

UVM Tile Drainage Research

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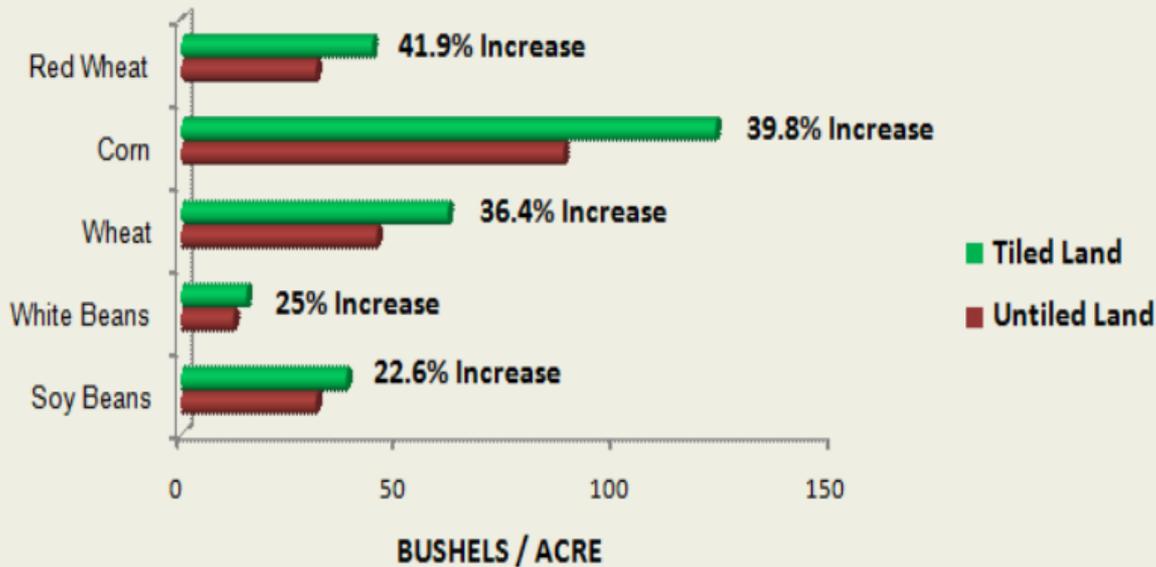
Vermont House Committee on Agriculture and Forestry
3/29/22



Benefits of Drainage

1. Improve crop production and less year-to-year variability
2. Allows earlier and later field operations

Crop Yield Increase Measured in Bushels/Acre

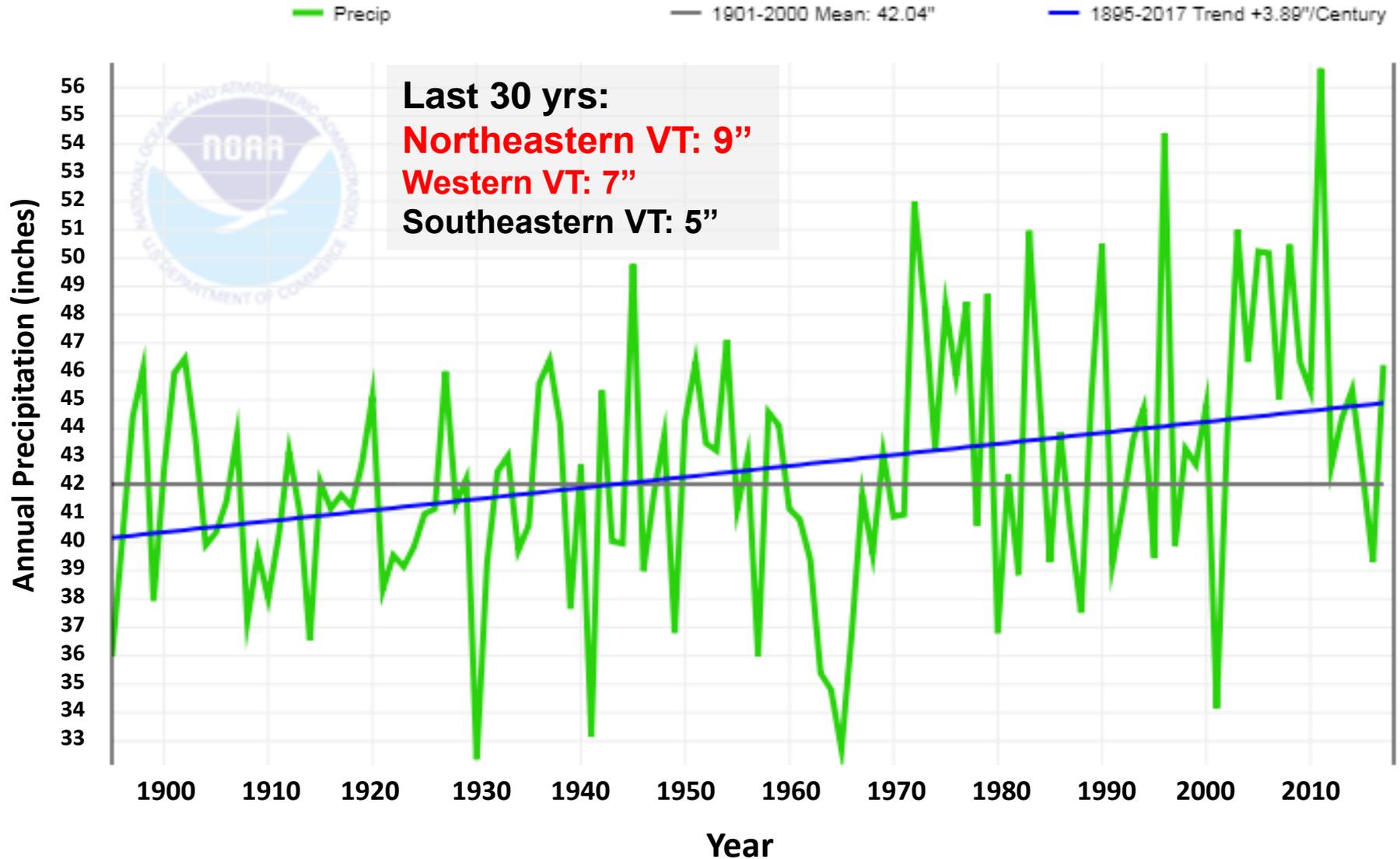


Average of 30% yield increase in corn and soybeans due to drainage over 25 years in Ohio (Reeder et al., 2011)



Sources: The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), and the National Crop Insurance Services (NCIS) program

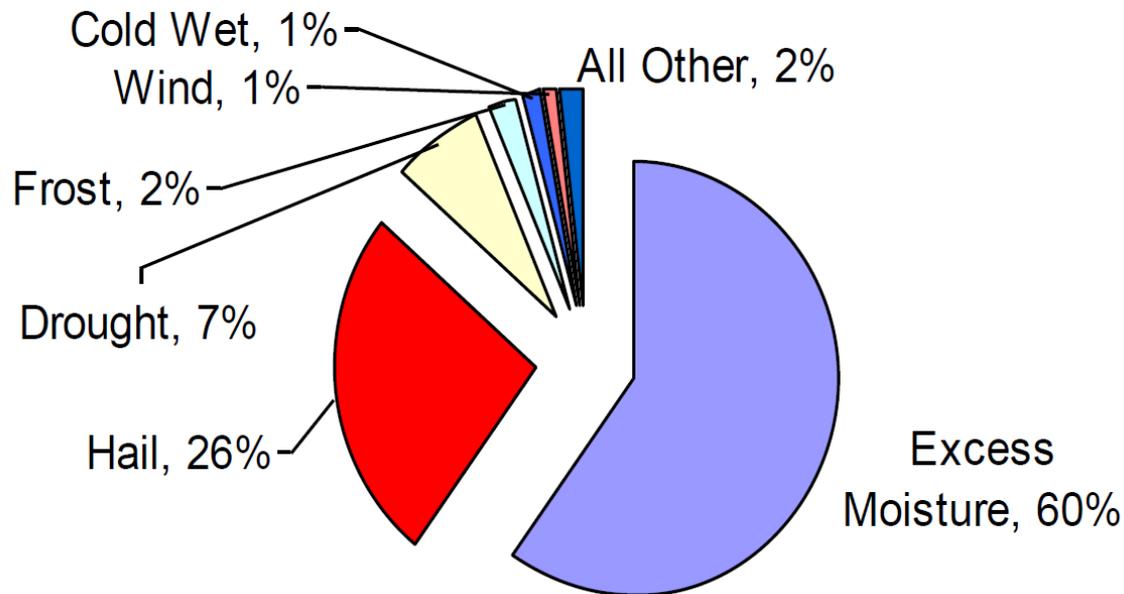
Average Annual Precipitation in the Northeast



Direct and Obvious Impacts...

Why Vermont Crops Fail (2001-10)

Since 1988, Crop Ins. provided
\$213 Bil. of Protection and Paid \$15 Million
in Loss Payments to VT Farmers



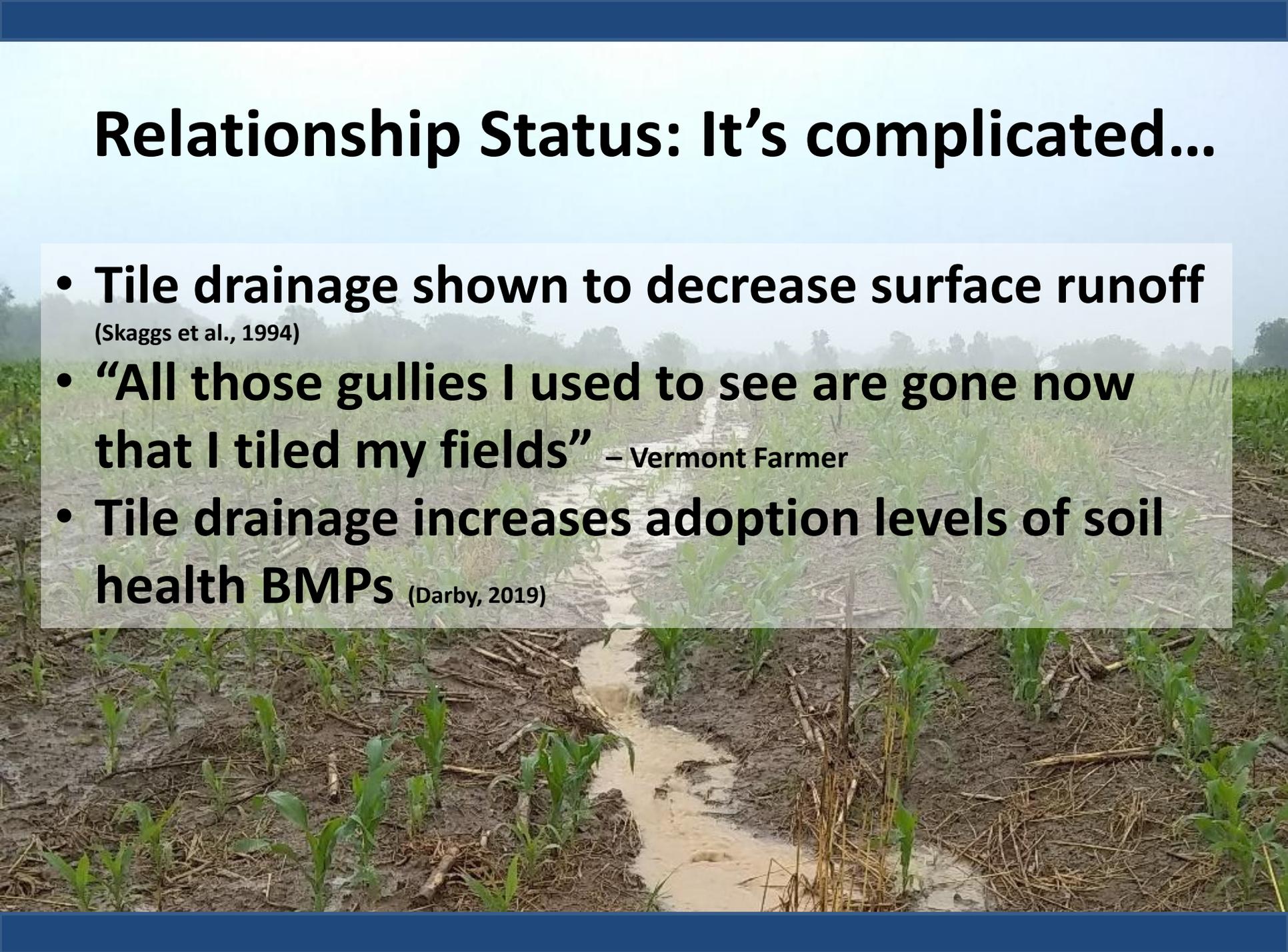
**Artificial drainage first described by Cato
in 200 BC in *De Agric Cultura***

***'The question then is not whether one can afford to
drain, but whether one can afford not to drain' –
Annual Report of the Vermont Ag Experiment Station, 1912***

**PLATE III. Cyclone Ditcher, drawn by six horses. (Courtesy Hon. E. S.
Brigham, St. Albans.)**

Relationship Status: It's complicated...

- **Tile drainage shown to decrease surface runoff**
(Skaggs et al., 1994)
- **“All those gullies I used to see are gone now that I tiled my fields”** – Vermont Farmer
- **Tile drainage increases adoption levels of soil health BMPs** (Darby, 2019)



Current and Planned UVM Research

- **AHS Study**
- **Dead Creek Study**
- **Discovery Acres**
- **Stacked Practices/P Filters**
- **VAAFMM Monitoring Data Analysis**

AHS Tile Study: From Nov 2, 2018 thru July 21, 2019,

37



Managing
planting

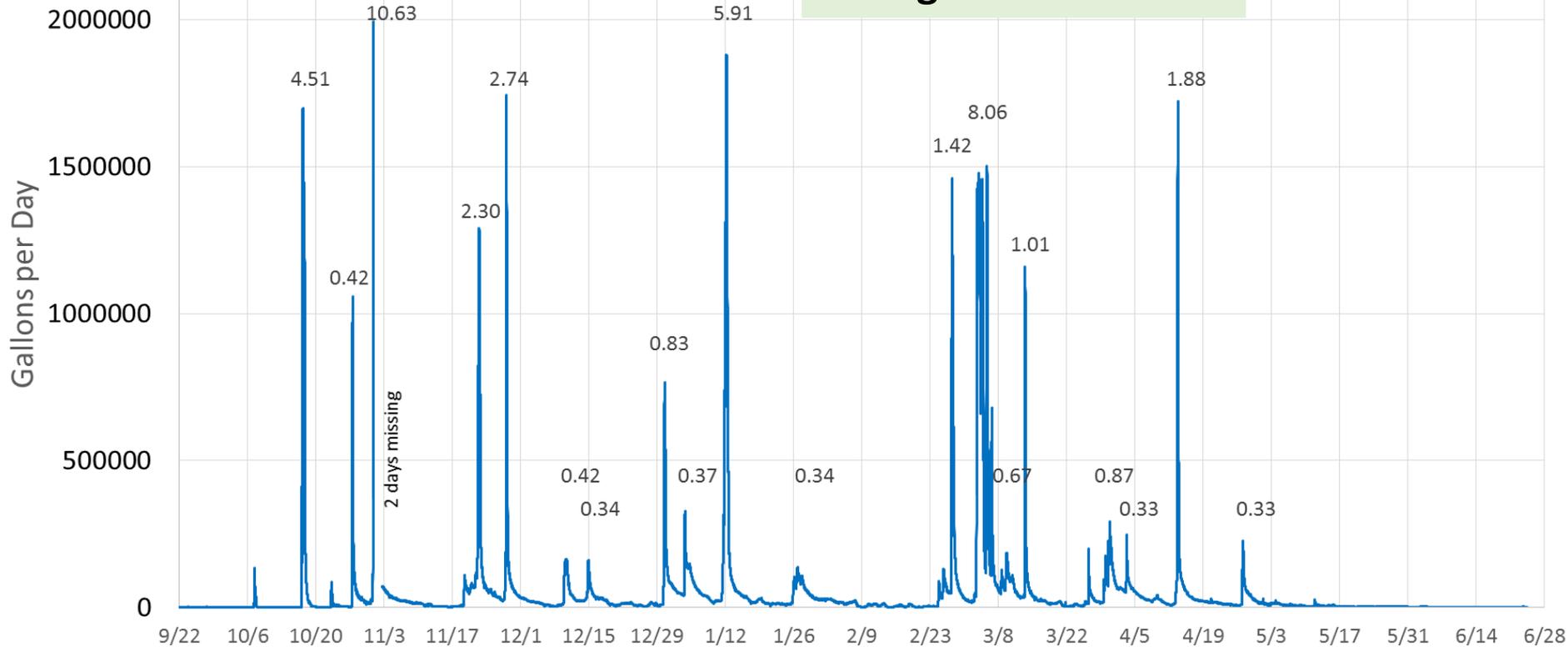
AHS Tile Study: From Oct 7, 2019 thru June 3, 2020, 45.0 lb of TP was exported or 1.4 lbs/acre

Units: gal/day and lbs

96% of TP load occurs during events

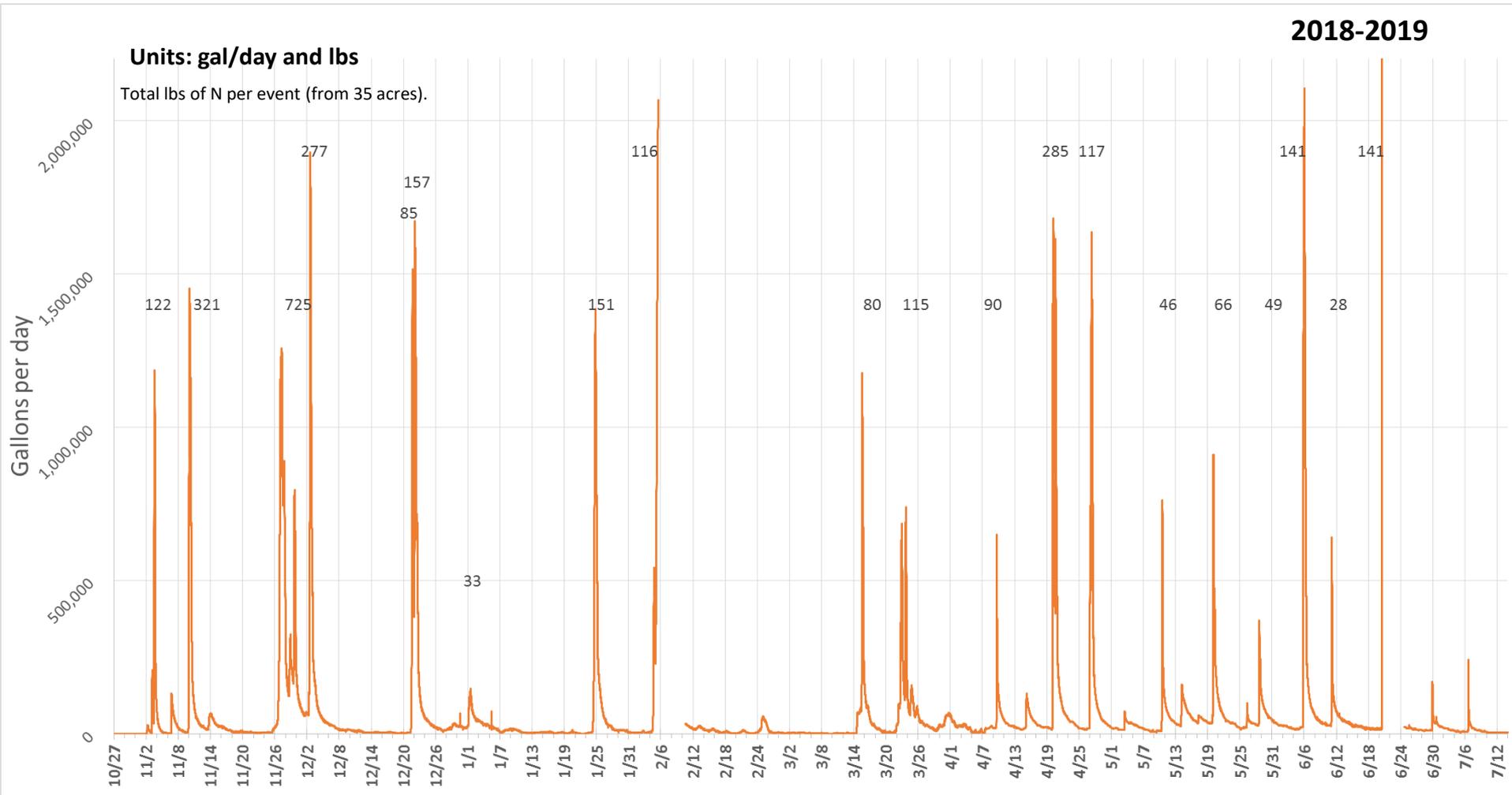
2019-2020

Total lbs of P per event (from 35 acres).



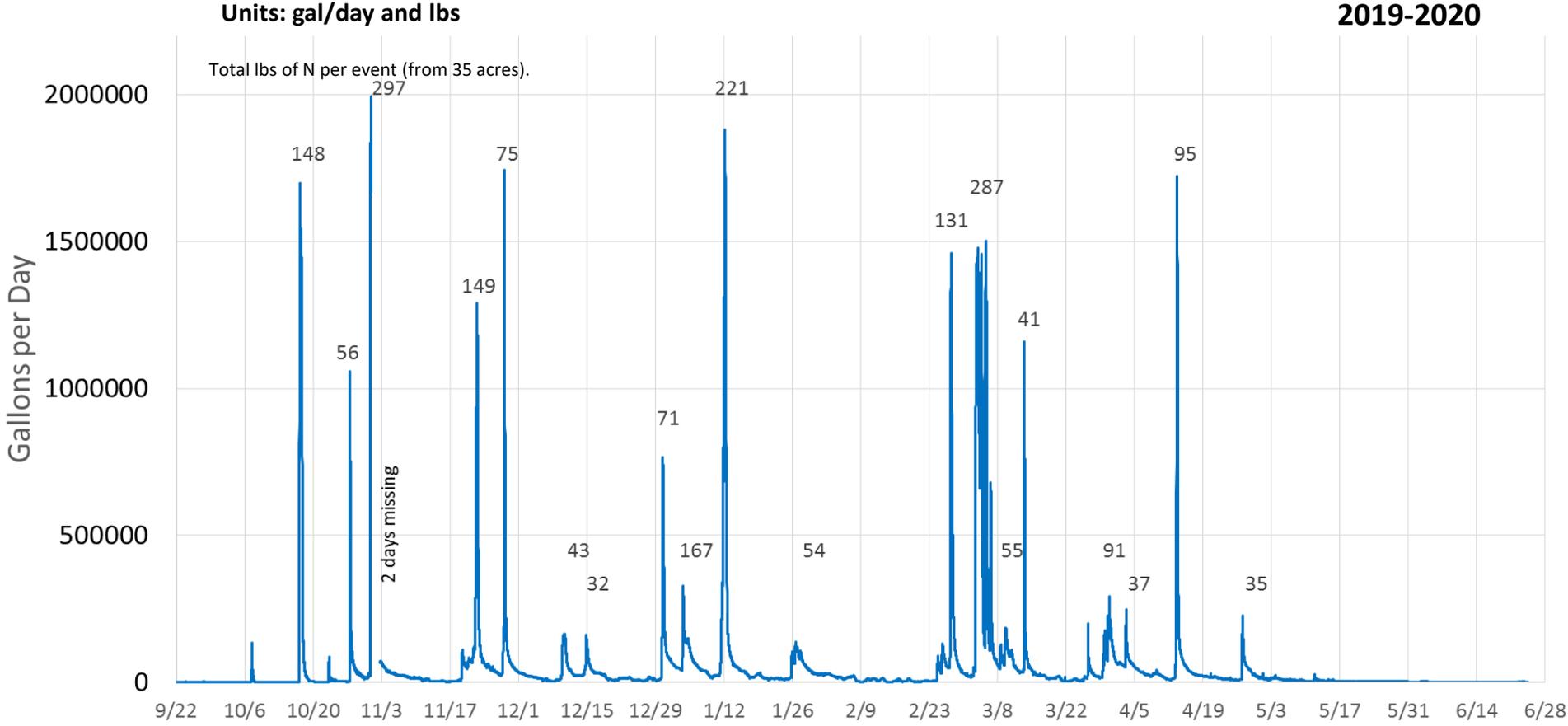
Management: Corn silage, fall injection, cover crops, very light spring tillage before planting

Nitrogen Concern\$? Nov 2, 2018 thru July 21, 2019, 3,894 lbs of TN was exported or 111 lbs/acre



Management: Corn silage, fall injection, cover crops, very light spring tillage before no-till planting

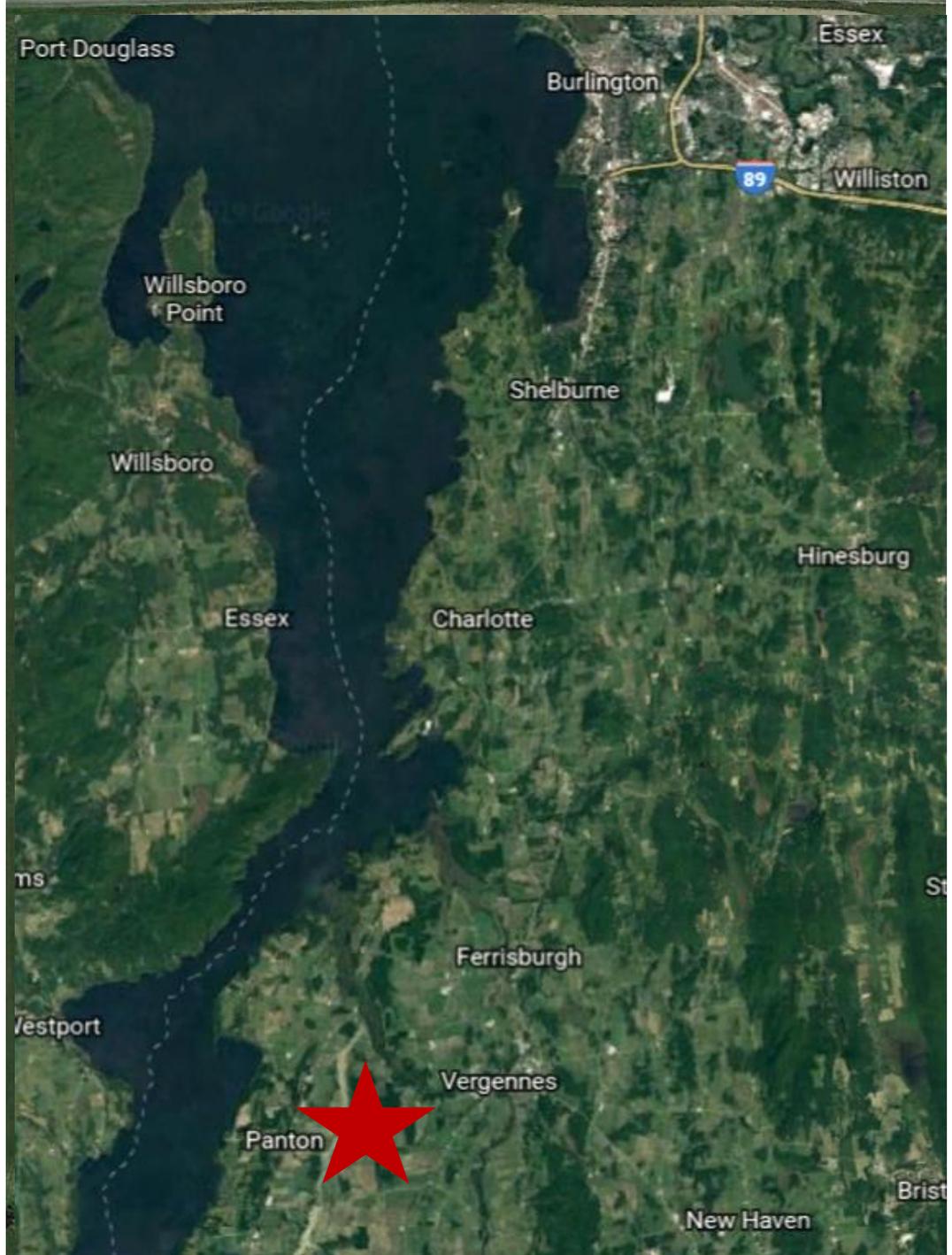
Nitrogen Concern\$? Oct 7, 2019 thru June 3, 2020, 2493 lb of TN was exported or 71 lbs/acre



Management: Corn silage, fall injection, cover crops, very light spring tillage before no-till planting

Dead Creek Study Site

- Addison Co.
- New tile
 - Fall 2017
- 77% Covington cl.
- Corn silage, manure injection, cover crop
- High level of farmer interest and cooperation
- Funded by LCSG



Dead Creek Study: Total Phosphorus Loss (2020 & 2021)

- Very dry conditions: 56% (2020) and 68% (2021) of typical precipitation

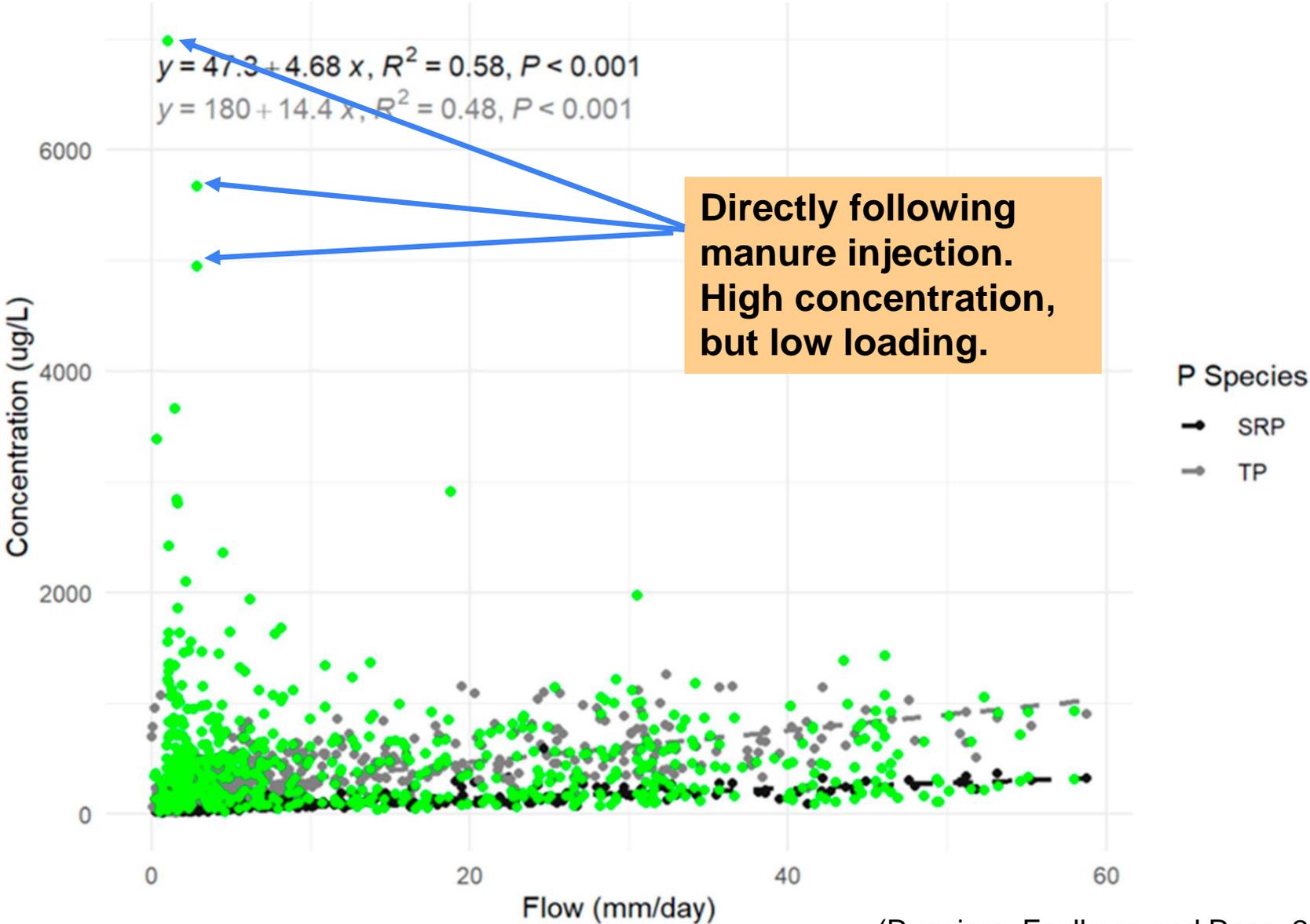
Table 1: Total Phosphorus Loss from Dead Creek Fields (lb/ac)

Field	2020			2021		
	Growing Season	Non-Growing	Total	Growing Season	Non-Growing	Total
DC-North	0.07	0.67	0.74	0.58	0.54	1.12
DC-South	0.42	0.28	0.70	0.39	0.28	0.67

- TP loss was generally within ranges reported elsewhere in the country (0.35 – 1.4 lb/ac/yr) (King et al., 2015)
- Monitoring will continue and the effect of manure injection will be evaluated

(Ruggiero, Faulkner, and Ross, 2022)

Concentration and Flow Rates



(Ruggiero, Faulkner, and Ross, 2022)



Discovery Acres (St. Albans Bay)

- Four large plots
 - Two tile drained and two undrained
- Surface and subsurface runoff being monitored
- Comparison of BMP to conventional management on drained and undrained land
- Currently in calibration period



Discovery Acres

Existing Ditches: 

Plastic 'curtain': 

System #1: 

System #2: 

System #3: No drainage

Watershed boundary: 

Surface Runoff Station: 

Tile Station: 

Study Area Boundary: 



Stacked Practices Project

Runoff Treatment



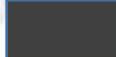
Tile Treatment



In-field Practices

Control
Side

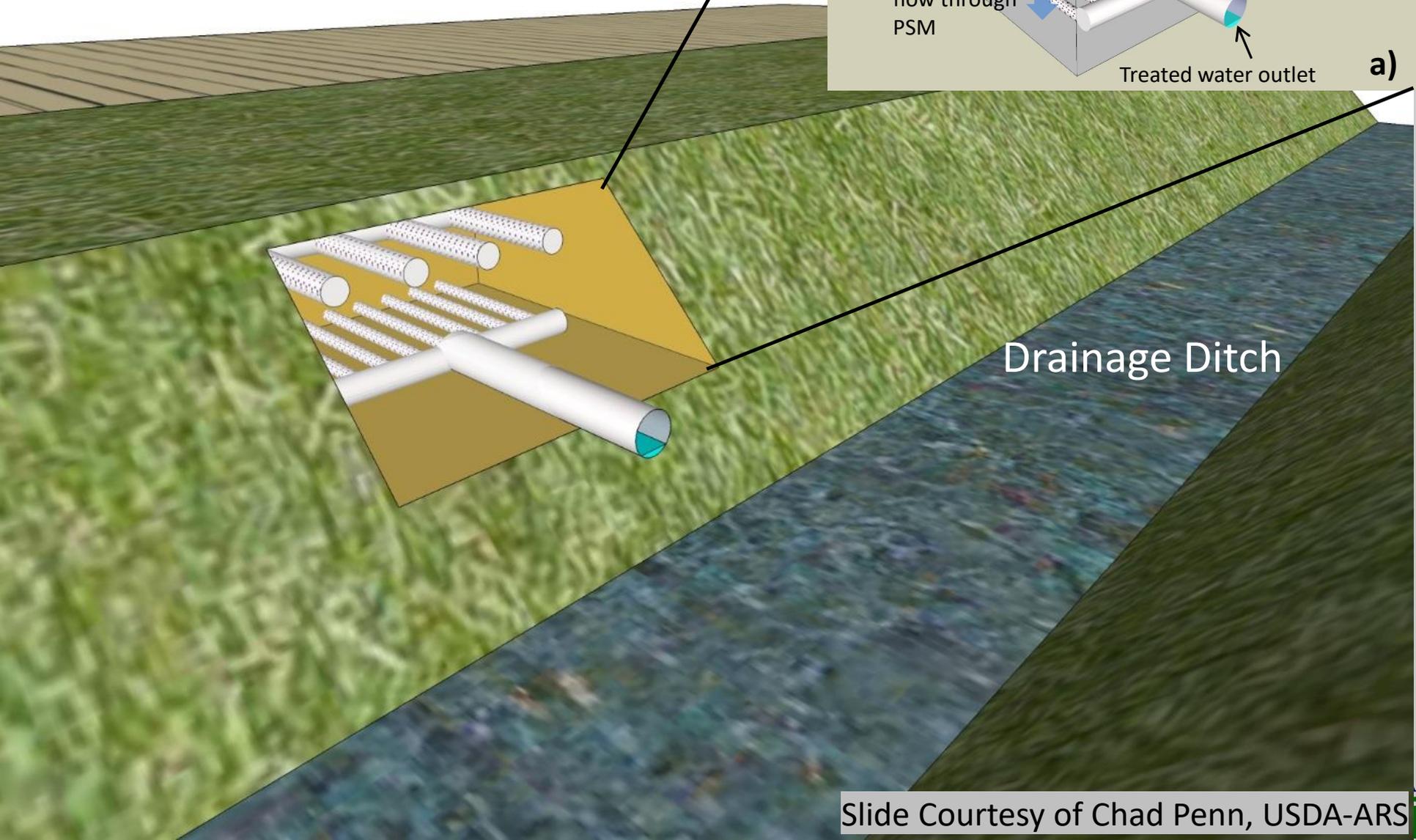
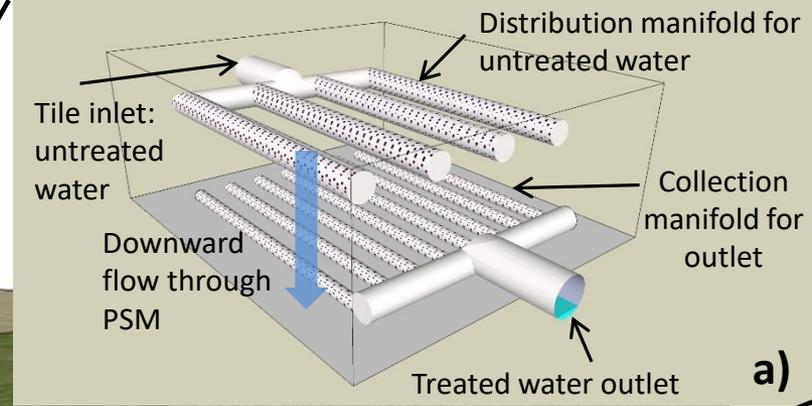
Treatment
Side

-  : Existing ditch
-  : Tile treatment
-  : Ditch Filter
-  : Monitoring station
-  : Surface watershed

In-field management practices being 'Stacked'

Control	Treatment
Conventional tillage	No-till
Broadcast manure	Injected manure
No cover crop	Cover crop

Tile Drain P Filters



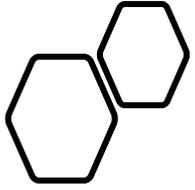
Paired Ditch Filter: To be filled with P filter media



Discrete %P removed



3,500



Questions?

