COVER CROPS IMPART RESILIENCE TO STORMS

Indiana Watershed Initiative, University of Notre Dame
www.indianawatershedinitiative.com

The Challenge: Ensure both food security and access to freshwater

With a growing global population, sustaining productive agriculture and minimizing downstream nutrient loss is critical.

Winter cover crops have been shown to reduce nitrate (NO_3^--N) loss from soils during vulnerable periods, such as spring snowmelt and storm events, which can result in significant nutrient loss from the agricultural landscape.

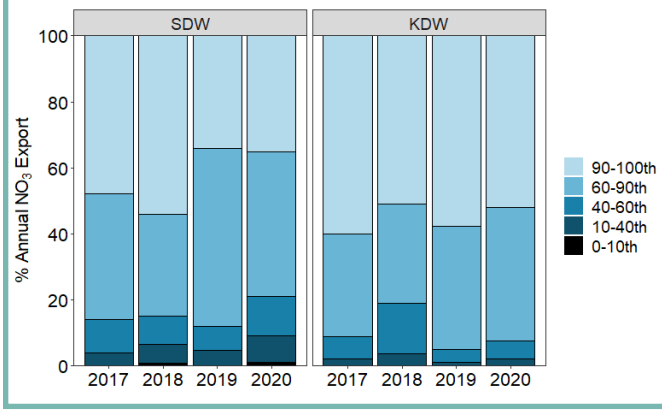
However, the efficacy of CC in buffering the impacts of storm events is understudied in the Midwest U.S.

Our Strategy

GOAL: Use high-frequency sensors to quantify the effects of cover crops on storm NO_3^--N export in two agricultural watersheds in northern Indiana, the Shatto Ditch Watershed (SDW; 65% of croppable acres) and the Kirkpatrick Ditch Watershed (KDW; 25% of croppable acres).

Understanding the potential for cover crops to mitigate the effect of extreme events will be critical, as storm frequency and intensity are expected to increase in the Midwest U.S. with future climate change.

Storms contribute disproportionately to watershed-scale NO_3^--N export



The majority of annual NO_3^--N export from SDW (79-88%) and KDW (81-95%) occurred at the top 40% of flows (60-100th percentile), highlighting the importance of stormflow in driving NO_3^--N loss in both watersheds.

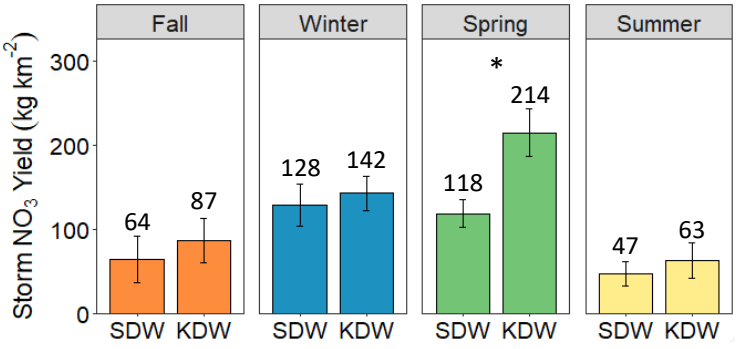
Tile drainage enhanced hydrologic connectivity across both watersheds, resulting in a tight linkage between NO_3^--N dynamics on the landscape and adjacent stream.

Sources of NO_3^--N to the stream during storms were widespread, and NO_3^--N yields for individual storms increased exponentially with storm size.

Cover crops can enhance resilience and reduce NO_3^--N loss during storms

In SDW, where cover crops were planted at the watershed scale (~65% of croppable acres), average NO_3^--N yields during storms were lower across all seasons compared to KDW, where cover crop use was lower and varied annually (average = 23% of croppable acres).

When cover crops were actively growing in spring, NO_3^--N yields were significantly lower during spring storms in SDW compared to KDW.



Outcomes: Increased cover crop coverage can reduce downstream NO_3^--N export during storms. Our results suggest conservation strategies that buffer the impact of large storms are essential to prevent nutrient losses to downstream ecosystems.

UNIVERSITY OF NOTRE DAME
ENVIRONMENTAL CHANGE Initiative
NORTH CENTRAL SARE

Contact: Shannon Speir (sspeir@alumni.nd.edu) & Jennifer Tank (tank.1@nd.edu)

Version: May 2021