Catching Rain:

Low Impact Development & Green Stormwater Strategies *for* Real Estate Professionals

Spring 2013

Presented by:

Sound Native Plants

SEEC LLC
Social, Environmental & Economic Consulting

Washington State University Extension

Funding from:

Department of Ecology
State of Washington

Marketing the Value of LID

Robbi Currey, SEEC LLC

- LID Benefits
  - Economic, Environmental & Societal
- Case Study 1 – High Point HOPE VI Redevelopment
- Case Study 2 – Shamrock Heights, King County

Marketing Hurdles

"fear about higher costs is cited again and again as one of the top hurdles to more widespread use of green solutions"

Source: Lisa Stiffler:
"Saving cash with green stormwater solutions," *Sightline*

Marketing Hurdles

"78 percent of the American public does not understand that runoff from agricultural land, roads, and lawns, is now the most common source of water pollution; and nearly half of Americans (47 percent) believes industry still accounts for most water pollution"

Source: National Environmental Education & Training Foundation 2005

7. Which of these are you most worried about?

Response Category	Total N=1200	Idaho N=400	Oregon N=400	Washington N=400
The quality of your drinking water	35%	34%	36%	34%
The health of local rivers, streams, and lakes	24%	24%	23%	24%
The air quality in your community	17%	22%	17%	15%
Industrial pollution	11%	5%	11%	13%
Agricultural pollution	5%	4%	3%	6%
The health of area forests	9%	11%	9%	9%

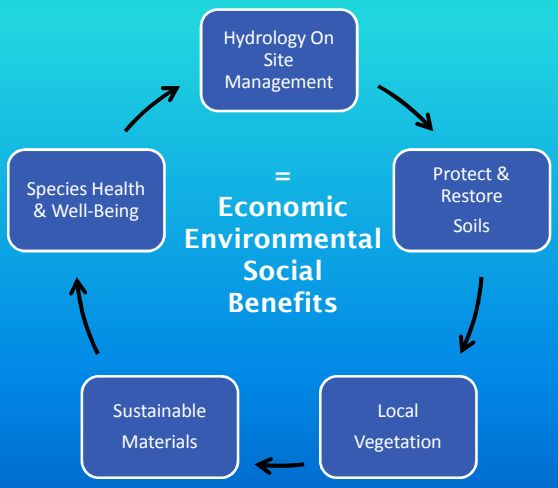
DHM Research | EarthFix Clean Water Act Survey, July 2012
EarthFix Clean Water Act Survey July 9 – July 14, 2012; N=1,200 (N=400 ID, OR, WA)

Marketing Advantages

"In addition to reducing polluted stormwater runoff, GI practices can also positively impact energy consumption, air quality, carbon reduction and sequestration, property prices, recreation and other elements of community health and vitality that have monetary or other social value"

Source: CNT The Value of Green Infrastructure

The Value Add Proposition of LID



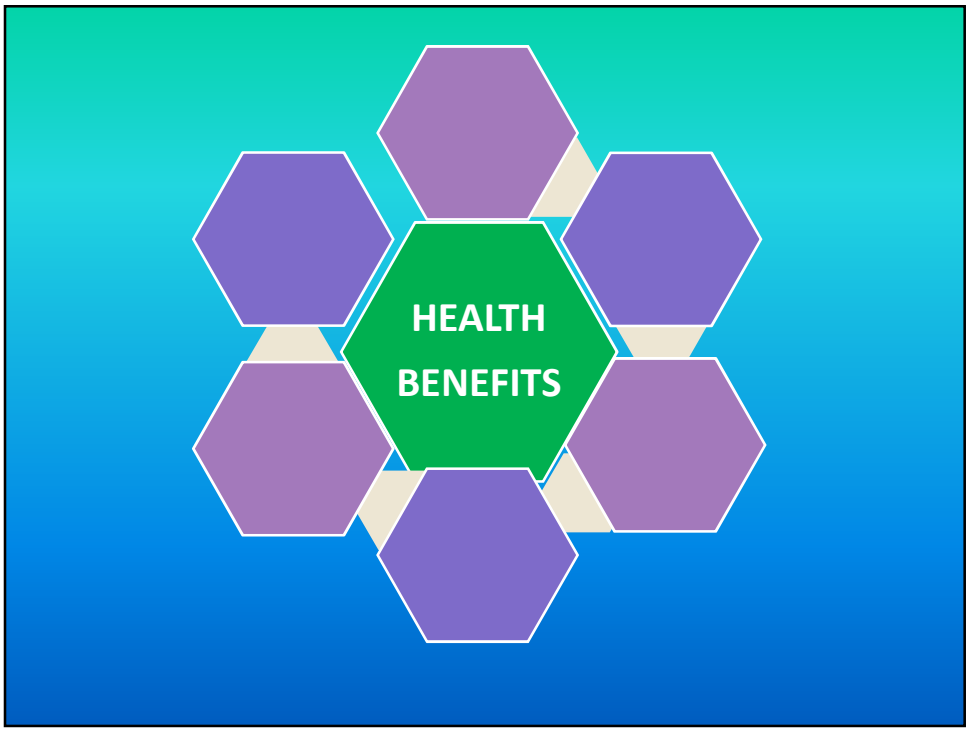
Quantifying The Benefits of LID

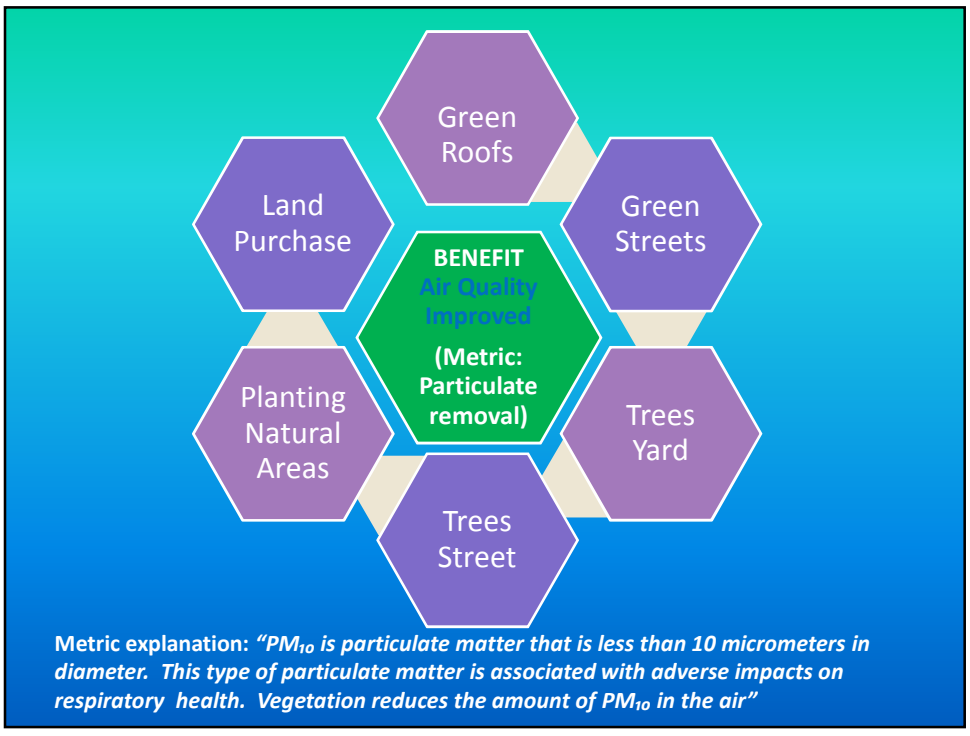
Health Benefits
- Air Quality Improvement
- Increased Greenness

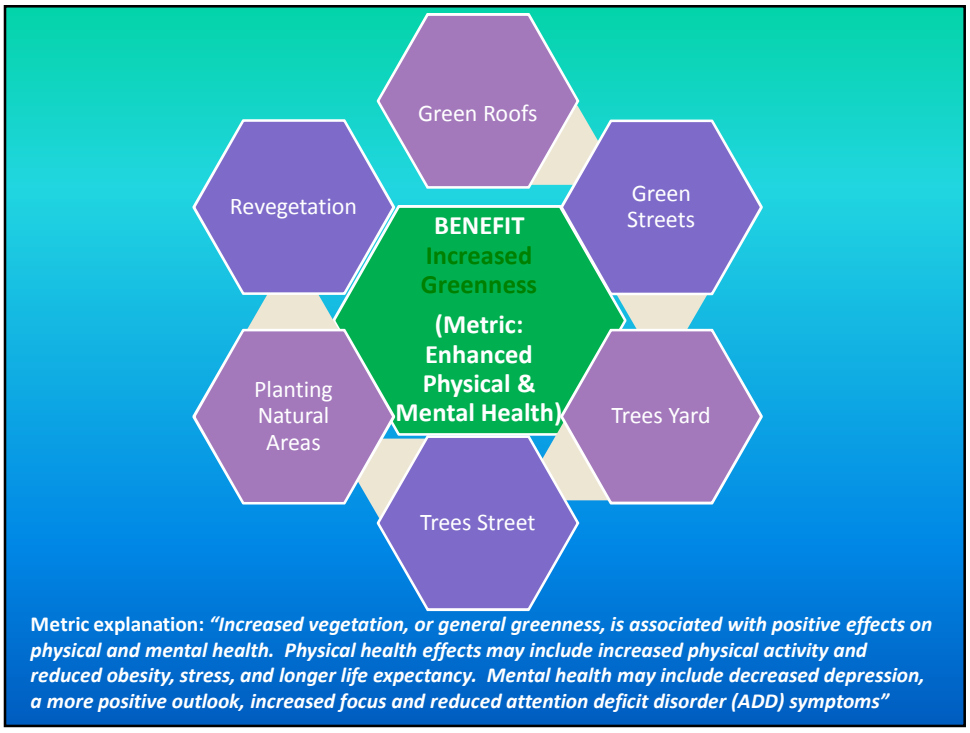
Energy Benefits
- Energy Savings
- Greenhouse Gas Reduction

Community Livability Benefits
- Amenity/Aesthetics Improvement
- Community Cohesion
- Environmental Equity
- Access to Nature

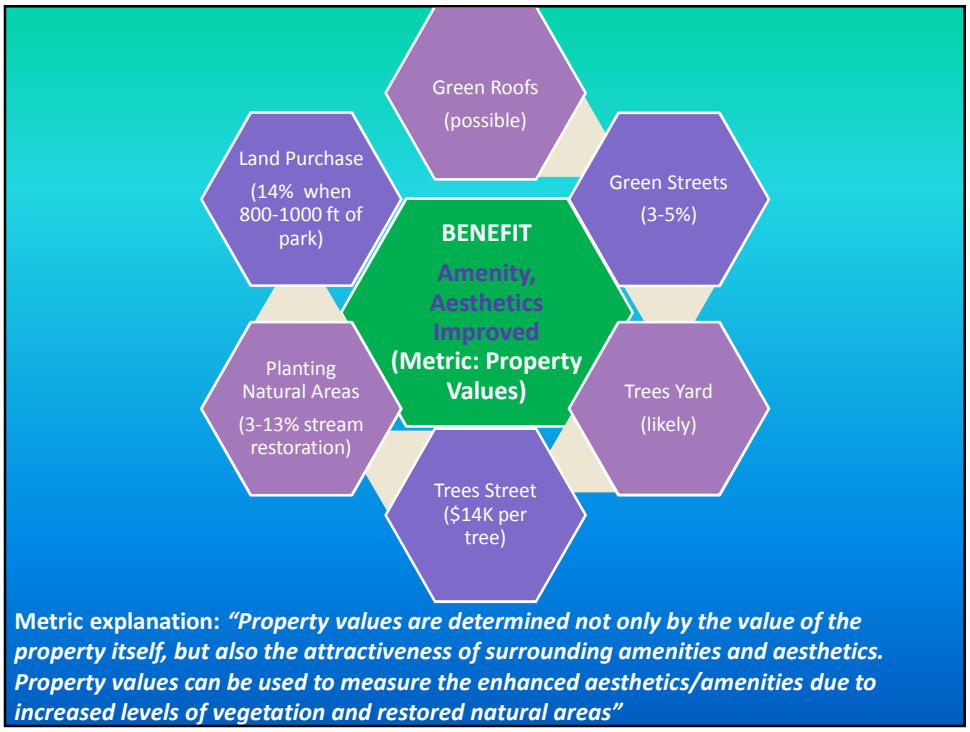
Source: **Portland's Green Infrastructure: Quantifying the Health, Energy, and Community Livability Benefits Report 2010**


HEALTH
BENEFITS


Green Roofs
Land Purchase
Green Streets
BENEFIT
Air Quality Improved
(Metric: Particulate removal)
Planting Natural Areas
Trees Yard
Trees Street
Metric explanation: "PM10 is particulate matter that is less than 10 micrometers in diameter. This type of particulate matter is associated with adverse impacts on respiratory health. Vegetation reduces the amount of PM10 in the air"



Metric explanation: ***"Increased vegetation, or general greenness, is associated with positive effects on physical and mental health. Physical health effects may include increased physical activity and reduced obesity, stress, and longer life expectancy. Mental health may include decreased depression, a more positive outlook, increased focus and reduced attention deficit disorder (ADD) symptoms"***



Metric explanation: ***"Property values are determined not only by the value of the property itself, but also the attractiveness of surrounding amenities and aesthetics. Property values can be used to measure the enhanced aesthetics/amenities due to increased levels of vegetation and restored natural areas"***

Property Values Affected by LID BMPs

Numerous studies have been conducted that explore how property values increase in locations near green infrastructure and open space. The approach used considers all properties within an area, and employs regression analysis to isolate the degree of price difference that is attributable to individual property characteristics. The technique is called the hedonic property value method. Fortunately, several hedonic property value studies have been conducted in the Portland area and have addressed the question of how trees, open space, and increased vegetation have an impact on property values in the City. As described above, this report uses property values as a metric or proxy for the benefit of improved aesthetics and amenities within the City, and so hedonic property value studies were sought that linked property values explicitly to G2G BMPs or similar environmental features.

- Donovan, Geoffrey H. and David T. Butry, Market Based Approaches to Tree Valuation, Arborist News 2008(August): 52-55.
- Lutzenhiser, Margot, and Noelwah Netusil, (2001), The Effect of Open Spaces on a Home's Sale Price, *Contemporary Economic Policy* 19(3):291-298.
- Steiner, Carol F. and John B. Loomis (1996) Estimating the Benefits of Urban Stream Restoration using Hedonic Price Method. Rivers 5(4): 267-278.
- Ward, Bryce;MacMullan, Ed;Reich, Sarah, (2008). The Effect Of Low-Impact-Development On Property Values *Proceedings of the Water Environment Federation*, Sustainability 2008 , pp. 318-323(6)

Born in Detroit

The answer, believe it or not, was born in Detroit, in 1938. Andrew Court, an economist for General Motors, was looking for a type of analysis that would compare the prices of cars produced at different times.

He argued that size, power, weight, etc. may vary from year to year, so what you wanted to do was a control for these changes in order to get a measure of the valuation of each component, and hence the price change, holding them constant.

In the simplest form, you had:

$P = {}_0 + {}_1Z_1 + {}_2Z_2 + \ldots + ¢t + £$,

where your Z_i are component parts, and t is your time trend.

Uses

When large databases became available, it became useful to consider the same type of analysis for several reasons:

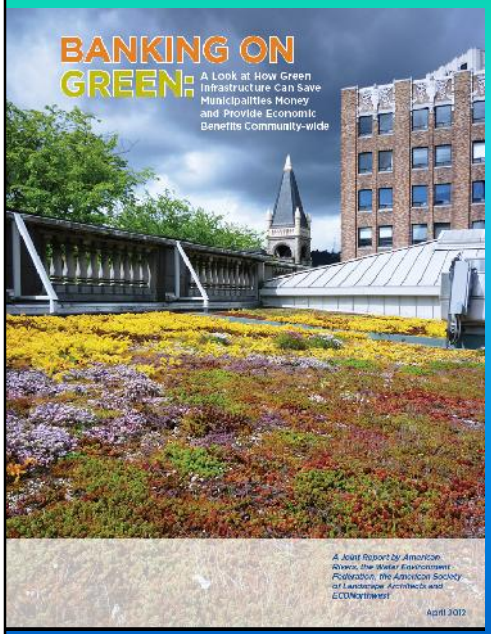
Real estate assessment - it could be done quickly.

Measurement of individual contributions - structure might be easy to measure based on costs, but what about neighborhood?

Externalities - If air pollution is important, for example, shouldn't we be able to measure its impact on property values?

$$P = {}_0 + {}_1Z_1 + {}_2Z_2 + \ldots + \text{¢}t + \text{£},$$

- Should equation be linear? Does the 10th room impart as much value as the 3rd room, or the 7th?
- What is the hedonic price of an attribute?
  A> $\hat{0}P/\hat{0}Z_i$ → hedonic price.
- What is the meaning of a hedonic price? Is it supply, or demand, or what?
- Are the coefficients stable over time?
- Should the buyer's or seller's characteristics go into the equation?



Washington

14th Avenue Neighborhood Street Fund Project, Seattle
Cromwell Park, Shoreline
Extended Wetland Multi-Cell Storm Water Facility for Low Impact Development, Woodinville
Half Moon Park, Liberty Lake
High Point HOPE VI Redevelopment, Seattle
Hockinson Meadows Community Park, Clark County
James Chase Middle School, Spokane
Olympia Woodland Trail, Olympia
Pioneer School Low Impact Development Project, Shelton
Spokane Community College, Jenkins Wellness Center, Spokane
Sprinker Recreation Center Low Impact Parking, Spanaway
Taylor 28, Seattle

Basic Findings

- 479 Green Infrastructure (GI) Case Studies nationwide
  - 41% found grey to green was cheaper than conventional
  - 31% found grey to green no cost difference
  - 25% found grey to green more expensive
- Seattle Public Utilities
  - GI cost $217,253 less than conventional streets
- City of Portland's CSO abatement program
  - Green approaches were among the most effective ranging from $.89-$4.08 per gallon removed

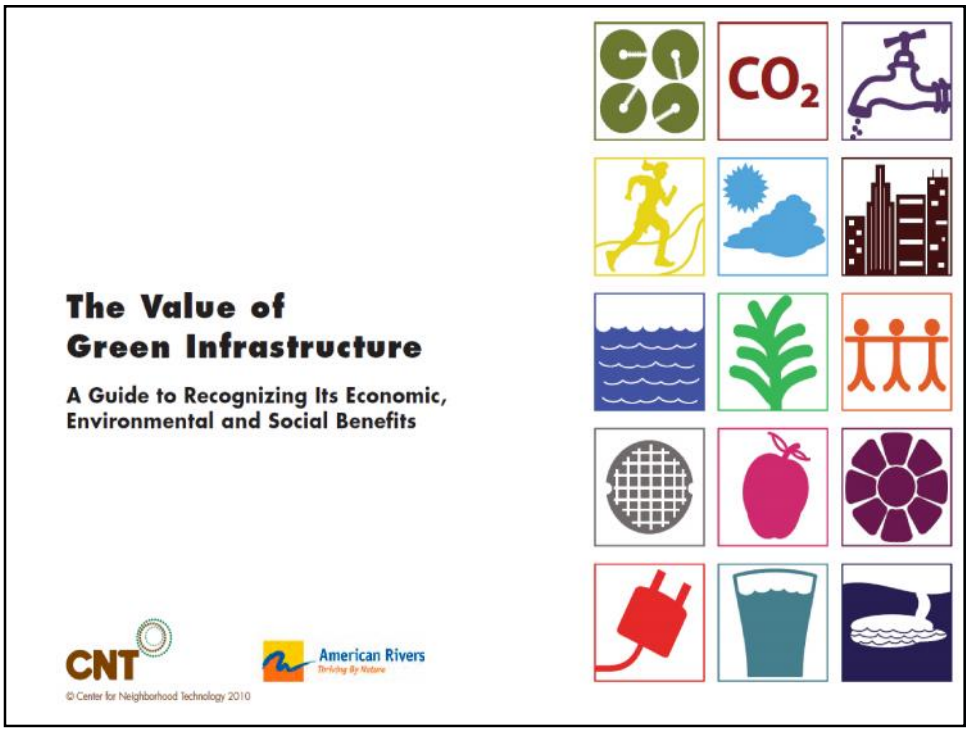
The Center for Neighborhood Technology (CNT)

CNT Sustainable Communities Attainable Results

www.cnt.org

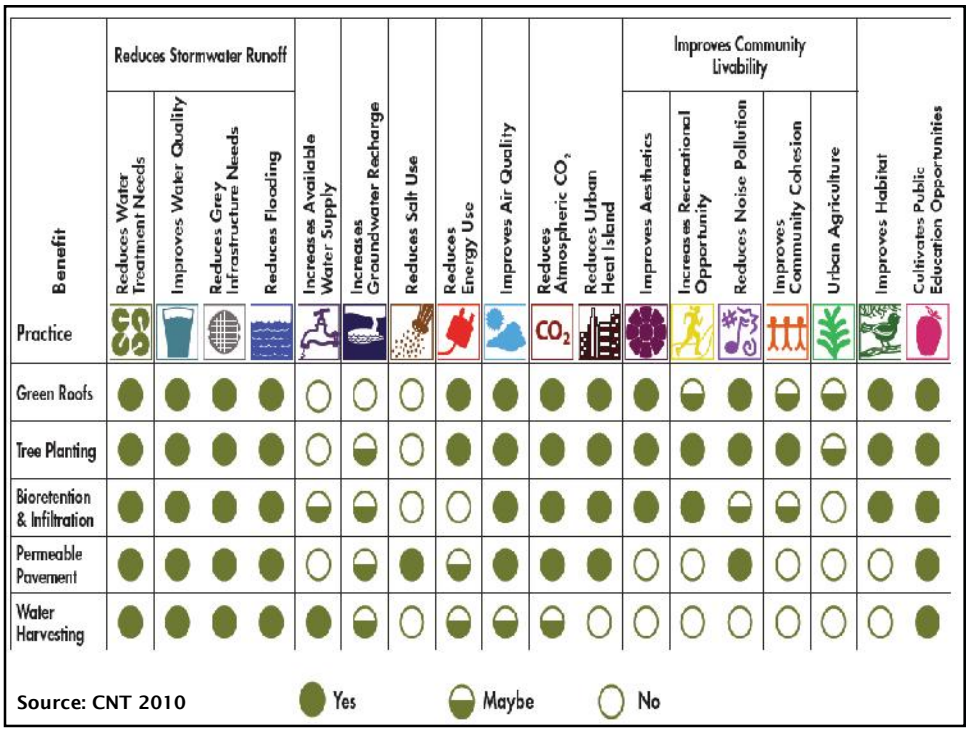
Tools for LID Evaluation:

Green Infrastructure Valuation Guide
Green Values® Stormwater Toolbox



Benefit Measurement & Valuation

- Step 1
  - Quantification of Benefit
- Step 2
  - Valuation of Quantified Benefits



Benefit / Practice	Reduces Stormwater Runoff: Reduces Water Treatment Needs	Reduces Stormwater Runoff: Improves Water Quality	Reduces Stormwater Runoff: Reduces Grey Infrastructure Needs	Reduces Stormwater Runoff: Reduces Flooding	Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO_2	Reduces Urban Heat Island	Improves Community Livability: Improves Aesthetics	Improves Community Livability: Increases Recreational Opportunity	Improves Community Livability: Reduces Noise Pollution	Improves Community Livability: Improves Community Cohesion	Improves Community Livability: Urban Agriculture	Improves Habitat	Cultivates Public Education Opportunities
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	◒	●	◒	◒	●	●
Tree Planting	●	●	●	●	○	◒	○	●	●	●	●	●	●	●	●	◒	●	●
Bioretention & Infiltration	●	●	●	●	◒	◒	○	○	●	●	●	●	●	◒	◒	○	●	●
Permeable Pavement	●	●	●	●	○	◒	●	◒	●	●	●	○	○	●	○	○	○	●
Water Harvesting	●	●	●	●	●	◒	○	◒	◒	◒	○	○	○	○	○	○	○	●

Source: CNT 2010 ● Yes ◒ Maybe ○ No

Review of LID BMP
Plant Trees

Feature: Planting Trees – Step 1 Quantification of Benefit

Economic Measurement	Environmental Benefit	Societal Benefit
Number of trees * av. Annual interception per tree (gal/tree) = total runoff reduction (gal)	-Reduces Stormwater run-off -Increases ground water recharge -Reduces energy use -Improves air quality -Reduces atmospheric C02 -Reduces Urban Heat Island -Improves Habitat	-Improves Community Livability -Cultivates public education opportunities -Improves mental well-being

Review of LID BMP Plant Trees

Feature: Planting Trees – Step 2 Valuation of Quantified Benefits

Benefit Reduces Stormwater Run-off	Valuation Methodology of Benefit
- Reduced Water Treatment Needs	Runoff reduced (gal) * avoided cost per gallon ($/gal) = avoided stormwater treatment costs ($)
- Reduced Grey Infrastructure Needs	Conventional cost of structure ($/SF) * total area of structure (SF) = total expenditure for conventional approach ($) Total expenditure for conventional approach ($) * % retained = avoided cost savings ($)
- Improved Water Quality	Secchi Disk Test (clarity of water depth) Hedonic Price Method
- Reduced Flooding	Hedonic Price Method; Insurance Premiums; Avoided Damage Cost Approach

Review of LID BMP Plant Trees

Feature: Planting Trees – Step 2 Valuation of Quantified Benefits

Benefit Improves Community Livability	Valuation Methodology of Benefit
- Improves Aesthetics	Hedonic Price Method -Ward et al (2008) 3.5-5.0% King County -Wachter (2004); Wachter & Wong (2008) 2-10% -Report recommends a mean of 3.5% increase be used
- Increases Recreational Opportunities	User Day Methodology (Stratus 2009)
- Reduces Noise Pollution	Hedonic Price Method Reduction in property value of .55-.86% per 1 decibel increase in noise level
- Improves Community Cohesion	-Increase in social capital -Decrease in crime (Sullivan, Kuo & Depooter 2004)

Example Demonstration 1: Benefit

Assessment of a single Green Roof

Benefit	Step 1: Benefit Quantification (resource unit(s))	Step 2: Benefit Valuation (resource unit * price	Annual Benefit $
Reduces Stormwater Runoff	**Annual Stormwater Retention Performance:** 71,100 gal retained *(Example 1.1)*	**Value of Annual Avoided Treatment Cost:** 71,100 gal * $0.000093/gal = $6.53 *(Example 1.6)*	$6.53
Reduces Energy Use	**Annual Building's Cooling (electricity) Savings (kWh):** 1,122 kWh *(Example 2.1)*	**Value of Annual Building's Cooling Savings:** 1,122 kWh * $0.0959/ kWh = $107.60 *(Example 2.5)*	
	Annual Building's Heating Natural Gas Savings (Btu): 36,158,750 Btu *(Example 2.2)*	**Value of Annual Building's Heating Savings:** 36,158,750 Btu * $0.0000123/Btu = $444.75 *(Example 2.5)*	
	Annual Off-site Water Treatment Electricity Savings (reduced treatment needs of 71,100 gal): 110.77 kWh *(Example 2.4)*	Annual Off-site Water Treatment Electricity Savings will not be valued here because the value has already been accounted for above *(Example 1.6)*.	
	Total Annual Electricity Savings (kWh, from on-site and off-site benefits): ∑ 1,122 kWh in cooling savings + 110.77 kWh in water treatment electricity savings = 1,232.77 kWh	The Total Annual Electricity Savings will not be valued here to prevent double counting. Instead, it is used to quantify "Air" and "Climate" benefits.	$107.60 + $444.75
Improves Air Quality *Note: The figures used here only account for the benefits of reduced NO_x. Similar steps should be performed for the other criteria pollutants, when possible*	**Annual Direct NO_x Uptake:** Lower Bound = 1.50 lbs NO_2 Upper Bound = 2.39 lbs NO_2 Average = 1.95 lbs NO_2 *(Example 3.1)*	**Value of Total Annual NO_x Benefit:** 30.19 lbs NO_2 * $3.31/ lb NO_2 = $100.83 *(Example 3.6)*	
	Annual Indirect Reduction in NO_x Emissions (from reduced electricity and natural gas): 28.24 lbs NO_2 *(Example 3.5)*		
	Total Annual NO_x Benefit (Direct uptake using the average NO_2 uptake value + Indirect avoided emissions): ∑ 1.95 lbs NO_2 + 28.24 lbs NO_2 = 30.19 lbs NO_2 *(Example 3.6)*		$100.83
Reduces Atmospheric CO_2	**Total Annual Indirect Benefit** (from electricity and heating natural gas savings): 1,689.58 lbs CO_2 + 4,226.6 lbs CO_2 = 5,866.18 lbs CO_2 *(Example 4.5)*	**Value of Total Annual Climate Benefit:** 6,486.41 lbs CO_2 * $0.00756/ lb CO_2 = $49.04 in total annual climate benefits *(Example 4.6a)*	
	Annual Direct Carbon Sequestration Benefit in CO_2 Equivalent (multiplying lbs C from Example 4.1 by conversion factor): = 620.23 lbs CO_2 *(Example 4.6)*	*Note: Here the lower bound (EU's ETS Carbon Price) of the range of carbon prices was used. Keep in mind that this provides a conservative estimate of the economic, environmental and other social values of carbon abatement*	
	Total Annual Climate Benefit (Direct + Indirect): ∑ 620.23 lbs CO_2 + 5,866.18 lbs CO_2 = 6,486.41 lbs CO_2 *(Example 4.6)*		$49.04
		Total Annual Benefit (∑ Annual Benefits)	**$708.75**

Example Demonstration 2:

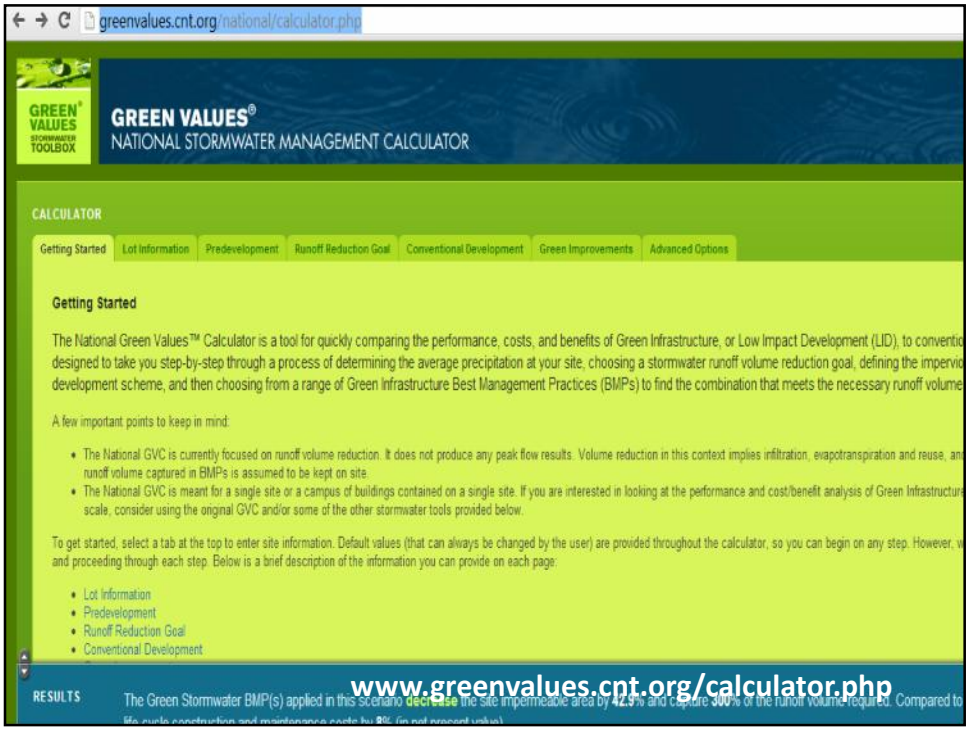
Benefit Assessment of a Neighborhood Scale

Benefit	Annual Benefit ($) per 5,000 SF green roof (Example Demonstration 1)	Annual Benefit ($) from scaled green roof program (= annual benefit per roof * 240 converted roofs)
Reduces Stormwater Runoff	$6.53	$6.53 * 240 = $1,567.20
Reduces Energy Use	$107.60 + $444.75= $552.35	$552.35 * 240 = $132,564.00
Improves Air Quality *Note: The figures used here only account for the benefits of reduced NO_x. Similar steps should be performed for the other criteria pollutants, when possible.*	$100.83	$100.83 * 240 = $24,199.20
Reduces Atmospheric CO_2	$49.04	$49.04 * 240 = $11,769.60
Total Annual Benefit (∑ Annual Benefits)	**$708.75**	**$708.75 * 240 = $170,100.00**

www.ECONorthwest.com

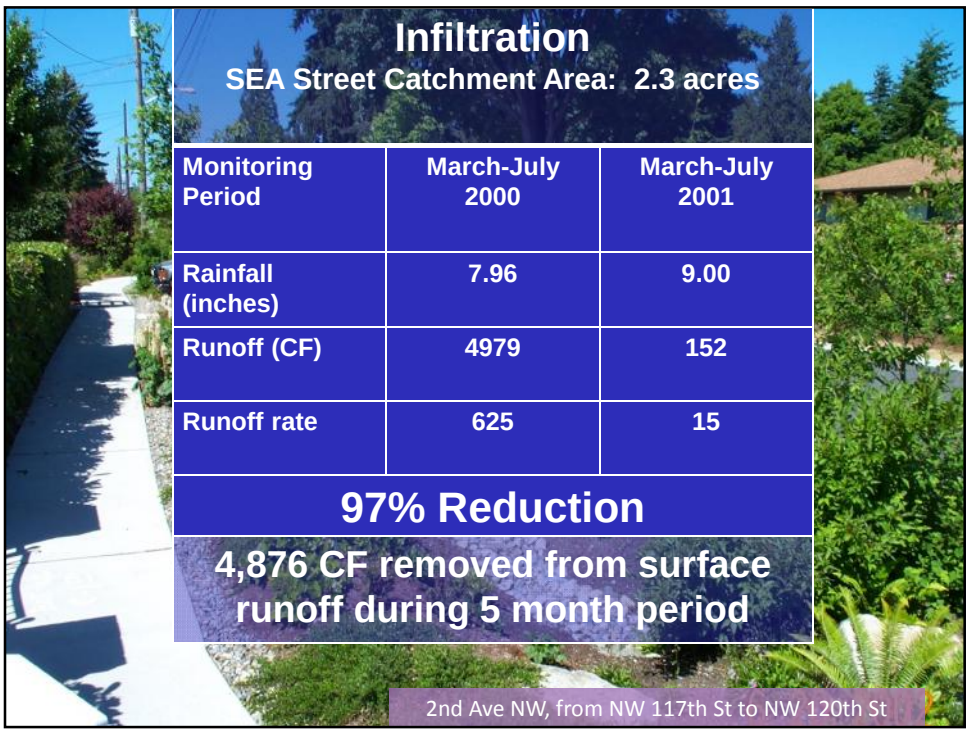
Limitations & Constraints

- More research needed to monetize social benefits
- Full life cycle analysis needed re long-term value
- Cost benefit analysis
- Valuation of further LID practices
- Need for more local and regional data
- Standards adopted to assess municipal/regional impacts of LID



www.greenvalues.cnt.org/calculator.php


Seattle Public Utilities:
SEA Streets
Demonstration Project


Infiltration
SEA Street Catchment Area: 2.3 acres
Monitoring Period
March-July 2000
March-July 2001
Rainfall (inches)
7.96
9.00
Runoff (CF)
4979
152
Runoff rate
625
15
97% Reduction
4,876 CF removed from surface runoff during 5 month period
2nd Ave NW, from NW 117th St to NW 120th St

Cost Analysis of Natural vs. Traditional Drainage Systems

Street Type	*Local street* SEA Street	*Local street* Traditional	*Collector street* Cascade	*Collector street* Traditional
Community Benefits	▪ one sidewalk per block ▪ new street paving ▪ traffic calming ▪ high neighborhood aesthetic	▪ two sidewalks per block ▪ new street paving ▪ no traffic calming ▪ no neighborhood aesthetic	▪ no street improvement ▪ moderate neighborhood aesthetic	▪ no street improvement ▪ no neighborhood aesthetic
Ecological Benefits	▪ high protection for aquatic biota ▪ mimics natural process ▪ bio-remediate pollutants	▪ high protection from flooding ▪ some water quality	▪ high water quality protection ▪ some flood protection	▪ high protection from flooding ▪ some water quality
% impervious area	35%	35%	35%	35%
Cost per block (330 linear feet)	$325,000	$425,000	$285,000	$520,400

HIGH-POINT HOPE VI REDEVELOPMENT SEATTLE

Case Study

Photo credit: Andrew Buchanan

High-Point Commons Park

Features:
Bioretention facility;
rain garden;
bioswale;
downspout removal;
pervious concrete streets, sidewalks, parking;
porous paving;
preservation of existing trees;
amended soils

Photo Credit: SvRDesign

Hi-Point 32nd Ave Porous Concrete

Stormwater is retained fully onsite

High-Point

ASLA Case Study: Property values performed better than market in recent decline

SHAMROCK HEIGHTS
Case Study

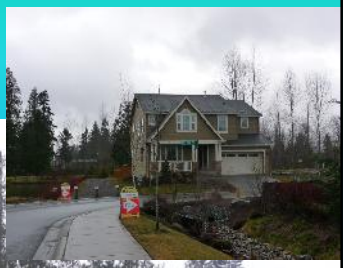
SHAMROCK HEIGHTS


Photo Credit: Triad & Associates

Question	Shamrock Heights	Cascade Crest	Westchester
	Av. Score	Av. Score	Av. Score
Neighborhood is Well Designed	8.8	8.1	8.56
Park(s), Greenbelts, and/or Open Space Add Value	9.45	8.24	5.83
Park, Play Toys, and Sport Court Enjoyed by Community	9.4	3.83	1.72

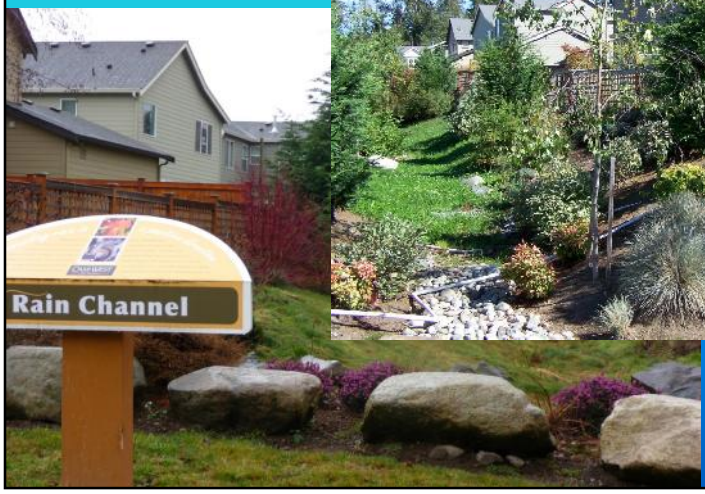
Restore Wetlands

The site had documented flooding issues which Triad Associates then corrected with grading and restoration of the pre-existing wetland.

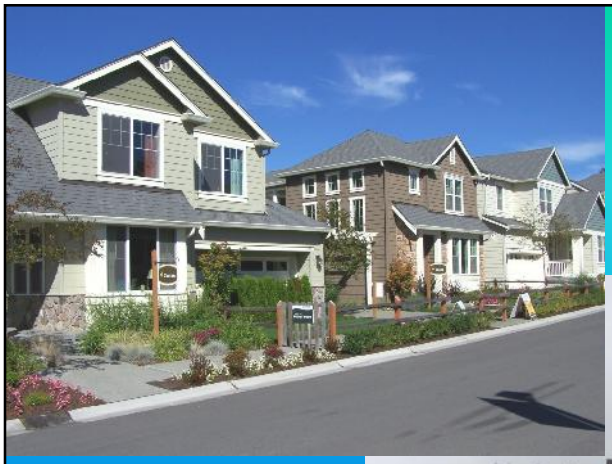


Rain Channels

CamWest *"buyers are looking for more privacy"*



Windermere *"people were very jazzed by the LID features"*



CanWest *"significant cost reductions only come when the streets can be designed at narrower widths"*

Paired Sales Analyses 2007-2009

Premium for Green Amenities: $7.50-$12.50 per sq.ft.

Resale 2013

	Property #1	Property #2	Adjustments	Property #3	Adjustments	Property #4	Adjustments
Address	622 Lyons Ave NE Renton, WA 98059	709 Rosario Pl NE Renton, Wa 98059		462 Rosario Av NE Renton, WA 98059		5009 NE 3rd Pl Renton, WA 98059	
Sale Price	$418,000	$439,950		$416,000		$415,000	
Date of Sale	4/26/2013	2/28/2013		10/18/2012		10/9/2012	
DOM	6	6		159		79	
Sale Conditions	Arms Length	Arms Length		Arms Length		Arms Length	
Site	.09 Acre	.17 Acre		.12 Acre		.10 Acre	
Design	2 Story	2 Story		2 Story		2 Story	
Quality of Construction	Good	Good		Good		Good	
Age	7 Yrs/Eff 3 Yrs	8 Yrs/Eff 4 Yrs	2,000	13 Yrs/Eff 6 Yrs	6,000	5 Yrs/Eff 2 yrs	-2,000
Total Room Count	7	9		8		8	
Bedroom Count	4	5	-10,000	4	-5,000	4	-5,000
Bathroom Count	2.5	2.5		2.5		2.5	
GLA	2,220	2410	-10450	2340	-6,600	2465	-13,475
Heat/Cooling	FAU/Central Air	FAU/Central Air		FAU/Central Air		FAU/Central Air	
Energy Items/Rating	BG Level 4	Typical		Typical		Typical	
Garage Count	2	2		2		2	
Fireplace Count	1	1		1		1	
Net Adjusted Price			-18,450		-5,600		-23,475
Gross Adjusted Price			$421,500		$410,400		$394,525
Property #1 Sale Price			$418,000		$418,000		$418,000
Adjusted Price/Comparable Sales			($421,500)		($410,400)		($394,800)
Estimated Market Value of Green Features			($3,500)		$7,600		$23,475
Average Value per SF for Green = $3.82							
Average DOM for MLS area 350 = 73							

Key Points to Remember

- LID = Enhanced community livability
- LID = Reduces flood risk
- LID = cleaner waterways for all
- Green Infrastructure typically costs less than conventional
- LID has environmental, economic and social benefits

"The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired, in value."

PRESIDENT THEODORE ROOSEVELT

Field trip transition

- Drivers: remember directions

Everyone:

- Find your carpool group quickly
- Bring your camera & gear