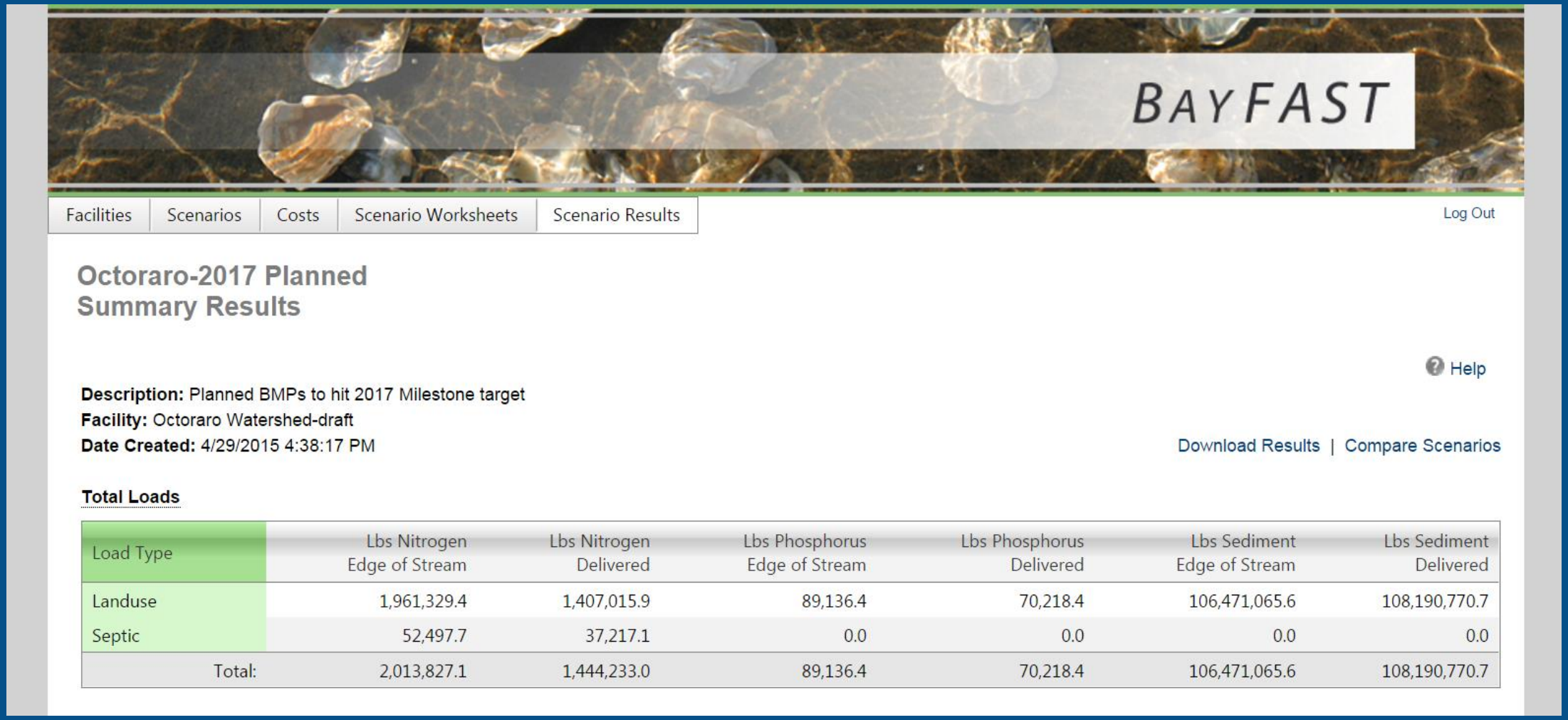


WWW.BAYFAST.ORG

February 17, 2016

Olivia Devereux

DECISION SUPPORT TOOLS

- Chesapeake Bay Program offers four decision support tools to facilitate development of plans that reduce nitrogen, phosphorus and sediment:

  - **Facility Assessment Scenario Tool – BayFAST.org**
    Site specific planning tool where user defines the planning area and land uses.
  - **Chesapeake Assessment Scenario Tool – CASTtool.org**
    Chesapeake Bay portion of NY, MD, WV, DE, DC, VA, PA included
  - **Maryland Assessment Scenario Tool – MASTonline.org**
    Maryland-specific version of CAST. Maryland-specific geographies like State Highway Administration and Phase I and II areas are available through the interface. MAST also has loads available for historical years to assist with local TMDL watershed planning.
  - **Virginia Assessment Scenario Tool – VASTtool.org**
    Virginia-specific version of CAST. VAST is now identical to CAST.

- Tools output nitrogen, phosphorus and sediment load for What-If scenarios of different BMPs. All use the same assumptions and calculation methods as the Chesapeake Bay Program's Watershed Model.

PURPOSE OF TOOLS

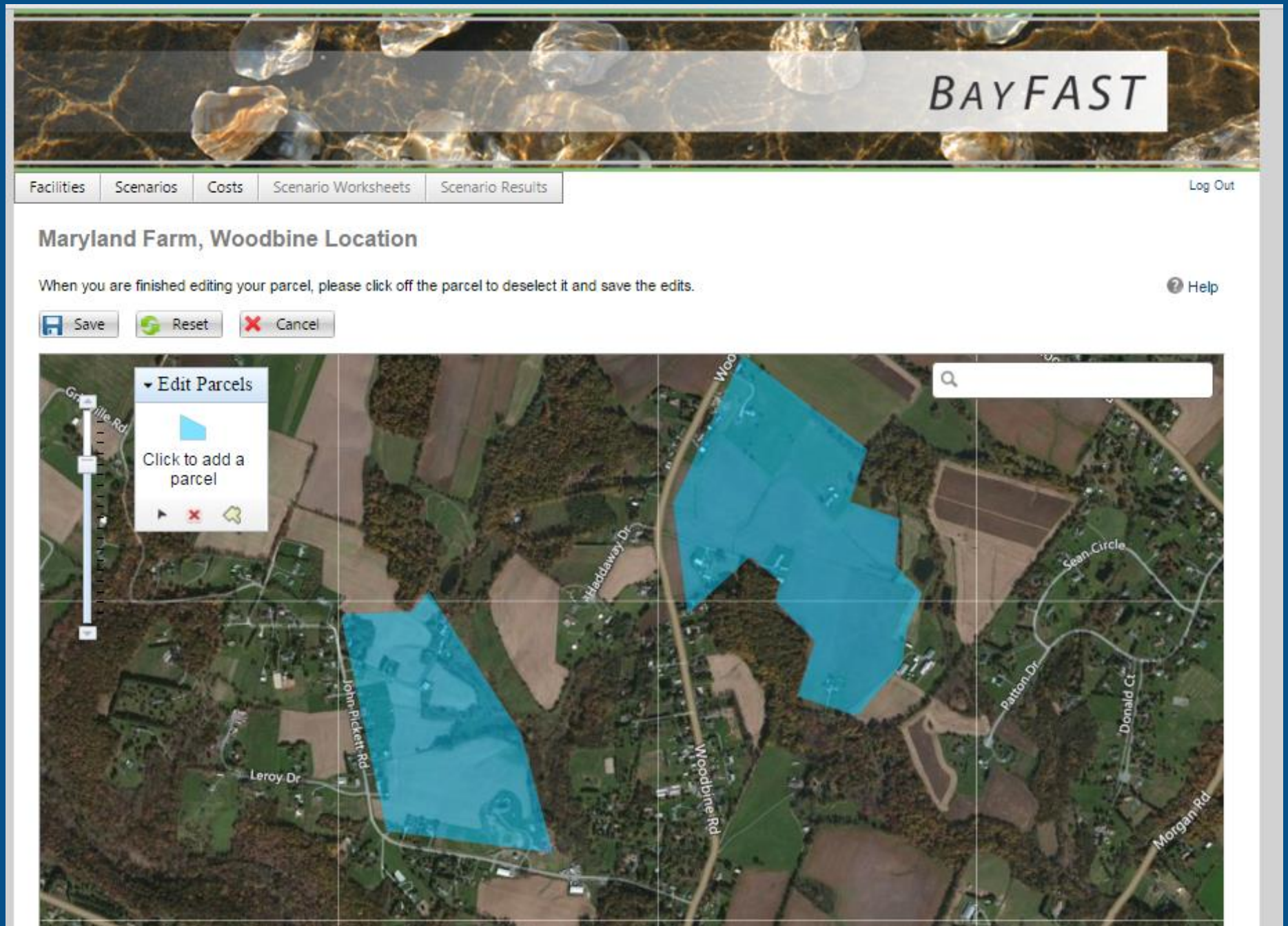
- The tools are designed as simple planning tools
  - Complex calculations and information embedded behind the interface
  - Users only need to know general information to use the tools
- Commonly used for
  - Milestones
  - WIPs
  - NFWF proposals and reports
  - 319 Plans
  - WLAs for MS4s
  - Nutrient and sediment local TMDL development and watershed management plans

- **Total users = 2,161**
- **Total scenarios = 6,975**

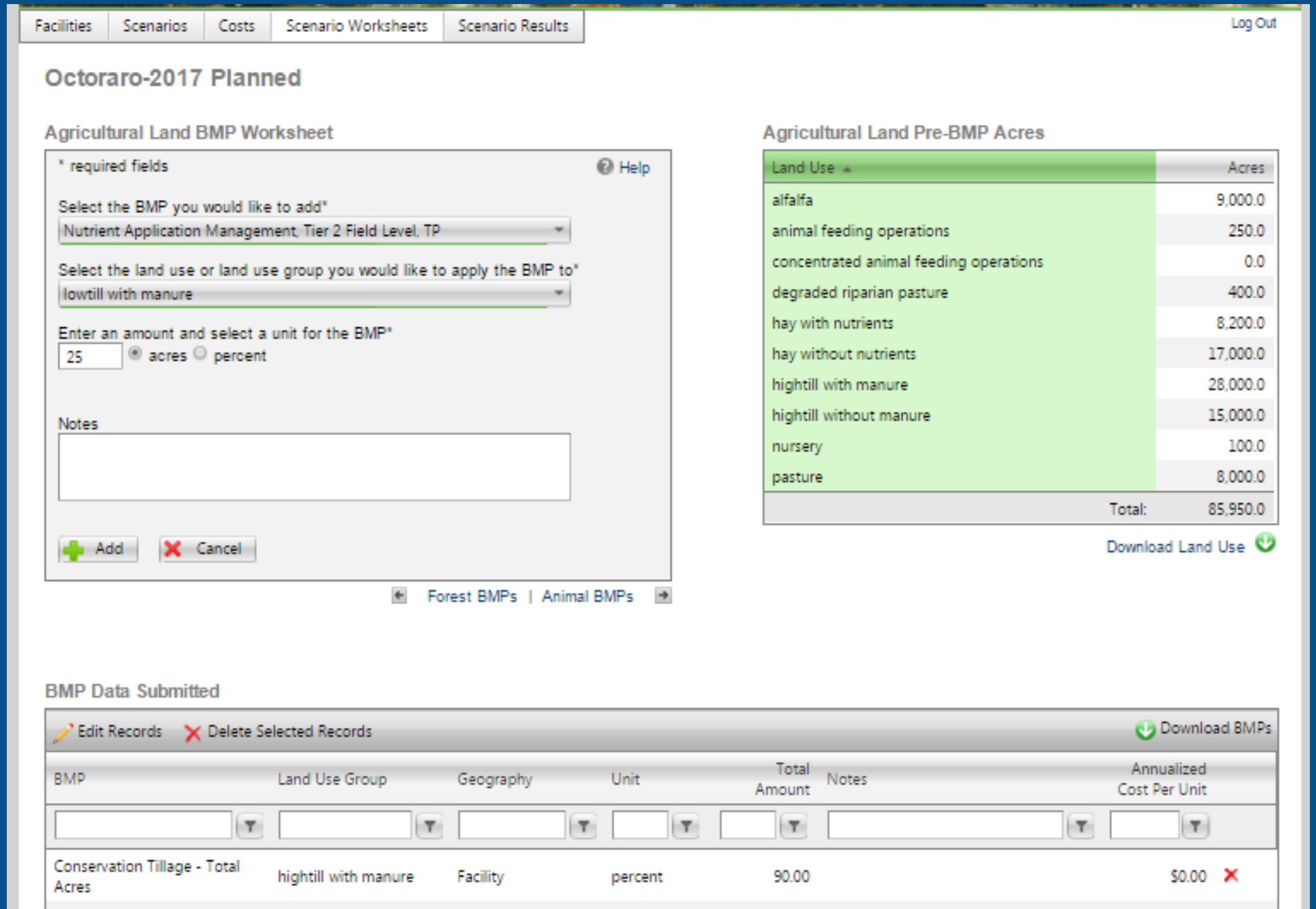
- Users are state and local planners who want to improve efficiency, savings, return on investment and quality of life in their communities
  - Virginia's Planning District Commissions
  - MD Phase I and II permittees
  - Pennsylvania's Conservation Districts for the MS4 Pollution Reduction Plans

EXISTING CAPACITY

DEFINE AREA


BAYFAST
Facilities
Scenarios
Costs
Scenario Worksheets
Scenario Results
Log Out
Maryland Farm, Woodbine Location
When you are finished editing your parcel, please click off the parcel to deselect it and save the edits.
Help
Save
Reset
Cancel
Edit Parcels
Click to add a parcel
Granville Rd
Haddaway Dr
John Pickett Rd
Leroy Dr
Woodbine Rd
Sean Circle
Patton Dr
Donald Ct
Morgan Rd

ENTER BMP INFORMATION



COMPARE LOADS BETWEEN CURRENT AND PLANNED SCENARIOS

Facilities | Scenarios | Costs | Scenario Worksheets | Scenario Results

Log Out

Compare Scenarios

Nitrogen Loads (lbs)

Land Use	Octoraro-No BMPs (Edge of Stream)	Octoraro-2015 Current (Edge of Stream)	Octoraro-2017 Planned (Edge of Stream)	Octoraro-No BMPs (Delivered)	Octoraro-2015 Current (Delivered)	Octoraro-2017 Planned (Delivered)
Sector: Agriculture						
	2,338,967.0	2,008,149.8	1,731,270.2	1,677,262.6	1,440,952.6	1,239,792.1
Sector: Urban						
	168,036.1	166,961.8	120,104.0	121,906.8	121,126.3	87,756.4
Sector: Forest						
	74,402.6	74,402.6	76,871.5	54,110.1	54,110.1	55,906.8
Sector: Septic						
	64,138.9	64,168.9	52,497.7	45,469.9	45,491.1	37,217.1
Sector: Water						
	33,083.5	33,083.5	33,083.5	23,560.4	23,560.4	23,560.4
Total Lbs:	2,678,628.2	2,346,766.6	2,013,827.0	1,922,309.8	1,685,240.5	1,444,232.8

Download

Phosphorus Loads (lbs)

Land Use	Octoraro-No BMPs (Edge of Stream)	Octoraro-2015 Current (Edge of Stream)	Octoraro-2017 Planned (Edge of Stream)	Octoraro-No BMPs (Delivered)	Octoraro-2015 Current (Delivered)	Octoraro-2017 Planned (Delivered)
Sector: Agriculture						
	111,236.1	112,693.7	86,073.6	87,647.8	88,798.0	67,805.6
Sector: Forest						
	1,149.3	1,149.3	1,185.6	905.0	905.0	933.6
Sector: Urban						

Percent change in Land Use Loads from Scenario 2: VA Development Baseline to Scenario 3: VA Development Plan

Land Use	% Change Nitrogen	% Change Phosphorus	% Change Sediment
Sector: Agriculture			
Sector: Urban			
CSS construction	0.0	0.0	0.0
CSS extractive	0.0	0.0	0.0
CSS impervious developed	0.0	0.0	0.0
CSS pervious developed	0.0	0.0	0.0
nonregulated extractive	0.0	0.0	0.0
nonregulated impervious developed	0.0	0.0	0.0
nonregulated pervious developed	0.0	0.0	0.0
regulated construction	-7.6	-13.6	-61.1
regulated extractive	0.0	0.0	0.0
regulated impervious developed	-3.0	-5.8	-4.7
regulated pervious developed	-3.0	-5.7	-4.1
Sector: Forest			
Sector: Septic			
Sector: Water			
Sector: Total			
Total	-3.8	-9.2	-32.7

Download

SOURCES AND LOADS

- Loads are calculated for all sources in the watershed
  - Urban, including MS4, Phase I & II municipalities
  - Agriculture, including CAFOs
  - WWTP and Industrial facilities
  - Forest and other natural areas
- Identifies the BMPs that give the greatest load reductions
- Specifies the extent these BMPs are to be implemented
- Output includes the acres of each BMP and the loads of N, P, and sediment.
- Cost per acre for each BMP

FEATURES

- **CONSISTENT**—Closely approximate the results of the Chesapeake Bay Program's (CBP) Watershed Model.
- **TRANSPARENT**—Scenarios and results can be shared among users and with CBP and states. The tools' calculation methodology is well-documented and replicable.
- **OPTIMAL**—Create plans for meeting a nitrogen, phosphorus, or sediment load allocation using the most cost-effective strategy.
- **RAPID**—Calculate and quickly revise "on-the-fly" estimates of load reductions.
- **FLEXIBLE**—Allow users to understand which BMPs provide the greatest load reduction benefit, the extent to which these BMPs can be implemented, and the cost of these BMPs.

MODELING METHODOLOGY

Stormwater

BMPS

- Approximately 200 BMPs
  - Majority of BMPs are efficiency BMPs
  - Some are land use conversions—load reductions attributed to movement to lower-exporting land uses.
  - A few other BMPs have unique calculation methodologies

- BMPs are calculated in a stepwise process. There is not a set amount of reduction per BMP that is constant. Interaction effects are considered by calculating BMPs in various groups and in specified sequences.

LOAD CALCULATION IN CURRENT VERSION

- Need a load for every land use in every modeling segment
  - Creat an artificial land use
    - Land Segments = 377
    - River Segments= 1,084
    - Land uses = 32
    - Simulation Years = 20
  - No BMPs
  - Run the scenario through Watershed Model

LOAD CALCULATION CURRENT VERSION-CONT.

- Adjust the land use from user-entered BMPs
- Apply load reduction same as the Chesapeake Bay Program models (same groups and sequence)
- Calculate the per acre load
- Display total load per segment to user
  - Multiply by acres
  - Show edge of stream loads and load delivered to the Bay

SUMMARY

- Creates a reasonable approximation of the Watershed Model's N, P, and sediment loads
- Available to the public – for free
- On line—no need to download special software
- Local jurisdictions learn that…
  - the model is more sensitive to some BMPs than others
  - the model is sensitive to the location of BMPs
- Users are selective about which BMPs they implement and where they are located to more effectively reduce loads

LOAD CALCULATION IN 2018 VERSION

- Calculation will be identical to all other Chesapeake Bay Models

- Transitioning to integrated logic engines: services, Bay/C/MAST and Static Watershed Model

EXPANDED CAPACITY
(PROPOSED)

Facilities | Scenarios | Costs | Scenario Worksheets | Scenario Results | **Trading** | Log Out

Results summary

Land use type: agriculture

Parcel area: 53 acres

Pollutants	Baseline load Delivered pounds	Current load Delivered pounds	Parcel meets baseline	Future load Delivered pounds	Reduction to Bay pounds	Credits
Nitrogen	540	600	No	520	20	0
Phosphorus	5	4.8	Yes	4	0.8	15
Sediment	13000	84000	No	109000	-96000	0

Land use type: afo/cfo

Parcel area: 2.5 acres

Pollutants	Baseline load Delivered pounds	Current load Delivered pounds	Parcel meets baseline	Future load Delivered pounds	Reduction to Bay pounds	Credits
Nitrogen	50	45	Yes	40	5	4.5
Phosphorus	25	38	No	30	8	0
Sediment	145	225	No	220	5	0

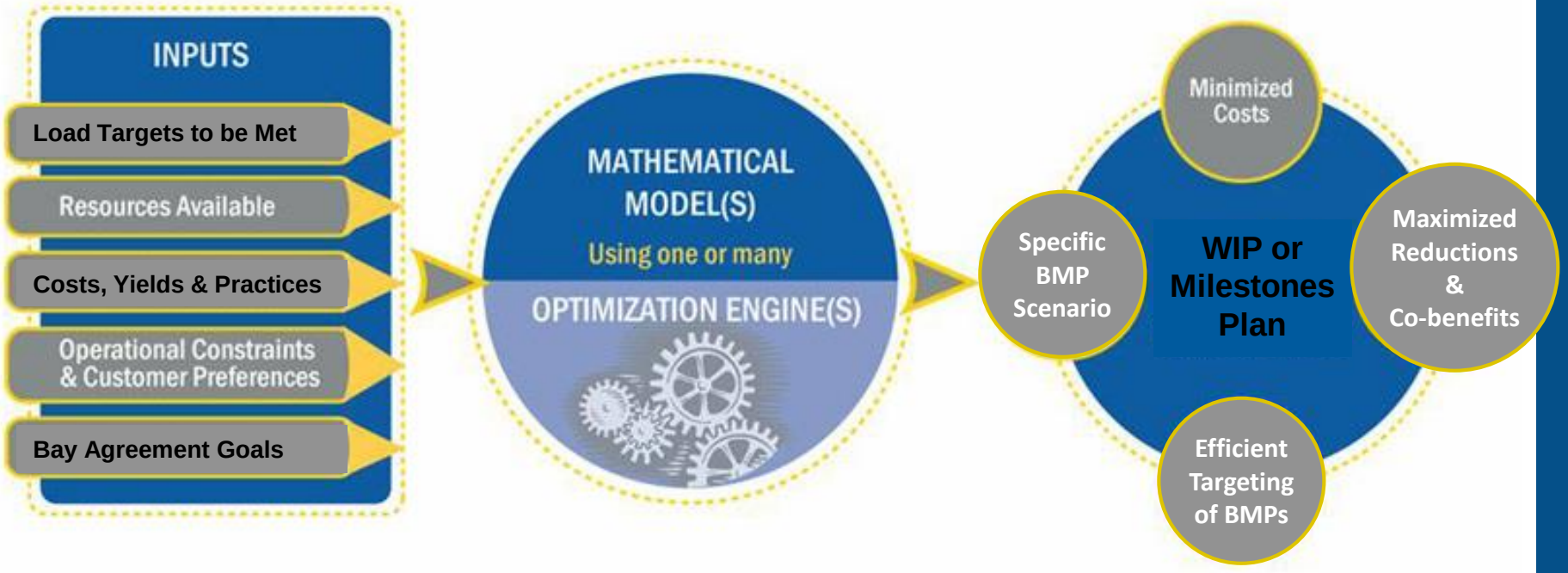
Land use type: developed

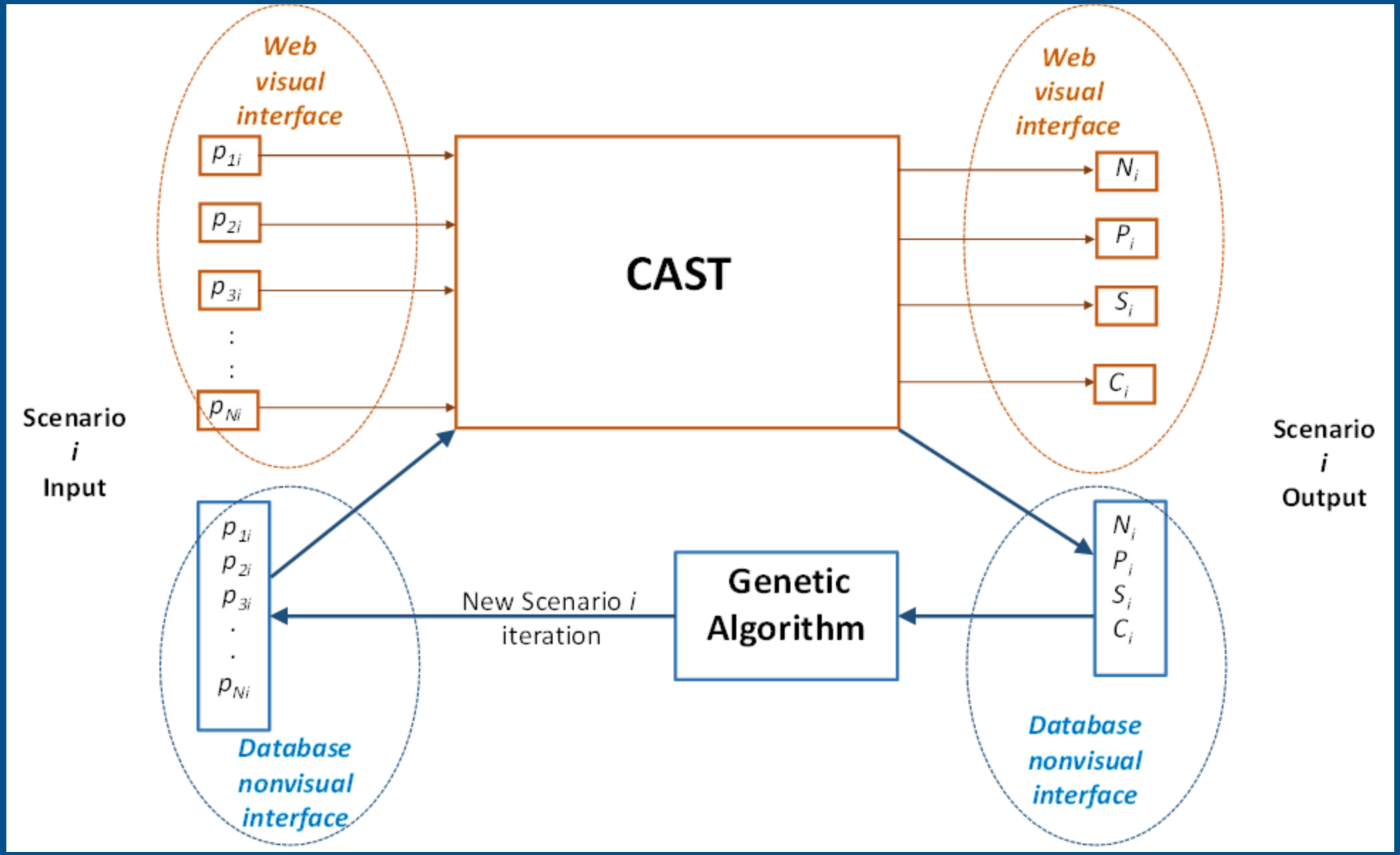
Parcel area: 5 acres

OPTIMIZATION CALCULATION ENGINE

Users input objectives, tool outputs BMPs in the plan that maximize effectiveness at minimum cost.

"Cracking the WIP"
Designing an Optimization Engine to Guide Efficient Bay Implementation
A Scientific and Technical Advisory Committee Workshop





RTI Memo, George Van Houtven, Keith Little 1/15/2016

Figure 1. Envisioned Approach for Linking a GA Optimization Routine the CAST Model

QUESTIONS?

We encourage you to test the tools at:

www.BayFAST.org
www.casttool.org
www.vasttool.org
www.mastonline.org