Phase 6 Land Use Calibration Targets

Agricultural Workgroup

February 19, 2015

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Export Rates and Targets

- Export rates from multiple models and literature are used to inform the targets

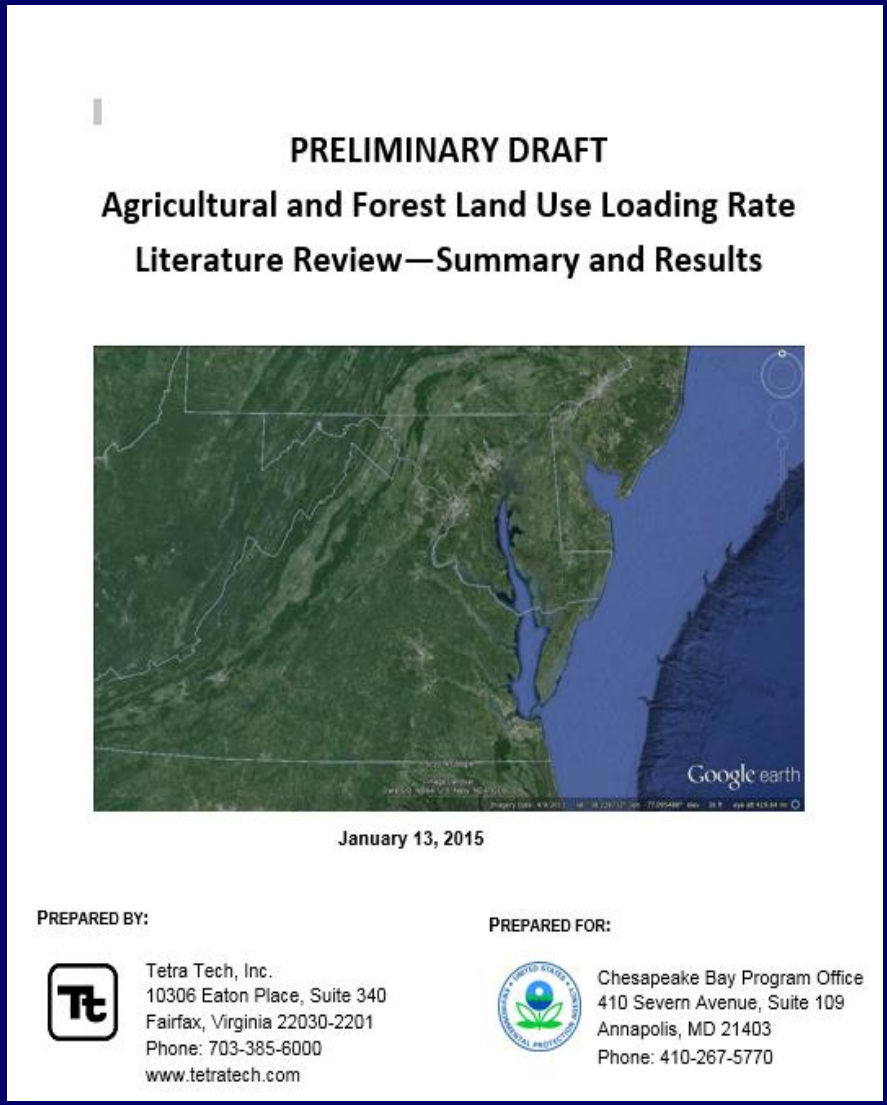
- Targets are specified export rates used to calibrate the Phase 6 Watershed Model
  - Do not include BMPs
  - Orders the influence of different land uses
  - Vary geographically based on nutrient and hydrology inputs
  - Subject to modification through calibration: actual rate adjusted while relative differences maintained

Agricultural Land Uses Literature Review

Available on line on the Midpoint Assessment Website.

https://www.chesapeakebay.net/about/wmp_for_mpa_effort/land_use_load_literature_reviews

(or Google “CBP midpoint assessment literature review”)



PRELIMINARY DRAFT

Agricultural and Forest Land Use Loading Rate Literature Review—Summary and Results

January 13, 2015

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Additional Information Gathering

- Agriculture “Grey” Literature (collected by Virginia Tech/CBW-ROC)
  - Unpublished, not peer reviewed
  - May include negative results
  - Negative results are generally considered to be systematically censored in peer-reviewed publications; meta-analysis from peer-reviewed sources may be systematically biased

Land Uses: Agricultural

- Backed out BMPs
- Excluded local TMDL data that was based on Phase 5 WSM loads and other local TMDL data since export rates were developed with different assumptions and for different purposes
- Cross-walked literature review land uses to proposed Phase 6 land uses
- Data weighted based on location
- For targets, use studies from 1995 or later
  - Tetra Tech analysis showed higher loads for TN and TP post 1995

Reasons to Differentiate Land Uses

- Literature, models, other data sources offer distinct land use loading rates
- BMPs are exclusive to one type of land use (e.g.: stream corridor buffers or fencing)
- Helps jurisdictions for planning and reporting purposes (in this case, there would not be a different loading rate).

Agricultural Land Uses

Literature Review = 9

Level 1	Level 2	Level 3
2.1 Commodity crops	__TBD	__TBD
2.1 Commodity crops	2.1.1 Corn - With manure	2.1.1.1 Grain - fallow
2.1 Commodity crops	2.1.1 Corn - With manure	2.1.1.2 Grain - fall sm grain
2.1 Commodity crops	2.1.2 Soybeans - With Manure	2.1.2.2 Fall sm grain
2.1 Commodity crops	2.1.3 Small grains-with manure	2.1.3.3 Sm grain - fallow
2.1 Commodity crops	2.1.4 Corn - Without manure	2.1.4.2 Grain - fall sm grain
2.2 Hay and Legume and forage	2.2.2 Non-legume Forage	2.2.2.1 Non-Legume Forage with manure
2.2 Hay and Legume and forage	2.2.3 Pasture and pastured cropland	2.2.3 Pasture and pastured cropland
2.3 Specialty & Other crops	2.3.3 High cover	2.3.3.1 High nutrient input

Proposed = 34

Level 1	Level 2	Level 3
2.1 Commodity crops	2.1.1 Corn - With manure	2.1.1.1 Grain - fallow
		2.1.1.2 Grain - fall sm grain
		2.1.1.3 Silage - fallow
		2.1.1.4 Silage - fall sm grain
	2.1.2 Soybeans - With Manure	2.1.2.1 Fall fallow
		2.1.2.2 Fall sm grain
	2.1.3 Small grains-with manure	2.1.3.1 Sm grain - Dbl Crop Beans
		2.1.3.2 Forage
		2.1.3.3 Sm grain - fallow
	2.1.4 Corn - Without manure	2.1.4.1 Grain - fallow
		2.1.4.2 Grain - fall sm grain
		2.1.4.3 Silage - fallow
		2.1.4.4 Silage - fall sm grain
	2.1.5 Soybeans - Without Manure	2.1.2.1 Fall fallow
		2.1.2.2 Fall sm grain
	2.1.6 Small grains-Without manure	2.1.5.1 Sm grain - Dbl Crop Beans
		2.1.5.2 Forage
		2.1.5.3 Sm grain - fallow
2.2 Hay and Legume and forage	2.2.1 Alfalfa and Other Legumes	2.2.1.1 Alfalfa and Other Legumes with manure
		2.2.1.2 Alfalfa and Other Legumes without manure
	2.2.2 Non-legume Forage	2.2.2.1 Non-Legume Forage with manure
		2.2.2.2 Non-legume Forage without manure
	2.2.3 Pasture and pastured cropland	2.2.3 Pasture and pastured cropland
2.3 Speciality & Other crops	2.3.1 Vines	2.3.1.1 High nutrient input
		2.3.1.2 Medium and low nutrient input
	2.3.2 Low cover	2.3.2.1 High nutrient input
		2.3.2.2 Medium and low nutrient input
	2.3.3 High cover	2.3.3.1 High nutrient input
		2.3.3.2 Medium and low nutrient input
2.4 Animals	2.4.1 Animal Impervious	2.4.1.1 CAFO (regulated)
		2.4.1.2 AFO (unregulated)
2.5 Farmstead	2.5.1 Impervious	2.5.1 Impervious
	2.5.2 Pervious	2.5.2 Pervious

Nutrient Input Differences

- If desired, we can preserve:
  - Legume and non-legume forage, pasture and hay
  - Manured vs. non-manured

- Data to support land use target differences between Manured and Non-Manured and Legume can come from the nutrient inputs and AgChem export rate sensitivities, in addition to the limited data from the literature review

- For manured, Ag Census provides percent of crops receiving manure.
  - What is a valid method to project the ratio of manured : non-manured crops?

Proposed Agricultural Land Uses (13)

- Crops
  - Corn with and without manure
  - Soybeans with and without manure
  - Small grains with and without manure
- Hay and Pasture and Forage
  - Leguminous alfalfa and other hay, pasture and forage
  - Non-leguminous hay, pasture and forage
  - Unfertilized open areas
- Specialty and other crops
- Animal production areas
  - Regulated and unregulated
- Farmsteads
  - Pervious and impervious

BMPs and Phase 5 Land Uses—Row

- Alternative Crops
- Cover Crop
- Cropland Irrigation Management
- Dairy Manure Injection
- Forest Buffers
- Grass Buffers; Vegetated Open Channel - Agriculture
- Land Retirement to hay without nutrients (HEL)
- Land Retirement to pasture (HEL)
- Narrow Forest Buffer
- Narrow Grass Buffer
- Nutrient Management
- Poultry Litter Injection
- Soil Conservation and Water Quality Plans
- Sorbing Materials in Ag Ditches
- Tillage
- Tree Planting
- Water Control Structures
- Wetland Restoration

BMPs and Phase 5 Land Uses—Pasture Hay

- Dairy Manure Injection
- Forest Buffers
- Grass Buffers; Vegetated Open Channel - Agriculture
- Horse Pasture Management
- Land Retirement to hay without nutrients (HEL)
- Land Retirement to pasture (HEL)
- Narrow Forest Buffer
- Narrow Grass Buffer
- Nutrient Management
- Off Stream Watering Without Fencing
- Poultry Litter Injection
- Precision Intensive Rotational Grazing
- Prescribed Grazing
- Soil Conservation and Water Quality Plans
- Sorbing Materials in Ag Ditches
- Stream Access Control with Fencing
- Streamside Forest Buffers
- Streamside Grass Buffers
- Streamside Wetland Restoration
- Tree Planting
- Water Control Structures
- Wetland Restoration

BMPs and Phase 5 Land Uses—Neither row nor pasture or hay

BMP	Land Use Group
Barnyard Runoff Control	afocafo
Loafing Lot Management	afocafo
Irrigation Water Capture Reuse	nursery
Nutrient Management	nursery
Soil Conservation and Water Quality Plans	nursery
Sorbing Materials in Ag Ditches	nursery
Dirt and Gravel Roads	Load Reduction
Non Urban Stream Restoration	Load Reduction
Shoreline Erosion Control	Load Reduction

Location of Literature Review Studies

Export rates are weighted based on location of study for each land use

CBWS and similar	Semiarid (pending more info)	Out of Country—Do Not Use	Humid Subtropical	Humid Continental, not CBWS
80%	2%	0%	10%	10%
MD	TX	NZ	GA	MN
PA	OK	CAN	NC	IL
VA	SD		AL	IA
OH	NE		LA	IN
				WI
				MO

Date of Study

- Tetra Tech analysis showed higher loads for TN and TP post 1995
- Calibration period is extended from 1985 to 2013 (possibly 2014)
- The post-1995 time period dominates.
- Decision to use the data from the 1995 averages

Role of Sparrow

- Sparrow's strengths are indicating the differences among large land use categories
  - Pasture vs. cropland
  - edge of small stream export rates by land use

- Sparrow generates uncertainty estimates

Role of Workgroups

Chesapeake Bay Program committees, goal implementation teams, workgroups or action teams	Meeting Date
Modeling Team Meeting	9/15/2014, 1/20/2015
Land Use Workgroup	9/25/2014; **2/26/2015**
Modeling Quarterly Review	9/30/2014, 1/29/2015
Forestry Workgroup	10/1/2014, **3/4/2015**
Watershed Technical Workgroup	10/2/2014
Agricultural Workgroup	10/9/2014, 10/22/2014, **2/19/2015**
Wetlands Expert Panel	11/12/2014
Agricultural Modeling Subcommittee	9/16/2014,12/16/2014, **2/12/2015, 2/18/2015**
Urban Stormwater workgroup	10/21/2014, 12/16/2014, **3/3/2015**

- Panel, workgroup documents and recommendations, and available literature are critical sources of data in addition to the full literature review
- Modeling workgroup approves the final Phase 6 model

Timeline

- December 31, 2014 - Sparrow and literature review results for draft land uses
- January 28, 2015 – Input from Modeling Workgroup on draft targets for draft land uses
- April 30, 2015 - final targets approved by Modeling Workgroup for draft land uses
- Oct 1, 2015 - Once the final land uses are approved, we will finalize targets using a Sparrow update, final sensitivities, and other information.