Riparian Buffer Nutrient Credit Yield

Subcommittee Meeting #2

June 4, 2009

Agenda

- Recap Last meeting
- Report on follow up items
- Discuss recommendation options

Recap of Last meeting

- Overview of current credit yield calculation
  - How benefits are calculated
  - Deficiencies with method
- Draft calculation method update
  - Policy guidelines for consideration
- Recommendations & Follow up task

Follow Up Tasks

- Clarify details of export coefficients
  - Surface runoff vs. subsurface
  - Uptake during transport over catchment area
  - Seek input from researchers
- Evaluate site specific catchment areas*

Report on Tasks

- Export Coefficients: Surface runoff vs. subsurface
  - Reviewed literature searches and available studies
  - Of the export coefficients studies reviewed, most were based on in-stream measurements and reflect contributions from both surface and subsurface

Report on Tasks

- Uptake during transport over catchment area
  - Contacted researchers at NCSU and Duke
  - Export coefficients reflect uptake and losses during transport
  - Caveats:
    - Many studies are conducted on small drainage areas where the potential for losses is small
    - Coefficients are sometimes applied to larger drainage areas where potential for uptake and losses can be much greater

Concerns Identified by Researchers

- Validity of “one size fits all” approach
  - Not all buffers have the same benefit
  - Location plays a large role and is not recognized in method
  - Need incentives for most effective buffer placement
- N & P reductions may not be as good as we think
  - N&P delivered to buffers may be overestimated
  - Export coefficients do not account for site specific conditions
  - High variability of denitrification rates based on site conditions
  - Need to recognize differences in how N & P behave
- Coastal plain projects may not be removing much P
  - General lack of P loss from fields in coastal plain

Concerns Identified by Researchers

- Lack of water quality monitoring for projects
  - Actual nutrient reduction of projects therefore unknown
- Failure to consider nutrient saturation
  - Buffers may not be able to sustain P removal over time
- Overbank flooding may play larger role in reductions of N
  - Some buffers flood on regular basis while others not at all
  - Emphasis on location
- Researchers asked to be included in the discussion
  - Outcome of process could affect approach in other states

Recommendations

Options

A. Keep existing credit method for now. Move ahead with ACM. Convene experts to sort out issues as separate process.

B. Keep existing credit method for now. Add policy guidelines. Move ahead with ACM. Convene experts to sort out issues as separate process.

C. Keep existing credit method for now but use site specific catchment information in credit calc and add policy guidelines. Move ahead with ACM. Convene experts to sort out issues as separate process

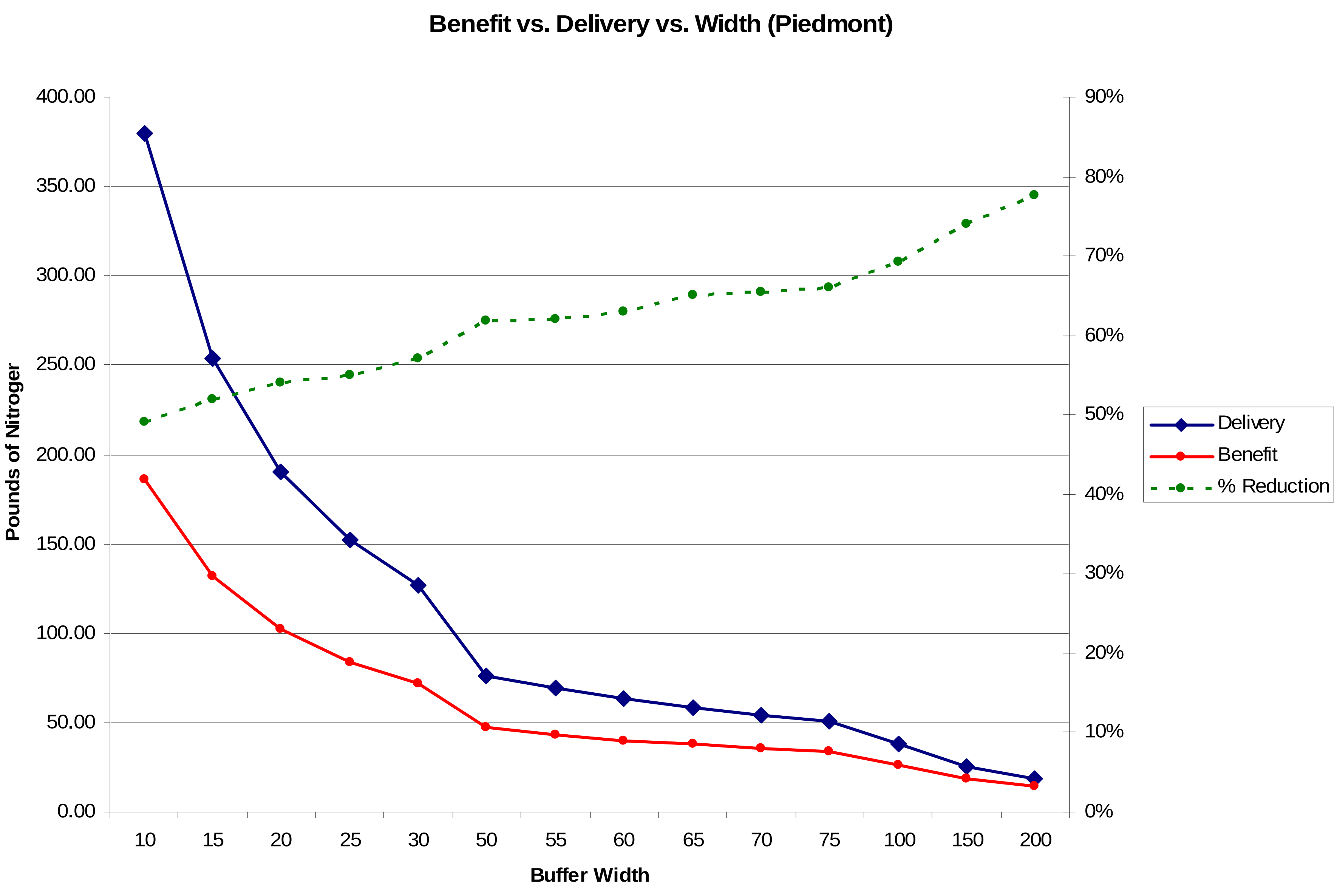
D. Resolve credit yield calculation through ACM process. (Resolve by July).

Policy Guidelines for Consideration

(Based on May 4th, 2009 Discussion)

- Locate buffers only on intermittent or perennial streams* (*Not needed, already policy*)
- Streams with buffers that are non-functioning cannot be used for credit. In piedmont, projects must address instability if present
- Land use in drainage area shall be agricultural* (*clarification needed*)
- Buffer width shall be 50 feet* (*More discussion needed*)

Slides in Reserve



Benefit vs. Delivery vs. Width (Piedmont)
Pounds of Nitroger
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
10
15
20
25
30
50
55
60
65
70
75
100
150
200
Buffer Width
Delivery
Benefit
% Reduction

Piedmont Region

Drainage Density (Stream miles / mi2 draiange area)	Buffer Width (Feet)	Drainage Area Conversion (Acres)	N Reduction (%)	Export Coefficient (lbs/ac)	Removal (lbs/ac)
9.39	10	28.12	49%	13.52	186.3
9.39	15	18.74	52%	13.52	131.8
9.39	20	14.06	54%	13.52	102.6
9.39	25	11.25	55%	13.52	83.6
9.39	30	9.37	57%	13.52	72.2
9.39	50	5.62	61.8%	13.52	47.0
9.39	55	5.11	62%	13.52	42.8
9.39	60	4.69	63%	13.52	39.9
9.39	65	4.33	65%	13.52	38.0
9.39	70	4.02	65.5%	13.52	35.6
9.39	75	3.75	66%	13.52	33.5
9.39	100	2.81	69.3%	13.52	26.3
9.39	150	1.87	74%	13.52	18.8
9.39	200	1.41	77.6%	13.52	14.7

Graphed Data

Buffer Width (Fee	Delivery Rate (lbs)	Removal (lbs)	% N Reduction
10	380.12	186.3	49%
15	253.41	131.8	52%
20	190.06	102.6	54%
25	152.05	83.6	55%
30	126.71	72.2	57%
50	76.02	47.0	61.8%
55	69.11	42.8	62%
60	63.35	39.9	63%
65	58.48	38.0	65%
70	54.30	35.6	65.5%
75	50.68	33.5	66%
100	38.01	26.3	69.3%
150	25.34	18.8	74%
200	19.01	14.7	77.6%

Draft Buffer Drainage Area Calculations

I. Drainage Area Value (Piedmont Region)

Calculation #1: Drainage area per acres of buffer calculation for **50 ft buffers**

$$\frac{9.39 \text{ stream miles}}{\text{mi}^2 \text{ drainage area}} = \frac{.106 \text{ mi}^2 \text{ drainage area}}{\text{mile of stream}} \times \frac{640 \text{ Ac DA}}{\text{mi}^2 \text{ DA}} \times \frac{\text{mi stream}}{5280 \text{ ft}} \times \frac{1 \text{ ft stream}}{100 \text{ ft}^2 \text{ Buffer}} \times \frac{43,\ 560 \text{ ft2 buffer}}{1 \text{ acre of buffer}}$$

$$= \frac{.106 \text{ mi}^2 \text{ drainage area}}{\text{mile of stream}} \times 52.8$$

= 5.62 acres of drainage area per acre of 50’ buffer

Calculation #2: Drainage area per acres of buffer calculation for **200 ft buffers**

$$\frac{9.39 \text{ stream miles}}{\text{mi}^2 \text{ drainage area}} = \frac{.106 \text{ mi}^2 \text{ drainage area}}{\text{mile of stream}} \times \frac{640 \text{ Ac DA}}{\text{mi}^2 \text{ DA}} \times \frac{\text{mi stream}}{5280 \text{ ft}} \times \frac{1 \text{ ft stream}}{400 \text{ ft}^2 \text{ Buffer}} \times \frac{43,\ 560 \text{ ft2 buffer}}{1 \text{ acre of buffer}}$$

$$= \frac{.106 \text{ mi}^2 \text{ drainage area}}{\text{mile of stream}} \times 13.2$$

= 1.4 acres of drainage area per acre of 200’ buffer

I. Drainage Density Value (Inner-Coastal Plain Region)

Calculation #3: Drainage area per acres of buffer calculation for **50 ft buffers**

$$\frac{4.53 \text{ stream miles}}{\text{mi}^2 \text{ drainage area}} = \frac{.221 \text{ mi}^2 \text{ drainage area}}{\text{mile of stream}} \times \frac{640 \text{ Ac DA}}{\text{mi}^2 \text{ DA}} \times \frac{\text{mi stream}}{5280 \text{ ft}} \times \frac{1 \text{ ft stream}}{100 \text{ ft}^2 \text{ Buffer}} \times \frac{43,\ 560 \text{ ft2 buffer}}{1 \text{ acre of buffer}}$$

$$= \frac{.221 \text{ mi}^2 \text{ drainage area}}{\text{mile of stream}} \times 52.8$$

= 11.7 acres of drainage area per acre of 50’ buffer

Calculation #4: Drainage area per acres of buffer calculation for **200 ft buffers**

$$\frac{4.53 \text{ stream miles}}{\text{mi}^2 \text{ drainage area}} = \frac{.221 \text{ mi}^2 \text{ drainage area}}{\text{mile of stream}} \times \frac{640 \text{ Ac DA}}{\text{mi}^2 \text{ DA}} \times \frac{\text{mi stream}}{5280 \text{ ft}} \times \frac{1 \text{ ft stream}}{400 \text{ ft}^2 \text{ Buffer}} \times \frac{43,\ 560 \text{ ft2 buffer}}{1 \text{ acre of buffer}}$$

$$= \frac{.106 \text{ mi}^2 \text{ drainage area}}{\text{mile of stream}} \times 13.2$$

= 2.9 acres of drainage area per acre of 200’ buffer