



TREE Foundation Annual Report 2014

Compiled by Meg Lowman, Executive Director

December 5, 2014 at Cavanaugh & Co. Accounting Offices, Sarasota FL

(cover: children learn canopy access at a TREE public climbing day)



Dr. Thomas E. Lovejoy, President, The H. John Heinz III Center for Science, Economics, and the Environment
Honorary Board Chairman

Dear TREE Foundation Supporters,

1 December 2014

Thank you for a wonderful year, as TREE is now well entrenched in its second decade of operation as Florida's premier conservation foundation dedicated to forests, and one of the world's few foundations dedicated to grass-roots, local-but-global education and conservation of trees. All of this success is due to your enthusiasm, generosity, and dedication to our mission: "Tree Research, Education and Exploration." Thank you from all of our board, research associates, and indirectly from the next generation whose lives are enhanced by your stewardship of local and global forests.

TREE Foundation continues to attract thousands of visitors to southwest Florida to explore our flagship project, the Myakka River State Park canopy walkway. We opened a second, family-friendly project, the TREE Treehouse, at Spanish Point historical site on Osprey, Florida last fall. The dedication took place on November 25 2013 – whereby a crowd of Spanish Point and TREE supporters all enjoyed the amazing architecture of Michael Walker, who cleverly worked around Indian middens and live oak trees to design a lovely thatched, family picnic hut on stilts along the gorgeous edge of Sarasota Bay!

In addition to these two tree-friendly programs in southwest Florida, our global reach continues to expand: our website received over 1.5 million hits during the past year, with outreach featured in 3 languages! Our church forest conservation in Ethiopia expanded from four forests to ten nearly-complete, walled conservation forests in perpetuity and under the stewardship of the Christian Orthodox church. We continue to expand our global outreach to women and children with sustainability programs in developing countries, including engagement of women in science in Africa through a scholarship program, distribution of conservation books to children in the Amazon and Africa, and ongoing efforts in other developing countries where we have canopy programs. We will co-sponsored the 7th international Canopy Conference in London next year, offer scholarships to students and teachers in the Amazon rain forest citizen science expedition held every July as well as from Ethiopia, and have expanded our distance learning to kids across the states of New York, Mississippi, and Missouri that are learning about forest canopies in middle school where TREE's canopy work is part of their state science curriculum standards. Way to go, trees!

Thank you to all our TREE donors, as well as our tireless board of directors and volunteers who create enthusiasm for our programs to educate, explore and study forests of the world. A summary of this year's ambitious activities is listed below:

Local Canopy Programs

1. **Myakka River State Park canopy walkway** – We purchased/revised new brochures this year, to keep pace with the increasing visitorship that flocks to this important conservation site. These brochures still only reach a handful of the estimated hundreds of thousands of visitors, but new signage along the walk insures that an educational message is delivered to everyone. Our new conservation signage (in English and Spanish) inspires diverse visitors with a take-home message. In addition to one-time visitors, our long-term researchers from Pine View School in Osprey, Florida continue to conduct scientific research at the site, monitoring the health of Florida epiphytes against insect pest invasions. Although they are only third- and fifth- graders, these young scientists have not only discovered a new invasive weevil in Florida but also have monitored the health of air plants in the forest canopy for more than 10 years. Go kids! This year, we also hosted home-school field trips to Myakka walkway to learn about forest canopies.
2. **Virtual nature** – Our website has been expanded to offer educational opportunities about forests and forest canopies to diverse audiences. We continue to offer Spanish translations, and have expanded to Ahmaric language for our Ethiopian forest conservation section. Our website was re-organized to include some special sliders and other social media tools, to insure an educational experience for our 1.5 million hits per year. An increasing number of students write blogs that we print, and send emails seeking information about forests and conservation! A special section for our mobility-limited student group who explore forest canopies is also featured on our website.
3. **Education outreach** – A new children's book, BEZA – Saving the Forests of Ethiopia, One Church at a Time, was published and funded by a generous grant from the Brethren Foundation. This book was published in both English and Ahmaric; for every English copy sold on www.amazon.com, a free copy is distributed to an Ethiopian child. The book is co-authored by Dr. Lowman and Dr. Worku Mulat, a TREE research associate who is fluent in Amharic. We received additional funds to advertise the book in the NY Times Book Review, sharing our message of why forests are critical to children. In addition, our Executive Director continues her newspaper column, Nature's Secrets, dedicated to educating the public about trees and related aspects of natural history; she also writes a column in Huffington Post about conservation.
4. **Matching grants** – TREE competed its first matching grant in early 2014, thanks to the Bennett Foundation and in this process doubled the funding available for conservation of Ethiopian church forests. Through this match and generosity of the Spurlino Foundation, a workshop for villagers in rural Ethiopia was hosted as well as another workshop that attracted 150 Coptic priests, and significantly changed the culture of conservation in rural Ethiopia. How? In this case, the priests learned that having a conservation wall is "part of their stewardship" of

nature, and so henceforth all priests are engaging in wall construction in exchange for a donation to their church. And the villagers learned about the value of their forests to their children's future. In short, our TREE efforts have made conservation walls a MUST for the religious leaders, not an option. This is a win-win-win – for the church, for conservation and for the people who need the forests for fresh water and pollinators.

5. **TREE Treehouse** – After several years of planning, our TREE treehouse now attracts families to enjoy nature at Spanish Point Historical site (a place that previously did not offer too many attractions for children). Big thanks for the Aaron Foundation and also to the Triad Foundation for helping us complete this project! Michael Walker and Associates, a premier building firm in Florida, has done incredible amounts of pro-bono work to bring this project to completion. Project Contractor Michael Walker developed the drawings for the 14 foot diameter round structure, in keeping with the historical Indian designs of the area, with a bridge/walkway approximately 25 feet in length. Eight posts, all harvested cypress timber, support the thatched roof and connector walkway. The structural portion of the project are constructed under the Florida Building Code exemption for Seminole Indian labor which makes permitting less difficult. Materials and labor for the covered structure were supplied by a Chickee subcontractor, while decking and guardrail installation were completed by additional subcontractors.
6. **Training the next generation** - TREE sponsored several student scholarships and educational programs throughout the past 8 months. High school minority science teacher, DC Randle, was funded to teach the local Peruvian guides about American science education and wildlife management as well as mentor undergraduates in Amazon ecology, and TREE donated useful science books to several Amazon teachers and river schoolhouses. Students in developing countries have also received inspirational forest science books, thanks to the Spurlino Foundation's donation for book distribution to students. A young girl from Taiwan, who aspires to become a canopy scientist, received a partial scholarship from TREE Foundation to study canopy biology at Oregon State University. And we also have sponsored an Ethiopian girl to study at University of Maine – Orono, with a focus on women's studies and environmental science. Tizezew Sisay is the first (and only) woman from her region near Bahir Dar, Ethiopia, to receive such advance training, thanks to generous contributions from our TREE supporters. When local students are empowered to talk about conservation in their own villages, the impact will be much more powerful than our western voices.
7. **Environmental Lecture series** – TREE Foundation's Fedder lecture series continues as part of TREE's lecture series in Sarasota Florida, and this year will feature James Burgess and Dr. Mark Smith, talking about cutting-edge advances in environmental health. Their talk, entitled "What's the Poop? Understanding the Microbiome and Human Health through Stool Banks" was held at University of South Florida – Bradenton. This duo has been featured in the Wall Street Journal,

the NY Times, and had wide publicity for their pioneering research on faecal transplants, saving many lives through an environmental understanding of the biodiversity in our digestive system.

National and International Activities

1. **National Environmental Policy** - Dr. Lowman was recruited to serve as the inaugural Chief of Science and Sustainability at the California Academy of Sciences in San Francisco, California in January 2014. This 163-year-old venerable biodiversity institution houses 45 million collections, the world's largest indoor living rainforest, the world's largest indoor coral reef, and the world's largest LEED platinum building. Lowman is tasked with reinventing the science messaging from museums, to include sustainability and to insure relevant science is the backbone of all public outreach in a museum platform. (She continues to commute back and forth from Sarasota!)
2. **International Meetings and Outreach** - Dr. Lowman visited Taiwan as the keynote speaker for the opening of the country's first canopy walkway for research. She also met with Museum officials in Hanoi, Viet Nam to offer advice for establishing a new nature museum in the country's capital. Lowman was a Fulbright Scholar to Jimma University in Ethiopia, mentoring women in science and also advising for a new botanical garden as a showcase for this country. TREE Foundation will co-host the 7th International Canopy Conference in London, England for 2015.
3. **Book and Journal Publications** – TREE has created a large reference collection on our website, featuring Ethiopian forest research, as well as canopy information. Spear-headed by volunteer Dr. Worku Mulat, this effort is the first such collection of current references on this subject. Two grants were secured from federal sources to boost the conservation activities in Africa. Several publications have featured women in science, innovative conservation activities of TREE Foundation, and using museums as public platforms for informal science education.
4. **Amazon Village Clean-water Systems** – Thanks to last year's citizen-scientist Carolyn Solomon of Raleigh NC, fund-raisers were held with students to pay for a new water filtration site in the upper Amazon. Carolyn's generosity led to a new clean-water system now operates and insures clean water for hundreds of residents. Carolyn came on our July 2014 Amazon expedition, and the village surprised her with a thank-you ceremony honoring her important contribution. Our Amazon Amigos program continues to attract donors who support the modest construction of fresh water filtration plants in Peruvian Amazon villages
5. **Citizen Science Expedition to the Amazon Canopy** – TREE led the annual citizen science expedition to the Amazon forest canopy, taking 35 enthusiastic

volunteers to conduct research and also assimilate the culture of this amazing region. In addition, our groups generate local revenues for villagers who find employment supporting ecotourism. Everyone was blessed by a shaman, and also analyzed leaf data from 25 rain forest canopy species.

6. **Books for Women in Science** – Over 500 books were distributed to underserved communities around the world, sharing the message about forest conservation and also sustainability. In countries like Ethiopia and India, where women are the links to the natural environment but yet receive very little formal education, these books are a critical inspiration and educational tool. We hope to distribute 2000 copies of our new children's book about Ethiopian forest conservation in 2015.
7. **Ethiopian forest conservation** – TREE continues to be a global force in the conservation of the last remaining forests of northern Ethiopia. Thanks to the Spurlino Foundation, we now have 10 church forests conserved in perpetuity, a clear sense of conservation ethics bestowed on many local villages (through education workshops), and a growing cadre of kids inspired about biodiversity. Now, cattle are excluded from eating the seedlings and farmers' plows will not ring-bark and stress the edge trees, leading to their demise and ultimate shrinkage of the church forests. These church forests house the last remaining biodiversity library for northern Ethiopia, as well as the ecosystem services of fresh water springs, medicinal plants, honey, pollinators, shade, tree roots that conserve soil, and an important spiritual site. A new federal grant with Colby College will fund TREE partnering with undergraduate students for the next 3 summers, conducting environmental science workshops for villagers, measuring biodiversity in Ethiopian forests, and participating in reforestation efforts. A current grant with Colgate University currently funds Dr. Alemayehu Wassie Eshete, our TREE research associate, to organize our church forest walls and conservation activities.
8. **Sloth Research** - Our sloth conservation work, inspired by former student TREE scholar, Bryson Voirin, continues bigger and better. Bryson has joined Lowman's team at the California Academy of Sciences to study sleep in canopy animals – sloths, koalas, frigate birds and many other charismatic megafauna are Bryson's target species. He combines his canopy expertise with great scientific questions to better understand canopy biodiversity. Bryson has also hosted over 50 public science TV shows, using his canopy expertise gained from our TREE Foundation exposure to leverage conservation and inspire kids about science.
9. **Mobility-limited students** – A federal grant was obtained from National Science Foundation to encourage wheelchair-bound students to climb trees and conduct research on micro-arthropods including water bears. Eight students trained in both 2013 and 2014, with another eight anticipated for summer 2015. It is an inspiration for all of us to see the photographs on our website of these students, vaulting from their wheelchairs onto the ropes and harnesses! Go team! The summer 2014 team discovered 8 new species in temperate oak trees – amazing!!!

10. **TREE is co-hosting other student projects**, including a forest conservation program in the Congo, tree-climbing classes for students through Tree Planet Climbers, and increasing communication and presentations to classrooms around the country who are studying trees! Lots of activities for students are expanding our portfolio!!

These are some of our highlights for TREE Foundation 2014. Thank you for your contribution – please consider a donation in honor of a loved one, or just for the sake of trees everywhere! We look forward to making the world a better place for the next generation.

Yours gratefully,

Meg

Meg Lowman, PhD
Executive Director

Gerri

Gerri Aaron
Board President

What's the POOP?

Wait....What???

Come join us to learn about a different kind of bank:
The world of stool banking, poop transplants,
and the human microbiome

OpenBiome

Speakers: James Burgess and Dr. Mark Smith
Co-Founders of OpenBiome,
the nation's first public stool bank

What: TREE Foundation's Annual Fedder Environmental Lecture

Cost: FREE

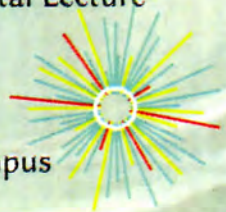
Date: December 4th, 2014

Time: 5 pm

Place: Selby Auditorium, USF Sarasota-Manatee Campus

Address: 8350 N. Tamiami Trail, Sarasota, FL 34243

Open to all students, public and families interested in keeping healthy !



OPENBIOME

USF

UNIVERSITY OF
SOUTH FLORIDA
SARASOTA-MANATEE

A New Kind of Transplant Bank

Building a safe, inexpensive stockpile to fight the potentially fatal infection *C. difficile*.

By PETER ANDREY SMITH

CAMBRIDGE, MASS. — Around noon on a recent Friday, Donor Five, a healthy 31-year-old, walked across M.I.T.'s frigid, wind-swept campus to a third-floor restroom to make a contribution to public health.

Less than two hours later, a technician blended the donor's stool into preparations that looked like chocolate milk. The material was separated and stored in freezers at an M.I.T. microbiology lab, awaiting shipment to hospitals around the country. Each container was carefully labeled: Fecal Microbiota Preparation.

Nearly a year ago, Mark Smith, a 27-year-old doctoral candidate, and three colleagues launched OpenBiome, the nation's first human stool bank. Its mission: to provide doctors with safe, inexpensive fecal material from screened donors to treat patients with *Clostridium difficile*, a gastrointestinal infection that kills at least 14,000 Americans a year.

"People are dying, and it's crazy because we know what the solution is," Mr. Smith said. "People are doing fecal transplants in their basements and may not be doing any of the right screening or sterile preparation. We need an intermediate solution until there are commercial products on the market."

C. diff, as it's known, resides among trillions of other bacteria in normal, healthy humans. When antibiotics wipe out the competition, the bacteria can produce toxins, causing persistent diarrhea.

The bacteria are increasingly resistant to conventional treatments. But researchers have discovered an alternative: A donor's stool can be transplanted in the intestine or colon of a sick patient via an enema, colonoscopy or nasogastric tube. The healthy bacteria fight off *C. diff* and re-establish a normal community in the gut.

A study published last year in *The New England Journal of Medicine* found that fecal transplants were nearly twice as effective as antibiotics in treating patients with recurring *C. difficile*.

But where to get healthy donor stool? For doctors, it's a tedious, time-consuming process, and some patients turn awkwardly to relatives or friends. Since September, OpenBiome has delivered more than 135 frozen, ready-to-use preparations to 13

"It's crazy. . . People are doing fecal transplants in their basements."

MARK SMITH
CO-FOUNDER, OPENBIOME

hospitals. The nonprofit project fields dozens of requests from doctors, hospitals and patients every week. (The preparations are not sent directly to patients.)

Carol Capps, 75, a retired nurse in Clemmons, N.C., had been in and out of hospitals for months with a *C. diff* infection that was not going away despite multiple courses of antibiotics. After a recurrence, her doctor suggested OpenBiome, and she received a fecal transplant. By that afternoon, Ms. Capps said, she felt like a new person and has been healthy since.

"I am just thankful for whoever donates," she said. "It's such a miracle."

Despite the promise, the Food and Drug Administration has grappled with the regulation of fecal transplants. In early 2013, the agency announced that it would treat them as biologic drugs requiring an Investigational New Drug application, which typically precedes a clinical trial.

Following outcry from patients and doctors, the F.D.A. announced it would "exercise enforcement discretion" — in effect, saying that it would not go after physicians performing fecal transplants for *C. diff*. Jennifer Rodriguez, an F.D.A. spokeswoman, said the agency planned to issue industry guidelines later this year.

Because of the legal ambiguity, some researchers are not preparing fecal microbiota for sale (usually at cost) — including Dr. Alexander Khoruts, a gastroenterologist at the University of Minnesota, who first published the methodology for doing so.

Dr. Khoruts worries that approval of OpenBiome's efforts will slow the development of next-generation therapeutics beyond the crude preparations available today. "We desperately need some clarity," Dr. Khoruts said. "We're going to be stuck with the OpenBiome model, and nothing better's going to come along."

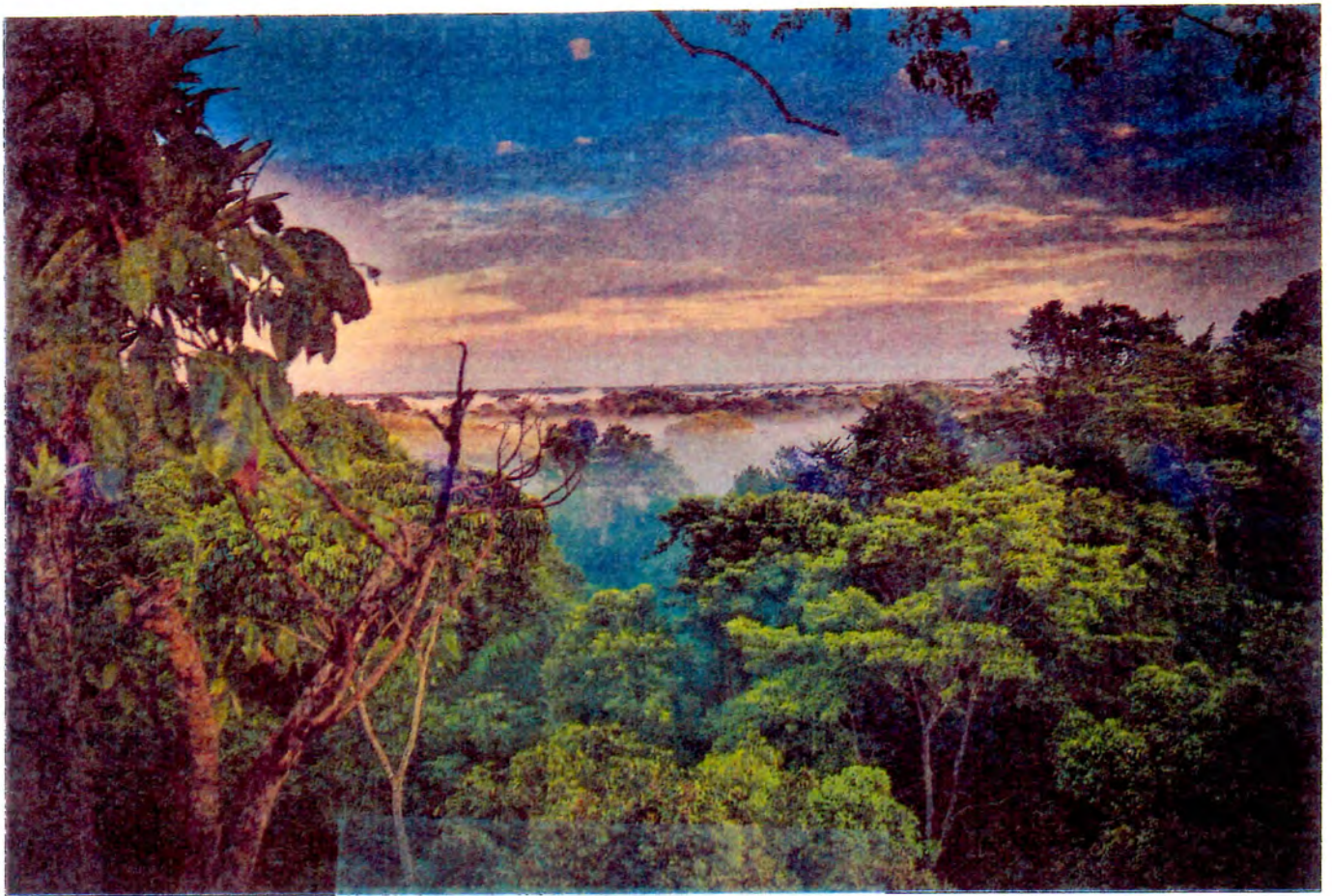
At the same time, Mr. Smith and Eric J. Alm, an M.I.T. microbiologist and adviser to OpenBiome, said the F.D.A.'s classification of fecal transplants as drugs hinders research into their possible uses to treat inflammatory bowel diseases and obesity.

"It's going to give a monopoly to whatever company gets the drug approved," Mr. Smith said.

"We think it should be regulated, but unlike most products the F.D.A. oversees, there's a real risk of the black market," he said. "If you restrict access, there's going to be lots of people doing it underground."

AMAZON CITIZEN SCIENTISTS JULY 2014





↑ Peruvian Amazon rain forest, site of TREE research.



10'

TREE citizen scientists measure insect defoliation in Peru.



Above: TREE citizen science students in Amazon canopy.



**INDEFINITELYWILD (/)**

Sharpening Blowgun Darts On Piranha Teeth

(<http://indefinitelywild.gizmodo.com/sharpening-blowgun-darts-on-piranha-teeth-1622159554>)

**Laurel C. Allen**

6,412

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Filed to: [INTO THE AMAZON \(/TAG/INTO-THE-AMAZON\)](#) Yesterday 10:01am (<http://indefinitelywild.g>

In part one of this series, Laurel C. Allen heads into the Peruvian Amazon in search of science. What she finds are big bugs, dragon's blood and pisco sours.

Through the plane's windows, rivers are suddenly plunging through dense forest, coming in from all corners, doubling back on themselves, curling in impossible directions. The trees go all the way to horizon, darkening from bright green to black as they reach away. The whole landscape seems both deliberately designed and totally out of control. It also seems to pulse with intent — a stage set for something, on a scale too big to take in.

We're dropping down into Iquitos, Peru — the largest city in the world that connects to no roads whatsoever. Located deep in the Amazon basin where three massive rivers meet, you get into (and out of) this place by plane, by boat, or not at all.

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What's going on: I'm not usually a group-travel kind of person, but that's what this is and I'm weirdly okay with it, because science. This trip's being led by famed canopy biologist Meg Lowman of the California Academy of Sciences

(http://en.wikipedia.org/wiki/California_Academy_of_Sciences), a cheerful, can-do badass who picked up a slingshot and rope in the '70s and became one of the first people to study trees from above instead of below. This is her thirty-first trip to the Amazon, and by bringing 25 of us with her, she'll collect more environmental data in one week than she could alone in two months. It's called "Citizen Science," broadly speaking — a movement that puts non-scientists like me into science-serving roles.

 EXPAND

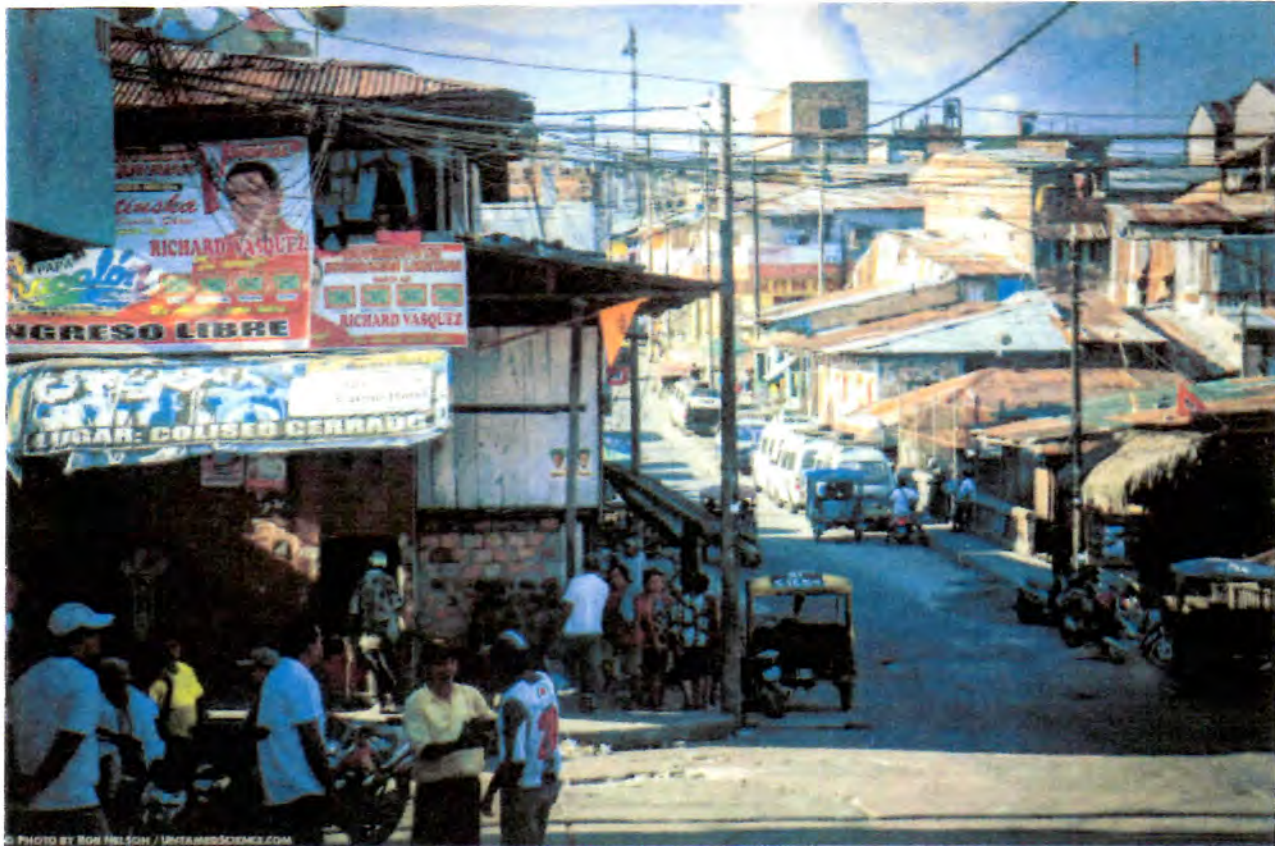


Why pay to travel with scientists? Because, with their knowledge underpinning it all, your experience of a place gets way more intense: more beautiful, more mind-blowing, more heartbreaking, more hopeful, more connected, and way, *way* more recognizably poisonous. It also gives you a chance to fight back against the kinds of damage being done to some of Earth's most beautiful places, all while drinking horse-powered rum and sharpening blowgun-darts on piranha teeth.

Day 1: The Way In

The humidity doesn't even wait for you to get out of the plane — it comes in after you as soon as the doors are open, rolling down the aisles like a hot, wet sheet. The tarmac's empty other than a few helicopters (which *might* come get you if something goes wrong, but probably won't), and the sun blasts everything with white light. Squinting to make out the details on the biggest bug I've ever seen in my life — which is dying next to my foot as I wait in customs — I catch the eye of an entomologist behind me in line and nod at it. She smiles and makes the international pinchy-finger sign for "tiny."

 EXPAND



We're soon on a bus trundling noisily through the city, swarmed by hordes of moto-rickshaws. Outside, every person looks hot and every job looks hard. Buildings shed paint and bricks just from the effort of standing, dropping pastel flakes onto cracked, red earth. Stepping down into the dim, labyrinthine alleys of the vast Iquitos market, things get quieter, cooler, and stranger. The smells come in waves here, shifting from delicious to revolting every few feet. On one street, enormous fish scales are washed up into every crack; on the next, blood and flies mix while vultures reel overhead.

In the medicine alley, Amazonian plants and animals have been repackaged for sale. "Dragon's blood" fills an old soda bottle; a severed anaconda head in a jar sits above a sleeping baby; bouquets of small, yellow flowers are packed into woven baskets. Vendors murmur promises, some legit, some suspect: tiny vials of berries protect against mosquitos; penis-shaped gourds will get you married in three months.

EXPAND



At the boathouse, I grab my bag, head for stairs, and almost fall as a first view of *Rio Amazonas* hits me full in the face. Somehow I forgot about the river itself until now, or just assumed I knew what it looked like. Instead, it takes two seconds to realize that this thing in front of me — this force of nature, this clay-colored torrent that looks ready to jump its tracks — is going to haunt me for the rest of my life. The river's alive, purpose-driven, unstoppable. It's a biological system — powering one-fifth of the whole world's river flow — and some sort of ancient god. It creates and destroys channels, shores, and islands at will; it makes everything around it temporary.

It's also beautiful, this river — more beautiful than anything that smells like decay should be. Tucked in the back of a roofed-in *rapido*, I catch one of those perfect moments that only hit when you're traveling: river spray sheets over the boat's open windows, sunset fires up the edges of clouds, and the real forest — the kind that crowds all the way up to the river's edge — starts to roll in. The air's so rich with oxygen that I'm literally/biologically high on life.

EXPAND



And then another shift in scale, so abrupt it feels like vertigo: the river unfolds three times wider, its opposite bank leaping miles away. That last river? It's called the Itaya. *This* is the real Amazon, and before it gets dark — before the light fades dangerously on the giant tree limbs and other debris flying along just below its surface — we're headed 50 miles downriver, into the interior.

An hour or so later, the boats duck into an unmarked side channel, cruising past weathered, elevated shacks whose outlines emerge slowly from the gloom. And then ahead: light, the soft hum of a generator illuminating a big, screened-in room now above us on stilts, a string of kerosene lanterns stretching into the forest behind it.

EXPAND



This is the Explorama lodge, a fixture at these coordinates since 1964. And before the night is over, it'll teach me three important truths: pisco sours taste better down here; the best use of first-aid tape is to patch holes in your mosquito netting; and if you breathe slowly enough — at a tenth of the pace of the plant and animal life pressing in on you from all four sides — you can almost trick your skin into thinking you're dead and don't need to sweat anymore.

This place will also promise the best trio of reasons I've ever heard for waking up: boats, breakfast, and blowguns. Next week in Part Two.

Photos: Rob Nelson.

IndefinitelyWild (<http://indefinitelywild.gizmodo.com/>) is a new publication about adventure travel in the outdoors, the vehicles and gear that get us there and the people we meet along the way. Follow us on Facebook (<https://www.facebook.com/indefinitelywild>), Twitter (<https://twitter.com/indefinitewild>), and Instagram (<http://instagram.com/indefinitewild>).

Like 24

1 30 Reply

196

TREE Announces our First Women-in-Science Scholarship

Sky Lan from Taiwan will study forest canopy ecology at Oregon State University. Here is her story:

"I love trees, especially the giant old-growth trees of Taiwan, many of which are more than 2,000 years old. Though they are easy to access, little is known about them. I am especially committed to expanding my understanding of canopies, e.g. crown structure, micro-niche, physiology, phenology, epiphytes, herbivory, and the wild life that dwell within. To my perception, the forest canopy is a world of wonder. I have always longed to understand how, during the period of tree growth, the canopy protects itself, and interacts with the environment. In order to broaden my knowledge in this field, beginning in fall 2014 I am enrolled at Oregon State University Forestry College as a PhD candidate, with a focus on Forest Ecosystems and Society.

I wish to understand how the ecosystem emerged from vertical canopy structure, and am interested in the overall interaction between different species. To this end I plan to begin my study in an LTER (long-term ecological research site), an example of which would be H.J. Andrews Experimental Forest, as a way to better understand canopy structure and the herbivore-tree relationship. To realize this goal I intend to do research not only in North America, but in Taiwan (East Asia) as well. The results of this project will reveal patterns of similarity or difference on either side of the Pacific Ocean. I find it exhilarating to scale towering trees and renew my acquaintance with old-growth forests. In the past, we understood little of these old-growth forests, due to the fact that most treatment or observation had been studied through seedlings. Based on experience gained in the course of working towards my Masters, I hypothesize that there are different strategies for survival, not only among old-growth trees, but even trees planted at the same time for variety of purposes. I am driven by the desire to know more.

Aside from my thesis research, I hope I can obtain a firm grasp of other canopy-related aspects. My interests even extend to such varied disciplines as geology, oceanology, and anthropology. Considering the limitations of time and energy allotted me in this one life, I hope that someday I may serve as the link bringing together specialists from different fields, with the ultimate goal of piecing together a narrative for canopy science applicable the world over. I also hope I can serve as the bridge between Taiwan and the rest of the world, thereby inspiring increasing numbers of scientists to focus on Taiwan's beautiful old-growth forests.



My dream for what I someday hope to accomplish

Because little research has been done on the beauty and diversity of Taiwan's forest canopy, it is my hope that someday I may serve as a conduit between Taiwan and the rest of the world. Such a conduit would play a vital role in collaborative study but, given the complexity and diversity of canopy science, would also link together related interdisciplinary subjects. In that manner it would be possible to construct a profound and wide-ranging narrative that would allow the public to understand what amazing things happen in the canopy. My dream is that one day my work will play a significant role in improving the earth's forest protection. Thank you to TREE Foundation to helping me achieve my dreams, and also create sustainable forests."



Tree 10 - 2011

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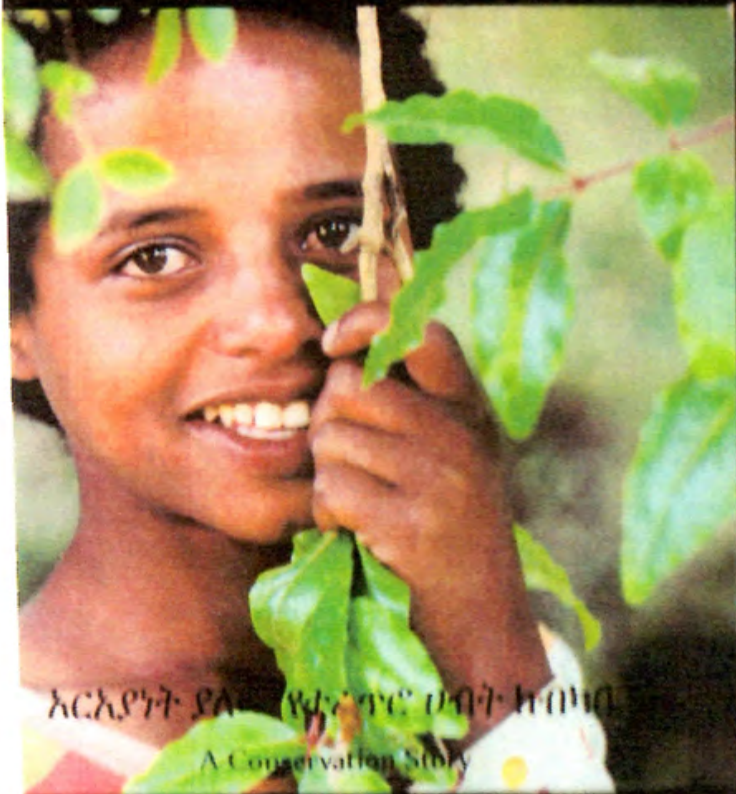
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TREE opens canopy walkway in Taiwan (above); and

Who Saved the Forests of Ethiopia, One Church at a Time

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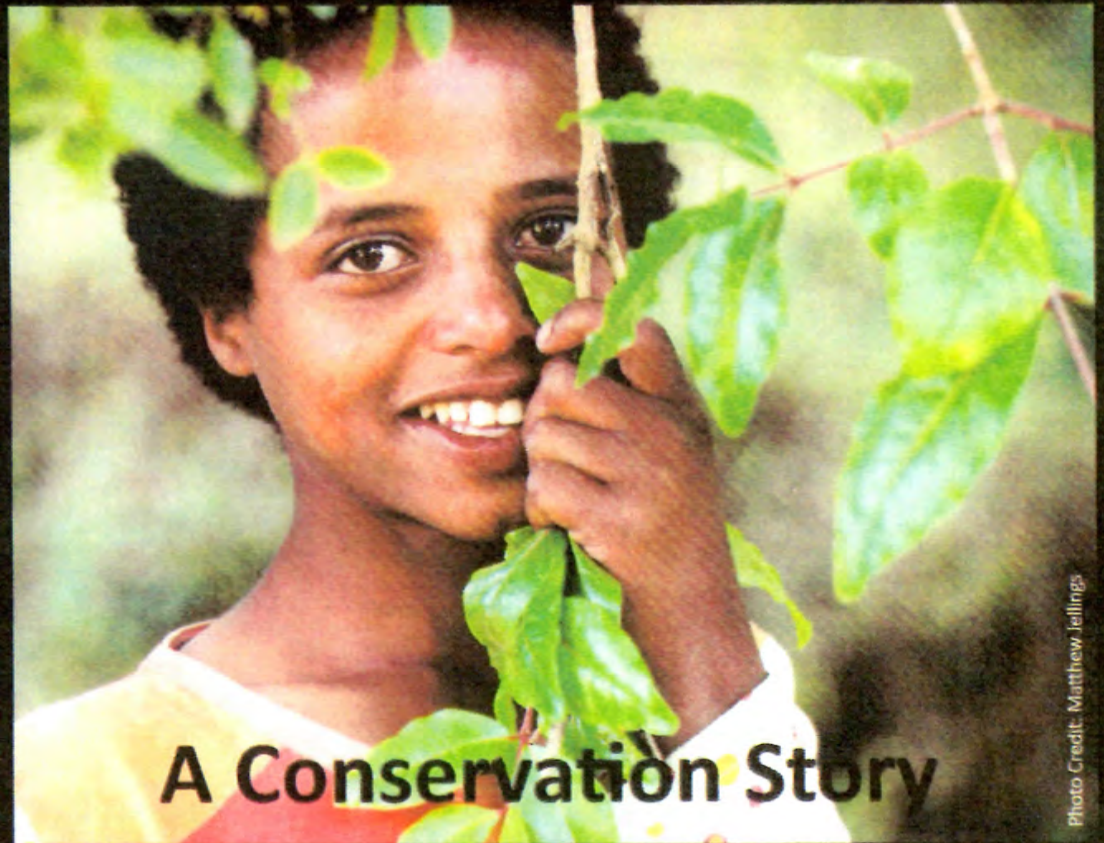
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A Conservation Story

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Beza

Who Saved the Forests of Ethiopia,
One Church at a Time



A Conservation Story

Photo Credit: Matthew Jellings

WHO NEEDS A FOREST?



Our children do!



A wonderful story of
a young girl helping
to conserve the
forests and
biodiversity of
Ethiopia.

This fun, inspiring and educational book for children (and adults) of all ages, written by Dr. Meg Lowman, Chief of Science & Sustainability at California Academy of Sciences, in collaboration with TREE Foundation colleague Worku Mulat.

For every English-language book sold,
one copy in Amharic (the native
language of Ethiopia) will be
distributed free to an Ethiopian child.



More award-winning, NY Times cover-
review, popular science books by Dr.
Meg Lowman:



AVAILABLE AT:
www.bezabook.com
www.treefoundation.org
www.amazon.com

Ad for
children's
Book,
Beza.

24'

Ser No	Name of The Church	Area of Forest	Species	Family	Dead Stumps/ Ha	Cattle trails /plot	% Wall Completed	GPS Location
1	Abegeldi	14	19	17	91	4.1	0	N12° 09' & E38° 07'
2	Alembor	14.5	37	27	141	2.3	0	N11° 54' & E37° 53'
3	Amstya	22.8	41	30	53	1.3	0	N12° 01' & E38° 04'
4	Ascha	1.6	22	18	128	3.2	0	N11° 43' & E38° 28'
5	Asolit	7.7	36	24	14	1.3	0	N11° 41' & E38° 35'
6	Debresena	11.5	34	27	119	1.3	100	N11° 51' & E37° 59'
7	Deder	14.4	22	19	88	3.4	0	N11° 32' & E38° 14'
8	Dedim	36.6	22	19	125	4.3	0	N11° 47' & E38° 12'
9	Dengolt	25	36	28	41	3.3	0	N11° 36' & E38° 04'
10	Emashenkor	3.4	38	25	12.5	0	100	N11° 42' & E37° 37'
11	Enshet Kuskuum	6.3	26	19	52	1.2	0	N11° 37' & E38° 32'
12	Gedamselase	15	74	41	74	2.4	0	N11° 21' & E38° 10'
13	Gelawdios	100	42	29	32	2.4	0	N11° 38' & E37° 48'
14	Gibstawit	8.7	35	24	130	2.3	0	N12° 07' & E38° 05'
15	Gunaguna	6.9	34	24	138	1.1	0	N12° 03' & E38° 06'
16	Hiruy	4	31	26	29	0.2	100	N11° 51' & E38° 03'
17	Mantogera	5	44	29	149	4.4	0	N12° 09' & E37° 47'
18	Mekedesemariam	4.7	33	21	33	0.9	0	N11° 19' & E38° 12'
19	Mosha	7	43	32	42	0	80	N11° 26' & E37° 56'
20	Qorata	48	60	32	52	1.3	0	N11° 45' & E37° 26'
21	Quar	3	34	25	69	3.3	0	N11° 51' & E37° 40'
22	Shamo	10	58	37	129	3.7	0	N12° 07' & E37° 53'
23	Woji	22.5	39	24	144	4.2	80	N11° 55' & E37° 48'
24	Wonberoch	35	15	12	117	3.2	0	N12° 11' & E38° 00'
25	Wonkesht	50	78	44	61	2.2	0	N11° 30' & E37° 37'
26	Wuahir	8.4	30	26	86	2.4	0	N11° 51' & E38° 05'
27	Zagua	6.8	33	29	94	1.1	0	N11° 42' & E38° 02'
28	Zhara	8	29	22	41	2.2	100	N11° 48' & E37° 34'

Progress in Ethiopia - new walls that conserve church forests

29	Geregera	5	30	24			100	N11° 44' & E37° 37'
30	Wonchet	7	27	24			70	N11° 45' & E37° 32'

ETHIOPIAN TREE BIODIVERSITY STUDIES



Ethiopian Proposed new Forest education center, Bahir Dar

Bata Church Forest Education and Community Outreach Center

Request for Support from the Colby College Biology Department

Travis W. Reynolds, Environmental Studies Program

Amount Requested: \$3,000 (other funds total \$4,500 + \$3,500 local in-kind contributions)

Background

Colby students and faculty have been conducting field research in the church forests of northern Ethiopia since 2012. Working in collaboration with church leaders, Ethiopian scholars, government officials, and international conservation organizations Assistant Professor of Environmental Studies Travis Reynolds and a total of nine Colby students have conducted fieldwork in over 20 church forests to date. Methods have ranged from social surveys, to interviews, to plant and insect biodiversity assessments. With the support of the Goldfarb Center we have also held two workshops – a regional Church Forest Workshop in January 2013 bringing together more than 150 Ethiopian Orthodox Priests to discuss threats to church forests and opportunities for conservation, and the Woji Church Forest Workshop in January 2014 where nearly 100 priests, farmers, and women from a single church community discussed similar challenges and opportunities.

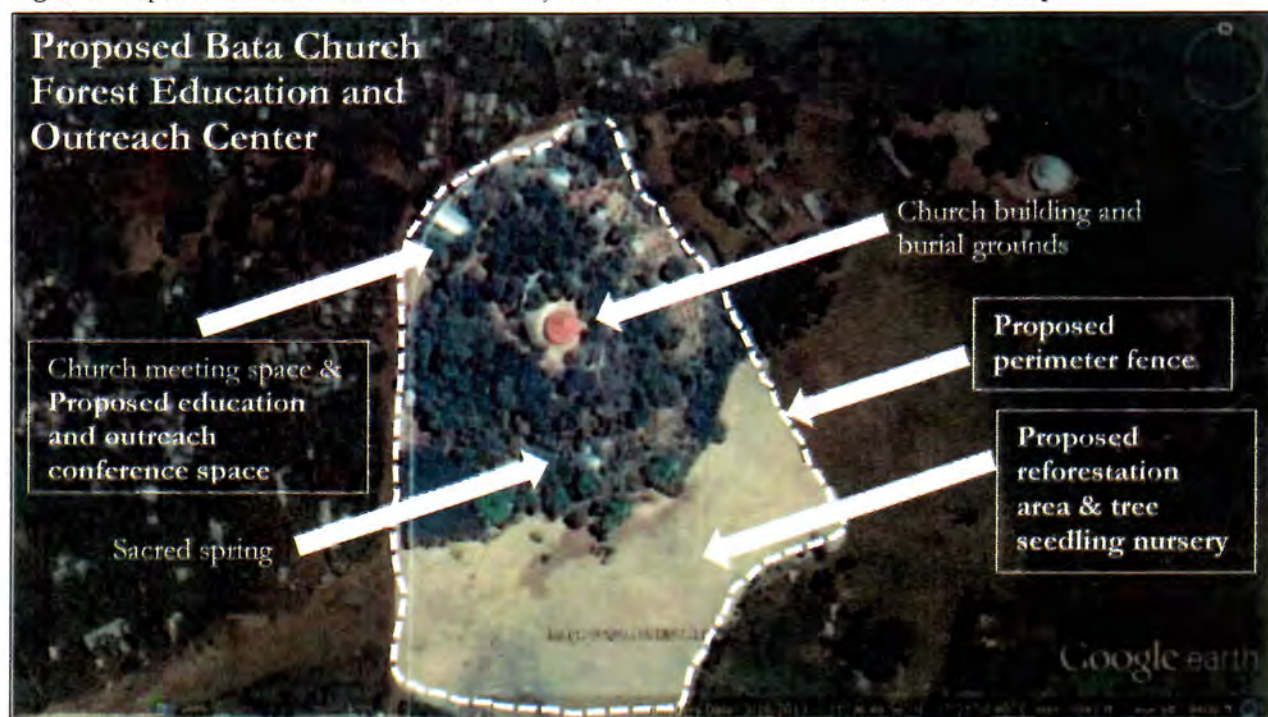
In addition to such on-the-ground efforts, through remote-sensing we have identified over 7,800 church forests across the Amhara Region, resulting in the most extensive database of Ethiopian church forests to date. We have also developed a broad network of collaborators across the U.S. and Ethiopia, and presented our work at conferences nationally and internationally. Most recently, in April a faculty team with Colby PI Travis Reynolds (ES) and Co-PI Cat Collins (Biology) was awarded \$390,000 from the National Science Foundation for a Research Experience for Undergraduates (REU) site – allowing us to bring eight new U.S. students to study church forest institutions and ecology with Ethiopian partners for the next three years.

Proposed Bata Church Forest Education and Community Outreach Center

This proposal is a direct outcome of our long-term collaborative work with Ethiopian Orthodox Church leaders, and seeks funding for the establishment of a Forest Education and Community Outreach Center at Bata Church, in Bahir Dar, Ethiopia.

While the majority of Orthodox churches remain off-limits to “outsiders”, the head priest of Bata Church has offered to open the Bata Church grounds to visitors – including students and city residents from Ethiopia as well as researchers and tourists from abroad, in the hopes of inspiring further local and international action to protect Ethiopia’s church forests. From a research perspective, the Center will serve as a training ground for Colby student researchers to meet with church leaders, to learn about church forest ecosystems, and to practice basic restoration ecology techniques in a real church forest setting in an urban center while preparing for field research in more remote church forest sites. From a broader community engagement perspective, the Center will serve as an unprecedented educational opportunity for Ethiopian students and community members to see and experience one of the few remaining natural forest areas in the rapidly expanding city of Bahir Dar.

Figure 1. Proposed Forest Education and Community Outreach Center, Bata Church, Bahir Dar, Ethiopia.





Walls under construction at Wonchet Forest



Doryphoribius elleneddiei Haecke, Spiers, Miller, & Lowman, 2014

Fund-raiser: Naming new-species Auction!



Agreement protocol from April 03, 2014

**MANAGEMENT PLAN FOR THE CONSERVATION CONCESSION BY
NGO DILO ASSISTANCE IN BIKORO TERRITORY.**

BOTUALI FOREST (87,254 Hectares).

Covering the period 2015-2018.

Written for DILO ASSISTANCE / G.C.E by : Pétro EBEMBE BOBEA, Willy BIMENU and Bavon MONGO, with Vinny NKOSO and Hovi ENGEA collaboration.

1. INTRODUCTION

The Democratic Republic of Congo has ratified the United Nations Convention Framework on Climate changes declared in New York on May 9, 1992. With it, States have become aware that the world's climate change and its adverse effects are a concern for all humanity.

From this concern, it is clear that human activity has significantly increased the concentrations of greenhouse gas in the atmosphere, that this increase strengthen natural greenhouse effects, and that an additional warming of the Earth's surface and the atmosphere will result on average from it, which may adversely affect natural ecosystems and humankind.

It should be noted that while ratifying the above-mentioned convention, the DRC forests were still governed by the Decree of April 11, 1949. While this colonial text had not yet been repealed, and in order to overcome the shortcomings it included with regards to the developments taking place in the country on the political, economic and sectoral levels, it evolved in 1984, with the support of the Canadian Cooperation for standards and procedures pertaining to logging operations and management, consisting essentially of memos and decisions of the Minister responsible of the forests, and which were gathered in a single volume under the name of "**The Forest Operator Guide**".

The DRC has undertaken enormous efforts to act in accordance with its international obligations by enacting a framework law on August 29, 2002 called the "**FOREST CODE**". This is a legal framework that allows for both the forest to fulfill its ecological balance and social functions, and the forest administration to substantially contribute to national and local population development, and to actively participate in forest management in order to derive a legitimate profits.

Thus, pursuant to Decree No. 011/27 of May 20, 2011, setting specific rules for allocating forest conservation concessions, a Memorandum of Understanding was signed on April 3, 2014 between the Democratic Republic of the Congo represented by his Excellency **Bavon N'SA MPUTU ELIMA**, Minister of the Environment, Nature Conservation and Tourism, and the Non-Governmental Organisation **DILO ASSISTANCE** for a conservation

concession of Ntomba Lake forest covering an area of **87,254 Hectares** in the Bikoro territory.

It should be noted that the operation guide concerning the framework of the conservation concession management plan does not yet exist; we were inspired by the loggers guide and have adapted it in the context of REDD+ in DRC.

2. OVERVIEW OF THE PROJECT ZONE

Ntomba Lake area is located in the northwestern part of the Democratic Republic of Congo, in Equator province and Bikoro territory. This region is in the heart of the Congo Basin forests and includes both wetlands and rain forest inhabitants. The lake covers about 765 square kilometers and is connected via the Irebu channel to the Congo River.

The people of Lake Ntomba are the Bantomba people, a tribe originating from the region and living from fishing, farming and hunting.

Lake Ntomba is of interest for conservation because it is one of the largest wetland areas on the African continent. It is located at the center of the Ntomba-Kiri-Mai-Ndombe area, designated "wetlands" of international importance by the Ramsar Convention in 2008;; its landscape of nearly 80,000 square kilometers has one of the highest biodiversity concentrations recognized worldwide. It contains many animals, fish, reptiles, birds, and plant species.

Ntomba Lake forest features a diverse and important ecosystem with many endangered plants and animals, and is one of the most resilient to climate changes. Thus, DILO ASSISTANCE had sought and received a grant for a conservation project of these forests, for reducing emissions from forest degradation and deforestation, for fighting climate change, and for fighting poverty in the area concerned by the project.

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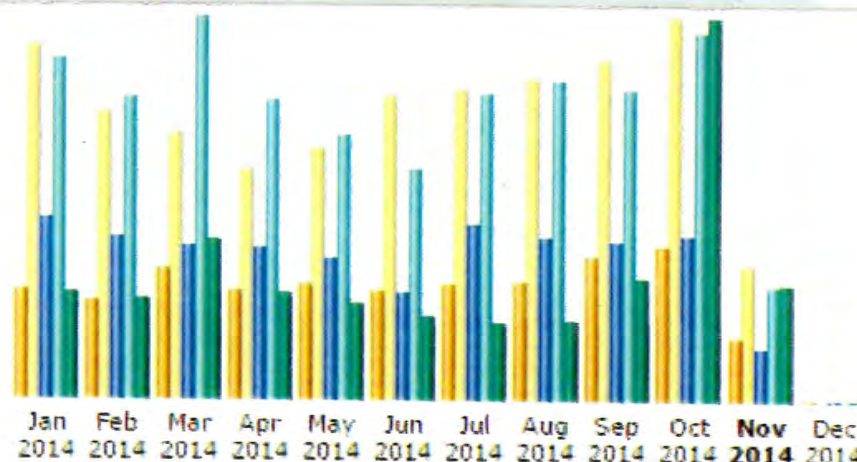
Women gathering firewood , Congo

Summary

Reported period	Year 2014				
First visit	01 Jan 2014 - 00:00				
Last visit	11 Nov 2014 - 05:12				
	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Viewed traffic *	<= 23,032 Exact value not available in 'Year' view	57,792 (2.5 visits/visitor)	683,938 (11.83 Pages/Visit)	1,374,652 (23.78 Hits/Visit)	58.73 GB (1065.58 KB/Visit)
Not viewed traffic *			816,691	954,405	15.50 GB

* Not viewed traffic includes traffic generated by robots, worms, or replies with special HTTP status codes.

Monthly history



Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2014	1,994	6,426	77,001	144,915	4.38 GB
Feb 2014	1,789	5,225	68,917	128,518	4.14 GB
Mar 2014	2,361	4,820	65,555	162,098	6.59 GB
Apr 2014	1,997	4,171	64,249	127,207	4.42 GB
May 2014	2,106	4,563	60,068	112,346	3.95 GB
Jun 2014	1,997	5,531	45,485	97,315	3.44 GB
Jul 2014	2,109	5,643	74,385	130,237	3.17 GB
Aug 2014	2,131	5,833	69,285	135,788	3.25 GB
Sep 2014	2,612	6,179	67,043	131,981	4.97 GB
Oct 2014	2,811	6,939	69,625	156,244	15.64 GB
Nov 2014	1,125	2,462	22,325	48,003	4.77 GB
Dec 2014	0	0	0	0	0
Total	23,032	57,792	683,938	1,374,652	58.73 GB

TREE Website Metrics



Church Forests of Ethiopia

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Wall Construction at Zhara Church Forest, Ethiopia



Dr. Mes Lelisa and Dr. Alemsefer Tessele discuss the importance and social value of the stone wall construction around the Zhara Church Forest, Ethiopia.

Donate Please support this church forest restoration and help with the ongoing maintenance for funding other forest projects.

Featured Church Forest

Garagana Church Forest (Est. 1260 A.D.)



Regional View of Deforestation | See Map of All Forests



Forest Health Indicators for Garagana Church Forest

Hectares of Forest Remaining	Woody Species Remaining	Number of Cattle Trails in the Forest	Number of Cattle Trails in the Forest	Percentage of Wall Completed
6.9	34	1.1	138	0%

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Church Forests of Ethiopia



Map data © OpenStreetMap contributors, Imagery © Mapbox

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The church forest project in Ethiopia is a unique and innovative approach to forest restoration and conservation.

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The church forest project in Ethiopia is a unique and innovative approach to forest restoration and conservation.

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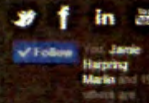


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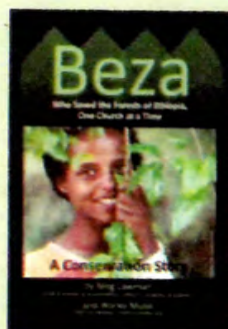
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Beza, Who Saved the Forests of Ethiopia, One Church at a Time – A Conservation Story

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About The Book

BEZA is the story of an Ethiopian girl who is helping to conserve the last forests and biodiversity of northern Ethiopia.

This is the English edition. [Click here for the Amharic Edition](#)

How to Purchase

Available for purchase via PayPal from TREE Foundation.

[Buy Now](#)



For every copy of Beza sold (cost \$20 including tax and free domestic shipping), one copy will be distributed FREE in Amharic to an Ethiopian child!

Thank you

Thank you for buying this book and helping us conserve Ethiopia's forests, as well as educate the next generation about the importance of their natural resources.

Please contact us with any questions!

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Books

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Window to the Bay at Historic Spanish Point listed in Sarasota Herald-Tribune's "Grand Openings" article

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From Sarasota Herald-Tribune

“Window to the Bay at Historic Spanish Point, 337 N. Taurus Trail, Opens

The Tree Foundation, led by Meg Lowman, determined that a overlook in a publicly accessible location would give children opportunities to explore and experience the natural Florida environment. Thus, Window to the Bay was born.

The exhibit is a natural platform overlooking Little Sarasota Bay, demonstrates how early inhabitants of the area connected with the environment and depended on the plant resources within the natural environment. historicspanishpoint.org, 906-5214.



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In the Canopy with Water Bears and Wheelchairs 2014

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NSF: REU

In the Canopy with Water Bears and Wheelchairs
June 1 – August 9, 2014

with W.R. Miller, M. D. Lowman and E. McCord, Ph.

Want A Different Research Experience?

Want new skills, new challenges, a bit of adventure, and an opportunity to publish your research?

NSF- REU: Research Opportunity

This is a three-dimensional research project to define the taxonomy and distribution of Tardigrades (Water Bears) in the canopy and the herbivory of insects on a North American deciduous forest. This project is a fast paced, tree climbing, data collecting, rapid analysis, and results oriented internship. It's not for the faint of heart. Students will be professionally trained to ascend into the canopy. There they will measure the impact of arthropods on the habitat and establish a baseline from which change can be measured. This is the cutting edge of ecological analysis in a world impacted by climate change. Students will learn to use remote sensing, GIS, image analysis and Scanning Electron Microscopy to document the microenvironment.

An Opportunity for Students with Ambulatory Disability

Designed for 8 students, 4 with ambulatory disability and 4 without, this research is based on the idea that wheelchair dependency is not a limit to good field biology. In the canopy we climb ropes, not trees, and in the lab we use computers, microscopes, and tools that have no boundaries.

Students will be employed for the summer. They will collaborate with the PIs to prepare their data for presentation and publication. They will also meet and network with the scientists and graduate students at the California Academy of Sciences, KU Microscopy & Analytical Imaging Lab, and the KSU LTER. Students may attend a regional or national meeting to present their results.

Graduates will be part of a small team of scientists who are defining the condition of the temperate forests before global warming changes the forests and canopy.

Contact: William Miller at 785-594-8379 or in-the-canopy@lsu.edu

Information and application: www.lsu.edu/in-the-canopy

Application Deadline: March 14 2014

[PDF Flyer](#)

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On January 1, 2014 / ANNOUNCEMENTS, EVENTS, REU CANOPY EXPLORERS

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TREE RESEARCH, EXPLORATION & EDUCATION



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Amazon

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10 Things to Do in the AMAZON

On October 4, 2014

Amazon, MULTIMEDIA, VIDEO

Blog



Untamed Science presents a video of the Top 10 Things to Do in the Amazon. Filmed on a recent trip to the Peruvian Amazon with Dr. CanopyMeg Louman.

Read more →

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Into The Amazon: What To Do When Attacked By A Poo Bat

On August 21, 2014

Amazon

Blog



Read part three of Laurel C. Allen's story about her Amazon adventure and her search for science. In part three Laurel takes a walk, finds dozens of "conspicuous spiders," and experiences a rainstorm. The article is number three of a four-part series published in *Indefinite Wild*. Read the full.

Read more →

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Into The Amazon: Boats, Breakfast And Blowguns

On August 21, 2014

Amazon

Blog



Read part two of Laurel C. Allen's story about her Amazon adventure and her search for science. In part two Laurel makes up to a boat ride, meets a baby sloth and learns to shoot a blowgun. The article is number two of a four-part series published in *Indefinite Wild*.

Read more →

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Into The Amazon: Sharpening Blowgun Darts On Piranha Teeth

On August 18, 2014

Amazon

Blog



Laurel C. Allen tells the story of her "Amazon Adventure," and her search for science. The trip was set by Dr. Meg Louman. It was Dr. Louman's first-time trip to the Amazon. The article is number one of a four-part series published in *Indefinite Wild*.

Read the full.

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Untamed Science provides a visual tour of CanopyMeg's Amazon field research

On August 5, 2014

Amazon, MULTIMEDIA, RESEARCH, VIDEO

Blog



Join Untamed Science for their visual tour of CanopyMeg's Amazon field research. The video was taped for July 2014 citizen science research expedition, so watch for a series of videos to be posted! Enjoy! This summer marked the 10th year of CanopyMeg's long-term research at this site.

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Local 6-yr-old Collects Donations for TREE Foundation at her Birthday Party

Home — [HEADLINE](#) — Local 6-yr-old Collects Donations for TREE Foundation at her Birthday Party



Like many children her age, Sara enjoys playing outside, climbing trees and observing a variety of animals in nature. However, Sara has a special affection for insects. Together with her parents, she has learned about many of the insects she has observed. When she learned that insects depend on a healthy habitat in which to live and that for many insects that habitat is our forest, she decided that she wanted to help protect the local forests. She had an idea of how to help with her own birthday approaching.

Sara's 6th birthday party was at her favorite place to be out in nature, Rye Preserve. The party included a wildlife board game, tree climbing, catching fish and, of course, finding insects. Sara wasn't hoping for a lot of toys or gifts at her party. She had requested that guests consider giving a donation instead. From the collected donations Sara decided to give a portion to TREE Foundation to help in their efforts to conserve the forests.

Thank you to Sara and her friends for their generous contributions.



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On March 27, 2014 / [HEADLINE](#)

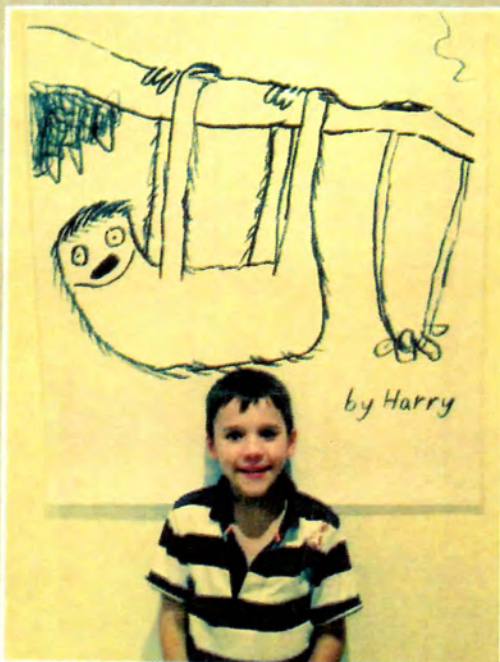
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9-yr-old raises money for sloth conservation at birthday party

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Instead of receiving presents for his birthday, 9-yr-old Harry requested donations in order to help his favorite animals, the sloths. Way to go, Harry!!!



Becky with 16-yr-old Harry and his drawing



100% chocolate sloths

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On April 14, 2014 [MAGGIE B. BROWN](#)

Ecoliteracy in informal science education settings



Meg Lowman

Chief of Biodiversity Science and Sustainability,
California Academy of Sciences,
San Francisco, CA
(mLOWMAN@calacademy.org)

Specific metrics for the status of US science education indicate that the country is losing its competitive edge on a global scale; among nations, the US ranks 22nd in density of broadband internet penetration and 72nd in density of mobile phone subscriptions, both of which are critical tools for science literacy and likely contribute to our international rank of 48th in quality of math and science education. Even worse, 69% of US public middle-school math students are taught by teachers without degrees or certificates in mathematics, and 93% of public middle-school teachers in physical sciences lack degrees in their subject (NAS 2010). All of these rankings represent indicators of global science leadership. In short, formal science education systems in the US lag behind those of many other countries, and our ability to train the next generation of scientists is at risk (Brewer and Smith 2010). In addition to shortfalls in public schools, US K–12 youth now watch at least 4 hours of television daily, and the average teenager spends a whopping 7.5 recreational hours daily in front of television and gaming screens (NAS 2010) – time that instead could be devoted to doing homework or experiencing the natural world through outdoor engagement. The formal STEM (science, technology, engineering, and mathematics) education metrics for US education are not keeping pace with those of other developed countries and are declining over time. Ecology education is experiencing one of the largest deficits: public schools have cut back on field trips and many K–12 students now experience nature virtually, rather than directly (Louv 2008; Lowman and Mourad 2010). Likewise, many undergraduate and graduate programs are eliminating their natural history programs, sometimes referred to as the “extinction of the ologies” (Lowman and Mourad 2010).

In contrast, informal science education (ISE) is now providing a larger compensatory component of STEM education to students as well as to citizens and policy makers. Currently, US museums tally approximately 850 million visits annually, which is more than the attendance for all major league sporting events and theme parks combined (483 million in 2011; www.aam-us.org). Along with these visits, museums are also recording a burgeoning virtual visitorship, with an additional 524 million online visitors in 2006 alone, which has escalated during the past 5 years. In the US, there are over 17 000 museums, whose visitors range from several hundred for a

rural museum with a local mission to >8 million annually for larger or national museums (www.aam-us.org); many of these ISE experiences bolster shortfalls in formal STEM education. Natural history museums, with their biodiversity collections and interpretive dioramas, serve as focal points to provide ISE about ecological concepts, including biodiversity, ecosystem services, climate change, and landscapes. In many cases, K–12 students become inspired by seeing, touching, and working with collections; and increasingly, virtual technologies and social media are becoming important drivers of science education concepts for youth outside of the formal classroom setting. Both undergraduate and graduate students can gain valuable training in science communication and outreach using the public floor of museums and other ISE platforms (Trautmann and Krasny 2006; Lowman and Mourad 2010). Given the declining competitiveness of US science education on a global scale, ISE has become an important pipeline for engaging the next generation of scientists and for contributing to otherwise declining ecological literacy.

Of US adults surveyed nationally, <20% possess an “acceptable” level of scientific literacy and a majority have little knowledge of natural science, the process of research, or the results of contemporary scientific investigations, despite the importance of science to both human and ecological health (Field and Powell 2001; Miller 2004). Many ISE institutions are embracing the urgency of providing visitors with hands-on experiences to understand science and especially ecology; such efforts may translate to a healthy community through an understanding of fresh water, pollinators, clean air, agriculture, carbon sequestration, forest products, and myriad other ecosystem services. Educators often suggest “the best way to help the public understand the research process is to involve them directly through hands-on research” (Ucko 2004). Public Engagement with Science (PES) is a term used in ISE circles that emphasizes the growing importance of providing citizens with a better understanding of science as a driver of economics and health; ecology is often a conduit for science understanding, whereby museums foster a sense of wonder that leads to greater science literacy by getting kids “hooked” on science. But more analyses of PES in museum settings – including theoretically based assessments of activities – are sorely needed (Bonney *et al.* 2009).

In my former home state of North Carolina, 39% of 8th graders report they “never or hardly ever” designed a science experiment, and another 29% report doing hands-on science activities only once or twice a month. Teaching methods that were traditional several decades ago – lectures, textbooks, recipes in laboratory sessions –

continue to be the norm in science education despite national outcries calling for radical change (eg Brewer and Smith 2010). Soon, science teachers may face additional pressure to incorporate hands-on experiences into their courses. Like those of many other states, North Carolina's revised science standards call for inquiry-based learning experiences emphasizing the Next Generation Science standards. Historically restricted to museums as an outreach activity, ISE may infiltrate the public school classroom, so that "citizen-science" activities originating in museums can be virtually transmitted to classrooms for dynamic new science activities (eg Project GLOBE, Project BudBurst, and iNaturalist.org; see Trautmann *et al.* 2012; Zoellick *et al.* 2012; www.yourwildlife.org). Programs such as the National Ecological Observatory Network (NEON) have national mandates from Congress to implement citizen science (or some major and transformational capacity of ISE) to reach diverse stakeholders with data streams about North American ecosystems (Lowman *et al.* 2009). In addition, for states like North Carolina, with large numbers of practicing scientists, the mentoring of K–12 teachers by scientists has the potential to become another pathway for ISE (Lowman and Randle 2009).

To keep North Carolina competitive in science (especially given the strength of Research Triangle Park, a huge driver of technology and jobs in the state), public–private partnerships funded a new wing of the North Carolina Museum of Natural Sciences that opened in April 2012. Called the Nature Research Center, it proposed to expand citizen science (ie PES) to diverse stakeholders using four innovative platforms of ISE (Dickinson and Bonney 2012). Drawing upon ecology and especially biodiversity as major drivers (since the museum houses a collection of over three million specimens of organisms endemic to the southeastern US), several ecology-based citizen-science programs were launched with marked success. These programs serve as a case study for integrating real nature and virtual technologies, thereby raising the ecological literacy of museum visitors. Researchers from the Friday Institute for Educational Innovation at North Carolina State University initiated visitor evaluations to track the success of the different platforms of informal learning that include: (1) citizen-science programs in partnership with local scientists (eg the Belly-Button Biodiversity program [Hulcr *et al.* 2012] or the "wild life of our homes" project [www.yourwildlife.org]); (2) virtual theater to connect K–12 students directly to environmental scientists working both in laboratories and in the field; (3) public education labs (called iLabs) that illustrate natural science techniques of "how we know what we know" about ecology and natural sciences; and (4) glass-walled laboratories where scientists work in the public eye and answer questions from onlookers about the scientific process.

Will ISE platforms succeed in bolstering STEM education for students and visitors? With its myriad educational programs for diverse audiences, the California



Figure 1. An informal science education (ISE) laboratory at the California Academy of Sciences encourages students and the general public to pose questions to practicing scientists. This interaction also allows visitors to learn how natural history hypotheses are tested by the scientific method.

Academy of Sciences (CAS) is proving the success of ISE. Located in San Francisco, CAS's ecoliteracy programs are rooted in science learning, but take the next step to reconnect learners to the natural world and equip them with tools to foster healthy communities through environmental action (eg <http://spotlight.macfound.org/featured-stories/entry/elizabeth-babcock>). For example, the Academy's Teacher Institute on Science and Sustainability engages 3rd- to 5th-grade teachers in a cohort-based, 2-year training program to incorporate sustainability action in their science teaching. Using simple metaphors that make the science accessible, CAS's ocean action programs (hosted near a 200 000-gallon live coral-reef exhibit on the museum floor) acquaint visitors with the causes and mechanisms of ocean acidification, and its impact on coral reefs. Conservation-oriented stories, as well as action steps designed for individuals and families to reduce carbon emissions, are directly woven into the program's message.

In addition, CAS has one of the museum world's first glass-walled laboratories, where visitors can "meet a scientist" and children can interact with diverse scientists as role models (Figure 1). Such innovative attempts to strengthen ISE may ultimately inspire the next generation of ecologists. Moreover, expansion of "virtual-plus-real" natural history educational platforms into other ISE institutions – botanical gardens, zoos, parks, and even school playgrounds (eg www.schoolofants.org) – will foster exciting opportunities to improve ecoliteracy, not just for students but also for their parents, for regional policy makers, and for a diverse public who enjoy destinations that offer ecology education in an informal setting.

References

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Botanist Margaret Lowman urges children to muddy their boots

June 21, 2014 - 12:15AM

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David Wilson

Dr Margaret Lowman, who is known as the "Einstein of the treetops", started her botany career in Sydney and is now an international star botanist, who likes to hang around in the forest.

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Tree queen: Meg Lowman is regarded as the mother of forest canopy research. Photo: Carlton Ward

Unlike other botanists who plant their feet in the dirt, Dr Margaret Lowman pursues high adventure. The so-called "mother of canopy research" has designed walkways and hot-air balloons for the purpose, becoming a legend in the process - another of her nicknames is the "Einstein of the treetops".

The bedrock of her success may well be her 1983 University of Sydney botany doctorate that stemmed from meeting the college's plant ecology professor then, Peter Myerscough, who was on sabbatical in England while she did her Masters in Scotland.

"He inspired me to apply - and, bingo!" says Dr Lowman, 60. Awarded an international scholarship, with Myerscough's guidance she learned the worth of British-style creative fieldwork.

"It was daunting at first but amazing to tackle something of that magnitude: I literally did not even know what a rainforest looked like - my adviser said, 'Drive north until it turns green.' I did, and 1000 kilometres later, I was in Queensland," says Dr Lowman, the Chief of Science and Sustainability at California Academy of Sciences, who specialises in canopy biodiversity and ecosystem health.

Initially, the question of how she should address Queensland's rainforest perplexed her. Back then, humanity had been to the moon but not the top of a tree, it seemed.

Banned from using binoculars or a monkey by Myerscough, she learned to climb by joining the University of Sydney's caving club, whose members thought her crazy. Persevering, she developed a slingshot climbing technique. Once aloft, eating chocolate biscuits and admiring the view from her harness helped her handle nerves.

One time, however, during a rushed descent before a thunderstorm, she failed to fasten her safety lines. Cue a bruising five-metre fall that taught her that, in her field, you must double-, even triple-check equipment.

She says you must be ready to sweat and spend time because a forest cannot be fathomed in a visit. A tolerance for ant bites and foliage stings also helps and it's nothing like Tarzan and Jane. "It is not quite as sexy and vibrant as in the movies," she says. Often she just hangs in her harness, watching.

Born in Elmira, New York, to two teachers, Meg Lowman was an anxious yet adventurous child, who built tree forts. Keen to work outdoors, she earned her first degree, in biology, in Massachusetts then an MSc in ecology at Aberdeen. From 1978 until 1989, she was based in Australia, studying and researching. A night-school teaching stint helped her overcome pre-talk nerves that had made her vomit.

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As her lecturing smarts and her "Canopy Meg" persona developed, she went on to study leadership and business. She also travelled intrepidly and wrote science books, and grew in stature. As her achievement-grenched 24-page CV notes, she has featured in *National Geographic*, *Smithsonian*, *The New York Times* and *The Wall Street Journal*.

Next she plans to save Ethiopia's forests, which are languishing in an urgent state of degradation (See <http://bit.ly/S98bul>). Meanwhile, she urges children to muddy their boots, and encourages emerging-world women to become their communities' future scientists and environmental leaders.

Lowman gains great perspective exploring the mysteries of the world's forests. She calls her lofty outdoors office "an amazing hotspot for life on earth". "Critters" she meets include occasional snakes and dozens of birds - macaws and toucans, for instance.

She has also encountered the formidable "giant stinging tree" and the tiny tardigrade or "water bear" - one of the world's most extremophile organisms. It looks cute under the microscope, she says. Only a botanist would believe that.

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10 Nov 2014

New eyes in the sky

Imagination is more important than knowledge.

— Albert Einstein

The era of “citizen spies” is upon us! “CSI: Miami,” take note. Many conservation biologists, geologists, public health specialists and nonprofits are building up a new army, called UAVs (Unmanned aerial vehicles) or “drones,” which are low-cost surveillance technologies that can fly over sites and capture visual data.



MEG
LOWMAN
NATURE'S
SECRETS

Once reserved for the high-end budgets of the military, drones have now decreased in price so that even a curious citizen can buy one to capture photographs of her local neighborhood. In February 2012, young biologists Lin Pin

Koh and Serge Wich developed the first low-cost prototype UAV for less than \$2,000. They flew it as part of their conservation research in North Sumatra, and easily captured thousands of images that would have been extremely expensive (even impossible) to collect through conventional techniques of renting a small plane and pilot, or reconfiguring satellite data.

After posting some of their images online, they were deluged with emails from colleagues and the press about this extraordinary new tool for conservation. Hence, they co-founded a nonprofit called ConservationDrones.com to share their applications with an eager public.

More recently, the role of drones has been creatively expanded to solve many environmental challenges, including the complexities between environment and the spread of infectious diseases. For example, drones were used to plan relief measures after Typhoon Haiyan devastated the Philippines. Medical supplies were delivered to remote areas via drone transport, and biological samples were flown from rural clinics to larger cities to track diseases; this was a critical breakthrough in a region where the roads were impassable, yet medical assistance was urgently needed. In addition, several tropical infectious disease research teams believe that drones can track changes in land use, which drives the emergence and spread of many infectious diseases. For example, deforestation is thought to increase human contact with parasites that

cause malaria, and medical teams used drones to monitor this throughout remote regions of Malaysia and the Philippines.

Closer to home, “citizen spies” are documenting illegal fracking activities in Pennsylvania. Using drones, vigilant locals mapped wastewater ponds that were not recorded by the drilling permits, but represented important potential sites of the distribution of toxic water. A nonprofit called SkyTruth attracted over 200 volunteers who crowd-sourced 90,000 image analysis tasks from the drone aerial surveys, and located 1,400 active drilling sites in Pennsylvania alone. Not bad for a bunch of dedicated citizens!

Whereas geospatial data used to be the privileged information of technical specialists with big budgets, SkyTruth and other groups are now downloading it for free. Even Google donates access to Map Engine and Earth Engine services through its “Geo for Good” programs. Affordable drones and other open source visuals have made it possible to map crude oil oozing on the surface waters in the Gulf of Mexico, to monitor illegal logging in tropical forests, and to locate water bodies where infectious malaria mosquitoes will breed. SkyTruth has expanded from its original mission in Pennsylvania to documenting illegal fishing around Easter Island and mapping oil flares in Nigeria—all possible thanks to the emergence of UAVs and innovative crowd-sourcing of the downloadable visuals.

The toolkit for environmental monitoring is growing, thanks to innovative and creative applications of new technologies. Drones are the newest addition to the existing array of methods that include apps, camera traps, satellite imagery, and even discarded smartphones affixed to tropical trees that monitor the noise of illegal chain saws! Creativity abounds, as science and technology come together for innovative solutions.

Stay tuned, as drones provide increasing opportunities for all of us to become citizen scientists who can harness the power of UAVs for conservation and environmental monitoring of our own neighborhoods. (But beware and behave—a drone can also record who is skinny-dipping in your neighbor’s pool!)

Meg Lowman, a longtime Sarasota-based scientist and educator, is chief of science and sustainability at the California Academy of Sciences. Email: mlowman@calacademy.org



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The most Influential Women

in Bay Area business

Janet Napolitano is steering the University of California, a \$24 billion-a-year system that's crucial to the state's economic future. **Page 6**

INSIDE

Male mentors offer a fresh perspective on climbing the corporate ladder. **Page 8**

Profiles of Influential Women from A-Z. **Page 12**

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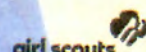
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**LEIGHANNE
LEVENSALE**

Vice president of human capital management products, Workday

Education: Bachelor's, education, Clemson University; Master's, human resource development, Georgia State University.

Community involvement: Class of Henry Crown Fellows at the Aspen Institute, Workday Foundation.

Best mentor: Over the last five years, I've had the phenomenal opportunity to learn from quite possibly the greatest business and technology strategist of our time — Anel Bhuri, chairman, co-founder and co-CEO of Workday.

How do you unwind: I like the Las Trampas Hills in my neighborhood.

Female role model: Over the last few years, I've had the pleasure of spending focused leadership development time with several amazing women in the context of a fellowship through the Aspen Institute. Two of the women — both in technology as well — have had a significant impact on my daily leadership experiences. Stephanie Tilenius (executive-in-residence, Kleiner Perkins Caufield & Byers) and Sheila Marcelo (CEO, Care.com) are, in my assessment, effective and enlightened leaders, and I'm grateful for the opportunity to directly observe, and try to emulate their model of leadership.

Surprising fact about you: I can sing over 140 camp songs, including all hand motions. I'm like a rock star to the 10 and under crowd.



**TERI
LLACH**

Chief marketing officer, Blackhawk Network

Education: B.A., economics, University of California, San Diego; M.B.A., University of California, Berkeley.

Community involvement: Mentor at Building Futures Now in East Palo Alto.

Proudest accomplishment: The Blackhawk Network IPO in 2013 was an incredibly proud moment for me. Having been with the company at its start in 2001, the public offering really demonstrated the magnitude of our work. It was wonderful to see how we've built something so profound that the general public wants to own a share of it.

Best mentor: My Parents — William and Patricia Callender. They have been invaluable mentors all my life.

How do you unwind: I've been painting for about 15 years. My oil-based flowers and landscapes have even been part of some local art shows.

Dream super power: To speak any language on (or even off) the planet.

Female role model: It's close to home, but Blackhawk Network President Talbott Roche has been a tremendous source of inspiration for me. She's been an incredible leader for the company and the entire industry.

Surprising fact about you: My ancestors were among the first settlers to the "new world" and California. My father's side of the family came over on one of the ships with the Mayflower, and we're connected to John Quincy Adams. On my mother's side, we were early settlers of California and settled in the Bay Area in the mid 1800s.



**DR. MEG
LOWMAN**

Chief of science and sustainability, California Academy of Sciences

Education: B.A., biology cum laude, M.A., Williams College; M.Sc., ecology, University of Aberdeen, Scotland; Ph.D., botany, University of Sydney, Australia.

Community involvement: Meg Lowman treetops camp (science mentor to at-risk teenage girls at the annual camp), Science Online, Earthwatch, Planets for People, Tree Foundation, Young Voices for Climate Change, Explore! (Discovery TV), 7th International Canopy Conference.

Proudest accomplishment: To be one of the world's first "arborists." (Transition: an astronaut explores outer space, whereas an arborist explores the tree canopy). As one of the only women in tropical ecology at the time, my tree-climbing career led me to discover that half of the world's biodiversity on land lives in the tops of trees.

Dream super power: My dream super power is children — I strongly believe that engaging youth with the magic and wonder of science will inspire solutions, leaving our world in good hands.

Female role model: Harriet Tubman, who was an extraordinary naturalist who could "read" the moss on the tree trunks to navigate the underground railway to free the slaves.

Surprising fact about you: I am an entomophagist, meaning that I eat bugs. My kids and I have lots of recipes for things like tarantula tempura and cricket hors d'oeuvres. Eating insects is actually one of the planet's most sustainable diets.



**KAREN
LUEY**

Executive vice president, chief financial and administrative officer, Jamba Juice

Education: B.S., business and accounting, California State East Bay.

Community involvement: Northern California Girl Scouts; Ascend; National Restaurant Association.

Proudest accomplishment: Partnering with our management team to affect a successful turnaround of Jamba and position the company for our growth acceleration. It was a far cry from 2008, when we were on the verge of a financial and strategic crisis.

Best mentor: From a personal perspective, my mother who passed away this year, was instrumental in setting the foundation for my drive and ambition. From a career perspective, James White, Jamba's CEO, has taken the foundation that mom laid and fosters my need for continuous growth.

How do you unwind: I use running to unwind, manage stress and as a way to look at things from a different perspective.

Dream super power: My dream super power would be the ability to heal, finding a cure for cancer, making people feel better and finding a solution to make all of those ills go away.

Surprising fact about you: In my youth, I was very interested in road racing automobiles and even participated in several races.



**REBECCA
MACIEIRA-KAUFMANN**

President and CEO, Banamex USA

Education: B.A., semiotics, Brown University; Fulbright Scholar, the University of Helsinki, Finland; M.B.A., Stanford Graduate School of Business.

Community involvement: Board of directors of the Bay Area Council and the California Chamber of Commerce, board of governors of the San Francisco Symphony, advisory board of the Asia Society of Northern California and board of Congregation Emanu-El.

Proudest accomplishment: Developing a world class, high-performing team is the achievement of which I am most proud. I strive to be an energetic and inspirational leader who coaches and motivates my team members to reach their full potential, while accomplishing their goals with grace and respect.

Best mentor: I'm fortunate to have had many mentors throughout my career, including colleagues, managers and team members. The best attribute a mentor can provide is sharing honest, helpful feedback to help attain and reach your aspirations.

How to help women advance: Be the judge of yourself. Remember to stay focused, trust yourself, and most importantly, be yourself!

How do you unwind: I dance, read a novel or take a walk.



**JOELLE
MAHER**

Chief operations officer, Gymboree

Education: B.S., Cornell University.

Community involvement: Carlton Together Cares, Habitat for Humanity, Oregon Humane Society.

Proudest accomplishment: Global Services status on United.

Best mentor: Dr. Elizabeth Oltenacu. I met her when I was 14 in the New York 4-H Club and she mentored me through my college years at Cornell.

How to help women advance: Women should always try to mentor and support each other. A mentor should see the talent and ability within you, even if you can't at the time. And help you bring that to life.

How do you unwind: Getting my hands dirty. I love my garden and I make award winning preserves and chutneys with what I can pull out of the earth.

Dream super power: The ability to function without sleep. That would be super.

Female role model: My mother. A great woman who was ahead of her time. Quickly put herself through higher education and worked every day while her husband was at war, prominent board member as well as an exceptional mother of four.

Surprising fact about you: I am the proud product of 4-H. I even raised goats.



**LINDA
MANDOLINI**

President, Eden Housing

Education: A.B., political science, Wheaton College; M.B.A., Boston University.

Community involvement: California Housing Consortium, Housing Trust of Silicon Valley, Enterprise Communities' Community Leadership Council, National Housing Conference, Cycling Coach, Leukemia and Lymphoma Society's Team in Training Program for the Death Ride.

Proudest accomplishment: The work I have done at Eden. Not only have we grown to meet affordable housing needs throughout the region, we've had a special emphasis on preservation of our portfolio to assure that it is a permanent, high-quality asset for the communities we partner with and the people we serve.

Best mentor: It is a tie for first between Alice Lee whom I worked with in Boston and Carl Guardino from the Silicon Valley Leadership Group.

Female role model: Carol Galante, former CEO of BRIDGE Housing and the current FHA commissioner, and Dianne Spaulding, the executive director of the Non-Profit Housing Association.

Surprising fact about you: Every year I hand-roll 1,000 tortellini for Christmas dinner using a 3-foot rolling pin I inherited from my grandmother.



**MARY
MARCY**

President, Dominican University of California

Education: B.A., political science, University of Nebraska; M.Phil and D.Phil., politics, University of Oxford.

Community involvement: Editorial board of the Journal of Liberal Education, academic advisory council of the Panetta Institute, the higher education advisory board of the National Council on Education and the Economy, member of the board of governors of the Commonwealth Club of California and board of directors of the North Bay Leadership Council.

Proudest accomplishment: My proudest personal accomplishment was earning a doctoral degree from Oxford. My proudest professional accomplishment was announcing the largest-ever gift in Dominican's 124-year history.

Best mentor: Sara Boatman, vice president of student life at the University of Nebraska.

How do you unwind: Every morning I either hike or ride my bike on the trails above Dominican.

Dream super power: The ability to overcome jet lag in a single bound. Leaping over long traffic jams to mitigate Bay Area traffic.

Female role model: Sonia Sotomayor.

Surprising fact about you: I coached the women's basketball team at Oxford University in England.