

Oklahoma Water Resources Center

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

Quarter no. 1 From July 1, 2021 Through September 30, 2021.

I. Abstract

This quarter, the contract was initiated, accounts setup, a kickoff meeting held, and the QAPP submitted and approved. The first demonstration ranch was identified, and plans were made for installation of virtual fencing. Virtual fencing was installed at the research ranges and stream visual assessments were conducted at the four watershed sites located on the research ranges. Equipment and supplies required for installation of water quality monitoring at the four watershed sites was ordered. Extensive outreach occurred with the launch of the project via television coverage, newspapers, social media, and other media. Next quarter, virtual fencing will be installed at the cooperating ranch. Runoff monitoring equipment will be installed on the research ranges. Stream visual assessments will be conducted at all sites. Finally, we will work to expand our outreach efforts.

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 1st quarterly report was prepared and submitted late on December 7, 2021.

8% 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. The contract was received June 7, 2021 and fully initiated on August 4, 2021.
- b. OWRC, ANSI, NREM, and BAE support accounts were setup on August 13, 2021.
- c. As of September 30th, no project funds had been expended.

0% 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. A project kick-off meeting was held on June 17, 2021.

8% 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 on September 2, 2021 and conditionally approved by EPA on September 24, 2021.

90% 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. No activity to report this quarter.

8% 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. The first cooperating ranch was identified this quarter and an agreement put into place between OSU and the 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. The VF system will be installed on the first demonstration ranch on December 15, 2021.

0% 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. No activity to report this quarter. Implementation of grazing management and riparian protection will begin following installation next quarter.

0% Complete

Subtask 3.4: *Perform Stream Visual Assessment.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter. Next quarter, the stream visual assessment will be conducted following installation of virtual fencing at the demonstration ranch.

0% 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. The wildlife and pollinator habitat assessment will be conducted following installation of virtual fencing at the demonstration ranch.

0% Complete

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

Subtask 4.1: *Implement grazing mgt & riparian protection via VF*

The following actions have been completed during this reporting period:

- a. Vence collars and 1 base station were installed the week of October 18-22, 2021. This included installation of the new collar design.
- b. The first year of the project, all four watershed sites will be continuously grazed and cattle location will only be tracked.
- c. In years 2-3, grazing management and riparian protection will be implemented at 2 sites (East Native 1 and 2) and continuous grazing will continue at the other 2 sites (LCB 1 and 2).

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 performed at all four watersheds. Stream condition at LCB 1, LCB 2, and East Native 1 was good with these watersheds scoring 8.6, 8.52, and 8.1 respectively. East Native 2 was in fair condition, scoring a 6.04.
- b. Stream visual assessments will be conducted quarterly to capture seasonal variation and changes due to virtual fencing.

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. Equipment and supplies have been ordered and should all arrive next quarter. Some site prep has been performed in preparation for installation of the flumes. We expect to complete installation by mid-January.

2% Complete

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

The following actions have been completed during this reporting period:

- a. No activity to report this quarter. Monitoring equipment has not yet been installed. However, drought conditions have prevented runoff from occurring thus far (i.e. we have not missed a runoff event yet since the project was launched).

0% 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.

0% Complete

TASK 5: WATERSHED MODELING

Subtask 5.1: *Gather input data*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter. We are actively recruiting a PhD student to perform the modeling and expect to bring a student on by summer 2022.

0% 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.

0% Complete

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

The following actions have been completed during this reporting period:
a. A rough outline for “Virtual Fencing: A Guide for Successful Implementation” has been drafted.

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.

0% Complete

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

The following actions have been completed during this reporting period:

- a. Articles on the project were published in a variety of media as outlined below:
 - “On the fence: Oklahoma State University to study virtual fences for cattle operations” The Oklahoman, July 3, 2021
 - “OSU Researchers Deploy Virtual Fencing Technology To Improve Grazing and Water Quality” Oklahoma Farm Report, June 30, 2021
 - “Virtual fencing technology improves grazing and water quality” Morning Ag Clips, June 27, 2021
 - “Researchers Deploy Virtual Fencing Technology to Improve Grazing and Water Quality” Muskogee Phoenix, June 26, 2021
 - “Researchers Deploy Virtual Fencing Technology to Improve Grazing and Water Quality” Oklahoma Farm Report, June 25, 2021
 - “Researchers Deploy Virtual Fencing Technology to Improve Grazing and Water Quality” Oklahoma State University, June 24, 2021
 - “EPA awards OSU researchers “Farmer to Farmer” grant for Virtual Fencing project” Stillwater News Press, June 23, 2021
- b. On July 12, 2021, the project was featured on KFOR News - <https://kfor.com/news/local/virtual-fencing-cattle-in-collars-studied-at-osu-for-high-tech-future-of-ranching/>
- c. A simple webpage was developed for the Water Center website describing the project - <https://water.okstate.edu/our-work/virtual-fencing.html>.
- d. Between the OWRC Facebook and Twitter, and our collaborators, we posted 11 times about VF during the reporting period with 163 engagements and a reach of approximately 15,000 people.

8% Complete

Subtask 6.6: *Deliver presentations at conferences.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

8% 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
- Obtaining graduate students, particularly for the modeling, due to tight job market and delays in obtaining visas for international students

- OSU has been donated a research ranch near Haskell, Oklahoma. This ranch appears to be an excellent ranch for demonstrating the benefits of virtual fencing as the ranch has an extensive stream network which is somewhat degraded. Integrating this new research ranch into the project would allow us to demonstrate how this technology can assist with range and stream restoration.

IV. Projected Work for Next Quarter

- Install 4' H-Flumes and ISCO automated samplers at research range watershed sites and initiate runoff collection and analysis
- Stream visual assessments will be conducted at all four research range watersheds and at the demonstration ranch
- Implement virtual fencing at cooperating ranch
- Conduct wildlife and pollinator habitat assessments
- Continue and expand outreach efforts on virtual fencing and the project