



# BIOPHILIA IN PUBLIC WORKS

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Heidi Siegelbaum- APWA Conference- April 11, 2024

Washington Stormwater Center/WSU, Stormwater Strategic Initiative Lead

**News Flash!**

**Stone Tablet.dot.com**

**NOT an Engineer...**

What the \_+#)(%\*#)\_\$(% is Biophilia?

Why am I here?

..... Ta da.....

*To center Biophilia as a central  
organizing principle to save our fannies  
and...*

Add **climate** resilience

Address **Stormwater**

Add or restore **infiltration**

Make places **welcoming** and **beautiful**

Keep folks in more **dense** places

Add essential **health** promoting elements and

Recognize that HUMANS- full of bias, intrigue and needs– need to be **listened** to.



# When asked...

- Put more back than was in there before
- Multiplier
- Safety and function
- Add to the biological structure, treatment and capacity of the system- **amplify the resilience of the system overall**
- The more people value it, the more people take care of it
- Being efficient and thoughtful is a manifestation of caring
- Biophilia is simply a human need for connection with nature
- Pavement “hellscape”

Your new Tag Line

“Engineers make the world  
safe for beauty”



# Where Public Works Meets Biological Diversity

COGITATIO

Urban Planning (ISSN: 2183-7635)  
2021, Volume 6, Issue 1, Pages 75-88  
DOI: 10.17645/up.v6i1.3633

Article

## Green Infrastructure and Biophilic Urbanism as Tools for Integrating Resource Efficient and Ecological Cities

Giles Thomson <sup>1,2,\*</sup> and Peter Newman <sup>2</sup>

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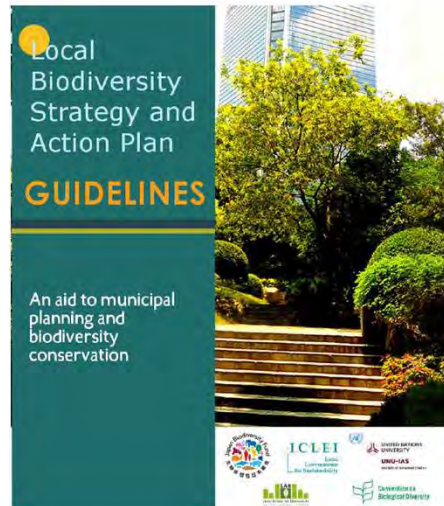
<sup>2</sup> Curtin University Sustainability Policy Institute, School of Design and the Built Environment, Curtin University, Perth, WA 6102, Australia; E-Mail: p.newman@curtin.edu.au

\* Corresponding author

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### Abstract

In recent decades, the concept of resource efficient cities has emerged as an urban planning paradigm that seeks to achieve sustainable urban environments. This focus is upon compact urban environments that optimise energy, water and waste systems to create cities that help solve climate change and other resource-based sustainability issues. In parallel, there has been a long-standing tradition of ecological approaches to the design of cities that can be traced from Howard, Geddes, McHarg and Lyle. Rather than resource efficiency, the ecological approach has focused upon the retention and repair of



## 7. Nature-based solutions as critical urban infrastructure for water resilience

**Lauren McPhillips, Hong Wu, Carolina Rojas Quezada, Bernice Rosenzweig, Jason R. Sauer, and Brandon Winfrey**

THE CASE FOR NATURE-BASED SOLUTIONS FOR WATER RESILIENCE

RESEARCH

Open Access

## Biophilic streets: a design framework for creating multiple urban benefits

Agata Cabanek<sup>1</sup>, Maria Elena Zingoni de Baro and Peter Newman



### Abstract

Biophilic urbanism is bringing new perspectives to how natural systems need to be integrated into the fabric of cities. This paper shows how biophilic streets can be the front door to biophilic urbanism by integrating nature into a new street design, benefiting a range of economic, environmental and social functions. A theoretical integrated Biophilic Streets Design Framework, is outlined and evaluated through the analysis of four street revitalisation projects from Vitoria-Gasteiz, Berkeley, Portland and Melbourne. Its practical applications and multiple urban benefits will be of value to street designers globally. The Biophilic Streets Design Framework demonstrated that the four case studies meet the main design categories, which is favourable since multiple additional benefits are likely to be obtained. Future research is needed to monitor and quantify the performance of biophilic streets design to address

## Green Infrastructure Guide for Public Works Projects

Franklin Regional Council  
of Governments

PART I:  
Biophilia context and  
applications

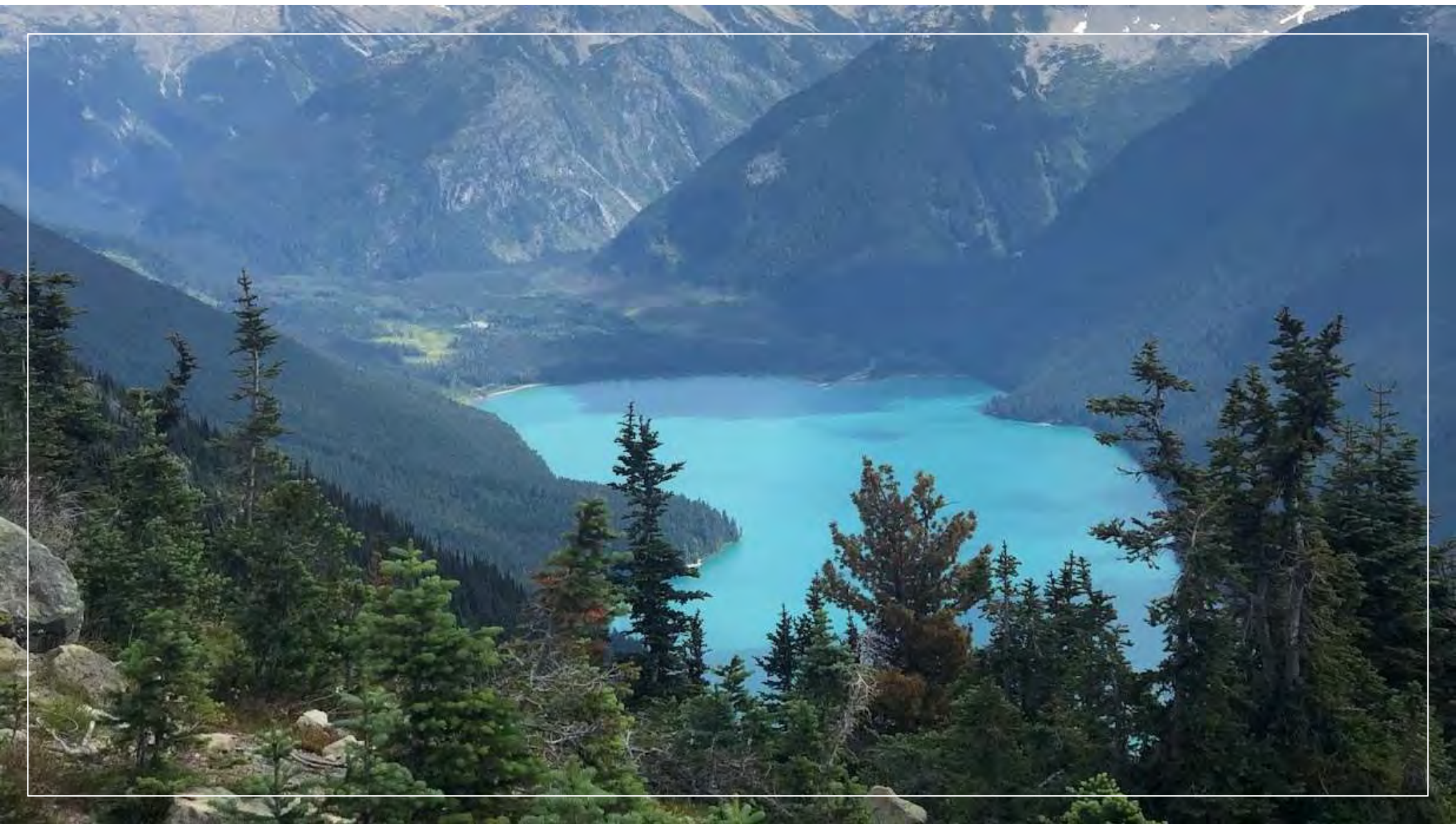




# Biophilia

The passionate love of life and all that is alive; it is the wish to further growth, whether in a person, a plant; an idea or a small group

*Erich Fromm, 1900-1980, German Psychoanalyst*























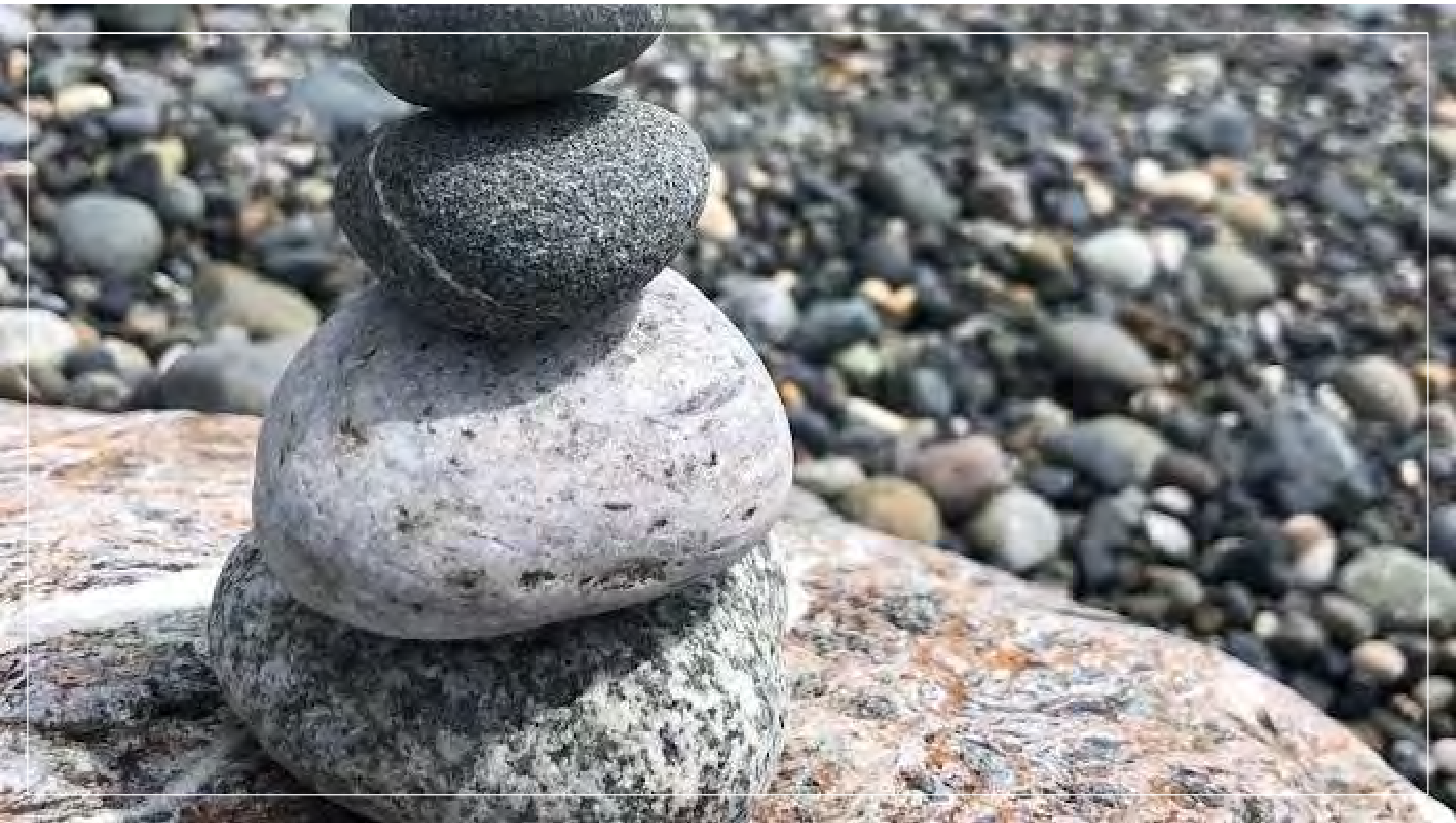






































## Part II: The Why

Clean Water

# Biophilia supports clean and available water

**Because when you plan for clean water, you want and need biophilic tools:**

**Tree Protection**

**Distributed Infiltration Space**

**Stormwater Parks**

**Green Stormwater Infrastructure and Green Infrastructure**

**Integrated Design**

**Facilitating Laws and Policies**

**Supportive Budgets**

# We need Biophilic Design and Planning

- Our lives literally depend on natural forms and functions
- We are enriched beyond measure with it
- It embodies respect for others, and respect for ourselves

We become our better selves in nature- leading to pro-community and pro-social behaviors





EMPATHY

# The Heart

“Man’s heart away from nature becomes hard, [the Lakota] knew that lack of respect of growing, loving things soon led to lack of respect for humans too.”

Correlation with animal abuse and human abuse

# MENTAL HEALTH



# Why Biophilia?

Tremendous Psychological Uplift

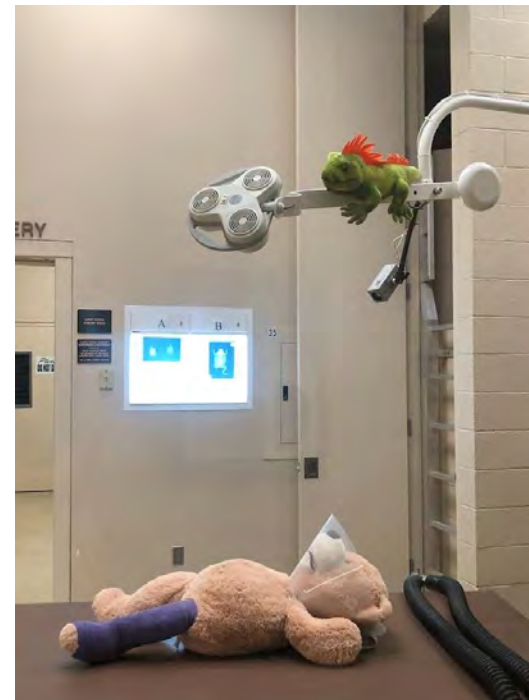
Improves health and hastens recovery from illness

Reduces stress, anxiety and depression

Provides resilience and lift

Economic Driver

Keep people in dense places





## Your Brain on Nature

- Parasympathetic nervous system responds well, with higher alpha wave activity, a wavelength ~ with relaxation, mediation and increased serotonin.
- Produces natural killer immune cells (NK cells) that protect us from disease agents. These are boosted by phytoncides emitted by trees.

**hospital healing gardens:**  
patients; family and friends; professional staff



health  
care \$\$  
savings





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 ...



### Place Attachment & Meaning

The experience of place is part of our sense of self, of community, and a connectedness to everyday life. Our place connections are significant, and provide meaning. Nature is a key aspect of many places that are important to people. [READ ABOUT THE RESEARCH](#)

### RESEARCH THEMES

- Livable Cities
- Social Strengths
- Local Economics
- Place Attachment & Meaning**
- Crime & Public Safety
- Safe Streets
- Active Living
- Reduced Risk
- Wellness & Physiology
- Healing & Therapy
- Mental Health & Function
- Work & Learning
- Lifecycle & Gender

## Local: Green Cities Good Health

<https://depts.washington.edu/hhwb/>

Scaling from the home, personal and neighborhoods to policy and practice for livable and healthy cities.

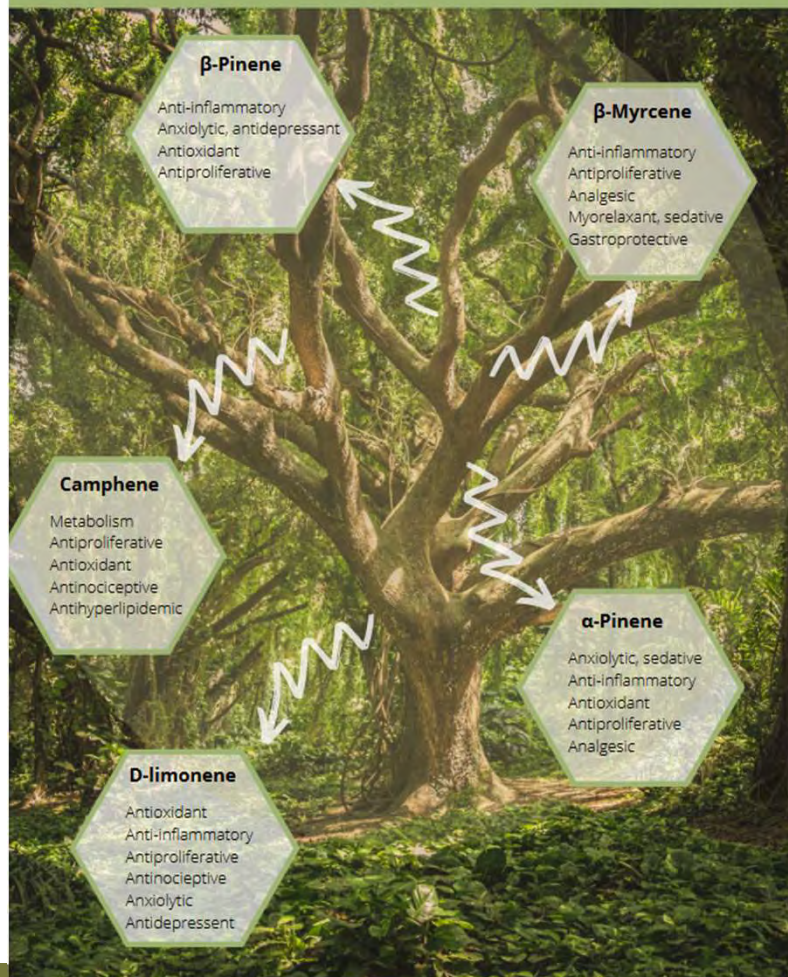
# A little Science

- Nature helps to direct attention- Multi-taskers have impaired ability to focus on cognitively demanding tasks
- Phytoncides reduce stress and lower blood pressure

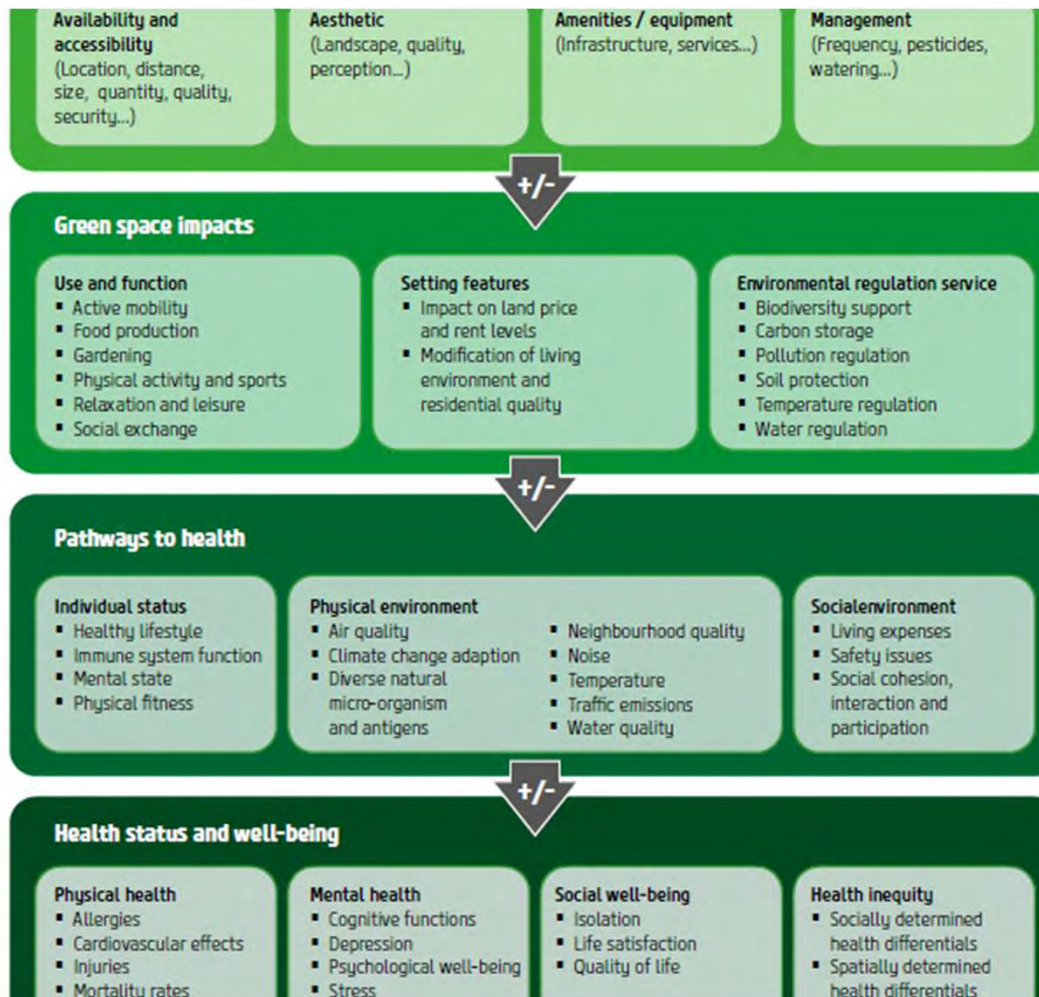
Phytoncides are antimicrobial allelochemic volatile organic compounds derived from plants.



# PHYTONCIDES FROM THE FOREST









# DESIGN AND BEAUTY

# Why Beauty Matters

- Without beauty, nothing else matters
- Beauty can change how people act
- Small civic actions can be beautiful
- Beauty begets beauty
- Beauty should be the starting point of everything
- Determine success by measuring happiness

*<https://ideas.ted.com/why-beauty-matters/>*



# ORIGINS

10,000 years of living synchronously with the land and sea

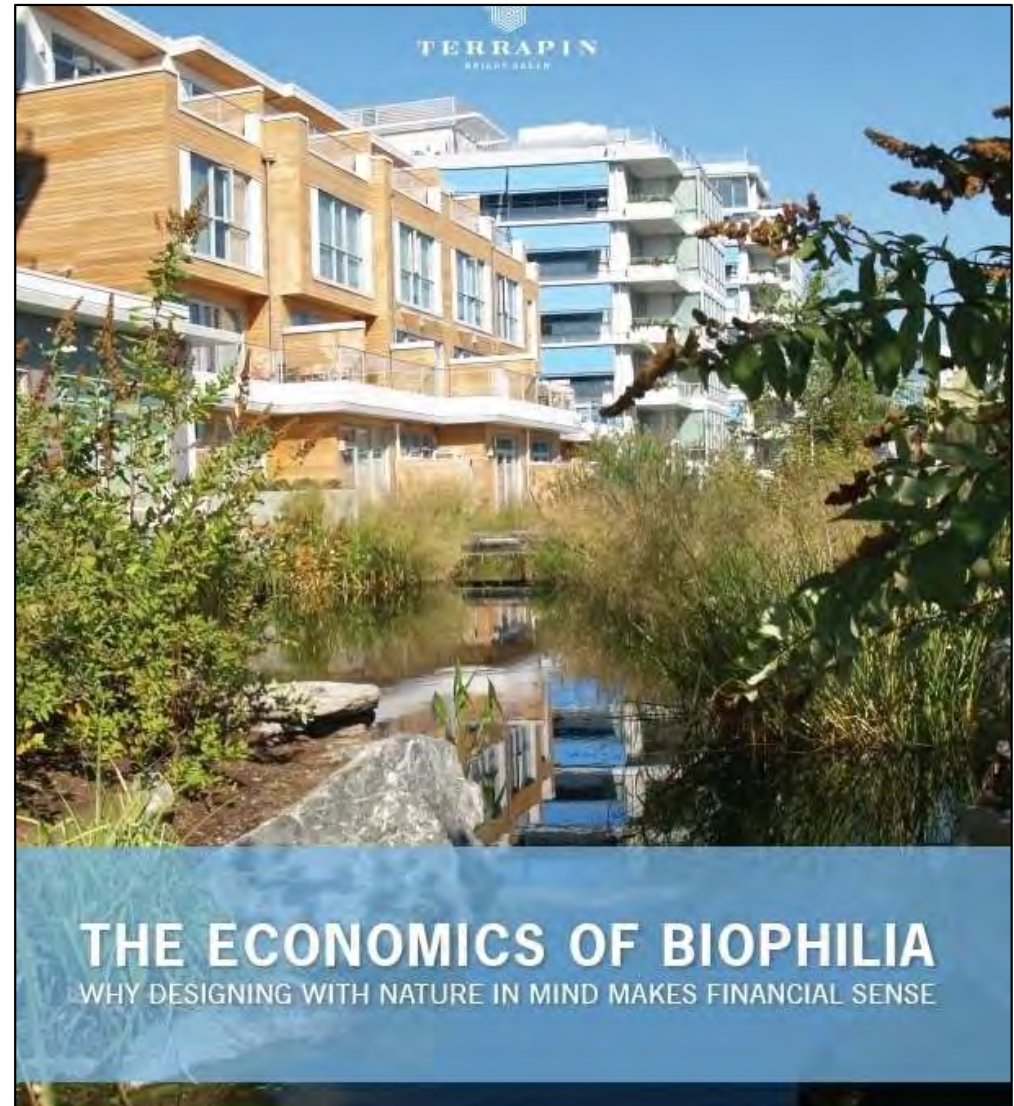




*the*  
NATURE  
FIX



*Why Nature Makes Us Happier,*



**THE ECONOMICS OF BIOPHILIA**

WHY DESIGNING WITH NATURE IN MIND MAKES FINANCIAL SENSE

# EVALUATING LANDSCAPE PERFORMANCE

A Guidebook for Metrics and Methods Selection  
2018

## The Rail Park, Phase 1



BEFORE AFTER

# PHILLY RAIL TRANSFORMATION



# But with acknowledged barriers



Journal of Environmental Planning and Management

Routledge  
Taylor & Francis Group

ISSN: 0964-0568 (Print) 1360-0559 (Online) Journal homepage: <https://www.tandfonline.com/loi/cjep20>

## Challenges of mainstreaming green infrastructure in built environment professions

Adriana A. Zuniga-Teran, Chad Staddon, Laura de Vito, Andrea K. Gerlak, Sarah Ward, Yolandi Schoeman, Aimee Hart & Giles Booth

To cite this article: Adriana A. Zuniga-Teran, Chad Staddon, Laura de Vito, Andrea K. Gerlak, Sarah Ward, Yolandi Schoeman, Aimee Hart & Giles Booth (2020) Challenges of mainstreaming green infrastructure in built environment professions, Journal of Environmental Planning and Management, 63:4, 710-732, DOI: [10.1080/09640568.2019.1605890](https://doi.org/10.1080/09640568.2019.1605890)

To link to this article: <https://doi.org/10.1080/09640568.2019.1605890>





## Part III: Us: A Guide to Humans & Relationships

We are VISUAL- nearly 60% of our neural networks are connected with vision

We are EMOTIONAL first- the rational human models are simply false

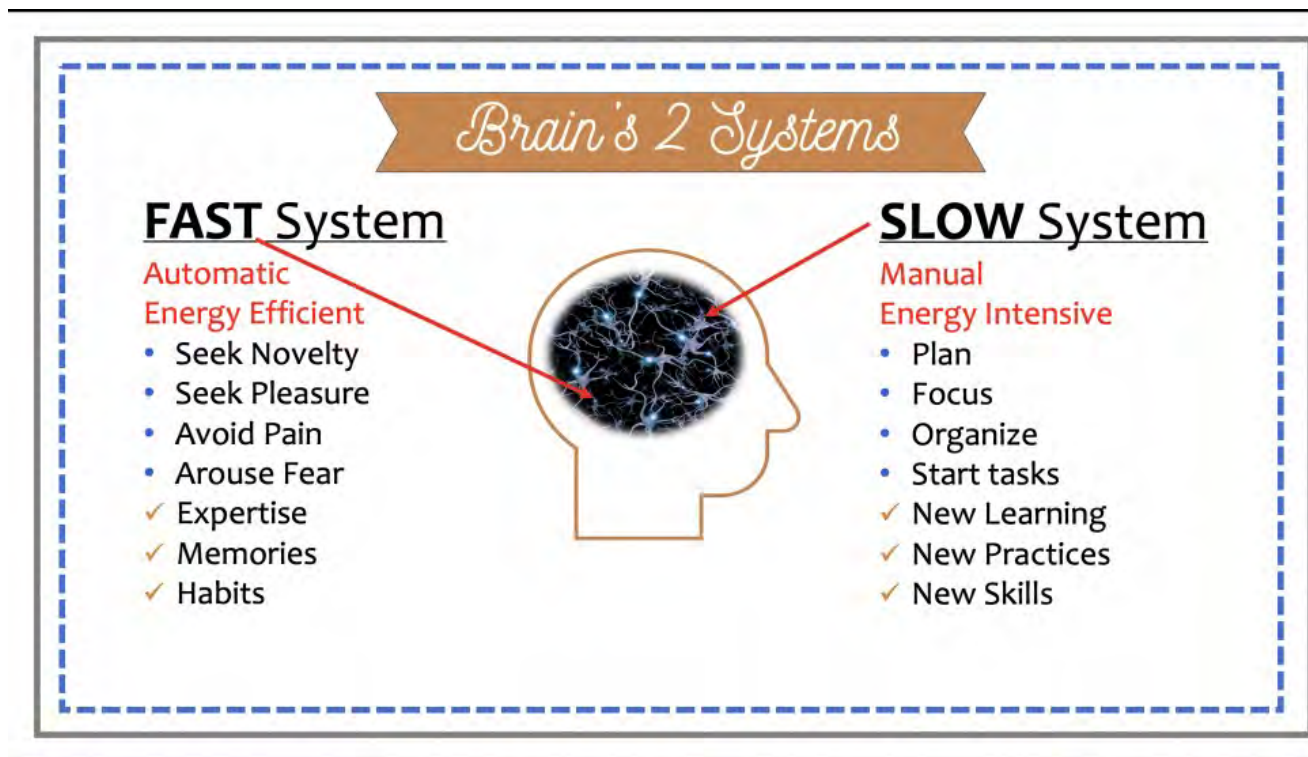
We use FILTERS for all incoming information

# Rational Actor Model is \*meh\*





# We think fast more than slow- epic battle





# Why Happiness Matters

Happy people make better decisions



# Human Happiness & Unhappiness

- Autonomy
- Competence
- Relatedness
- Self esteem
- Fear
- Confusion
- Loneliness
- Lack of Control

# Humans Have Limited Capacity to Store Information



SEVEN(7)



Uh oh....





"After careful consideration of all 437 charts, graphs, and metrics, I've decided to throw up my hands, hit the liquor store, and get snocked. Who's with me?!"



## Humans are Group Animals

Humans seek “In-group” affiliation- what our peers think and do is **INFLUENTIAL**- more than you think



## World Views are Cubby Holes

World Views formed  
through family, education  
and experience-

All incoming information  
fits into that world view



# Cialdini- Principles of Persuasion



Most Important  
Book Ever Read

People want to be  
Included

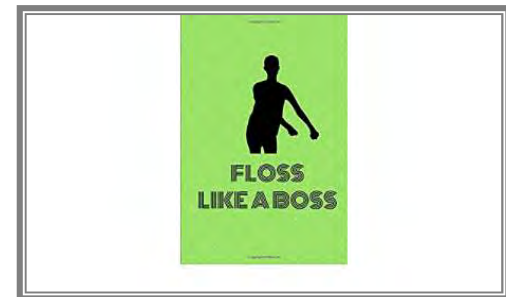


# If you do anything....

- Know something about your audiences and what they value
- Tailor your messages and messengers to those values
- Keep it local, simple and with good references and links for action
- Provide context- toxics are bad for fish, people and the economy
- Use visuals
- Tell Stories
- LISTEN and ask questions

# Do your Homework- Planning is like Flossing

- Identify objectives of the intended communication
- Identify priority audiences
- Define key messages
- Identify communication methods (channels) to disseminate information





# New Stormwater Messaging Research



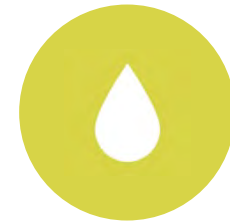
STORMWATER MESSAGING  
RESEARCH!



[HTTPS://PUGETSOUNDSTORMGR  
OUP.ORG/TOOLKIT.ASPX?NO=52  
1&DOCID=QO69Z02P5AQ%3D](https://pugetsoundstormgroupp.org/toolkit.aspx?no=521&docid=QO69Z02P5AQ%3D)



2018 RESEARCH FROM OUR OWN  
HEATHER TRIM AND HER TEAM



DON'T USE THE WORD  
"STORMWATER." *UH OH*



## Audience Identification

- No such thing as “the general public”
- Knowing specific audiences for your work is the very first step

# Inquiry based approach



Who stands to lose?



Who stands to gain?



What are the assets, values at play?

Who/what is causing the problem?



# Who loses?

## *Loss Sensitivity*

- **Who** loses when a normally available habitat, place and its function or product becomes degraded, extinct or no longer available (e.g., waters that produce fish and shellfish, clean places to recreate, waters that need expensive clean up, loss of resilience from removing floodplains, wetlands and other important protective functions). The “who” can be a person, organization, industry sector or a community of practice)
- **What is the frequency and magnitude** of the loss? Do they suffer from cost shifting whereby they have to pay for the consequences of someone else’s actions?



# Who has a gain or opportunity?

Think creative/solution opportunities

- Businesses or new/existing technology manufacturers/sellers who have fixes, products or approaches that help to mitigate the harm or prevent it to begin with
- NGOs that can use the problem to highlight or push for a new set of policies or laws, or use a new campaign (SRKW)
- A public sector entity that is in the process of developing new partners, approaches, cultivating new learning or undertaking an organizational development process who wants to use the emerging or existing problem as an opportunity to test out (for instance), a new interdisciplinary approach. They also may use the opportunity to develop new financing authority, new policies or laws or step up enforcement efforts.

# Cradle the Cause Makers



Focus on WHAT?????!!!!

How?

- Message about the reveal multiple benefits associated with taking action
- Appeal to their values, priorities and concerns
- Frame the action as a part of a big trend (everyone's doing it- to establish a social norm)
- Establish necessary legal and enforcement mechanisms to address the issue

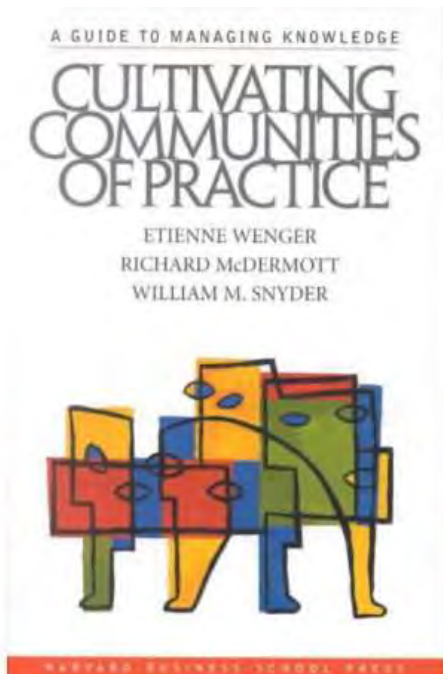
# Basics

- #1: What do you want audiences to know, think, feel and act?
- #2: Identify your different audiences
- #3 Find out their values, preferences, concerns: ASK QUESTIONS
- #4 Answer WIFM or “**W**hat’s **I**n it **F**or **M**e?”
- #5 Link *messenger* with who they trust (peers, mentors, opinion leaders in their social group- is often NOT US)

# Engagement

- You are already doing tons of engagement about Public Works Projects
- If you ask questions, let people get actively involved using visual tools and tell them it will be pretty, cool temperatures and make them safer, you are already bringing down the temperature on potential conflict





## Communities of Practice

- Purposeful
- Dedicated to a domain of knowledge/practice
- Best approach for change

# How to use COPs



Develop easy to use tools and models to share with them



Collaboratively develop workgroups to explore problem solving



Build trust relationships by meeting often and sometimes out of work hours (to build social capital)



Help them build capacity and use them to identify barriers to what you are asking them to do

## Part IV- Drivers



CLIMATE  
CHANGE-  
ANOTHER  
HOLY  
BANANAS BUT  
AN  
OPPORTUNITY



## Green Infrastructure for Climate Resiliency

Climate change is impacting urban areas in many ways, from exacerbating the urban heat island effect to elevating flood risk. Build green infrastructure to help improve community resilience.

### FLOODING



By the end of the century, annual damages from flooding in the U.S. are projected to **increase by 30%**<sup>1</sup>

### DROUGHT



**1 out of 3** U.S. counties in the lower 48 states face higher risks of water shortages by mid-century.<sup>2</sup>

### COASTAL DAMAGE



**50%** of Americans live in coastal counties, where water and energy infrastructure are increasingly vulnerable to higher sea levels.<sup>3</sup>

### URBAN HEAT



Climate change will likely lead to more frequent and severe heat waves during summer months.<sup>4</sup>

### Green Infrastructure Builds Resiliency



### Green Infrastructure at Work

#### LOWER URBAN HEAT ISLAND EFFECTS



Studies show that green roofs can **reduce the energy** needed for cooling on the floor below the roof by more than **50%**<sup>5</sup>

#### KEEP WATER LOCAL



By capturing rain where it falls, urbanized Southern California and the San Francisco Bay area could boost water supplies by up to **200 billion gallons per year** – as much water as the city of Los Angeles uses annually.<sup>6</sup>

#### BUILD COASTAL RESILIENCY



Research suggests that **wave height can be reduced by 50%** within the first 16 feet of marsh and 95% after crossing 100 feet of marsh.<sup>7</sup>

#### MANAGE FLOOD RISK

A study in Burnsville, MN showed a **93% reduction** in runoff volume after the installation of 17 rain gardens in a 5.3 acre neighborhood.<sup>8</sup>



#### USE LESS ENERGY



Give your air conditioner a rest! One young, healthy tree can produce cooling effects **equivalent to ten room-size air conditioners** operating 20 hours a day.<sup>9</sup>



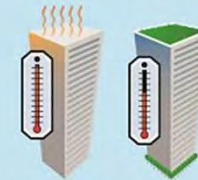
For more information on green infrastructure, see: [www.epa.gov/greeninfrastructure](http://www.epa.gov/greeninfrastructure)

1. <http://hatterasriver.com/2012/01/16/1111183-12633.pdf>  
 2. [www.epa.gov/epa/2012/01/16/1111183-12633.pdf](http://www.epa.gov/epa/2012/01/16/1111183-12633.pdf)  
 3. <http://www.epa.gov/epa/2012/01/16/1111183-12633.pdf>  
 4. [www.epa.gov/epa/2012/01/16/1111183-12633.pdf](http://www.epa.gov/epa/2012/01/16/1111183-12633.pdf)  
 5. [www.epa.gov/epa/2012/01/16/1111183-12633.pdf](http://www.epa.gov/epa/2012/01/16/1111183-12633.pdf)  
 6. [www.epa.gov/epa/2012/01/16/1111183-12633.pdf](http://www.epa.gov/epa/2012/01/16/1111183-12633.pdf)  
 7. [www.epa.gov/epa/2012/01/16/1111183-12633.pdf](http://www.epa.gov/epa/2012/01/16/1111183-12633.pdf)  
 8. [www.epa.gov/epa/2012/01/16/1111183-12633.pdf](http://www.epa.gov/epa/2012/01/16/1111183-12633.pdf)  
 9. [www.epa.gov/epa/2012/01/16/1111183-12633.pdf](http://www.epa.gov/epa/2012/01/16/1111183-12633.pdf)

# Flooding, Drought, Coastal Damage and Heat

## Green Infrastructure at Work

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For more information on green infrastructure, see: [www.epa.gov/greeninfrastructure](http://www.epa.gov/greeninfrastructure)



## Climate Change and Resilience

- Floodable Spaces
- Green Stormwater Infrastructure
- Mature Tree Retention and Urban Forestry
- Green Stormwater Infrastructure of all kinds: Low Impact Development, parks and open space, tree retention and planting

# New climate planning for GMA locally

New law passed in 2023 (HB1181) requires climate change plan element in Comprehensive Plans

<https://www.commerce.wa.gov/serving-communities/growth-management/growth-management-topics/climate-change/>

- Resilience element required by all jurisdictions
- Grants available
- Biophilia is a pathway to resilience!

# National Nature Assessment

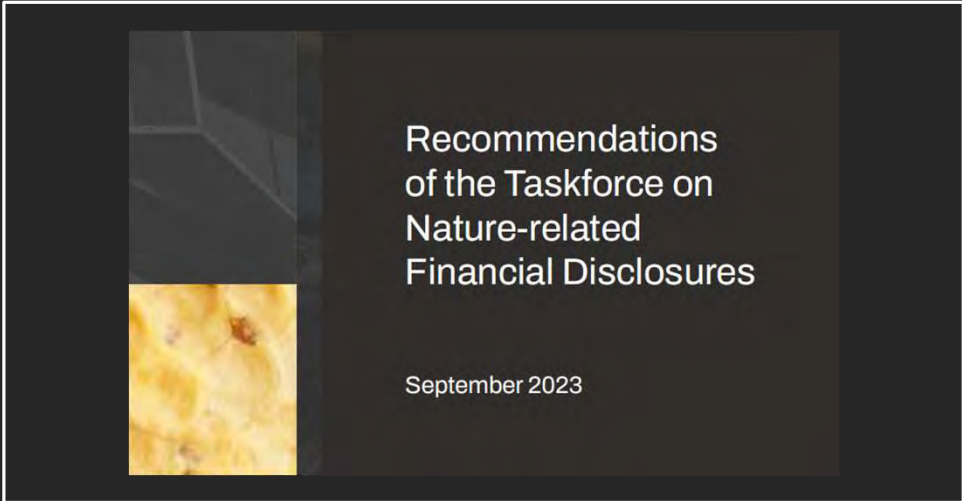
## **U.S. Global Change Research Program Announces First National Nature Assessment Chapter Leadership**

March 7th, 2024

USGCRP has named [11 Federal Coordinating Lead Authors \(FCLAs\)](#) and [11 Chapter Leads](#) to lead the writing of the first-ever [National Nature Assessment](#) (NNA1).

NNA1 will provide a holistic picture of America's lands, waters, wildlife, and ecosystems and the benefits they provide to us—to our economy, health, climate, culture, and even our national security.





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Article | [Open access](#) | Published: 20 January 2024

**Financial constraints and short-term planning are linked to flood risk adaptation gaps in US cities**

[Shirley Lu](#) & [Anyia Nakhmurina](#)

[Communications Earth & Environment](#) 5, Article number: 43 (2024) | [Cite this article](#)

1012 Accesses | 12 Altmetric | [Metrics](#)

**Abstract**

Adaptation is critical in reducing the inevitable impact of climate change. Here we study cities' adaptation to elevated flood risk by introducing a linguistic measure of adaptation extracted from financial disclosures of 431 US cities over 2013–2020. While cities with a higher flood risk



Our obligations as stewards  
extend to many generations and  
compel us to make our future  
more resilient- enriching the  
human spirit

AUSTIN CHILDREN'S  
**OUTDOOR**  
**BILL of RIGHTS**

In which every child has the right to:

Climb a tree

Catch a fish

Picnic in a park

Hike a trail

Ride a bike

Splash in a creek or river

Discover plants and wildlife

Play in the sand and mud

Gaze at the night sky

Chase a firefly

Plant a seed and watch it grow

Harvest and eat a fruit or vegetable

## Focus on Children

<https://www.childrenandnature.org/>

Guides on how to develop and maintain  
space for play and growth



# Who gets access? Equity in Planning

- Historical lack of access to nature in cities and ex-urban areas
- Poor air quality and higher rating on Heat Island Indices
- Excessive impervious surface (nail in the coffin)
- May require some depaving!

<https://depavepugetsound.org/>

<https://planning-org-uploaded-media.s3.amazonaws.com/publication/download/pdf/Planning-for-Equity-Policy-Guide-rev.pdf>





# Green Space: An Underestimated Tool to Create More Equal Cities

September 29, 2020 By Delfina Grinspan, **John-Rob Pool**, **Ayushi Trivedi**, **James Anderson** and Mathilde Bouyé Cover Image by: Ignascio Brosa/Unsplash

## Greening practitioners worry about green gentrification but many don't address it in their work(Article)

Nesbitt, L., Sax, D.L., Quinton, J., Harris, L.M., Barona, C.O., Konijnendijk, C. 

<sup>a</sup>Department of Forest Resources Management, University of British Columbia, Canada

<sup>b</sup>Institute for Resources, Environment and Sustainability and Institute for Gender, Race, Sexuality and Social Justice, University of British Columbia, Canada

<sup>c</sup>Anthropology and Development Studies, University of Johannesburg, South Africa

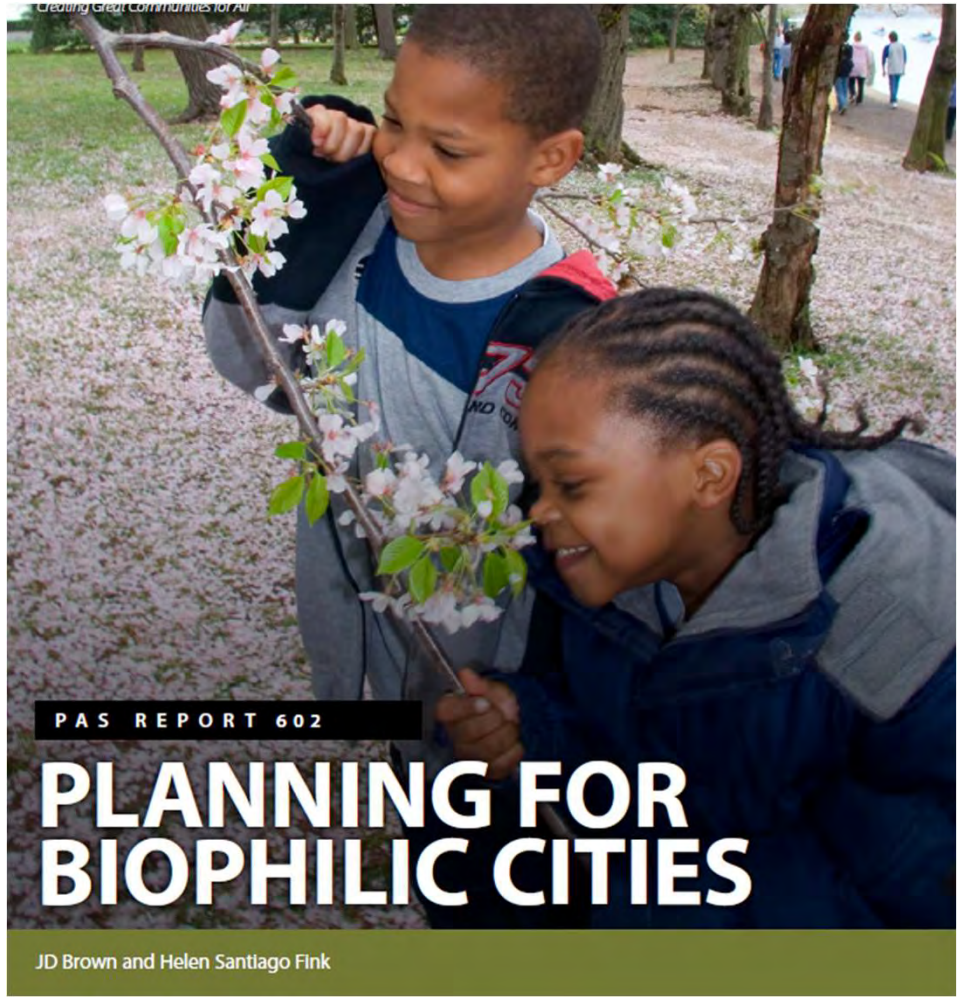
[View additional affiliations](#) 

# Resources

# Planning

- Develop integrated teams- know and understand other professions
- Map out processes, laws, values
- Understand multiple-benefit goals and desired outcomes
- Use tools from everywhere to learn
- Partner to communicate visually and effectively





Creating Great Communities for All

PAS REPORT 602

# PLANNING FOR BIOPHILIC CITIES

JD Brown and Helen Santiago Fink



# Retrofitting Our Legacy

**GREEN STRATEGIES FOR TREATING URBAN STORMWATER**



Accelerating the Strategic Use of Green Stormwater  
Infrastructure to Improve Water Quality for People and

**RETROFITTING  
OUR LEGACY-  
GSI IN URBAN  
SETTINGS**

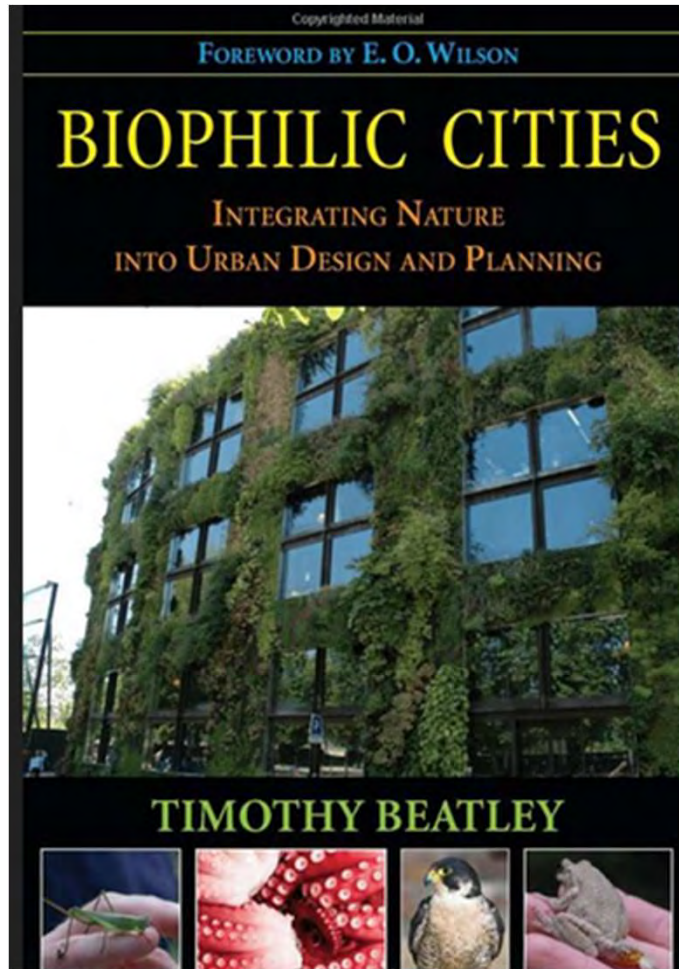
# Tools from The Nature Conservancy

SOW Template: <https://lnkd.in/gk6MQtEe>

Case Studies: <https://lnkd.in/gKYeN4Gd>

Modifiable Template: <https://lnkd.in/gxjU-S7i>







# What you work on with Biophilic cities

**International group advocating for Biophilic Cities**

Resilience!

Community!

Environmental Justice and Access!

Smart Planning!



## WORKING TO RESTORE YOUR WATERSHED?

Salmon-Safe certification now available through Cascadia Conservation District



## PREFERRED BY FREQUENT FLYERS



# SALMON SAFE

# Resource Fiesta

- ICLEI
- Natural Capital Coalition
- Biophilic Cities Initiative
- Terrapin Bright Green
- Retrofitting for Flood Resilience (Riba publications)
- Green Infrastructure Leadership Exchange
- University of Toronto Green Roof Innovation Testing Lab

# More Resources

- Landscape Architecture Foundation
- City Parks Alliance
- Salmon Safe
- Building Green Cities (WA. Commerce)
- APWA Green Infrastructure Toolbox

# Some Local Goodies

Guidance for Planning Stormwater Parks

<https://www.psrc.org/media/7331>

Urban Trees and Stormwater

<https://snohomishcd.org/trees-and-stormwater>

Integrating Stormwater Solutions into Comprehensive Planning

<https://www.psrc.org/media/7640>

<https://www.commerce.wa.gov/servicing-communities/growth-management/growth-management-topics/watershed-grants/>



Biophilia is like Where's Waldo-  
it's everywhere

# Biophilia in Schools



More  
Attentive

Attention  
Restoration  
Theory



# BIOPHILIA IN OFFICES

# Biophilia in Retail

Will pay more



Plants induce generosity





**THERAPEUTIC  
APPLICATION-  
PETS ARE  
BIOPHILIA!**







## BIOPHILIA FOR RETURNING VETERANS- FARMING

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FARMERS ASSISTING RETURNING MILITARY  
**F.A.R.M.**  
A VETERANS ORGANIZATION





# HOSPITALITY APPLICATIONS









# IN HEALTH CARE SETTINGS

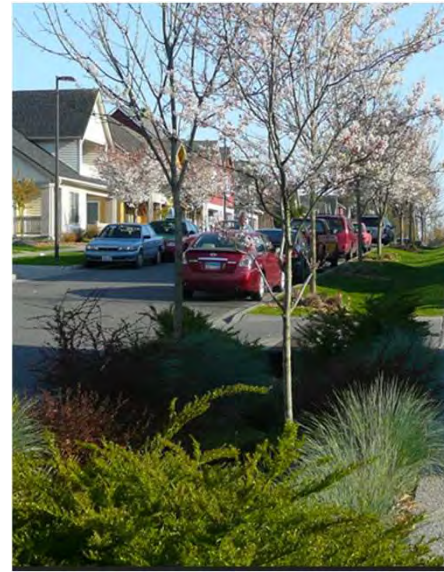
# Embodied in Architecture





# IN URBAN PLANNING





# HIGH POINT- GREAT LOCAL EXAMPLE

---



# Encourage Outings in Big cities











# Connecting stormwater parks and systems along the highly urbanized Seattle waterfront

October 26, 2023  
Jesse Williams, PE, Jacobs











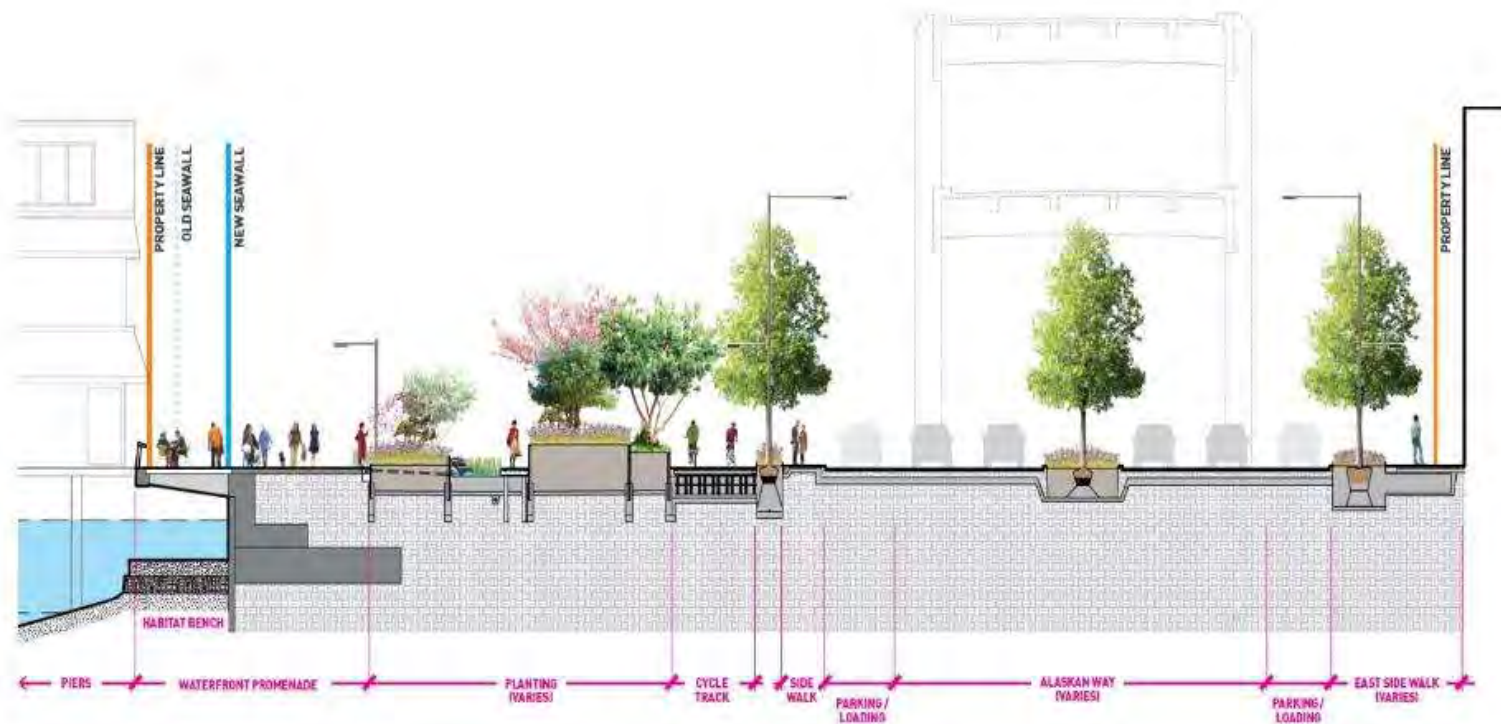
April 28 2023 © Tim Rice

Image courtesy of One Reel





# THE NEW WATERFRONT





# GREEN STORMWATER INFRASTRUCTURE (GSI)

Bioretention identified as the primary Best Management Practice (BMP) for stormwater treatment of all new roadway surfaces along Alaskan Way and Elliott Way.

- Able to treat an annual average of **10.4 million gallons (or 91%)** of the total stormwater runoff volume with:
  - 31 bioretention planters from Yesler Way to Pine Street
  - 1 large-scale 3-tiered bioretention planter at Pike Street
- Perfilter catch basins or filter vaults were used as water quality treatment in areas where bioretention could not be accommodated





# FUNCTIONS OF THE STREET



- VEHICLES, PARKING AND LOADING
- FERRIES: LOADING AND UNLOADING
- TRANSIT: SW TRANSIT PATHWAY
- NORTH/SOUTH BICYCLE AND PEDESTRIAN MOVEMENT

# PRIORITIZATION OF GREEN STORMWATER INFRASTRUCTURE (GS



## Bioretention planters

- 27 bioretention planters on east side  
(Yesler Way to Pine St)
- 4 bioretention planters on west side  
(Yesler Way to Columbia St)
- 1 large-scale 3-tiered bioretention  
planter at Pike Street treats water  
from northern extents of the project



# ALASKAN WAY BIORETENTION





# ALASKAN WAY BIORETENTION





# OVERLOOK WALK















# PROMENADE

## View from Marion Street Pedestrian Bridge





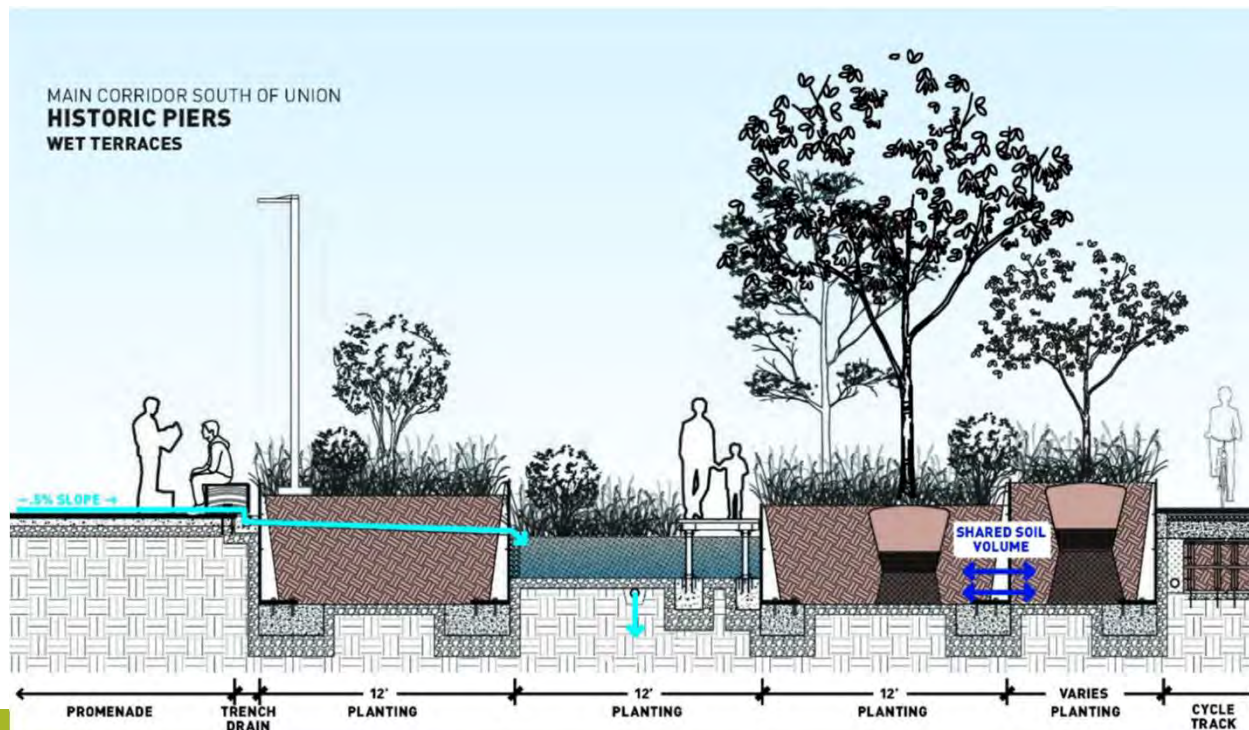
# PROMENADE TIDELINE TERRACES



# PROMENADE TIDELINE TERRACES – WET PLANTERS



- Manages runoff from promenade/sidewalk (non-polluting)
- Goes beyond current stormwater code requirements for water quality
- Provides treatment for addition 3.2M gallons of stormwater runoff





## QUESTIONS?

Contact us at:

[info@waterfrontseattle.org](mailto:info@waterfrontseattle.org)

206.499.8040

[waterfrontseattle.org](http://waterfrontseattle.org)

[Jesse.Williams@jacobs.com](mailto:Jesse.Williams@jacobs.com)

206.595.8175



# Green Stormwater Infrastructure

# Green Infrastructure- great ROI

Increases infiltration and reduces water pollution

Grows to be attractive and pretty

New GASB 87 interpretation (General Accounting Standards Board)- distributed GI can be booked as a capital asset and bonded against

Good for all spaces with infiltration- especially cities (see High point slide)

Engineered Bioretention removes most pollutants- this likely includes the tire wear particle 6PPD Q which kills coho salmon in short order



High Point: SEATTLE, WA  
Credit: Seattle Public Utilities

# Stormwater Parks

Stormwater parks can have multiple benefits:

- Provide recreation
- Treat, store, and infiltrate stormwater from hundreds of acres
- Address equity when built areas underserved by parks
- Support Tribal treaty rights
- Add natural features and wildlife habitat to an already built park
- Be funded by multiple sources





# Stormwater Parks Project

Puget Sound National Estuary Program Grant to promote stormwater parks

- Share lessons from already-built stormwater parks: <https://www.psrc.org/our-work/stormwater-parks>
- Identify opportunities for new stormwater parks regionwide and provide technical assistance for planning 6 stormwater parks
- Develop a guidance document on planning for stormwater parks





# City of Arlington

## Stormwater Wetland Park

- Constructed wetlands providing stormwater treatment and flow/flood control
- Recreation: Trails, water access, wildlife viewing, dog park
- Facility size: 21-acre park with a 9-acre wetland
- Drainage basin area: 280 acres (Old Town Arlington)





# Kitsap County



## Manchester Stormwater Park

- Small park with natural and engineered stormwater infrastructure that provides treatment and flood control
- Recreation: community gathering space/lawn, walking paths
- Facility size: 0.5 acres
- Drainage basin area: 100 acres



# City of Portland

## Tanner Springs Park

- Constructed wetland, cistern, and bioswales provide treatment
- Recreation: paths, art, waterscapes
- Facility size: .92 park
- Drainage basin area: 109 acres

Photo: GreenWork PC

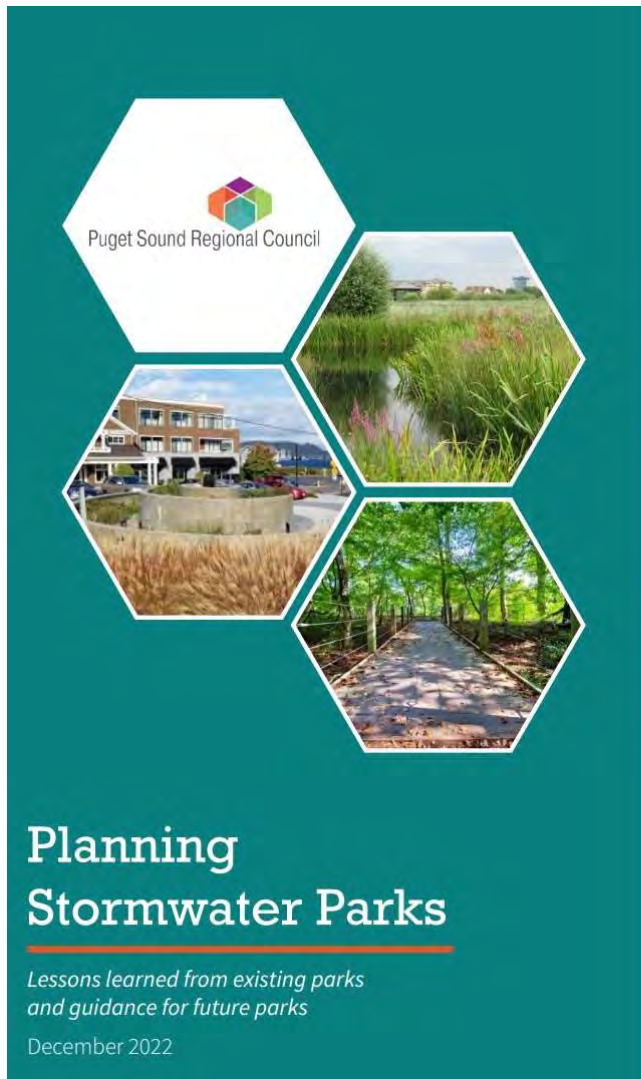




# Lessons Learned

- Can achieve **multiple benefits** when well sited and designed
- Find opportunities through working with **other departments** and **partners**
- Early **public engagement** leads to greater acceptance
- Having a **project champion** and **political support** is needed
- Consider **maintenance needs** in project design
- Factor **climate change** impacts into design
- **Vary greatly** in size, function, and cost; **many opportunities** to develop stormwater parks throughout the region





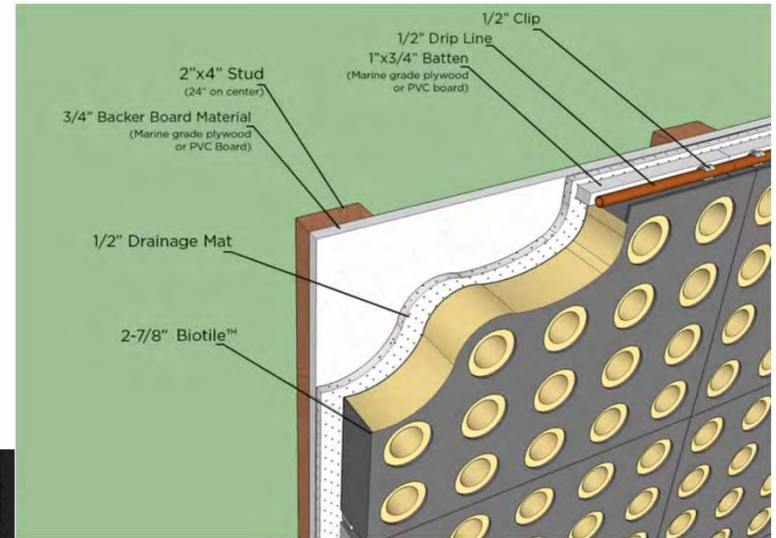
Planning Stormwater Parks:  
[www.psrc.org/our-work/stormwater-parks](http://www.psrc.org/our-work/stormwater-parks)

Erika Harris, AICP,  
[eharris@psrc.org](mailto:eharris@psrc.org)





# Green Roofs and Walls





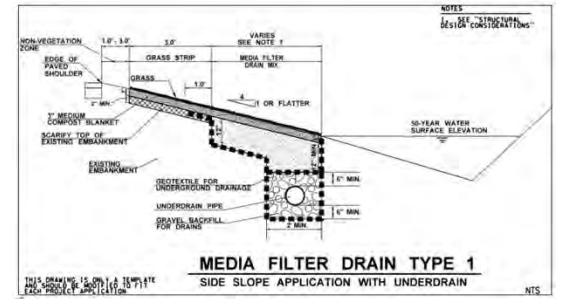
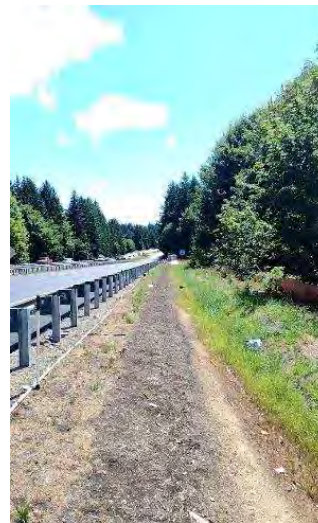
# Transportation



WSDOT - Chico Creek Remove Fish Barrier Project  
05/04/2023 3:13:15 PM



WSDOT - Chico Creek Remove Fish Barrier Project  
03/24/2023 12:13:05 PM



## Fish Barrier Removal in Chico Creek

Part II: Humans- can't live with `em-,  
can't do anything like integration  
without `em

# Integration

- Identify and close silos
- Assemble cross disciplinary and cross organizational teams
- Don't forget communicators and social scientists!
- Follow the scaffolding of the National Water and Land Planning work
- It takes more work but you get better results!



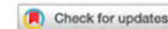
# Calling all Integrators!

We can do this ourselves, but dedicated professionals would accelerate integration practice

Humanities & Social Sciences  
Communications



ARTICLE



<https://doi.org/10.1057/s41599-022-01138-z>

OPEN

Integrate the integrators! A call for establishing  
academic careers for integration experts

Sabine Hoffmann <sup>1,2</sup><sup>2a</sup>, Lisa Deutsch <sup>1,3</sup>, Julie Thompson Klein<sup>2,4</sup> & Michael O'Rourke <sup>5,6</sup>



## Join the Water and Planning Network

Free! No need to belong to the APA \*unless you want to

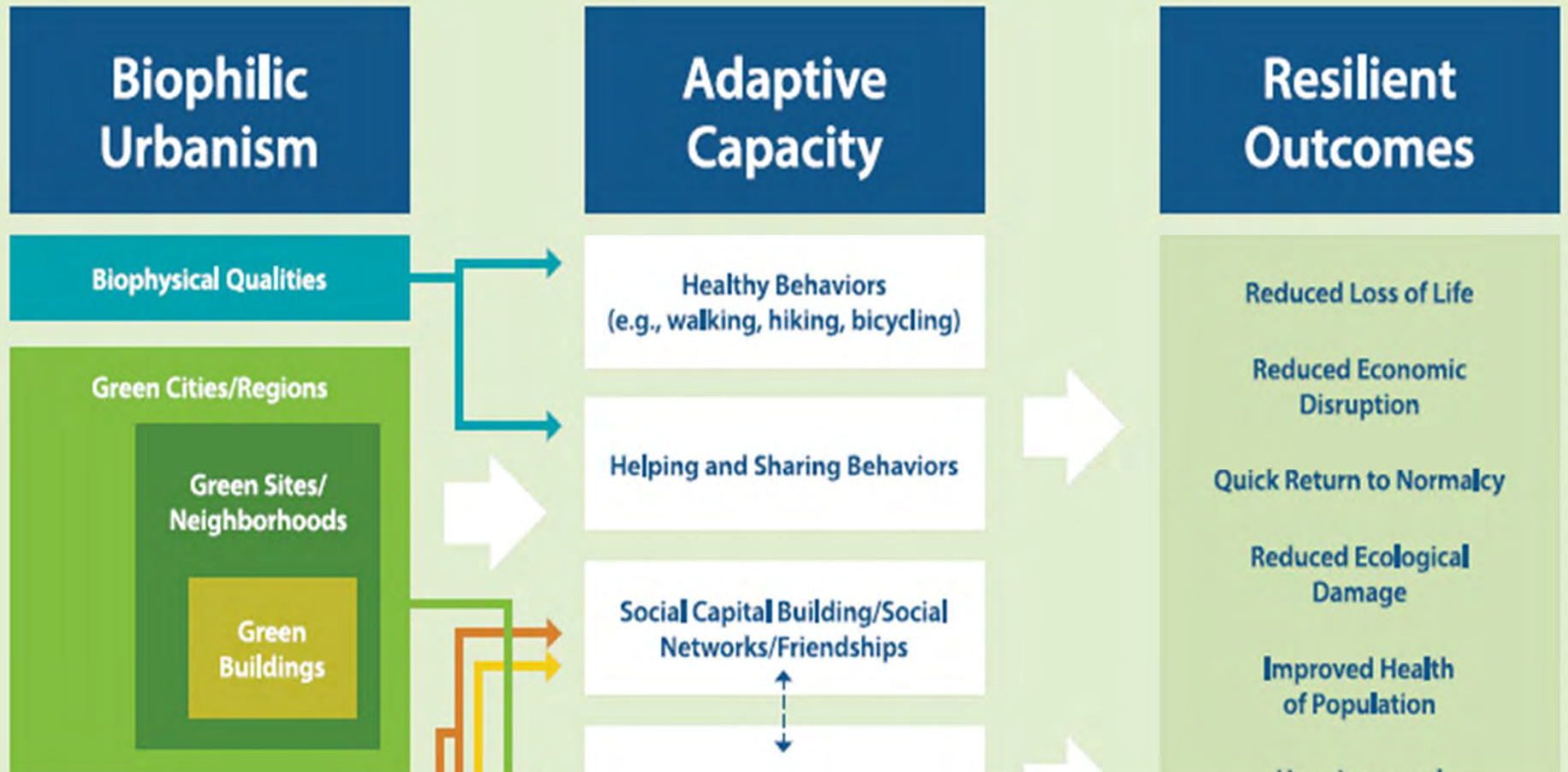
[Water@planning.org](mailto:Water@planning.org)

## Example Toolbox: Top 10 Tools, According to Experts

	Water Adequacy	Flooding	Aging Infrastructure	Water Quality	Resilience	Equity	Magnitude of Cost	Ease of Implementation
Comprehensive and Master Plans	●●	●	●	●	●●	●	●	●
Remove Existing Barriers	●	●	●	●	●	●	●	●
Public Engagement and Participation	●	○		●	●	●●	●	●
Coordinated Data and Information	●	●	●	●	●	○	●	●
Closed Approval Loop Between Land/Water	●●	●		○	●		●	●
Rate and Conservation Rates	●●	●			○		●	●
Water Resources Plans	●●	●	●	●	●		●	●
Developer Incentives	●	●	○	●	○	○	●	●
Ongoing Communication	●	●	●	●	●	●	●	●
Connection Charges	●●	●	●		○		●	●



# Biophilic Pathways to Urban Resilience



# Urban Ecological Planning- Overall PLAN

Know your benefits and how to contextualize and “sell” those benefits

Put some beef in your engagement- this is a real thing taxpayers and residents get from good planning and design

**TABLE 2.1 RESILIENCE BENEFITS OF URBAN NATURE**

**BENEFITS**

Air quality	Pollination
Biodiversity	Prosocial behavior
Carbon sequestration	Public safety
Childhood development	Reduced urban temperatures
Drought reduction	Social capital
Educational opportunities	Water quality
Erosion control	Wetland restoration
Flood and stormwater control	Wildfire mitigation
Health and well-being	Worker productivity
Improved property values	Zoonotic disease control
Pest control	

**TABLE 4.2. BIOPHILIC CONDITIONS INVENTORY AND ASSESSMENT TOOLS**

Assessment Tools	Description
<a href="#">EJScreen</a>	U.S. EPA environmental justice mapping and screening tool that combines environmental and demographic indicators.
<a href="#">EnviroAtlas</a>	An evolving interactive web-based platform created by the U.S. EPA that provides geospatial data, tools, and other resources related to ecosystem services and human health.
<a href="#">i-Tree</a>	A suite of free tools developed by the U.S. Forest Service and partners that aid in easily quantifying the benefits of trees, including canopy coverage, local urban forest structure and values, carbon sequestration, water management, and air quality.
<a href="#">NatureScore</a>	A tool from technology company NatureQuant that measures the amount and quality of natural elements using data sources that include satellite infrared measurements, GIS and land classifications, park data and features, tree canopies, air, noise and light pollutions, and computer vision elements (aerial and street images).
<a href="#">ParkScore</a>	Trust for Public Land index that measures U.S. park systems according to five categories: access, investment, amenities, acreage, and equity.
<a href="#">Singapore Index on Cities' Biodiversity</a>	Also called the City Biodiversity Index or the Singapore Index, this self-assessment tool helps cities evaluate and monitor the progress of their biodiversity conservation efforts against their own individual baselines.
<a href="#">Tree Equity Score</a>	A tool developed by American Forests to measure the equitable distribution of trees across cities.
<a href="#">Urban Biodiversity Inventory Framework</a>	Developed by a partnership of U.S. cities, this tool provides a methodology to assess, monitor, and guide planning of urban biodiversity.

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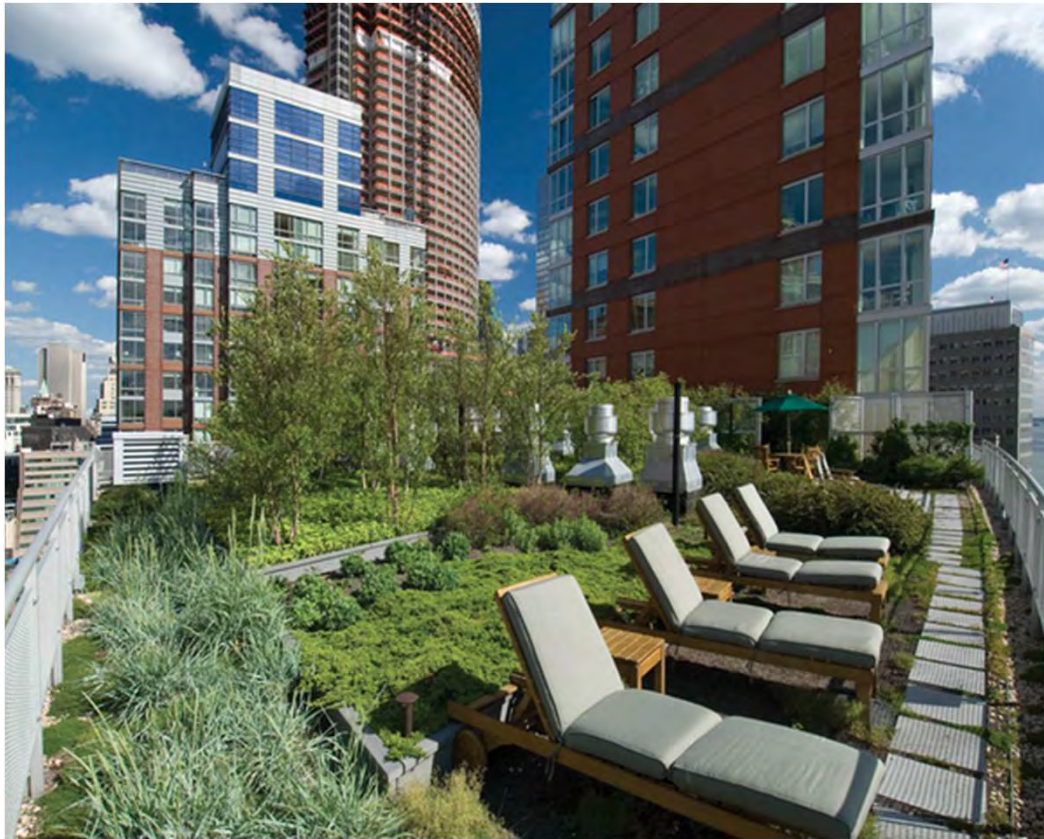
# INVENTORY AND ASSESSMENT TOOLS



# Indicators of Biophilic Cities

- Miles and acreage of green space
- Acres of natural areas protected
- Acres of brownfields turned into green space
- Wildlife passage creation
- Pollinator box distribution
- Demographics of residents participating in land use planning, nature-based programs
- Miles of streams restored and daylight
- Number or acres of stormwater mitigation projects





## Zoning Context

1. Capital Improvement Plans
2. Overlay Zones (see L.A.'s river improvement)
3. Viewshed Protection
4. Green Spaces and Open Space Zoning
5. Performance Zoning

BIOPHILIC LAWS: PLANNING FOR CITIES WITH NATURE

*James D. Brown\**

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# THE LAWS OF BIOPHILIC DESIGN

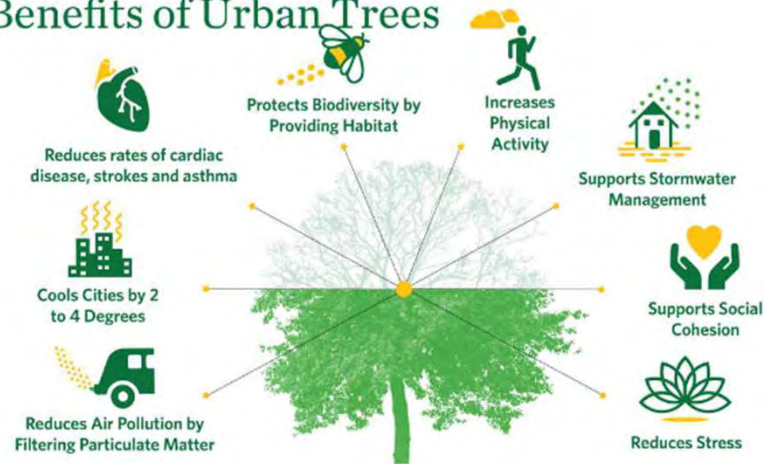


## About Trees

“ In the context of urban trees, there may be no adequate replacement for mature trees, which provide significantly greater value in comparison to younger trees in terms of stormwater retention and carbon sequestration. All efforts should be taken to prevent the loss of such irreplaceable natural resources.”

***Or what I say:*** “planting seedlings doesn’t do the trick- it’s like replacing a University Physics Department with three 2-year olds.”

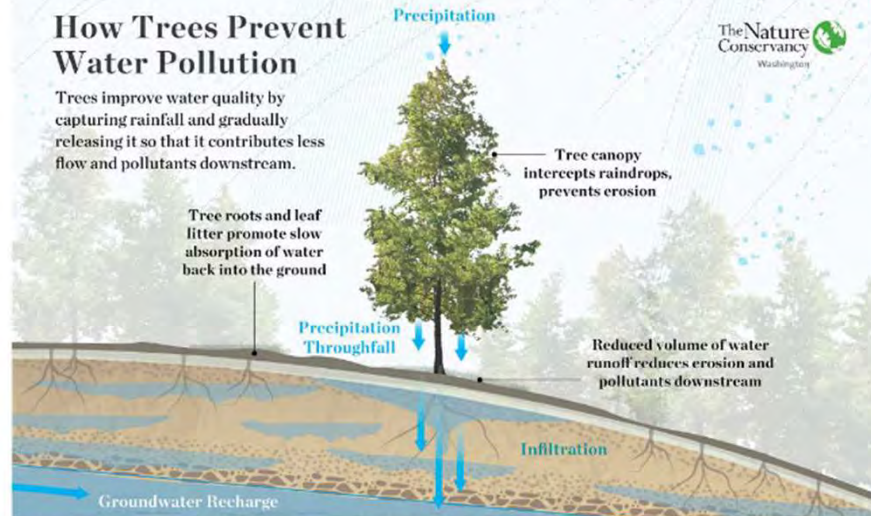
## Benefits of Urban Trees



Erica Simek Sloniker

### How Trees Prevent Water Pollution

Trees improve water quality by capturing rainfall and gradually releasing it so that it contributes less flow and pollutants downstream.



# Housing + Trees- the AND proposition

Presentation from the Arbor Day Foundation Conference 2022  
on **Achieving urban density and equitable healthy  
communities (37-minute presentation)**

<https://www.youtube.com/watch?v=UyoMCL8WCv8>

Bryant Heights Video- overview of dense development project

<https://vimeo.com/879395519>



# 3-30-300 for here

- 3 trees from every home
- 30 percent tree canopy cover in every neighborhood
- 300 metres (984 ft.) from the nearest public park or green space

Cecil Konijnendijk- Dutch urban forester



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INTERCONNECTING FORESTS, SCIENCE AND PEOPLE

# Resources for Planners

Stormwater Strategic Initiative Lead Team PUBLIC Box- full of goodies!!

**Parent Folder:**

<https://pspwa.box.com/s/m4ww5rzli8fdl4u1odwbop3rrfio5p2o>

**Folder on Integrated Water and Land:**

<https://pspwa.box.com/s/lgs7fp9ussjtsj1l89ptro52zd2xuvy5>



Thank you~Questions?

[Heidi.Siegelbaum@wsu.edu](mailto:Heidi.Siegelbaum@wsu.edu)

<https://wastormwatercenter.org>

<https://pugetsoundestuary.wa.gov>