

Yale SCHOOL OF FORESTRY & ENVIRONMENTAL STUDIES

# IMPACTS

2019 ANNUAL REPORT

# Knowledge and leadership for a sustainable future.



Cover: Cumberland Forest, Appalachian Mountains, Kentucky and Tennessee. See page 9 for details. © Byron Jorjorian

It has been three years since I arrived at the Yale School of Forestry & Environmental Studies, and the School community continues to inspire me.

Each day I am impressed by the talent and range of expertise of our faculty and students, the deep commitment of our staff, and the truly global impact of our network of alumni working in every corner of the planet.

I am also continually grateful for the engagement and generosity of our network of supporters, which allows us to pursue the aspirations laid out in our strategic plan.

This year, the thoughtfulness and dedication of our alumni and friends resulted in one of the most exciting and successful years in the School's history, with important investments in many of our new initiatives. Your generosity supports the Yale Environmental Dialogue, an ambitious F&ES initiative that has already infused fresh thinking and innovative ideas into the national conversation about sustainability – and even published a new book, “A Better Planet: Forty Big Ideas for a Sustainable Future.” It will fund a new visiting professorship in climate change that will bring to campus outside perspectives on this critical issue. It will enable us to host a major conference this fall on environmental justice, a vastly important field that touches on every issue we address. It will also help us strengthen our commitment to career development for our students and alumni, and strategic communications for the School.

All of these initiatives are helping us build on our existing strengths while at the same time allowing us to grow and evolve in the face of increasingly complex environmental challenges.

I am excited by the momentum we are building, and I appreciate the many ways you are helping us to achieve these goals.



Indy Burke, Carl W. Knobloch, Jr. Dean



A photo of Mumbai, India illustrates the contrast between continuing economic growth and persistent poverty.

### The nexus of energy and poverty

Generating the energy needed to lift billions out of poverty doesn't have to mean a steep rise in global carbon emissions. In an ongoing research project, **Narasimha Rao** has found that improving living standards across the developing world can be done in a sustainable way. Rao, an assistant professor of energy systems analysis at F&ES, leads the innovative Decent Living Energy project, which gathers data on the energy required for essentials like access to clean water and healthy food, powering household appliances, public transportation, and education.

### Seminal climate research continues to resonate

Twenty-five years ago, a team of researchers led by **Robert Mendelsohn**, the Edwin Weyerhaeuser Davis Professor of Forest Policy and Professor of Economics at F&ES, undertook the first major assessment of how climate change will likely affect agricultural production in the future. The influential paper, which was co-authored by Nobel Prize-winning Yale economist William Nordhaus, provided early evidence that the potential impacts of climate change would vary from region to region, with warmer regions paying the biggest price. Those findings continue to influence climate research: The paper earned the 2019 Publication of Enduring Quality Award from the Association of Environmental and Resource Economists.

### Can marshland keep up with rising seas?

One of the consequences of sea level rise in many coastal locations will be the inland migration of salt marsh. That is, of course, if these marshes are able to move fast enough to keep up with encroaching waters. In an ongoing research project on the Connecticut shoreline, senior lecturer and research scientist **Shimon Anisfeld** is studying marshland migration using a novel methodology that analyzes for microscopic fossils in the layers of sediment, which enables scientists to identify marsh migration that might not be evident through aerial photography. And, working with **Craig Brodersen**, associate professor of plant physiological ecology at F&ES, Anisfeld is also evaluating how tree damage caused by major storms influences this wetland migration.

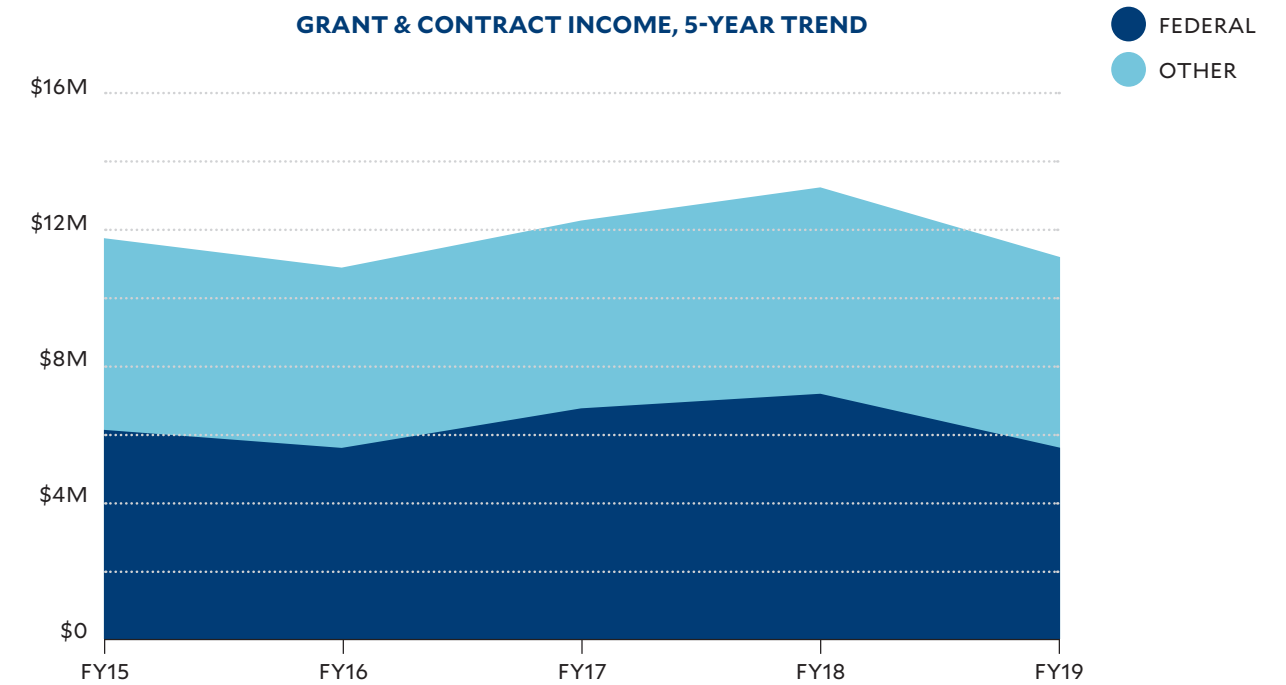
### Benign by design

Understanding the ins and outs of chemistry can be a challenge for anyone, and members of the U.S. Congress are no exception. The House Science, Space, and Technology Subcommittee on Research and Technology recently held a hearing, "Benign by Design: Innovations in Sustainable Chemistry," in preparation for a vote on the bipartisan Sustainable Chemistry Research and Development Act. The group convened a panel of expert witnesses for the hearing, including **Julie Zimmerman**, professor of green engineering and deputy director of the Center for Green Chemistry and Green Engineering at Yale, who stressed the importance of raising awareness, proper training, and research funding for sustainability in the chemical industry.



Julie Zimmerman, professor of green engineering and deputy director of the Center for Green Chemistry and Green Engineering at Yale

GRANT & CONTRACT INCOME, 5-YEAR TREND



**255**  
Faculty publications in 2018

Professors **Michelle Bell**, **Mark Bradford**, and **Karen Seto** this year appeared on Clarivate Analytics annual list of "highly cited researchers," which ranks the top 1 percent of total citations in their fields



Paul Hatanga stands alongside a new road in western Uganda this summer.

### The untold costs of road construction in Africa

Like many developing countries, Uganda is investing in large infrastructure projects. However, road construction projects have substantial social and ecological implications for local communities. Working with the Wildlife Conservation Society and the Uganda National Roads Authority, **Paul Hatanga** '20 M.E.M. is studying these impacts through the use of camera traps, mapping and GIS tools, and interviews with government, contractors and local citizens — producing results that he hopes will promote responsible investment in infrastructure that protects biodiversity.

### Energy efficient housing: To retrofit or to rebuild?

The quantity and carbon intensity of household energy consumption makes up 20 percent of U.S. greenhouse gas emissions. Strategies to reduce these emissions include improved housing and energy conversions, and changes to consumer behavior. **Peter Berrill**, a doctoral student at F&ES who studies the lifecycle impacts of energy production and consumption, recently examined the factors and trends driving household energy decisions. His research will help answer critical questions, including whether future mitigation efforts should focus more on retrofitting current housing stocks or replacing older stock with new housing.

### The future of water in the Himalayas

Bhutan, one of the few carbon-negative countries in the world, is so environmentally conscious, land conservation is written into its constitution. But the small Himalayan nation, which neighbors world powers India and China, remains at risk from climate change due in large part to its reliance on hydropower. **Emma Johnson** '20 M.E.M. spent a month traveling across Bhutan this summer as a student fellow with The Pulitzer Center, reporting on how the rural country is developing clean energy solutions in the face of rising temperatures and erratic weather.

**36** F&ES students participated in the 2018 United Nations Climate Change Conference, **COP24**, in Katowice, Poland

**87** F&ES students have completed fellowships through the Environmental Defense Fund's **Climate Corps Fellow** program since 2008, including eight in summer 2019

**7** F&ES students completed summer internships in Rwanda in summer 2019, where F&ES has built new partnerships in the past year

### Getting to know an insect's 'personality'

One's behavior has a profound effect on everything around them — and the same rings true for animals, argues Ph.D. candidate **Nathalie Sommer** '19 M.E.Sc. Her research focuses on “animal personality” — an animal's consistent behavior across contexts — and how variation of individual personalities within a population can mediate ecological processes, particularly predator-prey interactions and food web structure. Working with **Oswald Schmitz**, Oastler Professor of Population and Community Ecology, Sommer is conducting field experiments, behavioral and physiological measurements, and ecological stoichiometry on grasshopper and spider interactions at Yale-Myers Forest. Her research was recently honored by the National Science Foundation Graduate Research Fellowship Program.



Yale-Myers Forest provides a laboratory for Nathalie Sommer's research on “animal personality,” an animal's consistent behavior across contexts.



Community members tend a garden in an urban natural area in Seattle, one of many cities to participate in a survey administered by F&ES, The Trust for Public Land and The Natural Areas Conservancy.

### Keeping up with the trees in our cities

Urban natural areas are essential to ecosystem resiliency and local public health, and are proven to help combat climate change. These areas, however, are often underutilized and municipalities lack the resources for proper management, according to a landmark report produced by F&ES, The Trust for Public Land, and The Natural Areas Conservancy, a leading New York non-profit founded by **Sarah Charlop-Powers** '09 M.E.M. and **Bram Gunther** '91 M.E.M. The report, co-authored by Ph.D. candidate **Clara Pregitzer** and professor **Mark Bradford**, a professor of soils and ecosystem ecology at F&ES, is the first phase of a project that will now bring teams from 10 U.S. cities together to develop a path toward more efficient management.

### Taking stock of our natural resources

While many experts study how the harnessing of natural resources impacts the environment, others are more concerned with just how many of these natural resources Earth has left. **Nedal Nassar** '11 M.E.Sc., '14 M.Phil., '15 Ph.D. leads the Materials Flow Analysis Section at the Natural Minerals Information Center of the U.S. Geological Survey, which analyzes the stocks and flows of non-fuel mineral commodities to help policymakers and federal agencies understand the potential implications for economic development and national security. Nassar recently received the Presidential Early Career Award for Scientists and Engineers, the highest honor the U.S. government gives to promising scientists and engineers.

### Infusing sustainability principles in the beverage industry

As senior manager of environmental sustainability for Brown-Forman, **Suzette Carty** '04 M.E.M. is helping to drive change in one of the nation's largest spirits and wine companies. She has helped broker a wind power-purchase agreement that will help the company meet its greenhouse gas targets, and has worked to engage employees on issues related to sustainability and recycling. This year, she was named a First Mover Fellow by the Aspen Institute for Business & Society Program, which honors leaders who create environmental and social change within their companies. She's also shared her time and expertise with F&ES over the past several years, supporting the Yale Environmental Sustainability Summit and mentoring students.

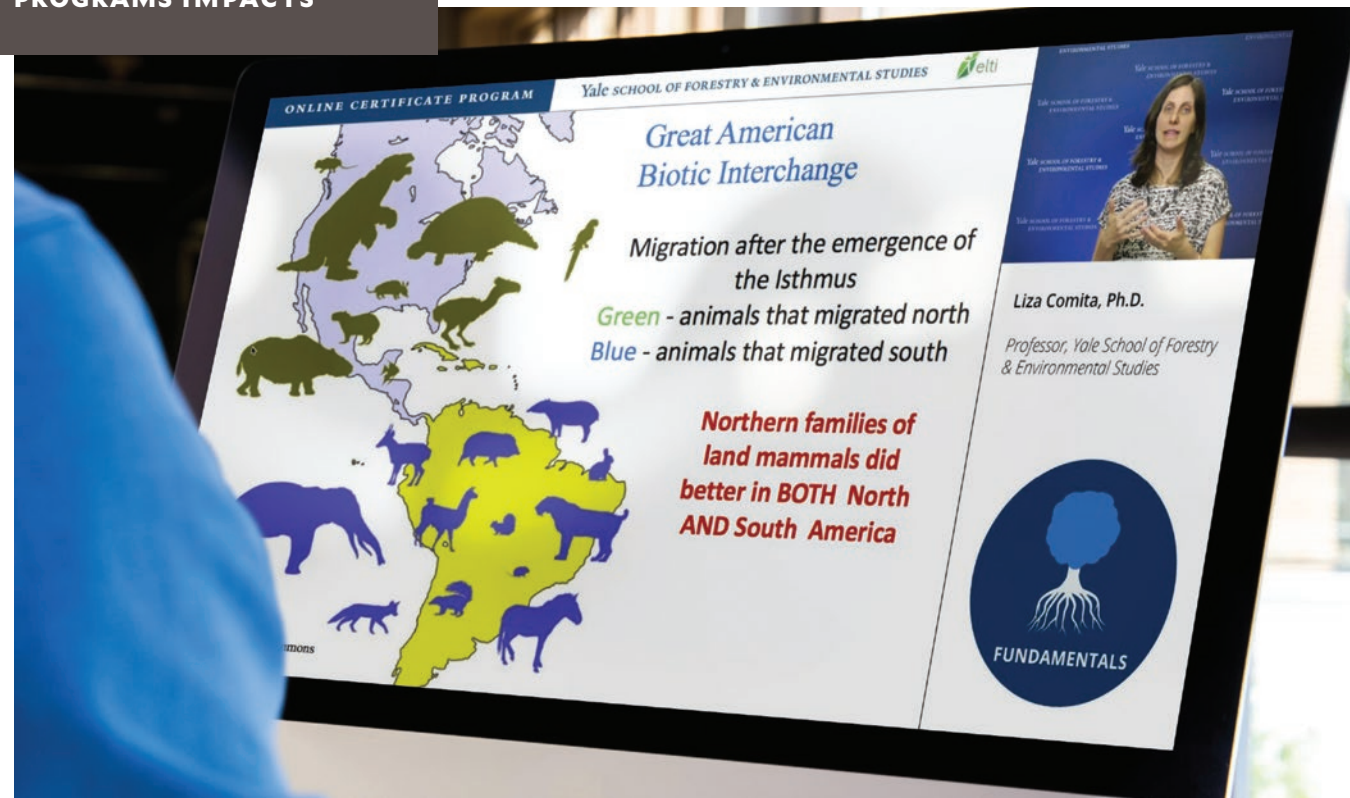
### Financing conservation in Appalachia

The Nature Conservancy (TNC) recently unveiled a conservation initiative that uses private investment to protect more than 253,000 acres of Appalachian forest. The initiative protects a massive store of carbon dioxide and preserves a critical climate migration corridor for species that will have to shift to cooler climates. The architect of the plan was **Tom Hodgman** '09 M.F./M.B.A., a senior director in TNC's NatureVest division. "This is a way to take our work to new scale," Hodgman says. "All across the Conservancy, we've done great forest conservation projects. We've done great carbon projects for the voluntary and California markets. We've built those muscles and can demonstrate that we know how to put these deals together. The Cumberland Forest Project pulls all of this work together into a project you can finance; it pulls this work into an investment."



A new deal brokered by The Nature Conservancy used private investment to protect more than 253,000 acres of forest in the Appalachian region of Kentucky and Tennessee. © Byron Jorjorian

- Working with Microsoft's "AI for Good" program, **SilviaTerra**, a company founded by **Zach Parisa** '09 M.F.S., has created the first high-resolution inventory for all U.S. forests
- 65** graduates work for the U.S. Forest Service
- Three alumni — **Dawn Lippert** '06 B.A., '07 M.E.M., **Shyla Raghav** '09 M.E.M., and **Adrien Salazar** '17 M.E.M. — were named to the **2019 Grist 50**, a list of young leaders doing 'game-changing' sustainability work
- 75%** of F&ES students are currently working with an alumni mentor



A new online certificate program developed by the Environmental Leadership & Training Initiative brings Yale expertise to practitioners in 29 countries.

**260** new episodes of Climate Connections, produced by the Yale Program on Climate Change Communications, reached 51 million listeners

**40** new or ongoing research projects hosted at Yale-Myers Forest

**34** F&ES student fellows and research assistants gained hands-on conservation experience in the U.S. West this year through the **Ucross High Plains Stewardship Initiative**

### Delivering Yale expertise to professionals worldwide

Two centers based at F&ES introduced one-year online certificate programs that allow emerging professionals in countries across the world to access Yale's faculty, training materials, and networks. In "Tropical Forest Landscapes: Conservation, Restoration and Sustainable Use," developed by the **Environmental Leadership & Training Initiative (ELTI)**, participants are learning to design, implement, and monitor effective forest conservation and restoration initiatives. The second course, "Financing and Deploying Clean Energy," which was developed by the **Yale Center for Business and the Environment**, a collaboration with the Yale School of Management, aims to accelerate the uptake of clean energy by building workforce capacity in the areas of policy, finance, and technology.

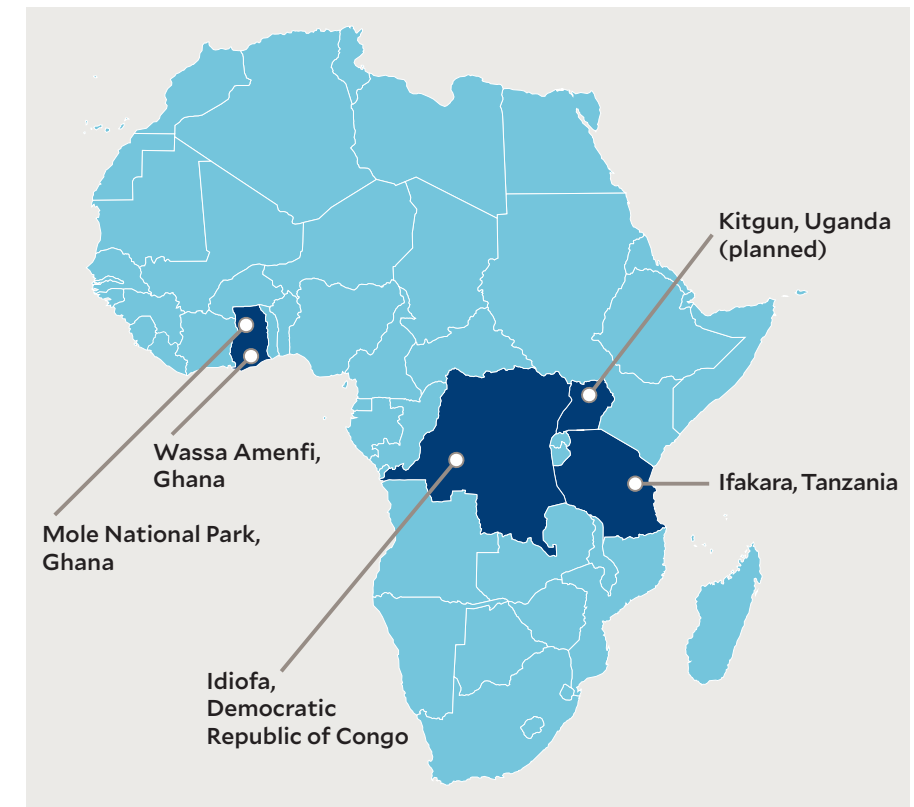
**118** people from 34 countries are enrolled in the **2** inaugural online certificate programs

### URI and partners keep New Haven green

The Elm City lives up to its nickname, with an abundance of street trees thanks to the country's first public tree-planting program developed in the early 20th century. The **Urban Resources Initiative (URI)** carries on that legacy today, planting thousands of trees and cleaning up greenspaces across New Haven with help from the Yale community and nearly 60 local community groups. In 2011, URI formalized a partnership with EMERGE, a program that provides employment for formerly incarcerated adults, making a meaningful difference in the community. Of the 274 participants enrolled in EMERGE since its inception, 75 percent of them have served more than six years in prison. Only 14 percent of those participants have returned to prison; 63 percent have gone on to further employment or education.

### Classes combine for 'land use dialogues' across Africa

Sixty local representatives from agriculture, business, and government participated in a weeklong Land Use Dialogue (LUD) in Ifakara, Tanzania, hosted by **The Forests Dialogue (TFD)** earlier this year. **Bethany Linton '19** M.E.Sc., **Paul Hatanga '20** M.E.M. and **Luca Guadagno '21** M.E.Sc. worked with local stakeholders to design implementable and inclusive policy and management plans that promote efficient land use and development of resources. TFD hosted three additional LUD programs in Africa in the past year (see map), and plans to host one more in Uganda.



# Building Momentum

The Yale School of Forestry & Environmental Studies continues to make great strides toward achieving the ambitious goals identified in its 2017 Strategic Plan.



Build on **historic strengths** through research, training, programs, and initiatives

- ✓ Completed first year of new Master of Environmental Management curriculum, which places greater emphasis on subject specialization, adding depth as well as breadth
- ✓ Hired new director of forest and agricultural operations
- ✓ Conducted extensive review of Career Development Office, resulting in revamped strategy and expanded capacity to better support students and alumni

Develop **areas of emerging strength**

- ✓ New Environmental Communications Center leverages strengths in research and public engagement
- ✓ Creating a new specialization in urbanization that will focus on critical environmental challenges unique to urban areas and urban growth

Create and revise **curricula** that align with strategic priorities

- ✓ New courses explore climate change, urban science, communications, and the intersection of energy and poverty
- ✓ “Learning communities” built around curricular areas introduce students to people, organizations, career paths, and other resources
- ✓ Regularly bring to campus media professionals — including leading journalists, designers, and graphic editors — to improve students’ communications skills

Build and maintain our **leadership** on issues of national and international importance

- ✓ Sent more than 30 F&ES students to COP24 in Katowice, Poland in 2018
- ✓ Formalized a partnership with Rwanda for collaboration on education and research in environmental and sustainability issues
- ✓ Raised funds to expand strategic communications capacity to more fully share F&ES expertise with policymakers and the public

## Opening Yale to the World

Two new online certificate programs enable global professionals to benefit from Yale resources and expertise. “Tropical Forest Landscapes: Conservation, Restoration and Sustainable Use” allows participants to design, implement, and monitor effective forest conservation and restoration initiatives. “Financing and Deploying Clean Energy” promotes the uptake of clean energy by building workforce capacity in the areas of policy, finance, and technology. Both programs combine online training from Yale faculty and guest experts from industry, peer feedback, and opportunities for in-person training.

## Commitment to Environmental Justice

Thanks to the generosity of Graciela Chichilnisky, an F&ES fund has been established to support the expansion of research, teaching, and outreach in global environmental justice — including an endowment for a conference to be held on campus this fall. The fund honors Natasha Chichilnisky-Heal, whose doctoral research at Yale focused on the environmental justice issues related to natural resource extraction in the developing world.

## New Voices on Climate Change

Thanks to the generosity of Coleman Burke ’63, the School will be able to address one of the most critical challenges facing the planet: climate change. The newly created Coleman P. Burke Visiting Professorship in Climate Change will bring one expert practitioner or scholar to campus for at least a semester each year. The professorship will enable the School to draw on the expertise of individuals addressing the climate challenge across the world and introduce new perspectives into the F&ES community.

## Enhancing the National Dialogue

This year, the School launched a series of national events through the Yale Environmental Dialogue (YED), which aims to transform the national discussion on environmental policy. In February, the YED convened more than 100 leaders from across many sectors to share their solutions to complex environmental challenges. The ideas that emerged are featured in a new book, “A Better Planet: 40 Big Ideas for a Sustainable Future,” published by the Yale University Press. More events will be held in cities across the U.S., including this fall in New York and Washington.





**Diversify** our faculty, student body, and staff to better address the complex challenges of the future

- ✓ Refined recruitment and hiring processes, such as a “target of opportunity” search for faculty, and increased diversity of staff, including in positions of leadership
- ✓ Added regular trainings — led by the School’s new Office of Community and Inclusion — on diversity, implicit bias, and cultural competence
- ✓ Launched former Pinchot Fellow Michael Mendez into faculty position at the University of California, Irvine
- ✓ Strengthened student recruitment strategies

**Promoting Community and Inclusion**

An expanded F&ES Office of Community and Inclusion has developed new programming and events promoting conversations that honor diverse perspectives and promote an inclusive culture and further enmeshed these principles in the orientation process for all incoming students. In the spring, Assistant Dean Thomas Easley debuted a podcast series, *Heartwood*, which explores issues at the intersection of diversity and the environment.

Create and support new **interdisciplinary** scholarship, teaching, and outreach

- ✓ Provided grant funding for two F&ES-led research projects through the Leitner Awards for Uncommon Environmental Collaboration
- ✓ Hosted numerous student-run events, including the Yale Symposium on Chinese Overseas Investment Impacts
- ✓ Hired Robert Klee ’99 M.E.S., ’04 J.D., ’05 Ph.D., former Connecticut Department of Energy and Environmental Protection commissioner, to teach courses for graduate and undergraduate students

**An Alaska Case Study**

A new “Perspectives” course was developed to allow students to dive into the complexity of a real-world environmental challenge. The course, taught by F&ES Professor Julie Zimmerman, will steer students through the case of the Bristol Bay Pebble Mine in Alaska, where a plan for a large-scale mining operation stands to threaten the local watershed. Presented with a variety of viewpoints from F&ES faculty and guest experts, students will pull the case apart through open discussion, creating a shared understanding of the importance of interdisciplinary approaches in managing thorny issues.



Enhance the spirit of **community** at F&ES, and strengthen connections across the Yale campus

- ✓ Organized and co-hosted campus-wide Yale Climate Day
- ✓ Established OneF&ES, a group of staff and faculty tasked with developing programs and events that bring the F&ES community closer together
- ✓ Hosted regional events, including F&ESinDC, which linked 100 F&ES students with alumni mentors and potential employers

**Leveraging the F&ES Network**

The School’s network of more than 5,000 living alumni stays connected through regional events and reunions, allowing individuals working across the world to provide mentorship and career support to fellow alumni and current F&ES students. Last year, F&ES introduced another tool, *Alumnifire*, that allows F&ES graduates to network with fellow alumni. The online program already has 1,272 users in 43 countries. More than 100 connections have been formed on the platform between people seeking and offering everything from career advice to collaboration on a work project, and seeking and finding employment from 370 posted jobs.

Create reliable **resources**, including funding and space, to support existing and new work

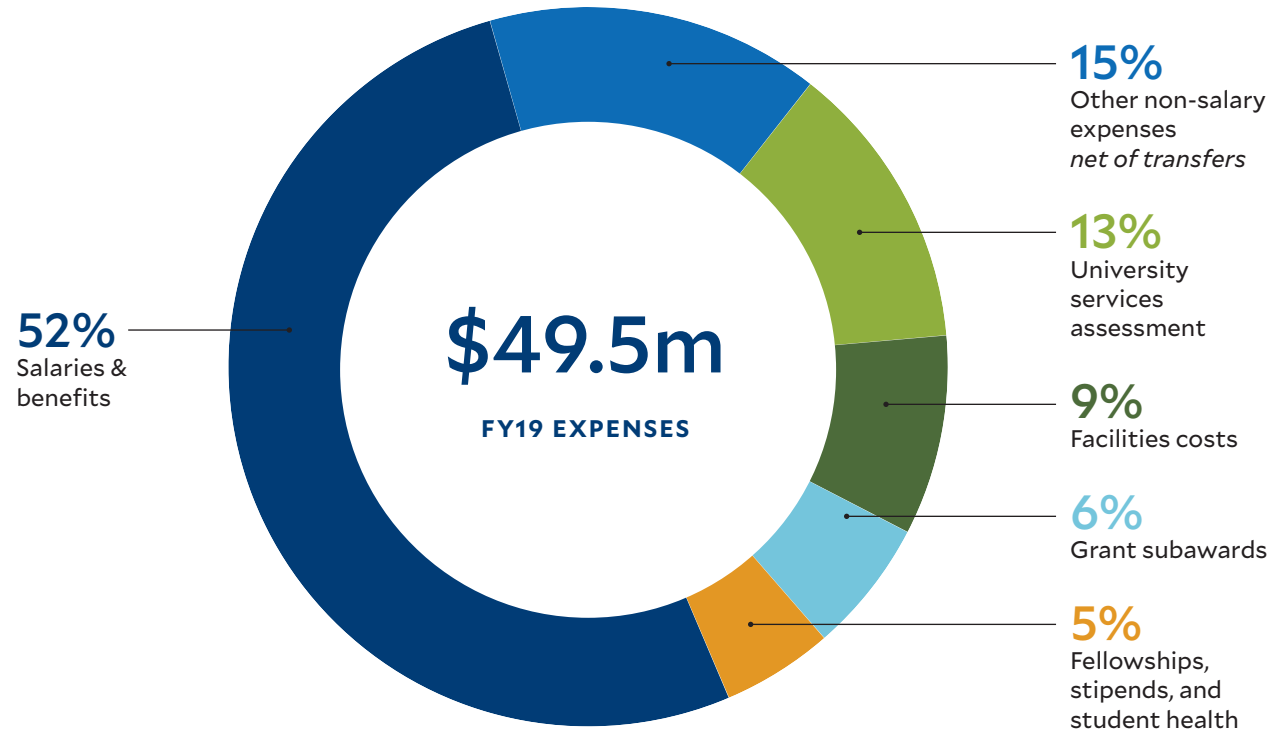
- ✓ Raised record amounts in new gifts and pledges, allowing the School to address priorities articulated in the Strategic Plan, including an emphasis on interdisciplinary collaboration, environmental justice, and strategic communications
- ✓ Expanded physical space to support centers, programs, and research fellows

**Help us continue the momentum**

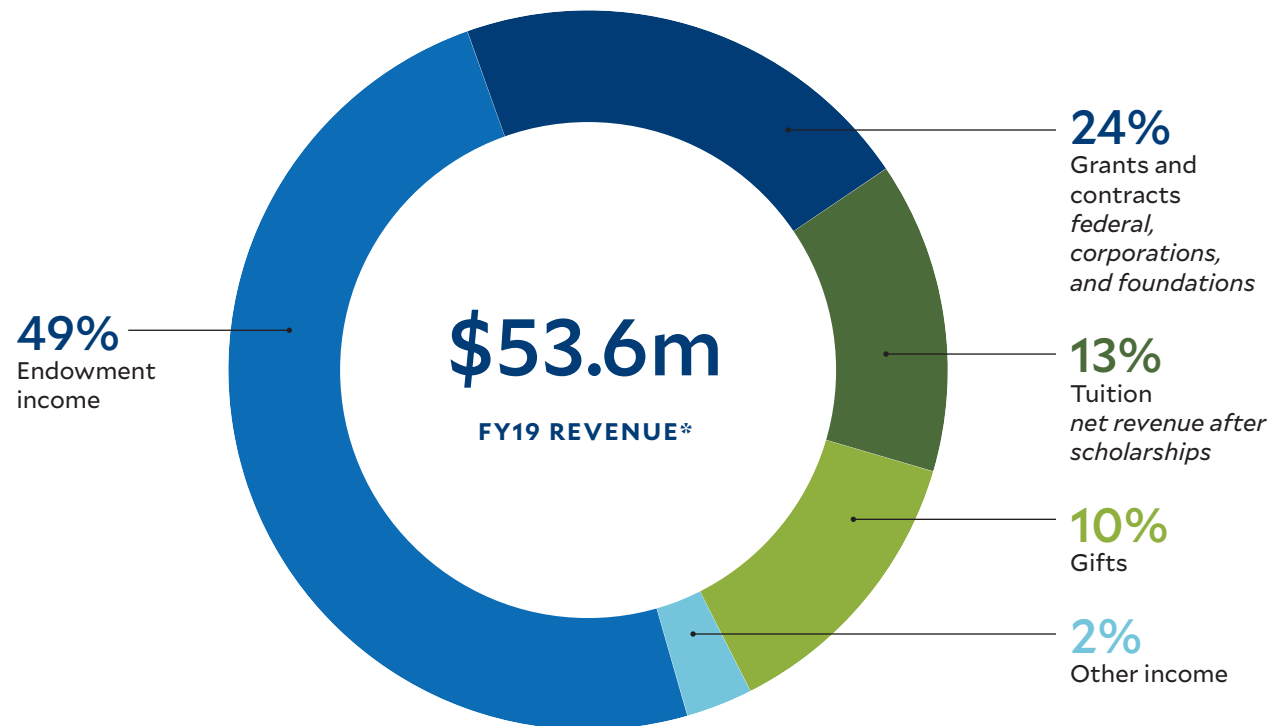
Some of our goals in the near future:

- Develop resources for new programs and professorships:
  - urban systems and environmental justice
  - environmental data
  - environmental leadership
  - climate change mitigation, communication, and policy
- Increase scholarship support for master’s students of all backgrounds
- Raise funds to create new professorships and boost faculty recruitment for inclusive excellence
- Expand the doctoral program to broaden our research impact and scholarly influence

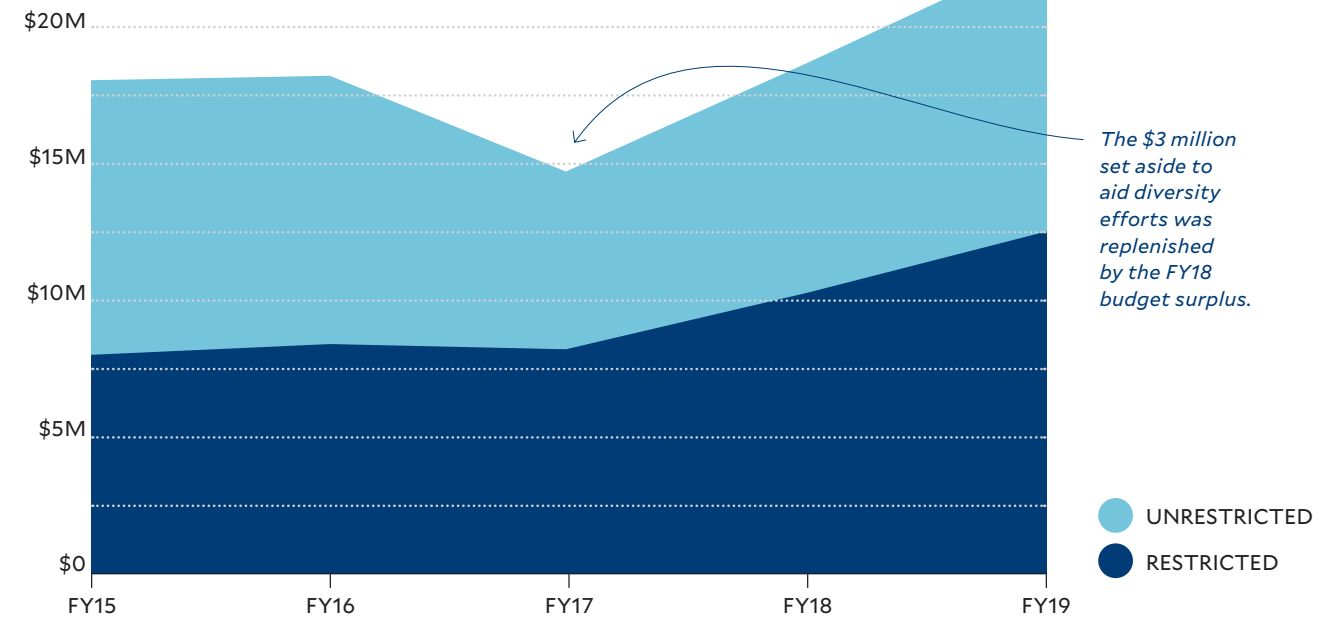




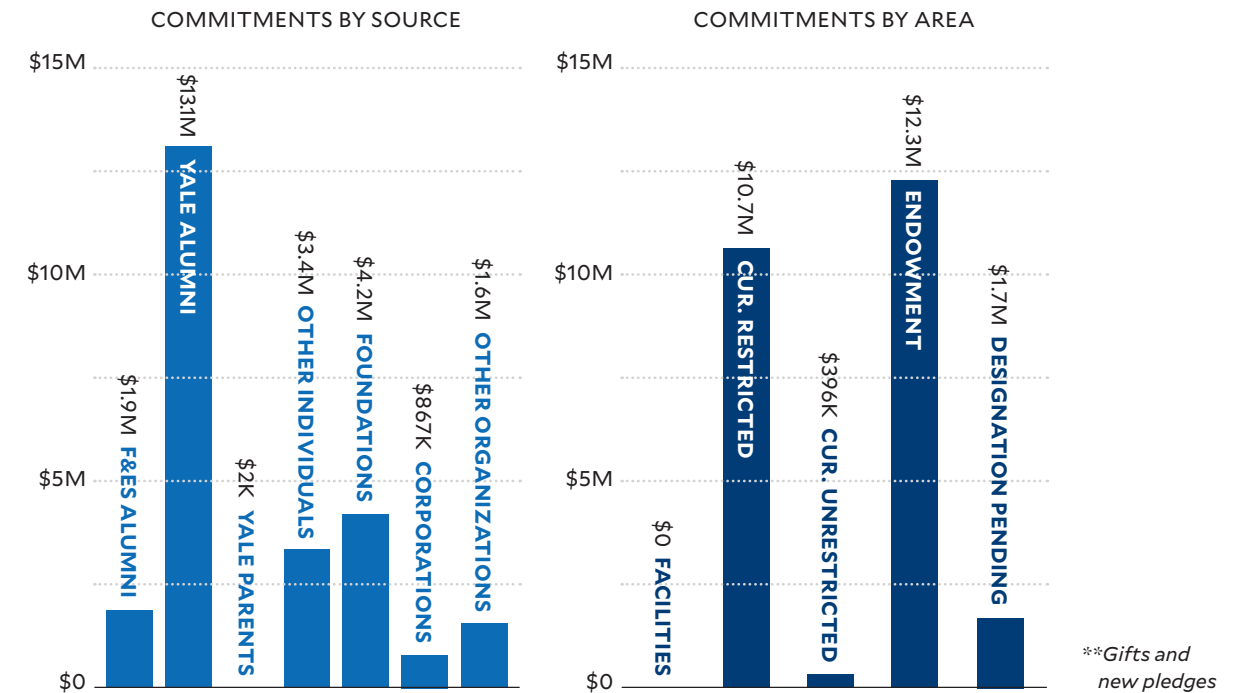
\*Fund balances support multi-year projects based on donor/sponsor restrictions or School priorities



5-YEAR TREND IN FUND BALANCES\*



FY19 COMMITMENTS\*\* = \$25,127,823



# Gifts to F&ES create a foundation upon which our entire school is built.

Because of your generosity, our faculty can conduct groundbreaking research, our students can take advantage of life-altering internships, and our alumni can pursue careers that provide solutions to the world's most pressing environmental challenges. We can continue to bolster our historic strength in research and education, while building an ambitious and innovative path to a sustainable future. Each dollar makes a difference.

Help us continue the momentum created by an incredible year of successes — made possible through gifts from alumni and friends — by donating to F&ES today. Go to [environment.yale.edu/giving](https://environment.yale.edu/giving) or use the attached envelope to make your gift!

Contact the Office of Development and Alumni Services at 203-432-9958 or email [fes.dev.alumni@yale.edu](mailto:fes.dev.alumni@yale.edu)



## THE POWER *of the* F&ES ANNUAL FUND

IN FY19, THE F&ES ANNUAL FUND COLLECTED

# 1,212

GIFTS THAT WERE IMMEDIATELY SPENDABLE, TOTALING

# \$361,013

EQUAL TO THE ANNUAL YIELD OF AN ENDOWMENT OF

# \$7,200,000

WITHOUT HAVING TO RAISE \$7.2 MILLION



27.6% of all alumni made a gift in FY19. Using last year's averages, if all alumni made a gift, F&ES could have raised over \$1.3 million.



# Investments of time, energy, and counsel make a big difference.

The alumni and friends who volunteer on our boards play a critical role in shaping the Yale School of Forestry & Environmental Studies for future generations, and set an inspiring example for members of the F&ES community.

We thank all of them for their service and commitment to our School.

## F&ES ALUMNI ASSOCIATION BOARD

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Gary Barrett '96 M.F.

Jaime Carlson\* '09 M.E.M./M.B.A.

Sue Ely '07 M.E.Sc.

Alex J. Finkral '97 M.F., '05 Ph.D.

Genora Givens '18 M.E.M.

Cilla Kellert '74 B.A., '81 M.F.S.

Jessica Leung '17 M.E.M.

Michelle Lewis '13 MDiv, M.E.Sc.

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Maclovia Quintana '11 B.A., '14 M.E.Sc.

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Whitney Tilt '85 M.E.S.

Mona Wang '13 M.E.M.

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Lav Kanoi, Doctoral Student

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Kristin Floyd '01 B.A.  
*Assistant Dean, Director of Development & Alumni Services*

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Sabrina Szeto '16 M.F.

Leandro Vigna '19 M.E.M.

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## 2018

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Corey Creedon 🇺🇸  
Annie Guo 🇺🇸🇰🇷  
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