

-John Stuhlmiller-

6/23/06

breaking small into smaller seems unnecessary/
may be affected by disclosure in ranges

look at enforcement "size"
smallest of enforcement? maybe SD?

fewer ranges better -

26th prefer

Livestock Reporting Ranges

WSDA Rule Development

Jeff Canaan
Livestock Nutrient
Management Program

WSDA Requirement

(42.17 RCW and 90.64 RCW)

Adopt rules that

- Provide meaningful information to the public, and
- Ensure confidentiality of business information regarding
 - Number of Animals
 - Volume of Livestock Nutrients Generated
 - Number of Acres Covered by Plan or Used for Land Application of Livestock Nutrients
 - Livestock Nutrients Transferred to Other Persons
 - Crop Yields

Developing Ranges

Starting Point: Federal CAFO Ranges

- “Meaningful” to all levels of government and many stakeholders.
- CAFO Ranges provide substantial confidentiality for operations in the “small” and “medium” ranges.

Goal: Robust Ranges

- Flexible enough to allow for industry dynamics (e.g., growth in maximum facility sizes).
- Predictable enough to handle changes to individual facilities with consistency.
- Reasonable enough to stand up to stakeholder and public scrutiny.

Challenges

- Few useful datasets are available.
- Available data is typically incomplete or too general.
- Data for many of the reporting categories (e.g., nutrient produced) is not collected in Washington State.

Proposed Solution

- Establish credible ranges for “Number of Animals”.
- Use the “Number of Animals” ranges in combination with book values and real world data (when available) to compute all other ranges.

“Number of Animals” Ranges

- Use established EPA Small, Medium and Large CAFO ranges as a starting point.

Example: Dairy Cattle Ranges

CAFO Ranges		
Small	Medium	Large
1-199	200-699	700 or greater

Problem:

- No indication of appropriate ranges for larger operations

“Number of Animals” Ranges

Goal:

- Develop a credible formula to calculate ranges in the Large CAFO category.

“Number of Animals” Ranges

Proposal:

- Where the Medium CAFO range breadth seems appropriate, it is carried forward to later ranges (e.g., layers, broilers).
- For beef cattle, the Medium CAFO range breadth is increased to 5,000.
- For all other cattle, the Medium CAFO range breadth is increased to 1,000.
- To protect business information, build in a minimum of 20% confidentiality.

Proposed “Number of Animals” Ranges

Livestock	Medium CAFO Range	WSDA Subsequent Range Breadths
Beef	300-999	The greater of 5000 or 120% of lower range limit
Mature Dairy	200-699	The greater of 1000 or 120% of lower range limit
Dairy Heifers	300-999	The greater of 1000 or 120% of lower range limit
Swine (breeding)	750-2,499	The greater of 1,750 or 120% of lower range limit
Swine (market)	3,000-9,999	The greater of 7,000 or 120% of lower range limit
Layers	25,000-81,999	The greater of 57,000 or 120% of lower range limit
Broilers	9,000-29,999	The greater of 21,000 or 120% of lower range limit
Horse	150-499	The greater of 350 or 120% of lower range limit

Why Increase the CAFO Range Breadth for Cattle?

Why 5,000 animals for beef cattle?

- ✓ Industry request.
- ✓ Places all current/planned WA State facilities in the first ten ranges.

Why 1,000 animals for dairy cattle?

- ✓ Industry accepted.
- ✓ Places all current/planned WA State facilities in the first ten ranges.

Why 20% Confidentiality?

- Facilities frequently experience animal number decreases of 10% or greater (mortality, sales, etc.)
- Dairy nutrient management plan updates are triggered by:
 - ✓ 10% increase in animal numbers.
 - ✓ 10% decrease in land available for nutrient application (depending on cropping this may represent an effective 15%-20% increase in animal numbers).

Why 20% Confidentiality?

Animal numbers at any given facility can be expected to fluctuate within a range of 25-30%.

Therefore, WSDA considers a 20% confidentiality level to be

- ✓ conservative,
- ✓ reasonable, and
- ✓ reflective of typical on-farm dynamics.

Example: Dairy Cattle Ranges

WSDA Ranges				
Range 1	Range 2	Range 3	Range 4	Range 5
1-199	200-699	700-1,699	?	?
Range 6	Range 7	Range 8	Range 9	Range 10
?	?	?	?	?

WSDA Proposal:

- Increase the medium CAFO range width of 500 to 1,000.

WSDA Ranges				
Range 1	Range 2	Range 3	Range 4	Range 5
1-199	200-699	700-1,699	1,700-2,699	2,700-3,699
Range 6	Range 7	Range 8	Range 9	Range 10
3,700-4,699	4,700-5,699	5,700-?	?	?

WSDA Proposal:

- Set all subsequent ranges widths at the greater of 1,000 or 120% of the lower range limit.
- Example: if a lower range limit is 1,700, then the upper range limit will be the greater of 120% of 1,700 (2,040) and 2,699.

WSDA Ranges				
Range 1	Range 2	Range 3	Range 4	Range 5
1-199	200-699	700-1,699	1,700-2,699	2,700-3,699
Range 6	Range 7	Range 8	Range 9	Range 10
3,700-4,699	4,700-5,699	5,700-6,839	6,840-8,207	8,208-9,849

WSDA Proposal:

- In the ranges above 5,700 animals, the upper range limit is determined by 120% of the lower limit, ensuring approx. 20% confidentiality.

WSDA Ranges: Dairy Cattle Ranges

Range 1	Range 2	Range 3	Range 4	Range 5
1-199	200-699	700-1,699	1,700-2,699	2,700-3,699

Range 6	Range 7	Range 8	Range 9	Range 10
3,700-4,699	4,700-5,699	5,700-6,839	6,840-8,207	8,208-9,849

Range 11	Range 12	Range 13	Range 14	Range 15
9,850-11,819	11,820-14,183	14,184-17,020	17,021-20,425	20,426-24,511

Note: Ranges 1-7 are greater than 20% of the lower range limit because of the baseline CAFO ranges.

“Volume of Nutrient Produced” Ranges

Assumptions:

- “Nutrient Produced” = manure, as excreted.
- Use “Animal Number” ranges to compute “Nutrient Produced” ranges.

“Nutrient Produced” Calculation

Nutrient Production =

“Number of Animals” range limits

X

Nutrient Production per Animal*

*For all industries, used "Manure Production and Characteristics", ASAE
D384.2 MAR2005.

Example: Dairy Cattle “Nutrient Produced” Ranges

Nutrient Production =

“Number of Animals” range limits

X

2.4 ft³ per day per animal

Example: Dairy Cattle “Nutrient Produced” Ranges

WSDA Ranges (ft ³ /day)				
Range 1	Range 2	Range 3	Range 4	Range 5
1-478	479-1,678	1,679-4,078	4,079-6,478	6,479-8,878

Non-Dairy Livestock

- Use the same method shown for Dairy Cattle.

“Number of Acres Operated” Ranges

Goal:

- Correlate animal numbers to number of acres operated.
- Use “Number of Animals” ranges to compute “Acres Operated” ranges.

“Number of Acres Operated” Ranges

Proposed Method:

- Calculate usable nitrogen produced by animals.
- Find the number of acres (forage production) required to utilize the nitrogen.

Why Nitrogen?

Agronomic use of nitrogen on Washington State farms is the driving force behind

- nutrient management planning, and
- the efficient production of quality forage.

“Animals to Acres” Correlation

Data used:

- 2003 and 2004 USDA NASS data to determine forage crop type and acreage grown in Washington State.
- NRCS Plant Nutrient Content Database to determine the nitrogen uptake of each type of forage crop.

Result:

- In 2003 and 2004, average nitrogen uptake for forage crops in WA was 284.6 pounds N/acre.

“Animals to Acres” Correlation

$$\begin{aligned} &\text{“Acres Operated”} \\ &= \\ &\text{“Animal Number” range} \\ &\quad \times \\ &\text{Nitrogen produced per animal per year*} \\ &\quad / \\ &\text{Average nitrogen uptake for forage crops grown in} \\ &\quad \text{Washington State**} \end{aligned}$$

*For all industries, used "Manure Production and Characteristics", ASAE D384.2 MAR2005.

**average includes silage corn, alfalfa hay, haylage, and grass silage crops. It is weighted by acres planted for various forage crops. Typical silage corn dry matter content was derived from NRCS Plant Nutrient Content Database.

Example: Dairy Cattle

$$\begin{aligned} &\text{“Acres Operated”} \\ &= \\ &\text{“Animal Number” range} \\ &\quad \times \\ &234.9 \text{ pounds (Nitrogen produced per animal per} \\ &\quad \text{year, assuming 35\% loss)} \\ &\quad / \\ &284.6 \text{ pounds/acre (Average nitrogen uptake for} \\ &\quad \text{forage crops grown in Washington State)} \end{aligned}$$

Example: Dairy Cattle “Acres Operated” Ranges

WSDA Ranges (acres)				
Range 1	Range 2	Range 3	Range 4	Range 5
0-164	165-577	578-1,402	1,403-2,227	2,228-3,052

Non-Dairy Livestock

- Use the same method shown for Dairy Cattle.

“Nutrients Transferred” Ranges

- Many intensive livestock industries transfer nutrients off-site rather than use it for their own forage production. For these industries, the “Nutrients Transferred” range is simply a repeat the “Nutrients Produced” ranges.
- Dairy operations utilize the majority of their nutrient, therefore dairy ranges do not simply repeat the “Nutrients Produced” ranges.

Example: Dairy Cattle “Nutrients Transferred” Ranges

- WSDA LNMP herd registration data indicate that WA dairies utilize approx. 78% of their nutrient for their own forage production, exporting 22%.
- For ease of calculation, we assume that WA dairies export approx. 20% of their nutrient.
- For dairy cattle, the “Nutrients Produced” ranges are multiplied by 20% to arrive at the “Nutrients Transferred” Ranges.

Example: Dairy Cattle “Nutrients Transferred”

WSDA Ranges (ft ³ /day)				
Range 1	Range 2	Range 3	Range 4	Range 5
0-96	97-336	337-816	817-1,296	1,297-1,776

Non-Dairy Livestock

- Assume all nutrients are exported.
- Repeat the “Nutrients Produced” ranges to quantify “Nutrients Exported”.

“Crop Yield” Ranges

Goal:

- Establish a meaningful correlation between animal numbers and yield.*
- Use “Number of Animals” ranges to compute “Crop Yield” ranges.

*In order to correlate animal numbers and crop production, “yield” is defined as “total production” rather than “per acre production”.

“Crop Yield” Ranges

Proposed Method:

- Use 2003 and 2004 USDA NASS data to establish a average yield per acre (dry matter tons) for all WA forage crops.
- Multiply “Acres Operated” ranges by average yield per acre to establish yield ranges.

“Crop Yield” Ranges

From 2003 and 2004 USDA NASS data,
Average WA forage crop yield is 5.3 dry
matter tons/acre for all forage crops.*

*average includes silage corn, alfalfa hay, haylage, and grass silage crops.
It is weighted by acres planted for various forage crops. Typical silage
corn dry matter content was derived from NRCS Plant Nutrient Content
Database.

Example: Dairy Cattle “Crop Yield” Ranges

WSDA Ranges (tons dry matter)				
Range 1	Range 2	Range 3	Range 4	Range 5
0-870	871- 3,060	3,061- 7,435	7,436- 11,810	11,811- 16,186

Non-Dairy Livestock

- Use the same method shown for Dairy Cattle.

Why are the range categories correlated to “number of animals”?

- Allows animal number range breadths to be addressed separately, then easily incorporated into the model.
- Allows quick identification of facilities which may have nutrient management problems.
 - ✓ Reported facility ranges should show a correlative relationship across range categories.

Nutrient Management Indicators

The methodology provides a consistent, reasonable correlation between all range categories. Consequently,

- ✓ unexplained deviation from the correlations between range categories may indicate nutrient mismanagement.
- ✓ correlation between ranges may reveal how nutrients are managed at a facility.

Nutrient Management “Red Flags”

Example: Dairy Cattle				
Range #	1	2	3	4
Animals	1-199	200-699	700-1,699	1,700-2,699

Consider a dairy with 855 animals. The animals numbers require that the dairy report Range 3 values.

Nutrient Management “Red Flags”

Example: Dairy Cattle				
Range #	1	2	3	4
Animals	1-199	200-699	700-1,699	1,700-2,699
Nutrient Produced	1-478	479-1,678	1,679-4,078	4,079-6,478
Acres Operated	0-164	165-577	578-1,402	1,403-2,227
Nutrient Exported	0-96	97-336	337-816	817-1,296
Yield	0-870	871-3,060	3,061-7,435	7,436-11,810

The range category relationship gives a reasonable expectation that the other reported ranges will correlate with Range 3.

Nutrient Management “Red Flags”

Example: Dairy Cattle				
Range #	1	2	3	4
Animals	1-199	200-699	700-1,699	1,700-2,699
Nutrient Produced	1-478	479-1,678	1,679-4,078	4,079-6,478
Acres Operated	0-164	165-577	578-1,402	1,403-2,227
Nutrient Exported	0-96	97-336	337-816	817-1,296
Yield	0-870	871-3,060	3,061-7,435	7,436-11,810

Given the approximations inherent in the methodology and confidentiality provisions, a facility might appropriately fall within a narrow band of ranges.

Nutrient Management “Red Flags”

Example: Dairy Cattle				
Range #	1	2	3	4
Animals	1-199	200-699	700-1,699	1,700-2,699
Nutrient Produced	1-478	479-1,678	1,679-4,078	4,079-6,478
Acres Operated	0-164	165-577	578-1,402	1,403-2,227
Nutrient Exported	0-96	97-336	337-816	817-1,296
Yield	0-870	871-3,060	3,061-7,435	7,436-11,810

Where the correlative relationship of ranges does not hold, facilities may have nutrient management problems. For example, low acres operated should result in low yield and increased nutrient export.

Nutrient Management “Red Flags”

Example: Dairy Cattle				
Range #	1	2	3	4
Animals	1-199	200-699	700-1,699	1,700-2,699
Nutrient Produced	1-478	479-1,678	1,679-4,078	4,079-6,478
Acres Operated	0-164	165-577	578-1,402	1,403-2,227
Nutrient Exported	0-96	97-336	337-816	817-1,296
Yield	0-870	871-3,060	3,061-7,435	7,436-11,810

Similarly, if one range categories does not correlate, nutrient management problems may be present. For example, non-correlative yields may indicate insufficient nutrient uptake.

Nutrient Management “Green Flags”

Proper correlation between range categories may

- ✓ confirm proper nutrient management, and
- ✓ indicate how nutrients are managed at a facility.

Nutrient Management “Green Flags”

Example: Dairy Cattle				
Range #	1	2	3	4
Animals	1-199	200-699	700-1,699	1,700-2,699
Nutrient Produced	1-478	479-1,678	1,679-4,078	4,079-6,478
Acres Operated	0-164	165-577	578-1,402	1,403-2,227
Nutrient Exported	0-96	97-336	337-816	817-1,296
Yield	0-870	871-3,060	3,061-7,435	7,436-11,810

Where facilities do not produce their own forage, the methodology should reveal a correlating yield decrease and nutrient export increase.

Summary

The proposed methodology

- ✓ protects confidentiality by providing a range breadth of at least 20%, and
- ✓ provides meaningful information by
 - limits on confidentiality,
 - nutrient-driven modeling, and
 - built in nutrient management indicators.

