College of Engineering & College of Agricultural Sciences

BIOLOGICAL & ECOLOGICAL ENGINEERING

Winter 2022

Ecological Engineering students, Sierra Smith, samples reservoir plankton during a harmful algal bloom. Sierra worked with Dr. Desiree Tullos on research to examine how water quality changes over the course of the Klamath dam removals will impact the base of the food web, which feeds things like salmon and other threatened and culturally-relevant aquatic species. She was excited to be part of the biggest river restoration project in history.

The Redesign of the Capstone

Engineering is a dynamic field and our understanding of ecological systems and potential solutions to address environmental problems is ever-changing. Because of this, our BEE regularly reexamines curriculum and surveys alumni, industry partners, and our advisory board to make sure that our graduates are well-positioned to meet the needs of the job market.. This year brought one of the biggest changes to the EcoE program, including moving our first-year engineering students to the main college as General Engineering students and making some updates to our capstone project course.

The biggest change for Senior Design this year is the move from a two-quarter sequence (4, 4 credits) to a three-quarter sequence (4, 3, 2 credits). The instruction of the course also saw a changing of the guard, with Dr. Gerrad Jones taking over for Dr. Ganti Murthy two years ago as instructor after Dr. Murthy moved onto a new position in India. This year Dr. Frank Chaplen took over for Dr. John Selker; John was with the course since its inception 10 years ago but has recently accepted the role of President of the Water Resources Division at the American Geophysical Union.

According to Dr. Chaplen, “The move to a three-quarter sequence for Senior Design appears to be having a significant impact on overall student experience. While the workload has not increased significantly, three quarters better fits the rhythm of Senior Design.” The change in increase in quarters also gives the students more designated preparation and development time prior to presenting

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DONOR & ALUMNI EVENTS

Engineering Expo

When: Friday, June 03, 2022; 11-4 pm

Where: Kelley Engineering, OSU

What: See what EcoE students are doing and ask them questions about their design projects.

Spring Banquet

When: Thursday, May 19, 2022. Appetizers at 5:30 pm, Dinner at 6 pm, followed by an awards ceremony

Where: TBA

What: Our end of the year award banquet for a chance to recognize the exceptional students in BEE.

Dinner is included

Graduation BBQ (Tentative)

When: Friday, June 10, 2022; 12:30-2 pm

Where: Outside Gilmore Hall

What: A potluck BBQ for graduating seniors and their families to tour Gilmore and meet the department. All students, alumni and donors are welcome.

Oregon State University

Miner Scholarship Recipient

The Ron Miner Memorial Scholarship honors the memory of J. Ronald Miner, an Agricultural Engineering professor at OSU from 1972-2003. Dr. Miner was an internationally recognized expert on livestock waste management, water quality and odor control. At the same time, he served as an endlessly supportive coach and mentor to his graduate students and is remembered for his charm, enthusiasm for life and love for teaching.

Daphne Guo is a PhD student in Biological & Ecological Engineering advised by Dr. Gerrad Jones and is this year's recipient of the Ron Miner Memorial Fellowship.

Daphne was born in Mesa, Arizona and grew up in the Phoenix metro area. She got her Bachelor of Science in chemistry at Harvey Mudd College, in Claremont, CA, where she completed a senior thesis in physical chemistry. Ms. Guo's area of research was the viability of organic fatty acids as phase change materials, a type of energy storage technology.

After graduating from Harvey Mudd in 2019, Daphne stayed in California to attend Stanford University for a Masters in Chemistry. Ms. Guo started with Biological & Ecological programin Summer 2021. According to Daphene, "[I] was drawn to chemistry as a field because of of its many real-world applications (Environmental protection, Medicine, energy, etc), and was happy to discover that her chemistry background would translate well in Gerrad's lab in BEE. Her work in the lab specializes in chemical "fingerprinting" of water using mass spectrometry data and machine learning tools.

Daphne hopes to continue work in water quality and environmental safety after she graduates, and perhaps eventually teach at an undergraduate institution to help prepare future generations interested in biological & ecological engineering.

While not working on her studies, Daphne is a Pokemon enthusiast, a novice mushroom forager and a proud first-time dog parent. She is excited about being a part of our Beaver community and we are delighted to have her in the program.

New EcoE course – BEE 270

At the end of a student's time in BEE, we like to sit down with them to find out what worked and what they felt needed improving. For several years the students were requesting a more Ecological based course during their first two years. Thanks to their extensive input and alumni surveys, the undergraduate Ecological Engineering curriculum was updated in the 2020-2021 academic year.

The first new course to be offered so far is "Ecology for Engineers" (BEE 270) which was first taught in Fall 2021. BEE was fortunate to find an instructor for this course in-house as our head advisor, Rachel Jones, has a PhD in Ecology.

Ecological Engineering Undergraduates, Colleen Anthony and Anabel Baker, collecting soil samples for a community ecology lab during class.

In the lecture portion of this course, students learned about interactions between organisms and the biotic and abiotic components of their environments. They also discussed how humans have altered the structure and function of natural systems and the role that ecological engineers can play in conservation and restoration. Students were able to get hands-on experience collecting data from aquatic and terrestrial systems during field laboratories and learned how to analyze data using basic statistics and clearly communicate their main findings in scientific reports. Initial student response to this course has been very positive.

Another benefit with the change in programming is the reduction of credit hours required. The program is now 180 credits (down from 192), which is in line with university standards. We are pleased to offer our unique, multidisciplinary degree in a more affordable and time-sensitive format and are particularly excited about several new course additions that should strength learning outcomes for students.

Other upcoming new courses include "Ecological Engineering Microbial Processes" (BEE 362) and a third term of the senior design (capstone) series, both which will be offered in the spring term. We will provide updates on these courses as well as the success of the new curriculum in future newsletters.

Keeping Internships Going During Covid

Q&A with Ecological Engineering undergraduate, Laurel Shepard, about her MECOP Internship with Intel during COVID

Laurel Shepard working at her home office for the Intel Global Environmental Team

COVID brought many changes to our learning environment, including the internship experience. After over a year of shut-downs, many organizations spun up their successful internship programs and used the opportunity to rethink what this work looked like.

Ecology Engineering Senior (Double majoring with Environmental Engineering), Laurel Shepard, was able to join Intel's Global Environmental team this past summer as an intern via the MECOP program (www.mecopinc.org).

Working from home made this experience quite unique from other experiential learning opportunities.

Tell us a little about yourself:

"Ever since I attended an environmental science middle school, I knew I wanted a career related to protecting the environment. Although I enjoy science experiments, I like solving problems and designing things even more; that's why I chose engineering over environmental science. I chose environmental engineering because I want to contribute to systems that mitigate environmental problems, and I chose ecological engineering because it covers a broader scope and has given me experience in things I would not have gotten with environmental, such as surveying, stormwater management, and modeling software. There is a lot of overlap between the two degrees so I'll be able to complete them in 5 years. Adding environmental engineering as a second major also allowed me to participate in OSU's MECOP program, which landed me an internship."

What did you work on?

"I was an environmental engineer intern at Intel on their Global Environmental team, which is a division of Environmental Health & Safety (EHS). The team's role is to help Intel sites across the globe maintain compliance in air, water, and waste programs. I worked entirely from home, but I still felt connected to my team and to other interns. I worked on:

•Notice-of-Violation Benchmarking

I researched how Intel differs from other semiconductor companies in the way that they publicly report EHS notices of violation to understand how transparent semiconductor companies are about the environmental and/or safety violations and fines issued to them by regulatory agencies.

In the end, I found that Intel is among the most transparent semiconductor companies when it comes to environmental, fire, and safety violations. I presented my findings to both the Global Environmental team and Intel's Legal team and everyone was pleased with the results because one of Intel's core values is truth and transparency. In addition, my work will be shared with legal management as part of a compliance program review.

•Emissions Data Management System Development

Of all my projects, this required the most attention to detail. Intel's EHS engineers must perform reoccurring testing on the chemical constituents of their facility's air and water emissions. This is done to ensure compliance with with regulatory and/or permit limits and various other engineering purposes. When evaluating compliance, it is often helpful to analyze trends from testing over the past five years or so. This helps engineers determine if emissions of certain compounds are increasing or decreasing over time, and therefore informs decisions on future abatement efforts.

However, it can be very time-consuming to track down old data sets so EHS has been developing an emissions data management system that can store and organize air and wastewater data for them. I was recruited to help compile air data from 2016 to 2021 into a single Excel file that will be uploaded to this new software system. My work will positively impact Intel by significantly reducing the time site engineers devote to examining multi-year trends in air emissions.

Although it may sound straightforward, there were many roadblocks that came up along the way. Sometimes it was not clear what equipment ID to assign to a data point, the test times were missing, or it was not clear whether the test should be designated as "outlet", "inlet", or something else. There were also several tests whose concentration values were below the detection limit of the measuring device; those tests had to be labeled as "non-detects" and their corresponding detection limit had to be included. The detection limits were often hard to find or missing from the source data.

•Data Support for PFAS and Chemical Footprint

Worked with large datasets to determine the chemicals that Intel uses the most, and therefore should be considered in the Chemical Footprint project. I also generated a list of all ingredients used at Intel that contain PFAS (polyfluoroalkyl substances), which are beginning to get regulatory attention due to their potential carcinogenic effects when present in air and water.

How did you find the Internship?

"I got my internship through the MECOP program, which unfortunately is not available to Ecological Engineering

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BEE Update - A look at the year past, and the year ahead*

The past year in BEE was an eventful one – adapting to COVID, new additions to the faculty, and continuing development of our undergraduate and graduate programs. Change has been the theme this year in the department, one that we embrace as new opportunities (and a few challenges) present themselves.

It is difficult to talk about 2021 without including COVID-19 in the discussion. As we worked through the second year of the pandemic and its many challenges, we've been able to successfully return to our classrooms, thanks to OSU's mandatory vaccine policy and emphasis on meeting educational goals while providing a safe and supportive teaching environment. We all, faculty, staff, and students, have appreciated being able to meet face-to-face for classes while still using electronic course delivery options and strategies developed over the last several years where appropriate. It's clear this "hybrid" approach, blending in-person instruction with remote access to materials and other resources, is here to stay and we are well positioned to take advantage of this blended approach moving forward. A good example of this is our "BEE Jupyter Hub", a web-accessible programming environment for learning new software tools for engineering analysis, which is utilized in several our BEE courses. Students can access this resource from anywhere in the world to learn programming skills, perform engineering analyses, develop mapping and remote sensing applications, and generate interactive engineering reports. Adding this resource has promoted student collaborative learning and program resources to practice analysis techniques and datasets used in real-world problem-solving, while building their communication skills. Modern engineering analysis is becoming increasing complex and resources such as this provide students with the tools they need to be successful after graduation. We are excited about the possibilities of this hybrid approach as we look toward educating our future engineers. More and more we are emphasizing "experiential learning", a hands-on approach to education that engages students in real-world problem solving, and the benefits to our students are clear. A leading example of this is our Senior Design sequence, expanded to encompass three terms this year. Students apply ecologically-based design principals to develop practical solutions to a variety of societal problems that provide real-world design experience.

2007 Open House

BEE has also seen a few changes in faculty this year. Dr. Ganti Murthy, a long-time BEE faculty member working in several areas related to biological engineering, left us to lead the development of a new engineering center at the Indian Institute of Technology in Indore, India. While we will miss his presence in Corvallis, we are looking forward to new collaboration and international exchange opportunities for our students his new Center can provide. We anticipate filling his position soon.

We also had the opportunity to bring in two new faculty members to address emerging state and national issues around water use and water supply. Dr. Maria Zamora Re is our new Statewide Extension faculty focused on agricultural water supply and irrigation management. She joins us from the University of Florida and will be working with producers and others around the state to develop efficient and effective irrigation and water use

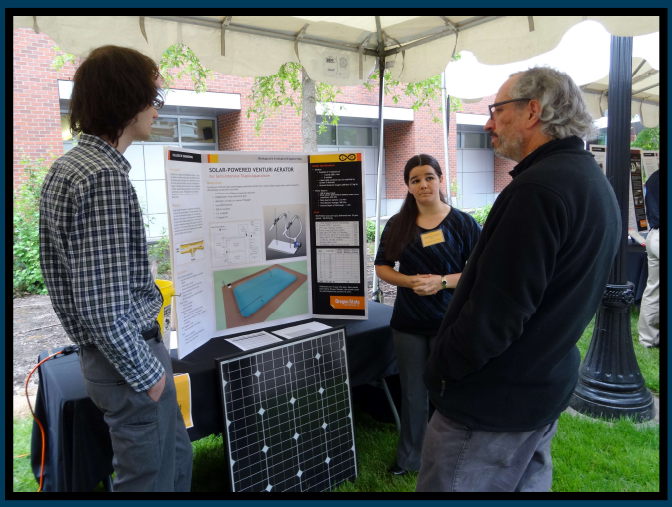
2018 Spring Award's Banquet

**We've included some photos of Dr. Bolte through the years; he's been quite elusive.*

2018 Spring Awards Banquet

strategies for agricultural production. Dr. Salini Sasidharan is a groundwater management expert who will be working with producers and regulators around the state and region to better understand and manage our increasingly stressed groundwater supplies. She comes from the Salinity Lab at the University of California, Riverside. We are very excited to have these two outstanding scientists join the BEE faculty!

Finally, I am stepping down from my role as BEE Department Head, a position I have held for nearly two decades, and returning to the faculty ranks to better focus on research and academic program development in BEE. Additionally, I'll be taking on a new role leading OSU's College of Agricultural Sciences' efforts at helping Oregonians address the many water-related challenges facing the state. OSU is a national leader in this area, and recent investments in new "water" faculty provides a great opportunity to continue providing cutting edge research, teaching, and outreach programs serving the needs of the state while building on our national and international reputation in this critically important area. I'm looking forward to this new opportunity, and excited about the possibilities ahead. I'm very proud of what the department has accomplished during my tenure as department head. Some highlights include the launch of our first-of-its-kind Ecological Engineering undergraduate program and achieving full accreditation for that program, bringing on a fantastic group of new faculty that are becoming national and international leaders in their fields, and developing a culture of inclusive excellence that is broadening the impact of our programs and providing new opportunities for students regardless of their background. We are currently engaged in a national search for a new Department Head, and I'm confident that the department will continue to thrive in the future as we transition to new leadership. It has been an extraordinary privilege to lead the department and the incredibly dedicated and talented faculty, staff and students that are the heart of BEE, as well as getting to know our many supporters. BEE is truly a special place, and I look forward to continued success for the department in the future and the new opportunities these changes will provide.



2015 Engineering Expo

Archived Marketing for Bioresource Engineering

Wishing everyone a safe and Happy New Year from BEE!

John P. Bolte

In honor of Dr. Bolte's time and impact on BEE and the hundreds of students we've brought through the program, the faculty have decided to establish a scholarship in his name. We are hoping to raise $50,000+ to endow this scholarship in perpetuity so that we can honor his legacy by assisting students to fulfill their dream of becoming an engineer.
If you can give, please use this link which will designate your tax-deductible donation for the John P. Bolte Legacy Endowment.
https://give.fororegonstate.org/ObAUx5Iluo

BEE Welcomes Two New Assistant Professors

Dr. Maria Zamora Re joined BEE last March as part of our Extension team working with Oregon communities.

María is excited to integrate disciplines and innovated technologies that can help increase crop water use efficiency, productivity, and sustainability in agricultural production systems. Innovation, integration, and collaboration are key components of her goals to help stakeholders thrive and be resilient while facing changes in climate and resources.

Dr. Zamora Re came from the integration of cultures and education values from different institutions and countries. Her goals at BEE are to explore and implement low cost, effective, and innovative tools and solutions that can help producers manage better their water resources in Oregon. Her research areas of interest focus on strategies that can help growers obtain "higher crop per drop" and increasing their productivity and water use efficiency while creating more sustainable ag production systems.

Maria earned her Ph.D. in Agricultural and Biological Engineering, with a focus in Agricultural Operations Management, at the University of Florida. At UF, she also earned her M.S. in Agricultural Operations Management. She received her B.S. in Agricultural Sciences at EARTH University, Costa Rica.

During her free time, María likes to explore and hike different landscapes in Oregon, she enjoys bike riding, going to the gym, and she loves dancing!

Dr. Zamora Re collecting on-site rainfall data (and making sure the collection device didn't have any bird nests) while at the University of Southern Florida. This study was conducted in a blueberry field at the Plant Research and Education Center near Citra, Florida. Maria tested different irrigation treatment regimes to determine blueberry water use and to evaluate an irrigation scheduling App for blueberries. This App was intended to help growers better manage water resources and conserve water.

Dr. Salini Sasidharan joined BEE in January 2022 as an Assistant Professor and Sustainable Groundwater Management Engineer. She received her M.Sc. in Biotechnology from the University of East London, UK, in 2010, and a Ph.D. in Environmental Science and Engineering from Flinders University, Australia, in 2016. Salini joins us after spending five years as a Postdoctoral Scientist at the University of California, Riverside, and USDA ARS Salinity Lab. Her postdoctoral research focuses on investigating the performance of various engineering techniques such as drywells, infiltration basins, and Ag-MAR for enhanced managed aquifer recharge (MAR). Dr. Sasidharan established the use of fundamental soil physics and hydrology on water flow, contaminant fate and transport, subsurface soil hydraulic properties, stochastic heterogeneity, 1D, and (2D/3D) numerical modeling to solve large spatial and temporal scale problems such as groundwater quantity and quality.

Dr. Sasidharan researches critical areas of Environmental Science and Engineering, including groundwater quantity and quality management, sustainably irrigated agriculture, and resilient urban and rural water resources infrastructures.

Dr. Sasidharan installing a vadose zone and groundwater monitoring well in Fresno, California

Her recent research includes using drywell as a MAR technique in agricultural fields in Central Valley, California, in conjunction with Ag-MAR operations to enhance the recharge and minimize contaminant mobility from the Ag-MAR field, funded by USDA-NIFA. Salini is working with Groundwater Sustainability Agencies and farmers across the Central Valley. In this research, the soil hydraulic property of the project site will be characterized using a combination of lab- and field-scale analysis coupled with modeling tools. This study will validate the role of site-specific subsurface heterogeneity on infiltration & recharge rate, and arrival time & location of recharged water, and how numerical modeling tools can be applied to determine the ideal location for MAR and groundwater monitoring well.

Salini's research interest also includes developing a pre-treatment unit to remove various contaminants from source water and the use of novel nanotechnology and polymer technologies to stabilize in-situ clay to prevent clay migration. In addition, she is collaborating with various faculty on emerging network properties of microbial communities in the nitrogen cycle, and the use of woodchip bioreactors to remediate NO3 and microbial pathogens. She collaborates with USDA, Davis, and UC Davis researchers to develop geophysical tools and modeling capabilities to characterize the subsurface hydrology to identify the best location to implement various MAR technologies. Finally, she also collaborates with researchers in Australia to compare the economic viability of various MAR practices in the urban water recycling sector and mining industry.

Salini loves to use models to predict the processes, work in the lab to develop innovative technologies, and get her hands dirty in the field to implement engineering solutions to solve real-world problems. When disconnected from research, Salini enjoys connecting with nature. She is a travel enthusiast and nature photographer. In addition, she loves to use social media to engage and inspire the public.

Senior Design continued from page 1

students yet (I had students apply for the program during their sophomore year, and interview with reps from various companies. You cannot choose the company you work at, but you can influence the decision by expressing your preferred interests during the interview.

Advice for future students?

"Working is so much different than school, so an internship is a great way to bridge that gap before you graduate. It also gives you a huge advantage when searching for a full-time job. Even if the company you interned for is not hiring, or even if you'd prefer to work somewhere else, that experience makes your resume stand out, and your previous manager/coworkers can be a powerful reference.

Something else to keep in mind when you're searching for internships is the company's past experience with interns. It was very beneficial that Intel and my particular team had worked with interns in the past. My teammates were willing to help whenever I needed it, and I was assigned a variety of projects that enabled me to develop new skills. I had peers at other companies who felt that they didn't get enough guidance or meaningful project work from their managers. I also learned what it's like to work for a large corporation; there are opportunities for growth and freedom to move into new roles. "

What are your long term plans?

"I've accepted a full-time position with Intel that starts right after graduation. I will be on the Oregon sustainability compliance team. Eventually I plan on getting my master's, but I want to spend some time in industry first to narrow my interests. It would be rewarding to work on Intel's national sustainability team someday, which works with teams across Intel to achieve company-wide goals, like reducing their carbon footprint by 10% or achieving zero waste to landfill by 2030. However, I would also like to try out working for an environmental consulting firm."

Anything else you would like to tell us?

"For my Honors thesis, I am also writing a research paper with Dr. Chad Higgins on a niche topic within the field of agrivoltaics. I built a model in Python to quantify longwave radiation from the solar panels and its effect on soil moisture. I'm currently finishing up the writing stage and intend to submit the paper to a scientific journal.

In my free time, I enjoy swimming, painting, and playing piano."

ENGR: First Year Students

This Academic year not only saw a huge change to the Ecological Engineering program, but also to the first year student experience across the College of Engineering as a whole.

Many times first year students are still unsure about which direction in Engineering they want to go when they join OSU. Engineering+, the new first year engineering experience brings the incoming students into a general engineering setting that is more exploratory, giving them a chance to discover which major in engineering they wanted to join. In the past, transferring between programs sometimes meant redoing a whole year of requirements; the new first year experience was developed partially to help ease those major changes and save students the time and money they were spending to follow the specific engineering major they had realized they wanted. Ecological Engineering sees a lot of transfer students into the program Fall of their second year, making this change incredibly beneficial for our potential students.

This year the Ecological Engineering undergraduate program admitted 24 students – all of who started as General Engineering students. The general engineering first year experiences brings them into a classroom of 125 students taught by faculty from across all College of Engineering disciplines, including Dr. Frank Chaplen teaching ENGR 100 and Dr. Desiree Tullos teaching ENGR 102. Each section has it's own spin on what they teach in the course, with EcoE faculty leaning towards climate change and ecological engineering design.

YOU HELP SUPPORT BEE BY MAKING A TAX-DEDUCTIBLE DONATION THROUGH THE OSU FOUNDATION

Congratulations to this year's scholarship winners...

Thanks to the generous donations from our Alumni and community, BEE is able to award over $38,000 in scholarships for the 2021-22 Academic Year!

Ag Engineering Student of 1941 Scholarship
Colleen Anthony
Ryan Bernardino
Erin Drumm
Gina Kay
Abigail Marx

Myron G. Cropsey Agricultural Engineering Scholarship
Erin Drumm

Dake Kirk Scholarship in Bioresource Engineering
Abigail Marx

John W. and Matha B. Wolfe Memorial Scholarship
Tairenee King
Dragomira Zheleva

Ag Engineering Tech Student Experiential Learning Fund
(1st year of award)
Joseph Ellingson
Jordan Jimmie
Kyle Proctor
Dawn URycki

Ralph N. Lunde Memorial Award
Ryan Bernardino

Drew Mahedy Scholarship for Civic Engagement in Engineering
Isabella Ruikis

The Irrigation King Scholarshiop
Casey Steadman

Andrew & Merle Hashimoto Scholarship in Biological and Ecological Engineering
Anabel Baker
Gabe Jones

J. B. Rodgers Agricultural Engineering Scholarship
Rowan Fay
Dragomira Zheleva

HELP SUPPORT BEE STUDENTS BY DONATING TO A SCHOLARSHIP

https://bit.ly/3FjCrea

Capstone continued from page 1

at the engineering expo, whereas past years they had to figure out how to work it into their schedule as there wasn't a designated class-time. "While individually, the changes were minor," Frank continues, "the sum total of the changes have resulted in a major change in the look and feel of the course. This is reflected in the positive movement of student perceptions as measured subjectively and objectively."

This year's class has 20 students divided into five teams. The teams were tasked with developing one of three projects: Graywater, Nitrogen Management and Brewery treatment.

Graywater is the wastewater discharged from home water use from things like showers, bathtubs, and sinks; it does not include contaminated discharges like toilet water. As climate change continues to threaten water security around the world, the ability to reuse graywater becomes more and more important. If appropriately collected and handled, graywater can be safely reused to flush toilets as well as irrigating certain trees and plants. The Graywater project tasks the students with developing a permittable prototype that could be implement in a residence that maximizes treatment.

Nitrates in agricultural runoff are a serious cause of pollution around the world. One solution is using woodchip bioreactors to denitrify the nitrates in the effluent water into nitrogen through bacterial action. It has been found that the type of wood chips, hydraulic retention times, wood chip size, geometry of the wood chip bioreactor are all variables that impact the treatment efficiency. This team will design a woodchip bioreactor to treat the surface runoff from a pasture irrigated with effluents from dairy barn at OSU and channeled through a drainage ditch during rain events in hopes of minimizing the concentration of nitrates at the outlet of the bioreactor. The system should be suitable for Willamette Valley.

The final project has teams working with brewery wastewater. Highly polluting industries, such as food and beverage, are generating billions of gallons of organic-rich high-strength wastewater per year and face rapidly increasing surcharges or must purchase and operate expensive treatment equipment. Brewery wastewater streams have high levels of Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS) that must be actively managed to avoid overloading municipal wastewater systems and minimize disposal costs. Anaerobic digestion is a process that has the potential for reducing BOD and TSS. Teams will investigate the feasibility of reducing the BOD and TSS of brewery waste streams from a hypothetical local microbrewery, using the process of anaerobic digestion while maximizing the economic benefit of the resulting methane and other gas streams from the digester.

All of the senior design students will research the project and develop a prototype that is not only economical but also easy to maintain to ensure longevity. The prototypes are presented at the Annual Engineering Expo on June 3, free and open to the public.

Jordan Jimmie

By Jordan Jimmie, Water Resource Engineering PhD Candidate

Yá'át'ééh, I am a proud member of the Navajo Nation (Diné), and originally from Flagstaff, Arizona. My heritage and family ties to the Navajo Nation are important to me, as well as my connection to the high deserts of northeastern Arizona. I enjoy running (sprinting and distance), lifting weights, reading about Indigenous History in the Americas, backpacking, and hiking. Generally, I am a homebody. I have interests in playing percussion, specifically the Marimba, and painting. Ceramics have always intrigued me as well.

I am working on a M.S. degree in Biological & Ecological Engineering, and a Ph.D. in Water Resources Engineering [and am advised by Dr. John Selker].

During summer 2021, I served as an intern for the Yakama Nation Department of Water Resources, and the Department of Fisheries. The internship was hosted by the Yakama Nation but sponsored by the Bonneville Power Administration (BPA). Luckily, my internship aligned with the mission of my PhD and MS projects, respectively. I spent most of my time at the Department of Water Resources, aiding Dr. Danielle Squeochs, a Hydrogeologist for the Tribes who is also serving on my graduate committee. The purpose of my research projects is to build a 3-D mathematical model that simulates shallow aquifer recharge events on the floodplains of the lower Toppenish Creek watershed, located on the Yakama Nation. The Tribes divert excess water from Toppenish Creek via Olney Dam during high flow events, generally during winter, and spread the water across of the landscape to infiltrate into ground. The Toppenish Creek is a major tributary to the Yakima River, which is a tributary of the Columbia River. Currently in the late summer season there is a thermal barrier at the mouth of the Yakima River which makes it difficult for migratory fish to return and spawn. The benefits of this managed aquifer recharge project are to address decreasing groundwater elevations, help provide domestic water supply, rehabilitate degraded habitat, increase streamflow in the Toppenish Creek, and provide irrigation water to users downstream. The 3-D model is to see if the project is doing what it was designed to do, identify and lookout for additional improvements that can be made on the system, storage capacity of the system.

I mainly focused on making progress for my project during the internship, however I had experiences outside of that. I helped the Fisheries Department conduct an invasive species survey on the Yakima River, took streamflow measurements for an alpine creek, and helped conduct a tour for the Yakama Nation Tribal Council and hop growers in the region. For my project, we deployed pressure transducers to monitor groundwater elevations and pulled together groundwater well construction logs to create regional geologic cross sections. For my internship, we were tasked with writing a technical report of the projects I completed over the 10-weeks and presenting our work to Tribal Council members. Although the internship was over the summer, the broader project associated with my thesis work will be ongoing for the next few years.

A recharge event, where water is being spread across the landscape to infiltrate.

Before attending OSU, I wanted to work with a Tribal Nation to help manage their water. I am not a member of the Yakama Nation, so my knowledge of water issues happening on the reservation was sparce. Working with the Tribes for the summer gave me a unique perspective in how individual water projects all work together to manage the Yakima River watershed equitably. The Tribes work with the State of Washington and Federal Agencies to help in this endeavor, and work being done on the Yakama Reservation has implications for water users outside reservation boundaries. This work is important because it is an example of the Tribes exercising sovereignty over natural resources and set up model (or tool) that helps answer questions the Tribes may have about the aquifer recharge project happening on the Toppenish Creek floodplains. The future impacts are to recharge the Toppenish Creek floodplains to improve water security for domestic and irrigation water users and improve ecosystem function on the floodplain landscape.

After graduation [planned for June 2024], I would like to pursue a university postdoctoral position, possibly internationally. If that does not work out, then I want to take some time off, travel, explore, and recharge. After that, I want to serve as a hydrogeologist for a Tribal Nation or the USGS. I hope to eventually return to my hometown of Flagstaff and work as a professor teaching hydrology at Northern Arizona University. I also wish to have teaching affiliation with either Navajo Technical University or Diné College, both Tribal Colleges/University located on the Navajo Nation.

Biological & Ecological Engineering
116 Gilmore Hall
Oregon State University
Corvallis, OR 97331

HELP SUPPORT BEE BY DONATING

Oregon State University

BEE Research

Graduate students Kyle Proctor (Water Resources Engineering PhD Candidate) and Azad Dazaea (Civil Engineering PhD Candidate) set up a system in support of Dr. Chad Higgins Agrovoltaic research program. They are Installing photodiodes (along a transect) below the photovoltaic panels to measure the light transmitted below the panels. This will help better understand how much light is available and where for possible crops planted under the photovoltaic panels, ultimately allowing to optimize the agricultural performance of agrivoltaic systems (systems where photovoltaic energy and crops are co-produced on the same land).

Undergraduate students Jose Torres (Fisheries and Wildlife) and Sash Weese (Environmental Sciences) conducting a stream and riparian survey as part of BEE Professor Derek Godwin's stream temperature research project for Oak Creek.

Join Ecological Engineering undergraduate, Isabella Ruikis, for their new podcast, "Shaping Ash".

Isabella and her family, along with many friends and neighbors, were displaced during the fires in Talent, OR in 2020. She hopes to use this platform, along with her knowledge gained in EcoE, to help educate the community and let the voices of fire survivors, unhoused people, youth and activist be heard.

http://shapingash.com/