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UNIVERSITY OF MARYLAND
COLLEGE OF AGRICULTURE
AND NATURAL RESOURCES

THE CHANGING CLIMATE OF COASTAL FARMING

RISE TO THE CHALLENGE

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Kate Tully and her team implementing potential solutions to address saltwater intrusion to coastal farms on Maryland's Chesapeake Bay

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DEAN BEYROUTY'S MESSAGE

Summer has arrived, and with it comes a new set of opportunities and challenges for Maryland farmers, with myriad implications for economic viability and the overall health of the Chesapeake Bay. This is an unpredictable period in the nation's history for those in our industry, with the effects of climate change and sea level rise bearing down on farmers and growers, in some cases shifting priority from a once financially-solvent commodity to an unfamiliar, alternative means of income. Underserved and vulnerable populations are experiencing greater risk of food insecurity, exacerbated by increased rainfall, extreme weather events, and newly discovered pest resistance. Climate change is also drastically affecting our treasured natural resources.

With this issue of *Momentum*, I am excited to illuminate several key areas where our college is addressing these challenges. Paul Leisnham and his team are working to establish a unique relationship with residents in Baltimore by encouraging managed green spaces and stormwater practices that prevent flooding, mosquito infestations, and provide environmental benefits to the Bay. We examine the destructive, fragile relationship between sea level rise and coastal farmland in Somerset County, where agroecologist Kate Tully is helping farmers navigate the tides of saltwater intrusion. Our strategic initiative, **Ensure a Clean and Healthy Chesapeake Bay**, takes center stage within these pages.

In this issue, we also celebrate the soil judging legacy of Marty Rabenhorst as one of the most decorated individuals in the history of the national competition, we share an Extension initiative that offers youth a deep dive into the power and life cycle of freshly grown food, and highlight exceptional alumni and students that are making significant professional and academic waves.

I look forward to connecting with you at two upcoming alumni events in the fall, with an experience at Butler's Orchard on October 5, and the Ag-tober Fest Tailgate on October 19. In the meantime, we hope you find some takeaways in this issue for how to help affect change locally in your community. The Bay in particular is counting on us to ensure its long and prosperous future.

Craig Beyrouthy
Dean and Director

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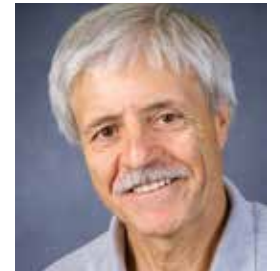
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Ask Adel



DR. SHIRMOHAMMADI DISCUSSES OUR WATER SUPPLY AND CHESAPEAKE BAY HEALTH

Professor Adel Shirmohammadi is back to discuss how our water use and management impacts Bay health, the importance of protecting the Bay, and what we can do.



Why is the Chesapeake Bay such an important natural resource to protect?

The Bay is one of the largest and most productive estuarine systems in the world. As a mixture of salt and freshwater, estuaries are important centers of biodiversity, which makes them valuable resources environmentally, agriculturally, and economically. Communities and industries depend on the Bay for their livelihoods, transportation, recreation, food, and improved quality of life. We need to be conscious about the health of the Bay to implement practices that will eliminate threats to its viability.

Why is managing water and sustainable water use and reuse important for the Bay?

When water washes away pesticides, fertilizers, chemicals, and trash, it goes into our groundwater and runs off into the Bay. Stormwater, if not managed properly, moves trash into

storm drains that become clogged, so mosquitoes breed, and biosolids end up as contaminants. When we build without proper stormwater management design, we get massive flooding that damages property and leads to more runoff. This runoff increases turbidity in the Bay, and it blocks the sunlight, depletes oxygen, and kills aquatic life, hurting our natural resources, and disrupting the role that aquatic creatures play in purifying the water column.

What is AGNR doing to promote Bay health and a sustainable water supply?

As part of our strategic initiative to **Ensure a Clean and Healthy Chesapeake Bay**, our college is taking a systems approach to Bay health with research from the molecular level to the ecosystem level. In addition to work in stormwater management and pollution in rural and urban watersheds, the biochemical processes of nutrient management, cover

crops, targeted irrigation, and increased infiltration keep soil healthy by conserving water and nutrients and biodegrading toxins before reaching the Bay. Reusing animal waste for bioenergy keeps it out of our waterways while adding economic value. And recently, in collaboration with other state agencies, we formed the Maryland Interagency Water Consortium to work on water sustainability in Maryland and beyond. Through this and research with CONSERVE, we are examining groundwater, surface water, water reuse, and the entire spectrum for all sectors, while holistically connecting this to social, economic, and ecosystem health.

How can we be better Bay and water stewards?

Extension colleagues are working to create environmental stewards in urban and suburban areas to help curb runoff into the Bay. This is done by implementing green infrastructure like rain gardens, rain barrels, and systems that redirect rainwater to irrigate flower beds. Because of impervious surfaces like asphalt, stormwater is not recharging our groundwater supply at the rate we need for our growing population. Be aware of the value of water, your water use, where it goes, what it carries, and realize that it is all connected to the water that we need to survive, and to the health of the Bay.



Following Food from Farm to Fork

UNIVERSITY OF MARYLAND EXTENSION BRINGS FARMERS AND FOURTH-GRADERS TOGETHER



AT BEALL ELEMENTARY, students are following their food — from its start as a seed in the soil, to the market, until it ends up in their mouths as a delicious bite.

Fourth-grade students from Beall Elementary in Frostburg, Md, were treated to an educational excursion to their local farmers market, hosted by an interdisciplinary team of UMD Extension educators in Allegany County, as part of the Food Supplement Nutrition Education (FSNE) and the Expanded Food and Nutrition Education Programming (EFNEP) youth curriculum.

Each class participated in an immersive experience into the life cycle of produce, working with Sara Barnard, EFNEP educator in Allegany County, to plant pepper seeds and learn about the proper care of a plant, culminating in a take-away lesson in agriculture, farming, safe food handling, cooking, nutrition, and even a little geography.

“We want our children to understand why local food matters,” said Lynn Rubin, senior faculty specialist with FSNE. “We want them to know how food grows, how it gets from the farm to their plates.”

The May 24 trip to the Frostburg farmers market included a classroom component with Tammy Humberson, FSNE project leader and educator, who has been working with these particular kids since their pre-K and kindergarten years, teaching them how far commercial produce travels to get to a supermarket, versus how far food travels to get to a farmers market from a local farm.



Jeanette Rinehart, owner of Walnut Ridge Farms, talks to the students about where food comes from.

“We want them to have that relationship with local food and farms. Activities like this help us to bring all of the pieces together.”

LYNN RUBIN, SENIOR FACULTY SPECIALIST, UME, FOOD SUPPLEMENT NUTRITION EDUCATION PROGRAM

“What are the three natural destroyers of vitamins?” Humberson asks the class.

The students shout, “Light! Heat! Air!”

“We need all those things for the plants to grow in the garden, but too much makes the fruit or vegetable break down,” Humberson tells the class. “The less miles that food travels to get to us will help with all three of those things.”

The students know the answers from their previous FSNE ReFresh programming in Beall Elementary, which also maintains a “Smarter Lunchroom,” a program in which FSNE educators work directly with cafeteria staff to incorporate more vegetable-based entrees and encourage healthy habits.

The farmers market field trip not only provided a food science component, it included a safe handling lesson and a tasting of “Sunshine Salad,” a special recipe prepared by Shirley Ann Guinn, FSNE faculty assistant, who teaches the class how to make the salad on their own.

Recipes provided by FSNE are shared through newsletters and the Text2BHealthy program. “Almost 40% of the parents are connected to the Text2BHealthy program in [Beall Elementary],” said Humberson. “Parents can learn about what the kids did in the



Students planted seeds, learned about proper care, and took home their seedlings.

FSNE programming that day, and link to recipes and tips online.”

Students toured the farmers market to learn what types of produce are in season at different times of the year. They also get to see what it’s like to live and work on a farm from farmers themselves, like Jeanette Rinehart, owner of Walnut Ridge Farm in Flintstone, Md, and retired PE teacher from Beall Elementary, who regularly makes trips to the school to talk to the students about where their food comes from and why it’s important to reduce food waste.

“Everything that goes in your mouth comes from a farm,” Rinehart tells the fourth graders over bags of fresh greens and rows of onions. “Even pizza—all the parts of a pizza come from a farm.”

FSNE educators across the state aim to help school-aged children make these connections between the farms in their communities, the food they eat, and their own health and nutrition.

“We want them to have that relationship with local food and farms,” said Rubin. “Activities like this help us to bring all of the pieces together.” — L.W.

TO LEARN MORE ABOUT HOW FSNE HELPS TO PROVIDE FAMILIES WITH THE SKILLS AND KNOWLEDGE TO MAKE HEALTHY CHOICES AND FIND HEALTHY RECIPES VISIT EATSMART.UMD.EDU

To the Victor Goes the Soils

From Freshman to Professor, Marty Rabenhorst Has Built UMD's Soil Judging Dynasty Over 50 Years

"NOBODY GOES TO COLLEGE with the intention to study soil science. Folks usually stumble upon it accidentally."

Martin (Marty) Rabenhorst '76 is just being honest. However, he doesn't mean to diminish the value or importance of this field. In fact, he speaks of his profession as the primary mechanism through which humans sustain life. "Food, fiber, water, everything that supports human existence has its origins in soil. Every drop of water that we've drank has moved through or over the soil. Incredibly, everything that we know about survival intersects in this thin little layer beneath our feet."

Now a professor of pedology—a term used to describe the study of soils in their natural environment—in Environmental Science & Technology, Rabenhorst arrived at AGNR in 1972 and enrolled in the conservation and

natural resources program. He didn't know the first thing about soils, and credits a friend and a life-changing trip to Peru as the impetus to change his major and immerse himself in competitive soil judging, for which he would go on to be one of the most victorious individuals in history.

UMD's soil judging team is a powerhouse. Rabenhorst is comfortable with the term "dynasty." "UMD is one of 5 schools that has achieved 5 or more national championships over the 59-year history of the competition, and during that period, only Wisconsin Platteville has more 'final 4' appearances [21] than UMD [14]," explained Rabenhorst.

In the last three years, UMD has finished first, fourth, and first respectively, and Rabenhorst captained both winning teams, as well as the national

"I was able to find a group that I identified with very early on in my college career, and not everyone is lucky enough to have that experience. I strive to facilitate that experience for my students."

MARTY RABENHORST



The winning team showing Maryland Pride!

But in the end, Rabenhorst credits the engaging nature of the science, the camaraderie on the team, and the work hard/play hard attitude of his students as the primary drivers of success. He pushes his groups hard, expects their undivided attention, and consistently strives to create a valuable experience for all involved.

"When you get to a National Championship, everyone there is good. On any given day, there are a half dozen schools that could win. There's no real 'X' factor for success. Victory is achieved through strong, competent coaching, dedicated students, and teams that are able to work through issues by consensus."

"This competition has been very important to me both as an individual and an academic. As a student, it was very formative in terms of exposing me to the right people and the discipline itself. I was able to find a group that I identified with very early on in my college career, and not everyone is lucky enough to have that experience. I strive to facilitate that experience for my students."

Rabenhorst has no plans to slow down, and will coach UMD in the national competition again in 2021. — G.B.

championship team in 1984. UMD's first of five national titles came in 1972, and incredibly, he was even on that team as a freshman undergraduate. In his first year, he finished 25th out of 80 students, an impressive performance for a freshman who had hardly any measurable experience to put into practice.

To understand why he is such a talented individual in this regard, both as a participant and leader, let's briefly explore what it means to actually judge soil. Rabenhorst describes soil judging as "the act of examining a soil profile, the vertical exposure of the soil, which spans about four or five feet in depth." In the competition, students are required to identify different soil horizons, describe the properties within a deep soil pit, and then classify the soil. Classification is like organizing by genus or species. Finally, competitors analyze soil suitability (i.e. for local road construction, wetlands, agriculture, or septic applications). Maryland also happens to have a particularly wide range of soils because of the state's varied geology. There are roughly 25,000 different soil series set up in the country, with between 300 and 400 in Maryland alone.

While humble about his contributions to the team and lifetime record as a coach, it's important to recognize that Rabenhorst is a leading expert in his

field, setting the stage for a tremendous learning experience for his students. One of his many contributions to the discipline includes the invention of a new method for measuring the quality of wetland soils which is easier to use, more accurate, and more environmentally friendly than prior methods. It eliminates problems by using reusable plastic tubes to insert oxide-coated plastic films into the ground for analysis, and 2D images can then be analyzed with the latest image processing and computing software. He was nominated for UMD Invention of the Year, 1 of 9 inventions recognized with a nomination in a field of over 170 new inventions disclosed in 2017.



UMD's team working within a deep soil pit at the national competition.



World Wide Wheat

Globetrotting for Amber Waves of Grain

WHEN JASON SCOTT '03 began his studies at UMD, agriculture was far from his mind. Spending time in engineering and business didn't feel right, so he decided to take an elective course, Intro to Horticulture with AGNR's Chris Walsh. "Since that day, I have never looked back."

Today, Jason works with his father on their 1500-acre farm operation, Walnut Hill Farms, on Maryland's Eastern Shore. Walnut Hill Farms grows wheat, malt barley, corn, soybeans, and sweet corn. Jason is also an independent sales representative for Pioneer as Scott's Seed, LLC.

In addition to launching a successful farming enterprise, Scott's curveball career path has given him a very important purpose. He serves as a global ambassador and advocate for wheat farmers throughout the country as Maryland's representative on the board of U.S. Wheat Associates. Maryland is not traditionally thought of as a leader in wheat production, but through his work, Scott is shining a stronger light on the dependability and high quality of U.S. and Maryland wheat.

"I never imagined that my farming involvement would lead to global travel to advocate for the well-being of Maryland Farms, but I am honored to play this role," said Scott. "The opportunity really grew out of my experiences in the College of AGNR."

During his senior year at UMD, Scott won the Maryland Grain Producers Association scholarship. After graduating, he was offered a position on the association's board to represent his region. He went on to serve in multiple leadership offices including vice president and president of the association itself. These leadership positions afforded Scott the opportunity to fund research projects, promote Maryland grain through the Maryland Checkoff Program, and advocate for the well-being of Maryland farms in local, state, and federal government.

In 2014, Scott was elected president of the U.S. Wheat Associates. In this role, he traveled to Africa, Asia, Central America, and Europe promoting the sale of U.S. wheat and helping to facilitate export options for American wheat producers.

This summer, Scott will travel to Barcelona for the World Staff Conference of U.S. Wheat, and will represent the U.S. on a five-country South America Crop Quality Tour in the fall.

"No matter where I travel, people's eyes light up when I share pictures of our farm, our products, and my family," Scott said. "Today, consumers are increasingly wanting to know where their food comes from. This is not a Maryland or even U.S. trend, but global. The U.S. has a fantastic product, and we need to share our story." — **A.C.**

“I never imagined that my farming involvement would lead to global travel to advocate for the well-being of Maryland Farms...the opportunity really grew out of my experiences in AGNR.”

JASON SCOTT '03

The Business of Hemp in Maryland

AGNR UNDERGRADUATE EXPLORES THE UNCHARTED TERRITORY OF HEMP

With the passing of last year's Farm Bill and the legalization of hemp horticulture in Maryland, one undergraduate has taken on the challenge of understanding the viability of hemp as an alternative fiber for products like clothing, textiles, and paper. Elizabeth Thilmany, entering her junior year in Agricultural and Resource Economics (AREC) in the fall, is working to help scientists and farmers determine the legal and economic implications of growing hemp as a fiber instead of for oil or seed.

"My preliminary research was focused on scoping the available resources on hemp since it was recently legalized," said Thilmany who is conducting this research as part of her Snider Undergraduate Research Experience (SURE) Fellowship through the Smith School of Business where she has a dual major in Information Systems. "Much of this topic is uncharted territory, making research tricky, but also important."

Working with her faculty advisor, Paul Goeringer, legal and senior faculty specialist in AREC, Thilmany is taking a focused approach.

"I decided to focus on hemp as a fiber crop because the oil and seed market is still subject to regulation by the FDA, and therefore, could change the contracts, manufacturing, and processing of hemp for oil and seed," she said. "I tried to focus on the side of the industry that has not been in the spotlight, and that could also become a large industry on its own."

With many fiber alternatives available on the market including cotton, flax, bamboo, and wool amongst others, Thilmany decided to run a life cycle assessment to compare two specific products—hemp

and timber—for a comparative analogy for paper processing. "From plant material to paper, there are marginal differences [between hemp and timber] in the inputs and outputs required," said Thilmany, awaiting results from her statistical analyses.

"There's not any supply chain built into the system currently, so it'll be interesting to see the timeframe and process to get the plant, grow and harvest it, and then establish a system for processing," Thilmany said. "Fabric, paper, and nutritional products all have different processing and supply chains. It will be important to look to international industries like Canada, which already has a legal hemp system in place."

Thilmany's interdisciplinary interests extend to her summer internship at the National Agriculture Library in Beltsville,

“We are a country founded on farmers, so taking care of farmers and making sure they still have ways to make money and keep their livelihoods is very important.”

ELIZABETH THILMANY



Md, combining her knowledge of agriculture and information systems. She is also currently working under Extension's Family and Consumer Sciences program to create and manage data entry of surveys for county Extension programs like Dining With Diabetes.

Thilmany's academic prowess isn't limited to just science and economics—she also plays bass in the UMD Repertoire Orchestra, works with the Food Recovery Network to collect unused food from the dining halls, and serves on the dean's advisory council.

Thilmany plans to continue conducting agriculture, Extension, and legal research under Goeringer beginning in the fall semester. "I want to solidify the uncertainty around hemp, especially with oil production, while also presenting other opportunities of the fiber sector that are less talked about, but could still become a profitable industry," she said.

"I see my research as being kind of a timely piece that shows the framework of what industrial hemp could mean, and I like the idea of recording different perspectives because it impacts farmers, consumers, and researchers and how they get this industry out of the 50 plus years of recess we are in," said Thilmany. "We are a country founded on farmers, so taking care of farmers and making sure they still have ways to make money and keep their livelihoods is very important." — **L.W.**



Terp Comes Out of Her Shell at the National Aquarium

EMBER LUCIER IS A RISING SENIOR from Glen Burnie, Md. She double majors in Animal Sciences and Environmental Science and Policy: Wildlife Ecology and Management and was recently selected as an intern at the National Aquarium, working with reptiles and exotic species. We caught up with her to discuss this unique opportunity and her plans for the future.

Q Tell us about your decision to double major, and what got you interested in studying animals and wildlife.

In high school, I discovered my love of learning about animals, so Animal Science was a given; however, I didn't learn about Environmental Science and Policy until my first semester here. Adding Wildlife Ecology and Management supplemented what I was learning from my animal science classes with applications to wild species like deer. I have been able to learn about why animals do the things they do, the evolutionary history of species, and how ecosystems come together. This combination

turned out to be the perfect mix for me and satisfies all of my animal knowledge fixes.

Q You had a very high-profile internship this past winter at the National Aquarium. Tell us about that experience.

I was in the Animal Programs department and was responsible for animal husbandry, enhancing their enrichment, and participating in animal-guest encounters. I worked with animals who weren't on exhibit that the public got to meet up close and personal. I cared for and handled species like turtles, milk snakes, boa constrictors, and bearded dragons. As a tactile learner, I loved how hands-on the internship was.

Being an intern pushed me to stay accountable and self-motivated. The staff was incredibly patient and kind, but they also challenged me to come out of my shell (pun intended!) and speak to the public about conservation during encounters.

Q Did you get to conduct research as part of your internship experience?

Yes! I completed a mini behavioral study on the aquarium's Chilean rose tarantulas. I then created a list of enrichment ideas to implement with the Animal Program's tarantula, Webster. I adore tarantulas, and through my project, I learned how intelligent and playful some spiders can be.

“

A major career goal of mine...is to work with underserved communities... I have a similar background, and I think it is really important for kids to meet someone with a cool career

that started out like them to learn what opportunities a college degree can afford.”

EMBER LUCIER



Q What are your plans for the future?

After I graduate, I hope to intern at “the most magical place on earth [Disney]” before applying to veterinary school. A major career goal of mine as a veterinarian is to work with underserved communities, especially children. I have a similar background, and I think it is really important for kids to meet someone with a cool career that started out like them to learn what opportunities a college degree can afford.

Q How has your time at the National Aquarium influenced your life and future career goals?

My experience at the National Aquarium has given me two major takeaways. First, I love exotic species like lizards and snakes, and now know that I want to focus on reptiles in my veterinary career. And second, I really enjoy education. It was so much fun teaching the guests about the importance of conservation and answering all of the interesting questions about the program animals. I hope to incorporate the education aspect into my future career. — **A.B.**

Pioneering Pedology: Boldly Going Where No Soil Scientist Has Gone Before

Shedding Light on Submerged Coastal Soils in the Bay and Beyond



Barret Wessel examining soil samples in the lab at AGNR.

BARRET WESSEL MAY NOT HAVE PLANNED on becoming a soil scientist, but he fondly remembers flipping over rocks, playing in the soil, and noticing differences in the color and texture with a natural-born scientific curiosity. Little did he know that this would become his career.

But pedology, the study of soils in their natural environment, is much more complex than simply flipping over rocks and marveling at what you find. Pedologists examine the physical, chemical, and biological properties of soils to determine their history and inform land use, agriculture, and conservation practices. The work requires knowledge of many different scientific processes across a wide variety of disciplines, but for Wessel, it's all about exploring uncharted territory.

Wessel was fascinated by astronomy and astrobiology, but when he came to UMD, he realized there was plenty to study right here on Earth hiding under the surface of the water in submerged soils. "I took

my intro soils class with Dr. Weil, and his textbook has a sidebar on subaqueous soils. It was a study that one of Dr. Rabenhorst's previous PhD students had conducted, and it was really the first of its kind. It was totally different from the rest of the book, and it became this mysterious thing that I was drawn to."

From there, Wessel became Dr. Rabenhorst's new PhD student, ready to dredge the depths of knowledge hidden in these subaqueous soils. Wessel remembered thinking, "I can see all this water and I have absolutely no idea what's underneath it right now!"

In addition to being novel, the study of subaqueous soils has a wide variety of practical applications. Aside from being an indicator of the health of the Chesapeake Bay, what is found there can be used to inform aquaculture and fisheries, agricultural practices, and beyond. With farmers losing land to sea level rise, finding ways to make this coastal land economically useful is a valuable prospect.



Wessel's interest in preservation was cultivated during his Fulbright in Odense, Denmark, from the shoreline to the historic city center.

"There are huge areas that could be used for aquaculture or subaqueous agronomy to produce shellfish, different types of useful plants, eel grass that grows in the Bay and can produce grain, kelp, algae—you name it. But it's not actively managed because we don't have detailed analyses of the benthic soils and landscapes."

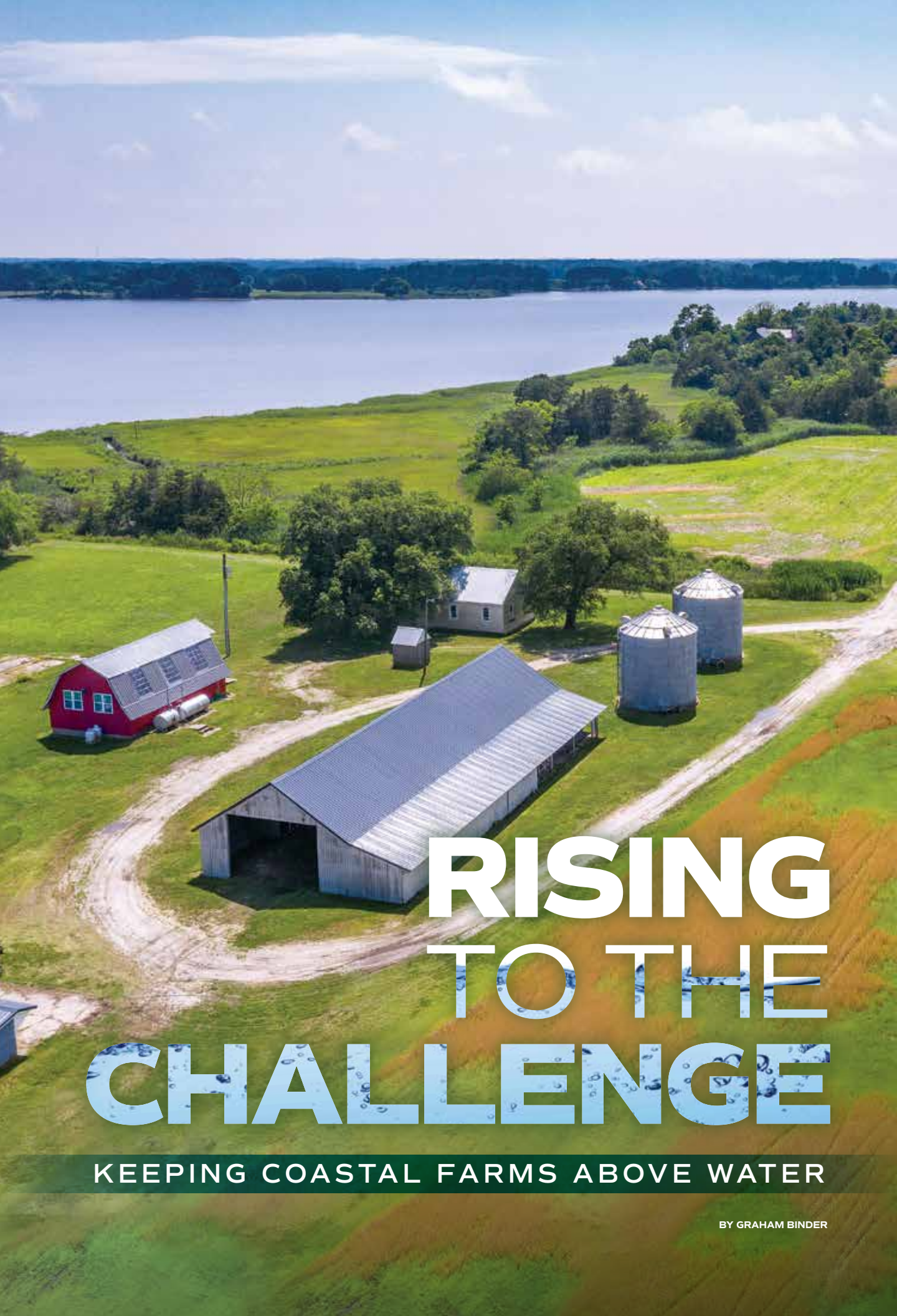
But the benefit of this knowledge goes well beyond the Bay, and far outside of agriculture. With subaqueous soils being literally on the edge of land and sea, Wessel realized there was so much more he could be learning from different perspectives and by bringing together multiple fields of science.

"One of the big issues with soil science is that it's very agronomic," explained Wessel. "Soil science, biology, chemistry, physics, and marine sciences may all be in different colleges, so there is a lot of siloing and lack of communication between fields. The researchers go to different conferences, develop different jargon, and then they can't even find each other's published papers because they are using different keywords."

With this in mind, Wessel received a prestigious Fulbright scholarship to travel to Odense, Denmark and study with a marine biogeochemist for a year at the University of Southern Denmark. In the area known as Gyldensteen Strand, a perfect estuarine test environment has been established in areas where land has been drained, farmed, and then resubmerged. With this environment, you can actually see experimental support for the processes that create some of the soils we see in the Bay, providing insight in Denmark and in Maryland alike on what goes on in and can be done with subaqueous soils.

"The Fulbright was about building a bridge between disciplines to help tear down silos," said Wessel. "Being a soil scientist well versed in these other areas, I can help continue to generalize the field and take it out of just agronomy, be it in oceanography, the coasts, and other landscapes that don't produce food, and even soils in the solar system, like astropedology." To establish even more diversity in his background as a pedologist, Wessel is pursuing a certificate in historic preservation to increase his understanding of environmental regulation and land records research, all with the goal of expanding soil science well beyond its current scope and continuing to explore new horizons as a future professor and researcher. — S.W.

...what is found in subaqueous soils can be used to inform aquaculture and fisheries, agricultural practices, and beyond. With farmers losing land to sea level rise, finding ways to make this coastal land economically useful is a valuable prospect.



RISING TO THE CHALLENGE

KEEPING COASTAL FARMS ABOVE WATER

BY GRAHAM BINDER



“
This area used to be
the canning hub of
the eastern United
States. Farmers
grew strawberries,
tomatoes, and beans
to name a few. It was
a very productive
agricultural area.
**Saltwater intrusion
has greatly affected
profitability.**
”

NOT LONG AGO, KATE TULLY, assistant professor of agroecology in Plant Science & Landscape Architecture, had a life-changing cup of coffee with her friend and colleague Keryn Gedan, a conservation biologist and assistant professor of biology at George Washington University. Keryn wanted to show her satellite images of Blackwater Wildlife Refuge on the Eastern Shore of Maryland connected to regional fluctuations in sea level rise and nutrient availability. Tully took a hard look at the map and without knowing it at the time, the next period of her professional life began to crystallize.

“I was looking at these images and noticed that there were farms pretty much everywhere. I was also noticing these white rings,” said Tully. “I said to Keryn, ‘You know, I think this is salt.’”

A few phone calls later, and following a tour from a representative with the National Resources Conservation Service, Tully had her answer. What she saw in Google Maps was an extreme case of what is referred to as saltwater intrusion, the phenomena of ocean water moving towards the land. It is driven by six major factors, including sea level rise, storms and tides, water management, hydrologic connectivity, precipitation, and drought.

We caught up with Tully on a beautiful morning in Somerset County, the southernmost county in Maryland, giving it tremendous exposure to saltwater with its immediate proximity to the Chesapeake Bay. It’s a beautiful area, but it is vulnerable. Due to saltwater intrusion, Tully



A Farmer's Perspective

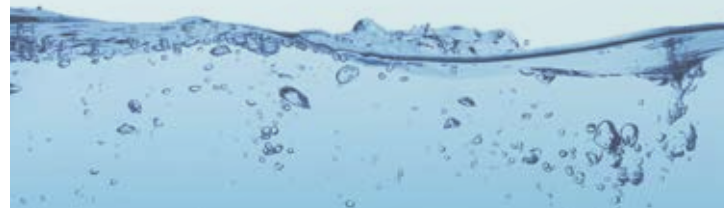
The Fitzgerald family is a legacy in Somerset County, with roots dating back to the county's inception in 1666. Bob Fitzgerald, a former educator and lifelong farmer still occupies and works the same plot of land that has been in his family for centuries. He has had intimate, first-hand exposure to the devastation caused by saltwater intrusion. He believes the direct culprit is sea level rise caused by global warming.

"My wife and I traveled to Canada in 1968 to a place called the Columbia Icefield. We returned there in 2013, 55 years later, and saw a noticeable difference. All of the beautiful glaciers were melting, and the Northwest Passage (a sea route to the Pacific Ocean through the Arctic Ocean) was wide open," said Fitzgerald. "With regard to sea level rise, if you have a global temperature rise of one or two degrees, the water expands and rises even more. When it comes to local agriculture along the shore where our distance above sea level is six feet, drainage ditches get stopped up when the tide is high. Crops get drowned out because there is nowhere for the water to go."

With a heavy heart, Fitzgerald explained that there are villages in his county that no longer exist due to sea level rise. There are old abandoned farm houses that have partially sunken into the earth. Groves of pine trees have met their demise due to saltwater intrusion. He offers a tour of his surrounding community, and the view from the window seat is eye-opening.

explained that over the last 150 years, 20,000 acres of farmland around the Bay has converted to marsh. According to Gedan, 860 acres has become marsh in just the last eight years, which represents about 1% of the total farmland in Somerset County.

"This area used to be the canning hub of the eastern United States. Farmers grew strawberries, tomatoes, and beans to name a few. It was a very productive agricultural area. Industries have since been consolidated and now most farmers are growing corn, soy, and wheat. Saltwater intrusion has greatly affected profitability. Farmers sometimes try to fight it off with mitigation strategies like dumping tons of soil to absorb the water. Sometimes they even abandon their land."



A Beacon of Hope

As an agroecologist and a scientist committed to mitigating the effects of saltwater intrusion for farmers, Tully is designing crop management strategies that work best in the new landscape of coastal farming. Through a variety of field trials and greenhouse experiments, she seeks to determine what crops may survive and can remain productive in a high salinity environment. She is also thinking about local agricultural systems in ways that provide more ecosystem functions than just food. She is exploring water quality provisioning through plants called recovery species, and carbon sequestration to promote climate stabilization through carbon storage. She is looking at improving soil quality and nutrient cycling. At the same time, she prioritizes protection of the environment and the Chesapeake Bay from added nutrient runoff. All of these methods will help farmers combat the acceleration of sea level rise and saltwater intrusion, which Tully admitted is almost impossible to reverse.

"Everyday, things are happening more quickly than the last. The rate of sea level rise is increasing, and that is pushing saltwater inland. Additionally, big weather events have increased in frequency," said Tully. "In reality, saltwater intrusion is meters to a kilometer ahead of all the lines that are drawn in maps. It's



“This project...combines many different disciplines and takes research directly into practical application and education for the farming community. ...we will share our results with farmers... to directly improve environmental and economic outcomes.”

extremely hard to manage this problem. It's unlikely that we'll be able to engineer our way out of this one."

But Tully is working hard to make sure farmers can remain financially solvent. She believes there are some new avenues for increased revenue. She has identified barley, sorghum, and quinoa as low input/low risk crops that will hold up in the face of saltwater intrusion.

"This project is unique in that it combines many different disciplines and takes research directly into practical application and education for the farming community. Once we determine what the most cost effective strategies are, we will share our results with farmers and Extension agents to directly improve environmental and economic outcomes."

This is a devastating issue for Maryland's coastal communities. The first European colonies were established in the Chesapeake Bay region, making this home to some of America's first farmlands. The region's heritage and the future of farming is under siege. Tully aims to bring everyone's heads back above water.

KATE TULLY AND AGNR STUDENTS TESTING PLANTS FOR USE AS RECOVERY SPECIES

The Biting Truth

BY SAMANTHA WATTERS

It may seem hard to connect the mosquitoes that bite you in Washington, DC or Baltimore to the health of the Chesapeake Bay, but there is one driving force flowing steadily from these urban blocks all the way to the Bay—stormwater.

Stormwater can breed mosquitoes when left stagnant gathering in containers or trash, wash trash and other pollutants across the asphalt straight into smaller streams that feed into the Bay, and even cause flooding and property damage when there is no place for water to go. Differences in urban communities and ecological injustices such as vacant lots, broken sewers, and trash all impact how residents perceive green space. But researchers across our college and the university are bringing together all the pieces of this complex puzzle to manage stormwater and reverse urban challenges by encouraging managed green spaces and stormwater practices. These tactics are designed to prevent flooding and mosquito infestations, and provide environmental

URBAN STORMWATER: FROM YOUR BLOCK TO THE BAY

benefits to the Bay through community partnerships in the Prince George's County, Washington, DC, and Baltimore watersheds.

"This research combines both basic and applied science with outreach education in a really unique way," explained **Paul Leisnham**, associate professor in Environmental Science & Technology. Through funding from the National Science Foundation, "We are modeling pollution hot spots in natural systems, testing stormwater management best practices, and examining symptoms of unhealthy environmental states, including flooding and excessive mosquito abundances. This is coupled with human systems—how residents manage private and public green space. There is often mistrust of green space in poorer communities, where vacant lots and unmanaged vegetation end up becoming hotspots not just for trash, but for mosquitoes, rats, crime, and drugs. We need to be able to properly communicate the



PAUL LEISNHAM AND KAITLIN SAUNDERS



advantages of green space for stormwater management in a way that communities care about, and which also benefits the greater Bay."

That is why Leisnham is focusing on a nuisance and health risk of stormwater management that tends to capture the attention of almost anyone on the street—mosquitoes. In fact, walking the streets of Baltimore near Union Square, he and his team of undergraduate and graduate students in bright red UMD shirts spark up conversations with the locals on their stoops, with many emphatically declaring, "Mosquitoes are always biting me up."

Leisnham spends time interacting with locals and explaining a major take-home message of urban stormwater management: "Less trash, fewer mosquitoes."

Mosquitoes can breed in an amount of water as small as what gathers in a bottle cap left outside in a shady area for four or five days. If the water gathers in a shaded container and isn't infiltrating into the ground through managed stormwater practices like rain barrels or rain gardens, it can easily become a mosquito breeding ground that can produce hundreds of biting adults.

Based on his expertise in mosquito ecology, Leisnham is looking at how mosquitoes perform under different habitat conditions, which trash containers cause the most trouble, and how effectively different management

practices infiltrate stormwater for mosquito breeding. This work will inform not only best management practices, but outreach strategies to the community.

Kaitlin Saunders, a graduate student working with Leisnham, will be doing some of this work, as well as leading groups of local elementary, middle, and high school students in all sorts of outreach projects over the summers to come, through partnerships with the Parks and People Foundation in Baltimore and other community groups. In the past, students have helped collect tires dumped throughout the neighborhood and either recycled or repurposed them as planters. "Tires are often dumped illegally and persist for a very long time in the environment," said Leisnham. "It's hard to move them and hard to get water out of them, so they end up as breeding grounds for mosquitoes for years or even decades."

"As a team of researchers, we are all interested in how human and natural systems interact. This is at the heart of the land-grant mission of AGNR."

PAUL LEISNHAM



LEISNHAM WORKING WITH UNDERGRADUATE AND GRADUATE STUDENTS COLLECTING SAMPLES IN A BALTIMORE VACANT LOT

LEISNHAM AND THE
TEAM EXAMINING
A SAMPLE AT A
COMMUNITY GARDEN
IN FRANKLIN SQUARE,
BALTIMORE



The goal is to show that managed green space and cleaning up your community has benefits that go beyond neighborhood beautification. “There is a misperception that community gardens, rain gardens, or other ‘green’ infrastructure that manage stormwater and have numerous other benefits breed mosquitoes. Research has shown that they don’t, but it does show that vacant lots with residual impervious surfaces and unmanaged vegetation do breed mosquitoes” explained Leisnham.

He added, “People are immediately concerned about mosquitoes and flooding, but they can’t see other stormwater pollutants, such as sediment, nutrients, metals, and pesticides in the Bay as easily. But we know that all those challenges are there, so connecting those things together educationally is really important.”

Leisnham’s diverse team is working on connecting this message from all different angles and perspectives. **Victoria Chanse**, associate professor in Plant Science & Landscape Architecture, is working to understand the needs and issues in communities. **Sacoby Wilson**, associate professor in the School of Public Health, is looking at environmental justice and the challenges of vacancies and unmanaged green space with Leisnham. **Hubert Montas**, associate professor in the Fischell Department of Bioengineering, is working with **Adel Shirmohammadi**, professor and associate dean

in AGNR, to model pollution hotspots in the two watersheds. And **Amanda Rockler**, senior agent with UMD Extension and the Maryland Sea Grant Program, is working with community partners to develop a comprehensive education strategy.

Partners include the Anacostia Watershed Society which runs a Watershed Stewards Academy with UMD Extension, Maryland Sea Grant in the Capital region to teach interested citizens about urban stormwater and nutrient management. In Baltimore, in addition to Parks and People, researchers are working with Blue Water Baltimore. Along with a partnership with Maryland Sea Grant through the UMD Center for Environmental Science (UMCES), these associations help build trust with the community and ensure education and outreach is appropriately messaged.

“We want to listen to the community for guidance on the best ways to solve these challenges, and then give back. As a team of researchers, we are all interested in how human and natural systems interact. This is at the heart of the land-grant mission of AGNR. Baltimore, in particular, is a city that lives with a long legacy of environmental injustice, so this project is a wonderful opportunity for our team and college to play a humbling role in trying to mitigate that injustice as much as possible.”

Recognitions

Dr. Frank J. Coale

APPOINTED AS ACTING ASSISTANT DEAN

The college is pleased to announce that Dr. Frank J. Coale has joined the dean’s office as acting assistant dean. Frank will fulfill a three-year appointment with responsibilities centered around advancing the college’s strategic initiatives, and coordinating planning and implementation of the burgeoning AgroEcology Corridor—a proposal that reimagines the university as an educationally-focused green space, rather than green spaces between campus buildings.

Frank has served in a number of leadership roles for the college, most notably as chair of the Department of Natural Resource Sciences & Landscape Architecture for one year prior to the launch of the new Department of Environmental Science & Technology, and for five years as the inaugural chair of the new Department of Environmental Science & Technology (2005–2011).

In the meantime, Frank will continue to fulfill his duties as Extension specialist in ENST with programs concentrated on efficient agronomic and environmental management of applied nutrients, and informing nutrient management and policy-makers in the Chesapeake Bay watershed. He has published 55+ refereed journal articles and 150+ Extension publications, delivered nearly 200 scientific presentations, and has given over 500 Extension education presentations. He has mentored 35 graduate students and has supported his programs with \$20 million in external grant funding.

The college looks forward to Frank’s leadership with several of its most important special projects.



Dr. Jinhee Kim

ASSISTANT DIRECTOR AND PROGRAM LEADER OF FAMILY AND CONSUMER SCIENCES, UME

The college welcomes Dr. Jinhee Kim to her new role as assistant director and program leader of Family & Consumer Sciences for UMD Extension (UME). Jinhee will direct priority areas for Marylanders including chronic disease management and prevention, food safety and preservation, financial literacy and capability, health literacy, and healthy living environments. As a professor in Family Science with UMD School of Public Health, she has served as the family finance Extension specialist since 2000.

Jinhee has published 3 book chapters, 50+ refereed journal articles, and made 100+ invited and refereed presentations. She has successfully secured and managed grants exceeding \$2.9 million as a researcher. In addition, Jinhee brings substantial leadership expertise, having served as president for the Association for Financial Counseling and Planning Education (AFCPE), and on national boards including the National Consumer League, the American Council on Consumer Interests (ACCI), the National Jump\$tart Coalition, and the Personal Finance Employee Education Foundation. She was named UMD Outstanding Faculty Woman of Color (2006) and received the Mid-Career Award from the ACCI (2009).

In her time with UME, Jinhee has obtained \$600,000+ in cost recovery. She has provided training to over 2,000 Extension and financial professionals. Her team received the national Dean Don Felker Financial Education Program Award from the National Extension Association of Family and Consumer Sciences (2005), and the Best Education Program award from the AFCPE (2009).

Maryland Day 2019

THOUSANDS OF VISITORS ENJOYED A BREEZY
SUN-WASHED SPRING DAY AS UMD THREW OPEN
ITS DOORS TO THE COMMUNITY



AGNR WAS FRONT AND CENTER at this year's **Maryland Day**, with 43 separate events spread all across campus, including two feature tents on McKeldin Mall and the Animal Sciences Courtyard. Following a breakfast showcasing the college's entrepreneurial and research innovation, attendees expanded their knowledge base through the Wonder of Soils, the Maryland Agricultural Showcase, beekeeping demonstrations, and the always popular livestock shows, just to name a few.

UMD College Park Hosts the 2019 4-H Congress

MARYLAND 4H-ERS GATHER FOR A WEEK OF DISCOVERY AND ENGAGEMENT

THE 2019 4-H CONGRESS, hosted June 23 through 29, gathered students from throughout Maryland to experience a week on UMD's campus and explore careers in agriculture and natural resources, STEM, creative and performing arts, health sciences, political science, and education, allowing them to interact and engage with professionals, professors,

and their 4-H peers from across the state.

The 4-H Congress is a unique educational opportunity for youth ages 14 to 18 to learn leadership skills and discover the countless possibilities available to them, building confidence and excitement for the prospects of their future endeavors.



Students participated in workshops and hands-on activities.

4-H students develop leadership skills during their week on campus.



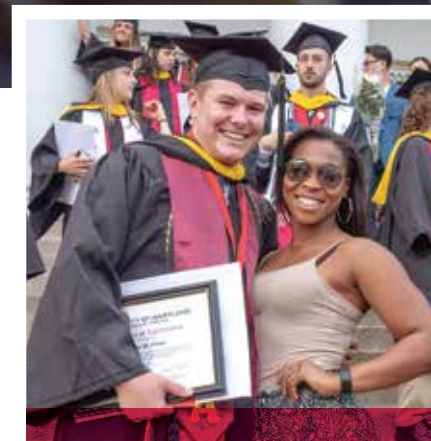
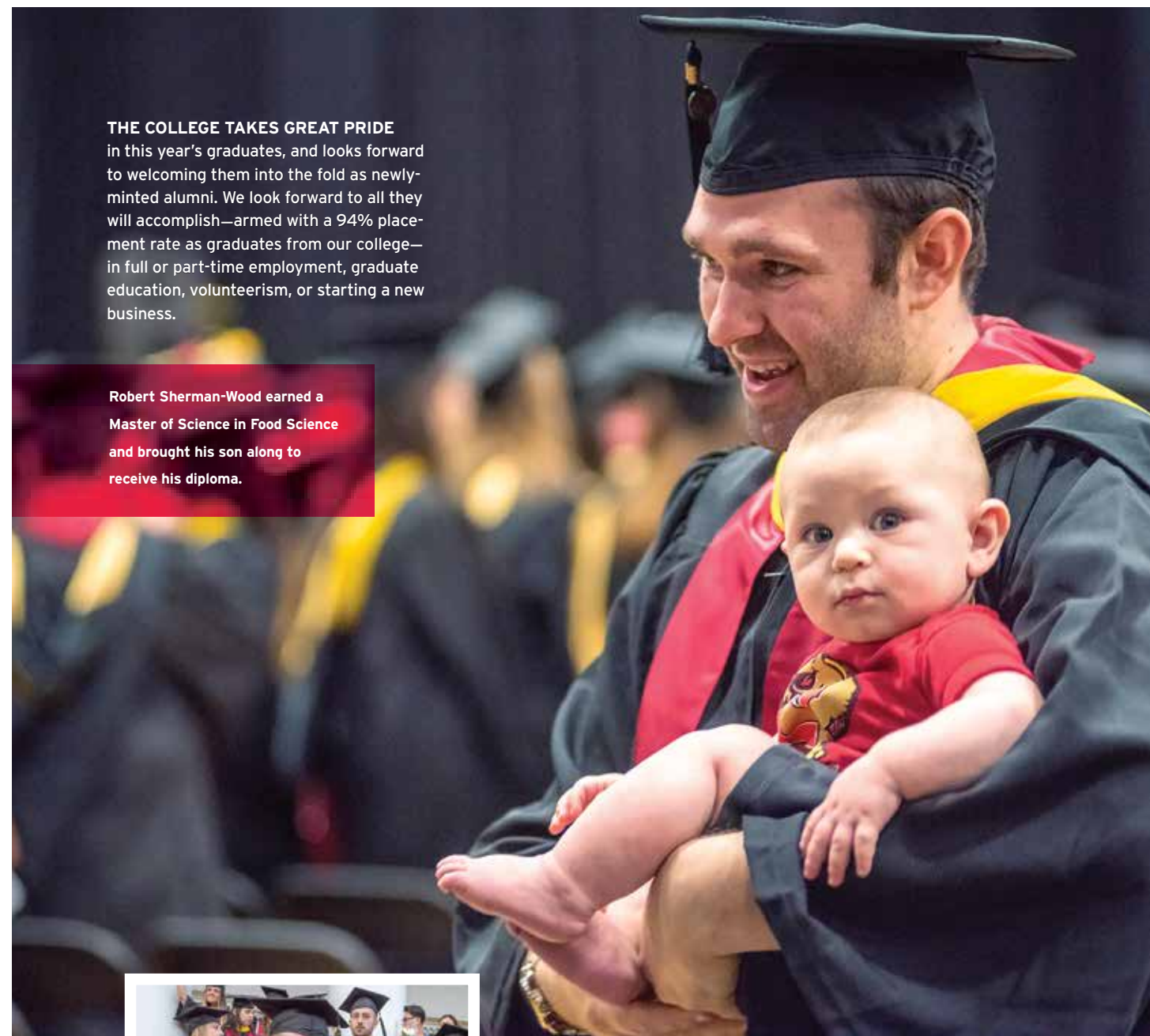
Engaging with UMD professors and peers from across the state, students also developed their collaboration and teamwork skills.



Spring 2019 Commencement

THE COLLEGE TAKES GREAT PRIDE in this year's graduates, and looks forward to welcoming them into the fold as newly-minted alumni. We look forward to all they will accomplish—armed with a 94% placement rate as graduates from our college—in full or part-time employment, graduate education, volunteerism, or starting a new business.

Robert Sherman-Wood earned a Master of Science in Food Science and brought his son along to receive his diploma.



Student commencement speaker Brian Glenn, who received a Bachelor of Science, Agricultural & Resource Economics, celebrates on the steps of Reckord Armory.

High Five!

UMD SOIL JUDGING TEAM WINS A FIFTH NATIONAL CHAMPIONSHIP



UMD TOOK FIRST PLACE at the 59th National Collegiate Soils Contest in San Luis Obispo, California, competing against 25 other universities from 7 different regions across the country. This is the fifth national championship for the UMD Soil Judging Team, solidifying their dominance in soil science. UMD was represented by a diverse group of undergraduate students, led by **Martin Rabenhorst**, professor in Environmental Science & Technology, and **Barret Wessel**, Rabenhorst's PhD student.

UMD will be hosting the regional Soil Judging Competition this fall, and both Rabenhorst and Wessel are excited to showcase some of the unique properties in Maryland's soils.

Professor Rabenhorst, PhD student Barret Wessel, and the winning UMD Soil Judging Team

Farewells



Mike Embrey

Mike Embrey, retired UMD apiculturist, passed on May 18, 2019. He graduated from UMD in 1979 with a general agriculture degree with an emphasis on Integrated Pest Management. He worked for 29 years with AGNR. He was also the apiculturist for the Winrock International FtF program where he served as a volunteer educator teaching new hygiene practices and marketing hive products. In 2007, he was awarded the George Imire Excellence in Beekeeping Education Award from the Maryland State Beekeepers Association. He will be sorely missed by the beekeeping community. He dedicated years to educating people about bees. He traveled locally, nationally, and internationally sharing his knowledge about beekeeping.

Barbara Ann Riggs Stiles

Barbara Ann Riggs Stiles passed on May 24, 2019. Bobby Ann, as she was known to friends, was a 1962 graduate of UMD in Animal Science. She is credited with being one of the first female Animal Science graduates from AGNR. She and her husband, Sam, met while judging dairy cattle in 4-H in Montgomery County, Md. She went on to judge with the winning U.S. team at the international competition in England on July 4, 1951. As the high-scoring individual, she accepted the trophy from Queen Elizabeth. Her love of farming and her desire to see her beautiful

upper Montgomery County farmland preserved led her to develop the Agricultural Reserve Program, which has protected almost a third of the county's land resources, over 93,000 acres. Today, over 500 farms remain in an area close to our nation's capital where development pressure remains perpetual and intense. Along with her many years serving as a 4-H leader, all of her children remember her housing and taking 4-Hers' animals to the fair for those who had no other way to participate, and teaching younger 4-Hers how to judge cattle.

Don Osburn

Donald Eugene Osburn, 84, passed on May 24, 2019. He is survived by his wife of 60 years, Barbara Osburn. Don grew up on a 365-acre livestock farm where he was active in 4-H and Future Farmers of America. He graduated from West Virginia University in 1958 with a Master's degree in Animal Husbandry, when he joined UMD Extension as an assistant agricultural agent in Anne Arundel County, Md. In 1961, he was awarded the USDA National 4-H Fellowship, and named an assistant professor and assistant state 4-H club leader. From 1967 to 1976, he served as 4-H director of program services in Chicago. From 1976 to 1991, he returned to Maryland to serve as a UMD Extension agricultural agent for Talbot County, Md. He retired in 1994 after serving three years as regional Extension director

FAREWELLS CONTINUED

emeritus for UMD Extension at the Wye Research and Education Center.

Robert Raver

Robert D. Raver, 86, passed on May 21, 2019. He was a 1953 graduate of Hampstead High School and a 1957 graduate of UMD. He was a member of the Terrapins wrestling team which won the Southern Conference championship in 1952. He had a passion for singing and won a radio talent contest in 1935 at the age of three. Growing up on the family farm, he developed an interest in raising cattle and gardening, winning first place at the Maryland 4-H Fair in 1947 with his first steer,

“Roscoe.” He served his country in the Army Reserves in 1958, just after beginning his career as an Extension agent in Montgomery County in 1957. In 1960, he travelled to Edinburgh, Scotland, as a chaperone for 4-H dairy judging. He retired from Extension in 1987, and was named “Man of the Year” in 1990 for introducing no-till crop production to Maryland farmers in the 1960s. He was inducted into the Montgomery Agriculture Hall of Fame in 2011, and in 2017, was recognized for more than 30 years of volunteer service to the Montgomery County Fair. In 2018, he was honored for 50 years of no-tillage agriculture in Montgomery County.

FEARLESS IDEAS

THE CAMPAIGN FOR MARYLAND

Eliminating hunger. Preserving our natural resources. Ensuring human health. At the College of Agriculture and Natural Resources, that is what we do. We are committed to carrying out the University of Maryland’s land-grant mission of providing the highest caliber of academics, research, and University of Maryland Extension services to improve the lives of citizens in Maryland and around the world.

To learn more visit: fearlessideas.umd.edu

SAVE
THE
DATES



MARYLAND STATE FAIR AUGUST 22 - SEPTEMBER 2, 2019

The fair is known across Maryland as **The Best 11 Days of Summer**. The college will be center stage all across the fair with demonstrations and showcases ranging from robotics, to crop and livestock production, to a live birthing center. Visitors can meet Dean Beyrouthy and other AGNR staff to learn about the impact we’re making on the state of Maryland.



AGNR ALUMNI PREGAME TAILGATE OCTOBER 19, 2019

This year’s Ag-tober Fest Tailgate starts three hours prior to kick off. Enjoy great food, friends and contests including the Great Giant Pumpkin Contest Weigh Off! Open to all alumni, students and families, faculty, staff, and friends! More details and registration information to be released soon.

Ms. Ellen Cook Nibali

B.A., ENGLISH, UMBC, 1990
COLONNADE SOCIETY MEMBER

Ellen Cook Nibali, a certified horticulturalist and columnist for the gardening section of the *Baltimore Sun*, has served as a horticulture consultant and coordinator for the Home and Garden Information Center (HGIC), part of UMD Extension for over 20 years. HGIC provides Maryland residents with free information and consultation services that help solve gardening, landscaping, and pest management problems. Ellen chose to support her passion for HGIC with a current gift through a donor advised fund. As a generous benefactor to HGIC, she hopes to get more people throughout Maryland involved in the Center’s work and using its services.

“The HGIC reaches out to those who live and own the 1/2 of Maryland in private (not agricultural or park) hands,” said Nibali. “That’s a lot of lawns, woods, and land mass needing individual decisions that impact the environment and health of us all. Knowledge changes and extends all the time, and Marylanders need help staying on top of it.”

Many Marylanders have not caught up to the fact that HGIC exists to serve them. Ellen hopes her most recent gift to HGIC will help reach wider communities and provide residents with better quality information. Whether someone is a new or experienced gardener or homeowner, Ellen wants people to know that the Center can provide them with helpful and up-to-date



information on sustainable gardening, integrated pest management, and using native plants and natural landscaping to protect the Chesapeake Bay watershed ecology. Her generous support will allow HGIC and the AGNR at UMD to create new innovative ways of thinking to solve challenges with solutions that will last long term, be sustainable, and conserve our environment.

Ellen states that “we know knowledge is power.” She feels passionately

about empowering others to make good decisions now and for the future.

For those who are interested in learning more about the Home and Garden Information Center:
extension.umd.edu/hgic

For those who are interested in supporting AGNR, please contact:

Carolyn Fernandez
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AGNR, University of Maryland
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**COLLEGE OF
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Join Us for Our Second Annual Global Challenges Event

October 29, 2019

**University of Maryland
College Park Campus**

We will celebrate and build partnerships around the college's strategic initiative, Ensure a Clean and Healthy Chesapeake Bay. We look forward to welcoming partners and thought-leaders from across academia, industry, and government, as well as citizens from around the state for a full day of discussion and collaboration on how to tackle this pressing Maryland-centric challenge.



**COLLEGE OF
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NATURAL RESOURCES**



Ensure a Clean and Healthy Chesapeake Bay
AN AGNR STRATEGIC INITIATIVE

