CALS Fights for Urban Well-being

Students from Pine Hills Elementary School in Albany made bird figurines as part of Cornell's Celebrate Urban Birds project.

The charge to research, teach, and provide extension reaches beyond the fields and farms and deep into the heart of our cities. CALS students, faculty, and staff are working to restore, feed, inspire, revitalize, and educate people in urban areas every day.

BY MARISSA FESSENDEN '09

The College of Agriculture and Life Sciences has changed agriculture time and again with discoveries and groundbreaking research. Since establishment as New York's land grant institution, agricultural research and extension has been a vital part of Cornell's contribution to the world. Today CALS is creating green spaces, celebrating urban birds, ensuring food assistance for the hungry, planning the renaissance of the New York Harbor ecosystem, evaluating the effect of trees on air pollution, revitalizing urban site planning, protecting people from waterborne disease, and teaching city students how to grow their own food. Through theses efforts and more, CALS is dedicated to an urban land grant mission.

Urban Greening

Keith G. Tidball, extension associate in the Department of Natural Resources, is investigating the role that nature plays in people's ability to survive, recover, and bounce back after disturbance.

More than half the world's population now lives in urban areas. This gives sustainability advocates and environmentalists a challenge to determine how the city integrates with nature.

After Katrina struck, Tidball traveled to New Orleans to help the community rebuild through the New Orleans Planning Initiative of the Department of City and Regional Planning in Cornell's College of Architecture, Art, and Planning. He has since returned many times with the support of the Ford Foundation.

"We expected people to talk about urban agriculture and gardens," Tidball says, "but what we didn't expect were people talking about how devastating it is to lose the trees. New Orleans was known as a tree-filled city. People were determined to show the world that they were bouncing back—by planting trees."

Running with this sentiment, Tidball is now helping New Orleans to revitalize through community-led urban greening efforts. He is excited to work with people passionate about their place in nature.

"People dismiss thinking about cities in terms of the environment," Tidball says. "They think that it is not natural, but humans are a part of nature. We evolved with it, and we are in cities by virtue of who we are."

Donna Gwin

Keith Tidball

CALS' Keith Tidball organized efforts to encourage urban kids to bring nature to cities by planting trees.

After 9/11, Tidball saw an upwelling of interest in creating green spaces—memorial parks, community gardens, and tree groves. This inspired him to think about how to clear the way for community members in cities to make green projects a reality. At Cornell, Tidball teaches the Urban Environments independent study and seminar course, service learning focused on cities and humans' relationship with the environment. The course culminates in a one-week experience in New York City, through a partnership with Cornell's Public Service Center, where students take a closer look at a topic discussed in class—it could be urban forestry, greening as in parks or gardens, wildlife and fisheries, water quality, or green building design.

Celebrating Urban Birds

The inspiration at the heart of the Cornell Laboratory of Ornithology's Celebrate Urban Birds project is to bring the wild to the child.

Karen Purcell '87, extension specialist and project leader, started Celebrate Urban Birds in 2006 to target underserved audiences in the sciences, particularly young urban Latinos.

"We wanted to bring a love of birds, science, and increased habitat awareness to people everywhere, anywhere," Purcell says. Encouraging active participation in science at a young age, she adds, opens the door to science careers later in life.

Like other citizen science programs at the Lab of O, Celebrate Urban Birds encourages participants to take a look at nature around them, jot down observations, and mail them in.

The Lab of O has been involving the public in science since Arthur A. Allen '16 first hung the lab's shingle on his door in Comstock Hall in 1915, but citizen science has blossomed via the Internet. Today the program runs a large selection of projects, with legacy data sets useful for studying impacts of global climate change.

Whether designed for research or education, each citizen science project has educational resources, data entry, visualization, and graphing tools that allow people to manipulate and see patterns in the data they contribute—see www.cornellcitizenscience.org.

"Participant numbers for Celebrate Urban Birds are fantastic," says Janis Dickinson, PhD '87, associate professor of natural resources and Arthur A. Allen Director of Citizen Science at the Lab of O. "We have 3,000 partner organizations—schools, clubs, 4-H, libraries, corporate wellness programs, rehabilitation clinics, and battered women's shelters."

Participants can host an urban bird celebration with a free "Celebration Kit" that includes an urban-birds poster, materials about birds and urban greening, data forms, and sunflower-seed packets for planting. More than 80,000 kits have been distributed.

In November 2008, the National Forum on Children and Nature endorsed 30 demonstration projects nationwide that creatively reconnect kids with nature, including Celebrate Urban Birds. The program has also elicited interest in other parts of the world, particularly in India, where it could be useful in tracking declines of native birds once common in cities.

Urban Divers Estuary Conservancy

Participants gather for a Celebrate Urban Birds event in Central Park.

Anticipating Emergency Food Assistance

Courtesy Food Bank of New York City

Volunteers from the Food Bank of New York City hand out meals in West Harlem.

When the economy takes a plunge, food pantries and soup kitchens step up to the challenge.

Calum Turvey, the W.I. Myers Professor of Agricultural Finance, is working on a model to predict a surge in emergency food demand months before it happens. He works with Food Bank of New York City employees, who sometimes become volunteers—working without pay to make sure the hungry get fed.

"When you are working with people who are that dedicated, you can't say no to whatever little thing you can do to help," Turvey says.

The Food Bank cannot spare money for research, so Turvey gives them his time. He is part of the Food Banks' Research Policy and Education advisory committee, which helps determine the demand for food pantries, soup kitchens, food stamps, or the Women, Infants, and Children supplemental nutrition program.

"At the end of the day we have a gap—the number of people in NYC that need emergency food assistance and aren't getting it," Turvey says.

The numbers are disturbing. "We had numbers that were very large in some areas that we couldn't explain," Turvey says. "We went over our methodology and decided it was good. We would rather that number go forward and be wrong than be kept back." The group concluded that up to 1.3 million people in New York City are in need of emergency food assistance at some point during the year.

The next step is to get ahead of the curve. Now Turvey is working on a model that will predict how many people will need food assistance three months in the future. He bases the model on a number of economic indicators, including interest rates, inflation, and building permits.

"I have high hopes for the prediction model," Turvey says. "The economy is crashing, which means that donors are crashing, but now the Food Bank has more clients. It is a pretty hard thing for them to manage. At least this will give them a three-month view. Instead of noticing on any given day they're open that they're out of food by 10 a.m., they will be able to anticipate an increase in demand."

Restoring the Hudson River Estuary

The New York Harbor may not seem like the place for an environmental renaissance, but that is exactly what Mark Bain, associate professor of aquatic systems ecology, hopes to see.

Bain and eight other experts have been meeting since 2007 to set the restoration agenda. The Port Authority of New York and New Jersey, the Army Corps of Engineers, and others have already invested millions to make New York City's waterways a world-class estuary and harbor, but they needed to figure out what that means in an urban environment.

"Even within our group of eight experts we were having a hard time coming to agreement on what needed to be done," Bain says.

The group was divided into four segments. Some called for a restoration of nature—a return to the past. Another philosophy was to create opportunities for natural processes to happen on their own—"rewilding." The third approach was to improve ecosystem functions, such as fisheries production. The fourth, and the eventual consensus, was to put natural elements back into a human-dominated ecosystem.

"Once we decided that the ecosystem had been irreversibly modified by human activity and made the decision to work with that activity, it became more practical, methodical work."

"We decided that we needed to have a mosaic of habitats for wildlife and make sure the ecosystem was still very oriented toward people," Bain explains. "We would specify conditions—measurable, identifiable goals—called target ecosystem characteristics."

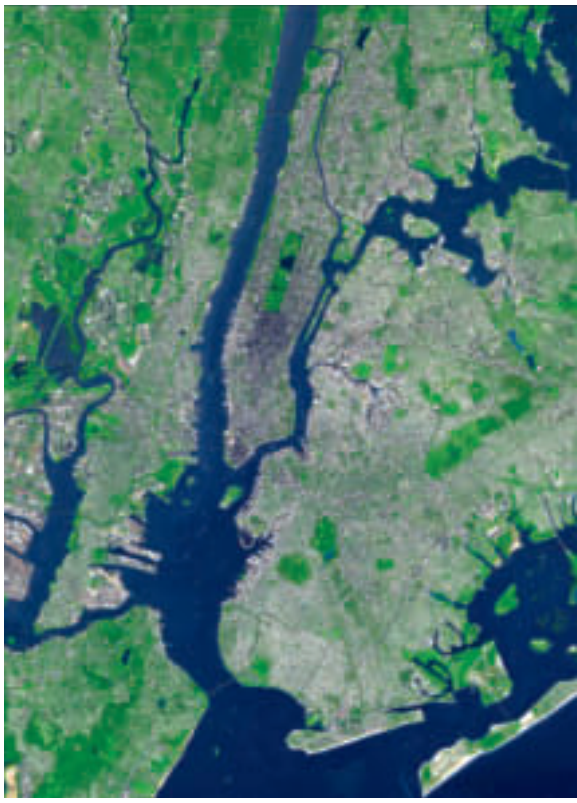
The targets, 11 of them, include a focus on coastal wetlands, reopening connections to tributaries, restoring oyster reefs, and maintaining islands for water birds.

"We started saying that what we were doing was mapping out a renaissance in the environment. We were making anew—looking forward to a new environment."

Bain can see that the goals are starting to be realized. At meetings with community members and policymakers, people are motivated.

"We haven't remade the environment yet, but we have steered the ship in the right direction and a lot of groups have gotten on board."

After the state saw the movement caused by the group's work in New York City, they asked Bain and the other committee members to repeat the process and draw up a similar restoration agenda for the upper Hudson.



Professor Mark Bain is collaborating with environmental experts, policymakers, and citizens to rebuild the New York Harbor's ecosystem.

Finding Out if Trees Filter Air Pollution

A tree-lined city is the urban Eden, and many believe that greenery helps cleanse the air of pollutants.

Tom Whitlow, associate professor of horticulture, knows that the correlation between more trees and cleaner air is not easy to make.

Many often-cited studies of trees as the "lungs of the city" look at the amount of particles deposited on leaves of trees. "But that tells us nothing about the particulate matter in the air that we breathe," Whitlow says.

In wind tunnels, Whitlow measured what happens when a stream of particulates is passed through tree branch groups of varying leaf density and area. Airborne particles come in all different sizes, but the most worrisome are those of less than 2.5 micrometers in diameter, small enough to enter the lungs and cause respiratory problems. The tests showed that leaf canopies actually increase the length of time that particles are airborne. Just as water flowing in a stream swirls slowly in the lee of a rock, particles in the tunnel remained suspended longer when blown through tree branches.

Next, Whitlow went to New York City for real-world data. Regulatory agencies often place particle detectors on rooftops and report hourly averages. Whitlow moved his to the street where people actually walk and sampled every six seconds—the rate at which most people breathe.

With research assistants attending each detector and noting events that might cause a spike in particulates, Whitlow's study showed that distance from the road mattered more than presence of trees or even a dense hedge.

As the study progressed Whitlow realized that the issue was complicated by many factors. Each new convolution means that there will be no easy solution to urban air pollution. For example, particulates of less than 2.5 micrometers aren't just tailpipe emissions but microscopic fragments of tires and even food.

"One of the spikes we saw correlated directly with an entry in the data book that said 'Strong smell of barbecue!'" he says. "And I think it would be even more difficult to regulate barbecue than auto emissions. It is a very complex picture. Our studies show some unexpected results that are difficult to interpret."

Tom Whitlow

New York City teens watch a Cornell research assistant monitor a device to sample the city's air for pollutants.

One thing is clear: we can't plant enough trees in cities to cleanse the air, even if the greens did provide the ecosystem service of filtering pollutants. But monitoring particulates where human activity occurs can certainly help us decide how to regulate for cleaner air.

Helping Plan Urban Green Revitalization

Students in Peter Trowbridge's class, co-taught with Deni Ruggeri, MLA '01, MRP '01, have a chance to design a community park atop a new parking garage adjacent to the World Trade Center site in New York City. Trowbridge, professor of landscape architecture, focuses his work on creating green spaces that integrate city function and nature.

"These student projects are partnerships with architecture firms to generate ideas," Trowbridge says. "Many times the organization follows up, takes the ideas the studio generated, and refines a concept to make it a reality."

The new parking garage project is happening because the Deutsche Bank building adjacent to the WTC site was badly damaged and scheduled for demolition. The Port Authority sought ideas to create a neighborhood park in the area over the new underground parking garage.

Trowbridge, with wife Nina Bassuk '74, also co-teaches Creating the Urban Eden: Woody Plant Selection, Design, and Landscape Establishment, a year-long landscape architecture course. Students learn how to assess a potential site; select appropriate trees, shrubs, vines, and ground cover; design the space; and install the new landscape. The course focuses on site remediation. Past projects include the CALS centennial garden behind Mann Library, a tree-planting project in Geneva, N.Y., and other work in Tompkins County.

Trowbridge's studio classes also worked on a greenway on the East River in New York City. Originally a construction bypass, the mayor's office decided to keep the roadway and expand it into a greenway. The studio worked on ideas for the greenway to help give people a chance to relax and recreate within a natural space.

"The Hudson River Trust is redesigning two piers near Battery City Park. This year, students in a design studio taught by Jamie Vanucchi, MLA '02 looked at how to incorporate nature and education into the space," Trowbridge says.

Last year, Cornell landscape architecture students placed second in the Ed Bacon Foundation competition, Rebuild/Revive. Graduate and undergraduate students in the Department of Landscape Architecture worked on a plan for urban renewal in the once-thriving industrial neighborhood of Ludlow in northern Philadelphia.

"These projects serve the community and get students involved with public projects and real clients," Trowbridge says. "It is a great way to teach."

Provided

LA3010, Integrating Theory and Practice Studio

CALS students sketched plans for more green space at Battery City Park in Manhattan as part of a redesign of two nearby piers.

Preventing Waterborne Disease

Marissa Fessenden

Professor William Ghiorse looks on as undergraduates examine *C. parvum* oocysts through a microscope.

In his lab in Wing Hall, William Ghiorse, chair of the Department of Microbiology, studies a tiny organism that caused the largest U.S. waterborne disease outbreak. In 1993, half the population of Milwaukee, Wis. was infected by *Cryptosporidium parvum*, an intestinal parasite that spreads through drinking water. Officials didn't realize what was happening until pharmacies ran low on Imodium—400,000 Milwaukeeans got sick, and as many as 100 people died. There is no treatment for *C. parvum*, and the deaths occurred among those with severely compromised immune systems.

During the same period, New York City was under pressure from the Environmental Protection Agency to filter its drinking water. It had been long suspected that runoff from farms could contaminate the reservoirs in the Catskills that hydrate New York City, but little was know about how much risk there was and how to counter the threat. Although it is known as some of the best tap water in the world, New York City's water supply is not filtered. The city was chlorinating the water, but chlorine does not kill *C. parvum*.

An individual infected with *C. parvum* develops watery diarrhea, stomach cramps, fever, and vomiting. Symptoms last one to two weeks in healthy people, and with each bowel movement millions of oocysts are shed from the intestinal lining. Oocyst viability is the key to *C. parvum*'s success.

Ghiorse realized unlocking that biological secret would require knowledge of how *C. parvum* is able to survive outside a host for long periods of time, especially in a farm environment.

"Each oocyst is a tough-walled capsule containing four infective cells," explains Ghiorse. "The oocyst wall is waxy, impermeable, and strong, protecting it from chemicals like chlorine."

"But a January thaw will kill them," he says. "Oocysts in manure spread on a field in winter can't stand the freezing and thawing. It breaks them into pieces. Problems could occur when you have a cold winter with no thaw and the snow melts all at once in the spring."

Ghiorse helped draw up guidelines for farmers, including requirements like setbacks to keep animals a certain distance away from streams and proper drainage procedures. Now, Ghiorse is focusing his inquiries into the reason for oocyst viability.

Helping with research along the way are many undergraduate students in Ghiorse's lab.

"The students learn how to do some experimental work comparing viability with biological factors like utilization of stored starch. At the same time, we're answering important questions that have implications for human health, public policy, and basic biology," he says.

Developing a Hydroponics Learning Model

How do you teach an innercity student about agriculture, when they are surrounded by sidewalks and buildings instead of fields and farms? You give them their own mini-farm to run.

Building on more than 20 years of research in hydroponics, Philson A.A. Warner from Cornell Cooperative Extension in New York City, has developed the nutrient drip flow technique (NDFT™) hydroponics technology and the Hydroponics Learning Model (HLM) curriculum to teach science and technology to youth and adults. Students are provided with seeds to grow edible crops, such as basil, Chinese cabbage, and lettuce, while exploring fundamental concepts in applied and biological sciences, technology, and environmental studies.

"It's not just teaching the sciences and technology. It is inquiry-based and hands-on—and at the end of the experience these youngsters are engaged in economics and entrepreneurial activities," Warner says.

Teachers interested in implementing HLM attend a three-day workshop and learn the methodology behind the model. They return to their classrooms with kits, each comprised of a mini NDFT-system, educational materials, and tools to test water quality, pH, and nutrient levels.

"The youngsters are put in charge of the system. It becomes their curriculum. They monitor everything that goes on in the plants—the environment and ecological factors for growth."

Students learn the science behind Warner's hydroponics technology. They learn how plants use the energy of the sunlight and nutrients in the water. They strategize production of the plants and learn how to make marketing decisions.

"This is a wonderful new methodology to teach the sciences," says Warner. "The curriculum fits in the New York Regents standards. The state expects that the classroom will complete approximately 22 labs, and HLM has more than 30 labs involved."

Ten high schools in New York City, such as Food and Finance High School and Brooklyn Democracy Academy, are currently learning through HLM, and more schools are adapting it. The program has also crossed over to the Rikers Island school system and is the standard requirement for science in the two high schools there.

"Many of these youngsters live in an innercity environment," Warner says. "They don't have a clue how vegetables are produced. The program is a grabber, because it happens in real time, right in front of them. This is not just something on television. They know that the program is being utilized professionally and at Cornell. The possibilities are in front of them."

Jesse Winter

Extension associate Philson Warner, right, instructs inmate and student Carlos Miranda in the Rikers Island hydroponics lab.