2018 Final Report Summary Sheet

Grantee Information

Project Title: Drainage water management and saturated buffers for achieving NLRS goals

Institution: University of Illinois

Primary Investigator: Christianson

NREC Project # 2017-4-360498-168

Is your project on target from an IMPLEMENTATION standpoint? ☒ Yes ☐ No
If you answered "no" please explain:

Is your project on target from a BUDGET standpoint? ☒ Yes ☐ No
If you answered "no" please explain:

Based on what you know today, will you meet the objectives of your project on-time and on-budget? ☒ Yes ☐ No
If you answered "no" please explain:

Have you encountered any issues related to this project? ☐ Yes ☒ No
If you answered "yes" please explain:

Have you reached any conclusions related to this project that you would like to highlight? ☐ Yes ☒ No
If you answered "yes" please explain:

Have you completed any outreach activities related this project? Or do you have any activities planned? ☒ Yes ☐ No
If you answered "yes" please explain and provide details for any upcoming outreach: See section 3d and 3e.

Additional Notes:

NREC February 2019 2.0 Year Report

Drainage water management (DWM) and saturated buffers for achieving NLRS goals

PI: Dr. Laura Christianson, Assistant Professor of Water Quality, Department of Crop Sciences, University of Illinois, S322 Turner Hall, 1102 S Goodwin Ave., Urbana, IL 61801.

Co-PIs: Dr. Paul Davidson and Dr. Richard Cooke, Agricultural and Biological Engineering, University of Illinois

1. List of objectives

The specific assessable objectives are to:

1. **Monitor drainage water management (2) and saturated buffer (2) sites** for nutrient loss reduction and crop yield impacts.
2. **Develop a water balance** at the drainage water management sites to better quantify lateral seepage impacts upon the overall nutrient loss reduction.
3. **Perform an economic evaluation** of these two practices ($ per acre treated and $ per pound of nitrogen removed).
4. **Evaluate if these practices should be added to the IL NLRS**. And if so,
    a. Develop an appropriate N loss reduction value to add to the NLRS tables.
    b. Develop a procedure and seek approval for adding drainage water management and/or saturated buffers to the NLRS.
5. Per the RFP, the final objective is "*to include a final report at the conclusion of this project to address each of the objectives stated above*."

2. Length of project - number of years completed: 2.0 years (of 4.0 years)

3. Accomplishments

a. Drainage water management sites
    i. University of Illinois Agricultural Engineering Farm: The free drainage plot has had notably more flow and greater N loading compared to the controlled drainage plot, despite the controlled drainage plot generally having higher nitrate concentrations (**Figure 1**). Potential lateral seepage caused by DWM is still being evaluated.
    ii. Private farm in Macon County: Monitoring continues at a 41 acre tile drainage system on a private farm where drainage water management is practiced.
    iii. Private farm near Effingham: Five fields, with four practicing DWM, are now being monitored for N loss. The fields vary in size from approximately 7.6 to 43 acres allowing us to test the hypothesis that if lateral seepage is occurring due to drainage water management, it will be a relatively greater percentage of the water balance for the smaller fields versus the larger fields.

b. Saturated buffer sites
    i. Knox County saturated buffer: Monitoring the flow and nutrient concentrations continues.
    ii. Piatt County saturated buffer: Monitoring the flow and nutrient concentrations continues.
    iii. Animal Science Farm: We are working with the UIUC university farm managers to gain access to install monitoring wells in this saturated buffer area which is on private land adjacent to the newly tiled university field. We are currently monitoring flow treated by the saturated buffer despite the monitoring well delay.

c. At the end of 2018, the NLRS Science Team formalized a procedure for adding conservation practices to the NLRS list of recommended practices. This is pending approval by the NLRS Executive Committee.

d. Results from this work were presented in 2018 at (presenter in bold):

   i. **Chandrasoma, J.**, R. Christianson, and L. Christianson. 2018. Assessment of the suitability and nitrogen loading reduction of saturated buffers across the US Midwest. ASA and CSSA Annual Meeting. Baltimore, Maryland. 04-07 November 2018. Abstract #148-1.

   ii. **Chandrasoma, J.**, P. Davidson, R. Cooke, and L. Christianson. 2018. Performance of a saturated buffer in Illinois after one year of establishment. ASABE Annual International Meeting. Detroit, Michigan. 29 July-01 Aug 2017. Paper #1801380.

   iii. **Chandrasoma, Janith M.**, Laura E. Christianson, Reid D. Christianson, Paul C. Davidson, and Richard A. Cooke. 2018. Nitrogen loss reduction performance at ongoing saturated buffer studies in Illinois. Illinois Nutrient Loss Reduction Strategy Workshop. Champaign, Illinois. 13 November 2018.

   iv. **Davidson, Corey**, Janith Chandrasoma, Paul Davidson, Richard Cooke, and Laura Christianson. 2018. Using unmanned aerial vehicles to assess drainage water management practices. Illinois Nutrient Loss Reduction Strategy Workshop. Champaign, Illinois. 13 November 2018.

   v. **Christianson, L.** Knox County Farm Bureau Field Day. Saturated Buffer Results. Knox Co., Illinois. 10 August 2018. ≈30 in attendance.

e. We have leveraged our NREC-funded time working with saturated buffers to write a new peer-reviewed publication:

   i. Chandrasoma, J.M., R.D. Christianson, and L.E. Christianson. 2019 (First Look). Saturated buffers: What is their potential impact across the US Midwest? Agricultural & Environmental Letters. doi: 10.2134/ael2018.11.0059.

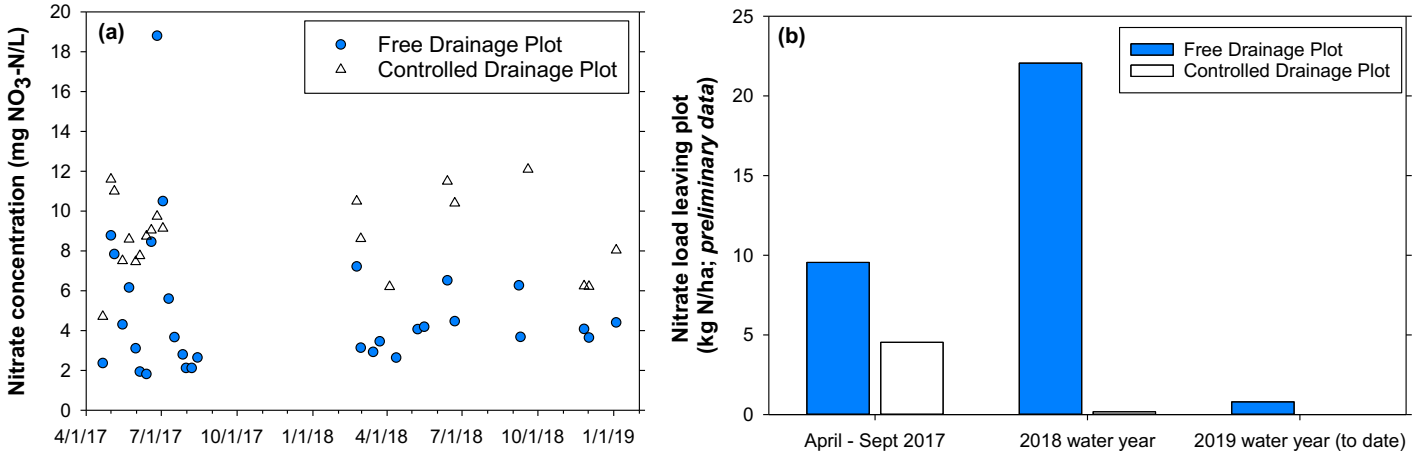
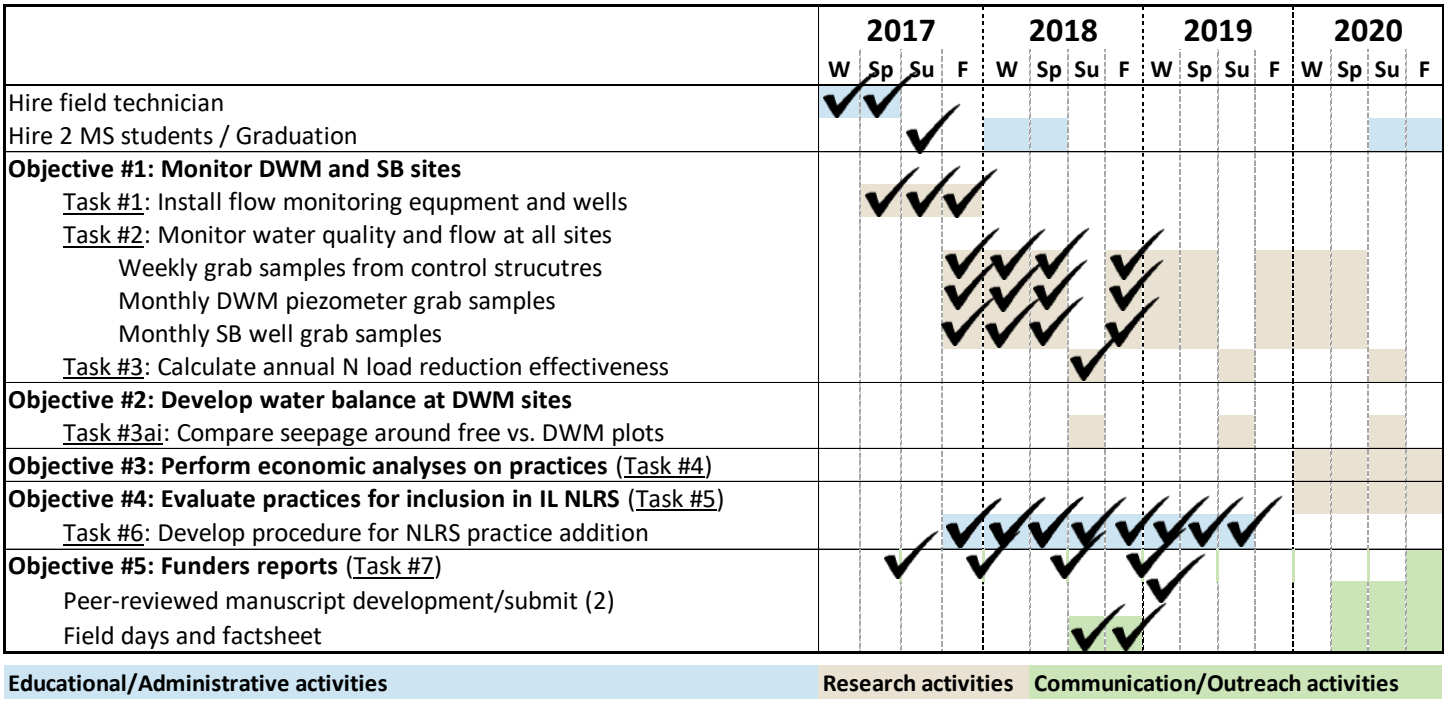


Figure 1. Nitrate-N concentrations (a) and nitrate-N loads (b) in tile drainage water from free and controlled drainage plots. The three time periods in Figure 1b represent 52, 99, and 99% reductions in N loading by the controlled drainage plot. *These data are preliminary*.

4. For first year projects, provide evidence of progress.

Monitoring is ongoing at all proposed sites, with project outputs (see above and **Table 1**) well underway.

Table 1. Up-to-date timeline for "*Drainage water management and saturated buffers …*" project



How will the research benefit the environment and/or crop production, etc.? Our recent journal article indicates Iowa and Illinois, the two most intensively tile drained states in the Upper Midwest which are also generally the top nitrate loading contributors to the Mississippi River, could each host approximately 70,000-100,000 saturated buffers (Chandrasoma et al., 2019). This practice can be an important component of plans to achieve water quality goals.

New questions created by this work: None in this reporting period.

Table 2. Budget analysis showing expenditures aligned with budget categories.

	Budgeted	Spent through 01/2019
A. Personnel		
1 UIUC MS Graduate Students	$27,177	$31,601
2 Academic salary and wages	$74,674	$40,520
B. Fringe Benefits	$34,711	$10,354
C. Travel	$19,952	$4,567
D. Equipment	$0	$0
E. Supplies	$56,238	$37,216
F. Contractual Services	$2,000	$6,245
G. Other	$0	$0
H. Indirect Charges	$24,194	$34,654
TOTAL COST (Year 2.0)	**$241,946**	**$165,155**
BALANCE REMAINING	***$76,791***	