Animal Population in CAST Chesapeake Bay Watershed

Sucharith Ravi, UMCES, Chesapeake Bay Program Office
Sravi@chesapeakebay.net
410-267-5779
Agriculture Modeling team
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Background

- Nutrient inputs to Agriculture Lands are separated to following categories in Phase 6 model.
  - Organic sources (manure, biosolids, and spray irrigation)
  - Inorganic fertilizer
- Manure Generation
  - Example: Nitrogen produced for 1,000 Beef Cattle per year = 1000 *5475(Lbs DryManure/Year) *0.028788 (Lbs of N/Lb)
- The first step in estimating manure available in a county is to estimate the Type and number of animals in existence on an average day in each county per year.

Animal Type	Manure Source	Lbs Dry Manure/Animal/Yr	Lbs TN/Lb Dry Manure	LbsTP/Lb Dry Manure
Beef	Beef - Cow (confinement) from ASAE 2005 for manure values	5,475.00	0.028788	0.006467
Dairy	Lactating Cow, Dry Cow and Heifer from ASAE 2005 for manure values	4,404.33	0.042221	0.006764
Other Cattle	Estimated based upon weighted average combination of Beef and Dairy from Census of Agriculture; See Appendix D	1,605.07	0.035504	0.006616
Horses	Average of Horse- Sedentary and Horse - Intense Exercise from ASAE 2005 for manure values	3,102.50	0.031672	0.005941
Hogs for Breeding	Swine Characterization Report; See Appendix E	220.62	.294653	Varies
Hogs for Slaughter	Swine Characterization Report; See Appendix E	97.09	0.106841	Varies
Sheep and Lambs	ASAE 2003 for manure values	240.9	0.038182	0.007909
Goats	ASAE 2003 for manure values	680.91	0.034615	0.008462
Pullets	PLS Report; See Appendix A	12.95	Varies	Varies
Layers	PLS Report; See Appendix A	17.89	Varies	Varies
Broilers	PLS Report; See Appendix A	Varies	Varies	Varies
Turkeys	Turkey Characterization Report; See Appendix F	7.62	Varies	Varies

Table 3-4: Total nutrient manure characteristics for livestock

Data Source

- The Phase 6 Model uses animal inventories for cattle, dairy, sheep, goats, swine, pullets, and layers that are provided every five years by the USDA-National Agricultural Statistics Service (NASS)'s Census of Agriculture.
- Broilers, Turkeys, Pullets, and Hogs
    - annual Census production numbers by state.
    - State numbers are then proportioned to individual counties based on the inventory numbers from Latest Agcensus.
- Populations for horses were provided by the states for the previous version of the modeling tools, and those populations were kept intact for the Phase 6 Model
- All other animals

    5-year Census inventory numbers by County

Historical Data

- AgCensus information is available every 5 years starting from 1982 to 2017.
- In between years are Interpolated.
- Statewide population for broilers and turkeys are provided every year in USDA-NASS's Poultry Production and Value surveys with data going from 1985-2019.
- Data beyond 2017 is projected using forecast method recommended by AMS for Phase 6 Watershed Model (CAST) and approved through AgWG, Water Quality GIT, etc.

Replacing Non-Disclosed Values

- The Census of Agriculture cannot release detailed sales or inventory data for an animal type if there are fewer than five operators raising that animal type within a county. When this occurs, the sales or inventory data are listed as non-disclosed.

Step 1: Total NonDisclosed = Statewide – Sum(All Disclosed Counties)

Step 2: Calculate number of farms per animal type in all counties with non-disclosed values and add farms up to create a statewide total of farms for non-disclosed counties.

Step 3: Determine the percent of statewide farms per animal type in each non-disclosed county.

Step 4: Multiply the non-disclosed animals found in step 1 by the percent found in step 3 to determine the final value for that animal type and county.

Forecast Method

- Double exponential smoothing is a short-term data forecasting method that is most often used when future values are believed to be related to both long-term and short-term trends in historic values. The method allows users to combine predictions of long-term and short-term trends by placing different weights or emphasis on each type of trend. A formula, explanation of terms and example projections are provided below.

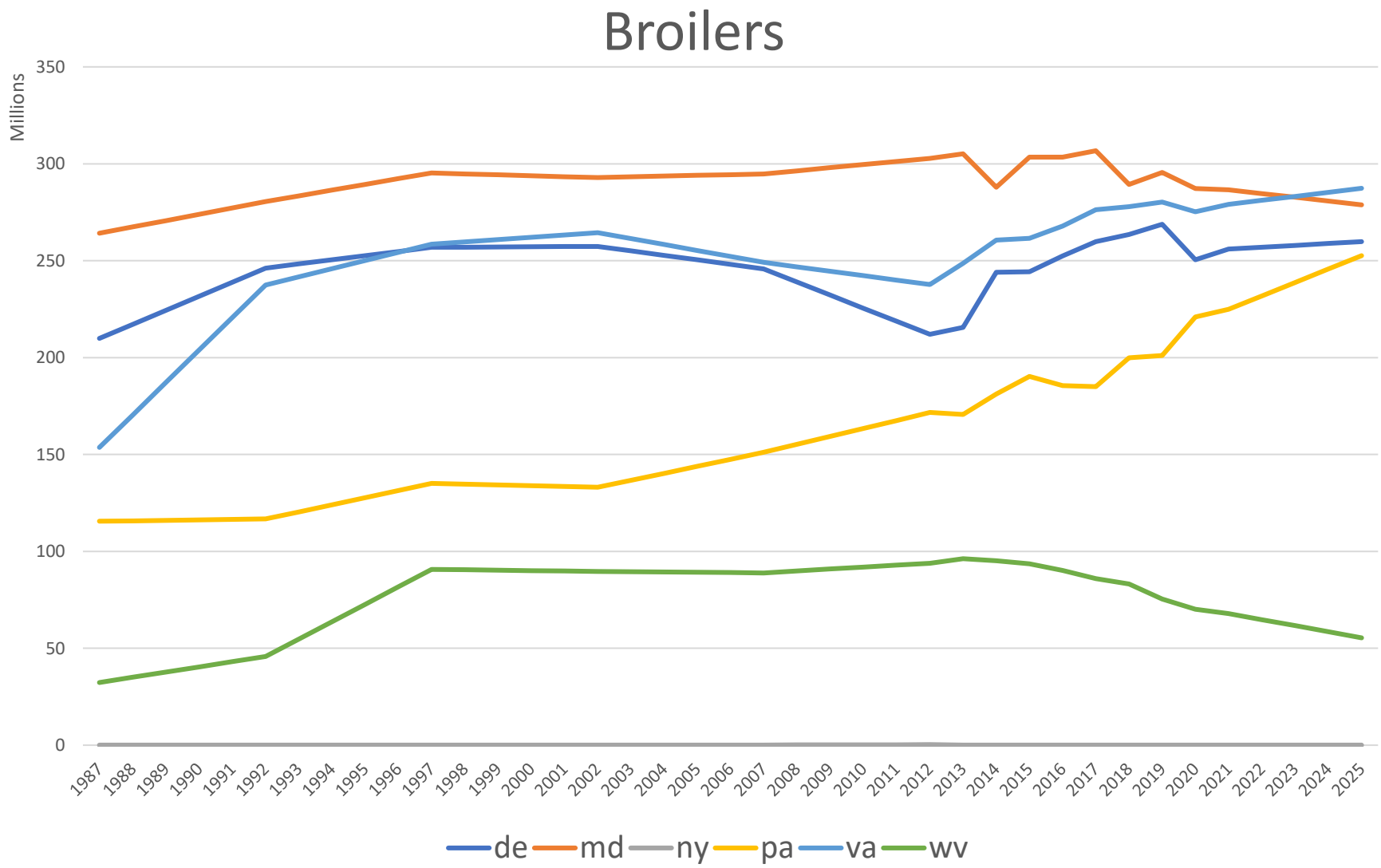
$$Ft = a^* At\text{-}1 + (1- a) * (Ft\text{-}1 + Tt\text{-}1)$$

$$Tt = b^* (At\text{-}1\text{-}Ft\text{-}1) + (1- b) * Tt\text{-}1$$

$$AFt = Ft + Tt$$

- At = Actual county value as reported by Ag Census
- Ft = Unadjusted forecast (before trend)
- Tt = Estimated trend
- AFt = Trend-adjusted forecast
- *a*= Alpha value is the weight placed upon the most recent Ag Census value
- *b*= Beta value is the weight placed upon the long-term trend in Ag Census values

- For forecasts, greater weight is given to more recent short-term trends than long-term trends by choosing (Alpha=0.8 beta=0.2).


Broilers
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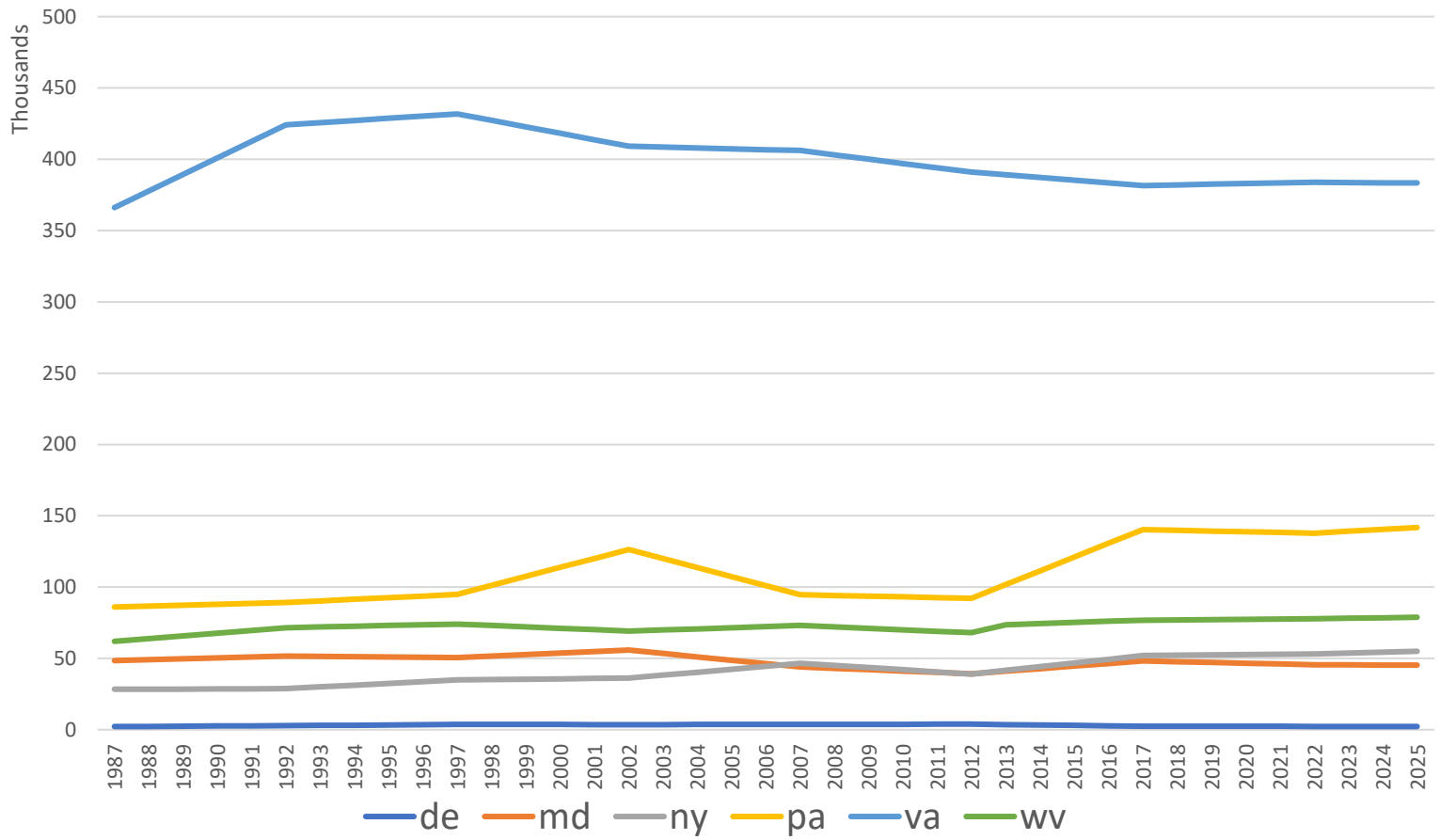
Beef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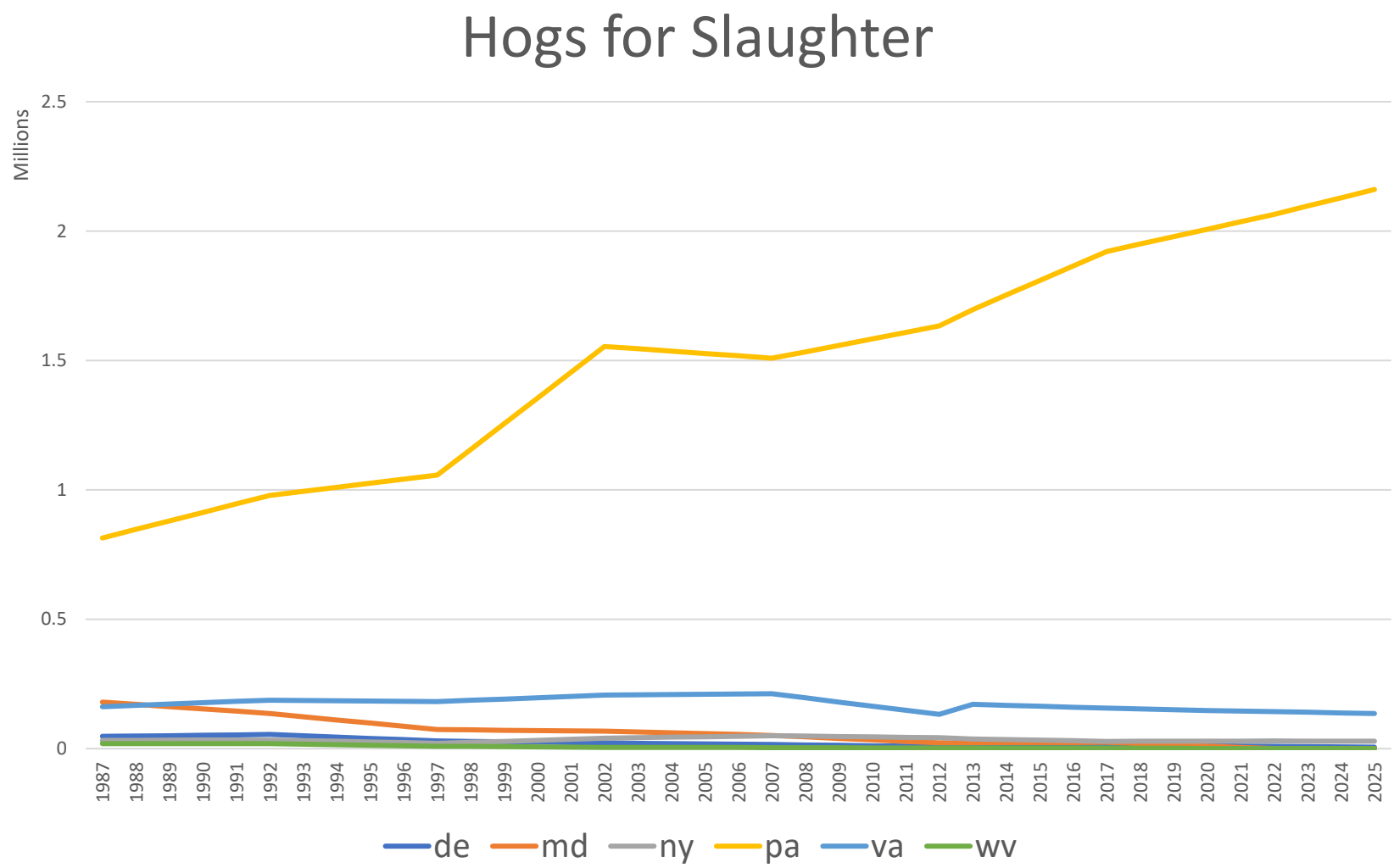
Hogs for Slaughter
Millions
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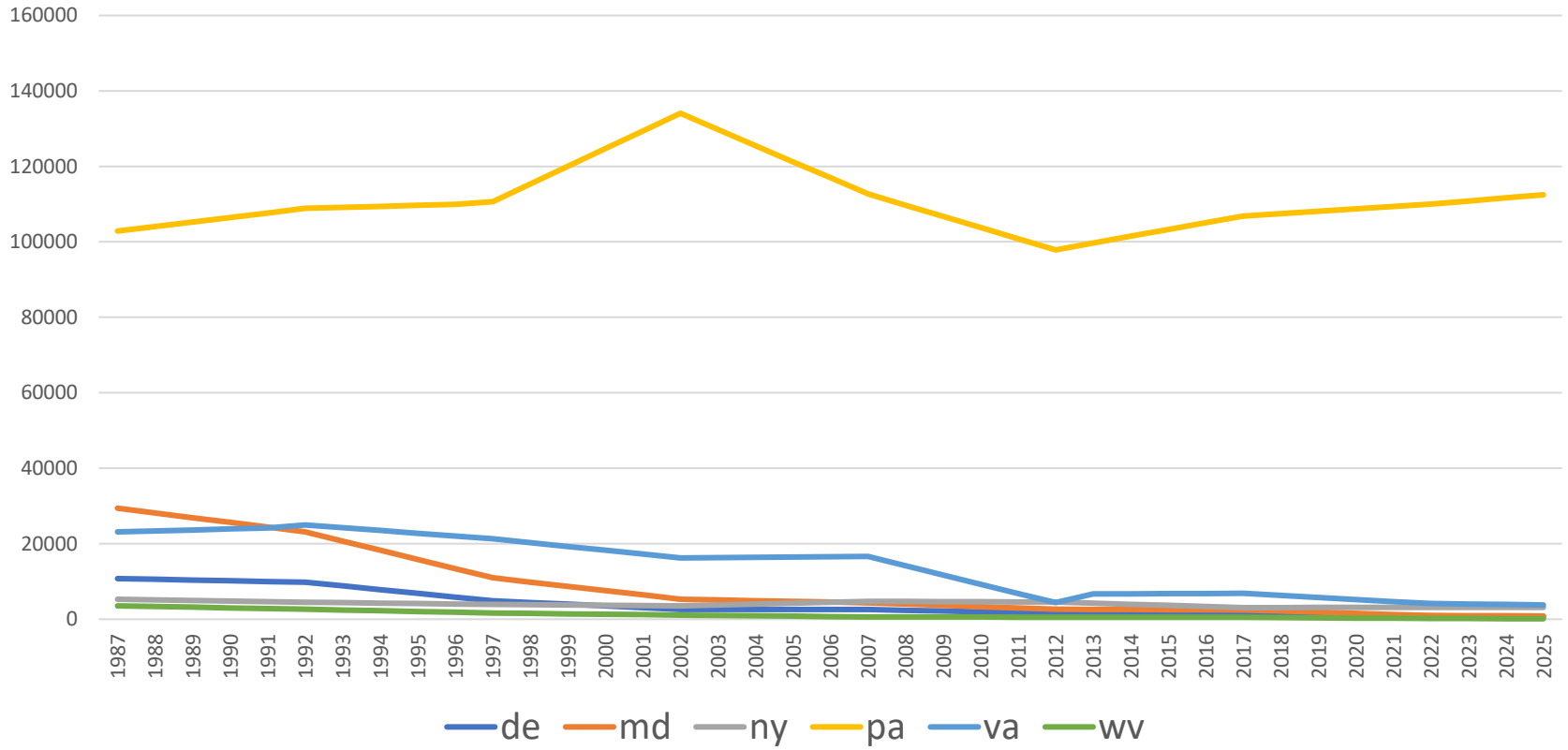
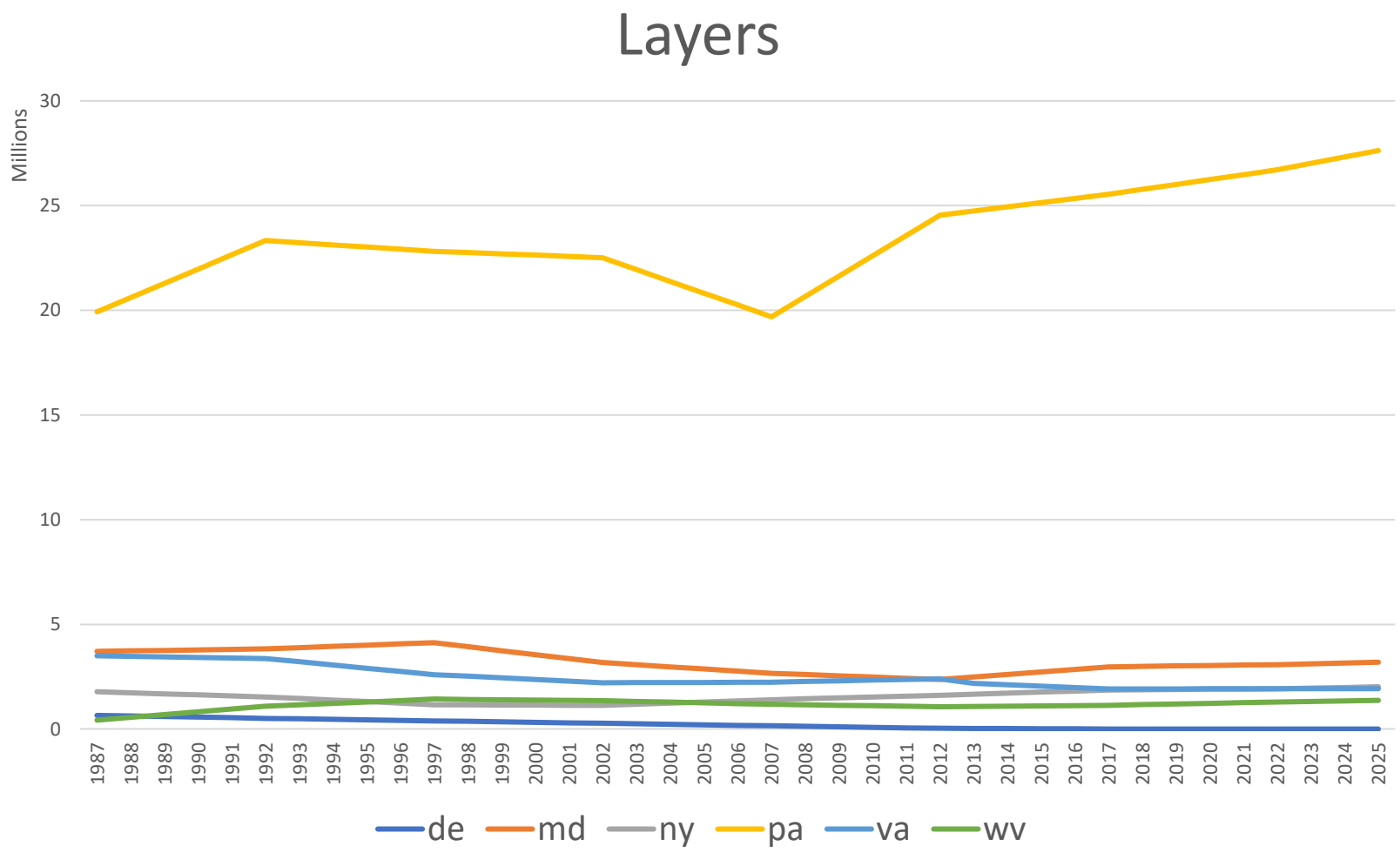
Hogs For Breeding




Layers
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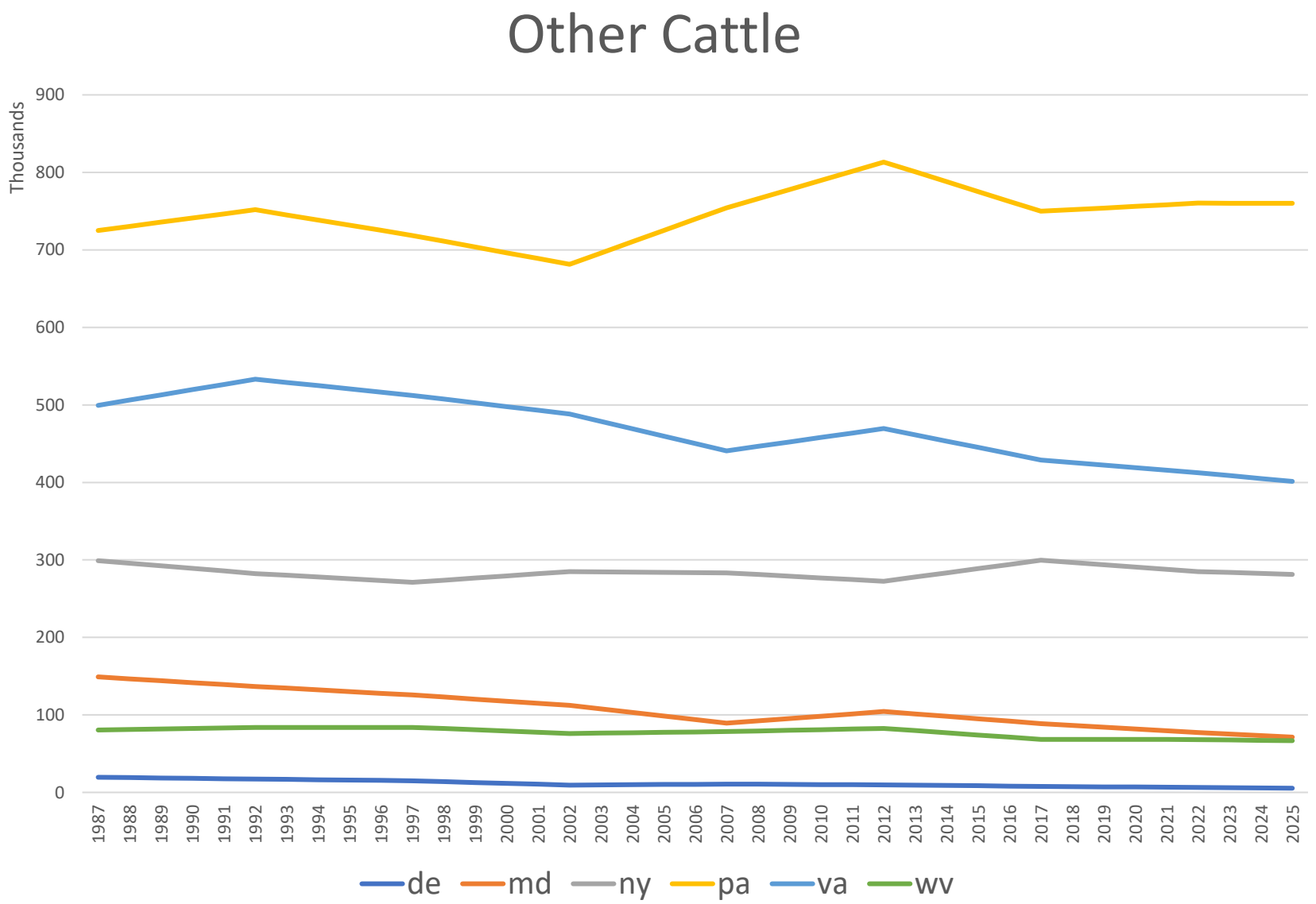
Other Cattle
Thousands
900
800
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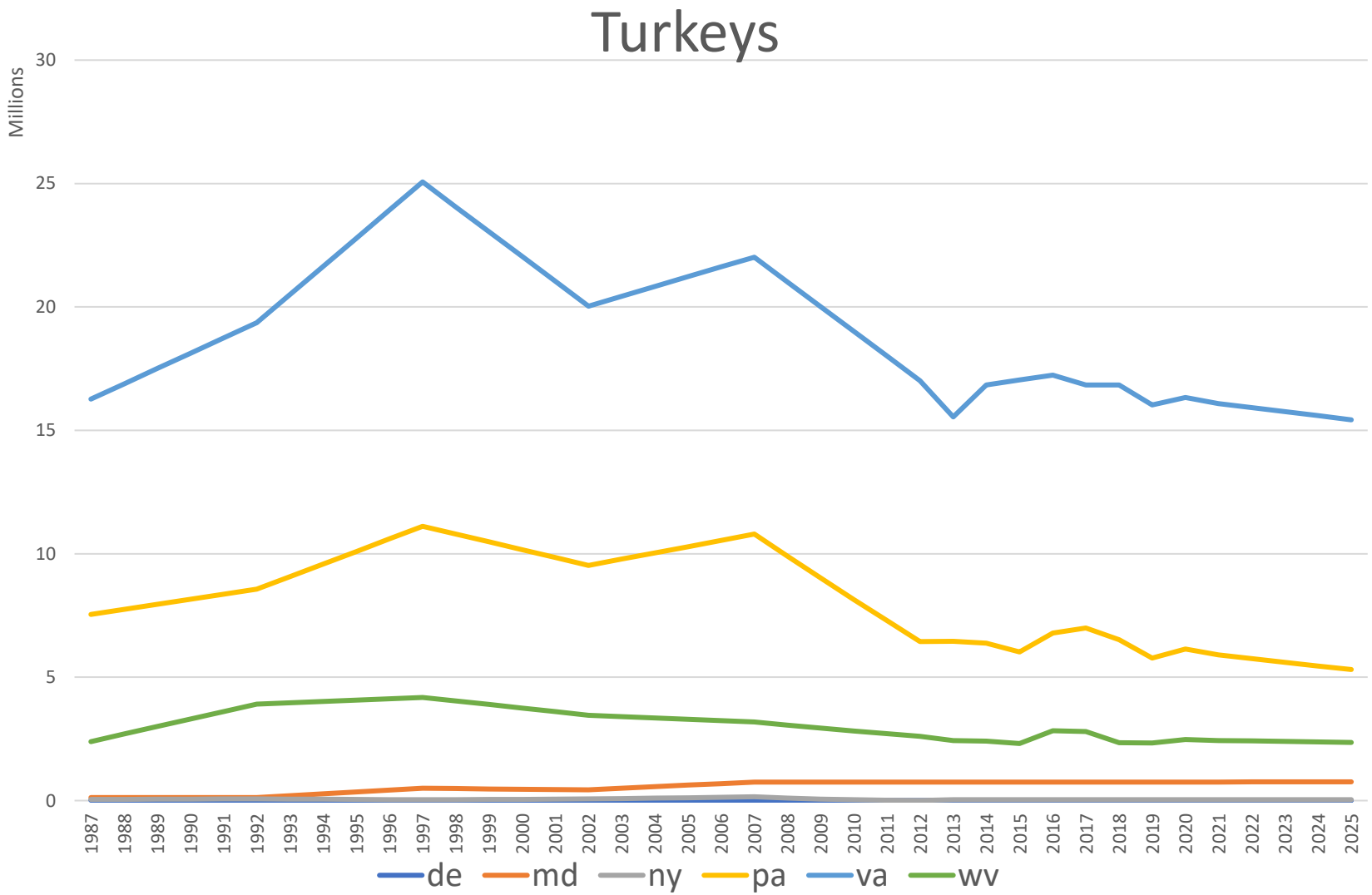
Turkeys
Millions
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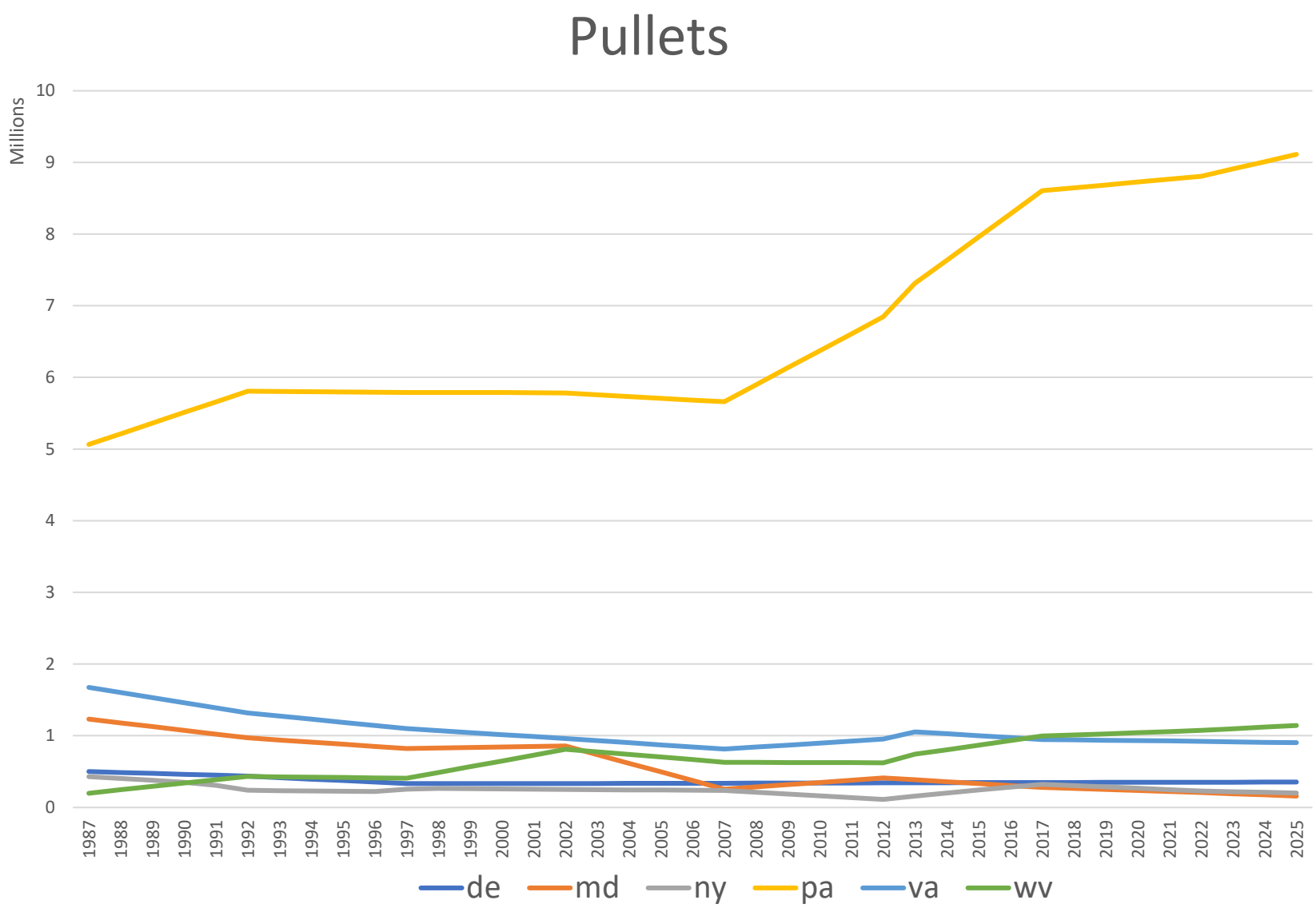
Pullets
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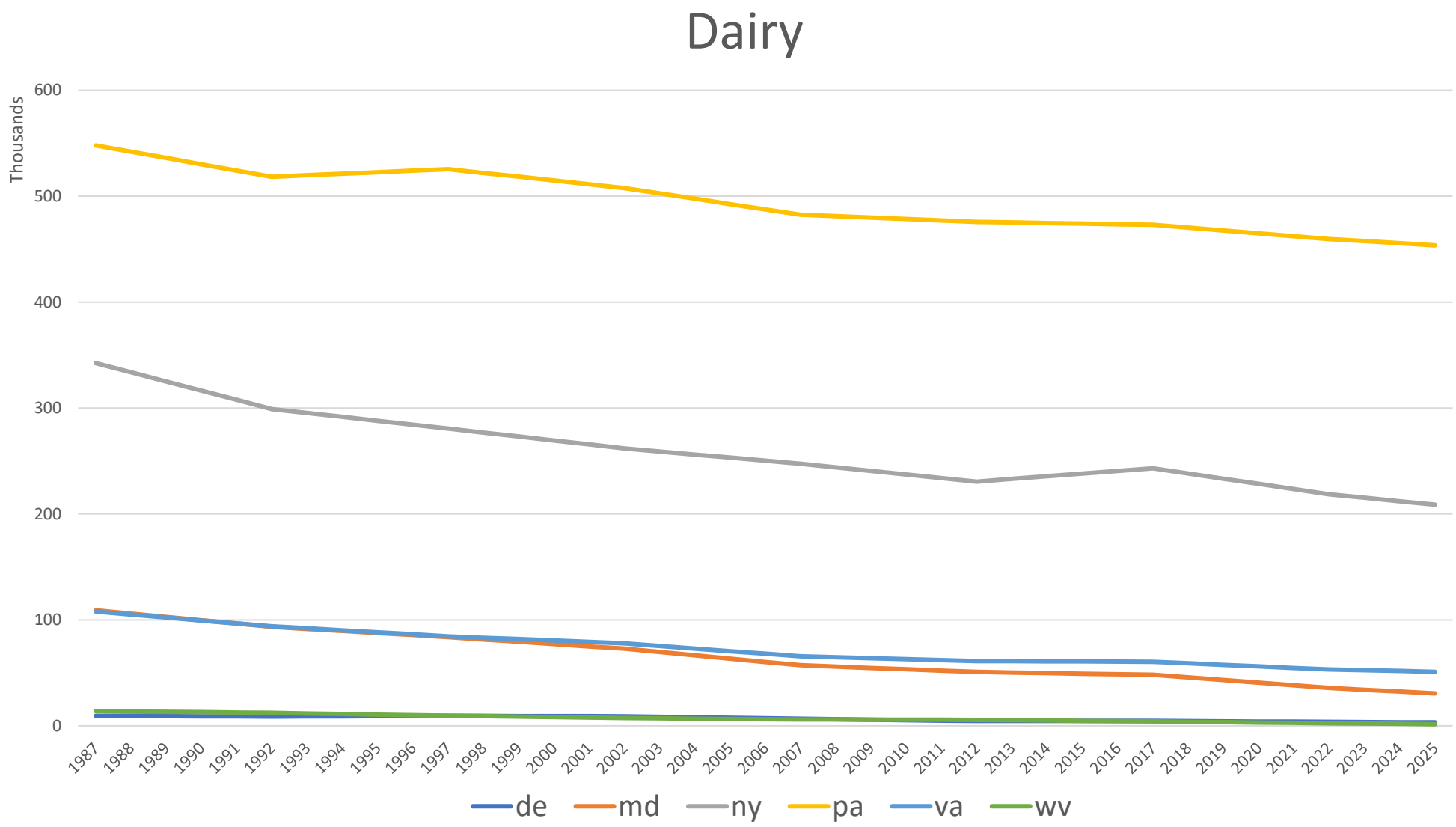
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Questions ?