Trees & Health:

Growing the Solutions! For Everyone!

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Research Social Scientist

University of Washington (Seattle)
School of Environmental and Forest Sciences

Public Interest Environmental Law Conference
and Friends of Trees
3 March 2018

Rachel Carson (1907-1964)

1962

A Remarkable Career

- aquatic biologist, U.S. Bureau of Fisheries
- 1950s full time nature writer
- 1951 Sea Around Us, National Book Award
- The Edge of the Sea, Under the Sea Wind
- 1962 Silent Spring, national pesticide policy
- launched grassroots environmental movement
- Environmental Protection Agency created 1970

Pervasive Pesticides

Environment = Toxin, Risk

Love C
Niagra

iver, OH

Earlier fire on Cuyahoga, 1952 (Associated Press)

Review and Special Articles

Beyond Toxicity

Human Health and the Natural Environment

Howard Frumkin, MD, DrPH, FACP, FACOEM

Abstract: Research and teaching in environmental health have centered on the hazardous effects of various environmental exposures, such as toxic chemicals, radiation, and biological and physical agents. However, some kinds of environmental exposures may have positive health effects. According to E.O. Wilson's "biophilia" hypothesis, humans are innately attracted to other living organisms. Later authors have expanded this concept to suggest that humans have an innate bond with nature more generally. This implies that certain kinds of contact with the natural world may benefit health. Evidence supporting this hypothesis is presented from four aspects of the natural world: animals, plants, landscapes, and wilderness. Finally, the implications of this hypothesis for a broader agenda for environmental health, encompassing not only toxic outcomes but also salutary ones, are discussed. This agenda implies research on a range of potentially healthful environmental exposures, collaboration among professionals in a range of disciplines from public health to landscape architecture to city planning, and interventions based on research outcomes.

Medical Subject Headings (MeSH): animals, ecology, environmental health, nature, plants, trees (Am J Prev Med 2001;20(3):234–240) © 2001 American Journal of Preventive Medicine

American Journal of Preventive Medicine, 2001

urban forest benefits

in the background

trees & metro nature for human health & well-being

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Outline

1. **Environmental Health**
2. **Trees, Metro Nature x Human Health**
3. **Environmental Equity**

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

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.

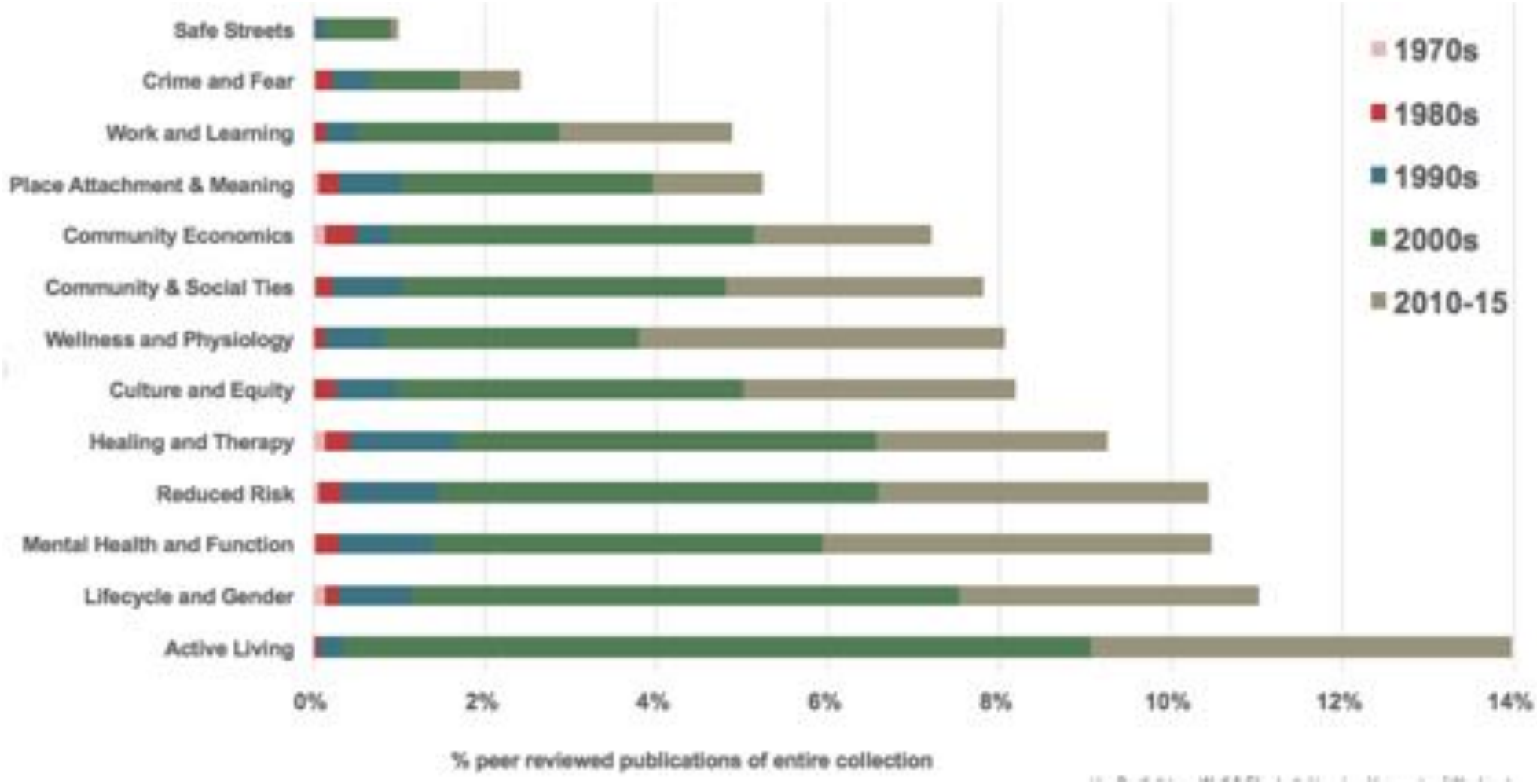
street trees boost market value of houses, providing tax revenue for communities

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]

Green Cities: Good Health

database of >4,500 peer reviewed publications



Metro Nature Settings

NEARBY NATURE INCLUDES A VARIETY OF SPACES AND PLACES

IMAGE BY MIG / SvR

the canopy of a city :: human health benefits

nearby nature & health evidence
> 40 years
~ 4,500 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

Nature Contact & Immune Systems

- absence of trees & green space
- less opportunity for ‘inoculation’

Fiddlehead Forest School
Washington Park Arboretum (Seattle)

cognitive
social &
physical
learning

Classroom Views & Stress

School No.1

School No.4

Li & Sullivan. Landscape & Urban Planning, 2016

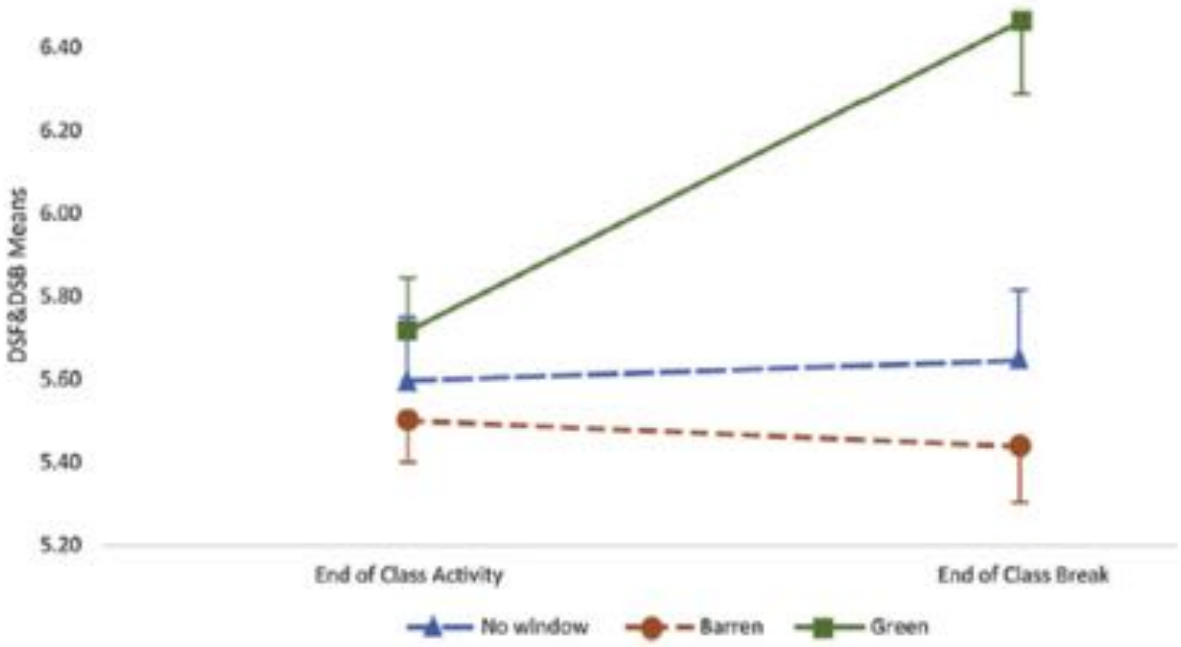


Fig. 2. Attention scores at the end of class activity and break (Means and SE).

attention scores

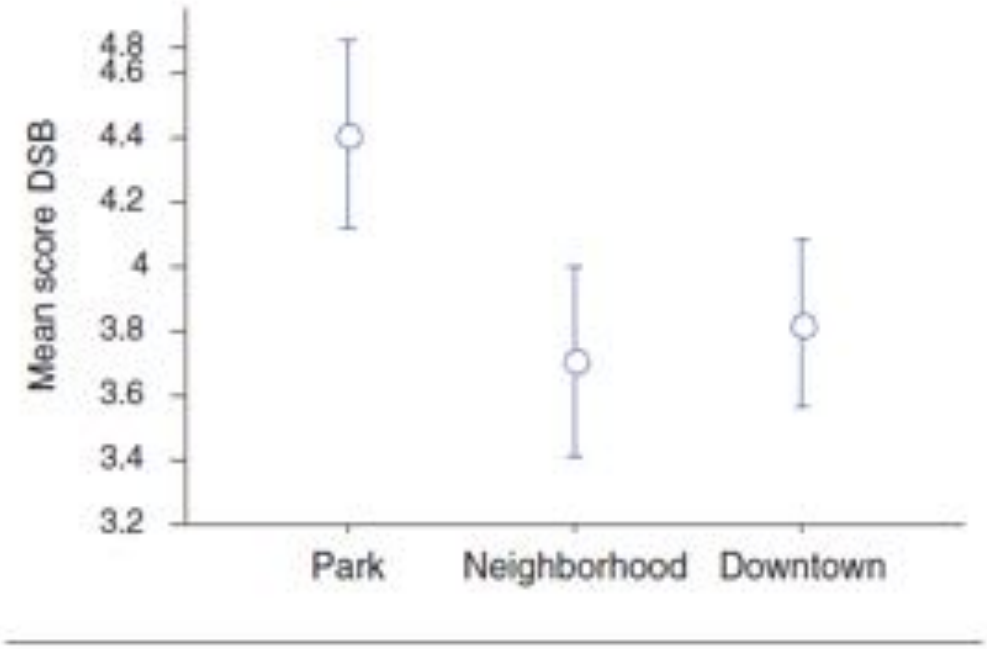
Fig. 3. Physiological stress at the end of class activity and break (Mean and SE).

stress scores

Classroom Views & Stress high school student response

ADHD and nature contact

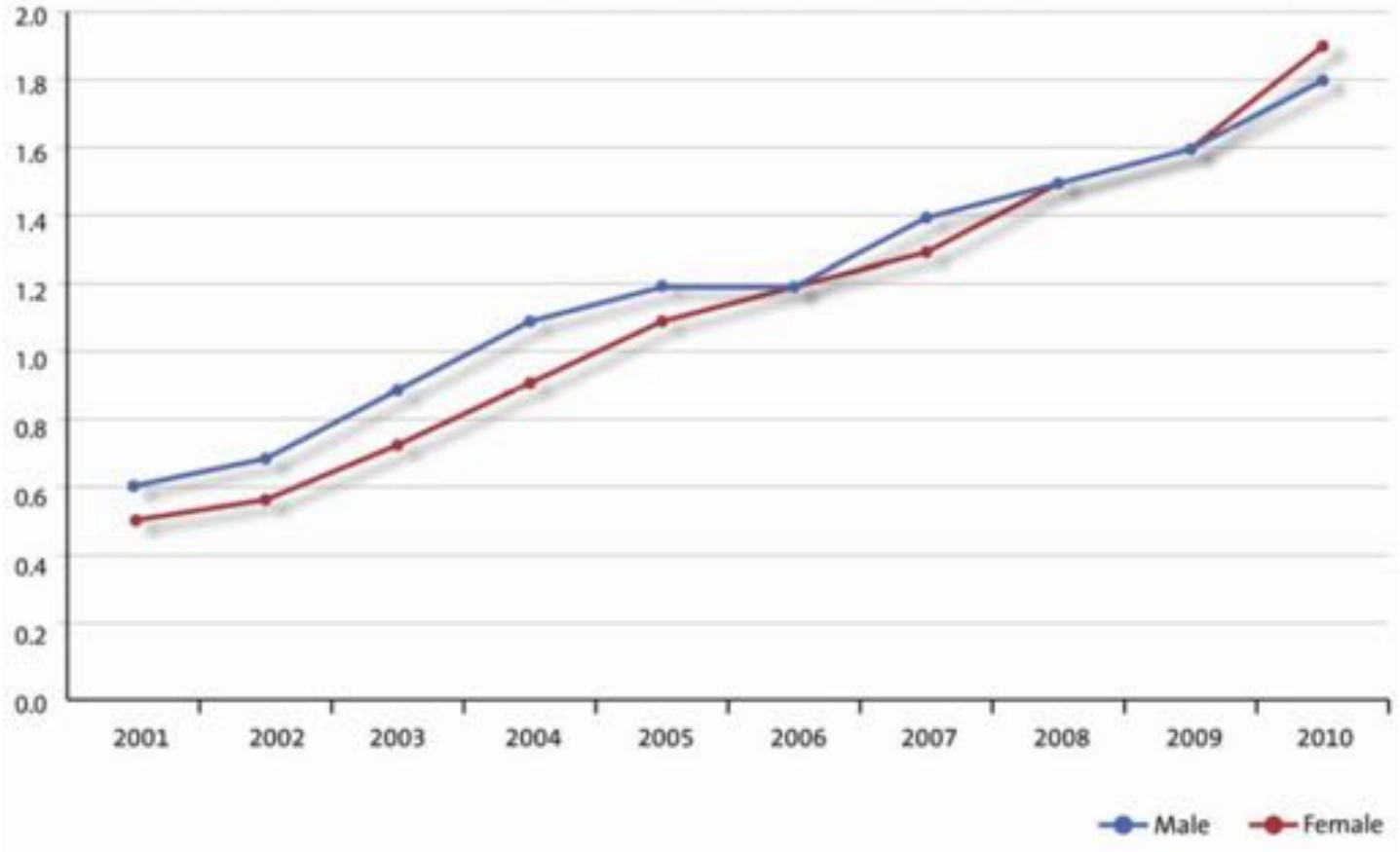
- 17 children aged 7-12 with diagnosed ADHD
- 20-minute guided walks
  - Park
  - Neighborhood
  - Downtown
- Pre-walk puzzles
- Post-walk cognitive test



Faber Taylor & Kuo. 2009.
Journal of Attention Disorders

ADHD Meds
% of Americans Ages 20-44

2001 - 2010



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

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: _____

doctors of bc

Doctors of BC

Parks Prescription

PARKS Rx

Your Prescription For Better Health

This information is provided for educational purposes and is not to be considered medical advice.

www.REACHforbetterhealth.com/ParksRx

Made possible with funding from the Centers for Disease Control and Prevention

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

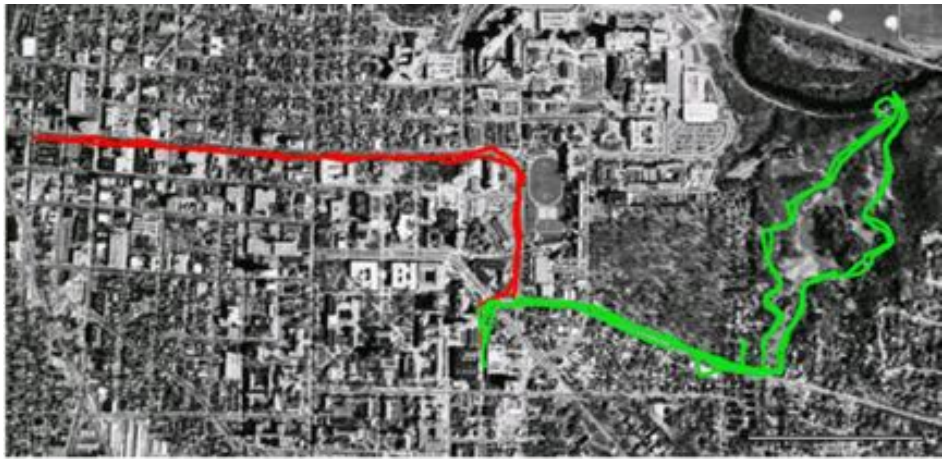
Improving Depression

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)

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

cognitive and affective improvements after walking in a nature setting



Sacramento Study :: LIDAR x CHIS data

7,900 adults, 250 m buffer, covariates

more tree cover

= better overall health

= better social cohesion

Ulmer et al. 2016. *Health & Place*. Multiple health benefits of urban tree canopy: The mounting evidence for a green prescription

Donovan et al. 2013. Journal of Preventive Medicine

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

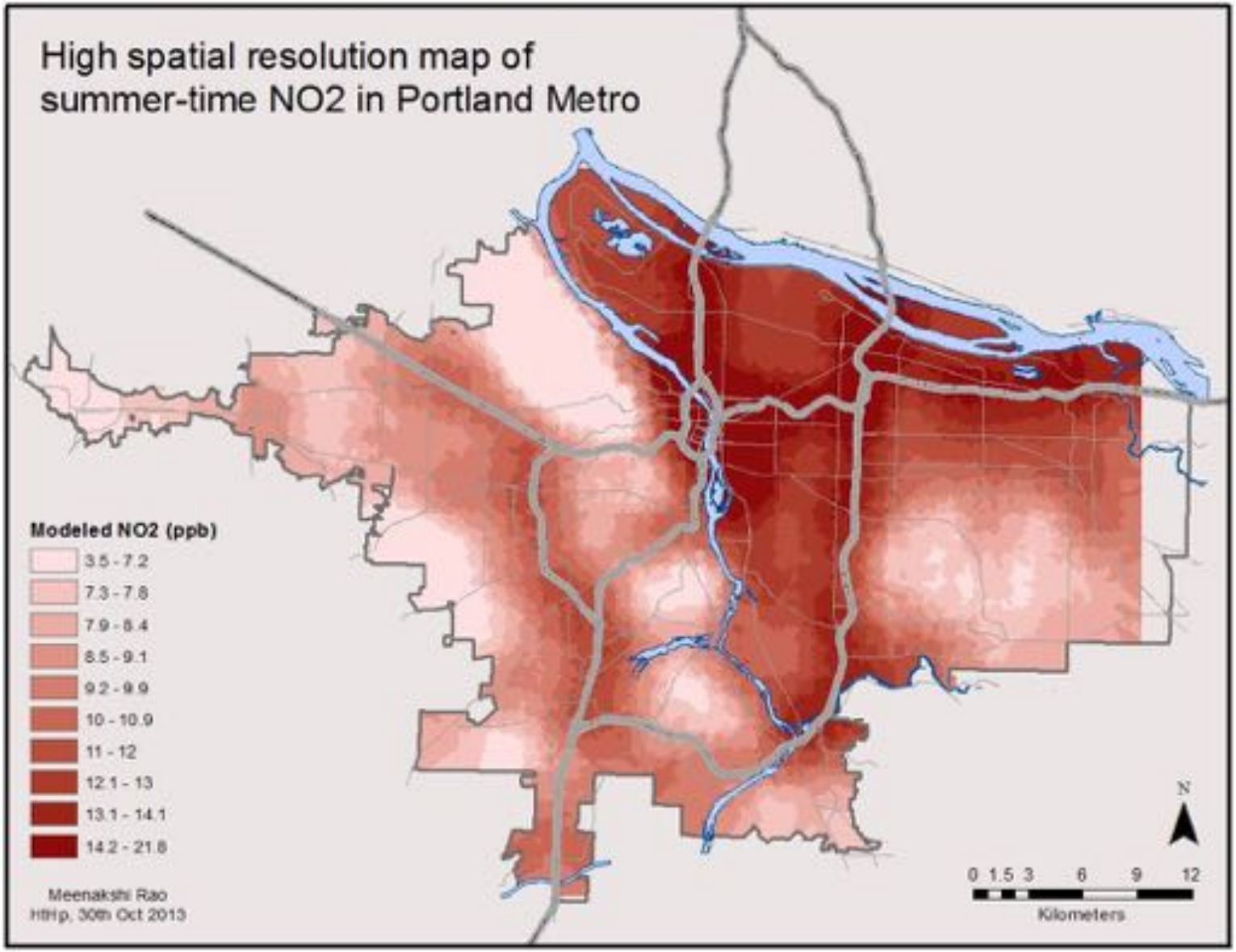
controlled for demographic, human mortality, and forest health data at the county level

Toledo, Ohio in 2006, pre EAB

2009, EAB in neighborhood

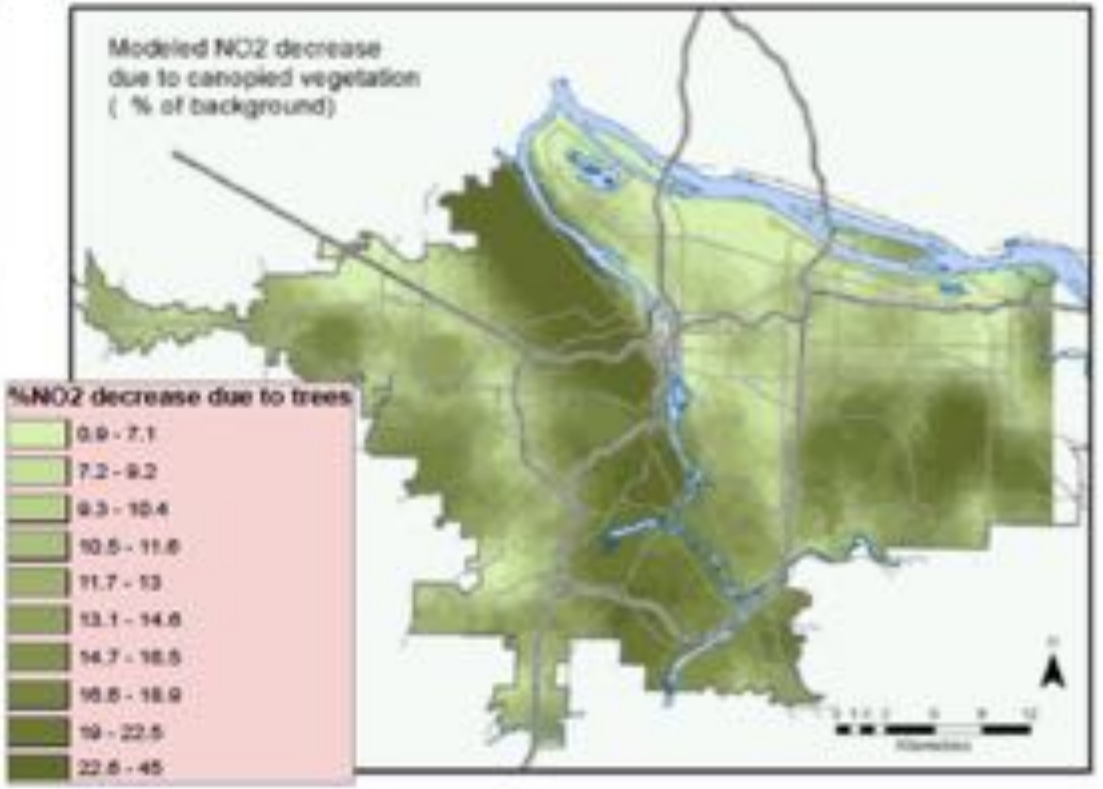
photo credits: Dan Herms, Ohio State U

Mobile Air Pollutants



Dr. Vivek Shandas, Urban Studies and Planning,
Portland State University

Health Value of Trees



Health Impact	Reduced Incidence due to Trees	Valuation of Benefit (in $1,000,000)
Asthma Exacerbation, Missed school days (4-12 years)	6083	0.52
Asthma Exacerbation, One or More Symptoms (4-12 years)	17,663	2.76
Emergency Room Visits, Asthma (all ages)	46	0.01
HA, All Respiratory (65 and older)	49	0.92
HA, Chronic Lung Disease (less Asthma) (65 and older)	24	0.33
	Sum Value:	$4.54

10% increase in tree canopy
~ 12% decrease in crime

Troy, et al. 2011. The relationship between tree canopy and crime rates across an urban–rural gradient in the greater Baltimore region. Landscape and Urban Planning

Effects of nature window view on recovery from surgery (Roger Ulrich, 1984)

hospital healing gardens

health care $$ savings
patient preference & return

Ulfelder Healing Garden,
Massachusetts General Hospital

Scripps Encinitas Hospital

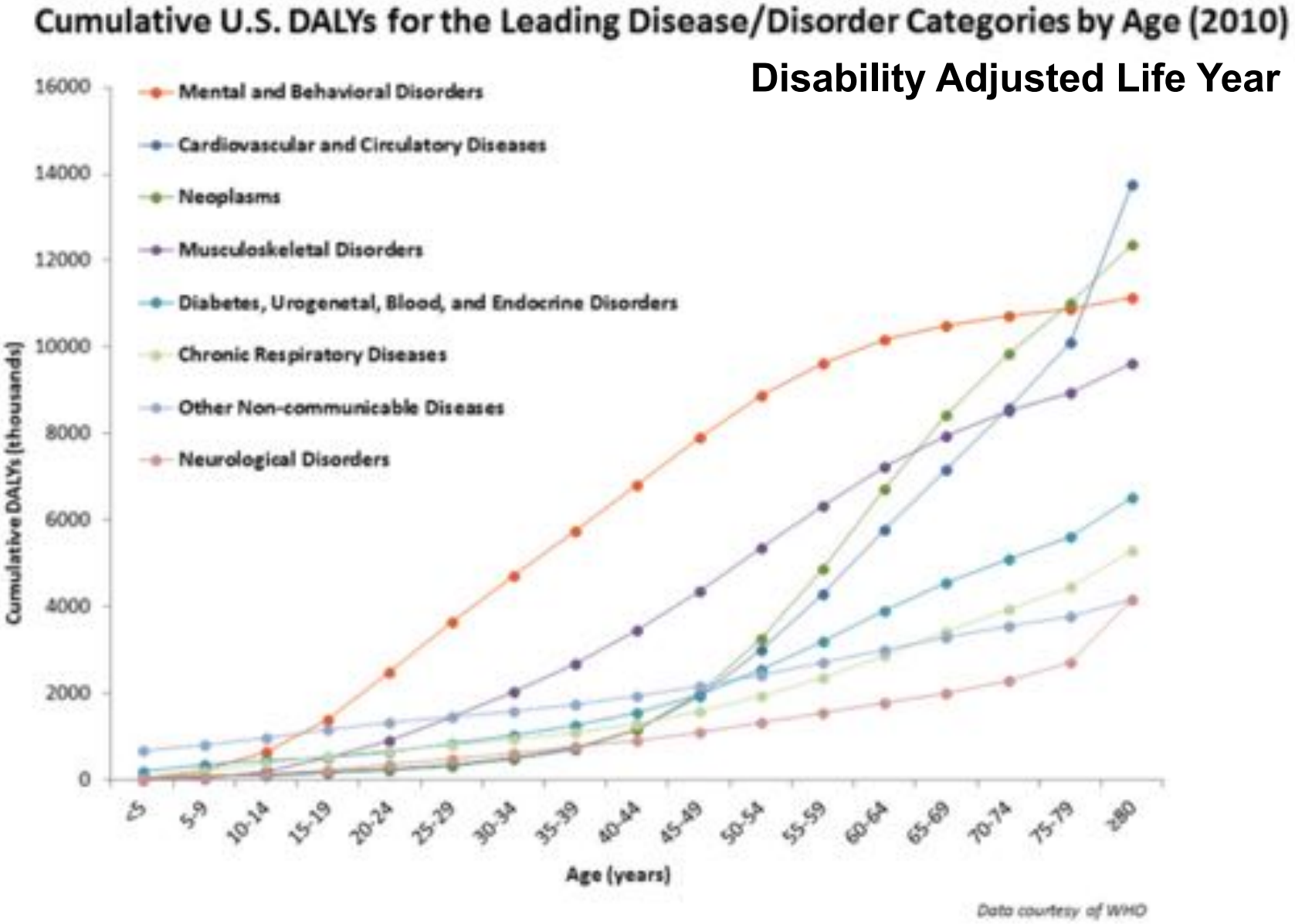
Legacy Good Samaritan Medical Center
Stenzel Healing Garden 1997
Rehabilitation Institute of Oregon

Oregon Burn Center Garden

Massachusetts
General Hospital
credit: Frank Oudeman

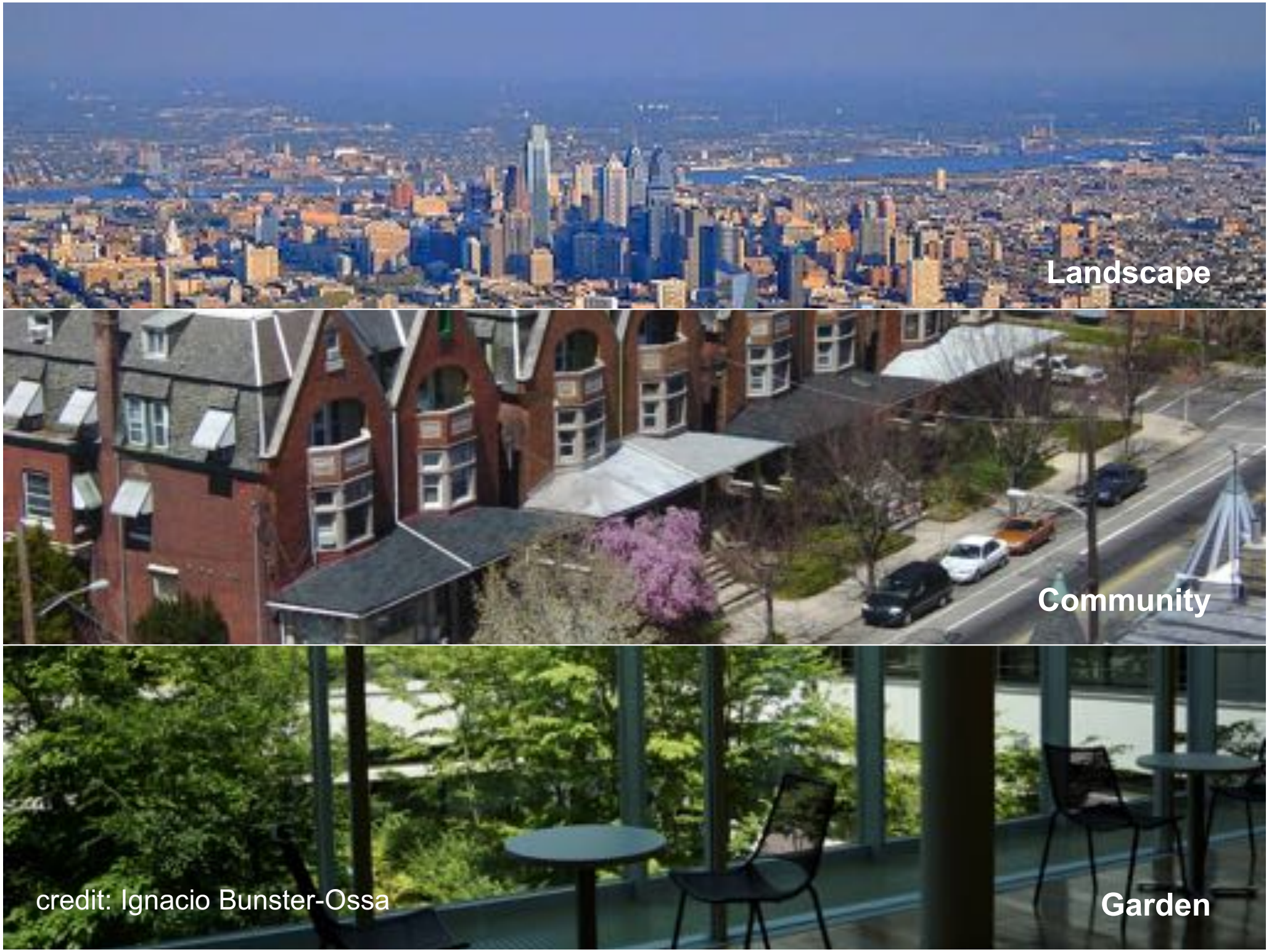
Hospital Staff – Respite and Support

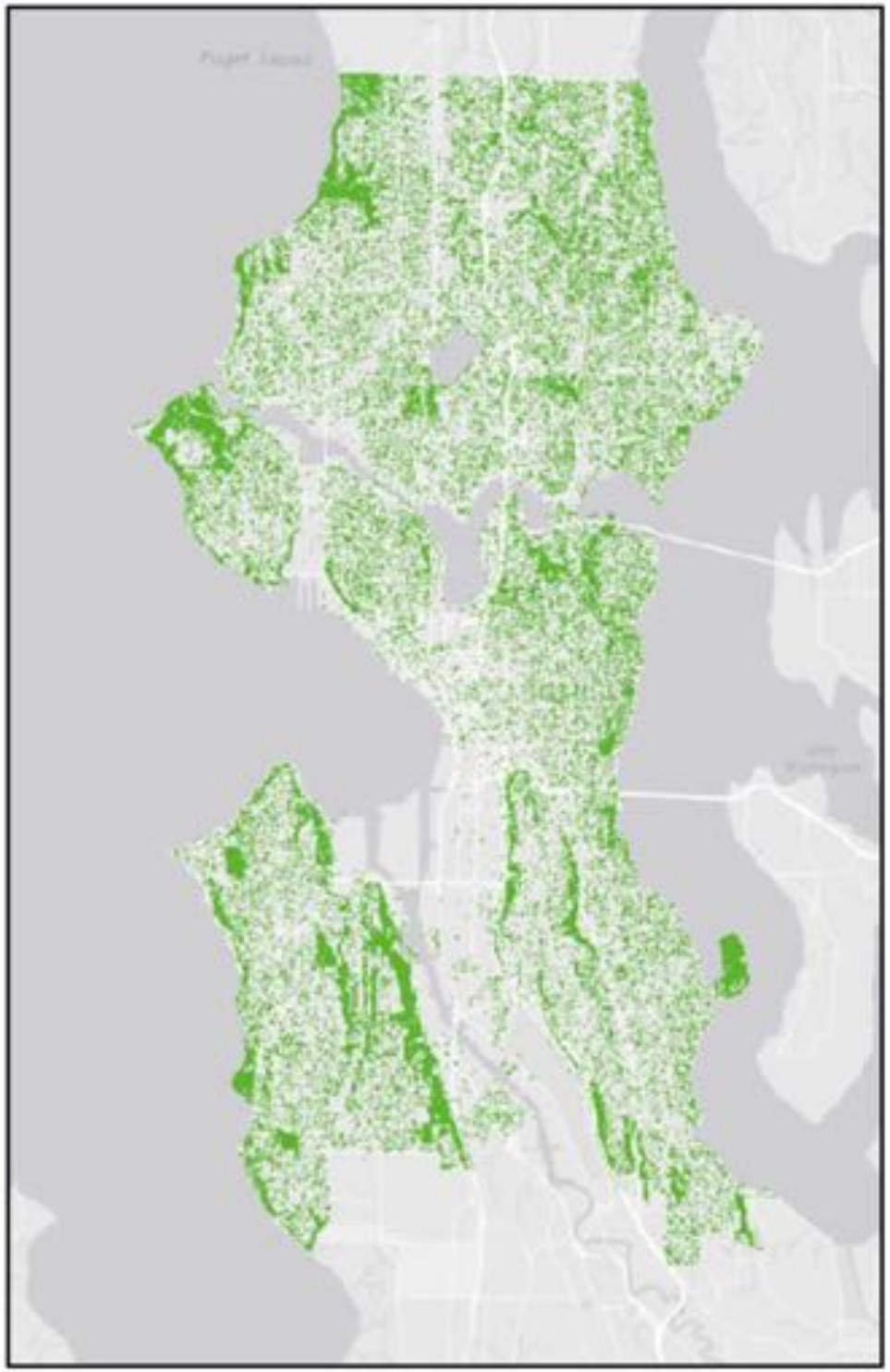
Lifecycle :: disease & illness



Environmental Equity

- tree canopy analysis
- parks distribution
- nature management & upkeep
- geographic disparities
- why is this important?


Landscape
Community
credit: Ignacio Bunster-Ossa
Garden

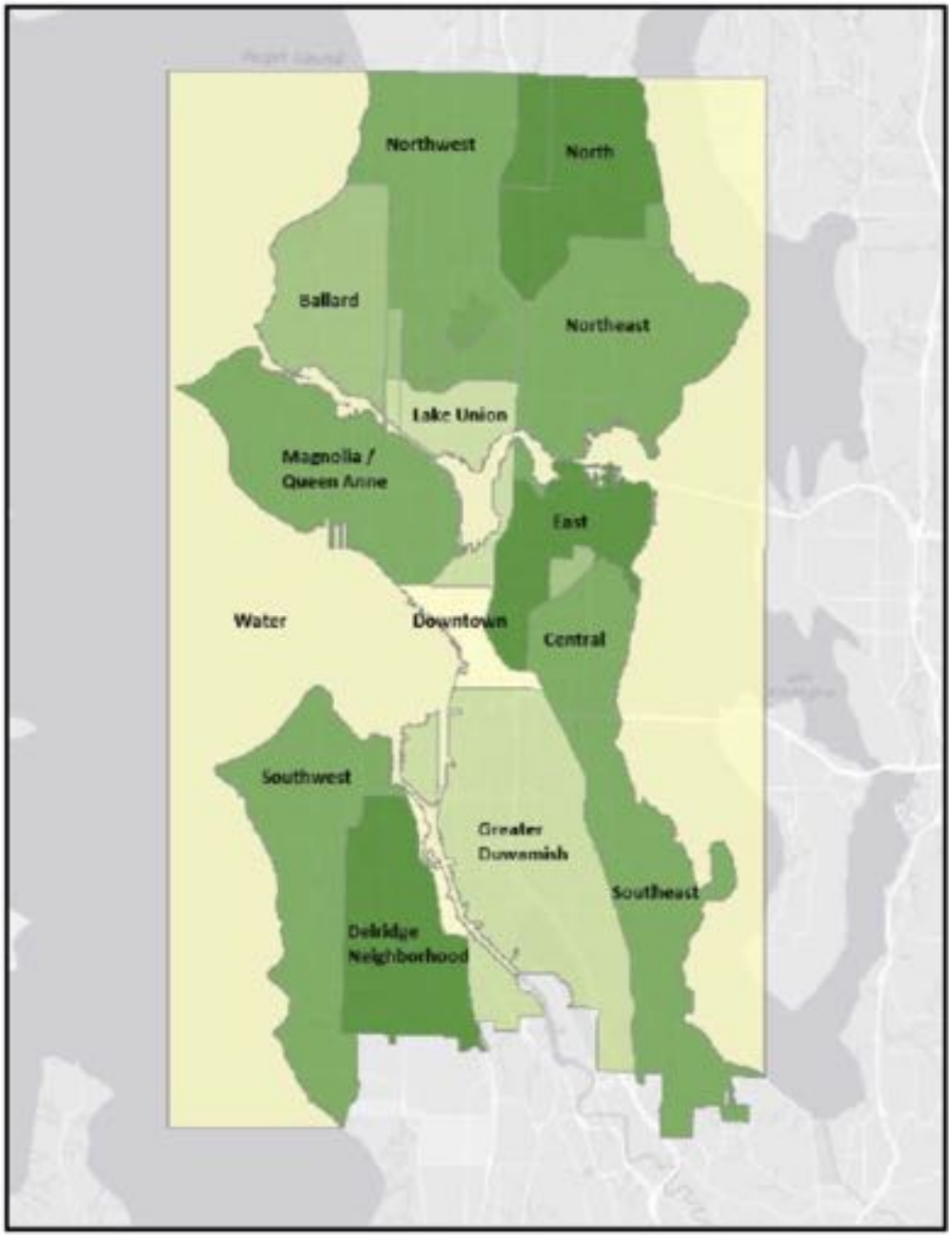


2016 Seattle
Urban Tree Canopy
Analysis

LiDAR imagery

goal 30%,
now 28%

report at:
http://www.seattle.gov/trees/canopycover.htm



2016 Seattle Urban Tree Canopy Analysis

degree of existing tree canopy for each of Seattle's neighborhoods

2016 Seattle Urban Tree Canopy Analysis

Seattle Census tracts

key:
% people of color (large dot = mostly Caucasian)

% tree canopy (lighter is more canopy)

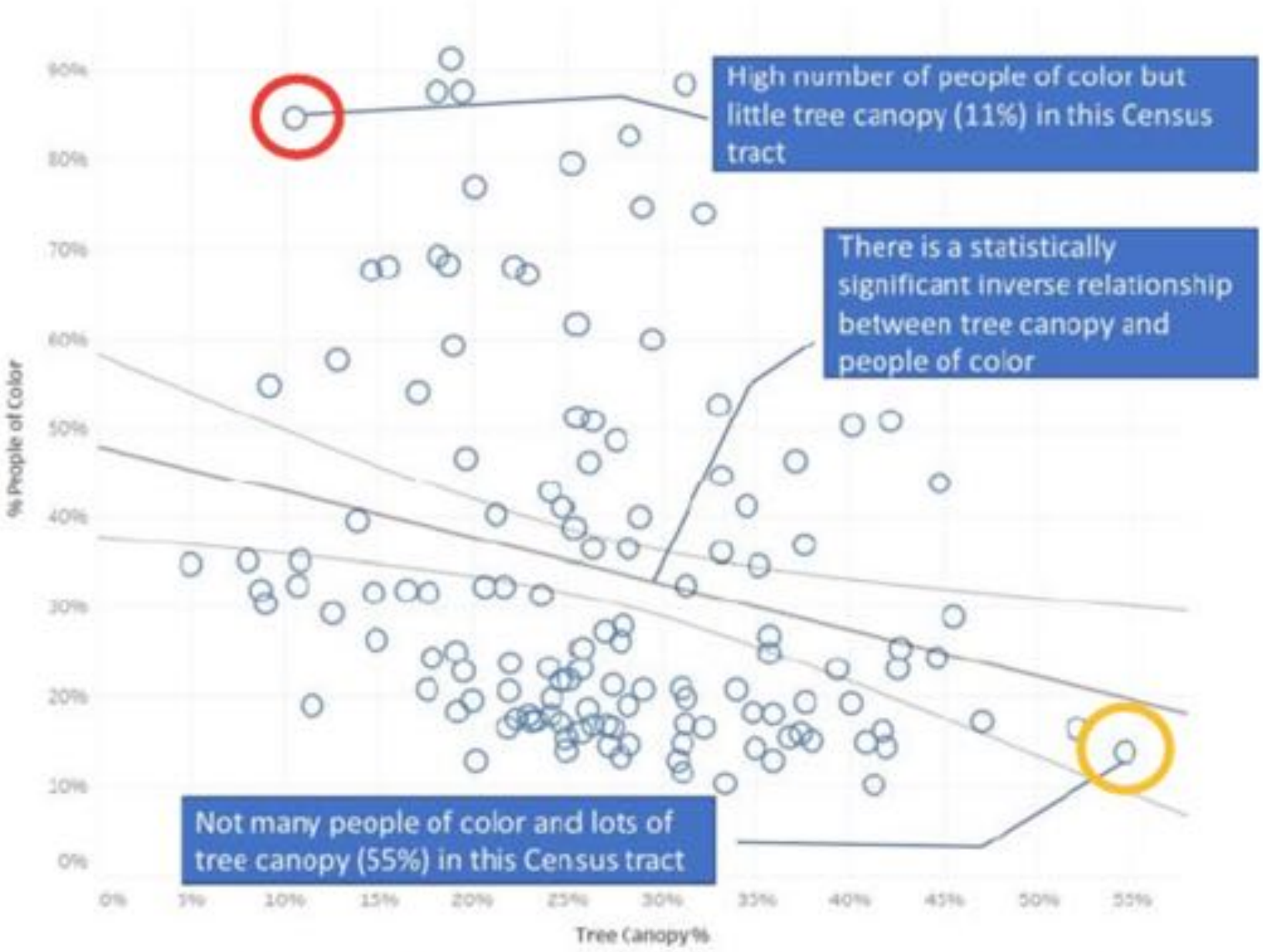
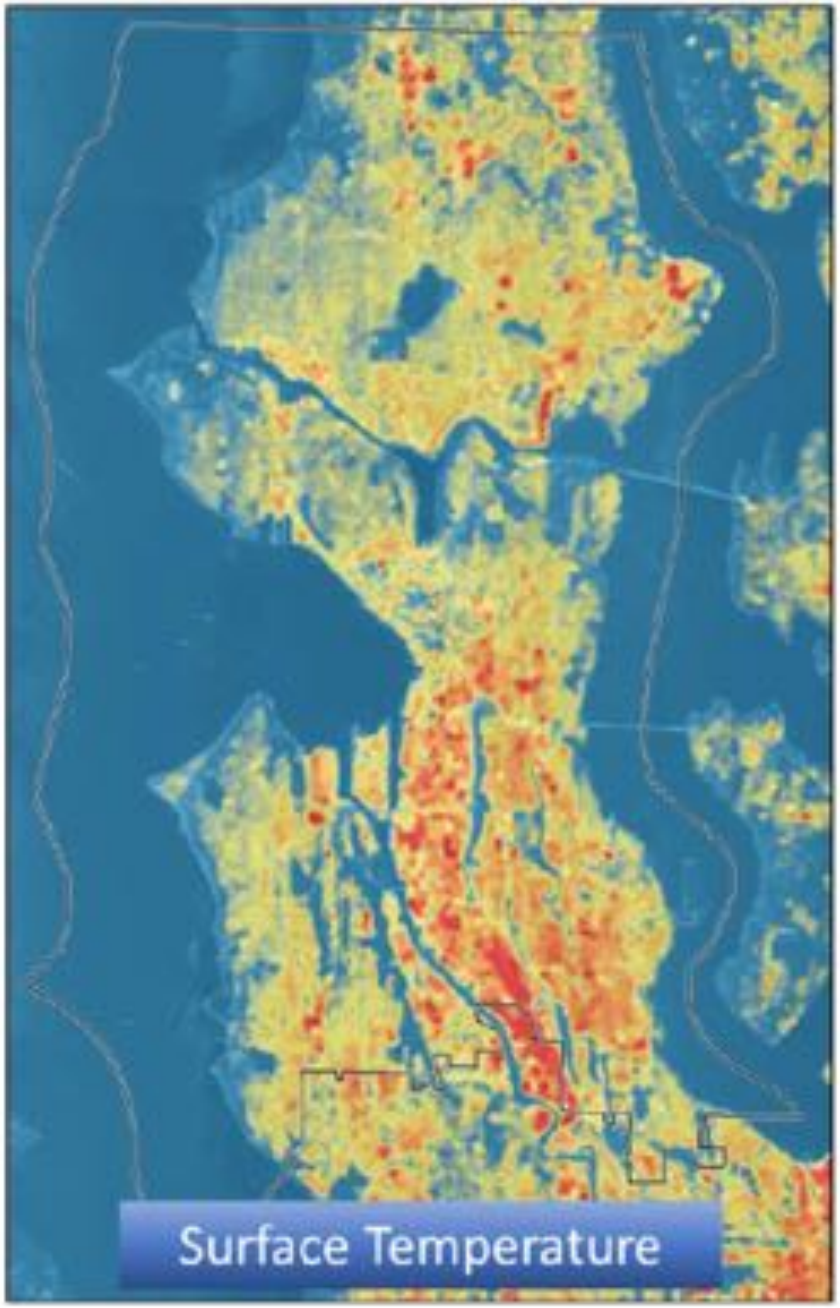
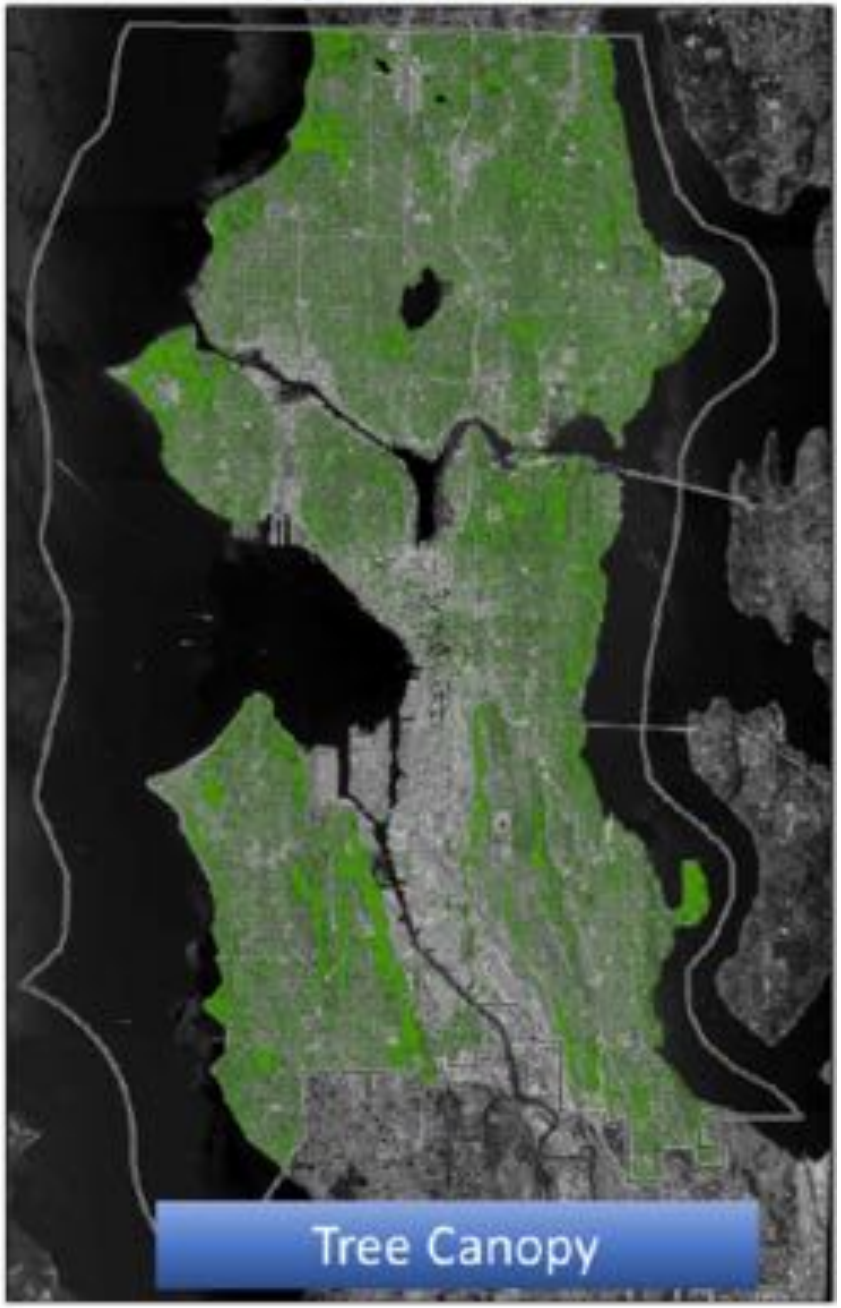


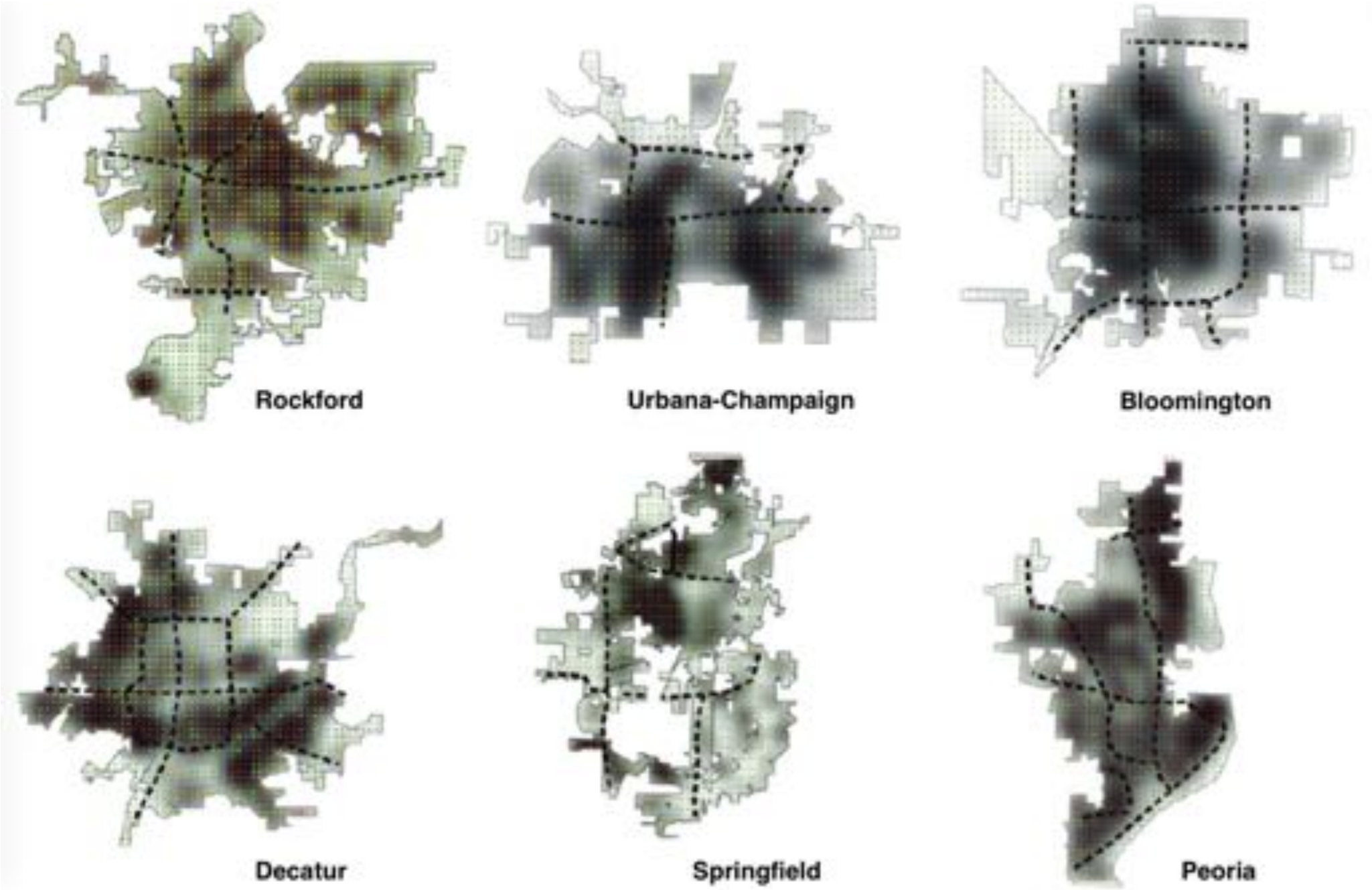
Figure 14. Figure describing percent tree canopy in relation to people of color. Each dot represents an EEA polygon.

Seattle's urban heat island hot spots correspond to low tree canopy areas





study in England (Mitchell & Popham 2008)
mortality stats (40 M population) & green space



Zhou, X., Kim, J. 2013. Social disparities in tree canopy and park accessibility: A case study of six cities in Illinois using GIS and remote sensing. Urban Forestry & Urban Greening

TOWARD A HEALTHY, EQUITABLE, AND SUSTAINABLE SEATTLE

The City of Seattle prioritizes actions and initiatives that foster healthy people, healthy communities, and a healthy and flourishing natural environment. Partnerships and collaboration among City departments, community organizations, and residents and businesses have been instrumental in advancing Seattle's environmental goals. This report provides a high-level overview of our accomplishments to date as well as highlights opportunities for improvement.

OUR COMMITMENT TO RACIAL EQUITY AND ENVIRONMENTAL JUSTICE

While Seattle has long been a pioneer for environmental progress, this success comes with a caveat. People of color, immigrants, refugees, people with low incomes and limited-English proficiency individuals bear a disproportionate burden of environmental health impacts, benefit less directly from our environmental progress, and environmental concerns of these communities often go unaddressed due to systemic racism and lack of data that includes a racial or economic analysis.

OSE's Equity & Environment Initiative is shifting the City's approach so those most affected by environmental challenges and racial-socio economic conditions will lead on designing solutions and directly benefit from our programs and policies.

Because of Seattle's history of land use and segregation, we can utilize a geographic approach to begin to understand racial inequity in Seattle. However, geographic considerations should not substitute for race as many of the concerns of communities would persist even if communities moved to a new location. Collecting data with a racial lens is a key way for the City to lead by example and understand our residents' experiences. Having this type of data is an important step in advancing racial and environmental justice in our work ahead.

SEATTLE
EEI focus areas

EQUITY & ENVIRONMENT INITIATIVE (EEI) FOCUS AREAS

These are the geographic areas where communities of color, immigrants, refugees, people with low incomes and limited-English proficiency individuals tend to live. These areas are highly impacted by socio-economic and environmental challenges.

In this report, we analyze, where possible, data as it relates to EEI focus areas or racial demographics of program users.

City of Seattle: Equity & Environment Initiative

TREES & GREEN SPACE

THRIVING & ACCESSIBLE

Trees and green spaces have significant environmental, economic, and social benefits including improving air and water quality, natural stormwater management and soil protection, and attracting people to local business districts and community spaces. The collective impact is significant: Seattle's urban forest removes 725 metric tons of pollution from the environment and sequesters carbon at a level valued at $11.7 million annually.

Seattle's reputation for being the "Emerald City" is well known, but residents do not experience those benefits consistently throughout the city. Large parts of Seattle—notably where our communities of color, immigrants, refugees, and residents with low incomes tend to live, learn, work and play—have less tree canopy cover than neighborhoods that are home to a majority of white, upper income residents. Seattle is working to address this disparity to bring the benefits of trees and green spaces to all our communities.

As our city continues to grow, protecting and enhancing our urban forest and green space remains a key priority in order to ensure the benefits of our natural assets are enjoyed by all Seattle residents.

Achieve a 30% canopy cover by 2037

We achieved a

28%

CANOPY COVER

in Seattle in 2016.

However, our EEI focus areas only had a

20%

CANOPY COVER

in 2016.

Area of Seattle where people of color and people with low incomes tend to live have less tree canopy then the rest of Seattle.

THRIVING & ACCESSIBLE GREEN SPACE

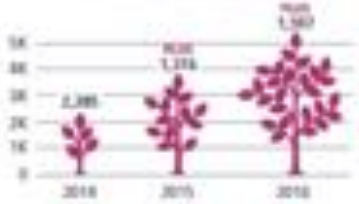
OUR PATH TO SUCCESS

Increase Seattle's tree canopy

SEATTLE DEPARTMENTS PLANTED

5,298

TREES SINCE 2014



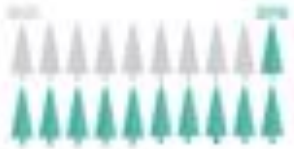
During the same time frame, forest stewards have planted over 40,000 seedlings as part of our forest restoration efforts!

Restore 2,500 acres of forested parkland by 2025

SEATTLE HAS RESTORED

1,374

ACRES OF FORESTED PARKLANDS and other designated natural areas since 2005 through the Green Seattle Partnership.



Develop new parks at land-banked sites

SEATTLE CURRENTLY HOLDS

14

UNDEVELOPED PARKS

With funding from the Seattle Park District, the City will begin planning for the development of all 14 parks by 2018.

Provide 3 acres of open space per 1,000 people

SEATTLE CURRENTLY HAS

9.34

ACRES PER 1,000 RESIDENTS

Seattle Parks & Recreation is currently updating the development plan and gap analysis and the thresholds for open space are subject to review as part of this process.

TRACKING, MEASURING, AND SHARING THE ENVIRONMENTAL BENEFITS OF TREES

In 2016, Seattle Department of Transportation (SDOT) launched the Street Tree Management Plan—a 9-year targeted approach to improve the condition of Seattle's street trees. To do this, they organized the city into 27 management units, and will prioritize 3 per year for tree planting, maintaining, and inventorying. Tree maintenance crews worked in South Park/Highland Park neighborhood during 2016, where they inventoried over 6,000 trees, planted 144 trees, and maintained 700 trees. Collectively, these trees provide benefits worth over $375,000 annually through energy savings, carbon sequestration, air quality, and aesthetics.

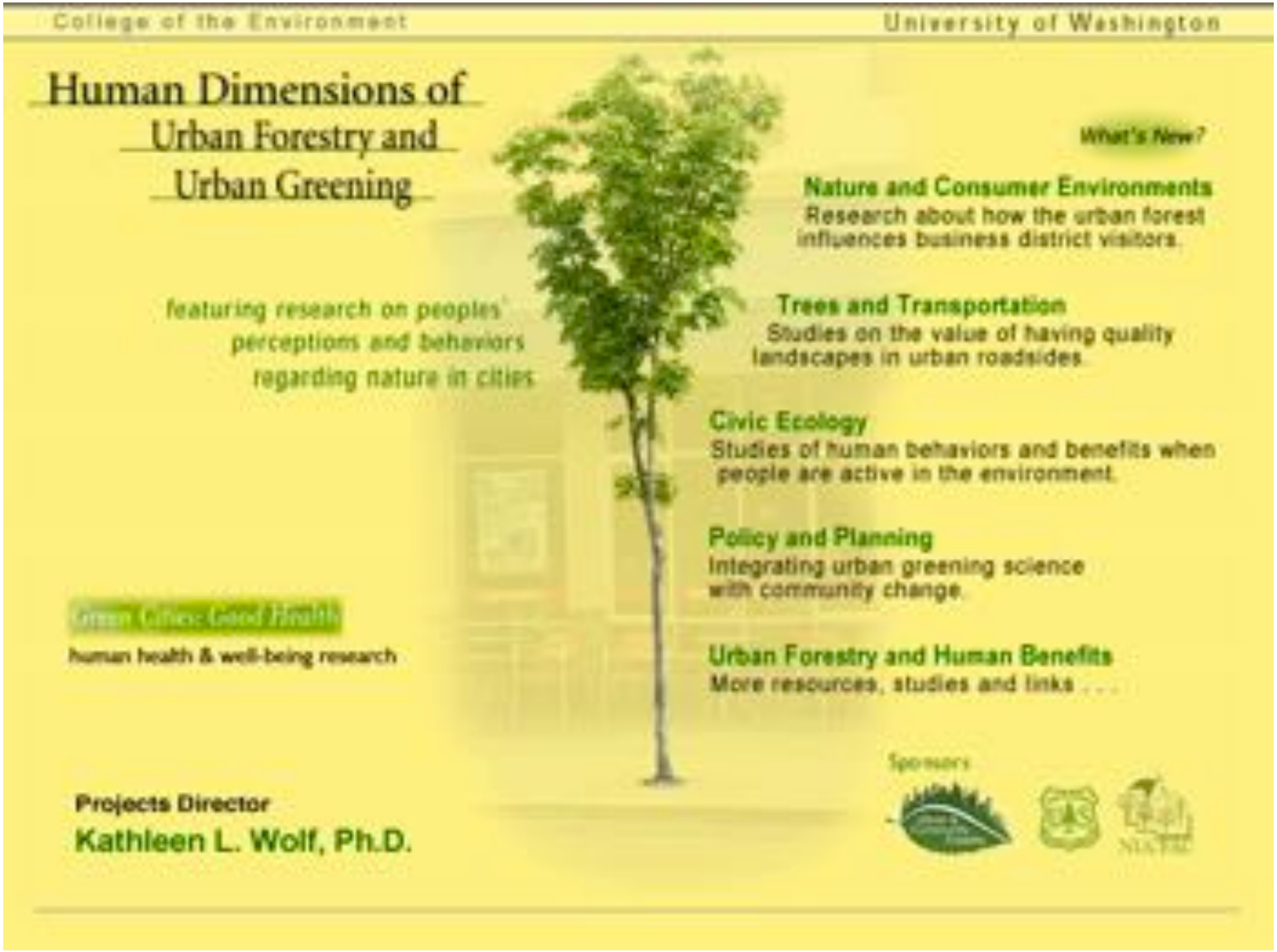
Photo provided by SDOT

Summary

Nature & Health Evidence

Attaining Environmental Health

Nearby Nature for Everyone

Environmental Equity

www.naturewithin.info