Preliminary P7 nutrient application scheme results

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6/12/2026

Moving forward

Source Data (Stage 1) April 1- July 31, 2026

- No changes
- Familiarize with information
- e.g. Time in pasture

Input data (Stage 2) August 1 – October 31, 2026

- No changes
- Familiarize with information
- e.g. State Fertilizer data

Output data (Stage 3) November 1 – February1, 2027

- No changes
- Familiarize with information
- e.g. Nitogen Load

POST February 2027

- Changes
  - Examine loads and connect to information from the associated source and input data

What is the goal of today?

Prepare for the full model review in 2027.

- Examine the background data used in CAST.
- As questions arise, engage with relevant jurisdictional parties.
  - E.g. fertilizer applications look strange in year X;
    - Begin talking with your state chemist, nutrient management planners, etc. to determine if a specific years data might have an explanation.

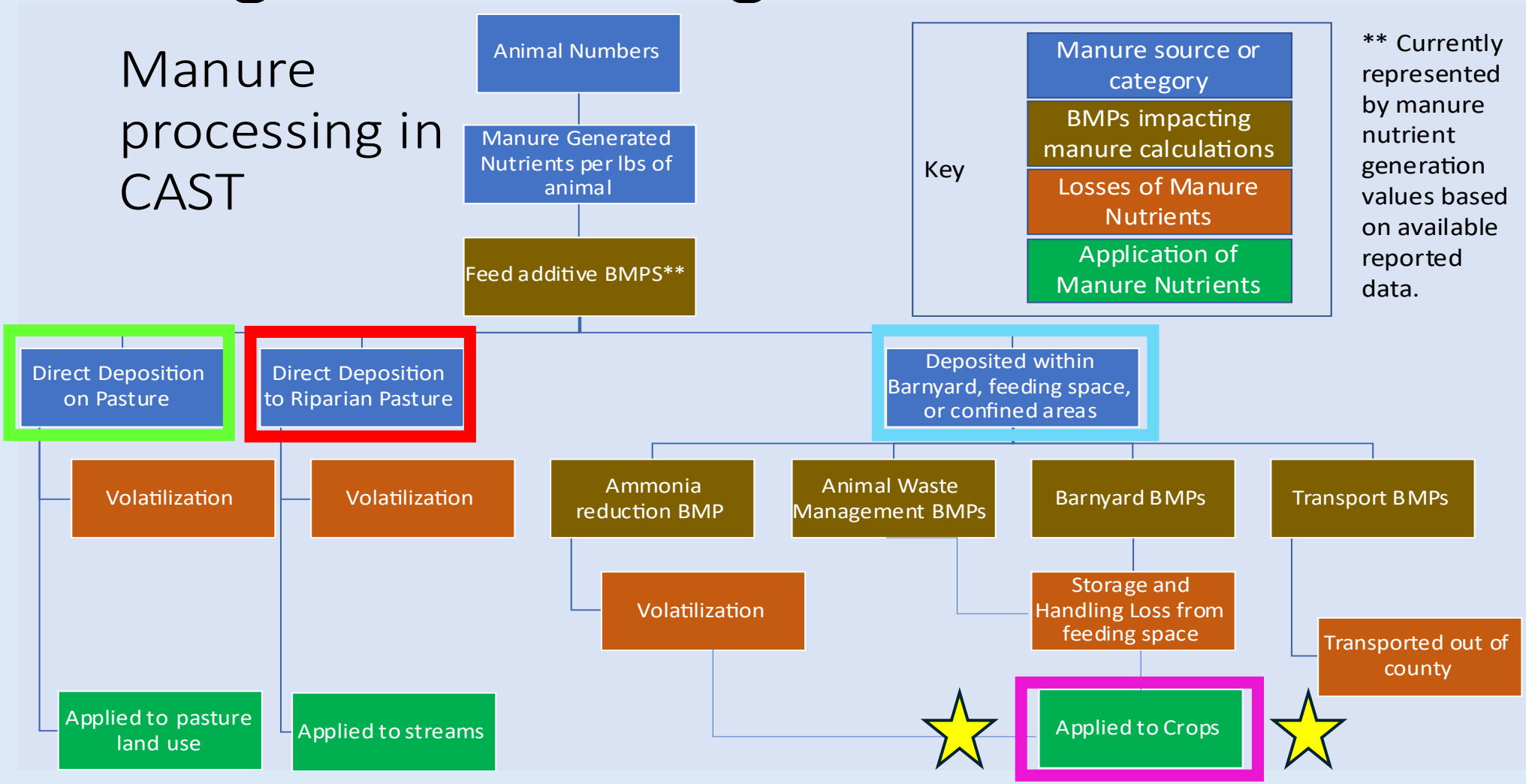
Plan for today

- State scale:
  - Examine nutrient sources:
    - Manure
    - Fertilizer
  - Preview applications
    - Crop application goal (N required to grow the expected yield)
    - Biosolid, manure, inorganic fertilizer applications
- County scale:
  - Examples of high application relative to application goal
  - Kickstart thinking about potential curious areas

Let's look at manure N

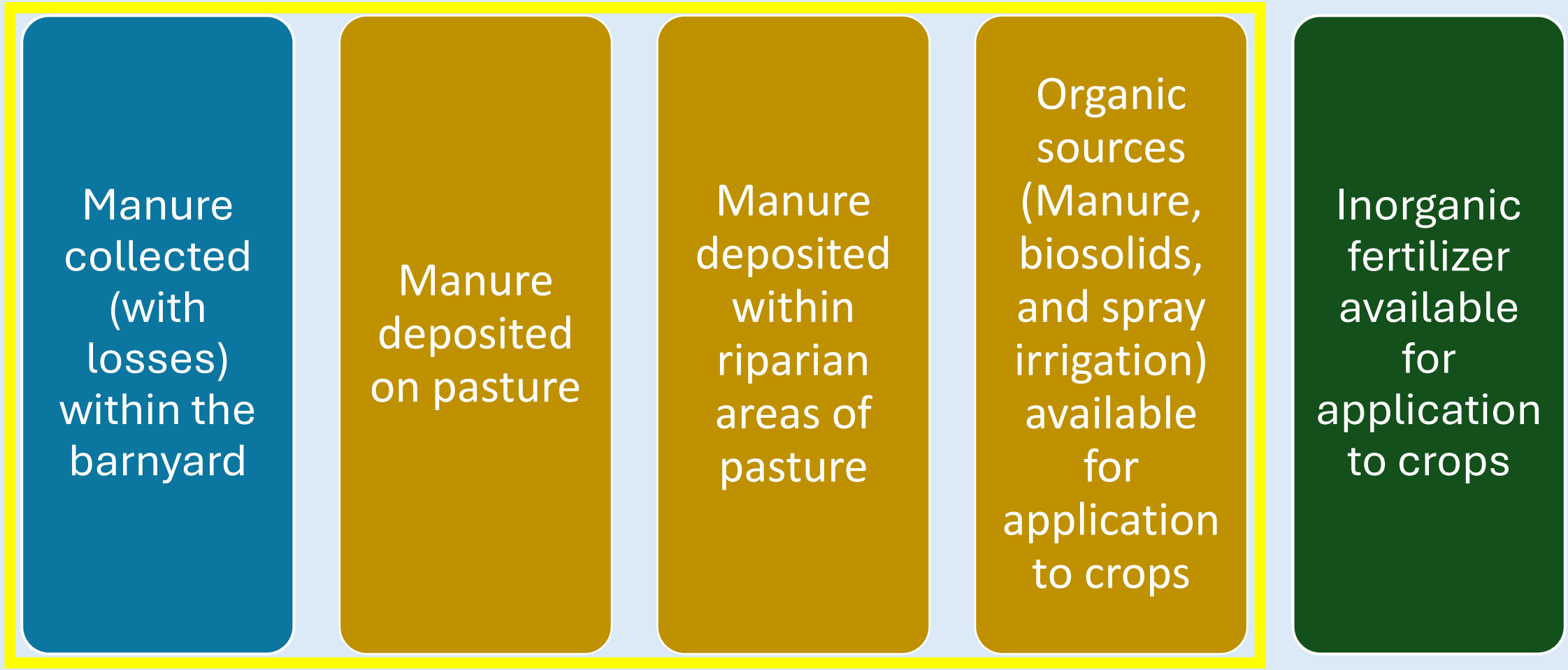
- Must be captured and stored to be used for application
- “Stored” = available for application to crops
  - Total N NOT Plant available portion

Manure generation diagram:

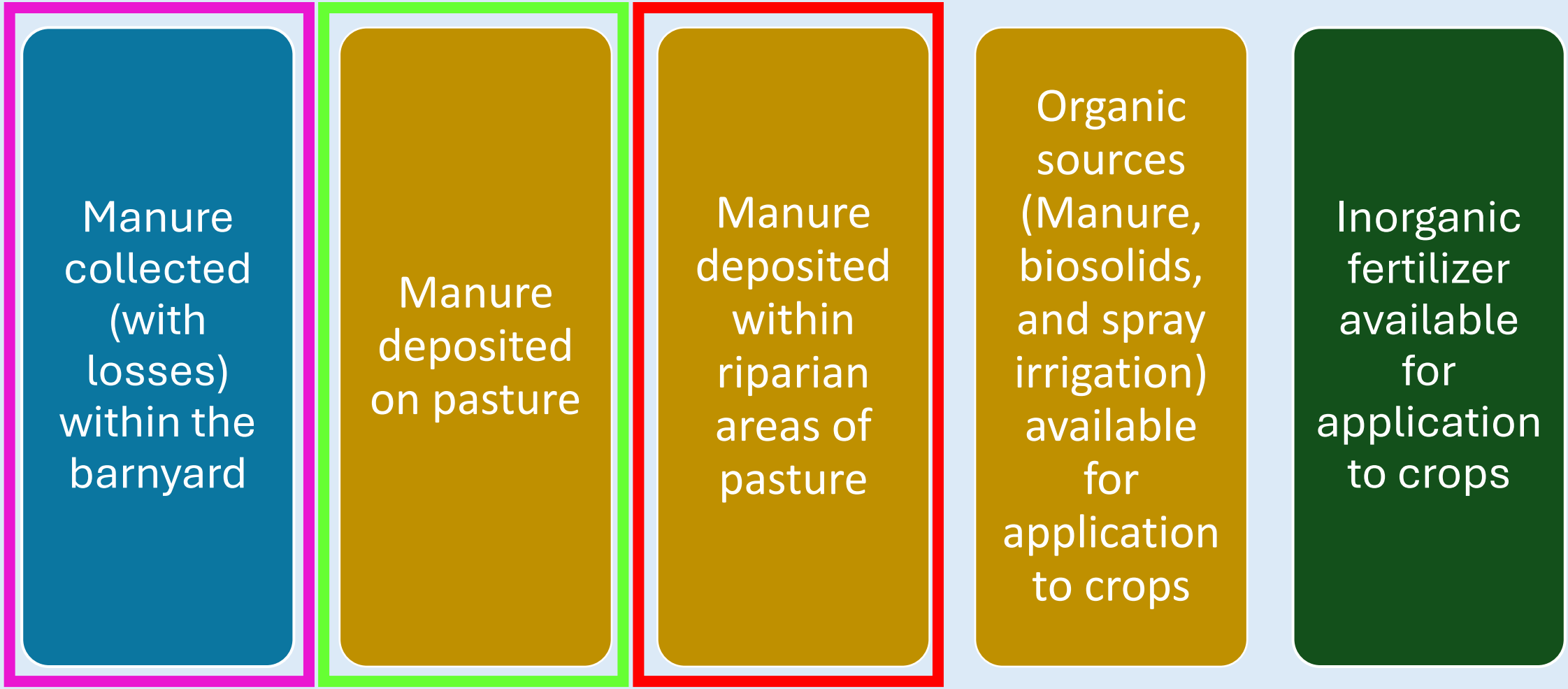


- Manure nutrients stay in their county of origin UNLESS they are transported
- Barnyard BMPs refers to runoff control management
- NOTE* after application to fields volatilization and additional BMPs can be used to increase the plant available nutrients

CAST Agriculture nutrient categories

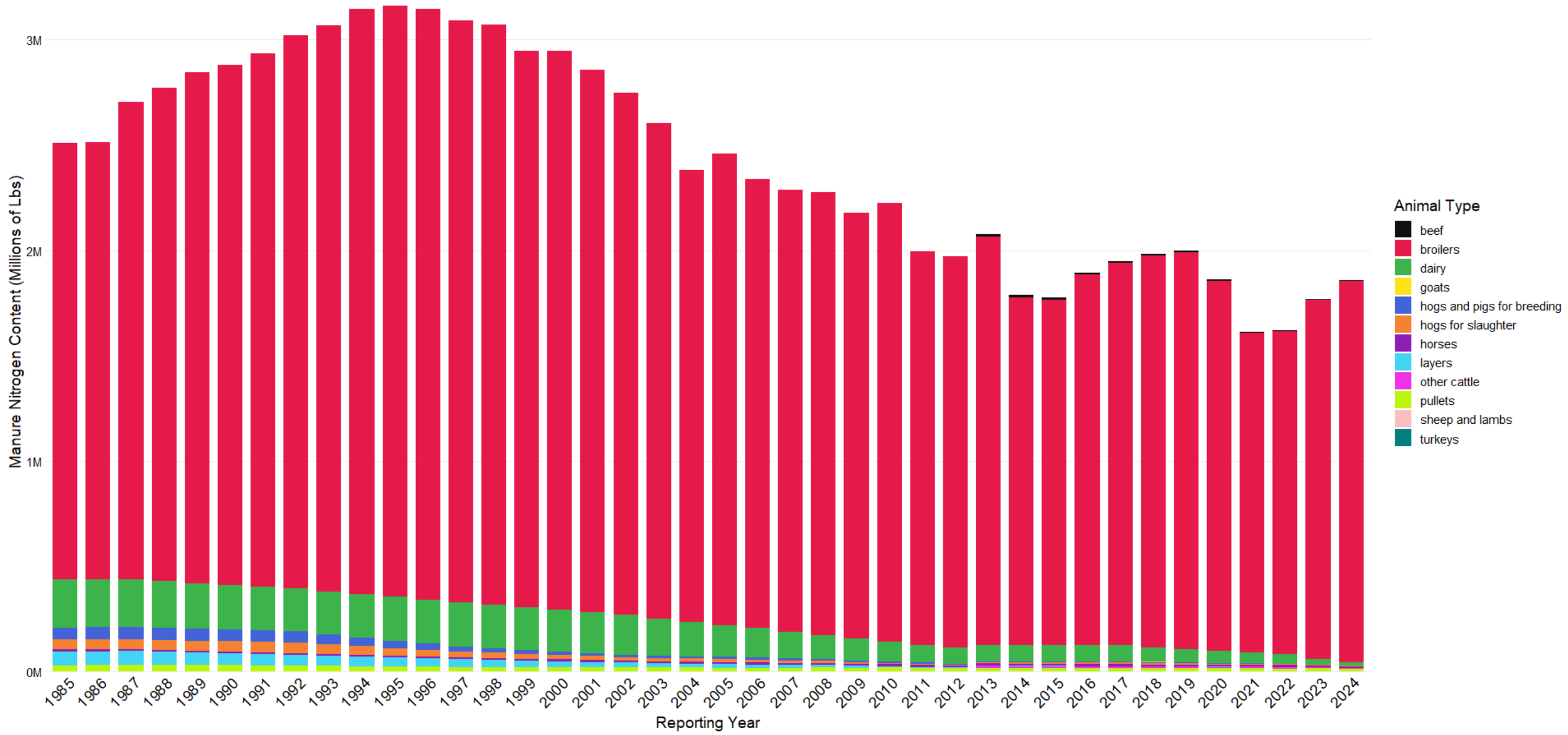


CAST Agriculture nutrient categories



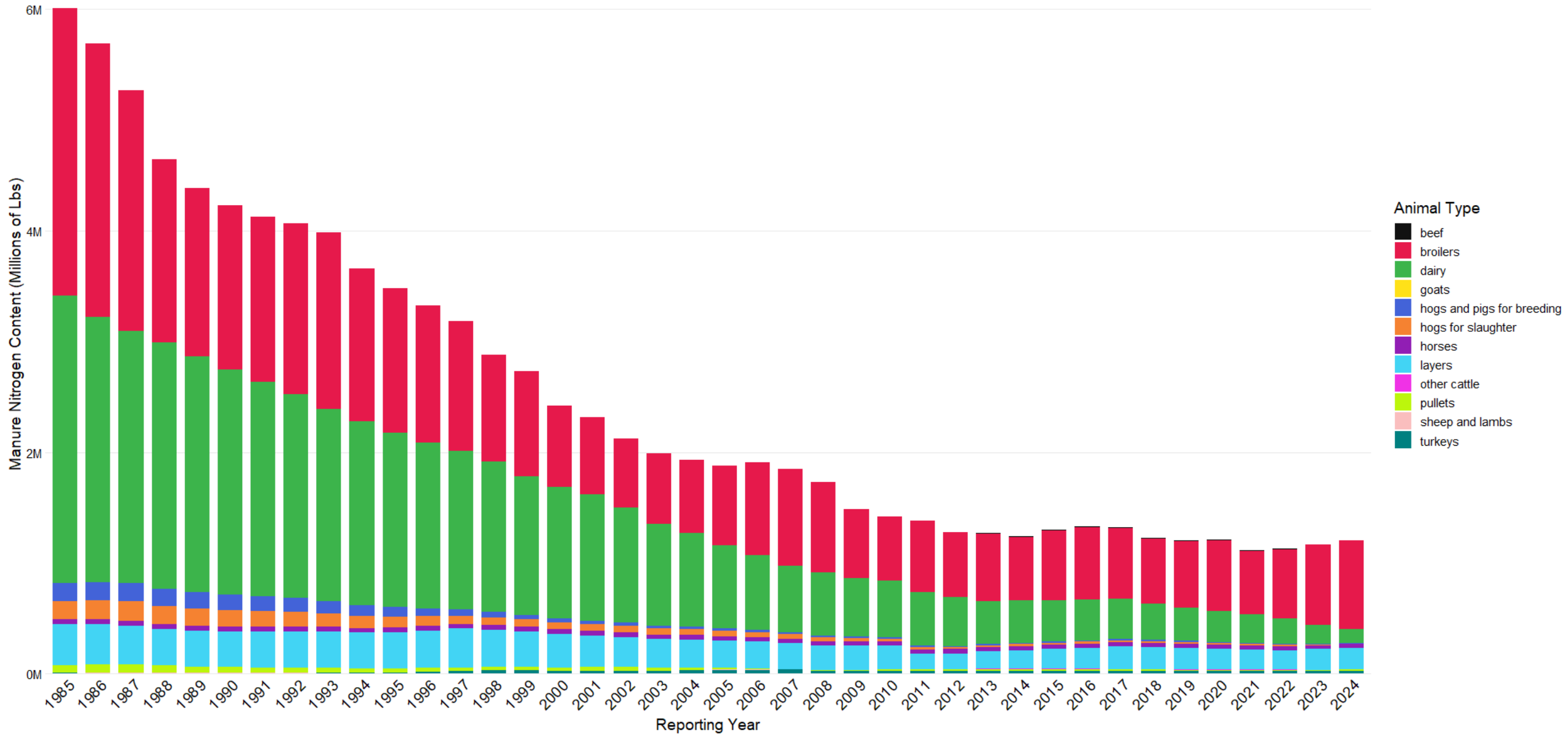
Annual Stored Manure Nitrogen Profile in DE

Total Stored Nitrogen (N) content values aggregated into solid blocks



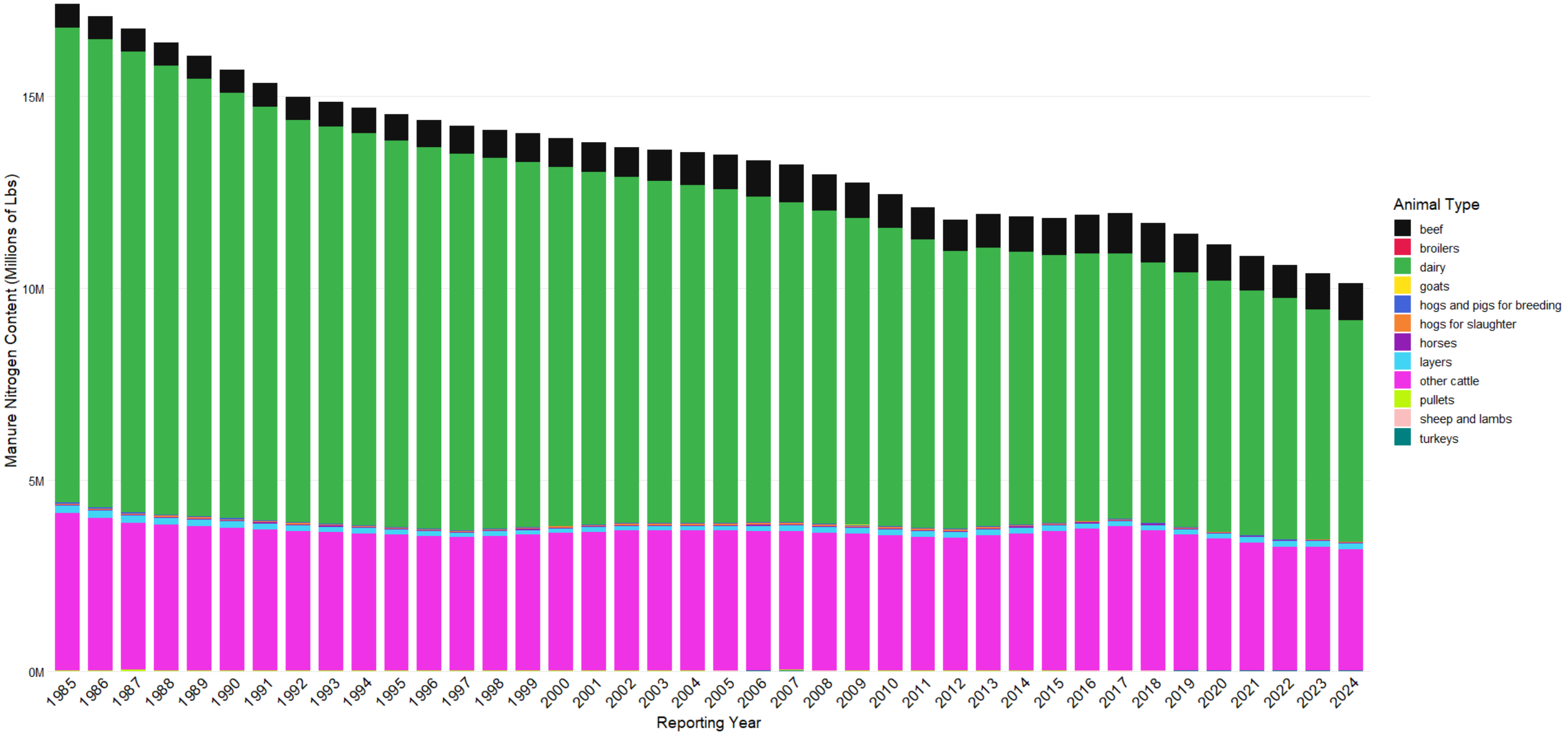
Annual Stored Manure Nitrogen Profile in MD

Total Stored Nitrogen (N) content values aggregated into solid blocks



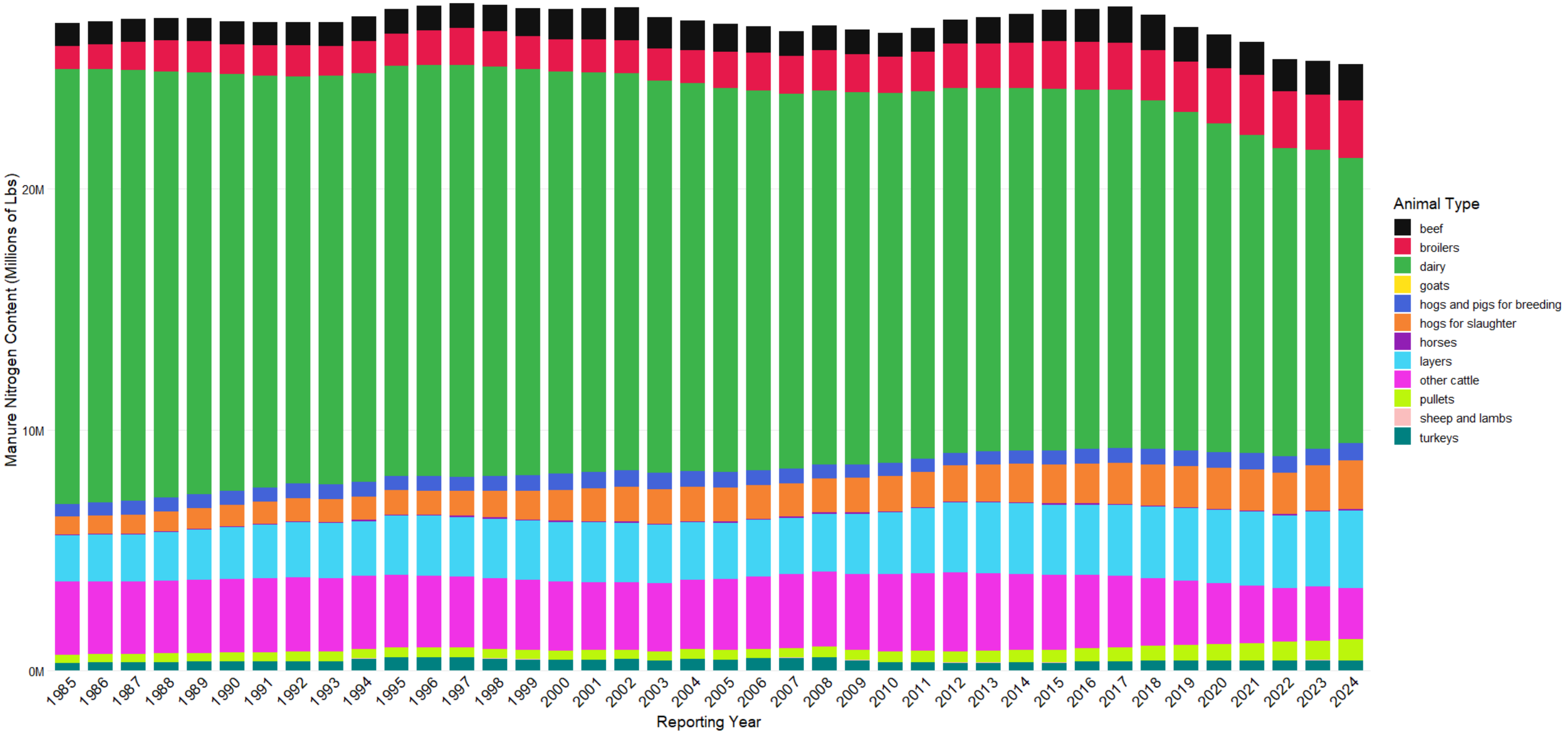
Annual Stored Manure Nitrogen Profile in NY

Total Stored Nitrogen (N) content values aggregated into solid blocks



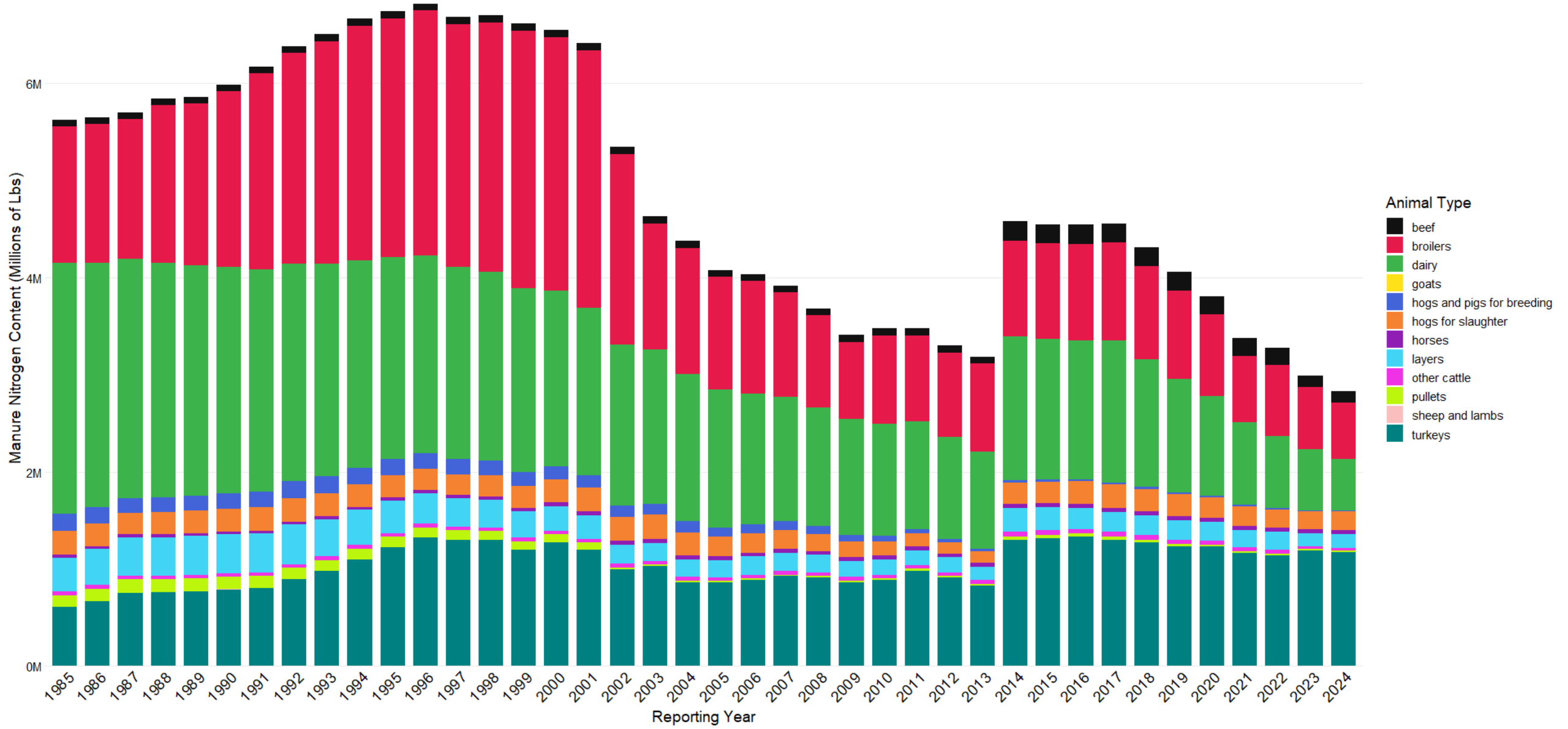
Annual Stored Manure Nitrogen Profile in PA

Total Stored Nitrogen (N) content values aggregated into solid blocks



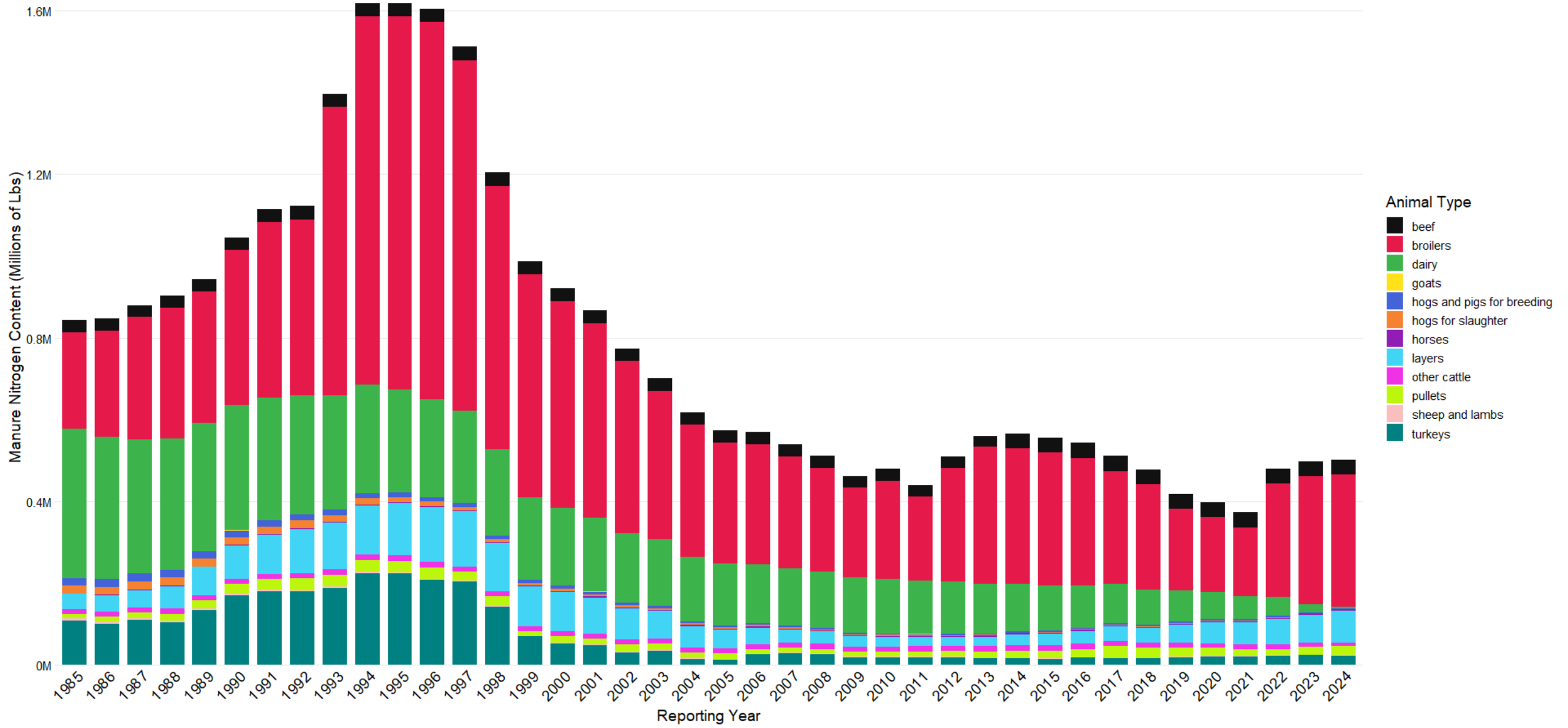
Annual Stored Manure Nitrogen Profile in VA

Total Stored Nitrogen (N) content values aggregated into solid blocks



Annual Stored Manure Nitrogen Profile in WV

Total Stored Nitrogen (N) content values aggregated into solid blocks

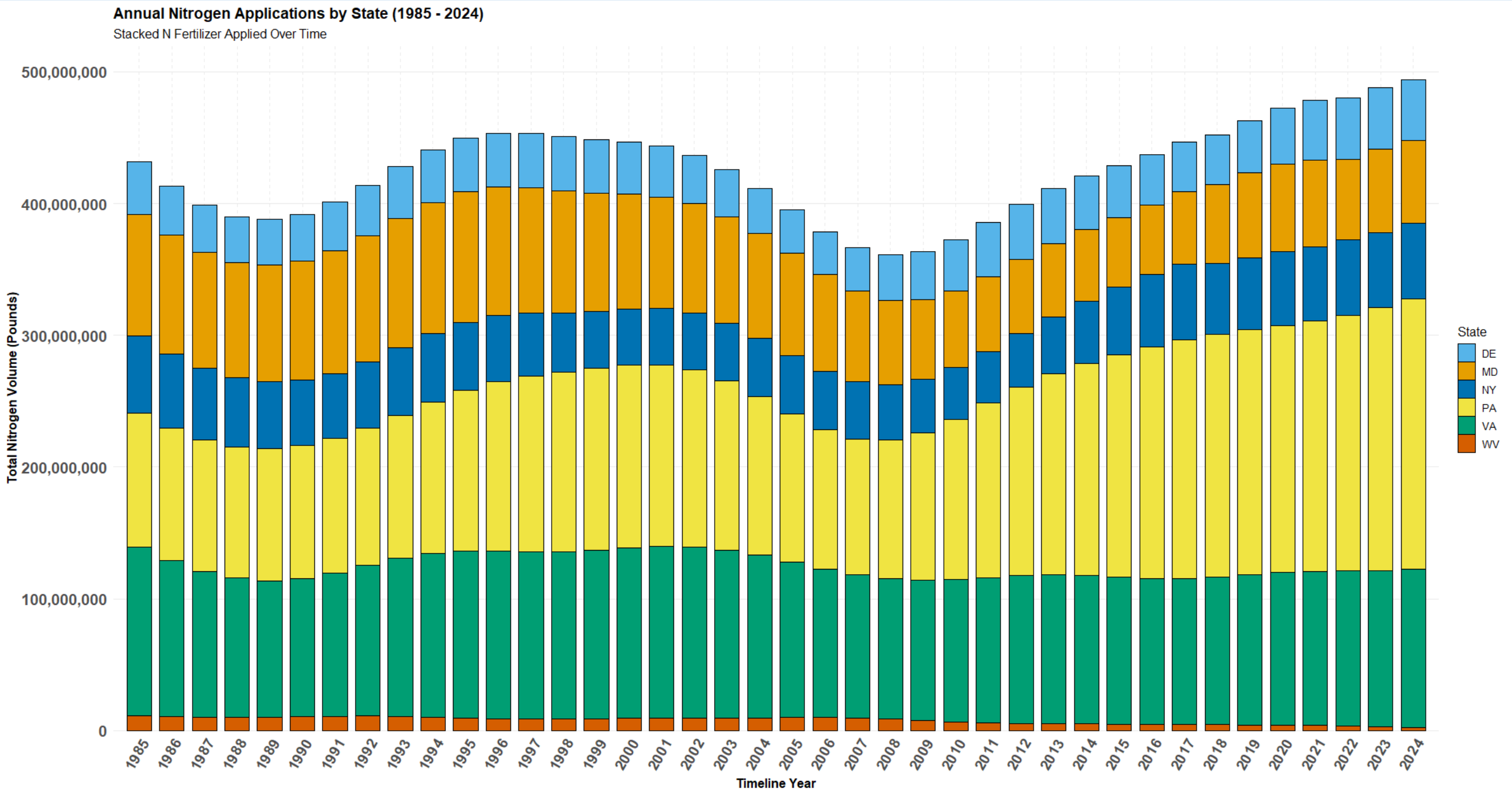


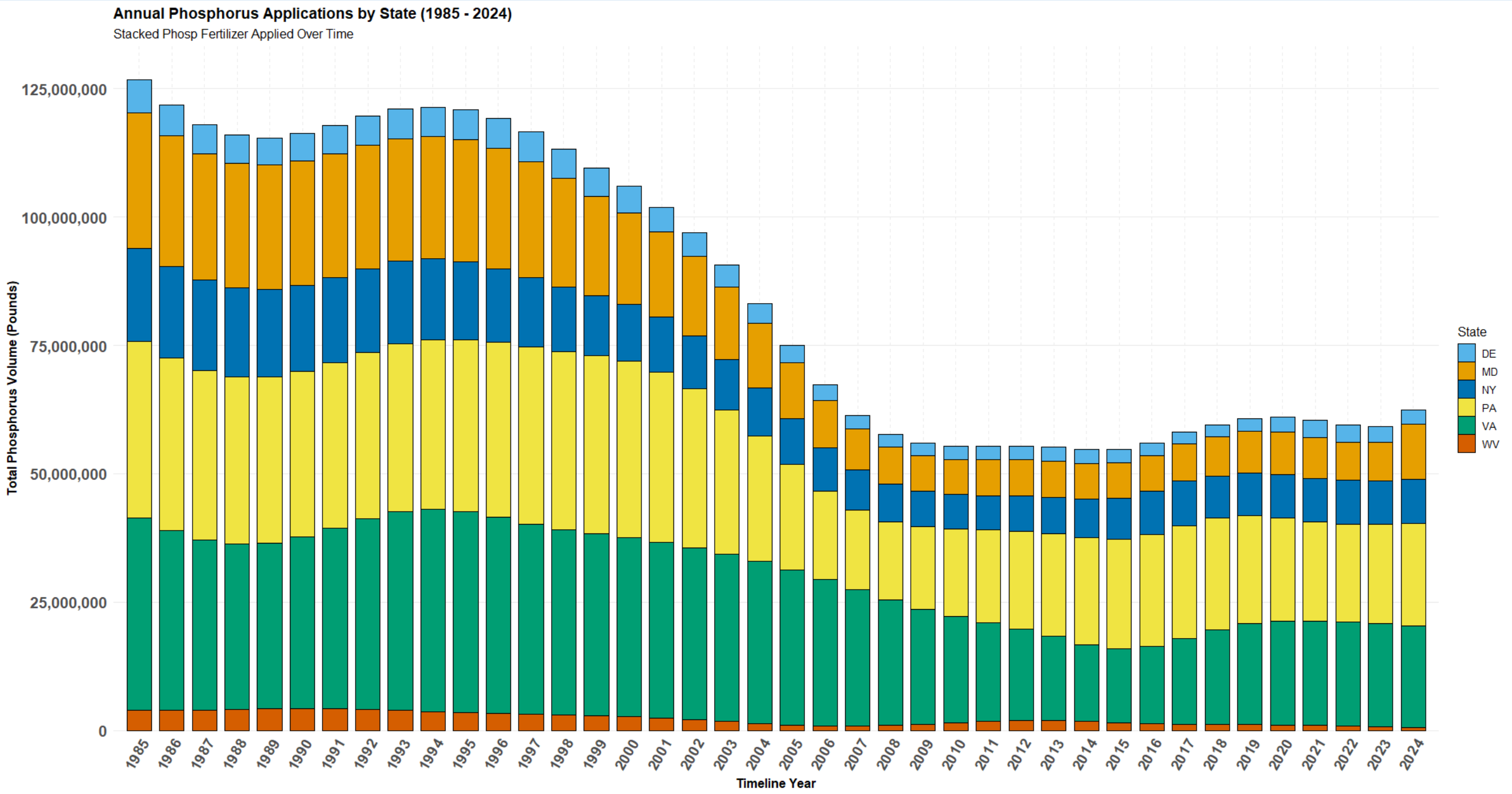
Takeaways:

- Animal types vary across jurisdictions
- Long term declines in stored manure N over time (1985- 2024)

What about inorganic fertilizer?

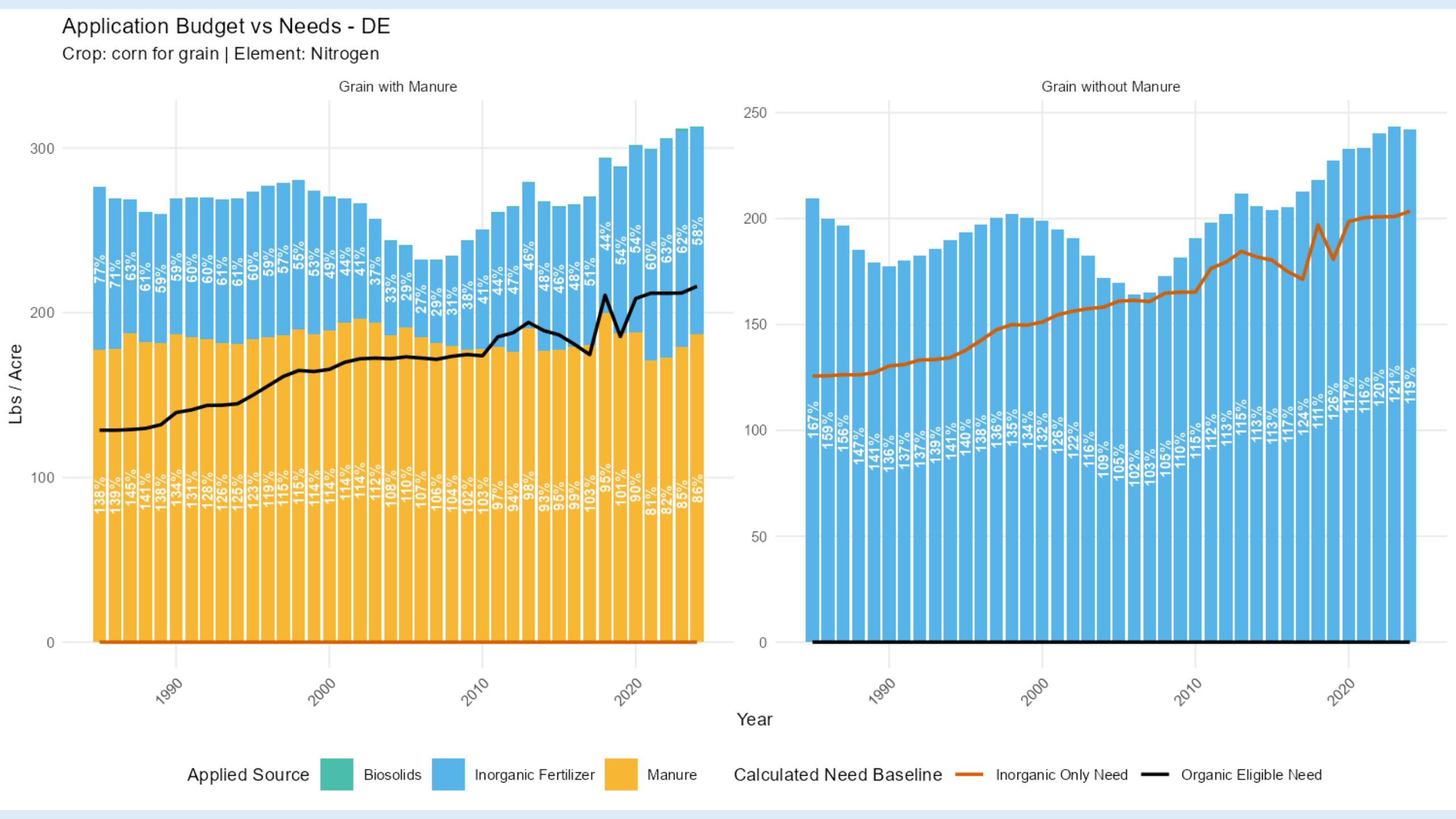
- Follows AMT approved smoothing methods
- Foundation in state sales data
- Updated through 2024
- **Big change:**
  - State scale fertilizer stocks

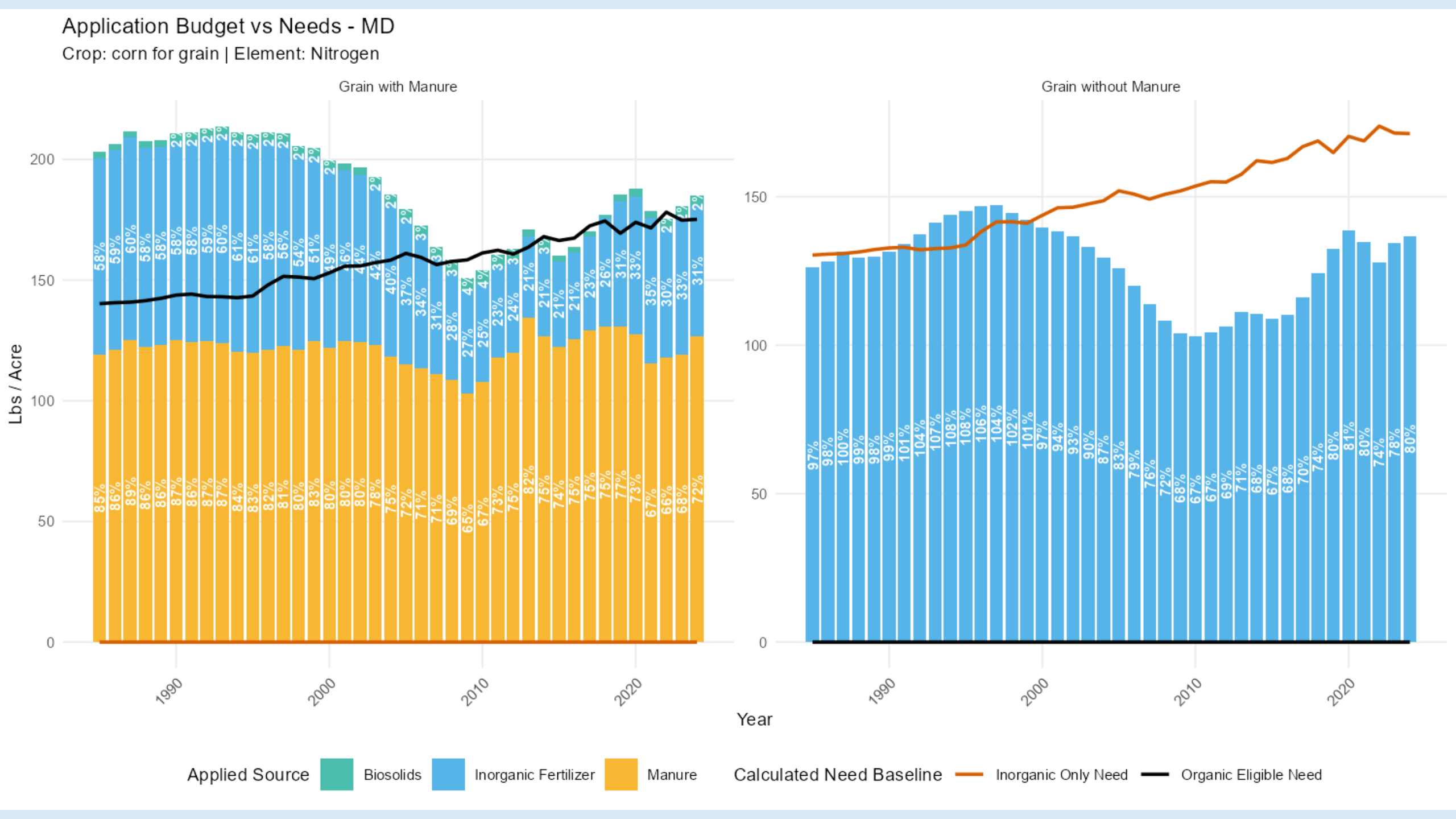

Annual Nitrogen Applications by State (1985 - 2024)
Stacked N Fertilizer Applied Over Time
Total Nitrogen Volume (Pounds)
500,000,000
400,000,000
300,000,000
200,000,000
100,000,000
0
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Timeline Year
State
DE
MD
NY
PA
VA
WV

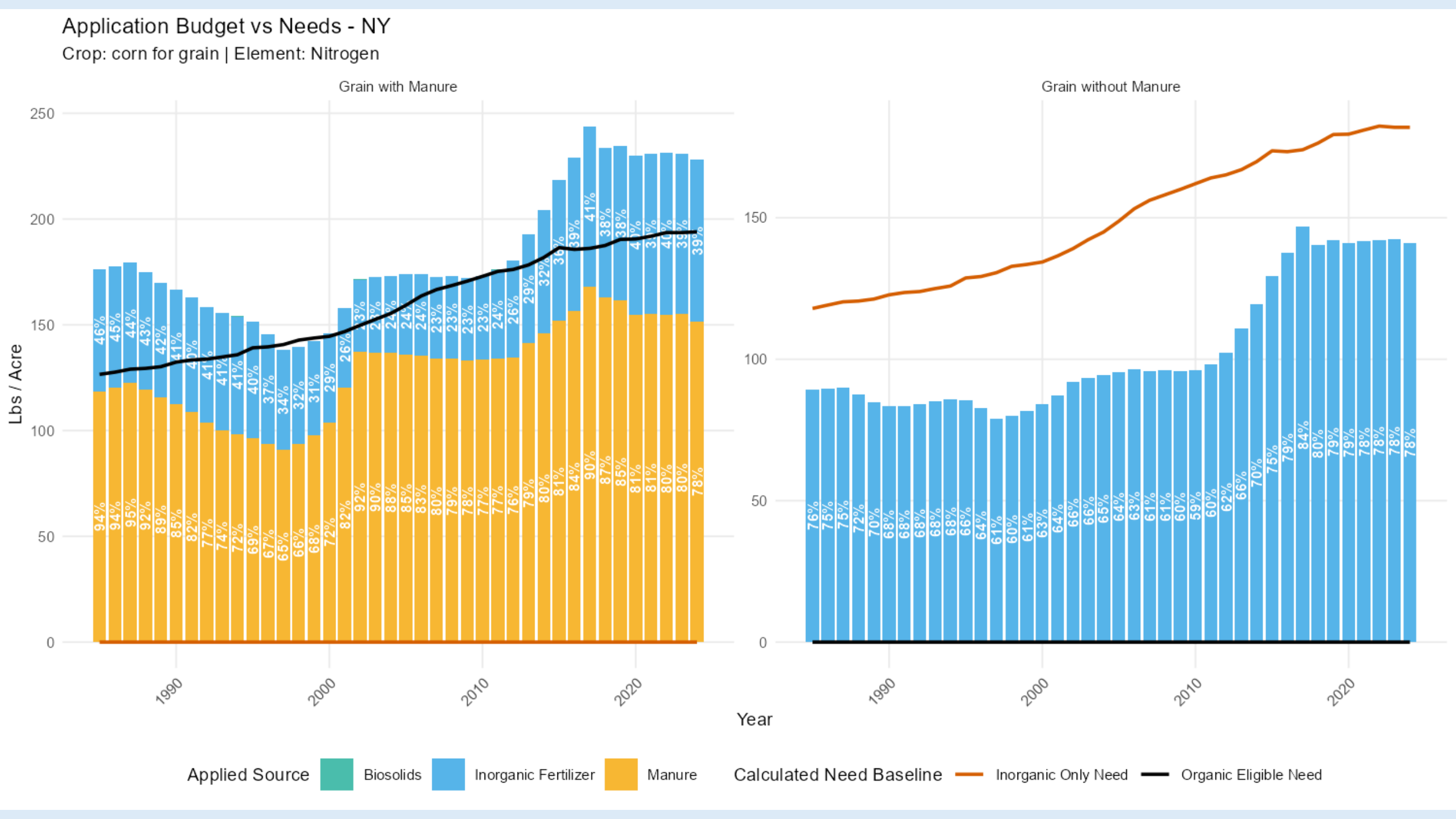

Annual Phosphorus Applications by State (1985 - 2024)
Stacked Phosp Fertilizer Applied Over Time
Total Phosphorus Volume (Pounds)
125,000,000
100,000,000
75,000,000
50,000,000
25,000,000
0
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Timeline Year
State
DE
MD
NY
PA
VA
WV

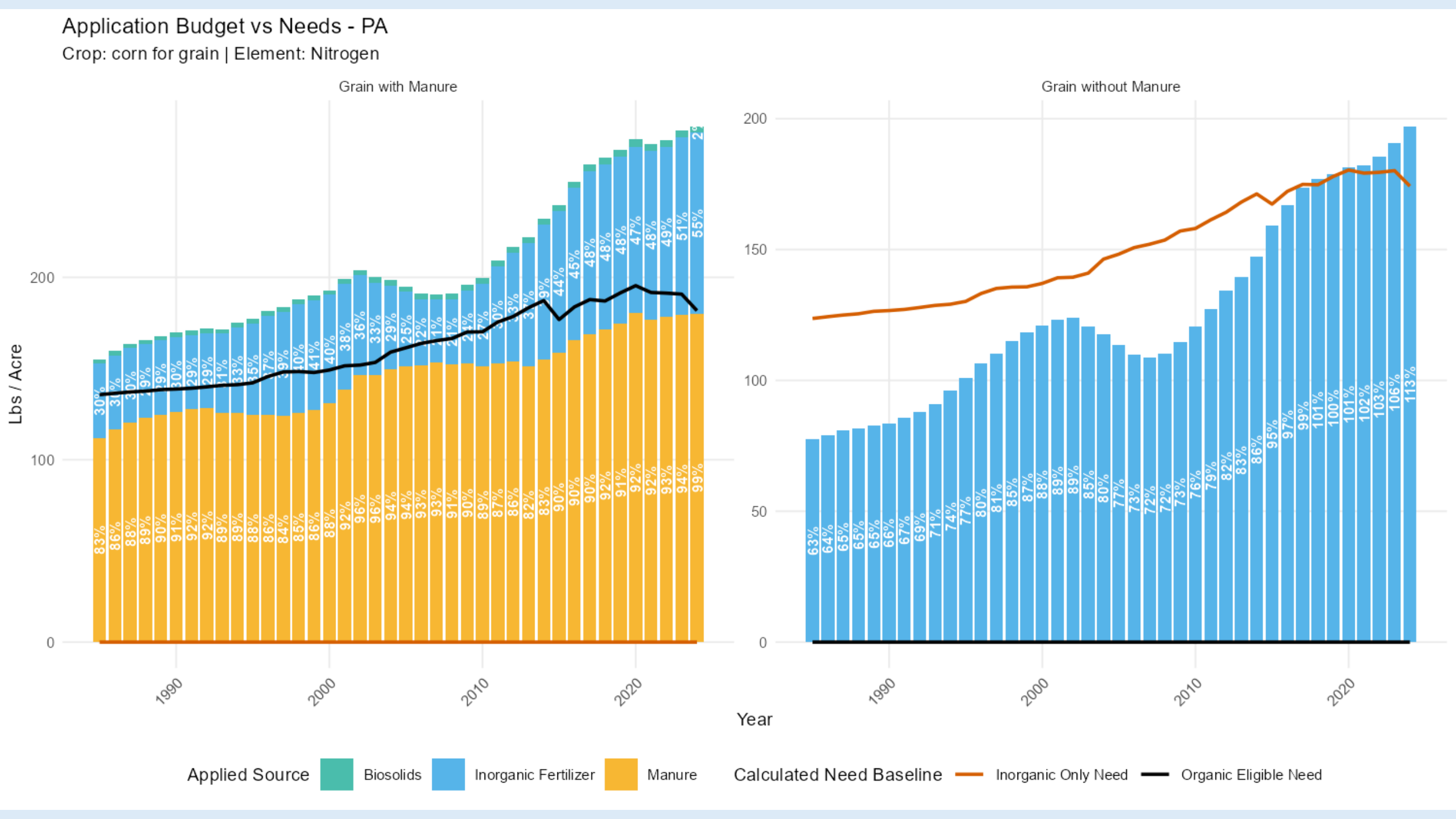
How do state scale applications look?

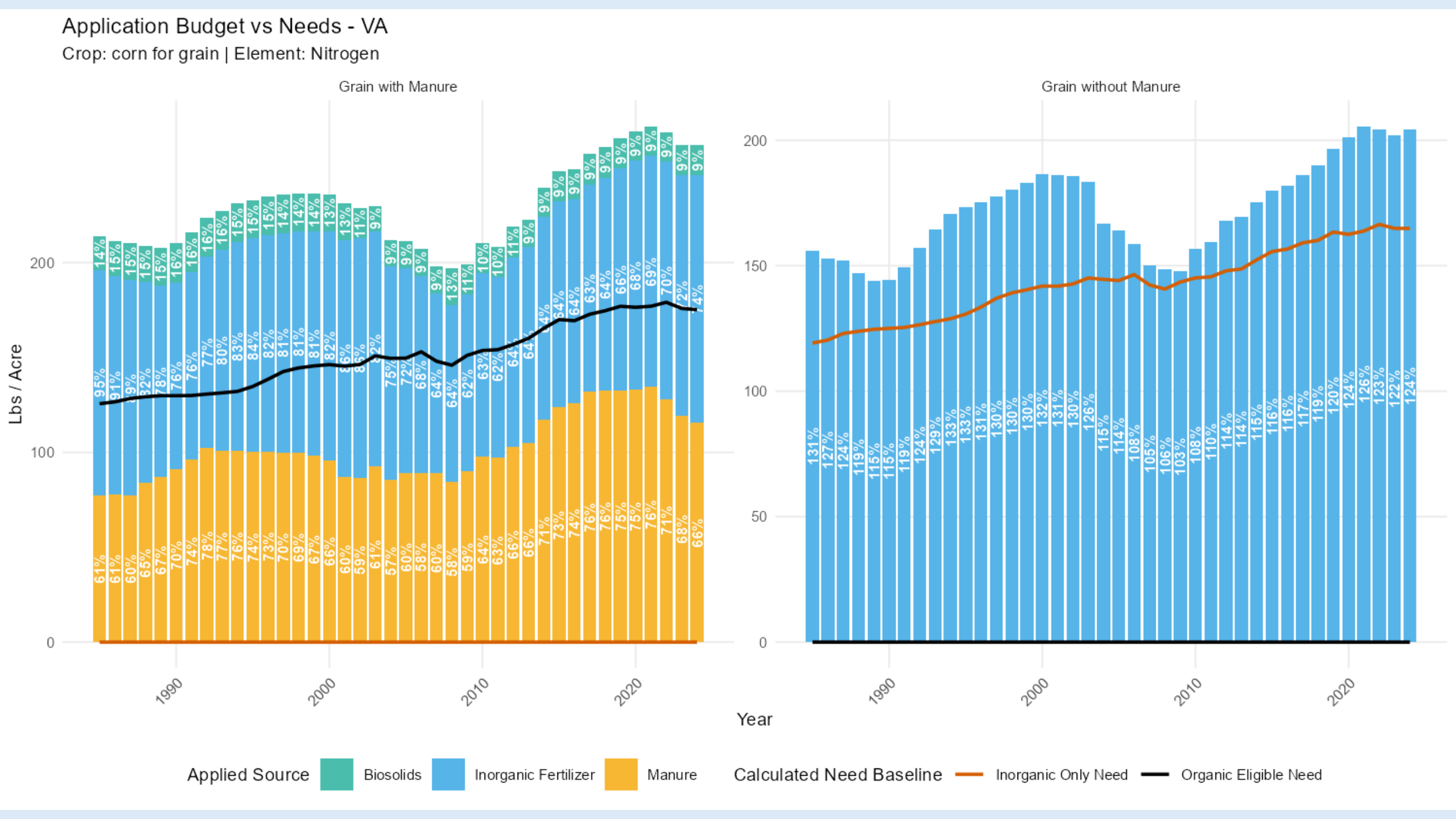
- Focused on the CAST Corn for grain crop
  - Encompasses two load sources:
    - Grain WITH manure
    - Grain WITHOUT manure
  - Large acreage across the watershed heavy applications

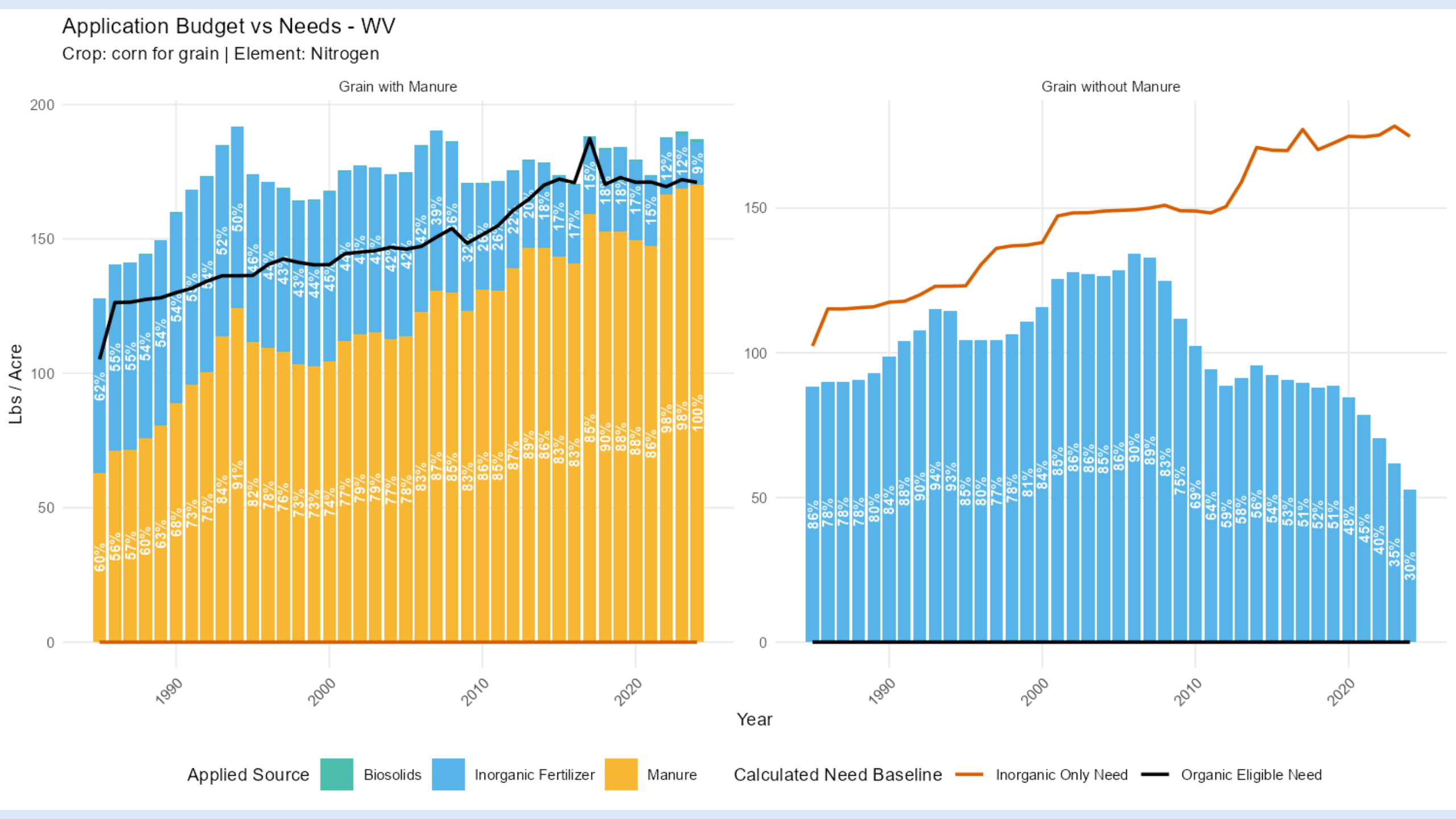

Application Budget vs Needs - DE
Crop: corn for grain | Element: Nitrogen
Grain with Manure
Grain without Manure
Lbs / Acre
Year
Applied Source
Biosolids
Inorganic Fertilizer
Manure
Calculated Need Baseline
Inorganic Only Need
Organic Eligible Need


Application Budget vs Needs - MD
Crop: corn for grain | Element: Nitrogen
Grain with Manure
Grain without Manure
Lbs / Acre
Year
Applied Source
Biosolids
Inorganic Fertilizer
Manure
Calculated Need Baseline
Inorganic Only Need
Organic Eligible Need


Application Budget vs Needs - NY
Crop: corn for grain | Element: Nitrogen
Grain with Manure
Grain without Manure
Lbs / Acre
Year
Applied Source
Biosolids
Inorganic Fertilizer
Manure
Calculated Need Baseline
Inorganic Only Need
Organic Eligible Need


Application Budget vs Needs - PA
Crop: corn for grain | Element: Nitrogen
Grain with Manure
Grain without Manure
Lbs / Acre
Year
Applied Source
Biosolids
Inorganic Fertilizer
Manure
Calculated Need Baseline
Inorganic Only Need
Organic Eligible Need


Application Budget vs Needs - VA
Crop: corn for grain | Element: Nitrogen
Grain with Manure
Grain without Manure
Lbs / Acre
Year
Applied Source
Biosolids
Inorganic Fertilizer
Manure
Calculated Need Baseline
Inorganic Only Need
Organic Eligible Need


Application Budget vs Needs - WV
Crop: corn for grain | Element: Nitrogen
Grain with Manure
Grain without Manure
Lbs / Acre
Year
Applied Source
Biosolids
Inorganic Fertilizer
Manure
Calculated Need Baseline
Inorganic Only Need
Organic Eligible Need

Takeaways:

- Application of N exceeds crop need in corn for grain crops in some areas but not all.
- The application of manure to corn for grain creates a greater propensity to overapply N vs systems with inorganic only applications.

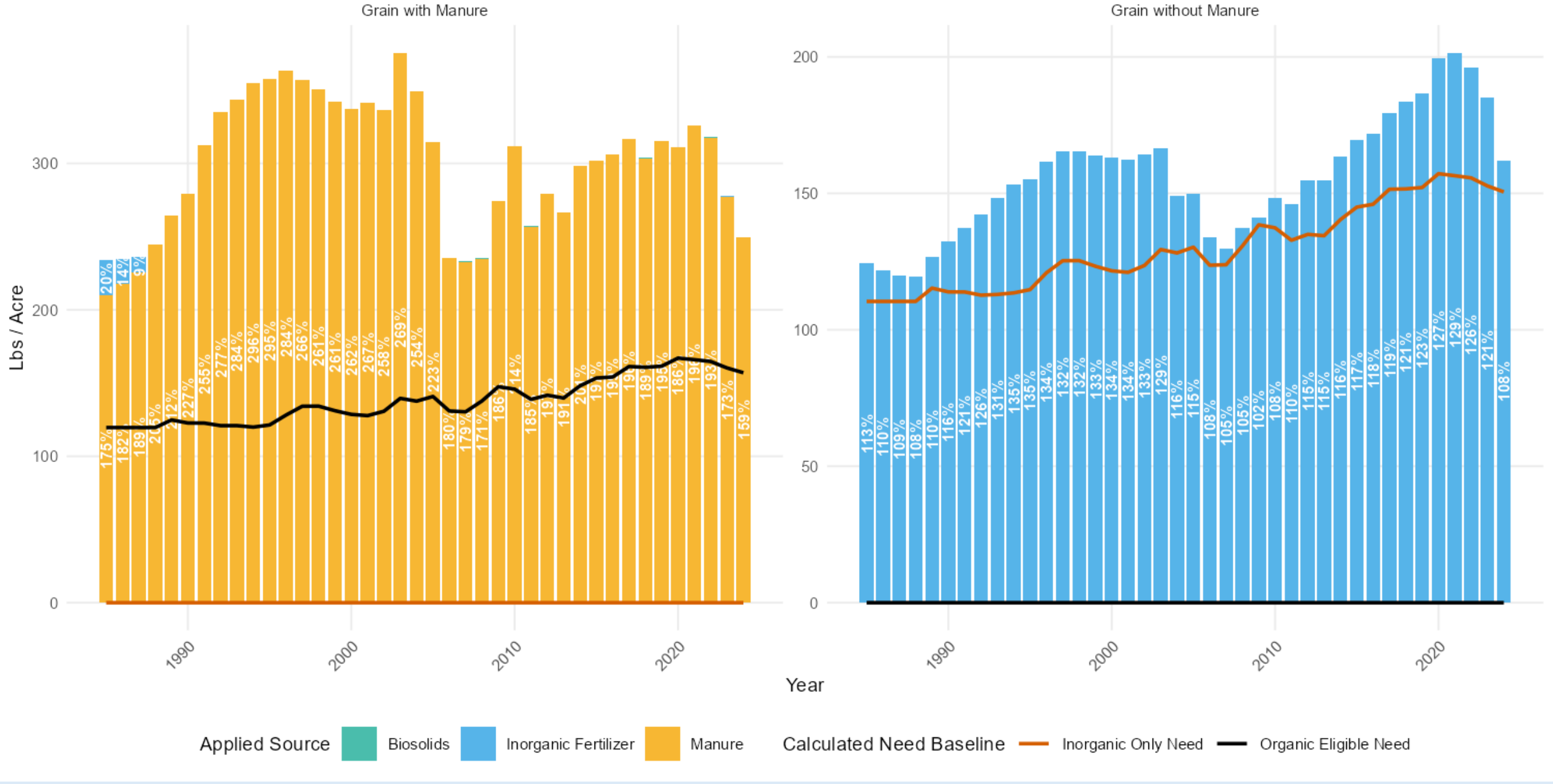
Let’s broaden the crops and look at counties:

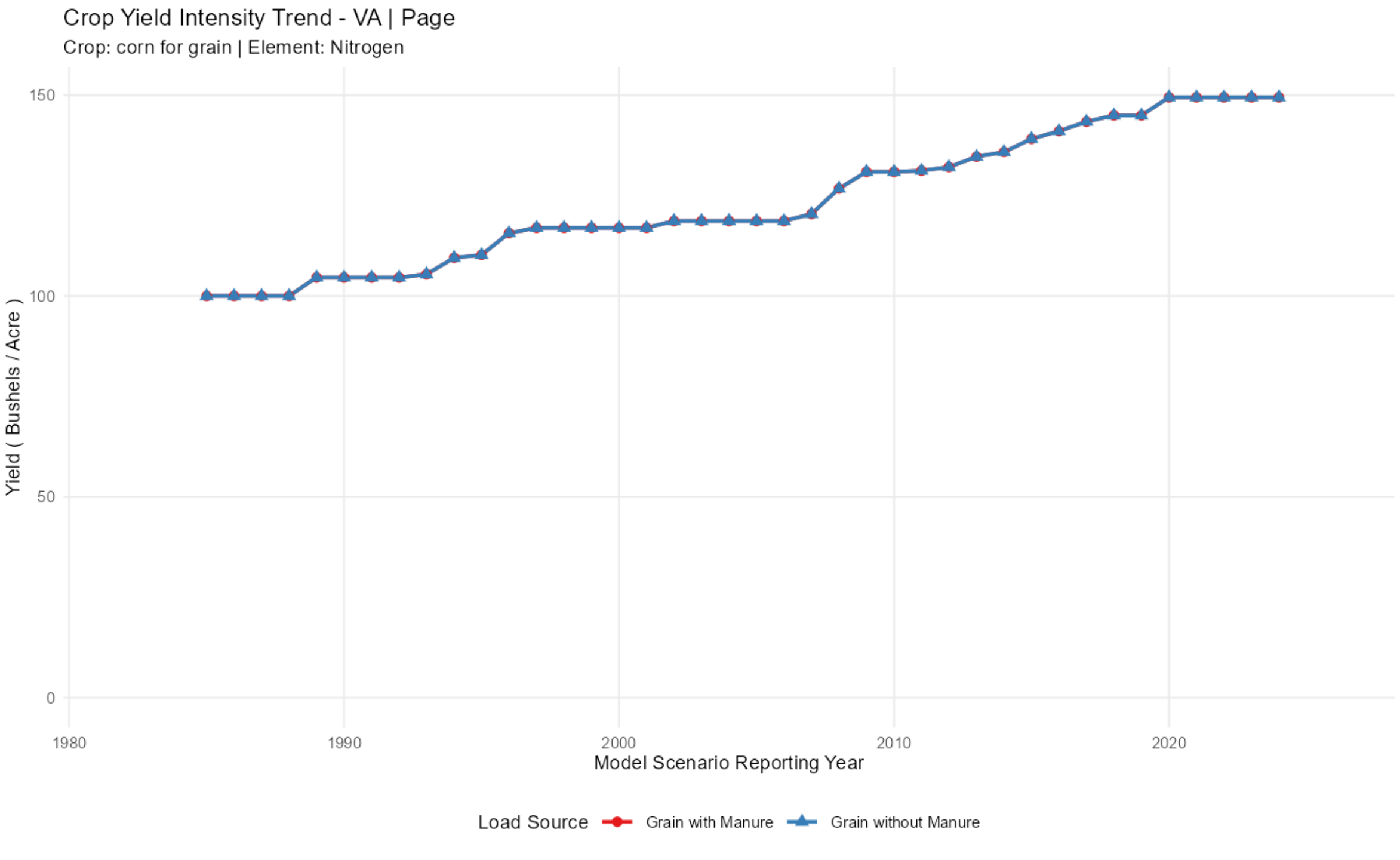
- Apply over 120% of nitrogen required for the crop to grow (Excess)
- Occurs at least five of the last 10 years of record
- More than 1000 acres of the crop are present

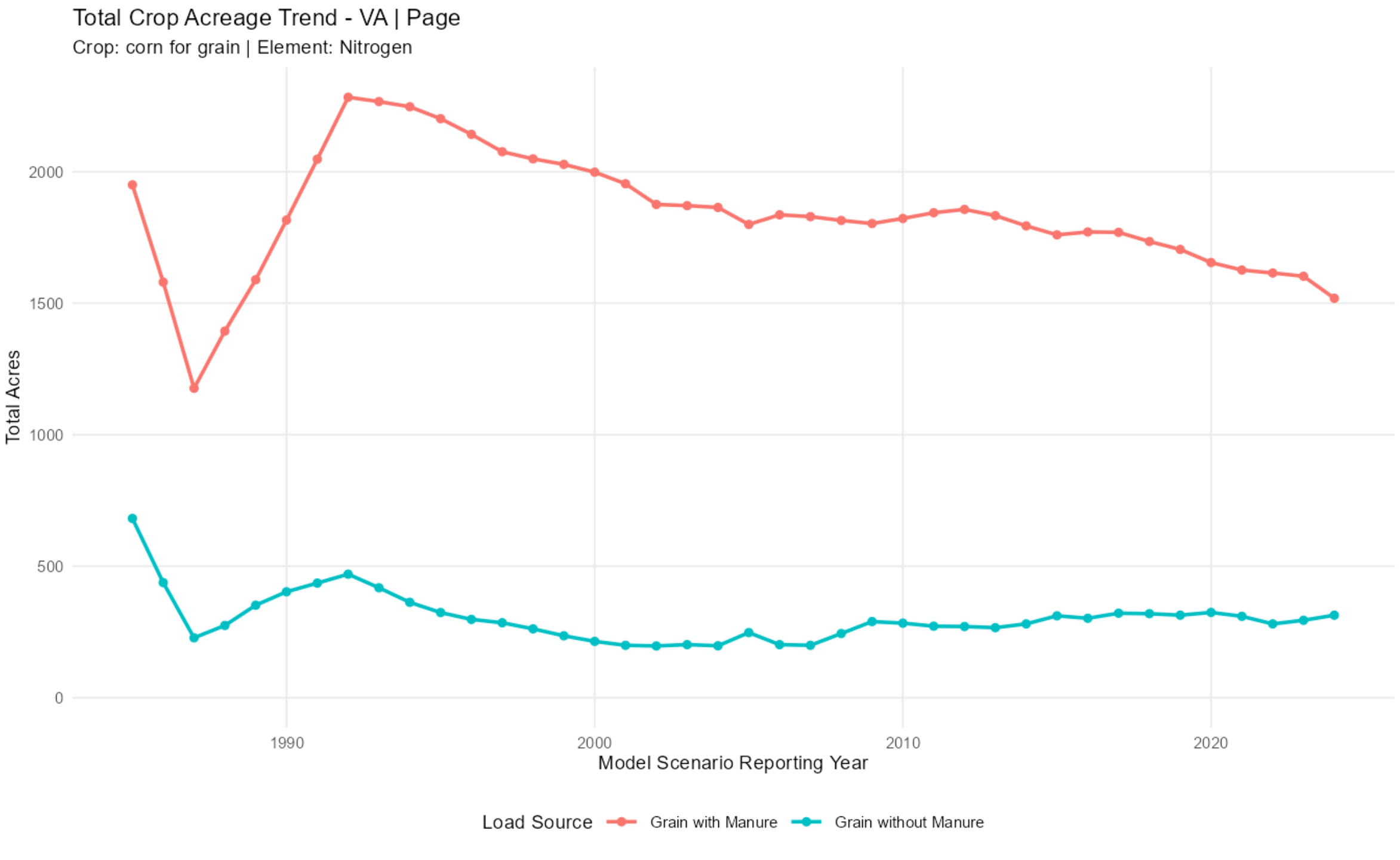
Page County, VA – Corn for grain
Union County, PA – Corn for silage

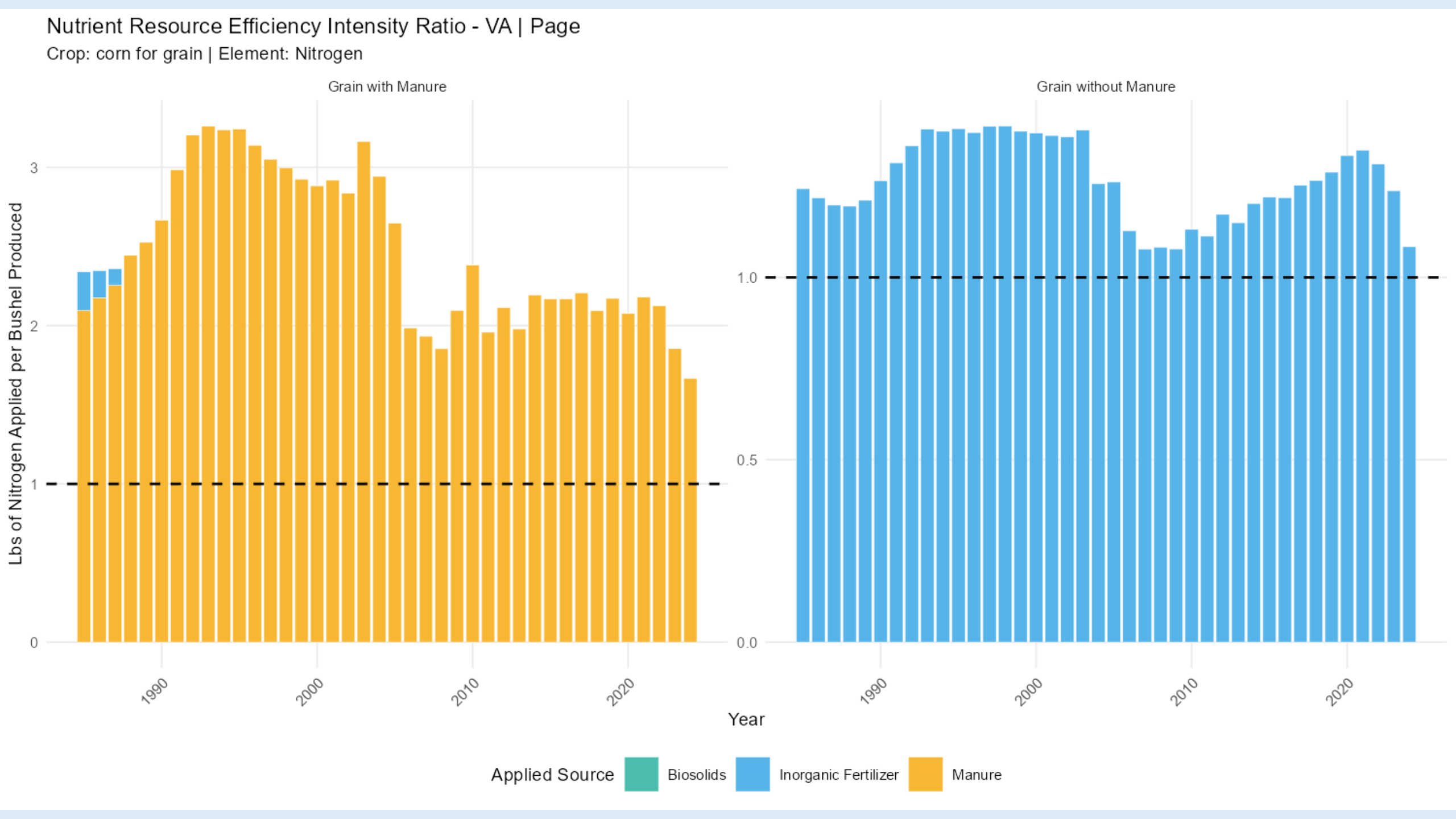
Application Budget vs Needs - VA | Page

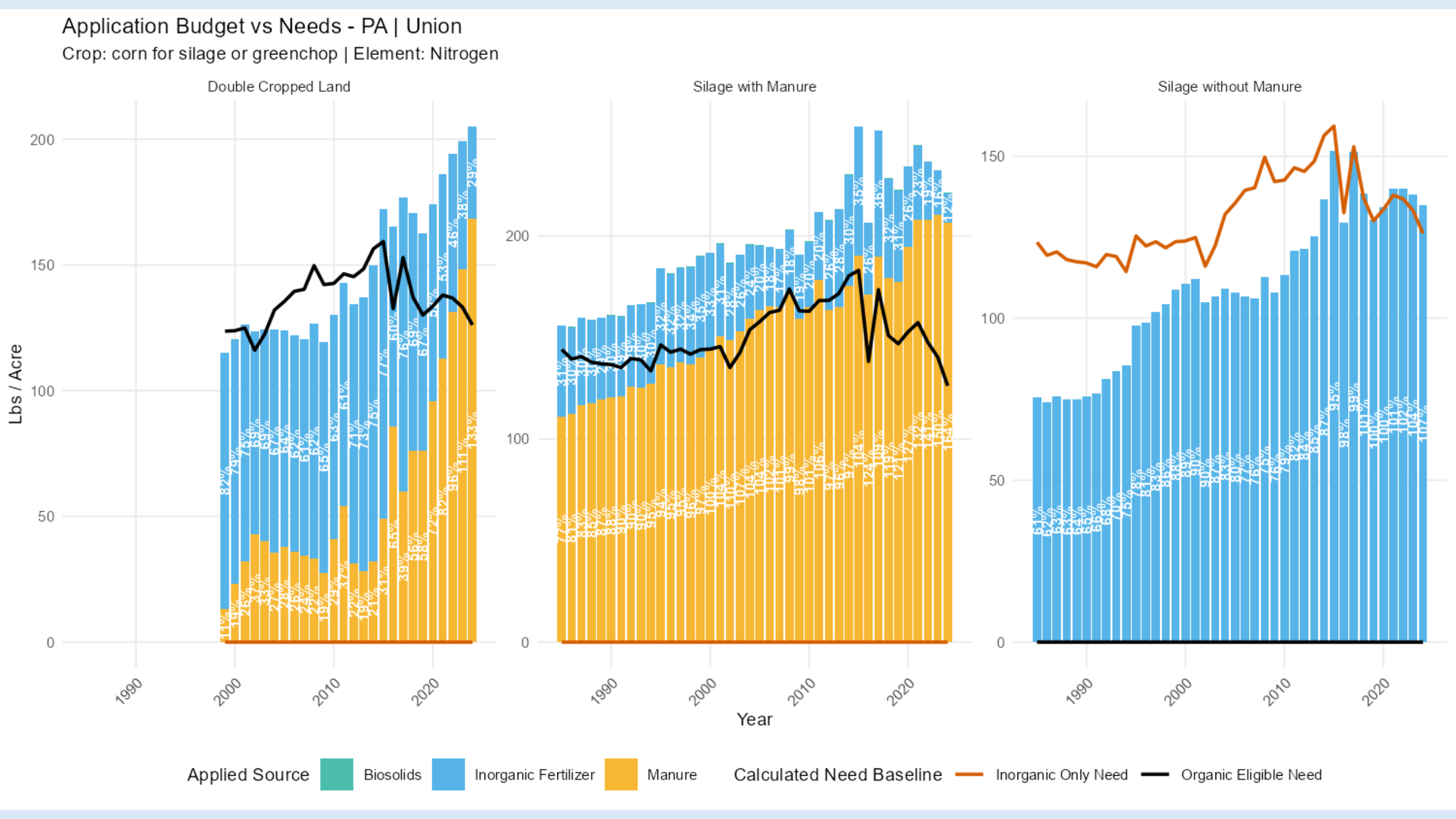
Crop: corn for grain | Element: Nitrogen

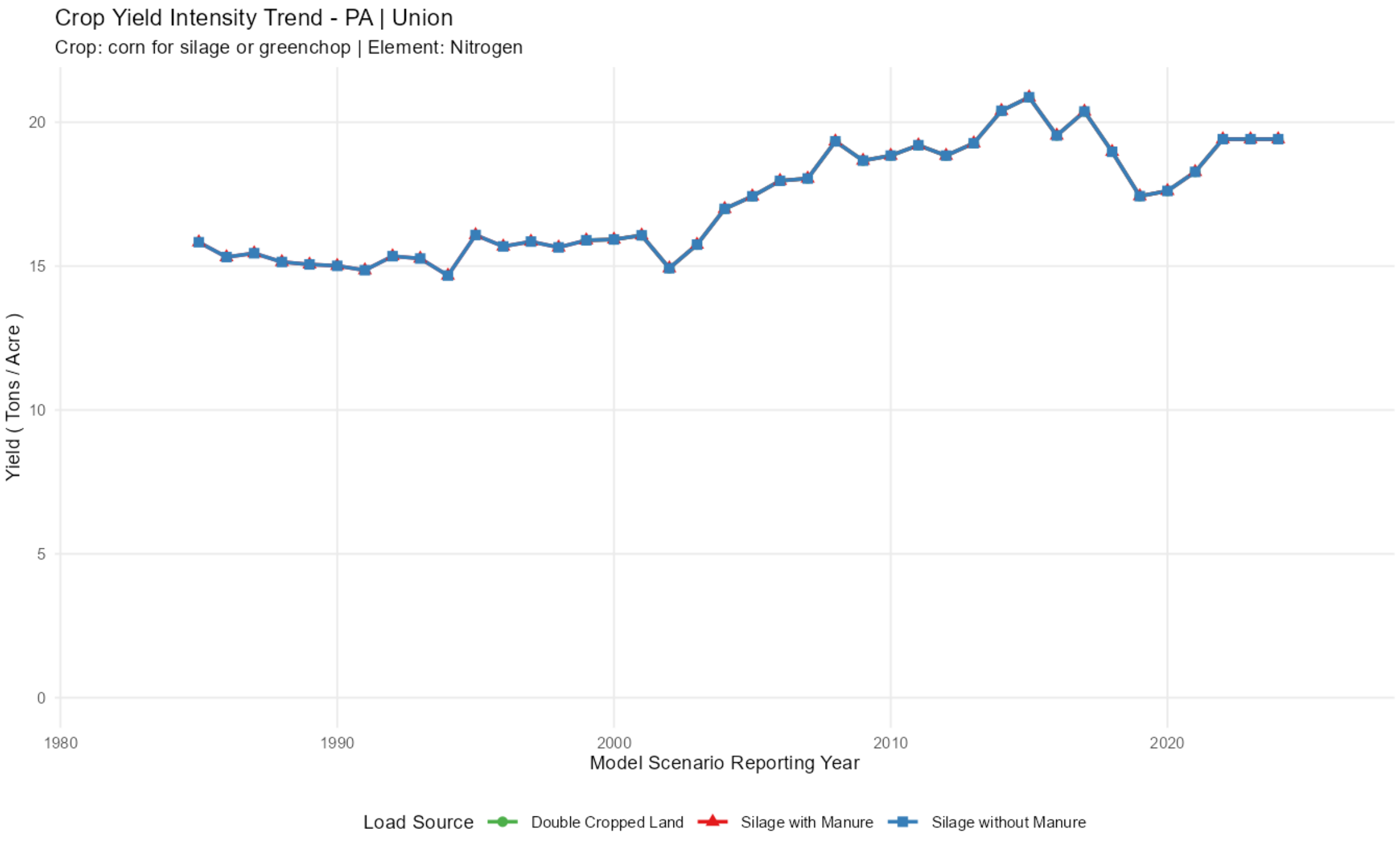


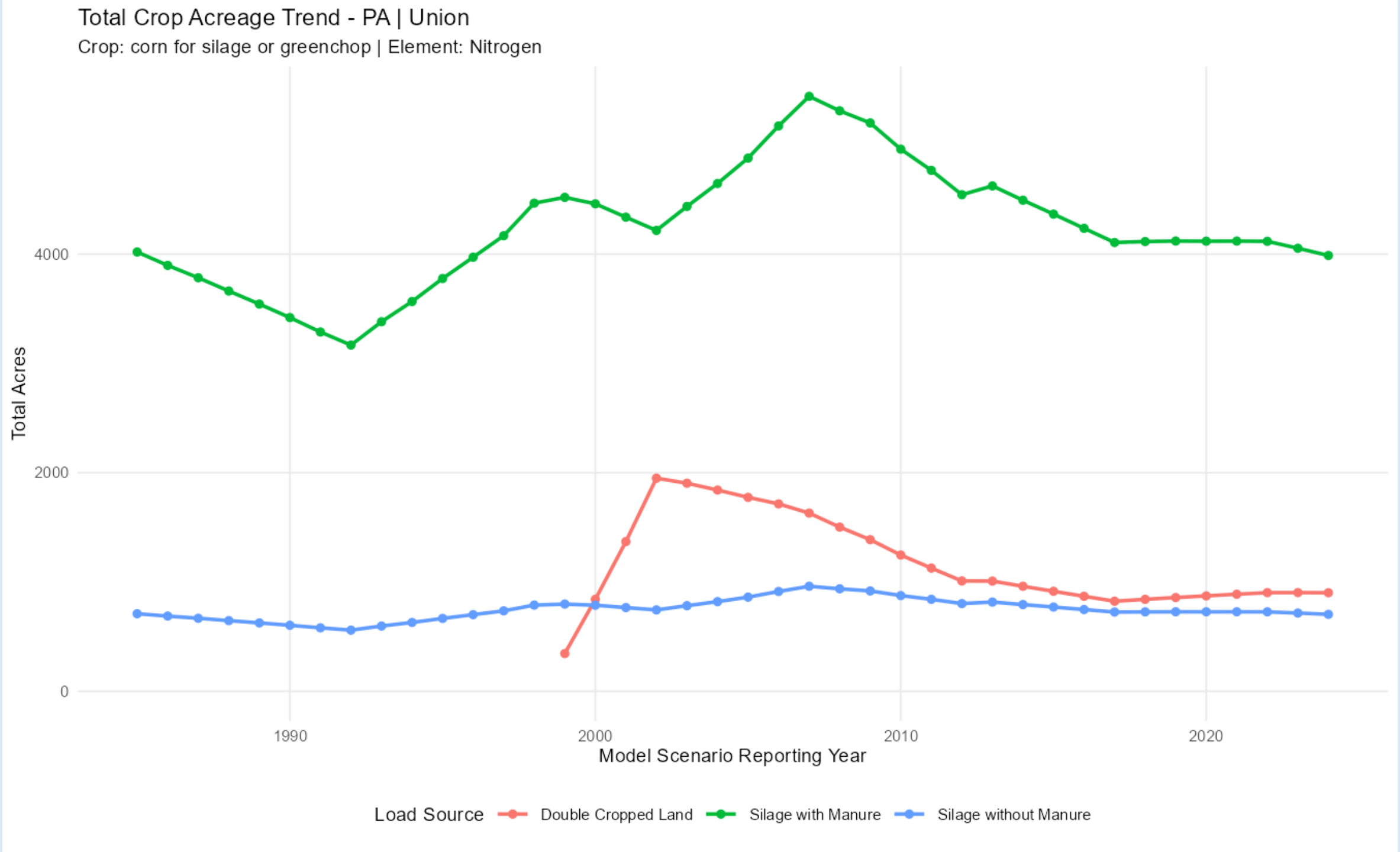

Crop Yield Intensity Trend - VA | Page
Crop: corn for grain | Element: Nitrogen
150
100
50
0
Yield (Bushels / Acre)
1980
1990
2000
2010
2020
Model Scenario Reporting Year
Load Source
Grain with Manure
Grain without Manure

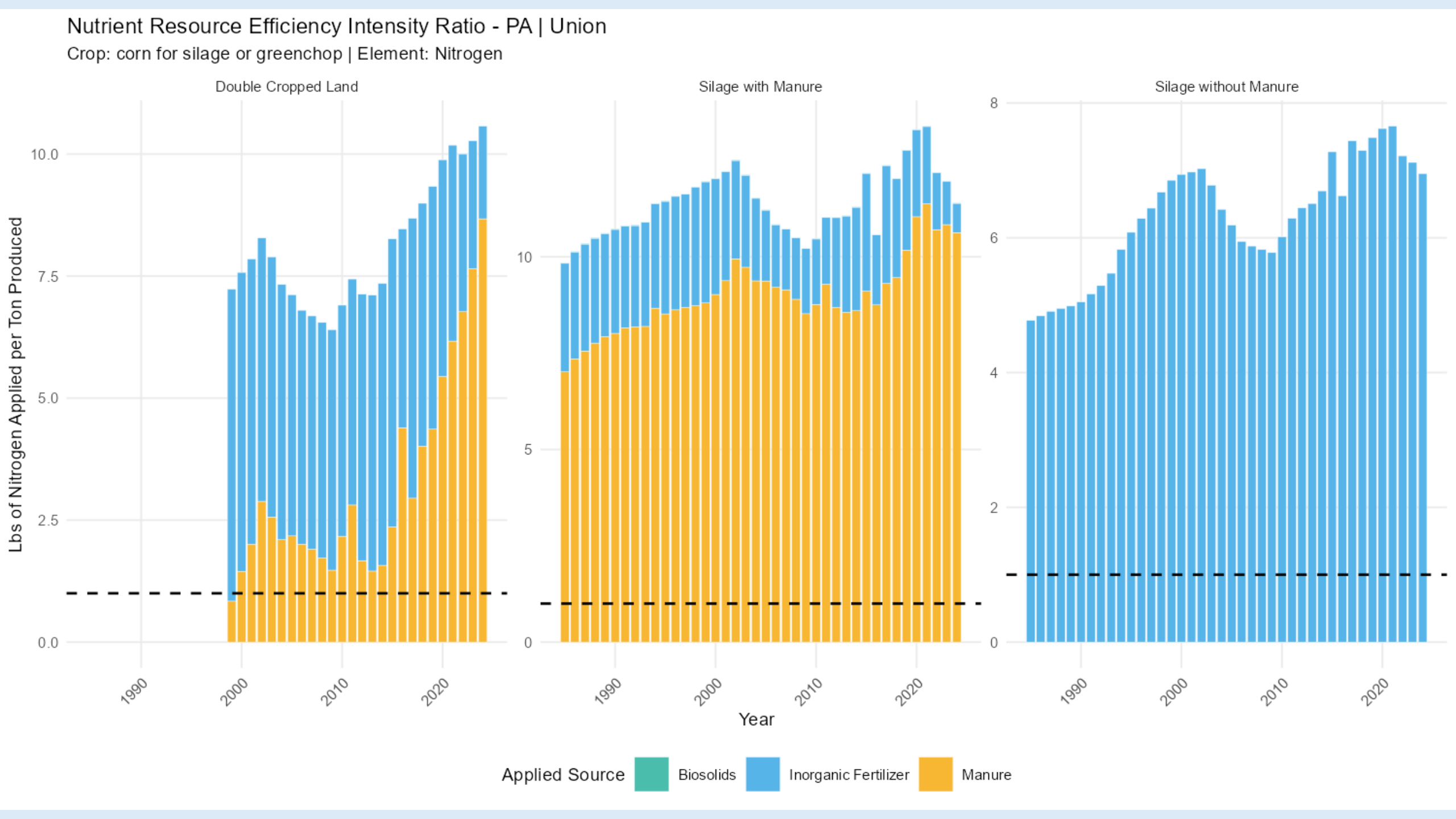

Total Crop Acreage Trend - VA | Page
Crop: corn for grain | Element: Nitrogen
Total Acres
2000
1500
1000
500
0
1990
2000
2010
2020
Model Scenario Reporting Year
Load Source
Grain with Manure
Grain without Manure


Nutrient Resource Efficiency Intensity Ratio - VA | Page
Crop: corn for grain | Element: Nitrogen
Grain with Manure
Grain without Manure
Lbs of Nitrogen Applied per Bushel Produced
3
2
1
0
1.0
0.5
0.0
1990
2000
2010
2020
Year
Applied Source
Biosolids
Inorganic Fertilizer
Manure


Application Budget vs Needs - PA | Union
Crop: corn for silage or greenchop | Element: Nitrogen
Double Cropped Land
Silage with Manure
Silage without Manure
Lbs / Acre
Year
Applied Source
Biosolids
Inorganic Fertilizer
Manure
Calculated Need Baseline
Inorganic Only Need
Organic Eligible Need


Crop Yield Intensity Trend - PA | Union
Crop: corn for silage or greenchop | Element: Nitrogen
Yield (Tons / Acre)
20
15
10
5
0
1980
1990
2000
2010
2020
Model Scenario Reporting Year
Load Source
Double Cropped Land
Silage with Manure
Silage without Manure


Total Crop Acreage Trend - PA | Union
Crop: corn for silage or greenchop | Element: Nitrogen
Total Acres
4000
2000
0
1990
2000
2010
2020
Model Scenario Reporting Year
Load Source
Double Cropped Land
Silage with Manure
Silage without Manure


Nutrient Resource Efficiency Intensity Ratio - PA | Union
Crop: corn for silage or greenchop | Element: Nitrogen
Double Cropped Land
Silage with Manure
Silage without Manure
Lbs of Nitrogen Applied per Ton Produced
Year
Applied Source
Biosolids
Inorganic Fertilizer
Manure

What do we takeaway from this?

- Organic applications, in these examples, appear to drive up applications of N in excess of 100% of crop N requirement.

Questions?

Next steps:

- Begin to note areas that are of potential concern.
- Begin internal jurisdiction discussions on these areas.