Thinking Beyond the Water:
Start Small, Think Big

New Partners for Smart Growth Conference | February 2, 2017

Kevin Robert Perry, ASLA
Why Do We Need To Retrofit With Green Infrastructure?

Portland’s First Retrofit Projects

Thinking Beyond The Water: Putting The Green Back Into Green Infrastructure

Start Small, Think Big
Why Retrofit?
Natural Landscape

Photo: Google Earth
Urbanization
Minneapolis, Minnesota

Photo: Google Earth
Natural Landscape

Photo: Google Earth
Urbanization
Houston, Texas

Photo: Google Earth
Natural Landscape

Photo: Google Earth
Sub-Urbanization
California Central Valley

Photo: Google Earth
Desert

Redwoods

Riparian

Oaks
Moving Towards An Unhealthy Watershed
The Urban Street Stormwater System
Impervious, Little or No Landscape

Photo: Kevin Robert Perry
The Natural Stream Stormwater System

Pervious, Considerable Landscape System

Photo: Kevin Robert Perry
The “Green Street” Stormwater System
Pervious, Integrated Landscape System
The Green Infrastructure “Toolbox”
Portland’s First Retrofit Projects
NE Siskiyou Green Street
Portland, Oregon

Photo: Kevin Robert Perry, City of Portland
NE Siskiyou Green Street
Portland, Oregon
SW 12th Avenue Green Street
Portland, Oregon

Photo: Kevin Robert Perry, City of Portland

2005
SW 12th Avenue Green Street
Portland, Oregon

Photo: Kevin Robert Perry, City of Portland
2012

SW 12th Avenue Green Street
Portland, Oregon

Photo: Kevin Robert Perry
Nevue Ngan Associates recently assisted URS Engineers with the development of streetscape design plans for Sandy Boulevard between NE 14th and NE 48th Avenue. NNA was responsible for assessing existing street trees, developing and illustrating streetscape design alternatives related to landscape, and assisting with the development of construction documents.

NNA worked closely with the Portland Bureau of Environmental Services, Portland Office of Transportation, and Urban Forestry to create an innovative plan that incorporates several landscaped stormwater treatment areas into the right-of-way. Both infiltration basins and landscaped curb extensions are being utilized to achieve the dual purpose of reducing CSOs and to bring a stronger visual identity to specific intersections.

NE Sandy Boulevard Rain Gardens
Portland, Oregon
NE Sandy Boulevard Rain Gardens
Portland, Oregon

2006

Photo: Kevin Robert Perry, Nevue Ngan Associates
Photo: Kevin Robert Perry, Nevue Ngan Associates

NE Sandy Boulevard Rain Gardens
Portland, Oregon
NE Sandy Boulevard Rain Gardens
Portland, Oregon
Logus Road Green Street
Milwaukie, Oregon

2008

Photo: Kevin Robert Perry, Nevue Ngan Associates
Logus Road Green Street
Milwaukie, Oregon
2008

Photo: Kevin Robert Perry, Nevue Ngan Associates

Logus Road Green Street
Milwaukie, Oregon
Logus Road Green Street
Milwaukie, Oregon
The SW Montgomery Green Street is regarded as Portland's most innovative green street effort. The project demonstrates how, in even the most ultra-urban conditions, downtown streets can be planned and retrofitted not only to fully manage stormwater runoff but to also create, integrate, and preserve vibrant pedestrian spaces. This 9-block concept plan incorporates a variety of green infrastructure and alternative transportation strategies throughout this emerging neighborhood in downtown Portland.
The “Stormwater Spine”

SW Montgomery Green Street
Connecting the West Hills to the Willamette River

1. Stormwater Bridges
Multiple pedestrian bridges across the stormwater spine are needed to provide adequate pedestrian flow throughout the corridor. These bridges should be wide enough and spaced frequently to accommodate specific users such as bikes, people, and even animals.

2. “Curbless” Street Profile
Providing a flush drainage condition along the stormwater spine allows stormwater runoff to sheet flow into the landscape area. This provides both a barrier free condition for pedestrians and a shallower and more aesthetic stormwater facility.

3. High-Density Planting
The stormwater spine is a functional landscape area used to clean and absorb stormwater runoff. Providing a high-density spacing of trees, shrubs, and groundcovers maximizes the ability for plant roots to clean pollutants and absorb runoff.

4. Simple and Shallow
There is a maximum grade change of 6-inches from the walking surface to the finish grade of the stormwater spine. This simple design approach eliminates the typical need for a perimeter curb around the landscape and still allows for adequate pedestrian safety.

5. A Continuous Theme
The stormwater spine functionally and visually links individual blocks within the street corridor. Planting types and the width of the spine do vary from block-to-block in response to unique conditions. However, the overall “green thread” remains consistent throughout.

The continuous Stormwater Spine along the SW Montgomery Green Street is planned as a highly functional landscape system used to capture and manage stormwater runoff from over 75,000 square feet of impervious area. The spine is the project site’s “workhorse” for stormwater management. Each block along the corridor has the stormwater spine traversing through it, however, the form and size of the landscape system does vary in response to the unique conditions of each block. Sections of the stormwater spine have already been built along the SW Montgomery Green Street and are so well integrated into the urban fabric that many can not even distinguish them as being functional stormwater landscapes.
2009

Smith Memorial Student Union Plaza
Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates
Smith Memorial Student Union Plaza
Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates
Smith Memorial Student Union Plaza
Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates
Smith Memorial Student Union Plaza

Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates
Urban Center Plaza Stormwater Retrofit
Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates
Urban Center Plaza Stormwater Retrofit
Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates

2010
Urban Center Plaza Stormwater Retrofit
Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates
Urban Center Plaza Stormwater Retrofit
Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates
Urban Center Plaza Stormwater Retrofit
Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates
Urban Center Plaza Stormwater Retrofit
Portland, Oregon

2015

Photo: Kevin Robert Perry, Nevue Ngan Associates
Urban Center Plaza Stormwater Retrofit

Portland, Oregon

2010

Photo: Kevin Robert Perry, Nevue Ngan Associates
Urban Center Plaza Stormwater Retrofit
Portland, Oregon

Photo: Kevin Robert Perry, Nevue Ngan Associates
Urban Center Plaza Stormwater Retrofit
Portland, Oregon

Photo: Kevin Robert Perry

2015
Thinking Beyond the Water
“One of the primary impacts of stormwater is related to the increased volumes of surface runoff that are a direct result of increased impervious surfaces in urbanized watersheds...”
Conventional Stormwater Solution
A focus on water volume removal: “Plants over a Pipe Solution”
Highly Engineered, Deep, and Concentrated

Too much focus on water volume removal
Decentralized Natural Capture Approach

Widespread and shallow stormwater facilities captures stormwater using decentralized management approach.

Concentrated Capture Approach

A small and deep stormwater facility captures stormwater using a concentrated management approach.

The amount of stormwater runoff volume is distributed frequently amongst stormwater facilities.

The amount of stormwater volume runoff is concentrated towards one downstream stormwater facility.
Create More Landscape In The Public R.O.W

Photo: Kevin Robert Perry, ASLA

Chicago
Create More Landscape In The Public R.O.W

Photo: Kevin Robert Perry, ASLA
Los Angeles

Create More Landscape In The Public R.O.W

Photo: Kevin Robert Perry, ASLA
Create More Landscape In The Public R.O.W
Create More Landscape In The Public R.O.W

Photo: www.actfortransit.org
Look to the Urban Landscape As A Design Model
The Micromanagement of Stormwater
Accidental Pervious Surface

A crack in the asphalt accepts roof stormwater runoff
Accidental Pervious Surface

A crack in the asphalt accepts roof stormwater runoff
Accidental Pervious Surface
A 100-year old street. Is this street failing?
Accidental Pervious Surface

Nature is telling us that it wants to be pervious
Accidental Pervious Surface
Nature is telling us that it wants to be pervious
Accidental Pervious Surface

It can be beautiful

Photo: Kevin Robert Perry, ASLA
Accidental Pervious Surface

Vegetation growing between the street and gutter intercepts runoff
Formalized Pervious Surface
A Bold Streetscape Example from Barcelona, Spain
Formalized Pervious Surface
NW Kennedy Street Design Competition
Formalized Pervious Surface
A Walkable Surface Over Vegetation
Start Small, Think Big
UC Davis California Avenue Rain Garden:
A Simple and Cost Effective Student Green Infrastructure Project
Reduce Irrigation Use
Manage Stormwater Runoff
Provide Hands-on Learning for Students
Demonstrate Simple & Cost Effective Green Infrastructure
Integrate the Project into Larger Campus Retrofit Efforts
Project Location
California Avenue @ Robbins Hall

Photo: Kevin Robert Perry, ASLA
1,000 SF
Turf Removal

Project Location
California Avenue @ Robbins Hall

Photo: Kevin Robert Perry, ASLA
Robbins Hall

California Avenue

Peter Shields Avenue

Rain Garden

Photo: Kevin Robert Perry, ASLA

Project Concept Plan
California Avenue @ Robbins Hall
Before Conditions
Thirsty Lawn, Low Plant Diversity

Photo: Kevin Robert Perry, ASLA
Before Conditions
Thirsty Lawn, Low Plant Diversity
Before Conditions

Stormwater Runoff From Street, Sidewalk, and Plazas

9,000 SF Stormwater Generated

Photo: Kevin Robert Perry, ASLA
Before Conditions

Stormwater Runoff From Street, Sidewalk, and Plazas
Construction
Layout the Grass Removal Boundary
Construction

Define the Grass Removal Boundary
Construction
Removal of Lawn Progress
Construction
Rain Garden Grading
Construction
Rain Garden Grading
June 4, 2015

Photo: Kevin Robert Perry, ASLA

Construction
Drip Irrigation System Installation
Construction
Drip Irrigation System Installation
Construction
Paver Walkway Installation

Photo: Kevin Robert Perry, ASLA
Construction
Paver Walkway Installation
June 11, 2015

Photo: Kevin Robert Perry, ASLA

Construction
Phase I Plant Installation
Construction
Phase I Plant Installation and Mulching
Construction
Phase I Plant Installation and Mulching
June 24, 2015

Construction
Keeping Plants Alive Over Summer 2015!
November 4, 2015

Plant Establishment
Keeping Plants Alive Over Summer 2015

Photo: Kevin Robert Perry, ASLA
Plant Establishment
Ready for El Nino!
December 18, 2015

Trench Drain Installation
UC Crews Cut the Street Curb Making the Project “Active”
January 6, 2016

Trench Drain Installation
UC crews cut the street curb making the project “active”
Trench Drain Installation
UC Crews Install New Trench Drain From Curb
February 18, 2016

Project Completion
First Rainfall is Captured by the Trench Drain
Project Completion
First Rainfall is Captured by the Trench Drain
Project Completion
First Rainfall is Captured by the Trench Drain
Project Completion
Project is Infiltrating Stormwater Very Effectively
Photo: Kevin Robert Perry, ASLA

Project Completion
Plant Material Is Thriving
Project Completion
A Great Campus Demonstration Project!
Before

Project Completion
A Great Campus Demonstration Project!
Project Completion
A Great Campus Demonstration Project!
New Hardscape and Landscape Project Improvements

Legend
- New Stormwater Landscape Area
- New Drought Tolerant Landscape Area
- New Hardscape Area
- New Conventional Lawn/Shrub Zone
- New Stormwater Conveyance/Boardwalk

Legend
- Stormwater Capture Landscape Zone
- Drought Tolerant Landscape Zone (Arboretum All-Star Showcase)
- Conventional Lawn/Shrub Zone
- Boardwalk for Stormwater Conveyance
- Specialty Paving

Note: Plan currently shows 644 bikes supporting the new lecture hall and 245 bikes supporting Haring Hall.
Thank You!

Urban Rain | Design

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