

Mud or Money – Simple Tools to Offset City of Seattle Marine Shoreline Ecosystem Service Losses With Equal Gains or Payment

Matt Luxon¹, Maggie Glowacki²,
Jenny Love¹, Abby Hawley¹, Mike
Yarnes¹, Ron Gougnet¹

1 – Windward Environmental LLC

2 – City of Seattle Department of Construction and Inspections

Stakeholder values



Legislative Driver



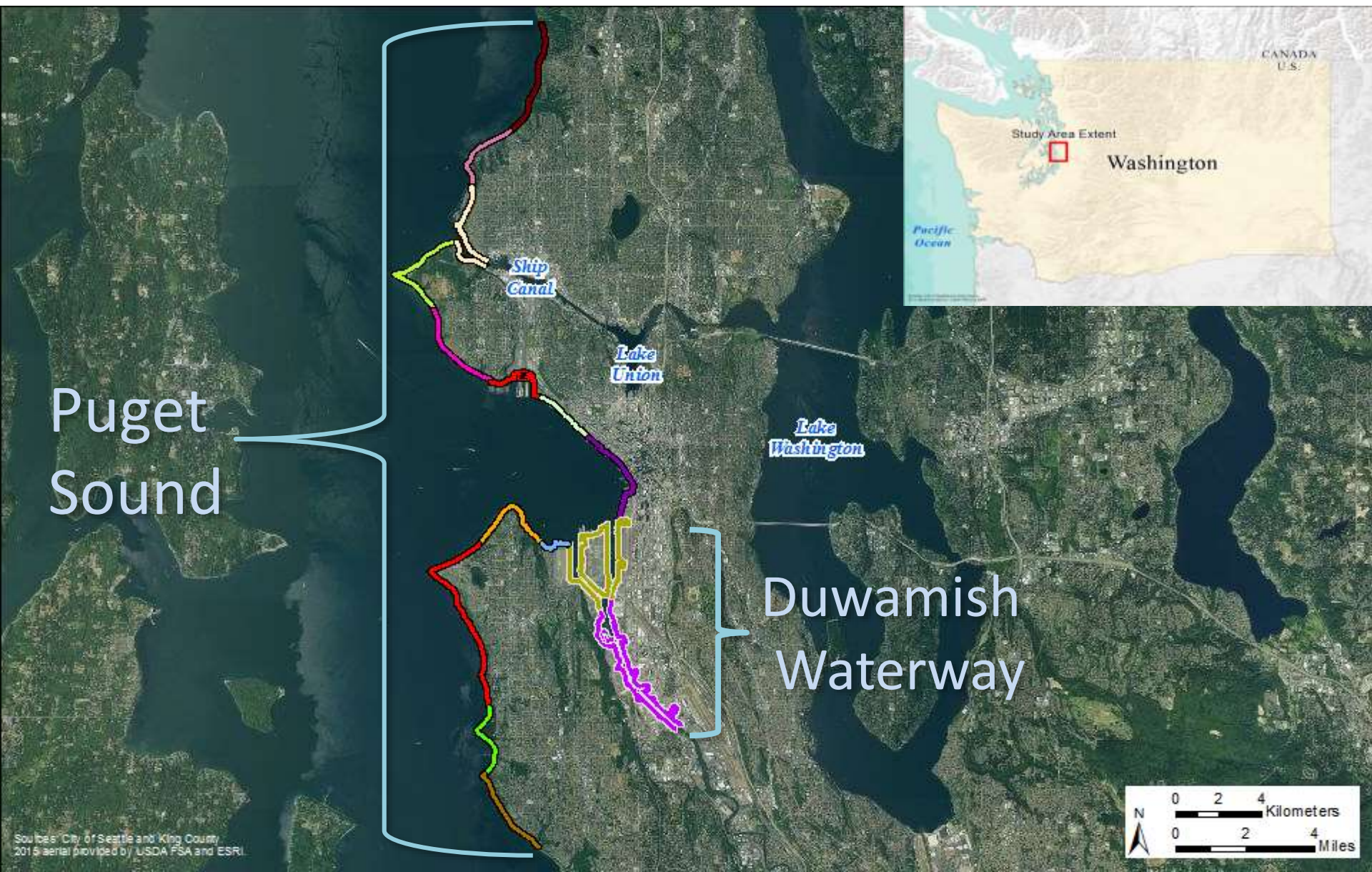
Goals

- Measure shoreline ecological function
- Predictability and transparency in permitting process
- Enhance quality of project mitigation
- Provide flexibility in application of mitigation requirements

What is the Shoreline Habitat Evaluation Procedures (HEP) Program?

- USFWS method for habitat services accounting
- Standardized approach to evaluating shoreline project impacts and determining mitigation requirements
- Optional in-lieu fee program for off-site mitigation of shoreline development impacts

Seattle Marine Shorelines

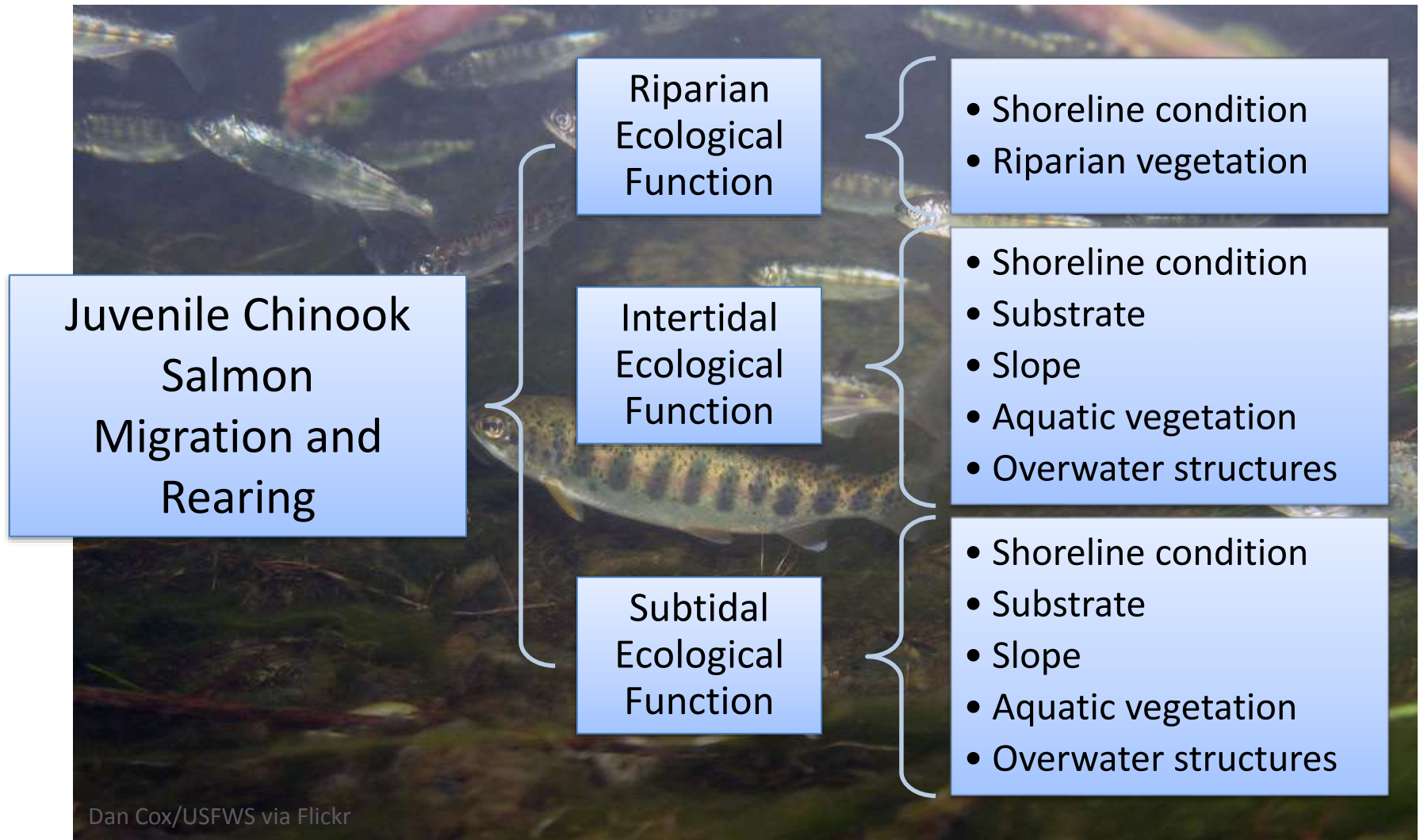


Sources: City of Seattle and King County
2019 aerial provided by USDA FSA and ESRI

Habitat Suitability Index (HSI)

- Score measuring ecological function
- Compares actual conditions to ideal conditions on a scale from 0.0 to 1.0
- $\text{HSI score} \times \text{Area} = \text{Habitat Units (HU)}$
- HUs provide an overall measure of changes resulting from shoreline development or restoration

Habitat Suitability Index Model

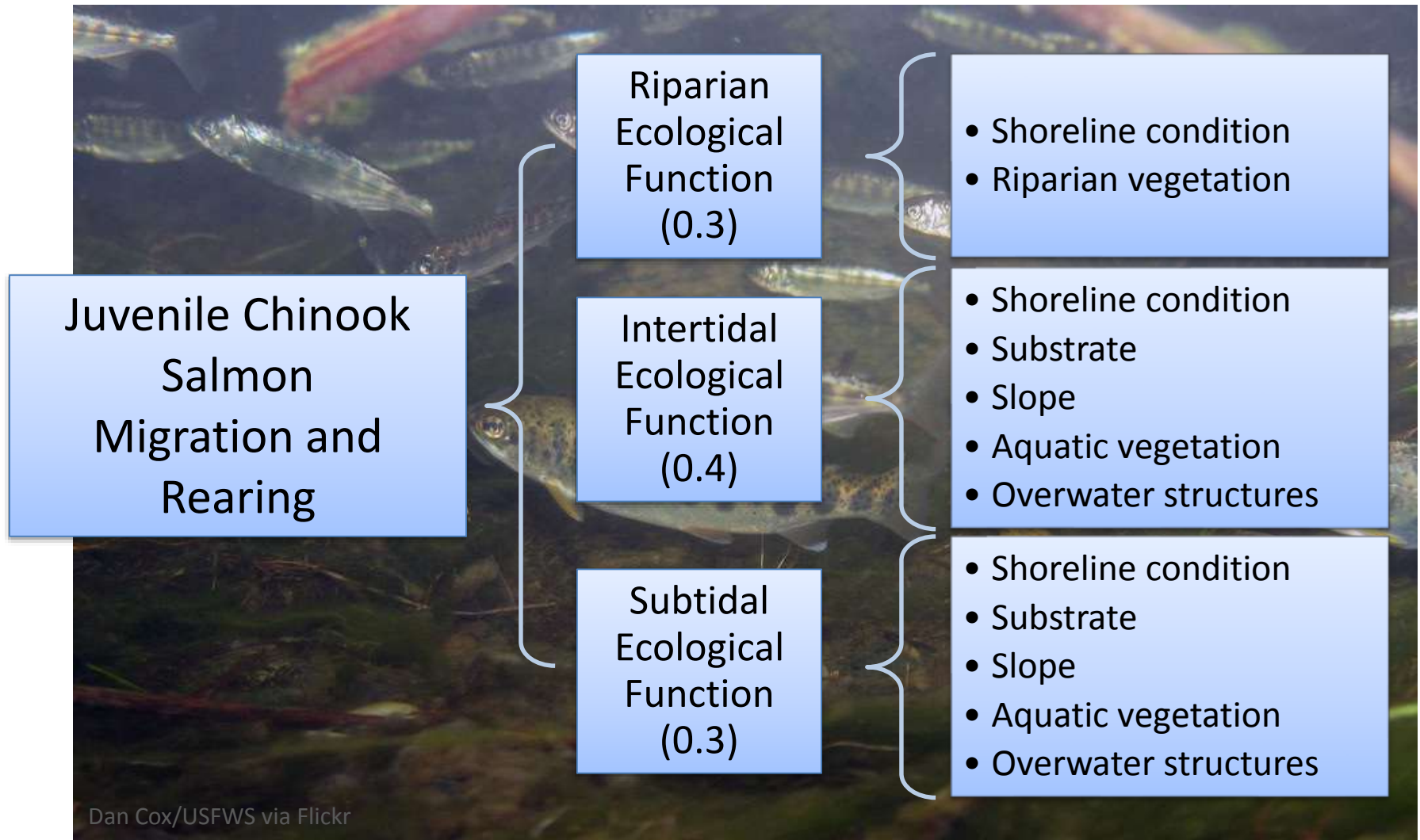


Example Suitability Index Score

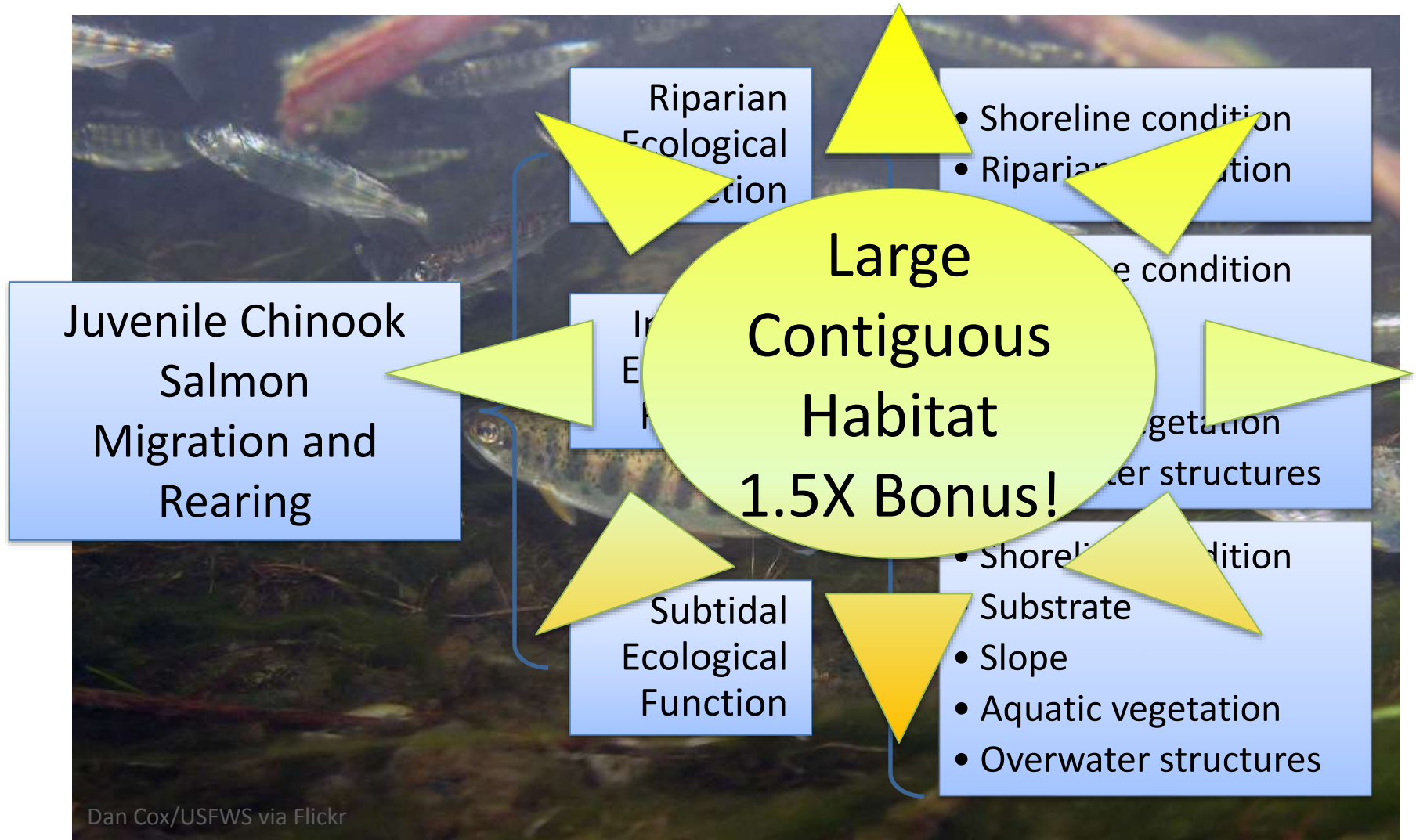
Shoreline condition suitability index

| Habitat Condition | Habitat Value |
|---|---------------|
| Natural/un-retained (approximates natural slope, contour, substrate) | 1.0 |
| Soft shoreline armoring, slope > 25 to 50% | 0.5 |
| Riprap/vertical bulkhead (slope > 50%) | 0.1 |

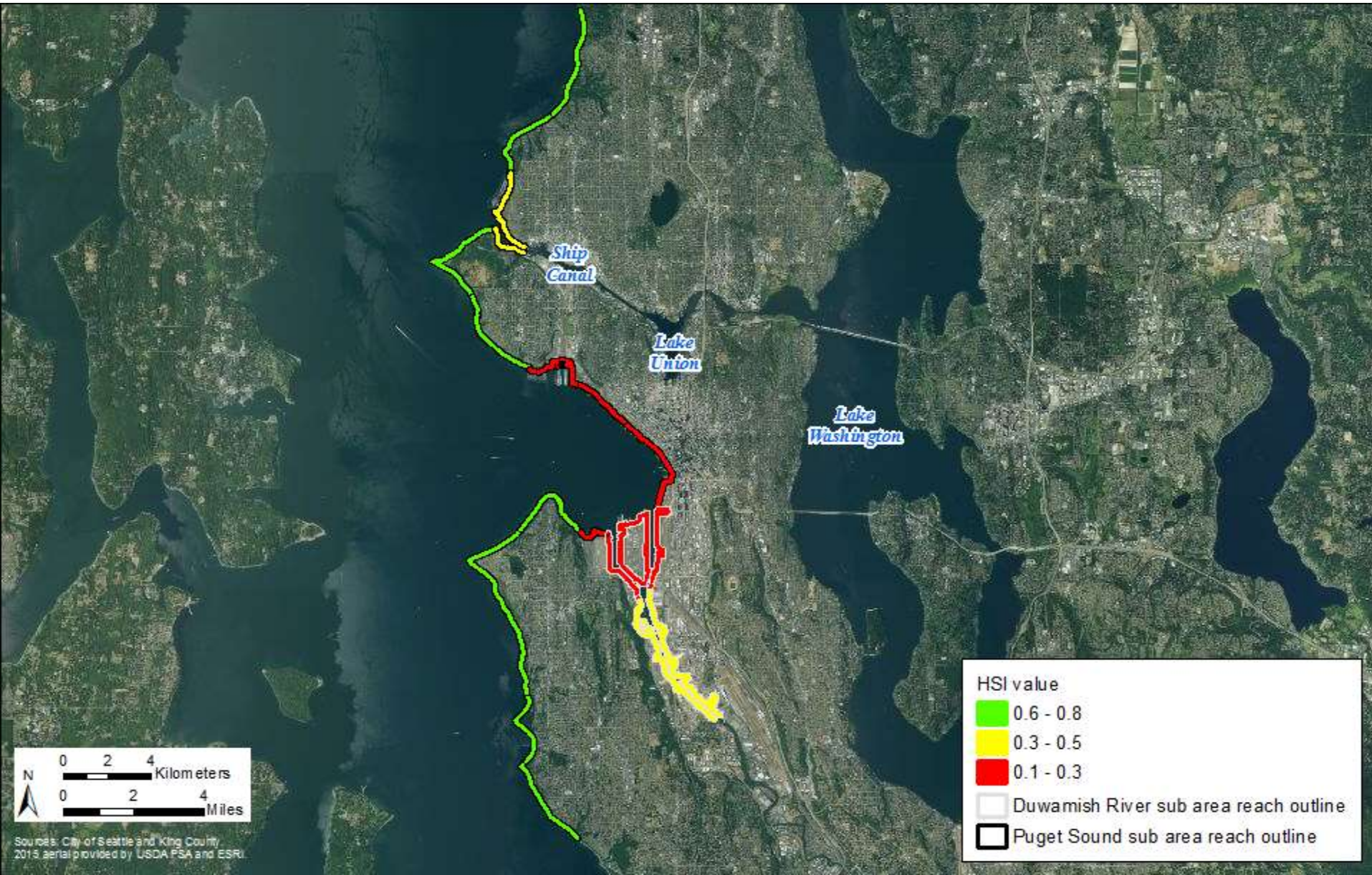
Habitat Suitability Index Model



Habitat Suitability Index Model



Marine Shoreline HSI Scores

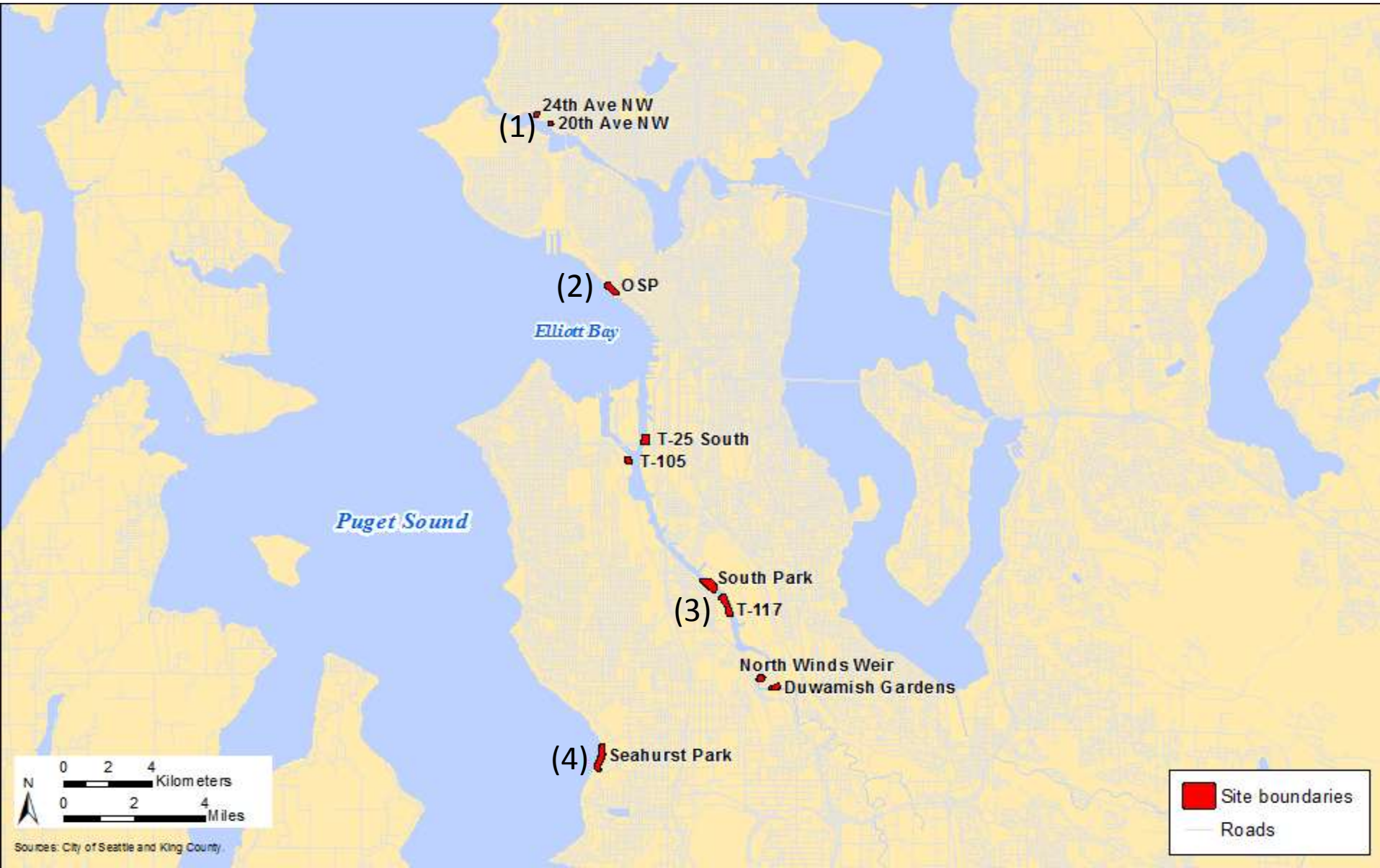


Cost Per Habitat Unit



Photo: Joe Mabel

Representative Restoration Projects



Cost analysis

| Project | Restoration Activities | Size (ac) | Cost | HUs | Cost per HU | Cost per Acre |
|---------|---|-----------|--------|---------|-------------|---------------|
| 1 | remove bulkhead; terrace shoreline; add large wood, rock, native plants | 0.3 | \$200K | 600 | \$320 | \$900K |
| 2 | create beach and intertidal and subtidal habitat benches; plant native vegetation | 5.8 | \$11M | 15,000 | \$750 | \$2.0M |
| 3 | create mudflat and marsh; plant upland vegetation; remove contaminated soils | 2.6 | \$8.0M | 67,000* | \$120 | \$2.4M |
| 4 | remove riprap bulkhead; create intertidal and subtidal habitat; plant riparian vegetation | 6.8 | \$13M | 40,000* | \$330 | \$1.2M |

* Project awarded 1.5X large contiguous habitat bonus

Conclusions

- Ties no-net-loss of ecosystem function to valued ecosystem service
- Provides measure of equivalency across sites
- Balances transparency with model precision and accuracy
- Provides realistic estimate of cost per HU for fee in-lieu of mitigation program