P6 Land Use Target Process

Modeling and WQGIT Workgroups

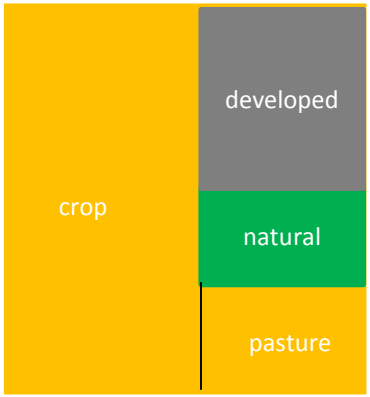
July 27, 2015

Today's Goal

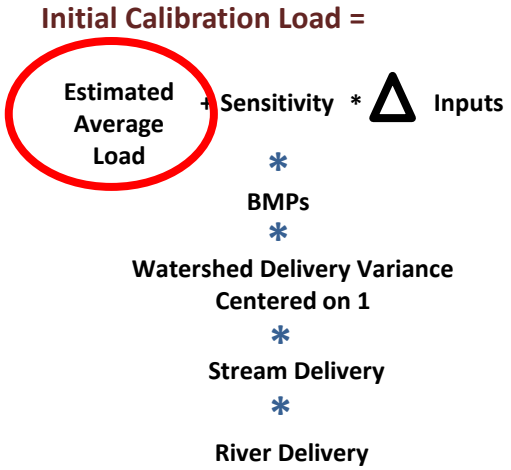
Your understanding of the process

Process is relatively simple, but hard to explain

Olivia



Gary



Build on those communications today

Targets - aka export rates

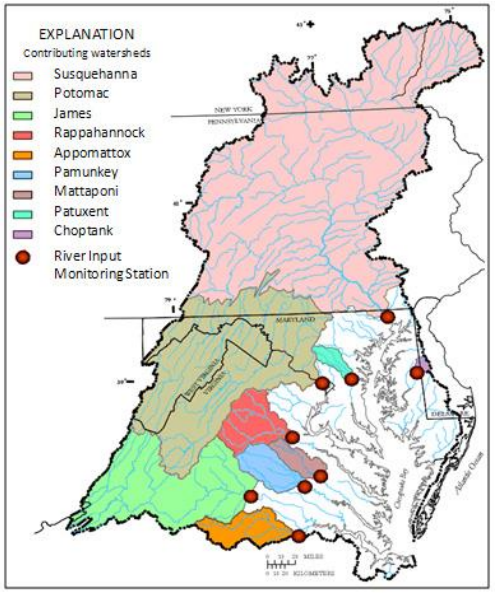
- What comes off the land?
- Based on monitored loads
- Four scales
  - Watershed-wide “land” loads
  - Large Land use group loads, watershed-wide
  - P6 Land Use loads, watershed wide
  - P6 Land Use loads by land segment

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 1993-2013, 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
- Leaves Edge-of-Small-Stream loads to distribute to land



Global Targets

TN≈ 400 MM #/yr, avg.

TP≈ 30 MM #/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#/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 # N/acre-yr

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

Large Land Group Loads

Group	Area (MM acres)	Unit Area Load (#N/acre/yr)	Total N Load (MM #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
- Will give “Developed” example

Developed Land Ratios and Areas

Group	TN	TP	Area
Roads	1.000	1.000	703,061
Turf	0.479	1.000	3,021,469
Tree Canopy	0.116	0.242	1,910,927
Construction	1.194	3.887	74,802
Buildings	0.786	0.794	782,367

P6 Land Use Example

Developed Nitrogen = (R+T+TC+CN+B) = 101 MM#/yr
(imp. roads, turf, tree canopy, construction, imp buildings)

N = (Ar*Rr + At*Rt + Atc*Rtc + Acn*Rcn +Ab*Rb)

Rr=Rr Rt=0.0.479Rr Rtc=0.116Rr Rcn= 1.194Rr Rb=0.786Rr (relative load ratios)
Ar = 0.7 MM At = 3.0 MM Atc = 1.9 MM Acn = 0.08 MM Ab= 0.8 MM (acres)

101 = (Ar*Rr + At*Rt + Atc*Rtc + Acn*Rcn +Ab*Rb)
101 = 0.7*Rr+ 3.0* 0.479*Rr + 1.9* 0.116*Rr + 0.08*1.194*Rr+0.8*0.786*Rr
101 = Rr*(0.7+1.44+0.22+0.1+0.63)

Rr = 101/3.1 = 32.6 # N/acre-yr
R = 32.6 #N/acre-yr * 700,000 acres = 23 MM #N/yr

Developed Land Use Loads

Group	Area (MM acres)	Unit Area Load (#N/acre/yr)	Total N Load (MM #N/yr)
Roads	0.7	32.2	23
Turf	3.0	15.4	46
Tree Canopy	1.9	3.7	7
Construction	0.1	38.3	4
Buildings	0.8	25.3	20
Total	6.5		100

Variability

- Spatial disaggregation of the average land use loads to land segments by
  - segment input differences from *average* x sensitivity
  - land to water variance factors (that are generally centered on 1)
- At this point we will have *EOSS* land targets for each land use in each land segment

After we have the targets…….

For each land segment, average land use targets modified by segment-specific input differences from average and sensitivities

Land Use Target + (Sensitivity * Δ Inputs) — EOSS

*

BMPs applied

BMPs — EOSS

*

Land to water variance factors applied

Watershed Delivery Variance Centered on 1 — EOSS

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Small stream attenuation credited

Stream Delivery — EOS

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Delivery factors applied

River Delivery — DEL

Disclaimer

Target loads are potentially subject to modification during calibration; Overall rates may be adjusted and relative differences will be modified only as a last resort.

But we may not need to adjust targets. We need to finalize all inputs and then see what adjustments are necessary and practical. Adjustments of “downstream” factors are possible.