Quantitative Nutrient Reduction Estimates and WSI's Nutrient Load Estimator

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2011 SWCS International Annual Conference
July 19, 2011

What is NLE?

- Nutrient Load Estimator (NLE) is a web-based software tool
- Developed by Water Stewardship, Inc. (WSI) in 2009
- Provides quantitative estimates of nutrient and sediment reduction activities
- Estimates are for agricultural or urban tracts at a local land-river segment level (community level)
- Results similar to results from the Chesapeake Bay Program Watershed Model (CBP WSM)

How does NLE work?

- NLE is a post-processer, not a simulation model
- Methodology and numbers adapted from Phase 5.3 of the CBP WSM
- Takes No BMP landuse loads generated by the CBP WSM and applies BMPs to those loads using application protocols adapted from those used in the CBP WSM

Landuse Loads

- Loads in NLE represent the average loads from different landuses in a specific land-river segment- NLE does not simulate a farm's actual loads
- Uses landuse loads from the CBP WSM calibration and No Action scenarios to represent No BMP loads
- Landuse loads available for total nitrogen, total phosphorus, and sediment
- Loads vary by land river segment and landuse type
- Estimates the local edge of stream load and the load delivered to tidal waters

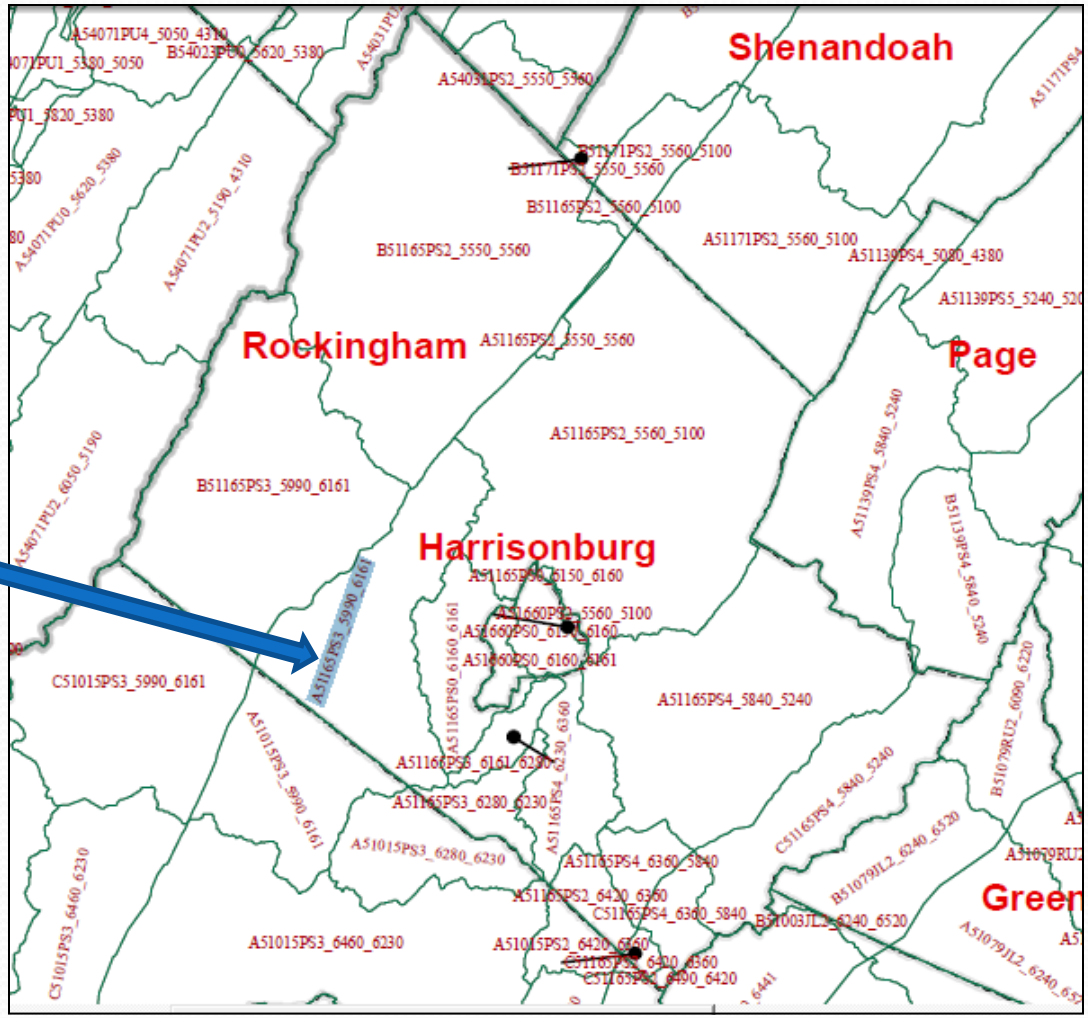
BMPs

- NLE uses CBP WSM BMP efficiencies and application protocols adapted for the farm/parcel level
- BMPs are applied to landuse acres or animal populations
- BMPs include structural, management, and land conversion practices

Example Farm: Background Info

Location

- Rockingham County, Virginia
- Land-River Segment: A51165PS3_5990_6161



Example Farm: Background Info

- **Pre-BMP acres**
  - 1 acre specialty crops
  - 133 acres row crops
  - 18 acres hay
  - 3 acres pasture
  - 0.2 acres degraded stream corridor
- **Animal numbers and time in confinement**
  - 75 Dairy Cows: 70% confinement, 30% denuded pasture
  - 65 Dairy Heifers: 50% confined, 50% denuded pasture

Example Farm: Scenario Info

- **Existing Scenario BMPs**
  - Conservation Tillage
  - Stream Fencing
  - Grass Buffers
  - Mortality Management
- **Continuous Improvement Program (CIP) Scenario BMPs**
  - All existing BMPs
  - Nutrient Management
  - Continuous No-Till
  - Covered Feeding Area and Pasture Management

NLE Results: Scenario Comparison

Animals

Animal	Number	Confinement Fraction	Denuded Pasture Fraction
Dairy Cows	75	0.7	0.3
Dairy Heifers	65	0.5	0.5

Landuse Acres

Landuse	No BMP Acres	Existing Acres	CIP Acres
Row Crops	133	0	0
Row Crops- Low Till	0	132.3	0
Row Crops w/ Nutrient Mngmt- Low Till	0	0	132.3
Unfertilized Grass	0	1	0.9
TOTAL	160.2	160.2	160.2

Existing Landuse Change and Efficiency BMPs

BMP	Landuse	Amount Submitted	Amount Credited
Conservation Tillage	Row Crops	133 acres	133 acres
Grass Buffers (Agriculture)	Row Crops- Low Till	0.7 acres	0.7 acres

CIP Landuse Change and Efficiency BMPs

BMP	Landuse	Amount Submitted	Amount Credited
Conservation Tillage	Row Crops	133 acres	133 acres
Nutrient Management	Row Crops- Low Till	133 acres	133 acres
Grass Buffers (Agriculture)	Row Crops w/ Nutrient Mngmt- Low Till	0.7 acres	0.7 acres
Commodity Cover Crop-Standard Other Barley	Row Crops w/ Nutrient Mngmt- Low Till	133 acres	132.3 acres
Continuous No-Till	Row Crops w/ Nutrient Mngmt- Low Till	133 acres	132.3 acres

Existing Animal BMPs

BMP	BMP Location	Animal	Time Confined	Amount Submitted	Amount Credited	Unit
Mortality Management	Animal Confinement Area	Dairy Cows	0.7	75	75	Total flock or herd size

CIP Animal BMPs

BMP	BMP Location	Animal	Time Confined	Amount Submitted	Amount Credited	Unit
Covered Feeding Area and Pasture Management	Denuded Pasture	Dairy Cows	0.7	75	75	Animals
Covered Feeding Area and Pasture Management	Denuded Pasture	Dairy Heifers	0.5	65	65	Animals
Mortality Management	Animal Confinement Area	Dairy Cows	0.7	75	75	Total flock or herd size

Edge of Stream Nutrient Loads

No BMP N Load (lbs/yr)	Existing N Load (lbs/yr)	CIP N Load (lbs/yr)	No BMP P Load (lbs/yr)	Existing P Load (lbs/yr)	CIP P Load (lbs/yr)
13,867.8	12,740.8	8,976.3	739.0	649.4	366.7

Load Reduction Percentages from No BMP Load – Edge of Stream

Existing N Load (%)	CIP No Load (%)	Existing P Load (%)	CIP P Load (%)
8.1	35.3	12.1	50.4

Adaptation Challenges

Challenges that arose when developing NLE included:

#1 Moving from landuse loads and methodology that were developed at the land-river segment level (smallest unit in CBP WSM) to a farm/tract level

#2 Determining how to represent practices/situations that are present in the real world but do not currently fit into the CBP WSM

Challenge 1: Moving to Tract Level

- Broad assumptions are often necessary when modeling at the land-river segment level
- When working at a farm-level, we actually see what is on the ground and how different areas interact
- Must adapt assumptions to be more farm-specific
- Example: Upland Buffer Benefit
  - CBP WSM- Upland benefit from a forest buffer is proportioned out among all ag landuses
  - NLE- Upland benefit is assigned to the landuse that the forest buffer is converted from

Challenge 2: New Practices

- Must determine how to best represent BMPs/situations that are not in the CBP WSM
- Will discuss these issues with CBP in an effort to have them addressed in the CBP WSM
- For now, placeholders are needed in NLE to enable us to complete our farm assessments
- Example: Backgrounding Cattle/Denuded Feeding Areas
  - Cattle receiving supplemental feed in an unenclosed area with no manure collection
  - Does not fit into existing pasture or confinement area landuse
  - Load for new NLE landuse based on manure deposited in denuded feeding area
  - BMP reductions adapted from existing confinement area BMPs