BMP definitions, efficiencies and reporting:

"The devil that is in the details"

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Will emphasize the need for good definitions, efficiencies, reporting (and verification) including problems and challenges

BUT

these are the essential tools for development of a nutrient reduction strategy

SO

learn the good and avoid the not so good from us, others and your own knowledge base and help us all make it a better process

BMP definitions and reporting progress

- Clear definition of the practice and implementation with minimum requirements based on the science used to develop the efficiency
- Reported practices should meet or exceed the definition
- "Implementing to the definition" essential to ever see expected reductions
  - Has been and remains a weak link in Chesapeake Bay progress reporting
  - WQ BMPs do not always match NRCS or other existing standards
  - Need credible, transparent means of tracking and reporting BMPs and a technically sound verification program that the public and farmers accept
- Tracking and verification should be, but often are not, part of the BMP development effort.
- At this early stage in Iowa, you have the opportunity to identify feasible means of reporting defined BMPs and doing ongoing verification

What is a BMP efficiency (in Chesapeake w/s)?

- Estimate of reduction in nitrogen and phosphorus delivery due to implementation based of a specific BMP on “best available science”
- May be a percent reduction in load, land use change, simulation change, upslope treatment, etc. that best represents the impact of the BMP
- May be just one or may vary by region (hydrology, soils, climate, etc.)
- In Chesapeake w/s, applied to specific land use(s)in a local “land segment” with local soils, hydrology, climate, etc. and local base load
- First developed in 1993, limited revisions in 1997, 2000, 2003 and major revision from 2006-2009
  - 2006-2009 used BMP specific expert panels, had panel protocols, decision matrix, peer reviews with coordination/review by Mid-Atlantic Water Program
- Now have a protocol and use expert panels for new/expanded BMPs

BMP efficiencies

- Science-based w/o policy, program or science bias
- For NPS BMPs, science is limited; variability high
  - Science and usually common sense indicate a benefit
  - Quantifying impact employs best available science, scientific expertise and experience (best scientific judgment)
  - Prefer term "effectiveness estimate"
- Making best effectiveness estimate possible is critical but understanding limits to knowledge base is also important
- Understand and accept efficiencies as best current science-based estimate and move forward
  - Cannot afford to monitor every stream/field
  - Provide reasonable means of estimating relative progress if reporting and verification done well
  - Only means of estimating the impact of different future implementation scenarios that can guide programs, policies and spending

Tom's "Corrects" for BMP Efficiencies

(expanded from ~2006 discussions with C. Kling, ISU)

- Scientifically (best available knowledge)
- Directionally (to be a BMP)
- Magnitudinally (reasonable, conservative estimate)
- Proportionally (to other BMPs)
- Practically (can be applied and maintain viability)

In Chesapeake (and elsewhere), why might monitored water quality not reflect simulated impacts of BMP implementation?

- **Lag times**
- **Cycling of nutrients in rivers, lakes etc.**
- **Modeling, monitoring or calibration issues**
- **Use 20+ year hydrology and average results so may not reflect hydrology for that year (but is consistent)**
- ***BMP efficiencies, application assumptions, implementation, and reporting***

Efficiency estimates tend to be optimistic

(or pessimistic if not wanted)

- Rely largely on results from controlled plot-scale research, modeling, etc.
- Applied to widespread implementation across variable fields, landscapes and management ability
- Some changes in farm operation may impact BMP effectiveness
- Farm dynamics with crops, animals, rental lands and markets change and these changes may impact BMP performance
- Assume implementation, operation, maintenance to definition over time

So all of this screams for ~~Adaptive~~ "Flexible" Management

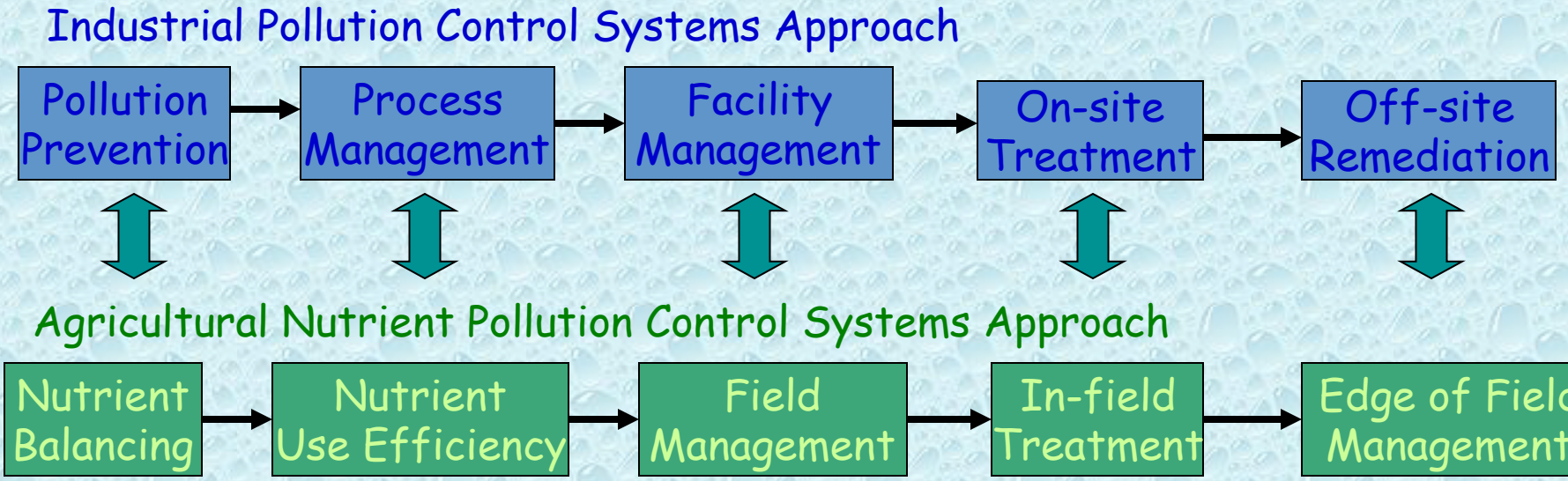
- Review definitions and efficiencies (at set intervals) to insert new knowledge and experience
- Develop a process for adding new BMPs and test it
- Assess/improve reporting process over time
- Assess and improve implementation and O&M verification program over time
- Do enough small w/s monitoring with thorough BMP verifications to assess efficiencies

You get your BMPs, efficiencies, reporting and verification systems?

So what do you do now?

- Implement and verify
- Monitor and measure change in big and small w/s
- Target?(But, to get proposed reductions, all need to do something)
- Systems approach to BMP implementation at key points from planning through harvest
- Whole farm (Continuous Improvement Programs- Incremental improvement towards reductions with verification)

Applying a Systems Approach to Agricultural Nutrient Pollution Control



Examples of Agricultural Nutrient Pollution Control System Practices

- Feed Management
  - Nutrient rate reduction
- Nutrient Management
  - Precision Ag
- Conservation Tillage
  - Erosion Control
- Cover Crops
  - Soil P Remediation
- Riparian Buffers
  - Wetland Treatment

Continuous Improvement Program (CIP)

Incremental improvement in 3-4 year CIP cycles that allows farmer to achieve target in more efficient and acceptable way in 3-5 cycles

(cost/funding is challenge but engages farmer in verified program)

The Water Stewardship Assessment-Verification and Continuous Improvement Process

1. Confidentiality agreement & Info. gathering e.g. NMP; Cons. Plan

2. On-farm assessment and farmer visit/discussion
   - Current practices, practices of interest, concern; WQ questions/discussion
   - Verify current BMPs-whole farm
   - Stream assessment –e.g. buffered, fenced?
   - Row crop field condition – e.g. residue mgmt., conservation tillage
   - Animals; pastured/confined; confinement area and manure mgmt & use
   - BMP O&M (e.g. cover crop type, planting date; buffer maintenance)
   - Identify/ photo document existing BMPS and areas/issues where BMPs or mgmt. changes may be recommended

3. Estimate loads for no BMP, existing BMPs and with recommended practice implementation using software based on Bay model land use loads

4. Develop Continuous Improvement Plan (CIP) BMP recommendations; discuss with farmer and get agreement to implement selected BMPs over next 3-4 years

5. Develop scenario showing reductions from agreed upon new practices

6. Review and CIP update every three to four years (who pays for this?)

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Continuous Improvement Plan Developed for Dairy Farm

The load reductions listed in this document are estimates of the annual edge of stream load reduction that would occur when a practice was implemented on your farm compared to existing conditions (which include existing BMPs). ***When CIP practices are incorporated into farm load estimates reductions from the multi-BMP scenario will likely be lower than if the individual CIP practice reductions were simply added together. This is due to the sequencing and interaction between BMPs that occurs in a multi-BMP scenario.***

Loads are estimates based on the Nutrient Load Estimator using CBP local land use loads

No BMP farm load: 13,868 lbs N 739 lbs P
Existing farm load: 12,741 lbs N 649 lbs P
(8% N reduction, 12% P reduction achieved from the No BMP load)
VA Tributary Strategy load needed to achieve a 55% load reduction:
6,240 lbs N 333 lbs P

#1 Practice to be Implemented Get an updated NMP and implement nutrient management recommendations
Impact: If a Nutrient Management Plan is implemented, it would result in a reduction of approximately 1,321 lbs N and 46 lbs P
Implementation date: 2011-2013
*Notes*_____

#2 Practice to be Implemented Install gutter on heifer barn to avoid runoff into bare lot
Impact: If confinement area water management is implemented on facilities, the reduction would be lbs 71 N and 3 lbs P
Implementation date: 2011-2013
*Notes*_____

#3 Practice to be Implemented Install an additional dry pack barn to avoid denuded pasture for milking herd & heifers
Impact: If a covered loafing area is installed for 75 cows, the reduction would be 82 lbs N and 5 lbs P
Implementation Date: 2011
*Notes*_____

#4 Practice to be Implemented Discontinue fall manure application to small grain silage
•Use as true cover crop

#8 Practice to be Implemented Rental Lands / Purchasing New Lands

Impact: Will be property dependent. In decision process for new rental lands or purchasing of new lands, consider the existence of *verifiable* conservation practices that will reduce nutrient losses. Also, check P status of any new rental land.

Implementation date: Ongoing

*Notes*_____

_____

In summary, if <u>all of the CIP practices</u> are implemented the farm loadings and reductions would be as follows:

CIP Scenario load: 8,976 lbs N 367 lbs P

(35% N reduction and 50% P reduction achieved from the No BMP load)

_____

_____

For further information contact: Dale Gardner with Water Stewardship 540-246-2839

Local NRCS Office for technical assistance 540-433-2853

Local Va DCR Office for technical assistance 540-433-2853

I agree to work toward the following practices #____, #____, #____, #____, #____, #____, #____and #____ as presented in this Plan and will partner with Water Stewardship, Inc. to implement the Plan.

_____ _____

(Farm Owner/Operator (Date)

_____ _____

(WSI Staff Member) (Date)

Additional Notes: (Optional)

NRCS/SWCD contact information
Cooperative Extension contact information
WSI developer contact information

Pilot Program Results

Average Percentage Reduction

Farm Type	# of Farms	Total Nitrogen		Total Phosphorous	
		Implementation Level		Implementation Level	
		Existing	First CIP	Existing	First CIP
Beef	7	22%	31%	38%	51%
Beef-Poultry	13	17%	26%	26%	45%
Dairy	21	17%	34%	26%	46%
ALL	**50**	**17%**	**31%**	**26%**	**47%**
All-Range	**50**	(5-42%)		(8-51%)	

Comments from Anthony Beery, Farmer, at 2012 Int'l Soil and Water Conservation Society Meeting

Advantages of 3PV over Regs

- Positive steps vs. coerced "improvements"
- Real world solutions vs. mandated goals
- 3PV will provide better results than regulation
- Encourages conservation, while providing a verifiable system
- Greater flexibility to maximize resources available
- Income producing potential

Observations from Water Stewardship Work

- Substantial existing practice implementation but not close to level expected by TMDL WIPs
- Needed reductions achievable on most farms, but
  - Need alternative uses of manure
  - Will require widespread BMP implementation by all
  - May require some changes in cropping systems and limited, strategic land retirement
  - Animal agriculture has more reduction options but needs to reduce more
- Local and state allowed activities reported as BMPs implemented may allow "not meet all parts of CBP
- Practices need to match "efficiency definitions" if estimated reductions likely to occur

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Value of Assessment, Verification & Continuous Improvement

1. Provides incremental continuous improvement with defined targets and quantitative assessment of recommended practices

2. Recurring review & update of CIP allows farmer to "transition to success"

3. Third party assessment, verification and continuous improvement can provide "reasonable assurance"

4. Concept of private sector, third party confidential assessment resonates well with farmers

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For change to occur, something has to change

- Farmers have implemented many, many BMPs.
- Our voluntary programs are working.
- These may both be correct but hard to verify and documented water quality improvement (from Ag areas) has been limited.
- Statements w/o accountability and verification reduce credibility

"We just need to show some (positive) change."

- Strong science based BMP implementation and verification (and I think, systematic continuous improvement) program will show change (or explain why not).
- The Chesapeake w/s is proof this is not easy and may require more change to farm systems than we want to admit, but it can be done while maintaining viability.
- We, in the Chesapeake, are to the point where real accountable, verified change with documented water quality improvement is a necessity, not an option.

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