Livestock and Water Quality: A farmer's perspective

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ClearWater Ag Strategies, LLC
May 30, 2017

ClearWater Ag Strategies LLC

Farmer: Corn, Soybean, Hogs

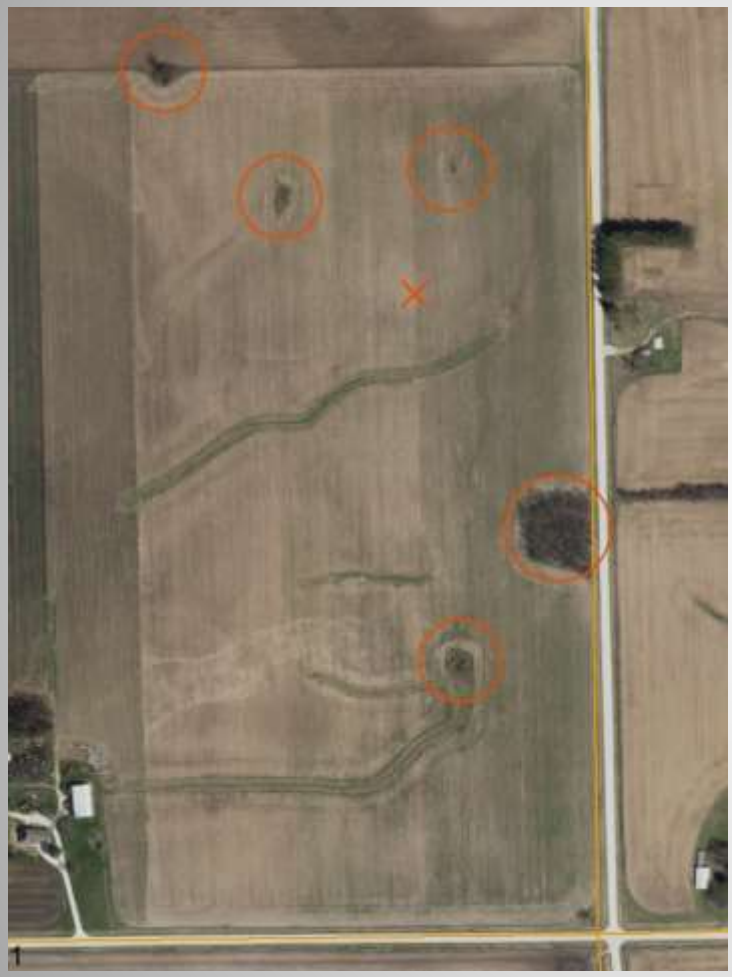
Former ISU Extension Watershed Specialist

Founder of ClearWater Ag Strategies, LLC

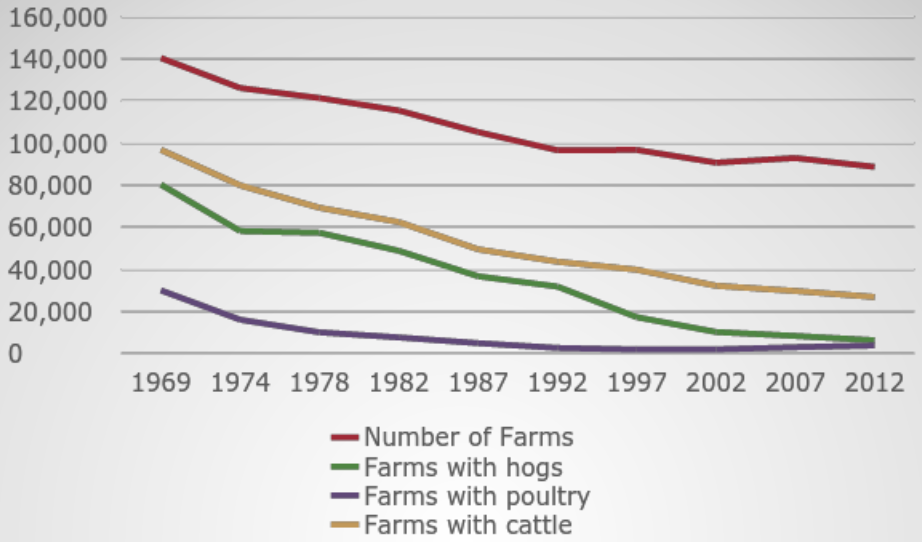
Environmental Protection Commissioner

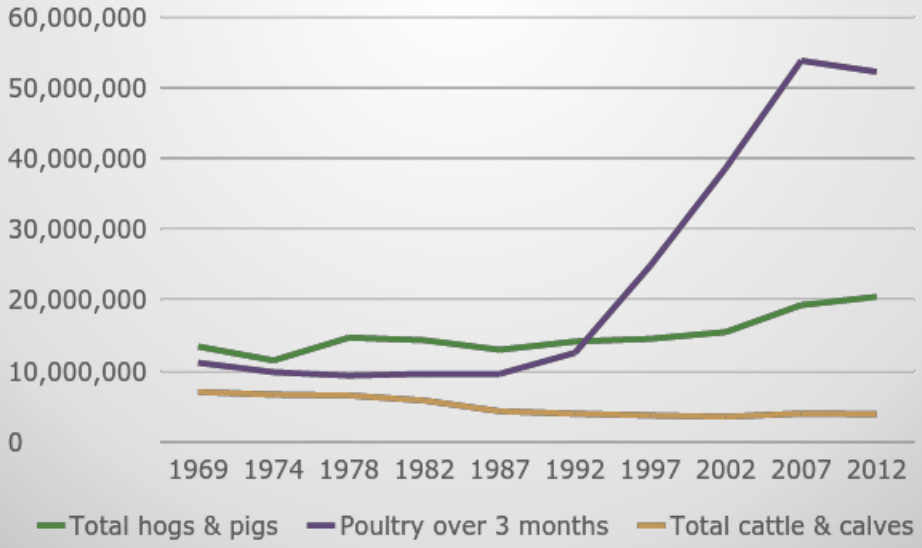
Iowa Nutrient Research and Education Council Liaison

Experience

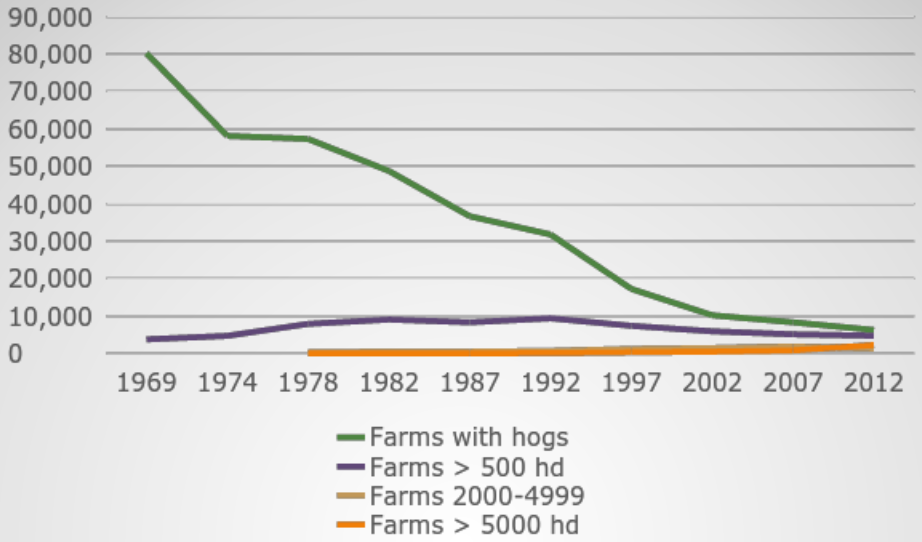


Experience





Farms and Livestock


90,000
80,000
70,000
60,000
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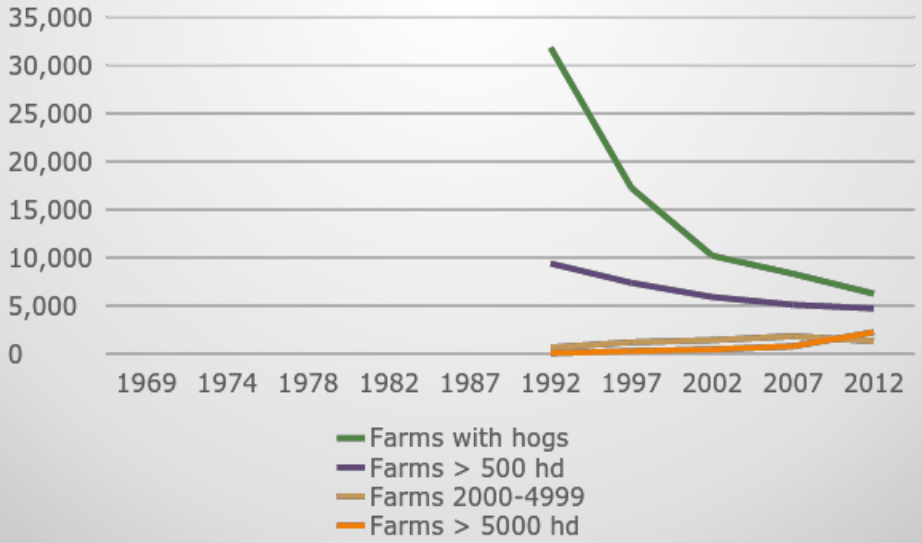
1969 1974 1978 1982 1987 1992 1997 2002 2007 2012
Farms with hogs
Farms > 500 hd
Farms 2000-4999
Farms > 5000 hd


35,000
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1969 1974 1978 1982 1987 1992 1997 2002 2007 2012
Farms with hogs
Farms > 500 hd
Farms 2000-4999
Farms > 5000 hd

Hogs

		Daily		Yearly
Swine	Space	Liquid, Pit* or Basin**	Liquid, Lagoon***	Solid Manure
Nursery, 25 lb.	1 head	0.2 gal	0.7 gal	0.34 tons
Grow-finish, 150 lb.				
Formed storage*				
Dry feeders	1 head	1.2 gal		2.05 tons
Wet/dry feeders	1 head	0.9 gal		2.05 tons
Earthen storage**	1 head	1.2 gal		2.05 tons
Lagoon***	1 head		4.1 gal	2.05 tons
Gestation, 400 lb.	1 head	3.0 gal	3.7 gal	2.77 tons
Sow & Litter, 450 lb	1 crate	3.5 gal	7.5 gal	6.16 tons
Farrow-nursery	Per sow in breeding herd	2.2 gal	5.4 gal	6.09 tons
Farrow-finish	Per sow in breeding herd	9.4 gal	30 gal	12.25 tons

19,000,000 finishing pigs = 7,000,000,000 gallons manure/year

7,000,000,000 gallons at 3300 gallons/acre = 2,121,000 acres

2,121,000 acres/13,709,408 acres of corn in Iowa = 15%

11,588,408 acres will still receive commercial N & P fertilizer

Manure quantity

SAMPLE!

SAMPLE!

SAMPLE!

Especially when utilizing liquid manure sources.

Manure value

Dry feed system (N=19)			
Sample location from pit	Average, lb/1,000 gallons	Range, lb/1,000 gallons	Standard Deviation
Nitrogen			
Top Sample	52.2	34.7 - 71.9	10.7
Profile Sample	58.3	34.8 - 94.3	15.1
First load sample	57.0	33.9 - 74.3	12.7
Middle load sample	58.0	30.4 - 86.3	14.1
Last load sample	61.1	42.1 - 79.2	11.6
Ammonium			
Top Sample	44.5	29.1 - 70.3	11.8
Profile Sample	44.6	27.9 - 86.3	15.7
First load sample	32.5	19.3 - 49.2	8.8
Middle load sample	32.5	17.7 - 46.7	8.2
Last load sample	32.8	21.7 - 54.9	9.1
Phosphate			
Top Sample	39.4	18.4 - 54.6	10.3
Profile Sample	48.3	24.0 - 120.5	21.9
First load sample	39.1	13.2 - 55.8	12.3
Middle load sample	39.7	12.7 - 70.4	14.4
Last load sample	56.3	24.9 - 103.4	20.7
Potash			
Top Sample	38.6	18.3 - 55.7	9.8
Profile Sample	38.5	26.0 - 52.8	8.4
First load sample	40.5	27.1 - 52.5	8.0
Middle load sample	41.5	26.9 - 62.8	9.7
Last load sample	41.0	25.4 - 62.6	9.9

Wet/Dry feed system (N=26)			
Sample location from pit	Average, lb/1,000 gallons	Range, lb/1,000 gallons	Standard Deviation
Nitrogen			
Top Sample	56.7	21.6 - 85.3	14.3
Profile Sample	61.3	27.3 - 98.3	18.7
First load sample	58.2	27.5 - 89.5	15.1
Middle load sample	59.3	28.5 - 92.8	15.4
Last load sample	64.6	41.7 - 95.4	13.3
Ammonium			
Top Sample	45.5	16.3 - 74.2	14.2
Profile Sample	47.3	18.7 - 85.9	18.1
First load sample	36.8	17.2 - 71.1	13.0
Middle load sample	35.5	20.4 - 70.2	13.1
Last load sample	38.2	19.4 - 77.8	13.0
Phosphate			
Top Sample	36.7	16.5 - 59.5	12.8
Profile Sample	46.9	22.4 - 78.3	14.3
First load sample	38.2	12.6 - 71.7	11.3
Middle load sample	41.5	14.5 - 77.2	11.9
Last load sample	51.4	34.1 - 87.7	12.7
Potash			
Top Sample	42.8	27.2 - 62.4	7.3
Profile Sample	43.7	29.8 - 60.2	7.2
First load sample	45.5	19.3 - 63.5	9.4
Middle load sample	46.4	19.2 - 68.5	9.5
Last load sample	47.0	21.5 - 67.5	7.9

Manure value

Sioux Co., Iowa

Iowa DNR Manure Management Plan Form Appendix A.

Manure Type	N	P	K
Swine (wet/dry feed)	58	40	45
Swine (dry feed)	50	42	30
Dairy (liquid)	25	12	11
Beef (liquid)	40	25	35
Dairy & Beef (dry)	12	6	12

Nutrient content

Nutrient content of beef systems

Facility Type	Total N Lbs/space-year	P2O5 Lbs/space-year	K2O Lbs/space-year
Open Lot (runoff not included)	66	48	54
Bedded confinement	98	57	58
Deep pit	94	59	82
Excreted	122	68	93

Via Dan Andersen, ISU ABE

http://themanurescoop.blogspot.com/2016/04/beef-manure-management-systems-manure.html

Nitrogen remaining

Incorporate liquid
98%

Broadcast &
Incorporate liquid
95%

Broadcast liquid
75%

Broadcast solid
70%

Application nutrient loss

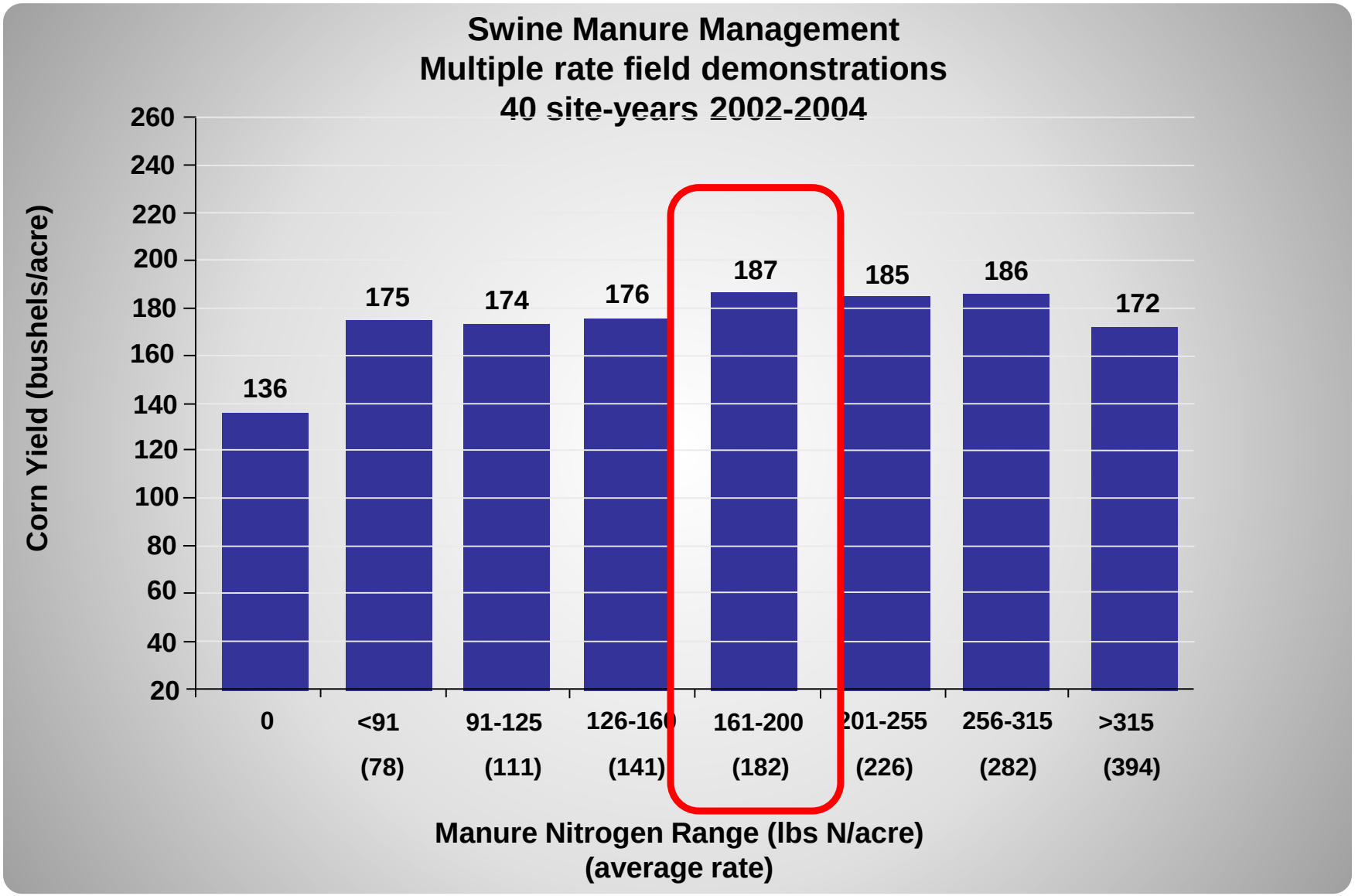
ISU PMR1003

CROP	N	P	K
Corn – grain (200 bu)	190	64	44
Corn – silage (200 bu)	190	88	220
Soybean (60 bu)		43	72
Alfalfa (6 t)		78	258

3300 gallons swine finishing manure has nutrient content of:

188N – 132P – 149K

Crop nutrient needs



Rate of application

Community-led watershed efforts

Phosphorus Index

Measure performance through sampling – manure, soil & water

No-till

Cover crops

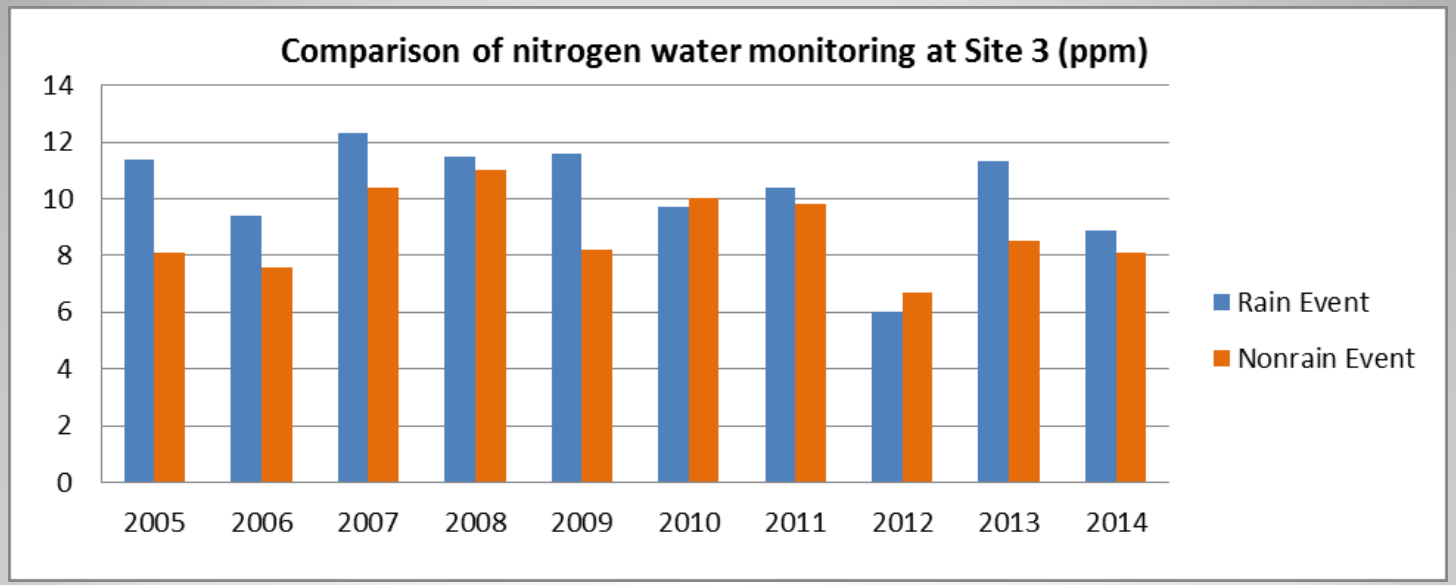
Bioreactors

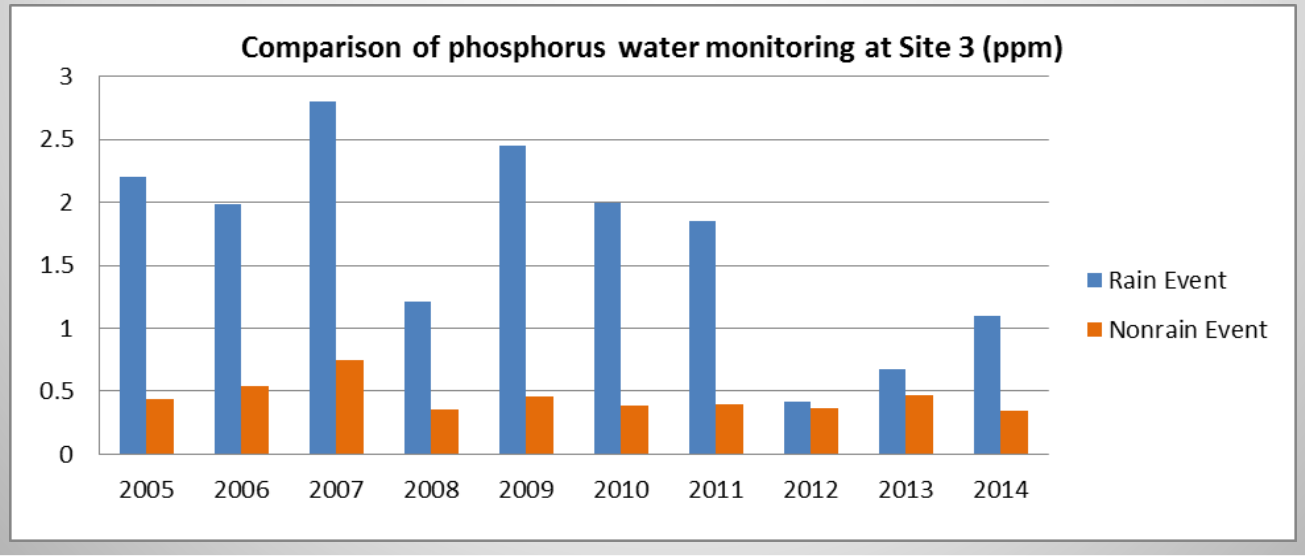
Saturated buffers

Reducing Environmental Impact

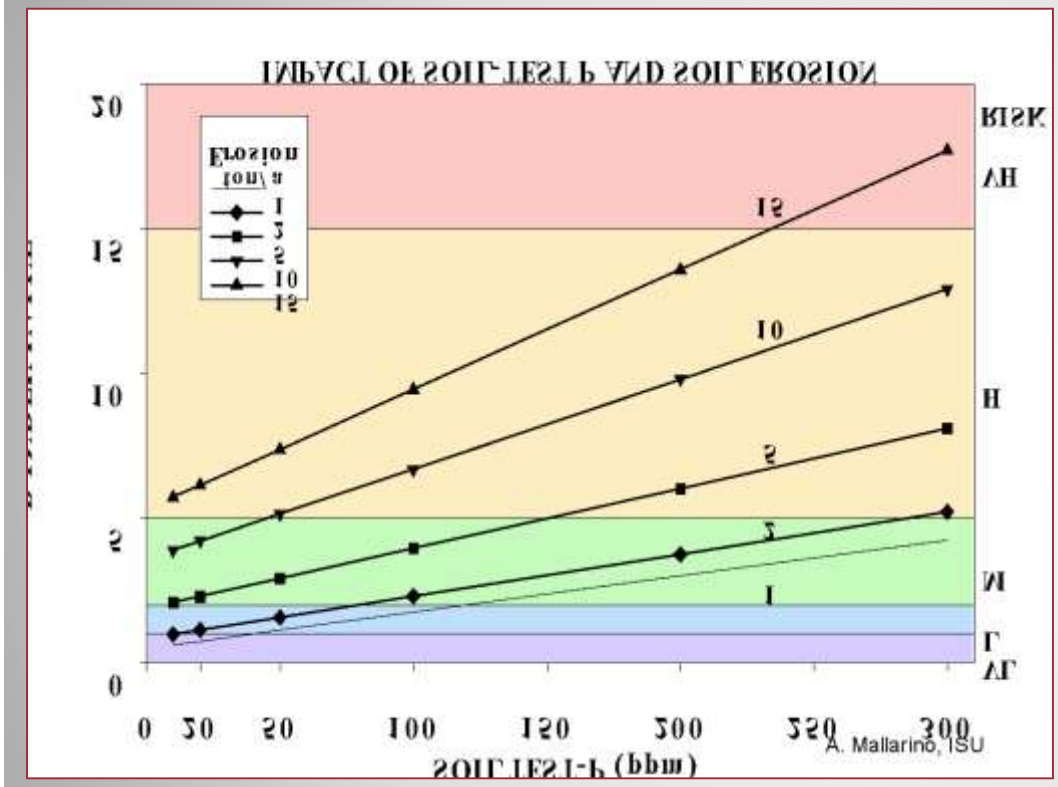
Community-led watershed efforts

Community-led watershed efforts





Community-led watershed efforts

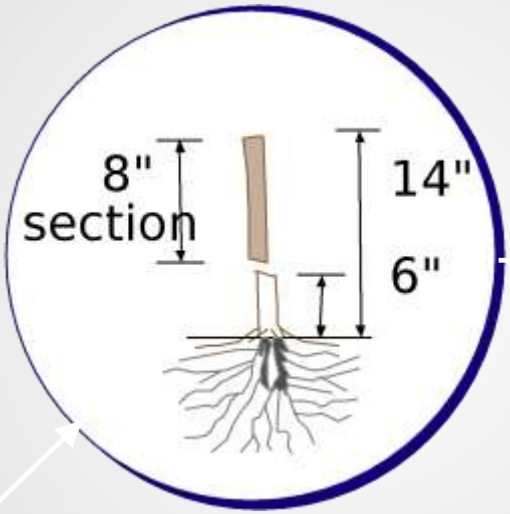


Iowa Phosphorus Index

- Soil loss
- Distance to stream
- Soil test P
- Management practices
- P application
- Drainage

A measure of the risk of phosphorus loss to the environment.

Phosphorus Index

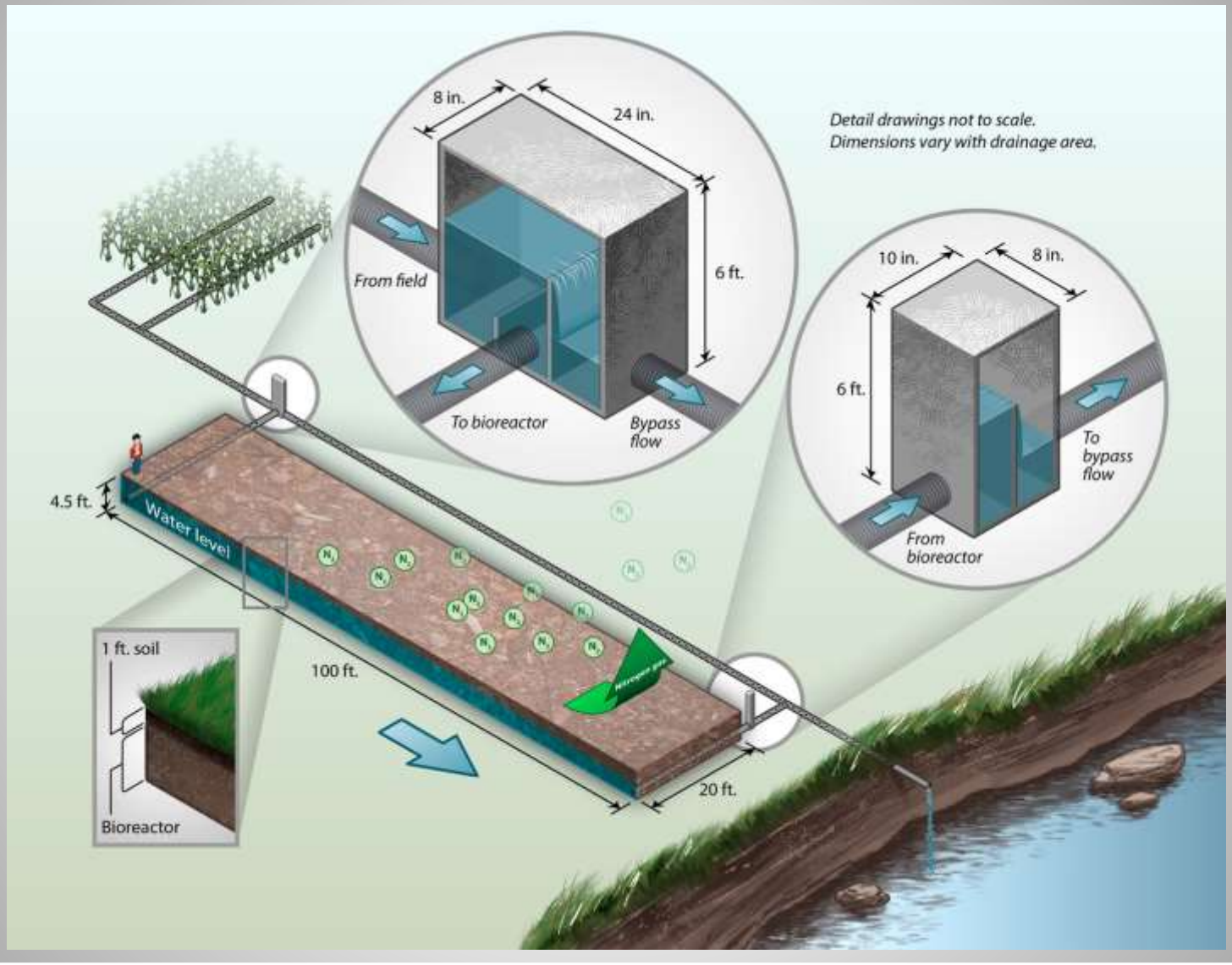


The optimum range is **700-2000 ppm N**. Results falling in the optimum range are expected to produce the most profitable return to the nitrogen/manure investment.

Measure performance in the field

Measure performance in the water

Cover Crops & No-Till



Denitrifying bioreactors

Saturated buffers

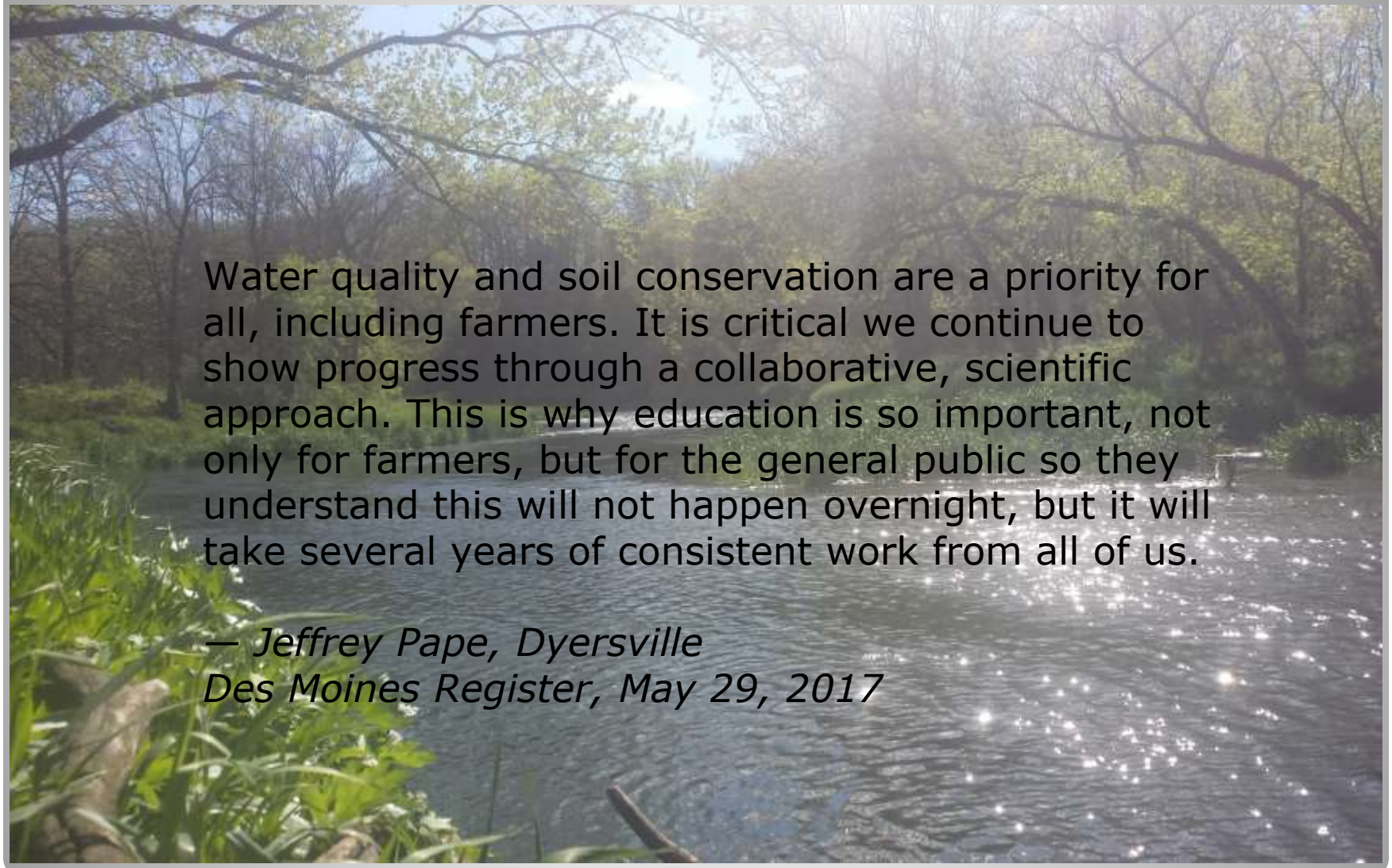
Cover the manure source

WHAT?

WHERE?

WHEN?

Documentation



Water quality and soil conservation are a priority for all, including farmers. It is critical we continue to show progress through a collaborative, scientific approach. This is why education is so important, not only for farmers, but for the general public so they understand this will not happen overnight, but it will take several years of consistent work from all of us.

— Jeffrey Pape, Dyersville
Des Moines Register, May 29, 2017

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