Chesapeake Bay Restoration

CAST Urban Fertilizer Application Rates

Jeff Sweeney

EPA, Chesapeake Bay Program Office

Urban Nutrient Management Task Force Meeting

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Turfgrass Nutrient Application Rates

- This presentation describes the issue with data abnormalities and (again) proposes changes for the short term to the current USWG-approved methods for consideration by the group.
- PSC Decision #3:
  "Refine the process to include additional safeguards to prevent data analysis variations and to assess reasonability of modeling results after CBP protocols are applied".

Turfgrass Nutrient Application Rates

- AAPFCO non-farm fertilizer sales data by county reported to AAPFCO by each state from the late 1980's to 2016.
- Urban method uses mass of fertilizer nutrients for each state distributed to one "crop" type = turfgrass
- Additional credit for practices that make up nutrient management depending on high-risk, low-risk, blended

Turfgrass Nutrient Application Rates

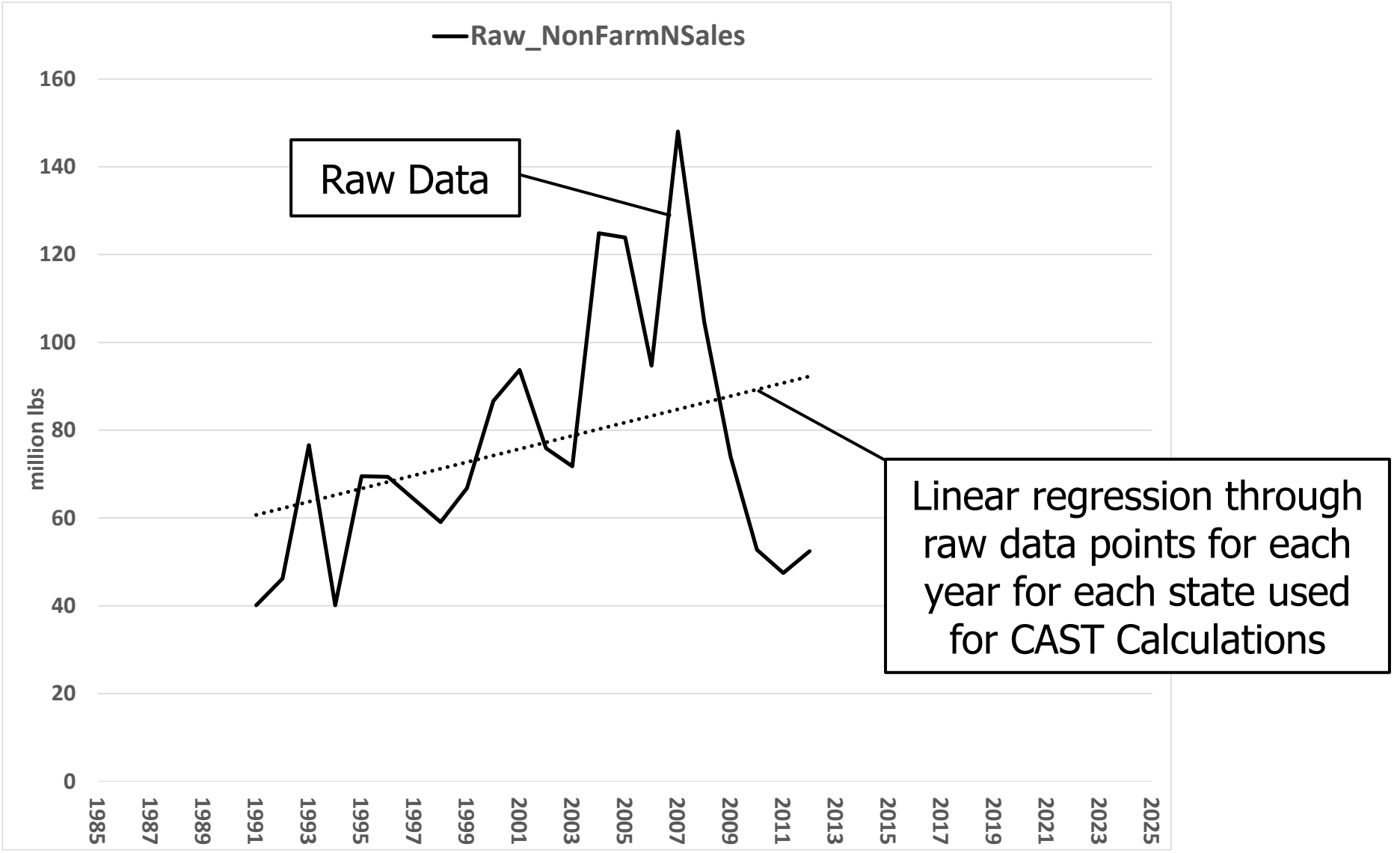
- Two components to turfgrass application rates:
  1) Fertilizer mass data
  2) Turfgrass acres – For CAST21, high-resolution land cover w/ approved change-product from 2013 to 2017
- Non-farm fertilizer mass ÷ turfgrass acres = turfgrass application rate (lbs. per acre)

Turfgrass Nutrient Application Rates

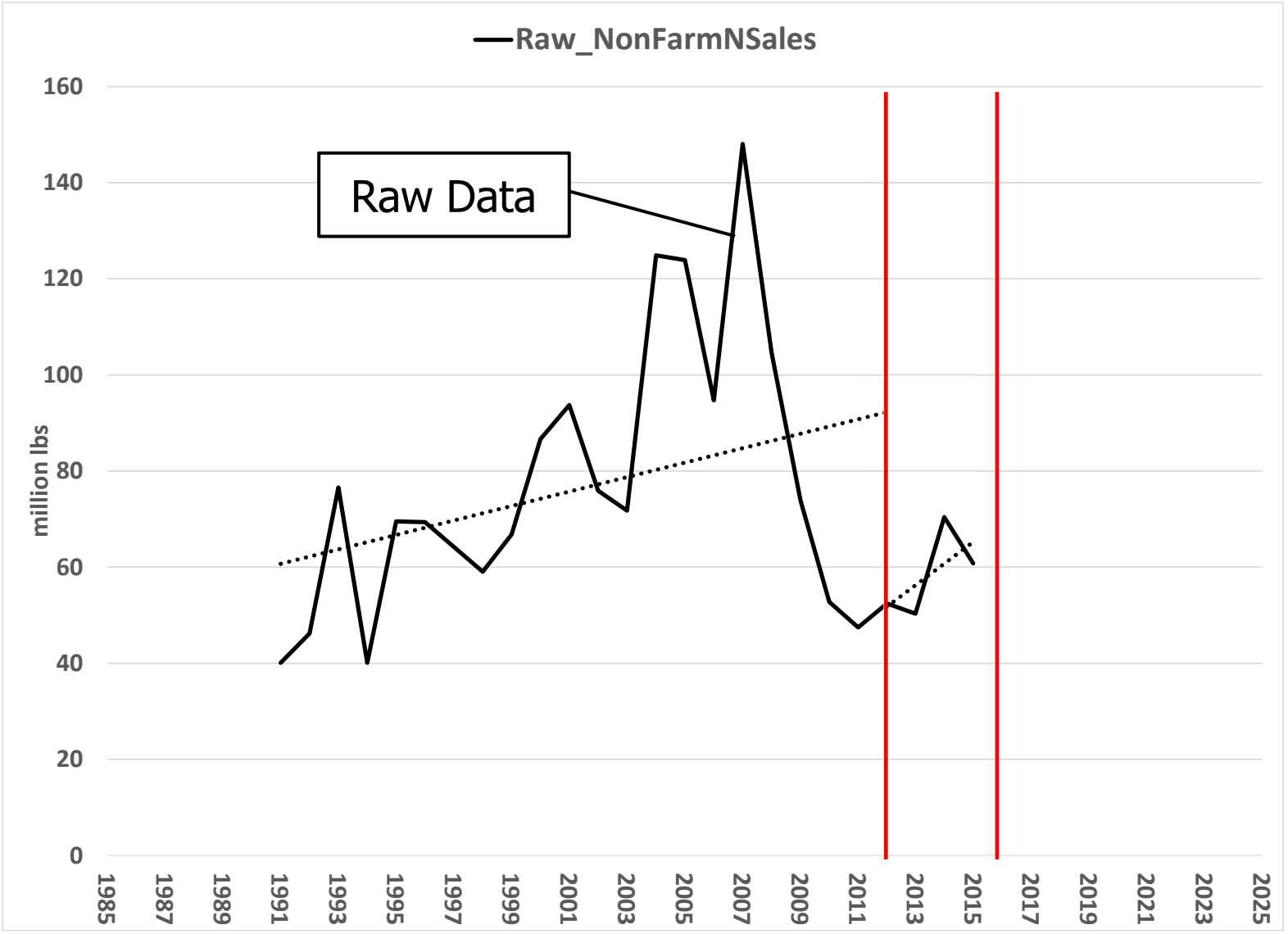
1) Current Method
   - Approved by USWG on 6/21/16, including varying applications by jurisdiction and through time.
   - Linear regression through 2012-2016 data points.

- Proposed Methods
  2) Remove Outliers and 3-Year Rolling Average at the State Scale with linear regression of latest 10 years.
  3) Remove Outliers and 3-Year Rolling Average at the County Scale with linear regression of latest 10 years.

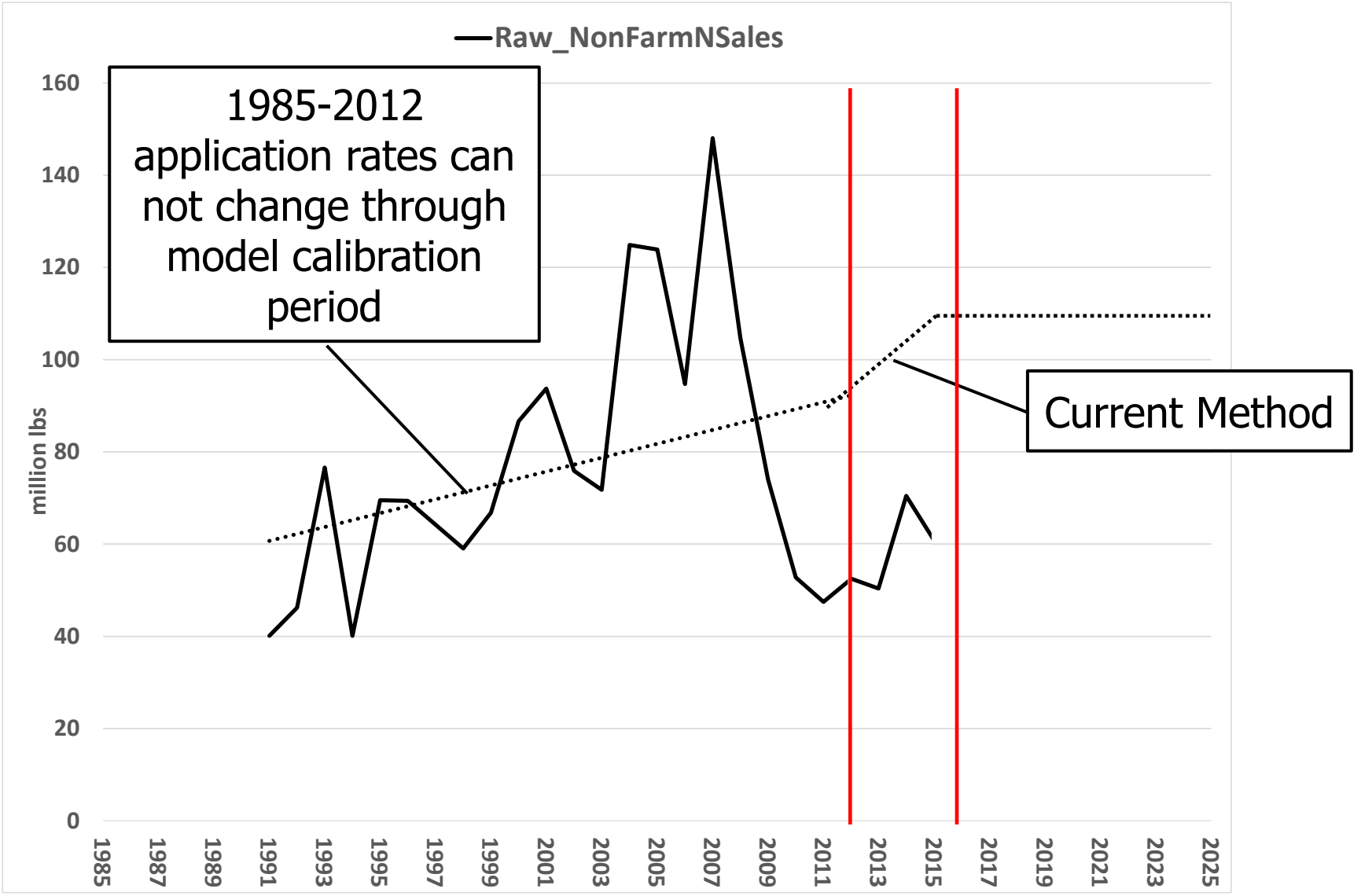
CB Watershed Pounds of Nitrogen Applied (1991–2012)



CB Watershed Pounds of Nitrogen Applied (1991–2015)



CB Watershed Pounds of Nitrogen Applied (1991–2025)



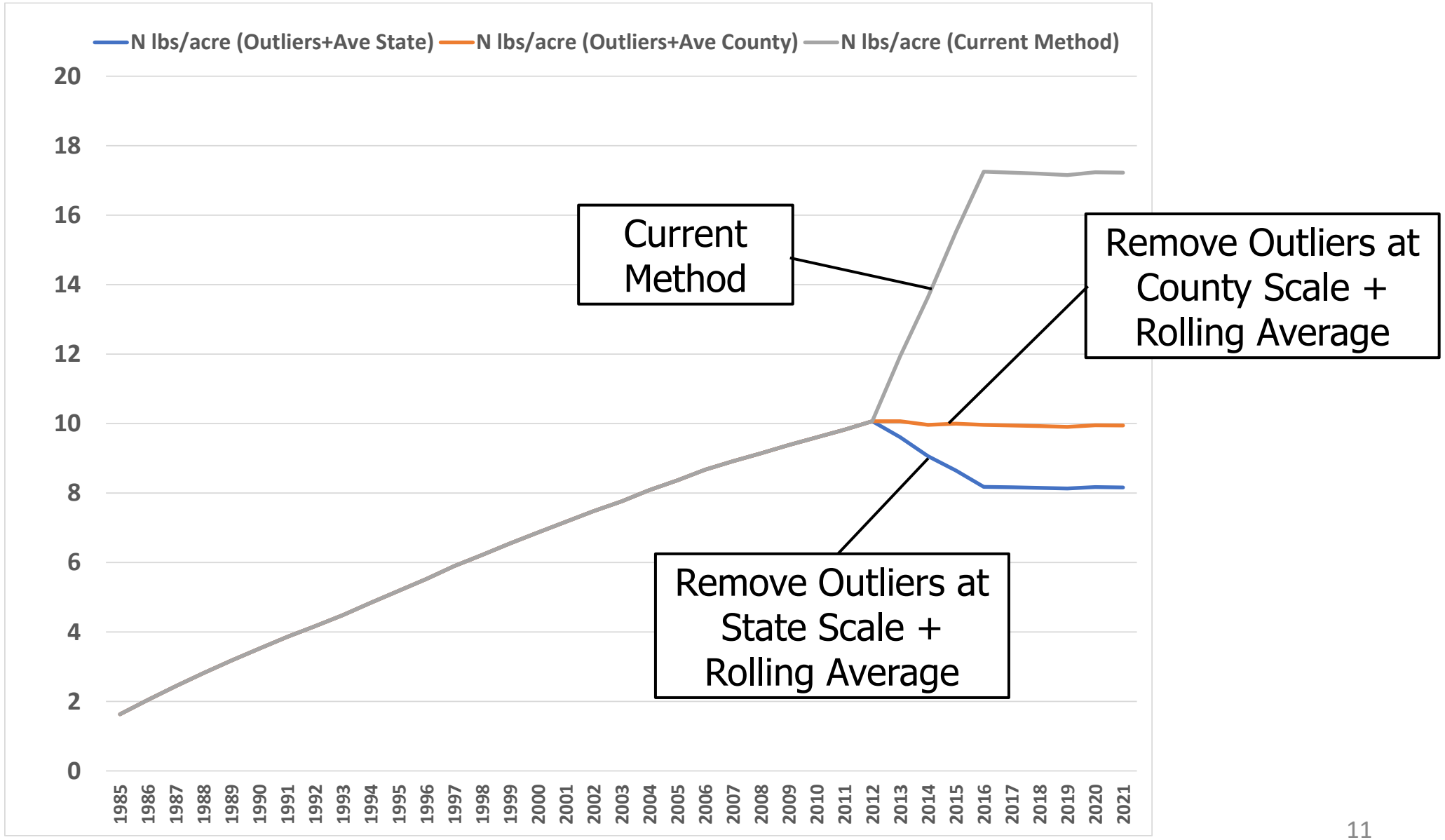
Turfgrass Nutrient Application Rates

Proposed Methods for 2013-2025

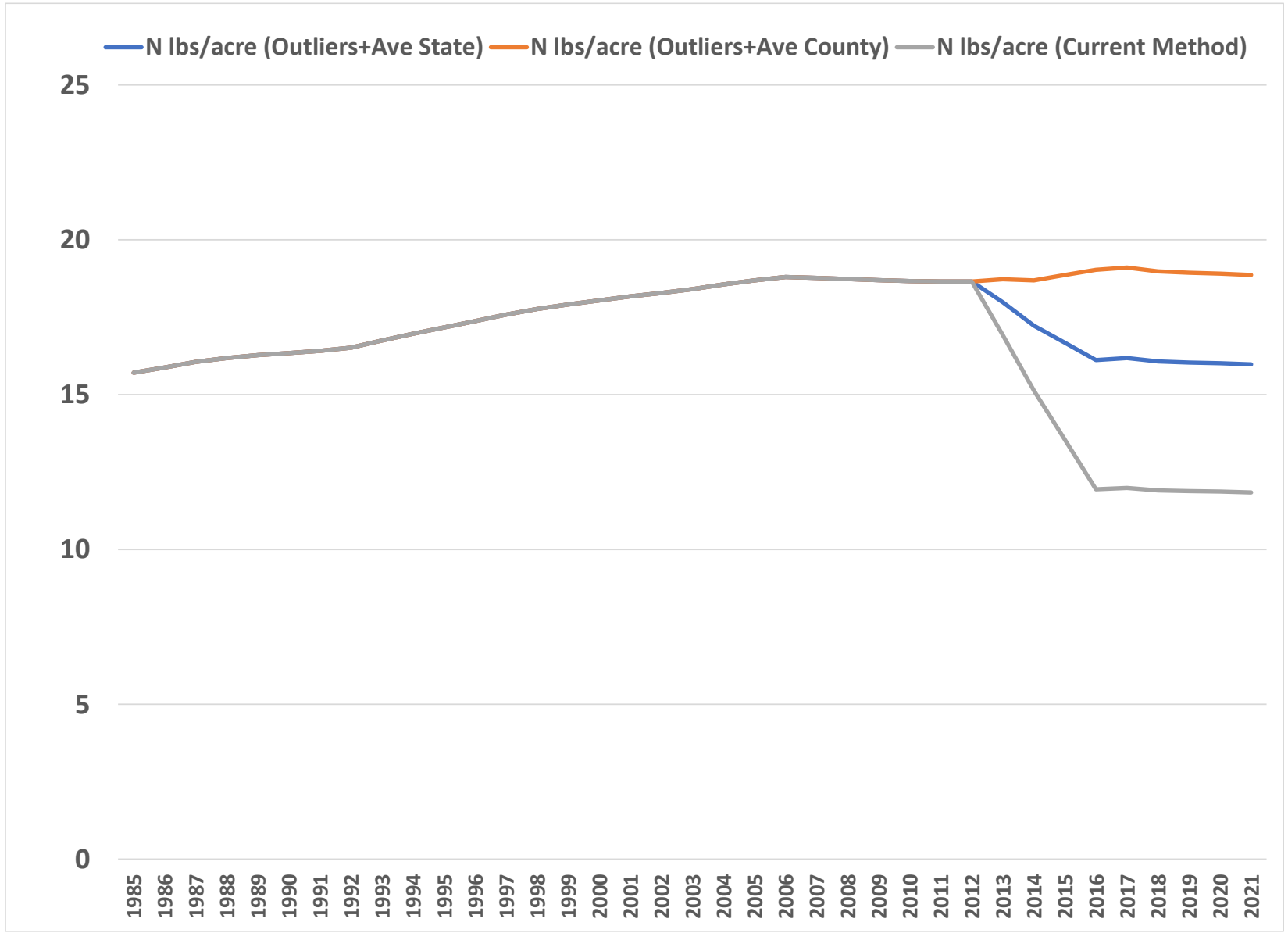
- Reduce the variability through time of state- and county-scale fertilizer nutrient sales data:
  1) Remove outliers – replace data that fall outside of two standard deviations from the median for the state (or county) over all years for which data were recorded.
     - Outliers are replaced by taking the average of the two years of available sales data closest in time to the outlier year.
  2) Calculate a three-year rolling average of the product of #1.
  3) Take a linear regression through the product of #2 for the ten most recent years (2007-2016).
- Sum county-level data to the state scale.
- The slope of the regression is the change in nutrient application mass from the 2012 mass data point for the period 2013-2016.
- The nutrient application mass is held constant at the 2016 level through 2025.
- For 2013-2016, divide the total nutrient mass by the respective acres to determine the application rate (lbs/acre).

TURFGRASS NITROGEN APPLICATION RATES (lbs/acre)

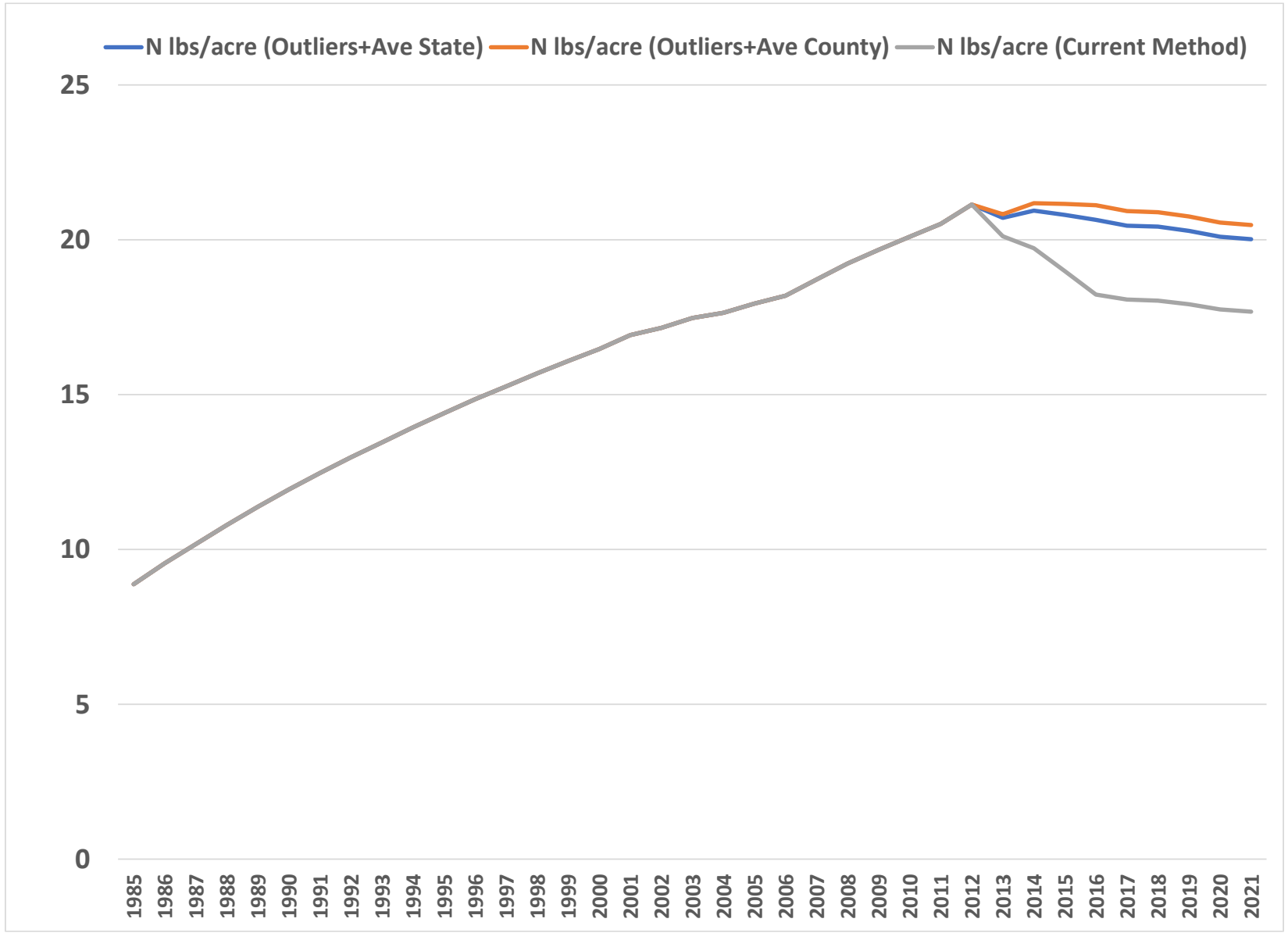
Pennsylvania Nitrogen Application Rates



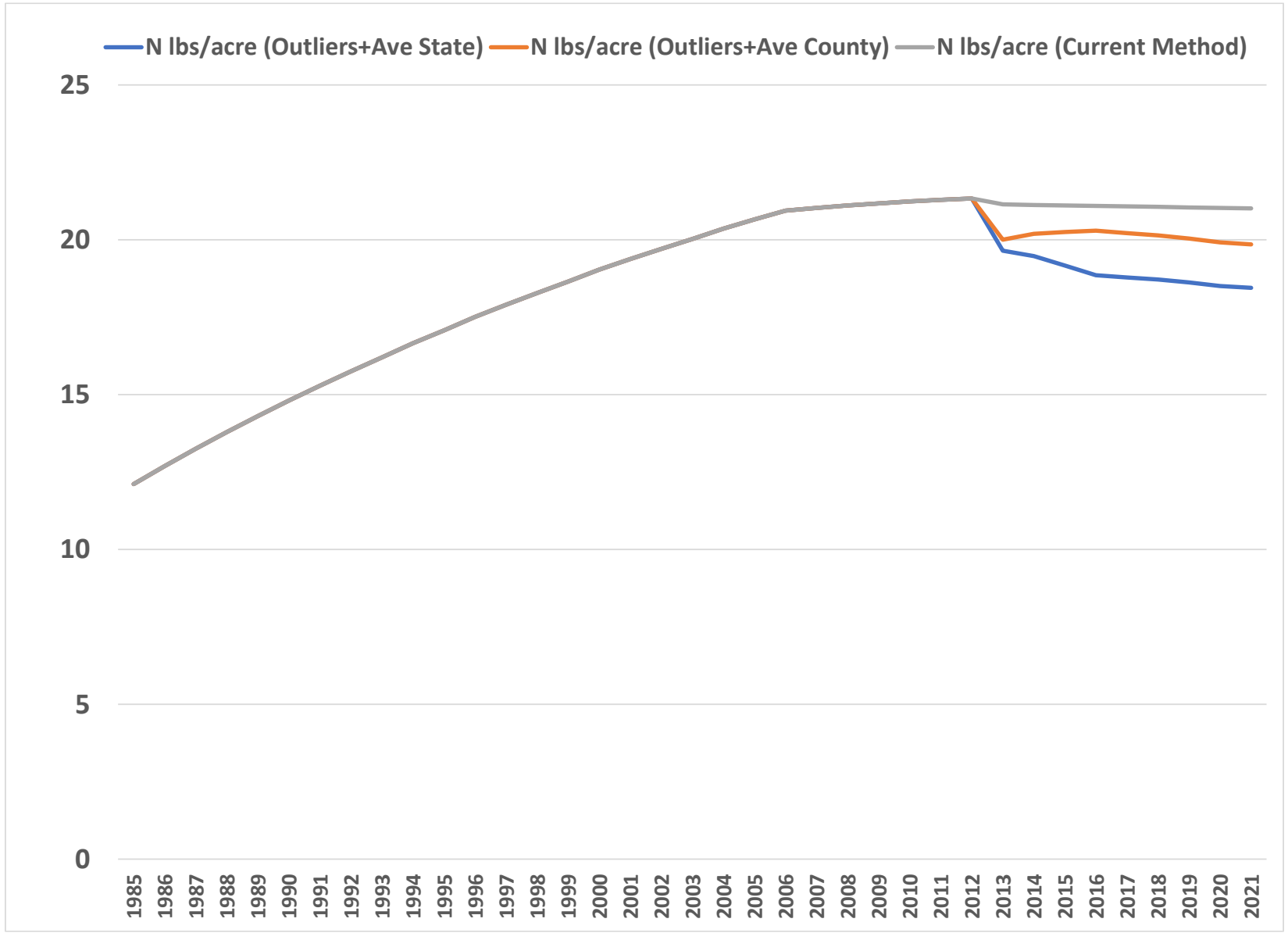
Maryland Nitrogen Application Rates



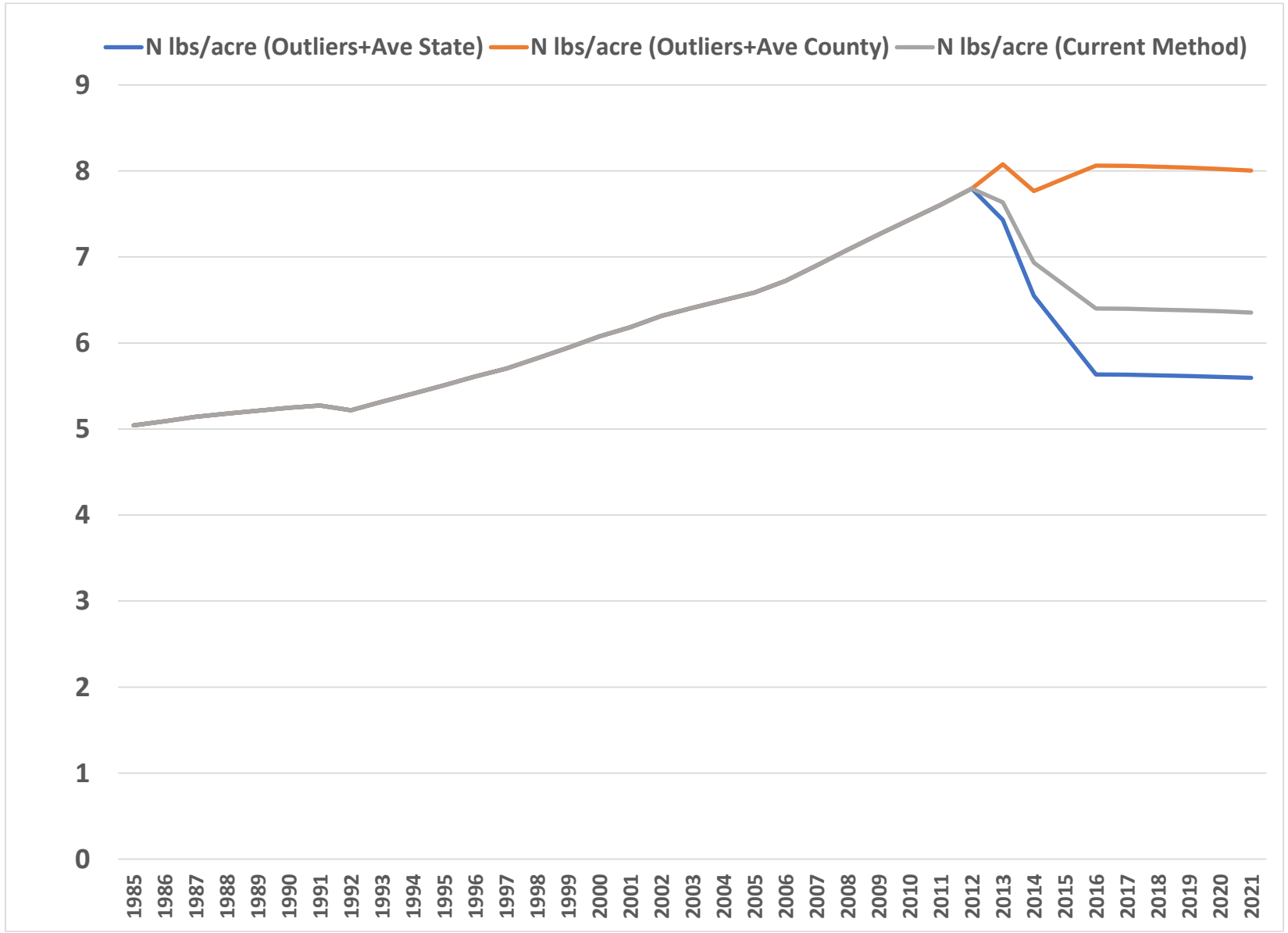
Virginia Nitrogen Application Rates



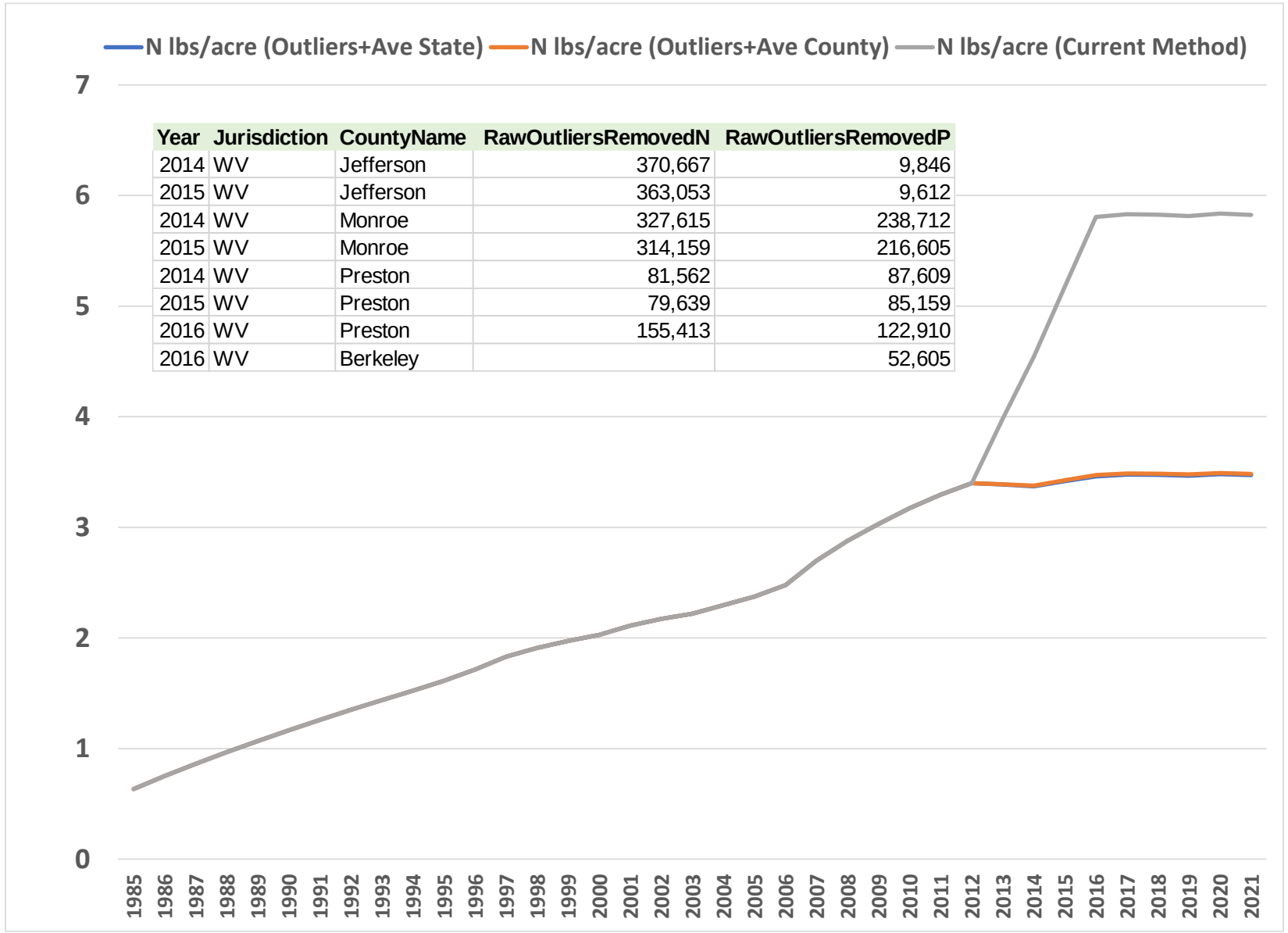
District of Columbia Nitrogen Application Rates



New York Nitrogen Application Rates

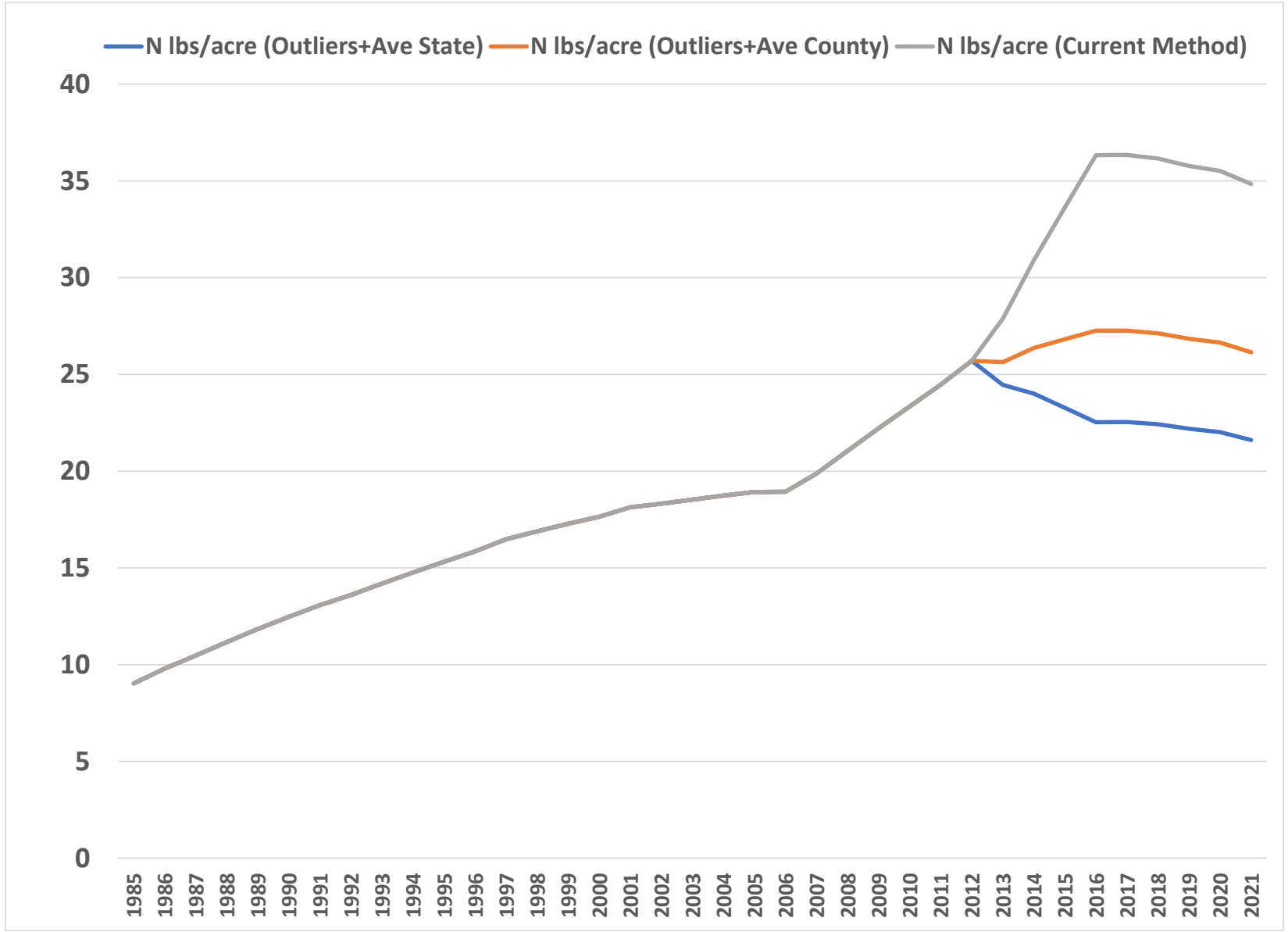


West Virginia Nitrogen Application Rates

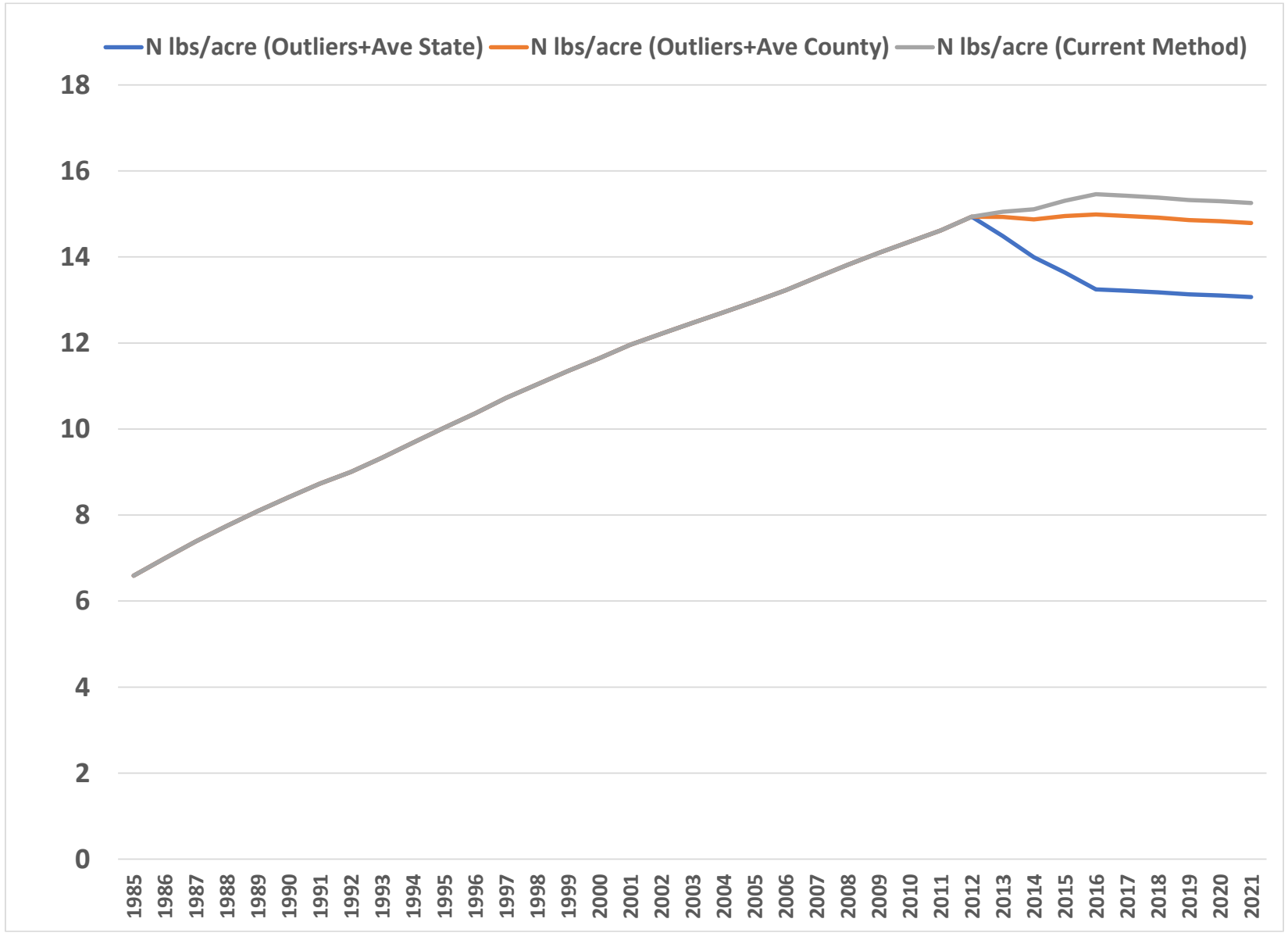


Year	Jurisdiction	CountyName	RawOutliersRemovedN	RawOutliersRemovedP
2014	WV	Jefferson	370,667	9,846
2015	WV	Jefferson	363,053	9,612
2014	WV	Monroe	327,615	238,712
2015	WV	Monroe	314,159	216,605
2014	WV	Preston	81,562	87,609
2015	WV	Preston	79,639	85,159
2016	WV	Preston	155,413	122,910
2016	WV	Berkeley		52,605

Delaware Nitrogen Application Rates



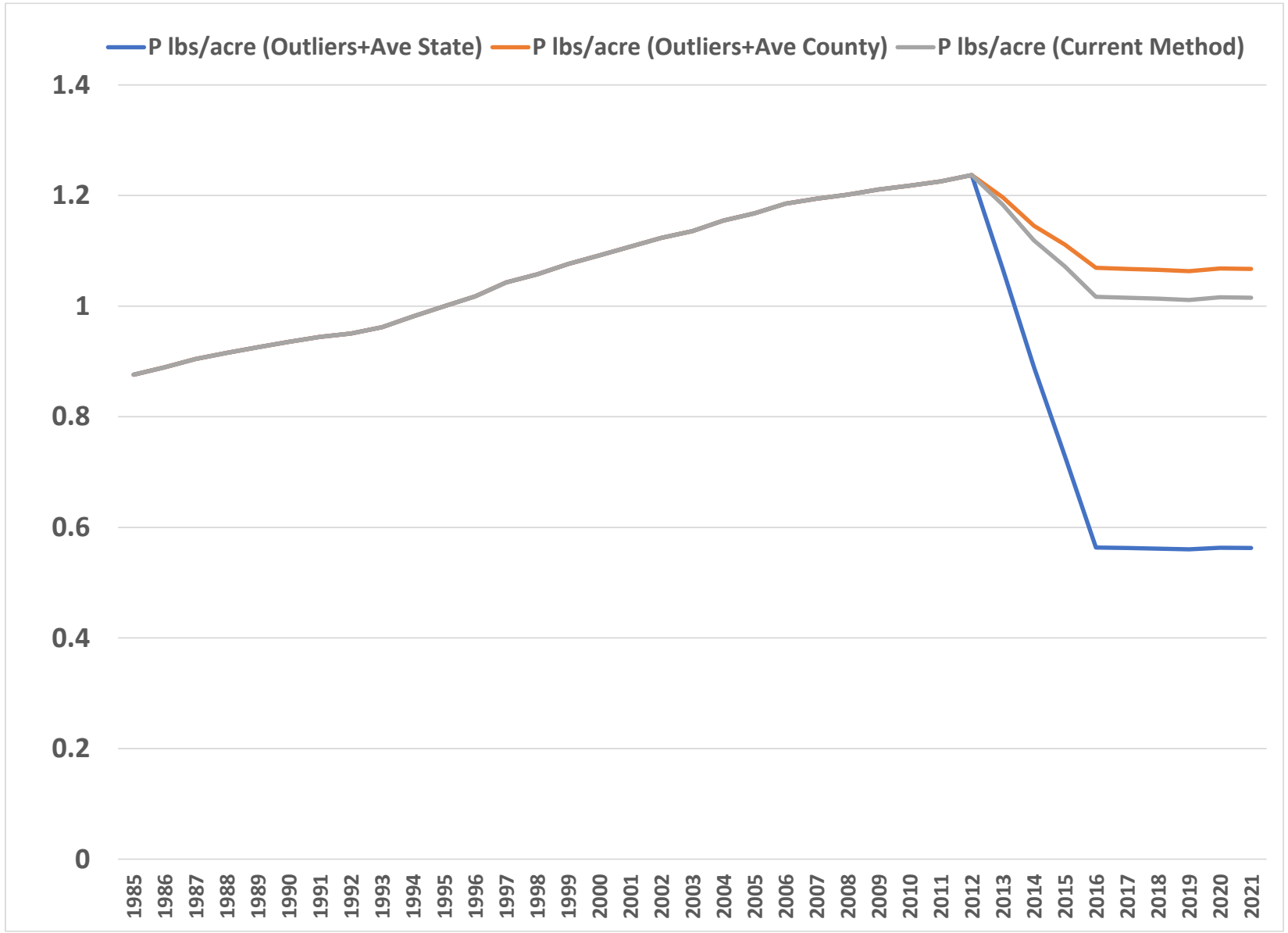
CB Watershed Nitrogen Application Rates



TURFGRASS PHOSPHORUS APPLICATION RATES

(lbs/acre)

Pennsylvania Phosphorus Application Rates



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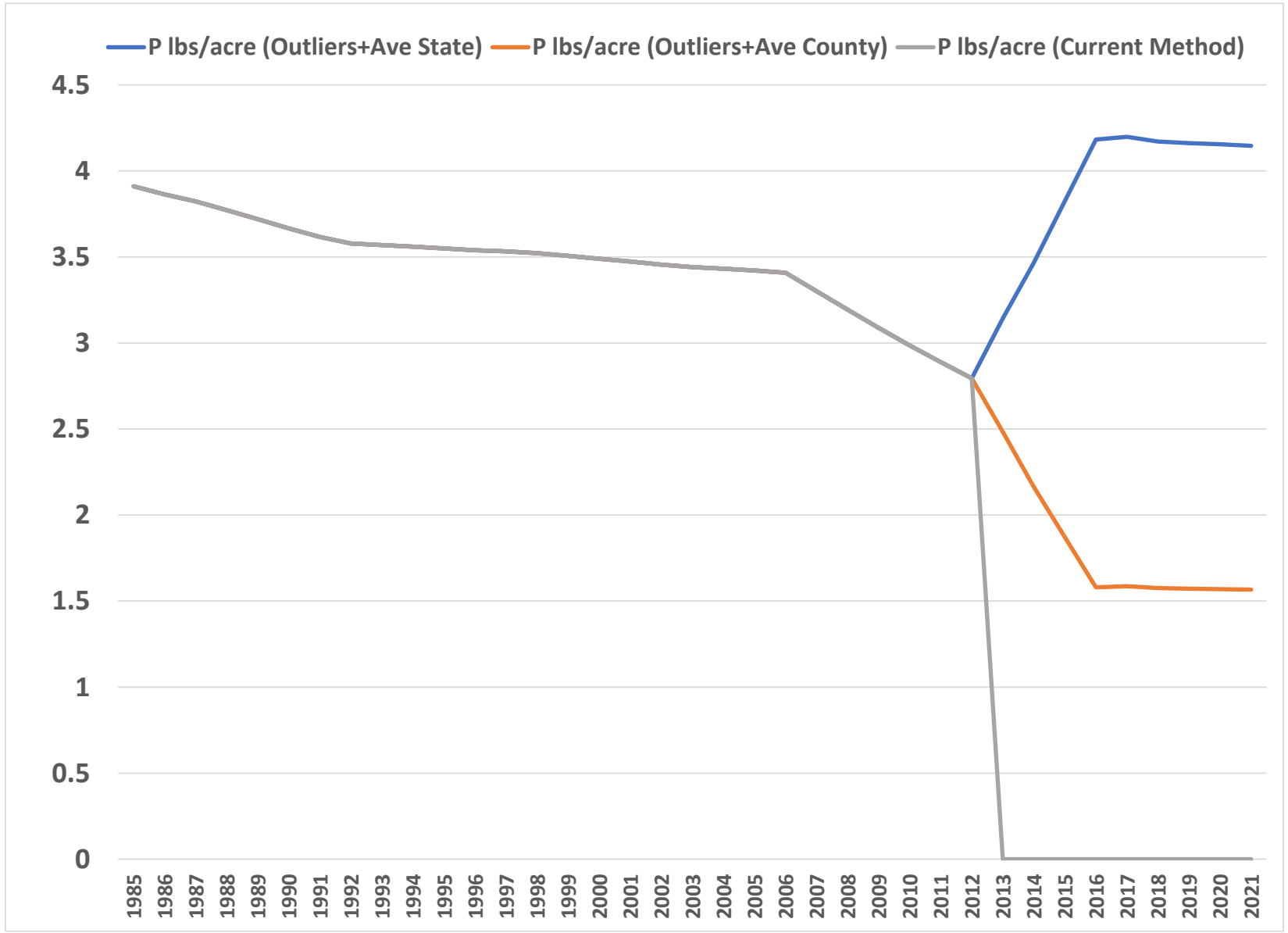

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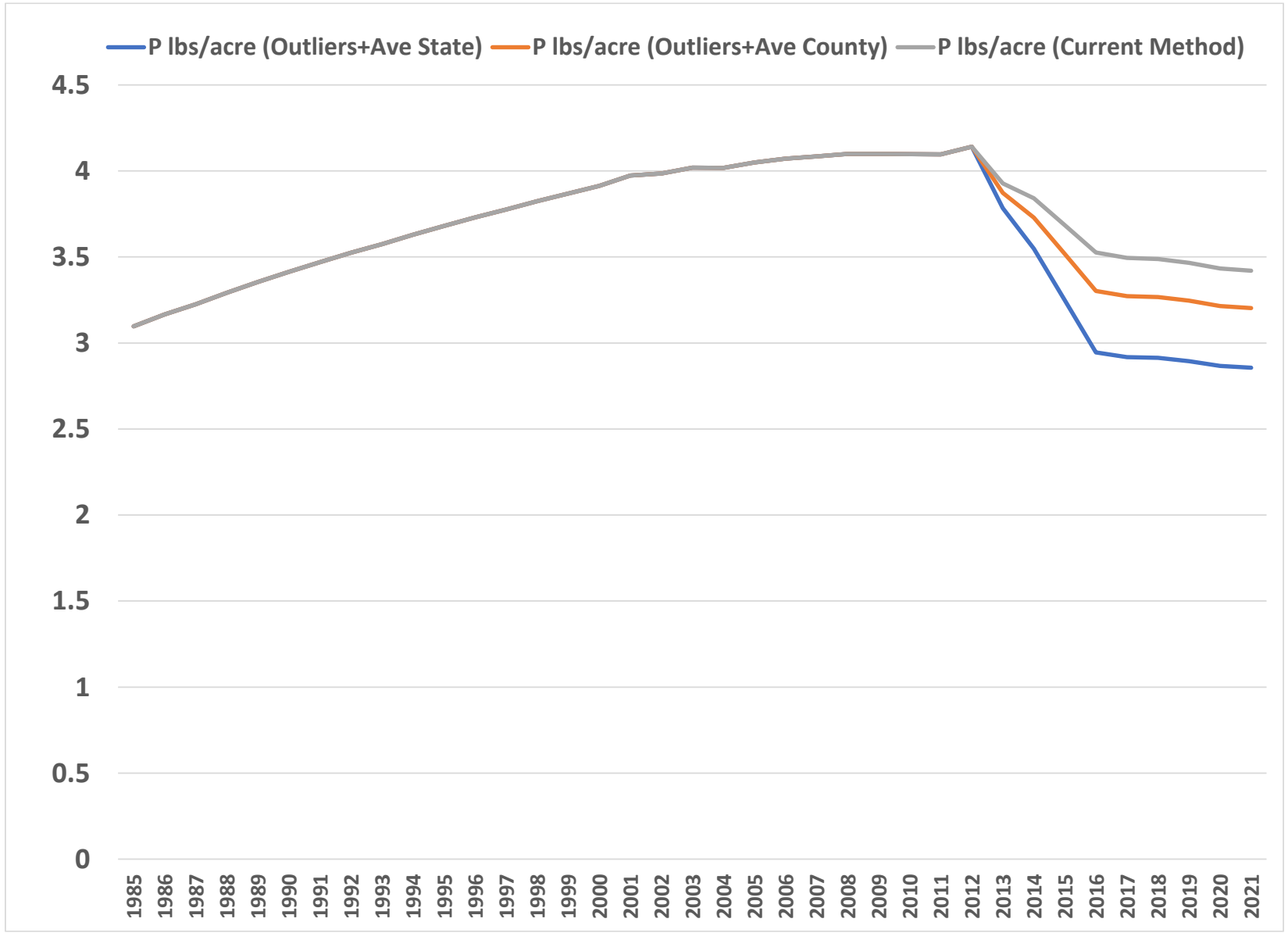

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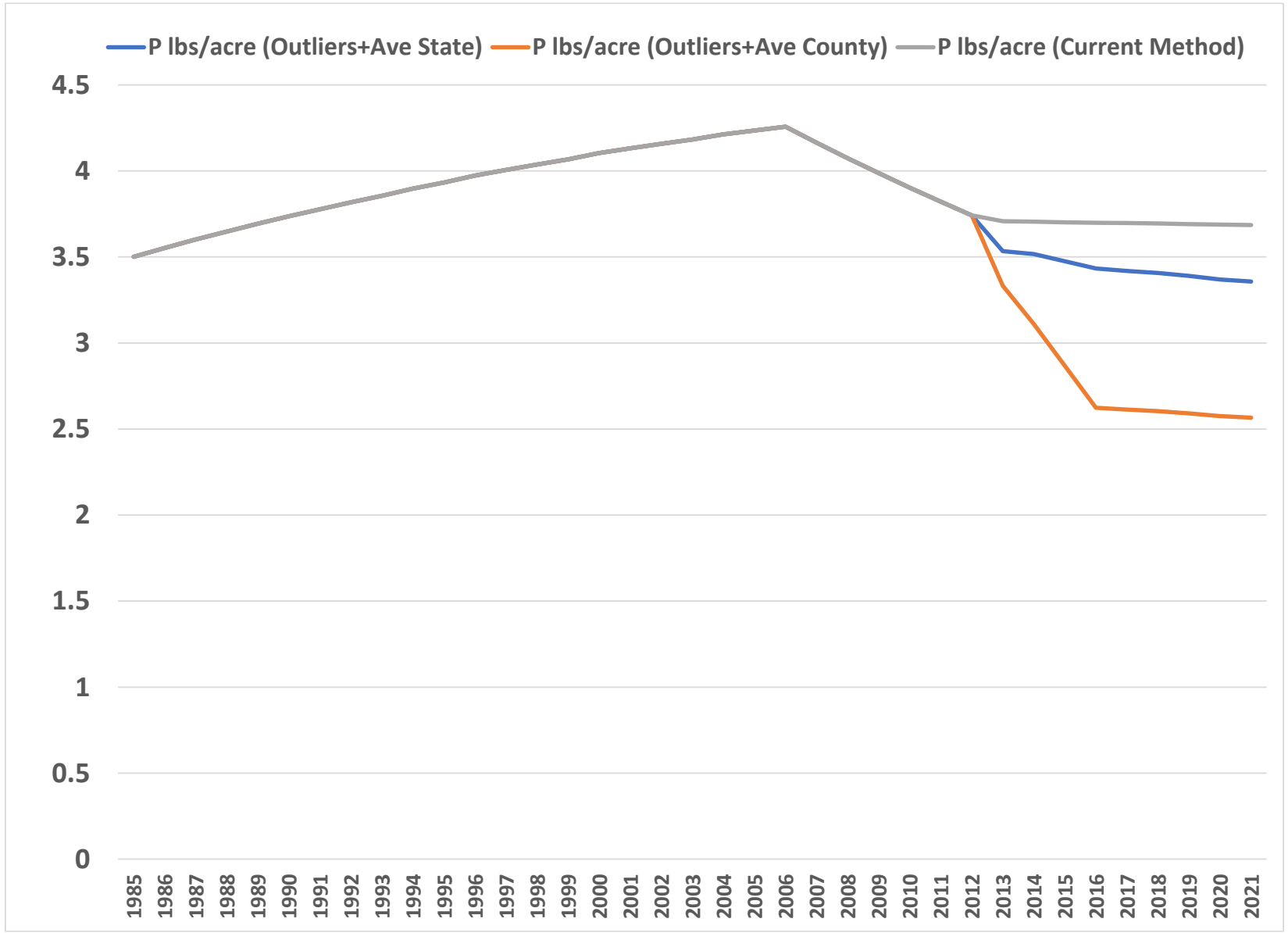

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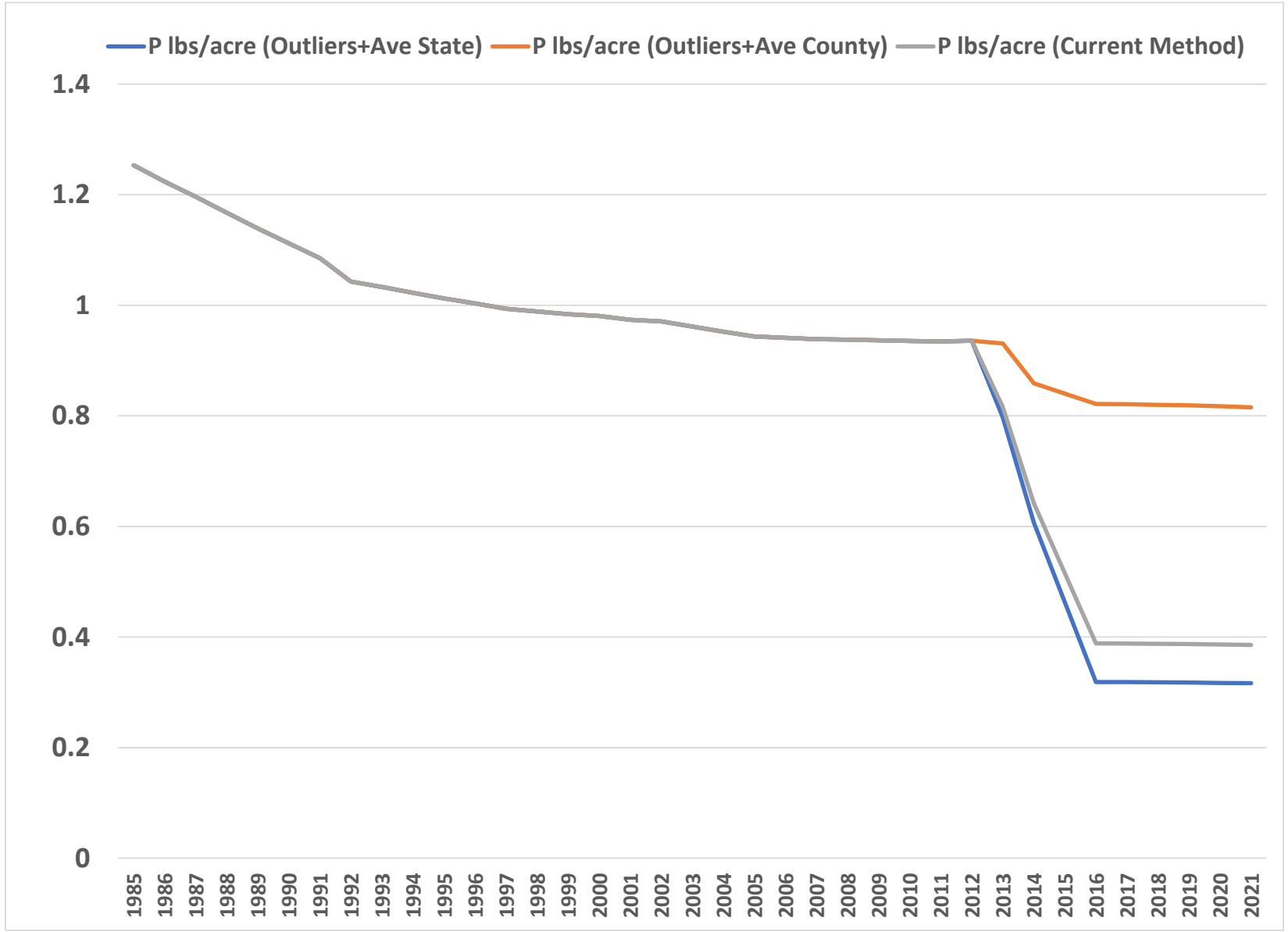

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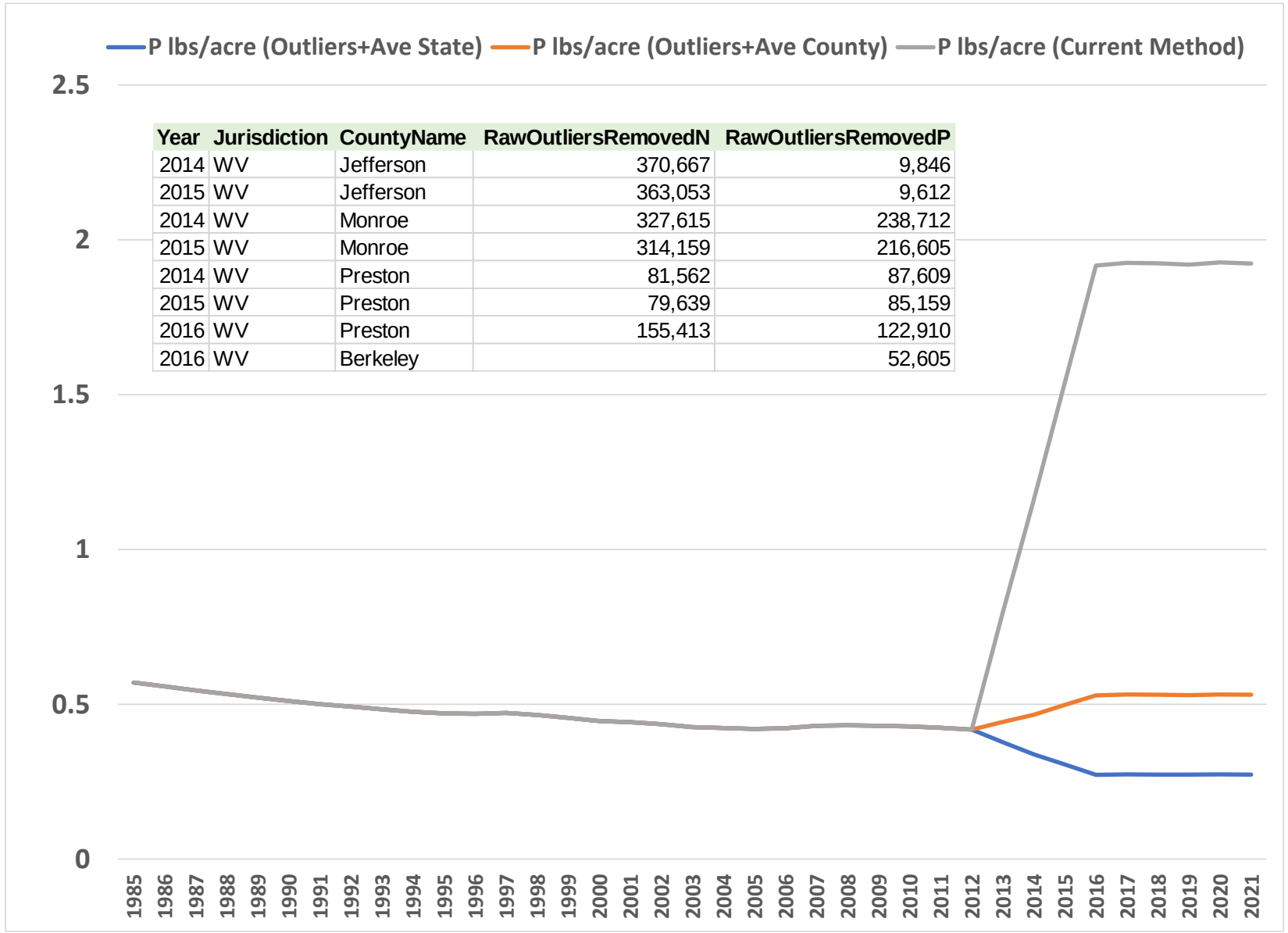

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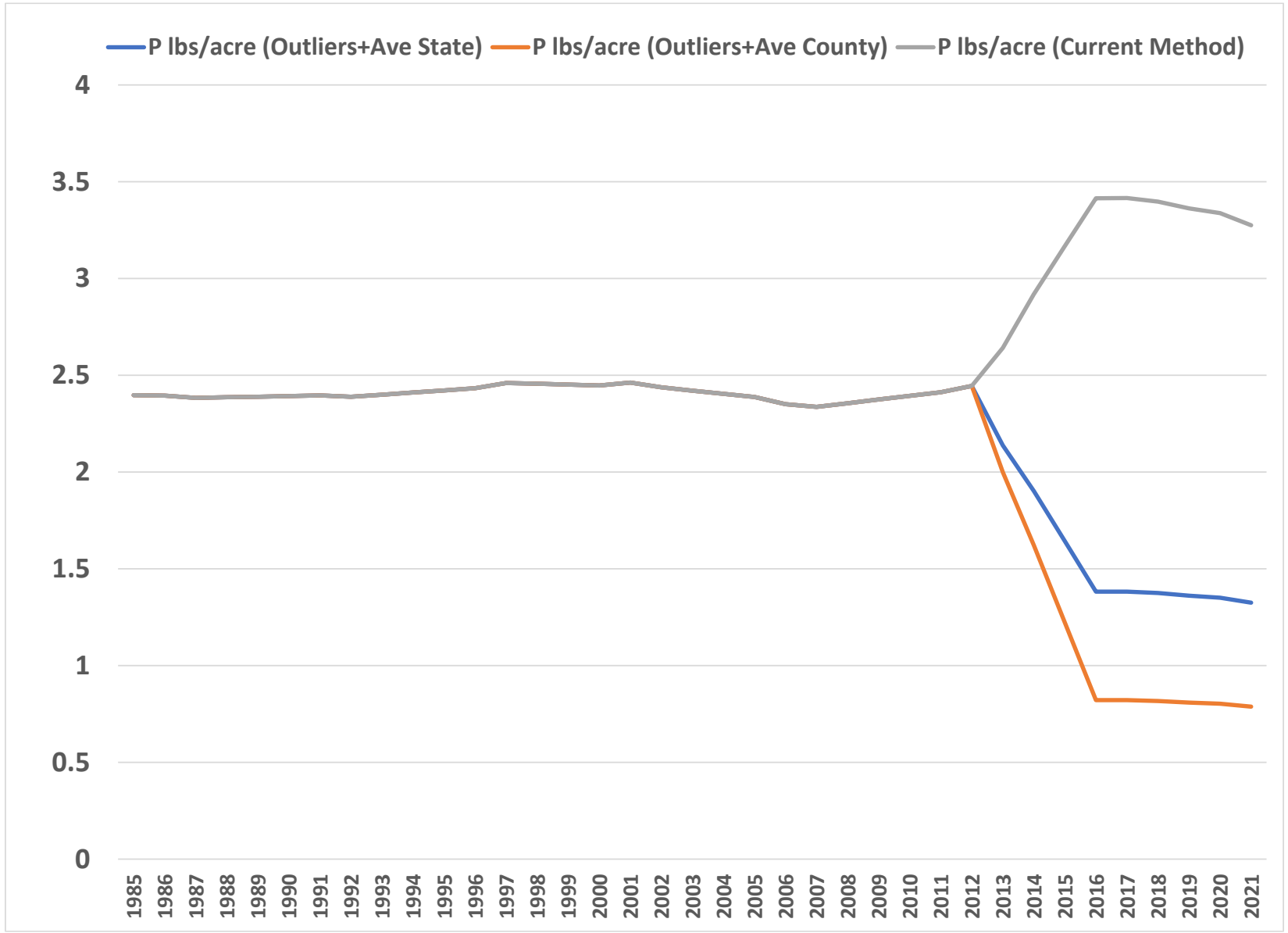

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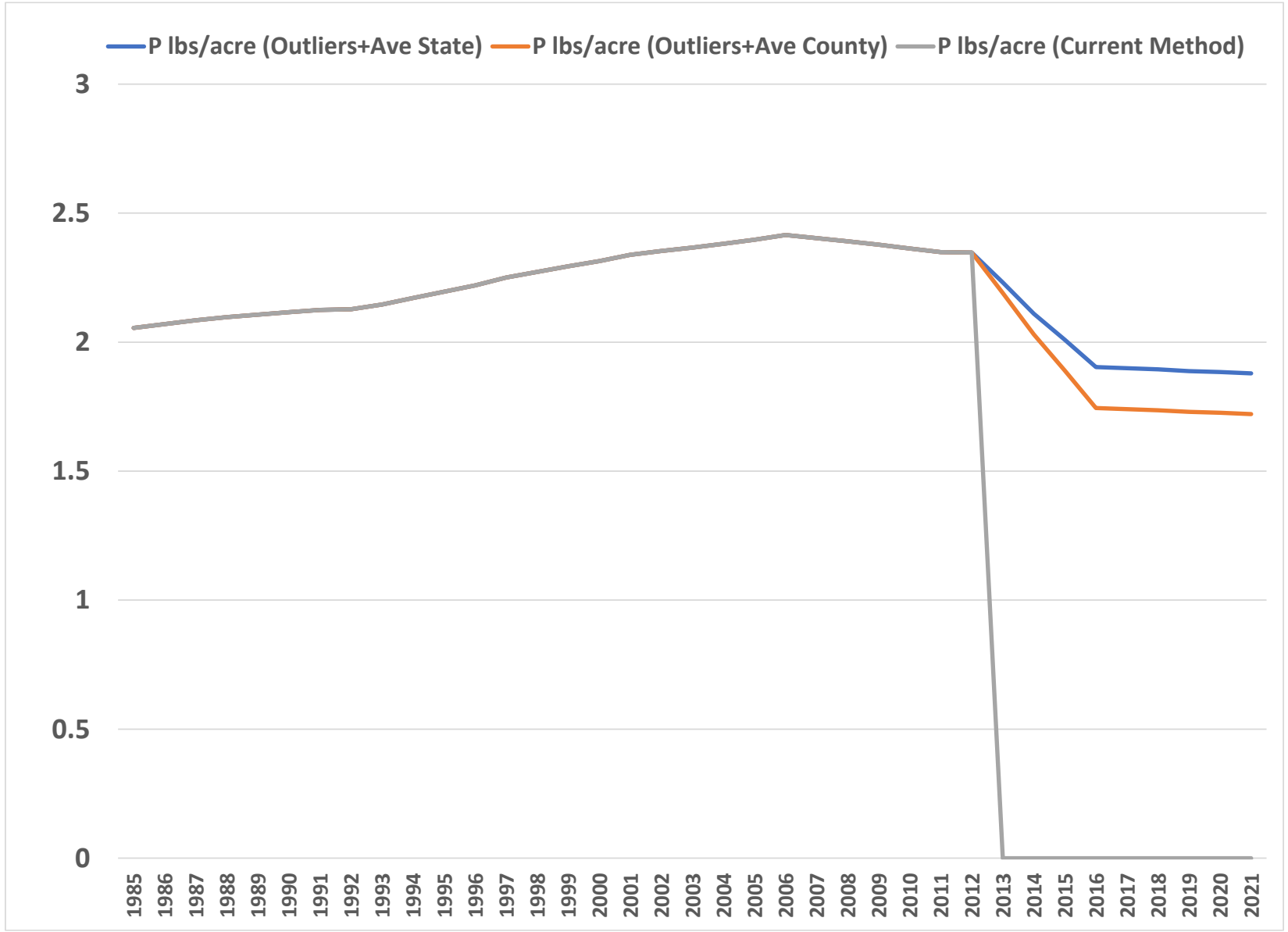

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Turfgrass Nutrient Application Rates

- CBP office recommendation is to use method #3 (orange line)
  - Lessens post-2012 trend differences among jurisdictions.
  - Is still sensitive to changes in reported sales – reductions in phosphorus sales versus generally level nitrogen trends.
  - Better not to remove a state's data for an entire year for a few counties where the quality of reported information is questionable.
  - Method (or some elements) could be used for Phase 7 Watershed Model for the entire history (back to late 1980's).
  - PSC Decision #3: Refine the process to include additional safeguards to prevent data analysis variations and to assess reasonability of modeling results after CBP protocols are applied.

DISCUSSION

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