Export Rate Targets for the October Version of the Phase 6 Watershed Model

Modeling Quarterly Review
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Calibration targets - aka export rates

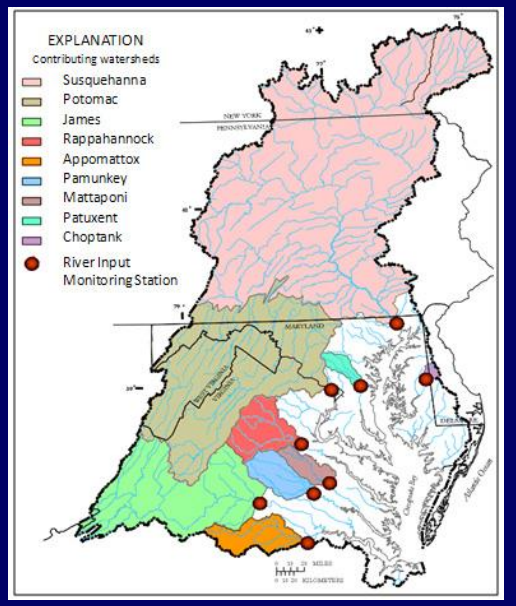
- What comes off the land?
- Based on monitored loads
- Four scales
  - Watershed-wide “land” loads
  - Large Land use group loads, watershed-wide
  - P6 Land Use loads, watershed wide
  - P6 Land Use loads by land segment

Think average everything

- Process relies on relative differences among land use groups and land uses within a group

Watershed Land Loads

- Monitored loads at RIM stations 1993-2014, averaged and summed + unbiased estimate of land loads downstream of RIMs
- Subtract out:
  - Point sources
  - Atmospheric deposition to water
  - Septic
  - AFO/CFO
  - River attenuation effects
  - Small stream attenuation effects
  - BMP effects



- Leaves edge-of-small stream loads to distribute to land

Global Targets

TN≈ 400 MM lb/yr, avg.

TP≈ 30 MM lb/yr, avg.

* These and all numbers that follow in this presentation are approximate and will change!

Large Land Groups

- Global Targets = Σ loads from four groups
- Crop, Pasture/Hay, Developed, Natural
- Relative load ratios determined from multiple models – Sparrow, Phase 5, CEAP (CEAP not used for developed)
- Relative differences from each applicable model averaged

Large Land Group Ratios and Areas

Group	TN	TP	Area
Cropland	1.00	1.00	3,758,086
Pasture/Hay	0.457	0.671	5,309,802
Developed	0.402	0.545	6,519,627
Natural	0.058	0.052	25,548,851

Large Land Group Example

Global Nitrogen = (C+D+N+P) = 400 MM lb/yr

$N = (Ac*Rc + Ad*Rd + An*Rn + Ap*Rp)$

Rc=Rc Rd=0.402Rc Rn=0.058Rc Rp= 0.457Rc (relative load ratios)

Ac = 3.8MM Ad = 6.5MM An = 25.5MM Ap = 5.3MM (acres)

$400 = Ac*Rc + Ad*Rd + An*Rn + Ap*Rp$

$400 = 3.8*Rc + 6.5*0.402*Rc + 25.5*0.058*Rc + 5.3*0.457*Rc$

$400 = Rc*(3.8+2.6+1.5+2.4)$

Rc = 400/10.3 = 38.8 lb N/acre-yr

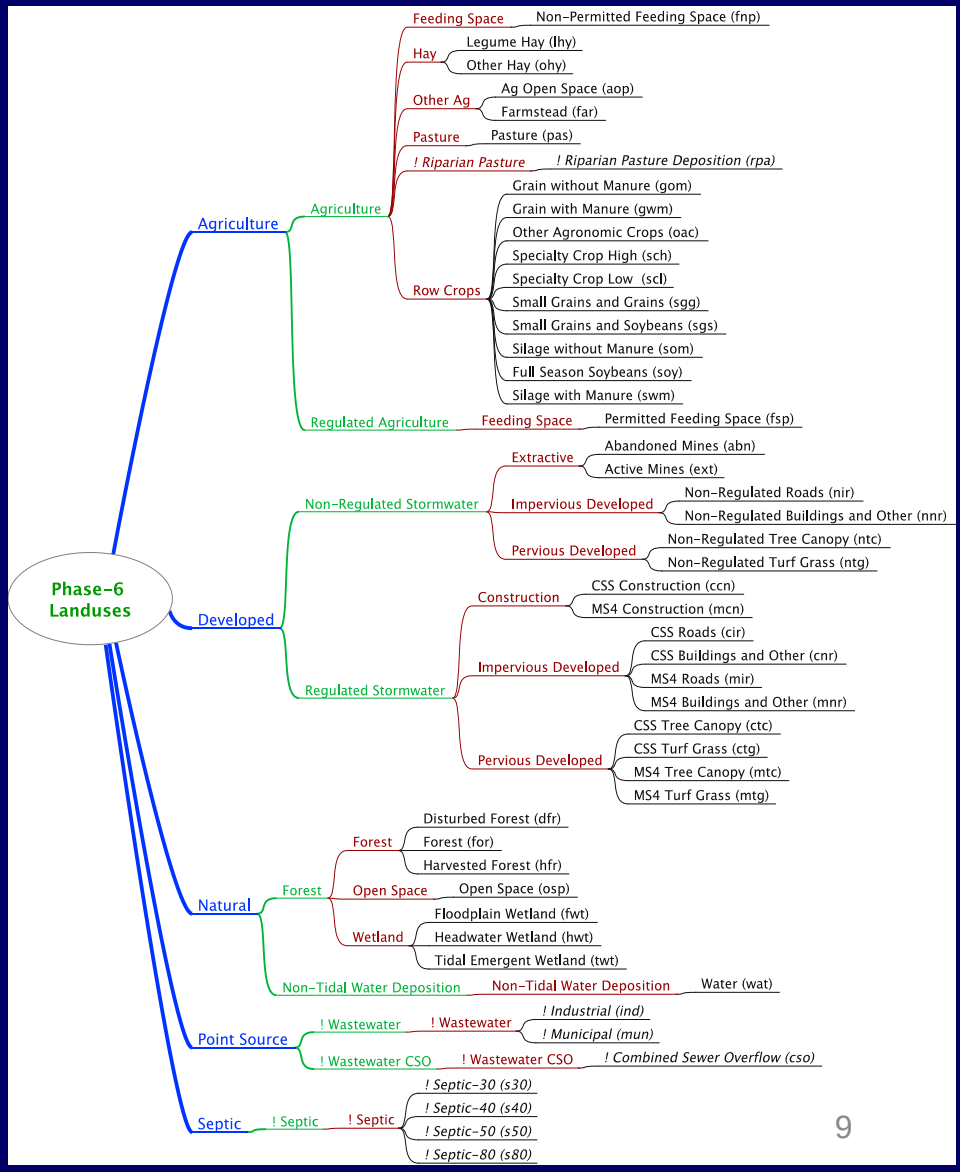
C = 38.8 lb N/acre-yr * 3,800,000 acres = 147 MM lb N/yr

Large Land Group Loads

Group	Area (MM acres)	Unit Area Load (lb/acre/yr)	Total N Load (MM lb N/yr)
Cropland	3.8	38.8	147
Pasture/Hay	5.3	17.7	94
Developed	6.5	15.6	101
Natural	25.5	2.3	58
Total	41.1		400

P6 Land Uses

- Calculation process is same
- Ratios provided by WQGIT Workgroups
- Each sector workgroup selected a base land use and provided relative rates



Developed Land Ratios and Areas

Group	TN	TP	Area
Roads	1.000	1.000	703,061
Tree Canopy over Roads	1.000	1.000	1,719,834
Turf	0.479	1.000	3,021,469
Tree Canopy over Turf	0.479	1.000	191,093
Construction	1.194	3.887	74,802
Buildings	0.786	0.794	782,367

Variability

- Spatial disaggregation of the average land use loads to land segments by
  - segment input difference from *average* * sensitivity
  - land to water variance factors

- At this point we have *EOSS* land targets for each land use in each land segment

After we have the targets

- *For each land segment, average land targets modified by segment-specific input differences from average and sensitivities*
- *BMPs applied*
- *Land to water variance factors applied*
- *Small stream attenuation credited*
- *Delivery factors applied*

Land Target + ∑(Sensitivity(input - average)) EOSS

*

BMPs EOSS

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Watershed Delivery Variance EOSS

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Stream Delivery EOS

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River Delivery DEL

Calibration Process

Target loads are potentially subject to modification during calibration; rates may be adjusted but relative differences will be maintained.

Loads may not need further adjustment. We need to finalize all inputs and then see what is necessary and practical.

Improvements over Phase 5.3.2

- Transparency
- Broad involvement of workgroups and others
- Multiple models that better represent the Chesapeake Bay region than solely using literature from a broader geographic area

Phase 6 WSM Targets – Data Flow