FIELD RUNOFF

Root River Field to Stream Partnership

PRIMARY PROJECT GOAL

Determine the range of sediment and nutrient losses associated with runoff from representative farming systems and small watersheds in southeastern Minnesota.

Status:

Data collected from four fields, collected over seven years (2010–2018).

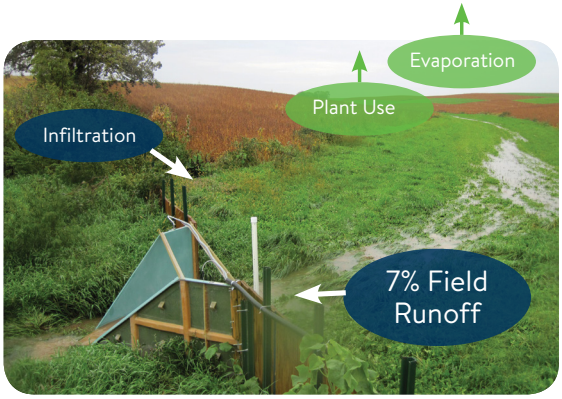
Contact:

Kevin Kuehner
Minnesota Department of Agriculture
507-765-4530
kevin.kuehner@state.mn.us
www.mda.state.mn.us/rrfsp

DEPARTMENT OF AGRICULTURE

April 2019

WHERE DOES THE WATER GO?

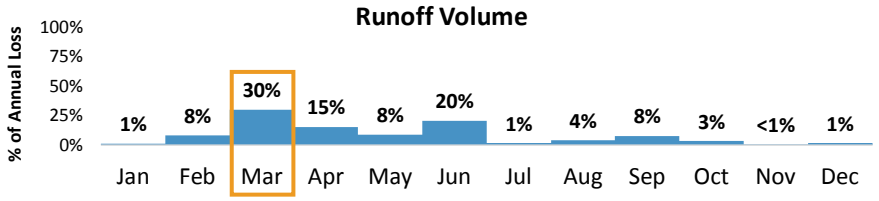


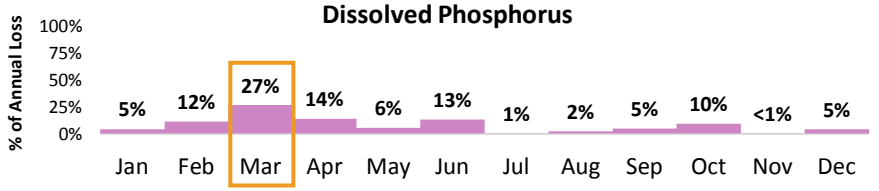
On average, 36 inches of precipitation was received annually. During the study, 7% of this total was measured as field surface runoff with a range of less than 1% in a dry year and up to 24% during a very wet year. How we manage this runoff can make a big difference for clean water.

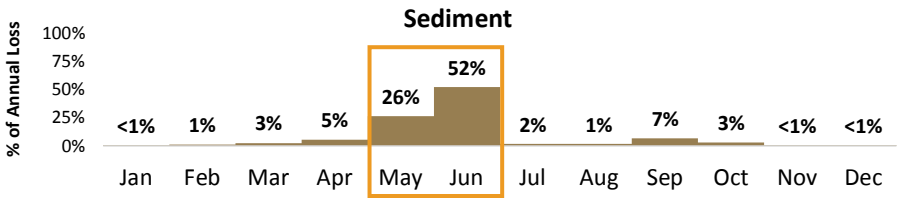
- **On average, 40% of the total runoff volume occurred when the soil was frozen.**
- Over 50% of the annual nutrient and sediment losses typically occurred during 1-2 rain events each year.

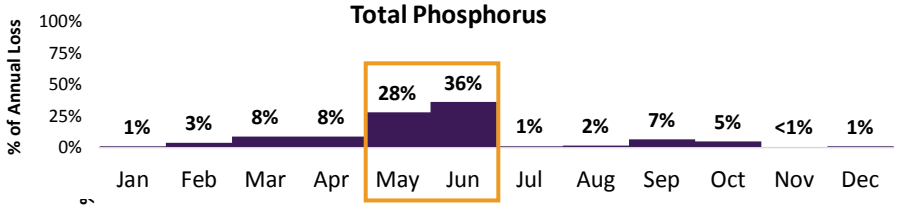
High Risk Periods

Sediment and nutrient losses peak at varying times of the year. Understanding these risk periods is key to reducing loss.









- Dissolved phosphorus losses were highest in March and often occur when the ground is frozen. **Incorporation of fertilizer and proper management of soil test phosphorus levels will help reduce these losses.**
- Nearly 80% of the sediment loss occurred during May and June. Total phosphorus loss is closely linked to soil loss. **Good soil conservation practices will help reduce these losses.**

Precipitation & Runoff

- Precipitation averaged 4% above normal during the study period with a mix of dry, normal and wet conditions.
- Field runoff averaged 2.7 inches (7% of annual precip.) with 40% occurring during frozen soil conditions.
- Field surface runoff has been observed in every month averaging 20 runoff events each year. Runoff does not occur every time it rains.

Field Sediment Loss

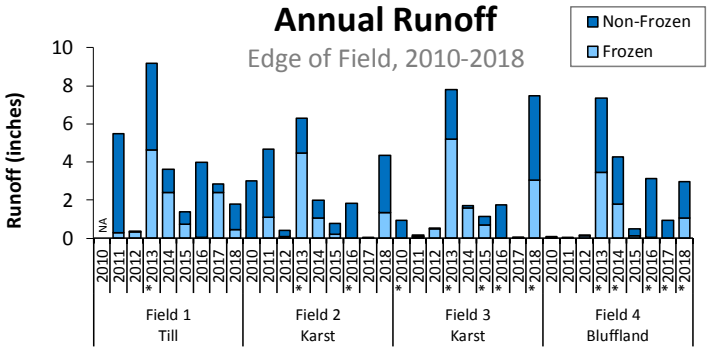
- **Average sediment loss:** 1,461 lb/ac. (0.7 tons/ac.)
  Range: <1 to 8,969 lb/ac.
- **Sustainable soil loss:** < 1,000 lb/ac./year
  If erosion is visible, losses likely exceed this.
- 78% of annual loss occurred during select storms in May & June. During this critical time, fields were prepared for planting, but not at full canopy.

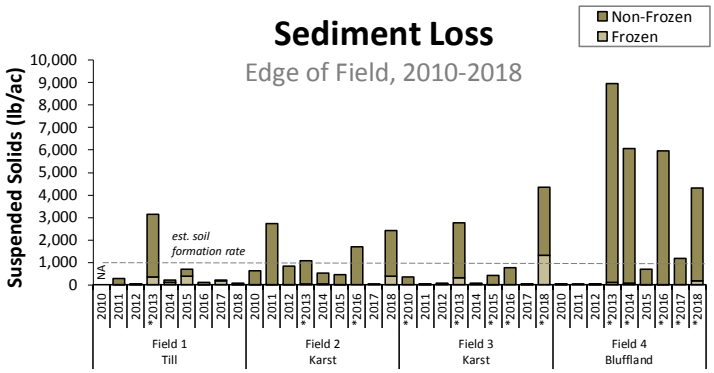
Field Phosphorus Loss

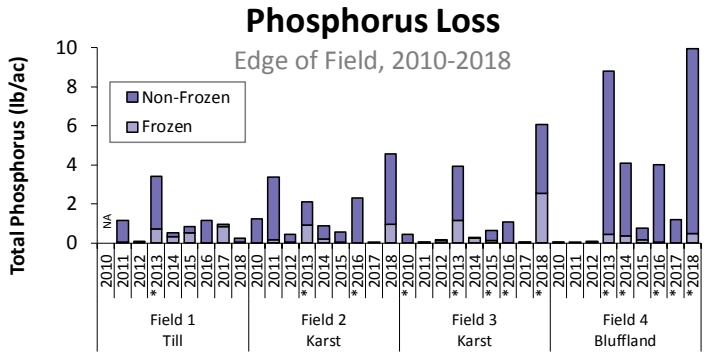
- **Average total phosphorus (P) loss:** 1.9 lb/ac.
  Range: <0.1 to 10.0 lb/ac.
- **Dissolve P (not attached to sediment):**
  Accounts for 16% of total P loss (44% of this loss occurs when the ground is frozen).
- **Particulate P (attached to sediment):**
  64% of loss occurred in May & June.
- For every 1,000 lb/ac. of sediment loss about 1.0 lb/ac. of P is lost. Goal is to keep this loss to less than 1.0 lb/ac./yr.

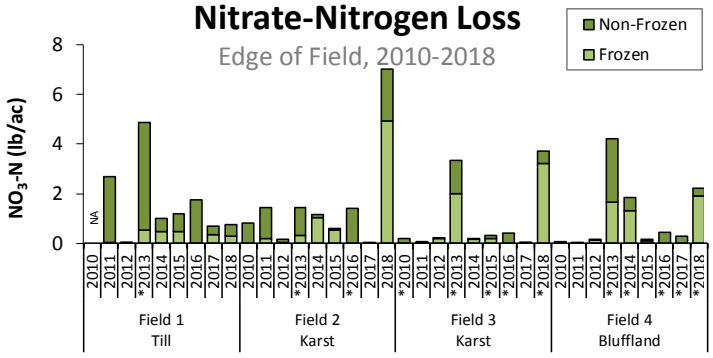
Field Nitrogen Loss

- **Average Total Nitrogen (TN) loss:**
  9.8 lb/ac. (includes organic form of N) if substantial soil loss occurs, TN in surface runoff can exceed 37 lb/ac.
  - **Nitrate-N form:** 17% of TN
    Range: <0.1 to 4.9 lb/ac.
    Surface average runoff loss: 1.6 lb/ac.
    Sub-surface average tile loss: 41 lb/ac., max 63 lb/ac.
- **Surface Runoff:** Total nitrogen transported in surface runoff can be controlled through soil conservation.
- **Sub-Surface Leaching:** Most nitrogen is lost this way and is detected as nitrate-nitrogen in tile drainage, springs, streams, rivers, and groundwater.









*Loss was underestimated during overtop events

Reducing nitrate leaching losses will be challenging, but it is a very important task. Fine-tuning nitrogen rates, split applying nitrogen, crediting legumes and manure, growing perennials, and using cover crops are important practices.

SWCD

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MAWRC
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Clean Water Land & Legacy Amendment

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