The Economics of Urban Greening for Human Health

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primary 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
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!
design:

printing:
Nearby nature experiences are important across the entire life cycle, from cradle to grave.

INFANTS

BIRTH WEIGHT

Higher birth weight is associated with lower risk of developing childhood diseases and a longer life span. Infants born with a higher birth weight are less likely to develop childhood diseases such as asthma, diabetes, and heart disease.

IMMUNE FUNCTION

Exposure to nature early in life can enhance the immune system. Infants who are exposed to nature have stronger immune systems and are less likely to develop infections.

FAMILY DYNAMICS

Nature exposure during infancy and early childhood can improve family dynamics. Infants who are exposed to nature have stronger bonds with their families and are more likely to develop healthy social skills.

CHILDREN & TEENS

OVERALL HEALTH AND WELL-BEING

Outdoor play and nature exposure can improve overall health and well-being. Children who spend time outside have lower rates of obesity, diabetes, and mental health problems.

ADHD

Exposure to nature can improve attention and reduce symptoms of ADHD. Children who spend time in nature have fewer symptoms of ADHD and are more able to focus on tasks.

FUTURE FINANCIAL SUCCESS

Exposure to nature can improve future financial success. Infants who are exposed to nature are more likely to excel academically and have higher earning potential.

ADULTS

DEPRESSION AND STRESS

Exposure to nature can reduce symptoms of depression and stress. Adults who spend time in nature have lower rates of depression and anxiety.

CARDIOVASCULAR DISEASE

Exposure to nature can improve cardiovascular health. Adults who spend time in nature have lower blood pressure and a lower risk of heart disease.

MOBILITY & QUALITY OF LIFE

Exposure to nature can improve mobility and quality of life. Adults who spend time in nature are more likely to participate in physical activity and have fewer health problems.

OLDER ADULTS

HYPERTENSION

Exposure to nature can reduce symptoms of hypertension. Older adults who spend time in nature have lower blood pressure and a lower risk of hypertension.

COGNITIVE DISORDER

Exposure to nature can improve cognitive function. Older adults who spend time in nature have better memory and a lower risk of cognitive decline.

contributing analysts:

Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaueser
Publications

- Green Cities, Good Health web site. A resource to learn more about nearby nature in cities and human health.

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WHO Health Definition

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

- Scale of individual to community
- Green condition
- Market & non-market valuation strategy

Screen for benefits
- Urban forestry, parks, gardens, etc.
process #1: screen for benefits
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 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.\(^1\)\(^2\) 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.\(^4\)
- 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.\(^4\)
Nearby nature experiences are important across the entire life cycle, from cradle to grave.

INFANTS

BIRTH WEIGHT
PHYSICAL ACTIVITY
IMMUNE FUNCTION
FAMILY DYNAMICS

CHILDREN & TEENS

OVERALL HEALTH AND WELL-BEING
RELATIONSHIP TO NURSERY CARE
IMPORTANCE OF ADAPTION

ADULTS

DEPRESSION AND STRESS
MOBILITY & QUALITY OF LIFE

OLDER ADULTS

CARDIOVASCULAR DISEASE
Cognitive disorders

contribution analysts:
Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaueser
Metro Nature & Health Evidence Framework

Synthesis of 40 years of peer-reviewed literature


Kathleen L. Wolfe, Ph.D.

Design: Milepost

Printing: The Nature Conservancy
design:

co-author & printing:
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
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?
### 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>
</tr>
<tr>
<td>Attention Deficit Hyperactivity Disorder (U.S.)</td>
<td>383.5</td>
<td>1,917.7</td>
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<tr>
<td>Schools (U.S.)</td>
<td>20.4</td>
<td>1,262.9</td>
</tr>
<tr>
<td>Crime (U.S.)</td>
<td>340.6</td>
<td>899.4</td>
</tr>
<tr>
<td>Cardiovascular Disease (U.K., U.S.)</td>
<td>1,220.0</td>
<td>1,220.0</td>
</tr>
<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>

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
Improving Depression

20 adults with major depression walk in a park setting and an urban setting

- 50-minute walks one week apart
- before-after testing:
  - Mood: Positive and Negative Affect (PANAS)
  - Cognition: Backward Digit Span (BDS)

Berman et al. 2012. *Journal of Affective Disorders*

cognitive and affective improvements after walking in a nature setting
% of U.S. Population Using Mental Health Medications
2001 vs 2010

America’s State of Mind, Medco Health Solutions, Inc
Prevalence of Adult Antidepressant Use
2001 vs 2010

America’s State of Mind, Medco Health Solutions, Inc
The times . . . .
they are a changin’   Bob Dylan

urban & community forestry
environment

business outlook
return on investment
making people great
Forest Therapy Road (Kubo Valley)
森林セラピーロード
（久保谷）
Takatori House
レストラン 鷹取の家
Military Service & Stress

- Military service to civilian transition issues
- Prevalence of Stress Response
- Service carry-overs
  - Purpose
  - High commitment & exertion
  - Advanced skill sets
  - Social cohesion/comraderie
Veterans Outdoor Therapy

Les Winkeler/The Southern Illinoisan

World-Herald News Service

Hope for the Warriors

Outward Bound
Civic Stewardship for Healing

urban forest restoration
community tree plantings

parks
public gardens
street trees
neighborhood

American Forests
Tree People, Los Angeles
community gardens

Keep Oakland Beautiful

local food
food security
child education
nutrition
food donations

The Heights Community Garden,
Dayton OH
Summary

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

Thank you to USDA Forest Service & NUCFAC!
copies available at this meeting!
Human Dimensions of Urban Forestry and Urban Greening

What's New?
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 roadways.

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.