Using Plant Analysis to Diagnose Nutrient Needs in Alfalfa

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UW Extension

Objectives

- To obtain info. on nutrition status of Wisconsin's alfalfa crop
- To determine if K and S deficiency are becoming more common throughout Wisconsin or in certain regions

How did we do this?

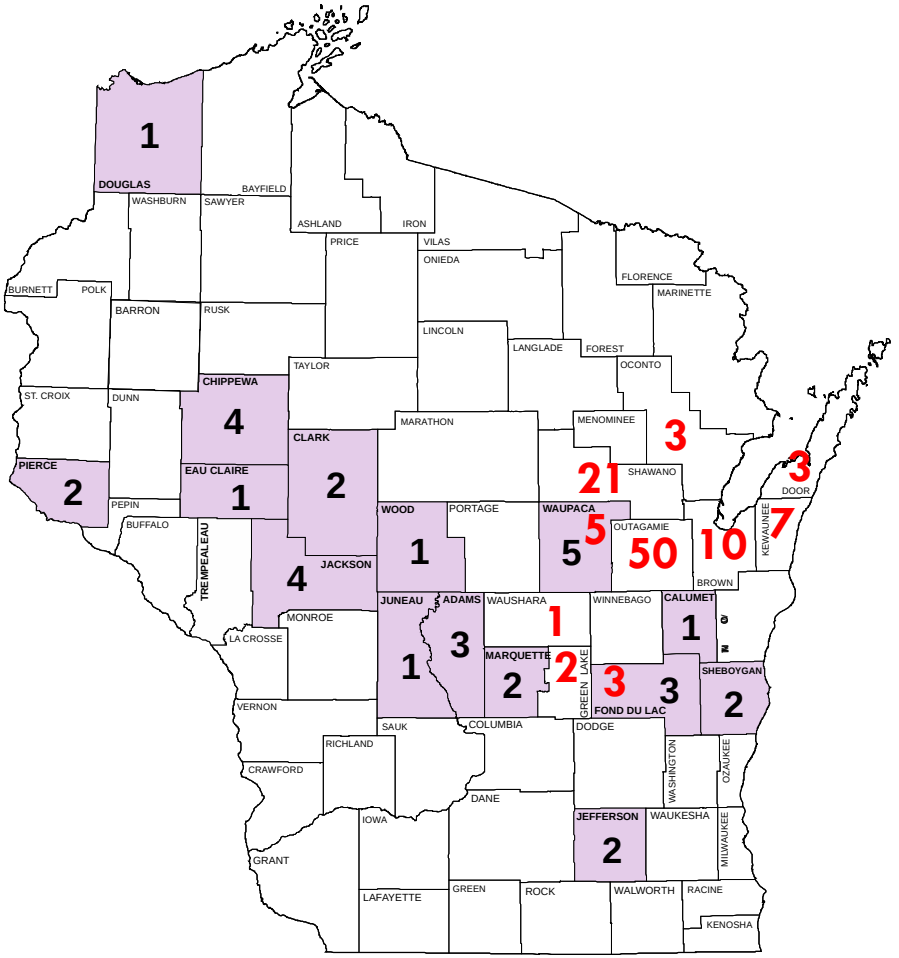
- Alfalfa fields throughout Wisconsin
  - No manure or fertilizer S 18 months prior to sampling
  - Plant sample bud to 1st flower stage after 1st or 2nd cut
    - Top 6" from 30-40 plants
    - Analyzed to total N and total mineral content
  - 0-6" soil sample
    - 10 cores taken from same area as plant samples
    - Anaylzed for P, K, pH, buffer pH, OM, S, and B

Field history

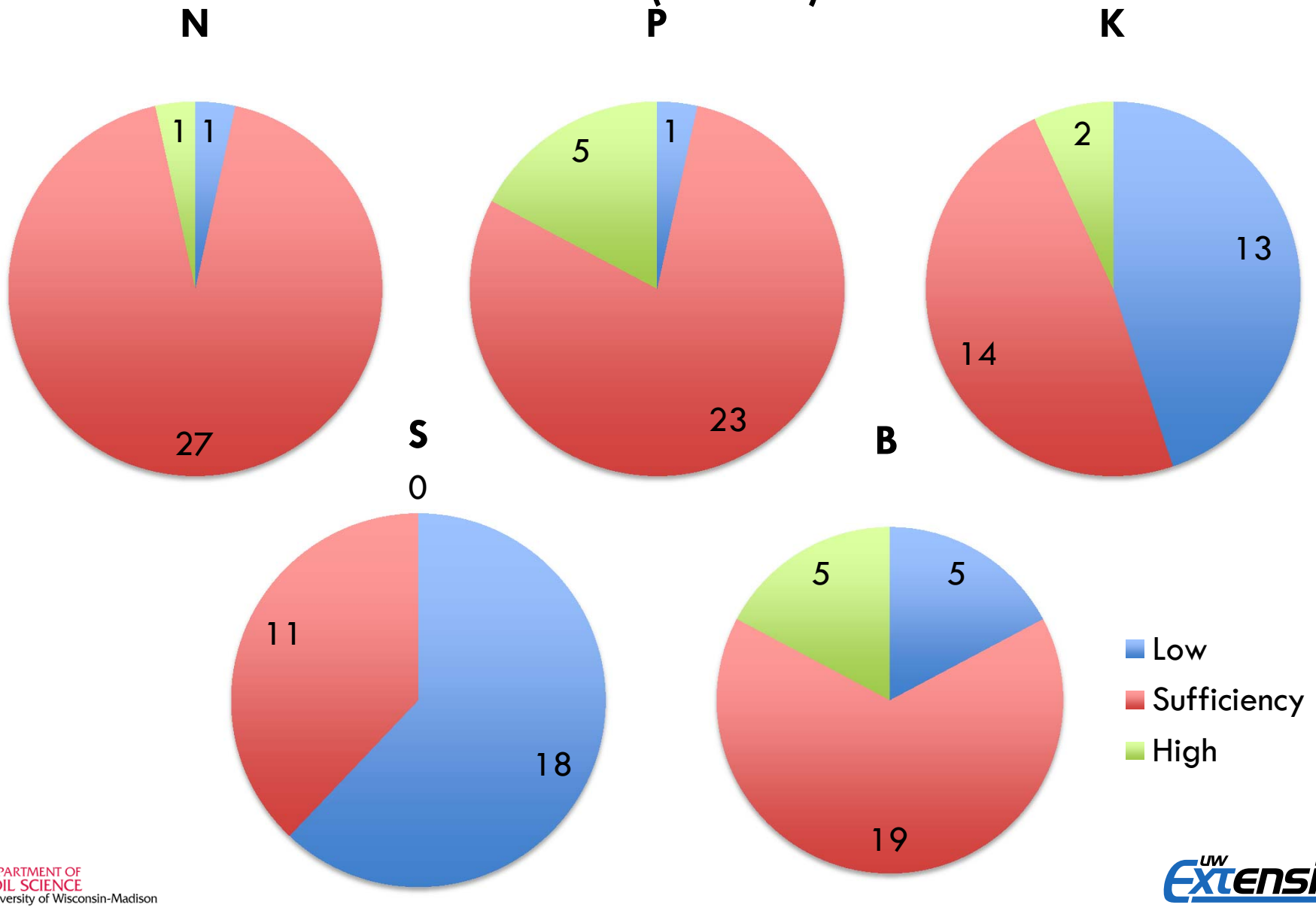
- County, nearest town, latitude & longitude (if known)
- Soil series
- Seeding date and variety
- Manure & fertilizer application history
- Previous crop history
- Number of cuttings in each year of the stand & annual yield (if available)
- Date of sampling, and general appearance (with photo if possible) at the time of sampling

What we learned in 2011

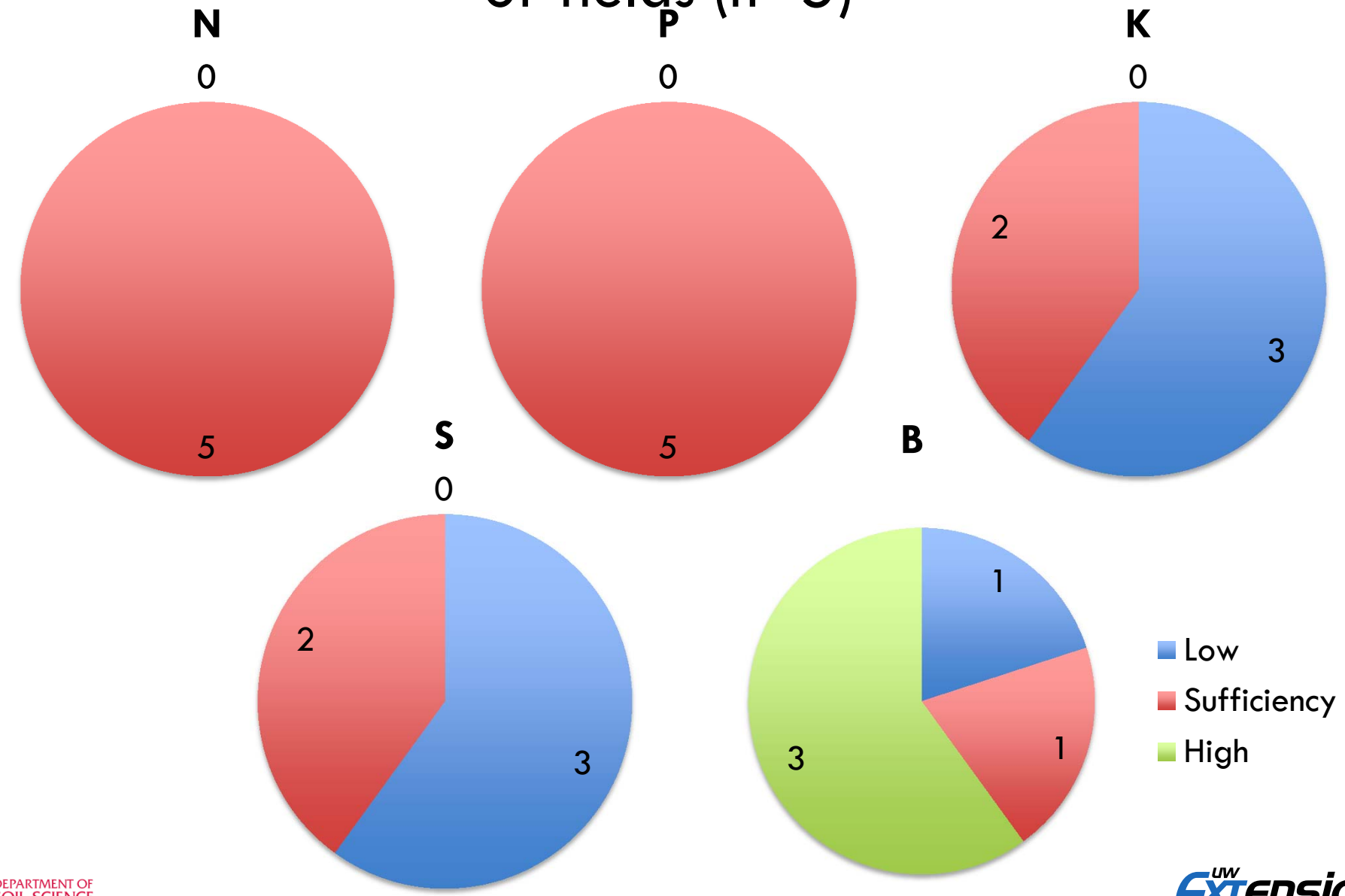
- Sampled by UWEX
  - 34 samples submitted
    - 29 normal appearing
    - 5 abnormal appearing
  - 2 fields had both normal & abnormal areas
- Sampled by consultants
  - 105 samples
  - All normal appearing



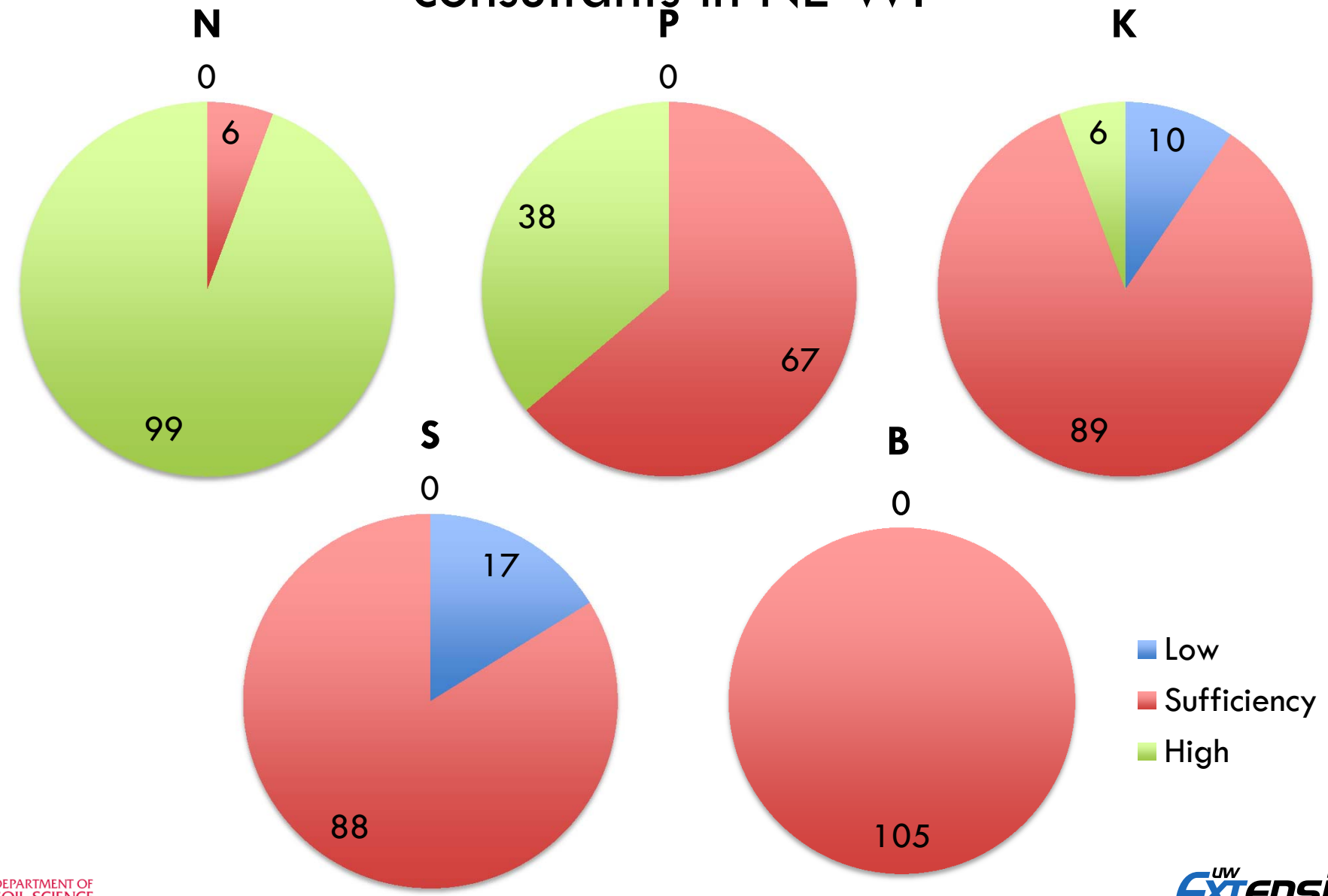
UWEX sampled normal appearing fields or portions of fields (n=29)



UWEX sampled abnormal appearing fields or portions of fields (n=5)



Normal appearing fields (n=105) samples by crop consultants in NE WI



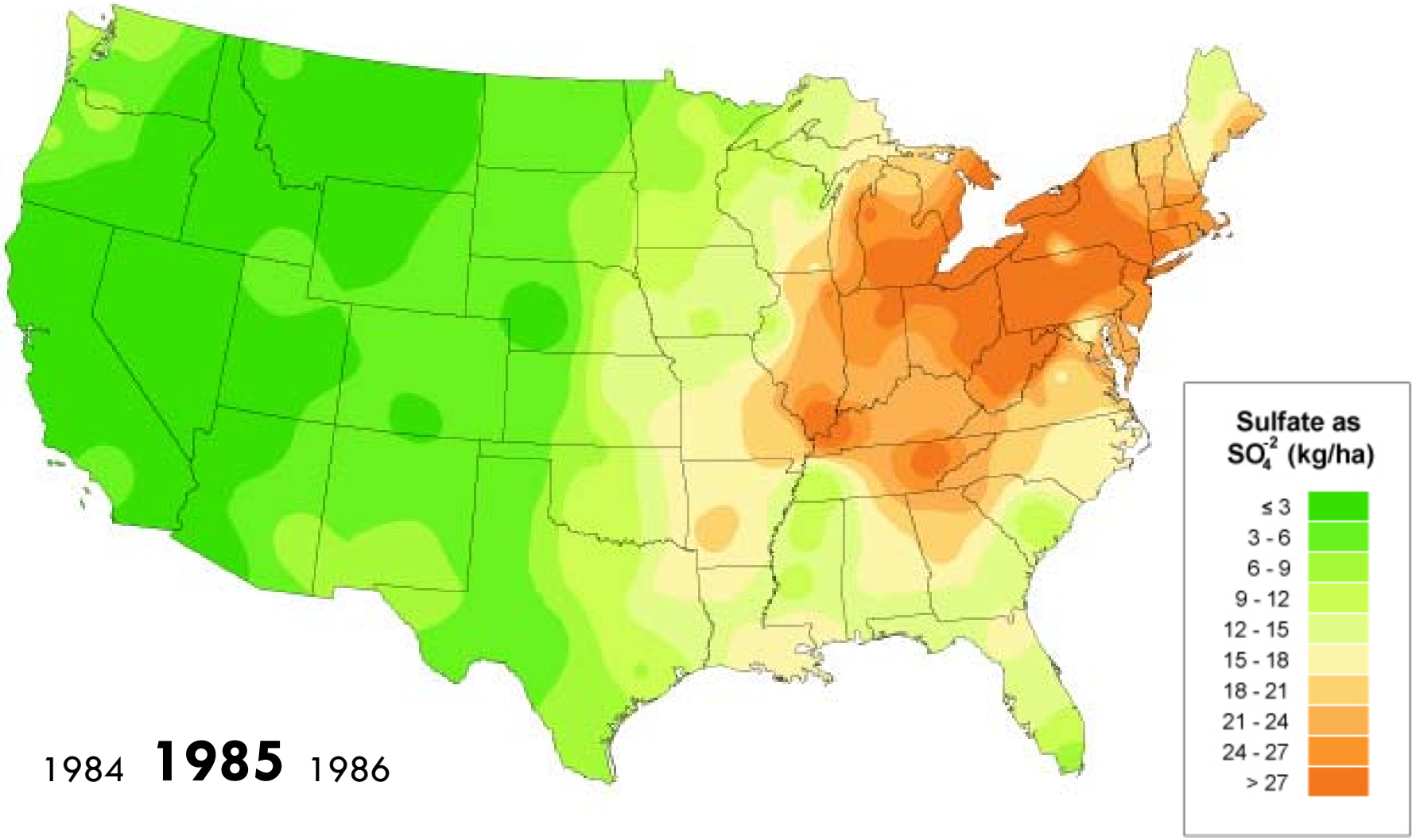
For all samples (normal & abnormal)

- UWEX sampled
  - 47 % of all samples were low in K
  - 62 % of all samples were low in S
  - 24 % low in K and S
  - Similar results as 2010
- Consultant sampled
  - 10 % low in K
  - 16 % low in S
  - 2 % low in K and S

Consultant sampled fields had more recent history of manure application than UWEX sampled fields.

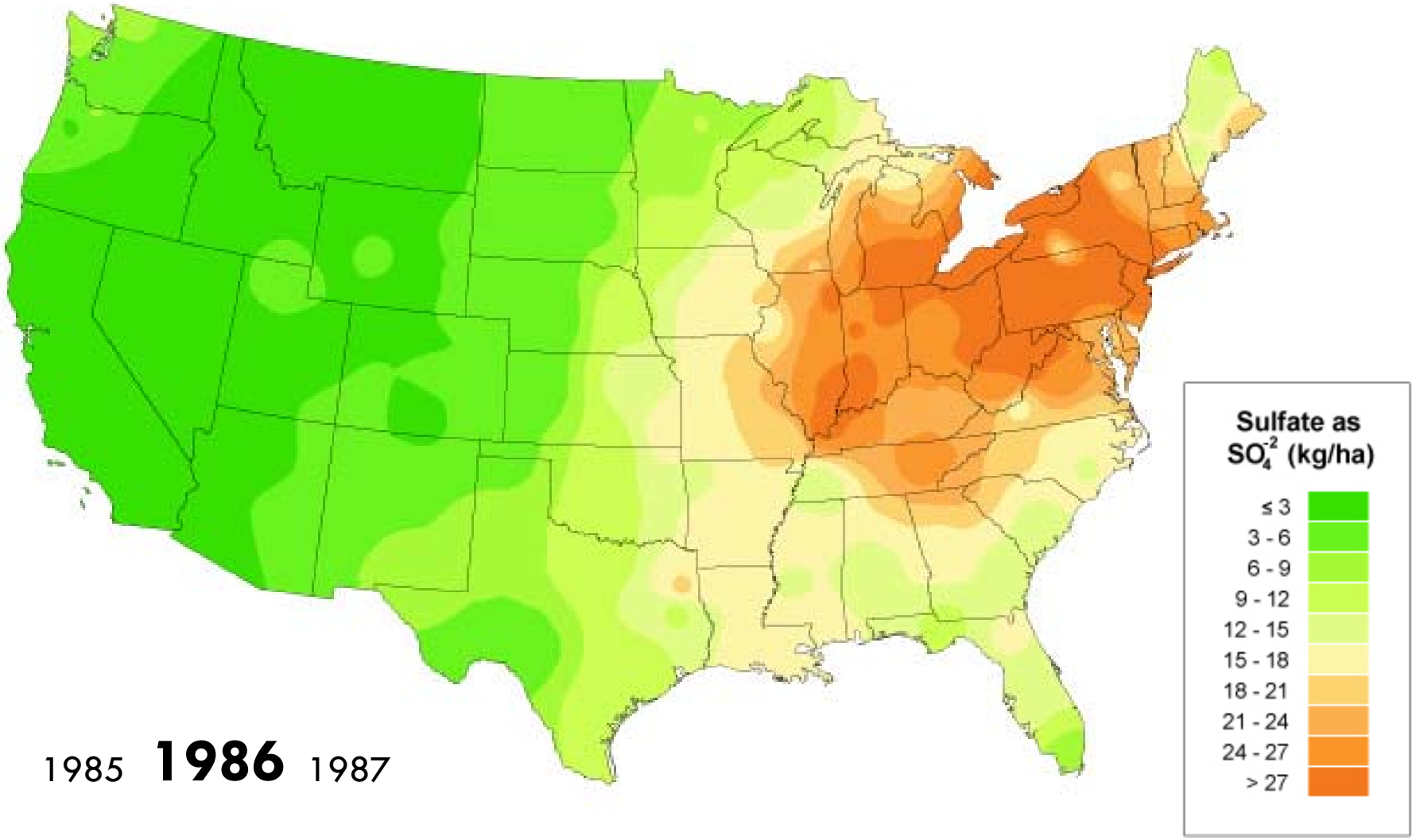
Why are we seeing low S and K?

Sulfate Ion Wet Deposition 1985-2005



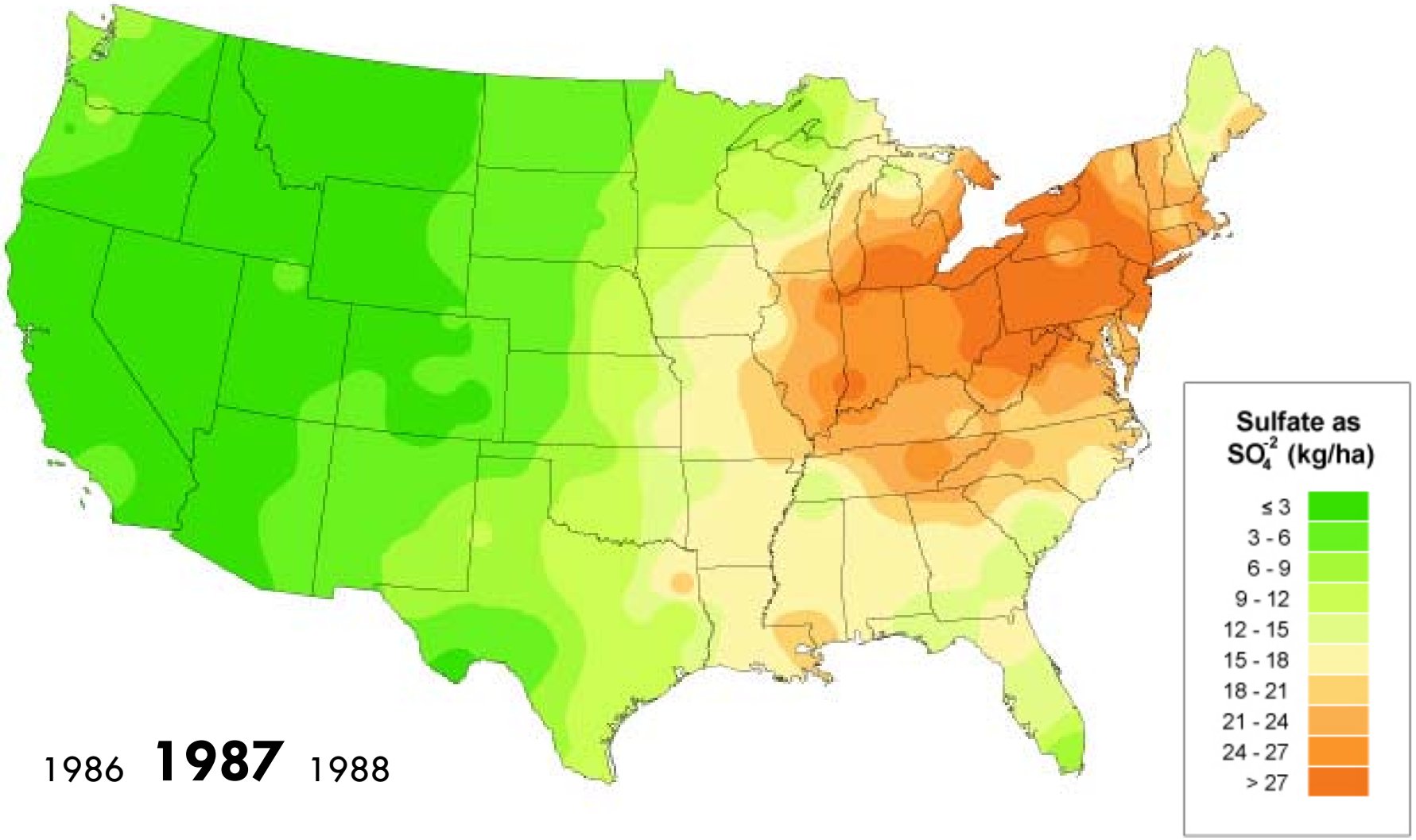
1984 **1985** 1986

Sulfate Ion Wet Deposition 1985-2005



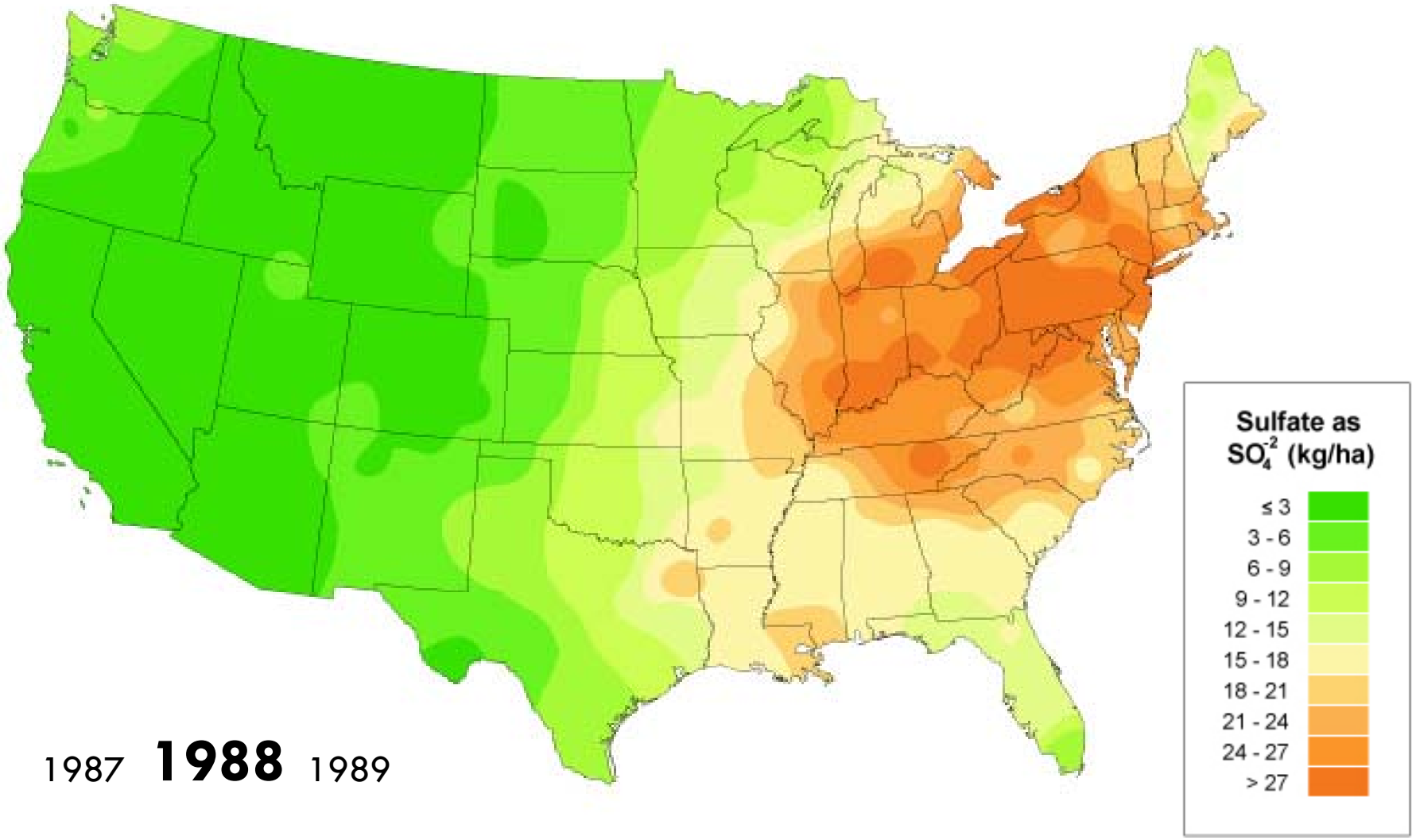
1985 **1986** 1987

Sulfate Ion Wet Deposition 1985-2005



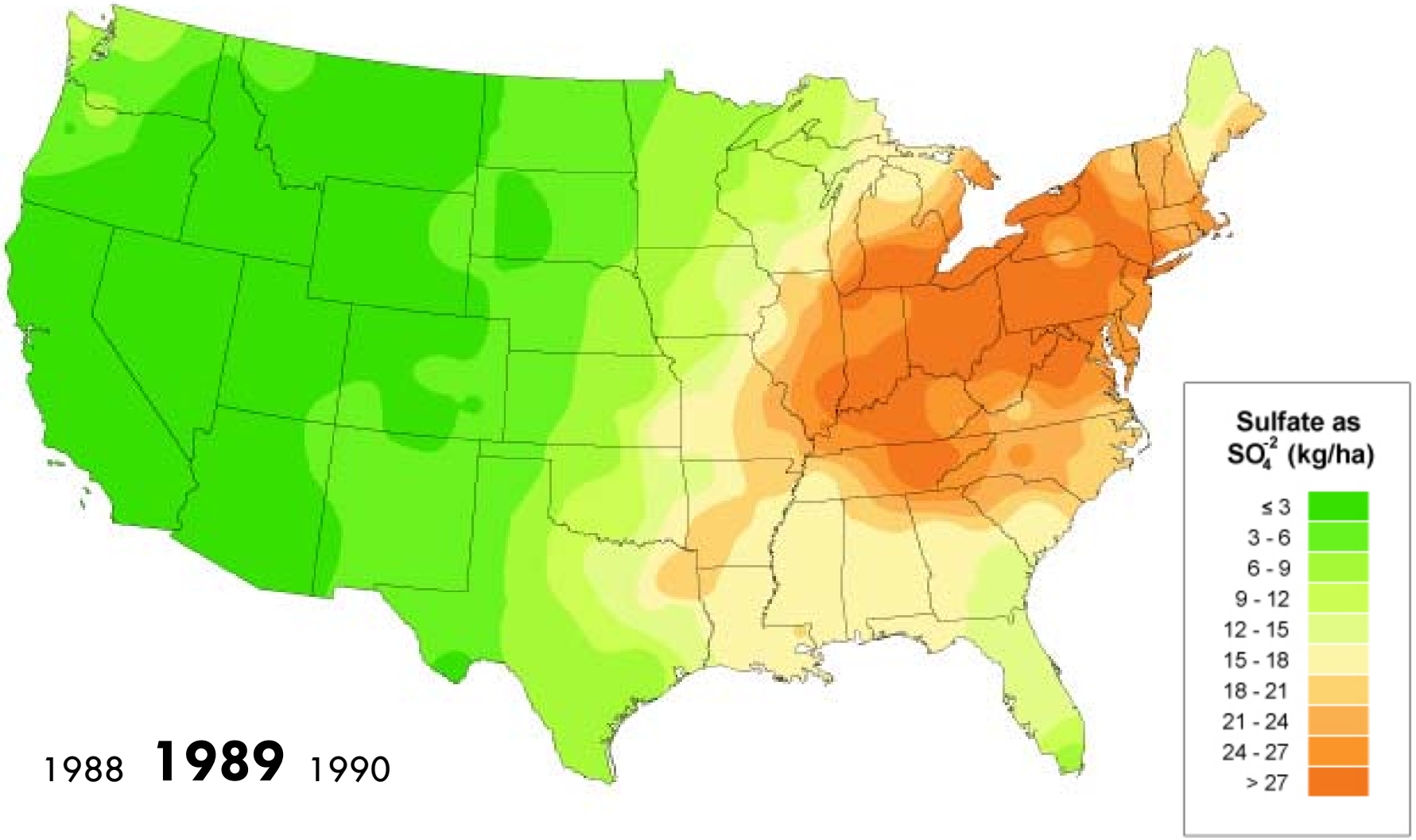
1986 **1987** 1988

Sulfate Ion Wet Deposition 1985-2005



1987 **1988** 1989

Sulfate Ion Wet Deposition 1985-2005



1988 **1989** 1990

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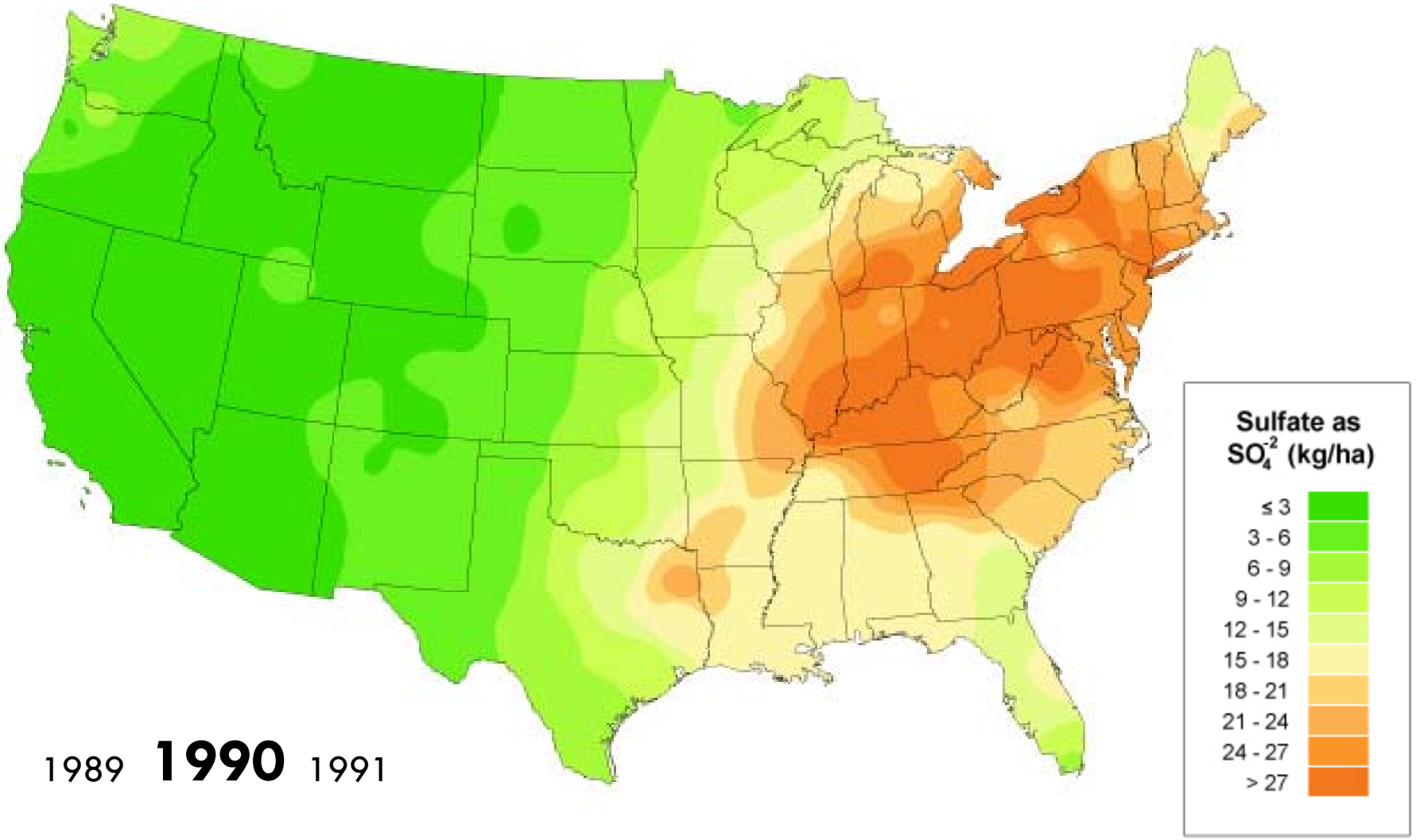

1989 **1990** 1991

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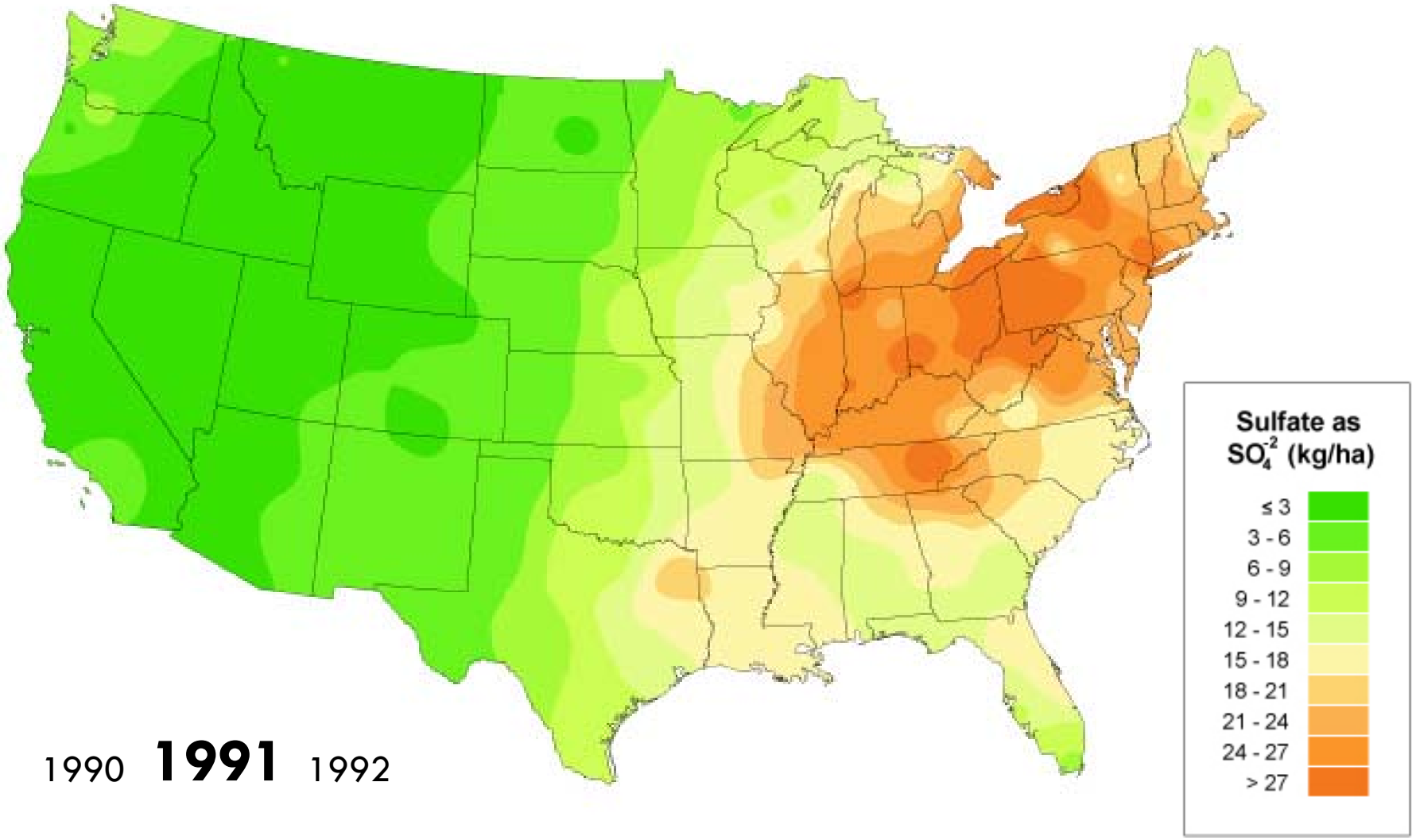

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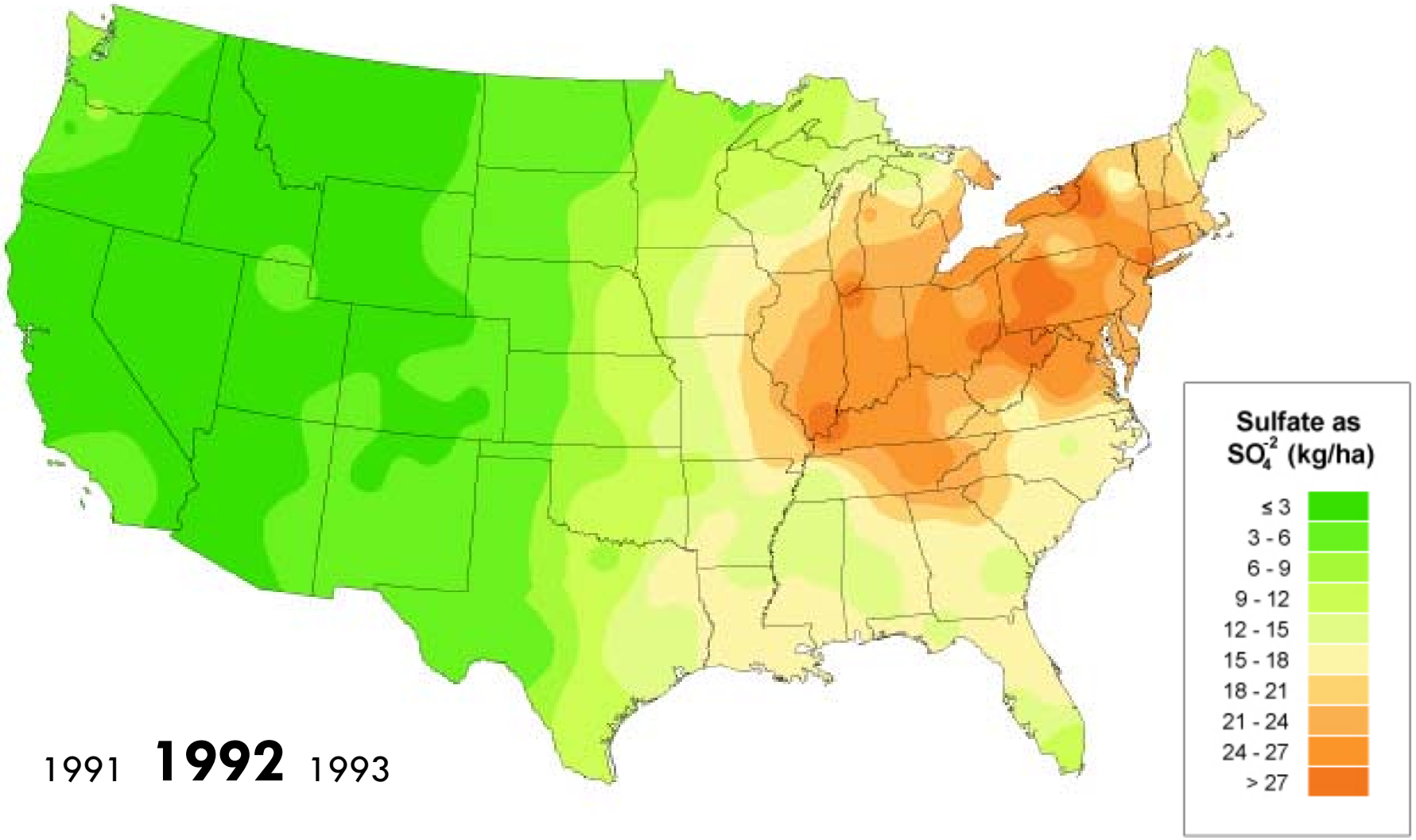

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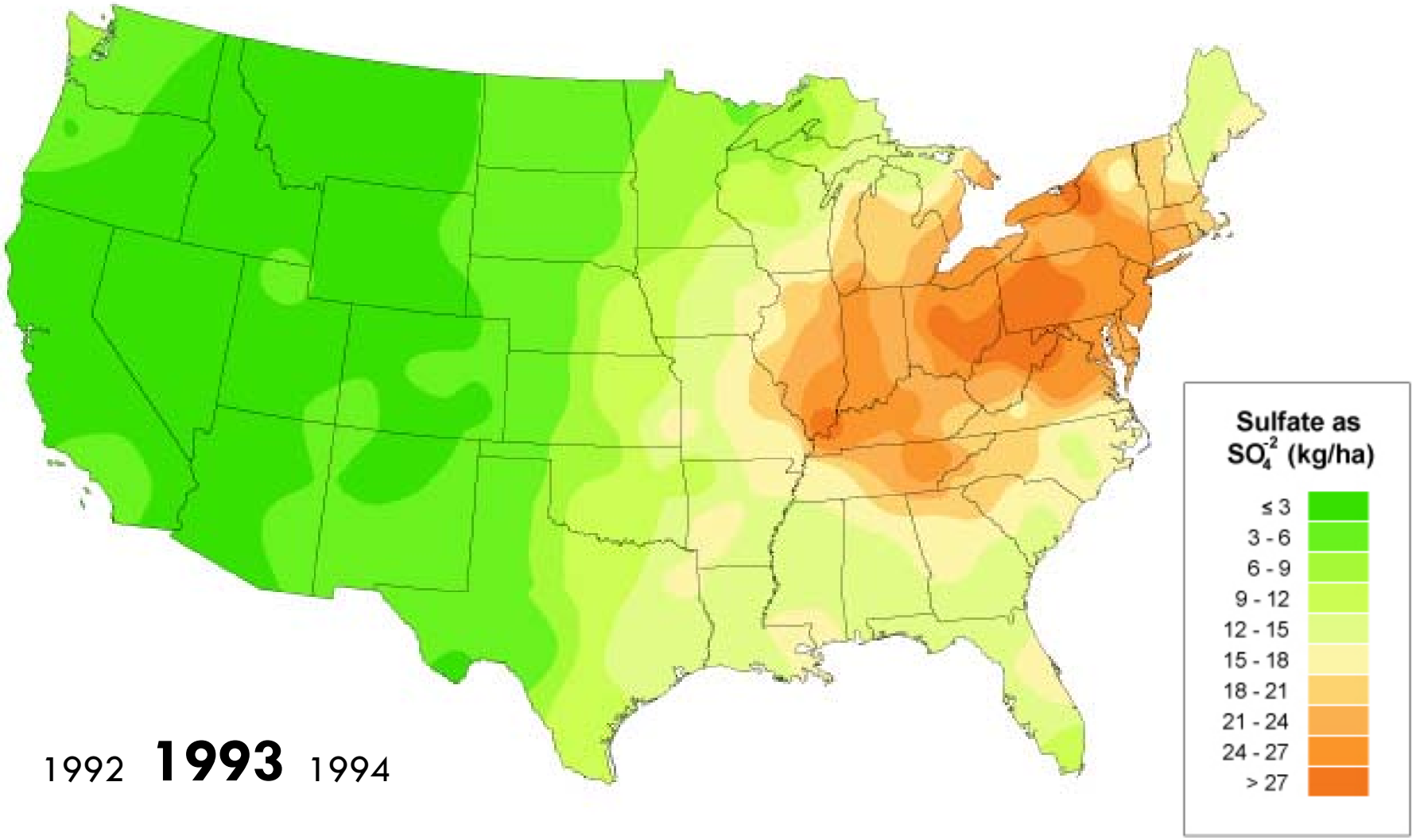

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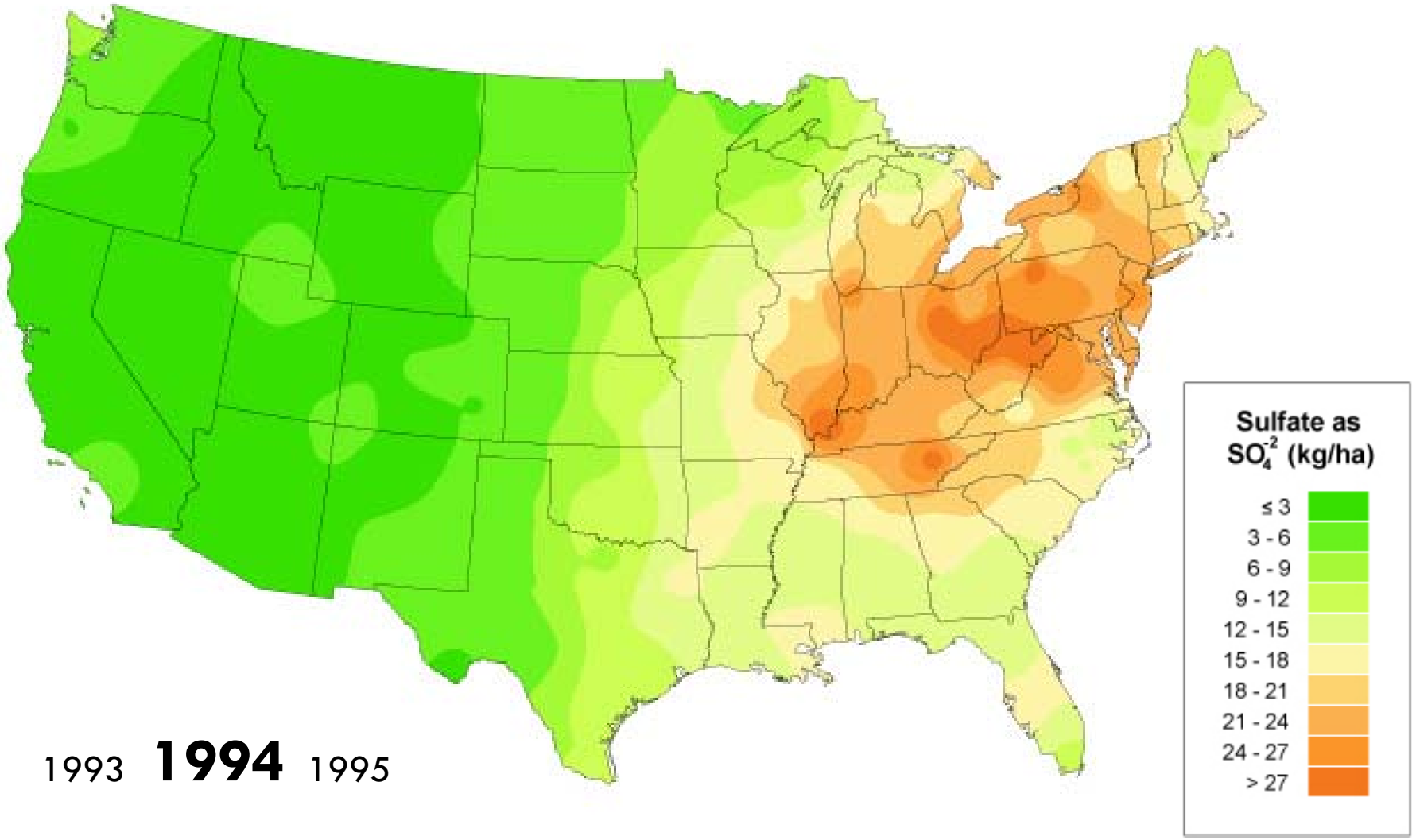

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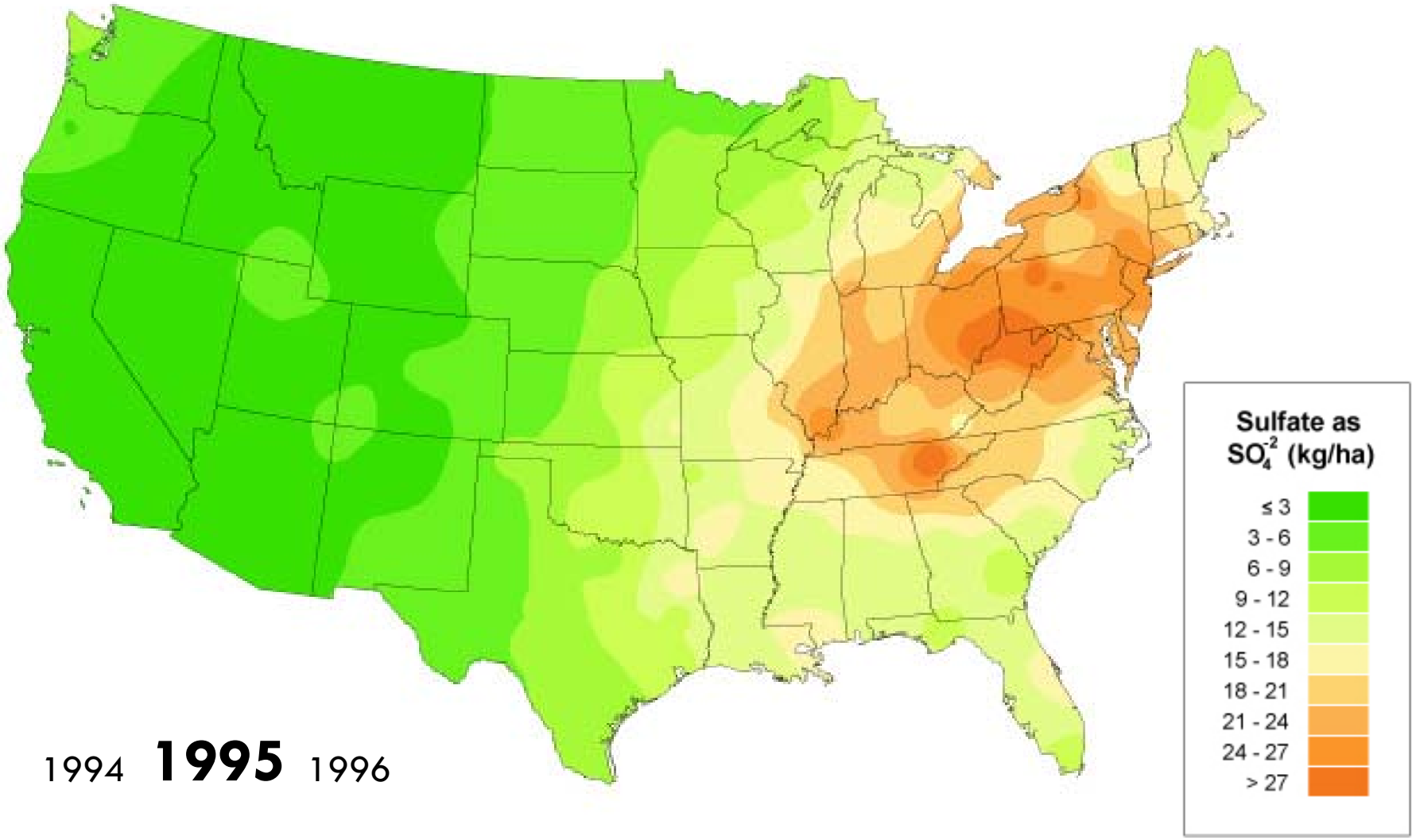

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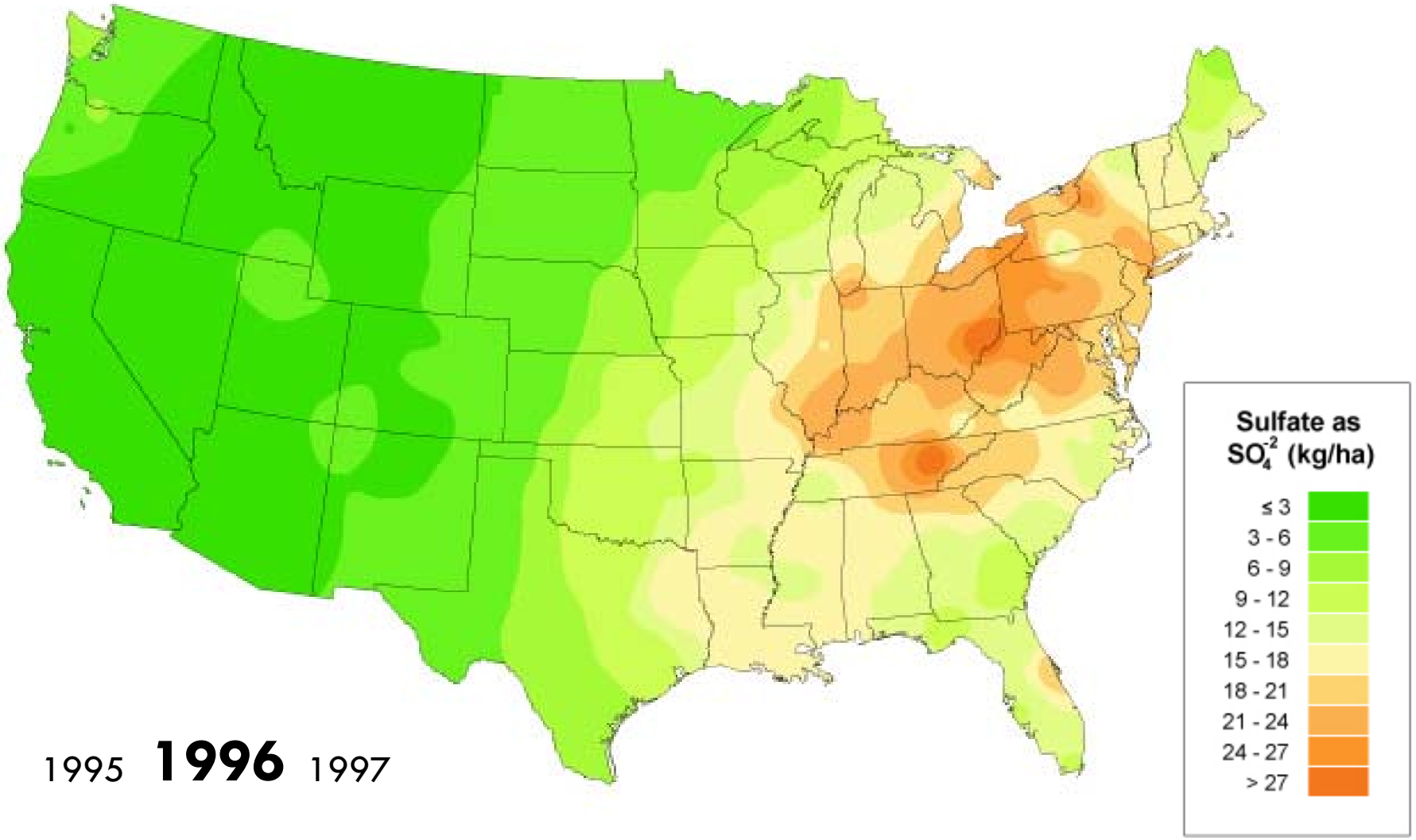

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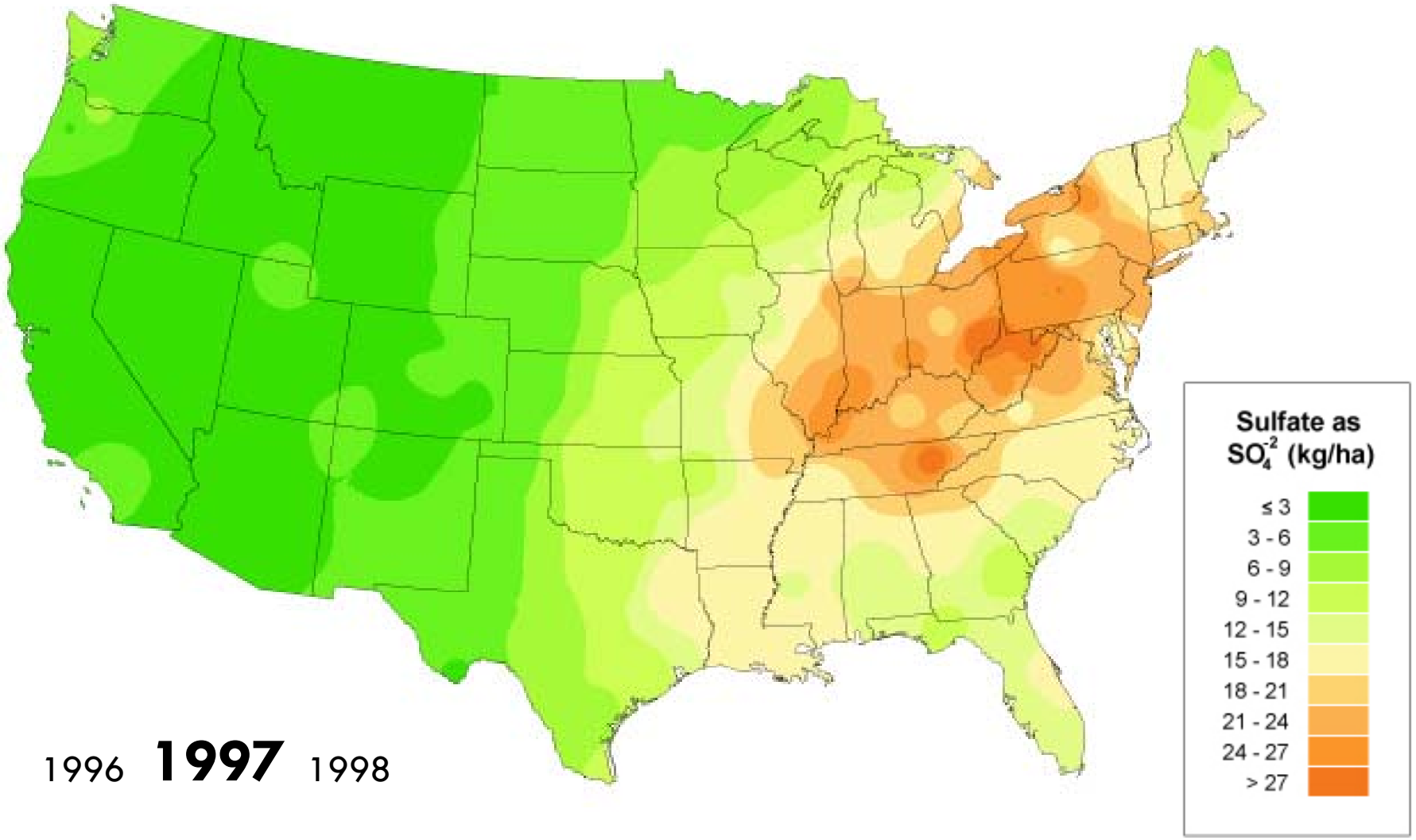

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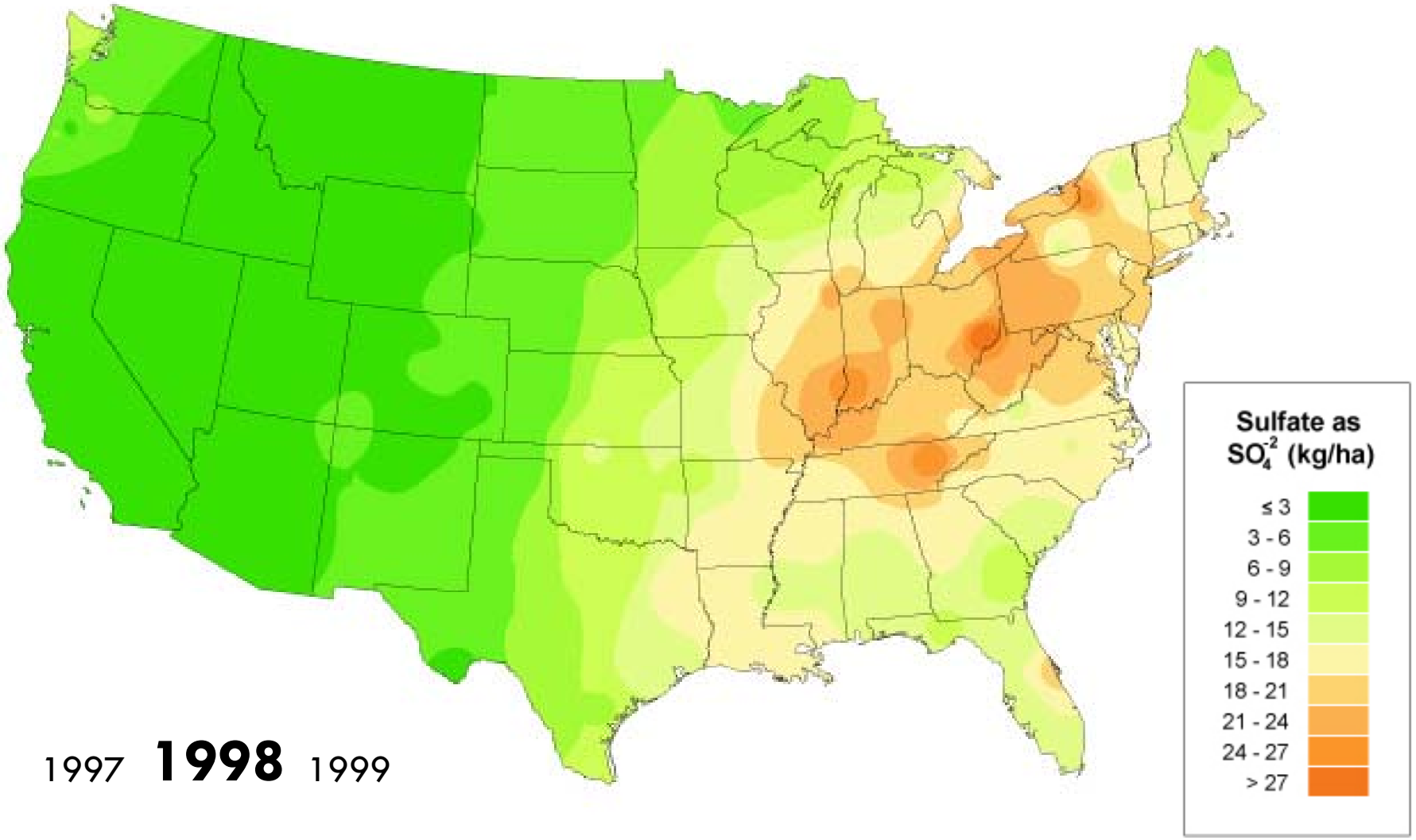

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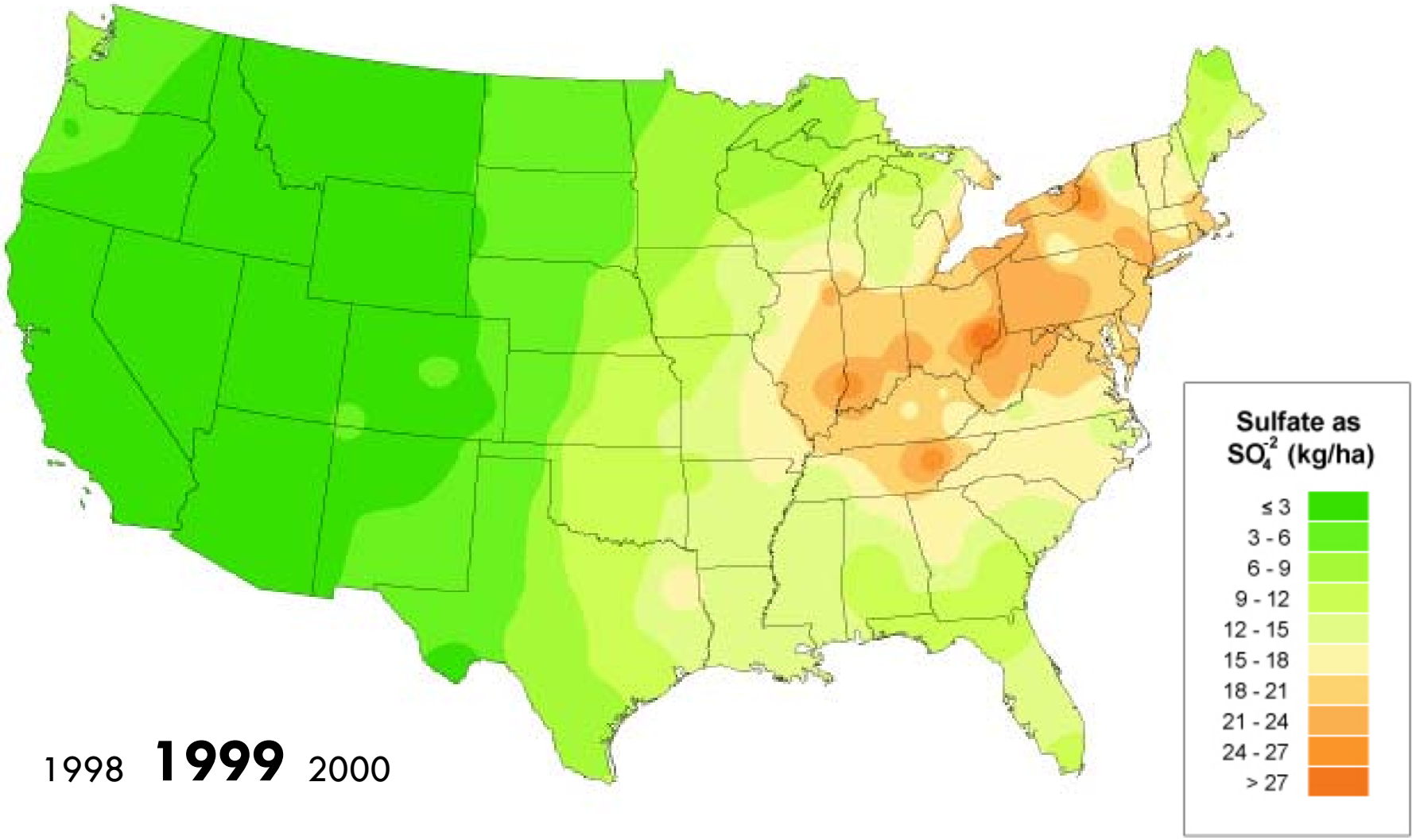

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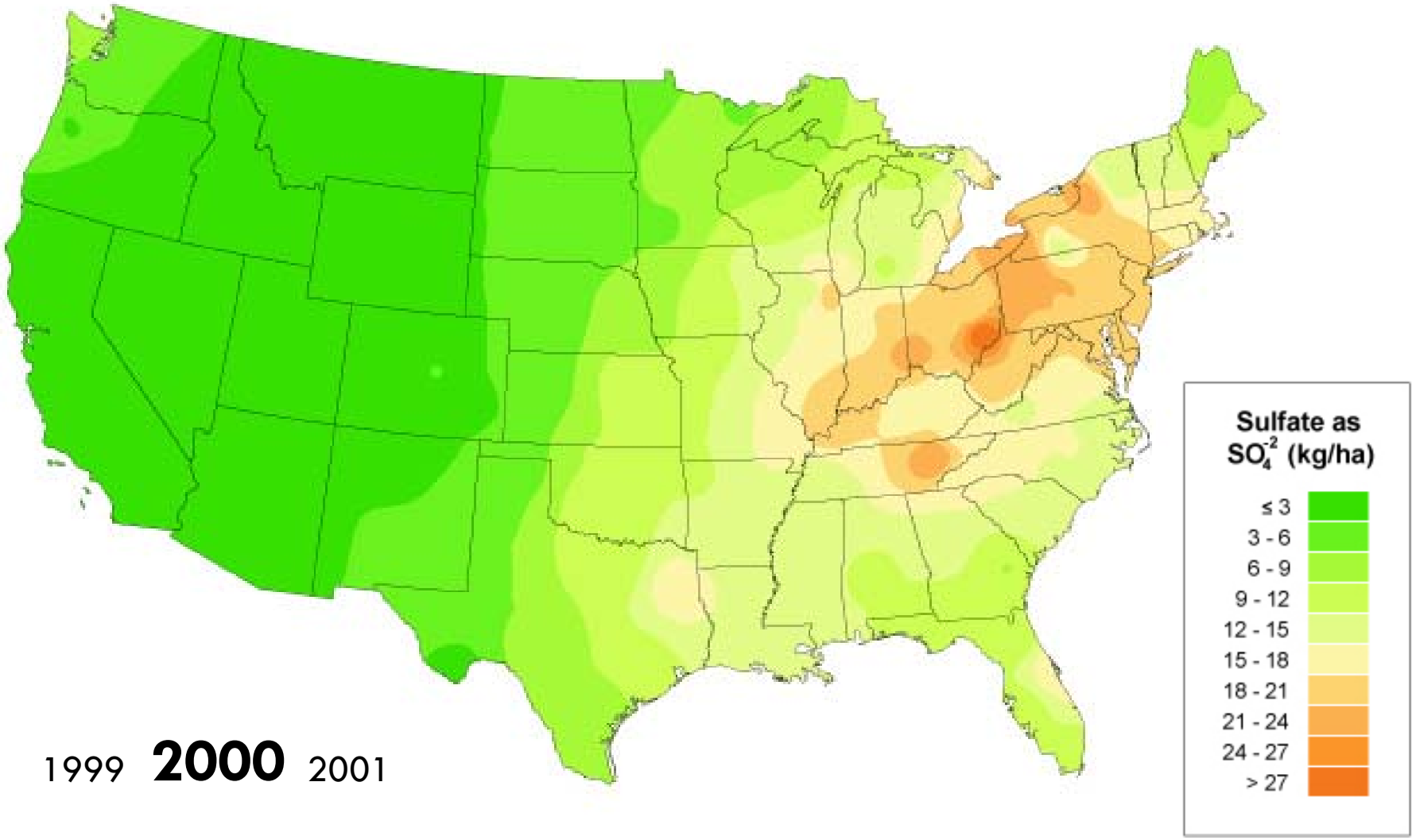

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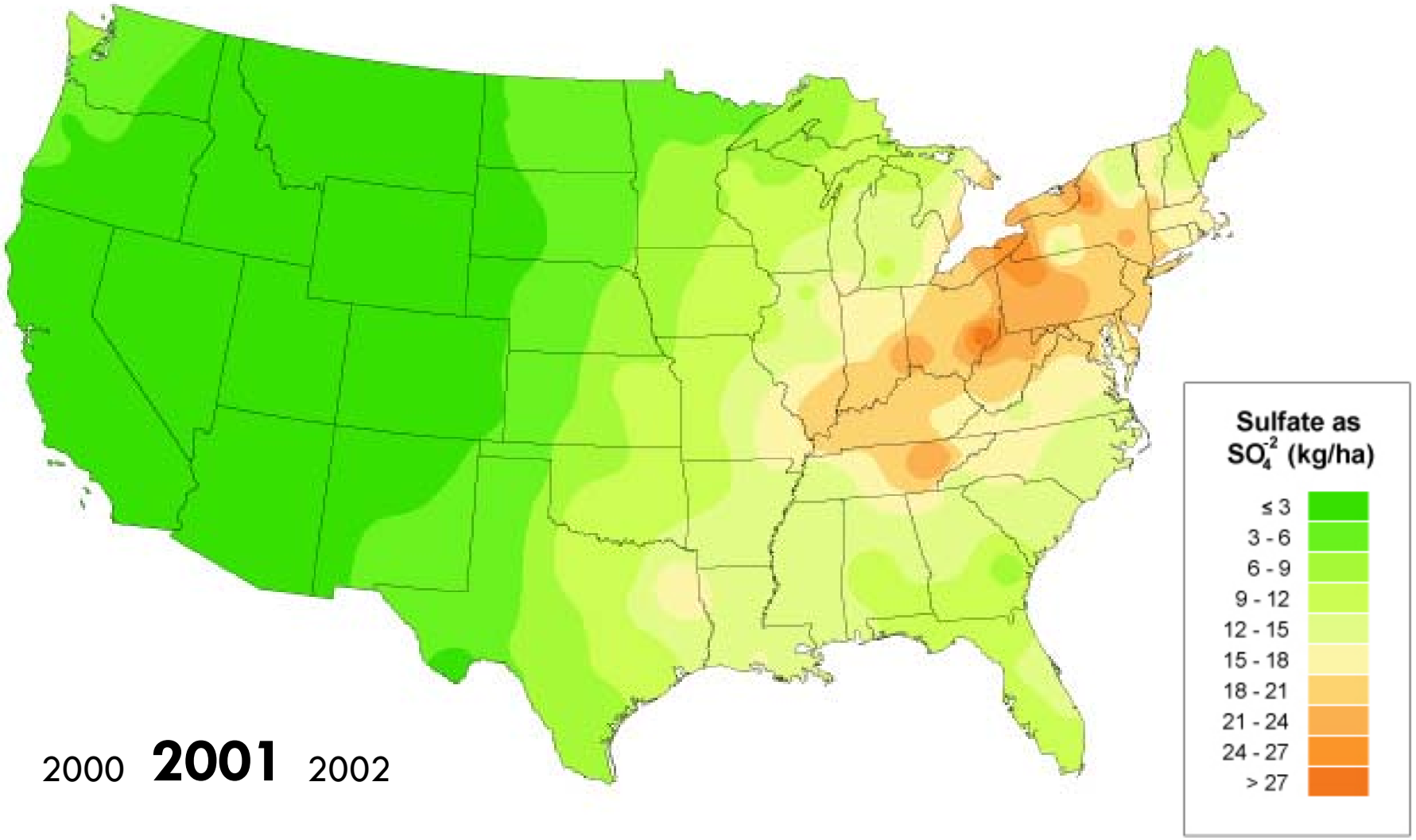
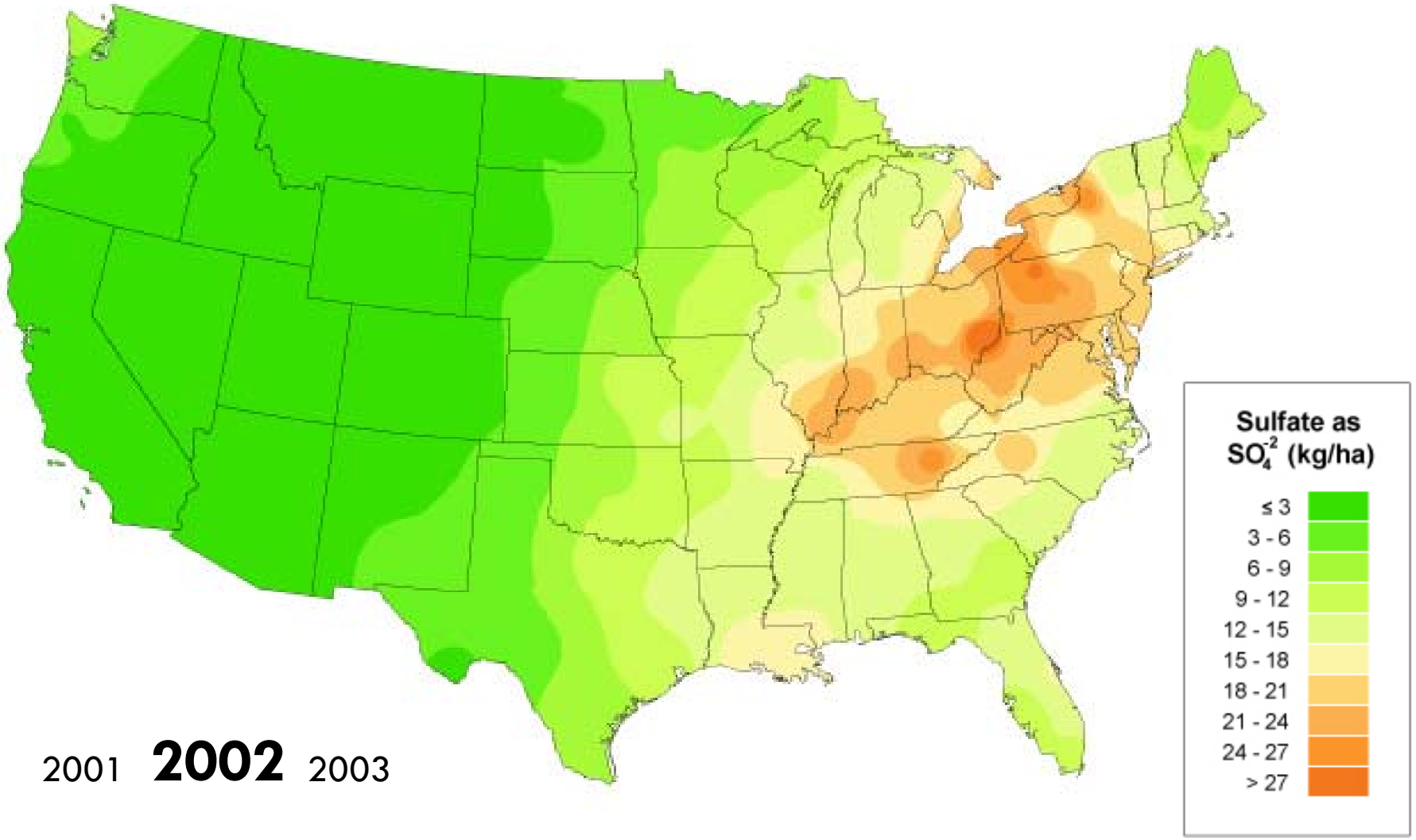


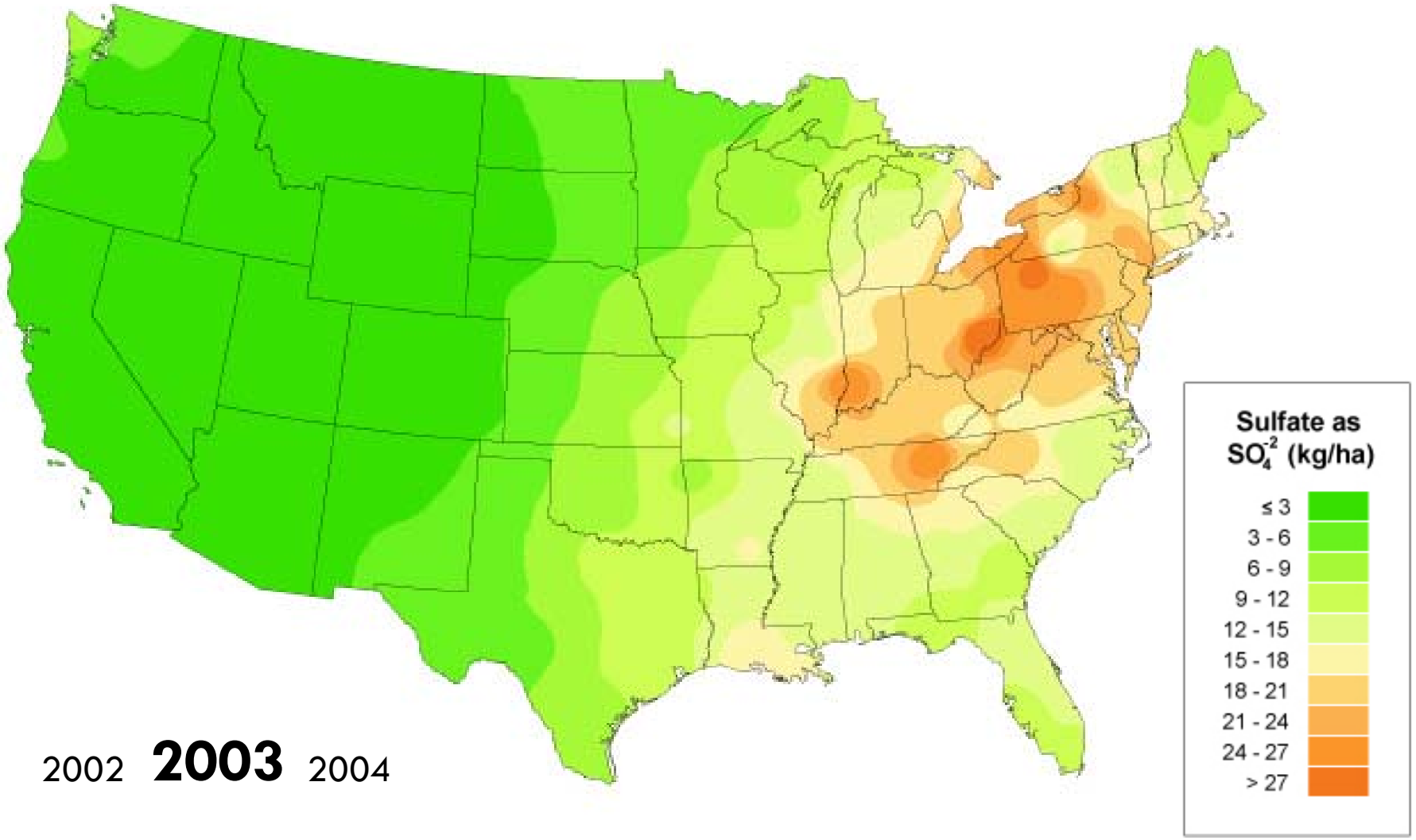
2000 **2001** 2002

Sulfate Ion Wet Deposition 1985-2005



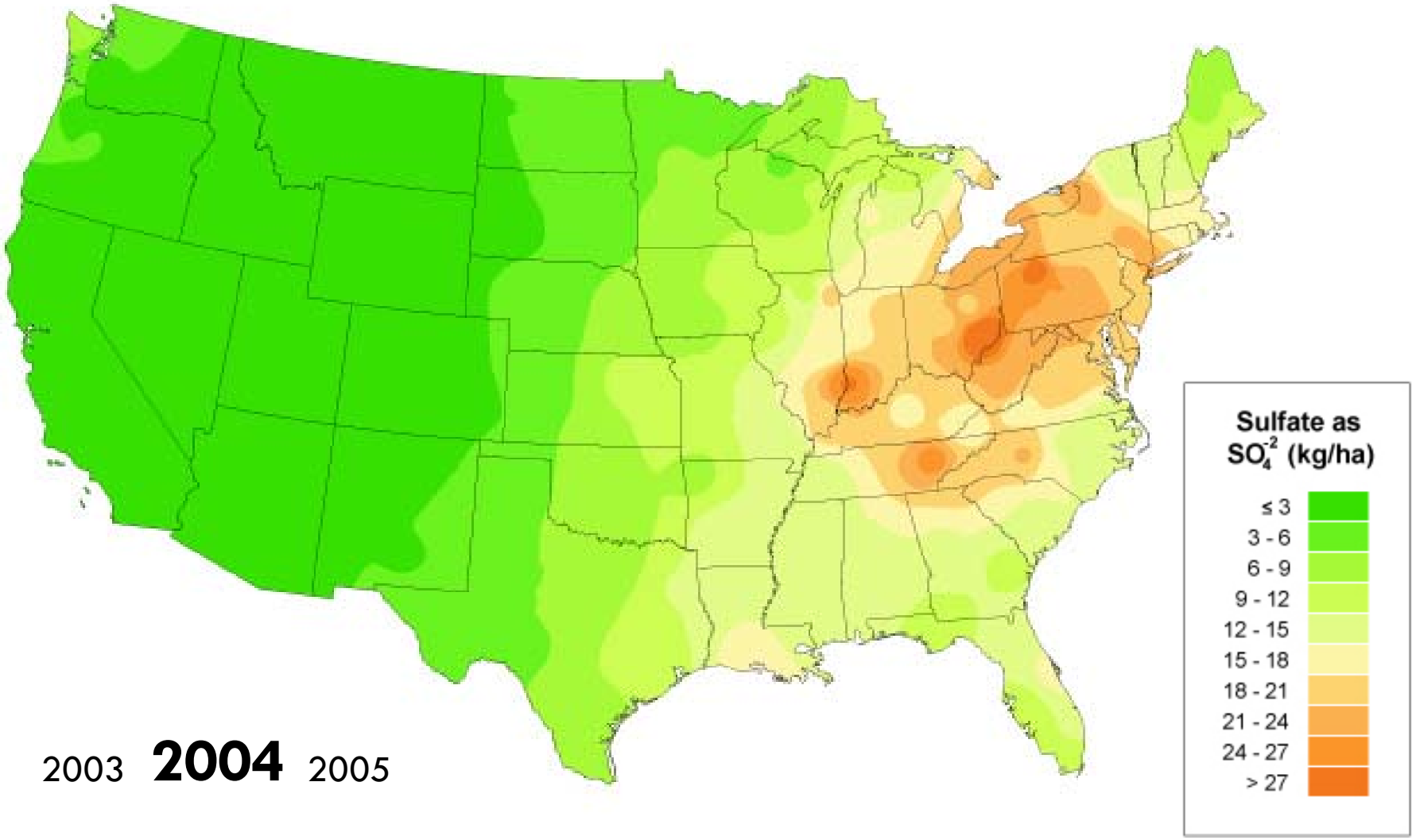
2001 **2002** 2003

Sulfate Ion Wet Deposition 1985-2005



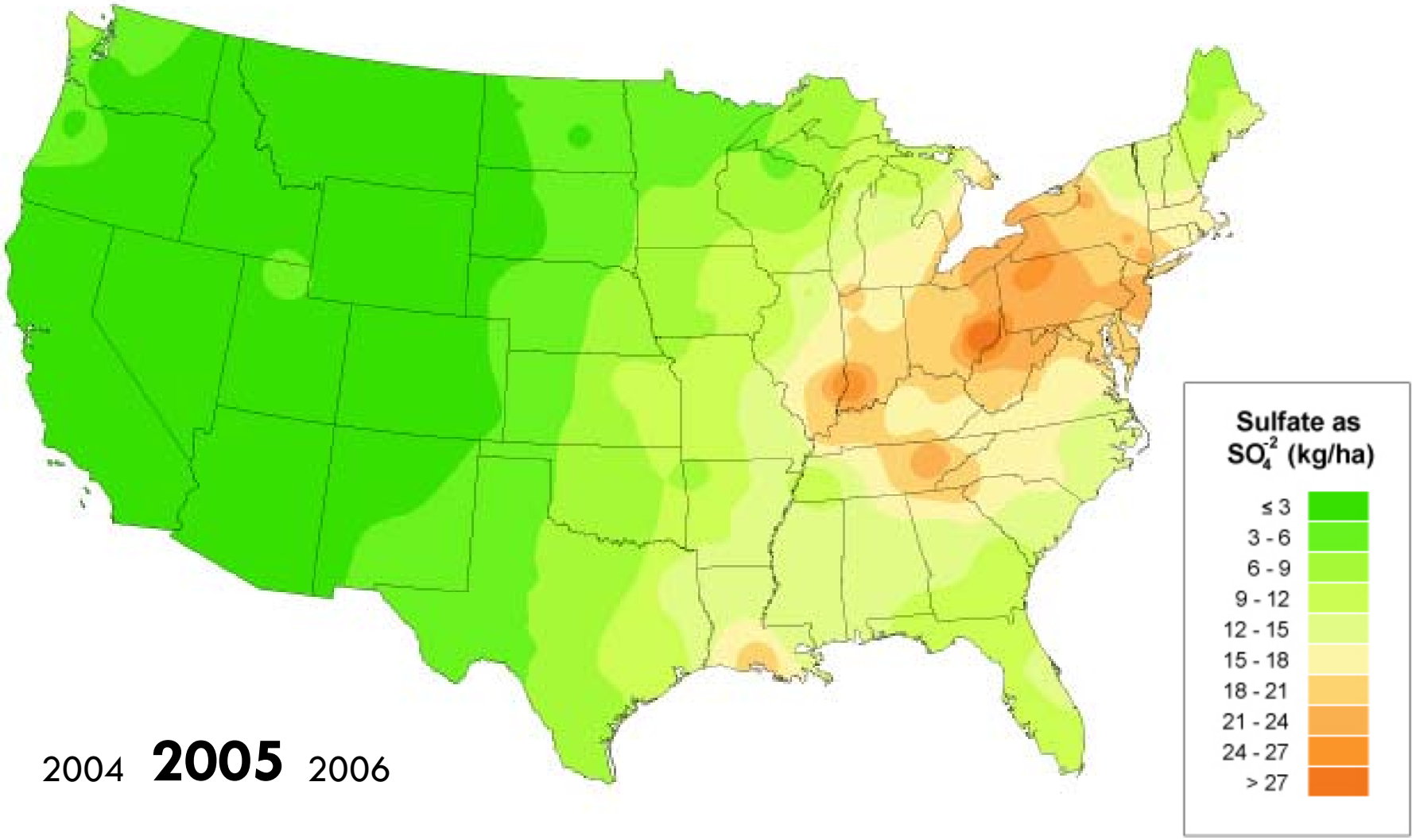
2002 **2003** 2004

Sulfate Ion Wet Deposition 1985-2005



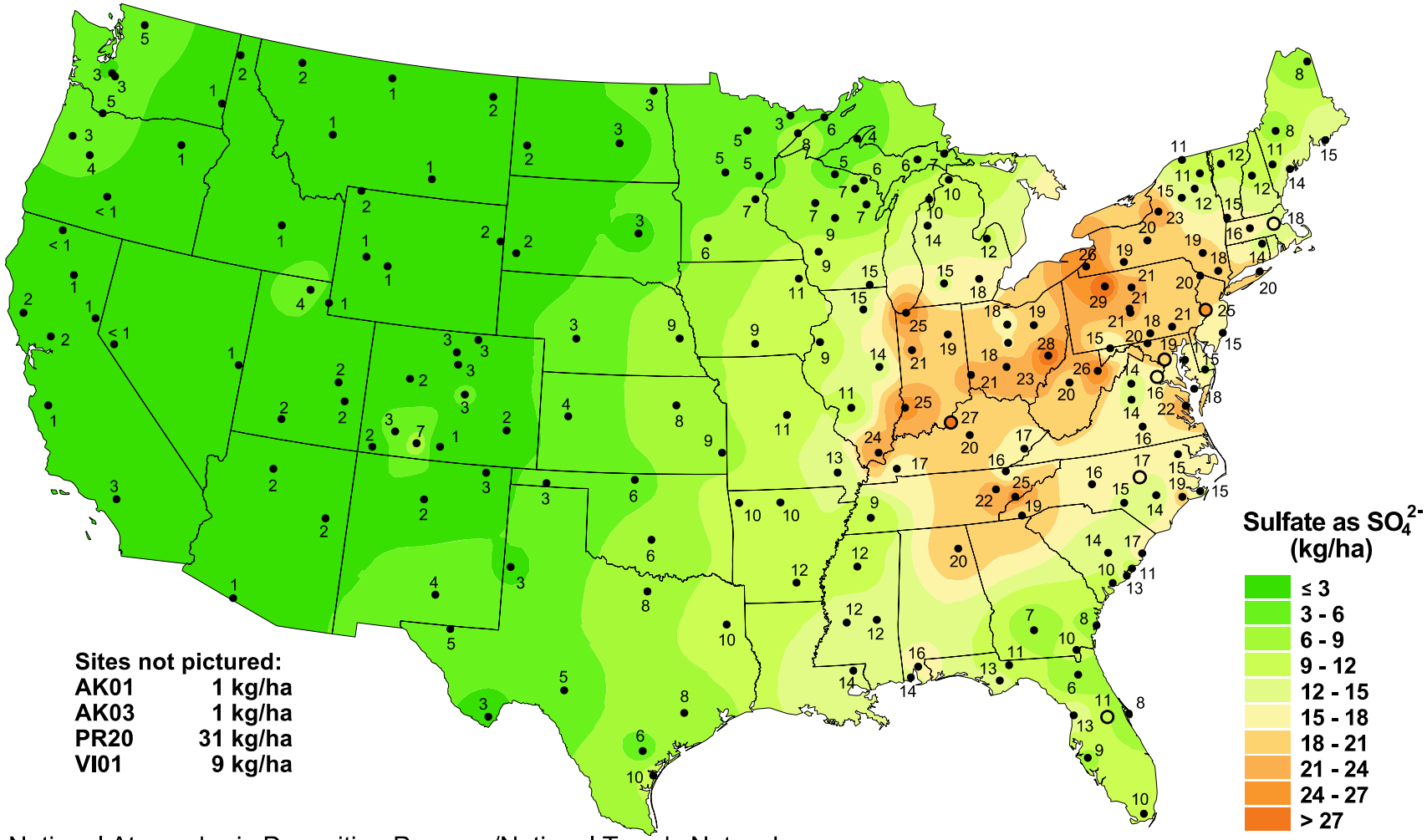
2003 **2004** 2005

Sulfate Ion Wet Deposition 1985-2005



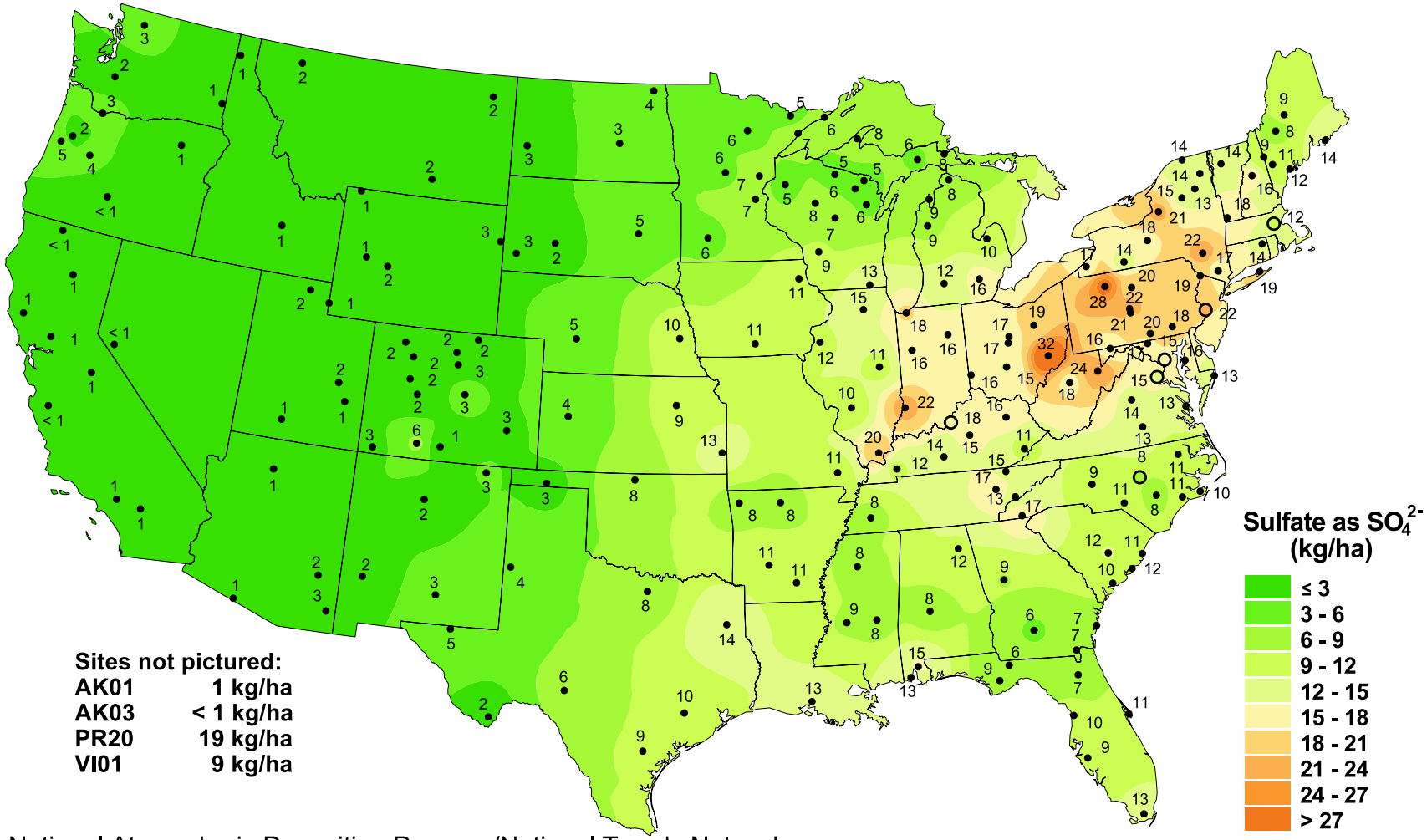
2004 **2005** 2006

Sulfate ion wet deposition, 2006



National Atmospheric Deposition Program/National Trends Network
http://nadp.sws.uiuc.edu

Sulfate ion wet deposition, 2007



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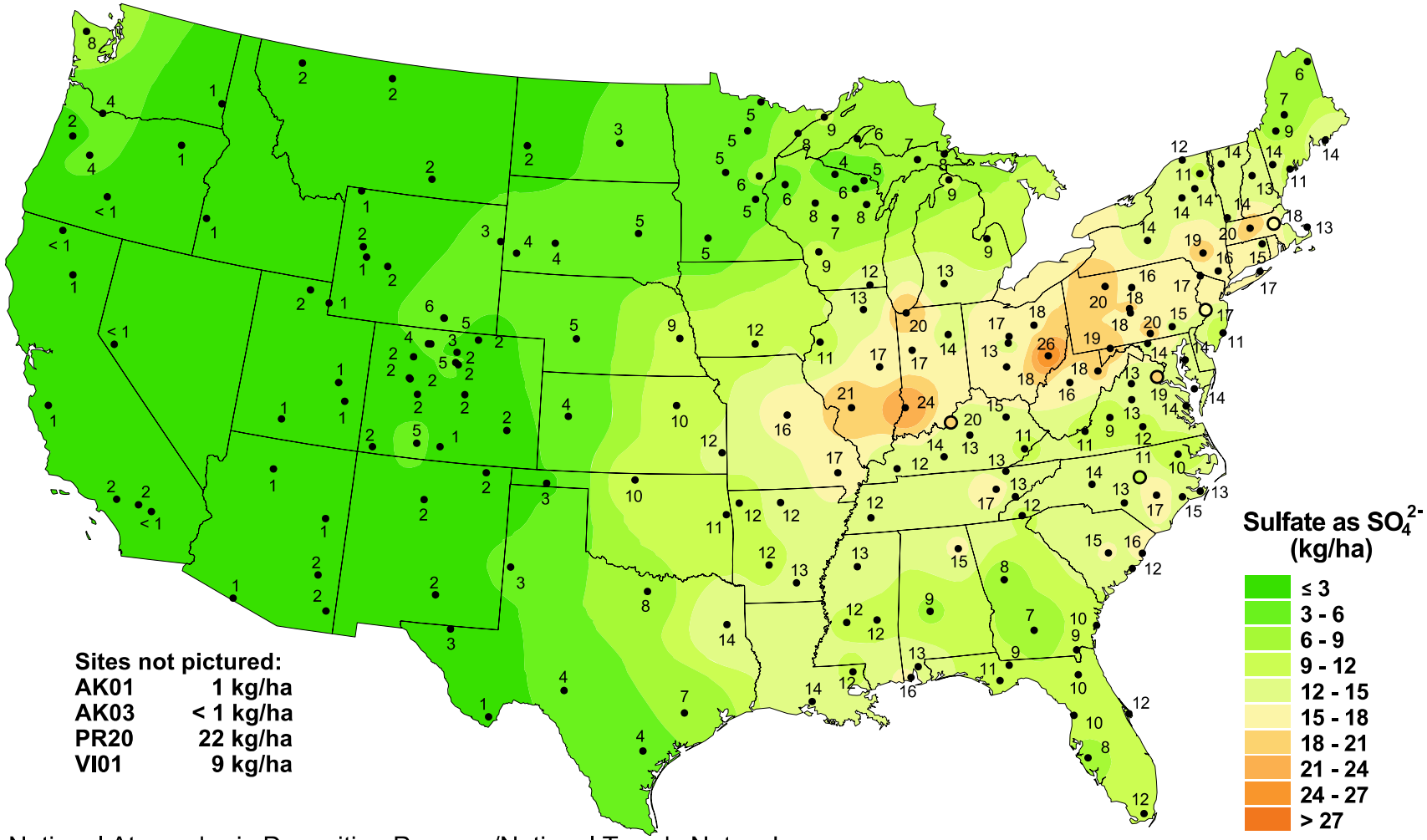
Sulfate ion wet deposition, 2008



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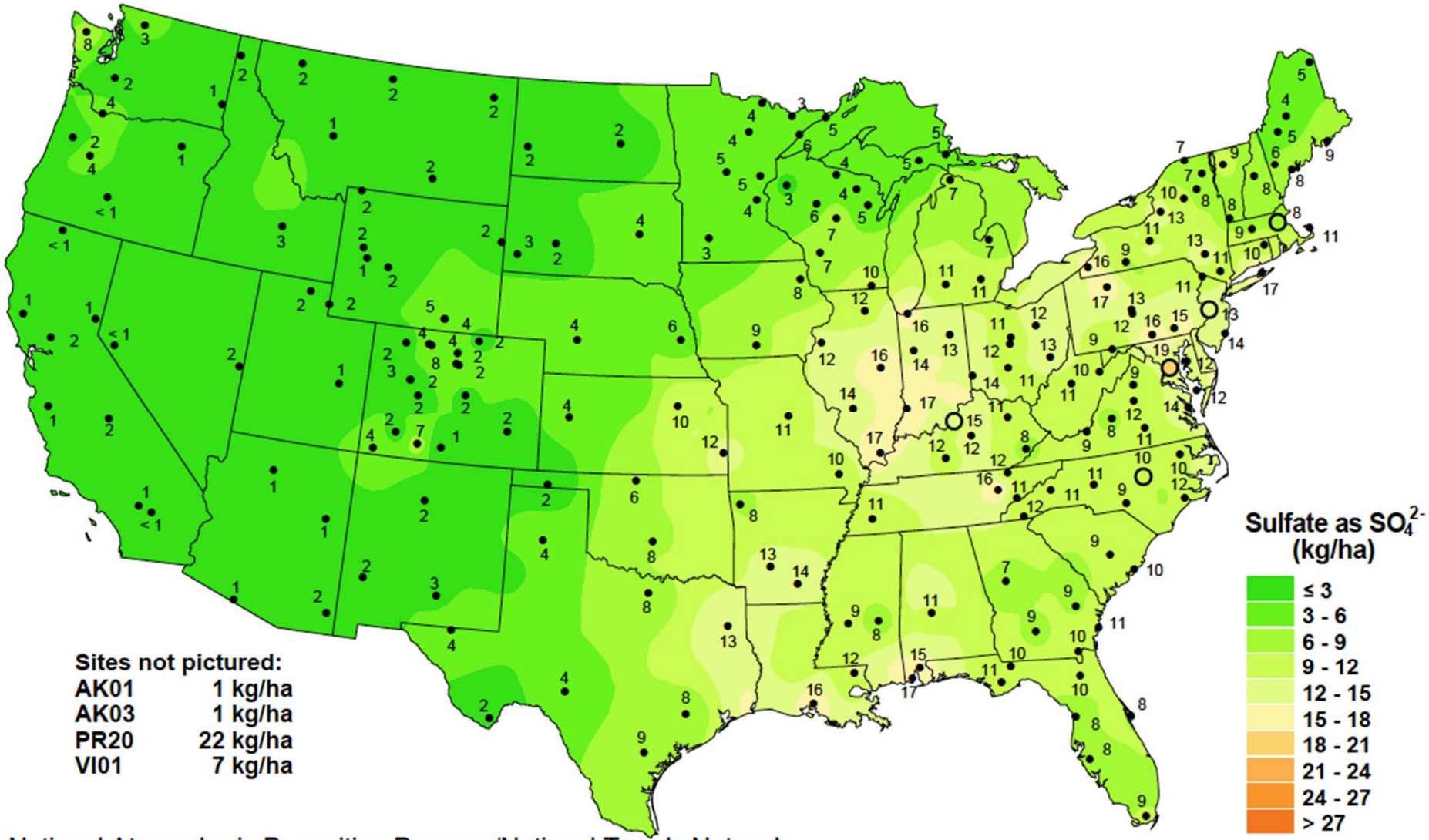
Sulfate ion wet deposition, 2009



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What can we do about S deficiency?

- Tissue test to confirm deficiency
  - If tissue S is < 0.25, then apply S

- Apply S
  - 25 lb S/a on established stands
    - Shortly after cutting before regrowth
    - Use a soluble source
  - 25 – 50 lb/a S at establishment

Sources of S

- Apply a soluble source of S to correct known deficiency
  - Potassium sulfate, calcium sulfate, ammonium sulfate
  - Elemental S will take too long to react

- Gypsoil or other FGD gypsum
  - 1 T/a application supplies 340 lb S/a
    - More S than needed;
    - Unsure over how many years this will be available
  - Unknown for how long S is available from a 1 T/a

Alfalfa field with patchy areas of yellow

Photo courtesy of Ted Bay, UWEX Grant/Lafayette Cos.

Alfalfa response to 25 lb S/a applied after 1st cutting in 2010, Lafayette Co., WI

		None	Calcium Sulfate	Ammonium Sulfate
		Dry Matter T/a		
2nd cut	Normal	1.23	1.29	1.30
	Abnormal	0.95	1.66	1.79
3rd cut	Normal	1.21	1.22	1.26
	Abnormal	0.90	1.49	1.58
2nd + 3rd	Normal	2.44	2.51	2.56
	Abnormal	1.85	3.15	3.37

	Tissue S	Tissue K	Soil Test K
	%		ppm
Normal	0.24	1.79 (L)	67 (VL)
Abnormal	0.14	2.46 (S)	117 (O)

Data courtesy of Ted Bay, UWEX Grant/Lafayette Cos.

Potassium applications fall short on UWEX sampled normal appearing fields

STK category (n)	Stand age †	2011 K_2O rec. (A2809)	2011 K_2O appl. rate
	yr	lb/a	lb/a
VL (5)	5.0 ± 2.2	338 ± 27	21 ± 49
L (10)	3.9 ± 1.0	322 ± 57	28 ± 59
O (4)	3.0 ± 0.8	300 ± 85	3 ± 6
H (4)	3.5 ± 1.7	135 ± 17	17 ± 29
VH (4)	3.3 ± 1.3	71 ± 19	7 ± 13
EH (2)	2.5 ± 0.7	0 ± 0	29 ± 3

† Includes establishment year to 2011.

Thanks for your support

- Midwest Forage Association
- Everyone that collected samples and took the time to complete the field historical info.
  - UWEX staff
  - Polenske Agronomic Consulting

- Carrie Laboski
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