Today's Agenda

- Introductions
- Sources and Credit Baselines Recap
- Potential Relative Credit Demand and Supply
- Relative Cost-Effectiveness among Nonpoint Source Credit Options
- Assessment of Trading Opportunities
- Trading Framework Models and Program Components
- Discussion of Framework Options and Preferences for Cape Fear
- Steps to develop draft Pilot Framework(s) for June 19 meeting discussion
- June-September Project Schedule

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Primary Objectives for Today

- Present high level assessment of most likely trading opportunities
  - relative demand, supply, comparative costs
  - not site-specific estimates
- Present implications of assessment for applicable and best-suited trading framework(s)
- Discuss preferred framework models for further development for presentation at June 19 meeting

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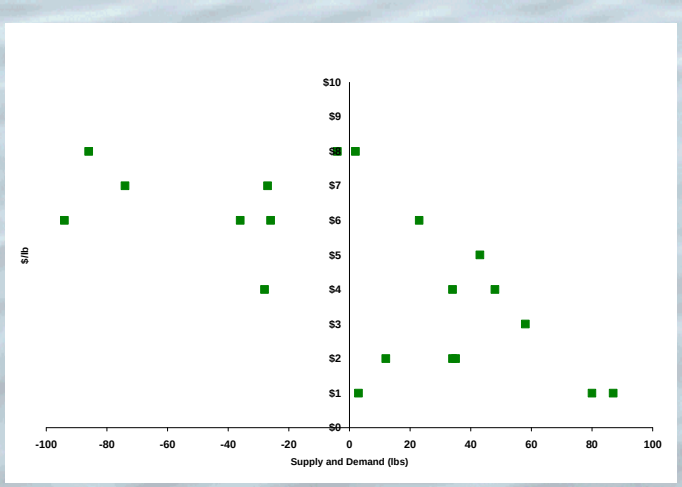
Why look at trading?

- Save money
- Better BMPs by type and/or location
- Faster progress toward goals



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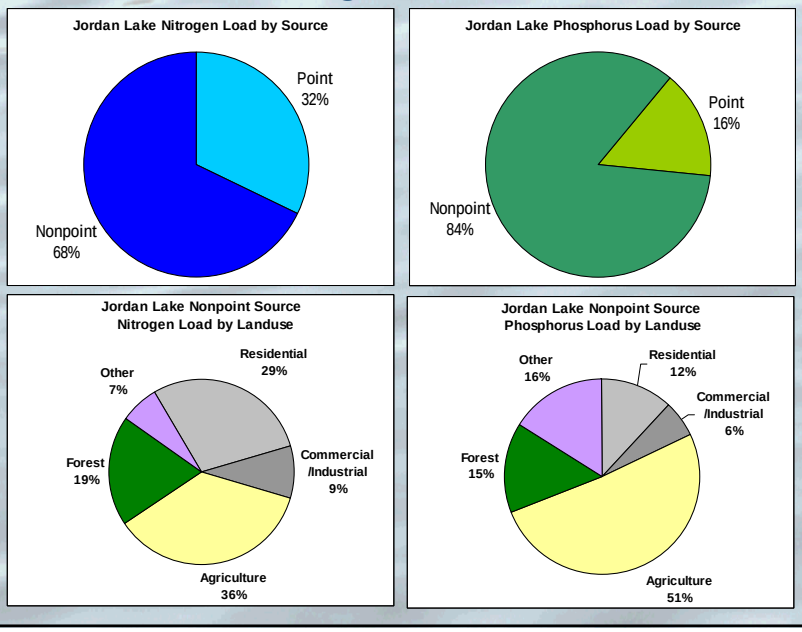
Relative Loadings in the Watershed



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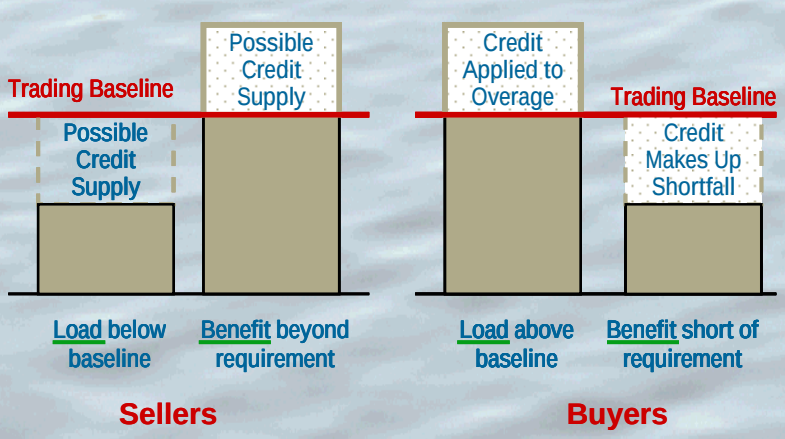
Performance versus trading baselines determines credit supply and demand



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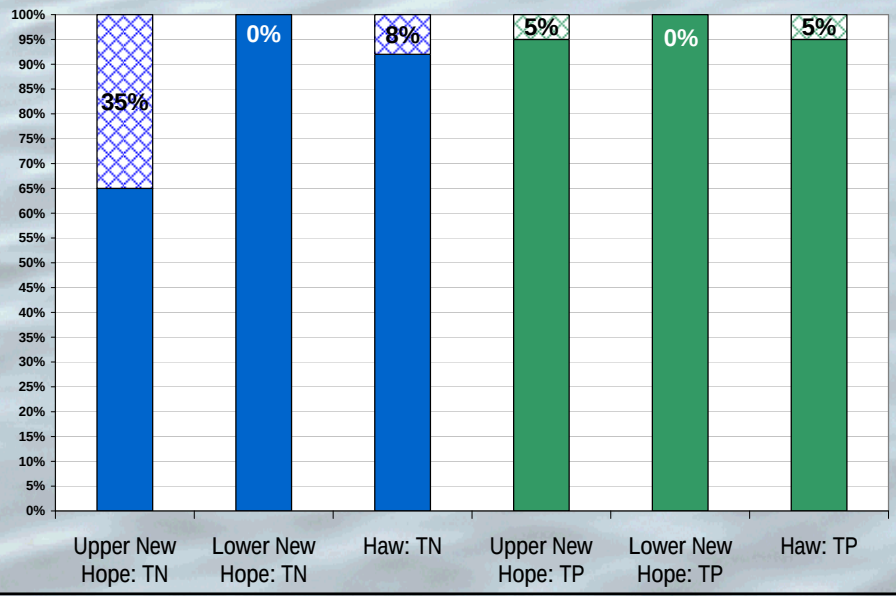
The TMDL establishes percent reduction targets for N and P



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Nitrogen compliance will be the primary driver of BMP selection

- Nonpoint source BMPs that meet TN targets will usually more than meet TP targets
- Analysis covers TP for completeness but will focus on TN

Photo by Debbie Roos, NC Cooperative Extension

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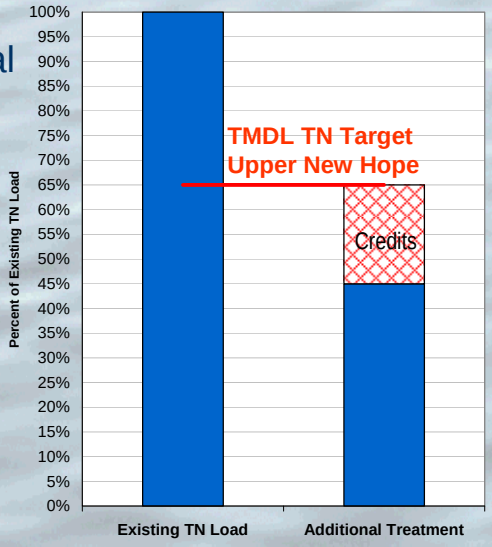
Potential credit opportunities for agriculture after targets attained

- Individual agricultural BMPs producing reductions beyond target may generate credits



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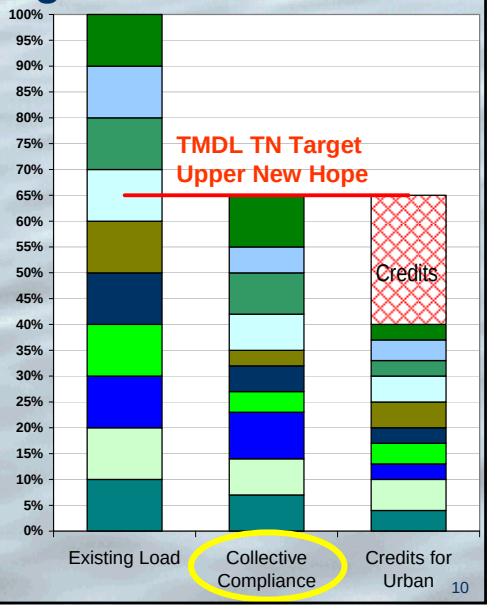
Potential credit opportunities for agriculture after targets attained

- Individual agricultural BMPs producing reductions beyond target may generate credits
- BUT, Ag sources may only trade with each other until collective target attained
  - Exception: livestock exclusion with buffer



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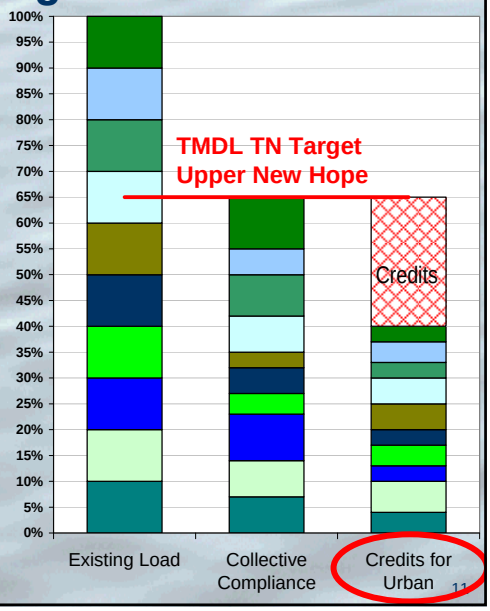
Potential credit opportunities for agriculture after targets attained

- Individual agricultural BMPs producing reductions beyond target may generate credits
- BUT, Ag sources may only trade with each other until collective target attained
  - Exception: livestock exclusion with buffer
- Then, may sell additional credits to other sources



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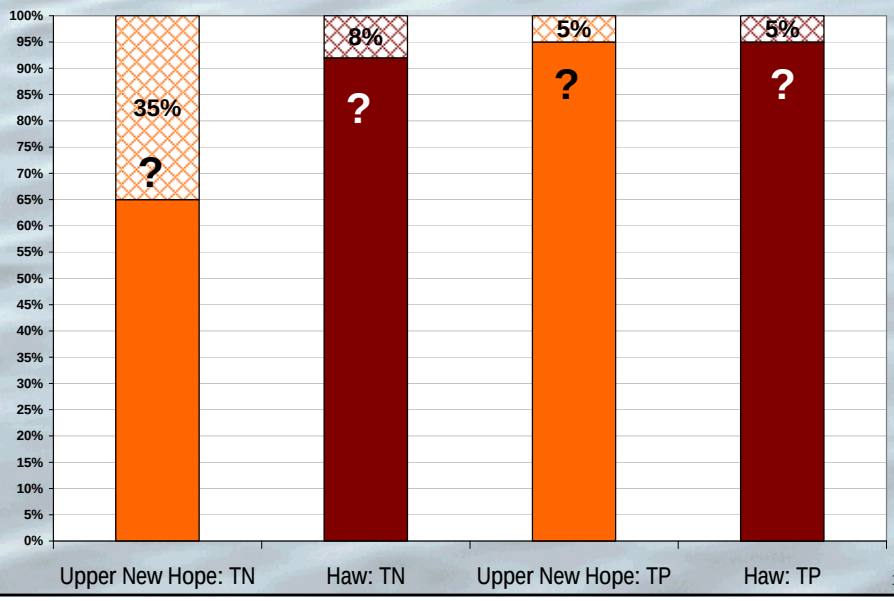
Where are agricultural sources in each watershed relative to their targets?



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Within agricultural sector, BMP selection will matter with efficiency differential

Agricultural BMPs	% TN reduction	% TP reduction
50 ft. Buffer	50%	75%
Cover crop	45%	15%
Grass waterway	40%	45%
Land conversion: Crop to Forest	88%	94%
Land conversion: Crop to Pasture	57%	80%
Land conversion: Pasture to Forest	72%	69%
Livestock exclusion - no Buffer	32%	35%
Livestock exclusion - with Buffer	65%	80%
Dry stacking *(not included 5/22/08)*	29%	14%

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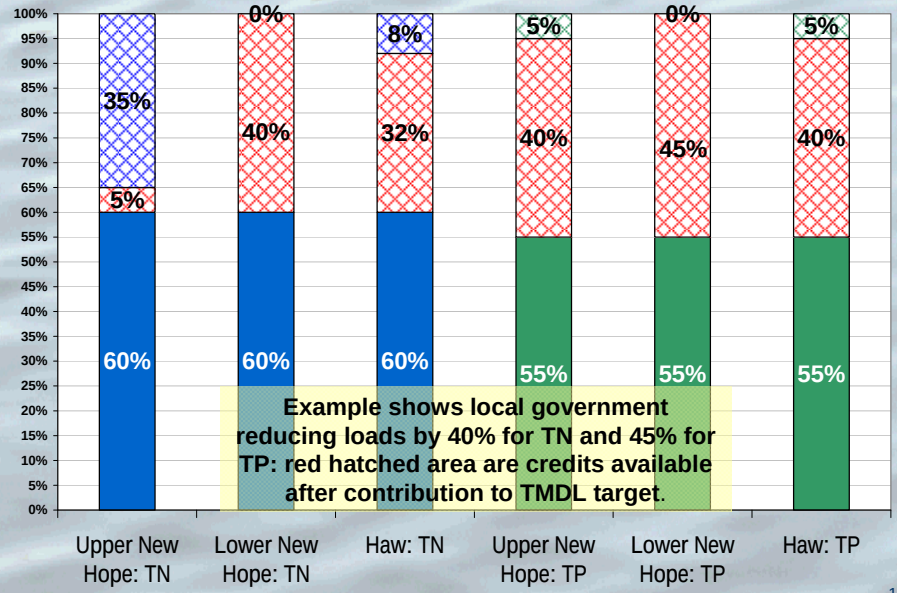
Existing development (aka local governments) can generate credits after meeting TMDL targets



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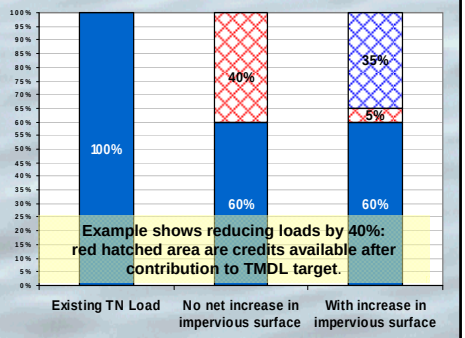
Redevelopment can generate credits

- No net increase in impervious surface would be required to have stormwater controls at least equal to the previous development
- With a net increase in impervious surface would have to option to achieve the percentage goals for the entire site associated with existing development or to meet the loading rate targets



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NCDOT

- Must provide the highest practicable level of treatment on new road development
- For new non-road development, to achieve and maintain each subwatershed goals
- For existing roadway, reduce 500 pounds of Nitrogen per 5-year period and at least 50 pounds per year

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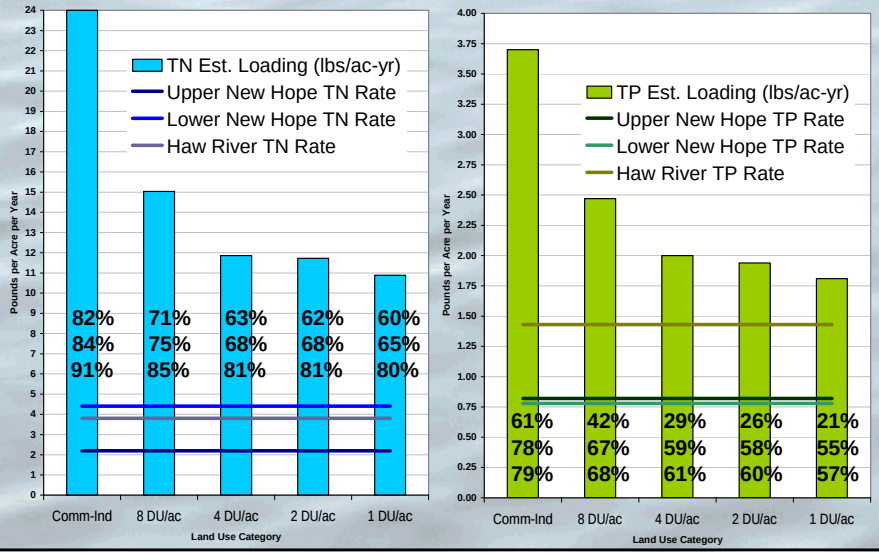
New development must first meet specific loading rate targets before credits can be created



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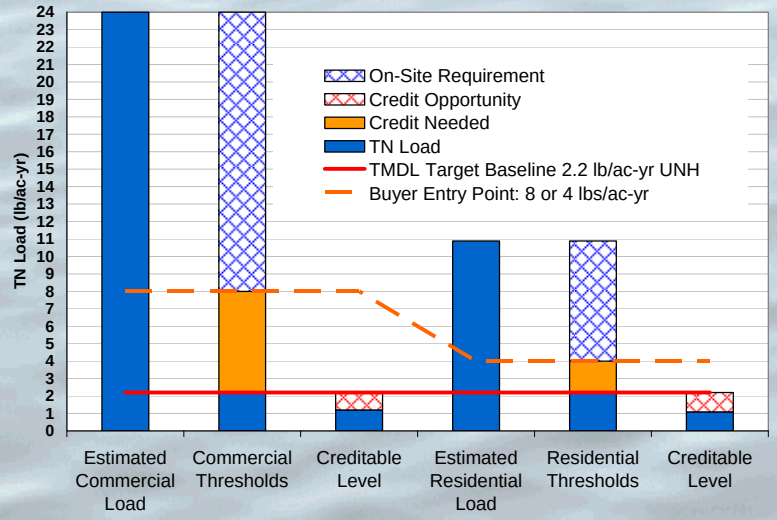
New development must meet "buy down" level on site, may purchase credits to meet target rate, and only after that may sell credits



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Within urban sector, BMP selection will matter with efficiency differential and limits on capabilities versus targets

Structural Urban Stormwater BMPs	% TN reduction	% TP reduction
Bioretention	40%	45%
Stormwater wetlands	40%	35%
Wet detention basin	25%	40%
Sand filter	35%	45%
Restored riparian buffer	30%	35%
Grassed swale	20%	20%
Infiltration devices	30%	35%
Filter strip	20%	35%
Dry extended detention basin	10%	10%

DWQ Stormwater Best Management Practices Manual (2007c)

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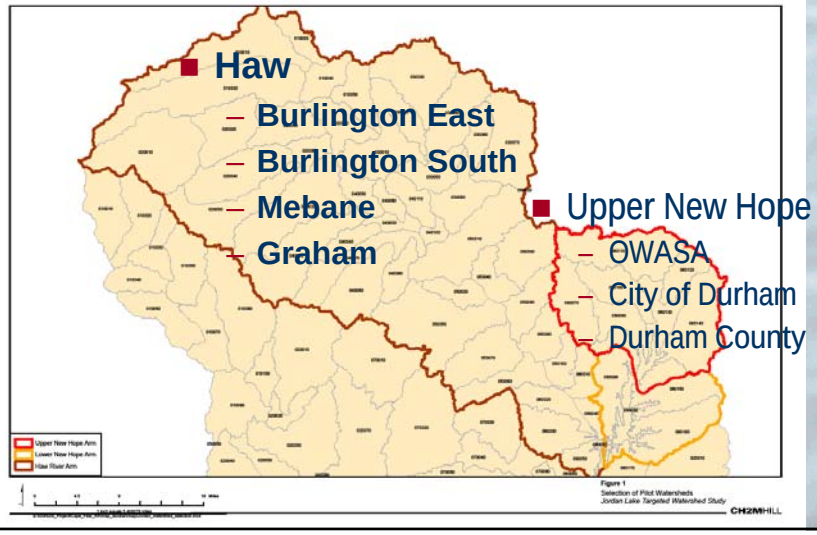
WLAs derived from concentration targets and design flows establish baselines for point sources



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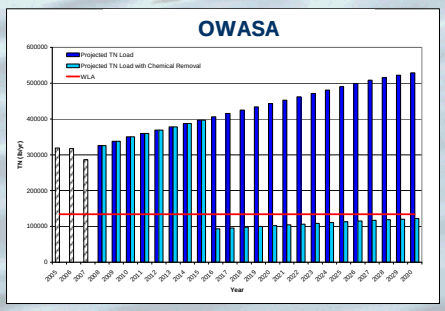
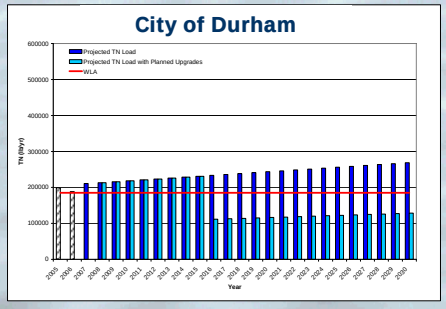
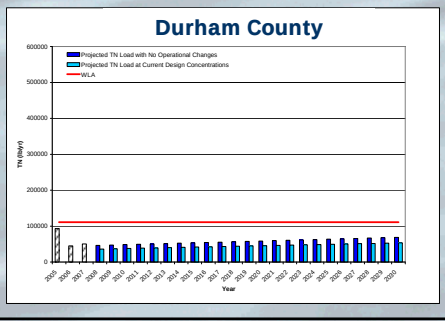
Upper New Hope Projected Loads: N



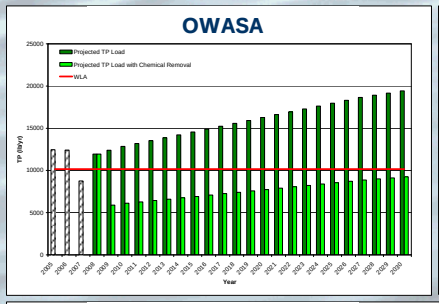


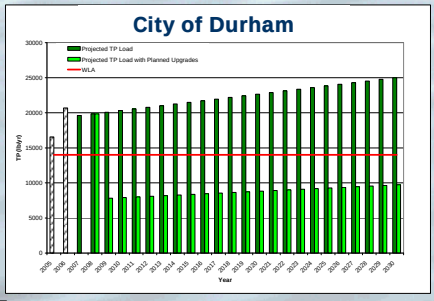


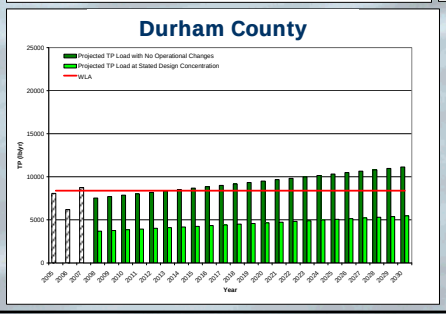
Completed or planned upgrades necessary to meet individual WLAs

21

Upper New Hope Projected Loads: P







Completed or planned upgrades/optimization needed to meet individual WLAs

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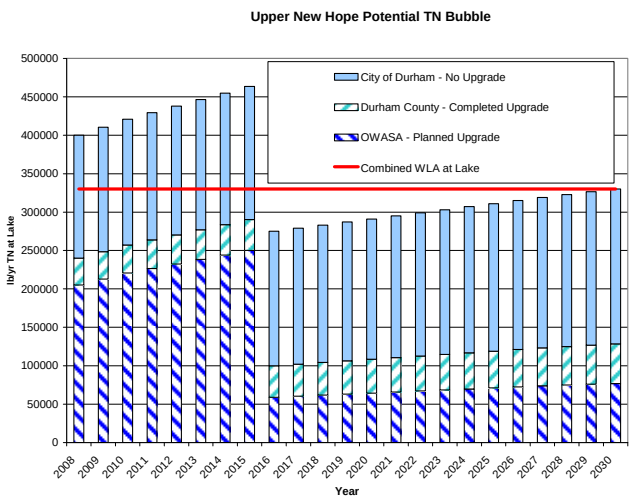
Upper New Hope Potential N Bubble



Under a bubble permit, the City of Durham could delay upgrades for TN past 2030 with Durham County's completed upgrades and OWASA's planned upgrades

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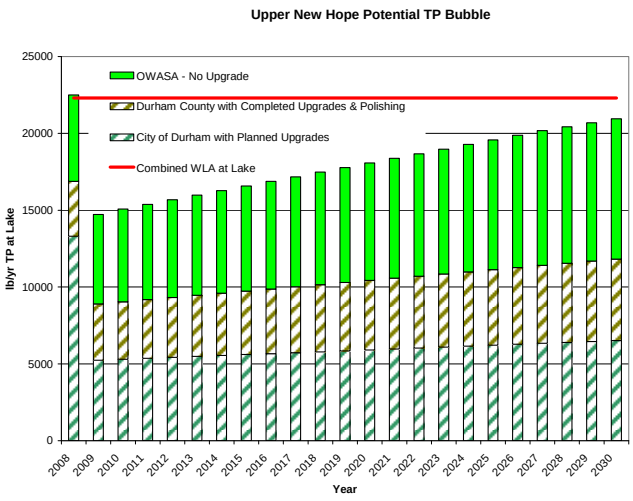
Upper New Hope Potential P Bubble



Under a bubble permit, OWASA could delay upgrades for TP past 2030 if Durham County and City of Durham complete planned operational and capital upgrades

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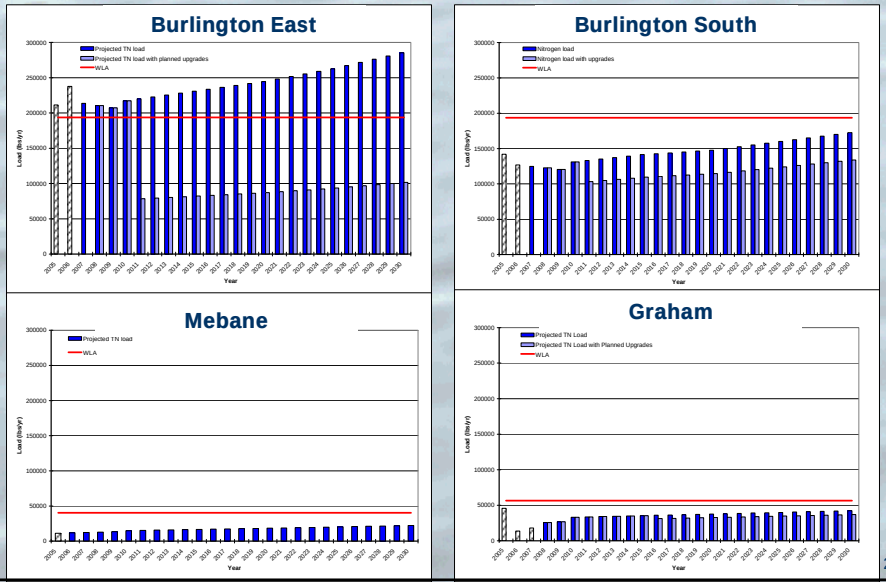
Haw Projected Loads: N

All meet WLAs with current mg/l except B-East which will with upgrade



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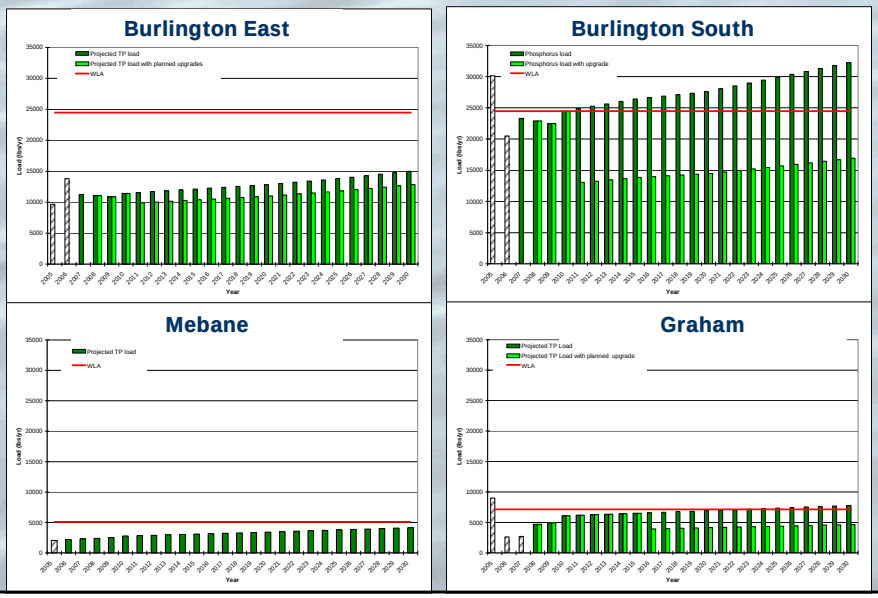
Haw Projected Loads: P

Planned upgrades more than meet WLAs



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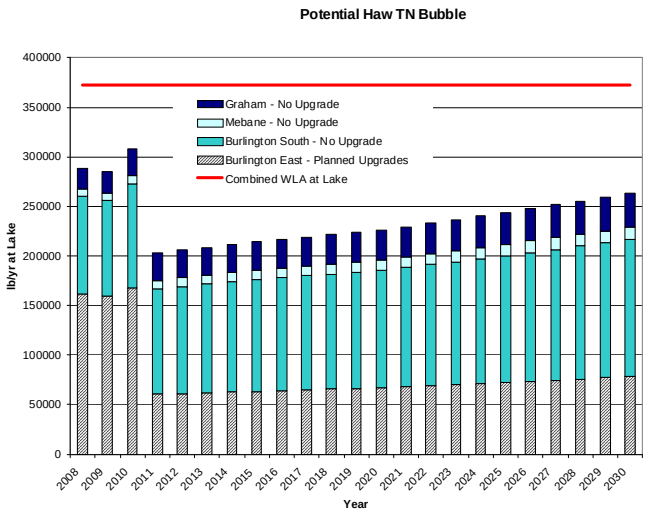
Haw Potential N Bubble



Under a bubble permit, if Burlington East does upgrade as planned other dischargers could delay upgrades for TN

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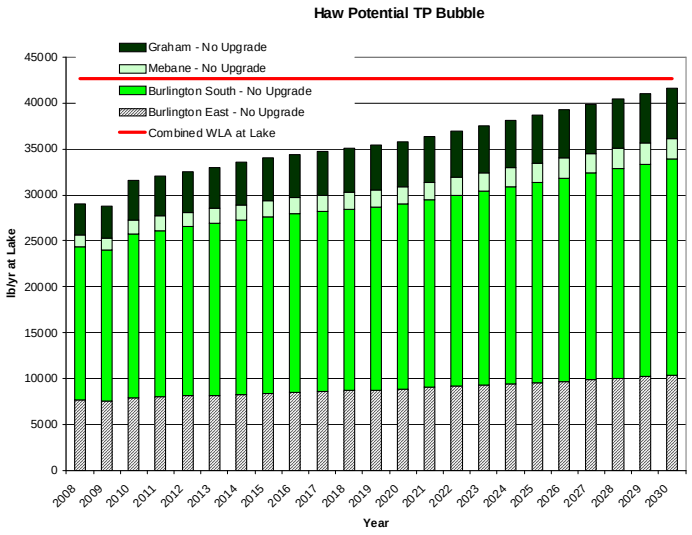
Haw Potential P Bubble



Under a bubble permit no one in the Haw would need to upgrade before 2030

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Observations about potential credit demand and supply across sources

- Agriculture: buyer and/or seller
  - Internal market only until hit targets
  - Then potential significant supplier to urban sources
- Urban: predominantly buyer
  - Existing development (local governments): depends on %
    - Like agriculture sector, must meet targets within jurisdiction before can generate credits
  - Redevelopment: buyers and sellers likely
    - % target theoretically leaves room for credit generation, depends on existing impervious % versus redeveloped %
  - New development: most likely buyers
    - Upper New Hope target rates leave little room to become sellers
    - Credit creation theoretically more feasible in Haw, and most feasible in Lower New Hope
- Point sources – sellers and a few buyers
  - Upgrades in place, planned obviate need for P trading
  - Some opportunity for point-point trading to meet N
  - Possible credit sales/transfers to local governments

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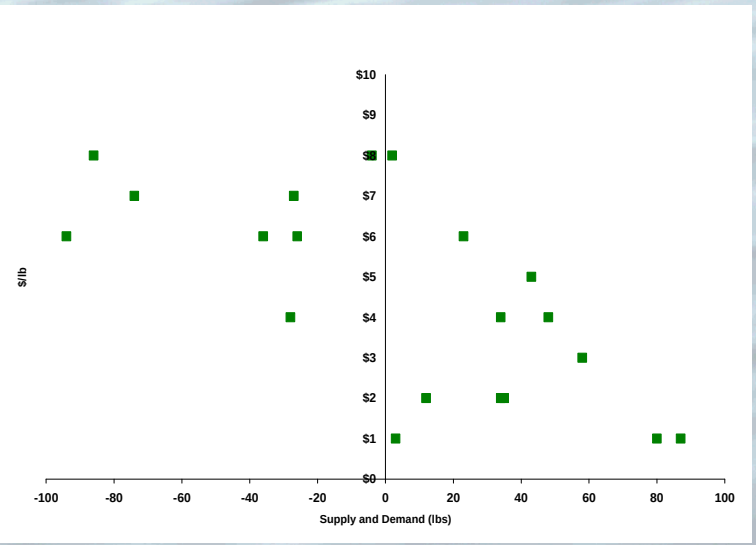
So do relative cost-effectiveness analyses support our demand/supply results?



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Relative Cost-Effectiveness among Nonpoint Source Credit Options:
Methods for Agricultural and Urban BMPs

Costing Element	Agriculture	Urban
Capital	DSWC, NCDWQ	EPA, DENR
Operation and Maintenance	DSWC, NCDWQ	EPA, DENR
Design and Contingency	35% of capital	
Present Value in 2008$	Escalated using ENR historical and CH2M HILL future projections Interest rate from US Federal Reserve Bank data	
BMPs Evaluated	Stakeholder and NC agency input	
BMP Life	10 yr per	20 yr per
Removal Efficiencies	NCCES, Chesapeake Bay Nutrient Subcommittee, NCDWQ, DSWC, Jordan Lake TMDL	Draft 2007 NCDENR Stormwater BMP Manual
Unit Costs	Annualize PV$ / lbs reduced per acre per year	

	Cost Per Acre in Watershed	
Land Use Category	***Upper New Hope***	***Haw***
Commercial/Industrial	$400,000	$350,000
Multiuse Residential	$350,000	$175,000
Residential	$150,000	$100,000
Rural	$20,000	$20,000

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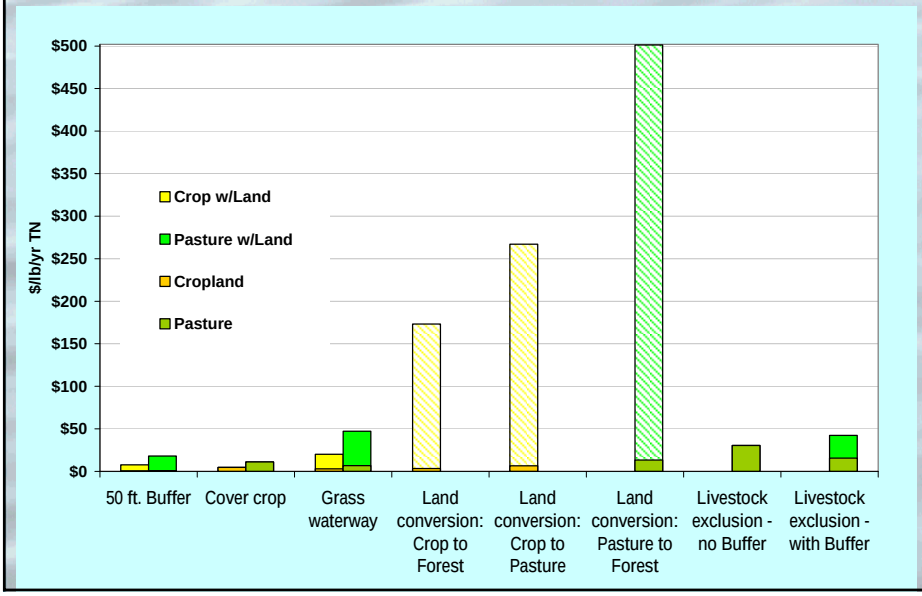
Agricultural BMP Unit Cost Results
Nitrogen Removal: Max $ Scale



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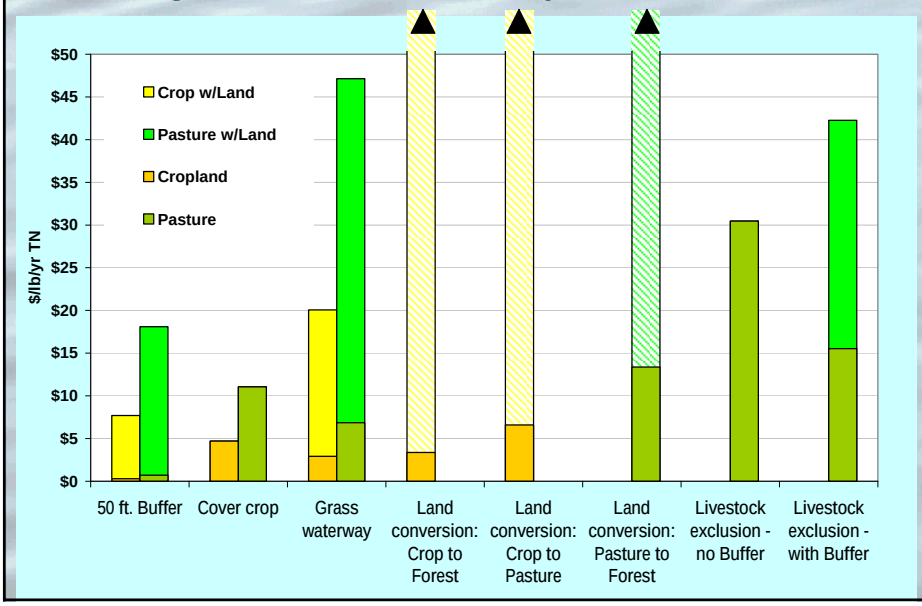
Agricultural BMP Unit Cost Results

Nitrogen Removal: < $50/lb/yr



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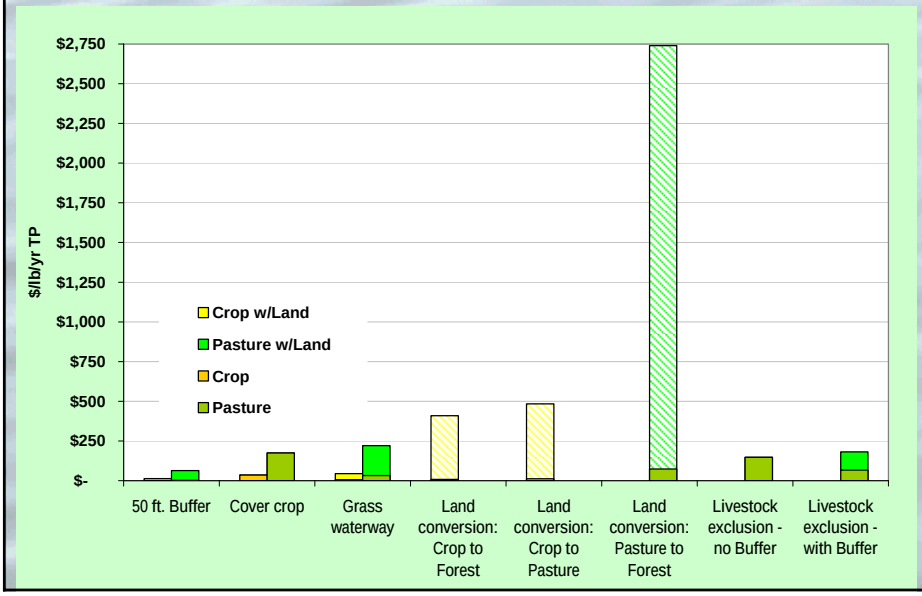
Agricultural BMP Unit Cost Results

Phosphorus Removal: Max $ Scale



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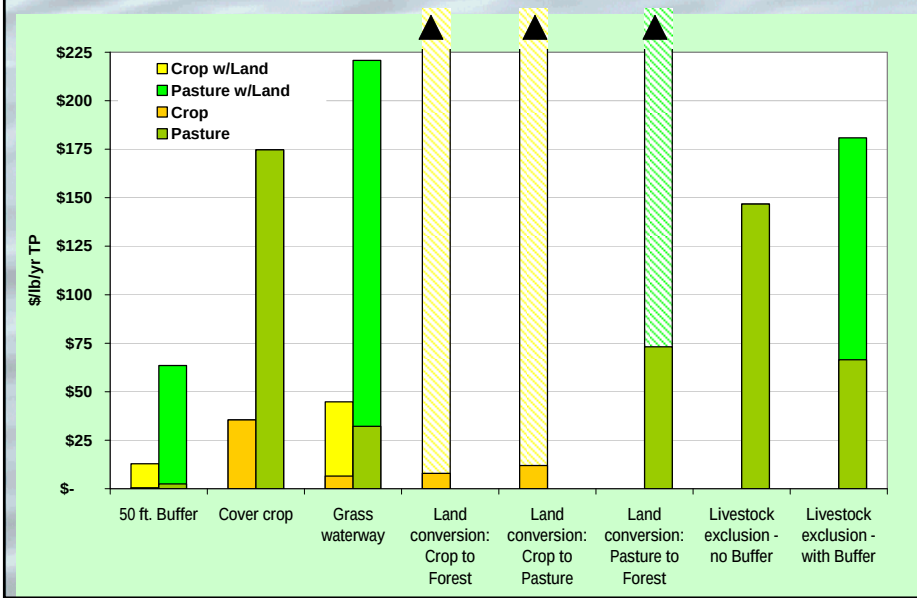
Agricultural BMP Unit Cost Results

Phosphorus Removal: < $225/lb/yr



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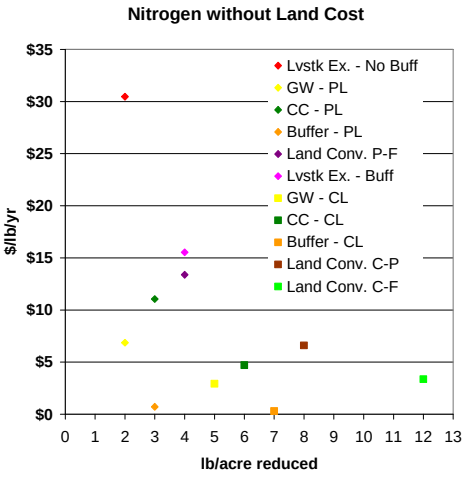
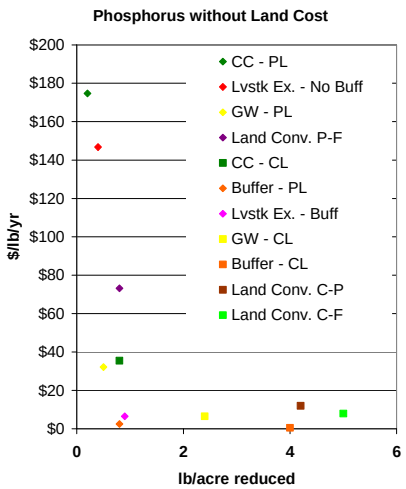
Observed unit cost differentials across agricultural BMPs





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Agriculture BMP Unit Cost Summary

- Variation in unit costs
  - TN varies from $5/lb-yr to $500/lb-yr
  - TP varies from $15/lb-yr to over $2500/lb-yr
- Land costs, if/how incurred, could be important consideration, particularly for land conversion

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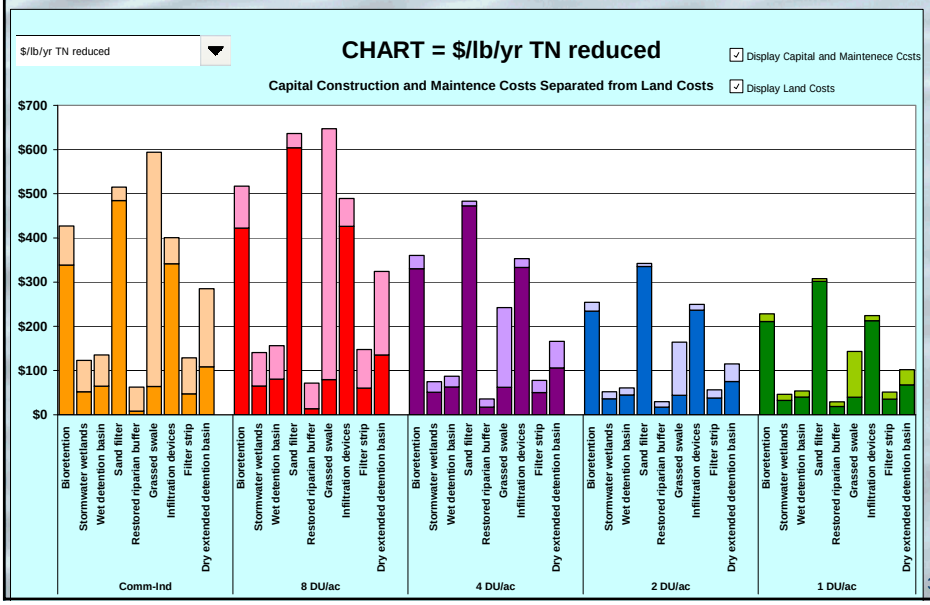
Urban BMP Unit Cost Results
For Nitrogen, By Land Use



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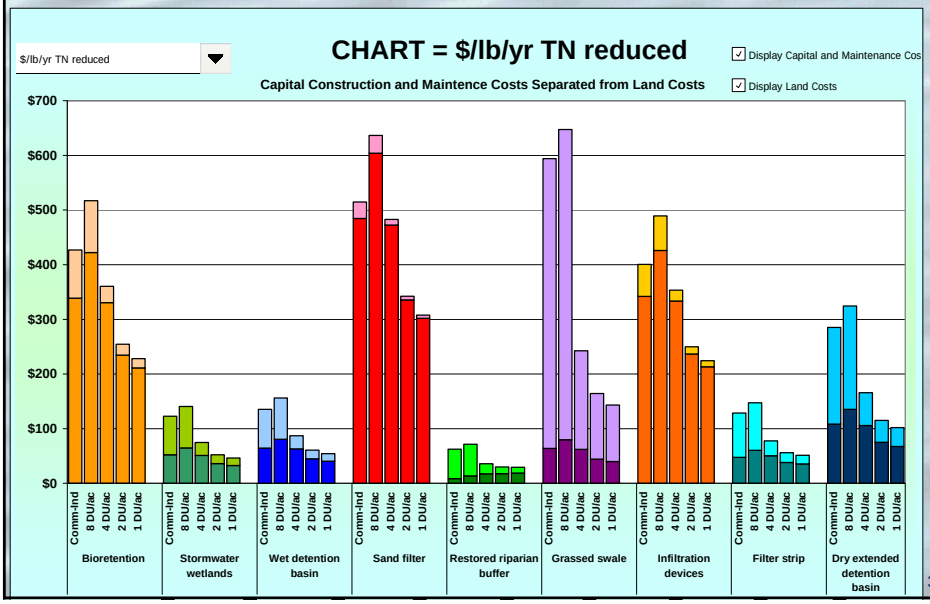
Urban BMP Unit Cost Results

For Nitrogen, By BMP



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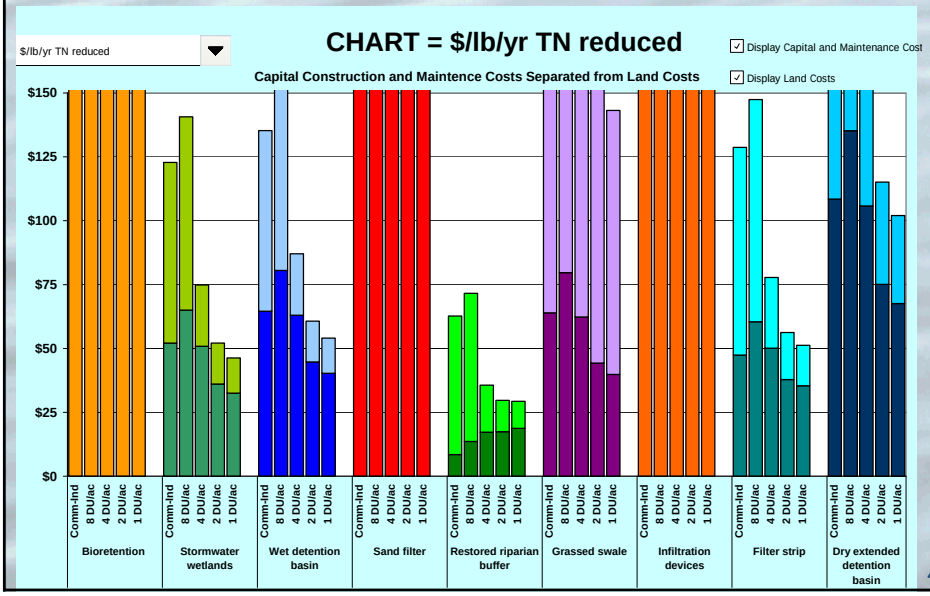
Urban BMP Unit Cost Results

For Nitrogen, By BMP: < $150/lb/yr



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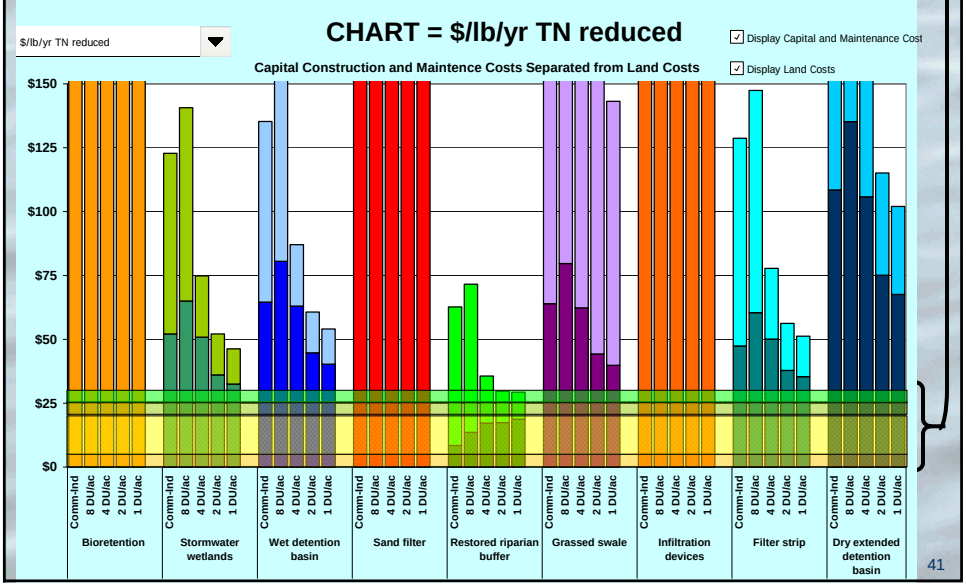
Urban BMP Unit Cost Results

For Nitrogen, By BMP: < $150/lb/yr with Ag Bands



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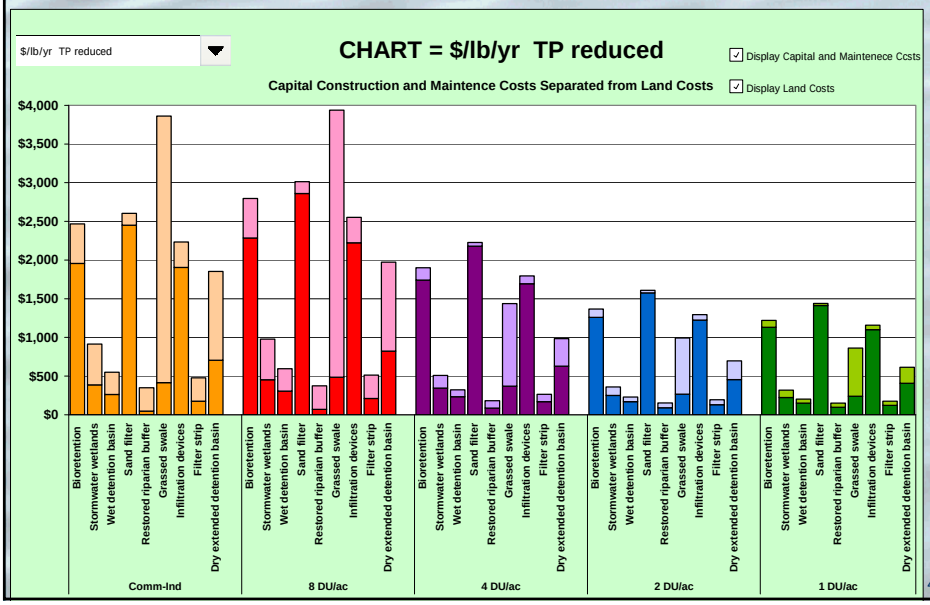
Urban BMP Unit Cost Results

For Phosphorus, By Land Use



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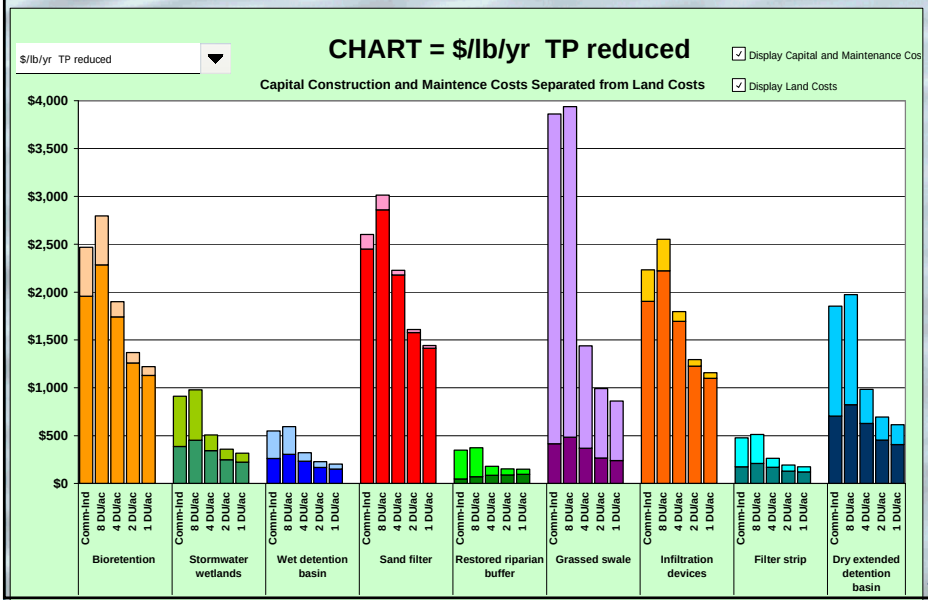
Urban BMP Unit Cost Results
For Phosphorus, By BMP



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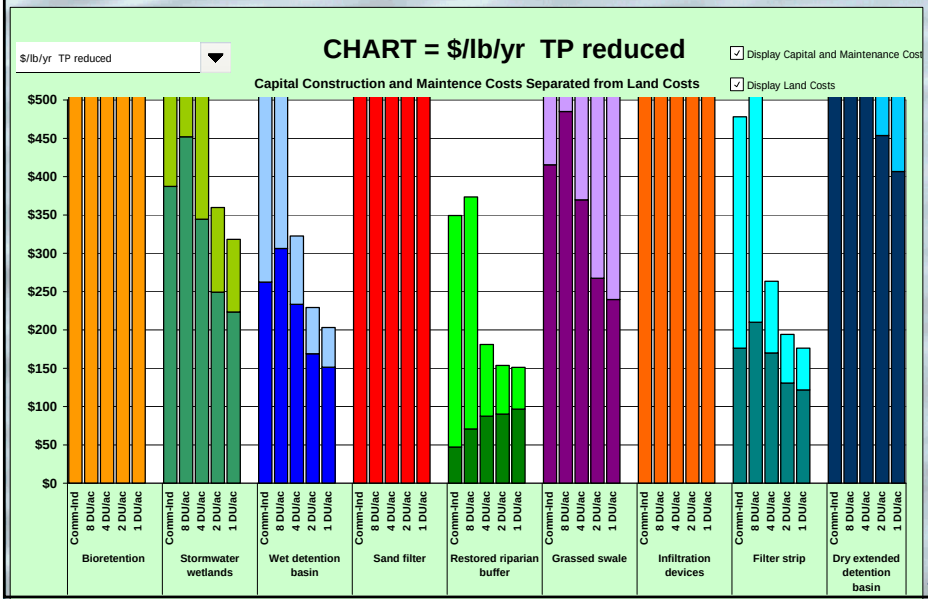
Urban BMP Unit Cost Results
For Phosphorus, By BMP: <$500/lb/yr



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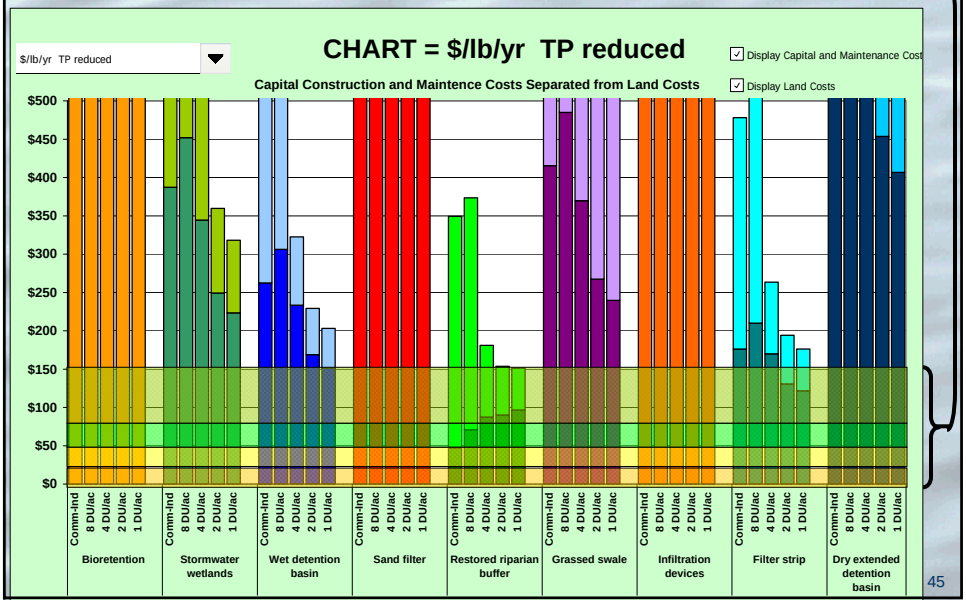
Urban BMP Unit Cost Results

For Phosphorus, By BMP: <$500/lb/yr w/Ag Bands



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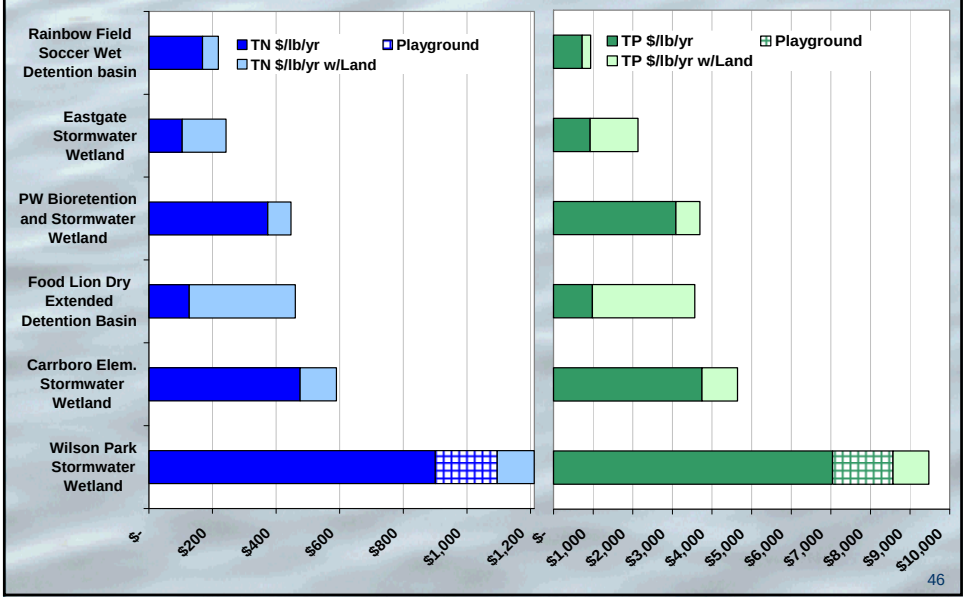
The 6 Demonstration BMPs:

Generally consistent with screening results



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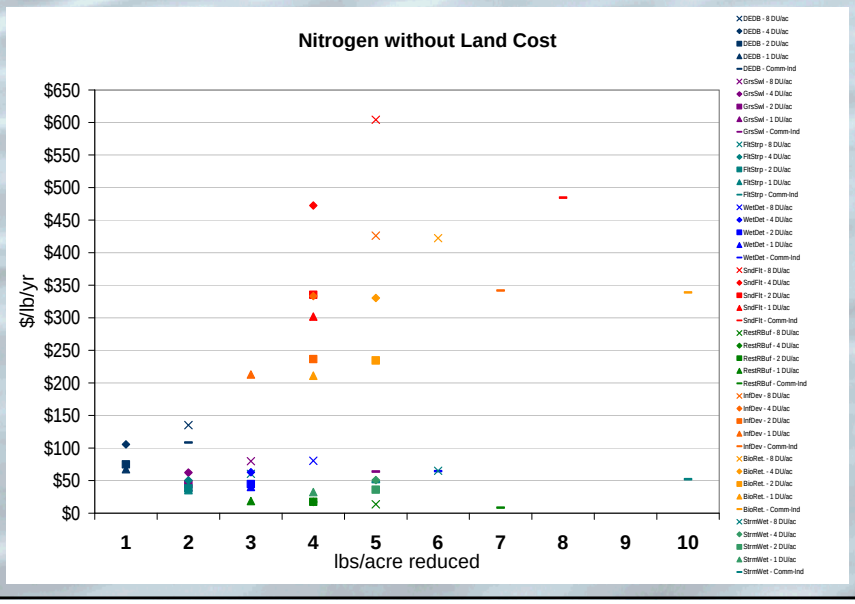
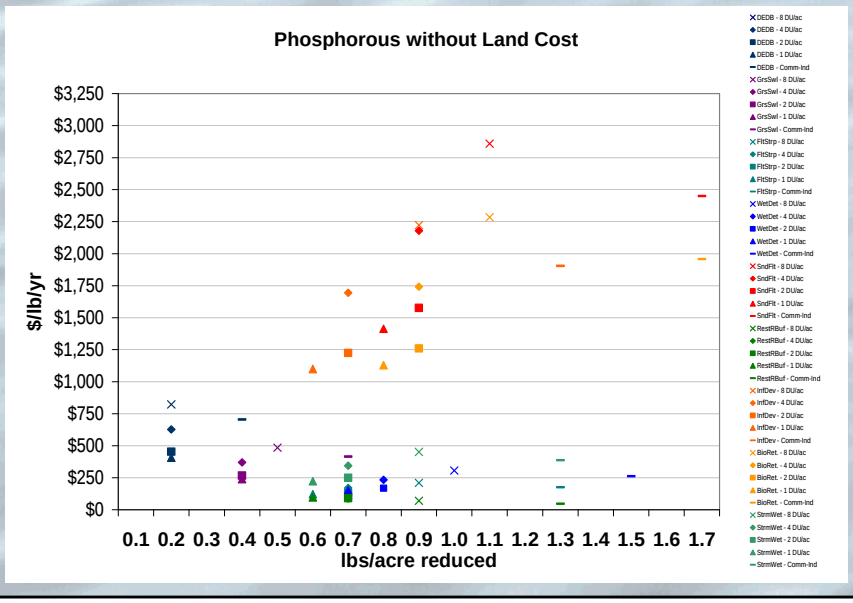
Urban BMP Options Comparison—N
Cost differentials favorable for trading



Urban BMP Options Comparison—P
Cost differentials favorable for trading



Urban BMP Unit Cost Summary

- Urban unit costs exhibit wide variation, by BMP and land use
  - TN varies from $30/lb-yr to $650/lb-yr
  - TP varies from $150/lb-yr to $4000/lb-yr
- Whether/how land costs incurred can make significant difference in relative relationships

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Assessment of Credit Trading Opportunities Among Nonpoint Sources

- What do the $/lb tell us?
  - Within agricultural options, it is more effective to address cropland than pasture
  - Agricultural BMPs are more cost-effective than urban BMPs (without trading ratios, and up to about 2:1)
  - Urban subcategories and patterns exist
    - More dense, higher cost for same BMP
    - Highest cost: bioretention, sand filter, infiltration devices
    - Middle range: wet detention basin, grassed swale, dry extended detention basin
    - Lowest cost: stormwater wetlands, restored riparian buffer, filter strip
- Factors that will influence relative costs in practice
  - Site-specific conditions and non-cost factors/preferences
  - Actual loading, removal efficiencies, land consumption/costs
  - Other requirements
    - TSS reductions for Phase II
    - Limits on number of urban BMP in series

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