BMP Costs in CAST

Watershed Technical Workgroup

February 5, 2019

BMP Costs

- Purpose and Use of CAST Cost Data
  - How to edit costs
  - How annualized costs are calculated
- Costs for New Planning/Interim BMPs
  - Septic—Includes new estimates for all 8 septic technologies, not just the 3 “advanced” ones.
  - Saturated Buffers
  - Denitrification Ditch Reactors
  - Conservation Landscaping
- Reevaluated BMP Costs
  - Oyster Aquaculture
  - Manure Gasification

Cost effectiveness increases implementation

- Best management practices (BMPs) must be implemented to reduce nitrogen, phosphorus, and sediment loads to meet the requirements of the Chesapeake Bay Total Maximum Daily Load (Bay TMDL)
- BMPs selected for implementation may be assessed on three factors:
  - can be more or less effective in reducing total pollutants
  - have a high or low unit cost of pollutant reduction
  - have co-benefits that meet local TMDLs and priorities, or not
- Cost effectiveness is important given limited funding for environmental improvements
- Implementing a BMP to achieve multiple objectives facilitates program and funding prioritization, and may result in a greater likelihood of implementation

Cost Profiles

Default unit cost estimates are provided for each state and the Chesapeake Bay Watershed. The Chesapeake Bay Watershed is an average of all states. Costs are provided as a starting point to use for creating your own cost estimates of various BMP scenarios. Costs are estimated in 2010 dollars. Capital and opportunity costs are amortized over the BMP lifespan and added to annual operations and maintenance (O&M) costs for a total annualized cost.

Costs are annualized average costs per unit of BMP (e.g.: $/acre treated/year). The formula is:

- annual costs = (capital * annualization factor) + O&M costs + (land * annualization rate)
- annualization factor = i/((1+i)^n - 1) + i
- i = annualization rate, which is always 5%
- n = period of annualization (also called lifespan)

Watershed Average | Delaware | New York | Virginia

District Of Columbia | Maryland | Pennsylvania | West Virginia

BMP Cost Data Sources

BMP costs included in CAST are developed by contractors to the EPA and are in 2010 dollars. The costs are available by logging in to CAST and going to the Cost Profiles. There is a profile for each state. CAST users may edit costs to their liking and determine the cost for any scenario. The original costs were reviewed with the states who provided input. Additional BMPs were approved by the Chesapeake Bay Program Partnership since the original TMDL costs were determined. The data source of the original BMPs and the more recently added BMPs are provided in the downloadable files below.

- Agricultural: Original and Additional
- Developed: Original and Additional
- Septic: Original and Additional
- Resource: Original

COST PROFILES

My Cost Profiles

View Documentation

Add New Cost Profile | Clear Filters

Cost Profile Name	Date Modified	Edit	Download	Delete
Lancaster	2018-11-02 04:22:28 PM			
Maryland_OHD	2019-01-27 06:06:11 AM			

Shared Cost Profiles

Clear Filters

Cost Profile Name	Author	Date Modified	Download
District of Columbia	CBP Admin	2016-06-29 01:03:58 PM	
Delaware	CBP Admin	2016-06-29 01:04:16 PM	
Maryland	CBP Admin	2016-06-29 01:04:45 PM	
Watershed	CBP Admin	2016-06-29 01:05:02 PM	
New York	CBP Admin	2016-06-29 01:05:25 PM	
Pennsylvania	CBP Admin	2016-06-29 01:05:57 PM	
Virginia	CBP Admin	2016-06-29 01:06:14 PM	
West Virginia	CBP Admin	2016-06-29 01:06:54 PM	

 Software Release: 5.6.0

EDIT BMP COST PROFILE - Lancaster

Edit Cost Profile | Developed BMPs | Septic BMPs | Natural BMPs | Agriculture BMPs | Animal BMPs

Developed BMPs

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Save Cancel Clear Filters

BMP	Lifespan (years)	Capital	O&M	Opportunity	Total Annualized Cost	Notes
Conservation Landscaping Practices	0	0.00 $/acres treated	0.00 $/acre treated/year	0.00 $/acre treated	$0.00	The default cost is represented as zero until it has been determined by the Chesapeake Bay Program. Please edit to your liking.
Dirt & Gravel Road Erosion & Sediment Control - Driving Surface Aggregate + Raising the Roadbed	20	10.39 $/ft	0.00 $/feet/year	0.00 $/feet/year	$0.83	
Dirt & Gravel Road Erosion & Sediment Control - Driving Surface Aggregate with Outlets	20	10.39 $/ft	0.00 $/feet/year	0.00 $/feet/year	$0.83	
Dirt & Gravel Road Erosion & Sediment Control - Outlets only	20	10.39 $/ft	0.00 $/feet/year	0.00 $/feet/year	$0.83	
Dry Detention Ponds and Hydrodynamic	50	10,281.00 $/acres	165.00 $/acre	635.00 $/acre	$759.91	

BMP Costs

- Costs are those incurred by both public and private entities
- Costs represent a single year of cost rather than the cost over the entire lifespan of the practice
- Costs are for all BMPs in a scenario, both those currently implemented as well as those planned
- These unit cost per BMP data support calculating the annualized cost per pound reduced per year
- Costs are estimated in 2010 dollars

BMP Costs, cont.

- The cost formula is:
- **annual costs = (capital * annualization factor) + O&M costs + (land * annualization rate)**
  - Where:
    - annualization factor = $i/((1+i)^n - 1) + i$
    - i = annualization rate, which is always 5%
    - n = period of annualization (also called lifespan)
- These unit cost per BMP data support calculating the annualized cost per pound reduced per year
- **cost per Lb reduced per year = cost per unit of BMP / Lbs reduced per unit of BMP**
- This information can enable targeting of the most effective BMPs at the lowest cost

Oyster Aquaculture

BMP	Life-span	Capital ($/oyster harvested)	O and M ($/year/oyster harvested)
Diploid Oyster Aquaculture 2.25 Inches	2.25	-$0.0059	$0.1014
Diploid Oyster Aquaculture 3.0 Inches	3	-$0.0102	$0.1014
Diploid Oyster Aquaculture 4.0 Inches	4	-$0.0148	$0.1014
Diploid Oyster Aquaculture 5.0 Inches	5	-$0.0182	$0.1014
Diploid Oyster Aquaculture Greater 6.0 Inches	6	-$0.0204	$0.1014
Triploid Oyster Aquaculture 2.25 Inches	1.7	-$0.0106	$1.1014
Triploid Oyster Aquaculture 3.0 Inches	2.3	-$0.0184	$2.1014
Triploid Oyster Aquaculture 4.0 Inches	3.0	-$0.0276	$3.1014
Triploid Oyster Aquaculture 5.0 Inches	3.8	-$0.0358	$4.1014
Triploid Oyster Aquaculture Greater 6.0 Inches	4.5	-$0.0428	$5.1014

- All costs are the same throughout the watershed
- Capital cost Includes costs of equipment and seeds MINUS revenues from oyster sales
- O and M Includes annual labor and fuel costs
- Opportunity costs are zero

Manure Gasification

- No change to costs upon the contractor's review of the information from Coaltec.
- Coaltec's data are for a unit that is much larger than the one included in our previous cost estimate (20,000 tons vs. less than 3500 tons). That makes it very difficult to compare the costs in a reasonable way.
- Since the Coaltec data are not published, but our previous estimates are published, we feel the original estimates are most defensible.

Septic BMPs

Bmp	Capital	O and M ($/year)
Septic Denitrification-Enhanced	$29,704.01	$1,207.36
Septic Denitrification-Advanced	$20,695.48	$1,330.06
Septic Denitrification-Conventional	$16,946.67	$780.57
Septic Secondary Treatment Enhanced	$22,399.74	$691.90
Septic Secondary Treatment Advanced	$20,067.17	$917.31
Septic Secondary Treatment Conventional	$9,642.40	$917.31
Septic Effluent - Enhanced	$12,757.34	$426.78
Septic Effluent - Advanced	$10,424.77	$652.19

- BMP lifespan is 30 years
- Costs are not state-specific
- Avg Capital and O and M costs per 450 GPD Unit
- New estimates includes example, a 30 yr lifespan and a 450 gallon unit are more appropriate than 20 years and 1000 gallons.

Saturated Buffers – Acre

State	Lifespan (Years)	Capital ($/acre)	O and M ($/acre/year)	Opportunity ($/acre)
MD	20	$4,676.50	$78.06	$0.02
VA	20	$4,644.72	$78.06	$0.01
AVG	20	$4,660.61	$78.06	$0.01

- Capital cost is cost of acre of buffer
- Operations and maintenance is the cost of control gates adjustment and replacement

Denitrifying Ditch Bioreactors – Acres Treated

State	Lifespan (Years)	Capital ($/acre treated)	O and M ($/acre treated/year)	Opportunity
MD	20	$307.48	$0.80	$ 0
NY	20	$355.90	$0.80	$ 0
PA	20	$333.20	$0.80	$ 0
VA	20	$313.83	$0.80	$ 0
DE	20	$357.84	$0.80	$ 0
AVG	20	$333.65	$0.80	$ 0

- Capital cost is the cost of treated acres
- O and M cost is the control gates adjustment and replacement
- The opportunity costs are zero because the implementation area relative to the treated area (0.07%) is negligible

Conservation Landscaping

State	Lifespan (Years)	Capital ($/acre)	O and M ($/acre/year)	Opportunity
VA	10	$159.80	-$320.00	$ 0
WV	10	$158.70	-$320.00	$ 0
MD	10	$157.96	-$320.00	$ 0
NY	10	$167.34	-$320.00	$ 0
PA	10	$167.52	-$320.00	$ 0
DE	10	$172.99	-$320.00	$ 0

- Lifespan is 10 years
- Conservation Landscaping offers an O and M cost saving alternative to mowed turfgrass

Questions?

Olivia Devereux

Devereux Consulting

Olivia@DevereuxConsulting.com