Watershed Model Issues

Presentation to
Water Resources Technical Committee

Sept. 10, 2010

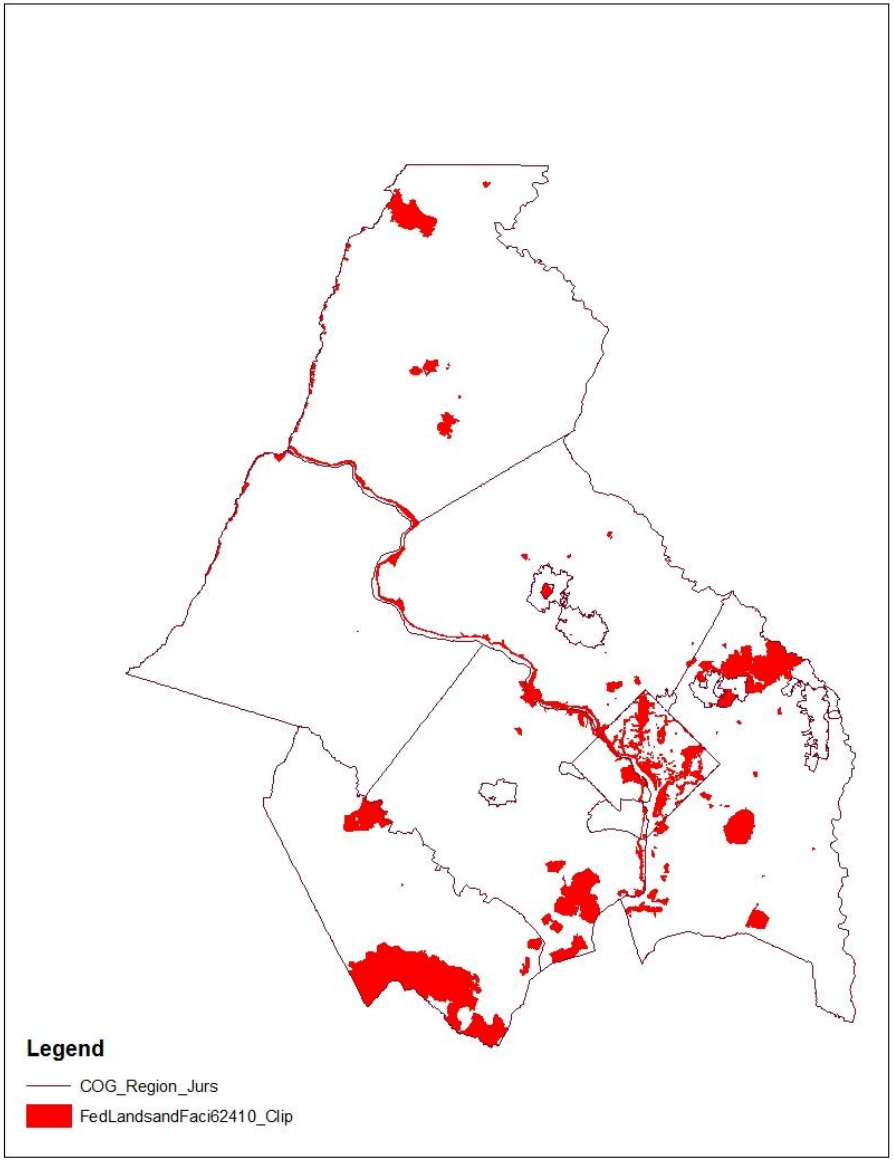
Watershed Model Development Status

- November 2009 – Phase 5.2 output used for preliminary allocations
- March - May 2010 – Phase 5.3 output available; major problems identified
  - Few corrections made (e.g. urban E3 scenario definition), but others deferred to new version (5.4 - ?)
- June – July 2010 – Phase 5.3 output used for final allocations, Phase I WIPs despite known flaws
  - Work begins on revising land use; collecting state data for new version
  - Local land use substitution protocol not developed
- Sometime in 2011 – New output available (in time for Phase II WIPs)

New Developments

- Federal land coverage layer
- MS4 land coverage layer
- Relative effectiveness data available

Federal Land Coverage in COG Region



Based on CBP analysis of projected 2010 land use

Federal lands analysis - CBP method

- Federal land areas, land cover classes and P53 segments were intersected.
- Urban land cover classes were converted to impervious and pervious P5.3 land use acres using impervious coefficients.
- Load aspect of analysis did not include CSO loads from federal lands or onsite system loads from federal lands

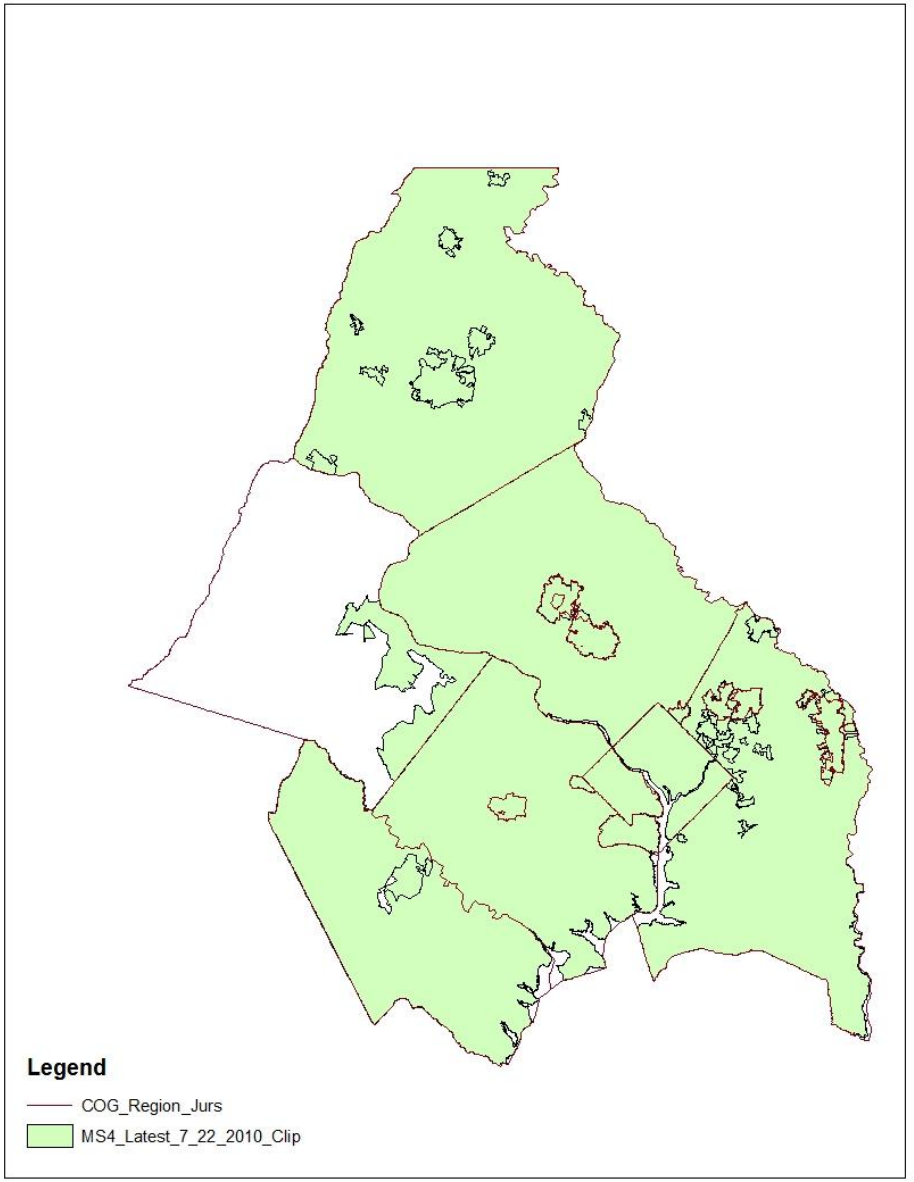
P5.3 Urban Land Cover	***Impervious Coefficient***	***P5.3 Urban Land uses***	
Developed Open Space (DOS)	6.57084	Low Intensity Impervious	Low Intensity Pervious
Developed Low Density (LID)	18.1859	Low Intensity Impervious	Low Intensity Pervious
Developed Medium Density (MID)	48.4522	High Intensity Impervious	High Intensity Pervious
Developed High Density (HID)	75.939	High Intensity Impervious	High Intensity Pervious

Federal Land Acres in COG Region

Jurisdiction	Urban Acres	Ag Acres	Forest Acres	Total Federal Acres	Total County Acres	Federal % of County
Arlington	1,502	17	3,590	5,108	16,640	31
District of Columbia	4,141	299	10,732	15,171	39,296	39
Fairfax County	3,989	1,724	945	6,657	252,800	3
Frederick	497	2	1,262	1,761	424,320	0
Montgomery	1,399	507	4,155	6,061	317,440	2
Prince George's	8,049	2,695	12,666	23,409	170,240	14
Prince William	2,140	2,318	34,706	39,164	222,720	18
Alexandria	143	3	92	238	9,728	2

Based on CBP analysis of projected 2010 land use

MS4 Land Coverage in COG Region



Based on CBP analysis of projected 2010 land use

MS4 analysis - CBP method

- MS4 areas, urban classes and P5.3 segments were intersected.
- Urban land cover classes were converted to impervious and pervious P53 land use acres using impervious coefficients.
- Urban acres outside the MS4 area were considered unregulated.
- CSO areas not counted
- Ag, forest acres not counted

P53 Urban Land Cover	***Impervious Coefficient***	***P53 Urban Land uses***	
Developed Open Space (DOS)	6.57084	Low Intensity Impervious	Low Intensity Pervious
Developed Low Density (LID)	18.1859	Low Intensity Impervious	Low Intensity Pervious
Developed Medium Density (MID)	48.4522	High Intensity Impervious	High Intensity Pervious
Developed High Density (HID)	75.939	High Intensity Impervious	High Intensity Pervious

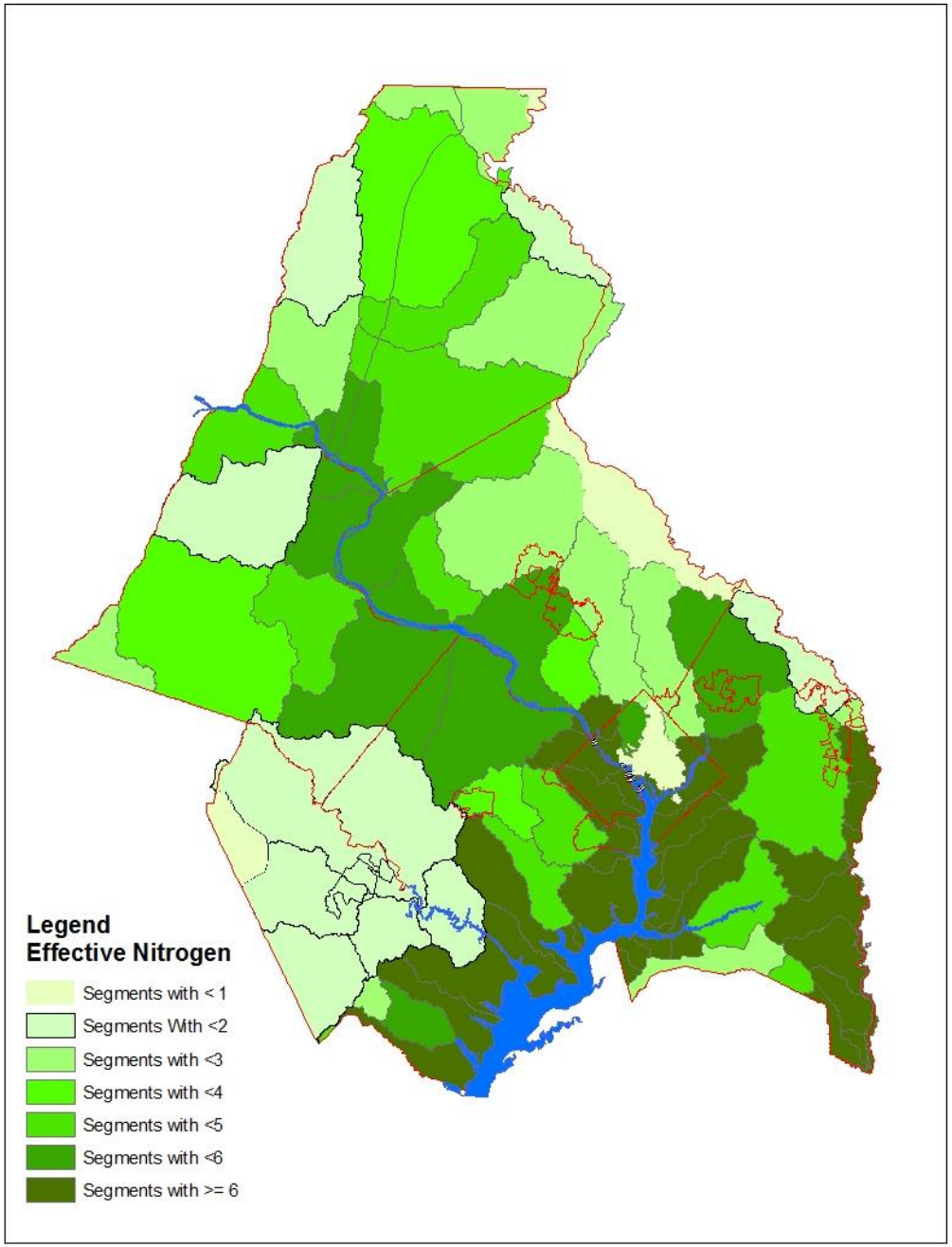
MS4 Acres in COG Region

Jurisdiction	Unregulated Impervious Acres	Unregulated Pervious Acres	MS4 Impervious Acres	MS4 Pervious Acres	Total MS4 Acres	Total County Acres	MS4 Percent of County Acres
District of Columbia	0	0	7,167	13,767	20,935	39,296	53
Frederick	0	0	6,068	25,715	31,783	424,320	7
Montgomery	0	0	24,972	84,711	109,683	324,480	34
Prince George's	0	0	35,229	86,795	122,024	318,720	38
Arlington	7	8	4,801	9,352	14,153	16,640	85
Fairfax County	493	296	33,467	94,977	128,444	253,440	51
Loudoun	6,447	17,220	8,306	19,133	27,439	332,800	8
Prince William	1,136	1,866	14,035	40,042	54,077	216,320	25
Alexandria	0	0	3,307	4,877	8,184	9,728	84
Fairfax City	0	0	1,007	2,191	3,198	4,032	79
Falls Church	0	0	305	624	929	1,408	66

Based on CBP analysis of projected 2010 land use

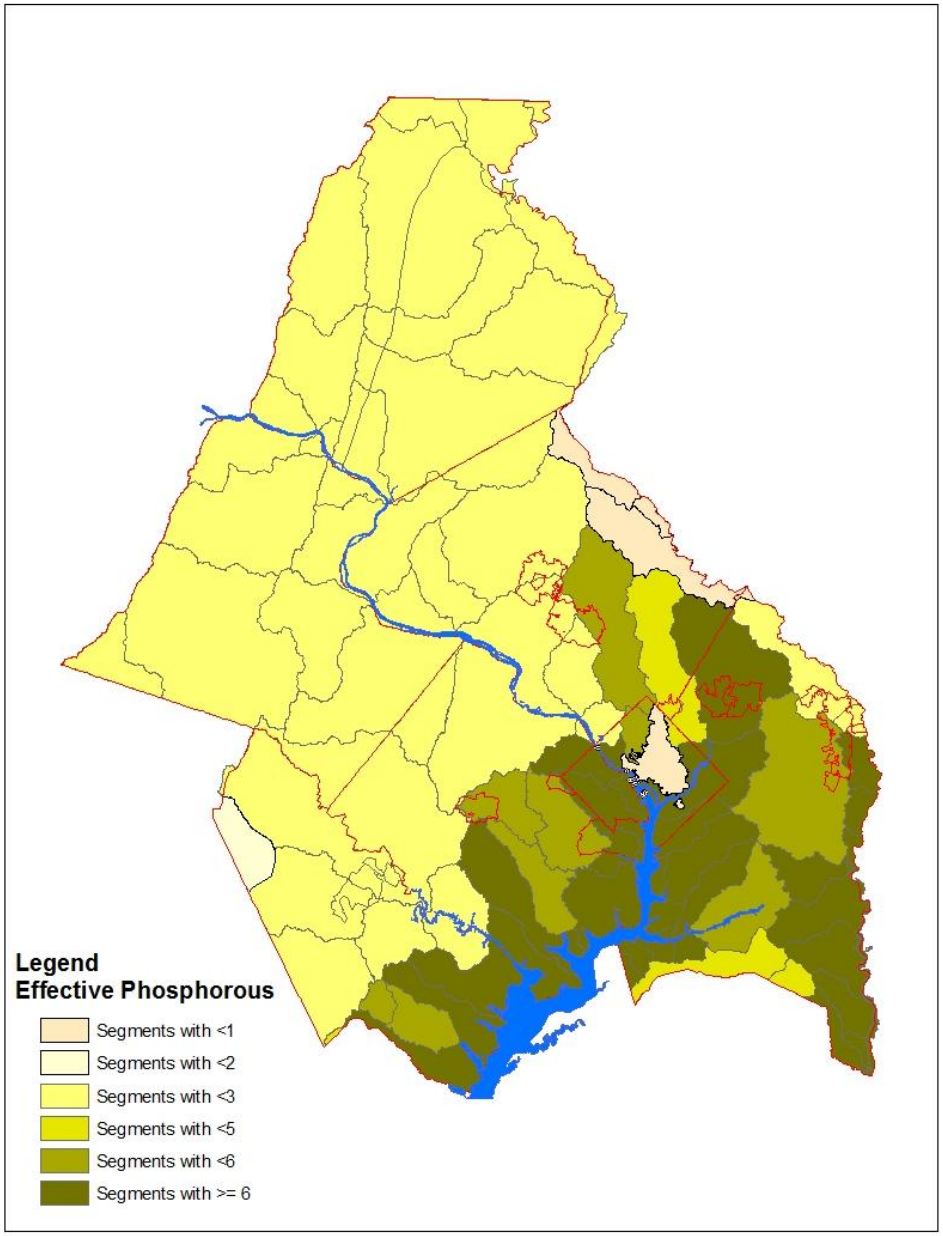
Relative Effectiveness for Nitrogen

- CBP measure of extent to which nutrients contribute to DO levels in main Bay
- Based on two components: delivery ratios X estuarine effectiveness
- Because estuarine effectiveness is relatively stable across Potomac watershed, mostly reflect delivery ratios
- Used in MD suballocation process (VA - ?)



Relative Effectiveness for Phosphorus

- Delivery ratios X estuarine effectiveness
- Because estuarine effectiveness is relatively stable across Potomac watershed, mostly reflect delivery ratios
- Used in MD suballocation process (VA - ?)



Relative estuarine effectiveness

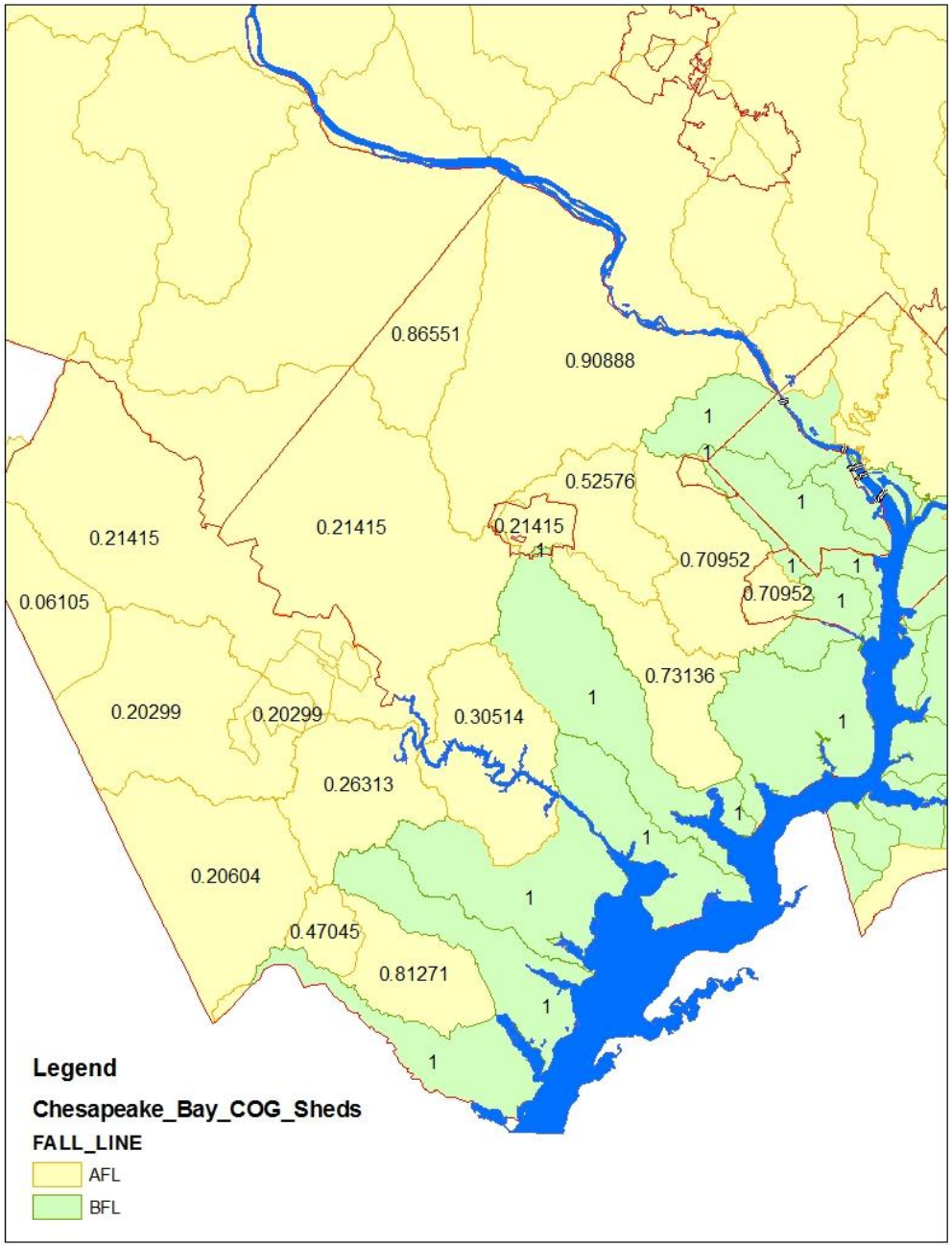
Basin-state	TN (from WWTPs)	TN (all other sources)	TP (from WWTPs)	TP (all other sources)
EshVA, VA	5.72	5.72	5.72	5.72
JmsA, VA	0.23	0.25	0.33	0.31
JmsA, WV	0.06	0.06	0.34	0.34
JmsB, VA	0.79	0.61	0.79	0.70
LowES, DE	7.93	7.30	7.97	7.46
LowES, MD	7.88	7.37	7.89	7.55
MidES, DE	4.13	4.74	5.51	5.83
MidES, MD	6.91	6.49	6.92	6.71
PotA, DC	6.09	6.09	3.08	3.08
PotA, MD	3.32	3.25	2.99	2.99
PotA, PA	2.10	1.98	3.08	3.08
PotA, VA	1.45	1.97	3.08	3.08
PotA, WV	1.34	1.72	2.12	2.89
PotB, DC	6.17	5.15	6.17	5.62
PotB, MD	6.17	4.86	6.12	5.75
PotB, VA	5.54	3.54	5.49	4.62
PxtA, MD	1.89	1.25	1.66	1.58
PxtB, MD	6.38	6.20	6.38	6.10
RapA, VA	1.05	0.83	2.10	2.10
RapB, VA	4.48	4.41	4.48	4.47
Susq, MD	9.39	8.68	9.11	8.77
Susq, NY	5.60	4.58	4.25	4.11
Susq, PA	6.99	6.44	4.38	4.58
UpES, DE	6.75	6.75	7.10	7.10
UpES, MD	7.49	7.27	7.49	7.40
UpES, PA	5.50	5.95	6.12	6.47
Wsh, MD	7.83	4.98	7.68	6.13
Wsh, PA	2.23	2.23	2.61	2.61
YrkA, VA	0.37	0.31	0.43	0.40
YrkB, VA	1.85	1.77	1.85	1.82

CBP measure of extent to which nutrients in particular tidal segment contribute to DO levels in main Bay

Source: EPA Chesapeake Bay Program

Delivery Factors for Nitrogen in COG Region

- CBP measure of extent to which nutrients in particular stream reach contribute to tidal (delivered) loads
- Reflects riverine transport processes
- Ratio of edge of stream loads to delivered loads



Model Upgrade – Urban Land Estimation

- CBP modelling team (Peter Claggett) developing new land use methodology to correct Phase 5.3 issue
  - Undercounts urban acreage (particularly pervious urban)
  - In Phase 5.3.0, developed land use based solely on satellite data (except extractive use)
  - In Phase 5.3.1, developed land use based on combination of satellite data and ancillary data from road networks, housing units and population
  - For new phase, developed land may change significantly based on stakeholder and expert (STAC panel) review
- Open to state (local - ?) government comment on assumptions regarding average imperviousness of various lot sizes, rural road widths, etc.

What's Next - ?

- Load analysis at local level (land-river segment) on hold; no one wants to work with outdated numbers
- BMP analysis (by number, type and acres treated)
- ???