



Oklahoma Water Resources Center

CY2018 Review

Summary of 2018 Accomplishments

- Completed the final 2016-2018 Berry Fellows project
- Awarded 3 faculty and 3 student research projects funding via USGS 104b and VPR support
- Hired Dr. Abu Mansaray as OWRC's Research Specialist
- Elevated OWRC's visibility through:
 - Hosting, sponsoring, and/or serving on planning committees for 4 water conferences
 - Distribution of water research and Extension information via social media (1503 followers/subscribers), OWRC's **redesigned** website (9,541 visitors), and three newsletters (~900 subscribers)
 - Delivering over 18 presentations to >600 attendees of university seminars, state/regional/national water conferences, water professional trainings, ag groups, and others
 - Serving as a President-elect of the Universities Council on Water Resources, board member of the Oklahoma Clean Lakes and Watersheds Association, and as the Great Plains representative on the National Institutes on Water Resources board of directors
- Facilitated the organization of the OSU Produced Water Research Program
- Initiate development of a watershed plan for the Lake Hudson watershed
- Facilitated, participated, led or supported 11 funding applications, including leading development of a multi-institutional, multi-disciplinary USDA-NIFA Sustainable Ag Systems proposal
- Worked with the VPR's Office and Biobased Products and Energy Center to initiate efforts to reinvigorate the Water-Energy-Food Systems program
- Served on 3 PhD student committees
- Assessed irrigation status and trends in Oklahoma and delivered findings via the *Ogallala Aquifer Summit White Paper – Oklahoma, Oklahoma Master Irrigator Program* white paper, and numerous presentations
- Administered a statewide survey of public perceptions, attitudes, and learning preferences on water issues in Oklahoma
- Published 6 peer reviewed publications

1. Major Unit Goals & Objectives (2018)

Goal 1 – Properly administer Water Center resources

Objective 1.1 – Provide administration and oversight of Berry Professorship funds

- Submitted Professorship Report on July 25, 2018
- Met with Malinda and Dick Fischer on August 20, 2018 to discuss efforts supported by Berry Professorship. Dr. Ochsner attended meeting to discuss results of Berry Fellows project.
- The final 2016-2018 Berry Fellows project was completed in September 2018 and final report posted on the OWRC webpage
 - Dr. Tyson Ochsner, Professor of Applied Soil Physics and Sarkeys Distinguished Professor in the Department of Plant and Soil Sciences – *Developing seasonal streamflow forecasts to inform surface water management*
- Administered a statewide survey of public perception, attitudes, and learning preferences on water issues in Oklahoma and initiated analyses of data

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

- Finalized 2018 USGS 104(b) grant application
- Issued Project Year 2019 104(b) RFP
 - Received 15 faculty and 3 student preproposals (down from 23 faculty and 19 student in 2017)
- Facilitated 2 Water Research Advisory Board Meetings to discuss priorities and select faculty and student projects for Project Year 2019 funding
 - Summer 2018 meeting: 6 faculty and 3 student pre-proposals were selected for full proposal development for 104(b) and VPR Produced Water Research Funding
 - Winter 2018 meeting: 3 faculty and 3 student projects selected for funding
 - 2 Faculty Projects selected for 104(b) funding:
 - Drs. Seok-Jhin Kim, Dave McIlroy, David Lampert, and Clint Aichele (OSU) – Rational Design of Solar-Energy-Combined Desalination Systems for Treatment of Produced Water
 - Drs. Jad Ziolkowska and Reuben Reyes (OU) – Understanding Economic Impacts of Groundwater and Soil Moisture Interactions in Oklahoma – A Decision-Support Tool for Sustainable Water Management
 - 1 Faculty Project selected for VPR Produced Water Research funding:
 - Drs. Pankaj Sarin and Khaled Sallam (OSU) - Low-cost ceramic membranes for ultra/nanofiltration of produced water
 - 2 Student Projects selected for 104(b) funding:
 - Chris Reid with Dr. Charles Fontanier (OSU) – Effects of deficit irrigation on water use of warm season turfgrasses under fairway maintenance

- Hossein Atoufi with Dr. Dave Lampert (OSU) – Four-Step Produced Water Desalination Process with Zeolite and a-Alumina Membranes
- 1 Student Projects selected for VPR Produced Water Research funding:
 - Babak Shabani with Drs. Javier Vilcaez and Mostafa Elshaheb (OSU) – *Beneficial use of petroleum produced water to convert crude oil to methane gas in depleted oil reservoirs*
- Facilitated submission of 9 pre-proposals and 2 full proposals for USGS 104(g) funding
- Submitted required annual report and 5-year evaluation covering 2011-2015 activities

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

- Hired Dr. Abu Mansaray as OWRC’s Research Specialist in March 2018
- Hired Brittany Davis and Dhruva Sinha as student workers to assist with OWRC communication as well as the statewide survey of the public’s perceptions on water

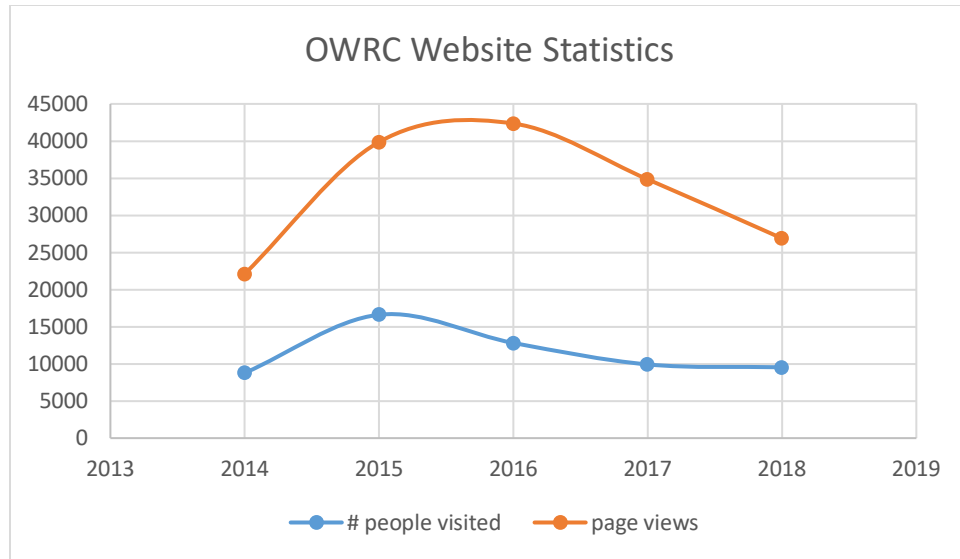
Objective 1.4 – Oversee OWRC budgets and proper expenditure of center funds

- Oversee OWRC’s 14 accounts (see Section 8 for more 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

- Generated Water Center faculty booklet for Center staff and Extension offices
- OWRC utilized three social media platforms, Facebook, Twitter, and YouTube, to distribute relevant and timely information on OSU water research, activities, and events:
 - 343 Facebook followers
 - 658 Twitter followers
 - 402 YouTube subscribers
- Added approximately 250 Oklahoma and regional water agency personnel to the Water Center’s listserv used to distribute OWRC newsletters
- OWRC used 3 newsletters to disseminate relevant and timely information on water research, activities, and events:
 - 1 *AQUA*homan was sent to ~900 external subscribers and ~80 Water Center faculty
 - *Currents* sent bimonthly to ~900 external subscribers and ~80 Water Center faculty (6 total)
 - *News & Notices* e-mails sent approximately biweekly to ~80 OSU Water faculty on off months when other newsletters were not distributed (17 total)
- According to Google Analytics, 9,541 people visited the OWRC website in 2018 and there were 12,756 total visits and 26,896 page views (see figure below), all less than the previous 2-3 years.



- Redesigned and reorganized Water Center website
- Served on DASNR’s Communication Council
- Served on the Oklahoma Water Resources Board’s Water for 2060 Committee and Brackish Water Group as well as the Oklahoma Clean Lakes and Watersheds Association’s Board of Directors
- Delivered presentations on Oklahoma water issues, research needs, and opportunities at 8 in-state events to >250 attendees of the Governor’s Water Conference, OK Panhandle Ag and Irrigation Association Annual meeting, departmental seminars, OSU student organizations, and other meetings.
- Continued developing and expanding OWRC’s network both within the university and with critical partners across Oklahoma (including Noble Foundation, OPAIA, Groundwater Protection Council, South Central Climate Science Center, Oklahoma Water Survey, Oka Institute, OU WaTER Center, USDA-ARS El Reno, USDA-FSA, USDA-NRCS, GRDA, OSU-Tulsa, National Research Consortium, OWRB, industry, and others)
- Collaborated with Dr. Taghvaeian to produce the *Ogallala Aquifer Summit White Paper – Oklahoma*
- Updated Oklahoma’s Congressional delegation on OWRC activities in February 2018
- Co-hosted and helped plan the 2018 Oklahoma Governor’s Water Conference and Research Symposium
- Sponsored the 2018 Irrigation Conference and 2018 Oklahoma Clean Lakes and Watersheds Association Conference

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
 - Worked with states overlying the Ogallala Aquifer to organize the *2018 Ogallala Aquifer Summit*
 - Providing leadership for developing a regional Master Irrigator program

- Worked with Great Plains States to organize the *National Institutes for Water Resources Regional Symposium – Water Resources of the US Great Plains Region: Status and Future*
- Submitted a Sustainable Ag Systems proposal to USDA-NIFA in collaboration with the Texas and Kansas Water Resources Institutes
- Participated in the Arkansas Water Conference hosted by the Arkansas Water Resources Center
- Assisted with the Fundamentals of Developing a Water Quality Monitoring Plan Training hosted by the Texas Water Resources Institute in Austin, TX

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

- Served a board member for the National Institutes on Water Resources representing the Great Plains Region
- Served as President-Elect of the Universities Council on Water Resources
- Delivered presentations at national meetings including the 2018 UCOWR/NWR Annual Conference in Pittsburgh, the AWRA Summer Conference on Transboundary Groundwater in Ft. Worth, and the Ecological Society of America
- Participated in Multi-State Research Project Annual Meetings:
 - 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 – Develop an idea bank of projects/proposal ideas

- Dr. Mansaray developed an initial listing of project proposal ideas in July 2018.
- No updates or development of white papers has been accomplished as planned.
- Instead, focus has been on developing proposal ideas via development of letters or statements of intent, pre-proposals, and proposals.

Objective 3.2 – Organize thematic programs addressing a minimum of 1-2 key water issues in Oklahoma including:

- Produced Water Research Program
 - Facilitated the organization of the OSU Produced Water Research Program which was kicked off during OSU’s Research Week in 2018 and continued developing via quarterly meetings throughout 2018. Multiple produced water proposal applications and contact with industry have resulted.
- Water Quality Assessment and Restoration
 - Worked with the OSU Environmental Science Graduate Program, Oklahoma Conservation Commission, and Grand River Dam Authority to initiate development of a watershed plan for the Lake Hudson watershed.
 - Worked with the OSU Environmental Science Graduate Program and Integrated Biology on developing proposals to expand HABS research.

- Sustainable Ag Systems
 - Led development of a USDA-NIFA Sustainable Ag Systems proposal focused on improving grazing management with technology.
 - 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
 - See below.
- Urban Water Conservation and Management
 - Initiative not pursued in 2018

Objective 3.3 – Facilitate acquisition and management of external funding

- Our 2018 goal was to facilitate, participate, lead or support >12 funding applications. We just missed our target with 11 funding applications submitted.

Objective 3.4 – Assist the OSU Vice President for Research and serve as an integral part of the Food-Energy-Water Nexus and Produced Water Councils

- Worked with the VPR's Office and Biobased Products and Energy Center to initiate efforts to reinvigorate the Water-Energy-Food Systems program at OSU. A university-wide survey was developed and distributed to gather information on faculty interest and expertise in this arena.
- Although not engaged with the OSU VPR Produced Water Council, OWRC worked closely with the VPR office to facilitate the organization of the OSU Produced Water Research Program (see above)

Goal 4 – Guide and conduct water resources research

Objective 4.1 - Support student research

- Provided grants for 2 graduate student projects via USGS 104(b) and supported 1 PhD student via Berry Professorship
- Served on 3 PhD student committees
 - Abu Mansaray, OSU Environmental Science Graduate Program
 - Sheyda Nazari Chamaki, OSU Environmental Science Graduate Program
 - Galen Roberts, Texas A&M Soil and Crop Sciences Department

Objective 4.2 – Evaluate water use in Oklahoma

- Assessed irrigation status and trends in Oklahoma and delivered findings via the *Ogallala Aquifer Summit White Paper – Oklahoma, Oklahoma Master Irrigator Program* white paper, and presentations to the OPAIA, departmental seminars, OSU student organizations, and state/regional/national conferences

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

- Administered a statewide survey of public perceptions, attitudes, and learning preferences on water issues in Oklahoma
 - Wrapped up collection on October 31
 - 416 responses received (target responses = 398)
 - Initiated analyses of data
 - Presented preliminary findings at the Oklahoma Governor’s Water Conference and Research Symposium
- Administered a survey of OSU students’ perceptions, attitudes, and learning preferences on water issues
 - Received 50 surveys from OSU students (target responses = 100)
- Administered a survey of Oklahoma water professionals’ perceptions, attitudes, and learning preferences on water issues
 - Received 60 surveys at Gov. Water Conference (target responses = 100)

Objective 4.4 – Initiate assessment of best management practice effectiveness

- Was not able to initiate edge-of-field monitoring of water quantity and quality in conjunction with NREM range research on brush control, switchgrass, and grazing in 2018 due to costs. Alternatives are being evaluated to allow initiation in 2019.

2. Major Unit Goals & Objectives (2019)

Goal 1 – Properly administer Water Center resources

Objective 1.1 – Provide administration and oversight of Berry Professorship funds

- Complete evaluation of statewide survey of public perceptions, attitudes, and learning preferences on water issues in Oklahoma and publish results
- As funds allow, support initiation of best management practice effectiveness assessment employing edge-of-field monitoring of water quantity and quality

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

- Finalize 2019 USGS 104(b) grant application
- Issue Project Year 2020 104(b) RFP
- Facilitate 2 Water Research Advisory Board Meetings to select faculty and student projects
- Facilitate 104(g) submission process
- Submit required 2018 annual report

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

- Develop Research Specialist's skills in writing grants, reports, and manuscripts, and developing budgets
- Hire student positions (as needed)

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

- Oversee OWRC's 14 accounts (see Section 8 for more details)
- Develop and implement a plan for most effectively expending funds, including remaining startup funds, to achieve 2019 goals and increase OWRC's impact

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

- Release timely information on water resource issues via routine e-newsletters, enhanced web and social media presence, and other media
 - Phase out *AQUAhoman* newsletter
 - Transition *Currents* to online format and expand content
 - Collaborate with DASNR to fit the Water Center's site into DASNR's new structure
- Expand audience for newsletter, social media, and other media outlets
- Expand participation in priority water/natural resource agency workgroups, Oklahoma water conferences (e.g. Oklahoma Rural Water Association), and other related Oklahoma associations
- Increase delivery of presentations in Oklahoma on the Water Center, ongoing water research at OSU, and critical water issues in the State and region
- Co-host Governor's Water Conference and Research Symposium

- Sponsor Oklahoma Irrigation Conference, OCLWA, and other relevant water resource conferences in Oklahoma
- Continue developing and expanding OWRC’s network both within the university and with critical partners across Oklahoma (including tribes, agricultural organizations, irrigation districts, municipalities, other universities, agencies, foundations, etc.)
 - Re-engage with key OSU department heads and water faculty
 - Initiate relationships with Lugert-Altus Irrigation District, Farm Bureau, and tribes and enhance relationships with ODEQ, OCC, GRDA, South Central Climate Science Center, cities of Tulsa and Oklahoma City, and members of the Water Research Advisory Board
- Collaborate with OSU water faculty to produce relevant and timely research and Extension publications and products

Objective 2.2 – 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 states overlying the Ogallala Aquifer 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.

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

- Serve a board member of the National Institutes on Water Resources and President-Elect and President of the Universities Council on Water Resources
- Serve on the Ag Science Committee of EPA’s Science Advisory Board
- Deliver research presentations at national meetings
- Participate in 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
- Watershed Planning
- Harmful Algal Bloom Detection and Response
- Sustainable Ag Systems
 - Master Irrigator
 - Grazing Technology

- Water-Energy-Food Systems
- Water Technology
- Others as opportunities arise (climate change, drought management, etc.)

Objective 3.2 – Facilitate acquisition and management of external funding

- 2019 goal is to facilitate, participate, lead or support >12 funding applications (see Section 7 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

- Facilitate successful development of INFEWS proposal for submission to NSF
- Continue facilitating and developing OSU Produced Water Research Program

Goal 4 – Guide and conduct water resources research

Objective 4.1 - Support student research

- Provide grants for a minimum of 2 students via USGS 104(b) and other grants
- Serve on a minimum of 3 student committees

Objective 4.2 – Evaluate water use in Oklahoma

- Continue to assess irrigation status and trends in Oklahoma incorporating latest Census of Ag data
 - Develop relevant fact sheets based on analysis
 - Identify critical research and Extension needs for future efforts
 - Present results of assessment to relevant groups

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

- Complete surveys of OSU students’ and Oklahoma water professionals’ perceptions, attitudes, and learning preferences on water issues in Oklahoma
- Submit >3 manuscripts for journal publication
- Convey 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

- Work to initiate edge-of-field monitoring of water quantity and quality related to various land management practices

3. 2017 Impacts in Extension & Research

Unit: Unit: Oklahoma Water Resources Center, Plant and Soil Sciences, Biosystems and Agricultural Engineering

Faculty Name: Kevin Wagner, Jason Warren, Saleh Taghvaeian

Title: Improving Oklahoma's Irrigation Efficiency

Relevance:

Crop irrigation is the number one water user in Oklahoma accounting for 41% of water use in Oklahoma. With over 500,000 acres irrigated in the state, Oklahoma is currently ranked 23rd in the U.S. in irrigated acres. However, crop irrigation water demand is increasing (based on the State Water Plan).

Meeting current and future irrigation water demands will be challenging. Approximately 50% of the State's irrigation is supported by the Ogallala Aquifer which is declining. Furthermore, Oklahoma has established a statewide goal of consuming no more fresh water in 2060 than was consumed in 2010 (termed Water for 2060). Irrigation water conservation is a key component of Oklahoma's plan for achieving this goal.

Over the last 40 years, adoption of center pivots in the State has gone from 20% to over 90% of irrigated acres supplied by pivots providing significant improvements in application efficiency (~18% increase in efficiency) over furrow irrigation. However, the majority of these center pivots are estimated to be MESA systems (Mid-Elevation Spray Application). Additional savings, equating to 10-20% increases in efficiency, could be realized through conversion of these pivots to LESA (Low Elevation Spray Application), LEPA (low energy precision application), or SDI (subsurface drip irrigation). These equipment conversions can be very costly. Another approach to meeting future irrigation needs is through improved management of existing systems using new technologies such as soil moisture sensors, crop monitoring sensors, irrigation scheduling tools, and other new technologies. Few farmers currently use these tools and technologies. According to the 2012 Census of Agriculture, only 11% of farmers use sensors and 8% use schedulers for managing irrigation applications. Expanded use of these tools and technologies are expected to result in significant increases in water use efficiency, but at a much smaller price tag than that of equipment upgrade or conversion.

Response:

In order to help the State and its producers achieve increased crop water use efficiency, a multi-pronged approach has been taken by a multi-disciplinary team consisting of faculty from Plant and Soil Sciences, Biosystems and Agricultural Engineering, and the Oklahoma Water Resources Center (Drs. Jason Warren, Saleh Taghvaeian, Robert Frazier, Seth Byrd, Kevin Wagner, and others). Key foci to date have been on:

- Soil sensor, water use and economics of crop selection, drip irrigation, and other research
- On-farm irrigation system audits via Mobile Irrigation Lab
- Establishment of "technology farms" on Altus Experiment Station and McCaull Farm

- Increased outreach and engagement:
 - Hosting conferences (Annual Irrigation Conference, Ogallala Summit, etc.)
 - Initiating the creation of a Master Irrigator program
 - Increasing collaboration with Oklahoma Panhandle Agriculture and Irrigators Association (OPAIA); the Lugert-Altus Irrigation District (LAID); Oklahoma Water Resources Board; Oklahoma Department of Agriculture, Food, and Forestry; USDA-NRCS; Oklahoma Conservation Commission, and others

The Water Center's role in this team's effort has predominately been as a supporter/facilitator/advisor/promoter. Contributions of the Water Center in 2018 included:

- Assessment of irrigation status and trends in Oklahoma
- Presenting to Oklahoma Panhandle Ag & Irrigation Association on OSU's ongoing research on ag water sustainability (1/18/18)
- Expanding the discussion of irrigation sustainability regionally/nationally via presentations at the American Water Resources Association Summer Specialty Conference on *The Science, Management and Governance of Transboundary Groundwater*, 2018 Universities Council on Water Resources Annual Water Resources Conference, and Ogallala Summit
- Co-hosting/sponsoring/planning the Ogallala Summit and Irrigation Conference
- Working with Drs. Taghvaeian to develop the *Ogallala Aquifer Summit White Paper – Oklahoma*. <http://ogallalawater.org/ogallala-summit-april-2018-oklahoma-white-paper/>
- Engaging OSU with OWRB's Water for 2060 and other efforts/meetings
- Facilitating meetings between Extension specialists, ag industry organizations, state and federal agencies, and legislators to discuss initiating a Master Irrigator Program in Oklahoma
- Working with Jason Warren and Saleh Taghvaeian to develop a two-pager and 3-year budget for initiating Master Irrigator Program in Oklahoma
- Providing regional leadership for Master Irrigator Program establishment efforts
- Supporting funding initiatives to install drip irrigation at Altus Experiment Station
- Promoted events before and during to encourage attendance and inform our followers of the goings-on during meetings.

Results/Impact:

This program has tremendous potential for impact. According to the 2012 Oklahoma Comprehensive Water Plan, higher-efficiency irrigation systems could save 68,000 acre-feet/year by 2060. Estimates by Dr. Warren suggest that adoption of precision irrigation management could reduce water demand by 76,000 acre-feet/year while increasing gross domestic product approximately \$22.4 million annually.

The research and outreach/engagement is already having an impact. A groundswell of support by ag groups and natural resource agencies for initiation of a Master Irrigator Program and adoption of new technologies by innovator producers is already being observed. As the program matures and expands through delivery of the Master Irrigator Program, OSU evaluators will be engaged to assess behavioral changes and practices adopted and how these are impacting water use and efficiency, yields, and earnings.

4. OCES Report

In 2018, OWRC Extension and outreach activities consisted primarily of meeting one-on-one with key stakeholders, delivering presentations (see below), organizing conferences (see below), developing and distributing newsletters (*News & Notices*, *Currents*, *Aquahoman*), responding to information requests per week, and delivering timely information via the OWRC website, Facebook, and Twitter (see OCES Benchmarks table for additional information).

Presentations Delivered:

Presentation Title	Event
OK Water Resources Ctr - Bridging the gap btwn research & application	OK Panhandle Ag and Irrigation Association
OK Water Resources Ctr - Bridging the gap btwn research & application	OSU Plant & Soil Science Dept.
OK Water Resources Ctr - Bridging the gap btwn research & application	OSU OK-LSAMP
Faculty Panel - Produced Water	OSU Research Week - VPR Panel Discussion
Water Quality & Conservation Research Needs in OK	OSU Soil & Water Conservation Society
Impacts & Implications of Background Bacterial Sources on Water Quality Management Efforts	Oklahoma Clean Lakes and Watershed Association Annual Conference
Satellite Remote Sensing of Algal Blooms in the southcentral USA	Oklahoma Clean Lakes and Watershed Association Annual Conference
Carters & Burton Creek TMDL Monitoring Case Study	Fundamentals of Developing a Water Quality Monitoring Plan Training
Transitions in Agriculture in Oklahoma – Where have we been and where are we going?	2018 NIWR/UCOWR Annual Conference
Transitions in Ag & Water Use Panel Discussion	2018 NIWR/UCOWR Annual Conference
Panel Discussion: Depleting Aquifers & Transition from Irrigated Ag to Sustainable Ag Related Ecosystems	AWRA Summer Conference - Transboundary Groundwater
Irrigation Status & Trends in Oklahoma	Summer 2018 WRAB Meeting
OWRC 2017-2018 Program Update	Summer 2018 WRAB Meeting
Impacts & Implications of Wildlife on Water Quality Management	2018 Arkansas Water Resources Center Annual Water Research Conference
Impacts & Implications of Background Bacterial Sources on Water Quality Management Efforts	Hatch S1063 BMP Effectiveness for Water Quality Protection at the Watershed Scale
OWRC: Current Research Priorities	Great Plains Water Conference
Oklahomans' Perspectives on Water Issues	Oklahoma Governor's Water Conference & Research Symposium

Conferences Organized:

- 2018 Governor's Water Conference
- 2018 Oklahoma Clean Lakes and Watersheds Association Annual Conference
- National Institutes for Water Resources Regional Symposium – Water Resources of the US Great Plains Region: Status and Future
- 2018 Ogallala Summit

Educational Material Developed	Wagner	Elmore	Mansaray	Total
OSU Fact Sheets	0	0	0	0
New	0	0	0	0
Major Revision	0	0	0	0
Minor Update	0	0	0	0
Extension Handbook Chapters	0	0	0	0
New	0	0	0	0
Major Revision	0	0	0	0
Minor Update	0	0	0	0
Other Extension Publications	0	0	0	0
Presentations (including Webinars)				
Presentations at OCES organized meetings	0	0	0	0
Presentations at other in-state meetings	7	0	0	7
Training Provided				
In-service training sessions (internal audience)	0	0	0	0
Certification training sessions (external audience)	0	0	0	0
Other training sessions, workshops, etc.	1	0	0	1
Events Organized				
Workshops, conferences, field days organized	2	1	1	4
Field Demonstrations (sites or locations NOT plotsxreps)	0		0	0
Mass Media				
Newsletter Articles	2	1	1	4
Website Updates	0	1	0	1
Radio or TV presentations	0	0	0	0
Newspaper or magazine articles	0	0	0	0
Professional Activities				
Presentations at out of state Extension meetings	0	0	0	0
Presentations at professional meetings	7	1	2	10

Social Media Use	Wagner	Elmore	Mansaray	Total
# of Professional Media Accts	1	3	3	7
# of followers/fans	1056	1403	931	3,390
# of tweets/posts	13	61	5	79
Impressions	0	36,771	40	36,811
Engagements	0	218	0	218
YouTube Videos	0	1	0	1
Views	0	45	0	45
Podcasts Produced	0	0	0	0
Mobile Applications Developed	0	0	0	0

5. OAES Report – CY2017

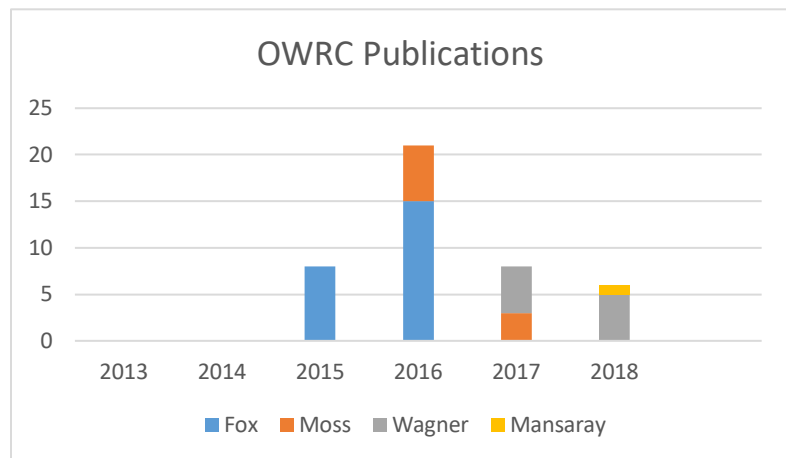
Publications

a) Documentation (compiled citations from annual A&D reports)

- 1) Rafi, K., **K. Wagner**, T.J. Gentry, R. Karthikeyan, A. Dube. 2018. *E. coli* Concentration as a Function of Stream Order and Watershed Size. *Journal of Environmental Quality* 47(5):949-957.
- 2) Gholson, D.M., D.E. Boellstorff, S. Cummings, **K. Wagner** and M. Dozier. 2018. Consumer Water Quality Evaluation of Private and Public Drinking Water Sources. *Journal of Water and Health* 16(3):369-379.
- 3) Dewald, S., H.R. Leggette, T. Pesi Murphrey, T.A. Berthold and **K. Wagner**. 2018. Communicating to landowners in the Texas Little River watershed: A descriptive analysis of their communication preferences for receiving water-related information. *Journal of Agricultural Education* 59(2):343-369.
- 4) Gholson, D.M., D.E. Boellstorff, S.R. Cummings, **K.L. Wagner**, and M.C. Dozier. 2018. Outreach preferences for water resource information from Extension and other sources. *Natural Sciences Education* 47(1):1-7.
- 5) Harmel, R.D.; R. Pampell, T.J. Gentry, D. Smith, C. Hajda, **K. Wagner**, P. Smith, R. Haney, K. Higgs. 2018. Vegetated treatment area (VTAs) efficiencies for *E. coli* and nutrient removal on small-scale swine operations. *International Soil and Water Conservation Research* 6(2018):153-164.
- 6) **Mansaray, A.S.**, Aamodt, J. and Koroma, B.M. (2018) *Water Pollution Laws in Sierra Leone—A Review with Examples from the UK and USA*. *Natural Resources*, 9, 361-388. <https://doi.org/10.4236/nr.2018.911023>

b) Trajectory over the years

The OWRC's publication rate (including both peer-reviewed Extension and journal publications) has ranged from 0 in 2013-2014 to a high in 2016 with Director Fox and Interim Director Moss producing a combined 21 publications. In 2018, the OWRC publication rate (6) was lower than its 5-year average (7 publications/year).



c) Qualitative assessment of the impact of the publications (journal reputation, impact or citations)

The overall impact of these publications to date would be rated low. Two of the journals do not have an impact factor (*Journal of Agricultural Education* and *Natural Sciences Education*). The manuscript published in the *Journal of Environmental Quality* (Dr. Wagner is the corresponding author) has the highest impact factor (2.405) and has been downloaded 49 times to date.

d) Publications per FTE – 3

Invited talks

- a) Keynote addresses at international, national and regional professional meetings
 - Wagner, K. and C. Eck. 2018. Oklahomans' Perspectives on Water Issues. Oklahoma Governor's Water Conference & Research Symposium. December 6, 2018, Midwest City, OK.
 - Wagner, K. 2018. Oklahoma Water Resources Center: Current Research Priorities. Great Plains Water Conference. October 24-26, 2018, Lincoln, NE.
 - Wagner, K. 2018. Impacts & Implications of Background Bacterial Sources on Water Quality Management Efforts. Hatch S1063 Best Management Practices Effectiveness for Water Quality Protection at the Watershed Scale. September 13, 2018, Purdue, IN.
 - Wagner, K. 2018. Impacts & Implications of Wildlife on Water Quality Management. 2018 Arkansas Water Resources Center Annual Water Research Conference – The Value of Water. July 23, 2018, Fayetteville, AR.
 - Wagner, K. 2018. Groundwater policy and management for Oklahoma, Kansas, and Texas and gaps needing resources – Overview of current major research projects. Panel on “Depleting Aquifers and Transition from Irrigated Agriculture to Sustainable Agriculturally Related Ecosystems.” American Water Resources Association Summer Specialty Conference – The Science, Management and Governance of Transboundary Groundwater. July 10, 2018, Fort Worth, TX.
 - Wagner, K. 2018. Transitions in Agriculture and Water Use Panel Discussion. 2018 UCOWR/NIWR Annual Water Resources Conference. June 27, 2018, Pittsburg, PA.
 - Wagner, K. 2018. Transitions in Agriculture in Oklahoma – Where have we been and where are we going? 2018 UCOWR/NIWR Annual Water Resources Conference. June 26, 2018, Pittsburg, PA.
 - Wagner, K. 2018. Impacts & Implications of Background Bacterial Sources on Water Quality Management Efforts. Oklahoma Clean Lakes and Watershed Association. April 1, 2018, Stillwater, OK.
 - Mansaray, A., Dzialowski, A., Stoodley, S., Storm, D., Wagner, K., & Torbick, N. (2018). Satellite Remote Sensing of Algal Blooms in the southcentral USA: Landsat 8 based algal and turbidity indices in the Grand Lake watershed. Oklahoma Clean Lakes and Watershed Association. April 1, 2018, Stillwater, OK.
- b) Plenary presentations at professional meetings – None in 2018
- c) Seminars at other academic institutions – None in 2018

Peer institutions

- a) 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)

b) Status of steps taken in 2018 to increase standing.

1) Worked to build “brand recognition” of the OWRC

- Worked to serve as a resource for State water agencies/initiatives, industry, and ag organizations particularly the following:
 - a. Oklahoma Panhandle Agriculture and Irrigation Association – Working with OPAIA to better support irrigators’ efforts to improve water use efficiency through education, incentives, and technical and financial assistance
 - b. Oklahoma Water Resources Board – Established excellent working relationships with OWRB supporting *Water for 2060* and produced water efforts
 - c. Oklahoma Department of Agriculture, Food, and Forestry – Established excellent working relationships with ODAFF by working together to improve irrigation efficiency
 - d. Organized OSU’s Produced Water Research Program supporting state and industry efforts to reduce issues with disposal
- Increase outreach and networking, and state/national water organization involvement
 - a. Delivered 18 presentations to >600 attendees of on-campus seminars, ag industry meetings, and state/regional/national conferences. Presentations focused on water resource issues in OK including treating and reusing produced water, improving irrigation efficiency, sources of and practices to address bacteria water quality issues, stream trailers as an Extension tool to inform landowners and youth and the public’s perceptions on water issues.
 - b. Joined two Hatch Multi-state Research Projects
 - S1063 Quantification of best management practice effectiveness for water quality protection at the watershed scale
 - S1074 Future Challenges in Animal Production Systems: Seeking Solutions through Focused Facilitation
 - c. Elected to Oklahoma Clean Lakes and Watersheds Association Board
 - d. Serving on Southern Region Water Conference Planning Committee
 - e. Elected President-Elect of the Universities Council on Water Resources
 - f. Serving as Technical Program Chair for the 2019 Universities Council on Water Resources Conference

2) Increased collaborations with WRRIs in the region

- Helped plan a Regional NIWR Symposium focused on water issues in the Great Plains Region hosted by the Nebraska Water Center
- Helped plan the 2018 Ogallala Summit cohosted by Kansas and Colorado
- Continued serving on the Leadership Team for the Ogallala Water CAP
- Participated in the Arkansas Water Conference hosted by the Arkansas Water Resources Center

- Worked with KS and TX Water Resources Institutes to develop a Sustainable Ag Systems proposal for submission to USDA-NIFA
 - Coordinated a bi-annual meeting with the other three Oklahoma Water Centers/Institutes to enhance coordination/collaboration
- 3) Fostered soft-funded research and worked to expand grant support for OSU faculty
- The Water Center’s 2018 goal was to facilitate, participate in, lead or support >12 funding applications. We fell short, participating in only 11.

c) Additional steps planned in 2019:

- Expanded proposal development/involvement particularly:
 - Supporting EPSCoR proposal development (SWM & Water Reuse)
 - Leading development of a Water Tech HIBAR (SWM & Water Reuse)
 - Initiating Grazing Tech project or resubmitting to NIFA, CIG & SSARE)
 - Leading/supporting an INFEWS proposal (planned focus on reuse of WWTP effluent for ag production)
 - Supporting OWRB Comprehensive Water Plan efforts
 - Supporting Ogallala/S. Plains focused NIFA proposal
 - Leading/supporting an RCPP application to support irrigation efficiency in Ogallala
 - Leading proposal development to support HABs research via USGS & NASA funding
- Support/facilitate development of a Master Irrigator Program for OK and the Ogallala region
- Increase engagement with the South Central Climate Adaptation Science Center, tribes, Grand River Dam Authority, Oklahoma Department of Environmental Quality, Oklahoma Conservation Commission, Lugert-Altus Irrigation District, Oklahoma Farm Bureau and U.S. Environmental Protection Agency

Material supplied by OAES

- a) Patents or PVP– None in 2018
- b) Royalties – None in 2018
- c) F&A distributions and use – \$117.05 F&A recovered, none used to date
- d) Proposals and Awards – 11 funding applications submitted and 3 awarded (\$160,315)
- e) Allocations of M&O and staff block salary over time

Chart	Fund Code	Title	Balance Forward	Maint Allocation
2	150700	Water Center Admin	4,459.90	10,000.00
2	150794	Water Center Block	(9,666.71)	46,866.71
2	450700	Water Center Admin	6,656.16	0.00
3	162714	Water Center		5,000.00
3	162776	Water Center Block	0.00	23,025.00
Grand Total			1,449.35	84,891.71

6. CASNR Report

The OWRC has developed a good working relationship with the Environmental Science Graduate Program over the last year, providing guest lectures, serving on student committees, and funding research. In the coming year, it is the desire of the Water Center to develop a strong linkage with the undergraduate Environmental Science program and work to provide undergraduate research opportunities for students in that program.

7. Grants and Contracts

In 2018, the OWRC facilitated, collaborated on, led or supported 11 funding applications (see table on following page), just 1 short of our goal. **Our goal for 2019 is again to facilitate, collaborate on, lead or support a minimum of 12 funding applications.** We are off to a good start in 2019 with 1 proposal submitted to USDA, 5 pre-proposals in preparation for submission on February 15 for USGS 104g and South Central Climate Science Center funding. In addition to these, the OWRC plans to facilitate, collaborate on, or lead proposals to the following:

- NASA
- NSF-INFEWS
- NSF EPSCoR
- USDA-NIFA (\$10 M)
- USDA-NRCS CIG
- USDA-SSARE (\$300K)

On the proposals submitted to date, cooperating/partner units include:

- High Performance Computing Center
- Civil & Environmental Engineering
- Plant & Soil Science
- Biosystems and Agricultural Engineering
- Environmental Science Graduate Program
- Animal Science
- Mechanical & Aerospace Engineering
- Natural Resource Ecology & Management
- Integrative Biology
- Geography
- Sociology
- Geology
- Materials Science and Engineering, OSU-Tulsa

On the proposals submitted to date, cooperating off-campus organizations & entities include:

- Grand River Dam Authority
- Kansas State University
- Oklahoma Water Resources Board
- Texas A&M AgriLife Research & Extension Service
- USDA-ARS
- West Texas A&M University

Name (List/PD #1 first)	Supporting Agency	Total \$ Amount	Effective & Expiration Dates	Title of Project	Current / Pending
K. Wagner	U.S. Geological Survey	\$92,335 (\$34,182)	3/1/18 - 2/28/19	104B State Water Resources Research Institute Program	Funded
J. Jacob, A. Frazier, P. Jaiswal, G. Kakani, K. Wagner, S. Stoodley, N. Wang, S. Leonardi, V. Iungo, C. Dunn, S. Brewer, J. Bruck, D. Brunson, T. Griffith, B. Jayaraman, D. Lampert, A. Mathews, P. Weckler	National Science Foundation	\$2,125,396 (\$199,952)	7/1/18 – 6/30/23	Collaborative Research: NRT- INFEWS – Increasing Student Expertise in Robotics and Modeling to Solve Food, Energy, and Water Problems in the 21st Century	Rejected
R. Singh, K. Sallam, P. Sarin, K. Wagner	National Science Foundation	TBD		IUCRC Pre-proposal Oklahoma State University: Center for Produced Water Solutions (PROWESS)	Rejected
K. Wagner, S. Stoodley	Oklahoma Conservation Commission	\$52,474	5/1/18 – 8/1/20	Lake Hudson Watershed Based Plan	Funded
K. Wagner, D. Dzialowski, N. Torbick, S. Alian	NASA, Earth Science Division	\$750,000		Utilizing Earth Observation systems to reduce monitoring challenges and risks of exposure to harmful algal blooms (HABs) in inland water bodies in the southcentral United States	Rejected
P. Sarin, J. Khojasteh, K. Sallam	NSF	\$1,759,814 (\$26,315)		CRISP 2.0 Type 2: informed Consumer Aided Design (iCAD) of Long Term Technological Solutions for Produced Water	Rejected
R. Singh, L. Ritchie, T. Halihan, K. Wagner, W. Beaulieu	NSF	\$100,000		Engineering Research Center for Environmentally Sustainable Processes for Oil and Natural Gas Extraction (ERC: E-SPONGE)	Rejected
R. DeOtte, T. Gerik, J. Tracy, B. Guerrero, M. Schipanski, D. Devlin, K. Wagner, B. Golden, B. Auvermann, R. Lacewell	USDA-NIFA	\$10,000,000		Transforming Agriculture in the Water Challenged Great Plains to Build Sustainable, Ro-bust, and Resilient Food and Fiber Production Systems while Strengthening Rural Communities	Rejected
R. Reuter, K. Wagner, L. Goodman	USDA-SSARE	\$285,000		Improving grazing management using virtual fencing technology	Rejected
K. Wagner, R. Reuter, J. Jacob, J. Angerer, J. Long, C. Moffet, D. Anderson, A. Campbell, B.J. Gray, L. Goodman, T. Ochsner, W. Fox, P. Gowda, D. Devlin, T.A. Berthold	USDA-NIFA	\$10,000,000	6/1/19- 5/31/24	Revolutionizing Grazing Systems Management through Technology	Pending
K. Wagner, D. Brunson, M. Krzmarzick	OSU-HIBAR	\$15,000	1/1/19- 7/1/19	Sustainable Water for Oklahoma’s Future - Phase I	Funded

8. General Administration

In CY2018, OWRC staffing consisted of the Director (Dr. Wagner), a Program Coordinator (Leslie Elmore), a Research Specialist (Dr. Mansaray – March through December) and two part-time students which assisted with communications and outreach efforts under the direction of Drs. Wagner and Mrs. Elmore. In 2019, OWRC staffing will remain consistent until grant funding allows expansion.

All OWRC personnel are compliant with safety and Title IX trainings thanks to Vickie Brake, Plant and Soil Sciences Department. Plant and Soil Sciences continues to handle recordkeeping for the OWRC's training and sends us quarterly reminders to ensure we complete our trainings in a timely manner.

An office suite for the OWRC consisting of 5 or more offices allowing Director, 3 staff, and 2-3 students to office together would strengthen teamwork and comradery, and enhance efficiency and output.

Budgets: Leanne Lewis supports the OWRC with budget tracking. DASNR sponsored programs supports the OWRC with budget and grant development. Below is a summary of current OWRC accounts and their status.

Chart	Fund Code	Title	Revenue		Expense		Balance	
			Balance Forward	Maint Allocation	YTD Expenditures	Encumbrances	Balances as of 1/3/19	Balance less Encumbrances
1	151235	OWRC Startup	53,118	0	20,747	12,113	32,371	20,259
2	150700	OWRC Admin	4,460	10,000	3,237	0	11,223	11,223
2	150794	OWRC Block	(9,667)	46,867	19,647	25,530	17,553	(7,976)
2	150795	OWRC Startup	17,500	0	0	0	17,500	17,500
2	450700	OWRC Admin	6,656	0	594	0	6,063	6,063
2	450739	Center - F&A OWRC	0	42	0	0	42	42
2	450797	F&A Recovery	0	75	0	0	75	75
2	454700	2-561210 OWRC Admin	0	0	4,511	1,128	(4,511)	(5,639)
2	541310	Lk Hudson	25,000	0	15,944	11,109	9,056	(2,052)
2	561210	104b Admin	51,821	0	7,526	33,306	44,295	10,989
2	561220	104b Info	57,298	0	11,094	4,620	46,204	41,584
3	162714	OWRC	20,129	5,000	3,831	0	21,298	21,298
3	162776	OWRC Block	0	23,025	11,942	12,923	11,083	(1,841)
4	50425	Berry Prof	55,937	35,416	16,610	7,274	74,743	67,469
Total			282,252	120,425	115,683	108,003	286,995	178,994

Note the negative balances above are being addressed. Those associated with the OWRC Blocks and Admin resulted during the setting up of the OWRC as a stand-alone unit. Additionally, a student was inadvertently placed on the Block grant instead of the Lake Hudson project. Regarding the Lake Hudson project, we are awaiting the addition of \$27,980 from the Oklahoma Conservation Commission and Grand River Dam Authority for Phase 2 of that project. This will eliminate the negative balance there.

Finally, most start-up funds (\$50,000 in field equipment and \$10,000 in travel) remains. To date, only a Hydrolab has been purchased jointly with the Environmental Science Graduate Program (Dr. Stoodley) and Integrated Biology (Dr. Dzialowski). Most travel has been funded using USGS grant funds and OAES/OCES annual allocations. Automated samplers associated with the PaSS and BAE Departments have been made available to the OWRC by corresponding department heads until such time as needed by researchers in those departments. Thus, start-up funds will first be used to get this equipment running and deployed in the field. Remaining equipment funds will be used to purchase additional equipment (GPS collars for cattle, other in-stream monitoring equipment, etc.).

9. Personnel

Unit Administrator Request for Faculty / Staff Positions

Unit Administrator Name: Kevin Wagner
 Department / Unit: Oklahoma Water Resources Center
 Date Prepared: 27-Apr-18

See instruction page for notes about each of the fields requested in this spreadsheet.

A	B	C	D	E	F	G	H	I	J
POSITION TITLE	Likelihood of Grant Funding			Desired Appointment Split %			Estimated Salary	Start-up Funds	Importance Rank Order
	High	Medium	Low	Research	Teaching	Extension			
Proposal Development Specialist		X		75%		25.00%	\$40,000	\$120,000	1

Unit Administrator Request for Faculty / Staff Positions

Unit Administrator Name: Kevin Wagner
Department / Unit: Oklahoma Water Resources Center
Date Prepared: 4/27/2018
Position Title: Proposal Development Specialist

DRAFT Position Description:

Job Summary: Assist faculty members and research staff with the preparation and submission of complex research proposals to federal, state and private sponsors. Review, interpret and research requirements for funding opportunities. Work closely with researchers to coordinate, develop and submit compliant proposal applications, budgets, and other sponsor-required documentation. Adhere to sponsor rules and regulations and university policies and procedures. Develop complex budgets in accordance with federal regulations, sponsor requirements and university policies. Demonstrate effective interpersonal communication, critical thinking and problem solving skills. Manage multiple tasks while adhering to sponsor deadlines. Perform special assignments as requested by the OWRC Director with creating proposal development training materials for water faculty and staff. Continue professional development by attending conferences, courses, classes and/or seminars on research administration-related topics.

Rationale for the position: This position would help the OWRC better facilitate development of large, multi-departmental, multi-institutional proposals and allow the OWRC to support a greater number of proposals. Support will be needed for this position until such time as F&A returns and grant funding are able to fully support it.

Relationship to DASNR Initiative teams or strategic plan: This position would enhance the numbers of proposals supported by the OWRC, the success rate of those proposals, and ultimately the amount of funding for water resources research at OSU.

Relationship to county extension (if applicable): There will likely be opportunities to include county extension in proposals submitted; however, the extent to which county extension personnel can be included is unknown at this time.

Potential sources of grant funding (if a rating of High or Medium is shown on Grid-Ranking sheet): Sources of grant funding for this position would either need to come from F&A or direct inclusion of this position in grant budgets. However, in order to be able to include this position in a grant, we would likely need to rename the position to "Program Coordinator," "Program Manager," or similar title.

10. Honors and Awards

Faculty Honors and Awards January 2018 through December 2018

Department Name: Oklahoma Water Resources Center

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

Lastname	Firstname	Honor / Award Received	Award Type (U, R, N, I)
<hr/> <i>None to report</i>			