

Identifying Phosphorus Hotspots in the Red River Valley of the North

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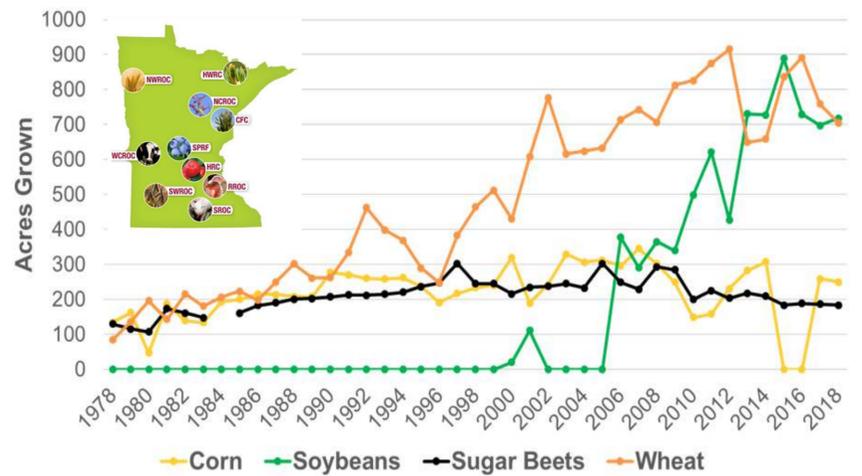
Abstract

This study explores a 40-year historical record of nutrient management data to identify how changing trends in cropping and fertilizer application has affected phosphorus loss risk in Northwest Minnesota. For this study, nutrient management records spanning from 1978 to 2018 were compiled across 1500 acres farmed by the University of Minnesota Northwest Research and Outreach Center (UMN NWROC). The UMN NWROC is located in the Red River Basin of the North—a critical watershed leading to Canada's Lake Winnipeg. Due to rising concerns about recurrent harmful algal blooms in Lake Winnipeg, there is a growing need to identify best management practices (BMPs) for phosphorus loss within the basin. This study combines long-term historical data with the Minnesota Phosphorus Index to provide insight into the benefits and limitations of in-field phosphorus management (the 4Rs) as a BMP for water quality improvement in the Red River Basin of the North.

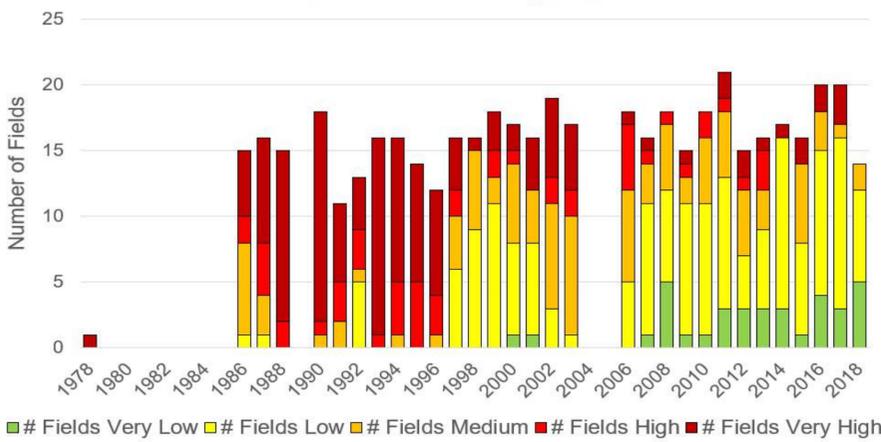
Introduction

- **First of ten ROCs throughout MN**
- **Established in 1895 on 500 acres**
- **Today: Farms 1500 acres**
- **Mission: How to farm in the Red River Valley of the North**

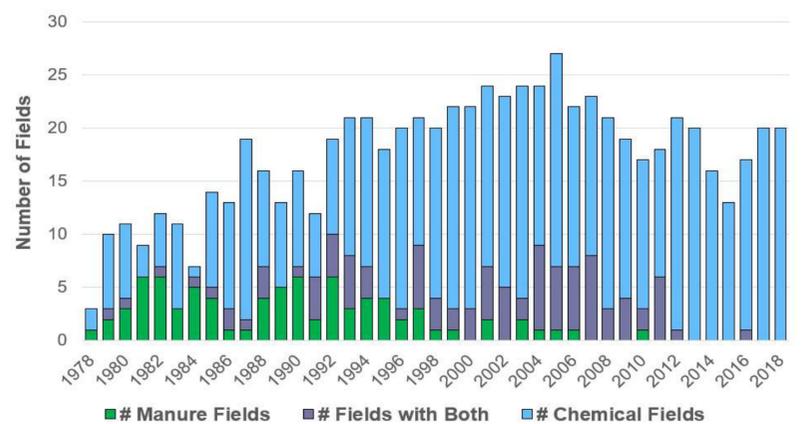
Selected Crops Grown at NWROC: 1978-2018



Soil Test P Levels by UMN Category



Type of Fertilizer Used at NWROC



Materials & Methods

- Identifying P hotspots in a selection of fields
- Historically high levels of P
 - Using sites to calculate indices of P loss risk
 - Suggestions for P loss risk management strategies
- Extrapolate management to other fields

Fields 1, 5, and 8 Analyzed with the MN P Index

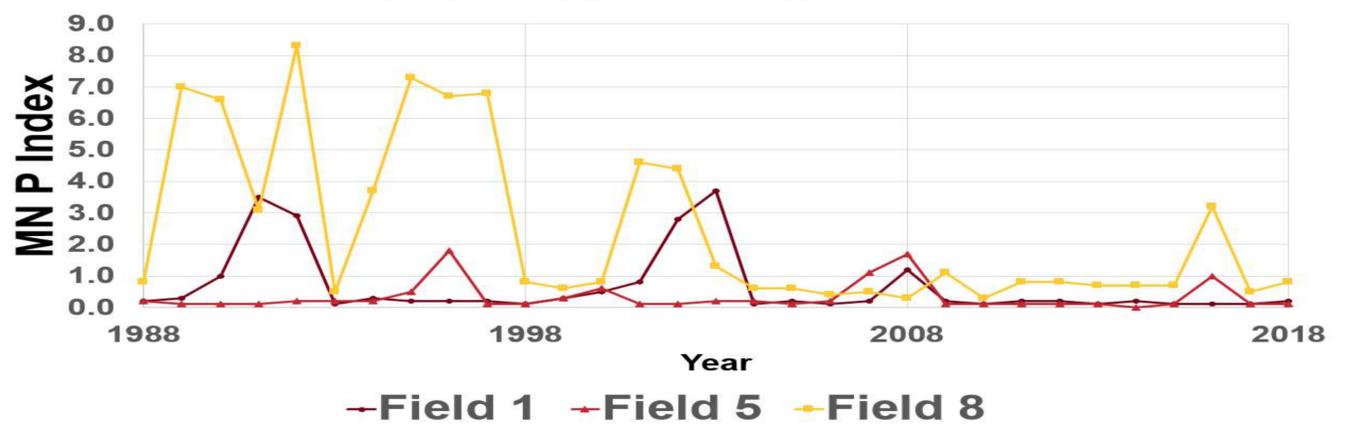
- Similar topography
- Different management
- Records dating to 1978



Minnesota P Index

Results

MN P Indices 1988-2018



- Field 8 had highest reported STP
- And highest manure application rates over time
- Fields 1 and 5 not as at risk of P loss
- Earlier years (1988-2008) with generally higher P loss risk than more recent years
- Recent years with more commercial fertilizer
- More targeted amount of P applied