

# Oklahoma Water Resources Center

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

Quarter no. 5 From July 1, 2022 Through September 30, 2022.

### I. Abstract

This quarter the remaining two 4.5 foot H-flumes were installed and are now prepared to collect runoff from upcoming events. Drought conditions this quarter caused for no runoff samples to be collected and processed for water quality. Virtual fencing demonstration (at private ranch) and cattle movement tracking using the Vence collars at the cooperators range, East Native Range, and the Lake Carl Blackwell Range continues. Afsaneh Kaghazchi was successfully hired and has begun working on data collection for the modeling component of this project. Meetings were held this quarter to address data collection for remote assessment of wildlife and pollinator habitat and producing outreach materials regarding virtual fencing technology with the Oklahoma Conservation Commission's Soil Health team. These meetings resulted in vegetation sample collection and strategic outreach. Social media outreach through the Oklahoma Water Resources Center has reached 446 through 2 Facebook posts and extension programs are underway. Next quarter we will continue monitoring riparian and water quality, developing and delivering outreach materials, and monitoring cattle movement.

### 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 5<sup>th</sup> quarterly report was prepared and submitted on October 15, 2022.

**42% 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 September 30, \$118,514.74 (16%) had been expended and another \$61,956.43 encumbered.

**16% 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 August 9, 2022, and September 20, 2022.
- b. Additionally, OSU met with industry partners to discuss the virtual fencing project status and coordinate activities. This quarter, meetings were held on August 9, 2022, and September 20, 2022.

**42% 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.

**42% 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.

- b. Presented to stakeholders on September 9, 2022 to distribute virtual fencing information and possibly identify another cooperator.
- c. Met with NRCS on September 9, 2022 to aid in the identification of an additional cooperator.

**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.

**35% Complete**

**Subtask 3.4:** *Perform Stream Visual Assessment.*

The following actions have been completed during this reporting period:

- a. Stream visual assessment was conducted at cooperating ranch #1 ranch on July 12<sup>th</sup>, 2022.

**42% Complete**

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

The following actions have been completed during this reporting period:

- a. Meeting to discuss response variables, sampling size/protocol, and unmanned aerial vehicle (UAV) sampling on August 11, 2022.
- b. 90 vegetation samples across 10 random points were collected at cooperator ranch on September 10, 19, and 20, 2022.

**25% 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.

**42% Complete**

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

The following actions have been completed during this reporting period:

- a. Stream visual assessments were conducted on four experimental range riparian areas on July 11<sup>th</sup>, 2022.

**42% 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. All (4) sampling sites are completed, using H-flumes for monitoring flow and ISCO automated samplers for collecting water quality samples.

**100% Complete**

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

The following actions have been completed during this reporting period:

- a. No samples collected this quarter due to drought conditions.
- b. Regularly scheduled maintenance for ISCO samplers conducted August 3, 2022, August 22, 2022, and September 30, 2022.

**42% 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. Meeting to discuss response variables, sampling size/protocol, and unmanned ariel vehicle (UAV) sampling on August 11, 2022.
- b. Planned vegetation sampling for October 4, 2022 across 10 random points at experimental ranges

**25% Complete**

**TASK 5: WATERSHED MODELING**

**Subtask 5.1:** *Gather input data*

The following actions were underway during this reporting period:

- a. A PhD student, Afsaneh Kaghazchi, was hired on August 22, 2022 and she worked to organize available data for the APEX model.
- b. Afsaneh Kaghazchi visited the water quality monitoring sites on September 9, 2022.

**45% 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. Discussed outreach materials with the Oklahoma Conservation Commission's soil health programs on August 19, 2022 and created an outline for a presentation on Virtual Fencing.

**15% Complete**

**Subtask 6.2:** *Deliver Extension programs to producers.*

The following actions have been completed during this reporting period:

- a. May 4, 2022 CARE Project Field Day Muscogee Nation – Okmulgee, OK (27 participants)
- b. July 26, 2022 Drought Resilience Meeting – Enid, OK (31 participants)

**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

**15% Complete**

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

The following actions have been completed during this reporting period:

- a. Oklahoma Water Resources Center
  - Analytics for the 2 Oklahoma Water Resources Center social media posts are as follows.

	Posts	Reach/Impressions	Engagements
Facebook	2	446	37
Total	2	446	37

- b. Virtual Fencing CIG Project featured in Oklahoma Farm and Ranch News Update on July 11, 2022.
- c. OSU Natural Resources Extension social media has no activity to report this quarter.

**42% Complete**

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

The following actions have been completed during this reporting period:

- a. Two abstracts on virtual fencing were submitted on September 30, 2022 for the Society of Range Management Annual Meeting: "Effects of virtual fencing on cortisol concentrations and behavior of beef cattle" and "Burtrum Cattle LLC. Producers' perspective on implementing a virtual fence system"
- b. Presentation to VF Advisory Board Meeting on September 9, 2022. Note: The Advisory Board is part of CIG project but activities of EPA project were presented during the meeting.

**30% 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**

- Drought has caused for no water quality samples to be collected this quarter.
- Continued challenges for identifying a cooperating ranch in the Stillwater Creek Watershed

#### **IV. Projected Work for Next Quarter**

- Continued data collection for water quality sampling, riparian/stream visual assessments, and cattle movement using GPS collars.
- UAV flights and vegetation sampling continue to address pollinator and wildlife habitat assessments
- Progress on model development using available data sets and incorporating runoff data