

# Planting cover crops to reduce nutrient loss from agricultural fields and improve water quality

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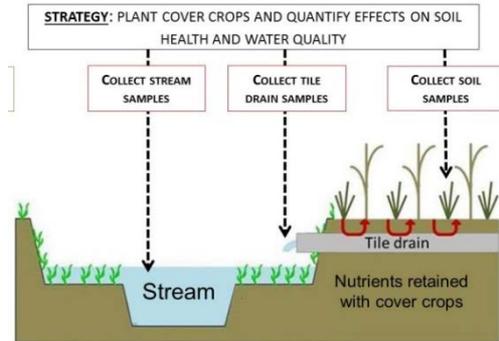
## Problem of Excess:

- Channelized agricultural streams and ditches export excess nitrogen (N), phosphorus (P), and sediments to sensitive downstream ecosystems where they contaminate drinking water, fuel downstream algal blooms with “dead zones”, and harm sensitive fish and mussels.

- Excess fertilizer nutrients often enter streams and ditches via tile drains, especially during Winter and Spring when fields are bare.

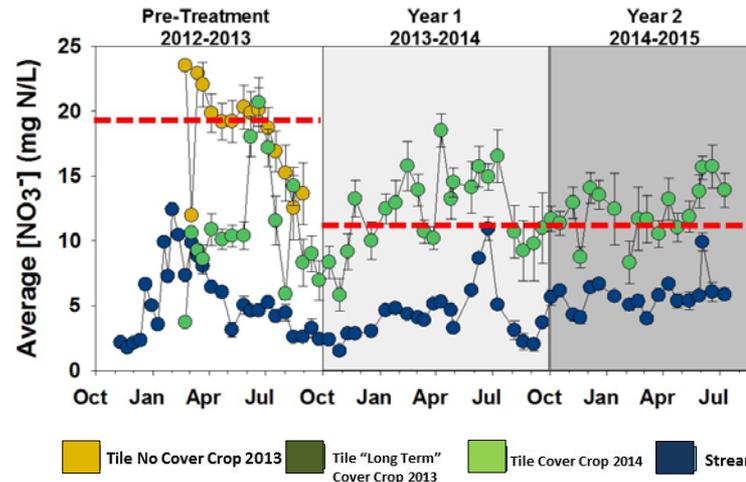
## Cover crops can reduce nutrient loss:

- Cover crops, like ryegrass, are planted after cash crop harvest and their growth coincides with critical times for nutrient export from tiles to streams/ditches.

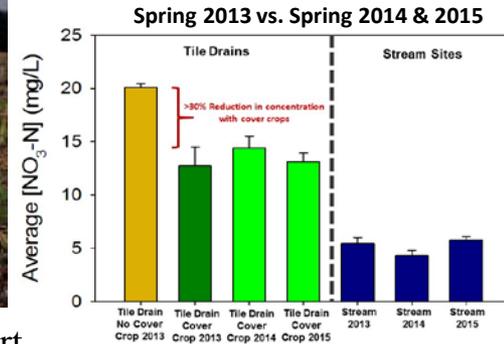


**Goal:** Retain nutrients/soils on fields, and reduce stream export.

## Nitrate-N export from tile drains is lower with cover crops



- Tile drain NO<sub>3</sub><sup>-</sup> without cover crops is especially high during Winter 2012 and Spring 2013 (see left panel).
- In 2014 (Yr 1) and 2015 (Yr 2), NO<sub>3</sub><sup>-</sup> from tile drains with widespread cover crop planting are lower and similar in concentration to tile drains draining fields w/ long term cover crops.



- Year 1 and Year 2 planting suggests that the planting of cover crops reduces tile drain nitrate concentrations by ~30%.
- Our data suggest that cover crops have the potential to significantly reduce N export from tile drain outlets.

## Conclusions:

- Cover crops provide a field-scale management solution that reduces nutrient loss to tile drains and keeps fertilizer on fields.
- Cover crops applied at the watershed scale have the potential to meet current reduction goals set by managers to significantly reduce nutrient export to downstream waters.

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## Problem of Excess:

- Tile drains transfer excess nitrogen (N) and phosphorus (P) from agricultural soils to adjacent streams.
- Excess N and P can contaminate drinking water, harm fish, and fuel downstream algal blooms.

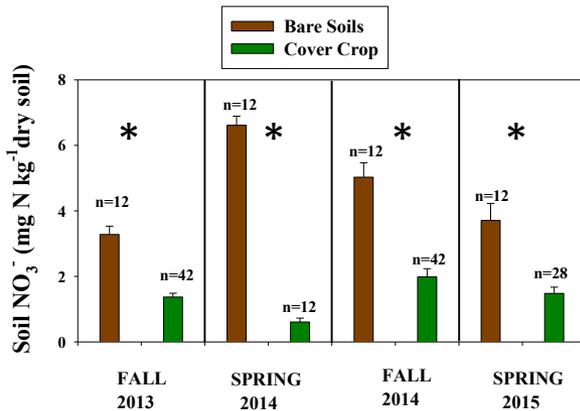


**Goal:** Retain nutrients on fields and reduce tile export to streams

## Do cover crops influence organic matter or soil P?

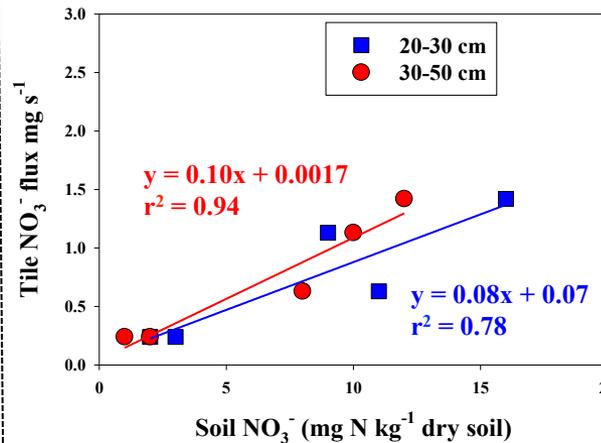
- We have not seen any significant increase soil organic matter or carbon in 2 years of sampling.
- In contrast, soil Mehlich III P was lower with cover crops than in fields without during both Fall and Spring sampling in from 2013-2015.

## Do cover crops influence soil NO<sub>3</sub><sup>-</sup> concentrations?

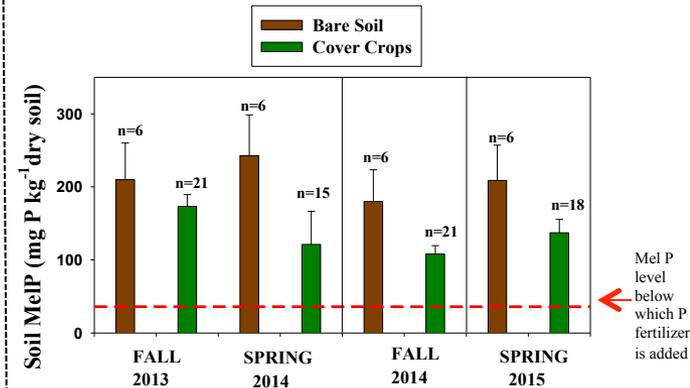


- Soil nitrate-N concentrations were lower in cover crop fields than those without cover crops during both Fall and Spring sampling over 2 years.
- Reductions in cover crop fields could indicate that bioavailable-N is tied up in cover crop biomass during Fall and Spring.

## Can we correlate soil NO<sub>3</sub><sup>-</sup> with tile drain losses to Shatto Ditch?



- There was a positive relationship between soil and tile drain nitrate-N.
- This relationship suggests that cover crops could reduce NO<sub>3</sub><sup>-</sup> loss from fields, and keeping N on fields for future crop growth.



## Summary

- Cover crop fields had lower soil NO<sub>3</sub><sup>-</sup> and Mehlich III P than fields without cover crops.
- Decreases in soil NO<sub>3</sub><sup>-</sup> were related to lower tile drain NO<sub>3</sub><sup>-</sup>, suggesting that cover crops could retain N and prevent leaching from agricultural fields.
- We have not seen changes in soil organic matter, and likely changes occur over a longer time frame. With USDA RCPP funding, we will continue to sample these fields through 2019.