CAMINOS DE AGUA

2017 YEAR IN REVIEW





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CAMINOS DE AGUA

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Dr. Joe Mercola

100 Women Who Care

ProEconomy

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UCL Grant Challenges for Global Health

UCL Global Engagement Fund

UCL Scenario for Sustainable Building

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The Jonathon D. Krist Foundation

The Global Giving Campaign

Benevity & Guggenheim Partners

The JWH Initiative

The Terrell Charitable Fund

All of our friends and family who attended Pilar and Dylan's

wedding/fundraiser

...and a very special thank you to the

227 Individual Donors

who believe in our work.

Our sincere thanks to:

Caminos de Agua Team

Dylan Terrell • Jennifer Ungemach •
Saúl Juárez • Casilda Barajas • Jeff Rottler •
Nico Vargas • Fili Baltazar Vargas • Ismael
Rodriguez Bolaños • Carmelo Gonzalez Ramirez •
Aaron Krupp • Billy Thurston • Chantal Kronenburg
• Elena Diek • Sarah Mitchell • Martijn Eikelboom •

- July Gracient Sarah Hartman Melissa Landman
 - Simona Dossi Fernanda Arce Viridiana Piña González • Viviana Rodríguez Hernández

And all our Families

International Organizations & Partners

Engineers Without Borders UK • Engineers
Without Borders – UCL • Aqueous Solutions •
Aqua Clara and Dr. Harry Knopke • Regeneration
International • Organic Consumers Association •
Missions for Life & Matt Morrison • The Willamette
River Initiative • The Pun Pun Institute in Thailand
and Nate Reents • Watershed Management
Group & Joaquin Murrieta-Saldivar • JWH
Initiative • The International
Biochar Initiative

Board of Directors

Dr. Ilan Adler • Bruce
Janklow • Rob Lerner • Muriel
Logan • Agustin Madrigal •
Ercilia Sahores • Joshua
Samson • George
Terrell

National Partners

Concern America, Chiapas
Mexico and Bruno Morales • Madre
Tierra México • Cántaro Azul • INANA
(Veracruz) • IRRI Mexico • National
Water Quality Inventory (INCA) •
Border Partners • Isla Urbana
and David Vargas

Community Leaders

Lucha Villafuerte and United
Communities for Life and Water
(CUVA) • Carmen Castro and Pozo
Ademado Community Center
(SECOPA) • Padre Juan Carlos
Zesati and the San Cayetano
Community Center

Rural Communities

Arenal de Abajo • Arenal de Arriba •

Cañajo • Cerritos • Guadalupe de Támbula •

La Escoba • La Laguna Escondida • La Onza • Las

Liebres • Las Negritas • Llano Verde • Los Platanos •

Misión de Chichimecas • Morelos • Palo Colorado •

Palomas, Chihuhua • Pozo Ademado • Pozo Hondo

• Rancho Nuevo • San Antonio de las Mujeres • San

Antonio de Lourdes • San Antonio de Varal • San José del Carmen • San Juan (Chiapas) • San Miguel

Viejo • Santas Marias • Soledad Nueva •

Sosnabar • Vergel de Guadalupe •

Villa de Guadalupe

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Rosanna Álvarez • Susan Page •

Pilar Quintanilla • Humberto

Manduley • Mario Hernandez

• Jim Hallock

Local Partners & Organizations

Adelante Juntos por La Colorada, A.C. • Buena
Tierra, I.A.P. • Casita Linda • CECyTE High School •
FAI Guanajuato • Feed the Hungry • El Maíz Más
Pequeño, A.C. and Henry Miller • Midday Rotary Club
San Miguel de Allende • OCAS - Citizens Observatory for
Water & Sanitation • Ojalá Niños • Procuencas Guanajuato

• The Center for Global Justice • The San Miguel Writers' Conference • Vía Orgánica, A.C. • Ser Mujer and

Trish Sneider • Audubon Mexico and April Gaydos •

Amigos de la Presa and Mike Lambert • CBTis #60

All of the Volunteers from the Urban
Water Quality Monitoring

Program

Academic Partners

Dr. Joshua Kearns, Dr. Matt
Polizzotto, and Graduate Student Maia
Fitzstevens – NC State University • Dr. Jaime
Hoogesteger – Wageningen University • Dr. Ilan
Adler – University College of London • Dr. Peter
Knappett – Texas A&M University • Dr. Yanmei Li
– University of Guanajuato • Dr. Saugata Datta
Graduate Researcher Forest Shepherd –
Kansas State University • Dr. Josh Ellsworth
– Brandeis University • Alison Parker
– Cranfield University

Local Businesses

Javier Garcia and
Artisan Tile SA de CV •
Eric Ramirez • La Lonja
• Don Ciro • Don
Pedro

Dear Friends of Caminos de Agua,

This has really been a year of incredible growth for the organization. Our team has gone from just 3-4 in early 2016 to 15 now at the end of 2017. We have 11 full- and part-time staff, eight dedicated board members, and we have welcomed nine long-term volunteers, interns, and fellowship recipients through our doors this year (who produced five master's theses along the way to boot). We're a mix of Mexican and expat residents, community organizers and technologists, researchers and educators — united by our concern for public health and welfare.

We have grown all of our programs this year, and in this report you will read about:

- Increased access to safe and healthy drinking water to thousands of people, not only in our watershed, but throughout the country, through our rainwater harvesting systems and our ceramic water filters;
- The expansion of our water monitoring program into new frontiers, growing our understanding about how these complex water quality and scarcity issues impact more people, every day, and with greater urgency and ferocity;
- The fruits of our painstaking research and development into low-cost and truly pioneering water solutions, and;
- The hundreds who flowed through our "classrooms" this year from local high schools to indigenous communities in Southern Mexico and even our first accredited university course.

Our growth is only possible with the dedication of volunteers whom we rely on heavily. Between our rainwater harvesting projects – where local residents provide more than 90% of the labor – and our largely pro-bono research and technology development team, volunteers provided over 20,000 volunteer hours in our programs this year, up double from 2016.

That does not even include the time devoted by community leaders, like Lucha Villafuerte, Padre Juan Carlos Zesati, and Carmen Castro, with whom we have partnered with for years. Their determination and dedication cannot be quantified by traditional measures. They are the cornerstone of the communities where we work, weaving the social consciousness and empowering local residents to organize and take solutions into their own hands. We are infinitely grateful for their partnership and their tenacious commitment to the communities of Northern Guanajuato.

We continue to collaborate with renowned and impassioned researchers – like Dr. Josh Kearns at NC State University and Dr. Ilan Adler from University College of London – who share a worldview of providing safe and healthy drinking water through affordable, yet scientifically-validated, solutions that actually work for real people in real communities – a rarity in academia.

We count on teams from universities like Texas A&M, University of Guanajuato, and Kansas State whose equipment and expertise help to validate our own methods.

We are continually grateful for the support from the *Natural Health Research Foundation* for its long-term support of our arsenic and fluoride solutions research and development. Their understanding and willingness to risk immediate "results" for greater impact down the road is almost unheard of in the development world, but it is exactly what is needed to fill the gap where governments and markets do not.

Because of their support, in 2018 we will begin implementing world-class solutions that will appropriately treat entire community water supplies, quickly and efficiently – providing a dignified source of water that will not cause dysentery tomorrow as much as it will not cause cancer 20 years from now.

We continue to work with more local and national organizations. We thank local organizations like Casita Linda, Ojalá Niño, Procuencas Guanajuato, Buena Tierra, Feed the Hungry, 100 Women Who Care, and especially El Maíz Más Pequeño and Director Henry Miller for their partnership and support on a variety of diverse projects this year. We are also grateful to national organizations like Concern America Chiapas and specifically Bruno Morales, Madre Tierra Mexico, Border Partners, INCA (National Inventory for Water Quality), and Cantaro Azul, the latter of whom made the painstaking investment to get our ceramic water filters officially certified through the proper channels this year.

I am grateful not only for those who partner with us but as well as by those who work by my side. Aaron, Billy, Casilda, Chantal, Elena, Fernanda, Fili, Ismael, Jeff, Jenn, July, Martijn, Melissa, Nico, Sarah H., Sarah M., Saúl, Simona, and Viri: I am awestruck by your resolve and humbled by your talents. You make me better at my job, this watershed a safer place, and consequently the world a better place in which to live.

So, on behalf of the entire Caminos de Agua team, thank you to everyone who makes our work possible and helped make 2017 a better, and healthier, year for so many people.

Dylan Terrell

Caminos de Agua, Executive Director



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Our Impact This Year

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Caminos de Agua

Water Quality Monitoring

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Education













215

Water quality tests conducted

70

Rainwater harvesting systems installed

958

Ceramic water filters distributed

7,168

Hours dedicated to research and technology development

110

Days of education

Our Impact This Year

We collected a lot of rainwater this year – about 760,000 liters (~200,000 gallons) to be precise. The 70 rainwater harvesting systems were built in conjunction with (new) organizational partners, local communities, and dozens of high school students who provided more than 14,000 hours of volunteer labor to bring safe and healthy water solutions to their communities.

Our ceramic water filters not only make all of that rainwater safe to drink in our region, but by quadrupling our filter sales and distribution this year, we have made impact throughout the country – responding to disasters and supplying partner organizations with our ceramic water filters. In total, 2017 brought about 4,890 people safe drinking water access through our ceramic water filter programs.

Our "tech team" dedicated thousands of hours more this year, building our first arsenic and fluoride filter prototypes and testing them around the clock as well as building and piloting a variety of low-tech water pumps to enhance our rainwater projects. The pioneering designs and enhancements the team is working on for our ceramic water filters will bring sweeping changes to that program in 2018, profoundly increasing our reach for years to come.

In all, we took our solutions directly to more than 30 communities this year and worked sideby-side hundreds of talented local high school students, international university students, leading researchers, and more than a dozen local and national partner organizations.

31 community Collaborators

Arenal de Abajo • Arenal de Arriba • Cañajo • CBTis #60 • Cerritos • Guadalupe de Támbula • La Escoba • La Laguna Escondida • La Onza • Las Liebres • Las Negritas • Llano Verde • Los Platanos • Misión de Chichimecas • Morelos • Palo Colorado • Palomas, Chihuhua • Pozo Ademado • Pozo Hondo • Rancho Nuevo • San Antonio de las Mujeres

- San Antonio de Lourdes San Antonio de Varal San José del Carmen
- San Juan (Chiapas) San Miguel Viejo Santas Marias Soledad Nueva
- Sosnabar Vergel de Guadalupe Villa de Guadalupe

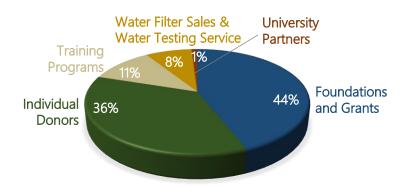
Financial Report

Financial report highlights:

- Our annual income topped \$175,000 for the first time. Revenue from ceramic water sales doubled and water testing tripled;
- We celebrated our 4th year of Natural Health Research Foundation Funding;
- Saúl Juárez received a 2500 euro grant for professional development through the JWH Initiative:
- We expanded our San Miguel de Allende donor base and raised over \$3500 in a fundraiser at the Naomi Klein talk at the Writers' Conference;
- We were selected for the second time as a 100 Women Who Care grantee earning over \$5000 for local programming.

Income

\$179,116.06



Expenses

\$167,660.98



Caminos de Agua



Water Quality Monitoring





Water quality monitoring highlights:

- 215 total sites monitored in 4 different municipalities throughout the country (Independence Watershed (141), Durango (18), Irapuato (10), Lake Chapala (46));
- 95 private water quality tests done, tripling our private testing service;
- Extensive interviews and data collected in 10 communities to create a comprehensive water poverty index that will continue to grow over time.

This was a big year for our water quality monitoring program. Billy Thurston, a former Engineers Without Borders UK fellowship placement, decided to stay on with Caminos de Agua full-time as our Water Monitoring Program Coordinator. Billy helped substantially expand our private water quality testing services, which tripled in 2017! This program gives us the chance to better inform more and more people on the complex water quality issues in the region and the appropriate solutions they can implement in their own homes. We project our entire water monitoring program to be financially sustainable in 2018 due to the income generated from private testing services.

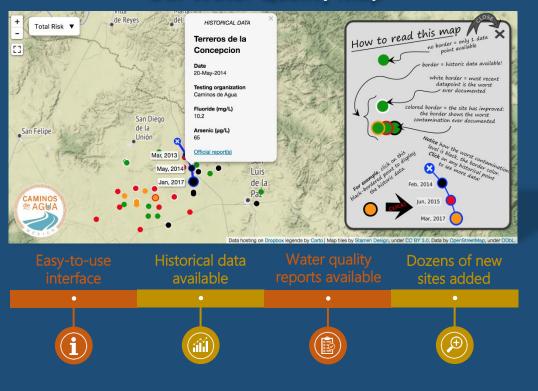
Billy also spent weeks in the field, testing rural community wells in partnership with research groups at Texas A&M University, Kansas State University, and the University of Guanajuato. With the help of Cranfield University student, July Gracient (who did her master's thesis research with Caminos de Agua) we were able to begin incorporating new data into our monitoring program, which looks at scarcity conditions, cost, access, water quality, and other factors to develop a comprehensive water poverty index. We will publish this information on our free interactive online maps in 2018. In the long-term this will help us better identify the most at-risk regions for our different programs.

Having Billy on full-time also allowed us to offer our services for free to other partners throughout the country. We ran water quality studies in Durango, Irapuato, and several other regions. The results illustrate that arsenic and fluoride contamination is a growing concern throughout the country in wells, household taps, and even expensive bottled water!



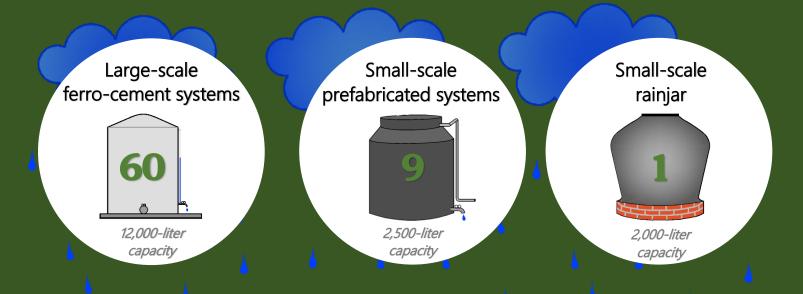


Our Water Quality Map





70 rainwater harvesting systems installed



Rainwater harvesting highlights:

- We built 70 rainwater harvesting systems with a total storage capacity of 765,500 liters, serving 155 families;
- The systems were accompanied by **82** ceramic water filters;
- We piloted **2** new biological treatment systems (slow-sand biofilter and chlorine/biochar contactor);
- 8 schools and 62 homes now have access to a rainwater harvesting system.

Our rainwater harvesting projects took on a more diverse and youthful face this year. New organizational partners, new educational models, and new improved designs were implemented throughout 2017. We mobilized hundreds of local youth from community high schools and even international university students in educational workshops and system constructions. We celebrated our 64th large-scale rainwater system (37th this year) with United Communities for Life and Water (a coalition of 21 rural communities in the northern region of the watershed), and we built seven large-scale systems with Pozo Ademado Community Services – a community partner we have been working with since 2011.

New partnerships helped to increase our impact this year. With El Maíz Más Pequeño, we developed comprehensive educational programs, which led to the student-led construction of seven rainwater harvesting systems in community schools and homes. Our new collaboration with Ojalá Niño led to the construction of four rainwater harvesting systems in San Miguel Viejo. Concerned by the increasing prevalence of dental fluorosis in their children, 39 mothers participated in workshops at the local kindergarten where two of these systems were installed by several of the women with Caminos de Agua staff supervising. And Casita Linda, a local organization that builds homes for low-income families, brought us on board at the end of the year to begin incorporating large-scale rainwater harvesting systems in all of their new homes and the elementary school (7 in total) in the community of Palo Colorado.



Rainwater Harvesting



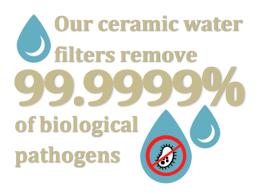
When do we start?"

Cerritos High School serves more than 20 rural communities, and earlier this year, Saúl Juárez gave a talk to dozens of their students. At the end, eight young women asked Saúl to help bring rainwater solutions to their communities. Saúl's reaction: "Sure, but first find a mason to donate time for the technical construction."

The students went back to their communities and asked around. When they found no one, they took matters in their own hands, telling Saúl: "We'll do it. When do we start?" These eight young women helped coordinate more than 60 students, and in early February, they broke ground on their first large - scale rainwater harvesting system, with El Maíz Más Pequeño providing the materials. The young women and the project were highlighted at World Water Day (March 22nd). This workshop also became the inspiration for developing two new comprehensive courses offered by Caminos de Agua to local high schools later in the year.

Ceramic Water Filters





Ceramic water filters highlights:

- Our ceramic water filters are now certificated by the official Mexican regulating agency, COFEPRIS;
- In total, we distributed and sold **958** ceramic water filters;
- These 958 ceramic water filters have a combined capacity to produce nearly **42 million** liters of safe drinking water over their **5** year lifespan.

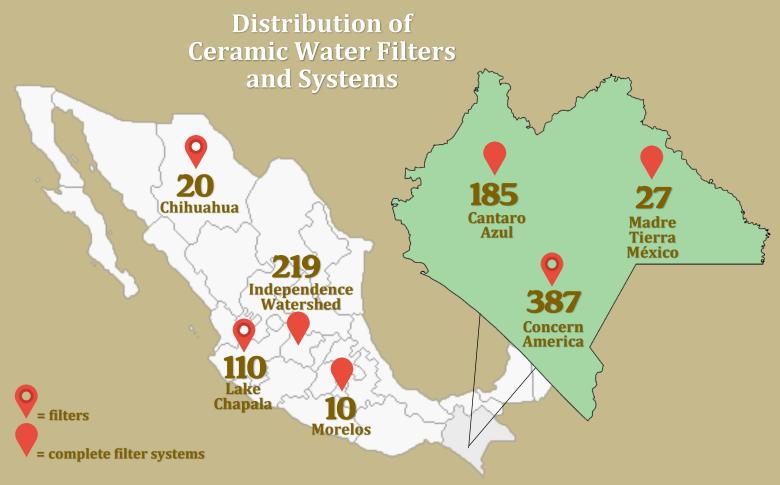
Something we have been working towards finally happened this year! Thanks to the sponsorship of our non-profit partner, Cantaro Azul, our ceramic water filters are now officially certified by COFEPRIS, the Mexican equivalent of the US Environmental Protection Agency, to effectively remove biological contamination from drinking water.

Twenty seventeen was a big year for our ceramic water filters. In total, we ended up **quadrupling distribution and sales** this year through our own regional projects but mostly through partnerships throughout the country like Concern America Chiapas, Cantaro Azul, and Border Partners.

Our ceramic water filters also played a role in disaster relief. Two of the biggest earthquakes Mexico has seen in decades hit in 2017. The first, registering at magnitude 8.1, struck southern Mexico. The second followed closely, rocking Mexico City and the surrounding region, toppling buildings, and killing hundreds. Hurricanes Maria and Irma and numerous tropical storms pummeled the region as well. Caminos de Agua responded by supplying 23 families in San Juan (Chiapas) with ceramic water filters through our partners at Concern America Chiapas. Additionally we provided 10 filter systems to students doing disaster relief in Morelos, the epicenter of the second earthquake. Unfortunately, we realized that we were unable to fully respond to disasters due to the current filter design. So the biggest news for our filters came at the end of the year. We have recently designed a new attachment for our ceramic water filters, as well as a new method of molding the filters, which, together, will allow the filters to be fixed into nearly any container, in minutes and with no skill required. This will allow us to respond to disasters quickly and more efficiently in the future while also increasing distribution to partners and creating a sustainable revenue stream for the organization.

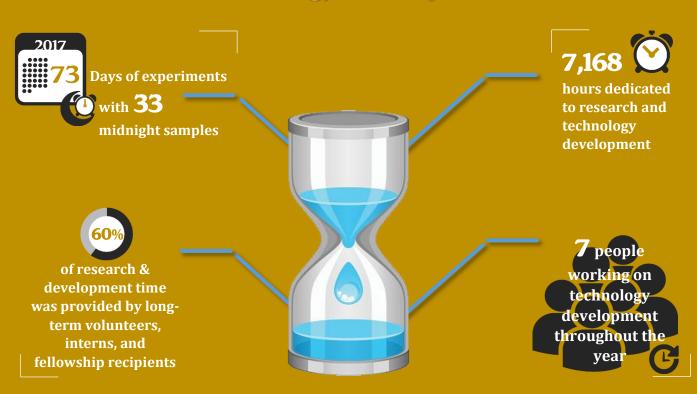








Time Invested to Technology Developemnt



Technology development highlights:

- Experiments were running 73 days this year;
- Team members spent **33** nights sleeping in the lab to collect midnight samples;
- We built and tested **4** pilot-scale systems in our laboratory for removing arsenic and fluoride;
- To make our bonechar filter media, we used 320 kg (705 pounds) of cow bones, which was produced in 32 distinct "burns";
- ♦ We transported 8,000 liters (~2,100 gallons) of contaminated water across a total of ~670 km (415 miles) to our in-town lab to perform all of our experiments under "real-world" testing conditions;
- 7,168 hours were dedicated to the development of 10 new water technologies and enhancements.

The need to get as many people off of contaminated groundwater as soon as possible is ever-growing, and we are really feeling the pressure. Our rainwater harvesting systems are one solution. While rainwater harvesting is more sustainable for watershed recharge, the high upfront cost and the time needed to build them limit our reach. Therefore we prioritized and made substantial progress on the development of our low-cost arsenic and fluoride filters. The filters will allow us to increase our impact quickly and inexpensively — providing entire communities with safe and healthy water supplies and staving off the health impacts of arsenic and fluoride toxicity for generations to come.

Our Research and Development (R&D) Program would not be possible without the endless dedication of staff, volunteers, and expert consultants. We are fortunate that Dr. Josh Kearns from NC State University offers technical oversight to our R&D on arsenic

and fluoride remediation. Aaron Krupp, our Research and Technology Development Coordinator, designs the experimental parameters and testing protocols and supervises a rotating team of 2-5 volunteer engineers, students, and fellowship recipients to run our technology development program. This mixture of local and international engineers literally work around the clock; trading shifts and sleeping in our lab to not miss one of our three daily sample times. In total, members of the tech team dedicated about 5,120 hours of volunteer work in 2017!

Sarah Mitchell and Simona Dossi, both Engineers Without Borders Fellowship recipients, along with environmental engineer Sarah Hartman, led the testing of our own fluoride filtration media as well testing the commercial arsenic media we will be using in our 2018 prototypes. Martijn Eikelboom's work on arsenic removal laid the foundation for our own arsenic filter and fundamentally improved our internal arsenic testing methodology. Mechanical engineer Melissa Landman and civil engineer Fernanda Arce focused on our ceramic water filters redesign, which will revolutionize the mode and ease of filter use in 2018.

It is because of their dedication that we will be piloting our first, community-scale, arsenic and fluoride treatment systems in 2018 as well as increasing access to safe drinking water by orders of magnitude in the coming years through new and improved ceramic water filters.

Technology Development



Education



We reached

3,000+ people

with our educational campaigns

Education highlights:

- In total, we reached over **3,000** people directly with our educational campaigns;
- Our 33 programmed educational events equal 110 days;
- The majority of our community educational programs is carried out by our full-time Director of Community Projects, Saúl Juárez.

Our community education programs grew greatly this year. Saúl Juarez, our Coordinator of Community Projects, led the charge, helping develop extensive courses ranging from three days to three weeks for high school students throughout our watershed. Students learned about regional water issues, scarcity, the global water crisis, biological contaminants, and inorganic and organic water contaminants. They built both small-scale and large-scale rainwater harvesting systems. One class even built a slow-sand biofilter and small-scale biochar treatment plant, each capable producing 300-liters of safe and healthy drinking water per day. Additionally, Caminos de Agua led 33 workshops and capacity trainings, spending a total of 110 days teaching (and learning) in the field with local communities like La Laguna Escondida, San Miguel de Allende (CBTis #60), Cerritos, San Miguel Viejo, San Antonio de Varal, Pozo Ademado/Villa de Guadalupe, Palo Colorado, and La Onza.

Our annual summer program coordinated by our Development Director, Jennifer Ungemach, in partnership with Engineers Without Borders UK and IRRI-Mexico, was a huge success this year. The summer course was followed by a 3-day technical workshop biochar treatment systems. Long-time friends and collaborators Dr. Josh Kearns (NC State University) and Nate Reents (Director of Operations at the Pun Pun Institute for Self Reliance in Thailand), and Caminos de Agua's own Aaron Krupp (Research and Technology Coordinator) and Dylan Terrell (Executive Director) led the course. Aaron later took the biochar course to our partners at Madre Tierra in Southern Mexico, where he led a 3-day workshop building the treatment system that is now being replicated throughout Southern Mexico and into Guatemala. One of the most exciting educational evolutions this year was offering our first university-accredited course in partnership with Western Washington University.





ACCREDITED COURSE

Intimately blending theory with practical hands-on learning

Different Lecture Topics

Water Politics in Mexico; Over-extraction and Contamination: Causes and Consequences of Northern Guanajuato's Water Crisis; The Impact of Foreign Assistance on at-risk Communities; Projects vs. Processes: Community Organizing and Methods for Responsible Community Development; Women in Water; Water Contaminants; and Rainwater Harvesting Systems for Rural, Urban, and Peri-urban Settings.

Days of Field Experiences

A one-day visit to a pilot fog harvesting project and three days participating in a Caminos de Agua project – building a rainwater harvesting system in a remote rural community with community partner organization, Pozo Ademado Community Services.

"I can't say enough about our time with you. You were able to communicate challenging nuanced topics like sustainable development, climate change, privilege and international cooperation and then back it up with meaningful real life experiences. It was magical to watch our students make connections and deepen their self-reflection and understanding. This was a trip that changed many lives for the better." Terri Kempton (Professor at Western Washington University)

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