

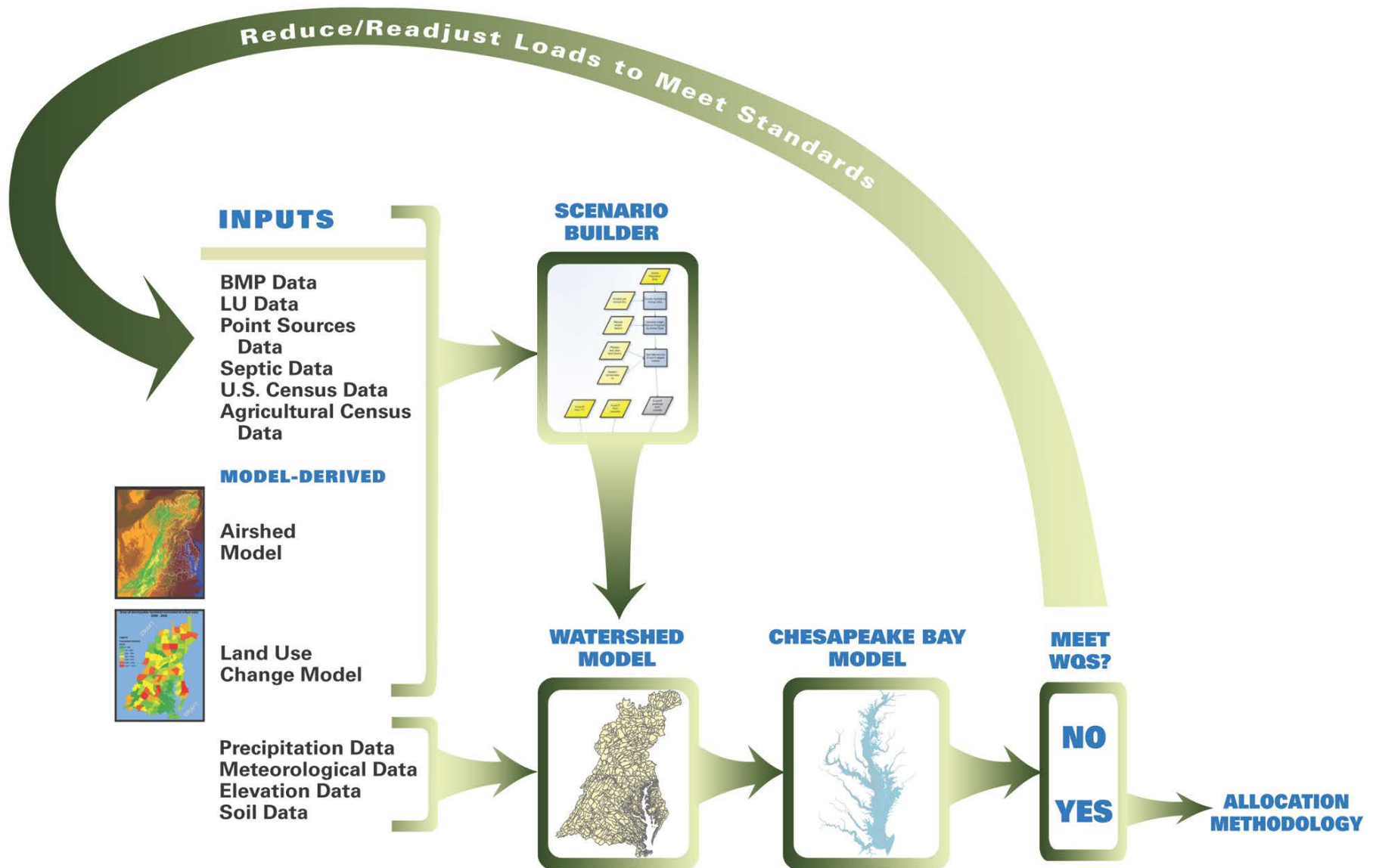
# **Poultry Production and Nutrients in the Model**

Chesapeake Bay Program Agricultural Workgroup's  
Building a Better Bay Model Workshop  
05/23/2013

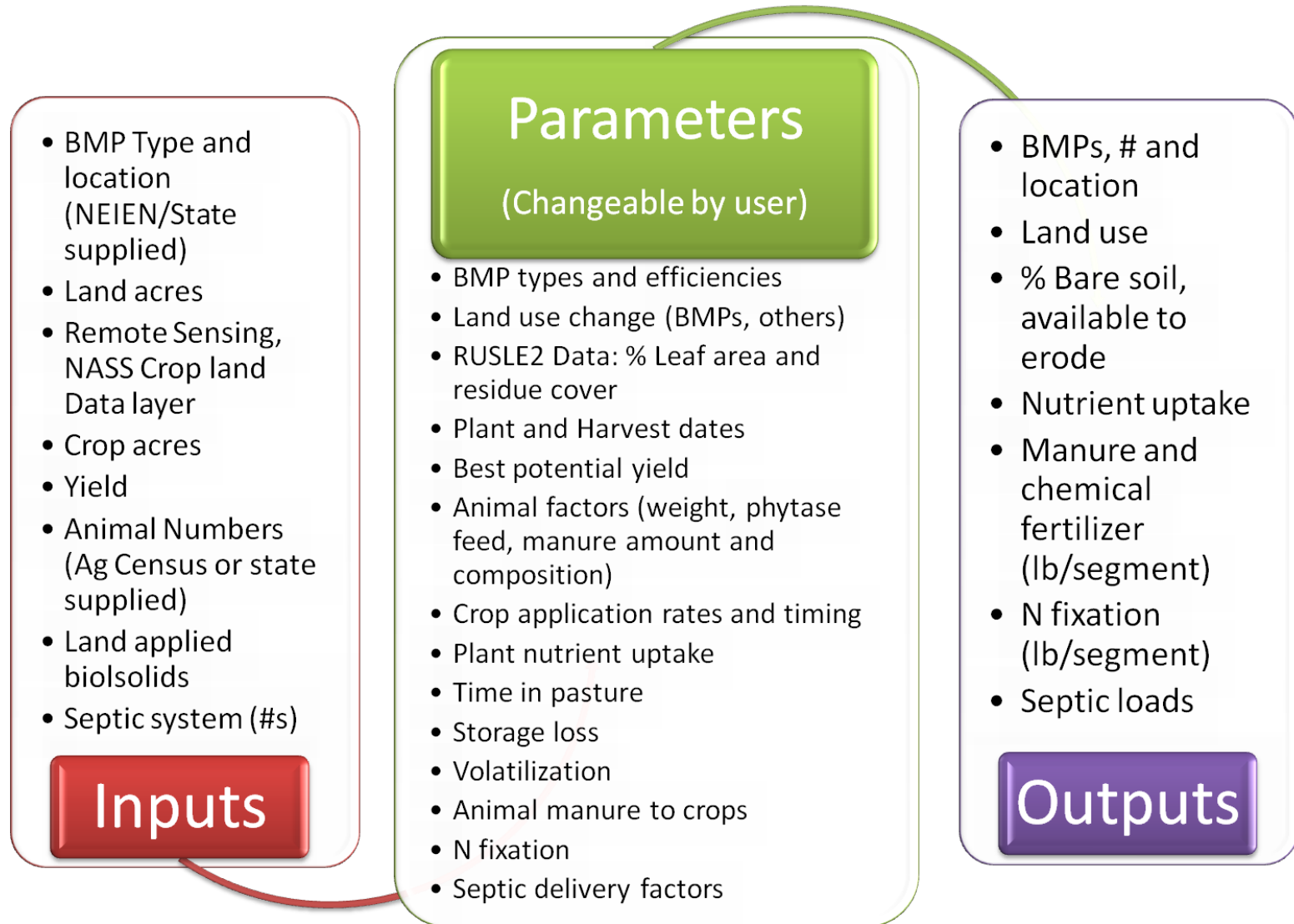
Matt Johnston  
Chesapeake Bay Program's Non-Point Source Data  
Analyst

Photos and graphics courtesy of USDA Image Gallery and CBP

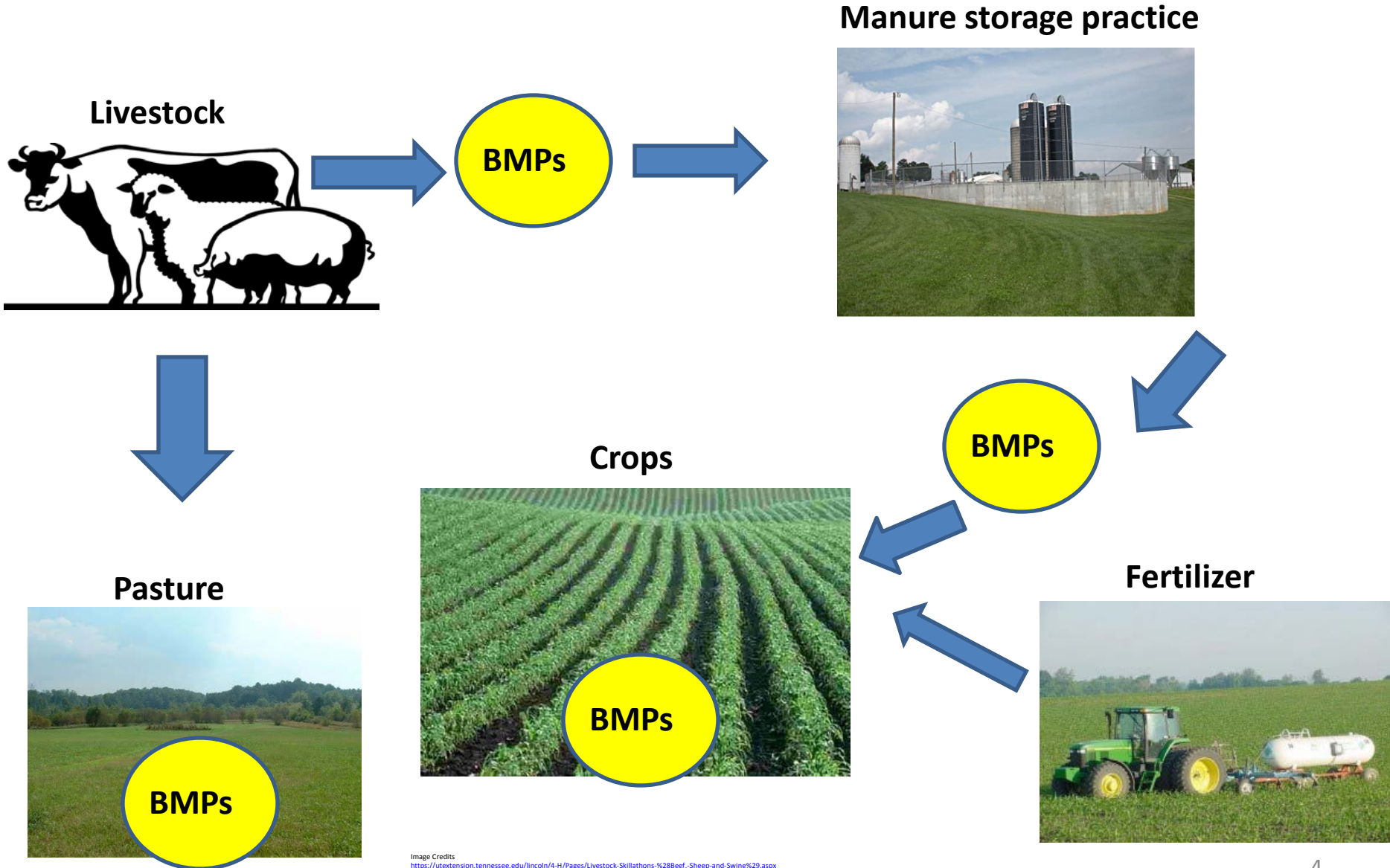
# Chesapeake Bay Program Modeling Tools



# Scenario Builder Data Inputs and Outputs



# Scenario Builder



# Nutrient Generation by Poultry

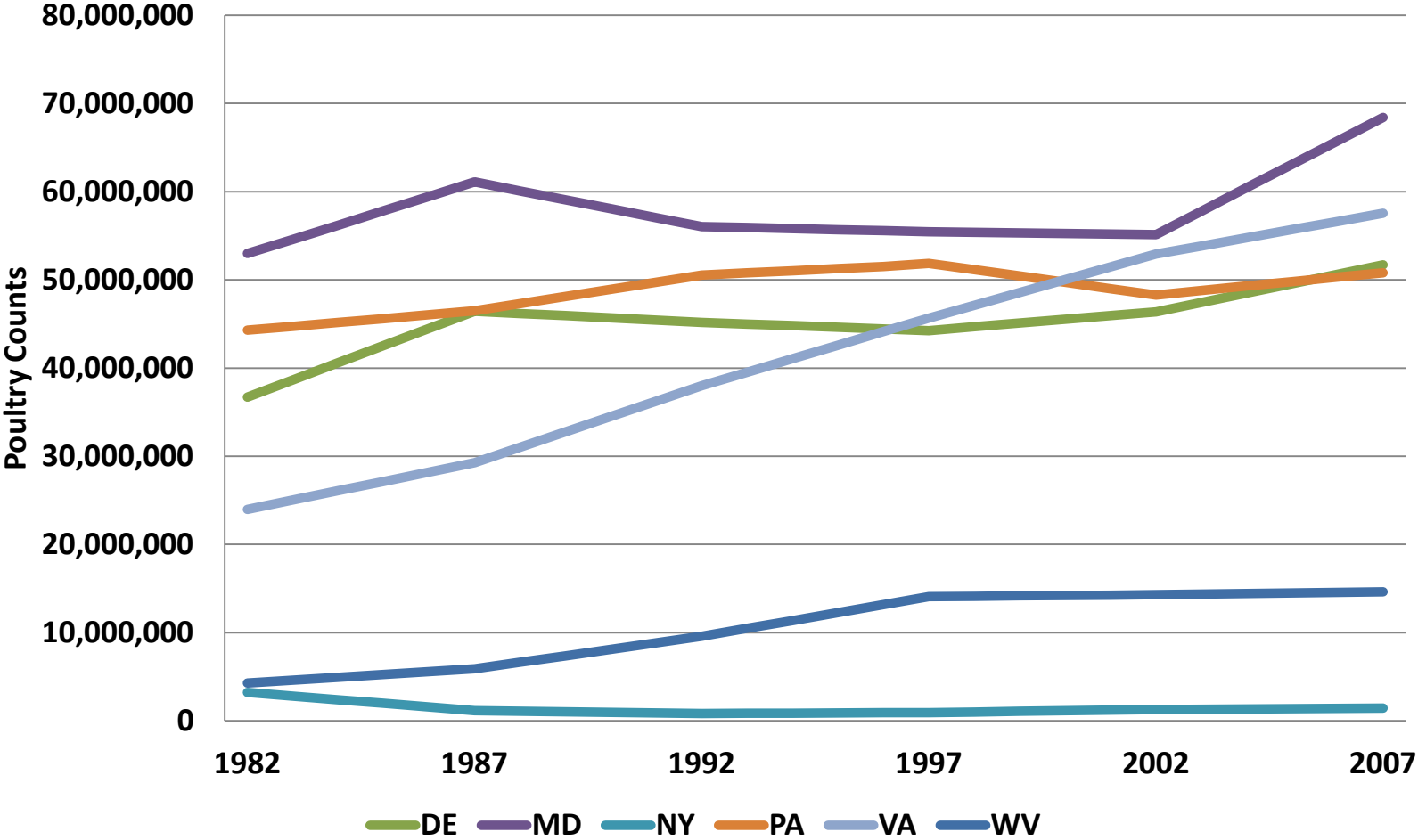
**Number of  
Birds in  
County**

- Lbs Live Weight of Birds
- Lbs Manure Produced/Bird/Day
- Days of Manure Production
- Lbs of Nutrient Species/lb of Manure
- Phytase Reductions to Nutrients
- Moisture Content
- Ammonia Volatilization Rate
- Ammonia Emissions Reductions
- Storage and Handling Loss
- Animal Waste Management Practices
- Manure Transport

**Lbs  
Phosphorus**

**Lbs  
Nitrogen**

# Inventoried Poultry Counts Through Time



# Census of Agriculture Inventory Data

- The guide to the USDA's 2012 Census of Agriculture directs producers to report **“inventories of all poultry including layers and all meat-type birds on this operation regardless of ownership on December 31, 2012.”**

**SECTION 18 POULTRY**

1. Did you or anyone else have any poultry, such as chickens, turkeys, ducks, emus, ostriches, etc., on this operation in 2012? Include poultry grown for others on a contract basis.

1217 1  **Yes - Complete this section**      3  **No - Go to SECTION 19**

		Number on this operation December 31, 2012	Total number sold or moved from this operation in 2012
<b>2. CHICKENS</b>			
a. Broilers, fryers, and other chickens raised for meat production, including capons and roasters. . . . .	0898	<input type="checkbox"/>	
b. Table egg layers – Include those for home use . . . . .	1229	<input type="checkbox"/>	
c. Hatching layers for meat-types – Include layers for broilers, roasters, and other meat-types . . . . .	1231	<input type="checkbox"/>	
d. Hatching layers for table eggs . . . . .	1233	<input type="checkbox"/>	
e. Pullets for laying flock replacement . . . . .	1221	<input type="checkbox"/>	
<b>3. TURKEYS</b>			
a. Turkeys raised for meat production – Exclude breeders . . . . .	1225	<input type="checkbox"/>	
b. Turkey hens and toms kept for breeding . . . . .	1227	<input type="checkbox"/>	
c. Turkey brooders, immature birds for further growout on another farm. . . . .	1219	<input type="checkbox"/>	

# Kellogg et. al (2000) and ASAE (2003)

- Average Lbs Manure Excreted/AU/Day
  - Average Lbs Live Weight
  - Average Lbs Solids Excreted/AU/Day
  - Average Lbs Total Phosphorus Excreted/AU/Day
  - Average Lbs Total Nitrogen Excreted/AU/Day
  - Average Lbs Ammonia Excreted/AU/Day
- 
- ASAE. 2003. Manure Production and Characteristics In ASAE Standards. D384.1. St. Joseph, MI. pp. 683-685
  - Kellogg, R.L. et al., 2000. Manure nutrients relative to the capacity of cropland and pastureland to assimilate nutrients: Spatial and temporal trends for the United States. Proceedings of the Water Environment Federation, 2000 (16), 19-157.



# Poultry Manure Nutrient Concentration Data

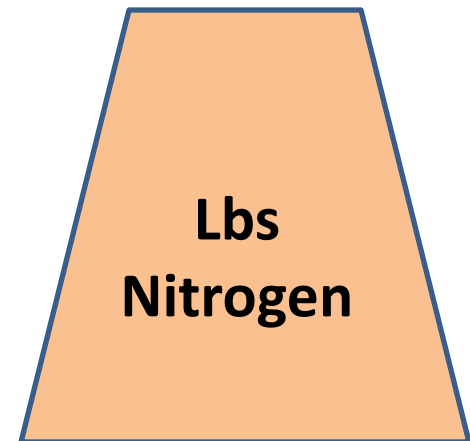
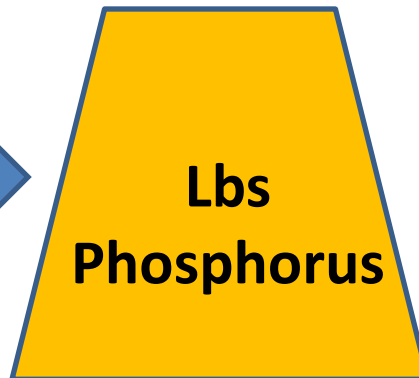
<b>Bird Type</b>	<b>Lbs manure/day/AU</b>	<b>Lbs TN/lb manure</b>	<b>Lbs TP/lb Manure</b>
<b>Broilers</b>	<b>85</b>	<b>0.0129</b>	<b>0.0035</b>
<b>Layers</b>	<b>64</b>	<b>0.0131</b>	<b>0.0047</b>
<b>Turkeys</b>	<b>47</b>	<b>0.0132</b>	<b>0.0049</b>
<b>Pullets</b>	<b>46</b>	<b>0.0136</b>	<b>0.0053</b>

# Poultry BMPs

- Poultry Phytase
- Poultry Litter Treatment
- Biofilters
- Mortality Composters
- Loafing Lot Management
- Barnyard Runoff Control
- Animal Waste Management Systems
- Poultry Litter Injection (Interim)

# Generating the Piles

- 1) Convert Inventory to Animal Units (1,000 lbs)
- 2) Multiply AU by Lbs Manure/Day
- 3) Multiply Total Lbs Manure/Day by Nutrient Species



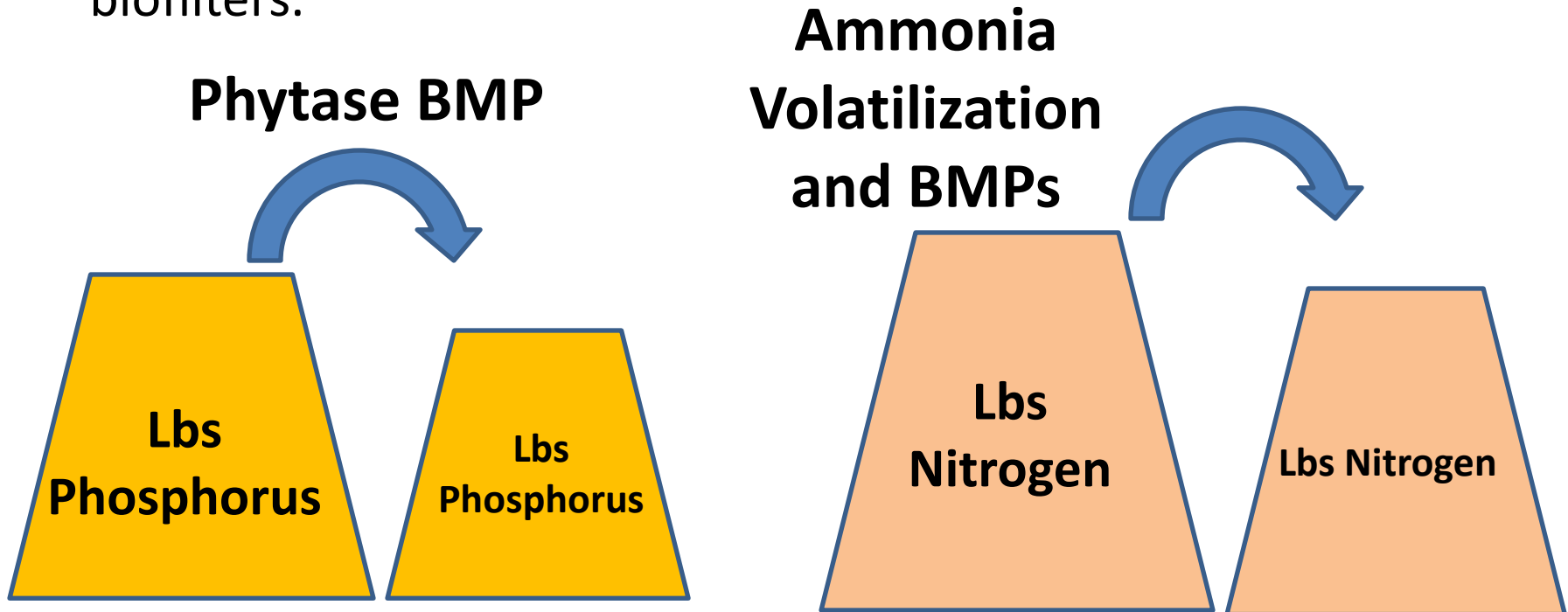
# AFO/CAFO Land Uses

Farm Animal Type	Acres per farm
Cattle and Calves	0.5
Total Hogs and Pigs	0.2
Any Poultry	0.25
Sheep and Lambs	0.1
Milk Goats	0.05
Angora Goats	0.05

- AFO/CAFO land uses are meant to simulate production areas upon which stored manure can be lost from storage and transportation.
- Acres are not defined by number of animals. Census of Agriculture farm counts by animal type are multiplied by fractions in table to achieve animal production area acreages.

# Reducing the Nutrient Piles

- Nutrients generated are reduced through the poultry phytase BMP.
- Nutrient piles are altered through natural ammonia volatilization, poultry litter treatment (like alum) and biofilters.

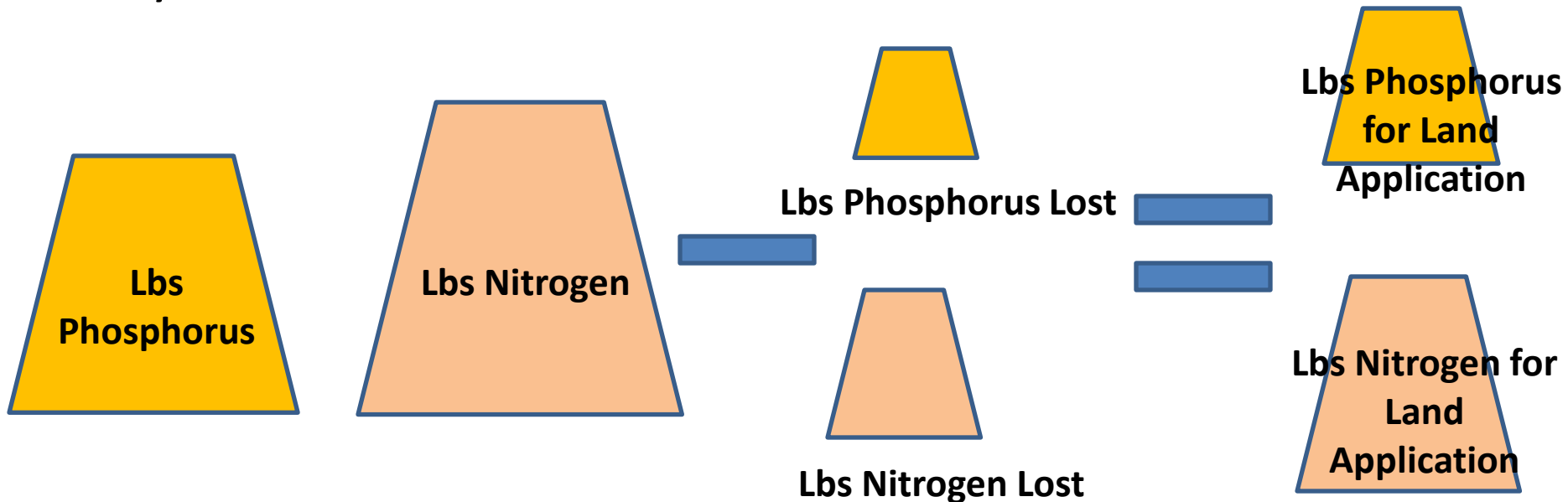


# Poultry Phytase BMP

- States began reporting poultry phytase reductions in the mid-late-1990s.
- Post-2002, poultry phytase implementation resulted in a 16.25% reduction in phosphorus generated by broilers and turkeys and a 21% reduction in phosphorus generated by layers and pullets.
- The Poultry Litter Subcommittee is currently investigating the changes in poultry litter nutrient concentration over time.

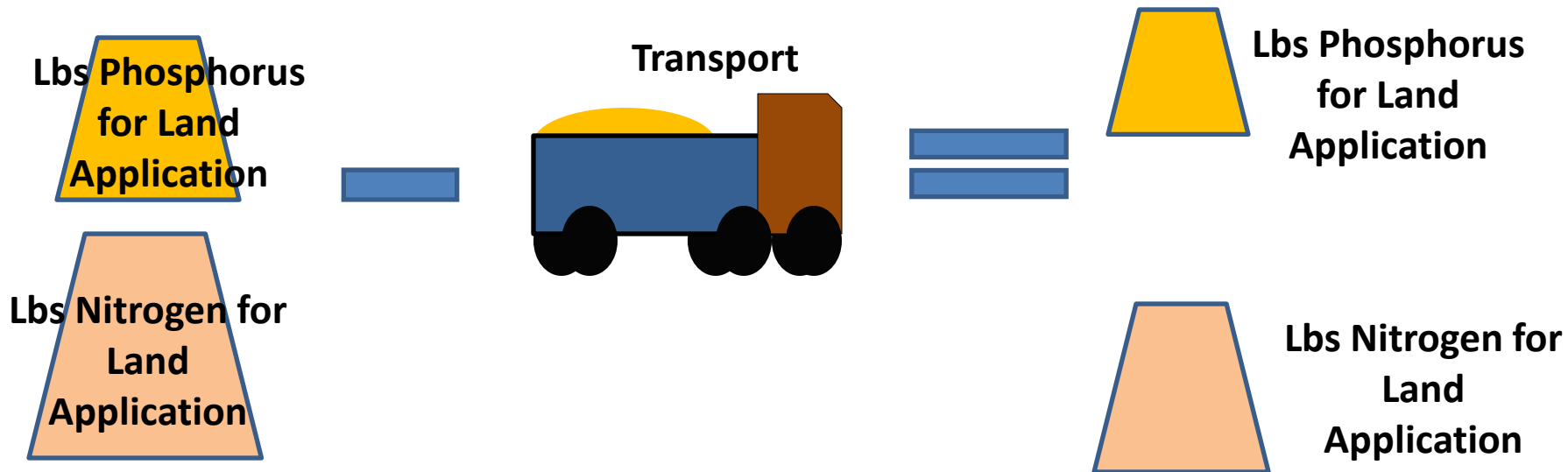
# Storage and Handling Loss

- All poultry manure piles are assumed to have a 15% loss of manure to the barnyard/production area.
- This becomes the load to the AFO/CAFO land use.
- Loafing lot management, barnyard runoff control, mortality composting and animal waste management systems reduce the amount of manure lost to this land.



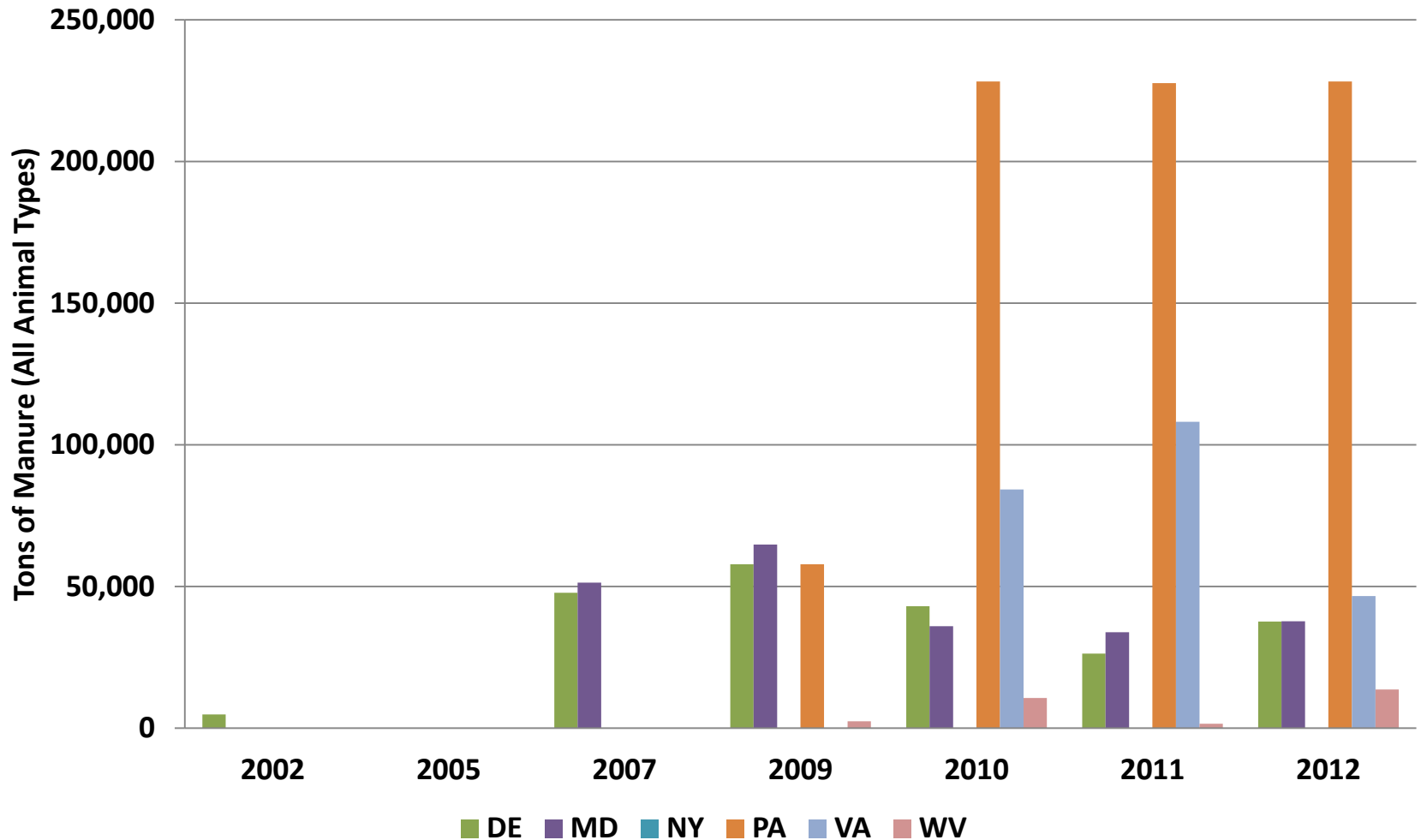
# Manure Transport

- Manure generated in a county is assumed to be available for crops in that county and nowhere else.
- Manure Transport reduces the manure available for crops in one county by shipping it to another county.



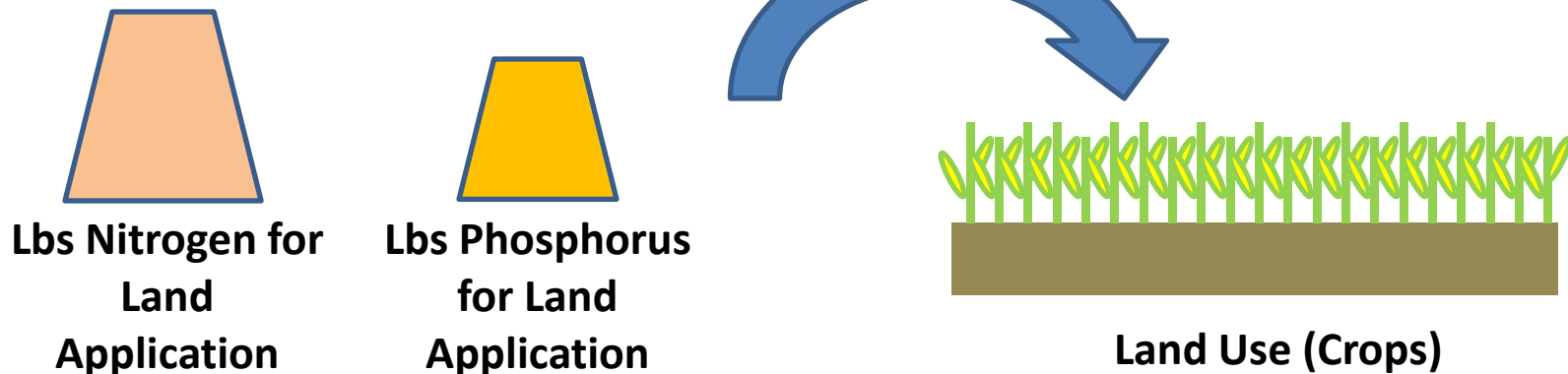


# Manure Transport Through Time



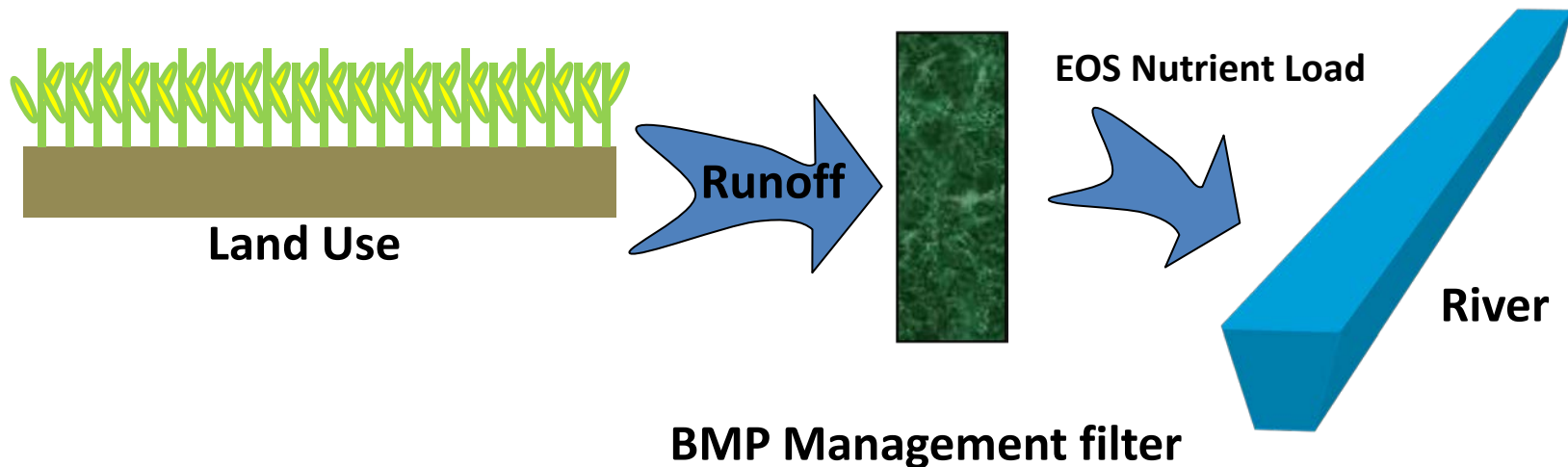
# Distributing the Manure

- Nutrient Types include biosolids, manure and fertilizer.
- Manure has nutrients not available for plant need.
- Fertilizer is assumed to be 100% available for plant need
- Order by Nutrient Source
  1. Fertilizer (to fulfill inorganic need as defined by agronomic guides per crop)
  2. Direct excretion
  3. Biosolids (to NM land first if available)
  4. CAFO Manure (to NM land first if available)
  5. AFO manure
  6. Fertilizer (to supplement remaining need)
  7. Disposal sequence



# Poultry Litter Injection

- Poultry litter injection is an interim BMP not yet approved for yearly Progress reporting.
- This BMP reduces the export of nutrients from the land.



# Nutrient Concentration Data

- Nutrients applied to the land do not equal nutrients excreted by birds. Many BMPs alter the amount of nutrients applied.
- Changes in nutrient concentration data require additional data assumptions to convert values to Scenario Builder's as-excreted methods.