OKLAHOMA WATER RESOURCES CENTER

CY2019 Review

1. Major Unit Goals & Objectives (2019)

Goal 1 – Properly administer Water Center resources

Objective 1.1 – Provide administration and oversight of Berry Professorship funds

- Continued evaluation of statewide survey of public perceptions, attitudes, and learning preferences on water issues in Oklahoma and published three manuscripts
- Submitted Professorship Report on time
- Met with Malinda and Dick Fischer to discuss efforts supported by the Berry Professorship. Chris Eck, a PhD supported by the Professorship, attended meeting to discuss results of statewide survey.
- Worked with Dr. Chris Zou to advertise for and secure a graduate student to support quantification of best management practice effectiveness for water quality protection at the watershed scale (Hatch/Multi-State OKL03147)

Objective 1.2 – Provide administration and oversight of USGS 104(b) and 104(g) Grants

- Finalized, submitted, and was awarded the 2019 USGS 104(b) grant
- Issued Project Year 2020 104(b) RFP
    - Received 19 faculty and 4 student preproposals
- Facilitated 2 Water Research Advisory Board meetings to select faculty & student projects
    - Summer 2019 meeting: 8 faculty and 4 student pre-proposals were selected for full proposal development for 104(b) Funding
    - Winter 2018 meeting: 3 faculty and 2 student projects selected for funding

      Faculty projects
        - Sabit Ekin (Soil Monitoring through UAV-Assisted Internet of Things Wireless Underground Sensors)
        - Jason Vogel (Investigation of Indicator Bacteria in OK Streams)
        - Javier Vilcaez (A new dolomite filtration technology to remove heavy metals and NORM from produced water)

      Student projects
        - Stephen Polkowski (Design of novel electrocoagulation systems for produced water treatment)
        - Hossein Atoufi (Passive Samplers for Monitoring Perfluoroalkyl Substances at Contaminated Sites)

- Facilitated submission of 7 pre-proposals and 5 full proposals for USGS 104(g) funding; however, none were selected for funding
- Submitted the required 2018 annual report

Objective 1.3 – Provide needed staffing and oversight of Water Center Staff

- Hired Ali Meek as a student worker to assist with OWRC communication
- Leslie Elmore left OWRC after a decade
- Hired JoMarie Hickerson as a Communications Specialist jointly with BAE to enhance outreach
- Hired Dr. Nicole Colston as an Assistant Research Professor jointly with NREM to enhance water/climate education

Objective 1.4 – Oversee OWRC budgets and proper expenditure of center funds

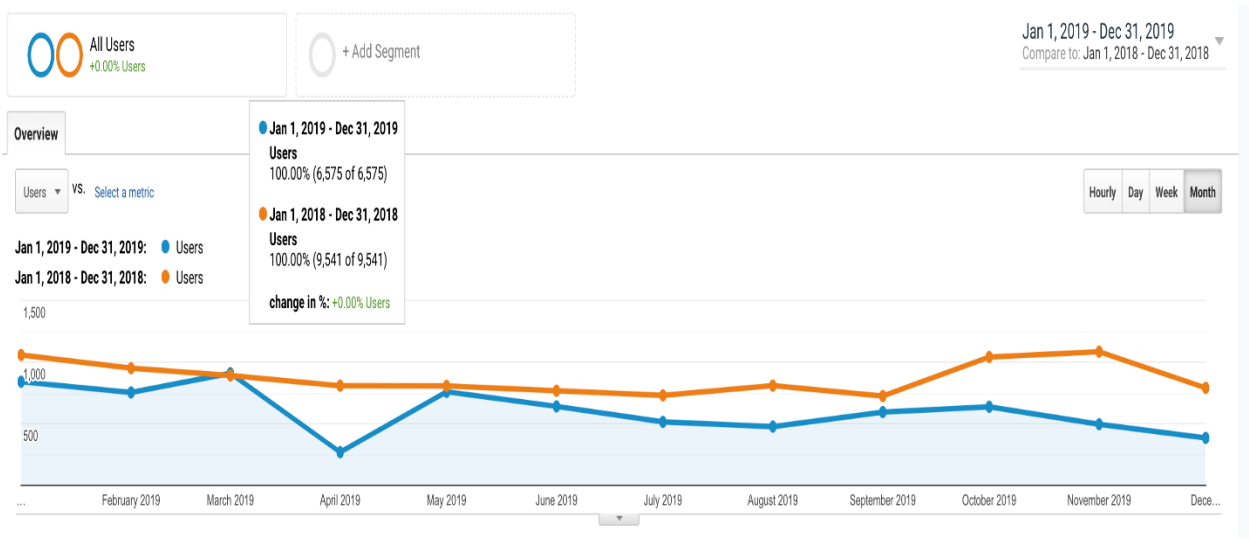
- Oversaw OWRC's 19 accounts (see Section 7 for details)

Goal 2 – Increase OWRC's visibility and recognition as a resource

Objective 2.1 – Build OWRC's recognition by university faculty and the State as a resource

- Phased out the *AQUAhoman* newsletter
- Transitioned the *Currents* newsletter to an online format and expanded its content
    - Four *Currents* were sent to 1060 external subscribers (>10% increase over 2018) and 98 Water Center faculty/staff affiliates (>20% increase over 2018).
- Expanded audience for social media
    - Twitter:
        - Followers gained: 42. Which is a 21% decrease from last year.
        - Impressions (the number of times a tweet shows up in somebody's timeline): 43,815. Which is a 20.36% increase from 2018.
        - Tweet likes: 199. Which is a 30.07% increase from 2018.
        - Retweets: 104. Which is a 73.33% increase from 2018.
    - Facebook:
        - Followers gained: 47. Which is a 34.29% increase from 2018.
        - Page likes gained: 47. Which is a 46.88% increase from 2018.
        - Reach (The number of people who saw any content from your Page or about your Page):
        - We reached 2,935 people total in 2019, with an average of 244.58 per month. Which is an increase of 495.33% from 2018.
        - Engagements (Post clicks, reactions, comments, and shares): 1618. Which is a 725.51% increase since 2018.
    - Instagram:
        - Added in October 2019 to increase our reach.
        - Reach: 411
        - Followers: 76
        - Likes: 37
        - Engagement: 44

- According to Google Analytics, usage of OWRC's webpage was down 30% in 2019. The number of users declined for the fourth straight year from 9,541 in 2018 to 6,575 in 2019, total visits declined for the third straight year from 12,756 in 2018 to 8,783 in 2019, and page views declined from 26,896 in 2018 to 19,350 in 2019 (see following page). A revamping of the website is severely needed to stem this decline.



- Served on the Oklahoma Clean Lakes and Watersheds Association's Board of Directors and became a South Central Climate Adaptation Science Center Affiliate
- Delivered 7 presentations to >200 attendees of on-campus seminars and in-state conferences (down slightly from 2018). Presentations focused on Oklahoman's perceptions on water resource issues, improving irrigation efficiency, sources of and practices to address bacteria water quality issues, monitoring harmful algal blooms, and development of decision support tools
- Co-hosted and helped plan the 2019 Governor's Water Conference and Research Symposium
- Sponsored the Oklahoma Irrigation Conference, Oklahoma Clean Lakes and Watersheds Association 2019 Conference
- Continued developing and expanding OWRC's network both within the university (particularly NREM, BAE, PaSS, CIVE, ChE, and Env Sci) and with critical partners across Oklahoma (particularly OWRB, OCC, OPAIA, OFB, ODAFF, NRCS and other farm groups)
- Updated Oklahoma's Congressional delegation on OWRC activities in February 2019

Objective 2.2 – Build collaborations with surrounding states to address regional water issues of importance to Oklahoma

- Continued providing leadership for the Ogallala Water CAP project
- Working with states overlying the Ogallala Aquifer to organize the 2020 "Ogallala Aquifer Summit"
- Served on the Planning Committee and presented at the Southern Region Water Conference, College Station, TX, July 23-25, 2019.

- Worked with the University of Kansas and USGS in Kansas to develop a proposal on remote sensing of HABs
- Submitted a Sustainable Ag Systems proposal to USDA-NIFA in collaboration with the University of Nebraska, Kansas State, Colorado State, and others to address water depletion in the Ogallala Aquifer

Objective 2.3 – Elevate OSU's and the Water Center's visibility nationally

- Served a board member of the National Institutes on Water Resources and President-Elect and President of the Universities Council on Water Resources
- Served on the Ag Science Committee of EPA's Science Advisory Board
- Served on the Planning Committee for the National Drought Forum, Washington, DC, July 30-31, 2019.
- Dr. Wagner served on a panel at the Council for Agricultural Science and Technology in Washington, DC. Drs. Wagner and Mansaray presented at the 2019 UCOWR/NIWR Annual Conference national meetings in Snowbird, UT. Dr. Mansaray also served as the keynote speaker discussing Education in Developing Countries at a conference organized by the Education and Development Initiative – Sierra Leone in collaboration with the Department of Social Work, Rutgers University, New Brunswick, NJ.
- Served as an ad-hoc reviewer for USDA-NIFA conference proposal
- Participated in two Multi-State Research Projects
    - S1032 – Animal Production Systems: Synthesis of Methods to Determine Triple Bottom Line Sustainability from Findings of Reductionist Research
    - S1063 – Quantification of Best Management Practice Effectiveness for Water Quality Protection at the Watershed Scale

Goal 3 – Develop and move forward initiatives that address pressing water resources issues facing Oklahoma, the region and the nation

Objective 3.1 – Continue organizing thematic programs addressing key water issues in Oklahoma and responding to key funding/research opportunities including:

- Produced Water Research Program
    - Facilitated 2 OSU Produced Water Research Program meetings (in April & November 2019) to bring together faculty from across campus with agencies and industry working on produced water with the anticipation that increased collaboration would result.
    - Five of the proposals OWRC participated in during 2019 involved some element of produced water treatment and reuse.
- Watershed Planning
    - OWRC continued working with the OSU Environmental Science Graduate Program, Oklahoma Conservation Commission, and others on watershed planning efforts in Lake Hudson and other watersheds around the state (Lake McMurtry).

- Harmful Algal Bloom Detection and Response
    - OWRC continued working with Integrative Biology, CIVE, BAE, the OSU Environmental Science Graduate Program, and others (USGS, KU, etc.) to initiate a HABs detection and response program.
    - Monitoring of algal blooms was conducted at Lake McMurtry using both UAVs and in-lake sampling.
    - Two proposals were submitted in 2019 to provide needed funding for research on HABs.
- Sustainable Ag Systems
    - Worked with the University of Nebraska, Colorado State University, Kansas State University, South Dakota School of Mines and Technology, University of Florida, University of Kansas and OSU faculty in PaSS and BAE to develop a USDA-NIFA SAS proposal titled: *Agricultural Risk, Variability, and Incentives for Sustainability in the Great Plains.* OK Master Irrigator, as well as OK TAPS, were major components of the proposal.
    - Worked with KSU, A&M, and West Texas A&M to submit a letter of intent to USDA-NIFA focused on the transition of the Ogallala from an irrigated system to a dryland system
- Water-Energy-Food Systems
    - As stated below, formal efforts to coordinate a Water-Energy-Food Systems program at OSU were abandoned in 2019 due to elimination of funding for this program.
- Water Technology
    - The OWRC facilitated the development of an OSU Tier 1 initiative focused on Water Technology. This initiative brought together 37 faculty from 18 departments and 6 colleges. Although not funded, it elevated water research across campus, brought together new collaborations, and provided a roadmap for the OWRC for moving forward.

Objective 3.2 – Facilitate acquisition and management of external funding

- In 2019, the OWRC facilitated, collaborated on, led or otherwise supported 20 funding applications (i.e. letters of intent, pre-proposals, full proposals, and contracts). This far exceeded our 2019 goal of facilitating, participating in, leading or supporting >12 funding applications (see Section 6 for details)

Objective 3.3 – Assist the OSU Vice President for Research and serve as an integral part of the Food-Energy-Water Nexus and Produced Water Councils

- Efforts to initiate a Water-Energy-Food Systems program at OSU was disbanded when USDA-NIFA confirmed it would no longer be supporting that program specifically.
- OWRC continued facilitating OSU's Produced Water Research Program (see above)

Goal 4 – Guide and conduct water resources research

Objective 4.1 - Support student research

- Provide grants for 2 students via USGS 104(b) and supported 1 PhD student via Berry Professorship
- Served on 4 graduate student committees
    - Martha Sibley, PhD, Department of Sociology, Oklahoma State University
    - Samantha Rosado, MS, Environmental Science, Oklahoma State University
    - Maryam Samimi, PhD, Biosystems and Agricultural Engineering, Oklahoma State University
    - Galen Roberts, PhD, Soil and Crop Sciences, Texas A&M

Objective 4.2 – Evaluate water use in Oklahoma

- No progress made during 2019

Objective 4.3 – Assess public perceptions regarding water resource issues in Oklahoma

- Completed surveys of OSU students' and Oklahoma water professionals' perceptions, attitudes, and learning preferences on water issues in Oklahoma
- Submitted >3 manuscripts for journal publication
- Conveyed survey results via presentations at state (Governor's Water Conference and Research Symposium, OCLWA) and national conferences (UCOWR)

Objective 4.4 – Initiate assessment of best management practice effectiveness

- Worked with NREM to advertise for and secure a graduate student to initiate edge-of-field monitoring of water quantity and quality related to various land management practices
- Worked with ANSI to secure an agreement with Vence Corporation to test, demonstrate, and evaluate virtual fencing technology at OSU

2. Major Unit Goals & Objectives (2020)

Goal 1 – Expand water resources research in Oklahoma to better address the most critical water resources issues facing the State, region and nation

Objective 1.1 – Provide grants to support high priority water research at universities throughout Oklahoma via the USGS 104b and 104g programs

- Finalize 2020 USGS 104(b) grant application
- Facilitate the 104(g) submission process
- Issue Project Year 2021 104(b) RFP
- Facilitate Water Research Advisory Board Meetings to identify key water resources issues and select faculty and student projects to receive seed grants
- Submit the required 2019 annual report

Objective 1.2 – Lead, facilitate, and assist research teams developing and implementing water research projects and programs

- Hire a part time Program Specialist to provide administrative support (i.e. purchasing, travel, etc.), grant organization (maintaining biosketches, current and pending, and conflict of interest documents; scheduling team meetings; managing proposal timelines); and project management (monitoring activities, tracking metrics, reporting).
- OWRC faculty (i.e. Director, Water Research Specialist, and Assistant Research Professor) will facilitate, participate, lead or support >18 funding applications by:
    - Organizing interdisciplinary teams to address key water issues in Oklahoma and respond to funding/research opportunities
    - Assisting research teams with tracking funding opportunities, coordination, concept development, stakeholder engagement, grant and budget development, internal/external reviews, and project management.
- OWRC faculty will continue organizing and supporting thematic programs addressing key water issues in Oklahoma and responding to key funding/research opportunities:
    - Marginal water treatment and reuse (including produced water)
    - Improving irrigation efficiency
    - STEM education on water
    - Formal and informal science learning
    - Others as opportunities arise (climate change, drought management, etc.)

Objective 1.3 – Assess and improve grazingland water quality

- In collaboration with NREM and BAE, and with support from the Berry Professorship and Multi-State Research Project S1063 *(Quantification of Best Management Practice Effectiveness for Water Quality Protection at the Watershed Scale),* **assess edge-of-field runoff water quantity and quality related to grazingland management**
- In collaboration with ANSI and Vence Corporation, and with support from Wagner start-up funds and Multi-State Research Project S1032 (Animal Production Systems: Synthesis of Methods to Determine Triple Bottom Line Sustainability from Findings of Reductionist Research), **assess virtual fencing technology and its impact on grazing management, animal health, and ecosystem services**

Objective 1.4 – Improve water quality monitoring and watershed management

- Work with the Oklahoma Conservation Commission to facilitate development of the Oklahoma - Hydrologic and Water Quality System (HAWQS) model to **expedite water quality modeling**
- Work with the City of Stillwater, GRDA, USGS, South Carolina Department of Health & Environmental Control, and faculty at OSU, Baylor, OU, Univ of SC School of Public Health and elsewhere to **understand and manage Harmful Algal Blooms**
- Work with the Chickasaw Nation's Department of Environmental Services, Oklahoma Conservation Commission, Grand River Dam Authority, Bureau of Reclamation, and others to **develop and implement watershed-based plans**
- Develop international relationships (e.g. Ethiopia, Sierra Leon, OU's WaTeR Center) to **assist water quality monitoring and watershed management efforts in developing countries**

Goal 2 – Increase the public's and water resources managers' awareness of water issues in Oklahoma and research findings to improve their management

Objective 2.1 – Assess Oklahoman's perceptions regarding water resource issues

- Utilize Berry Professorship to support PhD student analysis of results of the 2018 survey the public's, OSU students' and Oklahoma water professionals' perceptions, attitudes, and learning preferences on water issues in Oklahoma
- Submit 2 manuscripts for journal publication assessing 1) changes between 2008 and 2018 and 2) regional variability in the results
- Convey survey results via presentations at state and national conferences
- Implement findings to enhance OWRC outreach and education efforts

Objective 2.2 – Expand the reach and impact of OWRC Communications

- Improve OWRC communications by developing & implementing a communications plan
- Revamp and consistently brand OWRC's website, newsletter (*Currents*), and social media (Facebook, Twitter, Instagram, YouTube) to broaden and expand the audiences for and impacts of OWRC's media products
    - Expand audience for newsletter, social media, and other media outlets by 10%
    - Increase social media engagement (0.02 currently to 0.05)
- Revise and better communicate OWRC's mission, vision, goals and objectives
- Redesign popup banners for display at conferences and other events
- Collaborate with DASNR to enhance the Water Center's website via DASNR's new structure to better communicate information on OWRC projects, affiliated researchers, and benefits/outcomes for Oklahoma's citizens and water resources
- Hire a part time Program Specialist to assist with event planning and communications (website updates, social media, marketing)
- Work with other outlets to publicize OSU's water research including participating department and college media, publications of the OSU Vice President for Research (VPR) and university, and relevant internal and external multi-media outlets.

Objective 2.3 – Expand OWRC's public outreach through citizen science and increased educational opportunities

- Host an annual Citizen Science Expo for the general public, spotlighting water-related monitoring projects (e.g. Blue Thumb, CoCoRaHS)
- Expand participation in the Spotty Rain Campaign by connecting OWRC and peer WRRI resources/scientists/products with rural librarians in Texas and Kansas
- Support youth-focused and community science programs for formal and informal settings that broaden public engagement in water and environmental monitoring

Objective 2.4 – Facilitate the full launch of the Master Irrigator Program

- Work closely with the Panhandle Irrigators and other ag groups, state and federal agencies, and BAE and PaSS faculty to launch Oklahoma's Master Irrigator Program.
- OWRC will assist with:
    - Team meetings to keep program development on schedule
    - Curriculum development
    - Recruitment of participants
    - Training logistics
    - Securing incentives for participants including:
        - Soil moisture probes
        - Increased ranking for EQIP funding
        - Potentially targeted cost-share funding for graduates to help in implementing improved management learned during the training.
    - Training of the first cohort of irrigators on irrigation management techniques, tools, and technologies saving water, energy, and money
    - Follow-up farm visits by a Mobile Irrigation Lab
    - Funding applications for USDA-NRCS Regional Conservation Partnership & Conservation Innovation Grants, USDA-NIFA grants, and State funds

Objective 2.5 – Present at, organize, sponsor, and host water resources conferences

- Co-host the Oklahoma Governor's Water Conference and Research Symposium
- Present, sponsor and/or exhibit at the Oklahoma Irrigation Conference, Oklahoma Clean Lakes and Watersheds Association, Oklahoma Association of Environmental Education, regional library conferences and other relevant water resource conferences in OK
- Work to organize tracks at and/or host or co-host regional & national water conferences
- Increase delivery of presentations in Oklahoma and elsewhere on the Water Center, ongoing water research at OSU, and critical water issues in the State and region

Goal 3 - Foster the training of new water resources scientists, engineers, and technicians

Objective 3.1 - Support student research

- Provide grants to support student research via USGS 104(b) and other grants
- OWRC faculty will serve on a minimum of 8 student committees
- Expand opportunities for undergraduate and graduate experiences in water education and research, particularly for Native American students

Objective 3.2 - Enhance learning opportunities for faculty and students

- Host symposiums and seminars for national experts, industry leaders, and agency program officers (POs) to discuss cutting-edge water research, research needs, and collaborative/funding opportunities.

Objective 3.3 – Help develop and support a strong academic program on water

- In order to attract and develop high caliber students and help build a community of practice around water, a strong academic program will be needed. We will work with departments and academic programs (i.e. the graduate and undergraduate Environmental Science Programs) to help meet student needs and advance water programs across campus.
- Support hiring of new water faculty
- Dr. Mansaray will serve as the advisor for the OSU Oklahoma Clean Lakes and Watersheds Association student chapter
- Dr. Mansaray will teach ENVR 3113 “Sampling and analysis for solving environmental problems” and an independent study on ENVR 5200 “remote sensing of water quality”

Goal 4 – Engage university researchers, state and federal agencies, and other stakeholders to resolve State, regional, and national water resource issues.

Objective 4.1 – Better engage OSU water faculty

- Hire a part time Program Specialist help organize on campus events to engage faculty
- Meet individually and collectively with key OSU department heads and water faculty to enhance collaboration
- Host colloquia (consisting of flash talks, poster sessions, focus groups, etc.) and socials to enhance faculty awareness of water research across OSU and facilitate collaborative research and establishment of a Water Research Community of Practice

Objective 4.2 – Deepen partnerships with state and federal agencies, industry partners, and stakeholders to assist water management efforts in Oklahoma

- Increase engagement with the Water Research Advisory Board to identify new collaborative opportunities, gain assistance with the planning of the Research Symposium, and advise the OWRC on its research and activities
- Expanded stakeholder engagement.
- Strengthen strategic partnerships with agencies and water resource managers.

- Establish close working relationships with federal agency POs via more frequent visits and communications to help prioritize our research efforts to better align with funding program and agency needs, leading to higher funding success rates.
- Build on existing networks to increase engagement in water quality issues in Oklahoma and deepen our partnerships with water management and related groups, particularly the OCC, OWRB, ODEQ, USDA-NRCS, USDA-ARS, Grand River Dam Authority, Native American Tribes, the Bureau of Reclamation, Oklahoma Department of Environmental Quality, and ag groups. Achieve this through greater communication and engagement with these groups and quick follow-through on discussions
- Expand participation in priority water/natural resource agency workgroups, Oklahoma water conferences (e.g. Oklahoma Rural Water Association), and other related Oklahoma associations

Objective 4.3 – Build collaborations with surrounding states to address regional water issues of importance to Oklahoma

- Continue providing leadership for the Ogallala Water CAP project
- Work with Ogallala Aquifer states to organize the 2020 "Ogallala Aquifer Summit"
- Continue work with surrounding Water Resources Research Institutes to identify and develop programs to address key regional issues. Pursue joint grant funding from USGS, USDA, and others to address these regional issues.
- Engage with the *National Collaborative for Food, Energy, and Water Education* (NC-FEW) to advance education research & educational programming grounded in the FEW-Nexus
- Work with the Drought Mitigation Center at the University of Nebraska on citizen science drought monitoring programs
- Work with Great Plains Librarians to increase the number of libraries we engage in our education and outreach programs

Objective 4.4 – Elevate OSU's and the Water Center's visibility nationally

- Serve as President-Elect of the National Institutes on Water Resources and President of the Universities Council on Water Resources
- Serve on the Ag Science Committee of EPA's Science Advisory Board
- Serve on the National Integrated Drought Information System Executive Council
- Deliver research presentations at national meetings
- Serve on review panels as possible (i.e. NSF, NOAA, USDA)

3. Thematic Area Reporting for Extension and Research

(See attachment A)

4. Narrative

Active engagement of units across campus and partners across the state and region, is a central focus of the OWRC. In 2019, OWRC collaborated with 20 departments at OSU, representing 6 colleges. Development of the Tier 1 Water Initiative was certainly a driver behind this wide engagement;

however, even without that initiative, OWRC would have engaged >15 departments. Most engagement occurs within the context of developing proposals; however, the OWRC is actively working with half of these units on active research or Extension projects (notated by an * in the list below).

1. Agricultural Economics
2. Ag Edu., Communication & Leadership*
3. Biosystems & Agricultural Engineering*
4. Civil & Environmental Engineering*
5. Chemistry
6. Chemical Engineering*
7. Computer Science
8. Education
9. Electrical & Computer Engineering*
10. Entrepreneurship
11. Environmental Science Grad. Program*
12. Horticulture & Landscape Architecture
13. Integrative Biology
14. Materials Science & Engineering, Tulsa
15. Mechanical & Aerospace Engineering
16. Microbiology & Molecular Genetics*
17. Natural Resource Ecology & Mgmt.*
18. Physics
19. Plant & Soil Science*
20. Sociology*

Additionally, OWRC collaborated with 22 off-campus organizations and entities including 11 universities, two agriculture groups, two cities, and seven agencies (see below). Although there is some overlap, this generally does not include the OWRC's engagement with the Water Research Advisory Board which is comprised of 25 state, federal, tribal, and private organizations (notated by an * in the list below).

1. City of Perry
2. City of Stillwater
3. Colorado State University
4. Kansas State University
5. Mississippi State University
6. South Dakota School of Mines & Tech.
7. University of Florida
8. University of Kansas
9. University of Nebraska
10. University of Oklahoma
11. Southwestern Oklahoma State Univ.
12. Texas A&M University
13. West Texas A&M University
14. Grand River Dam Authority*
15. Oklahoma Conservation Commission*
16. Oklahoma Dept of Ag, Food & Forestry*
17. Oklahoma Farm Bureau*
18. Oklahoma Water Resources Board*
19. Panhandle Irrigators Association
20. USDA-Agricultural Research Service*
21. USDA-Nat. Resource Conserv. Service*
22. US Geological Survey*

Regarding grants, the OWRC facilitated, collaborated on, led or otherwise supported 20 funding applications (i.e. letters of intent, pre-proposals, full proposals, and contracts) in 2019 (see Section 6). This is 9 more than we supported in 2018 and 8 more than our goal for 2019 (i.e. 12). However, only 2 have been awarded, while 5 are still under review and 13 were rejected (10% success rate currently). **Our goals for 2020 are to: 1) facilitate, collaborate on, lead or support a minimum of 18 funding applications, 2) increase our success rate to 20%, and 3) expand the number of units supported.**

Finally, at the request of Dr. Karen Hickman, Dr. Wagner joined the Environmental Science Steering Committee in 2019. Additionally, Dr. Mansaray was asked to join the program's teaching faculty. We expect that this will yield greater interactions between the OWRC and this excellent program.

5. Peer Reviewed Output

See attachment B

6. Grants and Contracts

Name	Agency	OWRC Contact	PI	Lead Org	Award Status	Funding Source	Total Award
Growing Tomorrow`s Leaders Through Graduate Studies in Sustainable Urban Horticulture	OAES	Kevin Wagner	Charles Fontanier	OSU-HORT	Rejected	USDA NNF	$241,000
Adopting the National Hydrologic and Water Quality System (HAWQS) SWAT-based modeling platform in Oklahoma	OAES	Abu Mansaray	Ali Mirchi	OSU-BAE	Rejected	USGS 104g	$250,000
The Impact of climate change on the frequency and spread of Harmful Algal Blooms in the Red River Basin	OAES	Abu Mansaray	Kevin Wagner	OWRC	Rejected	USGS CASC	$250,000
Impacts of Climate Change on Natural Salinity Dynamics in the Red River Basin	OAES	Abu Mansaray	Ali Mirchi	OUS-BAE	Rejected	USGS104g	$250,000
USGS Base Funds FY19	OAES	Kevin Wagner	Kevin Wagner	OWRC	Awarded	USGS 104b	$92,335
Enhancing Reliability of Early Warning Systems for Harmful Algal Blooms (HABs) in the Southern Great Plains	OAES	Abu Mansaray	Scott Stoodley	OSU-ESGP	Rejected	USGS 104g	$250,000
Integrating Research with Innovations in Education & Extension to Transform Ag in the Water Challenged Southern High Plains to Build Sustainable, Robust, and Resilient Food & Fiber Production Systems while Strengthening Rural Communities through Innovative Farm Practices & Resource Recovery	OAES	Kevin Wagner	Bob DeOtte	WTAMU	Rejected	USDA-NIFA AFRI SAS	$10,000,000
Sustainable Water for Oklahoma's Future: Phase II	OAES	Kevin Wagner	Kevin Wagner	OWRC	Rejected	OSU Tier 1	$3,750,000
Low cost ceramic membrane based modular system for residual oil recovery & radionuclide separation from produced water	OAES	Kevin Wagner	Raman Singh	OSU-Tulsa	Rejected	DOE Office of Fossil Energy	$1,249,985
Impacts of Climate Change on Natural Salinity Dynamics in the Red River Basin	OAES	Abu Mansaray	Ali Mirchi	OSU-BAE	Rejected	USGS CASC	$250,000
Socially Sustainable Solutions for Water, Carbon, and Infrastructure Resilience in Oklahoma (S3OK)	OAES	Kevin Wagner	Hank Jenkins-Smith	OU	Submitted	NSF EPSCoR	$20,000,000
A Southern Regional Water Conference: A Train the Trainer Approach to Increase Grower Adoption of Sustainable Practices	OCES	Kevin Wagner	Drew Gholson	Miss. State	Rejected	USDA-NIFA SSARE	$79,991

Name	Agency	Primary Contact	PI	Lead Org	Award Status	Funding Source	Total Award
Hydroecological Modeling to Support Conservation Planning in the Upper Red River Basin	OAES	Abu Mansaray	Abu Mansaray	OWRC	Rejected	DHSCSP-SCB	$185,000
EFRI DCheM: Distributed Produced Water Treatment Fueled by High Value Product Extraction	OAES	Kevin Wagner	Clint Aichele	OSU-ChE	Rejected	NSF	$1,814,783
Impacts Of Climate Change On Natural Salinity Dynamics In The Red River Basin	OAES	Kevin Wagner	Ali Mirchi	OSU-BAE	Rejected	NTMWD	$312,870
Oklahoma Military Airspace Compatibility Assessment Mapping Portal (OMACAMP) Project	OAES	Kevin Wagner	Bryan Murray	OSU-NREM	Submitted	OK Aeronautics Commission	$754,403
Agricultural Risk, Variability and Incentives for Sustainability in the Great Plains	OCES	Kevin Wagner	Karina Schoengold	UNL	Submitted	USDA-NIFA AFRI SAS	$9,999,706
Estimating sediment deposition rates in Lake McMurtry	OCES	Abu Mansaray	Abu Mansaray	OSU-ESGP	Submitted	City of Perry	$50,000
Louis Stokes STEM Pathways and Research Alliance: OK-LSAMP Alliance Phase VI	OAES	Nicole Colston	Nicole Colston	OSU-NREM	Awarded	NSF LSAMP	$3,973,463
Native American Middle School Students After-school STEM (NAMSAS) Program	OAES	Nicole Colston	Nicole Colston	OSU-NREM	Submitted	NSF ITEST	$1,499,616
Total						**20**	**$55,003,152**

7. Fiscal Report

The OWRC currently manages 19 accounts (see next page for details on each account) including:

- 3 startup accounts which terminate at the end of July 2020. Note that OCES M&O and Wagner startup funds are deposited in the same account. The <$10,000 remaining in the startup accounts will be used to purchase field and office supplies, refurbish a Polaris for field work, and as possible, purchase a portable flow meter. Also, note that funds will be transferred from the OCES startup account to address the negative balance in the OAES account.
- 2 multi-state Hatch project accounts that do not currently have a balance.
- 6 grant accounts of which 1 is closed out, 1 has no balance & 4 are being spent as scheduled
- 2 block accounts. Note that VPR salary funds are deposited in the VPR Wagner Startup account. Also, with Mrs. Elmore's departure, we are anticipating carry-over. A part-time program specialist will be hired in April 2020 and carry-over will be used to increase this position's hours.
- 2 M&O accounts which will be used to support travel for the OWRC Director and faculty/staff to meetings and conferences. Any carryover will help support field research activities.
- 1 professorship account which will be used to support 1 MS student, partially support 2 PhD students, and lab analysis of stormwater samples (which is expected to exceed $20,000/year)
- 2 F&A accounts with a combined balance of $2,230. No plans are in place to expend these funds.
- 1 cost-share account which provide match for the OWRC portion of the USGS 104b grant

8. General Administration

At the beginning of 2019, OWRC staffing consisted of the Director (Dr. Wagner), a Program Coordinator (Leslie Elmore), a Research Specialist (Dr. Mansaray – March through December) and a part-time student worker (Ali Meek). All employees are compliant with annual Title VII & IX trainings; however, Dr. Mansaray is not compliant with required safety trainings as a result of an oversight by the Director.

Upon Leslie's departure in July 2019, the OWRC strategically evaluated refilling this position and began collaborating with BAE and PaSS to secure expertise in communications and grant development. OWRC and BAE worked together to jointly hire JoMarie Hickerson as a Communications Specialist. She is working closely with AgComm to ensure compliance with DASNR Style Guide for communications and marketing brand standards. OWRC worked with PaSS to pursue hiring a Research Specialist to support grant development; however, after a failed search, this effort was terminated. At the end of 2019, with Dr. Owens' help and collaboration with NREM, Dr. Nicole Colston joined the OWRC expanding our education and outreach capacity. During this time, it was determined that OWRC had critical need for administrative support, event planning, communications assistance, coordination of grant development, ensuring training compliance, and project management. A new part-time Program Specialist position was created and a qualified candidate identified for onboarding in April 2020. Finally, although OWRC has not explicitly participated in diversity initiatives, its staffing is diverse.

9. Honors and Awards

None (See Attachment C)

OWRC Fiscal Report – *as of January 20, 2020*

Chart	Fund Code	Title	Balance Forward	Maint Allocation	YTD Expenditures	Encumbrances	Balance w/o Encumbrances	Balance w/ Encumbrances
1	151235	Wagner Startup	15,853.72	32,832.00	19,369.24	10,766.56	29,316.48	18,549.92
1	151253	Water Planning Grant	9,623.01	(1,682.77)	7,940.24	-	-	-
Chart 1 Total			25,476.73	31,149.23	27,309.48	10,766.56	29,316.48	18,549.92
2	150700	Water Center Admin	9,966.04	8,000.00	6,163.17	5,257.38	11,802.87	6,545.49
2	150705	Future Challenges Animal Prod.	-	-	-	-	-	-
2	150794	Water Center Block	17,838.24	28,950.00	3,593.06	-	43,195.18	43,195.18
2	150795	Water Center Startup	17,500.00	-	-	18,650.00	17,500.00	(1,150.00)
2	430705	Future Challenges Animal Prod.	-	-	-	-	-	-
2	450700	Water Center Admin	5,428.33	-	791.34	-	4,636.99	4,636.99
2	450425	Berry Professorship	64,363.00	36,108.00	10,503.00	2,311.00	89,968.00	87,657.00
2	450739	Center - F&A Water Center	430.45	372.46	-	-	802.91	802.91
2	450797	F&A Recovery	765.29	662.16	-	-	1,427.45	1,427.45
2	454700	2-561210 Water Center Admin	-	-	4,670.67	13,889.12	(4,670.67)	(18,559.79)
2	541310	Watershed Plan for Lk Hudson	107,980.00		63,541.00	28,892.00	44,439.00	15,547.00
2	561860	USGS 104b - Admin	-	-	-	-	-	-
2	561870	USGS 104b - Info Transfer	32,335.00		12,314.00	10,409.00	20,021.00	9,612.00
2	581560	Lois Stokes STEM - OK-LSAMP	71,452.00		3,888.00	34,132.00	67,564.00	33,432.00
2	581570	Rural Libraries	258,901.00			120,192.00	258,901.00	138,709.00
Chart 2 Total			586,959.35	74,092.62	105,464.24	233,732.50	555,587.73	321,855.23
3	162714	Water Center	18,926.15	5,000.00	3,237.96	-	20,688.19	20,688.19
3	162776	Water Center Block	1,785.27	24,063.00	3,473.99	-	22,374.28	22,374.28
Chart 3 Total			20,711.42	29,063.00	6,711.95	-	43,062.47	43,062.47
Grand Total			633,147.50	134,304.85	139,485.67	244,499.06	627,966.68	383,467.62

Attachment A

Improving Oklahoma's Irrigation Efficiency

Successes over the last year

A strong collaboration has been established to support research and Extension efforts to improve irrigation water use efficiency. The partnership includes the Oklahoma Cooperative Extension Service, Oklahoma Agricultural Experiment Station, Oklahoma Farm Bureau, Panhandle Irrigators, Oklahoma Water Resources Board, Oklahoma Conservation Commission, Oklahoma Water Resources Center, Lugert-Altus Irrigation District, the irrigation industry, and USDA-Natural Resources Conservation Service.

OSU's capacity for conducting research and demonstrations on irrigation efficiency has been significantly enhanced through installation of subsurface drip irrigation at Altus, upgrade of the irrigation system at McCaull, and the successful search and selection of a High Plains Irrigation/Water Management Assistant Extension Specialist.

This collaboration and increased capacity allowed the launch of the Oklahoma TAPS program by Dr. Jason Warren in 2019 and set the stage for launching a Master Irrigator program in 2020. Furthermore, this collaboration and expansion of OSU's efforts and capacity has resulted in verbal commitments from NRCS, OWRB, and OCC to support these new efforts. The NRCS has verbally agreed to increase EQIP contract rankings for graduates of the Master Irrigator program. The OWRB has agreed to provide funding for outfitting a mobile irrigation lab for the Panhandle, irrigation scheduling technology for on-farm demonstrations, and soil moisture sensors for Master Irrigator program graduates. The OCC has verbally agree to provide staff support and funding for the Master Irrigator Program as well.

Gaps or Areas Needing Investment

a. Facilities and Laboratories
    i. Plans for renovations
        1. Expansion of SDI at Altus and installation of irrigation scheduling technology
        2. Upgrade pivots and install irrigation scheduling technology at Goodwell and other research stations with center pivots
    ii. Accomplished renovations or major equipment purchases
        1. Phase I installation of SDI at Altus
        2. Upgrade of pivots at McCaull
b. Personnel
    i. Faculty Expertise
        1. None beyond those currently involved
    ii. Staff support
        1. Technician(s) to support mobile irrigation lab and farm demos
    iii. Graduate student recruitment
        1. Students to support mobile irrigation lab and farm demos

Collaborations

a. Associated Research Centers and Institutes
    i. Plant and Soil Sciences
    ii. Biosystems and Agricultural Engineering
    iii. Water Resources Center
    iv. Research and Extension Centers (see below)
b. Current and planned use of OAES stations, facilities or OCES supported facilities
    i. Which stations or facilities
        1. Southwest Research and Extension Center
        2. Oklahoma Panhandle Research and Extension Center
        3. McCaull Research and Demonstration Farm
    ii. FRSU staff support
        1. Cameron Murley
        2. Skeate Beck
        3. Mike Schulz
c. County and Area Extension Staff
    i. County Extension Educators in major irrigation counties (i.e. Texas, Cimarron, Beaver, Jackson, and other counties)
d. Agencies, NGO's, Commissions, etc.
    i. Oklahoma Farm Bureau
    ii. Panhandle Irrigators
    iii. Oklahoma Water Resources Board
    iv. Oklahoma Conservation Commission
    v. Lugert-Altus Irrigation District
    vi. USDA-Natural Resources Conservation Service
    vii. Irrigation industry

Impact Statement

a. Issue:
    - Crop irrigation, which is the number one water user in Oklahoma, is threatened by growing demands and declining supplies.
b. Response/Action
    - A multi-disciplinary team consisting of faculty from OSU's Plant and Soil Sciences, Biosystems and Agricultural Engineering, and Water Resources Center (Drs. Jason Warren, Sumit Sharma, Saleh Taghvaeian, Robert Frazier, Seth Byrd, Kevin Wagner) is working with key partners to test and demonstrate irrigation scheduling tools (soil moisture sensors and irrigation schedulers) and efficient irrigation systems (bubbler nozzles, VRI, and SDI), conduct irrigation system evaluations (mobile irrigation lab), expand adoption and improve management of drought resistant crops (cotton), and provide needed training opportunities on the use of irrigation technologies (TAPS and Master Irrigator).

c. Results/Output
    - The team has found that soil moisture sensors and irrigation schedulers are effective tools for improving irrigation efficiency, cotton can be a viable crop for conserving water if managed properly, and significant water and energy savings can be achieved through implementation of mobile irrigation lab recommendations. Furthermore, efforts have resulted in a groundswell of support for irrigation research, demonstration, and Extension education programs.

d. Public Value Statement
    - When you support testing, demonstration, training and incentives on irrigation technology, participants will be more likely to adopt these new technologies, which leads to increased on-farm water use efficiency, and sustained agricultural production and water supplies benefitting counties throughout western Oklahoma.

Marginal Water Treatment and Reuse

Successes over the last year

Through OSU Produced Water Research Program meetings hosted by the OWRC and development of the *Sustainable Water for Oklahoma's Future (SWOF)* Tier 1 initiative led by the OWRC in 2019, our marginal water treatment and reuse team really solidified despite SWOF not being funded. In fact, much of this team formed the core research group for the Variable and Marginal Quality Water Supplies Focus Area of the NSF EPSCoR proposal. As a result of these meetings, initiatives, and proposals, OSU researchers have been able to actively engage with state and federal agencies as well as oil and gas industry in Oklahoma, setting the stage for future successes.

Further, to stimulate produced water treatment related research to the point where a highly competitive external proposal can be developed, the OWRC funded two faculty and two student projects in 2019 and selected one faculty and one student project for funding in 2020 (see below).

- Faculty projects funded in 2019:
    - Drs. Seok-Jhin Kim, Dave McIlroy, David Lampert, and Clint Aichele – Rational Design of Solar-Energy-Combined Desalination Systems for Treatment of Produced Water
    - Drs. Pankaj Sarin and Khaled Sallam - Low-cost ceramic membranes for ultra/nanofiltration of produced water
- Student projects funded in 2019:
    - Hossein Atoufi with Dr. Dave Lampert – Four-Step Produced Water Desalination Process with Zeolite and a-Alumina Membranes
    - Babak Shabani with Drs. Javier Vilcaez and Mostafa Elshaheb – Beneficial use of petroleum produced water to convert crude oil to methane gas in depleted oil reservoirs
- Faculty projects selected for funding in 2020:
    - Javier Vilcáez – A new dolomite filtration technology to remove heavy metals and NORM from produced water
- Student projects selected for funding in 2020:
    - Stephen Polkowski with Pankaj Sarin – Design of novel electrocoagulation systems for produced water treatment

Finally, the OWRC has found that good public support for treatment and reuse of produced water. Data from the 2018 statewide survey conducted by the OWRC showed significant support for reusing produced water for industrial purposes (71%) and non-food ag production -i.e. fiber, feed, forage (58%).

Gaps or Areas Needing Investment

a. Facilities and Laboratories
    i. Plans for renovations
        a. Through development of SWOF, we have identified the need for: 1) vacuum pumps, heat exchangers, compressors, and a pool boiling setup for desalination; 2) a liquid chromatograph with tandem mass spectrometers for water analysis; and 3) dedicated space for onboarding, storing, and handling wastewater in order to advance reuse technology development.
    ii. Accomplished renovations or major equipment purchases
        a. None
b. Personnel
    i. Faculty Expertise
        a. The SWOF Team identified the need for expertise in environmental engineering related to contaminants of emerging concern (CECs). CEAT is in the process of hiring this expertise.
    ii. Staff support
        a. Staff support needed is yet to be determined
    iii. Graduate student recruitment
        a. Significant graduate student support will be required to advance this research. Through OWRC grants, at least six students are being partially supported.

Collaborations

a. Associated Research Centers and Institutes (on- and off- campus)
    i. Microbiology
    ii. Chemical Engineering
    iii. Civil and Environmental Engineering
    iv. Physics
    v. Plant and Soil Sciences
    vi. Biosystems and Ag Engineering
    vii. Geology
    viii. Mechanical & Aerospace Engineering
    ix. Ag Economics
b. Current and planned use of OAES stations, facilities or OCES supported facilities
    i. Which stations or facilities
        a. None currently, but the South Central Research Station will be engaged in the future
    ii. FRSU staff support
        a. None currently

c. County and Area Extension Staff
    i. None currently
d. Agencies, NGO's, Commissions, etc.
    i. USGS, ODEQ, OWRB, Bureau of Reclamation, Groundwater Protection Council

Impact Statement

a. Issue
    - Oklahoma's water demands are projected to increase 600,000 acre-feet per year between 2007-2060 (OWRB 2012). Reliable water supplies are needed to provide for these demands while meeting the state's goal of capping freshwater use to 2010 levels. However, freshwater supplies are declining due to reservoir sedimentation and groundwater overdraft, and increasingly vulnerable to weather variability. Concurrently, volumes of oil and gas 'produced water,' municipal wastewater, and stormwater are increasing with continued oil and gas development and urbanization. Further, disposal of produced waters has been correlated to seismicity, potentially impacting infrastructure and resulting in energy production curtailment in some regions. The challenge is finding a mix of solutions that allow Oklahoma's diverse array of marginal quality waters be economically treated for beneficial use to address water scarcity, waste disposal, and infrastructure risk, while supporting continued energy production and economic growth.
b. Response/Action
    - The quality of Oklahoma's marginal quality waters can be improved by developing and deploying a chemical, biotechnological, hydrological, engineering, and sociological principles, with a focus on expanding opportunities for marginal quality water reuse. Reuse of marginal quality waters (including produced water, stormwater, and municipal wastewater) has the potential to provide substantial quantities of water for the industrial, energy, agricultural, and municipal sectors, making communities and economies more resilient to increasing weather variability.
    - Through discovery and advancement of innovative treatment technologies, we are working to find solutions to the complex competing interests and social, scientific, engineering, and economic issues restricting greater marginal quality water use.
c. Results/Output
    - We are in the early stages of this research program. We have found significant support for this research from the public (see 2018 statewide survey results), state agencies, the oil and gas industry, and Oklahoma's Congressional delegation. However, securing needed funding to support this program has proven to be extremely challenging.
d. Public Value Statement
    - When you support research and development of economical wastewater treatment technologies, participants (i.e. municipalities and industries) will be more inclined to adopt these technologies, which leads to reduced reliance on freshwater sources and disposal of wastewaters, and will benefit Oklahoma by providing greater water security for the state, its citizens, and its industries.

Harmful Algal Bloom Detection and Response

Successes over the last year

A strong collaboration has been established to support research efforts to improve our understanding of the formation and early warning indicators, as well as the management of cyanobacterial Harmful Algal Blooms (cHABs) in the Southern Great Plains. The partnership includes the Oklahoma Water Resources Center, various departments on campus, the Grand River Dam Authority (GRDA), Oklahoma Water Resources Board (OWRB), Oklahoma Conservation Commission, the City of Stillwater, the Kansas Department of Health and the Environment (KDHE), and the University of Kansas Field Station.

OSU's capacity for conducting research on cHABs has been significantly enhanced through the development of optical predictive models for HABs in the Grand Lake watershed, routine water quality monitoring in Lake McMurtry, developing an alarm index for HABs in small inland water bodies, and plans to install a pilot aeration diffuser system to impede growth of cHABs in Lake McMurtry.

This collaboration and increased capacity has brought us close to establishing a cHABs mitigation research group in the Southern Great Plains, and enhanced submission of grant proposals to USGS, OSU-HIBAR, and the City of Stillwater. The City of Stillwater has verbally agreed to provide support for limnological studies and installation of a pilot aeration diffuser system in Lake McMurtry.

Gaps or Areas Needing Investment

a. Facilities and Laboratories
    i. Plans for renovations
        1. None
    ii. Accomplished renovations or major equipment purchases
        1. YSI Multi parameter probe: basic chemical and physicochemical parameters and total algae
b. Personnel (Campus, Area, and County)
    i. Faculty Expertise (including appointment split)
        1. None
    ii. Staff support (including appointment split)
        1. None
    iii. Graduate student recruitment
        1. Students to support water quality sampling

Collaborations

a. Associated Research Centers and Institutes
    i. Environmental Science Graduate Program
    ii. Biosystems and Agricultural Engineering
    iii. Water Resources Center
    iv. Integrative Biology
    v. Geography
    vi. Mechanical and Aerospace Engineering
    vii. Civil and Environmental Engineering
b. Current and planned use of OAES stations, facilities or OCES supported facilities

i. Which stations or facilities
    1. None
ii. FRSU staff support
    1. None

c. County and Area Extension Staff
    i. None
d. Agencies, NGO's, Commissions, etc.
    i. Grand River Dam Authority
    ii. The City of Stillwater
    iii. Oklahoma Water Resources Board
    iv. Oklahoma Conservation Commission
    v. The Kansas Department of Health and the Environment
    vi. The University of Kansas Field Station

Impact Statement

a. Issue
    - Recreation in lakes, which is a major activity in Oklahoma, is threatened by increasingly frequent cHABs events.
    - cHABs have a toxin called Microcystin which poses health risk to people and animals. In addition to recreation, most of the susceptible reservoirs are used as drinking water sources.
b. Response/Action
    - A multi-disciplinary team consisting of faculty and researchers from various OSU departments (Drs. Abu Mansaray, Kevin Wagner, Scott Stoodley, Andy Dzialowski, Hamed Gholizadeh, Dave Lampert, Jamey Jacob, and Ali Mirchi) is working with key partners to develop and test a cHABs alarm index, and develop and test cHABs mitigation strategies.
c. Results/Output
    - The team has learned that, even though a lot is known about cHABs, there are a lot of unknowns regarding the temporal and spatial dynamics of their formation and growth. Furthermore, efforts have resulted in tremendous support for development of an early warning system as well as cHABs management strategies.
d. Public Value Statement
    - When you support development of early warning systems and mitigation strategies for cHABs, drinking and recreational waters will be sustained, better managed, rendered safe for human and animal consumption, and will benefit counties throughout Oklahoma.

Attachment B - Publications Report

Publications

Documentation

a) Eck, C.J., **K. Wagner**, B. Chapagain, O. Joshi. 2019. A Survey of Perceptions and Attitudes about Water Issues in Oklahoma: A Comparative Study. *J. Contemporary Water Research and Education 168:66-77; doi: 10.1111/j.1936-704X.2019.03321.x.*

b) Dewald, S.S., T. P. Murphrey, H.R. Leggette, T.A. Berthold and **K. Wagner**. 2019. Landowner adoption of water quality best management practices: motivations and barriers. *Journal of Extension 57(5): 5RIB4.*

c) Gregory, L., D. Harmel, R. Karthikeyan, **K. Wagner**, T. Gentry, J. Aitkenhead-Peterson. 2019. Elucidating the Effects of Land Cover and Usage on Background *E. coli* Sources in Edge-of-Field Runoff. *Journal of Environmental Quality 48:1800-1808 doi:10.2134/jeq2019.02.0051*

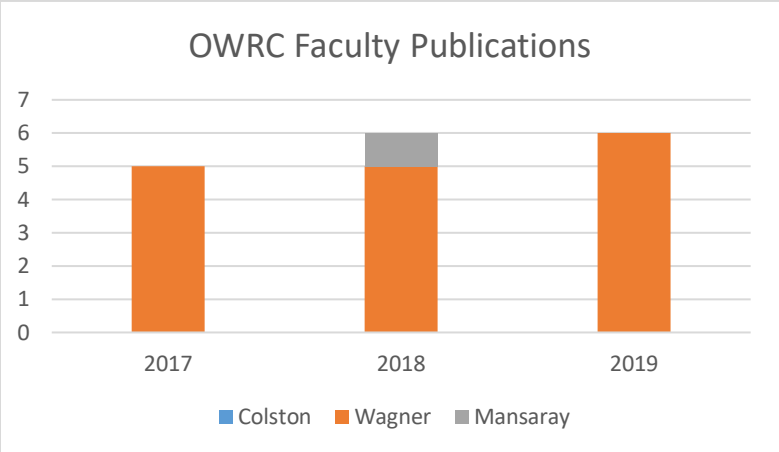
d) Gregory, L., A. Gitter, S. Muela, **K. Wagner**. 2019. Should Contact Recreation Water Quality Standards be Consistent Across Hydrological Extremes? *J. Contemporary Water Research and Education 166(1):12-23. https://doi.org/10.1111/j.1936-704X.2019.03298.x*

e) Gholson, D.M., D.E. Boellstorff, S.R. Cummings, **K.L. Wagner**, M.C. Dozier. 2019. A Survey of Public Perceptions and Attitudes about Water Availability Following Exceptional Drought in Texas. *J. Contemporary Water Research and Education 166(1):1-11.* https://doi.org/10.1111/j.1936-704X.2019.03297.x

f) Jeong, J., **K. Wagner**, J. Flores, T. Cawthon, Y. Her, H. Yen, J. Osorio. 2019. Linking watershed modeling and bacterial source tracking to better assess *E. coli* sources. *Science of the Total Environment 648:164-175.*

Trajectory over the years

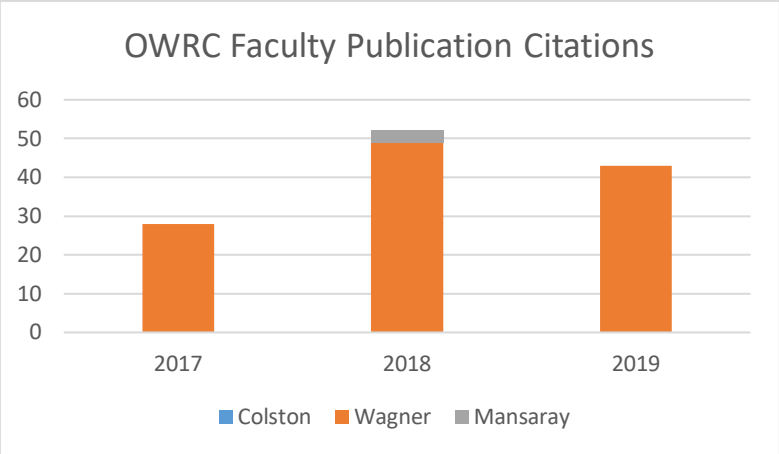
The Water Center's publication rate has remained relatively steady over the last 3 years at 5-6 publications per year. With the addition of Dr. Nicole Colston to the team, we expect publication numbers to increase to 12 in 2020.



Publications per FTE = 3

Qualitative assessment of the impact of the publications

Four of the publications in 2019 were published in journals with low impact factors (*J. Contemporary Water Research and Education* and *Journal of Extension*). The *Science of the Total Environment* (5.589) and *Journal of Environmental Quality* (2.405) are high and moderate impact journals, respectively. Based on Google Scholar, OWRC faculty publications average 41 citations annually.



Invited talks

Keynote addresses at international, national and regional professional meetings

- Dr. Abu Mansaray, Keynote Speaker, Education in Developing Countries. Organized by the Education and Development Initiative – Sierra Leone in collaboration with the Department of Social Work, Rutgers University, New Brunswick, NJ.

Plenary presentations at professional meetings

- Dr. Kevin Wagner, Introduction and Moderator for Plenary Session: Innovating Oklahoma Ag Production, 40th Annual Governor's Water Conference, Oklahoma City, OK.
- Dr. Kevin Wagner, Opening Plenary Session Welcome, 2019 Universities Council on Water Resources/National Institutes on Water Resources Conference, Snowbird, UT.
- Dr. Kevin Wagner, Introduction and Moderator for Warren A. Hall Medal Recipient Plenary Session, 2019 Universities Council on Water Resources/National Institutes on Water Resources Conference, Snowbird, UT.

Seminars at other academic institutions

- None

Peer institutions

Peer Water Resources Research Institutes (WRRIs) in the region include:

- Texas Water Resources Institute (TWRI)
- Arkansas Water Resources Center (AWRC)
- Kansas Water Resources Institute (KWRI)

Status of steps taken in 2019 to increase standing.

i) Worked to build "brand recognition" of the OWRC

- Secured strategic hires to support communications and education programs
    a. Hired a Communications Specialist jointly with BAE to enhance outreach

    b. Hired an Assistant Research Professor jointly with NREM to enhance water/climate education
- Launched use of Instagram to expand reach of the OWRC
- Worked to serve as a resource for State water agencies/initiatives, industry, and agricultural organizations
    a. Continued working with the Oklahoma Panhandle Agriculture and Irrigation Association, Oklahoma Farm Bureau, Oklahoma Department of Agriculture, Food, and Forestry, Oklahoma Conservation Commission, Oklahoma Water Resources Board, and USDA-Natural Resources Conservation Service to better support irrigators' efforts to **improve water use efficiency** through education, incentives, and technical and financial assistance
    b. Continued working with the Oklahoma Water Resources Board, Oklahoma Department of Environmental Quality, Groundwater Protection Council, and the oil and gas industry to **address produced water issues** in Oklahoma
    c. Working with the Oklahoma Conservation Commission to facilitate development of the Oklahoma - Hydrologic and Water Quality System (HAWQS) model to **expedite water quality modeling** and support watershed planning efforts
    d. Working with the City of Stillwater to understand and manage the repeated cases of **Harmful Algal Blooms** in reservoirs under their jurisdiction.
    e. Working with the Chickasaw Nation's Department of Environmental Services to **develop and implement watershed-based plans**
- Increased outreach, networking, and involvement in state, regional, and national water organizations and efforts
    a. Delivered 11 presentations to >300 attendees of on-campus seminars and state/regional/national conferences. Presentations focused on Oklahoman's perceptions on water resource issues, improving irrigation efficiency, sources of and practices to address bacteria water quality issues, monitoring harmful algal blooms, and development of decision support tools.
    b. Participated in Hatch Multi-state Research Project S1063 - Quantification of BMP effectiveness for water quality protection at the watershed scale
    c. Participated in Hatch Multi-state Research Project S1074 - Future Challenges in Animal Production Systems: Seeking Solutions through Focused Facilitation
    d. Served on the Oklahoma Clean Lakes and Watersheds Association Board
    e. Served on Southern Region Water Conference Planning Committee
    f. Served as President of the Universities Council on Water Resources (UCOWR)
    g. Served as Technical Program Chair for the 2019 UCOWR Conference
    h. Served on the National Integrated Drought Information System (NIDIS) Executive Council and helped plan the 2019 National Drought Forum
    i. Served on the Agricultural Science Committee of the U.S. Environmental Protection Agency's Science Advisory Board
    j. Became an Affiliate of the South Central Climate Adaptation Science Center

k. Served as Associate Editor – Water Quality and Watershed Management for the *Journal of Contemporary Water Research & Education*.
l. Served on the Board of the National Institutes for Water Resources.

ii) Continued collaborating with WRRIs in the region
- Helping plan the 2020 Ogallala Summit
- Continued serving on the Leadership Team for the Ogallala Water CAP
- Worked with NE, KS and CO Water Resources Institutes to develop a Sustainable Ag Systems proposal for submission to USDA-NIFA

iii) Fostered soft-funded research and worked to expand grant support for OSU faculty
- The Water Center's 2019 goal was to facilitate, participate in, lead or support >12 funding applications. We exceeded our goal, participating in 21 funding applications. To date 2 have been funded, 5 are pending, and 14 have been rejected (10% success).

Additional steps planned in 2020:

- Strategically expand OWRC's staff through hire of a part-time Program Specialist to provide administrative support, event planning, and assistance with communications, coordination of grant development, and project management
- Revamp and consistently brand OWRC's website, newsletter, and social media and expand audiences for media products by 10% in 2020
- Expand OWRC's public outreach through increased educational opportunities
  - Host an annual Citizen Science Expo for the general public, spotlighting water-related monitoring projects (e.g. Blue Thumb, CoCoRaHS)
  - Expand participation in the Spotty Rain Campaign by connecting OWRC and Peer WRRI resources/scientists/products with rural librarians in Texas and Kansas
- Strategically expand proposal development/involvement particularly those focused on:
  - Improving grazingland management and water quality (NIFA, CIG & SSARE proposals)
  - Supporting OWRB Comprehensive Water Plan efforts particularly as it relates to ag water management and characterizing the Ogallala
  - Supporting Ogallala/S. Plains irrigation related efforts (NIFA, RCPP application, etc.)
  - Leading proposal development to support HABs research (USGS & NASA)
  - Working with Oklahoma Cattlemen's Association, Oklahoma Pork Producers, Oklahoma Farm Bureau, Oklahoma Conservation Commission, Oklahoma Department on Environmental Quality, and USDA to conduct bacterial source tracking to better identify wildlife, human, and domestic animal sources of *E. coli*
  - Working with OCC, Bureau of Reclamation, Chickasaw Nation, and others to grow watershed planning efforts in Oklahoma
  - Expand opportunities for undergraduate and graduate experiences in water education and research, including efforts to increase participation by Native American students
  - Support youth-focused and community science programs for formal and informal settings that broaden public engagement in water and environmental monitoring

- Support/facilitate development and implementation of a Master Irrigator Program for OK and the Ogallala region working with producer groups and agencies in Oklahoma as well as Water Centers throughout the Ogallala region and beyond.
- Increase engagement with local groups and agencies, particularly Native American Tribes, Grand River Dam Authority, Lugert-Altus Irrigation District, Oklahoma Department of Environmental Quality, U.S. Bureau of Reclamation and other members of the Water Research Advisory Board

Attachment C

Honors and Awards
January 2019 through December 2019

U=University
R= Regional
N=National
I=International

Department Name: **Oklahoma Water Resources Center**

Lastname	Firstname	Honor / Award Received	Award Type (U, R, N, I)
NA			