Developing Efficient Conservation Tillage Systems for Potato and Vegetable Crops Grown on Sandy Soils

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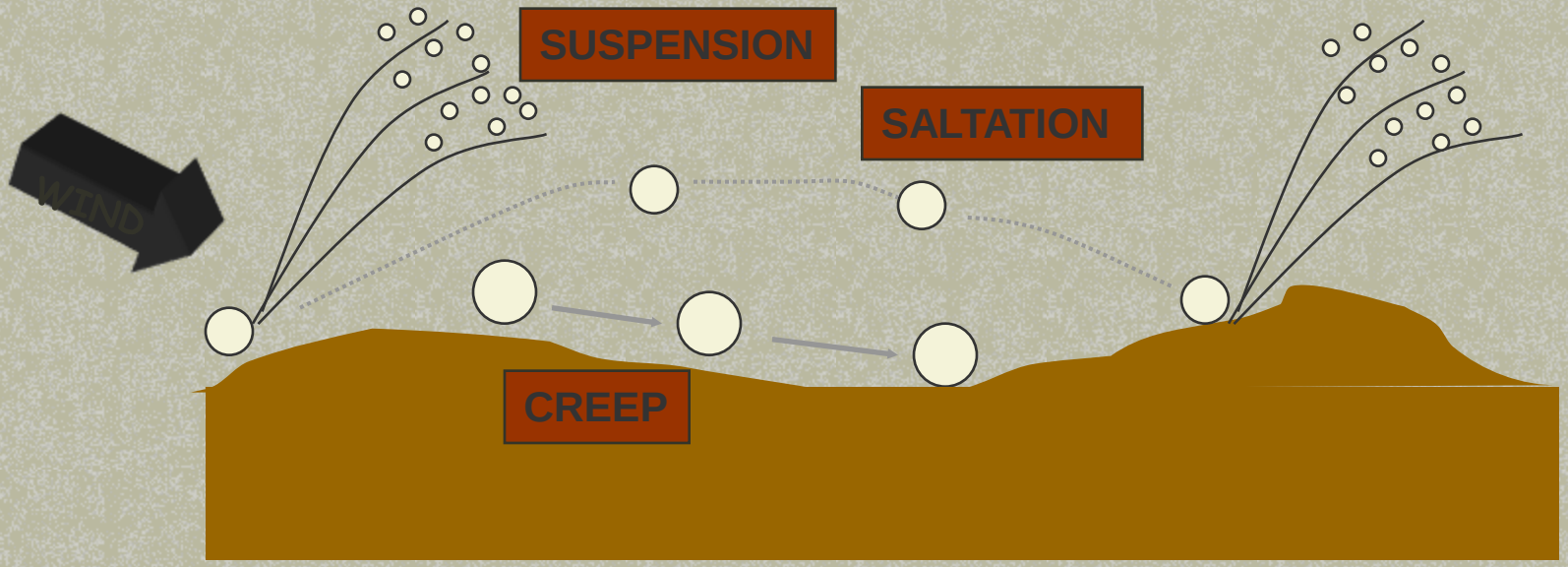
Background

- Conservation management is a win/win situation
  - Conserve resources
  - Promote stewardship
  - Saves time and labor
- Cover crops and reduced tillage
  - Reduce wind erosion
  - Trap some nutrients
  - Creates management issues

Wind erosion near Plainfield, Wis.

The Wind Erosion Process



- SALTATION DETACHES PARTICLES
- SMALLER PARTICLES SUSPENDED
- LARGER PARTICLES CREEP
- SANDY AND SILTY SOILS MOST SUSCEPTIBLE
- SOIL ACCUMULATION IN DITCHES AND FENCE ROWS

HARS Cover crop/tillage study: Objectives

- Compare crop response between conventional and conservation tillage
- Evaluate the effectiveness of cover crops
  - Providing residue
  - Trapping N
- Evaluate the interaction between tillage, cover crop, and N management

HARS Cover crop/tillage study: Procedure

- Crop rotation (Potato, sweet corn, snap bean)
- Cover crop (none, oat, winter rye)
- Tillage (Moldboard, Chisel, Para-till)
- Nitrogen (none or recommended)
- Split-split plot design within each crop

HARS Cover crop/tillage study

Conventional tillage:

HARS Cover crop/tillage study

Chisel tillage:

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Para-till:

HARS Cover crop/tillage study

Secondary tillage:

HARS Cover crop/tillage study: Measurements

- Cover crop biomass and N content
- Surface crop residue
- Emergence rate and population
- Crop tissue N
- Horstfall-Barrett and scab assessment
- Yield and grade-out


April, 2002

Cover crop biomass and N, 2003

Cover Crop	Biomass	N content	N uptake
	lb/a	%	lb/a
Oat	1238	1.13	14.0
Rye	1497	1.29	19.3

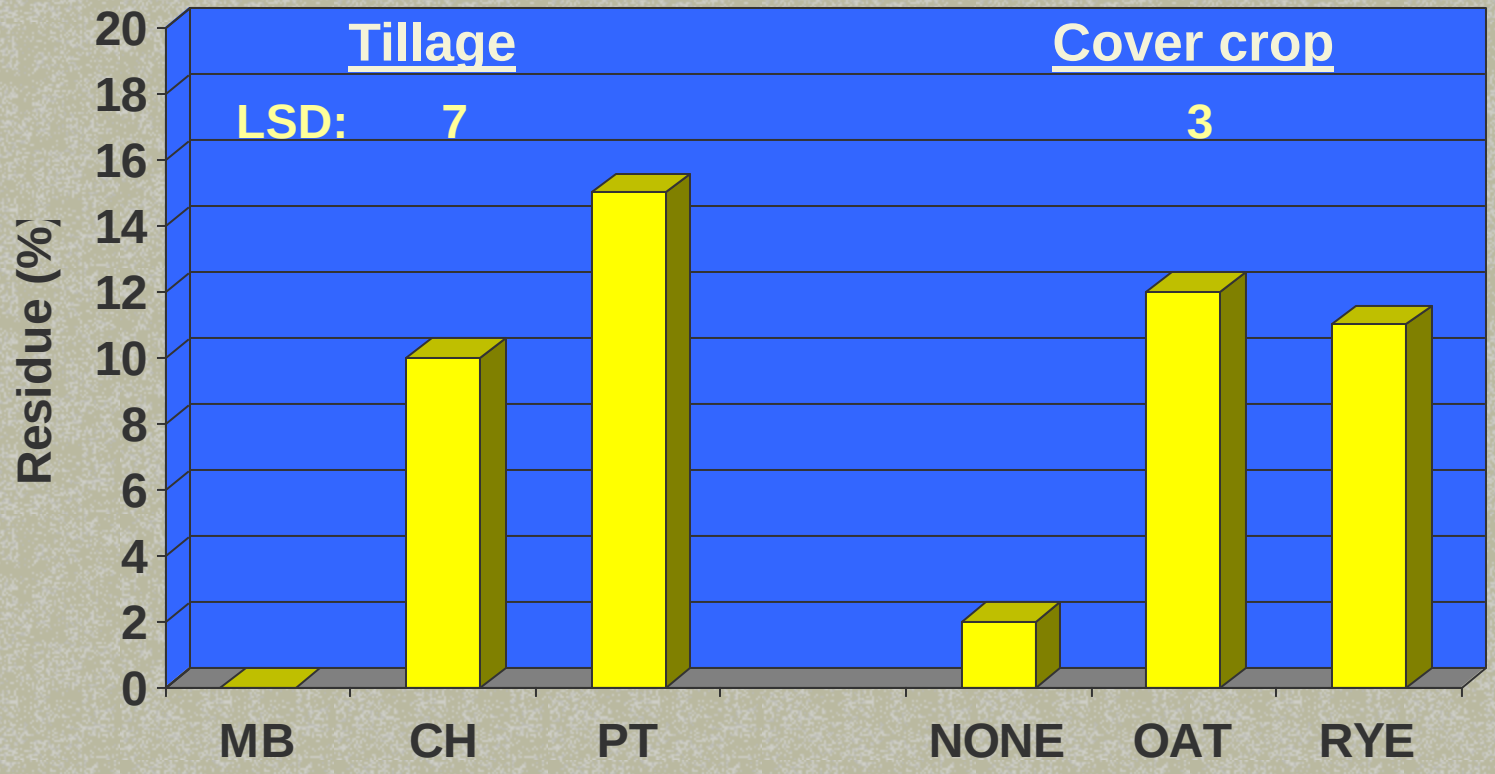
Mean of four measurements

Effect of tillage and cover crop sweet corn whole plant N, 2003

Cover Crop	Moldboard	Chisel	Para-till	Avg.
None	**0.86**	**0.82**	**0.87**	**0.84**
Oat	**0.95**	**0.90**	**0.87**	**0.91**
Rye	**0.93**	**0.90**	**0.94**	**0.92**
Avg.	**0.92**	**0.87**	**0.90**	

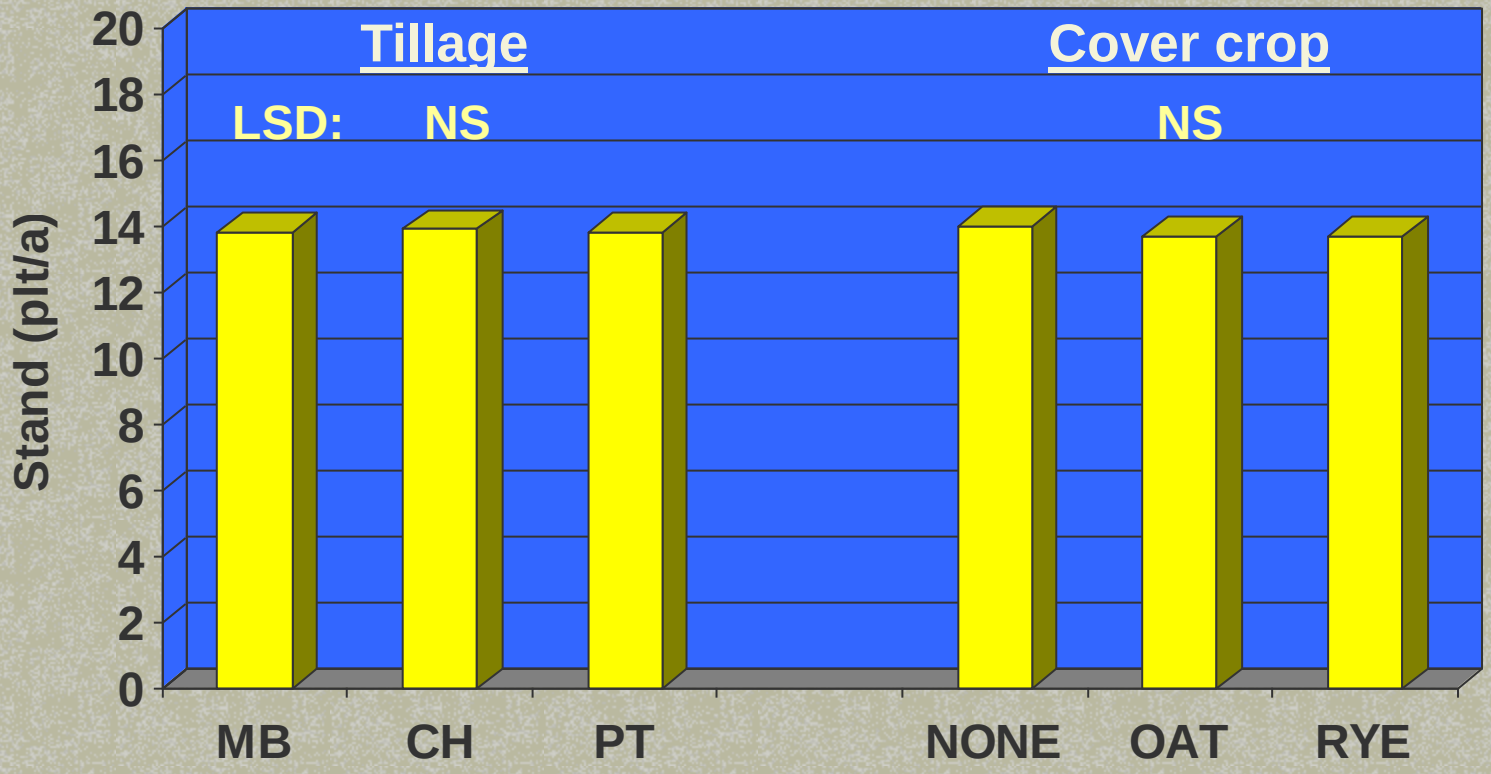
Results – 2003

- Residue after planting potato



Results – 2003

- Population potato (x 1000)



Note: Snapbean and sweet corn populations not affected by treatment

Results – 2003

- Snap bean yield and grade-out

TILLAGE	FRESH YIELD	1-3	4	5
	t/a	---------- % ----------		
MB	1.7	31	44	25
CH	1.9	29	47	24
PT	1.3	28	46	26
LSD	0.3	NS	2	NS

Results – 2003

- Snap bean yield and grade-out

COVER CROP	FRESH YIELD	1-3	4	5
	t/a	---------- % ----------		
NONE	1.4	32	45	23
OAT	1.7	30	46	23
RYE	1.8	27	45	28
LSD	0.3	NS	NS	NS

Results – 2003

- Sweet corn yield

TILLAGE	FRESH YIELD	COVER CROP	FRESH YIELD
	t/a		t/a
MB	4.2	NONE	3.5
CH	3.9	OAT	4.5
PT	4.6	RYE	4.5
LSD	0.5		0.7

Results – 2003

- Potato yield and grade-out

TILLAGE	FRESH YIELD	GRADE OUT			SPEC. GRAVITY
		US1A	US1B	CULL	
	cwt/a	---------- % ----------			
MB	291	83	15	2	1.070
CH	299	86	13	1	1.070
PT	300	85	13	3	1.070
LSD	NS	3	NS	1	NS

Results – 2003

- Potato yield and grade-out

COVER CROP	FRESH YIELD	GRADE OUT			SPEC. GRAVITY
		US1A	US1B	CULL	
	cwt/a	---------- % ----------			
NONE	290	85	12	2	1.071
OAT	311	85	14	1	1.070
RYE	290	84	14	2	1.069
LSD	NS	NS	NS	NS	NS

Summary - 2003

- Cover crops provided minimal residue and N trapping because of limited growth
- Plant population not affected by treatment
- Snapbean and sweet corn yield increased with cover crops, potato not affected
- Crop yield variably affected by tillage
- Cover crop and reduced tillage a viable conservation system
  - Cover crop doesn’t interfere or compete
  - Soil compaction is managed
  - Equipment is designed for conditions