

A Letter from the Chairman Jim Dowland



As 2019 comes to a close, and with it, EREF's 25th anniversary, I would like to take a moment to thank everyone who supported EREF through donations and participation in EREF events and educational opportunities.

EREF's 25th Anniversary Celebration in October was a unique opportunity to witness the power and necessity of research and education in our industry. During this event, attendees had the chance to reconnect with old friends and meet those who played key roles in EREF's history. The night featured videos on EREF's history and testimonials from Richard Burke (Advanced Disposal), Jon Vander Ark (Republic Services), Worthing Jackman (Waste Connections) and Tara Hemmer (Waste Management). These speakers discussed the importance of supporting organizations like EREF who further the scientific research that drives our industry forward.

For more on EREF's history and its impact on the industry, be sure to [watch these videos shown at the celebration](#).

In addition to its 25th anniversary, 2019 has been a significant year for the Foundation. In the coming months, EREF will move in a new strategic direction, stepping further into the sustainable materials management space. While EREF has funded projects in this area in the past, this new strategic direction will see EREF directly managing relationships with all participants in the circular economy – including manufacturers, brands, consumers and the waste industry. Read more about this new direction and the benefits for the industry [here](#).

Other major accomplishments for EREF this year include:

- Leading the per- and polyfluoroalkyl substance (PFAS) conversations and research:
 - EREF released a targeted RFP in March related to the management of PFAS.
 - EREF held its Summit on PFAS in August, a 2-day event featuring presentations that identified current challenges, data gaps and ongoing research. Over 250 attended the event.
- Funding 6 graduate scholars:
 - EREF awarded scholarships to 3 master's students and 3 Ph.D. students. More information on the new scholars is on [EREF's website](#).
- Continued investment in organics research:
 - In July, EREF held its 3rd Summit on MSW Organics in collaboration with the California Refuse Recycling Coalition (CRRCC). The educational event included a full day of presentations and a half day of facility tours.
 - EREF donated \$2,000 from the Summit to the CRRCC Northern District Scholarship Program, supporting students continuing their education

in college or vocational programs. Find out more on this donation [here](#).

- Growing the mission:
 - EREF hired 6 part-time employees. New roles range from research to events to communications. Learn more about these new hires [here](#).
 - EREF's Debra Kantner transitioned from Data & Policy Program Director to Sustainability Director. Find out what this transition entails [here](#).
 - EREF is currently hiring for 3 new positions related to research and marketing/development. Learn more about these positions and how to apply [here](#).

This has been a remarkable year for the Foundation, one that would not have been possible without your support. As we move into the holiday season, if you're shopping with Amazon, don't forget to select EREF as your [AmazonSmile charity of choice](#) and be sure to shop at [smile.amazon.com](#). With each eligible purchase, Amazon will give back a portion of your purchase to EREF.

Thank you again for your support of this organization. Let's make 2020 the best yet.



Jim Dowland
Chairman, EREF Board of Directors
2018—2019

EREF Expands Further into Sustainable Materials Management Space

EREF has a long history of funding innovative research that the industry needs to move forward and adapt to changes in policy and management. The Foundation will be taking this to the next level in the coming months, stepping further into the sustainable materials management space.

While the Foundation has funded research projects and other initiatives related to sustainable materials management in the past, this new strategic direction will see EREF in the driver's seat, directly managing relationships with all participants in the circular economy, including manufacturers, brands, consumers and, of course, the waste industry. These new relationships will open doors to untapped constituents who can benefit from the Foundation's research and provide data to inform EREF studies.

EREF's growth into this space comes at a time when a number of industries are in search of solutions to more efficiently reuse and reduce waste. Given the high rate of contamination in recycling and the 2017 China ban, the viability of recycling, which for years has been hailed as the optimal method of decreasing environmental burden, has been called into question. What is the answer to less waste? Is it greater focus on public education? Is it more sustainable packaging? One simple answer does not exist, but EREF recognizes that ensuring all players have access to credible science and the current state of practice affecting the life-cycle of a product is necessary for an open dialogue to occur, which then proctors solutions.

"Expansion into sustainable materials is a natural progression of EREF's mission. We've occupied that space for years, through projects like the Solid Waste Optimization Life-Cycle Framework (SWOLF) model, and it only makes sense that we take on a bigger role," said Bryan Staley, EREF President and CEO. "EREF is well-positioned to have a huge impact on the way materials are sourced, produced and disposed of."

Current initiatives will continue: Grants, Scholarships, Data & Policy, Education, Internship in Excellence and the MSW eTextbook. Research and data from these programs will inform conversations with new constituents.

With this expansion comes a need for additional full-time staff who can build and manage the relationships and content.

EREF is excited to announce that Debra Kantner has transitioned from the Data & Policy Program Director to the Sustainability Director. In this role, Debra will evaluate the sustainability of end-of-life options for discarded materials, track and communicate current scientific findings and help educate product manufacturers and consumers regarding sustainable materials management strategies. An aspect of this will include internal research and data aggregation efforts.

The Foundation is currently searching for a Sustainability Development Coordinator/Manager who will be responsible for primary relationship building, marketing and promotion of EREF's efforts to engage upstream product/packaging manufacturers that evaluates sustainable materials management.



Additional open positions are:

- Program Manager – Data & Policy Program
- Data Analyst – Data & Policy Program

To learn more about these three positions, including how to apply, [click here](#).

5 New Solid Waste Research Projects Funded

Next research grant pre-proposal deadline is June 1, 2020.

The EREF Board of Directors is pleased to announce the award of 5 new research grants.

Research conducted through these grants aligns with EREF's mission to advance sustainable solid waste management practices.

The following projects have been contracted in 2019:

Recovering High Value Acids from Anaerobic Co-digestion of Municipal Solid and Grease Interceptor Waste Using an Electrically Driven Separation Process

North Carolina State University and University of North Carolina at Chapel Hill

Re-engineering the anaerobic co-digestion (co-AD) of organic-rich, municipal solid waste (MSW) to yield high-value chemical products could dramatically change the economics of co-AD technologies. Conventional co-AD, in which two distinct waste streams are digested together (e.g., food waste and wastewater solids), generates methane gas (CH₄). However, the low market value of CH₄ (\$160/ton) translates into a long return on initial capital investment and limits revenue generation that could help offset maintenance and operating costs. Shutting down the biological pathways to CH₄ production in co-AD (via inhibition of methanogenesis) can result in the production of volatile fatty acids (VFAs) without compromising solids destruction goals. For example, prior research has shown that too much grease inceptor waste can stop gas production and increase the production of volatile fatty acids. These VFAs have current market values in the range of \$525 (acetic acid) to \$6,000 (valeric acid) per ton and are therefore significantly more valuable than CH₄. While the knowledge of how to operate co-AD to generate VFAs exists, the primary challenge facing implementation of this approach is the lack of effective methods to separate and recover VFAs from co-AD.

The overall goal of the proposed research is to demonstrate the technical feasibility of recovering VFAs from co-AD using electrochemical methods. To accomplish this overall goal, the following specific objectives will be pursued:

1. To determine how the composition of organic-rich, solid waste mixtures impacts VFA production during co-AD.
2. To measure VFA recovery efficiencies and rates using an electrochemical-based separation process.
3. To build and test a scalable electrochemical cell (e-cell) design that will be used to validate VFA recovery from co-AD effluents.

Rapid and Cost-Effective Approach to Evaluate the Effectiveness of Wastewater and Treatment Byproduct Solidification and Stabilization

University of Texas at Austin, Texas A&M University & EPRI

Disposal of residual industrial waste streams and treatment byproducts (WTBs) presents many challenges for approaching zero liquid discharge. Solidification/stabilization (S/S) using combinations of additives such as lime, portland cement, and coal combustion residuals (e.g. fly ash) can provide a final disposal option. The solidified waste can be landfilled, where encapsulation of the contaminants prevents leaching into landfill leachate collection systems and ground water. Successful mixture designs will likely depend on the composition, pH and contaminants of concern in the liquid wastes, and a strategy for S/S of wastewater across industries is needed. Further, the success of a S/S strategy to prevent leaching of contaminants is often approached using methods that do not effectively evaluate the chemical stability of solidified materials, especially when several S/S methods are to be compared, which hinders the progress of new developments in material designs.

The overall goal of this project is to develop streamlined processes for solidifying brines and testing the solidified materials that are rapid, cost-effective, relevant, accessible, and user-friendly for industry researchers. The objectives are:

1. To develop a method to efficiently design mixtures to solidify industrial wastewater and leachates using additives (fly ash, lime, portland cement).
2. To develop and test a better method for leaching assessment of monolithic specimens that also captures hydraulic conductivity (permeability), a crucial encapsulation physical property.

The Influence of Social Norms on Recycling Behavior in Urban Multifamily Buildings

Stony Brook University

The primary goal of this research is to test the influence of social norms on recycling behavior in multifamily buildings in the New York City area. Recycling rates for multifamily buildings are lower than single family homes, and even when residents are knowledgeable about what is recyclable, knowledge of non-recyclables lags, leading to significant contamination. While multifamily recycling research strongly emphasizes the role of convenience in increasing recycling, once such structural characteristics are in place there is a need to look to behavioral factors to see further gains. While social norm-based interventions are well-studied in the energy field, there is less work in this area for recycling research, highlighting an important gap.

The objectives of the research are to:

1. Assess the effectiveness of social-norm based interventions on household recycling behavior in multifamily buildings.
2. Determine if significant differences in effectiveness exist between two different social norm-based interventions—peer pressure and competition.
3. Develop outcomes and recommendations that form the basis for replicability in buildings of other sizes, types, and uses.

Recycling, Contamination, Markets and MRFs: Practical Strategies for Communities, Non-Profits and MRFs

Skumatz Economic Research Associates, Inc.

Recycled materials have been looking more and more like trash for quite some time. The recycling bales quality issue did not originate with China's Green Fence or its recent embargo. U.S. mills have been complaining for years, but China's actions are forcing the US to recognize elements of the U.S. recycling system are not working. MRFs can technically produce quality materials out of dual stream and single stream inputs, but were not designed or equipped to process material with 20% or more trash/contamination. What can be done to get cleaner materials in-bound and out-bound? What should communities be recycling based on what makes economic, collection and clarity-of-instructions points of view, and how do we make these dynamic-not simple-decisions? This quantitative research report addresses these three main topics – what can be done to get cleaner materials, what makes sense to recycle (collect and process) and is there a sustainable recycling structure. Millions of dollars in programs and infrastructure, as well as enormous customer good will and city progress are at risk as stakeholder economics change, the media fans flames, households become skeptical, and communities panic and look for a feasible solution. The goal is to identify feasible (short and long term) strategies for developing a sustainable recycling system for small, medium, and larger communities as well as non-profits, providing clean-enough “commodities” that meet the needs of end-users-both domestic and international. The focus is residential because there is little commercial data available; but if commercial data are found, it will be identified/pursued.

Objectives include:

1. Identify a range of short- and long-term workable strategies (with supporting data and case studies) that clean up the recycling stream (in and out).
2. Analyze tradeoffs in processing & collection to identify material mixes and processing alternatives that are economically sustainable but optimize/provide strong recycling program performance, low contamination and high diversion.
3. Develop template materials, case studies and resources for guidance, and publicize the results.

Development of Recognizable Recycled Paper Based Containerboard Products and Their Ability to Promote Positive Brand Recognition

North Carolina State University and North Carolina at Chapel Hill

There is a growing interest in sustainable packaging given the public's increasing awareness of packaging environmental issues. At the same time, recent waste import restrictions by China are destabilizing the demand for low quality waste materials. This project proposes that paper based packaging with obvious recycled content from low quality waste can instill positive perceptions from consumers about a product or brand, making these containers more desirable. The overall goal is to develop systems to effectively utilize low-grade paper wastes in innovative containers, with recognizable recycled content, in order to increase and stabilize the demand for low-grade recovered paper. This project can serve as a model for other recovered materials.

Objectives of this research are the following:

1. Evaluate the product performance of using low-grade paper wastes in packaging materials with obvious recycled content.
2. Perform an economic/LCA sustainability evaluation on the new products.
3. Evaluate the desirability of having packaging with obvious recycled content from the perspective of companies that use packaging.

4. Determine if packaging with obvious recycled content develops a strong positive brand or product impression with the public.
5. Disseminate the results.

Pre-proposals are required prior to submitting a full proposal. EREF invites investigators to submit pre-proposals pertaining to the topics outlined on the “How to Apply for a Grant” page on EREF’s website.

The next pre-proposal deadline is June 1, 2020. For more information regarding EREF’s Research Grants Program, please visit erefdn.org.

Data & Policy Releases

New Analyses

Analysis of MSW Landfill Tipping Fees: April 2019

Results from a recent EREF analysis of municipal solid waste (MSW) landfill tip fees indicate a 5% increase in the national average to \$55.36/ton for 2019.

From its database of 1,540 active Subtitle D MSWLFs in the U.S., EREF created a sample of facilities that was used for surveying landfill owners regarding tip fee information for MSW disposal. Results for 2019 reveal a national average tip fee of \$55.36/ton, compared to \$52.62 in 2018, with regional averages ranging from \$40.92 (South Central) to \$73.03 (Pacific). While tip fees in the Northeast and Pacific regions remain the highest in the U.S., the Pacific saw an increase of \$4.57/ton or 6.7% for 2019 while rates in the Northeast experienced a \$0.86/ton decrease on average. This year's large increases were seen in the Mountains/Plains region (+\$7.14/ton, +16.4%) and South Central region (+\$6.12, +17.6%). The table below indicates average tip fee by region.

MSW landfills often accept a variety of non-MSW special wastes. A [recent EREF study](#) found that construction and demolition (C&D) waste is the most commonly accepted special waste at MSW landfills. C&D is accepted at MSW landfills in 41 states and comprises roughly 12% of waste buried at these facilities. Given its prevalence, this year's analysis includes data on C&D pricing at MSW landfills. Nationally, the average tip fee for C&D disposal at MSW landfills was \$54.04/ton. Results show that while the majority of MSW landfills charged the same rate for MSW and C&D, this pricing strategy is not uniform. The cost to dispose of C&D was lower than MSW at 27% of sites. At the remaining 16% of sites, C&D tip fees were higher than those for MSW.

EREF's report, Analysis of MSW Landfill Tipping Fees: April 2019, shares additional 2019 tipping fee data. Get the free report [here](#).

Estimating Degradable Organic Carbon (DOC) Values & the Impact of Non-MSW Materials

Study finds degradable organic carbon (DOC) content of landfilled wastes to be lower than federal guideline values.

In landfills, biogas production is the result of anaerobic degradation of organic wastes. The amount of degradable organic carbon (DOC) in landfilled organics (e.g. paper, food, yard waste, wood) dictates the amount of carbon available for conversion to biogas.

Due to its high methane content (i.e. 50-70%), entities, such as U.S. EPA and Intergovernmental Panel on Climate Change (IPCC), maintain inventories of landfill gas emissions. When estimating emissions, guideline DOC values for MSW or total (bulk) waste are typically used. However, if these guideline values are not representative of landfilled waste stream(s), the resulting landfill emissions estimates could be inaccurate.

EREF found the composition-based numbers are statistically different than the guideline values, with guideline values overestimating DOC content by 62% for MSW and 20% for bulk waste.

Get the free report [here](#).

Utilization and Effectiveness of Waste Bulking and Stabilization Strategies

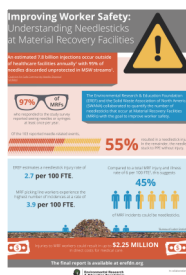
Study finds that 48 states allow non-municipal solid waste (MSW) materials to be placed in MSW landfills.

There has been an increasing trend to accept aqueous wastes at landfills in recent years, achieved through the use of bulking or solidification/stabilization (S/S) agents. The practices and strategies are generally developed on a case-by-case basis, and in some instances are viewed as proprietary.

While a wide array of materials have been used as bulking or S/S agents, summarized information regarding the state of practice, material properties and usage is not widely available. In particular, material physical and chemical properties are important to ensure their use does not cause excessive heat generation, create odors or leach undesirable or toxic compounds.

EREF found that 48 U.S. states allow non-MSW materials to be placed in MSW landfills, including 33 states allowing industrial waste and 27 allowing biosolids and sludge. Due to the aqueous nature of these special wastes, landfill operators have had to tailor their management approaches. This is accomplished through the use of bulking agents, which absorb moisture, or stabilization/solidification agents, which harden through chemical reactions.

Get the free report [here](#).



Household Needles in Municipal Solid Waste (MSW)

In 2018, EREF released this study that examines the number of needles disposed of in household garbage and the safety challenges this presents for industry workers.

Check out this [infographic](#) released earlier this year that summarizes the key findings. Plus, be sure to download the free report [here](#).

FINAL CHANCE!

In celebration of EREF's 25th anniversary, EREF has discounted its paid reports:

- [Municipal Solid Waste Generation in the U.S.: 2010 & 2013](#)—25% off
- [Municipal Solid Waste Facilities in the U.S.](#)—25% off
- [Anaerobic Digestion of Municipal Solid Waste](#)—only \$25

Your purchase of Data & Policy reports helps fund the undergraduate and graduate students who assist with the data aggregation and analysis.

View additional Data & Policy reports [here](#).

EREF Leads Recycling Definitions Discussion in U.S. EPA Workgroup

The industry has recognized the need for a standardized recycling definition for years; however, this need came to a head with the 2017 China ban. States have penned a number of different definitions; in fact, EREF found 18 different definitions of recycling. The biggest difference in these definitions being whether or not to include composting. Without a consistent definition, consumers, uncertain of what actually belongs in the bin, commit the sin of wish-cycling which often contaminates the bin, and states are unable to accurately measure their sustainability goals.

In response to this concern, EREF was invited to be a part of the EPA's Measurement Workgroup, leading the discussions to create a standardized recycling definition that is built on science, including findings from several Data & Policy Program projects. EREF chairs the workgroup, which consists of 40 participants representing state and local government, retail, manufacturing, material-specific organizations (e.g. The Aluminum Association), waste industry organizations and waste management companies.

On America Recycles Day in November, EREF, represented by Sustainability Director Debra Kantner, presented the new definition in order to advance consistency and clarity in recycling measurement and reporting. This new definition does not include composting, which provides a more accurate picture of commodity recyclables recovered from the waste stream.

In 2020, the workgroup will focus on goalsetting and measurement using the new definition. More information on this effort will be shared as it is made available.

EREF conducted a recycling definition analysis. View the analysis [here](#).

Education Program Tackles Growing PFAS and Organics Concerns in Waste Industry

In response to the rising concerns related to the management of per- and polyfluoroalkyl substances (PFAS) and organics in the waste stream, EREF held 2 educational summits in 2019.

EREF's Summit on MSW Organics, a bi-annual summit held in partnership with the California Refuse Recycling Coalition, was held in San Francisco, CA in July. The event featured a full day of presentations related to organics including management strategies including diversion and anaerobic digestion. The following day attendees toured the South San Francisco Scavenger anaerobic digestion facility and the GreenWaste Recovery material recovery facility. View the Summit agenda [here](#).

In August, over 300 attended the EREF Summit on PFAS in Ann Arbor, MI. The Summit featured 2 days of presentations and a special conversation with EGLE Director, Liesl Clark regarding the steps that Michigan is taking to address the PFAS problem. Michigan has been at the forefront of PFAS news due in part to its proactive steps to identify areas of concern and find the best course of management action. View the Summit agenda [here](#).

Key takeaways from the EREF Summit on PFAS indicate that little is known about the effects of these substances in both the waste stream and the human body. Nonetheless, it is clear that a substantial amount of research is needed to learn more and collaboration from both the waste and packaging industries is vital.

EREF is leading the PFAS research conversation, issuing a targeted PFAS RFP earlier in the year. EREF's Board of Directors approved funding for a number of projects in December 2019. Information on these projects will be released early next year.

In an effort to make PFAS related content more readily available, the Foundation has created a PFAS Resource on the EREF website. Information on this page ranges from basic (i.e. what is PFAS) to highly technical peer-reviewed articles. The information is organized into a number of categories allowing the user to more easily find the desired information. Website will be available in 2020.

Interested in learning more about PFAS? Be sure to register for the [2020 Global Waste Management Symposium](#) in Indian Wells, California featuring a variety of waste industry topics including PFAS.

6 Master's and Doctoral Scholarships Awarded

The EREF Board of Directors is pleased to announce the award of six scholarships to Master's and Doctoral students across North America pursuing education in solid waste management.

Congratulations to the 2019 EREF Scholars:



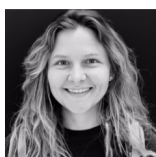
Ashley Berninghaus

Oregon State University, Ph.D.

Evergreen Surety Bond Scholar

[Anaerobic Co-digestion of Organic Solid Waste for Increased Methane Production](#)

Ashley's work focuses on improving a process that is already occurring at some wastewater treatment plants across the country. This process, called anaerobic digestion, typically serves as the final step in wastewater treatment. The anaerobic digester is where all of the sludge and solids are sent to be broken down by microorganisms in the absence of oxygen. Fats, oils, and greases (FOG) can be used to enhance biogas production in anaerobic digestion, but this process is fairly sensitive to changes in feedstocks. Ashley's research looks at how to optimize the system by altering the microbial community that exists in a digester. She is doing this by stressing the system and overfeeding it fats, oils and grease so that, ideally, the weaker microbes, or those that are not attuned to dealing with fats, die out and those that are better at handling fats make up a larger portion of the population. These results can be used to help operators better adapt their systems to the digestion of fats, oils, and greases and will hopefully allow for existing systems to increase their loading rates, allowing for more food waste to be diverted from landfills in the future.



Morgan Higman

Florida State University, Ph.D.

Robert J. Riethmiller/PTR Baler and Compactor Scholar

[Evaluating Local Management Strategies for Post-disaster Waste Collection](#)

Morgan's project examines local government strategies to manage waste collection challenges in the wake of natural disasters such as flooding, hurricanes or wildfires. Following these kinds of events, the sheer volume and haphazard distribution of waste materials can pose significant collection burdens as well as threats to public safety. This project evaluates the use of particular contracting strategies to reduce the costs and administrative burden affiliated with this special kind of waste collection. Altogether, this project seeks to identify dimensions of effective, efficient special waste collection across a variety of local governments and disaster types to guide decision-makers, improve service delivery and advance recovery efforts in post-disaster waste collection scenarios.



Seth Kane

Montana State University, MS

GMI Scholar

[Biochar from Residential Food Waste as a Value-added Filler in Thermoplastics](#)

Seth's project looks to develop novel composite materials by combining biochar from food waste with recycled or biodegradable plastics. Biochar is a carbon-based material produced by heating biomass in a low oxygen environment. From a waste reduction perspective, it is not desirable to add fillers to plastics that may be recycled, as recycling of composite materials is not widespread and is economically expensive. For this reason, recycled high-density polyethylene (HDPE) and a biodegradable plastic, polylactic acid (PLA), will be examined. When added as a filler material to plastics, biochar from agricultural residues has been shown to increase the strength of plastics, and decrease the weight. This analysis will identify potential areas in which these composites could replace neat plastics (pure compounds).



Zachary LaTurner

Rice University, Ph.D.

Waste Industries Scholarship Honoring Lonnie C. Poole Jr.

[Developing Novel Methods for Resource Recovery: The Future of Food Waste Management](#)

Food waste is a vastly underutilized resource that contains large amounts of bioavailable nutrients and resources. Acid fermenters are microbially based platforms that can break down food waste into volatile fatty acids. Additional biological or chemical processes can turn these volatile fatty acids into many different organic chemicals. As such, volatile fatty acids are a potential chemical production platform to replace the petroleum and oil-based platform that is used to produce a wide range of products today. One of the goals of Zach's research is to elucidate how different functional groups of microorganisms in acid fermenters break complex organic matter down into simple volatile fatty acids. This knowledge will help determine how the variability in the incoming organic waste stream affects the composition of the effluent stream. Additionally, a fundamental understanding of the interactions will give us greater control over the function of the microbial community.



Sierra Schupp

North Carolina State University, MS

Carl J. Apicella Scholar

[Methane Production and Microbial Ecology of Solid Waste in Elevated Temperature Landfills \(ETLFs\)](#)

As solid waste anaerobically decomposes in a landfill, methane gas is produced and often captured. It is generally accepted that landfills operate optimally at mesophilic temperatures (moderate, around 37°C/98.6°F). In addition to threatening the infrastructure of a landfill, elevated temperatures are presumed to inhibit methane generation. However, there is evidence that microbial communities present in waste are able to adapt and sustain methanogenesis (formation of methane by microbes) as temperatures rise in landfills. Sierra's research project aims to evaluate the temperature range for methane production in landfills exhibiting elevated temperatures. In concurrence, this work will elucidate the microbial ecology of solid waste in elevated temperature landfills.

**Martina Soliman***The Pennsylvania State University, MS**Robert P. Stearns/SCS Engineers Scholar*[Reclaimed Waste to Energy Aggregates as Lightweight Sand in Concrete Masonry Units](#)

In the United States, solid waste is being disposed of in landfills at a rate of 50 – 60% due to a lack of existing recycling infrastructure. Solid waste is processed through municipal solid waste incinerator plants, where it is burnt into ash to significantly reduce its volume. 80 – 90% of this ash is sent to landfills, which is an unsustainable practice due to decreasing land availability. In addition, landfill disposal of raw ash costs \$30-40 per ton. Alternatively, in recent years a recycling process has been developed to refine solid waste ash into a sand-like material known as reclaimed sands. Martina's research investigates the utilization of reclaimed sands as lightweight, fine aggregates in concrete masonry units (CMU).

EREF scholarships recognize graduate students pursuing excellence in solid waste management research and education. Recipients are chosen based on credentials and potential contributions to the solid waste industry and its scientific community.

EREF scholarship applications for the 2020-2021 school year are due late Spring 2020. At the time of application, students must be, or will be in 2020, a full-time master's or doctoral student, and have a clearly demonstrated interest in solid waste management research.

For more information on the EREF Scholarship Program or to access the application, please visit erefdn.org.

New Named Scholarship Honors Tom J. Fatjo, Jr.

EREF's Scholarship Program has provided financial support to over 80 students since its inception in 1998. A number of the scholarships offered were established in memory of those who have played a vital role in the waste industry. This year, donations from companies and individuals from the waste industry have funded a named scholarship honoring Tom J. Fatjo, Jr., who passed away earlier this year. The first Tom J. Fatjo, Jr. scholar will be named in 2020.

"My father was a true visionary who believed that any obstacle could be overcome," said Tommy Fatjo, Tom's son. "People gravitated toward him, drawn by his charisma, creativity, positivity, honesty and integrity."

Tom was no stranger to dreaming big. Early in his career, he came across a challenge to improve waste collection in his neighborhood. Tom embraced this challenge which led to the creation of Browning-Ferris Industries. Under Tom's leadership, BFI became one of the largest waste management companies in the nation. This entrepreneurial venture was only the beginning. Tom has been the founder and major shareholder in many different businesses including Fannin Bank, Mortgage Banque, American Title Co. and Criterion Management. Tom shared his creative enterprise process through authoring the book "With No Fear of Failure." In 1979, driven by a personal passion towards health and fitness, Tom developed the Houstonian Hotel and Fitness Center along with the Houstonian Estates. His expertise in health and fitness resulted in his appointment to the President's Council on Physical Fitness and Sports under Presidents Jimmy Carter, Ronald Reagan, and George H. W. Bush. During this time, Tom ran over 30 marathons, including 13 Boston Marathons. Tom returned to his roots in the waste business in 1990 and over the next 10 years founded Republic Waste, TransAmerican Waste and Waste Corporation of America.

EREF awards scholarships to Master's or Doctoral students pursuing an education in solid waste who demonstrate excellence and passion for their work. The Scholarship Program aims to encourage students to work in the waste industry upon graduation. Cumulative scholarship funding is nearly \$2 million.

"WCA is honored to support the establishment of the Fatjo Scholarship," said WCA Waste Corporation CEO, Bill Caesar. "Tom was the driving force behind the establishment of WCA and we are thrilled to give something back to him and his family."

EREF is still seeking additional support for this scholarship. If you would like to honor Tom's memory, please consider making a donation. To donate to the Fatjo scholarship, contact Kristy Pickurel at kpickurel@erefdn.org.

Internship in Excellence Program Instills Passion for Solid Waste in Students

In a time when the waste industry faces labor shortages, bringing in young talent is imperative. For 2 years, EREF's Internship in Excellence Program (IEP) has connected full-time students with waste industry companies in the hopes of opening students' eyes to the important role the industry plays in the sustainability movement and encouraging students to pursue a career in the solid waste field. Students work full-time over the summer, learning the ins and outs of solid waste, and, upon completion of the internship and other requirements, interns are eligible for a scholarship.

In 2019, IEP interns Jessica Babb and Samantha Steele received scholarships. Below, they discuss the value of their experiences.

Jessica Babb
Purdue University

This summer I interned at Casella Waste Systems, which is a waste management company based in Rutland, Vermont. Casella Waste Systems is a mid-size company that operates mainly in the Northeast United States including states such as New York, New Hampshire, Maine, Vermont and Massachusetts. They provide services such as collection, recycling, transfer and disposal of waste. I was lucky enough to see a couple of their facilities including a landfill, composting site, and a recycling facility. Throughout the summer I was able to see how many of their departments operated and gain more knowledge on the waste industry.



While at Casella, I worked as an Environmental Engineering intern in the Environmental Compliance Department. I worked with the Vice President of Engineering and Compliance to update Casella's facility list. The facility list already had information like whether or not the property is owned or leased, the address, and also the name of environmental analysts overseeing the property. I expanded the list by adding the parcel number, zoning, acreage, and owner of each property. I found this information on county and town websites that gave public access to property data. Once I collected all the data, I had a meeting with one of the environmental analyst to ask questions about property information I found and filled in the missing gaps. Unfortunately, due to time constraints, I was unable to talk to the other environmental analysts and fill in the

rest of the missing information. Luckily, I reformatted the excel sheet to make it more appealing and also easy for the next person who will be working on the list to follow.

This project might not have had a direct impact on the waste industry, but it does impact Casella in a small way. Gathering all this information into one excel sheet helps Casella gain a better understanding of all the properties they own. This will

help them know where they have room to expand and build more facilities in the future.

I also worked with the environmental analyst located at Casella's home office and read through a newly released Storm Water Permitting Rule for Vermont. I used the property list I expanded on to find the Casella's properties that might be subjected to the rule. I gathered up this information and put it into a document for the Environmental Compliance team to view. This permitting project does not have a major impact on the waste industry, but it helps Casella keep up with new permits and remain in compliance.

Working at Casella was a great experience because I was able to get a preview of what it will be like working full-time. I also learned more about the waste industry and just how important it is to everyday life. I hope to continue learning more about the waste industry, so I can contribute more in the future.

Samantha Steele

University of Michigan, Ann Arbor

Normally, when people hear the phrase "ride along", what they imagine is a rookie police officer riding in a patrol car with an experienced officer. My ride along however, was rather unique and quite a different experience. As part of my internship with Republic Services, I had the opportunity to participate in a ride along on a garbage truck and learned a great deal along the way.



My morning began with an alarm sounding at 1:30 AM, as I needed to be ready at the facility at 3:00 AM. Based on this early start, I immediately gained an incredible amount of respect for the drivers who were able to wake up so early every single day. Once I arrived at the facility, I was greeted by smiling faces and an abundance of hot coffee. The workday started with an informational video regarding a few changes the company was implementing, and next there was a discussion with the full staff regarding changes in pick up routes and personnel. Once the drivers were aware of any variations to their normal routes, the team was ready to head out onto the road at approximately 3:30 AM. Ready for my adventure, I laced up my boots and hopped into the truck. Luckily, I had been paired with a very enthusiastic driver with whom I would spend the next 6 hours.

Our route was primarily commercial, picking up and unloading dumpsters at restaurants, convenience stores, gas stations, apartment complexes, and many more locations. What impressed me the most was the skill the driver possessed throughout the entirety of the ride along. First, he needed to understand how to navigate such a large vehicle, driving on both highways and back roads. In addition, at all times he was in full control of the vehicle when he extended the arms of the truck in order to lift the dumpsters to drop the load in the cabin. Lastly, my driver had his route of over 80 stops completely memorized, including the best way to drive to each location and then the quickest approach to reach the dumpsters.

Being out on the road and the opportunity to witness the waste industry through the ride along was extremely beneficial. Although I was absolutely exhausted, by the end of our ride along I had learned many aspects of the waste industry that I could not have gleaned from my desk in the office. I gained the utmost respect for the front-line workers who are extremely knowledgeable, skilled and dedicated, and I wish more people appreciated how vital their work is for everyone in the community. I am thrilled that I had this opportunity and would recommend that anyone in the waste industry participate in a ride along to truly appreciate the importance of this industry.

For more information on the IEP, [click here](#).

2019 Fundraisers Raise More Than \$2.4 Million

The EREF Annual Charitable Auction (held at WasteExpo, with EREF's booth space provided by Waste360) features generous donations from members of the waste industry and provides opportunities for exhibitors to increase their visibility at WasteExpo. This year the Silent Auction brought in more than \$52,000, while the Live Auction raised more than \$1.9 million. [Click here](#) to view the sponsors, donations and winners. During the Live Auction, following a brief thank you from EREF scholar Chad Spreadbury, who received funding for his Ph.D. research on [Waste to Energy Ash in Roadway Construction](#) at the University of Florida, bidders were asked to raise their paddles to Fund a Need. Money raised supports EREF's scholarships and Data & Policy Program (D&P). In total, EREF received over \$237,000 to directly fund research in the solid waste industry through scholarships and assistantships.

In October, EREF celebrated its 25th anniversary with a celebration in Orlando, FL. The celebration, co-located with the Foundation's annual Fall Classic, began with a networking reception then moved into a program with a plated dinner. The dinner portion of the evening included a message from the EREF board chair, Jim Dowland, video interviews with key participants in EREF's history as well as those who have received funding from EREF and how their research impacted the industry. The night concluded with keynote speeches from Richard Burke (Advanced Disposal), Jon Vander Ark (Republic Services), Worthing Jackman (Waste Connections) and Tara Hemmer (Waste Management) regarding the value of EREF and the importance of supporting the charity. The following day, Fall Classic attendees loaded up their golf carts for a shotgun start at the Villas of Grand Cypress. Golfers participated in a number of contests on the courses including a longest drive marshmallow contest and an air gun contest. The event concluded with an awards luncheon during which contest winners and 1st and 2nd place teams received awards. [Click here](#) to view a complete list of Fall Classic sponsors and winners.

Mark your calendars for EREF's 2020 fundraisers!

Annual Charitable Auction

Silent Auction: May 5 – 6

Live Auction: May 6

WasteExpo – New Orleans, LA

Fall Classic & Networking Event

September 30 – October 1

Pinehurst Resort – Pinehurst, NC



Staff Updates

Full Time Staff

Debra L. Kantner, Sustainability Director



Debra L. Kantner joined EREF in January 2012, as an intern in what would eventually become EREF's Data & Policy (D&P) Program. Over her tenure at EREF, Debra has worked to create and transform the D&P Program into a leading source of data and analysis on MSW management. Since November 2019, Debra now serves as EREF's Sustainability Director. In this new capacity, she leads EREF's initiatives surrounding product packaging and sustainable materials management.

Debra received Bachelor's and Master's degrees in Environmental Engineering from North Carolina State University. She lives in Raleigh with her partner, Bradley. In her free time, Debra plays French horn in the Duke Medicine Orchestra and the Durham Community Concert Band and volunteers in the local community as a member of the Junior League of Raleigh.

Caitlin Conklin, Events Manager



Caitlin Conklin joined EREF in February 2019. The responsibilities of her position include planning and logistics for all EREF events, and maintaining continuing education accreditation. Caitlin brings more than five years of experience in non-profit project and event management to the role.

Caitlin grew up in North Carolina and received her BA in Hospitality and Tourism Management with a minor in Business Administration from the University of North Carolina at Greensboro. She lives in Raleigh with her life partner Dennis, her eight-year-old son Chase and her 18-year-old step-daughter Carly who attends East Carolina University. She loves baking, her Olde English Bulldogges and spending time with family and friends in her free time.

Part Time Staff

Ty Jackson, Events/Administrative Coordinator



Ty Jackson joined EREF in October 2019 and is responsible for assisting with planning and logistics for all EREF events, as well as supporting the Internship in Excellence Program. Ty has over 20 years of experience within the event/administrative support role; with experience at Warner Media (formerly known as Turner Broadcasting System, Inc.) and most recently at the Metro Atlanta Chamber.

Ty grew up in Queens, New York and received her BS in Communications from St. John's University; she is also a Certified Event Planner through Correlations LLC. Ty lives in Wake Forest, NC with her husband and son. In her spare time she loves planning children's events and spending time with her family and friends.

Kimberly Lewandowski, Research and Scholarship Coordinator



Kimberly Lewandowski joined EREF in October as the Research and Scholarship Coordinator, a role which assists with the Research Grants and Scholarship Programs. Kimberly has a BS in Biological Sciences from Wayne State University, as well as a MBA from the University of Michigan. Prior to joining the EREF team, she has worked as a Project Scientist in R&D and as an Environmental Scientist for a private civil engineering firm, and she has experience in environmental compliance including Phase I & II ESA's, Brownfield Remediation, NEPA permitting and air & water monitoring and testing.

Kimberly recently moved to Raleigh from Michigan with her husband Mark, and their children, Jack, Cate and Natalie. Outside of the office, Kimberly loves spending time with her family and is the owner of her own personal chef service.

Lisa Price, Communications Coordinator



Lisa Price joined EREF in October as the Communications Coordinator, a role in which she supports EREF communications initiatives to disseminate EREF's research and education. Lisa has a BA in Business Management and a BA in Speech Communications from North Carolina State University. Prior to joining the EREF team, she worked as an Intranet Editor for a global provider of legal, regulatory, and business information. She did inside and outside sales and marketing communications for a global electrical engineering and automation provider. Lisa is also an award winning radio news reporter and anchor. She has worked for two local major media outlets. She also helped create a podcast network for a

Triangle-based nonprofit group.

Lisa is a Raleigh native. She has one son, Josh, and a daughter-in-law, Rachel. She is the primary caregiver for her 83-year-old mother. Outside the office, Lisa enjoys traveling and finding that elusive bargain at area flea markets, thrift and consignment stores.

Susan Rigby, Development Coordinator



Susan Rigby joined EREF in October as Development Coordinator. In this role, she supports EREF's development initiatives and goals through data management, prospect research and development events. She studied Political Philosophy and Ethics in undergrad, receiving a Bachelor of Arts in Philosophy from Appalachian State University and graduating Cum Laude with Departmental Honors in 2013. After graduation, Susan moved to New Orleans and spent six years working in the nonprofit sector focusing on organizations geared towards education, arts administration and

conservation. Now that she is back in the Triangle, Susan is thrilled to work at EREF, continuing her career in the nonprofit sector. When Susan is not at work, you can find her reading, playing guitar, or hiking with her dog, Barnaby.

Meghana Kuppa, Research Assistant



Meghana Kuppa began working at EREF as a Research Assistant in October 2019. She has a master's in Environmental Engineering from Duke University and obtained her Bachelor's in Civil Engineering in India. Watching Al Gore's 'Inconvenient Truth' as a 10-year old was what made her decide on pursuing a career in environmental protection and sustainability.

Meghana has prior internship experience in sanitation engineering and policy, energy-efficient building design, and also has experience conducting science research to support environmental litigation. Her current work at EREF involves studying and assessing the causes and frequency of fires at material recovery and scrap recycling facilities.

Going forward, she hopes to build a career in the waste-to-energy space; finding solutions to the problems of seemingly endless waste generation and fulfilling energy needs. In her spare time, she enjoys reading, singing, playing guitar, and never finishing a TV show she started watching.

Marissa Nixon, Research Assistant



Marissa Nixon is a recent NC State University graduate with a Bachelor of Science in Environmental Technology and Management. She became interested in waste management after working for the Department of Environmental Quality, Waste Management Division for two years during college. Additionally, she developed a passion for non profit work after working part time for the NC Building Performance Association, a non profit focused on sustainable building practices and materials. She is joining the team as a Research Assistant, and is looking forward to gaining more experience in the industry.

Marissa has been passionate about the environment and outdoors for many years. Her hobbies include rock climbing, backpacking, and any other outdoor activity. For a gap year after college, she completed a thru-hike of the entire Appalachian Trail, which spans the length of 14 states and took 6 months to complete.

[Click here](#) for a complete list of EREF staff.

Former Research Assistant Reflects on Lessons Learned During His Time with EREF

EREF's Data & Policy Program (formerly Internal Research Program), has employed undergraduate students to assist with the data aggregation and analysis. Written at the end of his assistantship in May 2014, one of the first Research Assistants, Ryan Duckett, explains the lessons he learned during his time with EREF and why solid waste is a field you never knew you would love. Ryan currently serves as Project Engineer at SCS Engineers where he has worked for 5 years.



In my nearly three years as an intern at EREF, I've come to learn a thing or two about waste. Not just waste in the way you're thinking though – a noun used to describe the material we all know and maybe, just maybe, love – but waste taken as a verb. My favorite definition for this comes from dictionary.com: to consume, spend or employ uselessly or without adequate return; use to no avail or profit. That last part cuts particularly deeply into the mind of a career-seeking college student due to its economic relevance. The truth is that wasting "waste", especially in today's world, is still waste. And waste means loss of resources and money.

This applies on several fronts. First and foremost is the stage of the producer. This is the part of a product that is largely out of the consumer's and waste manager's hands. I started out at EREF exploring how the terms "Zero Waste" and "Zero Landfill" were being used by corporations and the occasional municipality of today. My conclusion was that trying to achieve zero of either, especially the mythical former, looked like an asymptotic curve coming closer and closer to nil, but never quite getting there. Zero waste was a good goal towards which a sustainability-minded entity should strive, but at face value is hardly attainable. True zero waste with current technology is off the table, as papers and plastics lose their structural strength and eventually their ability to be recycled after something like seven or eight cycles. That means that a fraction of material is coming out in the waste sludge. Zero landfill is theoretically doable, but if a company is incinerating waste residuals to be able to claim zero landfill, is the term that meaningful? The tangible material is still being obliterated, even if waste to energy (WTE) technology is employed. Striving to minimize the loss of resources, whether material or energy, is a noble goal no matter what the word for it is. The best way to do this is to practice the first of the three R's in that old buzz phrase: reduce, reuse and recycle. Source reduction, the design of products to minimize the volume or toxicity of waste generation, is most effective from the side of the producer.

My next major project at EREF sought to determine whether the presence of a WTE (mass burn or RDF) plant has an effect on recycling rates, and this is where the next two fronts of consumers and waste managers come in. This project is ongoing, but the complexities revealed so far make this a tough issue. Whether the answer is tied psychologically to the consumers in a WTE community or policy-wise to its waste handlers and political decision-makers remains to be seen. Another big

question is how emerging waste conversion (WC) technologies fit into the waste hierarchy. Gasification (including plasma arc), pyrolysis and hydrothermal carbonization all seem promising, but are relatively unknown. In fact, a petition of roughly 400 people shut down plans to build a modern pyrolysis plant in my home county, a facility that would have eliminated the need to truck 100,000 tons of waste per year an extra 60-80 miles roundtrip under the current landfilling system. The facility would have produced biochar, a charcoal like material that can be used as a fuel or soil amendment, and synthetic natural gas. It makes economic sense to make waste into products of value, so long as the cost of the production process does not exceed that value.

Consumers are the largest component of the waste system, and this particularly came to light during my final projects at EREF, which involved helping to aggregate the national MSW tonnage produced in 2010. In addition to the volume of incineration, I compiled tonnage data for both recycling and composting. Going through lists of hundreds of MRFs, scrapyards, drop off centers, composters and other facilities really highlighted the breadth of infrastructure we have, even in Middle-of-Nowhere USA. Therefore, if a recycling or diversion rate needs improving, it's largely up to the individual consumers. Reusing and recycling is simply a matter of motivation and effort for most people. During my time at NC State University, I would often scan Craigslist for items to resell for extra cash. Many of these items were regarded as trash by their owners, given away for free or chump change as a result of a quick move-out, and would often be threatened to be landfilled if nobody came and got them. Sadly, the majority of these mass-discarders do not utilize online resources or take the time to donate items. Large amounts of junk varying from useless to valuable end up going onto the curb or crammed in the can if resourceful scavengers such as myself don't get to them first. Just this morning the contents of my neighbor's house met this fate. Keep in mind that this is a family that knows trash; they work for the city and I've seen at least four different sanitation services vehicles in their driveway. This is also a family that forfeited a recycling can for a second one for garbage. Perhaps, like many Americans, they know trash too well and have adapted the attitude that it is simply a necessary part of life.

While attending college, most people don't get a simultaneous 3-year education on solid waste (especially while getting paid!) and for that I am extraordinarily grateful for my time at EREF. What started as a high school senior project is cumulating into what is shaping up to be a career in solid waste engineering/consulting or something related. You may wonder why someone would intentionally choose this field from the get go instead of suddenly finding themselves in it 20 years later, but waste is important. After all, it is the tangible remains of all the other goods and services that make up our bustling economy, and right now it looks like those goods and services are going to be around for some time. It is also important, however, that we do not view waste solely through the lens of its definition as a noun, but also as its status as a verb. As producers, consumers and waste managers, let us be reminded that a material's status as waste does not mean we are entitled to let it go to waste.