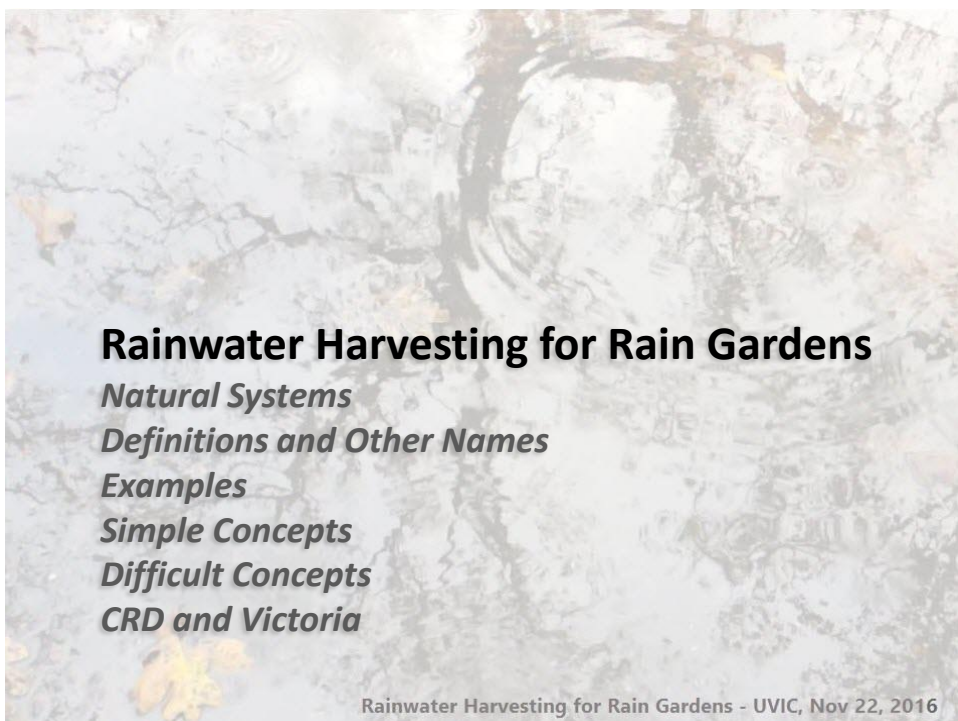




Rainwater Harvesting for Rain Gardens

Ken Nentwig

BLA MIA CLM CLD
RCSA AP and Trainer



Rainwater Harvesting for Rain Gardens

Natural Systems

Definitions and Other Names

Examples

Simple Concepts

Difficult Concepts

CRD and Victoria

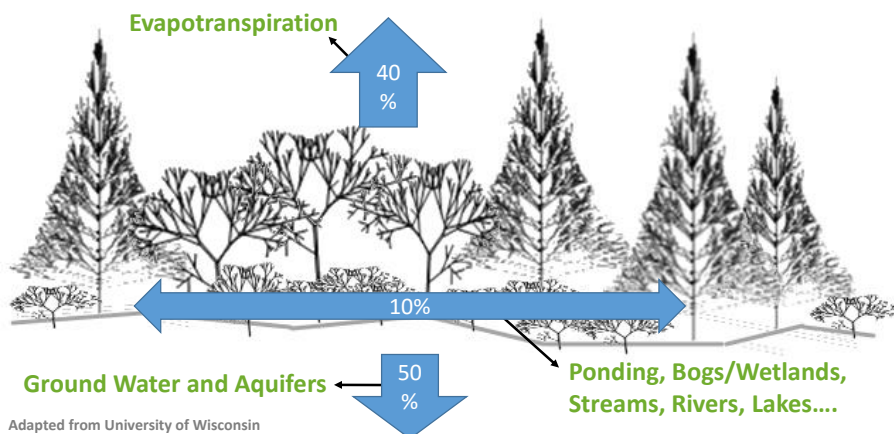
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RAINWATER HARVESTING SYSTEMS of good quality and suitability:

- ARE NOT OFF-THE-SHELF PRE-PACKAGED
- ARE NOT THE SAME FOR NEAR-IDENTICAL SITES
- ARE NOT ROCKET SCIENCE, BUT REQUIRE CAREFUL CONSIDERATIONS and CALCULATIONS
- ARE NOT ALWAYS THE BEST SOLUTION to water-related problems
- MAY NOT RESEMBLE ANYTHING YOU WILL SEE IN THIS PRESENTATION
- WEB-BASED INFO CAN BE GOOD or BAD, no guarantees

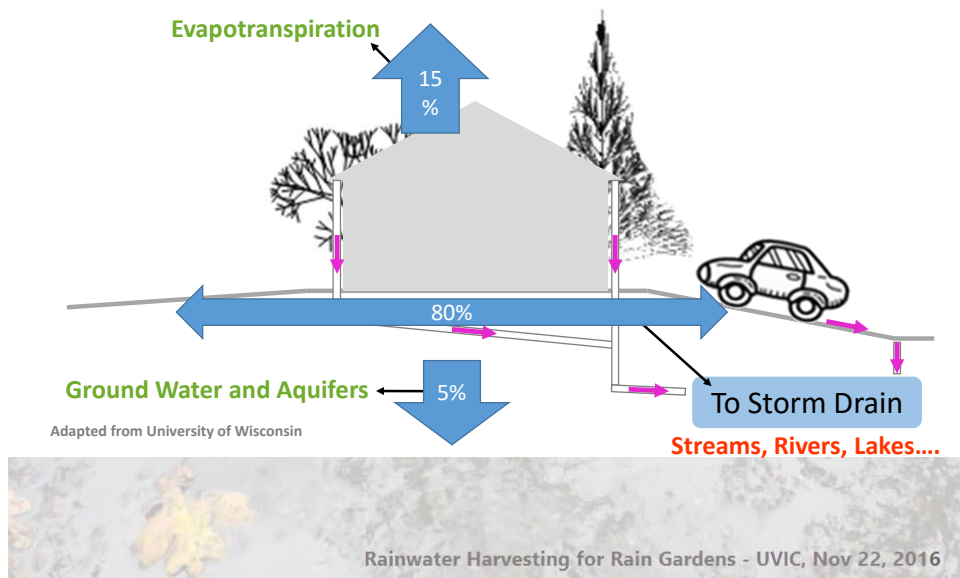
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Previously...



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Currently...



A **rain garden** is a planted depression or a hole that allows rainwater runoff from impervious urban areas, like roofs, driveways, walkways, parking lots, and compacted lawn areas, the opportunity to be absorbed.

https://en.wikipedia.org/wiki/Rain_garden

Rain Gardens are landscape features designed to treat stormwater runoff from hard surface areas such as roofs, roads and parking lots. They consist of sunken garden spaces where runoff can pond and infiltrate into deep constructed soils and then into the native soils below.

<https://www.crd.bc.ca/education/low-impact-development/rain-gardens>

A **rain garden** is a shallow depression that uses soils and plants to slow and clean runoff from hard surfaces such as your roof or driveway. The plants and compost-amended soil can hold several inches of rain water, allowing the water to slowly seep into the ground.

http://www.victoria.ca/EN/main/departments/engineering/stormwater/managing-rain-as-a-resource/rain_gardens_in_Victoria.html

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Rain Gardens:

landscape features

shallow depression
planted depression ('hole?')
sunken garden spaces

to slow and clean runoff
treat stormwater runoff

allows rainwater to be absorbed
runoff can pond and infiltrate
slowly seep into the ground
constructed soils and native soils below

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Rain Garden 'Cousins'

Landscape features:

Bioswales

Vegetated Swales

Infiltration Ponds

Infiltration Ditches

Bogs and Wetlands

Processes:

RESTORATION

'REPLICATION'

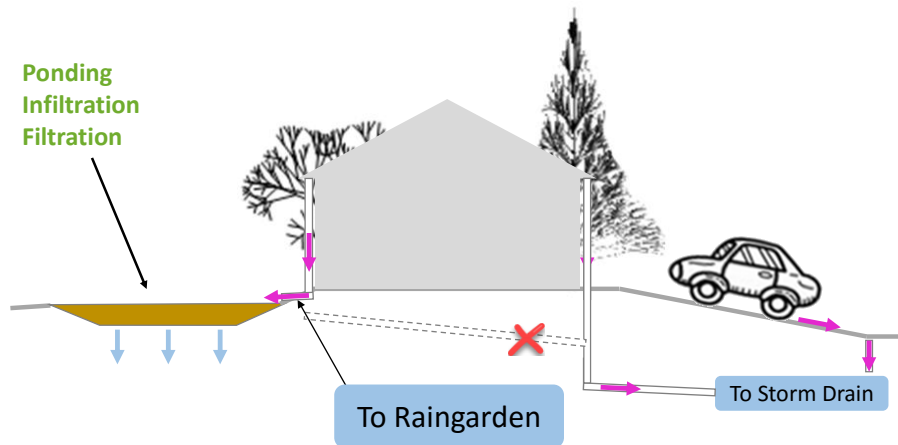
RE-CREATION

REHABILITATION

REMEDIATION

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Simple Rain Garden



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Cecelia Road Playground



Trent Street



Spirit Garden (Centennial Square)



http://www.victoria.ca/EN/main/departments/engineering/stormwater/managing-rain-as-a-resource/rain_gardens_in_Victoria.html

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Fisherman's Wharf Park**Greenrock Industrial Park, Nanaimo****Tyee Rd (Dockside Green)**

http://www.victoria.ca/EN/main/departments/engineering/stormwater/managing-rain-as-a-resource/rain_gardens_in_Victoria.html

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Yates Street (near the Atrium)

http://www.victoria.ca/EN/main/departments/engineering/stormwater/managing-rain-as-a-resource/rain_gardens_in_Victoria.html

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Rain Garden Considerations



SPACE AVAILABLE

WATER TREATMENT

WATER STORAGE

PLANTINGS REQUIRED: Wet and Dry condition species

ANY SHAPE, 'AREA' is BASED ON BOTTOM DIMENSIONS

MAY BE STEPPED if <10% slope

UNDERGROUND UTILITY TRENCHES

RESTRICT FOOT TRAFFIC through Rain Gardens

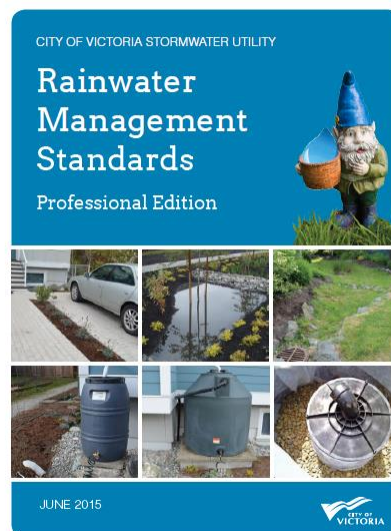
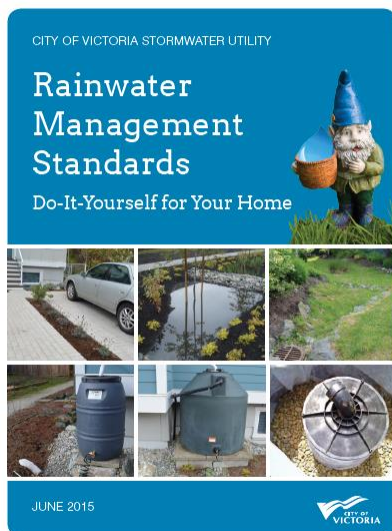
CARE and WATERING UNTIL ESTABLISHED

STRAIGHT-SIDED and NON-INFILTRATION Rain Gardens

= Professional Design and Installation Needed

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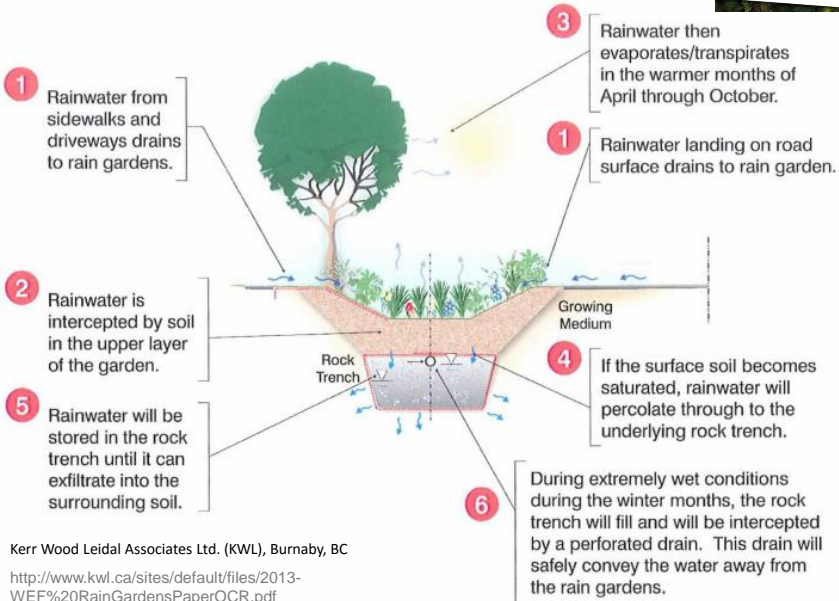
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Rain Garden Anatomy

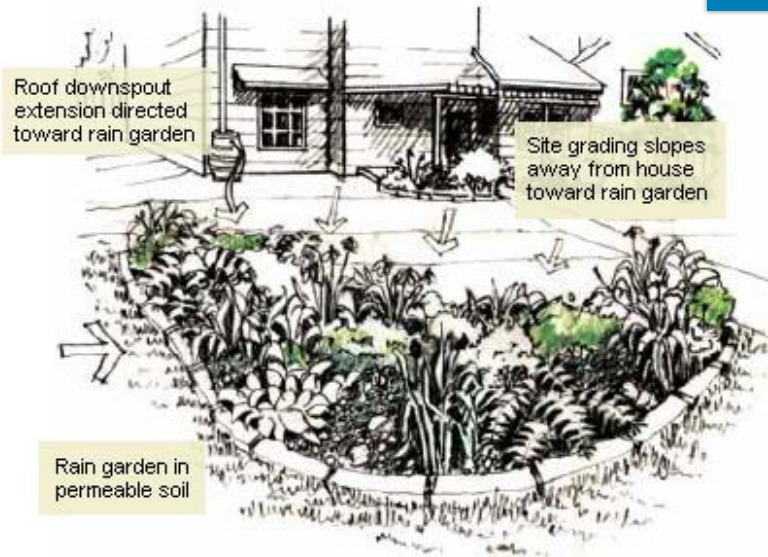
KW KERR WOOD LEIDAL
consulting engineers



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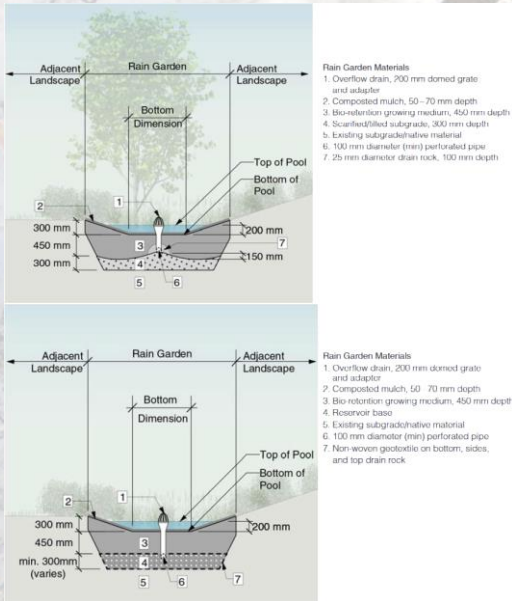
Rain Garden Anatomy

OFFICE OF WATER ENVIRONMENTAL QUALITY
Rainwater Management Standards
Do It Yourself for Your Home



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Rain Garden Anatomy



Rain Garden without Reservoir

Rock mulch not permitted, bottom must be planted

Minimum size: 5% of impervious area

Maximum side slope 3:1 (4:1 preferred)

Rain Garden with Reservoir

Rock mulch not permitted, bottom must be planted

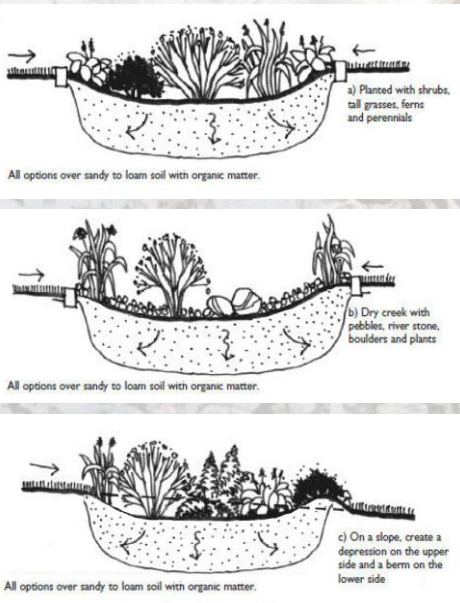
Trees cannot be planted

Minimum size: 5% of impervious area

Maximum side slope 3:1 (4:1 preferred)

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Rain Garden Anatomy



Adapted from: "Rain Gardens: Improve Stormwater Management in Your Yard", CMHC, 2004

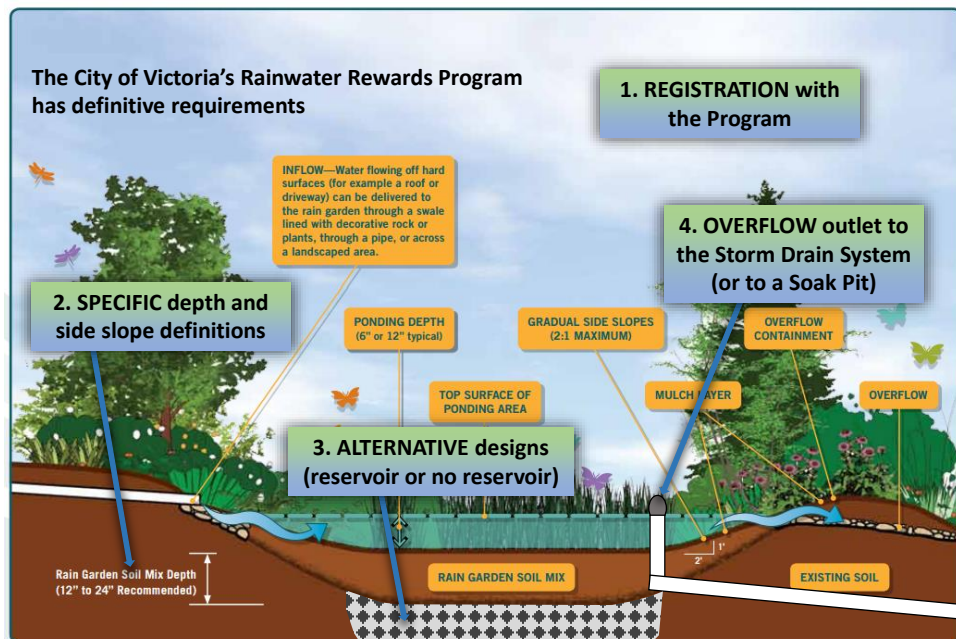
Rainwater Harvesting for Rain Gardens - UVIC, Nov 22, 2016

http://ext100.wsu.edu/raingarden/wp-content/uploads/sites/74/2016/03/Rain-Garden_LowRes_Page_1.jpg



Rainwater Harvesting for Rain Gardens - UVIC, Nov 22, 2016

ADAPTED FROM: <https://fortress.wa.gov/ecy/publications/publications/1310027.pdf>



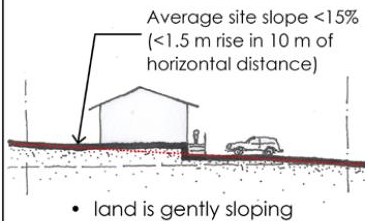
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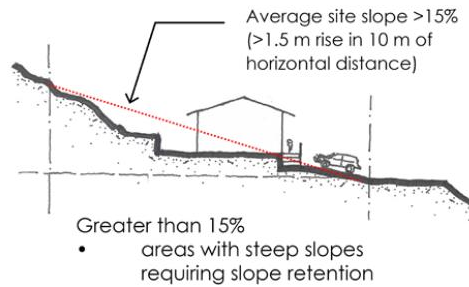


Basic Site Conditions

Site Slope



Challenging Site Conditions



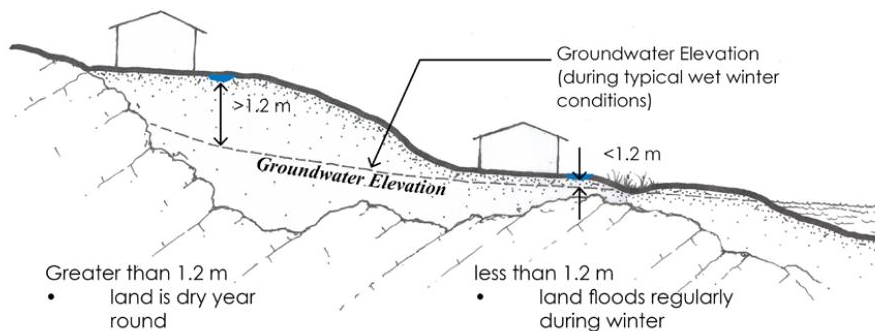
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Basic Site Conditions

Depth to Groundwater



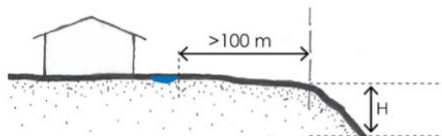
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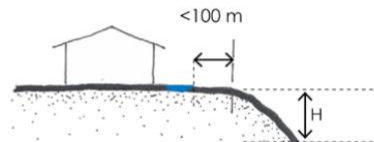
Basic Site Conditions

Proximity to Steep Slope >15%



Greater than 100 m from top of steep slope.

Challenging Site Conditions



Less than 100 m from top of steep slope

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Table 4: Can this Project be DIY Checklist

	DIY Allowed	Professional Only
Land Use	<input type="checkbox"/> Low Density Residential (1 – 4 Dwelling Units) <input type="checkbox"/> Impervious surface area < 300 m ²	<input type="checkbox"/> Multi-family Residential (5+ Dwelling Units) <input type="checkbox"/> Civic and Institutional <input type="checkbox"/> Commercial and Industrial <input type="checkbox"/> Impervious surface area > 300 m ²
Depth to Groundwater	<input type="checkbox"/> Greater than 1.2 m (land is dry year round)	<input type="checkbox"/> less than 1.2 m (land floods regularly during winter)
Proximity to Hazardous Slopes	<input type="checkbox"/> Method is greater than 150 m from top of known hazardous slope	<input type="checkbox"/> Method is less than 150 m from top of known hazardous slope
Proximity to Steep Slopes	<input type="checkbox"/> Method is greater than 100 m from top of steep slope (>15%)	<input type="checkbox"/> Method is less than 100 m from top of steep slope (>15%)
Bedrock on Site	<input type="checkbox"/> No known or visible bedrock	<input type="checkbox"/> Visible or known bedrock
Contaminated Soils	<input type="checkbox"/> No known contaminated soils or buried oil tanks or <input type="checkbox"/> Rain Barrel or Cistern is planned	<input type="checkbox"/> Known contaminated soils or buried oil tanks
Available Stormwater Main	<input type="checkbox"/> Stormwater main fronting or adjacent to property (VicMap)	<input type="checkbox"/> No stormwater main fronting or adjacent to property
Type of Rainwater Management Method to be installed	<input type="checkbox"/> Rain garden (slopes <5%) <input type="checkbox"/> Infiltration chamber (rock) <input type="checkbox"/> Permeable concrete unit paving (slopes <6%) <input type="checkbox"/> Rain barrel <input type="checkbox"/> Cistern at grade (plumbed for gravity irrigation)	<input type="checkbox"/> Methods requiring advanced design, e.g.: green roof (intensive and extensive), rain planters, cisterns below or above grade or plumbed for indoor use/irrigation, infiltration chamber (open), bioswale, permeable concrete unit paving (slope >6%)
Who can prepare the design?	If all of the conditions in the above column apply to your site, and only Standard Methods are used, the project can be designed by the: <ul style="list-style-type: none"> • Home Owner or • Qualified Designer or • Qualified Professional 	If any of the conditions in the column above apply to your site, the plans must be designed by a: <ul style="list-style-type: none"> • Qualified Designer or • Qualified Professional
Who can build the project?	The project can be built by the: <ul style="list-style-type: none"> • Home Owner or • Contractor/Professional 	If any of the conditions in the column above apply to your site, the project must be built by a: <ul style="list-style-type: none"> • Contractor/Professional
Documentation Requirements	<ul style="list-style-type: none"> • Concept Plan of Site and Methods • Sizing Calculation Sheet • Standard DIY Design to be used 	<ul style="list-style-type: none"> • Concept Plan of site and methods • Construction Details and Plans • Sizing Calculation Sheet

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Rainwater Management Standards – City of Victoria



Professional Design Qualifications and Requirements

In many circumstances site constraints and project complexity will warrant use of a Qualified Designer or a Qualified Professional in order to meet rainwater management objectives and the City of Victoria Rainwater Management Standards. The term "professional" used in this document includes both Qualified Designers and Qualified Professionals.

"Qualified Designer" means an individual who demonstrates to the satisfaction of the Director of Engineering and Public Works for the City that he or she has the training and experience necessary to design and oversee the installation of a rainwater management method.

"Qualified Professional" means an applied scientist or technologist, acting alone or together with another qualified professional, if:

- (i) The individual is registered in good standing in British Columbia with an appropriate professional organization constituted under an Act, acting under that association's code of ethics and subject to disciplinary action by that association,
- (ii) The individual's area of expertise is recognized by the individual's professional organization as one that is acceptable for the purpose of performing a professional service for design of rainwater management methods, and
- (iii) The individual is acting within the individual's area of expertise.

Qualified Professionals include but are not limited to:

- **Landscape Architects** – registered or licensed to practice as a qualified landscape architect under a recognized professional association (within BC the BCSLA and CSLA); and
- **Professional Engineers** – registered or licensed to practice as a professional engineer, under the Engineers and Geoscientists Act (APEGBC).

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Rainwater Management Standards – City of Victoria



Table 3: Setback and Minimum Values Summary

	Setback or Minimum Required
Infiltration setback from building foundation	5 m
Infiltration setback from steep (> 15%) slope	30 m minimum
Vertical and horizontal clearance from utilities	1.5 m
RMM setback from natural boundary/shoreline	10 m
Infiltration setback from drinking water well/spring	30 m minimum OR as directed by a hydrogeologist
Infiltration setback up-gradient from landfill or contaminated site	30 m
Rainwater Management Method near a protected or significant tree (see the City's Tree Preservation Bylaw)	Outside protected root zone
Vertical separation from bottom of infiltration RMM to high water table	0.6 m for catchments < 900 m ² 1.0 m for catchments > 900 m ² OR as directed by qualified professional

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Rainwater Management Standards – City of Victoria



Table 6: Bioretention Growing Medium Specs

Properties		Proportions
	Particle Size Classes	Gravel component measured from total sample (% dry weight)
Gravel Component of Growing Medium	Coarse Gravel (particles greater than 19mm and less than 40mm)	0 to 1%
	All Gravels (particles greater than 2mm and less than 40mm)	10 to 25%
Texture	Sand, Silt, Clay & Organic components measured from remaining non gravel portion of sample (% dry weight)	
	Sand (particles greater than 0.05mm and less than 2mm)	60 to 70%
	Combined Silts and Clays (particles less than 0.05mm)	10 to 20%
Organic Content	Organics (particles less than 2mm)	15 to 20%

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Rainwater Management Standards – City of Victoria

1

Read the DIY Standards, understand the pertinent parts

Use online Rainwater Planning Tool: sizing, permit requirements

Site assessment: boundaries, slopes, utilities, downspouts, wet areas...

Determine Rainwater Management Method(s) (RMM) to be used

Rain Barrel/Cistern

Rain Garden (with or without reservoir)

Infiltration Chamber

Permeable Pavement

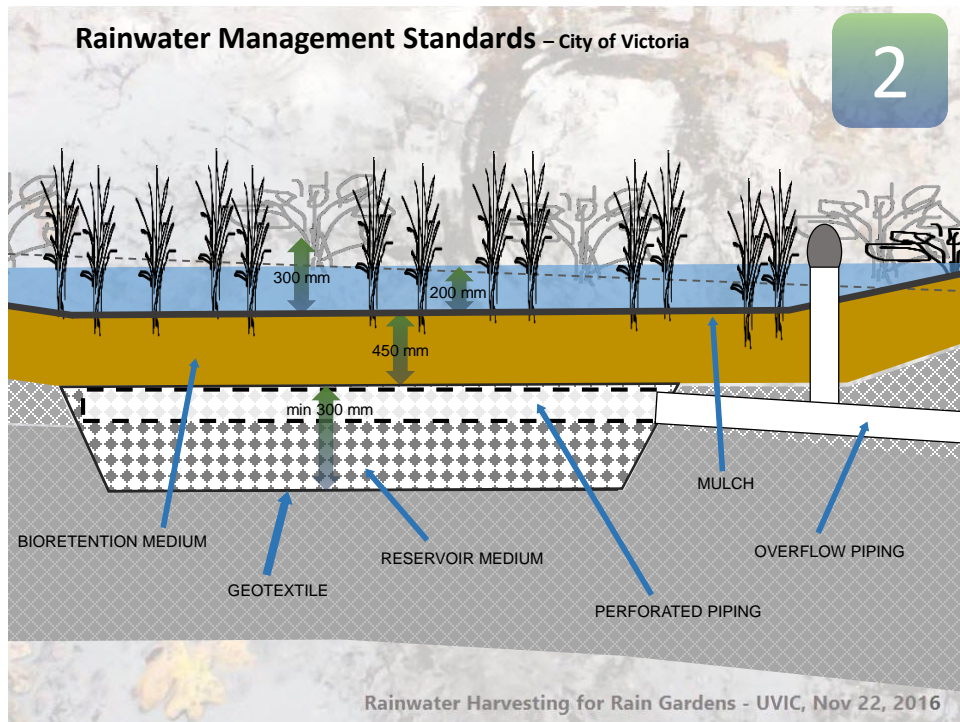
Confirm DIY or requirement for a professional

Determine size: catchment area, RMM volume/area

Locate utilities and connections

Apply for the program: plans and details of the project

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Restoration Walks in Victoria

<https://www.uvic.ca/socialsciences/environmental/assets/docs/RestorationWalksInVictoria.pdf>

Rain Gardens in Victoria

http://www.victoria.ca/EN/main/departments/engineering/stormwater/managing-rain-as-a-resource/rain_gardens_in_Victoria.html

CRD Home > Education & Environment > Green Infrastructure > **Rain Gardens**

<https://www.crd.bc.ca/education/low-impact-development/rain-gardens>

Kerr Wood Leidal – “Top Ten Design Considerations for Rain Gardens”

<http://www.kwl.ca/sites/default/files/2013-WEF%20RainGardensPaperOCR.pdf>

WSU (Washington State University)

http://ext100.wsu.edu/raingarden/wp-content/uploads/sites/74/2016/03/Rain-Garden_LowRes_Page_1.jpg

Rainwater Management Planner – City of Victoria

<http://vicmap.victoria.ca/Html5Viewer/index.html?viewer=rainwater>

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Michell Excavating

7473 East Saanich Rd, Victoria 250 652 1640

<http://michellexcavating.ca/>**MacNutt Enterprises**

1416-B Allan Rd, Victoria 250 479 6560

<http://www.macnuttenterprisesnanaimo.ca/>**Penninsula Landscape Supplies**

2078 Henry Ave. West, Sidney 250 656 6719

<http://www.peninsulalandscape.com/>**Victoria Landscape - Gravel Mart**

2516 Pleasant St, Victoria 250 381 2419

(no website)

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Rainwater Harvesting for Rain Gardens

Ken Nentwigken@canarm.orgken.nentwig@gmail.com

250 999 2472

604 757 1805

Slides: www.rainwatercanada.ca/about-rainwatercanada/information-and-links
 Presentations, UVIC

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