Multiple Benefits from Green Stormwater Infrastructure

human health & wellness

Kathleen Wolf, Ph.D.
Research Social Scientist

University of Washington (Seattle)
USDA Forest Service, Pacific NW Research Station

15th Annual New Partners for Smart Growth
Portland, OR :: February 2016
Industrial Age – city squalor
Sewers & Streets
Urban Neighborhoods

credit: Kristine Cramer, King County, WA
credit: American Planning Association
Trees & Stormwater Runoff

credit: City of State College, PA
Stormwater Management

Pierce County WA, Chambers Creek Properties
Pierce County WA, Chambers Creek Properties - 4 year growth
Thornton Creek Water Quality Channel  (Seattle, SvR Design)
1 hectare, treats runoff from 275 hectares
in cities . . . .

expensive land values
reduced public funds
increasing community needs
new parks??

SO . . . . .
multi-tasking nature
creating co-benefits
<table>
<thead>
<tr>
<th>GSI Tool</th>
<th>Image</th>
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</thead>
<tbody>
<tr>
<td>Bioretention</td>
<td><img src="image1.png" alt="Bioretention" /></td>
</tr>
<tr>
<td>Rain Gardens</td>
<td><img src="image2.png" alt="Rain Gardens" /></td>
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<tr>
<td>Stormwater Cisterns</td>
<td><img src="image3.png" alt="Stormwater Cisterns" /></td>
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<tr>
<td>Dispersion</td>
<td><img src="image4.png" alt="Dispersion" /></td>
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<td>Dry Well/Infiltration Trench</td>
<td><img src="image5.png" alt="Dry Well/Infiltration Trench" /></td>
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<tr>
<td>Biofiltration</td>
<td><img src="image6.png" alt="Biofiltration" /></td>
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</tbody>
</table>

Green stormwater infrastructure tools & strategies
linked to active living network
neighborhood social cohesion

environmental education & social learning
WHO health definition

a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (1946)

science & evidence re: environment role of ‘metro nature’?
not a panacea, but important!
Determinants of Health
in the background

support functions, needs, benefits, ecosystem services
Green Cities: Good Health
www.greenhealth.washington.edu

Sponsors:
USDA Forest Service, U&CF Program
University of Washington
NGO partners

thanks!
to U of WA students:
Katrina Flora
Mary Ann Rozance
Sarah Krueger

research review & summaries
Local Economics

Trees in cities are not grown and managed for products that can be bought and sold on markets, but they do provide many intangible services and functions! This article serves two purposes. First, it introduces valuation methods that are used to convert intangible benefits to dollar sums.\(^1\),\(^2\) Then, it shows how nonmarket valuations can support local decision-making.

Fast Facts

- The presence of larger trees in yards and as street trees can add from 3% to 15% to home values throughout neighborhoods.
- Averaging the market effect of street trees on all house values across Portland, Oregon yields a total value of $1.35 billion, potentially increasing annual property tax revenues $15.3 million.\(^9\)
- A study found 7% higher rental rates for commercial offices having high quality landscapes.\(^{14}\)
- Shoppers claim that they will spend 9% to 12% more for goods and services in central business districts having high quality tree canopy.\(^{34}\)
- Shoppers indicate that they will travel greater distance and a longer time to visit a district having high quality trees, and spend more time there once they arrive.\(^{34}\)
green stormwater infrastructure

+ human health co-benefits

King County, WA
Barton CSO Basin Then and Now

Development and the addition of impervious surfaces have changed the natural flow of stormwater.

on-going land use changes = less natural flow

photo credits:
Kristine Cramer, King County, WA
It seemed like a good idea!

water quality?
extend the pipe!

photo credits:
Kristine Cramer, King County, WA
Separated Sewer System
Combined Sewer Systems
Urban Drainage

- City of Seattle sewer and stormwater drainage systems
Change & Water Quality

- King County/City of Seattle CSOs (> 120 combined sewer overflows in city)
- EPA consent decree
- approach – green stormwater infrastructure
- co-benefits?
study in design phase

stormwater reduction performance
health co-benefit
neighborhood scale
Stormwater Report, online April 2014 (search health)

cobenefit design opportunities
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streets that work like the forest
Analysis :: Surface Infiltration Potential

public & private lands
Study :: Health Outcomes

- neighborhood green stormwater infrastructure installation - 2017
- consent decree co-benefits
- pre/post analysis
- measures? property value, physical activity, social capital, mental health, school performance . . . . .
Equity in Action ::
King County & City of Seattle

- **Key Recommendations:**
  - Consider the needs of nearby residents and businesses, including Martin Court (transitional housing at the northeast corner of 4th Ave S. and S Michigan St.).
  - Pursue partnership with Seattle Department of Transportation (SDOT) to improve the corners of 4th Ave S and S Michigan St.
  - Thoroughly document and share information about equity determinants the project will impact – share successes.
  - Increase vegetation in and around the project site.
  - Employ strategies during construction and operation to reduce pollution.
  - Create quality educational opportunities during design, construction and operation.
  - Keep relocated businesses in Georgetown, if possible and desired by the business.
  - Seek opportunities throughout project (design through operation) to provide job training.
  - Engage and employ small-, minority-, and woman-owned businesses and consultants.
  - If possible, pursue opportunities to support the creation of open or green space in the community.
Summary

- sanitary city (drains & pipes)
- sustainable city (socio-ecological systems)
- Green Cities: Good Health
- green stormwater infrastructure
- potential health & wellness co-benefits
- King County/City of Seattle research case study
- scalable to other U.S. cities with GSI
Human Dimensions of Urban Forestry and Urban Greening

featuring research on peoples' perceptions and behaviors regarding nature in cities

Nature and Consumer Environments
Research about how the urban forest influences business district visitors.

Trees and Transportation
Studies on the value of having quality landscapes in urban roadsides.

Civic Ecology
Studies of human behaviors and benefits when people are active in the environment.

Policy and Planning
Integrating urban greening science with community change.

Urban Forestry and Human Benefits
More resources, studies and links . . .

Projects Director
Kathleen L. Wolf, Ph.D.

www.naturewithin.info
well, maybe not . . . .

early 1960s – raw sewage plumes in Puget Sound

1958-sewage treatment plant approved; 1965-in operation

photo credits:
Kristine Cramer, King County, WA