It's More than Pretty: Evidence & Economics of Nature-Based Human Health Benefits

Kathleen Wolf, Ph.D.
Research Social Scientist
University of Washington (Seattle)
School of Environmental and Forest Sciences

2017 Sustainable Denver Summit
Denver, CO :: December 2017
Outline

- sanitary to sustainable city
- green stormwater infrastructure
- human health – performance
- economic value
sanitary city

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

Filthy Cities!

credit: BlendSpace

credit: blogs.isb.bj.edu.cn
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
Grey Infrastructure

Drain, direct, dispatch

Green Infrastructure

Slow, spread, soak

credit: Low Impact Development: A Design Manual for Urban Areas, 2010
stormwater retention
green infrastructure tools & strategies

= mini parks?

credit: Seattle Public Utilities
Gray to Green

Decision support tool for transitioning to vegetation-based stormwater management

Rob Northrop
Andrew Koeser, PhD.
Green Stormwater Infrastructure :: Hermosillo, Mexico (6 inch annual rainfall)
residential stormwater management
management for co-benefits - retail
Thornton Creek Water Quality Channel (Seattle, SvR Design)
1 hectare, treats runoff from 275 hectares (1 hectare = 2.47 acres)
Historic Fourth Ward, Atlanta

Clear Creek Basin, 2 acre stormwater detention lake, 17 acres of greenspace & parks amenities
Outline

sanitary to sustainable city
green stormwater infrastructure
human health – performance
economic value
Health Definition
World Health Organization

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

- General socio-economic, cultural and environmental conditions
- Living and working conditions
- Unemployment
- Education
- Agriculture and food production
- Social and community networks
- Health care services
- Housing
- Water sanitation
- Individual lifestyle factors
- Age, sex & hereditary factors
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. 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.
strength of evidence; causal mechanisms?

Prison Inmates :: nature videos
solitary confinement, video room/exercise option

- felt significantly calmer, less irritable, more empathetic
- committed 26% fewer violent infractions

Outline

sanitary to sustainable city
green stormwater infrastructure
human health – performance
economic value
Price

Demand

Supply

Equilibrium

Quantity

source.wisegeek.com
Elements of Economic Valuation

- What are the benefits?
- Who are the beneficiaries?
- 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?
Analysis Process

- scale of individual to community
- screen for benefits

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

- market & non-market
- valuation strategy
Nature’s Riches:
The Health and Financial Benefits of Nearby Nature

Kathleen L. Wolf, Ph.D.

design: milepost

author: UAS

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

INFANTS

BIRTH WEIGHT

Fetal exposure to nature reduces stress and improves health.

OVERALL HEALTH AND WELL-BEING

Nature exposure improves emotional and mental health.

IMMUNE FUNCTION

Nature exposure strengthens the immune system.

FAMILY DYNAMICS

Nature exposure improves family dynamics and reduces stress.

FUTURE FINANCIAL SUCCESS

Nature exposure improves financial stability and future earning potential.

CHILDREN & TEENS

DEPRESSION AND STRESS

Nature exposure reduces depression and anxiety.

ADHD

Nature exposure improves focus and attention.

FUTURE FINANCIAL SUCCESS

Nature exposure improves financial stability and future earning potential.

ADULTS

MOBILITY & QUALITY OF LIFE

Nature exposure improves mobility and quality of life.

CARDIOVASCULAR DISEASE

Nature exposure reduces cardiovascular disease risks.

CRIME & SAFETY

Nature exposure reduces crime and violence.

OLDER ADULTS

MOBILITY & QUALITY OF LIFE

Nature exposure improves mobility and quality of life.

CARDIOVASCULAR DISEASE

Nature exposure reduces cardiovascular disease risks.

CRIME & SAFETY

Nature exposure reduces crime and violence.

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.

contributing analysts:
Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaueser
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 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;
Hystad et al., Env Health Perspectives
Hygiene Hypothesis

- presence of soil bacteria in body, *Mycobacterium vaccae* = increased serotonin
- boost immune function
- may alleviate depression (dirt or Prozac?)

Lowry et al. 2007. Neuroscience
ADHD and nature contact

- 17 children aged 7-12 with diagnosed ADHD
- 20-minute guided walks
  - Park
  - Neighborhood
  - Downtown
- Pre-walk puzzles
- Post-walk cognitive test

Faber Taylor & Kuo. 2009. *Journal of Attention Disorders*
% of Americans Ages 20-44 on ADHD Meds
2001 - 2010
CDC moderate activity recommendations

parks, active living, active transit
Date: ____________________________
Dr: ____________________________
Name: __________________________
I recommend:
☐ Walking      ☐ Other: _____________

______________ minutes a day

______________ days per week

* Health Canada suggests moderate activity of 30 minutes per day 15 days a week

Benefits of daily activity
• Improve overall physical and mental health
• Maintain a healthy weight
• Reduce the risk of diabetes and other chronic conditions
• Lower cholesterol levels
• Manage stress and anxiety

Signature: ________________
Parks Prescription

Dr. Robert Zarr  

‘walk with a doc’
Shinrin yoku
(Japan :: forest bathing)

- extensive research
- stress, immune function, diabetes
- restorative experiences
- workers retirees
- networked system, 52 bases in Japan
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)

cognitive and affective improvements after walking in a nature setting

Berman et al. 2012. Journal of Affective Disorders
% of U.S. Population Using Mental Health Medications

2001 vs 2010

America’s State of Mind, Medco Health Solutions, Inc
Effects of nature window view on recovery from surgery (Roger Ulrich, 1984)

- Shorter stays
- Less pain
- Fewer minor complications
- Better emotional well-being
hospital healing gardens

health care $$ savings
patient preference & return
reduced staff stress

Ulfelder Healing Garden,
Massachusetts General Hospital

Scripps Encinitas Hospital
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
Summary

• cities are integrating grey & green
• consider co-design for co-benefits
• eco + human health performance
• health outcomes evidence – 40 years!
• economic consequences, return on investment
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

Projects Director
Kathleen L. Wolf, Ph.D.

www.naturewithin.info