Urban Forest & Community Economics: Money Does Grow on Trees

Kathleen Wolf, Ph.D.
Research Social Scientist

University of Washington (Seattle)
School of Environmental and Forest Sciences

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Forest Economics 101
Economic Value of City Nature
Methods Challenges

Forest Products
= market goods
excludable
identifiable ownership
expenses-revenues
= profits

Trees/Green in Cities
= public goods
non-excludable
multiple “owners”
expenses-returns?
-profits?
Trees & Property Value

hedonic value

street trees

yard landscape

local revenues
Yard & Street Trees

Value

<table>
<thead>
<tr>
<th>Increase</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>2%</td>
<td>mature yard trees (greater than 9-inch dbh)</td>
</tr>
<tr>
<td>3%</td>
<td>larger street trees (up to 100’ away)</td>
</tr>
<tr>
<td>3-5%</td>
<td>trees in front yard landscaping</td>
</tr>
<tr>
<td>6-9%</td>
<td>good tree cover in a neighborhood</td>
</tr>
<tr>
<td>10-15%</td>
<td>mature trees in high-income neighborhoods</td>
</tr>
</tbody>
</table>

multiple studies:
Green Cities: Good Health > Local Economics
## Tree Retention In Development

<table>
<thead>
<tr>
<th>Increase</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>18%</td>
<td>building lots with substantial mature tree cover</td>
</tr>
<tr>
<td>22%</td>
<td>tree-covered undeveloped acreage</td>
</tr>
<tr>
<td>19-35%</td>
<td>lots bordering suburban wooded preserves</td>
</tr>
<tr>
<td>37%</td>
<td>open land that is two-thirds wooded</td>
</tr>
<tr>
<td>Increase</td>
<td>Condition</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------------------------</td>
</tr>
<tr>
<td>10%</td>
<td>inner city home located within 1/4 mile of a park</td>
</tr>
<tr>
<td>17%</td>
<td>home near cleaned-up vacant lot</td>
</tr>
<tr>
<td>20%</td>
<td>home adjacent to or fronting a passive park area</td>
</tr>
<tr>
<td>32%</td>
<td>residential development adjacent to greenbelts</td>
</tr>
</tbody>
</table>
Local Government Benefits

Civic Investment – Public Goods like schools, emergency response, roads

- Street trees average positive effect on house values
- Added up across Portland, Oregon
- Yields a total value of $1.35 billion USD
- Potentially increasing annual property tax revenues $15.3 million USD

Donovan & Butry. 2010
*Landscape and Urban Planning*
Community Economics

retail & shopper behavior
indirect economic measures
Trees & Retail Environments Research

Trees & Shopper Environments Research

• Research Questions •
  trees and visual quality?
  trees and consumer behavior?
  trees and product pricing?

• Methods:
  mail out/in surveys
  national or local sample
  residents/nearby city residents

partners: U of Washington, NGOs, business organizations
funded by USDA Forest Service
Image Categories (sorted by ratings)

Scale: 1=not at all, 5=like very much, 26 images

Pocket Parks
mean 3.72
(highest)

Full Canopy
mean 3.63
Enclosed Sidewalk
3.32

Intermittent Trees
2.78
No Trees mean 1.65 (lowest)
(high - 3.72)
1. Place Perceptions
   • Place Character
   • Interaction with Merchants
   • Quality of Products

2. Patronage Behavior
   • travel time, travel distance
   • duration & frequency of visits
   • willingness to pay for parking

3. Product Pricing
   • higher willingness to pay for all types of goods
   • higher in districts with trees – 9-12%

Place Marketing
Relationship Marketing
Retail & Place Marketing

“Companies stage an experience when they engage customers in a memorable way.”
summary

urban forests = human habitat = retail environment

studies of trees in business districts
perception, preference & behavior
design & place messaging/identity
customer relationships
Trees as Place-Makers
the Chenoggye freeway in Seoul  
~ 1970-2005
Cheonoggyecheon Stream Restoration
8.4 km, $900 M
ALPHA
Awaji Landscape Planning & Horticulture Academy
retail street in urban Japan (and other Asian cities)
Namba Parks, Osaka
view from nearby hotel
interior
retail space
ground level
small plazas
retail entry
up-close nature experiences

place of respite
Namba Parks
retail success & nature experience benefits
lessons learned?
social spaces
small rooms
variety within unity
public xeriscape
shared design & management
identity

affordable materials

message of renewal
Bainbridge Island, WA
“main street”
outdoor rooms
social spaces
sense of welcoming
Human Health Evidence & Economic Value

nearby nature experiences
human habitat for wellness
disease prevention
health promotion
What are the economic values of nature and human health benefits?
In the diagram, the price is represented on the vertical axis (Price) and the quantity on the horizontal axis (Quantity). The point where the demand and supply curves intersect is labeled 'Equilibrium.' This point indicates the market price (P) and quantity (Q) at which the quantity demanded equals the quantity supplied.
Elements of Economic Valuation

• What are the benefits?
• Who experiences nature and gets benefits?
• What is the green condition or situation that provides benefits?
• Scale of value question (i.e., community, province/state, nation)
• What are the costs/income gained/lost associated with these benefits?

KATHLEEN L. WOLF, PH.D.

design: milepost

author:

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

Research about nature benefits and economic value is fairly new. Some of the quantified health benefits of nature in cities are easier to convert to economic value than others. Here are some preliminary valuations - estimated for the entire U.S. on an annual basis.

INFANTS

BIRTH WEIGHT

OVERALL HEALTH AND WELL-BEING

IMMUNE FUNCTION

FAMILY DYNAMICS

FINANCIAL SUCCESS

ADHD

CARDIOVASCULAR DISEASE

CRIME & SAFETY

hypertension

COGNITIVE DISORDERS

Contributing analysts:
Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaueser
Lifecycle :: disease & illness

Cumulative U.S. DALYs for the Leading Disease/Disorder Categories by Age (2010)

Disability Adjusted Life Year
Analysis Process

- scale of individual to community
- screen for benefits

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

- market & non-market
- valuation strategy
process #1: screen for benefits
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.\(^3\)

- A study found 7% higher rental rates for commercial offices having high quality landscapes.\(^4\)

- Shoppers claim that they will spend 9% to 12% more for goods and services in central business districts having high quality tree canopy.\(^5\)

- 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.\(^6\)
healthy trees.

happy people.

www.leaflimb.com  919.787.9551
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 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
Natural Resources Valuation

- travel cost
- income loss
- hedonic margin
- willingness to pay
Stormwater Ecosystem Services

green infrastructure

goal: co-design for co-benefits
Grey Infrastructure

Drain, direct, dispatch

Green Infrastructure

Slow, spread, soak

Source: Low Impact Development: A Design Manual for Urban Areas, 2010
Avoided Costs Potential?

$3 trillion
17% of US GDP


$222 billion
$134 billion
$57 billion
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>

common values: avoided costs & burden of illness
Analysis Process

- Scale of individual to community
- Screen for benefits
- Green condition
  - Urban forestry, parks, gardens, etc.
- 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>
</tr>
<tr>
<td>Attention Deficit Hyperactivity Disorder (U.S.)</td>
<td>383.5</td>
<td>1,917.7</td>
</tr>
<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>

Summary

• evidence-based human health & wellness benefits
• economic consequences!
• market & non-market valuations
• first efforts – promising!
• = demonstrating return on investment
Urban Forests for Human Health: A Focused Economic Valuation

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TREE Fund • 552 S. Washington St., Ste. 109, Naperville, IL 60540
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