Chesapeake Bay Program
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Agricultural Modeling Team Meeting Minutes

February 13, 2026
8:00-11:00AM

Visit the meeting webpage for meeting materials and additional information.

Purpose: To recommend supplemental NM efficiencies and discuss the AMT timeline, broiler data updates, and nutrient applications.

Summary of Actions & Decisions

Decision: The AMT approved the January 2026 meeting minutes.
Action: The AMT will decide on its meeting frequency past February at their next meeting. It has been recommended that the AMT meet bi-monthly (every two months) starting in April until we have outputs for the Phase 7 model. This would include a three stage review of the following:

a. Source Data (April-July)
b. Input Data (August- October)
c. Output Data (November-February)

Decision: The AMT recommends the Watershed Technical Workgroup adopt the following supplemental nutrient management efficiencies for hay high and pasture high.

	Placement		Rate		Timing	
Load Source	N	P	N	P	N	P
Hay High	5.00	10.00	15.00	5.00	5.00	1.00
Pasture High	3.00	10.00	5.00	5.00	5.00	1.0

Decision: The group endorsed continued investigation of data required to make the proposed updates to broiler populations, litter, and nutrient concentrations. The final progress on updated broiler data will be shared at the February 27th AMT meeting, and the group will vote on the adoption of this updated data for Phase 7. Additional coordination will take place offline as needed, in advance of the second February AMT meeting.
Action: Please reach out to Tom Butler (Butler.Thomas01@epa.gov) with any remaining questions or concerns regarding the broiler data update, ahead of the February 27th AMT meeting.

Action: A conclusion was not reached regarding options for the backfilling of organic sources with inorganic sources. Please provide any remaining insights on how to proceed with the nutrient application algorithm by Wednesday February 18th. If there are no proposed paths forward, the group will determine this topic finished and instead focus on the inclusion of updated broiler data at the next meeting.

Minutes

I. Introduction & Announcements

Lead: Tom Butler, EPA; Zach Easton, VT

The group was asked to review the January minutes for approval. The AMT also heard a brief update on the group's tentative review timeline and meeting schedule moving forward.

Actions:

1. The AMT will decide on its meeting frequency past February at their next meeting. It has been recommended that the AMT meet bi-monthly starting in April until we have outputs for the Phase 7 model. This would include a three stage review of the following:
    d. Source Data (April-July)
    e. Input Data (August- October)
    f. Output Data (November-February)

Decisions:

1. The AMT approved the January 2026 meeting minutes.

Discussion Notes:

Dave Montali: At the Modeling Team meeting this week, Joseph brought up an issue that people should be aware of. The job of the Modeling Team is to incorporate all of the inputs that this group has recommended. It could happen that in taking that information and building it into the model, the Modeling Team sees something "fatal", something really bad about what we told them to do. So, somewhere in 2026, an issue could come up. I assume that if it was something really bad about something that this group recommended, there would be communications to Tom, and Tom would have to bring it up to us.

Chris Brosch (in chat): Are the stages without changes also opportunities to continue testing proposed changes?

Tom Butler: Dave, that's a really good point. We definitely want to have that communication line open and, obviously, the smart people working on the model will have a good idea for what's happening there. If there's something that can be changed within that framework, I think that is a potential discussion. I just didn't want to set the stage that people might expect we can continue to test and change things. I see a question in the chat already about that, and the answer is we have to lock it down. We have Jess, Joseph, and people like Gopal and other Modelers who really need to have things locked in. If things are egregious and crazy and can be changed without having to restart, maybe. But, I don't even want to promise that because these people need time to work. I think that is the main takeaway from that.

Zach Easton: If there are no other questions about this proposed workflow/timeline, then I suppose we could move forward.

II. Supplemental Nutrient Management on Pasture and Hay

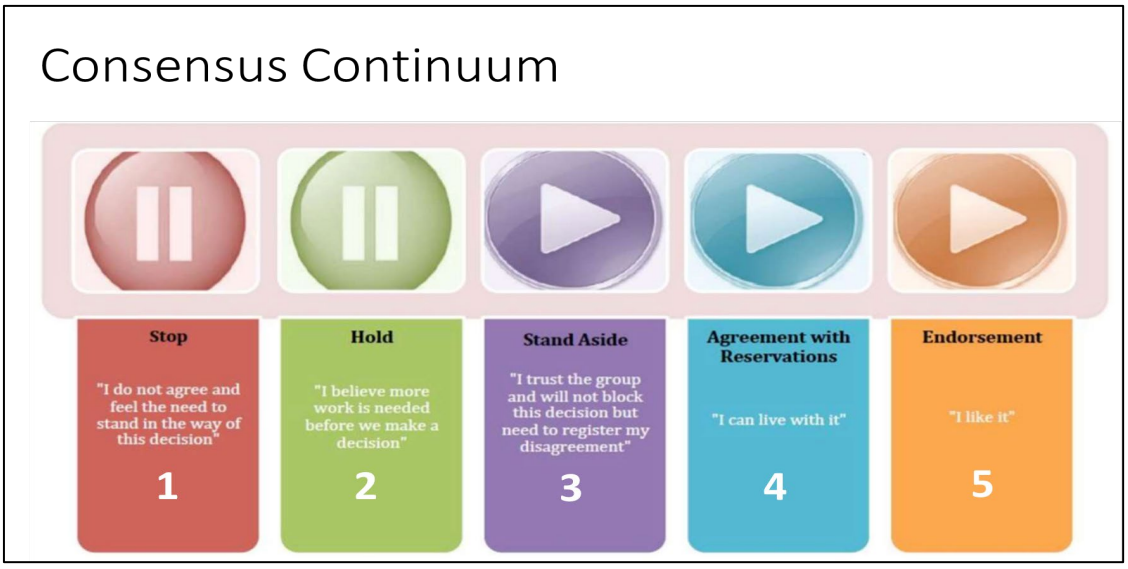
Lead: Tom Butler, EPA

During the creation of Hay High and Pasture High Land Uses we did not address the efficiencies of Supplemental Nutrient Management, Rate, Placement, and Timing. The AMT reviewed potential efficiency values for Phase 7 and decided on what to recommend to the Watershed Technical workgroup for adoption.

Decisions:

1. The AMT recommends the Watershed Technical Workgroup adopt the following supplemental nutrient management efficiencies for hay high and pasture high:

	Placement		Rate		Timing	
Load Source	N	P	N	P	N	P
Hay High	5.00	10.00	15.00	5.00	5.00	1.00
Pasture High	3.00	10.00	5.00	5.00	5.00	1.00



Role	Name	Affiliation	Vote
Signatory	Clint Gill	DE	4
	Alisha Mulkey	MD	4
	Cassie Davis	NY	3
	Scott Heidel	PA	3
	Tim Larson	VA	4
	Dave Montali	WV	4
	Auston Smith	EPA	4
At-Large	Ken Staver	UMD	3
	Tamie Veith	USDA-ARS	3
	Candiss Williams	USDA-NRCS	3
	Alex Soroka	USGS	3
	Zach Easton	VT	4

Discussion Notes:

Ken Staver: I thought in all of our practices, the only place that rate made a difference was in our inputs. I never thought rate was handled as an efficiency.

Tom Butler: The way that nutrient management effectively works is that the rate is reduced with the core. The supplemental has its own rate component outside of that. So, the core nutrient does contain a component of it, but the rate does have an efficiency.

Ken Staver: Is it that way with the other row crops?

Tom Butler: Yeah.

Ken Staver: I just always thought all of the inputs were handled in terms of the pounds applied, it wasn't actually an efficiency.
Tom Butler: That's when they do core. So, not everyone will put a rate, placement, or timing. So, they could get their rate reduced with the core, but they can do the additional step of a rate. This is how it is set up.
Ken Staver: And then that is handled as an efficiency? I am wondering how it affects the fertilizer bucket then if it's not actually a change in the pounds applied.
Chris Brosch (in chat): Eligibility for rate efficiency was for "enhancement rates" akin to a value below LGU rates.
Tom Butler: Chris has got some input on that. The eligibility for the efficiency value was kind of an enhanced rate. So, the land grant university would be the value for nutrient management, and then you would go below that for the enhanced rate. In terms of the bucket, that would be kind of how it would play out. It's the rate. So, it's added on. We would first go through, reduce the overall application rate, and then it's kind of blended. We don't have nutrient management acres and non-nutrient management acres. So, that kind of goes into one pot, and then this would be on top of that.
Ken Staver: We don't have many acres in the other practices that get the extra reduction, right?
Tom Butler: I don't know the overall breakdown. I would actually have to look at that.
Jess Rigelman (in chat): Supplemental NM BMP do not affect the fertilizer bucket.
Hunter Landis: I was just going to comment on that enhanced rate efficiency. If you are doing a PSNT, additional practices are the factors that affect the enhanced rate.
Tom Butler: I think you're right on those, Hunter. It's different practices. Any additional comments?

Proposed Recommendation to WTWG

Ken Staver: To be super clear about what that table is, those numbers are the percent reduction in the edge of stream load if you apply these practices? Is that what those numbers are?
Tom Butler: Yes, and we have those for Nitrogen, and Phosphorous for placement, rate, and time. Just as another note, to get these you would first have to put core nutrient management down and then you are eligible to put rate, placement, timing, and they would have that impact on the edge of stream loads.
Dave Montali: One of the things I was thinking was let's just not get into what the BMP Expert Panel came up with and why, and just simply do the same thing for hay high and hay low- the rates that were already established, their percentages, and their efficiencies. You could just simply say if it had one before, we give it the same one for high as we did on low. I did recall, too, when I asked our nutrient management specialists about what the recommendations were for hay (how much N, how much P), there was a component that was split application, and the guy said a majority of the people don't apply that second amount. There I could see a reason for an additional rate for hay high. Whereas hay low doesn't have one because hay low consists of predominantly hay acres with little or no nutrient application. So, I think what you've got makes sense. Whatever the will of this group is, I could go either way.
Tom Butler: Thanks, Dave, I appreciate that insight. Were there other comments on this? Maybe I will run through this here and ask does anyone have an objection to sending these values to the WTWG for their approval on March 5th?
Ken Staver: Just to be clear, if they don't have core nutrient management on these acres, none of this is in play?
Tom Butler: Correct.

Ken Staver: I never did understand how placement of nutrients only counts if you have core nutrient management. If you are subsurface applying nutrients, you are subsurface applying nutrients whether you've got the box checked for core nutrient management or not. I know we don't want to go back and open that all up, but it seems like there are some practices that are beneficial no matter what. I don't want people to not encourage practices that are positive just because they don't get credit because they don't have core nutrient management on those acres. So, it should still be practices that are being emphasized and promoted. But, that's kind of assuming everybody's paying attention to whether or not they're getting credit. Hopefully, at the implementation level, people aren't actually paying attention that much. They're just encouraging the things that should be done. If you're subsurface applying nutrients, it's a positive thing no matter what your core nutrient management status is. But that's another decision that's probably already concrete.
Jess Rigelman: That's the official party line that's in the nutrient management expert panel and technical appendices, but there's no way we can enforce that in the model because of overlapping practices and how they have to be proportioned to land river segments. So, there's no actual verification or validation of this in CAST or in the model. So, I guess what I am saying is that's the party line, but it isn't enforced.
Ken Staver: What kind of reductions come out of these practices? Are they significant practices in terms of reporting around the watershed?
Tom Butler: You mean just efficiency?
Ken Staver: Some of these numbers are 10/15%. There are some practices that could yield some significant reductions. Are they being widely implemented and credited?
Jess Rigelman: If they are submitted, they are usually credited mainly because they're not being reported or there isn't that much of it in the watershed. They are increasing every Progress year, but the numbers are still relatively low.
Sarah Xenophon (in chat): To Ken's point, in the field, I think there may be a wide variety of how Ag Techs across PA are collecting BMP/management data. It would be good for them to understand that if they are doing the work to input one of these practices, that they need to account for and include core management as well.
Dave Montali (in chat): WV hasn't yet reported any supplementals.
Tom Butler: I see a chat from Sarah. Thank you, Sarah. Does anyone have any issues? If not, I will just put everyone as a 4 and register this up to the Watershed Technical Workgroup and they can vote on it there for the final approval.
Tim Larson (in chat): 4
Clint Gill (in chat): DE is a 4
Auston Smith (in chat): EPA is a 4
Zach Easton (in chat): 4
Alisha Mulkey (in chat): MD 4
Scott Heidel (in chat): PA 3
Dave Montali (in chat): 4
Tom Butler: Hearing nothing and seeing these votes, we are going to put this through to the Watershed Technical Workgroup, and the Watershed Technical Workgroup can make the ultimate decision. If I have not heard from you in the chat, I will register you as at least a three, and we will go forward.
Auston Smith (in chat): Thanks everyone, look forward to the conversation at the March 5 WTWG on this topic!

III. Broiler Update

Lead: Mark Nardi and Chris Brosch

A progress report was given on the effort to update broiler populations, manure generation, and concentration data. This presentation sets the stage for a future group vote on the adoption of these updated data for Phase 7.

Action:

1. Please reach out to Tom Butler (Butler.Thomas01@epa.gov) with any remaining questions or concerns regarding the broiler data update, ahead of the February 27th AMT meeting.

Decisions: The group endorsed continued investigation of data required to make the proposed updates to broiler populations, litter, and nutrient concentrations. The final progress on updated broiler data will be shared at the February 27th AMT meeting, and the group will vote on the adoption of this updated data for Phase 7. Additional coordination will take place offline as needed, in advance of the second February AMT meeting.

Consensus Continuum

Role	Name	Affiliation	Vote
Signatory	Clint Gill	DE	5
	Alisha Mulkey	MD	5
	Cassie Davis	NY	3
	Scott Heidel	PA	4
	Tim Larson	VA	3
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	Tamie Veith	USDA-ARS	3
	Candiss Williams	USDA-NRCS	3
	Alex Soroka	USGS	3
	Zach Easton	VT	3

Discussion Notes:

Dave Montali: Are you proposing today changing the pounds P/pounds N for pounds dry litter?

Chris Brosch: I will get to that. It's not the most complicated proposal today but yes.

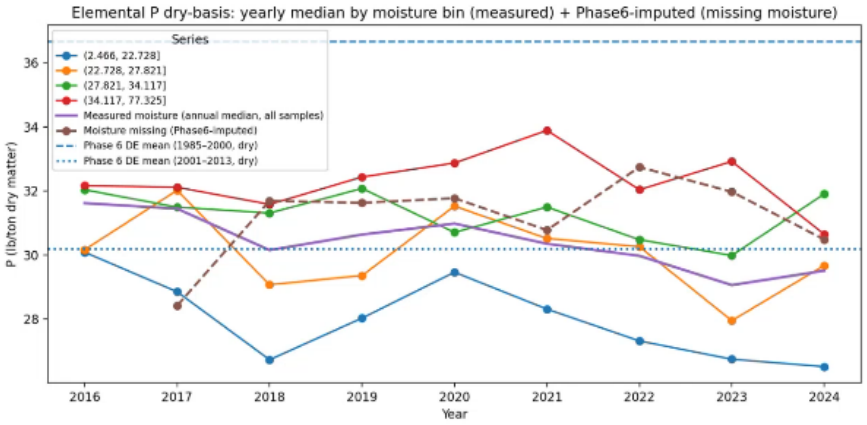
Hunter Landis: The numbers in the series next to the blue, orange, green, and red are moisture contents, correct?

Mark Nardi: Those are 100 percent moisture content, yes.

Hunter Landis: Was the number of samples within those fairly distributed?

Mark Nardi: I didn't investigate that. I will put a pin in that and do that. That's a good data exploration question.

Chris Brosch: I would say the moisture is relatively normally distributed. So, the orange and green lines should have the most number of samples. But, it's just a guess.



Elemental P results, dry basis

- Elemental P converted from lab-reported P2O5.
- Normalized to dry-matter basis.
- Median dry-basis P consistently below Phase 6 benchmark.

Dave Montali: Overall, I've heard from West Virginia folks that our chicken production isn't the same as the Delmarva. Have you incorporated information from West Virginia labs, or have you talked to West Virginia DA folks in doing this work at all?

Chris Brosch: We did outreach on both sides of the New Year to the states to try to get lab and production data. We heard from Virginia that their data is missing moisture, which is a quality issue. We're trying to work that out, but that was the only data that we got in that data call.

Dave Montali: With some of the trends that you are talking about for Delaware, do you anecdotally believe those to be the same kind of trends that are going on in Pennsylvania, West Virginia, Virginia, or do you just not know?

Chris Brosch: I have heard from the industry that they expect organic birds to be similar to organic birds. So, the Coleman line for Perdue should be husbandry/management wise, similar to Bell & Evans. That's a harder signal to track, because it's a shorter temporal signal. So, we have fewer years with which to try to build a robust analysis, and we are limited by only talking to one of the two growers. Of course, the integrators that are out near the Shenandoah Valley that you're familiar with, Dave, haven't provided this information even historically when the data call was done in 2011 and 2012. So, not having that information is not uncommon for this analysis in its second generation. But, we can try to make expert judgements to capture what may have changed in those areas without derailing some of the robust data we've got here on the Delmarva Peninsula.

Dave Montali: Good enough for now.

Robert Sabo (in chat): Do Chesapeake Bay birds get fed distillers' grain? DDGS, highly enriched in N and P, are likely a major part of the feed conversion efficiency improvements after 2007 for our national flock?

Chris Brosch: I don't know of any integrators buying dry distillers' grain for feed. It's largely corn, soybeans, and wheat as well as mineral and pH adjustments. Phytase is used ubiquitously in these integrated contract poultry houses.
Robert Sabo: Fantastic presentation, thanks for that. We're just trying to figure out where this distillers' grain is going. Of course, it is probably just concentrated in the midwest feeding the swine and poultry and cattle out there. The second question I have is in regard to the nitrogen content of the poultry litter going down. Is the nitrogen content of the excreta of the birds literally going down, or is it more with the practices you're leading to more ammonia volatilization, so the nitrogen content of the poultry litter is going down?
Chris Brosch: That's a good question. Literature captures the excreta, and that includes the ASABE, the prior analysis that was used in Phase 5 and earlier versions of the model. Phase 6 and this proposal ignore any analysis on excreta. We are looking at litter exclusively. That includes bedding and includes the management effects. It's going to implicitly include any litter treatment. We don't have robust data sets for wet excreted manure, just litter.
Robert Sabo: Do you think some of the industry or ag partners you have might be able to get some of that data? Do you think they have that handy? That would be powerful to demonstrate that the protein content of their excreta is actually going down. I think that'd be an exciting development.
Chris Brosch: I'm sure there's more information about it in the literature than this very simple review, but a third study I left off was actually a meta-analysis of quite a few papers, and I'll send all three of those to you for your review.
Robert Sabo: That'd be awesome.
Chris Brosch: I don't want to not answer your question, but Mark is doing this work with an agreement. So, we have bounds with what we can do. Certainly, the hardest parameter to meet is the timeline for you guys.
Robert Sabo: This is fantastic. I look forward to hearing more about it. On the volatilization issue, if this was to be incorporated, I guess there has to be some discussion on the atmospheric deposition side as well.
Chris Brosch: There's a whole STAC report coming out about that, so I am very carefully going to not address that.
Hunter Landis: I had a question that I think you might have already acknowledged. In looking at your feed efficiency line, I understand the feed efficiency process and what that indicates, but is it possible that there's a concentrated level of N and P in that feed, which we would know on the back end? I think you kind of acknowledged that in one of your literature review points. Does that question make sense?
Chris Brosch: I don't think they detected or even looked at anything on the phosphorous side with regards to feed efficiency. Phosphorous is a feed additive just for strong bones and that undercarriage of the bird to hold up all that weight that genetics pack on. So, I wouldn't expect that to be any different. But, we're not seeing a strong signal other than a very slight decline in the litter. So, I don't think that feed efficiency has a strong effect on phosphorous. It would correlate to Nitrogen because feed efficiency and weight gain have to do with the muscle and, like Robert was saying, the protein is formed from the nitrogen in the feed. So, a more efficient bird would be more efficient with nitrogen as a result. In a benchtop study, it could be that all the feed efficiency is directly correlated with weight gain. You could have an improved feed efficiency for a bigger bird that grows faster in the same amount of excreta, but that's why we need the literature to tell us, no, they're both going down as a result.
Joseph Delesantro: I have two questions. The first is just to make sure I understand these clean out cycles. This is new for me- these sort of specifics of how this is done. So, rather than doing

a running average on this, for the tonnage removed and the population of birds you'll need to take sort of a windowed approach between these clean outs, right? So, you'll take all the mass within this period and then divide that by the mass of birds within the period to get the generation per mass of birds. Is that the idea?
Clint Gill (in chat): Thanks Chris and Mark, lots of hard work here!
Chris Brosch: Yeah. I might replace some of that terminology, but I think it's semantics. I think you've basically captured it.
Joseph Delesantro: So, one thing I might be concerned about is the results that are going to be pretty sensitive to what this window is. Maybe the haulers have 100% confidence that this is what the cleanout period is, maybe it comes out of the data really obviously that this is what the window is, but I think there could be quite a bit of sensitivities to that tonnage hauled based on that windowing. So, it would be good to see what that confidence, uncertainty, or what that sensitivity would be.
Chris Brosch: I agree. This is what we're proposing to change. So, on this slide is the line that allows bird weights and bird counts to be converted to wet pounds of manure or litter. It's litter because it's always mixed with bedding. I want to be consistent. What I think is going to happen, and I've convinced Mark and Paul Bredwell and others is that if we reevaluate this based on the hauler data and the industry's production information for individual farms, and we add 60 dots to the dots on the screen, you are going to see a very different signal. That's what we are proposing is to look at that signal and interpret it in a different time step. I haven't been able to find the paper that produced this. But, my understanding based on forensically trying to look it up is that it captures a very narrow window. We are looking at a decade of data, and we know how much feed efficiency can be gained in a decade. So, that's why we're trying to chase this down. If this feed efficiency affects the volume of litter, it should show up here. Because this is old data, produced prior to 2011 and, again, I think it was over a year, there is some reason to think that the distribution of market weight is centered around 6.1/6.2 pounds. If I can take you up to some snippets from Appendix B, 6.2 pounds happened in 2004 on an industry scale. So, that's just two decades. Those two decades (2004-2024) capture almost all of the trend in that black line. So, that's a really strong reason to investigate this.
Joseph Delesantro: Sure, sounds good. Once you all have the population or the mass number, it would be interesting to see exactly how that math is done to get to the plot you showed on slide 24 for those really sporadic clean outs. My second question is just about the timeline here, and probably Tom has more to say on it than I do. You mentioned that you've gotten some positive feedback from the producers about population/mass numbers. Is this to the point where they've said yes, we are providing it, and then we are just waiting for the numbers?
Chris Brosch: We reached out to the integrators in the first two weeks of January and got tacit approval from the four we met with. We weren't able to nail down Tyson, but the feeling locally was that they would not be able to meet our deadline or even agree to help us. The other four that make up 90% of the bird production on the Delmarva have all agreed to it. They all understand the deadline, and we already have results back from Perdue, which is 35-ish percent of the birds grown in the Delmarva and captures the organic signal that we're really anxious to see if we can tease out to help us with Pennsylvania. I don't know if the organic question can be answered by the deadline that Tom's explained to me, and we do get that. It is a long shot to get all these things done. But, to get the moisture, the nutrient concentrations, and a visual representation of modern wet pounds of litter per pound of average market weight, that can all get done by the deadline.
Joseph Delesantro: Ok, great. Thanks.
Robert Sabo: On slide 23, one thing that could be helpful for me is if we can get that black line normalized into units of nitrogen or phosphorous because sometimes the mass of the feed

varies based on your combination of soy or corn. The second thing I want to emphasize is the importance of small grains in feed conversion efficiency. Nationally, the Nutrient Inventory just reported that a 2% gain in efficiency resulted in almost a 10% decline in what you would have expected in terms of manure excreted. So, these small changes in efficiency lead to huge differences and assume manure excreted values and, of course, have big implications for the mass balance. So, I just want to emphasize this is a really important topic. Caitlin Grady, who presented to the AMT two or three months ago, her model is also emphasizing this is a very important lever point. If poultry and livestock producers can increase their feed efficiency, they can greatly decrease the mass of manure nitrogen and phosphorous being generated by these animals that cause some burden to water quality in the Bay. So, this is a hugely important topic, and small changes in efficiency have huge implications for manure.

Chris Brosch: This signal is really just speaking to us as a reason for which to reinvestigate the Malone relationship. It would be a very academic question that's outside of the scope of our project to tie it directly to nitrogen and to do that and find the overall effects of that on the mass balance would be huge and also a significant deviation from the methods in the Glancey report. So, for those reasons, we don't want to touch that. If we can detect a different relationship in modern times and know that it's impacted by the feed conversion that has accelerated, know that it's impacted by the windrowing/husbandry with invisible but real effects from litter treatment technologies, we need to update this.

Dave Montali: Early in the presentation when you were talking about changes in moisture, you were talking about in-house practices. More blowing off of ammonia, I assume that ultimately that's a component in the change in the nitrogen content in the litter, but is it a big thing? Is it fair to do that without reexamining our volatilization stuff in the model, or is that a little thing? I don't completely understand other than the idea that I think we prescribe a certain volatilization rate of all manures. Is that a big thing going on that we need to also look at if we consider changes in the nutrient content of the litter?

Chris Brosch: The same question was discussed when the 2015 report was produced. Where is the model simulating the volatilization, because it happens through the life cycle of manure? Where we have the DDA logo, the data is representing manure sampled from the house, manure sampled from the shed, manure sampled from the back of the truck as it is leaving the farm, so it's somewhere in between. Volatilization effects on those different samples will have taken place. The seasonality of rearing the birds has a major impact on volatilization as well as the pH of the litter, which has feed impacts. The litter treatment technologies generally adjust pH, which has a major effect on ammonia, and we just can't tease it out. We can't do the cradle to grave analysis that would capture that. But we can implicitly capture it and make decisions about the efficacy and implementation of BMPs, like litter treatment technology, after the fact. I don't want to touch it today. I'm not recommending we deal with that in any different way than we have historically because I am aware of the STAC report that's about to come out on ammonia and sensitivity of ammonia volatilization from different animal types and those management practices. The literature we reviewed tells us that there are effects but, to tease it out is way more complicated than the next steps we've outlined for you here today.

Mark Nardi: Chris, the sensitivity between the bird mass and the litter mass in the haulage data, there's a lot of picking at that data and understanding when those events happen and how they all line up. So, that's something else that is not a simple thing.

Chris Brosch: Mark, thank you for pointing that out. We also discussed identifying that as an opportunity to reconvene with those of you on the call who are interested offline. We've detected, with the hauler's help, 60 or so farms for which there was a clean out signature noticed. When we got that data back from the integrators to tie it to the bird weights and analyze those cumulative charts, we noticed that the hauler isn't always right. I've redacted the

farm names, but the farms change through time, too. It's also a matter of how accurately the hauler captured it. So, there are lots of different things that make this a manual process that we'd like to automate perhaps in the future. So, if anybody wants to roll up their sleeves a little bit and help inform the big red zone drive we've got in the last two weeks, we'd love to take the time and investigate that further with anybody that's interested and willing to lend some help.

Ken Staver: I wonder where you see this going at the management level? If you are a crop farmer, most of this litter ends up on crop fields. The farmer has their litter test and puts the litter out there based on test results, hopefully. Because of the P content, there aren't too many folks using all litter for meeting their N requirements. They're just using some litter and then they're filling up the rest with inorganic. I am a big proponent of the idea that nutrient reduction happens field by field. If litter is just a component of the N and we are backfilling with inorganic and if the farmers are already testing the litter that they're using on fields, hopefully within the constraints of a nutrient management plan, where is this going to change things?

Chris Brosch: The management of the nutrients on the landscape is a question that's independent/separate from the methods of analyzing the data on a county basis in an annual time step in the "big averaging machine" that lives in Annapolis. But, I appreciate the question. If we have more infrequent clean outs and cake outs, and we expect higher nitrogen and higher phosphorous, [and we go back to the data for N and P], they've decreased when done on a dry weight basis. So, the Watts paper summarized as a wet basis, and the moisture is the correction factor, but to illustrate the manure data the phosphorous is still decreasing.

Ken Staver: I have no issues with all the points you are making and it makes sense. There's always a push for more feed efficiency, and the producers have to deal with house issues. If they need to get rid of ammonia for bird health, they get rid of it, and they aren't worried about ammonia for corn. At the end of the day, whatever the litter is, the producer who was putting it on the field is going to test it and adjust management appropriately. So, I am just thinking in terms of how we manage the landscape which turns into loads and is where you see the bottom line at the end of all of this.

Chris Brosch: Mark asked me this question because someone posed it to him. What are the farmers going to think if they know that it's very likely the manure they bought this year is lower in nutrients than last year? Aren't they going to pay less? I said they have the analysis, they know what they bought, and then the free market is going to take over. The same is going to happen with the analysis in the tonnage. If we're moving from 51 pounds per ton of phosphate down to 48, how does that change the tons that are spread on the landscape? Well, you know, Ken, you can't calibrate that spreader better than a couple tenths of a ton per acre. So, I don't think it has an effect on a year over year basis. But, on a decadal scale which is often how we look at this, I think there's going to be a little signal, and that's good.

Ken Staver: I agree. I think it's all good to know. I like to be data driven. I guess it's just going to change our balance. If we now have a fertilizer bucket fixed by sales data, then it is important that we have the manure nutrients as close as possible.

Chris Brosch: The fertilizer data that is variable by state in the way it is collected and variable in quality because it undergoes different types of analysis before it is submitted to AAPFCO, that is all less rigorous and academic than the way Glancey produced his report. That was based on analysis from three labs that are all unified and have accreditation from the Manure Testing Authority in Minnesota. With the exception of the data submitted by Virginia, which we really appreciate, we have moisture content for all of it too. So, I believe this data set to be more robust, and it may apply better to the Delmarva than anywhere else. But, we can

extrapolate the trends in the industry, where they apply, and set the bar for the other states. If it doesn't apply well to them, we can go reproduce it with the group's help.

Ken Staver: I didn't really want to open up that sort of fertilizer argument, but I won't disagree with you.

Chris Brosch: You are saying they are connected though, right? They are connected, and one of those data sources is exceptionally well known in one big piece of the landscape.

Ken Staver: It seems to me that doing the whole picture would be really good to work on. I know you said there's a STAC report coming so you don't want to touch it, and I don't know if the STAC report goes into what you lose in the field, but we have no till and litter, so there's a whole other slug of ammonia that gets lost and that's a sticky part in nutrient management. How you go from litter analysis to plant available N for the crop is also tillage and weather dependent. So, the whole story, tying this into the whole package from the chicken to the corn plant, I think would be really [interesting]. I know that's not what you're supposed to be doing but, at the end of the day, that's sort of what we are after.

Chris Brosch: I appreciate all the questions. They're well thought out. I'll do what I can, but I think we've been sensitive to those as best we can, based on the limitations of the data.

Mark Nardi (in chat): Does this question loop back to the crop demand mass balance that Ed Kee and Kelly Shenk worked on way back when?

Chris Brosch: Any other questions? I am going to read Mark's comment and kind of make it last call. He said, "does this question loop back to the crop demand mass balance that Ed Kee and Kelly Shenk worked on way back when"? It sure does, Mark. Ed was directing Clint and I, and Alisha Mulkey was almost spearheading it with supervision from Jim Glancey. So, with my expertise and Alisha weighing in on this from time to time as I updated here, it's steeped in that mass balance question.

Mark Nardi: Right, that's the endpoint I think that Ken was driving at and how it is applied to the landscape. So, I just wanted to remind people that it was out there. I don't think that was ever accepted, but it is a tool that still exists that could be revisited.

Ken Staver: Agronomically, we are interested in what's available for the crop and then what's available for leeching. So, we have this infield N thing we have to work on. But, when we talk about the big mass balance, and there's a whole lot of N mass balances flying around out there, this ammonia thing is a giant part of it. In your data, somewhere in there it says half of the N is volatilized before it even gets to be applied and then there's more atmospheric losses there. On the flip side, we have fixation coming into our soybean field which are massive, imprecise quantities. So, I don't want to run too far with the mass balance thing at the large scale because there are just giant question marks there. I do think what's available for the crops is where we really need to focus to get it tightened up as much as we can.

Mark Nardi: Fair enough, thanks.

Chris Brosch: I agree. Let's tell the new Ag Advisory Committee and see if they've got some resources.

Scott Heidel (in chat): We should also account for MTT since we have facilities in PA that are treating millions of birds each.

Chris Brosch: Absolutely, Scott. Historically in Delaware, we treat that as transport out of the watershed because it kind of leaves agriculture, understanding that the leftovers of that process probably come back to agriculture. But, that's how other states have handled it. Along with some of the thinking Ken shared, it's outside the scope of this project. Tom and Zach, if we could ping the group to tell us to keep working and that they like the direction, that would be appreciated.

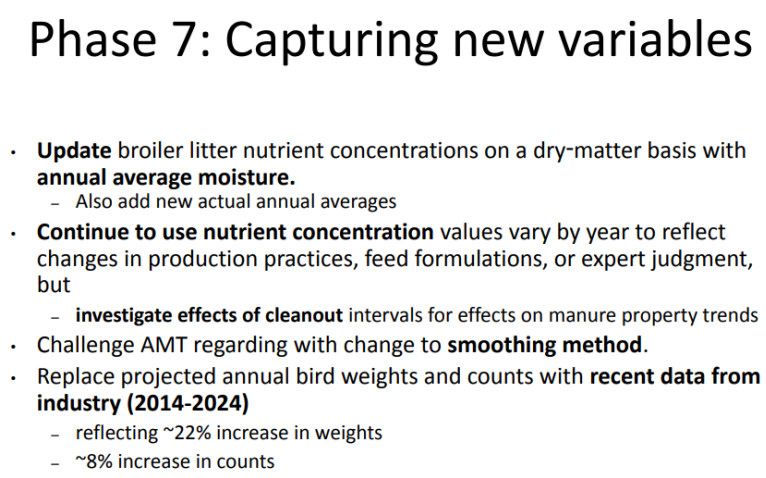
Clint Gill (in chat): Delaware is a hard agree that this work should progress.

Tom Butler: I definitely appreciate this. Huge thank you to Chris and Mark for doing this. If there are other comments people would have on this, we'd really appreciate you guys getting those out. If you have them now, that's fine. If you could email them in the next few days, that's great. Obviously, we have a very quick turnaround on this, so we will be voting on this on the 27th for the incorporation/change. So, it doesn't leave a lot of time. We'd really appreciate if anyone has concerns with this that they voice them now. It sounds like we don't necessarily have those. So, I think it's more of a tacit approval, but I just want to float that by everyone here. Clint has already put in the chat that Delaware agrees this should progress pretty adamantly.

Alisha Mulkey (in chat): MD 5

Scott Heidel (in chat): PA 4

Hunter Landis: Tom, is the slide that Chris has got posted there what the voting action or decision would look like?



Chris Brosch: It would be endorsement of that slide especially, Hunter, or anywhere on the continuum where you land.

Dave Montali: Is all of this something that we could get to a vote on in two weeks?

Chris Brosch: Yes.

Dave Montali: Ok, sure. Continue.

Hunter Landis (in chat): Vote at next meeting?

Tom Butler: Yes, Hunter, that would be the 27th we vote. If you put a vote in the chat, we will register that for what it is. If not, we will put you down as a stand aside that you're not going to inhibit this, and we'll roll from there. It seems like there is pretty good support to keep doing that, and we will shoot for a vote to incorporate it in two weeks from today. I'll give anyone a chance here in the next 30 seconds or so if they have an objection to that.

Auston Smith (in chat): EPA 4

Cassie Davis (in chat): NY 3- stand aside

Chris Brosch: I will stay on the call, too, and happy to monitor the chat or take any questions for the duration of the meeting.

Tom Butler: Ok. Thank you, again, Chris and Mark. You've been great on this. We will get those materials posted and we will have it so everyone can see. Any questions, please reach out.

IV. Nutrient Application Algorithm Discussion

Lead: Tom Butler, EPA

We examined several CAST runs that examine the impact of modified plant available nitrogen on the acres of Grains with Manure and Grains without Manure. Further investigation regarding the backfilling of organic sources with inorganic were examined as well as the manure transport from specific areas. Discussion took place regarding these results.

Actions:

1. A conclusion was not reached regarding options for the backfilling of organic sources with inorganic sources. Please provide any remaining insights on how to proceed with the nutrient application algorithm by Wednesday February 18th. If there are no proposed paths forward, the group will determine this topic finished and instead focus on the inclusion of updated broiler data at the next meeting.

Discussion Notes:

Ken Staver: When you are in scenario mode, you are going to propose that you are moving manure out of the county in the scenario, right? You don't have fertilizer data. In that scenario, do you change your manure acres? Do you just put less manure on all your manure acres?

Tom Butler: There's a catch to this, and I will put you on hold for that one because that is something I want to talk about in the next part.

Ken Staver: There's two parts to that. One is that the model makes your load go up when you have less manure and more inorganic on a manure acre. That's the one part. But there's also the part of whether or not you adjust your manure acres in your scenarios.

Tom Butler: Yeah, and that's a great question. I will jump ahead quick to an image on that. We did some runs where we varied manure transport to see the implications for the acres, and it does cause changes. This is an example of a county that exports lots of manure, and I will go through the specifics of it later. But, Ken, to really get to your point, if you have your progress run in a scenario time, you'd have, say in Wicomico, MD, 9,000 acres of grain with manure and 16,000 acres without. If you double your manure transport, you will drop it to 2,500 acres of grain with manure. So, you would change that in the way we have it set up now because you are affecting the plant available nitrogen, which I think was a question you had last time. Obviously, there is the load implication, and I could not speak to the offset of that in the new version we have where grain with manure is going to load differently than grain without manure. So, that fertilizer sensitivity versus the loading rate ratio difference, I can't speak to what that actually looks like. But, you are right, they both play into it.

Robert Sabo: I think this one is more straightforward. Say you have a crop need of 100 pounds and a manure and fertilizer of 110. The blue box is simply saying that you have a mass of fertilizer than needs to be allocated across these different crop types. So, is there always just a built in inefficiency in the model, or is it a function of how much of that blue box at the state level is available and needs to be allocated?

Tom Butler: That's a great question. In a year where we have it, it is allocated based on specific rules we have in place that would say all the land uses we have will get an application relative to their crop need of inorganic, after they had satisfied a portion with whatever organic nutrients were available. So, that would be distributed based on those rules that we have. So, it's a specific group. There are three groups for fertilizer, four groups for manure, so we would apply to one set of land uses fertilizer first, then it would go on another, and so on after that. So, you would have to have to get through all of them to kind of get to the same rate. So,

you're going to preferentially put it down. When you don't have that fertilizer stock set, say we cap it at 22, we're running 23, and we don't know what the fertilizer amount is but we know what the crop need is in organic, we're going to apply literally just to fill that percentage difference. So, if it's 20-30% difference, we're going to apply 20 or 30% of inorganic fertilizer.
Dave Montali: I am trying to think this through. When we are in scenario mode, we are really looking at a longer period. The common scenario is what your WIP going to do in 2025 the way it was done in the past. If the last year we might have data for is '25, that relationship- the percentage of crop need in '25- gets carried all the way through '35. For '35, we project a lot of things (people, animals, all the BMPs we are going to have, manure transport included), but that factor stays the same the first time we do it, right?
Tom Butler: I can even take it back to a shorter time period. Right now, we do two-year updates to CAST. Say we did an update in 2015, and we have fertilizer data that we don't update in 2015 because there's nothing available, say we only have fertilizer data from 2010. So, when we get updated data, we're going to get a lot of new stuff, but we don't have fertilizer information. So, we have to lock in something in that run that we're doing that is going to account for not having that information. If there's data in, we don't have anything for fertilizer in that known year, we have to have something to tell us which fertilizer is there.
Dave Montali: I am just thinking out loud. Maybe it helps others. With the fertilizer data, our latency is going to be a couple/three years instead of six, right? We may never have a progress year with that current fertilizer. But a couple of years from now, we will. So, is it a situation where if we look at progress three years from now, the loads may change because we have a new relationship? The 110% may change in three years.
Tom Butler: Yeah, so it would change going forward. We'll update the new data. Say we got new information, the fertilizer would go in for those years to define that until the last year we had data. That last year would then define the behavior moving forward. So, yes, the data would go in for the years we previously had a gap but then it might only go to two years behind. We would have the relationship from two years ago defining what we had today. Then that last year of known information gives us that percentage of crop need met.
Robert Sabo (in chat): In the scenario tool, can't there just be an option for the state to choose a previous sales value or even a "target" sales value?
Jess Rigelman (in chat): No, scenarios are run at various scales.
Dave Montali: One last question- the WIP scenario would not ever be revised until we do a model update, right? That scenario would kind of stay the same until we do a model update which was previously every two years, but I don't think it's going to be that frequent this time. Let's say it's five years. If halfway through we do an update, then the WIP scenario would change?
Jess Rigelman: The way we currently have it is that we have two versions of the WIP- the official version and the version of CAST we are in. So, the official version would not change. For example, West Virginia did their WIP in 2017. Obviously, we had a CAST 19 and CAST 23. The official version of your WIP that is in the tool is the CAST 17 version. It has never been updated. The CAST 23 version takes in all the newest data (land use, fertilizer, any other changes in CAST 23). So, a WIP doesn't change officially unless a state submits a new WIP, but there will be a version in whatever version of CAST that will take into account the changes, but that's not official.
Dave Montali: But a person could look at the differences between those. I have another very simple question. If we trended fertilizer, could we make this constant go away? If we trend fertilizer like we trend the animals, we could make this problem go away?

Tom Butler: It's possible that we could. I think it would give us a different result, potentially, based on what the actual trend showed us. It would be different, but I don't know how different.
Dave Montali: If we did, we would have a so-called "known".
Jess Rigelman: The problem is, Dave, that scenarios in CAST run at various scales like county, and we have a state bucket. So, we could change CAST, yes, but with each scenario no matter what size it is, we run it at the state scale. So, we have the state bucket. As you know, if you run something at the county scale and you bring in the progress BMPs for a county scale scenario, that county isn't going to act the same way as if you had the entire state or even the entire watershed because it only pulls in the BMPs that affect that county. So, yes, we can make it so that we run it at the state scale in all cases, so we have that bucket if you were to trend it, but everything is set up for that state scale right now as far as running fertilizer.
Robert Sabo: Fertilizer is one of the largest levers that drive nitrogen and phosphrous loads in the Chesapeake. For a state to be able to see if we decrease fertilizer sales by 20%, thereby increasing nutrient use efficiency, instead of having this default fertilizer value being applied in the scenarios, I think that could be very valuable from a planning standpoint and a farmer outreach standpoint. I understand there's some computational challenges, but you should be able to go from state fertilizer sales buckets and then have that manifest itself at the individual counties as well. But I didn't develop CAST. I don't exactly know how it works out, but I think if there's a will, there's a way. We could probably get some thinking together to make it happen.
Tom Butler: I appreciate that comment, Robert, and I think with the scale at which CAST gets its data and is able to operate, we've hit some limitations. So, I'm never going to say never. But, with the timing that we're working with and the information level we have, I think that there are some concerns with the potential for things like that and what they might imply for how it interacts with the other information we have. So, I'll never say never, but I think we should also be looking at what the level of concern is with this as we proceed. So, I appreciate the feedback.
Robert Sabo: I am just a little confused. Right now, you have state buckets, and you are running CAST through time for multiple years. So, I just don't understand what the limitation is. If a state says, in Pennsylvania, I want to use my 2007 fertilizer rate for this scenario, and then I can play with my scenarios, I don't understand why that can't be a feature in the scenario tool.
Tom Butler: In terms of how CAST is set up, we are trying to operate at a level of consistency that if you were to change the fertilizer sales tonnages as a feature, it would not be an insignificant effort. I am sure anything can be done but is not something consistent with how we've done it. Again, I am not going to never say never to it, but there are definitely things we need to think about and, if you want to talk more, I would suggest we go offline.
Patrick Thompson (in chat): The scenario presentation assumes 1:1 exchange of manure N with mineral N. This ignores difference in nutrient use efficiency.
Patrick Thompson: We are seeing significant differences in the nutrient use efficiency between mineral fertilizer and manure application. We've been particularly focused on Pennsylvania where the typical method of manure application is surface broadcast. For a variety of reasons, there is very little incorporation of manure. On the other hand, we are seeing improvements in nutrient use efficiency for mineral fertilizers. Down the road, we are expecting significant changes with enhanced efficiency fertilizers. But, even with current conventional mineral fertilizer, there is more opportunity for 4R practices in the application. So, in general, we believe that there's a significant difference in the nutrient use efficiency between mineral

fertilizer N and manure N. So, it's not realistic to assume that the two types of nitrogen application are equivalent on a one for one basis.
Tom Butler: I appreciate that input and, obviously, if you're talking about 4R's you are talking about nutrient management and its impact on these application rates. So, I think that is certainly something we will talk about a little bit later. So, I appreciate you giving us a segue to the later part of the presentation.

Part 2: Nutrient Backfilling

Jess Rigelman (in chat): It is double manure treatment - MT or MTT.
Robert Sabo (in chat): What happens to the sold fertilizer for nutrient management plans, it just gets pushed to other crop types in the state?
Tom Butler: We have the state fertilizer stock. That is run through those application decisions and with nutrient management put on, it might reduce it. We don't have an acre for nutrient management and an acre for non-nutrient management. It kind of ends up as a blended rate, so it will change the blended rate for land uses, and then it would go to other land uses that were potentially not getting their crop need met. So, you'd report nutrient management on grain, that's going to change that rate. It will go somewhere else.
Robert Sabo: And it might go somewhere else- a different crop type or ag type within that county?
Tom Butler: It's fertilizer. It has the ability first to go to that same crop in another part of the state. You'd have to report it to every crop type, the same amount in every county, to have that effect. So, obviously you see the dominoes here.
Robert Sabo: It's pretty fascinating how all the intricacies play out.
Scott Heidel (in chat): I would like to see scenario runs using a much higher and more representative example of what we are seeing in MTT implementation, something capable of moving the needle since all the results for PA were 1.04 regardless of what is being modeled here. Thanks
Tom Butler: With nutrient management in place, you can be at 1.04, but 1.04 with reduced application rate is lower than 1.04 without the application rate reduced with nutrient management in place. So, I would just let that sit there and see if that impacted where your thinking was and maybe ask for clarification on what you wanted to see more of.
Scott Heidel: In one of the supporting documents, you have the spreadsheet that shows the scenario runs of 100% nutrient management, 0% nutrient management, as well as manure treatment technology or transport multiplied by two, and they are all the same result. I am a little confused by that.
Tom Butler: You mean like the 1.04, the percent of crop need being the same?
Scott Heidel: Yes.
Tom Butler: The whole way that CAST operates is based on the percentage of crop need from the last known year. So, we are running 2023. We locked the data in at 2022. In 2022 it was 104, so it's going to be 104 for 2023. The difference becomes when you implement nutrient management/ treatment or transport in conjunction with nutrient management. With nutrient management, 104 stays 104, but 104 with a reduced application rate is lower than 104 without that. So, in other words, you will always have the value from the last year. That 104 will stay the same because that was the last year that we had fertilizer. But that's a really good question, and I think it harks back to the earlier example. In our example, we met 110%. It was 104 for you. Say this was 104 pounds of nitrogen. Based on the sales data for fertilizer and manure, the next year would be 104 percent. Regardless of what it is, it's 104% because that's the crop need that was met. We met 104%, so there was enough sales data in Pennsylvania and enough manure in Pennsylvania in the year preceding this that 104% of crop need was met. So, every year after that we don't have fertilizer or something like that, it's going to be 104%, and it

would not change until say you had a year where you had lower fertilizer sales data and you met 98%, then 98% would carry forward for every year after that. So, it's a really good question, because I think that's the important thing to realize is that it's based on the last year.
Ken Staver: So, the bottom line on this is looking ahead into scenario years, because this number is held constant, you stick with the last year you knew what it was moving forward, right? Moving forward, you can't develop scenarios where you would get reductions by increasing your N efficiency because that number is going to stay the same. Is that right?
Tom Butler: You could change your application rate. Maybe Jess has more on that question, so I will let her go before I tackle that.
Jess Rigelman: There's the supplemental nutrient management which is just a straight up reduction from edge of stream. But, more importantly, we're talking about core nutrient management here. So, despite it being 104%, 104% of 100 pounds per acre is more than 104% of 80 pounds per acre, and the load is not the pounds of fertilizer. The load is the change in input from what was in the calibration average. So, more and more nutrient management means your pounds per acre in your newer scenario with newer nutrient management presumably would have less of an application than it did over the calibration average and, therefore, your load would be lower. So, yes, it is still 104%, but your pounds per acre should be reducing because your application rate is less.
Ken Staver: What happens when you get there and you have the data and the sales data don't show effects of nutrient management? When you actually get the numbers, how does that work with crediting nutrient management if the fertilizer sales data says rates didn't go down? When you get to the year when you have the data, how does that affect what you thought you were going to accomplish, even though you check the boxes for nutrient management?
Jess Rigelman: Well, it really depends on where you have your nutrient management, and those application rates are going to go down. Then the fertilizer may shift because you have a known bucket. So, I get what you are saying but, theoretically, you would have to have faith in the fact that if you have more nutrient management four years from now, the fertilizer bucket for your state should be less because you have more nutrient management. I realize there's a lot that goes in there as far as yields and other things. But I guess that is the assumption that nutrient management exists. Even if it is just on your row crops and the fertilizer is shifting into some of those other curves, they are lower loading land uses, and the pound per acre is based on the land uses, not an overall for your county. But it should have an effect but, just like everything else, there's a lot of things that can affect this.
Ken Staver: It's kind of like we have one foot in the old bucket where fertilizer is not constrained and one foot in the new bucket where we got sales constraining it, and we are trying to mesh those two approaches together.
Cassie Davis: When we have the state bucket, how do we determine how much each county receives? Is it proportional for the entire state, or is it based on the amount of cropland across the state? I'm just wondering because we have some heavier agricultural areas in the state where we would expect to see more fertilizer, and then we have counties that are mostly forested.
Tom Butler: We have the organic part first, and that goes to meet crop need. So, it is based on your yields and your counties and your organic amount that goes down. From there, there's an application that distributes the state stock bucket. It distributes that to the remainder of your crops, so it is dependent on the organic sources and the yields and, obviously, the acres associated with those yields in each of your counties.
Jess Rigelman: We apply the biosolids, we apply the manure, and then we have the remaining crop need. So, at that point, we take the state bucket and basically take each of the 10 counties, or however many counties New York has, and we say how much remaining need do they have?

Then we apportion that bucket to those counties and then take that county bucket and apply it using the fertilizer curves.
Dave Montali: I thought Cassie's question was simply how you distribute the state bucket. I may not understand this, but I thought there was a component with what we did last time where we had the state bucket of sold fertilizer and we somehow used expenditures from the Ag Census to apportion that state bucket to the counties. Is that not true?
Tom Butler: To get in and out of the watershed, yes.
Dave Montali: One of my counties, the sales say there's not enough fertilizer in that county or people don't use fertilizer in that county. I thought that somehow might have been related to how we distribute the state bucket of fertilizer for a known year. For a known year, how do we get five million pounds of N to the amount of N in Jefferson County that was sold.
Tom Butler: I don't think it's working exactly the way that you are thinking.
Dave Montali: We will take it offline, then.
Jess Rigelman: Dave, it works the way that I said. It's expenditure data that said we have a West Virginia fertilizer bucket and only 10% of the expenditure is in those eight West Virginia counties that are in the watershed. So, we take 10% of the West Virginia total fertilizer bucket and then that is the West Virginia fertilizer bucket in CAST. So, it only takes from the fraction of the expenditures that were supposedly in those counties.
Dave Montali: Ok, and then the need basis happens from that 10% of the total. That's how it gets distributed specifically to the county?
Jess Rigelman: Yeah, so your West Virginia bucket is that bucket.
Cassie Davis: The 10% that you came up with as an example, is that the percent of acreage that is in the watershed versus out of the watershed?
Jess Rigelman: That's the percentage of the total dollars that were spent on fertilizer that were in the counties that are in or partially in the watershed.
Cassie Davis: Thank you. Ok, I am getting it now.
Tom Butler: In terms of where this goes, I am not exactly sure where the group wants to take it next. This is getting at the crux of that replacement and how things can work in CAST. If there is additional follow-up you want on this, please reach out by Wednesday next week so we can try and come up with a direction to go for something. I am not exactly sure how we want to keep proceeding with this and that backfilling conversation or if there's an answer in there that could already exist. I am not saying it's a panacea for everything. But we also want to get closure on this in a way that's acceptable. So, please, if we could get that by next Wednesday, I would really appreciate that. Otherwise, I am not sure where we could take this one and we can kind of focus on broilers to get things through. With that, I will pass it off and try and get some wrap up from Zach.

V. Wrap-Up

Lead: Zach Easton, VT

VI. Adjourn

Next Meeting: Friday, February 27th from 8:00 - 11:00 am.

Attendees:

Zach Easton, VT
Tom Butler, EPA
Caroline Kleis, CRC
Dave Montali, Tetra Tech
Brooke Walls, DDA
Krista Crone, PA DEP

Tim Larson, VA DCR
Mark Dubin, VA Cooperative Extension
Tyler Trostle, PA DEP
Karl Blankenship, Bay Journal
A.K. Leight, MDA
Arianna Johns, VA DEQ
Auston Smith, EPA
Curtis Dell, USDA ARS
Joseph Delesantro, ORISE/EPA CBPO
Jess Rigelman, J7 Consulting / CBPO Contractor
Scott Heidel, PA DEP
Alisha Mulkey, MDA
Sarah Xenophon, PA SCC
John Lancaster, PA DEP
Denise Uzupis, PDA
Ken Staver, UMD/Wye
Seth Mullins, VA DCR
Chris Brosch
Mark Nardi
Clint Gill, DDA
Cassie Davis, NYS DEC
Patrick Thompson, Energy Works
Hunter Landis, VA DCR
Eric Hughes, EPA
Lisa Duriancik, USDA NRCS
Robert Sabo, EPA
Alex Soroka, USGS
Bo Williams, EPA
Anne Coates, TJSWCD