

## Oklahoma Water Resources Center

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

Quarter no. 3 From January 1, 2022 Through March 31, 2021.

#### I. Abstract

This quarter the first 4.5 foot H-flume was constructed, delivered to site, and construction is underway at OSU's Research Range. 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. Austin Phillippe was hired by the Water Center on January 1<sup>st</sup> to oversee water quality assessment and project management. Alayna Gerhardt, doctoral student in Animal Science, was also hired to assist with the virtual fencing evaluation this quarter. The Water Center worked with Environmental Science Capstone to develop riparian assessment protocols directed toward measuring grazing impacts. Water quality monitoring of surface runoff began and collected two samples on March 22<sup>nd</sup>, 2022 using in stream measurement techniques. Monitoring will continue and transition over to using H-flumes as the flumes are constructed. Outreach through OSU Natural Resources Extension has reached 9,195 through two social media posts. Additionally, two full-color display advertisements ran in "The Oklahoman" and the "Tulsa World" news outlets reaching an estimated 226,179 through readership and 110,602 through digital ad impressions. Next quarter will focus on installing H-flumes, continuing riparian and water quality monitoring, and recruiting a student for watershed modeling.

#### 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 3<sup>rd</sup> quarterly report was prepared and submitted on April 15, 2022.

**25% 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 March 31<sup>st</sup>, \$48,626.58 had been expended and another \$65,452 encumbered.

**7% 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 January 20, 2022 and 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 January 11 and 25, February 8 and 22, and March 8 and 22.

**25% 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 and is also available for team members to refer to throughout the project on a shared drive. No activity to report this quarter.

**25% 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 cooperating ranch.

**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 conducted on January 27, 2022 at cooperator ranch.

**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. Alayna Gerhardt, doctoral student in Animal Science, was also hired to assist with the virtual fencing evaluation this quarter. To gather background data, only cattle movement was tracked this quarter. Once sufficient baseline data has been gathered for comparison, grazing management and riparian protection will be implemented.

**16% Complete**

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

The following actions have been completed during this reporting period:

- a. Worked with Environmental Science Capstone to develop and test riparian assessment protocols. Spring stream visual assessments will be collected early next quarter.

**8% 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. Samplers have been installed at all sites at OSU Research Ranges
- b. One 4.5 foot H-flume has been built and delivered to EN1
- c. One 4.5 foot H-flume has been delivered to EN2
- d. Two other H-flumes are yet to be built and will be installed once completed and delivered

**25% Complete**

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

The following actions have been completed during this reporting period:

- a. Water quality monitoring equipment is in place.
- b. Two samples were collected (from LCB 1 and 2) on March 22, 2022 and processed.
- c. Austin Phillippe hired by Water Center on January 10, 2022 to oversee water quality assessment and project management.

**5% 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. We continue actively recruiting a PhD student to perform the modeling and expect to bring a student on by Summer or Fall 2022.
- 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.

**10% 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. VF interview with Lancaster Farming on February 8, 2022  
b. VF interview with Gulf Coast Cattleman on February 11, 2022

**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. No activity to report this quarter. The project team will be meeting with OCC next quarter to initiate this task.

**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 2 posts to date (see links below) on:
  - Analytics for the 2 Natural Resources Extension social media posts are as follows.

	Posts	Reach/Impressions	Engagements
Facebook	1	8,920	375
Instagram	1	275	29
Twitter	0	0	0
Total	2	9195	404

- b. Members of the team participate in the informal “VF Working Group” monthly web conference with approximately 10 other VF researchers from across the U.S.
- c. Two full-color display advertisements that ran in The Oklahoman and the Tulsa World on Sunday, March 20 as part of the university’s Orange is the Answer campaign.

	Posts	Estimated Readership	Digital ad Impressions
Tulsa World	1	126,703	51,602
Oklahoman	1	99,476	59,000
Total	2	226,179	110,602

**25% Complete**

**Subtask 6.6:** *Deliver presentations at conferences.*

The following actions have been completed during this reporting period:

- a. Presented a poster “Virtual Fencing to Control Cattle for Improved Water Quality of Surface Runoff” at the 2022 Texas and Southwestern Cattle Raisers Association Convention and Expo and received third place in the poster competition

**16% 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**

- Obtaining supplies and equipment for monitoring due to supply chain issues has been problematic.
- Obtaining graduate students, particularly for the modeling, due to tight job market and delays in obtaining visas for international students has been challenging as well.

**IV. Projected Work for Next Quarter**

- Install three 4.5' H-Flumes at EN2, 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