

Fertilizer Expert Group Meeting

June 5th, 2023

01:00 PM – 03:00 PM

FEG findings summary:

On June 5th the FEG recommended that CAST utilize a combination of AAPFCO fertilizer sales tonnage and direct reported state fertilizer sales tonnage data. To accomplish this at a watershed wide scale there may be situations where not all states within the watershed report fertilizer sales tonnage data. To account for the portion of a watershed wide stock which is represented by non-reporting states the group recommended the following. That if three of the six states in the watershed report data directly their tonnage will be summed and the percentage difference from the previous year to the current year be calculated. Once this has been calculated that percentage of change will be applied to the last known data from non-reporting states. This new number will be added to the watershed wide stock to fill all unreported states fertilizer sales tonnage data.

Key takeaways:

- The Fertilizer Expert Group (FEG) has recommended that state fertilizer sales tonnage data be used to improve the Phase 6 fertilizer data when it is available.
- In situations where states have not provided fertilizer sales tonnage data the group recommends calculating a fertilizer amount based on the percent change observed from reporting states data.

Action Items:

- Provide feedback on recommendations for review by the WQGIT, MB, and PSC by 6/9/2023.
- Examine the TFI/FAO data set to determine how its data compares to the directly reported state data.

Recommendations and Testing [01:00-03:00]:

Recommendation discussion – 01:00-01:20 [20 min (Tom Butler, EPA)]

We will discuss the recommendations for improving agricultural inorganic fertilizer application data in CAST Phase 6. This time will summarize group feedback and set the stage for discussing how different recommendations impact the formation of a watershed fertilizer stock.

- James Martin asks if less than three states provide data for any year then option B is what applies to everybody correct?
 - Tom Butler clarifies that the data would not change but that we do not keep the same value for years after we have data. It is the percentage relative to crop yield which is held constant.
- James Martin asks if the reporting of direct state fertilizer sales tonnage will be written in as a requirement in state grant language?
 - Tom Butler does not know the answer and defers to Lee McDonell.
 - Lee McDonnell says this hasn't been contemplated and that the hope is states will provide the data willingly, especially if we adopt option A. That is his understanding of the situation.

- James Martin clarifies that states have been able to provide fertilizer sales data up to different points in time.
- Lee McDonnell confirms this and states that the 5–6-year lag from AAPFCO would drop to something like two years. He adds that PA in particular had this two-year lag due to the late reporting of sales tonnage which would cause reports to be altered after their initial submission.

Statistics analysis of recommendations – 01:20-01:40 [20 min (10 min presentation 10 min discussion) (Gary Shenk, USGS)]

A statistical analysis was performed investigating relationships pertinent to the group's recommendations. This analysis will be used to help improve the group's recommendations.

- Marel King asks if option A is based on only one states with all other states reporting?
 - Gary Shenk clarifies that they did not run scenarios on which states did not report. They ran these analyses based on historic data.
 - Tom Butler adds that a comment by Jess Rigelman in the chat mentions that two states have not reported. Option A is intended to work with up to three states not reporting.
- James Martin asks if the data being shown are on ag only?
 - Jess Rigelman clarifies that these data are based on all fertilizer since that is how it is done with ag.
- Marel King asks if the accuracy of option A decreases as fewer states report?
 - Gary Shenk says they have not run that test either, but they could.
- James Martin asks if this was all based on the AAPFCO data which goes until almost 2017?
 - Gary Shenk says yes.
- Dave Montali asks if there is any indication that the two nonreporting states, NY, and WV, behave differently than the other states?
 - Gary Shenk says they can investigate this but do not have the answer right now.
 - Dave Montali comments that the behavior of the two nonreporting states might not have a large impact on the watershed as a whole. HE wonders if things like a P ban in one state make the behavior of reporting states substantially different in WV where there is no such ban in place. Would this increase the nutrients from non-reporting states that is unrealistic? Would this make a difference in using options A or B?
 - Gary Shenk says that these are good points. It DOES seem like for P option A is a better way to go for all the states. For N it appears that both A and B show the same for New York with B maybe being slightly better, for West Virginia they are the same.
- James Martin states that we are currently doing option B and that absent any state data that would continue. Do we need to make another recommendation about changing the overall approach? This would need to address the way that forecasting mechanism that we use to forecast fertilizer sales when we have absences of data.
 - Gary Shenk voices his surprise that when it comes to projection holding the data constant is better then using a state specific trend.
 - Jess Rigelman clarifies that we use the percentage of crop need met with fertilizer from the last reported year, 2016. In this case we are holding the actual amount for NY and WV constant and using that same numeric value for 2017, 2018, 2019, 2020. We are then using that same fraction of crop need met for 2020 forward. Since we are extending our fertilizer stock to 2020 vs 2016 this leads to a significant difference from what we do now.

Results of different recommendations – 01:40-01:50 [10 min (Tom Butler, EPA)]

Based on the previously provided recommendations several different watershed fertilizer stocks have been calculated. Each of these stocks will be provided for comparison by the group to refine the group's recommendations for CAST 21.

- Dave Montali asks if the pictured plot is showing raw data or data which is smoothed with a three-year average?
 - Tom Butler clarifies that we are working with the data after all the smoothing occurs and each option presented on is actually calculated. For option A this would include calculating the percentage change of reporting states and applying this to non-reporting states.
- Dave Montali says one of the initial hopes behind this data gathering effort was to collect more recent data that would indicate reduced sales due to increased prices of nitrogen. He asks the fertilizer experts if these data seem to be tracking what is happening in the real world? Maybe we haven't seen the decline yet, are we seeing the increased fertilizer sales universally despite the increased cost of nitrogen?
 - Tom Bruulsema comments that he hasn't tracked the prices in detail, but that fertilizer price is often connected to the price of crops. He also adds that the price increases have been much more recent, say a year ago, rather than what would be reflected in 2020. Generally speaking, as fertilizer prices increase it is because the price of crops have also gone up which drives the increased demand for fertilizer.
 - Justin Lontz says that in DE trends have been increasing in N for 2021, there was a slight drop in the latest 2022 data.
- James Martin comments on the shape of the data being different between Tom and Gary's presentations. He wonders if something else is governing the shape of the curves?
 - Tom Butler mentions that the data he showed are from several years after 2016 which is the last year Gary shows.
 - Gary Shenk adds that the scales of the two figures are different when you show the axis going to zero it reduces the perceived variability in the figures. Additionally, by combining states you reduce the variability.
 - Jess Rigelman adds that Gary showed the full six state regression of all the AAPFCO data the other figure shows the watershed fertilizer stock with options A, B, and C. This also shows the data after we apply the rolling average on the fraction which is farm to get this stock. Expenditure data was also applied to get the portion only within or touching the watershed. This is also using the updated AAPFCO data based on conversations with this organization. So really three steps, the three-year rolling average on the fraction of farm, the expenditures, and the change product.
 - James Martin asks how variable the percent farm vs nonfarm is?
 - Jess Rigelman hasn't look at this closely, but that data can be shared.
- James Martin comments that when you look at a state-by-state figure the trend appears to be flat or maybe recently upwards for some states while others appear to be declining. He questions why we would see a large jump then flattening out of the trend. He also adds that we are looking at only half the equation. He asks for what year we are using for yield data and forecasting to 2020? He questions if we are outpacing the crop yield data with fertilizer data.
 - Tom Butler says that is a topic the AMT is discussing for the Phase 7 model.

- Gary Shenk adds that two things drive that, per acre yields which do increase over time and then acres planted. As acres in ag are decreased due to development we are tracking this. He isn't sure about the latest year of yields.
- Jess Rigelman says that we are using the most recent yield data and carrying that forward. There is no projection.
- Olivia Devereux asks what this most recent year is?
- Jess Rigelman says it is 2020, but that is only for a handful of crops. This would be for seven or eight crops from the annual surveys.
- Mark Dubin notes that there tends to be high variation in the nonfarm fertilizer which could drive overall variations.
- Tom Bruulsema says that what we are seeing is around 20% increase from 2016 to 2020 from this state data. The only other figures that he can compare this to is the US national data which has no more than a 1.5 -1.3% increase over this same period. He wonders what the driving factor behind this is. He suggests that we are looking at the state totals for NY whereas NuGIS shows that 6-7 percent of the NY total fertilizer falls within the watershed. He hopes this is not a misunderstanding and that there is some reason for the difference in change between the US totals and the watershed totals.
 - Tom Butler says he can't speak to the national fertilizer data but refers to the states which have provided data and says that the trends in these data are what he is seeing.
 - James Martin questions why we would see the difference in these trends.
 - Tom Butler again clarifies that he is looking at the state data and does not know anything about the national data or trends. He asks Tom Bruulsema came from AAPFCO or some other source?
 - Tom Bruulsema says that his source was from the FAO website. Here each country reports national fertilizer sales to the FAO and they work with the International Fertilizer Association.
 - Tom Butler reiterates that he has no knowledge of these data and asks if anyone on the call is familiar with data on the national scale?
 - Tom Bruulsema says that Jason Troendle, lead on the economic and fertilizer tonnage information, would be a good person to contact. He may also be a source of information for the FAO as well.
 - Tom Butler asks if FAO would have AAPFCO data through 2020?
 - Tom Bruulsema says no, they get data from TFI.
 - Tom Butler asks if TFI has a different data source than AAPFCO?
 - Tom Bruulsema says TFI is reporting earlier than AAPFCO but isn't sure what the process is.
 - Mark Dubin says that another way to look at this is to examine the change in state data over time.
 - Tom Butler clarifies that people would like to see state information with percentage changes over time and see how this compares to the FAO data?
 - James Martin says yes. It would be good to look at this as a possible data source.
 - Tom Butler calls on Leanna Nigon to see if she has any insights on the TFI data.
 - Leanna Nigon refers to the chief economist at TFI, Jason, who collects data from AAPFCO, but he would know more about what happens including other data sources.
- Dave Montali asks if the graphics shown represented WV and NY?
 - Tom Butler says yes.
- Dave Montali asks how we will deal with the spread for those two states? Are the blue line states where actual data is right? What if we add WV and NY 2016 data to this?

- Tom butler says that each line already has NY and WV factored in. The different colors are just different options on how those two states are accounted for.
- Dave Montali says that the shape of the lines indicates to him that the issue isn't one or two states. All the states are following a similar track and so the problem seems to affect all of them.
 - Jess Rigelman comments on this stating that the percent changes for the states of VA, MD, DE, and PA are all increasing, and the farm fertilizer increase was probably over 20%. In fact, one of the sates went up almost 40% from 2016 to 2020.
 - Dave Montali doesn't see option B as an option, He feels there is no evidence to suggest that the two nonreporting states are following anything other than the regional trend from reporting states.
- Tom Butler shows data reflecting specific states and the changes in their data over time.
- James Martin asks if it is accurate that PA has seen most of its change in the last year?
- Tom Butler says that it appears a lot of it happened in the last year.
- James Martin asks if something like this data point might have been eliminated by processing?
 - Tom Butler says that it is possible that is could have been.
 - Jess Rigelman says the state data has gone through the same outlier process that AAPFCO went through. This means that if 202 was an outlier it would have been removed.
- Tom Bruulsema points out fluctuations in the data with the current method and suggests calculating the percentage change off the previous three years or five years we might get a different one-year projection.
 - Tom Butler states they currently have averaging in over a three-year period to determine the fraction of farm fertilizer so that may get at this to smooth the data.
 - Tom Bruulsema says that the data may be artificially higher or lower when making a forward projection for the other states with no data.
 - Tom Butler says that the data should already have this effect dampened based on the rolling averages calculated previously but would like to hear other thoughts.
 - Mark Dubin brings up the decisions used to develop the Phase 6 smoothing. Those decisions were made after looking at various lengths of time for smoothing. The partnership decided on the existing timeframe for smoothing. He states that there is not necessarily a lot of room to adjust the methods until Phase 7.

General Discussion – 01:50-02:50 (60 minutes)

- Tom Butler refocuses the group on the current short-term solutions for Phase 6. He asks for feedback on how the recommendations are currently written. He notes that these recommendations will soon be sent to different workgroups and that we are between options a and b at this point. He wonders if the group can come to a clearer decision on what the move forward with.
 - Dave Montali supports option A and then putting our efforts into Phase 7.
- Olivia Devereux makes a comment in the chat that each of the state's fertilizer data goes up and the difference between these data and TFI is likely a difference in TFI data processing methods.
 - Tom Butler makes a comment that again TFI data will be looked at but in terms of using it as a unique data stream this can be encompassed by the Phase 7 recommendation to look at more data sources.

- Tom Butler asks if the group is ok providing each of the recommendations with Option A as the preferred followed by Option B as preferred and Option C as a third alternative? Tom wants to have this ready before it is presented to the WQGIT at the end of the month.
 - Tom Bruulsema points out that his comment applies to Option B as well. If we were to use the last year of data, it may be a high number. He suggests that the last year could be an outlier, and this will remove the data if we just use one year.
 - Mark Dubin seconds this thought.
- James Martin says there are a few ways we can look at these choices, right? WE can pick on that lets us play the model the easiest. In a case like this VA could withdraw the previously provided data if they look at it and think its erroneous. They would then be using the last reported year of data. This could be done whenever the last year of data were provided and disincentivize reporting data. For this reason, he would steer clear of Option B. this would leave us with Options A and C with C being the least desirable based on the statistical analysis. He would lean towards Option A.
- James Martin also makes the comment that these applications will play a factor in the loads which will be a part of unaccounted for loads. This will push dealing with them off until 2025.
- Olivia Devereux asks if the watershed wide stock would be continued if we used Option C?
 - Tom Butler says yes. He asks if earlier conversations about the averages Tom Bruulsema suggested for Options A and B were tested in Option C.
 - Tom Bruulsema says Option C is sufficiently different since it uses a trend from historic data to project forward. Meanwhile A and B use data from more current sources and does not project forward.
- James Martin asks if you were to use Option A would you be exacerbating change by applying a one-year percent change?
 - Tom Butler says that he doesn't know the answer to this but if the group would like to go this route it can be investigated.
 - James Martin asks what effect this might have?
 - Gary Shenk clarifies what James would like to see, the change between a period, such as 2014 to 2016 and the following year. Is this correct?
 - James Martin asks how the percent change was calculated?
 - Gary says his analysis was from the change of the reported data from the last reported data.
- Dave Montali asks if we would be taking the percentage change from each of the states combined and applying this to get the difference for both NY and WV? Does using a three-year average in this process make sense?
 - Tom Butler asks if Dave is saying that the current three-year average being used for the percentage of farm fertilizer already accounts for the differences we are talking about?
 - Dave says this seems right and asks if this is sufficient or if we went further, we would overcomplicate things?
 - Jess Rigelman says that each methodology, A, B, C are used to fill fertilizer stock portion which represents the two states who have not reported for the entire farm and nonfarm stocks. There is a three-year rolling average that is done on the fraction of farm vs nonfarm and that is applied to the fixed stock to calculate the farm fertilizer. There is no rolling average done on the actual fertilizer.
 - Tom Butler clarifies Dave's question to use a three-year rolling average for the fertilizer for just ag and compare that to the next year?

- Dave Montali says that is how he understands it, especially since AAPFCO does not have a breakdown of farm vs nonfarm. He assumes that state supplied data would not have an issue with farm vs nonfarm.
 - Jess Rigelman clarifies that there is no issue differentiating farm vs nonfarm for either data set. We sum both and apply the rolling farm fraction to this. The options for outlier removal happen at the state level and filling in for any option would be done at this same level. We would then combine the states into a single stock. This happens BEFORE the rolling average for farm fraction is done on the entire six state region.
 - Dave Montali says he trusts the partnership appropriately applies the Phase 6 methodology to the states with new data to come up with NY and WV values. He feels that real data from states with reduced latency can produce a percent change year over year that can be used to calculate fertilizer amounts for NY and WV.
- James Martin asks why if both AAPFCO and the states supply a farm and nonfarm split the current methodology uses all fertilizer instead of just the ag fraction? He understands we must remain consistent but questions how variable the ratio of farm to nonfarm is between states? He questions if we are doing a disservice by applying a three-year rolling average to this number. He wonders how different this ratio is between AAPFCO and the states, and further how variable it is between states. He suggests that larger states can dominate what is happening in smaller states.
 - Tom Butler says that this methodology was agreed upon for Phase 6 and so there are good reasons for the methodology being this way. Tom shows a figure showing how the AAPFCO data compare to the state data and the fertilizer which is attributed in CAST. This shows the how the fertilizer is distributed in PA and sometimes it is more or sometimes it is less then what AAPFCO of the state data say the state should get. This shows that our current methodology does factor in changes over time with this ratio.
- Tom Butler wonders if the current methodology is enough to satisfy some of the earlier comments? He wonders if going back to the recommendations if we already have an average ratio built in if it satisfies people's concerns with averages?
 - Tom Bruulsema says it would make the calculations more robust.
- Tom Butler says it sounds like the group is ok moving forward with the current recommendations and methods that we started the say with. He asks for clarification from the group.
- Olivia Devereux asks if the group is looking for a consensus decision?
 - Tom Butler clarifies that we are not looking for a consensus decision with this group. We are looking for a set of recommendations that will be reviewed by the WQGIT in June and July for a formal decision. The recommendations will go to the AMT and AgWG for comment before this, but we will want to have things pretty well finalized by the WQGIT June meeting.
 - Dave Montali asks if we want to give options A, B, and C by the MB meeting of a single option?
 - Tom Butler says that we can do either. We just want to give the next group a clear idea of what is best to act on from the findings of this group, that can be one recommendation or several.
 - James Martin says that no one has yet voiced support for any other option than Option A. He advocates for moving forward with Option A as the only option recommended.
 - Dave Montali says that we should keep thing simple and provide one option.

- Greg Albrecht says that we can present the alternative options as work that was done but keep the focus on Option A.
 - Mark Dubin supports this idea from Greg.
- Tom Butler asks if we need any modifications to Option A?
- James
- James Martin says that we should move forward with Option A and make sure that we clarify how the percent change is calculated.
 - Gary Shenk says that what he said and earlier is mathematically equivalent to a year over year percentage change.
- Tom Butler confirms that Option A with its current wording is still good and that if there are comments to provide these by the 9th of June.
- James Martin says that is a good wrap up on Phase 6 recommendations and clarifies that we will want to have comments in by June 9th.
 - Tom Butler confirms this.
- James Martin begins to discuss additional Phase 7 recommendations and adds that we should move from a six-state watershed fertilizer stock to an individual state stock for all the watershed states. He also proposes looking at more depth into the TFI data source.
- Dave Montali says that we should look at making a more simplistic method to project fertilizer beyond the last reported year. He would like to see some way to fact check our data vs other products. Dave asks if these recommendations will shape the AMT direction?
 - Tom Butler says yes.
- Tom Bruulsema offers the link to TFI data: One information source to explore for fertilizer use - https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Chemical_Use/

Adjourn – 03:00

Attendees:

- Alisha Mulkey, MDA
- Tom Butler, EPA/CBPO
- Tom Bruulsema, IPNI
- Cecilia Lane, DOEE
- Chad Linton, WV Dept of Ag
- Clint Gill, DDA
- Curt Dell, USDA-ARS, University Park, PA
- Dave Montali, Tetra Tech, WV
- David Wood, Chesapeake Stormwater Network
- Douglas Farmer REE-NASS
- Elizabeth Hoffman, MDA
- Frank Schneider, Pa SCC
- Gary Shenk USGS@CBPO
- Greg Albrecht New York State Department of Agriculture and Markets
- Helen Golimowski, Devereux Consulting
- James Martin, VA DCR
- Jeff Sweeney, EPA
- Jessica Rigelman, J7 Consulting
- Justin Lontz, Delaware Dept. of Ag
- Kaylyn Gootman, EPA/CBPO

- Kevin Du Bois, DoD Chesapeake Bay Program
- Kevin McLean, VA DEQ
- Leanna Nigon, TFI
- Lee McDonnell - EPA/CBPO
- Leon Tillman, NRCS
- Mark Dubin, UM/CBPO
- Marel King, CBC
- Olivia Devereux, Devereux Consulting
- Phil Davidson - Maryland Department of Ag.
- Ruth Cassilly, UMD
- Roberto Mosheim, ERS
- Scott Heidel, PA DEP

Up Next: TBD

****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](#)