UNIVERSITY DISTRICT

Nature-Positive Urban Development and Regenerative Growth

ACES, Austin, Texas
December 10, 2024

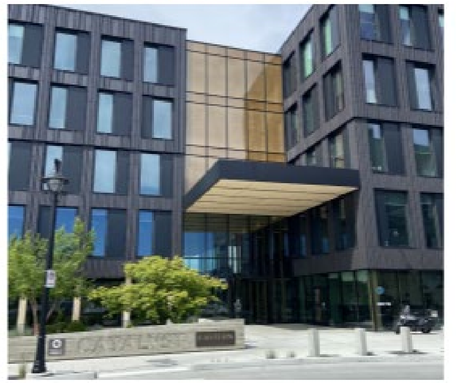
Juliet Sinisterra, CEO
Spokane University District

TODAY'S AGENDA

- Spokane University District
- Nature-Positive Urban Design
- How we Design
- How we Measure





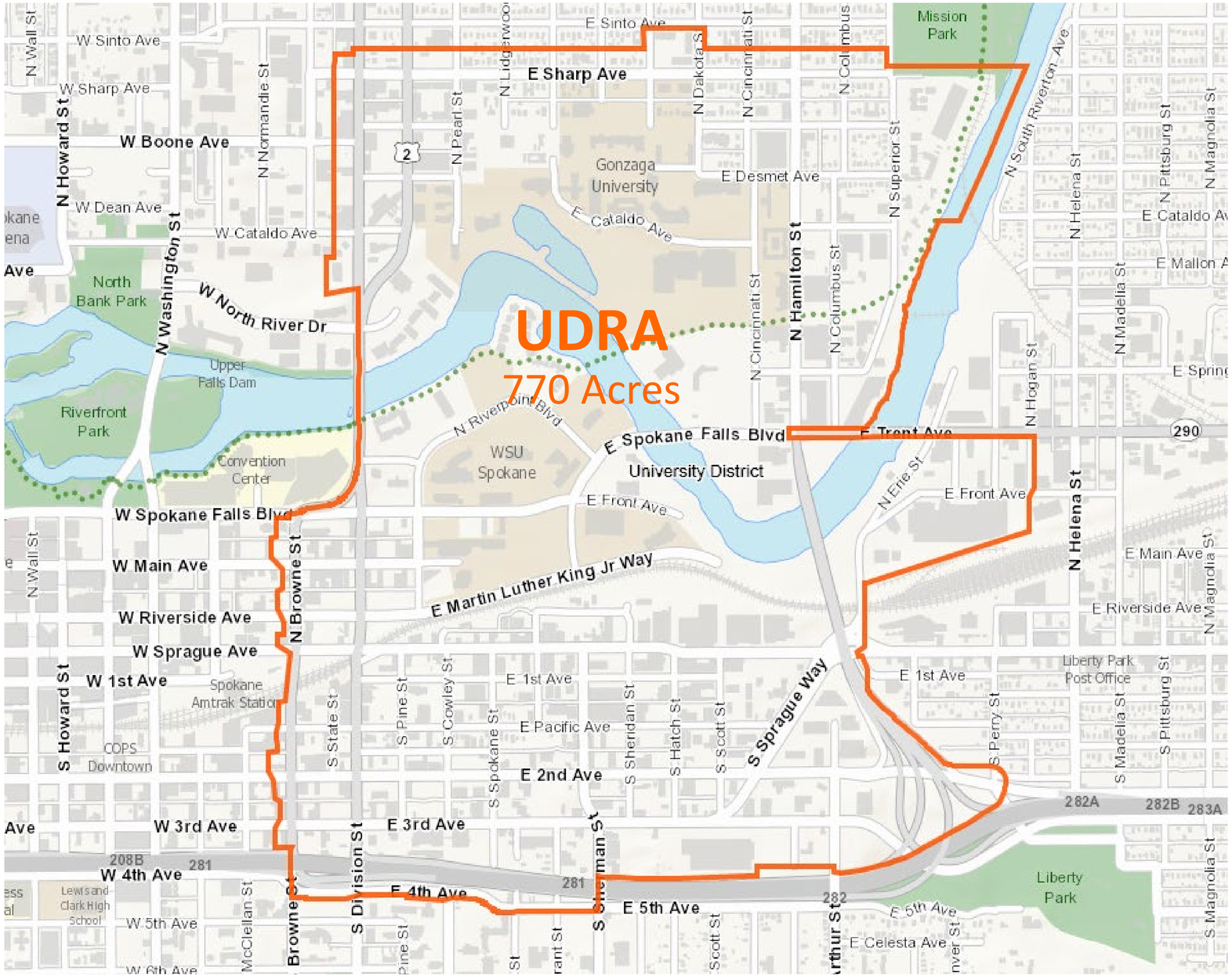




Built for Collaboration

INNOVATING TOGETHER

The University District is where business and education grow together. Community partners are connected through geographical ecosystem and strong commitment to collaboration with a focus on four key areas:

- HIGHER ED AND UPLIFT OPPORTUNITIES
- MEDICAL AND LIFE SCIENCES
- BUSINESS AND ENTREPRENEURSHIP
- ENERGY AND SUSTAINABILITY

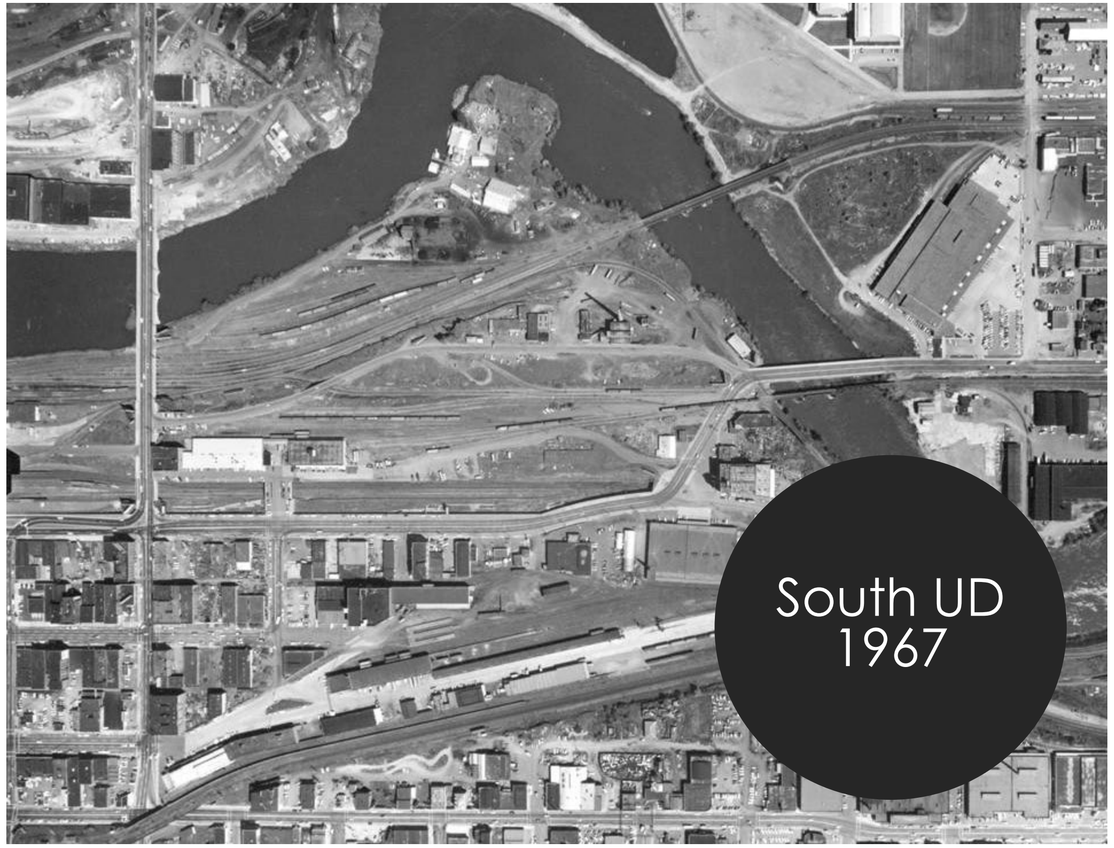


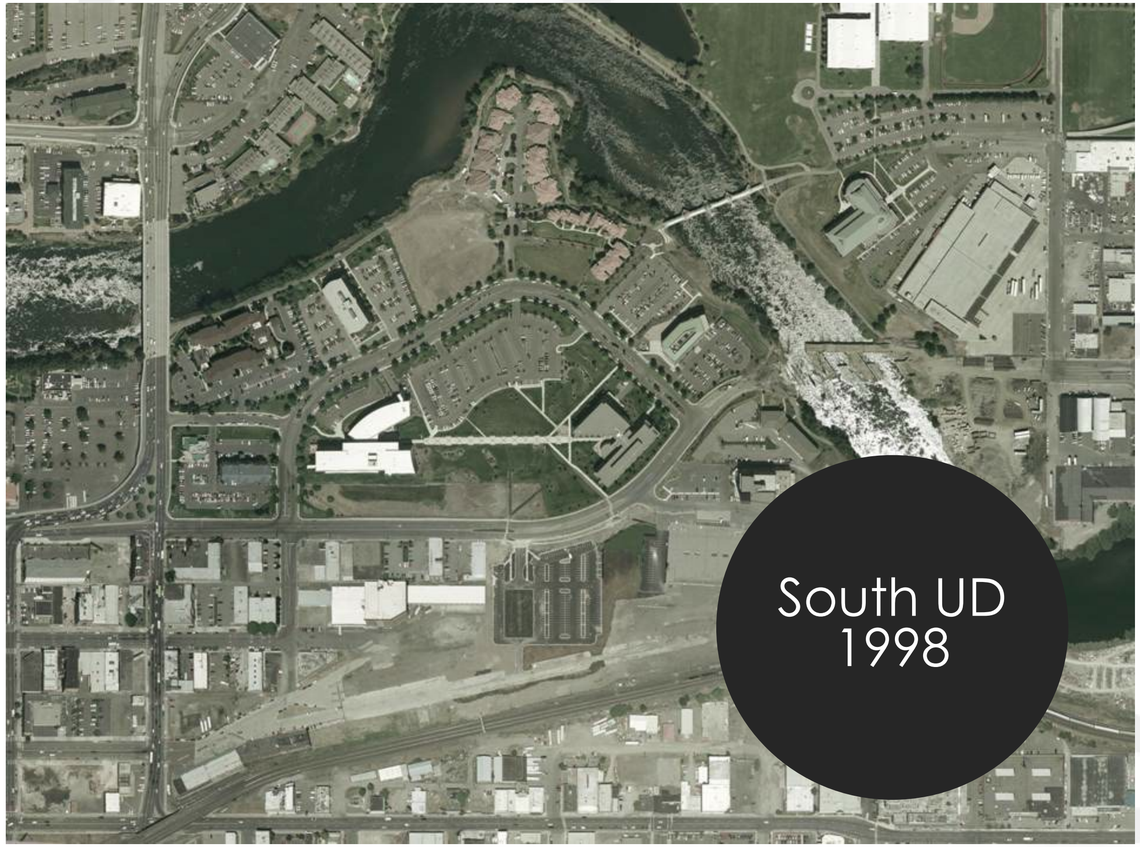
UNIVERSITY DISTRICT

The Bioregion as Eco-Tone

A Traditional Crossroads

- What today is the University District was intersected by important native trails linking the area to the fisheries in the east, the winter camps in the west and trails connecting north to fisheries near Kettle Falls, **an intertribal gathering place attracting as many as 10,000 natives at the height of the fishing season**
- Cayuse, Palouse and Nez Perce would have traversed through the UD on their way to Kettle Falls, trading with the Spokanes, along the banks of the River


South UD
1967


South UD
1998

Spokane University District: People

Demographic overview

Total population

City of Spokane
228,989
Source: US Census Bureau 2020

University District
≈3,548
Source: US Census Bureau Blocks 2020

Addiction State of Emergency

18% increase in overdose deaths 2023-2024

Overdose responses clustered around Division and Brown

Traffic Safety

40% increase in people hit by cars 2022-2023

Hot spots along Division, Brown, and Hamilton, arterials which carry 20,000-40,000 ADT (2018)

Housing Crisis

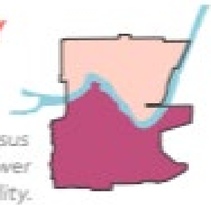
>2,000 people experiencing houselessness

Jan 2024 point in time count; 54% decrease in unsheltered houselessness; 10% increase in sheltered houselessness; 15% decrease in overall houselessness

SOCIAL VULNERABILITY INDEX

Susceptibility of social groups to the adverse impacts of natural hazards, including disproportionate death, injury, loss, or disruption of livelihood.

RELATIVELY LOW
Tract 25.03
Score 31.12
31% of U.S. Census tracts have a lower Social Vulnerability.



VERY HIGH
Tract 145
Score 94.37
94% of U.S. Census tracts have a lower Social Vulnerability.

Fig. 14 FEMA National Risk Index 2022

HEALTH SUPPORTIVE NATURE

NatureScore: Amount and quality of natural elements.

ADEQUATE
Tract 25.03
Score 42.2

Balanced mix of natural and built environmental elements. Modest effort required for immersive nature exposure opportunities.

DEFICIENT
Tract 145
Score 11.9

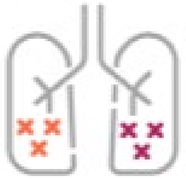
Low density of natural elements. Effort required for immersive nature exposure opportunities.

Fig. 15 NatureQuant LLC 2024

HEALTH DATA

ASTHMA

Estimated prevalence of current asthma among adults aged 18 and older.



14.5% tract 25.03

13.7% tract 145

Fig. 11 CDC ACS 2021

OBESITY

Estimated prevalence of obesity among adults aged 18 and older.

27.3% tract 25.03

37.8% tract 145

Fig. 12 CDC ACS 2021

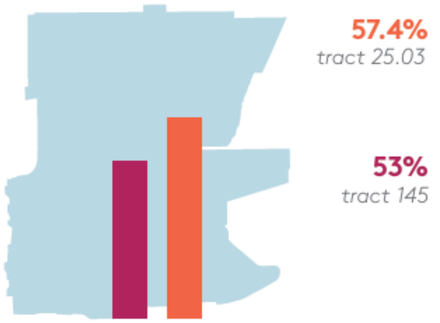
PHYSICAL INACTIVITY

No leisure-time physical activity during the past month among adults aged 18 and older.

27.9% tract 145

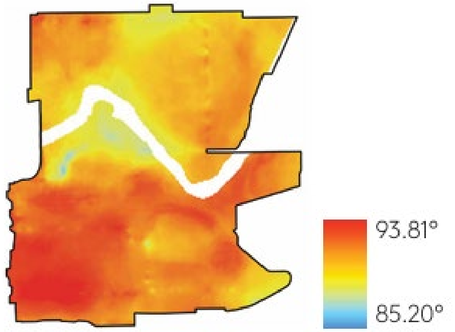
Fig. 13 CDC ACS 2016 - 2019

Spokane University District: Place



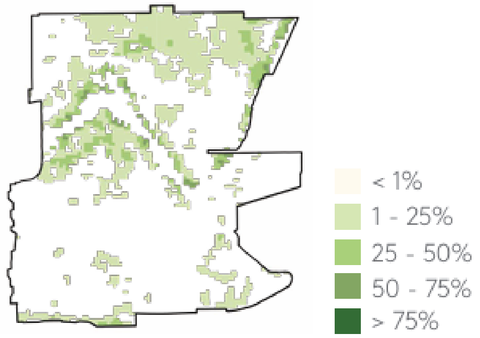
Poverty
Percentage of persons living below 150% of the poverty level.

US Census Bureau 2022: 19.1%
Source: ACS 2017 - 2021



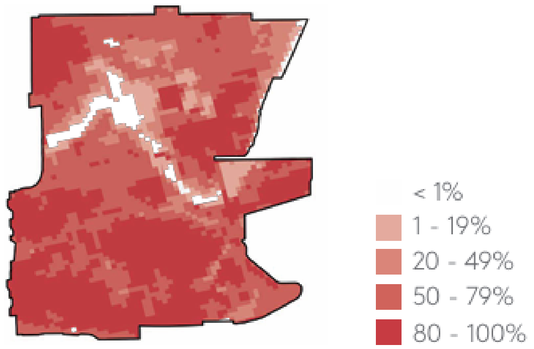
Heat
Afternoon heat temperatures comparison

Source: Gonzaga Center for Climate, Society, and the Environment, 2022



Tree canopy
Percentage of tree canopy

Source: USA NLCD Tree Canopy 2021



Impervious surfaces
Percentage of impervious surfaces

Source: USA NLCD Impervious surfaces 2021

Climate Impact and Environmental Justice

Climate change is increasing the frequency of days with wildfire smoke. Since 2015, **Spokane has averaged eight unhealthy smoke days per year, up from zero** between 1999 and 2011

In recent years, the number of days in Spokane over 90 degrees has increased: in **2019, 13 days; in 2020, 20 days; in 2021, 44 days; in 2022, 44 days; in 2023, 34 days**

In 2021, the Pacific Northwest experienced a **heat dome event that killed 112 people in Washington State, including 19 in Spokane**

Table 1. EJSCREEN Environmental and Health Burden Data

	Census Block Group 530630145002		Census Block Group 530630145004	
EJScreen, Supplemental Index	State Percentile	National Percentile	State Percentile	National Percentile
Particulate Matter 2.5	98	99	99	99
Diesel Particulate Matter	97	97	99	99
Traffic Proximity	99	96	99	99
Nitrogen Dioxide	99	98	99	99
Lead Paint	98	95	99	99
Superfund Proximity	97	97	99	98
Hazardous Waste Proximity	99	96	99	98
Asthma	99	97	95	94
Heart Disease	90	71	99	95
Persons with Disabilities	99	99	99	99

What is Nature Positive Urban Design?

"The Sustainable Development Goals set by the United Nations stress the importance of local ecosystems and suggest that **all aspects of a city - its buildings, infrastructure, and natural surroundings - should actively contribute to environmental health**. This includes maintaining clean air and water, healthy soil, sequestered carbon, cycled nutrients, reduced erosion, reduced heat, and supporting biodiversity."

- Dayna Baumeister and Nicole Miller,
- Innovation for Ecological Transformation

“We live in a competent universe, we are part of a brilliant planet, and we are surrounded by genius. Nature is incredibly generous, and it has learned to live gracefully on this planet for billions of years.”

– Janine Benyus,
Founder, Biomimicry Institute

Fate of anthropogenic CO_2 emissions (2013–2022)

Sources

35.3 $GtCO_2$/yr

88%

12%

4.7 $GtCO_2$/yr

= Sinks

18.9 $GtCO_2$/yr

47%

31%

12.3 $GtCO_2$/yr

26%

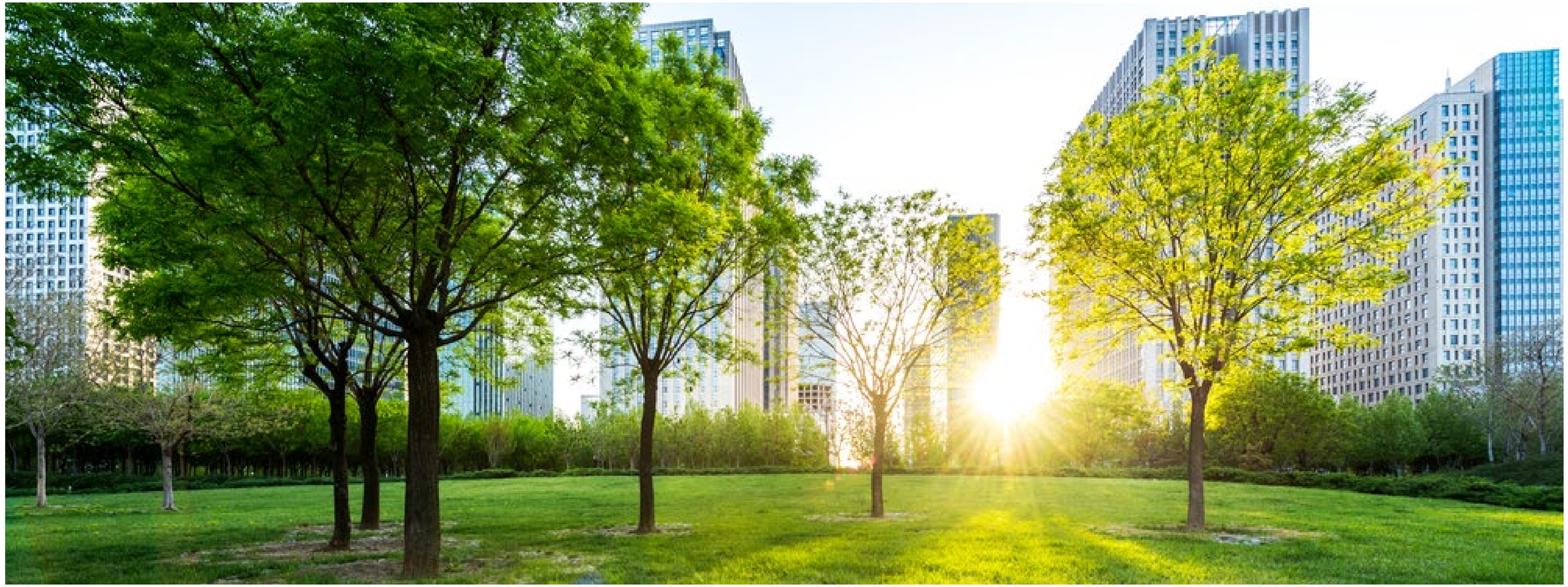
10.4 $GtCO_2$/yr

Budget Imbalance:
(the difference between estimated sources & sinks)

4%

-1.6 $GtCO_2$/yr

Source: Friedlingstein et al 2023; Global Carbon Project 2023



Cities Helping Nature capture Carbon

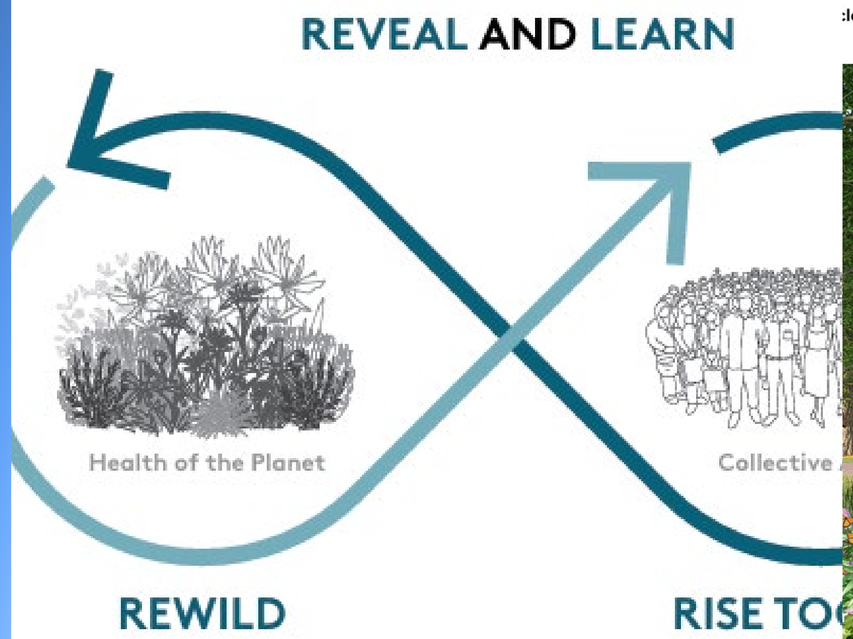
- Soils globally sequester **1.5 gigatons** of carbon
- Trees and other types of vegetation sequester **7.9 gigatons**
- Wetlands: 3% of earth's surface but contain **2x carbon as all forests**
- Estimates are that we could capture an additional **20 gigatons** via regenerative agriculture, urbanism and carbon farming.

YOU BELONG IN THE UD UNIVERSITY DISTRICT

How We Design

"When we talk about relational maturity, we need to recognize that we are part of the metabolism of the planet."

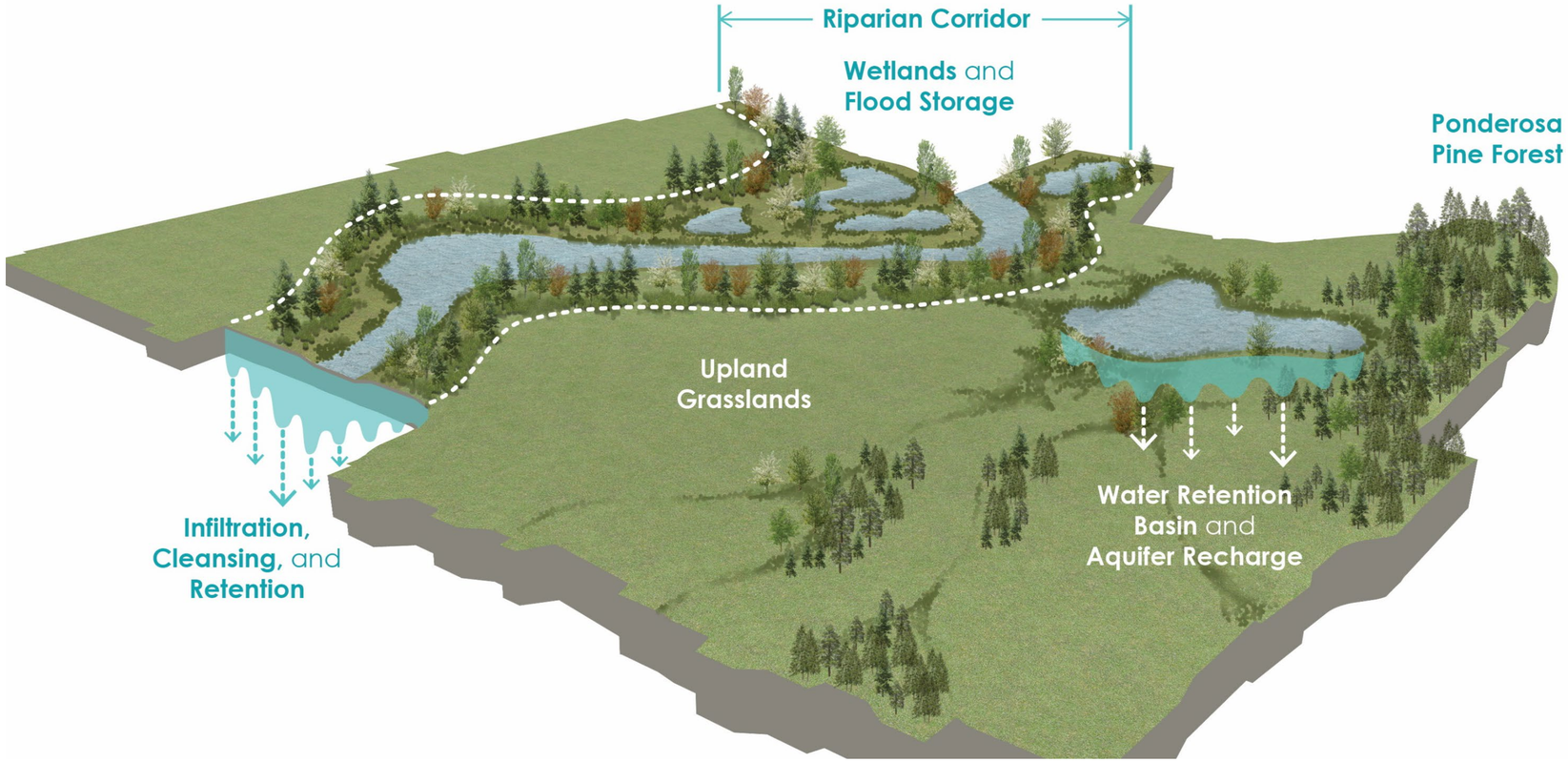
- Dr. Vanessa Andreotti, Dean of Education, University of Victoria, CA



Images courtesy of Mithun for the Spokane UD

Design Premise: Ecological Context and Historical Indigenous Practices

- The Spokane River is **the center of life** for region
- **Four distinct ecosystems** present in the region encompassed: pine/ponderosa savanna, shrub-steppe grassland, riparian corridor, and floodplain.
- River provided food, water, a means of transportation and a meeting place for **indigenous people**
- The system is characterized by **grassy-floored open forests with ponderosa pine**, Douglas-fir, western larch, western white pine, and quaking aspen
- System provided **water retention, flow regulation, carbon sequestration, erosion control, soil warming, microbial activity and pollinator habitat**
- The dominant native trees species, Ponderosa pine supports **116 bird species, 70 mammals and 17 species of reptiles and amphibians**
- Coniferous Forests, Ponderosa Pine, historically sequestered up to **260 metric tons of carbon per acre**

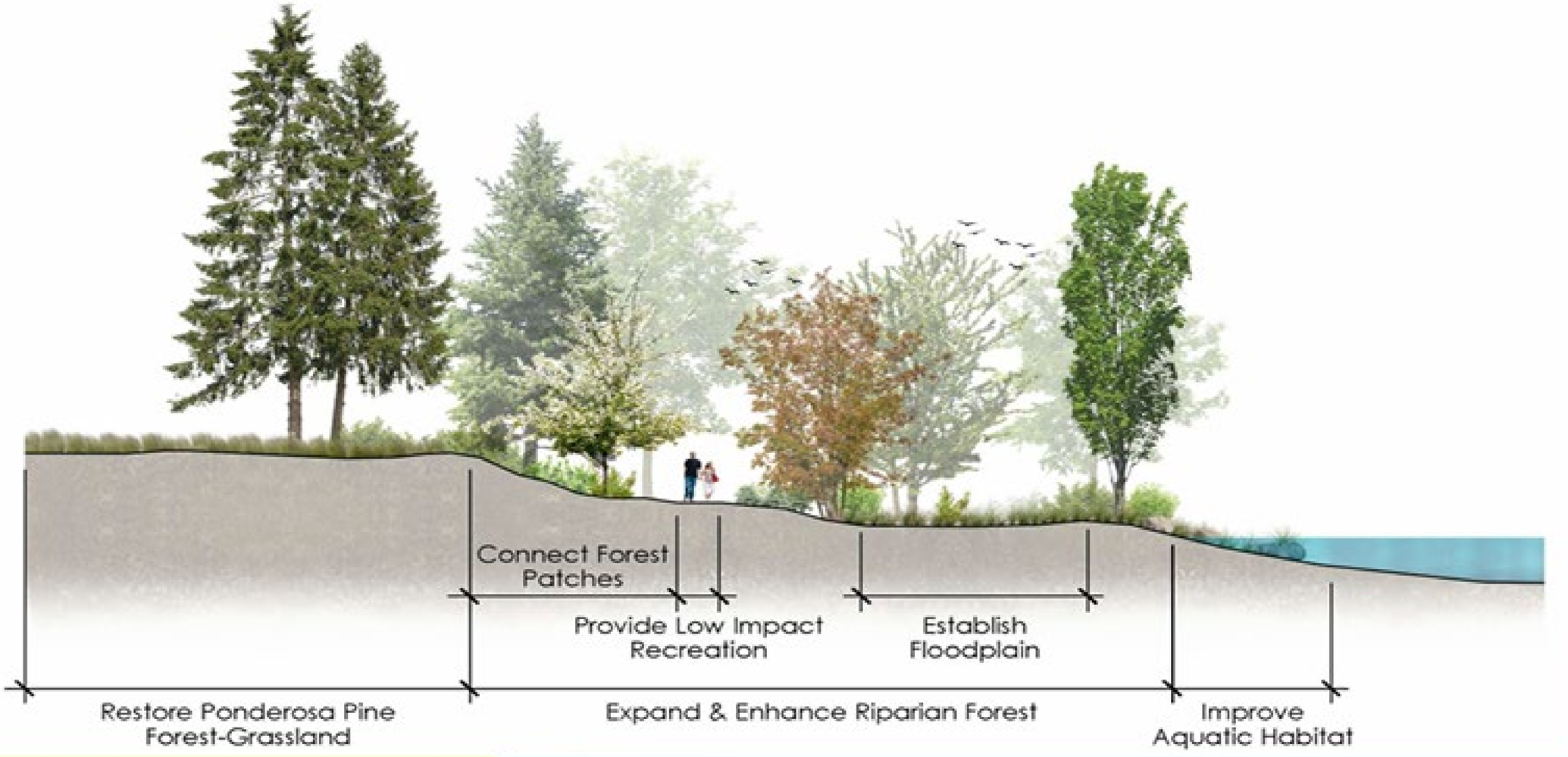


UD Core Ecosystem Services

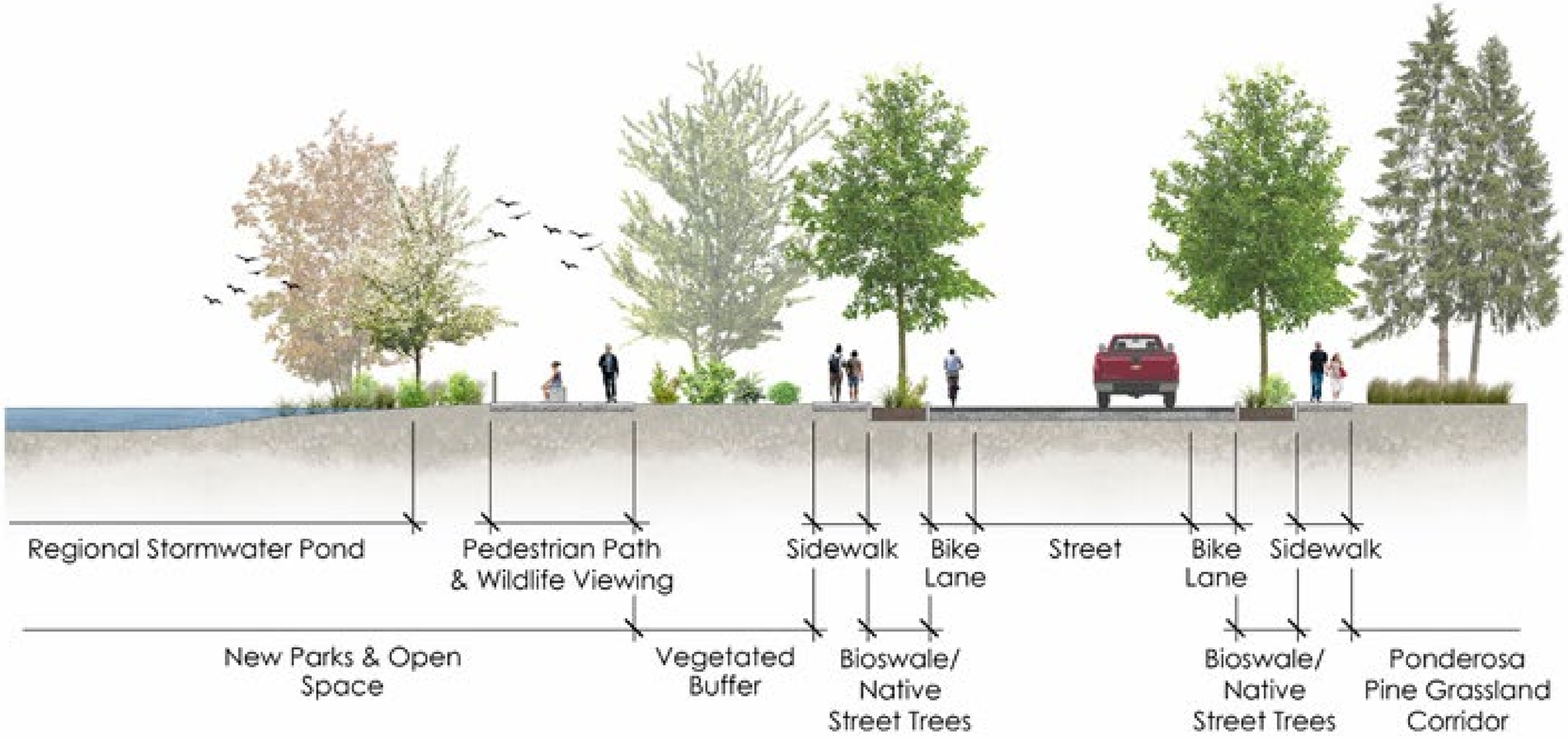
1. Air Filtration
2. Biodiversity
3. Carbon Sequestration
4. Energy Provision
5. Fire Adaptation
6. Nutrient Cycling
7. Pollination
8. Stormwater Management
9. Temperature Regulation
10. Waste Generation and Management
11. Water Cycling
12. Human Health and Wellbeing

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.

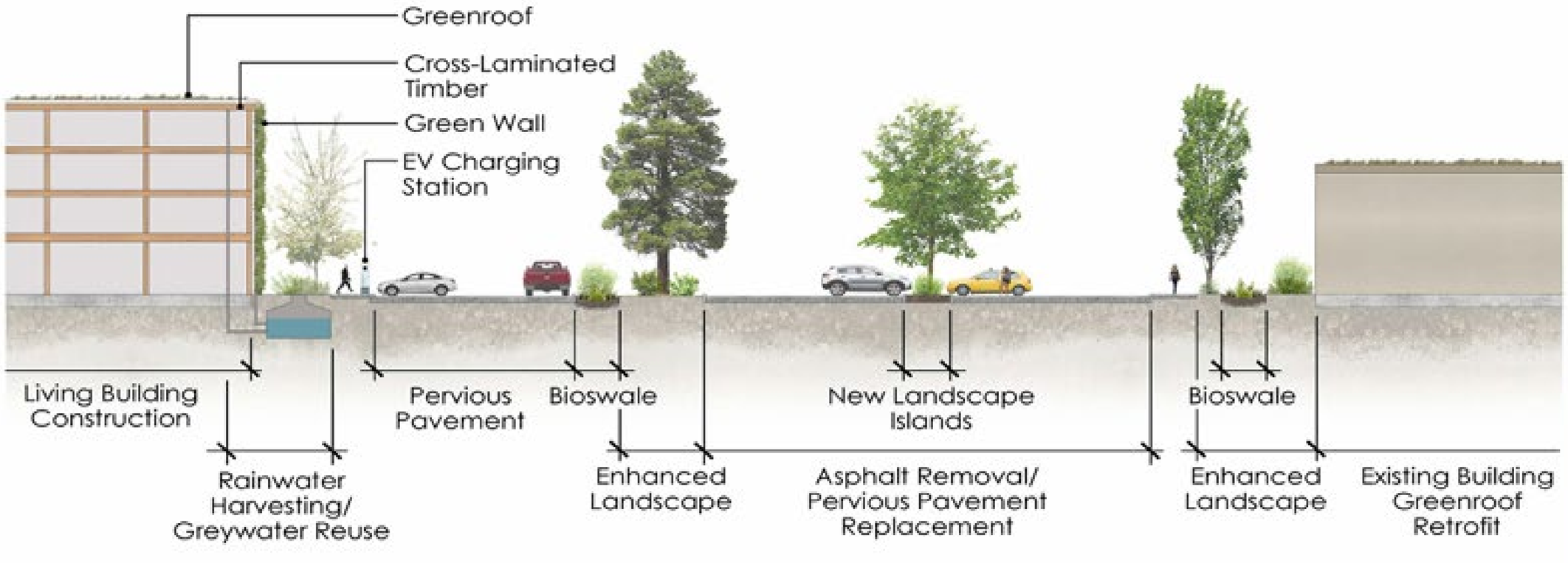
Riparian Ecosystem Conceptual Cross Section

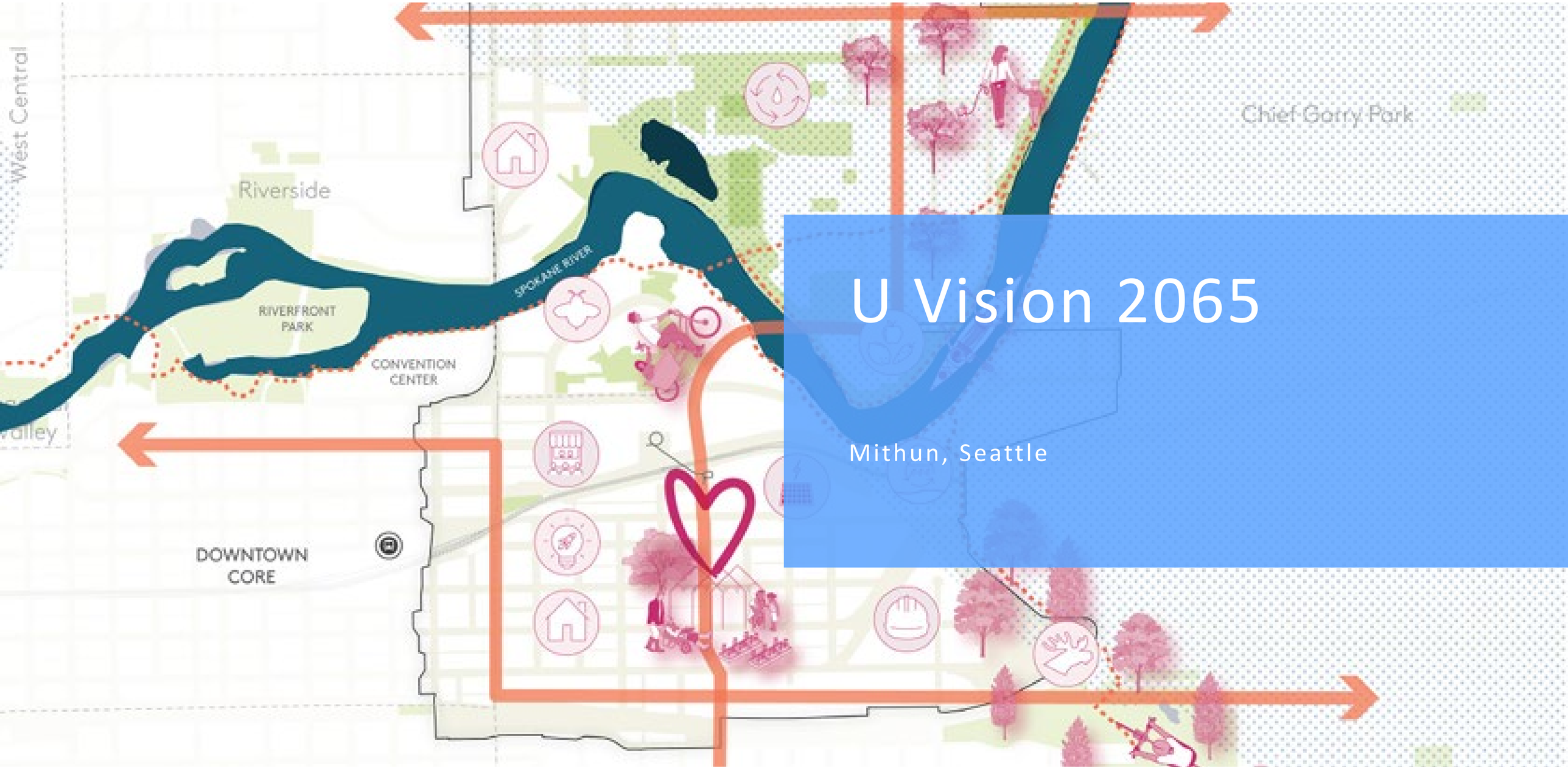


Public Realm Ecosystem Conceptual Cross Section



Built Environment Ecosystem Conceptual Cross Section





U Vision 2065

Mithun, Seattle

Partnership for Southern Equity™
TOGETHER WE PROSPER

JUST COMMUNITIES

A Bold Reimagining of How Communities Grow

Just Communities is helping neighbors and practitioners worldwide co-create more just, liberatory, and green communities.

1. CENTERING RACIAL AND CLIMATE JUSTICE

The Protocol starts with an unwavering commitment to Racial Equity and Climate Resilience in every phase of organizing, planning, and implementing neighborhood-scale community development. We call these our *Just Communities Pillars* and they form the key imperatives that every community must address. The legacy and impact of structural and spatial racism and environmental injustice in land use policy and development – in the form of segregation, disinvestment, and displacement – has led to trapping millions of Black and historically disinvested communities of color in generational poverty (while others sustain wealth and privilege) and at constant risk from the growing impacts of climate change. This framework seeks to begin the important and necessary task of putting justice at the center of community development.

2. POWERFUL METRICS TO SHAPE EQUITY AND RESILIENCY OUTCOMES

The Protocol includes a set of seventeen comprehensive *Just Communities Commitments* organized into the five essential categories – Belonging, Opportunity, Wellbeing, Mobility, Environment – to help communities tackle the most entrenched and complex challenges facing communities today – poverty, blight and deteriorating infrastructure, lack of economic opportunity, environmental pollution, climate disruption, and health inequities.

3. FOUR IMPLEMENTATION PHASES TO ADVANCE THE WORK

The Protocol includes seventeen discrete and practical *Just Community Actions* organized into four implementation phases. Each action includes guidelines, engagement tips, and templates to help stakeholders move community-scale projects from vision to reality. They include: 1) Groundwork, 2) Governance, 3) Roadmap, and 4) Implementation.

WHAT WE HEARD

60+ Stakeholders

2 Open Houses

1 Focus Group

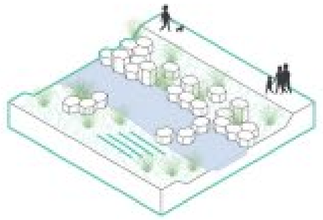
5+ Interviews

Key Themes

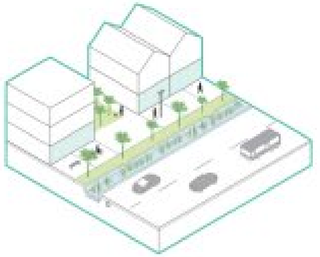
- Create a District Heart
- Connect to the River
- River as a family member
- Restore Liberty Park
- Multicultural Center
- Food Markets
- Integrate Art
- Improve water quality and restore river health
- Food Sovereignty and Community Gardens
- Connect to Downtown
- Support and grow local businesses
- More cover and shelter
- More water throughout the UD
- More Trees
- Limit Displacement
- The houseless do not feel welcomed in UD
- Increase infrastructure such as benches, lights and trash cans

ENGAGEMENT

NATURE-BASED STRATEGIES PALETTE

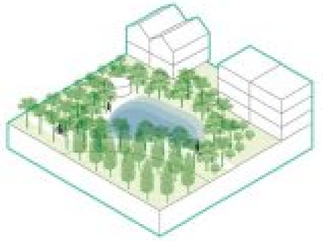


Coulee (Blue-Brown) Water
Urban coulee streets for water conveyance, xeriscaping, and basalt gardens, with potential for deep-infiltration wells

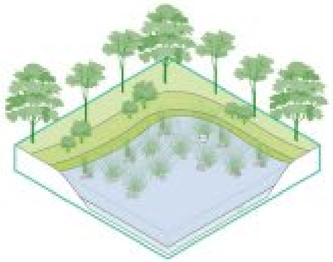


Blue-Green
Infiltration and stormwater infrastructure including greenways /curbless streets/ rain gardens and permeable pavement

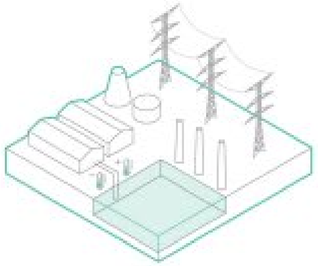
Energy Independent Buildings
Electrification and battery islanding which can be combined with resilience hub elements



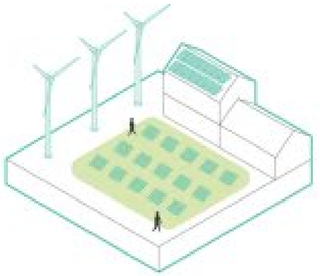
Urban Forests
Areas for planting Ponderosa Pine groves, or micro forests such as Miyawaki Tiny Forests



Clean Water Parks
Accesible stormwater parks that slow the stormwater and reduce combined sewer overflows

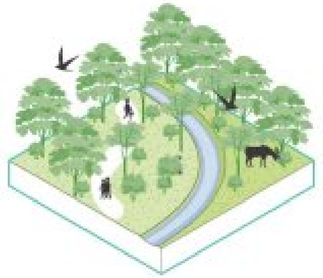


Shared Energy Systems
Geothermal and ground coupling of water pipes to facilitate heat and cold transfer and reduce waste



District Renewable Energy Production
District renewable energy and micro-grids, solar on land or buildings

Clean Soil Parks and Trails
Bioremediaton of brownfield areas highlight phytoremediation of soils with artist program and research innovation



Biodiverse Corridors
Connect people, pollinators, animal habitat, and flyways for birds to and from the river and to parks

Pixelation Across the District
Green factor code infrastructure for planting both on land and buildings

Rainwater Harvesting
Water efficiency programs at buildings/sites

Multi-modal Mobility
Ride shares, shuttles, and accessible transit programs

Microgrids
Renewable energy including community solar

District Parking
Coordinate parking and transportation demand management

Street Tree Canopy
Using silva cells or planters on basalt

Water Storage
Aquifer recharge ponds

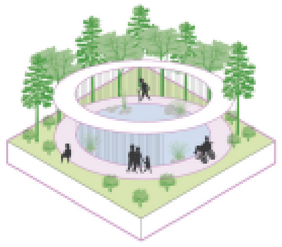
Recreation
Active park improvements. Play areas, Kayak launch, basketball courts, pickle ball and active sports

Mobility Hubs
Micromobility stations, EV charging stations

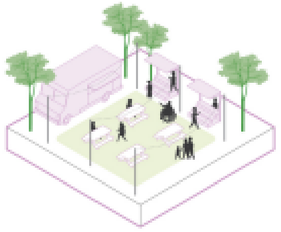
EQUITY, INCLUSION AND BELONGING STRATEGIES PALETTE

Inclusive Childcare
Early education and childcare choices including home based, care centers and education for all

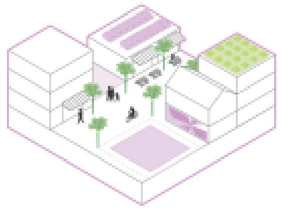
Inclusive Housing Choices
More housing choices including rental, ownership, multi-generational, affordable, and middle housing



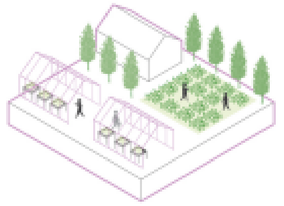
Multi-Cultural Gathering
Inclusive gathering spaces with arts and culture, public realm improvements both indoors and outdoors, with shade structures for people of all ages, abilities, and cultures to meet



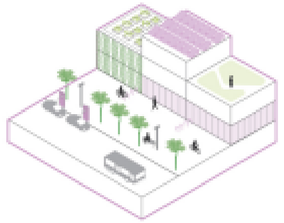
Multi-Cultural Market
Multi-vendor marketplace, or pop-up markets for place-making and community connection. Could be day or night



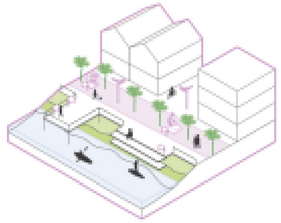
Rehabilitation and Infill
Existing building retrofits and vacant lot infill to support and complement existing businesses and community orgs including energy, sustainability, public art upgrades



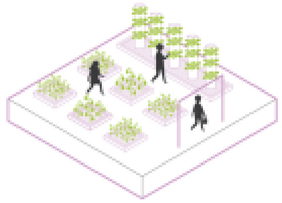
Food Production and Distribution
Multi-cultural food production and distribution opportunities for small businesses, job training, and workforce development



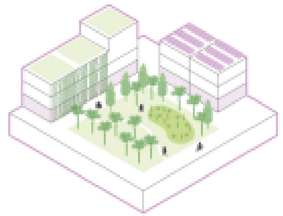
Community Resilience Hub
A network of community-serving facilities to support residents, distribute resources, coordinate communication, and reduce carbon pollution for both on-going social connection and emergency support services



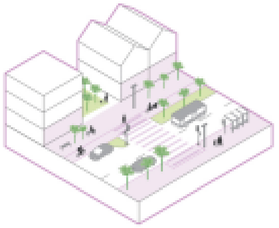
Inclusive Wayfinding + Storytelling
Placekeeping in the public realm with public art, signage, furnishings, new plazas and viewpoints. May include multi-cultural and indigenous representation or interpretive storytelling.



Food Growing and Access
Individual and community gardens, urban agriculture, and access including fresh food markets, CSO pick ups serving multi-cultural needs



Community Engagement and Research Center
Community-serving facility to support civil participation and community based research advancing district goals



Placekeeping
Focus on enabling social connections with ample wayfinding, arts and culture elements, street furniture, wider sidewalks for outdoor uses, and universal design / complete streets

Inclusive Services and Shelter for All
Healthcare, childcare, early childhood education, shelter for people who are houseless, and other services and programs

Anti-displacement Programs
For businesses, community organizations, and residents

Inclusive arts and culture Festivals and Events
Arts, culture, education and community organization events

Inclusive District Business
Arts, culture, education, and business directory and marketing programs with a focus on enabling networking opportunities for small and startup businesses

Inclusive Workforce Development
Job training programs prioritizing historically marginalized populations

Inclusive Educational Opportunities
Programs, schools, and lifelong education

Holistic Health and Wellness Festival
As part of the U Vision 2044

Equitable Business Incubator
Life sciences and Institutional partnerships supporting marginalized business enterprises

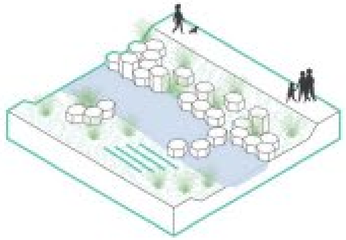
Inclusive Public Realm

Public spaces that encourage social mixing advance economic opportunities and community resilience

UD STREETSCAPE ELEMENTS

Applying the strategies palette to infrastructure in the District

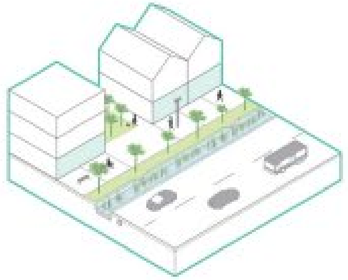
Coulee



Urban coulee for water conveyance, with potential for deep-infiltration wells.

21st Street Redesign, Paso Robles, California
Photo credit: MIG/SVR

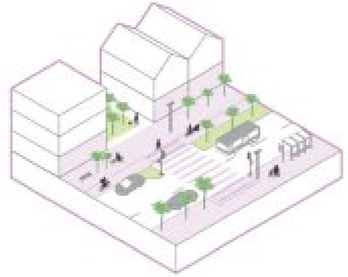
Blue-Green



Infiltration and stormwater Infrastructure Including greenways/curbless streets/rain gardens and permeable pavement.

Bioswale streetscape design location

Placekeeping



Enable social connections with ample wayfinding, arts and culture elements, street furniture, wider sidewalks for outdoor uses, with universal design and complete streets.

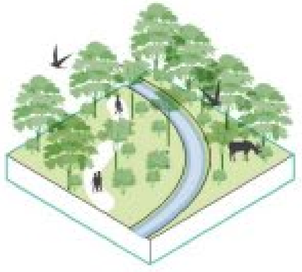
Kapuso at Upper Yards, San Francisco CA

REWILD AND RECHARGE THE RIVER

GREEN BLUE INFRASTRUCTURE, HABITAT, AND PUBLIC REALM

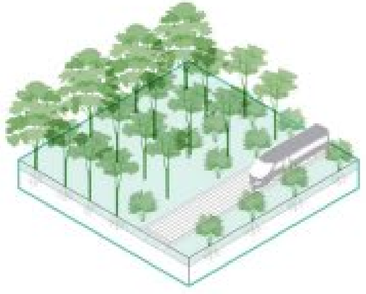
Purpose: Heal the Spokane River and improve the health of Spokane. Create more space for stormwater cleaning and infiltration to recharge the aquifer and create more people, flora, and fauna habitat and access to the river.

Blue-Green Streets

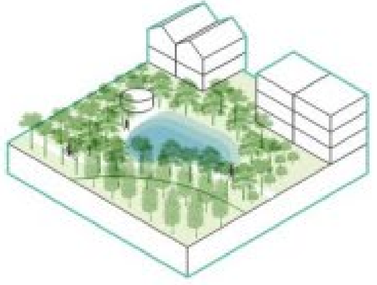


Biodiverse Corridors

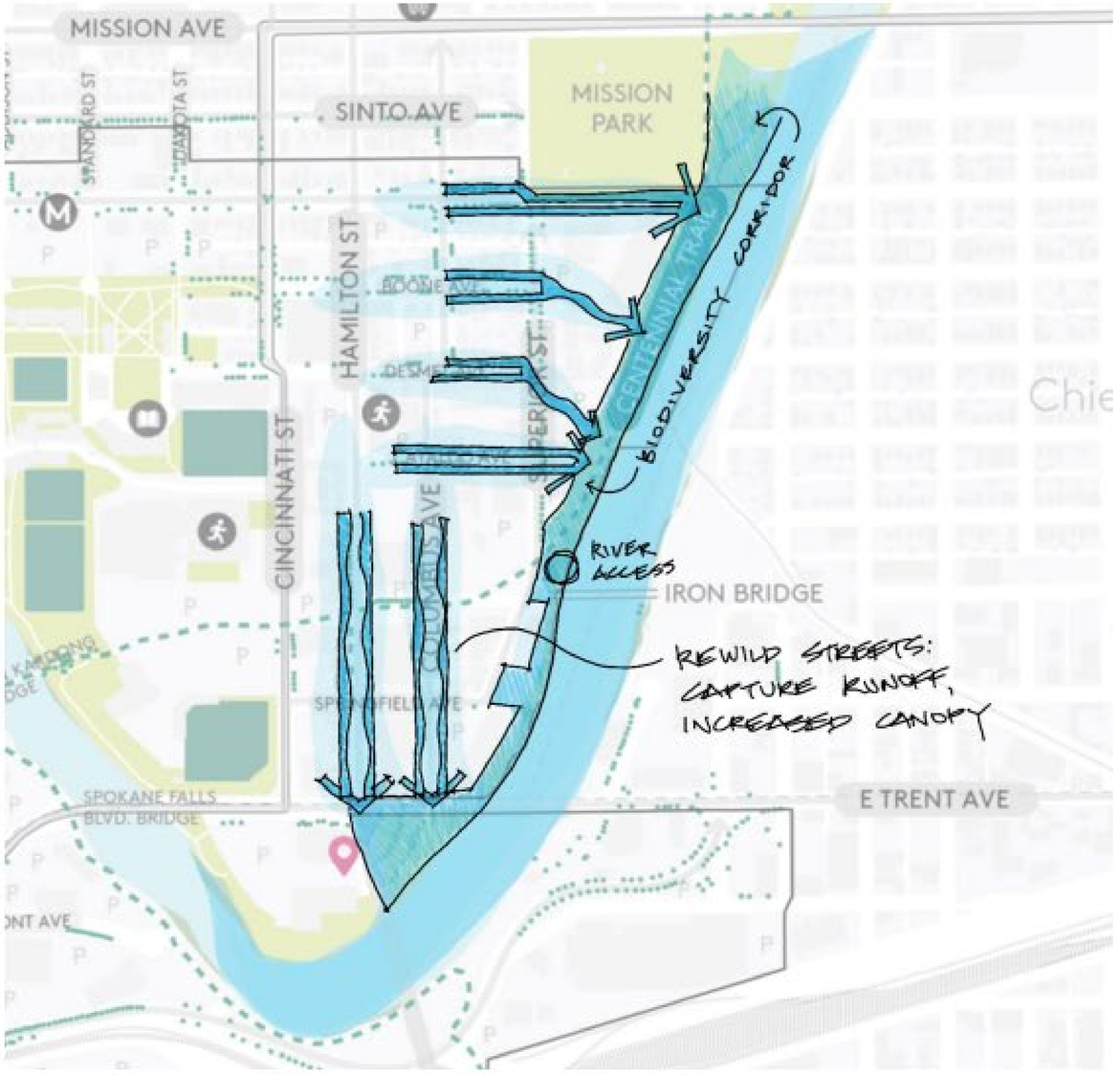
Building Integrated Green Infrastructure



Clean Soil Parks and Trails



Urban Forests

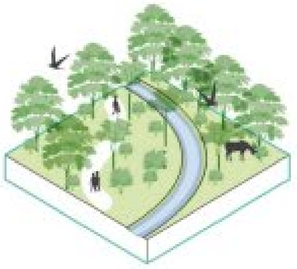


REVIVE WITH COULEE SYSTEM

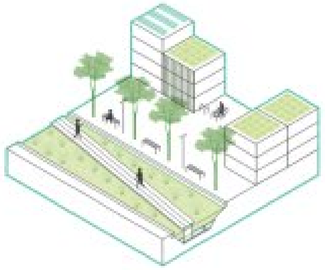
URBAN SPILLWAYS AND WATER CONVEYANCE INFRASTRUCTURE

Purpose: Create a new system to transform the South UD scablands into a more productive place for people and planet to thrive with physical, social, and economic networks and connections.

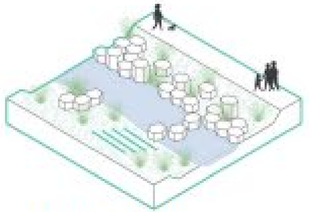
Blue-Green Streets



Biodiverse Corridors

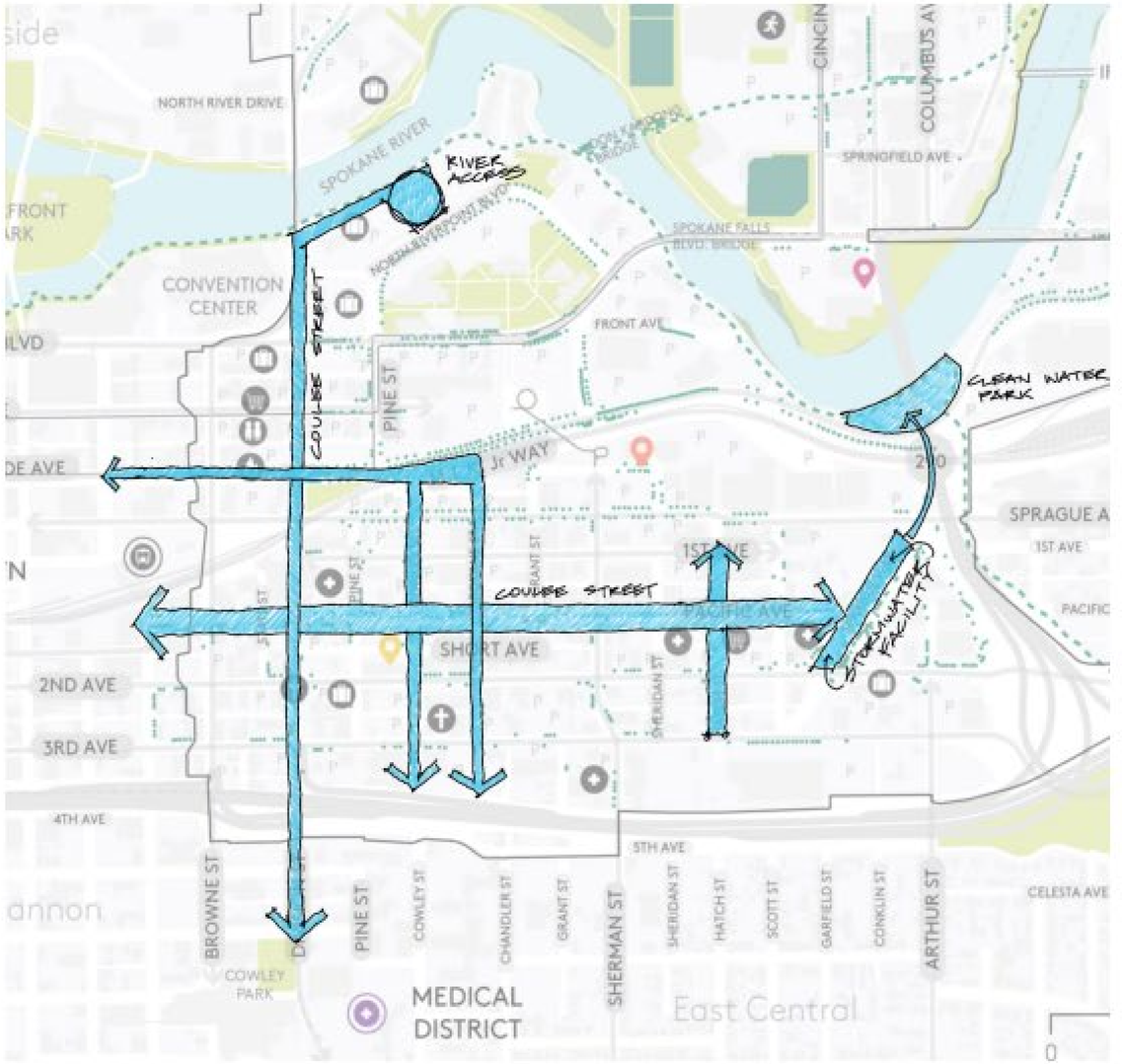


Building Integrated Green Infrastructure



Coulee (Blue-Brown)

Placekeeping




PEDESTRIAN TRAIL
AND PROMENADE
MULTI-USE PATH AND
PACIFIC AVE CONNECTION
OVERLOOK
Before
FILTER MEDIA
MULTI-USE PATH
TRAIL
FORMER N SPRAGUE WAY
BASALT SLOPE
FORMER S SPRAGUE WAY

How we Measure

Greene Economics

Ecological Asset Study: Measurement and Target Tool

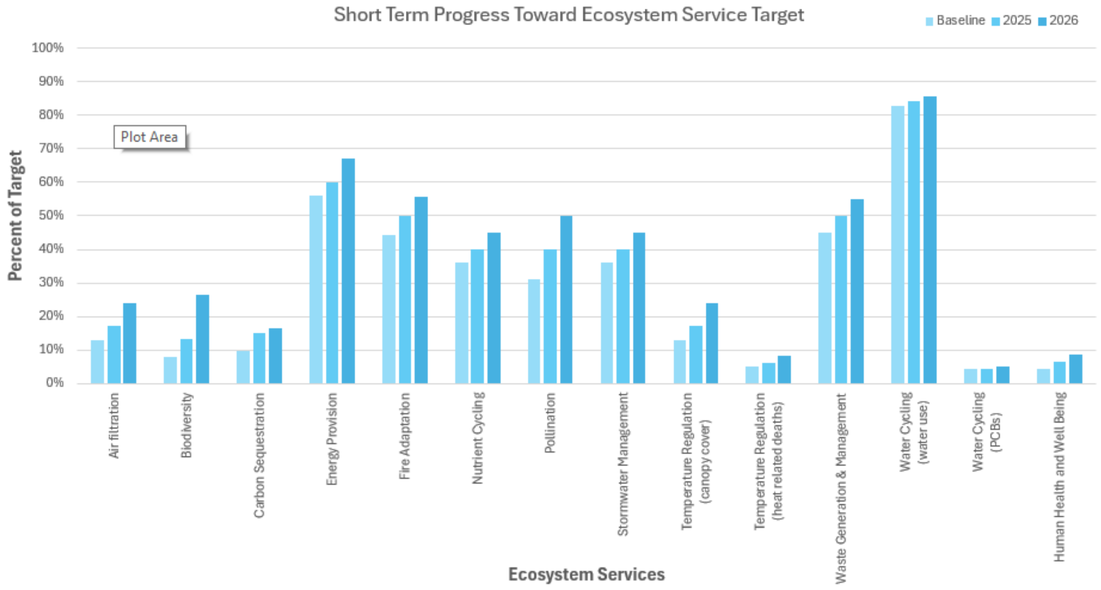
- Baseline values were established for each ecosystem service. These values represent the level of the ecosystem service provided in the UD in 2023.
- The target value is 100%. The target values were determined based on what ecosystem services would have been present in the UD before it was developed by humans.
- Achieving these targets will ensure that the district is performing as it was historically meant to, making it more resilient to climate change, more compatible for native wildlife, and a healthier environment for people

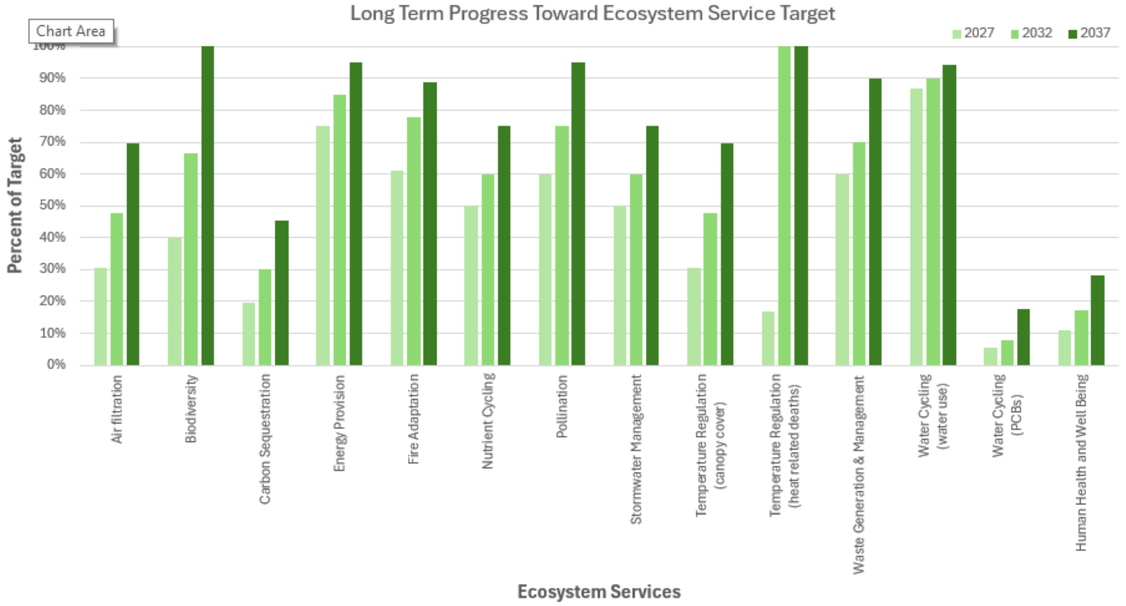
Summary Table

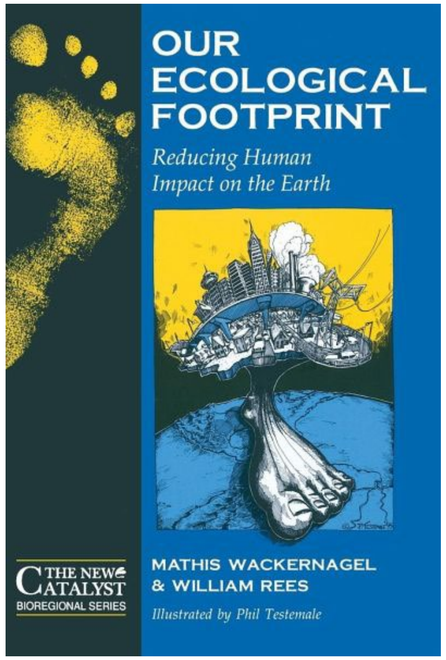
Ecosystem Servic	Baseline Value	Metric	Target Value
Air filtration	30	Acres of tree cover	230
Biodiversity	6	Percent of native vegetation in the UD	75
Carbon Sequestration	32	tons of carbon sequestered annually	330
Energy Provision	56	Percent of energy produced from renewable sources	100
Fire Adaptation	40*	Percentage of buildings with majority of external materials meeting 1 hour fire resistance rating	90
Nutrient Cycling	36	% Pervious surface	100
Pollination	31	Number of native pollinator species found in UD annually	100
Stormwater Management	36	% Pervious surface	100
Temperature Regulation	30	Acres of tree cover or other shading structure cover	230
	19	Number of heat related deaths per year	0
Waste Generation & Management	45	% of waste diverted	100
Water Cycling	193	Avg. daily water use in the UD during summer months- Gallons per capita	160
	164	Average concentration of PCBs in fish in the Spokane River in ppq	7
Human Health and Well Being	10	Acres of dedicated public green space	230

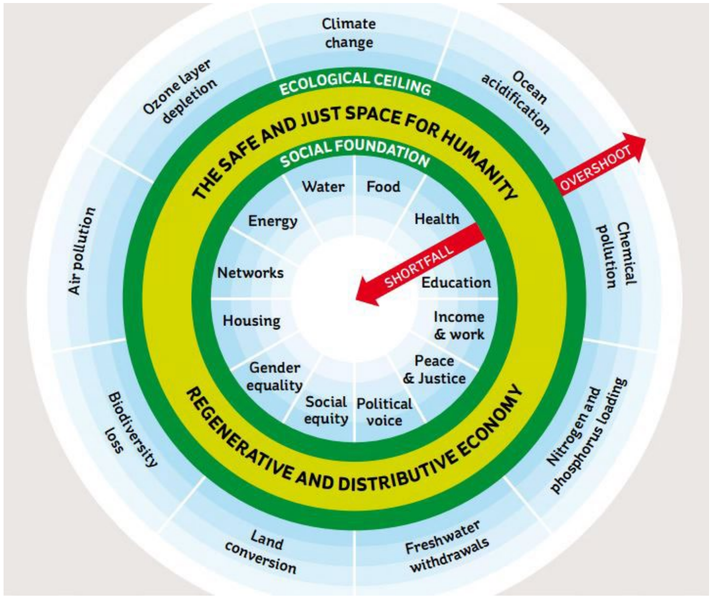
Ecological Asset Study: Measurement and Target Tool

The ultimate goal is for the UD to reach the target value in each of these Ecosystem Services. Ecosystem service status is measured on a short-term scale and a long-term scale, with the target goal remaining constant.





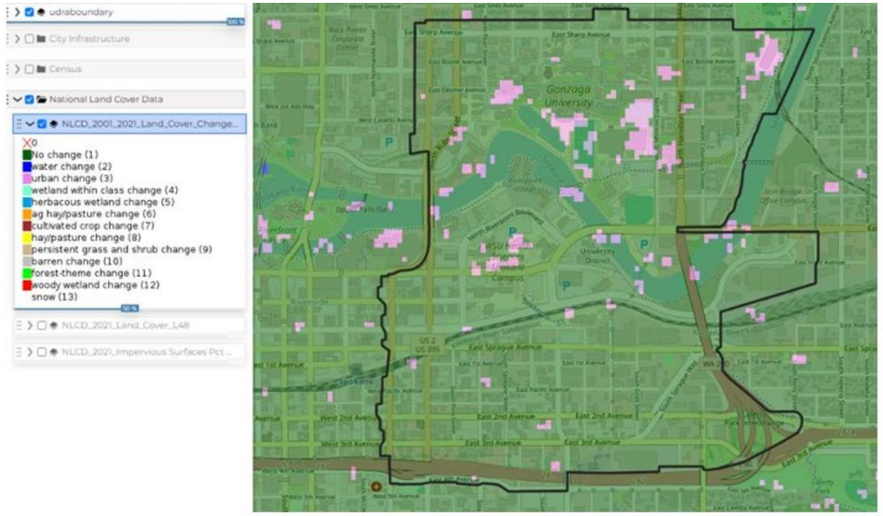




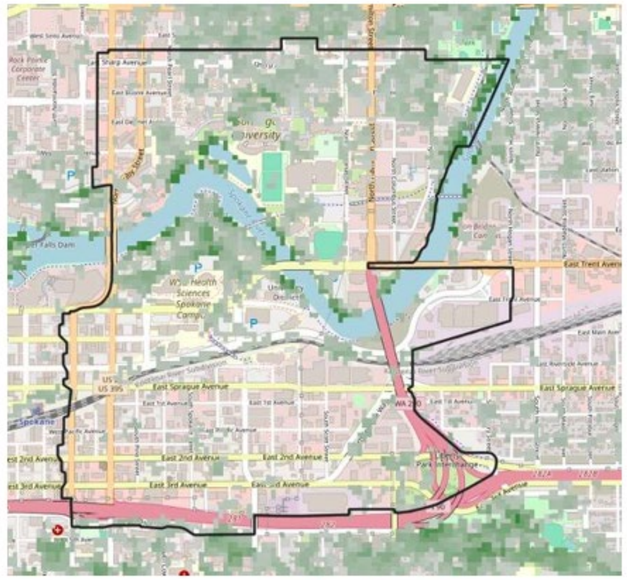
"Without a biosphere in a good shape, there is no life on the planet. It's very simple. That's all you need to know. The economists will tell you we can decouple growth from material consumption, but that is total nonsense."

- Professor Vaclav Smil, University of Manitoba, CA

UD Urban Ecological Development Tool



Detail: https://www.mrlc.gov/data/nlcd-land-cover-change-index-conus



Detail: https://www.mrlc.gov/data/nlcd-2021-usfs-tree-canopy-cover-conus

Outcomes:

- Based on ecosystem services look to measurable performance-based goals that define a healthy, urban ecosystem within ecological boundaries
- Translate and incentivize the district's ecosystem services into tangible design targets for the built environment
- Establish a replicable tool to be used nationwide by municipalities, communities and institutions

Partners:

- City of Spokane
- Avista Utilities
- WSU Integrated Design + Construction Lab
- Gonzaga University Institute for Climate, Water and the Environment
- Urbanova
- Spokane RiverKeeper
- Spokane Conservation District
- The Lands Council

Tools Used:

- The EO Wilson Biodiversity Foundation: Half-Earth Project
- Environmental Protection Agency's EJScreen
- Multi-Resolution Land Characteristics: The National Land Cover Database
- Regional Greenhouse Gas Inventory Estimator (REGGIE)
- iTree Tools
- Tree Plotter Canopy Software (via City of Spokane)
- Avista Utilities Database
- City of Spokane Water Use Database

Next Step: UD Development Incentives

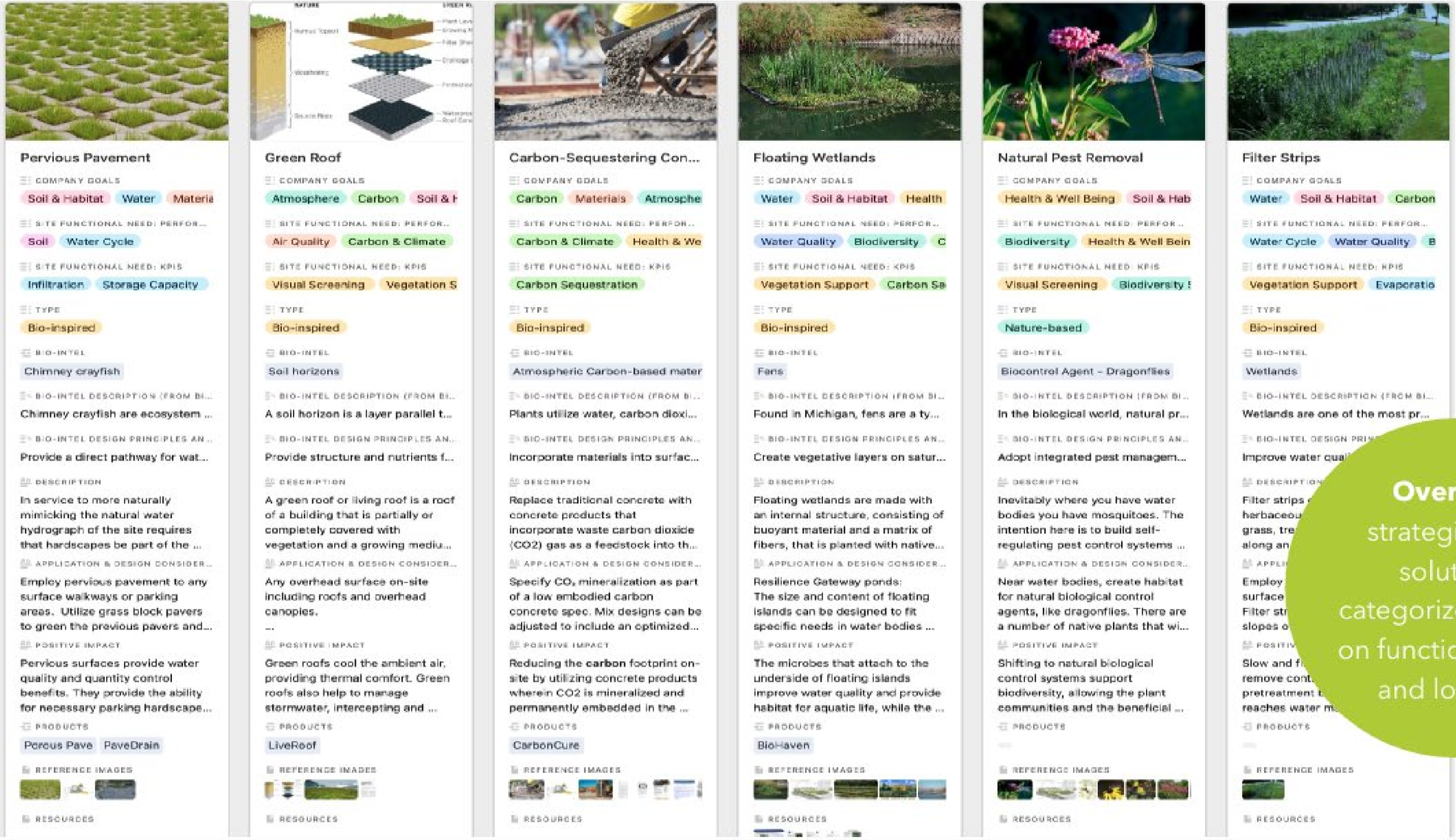


Image courtesy of Biomimicry 3.8

Thank you!

Juliet Sinisterra, CEO

jsinisterra@spokaneudistrict.org