Costs and Cost-Effectiveness of Stormwater and Agricultural BMPs in Maryland

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Purpose and Overview

- Provide updated cost estimates for nonpoint source nutrient management practices
  - Stormwater
  - Agricultural
- Overview
  - Methods
  - Results
  - Comparison with CAST

Data Sources – Implementation Costs

Stormwater BMPs

- Maryland MS_4 Counties and SHA reports (n = 353)
- O&M – PG County methods

Agricultural BMPs

- Maryland Agricultural Cost Share (MACS) (n=3,830)
- USDA NRCS Program (EQIP & CRP) (Maryland, 2018)

Stormwater – Additional Data Sources

1. Lifespans estimated from county and state input
2. O&M costs estimated using methods from PG County and CAST
3. Land costs from CAST

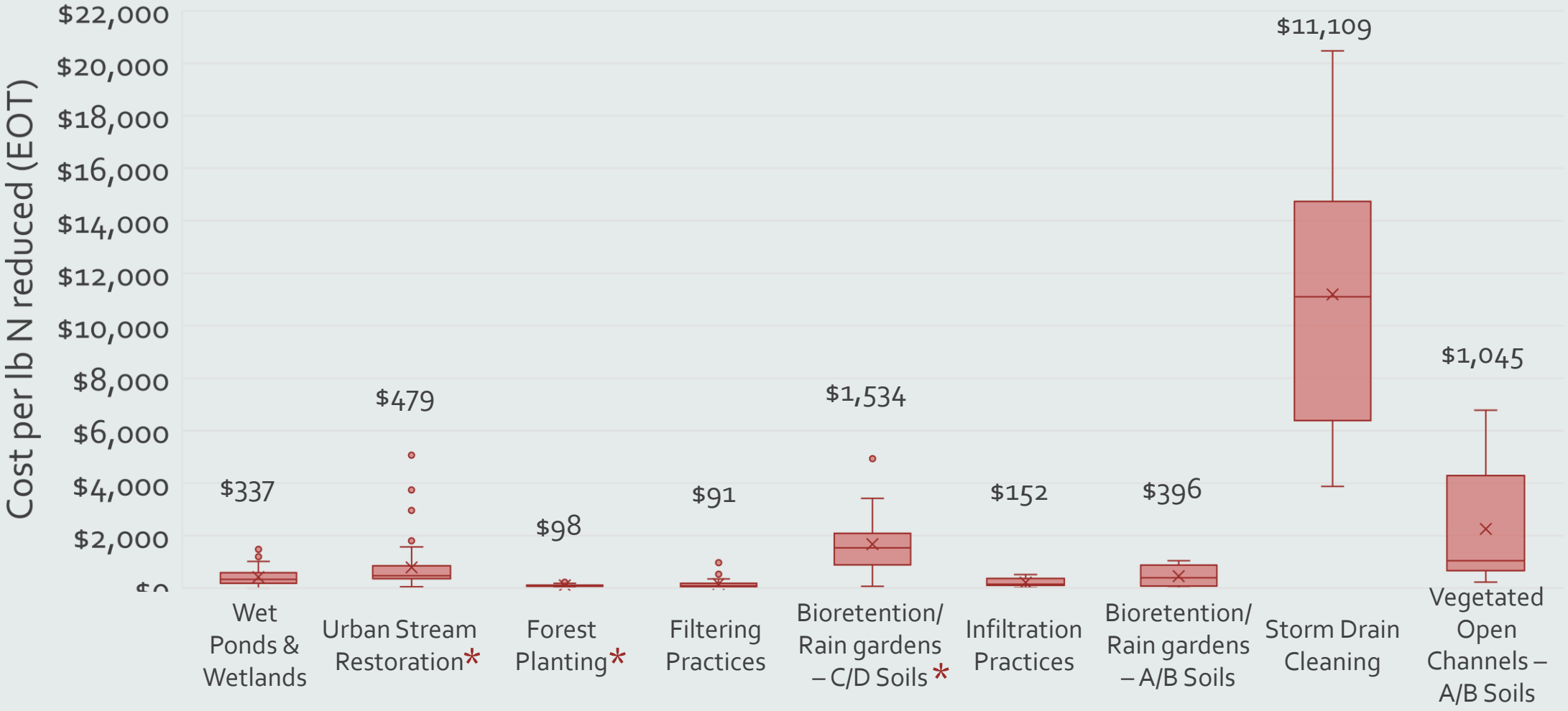
Agricultural BMPs – Additional Data Sources

1. Lifespans from MACS or NRCS Maryland payment schedules
2. O&M costs from MDA
3. Land costs (ag rental rates) from CRP

Variability of cost-effectiveness

Stormwater Results

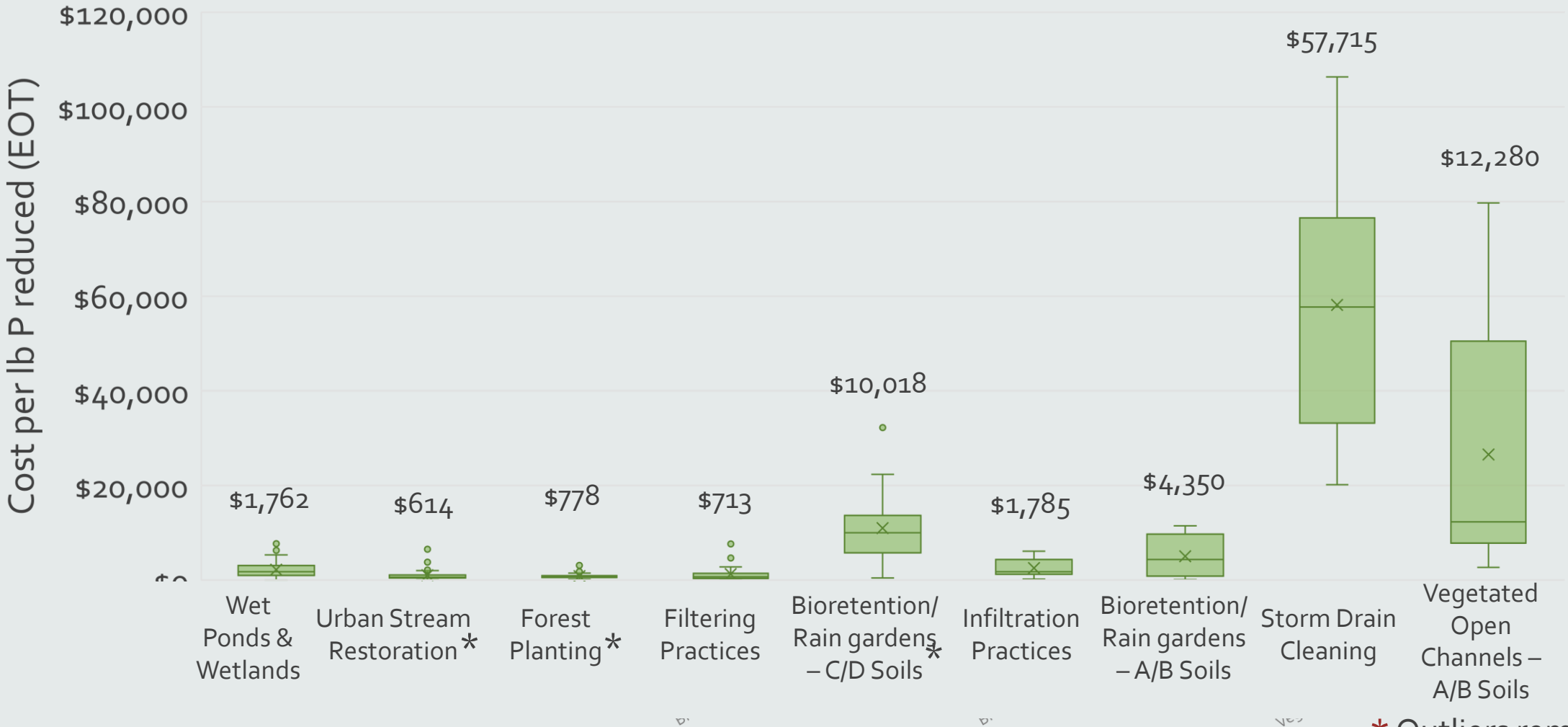
Cost Effectiveness for Nitrogen (Annual Implementation Costs)



* Outliers removed

Stormwater Results

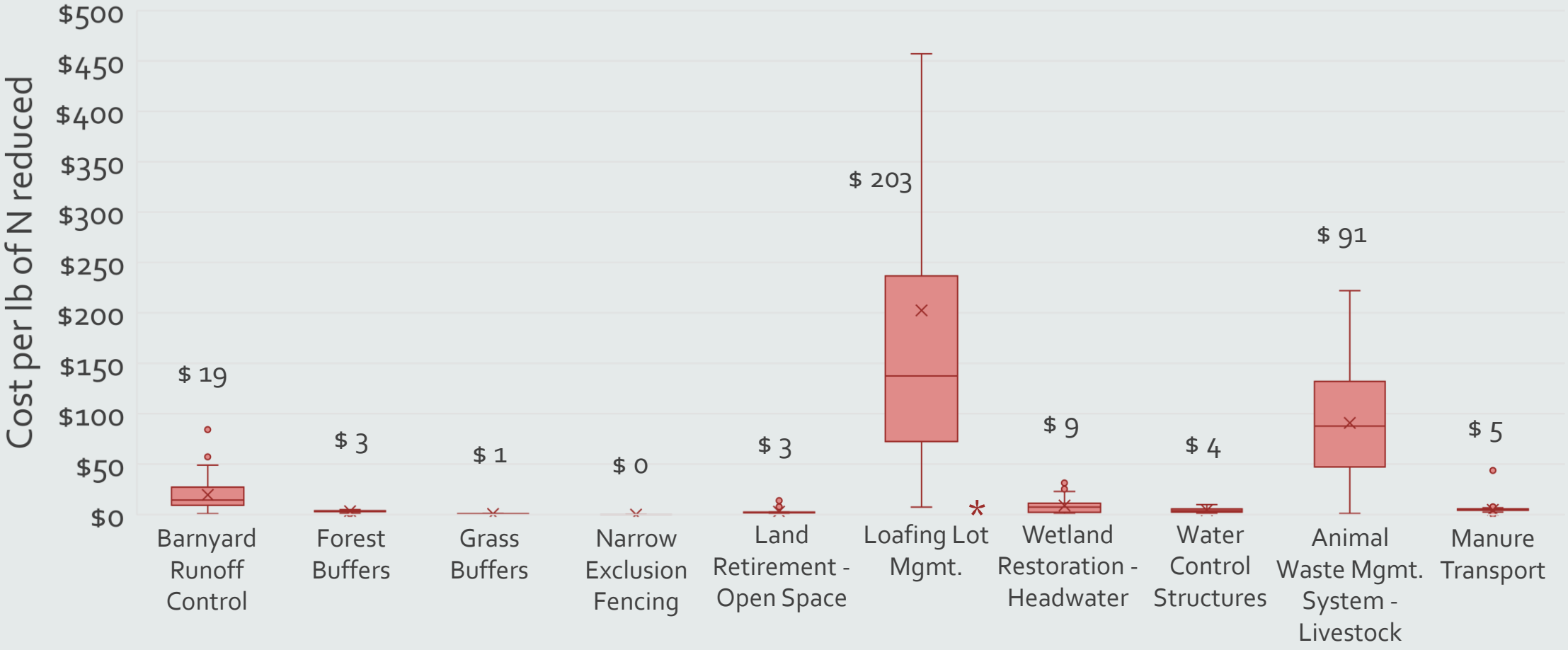
Cost Effectiveness for Phosphorus (Annual Implementation Costs)



* Outliers removed

Agricultural Results

Cost Effectiveness for Nitrogen (Annual Implementation Costs)

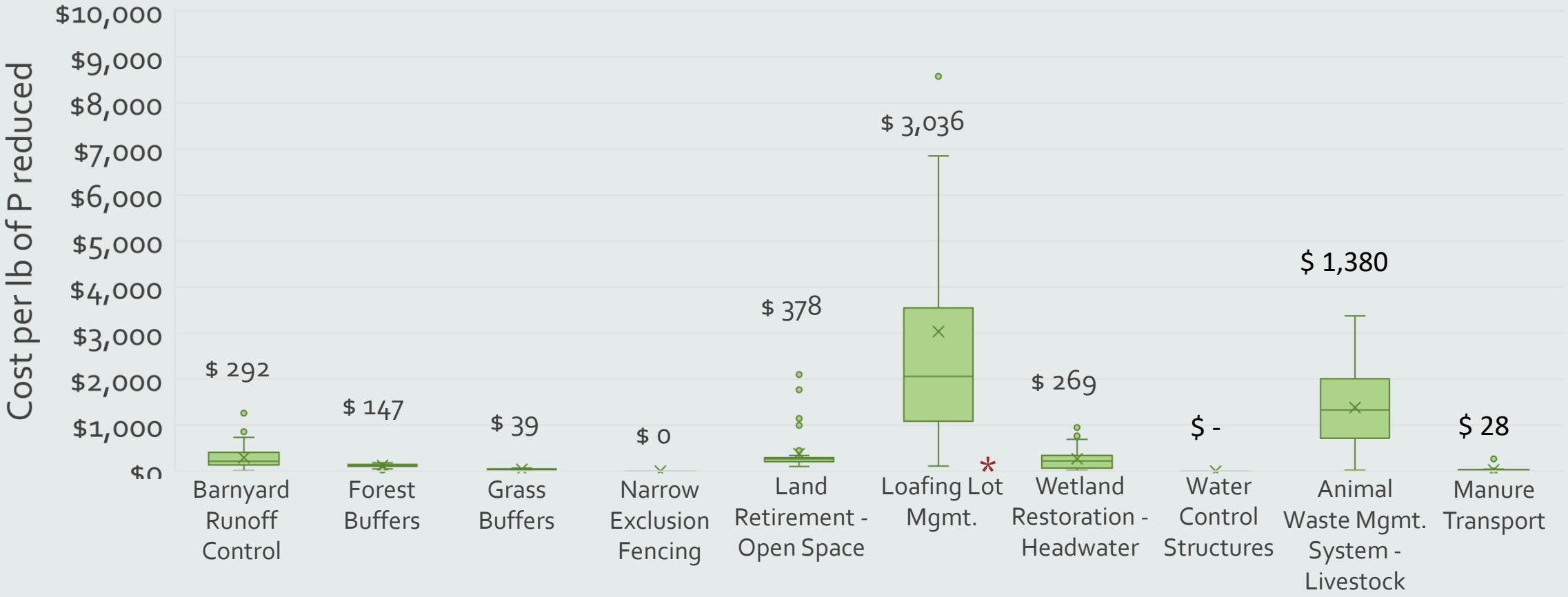


* Outliers removed

Oswnofence removed - $1,392/lb

Agricultural Results

Cost Effectiveness for Phosphorus (Annual Implementation Costs)



* Outlier removed

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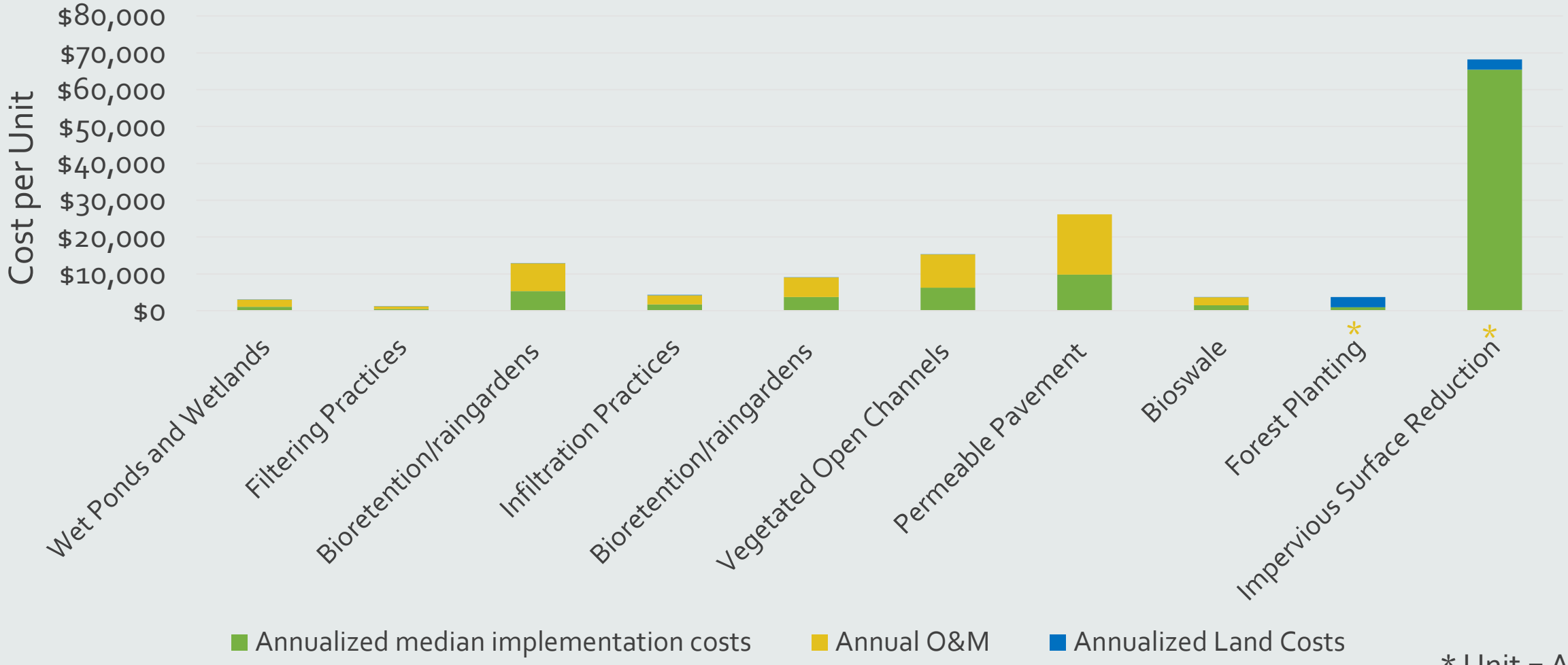
Cost components

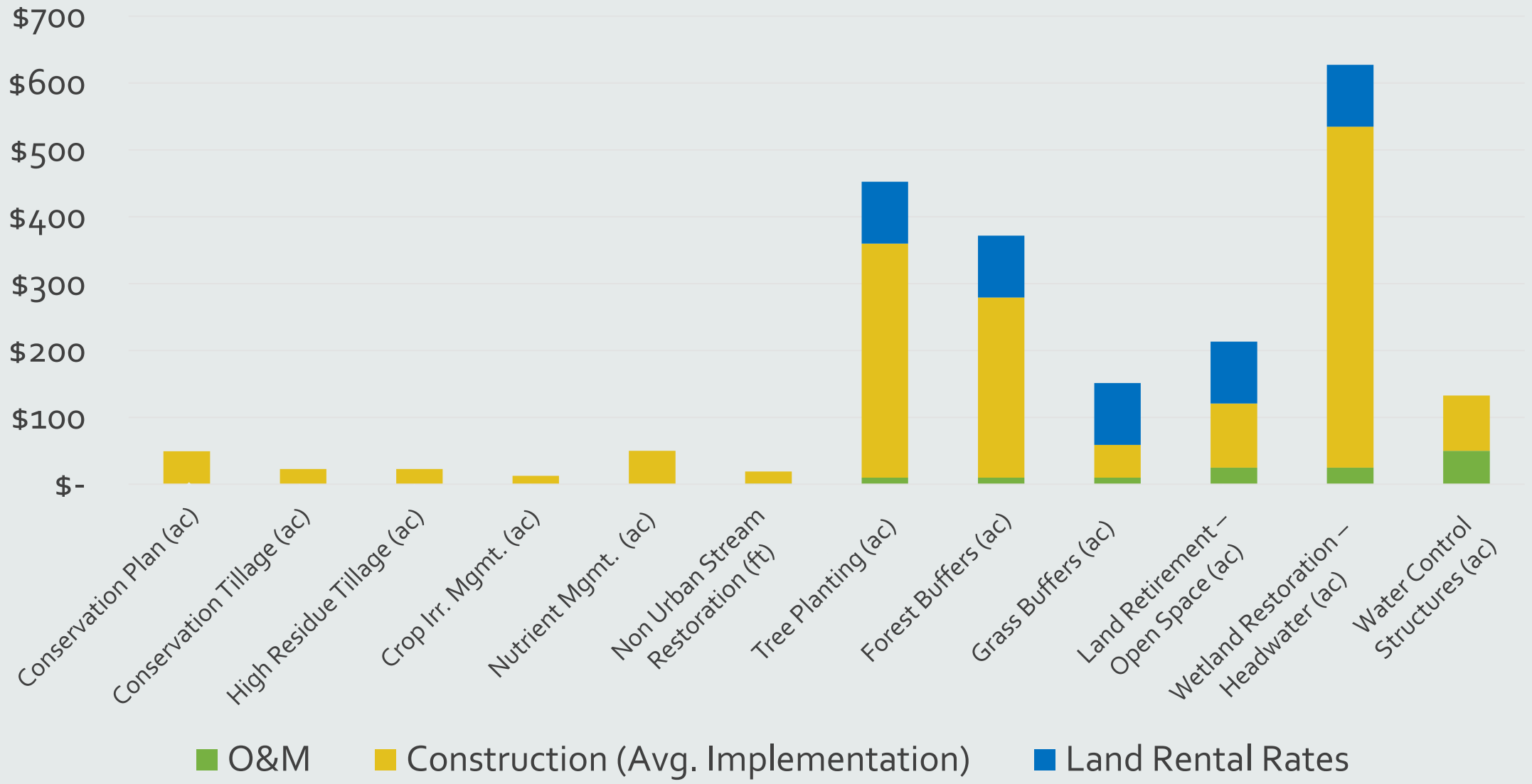
Annualized Stormwater BMP Costs
CAST BMPs with Unit of Acres Treated or Acres



* Unit = Acres

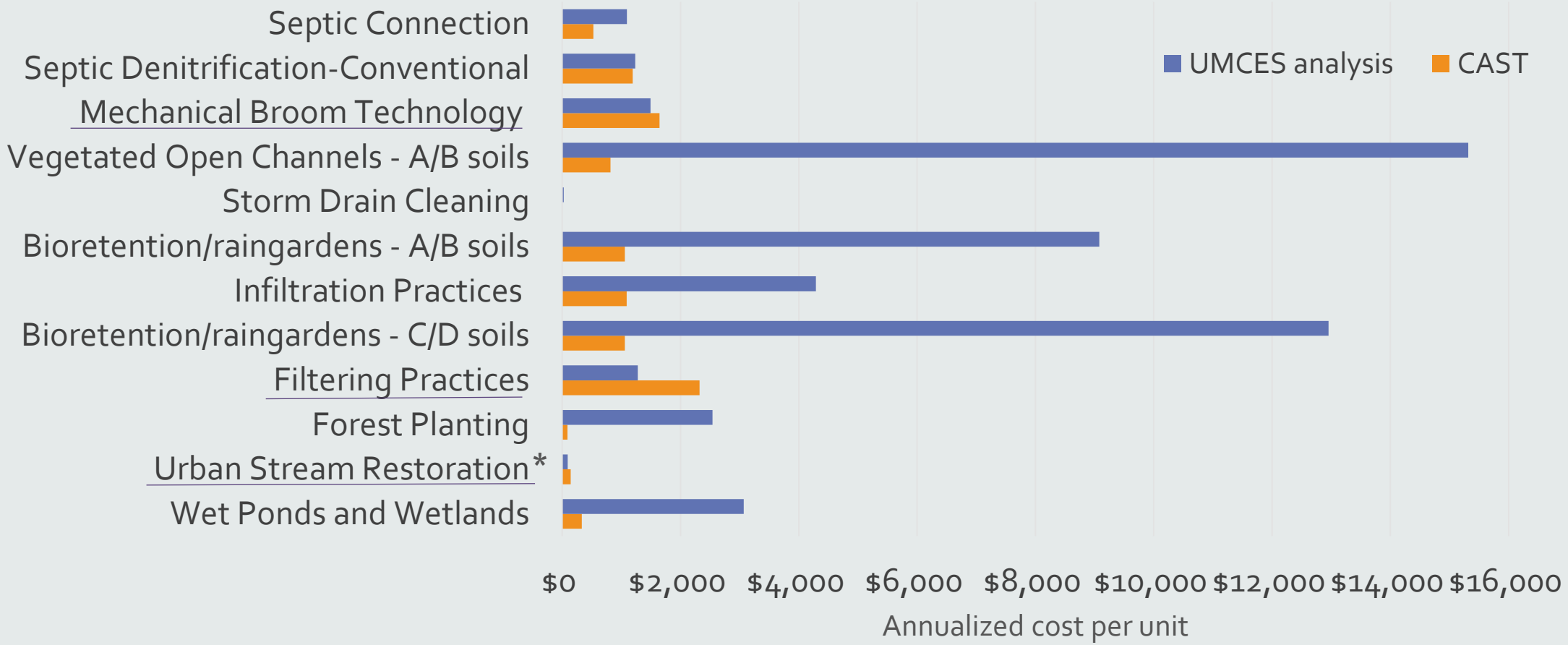
Annualized Agricultural BMP Costs

Land Management



Comparison of UMCES and CAST total annualized costs per unit

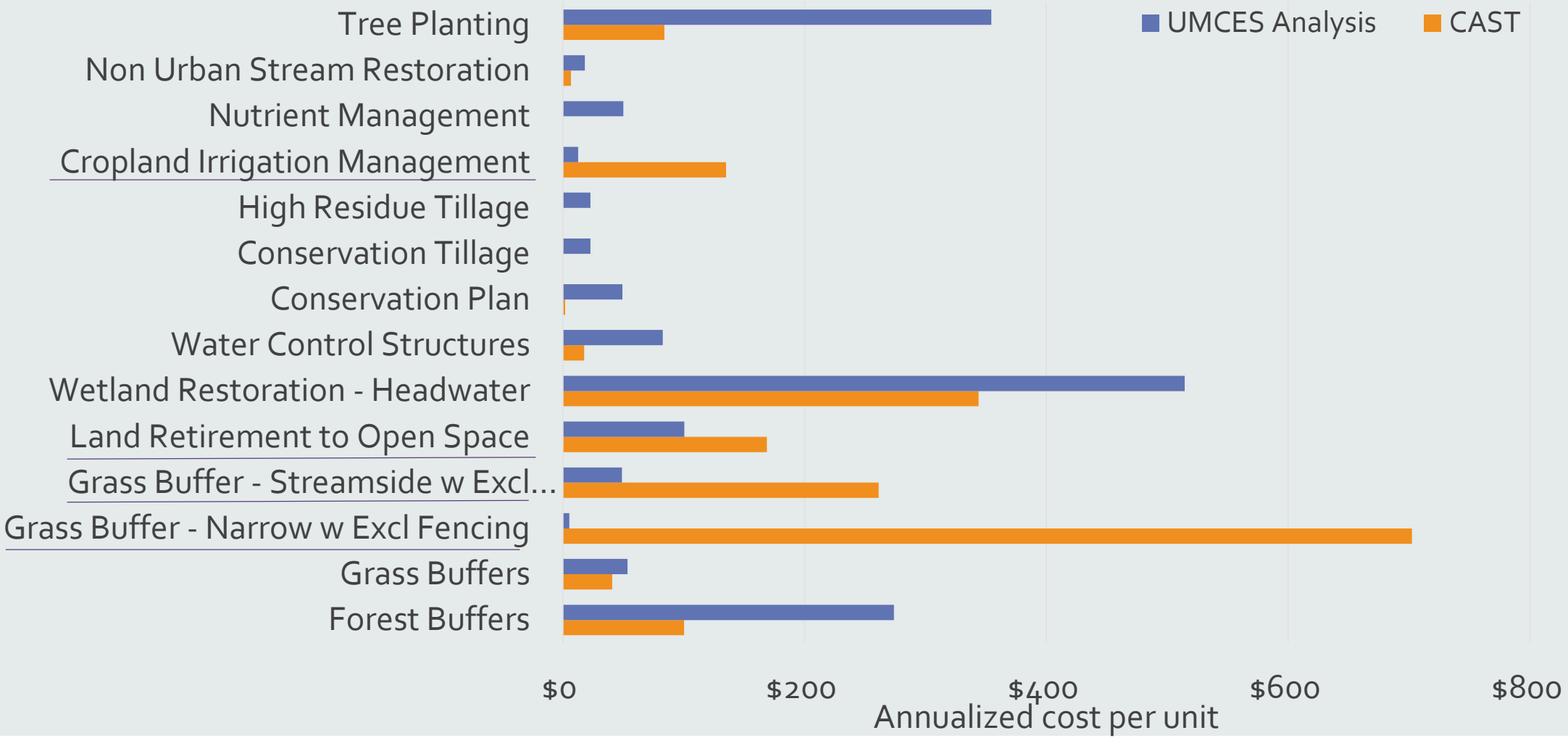
Stormwater Practices
UMCES & CAST Comparison (mixed units)



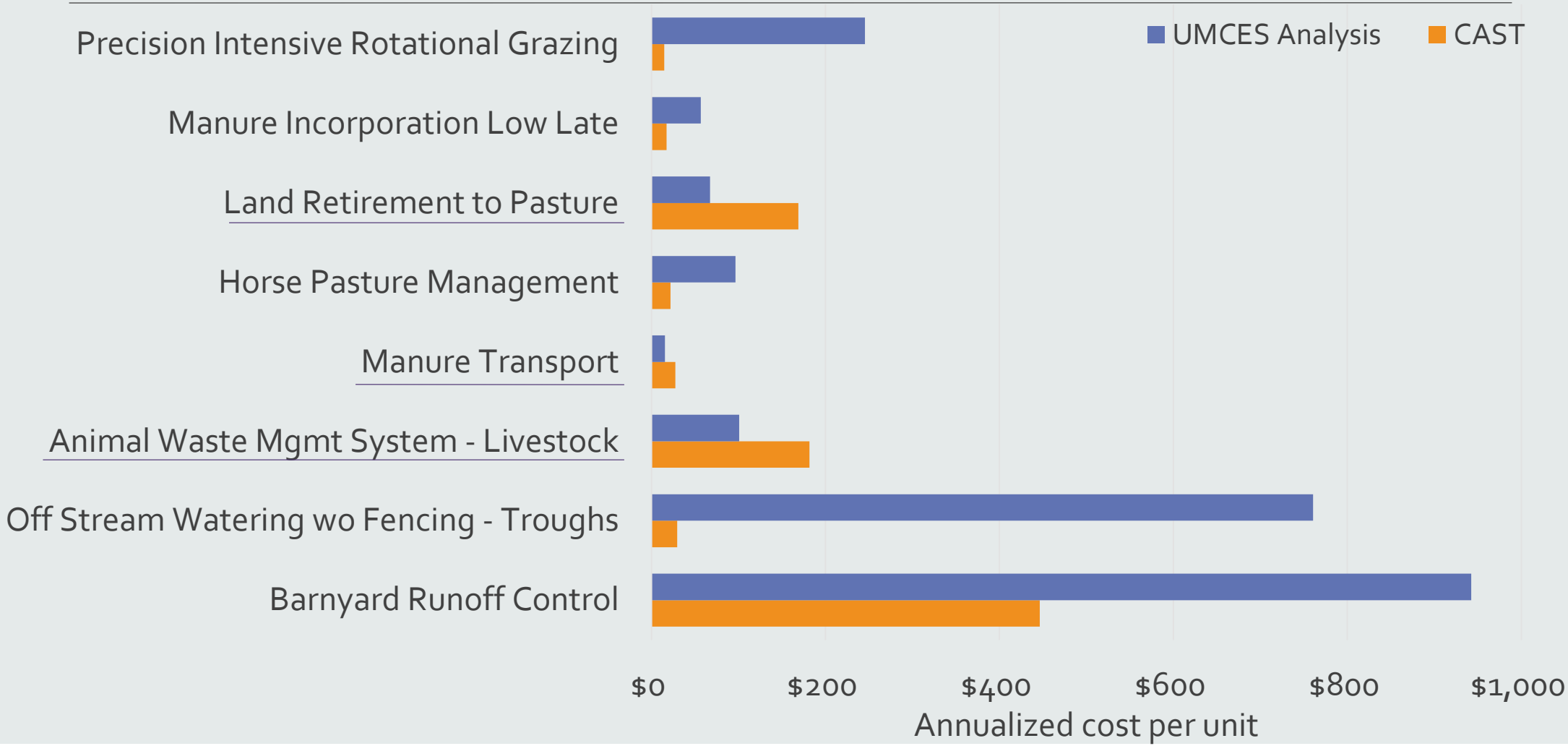
Stormwater – Reasons for generally higher costs

- Higher median implementation costs
- Higher operations and maintenance (O&M) costs; 8.2% - 13.4% compared with 2.5% - 6% in CAST.
- Shorter lifespans for some practices
  - e.g., 20 years in UMCES vs 50 years used in CAST for infiltration practices

Agricultural Practices – Land Management
UMCES & CAST comparison



Agricultural Practices - Animal & Manure Management
UMCES & CAST comparison

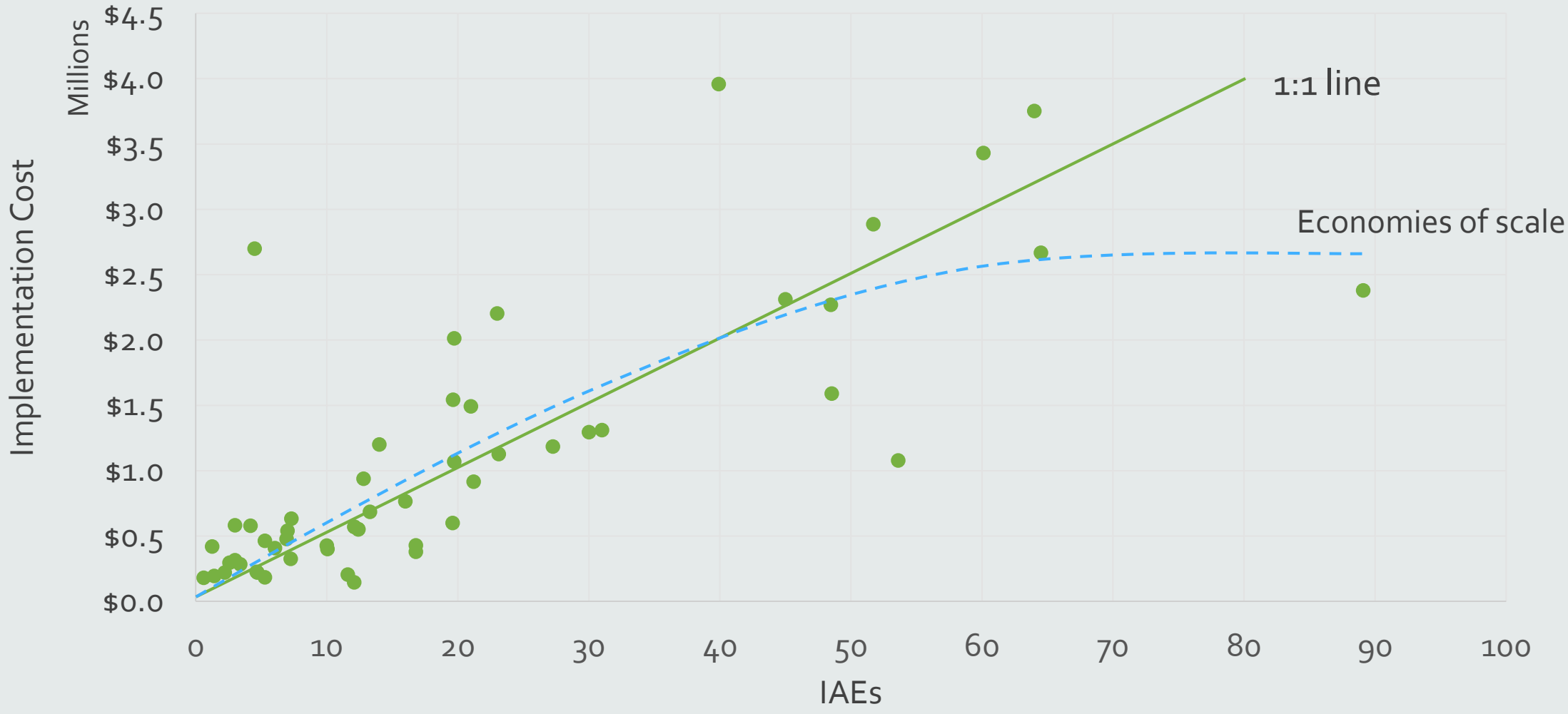


Agricultural Results

- ~ 75% of practices had higher estimated annualized cost per unit than CAST estimates (16%-100%)
- ~ 25% had lower annualized costs than CAST estimates (79%-13,000%)
- Differences due to:
  - Implementation costs higher for 70% of practices
  - O&M costs usually higher than CAST for MACS and lower for EQIP
  - Longer lifespans for MACS practices lowered costs
  - (Opportunity costs of land were not a major factor)

Did we see economies of scale?

Stream Restoration IAE vs Implementation Cost



Cost-effectiveness across Stormwater and Agriculture Sectors

Median Annualized Costs of Practices in Use

	Median $/lb of N reduction	Median $/lb of P reduction
Stormwater BMPs (excluding storm drain cleaning and practices n<3)	$1,082	$8,384
Agricultural BMPs	$16	$489

Data from Price et al. 2019. Cost Analysis of Stormwater and Agricultural Practices for Reducing Nitrogen and Phosphorus Runoff in Maryland.

Conclusions on Cost Updates

- Updated costs for a subset of BMPs using spending data
  - 33 SW BMPs (17 CAST BMPs)
  - 20 Agricultural BMPs
  - CAST Cost Profile available
    "Maryland Costs Updated with UMCES BMP Cost Report"
- Updated cost estimates differ from those in CAST
  - SW: 14 higher, 3 lower
  - Agricultural: 13 higher, 7 lower
- Cost variability for a given practice is high for SW, more modest for most agriculture

Implications for Cost-Effectiveness Targeting

- Stormwater BMPs generally cost more than CAST estimates
- Stormwater costs remain 1-2 orders of magnitude higher than agricultural, when all costs are included
- Several Ag BMPs had substantial differences from CAST
  - Stream fencing and narrow buffers appear much more cost effective
  - Wetland restoration and tree planting appear less cost effective
- Caveat – Average land costs are likely to fail to represent high variability of opportunity costs of land