



ECOFOCUS

CARY INSTITUTE OF ECOSYSTEM STUDIES

Science for environmental solutions

Spring 2020



Environmental Protection Agency

Green roof in Denver, one of the cities studied in this nationwide green infrastructure assessment.

GREENER, MORE EQUITABLE CITIES

In cities, the impacts of climate change, infectious disease, and development are not felt equally by all residents. With collaborators, Cary Institute is advancing solutions that are science-based and equitable to all, including vulnerable and marginalized groups.

A recent study, funded by The JPB Foundation, explored green infrastructure – a strategy that has been adopted by many cities as a win-win solution for stormwater management. Cary’s Steward Pickett explains, “By investing in green spaces instead of buried pipes, green infrastructure has been embraced as a universal good. We wanted to test this assumption. Who really benefits? Who is burdened? And how can we do better?”

To answer these questions, Pickett joined forces with urban ecologists, social scientists, GIS analysts, and environmental historians, with collaborators from The New School Urban Systems Lab, the USDA Forest Service, and the University of California, Davis. Insights from their two-year study will improve green infrastructure equity through policy and practice.

The team inventoried the distribution and condition of green infrastructure in neighborhoods throughout Baltimore, MD, creating the first complete map of installations in the city. They found that

40% had not been tracked by the Department of Public Works; undocumented projects tended to be smaller and installed by nongovernmental agencies (NGOs) on public land. In lower-income neighborhoods, NGO installations were in need of support to ensure long-term maintenance.

“It’s time to treat green infrastructure with the same care afforded to pipes and storm drains. Green infrastructure can work together as a system, yet it’s not overseen that way from a maintenance or management perspective,” Pickett explains. “This can leave residents burdened with installations that are in disrepair due to lack of maintenance funds, while the city misses out on projects that could count towards stormwater mitigation requirements.”

Surveys of residents living in underserved Baltimore neighborhoods found that negative perceptions of green infrastructure were rooted in maintenance issues and poor communication during the siting and construction process. The good news: when residents were kept informed and installations were cared for, green infrastructure was viewed as a community asset and a source of pride.

“Addressing equity deficits goes beyond improving how green infrastructure is

funded and maintained over time,” explains Amanda Phillips de Lucas, a Cary Institute Postdoctoral Research Associate who led the survey work. “Residents need to be authentically engaged as stakeholders throughout the life of the installation.”

The team also looked at how equity and community engagement were addressed in green infrastructure plans in Baltimore and 19 other US cities. Numbers were sobering. Only 19% of plans discussed environmental justice issues, and just 12% recognized that vulnerable populations were more at risk from hazards posed by green infrastructure projects.

Lessons learned will inform recommendations for city governments and NGOs. These include: conducting ‘equity audits’ of existing green infrastructure, ensuring all installations are documented, engaging residents as stakeholders, developing long-term maintenance plans, managing green infrastructure as a system, and rejecting the assumption that all green infrastructure is good.

Green infrastructure toolkits available to city officials often fail to address governance issues, working with diverse stakeholders, and equity. We are seeking funding to develop a toolkit that fills these gaps, and includes a version for community members, to help them advocate for their own needs.

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ECOfOCUS

Ecofocus is published by Cary Institute of Ecosystem Studies, an independent nonprofit center for environmental research. Since 1983, our scientists have been investigating the complex interactions that govern the natural world and the impacts of climate change on these systems. Our findings lead to more effective management and policy actions and increased environmental literacy. Staff are global experts in the ecology of: cities, disease, forests, and freshwater.

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FROM OUR PRESIDENT

Dear Friends:

As this newsletter goes to press, Cary Institute is hard at work, albeit virtually. While labs are shuttered and field work is suspended, staff are writing papers, catching up on data analysis, working collaboratively via videoconferencing, and writing new grants that will help us continue to address the wicked ecological problems that will persist long after the COVID-19 pandemic has passed. Not surprisingly, our disease ecologists are in high demand with the press. Visit the recently relaunched Cary website for links to the latest news.

This has been a time for reflection and I have been hugely impressed with the ideas and projects that are being gestated during our time away from the office. For instance, our disease ecologists are thinking long and hard about how to prevent future pandemics. Our urban ecologists are exploring the history of urbanism and pandemics across the centuries, and how we can

better design 21st century cities to make them healthier, more resilient, and more equitable.

And, of course, we are aggressively looking to the future. In February, we hired two remarkable young scientists, Jane Lucas and Winslow Hansen (see their profiles on page 4). We are also moving forward with planning a major renovation of our headquarters, taking what we learned from our conversion of the ground floor to a beautiful conference center, and applying it to the rest of our core lab and office space.

I remain confident and optimistic that with your support, our science and our entire institution will come out the other side on a strong, upward trajectory.



John Halpern



IN THIS TIME OF CRISIS...

Take care of *yourself*.

Take care of *those around you*.

Then, when you can, take care of the planet's future with a gift to *ecosystem science*.

www.caryinstitute.org/support

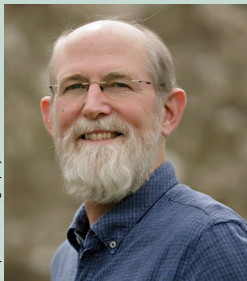
Rhea Esposito

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ASK THE SCIENTISTS

HOT OFF THE PRESS

Just out: two new books by Cary scientists Charlie Canham and Steward Pickett. In *Forests Adrift*, Canham discusses the many threats facing forests and reflects on opportunities to set them on a positive course. Pickett's *Patch Atlas* explores the way we think about landscapes and invites ecologists and designers to work together to reimagine cities of the future. Both books can be purchased online at www.yalebooks.yale.edu.



Charlie Canham, Forest Ecologist

What inspired the title *Forests Adrift*?

Having spent much of my life around forests and the ocean, I've come to notice important parallels between them. Forests have an enormous amount of inertia. Boats do too. If you read a maritime manual on how to steer a ship, most of it involves planning for the

drift in the boat. As you go around a corner, you don't just steer to where you want to go. You must plan for how the boat's inertia is going to affect its path as it turns into the dock. We need to apply this concept to managing forests. Our plans must also be adaptive and anticipate ever-changing currents along the way.

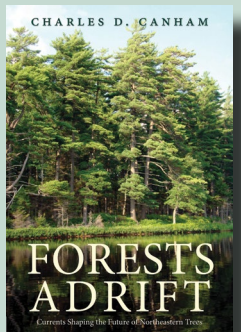
What was your favorite part to write?

I've always been a history buff, so I enjoyed writing about northeastern forests' post-glacial history and the history of forest recovery following abandonment from agriculture in the region. In fact, my interest in history is what sparked my interest in forest dynamics. An image that sticks in my mind is of myself as a teenager skipping class in high school. I was hiking in the woods at West Point thinking that I was wandering through a primeval wilderness when I came across an old stone foundation with a mature oak growing in the middle of it. Far from untouched, this forest had been a farm over 200 years ago.

What key message do you wish to convey to readers?

Forests change very slowly, so we must think about planning for their future on long, constantly evolving time scales. With climate change, we often talk about 'novel ecosystems'. The truth is, every ecosystem in the world has been 'novel' for hundreds of years. With all of the different human impacts since European settlement, we set the forests around us on entirely new courses long ago.

With new forest assemblages come new challenges. To protect future forests, we must account for the many currents impacting them today and plan for constant change, including changes that we've never seen before.



Steward Pickett, Urban Ecologist

Why is land classification important?

Land classification is a key aspect of city planning. Traditionally, the way we classify land types is by 'use' with labels like commercial, agricultural, residential, and forest. This broad stroke approach makes it difficult to infuse ecology into city plans.

Consider a 'residential' area. There are trees, buildings, pavement, lawns – all of these cover types interact differently with things like precipitation, heat, and pollution. A park might be classified as 'forest', but it's more than trees; there are also parking lots, trails, and sidewalks. There is much more happening in a neighborhood or a park – ecologically speaking – than simple labels imply.

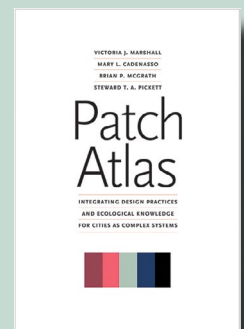
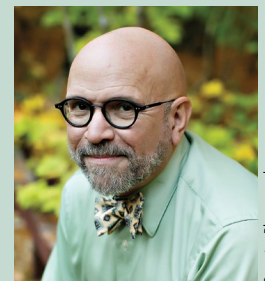
What inspired this book?

Patch Atlas stands on over 12 years of work in Baltimore, stemming from an image analysis tool called the High Ecological Resolution Classification for Urban Landscapes and Environmental Systems – aka 'HERCULES'. This approach analyzes aerial images and classifies land cover into five types: woody vegetation, herbaceous vegetation, bare soil, pavement, and buildings. Using this fine-scale tool, we created the 'periodic table of patch types,' which includes over 300 combinations of these elements.

From this thinking emerged an opportunity to integrate the unique perspectives of urban design and ecology. Designers, planners, and ecologists are all concerned with social processes and equity, but in different ways. We wanted to merge ecology and design and create a tool for city planners that reflects both perspectives.

What is the key message for readers?

To build cities that meet today's challenges, we need to think about planning in new ways, to benefit city residents and the environment. That's what we're trying to encourage in *Patch Atlas*. We present information on land classification – a key aspect of city planning – in a way that dares readers to look more closely at the world around them and imagine new possibilities for how these spaces could look and function.



Surprise Photography

Surprise Photography

CARY WELCOMES NEW SCIENTISTS

Please join us in welcoming two new hires to Cary Institute’s scientific staff. Community ecologist Jane Lucas and forest ecologist Winslow Hansen will be arriving later in the year; their work will complement and expand our expertise in the ecology of soils and forests.

Jane Lucas comes to Cary following a USDA Postdoctoral Fellowship



Jane Lucas

Evan Gora



Winslow Hansen

Ann Olsson

at the University of Idaho. Her research explores big ecological questions via some of the smallest and most abundant things on Earth: microorganisms and invertebrates.

Her current work focuses on how livestock practices shape antibiotic resistance and communities in soil ecosystems. Lucas collaborates with farmers and governmental agencies to inform sustainable land management. She received her PhD in ecology and evolutionary biology at the University of Oklahoma, where she combined field experiments and molecular techniques to understand how nutrient availability and antibiotics shape tropical soil communities.

Winslow Hansen comes to Cary following an Earth Institute Postdoctoral Fellowship at Columbia University’s Lamont-Doherty Earth Observatory. His research investigates how drivers of environmental change, like natural disturbances and climate change, are shaping 21st century forests – from individual trees to biomes. He also evaluates how changing forests influence both the climate and ecosystem services.

Hansen works at the intersections of ecology, sustainability science, and eco-climatology. He earned his PhD in integrative biology from the University of Wisconsin, Madison, where he used large-scale experiments, field observation, and computer simulation to identify the mechanisms underpinning post-fire resilience of subalpine forests in Yellowstone National Park.

TICK TALK: NEW RESEARCH FUNDING + BE TICK-SMART

Spring has arrived and ticks are on the move. They aren’t alone. Cary scientists will soon be heading into the field to study ticks, their mammal hosts, and the environmental factors that regulate tick numbers. This work is part of our long-term research on the ecology of Lyme disease.

We are pleased to announce that Cary scientists Rick Ostfeld, Charlie Canham, and Shannon LaDeau were recently awarded a five-year National Science Foundation grant to continue our decades-long work untangling ecological factors that impact



Kate Beadour

White-footed mice play an outsized role in infecting ticks with the Lyme disease bacterium.

tick numbers and infection rates on Cary Institute’s 2,000-acre Millbrook campus.

The team is monitoring acorns – an important food source for the mammals that feed ticks; population dynamics of mice, chipmunks, and squirrels – sources of tick blood meals and infection; and data on blacklegged ticks at each life stage. The research explores Lyme infection rates within ticks, as well as changes in tick numbers in response to climatic variables. They are also monitoring whether the presence of predators, such as foxes and bobcats, can reduce our exposure to tick-borne disease by regulating rodent abundance.

By studying the ecology of Lyme disease, this work aims to reveal factors that give rise to high numbers of infected ticks, help people avoid high-risk areas and prepare for years of unusually high risk, and ultimately mitigate tick hotspots.

When venturing outdoors, take steps to protect yourself and your family from tick bites. Here are some recommendations from the US Centers for Disease Control and Prevention:

- Wear long-sleeves, long pants, and closed-toe shoes. Light-colored clothing is best.
- Apply EPA-recommended insect repellents.
- Avoid prime tick habitat like forested areas with leaf litter and shrubby areas.
- Walk in the center of trails to avoid contact with nearby vegetation.
- When you get home, do tick checks. Don’t forget pets and gear.
- Kill tagalong ticks by tumble drying clothes on high heat for 10 minutes.
- Shower within two hours of coming home.

THE FISHING IS GOOD, THEN IT'S GONE

If there's a monster under the bed keeping fisheries managers up at night, its name is hyperstability. Hyperstability is a simple phenomenon common in fisheries from the ocean to lakes: catch rates can remain stable even as fish abundance declines. This heightens the risk of fishery collapse because there is no signal that fish are in trouble until it's too late.

Cary scientist Chris Solomon and colleagues are working to understand what causes hyperstability in recreational fisheries. Globally, ~47 billion fish are caught via recreational fishing each year.

Using a whole-lake experiment in a northern Wisconsin lake, the research team tested how angling catch rates changed as they manipulated the abundance of largemouth bass. "Previous studies on hyperstability in



FishScapes researchers working on Camp Lake in WI. Left to right: Spencer Phillips, Colin Dassow, Alex Ross.

recreational fisheries, like those in commercial fisheries, have relied on observational data," explains Solomon. "By using a novel experimental approach, we were able to pin down the mechanisms that lead to hyperstability."

Over the span of three months, the research team changed the abundance of bass in Camp Lake on a weekly basis, from over 350 to only 25 fish. Electrofishing was used to temporarily move fish from the lake's main basin to an isolated side

basin. Against this backdrop of declining bass, anglers fished the lake each week, using similar gear and methods. When their catch rates were compared to the known abundance of fish in the lake each week, the team documented that angler success remained high until only a few fish remained.

"Our study provides strong evidence that hyperstability in recreational fisheries is independent of angler skill," says Solomon. "It can occur simply because fish gather in preferred habitats and anglers know to target those areas." That's worrisome because most fish species have habitat preferences – suggesting that many recreational fisheries may be susceptible.

Future work will explore interventions that can help lake managers make decisions about limiting angler effort to head-off collapse.

OUR WATER

CATSKILL SCIENCE COLLABORATIVE: SUMMER 2020 STUDENT PROJECTS

The Catskill Science Collaborative (CSC) connects research organizations working in the Catskill region to promote data sharing and collaboration on topics relevant to natural resource management.

Now in its second year, the Catskill Research Fellowship program is a CSC initiative designed to fill research gaps identified by natural resource managers in the region. Fellowships are awarded to undergraduate and graduate students. Each student conducts a research project with a university professor in collaboration with advisors from natural resource management organizations.

Here's a look at the teams and the projects they have underway for summer 2020:

Columbia University will explore ways to educate Catskill tourists about how to recreate safely while sharing the outdoors with black bears. They will work with owners of rental homes to determine what types of educational

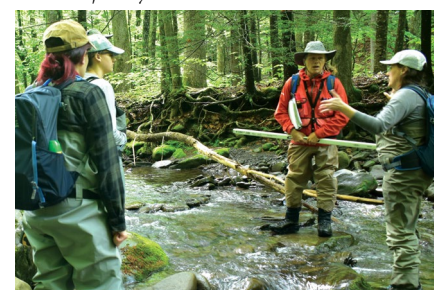
materials work best to help visitors avoid human-bear conflicts. New York State Department of Environmental Conservation wildlife biologists will advise.

Cornell University will assess the effectiveness of streambank restoration efforts aimed at reducing sediments entering Catskill streams, advised by New York City Department of Environmental Protection stream managers. Using simulation and statistical modeling, they will compare erosion and sediment inputs entering restored and unrestored sections of the Stony Clove stream.

City University of New York will develop remote sensing methods to assess tree damage caused by hemlock woolly adelgid, an invasive insect, in the Catskills. They will use two different types of satellite-based imaging to map distribution of hemlock forest and monitor adelgid-driven decline. They will collaborate with the Catskill Regional Invasive Species Partnership.

State University of New York Cobleskill will study stream restoration effects on trout. They will compare habitat quality and trout populations in restored versus unrestored streams in the Ashokan Watershed. Staff from the Ashokan Watershed Stream Management Program and fish biologists from the United States Geological Survey will advise.

The 2020 Catskill Research Fellowship program is co-funded by the New York State Department of Environmental Conservation, the Ashokan Watershed Stream Management Program based at Cornell Cooperative Extension of Ulster County, and Cary Institute of Ecosystem Studies.



NYCDEP stream restoration training 2019

OUR FORESTS

OUR THANKS TO YOU

DONOR PROFILE: NED AMES

Ned Ames is a founding Trustee of Cary Institute, and he continues to serve on our Board. In the early 1970s, when Mary Flagler Cary's land was still managed by the New York Botanical Garden, Ned was instrumental in directing support from the Mary Flagler Cary Charitable Trust to what was then known as the Cary Arboretum. In 1983, in collaboration with founding President Gene Likens, Ned became involved in the creation of Cary Institute as it exists today, on the site of the Arboretum.

Ned has been a key Cary supporter for five decades – through consistent core funding from the Trust, ensuring the establishment of our endowment, and helping secure funds for our Hudson River research boat, eponymously named 'The Ned Ames'. We honor Ned annually with the 'Ned Ames Lecture' held in June; this event is also one way we say 'thank you' to our Aldo Leopold Society members.



Pamela Freeman

Ned Ames and his wife Jane Sokolow.

Most recently, Ned became a founding member of the Mary Flagler Cary Legacy Society, which helps ensure Cary Institute's future. Ned's strong vision for the Institute and his tireless efforts to secure the best possible future for our science make him, along with his wife, Jane Sokolow, beloved friends of Cary.

We asked Aldo Leopold Society Member Jonathan Zearfoss why he supports Cary Institute:

"Cary Institute of Ecosystem Studies has for many years conducted sustained and important research on the local ecosystem with mindful application to global issues. It is an honor to support that work."



Phil Mansfield

Jonathan Zearfoss

IN CASE YOU MISSED IT

Looking for ecological entertainment while social distancing?

Consider exploring our **archive of lecture videos** to learn about topics ranging from monarch butterflies to snow leopard conservation: www.caryinstitute.org/news-insights/videos. Highlights include:

- Cary's Steward Pickett and Timon McPhearson joined Kristin Baja of the Urban Sustainability Directors Network to discuss equity issues and urban green infrastructure at WNYC's Greene Space.
- Bucknell University's DeeAnn Reeder gave a Friday Night lecture on bat ecology, physiology, and conservation.



Pamela Freeman

SUPPORT SCIENCE

PROTECT YOUR HEALTH OUTDOORS

While enjoying time in nature, please remember that each surface is only as clean as the last person who touched it.

Take care to avoid contact with high-touch surfaces, such as picnic tables, benches, and informational kiosks, and keep at least six feet of distance between you and others, especially on trails.

Be sure to do a thorough tick check when you get home.

Further recommendations, issued by the New York State Department of Parks, Recreation, and Historic Preservation are outlined at right.

Barry Haydeez

SOCIAL DISTANCING



STAY LOCAL

ENJOY OUTDOOR SPACES CLOSE TO HOME AND KEEP VISITS SHORT. AVOID TRAVELING TO HIGH-TRAFFIC DESTINATIONS.

STAY HOME



THOSE 70 AND OLDER OR FROM A VULNERABLE POPULATION SHOULD POSTPONE VISITING. IF YOU ARE NOT FEELING WELL, STAY HOME.



GO SMALL

AVOID CROWDS AND GROUPS. ENJOY YOUR VISIT, BUT UNDERSTAND IT IS BEST TO DO SO SOLO OR WITH THOSE IN YOUR IMMEDIATE HOUSEHOLD.

BE READY



MOVE QUICKLY THROUGH AREAS WHERE PEOPLE CONGREGATE SUCH AS PARKING LOTS, TRAILHEADS AND SCENIC OVERLOOKS. IF CROWDS ARE FORMING, CHOOSE A DIFFERENT PARK, TRAIL, OR RETURN ANOTHER DAY/TIME.



BE SAFE

MAINTAIN A DISTANCE OF 6 FEET FROM OTHERS. WHILE ON TRAILS, ALERT OTHER USERS OF YOUR PRESENCE AS YOU PASS, AND STEP ASIDE TO LET OTHERS PASS.

New York State Department of Parks, Recreation, and Historic Preservation

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Visit us online at www.caryinstitute.org

HUDSON DATA JAM GOES VIRTUAL

Calling all students interested in science and art! Cary Institute's Hudson Data Jam competition offers a chance to explore scientific datasets and communicate the stories they tell through visual or performing arts. Sing a song, make a video, paint a picture, write a children's book – your imagination is the limit.

Scientists are collecting data around us all the time. Hidden in those numbers are stories that reveal how the world works. Are birds arriving earlier in the spring? How does salinity shape fish diversity in the Hudson River estuary? Data Jam allows students to delve into datasets collected by scientists, including Cary Institute ecologists, form their own questions, analyze data, and share findings creatively.

This year's Data Jam will be 100% virtual. At home together? Your family can work as a team. Each Data Jam submission is judged by a panel consisting of a scientist, an artist, and an educator. Cash prizes will be awarded for the top middle school, high school, and family projects at the virtual Data Jam Expo on June 19.

We invite all Data Jammers to visit our Hudson Data Jam Facebook page to connect, share strategies, and sign up for webinars: **www.facebook.com/HudsonDataJam**. If you have questions, email India Futterman at futtermani@caryinstitute.org.

Thank you to our generous Data Jam supporters: Marist College, The Art Effect, Adams Fairacre Farms, Central Hudson, M&T Bank, The Chazen Companies, and Price Chopper's Golub Foundation.

For competition deadlines and more info, visit: www.caryinstitute.org/datajam