

Toward a New Legacy

Shaping the
next era of
wildlife and
conservation
research

PAGE 14



Building bridges
for future PhDs
PAGE 10

50 years of Conservation
and Resource Studies
PAGE 22

Student-led
courses
PAGE 8

Berkeley Rausser

College of Natural Resources

DEAN

David D. Ackerly

EDITOR

Julie Gipple

ASSOCIATE EDITOR

Mathew Burciaga

CREATIVE DIRECTOR

Arnaud Ghelfi

COPY EDITOR

Laura Deck

CONTRIBUTING WRITERS

Mathew Burciaga

Robin Donovan

Julie Gipple

Kara Manke

Kristin Baird Rattini

Zac Unger

CONTRIBUTING PHOTOGRAPHERS

Mathew Burciaga

Brittany Hosea-Small

Anastasiia Sapon

Vishal Subramanyan

DESIGN & PRODUCTION

l'atelier starno, www.starno.com

ONLINE DIRECTOR

Joseph Bunik

ONLINE PRODUCTION

Magaly Santos

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CORRESPONDENCE TO:

Breakthroughs

Rausser College

of Natural Resources

University of California, Berkeley

101 Giannini Hall, #3100


Berkeley, CA 94720-3100

breakthroughs@berkeley.edu

nature.berkeley.edu/breakthroughs

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LETTER FROM THE DEAN

As I begin my second term as Dean of Rausser College of Natural Resources, I'm excited to be working with our community to advance the goals set forth in our recently released strategic plan. Underlying all the goals are three shared values: excellence, engagement, and access. By access, specifically, we mean that we value diversity in our community and strive to apply the principles of equity, inclusion, and antiracism in our research, teaching, and service.

While the stories throughout this issue of *Breakthroughs* cover many topics, they are similar in that they represent ongoing work to increase access on campus and beyond. We highlight an outstanding program connecting undergraduate students from Historically Black Colleges and Universities to Rausser College researchers with the intention of creating a more diverse community of scholars. We also examine wildlife conservation and biology—a field historically dominated by white men—and introduce Berkeley Wildlife faculty leading inclusive research that moves beyond traditional academic bounds.

Other stories spotlight student-led courses, policies making energy prices more equitable, faculty projects that build climate resilience and equity in California, and more. We also thank donors supporting our efforts to make the College more diverse, equitable, and inclusive, and hope you'll consider doing the same.

Looking ahead, we're preparing to celebrate 50 years of our College in its current form—the result of the merger of the College of Agriculture and the School of Forestry in 1974. As a kickoff, in this issue, we commemorate the groundbreaking Conservation and Resource Studies program, which was started just prior to the College itself.

Whether you graduated in the '70s, joined us this fall, or anywhere in between, we're so glad you're a part of Rausser College.

David D. Ackerly



BREAKTHROUGHS

FALL 2023 / CONTENT

Building Bridges

Expanding paths to PhDs for students from HBCUs

Page 10

Toward a New Legacy

Faculty shaping a new era of wildlife research

Page 14

2 BRIEFS

California energy prices | Wildlife and megafire | Mosquitoes and heat | A pioneering naturalist | Climate action grants | Supporting monarchs ... and more

5 LAB SPOTLIGHT

Biological Imaging Facility

8 ON THE GROUND

Students as teachers

20 PROFILE

Vishal Subramanyan, wildlife photographer

22 THEN AND NOW

Celebrating 50 years of interdisciplinary, student-led scholarship

26 PROFILE

Michal Colvin is working to decarbonize California

28 COLLEGE GIVING

Vernard Lewis and Lisa Kala support diversity and inclusion initiatives

29 THE BIG PICTURE

River ecology at work

ONLINE

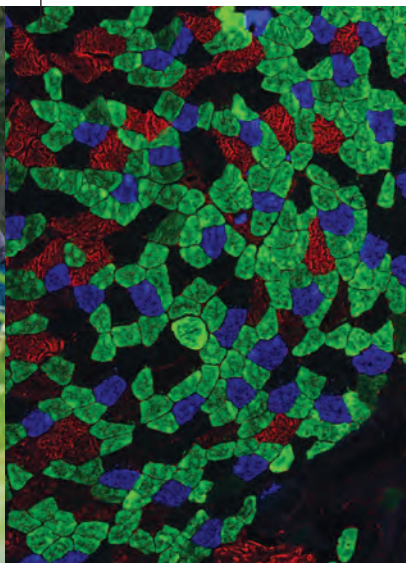
Find more to enhance your *Breakthroughs* magazine experience by following QR codes throughout the issue.



6 | 5

10

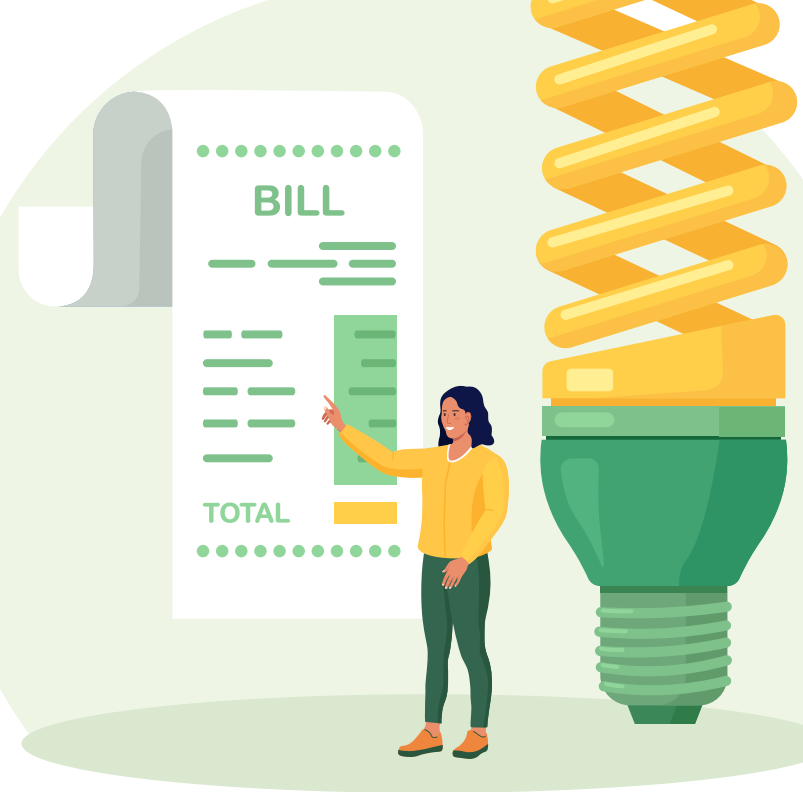
22



Reshaping California energy prices

Changes are coming to the way Californians are billed for electricity that—though controversial—will result in a more equitable rate system.

Utility companies across the state have been increasing retail electricity rates to pay for maintaining the electric grid and investing in measures to mitigate and adapt to climate change. But researchers **Severin Borenstein**, **Meredith Fowlie**, and **James Sallee** say using electricity price increases to pay for fixed infrastructure and policy costs is slowing progress on electrification and places a dis-



proportionate burden on low-income households.

Borenstein, a professor at the Haas School of Business, told *The Guardian* that the current rate structure—along with the growing popularity of rooftop solar—has created a “death spiral” where rates will continue to climb. Households with solar directly benefit from rising rates when selling their excess power back to the grid; they also

Wildlife and megafire

In 2018, the Mendocino Complex Fire ripped through UC’s Hopland Research and Extension Center (HREC), transforming the Northern California property’s grassy, oak-dotted hillsides into a smoldering, ash-covered landscape.

But just months later, motion-sensor camera traps operated by researchers in the lab of Environmental Science, Policy, and Management (ESPM) professor **Justin Brashares** observed animals returning to the area. “We were surprised that many species seem to be resistant [to the impacts of the fire],” said **Kendall Calhoun**, BS ’15 Molecular Environmental Biology; PhD ’23 ESPM.

Calhoun is lead author of a study that analyzed more than 500,000 camera grid images taken at the HREC in the years before and after the Mendocino Complex Fire to understand how the blaze impacted small- and medium-sized mammals on the property. Published this summer in *Ecosphere*, the study is one of the first to compare contin-



uous wildlife observations made before and after a megafire. It is also one of few studies focusing on the impacts of megafires on California’s oak woodlands.

Six species—coyote, black-tailed jackrabbit, gray fox, raccoon, striped skunk, and bobcat—were found to be resistant to the impacts of the fire, using the area in the same ways and with approximately the same frequency as they did before. Western gray squirrel and black-tailed deer, however, appeared to be more vulnerable.

Photos revealed many animals taking refuge in small patches of tree cover that were spared by the fire, which the authors believe helped those species remain in the area.

implicitly benefit by consuming their self-generated power, thus avoiding the growing grid and policy costs.

To address that gap, a new energy bill signed by Governor Gavin Newsom requires utilities and the California Public Utilities Commission (CPUC) to add an income-based fixed fee to support infrastructure costs like wildfire mitigation efforts and clean energy development. The idea was first proposed by Borenstein, Fowlie, and Sallee with nonprofit think tank Next 10 in 2021.

Under one proposal from the three largest electric companies in the state, lower-income households could save up to \$300 per year, while higher-income households could experience a \$500 annual increase. Sallee, a professor in the Department of Agricultural and Resource Economics (ARE), told the *Los Angeles Times* that those savings could encourage low- and middle-income households to adopt cleaner technologies—like electric cars and heat pumps—without worrying about their electric bill skyrocketing.

“This may feel like a loss if you are among those who will be asked to pay more, but it’s a big win for California and the climate,” wrote Fowlie, who is also a professor in ARE, in a *San Diego Union-Tribune* op-ed. She notes that the proposed reform would not increase utility revenues, but it would change how the same amount is collected.

The CPUC has until July 1 of next year to adopt a fixed-price structure.

— *Mathew Burciaga*



Biting Heat

Selectively-bred mosquitoes have been tested around the world as a solution to control the spread of Zika, dengue, and other mosquito-borne diseases. One method breeds *Aedes aegypti* mosquitoes, which can transmit dengue, to carry *Wolbachia*—an insect-borne bacterium with natural virus-blocking properties. But this promising pest control method has a catch: it is significantly affected by heat.

A new study published in the August issue of *Nature Climate Change* predicts that mosquito populations carrying the wMel strain of *Wolbachia* will remain stable for the next 30 years. Beyond that, the study says, the accelerated temperature increases expected under climate change could adversely affect the helpful bacteria, permitting the continued spread of dengue.

The research was led by then-graduate student **Váleri Vásquez**, PhD '23 Energy and Resources Group, and professor **Lara Kueppers**, and is the first to investigate whether anthropogenic climate change could jeopardize the use of this important vector control technology. Vásquez, Kueppers, and their co-authors selected two locations where wMel-carrying mosquitoes are currently being used or tested for disease prevention—Cairns, Australia, and Nha Trang, Vietnam—and computationally modeled how those insect populations might respond as each region warms, based on existing laboratory data.

According to the study, the wMel strain begins to disappear from mosquito populations as average daily temperatures surpass 95 degrees Fahrenheit, and extended heat waves could lead to a notable decline in wMel density. The authors conclude that important actions for adapting this technology to future climate change include additional empirical study of its key biological mechanisms and operational changes such as more frequent releases of wMel-carrying *Aedes aegypti*.

— *Mathew Burciaga*



Left: Kendall Calhoun checks a camera trap. Middle and right: Motion-sensor camera traps captured images of fire ripping through Hopland Research and Extension Center in July 2018, and the return of wildlife in the months following.

These findings highlight the importance of using forest management techniques like grazing and prescribed burning to reduce the intensity of wildfires, since lower severity fires are more likely to leave the tree canopy intact. “We can use these approaches to increase the chance that when fire does come through, it will leave behind some of these fragments,” said Brashares.

— *Kara Manke*



Ted Grantham



Miranda Redmond



Daniel Kammen



Peter Nelson

Accelerating California Climate Action

Four projects led by Rausser College of Natural Resources faculty have received large grants to advance research that builds climate resilience and equity in California.

A partnership between the University of California and the state of California, the California Climate Action Seed Grants and Matching Grants represent an \$80 million investment in 38 projects across the UC and California State University system to spur the implementation of solutions that directly address California’s climate priorities.

The largest of the grants, at nearly \$8.2 million, funds work spearheaded by **Ted Grantham**—an associate professor of Cooperative Extension in the Department of Environmental Science, Policy, and Management (ESPM)—that is dedicated to broadening community involvement in the management of California’s water resources. The COEQWAL (COLlaboratory for EQUity in Water ALlocations) project will develop new planning tools for sustainable, inclusive, and equitable water distribution for the state’s nearly 40 million residents.

“Our project aims to deliver actionable information about how water moves through the state and what it means for farms, cities, small communities, and ecosystems,” Grantham said. “We’re particularly interested in

engaging communities that are vulnerable to water shortages but have not had a seat at the decision-making table.”

Miranda Redmond, an assistant professor in ESPM, was awarded nearly \$2 million for a project that seeks to improve the resilience of California’s dryland forests and expand Indigenous forest stewardship in the eastern Sierra Nevada.

Daniel Kammen, a professor in Berkeley’s Energy and Resources Group, received \$1.4 million to lead a project building tools to help cities and counties create climate action plans and mitigate greenhouse gas emissions.

Peter Nelson, an assistant professor in ESPM and the Department of Ethnic Studies, received nearly \$1 million to work with Tribal entities to expand the use of prescribed and cultural fire and increase Tribal leadership in fire stewardship programs.

“These projects highlight Berkeley’s commitment to climate justice and equity across multiple sectors,” said Rausser College Dean **David Ackerly**. “We’re excited to be partnering with the state of California to produce actionable research that can help address the state’s climate needs.”

— Kara Manke

The Ticker

ESPM graduate student **Cedric Lee** discovered a new species of millipede, *Illacme soca*, also known as the Los Angeles thread millipede.

A study led by Agricultural Economics professor **Sofia Villas-Boas** found that women, young adults, and low-income workers experienced the largest increase in depression risk during the early years of the COVID-19 pandemic.

Berkeley graduate programs in microbiology, environmental science, and environmental policy and management all **ranked in the top 5** in the U.S. News & World Report’s 2023-24 rankings.

Mathew Burciaga (Grantham and Redmond); Elena Zhukova (Kammen); Brittany Hosea-Small (Nelson)

Lab Spotlight

Biological Imaging Facility

When **Steve Ruzin**, PhD '84 Botany, arrived at UC Berkeley in 1989 to manage the Center for Plant Developmental Biology, the fledgling facility's mission was to utilize modern and classical techniques in genetics and cell biology to deepen scientific understanding of the development of specialized cells in corn and other plants.

As the field of developmental biology advanced and equipment capabilities evolved, Ruzin predicted that high-magnification microscopes would be useful for researchers across campus. So in 1991, Ruzin used funds from the Center's initial National Science Foundation (NSF) grant to purchase a Sarastro Phoibos 1000, the first commercial laser-scanning confocal microscope capable of producing a three-dimensional visualization of a sample. "That was probably the first confocal microscope at UC Berkeley," he said. "I don't think anyone in the NSF center had heard of it before."

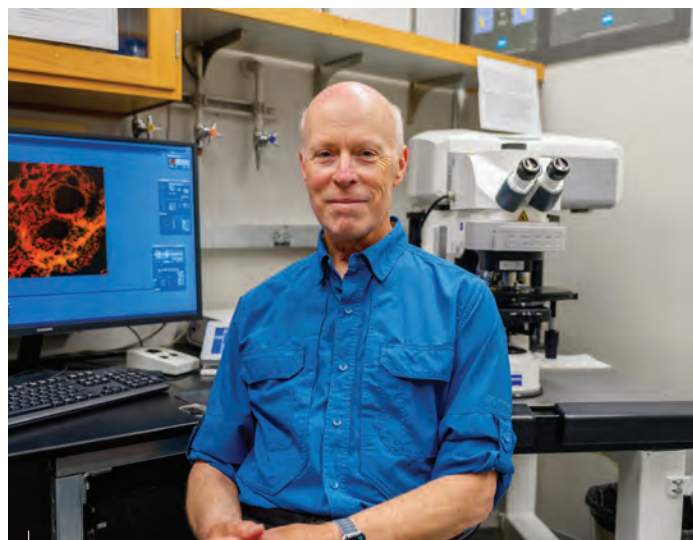
The Center acquired more equipment and increased its user base, and Ruzin approached College of Natural Resources leadership with a proposal to transform it into a dedicated microscopy core facility. In 1998 he was named director of the Biological Imaging Facility (BIF), one of four core laboratories on campus that offer expertise, instruction, and instrumentation in microscopy for research. He hired **Denise Schichnes**, PhD '97 Plant and Microbial Biology, as a lab scientist to help run the facility.

"Microscope technology has changed so much over the years," said Ruzin, who worked with Schichnes and other faculty during his career to secure more than \$2.5 million in grant funding for new equipment.

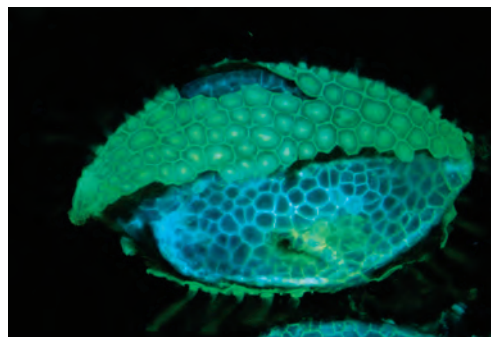
Now, the BIF is capable of high-magnification and high-speed microscopy, examining living cells using fluorescent proteins and imaging through microscope-mounted digital cameras. More than 5,000 scientific publications have benefited from the BIF's equipment, and the Facility has hosted upwards of 4,000 users from across the university and elsewhere.

Ruzin retired from full-time duties in 2022 but remains active with the BIF, which—now under the direction of Schichnes—continues to offer cutting-edge tools for researchers.

— *Mathew Burciaga*



Steve Ruzin with a Zeiss Lm 710 confocal microscope.



A stained *arabidopsis* seed imaged under ultraviolet excitation on a Zeiss Axiophot epifluorescence microscope. Graduate student Brianna Parrington using a ZEISS Axio Observer.

Mathew Burciaga (BIF), Paul Bethke (*Arabidopsis*)

ESPM Professor **Allen Goldstein** received the California Air Resources Board's Haagen-Smit Clean Air Award in honor of his ongoing work providing data on air quality and climate change.

The Department of Nutritional Sciences and Dietetics welcomed the first cohort of the **Master of Nutritional Sciences and Dietetics** program this fall.

ESPM professor **Christopher Schell** was featured in a recent episode of the PBS documentary series *Human Footprint*, discussing how coyotes and other animals adapt to life in cities.

Supporting Monarchs

Just north of campus, the Gill Tract is one of UC Berkeley's oldest living laboratories and, since 2013, the host of a community-engaged urban agriculture project led by the Gill Tract Farm Coalition, Sogorea Te' Land Trust, and Rausser College of Natural Resources. But for far longer than that, the site has provided important habitat for migrating western monarch butterflies.

Every fall, butterflies cluster in the eucalyptus, cypress, and redwood trees on the Gill Tract, feed off the nectar-producing plants, and wait out the winter. "This place is a sanctuary and habitat for monarchs," said **Cole Rainey**, a graduate student in the Department of Environmental Science, Policy, and Management who conducts research at the Gill Tract.

Unfortunately, the number of western monarchs in California has plummeted since the 1970s. Only 2,000 monarchs were counted at overwintering sites in California in 2020, with the Gill Tract supporting the largest number of migrating monarchs in the East Bay that year.

The University contracted monarch expert Stu Weiss to assess the site and recommend management and restoration actions to support the butterflies. Weiss suggested irrigating drought-stressed redwoods and adding new vegetation to the grove.

In May, a group of staff, community volunteers, student interns, and undergraduates in professor **Kathryn DeMaster's** urban agroecology course worked together to plant more than a dozen Monterey cypress trees and two types of California native shrubs and installed an irrigation system. The additions will create habitat for monarchs and other pollinator species.

"The College is excited to help ameliorate the decline of monarch butterflies through this targeted planting of native trees at the Gill Tract," said **Dennis Baldocchi**, executive associate dean and director of agriculture and natural resource programs at Rausser College.

"Monarchs are a symbol of ancestors in many cultures, so in a way, monarchs returning to the Gill Tract is a sign that we are doing something right," Rainey said. "We're trying to honor the ancestors of this place—and our own ancestors—through this work."

—*Mathew Burciaga*

Undergraduate students plant a Monterey cypress at the Gill Tract.



Mathew Burciaga

Introducing the Master of Climate Solutions

As the impacts of climate change intensify, we desperately need leaders who can create and implement climate solutions around the world and across sectors. That's the goal of the new and unparal-

leled Master of Climate Solutions (MCS) at Rausser College.

The one-year program will train those who already lead or aspire to take an active role in leadership positions in business, government, and

nonprofit organizations tackling climate change. Drawing on the College's interdisciplinary expertise, the curriculum will focus on analytical, data-driven, and science-based decision-making skills to enable impact-focused and equitable climate solutions. In addition to core coursework and a hands-on capstone project, students



Scan to
learn more

A pioneering naturalist

When **George Meléndez Wright**, BS 1927 Forestry, was hired by the U.S. National Park Service (NPS) in 1927, the agency did not yet manage national parks as ecosystems, based on science, but rather as tourist attractions. For example, parks fed bears for spectators, killed wolves, cougars, coyotes, and other natural predators, and even kept animal zoos.

Wright, who studied forestry, wildlife biology, and conservation under UC Berkeley professors **Walter Mulford** and **Joseph Grinnell**, developed a different vision of the parks: natural-functioning landscapes where science and ecology guide the treatment and management of plants and wildlife.

By late 1929, Wright—the first Spanish-speaking professional in the NPS—had convinced NPS Director **Horace Albright**, BS 1912 Economics, to approve a multi-year survey of wildlife and plant conditions in the national parks, during which Wright and colleagues documented instances of questionable practices by NPS staff and other conflicts between animals and humans.

Albright later named Wright the first chief of the NPS Wildlife Division, based on campus in Hilgard Hall. He served in that position until his death in a car accident in 1936. Mountains in both Denali and Big Bend National Parks bear Wright's name, as does the nonprofit George Wright Society, which promotes the conservation of parks, protected areas, and cultural and historic sites worldwide.

Conservation writer **Jerry Emory**, MA '85 Geography, and other historians credit Wright



George Meléndez Wright as a forestry student on the UC Berkeley campus in the early 1920s.

with making the case for science-based natural resource management of the national parks. Emory's latest book celebrates Wright's vision and offers a historical account of a crucial period in the evolution of U.S. national parks and protection of wilderness.

Emory and **Alison Forrester**, PhD '13 Environmental Science, Policy, and Management, Chief of Natural Resources and Science for Golden Gate National Recreation Area, discussed the origins and innovations of science in U.S. National Parks in the 2023 A. Starker Leopold Lecture in September.
— *Mathew Burciaga*



Watch the lecture

Courtesy of Pamela Meléndez Wright, Lloyd, Mathew Burciaga (MCS 2x)

can select between three tracks: climate strategy and management, climate policy and politics, and a self-designed specialization.

A concurrent degree program with the Haas School of Business, which would allow students to earn both an MBA and the MCS in two and a half years, is in development.

Applications for the program will open in fall 2024.



From left: Anna Julian, Nicole Parker, Elli Arzbaeher (also below), Isabel Cabrera, and Jordan Honeysucker, students leading Solutions for a Sustainable & Just Future.



Past sessions of the Exploring the Bay Area's Bioregion course involved outings to kayak, hike, and enjoy the outdoors.

Nithya Shankar presenting during the Fruits of the World course.

Students as Teachers

BY MATHEW BURCIAGA

At UC Berkeley, students have the opportunity to learn from world-class professors who are at the leading edge of their fields. But for some, equally memorable lessons come from their peers.

Every semester, between 3,000 and 4,000 students across campus enroll in more than 100 student-led courses offered through the Democratic Education at Cal (DeCal) program.

Working with faculty sponsors, students identify gaps within the current curriculum and then propose, create, and facilitate their own classes.

Dozens of students in Rausser College of Natural Resources lead DeCal courses on various environmental and general interest topics each semester. Here we present a selection of recent courses led by our undergraduates.



ESPM 198

Climate Change Denialism

Facilitators Mara St. Amant and Christine Shimahara introduce the scientific basics of climate change before expanding on the psychology of and challenges caused by science denial. They explore the relationship between the material economy and public discourse about climate change and review historical instances of climate change denialism including media manipulation, political corruption, and misinformation.

ESPM 98

Introduction to Natural Toxins

Students explore the presence of naturally occurring toxins and compounds across human history, culture, and physiology with facilitators James Pak, Louise Chen, and Lindsey Kojima. They analyze the role, evolution, and bioapplications of natural toxins and compounds and discuss the environmental consequences of mass drug production.

PLANTBI 98

Fruits of the World

With their culinary, economic, and cultural significance, fruits play an important role in global society and serve as an example of how plants evolve to thrive across different global ecosystems. Facilitators Nithya Shankar and Sara Otgonbaatar explore the biology, natural history, usage, and symbolism of a different fruit each week.

ESPM 198

Exploring the Bay Area's Bioregion

Facilitators Addison Eftekhari, Thuy-Tien Bui, and Caitlin Grace help participants connect deeply with the space they inhabit through weekly field excursions to sites across the Bay Area. Students learn about the land-use history of the Bay Area drawing on elements from ecology, hydrology, energy, community connections, and Indigenous history.

PLANTBI 198

Medical Microbiology

Facilitators Azeeta Bance and Gabrielle Trapse explore the many ways bacteria, fungi, protozoa, and viruses interact with human health. From the impact of yeasted bread on the nutrition of ancient humans to the way malaria has shaped genetics, the course offers a weekly look at different microorganisms that have shaped society.

NUSCTX 98

Nutrition, Well-Being, and the Environment

Students learn how to live a clean and balanced lifestyle by delving into the relationship between food and the environment with facilitators Ava Nadell and Ashley Carter. The course provides an in-depth look at sustainable food systems by exploring topics in food production, environmental impacts of agriculture, and related public health issues.

ESPM 198

Solutions for a Sustainable & Just Future

A crash course in sustainability through lessons on waste and consumption, climate change, politics, environmental justice, decarbonization, and more is facilitated by Elli Arzbaecher, Isabel Cabrera, and Nicole Parker. The popular solutions-based course offers scalable actions to implement in everyday life. Course creator Sage Lenier, BS '20 Conservation and Resource Studies, is now working with former and current course facilitators to bring the curriculum to a global audience through a new youth-led nonprofit.

Other Recent Rausser College DeCal Courses

- Life Skills: Introduction to Baking
- Assistants, Therapists, and Practitioners
- Introduction to Food Systems
- Introduction to Composting & Vermiculture
- Health for High Achievers
- TreeCal: Tree ID & Ecology
- Going Green or Greenwashing



BUILDING BRIDGES

Undergraduates at Historically Black Colleges and Universities are collaborating with Rausser College scientists to prepare for graduate-level research

BY ROBIN DONOVAN | PHOTOS BY MATHEW BURCIAGA



As graduate programs work to ease pathways to PhDs for a more diverse group of incoming students, they're facing a steep challenge. Not only is recruitment essential for attracting students from a wide range of backgrounds, academic programs must take an antiracist approach to shift long-standing norms and practices that perpetuate barriers to belonging for students with minoritized identities. A new program at Rausser College of Natural Resources seeks to do just that—starting when students are only halfway through their undergraduate degrees.

The HBCU Environmental Scholars for Change Program represents a shift away from recruitment-focused models, with an immersion opportunity for students from Historically Black Colleges and Universities (HBCUs). The mission: create opportunities for visiting students to participate in research while learning from mentors about what daily life as a doctoral candidate is really like. It's the ultimate internship: a chance for students to develop as scientists and enrich the Rausser community with their own unique perspectives.

BUILDING A PARTNERSHIP

Hosted by the Department of Environmental Science, Policy, and Management (ESPM), the program is geared toward

undergraduates at Tuskegee University, Spelman College, and other HBCUs who are interested in pursuing a PhD in the environmental sciences and related fields. The program was co-created by ESPM professor **Timothy Bowles** and ESPM doctoral candidate **Rosalie Fanshel**, and it has received support from Spelman College as well as ESPM, the Berkeley Food Institute, Berkeley's Office of Graduate Diversity, and Rausser College donors (see page 28).

Faculty collaborators at Tuskegee and Spelman recruit students who are curious about environmental scholarship and might have an interest in visiting Berkeley. Then, Fanshel and Bowles visit those campuses, working to match undergraduates with a Rausser College professor in their area of interest. There has been strong interest both among students and Berkeley faculty, but so far, the program has only had enough funding to support four students per summer, says Bowles.

"I see the partnership as another way of expanding the pathway of Black scholars into these fields," says Kimberly Jackson, chair of chemistry and biochemistry, professor of biochemistry, and director of food studies at Spelman.

Carlos Jackson (left) and Na'Zyia Dowdy-Arnold are two of eight students who have come to campus as part of the HBCU Environmental Scholars for Change Program.

She oversees partnerships with several institutions that welcome Spelman students, mentoring participants during their time at Berkeley and elsewhere. Jackson says there are plenty of opportunities for students to plug into existing research. But at Berkeley, she says, “We’re able to tailor some of the programming for our students’ needs.”

Students in the program receive a \$5,000 stipend during their two-month stint at Berkeley, as well as travel and housing. They spend about 25 hours each week on research projects, then participate in networking and mentorship sessions, cultural activities, and workshops. Outings this past summer included visits to Planting Justice nursery, labs

in the Joint BioEnergy Institute, and Pt. Reyes National Seashore, to name just a few. Each week participants spent time with Fanshel, Bowles, and a graduate student coordinator—**Kenzo Esquivel** in 2022 and **McKalee Steen** this year—and throughout the program they interacted with numerous Black faculty members, graduate students, and academic leaders across the University.

The goal is to allow students to experience grad school on a condensed timeline, from direct participation in ongoing research and visits to Bay Area cultural institutions to chatting with current doctoral candidates for day-to-day insights and tips on applying for graduate school.



From left: Carlos Jackson, Destinee Whitaker, Christopher Bass, and Na’Zyia Dowdy-Arnold.

2023 PROJECTS AND MENTORS

Carlos Jackson, Tuskegee University

“Do Transpiration and Photosynthesis Rates Determine Future Stand Success in Quaking Aspen?”

Mentors: *ESPM professor Benjamin Blonder and postdoctoral researcher Roxanne Cruz-de Hoyos*

Destinee Whitaker, Spelman College

“Where’s My Water?: Investigating the Effects of Drought in Po Valley, Italy”

Mentors: *ESPM professor Manuela Giroto, postdoctoral researcher Grace Carlson, and graduate student Tianxin Carlos Wang*

Christopher Bass, Morehouse College

“Deep Soil Profiles Net Nitrification Rates in the Northern California Delta”

Mentors: *ESPM professor Whendee Silver, postdoctoral researcher Tyler Anthony, and graduate student Shayla Husted*

Na’Zyia Dowdy-Arnold, Spelman College

“Qualitative Data Coding in Clean Cooking Research: Coding the Sustainability and Affordability of LPG in Rural Tanzania”

Mentors: *ERG professor Isha Ray and graduate student Annelise Gill-Wiehl*

RISING RESEARCHERS EXPLORE OPTIONS

Joy Rutledge was among the first students to benefit from the program. A computer science major at Spelman, she joined the Environmental Scholars Program in its first summer in 2022 to explore twin interests in agriculture and technology.

Using machine learning methods and satellite data imagery to quantify farms’ ground coverage over time, Rutledge did just that. With mentorship from Bowles, professor **Manuela Giroto**, and ESPM graduate student **Tianxin Carlos Wang**, she studied the impact of soil health on carbon storage in farms in central California. Thanks to the program’s flexibility, Rutledge and a peer contextualized their work by traveling to farms in the Salinas Valley, observing the study areas in person.

“I didn’t just want to be on my computer coding all day, I wanted to see what the farms actually looked like,” Rutledge says. “What I learned at Berkeley is that everything is interdisciplinary.” Now dreaming of starting a family-owned microgreens farm one day, she gained new tech skills through another Bay Area internship this summer at Salesforce, and she still has her eye on a potential PhD in environmental sciences.

Na’Zyia Dowdy-Arnold, a Spelman student who participated in the program this past summer, is a women’s studies major and part of the college’s interdisciplinary food studies program. “A big part of our program is preparing us for PhDs,” she says, so she was intrigued when she heard high praise of the program.

Dowdy-Arnold is interested in food policy and urban planning, and she has advocated for food security and environmentally friendly agricultural practices. This fall she’s launching a business selling artisanal soaps and herbal teas made from plants grown in a garden at Spelman.

In collaboration with Energy and Resources Group professor **Isha Ray** and graduate student **Annelise Gill-Wiehl**, Dowdy-Arnold studied the gender dynamics and affordability of liquified petroleum gas (LPG) in rural Tanzania, where women typically cook with charcoal or firewood.



Left: Julia Toro, MF '21 Forestry, discusses plants with program participants and other collaborators during an outing to Planting Justice Nursery in Oakland. Right: Christopher Bass presents his research at the end of the program in July.

LPG is safer, cleaner, and more efficient, but also more expensive; women save for weeks or even months to afford a single canister. For the experiment, researchers offered women two LPG canisters and a lockbox for their savings, then interviewed them about how it changed their habits. Dowdy-Arnold coded interviews, sorting what the women have said to identify common patterns and themes, while leveraging her women's studies and food security expertise to improve the project.

Carlos Jackson, a rising junior and environmental science major at Tuskegee, hopes to become an extension specialist within a university or at the U.S. Department of Agriculture after he completes his education. When chosen for the program this summer, he knew right away that he wanted to work with ESPM professor **Benjamin Blonder** and postdoctoral researcher **Roxanne Cruz-de Hoyos**, PhD '20 Integrative Biology, on their study of quaking aspen trees. A collaboration with the U.S. Forest Service, the research tracks drought resistance in the species, measuring the growth of 2,700 saplings at the Oxford Tract greenhouse; the saplings represent genetic varieties that grow at different elevations or in various regions. The scientists hope to determine which genotypes might best tolerate climate change.

SHARING WISDOM

For Dowdy-Arnold, the program's combination of research, field trips, mentoring, and meeting with alumni strengthened one conviction: "If we're going to do research, I want to see how our communities are affected and how we can help them through our work," she says.

During one of the program outings to Allensworth, California—a town founded exclusively by Black people in 1908 that was then marginalized by white farmers—Dowdy-Arnold recognized discrimination she'd seen before. Among other injustices, trains were steered away from the town and waterways were dammed to limit Black farmers' access to water. "The challenges that they faced with their water quality, even with their land," Dowdy-Arnold says, "I see those things happen all the time."

Bowles hopes the program will be among a rising wave

of opportunities for diverse students not only to pursue PhDs, but to infuse environmental fields with their own wisdom. "The field of environmental science has some of the least representation of diverse identities, and yet we're trying to work on explaining some of humanity's biggest issues," he notes. "We just won't be able to do that without more diverse voices and perspectives and experiences present."

Fanshel also stresses that the program has benefits far beyond opportunities for Spelman and Tuskegee students. "We view mentorship as a two-way learning space," Fanshel says. "The Berkeley faculty really learn from our faculty partners at Spelman and Tuskegee, because what they are teaching and what the students have been exposed to at their home institutions is different than the orientation here. We have so much to learn."

LASTING IMPRESSIONS

Overall, Dowdy-Arnold says the program has pushed her academically. "It has me thinking about what my future career path will be."

At first glance, she was struck by how walkable Berkeley's campus is, and how much food access there is. Jackson had his own early impressions: huge, beautiful, and colder than he expected. The Houston native says Berkeley feels like "a different world."

"I appreciate the diversity, the different types of food. It's just a much more laid-back atmosphere," Jackson says. "Here, there's a variety of different perspectives and ways of thinking." Jackson says the impact of the program will last long after his summer research is over, as he hopes to maintain ties with his research team and mentors. Also, "I know my family will be proud of me, after finishing this, after they see my work," he says.

"They'll be proud." His Tuskegee mentors, he says, will be, too.



Funding is needed to continue the program. Follow the QR code to support this partnership.





Toward a New Legacy

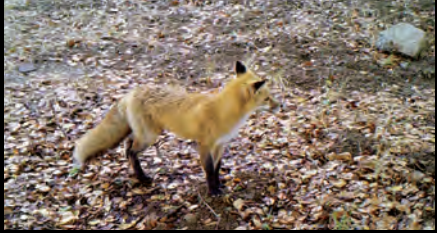
Rausser College faculty are shaping the next era of wildlife and conservation research

BY ZAC UNGER

A hundred years ago, anyone picturing a wildlife biologist would probably think of a man with a shotgun on his shoulder, smoking a pipe while standing atop a mountain, surveying a vast wilderness stretched out before him. He would have considered himself a nature lover, and more than likely, he would have also had ties to UC Berkeley, either as a professor, a former student, or someone whose views were shaped by researchers working within a stone's throw of Strawberry Creek.

Very few universities have dedicated wildlife programs, and among those that do, Berkeley's history in the field is legendary. Alums **George Meléndez Wright**, BS 1927 Forestry, and **Starker Leopold**, PhD '44 Zoology, son of the famed writer and naturalist Aldo Leopold, are both known for groundbreaking reports on wildlife management in America's national parks. **Joseph Grinnell**, the founding director of Berkeley's Museum of Vertebrate Zoology, described the foundational concept of the "ecological niche" and conducted the first exhaustive survey of

Left to right:
Justin Brashares,
Arthur Middleton,
Alejandra Echeverri,
Christopher Schell,
and Stephanie
Carlson



California wildlife from 1904-1940. A century later, Professor **Steven Beissinger** led a 15-year project to resurvey Grinnell's sites and document the impacts of changing climates and landscapes on biodiversity. "Once I came to Berkeley I was surprised to learn how much of my thinking and training had been shaped by its legacy, without me even knowing it," says **Arthur Middleton**, a professor of wildlife management and policy. "It's exciting to be part of that tradition and also to have the opportunity to think about where the field should go next."

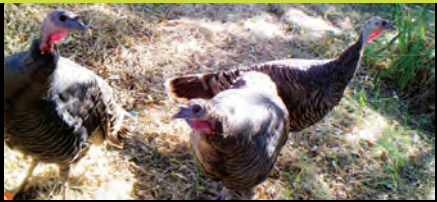
Professor **Stephanie Carlson**, who holds the A.S. Leopold Chair in Wildlife Biology, is honored to be part of this storied legacy, and along with her colleagues, is working to build upon it. "We are in a moment of rejuvenation that makes this an especially exciting time to be part of Berkeley Wildlife," she says. Today the group works hard to incorporate new and diverse voices, to ground their research in real-world policy discussions, and to reimagine what wildlife means in an increasingly urban and digitized world.

BEYOND DEFINITION

"I'm definitely not an elk biologist!" Middleton says, despite having written his dissertation on nutritional and predation factors affecting elk reproduction. His colleague **Justin Brashares**—the Goertz Distinguished Professor in Wildlife Management—feels the same. "When somebody calls me a wildlife biologist, all I can think is that biology is such a small part of what I'm trying to do." And if you take a step back and ask Assistant Professor **Christopher Schell** to define the field of wildlife biology in general, he'll push back on the very definition of what constitutes wildlife: "Is a rat wildlife? What about a domesticated dog? Can wildlife biology include talking about the whole framework of how we govern ourselves?"

Carlson emphasizes that "wildlife biology in the modern era recognizes that the biodiversity crisis, climate crisis, and pervasive social injustices are intertwined—and this realization requires new perspectives and approaches." Assistant Professor **Alejandra Echeverri**, the most recent hire in the group, seems like she's going to fit right in with new colleagues when she says, "If I try to think of myself as a traditional academic, then...I'm working in way too many fields!"

But what Echeverri says next cuts through the confusion and gets to the heart of why everyone teaching in Berkeley's wildlife program struggles to define themselves clearly. "If you start from the problem—say, trying to halt



Schell and Carlson examine a camera trap strapped to a tree on the UC Berkeley campus. The devices are used in several field sites to capture photos of wildlife.

biodiversity loss—and work backwards to what we need to address (change human behavior? stop the spread of wildlife diseases?), then answering questions from many academic fields makes sense.”

Brashares arrived at a similar realization during his graduate work in Tanzania’s Serengeti National Park. “You couldn’t have been in a more pristine environment,” he recalls. “It seemed like the whole point of studying wildlife was to get somewhere you could pretend that humans had no role.” Even in the vast wilderness of northern Tanzania, though, Brashares found that human impacts were constant, from tourists to local communities hunting in the area. The model of wildlife biology was to find places where humans weren’t radically altering ecosystems and then apply that knowledge to everywhere else. But Brashares realized that he needed to do the opposite, and that “meant understanding local culture, history, policy, and economics—and particularly poverty.”

The idea that wildlife must be studied within a broader context is the animating principle that guides Berkeley Wildlife professors. Working with tribal colleagues at the Wind River Reservation in Wyoming, Middleton had to learn to put a cultural lens on a species that he had mostly considered from an ecological perspective. “When there are ten bison that have been reintroduced, it doesn’t sound like a meaningful population for someone who has been trained in population ecology,” he says. “But from the perspective of residents, who had seen bison eradicated over a hundred years ago, the reintroduction of even a small herd had profound effects on tribal sovereignty, cultural revitalization, and potentially as a source of long-term, nutritional, self-sustainability.”

THE ROLES OF WILDLIFE

There is no one who understands this new paradigm better than Schell, who joined the faculty in 2021 and has focused his work on wildlife in urban settings. In particular, the increasing presence of coyotes in urban and suburban spaces offers a fascinating window into how a single species can quickly implicate larger societal issues.

Coyotes are polarizing; it’s indisputably cool to see one walking down the street, but also terrifying for people with small kids or beloved pets. Rapid urban development, rising disease, access to human food, and the societal inequities that underpin all those factors have contributed to increased human-coyote interactions. Wildlife and park officials often find themselves in peacekeeper roles yet are battling multiple issues across parks simultaneously. The resulting conundrum often pits neighbors—or even entire neighborhoods—against coyotes, and sometimes, each other.

But Schell sees these conflicts as opportunities for engagement. To understand why coyotes go where they go, scientists and policymakers must understand the ecological

disturbances that underlie changing habitat patterns. “Those disturbances have been here for decades,” Schell says. And, he explains, they’re largely the result of race-based policies where pollution and blight are localized in poorer neighborhoods because of race- and class-based disparities. “So, we start the conversation by talking about charismatic coyote pups to engage folks reluctant to talk about racism, and we end by addressing how important justice and equity are for people and wildlife in our cities.”

Schell and his colleagues are nudging the field away from the so-called fortress model of conservation, in which reserves were set aside for animals, partly for their own protection and partly as a playground for recreational hunters and anglers. While sport hunting and fishing are still critical components of human-wildlife interaction, the stakeholders are rapidly broadening, and the result is a recognition that wildlife plays a broader role in our lives than previously thought, even in urbanized landscapes. Wild ungulates like elk reduce potential fuel load for wildfire as they eat underbrush and grasses, for example, which is critically important as climate change brings the threat of wildfire ever closer to cities. In addition, animal populations pose serious and ever-changing risks to human health. “We need to better understand how changing habitats affect the transmission of disease, and the ways that wild animals are central to outbreaks of COVID-19 and other pandemics,” says Brashares.

Moreover, the PBS documentary style of animal appreciation ignores the many people who don’t have the financial means or the privilege to go on safari or travel to remote locations. “Many folks’ experiences of wildlife are the common house sparrows, the pigeons, the raccoons, the deer,” says Schell. “In order for us to advance conservation efforts writ large, it’s these folks that we need to help push the narratives required to preserve the intrinsic value of places they may never get to see.”

DEMOCRATIZATION AND MODERNIZATION

The old fortress model was a top-down process, with the values of politicians and experts dictating outcomes. A wider array of stakeholders not only democratizes the field, but also improves the quality of the research. Echeverri works with farmers in Costa Rica to design wildlife corridors between national parks. By creating community-engaged groups to conduct real-time monitoring and bird counts, Echeverri enlists local populations as allies in conservation. Farmers tell her that they’ve seen a particular kind of bird they enjoy and ask her advice on attracting more of them. “Then they’ll decide to grow more plantains to get more toucans,” she says, which in turn encourages communities to steward the land because they acknowledge that they’re sharing space with other species.

Appreciating Animals

“It’s crucial to see wildlife’s role in history, injustice, food security, poverty, civil conflict, economies, epidemic disease, human psychology, culture, and scientific discovery,” says Justin Brashares. “When we reduce animals to memes, calendar photos, or factoids, we risk missing the bigger picture.” While the Berkeley Wildlife faculty focus their work on that bigger picture, they still hold a deep love for animals. Here are some species they find fascinating.

“I love deer, elk, and other drab brown animals that people just drive past, not realizing that many of them have taken hundred-mile journeys over 11,000-foot passes in deep wilderness to end up in their backyard.”

— Arthur Middleton

“Though coyotes are the flagship species for our lab, I find red foxes fascinating because of their intercontinental reach. Foxes from the U.S., London, and Tokyo, all have different political, cultural, and economic histories that shape how these communities perceive and interact with foxes.”

— Christopher Schell

“The Resplendent Quetzal, a colorful, majestic bird found only in the rainforests of Central America. It holds a lot of cultural value: The name means sacred and it symbolized the god of the air for the Aztecs and Mayans. In Guatemala, the bird adorns the flag and gives its name to the currency.”

— Alejandra Echeverri

“We study elephants, lions, wolves, hippos, but my heart is with an underdog of the wildlife world, a little African antelope I studied in grad school called the oribi. It feels like a gift to have spent so much time with them.”

— Justin Brashares

“Steelhead trout, because of their diversity within the species. Some spend their whole lives in freshwater while others migrate to the ocean. Some are adapted for life in California’s bar-built estuaries, and others for intermittent streams! These many forms give the species options in the face of an increasingly variable and changing climate.”

— Stephanie Carlson

It might seem obvious, but actually talking to local stakeholders is something of a new research method in the field. While studying cattle predation by grizzlies and wolves, Middleton had an “epiphany that is kind of hilarious to me now,” he says. He recalls getting stumped by how to scientifically measure something as complicated as whether particular deterrent methods successfully reduced the destruction of livestock by wild predators in rugged, mountainous terrain. “And then we realized we can just go ask the ranchers what they’re seeing, and we’ll get much better data than with any other technique,” he says.

Modern methods in wildlife biology span the range from high- to low-tech, all of which would be revelations to old-school biologists like Leopold and Grinnell. “We’re doing more partnerships with anthropologists and psychologists, using interviews and questionnaires,” says Echeverri, “and we’re even working with artists to incorporate photography and narrative to elicit what people care about in their landscapes.”

On the aquatic side, Berkeley researchers are using underwater videography to identify fish species, and the resulting video feeds open windows into the richness and beauty of life below the water’s surface. On the higher-tech end, Schell and his graduate students overlay data from the crowd-sourced app iNaturalist and the health monitoring tool CalEnviroScreen atop redlining maps and census tracts in Oakland to correlate wildlife distribution with air pollution, groundwater availability, and urban heat islands. Further afield, Brashares and Middleton work with remote sensing technology and machine learning to identify and map fence lines. They hope that eventually livestock can wear stimulus collars that keep them bound within virtual fences rather than physical ones that impede ungulate migration.

ADVANCING PAST ORIGINS

There was a time when simply understanding the natural history and population dynamics of a species would have been enough for most wildlife biologists. But today’s faculty don’t have the luxury of remaining siloed into pure observation and description. “We’re running out of time,” Schell says. “Understanding how to build ecological and urban resilience will help us understand that biodiversity conservation and the environmental justice movements are joined at the hip.”

All the professors involved in the Berkeley Wildlife group work hard to ensure that their research is accessible for policymakers and tailored to address the specific problems that impact the inevitable conflicts between people and animals. For example, when Brashares and his team studied the burgeoning cannabis cultivation industry in California and the effects of greenhouse lights and generators on nearby ecosystems, they were careful to always refer to the specific text of the regulations that California had enacted. Ensuring that the questions they asked fit the facts on the

ground gave them the best chance of finding answers with concrete applications. That desire to produce tangible results is part of what led Brashares to become a policy advisor to California’s 30x30 Initiative, an ambitious plan to conserve thirty percent of the state’s land and water resources by 2030 to both preserve biodiversity and fight climate change.

For some faculty, influencing policy even means becoming one of the policymakers. Middleton had been working on the migratory patterns of ungulates and the ecology of their predators around Yellowstone National Park and increasingly dealing with policy issues around land conservation and human-wildlife conflict reduction. He grew frustrated and vocal that agencies didn’t have the time, staff, or funding to prioritize these crucial issues. “But be careful what you wish for,” he says with a laugh. In January 2022, the United States Department of Agriculture appointed him as its first ever Senior Advisor on Wildlife Conservation. Now on the inside, with more connections and institutional muscle, he advances both national policy and exemplary local projects, like streamlining conservation easement and land rental programs and getting agreements on the ground to incentivize landowners to protect wildlife while also putting money in their pockets to keep ranches solvent.

The goal of making the field more inclusive is another way that the program has advanced far beyond its origins. “Let’s just start with the fact that I’m a black man in wildlife ecology,” says Schell. “The fathers of this field, the original arbiters, never saw me being here and never saw urban centers as part of the narrative. Those were the same forefathers who subscribed to removing Indigenous people from the land that they were stewarding.”

For a field focused on the inherent values of biodiversity, there was, for many years, a lack of awareness that a homogenous group of faculty and students would lead to a blinkered worldview and an incomplete set of questions being asked and answered. “Conservation biology has been shifting from an ivory tower discipline to a community-engaged one,” Echeverri says. “We’ve sought out much more participation from people of color, Indigenous groups, the LGBTQ community, and people with disabilities.”

Carlson highlights that in river ecology, decades of tribal activism and advocacy are leading to improved outcomes for fish and people, pointing to the historic removal of the Klamath River dams and recent efforts to reintroduce winter-run Chinook salmon upstream of Shasta Dam as two local examples.

More generally, the team has been working hard to make the field more welcoming to people who have historically been excluded, revising curricula and case studies to send new signals about who “belongs” in the field. “We are working together to reimagine a wildlife program for the 21st cen-



Migratory pronghorn navigate fences and subdivisions in Wyoming (top). A Red-Headed Barbet caught and released by researchers in the Colombian Andes (left). Alejandra Echeverri monitoring the forests of Guanacaste, Costa Rica.

tury, one that centers justice and inclusion,” Carlson says.

Despite pursuing research that spans the globe from Berkeley to Botswana to Bogotá, the Berkeley Wildlife professors are a cohesive and interdependent team. “It’s a great environment,” says Middleton. “We’re always talking over ideas. Nobody retreats to the seclusion of their lab.” Their teams—from undergrads to postdocs—are an integral part of that mix. “We’ve got brilliant, inspired students,” says Brashares, “and we tell them our field and planet needs them to be experts in everything from biology to socioeconomics, urge them to learn new languages, train to communicate like a journalist, and, as though that’s not tough enough, publish a bunch along the way. I’m amazed by how they always rise to the challenge.”

The faculty intuitively understand that studying and managing ecosystems in the 21st century requires breaking down the barriers that have historically defined the field. Schell connects their collegiality back to the subject they’re all working on: “The greater the biodiversity, the more stable that ecosystem is. So why on earth, as scientists, would we start to think that we have to all be the same, do the same, and produce work in the same way?” **31**

Keeping Wildlife in Focus

Fourth-year Vishal Subramanian’s photos capture the wonder of wildlife and emphasize the importance of conservation

BY MATHEW BURCIAGA | PHOTOGRAPHY BY VISHAL SUBRAMANYAN

Vishal Subramanian first picked up a camera during a 2015 trip to Katmai National Park and Preserve in southern Alaska, where he and his family hoped to witness brown bears catching fish during the park’s annual salmon run. “My dad borrowed a long lens from his friend for the trip, and he let me use it when we got there,” Subramanian said. “I’ve been photographing ever since.”



Subramanian has honed his skills through trial and error, as well as mentorship from *National Geographic* photographer Steve Winter, who is best known for his images of big cats. Now, eight years after the Alaska trip, Subramanian has captured incredible images of bobcats, coyotes, mountain lions, and other species found in parks and open spaces in California and beyond. His wildlife photography has been featured in a handful of Bay Area news outlets and even earned him recognition in photo contests run by the California Department of Fish and Wildlife and London’s Natural History Museum.

When he’s not focusing on coursework for his double major in ecosystem management and forestry and statistics, Subramanian spends his free time scouting the Bay Area’s parks and open spaces for subjects. In addition to using telephoto lenses capable of getting close-up images of wildlife from safe distances, he’s also begun to utilize digital camera trapping techniques. Unlike traditional wildlife photography, this method—which requires a photographer to leave cameras, flash units, and remote triggers in the field for multiple days—has helped him to capture more elusive animals and incorporate more habitat into images.

“It’s not only helped me better understand composition and light, but it also forces me to be a better naturalist,” Subramanian said. “You have to look for signs of the animal

Mathew Burciaga (Subramanian)



in the environment, predict where exactly it is going to be, and think about how it's going to walk through the landscape." He currently has eight camera traps deployed throughout the Bay Area, including at the UC Berkeley-managed Blue Oak Ranch Reserve, and is working with the National Park Service on a project documenting efforts to help conserve Yosemite National Park's endangered great gray owls.

Subramanian's photography has also helped him connect with other wildlife photographers and researchers across UC Berkeley. He is currently an undergraduate research apprentice in the lab of Environmental Science, Policy, and Management professor **Christopher Schell**, where he works with graduate student **Cesar O. Estien** to classify the behaviors of urban wildlife observed by the lab's camera traps. He is also working with Integrative Biology researcher **Alan Shabel** on field surveys and camera trapping relating to a subspecies of mountain beaver found exclusively in Point Reyes National Seashore.

As he finishes his undergraduate studies, Subramanian plans to continue his photographic practice—and possibly expand into filmmaking. He hopes to one day produce the same type of nature documentaries that sparked his interest and raise awareness about the issues wildlife face across increasingly altered landscapes.



Subramanian has photographed bobcats in the East Bay hills, coyotes and other wildlife at UC field stations like Blue Oak Ranch Reserve, owls in Yosemite, and more.



Skye Michel (left) hands a living diploma to a fellow student during the Conservation and Resources Studies program's alternative graduation ceremony in Tilden Park in 2019.

Choosing their path, making an impact

Rausser College's Conservation and Resource Studies program celebrates 50 years of interdisciplinary, student-led scholarship

BY JULIE GIPPLE

It was the early 1970s—half a century ago. Antiwar protests were common. Unmarried couples got the right to use contraceptives. Richard Nixon and Leonid Brezhnev signed the Anti-Ballistic Missile Treaty. The Beatles broke up. In the San Francisco Bay Area, the BART system was taking its first passengers. The Free Speech Movement and hippie culture were in full swing.

The Clean Air and Clean Water Acts were beginning to address pollution around the country, the Environmental Protection Agency was founded, and there was an awakening consciousness about the importance of protecting the earth. On the Berkeley campus, a group of faculty and students wanted to live ecologically and devote their careers to helping the environment. It was in this set-

ting that the Conservation of Natural Resources (CNR) major was born.

A true collaboration between faculty and students, the new program took an interdisciplinary approach to environmental problems, with the goal of delivering the best solutions for nature and humanity. Flexibility was a core ethos: each student designed their individual focus area and selected courses, with faculty mentorship, from departments across the University. Many students earned credit for practical experiences including fieldwork, internships, and community involvement—activities that were seen as essential to making connections between theory and



Residents and friends of the Greenhouse, where CNR students hosted classes and demonstrated ecological living in the '70s.

The CNR Review was a student-led effort to build community in the major. Today, students in the CRS student organization use social media to advertise social events.



Then and now: CRS graduates at alt-grad in 2019 (above) and CNR graduates with program co-founder Arnold Schultz in 1977.



practice and choosing future careers. Those involved in the program also valued creating a community and a democracy, where students, faculty, and staff worked cooperatively and participated jointly in decisions.

“The [program] offers students the opportunity to receive an interdisciplinary education,” wrote U.S. Congressman **Ronald Dellums** (MSW '62 Social Welfare), in a 1981 letter to UC Berkeley Chancellor Ira Michael Heyman. “In addition, its course of study is one which is vital to the future of our society.” The program has gone through changes over the years, including a name change to Conservation and Resource Studies

(CRS). And though Berkeley and the world may look very different from those early years, the core elements of the major still exist today—as do the benefits of cross-departmental study and the importance of taking tangible action for change.

This year, Rausser College of Natural Resources celebrates 50 years of this groundbreaking major and the many alumni who have taken their unique experiences with them to careers around the globe. They have served in local and state government positions, led environmental organizations, worked as conservation biologists and resource managers, advanced green building and con-

struction practices, started nonprofits, engaged in environmental education, and much more.

An anniversary event held at the Blue Oak Ranch Reserve in Santa Clara County in April offered students, alumni, faculty, and staff the chance to connect and share memories. Here we present a collection of reflections from some of those who have been a part of this special program through the years.



Current students Anu Thirunarayanan (left) and Addison Eftekhari speak with Dan Kalb, '82 CNR, at the program's 50th anniversary celebration held in April.



Joseph Holmes, '73 CNR, captured this image of himself and classmates Anne Parker (left) and William Searcy (right) atop Matterhorn Peak in Yosemite National Park in 1972. They and other students in the program created one of the first wilderness permit programs for Yosemite.

Community Matters

“We felt freedom and equality, with faculty that respected us and allowed us to participate in decision-making. Some environmental issue would be in the news, and we’d have a class on it the next quarter. It felt really cutting edge.”

— **Ellen Kaye Gehrke** (BS '75 CNR), one of the first students in the program

“The faculty would urge us students to take learning to work and get involved in community efforts like recycling, lobbying the city to ban pesticides, and working on campaigns like the one to municipalize PG&E. Next thing I knew I was walking precincts and registering students to vote.”

— California State Senator **Nancy Skinner** (BS '77 CNR; MA '89 Education), in written remarks for the CRS 50th anniversary celebration

“It was a really creative place at that time. The faculty actually listened to us; we were co-creating and designing things together. Berkeley’s big, but being in the program was like having a family.”

— **Anne Parker** (BS '74 CNR), another early student in the program

“Alt-grad is a great opportunity for us to get away from the hustle and bustle of campus during graduation season, and knowing that it was planned by students for students makes it a really intimate and meaningful celebration.”

— **Thuy-Tien Bui** (BS '23 CRS), on the tradition of an alternative graduation organized by CRS students

Interdisciplinary Environmentalism

“We hope to facilitate the interdisciplinary links between humans and nature, between past and future, between science and ethics... The excitement and inspiration of devising and implementing new policies, scientific approaches, and ways of thinking vitalize us. The hope that we may have some small effect on the earth of the future unifies our study and work.”

— Professor **Carolyn Merchant**, then chair of CRS, in the 1986 major bulletin



An Academic Outlier

“We wanted to be together and focus on what it would mean to live a more sustainable lifestyle in the city. The terms ‘environmentalism’ and ‘sustainability’ weren’t even being used yet.”

— **Tom Javits** (BS '74 CNR), who co-founded the Greenhouse on Ellsworth Street where CNR students held courses, grew their own food, and promoted ecological living

“There was no other program like it at the time anywhere in the country. It was and still is quite unique.”

— **Gordon Frankie**, an emeritus professor who taught ESPM 100, a core course in the program, for 20 years

“We sense something relatively unique in CNR students and graduates: they express a hope for the future. Not a naive hope, but a hope fashioned out of a prolonged struggle with the crises confronting humankind, and the experience of relationship, support, and strength from working together to resolve these crises in a cooperative community.”

— **John Hurst**, a UC Berkeley professor of education who co-founded the CNR program, in a 1981 report about its impact.

“Berkeley wasn’t exactly a friendly ecosystem to this kind of endeavor. Faculty members who were involved were sometimes sailing against the wind. In some sense, they were ahead of their time.”

— **Rolf Diamant**, valedictorian of the first class that graduated with a CNR major in 1973

“In the early 70s there was still the idea that you could have the hero scientist or the hero scholar who would come up with a new way of solving all environmental problems at once. But what we recognize today is that there is no solution to environmental problems unless there is an intergenerational responsibility and connectivity.”

— **Ignacio Chapela**, a professor in the program and its current faculty advisor

“The CRS program is visionary in its approach to environmental problem-solving. It emphasizes systems thinking and collaboration across disciplinary boundaries, which maps nicely onto the very complex real world of policy and decision-making where there are folks who may not share our values or see the world as we do.”

— **Hillary Lehr** ('07 CRS), moderating an alumni panel during the CRS 50th anniversary celebration

“As individuals we may have different interests but we are all analytical and passionate, and being in one space together during office hours is really impactful.”

— **Isabel Cabrera**, junior CRS major and co-president of the Conservation and Resource Studies Student Organization

“Students are the pilots of their education, and the faculty advisors and I are like the air traffic control, making sure things are going in the right direction.”

— **Sarah Rhoades**, academic advisor for the major



This is the first in a series of stories commemorating 50 years of the College of Natural Resources at UC Berkeley. Stay tuned for more in 2024!



Decarbonizing California

MICHAEL COLVIN, BS '05 ENVIRONMENTAL ECONOMICS AND POLICY; '07 MASTER OF PUBLIC POLICY

BY KRISTIN BAIRD RATTINI

Michael Colvin recognizes that few children grow up thinking they want to become a utility regulator. “It’s not nearly as cool as being an astronaut,” he says with a chuckle. But through his work at the California Public Utilities Commission (CPUC) and Environmental Defense Fund (EDF), Colvin has done some pretty impressive stuff. To advance the fight against climate change, he’s devoted his career to decarbonizing the state’s massive energy grid and ensuring an affordable, clean, and safe energy system for all Californians.

“GREENING” THE STATE’S LARGEST EMITTERS

Colvin entered the College of Natural Resources knowing he wanted to do something with the environment, but he wasn’t sure what, why, or how. Then he attended a lecture at Wheeler Hall by former vice president Al Gore about the urgent need to combat climate change. “I vividly remember turning to my friend and saying, ‘This is it. This is what I am doing,’” he says.

It was in the Energy and Society class taught by **Daniel Kammen**, a professor in the Energy and Resources

Group, that Colvin was galvanized by the connection between utilities and climate change. “There was something extraordinarily appealing to me about understanding this large, fixed infrastructure and how the choices we make about the money we spend on it can lead to less pollution,” he says.

Energy infrastructure was very much in California headlines at the time. The state experienced significant rolling blackouts in 2001. That provided impetus for the state legislature to pass, in 2006, the groundbreaking Assembly Bill 32, which established a carbon cap-and-trade program and the state’s 2020 greenhouse gas emissions reduction target.

After earning his Master of Public Policy at Berkeley’s Goldman School, Colvin joined the CPUC in 2008 as a policy analyst. He was involved in launching programs targeted at increasing energy efficiency, which not only reduced emissions but helped the state to defer the construction of a new power plant indefinitely. “It is hugely important for fighting climate change to figure out how we spend money on the largest source of emissions in the state,” he says.

“I got to be a part of the conversation about how, if we decarbonize the power sector, we can leverage that to other parts of the economy.”

The Commission incentivized appliance makers to produce more energy-efficient models, and then subsidized those “greener” appliances and smart thermostats for lower-income consumers. “One third of our citizens cannot afford their utility bill,” Colvin says. “If we as a state free up a little extra money in their monthly budget, it can have an outsized influence on everything in their lives.”

Colvin later served as an energy advisor to two CPUC commissioners and developed a reputation as a creative thinker on thorny issues, such as establishing the first electric vehicle charging rates. He also served for a year as chief of staff for CPUC’s safety and enforcement division, where he focused on integrating risk-based decision-making into how utilities make new infrastructure investments. Colvin credits his multidisciplinary training at Rausser College for his ability to approach problems from multiple perspectives.

California not only succeeded in meeting its 2020 greenhouse gas emissions reduction targets, but it did so

ahead of schedule. “Something that was thought to be impossible ended up being very achievable,” he says. “We set up increasingly aggressive targets and saw that the world would keep spinning if we decoupled energy and emissions from economic development.”

AFFORDABLE, CLEAN, AND SAFE ENERGY

Colvin joined EDF in 2018 and was promoted to director of its California Energy Program the following year. “I was

always impressed with EDF because it combined the best from law and policy with science, economics, and business,” he says.

His focus at EDF is on transitioning California’s energy markets from gas-powered electricity to clean energy, which means advocating for more solar and wind power and infrastructure to get that renewable energy where it’s needed, when it’s needed. The growing demand from electric vehicles and appliances requires not only converting the existing grid but preparing to grow a greener grid by an estimated seven times its current size.

Colvin has drawn attention to the gas system’s legacy infrastructure with a white paper that has been cited across the country. EDF is also working on completely eliminating emissions from the power sector by 2045. “We have seen multiple times when the California electric grid has hit 100 percent renewable,” he says. “Fifteen years ago, that was inconceivable.”

Colvin advances EDF’s goals in myriad ways: helping legislators draft clean energy legislation and budget proposals, serving as an expert witness, filing briefs on energy standards, speaking at conferences, and writing blog posts. “No two days are ever the same,” he says.

He devotes some of those days to Rausser College of Natural Resources. He currently serves as chair of the College’s advisory board, two decades after serving as the board’s student representative. “It has been a professional joy to be a booster and see the College on an extraordinarily strong footing,” he says. “Rausser College is a leading voice on what we can do next for the environment. It’s something I want to continue to be a part of.”

“We set up increasingly aggressive targets and saw that the world would keep spinning if we decoupled energy and emissions from economic development.”

— MICHAEL COLVIN

For the next generation

VERNARD LEWIS AND LISA KALA CONTINUE THEIR EFFORTS TO CREATE A DIVERSE AND INCLUSIVE UNIVERSITY

BY MATHEW BURCIAGA

To many at UC Berkeley and within Rausser College, **Vernard Lewis** and **Lisa Kala** need little introduction. Lewis (BS '75 Agricultural Sciences; MS '79, PhD '89 Entomology) was the University's first Black entomologist and a 26-year professor of Cooperative Extension. Kala (BA '78 Psychology; PhD '93 Education) has held administrative, research, and teaching positions at the Berkeley School of Education for over four decades. They've since retired, but their reputations as experts—Lewis as an urban entomologist and Kala as an educator—keep them professionally engaged.

"We're still busy," Kala says, "but now we have more control over how we spend our time." That freedom allows them to focus on advancing initiatives that encourage the recruitment, retention, and advancement of students from underrepresented backgrounds. They say these efforts—which they support through Rausser College's newly established Vernard Lewis and Lisa Kala Diversity, Equity, and Inclusion Fund—are integral to developing new generations of diverse scholars.

By their own admission, Kala and Lewis could not have been more different when they met in 1975. Born and raised in San Francisco, Kala was a studious, straight-A student who accepted admission to Berkeley as a first-year psychology major. Lewis was born in Minnesota and spent seven years with his grandparents in Fresno, then moved to Oakland after high school to prove his counselor wrong. "My counselor was a white man that, during the civil rights era, told me I wasn't good enough to go to any college," Lewis says. "So, I made it my goal to go to the best university in the land."

Despite their different paths, both were the first in their large families to go to college. The second oldest of seven, Kala often accompanied Lewis to dinners and other gatherings hosted by faculty in the College of Natural Resources. "Not only did they welcome Vernard, who was a student, they invited me and my younger brothers and sisters," she adds. "No other College on campus was this welcoming."

Making higher education accessible for first-generation students has been a career-long focus for both Lewis and Kala, who is half Filipino and half Native Hawaiian. Prior to retiring, Kala's research focused on ways to facilitate academic achievement for underrepresented students. She



Vernard Lewis and Lisa Kala with their daughter Aikane Lewis and grandson Tahir. "We do what we do to pave the way for him, and for other young people of color," says Lewis.

advances that goal through continued involvement in the Academic Talent Development Program, which introduces thousands of K-12 students to UC Berkeley every summer and which she directed for many years.

Lewis, who considers himself living proof that affirmative action works, has been a longtime advocate of the importance of diversity. "When you walk outside, you don't see two trees that look alike or two bugs that are the same," he says. "Being a scientist teaches us that being different is good." Lewis regularly works with College, University, and systemwide leaders on efforts to improve a sense of belonging for Black faculty and students.

The couple's philanthropic contributions are already making an impact at Rausser College. Some of their fund's money supported the HBCU Environmental Scholars for Change Program, which provides visiting undergraduates from Historically Black Colleges and Universities an opportunity to conduct research with Rausser College faculty (see page 10). Additional contributions to the fund will be used to foster similar programs and initiatives.

"This College has taught and trained people of color who are now leading intellectuals and administrators around the world," Lewis says. "If people came together to support these new programs and initiatives, we would be able to continue doing that."

To contribute to diversity initiatives at Rausser College, please consider making a gift to the Lewis and Kala Fund. Just follow the QR code.





River Ecology at Work

PHOTOGRAPH BY
MICHAEL WIER,
CALIFORNIA TROUT

Recovery of steelhead trout and other salmon species in northern California's Eel River watershed has been threatened by pikeminnow for decades. Although they are native to California, pikeminnow are invasive to the Eel River and known to prey on or compete for resources with native fish.

To advance recovery efforts for native salmon, researchers in the lab of Cooperative Extension professor **Ted Grantham** and their collaborators have recently received permits to remove pikeminnows in the Eel River system. Working with the Wiyot Tribe and the freshwater advocacy group California Trout, **Gabe Rossi** and **Phil Georgakakos** are overseeing the development and deployment of an experimental weir on the river's south fork.

The photo here shows Rossi examining the weir with Keane Flynn, a graduate student at the University of Nevada, Reno. While fish are able to move downstream freely through a chute, all migrating fish are herded into a pen as they move upstream. The system is designed to let native fish continue upstream while allowing for the removal of non-native fish.

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