

## **Rainwater Management: Holistic Approaches to Put Water Back in the Ground Where it Belongs**

### **Shape the Landscape To Slow down and Retain Water: Low slope, flat and dish shaped in places**

Try to shape your landscape so that water flows away from your house at least 4 meters, but has a chance to soak in somewhere. Terraces, swales and some dish shaped depressions in some areas are a good start and they don't all have to be visible from the surface. Swales can be filled with crushed rock wrapped in filter fabric and then covered with highly permeable gravel or washed sand and soil. Alternatively, water can be piped into the crushed rock storage below ground. The surface can be fairly flat. These hidden infiltration chambers can be covered with permeable paved driveways, walkways or patios, grass, landscaping or gardens. The water just needs to be directed into the underground storage and the water level controlled with a pipe. If you are growing bigger landscape plants, you want to make sure the overflow pipe is set so that the water level will be more than 40 cm down into the soil most of the time.

### **Layered Vegetation: heat, wind protection, protects soils (keeps them permeable)**

Layers of vegetation canopies from trees to shrubs, and ground covers, provides heat, wind and soil protection (keeps it permeable.) Vegetation intercepts rainfall and directs it down the stem and allows it to drip through more slowly and with less force. Think of the plants like so many umbrellas, preventing the soil surface from being pounded into a pulp which dries into a hard crust. The roots suck up water and pump it back into the air and the soil soaks up water like a sponge. The more organic matter in and on the soil, the better water can soak in and the more water it can hold. Add lots of compost and layers of grass clippings, leaves and other mulch. Dense surface vegetation and mulch also protect the soil structure and slows down the drying process. Keeping your lawn 3 or 4 inches high and using the mulching attachment and occasional aeration makes it more effective at infiltrating water. Even an hour of rain on exposed soils can damage the surface structure leading to crust formation which reduces water infiltration and plant growth. The shade and air-conditioning effect from vegetation 'breathing' (evapotranspiration) results in less evaporation from the cooler soil surface. That is part of the reason why the shadier part of my non-irrigated lawn stays green into late summer. Also the moss stays green even when its dry and crispy.

Green roofs are also an excellent way to add a layer of vegetation and soil which slows down the water.

Soil composition also influences how fast the water moves into the soil and how much it can hold. Clay absorbs water slowly, but holds a lot, whereas sandy loam is a better compromise between infiltration and water holding ability. Adding organic matter is a good way to improve almost any soil. Even your lawn can be sprinkled with compost.

For more information please refer to the Naturescape website

[http://www.naturescapebc.ca/naturescape/Provincial\\_Guide\\_2003.pdf](http://www.naturescapebc.ca/naturescape/Provincial_Guide_2003.pdf)

### **Rain Barrels, Cisterns and Ponds**

Connecting a storage tank to your eaves trough downspout will help make better use of precious rainwater which is better for your garden than cold, chlorinated tap water. I find a large tank that is at least 500 - 2500 gallons to be most useful, because the smaller 50 gallon barrels only last for a short time. A big cistern will help get your small garden through a month or more of drought with out wasting highly treated tap water on irrigation. Some tanks can be buried, placed under your garage, deck or home or you can build a shed around them. A pond is another economical and beautiful way to store a large volume of water for irrigation or aesthetic purposes. In sandy areas, a pond liner will likely be needed.

### **Rainwater Harvesting Tips**

- use gutter gloves on your eaves troughs to keep the needles and debris from clogging the system
- use a short section of slightly uphill pipe trap more sediment

- use a filter to eliminate at least the coarse debris
- use a dark coloured tank and shade it as much as you can to reduce algae
- include an overflow pipe directed to a rain garden or drain, and a bypass pipe for when the tank is full and to allow the first 10 minutes of dirtier roof runoff to be discarded (also traps coarse sediment)
- install cistern with base angled slightly towards the manhole to make cleaning with a pool vacuum easier
- never enter a cistern because there can be a lack of oxygen inside which can kill you
- for most irrigation systems, a small pump would be needed to supply adequate pressure
- for drinking water, a more elaborate filtration system and maintenance program would be needed
- for more information visit the RDN green building website, and find the presentation by Bob Burgess on rainwater harvesting  
<http://www.rdn.bc.ca/cms/wpattachments/wpID2461atID4253.pdf>

### **Mitigating Hard Surfaces: roofs, driveways, patios**

Re-directing rain water flowing off hard surfaces into swales, rain gardens or hidden underground soak away pits helps mitigate their flooding and polluting effects and put water where it belongs – back in the ground. A residential rain garden typically is designed to handle roof, driveway and/or patio run-off. You will need an area at least 4 meters from your foundation where the land slopes away from your house, preferably in sand or gravel. Ideally this is a low spot or an area that can be sloped into a concave depression of any shape or a flat bottomed hole. The final surface can be fairly flat though, once you put in your crushed rock and soil.

1. It is a good idea to check with your local government engineering department for professional advice during your planning stages to make sure that your plans are compatible with theirs. If you don't feel inclined to take on such a project yourself, or are planning something larger and more complex, a landscape architect can design one for you and oversee the construction.
2. Choose a low, fairly flat area that is not over the septic system, utilities, or tree roots and where the winter water table is at least 60 cm down
3. Dig a hole 30cm by 30cm by 30cm deep and fill it with water then check back after 24 hours and see if it has soaked in - if not, your soil may not be able to soak in water quickly enough
4. You can calculate the drainage area that you plan to direct into the rain garden to get a rough idea of the size required. The raingarden size should be 10-20% of the drainage area for sandy soils and 50-60% for finer soils (increased depth can also help)
5. Dig a basin with a flat bottom, loosen up the bottom and line it with enough filter fabric to go up the sides and over the top, dump in some washed drain rock to within 40 cm of your final elevation.
6. Direct piping from your roof into the top of the drain rock. The portion nestled into the top few inches of the drain rock should be perforated with some holes facing straight down. This perforated section can run the entire length of the rain garden to help distribute the water.
7. Then wrap the fabric over the top of the rock and pipe. Now you have a filter fabric tube with crushed rock and perforated pipe on the inside. The depth of the hole determines the amount of water that can be stored in the crushed rock. The rock and filter fabric is optional, especially for highly permeable gravel or sandy areas where a small amount of water is directed into the garden.

8. Next add 40cm of soil, ideally half washed sand and half compost. Many grasses can get by with just 20cm of enriched soil. Raised vegetable or flower beds, landscaping, driveways and walkways are other ideas for the surface.
9. The required overflow pipe or/and notch will have to handle any extra water from big storms or an over-sized drainage area. Water levels are controlled by a riser pipe or perforated pipe at the top of the crushed rock and connect to a lower swale, grassy area, pond, garden, or a ditch or storm drain connection. You can even build a depression for water storage area in clay soil that will slowly discharge the water through a small pipe.

Visit the Kwalikum Secondary school raingarden, swale and interpretive sign for some ideas and our website <http://www.mvihes.bc.ca/projects/demonstration-rain-garden> and <http://www.groundwater.org/ta/raingardens.html> <http://www.appliedeco.com/Marketing/RainGardendesign.pdf> [http://www.cmhc-schl.gc.ca/en/co/maho/la/la\\_005.cfm](http://www.cmhc-schl.gc.ca/en/co/maho/la/la_005.cfm)  
Video: <http://www.youtube.com/watch?v=PK6tQgkuZZM>

### **Increase permeability of your planned patios, driveways, walk ways**

In your landscape plan, try to minimize the area of hard surfaces to what is needed. Using clean crushed rock, permeable pavers, porous pavement or permeable concrete is a great way to allow the rain to soak in. Just remember that for maximum effectiveness, use the angular quarter inch rock as the base instead of sand. Driveways could also consist of two paved tracks or at least be no wider than necessary.

### **Encourage your Local Government and Developers to use the best Low-Impact Development Techniques**

This includes many of the items mentioned for residential, business and industrial properties.

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