

# Considering Beneficiaries :: Human Health Ecosystem Services

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**ACES 2016 Conference**  
December 2016



# Lands Management & Investment

analytics  
models


& 'stories'



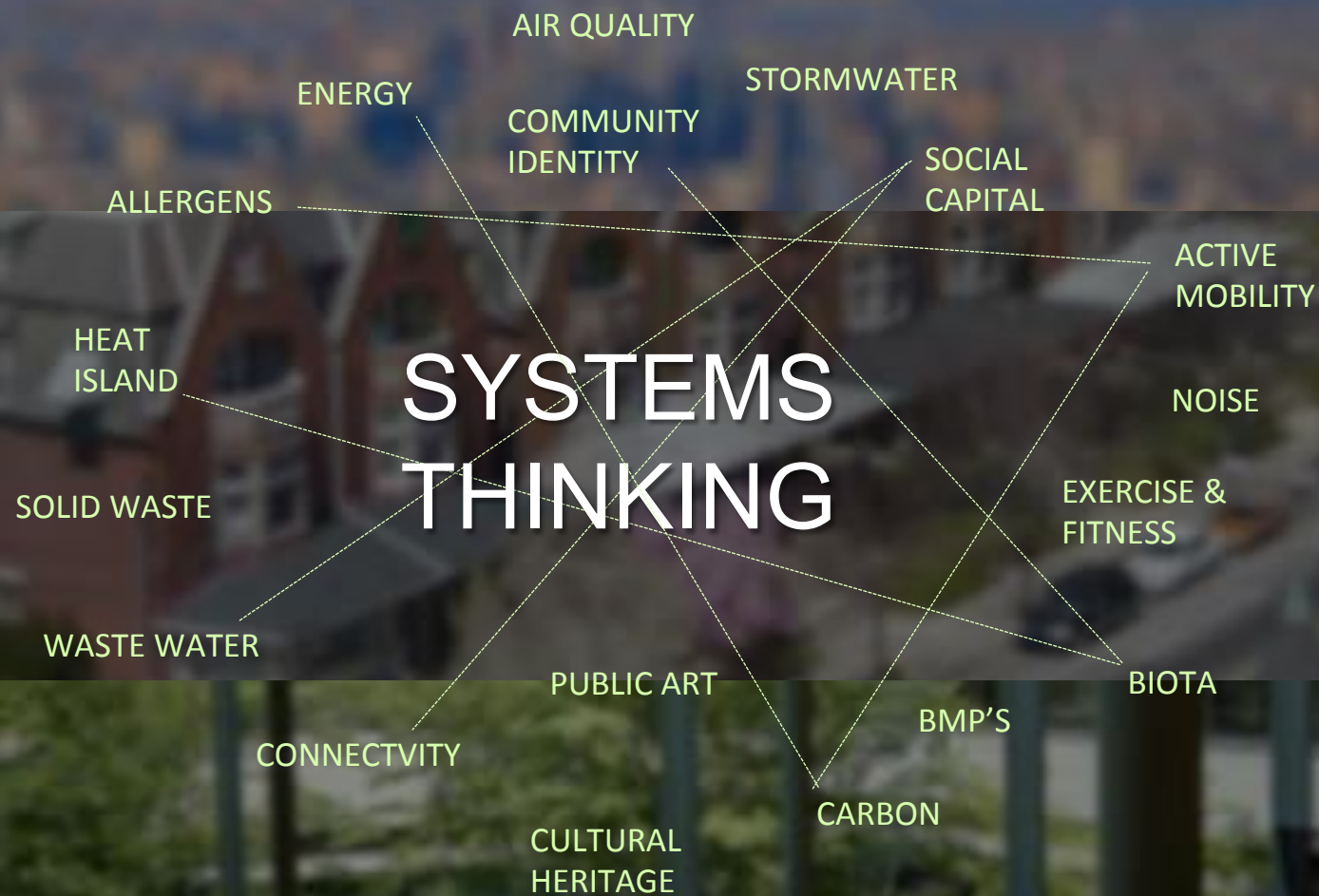


# WHO Health Definition

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



credit: American Planning Association





# Determinants of Health

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The Nature Conservancy 

February 2016

design:  milepost

# Green Cities: Good Health

[www.greenhealth.washington.edu](http://www.greenhealth.washington.edu)

## Sponsors:

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**Thanks!**

**to U of WA students:**

**Katrina Flora**

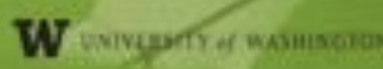
**Mary Ann Rozance**

**Sarah Krueger**



## Research Reviews & Summaries

# Green Cities: Good Health



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[Culture & Equity](#)

[Lifecycle & Gender](#)

## 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.<sup>1,2</sup> 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.<sup>9</sup>
- A study found 7% higher rental rates for commercial offices having high quality landscapes.<sup>14</sup>
- Shoppers claim that they will spend 9% to 12% more for goods and services in central business districts having high quality tree canopy.<sup>34</sup>
- 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.<sup>34</sup>

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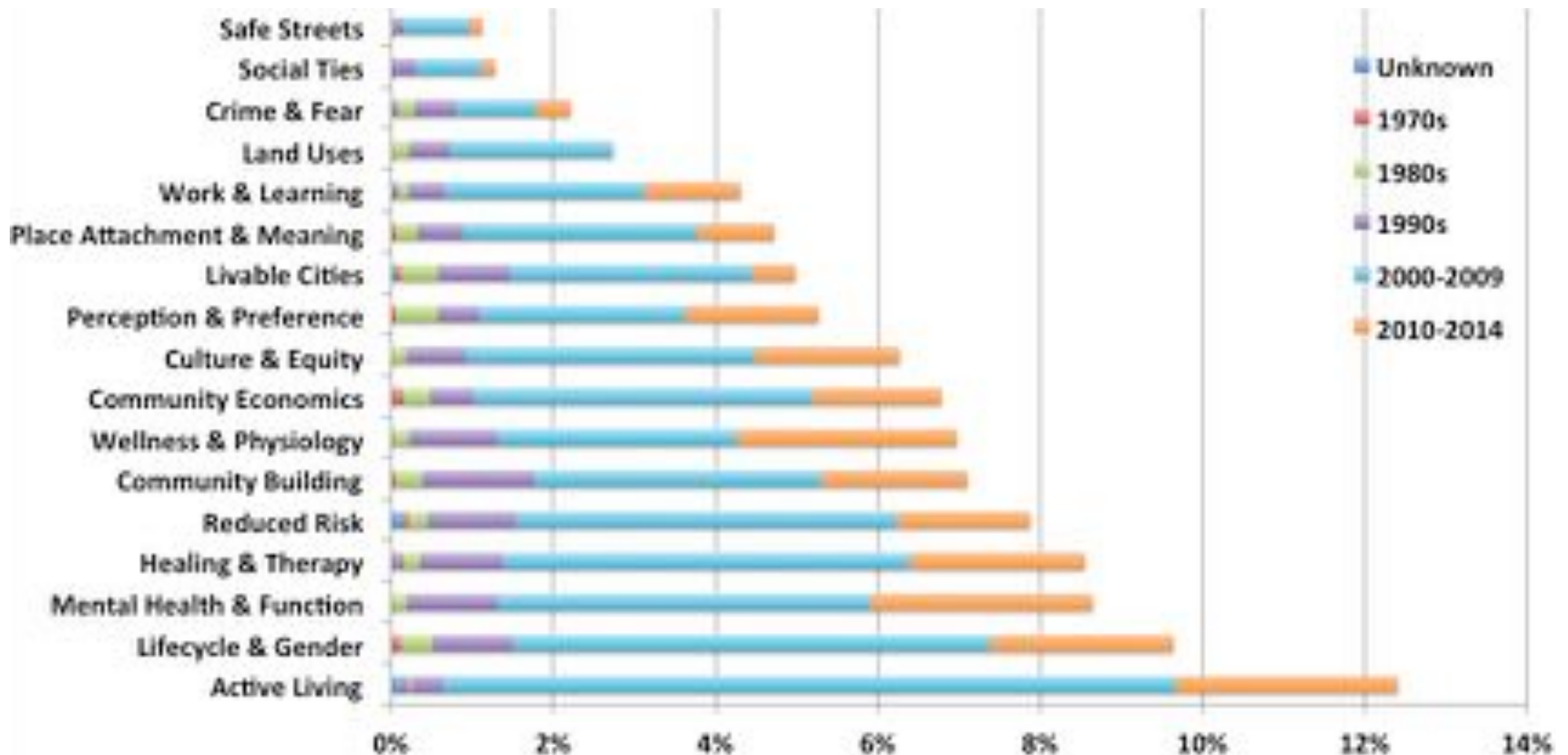
*street trees boost market value of houses, providing tax revenue for communities*





# Green Cities: Good Health

database of ~ 3,800 peer reviewed publications



% distribution of entire database



The Nature Conservancy 

November 2016

design:  milepost

# Publications



- ✱ Wolf, K.L. 2016. Uncovering benefits of the urban forest: A look at how urban forestry investment assists local economies, public health. *Properties Magazine* 70, 2: 55-57.
- ✱ Wolf, K.L., M.K. Measells, and S.C. Grado. (in review). Economics of nearby nature and elder health: A quantitative review. *Environmental Health Perspectives*.
- ✱ Wolf, K.L., M.K. Measells, S.C. Grado, and A.S.T. Robbins. 2015. Economic values of metro nature health benefits: A life course approach. *Urban Forestry and Urban Greening* 14: 694-701.
- ✱ Wolf, K.L., and A.S.T. Robbins. 2015. Metro nature, environmental health, and economic value. *Environmental Health Perspectives* 123, 5: 390-8.
- ✱ Wolf, K.L. 2015. Green strategies to improve public health and save billions. *International Innovations* 195: 54-55.
- ✱ Wolf, K.L. 2013. The urban forest. *Communities & Banking* 24, 2: 25-27.
- ✱ \* Research and publications were funded in part by the U.S.D.A. Forest Service, National Urban and Community Forestry program, as recommended by the National Urban and Community Forestry Advisory Council (NUCFAC).

# Nearby nature experiences are important across the entire life cycle, from cradle to grave.

## INFANTS



### BIRTH WEIGHT

POTENTIAL ECONOMIC VALUE

**MAJOR 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 that have more tree canopy and green space near their homes generally have babies with healthier birth weights.

### IMMUNE FUNCTION

ECONOMIC IMPLICATIONS

**STRONGER IMMUNE SYSTEM LEADS TO REDUCED ILLNESS AND CHRONIC DISEASE ACROSS A LIFETIME**

We are most vulnerable in the early months of our lives, when the body and mind are growing and developing at an astonishing rate. The "hygiene hypothesis" suggests that early contact with outdoor microorganisms stimulates the development of a healthy immune response.

### FAMILY DYNAMICS

ECONOMIC IMPLICATIONS

**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 views and walks help reduce these conditions and improve interactions between people within the household.

*Note: All economic values are in 2018 U.S. dollars, and are potential annual savings for each child born U.S.*

## CHILDREN & TEENS



### OVERALL HEALTH AND WELL-BEING

ECONOMIC IMPLICATIONS

**INCREASES PHYSICAL ACTIVITY, REDUCES ASTHMA OR LEADING CAUSE OF EMERGENCY DEPARTMENT VISITS, HOSPITALIZATIONS AND MISSED SCHOOL DAYS, AND REDUCES RISK OF ADULT SKIN CONDITIONS**

Negative emotions in a child's surroundings can cause both immediate and ongoing health impacts. Nature is a positive influence; playing in nature helps children develop learning, social, and intellectual skills that improve both health and later life achievement. Green spaces close to the air- and water- and noise- and stress- give them space for moderate to vigorous activity, and shield them from too much sun exposure.

### ADHD

POTENTIAL ECONOMIC VALUE

**\$10.6M-\$10.8M ON MEDICATION SAVINGS PER YEAR**

Millions of children ages 3-17 are 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 play or just 20 minutes of walking, can reduce symptoms.

### FUTURE FINANCIAL SUCCESS

POTENTIAL ECONOMIC VALUE

**\$1.3M INCREASE IN HIGH SCHOOL GRADUATES' LIFETIME ANNUAL INCOMES**

School performance affects both near-term self-esteem and long-term success. Having green views from classrooms and outdoor spaces in schools can improve students' capacity to direct attention and feel less stressed. Green high school campus landscapes are linked to higher graduation rates.

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.

## ADULTS



### DEPRESSION AND STRESS

ECONOMIC IMPLICATIONS

**REDUCES FRUSTRATION, MENTAL DISTRESS AND DEPRESSION DISORDERS, AND IMPROVES BODY IMAGE, SELF-ESTEEM AND LIFE SATISFACTION**

Depression, highly prevalent lifestyle takes their toll. Nature experiences reduce stress. Nearly 14 million adults experience major depressive each year in the U.S., and mental, behavioral, and neurophysiological disorders are a leading cause of disability. Nature experiences support people and communities for improved mental health, mood, and life function. Improved mental health and function reduce disease treatment costs, and improve worker productivity.

### CARDIOVASCULAR DISEASE

POTENTIAL ECONOMIC VALUE

**\$1.2-\$1.3M ANNUAL SAVINGS, BASED ON A 1-P% REDUCTION IN MORTALITY EXPENDITURES**

Cardiovascular Disease is the leading cause of premature death in the U.S. People show slightly reduced risk of CVD if their neighborhoods have greater nature coverage (particularly tree canopy), however it is worth noting the majority of studies have focused on trees.

### CRIME & SAFETY

POTENTIAL ECONOMIC VALUE

**GROWN IN REDUCED COSTS OF CRIME FOR VICTIMS AND PROPERTY OWNERS PER YEAR**

Personal safety and security are important conditions for quality of life. The presence of nature in neighborhoods - community gardens, forest canopy, and landscaped vacant lots - is associated with reduced personal and property crime.

## OLDER ADULTS



### MOBILITY & QUALITY OF LIFE

POTENTIAL ECONOMIC VALUE

**\$1.7-\$2.4M SAVINGS ON HEALTH CARE COSTS FROM FALLS PER YEAR**

One in three older adults falls each year, giving rise to fatal and nonfatal injuries. Residents' falls within older care facilities are particularly expensive medical situations. Being out in nature improves personal mobility, leading to reduced falls and reduced need for medications. Further, those who are socially isolated are more likely to be unhealthy, so gardening and nature walking activities that promote social interactions support positive lifestyles and quality of life.

### HYPERTENSION

ECONOMIC IMPLICATIONS

**\$1.3-\$1.4M SAVINGS ON TREATMENT COSTS ANNUALLY**

Hypertension, or high blood pressure, is one of the five most expensive conditions impacting older adults. Views of nature, particularly forests, and "forest bathing" (conscious walks in suburban forest settings) decrease diabetic risk.

### COGNITIVE DISORDERS

POTENTIAL ECONOMIC VALUE

**\$1.2-\$1.3M ANNUAL SAVINGS ON MEDICAL SERVICES, NOT COUNTING THE VALUE OF HOME CARE/SUPPORT SERVICES**

About one in five older adults experience mental and cognitive disorders, with age being the greatest risk factor. In 2016, about 17% of people aged 65 or older were affected with Alzheimer's Disease. Those with dementia have three times as many hospital stays per year as other elders. Encounters with nature improve symptoms related to cognitive disorders, such as agitation, depression, and reduced mobility.

contributing analysts:

Dr. Stephen Grado & Marcus Measells, MSU; Dr. Alicia Robbins, Weyerhaeuser



# **'Stories' of Nearby Nature & Human Health**



stormwater management & biophilic design

children, outdoor activity & ADHD

veterans & stress response

# Metro Nature & Health Evidence Framework

Synthesis of  
40 years of  
peer-reviewed  
literature



Wolf, K.L., A.S.T. Robbins. 2015. Metro nature, environmental health, and economic value. *Environmental Health Perspectives* 123, 5:390-8.

# 'Stories' of Nearby Nature & Human Health



**stormwater management & biophilic design**

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green  
stormwater  
infrastructure  
tools &  
strategies

= mini parks?

credit: Seattle  
Public Utilities



# 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**

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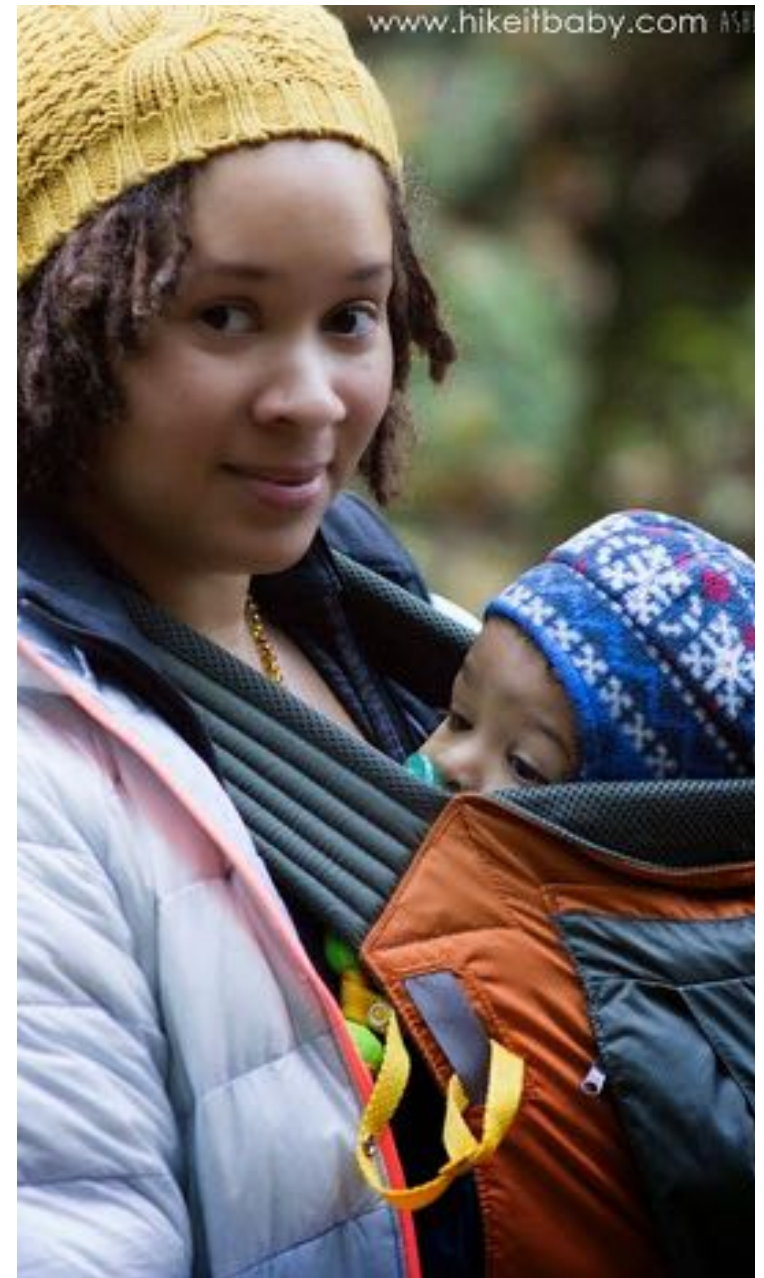


# Walking Programs

children  
elders  
families

walking  
meetings







# Shinrin yoku (forest bathing)

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



# green stormwater infrastructure

Philadelphia

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

vs. 65% increase  
across city



Kondo et al. 2015. Journal of Public Health



# 'Stories' of Nearby Nature & Human Health

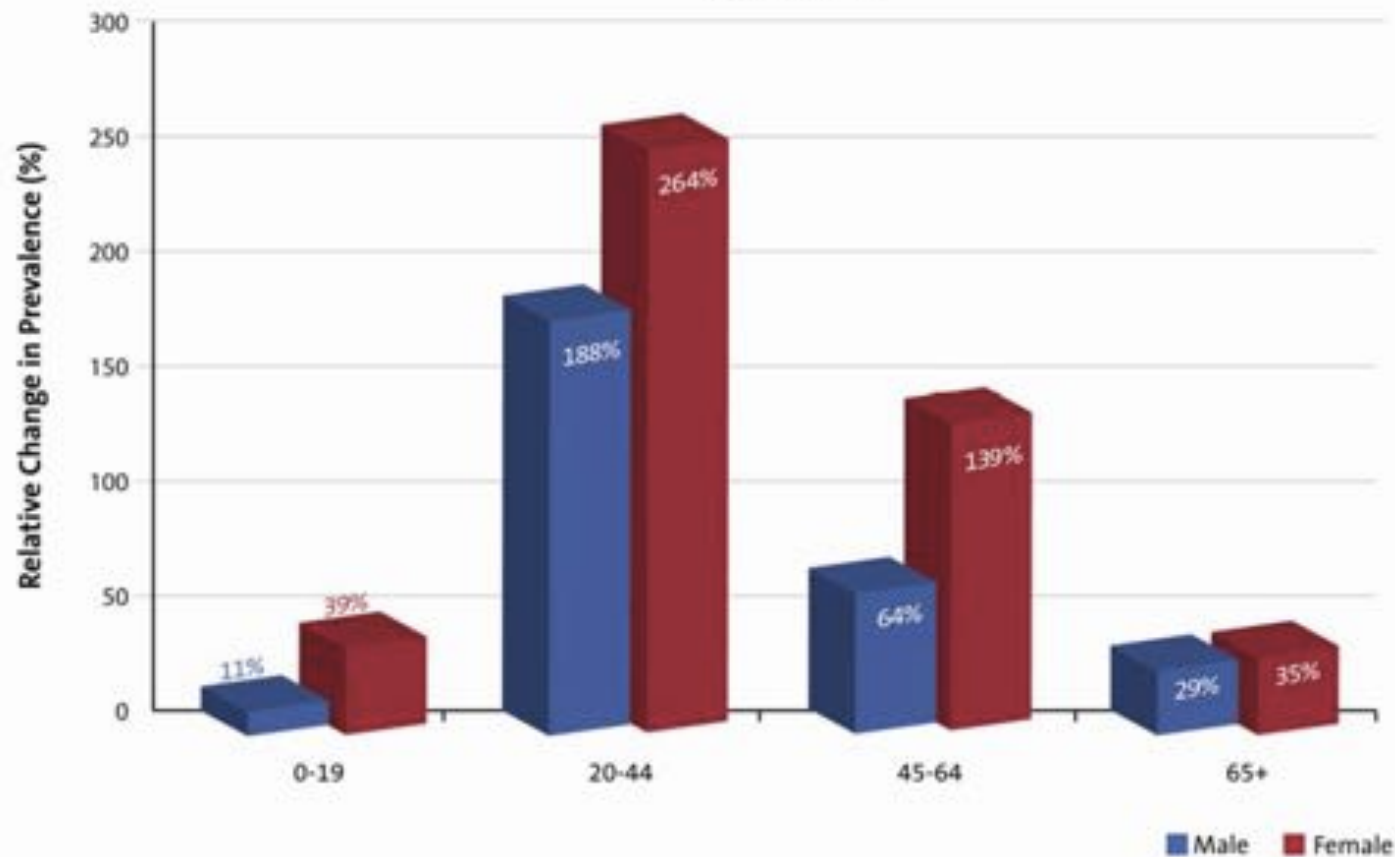


stormwater management & biophilic design

**children, outdoor activity & ADHD**

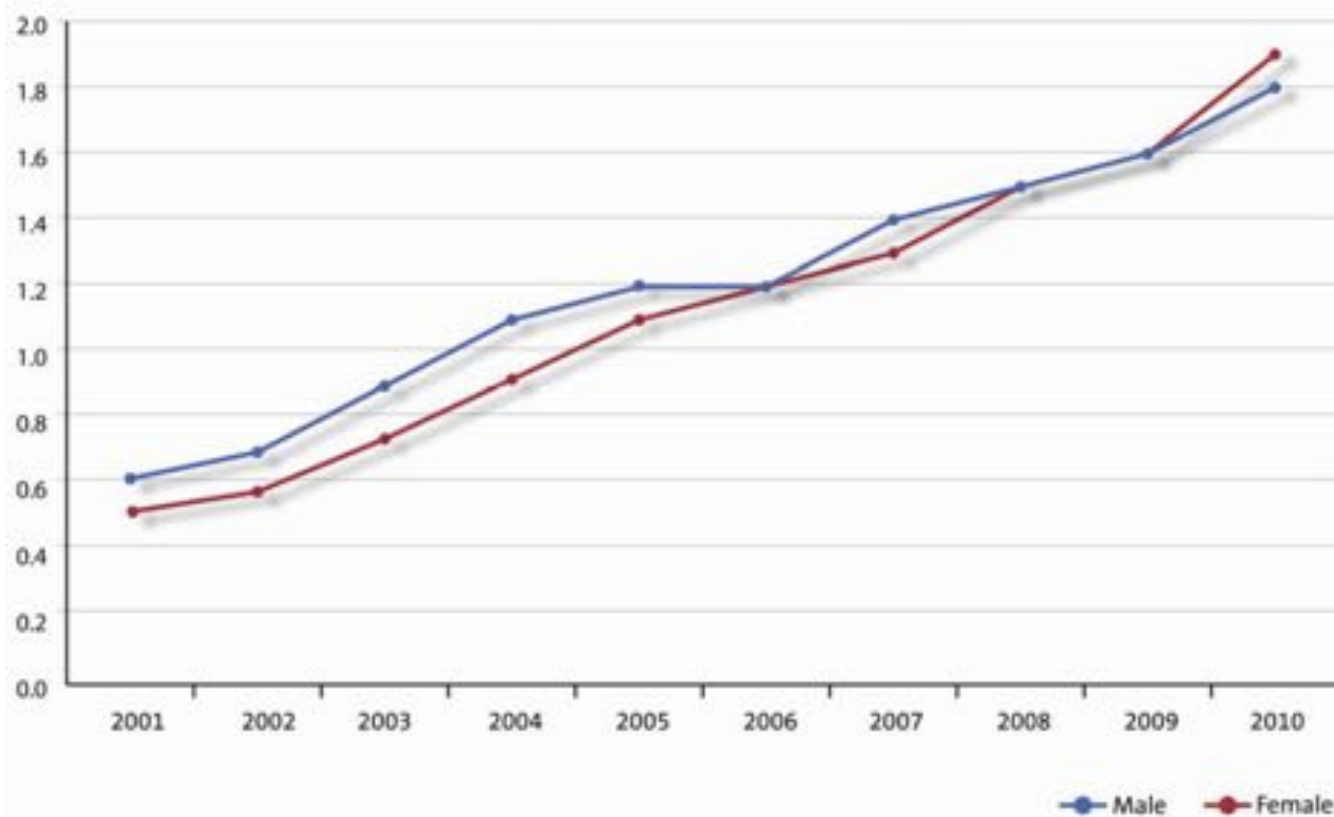
veterans & stress response

# Change in % Population for ADHD Treatments 2001 - 2010



America's State of Mind, Medco Health Solutions, Inc

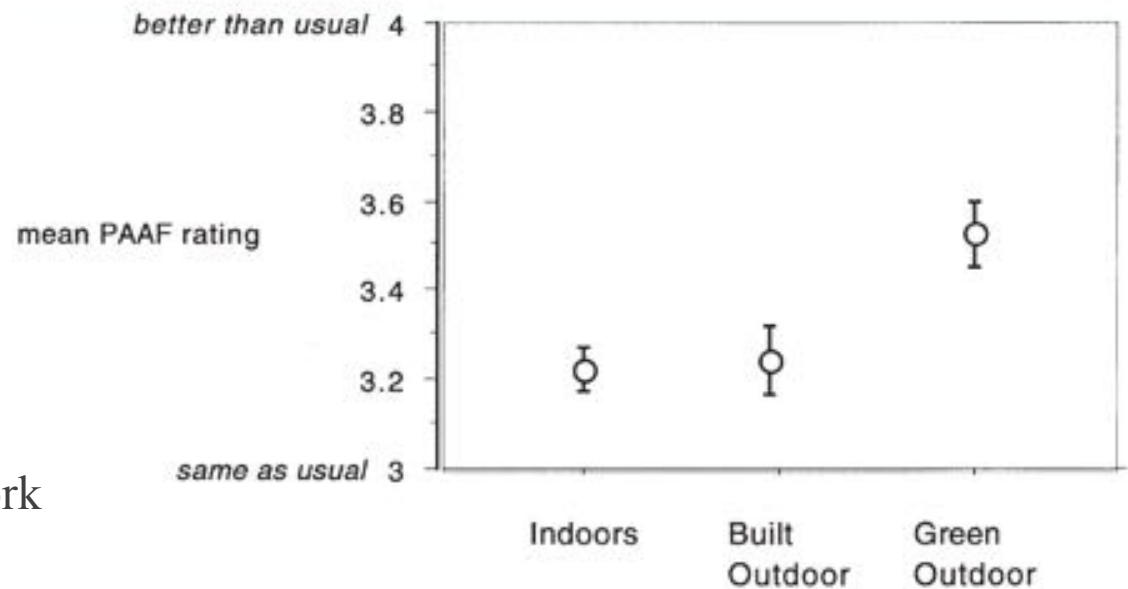
# **% of Americans Ages 20-44 on ADHD Meds 2001 - 2010**



America's State of Mind, Medco Health Solutions, Inc

# ADHD and nature contact

- 96 children aged 7-12 diagnosed ADD or ADHD
- Parents gave *postactivity attentional functioning ratings* (PAAF) – 4 measures:
  - Can't stay focused on unappealing tasks (homework or chores)
  - Can't complete tasks
  - Can't listen and follow directions
  - Easily distracted

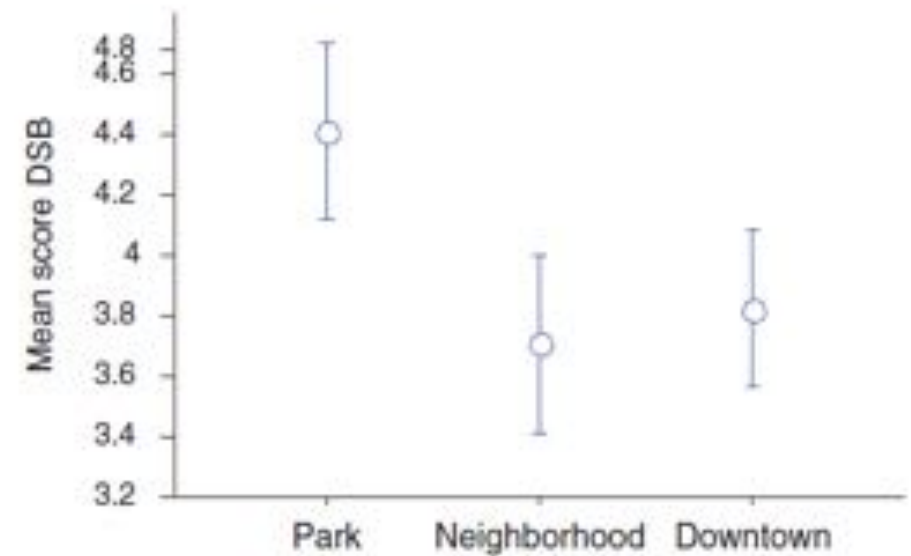


Faber Taylor. 2001. *Environment & Behavior*



# ADHD and nature contact benefit

- 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*

# 'Stories' of Nearby Nature & Human Health



stormwater management & biophilic design

children, outdoor activity & ADHD

**veterans & stress response**



# **The Green Road**

**The TKF Foundation**

**info@Naturesacred.org**

**<http://naturesacred.org/>**

**Nature Sacred**

Helping communities heal from the outside.

# 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*

slides credit: Frederick Foote, M.D.

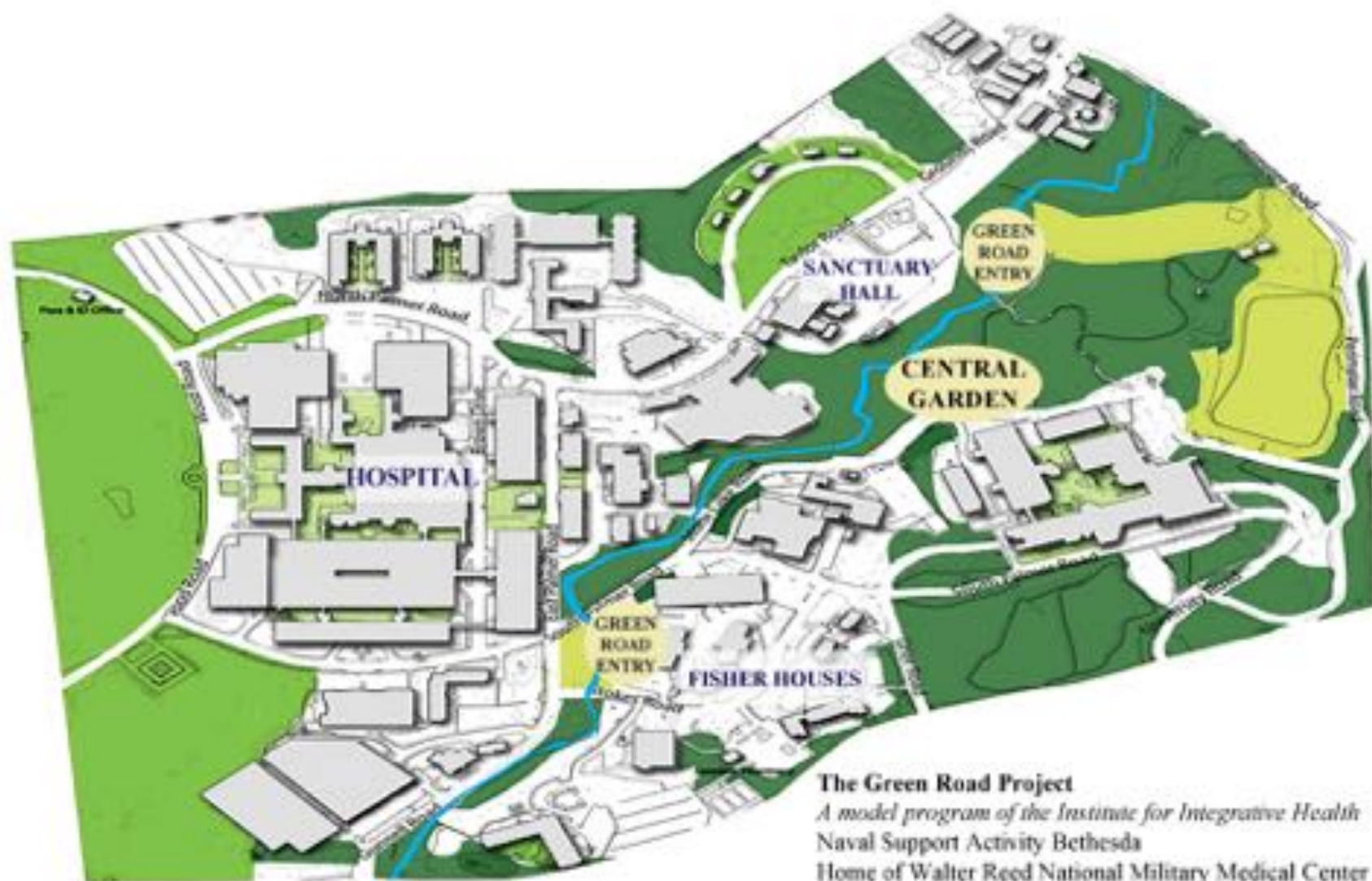
Project Manager for the Green Road Project



THE INSTITUTE FOR INTEGRATIVE HEALTH







**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















Stream restoration heals the landscape and invites access to the water





The Commemorative Structure invites participants to quietly contemplate nature, remember the fallen, and reflect on their own lives in a place that gives prospect and refuge with little separation from the landscape.











Fallen tree trunks remain throughout the grounds, contribute to the ecological continuum and symbolize the fallen soldiers' legacy in the ever vigilant struggle for freedom.









Stone, wood and water are the durable and life-affirming materials of choice.



# Green Road Research Team



Harvard  
University



National Institutes of Health



UNIFORMED SERVICES UNIVERSITY  
*of the Health Sciences*



ARIZONA CENTER FOR  
**Integrative Medicine**

## **measures of veterans (and associates):**

cognition

mental health

physiology and healing

social



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# Veterans Outdoor Therapy



Les Winkeler/The Southern Illinoisan



World-Herald News Service



Hope for the Warriors



Outward Bound



# 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



# Civic Stewardship for Healing



**urban forest restoration**





American Forests

## community tree plantings

Tree People, Los Angeles

**parks  
public gardens  
street trees  
neighborhood**





Keep Oakland Beautiful

## community gardens

The Heights Community Garden,  
Dayton OH

**local food**  
**food security**  
**child education**  
**nutrition**  
**food donations**





# Conclusions

- Evidence of beneficiary response & outcomes
  - Urban to rural & wildlands gradient
  - Importance of 'place' in ecosystem management & investment
  - Crosswalk ecosystem and human scales
  - Analytics support 'stories'
- 



[www.naturewithin.info](http://www.naturewithin.info)

College of the Environment University of Washington

## 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.**

Sponsors

