

Oklahoma Water Resources Center

Virtual fencing to control cattle for improved ecosystem services EPA Project No. MX – 02D00721

Quarter no. 4 From April 1, 2022 Through June 30, 2021.

I. Abstract

This quarter two 4.5 foot H-flume were completed by BAE, delivered to site, and installation is underway at OSU's Lake Carl Blackwell pasture sites. Virtual fencing demonstration (at private ranch) and cattle movement tracking using the Vence collars at the East Native Range and the Lake Carl Blackwell Range continues. A graduate student for the watershed modeling aspect of the project has been identified and paperwork is ongoing to get the student approved for work in the United States. Water quality monitoring of surface runoff began using automated samplers. Multiple samples were collected using both in-stream structures and H-flumes (where completed). Monitoring will continue and transition over to using H-flumes exclusively once the flumes are installed at the remaining field sites. Outreach through OSU Natural Resources Extension has reached 111,225 through three social media posts. On June 7th the team was visited by EPA Chief Scientist, Troy Pierce, to make introductions with personnel and inspect procedures and facilities used for data collection. Next quarter will focus on finishing H-flumes, continuing riparian and water quality monitoring, and establishing protocols for remote assessment of wildlife and pollinator habitat.

II. Overall Progress and Results by Task

TASK 1: PROJECT ADMINISTRATION

Subtask 1.1: *OWRC will prepare electronic quarterly progress reports (QPRs) for submission to the EPA. QPRs shall document all activities performed within a quarter and shall be submitted by the 15th of October, January, April and July. QPRs shall be distributed to all Project Partners.*

The following actions have been completed during this reporting period:

- a. The 4th quarterly report was prepared and submitted on July 15, 2022.

33% Complete

Subtask 1.2: *OWRC will perform accounting functions for project funds and will submit appropriate Reimbursement Forms to EPA at least quarterly.*

The following actions have been completed during this reporting period:

- a. As of June 30, \$76,247 had been expended and another \$42,944 encumbered.

11% Complete

Subtask 1.3: *OWRC will host coordination meetings, at least quarterly, with the project team to discuss project activities and schedule, communication needs, deliverables, and other requirements.*

The following actions have been completed during this reporting period:

- a. EPA Virtual Fencing project team meetings were held with OSU researchers involved in the project on February 25, 2022.
- b. Additionally, OSU meets with industry partners biweekly to discuss the VF Project Status and coordinate activities. This quarter, meetings were held on April 5 and 19, May 3, 17, and 31, and June 14.
- c. EPA Chief Scientist visited Stillwater, Oklahoma on June 7, 2022 for evaluating facilities and protocols used for data collection and to meet with personnel.

33% Complete

Subtask 1.4: *OWRC will develop a Final Report that summarizes activities completed and conclusions reached during the project and discusses the extent to which project goals and measures of success have been achieved.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

0% Complete

TASK 2: QUALITY ASSURANCE

Subtask 2.1: *OWRC will develop a QAPP consistent with the most recent versions of EPA Requirements for Quality Assurance Project Plans (QA/R-5).*

The following actions have been completed during this reporting period:

- a. The project QAPP was submitted in September 2021.

100% Complete

Subtask 2.2: *OWRC will implement the approved QAPP. OWRC will submit revisions and necessary amendments to the QAPP as needed.*

The following actions have been completed during this reporting period:

- a. The QAPP was emailed to the project team last quarter and is also available for team members to refer to throughout the project on a shared drive. No activity to report this quarter.

33% Complete

TASK 3: VIRTUAL FENCING DEMONSTRATIONS ON COOPERATING RANCHES

Subtask 3.1: *Identify cooperating ranch(es).*

The following actions have been completed during this reporting period:

- a. Work continued this quarter to identify another suitable cooperating ranch in the Stillwater Creek watershed or adjacent watersheds.

35% Complete

Subtask 3.2: *Install VF system on cooperating ranch(es).*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter. Awaiting identification of a second demonstration ranch.

35% Complete

Subtask 3.3: *Implement grazing management & riparian protection on demonstration ranch(es) using virtual fencing.*

The following actions have been completed during this reporting period:

- a. Demonstration of virtual fencing at cooperating ranch #1 continued this quarter.

25% Complete

Subtask 3.4: *Perform Stream Visual Assessment.*

The following actions have been completed during this reporting period:

- a. Stream visual assessment was not conducted this quarter but a date has been identified to complete this next quarter.

25% Complete

Subtask 3.5: *Remote assessment of wildlife & pollinator habitat.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

0% Complete

TASK 4: VIRTUAL FENCING EVALUATION AT OSU RESEARCH RANGE(S)

Subtask 4.1: *Implement grazing management and riparian protection via VF*

- a. Background data collection on cattle movement continued. Small virtual fences were implemented around flumes for equipment protection.

33% Complete

Subtask 4.2: *Perform Stream Visual Assessment at OSU Research Range(s).*

The following actions have been completed during this reporting period:

- a. Students with Environmental Science Capstone finished their report and presented in class on developing and test riparian assessment protocols.

- b. Spring stream visual assessments were conducted on April 7, 2022.

33% Complete

Subtask 4.3: *Install ISCO samplers at paired watersheds at OSU Research Range(s).*

The following actions have been completed during this reporting period:

- a. Half of the sampling sites are now using H-flumes for monitoring with the installation of one 4.5 foot H-flume at EN2
- b. Two 4.5 foot H-flume have been delivered to Lake Carl Blackwell for installation next quarter

50% Complete

Subtask 4.4: *Monitor water quality at OSU Research Range(s).*

The following actions have been completed during this reporting period:

- a. One sample was collected from LCB 2 on April 24, 2022 and processed.
- b. Eight samples were collected between May 3 and 6, 2022 and processed.
- c. Twelve samples were collected between May 24 and 27, 2022 and processed.
- d. Nine samples were collected between June 6 and 11, 2022 and processed.
- e. Data structure and protocols were discussed with EPA at site visit on June 7th, 2022

33% Complete

Subtask 4.5: *Remote assessment of wildlife & pollinator habitat at OSU Research Range(s).*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

8% Complete

TASK 5: WATERSHED MODELING

Subtask 5.1: *Gather input data*

The following actions were underway during this reporting period:

- a. A PhD student has been identified and paperwork is taking place to get the student permission to work in the United States.
- b. We obtained weather data from the Oklahoma Mesonet to support model development for sites in Stillwater Creek watershed.
- c. We obtained soil water content data derived from ground-based soil moisture monitoring data from the Oklahoma Mesonet to support watershed model development.
- d. We started reviewing pertinent literature on the use of the Agricultural Policy/Environmental eXtender (APEX) model in simulating watersheds with grazing management.

15% Complete

Subtask 5.2: *Model development*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

0% Complete

Subtask 5.3: *Model calibration*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

0% Complete

Subtask 5.4: *Model validation*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

0% Complete

Subtask 5.5: *Perform long-term simulations*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

0% Complete

TASK 6: OUTREACH

Subtask 6.1: *Develop Extension programs and materials.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

0% Complete

Subtask 6.2: *Deliver Extension programs to producers.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

25% Complete

Subtask 6.3: *Develop standards, specifications, and guidance.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter

8% Complete

Subtask 6.4: *Deliver results to producers via Soil Health programs.*

The following actions have been completed during this reporting period:

- a. Met with the Oklahoma Conservation Commission to discuss adding materials to their soil health outreach program. A meeting to develop materials will take place next quarter.

0% Complete

Subtask 6.5: *Communicate results via social media, newsletter, webpage.*

The following actions have been completed during this reporting period:

- a. OSU Natural Resources Extension has had 3 posts for quarter 4:
 - Analytics for the 3 Natural Resources Extension social media posts are as follows.

	Posts	Reach/Impressions	Engagements
Facebook	1	110,522	2,104
Instagram	1	546	82
Twitter	1	157	8
Total	3	111,225	2,194

- b. Oklahoma Water Resources Center
 - Analytics for the 4 Oklahoma Water Resources Center social media posts are as follows.

	Posts	Reach/Impressions	Engagements
Facebook	3	1,366	142
Twitter	1	147	7
Total	4	1,513	149

33% Complete

Subtask 6.6: *Deliver presentations at conferences.*

The following actions have been completed during this reporting period:

- a. Dr. Reuter and Dr. Wagner provided “The Tuesday Pasture Talk,” to the Arkansas USDA-NRCS on April 5th, 2022.
- b. Dr. Wagner presented initial findings of virtual fencing implementation on excluding cattle from riparian areas during the talk, “Virtual Fencing for Improved Grazingland Water Quality,” at UCOWR on June 14th, 2022.

25% Complete

Subtask 6.7: *Publish manuscripts in peer reviewed journals.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

0% Complete

III. Related Issues/Current Problems and Favorable or Unusual Developments

- Rainy weather, followed by extreme heat has slowed flume installation.
- Continued challenges on getting a student a visa for permission to work in the United States.
- Downloading polygon files and data from Vence website for use with GIS analysis has caused delays in manuscript development. However, this was recently overcome.

IV. Projected Work for Next Quarter

- Install final two 4.5' H-Flumes at LCB1 and LCB2 research range watershed sites and continue runoff collection and analysis
- Initiate remote sensing of vegetation and habitat at OSU research range sites
- Conduct stream visual assessments at all four research range watersheds and at the demonstration ranch
- Continue and expand outreach efforts on virtual fencing and the project