Urban Ecosystem Services: Urban Greening & Public Health

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Society of American Foresters
91st National Convention
November 2011

Science & Research
New Facts = New Messages

collaborations & partnerships
political support
budgets retention and/or expansion
staff retention and/or expansion
program momentum
personal passion
Ecosystem Services Framework

Ecosystem Services

Millennium Ecosystem Assessment 2005

expand how we consider cultural services in the urban context, (e.g. EPA, USFS research)
An Integrated Approach

ECOSYSTEM SERVICES
All sites CAN provide ecosystem services

BROWNFIELD  GREYFIELD  GREENFIELD
Morrisania Homes
(Bronx NY)
Homes Certification
score: 62/108
rating: Silver

Tepeyac Haven
(WA state)
Homes Certification
score: 68/130
rating: Gold
Evidence-based Metrics

Guidelines and Performance Benchmarks

- Site Selection
- Pre-Design Assessment
- Site Design – Water
- Site Design – Soil and Vegetation
- Site Design – Materials
- Site Design – Human Health & Well Being
- Construction
- Operations and Maintenance
- Monitoring and Innovation

released November 2009
Precedent of LEED voluntary certification agency adoption

Why are city trees & urban greening important?

human health, functioning, & well-being
Research Reviews

Green Cities: Good Health

Metro areas - including trees, parks, gardens, and natural areas - enhance quality of life in cities and towns. The presence 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
- Liveable Cities
- Parks, Recreation & Healing
- Community Building
- Community Economics
- Social Ties
- Crime & Fear
- Reduced Risk
- Resilience & Adaptation
- Active Living
- Healing & Therapy
- Mental Health & Function
- Work & Learning
- Culture & Equity
- Lifecycle & Gender

www.greenhealth.washington.edu

first phase: June 2010
summaries complete: Dec 2011
additional products

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.2,2 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 1% to 11% 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.8
- Shoppers claim that they will spend 9% to 13% more for goods and services in 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.7
Urban Green :: Public Health & Well Being

> 1,700 articles

% distribution

Research Reviews

sponsors:
University of Washington
USDA Forest Service, U&CF Program
ARRA funding
NGO partners
Physical Inactivity & Obesity

majority of Americans not active enough
goal-30 minutes per day of moderate activity
to reduce risk factors for chronic diseases
(heart, stroke, cancer, diabetes)
significant costs to national health services

$168 billion medical costs
17% of all U.S. medical costs

CDC 2010

Obesity Trends* Among U.S. Adults

1985

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” person)

Source: Behavioral Risk Factor Surveillance System, CDC.
Obesity Trends* Among U.S. Adults

2008

(*BMI ≥30, or ~ 30 lbs. overweight for 5’4” person)

Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults


(*BMI ≥30, or about 30 lbs. overweight for 5’4” person)

Source: Behavioral Risk Factor Surveillance System, CDC.
Age-adjusted % of adults aged ≥20 years who are obese, 2007
parks, open spaces & trails

Parks Prescription
San Francisco
Albuquerque
City Trees & Nature
Active Living

<table>
<thead>
<tr>
<th>Positive Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Environment</td>
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<tr>
<td>higher population density (city core rather than suburbs)</td>
</tr>
<tr>
<td>higher housing density</td>
</tr>
<tr>
<td>mix of land uses (such as residential and retail)</td>
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<tr>
<td>street design with more connectivity (rather than cul-de-sacs)</td>
</tr>
<tr>
<td>availability of public transit</td>
</tr>
<tr>
<td>walking and biking infrastructure (such as sidewalks and bike lanes)</td>
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<tr>
<td>Psycho-Social Environment</td>
</tr>
<tr>
<td>safety from crime</td>
</tr>
<tr>
<td>safety from traffic</td>
</tr>
<tr>
<td>absence of social disorder</td>
</tr>
<tr>
<td>aesthetics (including trees and landscape)</td>
</tr>
<tr>
<td>educational campaigns (such as Walk-to-School)</td>
</tr>
<tr>
<td>incentive programs (such as work place reimbursement for transit use)</td>
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</tbody>
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Table 1: Determinants of City Walkability

make room for pedestrians
Nature, Human Health & Walkable Neighborhoods

- Outcomes: Elderly People & Walking
  - less illness
  - lower mortality rate

- Environments: Neighborhood Streets (Tokyo)
  - tree-lined
  - parks

City Trees & Nature
Community Economics

- Residential real estate values - 3-7% with trees in yard
- Residential real estate values - 5-20%, proximity to natural open space
- Commercial property rental rates - 7%
- Increased rent values – ROW & yard trees (Donovan 2011)
- Improved consumer environments in business districts - 9-12% product spending

Red Fields, Green Fields
urban neighborhood revitalization

cubicle farms – efficient?
Workplace Nature Views

- **Well-being**
  - desk workers without view of nature reported 23% more ailments in prior 6 months

- **Job Satisfaction**
  - less frustrated and more patient
  - higher overall job satisfaction and enthusiasm


The better office cubicle!

Bottom line = $$ benefits of trees & nature
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
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

Enclosed Sidewalk
3.32

Intermittent Trees
2.78
19

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
“Companies stage an experience when they engage customers in a memorable way.”
typical retail street in urban Japan
Namba Parks, Osaka

view from nearby hotel

interior retail space

ground level
small plazas, retail entry

passive nature experiences
Namba Parks: retail success & nature experience benefits

Nature and Consumer Environments

Shoppers are increasingly interested in the experience of shopping, as well as the products and services they expect to purchase. A series of studies has investigated associations between the urban forest and people’s response to shopping settings.

These studies show that providing trees in the streetscape is an important investment for a business community. The presence of a quality urban forest positively influences shoppers’ perceptions, and probability, their behavior. The information below includes research studies, tested to help create and sustain beautiful urban environments.

Studies

Tree and Business - Growing Together
A National Research Program

Trees and environmental benefits are clear, but also contribute to better-urban living. A number of scientific studies have found that shoppers respond positively to green spaces. These findings have been consistent across large, urban States. The most positive consumer response is associated with urban forest where overhanging trees and shrubs create a ‘feel-good’ experience. The research studies details found in sections below.

www.naturewithin.info
hospitals: healing gardens

Nature & Psych Development
children’s play & imagination
Nature Deficits
Richard Louv

http://www.treeclimbing.jp/
• physically disabled & tree climbing!

recreational tree climbing (& youth therapy)
School & Learning
the nature advantage

- 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

  Journal of Environmental Psychology

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
nature recovery & schools

Parks & People Foundation, Baltimore
first phase - reading circle

depaving & nature recovery
social influences: expanding understanding of complex systems in cities

Ecosystem Services Framework

<table>
<thead>
<tr>
<th>ECOSYSTEM SERVICES</th>
<th>Provisioning Services</th>
<th>Regulating Services</th>
<th>Supporting Services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food (crops, livestock, wild foods, etc.)</td>
<td>Air quality regulation</td>
<td>Nitrates cycling</td>
</tr>
<tr>
<td></td>
<td>Fiber (timber, cotton, hemp, silk, wood fuel)</td>
<td>Climate regulation (global, regional, and local)</td>
<td>Soil formation</td>
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<tr>
<td></td>
<td>Genetic resources</td>
<td>Water regulation</td>
<td>Primary production</td>
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<tr>
<td></td>
<td>Biochemicals, natural medicines, pharmaceuticals</td>
<td>Erosion regulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fresh water</td>
<td>Waste purification and waste treatment</td>
<td></td>
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</tbody>
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Cultural Services
- Aesthetic values
- Spiritual and religious values
- Recreation and ecosystem
Reducing Atmospheric Carbon Dioxide

An image showing a tree and an infographic about carbon emissions.

Image courtesy of the Center for Urban Forest Research

Reducing Atmospheric Carbon Dioxide

A graph showing carbon emissions sources per capita in 2008.

emissions sources?

plant more trees!

carbon emissions
Reducing Atmospheric Carbon Dioxide

Greenhouse Gas Emissions by Sector
United States, 2004

- Agriculture 8%
- Residential 17%
- Industry 30%
- Commercial 17%
- Transportation 28%
- Total Emissions = 7,074 MMT CO₂e

Reducing Atmospheric Carbon Dioxide

- SUV (tank to drive)
- Car (tank to drive)
- Airplane
- Transit bus (1/2 full)
- Train (1/2 full)
- Rail transit (25 riders per car)
- Carpool (2 occupants)
- Vanpool (6 occupants)
- Intercity bus
- Walk/bike
- Each additional traveler:
  - transit, carpool, vanpool

Pounds CO₂e ( emitted equivalents) per passenger-mile

emissions sources?
carbon emissions
plant more trees!
Reducing Atmospheric Carbon Dioxide

compact cities!

reduced emissions sources!

Green Cities: Good Health

carbon emissions

plant more trees!

Reducing Atmospheric Carbon Dioxide

compact cities!

reduced emissions sources!

Green Cities: Good Health

carbon emissions

plant more trees!
Reducing Stormwater Runoff

Image courtesy of the Center for Urban Forest Research

NUCFAC 2009 Annual Report
Trees & Nature Benefits

• messages • livability • quality of life •
• community competition • public values •
Ecosystem Services
Nature in Land Use Planning

- evidence says! experience of nature in cities is profoundly important for the health, well-being, and eco services
- essential! urban forestry + other urban greening programs
- needed! comprehensive, systematic approach to preserving, creating, and conserving nature places in cities
Research Reviews

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

- Livelihood Climates
- Public Investment & Health
- Community Building
- Community Economics
- Social Ties
- Crime & Fear
- Reduced Risk
- Wellness & Physiologic
- Active Living
- Healing & Therapy
- Health & Facilitation

www.greenhealth.washington.edu

additional products:

YouTube
powerpoint presentations
hard copy briefings