To Your Good Health!
Exploring Urban Forests,
Remote Sensing,
and Economics Linkages

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overview

health benefits & services evidence
‘cradle to grave’
economic values
metro trees/nature assessment
ambitions!
City Trees, Metro Nature for Human Health and Wellness

scientific evidence
life course concept
‘cradle to grave’
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*
Nature & Psych Development
children’s play & imagination

Richard Louv -
Last Child in the Woods
School & Learning
Green High School Campuses

- cafeteria & classroom window views with greater quantities of trees and shrubs
- positively associated with:
  - standardized test scores,
  - graduation rates
  - %s of students planning to attend a four-year college
  - fewer occurrences of criminal behavior

Matsuoka. 2010. Landscape & Urban Planning
College students with more natural views from their dorm windows
- scored higher on tests of capacity to direct attention
- rated themselves as able to function more effectively

Tenessen & Cimprich. 1995. Journal of Environmental Psychology
Trees & Crime Reduction

- trees in the public right of way are associated with lower crime rates
  - smaller, view-obstructing trees are associated with increased crime
  - larger trees are associated with reduced crime

Donovan & Prestemon. 2012. *Environment and Behavior*
EAB Tree Loss & Public Health

1990 to 2007, 1,296 counties in 15 states infected areas vs. no bugs
15,000 more deaths from cardiovascular disease
6,000 more deaths from lower respiratory disease
controlled for demographic, human mortality, and forest health data at the county level

Toledo, Ohio in 2006, pre EAB

2009, EAB in neighborhood

photos: Dan Herms, Ohio State University
Shinrin-yoku  Forest Bathing

- extended forest walks
  - reduced ‘fight or flight’ nervous system activity
  - lower cortisol – a stress indicator
  - increased immune function
  - lower pulse rate & blood pressure
Physical Activity & Depression Reduction

- Review of 13 high quality studies
  - exercise recommended for mild to moderate depression
  - people who are willing & motivated
  - associated meditation and mindfulness are important

hospital healing gardens:
patients; family and friends; professional staff

health care $$ savings
Effects of nature window view on recovery from surgery (Roger Ulrich, 1984)

- Shorter stays
- Less pain
- Fewer minor complications
- Better emotional well-being
Hospital Staff – Respite and Support
Nature: A stress coping resource for employees 24-7

thanks to Teresia Hazen
Legacy, Portland for slides
Elders: mobility & social connections
Where is the Evidence?
nearly 40 years of studies
diverse disciplines and publications
Research Review and Summaries

www.greenhealth.washington.edu

Sponsors:
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NGO partners

thanks!
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Mary Ann Rozance
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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. 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.

- A study found 7% higher rental rates for commercial offices having high quality landscapes.

- Shoppers claim that they will spend 9% to 12% more for goods and services in central business districts having high quality tree canopy.

- 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.
Metro Nature & Health Evidence Framework
what is the economic value?
## Economic Value Exploration

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Metro Nature</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Newborn Birth Weight</td>
<td>canopy cover and birth weight</td>
<td>more tree canopy-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>
Caveats and Conditions

• preliminary - still under peer review for publication

• life course focus
• subset of all metro nature findings
• the best current valuation prospects

• numbers rather small – why?
Valuation Challenges . . . .

- little crossover of natural resources and public health methods
- spotty local health data sources
- equivalent geographic scale of datasets:
  - < 1m for vegetation
  - neighborhood or block for health
- precision of vegetation assessment . . .
  (may need more than canopy)
vegetation assessment
urban forest benefits
Urban Tree Canopy Assessment

i-Tree analysis

City of Seattle

vegetation and land use map for Seattle image credit: UW Remote Sensing and Geospatial Lab
more than trees . . . nature & health evidence
Top Down Mapping

plus understory vegetation

for human habitat

school yard landscapes
forest = silviculture
forest = ecosystem
Remote Sensing-LIDAR

Remote Sensing-LIDAR

LiDAR response to built versus vegetative surfaces.
credit: Qian-Yi Zhou, Stanford University
Veg Assessment Explorations

oblique aerial view

LIDAR point cloud
Veg Assessment Explorations

ground view

LIDAR point cloud
future ambitions!
Eco Streets Hydro Vue

STRUCTURE

FUNCTION/BENEFIT

ECONOMIC VALUE

MANAGEMENT

photo credits: Seattle i-Tree Training by Al Zelaya
Future?
i-Tree
People
Health
Anthro
or?
Summary

• evidence of human health & wellness
• evidence portal: Green Cities: Good Health
• throughout human life course!
• economic implications – preliminary
• vegetation assessment – LIDAR for forest structure
• i-Tree ambitions
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.

Green Cities: Good Health
human health & well-being research

www.naturewithin.info