

Urban Ecosystem Services & Their Value

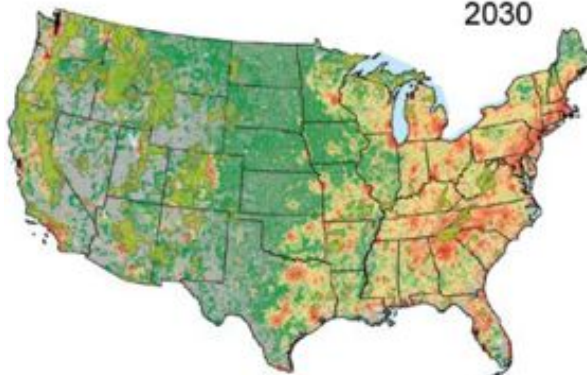
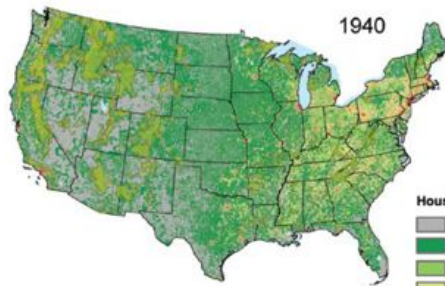
Kathleen Wolf, Ph.D.
Research Social Scientist
University of Washington
May 2011



1

Urbanization Trends (USFS)

> 80% of US
population lives in
urbanized areas



2

•urbanism:

- efficiencies
- smaller footprint
- livable communities
- conservation of working lands
- location choice

The Triumph of Cities. Edward Glaeser, 2011.

Green Metropolis: Why Living Smaller, Living Closer, and Driving Less are the Keys to Sustainability
David Owen, 2009



Ecosystem Services Typology

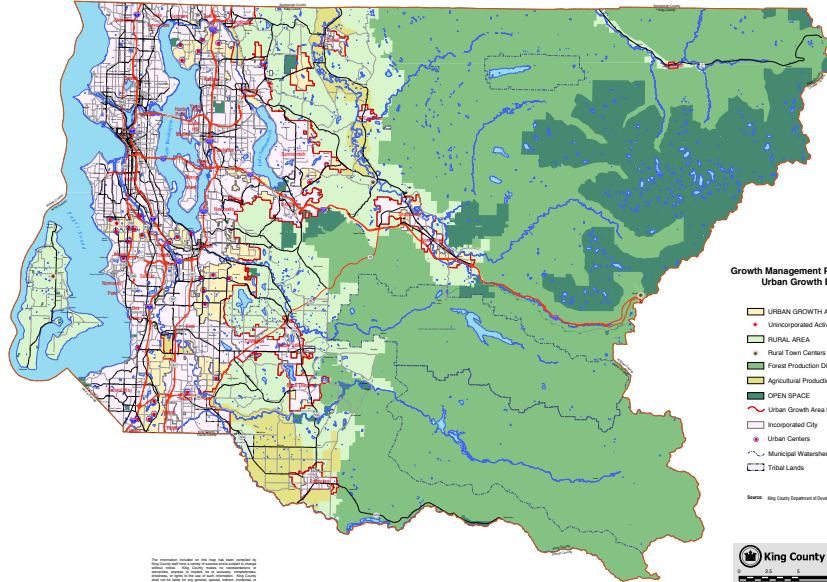
Millennium Ecosystem Assessment 2005

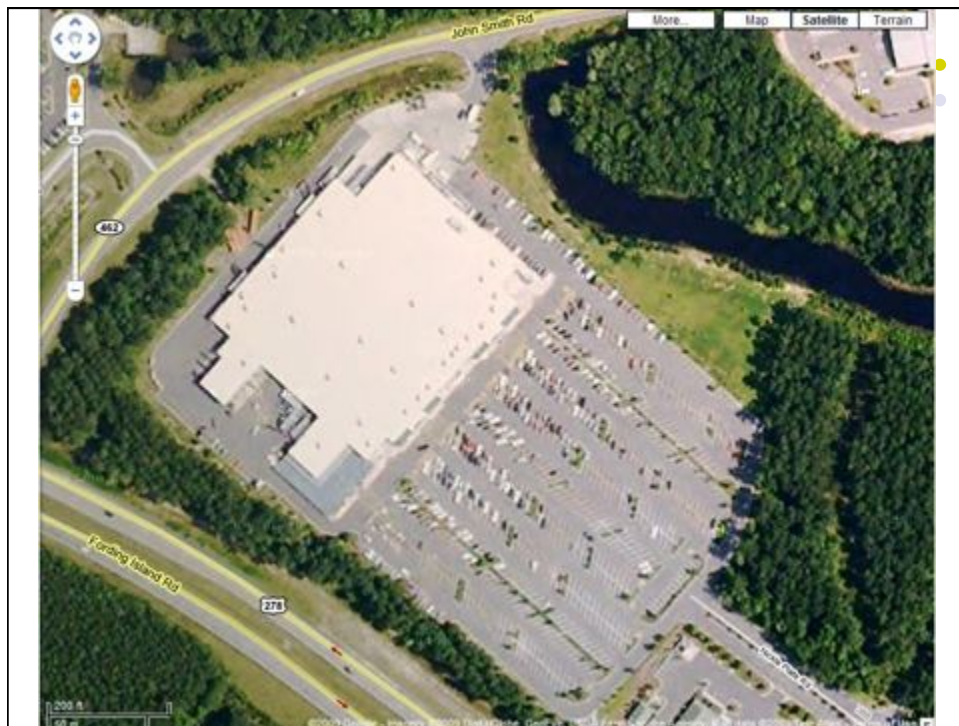
ECOSYSTEM SERVICES	
Supporting Services Nutrient cycling Soil formation Primary production	Provisioning Services Food (crops, livestock, wild foods, etc...) Fiber (timber, cotton/hemp/pulch, wood fuel) Genetic resources Biochemicals, natural medicines, pharmaceuticals Fresh water
	Regulating Services Air quality regulation Climate regulation (global, regional, and local) Water regulation Erosion regulation Water purification and waste treatment Disease regulation Pest regulation Pollination Natural hazard regulation
	Cultural Services Aesthetic values Spiritual and religious values Recreation and ecotourism

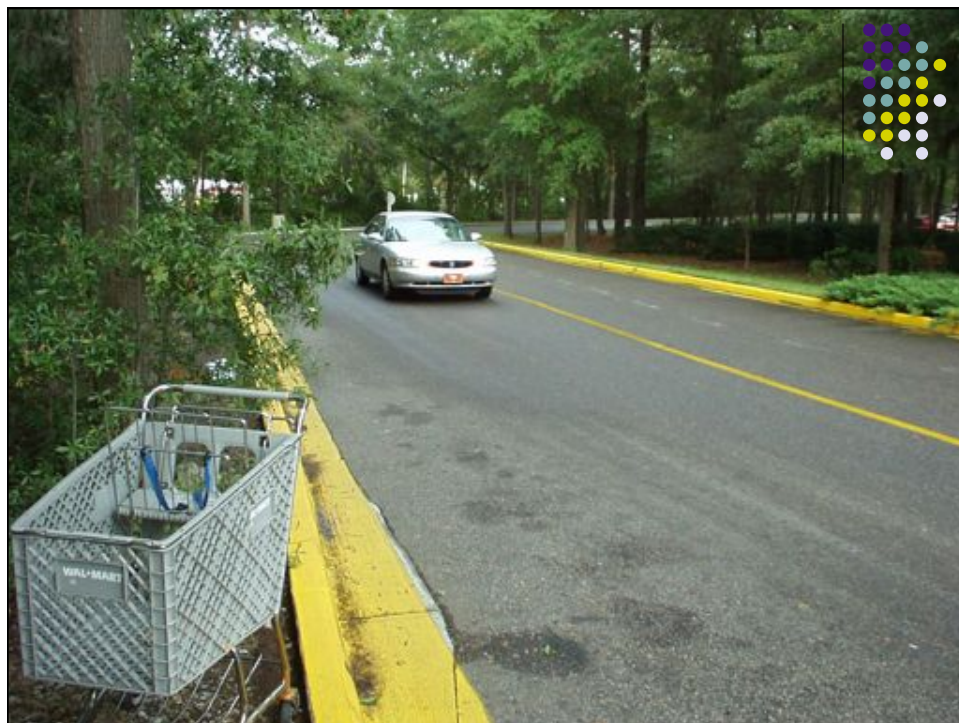
landscape
gradient

urban
suburban
exurban
rural
wildland

King County









12

THE SUSTAINABLE SITES INITIATIVE™



An Integrated Approach

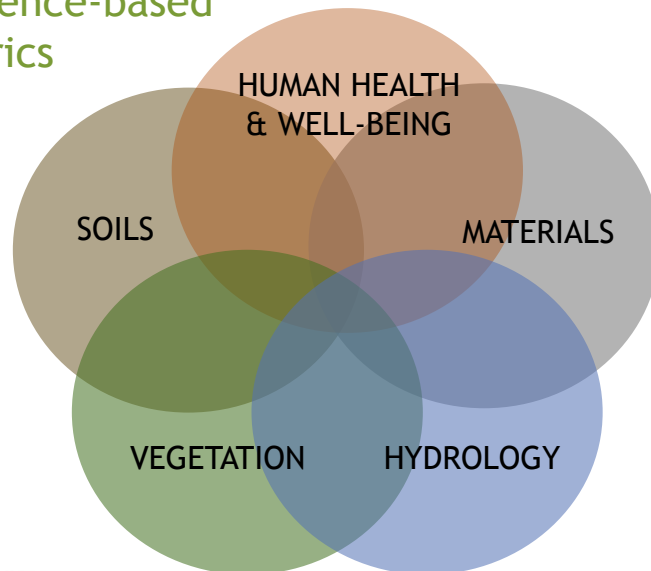


ECOSYSTEM SERVICES

*All sites **CAN** provide ecosystem services*



Evidence-based Metrics





What are the source landscapes for urban ecosystem services?

parks, trees, open space, and

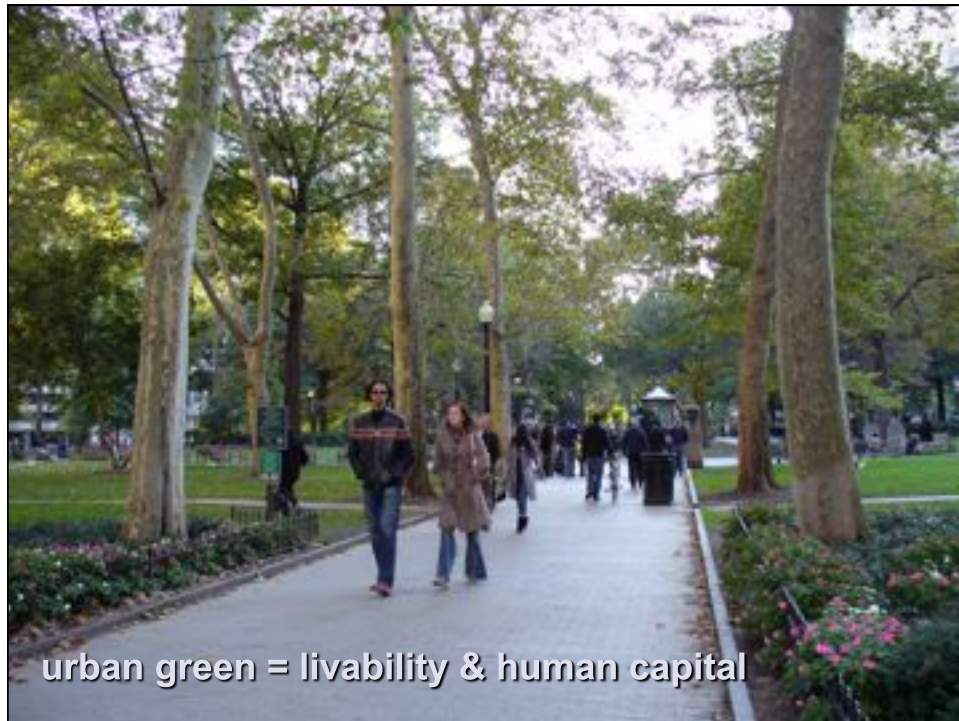
15

Nature & Livable Cities

“multi-tasking” green infrastructure



16



Open Space Stewardship Volunteers



collaborative
resource
management
**Elinor
Ostrom**

18

Community Gardens

food security :: community cohesion



19

hospitals: healing gardens



20

Gardens & Horticulture Therapy



Green Roof - Chicago City Hall



high-rise nature,
preferred views

energy savings,
stormwater
management



22

The High Line :: June 2009



**How are
urban ecosystem services
assessed or measured?**



i-Tree Suite of Software



**Urban Environmental Services
USDA Forest Service**



i-Tree Eco Seattle sample plots

Commercial/Mixed Use	19
Developed Park or Boulevard	20
Downtown	19
Major Institutions	20
Manufacturing/Industrial	19
Multi-family Residential	0
Natural Area Parks	20
Single-family Residential	68
2010 Completed Plots	185

USDA Forest Service
Cascade Land Conservancy
King County, City of Seattle

Conserving Energy



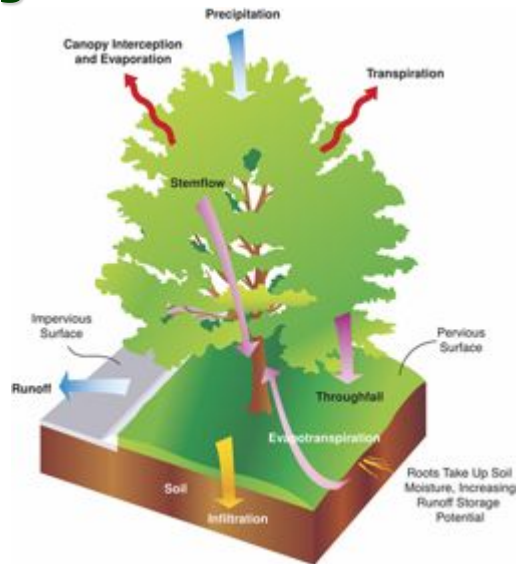
USDA Forest Service, Center for Urban Forest Research

Reducing Atmospheric Carbon Dioxide



USDA Forest Service, Center for Urban Forest Research

Reducing Stormwater Runoff



USDA Forest Service, Center for Urban Forest Research

Why are city trees & urban greening important?



human health,
functioning, &
well-being





human health & well-being as urban ecosystem services

31



Ecosystem Services

Millennium Ecosystem Assessment 2005

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	Cultural Services Aesthetic values Spiritual and religious values Recreation and ecotourism

**cultural
services**

**aesthetic
spiritual
religious
recreation
ecotourism**

**+ much
more!**

32

Finding that study



Research Reviews

Urban Forestry/Urban Greening Research

Green Cities: Good Health

INTRODUCTION RESOURCES FUTURE RESEARCH REFERENCES

Metro nature - including trees, parks, gardens, and natural areas - enhance quality of life in cities and towns. The experience of nature improves human health and well-being in many ways. Nearly 40 years of scientific studies tell us how. Here's the research ...

RESEARCH THEMES

- Livable Cities
- Place Attachment & Meaning**
- Community Building
- Community Economics
- Social Ties
- Crime & Fear
- Reduced Risk
- Wellness & Physiology
- Active Living
- Healing & Therapy
- Mental Health & Functioning



**first phase:
June 2010**

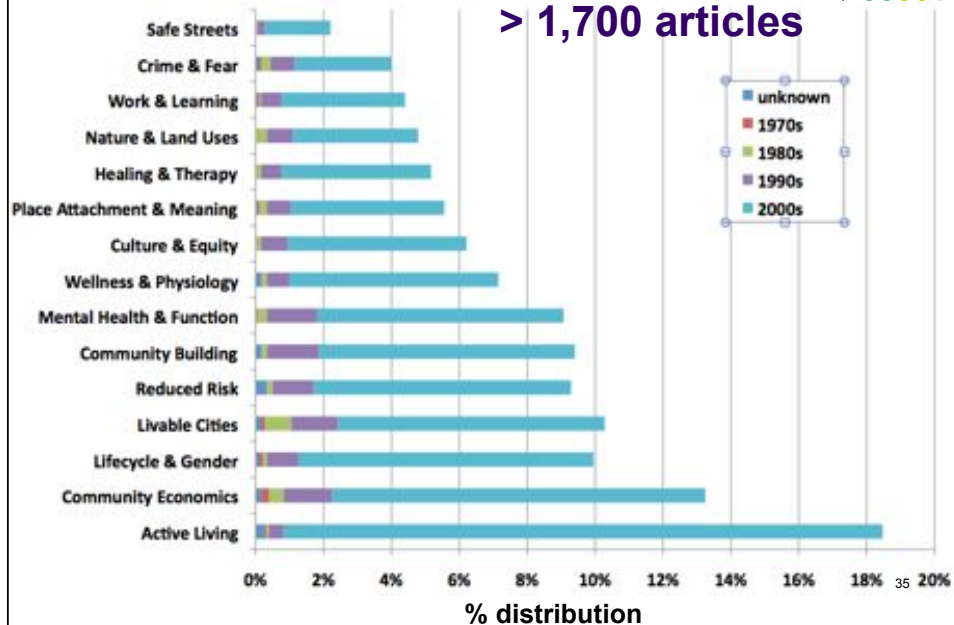
**summaries
complete:
July 2011**

**additional
products
June 2012**

www.greenhealth.washington.edu

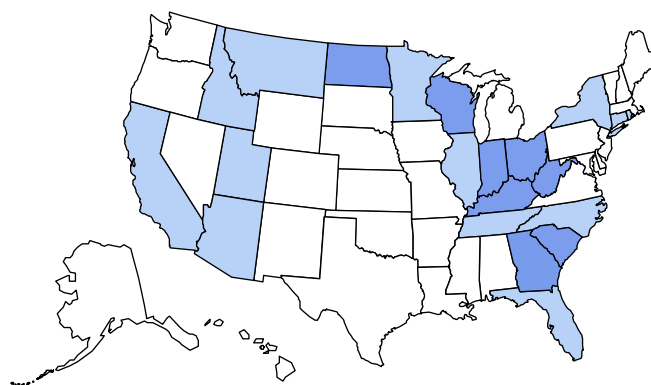
sponsors: Univ of WA; USDA Forest Service, U&CF Program; ARRA³⁴





Obesity Trends* Among U.S. Adults

(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



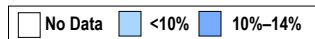
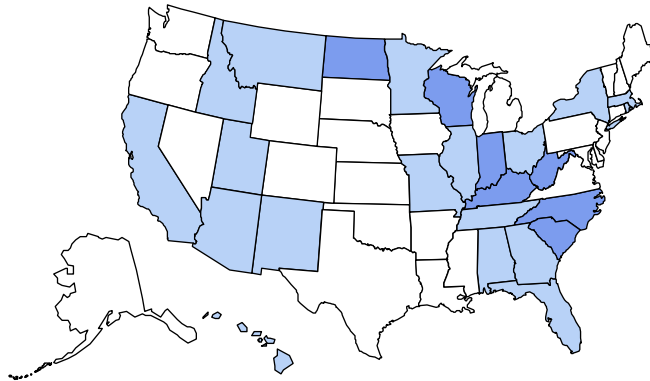
No Data
 <10%
 10%–14%



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1986

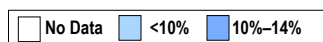
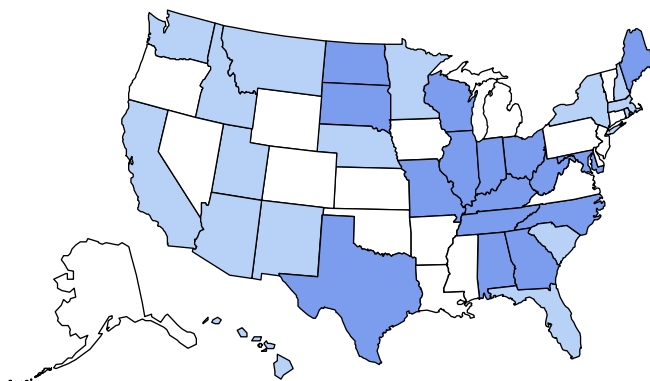
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1987

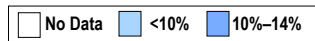
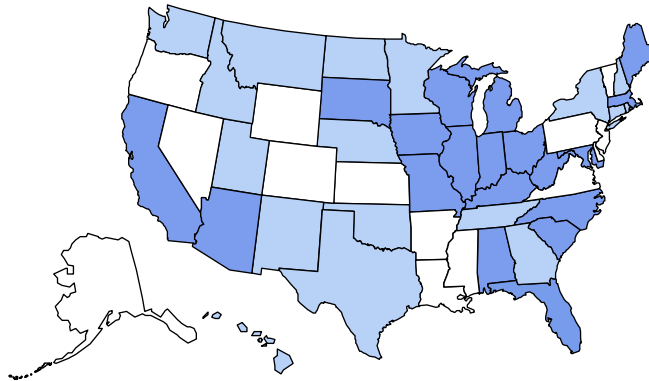
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1988

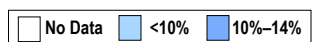
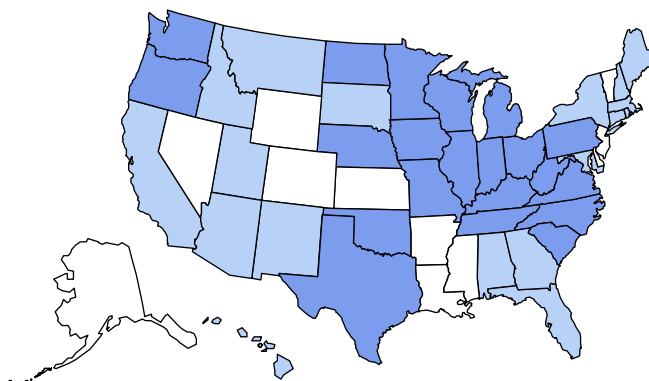
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

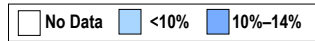
Obesity Trends* Among U.S. Adults 1989

(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



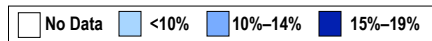
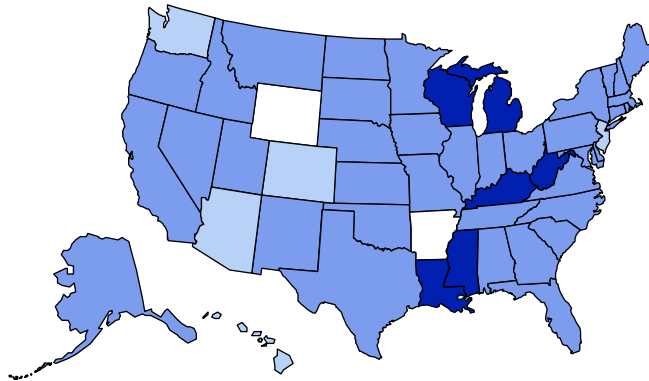
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1992

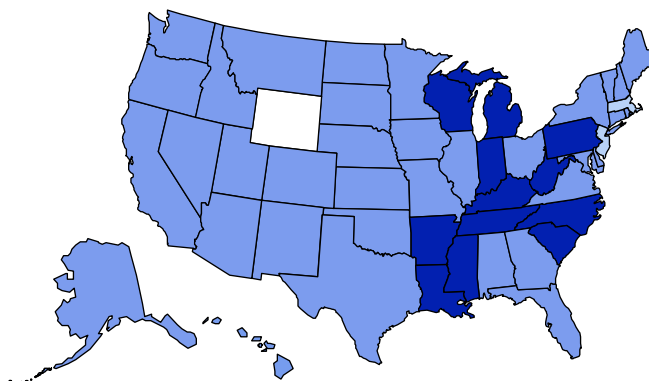
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1993

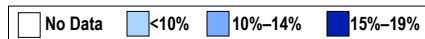
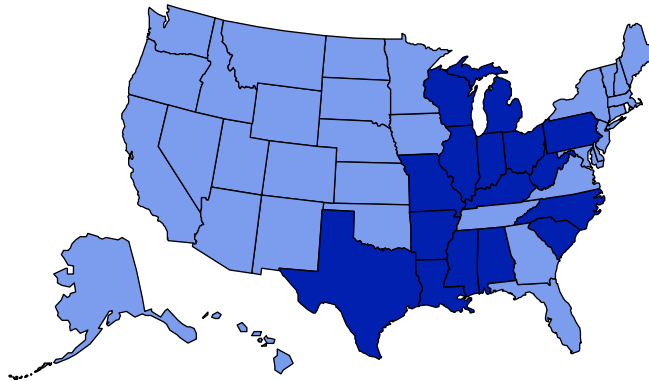
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1994

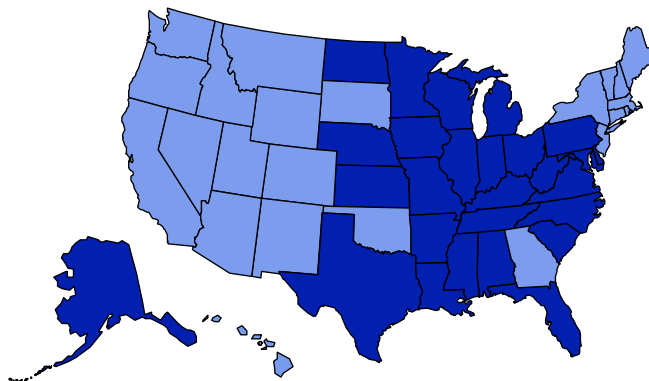
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1995

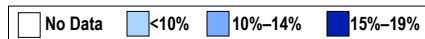
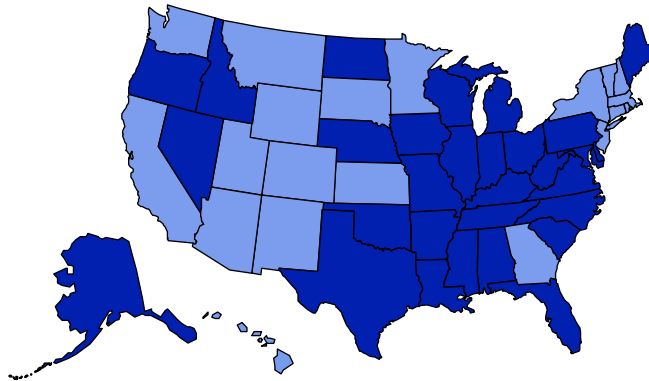
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1996

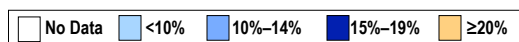
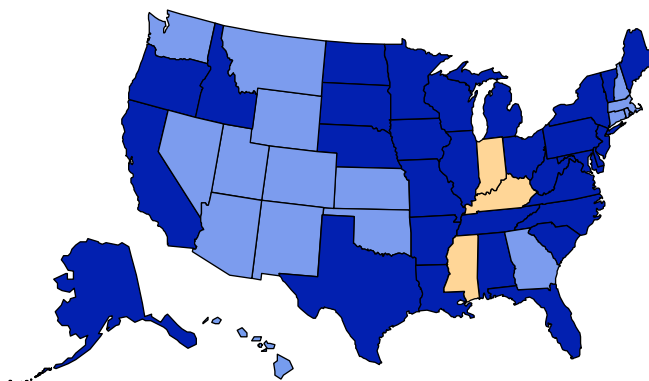
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1997

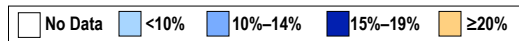
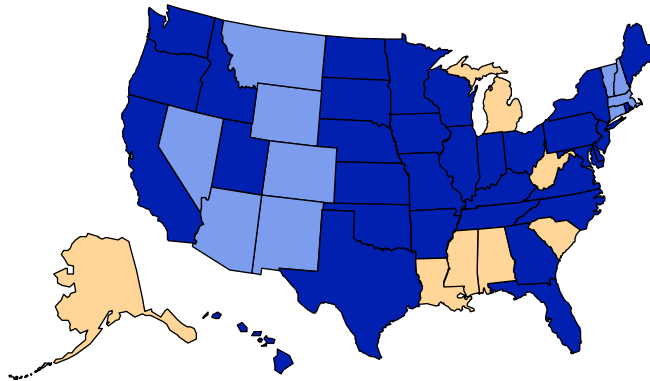
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1998

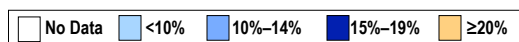
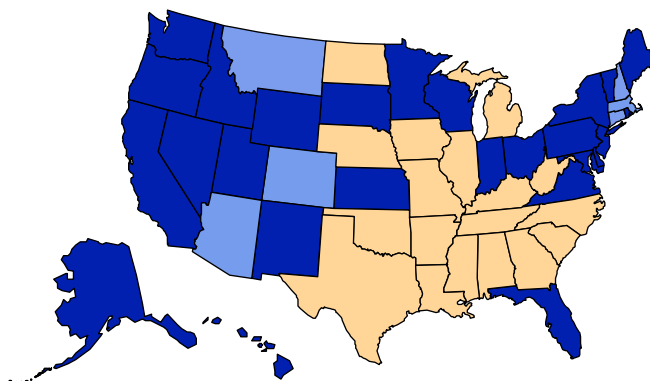
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 1999

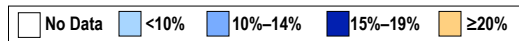
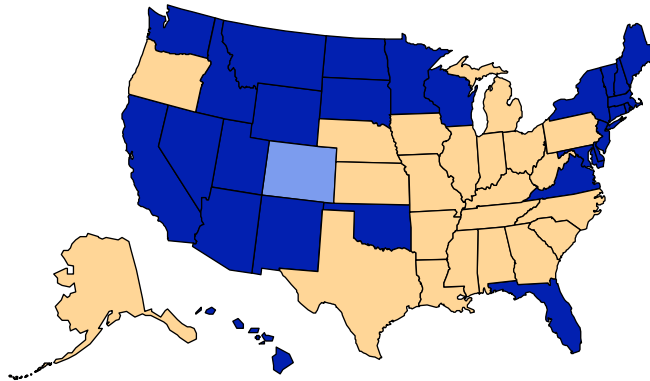
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 2000

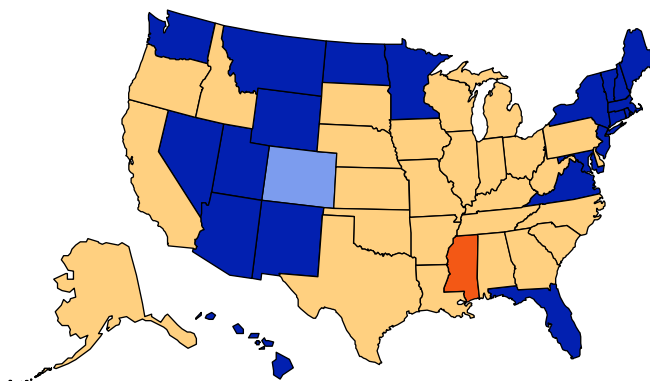
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 2001

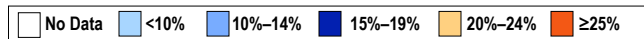
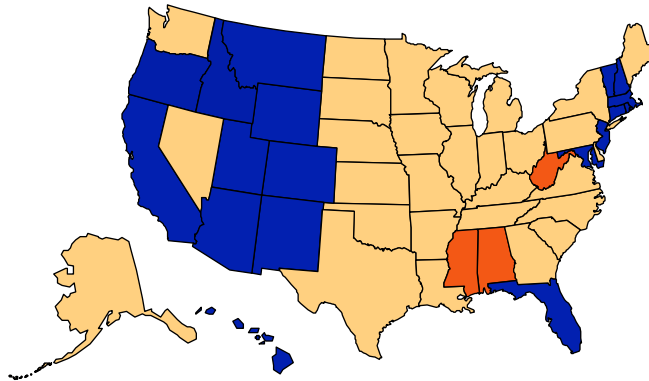
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 2002

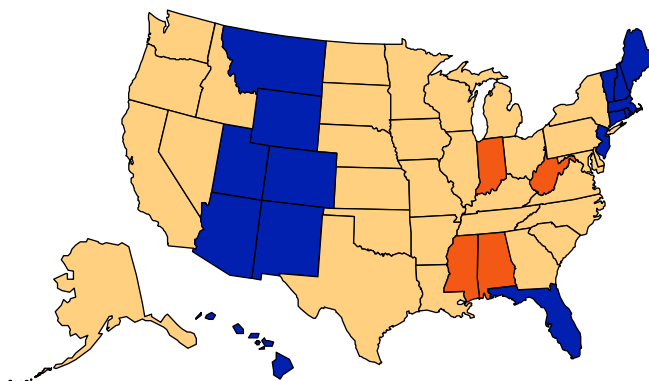
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 2003

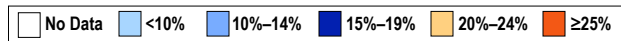
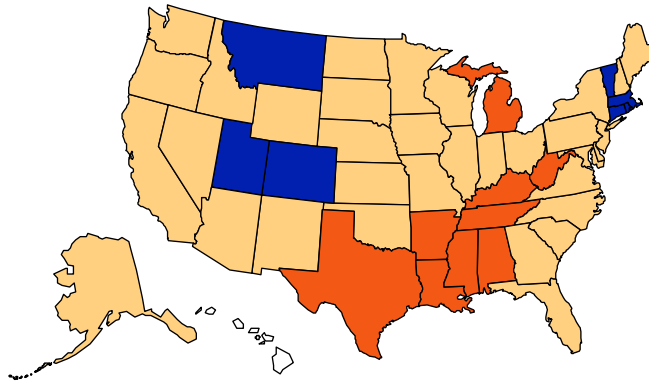
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 2004

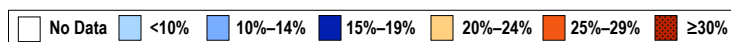
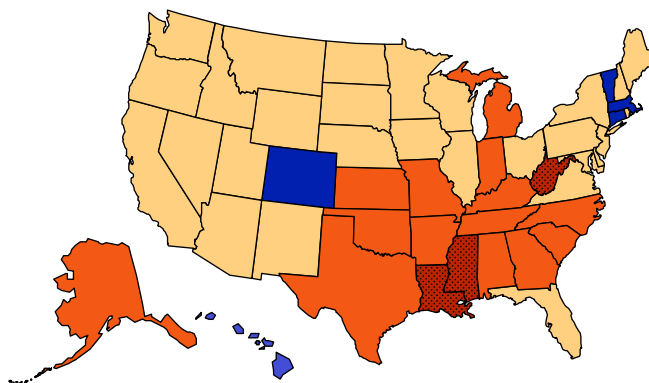
(*BMI ≥ 30 , or ~ 30 lbs. overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 2005

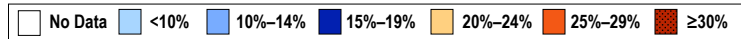
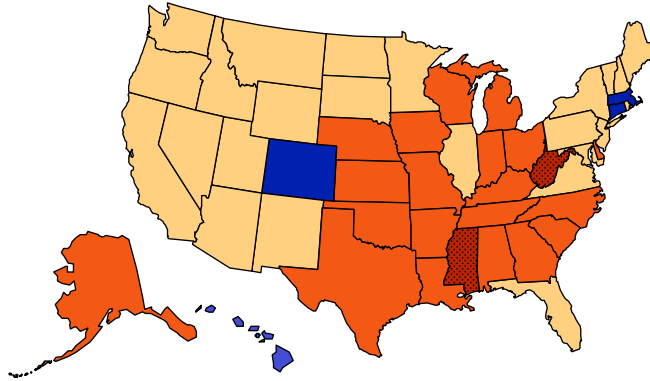
(*BMI ≥ 30 , or ~ 30 lbs. overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 2006

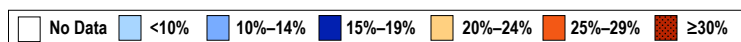
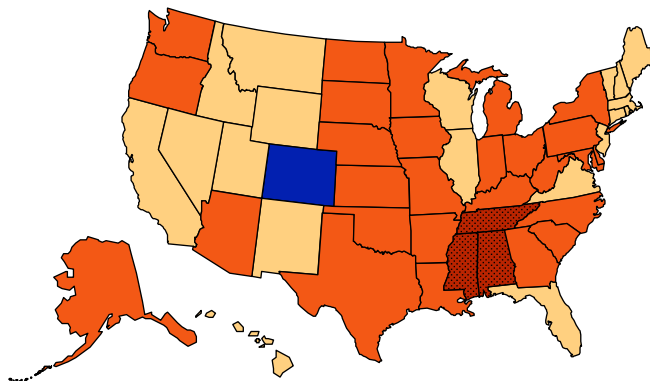
(*BMI ≥ 30 , or ~ 30 lbs. overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Obesity Trends* Among U.S. Adults 2007

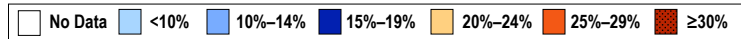
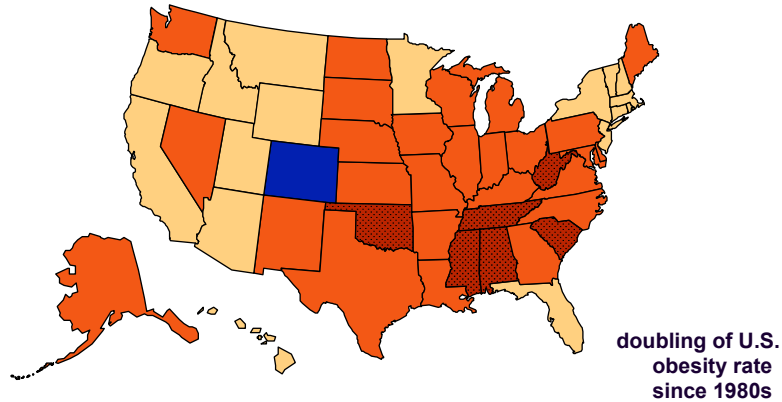
(*BMI ≥ 30 , or ~ 30 lbs. overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

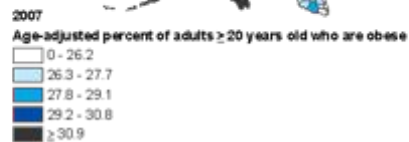
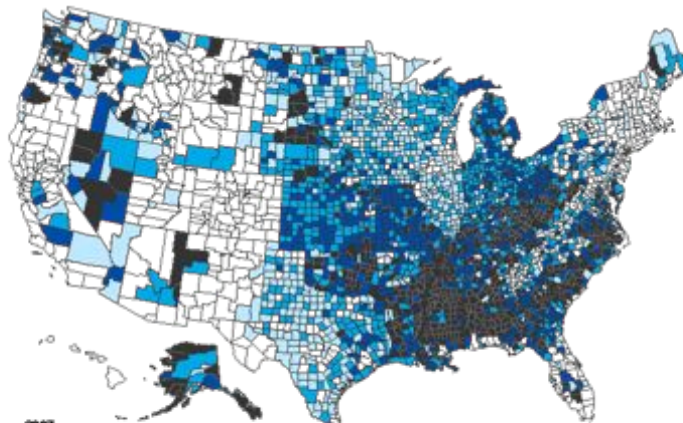
Obesity Trends* Among U.S. Adults 2008

(*BMI ≥ 30 , or ~ 30 lbs. overweight for 5' 4" person)



Source: Behavioral Risk Factor Surveillance System, CDC.

Age-adjusted % of adults aged ≥ 20 years who are obese, 2007



MMWR 58:1259-1263, 2009

Physical Inactivity & Obesity

majority of Americans not active enough
goal-30 minutes per day of moderate activity
to reduce risk factors for chronic diseases
(heart, stroke, cancer, diabetes)
significant costs to national health services

\$168 billion medical costs
17% of all U.S. medical costs

CDC 2010

61

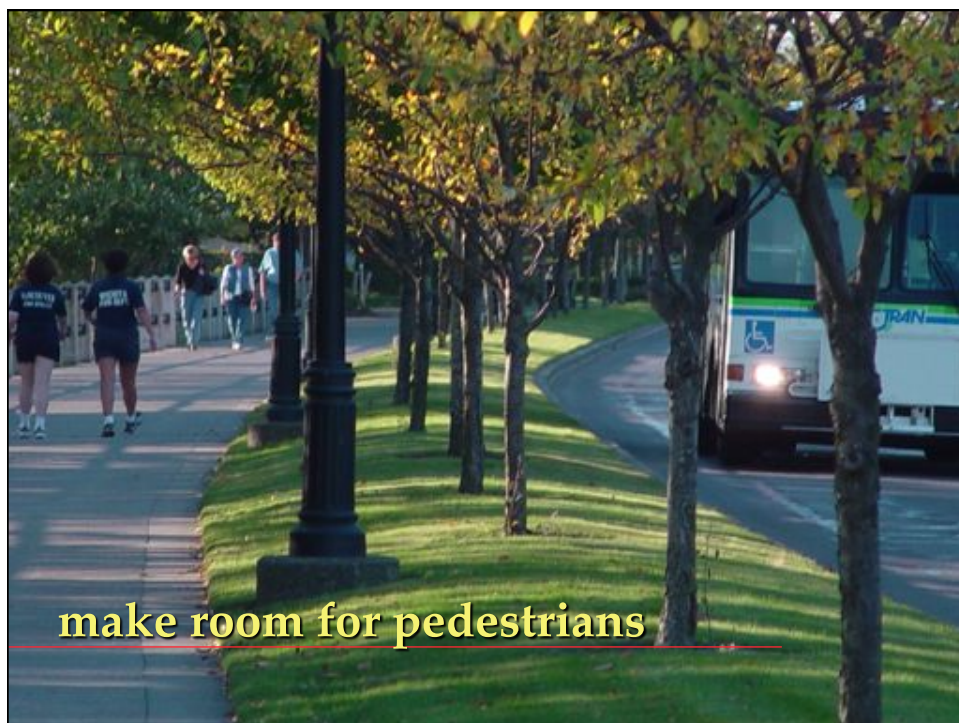
Urban Forestry & Greening Active Living



	Positive Elements
Physical Environment	higher population density (city core rather than suburbs) higher housing density mix of land uses (such as residential and retail) street design with more connectivity (rather than cul-de-sacs) availability of public transit walking and biking infrastructure (such as sidewalks and bike lanes)
Psycho-Social Environment	safety from crime safety from traffic absence of social disorder aesthetics (including trees and landscape) educational campaigns (such as Walk-to-School) incentive programs (such as work place reimbursement for transit use)

Table 1: Determinants of City Walkability

62



Nature, Human Health & Walkable Neighborhoods



- Environments: Neighborhood Streets (Tokyo)
 - tree - lined
 - parks
- Outcomes: Elderly People & Walking
 - less illness
 - lower mortality rate

Takano, Nakamura, Watanabe. 2002.
Journal of Epidemiology & Community Health

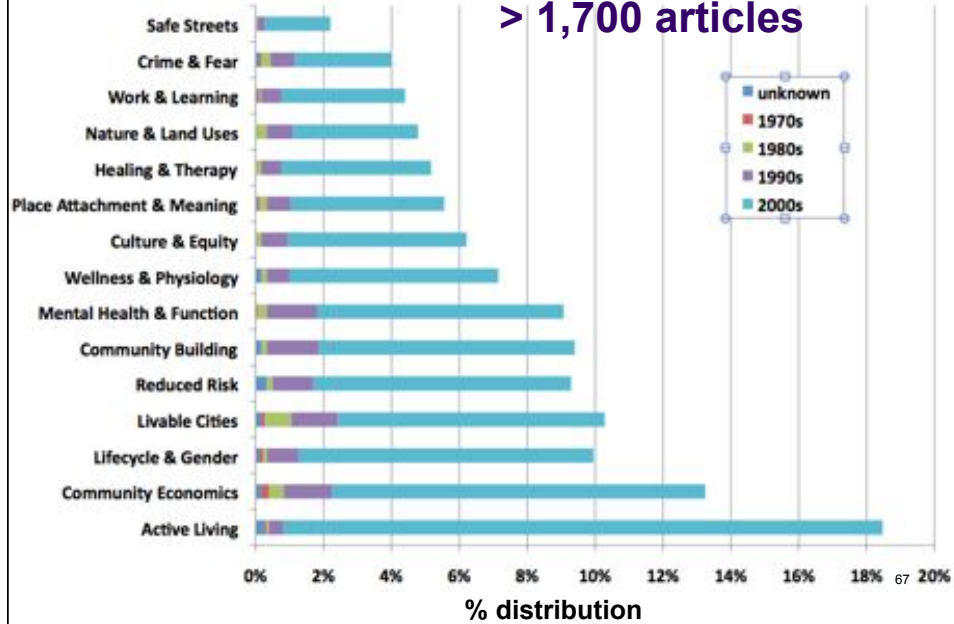
65



walkable places = health & happiness

Urban Green :: Public Health & Well Being

> 1,700 articles



Work & Learning



68



the nature advantage

- College students with more natural views from their dorm windows
 - scored higher on tests of capacity to direct attention
 - rated themselves as able to function more effectively

Tennessen & Cimprich. 1995.
Journal of Environmental Psychology

69

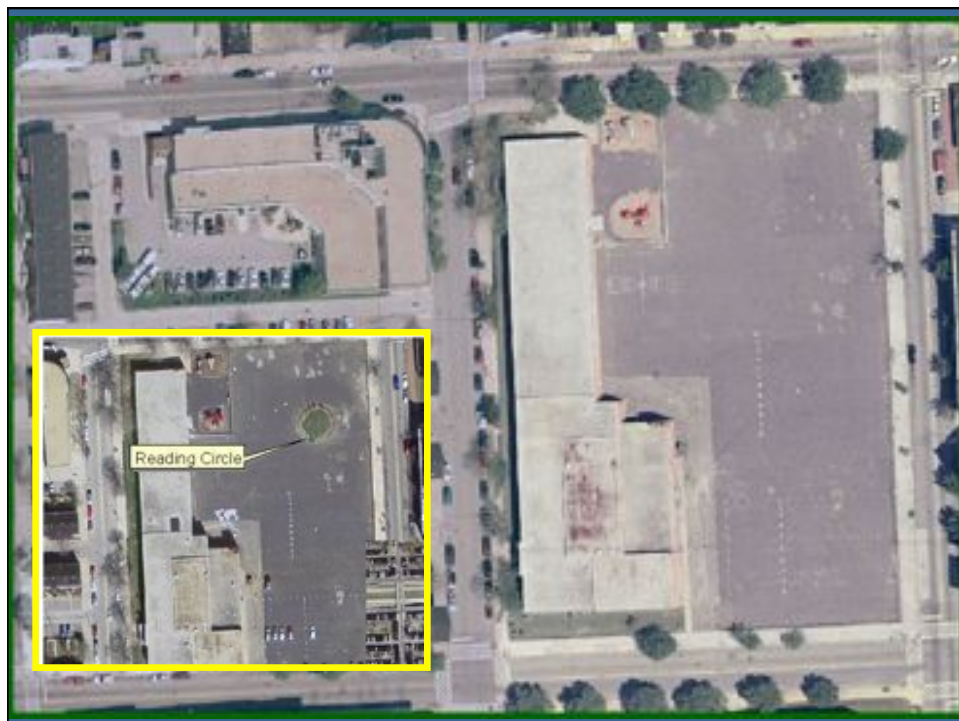
Matsuoka. 2010. Landscape & Urban Planning

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

70







Kaplan, R. 1993.
Landscape & Urban Planning



Workplace Nature Views

- 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

76



the
better
office
cubicle!

bottom line =
\$\$ benefits of trees & nature



in closing

Ecosystem Services

Millennium Ecosystem Assessment 2005

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	Cultural Services Aesthetic values Spiritual and religious values Recreation and ecotourism

cultural
services

aesthetic
spiritual
religious
recreation
ecotourism

+ much
more!

79

ECOSYSTEM SERVICES

All sites *CAN* provide ecosystem services



BROWNFIELD



GREYFIELD



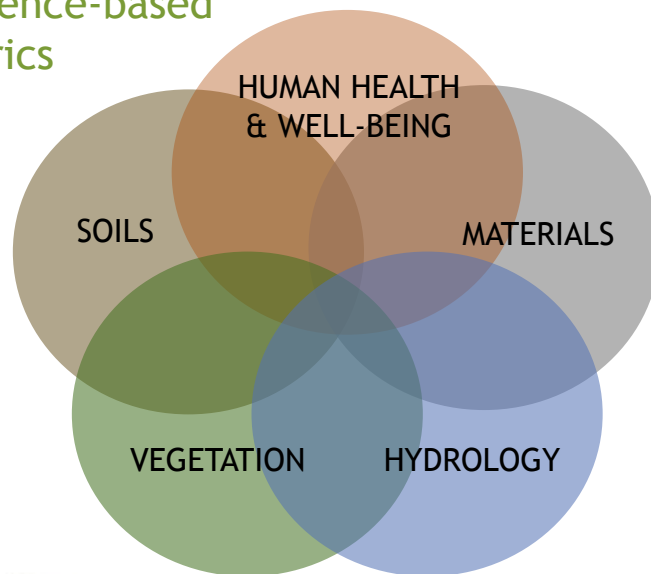
GREENFIELD



80

© 2009 Sustainable Sites Initiative

Evidence-based Metrics



81

© 2009 Sustainable Sites Initiative

Research Reviews

Urban Forestry/Urban Greening Research

Green Cities: Good Health

UNIVERSITY OF WASHINGTON

INTRODUCTION RESOURCES FUTURE RESEARCH REFERENCES

Metro nature - including trees, parks, gardens, and natural areas - enhance quality of life in cities and towns. The experience of nature improves human health and well-being in many ways. Nearly 40 years of scientific studies tell us how. Here's the research ...

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- Liveable Cities
- Place Attachment & Meaning
- Community Building
- Community Economics
- Social Ties
- Crime & Fear
- Reduced Risk
- Wellness & Physiology
- Active Living
- Healing & Therapy
- Mental Health & Functioning

www.greenhealth.washington.edu

sponsors: Univ of WA; USDA Forest Service, U&CF Program; ARRA⁸²





www.naturewithin.info

83