

# Oklahoma Water Resources Center

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

Quarter no. 6 From October 1, 2022 Through December 31, 2022.

### I. Abstract

Continued drought conditions caused for no runoff samples to be collected and processed for water quality. Virtual fencing demonstrations and cattle movement tracking using the Vence collars is ongoing at the cooperating ranch, East Native Range, and the Lake Carl Blackwell Range. A meeting was held to address the identification of another cooperating ranch. Riparian assessments and vegetation surveys were conducted for assessment of wildlife and pollinator habitat. Outreach events included the Southeast Extension District In-service Training and the Vet School Continuing Education Credit Conference. Additionally, we successfully reached over 4,000 through 6 social media posts by the Oklahoma Water Resources Center and OSU Natural Resources Extension. Next quarter, we will continue identifying another cooperating ranch, monitoring riparian area and water quality, developing and delivering outreach materials, and tracking 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 6<sup>th</sup> quarterly report was prepared and submitted on January 15, 2023.

**50% 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 December 31, \$156,206.43 (22%) had been expended and another \$72,751.69 encumbered.

**22% 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 October 4, 2022, November 1, 2022, November 15, 2022 and November 29, 2022.

**50% 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.

**50% 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 or adjacent watersheds.
- b. A team meeting was held on December 1, 2022 to review desired attributes for cooperating ranches and create a plan for securing a cooperator.

**45% Complete**

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

The following actions have been completed during this reporting period:

- a. Awaiting identification of a second cooperating ranch.
- b. Modems switched from AT&T to Verizon and antenna realigned to maximize signal

**40% 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.

**40% 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 on October 15<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. No activity to report this quarter.

**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.
- b. Continuing to monitor the V3 collars

**50% 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 the four experimental range riparian areas on October 14, 2022.

**50% 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 with H-flumes installed 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 October 31, 2022, November 30, 2022, and December 20, 2022.
- c. Sampling program was turned off on December 20, 2022 until January 2, 2023 to prevent damage from extreme cold. No significant rainfall occurred during this period.

**50% 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. 90 vegetation samples across 10 random points were collected at experimental ranges on October 4, 2022

**40% Complete**

**TASK 5: WATERSHED MODELING**

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

The following actions were underway during this reporting period:

- a. Afsaneh Kaghazchi continued to gather data and review procedures for APEX modeling

**50% Complete**

**Subtask 5.2:** *Model development*

The following actions have been completed during this reporting period:

- b. 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

**15% Complete**

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

The following actions have been completed during this reporting period:

- a. Southeast Extension District In-service Training (Train the Trainer) in Shawnee, OK on November 10, 2022 entitled Virtual Fencing for Oklahoma Grazing Lands (25 participants)
- b. Vet School Continuing Education Credit on November 3, 2022 (50-75 participants)

**40% Complete**

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

The following actions have been completed during this reporting period:

- b. 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 5 Oklahoma Water Resources Center social media posts are as follows.

	Posts	Reach/Impressions	Engagements	Reactions
Facebook	2	384	29	16
Twitter	3	524	13	N/A
Total	5	908	42	16

b. OSU Natural Resources Extension

- Analytics for the 6 OSU Natural Resources Extension social media posts are as follows.

	Posts	Reach/Impressions	Engagements
Facebook	2	31,813	2,250
Instagram	2	487	32
Twitter	3	1,364	174
Total	6	33,664	2,456

### 60% Complete

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

The following actions have been completed during this reporting period:

- Geo Fence virtual conference with the United States Forest Service on December 7 and 8, 2022 via Zoom (250 attendees)
- Oklahoma Governor's Water Conference talk on December 8, 2022 entitled: Water Quality Response of Rotational Grazing and Riparian Zone Exclusion Using Virtual Fencing Technology (60-70 attendees)
- Vet School Continuing Education Credit Conference on November 3, 2022 entitled: Virtual fence – a game changer for grazing (50-75 attendees)

### 40% Complete

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

The following actions have been completed during this reporting period:

- 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 that meets project needs/requirements.

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

- Continued data collection for water quality sampling, riparian/stream visual assessments, and cattle movement using GPS collars. Runoff sample collection anticipated to increase during Spring rainfall.
- 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