
	Exe	cutio	n/Ap	prov	val												Cos	st/Va	lue			
	✓ E	asy/C	ompa	tible													VH	Very I	High			
	? ו	Possik	ole/Mc	ore diff	ficult												нн	igh				
	- C	Difficul	t or N	ot App	licable												MN	lediun	n			
																	L Lo	w				
	* Execu	ition of	f these	forms	of storn	nwate	er retro	fits on	private	ely owr	hed lar	id is not	possib	ole in the		text of the	nis stu	dy. Th	e inter	nt of		

has been omitted. The first 5 retrofits would be suitable for home and business owners to implement (depending on the scale of

MURDOCH DE GREEFF INC.

the project) but it would have to be on a voluntary basis.

PROPOSED RETROFIT SITES





RETROFIT SITE DESIGNS







Retrofit Site 2: Site Context and Description Stormwater Traffic Bulge



Stormwater Retrofit Existing Condition





INTEGRATE VALUE AND COMMUNITY BENEFITS

Retrofit Solutions will be successful if they...

- meet stormwater/rainwater management objectives
- function to meet environmental design objectives
- meet the needs and desires of the end users-the public
- easy to maintenance, and
- fit the context of the site (no palm trees please)



IDENTIFY / QUANTIFY WATERSHED PROBLEMS

RESIDENTIAL EXAMPLE









RESIDENTIAL EXAMPLE



Single Family House

- CONVENTIONAL
 STORMWATER
 MANAGEMENT
 SYSTEM
- ' LOTS OF LAWN
- NOT MAY TREES



RESIDENTIAL EXAMPLE



Single Family House

- 3 CUBIC METRE
 CISTERN
- RAIN GARDENS
- ' LESS LAWN
- MORE TREES
- , RAIN WATER FOUNTAIN!!



Irrigation and Water Fountain





rain cistern X's 2 = 3 m^3 storage

summer = dead storage
winter = live storage



























Information

- Manage runoff from road and sidewalk area of 1550 m²
- Rain garden area of 80 m² or roughly 5% of the catchment area
- separates sidewalk from roadway
- provides traffic calming functions
- minimum of 10 cubic metres of soil per tree





COWICHAN LAKE SPORTS ARENA





COWICHAN LAKE SPORTS ARENA











THE ATRIUM - 800 YATES STREET



































Information

- 95% of building site managed by Green Roof
- Rain gardens manage 2950 m² of road and sidewalk runoff (90% of which is off-site)
- close to 100 metres of seating walls
- minimum of 7 cubic metres of soil per tree





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