

Cover Crops and Soil Water Dynamics - a Texas Perspective?

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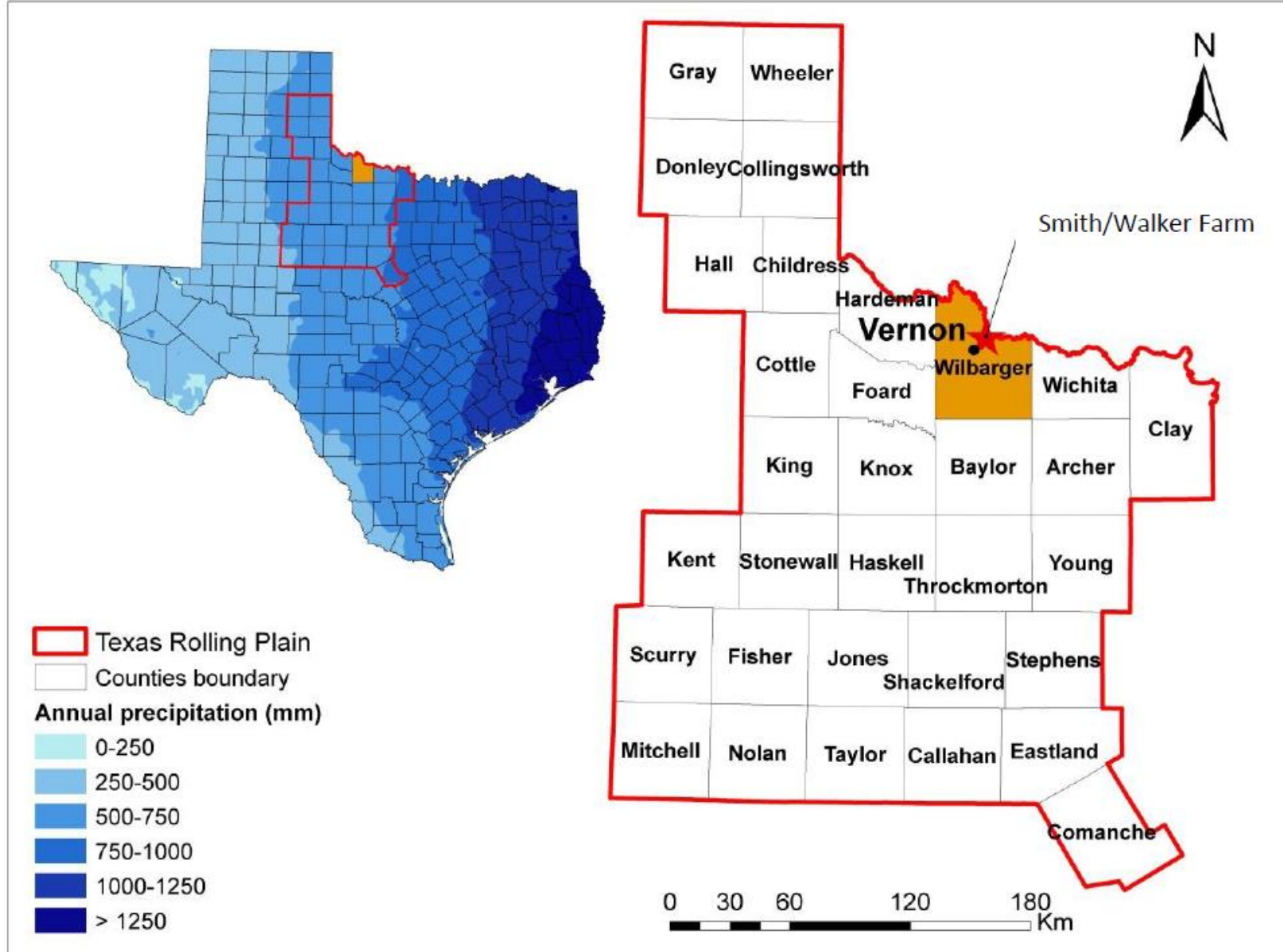
Katie Lewis – Texas A&M AgriLife Research at
Lubbock/Texas Tech University

Kevin Wagner, Jack Edwards – Oklahoma State
University

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RESEARCH

MSU Row Crop Short Course
December 4, 2023

Texas Rolling Plains



Highly Variable
Climate - latest trend
seems to be heavy
precipitation events
followed by extended
hot & dry conditions

Monoculture dryland
cropping systems are
predominant – wheat
and cotton

Conservation Agriculture

- USDA-ERS (Claassen et al., 2018; Economic Information Bulletin #197, Sept. 2018)
- Conservation tillage practices include no-till, strip-till, and mulch tillage
- Conservation tillage was used on roughly:
 - 70% of soybean
 - 65% of corn
 - 67% of wheat
 - 40% of cotton

Conservation Tillage in Cotton by Region



Less than 3% of continuous tilled cotton acres adopt conservation crop rotation

† Figures adapted from Claassen et al., 2018; USDA-ERS Bulletin No. 197

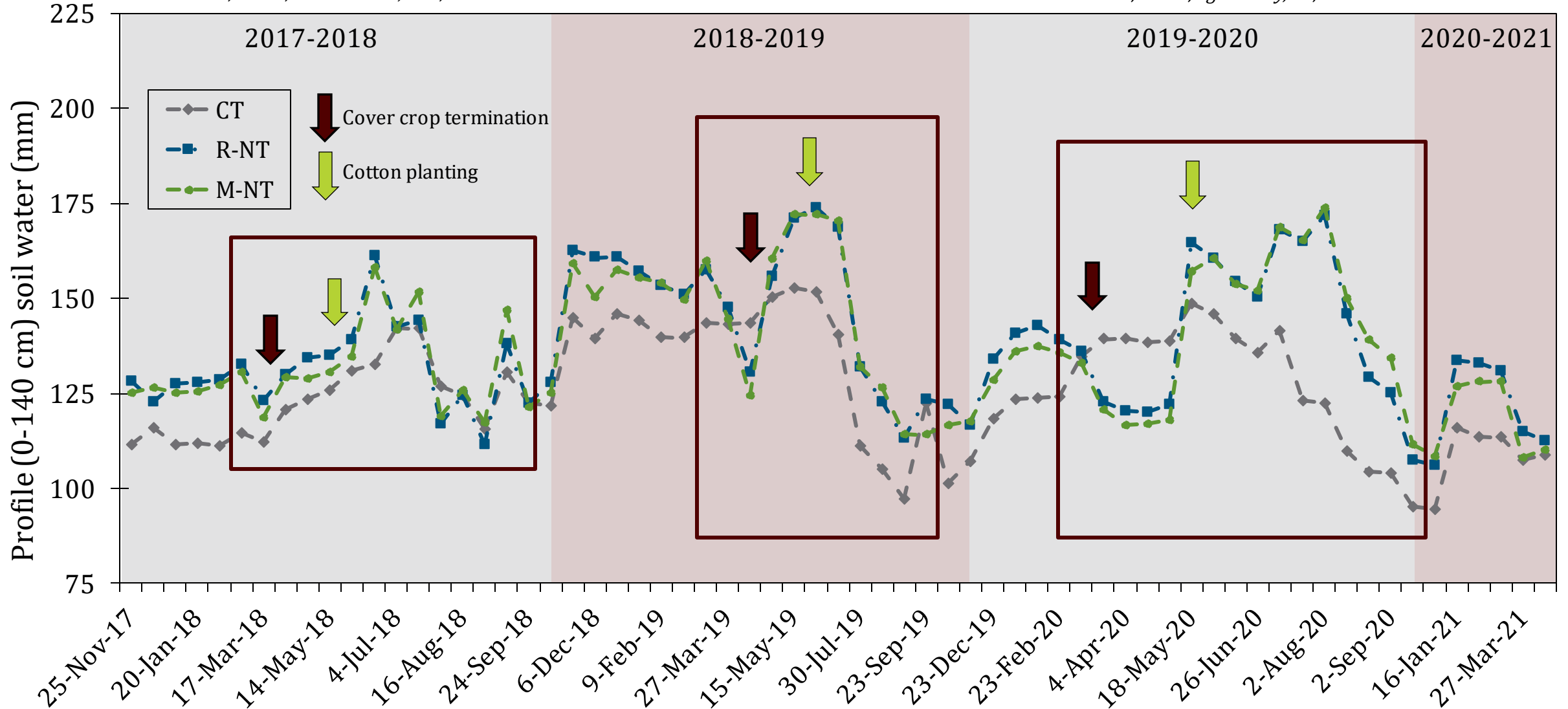
No-Till & Cover Crops

- ⦿ While struggling to promote and increase conservation tillage (e.g. cotton), NRCS soil health initiative was released shifting focus to cover crops.
- ⦿ Cover crops in semi-arid environments –
 - ⦿ Not a new concept, as small grain cover crops had been used to aid in protection from wind erosion
 - ⦿ Soil water use
 - ⦿ Cost
 - ⦿ Multi-Species mixtures
 - ⦿ Management (from planting to termination)
 - ⦿ *It may take years to realize benefits.*

Soil water in continuous cotton

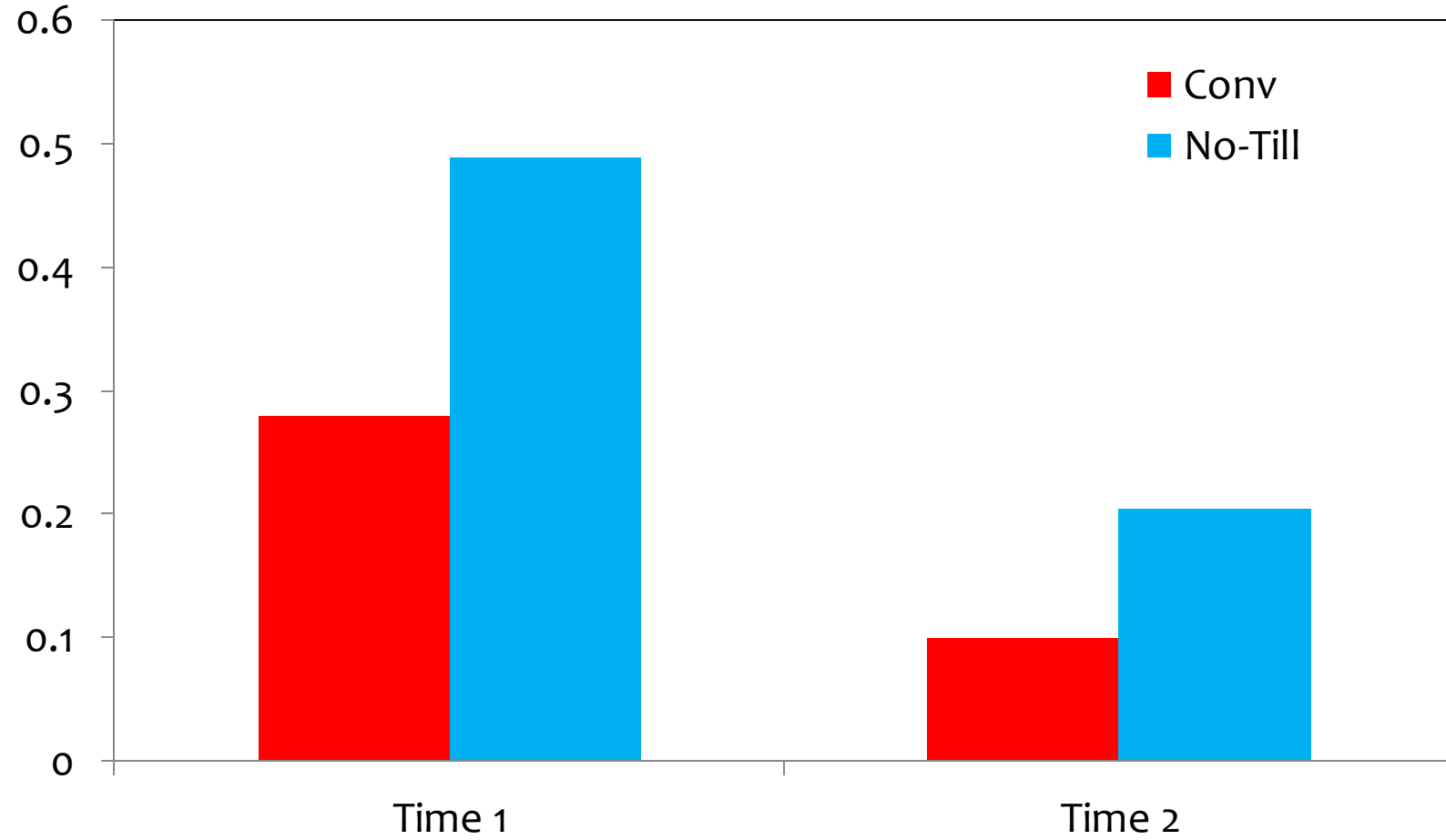
Burke et al., 2021, *Soil Till. Res.*, 208, 104869.

Burke et al., 2022, *Agronomy*, 12, 1306.

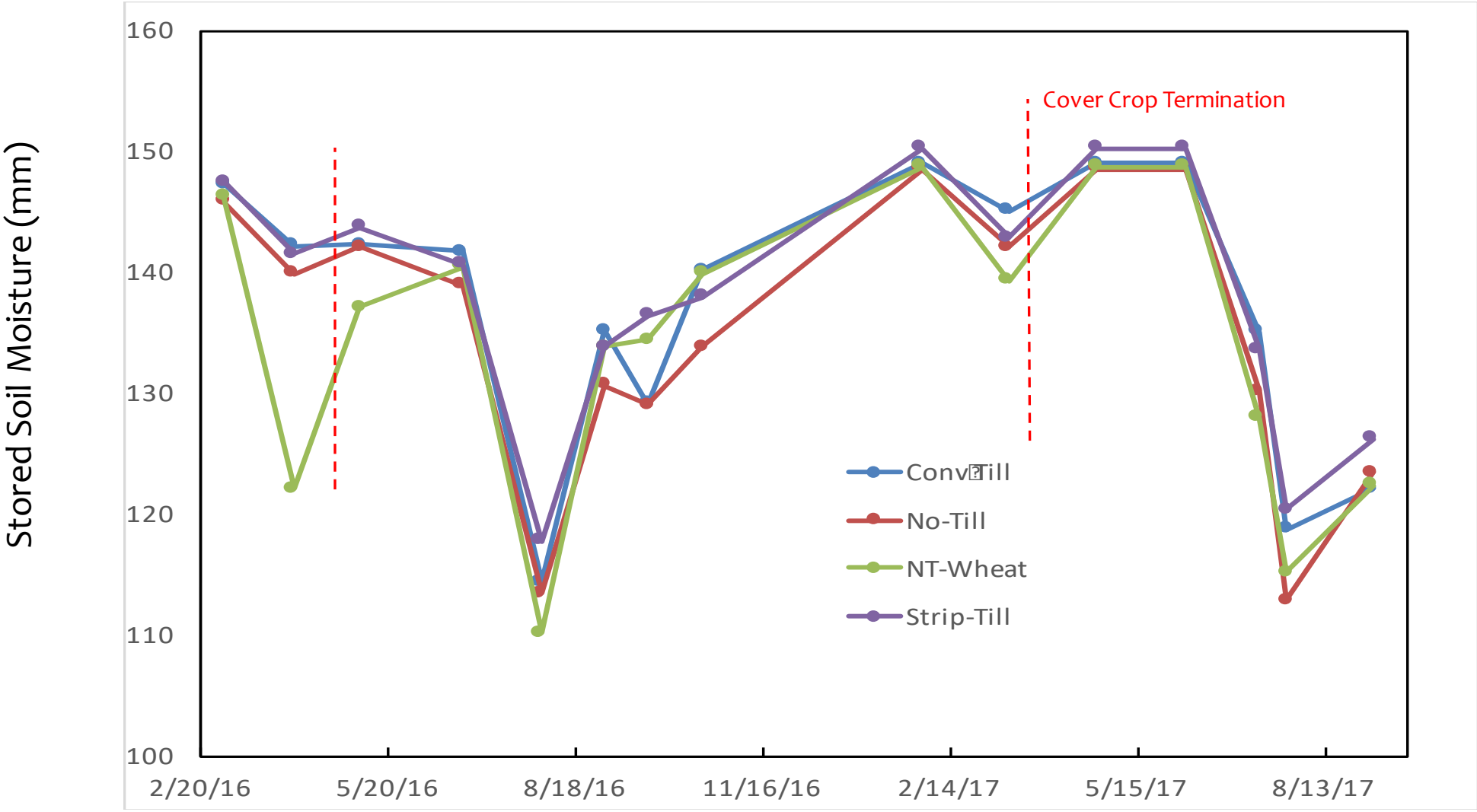


CT = conventional tillage, winter fallow; R-NT = no-tillage, rye cover; M-NT = no-tillage, mixed species cover

Infiltration

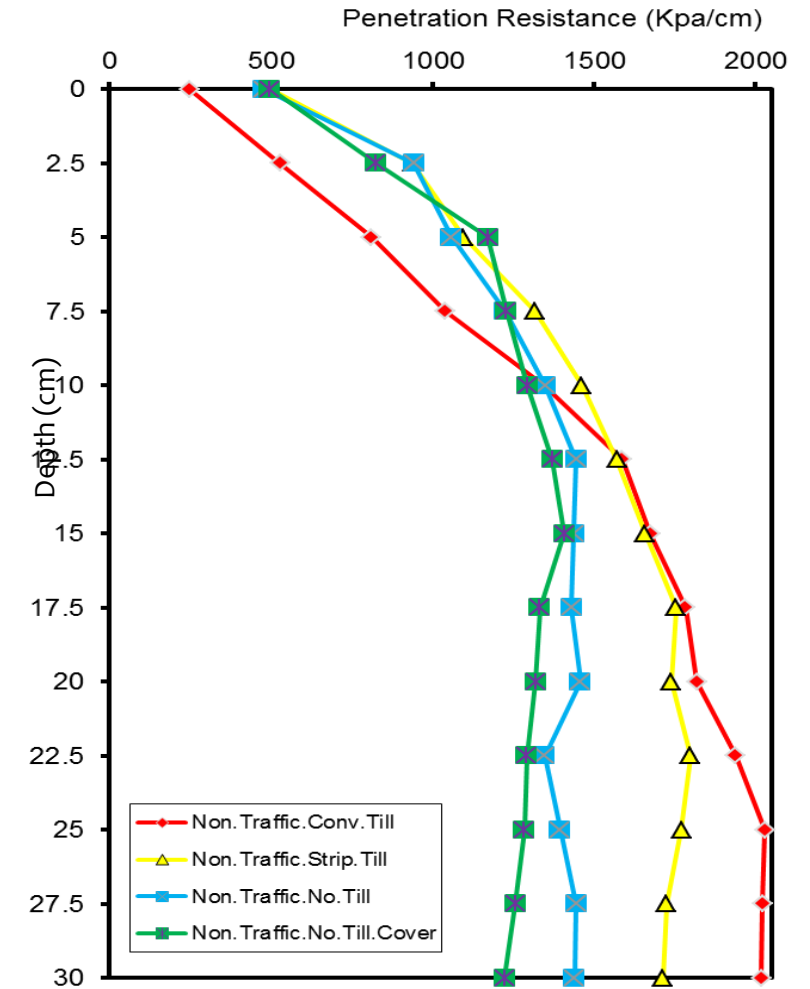
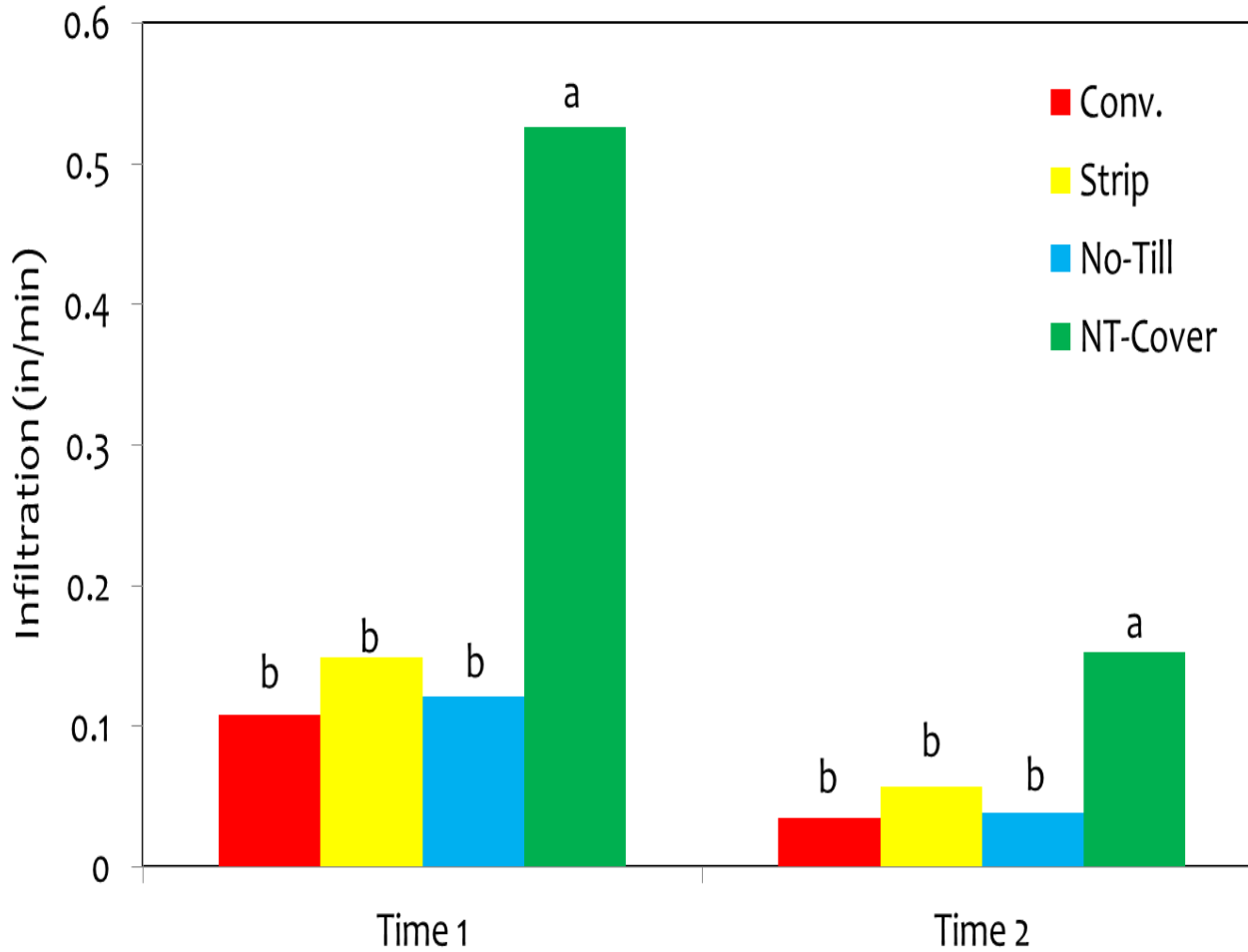


Stored Soil Moisture – 2 ft (SDI)

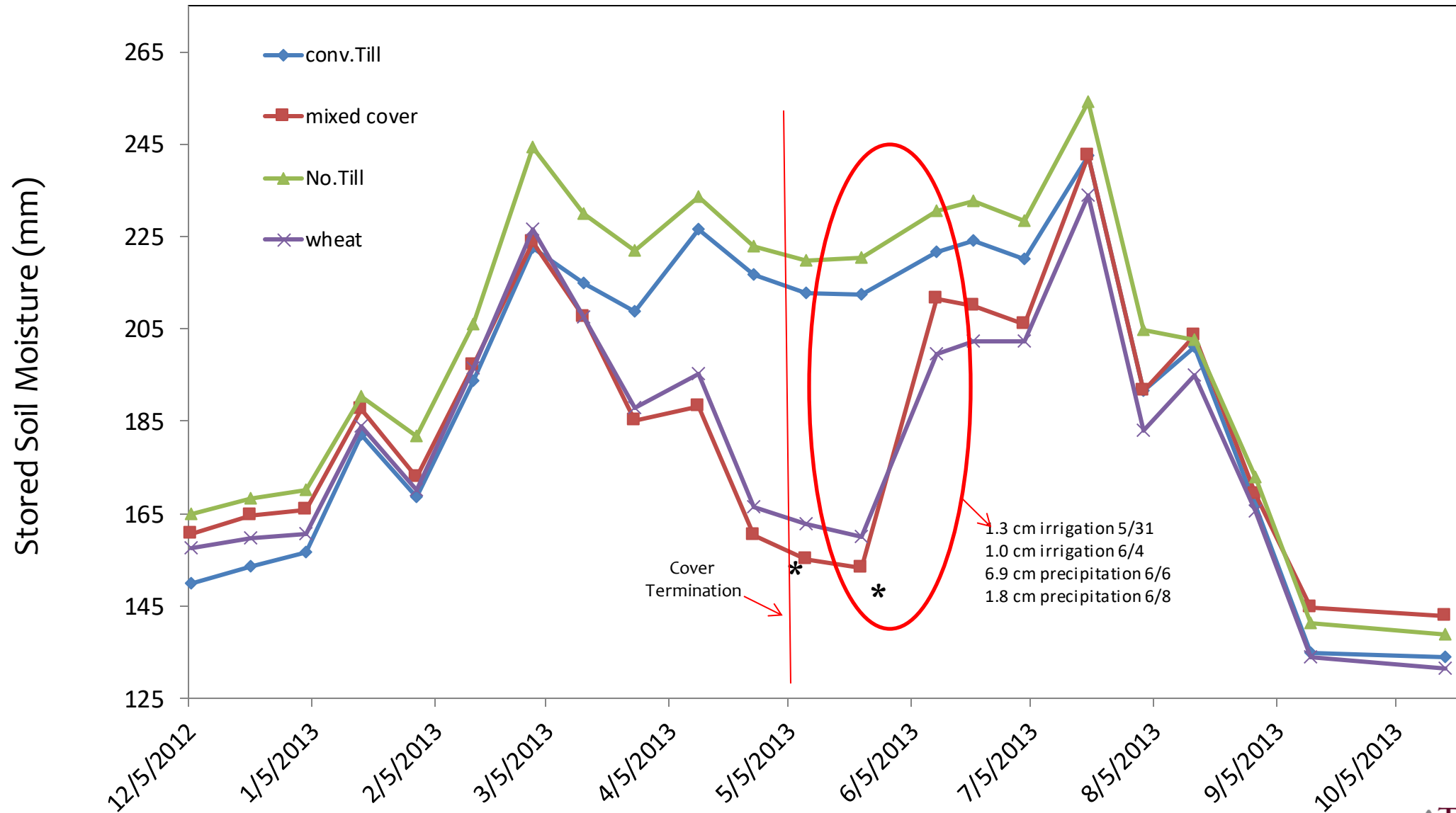




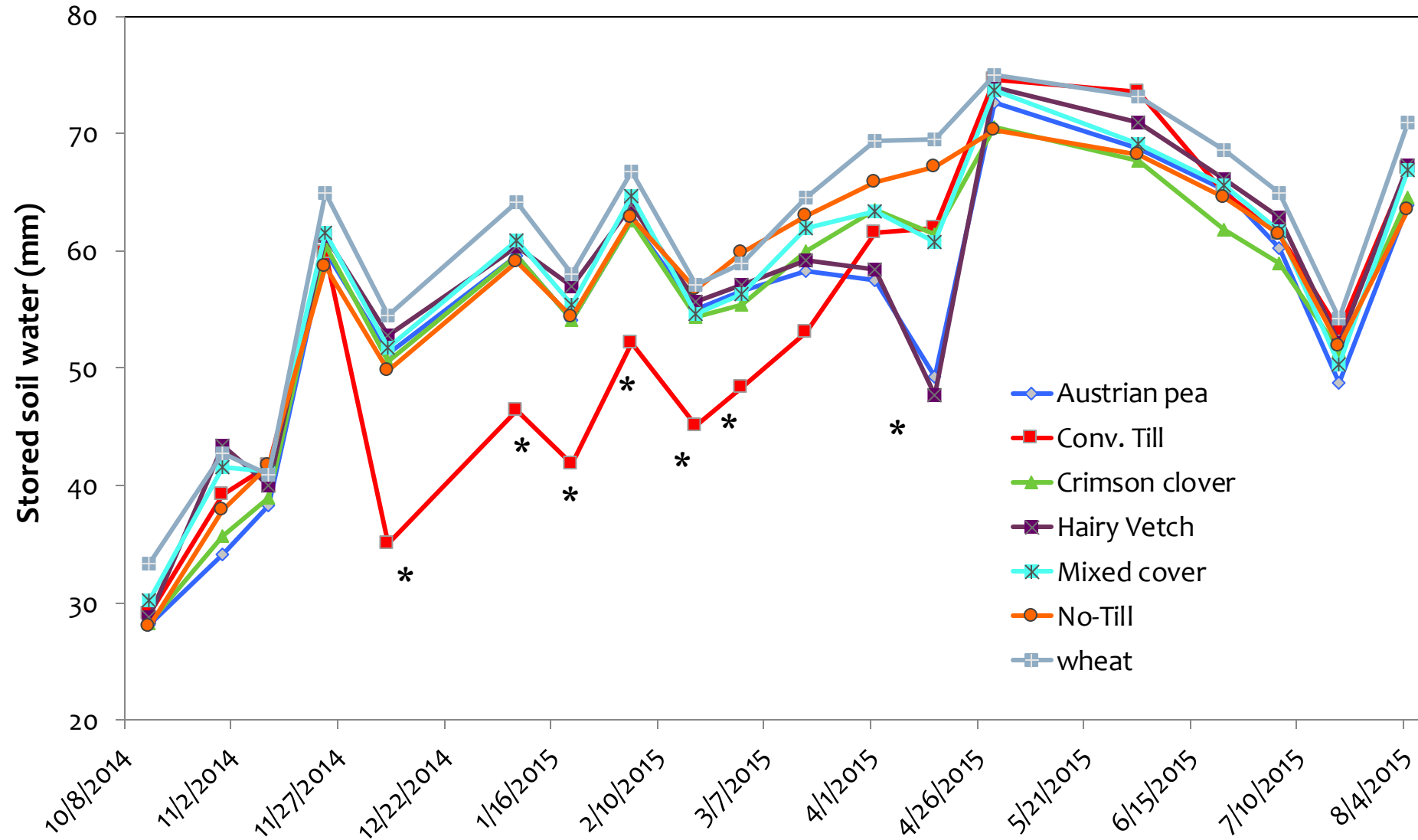
Physical Properties

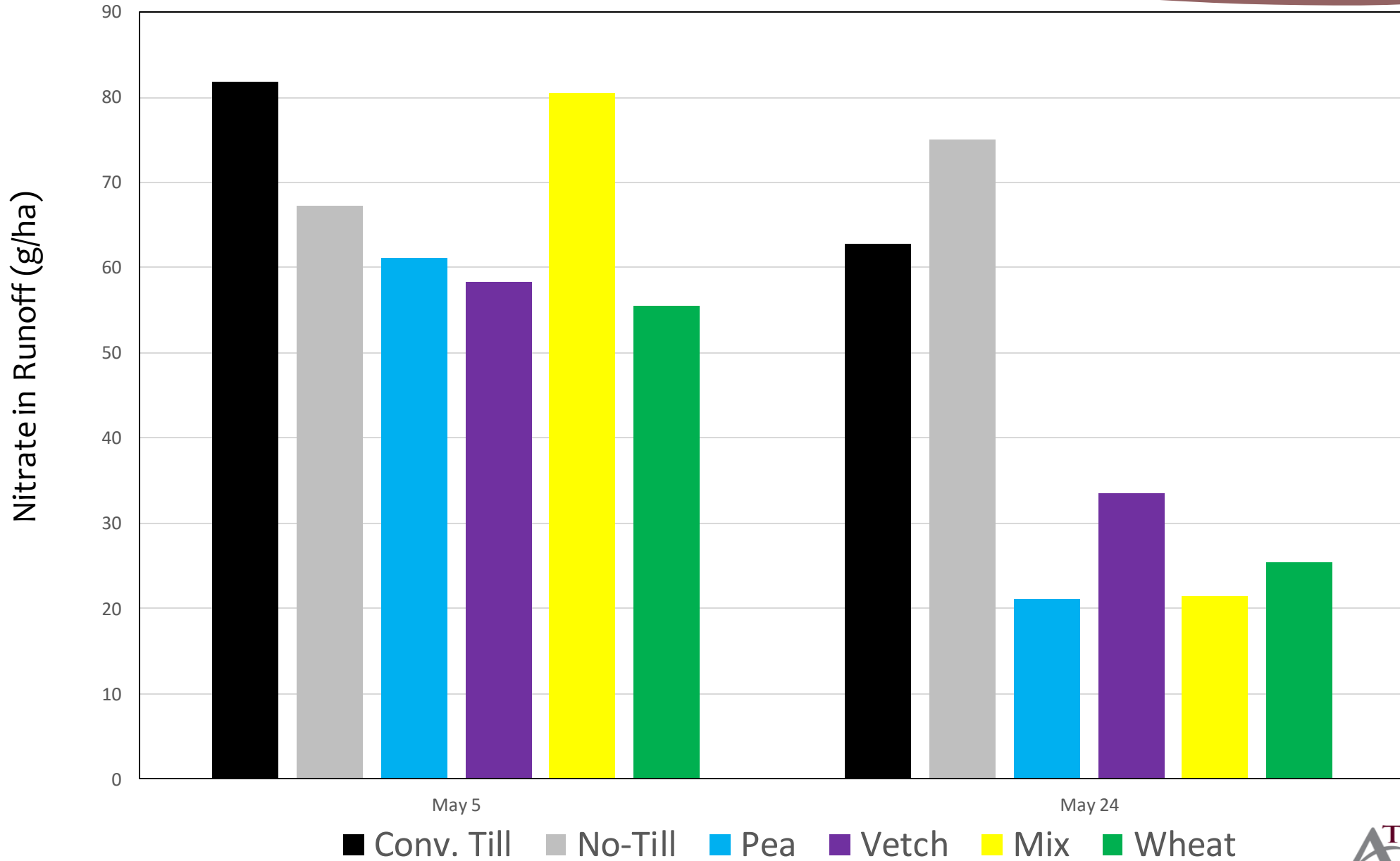


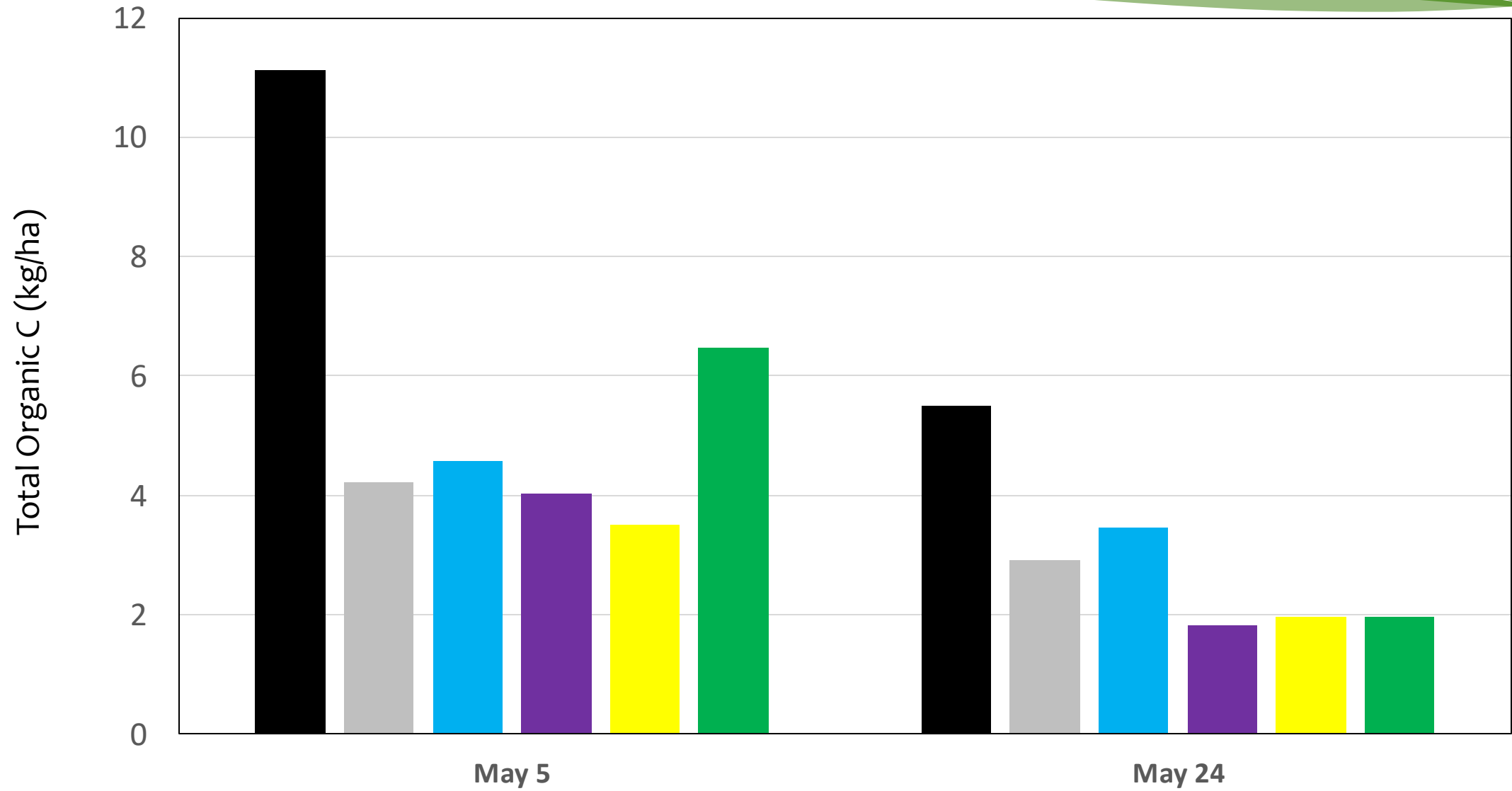
Stored Soil Water in Top 4.6 ft (Pivot)



Stored Soil Moisture in Top 12" (Dryland)



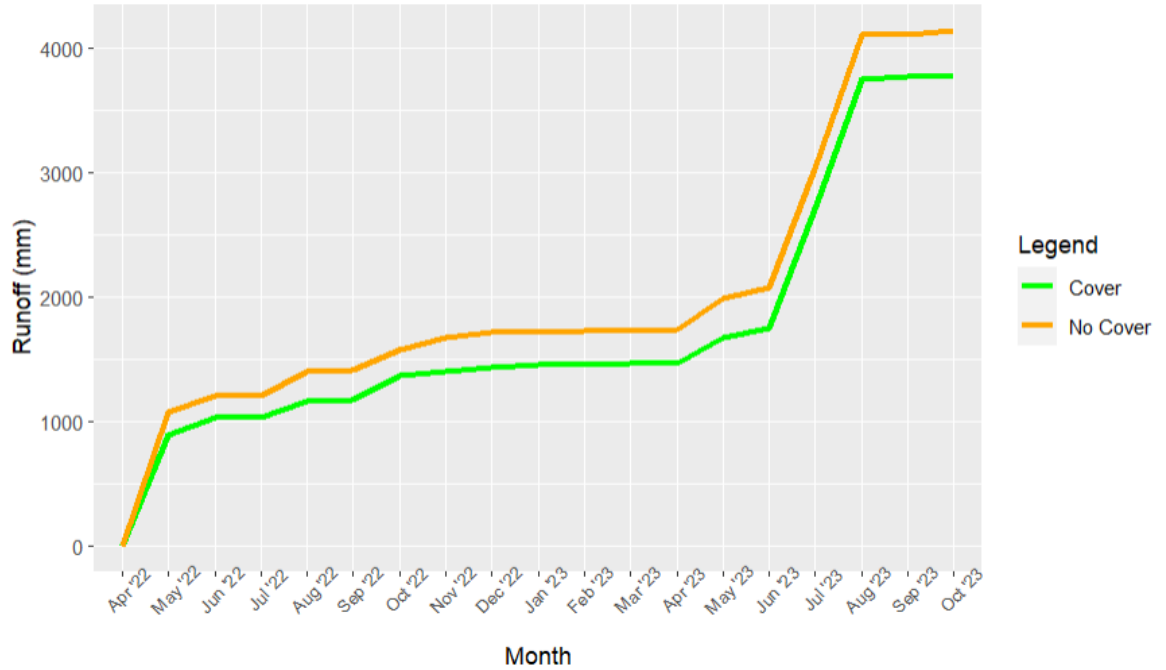




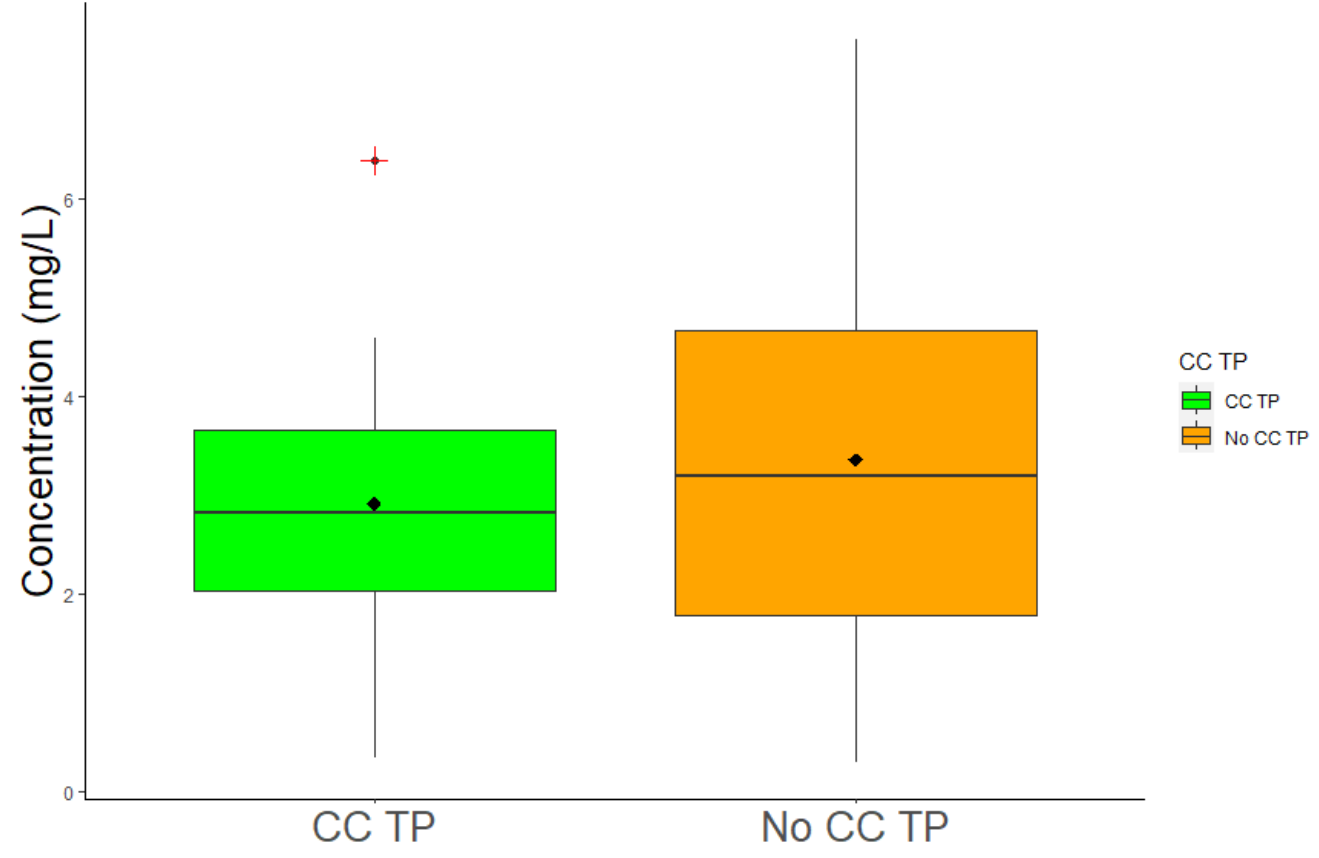
■ Conv. Till ■ No-Till ■ Pea ■ Vetch ■ Mix ■ Wheat



Cumulative Runoff by Treatment



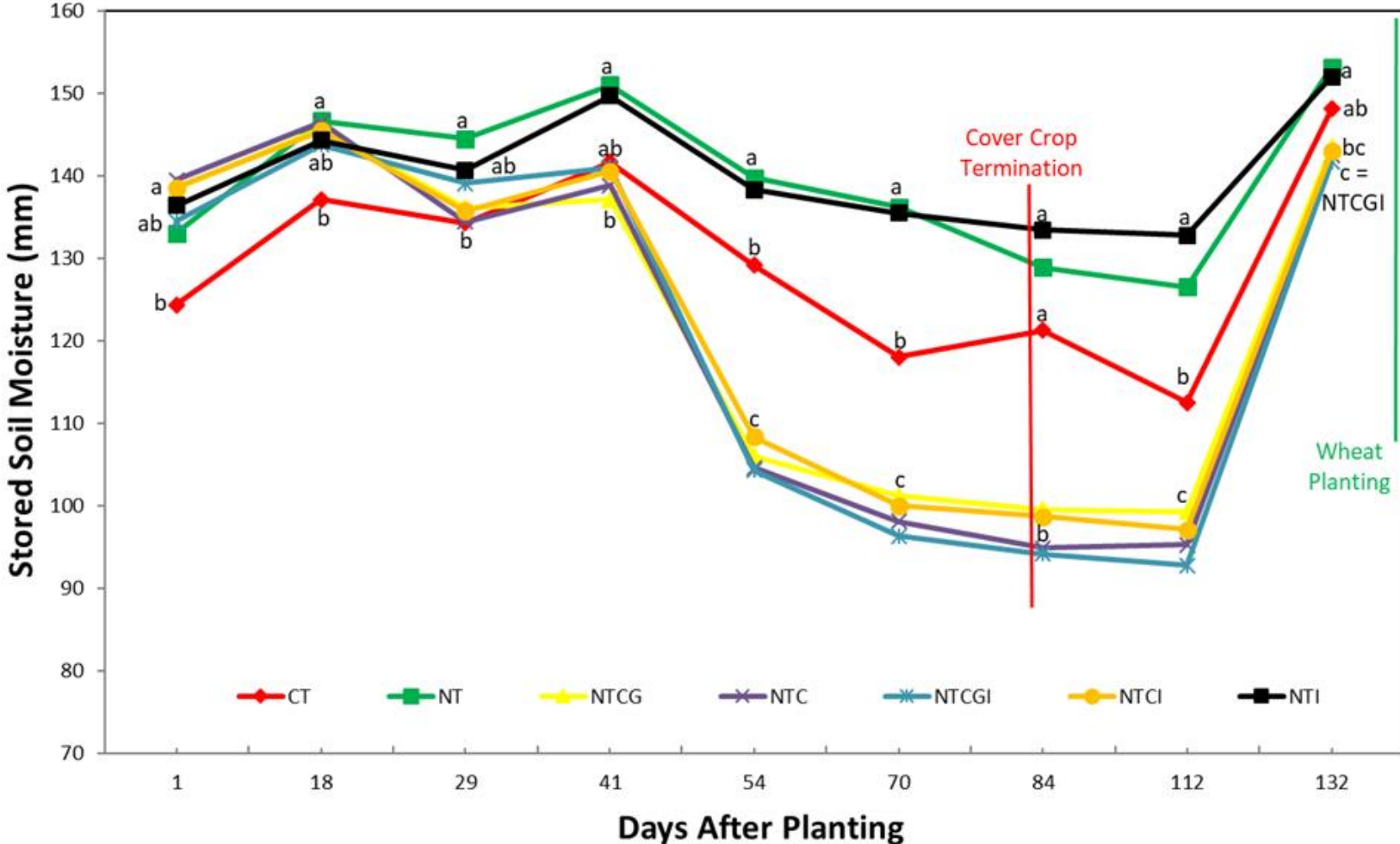
Total Phosphorus Concentration



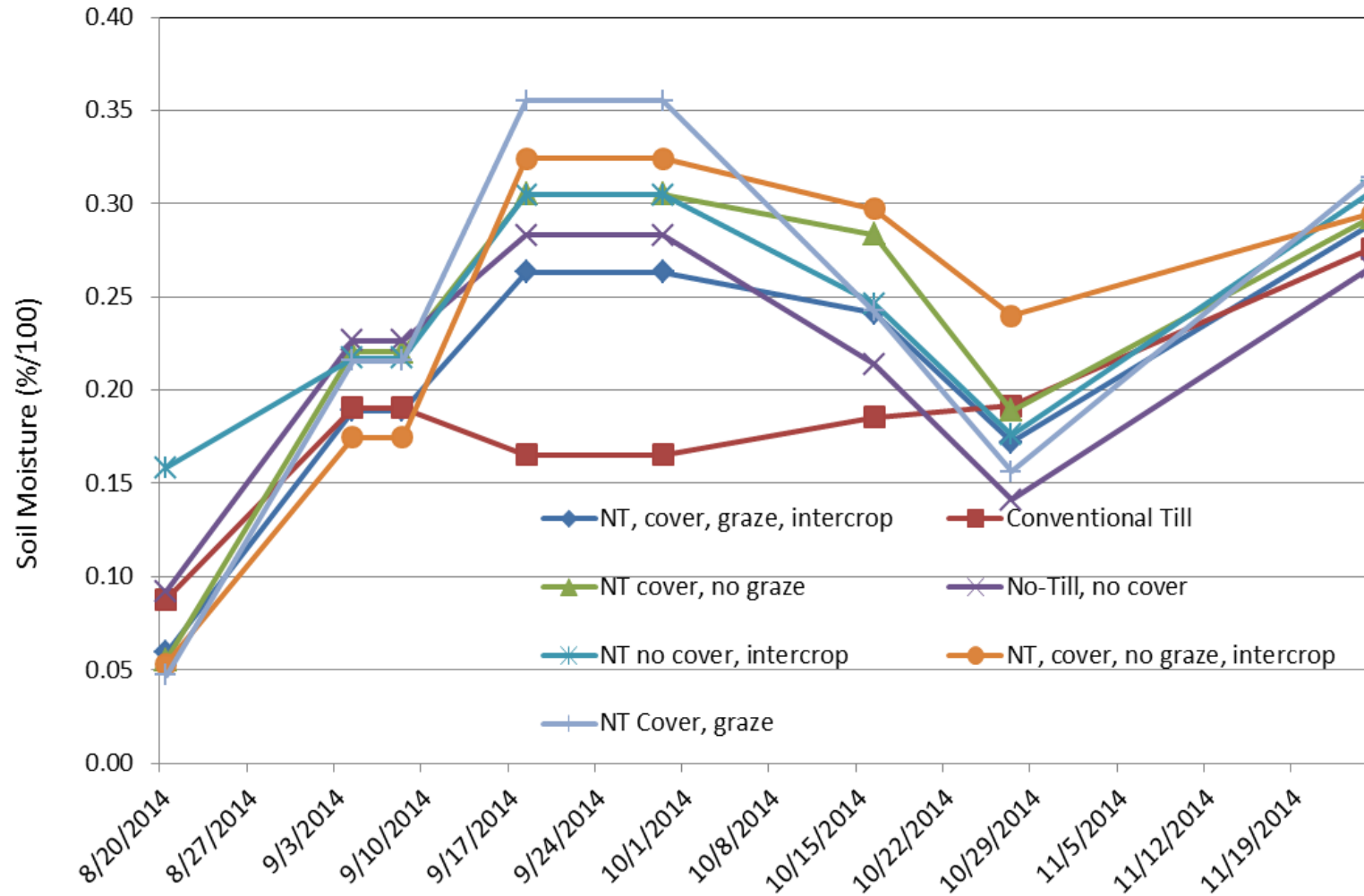
Livestock Integration



Stored Soil Water 0-24 inches



Wilbarger County (Surface Moisture)



No-Till



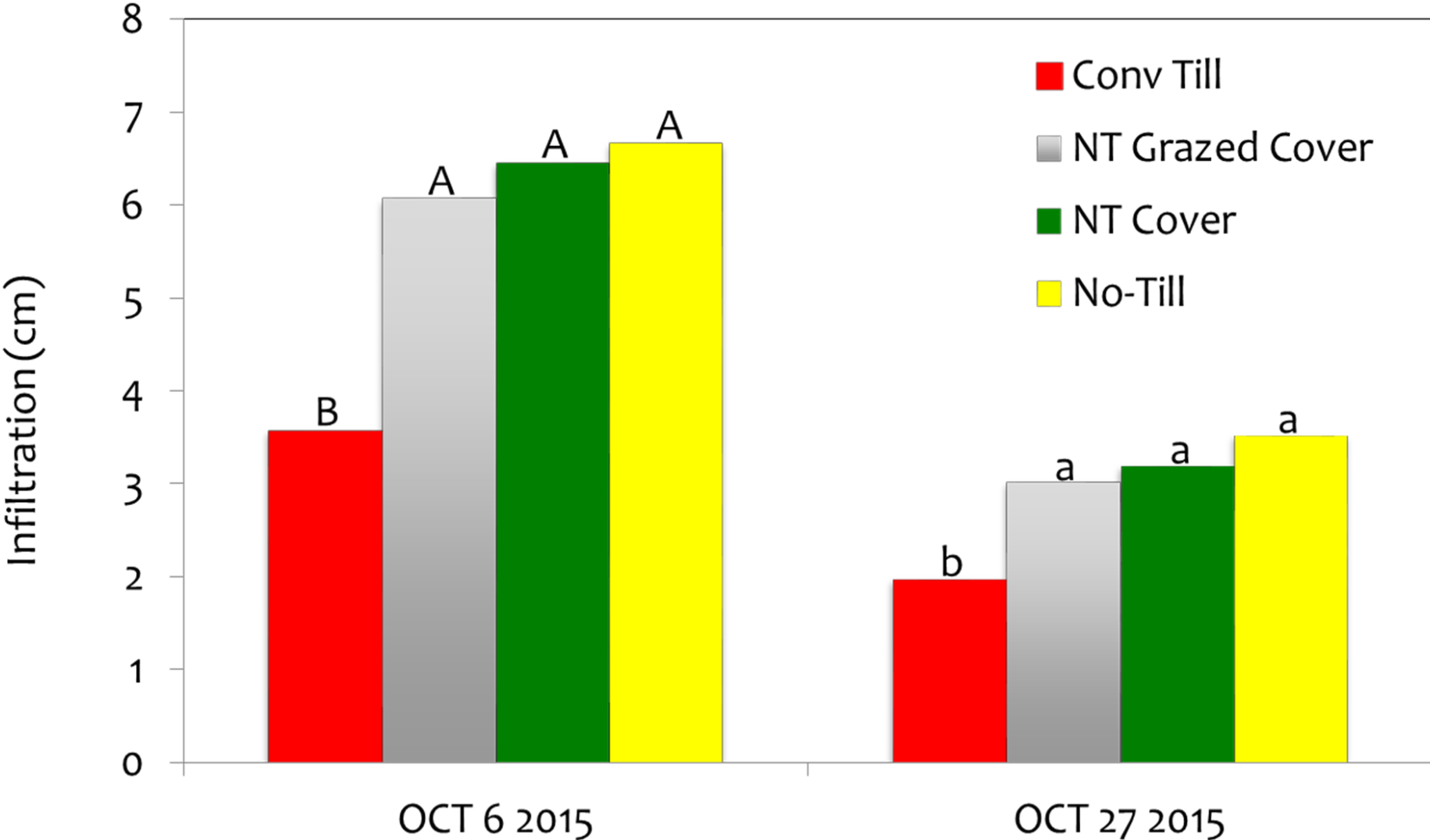
No-Till with Cover



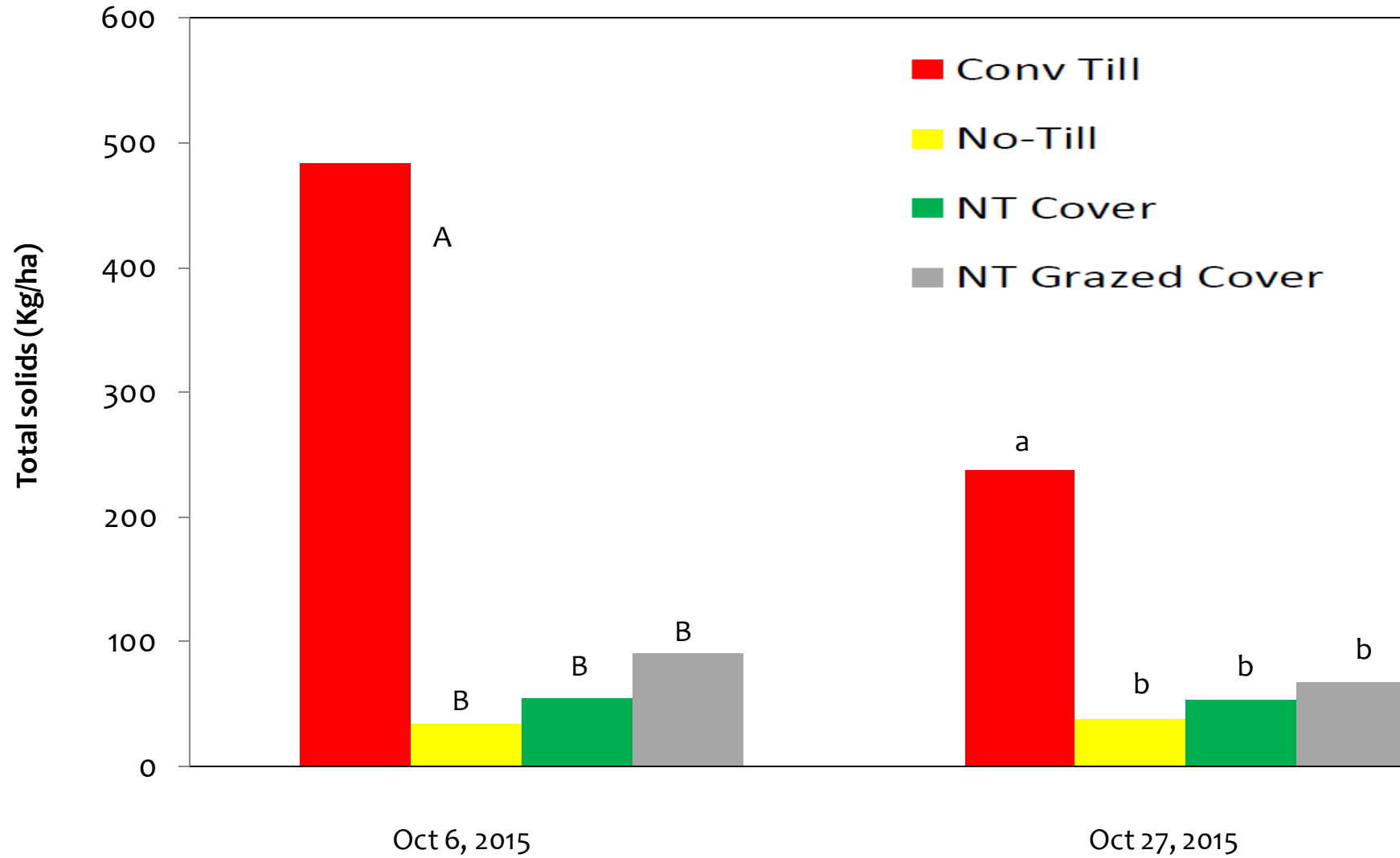
Conventional Till



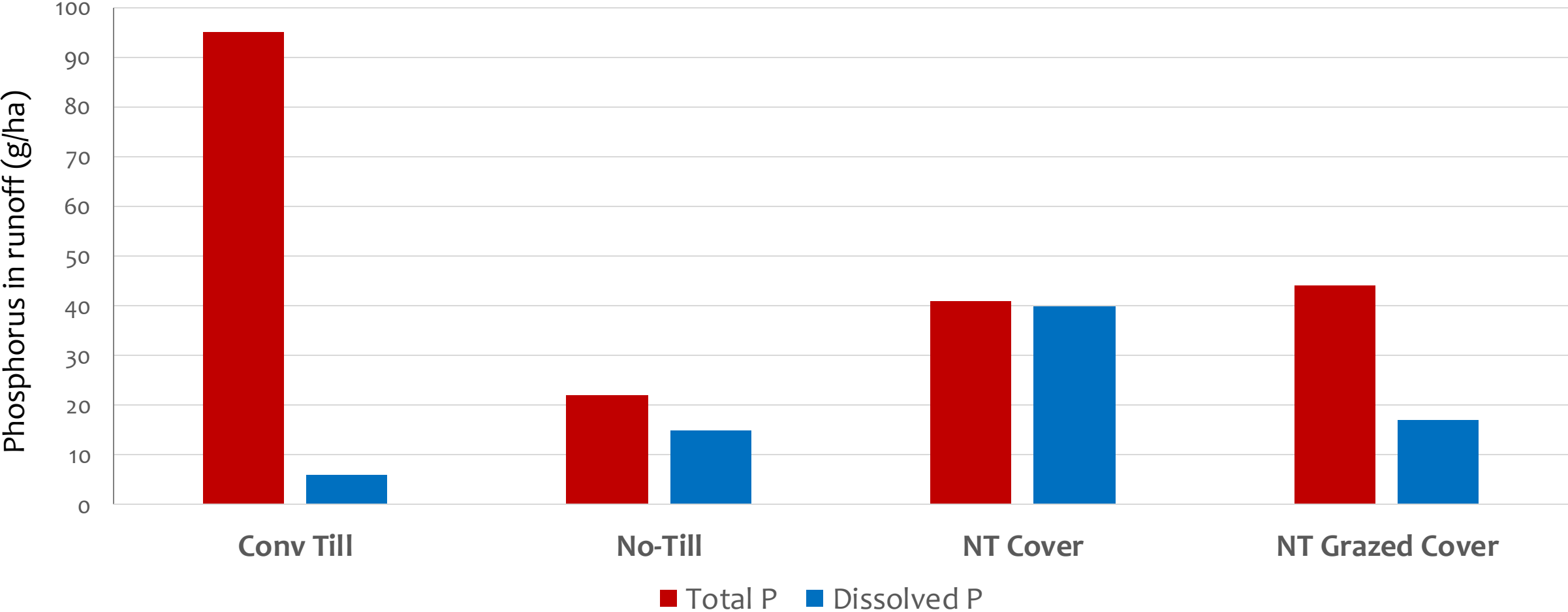
Infiltration

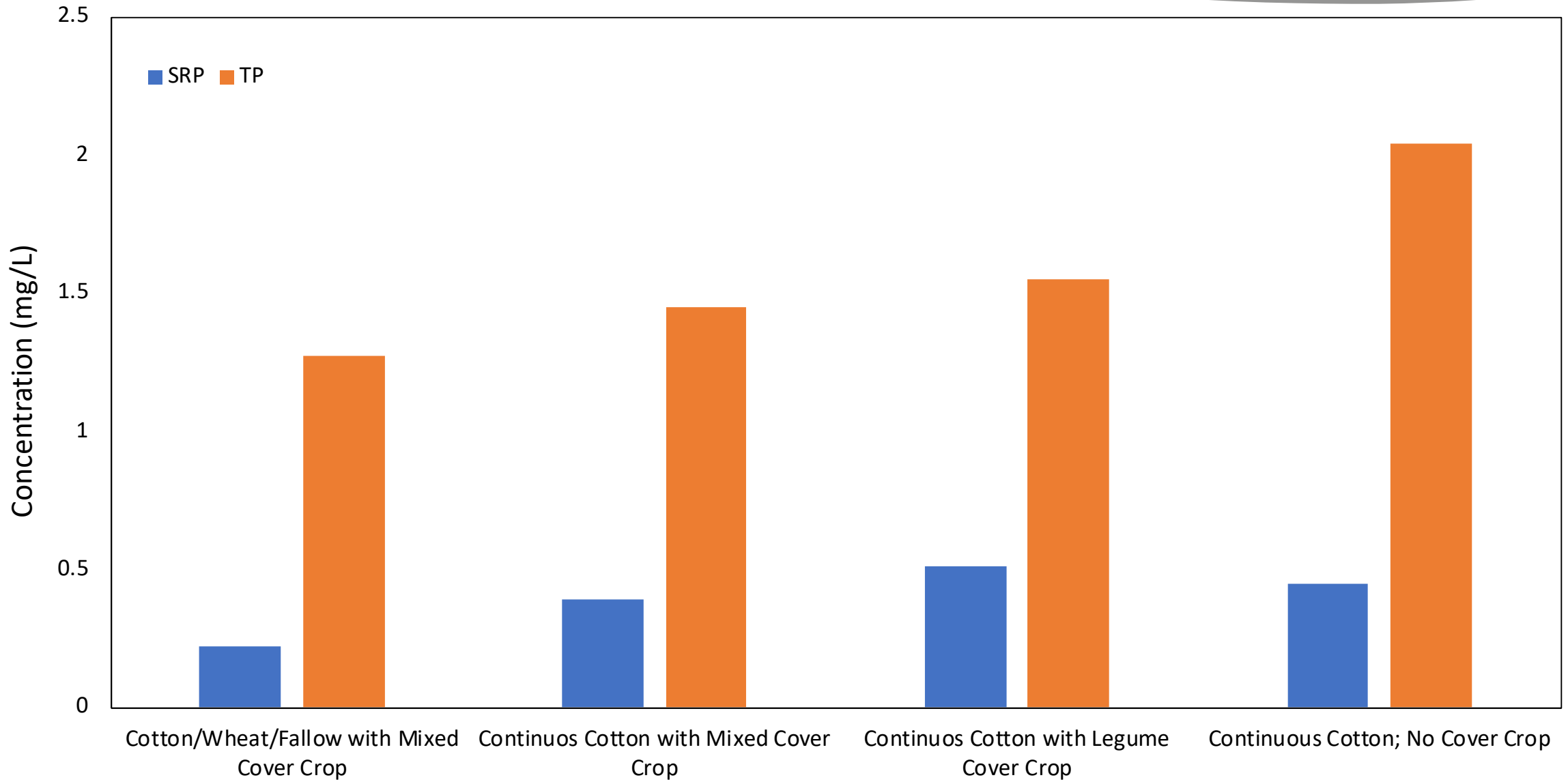


Erosion



Phosphorus







Summary

- ⦿ Cover crops do use soil moisture. However, precipitation is generally captured more efficiently in cover crop systems (i.e. after termination).
- ⦿ With improved soil properties, cover crop systems have trended toward decreasing surface runoff.
- ⦿ Sediment losses are greater under conventional systems compared to conservation systems.
- ⦿ Nutrient losses (ammonium, total P, total C) are generally correlated with sediment losses; soluble nutrients (dissolved P and C) can be increased with high residue systems.

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