

Incentives for ecosystem services (co-benefits) in stormwater projects using Capacity, Opportunity, Payoff & Equity (COPE) criteria

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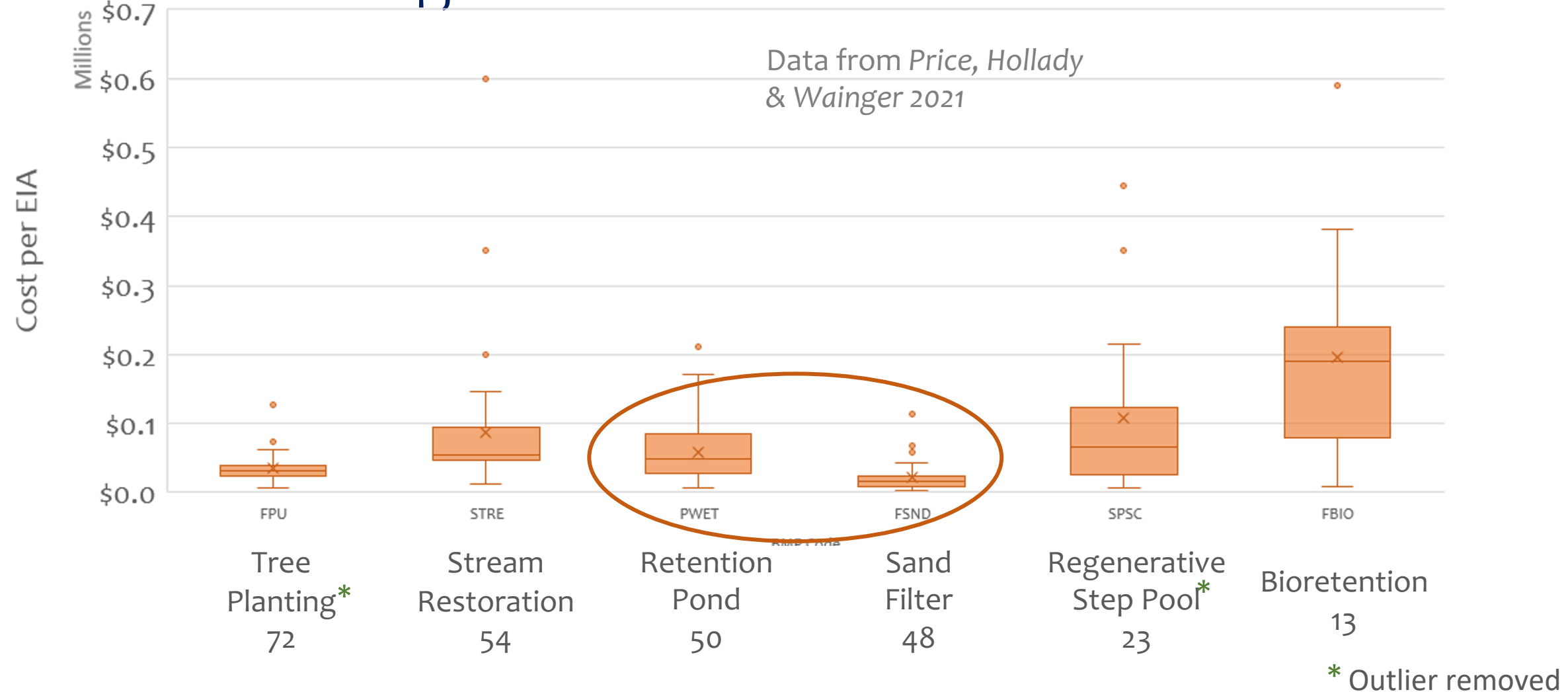
Project Overview

- Project Goal: Improve economic incentives for multi-benefit stormwater projects
- Approach: Modify current stormwater project crediting system to give credit for projects' ecosystem services
 - Equivalent impervious acres (EIAs) are the permit “currency”
- Method: Determine ES benefit magnitudes using Capacity, Opportunity, Payoff and Equity (COPE) system and increase EIAs to reflect these benefits



Motivation for using ecosystem services in stormwater

Cost-effectiveness strongly influences stormwater project choices in MD MS4 jurisdictions



Decision Science Methods Applied

1. Establish ecosystem service goals and weightings

2. Identify feasible performance indicators

3. Analyze magnitude of ES benefits per project

4. Create quantitative index to compare project performance across all goals

5. Evaluate results and refine methods as needed

1. Establish Co-Benefit Goals and Weightings

Goal hierarchy reflects agency mission areas

MDE Mission Goal	Co-benefit Sub-goal	Equal Weighting	Hierarchical Weighting
Protection of Human Health	Safe water contact recreation	12.5	10.0
	Safe commercial shellfish	12.5	10.0
	Safe drinking water	12.5	10.0
	Safe recreational fish consumption	12.5	10.0
	Safe urban temperatures	12.5	10.0
Protection of Aquatic Habitat	Protect coldwater habitat	12.5	16.7
	Protect existing aquatic habitat (ion reduction)	12.5	16.7
	Promote resilience of aquatic life	12.5	16.7

2. Identify Feasible Performance Indicators

COPE System of Ecosystem Service measurement

Indicator	Description
Capacity	Ability of BMP to reduce stressor
Opportunity	Location characteristics that influence stressor presence or magnitude
Payoff	Magnitude of social benefit - size of exposed population or conservation priority
Equity	Social vulnerability of the population at risk <i>Not scored for non-use goals (habitat protection)</i>

Sample Scoring for a Single Goal

Urban Heat Island



COPE Approach: Urban Heat Island Example

Capacity

Air Temperature
Reduction of BMP

Opportunity

Impervious surface
density increases UHI
risk

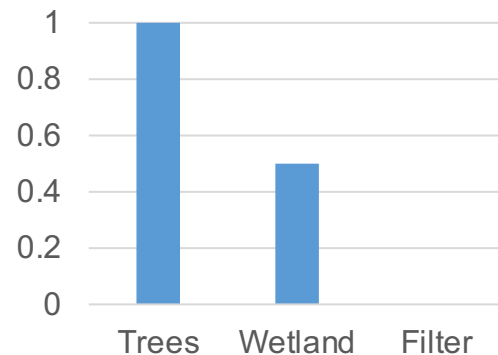
Payoff

At risk population

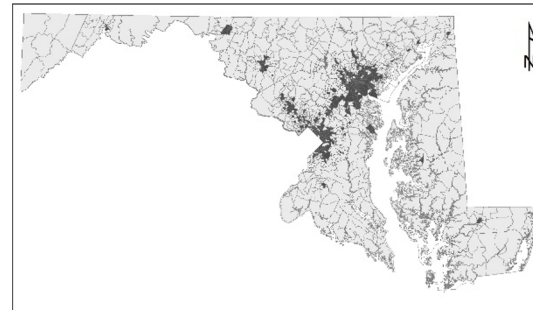
Equity

Social vulnerability to
UHI

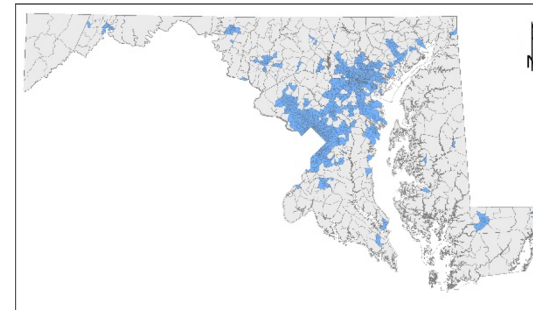
Temperature
Control



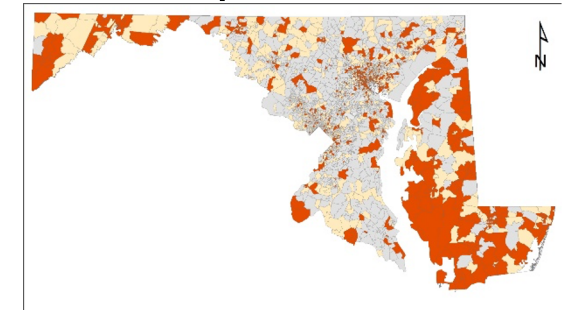
Tracts with Imp
Surface Area > 25%



Tracts with Pop
Dens >1,000



Poverty &
Pop over 65



4. Create COPE Index of Multiple ES Benefits

Forest Planting Example – 4.7 EIA



Chesapeake Tree Canopy
Network

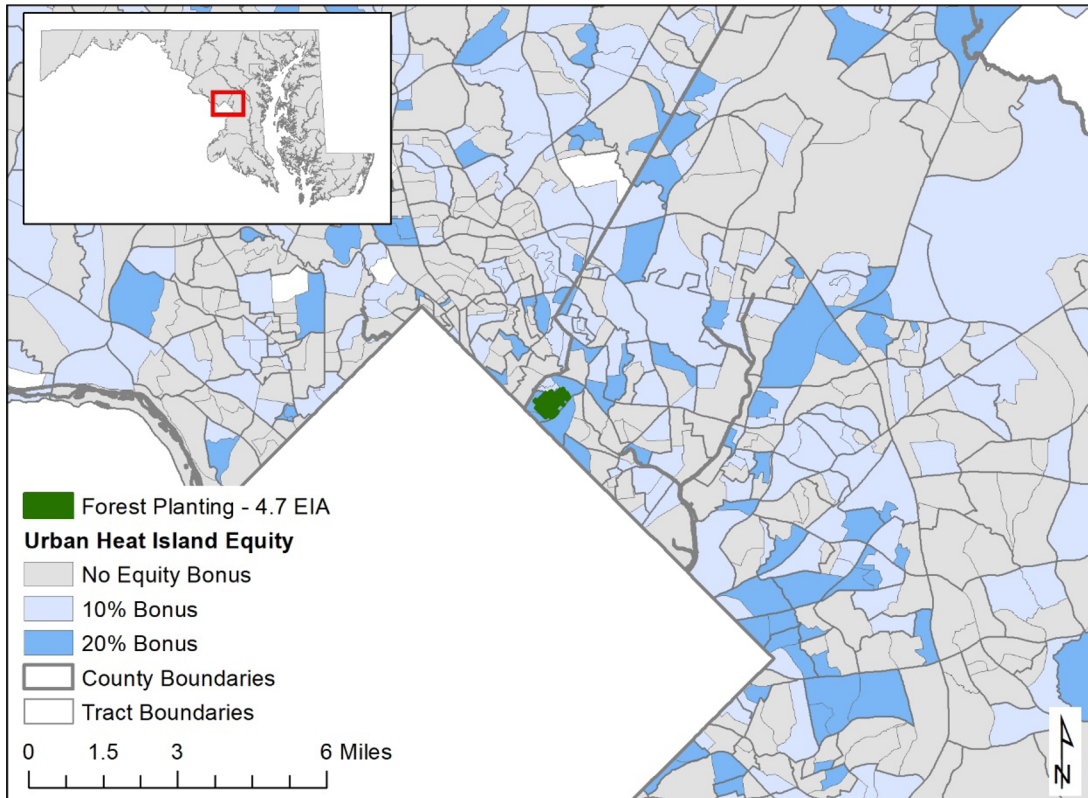
Capacity, Opportunity & Payoff Scoring

Forest Planting – 4.7 EIA

Capacity x Opportunity x Payoff = COP Score for each Goal

Capacity	
Bacteria – Rec	1.0
Bacteria – Shellfish	1.0
Bacteria – DW quality	1.0
Fish consump - PCBs	0.75
Air Temp	1.0
Water Temp	1.0
Hab protection	0.0
Habitat creation	0.5

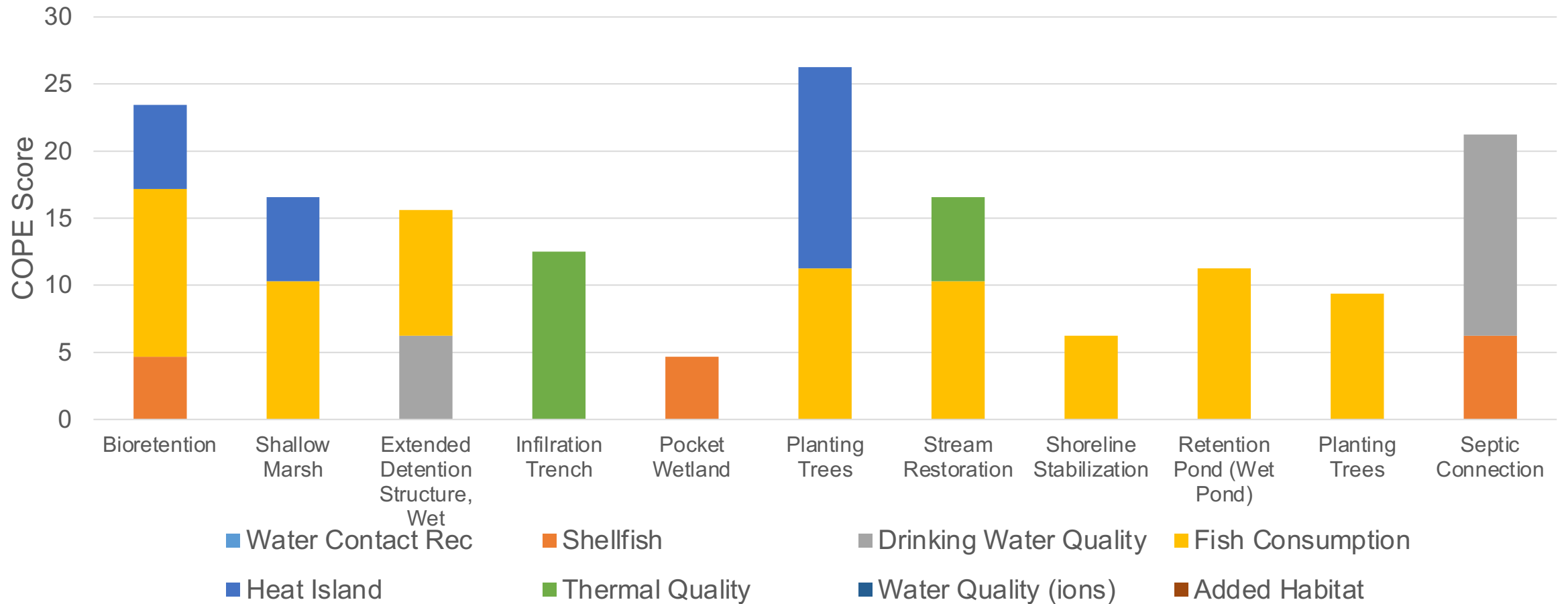
Equity Scoring Forest Planting – 4.7 EIA



Co-ben Sub-goal	Equity Scoring
Water contact rec	20% Bonus
Shellfish	
Drinking water qual	20% Bonus
Fish consumption	20% Bonus
Heat island effects	20% Bonus
Coldwater streams	
Aq hab protection	
Aq hab creation	

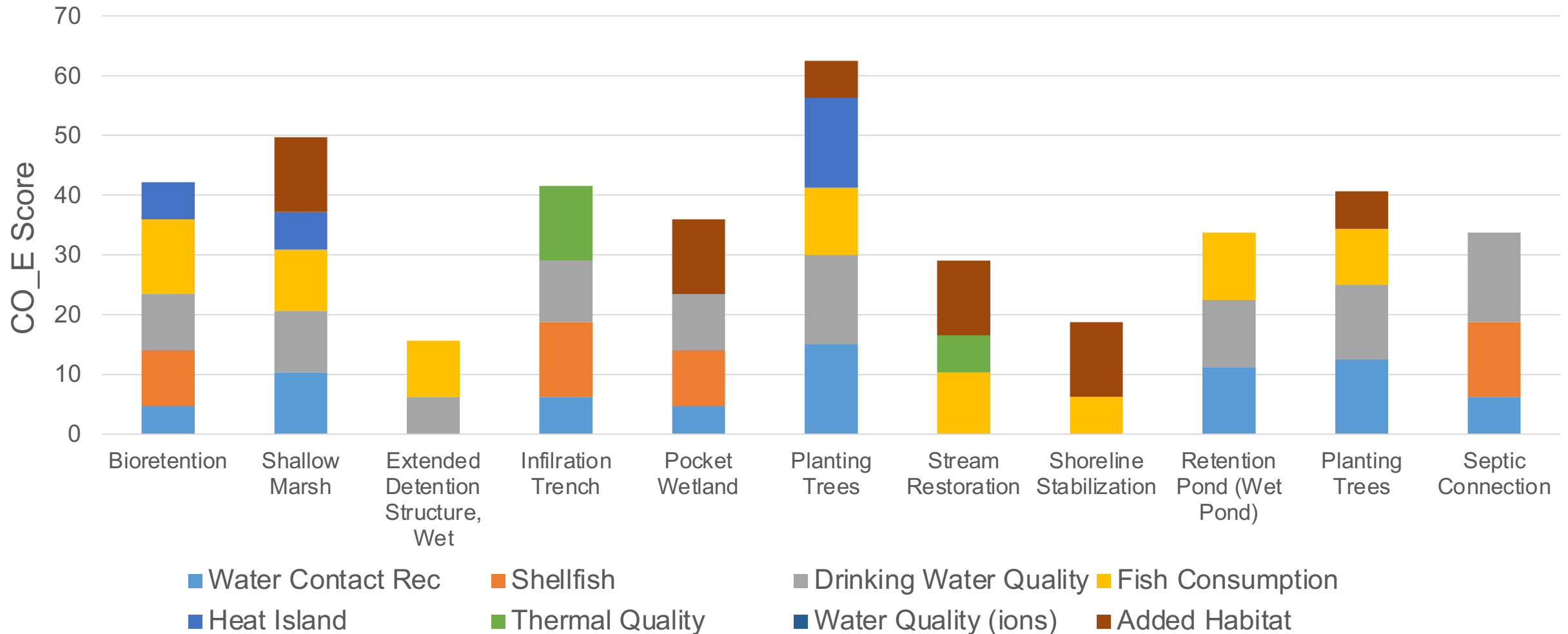
5. COPE Results across ES and installed projects

Equal Weighting of Sub-goals

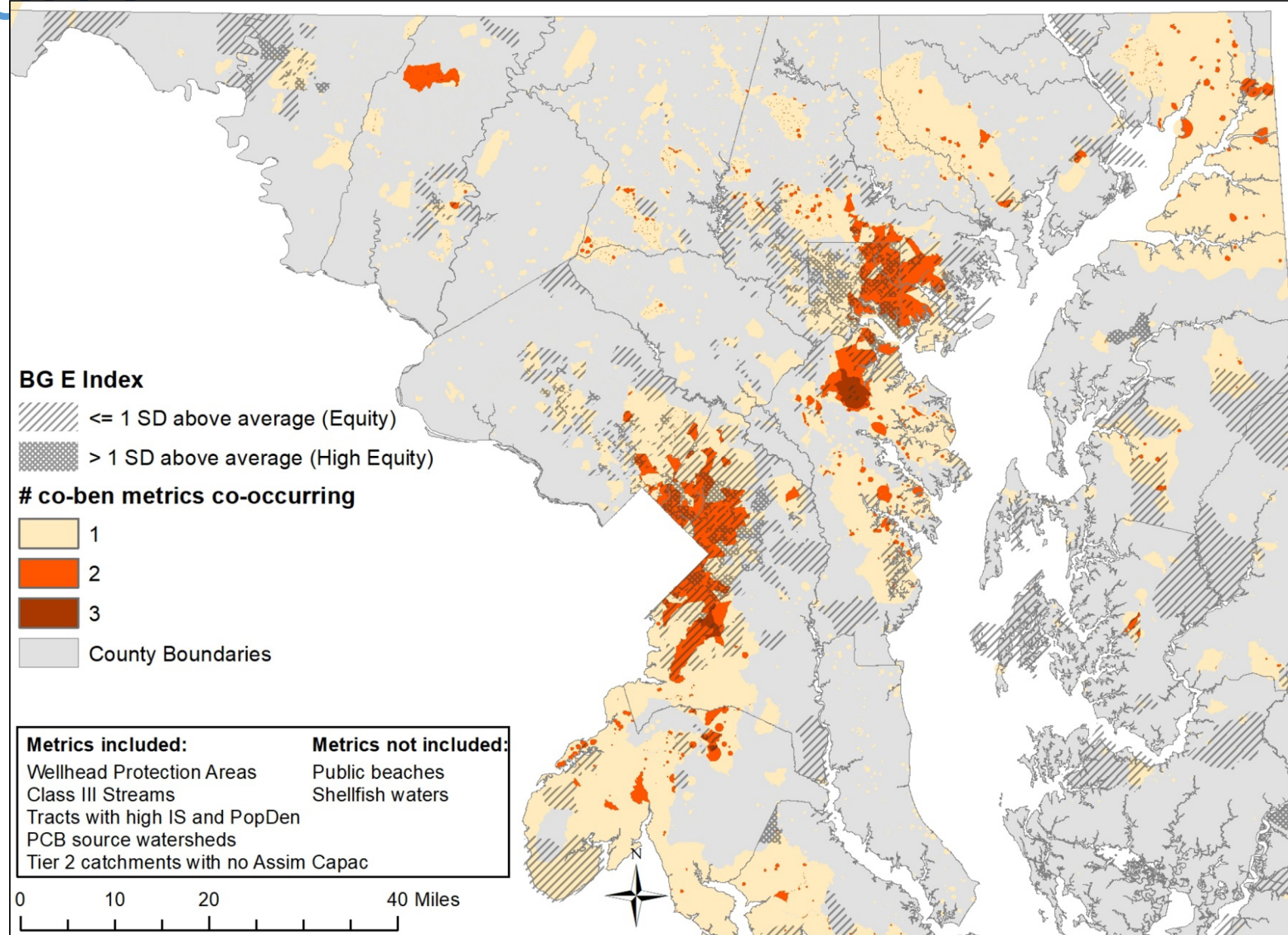


Sensitivity Analysis – Effect of data limitations

No Payoff Metric (CO_E)



Overlapping Opportunity & Equity locations



Conclusions

1. Agencies or groups may only be interested in a subset of ecosystem services
2. Data were (mostly) not limiting for **CO_E**
 - **Capacity** (stressor reduction), **Opportunity** (effective location) and **Equity** data were adequate for most stormwater practices
3. **Payoff** (human use or appreciation) data were highly limiting
4. Omitting low quality Payoff data increased the economic incentives but could also lower program social benefits
5. Incentives for ES need to be fairly large to cover additional costs of more complex projects



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Added details

EIAs vs Costs With and Without ES

