Agricultural Modeling Team (AMT) Meeting

May 9th, 2025
09:00 AM – 11:00 AM
Meeting Materials

Summary of Actions and Decisions

Decision: The AMT approved the April minutes.
Action: By 5/23, please provide feedback on the remaining topics you'd like to see added or prioritized ahead of the September model input deadline, as well as any input on increasing AMT meeting frequency. Please email this feedback to Zach Easton (zeaston@vt.edu), Tom Butler (butler.thomas01@epa.gov), and Caroline Kleis (Kleis.Caroline@epa.gov).
Decision: The AMT approved adopting the new statistical methods for determining crop yield trends for all crops that have nutrient application goals per production per acre (true yield units).
Action: AMT members are asked to provide feedback to Joseph Delesantro (jdelesantro@chesapeakebay.net), indicating their thoughts on pursuing the modeling of crop yield trends for the eight additional crops that are currently without true yield units.
Action: If you have additional questions or feedback regarding the ag land use mapping data, please contact Jackie Pickford (jpickford@chesapeakebay.net), Sarah McDonald (smcdonald@chesapeakebay.net), and Peter Claggett (Pclagget@chesapeakebay.net).
Action: If you have any questions regarding the inorganic fertilizer data, please reach out to Tom Butler (Butler.Thomas01@epa.gov).
Action: The group will continue to discuss inorganic fertilizer data at the June meeting.
Action: If you have additional feedback on the handling of animal systems excess or if you have specific counties of concern, please contact Tom Butler (Butler.Thomas01@epa.gov), Jess Rigelman (jrigelman@j7llc.com), and Joseph Delesantro (jdelesantro@chesapeakebay.net).
Action: The AMT will continue discussions on animal systems excess at a subsequent meeting.

Meeting Minutes

Statement of purpose:

Determine whether to utilize a new method of projecting crop yield trends, discuss Ag Land Use mapping, evaluate inorganic fertilizer data sets, evaluate animal concerns for Phase 7.

Decision items:

1. Approve the April minutes.

   Decision: The AMT approved the April minutes.

2. Decide on the adoption of a new method to predict crop yield trends.

Introduction/Recap: 09:00-09:15 [15 min (Zach Easton, Virginia Tech)

Zach went over the group's timeline and a list of topics we have yet to cover. Feedback was requested regarding the topics the group would like to tackle with the time remaining. Feedback requested post meeting.

Discussion:

Ken Staver: On that last slide, you had a start with the legume nitrogen fixation. I guess you are talking about that decision we made about the hay land uses. Is that what that's about? I'm not sure when that topic was put on there, and that was a long time ago. We weren't even thinking about those grasslands. The new hay and managed hay stuff wasn't even on the agenda. So, that was just a quick one on that legume N fixation. Maybe that's all we are going to do, and I don't think it was even my topic, but I am wondering whether or not we're tangling with any other aspect of legume nitrogen fixation. I'm not saying we should.

Alisha Mulkey (in chat): Agree with Ken. It was a discussion on soybean fixation.

Zach Easton: You are going to have an opportunity to suggest new topics that should come back up in the order here in a second. Maybe that's something we need to revisit if the group thinks that is appropriate. That was with respect to the new land uses that we discussed, the nitrogen fixation. We haven't touched on the other leguminous nitrogen fixation. So, that's what we are asking. Is there anything that we need to add to that list of move up in that list, or anything we should drop? Are there any of those topical areas that we ranked that we now feel like are not rising to the top of our list of things to do? Should we change the meeting frequency? I think Tom added more often through September. I'm not sure people are going to go for that, but that's a question we need to answer. Given our list of topics to cover, do we need more time to cover them? So, those are the two things we'd like to ask the group today. You don't need to respond now, but we'd like to have emails within the next two weeks that basically respond to these questions. So, drop or pick up any new tasks on that list, and do we need to meet more often through September?

Alisha Mulkey: Forgive me. I must have missed this at some point today or earlier. Why is the deadline to close this out in September if the Phase 7 model time window is into 2028, last I heard?

Auston Smith: It's a great question, Alisha. Where are those other two years going? So, the major inputs to the Phase 7 model have to largely be finalized for model development and what the EPA is often calling the year of exercise in 2027, to be performed. So, the major inputs that go into the Phase 7 model are the ag inputs that the AMT discusses and the land use data team's land use data product that is then translated through a few different steps in CAST. So, to keep on schedule and to have a model that can be reviewed and exercised in '26 and 2027, respectively, the modelers led by Lew Linker have kind of October, November, December, to get that model up and running with these inputs largely finalized by the end of September. So, that's kind of the genesis of the September 30th date.

Dave Montali: Everything that Auston said plus the year of review needs to be discussed. I haven't even talked to Lew about this yet, but I am thinking in our next Modeling Quarterly, we need to open that discussion up about what the year of review will look like. The decisions the AMT makes about inputs, we often hear we really can't see what that's going to do to loads. I would assume that in that year of review , there would be checking of the decisions we made with regard to the reasonableness of the output of the model and an opportunity to revise real problematic things, fatal things, at least for sure in 2026. But we need to be done with our Model 2 review by December 31st. That's our deadline.

Alisha Mulkey: I'll piggyback on Dave's comment. I am not advocating for more meetings, but I have real concern if it's not explicitly stated how and what schedule the AMT would be re-engaged. For those of us who were here for Phase 6, of which I know Dave was one, we went through at least three betas of the Phase 6 models with the prior version of the AMT before we felt like there was consensus. So, I'd like to understand whether today or offline, if we're going to cease meeting as a group, when is that testing window to then reopen some of these really critical inputs? I have the most concern about fertilizer, and I don't know that we're going to get through Zach's list between now and September. So, I'll put that back to you and Auston how you're going to time manage to get us to consensus.
Auston Smith: This does go back to Lew, so I'm certainly going to defer to him as Dave mentioned but I know that the year of review has, in the past, used kind of a quarterly look at fatal flaws, as they are called lovingly. In that quarter, you kind of see what may be wrong or what needs adjustment so then at the end of those three months, some sort of revision or alteration can be made so it can continue to be reviewed. So, what that looks like for Phase 7, I think still needs to be ironed out, but that's my impression of how 2026 may go. With respect to AMT meetings and how that review will undergo, I'm going to turn it right back to Tom.
Tom Butler: Yeah, that's a really good point, and I think that's part of the discussion that we need to keep having. I appreciate feedback offline because I think, at least initially, the idea was to meet quarterly every time there's something new to evaluate. So, that's essentially where my mind is right now but, obviously this is a group, and we have discussion and a partnership to think about, so I would be open to any feedback you guys have. Again, providing that to us as soon as you could in the next two weeks would be ideal. Quarterly was kind of I think where Zach and I had thought. I don't want to put words in his mouth though. That's essentially where we were. Stopping in September and then picking it back up in the new year once there was something to review. Those are, unfortunately, I think the deadlines we have, and if we don't get to things, then the default for this group has always been to stay with phase six. So, if we're not able to address something, then it stays essentially as it is now. So, if soybean nitrogen fixation is one of these top of the list things, we need to get that. I know Chris is taking a big step here to work on some of that broiler information. That's one that they're working to get in by the timeline. If we want to talk animal populations for things and other parts of the watershed, I think that needs to kind of surface as well. So, I'd ask you guys to again provide that feedback by e-mail, so we could try and get to those. Otherwise, we will be kind of sticking with Phase 6 as our default. If you want to meet twice a month until we get there, maybe we can get through more stuff. But, I understand everyone is very busy, and I'm not going to push that one. It's what everyone thinks is best
Ken Staver: Well, Tom, it's hard to know how things are going to go, you know? I'm telling you something that you already know. We need this meeting for this, and we need this meeting for that. Well, every time you sort of pick at something, it sort of blows up into something more and you need more time. So, I don't know what to say. Everybody is busy, but you get to the end here and then you get to the point where stuff is going to get carved into stone and all of a sudden, you're out of time. It's those last steps that sometimes are where the decisions get made that really make a difference. So, it's a tricky thing to call ahead of time. I think we should stay flexible about it. I don't want to ram stuff through at the end because we're out of time and then somebody says, oh, well you guys were good with this and then we weren't really good with it. I

didn't say much here except that we have to be open to maybe a little more. I would rather not commit to more, but you sort of go at a relatively slow pace and then all of a sudden, bang, all of this stuff has to be done. If the modelers have to wait a little bit, then they have to wait a little bit.

Dave Montali: We have a hard deadline. The rule is if we decide to do something, we do it. If we don't, then we fall back to what's in Phase 6, and that'll be in the draft model. I think folks just need to do a sensitivity analysis of what else is left and prioritize what they really want to change for Phase 6 in the last three months that we've got.

Zach Easton: Great discussion. Agree, though, we need to probably move forward with the rest of the meeting today and get these thoughts via email.

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Crop Yield Trends 09:15- 09:45 [30 min (10 min presentation 20 min discussion) (Joseph Delesantro, ORISE]

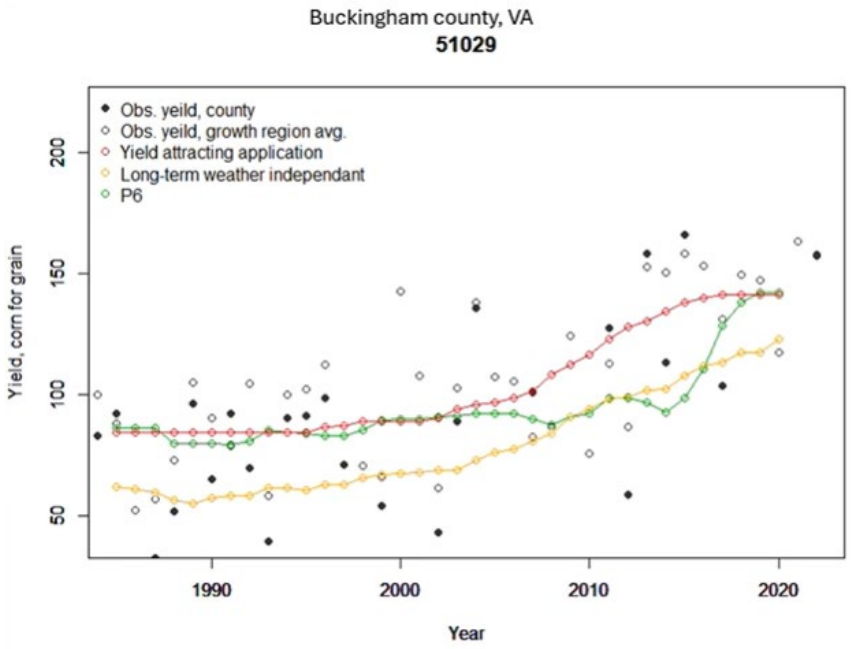
Following a presentation from Tom and Joseph, the group voted on the approval of the new method for calculating long term average crop yields for Phase 7. This method utilizes a statistical framework to predict the expected and average yields which influence nutrient applications and uptake respectively. Decisional.

Discussion:

Ken Staver: Look, this is how the initial loads are established. What you went through is the starting point for how different places got their loads to start. I just saw all those slides again yesterday in a talk that Helen gave to the Delmarva Land and Litter folks. Moving through time, the mass balance is what's making the difference between uptake and application. To stick with your example, that 36.7 is going up in every corn acre in the watershed because of our fertilizer and because of our increasing fertilizer bucket. So, the BMPs are all being done and they're nibbling at it. They're like these little things that chip away at the base number, but that 36.7 is going up because of the change in mass balance. It's not just mass balance, but even the example you went through, that's mass balance uptake versus fertilizer. You can hang tinsel on it, but underneath we got the Christmas tree that's mass balance. That's the way it looks to me, and that's our 800-pound gorilla. Unless I'm really missing something, that's what looks to me like is all the uproar in CESR about the increase since 2009. That's what's driving it. Whether you call it at the field level, every county is just a corn field. The corn land use is just a giant corn field in CAST. I mean that's all it is, just one giant county cornfield. So, that's just sort of a semantics kind of thing. You're just adding up all the little acres of corn. I don't see how our problem from 2009 till now is not basically the biggest part of the problem. Yes, we can implement more BMPs. If you exercise enough, you can eat all the banana splits you want. I just don't see how that's not our big issue.

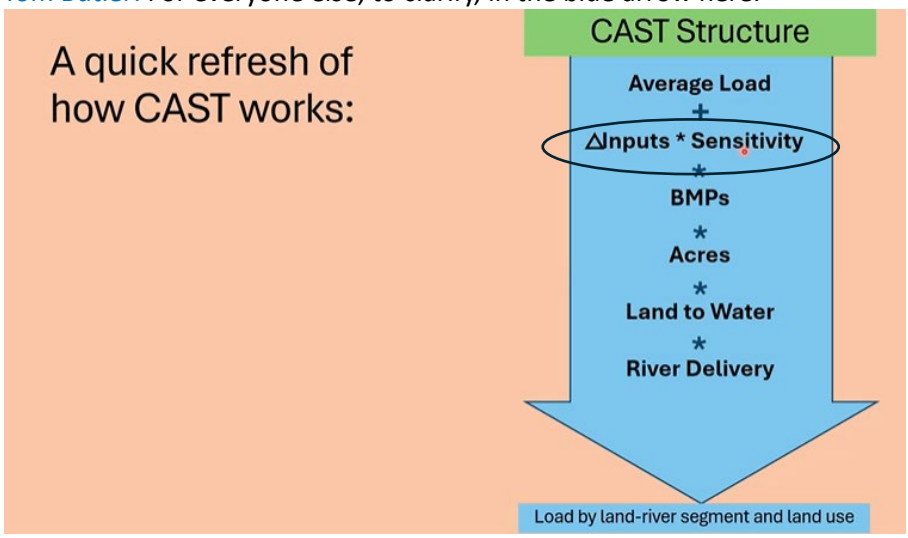
Tom Butler: Yeah, I'm not going to dispute you on that one, Ken. I'm trying to stick to understanding how this works and articulating that. We will certainly talk about that point. So,

Ken, I'm not trying to take away from anything you're saying. We will probably get to that towards the end when we talk a little bit about the fertilizer. For this point here, I wanted to try and just articulate how CAST is operating and express to people in the data set we sent, if people just took uptake minus application, they'd think that's the load. I'm trying to articulate that that's not inherently the case, but I understand what you're saying. We will try and get there today. I hope we have time, and we will certainly try and get there throughout the rest of our meetings.
Bill Keeling (in chat): Only BMPs deemed not in excess can chip away at loadings.
Ken Staver: There's only some fraction of the difference in mass balance that's lost, right? It's not like all of it is lost. 20% of the increase in mass balance is lost, and it does look to me like when you look at those CAST outputs for corn, this is the simplest case, which is corn without manure, if you just keep the whole mineralization thing with manure out of it, just look at fertilizer inorganic N on corn. If the mass balance goes up 10 lbs without BMPs, the load goes up 2 lbs, so we have mass balances going up 40 and 50 lbs per acre. Like in your example here, the base load would go from 36.7 lbs to 46.7 lbs, and that's what you have to attack with BMPs is a 10-pound bigger base load. So, that's the part of it that I'm talking about with mass balance, but I think this is more about establishing why somebody's corn acre in one part of the watershed doesn't have the same load as somebody's corn acre in another part of the watershed. But, that's sort of a starting point. Moving forward, they're all doing the same thing in the whole Bay Watershed. The corn acres are all going up on the same slope everywhere. It's like everybody's doing the exact same thing with nutrient management. Yields and nutrient management are having the exact same output because the slopes of the mass balances on corn acres are the same. I didn't break it down by every county, but it's every state.
Tom Butler: Yeah, and we'll try and get to some of those. We've got the corn acres in this, and Joesph's got more.
Alisha Mulkey: I am still not clear on what the yellow line is telling me or showing me. So, can we spend a few more minutes? I know Ken weighed in on an email, but talk me through interpreting the yellow lines.



Tom Butler: Yes. So, the yellow line is the average yield. So, this is weather independent and, Joseph, I don't know if you want to go into what you did to calculate this, if that's helpful.
Hunter Landis (in chat): Tom, is this the same slide set from office hours?
Tom Butler (in chat): I added in the yields for states and counties but they are very similar
Caroline Kleis (in chat): Link to slides currently presented:
https://www.chesapeakebay.net/files/documents/YIELDS_5.25.pdf

Joseph Delesantro: I don't know if it will be helpful, but it'll only take a minute. So, the way that the method works is that we're fitting a model to the annual yield data, essentially using the annual predictor variables that we've set out. Then once the model is fit, we take that same model, but now we apply predictors that are 10 year rolling averages. So, this sort of removes that effect of large year to year variation that we would get from differences in precipitation, or growing degree days, or whatnot, and gives us this yellow line which is then sort of a long-term weather independent average yield that is then used to inform the uptake calculation that's done with the sensitivity. That's in contrast to the red line which takes those same predictors but then uses a residual weighting method that was calibrated to the best three out of five, in order to essentially bump that line up to follow the higher yields in the observed data set. So, that there being our expectation of the yield which farmers are using to decide on the applications.
Alisha Mulkey: So, if I crosswalk this, Tom, back to your blue arrow, red is the fertilizer load? I guess my question is where would you use each of those data points in the blue arrow?
Joseph Delesantro: The red line is defining the demand, just to be clear.
Alisha Mulkey: Yes, that sets the bucket, if we kept Phase 6 methodologies.
Joseph Delesantro: Then the yellow would simply be used for the uptake part of the sensitivity calculation.
Alisha Mulkey: Ok. That's what I thought I heard, but I wanted to confirm. Ok, appreciate that.
Tom Butler: For everyone else, to clarify, in the blue arrow here.



Hunter Landis: Can you go back to that slide you just had with the two graphs? I thought there was something I could see visually in the office hours that I wasn't seeing here, and that's the question I had at the end. I don't know if it's a question at this point or just a concern. Like I said, I get the yield attracting applications change in the line there. I think my question or concern is that that's going to pull away from uptake over time, and maybe that's what Joseph was kind of starting to acknowledge at the end of the office hours. I get the yield attracting line going up over time. But, I would assume maybe that's going to be pulling away from the uptake at a faster rate than the uptake would increase.
Joseph Delesantro: The way that this would work statistically is that would be defined essentially by the spread of the data. So, in practice, the yellow line generally keeps very close to the mean of the observed data but in the observed yields, we see that the best three out of five yields are increasing over the mean yields. So, are the really good years getting better than the average

year? Then that would create a bit of a deviation. When we're looking at these plots, it's really hard to do, I look at data basically all day every day, but just remember there's a scaling characteristic here. When your average is 100, where things are going to look like they're much further apart, and they are in terms of magnitude, but maybe as a percentage of the average load, the two lines are actually not that much further apart. The lines might be pretty close together when the yield is 100 and, in terms of magnitude, they're further apart when the yield is 150, but in terms of that percentage difference, it might actually be quite small, and that's sort of hard to necessarily see.

Ken Staver: I think that's an important point. We measure loads in pounds, not in percent. So, in Tom's equation he put up there from the blue arrows from the sensitivity, where the yellow line and the red line get further apart, you have more pounds difference between your reduction from uptake and your loss increase from fertilizer applied, right? That's pounds, that's not percentage, that's pounds. That's what we're dealing with is pounds per acre.

Joseph Delesantro: At no point in the model are the pounds of application directly compared to the pounds of uptake. Instead, it's the difference, in absolute terms, of the mean for uptake and then the same thing for the fertilizer application. So, when we're thinking about uptake, and I think Hunter has been making good points, we should be thinking about that trend, not the difference between the two. It's going to be the difference from the average of each of those lines independently that is defining this sensitivity alteration or mediation to load. I'll thank everyone in advance for their patience with me explaining this. Going through topics like this, we're really missing Gary, but doing our best.

Ken Staver: Thanks. I'm just dealing with the reality of what's happened to loads since 2009, and why it's happening, and we're doing all these BMPs. What we haven't seen as part of this discussion about the timeline and how we get to react is, the fertilizer bucket is what it is. As far as we know, it's going to stay what it is. We aren't really hearing any reason to believe that the bucket is going to be any different. We're hoping that as we go through this yield exercise, what comes out the other end in terms of our loads is going to look a little bit better than it does now. So, we're looking at sort of half right now. We aren't seeing the other half yet, but it definitely seems like a step in the right direction to do a better job on adjusting yields. So, with that part, it seems like it's good to me. I guess that's where I am on this part of it.

Tom Butler: Thanks, Ken, and I would ask people to try and use your same perspective on that and keep the focus, right now, on the yields and if this is more accurate. These values versus what we had. Like in New York, is a yield of 125 what a farmer is going to apply for? Or are they going to apply for like 155? In Pennsylvania, 140 versus 160? Those are the questions I think we want to have in mind as we look at these. Over time, in Virginia, in 2015, were they applying for 100 lbs bushels per acre, or was it more along the lines of 150?

Dave Montali: This is real simple. You had me as a yes a long time ago when I saw the smoothness of the lines and the better relationships. The idea that your red line has got to be higher, you can't use the green line for both, your red line has got to be higher because of the optimism of the producer. That's what he's going to put down. Best three out of five, that's what the nutrient management plan says. Just with the smoothness and the practicality of what's been done so far, I'm a yes on using this. The other question is what are we going to do about the other crops? But maybe that doesn't even matter as much because these are the major crops where we've got all the good data for. So, that's my perspective.

Joseph Delesantro: Yeah, and we are prepared to talk more about those other crops but hoping to prioritize making a decision on these eleven that make up 70% of the watershed or something like that.
Ken Staver: Can I just ask a little technical question? What are all those little dots? What are the little data points on that one you just took off?
Joseph Delesantro: Well I think this actually might be an old plot, Tom. Let's not do West Virginia, because I made a mistake here, and I plotted all of the observed data for West Virginia as opposed to just the counties in the watershed, but that was fixed and then sent out to Dave. So, these black dots are observed data from the Census and the survey for each of the counties within the states.
Ken Staver: Ok, so then my follow-up question is when you come up with your lines, do you area weight the counties, you don't just average? Say in Pennsylvania, Lancaster County has a huge amount of corn and high yields, then you have some county up in the northern tier that has much lower yields than a few acres. They don't get averaged together based on just the yield, there's area weighting?
Joseph Delesantro: So, first of all, the solid lines that you're looking at here, are just state trend lines which are created via an area weighting, just as you said. Then the red and green and yellow dots, those are county by county data, and it's that county by county data that's actually going into the model. So, the priority, if you think back to that decision tree, is that we're using only county data, so there is no effect of another county in the state on the yields that are going to be predicted for that county. However, if there are issues with the amount of data and the fit of the model for that county, then we do expand first to the growth region and then on a case by case basis, we might aggregate growth regions together or we might use the whole watershed. When we do that growth region model, it is, again, just as you said, weighted by cropland area.
Ken Staver: Ok. That was what I was hoping to hear. Thank you.
Mark Dubin (in chat): Perhaps economics is another comparative factor. If the producer can not achieve an economic return at 125 BU/A but can at a higher yield, then why would then it could assist with answering the question of what to apply for in BU/A.
Thanks! https://extension.umd.edu/resource/field-crop-budgets/
Tom Butler: Thanks. I see Cassie's got her hand up and, Joseph, there's a comment in the chat about economics being a factor. Joseph, I think you had a list of those factors. I do not have it here. Did you want to pull that up and show Mark?
Joseph Delesantro: You mean the predictors that were used in the model?
Tom Butler: Yeah. I thought there was an economics one, and maybe that's good enough. We don't need to pull up new slides.
Mark Dubin: We do that with our operations as well. If you look at the cost factor, it's going to be a driver of what you're going to be looking to apply for because if you can't make it at 125 bushels per acre, you're going to have to try to get a higher yield to get a return. So, it could be a collaborating factor to sort of help answer that question of should we be applying for 125, or whatever that example is, or a higher yield. It may help give you a reference to that, separate from what you've been doing here. Just was a thought. I did tag in a link to the University of Maryland crop budgets in there as well that you could look at.
Joseph Delesantro: Yeah, I'll take a look at that. So, the economic predictors that we use in addition to the weather climate predictors and time, are the cost of feed, fertilizer, fuels, and

then the abbreviation is PITW. I forget what it stands for right now, but essentially it is an aggregate of farm costs.
Hunter Landis: Could you go back to the Virginia graph? It looks like there's a dip in the green line at 2015. I'm not sure exactly why that is, but if there's a hypothesis that fertilizer prices went really high that year, and they actually put out a lower amount closer to the green versus the red. Joseph, were you just saying that maybe fertilizer prices were a factor in consideration?
Robert Sabo (in chat): Illinois encourages their farmers to apply fertilizer within the range of Maximum Return to N. It might be a helpful calculator for folks to poke around: https://www.cornnratecalc.org/
Joseph Delesantro: Yeah, they are certainly a predictor in the model. To be clear, we have this set of 14 predictors, and not each of these predictors is used in every county and for every crop. Instead, there's this kind of fancy statistical method that identifies which of these predictors are most important for that crop and county in the model. But, there are handful of predictors related to the cost of things and the cost of fertilizers is in there. I would say that there's this dip in the Phase 6 estimation of yield that, to my eye, very rarely lines up with the observed yield.
Tom Butler: We're getting to the end on this. We are overtime. I like the discussion. I would like to try and push this towards the voting stage. So, do people have any other questions/ clarifications they would like before we move into this? Given none, we're going to be putting this up as a decisional point and the question is "should we adopt the new statistical methods for determining crop yield trends for all crops with the nutrient application goal per production per acre"? So, that's like a true yield unit, bushels per acre. That's the question. I'll start off by asking is there anyone opposed to this? If anyone wants to make comments on this, please do so at this time. If we have anyone who's against this, then we're going to go through this one at a time and see where everyone stands. So, to start this off, is there any heartburn? Hearing no heartburn, this then would be accepted, and we would use this method for Phase 7, as is described here. Does anyone have comments they would like to register about this and, if there's not anyone online, I'll make sure that I reach out to them and get any feedback. Does anyone here have any comments they'd like to register now? It's voting members only. If you're not a voting member, talk, and we will record it appropriately.
Tamie Veith (in chat): I like it. Let's do it.
Ken Staver: Do we see soybean yields? Maybe we saw them, and I just forgot them because I was so focused on corn.
Tom Butler: I have not showed them. We have them in the data set.
Joseph Delesantro: I've got them if we want.
Ken Staver: Just whether the same general thing happened there has happened with corn.
Joseph Delesantro: I think it is, except for maybe in New York, but let's take a quick look. As Tom said, soybeans were in the zip file that was sent out a few weeks ago. So, here's Delaware. We're looking at a very similar trend to corn. Same thing in Maryland. Here's New York. So, it is increasing in New York, but in Phase six, there were some weird high values used in the early period which creates some odd differences between the two. Regardless, the trend is consistent to other states. There's Pennsylvania, Virginia, and West Virginia.
Ken Staver: So, soybeans generally don't attract N, so I guess it's P. Forget what attracts nutrients. Are the soybean yields going to be higher with this method?
Joseph Delesantro: Well, for West Virginia, they're going to be a lot higher. So that would be essentially comparing the green line to the yellow/orange and the red line, and we see that, for

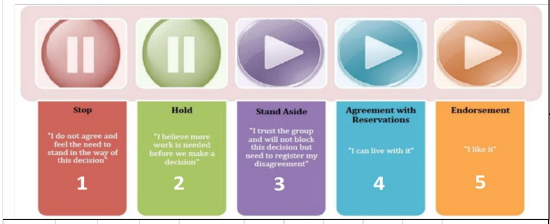
the most part, they are higher. The exception being this weird early period in New York of the model period.
Ken Staver: Just a thing to be mindful of is that it's not a fertilizer issue. It's an N fixation issue. I haven't paid as much attention to soybeans but if I understand it, as yield goes up, there's an incremental increase in load because fixation goes up a little faster than uptake. So, if your soybean yields go up, it might be the opposite in terms of how it works with corn. But, it's just something to put in the basket, I guess. I don't want people screaming bloody murder when we agreed this makes more sense, but how did our soybean loads go up? So, I don't know, just maybe put that somewhere in the comments. I mean it's our second biggest row crop. It's our other really big one, so it's a lot of acres.
Tom Butler: Thank you. With that comment there, we will put this as a decision that's passed, pending any feedback from others who are not able to attend. I didn't see anyone from Delaware, but we will circle back with anyone offline. Otherwise, this one's good. Sorry we are late, but we will move on.
Robert Sabo (in chat): being most loyal to the weather independent yield trend will greatly forward research in attributing drivers to water quality and tracking farmer's progress, often positive, in driving water quality trends in the Bay watershed. This a very valuable analysis and will serve as an improvement. Sincerely, Robert Sabo (non-voting member)
Joseph Delesantro: Do we have a second to talk about those other eight crops, Tom?
Tom Butler: If you would like to in a few minutes.
Joseph Delesantro: Yes. I will try to make this very quick. So, as we talked about, there are 11 crops that we have true yields for and, therefore, we can apply this method to. True yields being sort of mass per unit space or acre that we have to convert, essentially, that yield to a nitrogen application. So in CAST, we have those 11 crops that we just talked about and for the remainder of the crops, we just defined the application per acre. So, rather than a true yield unit, a true mass, we do it just in terms of per acre. But there are a handful of other crops that are in the census and survey for which there is sufficient data to model. So, using the exact same method that we just talked about, we can model true yield units for some of these crops as well. In order to incorporate this in Phase 7, we would need from the states what the application and the uptake per unit yield is for these crops. So, that's essentially where we stand there. We could potentially add these in a more accurate way, but we would require that data coming from the States. Dave and others had asked, ok, well what would it mean to incorporate these crops? What we see is with the current 11, we cover about 63% of cropland area and with these additional eight, we get an additional 19%, which would cover 82% of the cropland area, an additional 15% of the CAST 23 predicted nitrogen and phosphorus application. That said, there are really only two of these crops that are grown extensively throughout the watershed, which we believe would have a potentially significant impact. So, that is other managed hay and small grain hay. So, I can model all eight of these, but they might only model well for certain parts of the watershed, usually because they're only grown in those parts of the watershed. So, I think if we wanted to move forward with adding a couple of crops that have these true yield units in a way that might represent them more accurately, I would suggest we consider doing so for the other managed hay and small grain hay, for which we have data across the watershed and represent a reasonable amount of nitrogen and phosphorus application. That is all I have to say about that and, busy schedule today, so maybe this is something we need to let marinate and put on the agenda for the next meeting.

Mark Dubin (in chat): VT Extension would be a source of data for cotton, peanuts, and tobacco which would also likely represent the significant majority of Bay watershed production.
Dave Montali: Real quick, isn't this kind of negated by what we've just done with the different types of hay land? We've made an assumption that some portion or some amount of it is managed, and we set the application goals differently for the managed and other managed hay.
Tom Butler: So, I think that would require a changing of the application goal because it would change the unit. It would be like per acre, we'd have to change it to yield like tons or bales.
Dave Montali: I guess I'm just worried that given all the things that AMT has to do, does that rise up in terms of need? To go to trying to get the data from the states on something that's going to be pretty difficult, I think, to get that data for hay.
Tom Butler: Let's put that one in feedback for offline and emails if everyone's ok with that, and we can marinate on this one. Joseph, does that work for you?
Joseph Delesantro: Yeah, that works for me, and I think as Dave phrased that, that's the question. That's what we're asking you. We're saying this is the thing that we can do. Do you all think that this is worth the time and effort to do? Yeah, let's let that marinate.

Decision: The AMT approved adopting the new statistical methods for determining crop yield trends for all crops that have nutrient application goals per production per acre (true yield units).

05/9/2025

To what extent do you agree with the following: **We should adopt the new statistical methods for determining crop yield trends for all crops that have nutrient application goals per production per acre (true yield units).**



Role	Name	Affiliation	Vote	Notes
Signatory	Clint Gill	DE	4	The trends look more stable which is preferrable.
	Alisha Mulkey	MD	4	
	Cassie Davis	NY	4	
	Scott Heidel	PA	4	
	Tim Larson	VA	4	
	Dave Montali	WV	4	
	Jeff Sweeney	EPA	4	
At-Large	Ken Staver	UMD	4	It is noteworthy that not all crops will behave the same with regarding yield attracting applications. For example soybeans fix Nitrogen, as yield goes up, there's an incremental increase in load because fixation goes up a little faster than uptake. So, if your soybean yields go up, it might be the opposite in terms of how it works with corn. This is something to keep in mind if the second biggest row crop in terms of acres has its load go up.
	Tamie Veith	USDA-ARS	4	I agree that we should use the new yields methodology.
	Candiss Williams	USDA-NRCS	4	
	Alex Soroka	USGS	4	I believe that model is closer to predicting the expected yield than what we currently have.
	Zach Easton	VT	4	

Action: AMT members are asked to provide feedback to Joseph Delesantro (jdelesantro@chesapeakebay.net), indicating their thoughts on pursuing the modeling of crop yield trends for the eight additional crops that are currently without true yield units.

Ag Land Use Mapping Data 09:45-10:30 [45 min (20 min presentation 25 min discussion) (Sarah McDonald, USGS)]

The AMT heard from the Land Use team regarding the determination of the agricultural footprint within the Chesapeake Bay watershed. Informational.

Discussion:
Tim Larson (in chat): are you comparing acre summaries at county scale?

Cassie Davis: Hey Sarah, thanks for going through all this. I was curious with the ag census if it included retired age lands into the overall age census. I think a lot of farmlands in New York have been retired, so they appear on the imagery, but people are just mowing them.
Sarah McDonald: Retired…Peter, are you online?
Peter Claggett: Yeah, the CLU's I don't think would include retired fields. I'm not sure about the census. I don't think the census does either. Included in total cropland is idle, fallow, or failed crops. I'm not sure if retired would fall into one of those categories or not, but these don't look retired though, right? I mean from the imagery they look like they're still active.
Cassie Davis: Yeah, it does look like that. I am just trying to figure out why census would be lower than aerial imagery.
Peter Claggett: Yeah, and it's possible there could just be like low participation rates in some places. We don't know either. We don't know the answer to these things, and Jackie is following up with NASS to try to figure out what's going on, but it might be more appropriate to follow up with soil conservation districts in New York to really understand what's happening.
Tom Butler: Just curious, Tamie and maybe Candiss, do you guys have any idea? Obviously you're not NASS, but any inkling as to what might be happening here from the USDA side?
Tamie Veith: Not off hand. My guess would be that the CLUs, they probably just for some reason didn't participate in or didn't consider it to fall under whatever the question was. Maybe it's sort of more of a hobby farm at the moment or something or it's leased out. Just as general experience, I've had situations where I've asked people how many feet of stream do you have on your property, and they'll say none because their property ends at the stream. Sometimes it could be that kind of thing. It's reassuring to me to see that the CLUs are where you would expect. There is that match, and the fact that they are less I guess doesn't surprise me. I'd be surprised if they were way over, suggesting forest just grew up really quickly in an area that was cropped, but the other way I can see.
Alisha Mulkey (in chat): Is owner more likely to receive CoA and disregard if mostly idle (retired) fields.
Elizabeth Hoffman (in chat): I think that is a common issue - everyone has a different interpretation of these "buckets" we ask of them and what qualifies
Mark Dubin (in chat): I recall under USDA program definitions, croplands enrolled under CRP or CREP outside of land use change CP's such riparian buffers, wetland, etc, have to remain as viable for returning to ag production. Thus, they have to be maintained during the agreement period to enable the fields to be brought back into production.
Robert Sabo (in chat): Since 2002, one of the biggest nationwide drivers of total cropland acreage changes is the loss of "cropland pasture", but this decline is an artifact of the Census question. Farmers just starting to categorize their "cropland pasture" as "pasture". USDA changed the phrasing of the question leading to a huge data artifact
Tim Larson: Quick question. Between the two data sources, which one will end up being used in Phase 7? The CLUs or the land cover classification.
Sarah McDonald: The total ag land use land cover.
Candiss Williams (in chat): It could also be that a producer may not be a NRCS participant but their yields are reported to NASS.
Tom Butler: We had a comment from Candiss. In the chat she mentions it could also be that a producer may not be a NRCS participant but their yields are reported to NASS. Candiss, I didn't know if you wanted to elaborate on that.

Candiss Williams: Not really. I'm just reading the comments and trying to figure out why it was different, but I think I was also trying to figure out how you got a CLU layer.
Tom Butler: CLUs are like personal information, right?
Peter Claggett: Back in 2009 or so, USGS developed a 1619 agreement with USDA so that they could share their proprietary best management practice and common land unit data directly with USGS. Of course, we have to sign agreements and be very protective of these data. So, we have this data sharing agreement with USDA that allows us access to the common land units, and these are the 2023 common land units. We're showing you them only instances very zoomed in scale, to conceal the privacy of the particular area.
Candiss Williams: Ok. I'm just curious. Because even us, when we work with CLU data, we have to take a picture of the space that we are working in, or we have to work in kind of a space that they allow to even have access to it. This is being presented in a public venue. Anyway, I can have a conversation with you offline, but I think for consistency, you might not want to use the CLU data because you may not always maintain access from year to year.
Robert Sabo (in chat): I don't think I have ever heard of pasture being called rangeland in the eastern USA. Also, some of these counties have extensive strip mines (that have been "restored") which could be causing issues. For WV counties.
Robert Sabo: I have one quick question in regards to the pretty compelling XY plots showing spatial patters for a given year. One thing that was a little worrisome, though, is that it seems like certain counties are consistently off by 20-50,000 acres. Just want to see if you guys have any ideas about trying to get that a little closer to the one-to-one line, so they're not getting a lot more fertilizer allocated.
Sarah McDonald: Great question. Jackie has been looking into those specific outlier counties. We didn't want to make the presentation super duper long, but we have been looking into trying to understand if we're actually overestimating there, if the census underestimating there, what's actually going on. So, she has been doing county specific comparisons. So, if that's of interest, she'll be doing that work anyway, so whether it's a presentation we send out for folks as informational or come back and talk about it, or just make that information available as the analyses are done and share them, we are happy to do that.
Robert Sabo: Sounds good. Fantastic work, Sarah, and good job to you and your team.
Sarah McDonald: Thanks. I'll pass it along to Jackie because I just read the slides she put together.
Dave Montali: In our AMT work, do we have to approve this? I mean, I'm already there. Is it on our slate to have to make a decision on this? Or just us doing nothing, we are in good shape, and it's not one of the items left for us to deal with.
Tom Butler: That's my perspective, Dave. If we do nothing, Phase 6 is default, and Phase 6 is carrying on in this manner. That's how I interpret this. So, if you have an issue, you should probably email Sarah and Jackie.
Dave Montali: No, I'm the other way. This is good, let's be done with it.

Action: If you have additional questions or feedback regarding the ag land use mapping data, please contact Jackie Pickford (jpickford@chesapeakebay.net), Sarah McDonald (smcdonald@chesapeakebay.net), and Peter Claggett (Pclagget@chesapeakebay.net).

Inorganic fertilizer data update 10:30-10:45 [15 min (5 min presentation 10 min discussion) (Tom Butler, EPA)]

Efforts have been underway to compare inorganic fertilizer datasets. One such comparison has been done regarding a dataset called TREND and the current Phase 6 fertilizer dataset. At this meeting, Tom gave a brief verbal update on the inorganic fertilizer data. Informational.

Note: Given the limited time remaining in the meeting, Tom provided a brief verbal update regarding inorganic fertilizer below. Please see the slides posted on the calendar page for additional details.

Tom Butler: We have two things left, we have no time to get to them, so I'm going to make the inorganic fertilizer update verbal. The slides are there for people who want to see, so please take a look. Essentially what we did was a comparison using a statistical representation of CAST called CalCAST between two data sets for fertilizer. They are different, overall, in their amounts, and what we saw when we applied them was not necessarily an overall amount that was different, but that there were regional differences in how fertilizer was distributed. So, the takeaways from that are we need to look more at different datasets. We also still need to talk about the scale at which we are using them. So, those will all come up. So, if you have questions, please follow up with me offline on those. I am going to give Bill four minutes to do anything he can, and hopefully we can talk more about both of these at next month's time.

Action: If you have any questions regarding the inorganic fertilizer data, please reach out to Tom Butler (Butler.Thomas01@epa.gov).
Action: The group will continue to discuss inorganic fertilizer data at the June meeting.

Animal Systems Excess Discussion 10:45-10:55 [10 min (10 min presentation) (Bill Keeling, VA DEQ)]

It has been brought to the partnership's attention that circumstances have arisen where BMPs are being submitted in excess of what CAST shows possible. In these cases, excess BMPs are not given credit within CAST. We heard briefly about some of these circumstances and discussed why there is excess implementation, especially waste management BMPs which are commonly engineered and expensive. Informational.

Discussion:
Cassie Davis: One of the things I would be interested in is if we're reporting at the county scale or at the HUC scale, if there could be spillover once we hit that cap. It would just automatically go to the statewide scale and that would kind of solve some of these excess issues, because I feel like the animal unites are there, it's just what county they're in or what HUC they're in. That's the issue we are running into. Then if we report it lat/long, we are reporting at the smallest land unit possible, so that is just ripe for excess to happen.
Robert Sabo (in chat): it be great to discuss and learn more about this concern.
Bill Keeling: Particularly since the manure and animal waste is based on a county scale number and distributed, not necessarily based on what's necessary for animal production, and I would argue that we need to revisit how all that's figured up front. If it can be fixed up front, that's one

thing. If not, then we should look at redistribution like I proposed for the cover crops. Where you have high levels of verification, such as animal waste systems and, particularly for Virginia's cover crops, we should not just be throwing away verified BMPs that are in fact on the land uses that we're reporting, just because the model doesn't represent them properly for annual progress. It's very frustrating for the states to be told we're not doing enough, when we see tens of thousands of acres of various BMPs, or a large percentage of what we report, just thrown away as "can't be represented", when we are verifying these BMPs as being implemented correctly. So, I will just leave it with that.
Joseph Schell (in chat): Delaware would also like to further discuss this issue
Tom Butler: Thanks, Bill, and everyone for that feedback. There are a lot of issues we are identifying here. If you have specific counties of concern, I'm wondering if that would be useful for you guys to share with myself, Jess, Joseph, to help dig into it.
Bill Keeling: Well, this is systemic. Year in and year out, we've been losing animal waste management systems, whether it's because a lot of what we report in Virginia is at the HUC 12 scale and it's been distributed to the county in the model, and the HUC 12 scale we're reporting doesn't have animal units, maybe we should look at the reporting and say, hey, those are where the animals really are. Maybe we should look at how we distribute things in the first place. But, anyway, I'm just saying we need to look at this because this is unacceptable if we're actually trying to say our tool represents what the management actions are doing.
Mark Dubin (in chat): In the past when this occurred in MD we determined part of the excess was partly due to the replacement of older AWMS with new systems, especially for dairy operations expanding. May be one element for consideration, but not all.
Elizabeth Hoffman (in chat): Agreed. riparian access has layers of issues - not all pastures are stream adjacent why do we not split that out? and while we can communicate the time spent in pasture vs confinement vs access, some animal populations have 0 access.
Tom Butler: Yeah, I appreciate the perspective and bringing it up here. If there are concerns here, then certainly we want to get people to give us kind of these examples. So, I think if we can get those looking in, that would be helpful to figure out what is happening with some of these. So, I appreciate you bringing this up, and we'll certainly have offline conversations about this one. We are four minutes over, so I don't want to cut everyone off on this. So, Elizabeth, you get the last comment.
Elizabeth Hoffman: Ok. I just wanted to comment on Mark Dubin's comment in the chat about the systems that Maryland has done extensive verification, and some of this has been reconciled of connecting older systems to replacements, and we still experience cutoff. So, just wanted to add that there's lots of verification data in Maryland to also speak to some of this, so we can keep that in mind for a future conversation.
Tom Butler: Ok. Thank you. Well, we're going to come back to that one, I guess. So, we'll try and get some feedback offline with the people here and make the best use of our time going forward.

Action: If you have additional feedback on the handling of animal systems excess or if you have specific counties of concern, please contact Tom Butler (Butler.Thomas01@epa.gov), Jess Rigelman (jrigelman@j7llc.com), and Joseph Delesantro (jdelesantro@chesapeakebay.net).
Action: The AMT will continue discussions on animal systems excess at a subsequent meeting.

Recap/Closing 10:55-11:00 [5 min (Zach Easton, VT)]

Adjourn – 11:00

Up Next:

Office Hours: Friday, June 13th, 2024, from 8:00 - 9:00 am.

AMT Meeting: Friday, June 13th, 2024, from 09:00 - 11:00 am.

Participants

Tom Butler, EPA
Zach Easton, VT
Candiss Williams, NRCS
Sarah McDonald, USGS
Peter Claggett, USGS
Holly Walker, DNREC
Cassie Davis, NYSDEC
Bill Keeling, VA DEQ
Emily Dekar, USC
Arianna Johns, VA DEQ
Ruth Cassilly, UMD/CBPO
Tyler Trostle, PA DEP
Hunter Landis, VA DCR
Mark Dubin, UME/CBPO
Jeff Sweeney, EPA
George Doumit, DNREC
Ken Staver, UMD Wye
Alisha Mulkey, MDA
Auston Smith, EPA
Kate Bresaw, PA DEP
Scott Heidel, PA DEP
Tamie Veith, USDA-ARS
Curt Dell, USDA-ARS
Joe Schell, DNREC
Pat Thompson, Energy Works
Robert Sabo, EPA
Tim Larson, VA DCR
Elizabeth Hoffman, MDA
Cassie Davis, NYSDEC
Dave Montali, Tetra Tech
Joseph Delesantro, ORISE Fellow/CBPO
Helen Golimowski, Devereux Consulting
Nicholas Moody, VA DCR

**Common Acronyms

AgWG- Agriculture Workgroup
AMT- Agricultural Modeling Team (Phase 7)
BMP- Best Management Practice
CAST- Chesapeake Assessment Scenario Tool (user interface for the CBP Watershed Model)
CBP- Chesapeake Bay Program
CBPO- Chesapeake Bay Program Office (houses EPA, federal partners, and various contractors and grantees working towards CBP goals)
CBW-Chesapeake Bay Watershed
CRC- Chesapeake Research Consortium
EPA- [United States] Environmental Protection Agency PSC – Principals' Advisory Committee (CBP)
Sandbox Decision – A tentative decision made via consensus; these are made to allow for more focused testing of CAST. STAC- Scientific & Technical Advisory Committee
TMDL- Total Maximum Daily Load
WQGIT- Water Quality Goal Implementation Team