Chesapeake Bay Program
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Agricultural Modeling Team

December 12, 2025
8:00-11:00AM

Visit the meeting webpage for meeting materials and additional information.

Purpose: To discuss inorganic fertilizer data processing and the incorporation of Hillandale layer populations for Phase 7.

Summary of Actions & Decisions

Action: Please submit Pasture High and Hay High acres from 1985-2025 to Jess Rigelman (jrigelman@j7llc.com) as soon as possible, but no later than January 2026, with the following information:

- Year: 1985-2025
- Geography: County, HUC12, State Whole geography or CBWSOnly.
- LoadSourceGroup: Hay or Pasture or PastureHay
- Acres: Any area in the state that is not reported will get 0 acres of high since there is no default.

Decision: The AMT approved the September meeting minutes, October meeting minutes, and November meeting minutes.

Decision: The AMT approved renaming existing pasture and hay classes to be "Hay Low" and "Pasture Low". Classes in Phase 7 will be "Pasture High", "Pasture Low", "Hay High", and "Hay Low".

Action: Tom Butler, EPA, followed up with those not present on the call and consensus was reached on inorganic fertilizer decisional items.

Post Meeting Decision: We should utilize the provided fertilizer data smoothing methodology for Phase 7: State specific based on crop need, a four- year stockpiling window tied to crop need with a spline added.

Post Meeting Decision: We should adopt the provided method for projecting fertilizer for Phase 7: Projection based on state specific crop need with an average of the last three years. This is only applicable during periods where no data is reported.

Action: Tom Butler, EPA, will update the posted slides to include all the information presented on various fertilizer data sets, with sources cited, and Caroline Kleis, AMT Staffer, will link relevant presentations from early 2025 to the calendar page.

Action: Tom Butler, EPA, and Joseph Delesantro, ORISE/EPA CBPO, will look into the elevation/shift post 2012 in CAST data for application, specifically looking at whether or not there was a shift in ag Census methodology that might be driving this shift.

Action: Alisha Mulkey, MDA, and Scott Heidel, PA DEP, will follow up offline to discuss the implications of manure transported into Maryland as a result of the incorporation of Hillandale layers for Phase 7.

Action: Joseph Delesantro, ORISE/CBPO EPA, and Tom Butler, EPA, will compile a list of animals and crops that are updated annually from the NASS surveys and/or every five years as a result of the ag Census.

Decision: We should incorporate missing Hillandale Layers into the Phase 7 model based on a composite dataset utilizing Hillandale and CAFO reported populations.

Meeting Minutes

I. Introduction & Announcements

Lead: Tom Butler, EPA; Zach Easton, VT

The group was asked to review the September meeting minutes, October meeting minutes, and November meeting minutes for approval. Additionally, Zach walked the group through remaining AMT topics and the path forward into 2026. AMT members were reminded to submit acres for Pasture High and Hay High, and the AMT voted on a name change for existing Hay and Pasture land uses to follow existing naming conventions.

Actions:

1. Please submit Pasture High and Hay High acres from 1985-2025 to Jess Rigelman (jrigelman@j7llc.com) as soon as possible, but no later than January 2026, with the following information:
   - Year: 1985-2025
   - Geography: County, HUC12, State Whole geography or CBWSOnly.
   - LoadSourceGroup: Hay or Pasture or PastureHay
   - Acres: Any area in the state that is not reported will get 0 acres of high since there is no default.

Decisions:

1. The AMT approved the September meeting minutes, October meeting minutes, and November meeting minutes.
2. The AMT approved renaming existing pasture and hay classes to be “Hay Low” and “Pasture Low”. Classes in Phase 7 will be “Pasture High”, “Pasture Low”, “Hay High”, and “Hay Low”.

Discussion Notes:

Bill Keeling (in chat): Jess will it be okay if we get it to you by the end of January?

Jess Rigelman (in chat): Bill, yes.

Tom Butler: We want to make our naming conventions consistent, so we will have Pasture High, Pasture Low, Hay High, and Hay Low. So, if there are any objections to that, I'd ask that we please register them now. Otherwise, we will go ahead and adopt that as a new name for the current Phase 6 land uses, which will still exist, we just have the high ones that we have split out for Phase 7. Were there any objections to that name change? [Hearing none], we are going to adopt that name change. Phase 7 will have "Pasture Low", "Pasture High", "Hay High", and "Hay Low".

II. Inorganic Fertilizer Discussion

Lead: Tom Butler, EPA

Tom Butler, EPA, and Joseph Delesantro, ORISE/CBPO, walked the group through several topics discussed in October including:

a. Potential data collection changes in states
b. The addition of manure to a potential fertilizer smoothing protocol
    i. The projection methods for non-reporting jurisdictions.
c. The impact of smoothing on DE trends and possible next steps
d. Trends for crop yields, and fertilizer between national and Chesapeake Bay region scales. The intent behind these is to vote on the fertilizer smoothing protocol and associated projection method for non-reporting jurisdictions.

Actions:

1. Tom Butler, EPA, will follow up with those not present on the call to get their votes on inorganic fertilizer decisional items.
2. Tom Butler, EPA, will update the posted slides to include all the information presented on various fertilizer data sets, with sources cited, and Caroline Kleis, AMT Staffer, will link relevant presentations from early 2025 to the calendar page.
3. Tom Butler, EPA, and Joseph Delesantro, ORISE/EPA CBPO, will look into the elevation/shift post 2012 in CAST data for application, specifically looking at whether or not there was a shift in ag Census methodology that might be driving this shift.

(Post Meeting) Decisions:

1. We should utilize the provided fertilizer data smoothing methodology for Phase 7: State specific based on crop need, a four- year stockpiling window tied to crop need with a spline added.

Role	Name	Affiliation	Vote	Notes
Signatory	Clint Gill	DE	3	There is a slight concern with how much lower DE's crop need is compared to their fertilizer plus manure. They would like to keep digging into this as time permits.
	Alisha Mulkey	MD	4	
	Cassie Davis	NY	4	
	Scott Heidel	PA	3	
	Hunter Landis	VA	4	
	Dave Montali	WV	4	
	Auston Smith	EPA	4	
At-Large	Ken Staver	UMD	3	
	Tamie Veith	USDA-ARS	4	
	Candiss Williams	USDA-NRCS	3	
	Alex Soroka	USGS	4	
	Zach Easton	VT	3	

2. We should adopt the provided method for projecting fertilizer for Phase 7: Projection based on state specific crop need with an average of the last three years. This is only applicable during periods where no data is reported.

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

Discussion Notes:

Tom Butler: Upon speaking with state chemists in Pennsylvania, Delaware, Maryland, Virginia, and West Virginia it was confirmed that AAPFCO data is accurate.

Joseph Delesantro (in chat): And that is manure PAN.

Bill Keeling (in chat): Is manure just manure or all organic sources including biosolids?

Joseph Delesantro (in chat): It is just manure, not including biosolids. It would be trivial to add biosolids and I wouldn't expect it to make a large difference.

Ken Staver: Basically, all the increase in N fertilizer is in Pennsylvania. That's 100 million pounds. You show all of the states, and everything is flat, and Pennsylvania is up to 100 million pounds. Is that what I am seeing?

Tom Butler: There is definitely an increase in Pennsylvania.

Ken Staver: It is 100 million pounds. It doubles. It's not like it is trending up a little bit. It's a massive number. So, somebody's got to have an explanation. It was trending down, and then it went up to 100 million pounds since 2009. When we did it the old way and we spread it out over the watershed, it looked like everybody was going up. Now we have it so that everybody's mostly flat. Maryland is trending down notably but, overall, relatively flat compared to Pennsylvania. Pennsylvania's just almost doubled. They didn't double their crop land. It's not

like they're not working on nutrient management or that they just discovered fertilizer in 2009. It just seems really strange to sort of gloss over this and say we are talking about smoothing when, to me, the 800-pound gorilla in this room is that 100 million pounds of nitrogen fertilizer.
Joseph Delesantro: I think we definitely don't mean to smooth over this. Tom's jumping through a lot of slides here that we put together in order to delve deeper into that. Ken, would you mind if we finish the smoothing conversation and then delve deeper into these slides. If you would mind, and we need to go into these now, then we can do that, I think.
Ken Staver: I don't mind, but I do find that, in the past, votes have been done, and they say, well, we'll deal with that later. Somehow, we don't go back and deal with it. It's kind of like, oh, we already voted on that. So, I don't want to be an obstacle here to moving forward. The annual noise is really messy. So, getting rid of some of the annual noise and looking at the long-term trends is helpful so it's easier to see the long-term trend. I guess I don't really mind, maybe you have answers to my questions later. So, proceed. I am a little leery of voting on smoothing when I am looking at something that it seems like we should be talking about. To me, smoothing is a sideshow to what we are dealing with here.
Bill Keeling (in chat): It will not at this scale but as you look at things at finer scales it can be significant.
Joseph Delesantro (in chat): The smoothing is performed at the state scale.
Sarah Xenophon (in chat): Can we tell if that's from imports? I'd also like to know where that's coming from.
Tom Butler: Ken, I appreciate it, and we can certainly touch on some of these. Dave, did you want to talk a little bit about this, too?
Dave Montali: If you explored the validity of the sales data and say everything is in order, then that increase is lodged in the sales data, and that's really not what we are talking about now. We tried to talk about alternate ways to get that fertilizer bucket. We've been through that. We don't have anything. So, that's the way I look at it. I agree, the smoothing, I think, is a relatively easy decision. This one, I don't know what to do. But, it's not about the method that we're using for smoothing, it's about what the sales say.
Tom Butler: That's very well put, Dave. I did see a comment in the chat. Sarah, you were asking about that as well. That probably falls into Ken's bucket of questions about why that is happening and where is that coming from. So, maybe we can walk through that a little bit.
Sarah Xenophon (in chat): So this data is all from sales?
Tom Butler: The fertilizer data that we get comes from the states. Denise has been instrumental in getting us updated information. We had worked with Pennsylvania on this before. We use AAPFCO from 1985-2016/17, and that's the state reporting to AAPFCO, us buying the report, and that is processed. From that point on, we've been moving to the states directly reporting to us. So, that would be the Departments of Ag, the state chemists we've talked to for each of the jurisdictions and asking them to provide us with the same information they would give to AAPFCO in terms of sales. We then take that, and we utilize it through a process. In our previous iteration, we kind of put everything in one watershed amount, and that kind of references back to Ken's comments of everyone was going up because we had one stock. Now each state has their stock, so you see some of the differences are fairly stark. You'll see here Pennsylvania is going up, Maryland is kind of going down. When we are looking at this, we are smoothing to get rid of that annual variability that's kind of really spiky. But we are really after the long-term trend. So, we've discussed a little bit about the sate specific stocks being a better indicator for each of the jurisdictions. You would want to be looking at that 1985 data point moving into what we have for

the future. But the data is from sales. There are things that go kind of into that. We can certainly talk about that. But the real purpose of what I'm showing now, as Dave and Joseph have articulated, is to make sure we have a smoothing method in place, because we've got that stock in place. We have looked at multiple sources of data. I have a little bit more in this presentation to kind of compare data sources. If people want to see that now, we certainly can. In terms of the smoothing, I'd ask if there are more questions about the specifics of that. Hopefully that answers your question, Sarah. Relatively quiet right now. So, given this, we are going to kind of walk this one up to a vote. This is saying that we should utilize the provided method here for Phase 7. So, that's state specific crop need base with a four-year stockpiling window, with a spline added on. That's this black line that you will see in each of these plots. So, if people are ok with that, I'll bring up the continuum, and we can walk through it. I do see a hand from Hunter. So, he has a potential question, and then I will run down this list here for other votes.

Hunter Landis: Can you go back to that black line on any of the states?

Tom Butler: Sure, let's do West Virginia.

Hunter Landis: So, that's final that's been smoothed using the manure, but manure numbers are not in that number, correct?

Tom Butler: Yes, correct.

Scott Heidel (in chat): PA 3

Alisha Mulkey (in chat): MD 4

Candiss Williams (in chat): NRCS 3

Cassie Davis (in chat): NY 4

Emily Dekar (in chart): Cassie is actually the signatory for NY

Clint Gill (in chat): For DE, Chris has been more plugged into this than I have recently, so I'm going to have to circle back with him on Monday or Tuesday

Auston Smith (in chat): EPA: 4

Emily Dekar (in chat): I am the fill in. No worries.

Clint Gill (in chat): So, I'll be a temporary 2.

Dave Montali (in chat): 4 WV

Clint Gill (in chat): Thank you for the work, both Tom and Joseph.

Denise Uzupis (in chat): I may drop off for a moment as I may lose service. I will pop on when can.

Tom Butler: Do we have Tim from Virginia?

Hunter Landis: I don't think Tim is here. I'll say maybe Virginia is a 4. Tim will confirm over email beginning of next week, if you are alright with that.

Tom Butler: Ok, that is fine.

Ken Staver: I want to hang at a 3. I guess I am thinking about whether or not crop need is smoothed in the same way. So, if you want to look at a particular year when crop types go up and down, whether or not we can see all of that. But I guess you have to look at the data behind it. So, yeah, I'll just stay at a 3.

Joseph Delesantro: The crop need comes mainly from that process that we've run through with yields. Of course, the nutrient management and the acres are a large part of it as well. But the decisions we made on yield resulted in a much smoother yield change across time as well.

Tom Butler: Thank you, Joseph. Tamie, are you online or Curtis? Is Alex Soroka on? I will follow up with Alex. Zach?

Curtis Dell (in chat): I joined the call late, so USDA-ARS probably needs to pass on the vote for now.

Zach Easton: 3
Tom Butler: So, we will need some follow-up with Delaware, ARS, and USGS on this one. So, that one is still in the works. We will hopefully know by Tuesday next week. I will be following up with USDA and USGS, and we can get some closure on that one. Thank you very much for your input there. Hopefully we will have news for you shortly.

Item #2: Fertilizer Projections for States Not Reporting Data

Dave Montali: When you say, "crop need", is that somehow modified to crop need from fertilizer? Is it the crop need of fertilizer, or is it the overall crop need?
Sarah Xenephon (in chat): Sorry for the simple questions, but what data is being used to determine "crop need"
Joseph Delesantro: It's the overall crop need.
Dave Montali: Ok. So, in some scenario where there was a significant increase in the amount of manure, we would then say there would be a commensurate increase in fertilizer, right?
Joseph Delesantro: The fertilizer would remain constant. But I think what you mean is that we're going off of the fraction met by fertilizer in either the last known year or the last three known years. So, it's just the fraction met by fertilizer.
Dave Montali: Ok, so it's really the fraction met by fertilizer that you are basing on how to fill in your unknown.
Sarah Xenophon (in chat): I guess I'm wondering about the source of data for crop type and yield across the state?
Joseph Delesantro: To Sarah's question here about what's being used to determine crop need, there's quite a few different things that go into it. Essentially, we have acres of crops and the yields of those crops. Sometimes those are actual yields like bushels per acre, and that's what we use for major crops. Sometimes we use other stand in units like the number of acres for that crop, and then we have the recommended application rates for each of those crops based on yield. Then we also apply the nutrient management. Based on the nutrient management acres, it would be a reduction in the crop need to count for that lower recommended application rate. So, that's sort of how we get to crop need. We have 100 crops that are a part of CAST. If you need any more detail, I might need Jess to jump in.
Tom Butler: Sarah, I want to make sure that is sufficient for you. Did you want any additional insights into that? I want to make sure that it is all clear.
Joseph Delesantro: The yield comes essentially from the Census and survey. That's what we start with, and then there essentially a model of yield based on that survey data that was developed in '24 and voted on early this year in '25. So, essentially, we have a model of yield for the 13 major crops, which is based on those observations from the Census and the survey. Then the acres come from the type of crop, and the acres come from a couple of different sources. So, that comes again from the Census, but then we also have an extensive amount of our own mapping done by our GIS team, so the Census allows us to pull out the relative proportion of each type of crop within a county, and then the mapping that we have from our GIS team sort of allows us to identify the total cropland acres within a county.
Sarah Xenophon: Yeah, that does make sense. So, mostly Census data driving that kind of crop type discussion?
Joseph Delesantro: Correct.
Sarah Xenophon: Do we feel that the Census is getting a large enough sample size?

Joseph Delesantro: When it comes to the yield, we have a whole method for dealing with that. So, we certainly understand that in counties where there are less responses, we can get less reliable data for the crop yield. But, in terms of the proportion of crops in the county, that is, I believe, taken pretty much directly from the Census.
Sarah Xenophon: I guess I am just curious about these things. Seeing the nitrogen slide where Pennsylvania is doubling our application, I kind of want to dig into that. I don't know if this group is the group that does that kind of sleuthing, but I personally would want to know what is driving that trend. Is Pennsylvania importing more poultry manure and trying to make up for high levels of P with nitrogen purchases? Or is there something else going on? Is there a thought process in Pennsylvania where farmers think more N equals more yield that we should be addressing in policy or outreach? So, for me, I'm just trying to dig into the story behind those numbers and understand what can be done about Pennsylvania doubling its purchases. That's kind of where my head is at.
Joseph Delesantro: Yeah, and we can't answer all of those questions, unfortunately. That is the mission, but we do have some plots and some discussion that will come after this projection that I hope will start moving us towards answering those questions. So, we should get to that soon, I hope.
Sarah Xenophon: I really appreciate it. Thank you.
Bill Keeling (in chat): Is need equal to uptake?
Tom Butler: Thank you, Sarah and Joseph. That's good discussion. I think Bill had made a comment. I am trying to dig through the chat here. Is need equal to uptake?
Joseph Delesantro: Need is not equal to uptake. This goes back to the yield method. So, for the major crops that we model yields, they have two yields. They have the yield attracting application, and then they have the long-term average yield. They're often not that different, but the yield attracting application is the one that's used to define the crop need or the application goal, however you want to refer to it, and the long-term average is the yield that's used to calculate the uptake. They're all based on the same data. The primary difference is that the yield attracting application is weighted towards higher values to sort of capture that best three out of five that this group suggested was the way many farmers plan for their applications.
Tom Butler: Thanks, Joseph. Bill, hopefully that gets at your question there. I don't see any hands or any more comments. If there are no other questions, the current proposal we have in front of us is to adopt some type of projection. In this case, we're looking at option two, So, its projection based on state specific crop need with an average of the last three years. Again, it's applicable during periods where there is no data reported by the state, so we would be looking at the second option here for New York and Maryland. We can change options. We can say that it's not great at all, which we hope it is, but for now we really want to talk about that second option using that three-year period. So, with that in mind, were there any other questions? I am going to bring up our table. So, if we could get some feedback in the chat with numbers or people raising their hands, I will kind of walk through here.
Scott Heidel (in chat): PA 3
Candiss Williams (in chat): Is it common to determine this based on the crop rotation?
Tom Butler: We have a question here from Candiss. So, Candiss, could I maybe get you to elaborate on that? Are you asking if the projection is based on a crop rotation?
Candiss Williams: So, you have the discussion about crop need and crop uptake and determining how you would look at that data. For part two, you said over a three-year period, and my thought would be that you would do it based off of the length of the crop rotation or the plant production

sequence. So, if the average for Pennsylvania is three years, then you would say three years, but that is very site-specific type of information. But, if you have the data to show what the activities are within the state, you could use that average number of years, and that would be your number. So, every state might not necessarily be the same. So, I am just trying to understand.
Dave Montali (in chat): WV 4
Joseph Delesantro: I think I follow your point here. My question would be because we are doing this at the state scale, the smoothing/projection are both happening at state scale before it is then distributed down to the county scale, so my assumption would be that farmers are on slightly different schedules.
Candiss Williams: The LGUs normally have that data for their state, right?
Joseph Delesantro: If all the farmers in a state were doing corn one year and wheat the next year, soy, or whatever the sequence is, if they were all on the same sequence, then certainly capturing the full length of that sequence would be important. Because the farmers within the state, I am assuming, are going to be on different crops in that sequence on different years, that that would sort of all average out in a given year. That would be my assumption.
Tom Butler: So, with that comment, are there people who might want to change those three years, or do we feel that with the justification of capturing the trend of what could be variable over that period is captured within that window? The alternative we have here proposed now is one year, which it sounds like maybe wouldn't encompass that, but the three years potentially does.
Candiss Williams: I see the last bullet point, too, so that is clear to me. Thank you.
Tom Butler: Ok. Candiss, I think that's great input, and I'd ask if anyone else had any comments or feedback on that point, specifically on the jurisdictional side of things. If we are feeling like we are ok on the questions, I will come back to the vote chart here.
Alisha Mulkey (in chat): MD 4
Cassie Davis (in chat): NY 4
Auston Sith (in chat): EPA 4
Clint Gill (in chat): DE is a 4
Candiss Williams (in chat): NRCS 4
Tim Larson (in chat): VA 3
Alex Soroka (in chat): USGS-3, Missed conversation, apology for the delay
Tom Butler: Curtis, you were late for the first one. Did you feel that you were here for this one?
Curtis Dell: Yeah, I have to pass. I haven't gotten the flow of things this morning.
Tom Butler: That's fine. Zach?
Zach Easton: Another three, Tom.
Sarah Xenophon (in chat): Any considerations made for cover crops that aren't harvested?
Alisha Mulkey (in chat): Sarah, this would be limited to harvested small grain. Cover crops act as a bmp later.
Sarah Xenophon (in chat): So, the census wouldn't capture volunteer cover crops that aren't used as commodities?
Alisha Mulkey (in chat): Joseph/Tom - can you share these with states, please. I don't see them in the posted slides.
Tom Butler (in chat): Absolutely!
Tom Butler: Good discussion there. With that, we are through those decisions today for fertilizer, as far as we can be. We have not actually made those decisions. We need some further input from people. We will try and reach out and collect that. The goal is by next Tuesday to have finalized answers. This is a great segue into the next part of the presentation to highlight how these data

came to be what they are, and how we found them. We definitely want to address that. We had heard some concerns from Delaware. I think there's further discussion warranted on that, but we do have some information we provided for state level fertilizer buckets and that smoothed data as well, to try and help out with that discussion, along with the plots we showed earlier.

Item #3: Examing Delaware Fertilizer Data Behavior/ Variations in State Crop Need

Alisha Mulkey (in chat): Why the steep dip in MD at 2012?

Tom Butler: Joseph, I think there was a question about Maryland, specifically about the 2012 drop. I didn't know if you offhand had any insight. I know we can dig into that more. I didn't want to put you too much on the spot. Jess, you might speak to this, though.

Jess Rigelman: This is because nutrient management was reported incorrectly prior to 2012. Elizabeth and I have had a conversation about that, and she has cleaned up the history going back, so it will be pulled into Phase 7. But this is kind of the official Progress runs data that is in CAST 23 now. So, we should see that smoothed and cleaned up for Phase 7.

Alisha Mulkey (in chat): Jess, thanks. I will connect with her.

A.K. Leight (in chat): So, are these yields Ph7 version?

Jess Rigelman (in chat): A.K., yes.

Tom Butler: Thank you, Jess, that sounds like a good conversation to have there. Dave?

Dave Montali: I was just wondering if the spikiness in Delaware in those few years was also associated. Has anybody looked into that?

Joseph Delesantro: I have not looked into it specifically. It is not a function of the acres or the yield. So, I think that means it must have something to do with nutrient management. Certainly, that is something we can dive into.

Tom Butler: Yeah, and for any of those things that people notice, please let us know so that we can try and dive into them. Luckily, we have that insight into Maryland, so huge shoutout to everyone discussing that. Please let us know so we can engage with the right people from the right jurisdictions.

Ken Staver: If we're talking about delivered loads, which is what this whole discussion is about, this is not really an agronomy meeting. This is ultimately about the whole progress on nutrient reductions. What the Watershed Model does is when the surpluses per acre go up, the loads go up. It's sensitive to bigger surpluses of N. So, when the applied N goes up relative to the removed N, the model wants to increase loads. So, that's where this is all headed. Somehow, I think we have to look at it that way and also from an agronomic standpoint. If you want to ask the agronomists whether this makes sense, you have to talk in terms of pounds of N per bushel of yield, because that's how the nutrient management plans are written, and that's how farmers think. That's how nutrient management planners think.

Joseph Delesantro: Should we skip to those slides, Tom?

Ken Staver: We're eating salads. Why don't we get to the meat and potatoes here? There's a graph there. You've got to go back to this graph. Maybe you were sharing it, Joseph. Look at this graph. What are we supposed to do with that? It's like this massive spaghetti. Everything is going up and down and you're saying, well, it's all this or it's all that. There's not much for us to process. I mean, you've got to hone in a little bit on things.

Joseph Delesantro: Thanks, Ken. We've got extra time with these three-hour meetings. We do have other topics to get to, but I definitely will slow down and try to point out the highlights a little better. So, Tom, do you have the USDA ERS plot? Maybe we skip to this one for Ken. What we have is on the Y axis pounds per acre that are being applied to corn across time, and we have

a couple of different sources of data here. So, one source of data is this USDA ERS reported N application rate to corn. So, this is what farmers are saying in surveys that they're applying in terms of the pound per acre to corn over time, and we see that for Pennsylvania, New York, and the U.S. average, unfortunately, we don't have enough data from all six of the states. So, we are looking at PA and New York, where there were enough people who responded to that survey to create some reliable data to look at. The data that is from the USDA ERS surveys is the solid points, and the line is the trend going through those solid points. The open circles are the CAST predicted pounds per acre to corn. So, that's not the survey data. This is the data that CAST predicts based on the fertilizer sales, the yields, and everything we've talked about so far. There are two things I think we want to focus on in this plot. The first is that if we compare the solid circles to those empty circles of the same color, they are in fairly good agreement. The R squared for Pennsylvania is about .6, the R squared for New York where there's less data is about .4. So, both the reported (straight from the farmers) values, as well as the CAST estimated values, I believe, are in reasonably good agreement. The second thing to point out here, which comes to the point that we've been discussing about PA, is that even though the pounds per acre that are being applied in Pennsylvania are much lower than we see across the nation as the U.S. average, they are increasing substantially, more rapidly than the U.S. average. I'm sorry that we can't show this plot going all the way back to '85 when our modeling begins, but the data for New York and Pennsylvania starts around 1995. So, that's the period that we are looking at. So, Pennsylvania is doing a lot better in terms of pounds per acre to corn than a lot of those midwest states. But the rate of application is increasing a bit more over time, slightly outpacing the increase in yield.

Clint Gill (in chat): We've had an issue with the census indicating that DE's farmland acres are increasing, which does not reflect what we're seeing on the ground

Alisha Mulkey (in chat): I agree with Ken's point; it would help to share these slides (all) in advance of the meeting for states to better review and prepare.

James Martin: Joseph, I'm looking at this 2012 timeframe on this graphic. What I'm seeing, others may see it differently, is that for all dates prior to 2012, CAST is either on the line or generally below the line of the ARS. After 2012, both states shift to 100% of points above the line. What changes in CAST to skew our data higher compared to that ERS line starting in 2012?

Joseph Delesantro: I think there's a couple of things going on there. One of which is that the ERS data ends in 2017, whereas our data extends into 2023. I would also note that there are two data points in that period from the ERS survey that are above the line as well. So, I'm not sure if there's anything necessarily specific that we could say other than the lines are a regression. They're not a perfect correlation to the survey data. So, we expect some variation around the line. We see that variation with our CAST data as well as with these final 2017 points from the ERS data. But I do take your point that in that final period, it does appear that the CAST estimates are on the higher side of that line more often than the ERS surveyed data.

James Martin: I think if you were to draw a regression line from the 2012 CAST data and then draw another line for the for 2013-2023 CAST data, you may see parallel lines, but they will be shifted upwards for each state would be my guess just looking at the data points. But it would be an interesting thing to look at. If there is such an offset or shift, we should at least try to make sure we understand why in CAST we have that elevation post 2012, particularly since we're using those more recent data points in our forecast forward, right?

Joseph Delesantro: I did want to go ahead and address Clint's comment here in the chat. He says that there's an issue with the Census indicating that DE's farmland acres are increasing, which is not what they are seeing on the ground. I just wanted to highlight that what we looked at was not

farmland acres. It was just corn acres, corn being one of the largest receivers of nitrogen, which is what we are trying to focus on here.

Tom Butler: Thanks, Joseph. Clint, is there an issue with the corn that you would note? Obviously, it's a big one, but you guys have soybeans and other things that you grow, although that's usually a rotation. Is it kind of specific or is there something that you could point to that might be an alternative metric that shows that this is a curiosity or to maybe tease out why there's the difference? That's fine if not.

Clint Gill (in chat): Our cropping systems have not significantly shifted, so I don't know how to explain why our corn acres are going up.

Alex Soroka (in chat): But also in Delaware, those values for corn acreage are almost flat the last decade. The small increase at the end could be within the margin of error for data collection methods.

Clint Gill (in chat): Also, true Alex.

Tom Butler: There hasn't been a significant shift in their cropping system, so there's not a good explanation. Ok, very good. Alex has said in Delaware those values for corn acreage are almost always flat the last decade. The small increase at the end could be within the margin of error for data collection methods. Thanks, Alex.

Joseph Delesantro: I agree. I think that when we look at Delaware data, we need to be a little bit careful. To me, it's kind of like two separate stories (80's and 90's versus 2000s forward). So, the really dramatic change in crop need is happening. The 80's and 90's, of course, we all have in our minds what's happened more recently. So, we shouldn't expect that our understanding of how things are now would necessarily line up with what we saw in the 80's and 90's. So, just kind of keep that full time period in mind I suppose.

Alisha Mulkey (in chat): Clint, connection to irrigation uptick?

Clint Gill (in chat): Maybe? I hadn't considered that, but I don't think our rotation has changed much. I'll have to think on that Alisha.

James Martin: I just wanted to jump back to the prior comments I made about 2012 being a shift point. If you are going to dig into this, and I hope you do, I wonder if a good place to start would be the 2012 ag Census to see if there was a shift in methodology in some data points in the ag Census starting at 2012 and continuing into the future. I'd start by looking at those points that are the biggest drivers from the ag Census. I wonder if we wouldn't find something that was a methodological change in the ag Census that is really driving that uptick.

Tom Butler: Thanks, James, that's a good point. I've got that written down.

Joseph Delesantro: If there aren't any other questions about this plot, we do also have a comparison of fertilizer data sets. So, maybe we want to walk through that. Tom, do we have Delaware in here? Can we start with that one, since it has the EPA's data, or I can share my slides?

Tom Butler: Yeah, if you can share yours, that would be great. I think I tried to focus more on New York and Pennsylvania because of the USDA plot. I apologize for everyone here that we don't have these slides all up here. I will make sure they are put in and that they are posted. That's on me. Thank you for your feedback, though.

Joseph Delesantro: That's nice of you to say, Tom. I think that's on me as most of these plots have come together in the last couple of days, so I didn't give Tom a whole lot of time. Let me just take a second to find what I'm looking for here.

Alisha Mulkey (in chat): Joseph and Tom, the additional analysis is appreciated. just need time to consider.

[Joseph walked the group through additional slides comparing various fertilizer data sets.]

Denise Uzupis (in chat): I unfortunately have to leave the meeting. If you need any info for PA, please contact me.
Ken Staver: Is this for a particular land use? What's this fertilizer on?
Joseph Delesantro: Everything- cropland or farmland.
Ken Staver: Everything?
Joseph Delesantro: That's farm only fertilizer. Yes, that's right.
Ken Staver: Go back to Pennsylvania. So, what are we looking at? We're up to 100 million. Is that what I am looking at?
Joseph Delesantro: Sorry, you mean in terms of from 1985 to present?
Ken Staver: Yeah. I am looking at your Y axis. 80 million pounds, is that where we are in Pennsylvania in the Bay Watershed?
Joseph Delesantro: Yes, suppose that's what that is.
James Martin: [It's in] Kilograms.
Ken Staver: Ok, that's it. That's my problem. Thank you, end of question.
Joseph Delesantro: Sorry about that. I will try to be better about standardizing units to pounds. Thanks, James.
Ken Staver: You don't have to do it for me. I just wasn't paying attention. So, sorry about that.
Joseph Delesantro: I did want to highlight that Maryland is a little bit different here in that it does tend to show a bit more variation in the data sets for Maryland, relative to some of the other states where the different predictions seem to be much tighter. That said, I will say that there's a lot of variation in those other data sets relative to the state buckets for Maryland and the TREND N data set because it's based on a data set that had some missing counties for Maryland and had to do some extrapolations. So, I think I just wanted to note that there as well.
Alisha Mulkey (in chat): Sorry, mic issue it seems. What are the purple USGS dots again?
Joseph Delesantro: Yeah, so Maryland doesn't have the [purple dots] because the USGS data set was missing some counties for Maryland, so I didn't include that on here. I don't know if that was a problem in just the version I grabbed, or if that was a problem more generally. The purple points are the USGS method for estimating fertilizer application using mostly the same AAPFCO data sets that we are using. I don't have all of the details on those methods at hand. We did discuss them earlier this year.
Alisha Mulkey: Could you just in the chat or when the slides are shared cite those sources, either the USGS or EPA, so I can know what report you are referring to?
Joseph Delesantro: Yeah, we can definitely do that, and we can also reshare that talk from earlier this year where we went through a slide on each of these methods explaining how they were different. I should have included that here today, but I did not. So, we'll make sure you have that handy as well.
Alisha Mulkey: All good. I just need my own memory refreshed.
Ken Staver: Could you go back to PA again? The 2009 minimum always seems odd.
Tom Butler: I think we just lost Denise, so we might have lost the person who could talk to it. Again, this was the concern that they had in reference to AAPFCO versus their pulling of UFTRS when they migrated to PA Plants. So, there was a comparison done between the AAPFCO data and what they had versus what we had, and they said that everything lined up. Denise, I know is

gone. I don't know if anyone else might be online from Pennsylvania to talk about that. Scott, I don't know if you offhand knew of anyone involved. Perhaps maybe not.

Scott Heidel: That would definitely be Denise's information there, but we did review it with here, and we agree with you that there's a good deal of agreement with your data as well as ours.

Joseph Delesantro: I will say, Ken, in the early part of that period where there's the dip, there's also a dip in acres of corn. I know that dip in acres is not consistent across all crops but, of course, corn being the large draw of nitrogen, that might have contributed to that initial dip in fertilizer applications for Pennsylvania.

Ken Staver: There's a dip in N per bushel, too. When you look at it in N per unit of production, it's also a dip, so it's not just acres. It's both, I guess. So, it really makes a low point in the nitrogen. Somebody was asking about the obvious jump if you do a straight-line regression and everything up to the 2010 is below the line and everything afterwards is above the line. Yeah, the line goes through the data, but it's almost like two lines. That really is not a best fit. It's a best fit first order regression. I don't think it's the best fit curve for that data. But there's definitely something going on after 2010, at least in a couple of states.

Joseph Delesantro: That's a fair point. We use linear regressions because they're fast and easy to look at. But you could certainly argue that maybe some sort of power function or exponential function might be a better fit. It is unfortunate that we do not have a longer record of these survey pound per acre results from ERS.

Ken Staver: Well, we have what we have.

Joseph Delesantro: Tom, that's all I had. I am going to stop sharing so I can see the chat.

Tom Butler: I'll kind of keep walking us through as people marinate on what you've provided and, again, thank you for all that. The other things we had relevant to this topic, I will try and get through pretty quick. People had asked for county level data for crop need. We provided that with the smoothing method, so these links are here in case people wanted to look more fully at that as we dig into the things we're talking about. So, it kind of leads us in the direction of the next steps, and we don't need to approach this today, and we obviously have another topic. We're a little ahead of schedule, so maybe we can circle back to it. But the nutrient application algorithm is, I think, a logical direction that this heads in that now we have fertilizer in a state scale with kind of a specific smoothing method and projection strategies in place. It kind of sets the stage for how we are applying the nutrients in general. As just an idea, we could have the topic come up about an inorganic cap for replacing organic. I know this has come up previously. Just wanted to make sure that we could touch on it again, as I think it was brought up at least offline in a few discussions. So, I want to make sure there's time just to start brainstorming the next steps. That's likely the next direction we're headed with the fertilizer component of this. If there are any questions or comments on that, I will absolutely field them now, or we can kind of circle around back to this because we do have another topic to discuss.

Ken Staver: We aren't looking at the effects on load estimates, right? So, we're going through all of this stuff, but what we really care about in the end is what pops out when we put all this in and actually do the edge of stream loads? At the end, that is what this is all about. We make these decisions, and then we don't see any of that until we make all these decisions. So, what's the process for dealing with what pops out when we run all this through and do the part that we actually care about?

Tom Butler: That's a great question because, you're right, the rubber has not met the road yet. We're working on the car, but we haven't taken it out to see what it does. So, that kind of alludes a little back to the first presentation with the recap. So, we're going to make decisions through

February, and we may have to have a second meeting in February to get through discussions, and I think we have to do what we have to do given the deadline we have. Then there are other components to the model. We are the ag sector, but there are many other things being worked on. We have the land use, the urban stuff, and all that gets plugged in. Extensive discussions are going to happen. There will be different versions or beta test versions of CAST that are run from that. We will then see what the loads actually are, and we will be able to look at plots like we have been, except we'll be able to add on the load component. So, we won't know the loads until the model has gone through its calibration. That is going to happen through the course of the next year. All the data will have to come in and be run. Once that is the case, we'll start to see results. So, that's the point of meeting quarterly next year is to be in the loop. So, this group will kind of just slow down. We won't make decisions, but it might be a 30-minute update, and then we will go on our way. A few months go by, and we do the same thing. Then we'll start to see the actual results from the model pile out. That's really going to be kind of more of a review period, and we get to come in there back to our monthly schedule. We get to see the loads and we say, ok, what's what, and we can start to tweak things. If things are not what they should have been or if there's some egregious mistake, then we will need to look at what the impetus is behind that. It's not that we can necessarily just change everything because the calibration is, at that point, taking place. But we will be recalibrating several portions of that. So, I know Jess is involved in that. Joseph will definitely be there. I think that's kind of the direction that we're going to go. So, we will get a chance to see the loads, and we will get a chance to make some alterations.

A.K. Leight (in chat): And there will be new sensitivity testing and calibration, correct?

Sarah Xenophon (in chat): To Ken's point, are we hamstringing ourselves if the model assumes any reduced amount of manure (organic nutrients) application is replaced with inorganic nutrients? What if a farmer just applies less manure than avg crop nutrient need? How about programs that encourage applying less nutrients than allowable (crop need) - are those programs useless due to model assumptions?

Ken Staver: It's just interesting because it seems to me like the biggest thing that's happening with going to the state bucket is a whole bunch of the fertilizer for the Bay Watershed has now been kind of linked directly to Pennsylvania, as opposed to being spread out over the whole watershed. But almost all of Pennsylvania comes through a RIM station. So, there's monitored data there. So, stuff is being tracked, so it can't really change what the model cranks out too much because it has to match up with what's coming across the Conowingo Dam. So, it's one of those big areas of Maryland, Virginia, that drain directly into the Bay that aren't monitored. So, you have these modeled numbers, and that's what you have, and you can't really argue. You don't really have to hold the calibration and say, oh, this is what it has to be because this is what we measure. Whereas Pennsylvania and New York comes through there, too. It's already documented what's actually coming to the Bay from those states. So, anyway, it will be interesting to see. It seems to me a pretty radical change. But it still has to come back to the monitoring data which we have for Pennsylvania and New York. So, almost 100% of it. So, I'll be curious to see how that goes. So, anyways, just an aside.

Tom Butler: I appreciate that, Ken, and I don't want to dominate discussion. So, I will let Scott go and then Joseph. I do have some thoughts. But, Scott, take it away and then Joseph.

Scott Heidel: I definitely want to keep this on track, too, but saying that the gauge station at Conowingo represents what's coming out of Pennsylvania is not exactly accurate considering the impoundments in the lower Susquehanna and the nutrient dynamics that are taking place within them. I just wanted to make that point as well.

Ken Staver: I just have to respond back on that because we just had a town in Dorchester County, Cambridge Maryland, just as upset about Conowingo Dam. So, they're getting down towards the lower Eastern Shore, and they're pointing to the dam, too. So, during base flow and everything else, there's nothing that comes down through the dam that didn't come from Pennsylvania or New York. So, it might change the timing of it, but it didn't come from somewhere else. It all came from upstream. So, it's not like a source into itself. Just it affects the timing a little bit, but it doesn't create nutrients upstream. It might change how they come through a little bit.
Scott Heidel: I hear you, Ken, but we just need to be sensitive to that because the dam is in Maryland. The impoundment is majorly in Maryland, and there are very very distinct dynamics going on within that impoundment in particular, as well as the other ones upstream of it. So, let's just be cautious about the assumptions that we are making here and try to keep ourselves focused on the task at hand here.
Ken Staver: I agree. I am focused on ag nutrients, so I am totally with you on that.
Joseph Delesantro: To this point, though, in Phase 7, we will have many more calibration stations. Almost three times as many calibration stations as in Phase 6, and many of those are, as you both have mentioned, upstream. So, they will give us a better idea of what is happening before the impoundment, before the large rivers closer to the points of application.
James Martin: Tom, I just wanted to comment on this schedule. I think there's a lot of opportunity for this group to review the input side data. Once all the decisions are made and the model is constructed, as they are doing the calibration, we could certainly spend time reviewing manure inputs and how those are being distributed based on the decision rules that have passed. Manure, fertilizer, land use, yields and trends, are all things that can be actively reviewed during calibration before we get to the loads question and all things that should be reviewed. So, I am not arguing that this group needs to continue to meet monthly in 2026, but I certainly would like to see a lot of those input side elements coming from the finalized model, with all decisions applied, from all sectors but for the sake of this group for all ag inputs, and spend time either in quarterly or more frequent in the latter half of 2026 looking at those inputs to make sure they are behaving properly. Based on past experience, the review that happens in 2027 post calibration, looking at the loads, if you see a fluke in the loads that raises an eyebrow, you start working your way back, and you tie it back to a decision point, or an input, or a decision relating to an input, the longer it takes to dig in and find the source of the questionable metric. The harder it is to find support to make a change to fix it. What we've done in the past is that we get to it in the next version, or the next update, etc. so that's certainly an advantage to reviewing those inputs early and making sure there aren't anomalous elements in those.
Tom Butler: Thanks, James. I appreciate that, and we will certainly try and work that in. If it works out that we can meet more than quarterly, and people are ok with that, and that's a good use of time, I absolutely think we should do that. I will talk with people, and we will try to work things out.
Alisha Mulkey: I was just going to support James' comments. Not arguing for more meetings, but he is correct that, for those of us who have been around doing this probably longer than we should, we did iterate through at least five betas the last time and trying to figure out where those pinch points were before things really got locked down. So, I would agree with him that there is more to look at and tease out to figure out where things are going askew. To the degree that Tom and your team can accommodate that schedule in 2026, I think it's for our betterment of the final product.
Bill Keeling (in chat): I went through 6 versions of p6 betas. And all versions of p5.x

Joseph Delesantro: I just wanted to say that it's certainly something that we can discuss. Without getting into the details here, I did just want to briefly say that the calibration process in Phase 7 is quite a bit different than the calibration process in Phase 6 and that is, in my view, all positive. We've really enhanced what we can calibrate and parameterize in a rigorous manner, aided by all that additional data as well. However, it is certainly not trivial to bang out betas and calibrations. So, going through five betas in a year with how we have Phase 7 set up gives me a little bit of heartburn, and it probably gives Jess a little bit of heartburn. So, I just wanted to sort of make that distinction between Phase 6 and Phase 7 but, certainly, we will keep your comments in mind.
Alisha Mulkey (in chat): Bill Keeling - you are my hero! We had some very long meetings for P6 for sure.
Alex Soroka (in chat): Just want to jump in and say that for nitrogen, we should consider the Susquehanna mainstem Non-Tidal Network stations, those stations observe the Susquehanna River directly. The mainstem stations largely show decreases in TN over the 2014-2023 time period. Loads and Trends in the Chesapeake Bay Nontidal Monitoring Network The recent trend in decreasing TN is observed at the Columbia/Marietta station above the reservoir system and at Conowingo below. The lower Susquehanna has a system of 3 reservoirs, not just Conowingo. The process of infilling and scouring from each one is partially understood. We're currently working on models to estimate input and export using stations above and below the reservoir system.
Tom Butler: I will definitely lean on your all's experience from the past and how we have things set up, and we will try and make it the most efficient and productive use of time that we can. Circling back here, I think there are a few comments in the chat. From A.K., "there will be new sensitivity testing and calibration". I think that was before we started this discussion, so we talked about that a little bit. A point from Sarah here, "To Ken's point, are we hamstringing ourselves if the model assumes any reduced amount of manure (organic nutrients) application is replaced with inorganic nutrients? What if a farmer just applies less manure than avg crop nutrient need? How about programs that encourage applying less nutrients than allowable (crop need) - are those programs useless due to model assumptions?" So, all good points, and we would certainly welcome that perspective as we try and walk through that. I definitely recognize that it's a model and it isn't necessarily real world, but we want the representation to be the strongest of the real world that we can. So, certainly want to try and get that involved. I didn't know if you had a follow up you wanted to say with that or if you just put that out there for us for future reference.
Sarah Xenophon: Just for a little bit of backup, I'm more on the programmatic farmer incentive side. So, anything I can do to support getting really good data out from the model and from the folks gathering this data to then encourage better action on the ground, that's kind of what I would like to do. So, there are cases where we know that there are supply chains that are taking in organic materials and they might be processing them, repackaging them, and then transporting them outside of the watershed. It's hard to encourage that when you know or maybe they know that if you ship nutrients out of the watershed, it just gets backfilled with almost a never-ending supply of inorganic nutrients, and it doesn't really necessarily show what's actually happening on the ground. For instance, you have farmers who are applying less nutrients than crop need would say they should or can. So, how do we incentivize those farmers to keep doing it and show them that your little bit is actually making an improvement in the model. We're seeing trends. Obviously if they're doing it, it's going to at some point reflect in the monitored data. But, if we can capture the modeled data, I think that's important to show them, too.

Tom Butler: I appreciate that perspective, and I will harken back a little bit to our earlier talk about the role monitoring data plays and that it does factor in. So, certainly want to make sure that is articulated here. Joseph said we'll have more of that put in. Not saying that's the answer to what you are describing. We certainly want to work with people on that, though, to make sure there's good representation, and if there is something in here that needs to be changed with that algorithm that might affect that, we want to make sure we do the best we can with it.
Joseph Delesantro: This is a calibrated model, and we get very high fit scores, and so a lot happens between the point of application and the point of monitoring, and I think there are a lot of questions about how well all of those processes are represented. But, generally speaking, we replicate our monitoring results quite well. I'd also say that we'd expect to see the results in the monitoring data. We'd also expect to see the results in the fertilizer sales data. So, there's that element of it as well where that fertilizer sales data is continuing to show more and more nitrogen sold in Pennsylvania.
Tom Butler: Alex, would you please elaborate on what you put in the chat?
Alex Soroka: I was just responding to some of the conversation about the Susquehanna and the power of Conowingo in that reservoir system. It's true for sure that the Susquehanna delivers the majority of the load that actually reaches the Bay. It's upwards of 70% for nitrogen and phosphorous. But, if we're looking at recent trends from the non-tidal network, the stations that directly observe the Susquehanna River have been showing a decrease in total nitrogen over the last 10 years of the monitoring period. I wanted to bring that up just because it is a large supply, but we do see decreases as well in total nitrogen. Sediment is a different story because you do have the input and the export of the reservoir system and the questions of scouring and movement, and that's something that we're currently working on, looking at stations above and below to get a better understanding of sediment going in sediment export. Ken, when you do talk to the folks at Somerset, because of the proximity of some of the land that borders directly to the Bay, they actually can have an outsized impact in terms of the time it takes and the current and cycling pattern. So, nutrients that enter closer to the Bay could have a larger impact than those that are dispersed in the upper watershed. There's some nuance to that conversation.
Ken Staver: Thinking about this whole watershed model and what you are saying is that, overall, the numbers in the Susquehanna for nitrogen look like they are headed in the right direction. It's good. It's kind of a positive story, maybe not as positive as you want. Then we have this thing going on now where all of the sudden we have a fertilizer story in Pennsylvania that is kind of like the wrong direction. So, I am interested to see how this gets put together in the model. I appreciate your comments there. [The Lower Eastern Shore] are the last holdouts. Most of the Shore has kind of backed off the idea that it's all Conowingo's fault. But we still have a little bit of that.
Joseph Delesantro: To be clear, the fertilizer sales for Pennsylvania have been fairly steady over the past decade or so. So, I think that's about the timeframe that Alex is referring to in that monitoring data for the Lower Susquehanna.
Tom Butler: Thanks, Joseph. While we're on this, when we're looking at the applications, it is important to recognize that application does not necessarily equal load because of some of the processes we have in the model. So, despite some of the fertilizer increasing and somewhat leveling off the last decade, it does not necessarily indicate that the processes that happen between application and the point of entering the water are just straight. So, just wanted to highlight that.

Patrick Thompson (in chat): PSU SWAT analysis showed that replacement of Hillandale manure with fertilizer and 4R management would reduce N & P losses by 48% and 67% respectively.
Robert Sabo: Great conversation thus far. I just wanted to go back to Sarah's point and concern. I also just wanted to congratulate you all in the states for doing this. The concern was that farmers aren't going to be recognized for achieving improved nutrient use efficiency and decreasing fertilizer use, decrease in agricultural surplus. But, with this recent development that you all have implemented in terms of having state specific reporting rather than relying on AAPFCO, rather than waiting 5-6 years for the farming community to be recognized for improved nutrient use efficiency or decrease in surplus seems like it might be one to three years, and I think that's a huge development. Before, they would get the credit, they would report a nutrient management plan in CAST, and they have a little credit there. But, the majority of the gains and the credit is actually coming, like in Maryland, with decreased fertilizer use, steady or slightly increasing crop yields, dramatic decreases in surplus. So, I just wanted to point out that I also shared a similar concern with Sarah about the lack of recognition on the farmer's part and the lack of positive feedback. But, if you continue this state specific reporting and just providing data directly to the Bay Program to more rapidly update the CAST model, I think a lot of those concerns will hopefully go by the wayside and give us a chance to have better recognitions of some of the substantial gains farmers have made.
Sarah Xenophon (in chat): Thanks, Robert. I really appreciate the shift to state specific reporting, too!
Alisha Mulkey (in chat): Joseph Delesantro At a future date, MD has particular interest in coastal plains w/o RIM stations and calibration. We can take it to MWG though.
Tom Butler: Thanks, Robert. Always good to have a positive spin on things. Looking through the chat here, Joseph, I think you registered a comment from Alisha that might go to the Modeling Workgroup, so be on the lookout for that.
Joseph Delesantro: That is a Modeling Workgroup discussion. We can certainly touch base via email before the next meeting.
Alex Soroka (in chat): What hasn't been steady are the decreases in atmospheric deposition!
Alex Soroka: There's been a decrease in the amount of nitrogen deposited from the atmosphere itself. So, as we've done things to remove nitrogen from burning off fossil fuels, etc, other sources of nitrogen in the atmosphere, that has had an impact on the nitrogen that lands on the land surface and, subsequently, ends up in our waterways.
Robert Sabo (in chat): and you all giving the data to CBP to get things updated more rapidly!
Joseph Delesantro: The majority of you all who don't follow the day long Modeling Workgroup meetings that happen every quarter, very substantial steps have been made to better capture the effects of atmospheric deposition, and its decrease throughout the watershed for Phase 7.
Robert Sabo: I just wanted to make a shameless plug since we're on this topic. I'm actually going to be presenting some non-tidal network results explaining nitrogen loading trends across all NTN and RIM stations tracking the impact of atmospheric deposition, agricultural nutrient use efficiency, urban inputs, and wastewater. So, if you guys want to jump on that quarterly call, I think that's January 6th and 7th if you want to see some fun results using CAST data.
Tom Butler: It sounds like a rager, so if people want to attend, certainly please do.
Ken Staver: Tom, can you guys send out a little notice on that closer to the time? That sounds like something good to tune into. Is that possible to request?
Tom Butler: Yeah, we'll put a person on that.
Ken Staver: Thanks.

Caroline Kleis (in chat): You can access the calendar pages for the 6th and 7th here: https://www.chesapeakebay.net/who/group/modeling-team
Tom Butler: Caroline is already ahead of it and put it in the chat. Good conversations, definitely appreciate all of that. I think that given where we are, we're ok to move to our next topic.

III. Layer Populations

Lead: Tom Butler, EPA

We discussed the incorporation of the Hillandale layer population which is currently unaccounted for in Phase 6. This is a follow up to the October request to review population data supplied by the operations and CAFO permit data provided by PA DEP. The group voted on the inclusion of CAFO permit data should be used to represent the population in Phase 7.

Actions:

1. Alisha Mulkey, MDA, and Scott Heidel, PA DEP, will follow up offline to discuss the implications of manure transported into Maryland as a result of the incorporation of Hillandale layers for Phase 7.
2. Joseph Delesantro, ORISE/CBPO EPA, and Tom Butler, EPA, will compile a list of animals and crops that are updated annually from the NASS surveys and/or every five years as a result of the ag Census.

Decisions:

1. We should incorporate missing Hillandale Layers into the Phase 7 model based on a composite dataset utilizing Hillandale and CAFO reported populations.

Role	Name	Affiliation	Vote	Notes
Signatory	Clint Gill	DE	4	
	Alisha Mulkey	MD	4	
	Cassie Davis	NY	4	
	Scott Heidel	PA	4	
	Tim Larson	VA	4	
	Dave Montali	WV	5	
	Auston Smith	EPA	4	
At-Large	Ken Staver	UMD	5	
	Curtis Dell	USDA-ARS	4	
	Candiss Williams	USDA-NRCS	3	
	Alex Soroka	USGS	5	
	Zach Easton	VT	5	

Discussion Notes:

James Martin: I'm trying to understand which of these data are specific to Hillandale and which of these data are inclusive of everything that might be in the county where Hillandale has operations. I think I'm a little confused based on some of the language that's used in the labeling of these graphics. Which is which? Which is just the Hillandale operation, and which is countywide data? If the answer is Hillandale is the only player in that county, ok, then it's one in the same. But I'm just trying to make sure I understand the distinction. The second question I

have, also probably for the Pennsylvania folks, is just a little more clarity as to what the light green line is. I think in this one it's the reported or inspected data. How is that collected, and on what frequency, etc.?

Tim Larson (in chat): How many counties are affected?

Krista Crone (in chat): York and Adams County

Patrick Thompson (in chat): Since all of Hillandale's manure is exported from the layer sites, actual amounts of manure production can provide reliable nutrient data.

Scott Heidel: These are specific to Hillandale. So, there are other operations within Adams as well as York County. Apparently the Hillandale operation just didn't make it into the ag Census. So, we needed to get these numbers specifically added into the model since they are significant. So, as titled with the graph you're currently looking at, these are specific to Hillandale. There are operations within Adams as well as York County. The other information about the intervals of inspections, I would like to pass that to Krista if she's available to take that one.

Krista Crone: So, the interval of the inspection is every five years. However, as a part of the CAFO permit, the permittee is required to submit an annual report that actually provides the animal numbers for each facility. So, that's where we came up with the reported animal numbers from 2018-2024.

Dave Montali: Ok. So, this is Hillandale only. Operationally, we will take the info from the ag Census for those counties and that will be part of our animals, but we will add this to it. Is that the deal?

Tom Butler: Yeah, Dave, we would have to work it in. So, we looked at the Census and, normally, if an operator was so large in the county, you would pick it out, they would put it as a non-disclosed, and then spread it out. There were not enough birds in Pennsylvania in the Census to represent that for this. So, they are not there.

Dave Montali: This is Hillandale, and we're talking about approving these Hillandale birds but anything other than Hillandale would technically be the ag Census. Maybe the ag Census can't report it to you because there's not enough operations. Is that what you are saying?

Tom Butler: If that is the case, I don't know exactly the number of operators, they would be accounted for, because that does happen in places. So, it's a way to deal with that. Whatever was in Adams and York counties would be represented the way it currently is. These would then be added in in addition to those.

Dave Montali: Good enough, thank you.

Alisha Mulkey: Maryland agrees with including the bird inventory in Phase 7. You're saying the light green line on the current slide would be the extrapolation that we would use for numbers when it comes to voting, not the permitted dark green line?

Tom Butler: Correct. It would be a compilation of the previously reported Hillandale data. Stitched onto that would be this light green line.

Alisha Mulkey: My question then is to Scott and Krista. So, the implication to Maryland for this is in the manure that gets transported from these operations into Maryland. Can one of you speak from the CAFO permit side of where that manure is then exported potentially into Maryland and how you all are tracking and would be reporting that?

Krista Crone: Hillandale actually uses a broker system, so they broker all the manure, and it's handled under Act 49 which I believe is also reported. Scott, maybe you have a little bit more information about whether or not that information is reported to CAST, but I believe it's in the transportation BMP.

Scott Heidel: We do track manure transport and report it to CAST.

Alisha Mulkey: So, Hillandale transport to date has not been reported to CAST, but you will pick that up going forward. Do you have a sense of what is coming into Maryland, or she we talk about that offline?

Scott Heidel: Yeah, that's an excellent question, and I think we would have to dig into that a little bit more. I don't have that on the fly right now.

Alisha Mulkey: Ok, I will follow-up. Thanks.

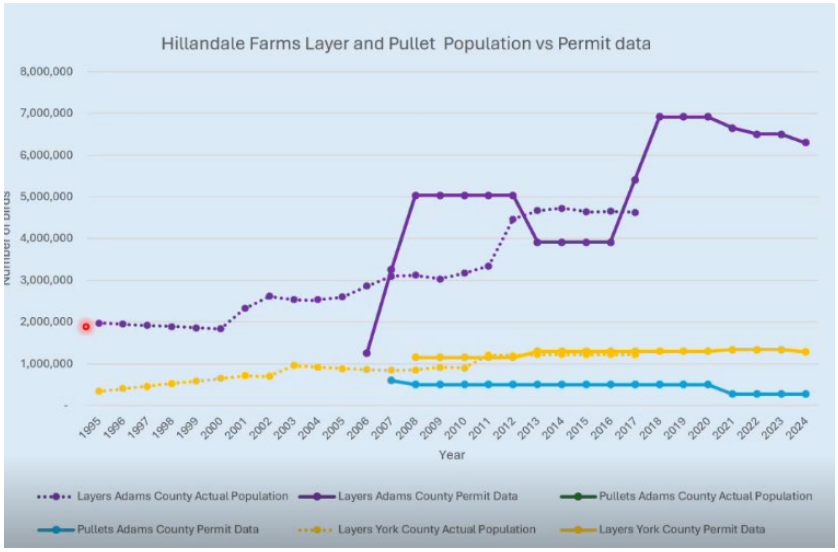
Ken Staver: Wasn't that one of the issues about BMPs being rejected? I thought somewhere along the line that one of the things that screwed this up was that manure transport was denied as a BMP because the manure didn't exist on paper. Am I remembering correctly?

James Martin: I think the language was "in excess of available". So, not that BMP was denied but the specifics that might have been reported would have been in excess because you're reporting more transported than you actually had generated.

Ken Staver: I remember that discussion quite a few years ago. I thought that was related to Hillandale, but maybe that was another situation.

Tom Butler: If we get too far down the road in BMPs, I'd urge us to turn back to the idea that we want the model to be accurate. It seems like adding in this population would make it more accurate, and that would be the grounds that I would want to approach this on, not necessarily the BMP side. Although, I understand the implications and the connection to it. For right now, we could pare down the population and if we thought putting it in in this fashion was the appropriate way to make that change.

James Martin: I understand this slide now is only related to the Hillandale operation both in Adams and York Counties. If you flip back a slide to the purple dash line that you're proposing as the historical entry point for this data, is this Hillandale only or is this all layers in Adams County?



Tom Butler: This is Hillandale only, so it's not everything.

James Martin: And the source of this data is?

Tom Butler: Hillandale Farms. They provided this in the previous effort. Someone went out to them and asked for this and collected it.

James Martin: And that someone has provided this to the Bay Program?

Tom Butler: When the discovery first happened, there was an attempt to go out and find out what was wrong, how many animals were missing, what the population was, and what the duration of that time was. So, they went out, talked to Hillandale, and they said is it possible to get your animal numbers over time? They took that and they brought it back to the partnership to say, hey, this is the operation, this is the scope of it over time and in terms of population. So, this is what we have that could be used in some capacity to feed into our modeling system. Lots of discussion happened, it did not get put in, but it is the representation from Hillandale on how many actual layers they have. It does seem to match up. We don't unfortunately have overlap, but it appears that the last part of the record from that effort is seeming to match up with the first part of Pennsylvania's reported information. I would not venture to say it was the same information provided to both. It is possible, but this is from the operation, it was collected by people in the partnership and then brought to the partnership for review.

James Martin: One last clarification, and I think Alisha asked it, and it's asked and answered. I just want to hear one more time that what we are suggesting is that the data on the purple line plus the data on the light green on the next slide be added to existing layer and pullet populations from the ag Census in these two counties to account for this one large operation in Pennsylvania, right?

Tom Butler: Yes, and if I am off base with that, Scott, you can let me know. That has been my understanding.

Scott Heidel: That's tracking what we are thinking. So, the light green line would be added into Adams and then the light blue would be added into York.

James Martin: Thanks for the clarification, Scott. It only makes sense to me that we have to account for these animals. This is a glaring example, and it was relatively easy to identify that we had a data gap. But it makes me wonder how many not so huge but also missing operations might be out there, all going back to our reliance on the Ag Census as a reliable source of input data for many things in our model.

Tom Butler: James, I definitely appreciate that perspective, and we made a call at the end of last meeting for people to try and look into it. There's recognition that, pretty widely, it's really hard to know what you don't know. So, that was kind of the answer. I understand that perspective, and I don't have a great answer to that, but I appreciate and recognize that it is an important perspective.

Hunter Landis: I have two questions and want to confirm what I am hearing or understanding on that light green line. That data comes from state inspections, or is a state required report based on the permit requirement. Is that accurate?

Krista Crone: Yes, that is accurate.

Hunter Landis: Then I have maybe a general model question, just kind of wondering how this data gets used moving forward. Will this data be potentially inputted on an annual basis going forward every time that new data is available? Are we just looking at the data from a reverse perspective?

Tom Butler: That's a wonderful question, because we do have to update data. Like we update from the Census, we have annual surveys, and we have things that happen that way for different animals. We would want to update with the frequency that we update the model. I think right now

we are on a two-year schedule. I will lean on Jess more about that, though. Obviously, in the future if that is changed, we would update it, but that frequency would be different. Jess, I don't know if you can speak to the frequency and how this might play into updating.

Jess Rigelman: I think you got it right. It would go into the calibration and any subsequent releases of CAST. I don't know if the two-year schedule is going to hold for Phase 7. But that's what it is currently. So, every two years we would get new annual data and incorporate it.

Hunter Landis: If other states felt they had better or more complete data on a two-year basis than was available through ag Census, could that be eventually supplemented or inputed?

Tom Butler: That's a good question. Are you referencing facilities we don't know about or facilities we do know about that the ag Census would be reporting incorrectly?

Hunter Landis: What's the ag Census, five years?

Tom Butler: Yeah.

Hunter Landis: So, what about facilities that reported at the most recent ag census went out of business and we were able to confirm that through our state permit inspection process?

Tom Butler: I will bring Joseph back in here, because I don't know if it's annual inventory data, so that would be a specific question for him. Joseph, can you speak to the frequency? It depends on the animal type, so there's a lot that would go into that in my mind.

Joseph Delesantro: I see Jess is off mute, so maybe I'll let her go first.

Jess Rigelman: We use inventory for the majority of our animals, so you don't have annual updates on that. I think, in general, that would have to be a partnership decision. But it would include not only animal operations that dropped out, but obviously animal operations that have started. I'm not sure how many of those there are nowadays. But we may not be able to use the numbers per se. We may have to use the trend and apply it to what we already have. I don't know. That would be a general discussion that this entire group would have to have as far as going forward.

Joseph Delesantro: That is my understanding as well and wanting to make sure that if we are capturing any decreases, the same effort is made to capture any increases.

Hunter Landis: Right, and I recognize that question might be a little off topic. So, I'm good with that.

James Martin: The other factor that would have to be considered, and I think the reason we haven't been able to incorporate those Hillandale data in previous Phase 6 CAST updates, is because the data was excluded through the entirety of the calibration period when, in fact, it existed during that time. So, having a bunch of new bird's past '23 wasn't an option because you didn't have them in the history and you're not going back through a whole recalibration. So, Hunter, to your point, if it's an adjustment to data that was already in the model, an operation that was already in the model, that would be fine. If it's a brand-new operation that's in addition to data that was in the model, that would be fine. But if we found another operation that wasn't in the ag Census and hasn't been included in the entirety of the history but existed through that history, we probably would not be able to add that data, at least if we follow the model that was used for Hillandale, until the next calibrated model development. So, I don't know that we need to get too far down this path. But, in terms of the update frequency, because we only have the rest of the animal data updated every 5 years with the new ag Census, I would suggest that be the frequency that we update Hillandale permit and reported and/or observed numbers on the same 5-

year history with ag Census. Maybe that aligns, Jess, with your suggestion that we may not do two-year updates anyway, but maybe 5-year updates to align with the new land use being supplied and new ag Census might be a better way to do it.

Bill Keeling (in chat): Updating things every two years is considered by many as excessive and counter productive.

Patrick Thompson (in chat): Frequent updates should prioritize CAFOs.

Jess Rigelman: We do update broilers annually, and I believe there is another bird as well. Maybe Joseph can speak to that. I'm not sure about hogs as well. So, that's something for this group to consider, but we definitely do annual updates. Obviously, we do an annual projection, so it's whether or not you believe that using this data versus the projection is a better method or if you wait and only do it every five years.

James Martin: Jess, those annual updates are from the NASS surveys, not the five-year ag Census, but the one-year NASS that are done in some states and not the others, is that right?

Jess Rigelman: It's not some states. They're done in all states, but they're done at the state level as opposed to the county level. I know they're used. I'm a little fuzzy as to how they're used. Joseph can speak more to that, but they're definitely all states and annual from the surveys.

Joseph Delesantro: Yeah, so essentially the five-year Census gives us the county level numbers, and then they can be adjusted annually given the change at the state level.

James Martin: Joseph, that's for all of the animals or only certain ones?

Joseph Delesantro: Only certain ones.

James Martin: Only certain crops, right?

Joseph Delesantro: That's correct.

James Martin: Ok, thank you. It might be good to share a list of those that do have annual updates and the list of those that are five-year update cycle. I'm sure that exists somewhere in the model documentation, I just don't know where to look yet.

Tom Butler: Yeah, we will make sure we dig through that. Bill's weighed in on the frequency. I appreciate that. I don't see any other questions anywhere. So, given that, I'm going to move us towards the decisional slide here. It says, "we should incorporate missing Hillandale layers into the Phase 7 model based on a composite dataset utilizing Hillandale and CAFO reported populations". So, essentially, it would be that purple line, and that green line combined for Adams and then the other one is for York. So, if there are more questions, we can absolutely field those. Otherwise, I'll bring up the voting table again. We can drop it in the chat, or you can speak up if you have comments.

Alisha Mulkey (in chat): MD 4

Alex Soroka (in chat): USGS 5

Scott Heidel (in chat): PA 4

Clint Gill (in chat): DE 4

Zach Easton (in chat): VT 5

Auston Smith (in chat): EPA 4

Cassie Davis (in chat): NY 4

Curtis Dell (in chat): ARS-4

Tim Larson (in chat): VA 4

Candiss Williams (in chat): NRCS 3

Tom Butler: Ken?

Ken Staver: I'm a 5.

Tom Butler: Do we have Tamie or Curtis?

Caroline Kleis: Curtis put a four in the chat.

Tom Butler: Dave, I think I see you on here, but if you can drop a vote in the chat that would be great. Otherwise, we might have to reconnect with you. We'll reach out to Dave afterwards. Pending that, then this will be incorporated into Phase 7 with the current method that we've proposed. Thank you to everyone for that. I will finalize that with Dave, and we will hopefully get some of these knocked out in the next few days. One huge thank you to everyone involved. We're going to have to talk about next steps again. Really the only thing that keeps coming up from discussions and could change the direction a little bit is talking about the algorithm for application. A lot of that is replacement. We've discussed it already a little bit, but now would be the time to circle back around to that if people wanted to see something different or have a different conversation on where to go with it. I definitely think that's the direction to proceed with this one. Were there any questions about where we want to go next?

Caroline Kleis: We had Dave join. I don't know, Dave, if you are able to unmute yourself.

Dave Montali: I had to go away from the computer and get in the car to go to another meeting, but I am a 5 on that.

Tom Butler: Great, we will put Hillandale in, and those layers will be there for Phase 7 with that method. Thanks, everyone, that was pretty good. I appreciate everyone's efforts on that. Hopefully we get a few more of these in the next few days. Take a pat on your back, everyone, that's a big one and, as I understand it, that's been going on for several years. For the rest of the time we've got, we can spend the remaining 15 minutes talking about this a little bit more or I can hand things off to Zach and we can do a wrap up. If there aren't other comments, I will let him take over, and we will maybe end early.

Alex Soroka (in chat): Excellent work getting real numbers.

IV. Wrap-Up

Lead: Zach Easton, VT

V. Adjourn

Next Meeting:

AMT Meeting: Friday, January 9th from 8:00 - 11:00 am.

Attendees:

Zach Easton, VT
Tom Butler, EPA
Caroline Kleis, CRC
Bill Keeling, VA DEQ
Emily Dekar, USC
Tyler Trostle, PA DEP
Scott Heidel, PA DEP
Alisha Mulkey, MDA

A.K. Leight, MDA
Joseph Delesantro, ORISE/CBPO
Arianna Johns, VA DEQ
Denise Uzupis, PDA
Cassie Davis, NYSDEC
Karl Blankenship, Bay Journal
Jess Rigelman, J7 LLC/CBPO
Dave Montali, Tetra Tech
Sarah Xenophon, PA SCC
Auston Smith, EPA
Clint Gill, DDA
Jen Nelson, AAC
Hunter Landis, VA DCR
Candiss Williams, USDA NRCS
Ken Staver, UMD/Wye
Tad Williams, VA DCR
Krista Crone, PA DEP
Curtis Dell, USDA ARS
Lisa Duriancik, USDA NRCS
Tim Larson, VA DCR
James Martin, VA DCR
Alex Soroka, USGS
Natasha Rathlev, Sustainable Chesapeake
Joseph Schell, DNREC
Patrick Thompson, Energy Works
Bo Williams, EPA
Robert Sabo, EPA