CONSERVE

A Center of Excellence at the Nexus of Sustainable Water Reuse, Food, & Health

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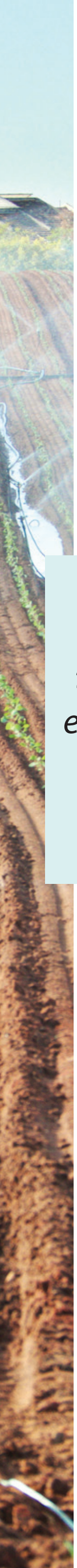


CONSERVE AT A GLANCE

CONSERVE: A Center of Excellence at the Nexus of Sustainable Water Reuse, Food, and Health was established in 2016 through funding from the United States Department of Agriculture (USDA) National Institute for Food and Agriculture (NIFA) Water for Agriculture Challenge Area program. The long term goal of the Water for Agriculture Challenge Area program is to "solve critical water resource problems in rural and agricultural watersheds across the United States,"[1] a need that integrates with the "sustainable food production" challenge area laid out by the National Research Council's New Biology for the 21st Century report.[XX] Within this framework, CONSERVE is focused on: 1) exploring nontraditional irrigation water sources that will enable agricultural producers to conserve groundwater and 2) developing cost-effective, sustainable water treatment technologies to improve the quality of these water sources. CONSERVE employs a systems approach (Figure 1) to evaluate the availability of nontraditional water sources; identify the socio-behavioral, economic and regulatory factors that impact the use of these sources; and develop, implement, and evaluate on-farm treatment technologies for the safe and successful use of nontraditional water. We will then share this new knowledge with agricultural and non-agricultural communities, and employ experiential education to teach, train, and inspire future leaders.

Our CONSERVE Mission: To facilitate the adoption of transformative on-farm solutions that enable the safe use of nontraditional irrigation water on food crops.

Our CONSERVE Vision: A national resource bringing together research, outreach, and education to effectively reduce the nation's agricultural water challenges that are exacerbated by climate change.

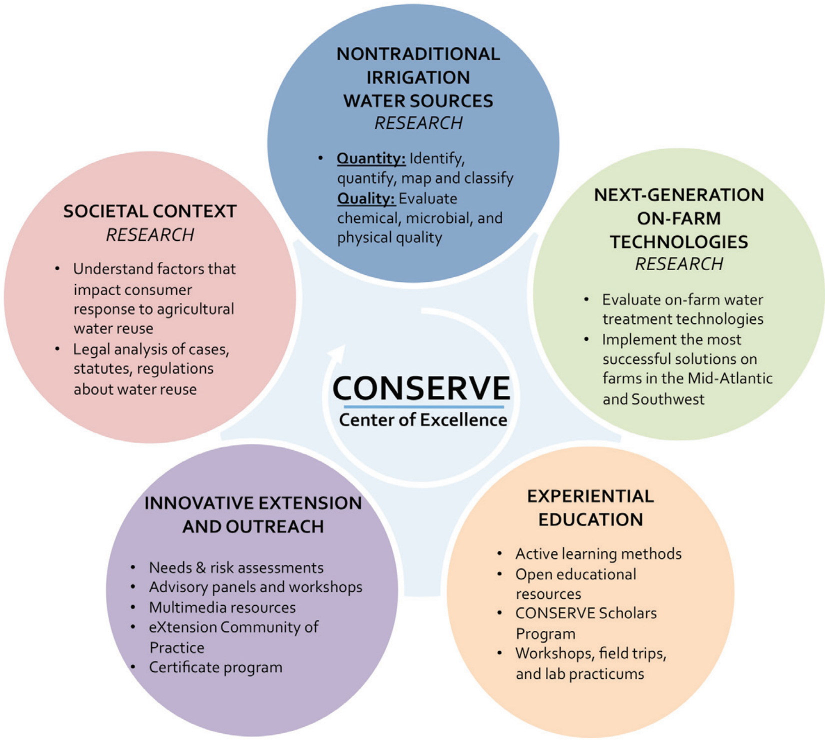


Figure 1. The CONSERVE Systems Approach

There are multiple unique strengths to CONSERVE. First, we have an exemplary and diverse team of researchers, extension specialists and educators (Figure 2), many of whom have 1) worked extensively on water reuse issues, and 2) collaborated successfully with each other. Our proven collaborative capacity speaks well for the success of CONSERVE and will allow us to maximally leverage existing resources. Our focus on the Mid-Atlantic and Southwest regions highlights two diverse climates that are in different stages of need for nontraditional irrigation. Specifically, the Mid-Atlantic is currently not experiencing serious water shortages, and the integration of new on-farm water treatment technologies at this time represents a proactive approach to climate change. In contrast, the Southwest region is experiencing severe water shortage crises, and thereby represents a need for reactive solutions to climate change. Finally, our extensive involvement with key government and industry stakeholders from project development to implementation and evaluation will enable CONSERVE to be on target with needs on-the-ground.

Figure 2. The CONSERVE Transdisciplinary Team

CLIMATE CHANGE, DROUGHT, AND FOOD

Our changing climate, escalating water demands from non-agricultural sectors and depletion of groundwater sources by agricultural use are immediate challenges that call for the urgent need to explore and adopt safe, alternative irrigation strategies to sustain food production across the U.S. As a result, food crop irrigation with nontraditional water sources (e.g., reclaimed water, return flows, and brackish waters) has been emerging in the U.S., particularly in states experiencing severe drought conditions, such as California and Arizona[2]. Other states, such as Maryland, are exploring ways to proactively address future agricultural water needs as our climate continues to change.

Ongoing agricultural projects that engage in nontraditional irrigation show promising results but also raise questions that require further study. In Monterey County, California, over 5,000 hectares of produce have been irrigated with tertiary treated municipal wastewater effluent (reclaimed water) for over a decade.[2] Pilot studies supporting this water reuse project showed that indicator organisms and pathogens were either not present or present at negligible levels in reclaimed water, suggesting that this water source can be safely used for food crop irrigation.[3-6] However, the type of wastewater treatment required in California under the Title 22 Code of Regulations more closely resembles drinking water treatment. This raises the question as to whether the Monterey data are representative of other irrigation sites that may be using reclaimed water resulting from varying tertiary treatment processes. Moreover, the focus of the Monterey studies was on microbial pathogens and no data were generated on pharmaceutical and personal care products (PPCPs) that may remain in reclaimed water and irrigated food crops. Beyond California, Water Conserv II[7]—a large reuse project in Florida where 4,000 acres of citrus are irrigated annually—has provided evidence that reclaimed water can be effectively used to irrigate citrus and that these practices are acceptable to growers and consumers.[8] Yet, as in the Monterey studies, no data were collected on PPCPs. However, our data and those of others have shown that PPCPs are detectable in produce irrigated with reclaimed water and could pose concerns to public health.[8-11]

Arid states are not the only ones looking towards the use of reclaimed water and other nontraditional irrigation water sources with regard to the future of food crop irrigation. For instance, in Maryland, a temperate state that still has an ample groundwater supply, 35 sites are currently registered users of reclaimed water for spray irrigation of crops (or landscapes) with municipalities and growers beginning to prepare for fluctuating climatic patterns that may impair groundwater sources in the future.[12] However, due to limited data on the chemical and microbial impacts of this practice on crops in Maryland, State guidelines (at this time) only allow for crops not intended for human consumption to be irrigated with reclaimed water.[13]

Other states are also actively developing guidelines and policies for agricultural water reuse, some of which have been informed by regulatory frameworks existing in other countries such as Israel (a leader in water reuse)[2] or those developed by the World Health Organization.[14] However, many state guidelines have not considered emerging contaminants such as PPCPs, endocrine disruptors, pathogens that are resistant to disinfection (e.g. norovirus, Cyclospora), and antibiotic-resistant bacteria—all of which may be of concern in foods consumed with limited processing. Even more concerning, some states have no guidance or regulations on water reuse and among those with guidelines the "intent among states' regulations and guidelines can be quite subjective and open to interpretation."[2]

In addition to the lack of robust state guidelines regarding nontraditional irrigation water sources, there is a dearth of extension and education programs specifically focused on agricultural water reuse. Yet, these programs are essential to the future of irrigated food crops in this country and beyond as our climate continues to change. Finally, aside from the examples of large reuse projects mentioned above, there is limited information on factors that influence consumer acceptance of food grown with reused water. However, available data suggest that positive consumer perceptions and acceptance of water reuse are key factors with regard to the successful implementation of water reuse projects in general[15-20]. *As we move forward, CONSERVE is comprehensively addressing these knowledge gaps as we formulate solutions to sustainably utilize nontraditional irrigation water on food crops.*

Nontraditional Irrigation Water Sources (Research): Evaluate the availability (quantity and quality) of nontraditional irrigation water sources that can be used to conserve groundwater.

There are significant knowledge gaps concerning the availability (quantity and quality) of nontraditional irrigation water sources. CONSERVE researchers are focusing on: quantity through the development of a user-friendly spatial platform of nontraditional water sources, and quality, utilizing cutting-edge analytical technologies to comprehensively characterize these water sources.

Impact: The most comprehensive chemical, microbial, physical and geographic characterization of nontraditional irrigation water sources that has ever been carried out in the U.S.

IDENTIFYING, QUANTIFYING, CLASSIFYING AND MAPPING NONTRADITIONAL IRRIGATION WATER SOURCES.
The first steps towards promoting nontraditional irrigation water use on food crops are to 1) identify potential water sources that best meet local or regional water management needs; 2) classify them in terms of quantity, quality, ease of access and economic value; and 3) make these data accessible via user-friendly spatial databases.

To advance these critical steps, CONSERVE is compiling local and regional data on the sources and quantities of reusable water in the Mid-Atlantic and Southwest and data on other potential non-traditional water sources. These data are marked as attributes on a user-friendly geographical information system (GIS) platform. We then link these sources to agricultural point-of-use sites, factoring in proximity and ease of access. We are also classifying the reusable water based on quantity and chemical, microbial and physical quality. Results of this classification are recorded as separate attributes on our GIS platform, enabling users (e.g., Extension specialists and producers) to match the appropriateness of specific types of reusable water with crop types.

Using this classification, CONSERVE is carrying out an economic evaluation of the reusable water based on its intended use, providing guidance for the user in terms of the location, quantity, quality, and economic value of potential nontraditional water sources. Economic value of reusable water is being assessed based on the acreage of cropland irrigated. This type of assessment will lead to future price comparisons and economic optimization considering the value of available reusable water, cost of water delivery systems (i.e., irrigation technology), crop yield and market price.

CHARACTERIZING THE CHEMICAL, MICROBIAL AND PHYSICAL QUALITY OF NONTRADITIONAL IRRIGATION WATER SOURCES

Chemical, microbial and physical constituents in many types of nontraditional irrigation water sources have not been fully characterized to determine the suitability of these sources for use on food crops.

To address these significant research gaps, CONSERVE researchers are identifying nontraditional irrigation water sources that require further characterization. In California and Arizona, these include return flows, saline waters, membrane filter retentate, collected rainfall, tile drainage waters (CA only) and reclaimed water (CA only). In Maryland and Delaware, we focus on reclaimed water, brackish water and river water. Sampling is taking place multiple times per year at each site throughout the growing season and multiple sample types are being collected (e.g., nontraditional irrigation water, groundwater). All samples are analyzed for indicator microorganisms (*Escherichia coli*, Enterococcus), select bacterial, viral and protozoal pathogens (e.g. *Salmonella*, enterohemorrhagic *E. coli*, reovirus, norovirus, adenoviruses, Cryptosporidium, Cyclospora), and antibiotic-resistant bacteria.

The CONSERVE data are expected to show that additional water treatment technologies are needed to improve the quality of these nontraditional water sources for use on food crops.

Societal Context (Research): Identify the social, behavioral, economic and regulatory factors that impact the current use of nontraditional irrigation water sources and might impact the integration of new on-farm water treatment technologies developed to treat these sources.

Social, behavioral, economic and regulatory factors will greatly influence the adoption of nontraditional irrigation water sources. CONSERVE is focusing on social, behavioral and economic factors impacting consumers purchasing food grown with nontraditional irrigation water. The research is honed in on the policy, regulatory and legal frameworks surrounding nontraditional irrigation water use.

Impact: Increased awareness and understanding of opportunities and barriers to nontraditional irrigation water use with regard to: 1) motivations of consumer behavior concerning foods produced with nontraditional irrigation water; 2) feasibility, costs, and benefits of using these water sources; 3) feasible approaches for implementing nontraditional irrigation under existing laws, regulations and policies; and 4) achievable opportunities for shaping future laws, regulations and policies.

EVALUATING THE SOCIAL, BEHAVIORAL AND ECONOMIC FACTORS IMPACTING CONSUMER RESPONSE TO FOOD PRODUCED WITH NONTRADITIONAL IRRIGATION WATER

Given strong consumer concerns regarding food processed with new technologies (e.g., genetic modification, irradiation), the agricultural sector has become increasingly reluctant to invest in new food processes that may face consumer opposition.[21] Yet, some consumers are attracted to environmentally friendly produced food (e.g., organic) and may be willing to pay a premium for foods marketed as having a low "water-footprint."

To better understand consumer responses to these processes, CONSERVE team members are recruiting consumers from the Mid-Atlantic and Southwest and evaluate real purchase decisions for food grown with and without nontraditional irrigation water.

Understanding consumer motivations and behavioral responses to agricultural use of nontraditional irrigation water will help shape appropriate infrastructure changes and legal frameworks. This information, once shared through our extension and education programs, also will help relieve levels of uncertainty about irrigation changes among producers and non-agricultural communities.

EXAMINE THE LEGAL, REGULATORY, AND POLICY FRAMEWORKS FOR NONTRADITIONAL IRRIGATION OPPORTUNITIES AND IMPLEMENTATION.

Legal, regulatory, and policy frameworks—elements of state law which vary by state—have not been extensively applied to nontraditional irrigation water sources because such sources have not been extensively used. Moreover, use of nontraditional irrigation water may implicate federal and state food safety laws and regulations. For use of nontraditional water sources to increase, water users will need to view these sources as predictable and reliable, which will require addressing these legal issues and ambiguities.[4]

To better clarify these complex frameworks, we are analyzing cases, statutes, regulations, and scholarly publications. We are conducting both a broad, national evaluation of relevant legal materials as well as a focused, in-depth study of the Mid-Atlantic and Southwest states hosting our primary sites. Since these Mid-Atlantic and Southwest states respectively use the riparian and prior appropriation water doctrines, two different regimes of United States water law, results of this study will offer not only insights into the Mid-Atlantic and Southwest states but also applicability to every state.

Available data suggest that positive consumer perceptions and acceptance of water reuse are key factors with regard to the successful implementation of water reuse projects.

Next-Generation On-farm Technologies (Research): Develop, implement and evaluate the effectiveness and sustainability of next-generation on-farm water treatment technologies that can improve the chemical, microbial and physical quality of nontraditional irrigation water sources and irrigated food crops.

In order to ensure the implementation and sustainability of nontraditional irrigation water use on food crops, on-farm technologies will likely need to be developed to improve the quality of these water sources and irrigated crops. CONSERVE researchers are focusing on the implementation of transformative on-farm solutions in the Mid-Atlantic and Southwest. Solutions are focused upon in each region and those that are highly effective in one region will be beta-tested in the other region.

Impact: The successful implementation of irrigation and process water treatment systems on working food crop farms that cost-effectively and sustainably reduce and manage risks due to contaminants in nontraditional irrigation water.

IMPLEMENT AND EVALUATE ON-FARM ZERO-VALENT IRON, BIOSAND FILTERS TO REDUCE CHEMICAL, MICROBIAL AND PHYSICAL CONTAMINANTS IN NONTRADITIONAL IRRIGATION WATER USED ON FOOD CROPS IN THE MID-ATLANTIC. Zero-valent iron (ZVI) biosand filters have been used as permeable reactive barriers to remove a broad range of contaminants in groundwater[22]. For example, ZVI-based technology has achieved greater than 5-log removal of two model viruses[23] and of the surrogate bacterial pathogen *E. coli* O157:H1280 in ground water. Another benefit of using ZVI biosand filters is that ZVI does not generate potentially harmful by-products like other chemical treatments. Because of this advantage, ZVI technology has been effectively used in groundwater remediation and wastewater treatment; however, it has not been evaluated on nontraditional irrigation water intended for food crops.

To address this knowledge gap, CONSERVE is implementing and evaluating unique field-scale water filtration units that incorporate ZVI technology on reclaimed or surface water from field sites that are judged to be of poor microbiological, chemical or physical quality. Field samples collected during the evaluation of ZVI filters are being tested for chemical, microbial and physical contaminants.

Reduction of selected microbial, chemical and physical contaminants in ZVI-filtered water is assessed using our groups previously-developed methods.[25] Continued improvements for pre-filtration, flowrate and ZVI content, and water requirements for specific farms will inform the optimization of on-farm ZVI systems.

IMPLEMENT AND EVALUATE ON-FARM UV AND OZONE SYSTEMS TO REDUCE CHEMICAL, MICROBIAL AND PHYSICAL CONTAMINANTS IN NONTRADITIONAL IRRIGATION WATER USED ON FOOD CROPS IN THE SOUTHWEST.

On-farm water treatment technologies developed for nontraditional water sources must not only be feasible, cost-effective and sustainable but also result in irrigation waters of the highest quality for use on food crops eaten raw or receiving minimal processing. We have studied both UV and ozone technologies for many years and have provided evidence that simple field-portable systems that incorporate these technologies could be used for this purpose (in addition to the ZVI filters described above).[24] Moreover, waters used to wash produce during processing can be recirculated to reduce water needs but, due to the potential for cross-contamination, the water needs to be disinfected on a continuous basis.

To address these concepts that could improve nontraditional irrigation water quality, we are implementing and evaluating simple low-cost disinfection methods at the point where irrigation water enters the field (flood, drip, spray). Specifically, we are integrating several disinfectant technologies; ozone, microbubbles and UV light is being evaluated in combination[25] with other sanitizers such as hydrogen peroxide and natural plant antimicrobials.[26-28] Various combinations are being investigated against foodborne pathogens of concern (e.g., *E. coli* O157:H7, *S. enterica* and murine norovirus) in fresh produce.

The efficacy of the treatment technologies on nontraditional irrigation and process waters are being analyzed and resulting water quality compared to that of traditional waters. Technologies that work best for specific waters will be recommended to key stakeholders, including growers, and included in our educational programs. Finally, the data will be utilized to develop standard treatment doses for each type of treatment for nontraditional waters.

Innovative Extension and Outreach (Extension): Integrate the knowledge generated through CONSERVE Research activities into preeminent extension and outreach programs for agricultural and nonagricultural communities.

A shift towards the implementation of on-farm technologies that enable the use of nontraditional irrigation water sources depends on translating our research into actual practice. CONSERVE Extension specialists are focusing on the development of high-quality, effective and accessible extension and outreach programs.

Impact: Advanced knowledge among food crop growers, agricultural service providers, extension faculty, and non-agricultural communities that will facilitate the implementation of nontraditional irrigation water sources and the subsequent conservation of groundwater.

DEVELOP PREEMINENT EXTENSION AND OUTREACH PROGRAMS ON NONTRADITIONAL IRRIGATION WATER SOURCES FOR AGRICULTURAL AND NON-AGRICULTURAL COMMUNITIES IN THE MID-ATLANTIC AND SOUTHWEST

Concerns about the real or perceived risks of nontraditional irrigation water use result in decision-making that is driven more by perception of risks rather than by scientific assessments. The development of high-quality extension programs regarding these issues (and based on the research generated by CONSERVE) in each of our target regions will 1) empower growers to make educated decisions about the use of nontraditional water sources while maintaining food safety; and 2) educate consumers (non-agricultural communities) on the potential benefits associated with these water sources.

To effectively evaluate the knowledge and needs of growers, CONSERVE extension educators are completing an initial needs assessment in the Mid-Atlantic and Southwest to understand growers' existing 1) knowledge of nontraditional irrigation water sources and on-farm water treatment technologies; 2) perceptions surrounding nontraditional waters as irrigation sources; and 3) understanding of the laws associated with the use of nontraditional waters on food crops. While the focus of our assessment is on growers, results will be made available to multiple stakeholder groups including consumers and domestic water users. Following our needs assessment, we will form regional extension advisory panels in both the Mid-Atlantic and the Southwest including consumers (non-agricultural community), growers, packers/shippers, producers, environmental leaders and extension faculty.

We anticipate that this programming will involve multiple outreach approaches. We are developing half-day CONSERVE Extension workshops and work with planners of existing conferences (e.g., Future Harvest's annual conference) to include a portion of our programming on their agendas. We are also working with extension agricultural educators on county-specific agendas and faculty in-services to highlight the research completed by CONSERVE and make educators and faculty aware of resources available.

In addition, our research findings will be used to develop a best management practices (BMP) tool-kit and guidance documents. Through close partnerships with stakeholders, we also will perform an extension risk assessment to investigate the relative risk of produce contamination for each nontraditional water source evaluated. Factors such as the water source, treatment method, irrigation method, and survival of pathogens will be included. The outcome will be an extension tool that can be used to assess what nontraditional water source presents the greatest risk to crop contamination and what actions can be taken to reduce this risk. This tool will be included in our BMP tool-kit and guidance documents, providing comprehensive information on water reuse and agricultural impacts. Beyond the BMP tool-kit, we will offer a Certificate for Safe Use of Nontraditional Irrigation Water to project participants to enhance participation in extension programming.

Finally, with our CONSERVE educational media team and our Data Management and Analysis Core, we are 1) developing multimedia resources based on CONSERVE findings to educate producers on nontraditional irrigation water sources, water quantity, water quality and food-safety; 2) creating a "nontraditional water sources for agriculture" eXtension Community of Practice as a platform to collaborate with other professionals and host webinars; and 3) launching a CONSERVE extension website (linked to the main CONSERVE website) that will house all of our extension products.

The impact of our CONSERVE Extension workshops, the BMP tool-kit and the Certificate Program will be determined by monitoring water use by participating growers pre- and post-program implementation, with the help of Cooperative Extension and community partners. Questionnaires and follow-up interviews will be used to gather data about attitudes, knowledge, skills and behaviors as well as explore the knowledge, opinions and beliefs of the growers about the resources created through this program. Tracking methods will help determine the number of participants involved at each level of extension, including the number of agricultural specialists, growers, trainers, volunteers, and people in attendance at extension events or participating in on-line education utilizing eXtension.

Experiential Education (Education): Translate the knowledge generated through CONSERVE Research into high-quality, experiential educational programs that will teach, train, and inspire the next generation of leaders engaged in sustainable water reuse on food crops.

The knowledge generated through CONSERVE Research will be translated into experiential educational programs that will teach, train, and inspire the next generation of leaders engaged in sustainable water reuse on food crops. CONSERVE educators are developing active learning-based educational modules to be incorporated into new and existing courses and programs as well as creating our unique CONSERVE Scholars program.

Impact: Increased acceptance and understanding of nontraditional water sources and the complex issues surrounding them among a diverse group of undergraduate and graduate students, K-12 teachers and 4-H groups—leading to the eventual transfer of this comprehension to the future agricultural workforce.

DEVELOP ACTIVE LEARNING-BASED EDUCATIONAL MODULES ABOUT NONTRADITIONAL IRRIGATION WATER FOR UNDERGRADUATE AND GRADUATE STUDENTS, K-12 TEACHERS AND 4-H GROUPS

The benefits of active learning methods are well documented at multiple course levels[29-30] and in numerous disciplines. Thus, to address the training gaps regarding agricultural water reuse, we will develop educational modules infused with active learning. These modules will explore water reuse using the CONSERVE systems approach, and will be 1) incorporated into existing and new undergraduate and graduate level courses at our partnering institutions; 2) integrated into programs for K-12 teachers and 4-H groups; and 3) shared via open educational resources (OER) to enable free distribution to wider audiences.

CONSERVE is developing innovative active teaching methods and educational technologies at the forefront of current practice, such as case studies, problem-based learning (PBL) narratives, student-centered instruction, role-playing exercises, and animations or learning games. For instance, our case studies may focus around the following questions relevant to our CONSERVE activities: "What technologies might affect consumers' attitudes toward the purchase and consumption of produce grown with reused water?"; and "How does perceived risk of chemical, microbial and physical contaminants relate to quantified risk?" Modules used in undergraduate and graduate courses: These active-learning-based educational modules will be integrated into existing and new undergraduate and graduate courses taught by the CONSERVE team at our partnering institutions, including land-grant universities, a Hispanic-serving institution and a historically black university.

Some of our materials are targeted to K-12 educators and 4-H groups. To ensure that these materials are useful and appropriate, an advisory panel of K-12 educators will be developed to provide feedback. To encourage implementation, we will offer workshops and webinars through partner educational programs and teacher collaborations.

FOSTER A DIVERSE CENTER AND FUTURE WORKFORCE BY DEVELOPING THE CONSERVE SCHOLAR PROGRAM FOR UNDERGRADUATE AND GRADUATE STUDENTS.

Key to developing human capital and increasing workforce diversity in agricultural disciplines is training a diverse group of future leaders, educated not only in sustainable water reuse but also in systems-based thinking.

CONSERVE is developing the CONSERVE Scholar program, that includes both undergraduate and graduate students. Undergraduate students will become CONSERVE Scholars by applying to the CONSERVE Summer Internship Program (SIP). CONSERVE SIP will provide traditionally underrepresented and disadvantaged undergraduate students with paid research training and career development internships during two consecutive summers, to enhance their potential to be accepted into graduate programs in fields relevant to CONSERVE focus areas. Undergraduate SIP students will be placed among our partnering institutions. They also will participate in Service-Learning by assisting with 4-H activities that target culturally and economically diverse populations.

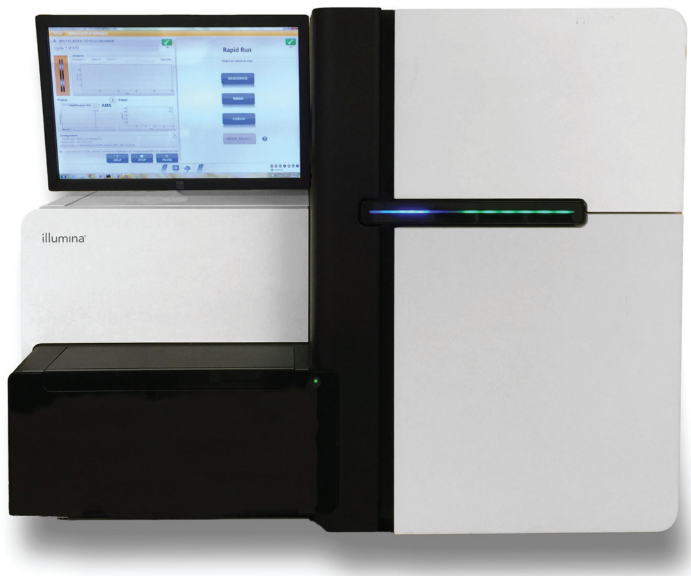
Graduate CONSERVE Scholars are funded on individual projects at each partnering institution. Similar to SIP, priority will be given to competitive graduate students from traditionally underrepresented groups. Our graduate CONSERVE Scholars will not only engage in work on individual CONSERVE projects but also benefit from our collaboration with the National Socio-Environmental Synthesis Center (SESYNC). Each year, SESYNC will host a three-day workshop for these graduate students at the SESYNC facilities in Annapolis, MD. These workshops will include an introduction to the cyberinfrastructure tools used for data discovery in food-water systems research, and hands-on training in combining and analyzing existing data formatted by SESYNC through those tools, with primary data generated by the CONSERVE project.

Both undergraduate and graduate CONSERVE scholars also will be integrated into CONSERVE extension activities in order to provide students with essential communication skills necessary for their future careers. In addition, all Scholars will join together in monthly virtual group meetings to foster greater collaboration and networking.

Extraordinary Resources: Laboratory and Data Management and Analysis Cores

With activities anchored on either side of the nation and occurring simultaneously, organizational management is essential to ensuring the success of CONSERVE. Together, our team has developed a plan that will facilitate project management.

The Laboratory Core is maximizing coordination and cost-effectiveness with regard to the lab methods that require in-depth analyses and are prone to inter-lab variability, such as LC-MS/MS methods, total genomic DNA extractions and next-generation sequencing methods. The Laboratory Core also coordinates sample chain-of-custody, sample storage and sample analysis.



To ensure effective data management and analyses, and coordinated data sharing between CONSERVE team members, key stakeholders and USDA-NIFA, the CONSERVE Data Management and Analysis Core is coordinating data management, sharing among partner institutions, and release to the public. The Data Core manages data storage and sharing among partner institutions through the establishment of a relational database and dedicated file storage system for all CONSERVE data. The Data Core also manages the public interface through the development of a public website that will serve as a main portal for CONSERVE, linking to individual resources developed by the different activities.

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