

Quantifying

Cultural

and

Social

Ecosystem Services

In the urban context



Zachary Christin
Project Lead

EARTH
ECONOMICS 

WRIA 9

The map displays the five subwatersheds of WRIA 9, each outlined in a different color: Nearshore (pink), Duwamish Estuary (orange), Lower Green River (yellow), Middle Green River (green), and Upper Green River (blue). The map includes a legend, a scale bar (0 to 4 miles), a north arrow, and a date stamp (December 2004). The map also shows major roads, urban areas, and water bodies.

Watershed Boundary
Subwatershed Boundary
Urban Growth Boundary
River
Lake

Nearshore Subwatershed
Duwamish Estuary Subwatershed
Lower Green River Subwatershed
Middle Green River Subwatershed
Upper Green River Subwatershed

0 2 4 Miles
December 2004

King County
Department of
Natural Resources and Parks
Water and Land Resources Division

Map designed/modified by: The WRIA 9 sub-area and the WRIA 9 sub-area Commission of King and Snohomish Counties (2004/2005/2006/2007/2008/2009/2010/2011/2012/2013/2014/2015/2016/2017/2018/2019/2020/2021/2022/2023/2024/2025/2026/2027/2028/2029/2030/2031/2032/2033/2034/2035/2036/2037/2038/2039/2040/2041/2042/2043/2044/2045/2046/2047/2048/2049/2050/2051/2052/2053/2054/2055/2056/2057/2058/2059/2060/2061/2062/2063/2064/2065/2066/2067/2068/2069/2070/2071/2072/2073/2074/2075/2076/2077/2078/2079/2080/2081/2082/2083/2084/2085/2086/2087/2088/2089/2090/2091/2092/2093/2094/2095/2096/2097/2098/2099/2100/2101/2102/2103/2104/2105/2106/2107/2108/2109/2110/2111/2112/2113/2114/2115/2116/2117/2118/2119/2120/2121/2122/2123/2124/2125/2126/2127/2128/2129/2130/2131/2132/2133/2134/2135/2136/2137/2138/2139/2140/2141/2142/2143/2144/2145/2146/2147/2148/2149/2150/2151/2152/2153/2154/2155/2156/2157/2158/2159/2160/2161/2162/2163/2164/2165/2166/2167/2168/2169/2170/2171/2172/2173/2174/2175/2176/2177/2178/2179/2180/2181/2182/2183/2184/2185/2186/2187/2188/2189/2190/2191/2192/2193/2194/2195/2196/2197/2198/2199/2200/2201/2202/2203/2204/2205/2206/2207/2208/2209/2210/2211/2212/2213/2214/2215/2216/2217/2218/2219/2220/2221/2222/2223/2224/2225/2226/2227/2228/2229/2230/2231/2232/2233/2234/2235/2236/2237/2238/2239/2240/2241/2242/2243/2244/2245/2246/2247/2248/2249/2250/2251/2252/2253/2254/2255/2256/2257/2258/2259/2260/2261/2262/2263/2264/2265/2266/2267/2268/2269/2270/2271/2272/2273/2274/2275/2276/2277/2278/2279/2280/2281/2282/2283/2284/2285/2286/2287/2288/2289/2290/2291/2292/2293/2294/2295/2296/2297/2298/2299/2300/2301/2302/2303/2304/2305/2306/2307/2308/2309/2310/2311/2312/2313/2314/2315/2316/2317/2318/2319/2320/2321/2322/2323/2324/2325/2326/2327/2328/2329/2330/2331/2332/2333/2334/2335/2336/2337/2338/2339/2340/2341/2342/2343/2344/2345/2346/2347/2348/2349/2350/2351/2352/2353/2354/2355/2356/2357/2358/2359/2360/2361/2362/2363/2364/2365/2366/2367/2368/2369/2370/2371/2372/2373/2374/2375/2376/2377/2378/2379/2380/2381/2382/2383/2384/2385/2386/2387/2388/2389/2390/2391/2392/2393/2394/2395/2396/2397/2398/2399/2400/2401/2402/2403/2404/2405/2406/2407/2408/2409/2410/2411/2412/2413/2414/2415/2416/2417/2418/2419/2420/2421/2422/2423/2424/2425/2426/2427/2428/2429/2430/2431/2432/2433/2434/2435/2436/2437/2438/2439/2440/2441/2442/2443/2444/2445/2446/2447/2448/2449/2450/2451/2452/2453/2454/2455/2456/2457/2458/2459/2460/2461/2462/2463/2464/2465/2466/2467/2468/2469/2470/2471/2472/2473/2474/2475/2476/2477/2478/2479/2480/2481/2482/2483/2484/2485/2486/2487/2488/2489/2490/2491/2492/2493/2494/2495/2496/2497/2498/2499/2500/2501/2502/2503/2504/2505/2506/2507/2508/2509/2510/2511/2512/2513/2514/2515/2516/2517/2518/2519/2520/2521/2522/2523/2524/2525/2526/2527/2528/2529/2530/2531/2532/2533/2534/2535/2536/2537/2538/2539/2540/2541/2542/2543/2544/2545/2546/2547/2548/2549/2550/2551/2552/2553/2554/2555/2556/2557/2558/2559/2560/2561/2562/2563/2564/2565/2566/2567/2568/2569/2570/2571/2572/2573/2574/2575/2576/2577/2578/2579/2580/2581/2582/2583/2584/2585/2586/2587/2588/2589/2590/2591/2592/2593/2594/2595/2596/2597/2598/2599/2600/2601/2602/2603/2604/2605/2606/2607/2608/2609/2610/2611/2612/2613/2614/2615/2616/2617/2618/2619/2620/2621/2622/2623/2624/2625/2626/2627/2628/2629/2630/2631/2632/2633/2634/2635/2636/2637/2638/2639/2640/2641/2642/2643/2644/2645/2646/2647/2648/2649/2650/2651/2652/2653/2654/2655/2656/2657/2658/2659/2660/2661/2662/2663/2664/2665/2666/2667/2668/2669/2670/2671/2672/2673/2674/2675/2676/2677/2678/2679/2680/2681/2682/2683/2684/2685/2686/2687/2688/2689/2690/2691/2692/2693/2694/2695/2696/2697/2698/2699/2700/2701/2702/2703/2704/2705/2706/2707/2708/2709/2710/2711/2712/2713/2714/2715/2716/2717/2718/2719/2720/2721/2722/2723/2724/2725/2726/2727/2728/2729/2730/2731/2732/2733/2734/2735/2736/2737/2738/2739/2740/2741/2742/2743/2744/2745/2746/2747/2748/2749/2750/2751/2752/2753

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UK Street: <http://www.friendscommunications.co.uk> (P. 28, 29)

What are Cultural Ecosystem Services?

Cultural	Social
Health	Community

Services → Benefits

Urban ↔ Rural

Provisioning Services		Regulating Services	
	ENERGY AND RAW MATERIALS Providing fuel, fiber, fertilizer, minerals, and energy		AIR QUALITY Providing clean, breathable air
	FOOD Producing crops, fish, game, and fruits		BIOLOGICAL CONTROL Providing pest and disease control
	MEDICINAL RESOURCES Providing traditional medicines, pharmaceuticals, and assay organisms		CLIMATE STABILITY Supporting a stable climate through carbon sequestration and other processes
	ORNAMENTAL RESOURCES Providing resources for clothing, jewelry, handicraft, worship, and decoration		MODERATION OF EXTREME EVENTS Preventing and mitigating natural hazards such as floods, hurricanes, fires, and droughts
	WATER SUPPLY Provisioning surface and ground water for drinking, irrigation, and industrial use		POLLINATION Pollinating wild and domestic plant species
Information Services			SOIL FORMATION Creating soils for agricultural use and ecosystems integrity; maintaining soil fertility
	AESTHETIC INFORMATION Enjoying and appreciating the presence, scenery, sounds, and smells of nature		SOIL RETENTION Retaining arable land, slope stability, and coastal integrity
	CULTURAL AND ARTISTIC INSPIRATION Using nature as motifs in art, film, folklore, books, cultural symbols, architecture, and media		WASTE TREATMENT Improving soil, water, and air quality by decomposing human and animal waste and removing pollutants
	RECREATION AND TOURISM Experiencing natural ecosystems and enjoying outdoor activities		WATER REGULATION Providing natural irrigation, drainage, ground water recharge, river flows, and navigation
	SCIENCE AND EDUCATION Using natural systems for education and scientific research	Supporting Services	
	SPIRITUAL AND HISTORICAL Using nature for religious and spiritual purposes		GENETIC RESOURCES Improving crop and livestock resistance to pathogens and pests
			HABITAT AND NURSERY Maintaining genetic and biological diversity, the basis for most other ecosystem functions; promoting growth of commercially harvested species

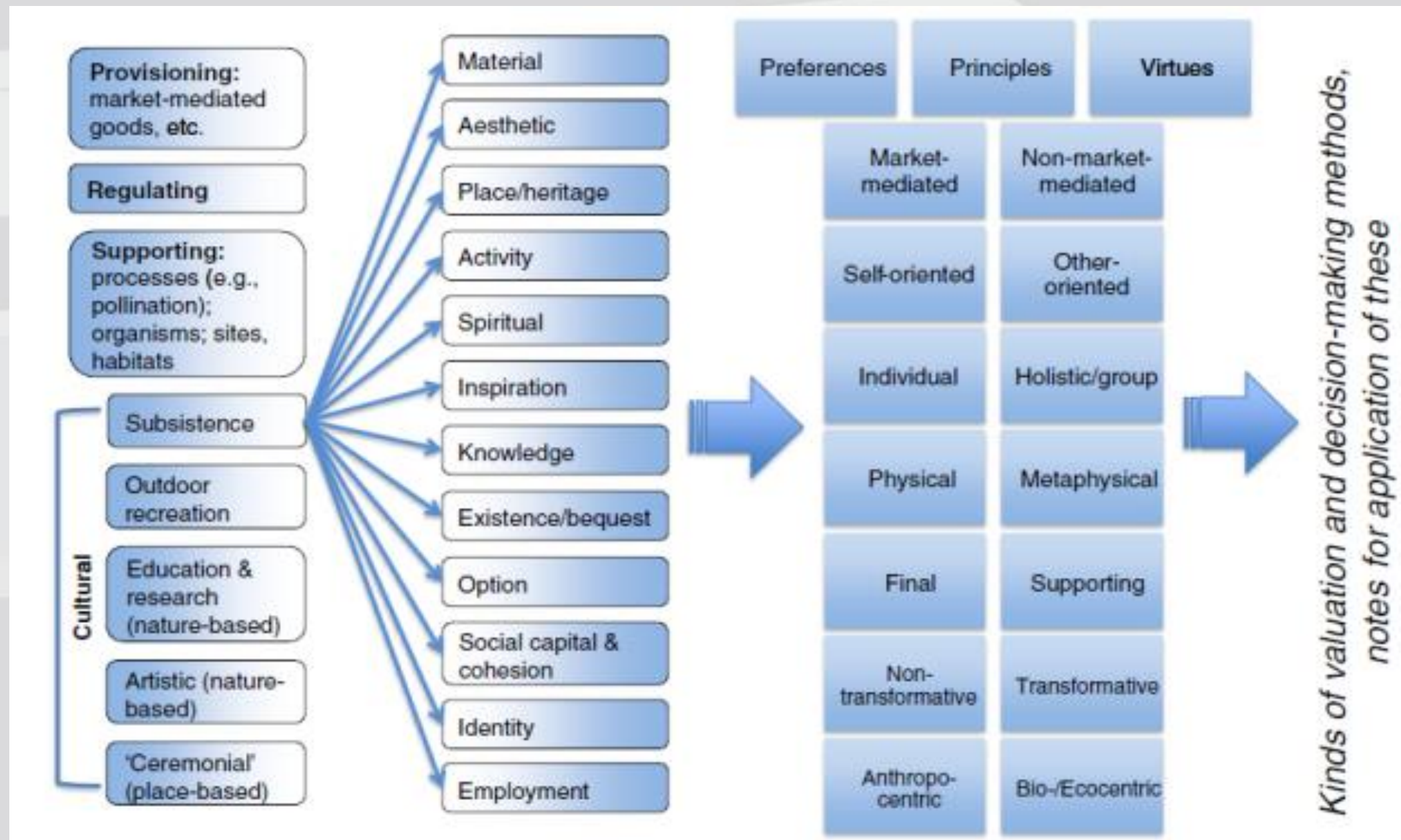
Identifying Cultural Services and Benefits

Existing Typologies

SoLVES Classification
Aesthetic value
Biological diversity value
Cultural value
Economic value
Future value
Historic value
Intrinsic value
Learning value
Life Sustaining value
Recreation value
Spiritual value
Therapeutic value

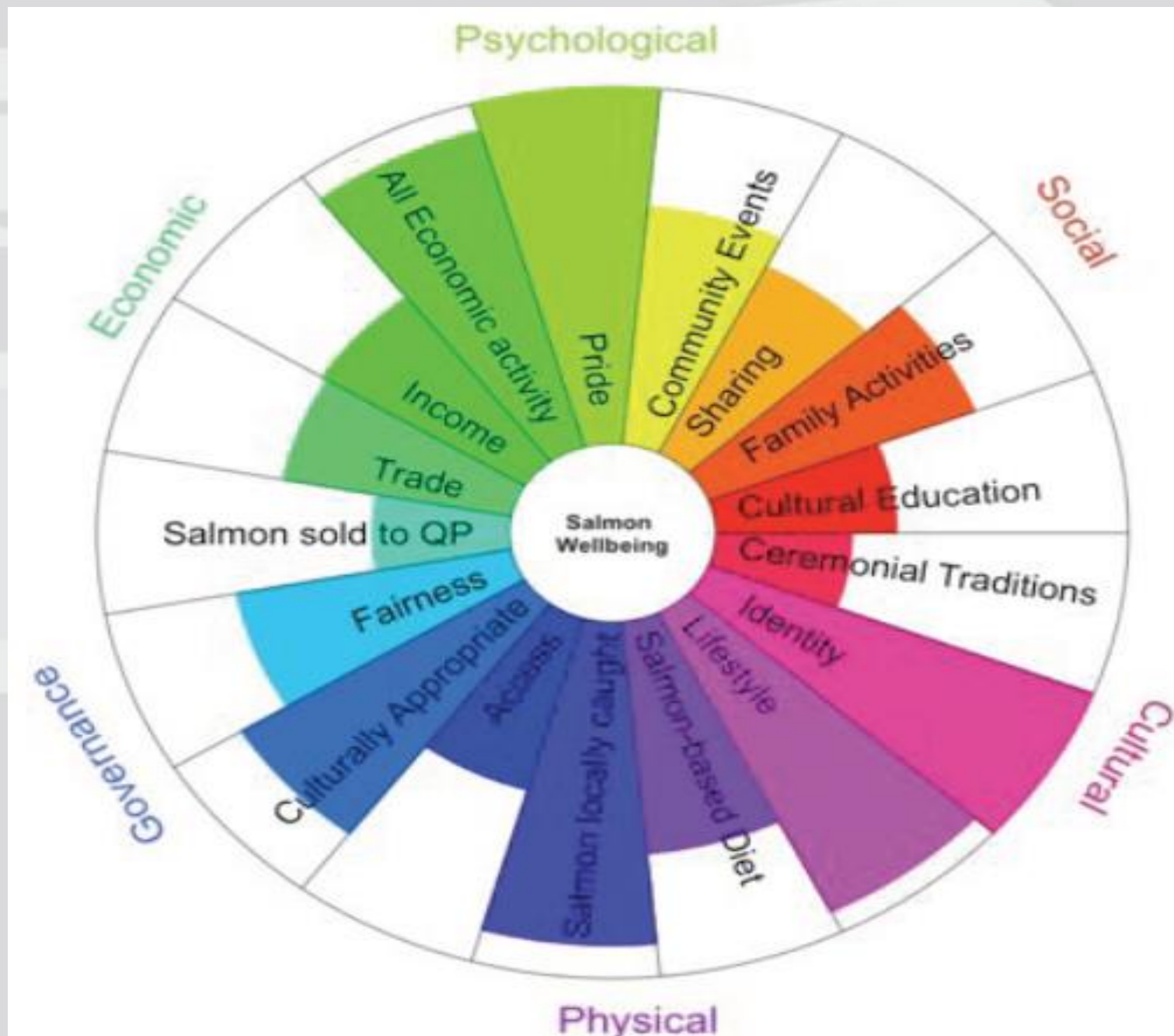
Identifying Cultural Services and Benefits

Existing Typologies



Identifying Cultural Services and Benefits

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Identifying Cultural Services and Benefits

Existing Typologies



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

“New” Cultural Service Framework

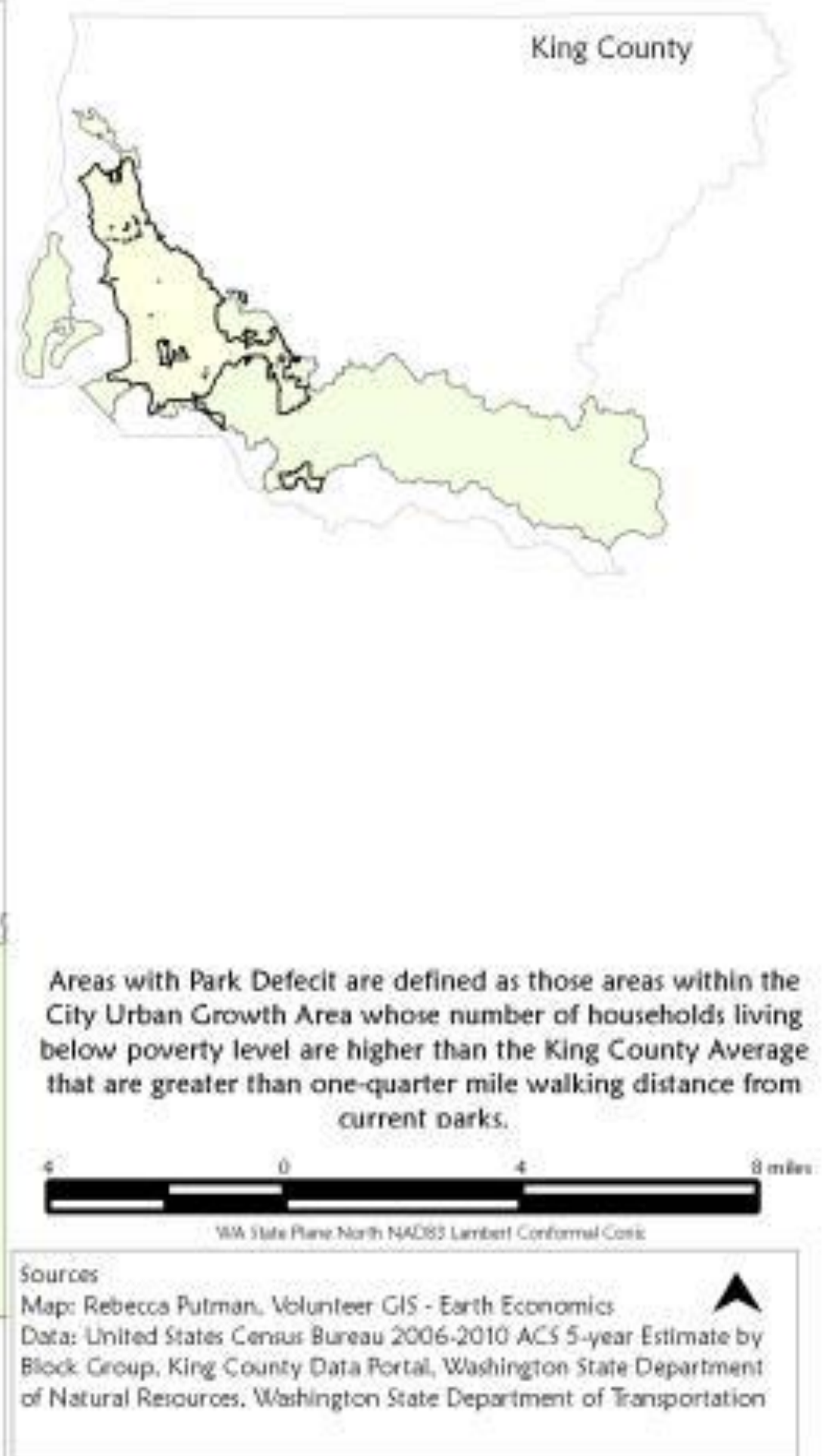
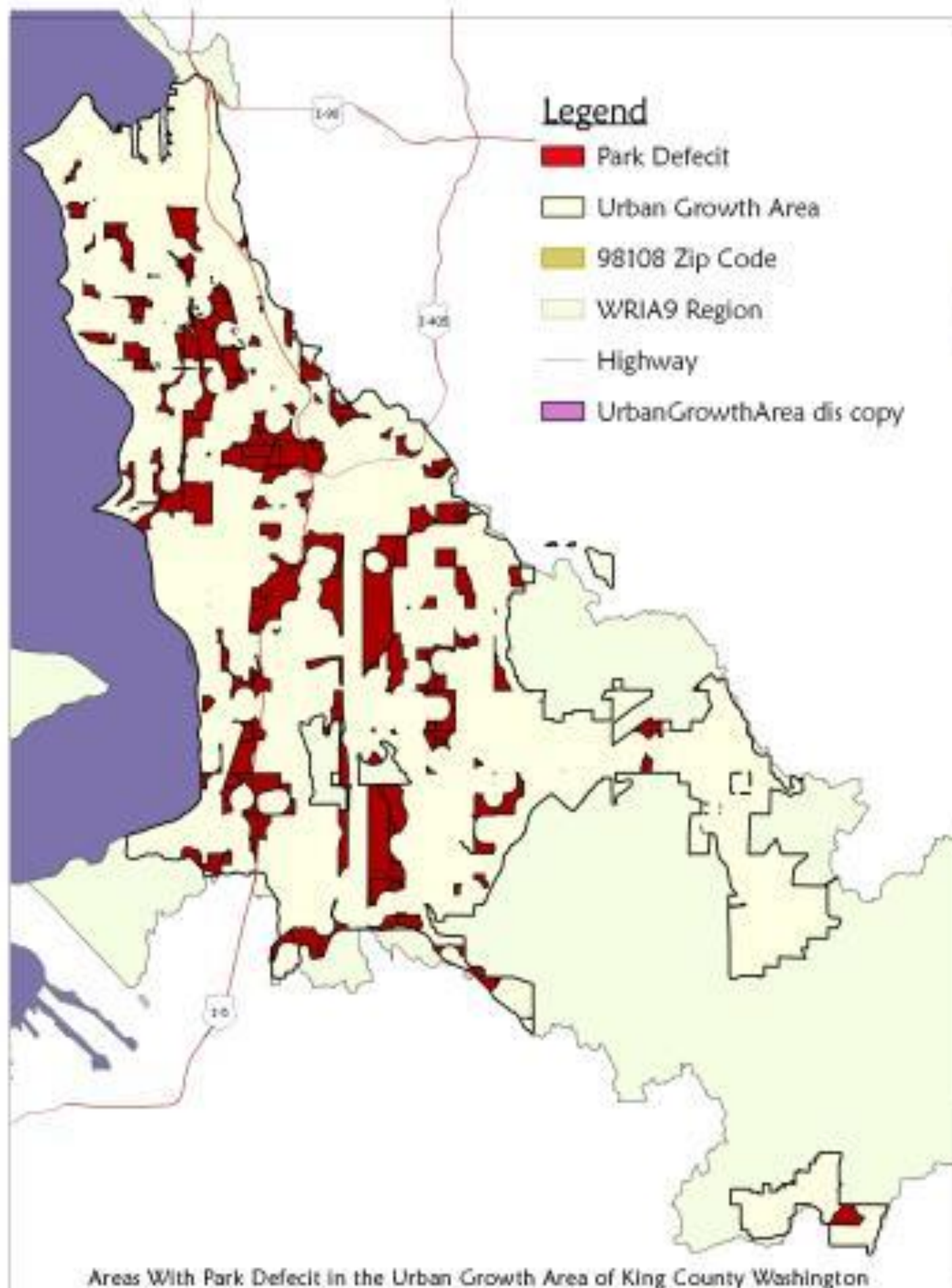
Access to Local Food	Access to Foraged Goods	Access to Clean Water, Food, and Air	Active Living and Exercise	Aesthetic
Biological Diversity	Communication	Community Cohesion and Social Capital	Crime and Public Safety	Cultural Events
Job Satisfaction	Education	Future	Heritage, Identity and Place	Historic
Intrinsic	Mental Health and Capacity	Physical Health and Recovery	Recreation	Reduced Physical Risk
Spiritual and Inspirational	Therapeutic			

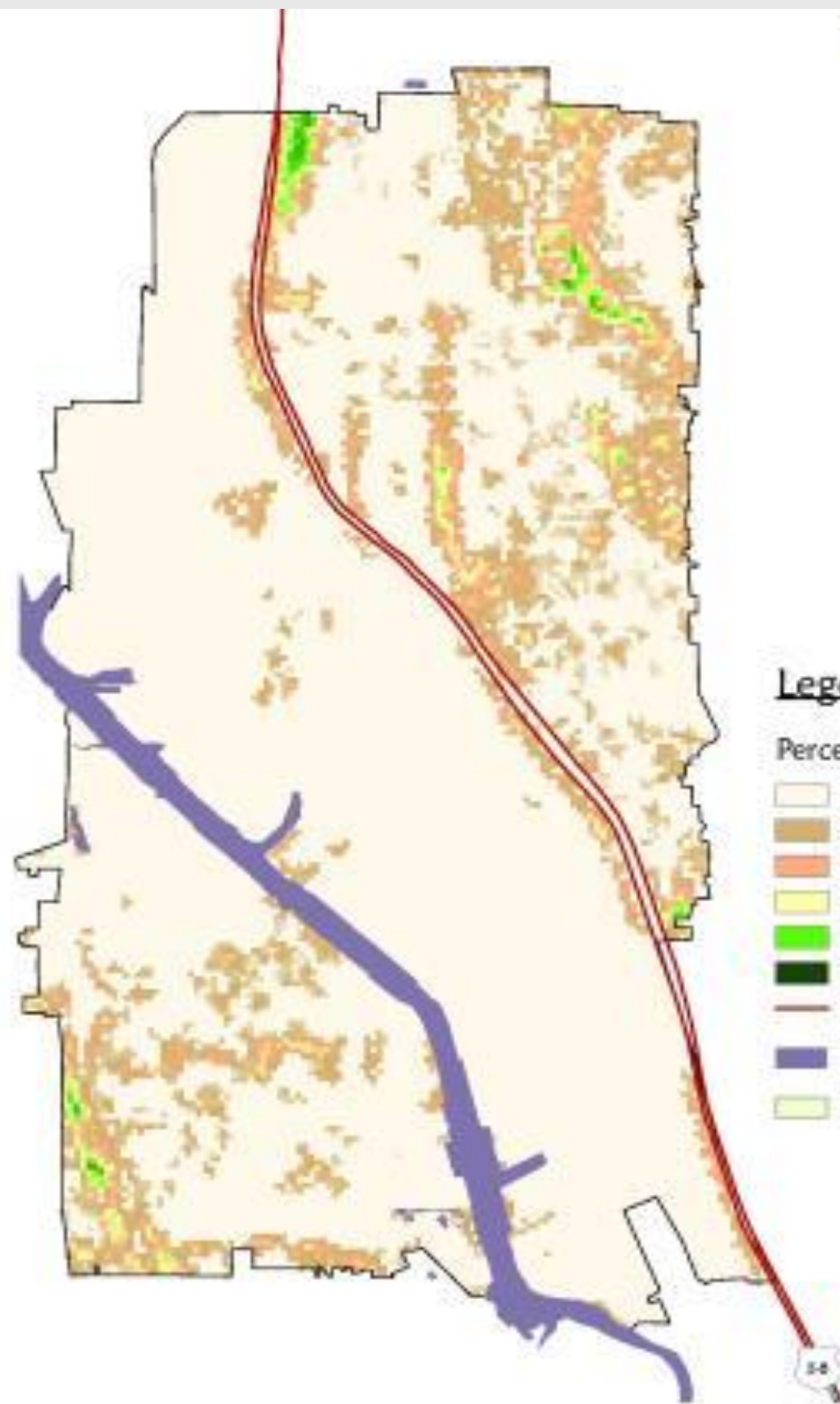
Measuring Cultural Services

Cultural Service	Data Proxy or Analytic Tool
Spiritual and Inspirational	Survey, SOLVES, Coding Narrative
Crime and Public Safety	Spatial Data, CHIA Score
Community Cohesion and Social Capital	Volunteer Data
Mental Health and Capacity	Park Proximity Map (ARIES), CHIA Score, Tree Canopy Cover
Cultural Events	Survey Data, Coding Narrative

Measuring Cultural Services

Monetization vs Quantification

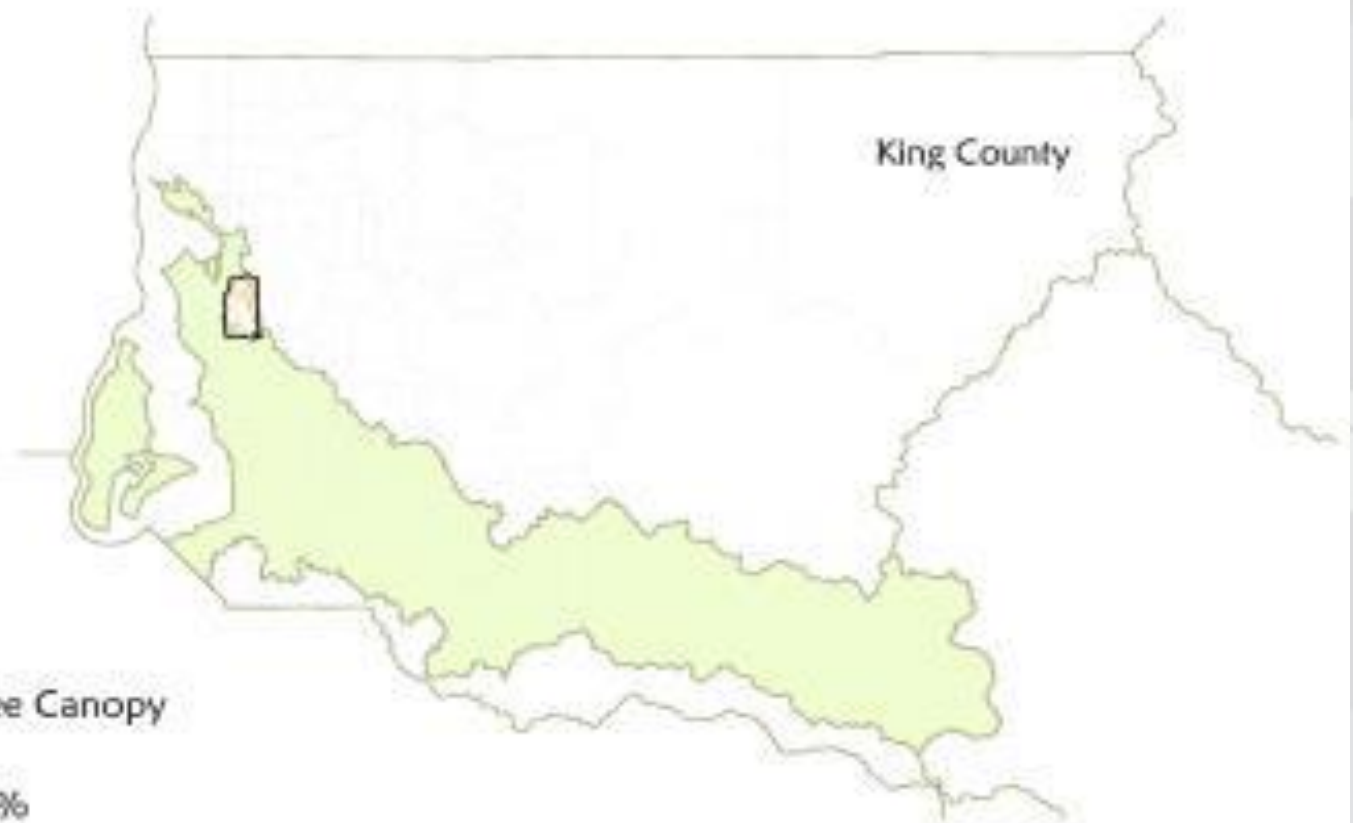




Legend

Percent Tree Canopy

- 0%
- <20%
- 20-40%
- 40-60%
- 60-80%
- 80-100%
- Highway
- Water
- WRIA 9 Region



WA State Plane North NAD83 Lambert Conformal Conic



2011 Percent Tree Canopy In the 98108 Zip Code of King County Washington

Sources

Map: Rebecca Putman, GIS Contractor - Earth Economics
 Data: National Land Cover Database 2011 Percent Tree Canopy, King County Data Portal, Washington State Department of Natural Resources, Washington State Department of Transportation

ESV Change from 2001 to 2011

Land Cover Type	Acreage change from 2001 to 2011	Ecosystem Value from 2001 to 2011 (\$/Year - Low Value)	Ecosystem Value from 2001 to 2011 (\$/Year - High Value)
Hay/Pasture	-992	(\$456,320)	(\$596,192)
Deciduous Forest	-365	(\$282,875)	(\$761,025)
Evergreen Forest	429	\$232,518	\$3,424,707
Mixed Forest	-1,045	(\$566,390)	(\$8,342,235)
Grasslands/Herbaceous	-1,211	(\$512,253)	(\$30,236,248)
Riparian	298	\$20,860	\$1,839,554
Shrub/Scrub	840	\$166,320	\$166,320

Tree Canopy Cover from 2001 to 2011

Density	Acres 2001	% WRIA9	Acres 2011	% WRIA9	Acre Change	% Acre Change
0–20%	145,259	39.67%	107,255	29.29%	-38,004	-10.38%
20–40%	21,601	5.90%	42,132	11.51%	20,531	5.61%
40–60%	16,404	4.48%	37,450	10.23%	21,046	5.75%
60–80%	38,401	10.49%	112,753	30.80%	74,352	20.31%
80–100%	144,471	39.46%	66,546	18.18%	-77,925	-21.28%

Ecosystem Service Value of MPT Parks After Restoration

High

\$13.0 Million

Low

\$3.6 Million

Each Year

Social and Human Capital

Education

- Child Education
- Academic Projects

\$1.4 million

Social Capital

- Volunteerism
- Donations

\$6.9 million



Community and Human Health

Community Cohesion

- Tacoma Garden Club
- Flower Societies
- Neighborhood Councils

Mental Health

- ADHD Treatment
- Stress Relief
- Noise Avoidance



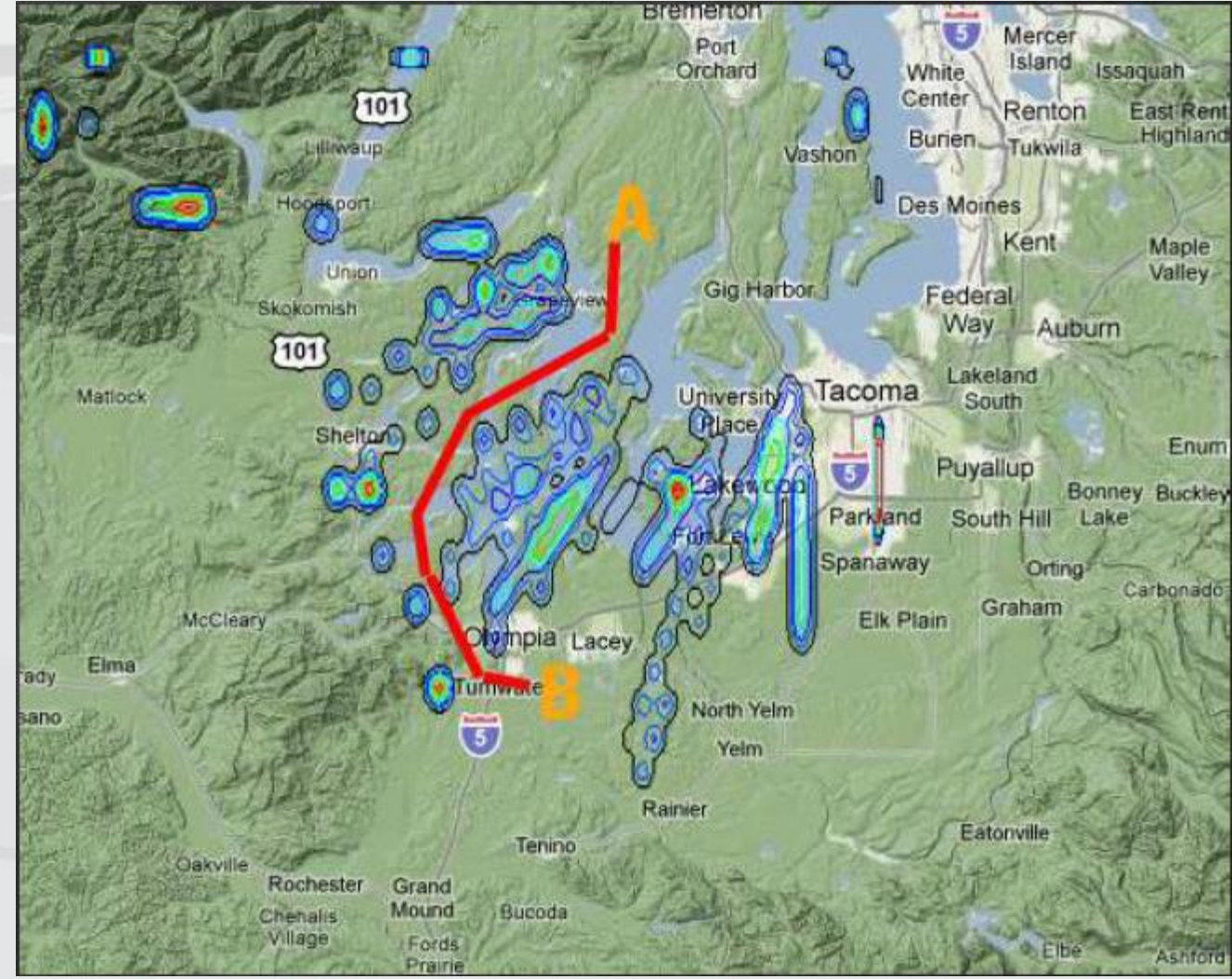
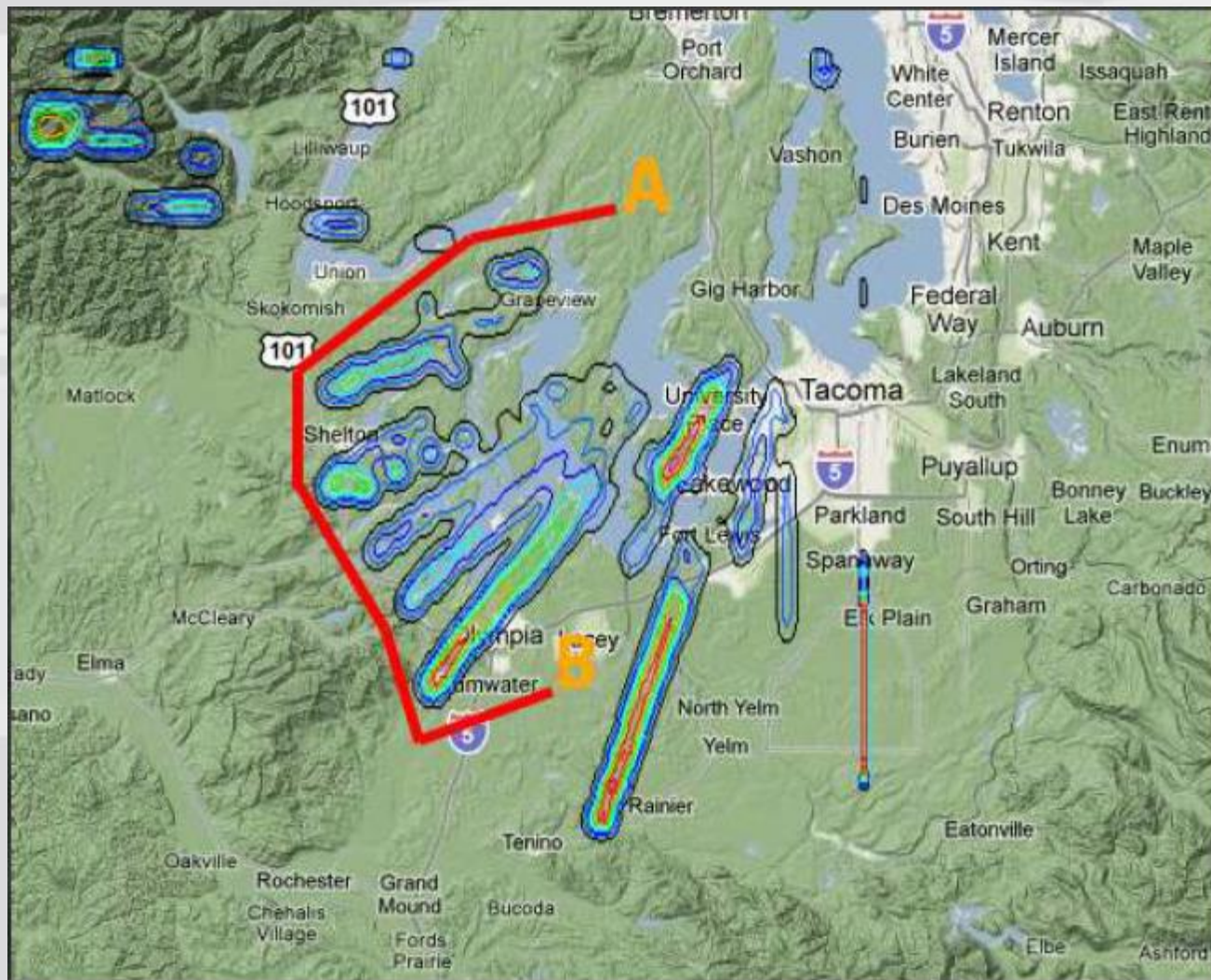
Metro Parks Tacoma Bond: \$198 Million



ARIES

Scenario 1: Baseline

Scenario 2: Reforestation

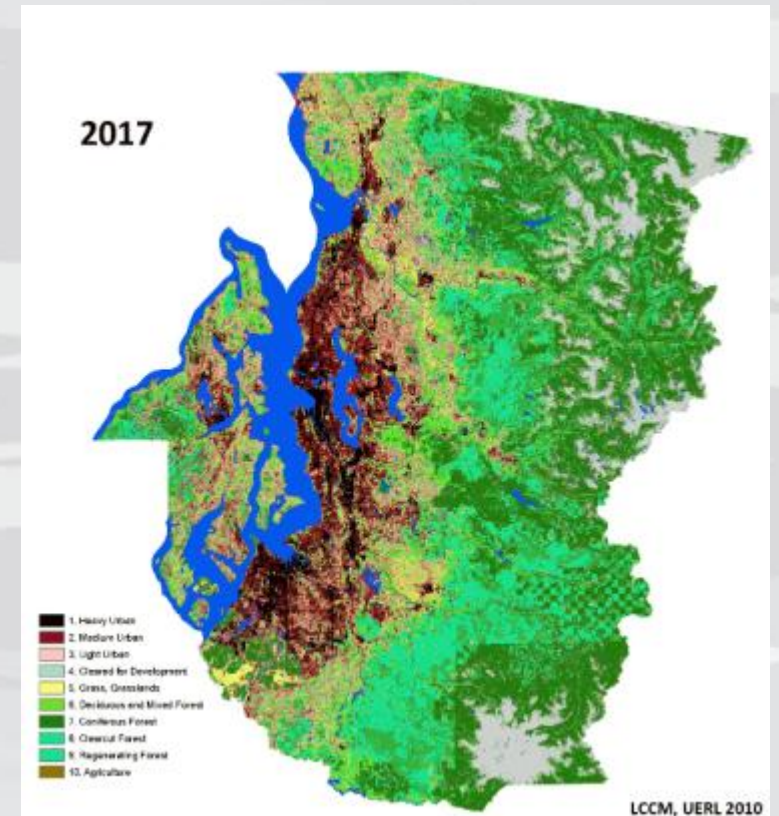


Snohomish Models

SHIRAZ



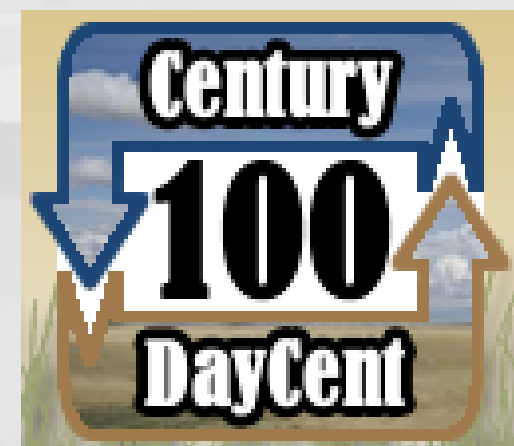
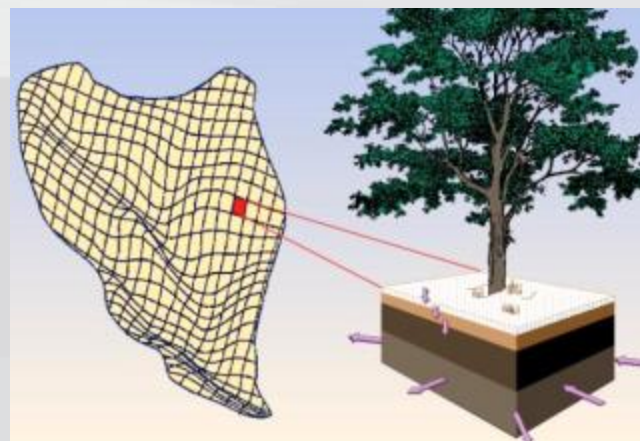
LCCM



ECOPath



DHSVM



Preference values

Representing the relative importance of your criteria, based on your decisions.

[HOME](#)[start and
mode](#)[your
criteria](#)[your
decisions](#)[preference
values](#)

Integer and % values are equivalent with respect to the ranking of alternatives they produce. [More »](#)

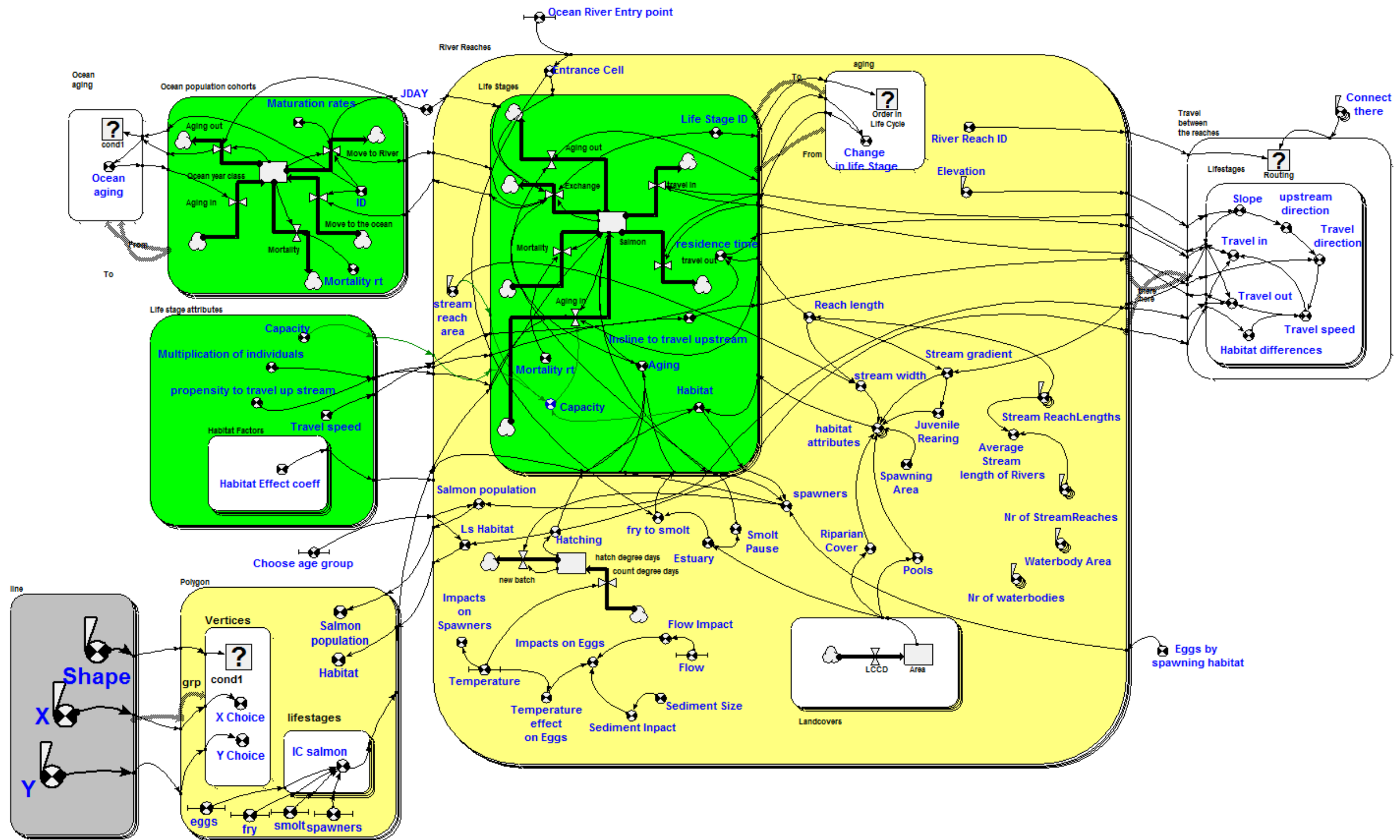
[Show all](#)[spreadsheet](#)[consistency of decisions?](#)[audit report](#)

- ☒ Convert integers to % values (maximum possible score = 100)
- ☒ Show % values as bar graphs
- ☐ Show scoring boxes (for printing)
- ☒ Order criteria by their relative importance

MIMES Ecosystem Service Preferences

< criterion a >		% Bar graph
< level 1, this criterion >	0.0 %	<div></div>
< level 2, this criterion >	33.3 %	<div></div>
< criterion b >		
< level 1, this criterion >	0.0 %	<div></div>
< level 2, this criterion >	33.3 %	<div></div>
< criterion c >		
< level 1, this criterion >	0.0 %	<div></div>
< level 2, this criterion >	33.3 %	<div></div>

Multi-Scale Integrated Models of ES





Contact Information

Zachary Christin | Project Lead

zchristin@eartheconomics.org

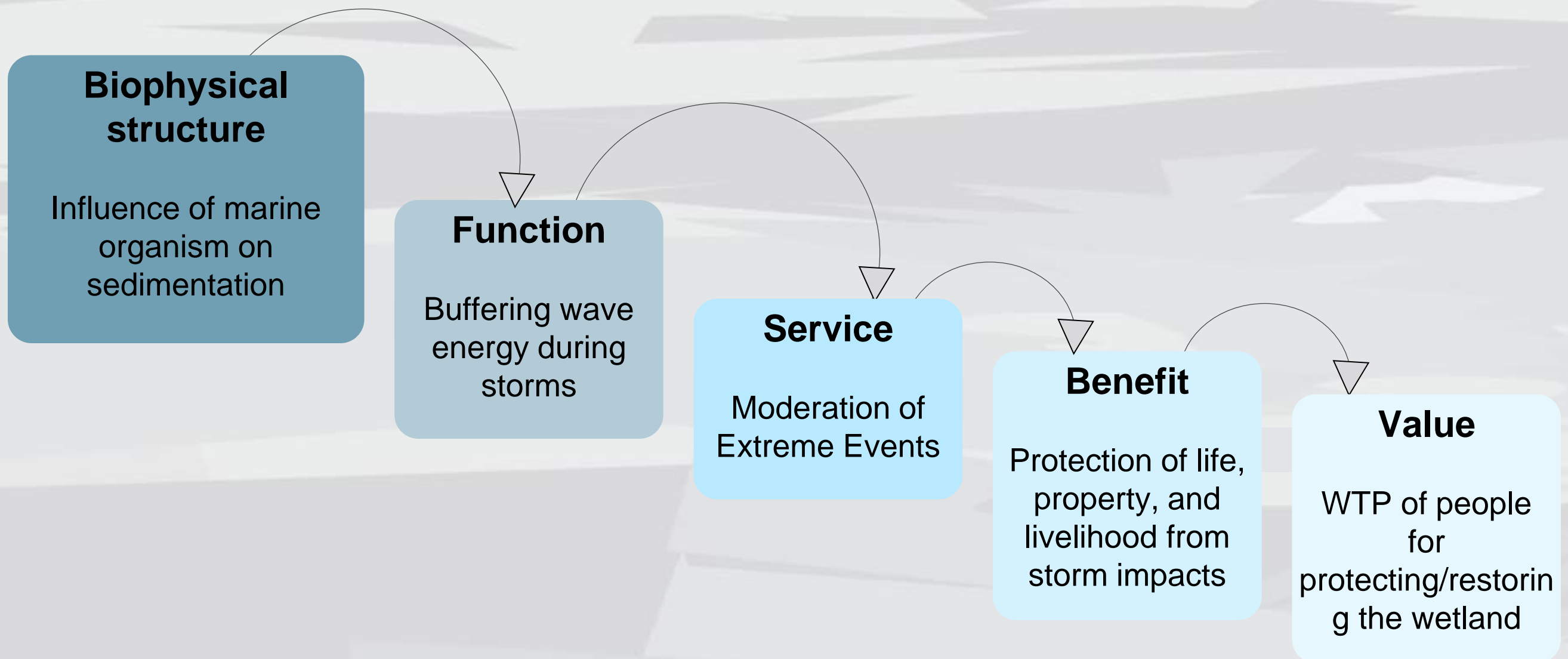
The background is a stylized, low-poly illustration of a landscape. It features a range of mountains in the distance, with some peaks having white, snow-like patches. In the foreground, there are various geometric shapes representing land and water, creating a sense of depth and perspective. The overall color palette is muted, with shades of gray, blue, and white.

Thank
you.

Linking nature and society

Ecosystems & biodiversity

Human well-being



Restoring Ecosystem Services

