

Draft Final Phase 6 Review Comments Received and Draft Responses

Agricultural Modeling Subcommittee

All comments below are paraphrased into summaries from original comment.

Commenter: Bill Angstadt

Date: April 24, 2017

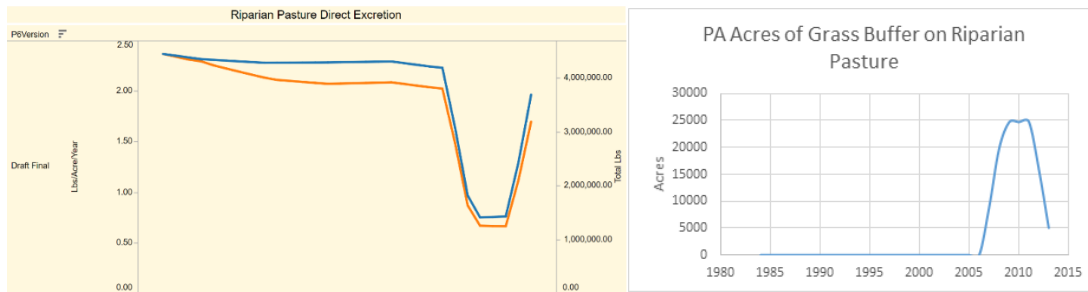
Subject: Total Nutrients Lbs Applied (graph) – 2013, PA- (applied amount = crop goal)

- **Comment: N looks reasonable for grain & silage with manure (1.18, 1.19) - low for w/o manure (0.91). Is atmospheric N included? If not, then what are the ratios after atmospheric N?**
 - Response: Atmospheric N is not included in this analysis, but is added on later in the process. If added in the ratios would be approx. [INSERT ATMOS. DEP.]
 - Action recommended: None
- **Comment: P may be reasonable (0.74, 0.71, 0.60); small grain (0.64); FSS (0.60). If soil P history adds sufficient P to grow the crop.**
 - Response: P applications to crop are often low in many counties due to the recent decreases in inorganic phosphorus sales. This is consistent with other findings from USGS and the industry. If P soil history was added as an assumed input, the ratios would be higher.
 - Action recommended: None
- **Comment: Pasture for N & P looks high. Maybe some amount of N & P should be allocated from pasture to row crops.**
 - Response: Pasture applications beyond direct deposition are often very low except in counties with large amounts of manure relative to overall crop and pasture.
 - Action recommended: None

Commenter: Dave Montali

Date: April 25, 2017

- **Comment: Why does riparian pasture deposition plummet in PA between 2006 and 2011, only to recover between 2011 and 2013?**
 - Response: The significant decrease and later increase in PA's pasture deposition is directly due to a significant increase and later decrease in PA's historical record of stream exclusion practices. This inverse, direct relationship is illustrated in the figures below.
 - Action recommended: PA review historical data, and revise if necessary; **AMS may investigate default stocking rates used in riparian fencing equation.**



Commenter: Bill Keeling

Date: April 26, 2017

Subject: Animal Numbers

- **Comment: Populations and spatial distribution of animals should be improved using available data from the states. This has 3 components: 1) numbers and spatial distribution through the calibration period, 2) numbers and distribution for annual progress runs, 3) numbers both contributing to a LA and WLA for an allocation. Numbers 1 and 2 could utilize population data other than permit maximums, but states should be allowed to use permit maximums for number 3. Number 3 would allow states to treat the regulated agricultural load similar to permitted wastewater facility discharges.**
 - Response to 1 and 2: At its May meeting, the Agriculture Workgroup agreed to the following:
 - Collect percentages of animals that were raised inside and outside the watershed in counties which share a border with the watershed boundary; and
 - Collect percentages animals raised in each county to improve distribution of statewide animal populations to specific counties.
 - The AMS will consider the following rules if no data is provided by states:
 - Distribution percentages for previous years will be set to most recent future year.
 - Distribution percentages for future years will be set to most recent past year, and are subject to updating in the future.
 - Distribution percentages for years between known data points will be interpolated.
 - Response to 3: The AMS has no comment on how states determine wasteload allocations for the Phase III WIP process.
 - Action recommended: States may submit spatial distribution data by county to better distribute animal operations inside and outside of the watershed and from statewide total populations down to the county level.

Commenter: Alana Hartman

Date: May 4, 2017

Subject: Stream Restoration BMP

Comment: Will the Phase 6 Stream Restoration BMP calculations require use of the stream delivery ratios as they did in Phase 5?

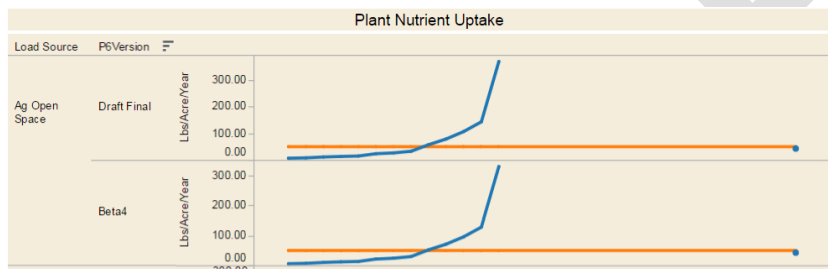
- Answer: No. The Phase 6 Watershed Model will calculate the stream delivery ratios separately. The Stream Restoration BMP technical appendix has been updated with this change.
- Action recommended: None.

Commenter: Chris Brosch

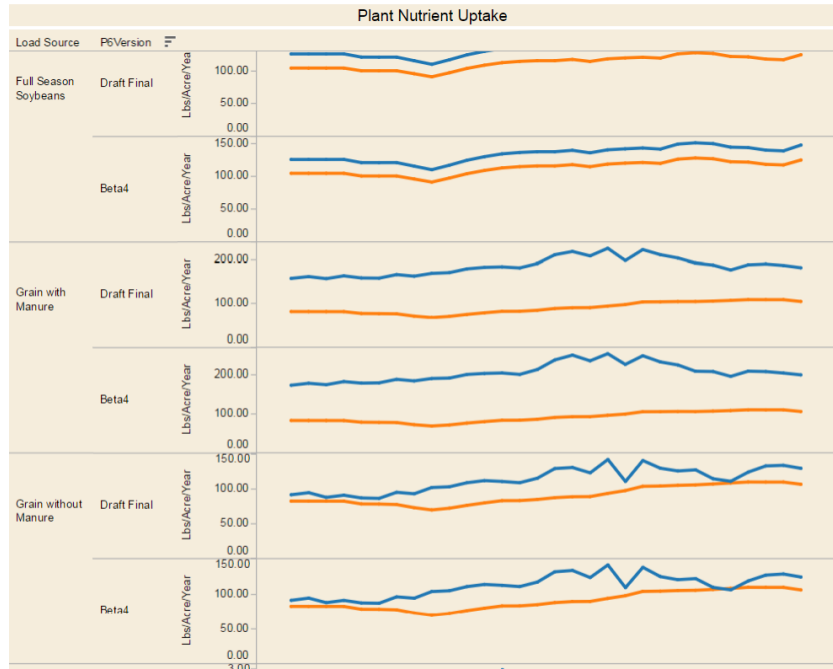
Date: May 8, 2017

Subject: Uptake and Application

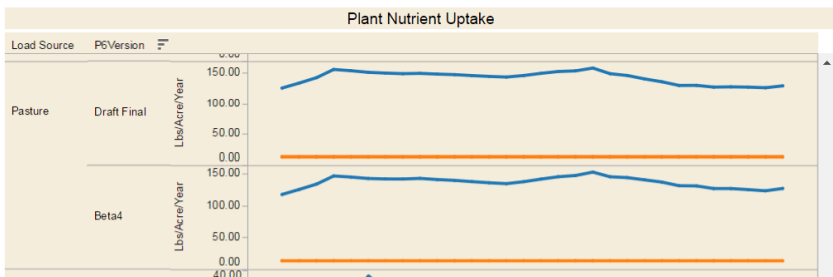
- **Comment: DE Ag open space inputs/outputs seems broken.**
 - Response: The only nutrient application to agricultural open space is atmospheric deposition.
 - Action recommended : CBPO Staff will review files behind Tableau, and fix any error found.



- **Comment: Uptakes across grain landuses seem far too low. Realistic gap is smaller on manure landuses.**
 - Response: Uptake is likely the incorrect term for this data for the major crops in Phase 6. The AMS approved the use of crop removal values in place of uptake for major crops. These data were derived from Meisinger and Randall, 1991. For example, uptake for corn for grain would be close to 1 lb of N/bushel of yield, yet removal, as displayed in the grain with manure land use depicted below was set at 0.73 lbs of N/bushel of yield.
 - Response: Removal is considered the same on grain with manure and grain without manure because the same crops make up these two land uses. However, the applications will differ. Those differences cause the gap between removal and application.
 - Action recommended: None



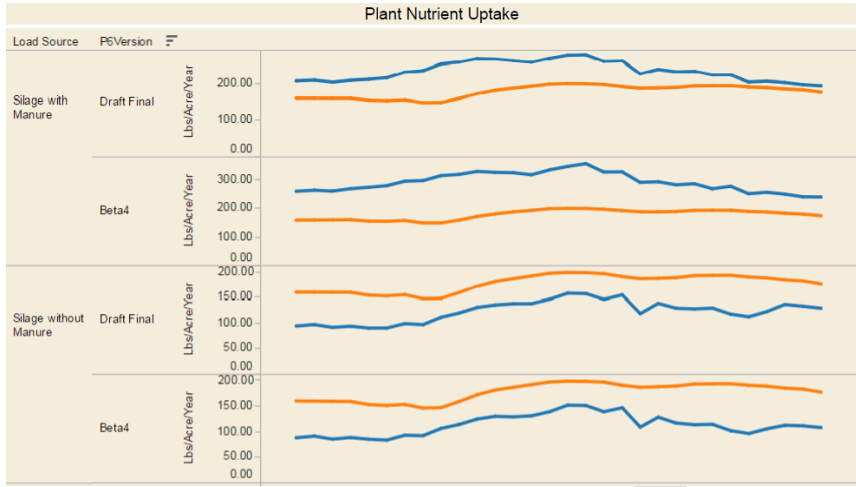
- **Comment: The incongruity of application and uptake is especially disconcerting when compared to pasture.**
 - Removal for pasture was set at 14.05 lbs of N/acre based upon 20 percent of crop removal set for alfalfa mixtures. Value for alfalfa mixtures was derived from the value reported for “Alfalfa Green Chop, Early Bloom,” in Meisinger and Randall, 1991.
 - The applications depicted here likely include direct deposition and atmospheric deposition, thus increasing the application rates considerably above what the AMS expects a producer would apply to pasture (approximately 15 lbs of N per acre).
 - Action recommended: None



- **Comment: Please explain the flip-flop of app and uptake in silage landuses. Is the conclusion that DE is starving all it's silage corn?**
 - Response: The uptake/removal in these two land uses do not differ. Yet the applications do. In areas with greater manure available, more nutrients will be applied to a silage crop that can receive manure than one that cannot.
 - Response: The application methods developed by the AMS do not seek to distinguish between crops which are starved vs. crops which receive adequate nutrients. The methods seek only to recognize trends in applications and yields over time. Because the model measures changes over time on each land use, it cares only how the gap between

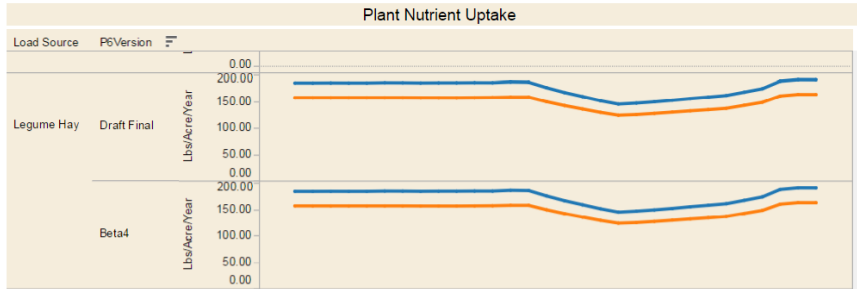
these two lines has changed for a single land use, not how one land use compares to another land use.

- Action recommended: None

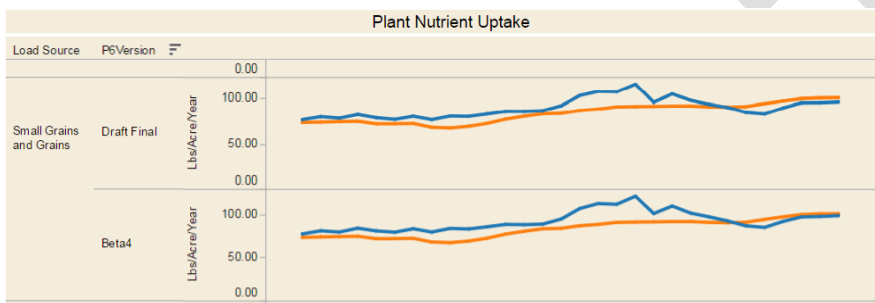


- **Comment: Leguminous Hay uptake should not “dip” for a period. This is unrealistic and calls into question uptake assumptions or use of the term “uptake.”**
 - Response: The crop removal for leguminous hay, and other land uses, can change over time as a result of changes in yields for crops within the land use. In the case of DE, there was an uptick in the reporting of the crop “Haylage or greenchop from alfalfa or alfalfa mixtures” beginning in the late 1990s as shown in the table below. This crop typically has a lower yield per acre than pure alfalfa hay, so the yield, applications and crop removal dipped as well.
 - Action recommended: None

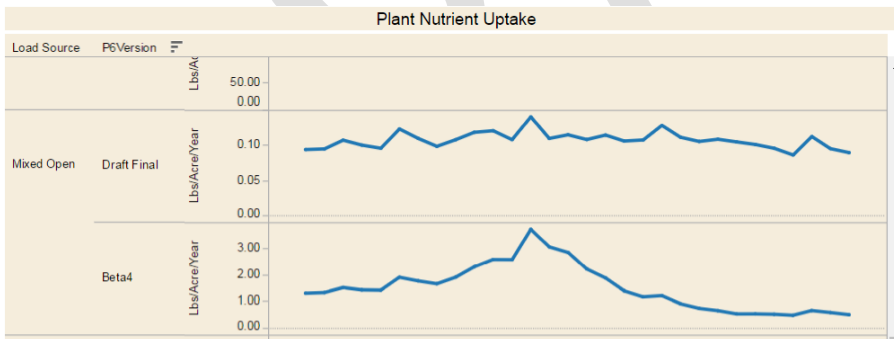
Year	Alfalfa Hay Harvested Area	Haylage or greenchop from alfalfa or alfalfa mixtures Harvested Area
1985	5,194	-
1986	5,643	-
1987	6,113	-
1988	5,553	-
1989	5,032	-
1990	4,539	-
1991	4,066	-
1992	3,611	-
1993	3,661	-
1994	3,715	-
1995	3,773	-
1996	3,835	-
1997	3,898	-
1998	3,808	410
1999	3,714	823
2000	3,615	1,240
2001	3,512	1,661
2002	3,397	2,082
2003	3,270	1,876
2004	3,135	1,665
2005	2,996	1,450
2006	2,852	1,232
2007	2,708	1,012
2008	2,869	907
2009	3,028	802
2010	3,184	699
2011	3,339	597
2012	3,492	497
2013	3,469	497



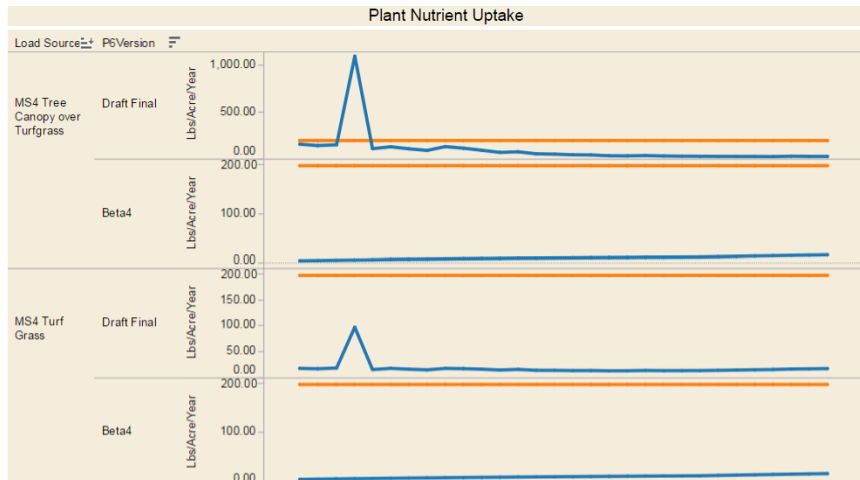
- **Comment: Small grain nutrient outputs should be a model for other ag landuses. This appears to be working quite well!**
 - Response: None needed.
 - Action recommended: None



- **Comment: Mixed open appears to be a major improvement!**
 - Response: None needed.
 - Action recommended: None



- **Comment: Turf grass of any landuse looks similar to below. Uptake is unrealistically high, especially compared to applied lbs. An under fed crop will have reduced uptake potential. The spike seen below, in early simulation needs to be explained.**
 - Response: This appears to be a mistake in the data which is being investigated by CBPO Staff.
 - Action recommended: Review and update by CBPO Staff



- **Comment: No screen shot, but Specialty is a mess too. Way too much volatility without obvious explanation.**
 - Response: Specialty is made up of a number of crops, and thus can vary in relative crop acreages significantly from one year to the next. This variability in crop acreages will absolutely result in variability in applications, yields and removal estimates.
 - Action recommended: None

Commenter: Bill Angstadt

Date: May 15, 2017

Subjects: Manure and fertilizer distribution; BMP sequencing; Regional factors; Soil P; and Complete Mass Balance

- **Comment: Is manure and fertilizer distributed on a reasonable number of acres given the following information?**
 - **Manured acres / Fertilizer acres (fertilizer with and without manure) / Fertilizer acres without manure from Phase 6 Model:**
 - **10,310,550 / 11,400,141 / 1,089,591 (9%) – source: 2013 ag landuse**
 - **2011 NRCS CEAP – 48% manured acres (Bay region)**
 - **Response:** CEAP was looking only at “cropped acres.” So we have to exclude pasture. Phase 6 2011 numbers actually break down extremely similarly to 2011 CEAP when pasture is excluded:
 - Manure Only Acres = 287,659 (3.4%);
 - Manure and Fertilizer = 3,983,648 (46.5%);
 - Fertilizer Only = 4,302,455 (50.2%)
 - Action recommended: None
- **Comment: Should Starter fertilizer be added to all Manured acres? Or does this distort N & P rates on non-manured acres?**
 - **Response:** Starter fertilizer is included on many manured acres, and is included on all grain and silage acres. The AMS debated whether or not starter fertilizer should be included for fear that it may distort the N and P rates on both manured and non-

manured acres. In the end, the AMS opted to keep starter. If starter were not included, then grain and silage without manure would receive more inorganic fertilizer.

- Action recommended: None
- **Comment: How are BMPs weighted against each land use edge-of-field (EOF) target load.**
 - **Response:** BMP efficiencies in Phase 6 are combined in a linear fashion and applied to a percent of land uses across a land-river segment. Example:
 - EOF Target TN Load for land use is 20 pounds
 - Two BMPs with 50% efficiencies submitted on 100 percent of acres
 - $\text{Target Load} \times [1 - (\text{Efficiency}_1 \times \text{Fraction of Acres of BMP}_1)] \times [1 - (\text{Efficiency}_2 \times \text{Fraction of Acres of BMP}_2)] = \text{EOF Post-BMP Load}$
 - $20 \text{ pounds TN} \times [1 - (0.5 \times 1)] \times [1 - (0.5 \times 1)] = 5 \text{ pounds TN}$
 - This same equation can be used to combine any number of efficiency BMPs.
 - Action recommended: None
- **Comment: Scenario Builder simulates EOF Loads, then BMPs are credited towards Edge-of-Small-Stream (ESS) calibration. Have the preliminary (2015) estimates of EOF Target Loads (ratios) been adjusted based on Scenario Builder (beta 6) simulated EOF loads?**
 - **Response:** BMPs are actually credited to the EOF loads. There is still a land-to-water factor applied from the EOF to ESS. These factors and the target loads are currently being adjusted as part of the calibration process based upon all the inputs provided by December 31, 2016.
 - Action recommended: None
- **Comment: Will regional factor adjustments (50-200% in Phase 5) be administered in Phase 6?**
 - **Response:** The objective is to have an adequate calibration without the need for additional regional factors. The Modeling Workgroup will review the calibration results this summer and address whether or not additional regional factors are needed.
 - Action recommended: None
- **Comment: Total lbs. Applied P is insufficient to meet Crop (Application) Goal.**
 - **Response:** Applications do not include phosphorus from soils, so it is not surprising that applications cannot keep up with yearly crop application goals in some years and counties.
 - Action recommended: None
- **Comment: Will Phase 6 documentation provide a complete mass balance of available P to crop (application) goal (soil P history)?**
 - **Response:** Applications do not include phosphorus from soils. Soil P history will instead be used to estimate future P runoff from acres as a result of changes in applications of fertilizer and manure, combined with estimates of countywide, soil P values produced by APLE. This process will be described in Chapter 3 of the documentation.
 - Action recommended: None
- **Comment: Will Phase 6 documentation provide a complete mass balance of available N to crop goal, including atmospheric N and legume fixation N?**
 - **Response:** Atmospheric deposition and legume fixation will be described in the documentation, and be included in future Tableau output. However, atmospheric deposition and legume fixation are not considered to impact the application goal for

crops. For example, the application goal for nitrogen to soybeans is 0.33 pounds of N/bushel-acre, while fixation for soybeans can exceed 200 pounds of N/acre.

- Action recommended: None

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