Trees and the Livable City: From Sanitary to Sustainable (to Sacred)

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sanitary city

efficient and hygienic
supply & removal
of materials and services
natural systems disconnect
Industrial Age – city squalor

‘Filthy Cities’
Baltimore: Public Works Museum
sustainable city

ecological function, green infrastructure, & ‘revealed’ processes

Pincetl, S. 2010. From the sanitary city to the sustainable city. Local Environment
measure the canopy of a city
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
Reducing Stormwater Runoff

Image courtesy of the Center for Urban Forest Research
Stormwater Management

Thornton Creek Water Quality Channel (Seattle, SvR Design)
1 hectare, treats runoff from 275 hectares (1 hectare = 2.47 acres)
Tanner Springs Park
Portland OR
linked to active living network
neighborhood social cohesion

environmental education & social learning
sustainable city

public health & wellness
social determinants
WHO Health Definition

A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (1946)
Determinants of Health
Green Cities: Good Health
www.greenhealth.washington.edu

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

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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. 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.\(^4\)

- 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.\(^4\)
Diversity in Metro Nature

NEARBY NATURE INCLUDES A VARIETY OF SPACES AND PLACES

URBAN FOREST CANOPY

BIOPHILIC DESIGN

PARKS AND GARDENS

GREEN STORMWATER INFRASTRUCTURE
Outside Our Doors

The benefits of cities where people and nature thrive.

design: milepost

co-author: U.S. Forest Service

co-author & printing: The Nature Conservancy
nearby nature & health evidence
> 40 years
> 4,200 publications

what are the ‘stories’
Discovery: Human Health Benefits Across the Life Cycle
Urban Forests and Newborns
the natural environment affects 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
Hygiene Hypothesis

- presence of soil bacteria in body, *Mycobacterium vaccae* = increased seratonin
- may alleviate depression
- dirt or Prozac?

Lowry et al. 2007. Neuroscience
Eat Dirt!
Fiddleheads Forest School
Washington Park Arboretum (Seattle)
cognitive social & physical learning
CDC moderate activity recommendations

parks, active living, active transit
Shinrin yoku (forest bathing)

- extensive research
- restorative experiences
- workers retirees
- networked system, 52 bases in Japan
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 a built setting

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

Cognitive and affective improvements after walking in a nature setting

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

children
elders
families

walking meetings
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

photo credits: Dan Herms, Ohio State U

Alzheimer’s Disease & Dementia
Provide wander gardens & horticulture therapy

- 10.5% reduction in amount of medications used in dementia facility
- 30% fewer falls, accompanied by a reduction in fall severity

Detweiler et al. 2009. American Journal of Alzheimer’s Disease and Other Dementias

www.rph.org/eden.html
economics

wellness
health promotion
disease prevention

U.S. health costs $3 trillion
~ 17% of U.S. GDP
Nearby nature experiences are important across the entire life cycle, from cradle to grave.

### INFANTS

**Birth Weight**

- Potential Economic Value: $51.2M savings on annual healthcare costs.
- Birth weight influences long-term childhood health and development, and has been linked to some adult diseases. Low birth weight is associated with both short- and long-term health care costs, as well as hospital stays and increased illness. Pregnant women who smoke are more prone to miscarriage and premature birth. Babies born to mothers who smoke are born smaller, with lower birth weights.

**Immune Function**

- Inflammation-induced conditions lead to reduced illness and chronic disease across a lifetime.
- We are most vulnerable in the early months of our lives, when the body is still growing and developing at an astonishing rate. The "nurture hypothesis" suggests that early contact with outdoor microorganisms stimulates the development of a healthy immune response.

**Family Dynamics**

- Improved family dynamics, perhaps reducing mental health treatment and counseling services.
- An infant's parents and siblings adjust their lives after a baby arrives, and the changes can bring on stress and anxiety. Nature walks and nature-based activities can help reduce these conditions and improve interactions between families and their environment.

### CHILDREN & TEENS

**Overall Health and Well-Being**

- Potential Economic Value: $31.4M in medication savings per year.
- Millions of children ages 6-17 years treated for Attention Deficit Hyperactivity Disorder (ADHD) in the U.S. Nature exposure is a potential alternative treatment. Studies show that activity within nature or green spaces, such as playing or walking, can reduce symptoms. A study published in the journal *Pediatrics* found that children who spend more time outdoors have lower levels of stress hormones.

**ADHD**

- Potential Economic Value:

**Cardiovascular Disease**

- Potential Economic Value: $81.3-85.4M in savings annually, based on a 1-2% reduction in hospital expenditures.
- Cardiovascular disease is the leading cause of premature deaths in the U.S. People who exercise daily have a lower mortality rate. In a study published in *Circulation*, researchers found that regular physical activity can improve heart function and reduce the risk of heart attack.

**Hypertension**

- Potential Economic Value: $51.2-56.4M in savings on treatment costs annually.
- Hypertension, or high blood pressure, is one of the five most common chronic conditions impacting older adults. A study published in *Hypertension* found that regular walks in nature can help reduce blood pressure.

**Cognitive Disorders**

- Potential Economic Value: $19.2-25.5M in savings on medical services, not counting the value of home caregiver services.
- About one in five older adults experience mental and cognitive disorders, which can lead to reduced independence and mobility. A study published in *Alzheimer's & Dementia* found that regular nature exposure can help reduce symptoms of dementia.

### ADULTS

**Depression and Stress**

- Potential Economic Value: $15.1-18.4M in savings on healthcare costs from falls per year.
- In three or four adults, falls occur each year, leading to injury and medical costs. Residences for older adults are particularly prone to falls and injuries. Those who are less active are more likely to be unhappy, stressed, and fatigued. Social interactions support positive lifestyles and quality of life.

**Mobility & Quality of Life**

- Potential Economic Value: $15.1-18.4M in savings on healthcare costs from falls per year.

### OLDER ADULTS

- The benefits of nature exposure for older adults are well-documented. A study published in *Gerontology* found that regular nature exposure can help reduce symptoms of depression and anxiety.

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**Contributing Analysts:**

- Dr. Stephen Grado & Marcus Measells, MSU
- Dr. Alicia Robbins, Weyerhaeuser
Neighborhoods with Trees

10 more trees on a city block?
health benefits comparable to $10,000 household income increase OR being 7 years younger

Kardan et al., 2015, Scientific Reports
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!
(civic) sacred city

meaning
connection
social cohesion
healing
www.treeclimbing.jp/
physically disabled & tree climbing!
recreational tree climbing – youth therapy
Military Service & Health Impacts

- Military service to civilian transition
- Prevalence of Stress Response
- Service carry-overs
  - Purpose/mission oriented
  - 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
Nature Sacred Project
6 projects
integrated design & research
Walter Reed National Military Medical Center

- world’s largest military medical center
- 243 acres, >2.4 M ft² clinical space
- > 1 million beneficiaries treated annually
Walter Reed National Military Medical Center, Bethesda, MD

- Iraq/Afghan wars: Brain injury and PTSD in 30% of force
- Military/Vet suicides: 20% of all U.S. suicides
- Drugs and surgery relatively *ineffective*

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slides credit: Frederick Foote, M.D.
Project Manager for the Green Road Project
The Green Road Project
A model program of the Institute for Integrative Health
Naval Support Activity Bethesda
Home of Walter Reed National Military Medical Center
The Green Road: Healing with *Wild* Nature

- Natural woodland
- Maximum encounter, minimum disruption
- Highlight core elements
  - Water – Stone – Trees - Animals
Green Road Research Team

measures of veterans (and associates):
cognition
mental health
physiology and healing
social
woody debris :: fallen tree trunks symbolize fallen soldiers’ legacy
Stream restoration heals the landscape and invites access to the water
Summary

sanitary city (hygiene for health)
sustainable city (ecology and wellness)
(civic) sacred city (deeper connections)

= economic value
= expanded partnerships
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 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

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