IOWA STATE UNIVERSITY

College of Agriculture and Life Sciences

Saturated Buffers and Wetlands for Nitrate Removal within Drained Landscapes

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Boone County, IA. circa 1914

Bennet, M.J. An Iowa Album: A Photographic History, 1860-1920. University of Iowa Press

Boone County, IA.

Bennet, M.J. An Iowa Album: A Photographic History, 1860-1920. University of Iowa Press

New York Times
September 22, 1910

PAYING $307,000,000 FOR IOWA DRAINAGE

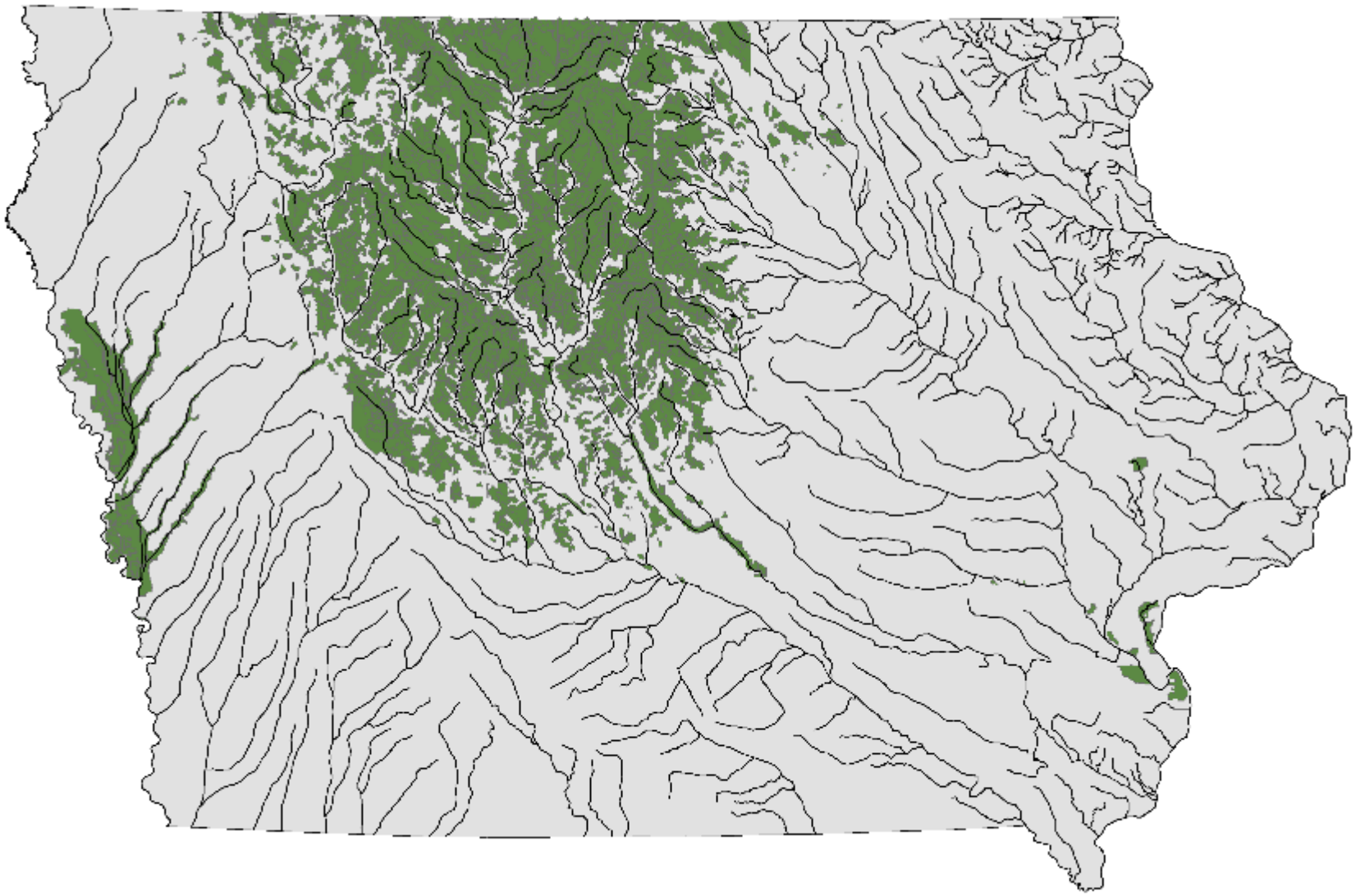
Private Owners of Farms to Spend All But $60,000,000 of the Sum.

TO RECLAIM SWAMP LANDS

Values Will Be Increased Millions of Dollars, Making the State One of the Richest for Agriculture.

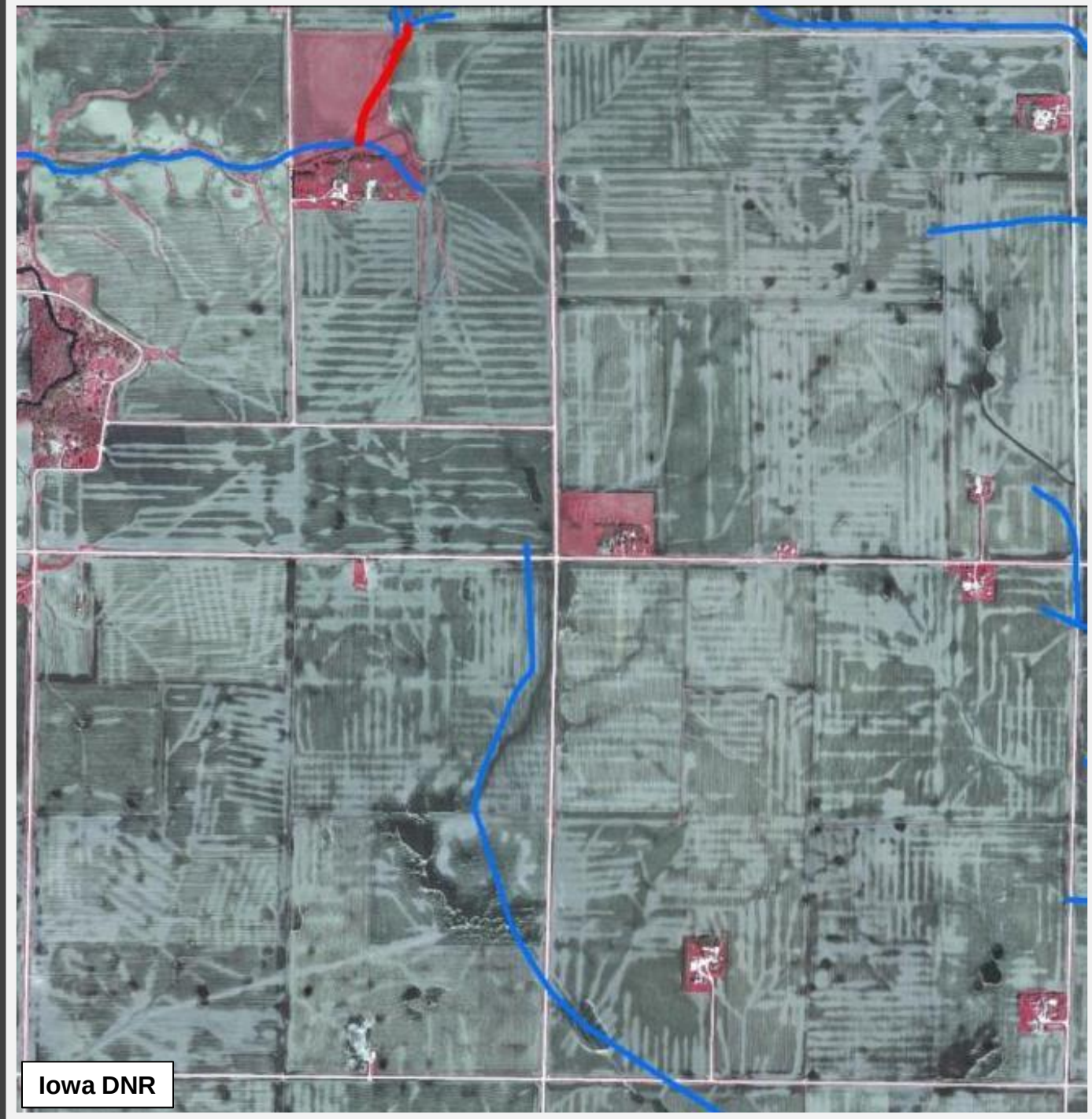
Special to The New York Times.

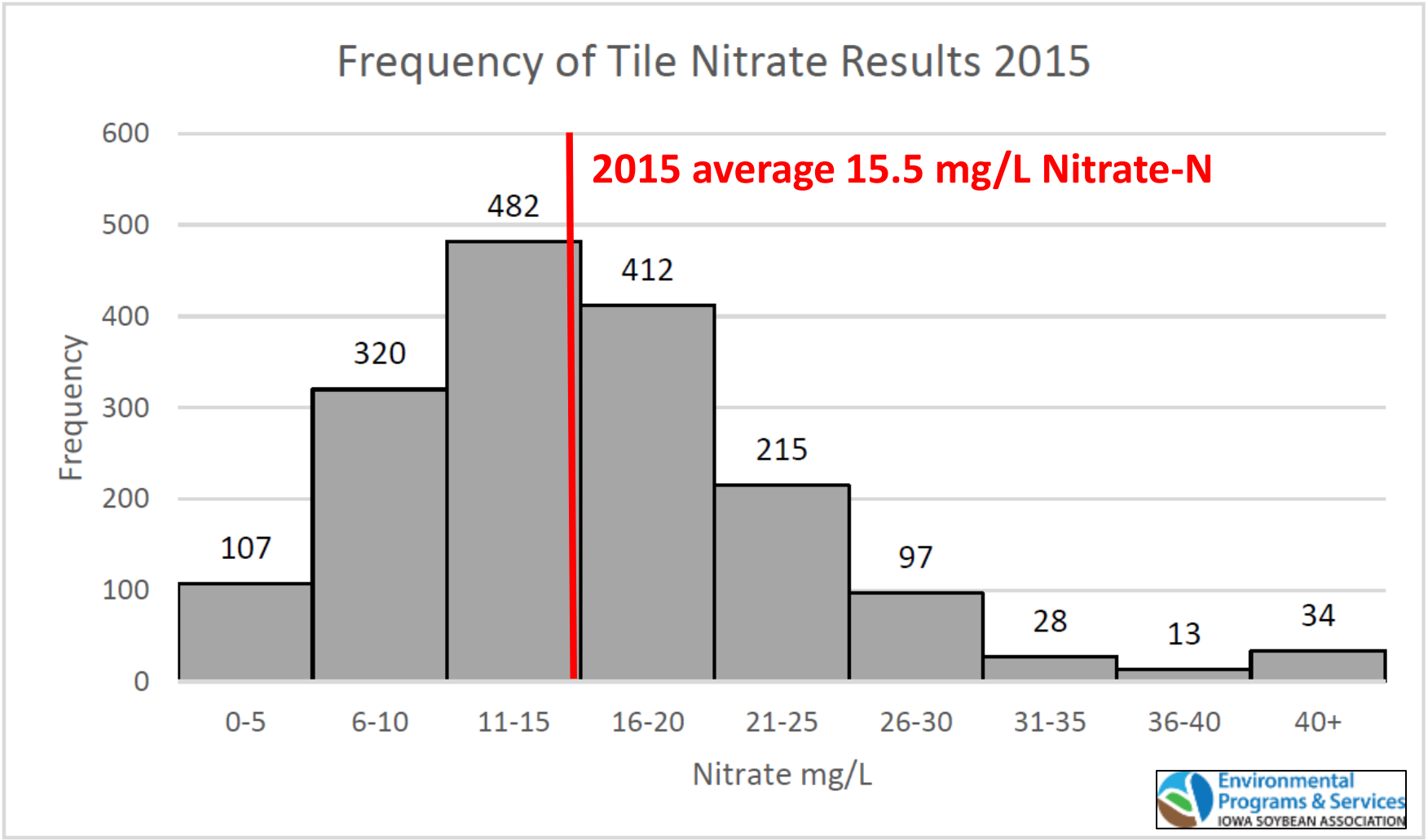
BURLINGTON, Iowa, Sept. 22.—So quietly that the fact has not become known widely, Iowa farmers have been arranging for drainage improvements in their low lands at a cost that will come within $85,000,000 of equaling the expense of building the Panama Canal. The general public has little conception of the extent of the enterprise which will increase the value of Iowa lands by millions of dollars.

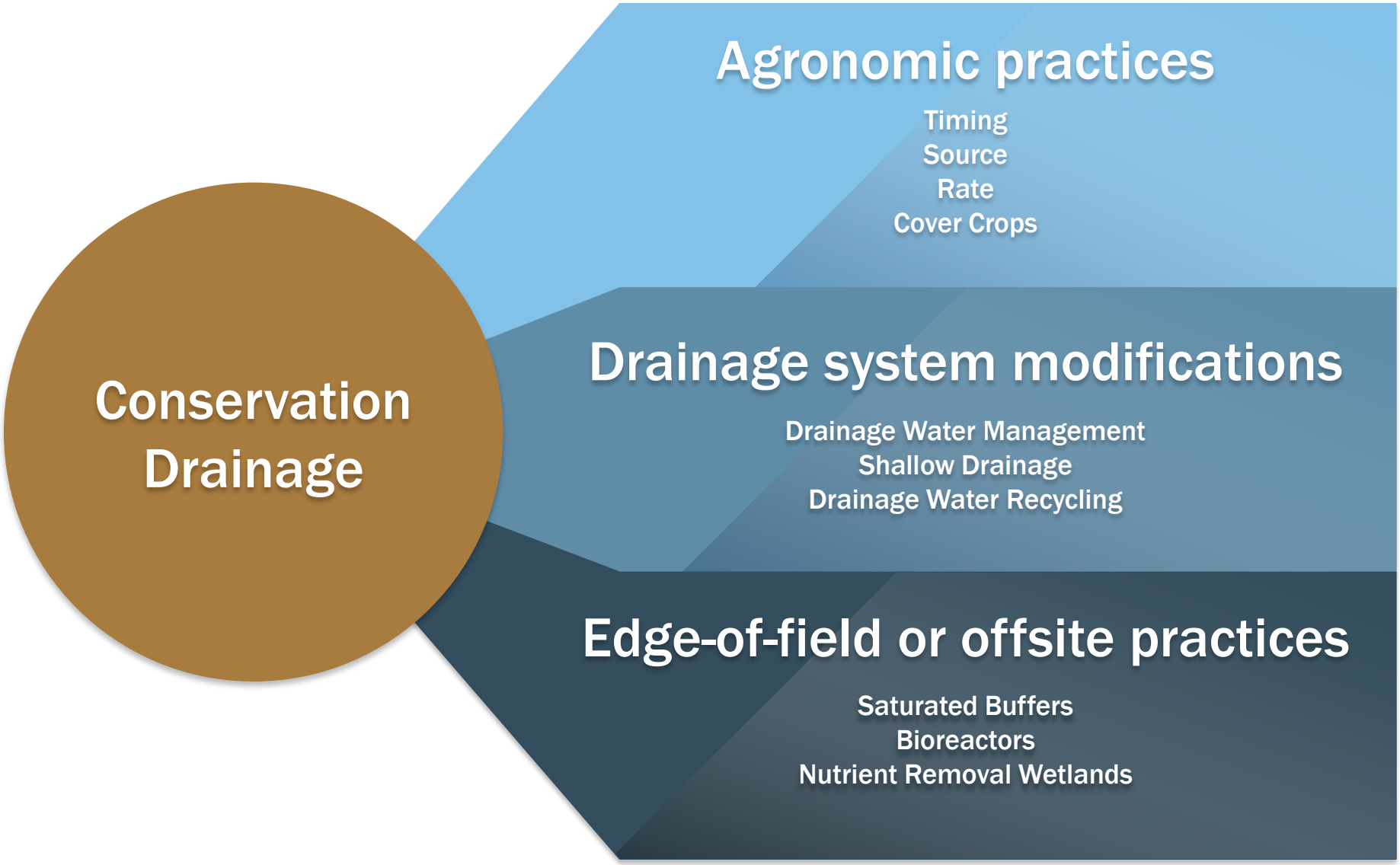


Organized Drainage Districts in Iowa

Iowa DNR


Iowa DNR


Frequency of Tile Nitrate Results 2015
2015 average 15.5 mg/L Nitrate-N
Frequency
600
500
400
300
200
100
0
107
320
482
412
215
97
28
13
34
0-5
6-10
11-15
16-20
21-25
26-30
31-35
36-40
40+
Nitrate mg/L
Environmental Programs & Services
IOWA SOYBEAN ASSOCIATION

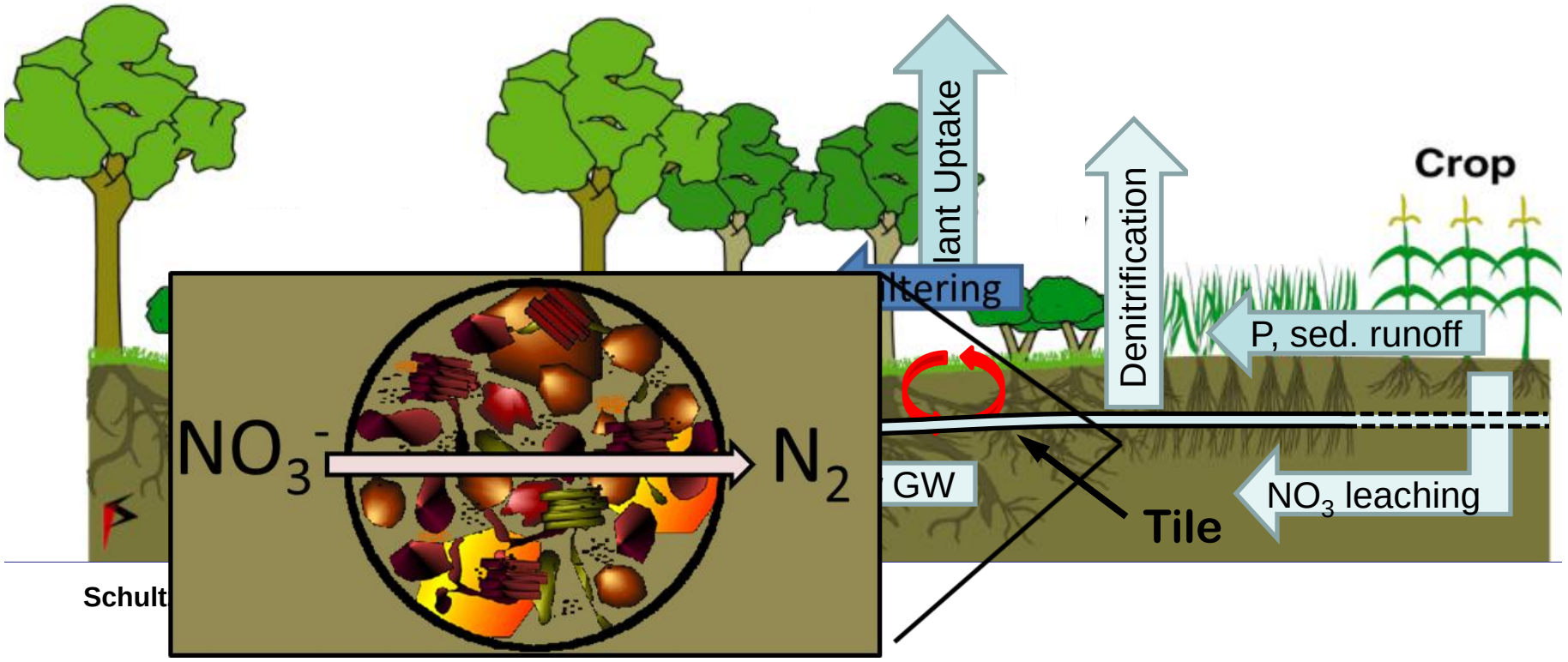


Modified from Iowa Soybean Association


Saturated Buffer
Nutrient Removal Wetland
USDA-NRCS

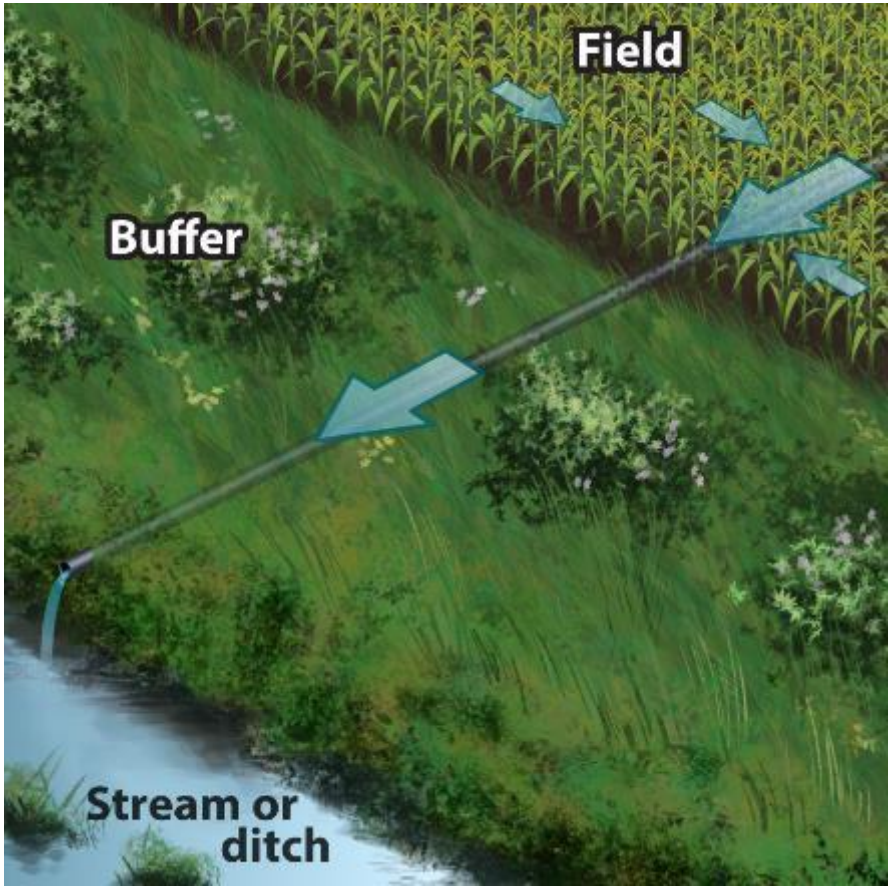
Saturated Buffer

Nutrient Removal Wetland

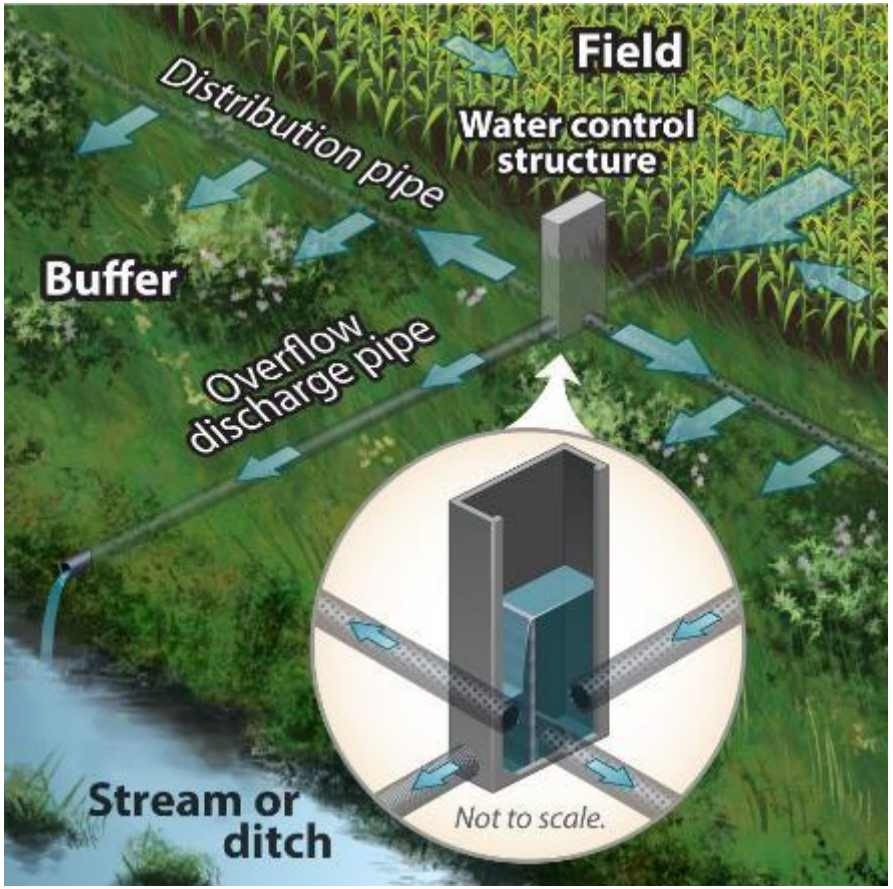


Schult

Conventional Outlet



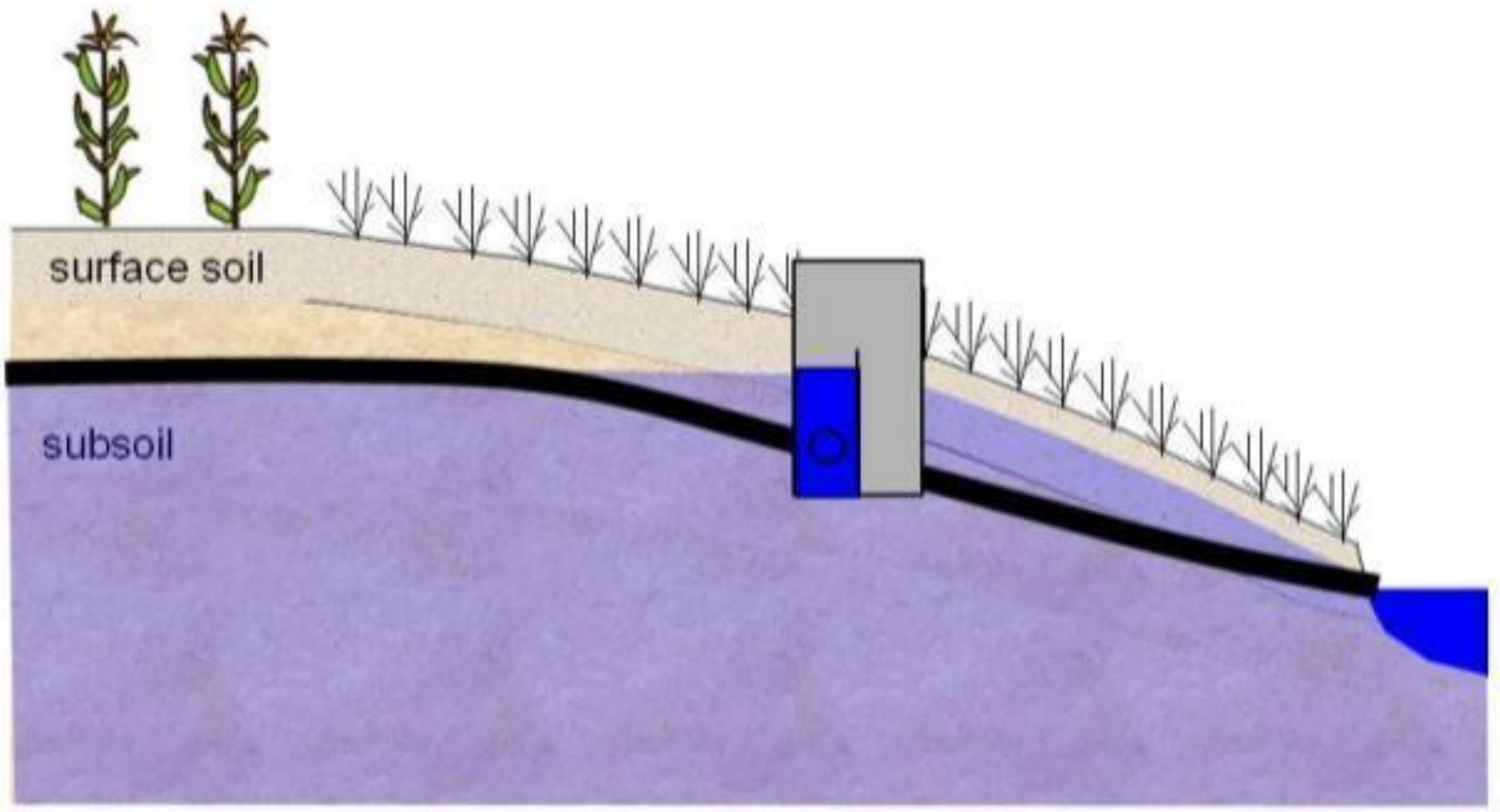
Outlet with Saturated Buffer



Christianson et al. (*In Press*)

Saturated Buffer

Nutrient Removal Wetland



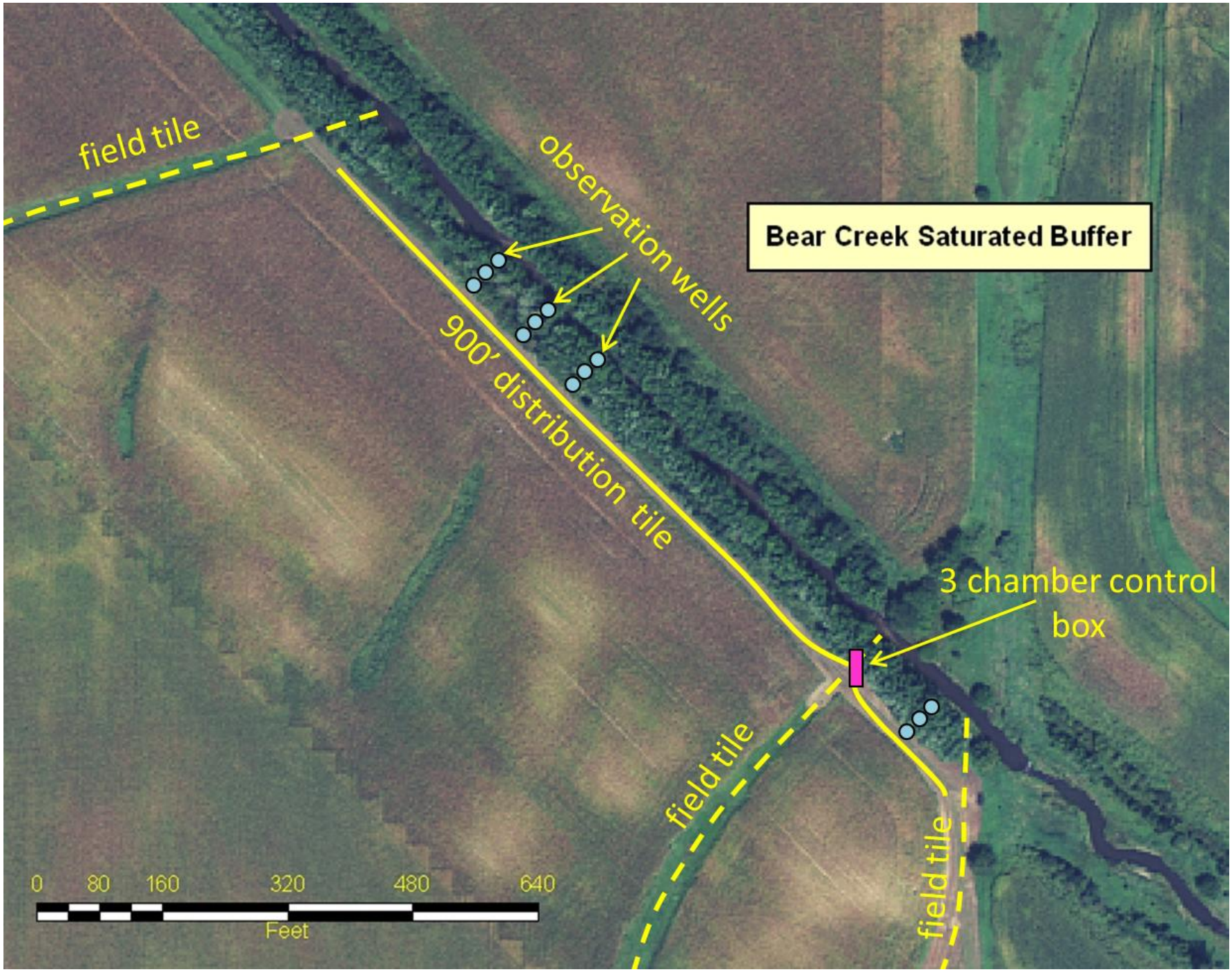
Jaynes and Isenhart

Saturated Buffer

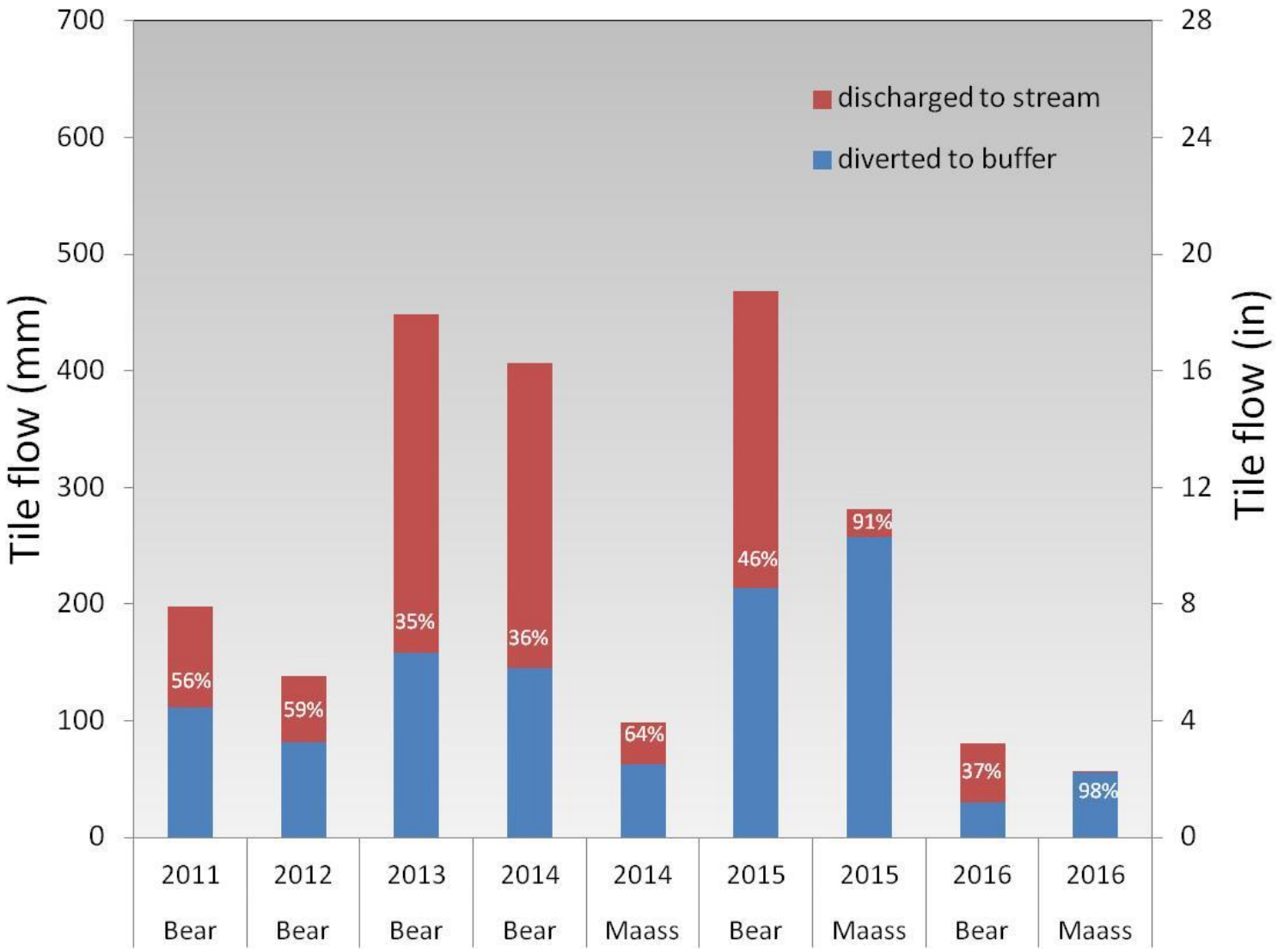
Nutrient Removal Wetland

USDA-ARS


Saturated Buffer
Nutrient Removal Wetland
Lynn Betts

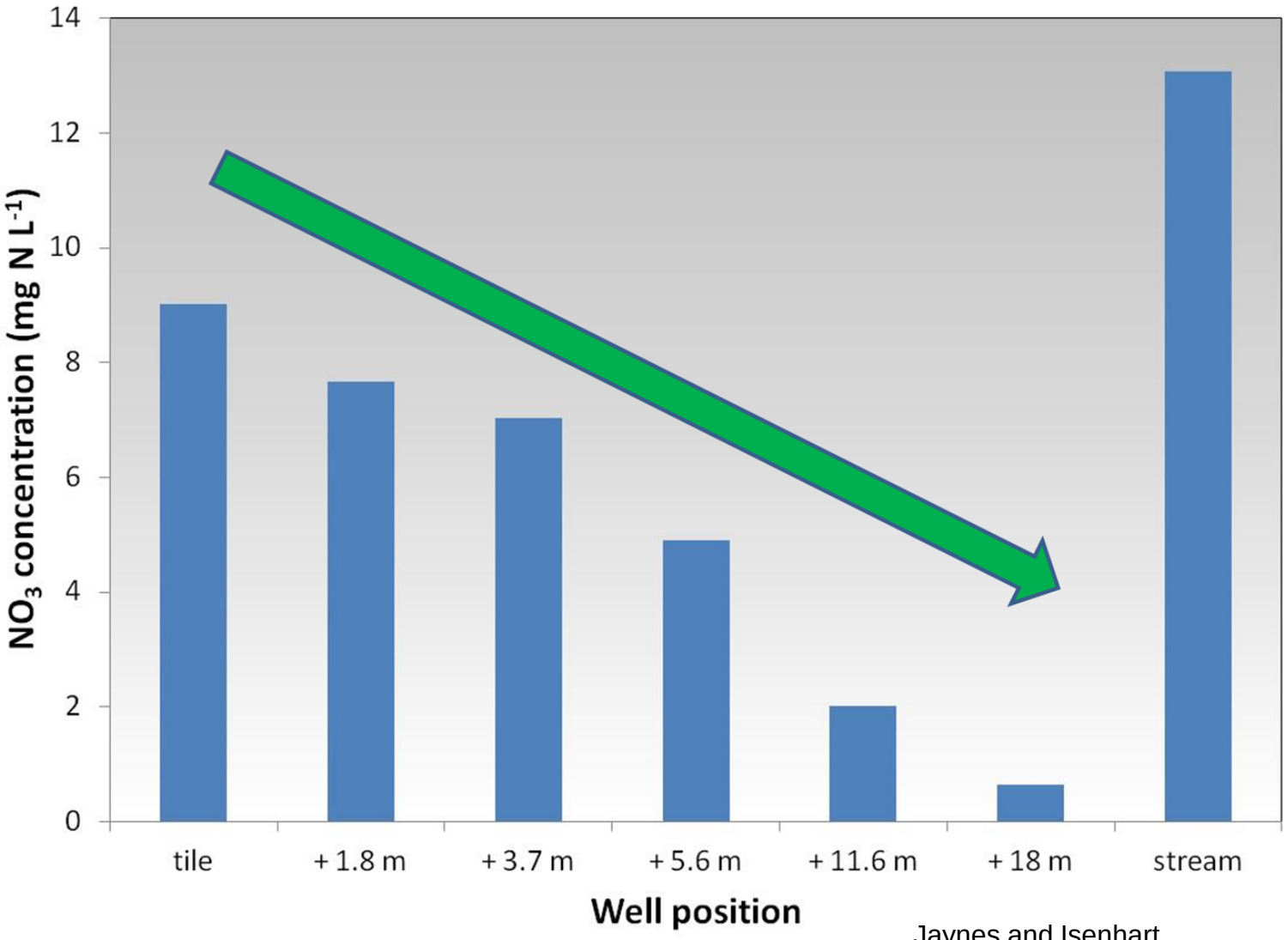

Bear Creek Saturated Buffer
field tile
observation wells
900' distribution tile
3 chamber control box
field tile
field tile
0
80
160
320
480
640
Feet

Tile Flow Diverted or Re-directed through Saturated Buffer



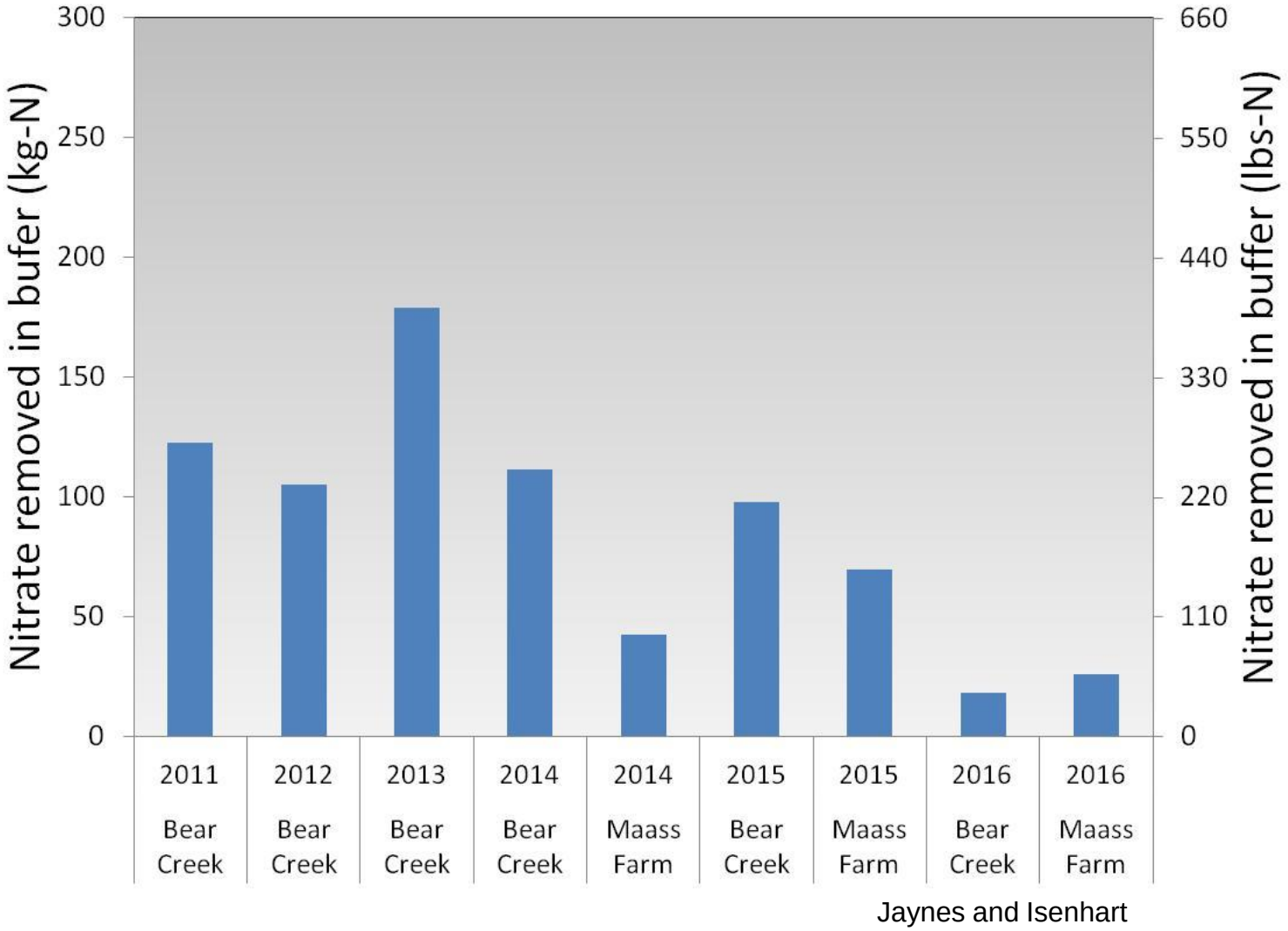
Jaynes and Isenhart

Average Nitrate in Buffer Wells



Jaynes and Isenhart

Annual Nitrate Removed in Saturated Buffer



Jaynes and Isenhart

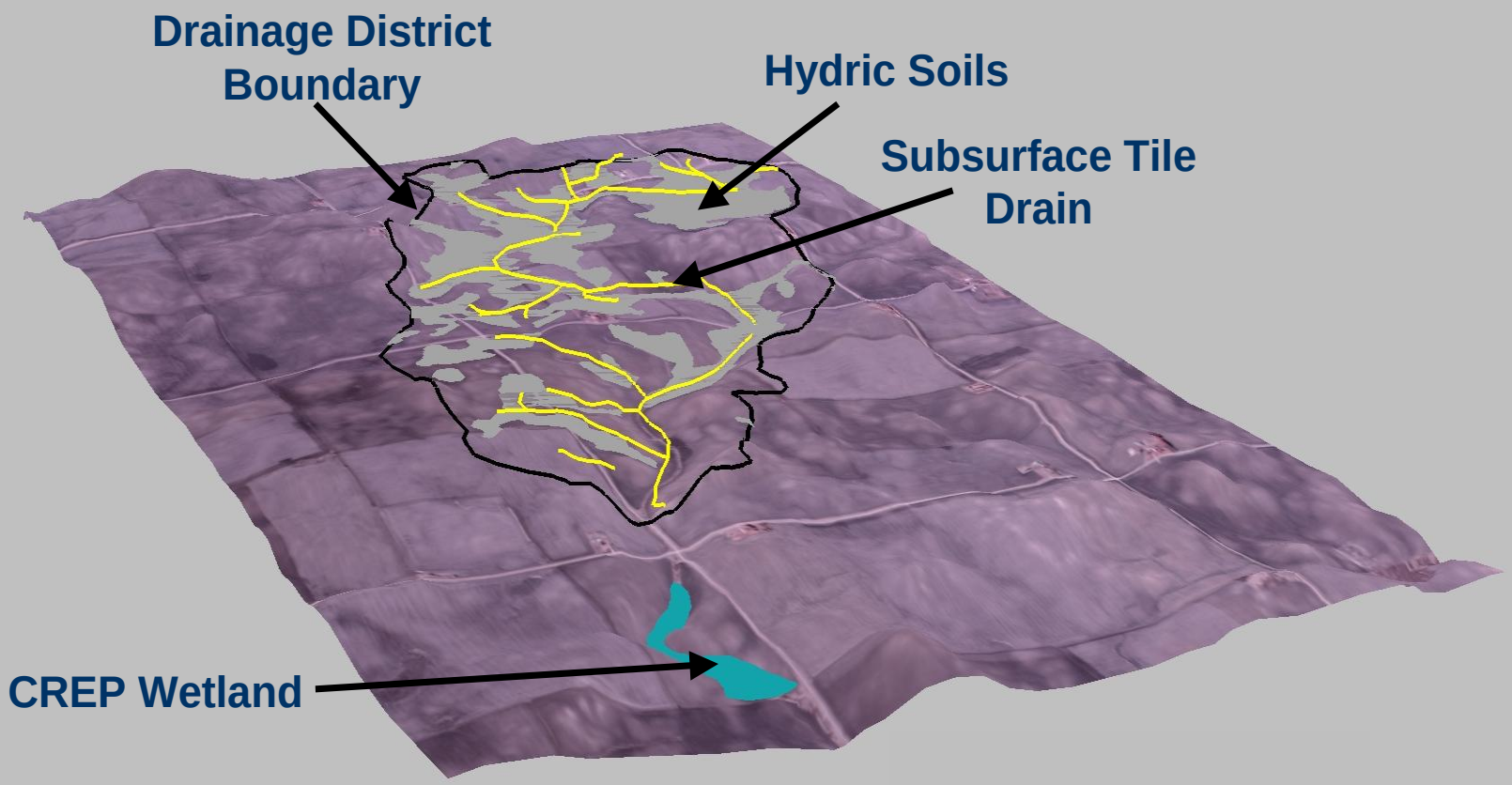
INRS = 50% Removal

Saturated Buffer

Nutrient Removal Wetland

Iowa Department of Agriculture and Land Stewardship

Iowa Conservation Reserve Enhancement Program



Strategic Wetland Targeting

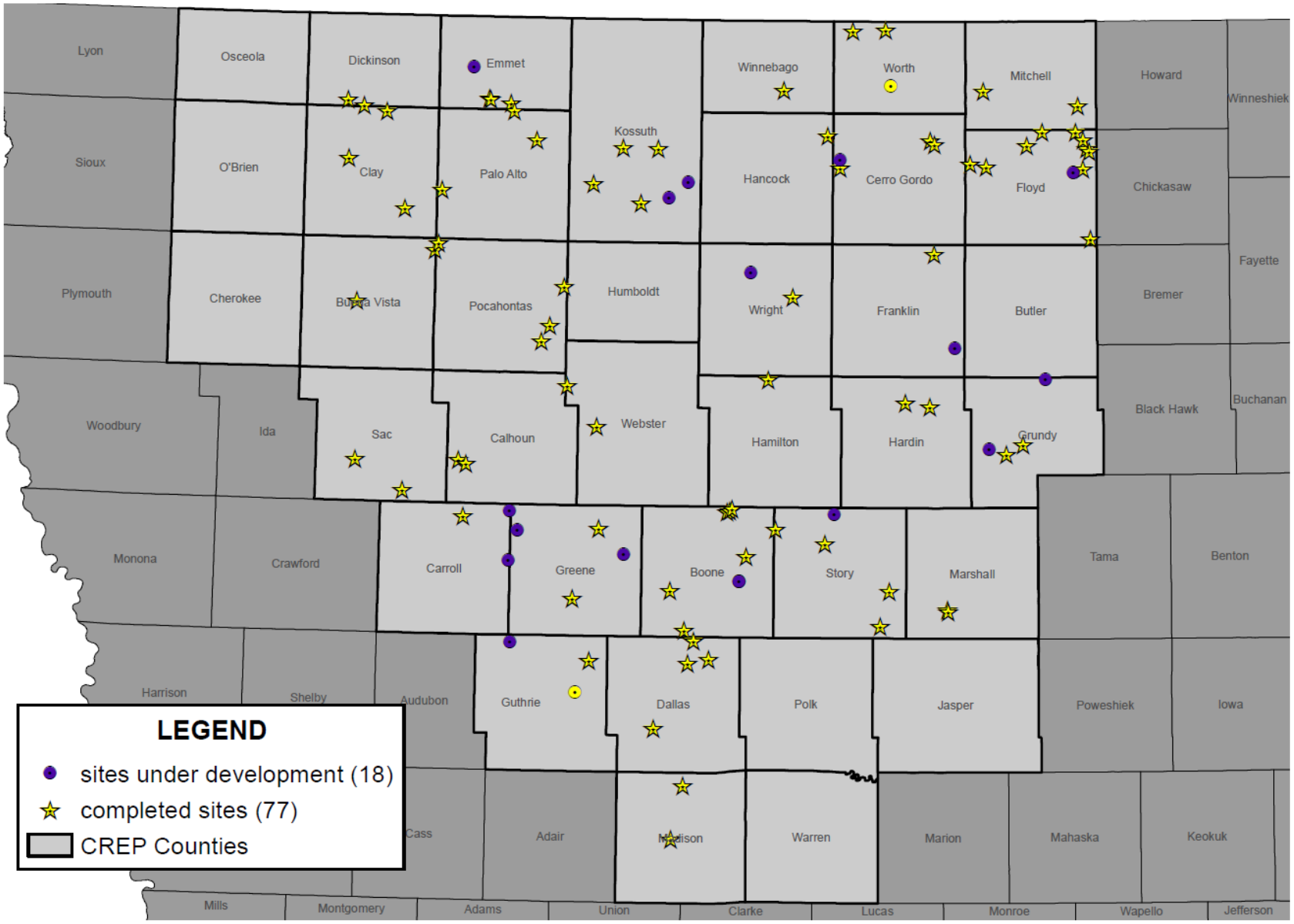
- **Watershed area between 500-4000 acres**
- **Wetland sized at 0.5% to 2% of watershed area**
- **To maintain wetland vegetation, no more than 25% of the wetland should be >3 feet in depth**
- **Designed so that placement of the wetland does not adversely impact drainage rights of upstream and downstream landowners**

Saturated Buffer

Nutrient Removal Wetland

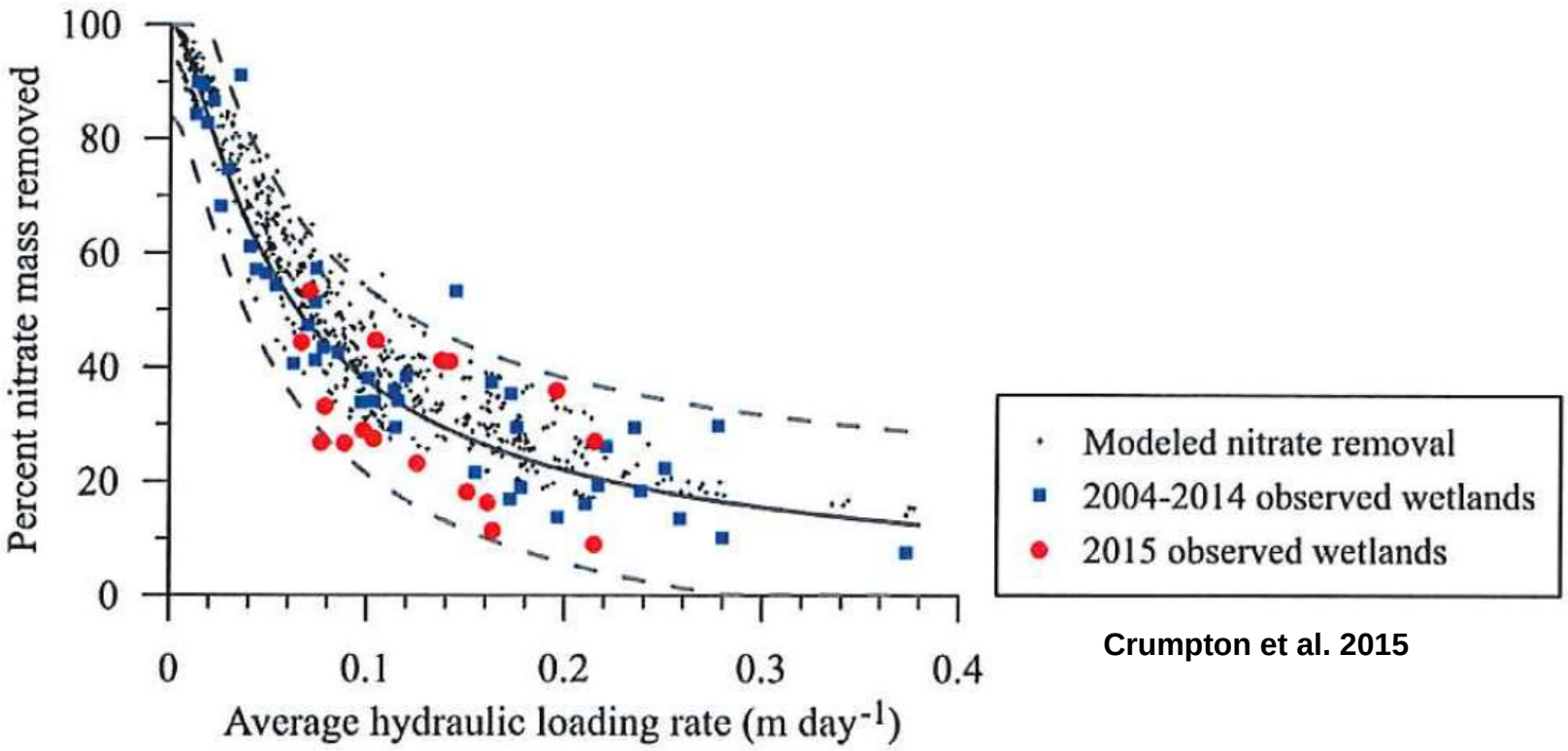
Iowa Department of Agriculture and Land Stewardship

CREP Wetland Status - 2015



Iowa Department of Agriculture and Land Stewardship

Water Quality Performance of Iowa CREP Wetlands



Crumpton et al. 2015

INRS = 52% Removal

Cost of N Removal

Practice	cost ($/lb-N)
Drainage Water Management	1.29
Denitrification Bioreactors	0.92
Saturated Buffers*	1.02
Constructed (CREP) Wetlands	1.32
Rye Cover Crop	3.08

* assuming buffer already in place


USDA-NRCS

Scale of Implementation to Achieve INRS Goals

Example Combination Scenarios that Achieve N and P Goal From Non-Point Sources

		N	P			
Name	Combined Scenario	% Reduction from baseline		Initial Investment (million $)	Total EAC* Cost (million $/year)	Statewide Average EAC Costs ($/acre)
NCS1	MRTN Rate, 60% Acreage with Cover Crop, 27% of ag land treated with wetland and 60% of drained land has bioreactor	42	30	3,218	756	36

Iowa Nutrient Reduction Strategy 2013