Holding Nature Accountable: economics of nature and human health

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action plan + research supplement

value of research to U&CF growth
Research Needs Framework

A. Understand Ecosystem/Ecological Services
B. Promote Human and Community Health
C. Planting, Inventory, and Analysis for Forest and Environmental Health
D. Prepare for Pests, Threats, Climate and Associated Changes and Risks
E. Enable Civic Stewardship and Improved Local Governance
F. Integrate Knowledge Networks and Data for Urban Socio-Ecological Systems
WHO Health Definition

A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (1946)
Social Determinants
Green Cities: Good Health
www.greenhealth.washington.edu

Sponsors:
USDA Forest Service,
(U&CF Program + Pacific NW Research)
University of Washington
NGO partners

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

Research Reviews & 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.\textsuperscript{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 \text{ billion}, potentially increasing annual property tax revenues $15.3 \text{ million}.\textsuperscript{9}

- A study found 7\% higher rental rates for commercial offices having high quality landscapes.\textsuperscript{34}

- Shoppers claim that they will spend 9\% to 12\% more for goods and services in central business districts having high quality tree canopy.\textsuperscript{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.\textsuperscript{34}
Outside our Doors
the benefits of cities where people and nature thrive

A Puget Sound Conservation Publication

The Nature Conservancy

design: milepost
co-author
co-author & printing:
The Nature Conservancy
Discovery: Human Health Benefits Across the Life Cycle
Urban Forests and Newborns
the natural environment may affect pregnancy outcomes . . .

10% increase in tree-canopy cover within 50m of a house
= lower number of low weight births (1.42 per 1000 births)

*Donovan et al., Health & Place 2011; Hystad et al., Env Health Perspectives 2014*
Hygiene Hypothesis

- presence of soil bacteria in body, *Mycobacterium vaccae* = increased serotonin
- boost immune function
- may alleviate depression (dirt or Prozac?)

Lowry et al. 2007. Neuroscience
Green Streets for Walkability

evidence of lower frustration and higher meditation when moving into the greener streets

Aspinall et al. 2013. The Urban Brain: Analysing Outdoor Physical Activity with Mobile EEG. British Journal of Sports Medicine
Civic Stewardship for Resilience

E. Svendsen, L. Campbell; USFS
Alzheimer’s Disease & Dementia
Provide wander gardens & horticulture therapy

- 10.5% reduction in amount of medications used in dementia facility
- 30% fewer falls, accompanied by a reduction in fall severity

Detweiler et al. 2009. *American Journal of Alzheimer’s Disease and Other Dementias*

[www.rph.org/eden.html](http://www.rph.org/eden.html)
Publications


* Research and publications were funded in part by the U.S.D.A. Forest Service, National Urban and Community Forestry program, as recommended by the National Urban and Community Forestry Advisory Council (NUCFAC). Also the USFS Pacific Northwest Research Station.
annual value of $11.7 billion U.S. (2015 dollars)

- cradle to grave human life cycle
- varied expressions of urban greening (metro nature)
- evidence based human health and wellness benefits
- just beginning the analysis!
Analysis Process

- Scale of individual to community
  - Screen for benefits

- Green condition
  - Urban forestry, parks, gardens, etc.

- Market & non-market valuation strategy
process #1: screen for benefits
Contributing analysts:
Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaeuser
Metro Nature & Health Evidence Framework

Synthesis of 40 years of peer-reviewed literature

process #2: understand green condition
Diversity in Metro Nature

NEARBY NATURE INCLUDES A VARIETY OF SPACES AND PLACES

URBAN FOREST CANOPY

BIOPHILIC DESIGN

PARKS AND GARDENS

GREEN STORMWATER INFRASTRUCTURE
Stormwater Ecosystem Services

green infrastructure

goal: co-design for co-benefits

Image courtesy of the Center for Urban Forest Research
Thornton Creek Water Quality Channel (Seattle, SvR Design)
1 hectare, treats runoff from 275 hectares (1 hectare = 2.47 acres)
economic & health co-benefits
Tanner Springs Park
Portland OR
linked to active living network
process #3: apply valuation strategy
### Valuation Sources

Benefit x Nature x Health Outcome

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Metro Nature</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn Birth Weight</td>
<td>increased tree canopy cover near mothers' homes</td>
<td>fewer small for gestational age babies</td>
</tr>
<tr>
<td>Attention Deficit Hyperactivity Disorder</td>
<td>greener play areas vs built outdoor or indoor settings</td>
<td>reduced symptoms potentially reducing medication</td>
</tr>
<tr>
<td>School Performance</td>
<td>green views from classrooms and cafeteria</td>
<td>reduced dropout rate - average annual income</td>
</tr>
<tr>
<td>Crime Reduction</td>
<td>trees and lawn in outdoor common areas</td>
<td>reduced violent and non-violent incidence and costs</td>
</tr>
<tr>
<td>Cardiovascular Disease</td>
<td>presence of residential tree canopy</td>
<td>reduced incidence or severity of cardiovascular disease</td>
</tr>
<tr>
<td>Alzheimer's Disease</td>
<td>wander garden in care facility</td>
<td>reduced medications for patients</td>
</tr>
</tbody>
</table>
Valuation Strategies

Benefits Transfer approaches

- factor income
- avoided or replacement cost
- burden of illness
- hedonic pricing
- stated preference/contingent valuation
- revealed preference (e.g., travel cost)
- quality adjusted life years
- benefit/cost
What is the Value?
Analysis Process

- scale of individual to community
  - screen for benefits

- urban forestry, parks, gardens, etc.
  - green condition

- market & non-market
  - valuation strategy
## Summary Table

<table>
<thead>
<tr>
<th>Benefit (geographic scope)</th>
<th>Minimum ($)</th>
<th>Maximum ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn Health (U.S.)</td>
<td>5.3</td>
<td>5.3</td>
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<tr>
<td>Attention Deficit Hyperactivity Disorder (U.S.)</td>
<td>383.5</td>
<td>1,917.7</td>
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<td>Schools (U.S.)</td>
<td>20.4</td>
<td>1,262.9</td>
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<tr>
<td>Crime (U.S.)</td>
<td>340.6</td>
<td>899.4</td>
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<tr>
<td>Cardiovascular Disease (U.K., U.S.)</td>
<td>1,220.0</td>
<td>1,220.0</td>
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<tr>
<td>Alzheimer’s Disease (U.S.)</td>
<td>724.6</td>
<td>1,449.2</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>2,694.4</strong></td>
<td><strong>6,754.5</strong></td>
</tr>
</tbody>
</table>

Summary

• evidence-based human health & wellness benefits
• economic consequences!
• market & non-market valuations
• first efforts – promising!
• = demonstrating return on investment
Future RESEARCH?
Knowledge to Practice

- OR Health & Outdoors Initiative + Willamette Partnership + Duke Univ.
- validated health outcomes measures that are scaled to local projects
- greening or health programming
- goal – toolkit and technical assistance