AG BMP IMPLEMENTATION VERIFICATION SUPPORTING INFORMATION

Steve Dressing and Don Meals, Tetra Tech, Inc.

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OBJECTIVES

In response to the AgWG request, Tetra Tech is providing technical assistance to obtain scientifically defensible information to support BMP verification protocols, with emphasis on assessment of data confidence levels.

PROCESS

- Literature review, including peer-reviewed scientific literature and project reports
- Interviews with 19 individuals identified by the AgWG as having significant experience and/or expertise in BMP verification

PROCESS

- Interview process
  - Tt interviewed 19 professionals August 2 - 22, 2012
  - Questionnaire sent in advance
  - 1-hour call
  - Confidential
  - Interview notes/summaries edited and approved by interviewees
  - Interviews generated additional literature and experts to consider

PROCESS

- Draft report including summary of literature and key points from interviews

FINDINGS FROM LITERATURE

- Literature on BMP implementation verification is limited.
- Each of the general protocols for BMP verification identified by the AgWG has been applied elsewhere in the U.S., with varying degrees of effectiveness

FINDINGS FROM LITERATURE

- **On-farm/trained personnel**
  - MD
  - Water Stewardship, Inc. – VA, MD
  - Retrospective – Black Creek, IN (Bracmort et al. 2006)

- **Farmer self-assessment/with or without check**
  - MN – survey/selected field audits
  - Everglades – field verification of farmer-submitted BMP plans
  - FL Dept. of Agriculture – tracking filed NOI

FINDINGS FROM LITERATURE

- **Agency/On-farm records**
  - GA – ARS experimental watershed BMP database from NRCS files and maps
  - MS – BMP database from EQIP, CRP records
  - UT – retrospective analysis of BMP implementation in a USDA HUA project

- **Surveys and statistical sampling**
  - FL, VA, OK, Canada – farmer surveys
  - CEAP ARMS – NRI
  - CTIC tillage survey (roadside transects)
  - EPA Ag Tracking Guidance (2000) statistically rigorous

FINDINGS FROM LITERATURE

- Remote Sensing
  - CBW – cover cropping (Hively)
  - GA – satellite mapping of conservation tillage

FINDINGS FROM LITERATURE

- Hybrid approaches
  - IA – NRCS records, aerial photography, field-by-field drive-by (Tomer et al. 2008)
  - IN – Agency records, producer interviews, aerial photography → no one approach documented all BMPs (Grady et al. 2012)
  - Ohio River Basin Trading Project – Farmer records, site-visits by agency personnel, assessment of O&M (EPRI/AFT 2012 – 2014)

FINDINGS FROM LITERATURE

- **Studies show that BMP function cannot be assumed even if presence verified in records**
  - UT – 16% of "implemented" contracted BMPs never installed; 20% abandoned(mostly management) (Jackson-Smith et al. 2010)
  - IN – 1/3 of BMPs no longer exist; remainder partially functional with efficiency << originally rated (Bracmort et al. 2006)
  - Concentrated flow significantly degrades performance of riparian buffers (Dosskey et al. 2002)
  - BMP reduction efficiencies are site specific, vary with topography, hydrology, land use → danger of assigning absolute values (Sharpley et al. 2009)

KEY POINTS FROM LITERATURE

- Assessments of statistical confidence or error reported for approaches to BMP verification described in the literature have been limited to some validation data from remote sensing analyses and a statement of >90% accuracy in the CTIC tillage survey.

KEY POINTS FROM LITERATURE

- Verification of structural, annual, and management practices will likely require different protocols and provide different information content and accuracy
- Hybrid approaches probably have the best potential to provide complete and accurate information on BMP implementation and performance
- BMP function should not be assumed, even if presence is well-documented

KEY POINTS FROM LITERATURE

- To meet the objectives of the Chesapeake Bay Program, BMP verification will need to go beyond simple documentation of presence/absence; some assessment of condition, or efficiency will be required.

FINDINGS FROM INTERVIEWS

- No formal report from interviews
- No specific attribution of comments
- Findings from interviews are summarized as key points raised by interviewees, not necessarily based on consensus or agreement

FINDINGS FROM INTERVIEWS

Interviewees described specific verification programs:

Virginia

- *GreenSeeker*, 6-county pilot program examines records of precision agriculture/nutrient management to assess the quality of the BMP record in support of TMDL.
- Watershed Stewardship Inc. Shenandoah Valley program, includes review of farm and agency records, farmer releases, farm visit by trained staff under proprietary protocol.

FINDINGS FROM INTERVIEWS

Maryland

- State of MD programs
  - Farm Stewardship Certification Program
  - Inventory of non-c/s practices
  - Nutrient trading
  - Verification of state c/s
  - Cover crop program
  - Nutrient management program
  - Conservation Tracker

FINDINGS FROM INTERVIEWS

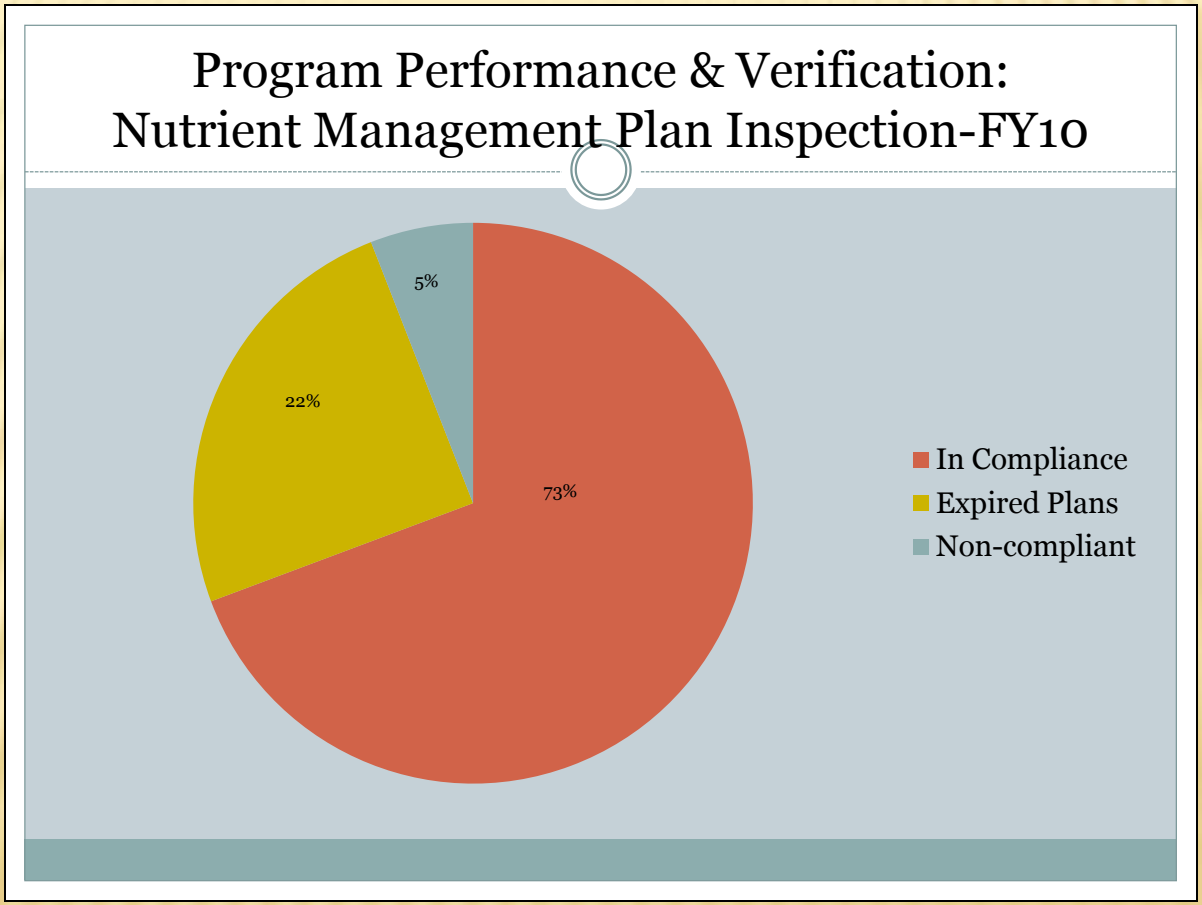
Table 6.4 Nutrient Management Plan Field Inspection Enforcement Actions

Program Performance & Verification: Nutrient Management Field Inspections

FY	NMP Site Inspections	NMP Compliance	Enforcement Actions
2006	167	78%	0
2007	500	89%	0
2008	450	65%	90
2009	400	69%	191
2010	391	73%	173

FINDINGS FROM INTERVIEWS

Table 6.5 FY 10 Nutrient Management Plan Inspections



FINDINGS FROM INTERVIEWS

Maryland

- Howard Co. pilot program
  - A combination of interviews and records review
  - Tracks both c/s practices and “functional equivalents,”
  - Is linked to the MD Nutrient Trading Tool and the MD Conservation Tracker with a direct tie-in to NEIEN.

FINDINGS FROM INTERVIEWS

Pennsylvania

- Warwick Township (Lancaster Co.) comprehensive watershed management program that includes stormwater and agriculture. Work in coordination with SWCD to identify benefits of agricultural BMPs implemented, to identify hot spots and work with landowners toward water quality improvement.

FINDINGS FROM INTERVIEWS

North Carolina

- NMP data and documentation of field conservation practices collected as inputs to N, P management tools (estimate N and P losses/reductions) in nutrient-sensitive watersheds, e.g., Neuse River, Tar-Pamlico.

Minnesota

- Livestock Environmental Quality Assurance II (LEQA II) Program tracks an index of BMP **systems** and qualitative assessment of BMP system function in order to give a reasonable assurance of performance.

FINDINGS FROM INTERVIEWS

Washington

- Developing program to manage water quantity and quality for irrigated agriculture and fisheries involves potential transfers of water rights in return for water quality improvements among irrigators and tribes in the Klamath River Basin. Requirements for effective trading provide incentives for verification of BMPs installed for water quality protection.

FINDINGS FROM INTERVIEWS

National Agricultural Statistics Service

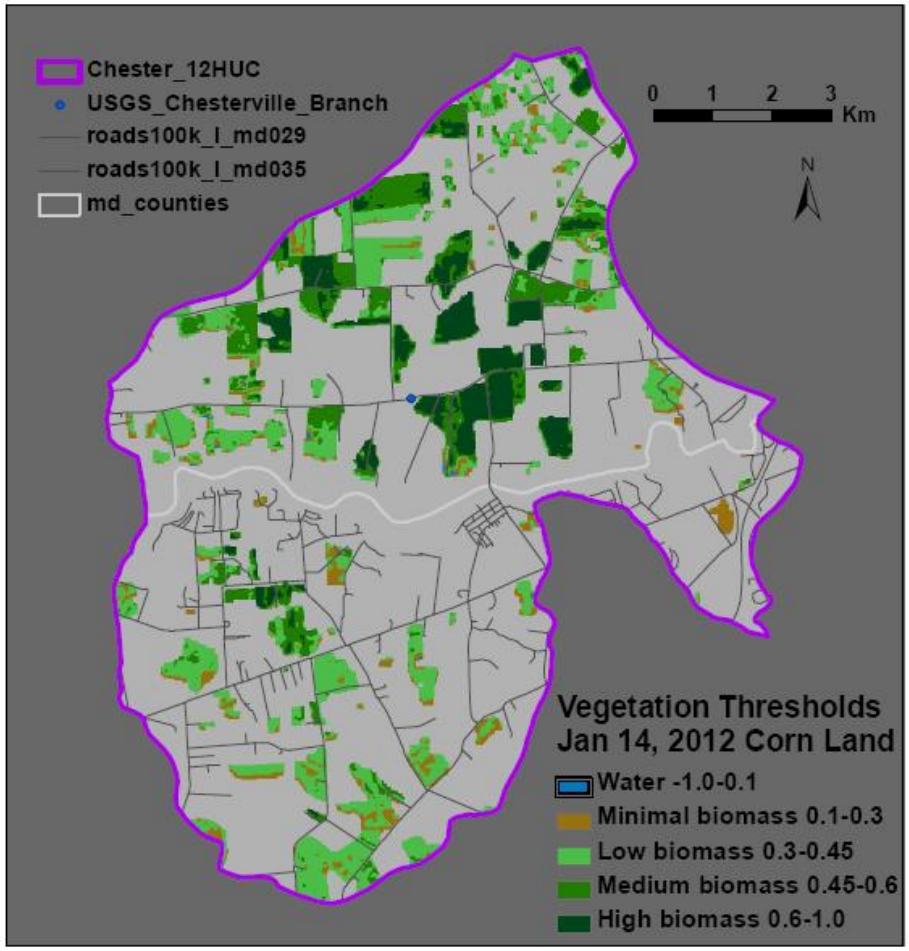
- NASS conducts full censuses and statistical surveys using highly-trained enumerators to provide statistics in service to U.S. agriculture. Although, they do not ordinarily collect extensive BMP data, they do report tillage and cover crop data, and can go beyond this in special surveys. NASS analyzes and reports on error and confidence in their surveys.

FINDINGS FROM INTERVIEWS

USGS

- Coordinates conservation data sharing between USDA-NRCS, USDA-FSA and USGS, including transfer of federal c/s records for all Chesapeake Bay farmland to support the NEIEN submission process.
- Also involved in remote sensing of winter ground cover for sediment and nutrient conservation, working in most of the state of MD, and areas of VA and PA surrounding the Showcase Watersheds.

FINDINGS FROM INTERVIEWS



These data are preliminary and are subject to revision.
They are being provided to meet the need for timely 'best science' information.
The assessment is provided on the condition that neither the U.S. Geological Survey nor the United States Government may be held liable for any damages resulting from the authorized or unauthorized use of the assessment

Provided by w. Dean Hively USGS EGSC
whively @ usgs.gov 301-504-9031

FINDINGS FROM INTERVIEWS

- Some interviewees reported costs associated with BMP verification programs:
  - Howard County, MD BMP inventory ~$1.50/acre, including verification by trained contractors. Data entry into the MD Nutrient Trading Tracker is an additional ~$2/acre.
  - MD program cost estimated to be ~$3.00/acre
  - USGS reported costs of ~$50,000 per year to perform practice tracking work on all federal conservation practices in the Chesapeake Bay watershed (~300,000 practices).

FINDINGS FROM INTERVIEWS

- Some interviewees reported costs associated with BMP verification programs:
  - Watershed Stewardship Inc. (WSI) reports a cost of $3,000 - 4,000 per farm (“research phase”); costs could be as low as $2.00/acre when expanded to production scale.
  - NC State University personnel have conducted 4 basin/watershed surveys at an estimated cost of ~$250,000 per basin to collect detailed agricultural information. Costs were projected to be about $9.00-10.00/acre for surveying fields.

FINDINGS FROM INTERVIEWS

- Some interviewees reported costs associated with BMP verification programs:
  - MN LEQA assessment, planning, and assurance process cost was ~$1,000/farm for the initial baseline assessment and base plan. A verification walk-through was an additional ~$400 and an annual confirmation was ~$200.

KEY PRINCIPLES FROM INTERVIEWS

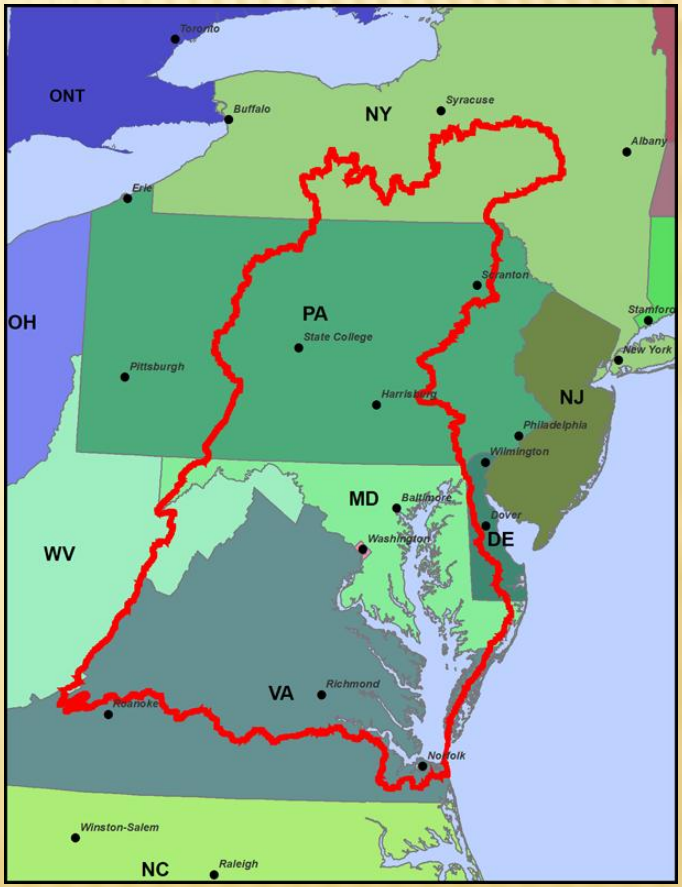
- Any proposed verification program, especially as applied to nutrient trading, should be scientifically defensible, and have a high degree of accountability and transparency.
- Verification programs must go beyond simple presence/absence to address actual practice efficiency.
- The Bay Program should seek widest possible verification of implemented BMPs, rather than focusing on intensive verification of a few individual practices.

KEY PRINCIPLES FROM INTERVIEWS

- Different types of BMPs – i.e., structural, annual, or management – will require different verification protocols. Remote sensing, for example, may do well at finding structural or land-cover practices, but verification of nutrient management will require strong presence on the ground. Verification – either on the ground or by remote sensing – must be conducted at the right time of year to assess BMPs like cover crops.
- A hybrid approach to BMP verification will generally give better results than a single protocol.

KEY PRINCIPLES FROM INTERVIEWS

- While some flexibility in verification programs among states may be desirable, some level of consistency should be assured so that core values/principles of verification cut across all states.



KEY PRINCIPLES FROM INTERVIEWS

- Assessments of accuracy or statistical confidence in verification results have been reported only for statistical survey and census data from NASS and from some validation exercises in remote sensing efforts; otherwise, **little reliable information exists on the confidence or accuracy of verification results**

KEY PRINCIPLES FROM INTERVIEWS

- If required, qualitative assessments of verification accuracy should be done by people with statistical and on-the-ground experience, not simply by best professional judgment or by consensus of a committee.
- Assessment of all sources of error in any verification process will provide some measure of transparency and confidence in the process

KEY PRINCIPLES FROM INTERVIEWS

- Although several programs collect BMP data at the field or other spatially-explicit scales, confidentiality issues generally prevent the release of such information and require the aggregation of data to county level.
- Ability to spatially reference practices to the field level may not be useful at present because the model is driven at the county/watershed level.

KEY PRINCIPLES FROM INTERVIEWS

- Special programs involving water quality and agricultural BMPs can provide strong incentive for verification of installed practices.
  - Chesapeake Bay TMDL
  - Maryland Nutrient Trading Program
  - Klamath River Basin irrigation/water quality trading program
  - Illinois River/Eucha-Spavinaw (AR) watersheds lawsuits
  - Ohio River Basin Trading Program

KEY PRINCIPLES FROM INTERVIEWS

- Numerous recommendations related to specific protocols, e.g., farmer reporting, remote sensing, statistical surveys

SUMMARY POINTS

- Each of the general protocols for BMP verification identified by the AgWG have been applied elsewhere in the U.S., with varying effectiveness.
  - On-farm trained personnel
  - Farmer self-assessment
  - Agency & on-farm records
  - Surveys and statistical sampling
  - Remote sensing

SUMMARY POINTS

- To meet the objectives of the Chesapeake Bay Program, verification programs must go beyond simple presence/absence to address actual practice efficiency. Some assessment of condition, performance, or efficiency will be required.
- BMP function should not be assumed, even if presence is well-documented.

SUMMARY POINTS

- There have been few assessments of statistical confidence or error reported for the approaches to BMP verification described in the literature. Such assessments are essential and should be done by people with statistical and on-the-ground experience.
- Any proposed verification program, especially as applied to nutrient trading, should be scientifically defensible, and have a high degree of accountability and transparency.

SUMMARY POINTS

- Verification of structural, annual, and management practices will likely require different protocols and provide different information content and accuracy.
- Hybrid approaches probably have the best potential to provide complete and accurate information on BMP implementation and performance.

Questions?