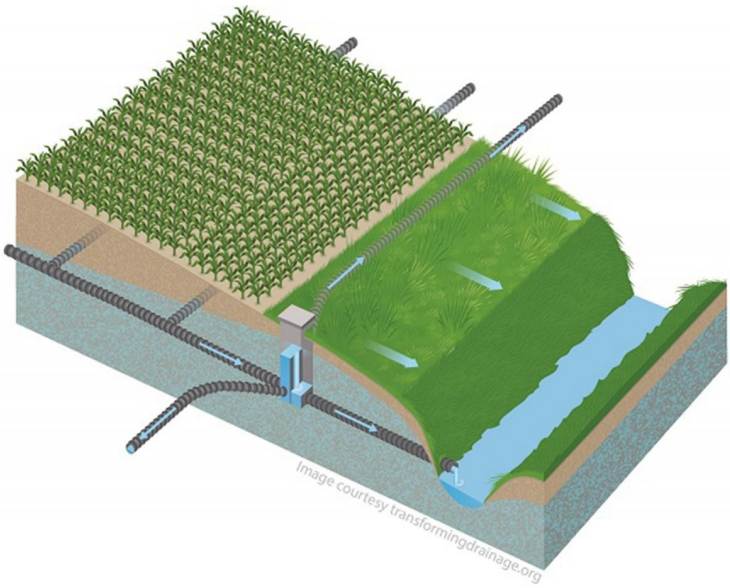
Saturated Buffers as an Agricultural Best Management Practice



What Are Saturated Buffers?

Saturated buffers are an edge of field conservation practice designed to remove nitrates from a portion of agricultural tile drainage water and reduce the volume of tile water discharged to watercourses by redirecting flow into the soil profile of a vegetated buffer. The design uses a controlled drainage structure to intercept tile drainage and redirect water laterally into a perforated distribution pipe installed roughly parallel to the watercourse. The water is then able to pass through the surrounding subsoil and through plant uptake, denitrification, and microbial activity, nutrients are removed from the tile water before entering the watercourse.

Monitoring Saturated Buffers

The Cade Tract saturated buffer was installed along a drainage outlet downstream of a large dairy operation. The 500’ saturated buffer was installed in 2021 and the frequency that water is diverted into the buffer is monitored.

The Western Field Station saturated buffer was installed in spring 2018. The site is monitored using eight monitoring wells along the buffer to collect data on water quality and quantity.


Cade Tract


Western Field Station

Preliminary Observations and Lessons Learned at Cade Tract

Preliminary results indicate that in the study period (July 2023-January 2024), just under 80% of rain events recorded at the Cade Tract Saturated Buffer were large enough for drainage water to reach the diversion chamber in the control structure. Of these, over 40% were fully diverted into the saturated buffer. For larger events where flow exceeded the saturated buffer capacity, further monitoring and analysis is required to quantify the proportion of drainage water diverted to both the saturated buffer and overflow tile.

The period from peak flow overtopping the gate to complete draw down within the diversion chamber into the saturated buffer was observed to be shorter (on average 5.5 days) during the growing season, and longer (>10 days) during the non-growing season (**Figure 1**). The approximate full draw down period during the non-growing season isn't known, as frequent rain and snow melt events coupled with slower infiltration from October 19th, 2023 through the end of January, 2024 resulted in the diversion chamber not reaching full drawn down at any point in that period. Continued monitoring during a drier winter season will be necessary to answer this question.

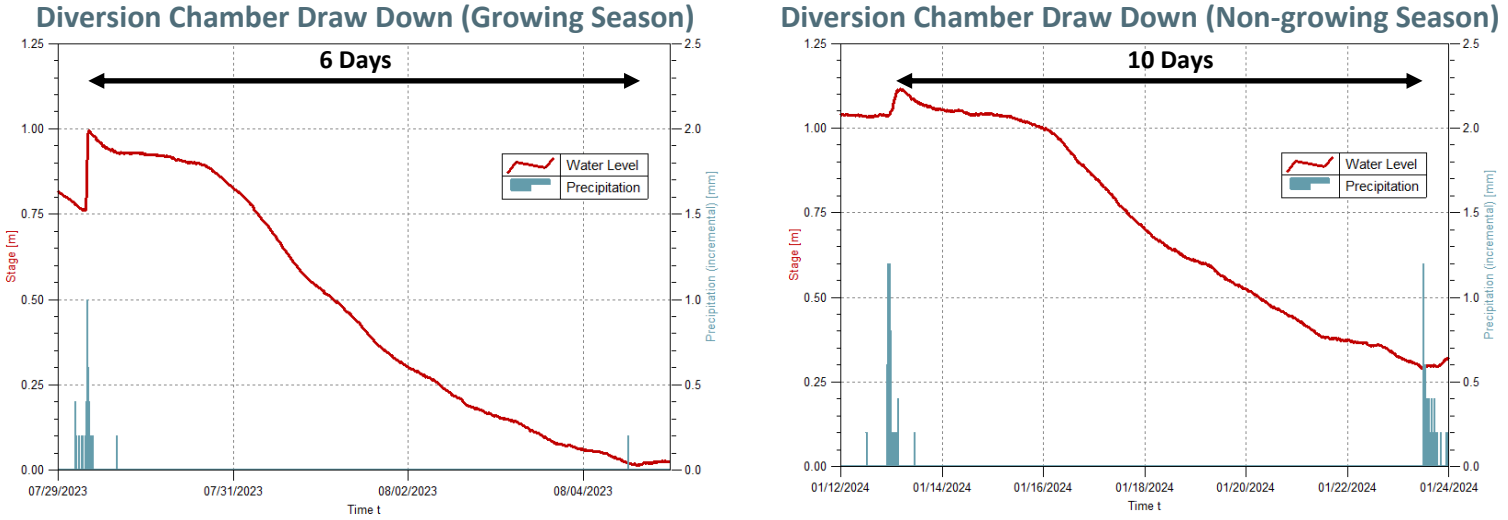


Figure 1 Example water level draw down periods within the diversion chamber into the saturated buffer during the growing season (left) and non-growing season (right) at the Cade Tract Saturated Buffer. The diversion chamber did not reach full drawn down (~0 m water level) at any point following October 19th, 2023 during the study period.

More frequent water level measurements (sampled every five minutes as opposed to 15 minutes) would help to better capture changes in tile drainage water level and peak flow regimes during large rain events as the system is quite flashy and control structure chambers can reach capacity quickly.

Next Steps

Monitoring will continue at higher sampling frequency in order to expand the data set to be able to assess larger trends over varying seasonal conditions at both saturated buffers.

For More Information

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