Invest from the Ground Up!
Economics of City Trees & Greening

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## Ecosystem Services

### Millennium Ecosystem Assessment 2005

<table>
<thead>
<tr>
<th>ECOSYSTEM SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provisioning Services</strong></td>
</tr>
<tr>
<td>Food (crops, livestock, wild foods, etc...)</td>
</tr>
<tr>
<td>Fiber (timber, cotton/hemp/silk, wood fuel)</td>
</tr>
<tr>
<td>Genetic resources</td>
</tr>
<tr>
<td>Biochemicals, natural medicines, pharmaceuticals</td>
</tr>
<tr>
<td>Fresh water</td>
</tr>
<tr>
<td><strong>Supporting Services</strong></td>
</tr>
<tr>
<td>Nutrient cycling</td>
</tr>
<tr>
<td>Soil formation</td>
</tr>
<tr>
<td>Primary production</td>
</tr>
<tr>
<td><strong>Regulating Services</strong></td>
</tr>
<tr>
<td>Air quality regulation</td>
</tr>
<tr>
<td>Climate regulation (global, regional, and local)</td>
</tr>
<tr>
<td>Water regulation</td>
</tr>
<tr>
<td>Erosion regulation</td>
</tr>
<tr>
<td>Water purification and waste treatment</td>
</tr>
<tr>
<td>Disease regulation</td>
</tr>
<tr>
<td>Pest regulation</td>
</tr>
<tr>
<td>Pollination</td>
</tr>
<tr>
<td>Natural hazard regulation</td>
</tr>
<tr>
<td><strong>Cultural Services</strong></td>
</tr>
<tr>
<td>Aesthetic values</td>
</tr>
<tr>
<td>Spiritual and religious values</td>
</tr>
<tr>
<td>Recreation and ecosystem</td>
</tr>
</tbody>
</table>
The value of the world’s ecosystem services and natural capital


- ecosystems provide at least US $33 trillion dollars worth of services annually
- about 38% of the estimated value comes from terrestrial systems, mainly from forests
Urban Forest Canopy Cover by Land Use

Seattle USA data :: distribution probably similar to many (northern) cities
What are the economic values of urban trees and urban greening?
Reducing Stormwater Runoff

Image courtesy of the Center for Urban Forest Research
Eco (UFORE)
Streets (STRATUM)
Hydro
Vue

tools provided by USDA
Forest Service

STRUCTURE
FUNCTION
VALUE
MANAGEMENT

photo credits: Seattle i-Tree Training by Al Zelaya
Residential Properties
hedonic valuation
# Yard & Street Trees

<table>
<thead>
<tr>
<th>Value</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase</td>
<td>mature yard trees (greater than 9-inch dbh)</td>
</tr>
<tr>
<td>2%</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>
**Tree Retention In Development**

**Value**

<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>Value</td>
<td>Increase</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>32%</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 US
- potentially increasing annual property tax revenues $15.3 million US

Donovan & Butry. 2010
Landscape and Urban Planning
Tree Canopy & Consumer Environments
social science of consumer behavior

‘atmospherics’
Trees & Retail 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)

Pocket Parks

mean 3.72
(highest)

Full Canopy

mean 3.63

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

vegetation

edited in

shopper

survey
“Companies stage an experience when they engage customers in a memorable way.”
Human Health & Well-Being
wellness & productivity valuation
Research Reviews

Green Cities: Good Health

Metro nature - including trees, parks, gardens, and natural areas - enhance quality of life in cities and towns. The experience of nature improves human health and well-being in many ways. Nearly 40 years of scientific studies tell us how. Here’s the research...

RESEARCH THEMES
- Livable Cities
- Place Attachment & Meaning
- Community Building
- Community Economics
- Social Ties
- Crime & Fear
- Reduced Risk
- Wellness & Physiology
- Active Living
- Healing & Therapy
- Mental Health & Functioning

www.greenhealth.washington.edu

summaries nearly complete
additional products
study of economic valuation
Research Review and Summaries

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

thanks to U of WA students:
Katrina Flora
Mary Ann Rozance
Sarah Krueger
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.
Urban Green :: Public Health & Well Being

> 2,800 articles

% distribution
Urban Greening & Health Evidence Framework

biophilia outcomes
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
Walkable Neighborhoods & Elder Mortality

- Environments: Neighborhood Streets (Tokyo)
  - “treatment” - tree-lined & parks
  - control – little green

- Outcomes: Elderly People
  - less illness
  - lower mortality over 5 years

Takano, Nakamura, Watanabe. 2002.
Journal of Epidemiology & Community Health
Conclusions
ecosystem services
pristine landscapes
ES of city trees & ‘nearby nature’
40 years of study . . .
Summary

- urban ecosystem services
- benefits research & evidence!
- environmental, social, community
- economic valuation
- formative economics methods
- hedonic to health
- benefit to cost analysis
- biophilia values? more to do!
Human Dimensions of Urban Forestry and Urban Greening

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

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 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...

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

Projects Director
Kathleen L. Wolf, Ph.D.

www.naturewithin.info