# Biosolids and the Phase 6 Model

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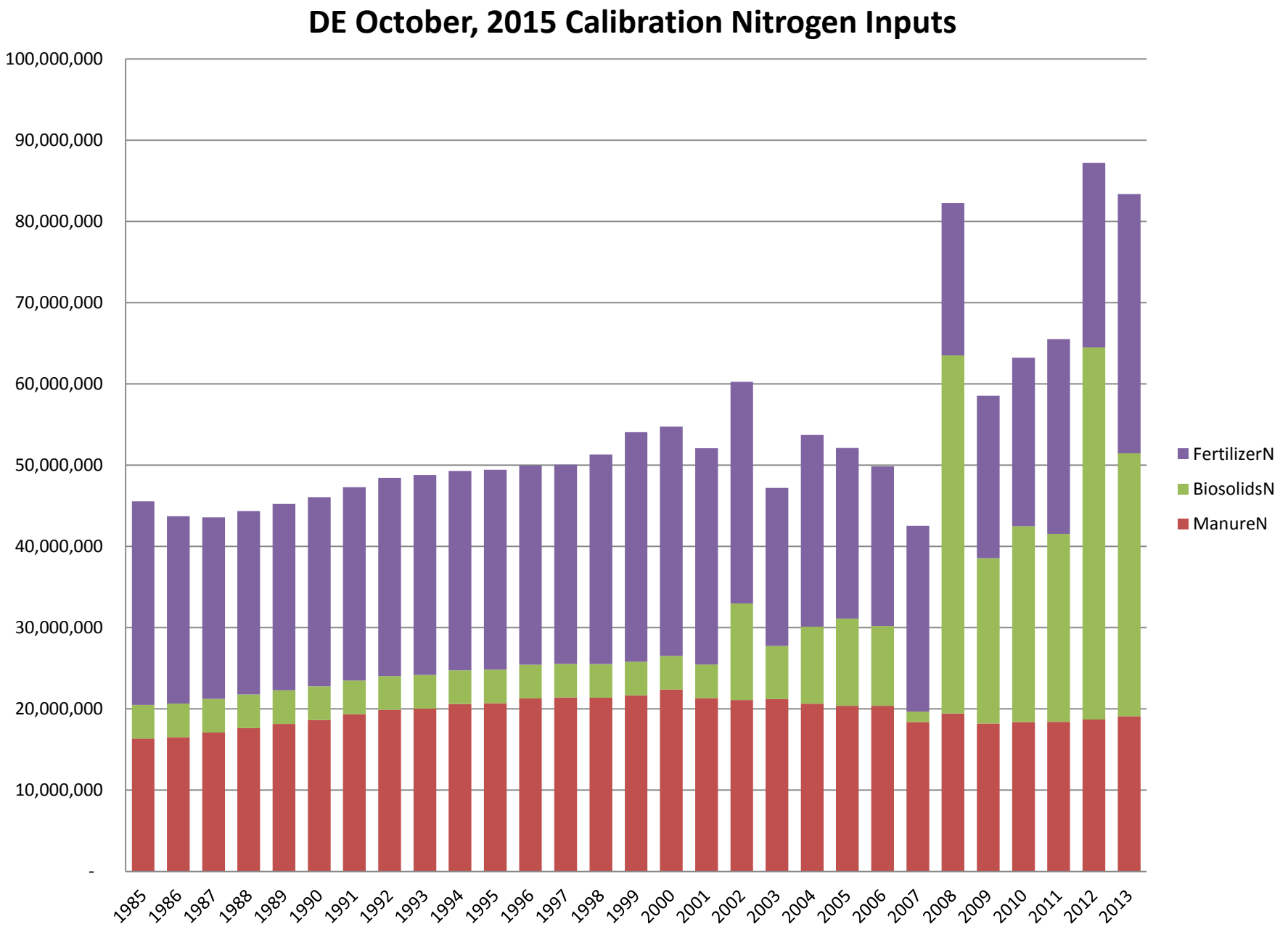
# Why Biosolids Matter

- Every county in every year has X pounds of biosolids, manure, fertilizer and crop need.
- Fertilizer inputs are estimated only AFTER manure and biosolids are accounted for.
- No biosolids or inaccurate biosolids data can result in very poor fertilizer inputs, and poor nutrient balances in general.


DE October, 2015 Calibration Nitrogen Inputs
100,000,000
90,000,000
80,000,000
70,000,000
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
-
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
FertilizerN
BiosolidsN
ManureN

# Manure Production and Concentrations

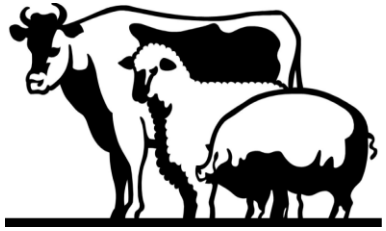
| Animal Type | Manure Source | Lbs Dry Manure/Animal/Yr | Lbs TN/Lb Dry Manure | LbsTP/Lb Dry Manure |
|---|---|---|---|---|
| Beef | Use Beef - Cow (confinement) from ASAE 2005 for manure values | 5,475.00 | 0.028788 | 0.006467 |
| Dairy | Use Lactating Cow, Dry Cow and Heifer from ASAE 2005 for manure values | 4,404.33 | 0.042221 | 0.006764 |
| Other Cattle | Use average of Beef and Dairy from above to estimate manure values | 4,939.67 | 0.035504 | 0.006616 |
| Horses | Use average of Horse- Sedentary and Horse - Intense Exercise from ASAE 2005 for manure values | 3,102.50 | 0.031672 | 0.005941 |
| Hogs for Breeding | Use Gestating Sow and Lactating Sow ASAE 2005 for manure values | 657 | 0.070273 | 0.019417 |
| Hogs for Slaughter | Use Grow-Finish from ASAE 2005 for manure values | 120 | 0.083333 | 0.014167 |
| Sheep and Lambs | Use ASABE 2003 for manure values | 240.9 | 0.038182 | 0.007909 |
| Goats | Use ASABE 2003 for manure values | 680.91 | 0.034615 | 0.008462 |

- **Lbs of Biosolids and nutrients are provided directly by jurisdictions**

- Poultry litter estimates vary by year and are explained in detail in the PLS report located at http://www.chesapeakebay.net/channel_files/22429/recommendations_to_estimate_poultry_nutrients_for_phase_6_model_03062015.pdf.
- ASABE, 2003. ASABE D384.1: Manure Production and Characteristics. February, 2003. American Society of Agricultural Engineers. St. Joseph, MI.
- ASAE, 2005. ASABE D384.2: Manure Production and Characteristics. March, 2005. American Society of Agricultural Engineers. St. Joseph, MI.

# Phase 6 Scenario Builder Conceptual Model

**Livestock Manure (and Biosolids)**



**Barnyard**

**Fertilizer**

**Nutrient Application Prescription**


**Pasture**

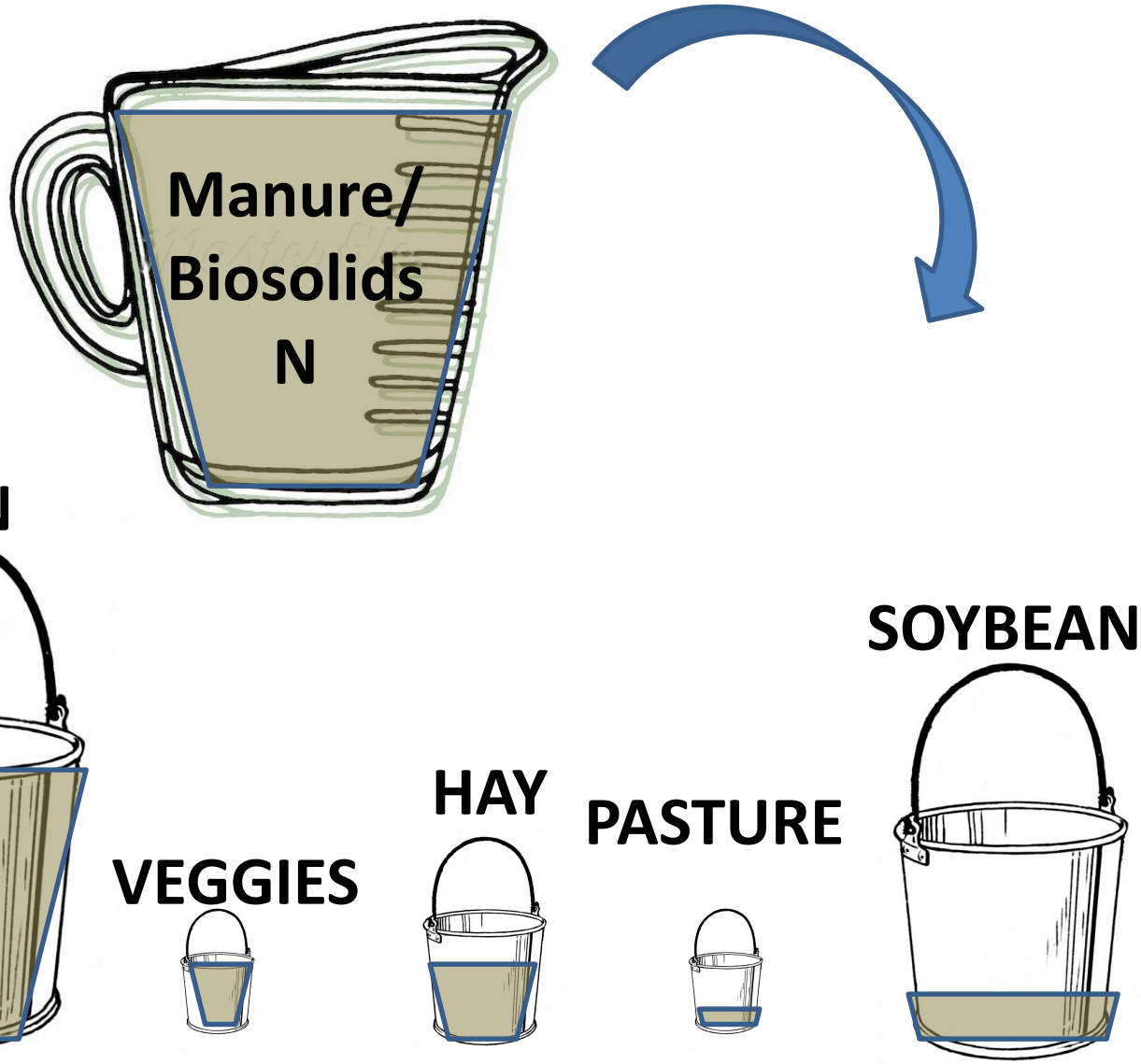
**Access Area**

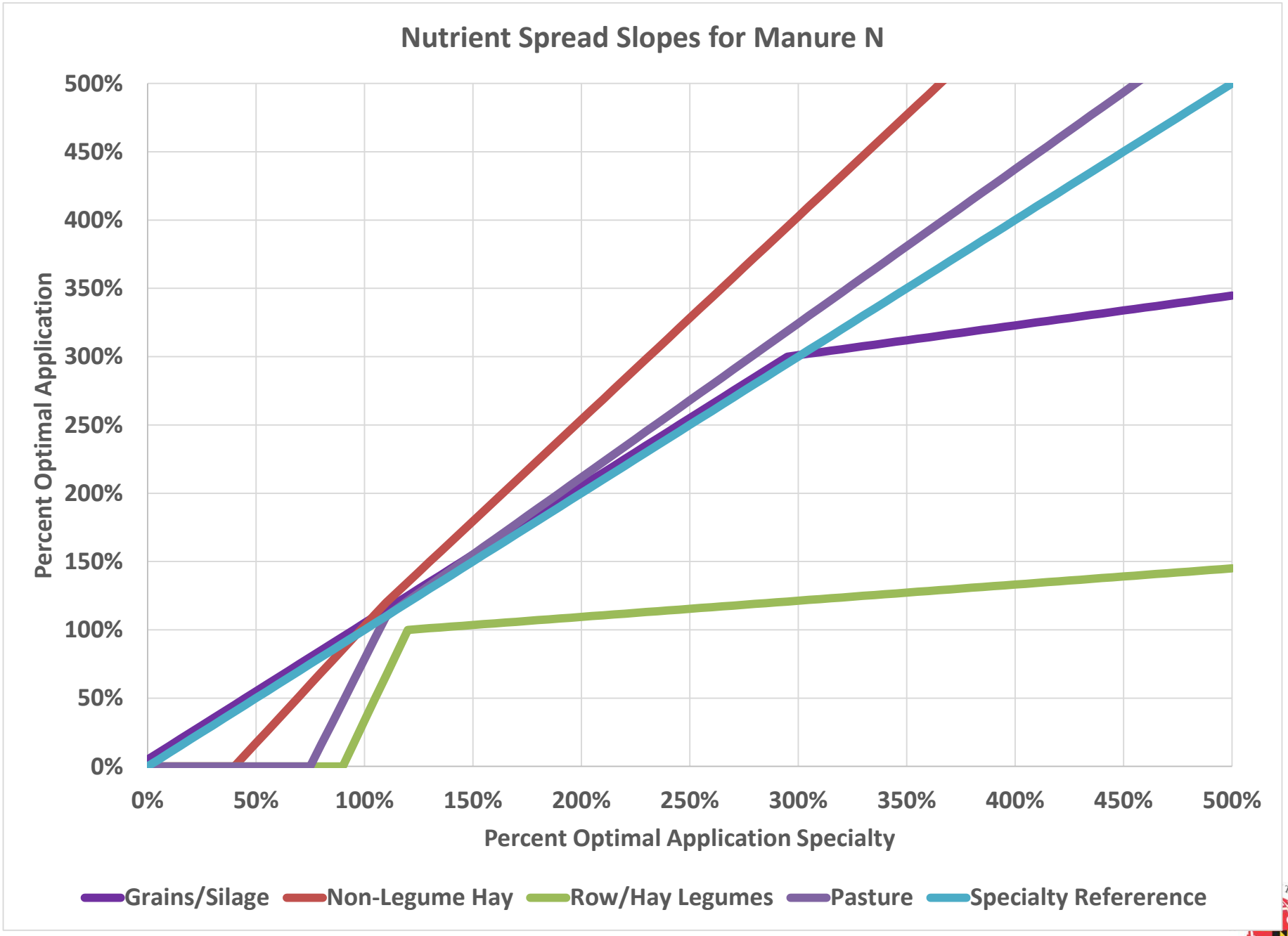
**River**

**Crops**

Image Credits
https://utextension.tennessee.edu/lincoln/4-H/Pages/Livestock-Skillathons-%28Beef,-Sheep-and-Swine%29.aspx
Rebelwoodsranch.com
Seaburst.com
http://pubs.ext.vt.edu/442/442-308/442-308.html
http://nh.water.usgs.gov/project/champlain_bmp/ag.htm

# Filling the Buckets of Application Goal




Nutrient Spread Slopes for Manure N
Percent Optimal Application
500%
450%
400%
350%
300%
250%
200%
150%
100%
50%
0%
0%
50%
100%
150%
200%
250%
300%
350%
400%
450%
500%
Percent Optimal Application Specialty
Grains/Silage
Non-Legume Hay
Row/Hay Legumes
Pasture
Specialty Refererence

# Needs

- Review of existing data and rules for establishing defaults if the data was not submitted
- Better biosolids data to improve nutrient balances and remove variability (unless it actually exists)
- One-size-fits-all approach to biosolids applications (think curves, but other approach may work)

# Potential Rules

- Gather actual data for as many years as possible.
- Interpolate between two years if complete data is not available.
- Determine a start date when biosolids applications likely began. Estimate starting amount based on any data available (like most recent year), and interpolate between.
- Use average, countywide or statewide concentrations if concentrations aren't provided for a given location in a given year.
- Assume the same county distribution through time if no other information is available.
- Regardless of the rules chosen, all methods and results should be presented to this group for review to ensure consistency across states.

# Timeline

- March 18 – Deadline for revised data for April calibration run.
- June 3 – Deadline for revised data AND application rules for July calibration run.
- Let’s not go past June 3! If we do, then we won’t have time to assess errors before the final calibration run late in 2016.