The Economics of Urban Greening for Human Health

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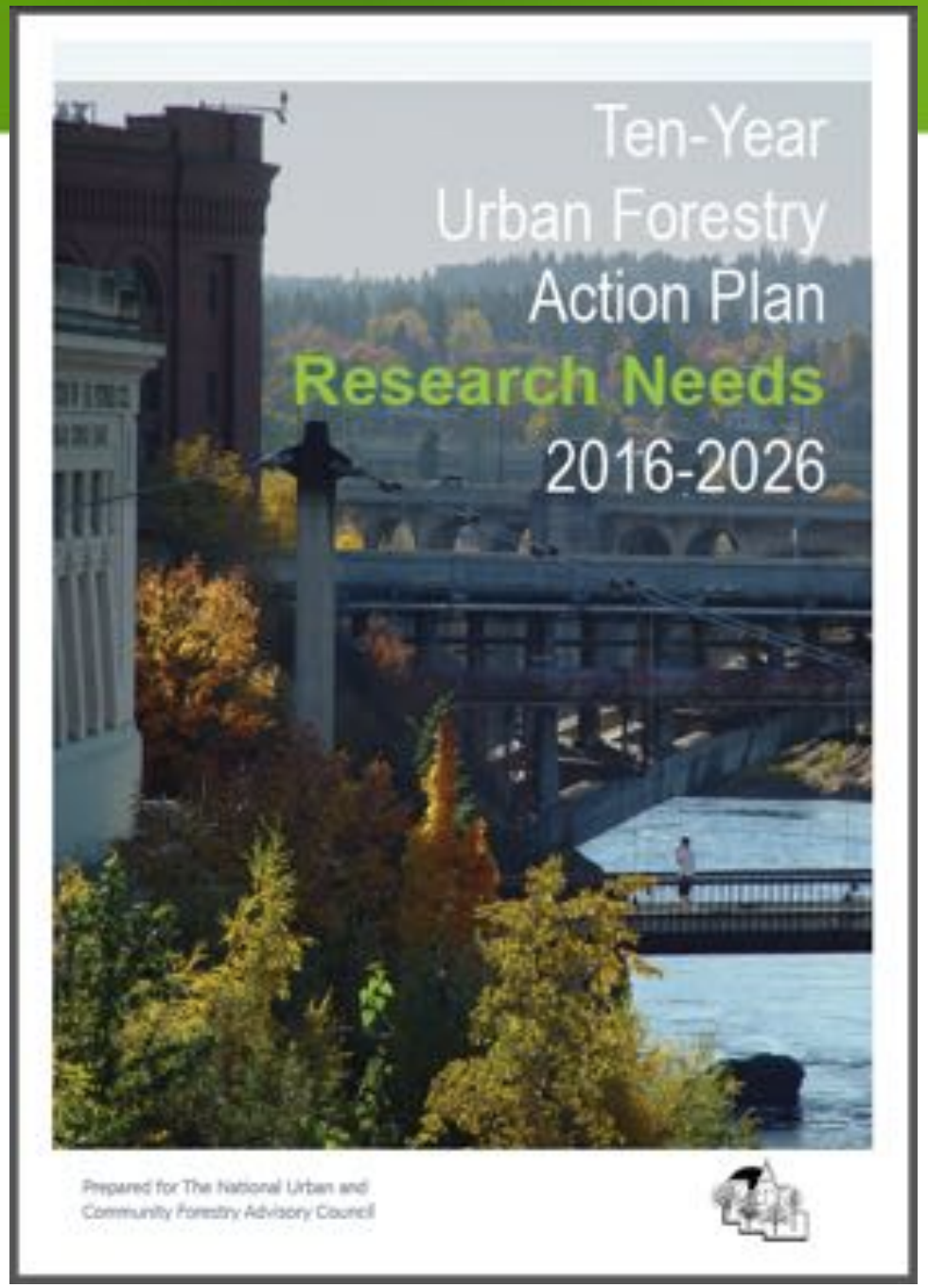
17 November 2016



primary action plan

research supplement

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value of research to U&CF growth

Research Needs Framework

A Understand Ecosystem/ Ecological Services

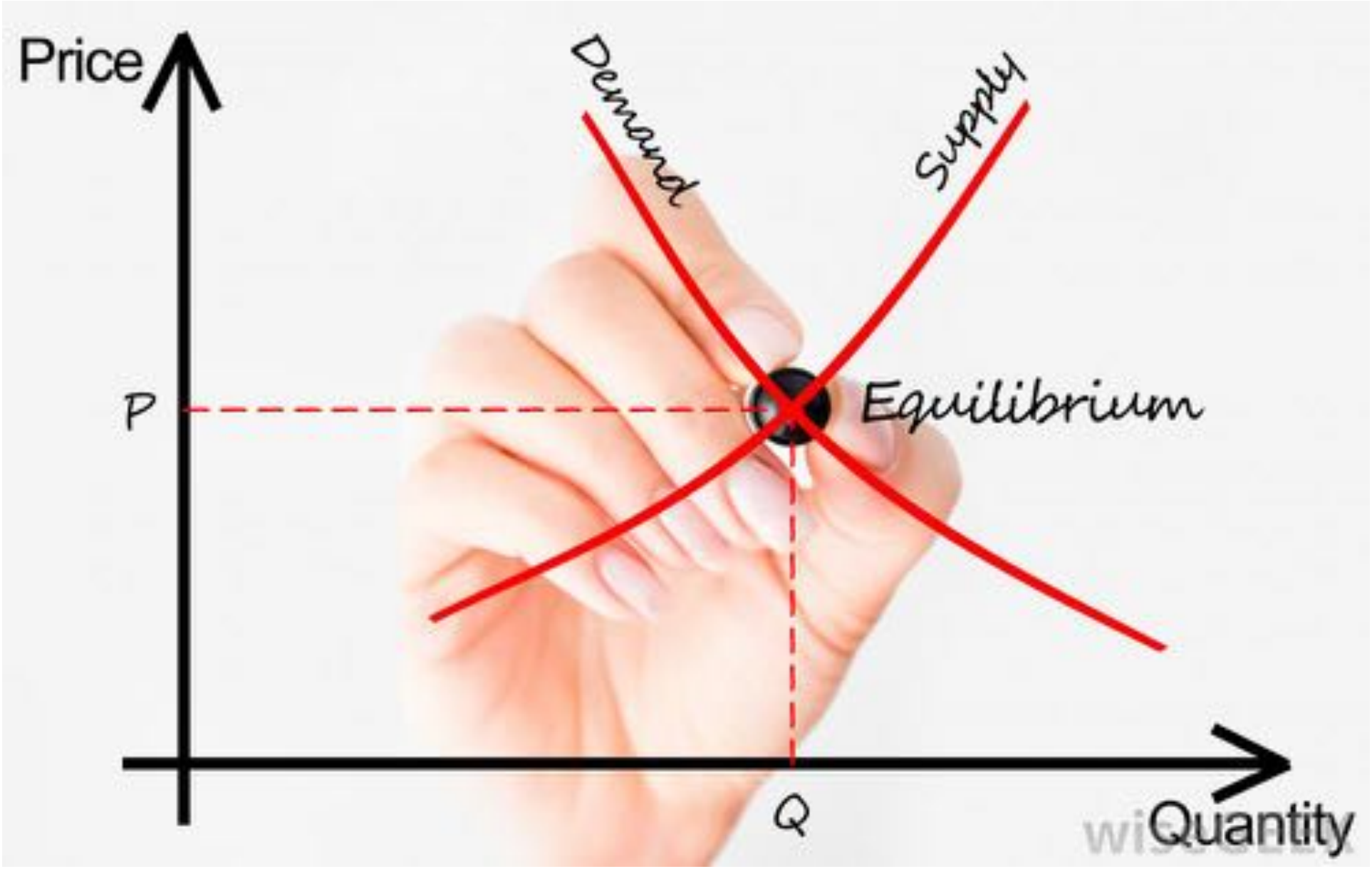
B Promote Human and Community Health

C Planting, Inventory, and Analysis for Forest and Environmental Health

D Prepare for Pests, Threats, Climate and Associated Changes and Risks

E Enable Civic Stewardship and Improved Local Governance

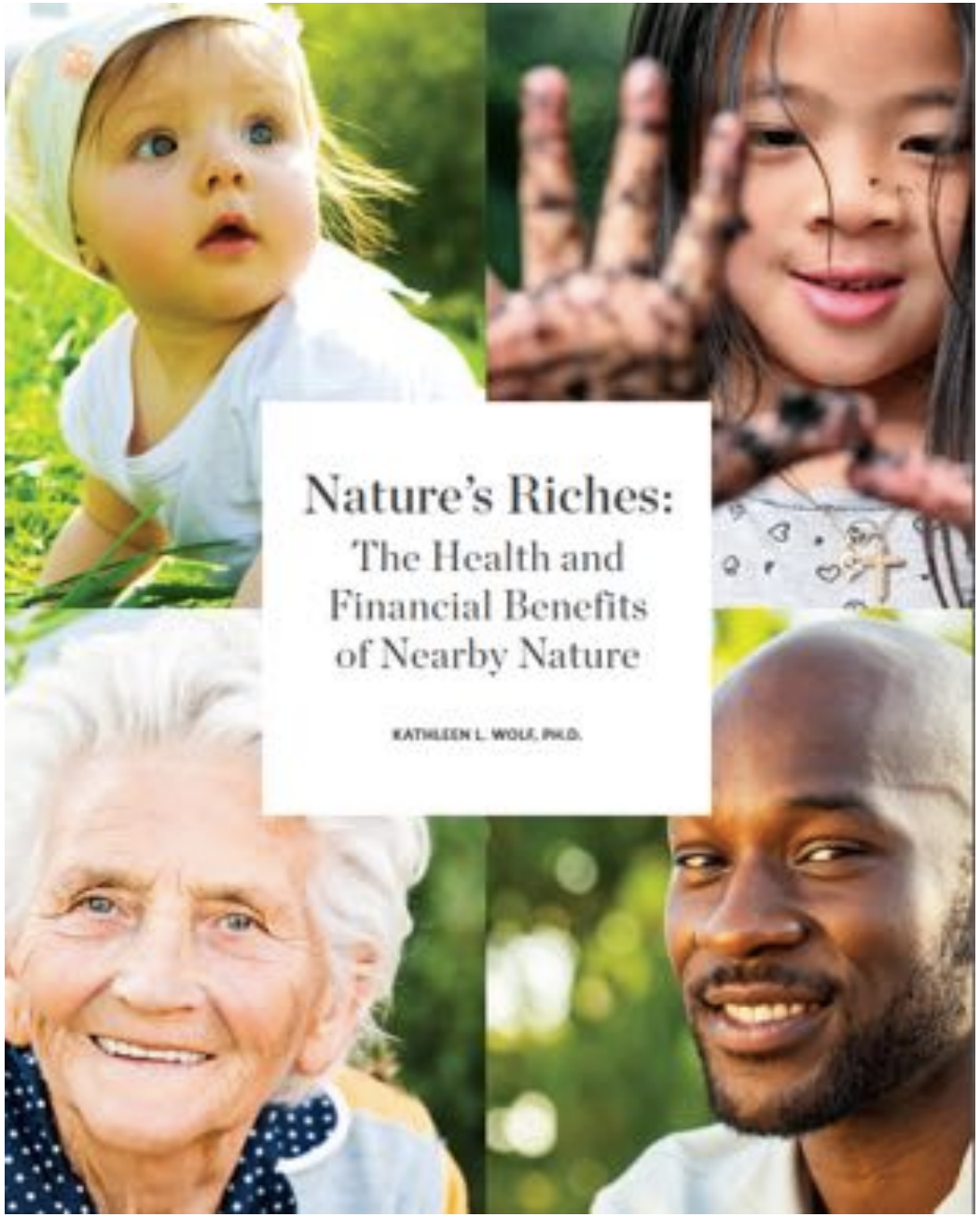
F Integrate Knowledge Networks and Data for Urban Socio-Ecological Systems



source.wisegeek.com

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!



design:

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The Nature Conservancy

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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.

INFANTS

BIRTH WEIGHT

$143M 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

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

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 2016 U.S. dollars, and are annual values average across the entire U.S.

CHILDREN & TEENS

OVERALL HEALTH AND WELL-BEING

INCREASED PHYSICAL ACTIVITY, REDUCED ASTHMA (A LEADING CAUSE OF EMERGENCY DEPARTMENT VISITS, HOSPITALIZATIONS AND MISSED SCHOOL DAYS), AND REDUCED RISK OF ADULT SKIN CONDITIONS.

Negative conditions 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 our children and teens breathe, give them space for moderate to vigorous activity, and shade them from too much sun exposure.

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FUTURE FINANCIAL SUCCESS

$1.2B INCREASE IN HIGH SCHOOL GRADUATES' LIFELONG ANNUAL INCOMES.

School performance affects both near-term self-esteem and long-term success. Having green views from classrooms and crossover 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.

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DEPRESSION AND STRESS

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

Busy, highly scheduled lifestyles take their toll. Nature experiences reduce stress. Nearly 16 million adults experience major depression each year in the U.S., and mental, behavioral, and neurodevelopmental disorders are a leading cause of disability. Nature experiences support respite and mindfulness for improved mental health, mood, and life function. Improved mental health and function reduces disease treatment costs, and improves worker productivity.

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$1.1–$1.2B ANNUAL SAVINGS, BASED ON A 1–2% REDUCTION IN HISTORIC EXPENDITURES.

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$918M 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.

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One in three older adults falls each year, giving rise to fatal and nonfatal injuries. Residents' falls within elder care facilities are particularly expensive medical situations. Being out in nature maintains 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.

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About one in five older adults experience mental and cognitive disorders, with age being the greatest risk factor. In 2016, about 11% of people aged 65 or older were afflicted 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, Weyerhaueser

Publications

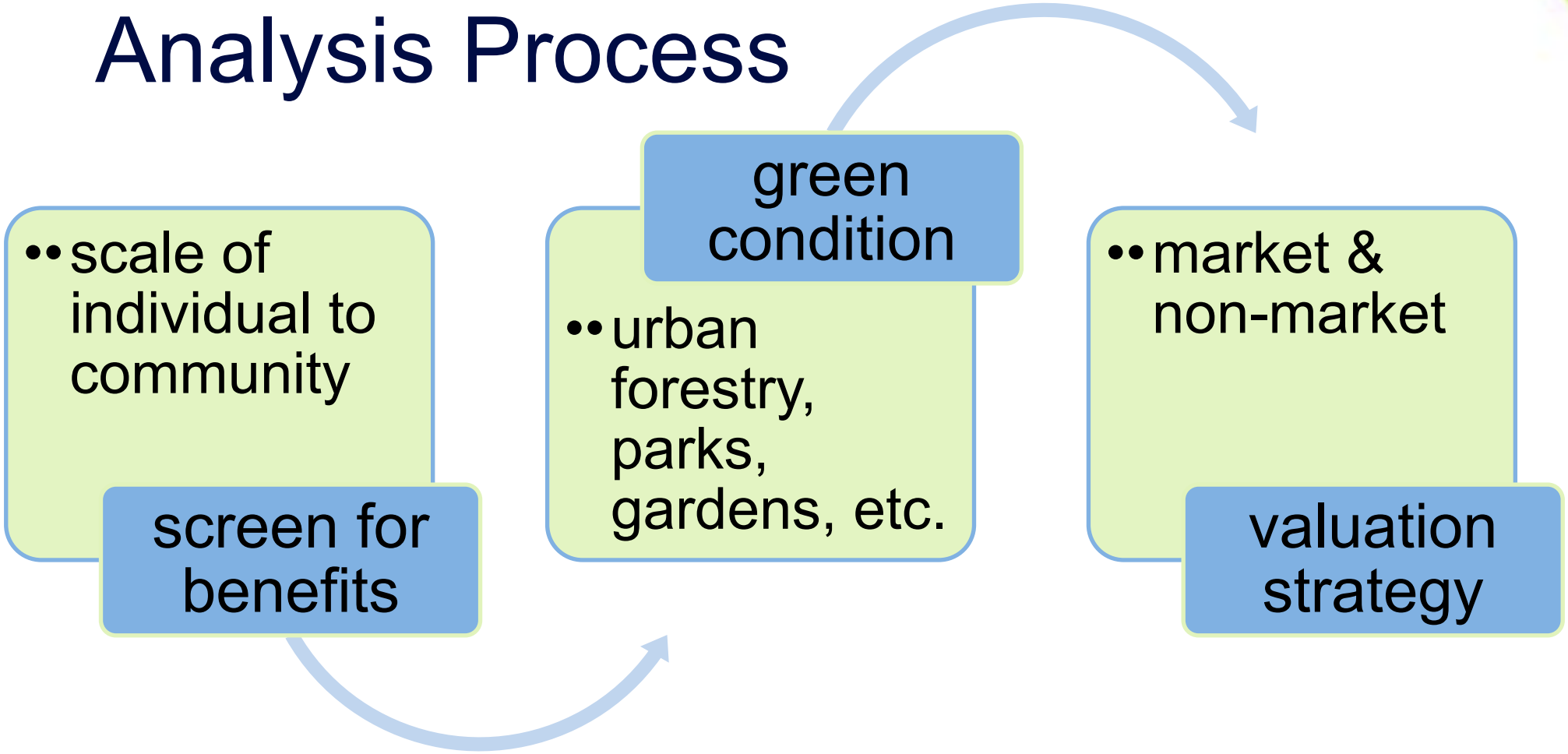
- Green Cities, Good Health web site. A resource to learn more about nearby nature in cities and human health.
- Wolf, K.L. 2016. Uncovering benefits of the urban forest: A look at how urban forestry investment assists local economies, public health. Properties Magazine 70, 2: 55-57.
- Wolf, K.L., M.K. 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).

WHO Health Definition

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

Analysis Process



process #1: screen for benefits

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

Community Building
Local Economics
Place Attachment & Meaning
Crime & Fear
Safe Streets
Active Living
Reduced Risk
Wellness & Physiology
Healing & Therapy
Mental Health & Function
Work & Learning
Culture & Equity
Lifecycle & Gender

Local Economics

RSS Feed Print

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.[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 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.[14]
- Shoppers claim that they will spend 9% to 12% more for goods and services in central business districts having high quality tree canopy.[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.[34]

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

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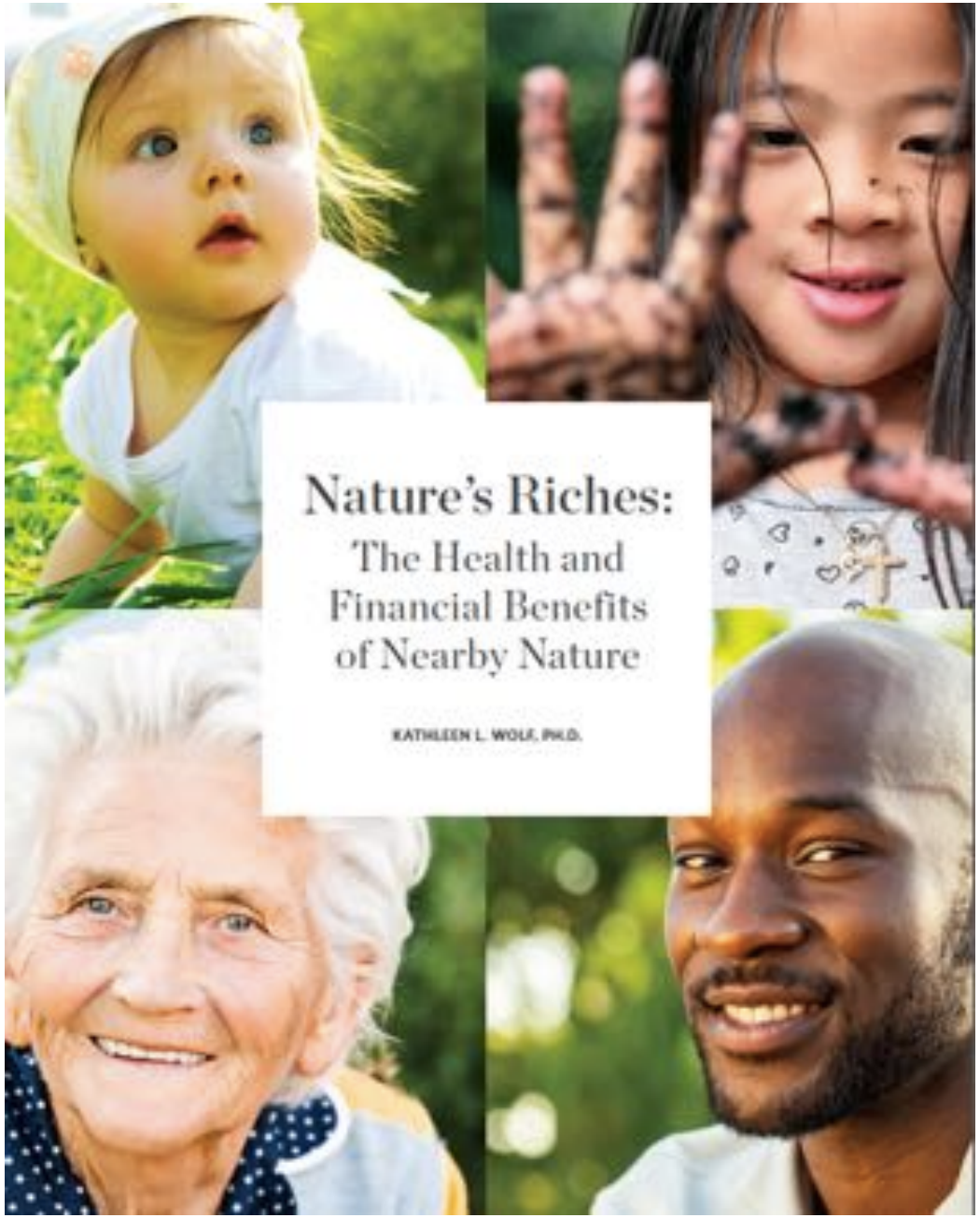
Metro Nature & Health Evidence Framework

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.



design:

milepost

printing:

The Nature Conservancy

design:

milepost

co-author & printing:

The Nature Conservancy

process #2: understand green condition

Landscape
Community
credit: Ignacio Bunster-Ossa
Garden

Diversity in Metro Nature

NEARBY NATURE INCLUDES A VARIETY OF SPACES AND PLACES

IMAGE BY MIG / SvR

process #3: apply valuation strategy

Valuation Sources

Benefit x Nature x Health Outcome

Benefit	Metro Nature	Outcome
Newborn Birth Weight	increased tree canopy cover near mothers' homes	fewer small for gestational age babies
Attention Deficit Hyperactivity Disorder	greener play areas vs built outdoor or indoor settings	reduced symptoms potentially reducing medication
School Performance	green views from classrooms and cafeteria	reduced dropout rate - average annual income
Crime Reduction	trees and lawn in outdoor common areas	reduced violent and non-violent incidence and costs
Cardiovascular Disease	presence of residential tree canopy	reduced incidence or severity of cardiovascular disease
Alzheimer's Disease	wander garden in care facility	reduced medications for patients

Valuation Strategies

Benefits Transfer approaches

- factor income
- avoided or replacement cost
- burden of illness
- hedonic pricing
- stated preference/contingent valuation
- revealed preference (e.g., travel cost)
- quality adjusted life years
- benefit/cost

What is the Value?

Summary Table

Millions of U.S. Dollars (2012)

Benefit (geographic scope)	Minimum ($)	Maximum ($)
Newborn Health (U.S.)	5.3	5.3
Attention Deficit Hyperactivity Disorder (U.S.)	383.5	1,917.7
Schools (U.S.)	20.4	1,262.9
Crime (U.S.)	340.6	899.4
Cardiovascular Disease (U.K., U.S.)	1,220.0	1,220.0
Alzheimer's Disease (U.S.)	724.6	1,449.2
Totals	**2,694.4**	**6,754.5**

Wolf, K.L., M.K. Measells, S.C. Grado, A.S.T. Robbins. 2015. Economic values of metro nature health benefits: A life course approach. Urban Forestry and Urban Greening.

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

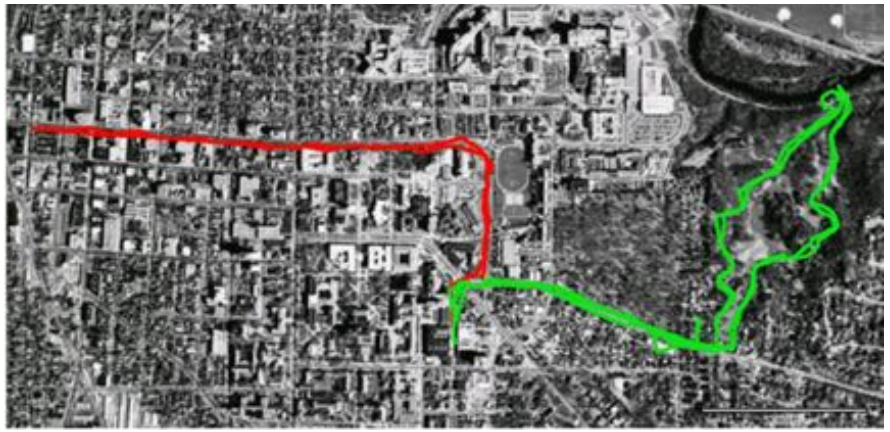
Improving Depression

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)

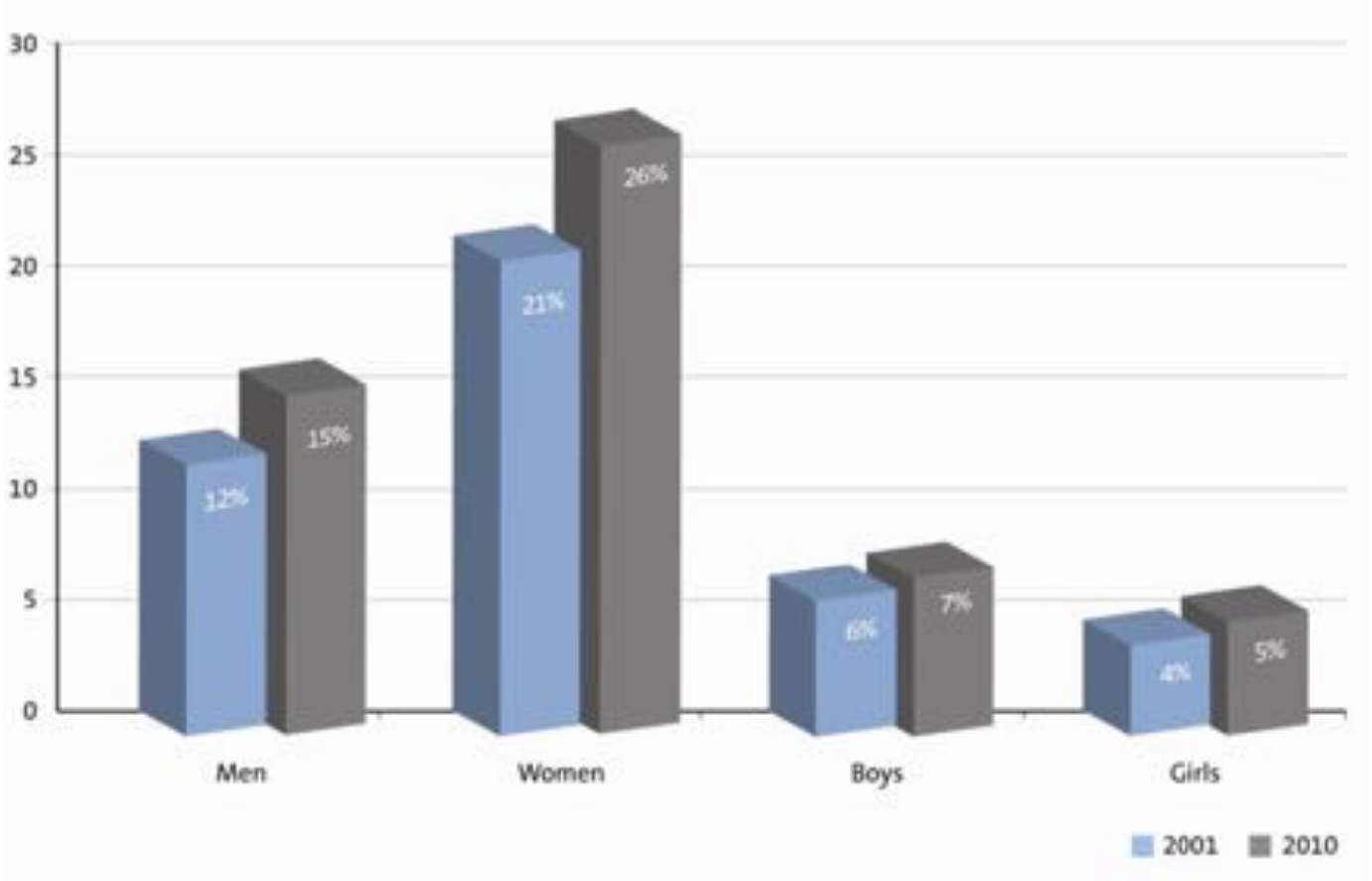
Berman et al. 2012. *Journal of Affective Disorders*

cognitive and affective improvements after walking in a nature setting



% of U.S. Population
Using Mental Health Medications

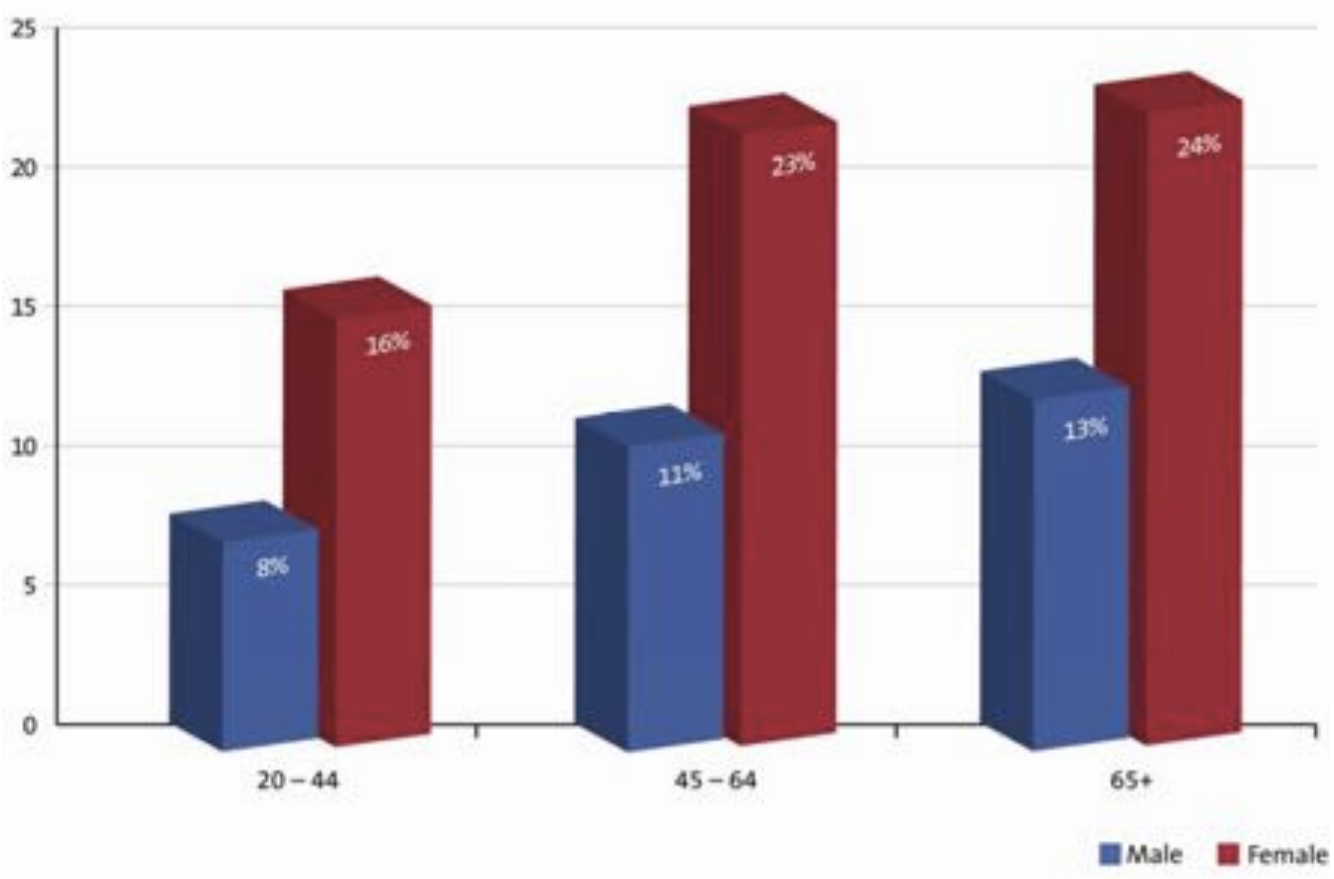
2001 vs 2010



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

Prevalence of Adult Antidepressant Use

2001 vs 2010



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

The times . . . .
they are a changin’ Bob Dylan

urban & community forestry
environment

business outlook
return on investment
making people great

credit: American Planning Association

避難所
鷹取の家
連絡先：佐原町役場 0889-65-1111
Forest Therapy Road (Kubo Valley)
森林セラピーロード
（久保谷）
Takatori House
レストラン
鷹取の家

まつばら Tel.0889-66-0044 11.8km
チムジルバン レストラン 鷹取 Tel.0889-62-3308 0.5km
まつばら
チムジルバン
現在地
鷹取キムチ

Military Service & Stress

- Military service to civilian transition issues
- Prevalence of Stress Response
- Service carry-overs
  - Purpose
  - 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

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

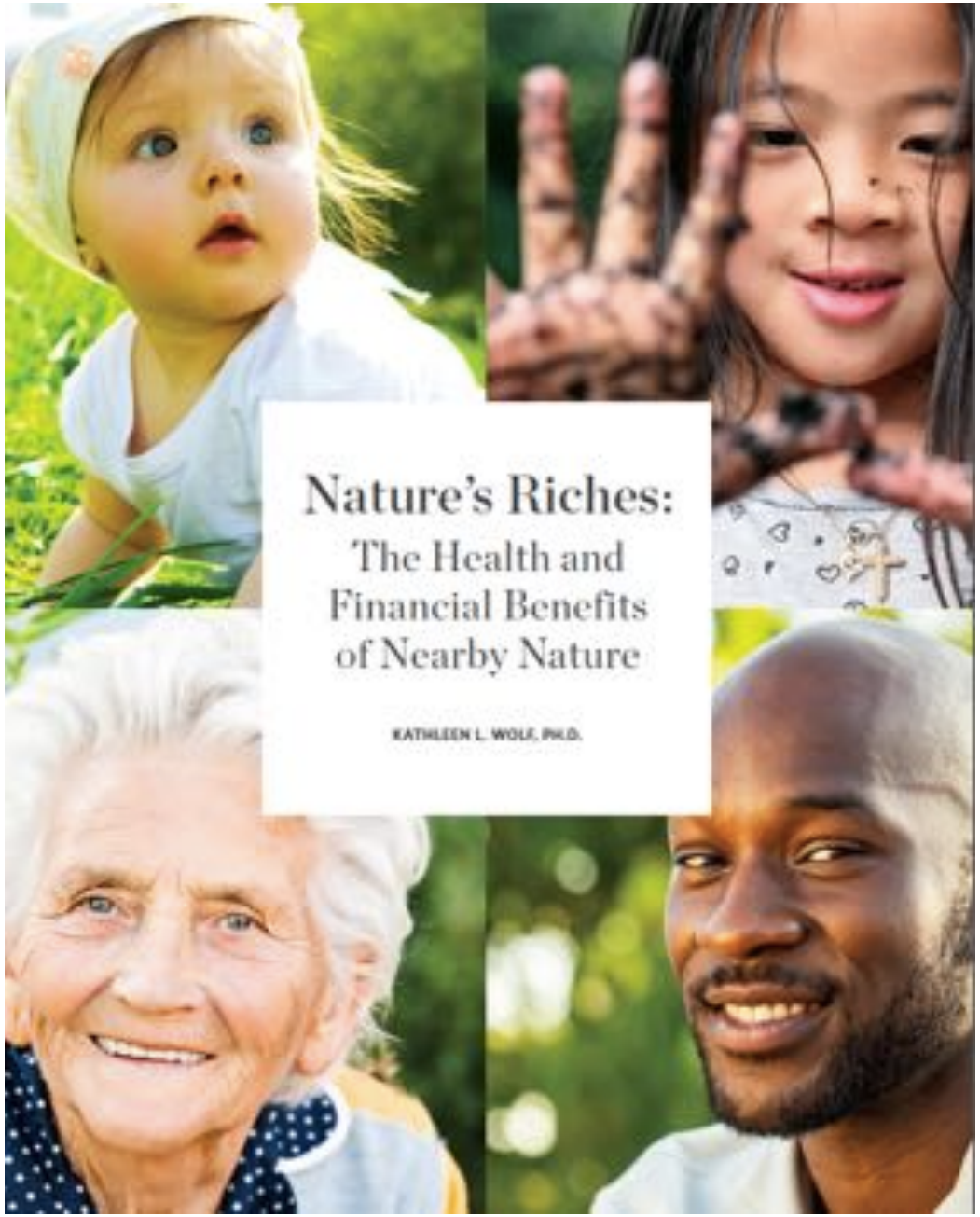
The Heights Community Garden, Dayton OH

local food
food security
child education
nutrition
food donations

Summary

Thank you to
USDA Forest Service
& NUCFAC!

- evidence-based human health & wellness benefits
- economic consequences!
- market & non-market valuations
- first efforts – promising!
- = demonstrating return on investment



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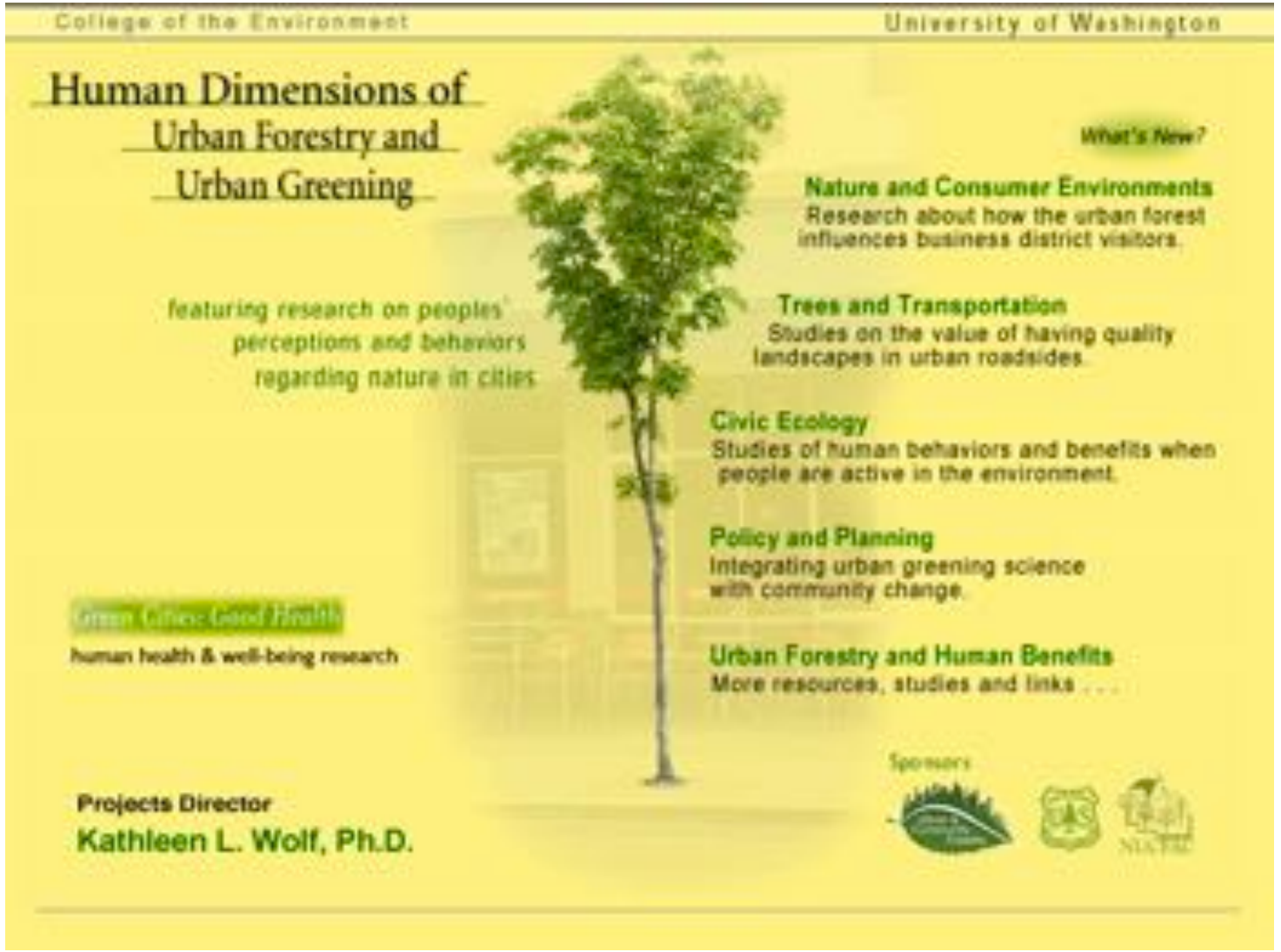
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