Agricultural Modeling Team (AMT) Meeting

January 10th

09:00 AM – 11:00 AM

Meeting Materials

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Meeting ID: 246 929 423 243

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This meeting will be recorded for internal use to assure the accuracy of meeting notes.

Summary of Actions and Decisions

Decision: The AMT approved the December minutes.

Tentative Decisions *(Both items are pending review by Delaware)***:**

- The group voiced support for altering the Land Uses in CAST to include Managed and Unmanaged Hay and Managed and Unmanaged Pasture.
- Members also supported the idea to modify the manure spread algorithm to create a fourth group.

Action: Tom will follow up with Delaware offline to gauge their level of support for going through with Virginia's proposal and the subsequent creation of two new land uses. *(Due to Avian Influenza outbreaks we have not been able to get the required responses as of 2/6/2025).*

Action: Tom will work to firm up a list of other decisions and information needed before proceeding with this proposal. Please send Tom any feedback on reporting acres, ratios, non-nutrient management factors, a definition for managed and unmanaged, and additional insights on fertilizer.

Action: Data requested to summarize the shifts in nutrient application can be found at the following link.

Meeting Minutes

Statement of purpose:

Evaluate industry data, Land Uses, and Inorganic fertilizer and discuss potential alternatives for Phase 7.

Decision items:

1. Approve the December minutes.
2. Decide on Pasture and Hay Land Uses for Phase 7.
3. Decide on the manure application groupings for Phase 7.

Introduction: 09:00-09:05 [5 min (Zach Easton, Virginia Tech)]

Seek approval of December minutes and walk through agenda.

Decision: The AMT approved the December minutes.

Poultry Industry Data 09:15- 10:00 [45 min (15 min presentation 30 min discussion) (Chris Brosch, DDA)]

Previous efforts revealed data deficiencies which proved prohibitive for the adoption of poultry industry datasets. We will hear about a possible new method to fill these deficiencies for broilers in Phase 7. Informational.

NOTE: **This presentation was rescheduled to a future meeting.**

Pasture and Hay Land Uses 10:00-10:40 [40 min (10 min presentation 30 min discussion) (Tom Butler, EPA)]

Last month the AMT voiced support for investigating new Land Uses for managed and unmanaged hay and pasture. Input was used to create these new Land Uses and run a new potential version of CAST. Results of this run and a control run to compare applications with these new Land Uses were presented.

Decisional:

- We should alter the Land Uses in CAST to represent, Managed and Unmanaged Hay as well as Managed and Unmanaged Pasture.
- We should modify the manure spread algorithm to create a fourth group as proposed by Virginia for Phase 7.

Discussion

James Martin (in chat): Those [application rates] are LGU Recommendations from VT
Ken Staver: On that nutrient management factor, does that mean with non-nutrient management the application rate is 144 for N? Then it comes down to 120 if you have nutrient management?
Tom Butler: Yeah.
Ken Staver: So, it starts at 144 without nutrient management?
Tom Butler: If that's 20% higher, I trust you on that.
Ken Staver: So, you don't go down from there, you go up with nutrient management, right?
Tom Butler: Yeah, that's how the rest of the land uses work currently. That's a great thing to bring up because the current application rate is much lower. When you are applying nutrient management to it, the credit doesn't necessarily allow you to reduce the load further. So, this is another issue that came up associated with this. This would give you a difference. CAST is working on an average condition and how your specific location changes relative to that. With that managed category, you would now be able to have a reduction compared to the average condition for those managed acres, and that would allow for potential differences in the load. I don't know what they would be. We can't actually run those now. If someone asked about loads, I would say I don't know, because we have to get everyone's input for every part of CAST.
Dave Montali: This just occurred to me; why the difference between N and P? Ultimately as we move forward with this, we need to understand what's going on with P, too. But it sounds like you can't get nutrient management credit for P on these lands. Let's just leave that for now as another thing that needs to be looked at. We need to look at what's going on with P, too.
Jess Rigelman: I'll let James answer for sure, but I think the proposal was that leguminous hay had these management factors, so James suggested these as the default for his new proposal. Why it is at 1.2 and 1 in the first place for leguminous hay, I don't know. I'll leave it to James.

James Martin: Thank you, Jess. These are not uncommon factors and, as she said, that's what was for leguminous hay. Ironically that's a crop that doesn't get a lot of nitrogen, does benefit from nutrient management, but I'm not going to go there. That's another rabbit hole we don't need to tackle today. But, as our team in Virginia was reviewing the data, conversation did circle around phosphorous as well. Honestly, for this proposal, you've been working with these graphics that Tom shared with everybody for a long time now, and they've always been focused on nitrogen, and that was our principal focus. Absolutely open to having a benefit for phosphorous, and my nutrient management team says they think there should be a benefit for phosphorous management as well. I don't have a number for you.
Tom Butler: I appreciate that explanation. Thank you, James, that is helpful. Dave, I guess we can start brainstorming on that if that's something people are interested in as well.
Dave Montali: To avoid unintended consequences in the situation with fertilizer, what kind of change in fertilizer application of P results from this change, is something that needs to be looked at.
Tom Butler: That's a great point. I know we talked about the connection between this proposal and the fertilizer in the office hours. Hopefully we can get some more feedback from the bigger group as a whole. These classifications are manure application curves. Each of these groups represents just the curve that's pretty much the application rate for each of these groups for manure. Fertilizer has different groupings, different curves, etc. Those are something we would have to revisit. Then there are also points about fertilizer on if we're in the watershed scale, or if we wanted to get narrower and if you jumped on, you probably heard some of those conversations still happening. So, we will have time for those hopefully later today.
James Martin (in chat): Related to NM Factors: Across all of our crops N NM Factors ranges from 1.0-1.4. P NM Factors range from 1.0-3.0
Dave Montali: This is really interesting. Again, I brought up in the office hours the amount of fertilizer going on pasture. I know Ken said it's all fertilizer where he is. But, where we are, the nutrient management is more to deal with the manure from chickens. So, it is very different. But watershed-wide, we basically said all the nutrients that are going on the old other hay and pasture are going to be coming from fertilizer, and that looks to me like 3/4 or 4/5 on these new land uses is coming from fertilizer. I don't know if that's reality, but maybe.
Tom Butler: That's a great point, Dave. On the whole, most of the counties that I've seen in doing these data analyses are not able to meet their nitrogen requirement with manure. So, they are pulling in fertilizer. I think what you'd see is maybe that reflected a little bit more heavily skewed towards counties that don't have excess or complete manure coverage. The other part of this is this is focused on putting newer curves into place. There were some decisions that had to be made about how these new land uses would get fertilizer applied, so those had to be put into place. We have only started to talk about fertilizer. The data sources, the applications for applying, any smoothing process, anything and everything to do with fertilizer, is still largely untouched. So, this is dealing with our watershed wide fertilizer stock, not anything state specific. These discussions were happening as people were jumping online earlier, but the focus right now is we've made two new land uses. We are putting them in the place from manure. So those manure bars are really the focus that we should try and have. Dave, I respect your perspectives on the fertilizer, Ken, as well. I understand that fertilizer might be what you expect it to be or not, but the manure is really the focus. It's putting these two new land uses in as the first part, and then the 2nd part is the manure behaving correctly, or more in line with what we'd expect. The fertilizer is probably a different discussion. Fertilizer is treated distinctly in terms of its applications in manure. Dave, I really do appreciate your perspective on that because it might

not be what you'd expect in West Virginia, and we definitely want to see how that could change moving forward.
Ken staver: Tom, so this is adding up all the counties, right? It's all done on a county basis. So, the manure application would be based on how much manure is available in that county. There would be counties where the application on the grass and the pasture would be a lot higher in manure, and there would be counties without animals where it would be all organic, right? So, the bottom line is, to know how it's treating you specifically, you have to look at your counties?
Tom Butler: Yes.
James Martin: Likely in those counties that don't have a lot of manure, there probably isn't a lot of pasture or hay. But every county is unique, so I wouldn't say that with absolute certainty.
Tom Butler: Great points, and I appreciate everyone bringing them forward. I think it is important that we recognize that counties are where it's at with this and really the emphasis. There were a lot of requests to look at specific counties, and for the watershed, I showed what the expected application of nitrogen was, and then I showed what the plant available nitrogen applications were. So, those two plots are in the same format for every county listed here in each of the states listed here. So, Delaware has three counties. New York has one. West Virginia has two, and you can see what they are. If you have not had a chance, I encourage you to go look at these. It shows really different things in different counties. The message there is that the devil is in the details. So, from all that, I think there are a few discussions points we could certainly take up. The main goal today is to get to a potential decision on how we want to deal with this. What discussions would people like to have? We had great ones in the office hours. I want to make sure those points get documented in the main meeting. So, if we could start to go through some of those, I'd appreciate it. This is the Virginia proposal. It's a tremendous amount of work to champion an idea like this, to get it put through. Huge shoutout to the CAST team for getting these things run. So, I want to open it up for any questions. I did want to try and get this to a vote, recognizing we don't have everyone, so this might be a little bit tricky.
Alisha Mulkey: MDA has not had an opportunity to look at the data for the specific county. So, full transparency there. We also couldn't be at the December meeting. The idea with the new land use is that the states would be able to define either a percentage of acres, on one slide you said 25%, or every state would have 25% of our acres now be deemed managed, and we would put the nutrient management factor against that 25% or the percentage as each state defines it?
Tom Butler: Great question. That is up in the air. So, there are a number of ways it could happen. This percentage here for hay and pasture was kind of set as a test. We could certainly keep it that way. We could certainly go another way. I think James has hinted at a few ways. We did hear, I think last meeting we had Candiss on, and Mark had made a request potential for CEAP information that might indicate percentages of nutrient management as a way to help break this out. I think using nutrient management plans was also recommended. I'm going to punt this to James. He said construction acres, but a lot of things have been discussed. That is not something that is completely hashed out.
James Martin: So, the original Virginia proposal presented last month had the acres of these managed land uses being reported by each jurisdiction, set by each jurisdiction, just like we report harvested forest or construction acres now. So, I believe September, but at some point, as we approach the coming progress year reporting, we established those land uses, construction and harvested forest. This would be in the same boat. The thought we had, and what we included in the proposal, was if a state does not report anything or is unable to estimate their acres of managed pasture and managed hay, that the default value would be the acres of nutrient management plans reported in the previous progress cycle on those land uses. So,

assuming that your nutrient management reporting would stay consistent from year to year, it would create an equal amount of acres as you have nutrient managed to apply to those acres. But, because we are using the prior year and nutrient management is an annual BMP, things are subject to change. That was the original proposal.
Alisha Mulkey: Thanks for that clarification, and I do remember the harvested construction kind of philosophy. So, back to Tom, if we vote in agreement today, how we determine the universe of acres that would go in to either of these managed categories is kind of to be determined. It sounds like we're just agreeing on the concept of including these as land uses and, with that, the application rates on this slide could also be reevaluated if a state felt differently?
Tom Butler: Yeah.
Alisha Mulkey: Ok. I just want to make sure I am clear on what you are asking. Thanks.
Tom Butler: It's two parts. Those are to be determined. Do we want those two land uses, and are we comfortable with where they sit in the hierarchy of application? So, right now, managed hay is in the same group as grain and silage with manure. Managed pasture is with small grains, double cropped, other crops, specialty high, and specialty low. So, it's do we want two land uses, but then the other part to that is are we ok with where they sit in the manure application? We still have to talk fertilizer. We still have to nail down the rates. We still have to talk and narrow down how we split the acres.
Tim Larson (in chat): States can use their own LGU recommended application rates, as they do other crops.
Ruth Cassilly: I was just going to make a quick comment in response to James. In the proposed method, if states don't report anything in terms of managed acres, and they haven't been historically, we would need to come up with a different way to get those acres rather than using the previous year, because some states are not reporting that. So, they're not separating it out now. So, we would need something else.
James Martin: Right. Ruth, so you are essentially alluding to some default minimum percent of existing pasture and existing hay. Maybe 25% and 10% isn't it, but some percentage of those acres you'd always have some fraction. Yeah, I think that's a road we can cross later, right? I think the reason a lot of folks don't have differentiated reporting of nutrient management is because there's been no benefit to doing so. This would create a benefit to doing so, right? If you don't get any credit, additional credit as Tom says, for nutrient management on hay and pasture as it exists now, why would you report nutrient management on hay and pasture?
Ruth Cassilly: I'll just add that since the default was row crop and that gives you more credit, there really wasn't an incentive to separate out the acres other than avoiding excess.
Tom Butler: Good conversation there. Last month's meeting there was a discussion and Mark and Candiss were involved with that. I don't know if they are both on now, but that was looking at some CEAP data, and those discussions have continued a little but offline. So, somewhere to follow up with on those as maybe a historic source of information to help with that split if a state didn't have it. But, again, that's just a potential thing. That's nothing concrete but might be able to help with that historic record.
Ken Staver: I know we are trying to limit what we decide on, but that little table has always come up, and we've dealt with it a long time ago about the N loading factors. Pasture and other hay had quite a bit lower values on that table, and now we've moved them into that category with the two highest. Now they're in that first category for manure, and they're getting more nutrients. Is that value going to get reassigned for them? Or what's going to happen with that?

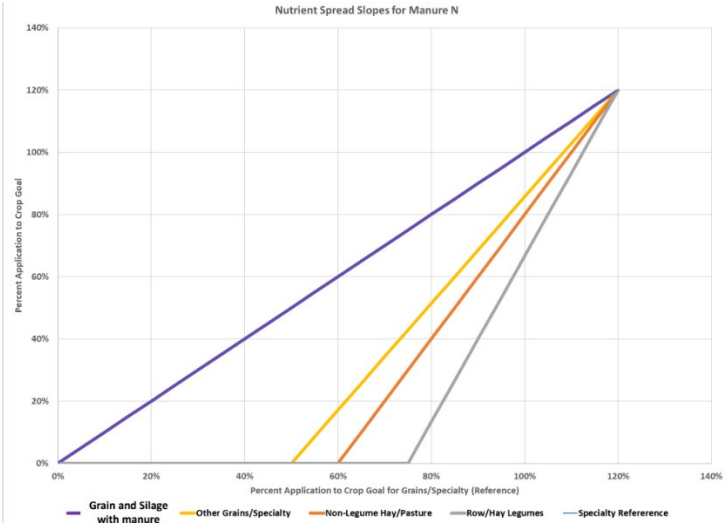
Chesapeake Bay Average			
Land class	Land Use	Loading Rate Ratio	Loading Rate (pounds per acre per year)
Cropland	Double Cropped Land	0.79	30.9
	Full Season Soybeans	0.71	27.7
	Grain with Manure	1.4	54.7
	Grain without Manure: **Reference land use**	1	39.1
	Other Agronomic Crops	0.45	17.6
	Silage with Manure	1.62	63.3
	Silage without Manure	1.16	45.3
	Small Grains and Grains	0.84	32.8
	Specialty Crop High	1.34	52.4
	Specialty Crop Low	0.31	12.1
Pasture	Ag Open Space	0.43	5.1
	Legume Hay	0.74	8.7
	Other Hay	1.04	12.3
	Pasture: **Reference Land Use**	1	11.8

Tom Butler: I'm trying to pull up the table on the loading rate ratios that you're talking about. My understanding of that is that we will still have to determine where they sit.
Ken Staver: I presume that will change with this decision.
Tom Butler: I'm fairly certain it would have to.
James Martin: Why? Why would that be so? The loading rate ratio is a function of the crop, not what's applied to it.
Ken Staver: Well one of the reasons those two grain with manure categories have the high loading rate is just the nature of manure applications. The timing. There's sort of manure factor there that's inherent in them having higher ratios.

James Martin: Alright, maybe I'm not understanding what these ratios are supposed to do. I thought it was supposed to represent the leakiness of a crop, and the amount of nutrients applied to that crop should be irrelevant to that factor, if I'm thinking about it right.
Ken Staver: I'm not exactly sure how, when the runs get done, how loads are going to pop out of these new grass land uses that have a lot higher inputs. I don't think they can just stay the same when you go from 20 pounds or 30 pounds of nitrogen, to now 140 possibly and have the base load. I understand it's less leaky, but still, you can't go to that fertility scenario and just have the base load stay the same. So, I'm not sure how that's going to happen in the model or if the model is going to change those loads. I guess that is my question at this point.
Alex Soroka (in chat): I think it should shift load from grain production areas to pasture areas? On almost all the county slides everywhere the grain nutrient input goes down while pasture goes up.
Tom Butler: We have certain land uses that are manure eligible. We have certain land uses that aren't, but the point is that the land uses here all have their ratio, and they all load relative to a reference. So, in this case, we have other hay and pasture as references for our new land uses. So, I think the discussion that Ken is bringing up is do we have to change these. Because if you keep those the same, like if other hay is still 1.04 and managed other hay is 1.04, and then the application rate goes from 30 to 120 pounds per acre, they still load the same. Even if you have nutrient management, you're applying 120 pounds per acre to a land use that loads the same as one that gets 30. So, that, I think, is the discussion Ken is bringing up.
James Martin: No, it doesn't load the same, because you apply more. It would have the potential to load more than its parent land use. If managed stayed the same. The other thing to keep in mind here is because we are shifting nutrients from grain and silage with manure, keep in mind that the pasture and hay ratios are relative to pasture and the cropland ratios are relative to grain with manure. If you looked at them all relative to each other, the hay and pasture ones are about 25% of the grain with manure one. So, it's substantially less leaky as you would expect for a perennial grass.
Ken Staver: I guess the question is will there be two more lines on that table in that pasture category? Now we're splitting it? Or are we just going to use the same values?
James Martin: There's going to be two more lines. They may have the same values, or they may have different values.
Tom Butler: I do see a chat from Alex. Again, we are looking at that application and loads are not something I am going to speculate on.
Alex Soroka: That comment really goes to a spatial question. The discussion that we were just having was is less spatial and more of on an individual land unit, how much is going to be released? Is it the loading rate ratio that matters. Or is it the loading rate? So, if you have 120 pounds applied, does this mean you will have an overall less loss because pasture holds it better? As I 'm looking at the loading rate it's 11.8 pounds.
Tom Butler: That ratio determines that rate, and if that rate is lower, then you have to look at the acres. There could be many implications that I would be ill equipped to look at and discuss.
Olivia Devereux: I can't answer that question directly, but I think the key here is that these are ratios, they are not actual loading rates, and that those ratios still govern. Whether it's 1,000,000 pounds applied, or half a pound applied, it's still going to have that ratio in reference to everything else. The concern I have is that none of this makes sense unless we go with a statewide stock of inorganic fertilizer, just as we go with county level stocks for manure. Doing a watershed wide stock for inorganic fertilizer is not going to be effective with this approach in my mind.

Dave Montali: These loading rates are long term averages. We started way back with a loading rate for ag and divided it into pasture, hay, and crop. This is the long-term average relationship of all the different ag land uses, and then it's the sensitivity in the model and the change to that stuff over space and time, too. So, I'm not sure what the answer is to the question of if we have these two new land uses, do we need to change their relative loading ratios? Gary might be able to help.
Jess Rigelman: I think he had to step away for another meeting. I'd be happy to ping him and see if he can come back on and answer that.
Scott Heidel (in chat): I believe that would involve an expert panel
Tom Butler: Scott, are you saying redoing the loading rate ratios?
Scott Heidel: Yeah, that's what I am thinking. These weren't just pulled out of a hat. A lot of thought went into this and the development. So, while I'm open to changing it, I think that that's going to take a pretty significant effort.
Dave Montali: That was done by the AgWG?
Olivia Devereux: Right. It was the Ag Modeling Subcommittee, which is essentially this group, who did it last time. An expert panel is only for BMPs. Not to say you couldn't have a different type of expert panel, but that's the way it's worked in the past.
Tom Butler: Mark, and I think, Ken, were probably involved in this one. So, it is an extensive report. So it was, as Scott's hinted at, nothing trivial. Granted, we probably wouldn't want to reevaluate all of them because a year and a half ago, we decided concretely that we didn't want to do that. So, if it were just these two, that's something else that might not be as much of a heavy lift, but still probably a lift.
Ken Staver: It's possible that just the N balance will change the loads. It might not be the whole shebang for that. We kind of did that test with grains when we were trying to get rid of this table and maybe that wouldn't be so hard to run that again on these just to see how much it would change when you up the N rate that much.
Mark Dubin: It's feasible to do it. Of course, what we have here are relation ratios on that. So, if we're essentially subdividing a couple of the land uses for Phase 6 into Phase 7, we probably would need to not only create the new ratios, but also make an adjustment to the associated Phase 6 land uses because we were changing the load on a partial portion of those land uses and so forth. So, I think it could be a targeted exercise that wouldn't necessarily impact the rest of the report, and we could develop a supplemental report to the existing one to update that information. Ken, does that sound in line with what you were thinking?
Ken Staver: They get manure now, so it's not that they don't get manure. They get fertilizer now. The three land uses do. So, it's not like they're totally changing, right? They're just getting more and more N. So, it may not have to be that much.
Mark Dubin: That's what I was thinking, too. Since they are ratios, we can probably tackle those separately and not have to impact the rest of the work.
James Martin: I think what I heard you say, too, Mark, was that it wouldn't just be two new ones. You'd have to look at the two parent land uses along with that, because if you're extracting out the fractions of pasture and hay that are getting higher rates, that would be good, although I still think the loading rate ratio should be a function of the crop itself, not anything about the nutrients applied or how they are applied. We've got timing and other factors.
Tom Butler: We certainly want to have a change in here if we think it's an improvement. Recognizing that a lot of effort has gone into this and that there's still more that needs to go in, but that this might be a significant improvement for anyone who has pasture and hay in a

significant portion of their counties. We obviously have a list of things to figure out, but are these two proposed decisions things people are having any egregious objections to?
Ken Staver: On the second part, the manure spread algorithm, these two land uses are just going to be on the same curve as manure and silage?
Tom Butler: Managed hay is now with grain and silage.
Ken Staver: So, it's on that same curve? On the graph that has the different groups? So, when you've met 50% of the corn need, you are also going to meet 50% of the pasture need?
Tom Butler: Other hay.
James Martin: Managed hay, not managed pasture.
Dave Montali: Hay is in one and pasture is in two.
Olivia Devereux: Are we at the point where we make a decision, Tom?
Tom Butler: We're pretty close. To answer Ken's last question, you would have this curve here for grains and silage with manure. You would also put managed other hay on this. Then you'd have a second curve, a third, and a fourth curve. Your second curve would have your other pasture managed on it.
Tim Larson (in chat):



Ken Staver: So, the new one of these will have four lines on it?
Tom Butler: Yes, Tim put it in the chat. Thanks for that, Tim.
Dave Montali: Going back to the idea that if we make a decision, we can change it later. So, right now we are just saying we're running with the two new land uses, and we're going to put them in these distributions for manure. But, as came up, there are all these other details. What else do we need to do? Do we need to go back and look at the land use loading rates? What are the rules for how to feed these things both in future progress and back in history? What are the implications of our current methodology for fertilizer, and what are we going to do on that? Does it all work together? If your ask is are we all good today based on what we think is happening with the distribution of manure, seems like everybody is pretty happy about that. But, all these other details will really need to be examined, and maybe there's a way that we would still have the land uses and we need to tweak things. Or maybe it all blows up. I don't know enough about if we make this decision, what impact it has and if that is a better measurement of reality for West Virginia. I don't know that yet.
Tom Butler: That's really insightful, Dave. Ken said we are painting the house without knowing the color it will be, and that is definitely on display here. But, I also want to try and drive home

that we are looking for what we might think is an improvement, and if we cant do that, that's fine, and we stay with what we have. I don't know we are going to get to perfect with this, but as a group we need to think is this better? We don't even know the full answer to that. In conjunction with this, we're going to be putting it in with the test conditions, but we certainly want to look at those other things.
James Martin: What we're doing here is eating the elephant one bite at a time, rather than trying to swallow the whole thing, and we're doing so knowing that we always have the option of starting over. There are many interrelated things we're going to have to work through, and as we consider any one of those and see the results, we might have to circle back. I think that's exactly how this group should be making decisions because trying to understand everything and then making all your decisions at once just isn't tenable.
Tom Butler: I appreciate that perspective and insight, James. If we are ok with this, I'm going to ask if people have issues and, if not, then we'll kind of move forward with this as our new decision as we test further things for Phase 7.
Dave Montali: I don't have an objection, but I don't want to lose track of where we are with the info you provided and, along those lines, I'd like to see a non-excess county in West Virginia. I'm not going to make my vote contingent upon it, but I'd like to see a non-excess county in West Virginia, like Berkeley, and what's going on there. I also liked the idea about, as we stand now with this new change, the differences between P7 1 and P7 2 in terms of total fertilizer by county or by the whole state. What's the difference in loads?
Tom Butler: You mean the application we have?
Dave Montali: Yeah, under the rules that those graphs were created, I kind of jumped and said we've got these new managed land uses in West Virginia, but they're being fed by half, or more in some cases, fertilizer. That doesn't make sense for us. How does our pool from the Bay wide fertilizer bucker change in regards to this change? Maybe we need to work offline about that but, to me, I don't understand the bigger impact. The biggest impact is loads, but I think I could infer that if I knew the change in what our draw from the fertilizer bucket was.
Tamie Veith (in chat): I am good with these changes.
Jess Rigelman: We can supply the data. I'm happy to do that. I just want to get back to this question on loads and why we can't do that. The base of the loads is obviously the base loading rate, but that is affected by the change in the scenario's input versus the calibration average input. Because we have changed everything, we don't have a calibration average input, nor do we have the new sensitivity. So, we are nowhere near being able to supply you the loads, because we don't have a new calibration data set. So, we will give you what we can on inputs and as much information as you need on inputs, but loads are just a nonstarter at this point.
Dave Montali: I recognize that.
Tom Butler: Dave, that isn't directed at you. I think we've had a lot of people ask about loads. I just want to make sure that's clear to everyone that's why we can't do that.
Joseph Delesantro: I was thinking about Dave's question. Maybe I'm a little confused, but isn't that the first slide you showed, Tom? Wasn't that the reallocation of application?
Tom Butler: This is not the total. I can show the total. This is how it generally shifts on a per acre basis. So, it's all the acres and all the applications across the whole watershed for each of the land uses. The data set will have totals or the ability to put totals together.
James Martin (in chat): Can we start pulling together a comprehensive list of other decision points needed related to these new LUs
Ken Staver: Tom, I think it's really important to point out in this graph that it's not the totals, but the major land use that gets N and that is a major part of our loads is grains with manure. I know

this is not the grassland issue at all. It looks to me like corn N rates go down about 20 pounds per acre as a result of this across some 15-20 pounds per acre, and the sensitivities for that are positive for more N. This does mean, unless the sensitivities really change, that the loads from grain acres are going to have to somehow trend down as a result of this. But, that's a big shift in corn N rates. 15-20 pounds per acre across the whole watershed. So, that's a huge shift.
James Martin: It's important to note that they remain above crop need, as defined.
Ken Staver: It's still in the right direction, anyways. That's one of the things we thought going into this was, are we missing a place where N is going? Is that why our grain acres are getting so much N and, right now, we have a partial answer that addresses that concern. I think it's a positive direction.
Tom Butler: I think we are at an ok spot with these two points. We are going to be making two new land uses. We have managed and unmanaged hay and managed and unmanaged pasture, and then putting them in their current spreads that I showed with those four groups. Heartburn? No. Ok, so we are good with those. We are going to get to Gary now on one of the things we need to look into as we try and assemble a list. Dave, your question was about ratios, I think?
Dave Montali: The simple question for Gary is, when we do this, do we need to go back into the Land Use loading ratios and create two new ones that are different from other hay and regular pasture?
Gary Shenk: Yes, if there is a land use, there has to be a loading rate ratio. Since this group is creating two new land uses, we'll have to discuss two new loading rate ratios. They can be one. If you want managed pasture to be the same global loading rate as unmanaged pasture, then you just put a 1. You just add a row and put a 1. If you say if it's receiving 100 pounds per acre, these others are receiving 15, we expect there to be higher loads from it, and you think it's a 1.5 or something else based on the literature, then we put a 1.5. The simple answer is, if there's a land use, there must be a row.
Ken Staver: So, these are the same crop, and the two new categories will be just like the old categories where, depending on the county, they will get manure. They will get fertilizer. So, with the sensitivities in the model, you will have a way of differentiating loads just based on how much N is applied, right?
Gary Shenk: Yeah, but those sensitivities and differential applications just spatially differentiate load within the same land use. So, if you're saying that you would want to allow the difference between application of managed pasture and unmanaged pasture to drive the difference in load, then you are in fact not creating a new land use. You have the same land use with different loading rates. You're creating a new crop, so managed pasture crop and unmanaged pasture crop, that get different application rates. Then, if you want that to drive the difference in spatial nitrogen export, you put them in the same land use. But, if you do that, you're probably going to get negative loading rates on places that have unmanaged crop. So, I think creating a separate land use for management, just as you've decided, is going to be more tractable in the model. But we do have to come up with some sort of rationale for what the export rate would look like.
Dave Montali: This is a global export rate for this land use compared to other pasture land uses, and it's starting with a global rate for all pasture, and how the loading rate ratios separate that long term average load, right?
Gary Shenk: Right.
Dave Montali: Ok, so when this group is thinking about this, we're putting more nutrients down on these new land uses, therefore they ought to have a high export rate. But, do you also consider that we're putting more nutrients down, but we're doing it under a management plan? Does that come into your thinking about how it relates to the regular land uses?

Gary Shenk: That would come into this group's thinking. I'm probably the least qualified in this group to come up with that number. Hopefully there's some literature available to say that when you have this heavily managed pasture versus unmanaged, this is what we expect as an export.
James Martin: Follow up for Gary- I know these loading rate ratios are referenced to pasture. Other hay has a loading rate ratio a little bit higher, and legume hay a fair bit lower. Are these loading rate ratios a function of the nature of the crops, or the loading rate is a combination of the nutrients applied and this loading rate ratio. Is that right? On these new land uses, if we left the loading rate ratios the same as the parent land use, the loading rate would be higher because we are applying more nutrients. But, the ratio, you could maybe make a case that when they are managed, you have a healthier stand of perennial grasses and, therefore, it's less leaky than it would be with fewer nutrients. I'm just trying to understand the loading rate ratio. Is it a function of the crop, or the crop plus the quantity of nutrients being applied.
Gary Shenk: The quantity of nutrients being applied doesn't come into anything in this table. Theoretically, the reason why silage with manure has a higher ratio than grain without the manure, the reference says that it gets a lot more nutrients. But, that's not how we came up with that number. The ag land use loading rate subcommittee came up with that number based on the literature of export, not considering the application. Then, within CalCAST, Isabella Bertani and the modeling group will come up with that 11.8 number, based on statistical analysis of monitoring data. If you move back up to grain without manure, those numbers will change. That is the export rate for that reference land use. So, the way that you get from 11.8 to 12.3, is just multiply 11.8 by 1.04. So, all of those loading rate ratios and everything else is all within CalCAST, and that's how we come up with that number. So, that 11.8 and 12.3 applies globally to all pasture and other hay, but it varies locally based on the application rates to those land uses. So, if county A has a higher application rate than county B, then the pasture in County A might be at 12.1, and County B might be 10.5 or something like that. Just to tie a bow on it, when you're coming up with the new row that says managed pasture, there's more application and there's more uptake. So, the consideration of that application and uptake goes into your thinking, but it's not necessarily explicit in the calculation. You don't necessarily use those numbers. Coming up with that ratio is more based on literature. If you wanted it based purely on application and uptake as if it were all a part of the same pasture, then that's not a new land use, that's a new crop. But, I don't suggest doing that.
Tim Larson (in chat): The purpose of nutrient management is to reduce the runoff. I would expect it to be much lower
Mark Dubin: The piece that I wanted to include was that, when the committee looked at the literature data for these, they were looking for average land use management situations pre-BMP. These were intentionally designed to be conditions that existed prior to nutrient management and other forms of BMPs that we represent. So, I think that's sort of an important element to add to the discussion on that.
Dave Montali: That's why I asked the question. These are different. The origin of these land uses are that they have the BMP, so that's a little different.
Tom Butler: Maybe it's useful if we can get definitions on what managed and unmanaged hay and pasture are. I don't know if it's possible in our definition that we would have a managed class that wouldn't necessarily have nutrient management. I would lean on James and Tim for some definitions here, so we could make it clear if it was specifically from the BMP or if it meant something different. Is unmanaged just a field?
Ken Staver: I thought they were land uses. I didn't think it was automatically that they had nutrient management, because you had a non-nutrient management rate. So, if they're just

under nutrient management, then they don't need a non-nutrient management rate. That doesn't even need to be a discussion, right?
Tom Butler: Right. Maybe I just put it incorrectly. I'm just trying to think about how, in defining these, we might lay that out. I think Dave's question is hinting at that. Maybe I just misinterpreted it, Dave, so correct me if I am wrong.
Dave Montali: We've got to figure out how this managed hay or managed pasture compares to pasture. So, if there is information out there where somebody doesn't do nutrient management, it's just an average pasture, is that exporting N and P the same rate as if they put nutrients down, managed them, had better forage, and all that stuff? Is it the same end result? Is it the higher end result, on average? I don't know how to do that, rather than just looking to the literature. I don't know if there is any literature that would answer that question.
Ken Staver: On that question, and being a veteran of this table, finding literature values is going to give us differentiated loads for these two new land uses. I'm thinking about going out there and splitting them further and looking for that data that's going to give us something that we can distinguish between them. It's going to be very slim pickings for annual loads from two more land uses that are not land uses people usually worry about that much. There's a lot of data on corn and soybeans, and even then, you sometimes can't find what you need. So, we're not going to get a real strong literature basis for creating new loading rate ratios for sub land uses of grasslands.
Tom Butler: In the past, expert opinion has been something that is useful if there's lacking literature. We have some experts here.
Jess Rigelman: These land uses aren't automatically nutrient management. People still have to report that. I think there was just a proposal that somehow that was used to define it if people don't report their acres. As far as I am understanding, there's no assumption that these land uses are nutrient management, unless reported in the BMPs.
Mark Dubin: I just wanted to echo Ken's feelings as a veteran of this group. Part of what we looked at is that relationship that we have there, which was nested in with the overall viewpoint. So, I think that we're going to probably be looking at some very specific literature examples to try and break this out. I think we'll have to look at what was the intention originally, and how do we decide through expert opinion what this will be. That's the path forward.
James Martin: I'm happy to see we have a decision to move forward with these land uses as we continue to consider all of these other decisions to be made. The proposal that was made last month included a number of other elements that we haven't decided on yet today, and perhaps won't. They include what the nutrient management, non nutrient management factor for N and P are. Obviously, we've got this loading rate ratio issue, and how we ultimately determine how many acres go into these new managed classes. So, I think it would be good for us to keep a running list of those still pending decisions, both related to the proposal Virginia made last month, as well as the deeper modeling needs, ration, and nutrient management factors that we need to still hash out and decide on. Thanks to the group for your consideration of our proposal. I hope it turns out to be a good thing for all of us and better representative of these pasture and hay land uses collectively.
Joseph Delesantro: In terms of decision points for this group, there will also be a decision point for the modeling workgroup in terms of new land uses and creating new sensitivities that would be needed for them. So, that'll also be something that will need to be considered. The decision will be in a different group, but it might be that you all have some useful input and can steer me to some appropriate literature to help in informing that.

James Martin: If you would, please make sure that we at VA DCR who originated this proposal are included when those topics start getting discussed at the next group.
Tom Butler: We'll follow up with people who are relevant and experienced with some of these as we move forward. We will try and get that list of other decisions locked up. I will put out a tentative list and look for feedback on that from the group at some point. Otherwise, I think we are sitting pretty good with this one right now.
James Martin: Just one other ask, when you get word from Delaware, please if you could share that. We'd definitely appreciate it if they have specific concerns or questions that are related to the Virginia proposal. Happy to be available if you need me.
Tom Butler: I will start with some email outreach and loop you in as needed. We know we at least have to talk about reporting acres, ratios, non nutrient management factors, and then it would be good to get a definition hashed out for managed and unmanaged, and, of course, we are going to have to dive into fertilizer, which is something we have to do anyways. With those things in mind, please send me any feedback on what I just mentioned.

Tentative Decisions *(Both items are pending review by Delaware)*:

The group voiced support for altering the Land Uses in CAST to include Managed and Unmanaged Hay and Managed and Unmanaged Pasture.

Role	Name	Affiliation	Vote	Notes
Signatory	Clint Gill	DE		(Due to Avian Influenza outbreaks we have not been able to get the required responses as of 2/6/2025).
	Alisha Mulkey	MD	4	
	Cassie Davis	NY	4	
	Scott Heidel	PA	4	
	Tim Larson	VA	4	Would like to see data summed by states to see where nutirents moved once implemented.
	Dave Montali	WV	4	Would like to see data summed by states to see where nutirents moved once implemented.
	Jeff Sweeney	EPA	4	
At-Large	Ken Staver	UMD	4	Would like to see data summed by states to see where nutirents moved once implemented.
	Tamie Veith	USDA-ARS	4	
	Lisa Duriancik	USDA-NRCS	4	
	Alex Soroka	USGS	4	
	Zach Easton	VT	4	

Members also supported the idea to modify the manure spread algorithm to create a fourth group.

Role	Name	Affiliation	Vote	Notes
Signatory	Clint Gill	DE		(Due to Avian Influenza outbreaks we have not been able to get the required responses as of 2/6/2025).
	Alisha Mulkey	MD	4	
	Cassie Davis	NY	4	
	Scott Heidel	PA	4	
	Tim Larson	VA	4	Would like to see data summed by states to see where nutirents moved once implemented.
	Dave Montali	WV	4	Would like to see data summed by states to see where nutirents moved once implemented.
	Jeff Sweeney	EPA	4	
At-Large	Ken Staver	UMD	4	Would like to see data summed by states to see where nutirents moved once implemented.
	Tamie Veith	USDA-ARS	4	
	Lisa Duriancik	USDA-NRCS	4	
	Alex Soroka	USGS	4	
	Zach Easton	VT	4	

Action: Tom will follow up with Delaware offline to gauge their level of support for going through with Virginia's proposal and the subsequent creation of two new land uses. (Due to Avian Influenza outbreaks we have not been able to get the required responses as of 2/6/2025).
Action: Tom will work to firm up a list of other decisions and information needed before proceeding with this proposal. Please send Tom any feedback on reporting acres, ratios, non-nutrient management factors, a definition for managed and unmanaged, and additional insights on fertilizer.
Action: Data requested to summarize the shifts in nutrient application can be found at the following link.

Inorganic Fertilizer 10:40-10:55 [15 min (Alex Soroka, USGS)]

We discussed possibly examining a potential modeling approach to simulate inorganic fertilizer applications across the Chesapeake Bay watershed. The group was asked to give their level of support in pursuing this effort. Informational.

Discussion

Alex Soroka: At the USGS, we make a national product for how much fertilizer is being applied across the country because, as a country, we have to pay attention to our overall use of different elements. So, we will take the fertilizer sales data that we're all aware of, but there's also expense data within the agricultural census, and we use that information to estimate the crop applications to different land uses. That's a national level product. Chris Brosch asked us if it would be possible to do the same thing but for the Chesapeake Bay. We know that there is a relatively short timeline, but we're about to do the national run and the people who did it last time have since retired. But, we have new folks starting it up, which means we will have all the scripts and necessary information to run. Chris asked us if we would be able to do the Bay, and I think it's possible, but we haven't quite worked out some of the methods. I don't really want to discuss the intricacy of this model today. We started talking about it again a month ago, but I don't know that we are ready to talk about individual components of this model, since one of them hasn't been published lately. So, Tom, I think we might actually want to punt on this.
Tom Butler: We're not ready to talk about this one specific avenue. I think it has a lot of merit to it and, if we can do that, it might alleviate people's concerns. Some of the states don't really report data anymore. We have New York and West Virginia who aren't tracking things the same way as some of the other ones. There are different levels of confidences in the state chemists due to people shifting positions. So, is this new method something that would be a benefit to using?
Ken Staver (in chat): In the model, the effect of nutrient management on loads comes from reducing N inputs, at least in other land uses.
James Martin (in chat): Isn't it actually that we assume higher inputs where we do not have NM
Dave Montali: All fair points. Alex, if you could do this, where can you present information? What about time history? What would be the output of your work, if you could do it?
Alex Soroka: The output would be probably fertilizer application numbers on a county by county basis up until the year of 2023. That would be my guess.
Dave Montali: And then that would go how far back in time?
Alex Soroka: 1985, probably.
Dave Montali: Ok. I was just concerned about whether, if this was possible and if we had it, it would be something that met our needs, and we have that need for going back in time as well.

Joseph Delesantro (in chat): We have county level weather data that is used for the crop yield model from NOAA and remote sensing products that are used for the Dynamic Model.
Alex Soroka: It has to be all unpublished data. Any of the work that we do now, has to use previously published information. So, for us, it's all these national products. However, because we're in the Chesapeake Bay, we have CAST. So, the model inputs are similar to what we were talking about here. You've got the percentage of corn, percentage pasture, nitrogen fixing crop, small grain crops, miscellaneous crops. All of that data is already in CAST going back to 1985. This model would be plug and play, so we can take the data out of CAST and put it into this model. So, the land use, we would have answers for that, and the current model also uses some weather parameters. So we found, on a national scale, including evapotranspiration and precipitation estimates was good, to increase our model accuracy at the national scale. Chris says we probably don't need it on the Bay. Likewise, we probably don't need an estimate of fertilized acres. So, we could skip those because we'd only be working on fertilized acres. You would estimate everything on a county basis, then reflect it back to a state level number on fertilizer. You can either get that by a fertilizer tonnage, or you could use the amount of dollars spend on fertilizer, then use a price index for different costs of fertilizer. That part about the dollar spent on fertilizer is the hiccup, because, in our least collection in the census of agriculture, it was dollars spent on fertilizer, plus soil amendments. Trying to split out fertilizer from the soil amendment, is our hurdle on this. The other part about the timeline is, in order for us to work on this, we've got the people who are doing the national model , so it wouldn't be that much to take this and run it regionally. We can even find someone who isn't on the survey.
James Martin: Don't we already use the Census of Ag soil amendments plus fertilizer expenditures as a distribution function to get fertilizer from the bay wide stock out to counties? Isn't that part of the equation now?
Tom Butler: We do use expenditures. It is soil amendments, which encompasses fertilizer and soil amendments. So, it's like conditioners. I think Alex is asking specifically about fertilizer, not things like compost, which are included in that.
Alex Soroka: Or lime. Or any number of things that aren't nitrogen or phosphorous.
James Martin: Micronutrients, biologicals, all kinds of things.
Alex Soroka: If you look at the total number, it's quite large. But, that's not all going to just nitrogen sulfur based fertilizer.
James Martin: My thought is, we're already reliant on that data. I don't disagree with you, Alex, that it would be amazing and wonderful if we just had fertilizer, but I'm not sure the census ever had a breakout for just fertilizer. It's always been this combined soil amendments, as I recall.
Alex Soroka: There was a comparison there with some sales data in Mississippi and another state, that I think allowed them to back it out.
Scott Heidel (in chat): I would like to hear more about the remote sensing products and the Dynamic Model
Joseph Delesantro (in chat): The dynamic model separates the long-term loads into hourly loads that are input to the Bay model. I believe it currently uses the PRISM Climate Data, but two other products are/were also evaluated. This is Gopal Bhatt's work.
Alisha Mulkey: From anecdotal conversations, that question is very much a potpourri of any number of products. So, I'm very much a skeptic about how we think about what portion is fertilizer versus any number of things. I agree with James. I don't know what else exists. The only thing I am thinking, and I know Delaware isn't here to speak for itself, but Delaware is one of the few states in the Bay that really has a stronger sense on their sales data. I don't know if there's any analysis, or if Alex and Chris have talked offline, of could they, like you're suggesting

Mississippi did, do a little truth test of what they know to be fertilizer, versus what may be represented in the census. I don't know how insightful that would be for other states, but I'm very leery of that question on the census and how we use it.
Alex Soroka: I'm with you, Alisha. I wouldn't go forward with using that data, because it encompasses so many things. Chris and I talked about it, and he said he could possibly go down that road but would have to tread carefully. I'm assuming that the relative rate of what is spent on fertilizer versus fertilizer plus soil amendment, wouldn't be that far different from Delaware versus Pennsylvania. Or at least to use as the assumption in a model, I would guess it would be close enough.
Tom Butler: I think I saw Candiss, or Lisa, or Tamie with USDA. Do you break out anything like expenditures on just fertilizer versus amendments? How do you guys deal with fertilizer in your modeling efforts?
Tamie Veith: We try to break out chemical fertilizer and manure, if we do have other amendments, chemical and that kind of thing, we do try to account for it. Right now, the SWAT model, which is largely used, really just takes in the pure chemical compounds of whatever you are adding. So how much nitrogen, how much ammonia, how much phosphorus, how much sulfur, or whatever it may be. It doesn't really account so well for the mechanisms; you have to add in the amount of liquids involved. So, it's nice to know, but it comes down to that extra effort of trying to find the info.
Lisa Duriancik: I don't work on the cropland model for CEAP directly, so not the best person to answer this question. Candiss has worked on that before, so she could give you a better answer. The way that CEAP uses data on fertilizer is based on what gets reported through the NASS survey for CEAP in terms of the management actions that the producers take. So, there are questions on that survey that ask how much fertilizer is applied, how much manure is applied, etc., and that's the information that gets utilized. We don't use sales data or try to back that out from costs, or anything like that. Having said that, we did try to look into the pasture questions that came up on the last call, and I think Candiss will be able to better address this on the next meeting we have. But, there were not enough points with that land use in the Chesapeake Bay Watershed that were part of the survey response set for us to pull out information that could be useful for this group. She can speak more to that next time.
Tamie Veith: I would agree. To echo what Lisa said, we typically look at the larger scale. When I'm trying to figure out how much nutrient, or whatever amendments to add, it's based on the NASS surveys or field farm reports, not sales reports. I don't ever go to the sales reports. I just look at what did the farmers say.
Lisa Duriancik: I have heard researchers raise questions about the sales data relative to what they think is being applied, and that there's maybe some differences, at least in a few states. I've heard that, but I don't know for the Bay states specifically if that data seems to align well with what researchers think is being applied or not. If it's amendments, I would wonder if it also includes things like expenses of enhanced efficiency fertilizers that are going to function differently, and the very expensive products as well, so I don't know how you sort all of that out.
Tamie Veith: That's something I've always wondered, and how much is actually sold versus applied. What the actual rates applied are. It's never been clear on how much difference there is. It's not something I've worked on.
Tom Butler: Thank you, both. That's helpful. Is it possible that we could get some level of indication that the group supports this effort. Something that we could take back and say, this is something we are really interested in doing. I think that would be really helpful, because there's a lot of effort that Alex will have to go through here. If that means we bring some of the state

chemists in to talk about that information, if it was talking more with people at CEAP about any type of information aggregated. I certainly recognize that everyone's time here is valuable, so I'll just pose to the group here if we could maybe get a measure of support for Alex doing this, that we could use a product like that.
Ruth Cassilly (in chat): Tom- are we going to invite state chemists to this conversation on fertilizer in the coming months?
Tom Butler (in chat): I think we certainly can, I hadn't gotten that far yet.
Alex Soroka: It's kind of a tough question because we haven't really given people a lot of information to go off of. I would like to come back and tell you if it's possible. I think there's quite a bit of opportunity here. Now that it's happening already, maybe we could run a parallel operation to that. This is a model that is run on using a previous estimate that was relatively accurate across the country, but using regional data. I'm going to walk down this road a little bit further, but maybe at the next meeting we'd be able to answer the question of would we be able to do this in the time needed.
Dave Montali: As far as the concurrence and whether we support Alex's approach of telling us more next month, what you can do, what scale, and by when, I'm supportive of it. At least to that next step. If it comes back to it's going to take four years, or we can't deal with the history, or we're not getting anything better than the approach we are doing now, maybe no. But, I'm certainly good with it for another month.
James Martin: I'm on the same page as Dave. We should definitely continue to explore it an consider it as potentially another line of evidence. Alex, keep in mind as you start looking at the various sources of information that you have and might bring to bear on this work, we'd be interested in hearing about each of those. Even if the collective thing may not be able to get done, you may have an input source that might be a viable line of evidence that we could use to support or back up state sales data and try to figure out what the best answer is.
Dave Montali: That's a great comment. I was thinking along those same lines. If there is a point in time in the back where things were pretty well characterized, and if we have regional things that tell us trends, and if we got a product that goes to 23, maybe those important trends can be looked at in the years before the next product comes, too. The key factors that cause change.
Tom Butler: Definitely got some fodder for the next few months here. Alex, did you have any other questions or things you wanted to say on this?
Alex Soroka: We'll probably have more conversation offline. I'll say that now. That's all.
Lisa Duriancik (in chat): I would be very interested in test cases (even from other states) that have validated sales data with application data (from some source) vs. backing out from cost data. If that is even feasible with data available or publications where this has been done. As a means to examining the best approach/source.

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

Action Items:

- Provide feedback on inorganic fertilizer investigations.

Adjourn – 11:00

Up Next:

Office Hours: Friday, February 14th, 2024, from 8:00 - 9:00 am.

AMT Meeting: Friday, February 14th, 2024, from 09:00 - 11:00 am.

Participants

Tom Butler, EPA
Zach Easton, VT
Caroline Kleis, CRC
Alisha Mulkey, MDA
Kate Bresaw, PA DEP
Cassie Davis, NYS DEC
Emily Dekar, USC
Eric Rosenbaum, Rosetree Consulting/PA4R
Scott Heidel, PA DEP
Helen Golimowski, Devereux Consulting
Eric Hughes, EPA
Ashley Hullinger, PA DEP
Jess Rigelman, J7 Consulting/CBPO
Joseph Delesantro, ORISE Fellow/EPA/CBPO
Lisa Duriancik, USDA/NRCS
Tamie Veith, USDA-ARS
Tyler Trostle, PA DEP
Hunter Landis, VA DCR
Curt Dell, USDA-ARS
Ruth Cassilly, UMD/CBPO
Dave Montali, Tetra Tech/WV/MWG
Karl Blankenship, Bay Journal
Mark Dubin, UME/CBPO
Patrick Thompson, EnergyWorks
Ken Staver, UMD-Wye
Alex Soroka, USGS
Tim Larson, VA DCR
Jackie Pickford, USGS
Olivia Devereux, Devereux Consulting
Nick Moody, VA DCR
Gary Shenk, USGS
James Martin, 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)
STAC- Scientific & Technical Advisory Committee
TMDL- Total Maximum Daily Load
WQGIT- Water Quality Goal Implementation Team