

University District Ecological Assets and Performance Standards



Prepared for the University District Public
Development Administration, January 2024



Infiltration,
Cleansing, and
Retention

Upland
Grasslands

Pine Forest

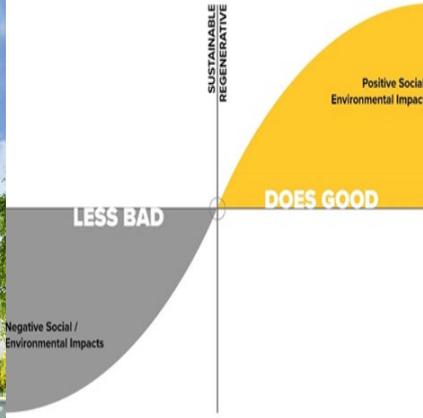
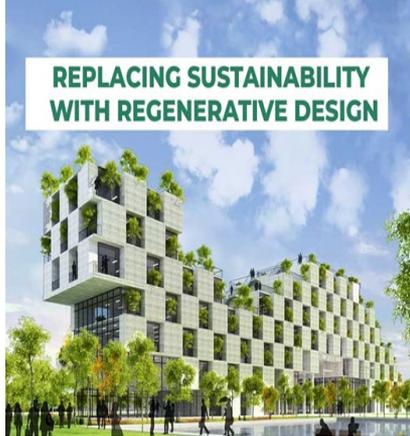
Presentation Outline

- I. Motivation and Vision
- II. Ecosystems Services, Biomimicry, and Regenerative Design
- III. UD Ecosystem Services and Targets
- IV. Design Standards and Considerations
- V. Measuring and Monitoring



District Ecological Asset and Performance Standards Study

Overarching Goal – Create standards around an urban ecological framework that leads to performance and design guidelines that sustain and improve the District’s baseline ecological assets.



WHAT IF EVERY SINGLE ACT OF DESIGN AND CONSTRUCTION MADE THE WORLD A BETTER PLACE?

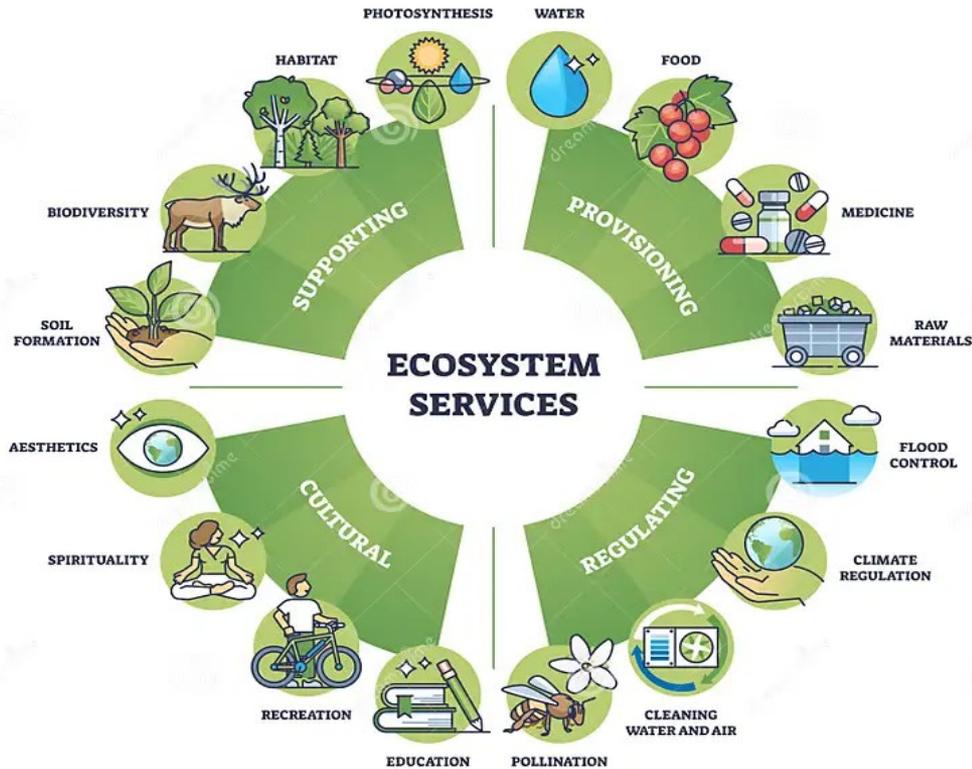
design that reconnects humans and nature through continuous renewal of evolving socio-ecological systems... moves beyond maintaining homeostasis of the current state while measuring impacts on future generations... HDR Engineering

buildings can serve as carbon sequestration sites. They can generate and store energy on site for surrounding communities, can use the site to clean stormwater runoff, and can even have skins that 'scrub' the air... this idea of not just using fewer resources, but of replenishing and bettering our environment HMC Architects



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What Are Ecosystem Services ?



Biomimicry and Regenerative Design

REGENERATIVE DESIGN

Use whole system thinking to create resilient and equitable systems that integrate the needs of society with the integrity of nature

Develop the built environment to restore the capacity of ecosystems to function at optimal health

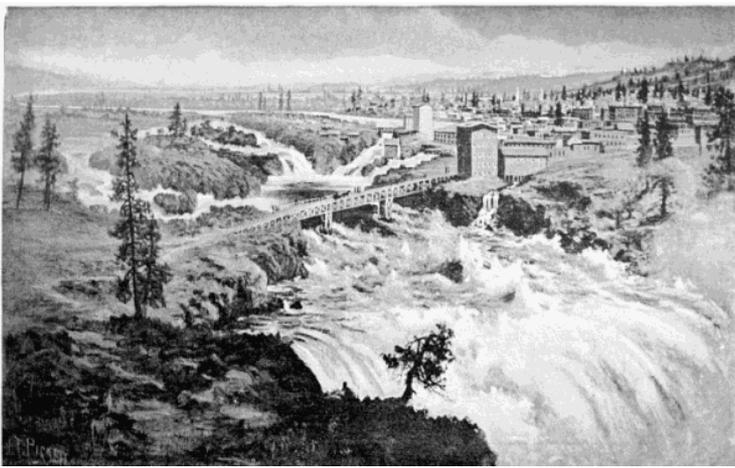
BIOMIMICRY

- ✓ Mimic the form and function of an organism
- ✓ Mimic behavior, aka interactions between an organism and its environment
- ✓ Mimic the behavior of the natural system- the ecosystem



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HISTORIC CONDITIONS

- Ponderosa pines and grass savannas
- Frequent fires (low intensity)
- Riparian corridor-priority habitat for many native species
- Cultural connection to the river
- Clean river and salmon
- Floodplains and vegetation provided water management and purification



EXISTING CONDITIONS

- Too much concrete – not enough pervious surfaces
- Few trees – not enough native trees
- No fire or extreme catastrophic fires
- Disconnected from river....
- Increased levels of air and water pollution
- Degraded or non-native soils
- Heat island effect

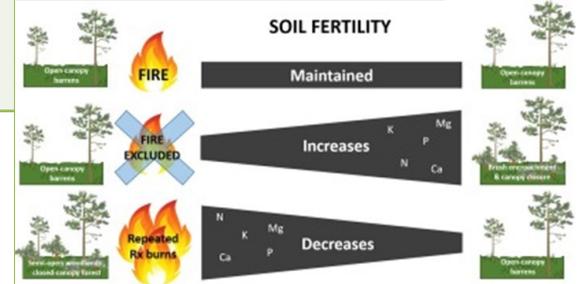
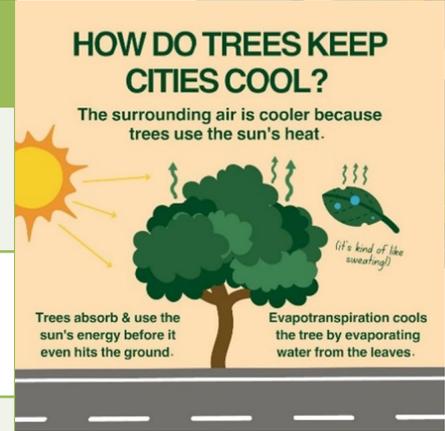


Core UD Ecosystems Services

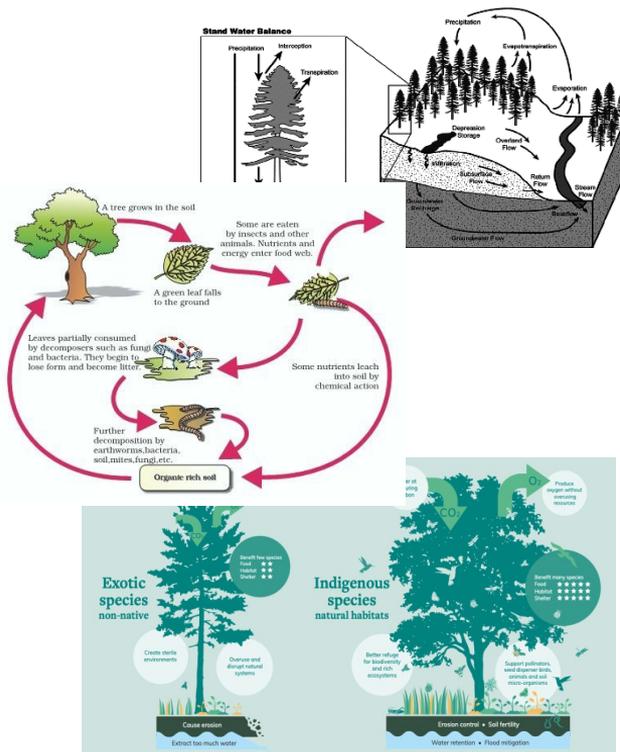
1. Air Filtration
2. Biodiversity
3. Carbon Sequestration
4. Energy Provision
5. Fire Adaptation
6. Nutrient Cycling
7. Pollination
8. Stormwater Management
9. Temperature Regulation
10. Waste Generation & Management
11. Water Cycling
12. Human Health & Wellbeing

Ecosystem Services and Targets

Ecosystem Service	Target
Air filtration	Particulates should not exceed that of native ponderosa pine savanna
Carbon Sequestration	Emissions should not exceed that which can be sequestered
Temperature	Shade should approach that provided by ponderosa pine savanna
Fire adaptation	Emulate low fuel load savanna grasses and fire- retardant outer materials similar to ponderosa bark



Ecosystem Services and Targets



Ecosystem Service

Target

Biodiversity

Environmental restoration activities will use species native to the ecosystem.

Stormwater Management

Zero percent impervious services or equivalent

Water Cycling

Water withdrawals will not exceed historic aquifer recharge rates

Waste Management

Manage waste in a closed loop (meaning all waste is decomposed or recycled back into ecosystem)

Ecosystem Service	Target
Air filtration	AQI PM _{2.5} and PM ₁₀ in the urban core should not exceed that of native ponderosa pine savanna (in fire-free conditions).
Biodiversity	Environmental restoration activities will use species native to the ecosystem in appropriate locations in ratios similar to the original landscape.
Carbon Sequestration	CO ₂ emissions from energy generated from fossil fuels and building construction should not exceed the net primary productivity (Mg C/ha/year) of the surrounding landscaping/vegetation including any engineered sequestration that may become feasible, and/or offset credits.
Energy Provision	Energy produced by rooftop solar and other distributed energy sources (geothermal and wind) should produce the equivalent net primary productivity of a mature ponderosa pine savannah.
Fire adaptation	Plant and maintain native fire-adapted vegetation that produces a fuel load similar to savanna grasses that burns quickly to reduce the incidence of and/or damage caused by catastrophic fire. Structures should have fire -retardant outer materials like the Ponderosa bark, and vegetation should emulate the quick-burning grasslands.
Nutrient Cycling	Open space areas should have the same ratio of trees to shrubs and grass as the ponderosa pine savanna ecosystem to enhance nutrient interception by roots and protect the system against nutrient losses. Artificial media in non-vegetated areas can also be used to absorb and retain nutrients.
Pollination	UD vegetation should mimic native perennial grasslands by including plant species known to host native pollinator communities represented in ponderosa pine savanna.
Stormwater Management	Zero percent impervious services or equivalent.
Temperature Regulation	The amount of shade in the developed urban ecosystem should be the same as what was provided by the ponderosa pine savanna. Shade targets could be met by both vegetation plantings and built structures. In addition, shade trees should be distributed equitably, as low-income areas tend to have fewer trees, and arguably less income to pay for air cooling.
Waste Generation & Management	The ecosystem assets and features of the pre-development UD site would have managed waste in a closed loop, meaning that all waste created would have been decomposed and recycled back into the ecosystem.
Water Cycling	Water withdrawals should be calibrated to protect the aquifer and limit water withdrawal to support historic aquifer recharge rates.
Human Health & Wellbeing	The ongoing development theme is to preserve the “winter camp” status of the area, as it was a meeting place for indigenous people where people come to share knowledge and food and culture.



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Design Framework



Riparian

- Spokane River
- 200ft Buffer



Public Realm

- Public Right of Way
- Public Open Space



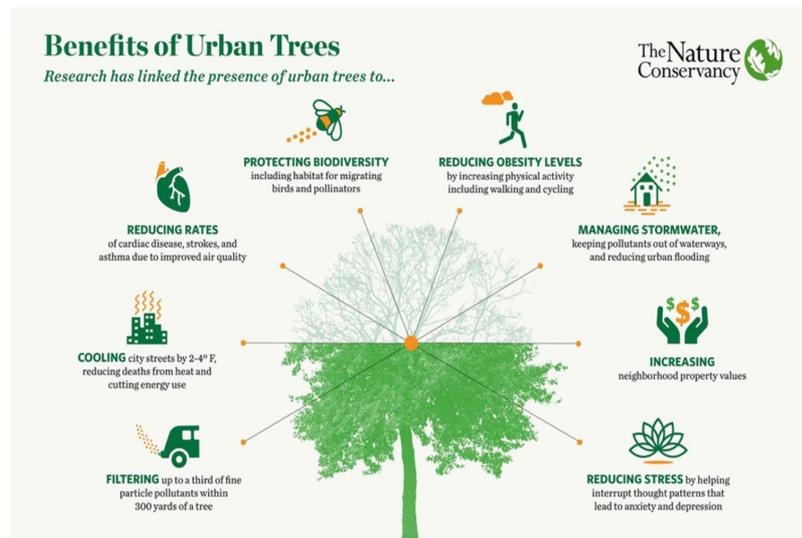
Built Environment

- New Construction
- Retrofitting

Design Concepts & Standards

Focused on:

- Incorporating Biomimicry
- Increasing Use of Native Plant Species
- Trees, Trees, Trees!
- Green Infrastructure
- Regenerative Design



Design Standard Considerations

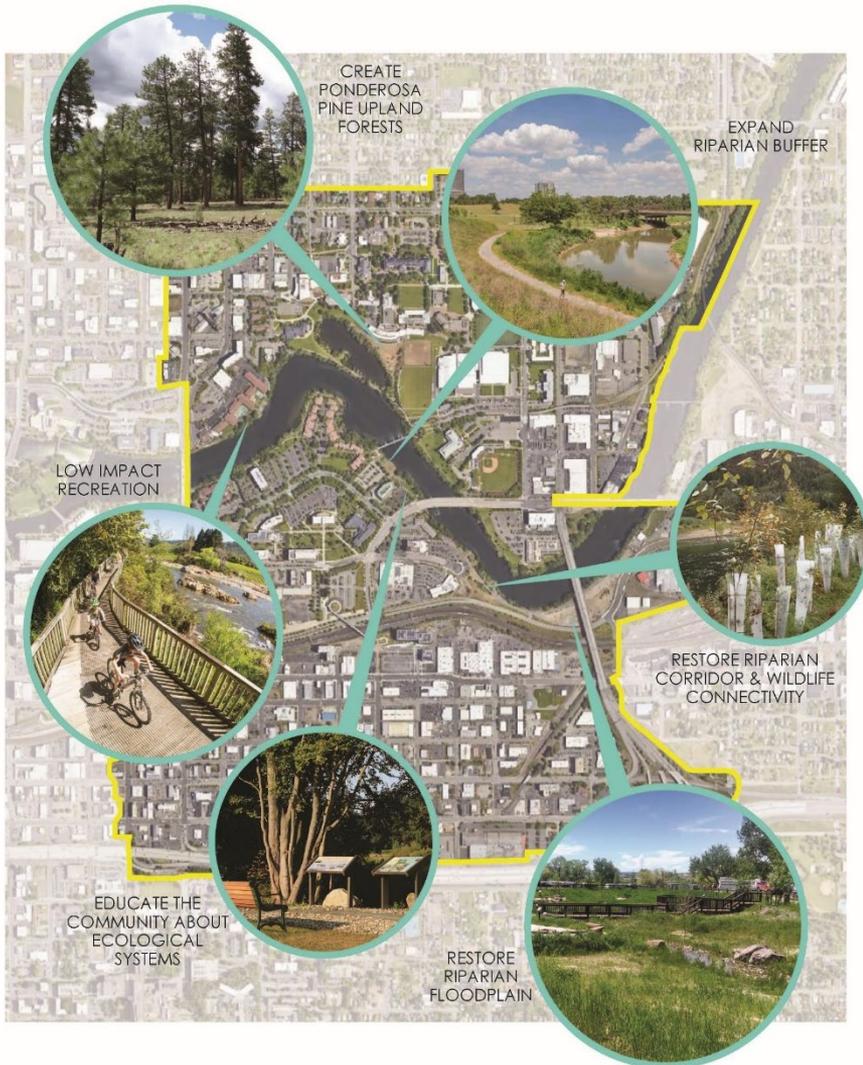
Ecosystem Service/ Design Consideration	Riparian		Public Realm		Built Environment	
	River/ Nearshore	Buffer Area	Right of Way	Parks	New Construction	Retrofitting
Air Filtration						
Urban Canopy	●	●	●	●	●	●
Green Walls		●	●		●	●
Emission Reduction		●	●			
Energy Conservation					●	●
Biodiversity						
Landscape Design		●	●	●	●	
Wildlife Connectivity	●	●	●	●		
Carbon Sequestration						
Carbon Specific Planting	●	●	●	●	●	
Green Spaces		●		●	●	
Building Materials				●	●	●
Energy Provision						
Promote Alternative Energy Sourcing	●		●	●	●	●
Smart Building Design				●	●	●
Reduce Heat Island	●	●	●	●	●	●

Design Standard Considerations

Ecosystem Service/ Design Consideration	Riparian		Public Realm		Built Environment	
	River/ Nearshore	Buffer Area	Right of Way	Parks	New Construction	Retrofitting
Fire Adaptation						
Protect Buildings and Envelope					●	●
Fire Resistant Landscape Design		●	●	●	●	●
Nutrient Cycling						
Symbiotic Planting		●	●	●	●	
Replicate Pine Savanna	●	●	●	●	●	
Pollination						
Pollinator Specific Planting		●	●	●	●	
Protected Pollinator Habitats		●		●	●	
Stormwater Management						
Green Stormwater Infrastructure		●	●	●	●	●
Reduction of Impervious Surfaces		●	●	●	●	

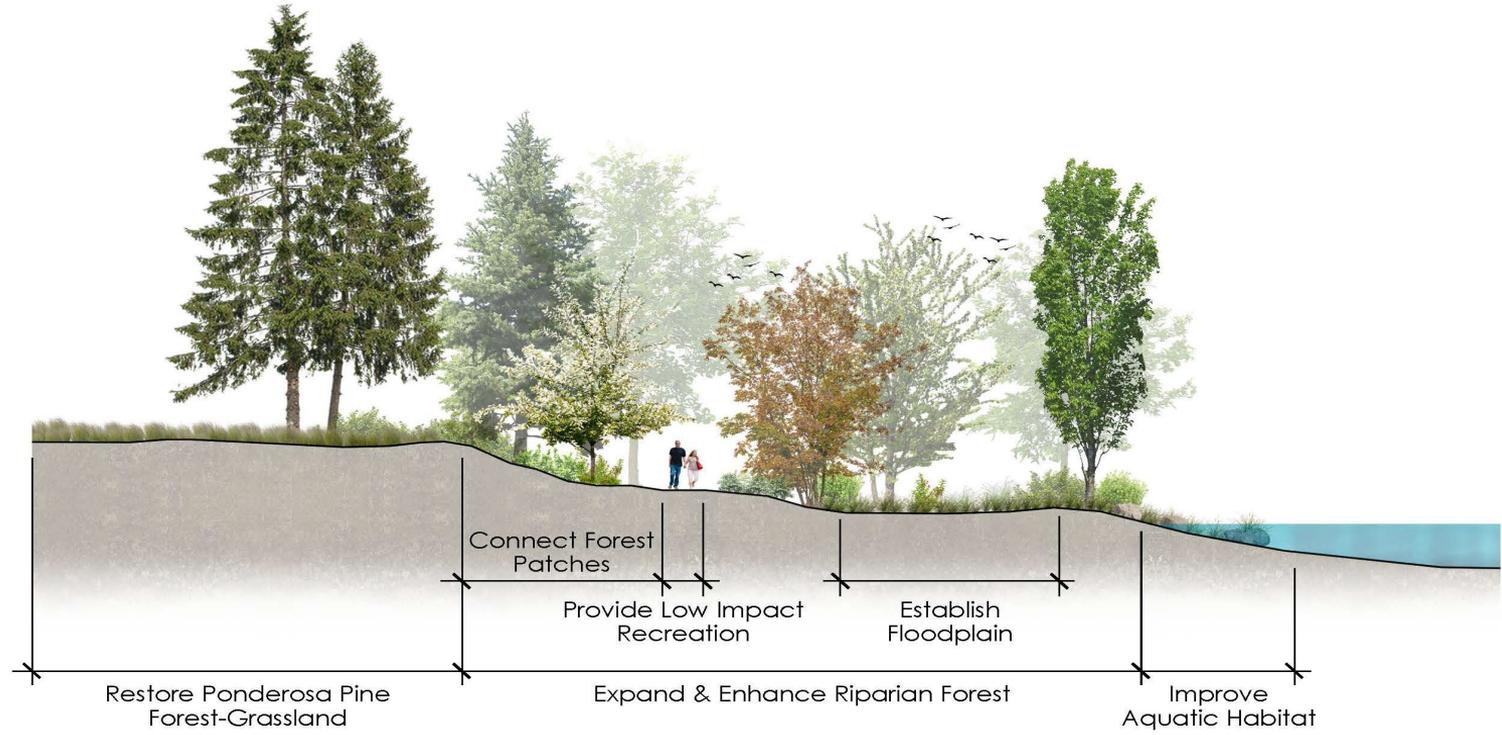
Design Standard Considerations

Ecosystem Service/ Design Consideration	Riparian		Public Realm		Built Environment	
	River/ Nearshore	Buffer Area	Right of Way	Parks	New Construction	Retrofitting
Temperature Regulation						
Cool Building Design					●	●
Vertical Planting			●	●	●	●
Waste Generation and Management						
Community Waste Reduction				●	●	
Waste to Energy Technology					●	●
Building Materials				●	●	●
Water Cycling						
Develop Drought-Tolerant Landscapes		●	●	●	●	
Rainwater Harvesting and Reuse		●	●	●	●	●
Human Health and Wellbeing						
Edible Landscapes		●		●		
Passive Recreation	●	●		●		
Culturally Relevant Design	●	●		●	●	

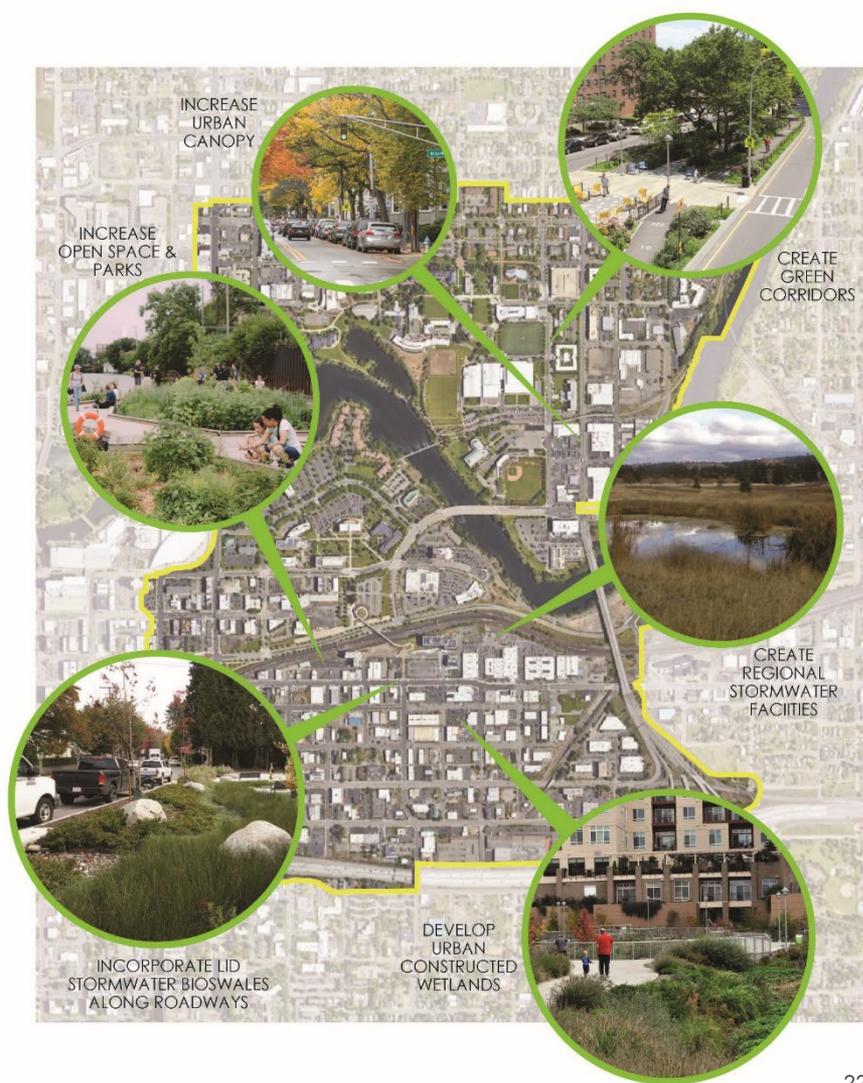


Riparian Ecosystem

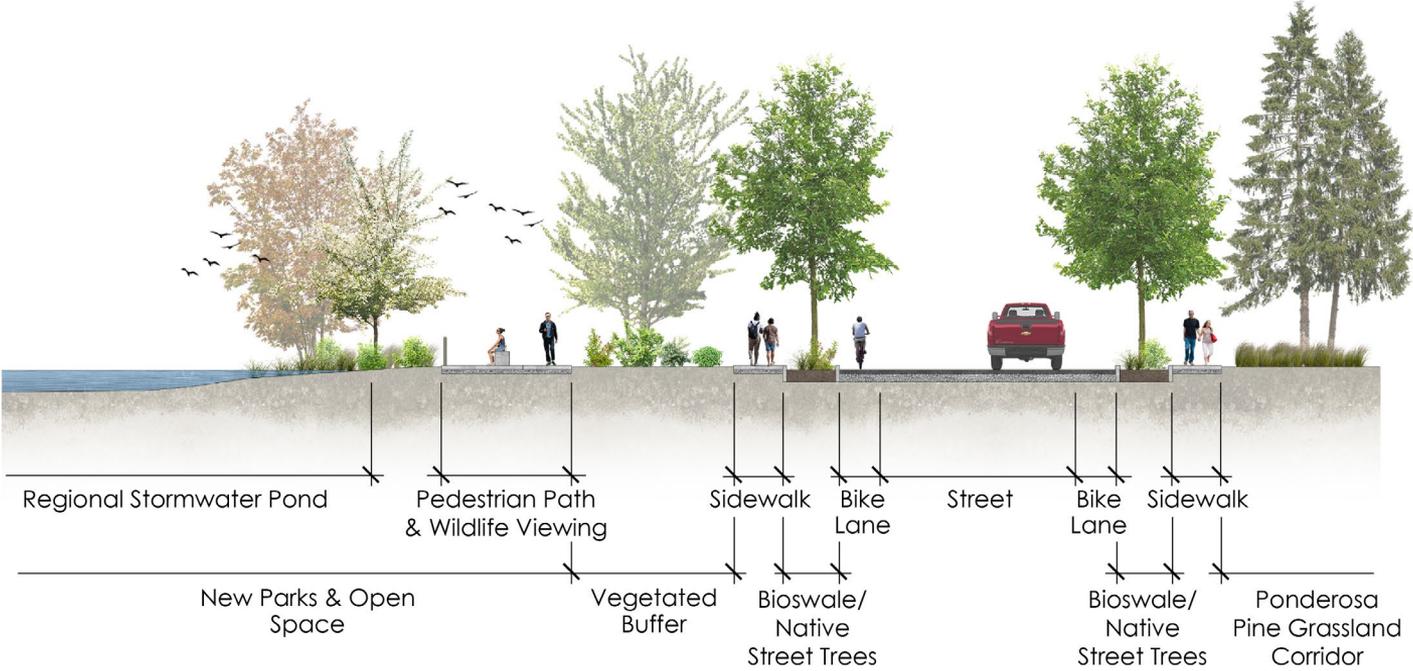
Riparian Ecosystem Conceptual Cross Section

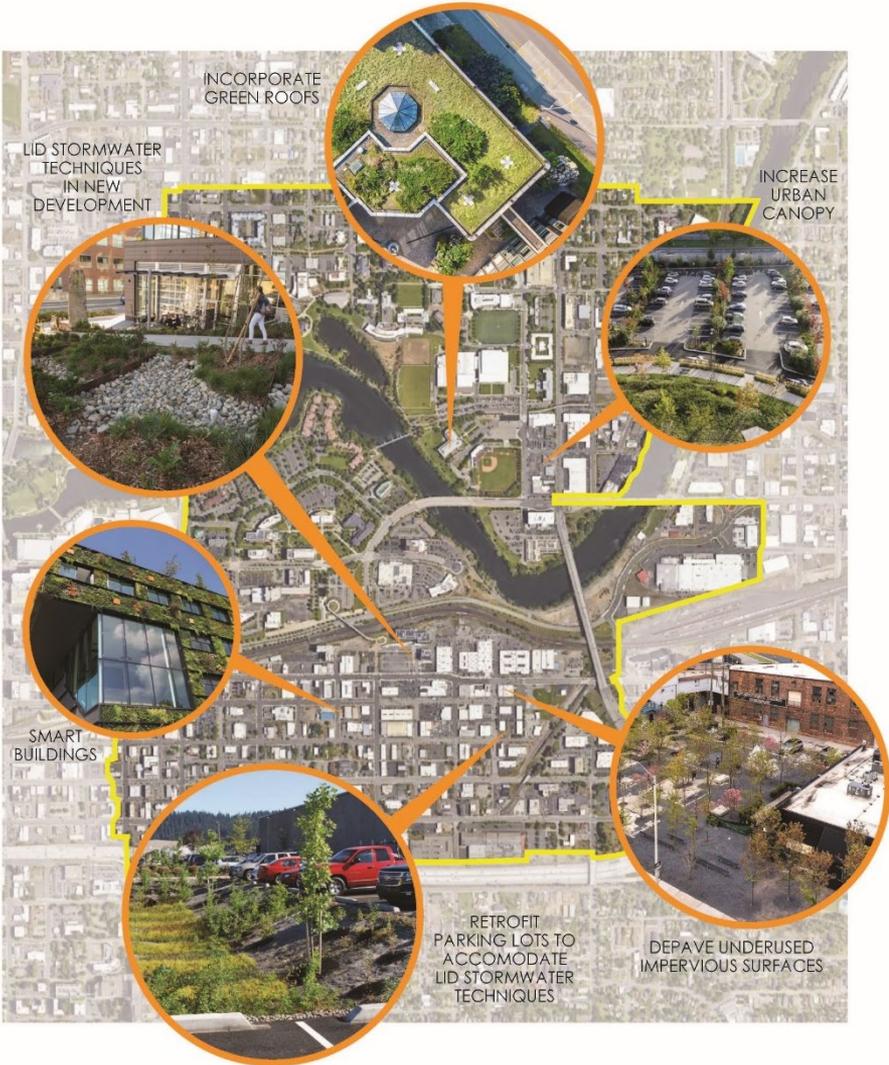


Public Realm Ecosystem



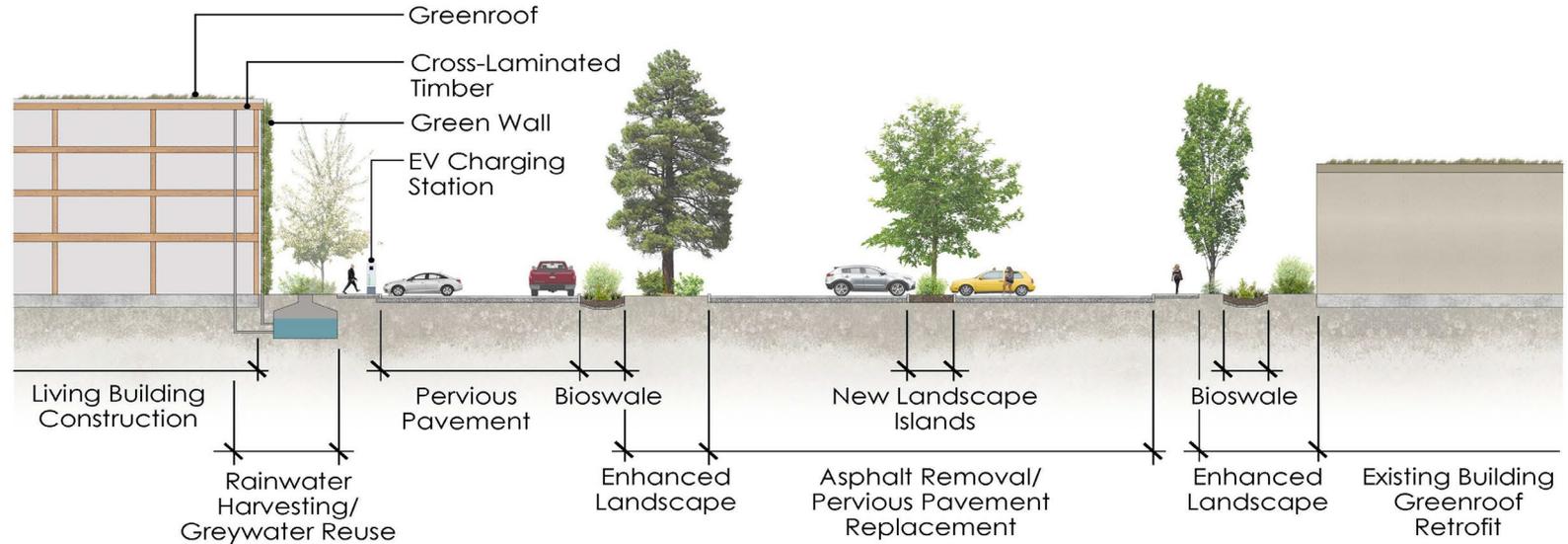
Public Realm Ecosystem Conceptual Cross Section





Built Environment Ecosystem

Built Environment Ecosystem Conceptual Cross Section





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Candidate Metrics

Ecosystem Service	Target	Candidate Metrics
Air Filtration	AQI PM2.5 and PM10 in the urban core should not exceed that of native ponderosa pine savanna (in fire-free conditions).	<ul style="list-style-type: none">• Tons of gas removed annually• Total savings in gas removal annually• Tons of PM_{2.5} and 10 removed from the air annually• Total savings in PM removal annually
Biodiversity	Restoration activities will use native species in ratios similar to the original landscape	<ul style="list-style-type: none">• Species richness of indigenous vegetation or wildlife• Area of habitat type (wetland, riparian, etc.) in the UD• Abundance of native species in designated area• Abundance of invasive species in designated area

Exploring Funding and Resources

- **The Inflation Reduction Act**
- **Nature Based Solutions Resources Guide**
- **Bipartisan Infrastructure Law**
- **How Public Agencies can Use Green Bonds to Advance Community Sustainability**
- **EPA Water Infrastructure Finance and Innovation Act (WIFIA)**
- **DOI WaterSmart Cooperative Watershed Management Program ...**



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THANK YOU