Field Edge Monitoring in Minnesota

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2024 MVTL Agronomy Update Meeting

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Upcoming Nitrogen and Nutrient Management Conferences

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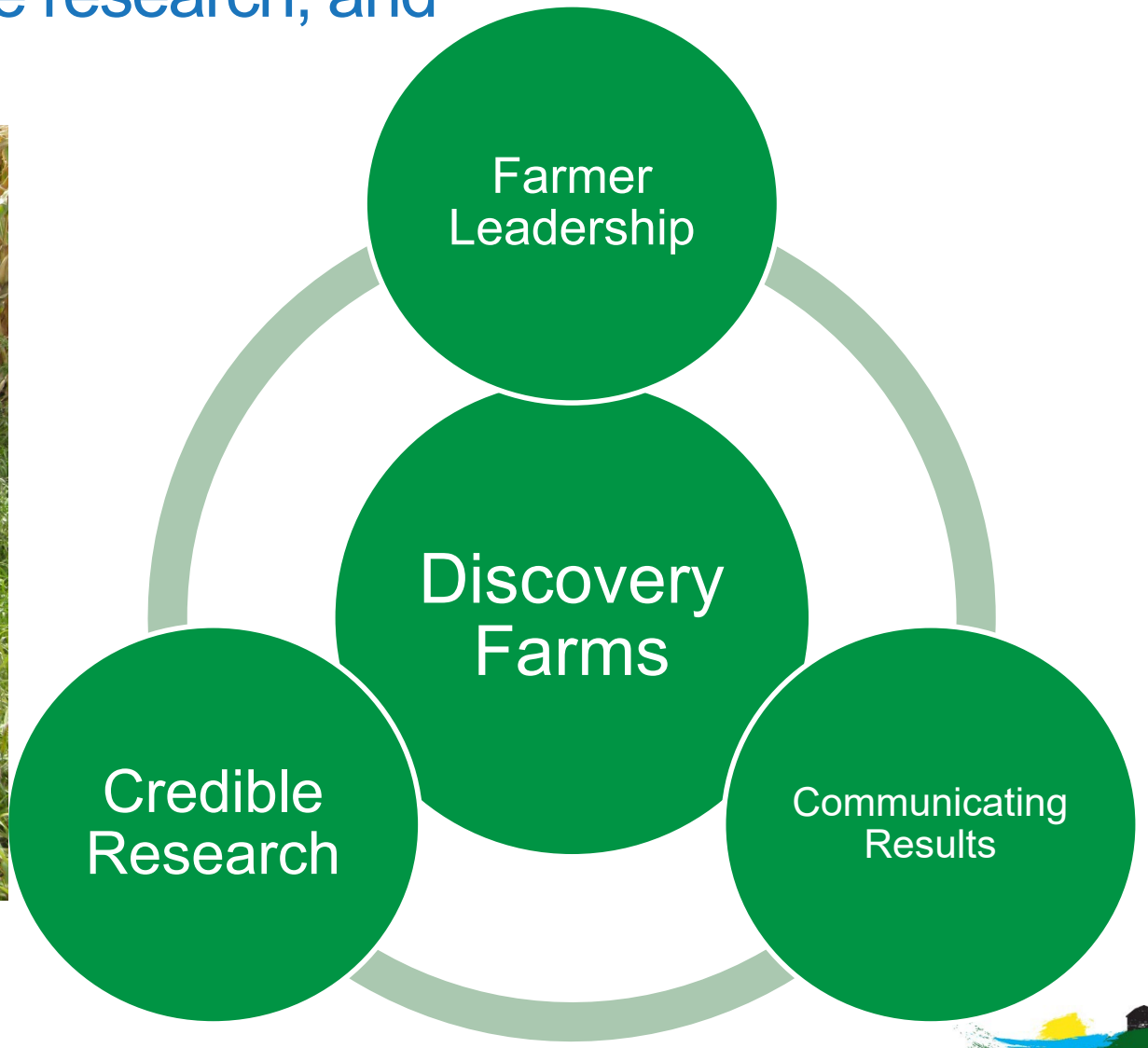
Discovery Farms is a farmer led water quality research and educational program, provides credible research, and communicates results



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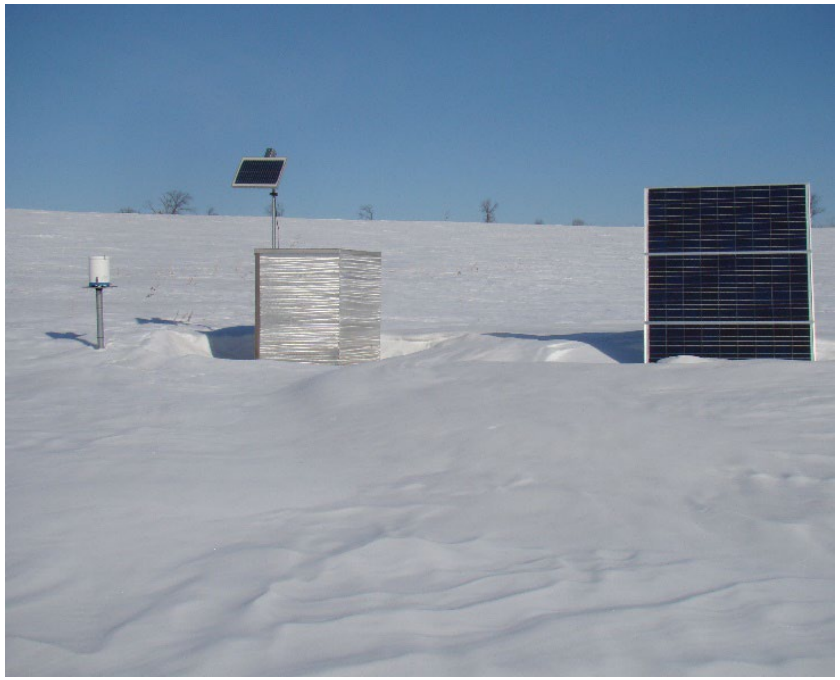
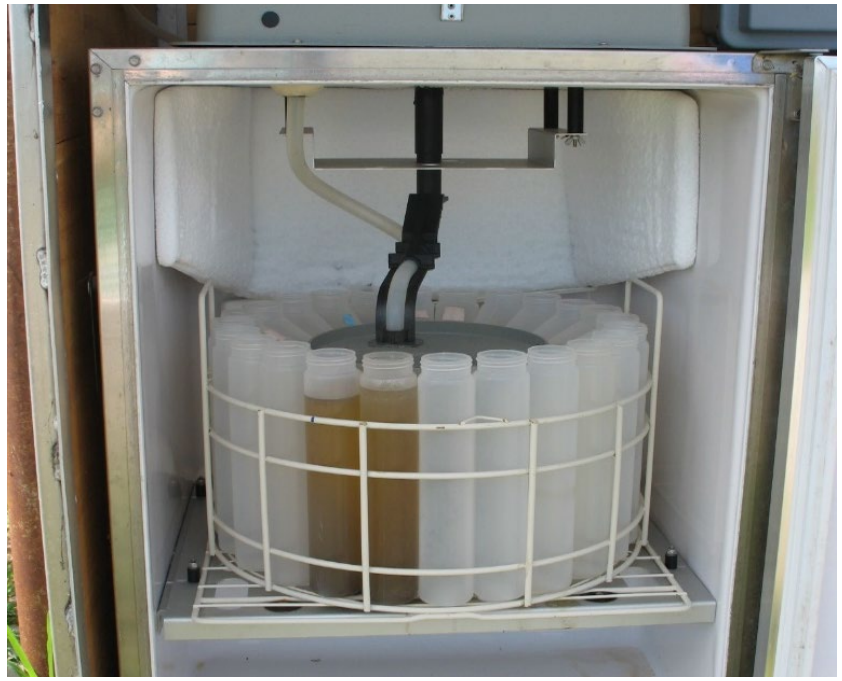
Edge-of-field surface runoff and tile drainage data is collected 365 days a year

Weather • Soil

Flow • Sediment

Nitrogen • Phosphorus





Flow Volume X Concentration (ppm) = Loss (lb/ac)

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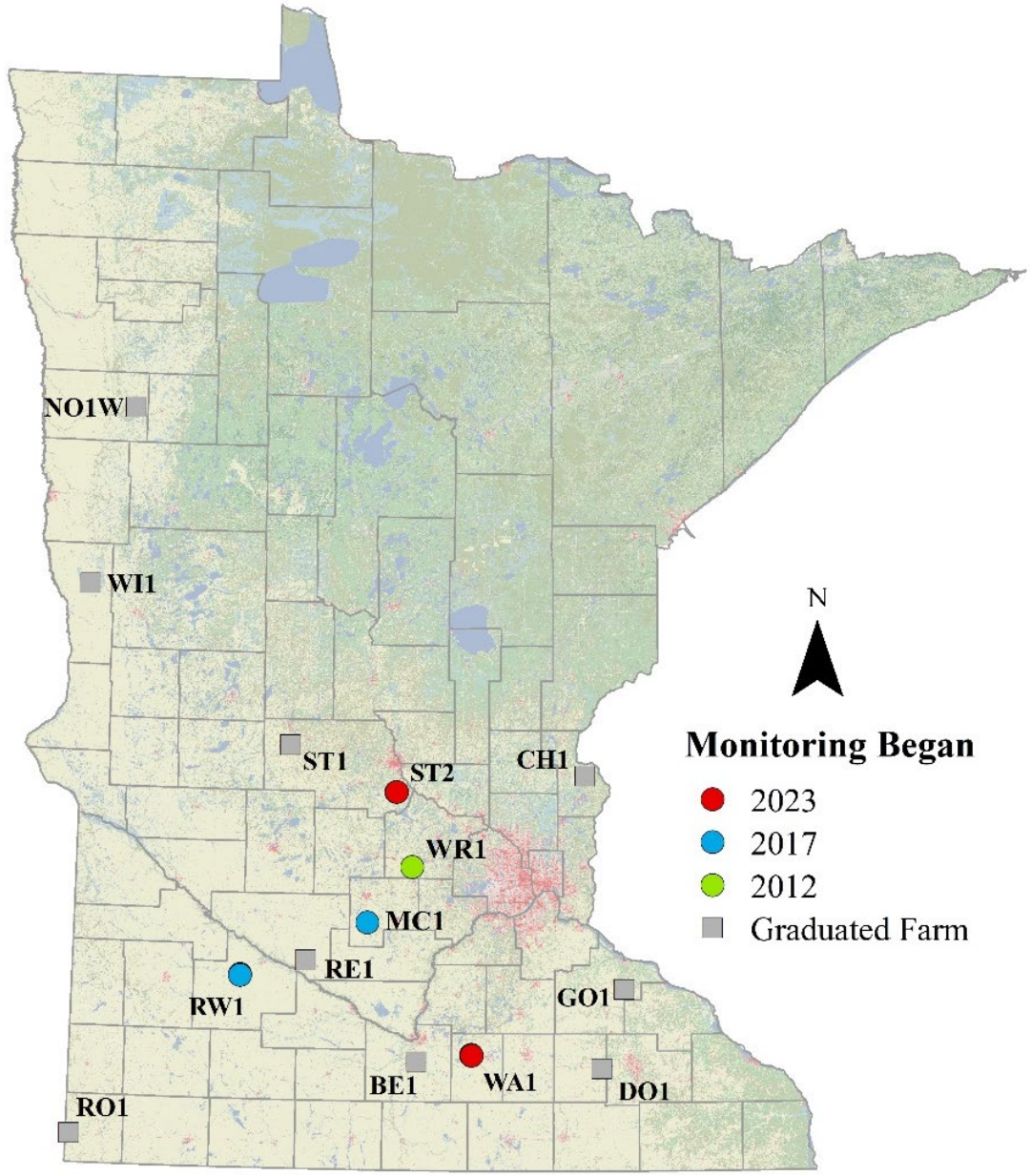
Where are we now?

- 5 Core Farms
- 10 monitored watersheds
- One farm: 12 years (WR1)
- Two farms: 6 years (MC1 & RW1)
- Two farms: 1 year (WA1 & ST2)
- Nine retired farms
  - 3 years: RO1
  - 6 years: CH1, WI1
  - 7 years: BE1, GO1
  - 8 years: DO1, NO1W
  - 9 years: RE1, ST1



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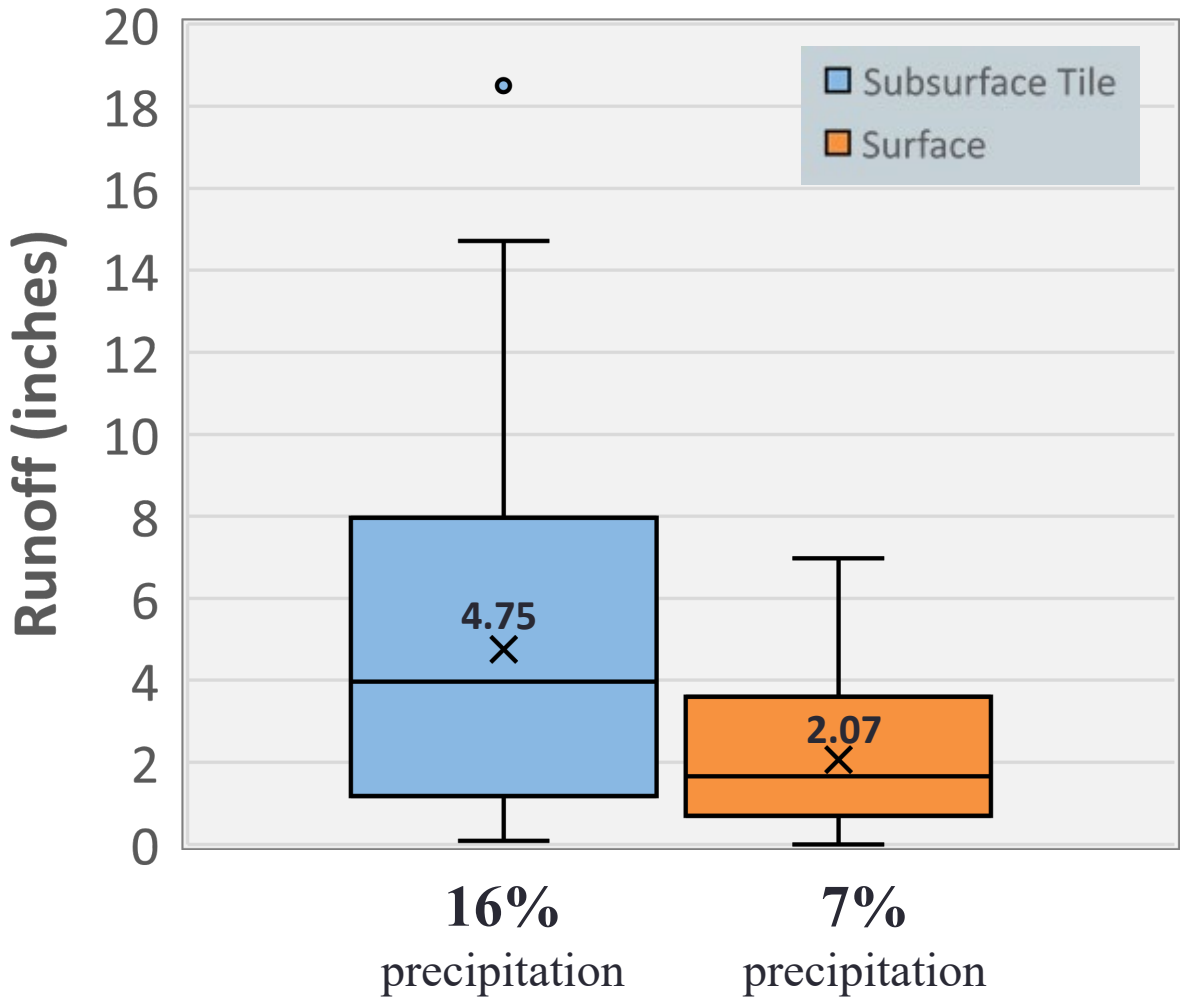
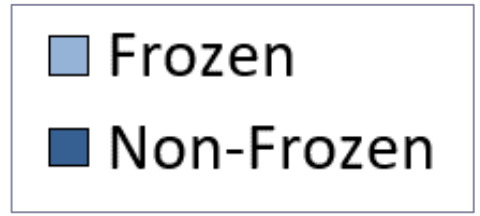
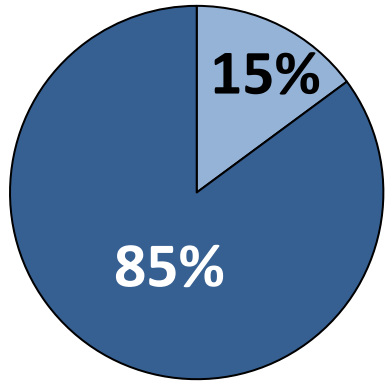
Runoff – All Sites/Years

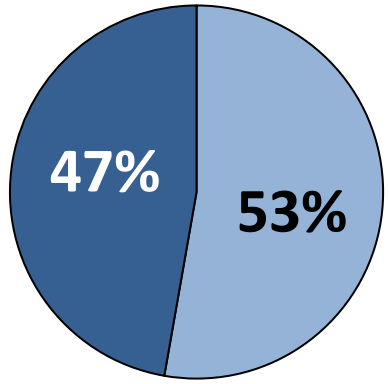




Subsurface Drainage



Surface Runoff



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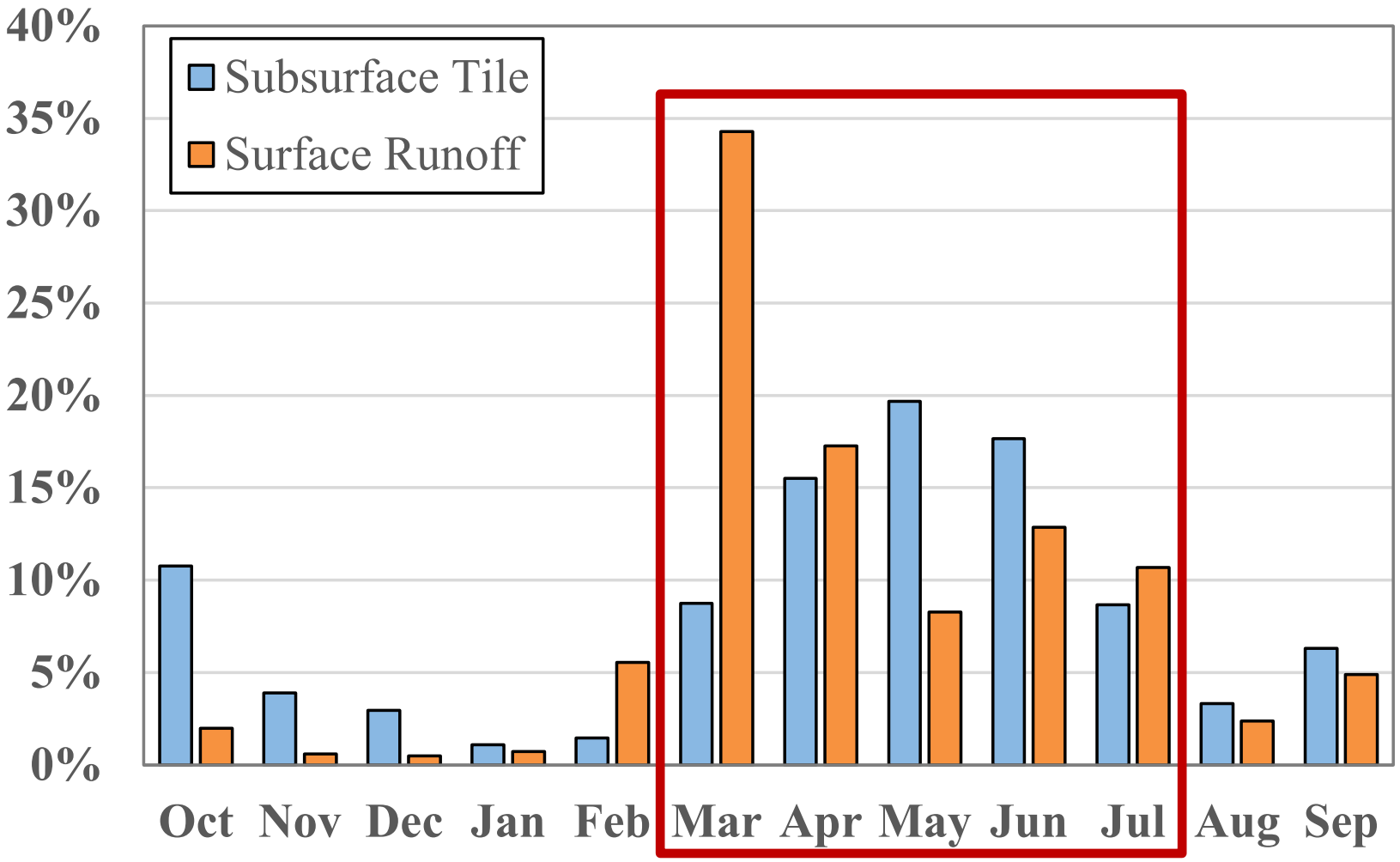
Timing of Runoff



- **83%** of surface runoff occurs from March through July
- **70%** of Tile Drainage occurs from March through July

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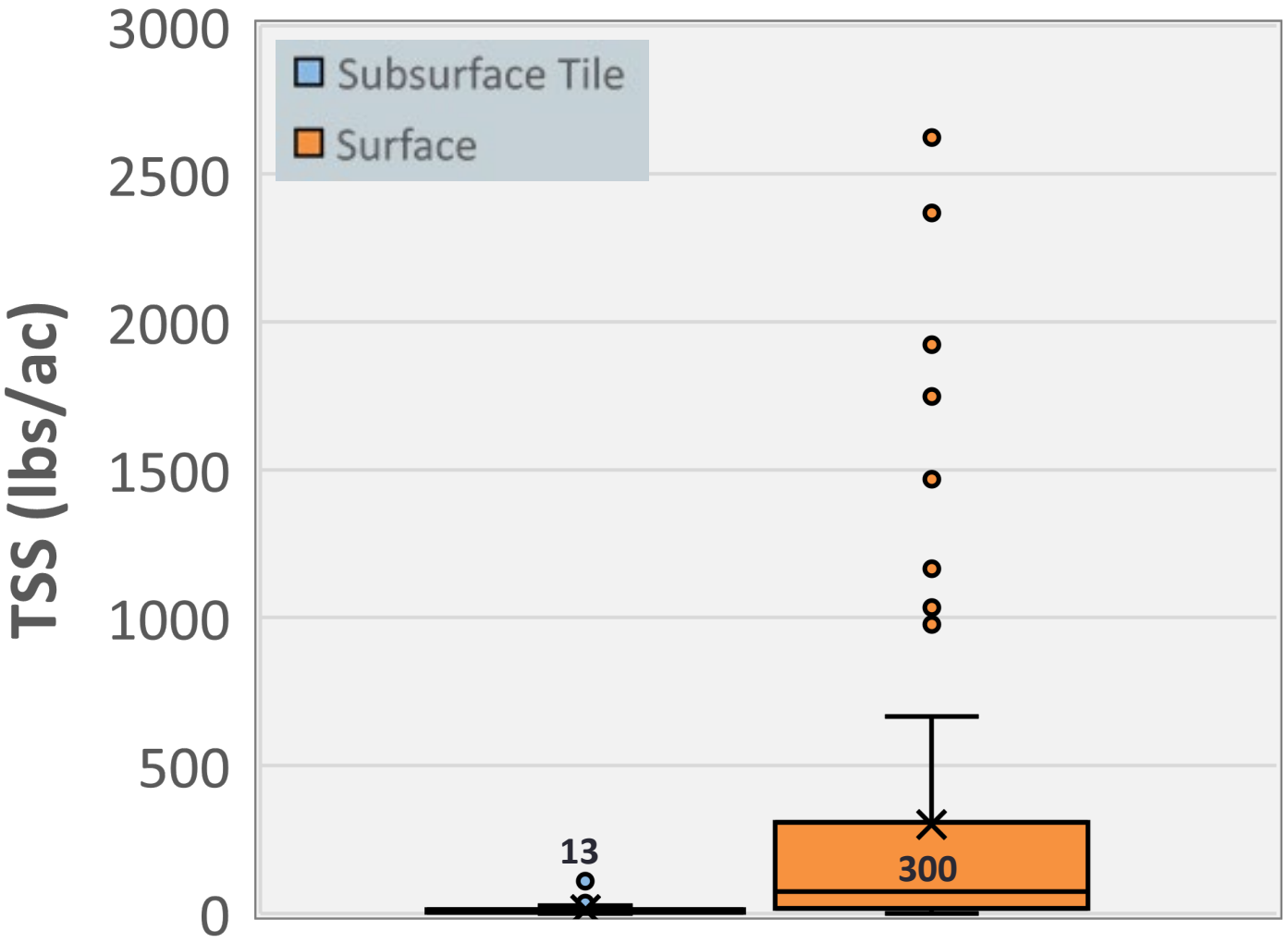
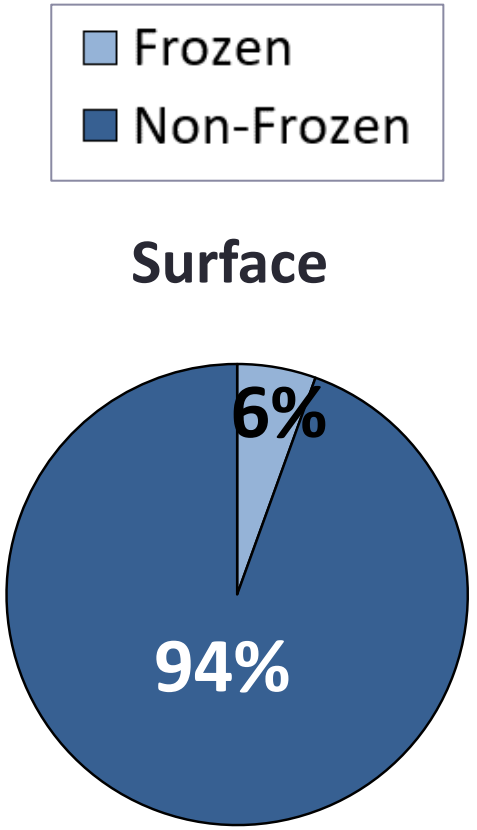
Soil Loss – All Sites/Years





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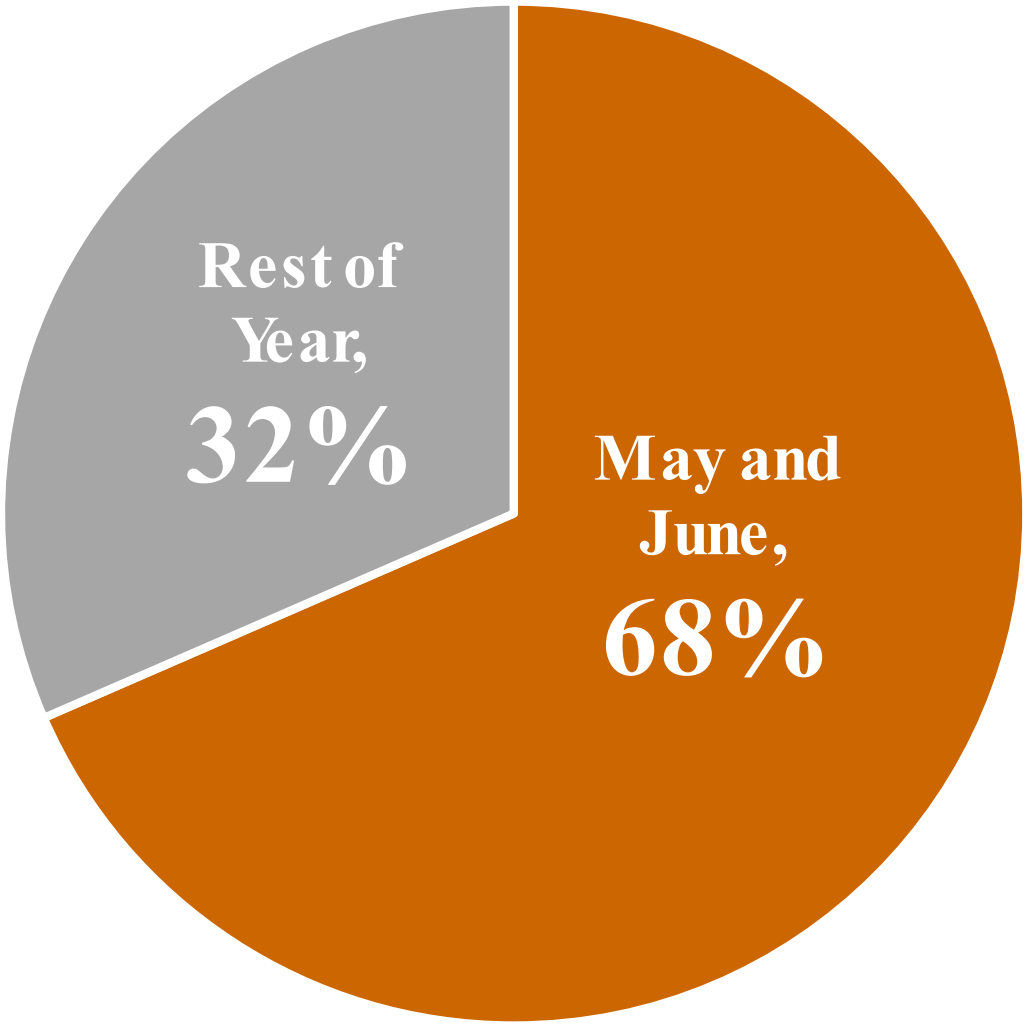
Timing of Soil Loss



May and **June:**
Combination of vulnerable fields and intense storm events.

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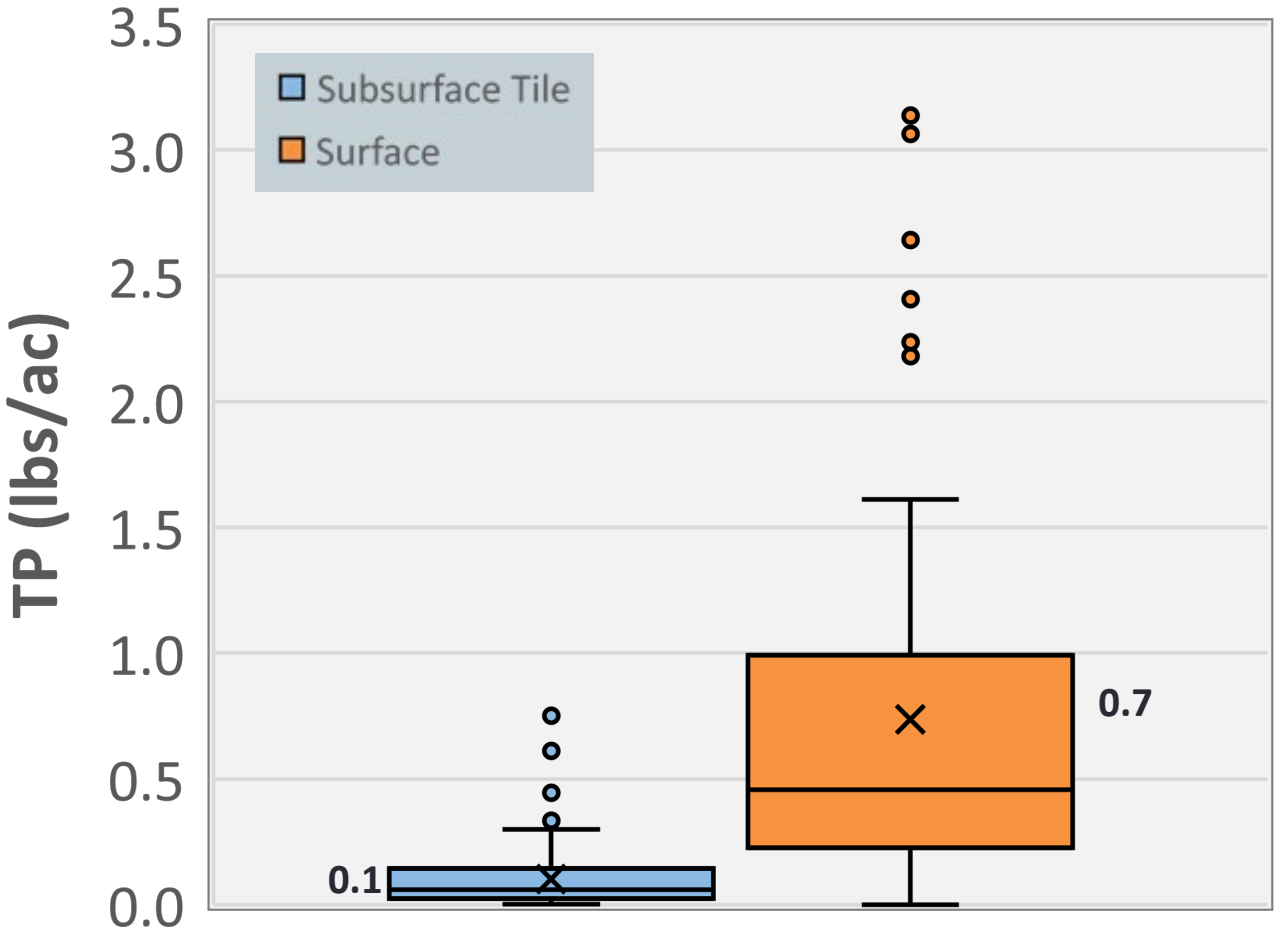
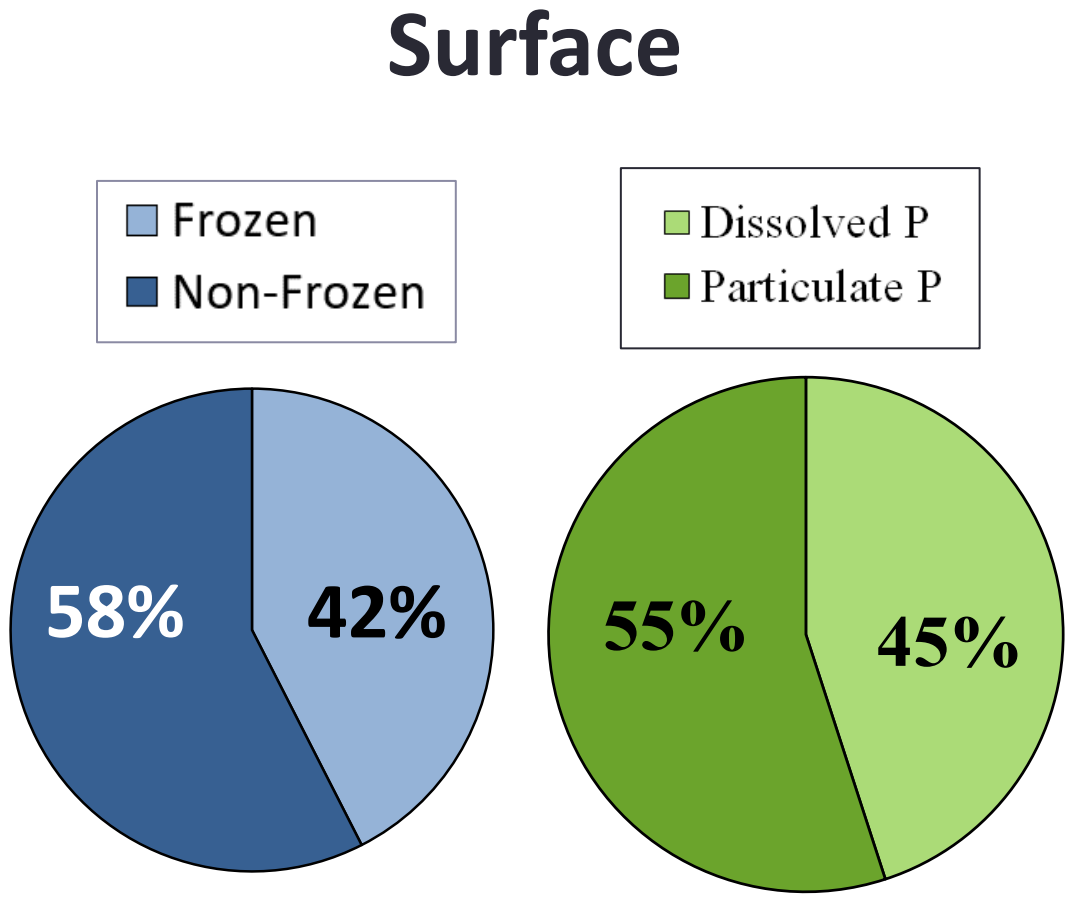
Phosphorus – All Sites/Years





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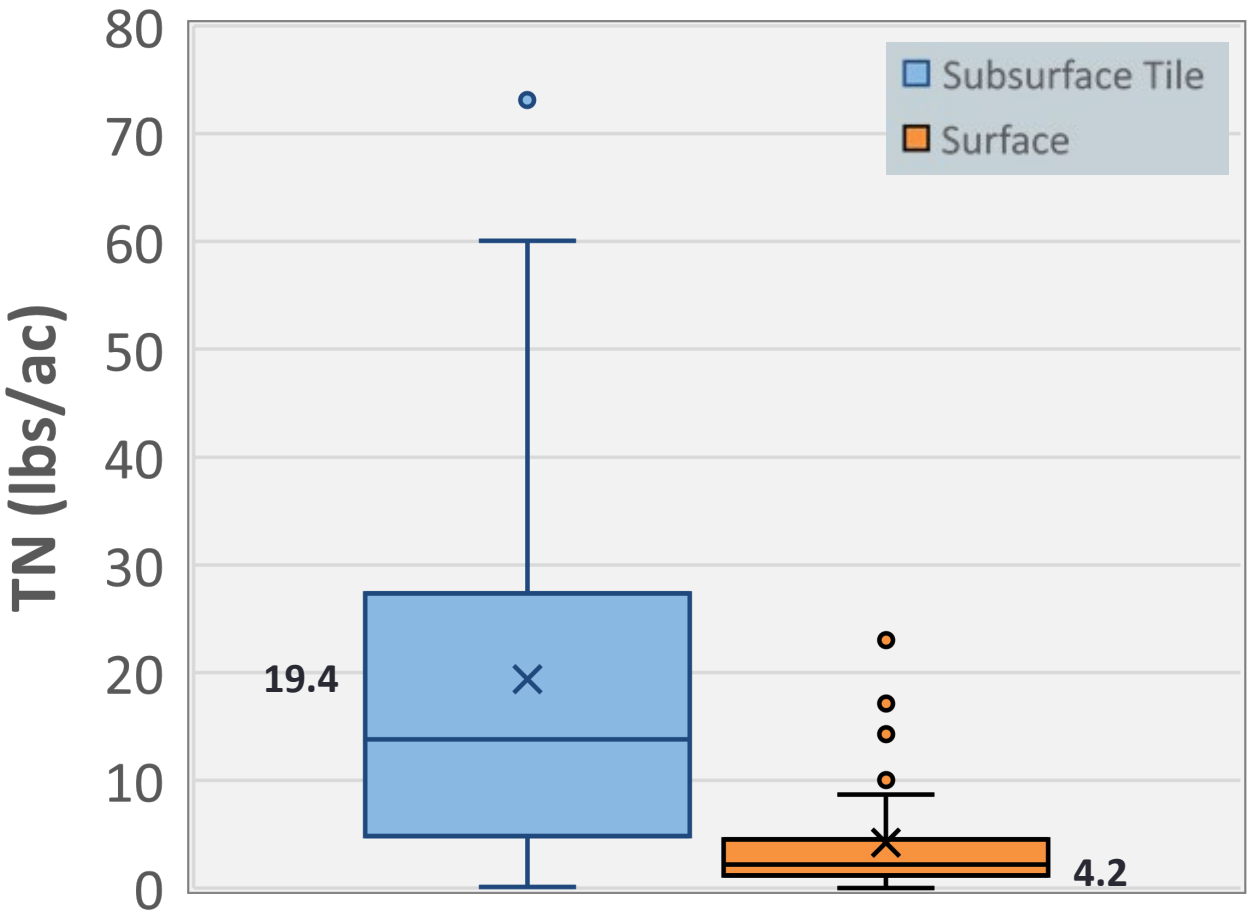
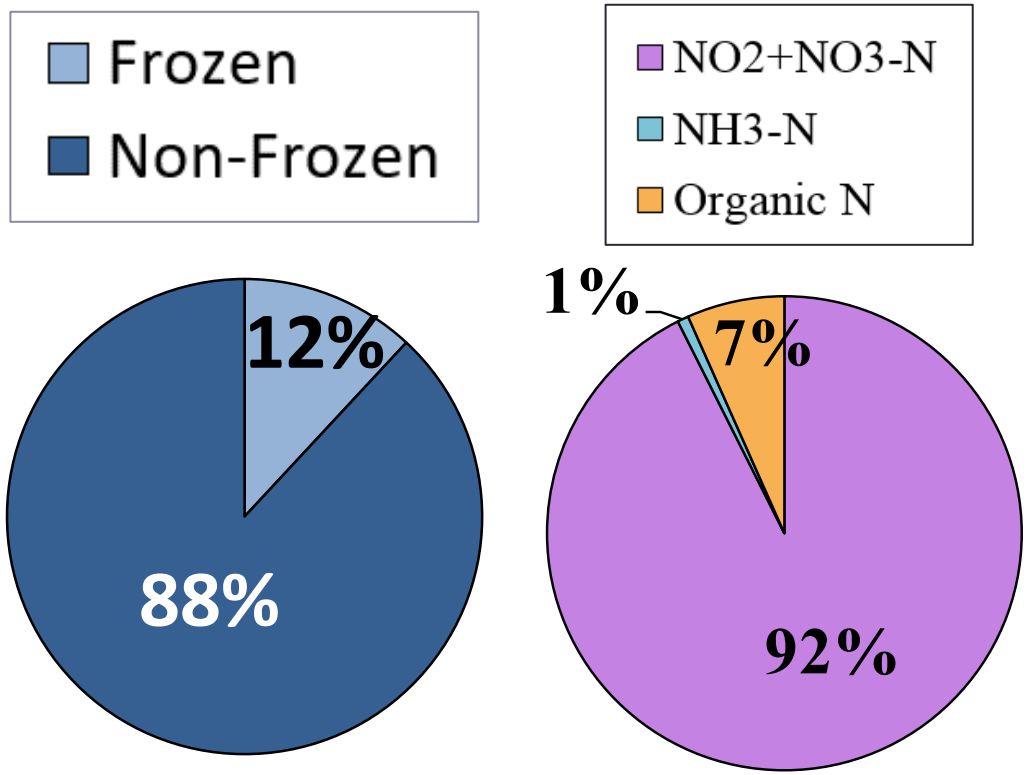
Nitrogen – All Sites/Years



Subsurface Tile



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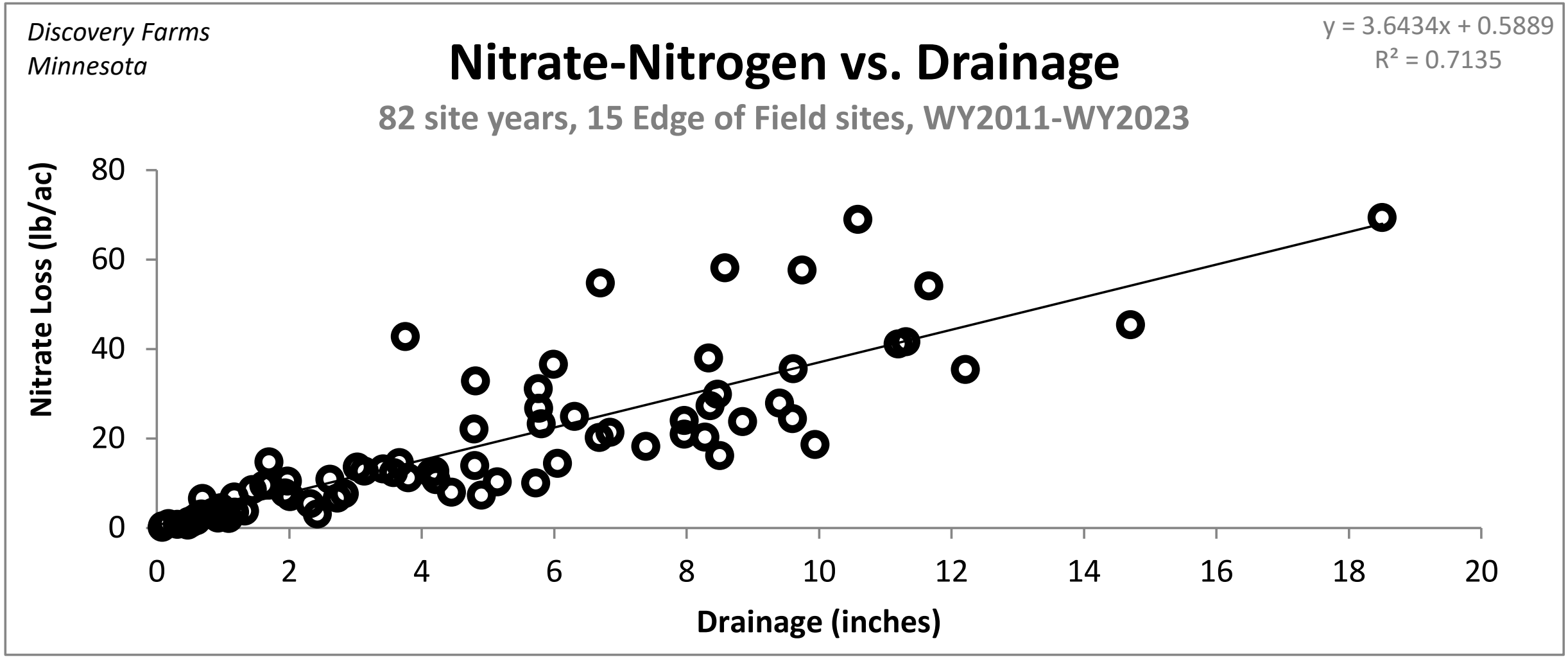
Nitrate vs. Drainage



- For every **1-inch** of drainage, there are about **4 lbs/ac** of nitrate loss.

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Interpreting tile nitrate concentrations

NO_3-N Concentration (ppm)	Interpretation
≤ 5	Native grassland, CRP land, alfalfa, managed pastures
5 – 10	Row crop production on a mineral soil without N fertilizer Row crop production with N applied at 45 lbs./acre below the economically optimum N rate† Row crop production with successful winter crop to "trap" N
10 - 20	Row crop production with N applied at optimum N rate Soybeans
≥ 20	Row crop production where: • N applied exceeds crop need • N applied not synchronized with crop need • Environmental conditions limit crop production and N fertilizer use efficiency • Environmental conditions favor greater than normal mineralization of soil organic matter

Source: Interpreting Nitrate Concentration in Tile Drainage Water, Purdue Extension, Purdue University

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Managing tile nitrate – proper nitrogen management

What are the 4Rs

RIGHT SOURCE

Matches fertilizer type to crop needs.

RIGHT RATE

Matches amount of fertilizer type crop needs.

RIGHT TIME

Makes nutrients available when crops needs them.

RIGHT PLACE

Keep nutrients where crops can use them.

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Practices we are currently collecting data on

- Cover crops impact on water quality and agronomics
  - Redwood County (started 2017)
    - Corn/soybean rotation with cover crops
    - Paired basin approach
    - 2017-2020 Calibration period
    - 2020-present – Treatment period
  - Stearns County (started in 2022)
    - Corn/soybean/wheat rotation with covers for forage
    - Paired basin approach
    - 2023-present Calibration period

Cover crop impacts on water quality and agronomics

- Redwood County
  - Strong calibration – should be able to test differences in flow/nitrogen, phosphorus and sediment will be more challenging
  - Issues
    - Establishment of cover crop
    - Lack of rainfall in the treatment period (2021-2023)

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Practices we are currently collecting data on

Controlled Drainage

- Waseca County – Farmamerica
- Mission of Farmamerica -To connect Minnesotans to the evolving story of agriculture through hands-on educational experiences, partnerships, and community engagement.

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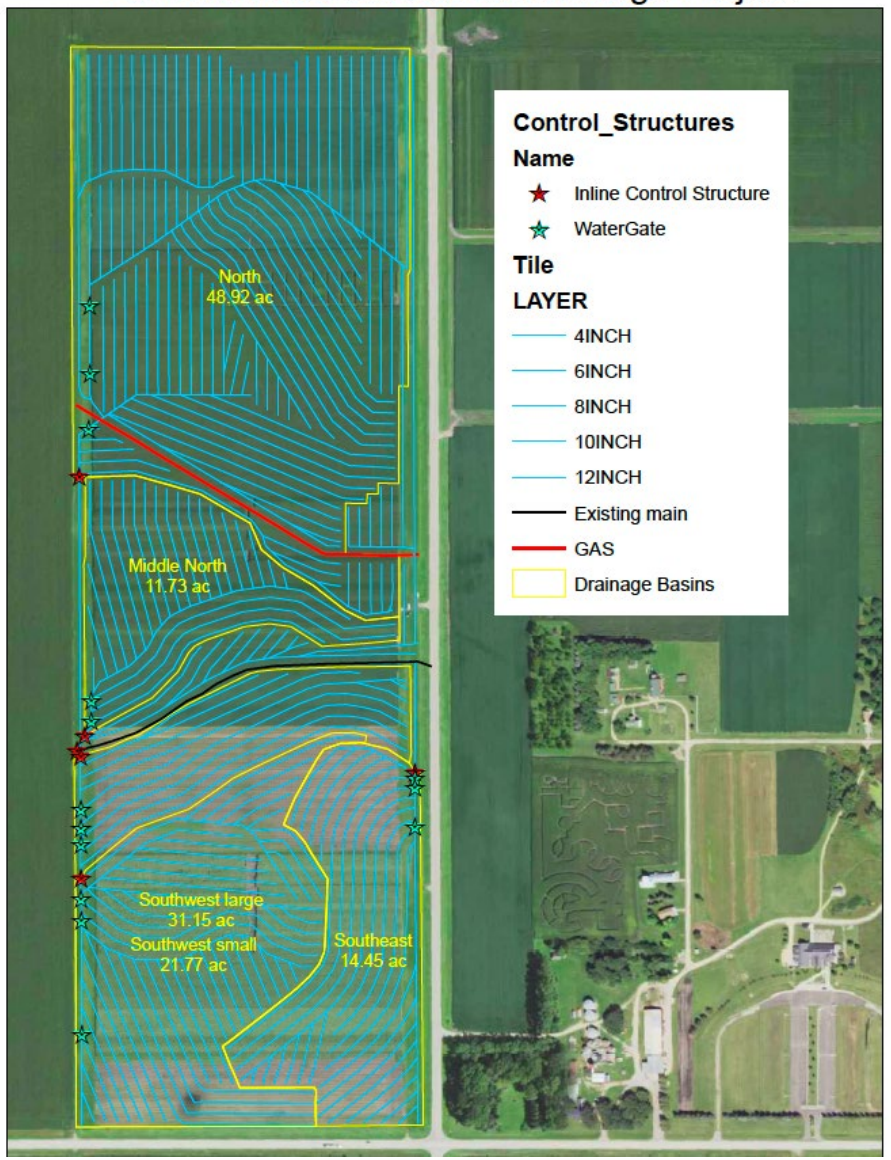
Controlled Drainage Waseca County

- Started in 2023
- Corn / soybean
- Strip till
- Paired basin approach
- 4 monitored basins – 2 will be controlled and 2 will not be controlled

Farm America Controlled Drainage Project



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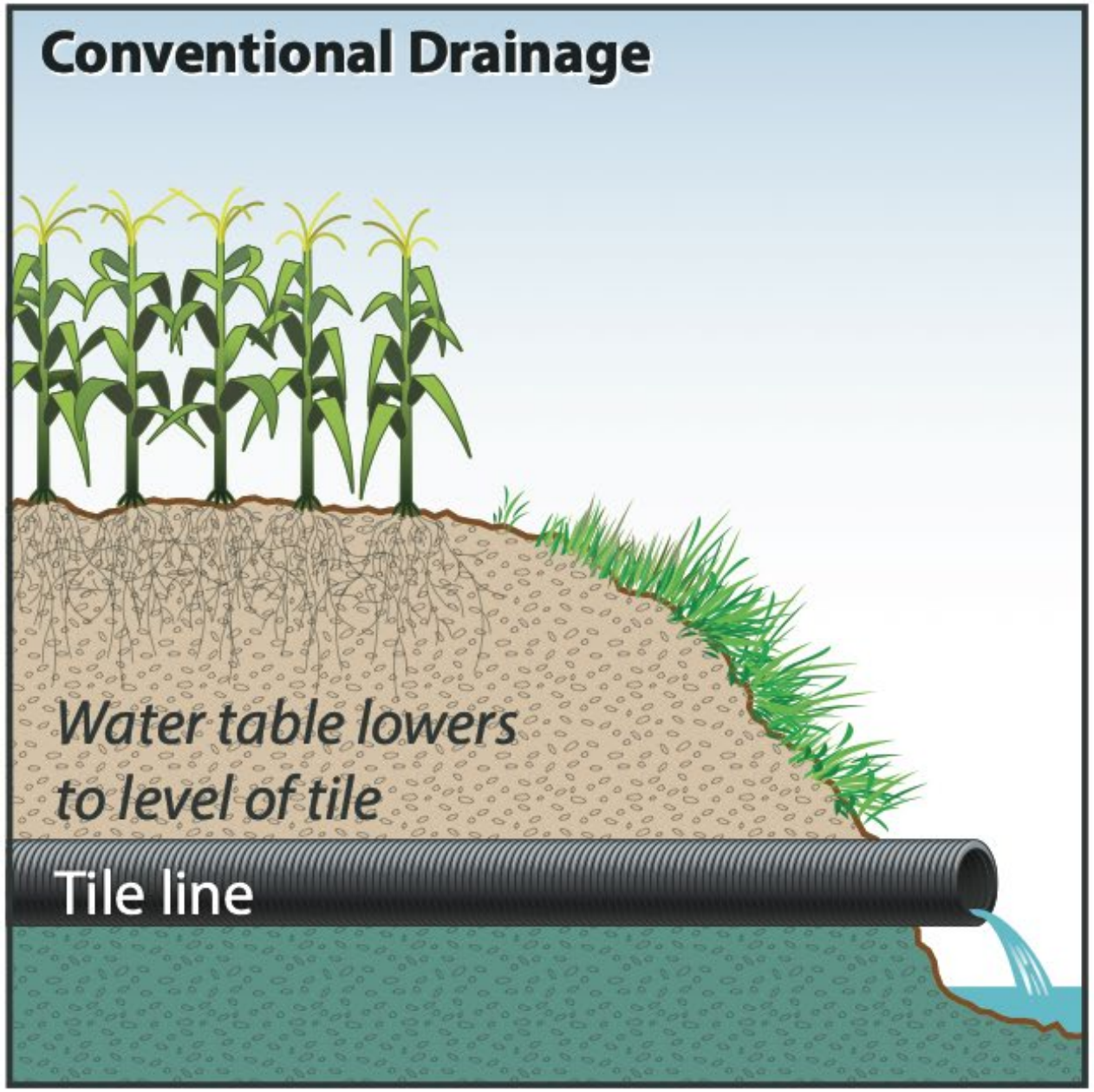

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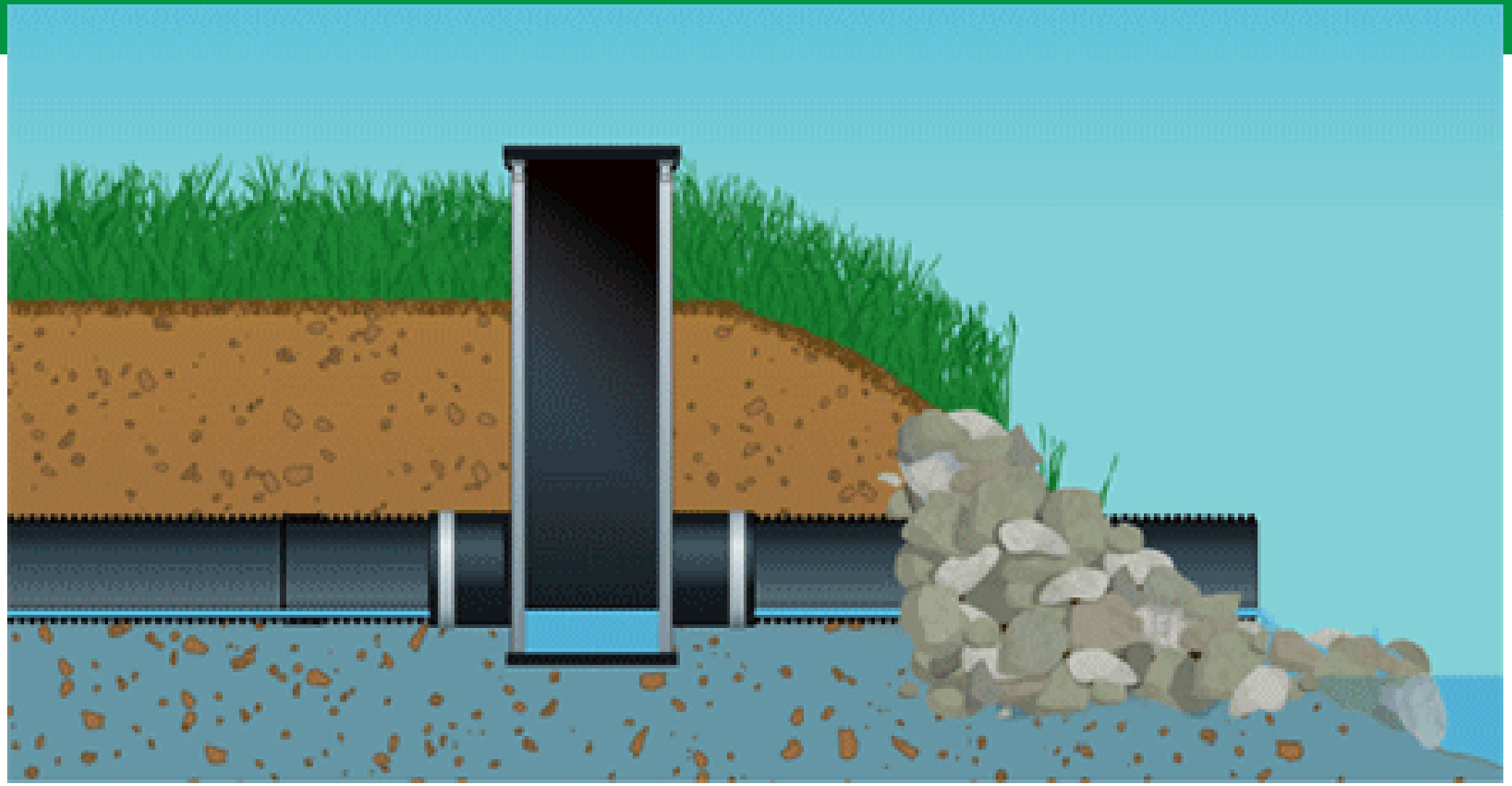

SPRING

No stop logs for free drainage

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