Manure Acres

4/12/2024

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Objective

Understand and potentially improve how we define the acres of:

- Grain with and without manure
- Silage with and without manure

How do Ag Nutrients cycle through CAST?

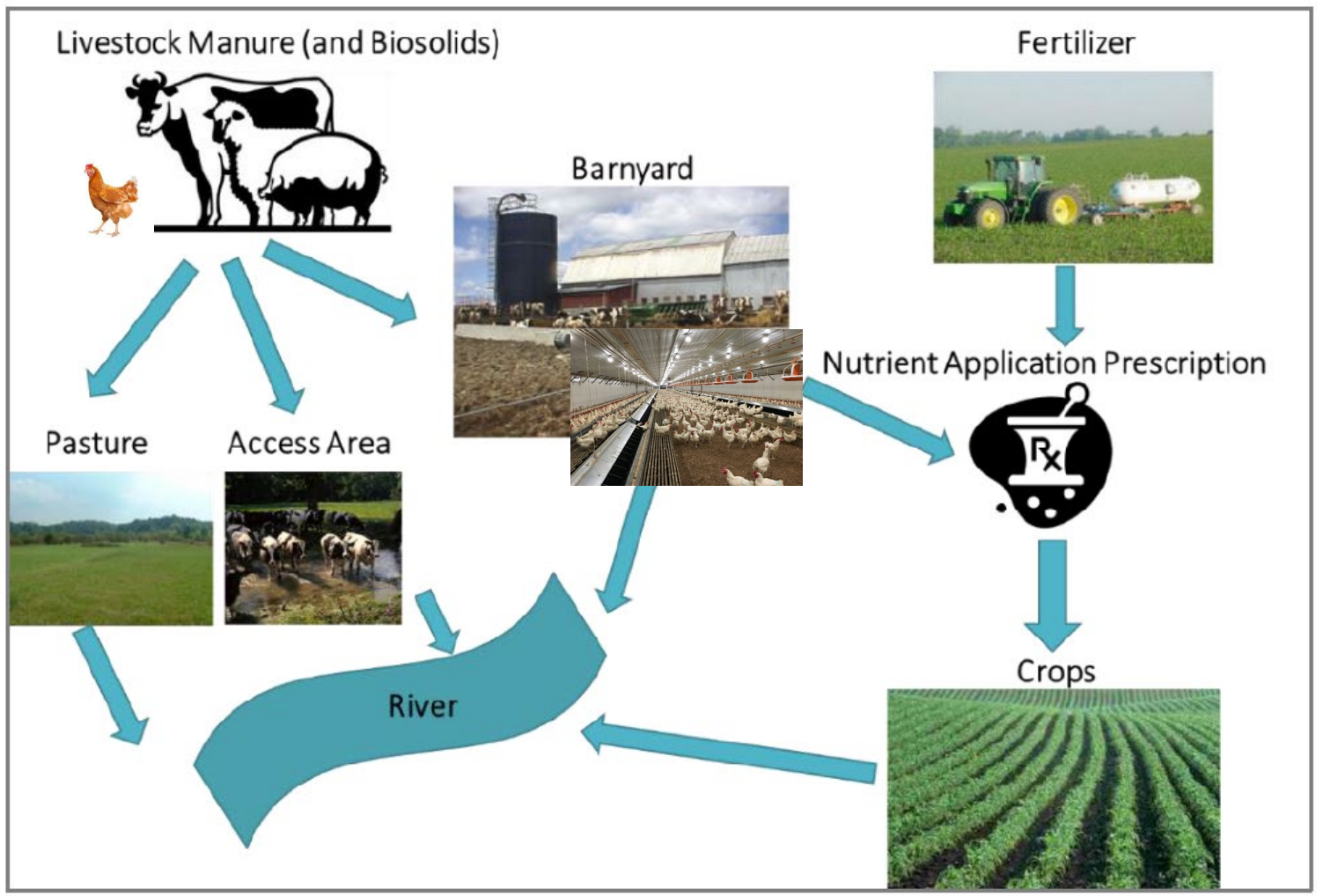


Figure 3-4 Conceptual diagram of nutrient fate through agricultural lands

Understanding manure and its nutrients

Lbs Manure Nitrogen from Beef cattle/Year
=
Beef animals
X
Lbs Dry Manure/animal/Year
X
Lbs of Total Nitrogen/Lb Dry Manure*

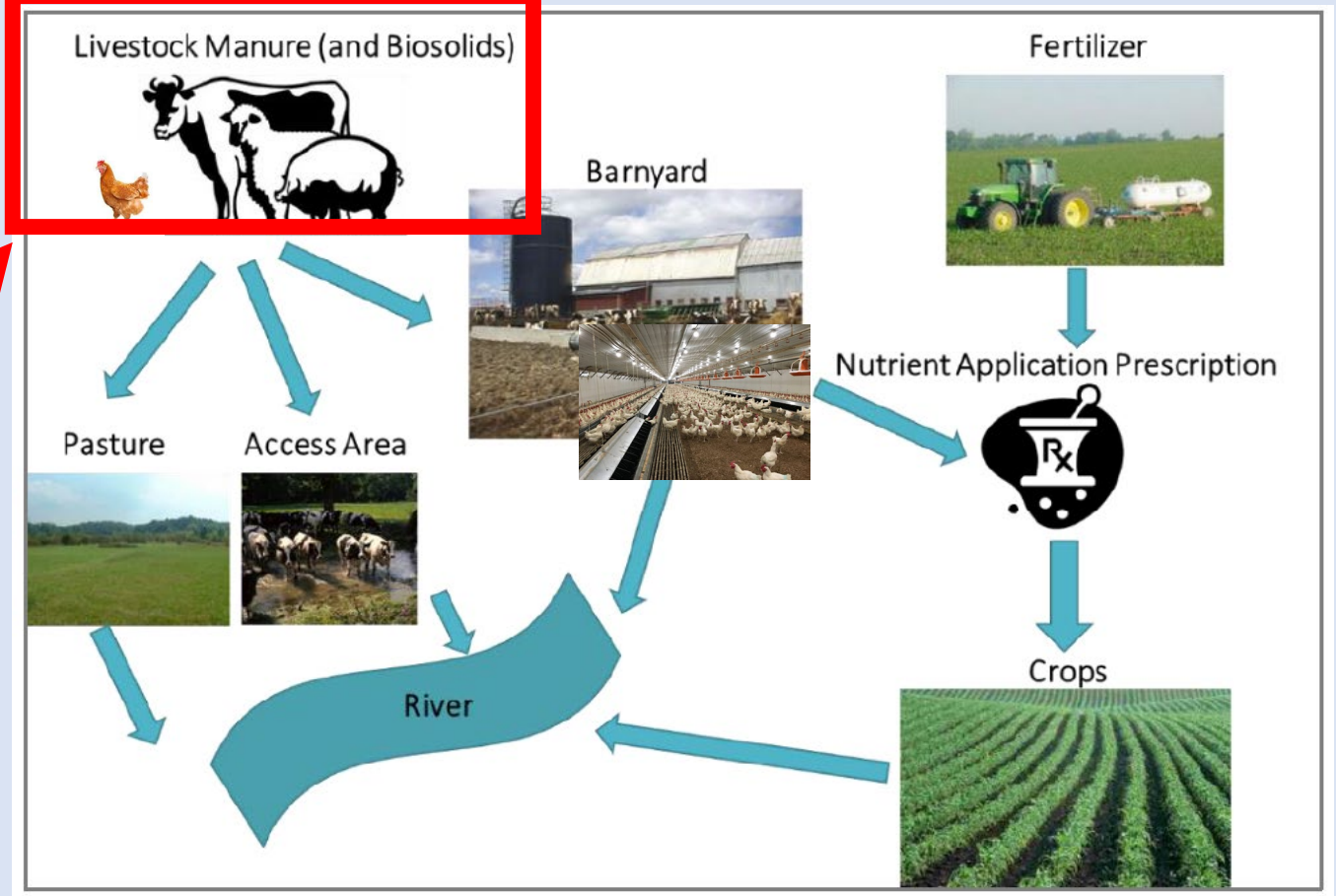


Figure 3-4 Conceptual diagram of nutrient fate through agricultural lands

Plant Available Nitrogen (PAN)

Amount of Nitrogen which a plant can use from a fertilizer source

- Never 100% for manure

Differs between species of livestock

- Beef cattle behave differently then egg laying chickens

Time in confinement does matter

How does time in confinement factor in?

- You must be able to:
  - Collect it
  - Store it for use
  - Apply it

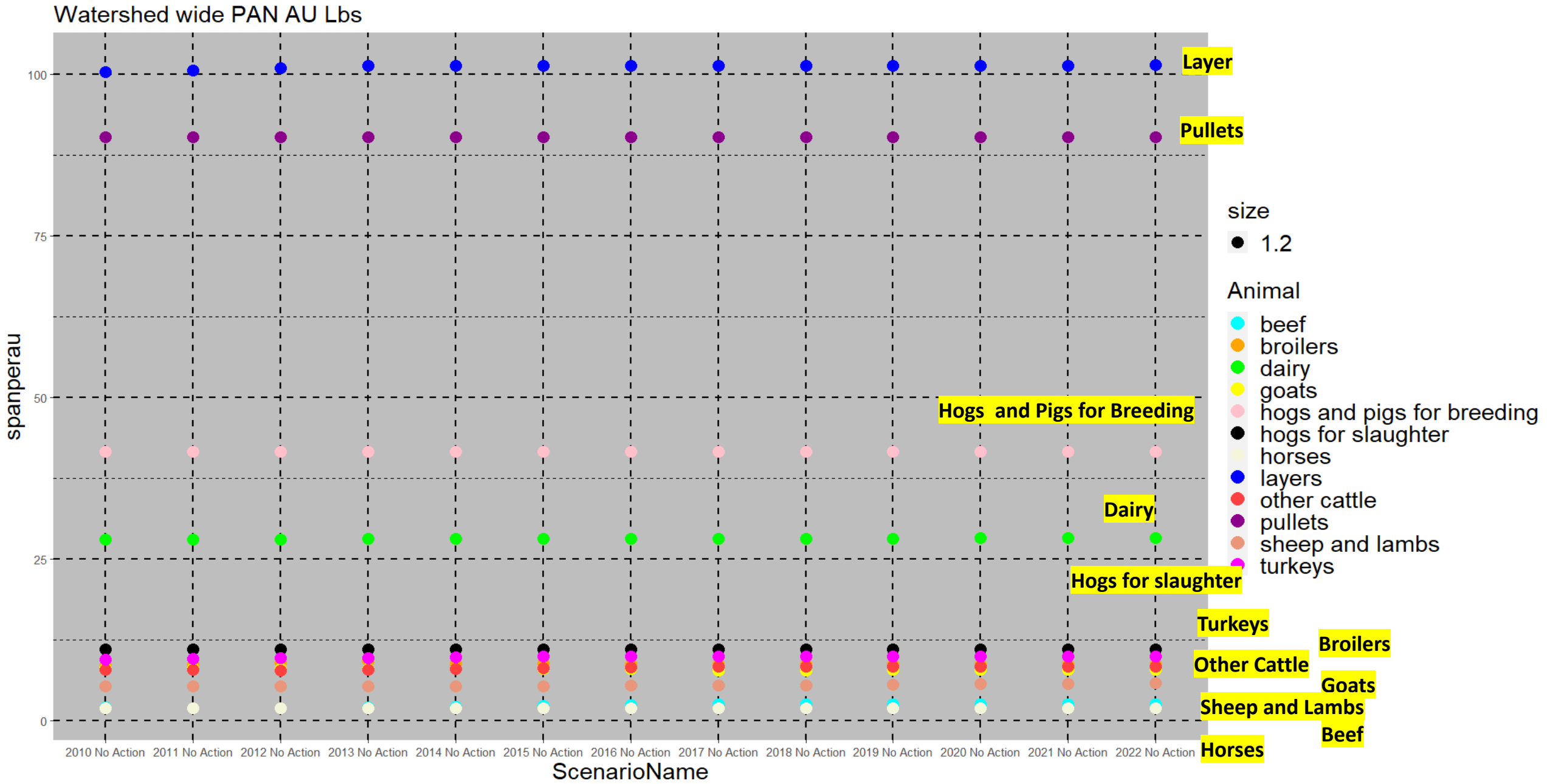
Table 3-7: Recoverability of Manure with and Without AWMS (Hawkins, et al. 2016)

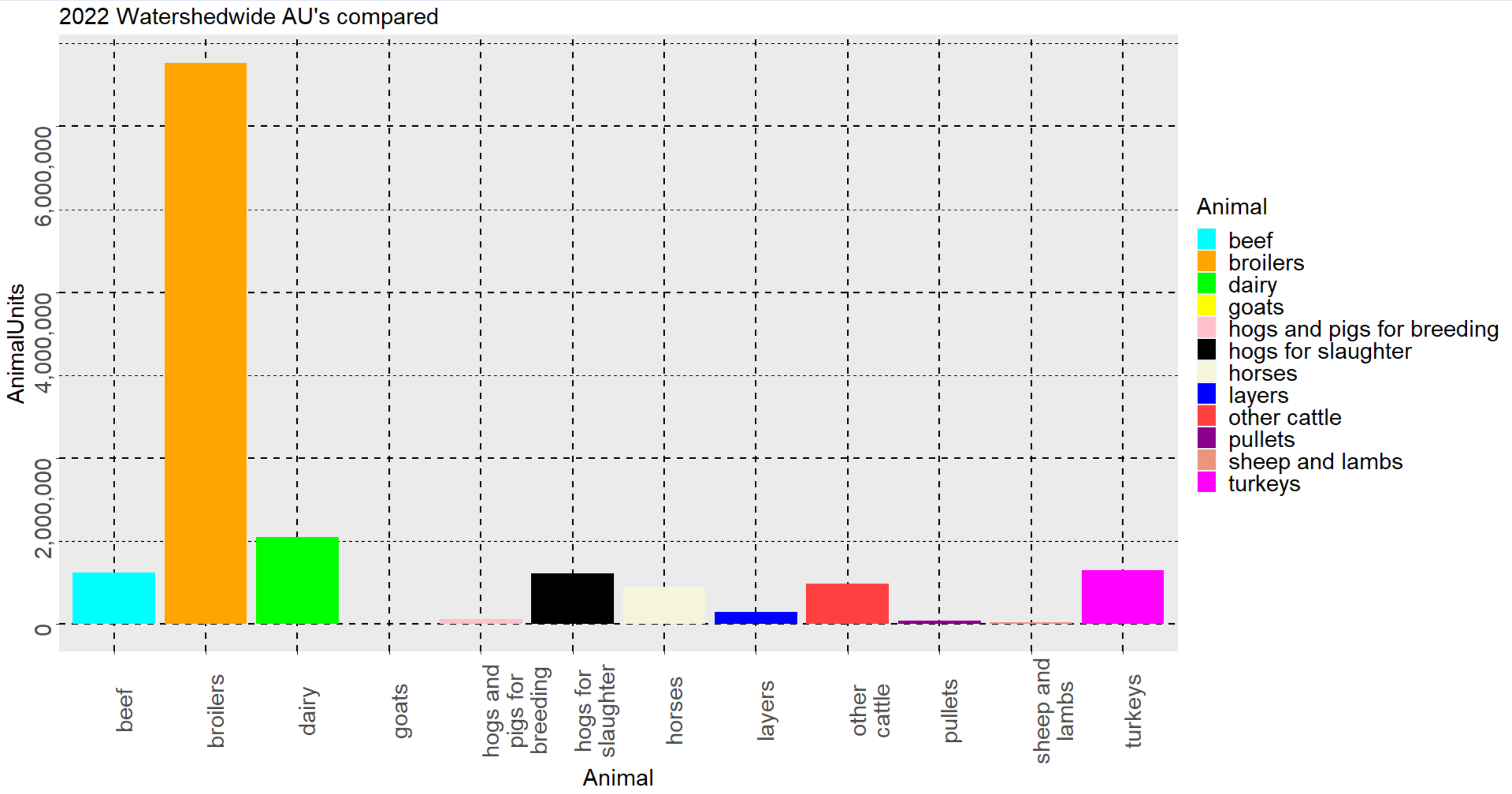
Animals	% Recoverable without AWMS	% Recoverable with AWMS
Beef	60	99
Dairy	75	95
Other Cattle	60	99
Hogs for Slaughter	90	99
Hogs for Breeding	90	99
Broilers	90	99
Layers	90	99
Turkeys	90	99
Pullets	90	99
Sheep	95	98
Horses	95	98
Goats	95	98

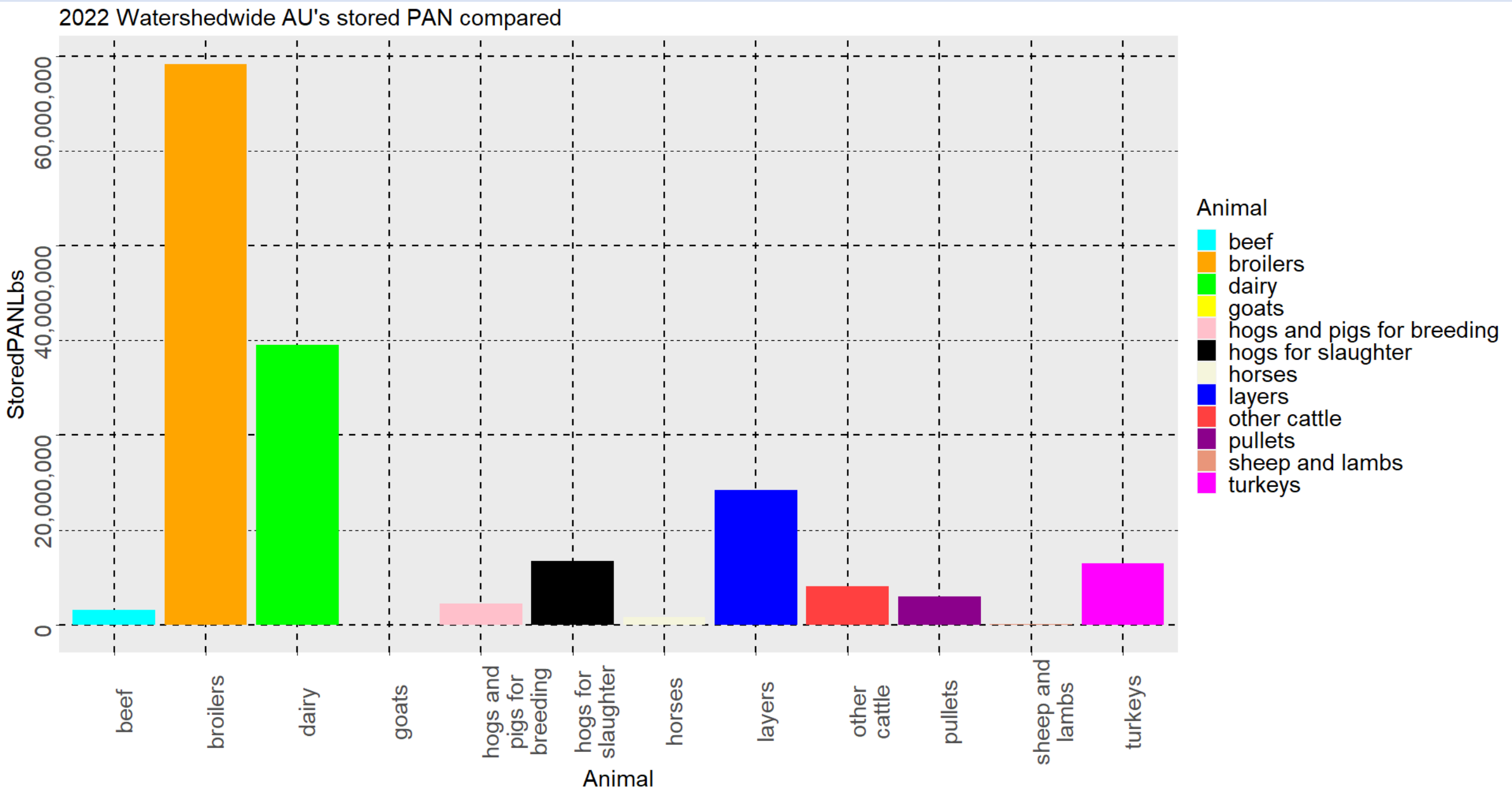
Table 3-5: Beef percent manure deposited by area in West Virginia growth region 1

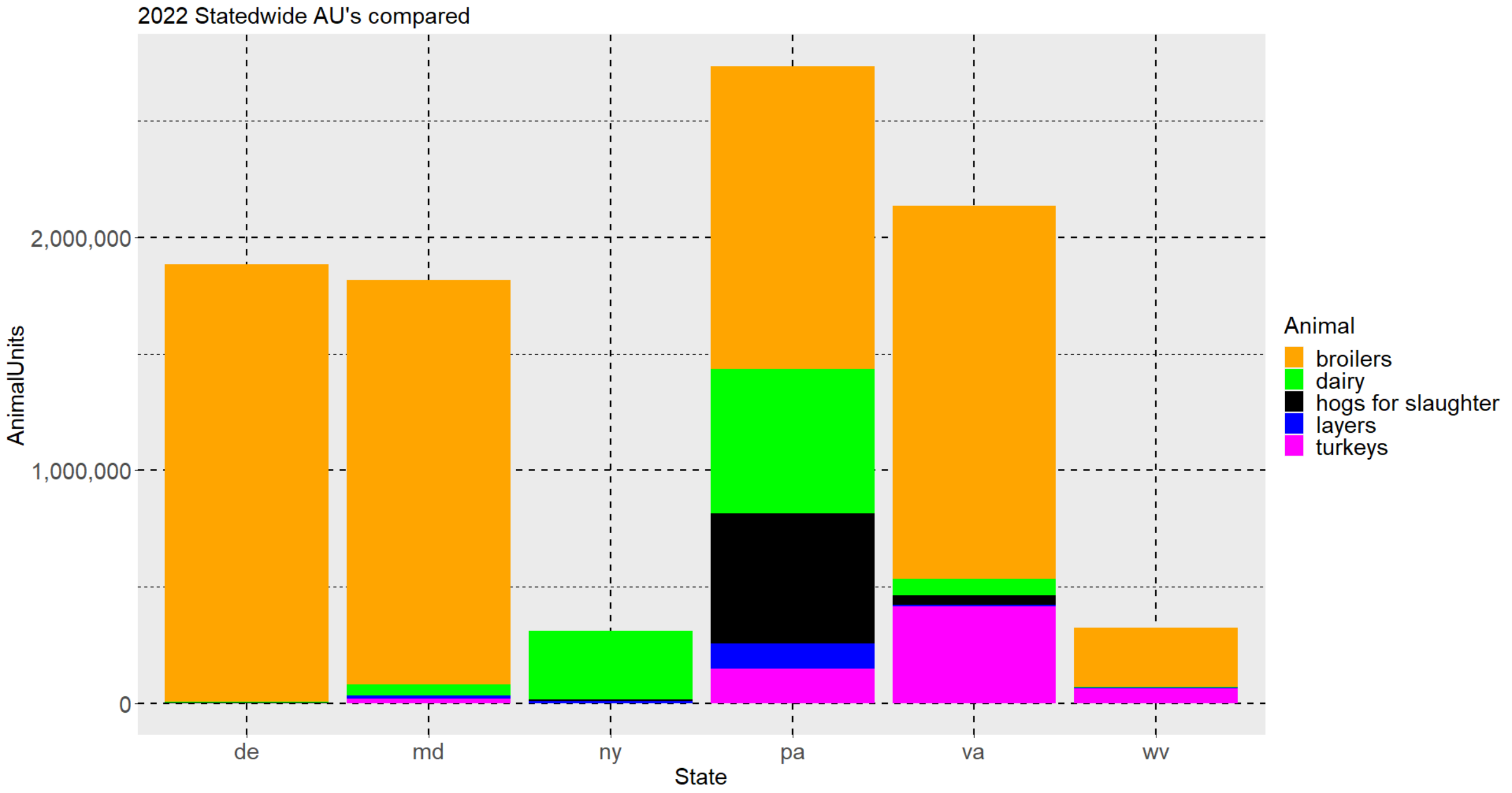
Growth Region	Animal Type	Month	Barnyard Percent	Pasture Percent	Access Area Percent
WV_1	beef	1	6	91	3
WV_1	beef	2	6	91	3
WV_1	beef	3	0	96	4
WV_1	beef	4	0	94	6
WV_1	beef	5	0	94	6
WV_1	beef	6	0	90	10
WV_1	beef	7	0	90	10
WV_1	beef	8	0	90	10
WV_1	beef	9	0	94	6
WV_1	beef	10	0	96	4
WV_1	beef	11	0	96	4
WV_1	beef	12	6	91	3

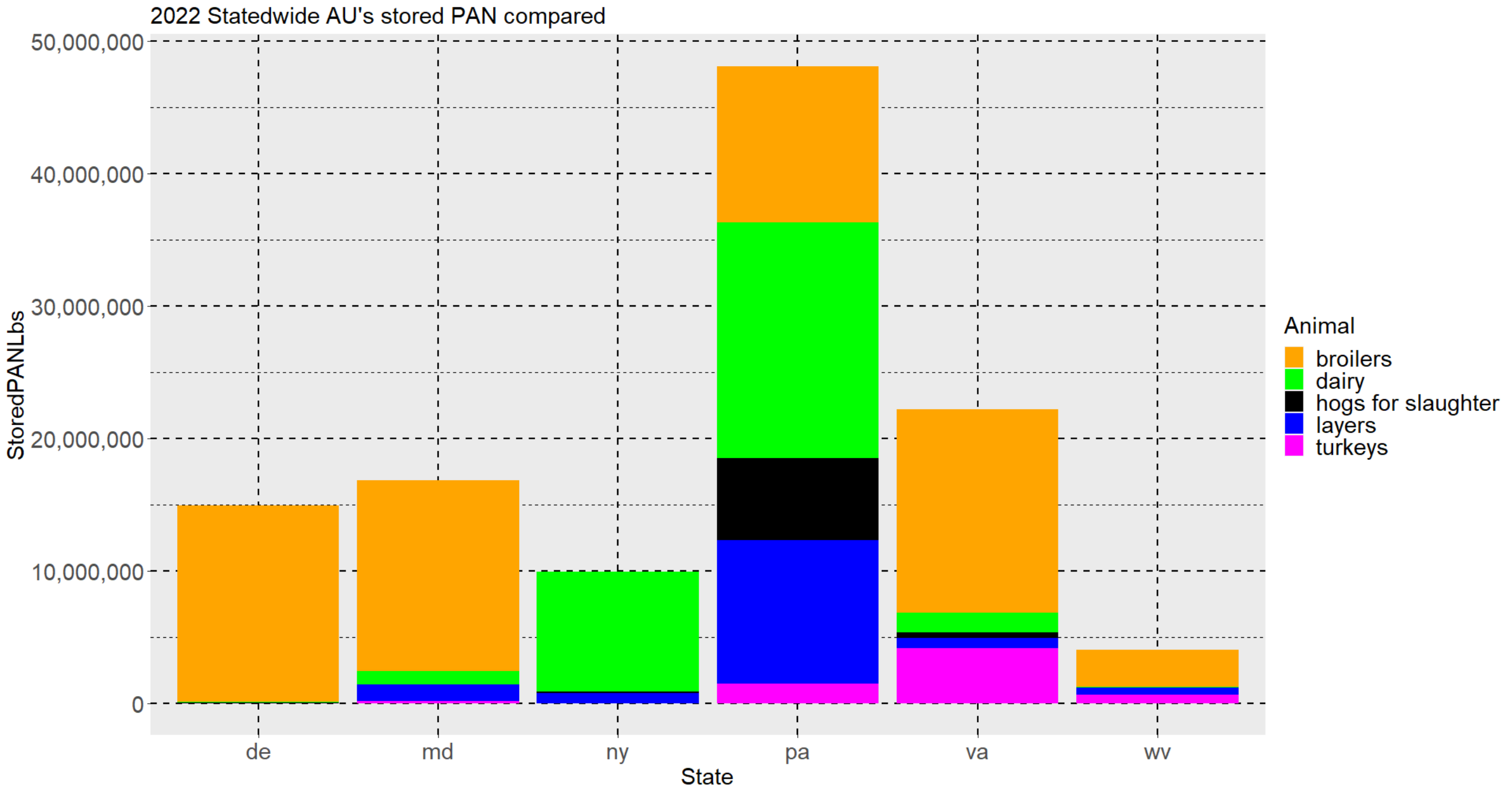
Plant Available N in stored manure per AU by animal type:




2022 Watershedwide AU's compared
AnimalUnits
0
2,000,000
4,000,000
6,000,000
beef
broilers
dairy
goats
hogs and pigs for breeding
hogs for slaughter
horses
layers
other cattle
pullets
sheep and lambs
turkeys
Animal
Animal
beef
broilers
dairy
goats
hogs and pigs for breeding
hogs for slaughter
horses
layers
other cattle
pullets
sheep and lambs
turkeys


2022 Watershedwide AU's stored PAN compared
StoredPANLbs
0
20,000,000
40,000,000
60,000,000
beef
broilers
dairy
goats
hogs and pigs for breeding
hogs for slaughter
horses
layers
other cattle
pullets
sheep and lambs
turkeys
Animal
Animal
beef
broilers
dairy
goats
hogs and pigs for breeding
hogs for slaughter
horses
layers
other cattle
pullets
sheep and lambs
turkeys


2022 Statedwide AU's compared
AnimalUnits
2,000,000
1,000,000
0
de
md
ny
pa
va
wv
State
Animal
broilers
dairy
hogs for slaughter
layers
turkeys

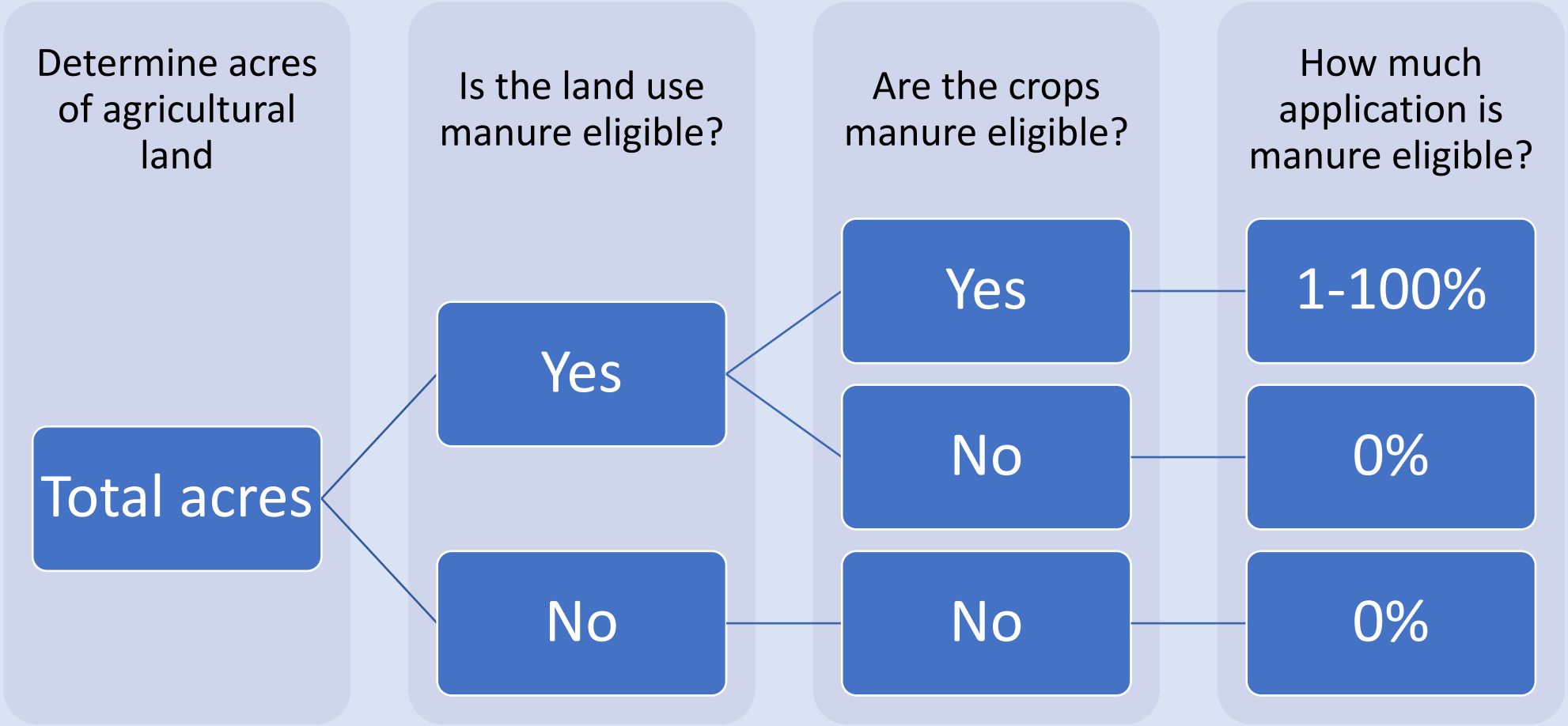

2022 Statedwide AU's stored PAN compared
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
0
StoredPANLbs
de
md
ny
pa
va
wv
State
Animal
broilers
dairy
hogs for slaughter
layers
turkeys

How is manure related to Land Uses?

- 14 total Land Uses
- **11 are ELIGIBLE to receive nutrients from manure**
- Two Land Uses are NOT eligible to receive manure nutrients
- **One Land use that can't get any nutrients**

Chesapeake Bay Average			
Land class	Land Use	Loading Rate Ratio	Loading Rate (pounds per acre per year)
Cropland	Double Cropped Land	0.79	30.9
	Full Season Soybeans	0.71	27.7
	Grain with Manure	1.4	54.7
	Grain without Manure: **Reference land use**	1	39.1
	Other Agronomic Crops	0.45	17.6
	Silage with Manure	1.62	63.3
	Silage without Manure	1.16	45.3
	Small Grains and Grains	0.84	32.8
	Specialty Crop High	1.34	52.4
	Specialty Crop Low	0.31	12.1
Pasture	Ag Open Space	0.43	5.1
	Legume Hay	0.74	8.7
	Other Hay	1.04	12.3
	Pasture: **Reference Land Use**	1	11.8

What is an eligible Land Use?



Why are grains treated differently?

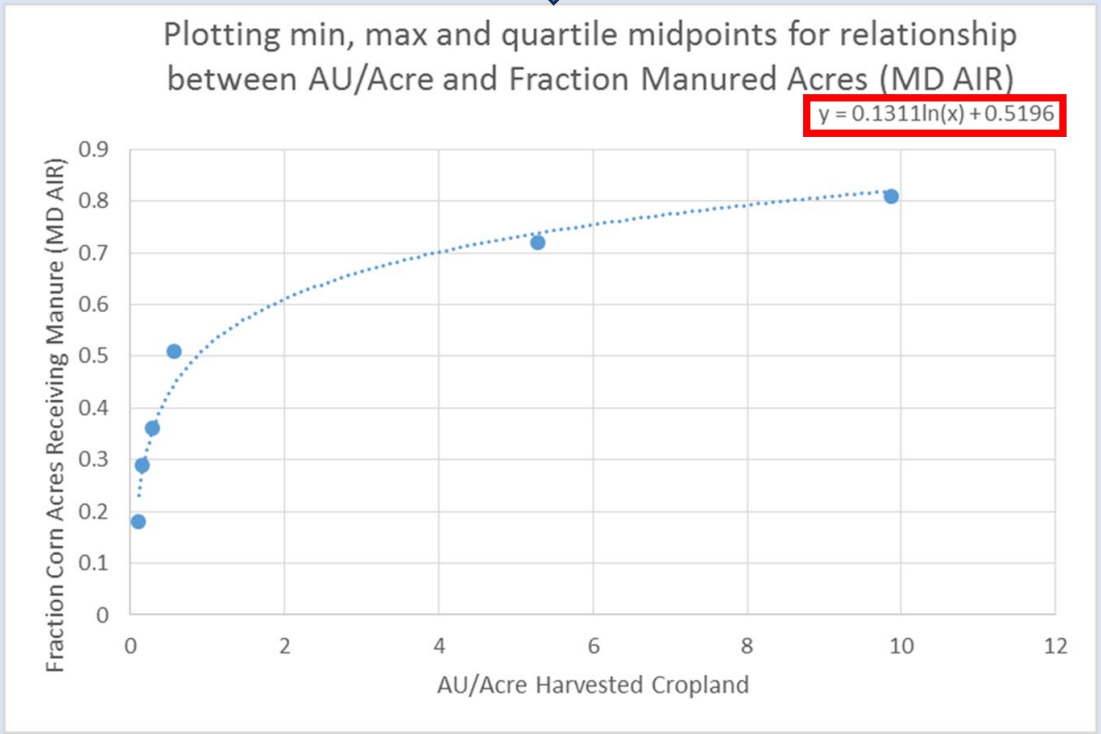
- The acres of grains are divided:
  - Part WITH manure
  - Part WITHOUT manure
- Different management history
- No data source defining this split

Introducing a concept: Manure Acres:

- Silage
  - 85 percent of corn and sorghum for silage acres received manure
- Grain
  - Fraction of acres receiving manure is constrained to be between 0.18 and 0.81.
  - Based on the total number of Animal Units (AU) in a county
    - (1000lbs animal = 1 Animal Unit)

Grain with Manure

Grain without Manure: **Reference land use**



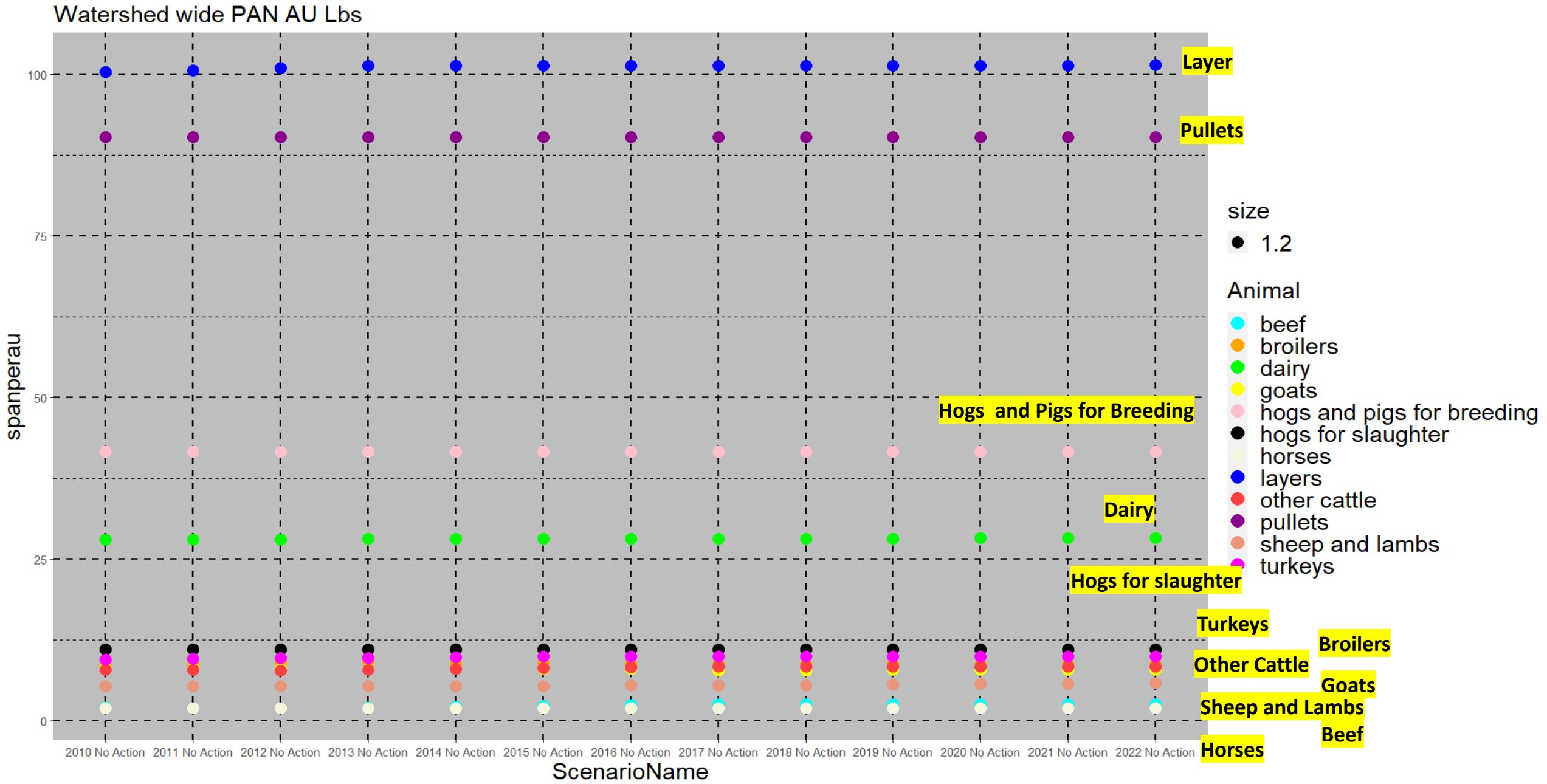
Let’s stop and think:

What if we have different types of animals within a county?

How do we account for differences in the nutrient content?

Is there improved data on corn manure applications?

Plant Available N in stored manure per AU by animal type:



Let’s look at a specific comparison

Compare counties

No action scenario

- No BMPs

Similar:

- Number of AU’s
- Acres of grains

Pre BMP 2022 County Comparison

Field	Northumberland County, PA	Steuben County, NY
Animal Units	65,389	64,596
Stored Plant Available Nitrogen	1,130,628	1,868,726
Acres of Grain with Manure	14,519	11,830
Acres of Grain without Manure	14,988	20,273
Acres of Silage with Manure	2,315	14,447
Acres of Silage without Manure	409	2,549

Why is this happening?

Animal	Northumberland Animal Units	Steuben Animal Units	Northumberland Stored PAN Lbs	Steuben Stored PAN Lbs
dairy	5,820	28,608	166,795	880,136
layers	3,747	4,301	379,718	435,831
beef	2,133	8,191	14,768	111,974
broilers	27,785	2	252,542	23
goats	36	31	363	310
hogs and pigs for breeding	1,504	121	62,573	5,035
hogs for slaughter	9,216	4,749	101,947	52,539
horses	1,368	4,499	2,059	10,995
other cattle	4,710	13,409	38,187	339,599
pullets	270	329	24,439	29,717
sheep and lambs	136	351	978	2,528
turkeys	8,664	4	86,257	39
Total Value:	65,389	64,595	1,130,626	1,868,726

Topic of discussion: Manure Acre Calculation

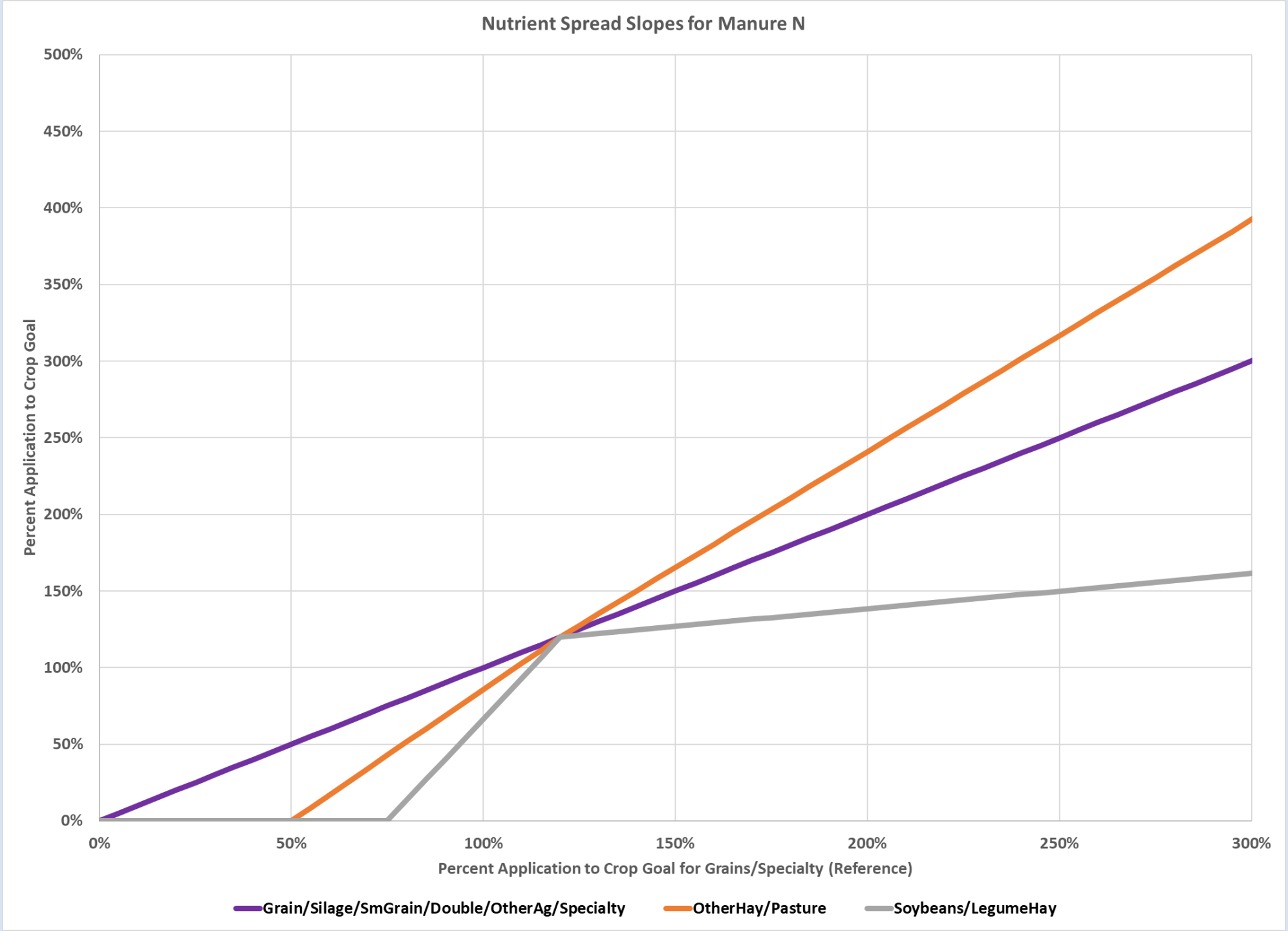
Summary:

- We separate acres based on Animal Populations
- We apply the nutrients from a stored manure nutrient pool

Two big questions:

- Is switching to PAN more realistic for determining manure acres?
- Would collecting more information about manure applied to corn be feasible for determining this split?

Questions?


Nutrient Spread Slopes for Manure N
500%
450%
400%
350%
300%
250%
200%
150%
100%
50%
0%
Percent Application to Crop Goal
0%
50%
100%
150%
200%
250%
300%
Percent Application to Crop Goal for Grains/Specialty (Reference)
Grain/Silage/SmGrain/Double/OtherAg/Specialty
OtherHay/Pasture
Soybeans/LegumeHay