Estimated Phase 6 Air Deposition

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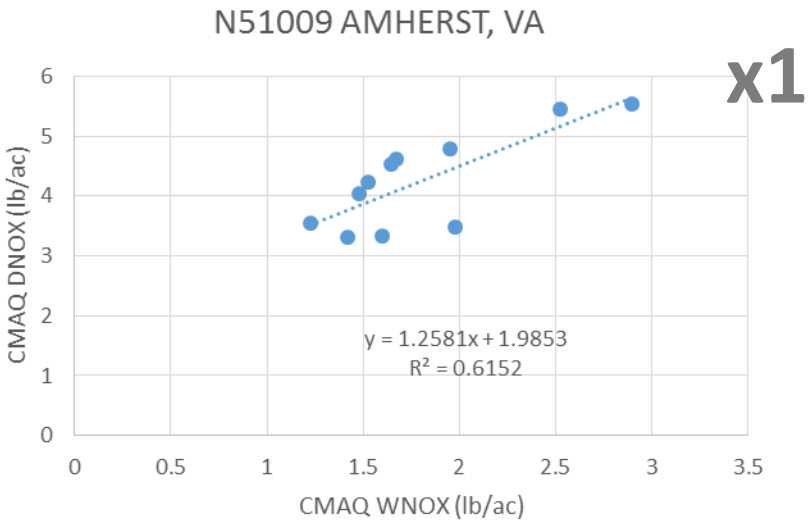
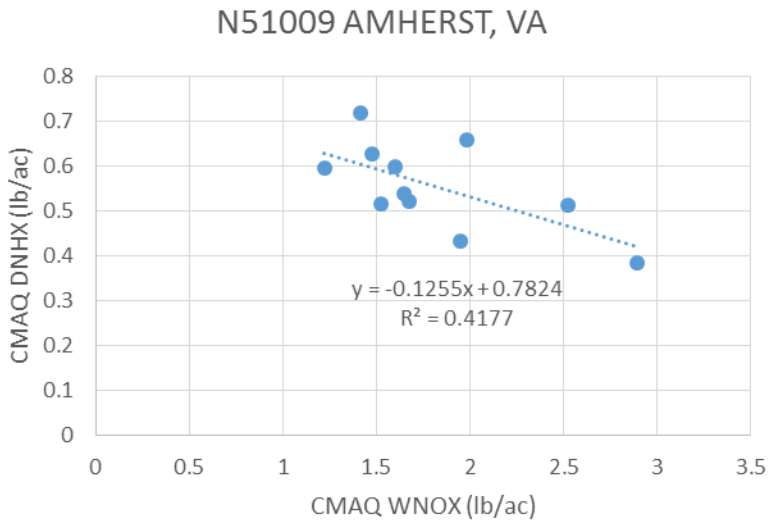
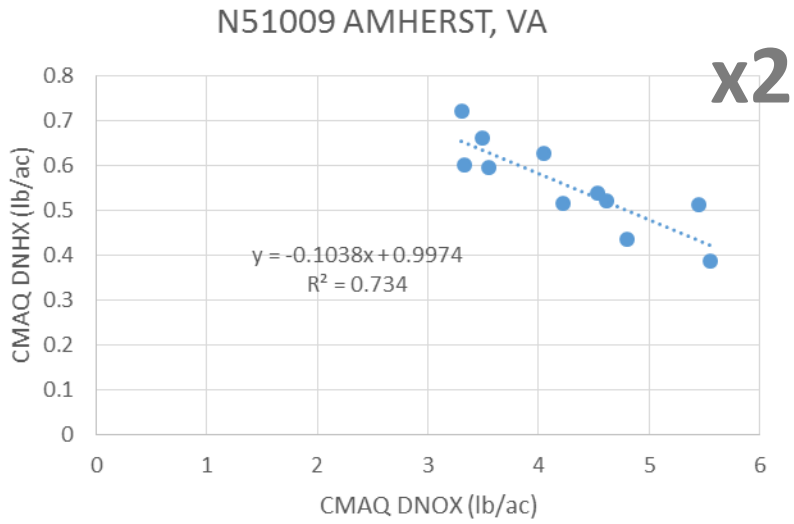
Conundrum and Solution

- There is a lack of available dry deposition data for the model's entire period of record
- However, Jeff Grimm has provided us with a wet deposition dataset that spans the model's period of record
- Jesse Bash has provided a high quality CMAQ dataset for the period 2002-2012
- **Solution:** Determine relationship between Grimm and CMAQ dataset, and apply the results of the comparison to the wet deposition dataset to produce a dry deposition dataset

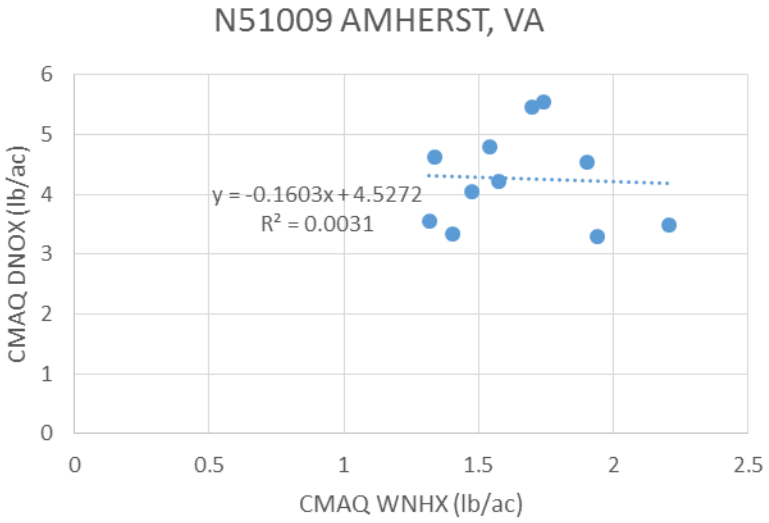


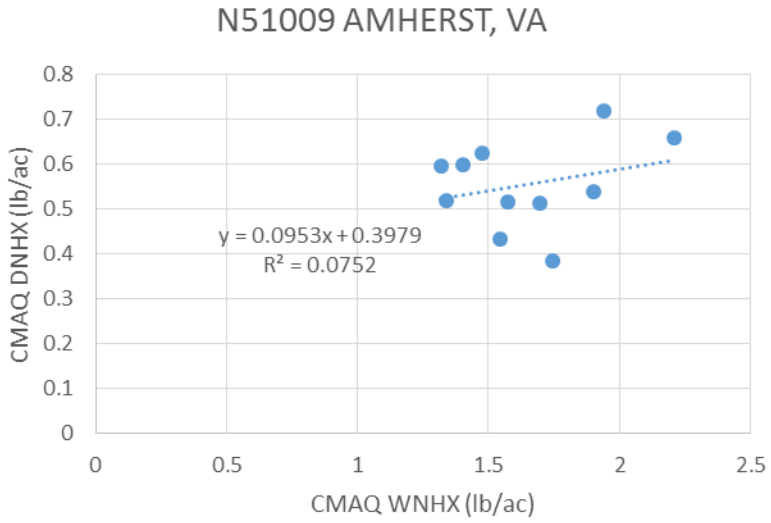
x1





x2

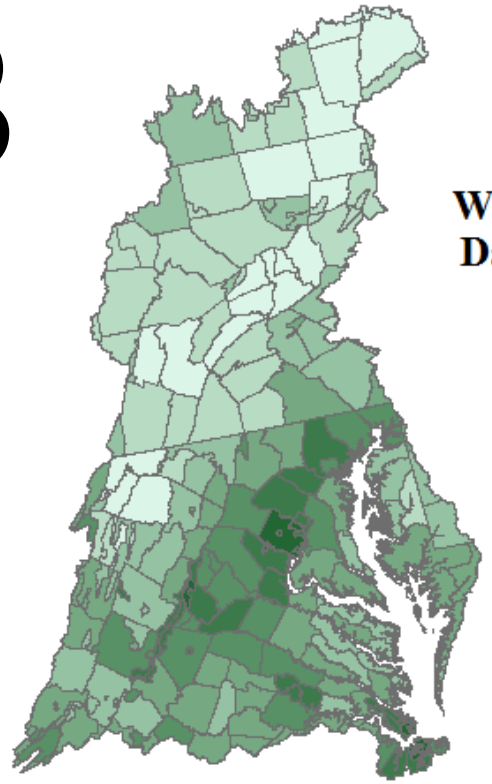




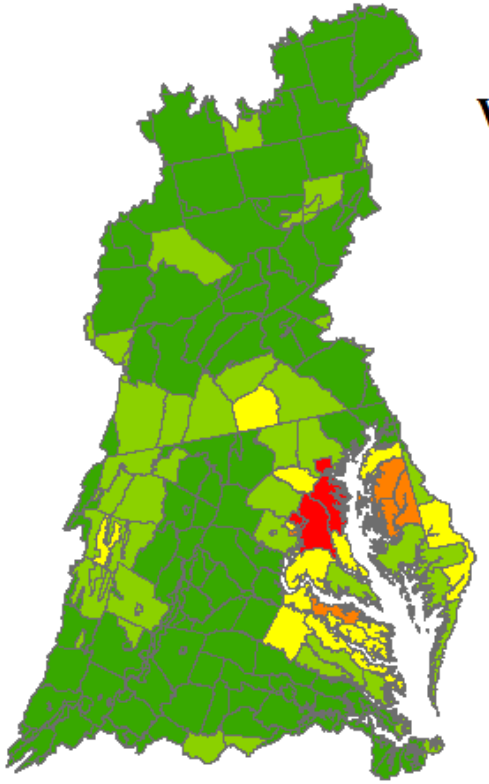
x1 Wet NOX best explained Dry NOX

x2 Dry NOX best explained Dry NHX

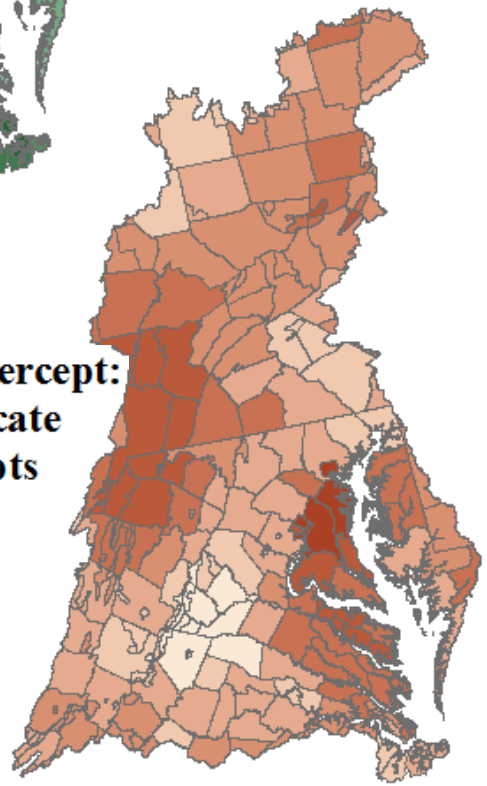
NO3



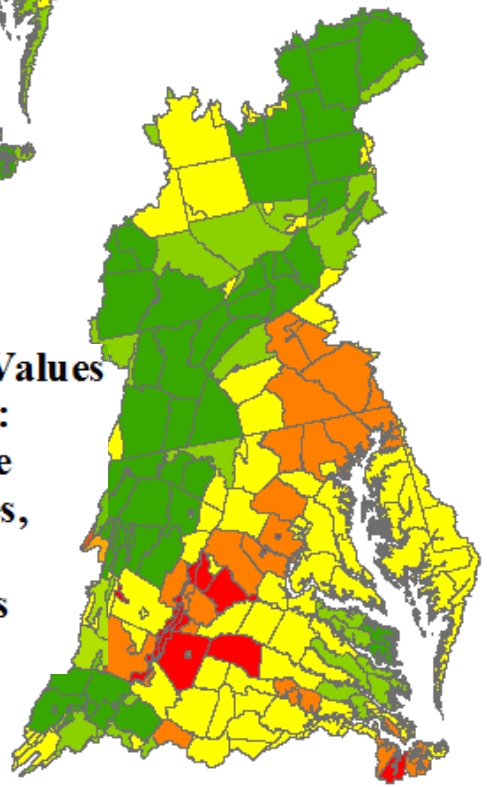
WNO3 to DNO3 Slope:
Darker values indicate
greater slopes



WNO3 to DNO3 P-Values
of Slope:
Greens indicate
smaller P-Values,
Reds indicate
larger P-Values



WNO3 to DNO3 Y-Intercept:
Darker values indicate
greater Y-Intercepts



WNO3 to DNO3 P-Values
of Y-Intercepts:
Greens indicate
smaller P-Values,
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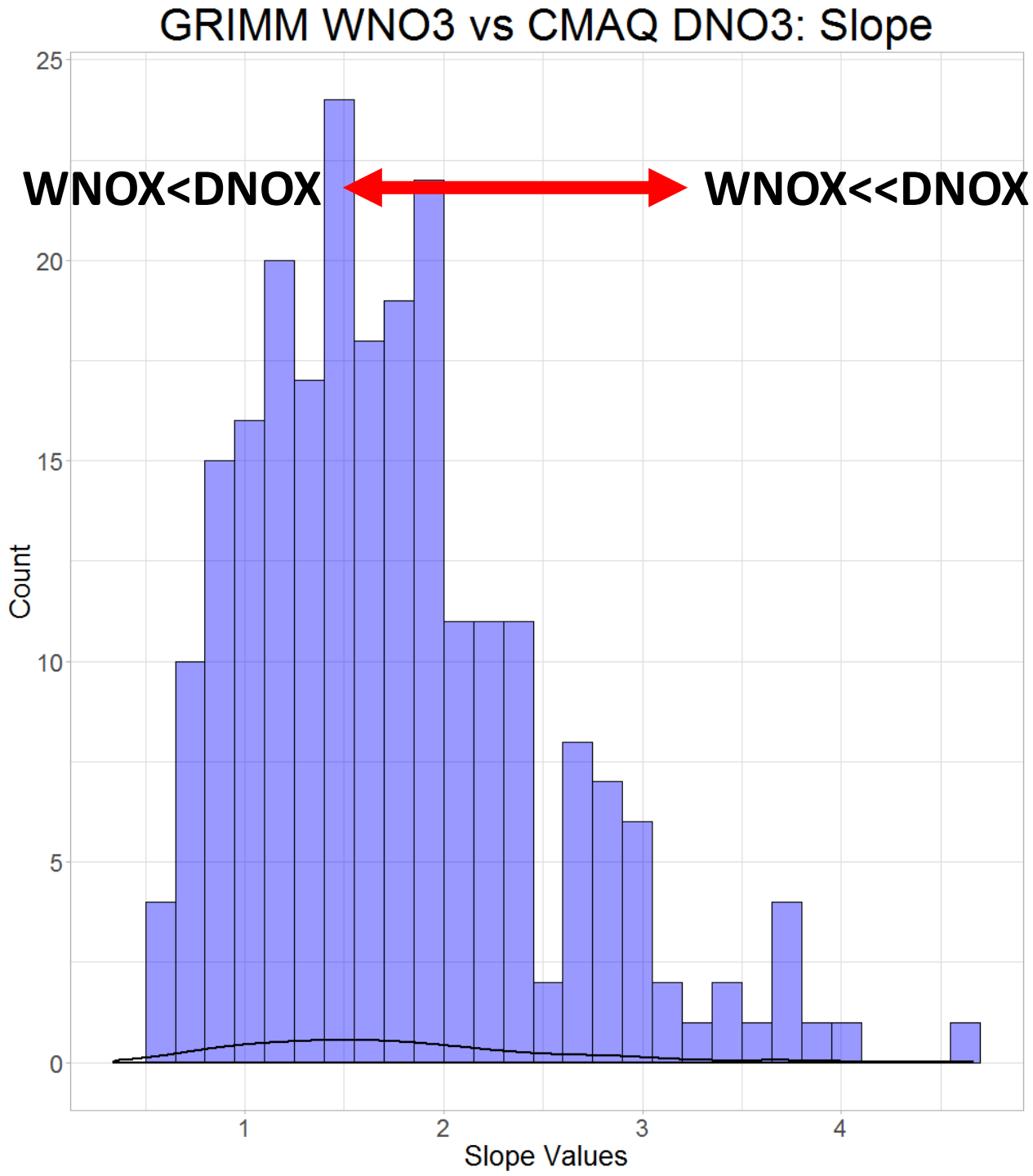
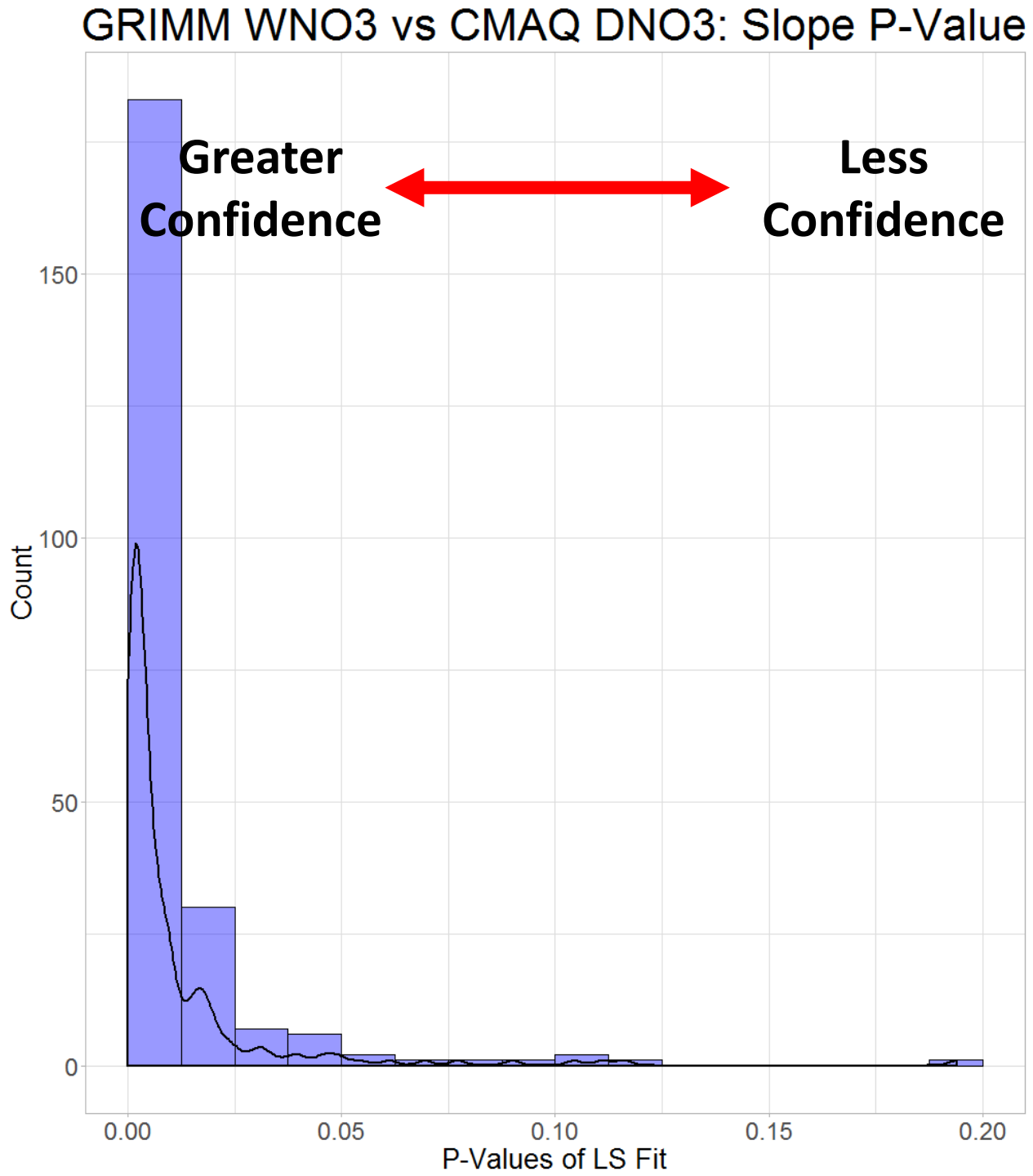
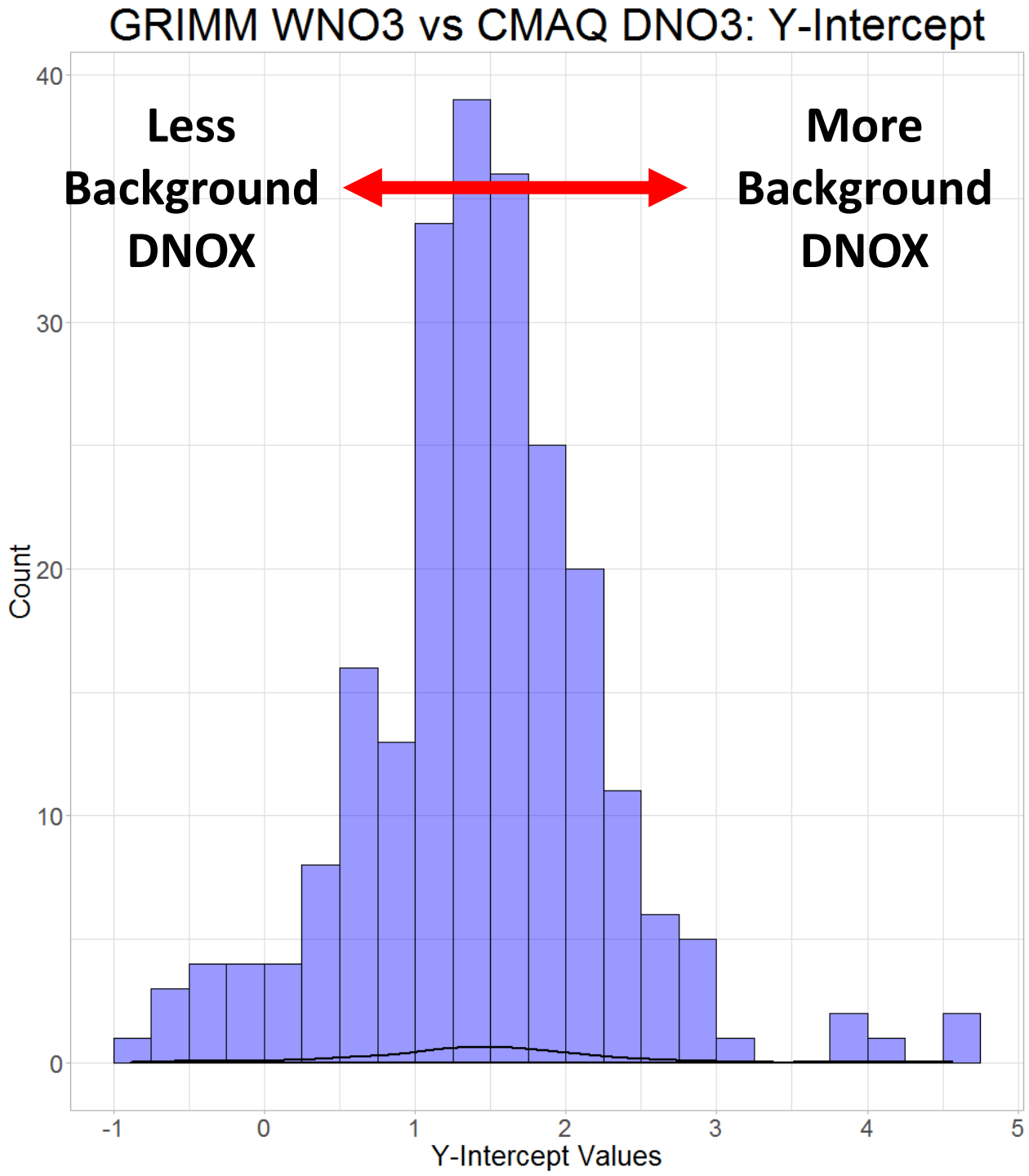
larger P-Values

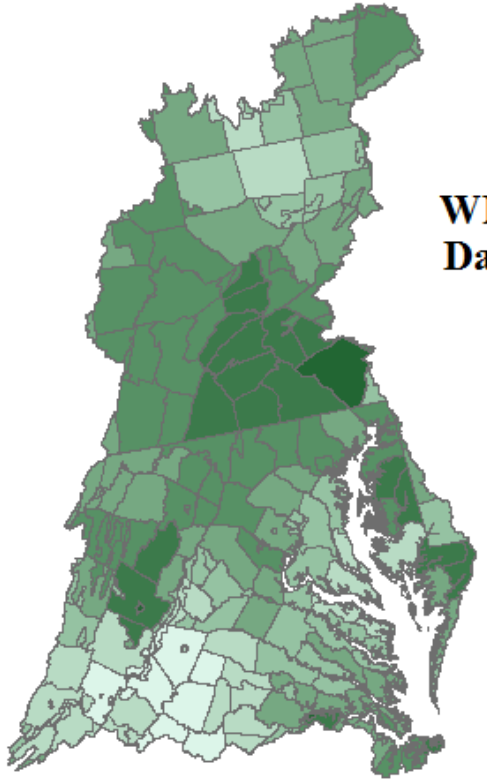

GRIMM WNO3 vs CMAQ DNO3: Slope
WNOX<DNOX
WNOX<<DNOX
Count
Slope Values
0
5
10
15
20
25
1
2
3
4


GRIMM WNO3 vs CMAQ DNO3: Slope P-Value
Greater Confidence
Less Confidence
Count
P-Values of LS Fit
0
50
100
150
0.00
0.05
0.10
0.15
0.20

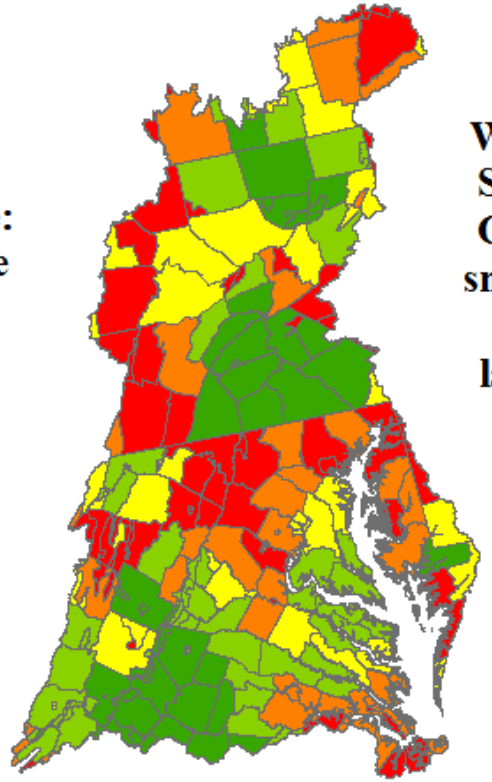

GRIMM WNO3 vs CMAQ DNO3: Y-Intercept
Less Background DNOX
More Background DNOX
Count
Y-Intercept Values
40
30
20
10
0
-1
0
1
2
3
4
5


GRIMM WNO3 vs CMAQ DNO3: Y-Intercept P-Valu
Greater Confidence
Less Confidence
Count
P-Values of Y-Intercept
60
40
20
0
0.00
0.25
0.50
0.75
1.00

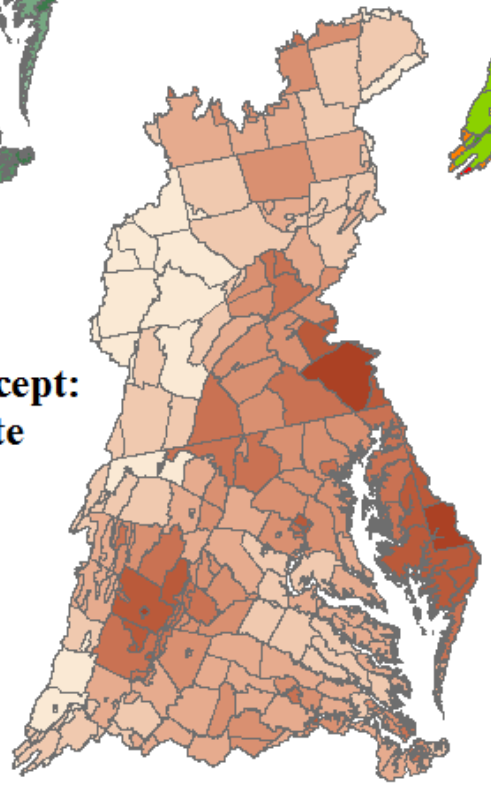
NH3



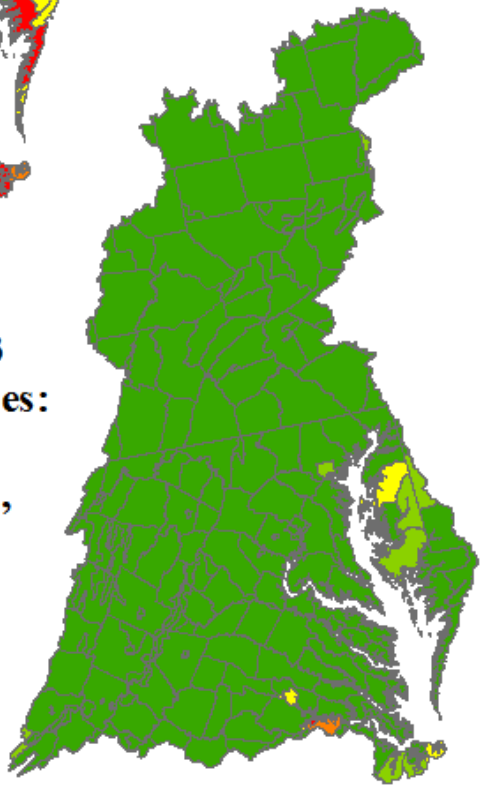
WNH3 to DNH3 Slope: Darker Values indicate greater slopes



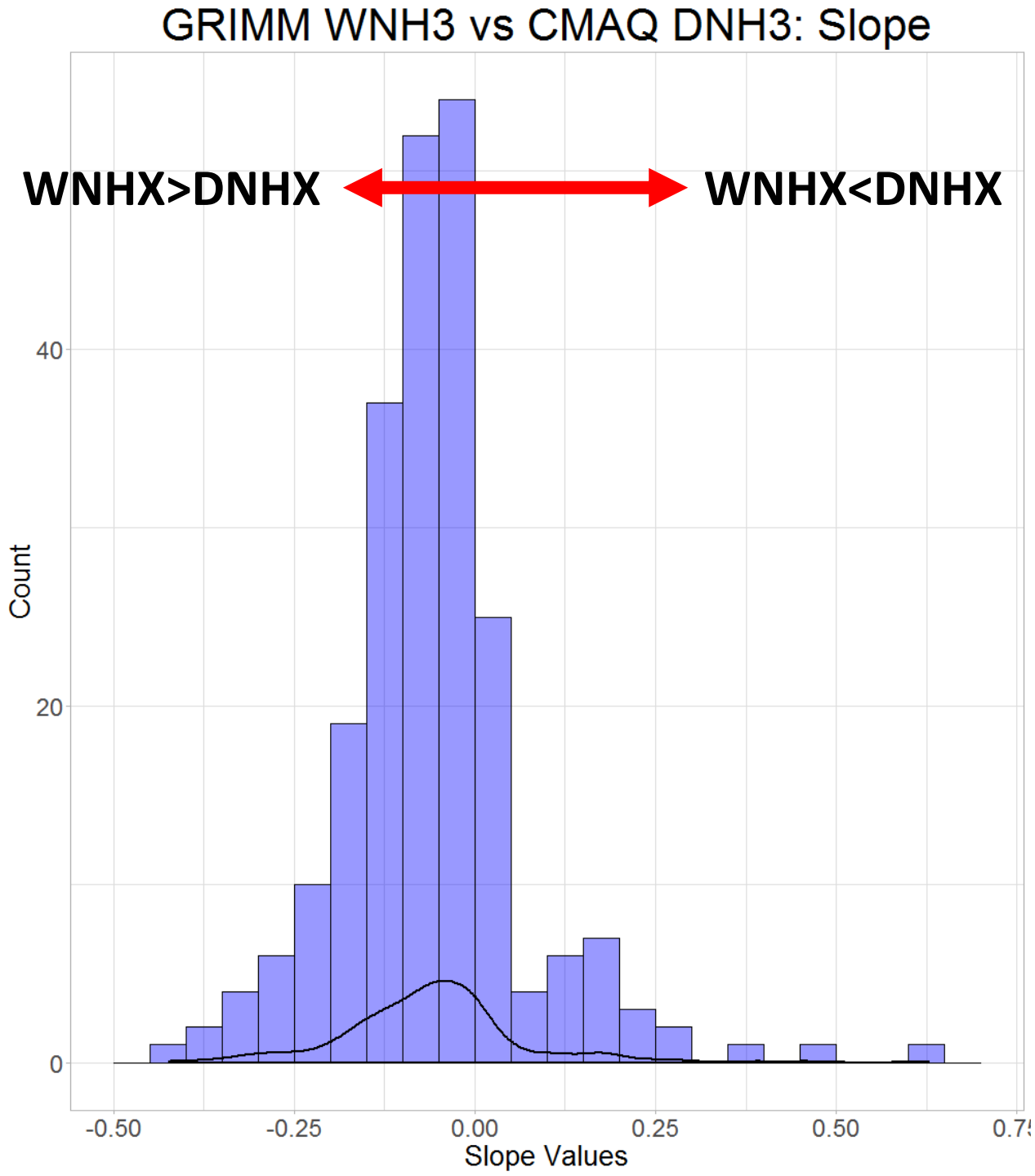
WNH3 to DNH3 Slope P-Values: Greens indicate smaller P-Values, Reds indicate larger P-Values



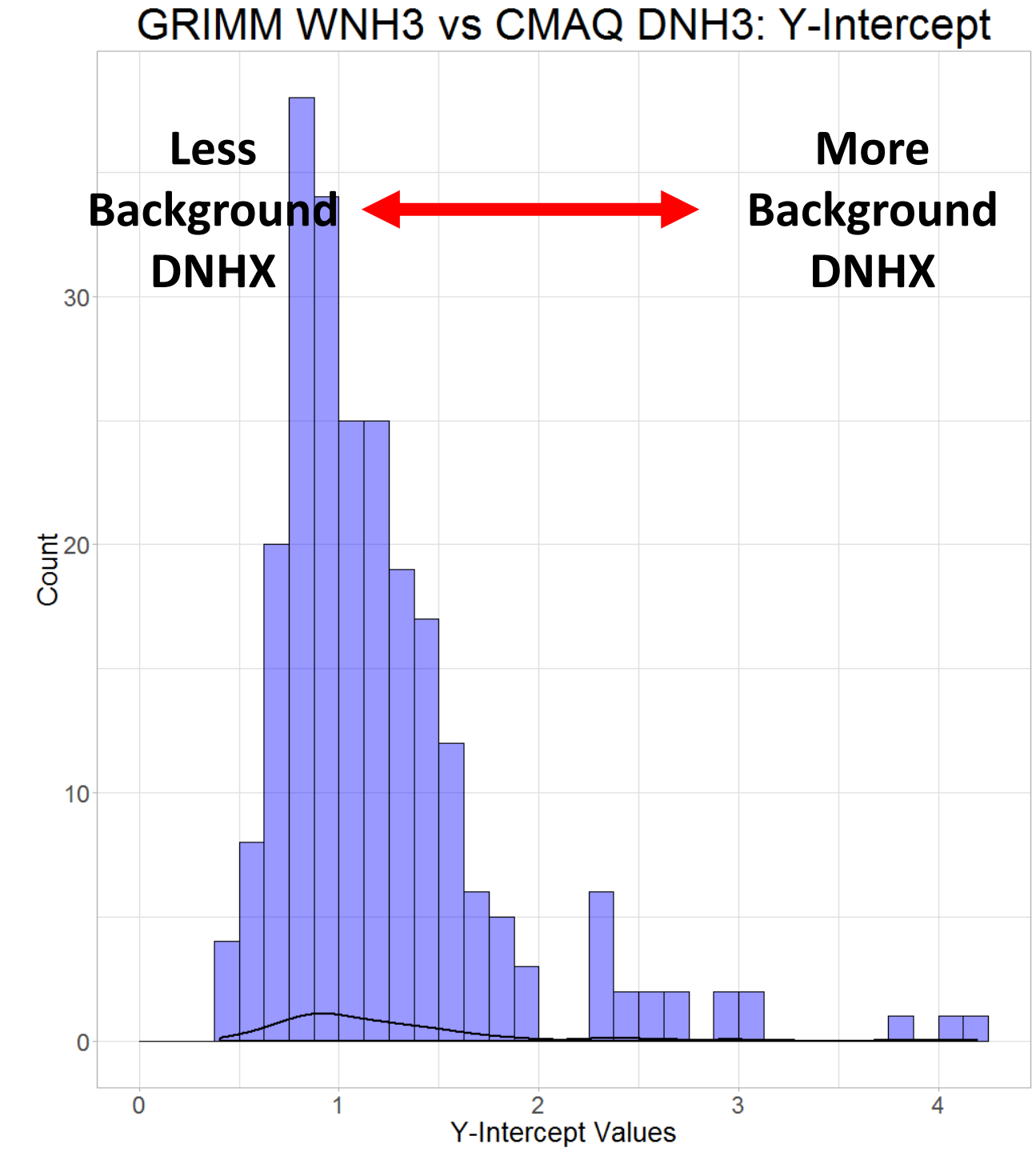
WNH3 to DNH3 Y-Intercept: Darker Values indicate greater Y-Intercepts

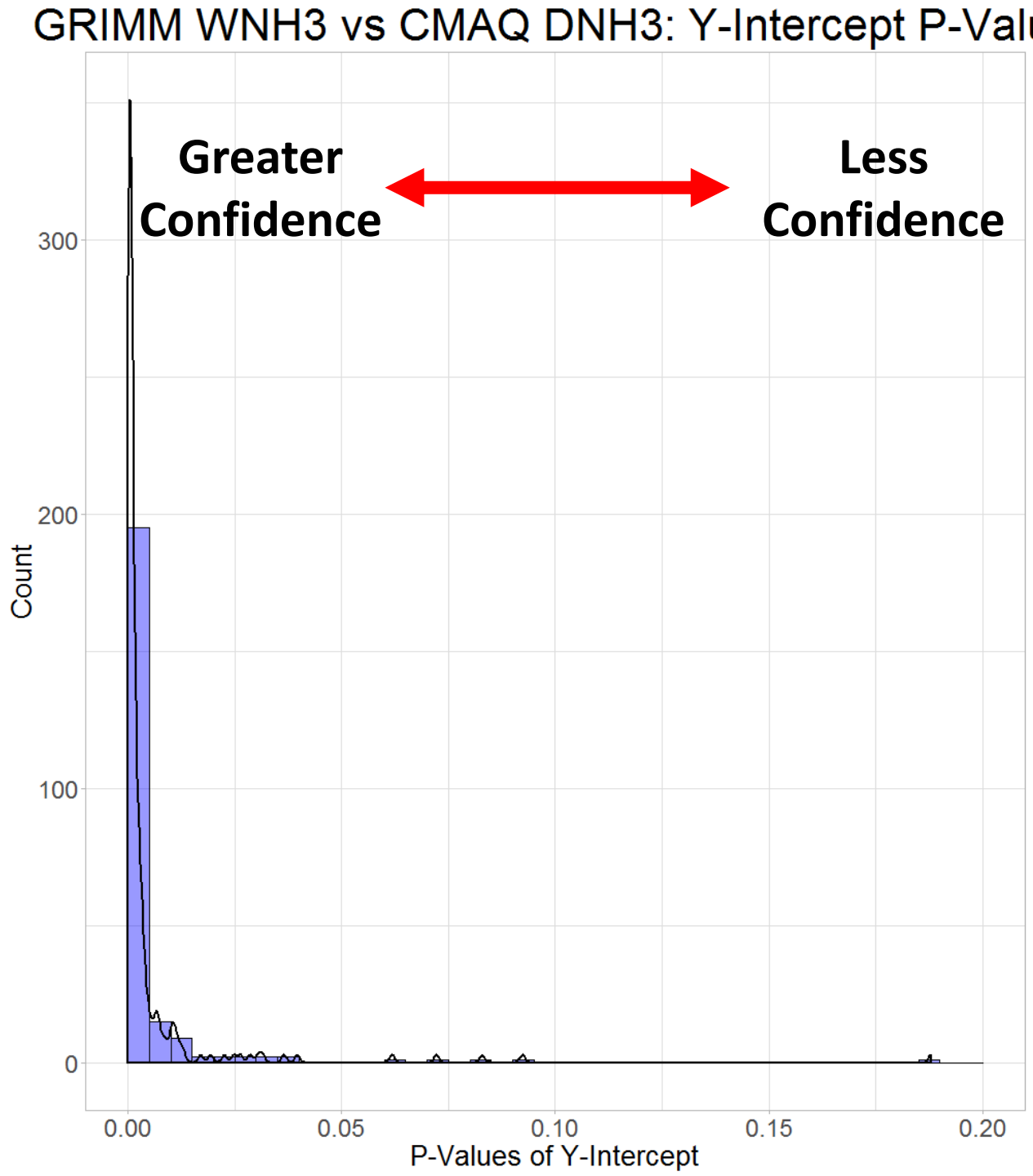


WNH3 to DNH3 Y-Intercept P-Values: Greens indicate smaller P-Values, Reds indicate larger P-Values


GRIMM WNH3 vs CMAQ DNH3: Slope
WNHX>DNHX
WNHX<DNHX
Count
40
20
0
-0.50
-0.25
0.00
0.25
0.50
Slope Values

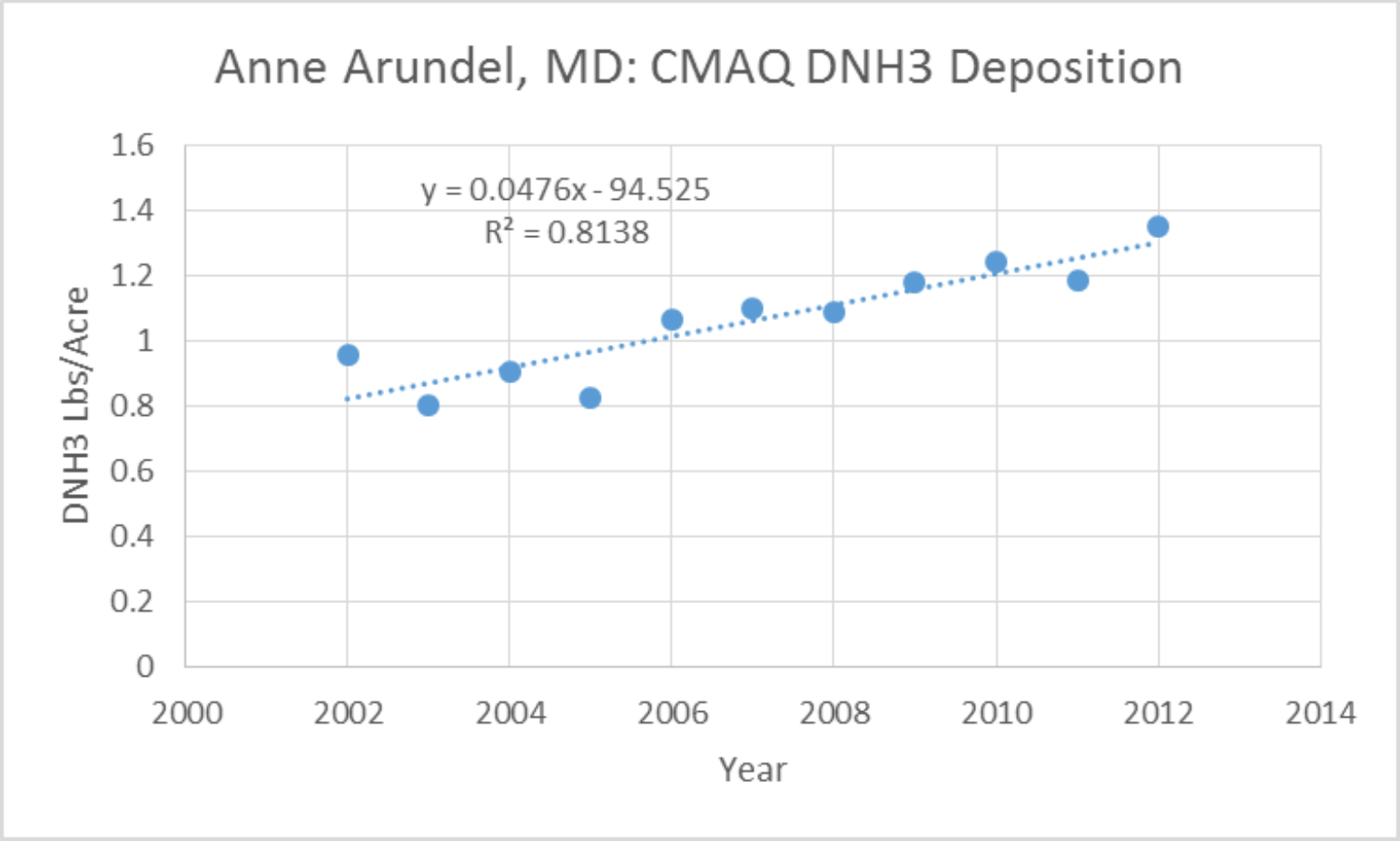

GRIMM WNO3 vs CMAQ DNO3: Slope P-Value
Greater Confidence
Less Confidence
Count
15
10
5
0
0.00
0.25
0.50
0.75
1.00
P-Values of LS Fit


GRIMM WNH3 vs CMAQ DNH3: Y-Intercept
Less Background DNHX
More Background DNHX
Count
Y-Intercept Values
0
10
20
30
0
1
2
3
4


GRIMM WNH3 vs CMAQ DNH3: Y-Intercept P-Valu
Greater Confidence
Less Confidence
Count
P-Values of Y-Intercept
0
100
200
300
0.00
0.05
0.10
0.15
0.20

Comments Received

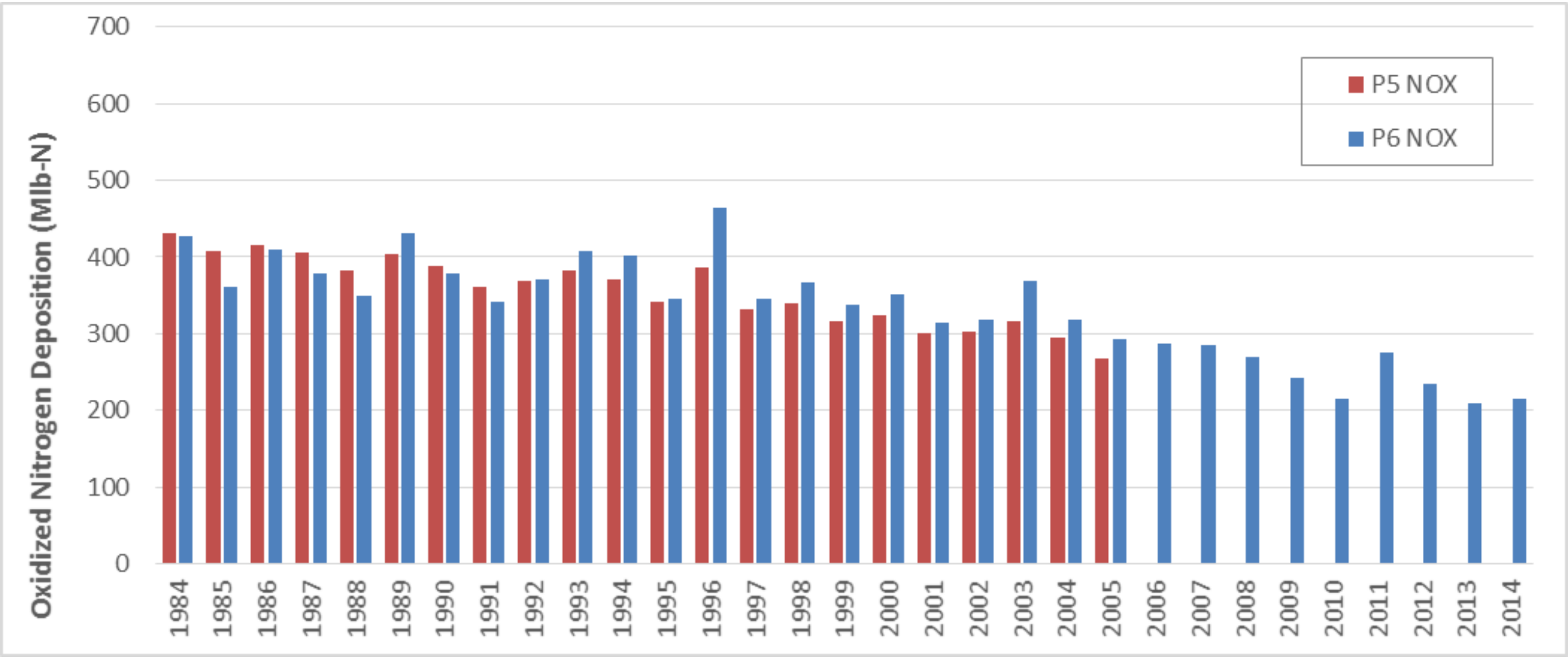
- Dry NH3 deposition has been increasing over time, which is not currently captured in the Phase 6 dataset
- A regression of dry NH3 data against time will be run and then extrapolated to cover the entire model time period



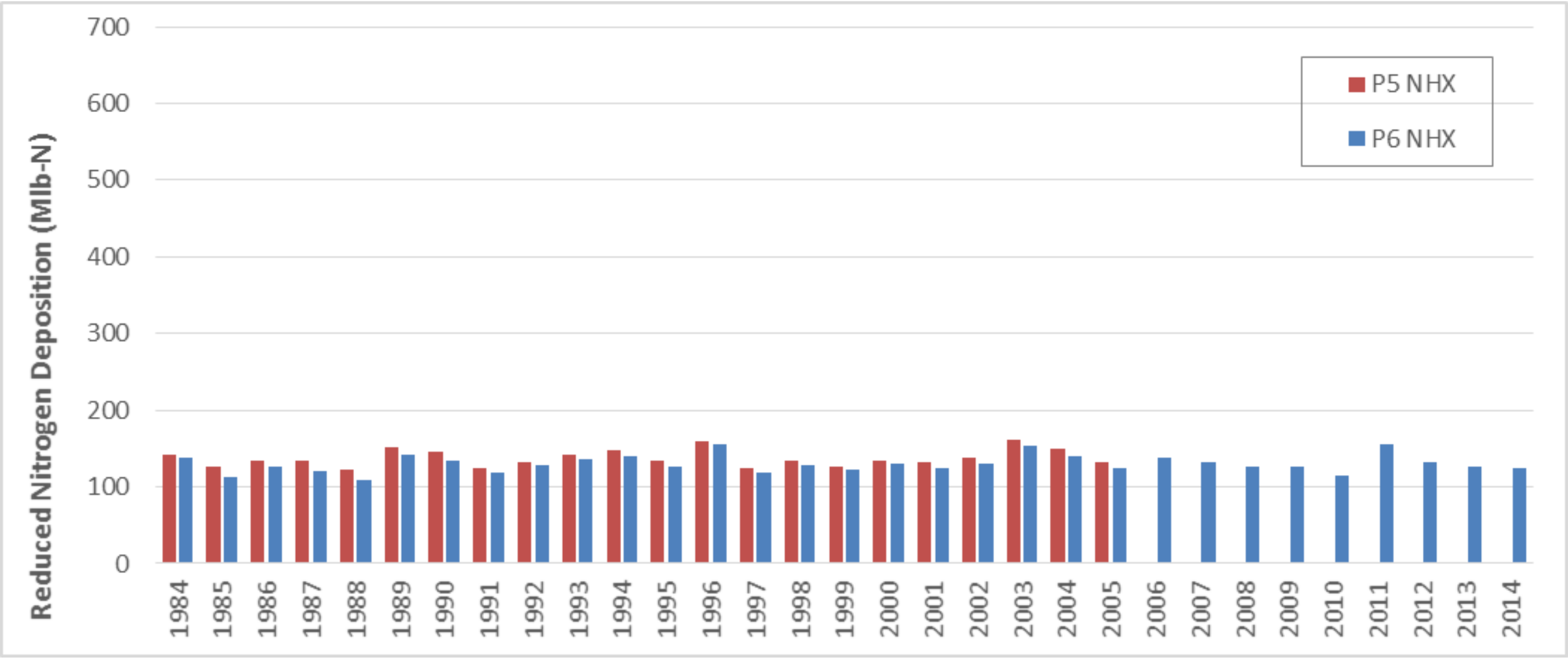
Time Series of Deposition

- Comparison of Phase 5 and Phase 6 records
- Development and inclusion of future time series which have not yet been de-trended
  - The values presented are preliminary, although the trends shown may help provide insights

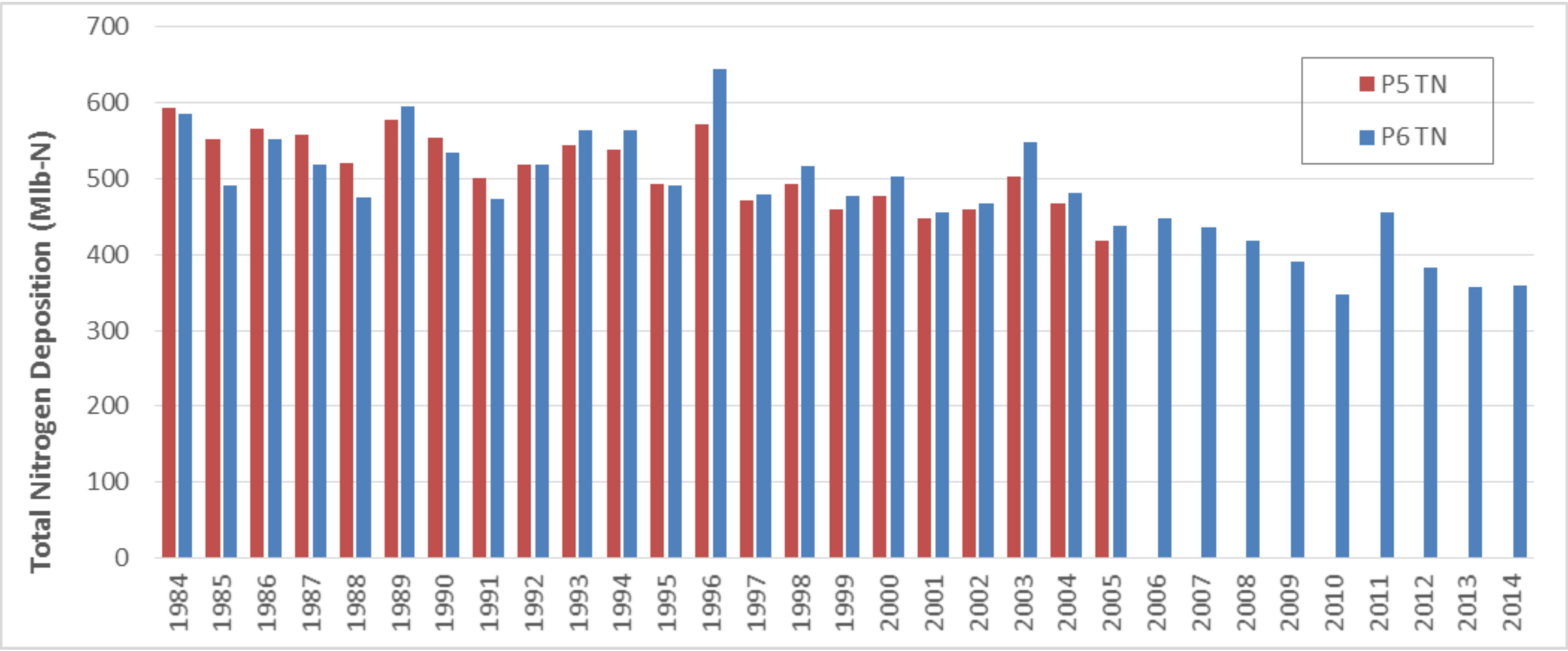
NOX Deposition Datasets



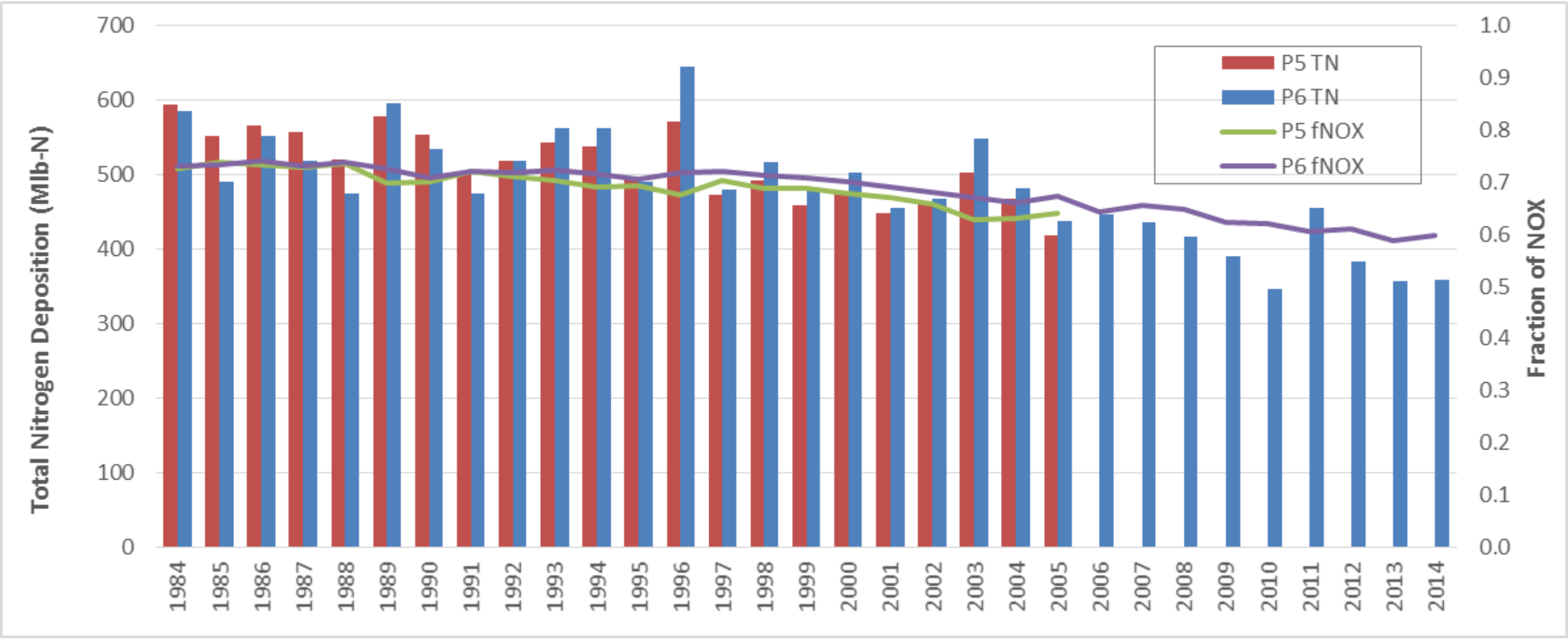
NHX Deposition Datasets



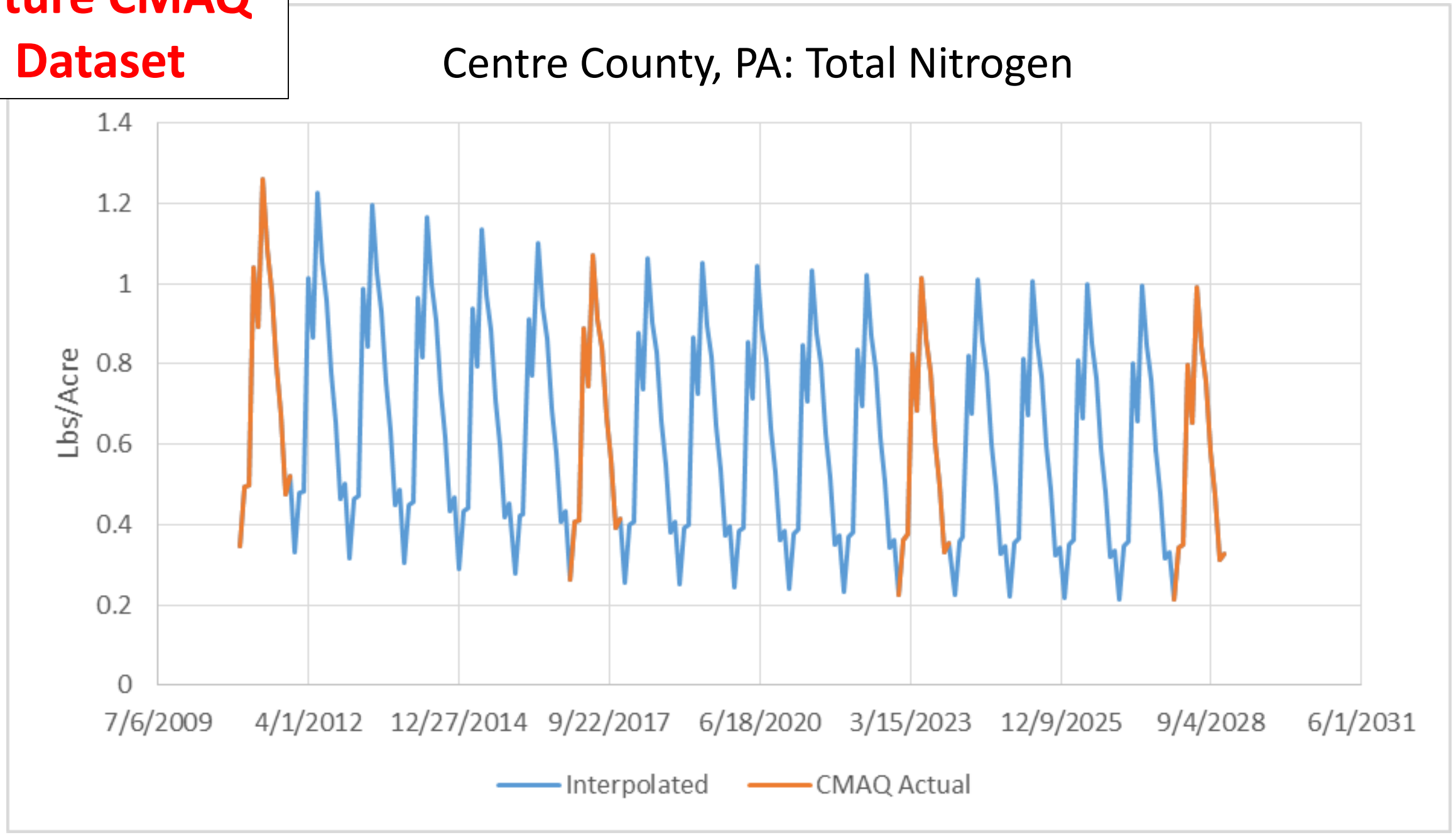
TN Deposition Datasets

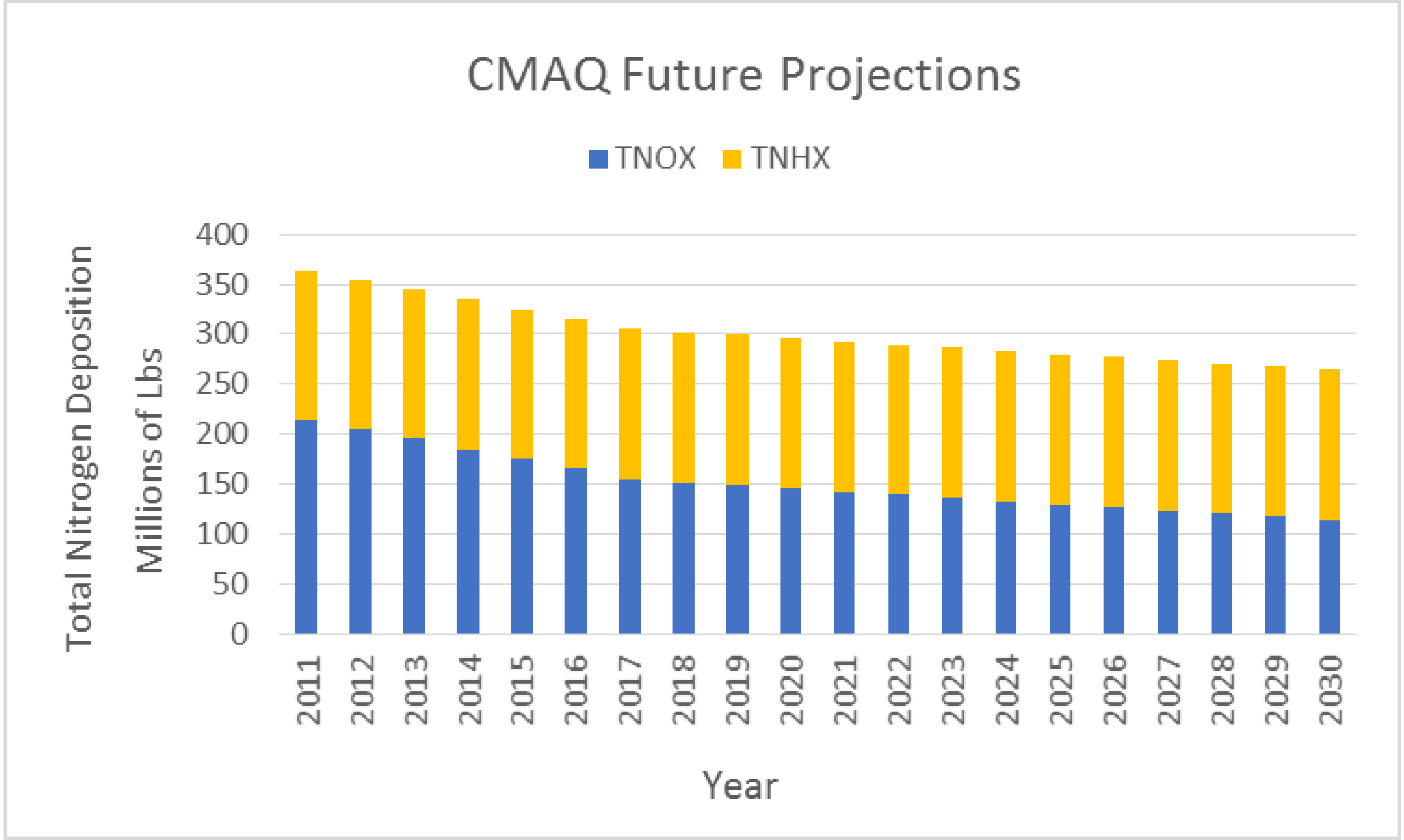


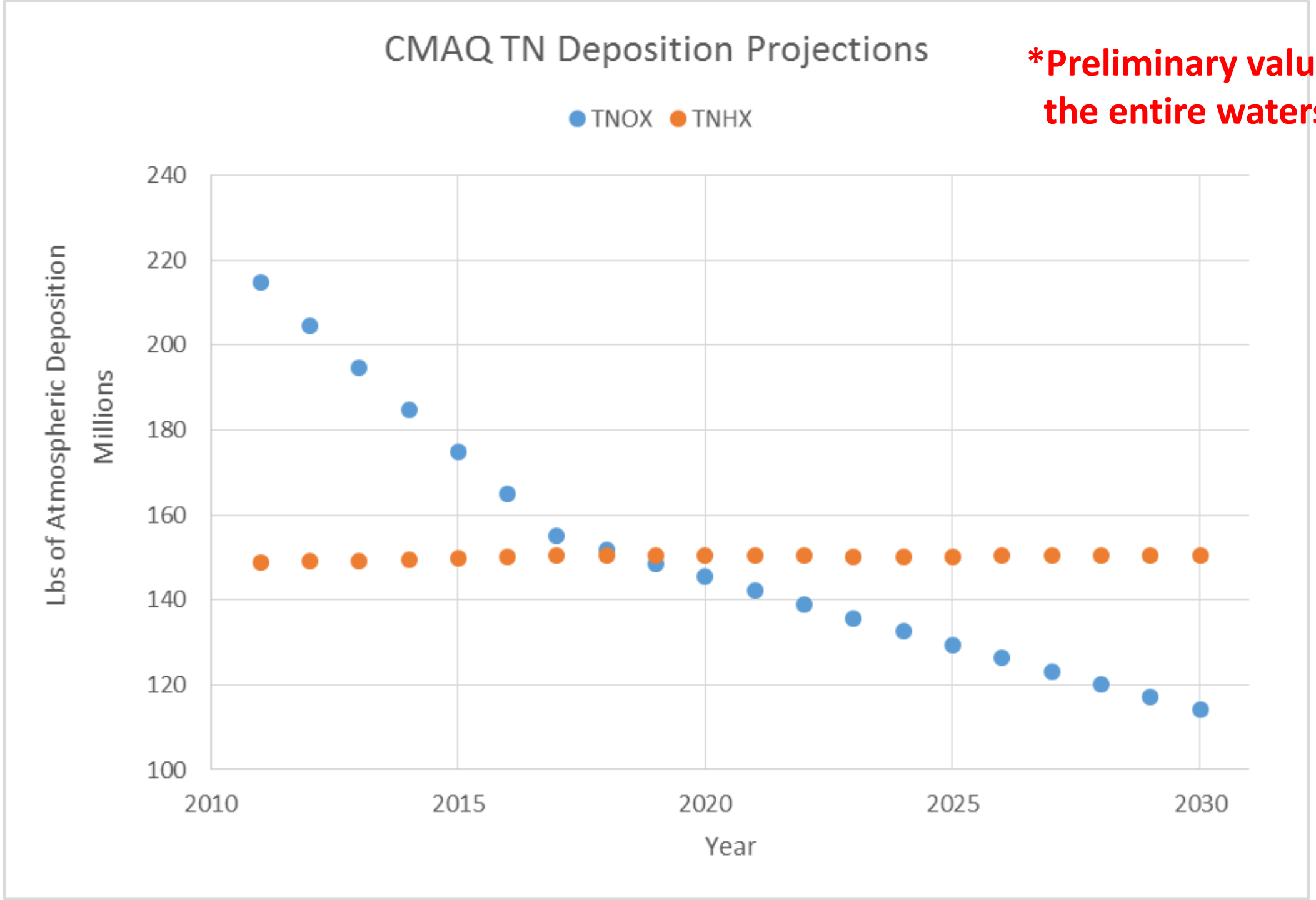
TN Deposition Datasets



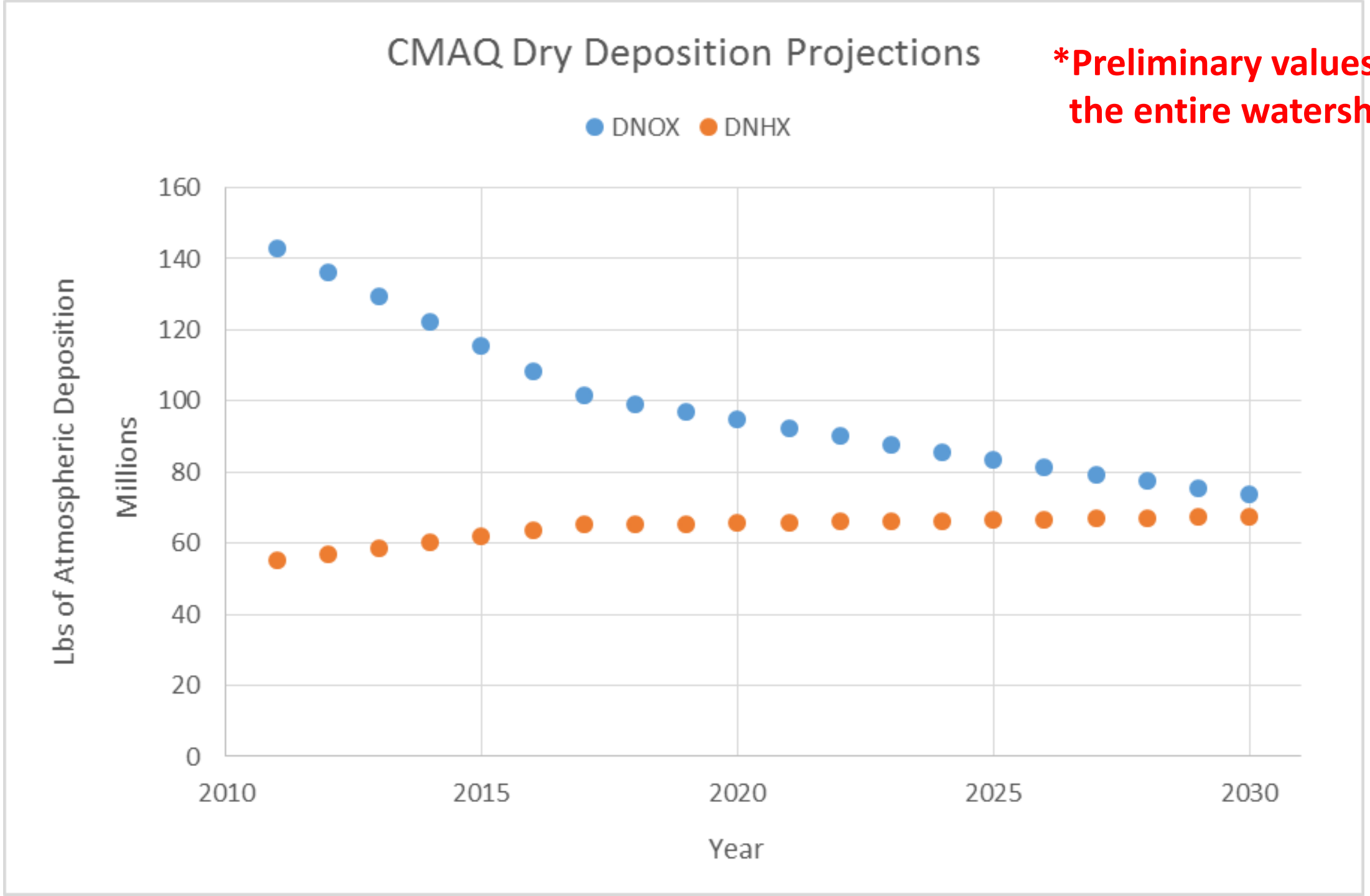
Future CMAQ Dataset



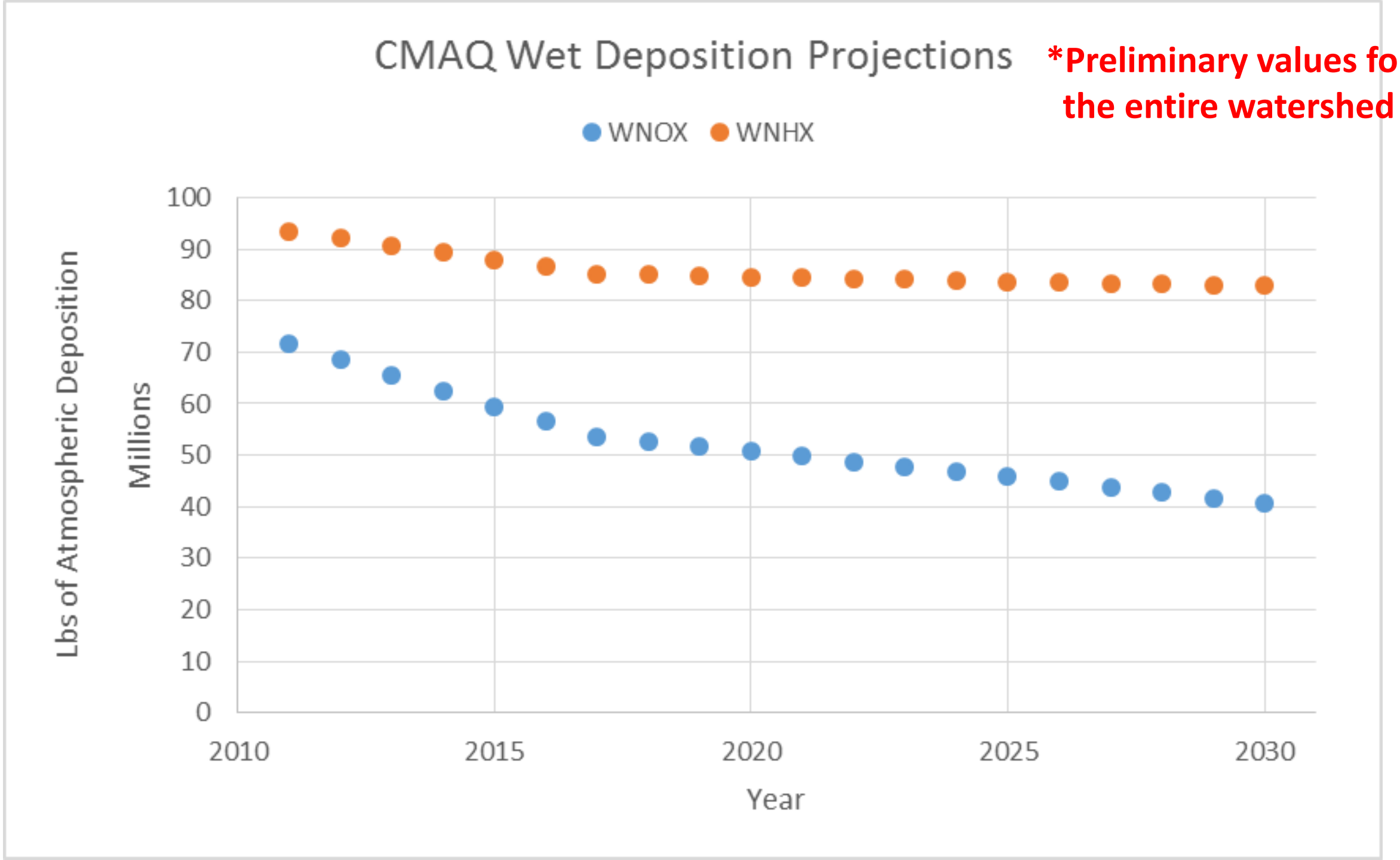

CMAQ Future Projections
TNOX
TNHX
Total Nitrogen Deposition
Millions of Lbs
400
350
300
250
200
150
100
50
0
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
Year



***Preliminary values for the entire watershed**



***Preliminary values for the entire watershed**


CMAQ Wet Deposition Projections
*Preliminary values for the entire watershed
WNOX
WNHX
Lbs of Atmospheric Deposition
Millions
100
90
80
70
60
50
40
30
20
10
0
2010
2015
2020
2025
2030
Year