Evaluation of Alfalfa Sulfur Needs in Wisconsin

K.A. Kelling, P.E. Speth, and S. van Wychen
Department of Soil Science
Univ. of Wisconsin-Madison

How We Got to Where We Are Today:

1. Sulfur need in northern and western Wisconsin identified in late 1960's
   - Sandy, low organic matter, no manure
2. Soil test tells half truth; plant analysis encouraged
3. Created sulfur availability index (SAI) in 1990
   - % organic matter x 2.8
   - T manure x % available S
   - Precipitation S (10 or 20 lb/acre)
   - Subsoil S (5, 10, or 20 lb/acre)
   - Soil test SO_4-S (ppm S x 2)

SAI Interpretation:

- < 30 = Apply S to S-demanding crop
- 30-40 = Confirm S need by plant analysis
- > 40 = No additional S needed

Saga Continuing:

4. Reports of deficiency in southern and eastern Wisconsin on older stands
5. Measured responses at Arlington (high organic matter, southern soil) in 1996 and 1997
6. Less S in precipitation

Confirming Studies:

- New versus older stands (Arlington and Lancaster)
- On-farm +/- S in three counties
- Alfalfa S survey by plant analysis

S and N Responses on "New" versus "Old" Stands at Arlington

	N	S	"New"			"Old"		
Source	rate	rate	1999	2000	2001	1999	2000	2001
	----lb/acre---		---------- T/acre dry matter ----------					
None	--	--	2.07	3.92	3.01	1.48	3.22	3.38
Gyp	0	48	2.14	3.99	3.12	1.40	3.35	3.42
AS	42	48	2.08	4.02	3.11	1.60	3.34	3.37
Gyp+AN	42	48	2.27	4.08	3.11	1.53	3.40	3.49
P value			0.12	0.71	0.89	0.06	0.82	0.95

"New" stand seeded in 1998; "Old" stand seeded in 1996.

S and N Responses on "New" versus "Old" Stands at Lancaster

Source	N rate	S rate	"New" 2000	"New" 2001	"Old" 2000	"Old" 2001
	----- lb/acre -----		----------T/acre dry matter ----------			
None	--	--	3.15	3.76	3.22	3.32
Gyp	0	48	3.39	3.97	2.97	3.15
AS	42	48	3.31	3.88	3.58	3.49
Gyp+AN	42	48	3.32	3.83	2.95	3.52
P value			0.67	0.42	<0.01	0.10

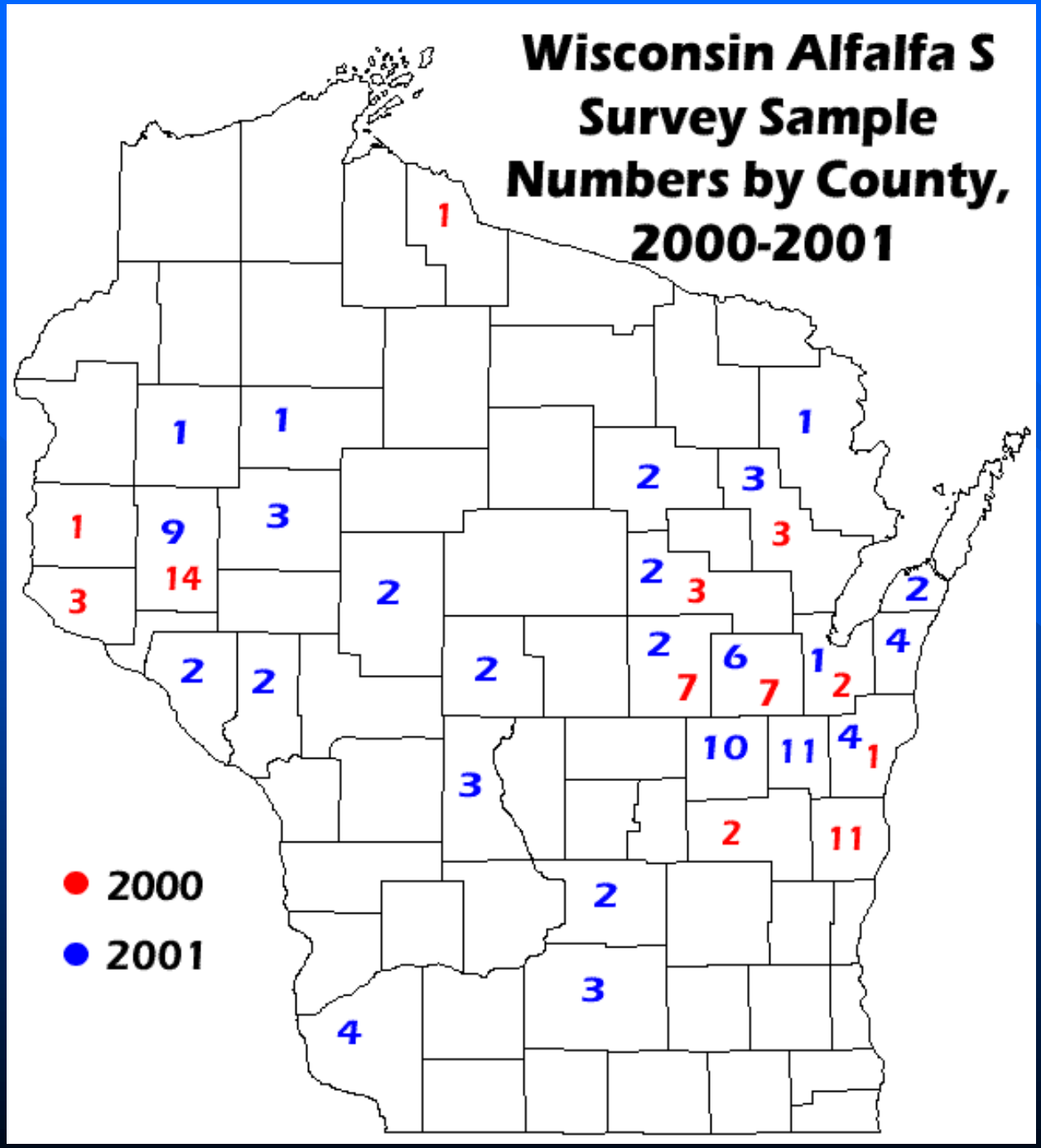
"New" stand seeded in 1999; "old" stand seeded in 1996.

Sulfur Responses at On-Farm Trials

	1999	2000			2001	
S rate	Man	FDL	Man	Dodge	FDL	Dodge
lb/acre	---------- T/acre ----------					
0	3.28	4.75	4.08	5.11	5.56	3.70
25	3.23	5.36	4.48	--	5.68	--
50	3.83	--	4.91	5.27	--	4.08
P value	0.08	<0.01	0.06	0.15	0.45	0.02

Tissue S Levels in On-Farm Trials

	1997	2000			2001	
S rate	Man	FDL	Man	Dodge	FDL	Dodge
lb/acre	----------	----------	% S	----------	----------	----------
0	0.21	0.23	0.18	0.19	0.29	0.15
25	0.32	0.28	0.24	--	0.35	--
50	0.32	--	0.25	0.19	--	0.27


Wisconsin Alfalfa S
Survey Sample
Numbers by County,
2000-2001
1
1
1
1
2
3
1
9
3
3
14
2
3
2
3
2
2
2
2
2
6
1
4
7
7
2
10
11
4
1
3
2
11
2
3
4
2000
2001

Wisconsin Alfalfa Sulfur Survey:

- Sample numbers:
  - 53 in 2000
  - 73 in 2001
  - 9 to be analyzed
- 28 counties represented
- Tissue S data:
  - 0.09 to 0.58%
  - 36 of 126 samples < 0.23% S
  - 14 of 126 samples 0.23 to 0.24% S

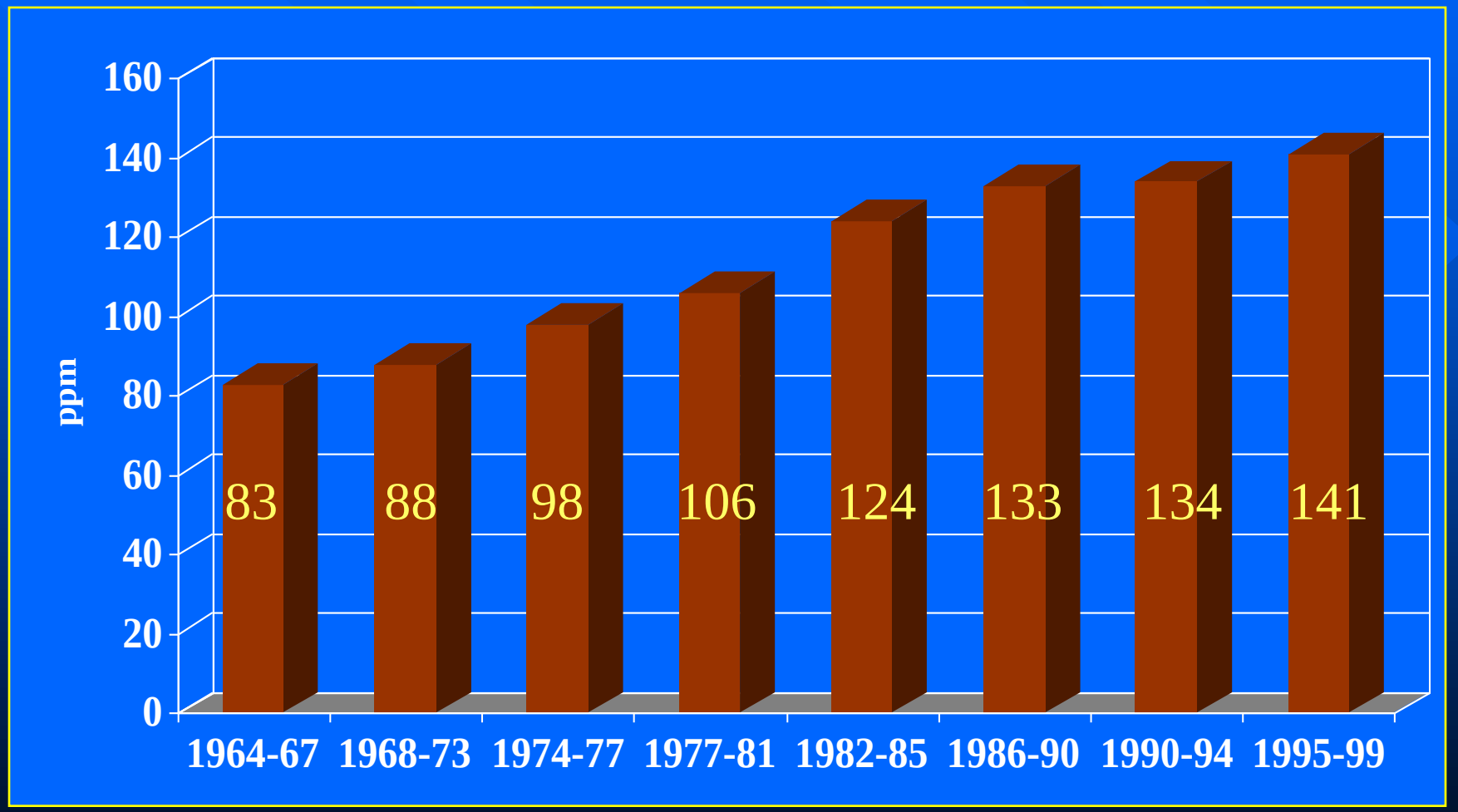
Location of “Deficient” or “Low” Samples

- Barron (1)
- Calumet (1)
- Chippewa (1)
- Dane (2)
- Dunn (12)
- Fond du Lac (1)
- Iron (1)
- Juneau (1)
- Langlade (1)
- Manitowoc (4)
- Marinette (1)
- Oconto (3)
- Outagamie (2)
- Pierce (3)
- Rusk (1)
- Shawano (2)
- Sheboygan (5)
- Trempealeau (1)
- Waupaca (1)
- Winnebago (6)

Conclusions:

- Sulfur deficiency possible in southern Wisconsin on medium-textured soils
- Tissue S < 0.23 = deficient
  > 0.25 = sufficient
  0.23 to 0.25 = maybe
- SAI works but precipitation S over-weighted
- Redo SAI by multiple regression; more emphasis on measured S?

Wisconsin Soil Test K Trends: 1964-1999



Wisconsin Soil Test P Trends: 1964-1999