

## Kids Count: Young Citizen Scientists Learn Environmental Activism

Student researchers become the eyes and ears of environmental scientists.

BY EVANTHEIA SCHIBSTED



Credit: Xplane

Three years ago, while sampling soil invertebrates with staff from the [Appalachian Highlands Science Learning Center](http://www.nps.gov/grsm/naturescience/pk-homepage.htm) (<http://www.nps.gov/grsm/naturescience/pk-homepage.htm>), at Great Smoky Mountains National Park, high school students from a nearby Cherokee reservation spotted a tiny purple bug with white antenna that had been eluding scientists for years.

The rediscovery of this species of wingless soil insects, known as springtails, delighted researchers. They hadn't seen one since its original discovery in New York in 1951. During the next few years, scientists returned to the site to look for the elusive critter, only to come up empty handed.

Finally, on a cold February morning in 2006, Susan Sachs, the science center's education coordinator, took another group of students from Cherokee High School to look again. When they found a springtail, she wasn't surprised.

"One of the reasons we like doing citizen science with kids is they can see things that we can't see with adult eyes," says Sachs. "Their eyes are younger and fresher." She also credits their youthful motivation. "When they know their data means something, they take it seriously."

### Clams, Crows, and Critters

Citizen science – a term coined to describe partnerships between trained volunteers and scientific researchers to answer real-world questions – finds fertile ground among today's students. Environmentally aware and tech savvy, this budding generation of activists connects the dots between personal lifestyle choices and big global issues. Bugging their parents to trade in a gas-guzzling SUV for a Prius goes hand in hand with saving polar bears from melting glaciers. Blogging about environmental concerns on MySpace is as commonplace as raising such issues in science class.

"They're trying to enact their environmental concerns in the world they live in. They say things like, 'Hey, Mom and Dad, why don't we change our lightbulbs to twisty fluorescent ones that are six times more efficient?'" says Andrew Kirk, environmental history professor at the University of Nevada at Las Vegas and author of *Counterculture Green: The Whole Earth Catalog and American Environmentalism*, to be published by University Press of Kansas this month. "They use the Internet, texting, cell phones, all the youth-driven technology avenues, to disperse information about practical environmentalism," Kirk explains.

Such technologies also are changing the face of citizen science, enabling students to enlist in projects through school (or on their own initiative) that have an impact off campus. Data collection for agencies and organizations dedicated to protection or enhancement of the environment becomes a lesson involving science, math, and service that is accessible, relevant, and fun. It is a lesson proliferating among K-12 students nationwide.

In backyards and neighborhoods throughout the United States, youngsters look for ladybugs to help researchers figure out why native species seem to be disappearing. As students comb the Atlantic Coast for evidence of toxins in phytoplankton that poison clams, mussels, and oysters, their counterparts along the Pacific Coast count bottom fish such as halibut, sand dabs, and sole to help the scientific community determine whether pollution has a negative impact on these sea creatures' breeding habits.

While urban youth search parks, yards, and tree-lined streets for birds such as the barn swallow, the American crow, and the mourning dove, young birders in the suburbs and rural areas do the same. Knowing where these species hang out gives ornithologists a handle on what types of green spaces their subjects prefer.

Meanwhile, through another program, at the Appalachian Highlands Science Learning Center, local high school students help collect data about salamanders. (Thirty species exist in a nearby park.) Because twenty-four of these types of amphibians are lungless and breathe through their skin, they serve as valuable indicators that help scientists determine air quality.

The number of engaging and worthwhile projects appears endless. And so does the enthusiasm and energy of this budding breed of young environmentalists. They take their charge seriously, say adults who work with them, when they know their efforts contribute to the greater good.

### Making Counting Count

"Kids merely doing the grunt work of coming up with data is not the point of citizen science," explains Karen Matsumoto, project coordinator of citizen science at the [Seattle Aquarium](http://www.seattleaquarium.org) (<http://www.seattleaquarium.org>). "The point is to engage them in inquiry-based learning and stewardship of the environment."

With this in mind, Seattle Aquarium staff work with seven local high schools that each "adopt" a nearby marine-reserve beach. Students study and then monitor twenty-four species, from starfish to sea slugs, all strong indicators of the health of a beach's environment. "They get down and dirty," jokes Matsumoto. "Around here we call it 'belly biology.' The point is to empower kids to feel like they can be scientists and that the data they collect makes a difference."

And it does make a difference. The data, posted at the aquarium's Web site, is part of a fifteen-year monitoring study to track changes in near-shore ecosystems that will inform scientists and fuel policy makers as they make decisions about the land. Student participation in projects like these is a boon to the scientific community. It helps fill a staffing shortage and provides much-needed information.

"We're making policy decisions based on a lack of good baseline data," says Rick Baker, senior program director at the [Ocean Institute](http://www.ocean-institute.org) (<http://www.ocean-institute.org>), in Dana Point, California. "A good example is carbon dioxide. The reason policy makers can get away with saying there isn't global warming is because we don't have enough information or data to map out the complex relationship of carbon dioxide to the flow of heat around the planet."

One of the Ocean Institute's programs entails gathering data for the Southern California Coastal Water Research Project, an extensive project created to help scientists better understand connections between human activities, natural events, and the health of southern California's coastal environment. Kids contribute by going a couple miles out to sea on the institute's floating lab, a 70-foot-long motorized vessel, casting nets and helping count, measure, and identify bottom fish as well as sharks, skates, and stingrays. Says Baker, "High school kids get really excited if they're part of a real research project."

### Desert-Isle Oasis

No one knows this better than Jane Disney, executive director of the Mount Desert Island Water Quality Coalition. This nonprofit organization, located on an island off the coast of Maine, offers young people meaningful hands-on opportunities to serve on the front lines of environmental stewardship.

One of these is the coalition's Red Tide Monitoring project. Through this initiative, students from six local public middle schools monitor the waters around Mount Desert Island by regularly testing phytoplankton for toxic species, particularly the most prevalent one, *Alexandrium*, which is known to trigger red tide events – toxic discoloration of ocean waters – that can result in poisoning shellfish. The students' efforts serve the dual purpose of protecting both nature and the public. Data they gather goes to the Department of Marine Resources, a government agency that manages the water quality of Maine's state fisheries. Such findings help that department's biotoxin-program staff determine the health of shellfish, particularly mussels and clams, and better target potential red tide events.



Credit: Getty Images

"The coast of Maine is so large, we can cover only so much ground with our biotoxin studies," says Alison Sirois, the agency's volunteer coordinator, "so this program helps with the staffing issue." (Disney's is one of forty-six groups participating in the Marine Shore Stewards program.)

Sirois adds that the work is not easy. "*Alexandrium* is very difficult to detect," she says. "Volunteers need a certain confidence level." The comment thrills Disney, who aims to instill in her students not just environmental stewardship but also invaluable life skills. "My hope is that they will know that one person can make a difference – that what they do matters. I want them to feel confident enough to ask questions and gain the skills to answer those questions."

To meet her ambitious goals, Disney relies on technology. "If we didn't have laptops, it would thwart our ability to work fast with the kids," she says. Fortunately, the 2002 [Maine Learning Technology Initiative](http://www.maine.gov/mlti/index.shtml) (<http://www.maine.gov/mlti/index.shtml>), a partnership between the state and Apple Computer, equips every public middle school student with a wireless laptop computer. (See "[The Maine Event: Laptops On Every Desktop \(/maine-learning-technology-initiative\)](http://www.maine.gov/mlti/index.shtml)," and "[A Computer for Every Lap: The Maine Learning Technology Initiative \(/maine-learning-technology-initiative-king\)](http://www.maine.gov/mlti/index.shtml)".)

On the project Web site, students can hand in data and analyze it, too. "They can look at trends and compare what they're seeing with what other schools are reporting," says Disney. "That's been very crucial in tide monitoring." And, she adds, by logging on, the two middle schools that are off island feel more connected to their on-island counterparts.

*Editor's Note: Although MDI Water Quality Coalition had funding challenges and had to close its doors in 2007, Jane Disney continues to work with students at the Mount Desert Island Biological Lab ([http://www.mdibl.org/high\\_school\\_students.php](http://www.mdibl.org/high_school_students.php)).*

### Ladybug Spotters

Technology also plays a critical role in a project – and [Web site](http://instruct1.cit.cornell.edu/courses/icb344/Lost_Ladybugs.htm) ([http://instruct1.cit.cornell.edu/courses/icb344/Lost\\_Ladybugs.htm](http://instruct1.cit.cornell.edu/courses/icb344/Lost_Ladybugs.htm)) – dedicated to monitoring ladybugs. Participants upload photos of the insects they've spotted, and from there, researchers identify the species. In the near future, that identification process will happen almost instantaneously and twenty-four hours a day. Jeffrey Drake, an engineer at the U.S. Department of Agriculture's Center for Plant Health Science and Technology and a researcher at New Mexico State University, is creating image-analysis software that can identify ladybugs.

John Losey, a Cornell University professor who is the driving force behind the Web site, welcomes youngsters as ladybug spotters. "Kids are high energy," he says. Plus, he says, their lack of expertise can sometimes lead them to discover treasures in places experts might overlook.

The point of finding and identifying these insects is to get baseline data on which ladybug species are out there (about 450 live in the United States) and how the overall population is changing. During the past two decades, native species, particularly the nine-spotted ladybug (*Coccinella novemnotata*) and the two-spotted (*Adalia bipunctata*) ladybugs, have been disappearing and may be on the brink of extinction.

At the same time, exotic and foreign types – such as the orangey Asian ladybug, initially introduced to control pests such as aphids and mealybugs – are on the upswing. Understanding the composition of the ladybug population, says Losey, may lead to better crop management and conservation of native species down the road.

Credit: iStock

### Birds of a Feather

John Losey is one of many scientists at Cornell behind innovative citizen-science endeavors. In fact, the university boasts a long-standing tradition in the field, particularly within its ornithology laboratory. Though these efforts aren't exclusively geared for the young, they definitely rely on their participation. Two recent projects of the [Cornell Lab of Ornithology](http://www.birds.cornell.edu) (<http://www.birds.cornell.edu>) that appeal to student volunteers are [Celebrate Urban Birds](http://www.birds.cornell.edu/programs/urbanbirds/celebration) (<http://www.birds.cornell.edu/programs/urbanbirds/celebration>) and [NestWatch](http://www.nestwatch.org) (<http://www.nestwatch.org>).



Celebrate Urban Birds seeks to overcome barriers of involvement with science, particularly among urban kids. "We hear teachers in inner cities say, 'I can't bus my kids outside the city to view nature,'" says project leader Karen Purcell. "We're telling teachers, 'You don't have to go far to get your kids tuned in to nature. You can walk right outside your city door.'"

Since Celebrate Urban Birds took flight in May, more than 10,000 participants nationwide, many of them teachers, have requested the project's free starter kits. These include everything from a poster with bilingual (English and Spanish) write-ups on sixteen native bird species to kid-oriented questionnaires that ask questions such as "How big is your birdwatching area?"

"The beauty of it is, you can participate for ten minutes or you can go further and do lessons on birds," says Purcell. "I used to teach third grade, so I know the stresses of having tests and materials to cover but still wanting to get kids outdoors for these experiences."

From a scientific perspective, Celebrate Urban Birds hopes to help scientists better understand how various birds use different green spaces, particularly within urban areas. "People living in cities have access to private places scientists can't reach – green balconies, green rooftops, small parks, and small yards," explains Purcell. "Getting lots and lots of people involved, sending us reports from those areas, gives us a powerful view of what's going on."

For the students, the benefit is often a sense of environmental stewardship. "When people start focusing on nature outside their window or on their city block, it makes them feel that the environment outside their windows is theirs," Purcell adds. "People can begin to know, understand, and care."

Data gathered for NestWatch also helps scientists. Participants in this continent-wide effort submit data about the location of nests as well as information such as the type of species and number of eggs or fledglings. (The group works closely with the [Neighborhood Nestwatch](http://nationalzoo.si.edu/scbi/migratorybirds/research/neighborhood_nestwatch/default.cfm) ([http://nationalzoo.si.edu/scbi/migratorybirds/research/neighborhood\\_nestwatch/default.cfm](http://nationalzoo.si.edu/scbi/migratorybirds/research/neighborhood_nestwatch/default.cfm)) program at the Smithsonian National Zoological Park's Migratory Bird Center.) Over the long term, these findings will help scientists understand the impact of climate and land-use changes on bird populations.

Rick Bonney, director of program development and evaluation at Cornell's Lab of Ornithology, anticipates a lot of student involvement and says, "We hope to get kids who are already living on the Internet to look at images and collect data."

### Budding Hope

Meanwhile, Cornell research scientist David Weinstein hopes to involve students in [BudBreak](http://budbreak.tc.cornell.edu) (<http://budbreak.tc.cornell.edu>), a project that began last spring to increase understanding of the relationship between plants and global warming in central New York. "The main goal is to get people looking in their backyards so the effects of global warming can become real to them," he says. "This isn't some exotic thing happening to polar bears." Eventually, data gathered for BudBreak will be fed into a similar nationwide effort called [Project BudBurst](http://www.windows.ucar.edu/citizen_science/budburst) ([http://www.windows.ucar.edu/citizen\\_science/budburst](http://www.windows.ucar.edu/citizen_science/budburst)). "There has been some backlash against science," observes Weinstein. "The citizen-science movement is going to make people feel science is part of their daily life."

The addition of students to the ranks of researchers working on understanding and protecting the environment is likely to add vital momentum to scientific projects that improve daily life. "You can have thousands of school kids doing research in a way that accomplishes much more than a handful of scientists," adds environmental history professor Andrew Kirk.

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