Dairy, Manure and AFO/CAFO 101

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Black River Watershed
Can you believe it?

- EPA estimates that >850 billion gallons of raw, untreated waste is discharged into surface waters each year! (USEPA, 2004)
- More than 27 billion gallons in NYS alone (Riverkeeper.org)
Multi-media Challenge

- Tension:
  - Odor vs water
  - Air vs Water
  - Surface Water
  - N vs P
  - Pathogens
  - Costs
  - Homeowners
  - Municipal
Why dairy cows in NY?

• Sustainable water supply
• 3-4’ annual precip
  – excess most years
  – fairly even distribution
• Cool climate
• Good for cows
• Good for forage production
• Good land base
What is manure?

- Urine plus feces of the cows
- 80-90% or more water
- Most from the cow, plus varying amounts of spilled drinking water, milking center washwater, rainwater
- Bedding material
  - Sawdust, recycled paper, straw, chopped hay, sand
Forms of manure

- Liquid/slurry
- Usually from milking cows
- Often includes milking center washwater
- Pumpable
- May be odorous (storage)
Forms of manure

- Semi-solid/solid
- Separated solids
- Heifers/dry cows
- Bedded pack
- Conventional barns where more solid bedding is used
- Must scoop/bucket
- Different spreaders
- May or may not stack well
- Often daily spread
Nutrient Management Basics

• Fertilizers are labeled: %N - %P2O5 - %K2O
• A 20-5-10 means that the product contains, by weight:
  – 20 percent N
  – 5 percent P2O5
  – 10 percent K20
• Many options available
• Manure contains critical nutrients
• Manure challenges:
  – N-P-K ratio
  – Low density/bulk
  – Cannot afford to haul long distances
Did you know?

- Under New York law, phosphorus-containing fertilizer may only be applied to lawn or non-agricultural turf when:
  - A soil test indicates that additional phosphorus is needed for growth of that lawn or non-agricultural turf; or
  - The fertilizer is used for newly established lawn or non-agricultural turf during the first growing season.
NMP: Accounting for nutrients

- Know:
  - nutrient levels in the soil (soil test by field)
  - how much manure is produced
  - manure nutrient content (manure test by source)
  - N credits from
    - soil OM
    - sod plowdown
    - legumes (eg soy)
    - past manure
- Calculate application rates
M
\textbf{Manure Nutrient Availability}

N credits from manure are based on:

- Initial nutrient content
- Current applications
- Past applications
- Time and method of application
  - Spring versus fall application
  - Incorporation versus surface application
Form and degree of nitrogen availability in manure

Total Manure Nitrogen

Urine
- Unstable Organic N (Fast N)
  - Urea - mineralized rapidly to plant available ammonium

Feces
- Stable Organic N. (Slow N)
  - Mineralized slowly during the year of application
  - Residual - mineralized very slowly in future years

Available N = Ammonium N from present application + Mineralized organic N from present application + Mineralized organic N from past applications
Nutrient Management Basics

• Two key ingredients for proper manure management:
  – Manure and land base need to be in balance
  – Then within the farm, good practices and decisions need to be made
• Nationally and globally, not all livestock farms are balanced
• Stocking density and linking manure application to crop need are key issues
  – NY CAFO regs require balance and proper practices!
Self-assessment
Implement as time and $ allows
Many thousands of farm participants statewide
All farm types
CAFO Regulatory Program

- **Animal Feeding Operation or AFO**: any location where animals are housed for 45 days per year in a barn or barnyard area (where grass does not grow)
- **Concentrated Animal Feeding Operation or CAFO**: any AFO location with more than 300 milking cows (medium CAFO) or 700 milking cows (large CAFO)
- **CNMP**: Comprehensive Nutrient Management Plan. Farmstead and field management plan to protect water quality.
<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Large CAFO</th>
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</thead>
<tbody>
<tr>
<td>Dairy Cows</td>
<td>700</td>
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<tr>
<td>Heifers</td>
<td>1,000</td>
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<tr>
<td>Veal Calves</td>
<td>1,000</td>
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<tr>
<td>Beef Cattle</td>
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<tr>
<td>Pig</td>
<td>2,500 (55 lbs or more)</td>
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<td></td>
<td>10,000 (under 55 lbs)</td>
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<td>Horses</td>
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<td>Sheep or Lambs</td>
<td>10,000</td>
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<tr>
<td>Turkeys</td>
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<td>Chickens, liquid manure</td>
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<td>Chickens, other than a liquid manure system</td>
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<td>82,000 (laying hens)</td>
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<td>Ducks</td>
<td>30,000 (except liquid manure system)</td>
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<tr>
<td></td>
<td>5,000 (liquid manure system)</td>
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<tr>
<td>Animal Type</td>
<td>Medium CAFO</td>
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<tr>
<td>Dairy Cows</td>
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<td>Heifers</td>
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<td>Beef Cattle</td>
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<td>Swine</td>
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<td>Horses</td>
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<td>Sheep or Lambs</td>
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<td>Turkeys</td>
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<td>liquid manure system</td>
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<td>25,000 - 81,999 (laying hens)</td>
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<td>1,500 – 4,999 (liquid manure system)</td>
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</tbody>
</table>

NY Regulates Medium CAFOs too
NY CAFO Permit

- Pollution control
- Point source: No discharge from farmstead
- NPS: manage fields and manure application
- USDA Standards and Land Grant Guidelines

- Exceeds fed
  - Certified planner
  - Medium cafo’s
  - Erosion control
  - PE certification/inspection
NY CAFO Plan, follows NRCS standards, prepared by 3rd party certified planner for:

**Farmstead Areas**
- Bunk silo/Feed Storage runoff
- Milking center
- Barnyards
- Manure Handling and Storage
- Mortalities
- Record keeping

**Field Areas**
- Land Application of Manure & Fertilizer
  - Land grant guidelines
  - Frequent soil and manure tests
  - Spreading setbacks
- Soil Conservation practices (in some)
- Record keeping
Engineered Manure Storage/Handling
Bunk Runoff
Milking center washwater
Barnyard runoff
Mortality Handling
Field Buffers

Manure application setbacks: 15’ (incorporated), 35’ (vegetated buffer) or 100’ (row crop) from “waters of the state”
Other practices

- Cover crops
- Grass waterway
- Etc
- Are often recommended and may be required in some situations
Manure/Nutrient Management Plan for all fields

- Rate, placement and timing for
  - Manure
  - Fertilizer
- Based on crop need
- No discharge to water
Recordkeeping

- Rainfall
- Weather conditions during application periods
- Manure and fertilizer rates/timing, Crop history, etc
Wells

- CAFO: 100’ setback
- More if necessary to protect
- Dug well?
- Spring?
- Drilled well properly installed and maintained???
- Where are they?
- Zoning rules? Enforcement?
Manure storage:

- USDA-NRCS standards
- Requires PE design and “as-built” certification
- Dictates clay content or liner, berm compaction, sideslope, separation distance from bedrock and groundwater, O&M, etc.
- USDA Standards ensure that properly designed and constructed manure storages do not fail.
Why Manure storage?

- Winter 2014
- Winter 2015
- Industry recognizes need for more storage
Why is stored manure pungent?

- Naturally occurring microbes
- Thrive in anaerobic environment
- Create odorous compounds
- So, this BMP creates another problem: odor
- Many farms shift to direct placement in the soil-injection or incorporation
Why satellite storage?

- Manure is mostly water
- Bulky and costly to haul
- NMPs require broad distribution according to crop need
- Getting manure to land base in off-season
- Allows rapid distribution when spring hits
- Optimal for direct injection with drag hose system
What about Anaerobic digestion?

- Methane generated from manure
- Manure NOT converted to gas
- Odor control
- Reduce GHG emissions
- Nutrients conserved
- Volume mostly conserved
- Challenging economics
- Can be part of a solution
Bottom Line:

• 1) farms need to be in balance so that nutrients can be recycled
• 2) farms need to use BMPs to reduce risk of loss, even when in balance
• 3) manure storage plays a critical role in reducing risk
• 4) NY CAFO Permit drives 1-3.
Web Resources

• http://www.dec.ny.gov/permits/6285.html
• http://www.agmkt.state.ny.us/SoilWater/ae
  m/index.html
• http://nmsp.cals.cornell.edu/
• http://www.ny.nrcs.usda.gov/technical/practices/index.html
Questions?