Chesapeake Bay Program
Science. Restoration. Partnership.

Agricultural Modeling Team

November 14, 2025
9:00-11:00AM

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: The AMT will approve the September meeting minutes and the October meeting minutes at a subsequent meeting.

Action: Please submit pasture high and hay high acres from 1985-2025 to Jess Rigelman (jrigelman@j7llc.com) by the end of the year 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.

Action: Tom Butler, EPA, will follow-up with state chemists and copy the respective AMT member to discuss if there have been changes in data collection that might have impacted AAPFCO data integrity.

Action: Joseph Delesantro, ORISE/CBPO, will work with Tom Butler, EPA, to enhance fertilizer smoothing and include manure effects on fertilizer plots.

Action: Joseph Delesantro, ORISE/CBPO, will examine Delaware fertilizer data for additional smoothing opportunities and follow-up as needed offline.

Action: Joseph Delesantro, ORISE/CBPO, and Jess Rigelman, J7 Consulting/CBPO, will work to supply AMT members with county level data for crop need, ahead of a potential CAST scenario run through 2020.

Action: Please reach out to Tom Butler, EPA, (butler.thomas01@epa.gov) if there is any feedback or additional questions on the method for interpolating data for non-reporting states.

Action: Joseph Delesantro, ORISE/CBPO, and Robert Sabo, EPA, will work together to compare the fertilizer data with other useful data sets and trends relating to crop yield, production, and other fertilizer estimates. This information will be compiled and shared for the AMT.

Action: The group generally supported the idea of including Hillandale layer numbers into Phase 7. If there are any concerns or other operations that you believe have been omitted, please reach out to Tom Butler, EPA, (Butler.Thomas01@epa.gov) prior to the December AMT.
Action: Tom Butler, EPA, will circulate data showing the Hillandale population/inventory and the CAFO permit numbers for the Hillandale operation.

Minutes

I. Introduction & Announcements

Lead: Tom Butler, EPA; Zach Easton, VT; Jess Rigelman, J7llc

We provided a quick recap of the AMT progress to date as well as the groups timeline. Given the short turnaround time for many federal members now back to work, the group will instead review the September meeting minutes and the October meeting minutes at a subsequent meeting.

- Announcement: Request for acres of pasture high and hay high from 1985-2025 for Phase 7 Pre-BMP Land Use- Jess Rigelman, J7 LLC
    - Jess noted that, with the advent of the pasture high and hay high land uses, acres for these land uses will need to be submitted each year for progress. Since these haven't yet been submitted, Jess needs the data, as she is in the process of getting the Phase 7 land use together for the Modeling Team. So, this would include the year going back to 1985, the land use (hay high or pasture high), geography (HUC 12 or county), and number of acres. Since there is no default, if that is not submitted, it will be zero acres. Some states have suggested using nutrient management acres, which is fine. However, they still need to be submitted and ideally as soon as possible.

Actions:

1. The AMT will approve the September meeting minutes and the October meeting minutes at a subsequent meeting.
2. Please submit pasture high and hay high acres from 1985-2025 to Jess Rigelman (jrigelman@j7llc.com) by the end of the year 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 d0efault.

Discussion Notes:

Dave Montali: If I were going to do this, I would go back and look at the records. We have, for 10-12 years, separated our nutrient management by hay, pasture, crop. So, I think it's going to be relatively easy for when I have that. I am worried about what to do for'85-2005 where I may have ambiguous acres of nutrient management. Any advice?

Jess Rigelman: That's up to you, but what I would do is basically create a ratio of nutrient management to non-nutrient management for the years you do have data, see if that is consistent, and apply that ratio. If not, if it's a ratio that keeps increasing, I would probably linearly interpolate that backwards to use that. That's what I would do but obviously it's up to you and your Ag Department.
Dave Montali: If I need some tabular thing about how many nutrient management acres there are by year, can I get that from you or not?
Jess Rigelman: You should be able to download that via a BMP summary report or BMP submitted credited report. If that doesn't work for you, feel free to contact me, and I can help you with that.
Dave Montali: Ok. Would those reports be detailed enough to see the distinction between hay, pasture, and crop, or not?
Jess Rigelman: BMP summary would not. BMP submitted credited would. So, I would take a look at that. If you need more help or help in getting a series of years, I can help you with that.
Dave Montali: Alright, thank you.
Tim Larson: If we determine a certain number of pasture high/hay high acres for a HUC, will you automatically deduct those from the prior land cover data? Or should we give you both the high and low numbers total? I worry about a doubling of the total acres for pasture hay land class. Does that make sense?
Jess Rigelman: I will be getting pasture and hay acres from the Land Data Team, and then I will take your hay high and subtract that from hay. What's left will be hay low. So, you only really need to give me the high acres.
Tim Larson: Thank you so much. Is a week reasonable for you? Two weeks? Can you give us some sort of deadline?
Jess Rigelman: I could use a draft version by end of the year or early December, when I think, I am supposed to turn something over to the Modeling Team for draft. Ultimately, I don't think you need to get me final acres until the end of February. The more accurate we can get an initial draft, the better. I know things are stressed here with the holidays and progress season. If it isn't until the end of February, that will work, but you are better off getting it to me by the end of the year.
Tim Larson: Thank you so much.

II. Inorganic Fertilizer Discussion

Lead: Tom Butler, EPA; Jess Rigelman, J7llc

We discussed the proposed ideas from the October meeting such as smoothing and projection methods for fertilizer. These discussions are pre-decisional and work towards a finalization of the methods for processing fertilizer in Phase 7.

Actions:

1. Tom Butler, EPA, will follow-up with state chemists and copy the respective AMT member to discuss if there have been changes in data collection that might have impacted AAPFCO data integrity.

2. Joseph Delesantro, ORISE/CBPO, will work with Tom Butler, EPA, to enhance fertilizer smoothing and include manure effects on fertilizer plots.

3. Joseph Delesantro, ORISE/CBPO, will examine Delaware fertilizer data for additional smoothing opportunities and follow-up as needed offline.

4. Joseph Delesantro, ORISE/CBPO, and Jess Rigelman, J7 Consulting/CBPO, will work to supply AMT members with county level data for crop need, ahead of a potential CAST scenario run through 2020.

5. Please reach out to Tom Butler, EPA, (butler.thomas01@epa.gov) if there is any feedback or additional questions on the method for interpolating data for non-reporting states.

6. Joseph Delesantro, ORISE/CBPO, and Robert Sabo, EPA, will work together to compare the fertilizer data with other useful data sets and trends relating to crop yield, production, and other fertilizer estimates. This information will be compiled and shared for the AMT.

Discussion Notes:

Dave Montali: I thought I remembered that what we did in the past was do a three-year rolling average of sales. It seems a bit complicated. What are the pros and cons of doing a multi-year rolling average for each year and, even if we need to go to five years to make it smoother, just simplifying that? That's my initial thought.

Jess Rigelman: We didn't do a rolling average of the total bucket. In Phase 6, we used the full fertilizer bucket (ag and urban), and we did a rolling three-year average of the farm fraction. So, we kept the fertilizer bucket the same, but it was just the farm fraction of it that was rolling. So, there definitely wasn't necessarily a smoothing of this.

Tom Butler: It is another differentiation that we've decided for Phase 7. We will just be using the agricultural portion. So, I just wanted to note that the smoothing of that farm fraction is a Phase 6 product. In Phase 7, we are only using the farm fraction. That was a decision that we made. So, we would not have anything like that in Phase 7. If the variability is too high, this is just one statistical method. There are other things we can certainly discuss like doing kind of a simpler three-year rolling average. That is something that I think the door is open to, but I'll certainly let Joseph weigh in on comments as well.

Joseph Delesantro: When we moved from the watershed wide bucket to the state buckets, we see a lot more variability in this smaller scale state data. So, it becomes more important to do some sort of smoothing. The advantages of using this method, which is more complicated than a three-year window, is that we are essentially trying to use some of the additional information we have to predict farmer behavior. Where there is a surplus in sales, that might not be all applied in that year. Some of that might be stockpiled, maybe not by the farmer but by the distributor, which is where the sales data is being collected, and then applied in future years where there might be a deficit. That's essentially the adding here in state one. In stage two, this is essentially a rolling average. However, instead of a centered rolling average, it's a right aligned rolling average, so it has the tendency to move fertilizer into the future, so you don't have sales moving backwards into the past. Then it just uses the crop need to weight that average to move the fertilizer to yields when we expect there to be a greater need. Holistically, what this does is go from data we have on sales, which is highly variable, and predict what the application might be based on some commonsense behavior centered around the estimated need for fertilizer based on our yield

estimates. Maybe that's another way to think about this. We aren't simply smoothing the fertilizer sales. We are smoothing the fertilizer sales to estimate applications, and that is more complicated than a simple smoothing. It would be for you all to decide if that additional complication was worthwhile.

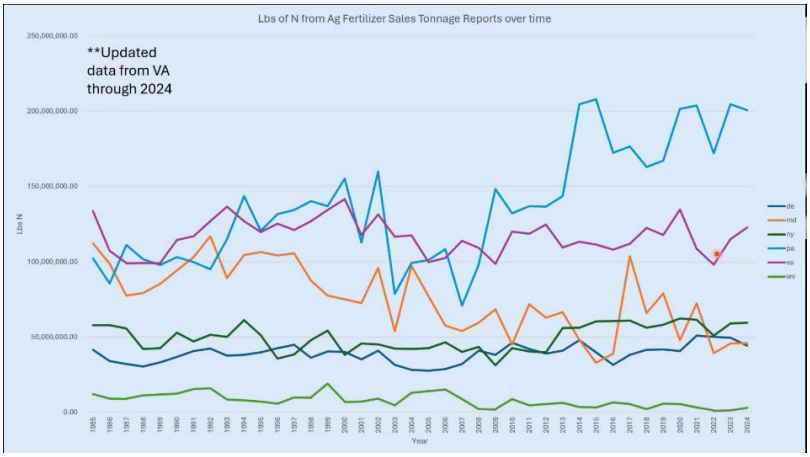
Hunter Landis (in chat): Is the estimated crop need based on a rolling average? Or annual data for crop acres planted?

Joseph Delesantro: I think that the vast majority of the nitrogen application is coming from that subset of crops where we are predicting crop need based on that yield attracting application that was voted on last spring. So, that yield attracting application is not a rolling average, but it was built to be much smoother than those annual values. So, we can think of that crop need as being smooth.

Alisha Mulkey (in chat): Crop need by county and load source, correct?

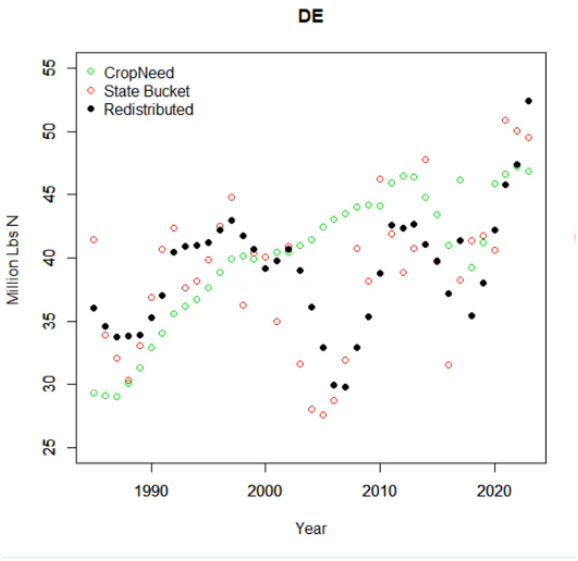
Alex Soroka (in chat): Joseph any chance you have a plot of the two smooths? Might help explain the value in this method. Not propagating backwards will likely fit QW models better.

Hunter Landis: It sounds like you are saying somewhat smooth, and I think someone asked my follow up question about whether it is state or local buckets versus baywide. Could you maybe go back a slide, Tom, where the lines were being presented? Looking at where you see some of those drops, I would wonder if that's a year where we went from high corn production to a higher soybean rotation which means, like Joseph was saying, that corn crop is going to be the high nitrogen feeder that one year and the next year it's a legume. So, I would assume we've got that data annually for crops planted, but I wasn't sure how that fit into this equation.



Joseph Delesantro: Jess can correct me if I am wrong, but that should be captured in the crop need. To Alisha's comment here, the crop need is calculated by county and crop. Then for the smoothing, we are summing that up to the state. Because we have the state sales, we are essentially smoothing the state data. So, we are looking at total crop need. We do have plots for each state here.

Tom Butler: What you'll see for each of these jurisdictions is exactly what Joseph has noted. It's nitrogen in millions of pounds versus the year. You will see a crop's need in the green circles. The red are more highly variable fertilizer data as we have them without the smoothing. With the smoothing in place would be these black dots, the solid ones. So, you'll see kind of that bigger spread of the red versus the black dots here. So, I definitely want to make sure everyone understands that. We have them for all the states. I can run through these slowly. We can stop and look at them individually. I want to pause here if there are any other questions. I think we want to discuss if people think this is the best way to do it. Is it realistic that we have this banking of the fertilizer? Is there a better timeframe? Are there any other metrics? We had been asked to look at things like price index. That relationship, I understand, fell apart a little bit more when we got more into the state level rather than a watershed scale. So, definitely if there were things people had in mind, we want to talk about those.



Caroline Kleis (in chat): Inorganic Fertilizer Slides: https://www.chesapeakebay.net/files/documents/AMT_Fert_11.25.pdf

Tim Larson: Is there any consideration to how surplus fertilizer in the model would be distributed spatially to neighboring HUCs as well as temporally? I think that is something within a state to have a smoothing model that considers the first order neighboring HUC, for example, as the first distribution for surplus and then temporally.

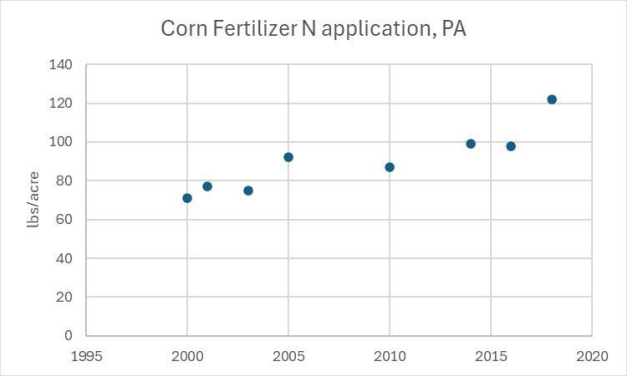
Jess Rigelman: The data Tom and Joseph are presenting is kind of a pre-processing in setting up the model. The bucket that is created for the state for that year does address somewhat of that surplus in the fact that it applies according to the newer curves. So, you have your state bucket, and it's going to spread according to the curves throughout the state based on need. So, there's still maybe a surplus for the state, but those fertilizer application curves are what is going to predict where that fertilizer goes down. Is that clear?

Tim Larson: Thank you.

Dave Montali: You went through the state graphs quickly, but it seemed to me like the smoothing wasn't doing a whole lot. The difference between the red and the black dots, is that a good result? Or is it a result that takes away some of the extreme variability we are trying to do?

Joseph Delesantro: There are certainly steps we can take to further smooth the data. At least at the watershed scale, it does seem like some of the variability in sales is a response to the fertilizer price index. The relationship certainly is weaker when we look at it at the state scale. So, I do think that there is some real variability in here. I think that's a great question, Dave.

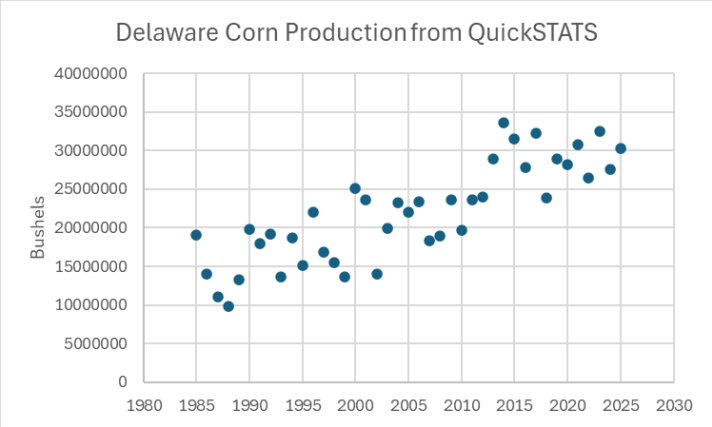
Dave Montali: West Virginia is not a good one to look at because we're low anyway. But, in some of the other states, the black line doesn't look much different than the red line if I was going to draw a line through them. That was my point.
Chris Brosch: Thanks, Caroline, for including the link in the chat so I can cycle through these. The Delaware graph I am trying to compare the most to West Virginia because the scales on the other states are just so much higher. But, Delaware has far more noise on each of the data sets (the three colors), than even West Virginia, which is sort of on par for the amplitude of millions of pounds of N. Looking at the Delaware data charted here, I don't see much smoothing at all with this method.
Robert Sabo (in chat): Some of those spikes are seemingly real when you look at farmer report Corn application rates:



Alex Soroka (in chat): Some of that variability is the scale, Y does not start at 0
Joseph Delesantro: It might help visually if I plotted this out as a line. I can tell you, mathematically, there's a fair bit of smoothing here. We can look at the spread of the red points with the red circles being much greater than the spread of the black points. One thing to note is to ignore that final year because we need some sort of final year rule since there are not future years to distribute to. So, essentially, the last year has artifacts. Again, I take your point. I think if we want to smooth this further, then the most straightforward thing to do would be to increase the span of years as Dave was mentioning and go from 4 to 5. If we think that we don't want something that is sort of as conceptually based in this temporal redistribution based on the crop need or surplus or deficit, then there are also other entirely different techniques we could use like splines or entirely different techniques that might smooth things even further. Those would require us to sort of move away from this idea of temporally redistributing based on surplus deficit and crop need.
Chris Brosch: The other point I wanted to make is the issue of the equities of scale. Moving to the state scale, which was decided in July, is obviously having a very strong effect in a small state like Delaware, which is also saddled with a lot of manure nutrients. So, understanding that so much of our retail of these products ignores the state lines, it might be useful to have a conversation with Maryland about how to reduce the signals in this data. I can't explain why there is a 50% or greater increase in demand from the crops in this time period that isn't replicated in any of the other states. Then the bucket and redistribution of supply is where, again, we're the only state where it is peppering both sides of that need. Unfortunately, we have a track

record of being the biggest loser in changes in methodology, and I am afraid that's happening again at a much greater degree. It just doesn't look like the others. So, just wanted to note that.
Tom Butler: Thanks, Chris. If there is a real concern, and it sounds like there is, between the two states who might be sharing this, I think the conversation is worth having. We can certainly have it now, but we can take that offline as well. I'd like to hear from some of the other states, too, to see kind of where you fall. Hearing from Delaware, that's one perspective, and it's definitely a concerning one. Everyone is kind of seeing them for the first time, so we are not asking for a decision. Some of the things I am taking away are we're not seeing a great deal of smoothing. So, we might want to expand that time frame that we're operating on. What are some other things people are taking away from this? We did have a nice comment in here from Alex. The plots we're looking at do not start from zero, so some of them might look different. We definitely see things going over 10, 20, 30-million-pound difference between years. So, what are some other people taking away from this? Basically, are we way off base, or are we kind of on base, or have we hit a home run? Sounds like we might not have hit a home run.
Joseph Delesantro: There are a couple of calls here for greater smoothing. Do we appreciate the idea of this temporal redistribution based on need surplus and deficit? As Dave mentioned earlier, it does add some complexity, so if that is something we want to keep, then I can explore options for further smoothing that maintain that conceptual basis. If we don't think that that's important, then that opens some other ideas or some other options for how we might smooth this data.
Ken Staver: Your theory of storage and using it the next year, does it work? Does it look like that happens? So, the next year sales are down but your need is just as high. Does this all kind of true up in the long run? If you never need it in that surplus year where you are saying it is stored, does it come out of storage? How does that look if you do the numbers?
Joseph Delesantro: It trues up over the 40 years we have. This method, because of that second step, it's not a perfect preserver of the total mass balance. But, for each state, the sales total versus the total of this smooth estimated application is within plus or minus a couple percent.
Ken Staver: So, if you did cumulative over that period, those two lines would end up at the same place?
Joseph Delesantro: Plus, or minus a couple of percent. That is correct.
Ken Staver: I agree with some of the comments that it doesn't seem to be, in the big picture, making a whole lot of difference in terms of the variability. You aren't going to do any smoothing to those red dots in that graph that are going to make it not be a big dip unless you do something monstrous.
Joseph Delesantro: That dip through the 2000s there, unless we just do a linear interpolation, we aren't getting rid of that.
Ken Staver: Back to the field level, where this all shakes out is you're looking at what you're putting on your different crops and how much of this is changes in acreage. Somebody asked that question. So, the biggest question in all this is how much N is being applied to corn per unit of yield? At the management/field scale, that's where you can look at this and say it is reasonable or unreasonable. It could be that's what happened. Maybe farmers are planting a lot less when prices are high and in this period from 2007/2008, for whatever reason, between the grain price and the fertilizer price, they just cut way back on N. Then grain prices went up and fertilizer prices went down, so they started putting on more. For people in agriculture, you look at this and

say, well, we don't know what Delaware's changing corn acreage is in that period. So, if you don't have that information, it's hard to have an intuition about whether or not this is good.
Robert Sabo (in chat):



Joseph Delesantro: Well, a lot of that is captured in the crop need. That is the yield per acre x the acre x the recommended application, at least for those eleven major crops. Then it is done slightly different for all the other minor crops. So, this isn't specific to corn, but a lot of the variability that you're mentioning should be captured in the crop need in those green circles.
Ken Staver: Right. So, go back to those graphs of pounds of N per bushel of corn, and that's the dip in 2009 when everything looked like we were getting super-efficient in our N, and it's been way up since then. So, again, when we think about delivered loads, delivered loads are based on the difference between applied and removed. So, the N surplus per acre is what drives the base delivered loads in the model. Then you've got all the in-stream losses and all that stuff. But, when we talk about the edge of field, the biggest factor is that difference. So, that's what really matters in terms of estimating loads. Not to say this for the hundredth time, but the problem from 2010-2020, we're doing all these BMPs, but N surplus is increasing. So, we aren't making any progress. We are basically offsetting our BMP effects by a bigger N surplus per acre. That's the big thing going on here.
Alisha Mulkey (in chat): I also question the dips in N need in recent years for several states
Robert (in chat): DE increased corn production from 10 to 15 million bushels in mid-80s and early 90s to 25 to 30 million bushels today.
Tom Butler: If there is a concern potentially with the crop need being tied to the application here, is it something people might want to move away from- using the crop need in this method?
Denise Uzupis: I don't really have a comment regarding the smoothing and stuff like that. I kind of agree with all the comments that are out there. My one comment is I am looking through these data points, and I think a lot of states show some very similar change as was indicated. You've got that 2007/2008 time period where it was really low and then it spikes. If you recall at the last meeting, Pennsylvania was kind of called out- why was there such a huge change? I did respond that one of the reasons we had a huge change in our nitrogen numbers, we believe anyways, was after looking at our crop acres specifically at corn, nitrogen need, and even dairy manure, changes in phosphate roles, etc., it came down to we changed how we reported our data. What we were providing to AAPFCO was based on the UFTRS codes, and there were some issues with

our codes. So, our data queries were actually failing to pull out some of the nitrogen data and reporting it to AAPFCO. So, AAPFCO's numbers were significantly lower than they should have been in reality. My question is, as we were switching to state data, for other states, have they changed how they are sending those reports to you? Are they capturing data more accurately and, perhaps, reflecting the true nitrogen load? It's not really gone up, but it's just being reported better. Just a thought.

Tom Butler: Thank you, Denise. That's a really good question, and I would rely on some of our other states here. Maybe that's a call we have as an action item. Certainly, if that's representative of other jurisdictions, then that's something we want to look at. So, if maybe we have a similar behavior happening in Delaware, and there was a change in the AAPFCO record, that would be good to know. In some preliminary talks I've had with people, they don't necessarily have the records that go that far back. Perhaps they do, and I just was asking the wrong question. So, we can certainly make that an action item. If people here could also weigh in, that would be useful.

Ken Staver: I would say that's the most important thing that has been said in this call so far. All this other stuff is just nothing if the raw data really changed how we collected it in this period. So, that has to be resolved. That's hugely important. All these other things of smoothing and everything else, you can do all you want, but if there was a major way we were calculating nitrogen use that changed, then all this other effort is like trying to make good chocolate chip cookies with spoiled ingredients or something.

Tom Butler: Yeah, we want to make that a priority here. We will definitely make an effort to reach out to everyones state chemists here. I will CC people on this call as well. Thank you, Denise, for looking into that. That's hugely important. I don't know if anyone else on this call has that expertise for their jurisdictions, but we would certainly welcome any input we have here.

Dave Montali: Can you throw up the WV graph? I know it is tough because the scale is different, but I just wanted to see. It looks like we've got a bump in that time period in the opposite direction that others have. So, I am just trying to figure out how much variability is in our stuff. It is interesting that, in that same period, the AAPFCO data goes up for us where it goes down for others.

Joseph Delesantro: Yeah, that is a bit of an anomaly. To highlight the point that has been made earlier, it is hard to compare between West Virginia and some of the other states because the scale is just so much lower. If we put the West Virginia data on the same scale as the Virginia or Pennsylvania data, it would just look like a straight line. So, just highlighting that again.

Tom Butler: Thanks, Dave. I am just looking through the chat here. I see there are a number of comments about corn applications. Robert, you put in a few plots here and mentioned Delaware increases corn production considerably from the mid-80s to the early 90s and today. So, good information there. I didn't know if you had any more you wanted to say about that, Robert.

Robert Sabo: I just wanted to point out some of these spikes we're seeing in the fertilizer sales record. Of course there might be some storage on the individual farms, but when you actually look at the survey data reported by the USDA, when you actually call up farmers and they're asking how much nitrogen you are applying to corn, soy, wheat, it can vary by 20-30 percent from year to year. Like in the Pennsylvania plot I provided, the difference between 2003 and 2005 is like a 20-25% difference for how much nitrogen they are applying to their corn crop based on their statistical inference. So, I think we can try and smooth the time series, but I just

don't want the impression to be that we can't trust these spikes we're seeing because farmers make year to year decisions about how best to cultivate their crops. That's also reflective in the survey data that USDA is putting out. To Chris' point about the dramatic increase in crop uptake in need, I just did a Quick Stats Survey and, impressively, Delaware farmers have dramatically increased their corn harvest at the state level. So, of course, another 15-20 billion bushels of corn requires quite a bit of nitrogen to sustain it.

Chris Brosch (in chat): Is that not replicated in other places? We are uniquely increasing irrigated acres in that time, but other factor affects other states.

Tom Butler: Thanks, Robert. So, from this discussion so far, we're hearing a few things. The current thing we've done here is probably not the answer that we want to finalize. We potentially want to look at smoothing information more, but perhaps the bigger topic here is if there has been a change in collection for any of these jurisdictions pre-2016. That is the AAPFCO record. So, again, we'll do that outreach. I am concerned about data availability in that time frame. I am ecstatic to hear that it exists in Pennsylvania. I don't know if it does in other states. So, that could bring up a new can of worms on if we only have it for one state or another and how we would want to deal with that. I will definitely do that outreach first to see if there is anything that exists there before we go down that road.

Denise Uzupis: I just don't know how important it is to try and figure that out. I am not a statistician. It might just be important to be aware if we are concerned about what's actually reaching the Bay. If you are concerned that the numbers are going up, there are so many different factors that could be influencing that. It doesn't necessarily mean it's reaching the Bay. Obviously, as times change, we have new systems, better ways of collecting data, increased need for food, so you obviously have an increased need for fertilizer. There are so many other factors. I don't know how much you want to get bogged down in trying to figure that out. It was just kind of an eye-opening moment for us that a simple change in how we reported the data was very influential in the amount of nitrogen we were reporting since that time. So, I am just wondering how much you want to get caught in the weeds.

Dave Montali: The crop need, the green lines, are relatively smooth for most states. When you see that dip like that, the other thing that is going on is that crop need was met by both inorganic and manure, right? So, what about the manure and the animals? Are they smooth? Like Denise said, there's a lot of different things going on here. My gut is the smoother the better for management. This year-to-year variation is just a pain for progress and all that stuff. I truly believe the long-term trend is more important than the short term. That's just my personal feeling.

Joseph Delesantro: This method for smoothing does not consider manure.

Jess Rigelman: I just wanted to quickly react to Denise's point. The absolute accuracy of the numbers, granted we don't want to be orders of magnitude off, are not the end all be all. What's important is the trend is correct. I do feel like this dip, if it is due to anomalous data processing, is worth looking at. I think the trend is important. This is an accountability model. We want to know whether or not management actions are going to affect the load. It's not data processing. This would be important for setting our calibration average, which is what is truly important for setting your loads in future scenarios, if we go back to everybody's beloved blue arrow. So, like I

said, this isn't the end all be all that we get it accurate, but I do think that looking into this data anomaly so that we have the trend correct is worth some time.

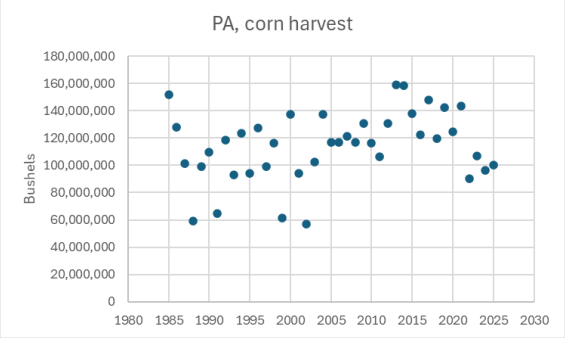
Robert Sabo: To make sure I fully understand the concern PA stated with their data collection, they reported data to AAPFCO, but now they are reporting data directly to the Bay Program and they think there is a methodological change that's leading to a bias? I just revisited the AAPFCO data for PA and it looks like, from 2011 to 2017, it did indeed increase by 44%. So, it looks like what Pennsylvania reported to AAPFCO still had that big jump and, now with what you are reporting to the Bay Program, it seems like that jump is being maintained. This also impacts the National Nutrient Inventory as well as of course the Bay Program work. So, I just want to delve deeper into this concern and see if we can find a solution to it.

Tom Butler: Denise, correct me if I am wrong in my understanding. My interpretation of what we'd heard is there was a procedural data collection difference. The data was reported to AAPFCO in a certain way that was inaccurate versus what you might have for your actual report. So, you pull a report and send it to AAPFCO and, perhaps, there was a procedural change in the data collection that caused an inaccurate reporting to AAPFCO. So, the actual state information might look much more linear, but the AAPFCO data is affected by that change in reporting or whatnot that's caused that. Am I correct in that?

Denise Uzupis: It is very possible, yes. Obviously there has been a change in staff. We've had a change in the programs we use to collect the data. Originally, we were using UFTRS codes. If you run a query using the UFTRS report, if those codes were entered incorrectly, they often excluded a lot of nitrogen-based products. So, they weren't being reported because of basically a code entry error, not an entry on our part, but what the guarantor was reporting as the code, if that makes sense. So, there was nobody to really swim through that data and make sure that what was reported to AAPFCO was absolutely accurate. It was just kind of sent. When our new specialist had come on board back in 2007-ish, he kind of took note that there were some missing data. So, he started running a different report, which is what we give you now, that isn't UFTRS based. It is much more comprehensive. So, you're getting a truer nitrogen report and nutrient report across the board than what you were getting previously. Does that make sense? There was some significant under reporting to AAPFCO.

Tom Butler: Ok, I think that is an important thing to recognize here and that can certainly have an impact on the trend. I don't know what it would be. We will absolutely want to look into that.

Robert Sabo (in chat): For PA, farmers were applying 80 lbs/acre on corn in 2010 and in 2018 they are reporting 120 lbs/acre--- a 50% increase.



Joseph Delesantro: I was going to address Chris' comment in the chat earlier. So, if you have more to say about that dip in reporting, please go ahead.
Tom Butler: No, I think it was just a highlight that that is an important thing I think we want to get a handle on and for other jurisdictions as well. So, that is going to certainly be an action item to reach out and try and figure out what is what and if that's something that's happened elsewhere. That's an action item that we will do. I will now hand it over. Joseph, you can address Chris' comment.
Joseph Delesantro: Chris asked, "is the change in corn yield not being replicated in other places"? I would say, in terms of the yield per unit acre, those trends are generally very consistent across the Watershed. What we are seeing in some states is that there has been a decrease in farm and cropland acres, which is resulting in what we see here with Pennsylvania which is this fairly flat crop need across the period, despite the fact that the corn yield per unit acre/the soy yield per unit acre, has gone up pretty dramatically over this period. So, that trend has not necessarily been replicated. That transitioning of cropland to pasture is not necessarily the same across all states.
Chris Brosch: The bulk of comment has to do with Delaware looking so different from other states in the way that these data sets interplay. It seems strange to me that, in the Mid-Atlantic, we would look so different from our neighbors. Perhaps isolating the Eastern Shore of Maryland could help illuminate some of those differences, but that would take a considerable effort on behalf of the state chemist to isolate the market of fertilizer in that geographical region. So, just trying to tease this out and understand whether it's valid or an issue of scale for the sampling, knowing that crops don't care where the fertilizer was bought and sold. We need to tease this out because, logically, it shouldn't be that different.
Tom Butler: That's a very good point, Chris. We'll certainly need to dig more. We will absolutely make that effort between now and next meeting to figure out what can be done and why it looks this way because, you are right, Delaware does look different.
Chris Brosch: If I could make one more comment to echo something I've heard maybe put a different way, trying to recreate a system with natural effects, economic effects, and all kinds of incentives boiled down to a simulation of crop need, estimation of smoothing sales, and a redistribution of those sales is something I would say people have very little real world experience in, including the people on this call. I think I heard Dave and perhaps Ken mention that thinking about this inclusive of the effects of manure is really important to provide a judgement of the performance of these tools, because that's how we deal with it.
Joseph Delesantro: We can certainly plot the estimated manure on these as well to help us better contextualize that. We can also, when we are identifying surplus versus deficit, we can include the manure data in that for stage one of the smoothing. So, those are two ideas that come to mind on how we might continue to think about that. Certainly, happy to take more specific advice from the experts on this call.
Denise Uzupis (in chat): I would agree that understanding manure applications is important to understanding fertilizer sales trends.
Chris Brosch (in chat): Sorry Denise, you also alluded to the point. Credit to you as well!
Ken Staver: I still see a need for going back to farm level data somehow to anchor this. At some point, if we don't do that, we have a hard time having much confidence in anything. So, I don't know how we do it, but there's got to be some effort made to figure out what farmers are actually

doing. Just a couple of little comments- every call I have to say something about the CESR report. CESR made all the trend lines starting in 2009, so it looks really bad if the dip in 2009 is an anomaly and the CESR report sort of created this conversation in the whole Bay Restoration effort about look how bad it is since 2009. That's a problem because if you don't have that dip, the trend looks long term kind of what you'd expect. If you just start in 2009, it looks pretty grim. The other one is the role of irrigation. Chris, you know this better than anybody. My sense is that Delaware by far has the highest percentage of irrigated corn ag land in the watershed. How much that has changed from '85 to now has huge effects on corn yield goals, how much N a farmer would apply, what yield would be expected, and what yield would be obtained. So, anyway, that's part of the equation that we haven't dealt with either.

Alisha Mulkey: Just a couple of comments. I agree with Chris' comments. I think at the large state level for Maryland, when I'm looking at this, the trends at this point are overlaying what I would consider for kind of nutrient management acres and compliance, so I'm interpreting that the crop need is also inclusive of nutrient management acres being reported. Happy to keep talking with Chris about our Eastern Shore counties and what that would look like. We would not have the ability to look at sales data at that finest scale but could consider some other ways to think about the disparity for the whole of the Delmarva versus Western Maryland. I also agree with the other points about bringing manure into this plot and conversation, particularly with the Eastern Shore.

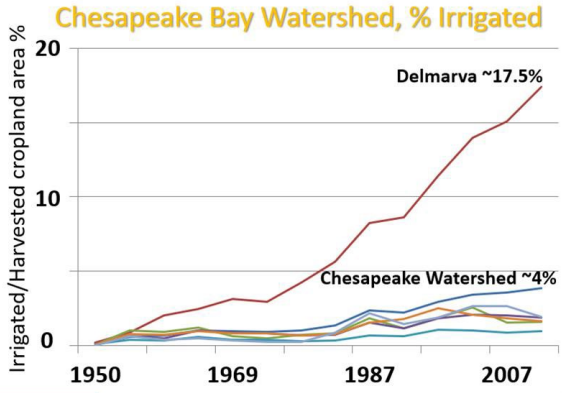
Tom Butler: Thanks, Alisha, that's good feedback as well. It sounds like adding in manure is certainly something we want to do. My cursory understanding is that if we see a dip here in fertilizer, it might not fill it. I think our manure has been relatively stable, but we are also looking at that in terms of updating that.

Alex Soroka (in chat): Chris, the DE plot does look similar to PA, but not Maryland, which is interesting, but this also doesn't have the manure.

Chris Brosch (in chat): 47% or so irrigated ground - up 3-4-fold in the simulation period

Chris Brosch (in chat): Alex, not seeing what you're seeing. Worth a concerted discussion.

Alex Soroka (in chat): This is an old plot but behold the power of soil.



Hunter Landis: I was going to maybe just circle back with a question and a comment to what I interpreted was Ken's statement. Maybe he can elaborate a little bit more. I thought I heard you say something, Ken, about farm level data. I think, if I understand correctly, I kind of agree with you and support that. I wanted to maybe see what your thought is if that's a reality where we're

using, at best, county data for fertilizer sales. I think what we really need, but I don't know that we know how to get it, is that we need to know truly what the farmer put on the field, ideally all farmers and all fields. But I see the issue there. Is that kind of what you are suggesting, proposing, thinking, at least?
Ken Staver: I don't think any states would put forward their nutrient management planning efforts and show that farmers are applying more N per bushel of corn. I don't know that, but I'm pretty sure nobody would have plans that say that's what's happening. They would have plans that show yields are going up, but I don't think they'd have plans that are saying the applied N per bushel is going up, and that's what the data shows when we anchor it with what we are doing now. That's what's happened since 2010. So, you've got two scenarios. One is there's this huge effort on nutrient management and these are the plans that are being written. So, the possibilities are what? We are looking at data sets that are basically saying the farmers aren't following nutrient management plans. I don't know how else to interpret what we're looking at since 2010. Alisha is the expert, but I know in Maryland, our nutrient management plans aren't saying put on more N per bushel of yield. I can't speak for other states, but I would suspect it's the same way whether you account for manure or not. It's all part of the same plant available pool when you do a nutrient management plan. So, what's going on? If this is real, we have a real problem with the efforts being put forth, what's promoted, and what's actually happening on the ground. I don't know how you capture that. Somehow, there has to be pilot studies or something to get some field level backstop on some of this. If we're going to go with this thing, if we are going to keep trying to do it this way in a model and there's lots of noise here that we're trying to struggle with, maybe having the model be an N balance thing and the N loss being driven by the surplus per acre might just be something that, given the quality of the data, it's just never going to be very good. Maybe we just have corn acre to corn acre, and you do BMPs, you do nutrient management and, beyond that, we're putting so much into this, and I am not sure where we are. Somehow there's a breakdown between what's the efforts on nutrient management and what we're seeing in this data. How we sort of resolve that, I don't know. Something to ponder.
Alisha Mulkey (in chat): Not true in MD
Robert Sabo (in chat): 2005 to 2010 trend is consistent with a nationwide dip in nitrogen fertilizer consumption. MD farmers seem to be implementing the nutrient management plans, based on this graphic.
Alex Soroka (in chat): and are struggling under urbanization pressure too most likely.
Tom Butler: I understand what Ken's saying about the surplus component. As we talked about with the operation of CAST, it isn't inherently what's added, what's up-taken, and then the difference being that. There are kind of independent values in that we'll have a calibration average versus that regional average. So, there's a little nuance to that. I just wanted to throw that out there just as a clarification.
Robert Sabo: I just want to second Ken's concern about development since the 2009/2010 period that we report in CAST and the Chesapeake Bay Nutrient Inventory. When you go back to that Pennsylvania plot I posted in the chat, Pennsylvania farmers are applying around 80 pounds per acre of nitrogen on corn in 2010. But, for some reason, in 2018, they're up to 120 pounds of nitrogen per acre that they're reporting to the USDA. When you look at the corn production for Pennsylvania later in the chat as well, it's flat. So, they are increasing inputs, but their overall

production at the state level is remaining flat. So, yeah, there seems to be some sort of miscommunication about what's effective in trying to achieve NUE. I don't know if there is an overemphasis on edge of field BMPs, if they think they can trap all that excess nitrogen. So, yeah, this is a major issue that needs to hopefully be remedied.
Alisha Mulkey: Yeah, I was going to politely scold Ken for his nutrient management comments, since we've worked so hard and are following nutrient management plans. My request was actually to Joseph. Do we have the raw data that you created these plots from, particularly at the county level that you could share with each of the states, so that we could take this offline and dig in a little bit closer? Could we make that request?
Joseph Delesantro: We can make this data available to you. I'm not sure how you would like it at the county level because, right now, we are still sort of one step in the process before it is redistributed to the counties. We're taking state sales and trying to do this redistribution, processing, and smoothing, prior to it being distributed across counties. So, if you really want to see what impacts this would have at the county scale, then we could ask Jess to go ahead and run a scenario through CAST with this redistributed data. Otherwise, happy to provide you all the state level data. I certainly can provide the crop need data at the county level. We just have not yet used the redistributed fertilizer data to do a complete scenario at the county level.
Alisha Mulkey: Let's start there and then I'll let Jess weigh in if that scenario would be practical.
Andrew Leight (in chat): What about crop need data at the county level?
Jess Rigelman: That is absolutely practical. I would run that through the years that we have the proper data, which is 2020, so I can give you whatever years you want for that.
Tom Butler: Ok. So, that's a data request that we'll then get out to you guys. We are getting some good action items here.
Robert Sabo: I just want to emphasize, too, that people are worried about this dip in the 2005-2010 period, but that's consistent with the national trends for fertilizer and nitrogen consumption, and then it jumped 20/30% after 2010. So, it's always good to be skeptical of the data and understand it's caveats. However, I'm reluctant to say that dip is completely untrue, though there are a lot of market forces at play. Corn saturated the market and things of that nature. So, I just want to point that out.
Tom Butler: Thanks, Robert. Always good to tie things to multiple lines of evidence as we've heard here.
Joseph Delesantro: Yeah, Robert got it. I was just going to highlight that there were those market forces throughout the 2000's and that peaking of doubling/tripling of fertilizer price in the late 2000s, those market forces he was mentioning.
Tom Butler: Thank you for that as well. So, we've got some really good action items here that will help us kind of with smoothing and that will help us with data investigations.

Filling Data Gaps (Interpolating data for non-reporting states and retaining independence)
Tom Butler: This method would be something that currently applies to Maryland and New York but could apply to any jurisdiction who misses a year or didn't have information for some reason or another. So, I kind of wanted to pause here and get feedback on this one. We definitely have a lot to run with on the other one, but we will certainly take any feedback on if there was any other information that would be supplemental or if we felt it was appropriate to kind of keep the states

in that independent lane or if it was kind of good enough to use crop yield. I'll just pause here if there are any questions or comments on this one. Certainly, send those offline to us in the next week so we can kind of work on those if necessary.
Cassie Davis: Thank you. This looks good to me. I felt like we did talk a little bit about tying it to Northern PA counties and was wondering if we did that analysis or not and how different it would be. But this methodology makes sense to me as is.
Tom Butler: We did do a superficial dig into that. Unfortunately, we ran out of time to kind of work it deeper. There is some variability in different areas as I recall. I'd really need to look back at that one and dig into it. If it was what you wanted to look at, we could certainly do that. If we're ok with this one, then that is fine, too. So, definitely wanted to be accommodating for what you guys would like to see.
Cassie Davis: Thanks, Tom. I will think about it a little more and circle back, but it is hard with just having two data points on here. Looks fine for now, though.
Tom Butler: Absolutely understand that. Alisha, I see you had your hand up.
Alisha Mulkey: Similar to Cassie, I think we got one data point. So, give us a minute to take a look, and then the data request for the other dots that we've asked for may help us kind of come up with a larger conclusion.
Tom Butler: Perfect. I don't want to obviously push this on anyone. I know that we are working through a lot of things here. So, certainly we'll get you the data that's been requested so far and we'll go from there. Thank you all. I want to thank everyone for that input. I don't see any other comments or questions, so we are going to move on to our next topic.

III. Layer Populations

Lead: Tom Butler, EPA; Zach Easton, VT

The group was asked to discuss the current omission of Layers from Hillandale operations in southern Pennsylvania. Our discussions centered around this population of animals and the merits of incorporating them into modeling efforts.

Actions:

1. The group generally supported the idea of including Hillandale layer numbers into Phase 7. If there are any concerns or other operations that you believe have been omitted, please reach out to Tom Butler, EPA, (Butler.Thomas01@epa.gov) prior to the December AMT.

2. Tom Butler, EPA, will circulate data showing the Hillandale population/inventory and the CAFO permit numbers for the Hillandale operation.

Discussion Notes:

Dave Montali: This is a large operation, and it is known that they don't report to our data sources and that there is relatively good information about how many birds are there. Without having that load in there, it gets really funky when you start talking about putting BMPs at that location. I think your question was do other states know of missing birds? To me, that's going to be pretty tough. If there is not a big operation focused like that, it's a question of do we know who all

reports to NASS? Unless there is something big like this, I don't know that we would have anything to provide.
Tom Butler: I appreciate that, Dave, and I'm not accusing anyone of not reporting things. I know that the operators are reporting things to NASS. For some reason, this facility was not reported for a number of years. So, addressing that, I think is the key. If there were other things that people knew about with that hard information and, like you said, it would have to be larger, that would be the key here. I appreciate your perspective there.
Robert Sabo (in chat): is it possible to get the censored data from USDA with the understanding that you will transform it into distributed manure values and will not make the population data publicly available?
Hunter Landis: I had a comment on that second question and then wanted to circle back to what I heard Dave say. I thought Dave said Hillandale does not report to NASS. My understanding is they do report to NASS and other single high number operations would report to NASS, but NASS withholds that data if it's a single entity in a county. Is my understanding of the glitch in reporting that data accurate?
Jess Rigelman: Your assumption is correct in general, but it is known that the Hillandale numbers aren't in there because even when we look at the state numbers, the difference between what is in Hillandale and what is in that unreported data is not even close. I don't know the details on it, but when Mark Dubin was here, I know he had looked into it and it was confirmed that the Hillandale data was not in the Ag Census in any way, and it's not just censored.
Hunter Landis: To that second question for Virginia, there may be scenarios where a single or small number of producers aren't reported in the NASS data. So, it may not show up. I don't know if this is relevant to this topic, but Central Virginia Tyson pulled contracts out of a big portion of the poultry industry in the middle of the state. So, their houses and operators may exist on paper, the birds exist on paper, but the birds basically left in a short period of time. So, I don't know how long it takes for that data to work its way in, but I think there are potential options on the other end where we may think that there are birds in an area but they're not there anymore.
Tom Butler: That's a really good point that I had not contemplated. So, that's a discussion that I certainly welcome. I will definitely weigh on you for that one, Hunter, and if other people have perspectives on that from their areas, I would like to hear them.
Alisha Mulkey: Two comments and a question. To those on the slide in front of us, Maryland agrees that Hillandale needs to be incorporated into Phase 7. On question two, we don't have any other operations we're unaware of being accurately included or represented in NASS. My question is we also know that by incorporating Hillandale, a fair amount of that manure is being transported into manure. So, we will also have the consequences of bringing that manure onto our land. So, to your slide before this, you said DEP had actual inventory for some years versus permit data. I'm going to assume that the permit data is capacity. You said a 10% inflation. Is that accurate? Can we see what those numbers are going to look like and an expectation of what the actual to the permit data and discrepancies of those data sources over there years? Is that available?
Tom Butler: We would be able to work that up for you. When I said 10%, I was speaking more generally about the CAFO, not the operation itself, and that was more to the effect of the 2017-2024 period. We do not have a population that's reported. So, they actually give us the inventory

in 2017. My intent was to discuss from 2017-2024 how we could potentially relate the population that has been supplied (the inventory) with the permit number, because there is some leeway there. I had talked with some CAFO permitting people who said there was kind of a threshold of exceedance that was met before they needed to apply for a new CAFO permit. So, I apologize for the confusion there. We will certainly work on that data to get you the inventory versus the permit. That's a great question, thank you.
Dave Montali: It seemed like Hillandale was cooperative. So, if they have that data through 2017, is there any effort to ask them if they have that same data from '17-'24? Is there a reason why it is absent?
Robert Sabo (in chat): you can leverage egg sales data reported in NASS-- 141 million dollars in sales in YORK/ADAMS county. sorry 176 million in 2022
Tom Butler: We have not gotten in contact with them about updated information. I understand that they were recently sold. If I am incorrect in that understanding, someone please jump on. So, if there is a method through DEP or through anyone else here who has information there, they can certainly help us with that. Or we can certainly reach out ourselves. If we understand that there is the accuracy of putting these in, this is important, we will certainly try and do everything we can to get that. I might rely on some other people here. I do see comments in the chat. Robert is talking about leveraging egg sales reported by NASS. That is a novel idea, thank you.
Robert Sabo: They don't report the population, but I just mined the NASS data set. You can do it based on egg production and sales of eggs and might be able to do some back calculation, especially if you have the 2017 population data.
Patrick Thompson (in chat): Hillandale layer population was include in the Phase 1 PA WIP but was omitted thereafter.
Tom Butler: I see the comment that the Hillandale layer population was include in the Phase 1 PA WIP but was omitted thereafter. I am not entirely sure. Could someone elaborate on this comment, potentially from DEP? I don't want to put you guys on the spot, so we don't certainly have to go through that. For the population perspective of this, it seems like there is some level of agreement that these animals should likely be put in as an improvement to the accuracy of our Phase 7 suite. We do want to try and see if there is more up to date information that I'm missing on this. I know I've been in contact with Scott and his team. They've been really helpful in giving us the permit information. We can certainly talk offline about discussing this with the actual operators themselves (Hillandale). Was there any other comment from people familiar with this who might have information on that data?
[No comment from the group]
Tom Butler: Ok, so it sounds like we have a desire to move forward with getting these in. This is not necessarily a formal vote on anything. Obviously, we're not doing that right now. But, putting these animals in sounds like something that's been in progress for many years, and we don't stand in the way of that. So, we will try and work on doing that. We'll show the data that we have for inventory versus permits now. It sounds like there's no knowledge of other facilities that are missing. If something were to show up that had information supporting it, we certainly welcome that. Please in the next two weeks bring that information or the concept of that to us. That way we kind of know what we are working with. Otherwise, I think it's kind of just going to be looking at Hillandale. So, for the next week, if we could get some indication from personnel on

that, that would be very helpful. Otherwise, we will focus ourselves on Hillandale and getting that information in, since it is improving the accuracy. That's what I've gotten here as a takeaway. If I am misunderstanding that, please let me know.
Patrick Thompson (in chat): Hillandale population is included in the Adam County populations. Refer to page 26 of the PA Phase 1 WIP.

IV. Wrap-Up

Lead: Tom Butler, EPA; Zach Easton, VT

Tom Butler, EPA, walked the group through the various next steps and action items. Time was made for remaining questions.

Discussion Notes:

Scott Heidel: There were a lot of different trends displayed earlier when we were talking about the fertilizer values. Independent of the graphing that you had shown, I would be really curious to see if there is any kind of correlation between whatever those trends were and maybe trying to smooth out the differences in the change of reporting the numbers for nitrogen, in particular. Anything that could be done to look into that would be great. Just an additional comment on why we provided the permit numbers for the Hillandale operations. Those are inspected and confirmed. So, we have a lot of confidence in those numbers.
Joseph Delesantro: I was going to ask if you could repeat that again a little slower so I can write this down.
Scott Heidel: There were a number of images that were placed in the chat showing increases or decreases in fertilizer sales or reporting in some capacity, mainly for corn. One thing that jumped out for me was that we're seeing based on the graphing that was provided in the presentation, a 100% increase from 2010 to now. Everything that I saw in the chat was around a 40% increase. So, that's a significant difference that I would just like to drill into a little bit before we come to any hard conclusions on this.
Joseph Delesantro: One option there might be that we can go ahead and look at some of the analysis we did of the fertilizer sales in the summer where we were correlating that to prices of corn to the fertilizer price index. We did all of that at the watershed scale. So, we can go ahead and look at that at the state scale as well. Is that sort of what you were thinking?
Scott Heidel: That would be great. Again, based on the images that were shared by Robert Sabo, while we were seeing some increases, the image that was shared by Tom was showing almost a 100% increase, and that's far different than what was shared in the chat. I just want to make sure that these things are saying the same thing because having a difference so extreme in the data is going to put us on a trendline that is hopefully accurate but, when being compared to outside data sources, looks like it's artificially high. So, I just want to dig into that a little bit more and make sure we are being as accurate as possible.
Joseph Delesantro: So, I think Robert and I will need to talk, and we can compare our two different sources of data here. I think we have done some of this in the past back and forth via email and come to the conclusion that things generally agree. So, maybe we will just work on putting that together for you all in a presentation.

Robert Sabo (in chat): I will follow up!
Scott Heidel: I appreciate that.
Tom Butler: Wonderful. Thank you for that collaboration there. To the second part, you were mentioning that for the data you provided offline you had inspected and verified that the inventories were what the CAFO max was?
Scott Heidel: How we get the data is through permit compliance inspections, and we believe that they are accurate.
Tom Butler: Ok, thank you. We will touch base with that data comparison, make sure we've got all of that, that we understand it correctly, and then we will get that to everyone.

V. Adjourn

Next Meeting:

AMT Meeting: Friday, December 12th, 2025, from 8:00 - 11:00 am.

Attendees:

Zach Easton, VT
Tom Butler, EPA
Caroline Kleis, CRC
Auston Smith, EPA
Dave Montali, Tetra Tech
Denise Uzupis, PDA
Andrew Leight, MDA
Joseph Delesantro, CBPO/ORISE Fellow
Krista Crone, PA DEP
Tim Larson, VA DCR
Scott Heidel, PA DEP
Jess Rigelman, J7 Consulting/CBPO
Ashley Hullinger, PA DEP
Chris Brosch, DDA
Alisha Mulkey, MDA
Hunter Landis, VA DCR
Arianna Johns, VA DEQ
Bo Williams, EPA
Lisa Duriancik, NRCS
Joseph Schell, DNREC
Kaylyn Gootman, EPA
Cassie Davis, NYSDEC
Hans Schmidt, MDA
Robert Sabo, MDA
Seth Mullins, VA DCR
John Lancaster, PA DEP
Tamie Veith, USDA ARS
Alex Soroka, USGS
Curis Dell, USDA ARS
Ken Staver, UMD/Wye
Patrick Thompson, EnergyWorks