Using “Sky Water”
For Gardening... and Indoors

- Why more of us are catching the rain
- How much can I collect and use?
- What’s involved? What does it look like?
- How can I build one?
- Using rainwater indoors – more need for clean water & disinfection

RDN Team Watersmart Workshop
Cedar May 26, 2012

Prepared by Bob Burgess
The Rainwater Connection
THE RAINWATER CONNECTION

- 11 Years of designing, building and servicing rainwater systems
- Extensive testing of available products
- Development and manufacturing of our own components
- Engineer approved Rainwater Permits for Potable Systems
- Actively promoting rainwater use thru’ presentations, workshops, User’s Guides and demonstration projects
A Rapid Growth in RWH (Rainwater Harvesting)

For Urban and Rural Homes
A Rapid Growth in RWH

...and for commercial and industrial too
The Rainwater Harvester’s Mantra
Store excess water in winter to use in summer when groundwater levels drop

“We forget that the water cycle and the life cycle are one.”  Jacques Cousteau
Rainwater Harvesting
For Gardens
One Way to Conserve Water

- Demand for our scarce groundwater doubles (or triples) during the summer
- Reducing total outdoor water use (Conservation) is THE first step
- Backyard collection and storage of rainwater is the next step
  - alternative water supply, and
  - Reduction of Peak Hour Demand
Water the Garden with Rainwater
And pressure wash in spring & fall

Typical garden use:

• 30 deck pots
  820L (180 gal) /month

• 150 SF flower bed around Patio
  1,410L (310 gal) /month

• Small Vegetable Garden
  910 L (200 gal) / month

(assumes 1” water per week)
### How Much Can I Collect

From 1,000SF (93m²) roof and 1,000 gal (4.5m³) Cistern Rain Supply
740 gal (3.4m³) per month in summer
PLUS 3,500 gal (15.9m³) for Outdoor Cleaning
SAVE 6,450 gal (29.3m³) per year

### GAB Garden Water from 1000 SF April 2012.xls
Monthly Water Balance Table

<table>
<thead>
<tr>
<th>Location</th>
<th>Gabriola Island Weather Station (1981-2006 stats)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td>NOTE: Precipitation Varies by 15% on different sites</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario</th>
<th>MAXIMUM OUTDOOR WATER USE from 1,000 SF (93m²) roof and 1,000 gal (4,550 L) cistern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal Roof</td>
<td>AVG Rain</td>
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<table>
<thead>
<tr>
<th>Max Storage Cap (gal)</th>
<th>4,550 Litres</th>
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<tbody>
<tr>
<td></td>
<td>1,000</td>
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<table>
<thead>
<tr>
<th>Assumed Rainfall Level</th>
<th>Avg</th>
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<tr>
<td>Enter 10%: 20%: 30%: 50%: Max: Avg Min</td>
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<table>
<thead>
<tr>
<th>Month</th>
<th>Indoor Usage gal/mon</th>
<th>Outdoor Usage gal/mon</th>
<th>Assumed Rainfall inches</th>
<th>Assumed Collection Efficiency</th>
<th>Rainfall Collected gal/mon</th>
<th>Alternate Supply gal/mon</th>
<th>Storage Volume gal/mon</th>
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<tbody>
<tr>
<td>Start</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>October</td>
<td>0</td>
<td>1.200</td>
<td>3.4</td>
<td>75%</td>
<td>1322</td>
<td>0</td>
<td>122</td>
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<td>November</td>
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<td>0</td>
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<td>85%</td>
<td>2449</td>
<td>0</td>
<td>1000</td>
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<td>January</td>
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<td>3.8</td>
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<td>1669</td>
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<td>April</td>
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<td>642</td>
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<td>1000</td>
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<td>1000</td>
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<td>1.7</td>
<td>75%</td>
<td>661</td>
<td>0</td>
<td>961</td>
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<tr>
<td>July</td>
<td>0</td>
<td>0.800</td>
<td>1.0</td>
<td>75%</td>
<td>376</td>
<td>0</td>
<td>537</td>
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<tr>
<td>August</td>
<td>0</td>
<td>0.800</td>
<td>1.0</td>
<td>75%</td>
<td>408</td>
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<td>145</td>
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<td>September</td>
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<td>1.3</td>
<td>75%</td>
<td>521</td>
<td>0</td>
<td>16</td>
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<tr>
<td>TOTAL</td>
<td>0</td>
<td>6,450</td>
<td>37.7</td>
<td>958 mm</td>
<td>15,668</td>
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<td>9,218</td>
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| Demand | 6,450 | 29,300 Litres |
| Supply | 15,668 | Surplus |

Volume Units: gal, litre
Adding Well Water to Your Tank Without Adding to Peak Hour Demand

- Double or triple your outdoor water supply by topping up your tank at night
- Add 100-200 gallons during the night (timer or slow drip)
- Reduces the “stress” on your well
- Garden water quality improves in the tank (vents gasses & warms up)
Backflow Protection Devices are Required

Typical Air Gap Device for “Topping up” a Tank
Rainwater Harvesting is a perfect companion to gardening

- Natures watering agent (PH, temperature, chlorine free)
- Environmental stewardship in your own backyard (ZERO Peak Hour Demand)
- Freedom from watering restrictions
- A fun adjunct to gardening (keeping the kids involved)
The Important Features
Non Potable (Outdoor) RWH System

- Gutter with opt. gutter cover
- Downspout
- Debris Removal Device
- Diverter Valve and Pipe
- Drainage Away from House Foundation
- Rainwater Storage Tank
- Connection to Hose or Irrigation System
- Covered Rainwater Pump
- Protected Exit Valve
- Tank Overflow
Important Features…again

- Water Cleaning
- Diversion
- Coloured Tank
- Sloped or Level?
- Overflow To Drain
- Piped water Here
- Pump
CASE EXAMPLES

GOOD DESIGN + MAINTENANCE = GOOD QUALITY WATER

- System Features
- Installation Costs
First class rainwater catchment system, and 2,346L (516 gal) slimline tank to water green roof. Piped water fill option.
Salt Spring Island Garden System
Water for vegetable garden from new woodshed

- Gutterglove on gutters
- Diverter valve & overflow to rock pit under garden

1,500 L (335 imp gal) tank $780
Gutterglove covers $410
Pipe & fittings $340
Pump and fittings $750
TOTAL PARTS $2,280
Design and owners manual $530
Installation labour (21hrs.) $1,260
TOTAL PROJECT COST $4,070
Gutter Dam and “Gutter Glove” direct to flushing/Diverter valve, and across to the fence.
Along the Fence and into the 1,500 gal (6,800 litre) Can West semi burial tank and Grundfos MQ3 pump

- Gutter Guard $650
- Catchment $1,250
- Cistern $1,850
- Tank Fittings $900
- Pump $900
- TOTAL $5,550
Victoria West Project
80% of Irrigation Water and Storm Water Management

Catchment from 1/3 roof, First Flush Diverter & Overflow

Drainage to Rock Pit to control storm water
Pump to plants in summer & to 2nd rock pit in winter
Cleanable, uphill pipe to tank

4.5m³ (1,000 gallon) leg tank (55” tall by 9’6” long) $1,400

Total Project Cost $5,200
Dual Pumping Garden Water System
Salt Spring Island

Rainwater pumped from big rain barrel to two 1,250 gallon poly tanks – with on-demand pressure pump to garden

Catchment: $1,600
Tanks: $2,000
Pump: $800

$4,400 (2005)
Pumping the Water to the Cistern

Courtesy of RDN Sustainability Dept. Watch for their “Rainwater Guidebook” in May
Triple Cleaning System to Surge/Pump Tank

Debris Box, FFD pipe, Gravity Filter to 120 gal Surge/Pump Tank

Removable Pump & Float Switches
Avoid “Wet” Systems
Overhead Pipe to Tank
To Avoid a Wet System
Rain chain to “streambed”. Hidden filter box & underground pipe to tank in crawl space.
TRY THIS ONE AT HOME

- Parts as low as $280 plus tank and pump
- Build it in an afternoon
- 5-15 years between tank cleanings
Up Hill Pipe Rainwater Cleaning System with options
Simple Garden Water System
Thetis Island

2160 gallons (9,800 Litres) storage from Shed Roof of 145 SF or 13m²
Gravity flow to garden

Premier 1200 & Premier 960 Tanks (tops at same level) $2,300
Thetis Garden System

Leaf trap, uphill sloped pipe & Diverter

Parts: $140  3 hrs Labour

Tank Fittings:
- Overflow
- Valved Connecting Manifold pipe
- Emerg Water Exit / Drain
- Sight Tube

$800 (parts & labour)
Galiano Island Garden Water
Gardening Water from \( \frac{1}{2} \) garage to two 7.5m\(^3\) tanks

Simple diverter/flusher and uphill pipe to lined tank basket

- Tanks (1,660 gal) $2,300
- Tank fittings: $470
- Catchment Parts: $260
- Pump: $680
- TOTAL PARTS: $3,710

- Design $255
- Install Labour (15 hours) $950
- TOTAL PROJECT COST $4,915
The Galiano Island “Tuffy” Liner

Cleans to 200 microns
Lasts 3-4 months
$11.00 each
Cobble Hill Garden Water
Gardening Water from studio to two (7.5m³) tanks

Both roofs of 600 SF Studio
Gutter cover; diverter/flusher,
and uphill pipe to tuffy liner
tank basket.
Two 1660 gal Tanks
Cobble Hill Garden Water
Gardening Water from studio

(April 2012 pricing)

Tanks (1,660 gal) $2,350
Tank fittings: $  350
Catchment Parts: $  400
Pump: $  750
TOTAL PARTS: $4,150

Design & Manual $600
Install Labour $1,900

TOTAL PROJECT COST $6,650
Potable Water RWH Systems

- Larger roof requirement
- Larger cistern needed
- Operate year round
- Require water disinfection
- Higher installation costs
- Increased maintenance

GOOD DESIGN + MAINTENANCE = GOOD QUALITY WATER
### How Much Can I Collect

2 Person Conserver Household using 35 gal (160L) per person per day needs a minimum 1,700 SF (158m²) roof area and 8,500 gal (38.6m³) cistern.
Tofino Demo Project
Triple Cleaning Catchment and First Flush Diverter

Single Downspout; Debris Pail, Horizontal Catchment Pipe; FFD, and pair of Screen mesh filters

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost</th>
</tr>
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<tbody>
<tr>
<td>Design</td>
<td>$600</td>
</tr>
<tr>
<td>Parts &amp; Tank</td>
<td>$2,000</td>
</tr>
<tr>
<td>Labour</td>
<td>$700</td>
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<tr>
<td>Total</td>
<td>$3,300</td>
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</table>
Full House Potable Water Catchment System

- All in One Debris Box
- Water from 3 sides of house
- Gravity Filters
- First Flush Diverter (FFD)
Cortes Island Cottage

Recycled Milk Tank
Debris Box
First Flush Diverter
Pair of Banjo Strainers
Bilge pump to upper deck
Gabriola Island Demonstration Site

Debris Box
First Flush Diverter
Pair of Banjo Strainers
Pair of 1200 gal (5,455L) tanks
FREQUENTLY ASKED QUESTIONS
Roofs

Catchment system that collect water for potable purposes should be made of non-toxic materials.
Roofs

Metal is best for collecting and easiest to clean

Unless you let 4 years of pollen build up
Asphalt or Fiberglass shingles contain fungicides, and are harder to keep clean.

Slate tiles are excellent, but expensive.
Storage

The Heart of any West Coast Rainwater Harvesting System
The Shedbies

The green one is rainwater.
The other two are draught and lager.
Be careful!!!
Price varies with location
Types of Storage
Above Ground Poly Tanks

Premier 1200 and 3,300 gal tanks

Premier 1660 set 14” into ground
Types of Storage
Above Ground Poly Tanks

Premier Box Tank
400 in foreground

200; 125, and 500 gal Leg Tanks
Types of Storage
Above Ground Poly Tanks

3 Premier 2500’s

“Tank Farm” of 4 tanks of 2,400 gal.
Polyethylene Semi Burial Tanks

Rectangular, Semi Burial Tanks work well in crawl spaces
Semi Burial - CONTINUED

Or semi buried in 2 ft. deep hole with soil mounded up over

Tanks $7,000
Installation $3,800
Water Lines $700
Pre-cast Concrete Tanks

Four 2,800 gal Pre-cast Tanks $3,100 each plus transport, plus excavation, plus interconnect piping, plus backfill p gravel for wet sites
Concrete Cisterns

Concrete Cistern Under Garage or under the house?

$1.50 -$2.30 per gallon
Steel Cisterns
Corrugated Steel Tank with Polypropylene Liner

16,000 gal. behind trellis

12,000 gal. in woods

$2.00 - $2.80 per gallon
Steel Cistern

12,000 imp. gal (55m³)
Steel Cistern

12,000 imp. gal (55m$^3$) Partly backfilled into hill
Pumps... Briefly

Grundfos MQ3
On-demand, High Volume Pump

On-demand, RV style pump. Low volume, and no run dry protection
Barrel or Tank with Automatic Pumping and Tank Refill

Conservepump Garden System

• Pump to drip water system
• Soil moisture sensor control
• Automatic tank top up
Strathcona Gardens Demo Project
Off the Grid Orchard Irrigation System

Water from 470 SF (44m²) roof delivered to orchard with no electronic pump.

< Gutter guard
Uphill catchment
Pipe with diverter
< “Day Barrel
On Left”

Banjo Filter to top of Premier 1950Gal > (8,900litre) tank.
DEBRIS REMOVAL DEVICES

All in One Debris Box

Cleans water from 2,500 sq. ft. of roof in two ways.
Whole House Debris Removal Devices

Graf Basket Style Filters
Cleans water from 4,000 sq. ft. Roof to 350 Microns (100% capture)

Empty and clean basket once per month
Whole House Debris Removal Devices

WISY Vortex Style Filters
Cleans water from 4,500 sq. ft. Roof to 500 Microns (90% capture)

Clean SS strainer every two months
Whole House Debris Removal Devices

Filtrific Basket Filter & Pump Chamber
Cleans water from 2,700 sq. ft. to 200 microns (100% capture)

Empty and clean basket strainer every month
Whole House Debris Removal Devices

Rainwater Connection Super Cleaner

Cleans water from 5,000 sq. ft. of roof to 250 microns
RAINWATER, a clean, sustainable alternative
Bolt-in-place Construction with Liner

5,000 – 20,000 gallons
Steel Cistern
Polypropylene “Bag” Liner

36 mil Polypropylene
NSF 61 Rated
Steel Cistern Roofs

Fabric roof under shed

Wood-frame and steel roof with inspection hatch
Steel Cistern ~ Wood & Metal Roof

Rated for BC snow loads

Full Venting Around Perimeter
Connected Barrels and Small Pump

2001 Garden Watering Rainwater System

Linked barrels with RV style pump.
Large Scale Irrigation Systems

The Rainwater Connection has recently installed 5 Garden Systems with 16,000 – 40,000 imp. gallon cisterns (73 – 182 m³)
Commercial Greenhouses

Greenhouses are the most cost effective rainwater users (2003 GVRD study)

60,000 m³ per year at a unit cost of approximately $0.23/m³
Seattle Office Building

Rainwater used for indoor/outdoor water feature
HSBC Bank, North Vancouver

1,320L (290 gal) tank provides 80% of their toilet water demand
Parksville Transfer Station

6,500 SF roof area supplies 18,900L (4,165 gal) tank for outdoor washing.
Pacific Sands Resort in Tofino

Rainwater Collection System

The rain water from the roof of this building is captured and then pumped into 2-3000 gallon storage tanks. From these storage tanks the water is then transferred into a mobile watering station, where it can be distributed as required to the gardens and flower beds throughout the resort property.

Annual average Rainfall in Tofino: 112 inches
Gathering area of roof 850 sq.ft.
Estimated storage capacity per year 35,000 gallon
Estimated use on gardens & flower baskets 15,000

During our winter months please conserve water whenever possible, thank you.