Public and Community Health Benefits of Green Infrastructure

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Green Infrastructure Forum
Centro Ecológico del Estado, Hermosillo, Sonora
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Seattle, Washington State :: wet climate

38 in :: 96 cm annual precipitation
Green Infrastructure

improved function
reduce costs
cleaner water
improved habitat
community connection
flexible strategies

Human Health & Wellness

codesign for co-benefits
Topics

city systems – sanitary to sustainable green infrastructure solutions
nature in cities & human health (mental health & wellness)
economic benefits
sanitary city

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

systems solutions
ecology that works
co-design for co-benefits
credit: American Planning Association
green infrastructure tools & strategies

= mini parks?

credit: Seattle Public Utilities
spatial linkages: the city becomes a park

TKF Foundation :: Nature Sacred initiative
nature in cities for human health

quality of life
livable places
disease prevention
health promotion
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:
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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.\textsuperscript{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 \text{ billion}, potentially increasing annual property tax revenues $15.3 \text{ million}.\textsuperscript{9}

- A study found 7\% higher rental rates for commercial offices having high quality landscapes.\textsuperscript{34}

- Shoppers claim that they will spend 9\% to 12\% more for goods and services in central business districts having high quality tree canopy.\textsuperscript{34}

- 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.\textsuperscript{34}
Outside Our Doors
The benefits of cities where people and nature thrive.

design: milepost
co-author & printing: The Nature Conservancy
Evidence-based ‘Story’

what are the ‘stories’

Mental Health & Wellness for all People

nearby nature & health evidence

> 40 years of research

> 3,500 publications
ADHD and nature contact

- 96 children aged 7-12 diagnosed ADD or ADHD
- Parents gave postactivity attentional functioning ratings (PAAF) –
- 4 measures:
  - focusing on unappealing tasks (homework or chores)
  - completing tasks
  - listening and following directions
  - easily distracted

Faber Taylor. 2001. *Environment & Behavior*
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*
Classroom Views & Stress

Classroom Views & Stress
high school student response

**Fig. 2.** Attention scores at the end of class activity and break (Means and SE).

**Fig. 3.** Physiological stress at the end of class activity and break (Mean and SE).
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
Attention Restoration Theory
Rachel & Stephen Kaplan, U of MI
directed attention fatigue . . . .
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

Walking Meetings

creativity, energy, communication, health
CDC moderate activity recommendations

parks, active living, active transit
Parks Prescription

Rx for Health

Date: ____________________________

Dr: ______________________________

Name: ____________________________

I recommend:

☐ Walking  ☐ Other: ______________

_______________ minutes a day

_______________ days per week

* Health Canada suggests moderate activity of 30 minutes per day | 5 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: ________________________
Walking Programs

children
elders
families
Side-track

- most research from cities in cool, temperate climates
- response in arid, desert landscapes?
- findings: universal positive health responses
- findings: diversity of nature settings
most studies done in temperate areas . . .

how to bring this work here?

credit: Prescott Valley Growers Landscaping
GREEN INFRASTRUCTURE FOR DESERT COMMUNITIES

Watershed Management Group
barren lot
October 2014
(community pocket park)

October 2016

credit: Green Infrastructure for Desert Communities
public ROW
1994

2006

credit: Brad Lancaster,
Harvesting Rainwater.com
Urbanite was arranged to create an outdoor seating area adjacent to the basin, converting a brown fields area to a pocket park for the community.
Back to mental wellness benefits of nature . . . .
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 an urban setting

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

Berman et al. 2012. Journal of Affective Disorders

cognitive and affective improvements after walking in a nature setting
Mind Full, or Mindful?
constant busyness

attempted multi-tasking

‘out of balance’

Anna and Elena Balbusso, NY Times
Mindfulness/Meditation Training

- meta analysis; clinical/non situations
- focus on moment-to-moment experience and mental awareness

Results

- more veridical perception (reality check)
- reduce negative affect
- improve vitality and coping
- medical symptoms & sensory pain

Nature and Mindfulness

focus
soft fascination
undirected attention

Attention Restoration Theory, Kapan & Kaplan
Civic Stewardship for Resilience

E. Svendsen, L. Campbell; USFS
green infrastructure & reduced crime

Philadelphia

reduction in narcotics arrests (18–27 %) for green not gray

vs. 65% increase across city

Kondo et al. 2015.
Journal of Public Health
Topics

city systems – sanitary to sustainable
green infrastructure solutions
nature in cities & human health
economic benefits
management for co-benefits - retail

Kathleen L. Wolf, Ph.D.

Design: Milepost

Author: US Forest Service Department of Agriculture

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

**INFANTS**

**BIRTH WEIGHT**

**POTENTIAL ECONOMIC VALUE:** $5.6M SAVINGS ON ANNUAL HEALTH CARE 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, such as longer hospital stays and increased illness. Pregnant women who have more tree canopy and green space near their homes generally have babies with healthier birth weights.

**IMMUNE FUNCTION**

Evidence indicates that prolonged exposure to nature leads to reduced illness and chronic disease across a lifetime.

We must remember that the early months of our lives, when the body and mind are growing and developing at an astonishing rate, the 'nature hypothesis' suggests that early contact with outdoor environments and activities enhances the development of a healthy immune system.

**FAMILY DYNAMICS**

Evidence suggests that outdoor experiences may improve 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. Early nature experiences may help reduce these conditions and improve interactions between people within the household.

**Note:** All economic values are in 2016 U.S. dollars, and are present annual savings across the entire U.S.

**CHILDREN & TEENS**

**OVERALL HEALTH AND WELL-BEING**

**POTENTIAL ECONOMIC VALUE:** INCREASED PHYSICAL ACTIVITY, REDUCED AUTISM OR LEADING CAUSE OF EMERGENCY DEPARTMENT VISITS, HOSPITALIZATIONS AND MISSED SCHOOL DAYS, AND REDUCED RISK OF AUTO IMMUNE DISEASE.

Early nature experiences may reduce the risk of future chronic diseases. Children who grow up with regular exposure to nature may have lower levels of stress, improved immune function, and better mental health in adulthood.

**ADHD**

**POTENTIAL ECONOMIC VALUE:** $2.3B SAVINGS ON MEDICATION SAVINGS PER YEAR.

Children ages 3-9 years treated for Attention Deficit Hyperactivity Disorder (ADHD) in the U.S. Nature exposure in a potential alternative treatment, shows that activity within or near green spaces, such as play or just 20 minutes of walking, can reduce symptoms.

**CARDIOVASCULAR DISEASE**

**POTENTIAL ECONOMIC VALUE:** $1.9B SAVINGS ON TREATMENT COSTS ANNUALLY.

Cardiovascular disease is the leading cause of premature deaths in the U.S. Nature exposure reduces the risk of heart disease, and the benefits of nature exposure extend to the whole body. Regular nature exposure can reduce the risk of heart disease, stroke, and other chronic conditions.

**FUTURE FINANCIAL SUCCESS**

**POTENTIAL ECONOMIC VALUE:** $1.7B INCREASE IN HIGH SCHOOL GRADUATES' LIFELONG ANNUAL INCOME.

School performance is strongly influenced by the environment. Children who grow up with regular exposure to nature are more likely to be successful in school and in life.

**ADULTS**

**DEPRESSION AND STRESS**

**POTENTIAL ECONOMIC VALUE:** REDUCES FRICTION, MENTAL DISTRESS AND DEPRESSION, AND IMPROVES BODY IMAGE OF ADULTS.

Recent research suggests that regular exposure to nature can reduce depression and anxiety. Nature exposure may improve mental health and reduce the risk of mental illness.

**CARING FOR OLDER ADULTS**

**POTENTIAL ECONOMIC VALUE:** $1.7B SAVINGS ON HEALTH CARE COSTS FROM FALLS PER YEAR.

Older adults are at a higher risk of falls and injuries. Regular nature exposure can reduce the risk of falls and injuries, and improve mobility.

**MOBILITY & QUALITY OF LIFE**

**POTENTIAL ECONOMIC VALUE:** $1.7B SAVINGS ON MEDICAL SERVICES NOT COUNTING THE VALUE OF HOME CAREGIVER SERVICES.

Regular exposure to nature can improve physical function and quality of life. The presence of nature in neighborhoods can improve mental health, and reduce the risk of depression and anxiety.

**CRIME & SAFETY**

**POTENTIAL ECONOMIC VALUE:** $1.0B SAVINGS ON COSTS OF CRIME VICTIMS AND PROPERTY OWNERS PER YEAR.

Nature exposure is associated with reduced property crime and reduced personal and property crime.

*Contributing analysts:*

Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaeuser
annual value of $11.7 billion U.S. (2015 dollars)

- cradle to grave human life cycle
- birth weight, graduation rates, reduced crime, cardiovascular disease, elder chronic disease
- various nature settings in cities
- just beginning the analysis!
Summary

city systems
green infrastructure solutions
nature in cities & human health
economic benefits
potential new partnerships &
community engagement