OSU | OKLAHOMA WATER RESOURCES CENTER

2021 ANNUAL REPORT

OKLAHOMA WATER RESOURCES CENTER

OUR MISSION

Empowering informed decision making and enriching understanding of the state's most critical water management issues through engagement, education and actionable science.

OUR VISION

Safe, secure and sustainable water resources for all.

OUR PURPOSE

Located at Oklahoma State University, the Oklahoma Water Resources Center (OWRC) has been providing science-based, community-supported solutions for the state's pressing water quantity and quality challenges for over 55 years. Established in 1965 by the Water Resources Research Act, the OWRC is one of 54 institutes/centers within the National Institutes for Water Resources, supported by the United States Geological Survey.

The Water Resources Research Act charged institutes with:

- Planning, facilitating and conducting research to aid in the resolution of state and regional water issues.

- Promoting technology transfer, dissemination of research findings, and implementation of improved technology and management practices.

- Training the next generation of water scientists and engineers through experiential-based learning and continuing education.

- Collaborating with other universities and partners in the state to develop a statewide program to meet the needs of the state.

- Administering grants funded via the USGS 104 program and other sources.

WE MAKE A DIFFERENCE

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Investing in Research

The Oklahoma Water Resources Center engages 25 state, federal, tribal and private organizations throughout the Water Research Advisory Board to set research priorities and select projects for funding.

With funding from the USGS' 104b program, in 2021 the OWRC funded six projects.

1. Studying zooplankton-harmful algal bloom feedback loops in Oklahoma reservoirs. (OSU)

2. Studying microplastic pollution of Oklahoma freshwater systems and the potential interactions with contaminants of environmental and health concern. (OSU)

3. Testing bioelectric treatment of nitrate-impaired waters. (East Central University)

4. Testing the relationship between isopod distributions and groundwater connectivity in the plains of northeastern Oklahoma. (University of Tulsa)

5. Utilizing high resolution space-air-ground platforms for early detection of cyanobacteria at near-shore locations in reservoirs. (OSU)

6. Synthesizing a novel fouling-resistant polyacrylic acid membrane utilizing UV-grafted technique on alpha-alumina for treating produced water. (OSU)

We connect research teams and communities to multidisciplinary expertise by serving as a gateway to a national network of water institutes, Oklahoma State University faculty and other universities and water resources organizations.

PROJECT FUNDING

PROPOSALS

$3,622,779

22

SOCIAL MEDIA FOLLOWERS

11% 994

23% 579

39% 1006

2,579 total followers

17%

Facebook users reached: **60,367**

NEWSLETTER SUBSCRIBERS

1,280

COLLABORATORS

86 individual academics

12 industry organizations

8 universities

STUDENTS SUPPORTED

23

OUR WORK

Regenerative Agriculture

This project's goal is to intensify agricultural production in an environmentally sustainable manner that enhances the agronomic, economic and community resiliency in the Southern Great Plains (SGP). We anticipate our research and outreach will provide the foundational information needed to increase agricultural production and profitability of multiple commodities by 25% (on a per acre basis) while reducing agriculture's environmental footprint by 50%.

Impacts

⬧ Identify adoption barriers of regenerative practices and pathways to overcome them.

⬧ Increase understanding of field level processes, effects and optimization of agricultural intensification using regenerative practices.

⬧ Quantify the watershed/regional scale effects of regenerative practice adoption.

⬧ Evaluate economics of regenerative practice adoption at farm and regional scales.

⬧ Enhance adoption via dissemination of knowledge gained from these objectives.

Partners

⬧ OSU Ag Research

⬧ OSU Extension

⬧ Texas A&M Agrilife Research

⬧ Texas A&M Agrilife Extension Service

⬧ Texas Tech University

⬧ Texas Water Resources Institute

⬧ West Texas A&M University

⬧ USDA - National Institute of Food and Agriculture

Modernization of Dam Analysis Tools

Many of the 12,000 flood control structures built by the USDA in the middle of the last century are past their engineered life. Oklahoma has over 2,100 of these dams, more than any other state. This new collaborative research effort will design and develop engineering tools, guidance documents, computer software and applications for monitoring, inspecting and rehabilitating these aging flood control dams ensuring their continued benefits to Oklahoma and the nation.

Impacts

- An online network for small flood control reservoir and levee monitoring data, hosted in the Agricultural Research Services cloud infrastructure.

- An application programming interface to expedite data transfer to collaborators and stakeholders.

- New and improved software for data collection, management and transfer.

- Geographic information system-based tools for dam monitoring and inspection.

- Curriculum and training workshops to educate personnel on dam inspection and monitoring methods.

- Collaboration will start in the Stillwater Creek and Sugar Creek watersheds.

Partners

- USDA-Agricultural Research Services

- USDA-Natural Resources Conservation Service

Master Irrigator Program

This program integrates OSU Extension training, incentive programs and on-farm assistance to facilitate improved water use efficiency and farm income via increased farmer adoption of advanced irrigation management strategies and technologies.

Program Need

- A recent study of producers in the Oklahoma Panhandle found:

  - 87% had experienced declining well capacities.
  - 50% had converted irrigated cropland to dryland in the past.

- Recent research found precision irrigation scheduling:
  - Reduced water use by 10%.
  - Increased yield by 13%.
  - Increased water productivity by 25%.

- Few irrigators have adopted advanced irrigation technology because:
  - Investigating improvements not a priority.
  - Financing.
  - Improvements increase management time/cost.
  - Risk of reduced yield.

Response

- Developed integrated program consisting of training, incentives and on-farm assistance.

- Delivered first program in Goodwell in 2021.
- Second program launched January 2022 in Altus.

### Impacts

- 95% of graduates stated their knowledge of irrigation increased.

- Graduates managed 70,000 acres overall.

- Graduates plan to implement soil moisture sensors, irrigation schedulers, etc.

Partners

- OSU Extension
- OSU Ag Research
- Oklahoma Conservation Commission
- Oklahoma Farm Bureau
- Oklahoma Panhandle Agriculture and Irrigation Association
- Oklahoma Water Resources Board
- USDA-Natural Resources Conservation Service
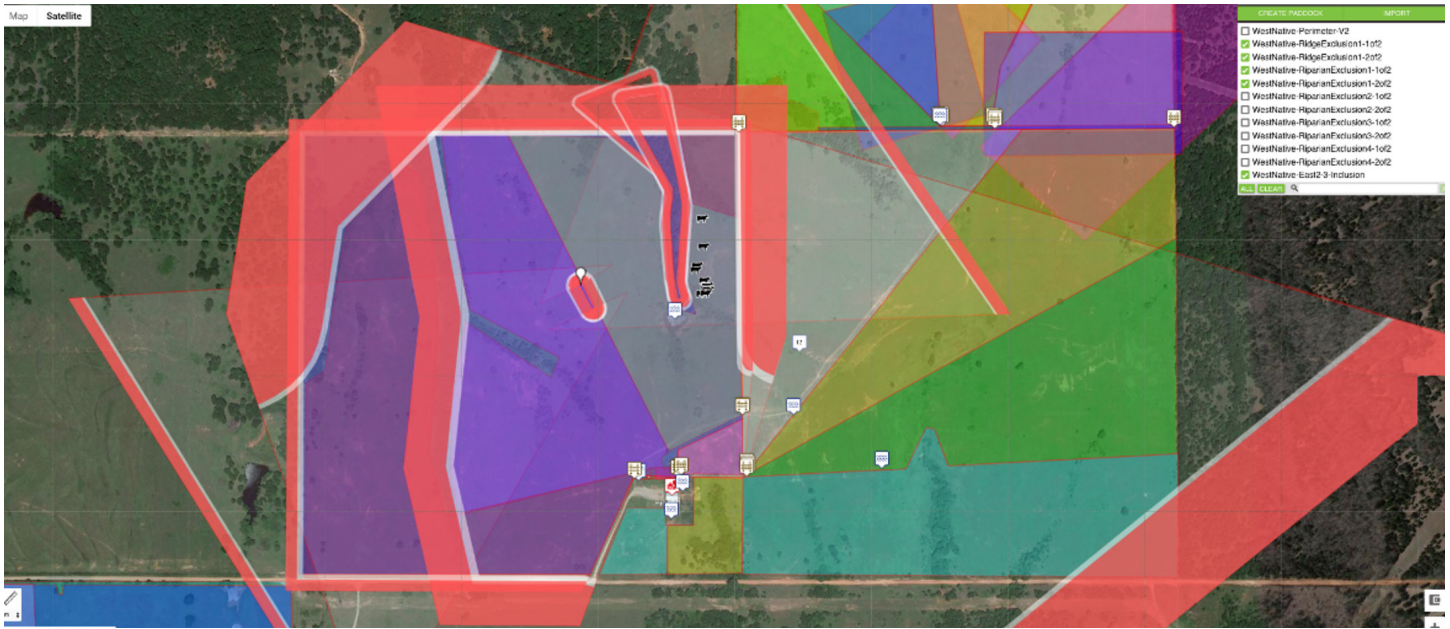
Improving Ecosystem Services with Virtual Fencing

Virtual fencing is anticipated to allow better management of grazing distribution and protection of ecologically sensitive areas (e.g. water bodies, habitat, etc.). Such new tools will allow ranchers to actively manage remote grazing sites, increase grazing efficiency, reduce infrastructure costs and labor, and improve animal welfare. However, the range of benefits of such practices needs to be understood to support adoption by landowners and funding by natural resource agencies. This project will evaluate the use of GPS-enabled collars on individual cattle to provide auditory and electric stimulus, to improve the management of livestock grazing, water quality and ecosystem services.

Impacts

Preliminary data indicates virtual fencing is 60% effective on average (and as high as 99% effective) in reducing cattle presence in protected areas.

Future Work

- Determine the effectiveness of virtual fencing to implement rotational grazing and riparian protection.

- Determine if the level of protection afforded provides sufficient stream health, water quality and habitat improvements to warrant its use as a recommended conservation practice.

- Develop guidance for optimal use of virtual fencing.

Partners

- U.S. Environmental Protection Agency

- OSU Ag Research

- OSU Extension

- Oklahoma Conservation Commission

Native American After-school STEM

This program focuses on the design, development and evaluation of tribal after-school science, technology, engineering and mathematics (STEM) programs by incorporating virtual reality, augmented reality and 3D printing through spatial design activities that are relatable to both boys and girls.

Impacts

- Increased participation of Native Americans in technology-rich STEM after-school learning environments.

- Professional learning opportunities for after-school educators to facilitate the new technology for students.

- Immersive after-school experience grounded in culturally relevant teaching and learning strategies.

- New technology centers at the after-school sites and an inclusive curriculum focused on each tribal nation.

Partners

- OSU Mixed Reality Lab

- OSU Emerging Technologies and Creativity Research

- Citizen Potawatomi Nation

- Pawnee Nation

- Chickasaw Nation

- OSU Center for Sovereign Nations

- National American Indian and Science Engineering Fair

- Cowboy and Western Heritage Museum

CONTACT US

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