Oregon’s Phytotechnology Toolbox for Urban Stormwater Management

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Photo: PDX Bureau of Environmental Services’ Water Lab
So, once upon a time . . .
We developed a problem . . . .
IMPERVIOUS LAYER
(i.e. Roads, Parking Lots, Rooftops)

NATIVE SOIL
Conventional Grey Infrastructure

Portland’s Tunnel System for Sanitary and Storm Flows
We developed a problem . . . .
A single green plant can simultaneously link together 4 major media systems that define our world—water, soil, air, and sun energy.
The Oregon Garden Wetlands
‘Putting Plants to Work’
for environmental sustainability and economic development

Mission:

• To develop and promote the strategic use of plants (phytotechnology)

• To provide ecosystem services and solve environmental challenges in managed landscapes

• To serve as Oregon’s phytotechnology resource center
SPROut integrates resource networks

Diagram by Rene Kane for SPROut

**Green Networks**
- Urban forests, schoolyards, open space
- Parks, urban agriculture
- Agricultural buffers

**Blue Networks**
- Lakes, ponds, rivers, creeks, streams
- Sloughs, marshes, wetlands
- Stormwater corridors

**Grey Networks**
- Utility corridors, sewage/treatment
- Highways, streets, sidewalks, parking lots

- Green and eco-roofs
- Stormwater wetlands
- Bioswales
- Phytoremediation of landfill effluent
Oregon Environmental Council

- Input from statewide professional team
- Two-pronged solution
- Regulatory context
- Barriers to overcome
- Recommendations
- Potential funding sources
Edible Skylines- Erin Altz

- A psychology alumni from PSU saw an opportunity to create a business using growing greenroof infrastructure for multiple benefits.
Tom Liptan’s Garage Ecoroof installed 1996
Green Roof Examples

Hamilton Apartments in Portland, Oregon

Photos courtesy of the City of Portland
Portland Building Ecoroof
Pushing the Envelope on Low-Tech

- Pringle Creek greenroof has an unheard of price tag at $5/sq ft
- PVC membrane plus growing media plus plants
Columbia Green-Made in Oregon

- Modular greenroof tray system that promotes SW retention rather than drainage
- Downtown Library Greenroof
- City Hall might be next
OR Greenroof Research Nuggets

- City of PDX has 2 monitored roofs
- OSU Greenroof Research Center
  - Plant performance beyond sedum
- OR BEST
  - Built Environment and Sustainable Technologies-Signature Research Center
  - Current focus on patentable hard products and energy
- PSU
  - Energy performance of wet vs dry greenroofs and the use of biochar
- Regional Research Collaborative
  - Organizing and publicizing small research, such as the SPROut roofs
SPROut Greenroofs

Pump house roof featured in National Geographic’s GR spread in May 2009!
Beyond greenroofs . . . .

Other forms of LID and sustainable stormwater tools

Focus on SW quantity reduction with assumption that WQ is also improved, referencing work by the Center for Watershed Protection (in MD) and the intl LID database by EPA
Demonstration Greenstreet

NE 35th and Siskiyou
Downtown PDX Greenstreets
Flow Testing
Flow Testing Results

SW 12TH & MONTGOMERY GREEN STREET
DATE: August 31, 2006
TEST: Summer 6 (CSO) Simulation

Flow Volume Reduction = 72%
dry antecedent conditions (0.15" in prior 14 days)

Inflow
Volume: 9,500 gallons

Outflow
Volume: 2,650 gallons
Fred Meyer remodels

Modifications on the Tom Liptan flow-through planter design

There are over 1,000 of these in PDX
A Few of the Incentives

- Points toward LEED certification
- FAR bonus for greenroof development tax credit
- Clean River Rewards Program
- $5/ sq ft for greenroof construction
- Cost savings
Portland - Brooklyn Creek Basin

Going from Grey to Green & Grey together will save $58 million

$144 M
$86 M
$0
$20
$40
$60
$80
$100
$120
$140
$160

$11 million - Green
$75 million - Grey
OSU Extension - The Oregon Raingarden Guide: landscaping for clean water and healthy streams

Design guidelines:
- 10% rule with min 0.5 inch/hr infiltration rate and min 6 inch depth
- designed to dry out in 24 hrs
- amended soil
- do not plant like a wetland
Glencoe Elementary Raingarden
East Multnomah SWCD
Raingarden
PCC Annex Bioswale
PSU swale
Mt Tabor School Rain-garden

Before

reduces city sewer Infrastructure rehab. costs and improves school property and reduces heat island effect…

After
Headwaters Raingarden and daylighted creek
Headwaters Raingarden
Living Walls
Rogue Six-Pack Experiment with SW

- Built by Rogue Water and students
- Water treatment plus crop production
# Results: Water

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<th>Input</th>
<th>Output</th>
<th>Change</th>
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<td>Cu</td>
<td>0.0817 mg/l</td>
<td>0.0055 mg/l</td>
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<td>Pb</td>
<td>ND</td>
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<td>Zn</td>
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<td>pH</td>
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<td>7.78</td>
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<tr>
<td>TSS</td>
<td>336 mg/l</td>
<td>ND &lt;4 mg/l</td>
<td>- 99%+</td>
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Detention time = 11 days (rationale for timing was convenience)
Eco-Reactor Research System

To treat agricultural SW runoff while producing crops
Floating Island Loan Program

- Coming in 2010
- Allows nurseries and farmers to test solution before investing in capital infrastructure
- We get research data
Soak It Up 2009

Water and ecology experts were Keynote Speakers!

- Gerould Wilhelm, Conservation Design Forum, Inc.
- Dave Maciolek, Worrell Water Technologies
- Eli Cohen, Ayala Water and Ecology, Israel
- Paul Stamets, Fungi Perfecti LLC

70 attendees; 16 presenters; Greenroofs 101; Raingarden Workshop; Constructed Wetlands Tour

- Plant physiology primer/mechanisms of phytoremediation
- History and international context
- Oregon’s efforts
- Water
  - Stormwater
    - Conventional treatment
    - Pollutants of concern
    - Plant mechanisms
    - Tools at landscape scale
  - Research
  - Laws and regulations and incentives
- Wastewater
- Soil / Air
- Organization profiles
- Education / Training / Certifications
PAW Supplements to SIJ

PLANTS at WORK
How Nurseries Are Growing Greentech

Designers dig plants for more than green roofs
Nurseries weed out waste
Green-collar jobs take root in Oregon

Floating wetlands grow market appeal
Plants gain inroads to transportation sector
Nurseries tap into carbon markets
Listen to their stories . . .
Thank-you!

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