Chesapeake Bay Program Watershed Model Developments

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WRTC Meeting

July 20, 2017

Presentation Overview

- Phase 6 key changes
- Key issues
  - Local Area Targets
  - Changes from 5.3.2 version
- Member input on Phase 6 analysis

Acronyms:

WSM = watershed model

WQSTM = water quality and sediment transport model

Importance of Modeling Tools

- WQSTM – estimates level of attainment with Bay TMDL water quality criteria (DO, water clarity, chlorophyll-a)
- WSM
  - Provides input to WQSTM
  - Accounting framework for TMDL
    - Geographic and sector equity
    - Reasonable assurance that harder-to-measure sources are doing their part

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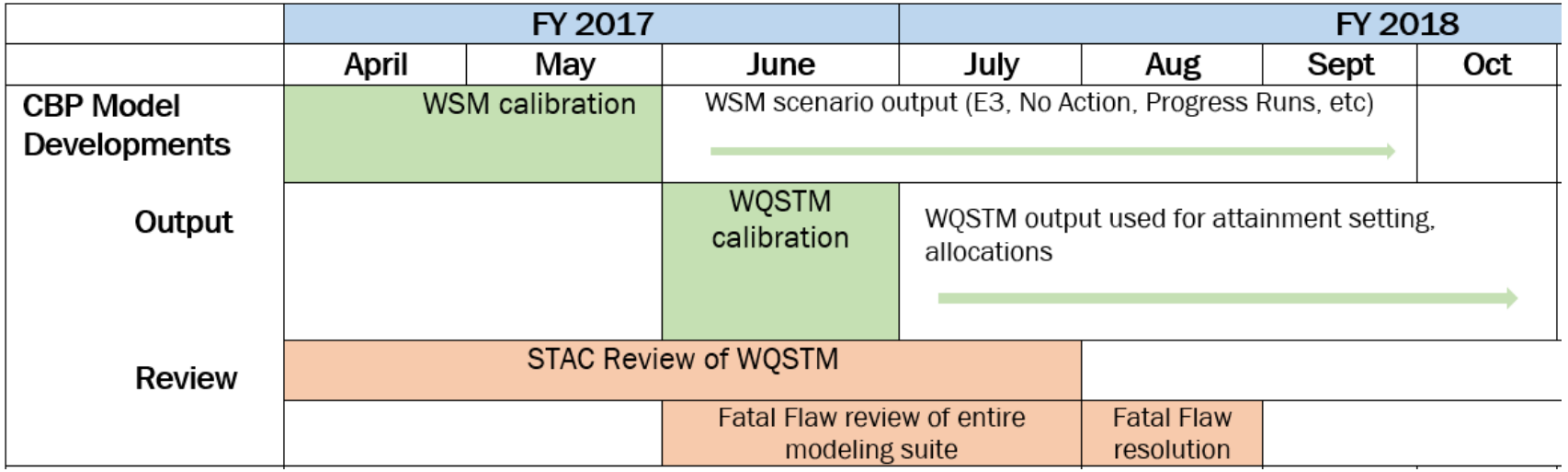
Disclaimer

- Information in this presentation is derived from the final draft of the CBP watershed model Version 6. This output may change somewhat when the final version of the model completes the fatal flaw review and any changes are made.

Overview of Modeling Schedule



- Scenario Runs — Aug 1 – Sep 30, 2017
- Quantify Conowingo, Climate Change, Growth — Aug 1 – Sep 30, 2017
- Policy Decisions on Additional Loads — Oct 2017
- Draft Phase III WIP Planning Targets (State-Basin) — Oct 2017
- Final Phase III WIP Planning Targets — Mar 2018

Phase 6 Key Changes

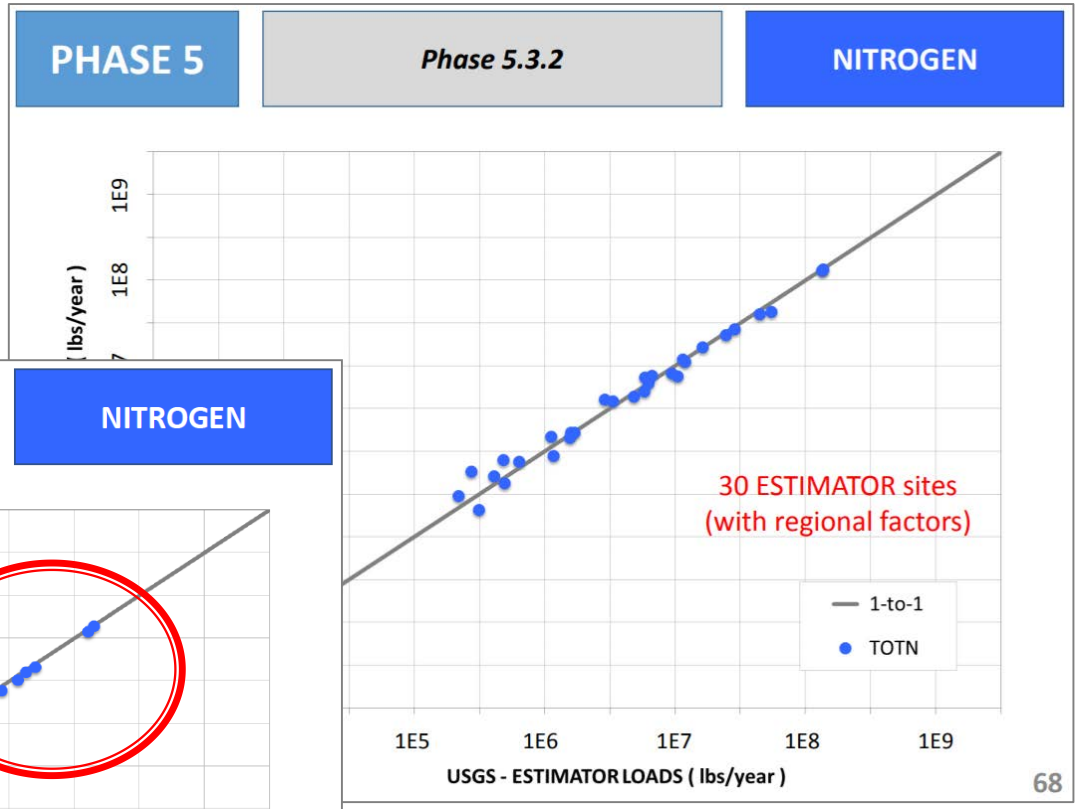
- Finer-scale land use
- New and revised BMPs
- New methods for calculating loads, new input data, revised sediment simulation, replacement of regional factors
- Revised simulation of Conowingo, quantifying growth and climate change effects -- policy decisions pending

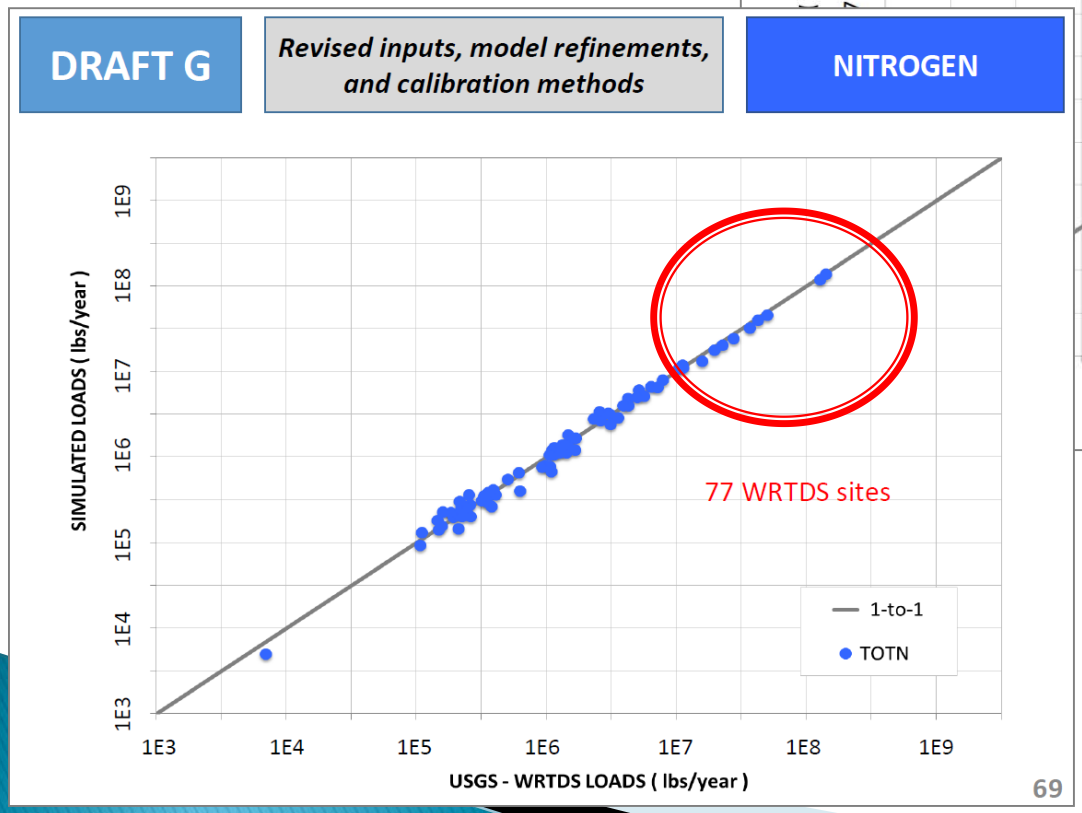
Phase 6 Key Issues

- WSM, WQSTM calibration
- Scale
- New sediment methods
- Accuracy of data inputs
- New urban fertilizer approach

Calibration Slightly Better in Phase 6

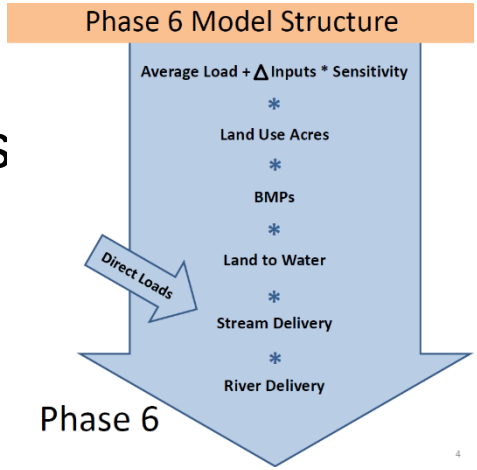
Tighter fit on 1:1 line in Version 6, especially at major basins





Monitoring data now derived from WRTDS loads rather than Estimator concentrations

Scale Issue – How Well Does Model Support Local Targets



Pro

- Finer-scale land use, more calibration stations and replacement of “regional factors”

Con

- Many inputs still at regional or county level
- Local discrepancies, e.g. # of septic systems
- Calibration accuracy declines at smaller scales
- WQSTM’s DO responses in key segments not dependent upon precise local loadings.

Revised Sediment Methodology

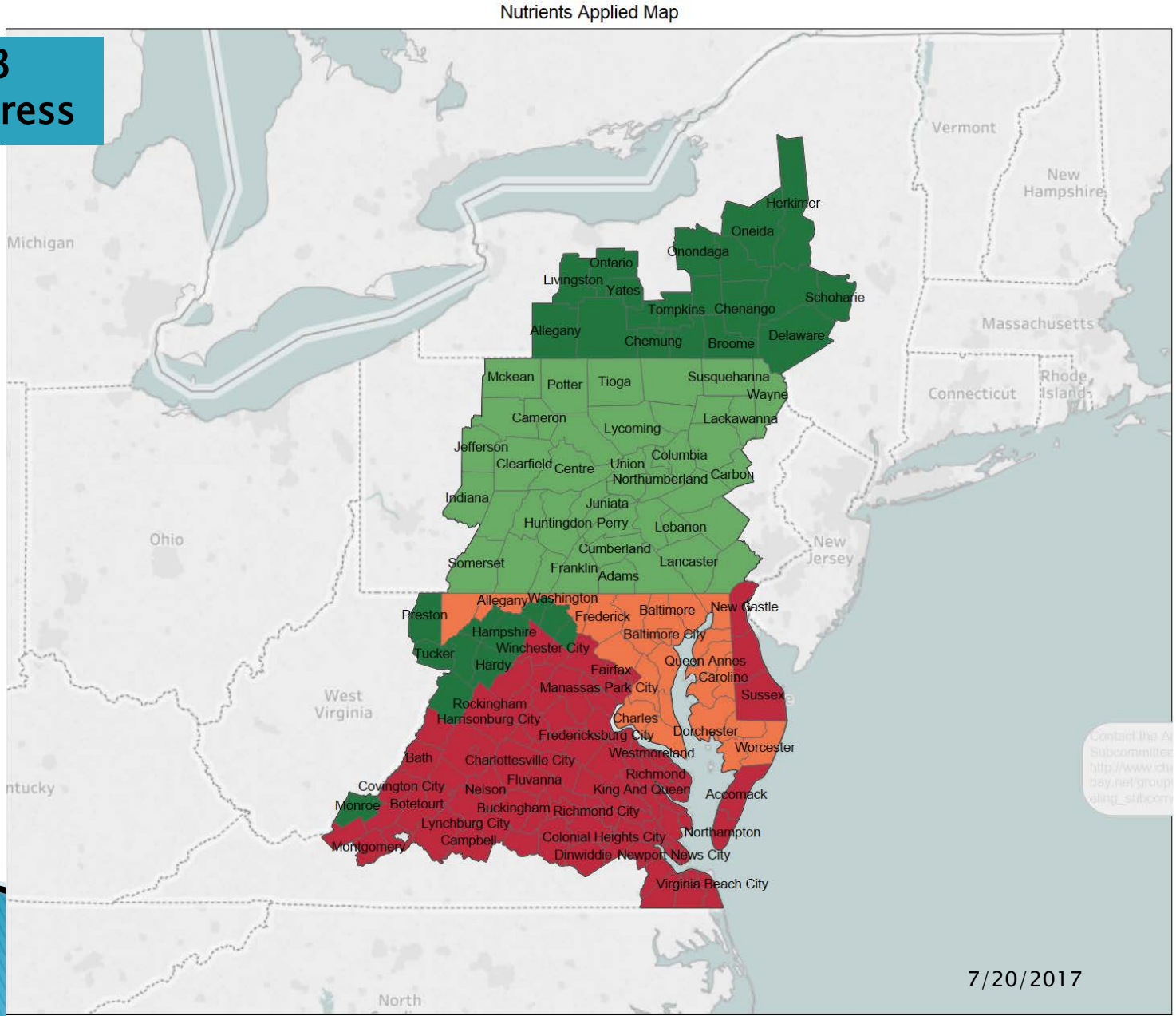
- Shoreline erosion now a large source
- Simulation of stream corridor effects still an issue
- Urban E3 is showing a negative load
  - Large amount of stream restoration
  - Model assumption that erosion and scour is equal to the floodplain accretion

Other Issues

- Data Inputs
  - Some instances of missing data discovered
- Urban Fertilizer
  - VA DEQ staff has cited in fatal flaw review
  - MDE staff has questions

Developed Fertilizer – TN application Phase 6

2013 Progress



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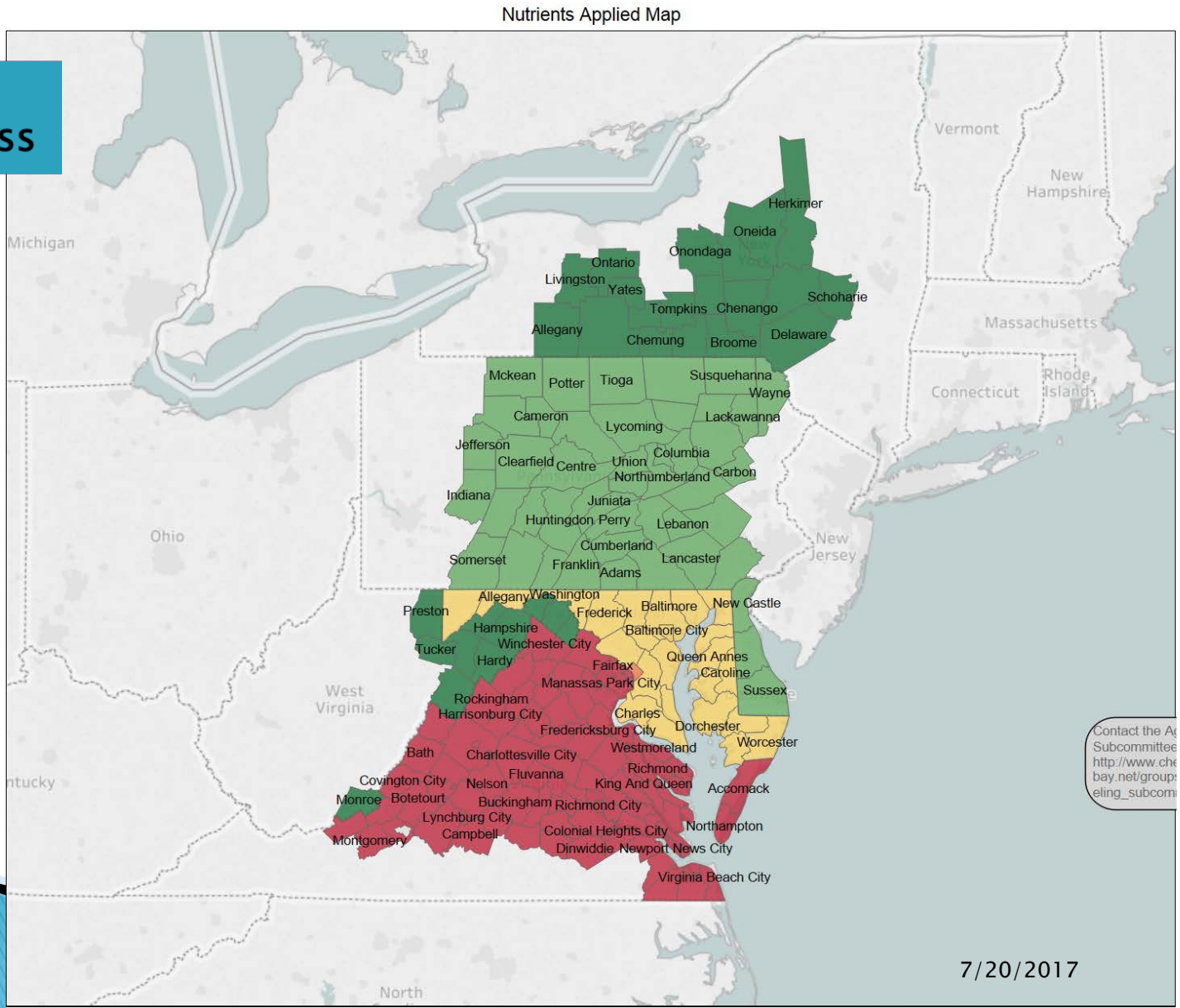
Developed Fertilizer – TP application Phase 6

2013 Progress



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Some Preliminary Results

The following slides all use results from 2013 Progress scenarios in either Phase 5.3.2 or Phase 6.

Because Version 6 is still in fatal flaw review and may undergo changes, data shown is provisional and subject to change

Downloaded from:

https://baytas.chesapeakebay.net for Phase 5.3.2. data
https://cast.chesapeakebay.net for Phase 6 data

6 vs. 5.3.2. Landuse

2013 Progress scenario

State Basin	Sector	Phase5.3.2 Acres	Phase 6.0 Acres
MD Potomac River Basin	Agriculture	492,722	480,509
VA Potomac River Basin	Agriculture	1,029,125	889,629
Ag Total		**1,521,847 (27%)**	**1,370,138 (24.5%)**
DC Potomac River Basin	Developed	24,876	22,348
MD Potomac River Basin	Developed	411,239	377,688
VA Potomac River Basin	Developed	717,288	634,058
Developed Total		**1,153,403 (21%)**	**1,034,094 (18.5%)**
DC Potomac River Basin	Natural	1,635	4,931
MD Potomac River Basin	Natural	1,075,461	1,108,678
VA Potomac River Basin	Natural	1,854,429	2,065,665
Natural Total		**2,931,525 (52%)**	**3,179,274 (57%)**
Overall Total		**5,606,775**	**5,583,506**

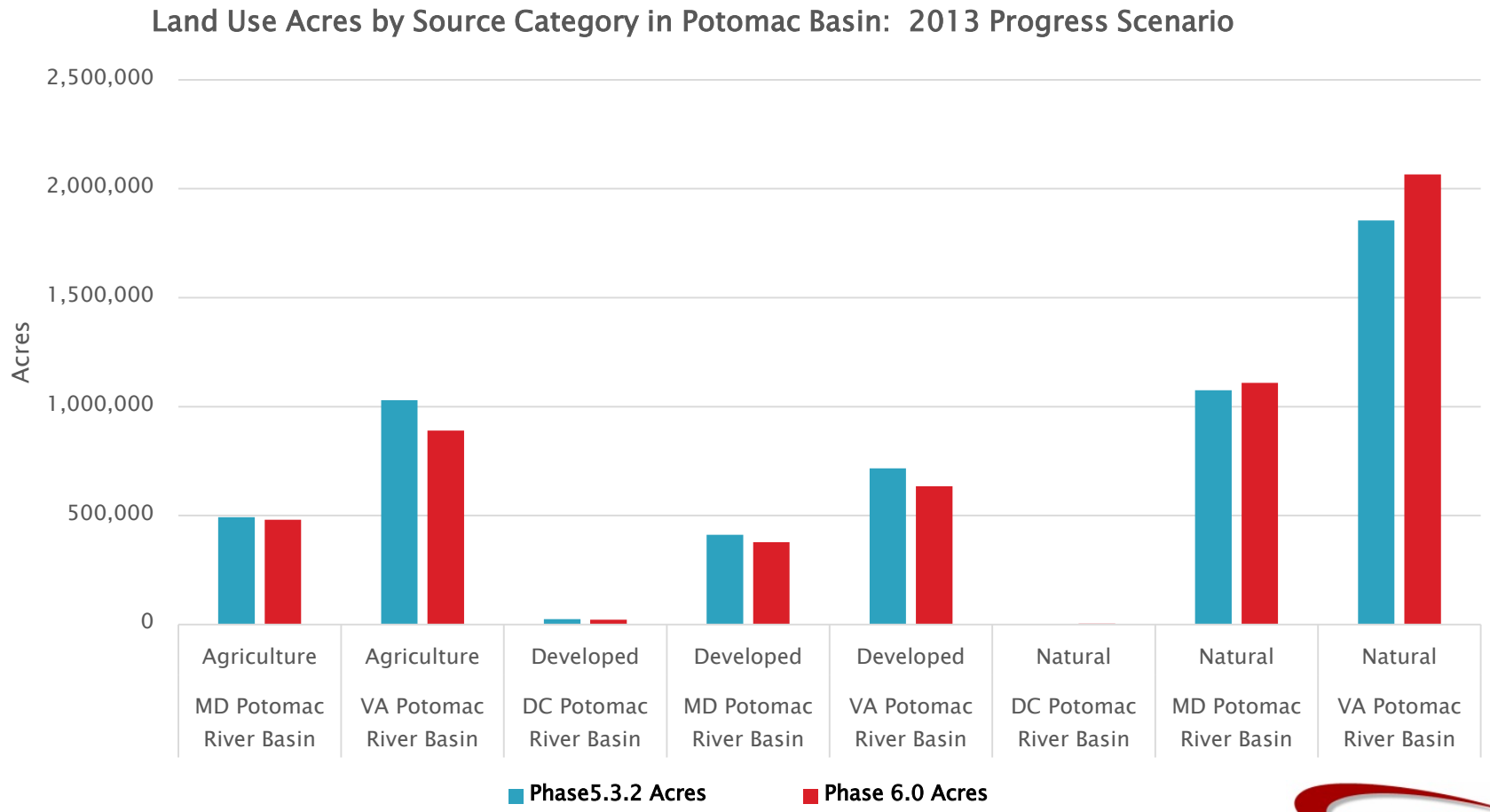
Overall:

- Ag and Developed acres decrease
- Natural acres increase

Notes:

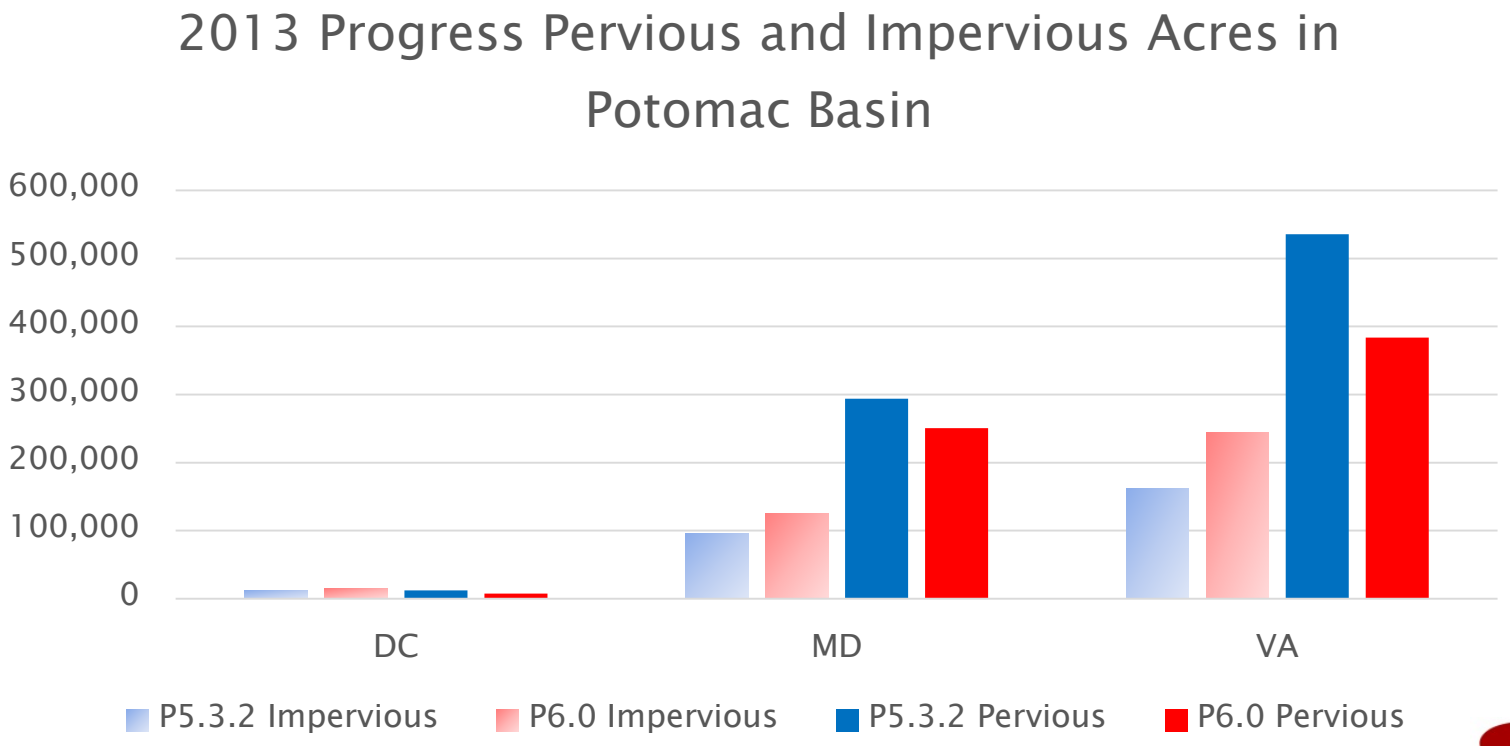
- DC totals computed from MS4 portion of the city only.
- Mixed Open and Forest were attributed to Natural category

6 vs. 5.3.2. Landuse



6 vs 5.3.2 Landuse

Within Developed, shift toward more impervious, less pervious acres



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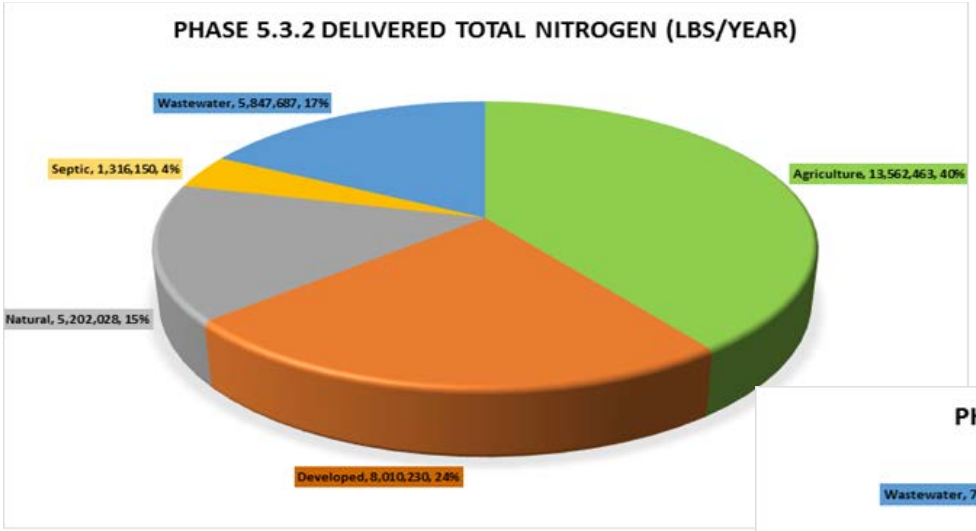
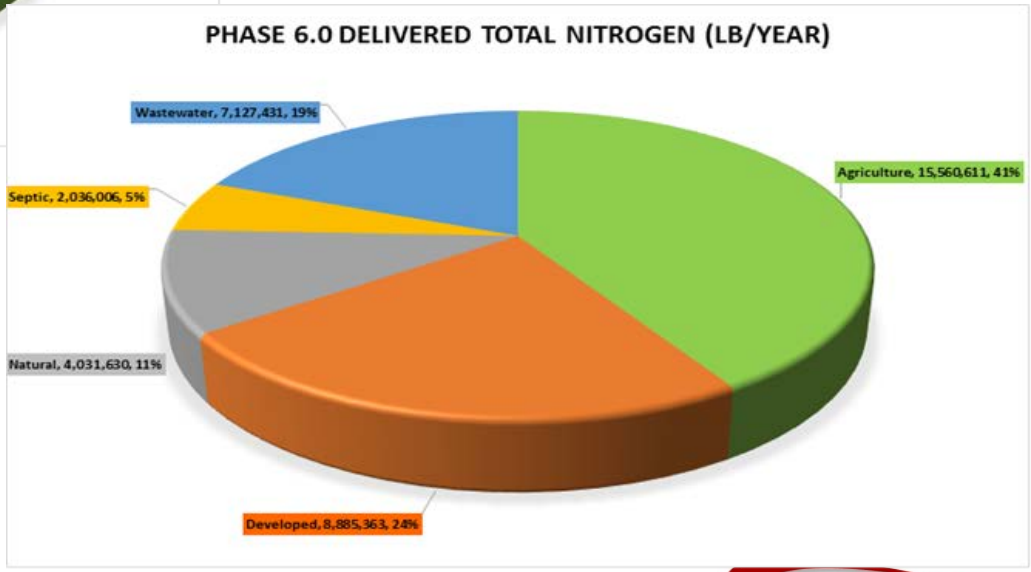
6 vs. 5.3.2. Loads



Results from 2013 Progress scenarios



N loads increase overall, but percentage of total loads relatively the same as in 5.3.2

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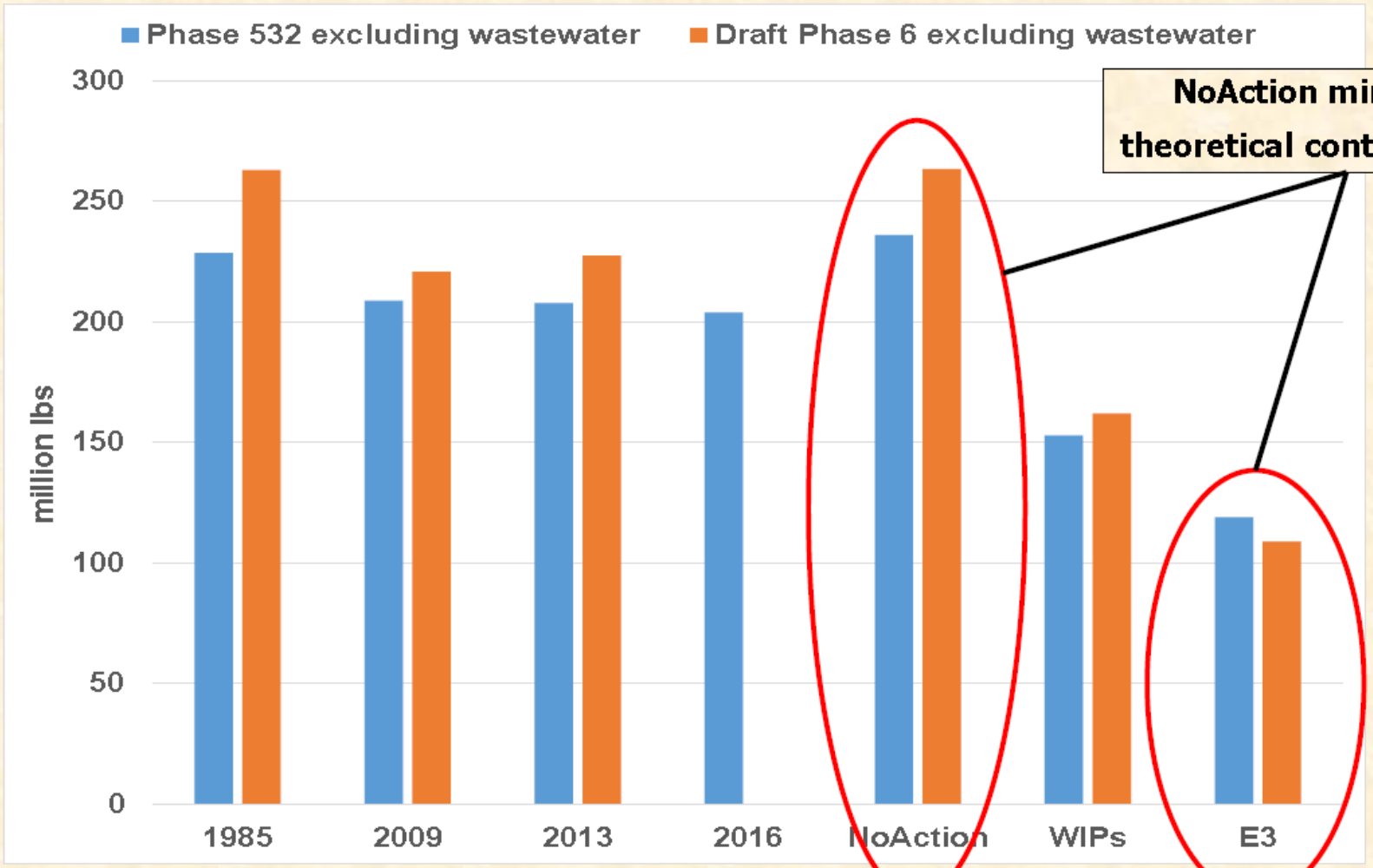
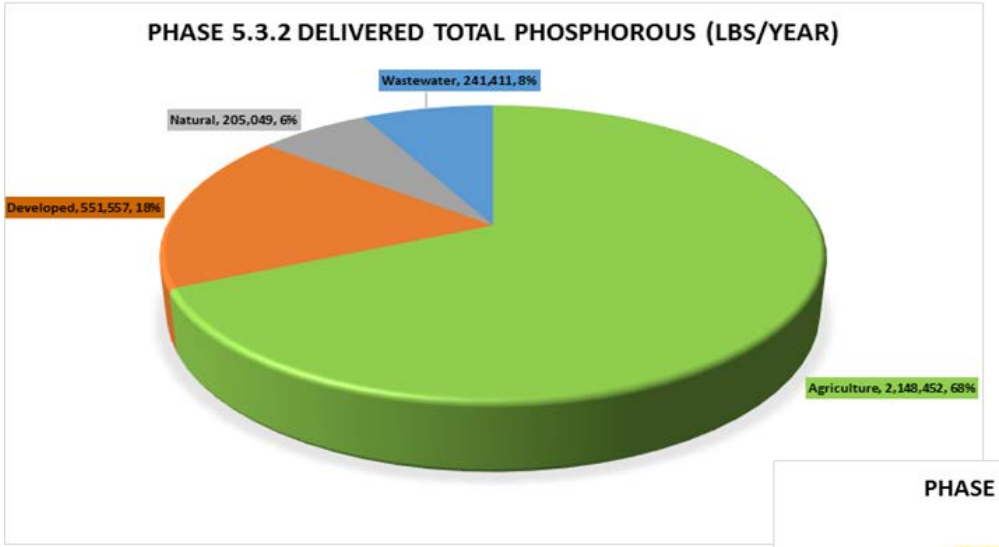
Phase 5 and Phase 6

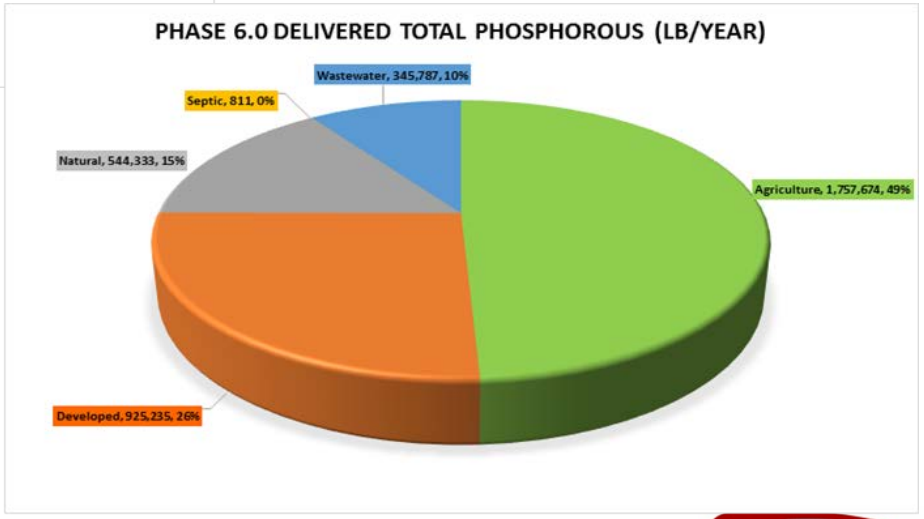
Nitrogen Loads, CB Watershed-wide (excludes wastewater)



6 vs. 5.3.2. Loads



Results from 2013 Progress scenarios



- P loads increase somewhat overall, urban % of total loads is higher while ag % is lower than in 5.3.2
  - BMP effects?
  - Changes in average loads

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6 vs. 5.3.2 BMP coverage

State Basin	P6 2013 Progress - Urban BMPs (acres treated)	Percent of Total Developed Land
DC Potomac	14,058	**63%**
MD Potomac	137,136	**36%**
VA Potomac	54,072	**9%**

From 2013 Progress scenario

Note: Based on stormwater management BMPs only

From 2009 Progress scenario

Figure 2. Extent of BMP Coverage

County	Percentage of Urban Acres Treated by BMPs in 2009 Progress Scenario	
	Impervious	Pervious
Frederick	41.9	44.4
Montgomery	32.6	40.6
Prince George's	19.9	37.9
Alexandria	34.6	32.9
Arlington	2.8	5.1
Fairfax	49.2	55.0
Loudoun	70.3	77.1
Prince William	39.1	43.7

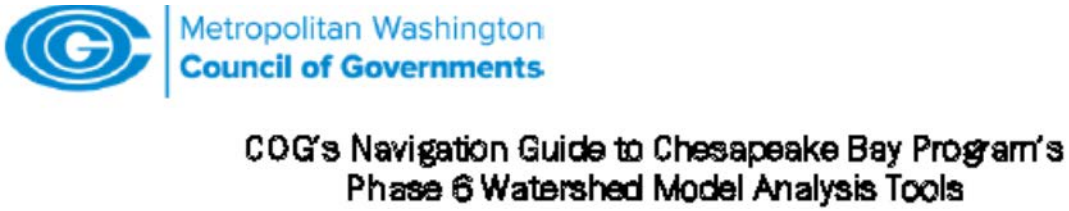
Top BMPs:
- Stormwater Management by Era 1985-2002 (MD only)
- Wet Ponds and Wetlands
- Dry Extended Detention Ponds / Dry Detention Ponds with Hydrodynamic Structures

Preliminary Conclusions

- Despite changes, scale is still an issue
- Sediment simulation remains less accurate than nutrient simulations
- Shifts in sector load ratios will lead to changes in WIP level of effort
- Fatal Flaw review – not enough time

Next Steps

- Updated Navigation Guide



- Continue to review data, fatal flaw comments
- Share issues and data among COG members
- Late summer WRTC session on model results – date tbd

COG Staff Contacts

- Watershed model analysis & assistance to members in navigating analysis tools
  - Mukhtar Ibrahim, mibrahim@mwcog.org, 202-962-3364
- Overall policy & CBP Water Quality Goal Implementation Team (WQGIT) At-large Member
  - Tanya Spano, tspano@mwcog.org, 202-962-3776
- Watershed model overview & process dynamics
  - Karl Berger, kberger@mwcog.org, 202-962-3350
- Wastewater-related data & GIS matters
  - Tanya Spano & Nasser Ameen nameen@mwcog.org, 202-962-3394

Additional slides

- CBP BMP cost info documentation available at:

https://cast.chesapeakebay.net/Documentation/AdditionalInfo