

Carver County Infiltration Monitoring



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Hydrology & Water Quality Field Methods

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Resilient Communities Project

UNIVERSITY OF MINNESOTA

Building Community-University Partnerships for Resilience

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Identifying Best Management Practices to Improve Storm Water Reuse Irrigation Systems

Data Report and Summary of Findings

Resilient Communities Project

ESPM 3111/5111 & Carver County Water Management Organization

Spring 2021

Contributions by

Mike Stoffel, Akia Vang, Christa Grethel, Bella Radler

Background

Carver County Water Management Organization seeks to improve stormwater management on various parcels of land in order to mitigate flooding, promote water quality, and reuse stormwater for irrigation.

The ESPM 3111/5111 course of Hydrology and Water Quality Field Methods students are consultants for the WMO and will provide information on infiltration data for two sites. The two site locations where field data are collected from are the Carver County Public Works Prairie and Hilks Lake Townhome Restoration Site.

Methodology

The Saturo Dual Head Infiltrometer was used to obtain infiltration data for this endeavor. The device measures infiltration rates and calculates the saturated hydraulic conductivity of the soil by oscillating between a high and low pressure head applied on water into and within the ring system. The two pressure cycles together take about an hour and a half to complete one trial of data gathering.

Four infiltrimeters were used for this project to conduct four trials conducted at each of the sites: two as controls on turfgrass and the other two on prairie vegetation.

Water used to run the devices could potentially have an effect on the experiment should there be considerable suspended solids in the water or should it be from an outdoor stream source. In this case, the supply of water used to run the devices and trials were provided by the Carver County Public Works facility and by a residential home at the Hilks Lake Townhome Site. The water used in the experiments were from the municipal water supply and any effects from contaminants present in typical municipal water is considered negligible in this instance due to lack of noticeable suspended solids.

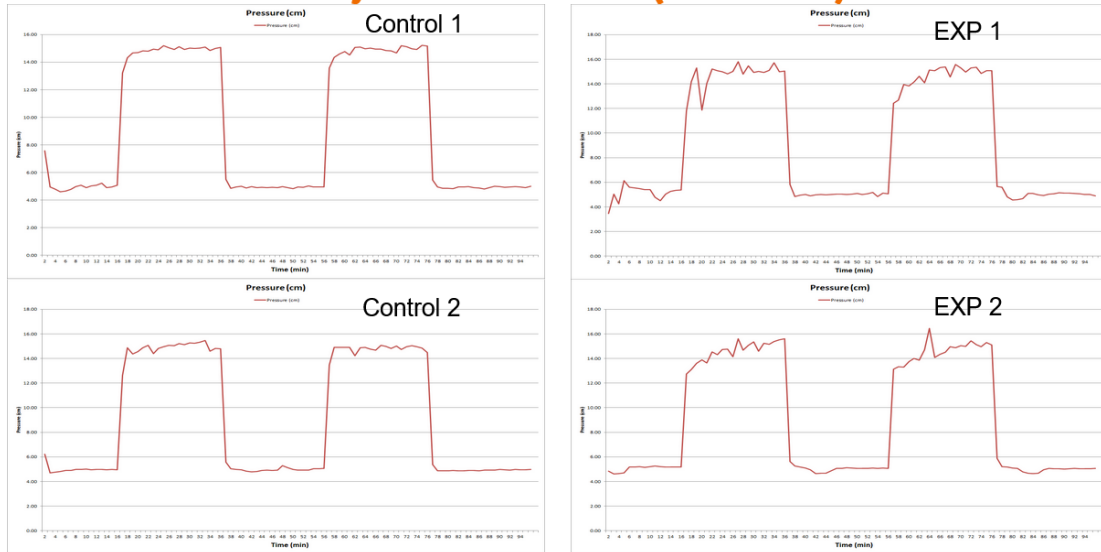
Summary of Findings

Carver County Public Works Prairie

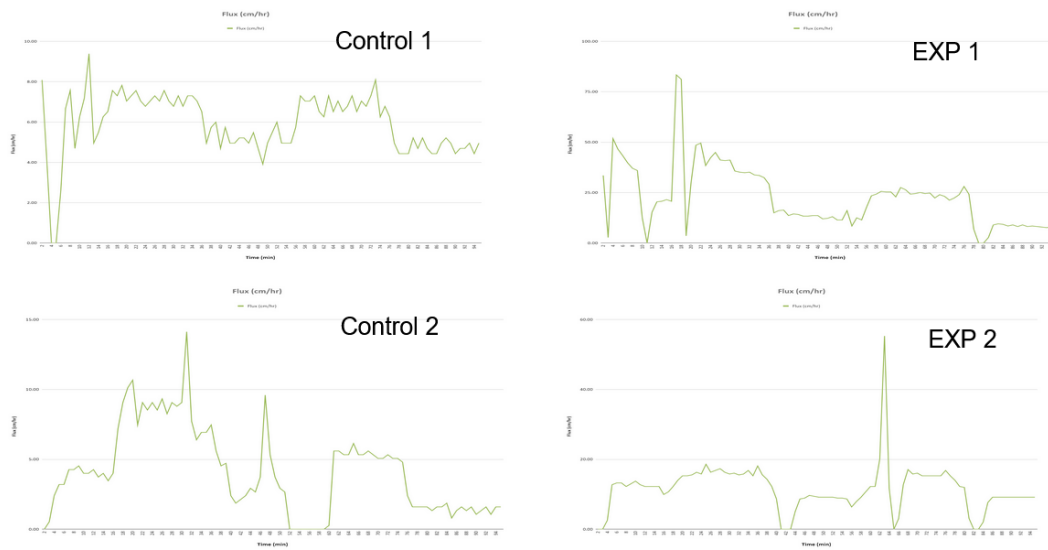
	Kfs (cm/hr)	Kfs Error (cm/hr)
Control #1	3.096	0.16992
Control #2	4.3236	0.70164
Experimental #1	24.8364	1.34316

Experimental #2	10.5732	3.9708
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Data: Carver County Public Works (Pressure)



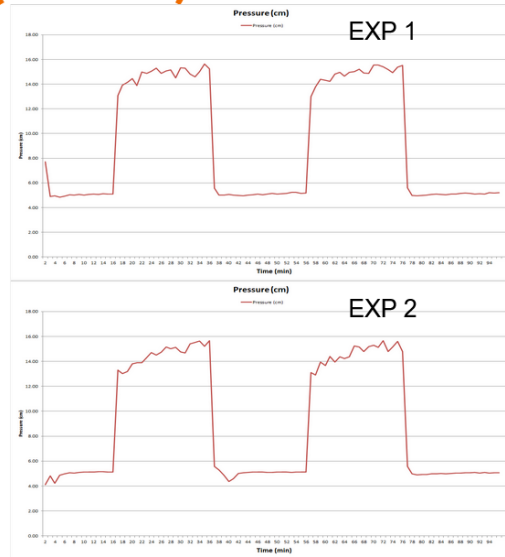
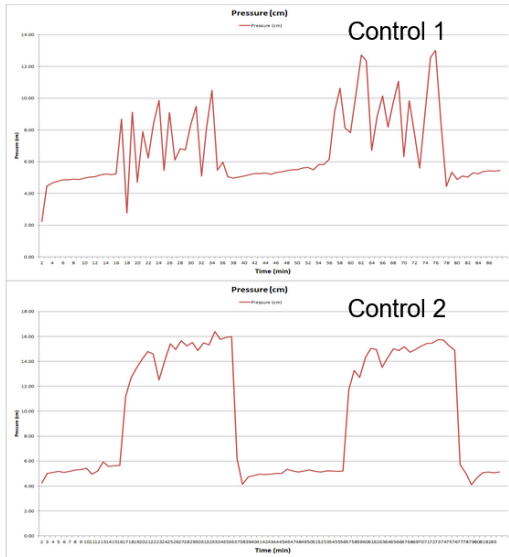
Data: Carver County Public Works (Flux)



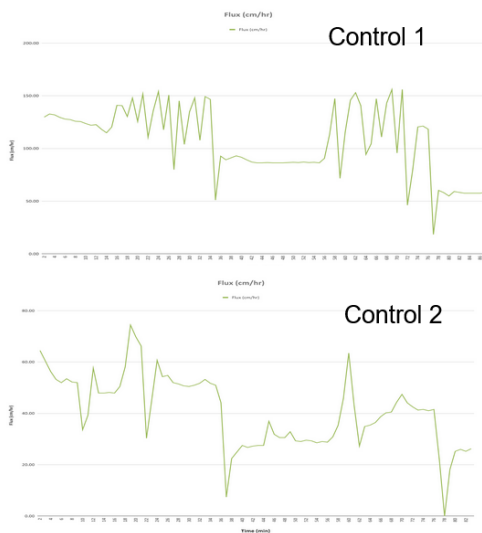
Hilks Lake Townhome Restoration Site

	Kfs (cm/hr)	Kfs Error (cm/hr)
Control #1	0	0
Control #2	0	0
Experimental #1	7.83	0.44352
Experimental #2	10.6524	0.279072

Data: Hilks Lake Townhomes (Pressure)



Data: Hilks Lake Townhomes (Flux)



Interpretation

The results obtained through the Saturo Dual Head Infiltrometers shows that the experimental trials conducted on prairie vegetation yielded a larger saturated hydraulic conductivity than the controlled trials on turfgrass. The data from this experiment suggests that the prairie vegetation has a higher potential to infiltrate and transmit more stormwater than typical turfgrass.

An expansion of the prairie at both sites to manage stormwater for irrigation would be the optimal choice as the preferred vegetation cover rather than just having turfgrass for these purposes.

Project Constraints & Suggestions

While the data collected at the Carver County Public Works Prairie seem to present a stark difference between prairie and turfgrass with well obtained data, the results from the Hills Lake Townhome Restoration Site are more unclear and need further data. The graphs of flux for the two control trials were in disarray and did not match the typical pattern for a good data gathering field occasion. The pressure cycles for the two trials were unstable at times and even spiking instead of maintaining a current pressure pattern like the other trials. This unstable pressure application may be in part responsible for the data obtained and ultimately giving a perception of zero for saturated hydraulic conductivity for the site that may be false. Furthermore, the turfgrass test locations at the Townhome site are all within 10 feet of pavement which may have limited the ability of the soil to laterally transmit water and ultimately affecting infiltration rates measured by the infiltrometer.

Our contribution to Carver County Water Management Organization's understanding of water infiltration at these sites is limited in several ways, including but not limited to number of usable infiltrometers for only two trials each for control and experimental vegetation cover, preferred specific test locations at each site, familiarity with site details such as historic land use, origin of water supply for experiment, water temperature, and personal experience operating infiltrometers.

The data collected by our group on the two sites regarding saturated hydraulic conductivity for turfgrass and prairie vegetation are only to be used as preliminary findings of the site and could be improved upon through additional testing.