Chesapeake Bay Program
Agricultural Modeling Team (AMT)
Meeting Minutes
December 9, 2022
9:00 - 11:00 AM
Meeting Materials

Summary of Actions and Decisions

Decision: The AMT approved the November 2022 meeting minutes.

Action: If members are interested in viewing the county raw data used in the CAST presentation, please contact Tom Butler (butler.thomas@epa.gov).

Meeting Minutes

Introduction – 09:00-09:10 [10 min (Tom Butler, EPA)

Tom gave a recap of our first meeting and group logistics.

Decision: The AMT approved the November 2022 meeting minutes.

Poll results – 09:10-09:25 [15 min (5 min presentation 10 min discussion) (Tom Butler, EPA)

Tom reviewed the initial prioritization ranking as well as new topics that the group felt should be included in the work plan.

Discussion

Eric Rosenbaum (in chat): PSNT tests are taken when corn is 12" tall. Good tool for adaptive nitrogen management. Charlie White at PSU is modifying PSNT guidance for 2023 to expand use in no till acres.

Mark Dubin: FYI - a STAC workshop paper will be published this upcoming year addressing poultry ammonia emissions in the bay watershed.

Chris Brosch (in chat): PSNT is an enhancement in the current NM panel report. Not sure if it's for timing or rate or both.

Robert Shoemaker (in chat): As I understand N and P rate enhancements it is not critical as to "why" a producer reduces rate below LGU recommendations but the fact and documentation that he does. In particular, the PSNT is not the only tool a producer could use to reduce rates. It's more centered around the number than the methodology.

Chris Brosch: Robert, you are right. There are identified items that would qualify you for an enhancement, whether its rate timing or placement. For rate and timing, you have pre-sidedress nitrate test (PSNT) that could also influence your sidedress application and as a result those are pieces of evidence that would qualify you for enhancement. A recommendation that is below LGU rates is another item that can qualify you for an enhancement. There is a table in the BMP report that connects the different enhancements (both N and P, but also time and placement) with various nutrient management plan items.

Eric Rosenbaum (in chat): PSNT is a N Timing Adjustment Practice
Clint Gill (in chat): Referencing the expert panel report, PSNT is a timing enhancement, and if it leads to an application less than uni rates you get the rate as well. The panel report for reference (p 30 and 31): https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/phase_6_nm_panel_report_11-28-2016_final.pdf
Ken Staver: Is there a document that specifies what the key concern is with each topic?
Tom Butler: this is the best we have at the moment: https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/AMT_Topics_w_input.pdf

Introduction of Topics – 09:25-10:30 [45 min (25 min presentation 20 min discussion) (Tom Butler, EPA)

We continued improving the group's understanding of CAST. Tom gave a presentation to show how changing inputs affect CAST. This presentation compared these changes across three different counties within the Chesapeake Bay watershed.

Discussion
Olivia Devereux (in chat): The map that Tom showed is here: https://cast.chesapeakebay.net/TrendsOverTime/NutrientsApplied
Olivia Devereux (in chat): It was definitely the lbs applied per year, not the load that runs off. That can be seen here, but like was said, is not relevant to his conversation. https://cast.chesapeakebay.net/TrendsOverTime/Loads
Robert Shoemaker (in chat): Does calculation consider transport of manure (poultry) from high concentration of origin areas to low concentration receiving areas?
Jessica Rigelman (in chat): The manure is the manure applied after transport.
Dave Montali: Yes, the numbers we look at already have the effect of manure transport in and out of the counties.
Robert Shoemaker (in chat): Does this calculation include manure nitrogen volatilization factors?
Jessica Rigelman (in chat): Yes, it includes volatilization losses.
Chris Brosch (in chat): The volatilization loss factor is over simplified and in one step in the sequence. In-house, storage and field losses are not separate.
Ken Staver: This is total N after inhouse volatilization has been accounted for but not field losses?
Tom Butler: Yes, that's correct.
Ken Staver: Is the crop need in Rockingham so low because of their yields?
Olivia Devereux: Probably due to a mixture of crop type and yields.
Dave Montali: So everyone is clear - the crop goals are not the recommended rates, they are a combination of recommended rates and elevated rates for the portions of the crop that are with NM and without NM. Jess, can you confirm that?
Jess Rigelman: That's correct, Dave.
Tom Butler: If folks think it would be helpful for me to isolate the nutrient management then I can do so in the future, but I don't have it shown here.
Robert Shoemaker (in chat): The direct deposition results from N removal from grazed pasture in the same field so recycled rather than being added to the system?

Gary Shenk: That's a reasonable point that they are recycled, but we are just saying that these things are applied and because it's sitting on the surface it is available for export. Also, just because the crop need is less than what is applied, it doesn't mean the load is really big. There is an average load from pasture. The loads you get from your county are relative to all other counties, not relative to that crop need necessarily. Crop need is a number that is used to figure out what is going to be applied in the absence of other applications.

Curt Dell (in chat): Does direct deposition include atmospheric N deposition?

Tom Butler: Direct deposition is not included in atmospheric category. Direct deposition is only for animals.

Olivia Devereux (in chat): There is a crop/pasture/hay removal rate that is the harvested amount for each type. We are not currently modeling cow recycling directly.

Mark Dubin: The crop need was originally generated watershed-wide from data that MDA had looking at what typical applications of N are for producers on pastures, so it is essentially an average value that was used. It doesn't reflect an agronomic recommendation from a LGU. It just reflects what the partnership wanted at the time. It is probably lower than what would be recommended from a LGU, so the expert panel didn't recognize an additional value for nutrient management application so this is essentially incorporating that.

Ken Staver: So then crop need is not what you need to grow the crop?

Mark Dubin: For everything else other than pasture, we used agronomic rates by state from land grant universities. So those values reflect that.

Ken Staver: Got it, so pasture and corn are different then.

Chris Brosch: Direct deposition of manure is an exception to the application sequence. The reason pasture crop need is so low is because of that logical change to pasture. Exists as a placeholder because the actual crop need needs to be constructed as a result of that direct deposition being automatically applied to pasture acres. In other examples of crop types, the crop need as a result of yield is easier to estimate. The crop need in the model acts similar to an ordering system - in order to apply any fertilizer, manure, or biosolids to an acre, there needs to be a crop need to call on that nutrient source to be applied in the next steps in the sequence. In this example, the 15 lbs is a placeholder to make sure those stockpiled amounts of nutrients are called on to these acres in the sequence with all the other crop types.

Olivia Devereux: The crop needs vary for every county and every year based on the actual yields reported in the ag census or in the NASS annual survey (if the crop type is covered in the annual survey), aside from pasture which is the same throughout all counties.

Mark Dubin: I believe the pasture crop need value is consistent across the watershed. The direct deposition is considered an uncontrolled nutrient source. That's why it's handled differently. Anything else handled in a barnyard or that you can collect for application is the primary focus for BMPs, so that is why pasture is unique in this regard.

Dave Montali: In my opinion, we need to make these processes more transparent and simplified.

Robert Shoemaker (in chat): Certainly a lot of pasture is not well-managed but a large number of acres are. Perhaps better addressed with a segregation of management types.

Olivia Devereux (in chat): There are pasture management BMPs that address that.

Chris Brosch (in chat): Right. And the logic for pasture was a VA lead construct in Phase 6 because VA dominates the acreage. BMPs are not always going to reduce the application of nutrients, but instead the estimated nutrient pollution load.

Chris Brosch: For the sensitivity aspect - you can compare it to "leakiness". You are converting application to load. 'Fertilizer' and 'grain with manure' categories are the leakiest factor on that land use in terms of lb for lb application converted to load.

Ken Staver: It doesn't seem to me like this needs to be simplified. We have animal numbers, manure, and land use data on the available places to put it. The soybean one is simple because it's just yield based. I think people get confused when new data shows up and it affects loads across the entire watershed, rather than what county that increase shows up in. Need to know how this ties into the loads to the bay.

Dave Montali: I agree with Ken. I don't think sensitivity is the issue. When the nutrient bucket changes in a county based on a change in data in a different county, that is where the problem exists.

Chris Brosch: The legume distribution of nutrients is not working the way we intended. I don't think any states signed up for applying fertilizer nitrogen to legumes, especially full season soybeans. We intended for areas with high concentrations of manure to use some disposal logic on acres of soybeans and we're seeing that in Rockingham, but I wouldn't expect any in New Castle or Berks County. Connection to yield is important but thinking about yield in terms of bushels per acre and having trouble reconciling the amount of fixation that is occurring. Might be worth looking into the sensitivities. In general, the logic at play had good reasoning but we weren't evaluating inputs we have today when we finalized Phase 6. Nutrients showing up in the model are outpacing the demand - that crop nutrient need is increasing at ⅓ rate that new nutrients are showing up in the model. Might be dominated by fertilizer and data we're evaluating outside the model.

Tom Butler: We can talk to modeling WG about sensitivities.

Gary Shenk: Sensitivities were determined based on literature reviews and model runs at the time. In the modeling WG work plan we have plans to reevaluate those values.

Chris Brosch: Literature on the effect of fertilizer on full season soybeans will not take into account the logic that was used in the model to simulate those acres. Can't really fathom why N fixation has a higher sensitivity than manure for fertilizer for full season soybeans.

Gary Shenk: The literature survey was based on a high-level estimate. The specific estimates were out of the Phase 5 model. We'll do things differently in Phase 7.

Ken Staver: Chris, when you put inorganic P on soybeans you have to use di-ammonium phosphate (DAP) and mono-ammonium phosphate (MAP) so you automatically get a little bit of N even though it's not recommended.

Chris Brosch: The model does not spread MAP or DAP. It spreads elemental versions of those formations as calculated by AAPFCO.

Mark Dubin: Even though the model is dealing with elementals, there was a recommendation to include the nitrogen in there as a percentage of that. Also - suggestion to add a third bar to these graphs to represent the LGU recommendations to compare to what the model is recommended and what the applications are.

Scott Heidel (in chat): An explanation of exactly how the TN applied per county is calculated would be helpful. specific examples of the calculations are needed.

Eric Rosenbaum (in chat): Does the model assume fixation can supply 100% soybean nitrogen needs?

Olivia Devereux (in chat): @Eric most states defined the soybean crop need, timing, and amount so that some inorganic fertilizer was put applied at planting. It doesn't have to be that way.

Chris Brosch: N fixation that is calculated in the model is based on the yield. Whereas on all other crop types nutrient application is being called on by crop need, N fixation in the model is not being called on. It is being generated by the yield in that county. In my opinion it's another reason why it is creating excess load.

Robert Shoemaker (in chat): Assuming N fixation reduction as manure is applied is being accounted for? i.e. legumes use free nitrogen before they expend energy to fix N.

Tom Butler: We have a set rate for that in the model.
Jess Rigelman: If there is manure and/or fertilizer applied, N fixation will be reduced. It does account for applied nitrogen.
Chris Brosch (in chat): @Robert The exact figure is in CAST documentation. It was based on some papers, dominated by one from Frank Coale.

Action: If members are interested in viewing the county raw data used in the CAST presentation, please contact Tom Butler (butler.thomas@epa.gov).

Closing –10:30-10:35 (5 minutes)

Participants

Tom Butler, EPA-CBPO	Jennifer Walls, DNREC
Jackie Pickford, CRC	Becky Barlow, VA DCR
Cassie Davis, NYSDEC	Scott Heidel, PA DEP
Zach Easton, VT	Dave Montali, Tetra Tech WV/Modeling WG
Mark Dubin, CBPO/UME	Chris Brosch, DDA
Eric Rosenbaum, PA4R Alliance, Rosetree Consulting	Alex Soroka, USGS
	Clint Gill, DDA
Jeff Sweeney, EPA	Clare Gooch, DNREC
Karl Blankenship, Bay Journal	Emily Dekar, USC
Kristen Bisom, WVCA	Holly Walker
Jessica Rigelman, J7 Consulting	Ken Staver, UMD
Gary Shenk, USGS-CPBO	Ruth Cassilly, UMD-CBPO
Curt Dell, USDA-ARS	Patrick Thompson
Tamie Veith, USDA-ARS	Kathy Braiser, PSU
Tom Basden, WVU Extension	Candiss Williams, USDA
Olivia Devereux, Devereux Consulting	

Acronym List

AAPFCO: Association of American Plant Food Control Officials
AMS: Agricultural Modeling Subcommittee (Phase 6)
AMT: Agricultural Modeling Team (Phase 7)
APLE: Annual phosphorus loading estimator
BMP: Best Management Practice
CAST: Chesapeake Assessment Scenario Tool
CBPO: Chesapeake Bay Program Office
DAP: Di-ammonium phosphate
DEQ: Department of environmental quality
GIT: Goal Implementation Team
LGU: Land grant university
LRseg: Land river segment
LUWG: Land Use Workgroup
MAP: Mono-ammonium phosphate

MDA: Maryland Department of Agriculture
N: Nitrogen
NASS: National Agricultural Statistics Survey
NHD: National hydrography dataset
NM: Nutrient management
P: Phosphorus
PSNT: Pre-sidedress nitrate test
RUSLE: Revised Universal Soil Loss Equation
STAC: Scientific and Technical Advisory Committee
TN: Total nitrogen
USDA: United States Department of Agriculture
WEP: Water extractable phosphorus
WG: Workgroup