Land Rolling: What happens to the water?

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UNIVERSITY OF MINNESOTA
EXTENSION
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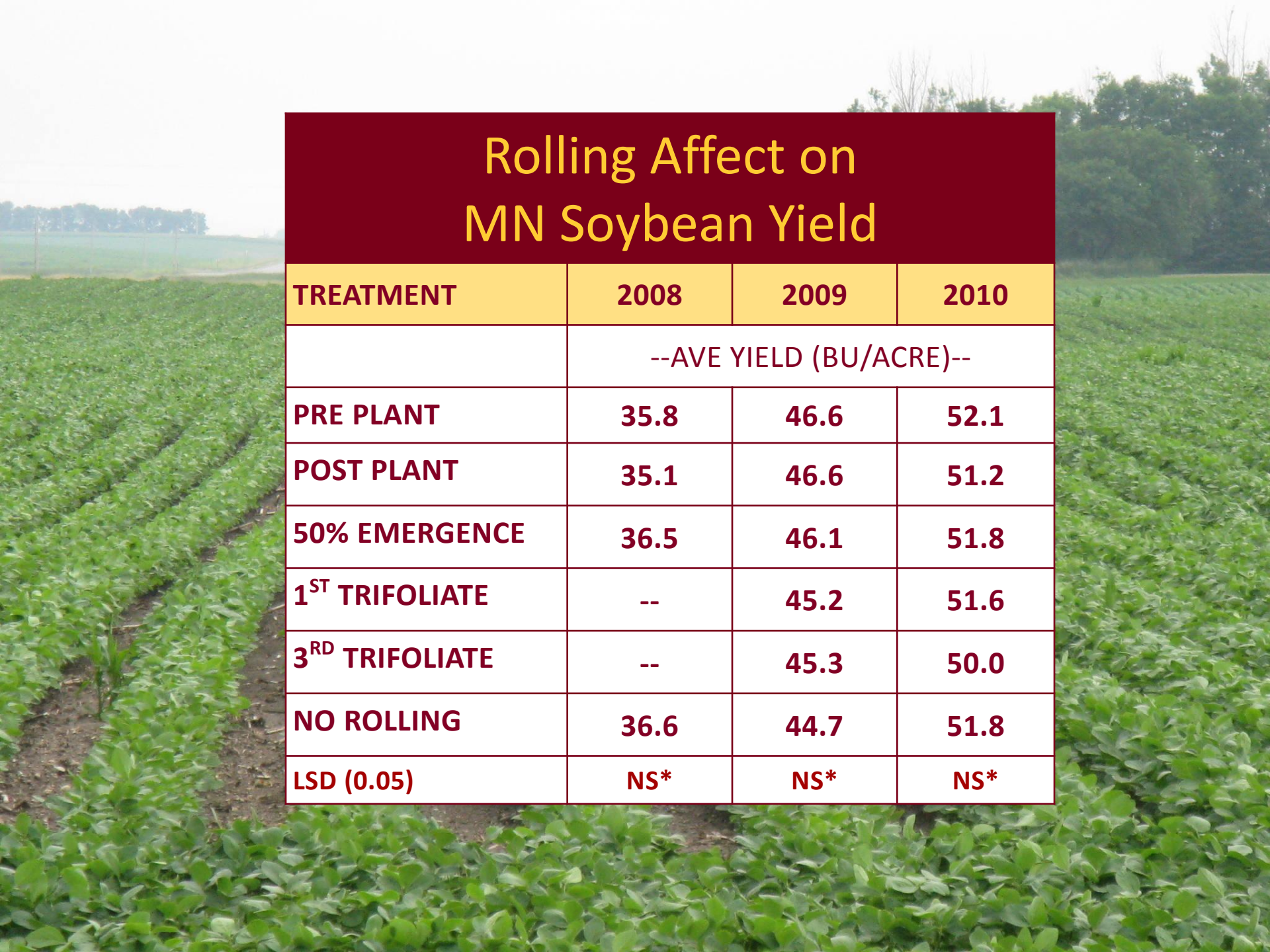


Rolling Affect on MN Soybean Yield

TREATMENT	2008	2009	2010
	--AVE YIELD (BU/ACRE)--		
PRE PLANT	35.8	46.6	52.1
POST PLANT	35.1	46.6	51.2
50% EMERGENCE	36.5	46.1	51.8
1ST TRIFOLIATE	--	45.2	51.6
3RD TRIFOLIATE	--	45.3	50.0
NO ROLLING	36.6	44.7	51.8
LSD (0.05)	NS*	NS*	NS*

North Dakota and Iowa Soybean Yields with Rolling

TREATMENT	NORTH DAKOTA		NW IOWA		NC IOWA
	2003	2004	2009	2010	2010
	--AVERAGE YIELD (BU/ACRE)--				
POST PLANT	30.9	19.2	64.2	58.8	57.4
50% EMERGED	28.7	21.4	--	--	--
1ST TRIFOLIATE	30.8	23.4	65.5	58.2	58.3
3RD TRIFOLIATE	--	24.7	--	--	55.7
6TH TRIFOLIATE	--	--	--	--	49.4
NO ROLLING	29.2	23.4	64.7	59.8	58.1
LSD (0.05)	NS*	NS*	NS*	NS*	5.9

Sources: Greg Endres, North Dakota State University Extension;
Mahdi Al-Kaisi, Iowa State University Extension

The impact of rolling on water infiltration rates - ISU

Soil Type	Unrolled	Rolled
	Infiltration Rate (inches/hr)	
Canisteo silty clay loam	2.6	1.7
Clarion loam	1.2	2.8
Canisteo silty clay loam	4.5	2.8
Webster silty clay loam	**6.4**	**1.2**

Can Rolling Decrease Water Infiltration?

Causing:

- Increase soil movement
- Increase phosphorus movement
- Soil ponding

Acceptable soil loss is

5T an acre per year

640 acres equals ***40 semi loads*** of soil!

Moving Soil Back Up the Hill

6” of soil increased yields over 2 years:

- ***26%*** for soybeans
- ***41%*** for corn

8 bu/ac x $13.50 = ***$108***

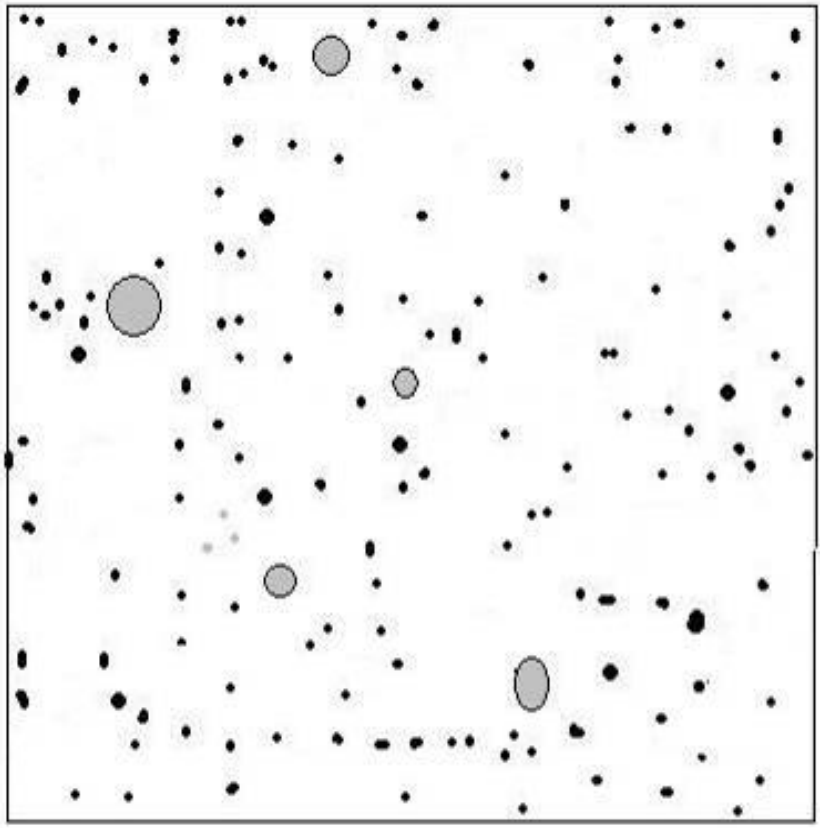
60 bu/ac x $6.60 = ***$396***

USDA-ARS, Morris, MN

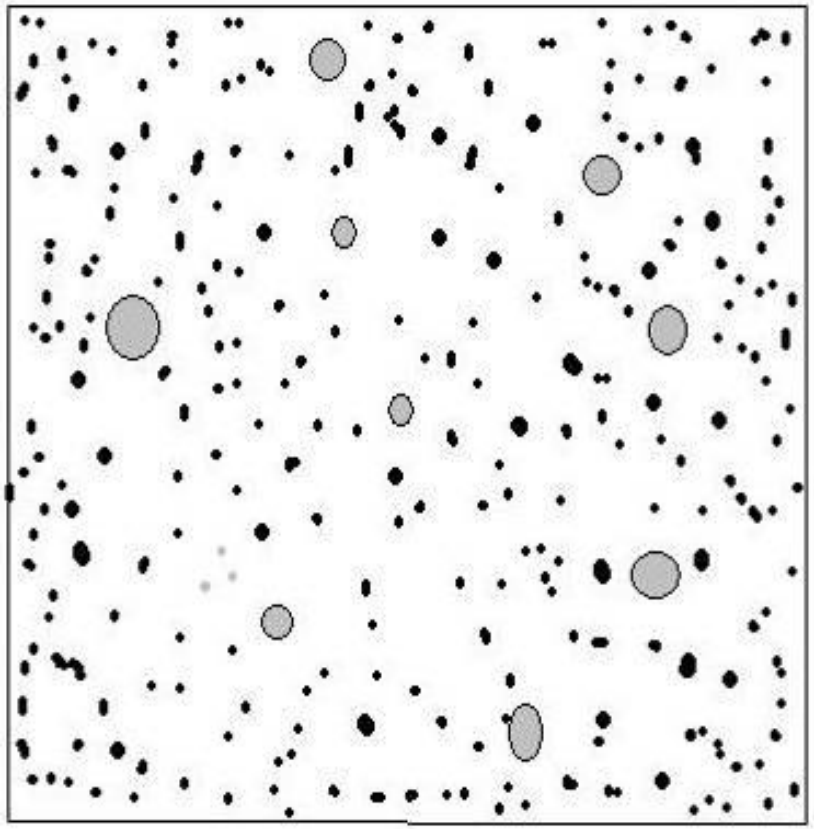
2008 Drown-out at Canby Site

Pounding rain around emergence

Soil Infiltration Potential



Rolled



Not Rolled

Adapted form the Irrigation Research Foundation – Yuma, CO

2010 - 6% Slope

Minnesota Soybean Research & Promotion Council

14% Residue, Wheat-Bean Rotation

6” row spacing

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Planted down slope

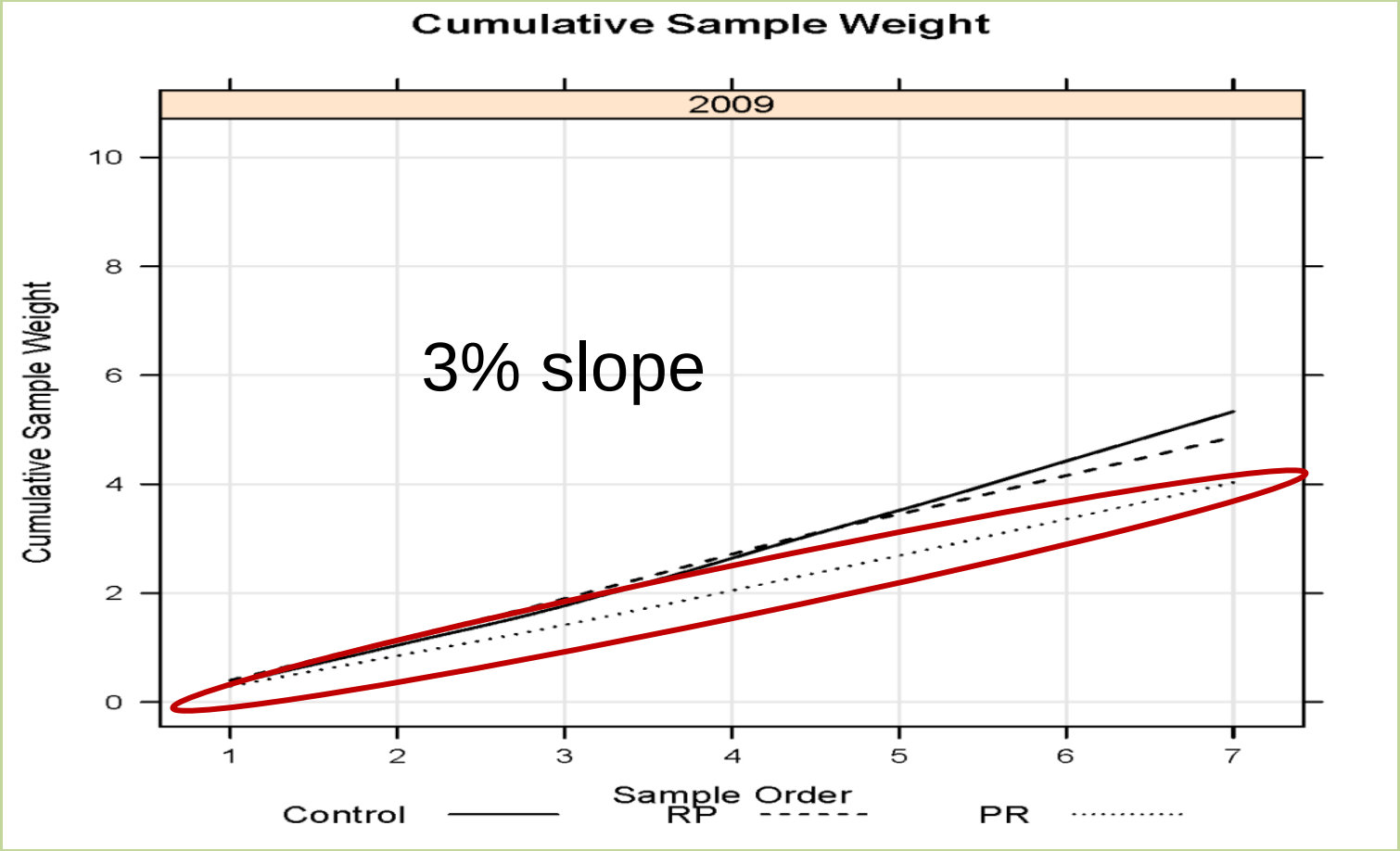
MINNESOTA DEPARTMENT OF AGRICULTURE

Roll 1st then Plant

Plant 1st then Rolled

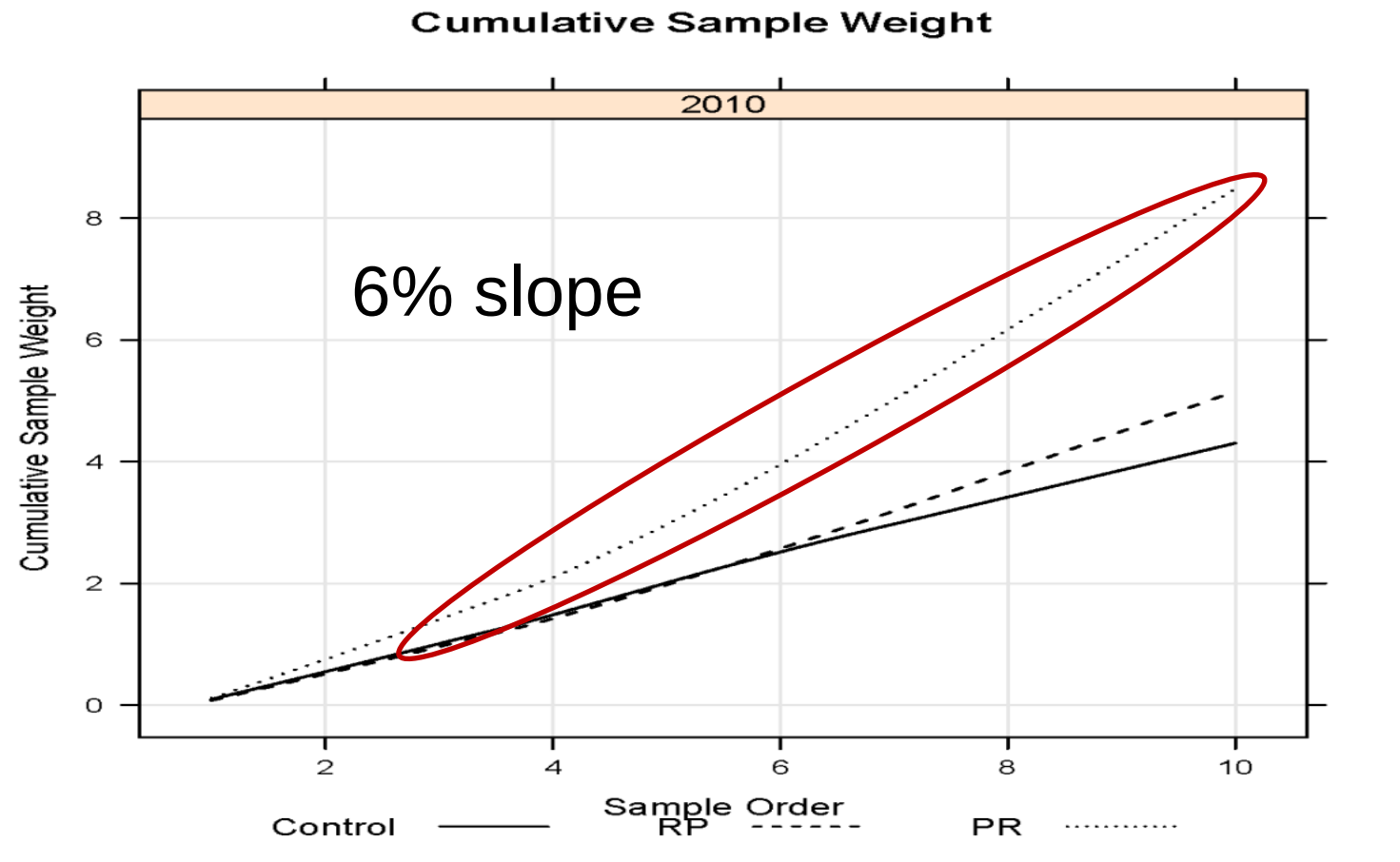
Control – No Rolling

Run Off – 2009



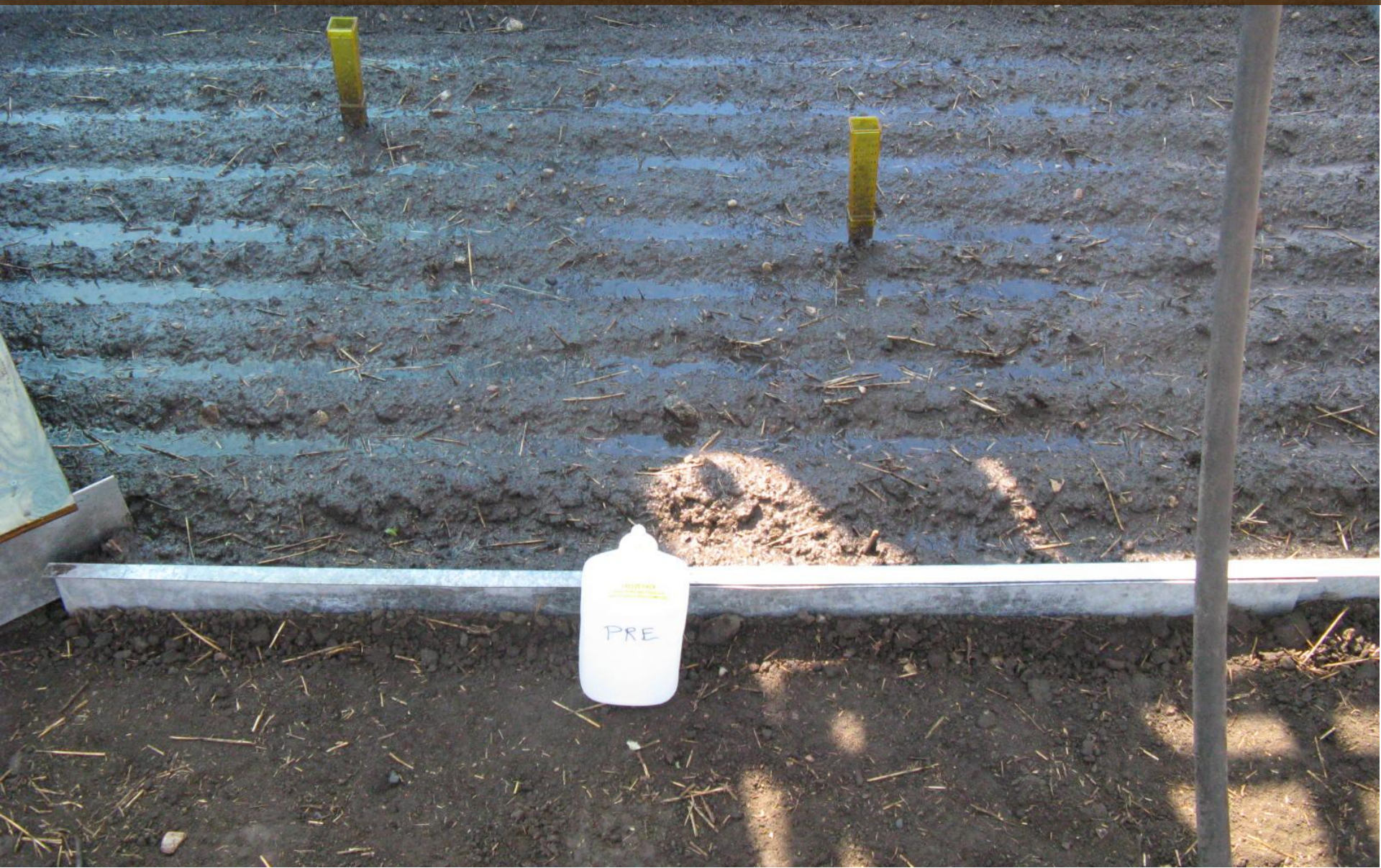
Some evidence that planted then rolled had *lower* run-off values than other two trts.

Run Off - 2010



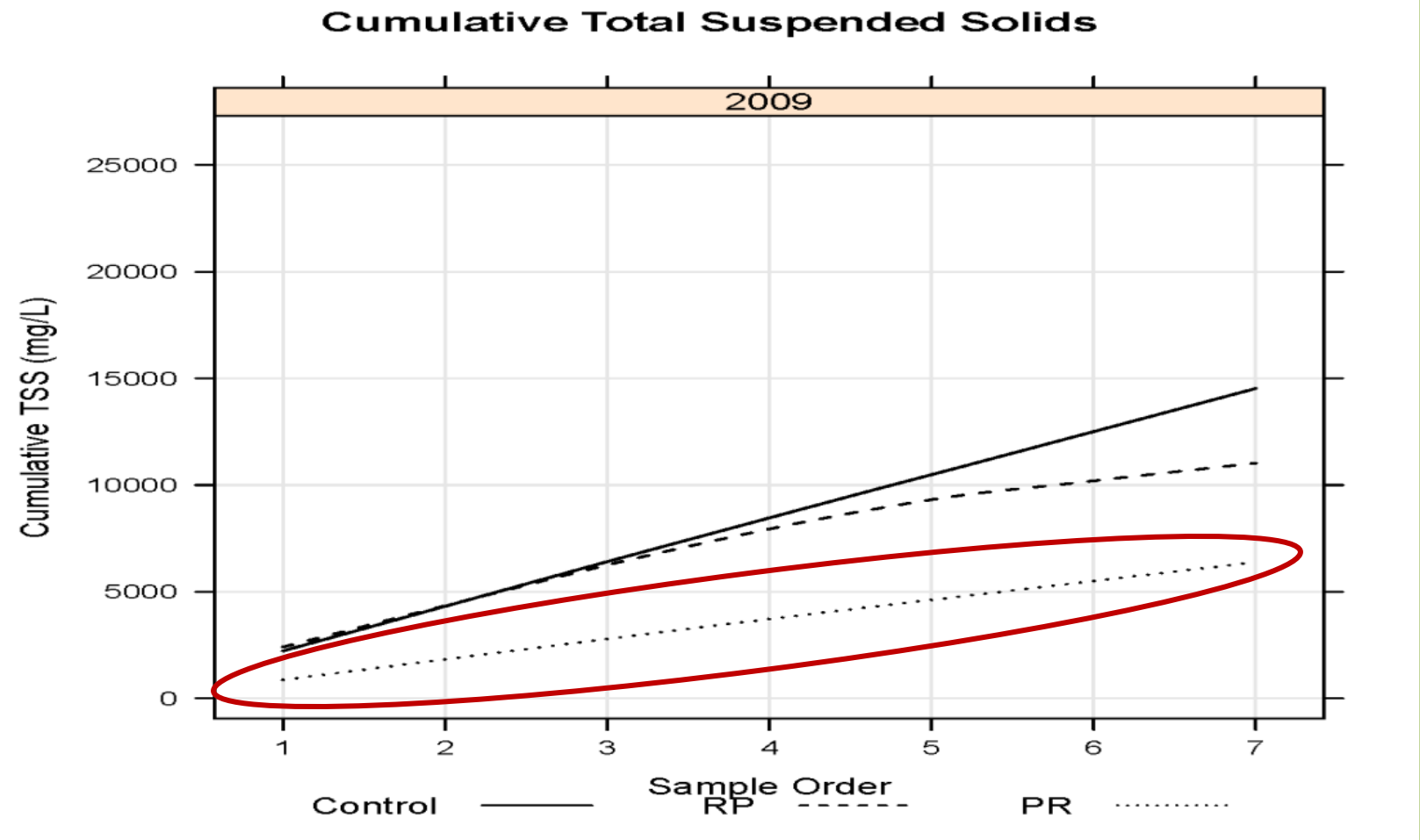
Evidence that planted then rolled had *higher* run-off values.

Preferential Flow



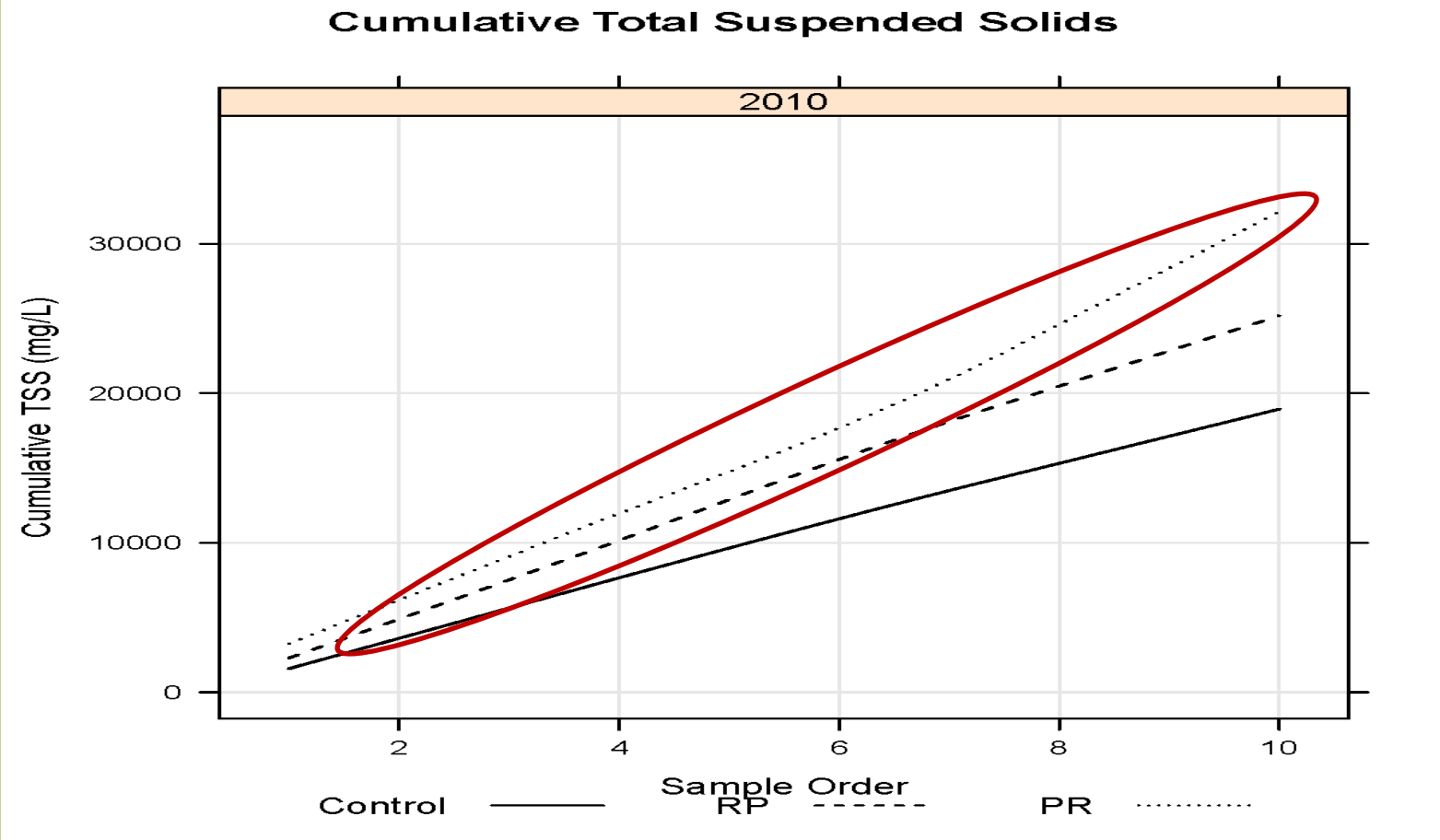

Channel Flow
by Planter

Total Suspended Solids - 2009



Evidence planted then rolled had ***lower*** levels than other treatments

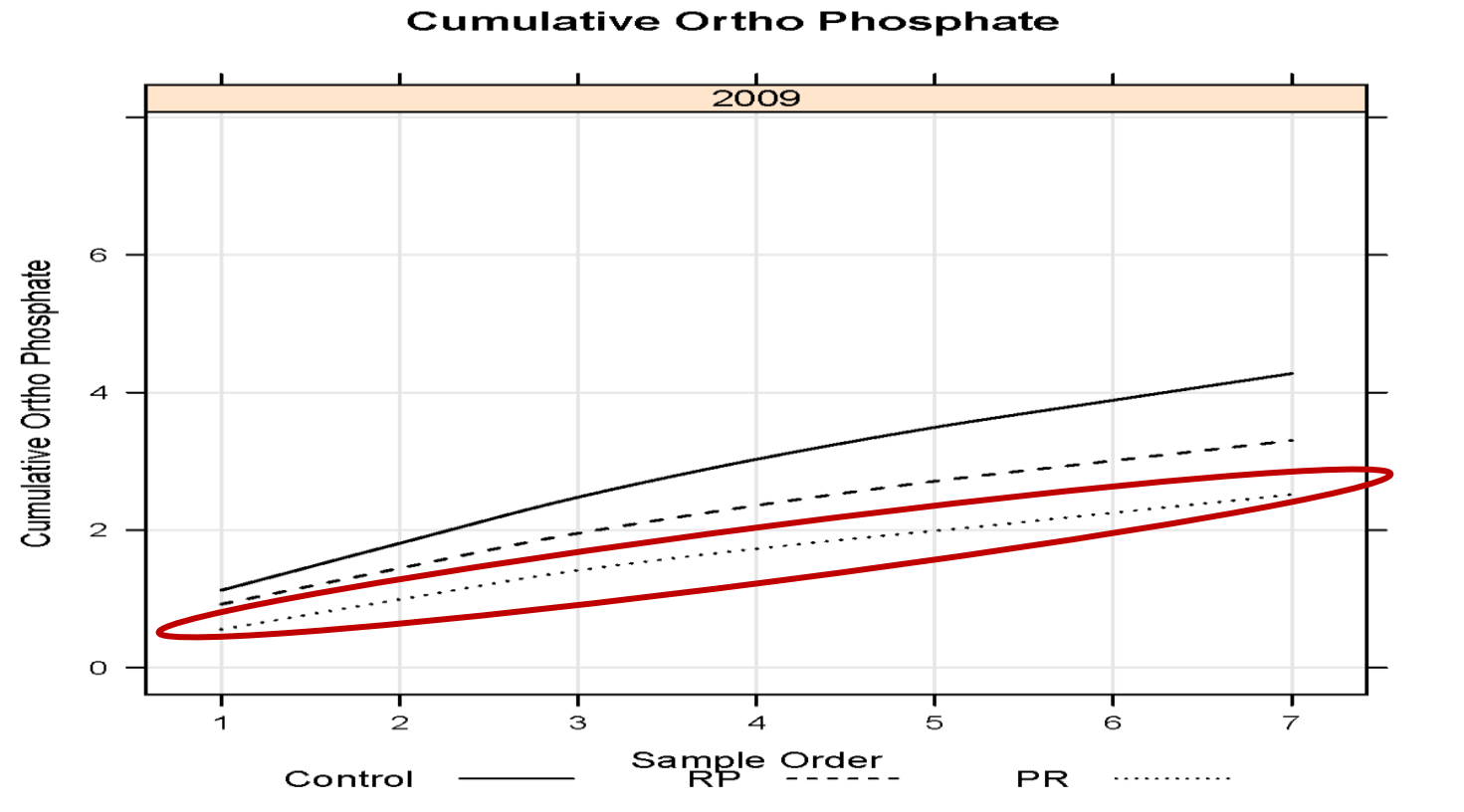
Total Suspended Solids – 2010



Evidence that rolled trts have ***higher*** rates than no rolling


All Trts had SOIL
in the Runoff

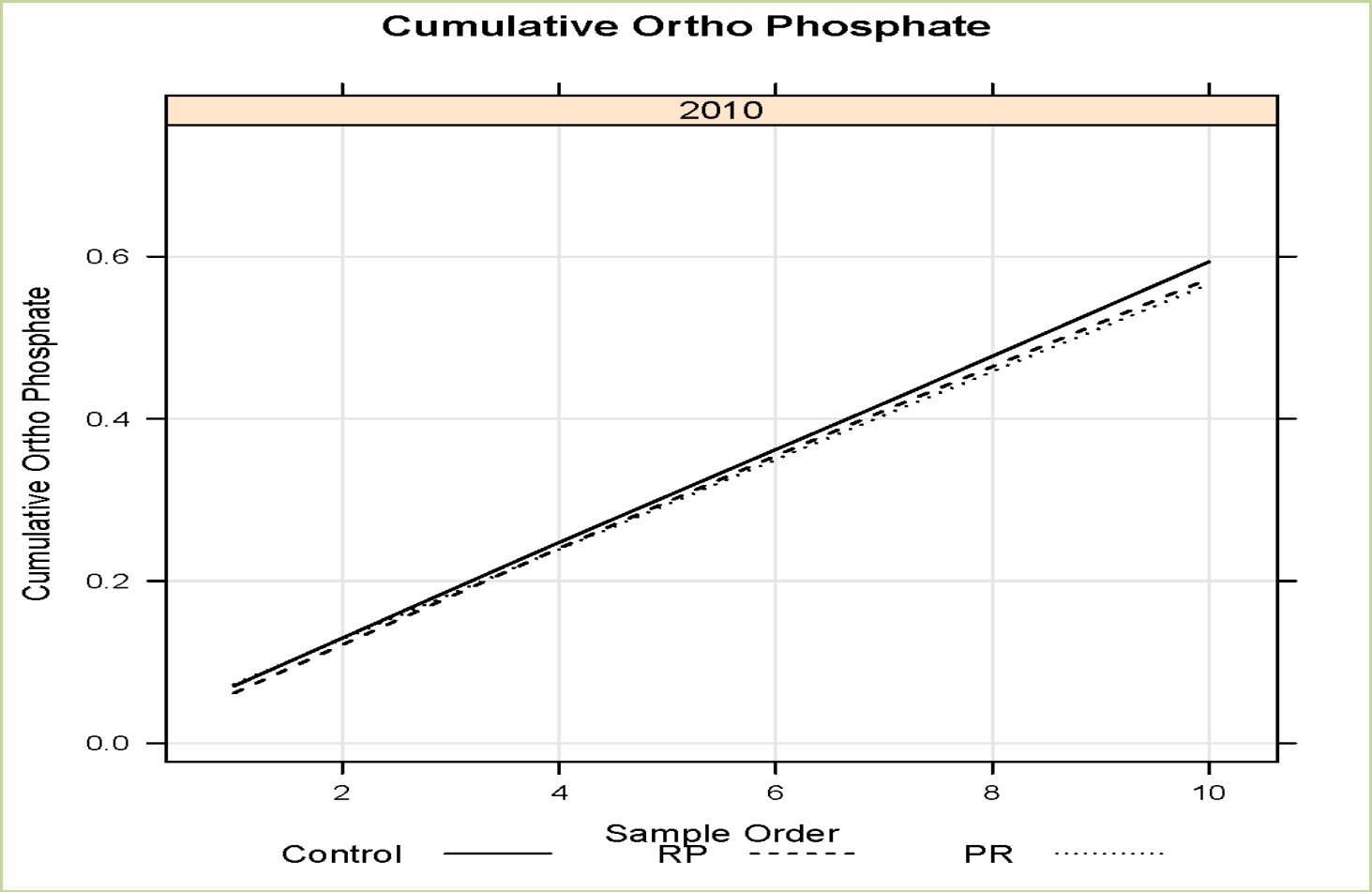
Orthophosphates (soluble) - 2009



Evidence planted then **rolled was lower** than other treatments

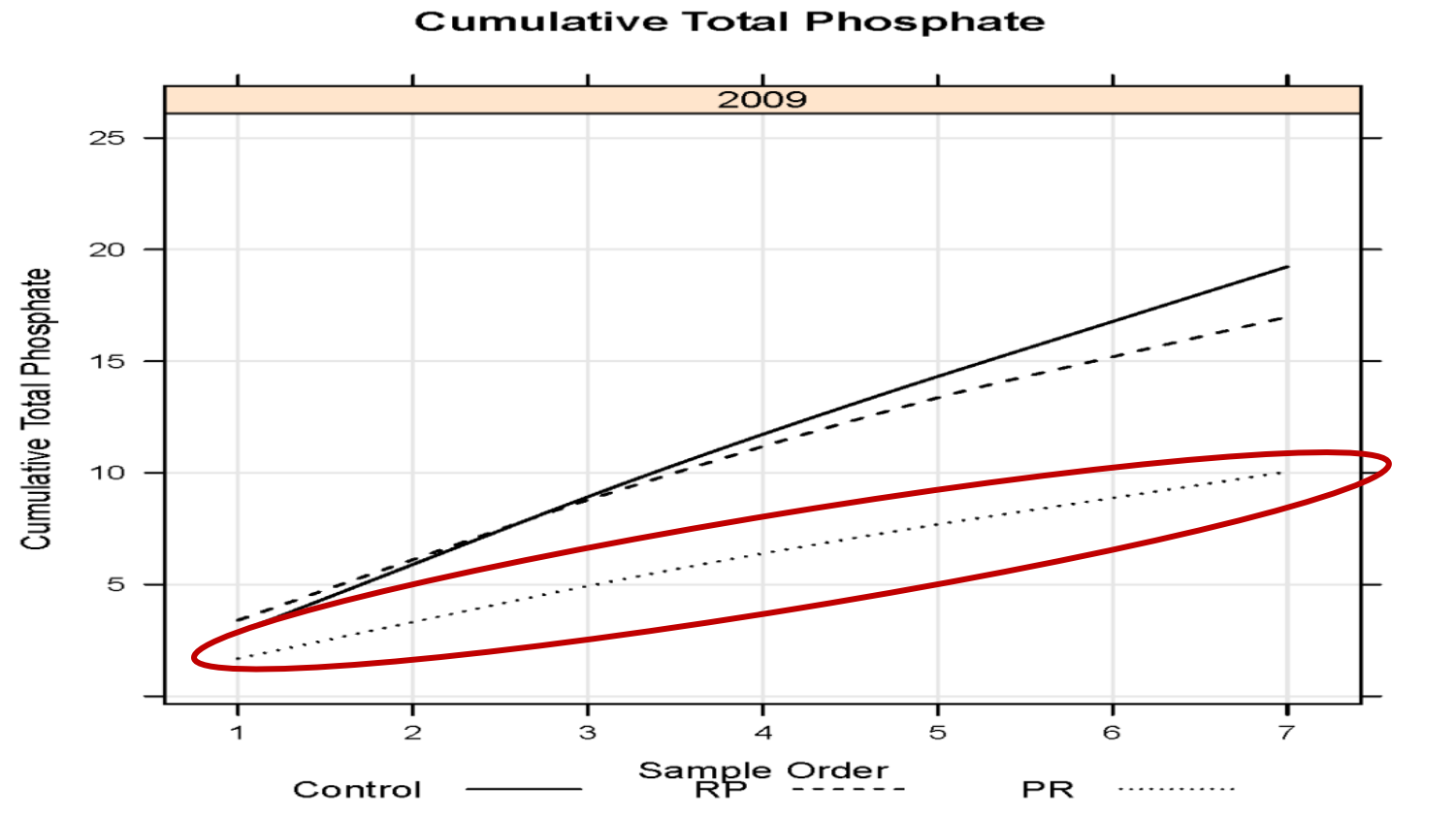
(also RP significantly less than control)

Orthophosphates (soluble) - 2010



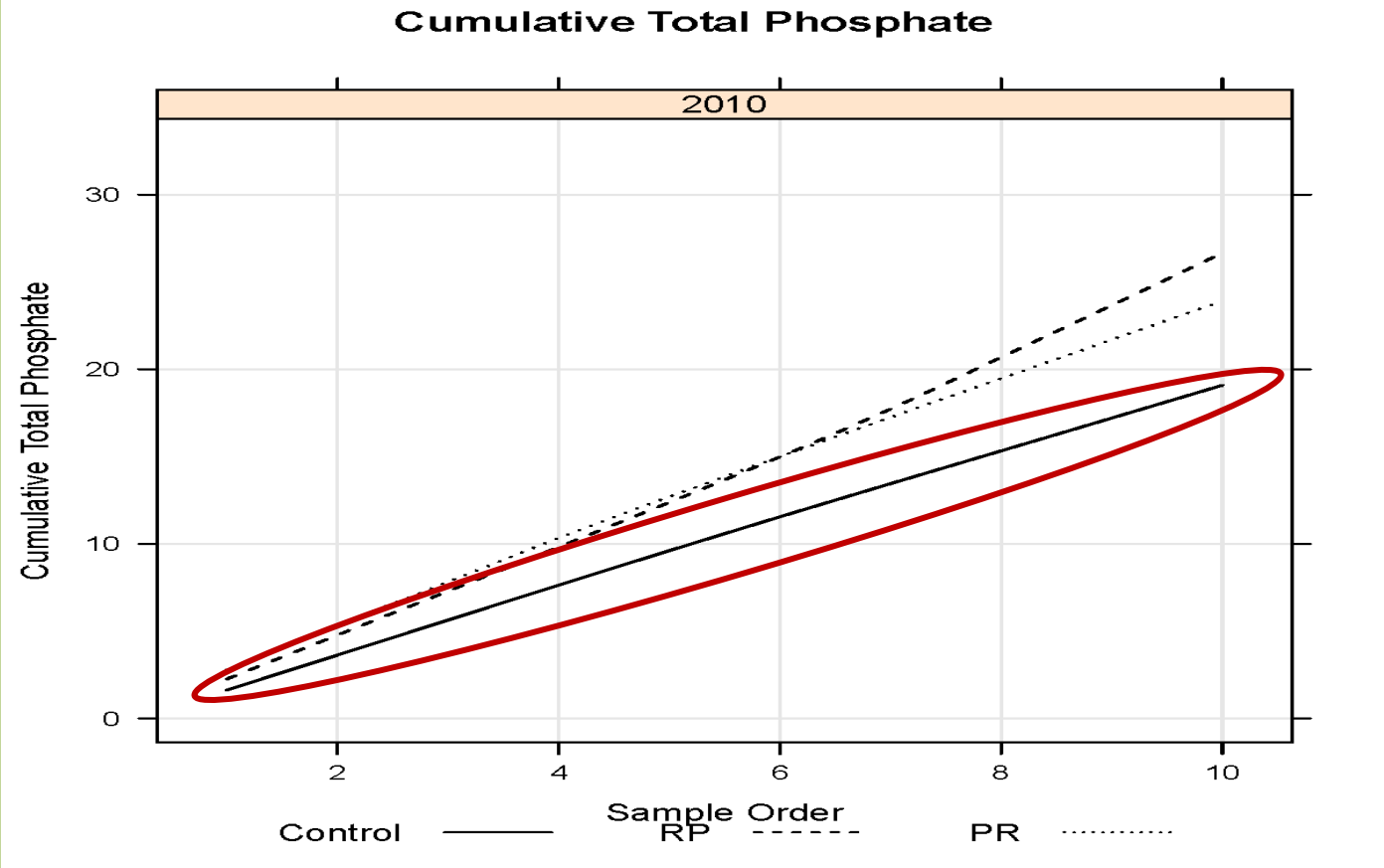
No evidence treatments differ

Total Phosphorus - 2009



Clear evidence planted then ***rolled was lowest*** (also RP less than control)

Total Phosphorus - 2010



Evidence that ***no rolling had lowest*** TP accumulation.

Factors that Affect Infiltration

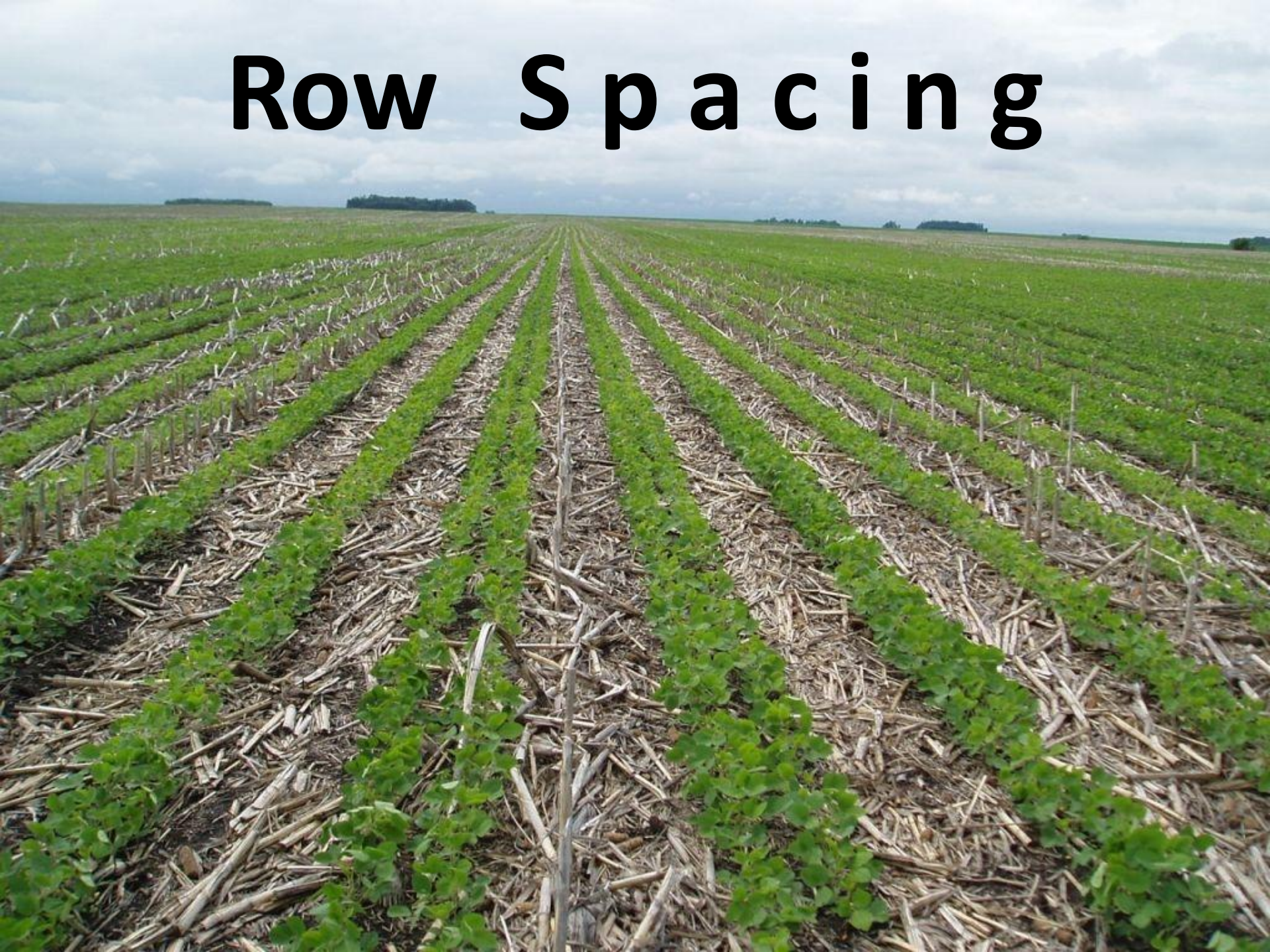
Soilerosion.net

Residue Coverage


Canopy or
Plant Cover


Slope and Planting Direction

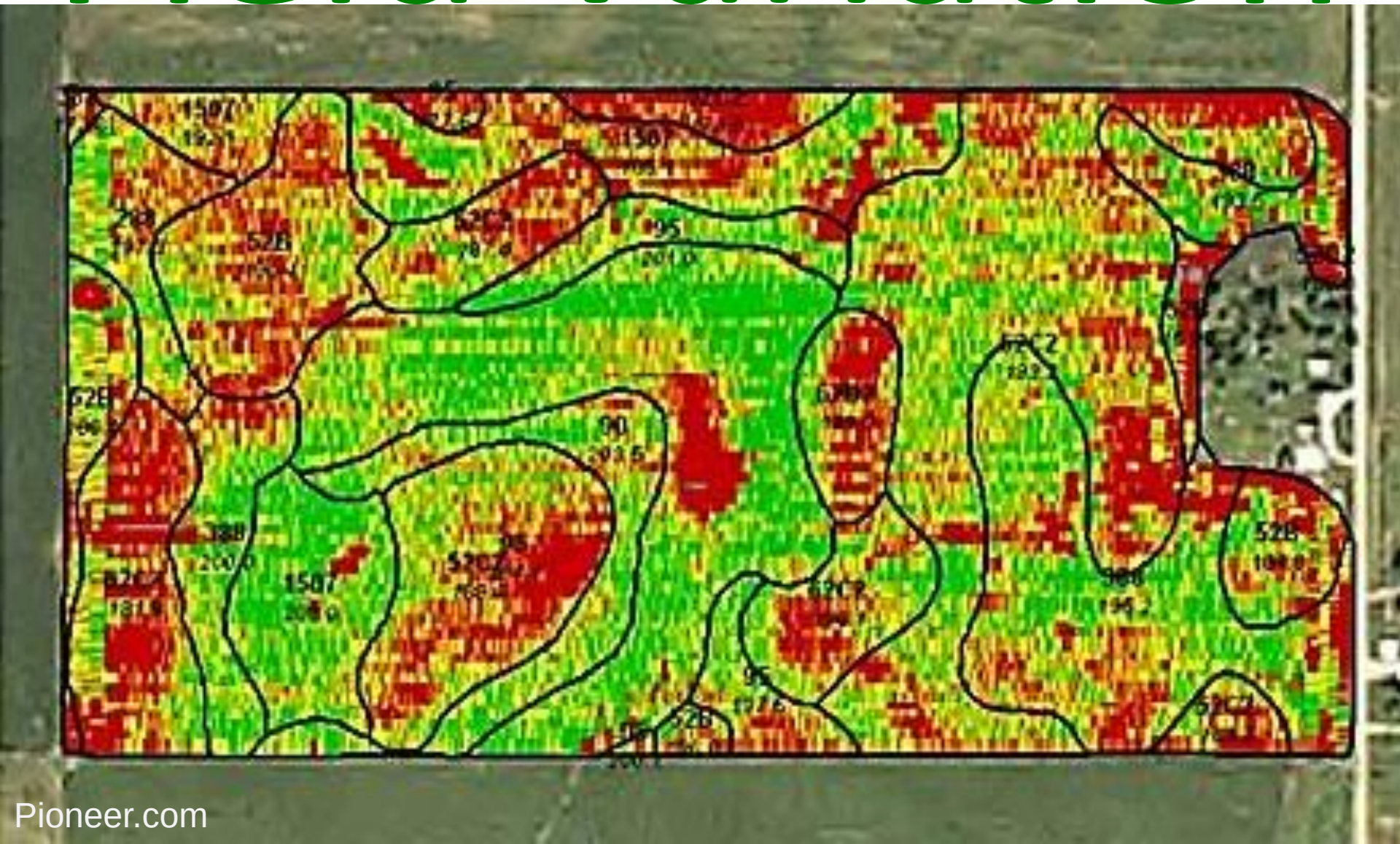
Row Spacing




Timing of Rolling

Roller Type

Field Variation




~ Soil texture and series
~ Moisture at rolling
~ Crop rotation…

Can Rolling Decrease Water Infiltration?

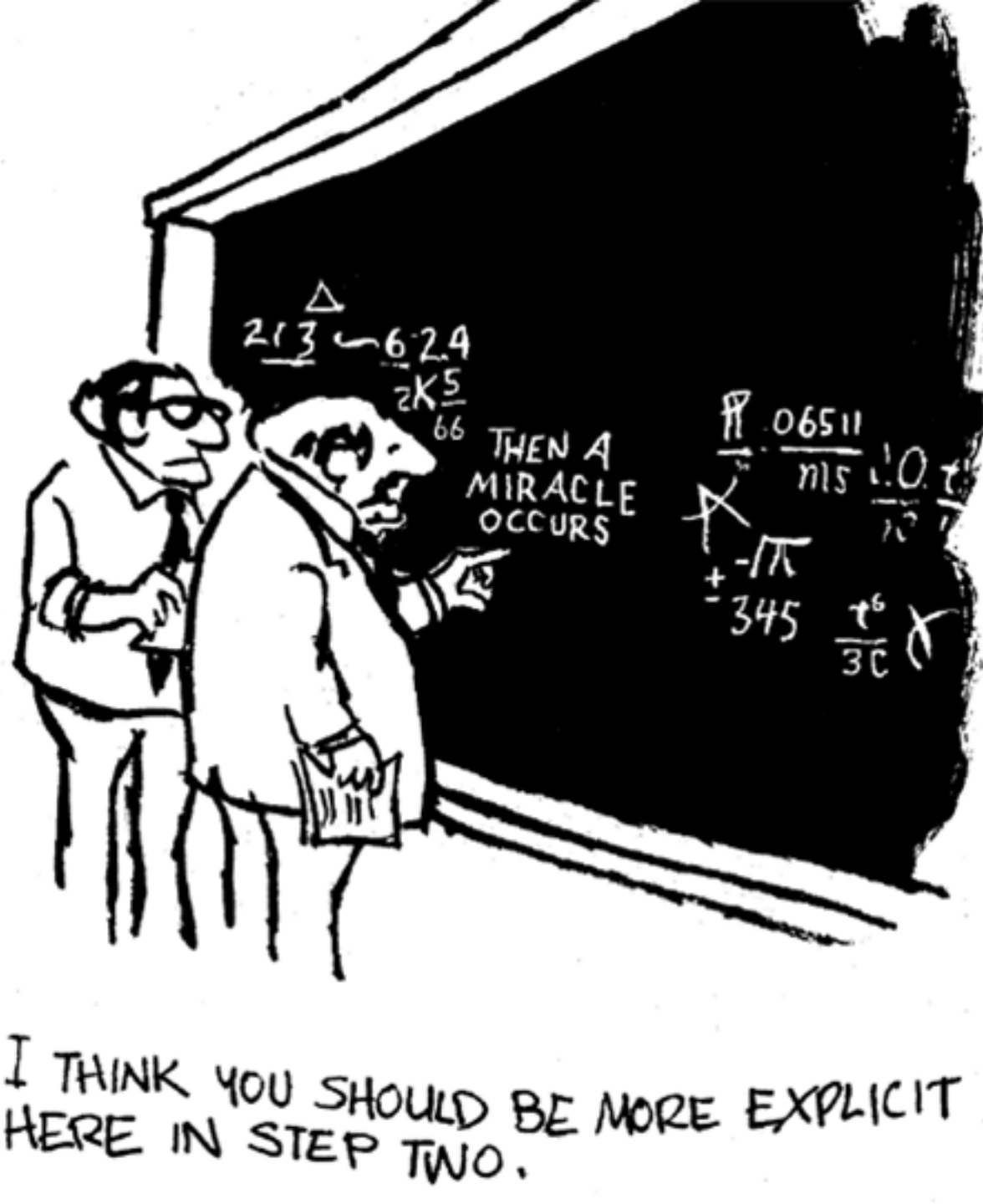
Yes, but not always


Can Rolling Increase Wind Erosion?
Without a doubt!

Summary

- Take into account **all** field factors before making any conclusions!
- Use basic soil science to reduce run-off and increase infiltration:
  - Leave over 30% residue
  - Less tillage and rolling on HEL land
  - Plant across the slopes
  - Roll before planting or wait till beans are up (before V3)
- Less soil movement = less P movement
  = less money leaving the field

Questions?


THEN A MIRACLE OCCURS
I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO.