Urban Sustainability

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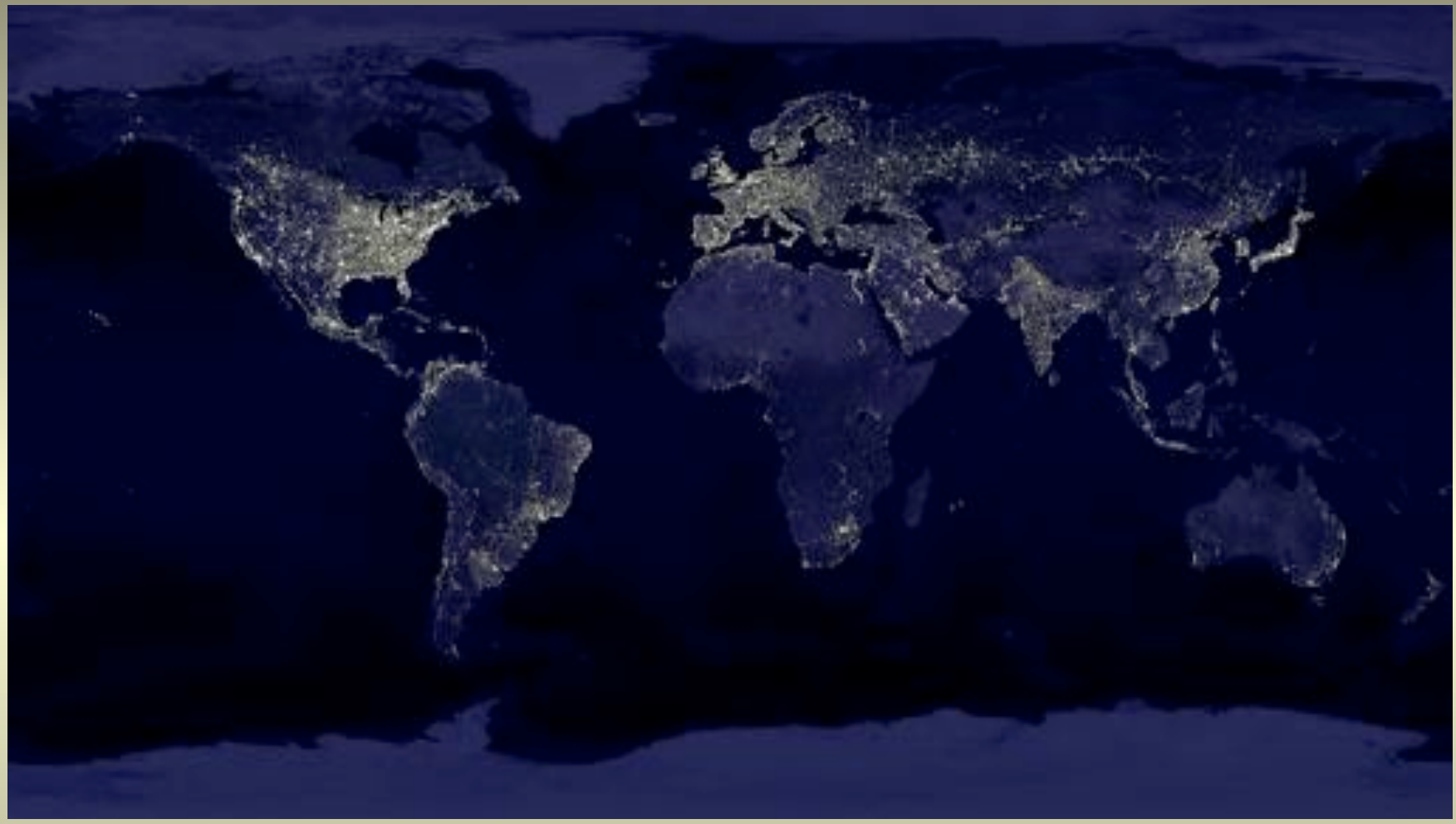
Presentation

- urbanization trends
- urban ecology examples

- sustainability systems
  - assessment
  - Sustainable Sites Initiative - voluntary
  - Seattle Green Factor - regulatory



Global Urbanization

1900 - 14% of humanity lived in urban areas, 2000 - 47%

Trends:

- increase in urban populations
- more density & compact spaces

planting &
restoration
strategies

ecology of
compact spaces

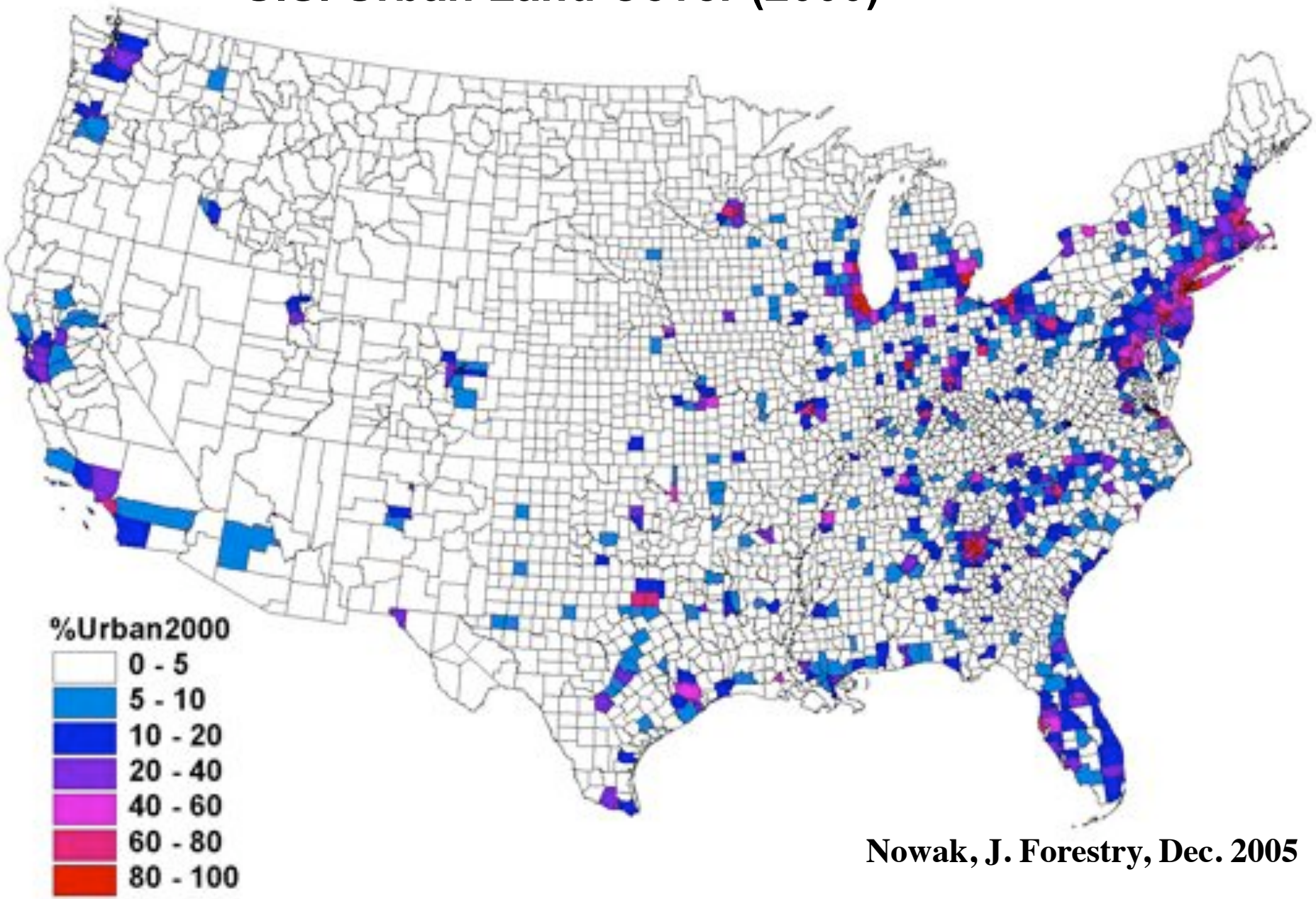
Washington State: Growth Mgmt Act

- effective tree retention
- new plantings in compact spaces

National Trends - Urbanization

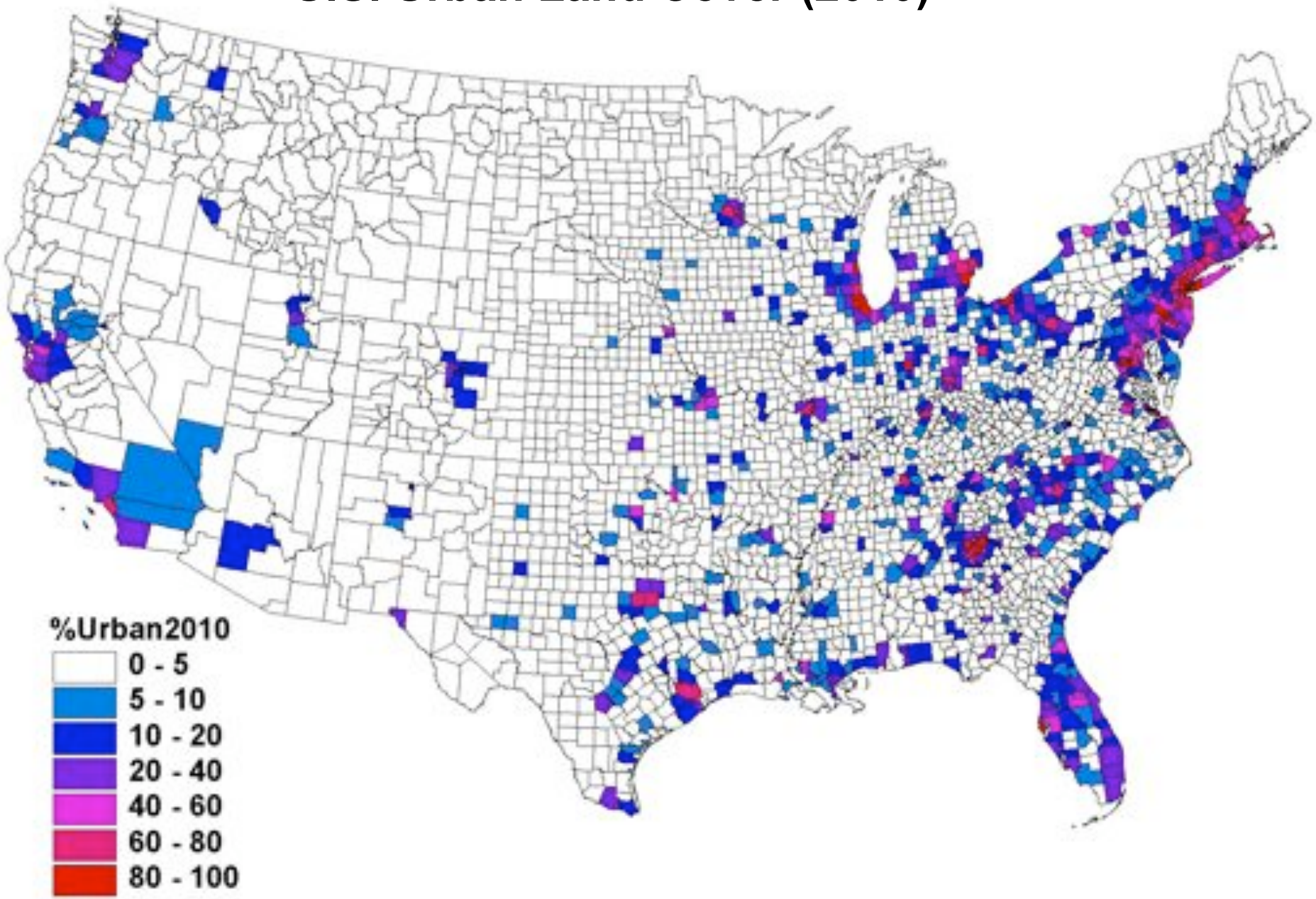
time series model - now to future

U.S. Urban Land Cover (2000)

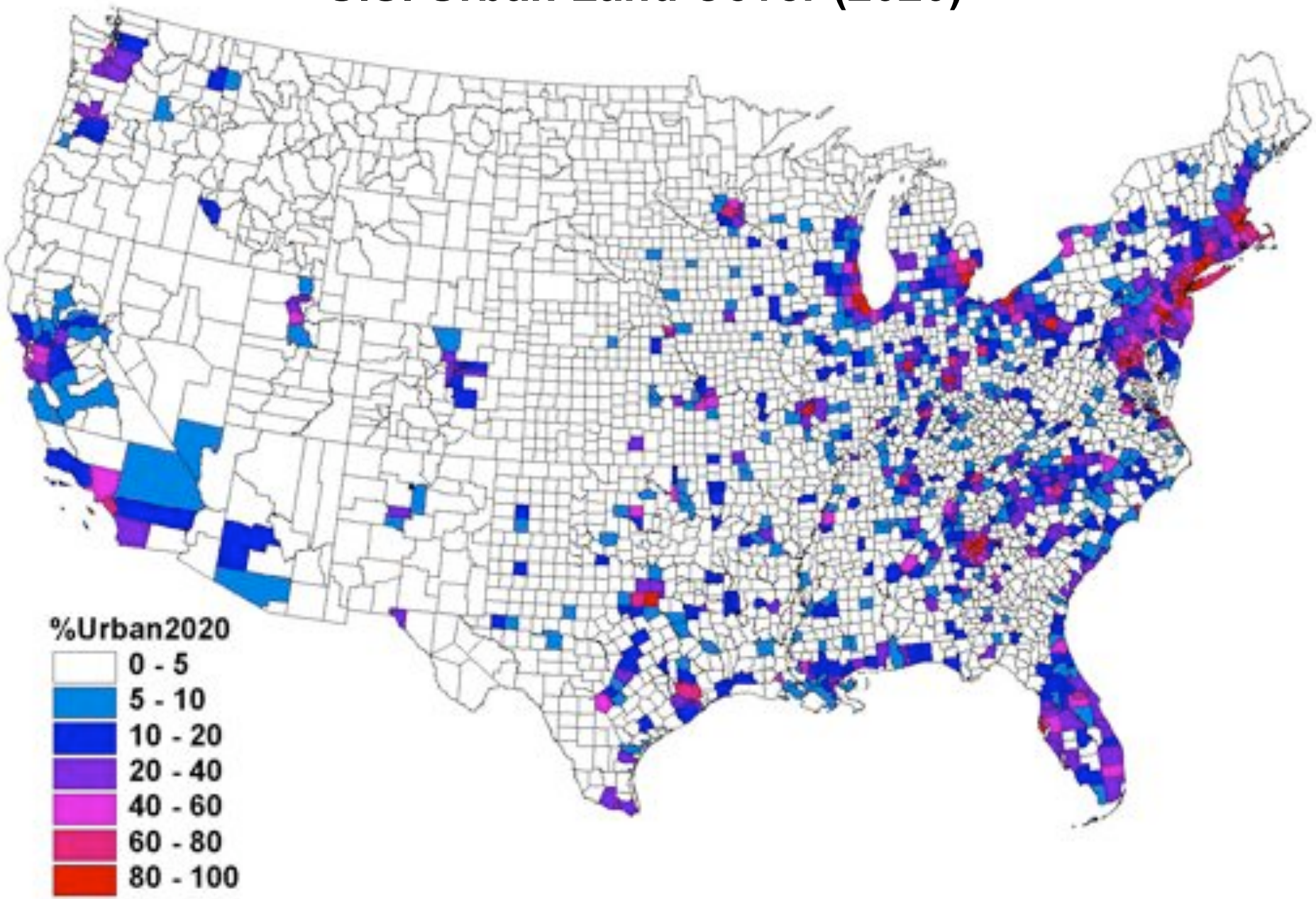


Nowak, J. Forestry, Dec. 2005

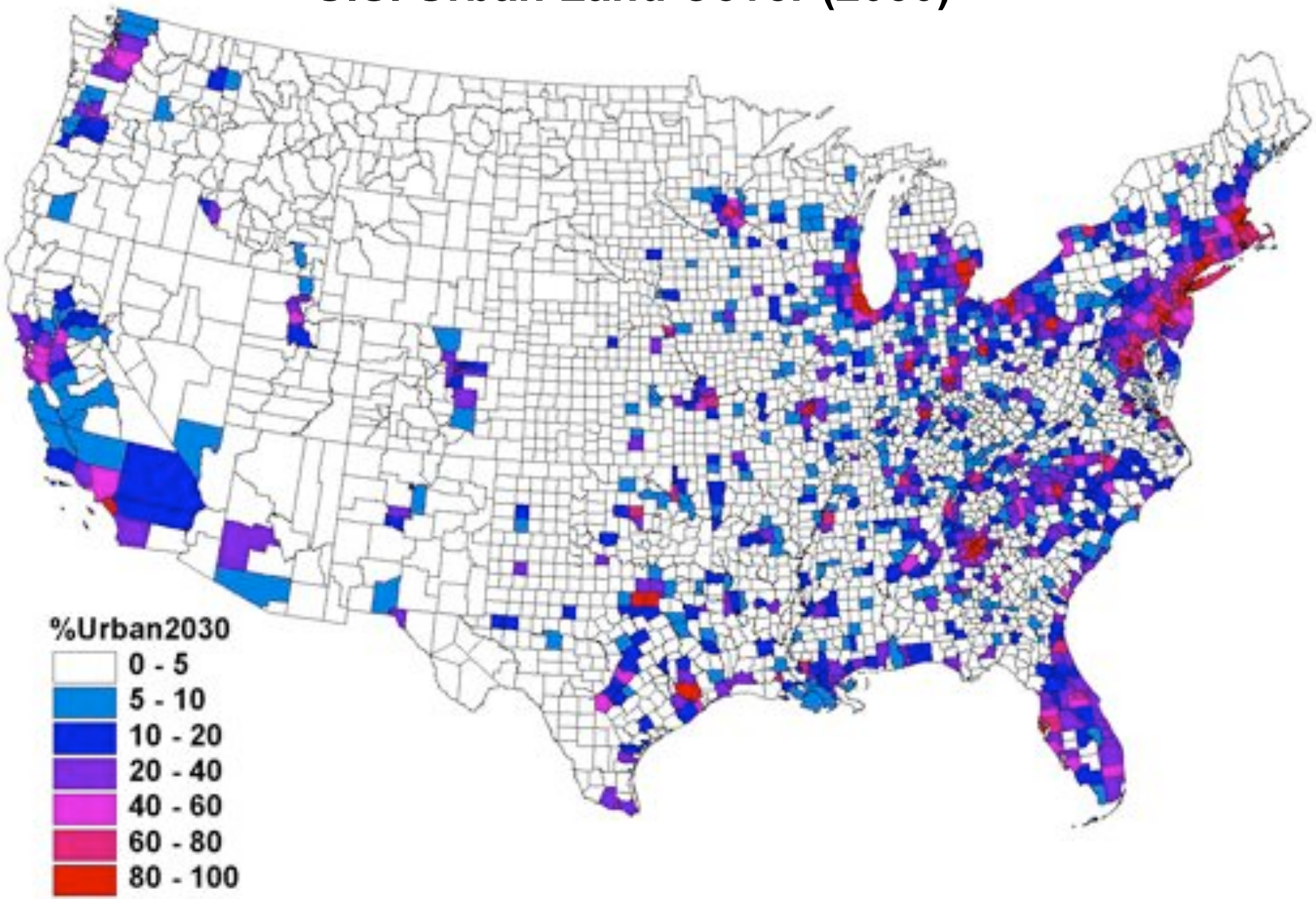
U.S. Urban Land Cover (2010)



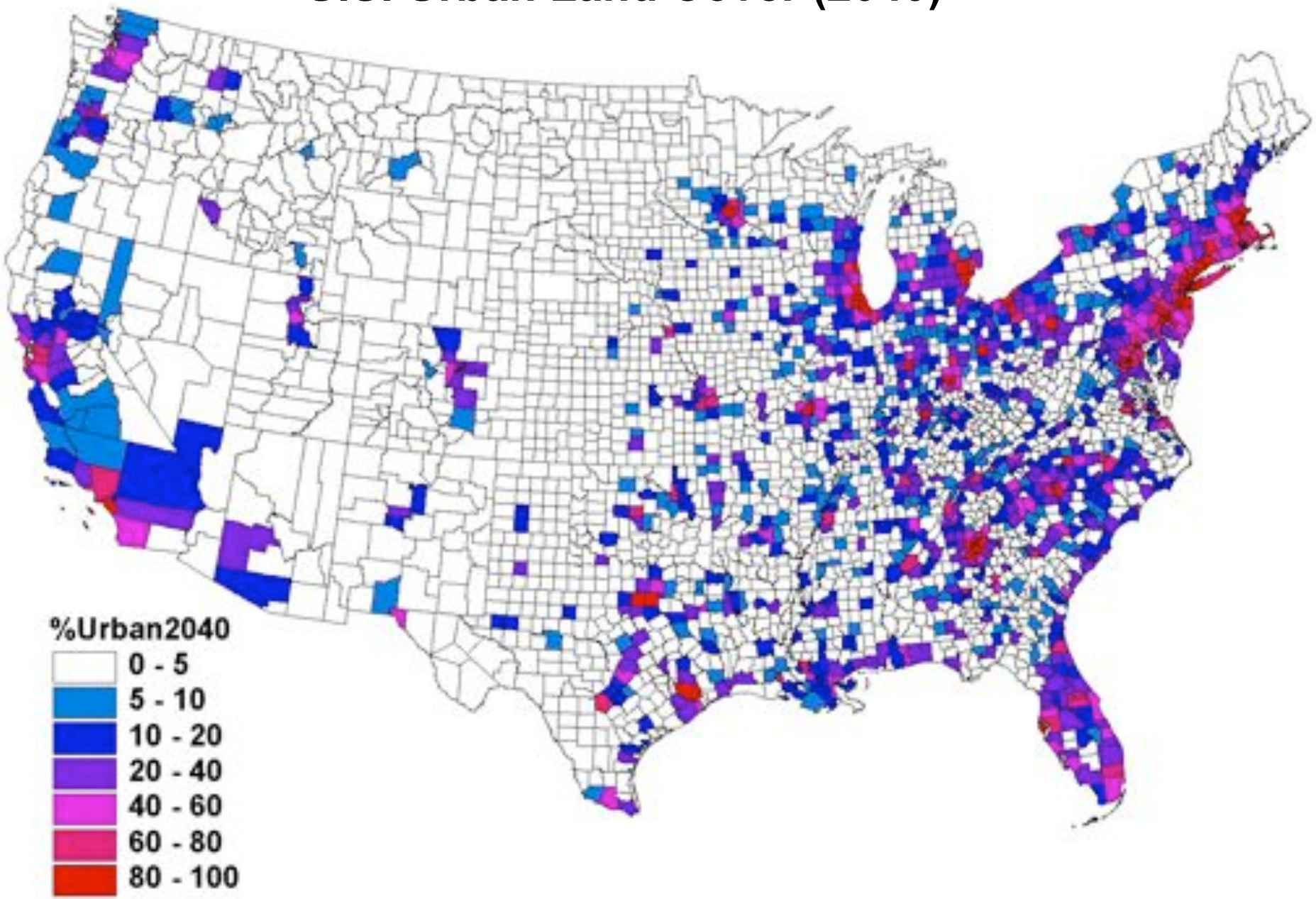
U.S. Urban Land Cover (2020)



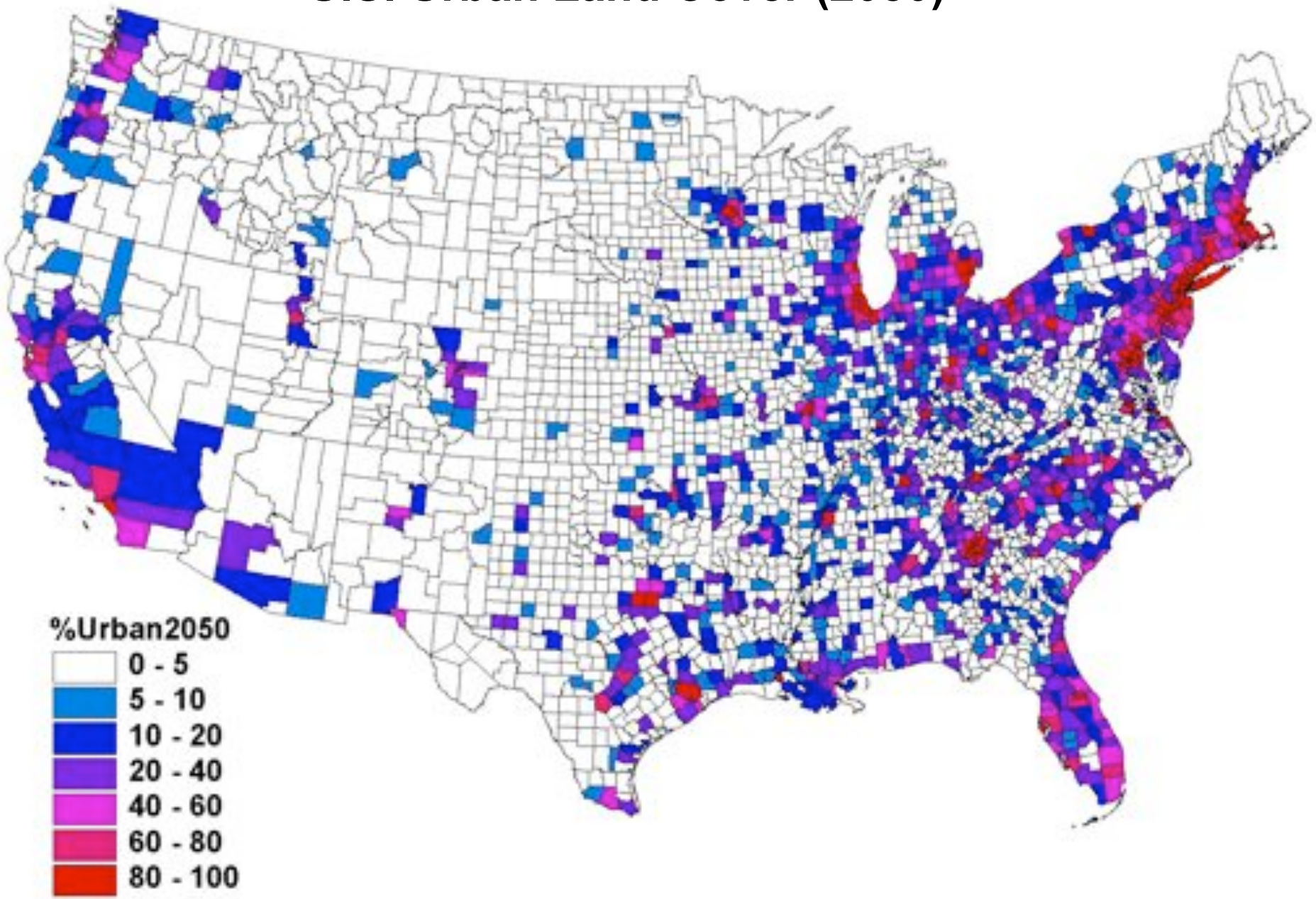
U.S. Urban Land Cover (2030)



U.S. Urban Land Cover (2040)

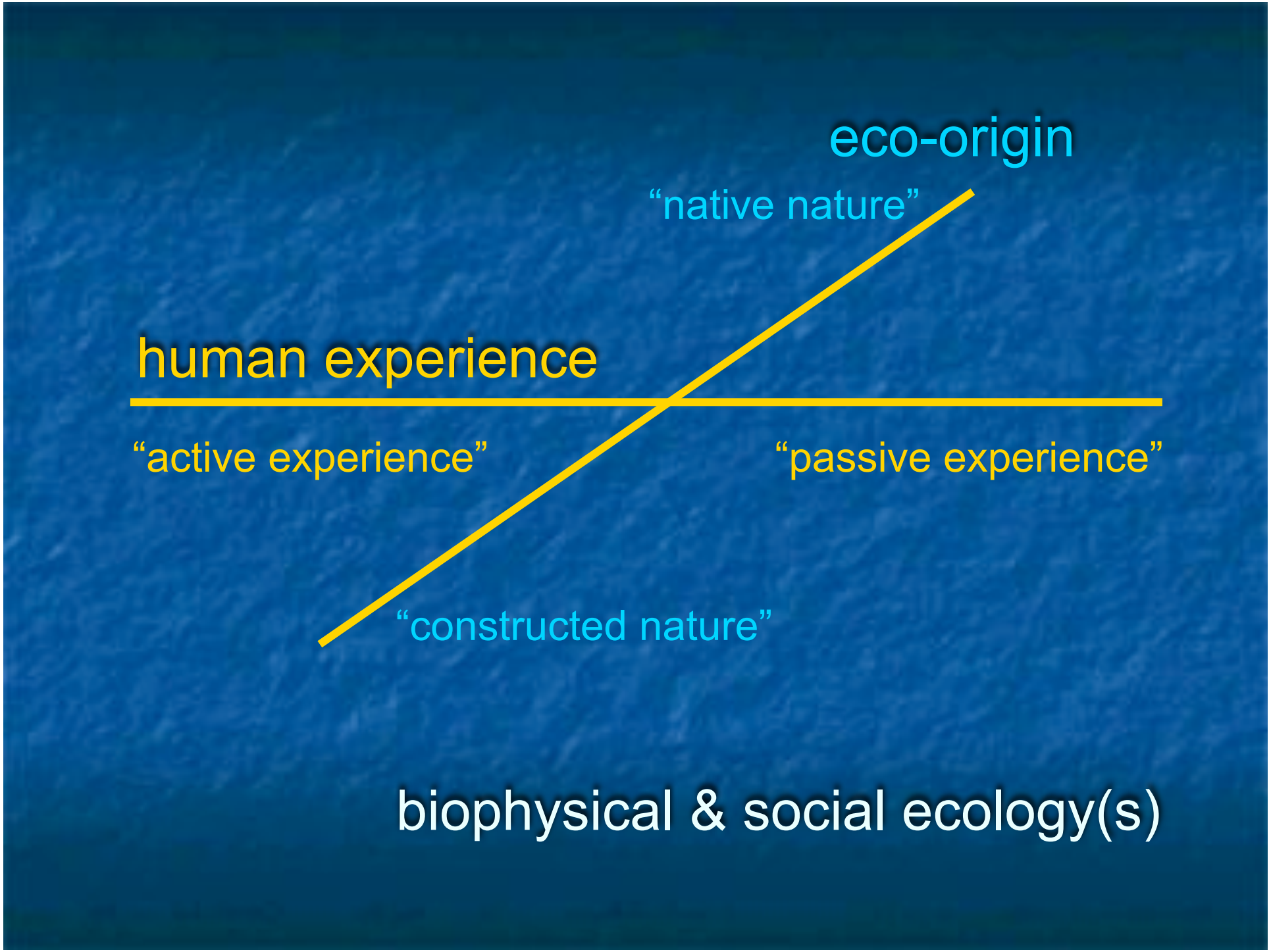


U.S. Urban Land Cover (2050)



Urban Ecology

biophysical complexity
psychosocial complexity


eco-origin
"native nature"
human experience
"active experience"
"passive experience"
"constructed nature"
biophysical & social ecology(s)

Site Scale Projects

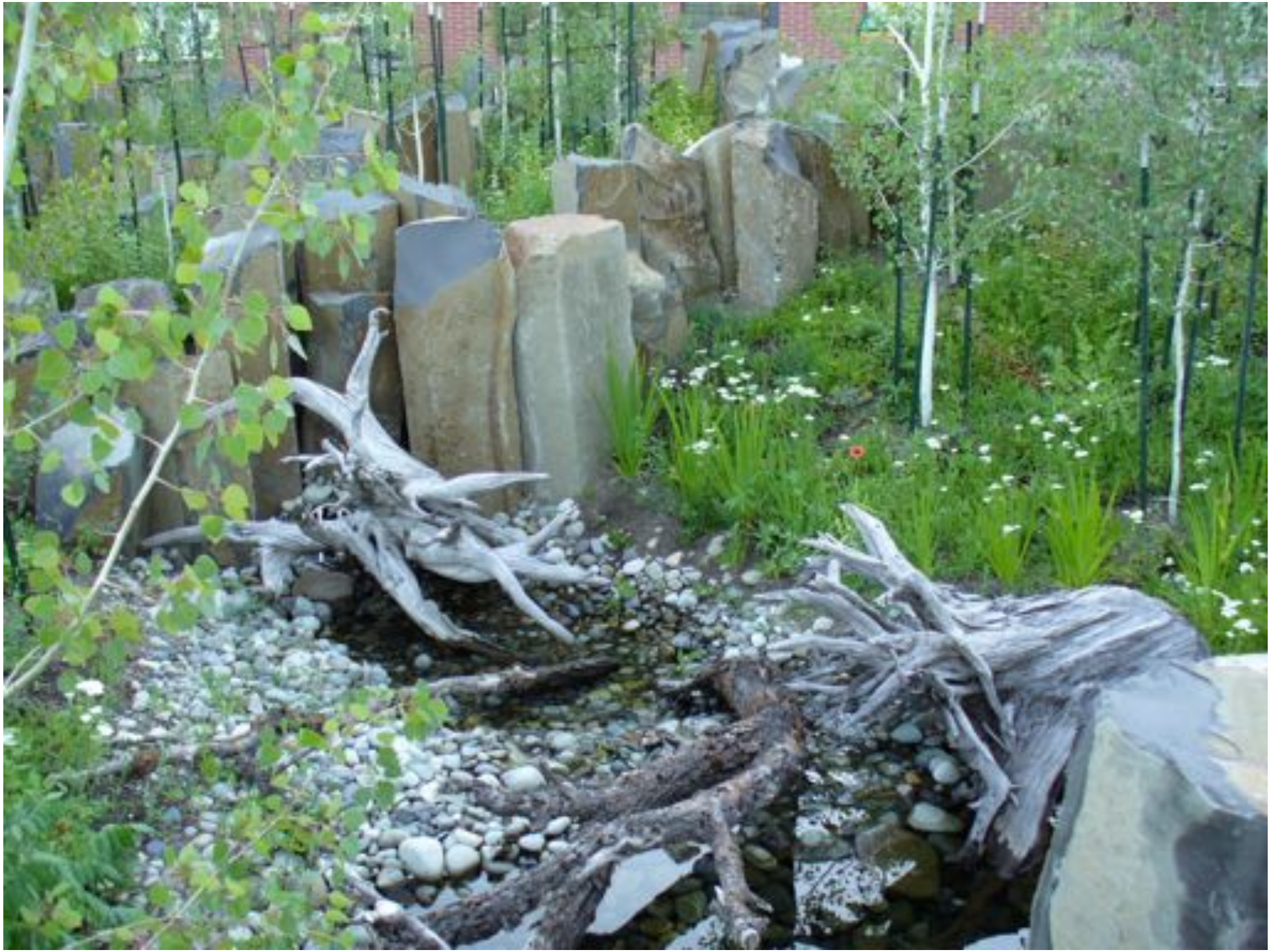
native nature to constructed nature

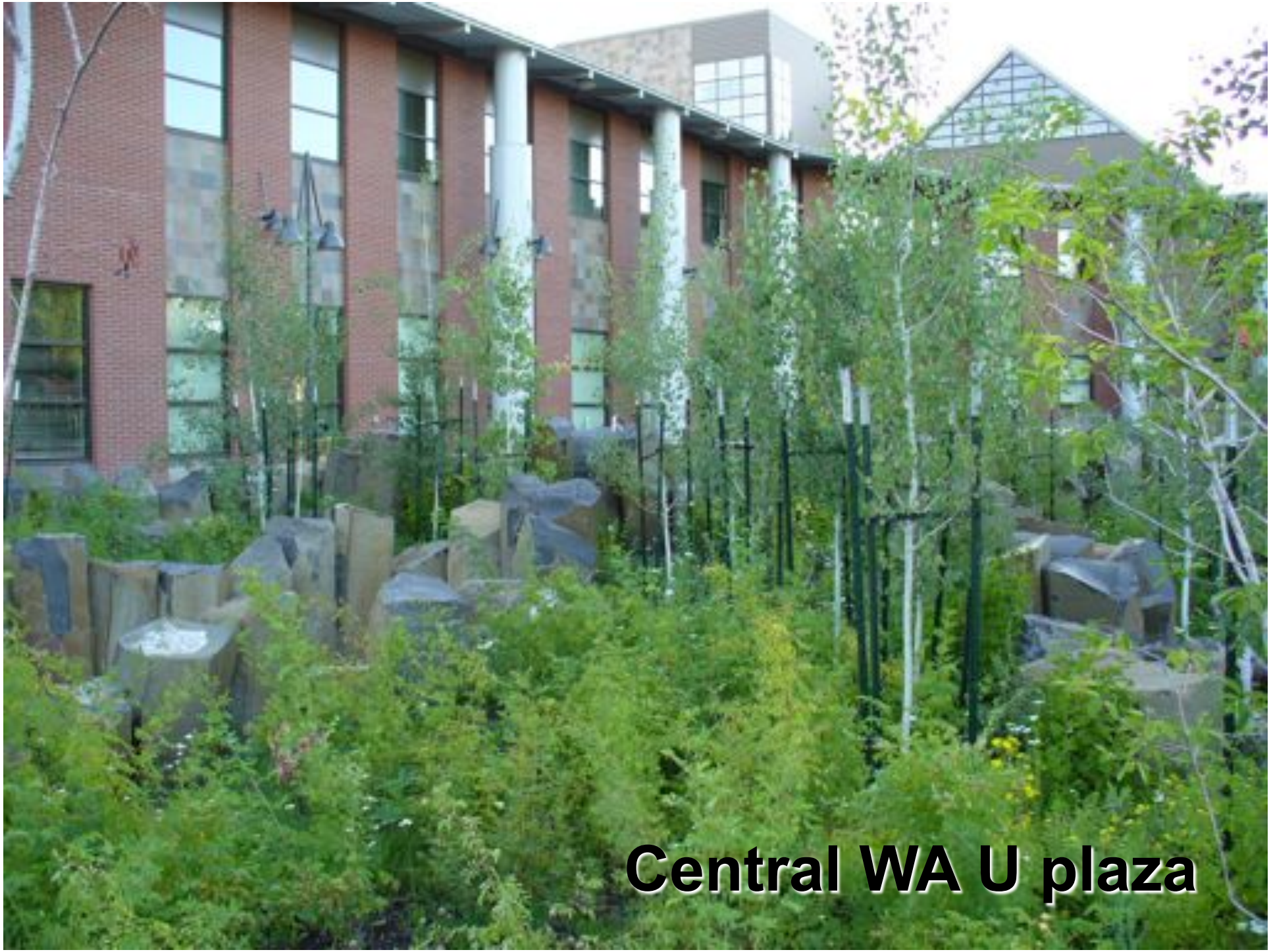
Pierce County, Chambers Creek Properties


native nature: PNW lowland forests


constructed nature


REI retail, Seattle



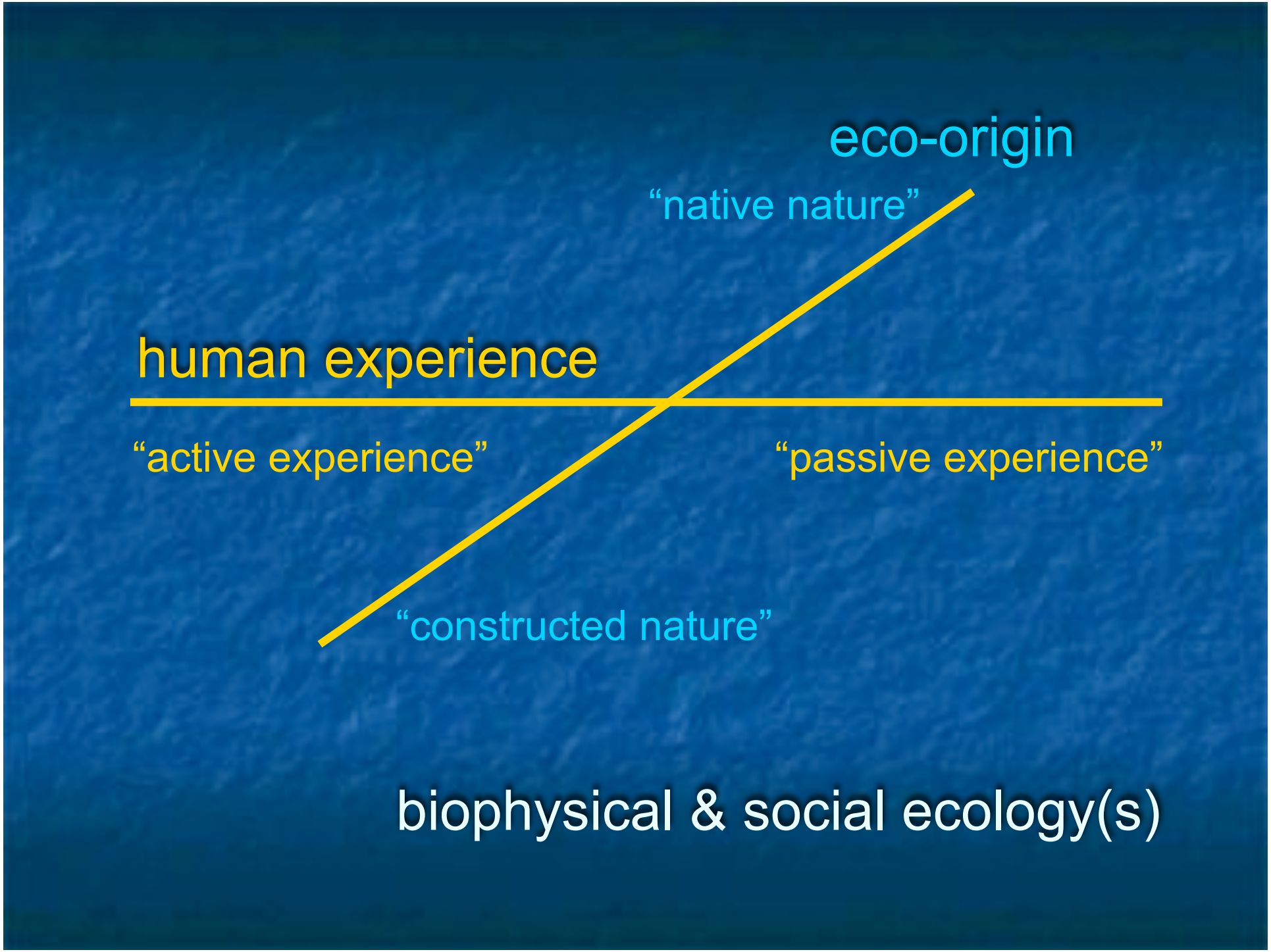

Central WA U plaza

Pierce County WA, Chambers Creek Properties

Pierce County WA, Chambers Creek Properties - 4 year growth


stormwater management
Parks & People Foundation, Baltimore

vertical forest structure


eco-origin
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"passive experience"
"constructed nature"
biophysical & social ecology(s)

Human Experience
passive to active

Parks & People Foundation, Baltimore

"civic ecology"

eco-restoration volunteers/employees -

eco-literacy

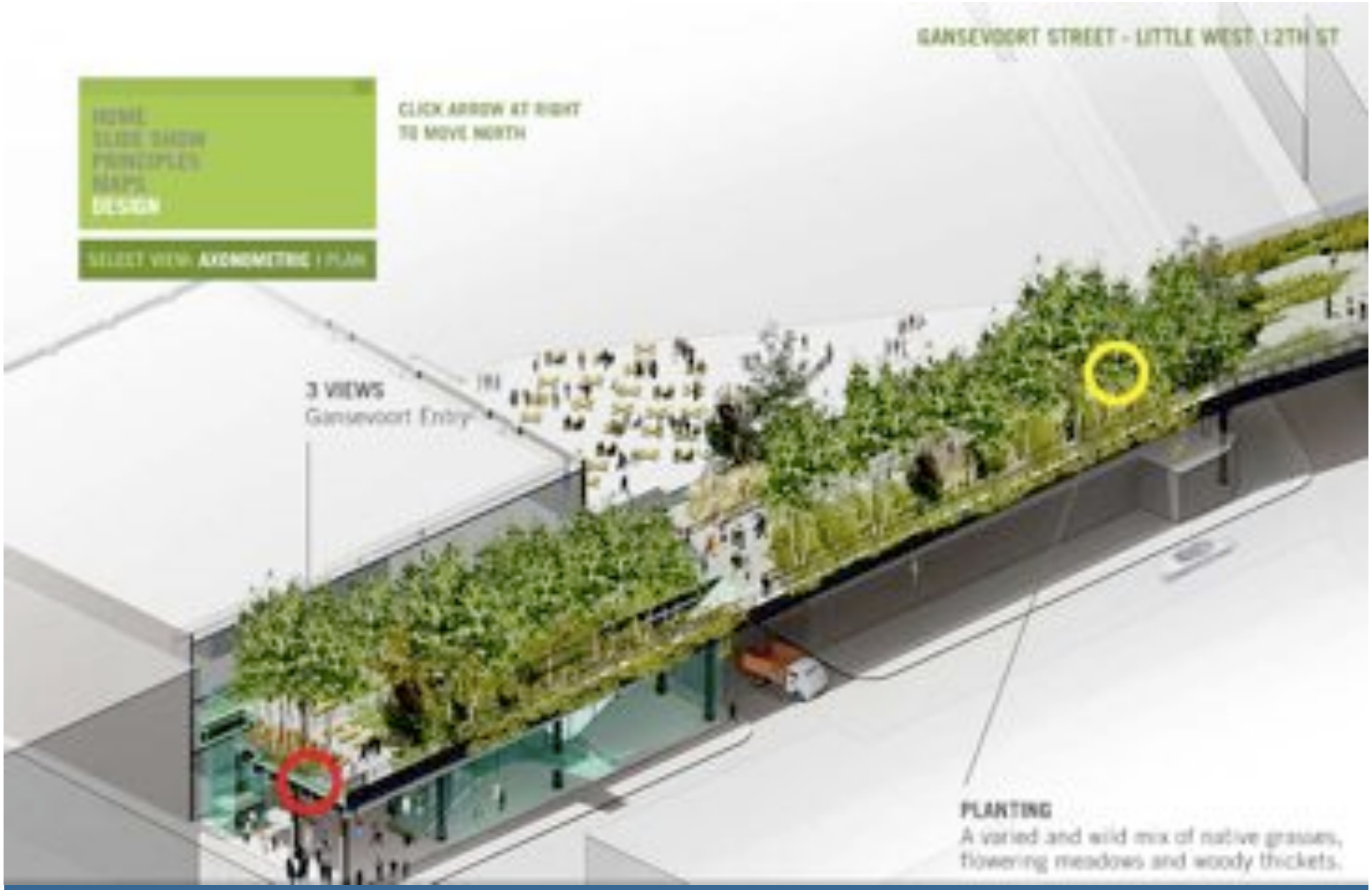
physical activity

EarthCorps

City of Chicago, City Hall **roof gardens/ecosystems**


Nashville, mixed use bldg
roof gardens/recreation

High Line Railway - W Manhattan

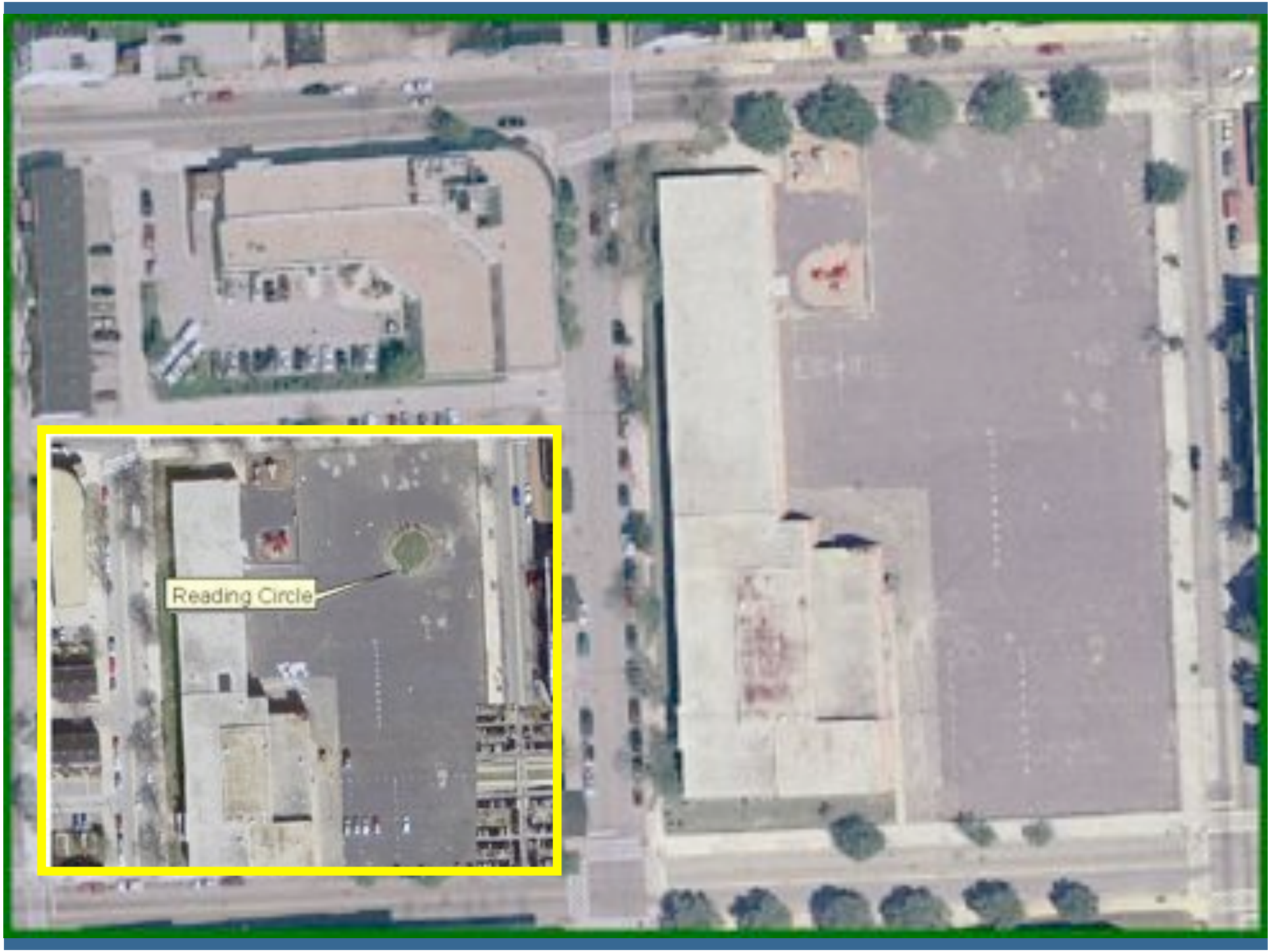


Friends of the High Line

Psychological Benefits of Nearby Nature

- Higher job satisfaction, reduced absenteeism (R. Kaplan)
- Faster healing, surgery & therapy (Ulrich, Cimprich)
- Lower crime rates in well landscaped areas (Kuo, Sullivan)
- Reduced violence and more constructive conflict resolution in domestic conflict (Kuo, Sullivan)
- Reduced ADHD symptoms in children (Faber Taylor, Kuo)


Parks & People Foundation, Baltimore
nature recovery & schools


Reading Circle


Parks & People Foundation, Baltimore
first phase - reading circle

Parks & People Foundation, Baltimore

nature recovery & schools


Parks & People Foundation, Baltimore
planning skills & efficacy


community gardens - renewal


“3rd place” & social cohesion

Discussion

wildland & working lands sustainability
vs. urban sustainability
how differ?

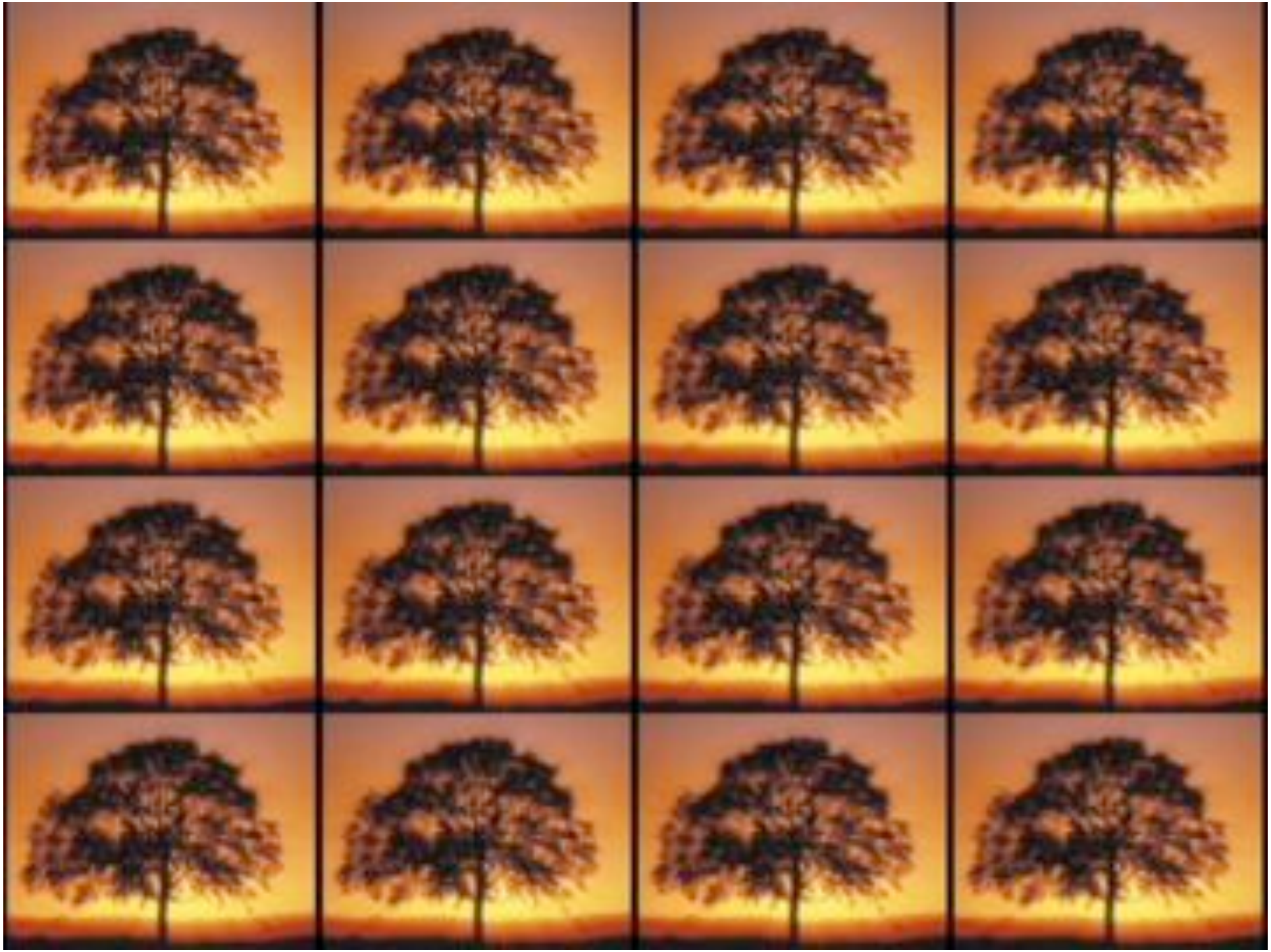
ecological social economic
Pugetropolis

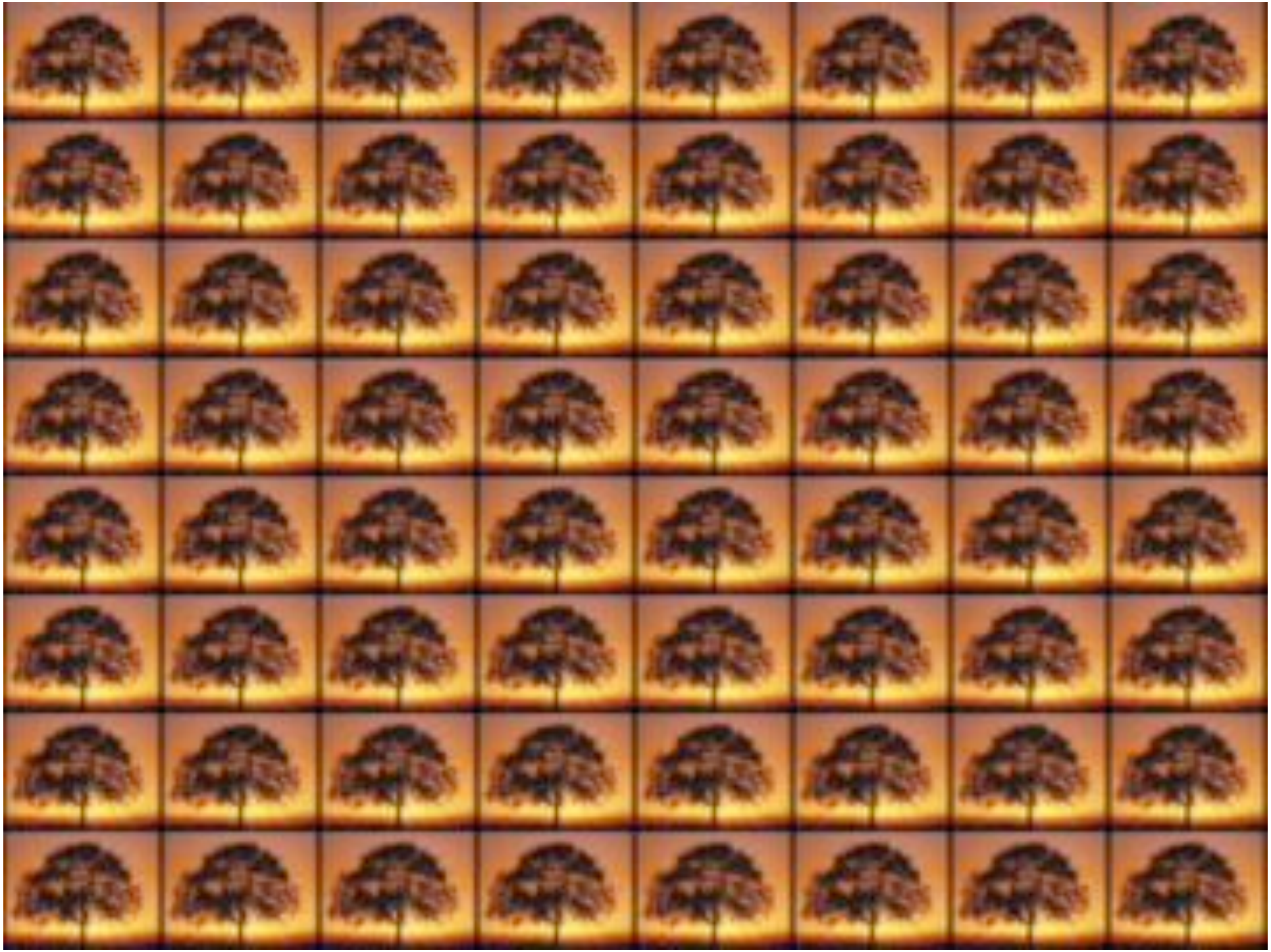
Urban Sustainability Systems

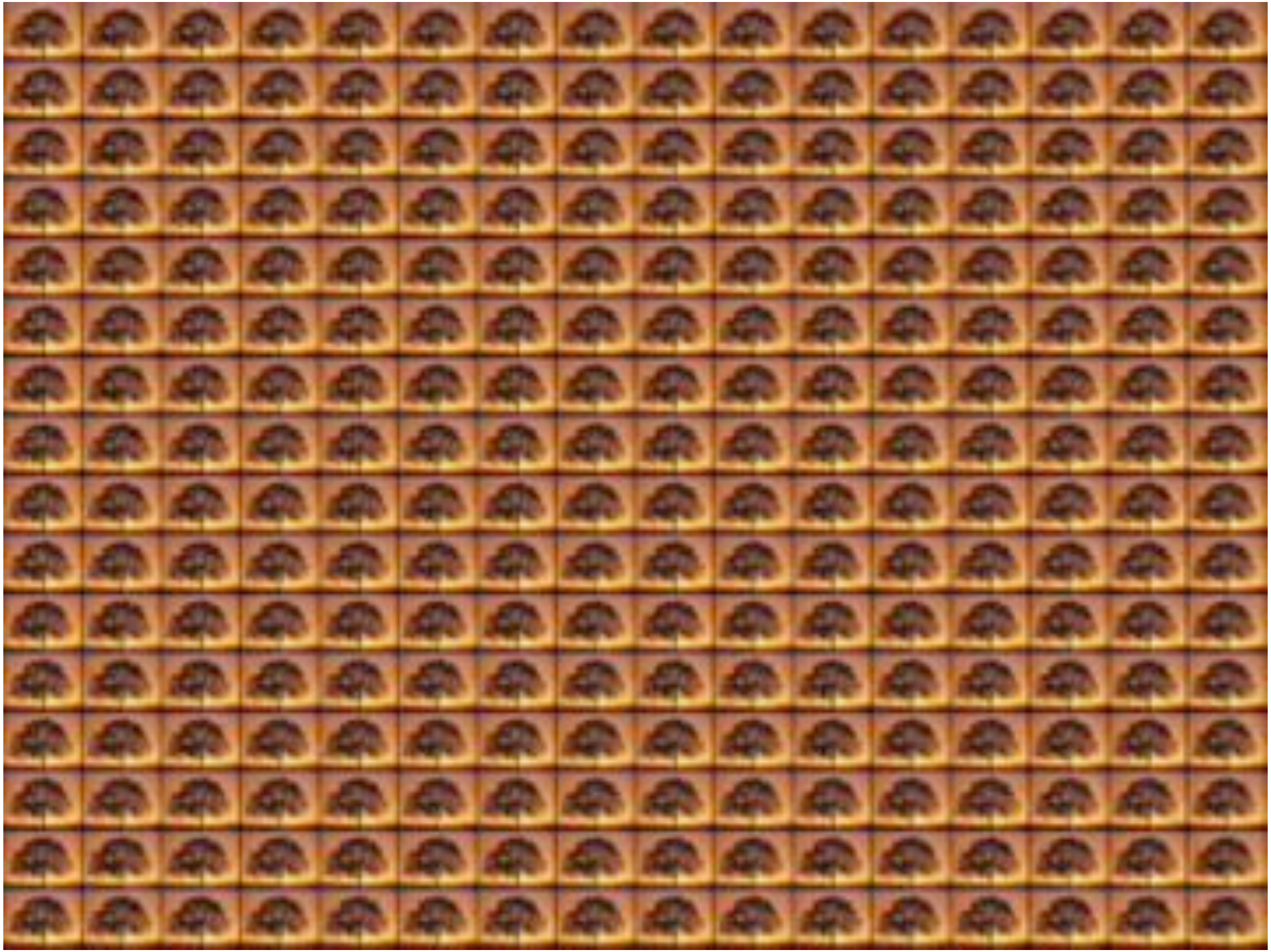
scale from landscape to site

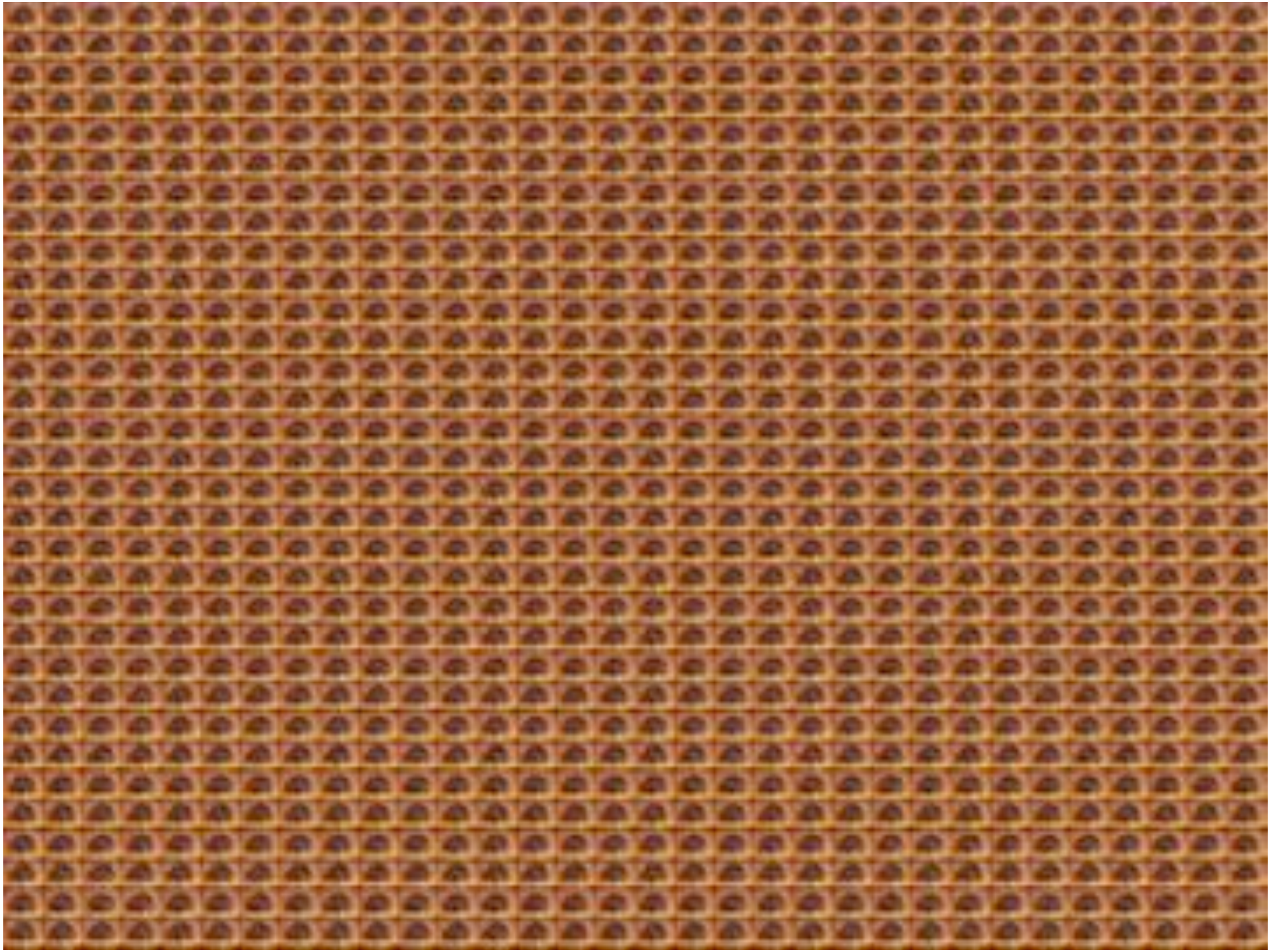
multiplier effect of a "distributed ecology"

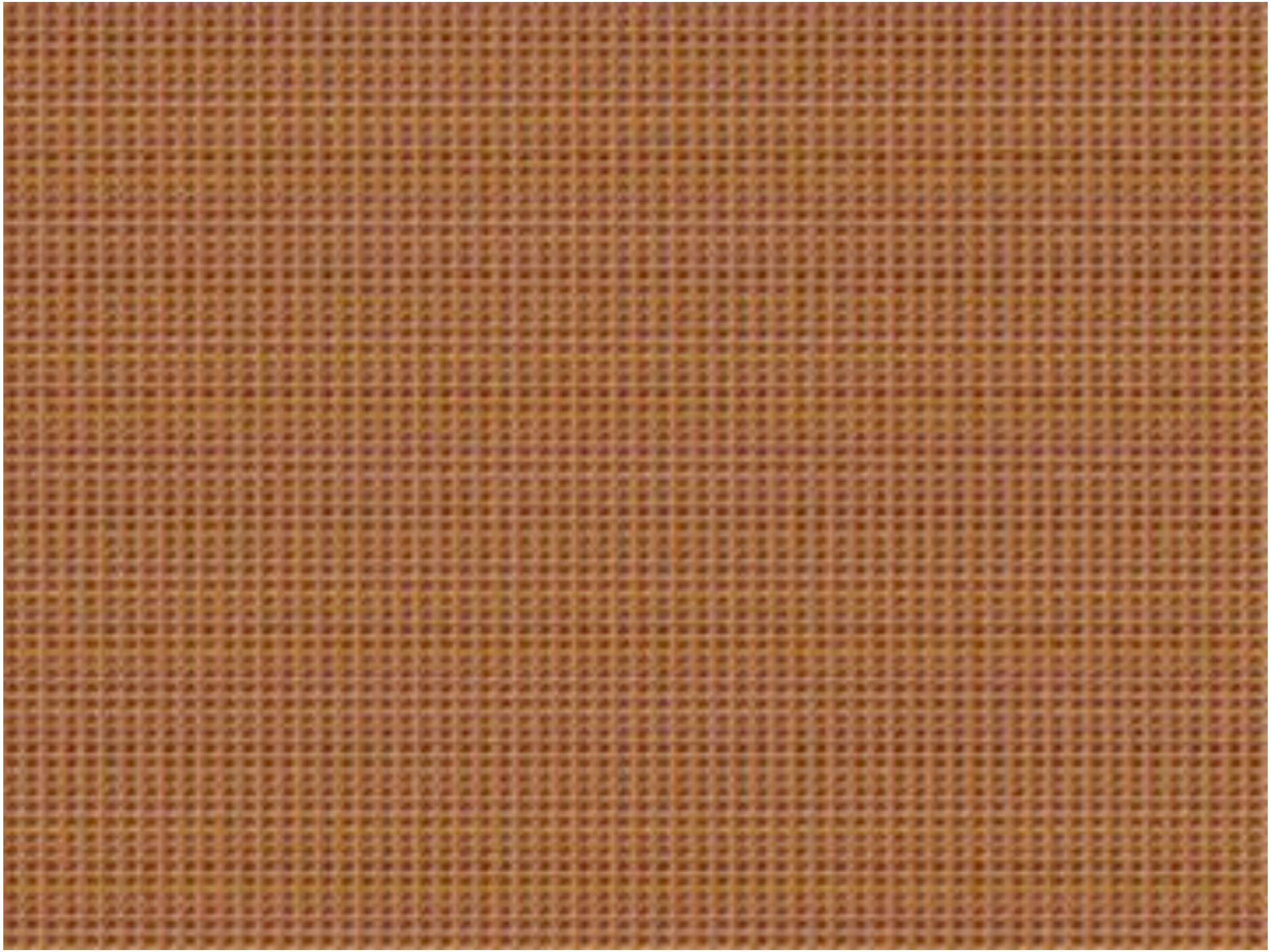
ecological social economic benefits











Resource Inventory & Assessment

know what you have to work with

US Forest Service i-Tree

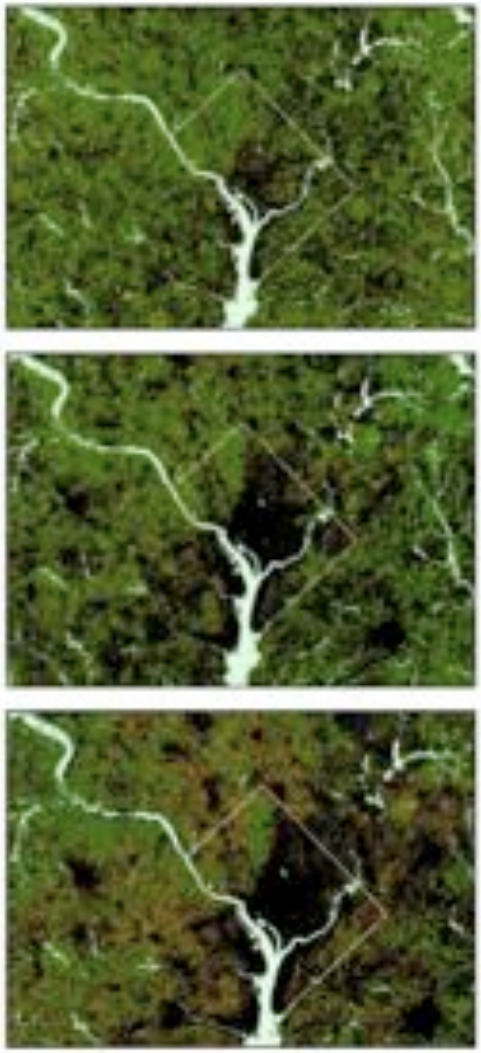
city tree and forest analysis

(voluntary)


i-Tree
Tools for assessing and managing
Community Forests
About i-Tree >>
Assessing Urban Ecosystems
Find out how to assess all the trees in your community
click here to begin
Assessing Street Tree Populations
Learn how to assess just the street trees in your community
click here to begin
Applications and Utilities
Access tools available for your tree management
click here to begin
The i-Tree Tools help quantify the structure, function and value of tree populations. They provide a scientific process for data collection, analysis and quantification of the benefits.
Find out more >>

WA D.C. Forest Canopy Assessment

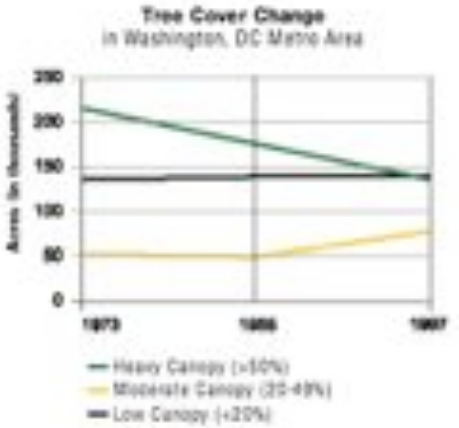
Regional Ecosystem Analysis



Lessons from Landsat

Landsat satellites have been in orbit around the Earth since 1972 and data from them allow us to look at changes in land-cover over time. AMERICAN FORESTS conducted a Regional Ecosystem Analysis of tree cover using three carefully selected Landsat images from the years 1972, 1986 and 1997 to determine how the vegetation has changed in the Washington DC Metro area over time. We found that heavy tree cover has declined more than 30 percent (green area) while the low canopy areas (black) have increased by more than 20 percent. This trend was even more pronounced within the District of Columbia.

The Landsat images provide valuable public policy information showing general trends, but do not provide the high resolution data required for local planning and management activities. High resolution satellite imagery, that only recently has become available for public use, produces a 4 meter or better multispectral image. This finer resolution is needed to see individual trees having a 13.5 foot or larger canopy spread. AMERICAN FORESTS designated this canopy spread as the "average urban tree".



Casey Trees (WA D.C.)

- science for public attitudes

A Casey Trees issue brief

Growing a Healthier DC: Greening Our City

A future DC is green

A green DC

- Benefits from the greatest tree canopy of any major city in the world
- Has much improved air and water quality
- Maximizes the beauty and utility of spaces like rooftops, medians and parking lots
- Offers a variety of spaces for outdoor gathering, learning, recreation and relaxation
- Provides habitat for birds and other wildlife through interconnected natural areas
- Attracts residents and businesses seeking a high quality of life
- Is a world-class sustainable city

The benefits of green grow over time.

The city as a green environment

Cooler temperatures. Summer temperatures in DC can be 10-15° hotter than surrounding areas due to the heat trapped by paved surfaces and buildings. Cooling provided by abundant shade trees and vegetation helps reduce this "urban heat island" effect.

Curbing climate change. Shade trees reduce energy demand for air conditioning which leads to fewer greenhouse gases. Vegetation also directly removes carbon dioxide from the air. DC's trees alone store 528,000 tons of carbon and remove an additional 16,000 tons of carbon from the atmosphere annually.

A livable city. People value trees, parks and open space. Individuals and businesses increasingly choose to locate in communities with beautiful neighborhoods, ample recreation opportunities and high environmental quality. Not surprisingly, these characteristics are also linked to positive mental and physical health.

Casey Trees

Green Factor (Seattle)

regulatory requirement - new development

(regulation)

Ordinance 122311, January 2007
all commercial development permitting

Seattle Green Factor

SEATTLE×*green factor*

DPD / Permits / Green Factor

Greening Seattle's Neighborhood Business Districts

What is the Seattle Green Factor?
As of Jan. 20, 2007, permit applicants must meet a new landscaping requirement in Seattle's commercial areas. Known as the Seattle Green Factor, this program requires new development in neighborhood business districts to meet a landscaping target using a menu of landscaping strategies. The Green Factor is designed to improve the extent and quality of landscapes, while allowing greater flexibility for developers and designers to meet open space requirements.

How does it work?
The Green Factor encourages layering of vegetation in areas visible to the public and along streets adjacent to new development. Bonuses are provided for rainwater harvesting and choosing plants with low water requirements. Use of larger trees, tree preservation, green roofs and vegetated walls is encouraged. A worksheet (see sidebar link) helps applicants calculate their project's score, allowing them to try different combinations of features to reach the requirement.

New buildings complying with the Green Factor will contribute to a lush urban aesthetic, consistent with our reputation as the "Emerald City." In addition to being attractive, new green elements in the landscape will improve air quality and help reduce energy consumption, cooling the city in the summer and insulating it in the winter. They will also reduce stormwater runoff, decreasing water pollution and public infrastructure costs.

Planning Context
The green factor was developed as part of the City Council's review of the Mayor's

More Info

Download the following documents for more on the Seattle Green Factor:

- Background brochure
- Green Factor Worksheet
- Planting Area Calculation worksheet
- Rainwater Harvesting Calculation Tool
- Green Factor Street Trees
- Ordinance 122311
- Green Factor areas map
- Draft Landscaping Director's Rule
- Draft Landscape Management Plan

HELPFUL LINKS

- Green Roofs website
- Biotope Area Factor - Berlin Senate
- Landscaping Resources for Professionals - Seattle Public Utilities

GREEN FACTOR WORKSHOPS

DPD sponsored a series of free workshops during spring 2007 to help applicants understand and apply the principles of the Seattle Green Factor. View the news story and the slideshows from these presentations:

- Green Factor—Learn Tips, Tricks & How-to
- Green Factor training presentation

Green Factor
Site Strategies

- green roofs
- green walls
- rainwater harvesting, rain gardens, Low Impact Development (LID)
- permeable paving
- soils conservation, amendment
- plant selection

Sustainable Sites Initiative

voluntary achievement rating system

companion to LEED
(Leadership in Energy & Environmental Design)
(voluntary)

THE SUSTAINABLE SITES INITIATIVE

The Sustainable Sites Initiative a national certification program

AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS
ASLA Library & Education Advocacy Fund

Lady Bird Johnson Wildflower center

United States Botanic Garden

LOOKS GREEN BUT IS IT SUSTAINABLE?

Around the country, polluted and contaminated storm water runoff accounts for 70 percent of water pollution in urban areas and is the leading cause of poor water quality and the degradation of aquatic habitat.

Loizeaux-Bennet *(*1999)

Tree canopy reduces residential home cooling costs. In Atlanta, Georgia, savings in home cooling costs amount to $2.8 million per year.

*American Forests (*October 2001 and August 2001)

Sediment runoff rates from construction sites can be up to 20 times greater than agricultural sediment loss rates and 1,000 to 2,000 greater than those of forested lands.

US EPA (2005)

In 2007, approximately 33 million tons of yard waste entered the municipal waste stream, representing 13 percent of total municipal waste in the United States.

US EPA (2007)

Views of natural settings have been shown to reduce the number of sick days taken by office workers and decrease hospital patient recovery time.

Faber Taylor et al (2001)

In New York City, trees are providing $5.60 in benefits for every $1 spent on tree planting and care.

Peper et al (2007)

TIME FOR CHANGE





Human needs and a healthy environment are not opposing claims that must be balanced; instead, they are inexorably linked by chains of cause and effect. We need a healthy environment because we need clean water, clean air, wood, and food . . . ~ Jared Diamond, biologist, 2003

SUSTAINABLE DEVELOPMENT:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Brundtland Report,
*Our Common Future (*1987)

LEED
Green Building Rating Systems

- *Leadership in Energy and Environmental Design*
- using tools and performance criteria
- building and development checklist
- started in U.S. 8 years ago, now 41 countries

LEED Performance Checklist

- sustainable site development
- water savings
- energy efficiency and atmosphere
- materials selection
- indoor environmental quality

LEED Ratings

- Certified
- Silver
- Gold
- Platinum

LEED Rating Systems

Bronx Library

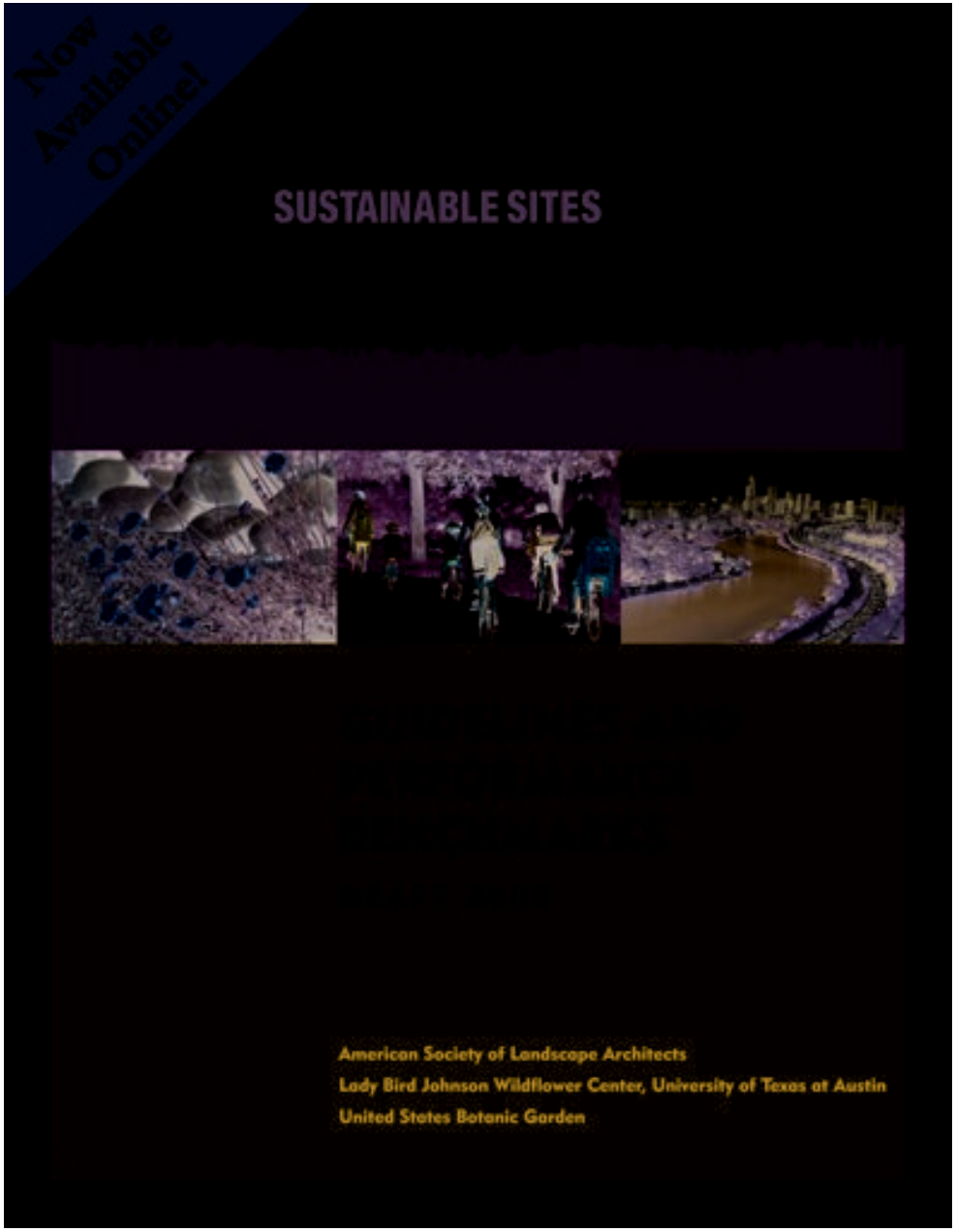
(New York City)

New Construction Certification

score: 34
rating: Silver

LEED Certification - Summary

- Performance Criteria = design score
- Rating Levels: Silver, Gold, Platinum
- Adopted widely! Incentive not regulation
- Project certification & professionals are certified



ECOSYSTEM SERVICES

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

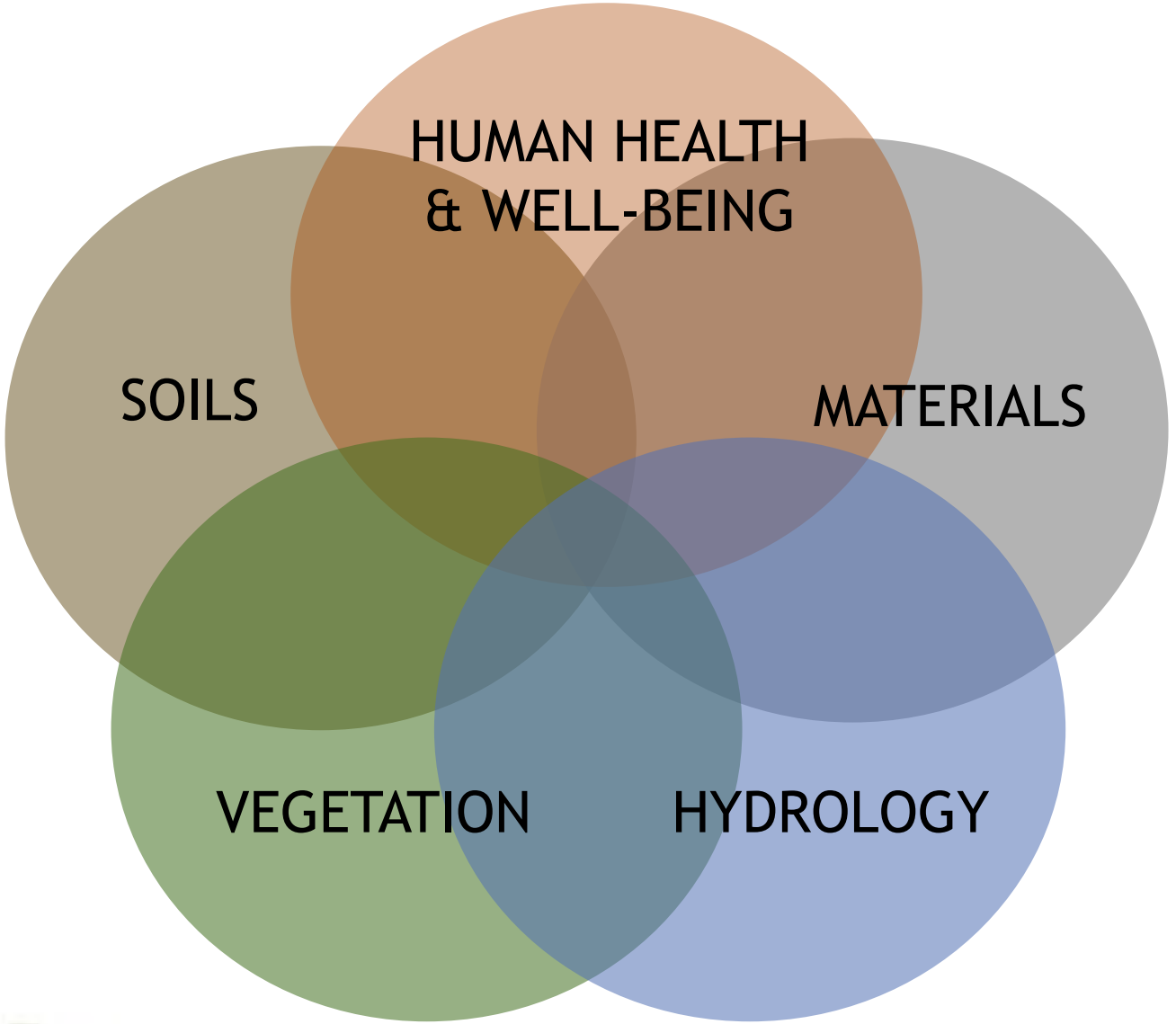
POTENTIAL PROJECT TYPES

Sites with or without buildings:

- parks, trails, campgrounds
- industrial and office parks
- govt. & medical complexes
- conservation easements
- botanical gardens
- university campuses
- residential sites
- streetscapes & plazas



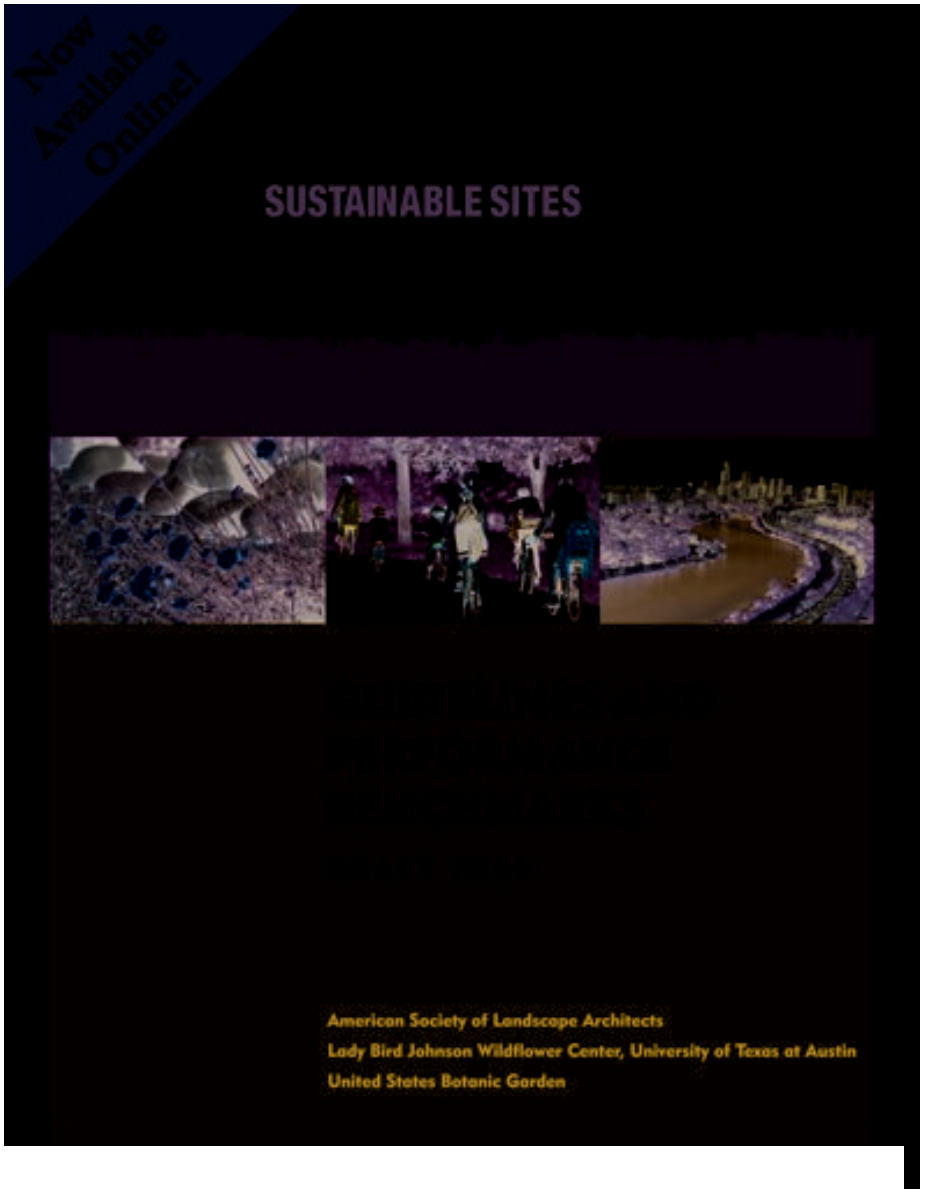

CURRENT RESEARCH



CURRENT REPORT

Released November 10, 2008

- Based on an ecosystems services framework
- Over 50 prerequisites and credits
- Various metrics from site selection to operations and maintenance
- Research on soils, vegetation, hydrology, materials and human health & well-being



Guidelines and Performance Benchmarks

Site Selection
Preserve existing resources and repair damaged systems

Pre-Design Assessment and Planning
Plan for sustainability from the onset of the project

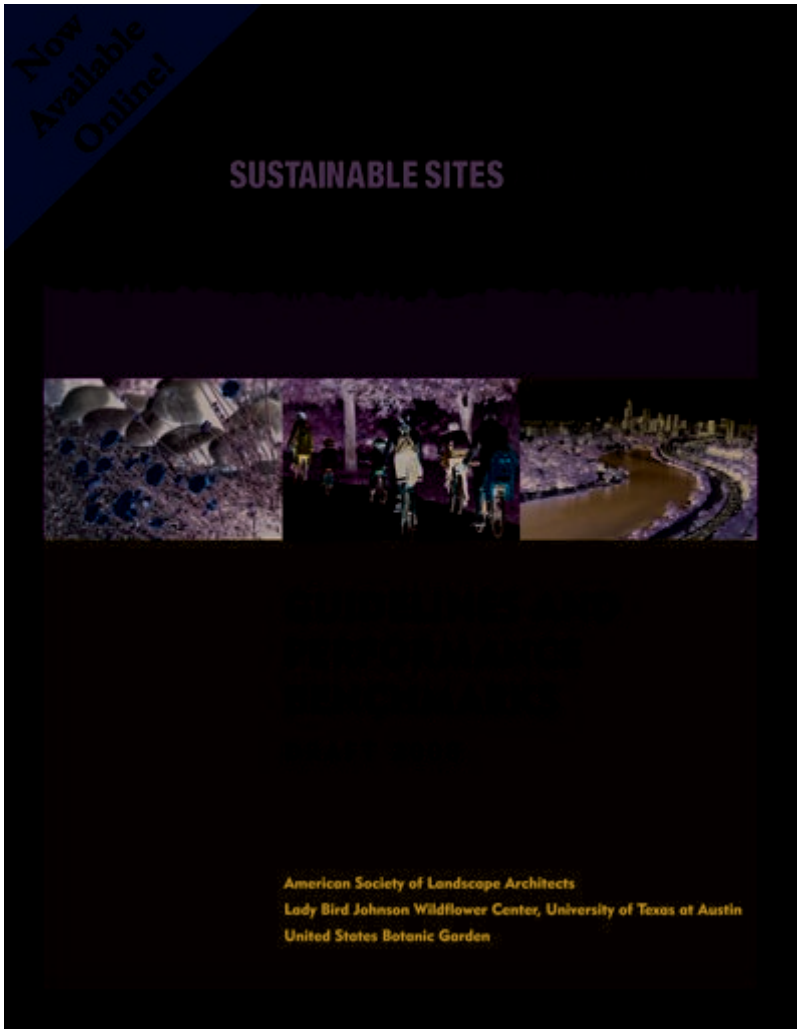
Site Design – Ecological Component
Protect and restore site processes and systems

Site Design Human Health Component
Build communities and a sense of stewardship

Site Design – Materials Selection
Reuse/recycle and support sustainable production practices

Construction
Minimize effects of construction related activities

Operations and Maintenance
Maintain the site for long-term sustainability



DRAFT PREREQUISITES AND CREDITS

1 SITE SELECTION

Select locations to preserve existing resources and repair damaged systems

1.1 Prerequisite	**Preserve threatened or endangered species habitat**
1.2 Prerequisite	**Protect and restore floodplain functions of riparian and coastal zones**
1.3 Prerequisite	**Limit disturbance of prime farmland soils, unique soils, and soils of statewide importance**
1.4 Credit	Select brownfields or greyfields for redevelopment

2 PRE-DESIGN ASSESSMENT AND PLANNING

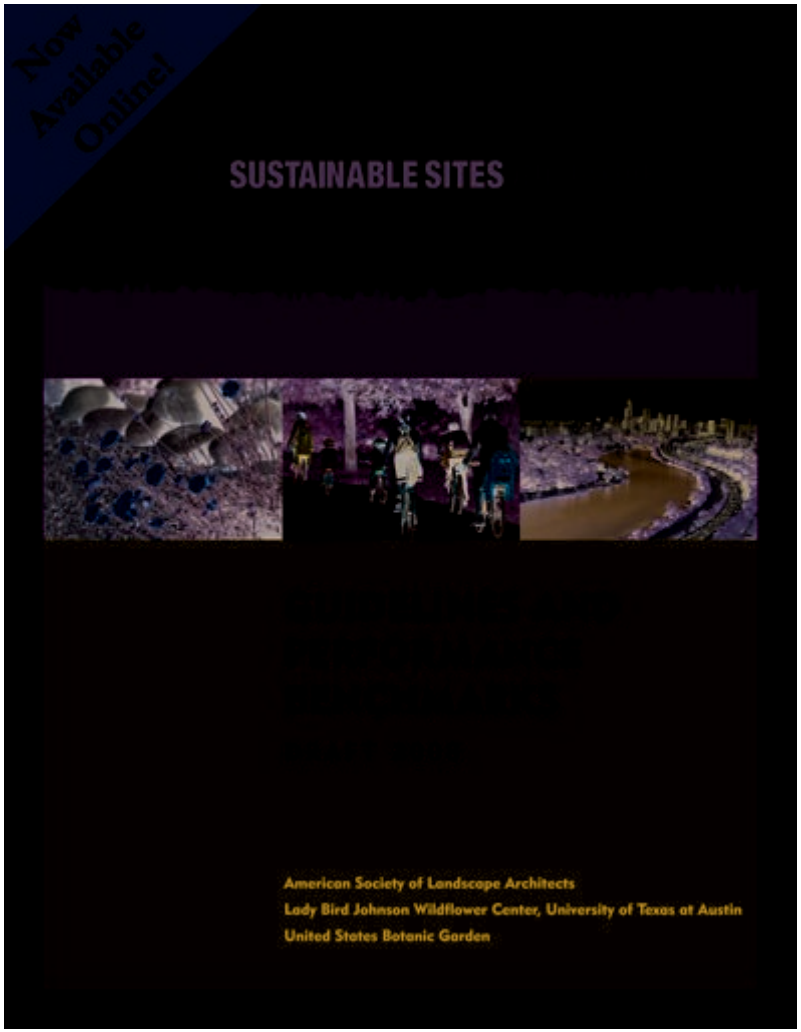
Plan for sustainability from the onset of the project

2.1 Prerequisite	**Conduct a pre-design site assessment**
2.2 Prerequisite	**Use an integrated design process**
2.3 Prerequisite	**Develop a program plan with site performance goals**
2.4 Credit	Engage users and other stakeholders in meaningful participation in site design

3 SITE DESIGN—ECOLOGICAL COMPONENTS

Protect and restore site processes and systems

3.1 Prerequisite	**Control and manage invasive species**
3.2 Prerequisite	**Use appropriate, non-invasive plants**
3.3 Prerequisite	**Preserve special status trees**
3.4 Prerequisite	**Reduce potable water consumption for irrigation**
3.5 Credit	Minimize or eliminate potable water consumption for irrigation
3.6 Credit	Preserve and restore plant biomass on site
3.7 Credit	Minimize building heating and cooling requirements with vegetation
3.8 Credit	Reduce urban heat island effects
3.9 Credit	Promote a sense of place with native vegetation
3.10 Credit	Preserve and restore native wildlife habitat
3.11 Credit	Protect and restore riparian and wetland buffers
3.12 Credit	Repair or restore damaged or lost streams, wetlands, and coastal habitats
3.13 Credit	Preserve existing healthy soils
3.14 Credit	Preserve existing topography
3.15 Credit	Restore soils disturbed by previous development
3.16 Credit	Manage water on site
3.17 Credit	Cleanse water on site
3.18 Credit	Eliminate potable water use in ornamental or stormwater features
3.19 Credit	Minimize use of potable water in water features designed for full human contact
3.20 Credit	Mitigate potential wildfire risks



4 SITE DESIGN—HUMAN HEALTH COMPONENTS

Build strong communities and a sense of stewardship

4.1 Credit	Promote equitable site design, construction, and use
4.2 Credit	Promote sustainability awareness and education
4.3 Credit	Provide for optimum site accessibility, safety, and wayfinding
4.4 Credit	Provide views of the natural environment to building occupants
4.5 Credit	Provide opportunities for outdoor physical activity
4.6 Credit	Connect site to surrounding resources, amenities, and services
4.7 Credit	Provide outdoor spaces for mental restoration
4.8 Credit	Provide outdoor spaces for social interaction
4.9 Credit	Design stormwater management features to be a landscape amenity
4.10 Credit	Prevent and abate sensory stress
4.11 Credit	Protect and promote unique cultural and historical site attributes

5 SITE DESIGN—MATERIALS SELECTION

Reuse/recycle existing materials and support sustainable production practices

5.1 Prerequisite	**Eliminate use of lumber from threatened tree species**
5.2 Credit	Support sustainable practices in plant production
5.3 Credit	Support sustainable practices in materials manufacturing
5.4 Credit	Reuse on-site structures, hardscape, and landscape amenities
5.5 Credit	Use salvaged and recycled content materials
5.6 Credit	Use certified wood
5.7 Credit	Use products designed for reuse and recycling
5.8 Credit	Use adhesives, sealants, paints, and coatings with reduced VOC emissions
5.9 Credit	Conduct a life cycle assessment

6 CONSTRUCTION

Minimize effects of construction-related activities

6.1 Prerequisite	**Create a soils management plan**
6.2 Prerequisite	**Restore soils disturbed during construction**
6.3 Credit	Achieve a carbon-neutral site
6.4 Credit	Divert construction and demolition materials from disposal
6.5 Credit	Control and retain construction pollutants
6.6 Credit	Use excess vegetation, rocks, and soil generated during construction

7 OPERATIONS AND MAINTENANCE

Maintain the site for long-term sustainability

7.1 Prerequisite	**Plan for sustainable landscape maintenance**
7.2 Credit	Minimize exposure to localized air pollutants
7.3 Credit	Recycle organic matter generated during site operations and maintenance
7.4 Credit	Provide for storage and collection of recyclables
7.5 Credit	Use renewable sources for site outdoor electricity

EXAMPLE CREDIT

1.4 Credit Select brownfields or greyfields for redevelopment

Intent
Channel development to urban areas with existing infrastructure and rehabilitate damaged sites to reduce pressure on undeveloped land and restore ecosystem services.

Requirements
- Option 1 Brownfield redevelopment: Select a site documented as contaminated (by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local Voluntary Cleanup Program) OR a site defined as a brownfield by a local, state, or federal government agency.
  OR
- Option 2 Greyfield redevelopment: Select a site that has been previously developed or graded.

Suggested submittal documentation
- Option 1: Provide confirmation that the existing site was documented as contaminated or defined as a brownfield, and provide a detailed narrative describing the site contamination.
  OR
- Option 2: Provide a site vicinity plan (e.g., sketches, block diagrams, maps, and aerial photographs) showing the project site and the surrounding sites and buildings.

Technologies and strategies
During the site selection process, give preference to previously developed or brownfield sites. Coordinate site development plans with remediation activity and use of existing infrastructure and materials, as appropriate.

Ecosystem services addressed:
- Global climate regulation
- Air and water cleansing
- Waste decomposition and treatment
- Human health and well-being benefits
- Cultural benefits

Economic and social benefits:
Brownfield and greyfield redevelopment reduces pressure on undeveloped land, thereby protecting habitat and preserving natural resources. Using existing infrastructure and on-site materials as resources can reduce project costs for new materials.

The rehabilitation of a site with environmental contamination is an opportunity to improve the environmental quality and resources available to local communities. Such properties may also cost less and be offered for sale with tax incentives.

PROJECT SCHEDULE

GUIDELINES AND PERFORMANCE BENCHMARKS Draft 2008
Released November 2008

GUIDELINES AND PERFORMANCE BENCHMARKS 2009
Target publication – Fall 2009

RATING SYSTEM
Target publication – 2011

PILOT PROJECTS PHASE
From 2010 – 2012

REFERENCE GUIDE
Target publication – 2012

CASE STUDIES

For more information, visit
www.sustainablesites.org/cases

THE SUSTAINABLE SITES INITIATIVE

For more information, please visit:

www.sustainablesites.org

AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS
ASLA Library & Education Advocacy Fund

Lady Bird Johnson Wildflower center

United States Botanic Garden

Discussion

what are the elements of urban sustainability systems?

should these be applied to properties as voluntary or regulatory systems?

www.cfr.washington.edu/research.envmind