

# Oklahoma Water Resources Center

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

Quarter no. 7 From January 1, 2023 Through March 31, 2023.

### I. Abstract

Virtual fencing demonstrations and cattle movement tracking continue at the experimental ranges and at the first cooperating ranch. A second cooperating ranch has been identified and the equipment from Vence has been ordered to begin virtual fencing at this location next quarter. Riparian assessments were conducted, drone imagery was captured at the first cooperating ranch, and plans for vegetation surveys are in place for next quarter to take advantage of enhanced plant ID during green up. Outreach this quarter includes a booth at the Oklahoma Association of Conservation Districts Annual State Meeting and presentations at the Society of Range Management meeting. Next quarter we will collect drone imagery at the other cooperating ranch and research ranges, process water quality samples, develop outreach materials, implement virtual fencing, and track 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 7<sup>th</sup> quarterly report was prepared and submitted by April 15, 2023.

**58% 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, \$200,046.50 (27%) had been expended and another \$53,859.98 encumbered.

**27% 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 and Vence on January 18, 2023, February 8, 2023, March 8, 2023 and March 22, 2023.
- b. A quarterly meeting was held on March 29, 2023 with all co-PIs to target progress on deliverables, recently added cooperating ranches, and publications.

**58% 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 revised, signed by all Co-PIs, and sent to EPA Project Officer on March 13, 2023.

**75% 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. Another cooperating ranch in the Stillwater Creek watershed has committed to joining the project in the upcoming quarter.

**75% Complete**

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

The following actions have been completed during this reporting period:

- a. Vence equipment (station components, collars, etc.) has been ordered for the second cooperating ranch and virtual fencing is expected to begin next quarter.

**50% 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
- b. Riparian protection and rotational grazing management program began at cooperating ranch #1 on January 24, 2023.
- c. The virtual fencing management program was turned off at cooperating ranch #1 on March 30, 2023 to allow cattle to cross stream between pastures.

**60% 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 January 11, 2023

**42% Complete**

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

The following actions have been completed during this reporting period:

- a. Drone imagery was flown at cooperating ranch #1 starting February 24, 2023 and completed March 3, 2023.

**35% 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 continues. Small virtual fences were implemented around flumes for equipment protection.
- b. Continuing to monitor the V3 collars.

**60% 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 January 11, 2023.

**60% 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 was conducted January 25, 2023, February 28, 2022, and March 28, 2022.

**60% 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.

**40% Complete**

## **TASK 5: WATERSHED MODELING**

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

The following actions were underway during this reporting period:

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

**60% Complete**

**Subtask 5.2:** *Model development*

The following actions have been completed during this reporting period:

- a. Baseline APEX models have been created and cattle movement data will be incorporated.

**20% 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. Field day planned for upcoming this summer at the Bluestem Research Range
- b. Virtual fencing flyer and information provided at the Oklahoma Association of Conservation Districts (OACD) Annual State Meeting on February 27-28, 2023

**45% 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	3	795	49	24
Twitter	3	183	14	N/A
Total		978	63	24

**60% Complete**

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

The following actions have been completed during this reporting period:

- a. Society of Range Management talk on February 11, 2023 entitled: Virtual fence and cattle stress
- b. Society of Range Management oral presentation on February 13, 2023 entitled: Effects of virtual fencing on cortisol concentrations and behavior of beef cattle
- c. Society of Range Management talk on February 14, 2023 entitled: Producers' perspective on implementing a virtual fence system

**40% Complete**

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

The following actions have been completed during this reporting period:

- a. Analysis and writing are underway for a paper demonstrating the effectiveness of VF on excluding cattle from sensitive areas.

**10% Complete**

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

- Drought has caused no water quality samples to be collected this quarter.

**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 rains.
- 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