

# Animal Manure Management in the Chesapeake Bay Watershed:

## *New Opportunities to Meet Nutrient Load reduction Goals*

FPPC Chesapeake Bay Summit

Ernie Shea

March 25, 2011

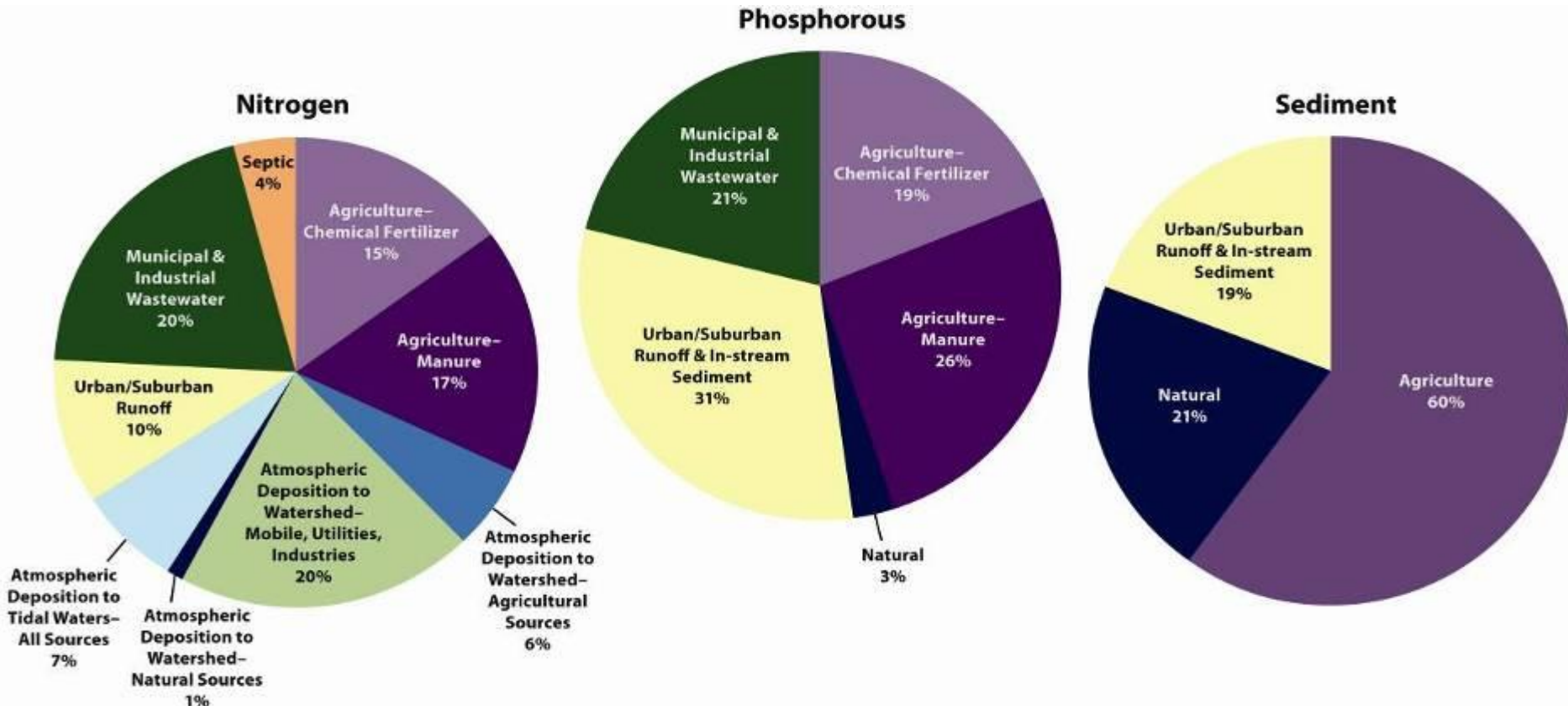


# Project Overview

- Exploration of emerging technologies and markets that can capture excess nutrients and create value added products.
- Funded by the Campbell Foundation
- Led by a steering committee composed of respected agricultural and conservation leaders.
- Four Components:
  - Technology scan
  - Review of innovative projects
  - Review of innovative national and state programs
  - Outreach sessions with farmers, service providers, partners and government officials

# Main Sources of Bay Pollution

- Agriculture – animal manure, commercial fertilizer
- Urban/suburban runoff – a growing problem
- Air pollution – tailpipes, power plants
- Wastewater – sewage treatment plants



**Note:** Does not include loads from tidal shoreline erosion or the ocean. Urban/suburban runoff loads due to atmospheric deposition are included under atmospheric deposition loads. Wastewater loads based on measured discharges; other loads are based on an average hydrology year using the Chesapeake Bay Program Airshed Model and Watershed Model Phase 4.3 (CBPO, 2009).

# Our Challenge

- Approximately 17% of nitrogen load and 26% of phosphorous load entering the bay comes from animal manure
- Given the diversity of animal agriculture operations in the watershed, find economically viable ways to use best management practices and emerging technology to meet environmental and production goals

# Animal Manure

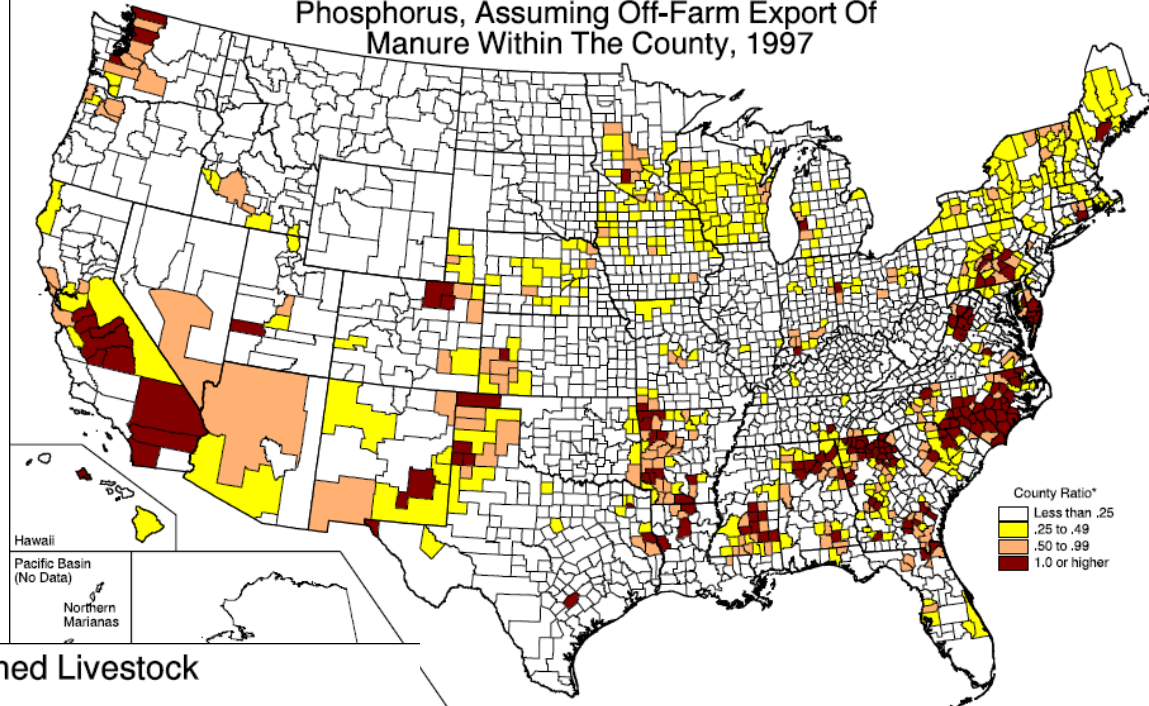
- One of a farmer's most valuable resources;
- Where available manure exceeds that which is required to support crop production, soil, water and air quality can be impaired.



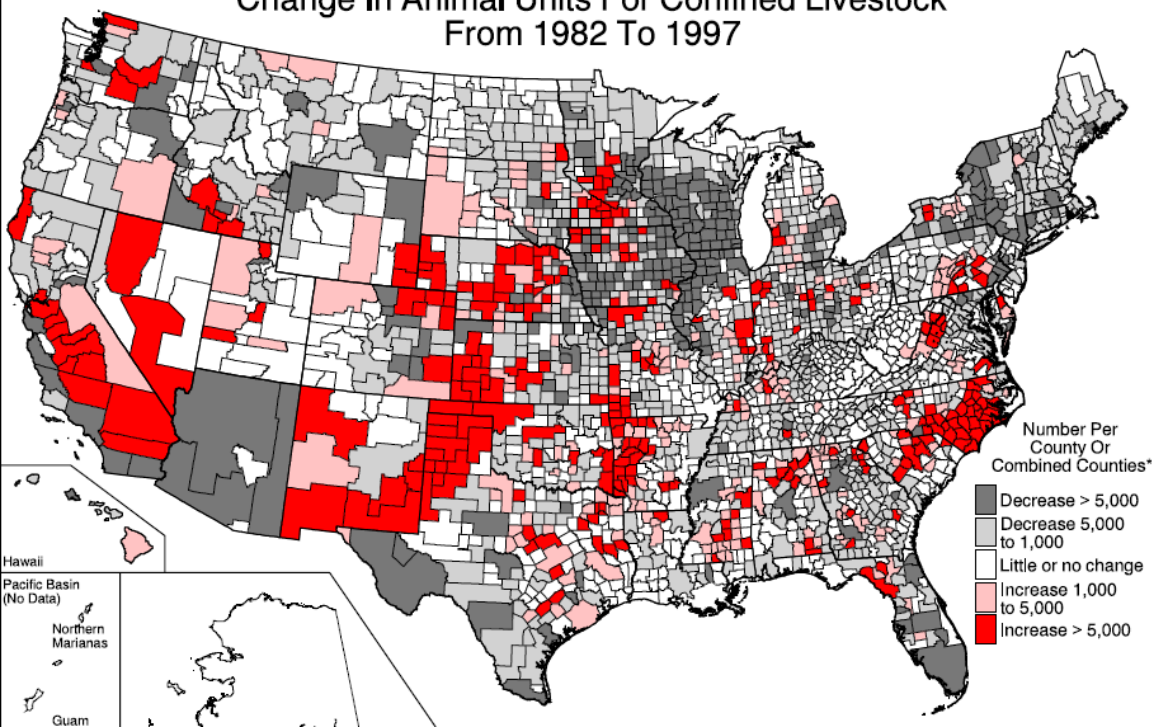
# What is the problem?

Too many nutrients accumulating in the watershed

Ratio of Manure Available For Land Application To Assimilative Capacity For Phosphorus, Assuming Off-Farm Export Of Manure Within The County, 1997



Change In Animal Units For Confined Livestock From 1982 To 1997



Distribution and proper utilization of nutrients!!!

# Key Findings

- Land application is still the primary method of managing manure in the watershed
- Long term application of manure and poultry litter has resulted in the accumulation of nutrients in excess of plant requirements (Phosphorous)
- Where adequate cropland is not available for land applying, the need exists to transform the manure and concentrate/relocate nutrients.

# Key Findings

- A number of technologies can be **combined** to provide nutrient *and* energy recovery
  - Anaerobic Digestion
  - Thermo-chemical conversion
  - Composting
  - Pelletizing
  - Solid Separation and Nutrient Capture

# Manure to Energy

## ■ Anaerobic Digestion

- Various types used to generate biogas primarily for heat or electricity generation;
- Does not by itself result in nutrient reduction; however as a unit process, can help fund an integrated system via revenue/credits;
- Solids after digestion used for dairy bedding
- Not currently a predominant technology in the watershed; some are pursuing co-digestion (i.e. combining with food waste)
- Lack of favorable power purchase agreements with utilities a deterrent.

# Manure to Energy

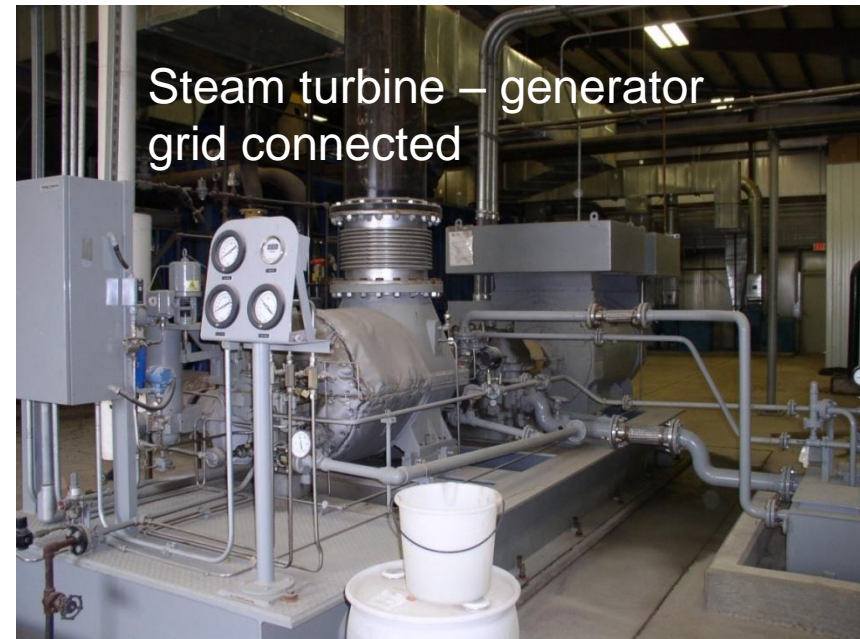
## ■ Thermo-chemical processes

- Manure at right moisture level will sustain combustion;
- BTUs are available to heat or to convert to electricity; dried waste can be co-fired with coal;
- Valuable co-products in the form of ash, minerals, biochar, fertilizers, feed supplements, syngas, bio-oils and fuels;
- Air quality (ammonia, NO<sub>x</sub>, SO<sub>x</sub> emissions) require evaluation;
- Feedstock transportation costs a major barrier to community scale projects.

# Dairy Solids to Energy



steam



Steam turbine – generator  
grid connected

ash

Dairy solids are extracted from the waste stream, dried and fed into the combustion chamber; steam is produced in a boiler

Requirement for 4,500 tanker trucks to land apply manure is now reduced to 90 trailers of ash for the cement plant



# Key Findings

- The three categories for greatest return on converting M/L into value added products include:
  - **nutrient use** (organic fertilizer, compost, biochar etc);
  - **energy** (biogas, heating oil, electricity, heating/cooling applications); and
  - **water re-use and management** (flushing, irrigation, animal watering needs).

# Key Findings

- Most technology solutions being advanced are still in early and immature stages of development
- These solutions usually focus on the feasibility of a unit process and have not been integrated well enough to be economically viable.

# Key Findings

- Operation and maintenance skills are critical and often well beyond the skill set available at the farm level
- Growing need for third party service providers
- Watershed lacks a comprehensive system for technology evaluation based on both technical and economic feasibility

# Recommendations

1. Authorize and fund and/or strengthen government programs that can accelerate the deployment of bundled technologies and processes that deliver nutrient reduction and energy recovery services along with value added end products.

# Initiative Areas

- Support Integrated Solution Sets
- Create demand for M/L products and co-products
- Establish a Public Benefits Fund to finance Integrated M/L Solution Sets
- Ensure access to markets and fair prices
- Reduce costs and help finance M/L technologies

# Recommendations

- 2.** Establish an adequately funded resource center in the watershed dedicated to support farm scale deployment of integrated animal agriculture nutrient reduction technologies.

# Resource Center

- Need to demonstrate technologies in a farm environment
- Nutrient reduction technologies and systems are in various stages of development
- Usually do not provide fully integrated solutions
- Need exists for an objective third party evaluation support system where new technologies and bundled solutions can be “piloted”

# Recommendations

- 3.** Create a steering committee composed of respected and forward thinking farm leaders in the watershed to help accelerate the deployment of animal agriculture nutrient reduction technologies and practices in the watershed.

# Recommendations

4. Task an existing or establish a new regional council to enhance interstate communication, coordination and cooperation around animal agriculture nutrient reduction efforts.



# What's in it for Agriculture and Forestry?

- Increased farm income
- Added value uses
- Alternative enterprises
- More productive uses of marginal lands
- Resolution of air, water and soil quality problems
- Enhanced rural economies

# Path Forward:

- Form a diverse leadership team
- Craft an “inside-out” vision
- Establish dialogue and build trust
- Reach out and engage all stakeholders
- Use a participatory model for developing plans.



***“What you’re in on.....  
you’re not down on!”***