Effects of Cropping Sequence, Ripping, and Manure on Pipeline Reclamation in Western North Dakota (Williston, ND - 2017)

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Summary

Soil disturbance during the construction of pipelines, roadways, and well pads has become a serious issue in western North Dakota. Within cropland, soil health and yields need to be restored during the reclamation process. Reclamation of pipelines in a cropland setting has not been extensively researched and little is known about the best management practices for restoring crop yields. During the spring of the 2015, installation of a 36” water pipeline was completed at the Williston-REC. We took advantage of this opportunity by planting a long-term experiment with five annual crop rotations and two perennial covers in pipeline, roadway, and undisturbed (control) areas. In addition to cropping sequence, ripping/manure is being tested as the subplot in a split plot design in efforts to decrease compaction and add organic matter. This study is designed to address barriers to successful pipeline reclamation. More specifically, this study aims to provide long-term management strategies for landowners to restore productivity to cropland. If economical reclamation options are available to stakeholders, more effective reclamation plans can be composed and more efficient pipeline installations will be possible. Preliminary results indicate soil compaction and crop yields are significantly different between disturbance areas. Additional soil and plant data collection will determine differences between ripping, ripping/manure, and no-till subplots.

Design

Sequence	2015	2016	2017	2018
	Min. till	Min. till	M	Min. till
1	Durum	Durum	Durum	Durum
2	Durum	Peas	Barley	Safflower
3	Peas	Barley	Safflower	Durum
4	CC Mix*	Durum	CC Mix*	Durum
5	Durum	CC Mix*	Durum	CC Mix*
6	Alfalfa	Alfalfa	Alfalfa	Alfalfa
7	Per. Grass	Per. Grass	Per. Grass	Per. Grass

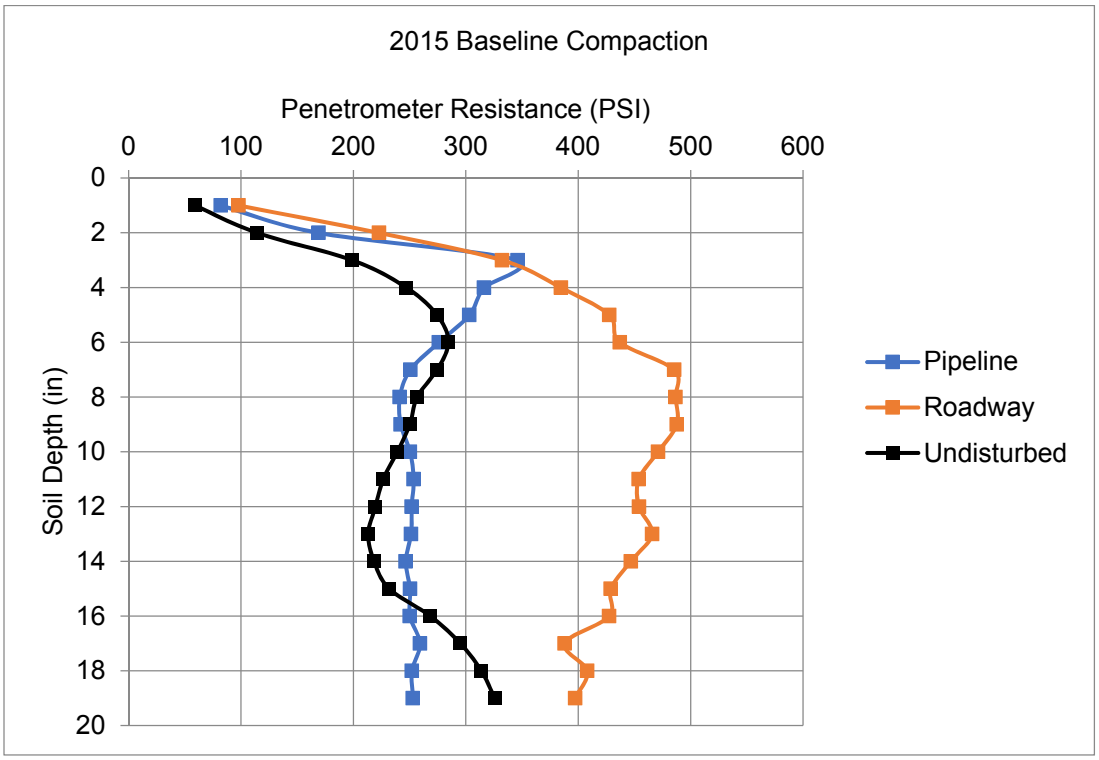
*CC Mix = Pearl Millet, Sorghum, Sudan, Turnip, Radish, Burseem Clover, Sunflower, Soybean, Cow Pea, Flax, Hairy Vetch, Phacelia, Mammoth Red Clover, Italian Ryegrass.

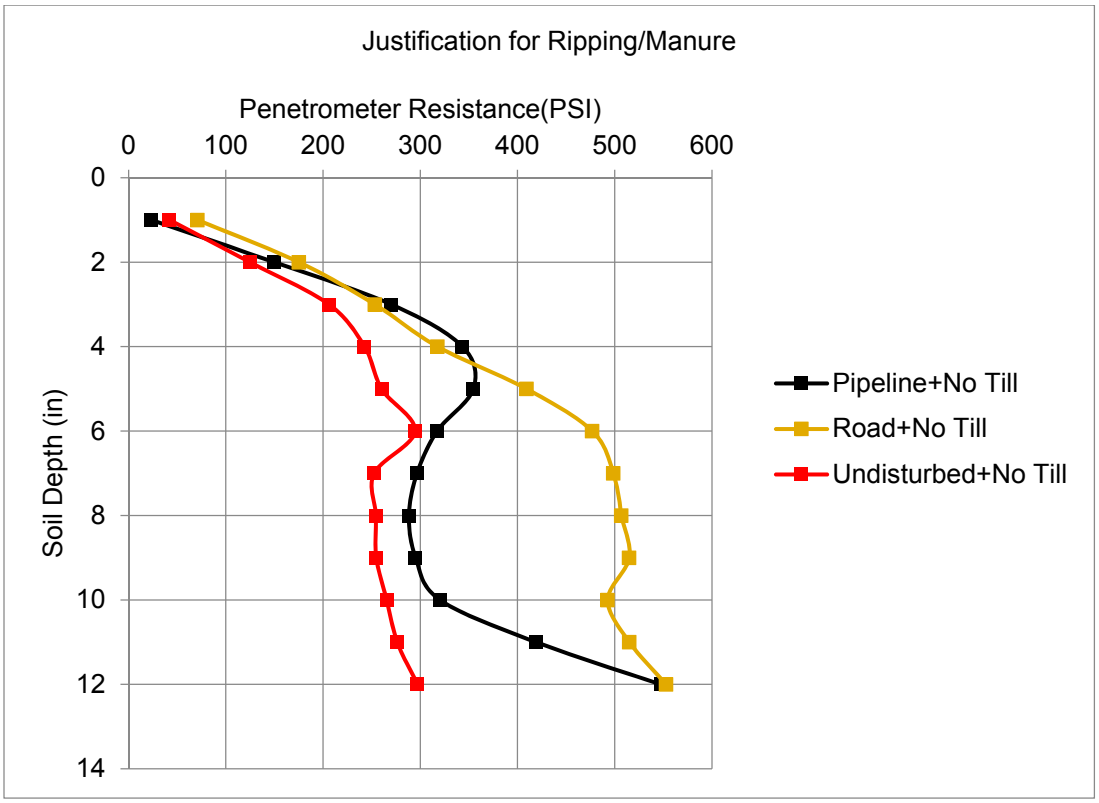
Undisturbed - Ripped	Road - Ripped	Pipeline - Ripped
Undisturbed – Ripped+Manure	Road – Ripped+Manure	Pipeline – Ripped+Manure
Undisturbed – No Till	Road – No Till	Pipeline- No Till

Design of each cropping sequence.

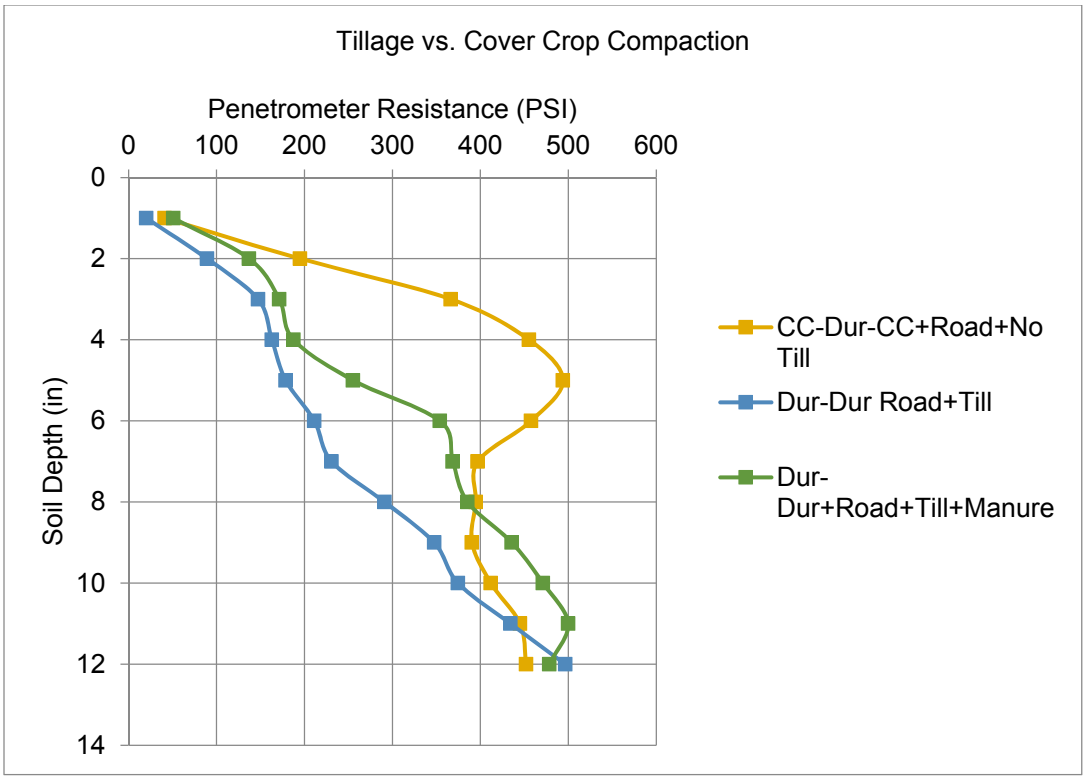
Manure application and tillage methods.

Results

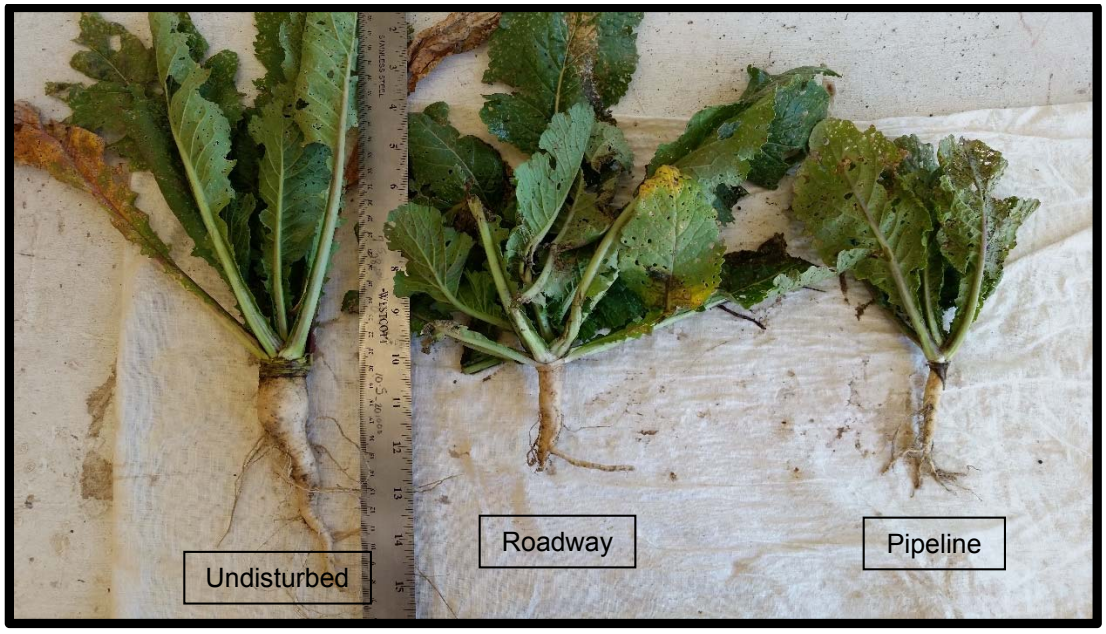




Between years one and three, no significant compaction improvement was observed. This data motivated the installation of ripping/manure treatments to further address excess compaction.



Ripping provided a greater reduction in compaction than a full season tap-rooted cover crop grown two of three years.



Subsidence occurred along portions of the pipeline in the project area.

In June and July 2018 (year 4), there were multiple large storm events that impacted annual crop yields. The July 9, 2018 event led to subsidence along portions of the pipeline, as pictured above.

23-Jun-18	Wind speed=46 mph; Precipitation=1.53".
28-Jun-18	Wind speed=61 mph; Precipitation=0.94"; Hail.
9-Jul-18	Wind speed=48 mph; Precipitation=1.67".

Conclusions

- In years one and two, annual crops yielded significantly less in road and pipeline areas ($P \leq .05$).
- In year two, alfalfa yielded significantly higher in the pipeline area ($P \leq .05$).
- In year three, alfalfa did not yield significantly different between disturbance areas ($P \leq .05$).
- DCP data trends suggests tillage treatments reduce compaction initially more effectively than deep-rooted annual cover crops; however, additional years of sampling will be conducted.