

Estimating Poultry Litter Nutrient Content and Generation

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Motivation

- EPA is using the 2003 ASAE Standard to estimate Nitrogen and Phosphorous generation from animal agriculture.
- The Standard is based on data from the late 1980's and early 1990's.
- The Agriculture Workgroup (AgWG) created the Poultry Litter Sub-Committee in 2011.
- Sub-Committee Charge:
 - Collect data that better reflects modern N and P generation from commercial poultry production.
 - Develop N and P generation trends and factors when possible with available historic data.
 - Provide recommendations to AgWG to improve modeling representation of poultry N and P generation within the watershed.

Committee Membership

| | |
|-----------------|-----------|
| Jim Glancey | UD |
| Mark Dubin | UM |
| Emma Giese | CBPO |
| Mark Davis | DDA |
| Tom Basden | WVU |
| Bill Brown | UD |
| Glenn Carpenter | USDA NRCS |
| Frank Coale | UM |
| Jason Dalrymple | WVDA |
| Doug Goodlander | PA DEP |
| Matt Johnston | CBPO |
| Bobby Long | VA DCR |

| | |
|-------------------|----------------|
| Jen Nelson | USDA NRCS |
| Jerry Ours | WVDA |
| Paul Patterson | Penn State |
| Jim Pease | VT |
| Royden Powell | MDA |
| Tim Sexton | VA DCR |
| Kelly Shenk | EPA |
| Trish Steinhilber | UM |
| Jeff Sweeney | EPA |
| Jennifer Timmons | UM |
| Jennifer Weld | PSU |
| Hank Zygmunt | Keith Campbell |

Our Interest

How much N and P is being generated within the Bay watershed from the poultry industry?

Pounds of N (or P) = (concentration) x (volume)

DDA Lab Analysis of Poultry Manure

2005 through 2011

| Year | No. Samples | Total N | | Phosphate (P2O5) | | Total P | |
|------|-------------|---------|---------|------------------|--------------|---------|-----------|
| | | % | lbs/ton | %P2O5 | lbs P2O5/ton | % P | lbs P/ton |
| 2005 | 462 | 2.93 | 58.6 | 2.23 | 44.7 | 0.98 | 19.5 |
| 2006 | 589 | 2.77 | 55.4 | 2.05 | 41.1 | 0.90 | 17.9 |
| 2007 | 522 | 2.86 | 57.2 | 2.36 | 46.4 | 1.03 | 20.2 |
| 2008 | 472 | 2.83 | 56.6 | 2.35 | 48.5 | 1.02 | 21.1 |
| 2009 | 721 | 2.77 | 55.5 | 2.24 | 44.7 | 0.98 | 19.5 |
| 2010 | 649 | 2.88 | 57.5 | 2.46 | 49.2 | 1.07 | 21.5 |
| 2011 | 743 | 3.02 | 60.3 | 2.45 | 48.9 | 1.07 | 21.3 |
| | 4158 | 2.86 | 57.3 | 2.31 | 46.2 | 1.01 | 20.2 |

(total No.
of samples)

averages

Summary of Poultry Data Sets Across the Watershed

- Delmarva
 - Chickens
 - Data Sets: 1996-1999, 2000-2005, 2006-2011
- Virginia:
 - Chickens, Turkeys
 - Data Sets: 2001-2005, 2006-2012
- West Virginia
 - Chickens, Layers, Pullets, Turkeys
 - Data Sets: 1996-1999, 2000-2005, 2006-2012
- Overall
 - 21 data sets summarizing over 8000 data points within the watershed.

Typical Data Set - Delmarva

Nutrient Content and Volume Generated - Chickens

| Parameter | Value |
|-------------------------|----------------------------|
| Time Range | 2006 to 2011 |
| No. of Data | 3696 |
| Avg. TN Concentration | 57.1 lbs/ton |
| TN Range* | 55.4 to 60.3 lbs/ton |
| Avg. TP Concentration | 20.1 lbs/ton |
| TP Range* | 17.9 to 21.3 lbs/ton |
| Moisture Content | 30.1 % w.b. |
| Moisture Content Range* | 28.0 to 32.1 % w.b. |
| Manure Generation | 1.5 tons/1000 birds |
| Manure Generation Range | 0.5 to 4.6 tons/1000 birds |

* Based on annual averages

Comments

- All manure samples analyzed by the DDA laboratory.
- Bird sizes: 60% roasters, 40% broilers
- Average bird weight = 7.1 lbs
- Manure generation based on a total of 702 poultry house cleanouts or crustouts
- Average NH₃-N = 10.6 lbs/ton (Range: 8.0 to 12.4 lbs/ton)
- 2012 data still being summarized by DDA

Comparison Across the Watershed – *Chickens*

2006-2012

Wet Basis

| Parameter | Units | Delmarva | Virginia | West Virginia |
|-------------------|----------------|----------|----------|---------------|
| Total N | lbs/ ton | 57 | 71 | 61 |
| Total P | lbs/ton | 20 | 15 | 20 |
| Manure Generation | lbs/1000 birds | 2,990 | 2,500 | 2,000 |
| Moisture | % | 30 | 27 | 33 |

Dry Basis

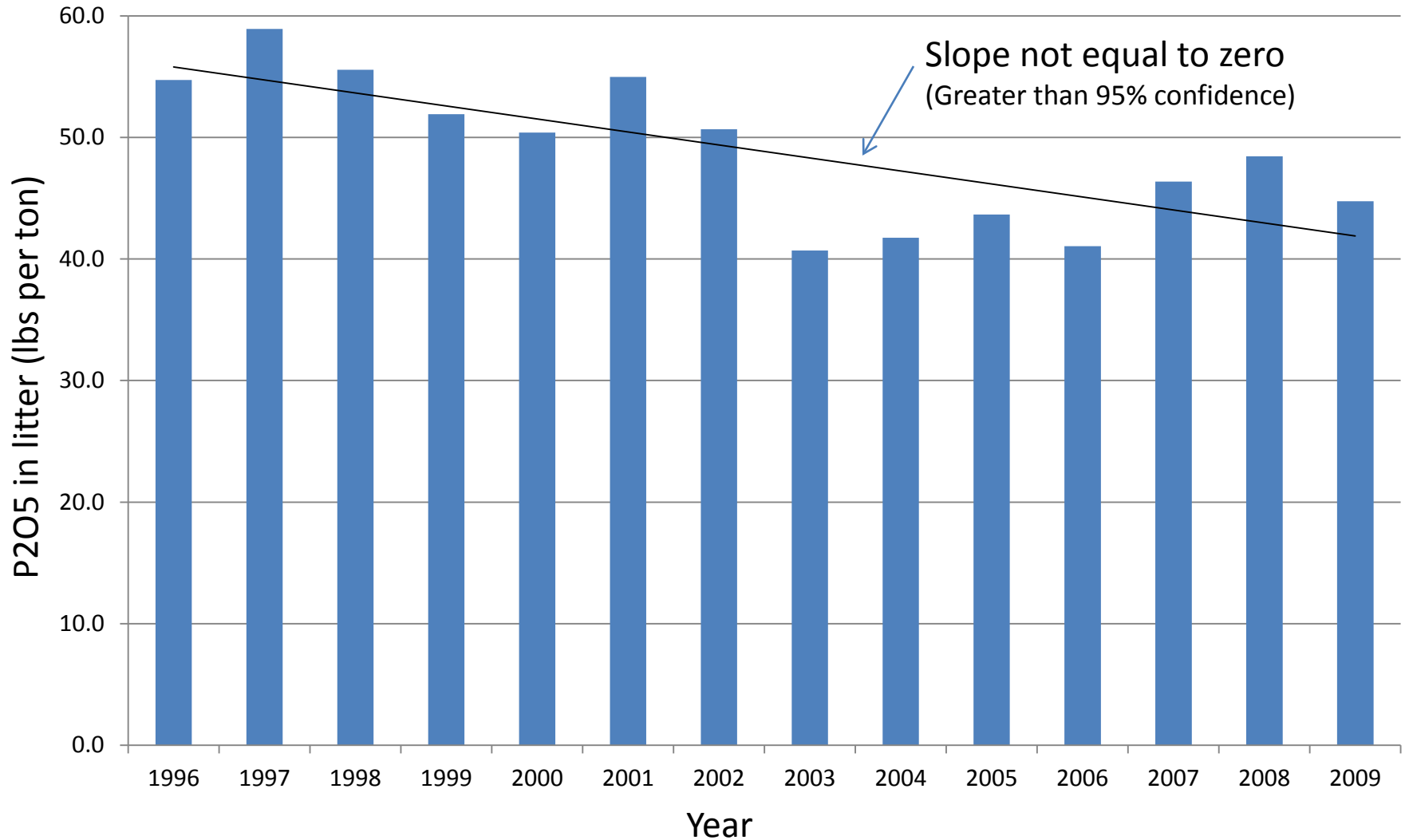
| Parameter | Units | Delmarva | Virginia | West Virginia |
|-------------------|----------------|----------|----------|---------------|
| Total N | lbs/ ton | 81 | 97 | 91 |
| Total P | lbs/ton | 29 | 21 | 30 |
| Manure Generation | lbs/1000 birds | 2086 | 1,825 | 1,340 |

Comparison Across the Watershed – *Chickens* 2006-2012

| Parameter | Units | Delmarva | Virginia | West Virginia |
|--------------|----------------|----------|----------|---------------|
| N Generation | lbs/1000 birds | 84.9 | 88.8 | 61.0 |
| P Generation | lbs/1000 birds | 29.8 | 18.8 | 20.0 |

Phosphorous Concentration Trend

Delmarva



Implications and Observations

- Genetics, feed technologies and improved growing environments have reduced waste produced from the poultry industry.
- Phosphorous Concentrations
 - Trending lower over time (statistically significant reduction from 1996 to today on Delmarva)
- Nitrogen Concentrations
 - No change on Delmarva
 - Increasing in Virginia and West Virginia

Current Status

- Chesapeake Bay Program modelers are working with us to better understand and integrate the data.
- Five of six states have (or are) collected regional data
 - N and P concentrations
 - Delmarva analyzed manure generation amounts from 800 poultry houses.
 - Modern production practices (bird sizes, flocks per year, etc.)
- Current request from the modeling group
 - Annual data rather than pre and post calibration time periods
 - Production practice data

Draft Recommendations

For the Current Model

- Data suggests a state/regional approach.
- All states excepting PA and NY have databases in place to track and report average N and P concentration data by bird type on an annual basis. PA is investigating data sources.
- PLS recommends to allow each state to report annual average N and P manure concentrations and manure generation volumes for their state/region.

Draft Recommendations cont.

- PLS recommends to directly utilize annual average N and P concentration data with manure generation data where available (where not available, the existing model data analysis would remain).
- The new annual concentration data would sub-plant the current model data and analysis assumptions based on excreted values, and replace BMP reductions associated with feed additives (Phytase), and litter amendments.
- The new manure volume data per 1k birds would be applied to the USDA-NASS Agriculture Census projected livestock populations to sub-plant the current manure volume assumptions.

Draft Recommendations

For the Next (v6.x) Model

- Develop new model data and analysis methods for representing poultry litter nutrient generation and volumes to calculate mass nutrients.
- Implement capacity in NEIEN for data reporting on annual average N and P concentrations by bird type by state/region.
- States responsible for collecting and reporting annual NEIEN data updates along with annual progress data.
- Update manure volume numbers as new data becomes available.

Summary

- CBP committee has summarized regional poultry litter nutrient and volume data.
- CBP committee recommendations are based on more than 8,000 data across the watershed.
- Differences exist between states/regions for both N and P concentrations as well as manure generation volumes.
- Needs:
 - Verification of data and observed trends.
 - Explaining observed trends in N and P concentrations and litter generation.
 - Better replicating actual production practices.

Questions?

Comments?