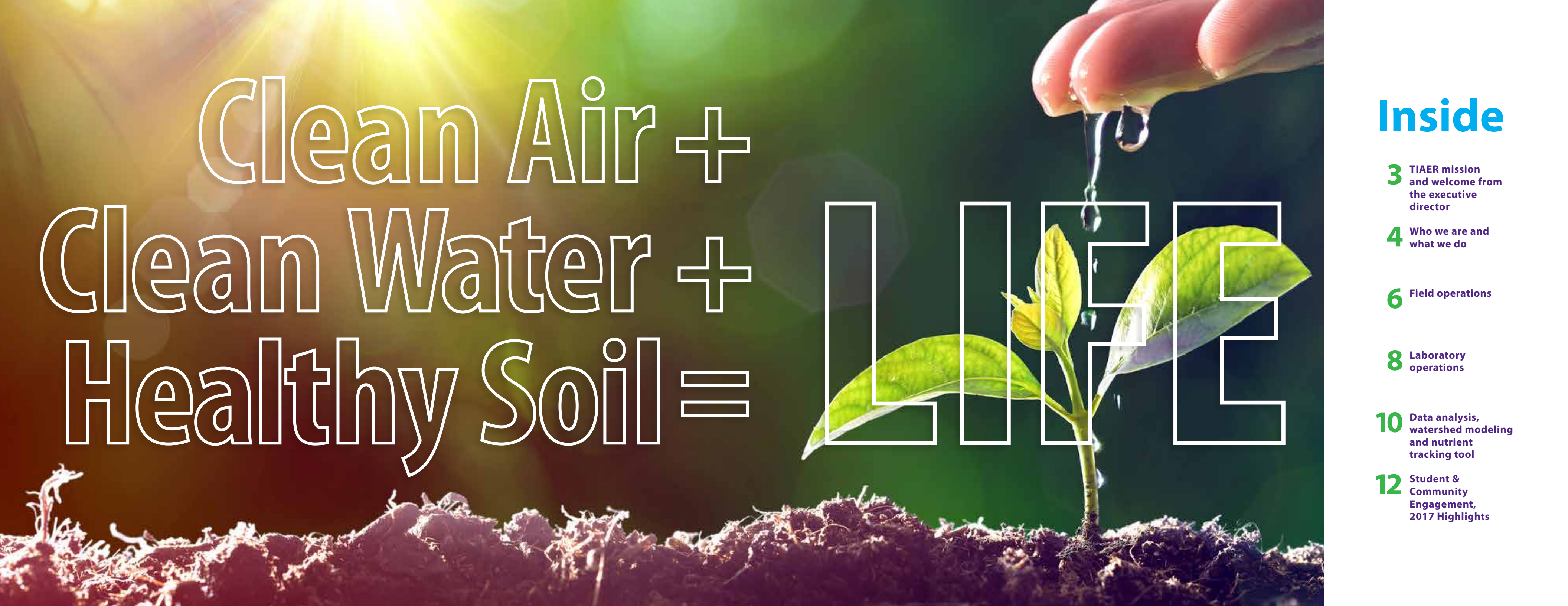




Texas Institute *for*
Applied Environmental
RESEARCH
TARLETON STATE UNIVERSITY

FISCAL YEAR 2017 ANNUAL REPORT





Clean Air +
Clean Water +
Healthy Soil =

LIFE

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TIAER MISSION

The mission of TIAER is to address environmental challenges and affected socioeconomic conditions by:

- 1** Providing science-based data and analysis for elected officials, government agencies, community planners and business leaders;
- 2** Enhancing environmental literacy within the general public; and
- 3** Engaging in the educational goals for Tarleton State University students and faculty.

Welcome from the Executive Director

QUENTON DOKKEN, PH.D.



November 7, 2016 was a career milestone for me, marking my first day of work as Executive Director of the Texas Institute for Applied Environmental Research (TIAER) of Tarleton State University (TSU). I am the fourth to hold this position, following in the footsteps of Ron Jones, Dan Hunter and Dr. Anne McFarland.

Moving to Stephenville from Corpus Christi, I left the flat coastal plains where Gulf waves continuously roll onto seemingly endless beaches and took up residence in the rolling hills of north Texas, covered with cedar and oak trees and cows. To meld into the Tarleton Texan frame of mind, I bought some purple shirts and season tickets to the 2017 football season.

As the newly anointed leader of THE Texas Institute for Applied Environmental Research, I inherited a research program with a long and successful track record of productivity and accomplishment, and a very talented staff of research professionals, technicians and administrators. Since its inception, it has been a no-cost profit center for Tarleton and an asset to the people of Texas. Created by the Texas Legislature in 1991 with line item funding as a “special project,” TIAER has more than repaid the taxpayers of Texas.

In the near and long-term, we are going to:

- 1)** Work with Tarleton and The Texas A&M University System leadership to re-energize support from the Texas Legislature.
- 2)** Continue to build on current TIAER strengths.
- 3)** Recruit more senior level scientists with a diversity of expertise to the TIAER staff.
- 4)** Expand topics of research and the geographical area in which TIAER scientists are active.
- 5)** Integrate TIAER into Tarleton’s academic programming.
- 6)** Implement a public relations and marketing program.

TIAER has been a success since inception, but it has not yet fulfilled its full potential as a purveyor of new knowledge, environmental guidance and education. The sky is the limit, but only if we are willing to put forth energy, resources and creative vision to move TIAER upward and onward. We need everyone to join the TIAER team and contribute to building a golden future.

Jump on board, let’s create something beyond our dreams—Go Purple!



TIAER

Who are we and what do we do?

The Texas Institute for Applied Environmental Research, established by the Texas Legislature in 1991, recognized early that our nation's success in cleaning up water pollution from the initial point sources was not being matched in efforts to curb pollution from runoff or wind—nonpoint sources.

When pollutants wash from the land into our waterways from nonpoint sources the cause often results from land-use decisions; for example, the way fertilizer is applied to cropland or urban lawns, or how people handle waste from pets or livestock. Some land-use decisions only create minor water quality consequences, but more intensive landscape uses and cumulative impacts from an increasing number of sources, even if small individually, can have major water quality impacts.

TIAER has become a national leader in understanding watershed linkages of landscape management to the quality of our waterways. Most of TIAER's early research focused on the North Bosque River—with monitoring now in its 25th year—providing a unique, long-term water quality dataset for evaluating trends with changes in land management.

TIAER currently provides water quality monitoring and modeling support to at least 26 different watersheds in Texas, primarily addressing nutrient, dissolved oxygen or bacteria issues. This work helps support standards review with Recreational Use Attainability Analyses (RUAAAs) and Aquatic Life Use Assessments (ALUAs), and watershed planning in developing Watershed Protection Plans (WPPs) and Total Maximum Daily Loads (TMDLs).

TIAER's work on water quality issues is recognized for its thoroughness and professionalism. TIAER staff have served on state-wide boards dealing with standards development for nutrient and bacteria criteria in Texas and aided instituting a tiered approach to bacteria impairments in the state's recreational waterbodies. Our capabilities allow us to directly monitor and analyze samples as well as model the larger watershed system. We also engage and facilitate local stakeholder groups needed in addressing watershed issues that often involve a broad community, mixing urban and rural areas.

Through the years, TIAER's watershed research efforts have expanded not only throughout Texas but to 35 states and even internationally. One of our current goals is to expand our watershed linkages, as upstream impacts influence water quality in our coastal waters and within the Gulf of Mexico.

TIAER has the capability to provide key research and tools needed to address emerging environmental issues in Texas and across the nation. With a staff comprised of environmental scientists, agricultural economists and individuals with public relations expertise, TIAER is uniquely positioned to engage stakeholders while holistically addressing key environmental concerns.



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Field operation proficiencies include:

- Establishing, maintaining and monitoring remote automated water quality monitoring equipment;
- Collecting, preserving and transporting water quality samples;
- Performing recreational and aquatic life Use Attainability Analyses (UAAs) and habitat assessments;
- Designing, constructing and maintaining experimental field plots;
- Deploying multiprobe sondes and automated samplers;
- Conducting time-of-travel studies;
- Making on site measurements of sediment oxygen demand (SOD), algal productivity, potential growth and nutrient limitation;
- Surveying;
- Measuring velocity and developing stage-discharge relationships;
- Ground-truthing to validate land use/land cover; and
- Maintaining real-time monitoring systems.



Field Operations

TIAER's full-time field operations team is critical to the success of many TIAER projects due to strict adherence to standard operating procedures. The quality assurance and quality control of a sample starts with how it is collected in the field. On call seven days a week, these highly trained individuals perform a wide range of water quality and aquatic ecosystem assessments. Many watershed monitoring samples are time sensitive, requiring initial analysis within hours. When a major rain event occurs, rapid response to remote sampling stations from on call field staff prevents compromised research results.



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The TIAER field operations team also has been key in developing and evaluating field protocols for:

- Storm monitoring, using automated sampling equipment;
- Real-time monitoring instrumentation in streams;
- Continuous water quality monitoring nutrient analyzers for more rapid and real-time analysis;
- Sampling location of routine monitoring from bridges as influenced by nesting birds on bacteria;
- Rapid monitoring of periphyton abundance in relation to water quality conditions associated with development of in-stream nutrient criteria; and
- Monitoring of intermittent/ephemeral streams versus perennial streams, as not all water bodies are the same.

Laboratory Analysis

The TIAER Laboratory is integral to its research. By analyzing samples in house, TIAER can assure that project data are of the highest quality. The TIAER Laboratory is accredited by the National Environmental Laboratory Accreditation Program (NELAP) and has extensive experience in analyzing surface water samples, soils and sediments. A wide range of organic and inorganic constituents have been measured on TIAER projects.

Currently the TIAER Laboratory is equipped to analyze samples for dissolved and suspended nutrients, oxygen demand, solids, chlorophyll and bacteria, as well as physical analyses such as pH and conductivity. TIAER specializes in analyzing for ultra-low levels of nitrates, orthophosphates and total phosphorus. Laboratory personnel are on call seven days a week to respond to sampling events with critical holding times. TIAER's mobile laboratory can be outfitted and deployed to analyze samples on-site, as necessary.

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The TIAER Laboratory through interagency partnerships is involved with:

- Developing site-specific bacteria criteria, using advanced microbiological methods;
- Evaluating bioremediation techniques on crude oil from the Deepwater Horizon Incident;
- Analyzing hydrocarbons related to flooding associated with Hurricane Harvey, and
- Method evaluations involving intra-lab and inter-lab comparison for chlorophyll.

The TIAER Laboratory, while certified for ambient water samples, recently gained certification to test drinking water for coliform contamination and is able to offer that service to the public. Additionally, TIAER recently received a Radioactive Materials License and is seeking accreditations to expand research capabilities in this area.

Data Analysis, Watershed Modeling & the Nutrient Tracking Tool



Once data are collected and analyzed, TIAER is at the forefront in providing needed information for decision makers. Our staff have the geospatial, statistical and modeling tools needed to tease information from complex environmental data.

TIAER currently:

- Assists the Texas Commission on Environmental Quality in developing water quality nutrient criteria for Texas Water Quality Standards;
- Provides geospatial analysis in developing a relational geodatabase of watershed catchments for Texas;
- Works with the National Rivers and Streams Assessment in analyzing statewide probabilistic data for Texas rivers and streams;
- Uses the latest in statistical methods to determine trends and linkages in water quality to load reduction measures in watersheds through Texas and beyond;
- Continues work on water quality standards for intermittent/ephemeral streams, as associated with evolving policy definitions of U.S. waters, and
- Provides technical assistance to the Trinity River Authority in developing modeling systems for long-term water supply planning for the Trinity watershed

Modeling becomes important in working with stakeholder groups, providing information on water quality and economic impacts of management alternatives. The TIAER modeling group focuses on surface water within streams and reservoirs and landscape modeling at the watershed scale.

The Nutrient Tracking Tool

The Nutrient Tracking Tool (NTT) represents an important part of TIAER's modeling program. The NTT is a user-friendly, web-based computer program developed by TIAER in collaboration with the United States Department of Agriculture–Natural Resource Conservation Services (USDA-NRCS).

This state of the art tool is a farm-scale simulator designed to estimate nutrient and sediment losses from fields managed under a variety of cropping patterns and management practices. When needed, the NTT can be linked to a watershed model to estimate watershed loadings.

The NTT, through USDA, is used in Texas, Missouri, Washington, Oregon, Mississippi, Ohio and the Chesapeake Bay. It also is being implemented internationally in Ecuador and Costa Rica through a Spanish language translation. The NTT is being used nationally and internationally for nutrient trading and economic analysis of environmental policy scenarios and optimized crop production.

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The modeling group at TIAER is further developing the NTT:

- As a decision-making tool involved with Life Cycle Analysis (LCA) for beef producers in Texas, Oklahoma and Kansas, evaluating resilience to climate and land use change under a NIFA funded project with Kansas State University, Oklahoma State University, University of Oklahoma, Nobel Foundation and USDA-Agricultural Research Service in El-Reno, OK and Bushland, TX;
- To expand use of NTT within Texas and the U.S., working with NRCS to provide training and to maintain cloud-based access to environmental and economic models and national environmental databases, and
- In working with USDA to provide a national version of NTT for its water quality assessment program.

Thousands of farmers and associated agencies are depending on TIAER to provide internet-based programs, guidelines and tools to improve water quality/quantity nationally, while economically optimizing crop and animal production.

Student & Community Engagement

While TIAER works in many different watersheds, the North Bosque River running through Stephenville provides an outdoor laboratory readily accessible for student engagement and for outreach opportunities with the local community.

TIAER staff teach classes in environmental modeling and watershed management, and provide hands-on experience in field techniques for a variety of other Tarleton classes.

This past summer, TIAER shared expertise in water resources and the aquatic environment with the first cohort through the Prairie Oaks Chapter of the Texas Master Naturalist program – a project that promises to continue expanding student involvement with the community.

TIAER staff aid in developing and conducting Future Farmers of America contests in Texas and nationally, providing support to high school students—tomorrow’s leaders.

Dr. Quenton Dokken, TIAER executive director, serves as the first Chair of the Executive Committee for the new Center for Environmental Studies at Tarleton, expanding TIAER’s interactions with students and faculty in research and academic programs.

2017 Highlights

- TIAER managed **38** contracts involving partnerships with **16** different agencies, generating almost **\$2.8 million**. TIAER spent more than **\$1.85 million** from grant funding, more than double its state funding.
- TIAER submitted **25** proposals, with **14** awarded or in negotiations as of August 2017, representing more than **\$936,000** in new funding.
- TIAER staff provided briefings or presentations to more than **20** groups, and were involved in producing **12** reports or publications for agencies and the public.
- TIAER was involved in research addressing water quality issues in at least **26** watersheds throughout Texas and several outside Texas.

TIAER BY THE NUMBERS

18 Students Supported

TIAER employed 18 students in FY17, enhancing student success through research but also through employment or internships providing real-world experiences in areas of environmental research, marketing, chemistry, programming and information technology.

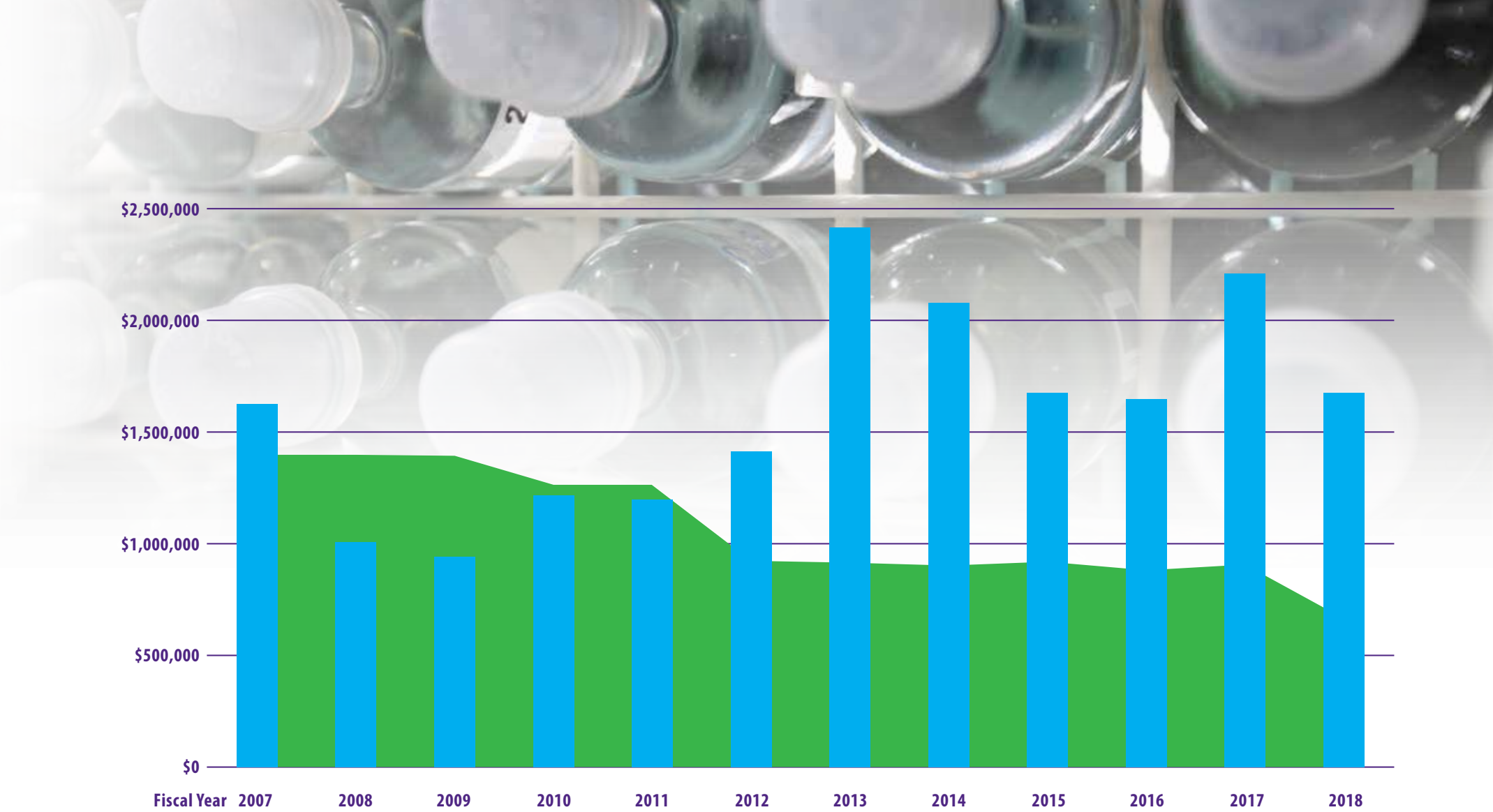
3 Classes Taught

5 Class Demonstrations

20 Presentations Given

12 Publications & Reports

26 Watersheds Influenced



TIAER State & Grant Funding FY2000-2018

FY17 External Grant Funds **\$2,205,671**

State Funding ■
Grant Funding ■

Tarleton, a member of The Texas A&M University System, provides a student-focused, value-driven educational experience marked by academic innovation and exemplary service, and dedicated to transforming students into tomorrow's professional leaders. With campuses in Stephenville, Fort Worth, Waco, Midlothian and online, Tarleton engages with its communities to provide real-world learning experiences and to address societal needs while maintaining its core values of tradition, integrity, civility, leadership, excellence and service.



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