RESES Project: Identifying and defining levels of meaningful change in ecosystem services of the Chesapeake Bay and its watershed
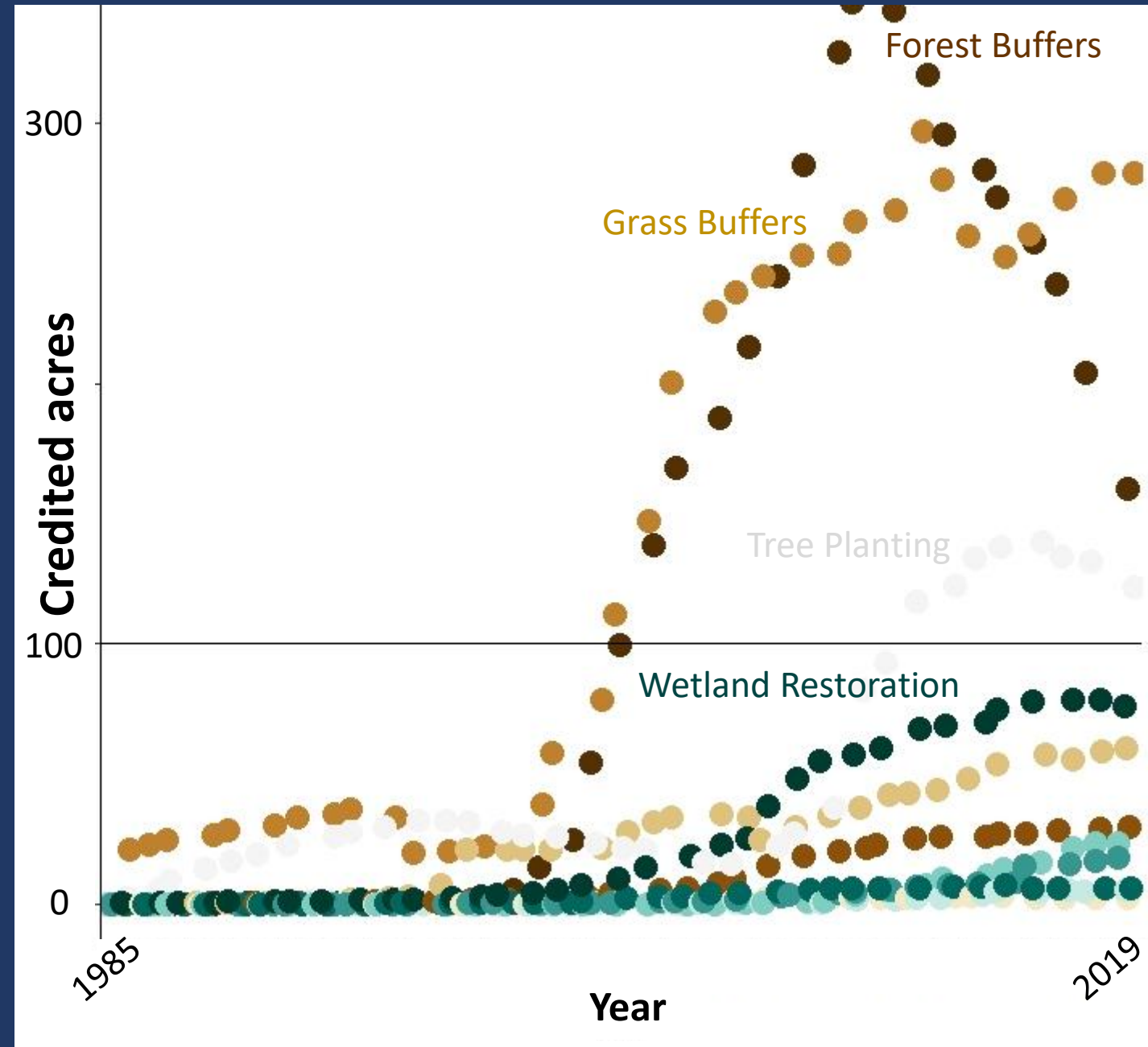
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Step 1: Decision Context: BMPs lagging in implementation

Forest Buffers

Grass Buffers

Tree Planting

Wetland Restoration

Credited acres

300

100

0

1985

2019

Year

Examples of BMPs focused on:
- Cover Crops
- Forest Buffers (Ag and Urban)
- Agricultural Grass Buffers
- Tree Planting (Ag and Urban)
- Forest Conservation
- Urban Forest Planting
- Impervious Surface Reduction
- Wetland Creation
- Wetland Restoration

2. Identify potential ecosystem services & beneficiaries associated with BMPs

- Use classification systems such as NESCS Plus to identify general ecosystem services (ES)
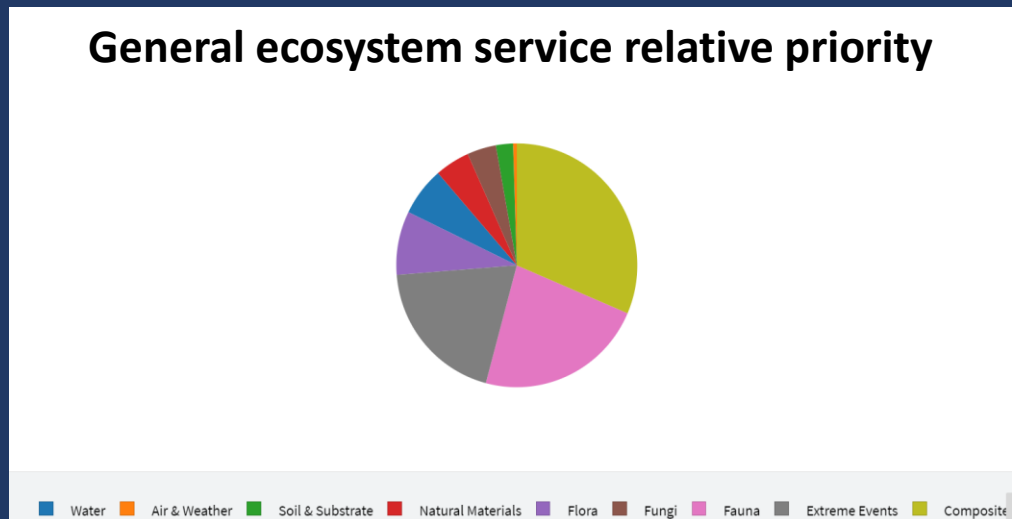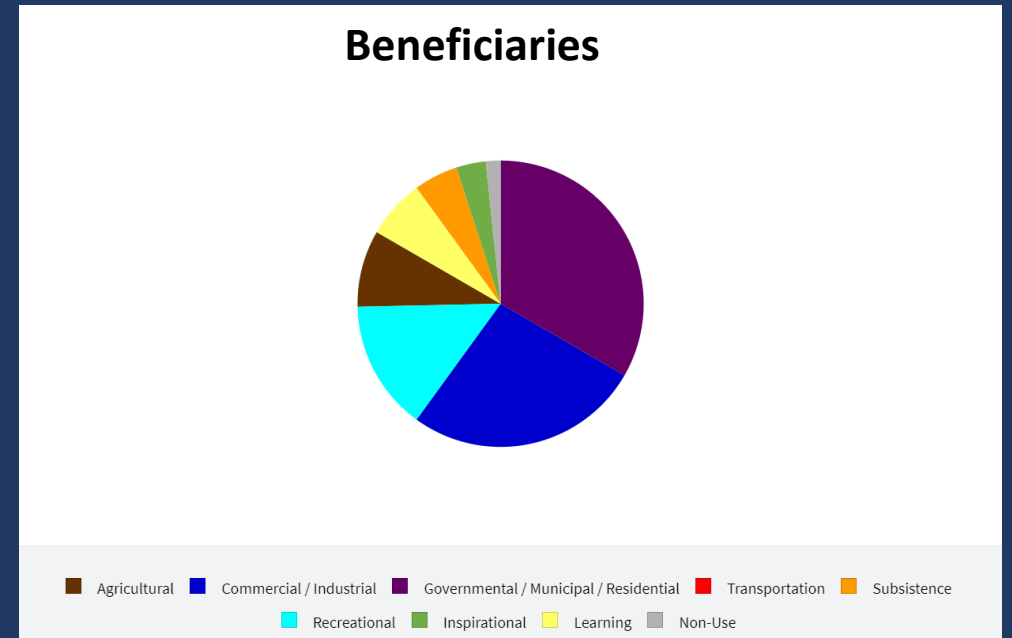

- Mine Chesapeake Bay Program (CBP) documents and reports for ecosystem services and add to list

Best Management Practice	Forest Buffers	Additional Co-Benefits					
		Habitat Biodiversity	Brook Trout	Stream Health	Fish Habitat	Healthy Watersheds	Tree Canopy
Agricultural Forest Buffer	5	4	4.5	4	4.5	4	4.5
Forest Conservation	3.5	5	4	4	4	5	5
Forest Harvesting Practices	3.5	2	2	4	3	3	2
Narrow Forest Buffer	5	2.5	3.5	2	3.5	2	5
Streamside Forest Buffers	5	4	4.5	3	4.5	3	5
Urban Forest Buffers	5	5	5	4	4	3.5	4.5

Tetra Tech Co-Benefits Report

3. Prioritize potential ecosystem services & beneficiaries associated with BMPs

- Present list of services identified from classification systems and CBP documents to CBP partners

- Use FEGS Scoping Tool to prioritize ecosystem services based on feedback and CBP documents
  - ES and beneficiaries identified in feedback and documents get more weight than those from base list

Beneficiaries

Legend: ■ Agricultural ■ Commercial / Industrial ■ Governmental / Municipal / Residential ■ Transportation ■ Subsistence ■ Recreational ■ Inspirational ■ Learning ■ Non-Use

General ecosystem service relative priority

Legend: ■ Water ■ Air & Weather ■ Soil & Substrate ■ Natural Materials ■ Flora ■ Fungi ■ Fauna ■ Extreme Events ■ Composite

4. Identify Metrics to quantify Ecosystem Services

Ecosystem Service (ES)	Short list of metrics	Source
Air quality	concentration of CO, NO2, O3, PM 10, PM 2.5, SO2	iTree (Nowak 2020)
Edible flora	plant diversity, cover of edible species	EnviroAtlas (Pickard et al. 2015)
Habitat quality	habitat suitability for species of interest	inVEST; Smith et al 2017 (Smith et al. 2017, Sharp et al. 2020)
Heat risk	daytime and nighttime temperature reduction	EnviroAtlas (Pickard et al. 2015)
High quality soil	soil C content, N fixation, pH, salinity, type, percent sand, bulk density, organic matter	NESP; Smith et al, 2017 (Russell et al. 2013, Olander et al. 2017, Smith et al. 2017)
Open space	open space access index; distance to open space	EnviroAtlas; NESP (Russell et al. 2013, Pickard et al. 2015, Olander et al. 2017)
Pest predator/depredator fauna	density of certain pest predators (e.g., ladybugs)	ESML (US EPA 2020)
Pollinator fauna	area of wild pollinator habitat; ratio of pollinator habitat to pollinator dependent crops	EnviroAtlas; inVEST (Pickard et al. 2015, Sharp et al. 2020, Warnell et al. 2020)
Risk of flooding	flood depth, duration, extent and frequency; maximum retained rainwater; soil precipitation retention; surface water runoff; wave attenuation	EnviroAtlas; inVEST; EPA H2O; ESML (Russell et al. 2013, Pickard et al. 2015, Sharp et al. 2020)
Water clarity	mean sediment retention; secchi depth; turbidity	Angradi et al. (2018)
Water quality- nutrients	concentration of nitrates in groundwater	Terziotti et al. (2018)
Water quality- pathogens	concentration of harmful bacteria (e.g., fecal coliform)	Yee et al. (2021)
Water quantity	water availability	inVEST (Sharp et al. 2020)

Quantify Ecosystem Services & Compare Between BMPs
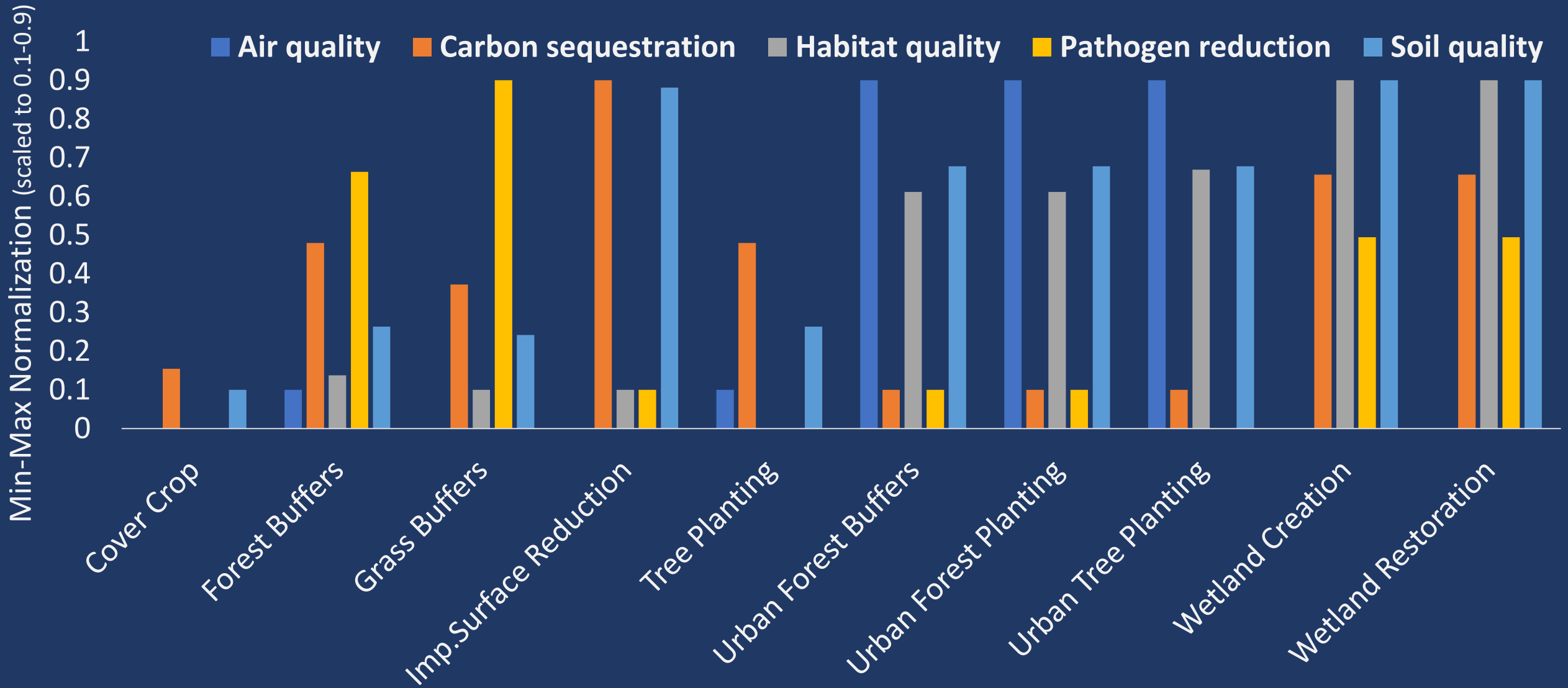
Outputs and Next Steps

Outputs:

- Long and short list of ES and beneficiaries

- Methods– set up for quantifying ES

- Communications and decision support:

  - CAST Fact sheets: Outcome, BMP, FEGS

  - CAST "Browser" tool