

Spring 2024

THRIVE

NEWS FROM THE COLLEGE OF LIFE SCIENCES AND AGRICULTURE

IN THIS ISSUE

COLSA's Impact on Landscapes,
Lives and Livelihoods



University of
New Hampshire



ON THE COVER

Russ Congalton, professor of natural resources and the environment, and **Ben Fraser**, postdoctoral research associate, take the unmanned aerial system, or drone, that they use to collect research data out for a flight.

A MISSION THAT MATTERS

Welcome to the Spring 2024 issue of THRIVE. I am excited to share stories highlighting how our work drives progress and positive change.

What is the value of higher education? This has become a question we hear with increasing, if not alarming, frequency. THRIVE tells us about opportunities that broaden and deepen our students' horizons and research that aims to protect and enhance our state's natural resources and economy — and celebrates the professional and personal achievements of those in our community. I read this and every issue with swelling pride and hear in my head the constant refrain: *what we do here matters*.

In this issue of THRIVE, you will see the breadth of impact, throughout the Granite State and across the region, of the intellectual horsepower and sheer hard work of our alumni, students, staff, faculty and partners. From job creation to innovations in wellness, this collection of stories demonstrates that higher education remains at the core of sustaining communities.

These stories remind us that we are a bridge between conservation and development, an engine of discovery that can transition economies and empower the next generation of leaders who will help make our communities and our planet *thrive*.

And a request: This is the fourth year that we've published THRIVE, and I genuinely hope you enjoy what is written on these pages. I would love to hear from you directly with any feedback to help us keep this magazine as relevant to you as possible. Please write to colsa.dean@unh.edu and use the subject "Thrive."

Warm regards,

A handwritten signature in black ink, appearing to read 'Anthony S. Davis'. The signature is fluid and cursive, with a long horizontal stroke extending to the right.

ANTHONY S. DAVIS

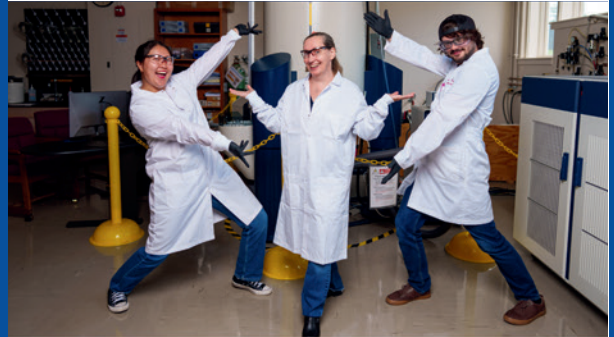
Dean, College of Life Sciences and Agriculture

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**University of
New Hampshire**
College of Life Sciences
and Agriculture



10th Anniversary
April 8th - April 12th, 2024

The (603) Challenge is a fantastic time to support COLSA because matching and bonus funds allow your gift to make an even bigger impact. We encourage you to rise to the challenge in support of COLSA this year making the 10th Anniversary the best (603) Challenge yet!

In 2023, 630+ donors helped raise \$125,000 for the college, supporting scholarships, research, and hands-on learning vital to the COLSA experience.



unh.edu/603

Scan the code using the camera on your phone to access The (603) Challenge website - unh.edu/603

BLOOM BOOM

Unusually massive expanse of algae captures interest and concern

Last summer, a coffee-colored algal bloom — which, at its peak, spanned more than 100 miles from Massachusetts to the Gulf of Maine — captured the attention of scientists from across the region, who called it the highest concentration of brown microalgae they've ever seen in these waters at that time of year.

UNH scientists first took note of the bloom, predominantly made up of dinoflagellate phytoplankton called *Tripes muelleri*, in April of last year when they noticed significant changes in the ocean carbon dioxide and pH levels they regularly monitor off the coast of New Hampshire. Although not known to be dangerous, high biomass blooms have the potential to cause low oxygen conditions when they decay, which can negatively

affect marine organisms, particularly those inhabiting bottom waters and sediments. In general, seasonal blooms, which provide food for animals and energy that fuels the ocean food web, are a normal occurrence in high-latitude marine ecosystems like the Gulf of Maine.

But **Liz Harvey**, associate professor of biological sciences, says this one was uncommonly intense.

The team of scientists from UNH, including researchers from the Ocean Process Analysis Laboratory at UNH's Institute for Earth, Oceans, and Space, and several other regional institutions, continue to monitor conditions and analyze the data to determine the cause of the bloom, its impact on marine life and whether its unusual

size was a sign of important changes in the Gulf of Maine.

"The bloom has faded since the summer, and we very luckily have not had any major reports of low oxygen in waters from our region," says Harvey. "But we are curious about what will happen this upcoming summer — if this was just a one-off event or if it was a bloom that will reoccur annually." ▀



LOBSTER LOSS

Fishery regulators are worried about the recent lack of juvenile lobsters off the coast of New England, and they wonder if climate change-driven effects on our oceans, like higher water temperatures and ocean acidification, could be to blame. **Brittany Jellison**, assistant professor in the department of biological sciences, is seeking to understand if these changes are impacting sea life, and she's beginning by examining whether increased ocean acidity is altering the behavior of juvenile lobsters.

According to NOAA, ocean acidity has increased about 30 percent over the last 200 years. Research has shown that

an increase in acidity can alter the physiology of many marine species, including decreasing reproduction, growth rates and calcification — the process of shell hardening — in shelled invertebrates like crustaceans and mollusks, including lobsters.

Using a new experimental system at UNH's Coastal Marine Lab that enables researchers to manipulate the chemistry of incoming ocean water, Jellison, along with **Todd Stelling '25G**, a marine biology master's student, is studying how ocean acidification affects lobster behavior with respect to prey and predators. The work is part of a larger research project studying how climate change will affect New Hampshire and Maine's coastal environment and New England fisheries.

"In the future, we may see a drastically different marine environment, where lobsters and other marine species struggle to survive in more acidic waters," Jellison says. "Our research is a step toward understanding these changes, but the bigger picture is clear: We need to address the root causes of ocean acidification to preserve New England's cherished ocean wildlife and its fisheries legacy." ▀



COURSE SPOTLIGHT:

Introduction to Marine Biology



Each fall semester, the New Hampshire coast serves as a classroom for students enrolled in Introduction to Marine Biology as they learn about marine biological communities and the various environments they inhabit.

On the day this picture was taken, students completed tidal surveys at Odiorne Point State Park in Rye, only a 20-minute drive from campus. Throughout the afternoon they traversed the rocky shore, tracking and observing marine life in the tidal pools. Students came across different critters, such as sea urchins, crabs and lobsters.

Beyond the obvious pleasures of spending a gorgeous afternoon by the ocean, the field experience allowed students to apply what they're learning in the classroom in a real-world, uncontrolled environment. This type of immersion is crucial to becoming resilient scientists who understand how to adapt their skills to solve real problems.

Students participate in a variety of field experiences during the course, which is taught by Assistant Professors **Brittany Jellison** and **Michelle Fournet**, including quantifying biodiversity in a local salt marsh habitat, measuring phenotypic variation in barnacles and exploring biofouling communities. 🍷

A CROP FOR A CHANGING CLIMATE

UNH researchers study Tartary buckwheat as a potential new crop for regional farmers

Iago Hale, associate professor of agriculture, nutrition, and food systems, and **Noah Abasciano '24G**, master's student in COLSA's genetics program, are seeking to identify an ideal grain crop for the Northeast — one that can be a staple in diets, offers significant nutritional benefits, provides price premiums for New Hampshire producers and is highly resilient in the face of the region's increasingly variable and unpredictable weather.

Hale and Abasciano believe they have an excellent candidate: an underutilized and lesser-known crop known as Tartary buckwheat. They're currently testing 78 genetically distinct versions of the crop — provided by the USDA — to determine which genetic lines possess the most desirable characteristics for breeding into a commercialized variety.

Tartary buckwheat is grown commercially on only a handful of U.S. farms, almost all in northern states with cool climates and shorter growing seasons. In mountainous sections of southern China and other Asian countries, Tartary buckwheat is much more common. It is prized

for its nutritional value and its ability to grow in poor-quality soil that won't support most other crops.

"A species like Tartary buckwheat is climate-ready in the sense that it tolerates extreme temperatures (heat and cold) and extreme moisture regimes (drought and saturation)," Hale says. "It matures fast, giving producers flexibility in integrating it into their cropping systems. It also establishes quickly, outcompeting weeds, and grows in poor soils without demanding costly inputs."

In addition to its climate resiliency characteristics, Tartary buckwheat is gluten free and contains more than twice the amount

of protein found in common grains, as well as high levels of essential amino acids and minerals and one of the highest levels of the plant pigment known as rutin. Rutin has strong anti-inflammatory and antioxidant properties and has

been shown to improve blood vessel health and decrease arthritis. Additionally, it's been linked to decreases in cancer and neurodegenerative diseases like Alzheimer's. ♡



This material is based on work supported by the NH Agricultural Experiment Station through joint funding from the USDA National Institute of Food and Agriculture (under Hatch award number 7005933) and the state of New Hampshire.



BIOTECH SKILL BUILDING: ÄKTA CHROMATOGRAPHY SYSTEMS

Preparing students for postgraduate success is a cornerstone of COLSA's mission. One way the college is meeting this commitment is by making strategic investments in the state-of-the-art lab technology used by the companies and research institutions that attract many of our students after they earn their undergraduate degrees.

Recently, COLSA acquired eight ÄKTA chromatography systems, considered by most biotech companies and academic research labs to be the gold standard for protein purification, which are used in the biochemistry teaching laboratory. The protein isolation and purification process enables scientists

to study specific proteins and protein complexes to advance our understanding of biochemical and cellular processes. The purification and characterization of proteins are central to biological and biomedical research, pharmaceutical development, diagnostics and various industrial processes.

Mastering the ÄKTA system and other analytical instrumentation provides a strong set of skills and knowledge that gives COLSA students a competitive advantage when furthering their careers in an academic setting or in the biotechnology and pharmaceutical fields. ▀

ADVANCING DISCOVERY WITH TWO NEW MASS SPECTROMETERS



Two new scientific instruments will let researchers measure the weight of molecules and advance our understanding of Alzheimer's disease, addiction, soil microbes and contaminants like per- and polyfluoroalkyl substances, or PFAS, and more.

The ThermoFisher Orbitrap Ascend Tribid mass spectrometer, funded by a \$1.1 million National Science Foundation grant secured by **Feixia Chu**, professor of molecular, cellular, and biomedical sciences, and the ThermoFisher Orbitrap Exploris 120, funded by a USDA grant to **Stuart Grandy**, professor of soil biogeochemistry and fertility, and **Paula Mouser**, professor of civil and environmental engineering, will reside at the University Instrumentation Center in Parsons Hall. The two state-of-the-art instruments will be accessible not only to the three principal investigators but also to researchers within and beyond UNH, who will use them to tackle a wide range of biological questions they previously could not answer. ▀



COLSA HOSTS EVENT FOR MANCHESTER HIGH SCHOOL STUDENTS

Day as a Scientist gives students a glimpse into scientific research at the college level



Alyssa Stasse '25G, a doctoral student in integrative and organismal biology, is the first member of her family to attend a four-year college, and she's aiming to build a career in academia. Before she gets there, she's working to open doors for other students to follow in her footsteps.

Thanks to Stasse's vision and hard work, COLSA hosted more than 60 students from three biology classes at Manchester West High School at a Day as a Scientist event last fall. Students chose from five different science experiment stations and spent the day creating and testing hypotheses, exploring scientific methods and analyzing results.

Stasse chose Manchester West because of its diverse population and the socioeconomic challenges facing the district, which can make access to opportunities like this hard to come by.

"It ignited curiosity in them, which has driven many classroom discussions since we came back from the event," says Sophia Sheehan, a science educator from Manchester West who accompanied the students. "Anything that increases engagement and excitement about science is a great thing in my book!"

The success of the day, which was made possible thanks in part to support from the college's Inclusion, Diversity, Equity and Access (IDEA) Committee and the Gudelsky Stone Fund, has created momentum to make it an annual event that would include opportunities for students to engage in other research areas.

"These outreach opportunities for students who don't typically get them is something I've always valued," Stasse says. "I wanted to show them that college is attainable, even if you are the first person in your family to go, and it's something you can do and something you can be good at if you put the time into it." ▀

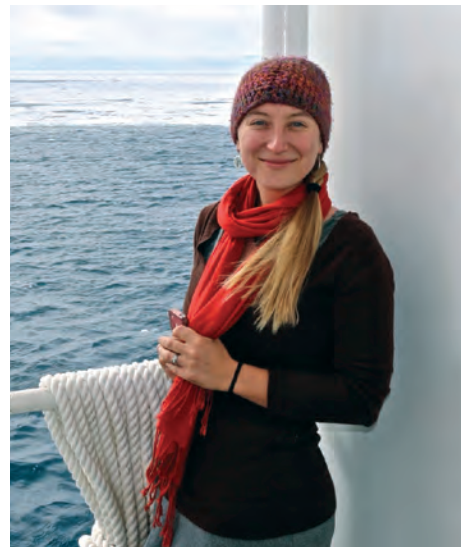


RECOGNITIONS

COLSA Faculty on Highly Cited Researchers List

Professors **Serita Frey** (*below*) and **Stuart Grandy** (*bottom*) were included in Clarivate's 2023 Highly Cited Researchers list, which identifies the top .1% of the world's scientists who have demonstrated significant and broad influence in their field or fields of research.

Frey is a leading researcher on soil microbial ecology. She focuses on how human activities — climate change, agricultural management, invasive species — affect ecosystems, with an emphasis on soil microorganisms and nutrient cycling. Grandy is a leading researcher in soil fertility and biogeochemistry. He leads a research program that examines the role of soil organisms in regulating soil carbon cycling, trace gas emissions, nitrogen cycling and productivity. 🇺🇸



COLSA Scientist Named 2023 Kavli Fellow

Assistant Professor **Michelle Fournet**, marine acoustic ecologist and affiliate faculty member for the UNH Center for Acoustics Research and Education, was named a 2023 National Academy of Sciences (NAS) Kavli Frontiers of Science Fellow, an honor that includes an invitation to attend one of three Kavli Frontiers of Science symposia.

Fournet opened the Japanese-American-German symposium session on animal linguistics with an introductory talk titled “Some Things Never Change: An Ethological Approach to Investigating the Origins of Humpback Whale Vocal Behavior.” 🇺🇸

SURVIVAL SEQUENCE

The game-changing impact of the UNH Hubbard Center for Genome Studies on humans, animals and the environment

Founded in 2001, the UNH Hubbard Center for Genome Studies (HCGS) has become one of the leading genomics research centers in the U.S. Led by **W. Kelley Thomas**, director and Hubbard Chair of Biological Sciences, the center leads research in genome sequencing and bioinformatics, provides training and education programs for students, researchers and healthcare professionals and works closely with industry partners to develop new genomics-based technologies and therapies.

The center follows the “One Health” approach, which recognizes the interconnectedness of human, animal and environmental health and emphasizes the importance of coordinated responses to health concerns. The recent addition of two long-read sequencers, located at the HCGS and the UNH Collaborative Core Wet Lab, is improving the university’s capabilities in testing, surveilling and sequencing pathogenic threats.

During the pandemic, the HCGS was instrumental in monitoring COVID-19 and its variants. But pathogenic threats aren’t just a concern for humans. “Viruses pose a threat to our food supply, our pets and our wildlife. New technologies available through the Hubbard Center make identifying those potential threats possible,” says Thomas.

Animal and Human Health

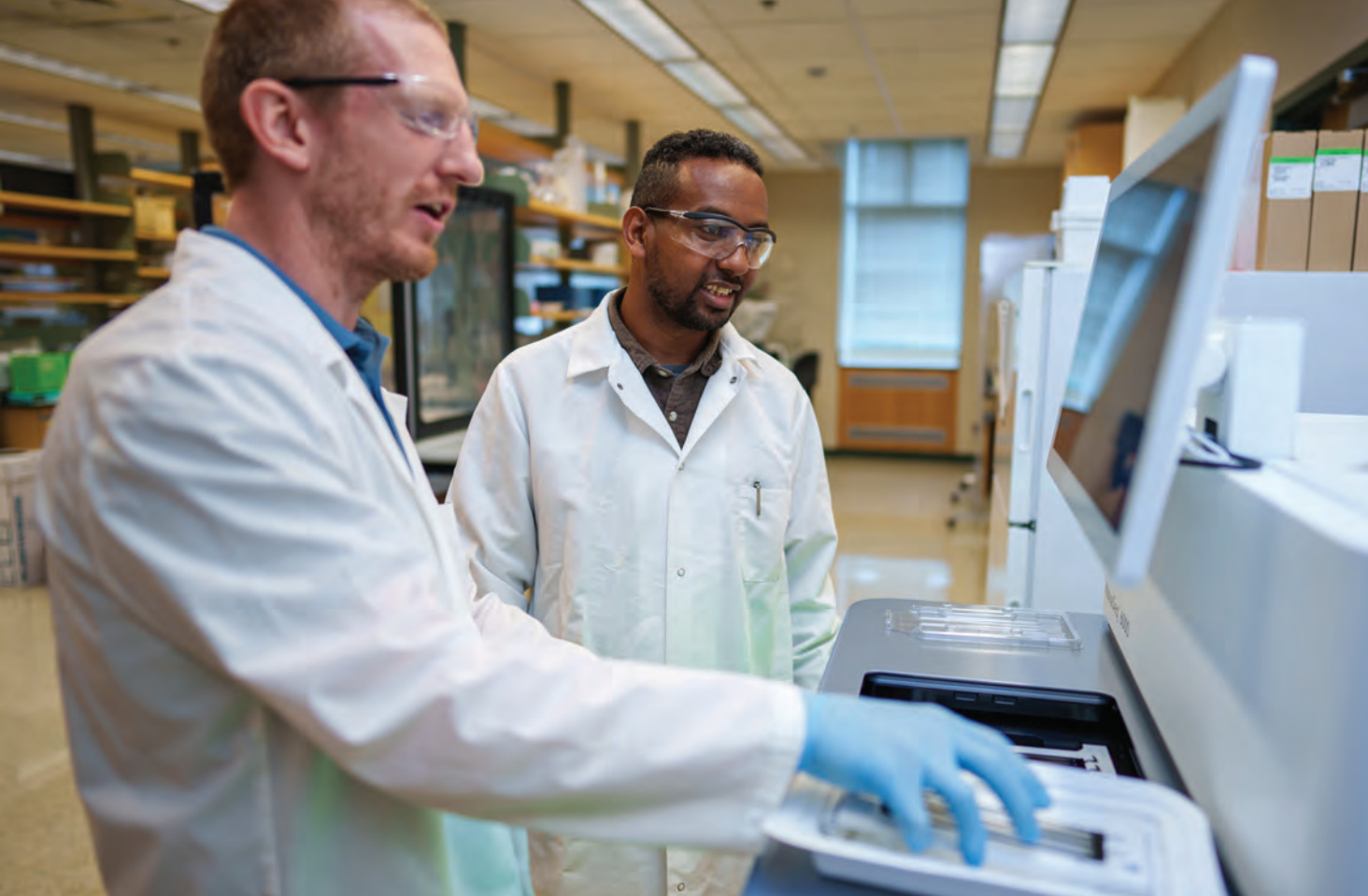
A significant rise in tick-borne diseases threatens the health of humans and domesticated and wild animals in northern New England.

“In the past, tick-borne illnesses, and even ticks themselves, were not a large concern for clinical practices in this

region,” comments **David Needle**, a senior veterinary pathologist with the New Hampshire Veterinary Diagnostic Laboratory (NHVDL). “Today, veterinarians are engulfed in work related to the increased burden of ticks and tick-borne diseases that infect domesticated and wild animals, and tick prevention is now a vital part of veterinary care for companion animals and livestock.”

To sequence genomic data from ticks found on deer, moose, bears and other furbearers, as well as birds and bats, scientists from the HCGS and the NHVDL will soon begin extracting DNA and RNA from individual ticks and from the blood that these ticks take from host animals. This will inform future epidemiological studies on the spread of tick-transmitted diseases in the region, enabling state agencies to use the data to ramp up education





and control efforts in high-risk areas and mitigate the growing health threat of tick-borne illnesses.

Human Nutrition and Health

With support from the HCGS, **Maria Carlota Dao**, an assistant professor of agriculture, nutrition and food systems, is using genomic sequencing to unravel the complex connections between diet, the gut microbiome and human health. Her investigation is particularly vital to understanding the health dynamics of Hispanic/Latino communities, which are disproportionately affected by obesity and related chronic diseases.

Dao and her team are also assessing food insecurity, dietary intake and gut microbiota in a study involving Hispanic adults in New Hampshire. They are using a comprehensive approach to develop culturally appropriate nutritional interventions for this population. The study, says Dao, will also reveal opportunities to make our food systems and nutrition assistance programs better equipped to serve the state's Hispanic/Latino communities.


Plant Health

In the area of plant pathogen monitoring, the HCGS is helping identify the origins and progression of diseases that are most devastating to our environment and our crops. For example, by analyzing the DNA of the fungi

The center follows the “One Health” approach, which recognizes the interconnectedness of human, animal and environmental health and emphasizes the importance of coordinated responses to health concerns.

associated with beech bark disease — which is caused by the combined effects of specific insects and fungi and has been attacking American beech trees across North America for more than a century — the HCGS is working to reveal some of the mechanisms behind this disease.

“One thing that we’re trying to identify is any adaptation to warmer temperatures that may have occurred during the dispersal of a fungus from Canada over the last few decades,” says **Eric Morrison ’09 ’12G ’17G**, a research scientist collaborating on this effort with **Jeff Garnas**, an associate professor of forest ecosystem health. “If we can identify which mutations are adaptive to warmer temperatures, then we can begin identifying which genes are involved in that adaptation and potentially predict which fungus might be more successful in warmer temperatures.”

This work illustrates the critical role of genomics in environmental monitoring and protection and in addressing ecological threats to biodiversity. 



STEWARDSHIP STANDOUTS

UNH Alumni Receive Prestigious Conservation Award

“Be good to the land and the land will be good to you.” Those words, spoken more than 150 years ago by Terry Jones’s great-great-grandfather, Philip James Jones, have guided every decision made by **Terry and Jean Jones**, both UNH class of 1969, related to their thriving farm and winery in Shelton, Connecticut.

It is also likely one of the reasons The Jones Family Farms and Winery was the 2023 recipient of the Sand County Foundation’s prestigious New England Leopold Conservation Award.

Like the four generations who worked its fields and forests before them, Terry and Jean have a deep respect for the 500+-acre farm and winery enterprise that they now run with their grown children. Terry traces the origin of his conservation ethic to his childhood, when he worked on the farm — then a dairy farm — alongside his father and grandfather. He also says the time he spent at UNH helped him succeed as both a farmer and a conservationist.

“UNH laid a firm foundation for my belief in following the road of lifelong learning,” Terry says. “I was inspired by several professors, even outside my forestry and plant science major. Members of the UNH community have been mentors and helped me grow our business and lead a fulfilling life.”

Under Terry and Jean’s stewardship, the farm continues to be very much a family affair. Twenty years ago, their son Jamie started an award-winning vineyard and winery on the property, and his wife, Christiana, brings her hospitality expertise to make farm guests feel welcome. Terry and Jean’s daughter, Gwyn, creates the farm and winery logos, wine labels, farm publications and packaging for special farm products.

And now **Jackson Jones '27**, Jamie and Christiana’s son, is a sustainable agriculture and food systems major at UNH and is preparing for his own role in the family business. 🍷



Eye in the Sky

According to **Russ Congalton**, professor of natural resources and the environment, remotely sensed imagery has played a role in forest management for many years. However, with the recent advancements in unmanned aerial systems (UAS), also known as drones, the ability to capture imagery has become significantly easier and more cost effective. In addition, the imagery has become more detailed, allowing scientists and land managers to detect, measure and study everything from species composition and tree health, height and crown size to invasive species spread and wildlife monitoring.

Congalton and his team of researchers in the UNH Basic and Applied Spatial Analysis Lab are using UAS imagery (similar to what is pictured here) in several projects, including studying the impacts of urban development on New Hampshire's forests and forest ecosystems. They have also used the technology, which is safer and more effective than traditional water sampling methods, to monitor and track cyanobacteria blooms on New Hampshire lakes. ▀

A multispectral aerial image of a forest in Southern New Hampshire featuring a combination of visible and near infrared light and textural details, which allows researchers to distinguish tree species and forest health.

THE TOWNSHIP OF SECOND COLLEGE GRANT

MILAN HILL STATE PARK

LANCASTER

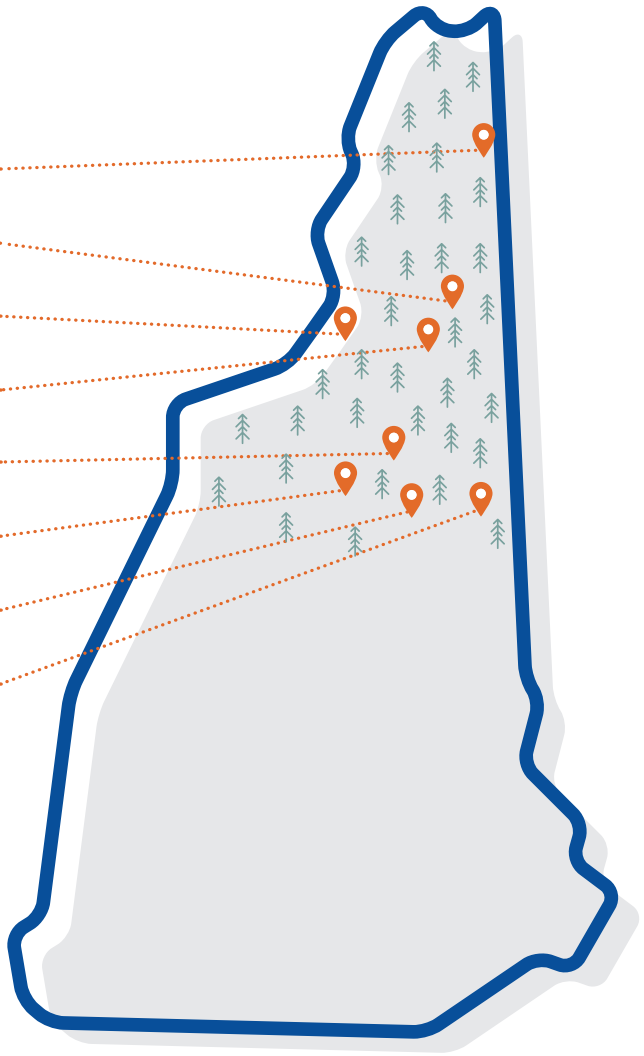
JERICO MOUNTAIN STATE PARK

CRAWFORD NOTCH STATE PARK

WHITE MOUNTAIN NATIONAL FOREST

BARTLETT EXPERIMENTAL FOREST

NORTH CONWAY



SPOTLIGHT ON NEW HAMPSHIRE'S NORTH COUNTRY

COLSA researchers are making a difference in an economically and culturally significant part of the state

New Hampshire's North Country, which stretches from Lake Winnepesaukee to the Canadian border and encompasses one-third of the state, plays an important role in the state's economy and culture. In this sparsely populated region, you'll find many of the distinctive landscapes associated with the Granite State: scenic highways and secondary roads weaving through the White Mountains, plentiful lakes and streams, and vast forests that transform into kaleidoscopes of color each autumn.

The North Country has undergone significant changes in recent decades. Tourism and recreation have flourished, increasing economic diversity and presenting new opportunities. COLSA researchers are investigating sustainable ways to manage the natural resources that support the prosperity of the region's communities in the face of climatic uncertainties.

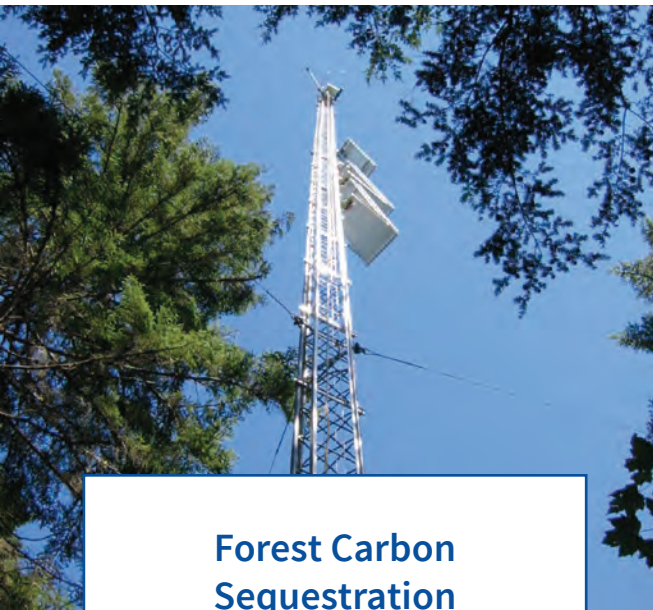
The Role of Red Oak



WHITE MOUNTAIN NATIONAL FOREST AND CRAWFORD NOTCH STATE PARK

NEW HAMPSHIRE'S STANDING RED OAK IS WORTH APPROXIMATELY **\$1.3 BILLION** TO LANDOWNERS

Northern red oak is one of our most valuable species in terms of both timber and wildlife habitat and may have an increasingly important role to play in North Country forests as the climate changes. Understanding this species' regenerative abilities and drought tolerance, and the unique role of fire in expanding its range, is crucial. Professor **Heidi Asbjornsen** is working with project lead **Matthew Vadeboncoeur**, a research scientist at UNH's Earth Systems Research Center, to enhance our knowledge of how fire helps northern red oak regeneration and transforms the soil in ways that support the process.



Forest Carbon Sequestration



BARTLETT EXPERIMENTAL FOREST

Professor **Scott Ollinger's** research on carbon and nitrogen cycling in forests examines interactions between terrestrial ecosystems and Earth's climate. His work supports the augmentation of forest carbon sequestration through a better understanding of environmental drivers and improved methods for assessing spatial and temporal patterns in forest processes. Ollinger's research has helped uncover a widespread decline in nitrogen availability across various nonagricultural landscapes, including forests, as evidenced by reduced nitrogen concentration in plants and changes in soil nitrogen dynamics, a phenomenon linked to increasing atmospheric carbon dioxide.

Invasive Impacts



BARTLETT EXPERIMENTAL FOREST

ESTIMATED

\$4 BILLION

IN ECONOMIC DAMAGE (NATIONALLY) CAUSED BY SOUTHERN PINE BEETLE OUTBREAKS SINCE 1973

99%

MORTALITY RATE OF ASH TREES INFECTED BY EMERALD ASH BORER BEETLES

25M

NUMBER OF NEW HAMPSHIRE'S ASH TREES THAT ARE AT RISK — ABOUT 6% OF THE AREA'S NORTHERN HARDWOOD FOREST

Beech bark disease, beech leaf disease and emerald ash borer, as well as insects native to the southern U.S., are damaging New Hampshire's forests as the climate warms. For



example, the southern pine beetle, originally native to the southeastern U.S., Mexico and Central America, has recently been detected as far north as Ossipee. Associate Professor **Jeff Garnas** is tracking how these insects are affecting key ecological traits of trees, like growth and mortality rates, and whether impacted forests can and will recover in the future. At particular risk of attack by the southern pine beetle are the Ossipee Pine Barrens, described by the Nature Conservancy as "New Hampshire's last intact pitch pine-scrub oak woodland natural community, a globally rare forest type." The Pine Barrens are home to more than 50 rare and endangered plant and animal species.



Supporting Moose Conservation: Moose Sighting and Sighting



JERICO MOUNTAIN STATE PARK,
MILAN HILL STATE PARK

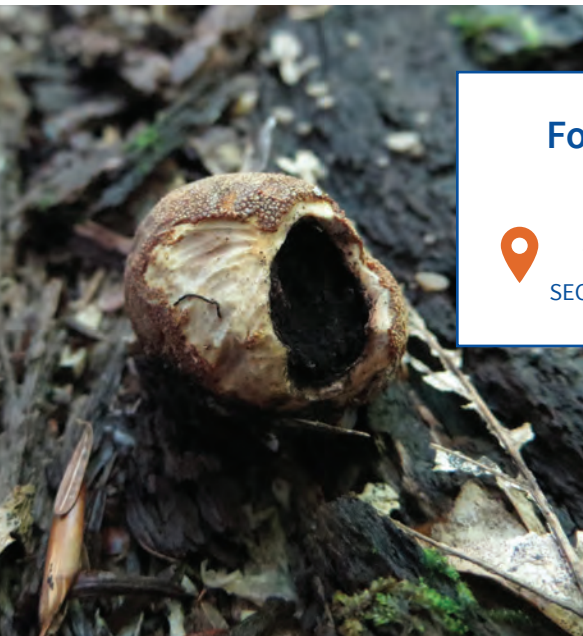
~3K-4K

CURRENT NEW HAMPSHIRE MOOSE POPULATION, DOWN FROM 6K-7K IN 1990s

\$115M

ANNUAL VALUE OF NEW HAMPSHIRE'S MOOSE-WATCHING TOURISM

Moose are an important part of the region's ecosystem and their presence drives North Country tourism, but they've been hard hit by parasites, particularly the winter tick, in recent years. Assistant Professor **Rem Moll** is using camera traps and thermal imaging drones to gather data on the moose population. Moll and his colleagues will use this information to study the animals' responses to different habitats and the impact of human activity and infrastructure. Assistant Professor **Laura Kloepper** is investigating moose vocalizations and how they differ by sex and age. Moll and Kloepper's work will help better understand and monitor the North Country's moose population and direct conservation planning for one of North America's largest land mammals.



Forest-Building Fungi



THE TOWNSHIP OF SECOND COLLEGE GRANT

~75,000

ACRES OF NEW HAMPSHIRE FORESTS ARE CUT, THINNED OR DISTURBED BY WEATHER EVENTS EACH YEAR

Logging and timber production contribute significantly to the North Country's economy. Responding to a greater need for sustainable forest management, Associate Professor **Rebecca Rowe** and Professor **Serita Frey** recently showed how fungal spores are dispersed by wind and small rodents following timber harvests and other forest disturbances. Their research revealed that these events work in tandem to disperse different fungal species critical to establishing and regrowing new forest.

The Future of the Timber Industry



BARTLETT EXPERIMENTAL FOREST

\$1.4B

ANNUAL VALUE OF NEW HAMPSHIRE'S FOREST PRODUCTS INDUSTRY (FOREST-BASED RECREATION ADDS ANOTHER \$1.4 BILLION)

Effective forest management requires assessing our forests' past and anticipating how they may change and/or recover in the future. Professor **Mark Ducey** studies compositional change: He analyzes forest inventories, determining which tree species have declined or which have increased over the past century and what these trends could mean for future timber markets in the North Country.



UNDERGRADUATE SPOTLIGHT: ELEORA MCCAY '26

Eleora McCay '26, a wildlife and conservation biology major, received a Research Experience and Apprenticeship Program (REAP) grant in 2023 from the Hamel Center for Undergraduate Research to support a project monitoring mammals across the Granite State. Above, McCay collects the memory card from the game camera she used to record wildlife and adjusts the camera settings to match the requirements for the season. Eleora says:

“My work focused on collecting and analyzing data for the UNH Wildlife Modeling and Management Lab, headed by **Rem Moll**, assistant professor of wildlife ecology and management. I worked mainly on monitoring the populations of furbearing species. The project uses game cameras across New Hampshire to count estimated populations and monitor their growth or decline over several years. The current methods used by New Hampshire Fish and Game to monitor furbearing species rely on counts made by hunters and trappers. The cameras used by the lab should create a more accurate estimate of the population sizes.

I love being a part of this research and growing the skills necessary for working in my field of study. I learned how to better navigate through the woods via maps, contour lines and a compass, proper field safety and how to come up with creative solutions to problems that occur in the field. After traversing through nearly every ecosystem in New Hampshire, I have an even greater appreciation for the state that I already love so much.”

Aerial Assessments



LANCASTER AND NORTH CONWAY

**~4.7
MILLION**

ACRES OF NEW HAMPSHIRE ARE COVERED BY FORESTS (ABOUT 80% OF THE STATE), AND CLOSE TO THREE-QUARTERS OF THAT FORESTED LAND IS PRIVATELY OWNED

New Hampshire ranks as the second most forested U.S. state as a percentage of its land area, behind only Maine. Professor **Russ Congalton's** research examines the use of emerging technologies, particularly unmanned aerial systems, or drones, for mapping and monitoring forest composition, condition, structure and change. This technology can produce 3D views of the forest, offering land managers more effective and efficient methods of assessing northern forests and developing management practices.



DEEP ROOTS

Lorraine Stuart Merrill’s lifelong connection to UNH yields a bounty of rewards

Up a long, gently sloping dirt driveway lined by stately silver maples sits Stuart Farm. **Lorraine Stuart Merrill ’73** has called the Stratham, New Hampshire, property home since 1961, when it was purchased by her parents and aunt and uncle.

At the driveway’s apex, the property opens up to reveal a collection of structures: a handsome center hall colonial built in the mid-1800s; three additional houses, including one originally used as a bunkhouse; several buildings where farm equipment and supplies are kept; and the large barns and pens that house the Merrills’ more than 300 head of dairy cows — all of which are hidden from the view of passersby on the main road by the rolling landscape.

Lorraine’s story is a narrative deeply interwoven with the land that she cherishes — and shaped in no small part by her time at the University of New Hampshire, just 8 miles up the road.

“I consider myself an alumna of three colleges at UNH,” says Lorraine, who earned her Bachelor of Science in human development and family studies with high honors. “The College of Liberal Arts, because I majored in English literature and journalism my first two years; then COLSA, when I changed my major to human development and family studies.” Years after Merrill graduated, human development and family studies became its own department in the College of Health and Human Services.

But Lorraine’s first experience with UNH began when she joined 4-H at 10 years old. “4-H clubs gave me the chance to learn basic parliamentary procedure, try out different organizational leadership roles, learn to work together with people and hone an array of skills, like persuasive writing and speaking,” she recalls. She also raised her own small herd of Brown Swiss cows and showed them at 4-H events — and eventually sold them to help pay for her UNH tuition.

A MOTHER, A WRITER AND A FARMER

On the day I visited Lorraine at Stuart Farm, her husband, **John ’72**, was busy re-roofing one of the barns. Surefooted and energetic at 73 years old, he has been the love of Lorraine’s life since they met in 1969 during her freshman year at UNH and discovered their shared love of good books, the outdoors and nature. They were married in 1970 and welcomed the first of their two sons shortly before Lorraine graduated.

Although Lorraine has always been involved with Stuart Farm “to one extent or another,” it was John who, after they were married, decided to take a full-time job at the farm and learn all he could about dairy farming, with guidance from two experts at UNH: **Hilton Boynton**, professor of animal science, and **Jim Mitchell**, forage crop scientist.

John and Lorraine became partners in the farm business in 1975, when Lorraine’s uncle retired. Lorraine “helped here and there” and was interested in the business, but her focus was her children: Applying what she learned in her major, she wanted to be a full-time mom when her children were young. When her second son started preschool, she accepted a half-time teaching position at a Montessori school. The job gave her time to devote to her burgeoning career as a freelance writer. At that time she also took on her first civic roles, first as a volunteer in the local school system, then as a member of the local school board for two terms. Being a full-time farmer was still not part of her plans.

“I really wanted a career in writing,” she says. “It wasn’t that I didn’t like farming or wasn’t interested in it, but I thought farmers worked too hard and didn’t have enough time to spend with their families — though I always wanted my children to grow up on a farm.”

CONNECTIONS AND OPPORTUNITIES SHAPED HER PATH

The idea to combine agriculture and her love of writing came from **Ernie George**, a UNH Extension dairy specialist who advised Lorraine's parents, James and Lorraine Stuart, on matters like accounting and legacy planning.

Taking George's advice, Lorraine pursued what became a successful freelance journalism career specializing in agriculture, land use, the environment and community planning. As she was distinguishing herself as a respected authority in those areas, she accepted statewide roles at the Farm Service Agency, participated in the USDA's Sustainable Agriculture Research and Education program, and was named a W.K. Kellogg Foundation Food & Society Policy Fellow. At the behest of **Tom Fairchild '59**, COLSA's dean from 1985 to 1994, Lorraine also served on the dean's advisory council and as a governor-appointed trustee of the University System of New Hampshire for two terms. She served another 10 years as trustee ex officio.

Fairchild also encouraged her to accept the position of New Hampshire's Commissioner of Agriculture. She was appointed first by Governor John Lynch and then by Governor Maggie Hassan, and held the role from 2007 to 2017. During this time, Lorraine championed initiatives to bolster the state's agricultural sector. She retired after a decade of service.

"I brought my love of farming and real-world family farm business experience to my job as commissioner of agriculture," says Lorraine, who continued bookkeeping and accounting for the farm and even kept up with barn chores most mornings before heading for Concord. "And throughout my 10-year tenure, UNH and UNH Cooperative Extension faculty and staff were invaluable partners, colleagues and resource people."

BACK ON THE FARM

Lorraine says her family partners have ensured that Stuart Farm has continued to thrive throughout her career. In 1981, it became one of the first conserved farmland parcels in the state when 170 acres of cropland were permanently protected by an easement through New Hampshire's first agricultural land preservation

program. The Merrill family hopes to see the rest of the farm's scenic and ecologically important land — including woods, salt marshes and tidal shorelines — permanently protected as well. They are working with the town of Stratham and the local land trust toward that goal.

The family's strong conservation ethic was recognized in 2003, when the American Farmland Trust named the Merrills Stewards of the Land — the organization's highest honor and a validation of farming in an environmentally sensitive place that Lorraine describes as "both a joy and a challenge."

For decades now, the farm has been a multigenerational family enterprise. In 1995, after graduating from Cornell

University's College of Agriculture and Life Sciences, the Merrills' son Nathan formally joined the family business along with his wife, **Judy Daudier Merrill**, who graduated from UNH in 1988 with a degree in animal science. Nathan and Judy's daughter Samantha, also a Cornell graduate, works at the farm and recently launched a fresh-cut flower business, Freckled Cow Flowers.

The Stuart-Merrill family are long-time members of the Agri-Mark Cooperative of family dairy farms, which owns and makes Cabot cheese, butter, yogurt and other dairy products. The cooperative is one of the largest milk processors in New England.



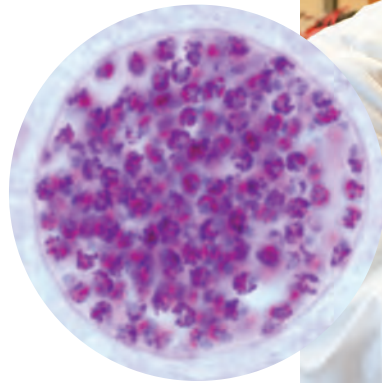
Lorraine and John Merrill, June 1970

BRAIDING THE STRANDS

It's been 50 years since Lorraine graduated from COLSA, yet the education she received as an undergraduate and the subsequent support she got from mentors and friends at the university continue to resonate with her. She is grateful for how well her education prepared her for success as a journalist, an engaged citizen, an agriculture commissioner and, early on, even as a mother — all of which contributed to a successful career that she describes as a "continual braiding of different strands."

But there is one more thing for which Lorraine credits the university — a knowledge and awareness that transcends the business of everyday life.

UNH, she says, "nurtured and reinforced how I look at the world — it has helped me to stay curious and open to learning new things, to seek the connections between us as people and to all of life on our planet." ▀



One out of four Americans likely has **TOXOPLASMOSIS.** **WHAT IS IT?**

New research investigates genetic “switches” of the toxoplasmosis parasite

Most people haven’t heard of *Toxoplasma gondii* (“Toxo” for short), but nearly one out of four Americans likely carries this single-celled parasite, as do pets — especially cats — and domesticated agricultural animals. While Toxo normally remains in a dormant but incurable state, immunocompromised individuals and infants born to infected mothers are at highest risk of developing toxoplasmosis, leading to chronic symptoms ranging from extended periods of flu-like discomfort to damage to the brain, eyes and other organs. **Vicki Jeffers**, assistant professor of molecular, cellular, and biomedical sciences, continues her decade-long research to identify what makes Toxo tick.

The most recent research, which Jeffers conducted with assistance from **Feixia Chu**, **Krista Fleck** and **Seth McNutt**, was published in the journal *mBio*. It examines the role a particular protein in the parasite — called bromodomain protein 1 (or BDP1) — plays in switching on and off the genes responsible for regulating Toxo infections.

“For *Toxoplasma gondii*, BDP1 was previously unstudied, so we had no idea what its role was when we set out,” says Jeffers. “However, we learned that the parasite needs this protein to survive and infect other cells.”

The protein’s important role in regulating gene expression and its unique structure make it a good potential target for treatment via drug therapy. And while drug treatments are available for people suffering from active infections, Jeffers points out that these drugs have side effects and may trigger allergies in some Toxo sufferers.

Jeffers’s findings and continued research are significant because the results could reveal important implications and treatment breakthroughs for managing other parasitic infections in both humans and agricultural animals.

“BDP1 can be found in a lot of parasites, including malaria, the *Eimeria* parasites that cause coccidiosis in farm animals, and *Cryptosporidium*, which can infect humans,” she added. “So, uncovering its role in Toxo might also open the doors to treatments of other diseases.”

This material is based on work supported by the Center of Integrated Biomedical and Bioengineering Research at UNH through a grant from the National Institute of General Medical Sciences at the National Institutes of Health.

CSA PROJECT PUTS STUDENT-GROWN FOOD ON COMMUNITY TABLES

For years, students in COLSA's Farm to You NH program — a two-semester course that gives them firsthand experience in sustainable agriculture — have helped grow a variety of fruits and vegetables that are delivered year-round to UNH Dining, UNH Conferences and Catering and the UNH Dairy Bar. Thanks to a new initiative, last summer participants were also able to put food directly on tables outside the university.

The program partnered with the families involved in the marriage and family therapy master's degree program offered by the College of Liberal Arts to launch a community-supported agriculture (CSA) pilot, providing fresh fruits and vegetables to the participating families at no cost.

The students, who are training to become counselors, coordinated and executed all aspects of the 10-week CSA under the guidance of horticultural program coordinator **Susan Soucy '13**: They chose what to plant, managed the plants' growth and made sure the produce was delivered at peak freshness.

Participating families received a wide variety of produce, including tomatoes, cucumbers, beans, squash, radishes, strawberries and blueberries. Soucy says that adding the CSA project to the course curriculum went even better than expected: "We got a lot of really great feedback from the families, and we're definitely planning to make it an annual collaboration." 🍅





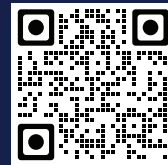
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REDUCING A RISK

New Hampshire prohibits the import of any oyster seed, no matter how tiny, from areas afflicted by a type of *Vibrio* bacteria — the leading cause of seafood-borne illnesses — out of concern that it could establish in local oyster farms and cause recurring illnesses as it has in regions to the south. But does this policy effectively prevent illness, or does it mostly prevent farmers from sourcing varied oyster seed that could help the growing industry's bottom line? **Cheryl Whistler**, professor of molecular, cellular, and biomedical sciences, is seeking answers with the help of UNH master's student **Ben Wasson '24G** and undergraduate students. They are testing the actual risk of *Vibrio* contamination through seed transport, investigating measures to lower that risk and improving techniques to detect harmful *Vibrio* strains. Whistler's research, which is funded by NH Sea Grant, will help oyster farmers stay afloat and keep New Hampshire's local oysters healthy and delicious.