

Effect of Subsoiling on Strength of a Chernozemic Soil

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Introduction

- *There are many questions about the effectiveness of tillage to address physical limitations such as soil compaction that may exist in Saskatchewan soils, especially under the wet conditions experienced over last few years.*
- *Deep tillage subsoiling requires specialized equipment, high draft requirement = ~\$30.00/acre, benefits limited where no dense subsoil or compaction (Ewen, 2015).*
- *Thus information is needed on the benefits that may be obtained from conducting a subsoiling operation on soils where compaction is present in specific areas e.g. wheel tracks.*



Background

- *Deep ripping and soil inversion has not been considered a viable option to address soil structural limitations in Saskatchewan due to severe soil disturbance and mixing of subsoil with surface soil (Grevers & de Jong, 1993; Grevers & Taylor, 1995).*
- *Subsoiling with an implement (Paraplow) designed to lift and shatter soil at depth can loosen soil, minimize surface residue mixing and create a more favorable environment for water infiltration and plant root soil penetration (Ewen, 2015).*
- *Previous research (Ewen, 2015) recommended subsoiling be restricted to only specific field areas where structural limitations (soil compaction) have been identified.*



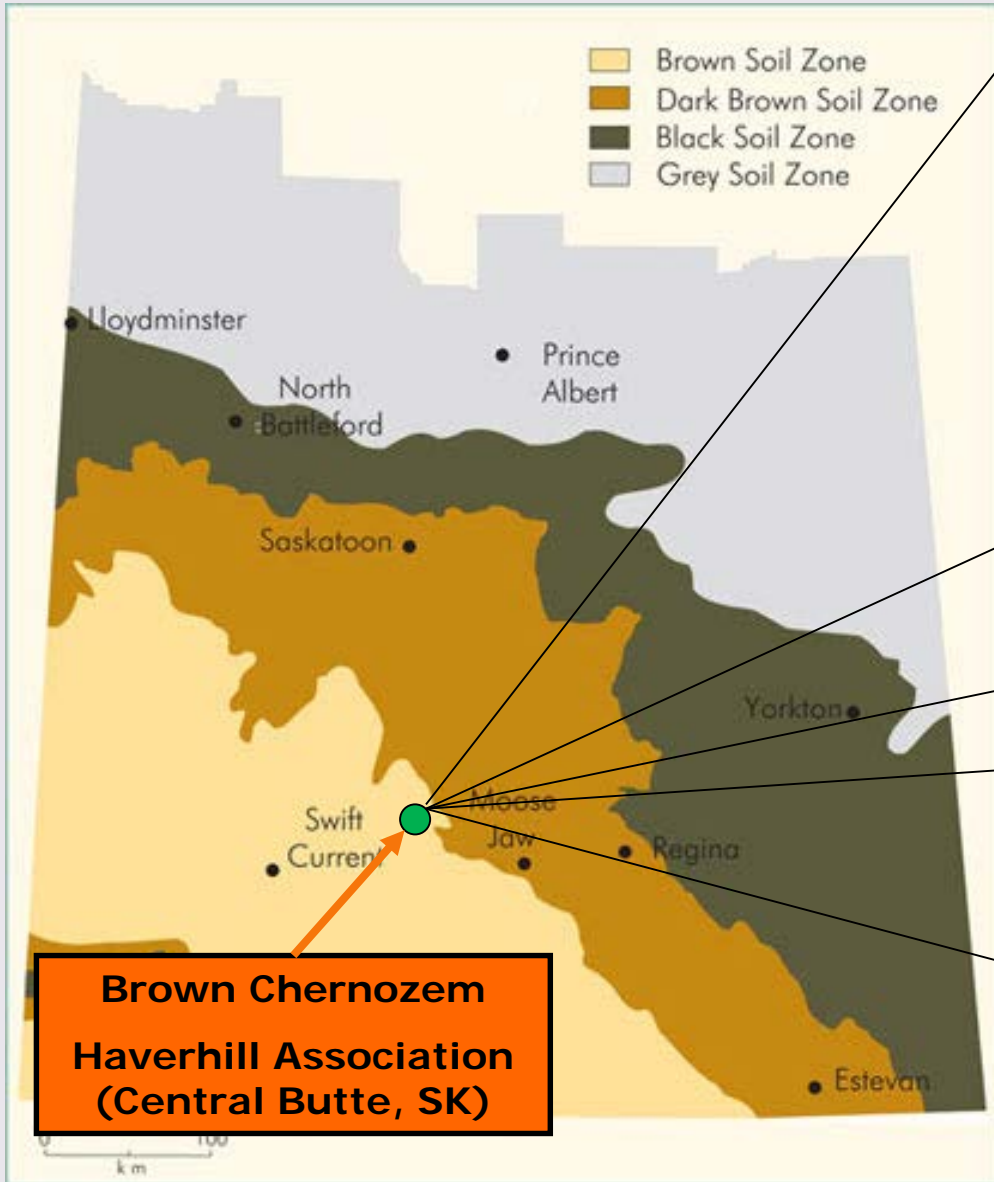
Study Objective



► To examine the effect that deep subsoiling would have on soil penetration resistance in a Saskatchewan Brown Chernozem soil.



Study Location



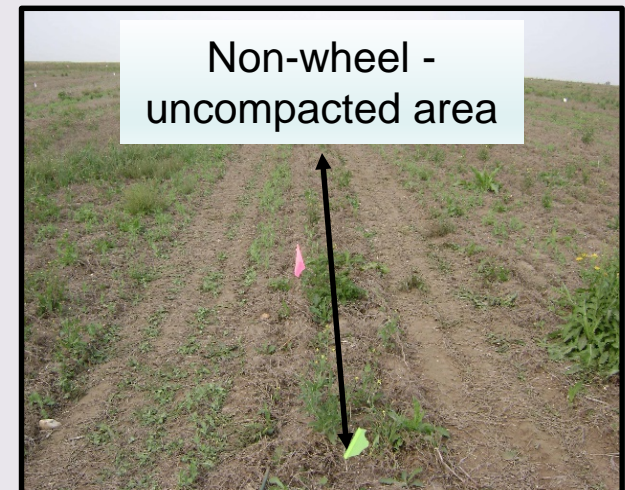
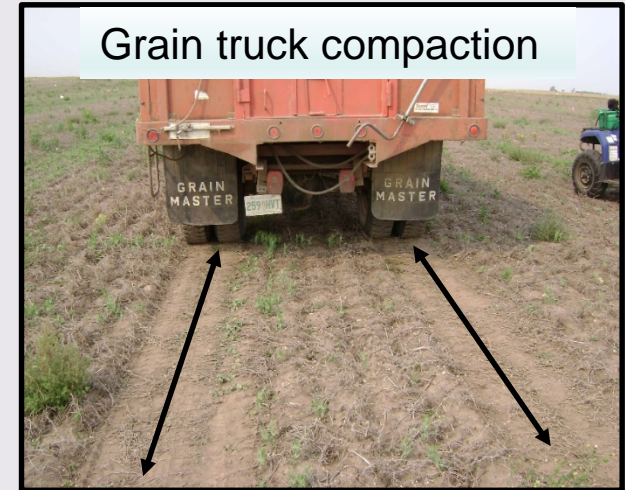
**Brown Chernozem
Haverhill Association
(Central Butte, SK)**

Study Design

- Experimental design: RCBD with 3 Replicates of Treatments
- Treatments: 1) wheel track no subsoil
2) no wheel track no subsoil
3) wheel track subsoil
4) no wheel track subsoil

Each Treatment Plot:

- 4 Transects spaced 10.0 m apart.
- 5 measurement points per transect, spaced 10.0 m apart.
- Grain truck loaded to a weight of 10 t made 3 passes over selected transect points in 1st week Sept. prior to subsoiling in 1st week Oct., 2015.



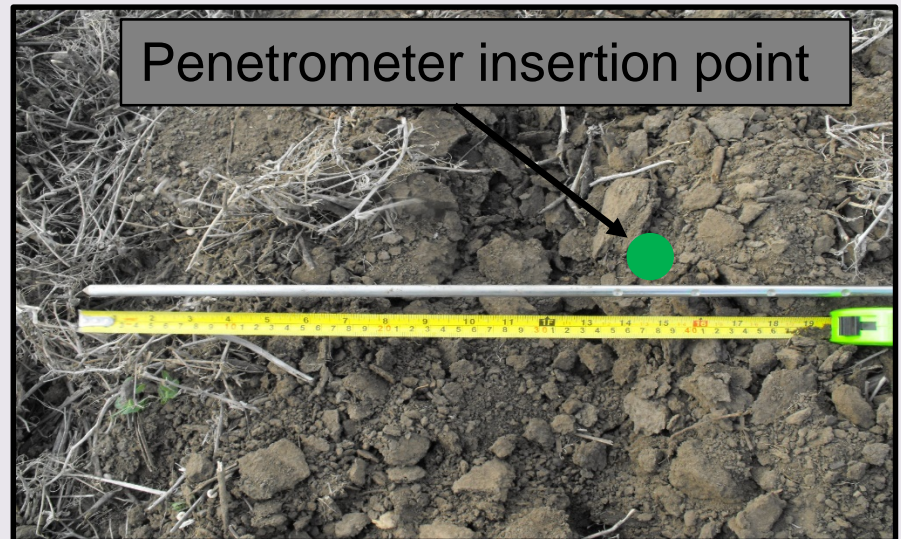
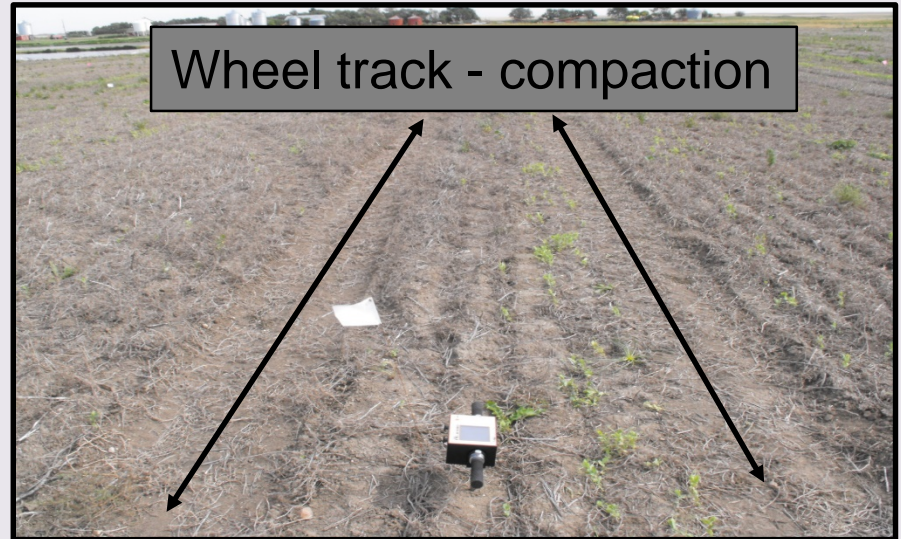
Subsoiling Treatments

- JD 2100 Minimum-Till Subsoiler equipped with 5 shanks spaced 76.0 cm apart, set to penetrate at 30.0 cm operating depth.
- Narrow profile subsoiler shank creates minimal surface disturbance with foot creating a lifting action. Soil profile was moist at time of subsoiling in fall 2015.



Soil Strength (penetration resistance)

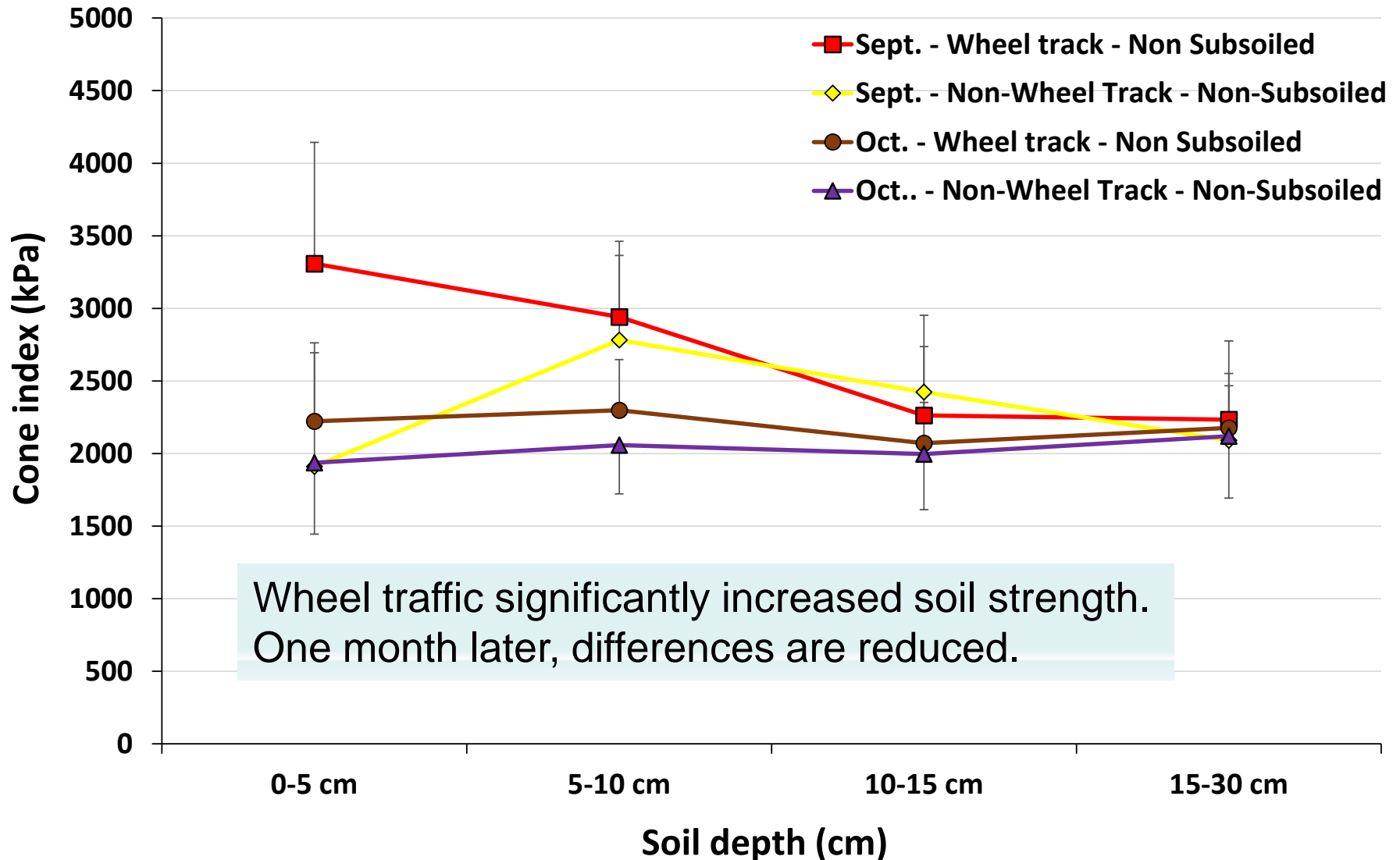
Measured using Rimik CP 40 II wireless cone penetrometer



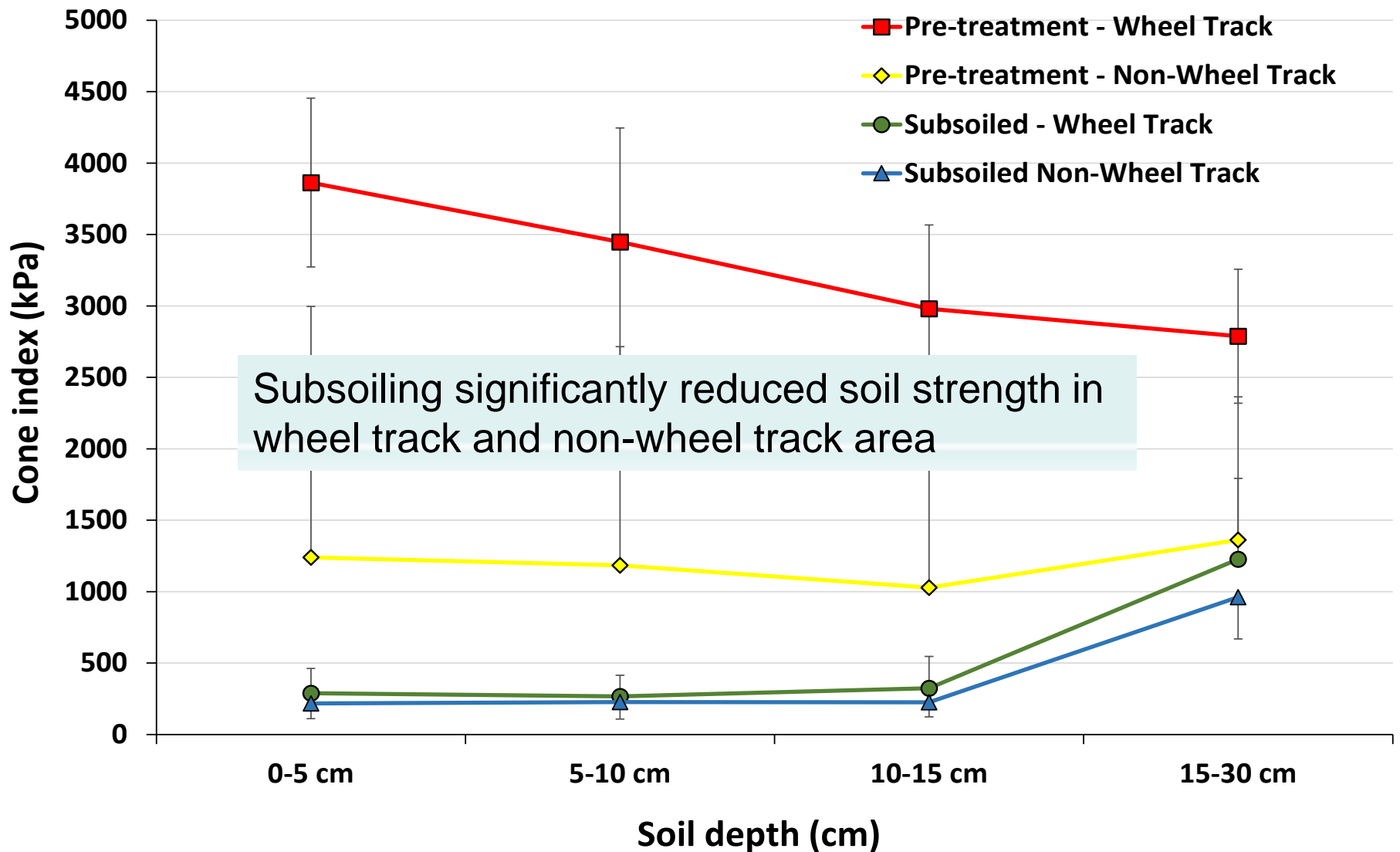
Results and Discussion



Control – No Subsoiling



Subsoiling Treatment Plot



Findings to Date

- Pre-subsoiling soil strengths (penetration resistance values) were higher at surface (0-5 cm) in wheel traffic zone compared to areas with no wheel traffic. Soil strength decreased with depth.
- Subsoiling significantly decreased soil strength at all depths down to 30 cm in wheel traffic compacted areas and non-compacted areas.
- Subsoiling reduced soil strength in compacted areas to levels below non-compacted areas not subjected to wheel traffic.
- Overall, the subsoiling was effective in reducing soil strength from the surface to the 30 cm working depth of the implement.



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Thanks For Your Attention!

