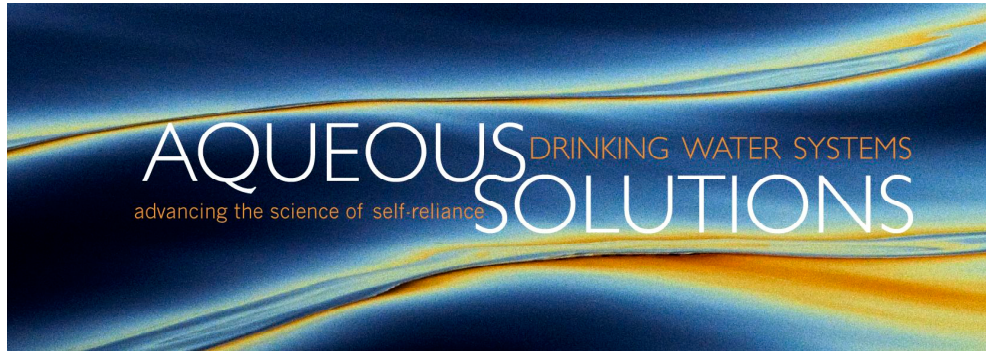




2007 ANNUAL REPORT

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MISSION

Each year, hundreds of millions of tons of pesticides are applied widely and intensively in agricultural zones around the globe.

Many of these chemicals exhibit toxic effects in humans and have been linked to a variety of diseases including cancer. One of our most vital resources – **clean drinking water** – is under the increasing threat of contamination by these substances.

At **Aqueous Solutions**, our mission is to enable households and communities to ensure the safety of their drinking water in a sustainable and self-reliant and manner. Our researchers and engineers are developing low-cost, robust **water purification systems** that can be constructed using locally sourced labor and materials, anywhere in the world, to remove pesticides and other agrichemical contaminants from drinking water supplies.

Our website –

www.aqsolutions.org

– is a resource and information hub providing scientific data, design specifications and other how-to information for construction of small scale self-reliant water treatment systems.





PROJECTS

INDIA

Our current project in India serves the rice farming villages in West Bengal. We have partnered with the Kolkata-based Center for Interdisciplinary Studies to set up a water filtration demonstration at the Center's agricultural biodiversity research station (*Basudha* – Bengali for “Earth-Mother”) in *Bankura* district. *Basudha* aims to conserve Bengal's vanishing rice varieties, in addition to demonstrating and encouraging organic and traditional multi-cropping techniques and promoting local knowledge of biodiversity. *Basudha* conducts workshops for farmers and villagers from throughout the region on topics in agriculture and ecology and runs a seed bank and distribution center. The water filtration demonstration will supplement *Basudha's* teaching curriculum on the dangers of pesticide use, and will give villagers the tools and information they need to ensure the safety of their drinking water.

THAILAND

Our current projects in Thailand serve three proximally located communities located sixty kilometers north of Chiang Mai city in the northern region of the country. They are called the *Pun Pun Organic Farm*, *Seed Center and Sustainable Living-Learning Center*, the *Panya Sustainable Living Project*, and the *You Sabai Organic Thai Cooking School*.

The communities have a combined year-round average population of about fifty people, about one-half Thais and the remainder internationals mostly from Western countries. They are committed to practicing a variety of sustainable and self-reliant living techniques including organic farming, seed saving, and earthen building. The community teaches these techniques during workshops, internships, trainings and permaculture courses to a diverse audience of four- to five-hundred people each year who visit the farm from all over Thailand and around the world.

The *Pun Pun Organic Farm* community considers that “only by living in a sustainable way ourselves is it possible for us to create a model from which others can learn and live. Through natural cultivation on our organic farm we display ways of transitioning to, and living more sustainably. Through the living and learning center we experiment with appropriate technologies, organic farming, and natural building techniques...Through our seed-saving operation we seek to bring back indigenous and rare species of all kinds of vegetables, fruits, and medicinal herbs. We propagate them at the farm and then exchange them for greater use amongst farmers and other interested people, thus empowering and improving the health of the general public.”

The *Panya Sustainable Living Project* “aims to be a thriving example of sustainable living in northern Thailand, while simultaneously providing a vehicle for

growth and expansion for all those involved.” *Panya* conducts year-round research and teaching exercises in permaculture, agroecology and natural building.

The *You Sabai Organic Thai Cooking School* hosts multi-day traditional Thai cooking courses including tours of the organic farm and local markets, yoga and meditation, and accommodations in bamboo and earthen guest houses.

In order to meet their drinking water needs in a self-reliant manner, the *Pun Pun*, *Panya*, and *You Sabai* communities capture rainwater from roofs of the farm buildings. However, it is not possible to capture and save enough drinking water to last through the long annual dry season from October to June. During these months, the community must purchase bottled water, which is expensive and must be trucked over great distances implying a significant expenditure of

fossil energy and the resultant pollution. This situation points up a critical dependence the community has on outside energy and resources to meet this vital need.

A network of irrigation canals fed by a nearby reservoir provides a steady source of freshwater to the farm. However, this water is contaminated by biological and chemical agents due to agricultural runoff from the non-organic farms in the region, pesticides being a significant concern. (See our Resources page on the Aqueous Solutions website, www.aqsolutions.org, for detailed studies about pesticide use in Thailand.) Thus the purpose of our project is to develop and deploy a simple, robust and inexpensive technology to provide the three communities with a stable, year-round source of safe drinking water using locally sourced labor and materials.



RESEARCH, PUBLICATIONS + PRESENTATIONS

Aqueous Solutions' website (www.aqsolutions.org) is a continually updated repository for our research and papers. The following titles are currently downloadable in PDF format from our Resources page:

Simple Field Tests for Water Quality, published January 2008
Agrichemicals of Concern in Northern Thailand, published December 2007
Pesticide Use in Thailand and the US: Ecological and Human Health Effects, published December 2007
Agrichemicals of Concern in West Bengal, India, published Fall 2007
Charcoal Filtration Basics, published Fall 2007
Constructing an Adobe Kiln for Making Charcoal, published Fall 2007
DIY (Do-It-Yourself) Water Purification: Basic System Design, published Fall 2007

In addition to these papers, Josh Kearns authored an article entitled *Drinking water purification using homemade charcoal: possibilities for self-reliance in water treatment*, published in *Permaculture Activist Magazine*, Issue #65, Autumn 2007.

In June 2007, Josh Kearns made a presentation on Aqueous' projects in Thailand to three Rotary Clubs in and around Statesville, NC, USA. These talks established a relationship between Aqueous and the Clubs, and conversations have since been carried out regarding how the Clubs, acting through Rotary International, can engage with Aqueous' project work in Asia.

In November 2007, Josh Kearns gave a guest lecture on pesticides, drinking water, and charcoal filtration to a Permaculture design course held at the *Panya Sustainable Living Project* (one of Aqueous' client communities) located in Chiang Mai province, northern Thailand.

Aqueous Solutions established an international presence in November 2007 with a presentation to

the *Third International Conference on Gross National Happiness*, held at Mahachulalongkornrajavidyalaya University in Bangkok, Thailand. The text and slides from the presentation, as well as the technical paper published in the conference proceedings are available for download from the Resources page on Aqueous' website.

From November 2007 through January 2008, Nathan Reents and Josh Kearns led a ten-week course called *Sustainability and Self-Reliance in Water and Sanitation Technologies* with a group of interns and community members at *Pun Pun Organic Farm, Seed Center and Sustainable Living-Learning Center* (one of Aqueous' client communities) located in Chiang Mai province, northern Thailand. This course dealt in depth with water contamination and drinking water issues, and involved hands-on work performing a variety of water quality testing experiments in the field, as well as in the design, construction and testing of the prototype water purification system installed to serve the farm community.

FINANCIAL REPORT

EXPENSES

CATEGORY	EXPENDITURE
Fundraising	\$51.00
Tools, Parts, and Supplies	\$438.55
Outreach	\$198.65
Research	\$94.41
Travel and Transport	\$1,767.99
TOTAL	\$2,550.59

INCOME

During 2007, Aqueous Solutions received \$926.25 in donations from individual, private sources.



LOOKING AHEAD

At Aqueous Solutions, we're expecting 2008 to be a landmark year in the elaboration and application of our water purification techniques, as well as in the development of our organization.

LABORATORY RESEARCH

A battery of laboratory experiments will be completed this year to provide the quantitative scientific basis required to achieve a high degree of precision and confidence in the design and performance of our water filtration systems. A subset of these experiments will characterize a variety of charcoal materials – charcoals made from different types of wood, bamboo, agricultural waste products such as straw, nut hulls, coconut husks, rice husks, etc. – and quantify their capacities as effective filtration media. Aqueous has partnered with university researchers in Thailand and the US to perform these analyses.

Our field research in Thailand and India has so far identified two-dozen different agrichemical products that are widely and intensively used in the vicinity of the communities Aqueous Solutions currently serves that threaten contamination of the communities' drinking water supplies. Table I summarizes some of the human health effects of these chemicals.

These toxic agrichemical pesticides will be the subjects of specific experiments designed to quantify the capacities of various charcoal materials to remove them from drinking water.

Table I. Human health effects of agrichemicals constituting a threat to drinking water supplies in the vicinity of Aqueous Solutions' client communities in India and Thailand.¹

Name	Locale	PAN Bad Actor	Acute Toxicity	Carcinogen	Cholinesterase Inhibitor (neurotoxin)	Endocrine Disruptor	Reproductive or Developmental Toxin
2,4 D (and 2,4 D isopropyl amine salt)	Thailand and India		moderate	possible		suspected	
acephate	India	yes	slight	possible	yes		
alachlor	Thailand	yes	slight	known	no	suspected	yes
aldicarb	Thailand	yes	high	unclassifiable	yes	suspected	
ametryn	Thailand		slight				
atrazine	Thailand	yes	slight	known		suspected	
carbofuran	India	yes	high	not likely	yes		
dicrotophos	Thailand	yes	high	possible	yes		
dimethoate	Thailand and India	yes	high	possible	yes		yes
fluazifop butyl	Thailand	yes	slight				yes
imidacloprid	India		moderate	not likely			
malathion	Thailand	yes	moderate	possible	yes	suspected	
mefenoxam	Thailand	yes	high	not likely			
metalaxyl	Thailand		moderate	not likely			
metaldehyde	Thailand		moderate	possible	no		
methamidophos	Thailand	yes	high	not likely	yes		
methomyl	Thailand and India	yes	high	not likely	yes	suspected	
methyl parathion	Thailand and India	yes	high		yes	suspected	
paraquat (and paraquat dichloride)	Thailand	yes	high	not likely			
phorate	India	yes	high	not likely	yes		
propiconazole	Thailand	yes	moderate	possible			yes
tebuconazole	Thailand		moderate	possible			
tebufenozide	Thailand		slight	not likely	no		
thiophanate methyl	India	yes	slight	known			yes

¹ These data are taken from the online database of the Pesticide Action Network (PAN), www.pesticideinfo.org. PAN defines "Bad Actors" as chemicals that exhibit one or more of the following properties: high acute toxicity, cholinesterase inhibition (neurotoxicity), known or probable carcinogenicity, known reproductive or developmental toxicity, or are known to constitute a groundwater pollution threat.

TECHNOLOGY TRANSFER

Our laboratory experiments, field research, and design trials with the prototype water purification system under development for the Pun Pun Farm community in northern Thailand will inform the creation of a detailed how-to manual that will be translated into several languages and made available on-line. This manual, due to be published in 2008, will include a comprehensive literature review of the science and engineering principles – communicated



in lay terminology – that underlie the water purification techniques used in each step of the process that our systems employ. The manual will give detailed, step-by-step instructions such that anyone, regardless of their degree of technical background, could construct their own water purification system tailored to the needs of their household or community and given their local resources for construction materials.

In 2008, Aqueous will also initiate a training program for volunteers in the science and engineering of our systems in order to enable the volunteers to act as consultants in their home communities or for communities with whom they visit when traveling internationally to implement our water treatment systems.

OUTREACH AND FUNDRAISING

In 2008 Aqueous Solutions will launch a fundraising campaign to identify potential sources of financial support for our research activities and field applications. In 2007, we submitted a grant proposal to the Charles A. and Anne Morrow Lindbergh Foundation; a decision regarding our application should be reached by mid-April 2008.

Also planned for 2008 is the creation of an informational brochure and other promotional print- and web-based materials. We will also be giving presentations on our research and projects in university classes and academic seminars, at conferences, to churches and civic clubs such as Rotary, in permaculture courses and self-reliance workshops, and in a wide variety of other forums in Asia, Australia and the US. And we're in hopeful expectation of the proliferation of publications about our work across a spectrum of printed and online media, from popular magazines to peer-reviewed scientific journals.

IDENTIFYING NEW PROJECTS

At Aqueous, we're expecting 2008 to bring many new opportunities to develop collaborations and projects serving additional communities in Thailand and throughout Asia. We're also working to establish a presence in Latin America. As our research program and prototype development activities come into full swing, we enthusiastically face the challenges that come with building capacity as an organization and expanding our work to serve additional communities around the globe.

ORGANIZATIONAL DEVELOPMENT

This year Aqueous Solutions will also engage in critical strategic planning activities to chart our further development as an organization and maximize our effectiveness for advancing our mission of facilitating households and communities around the world to ensure themselves access to safe drinking water. We've already had numerous requests for consultation with communities and other non-profits working in the field – keeping up with these burgeoning request will doubtless comprise one of the greatest challenges Aqueous will face in 2008.

With hundreds of millions of tons of toxic

agrichemicals applied widely and intensively each year throughout the globe, it's clear that the need for security in access to safe drinking water is on the rapid increase. Thus Aqueous is facing a monumental challenge to meet the demand for simple, inexpensive, low-tech, robust and dependable water purification systems that can be implemented by just about anyone, just about anywhere in the world to provide safe drinking water in a sustainable and self-reliant manner. It's an exciting time to be building capacity as a non-profit organization in an effort to meet this critical challenge.

SCIENTIFIC ADVISORY COUNCIL

Robert Catherman, Director, Safe Water Development Program, MEDRIX

Debal Deb, Director, Center for Interdisciplinary Studies, West Bengal, India

David Freedman, Professor of Environmental Engineering and Science, Clemson University

Brian Hill, Chief Scientist, Pesticide Action Network of North America

Detlef Knappe, Professor of Water Resources and Environmental Engineering, North Carolina State University

Richard Norgaard, Professor of Energy and Resources, University of California-Berkeley

Christopher Shanks, Co-Director, Project Bona Fide, Nicaragua

PARTNER ORGANIZATIONS

The International Society for Ecology and Culture (ISEC)

MEDRIX (Medical, Educational and Development of Resources through International exchange)

Pesticide Action Network of North America

Rotary Clubs of Statesville, North Carolina



MEET THE STAFF

DARWIN BOND-GRAHAM – OUTREACH + MEDIA

Darwin is a doctoral candidate in Sociology at UC Santa Barbara. His research involves issues of equity, environmental racism and disaster recovery.



He is currently working in post-Katrina New Orleans with several community groups on issues of public housing, health and education. In Santa Barbara Darwin helps run the SB Infoshop and is involved with multiple ecological projects. He is also currently co-

authoring a book on the University of California's nuclear weapons laboratory contracts.

JUDITH FLANAGAN – RESEARCH + FUNDRAISING

Judith received her bachelor's degree from University of Sydney, Australia and after spending 3 years working on the Human Genome Project, (LBNL, California) returned to Australia to complete a PhD in



Medicine from the University of New South Wales. From medicine and public health, Judith segued into environmental science during her postdoctoral studies as a molecular biologist at UC Berkeley to study the genetics of a microbial acid mine drainage community. It was through this experience that Judith

developed an interest in bioremediation and water contamination issues.

Combining her medical research background and ecology led to an appointment at UCSF to study the

"ecology" of patients suffering from asthma, cystic fibrosis and chronic suppurative otitis media (CSOM) a disease leading to hearing loss in children in marginalized communities. Upon returning to Australia she took up a position as scientific writer for a non-profit medical research institute that delivers eye care to indigenous and marginalized communities in Australia, Sri Lanka, Africa and Vietnam.

Judith's diverse background in the life sciences and her unparalleled skills communicating scientific and technical matters to a lay audience have prepared her well to head up grant-writing and fundraising activities for Aqueous.

JOSH KEARNS – EXECUTIVE DIRECTOR

Josh holds bachelor's degrees in chemistry and environmental engineering and a master's degree in environmental geochemistry. He has worked as a

researcher and activist in the field of ecological economics and sustainability science both in academia and in the non-profit, non-governmental sector. Josh is certified in permaculture design, and has studied and



practiced a variety of sustainable and self-reliant living techniques throughout the US and Asia including natural building, ecological agriculture, and home-brewing beers and wines.

Josh is also a prolific writer, developing themes in topics as diverse as agrarianism, ecology, science and society, Buddhism and Eastern philosophy, criticism of economics and globalization, local self-reliance, and adventure and eco-travel. His articles

and essays have been widely published in both on-line and print media.

Josh is an avid endurance athlete and enjoys long-distance trail running, road and mountain cycling, and swimming open-water and with the Temescal Master's swim club whenever he is around Berkeley/Oakland CA. He's also a bluegrass musician – he plays mandolin and guitar, sings lead, and on occasion attempts to sing harmony. Among his professional aspirations are to build a log cabin in the mountains using only hand tools and to farm using power from draft animals.

SUE ANN KEARNS – HOME OFFICE ADMINISTRATION

Sue keeps the books for Aqueous, manages correspondence with the donor-base and Aqueous' fiscal sponsor, and provides the central contact point for administrative operations. She also keeps Aqueous Solutions fiscally sound, and ensures that operations are on the up-and-up with the IRS.



Sue performed accounting and bookkeeping operations for her father's food processing and distribution business during high school. She's managed the Kearns family

household economy for thirty-five years, doing double-duty during much of this time as a special education teacher in the West Virginia public school system.

Sue is involved in a wide variety of folk arts and crafts using various media; she produces a range of high quality, aesthetic and useful hand-made goods including quilts and religious items. She's an avid reader and gardener and loves to take frequent nature walks.

TIM PATTERSON – DIRECTOR OF OUTREACH

Tim holds a bachelors degree in political science from Williams College (Massachusetts), but when his classmates applied to law school and took jobs with

investment banks, he bought a one-way ticket to Asia and hasn't looked back since.

As an adventure travel journalist, Tim writes narrative travel guides for traditional print media such as the San Francisco Chronicle, but also devotes energy to independent online media, serving as contributing editor at the daily online magazine BraveNewTraveler.com and as an editor at MatadorTravel.com, a social network for travelers.



Tim directs outreach for Aqueous, tapping the magic of the web to spread the word about our projects and research, and to leverage this publicity into financial support.

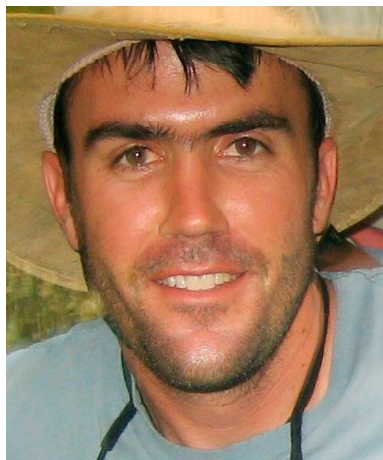
NICK RAHAIM – WEB DEVELOPMENT

Nick is a freelance writer, photographer, and web/print designer. In the daytime he is a legal assistant and web editor at the California First Amendment Coalition where he helps journalists and concerned individuals hassle the government for information. He received a BA in Economics and English Studies from the University of Vermont, where he also minored in Philosophy and Film. Nick was the Editor-in-Chief of The Vermont Cynic, the independent student newspaper at UVM. His work has been published in the San Francisco Bay Guardian, JANE Magazine, New America Media, and in other print and internet publications. In his spare time Nick climbs and surfs the rocks and waves of the Bay Area, struggles with languages like French, Spanish, Arabic and Farsi, and annoys his neighbors honking on his sax.



NATHAN REENTS – PROJECT MANAGEMENT + RESEARCH

Nate holds a bachelor's degree in mechanical engineering and a master's degree in environmental engineering. He worked three years with Peace Corps in Honduras on the design and construction of potable water systems. While on a bike trip in Bolivia he was offered a job as an environmental engineer with a non-profit organization and survived four years working in villages along one of the most dangerous roads in the world. His main activities included watershed mapping, protection and reforestation; environmental licensing; and designing coffee wastewater treatment systems, constructed wetlands and compost latrines. In the fall of 2007 he organized the first phase of a three-year National Science Foundation research project with students from Bolivia and the United States to evaluate the sustainability of several wastewater treatment systems in the tropical regions of Bolivia.



Nate is currently working at *Pun Pun Organic Farm* in Thailand, teaching and learning a variety of techniques for building with natural materials, and working in the Farm's many gardens. Nate is also the site manager for Aqueous' project at *Pun Pun Farm*, directing the design and installation of a potable water treatment system to provide safe drinking water to the community.

As a researcher and project manager for Aqueous Solutions, Nate draws on his considerable expertise in community scale water systems in the development of creative ways for using inexpensive and locally abundant materials to improve water quality. Currently Nate is developing protocol for monitoring and evaluating the performance of the prototype treatment system at *Pun Pun Farm*, and

using these data to make future designs easier and more affordable to build.

When he's not on-site at the farm in Thailand, Nate splits his time between Bolivia and his family home in Colorado, USA. Working with his partners in Bolivia, Nate recently acquired land for developing a sustainable, organic cocoa tree agroforestry system. And during the past several summers in the northern hemisphere he has helped to build strawbale and rammed-earth-and-recycled-tire (earthship) homes with his family in the mountains of Colorado. He also loves to travel, dance and hike.

TAI POWER SEEFF – PHOTOGRAPHY + GRAPHIC DESIGN

Tai Power Seeff grew up in Los Angeles, CA and at age 17 moved to New York City where she studied Photography, Cinematography, and Anthropology at New York University's *Tisch School of the Arts*.

Tai's work has been featured in various publications, including *National Geographic Traveler*, Benetton's *Colors Magazine*, *Rolling Stone*, and *O* (The Oprah Magazine). Clients include *Warner Brothers Pictures* and *Saatchi & Saatchi Advertising*. She was profiled in the Sept/Oct 2007 issue of *American Photo* as a "Green Photographer."



Tai recently completed a 10 week Earthen Building and Organic Farming internship at *Pun Pun* in where she also had the opportunity to photograph and design the 2007 Aqueous Solutions Annual Report.

Tai is currently based out of Oakland, CA and is represented by Getty Images. You can view more of her work at <http://www.taipowerseeff.com/>.

FROM THE DIRECTOR

A PERSONAL ANECDOTE ON THE HISTORY OF AQUEOUS SOLUTIONS

I'm hopelessly addicted to distance running. As addictions go, however, it's not such a bad one. Most people who run, run for the benefits to the body. I run for the *mind*, as a kind of meditation. As I settle into the rhythm of the pace, my mind cartwheels away across the far reaches of the universe, and, as often as not, reels off the screenplay of one wild fantasy or another. I've had entire conversations with friends, family, romantic partners, US Presidents – to name only a few – during the course of a typical sixty-minute run. I've written deeply inspired philosophical treatises on a multitude of topics. I've planned trips to exotic locales in vivid detail. And I've hatched all manner of crazy schemes for activism, muckraking, and general good-natured chicanery.

Most of the time, when I finish the run, stretch, shower, and grab a bite to eat, my wild imaginings begin to seem a little outlandish, and I reckon I won't really have that conversation with that person, at least not in the ostentatious way it unfolded in my head; I'll probably put off writing that particular philosophical treatise – surely the world isn't ready for it anyway. And all those crazy schemes? Well, to be honest, after more reasoned reflection they begin to seem, well, a little embarrassing and perhaps a bit ill conceived.

Sometimes, though, I wonder if I've hit on something that might just be the slightest bit legitimately brilliant. The idea for Aqueous Solutions (dorky name and all) came to me one evening in June 2007 while running on the fire trail that climbs steeply out of Claremont Canyon into the eucalyptus covered hills that make up the border of Berkeley and Oakland, California. I'd spent plenty of hours crisscrossing those rugged dirt tracks over the years of my tenure as a graduate student at UC Berkeley, and they have provided the verdant backdrop for countless wild musings, those both acted upon and not. The run last June was a nostalgia-soaked homecoming, as I'd just returned from a ten-month stint in “experiential learning,” tramping around the US and Asia getting a big dose of hands-on education in “sustainability science.”

My travels had taken me to live for several months with an organic farming community in northern Thailand, where the eclectic mix of Thais, indigenous hill tribe folks, and Westerners from all over Europe,

Australia and North America were creating a thriving experiment in sustainable and self-reliant living. Alongside them I learned the multifarious techniques of organic farming. I learned seed saving and the immanently vital folk wisdom of agricultural biodiversity conservation. I learned how to build elegant, utilitarian, durable and peerlessly beautiful dwellings out of natural and abundant earthen and organic materials.

Although this community skillfully practices all manner of sustainable and self-reliant living techniques, and teaches these techniques to a wide diversity of folks from all over Thailand and from around the world, they have a critical dependence on unsustainable systems for one of their most basic needs: clean drinking water. Thailand's eight-month dry season compels the community to purchase commercial bottled drinking water in order to survive the long period when no rainwater can be captured off of the roofs of the farm buildings. This comes at great expense economically and ecologically, as the water has to be trucked in over great distances and thus results in significant fossil fuel expenditure and attendant pollution.

A network of irrigation canals fed by a nearby reservoir brings a year-round steady supply of freshwater to the farm. But this water, like most of the surface water in Thailand and around the world, is unfit to drink. This water, like so many of our precious freshwater supplies everywhere on planet Earth, is most assuredly contaminated with toxic agrichemical pesticides – chemicals that have been linked to developmental and reproductive disorders, diseases of the endocrine system, and cancer, to name but a few of their known deleterious effects on human health.

The poisoning of our drinking water supplies is a worldwide plague that knows no distinction between rich or poor, dark or light skin, “developed” or “underdeveloped” or “overdeveloped” country, East or West, North or South, political “right” or “left.” In India, the pesticides DDT and BHC – chemicals so dangerous to human health and the environment that they have been banned in the West – have been widely detected in human breast milk. In the United States, each of us carries a frightening body burden” of hundreds of synthetic industrial

chemicals, including dozens of pesticides.

While running one evening in January 2007 on a well-worn livestock herders' trail through the lush tropical highland forest that embraces our small farm in northern Thailand, I recalled a lesson in environmental chemistry from my university days. Specifically, I remembered that a substance called "granular activated carbon" (which science-and-engineering-types call GAC for short) is widely used in municipal water treatment plants. This material, basically ground up bituminous coal – elemental carbon – when subjected to high temperature, steam, and acids in an industrial processes, has a great affinity for adsorbing organic hydrocarbon molecules out of water and thus makes a very effective filtration medium. Moreover, in recent years university researchers have begun to do experiments to gauge how effective GAC is for removing synthetic organic chemicals, including some pesticides, from drinking water.

I also knew that this idea was nothing new – apart from the industrial process to enhance the material's reactive surface area, elemental carbon, or as it is more commonly referred to, charcoal, has been used for water filtration for millennia. There's disagreement whether the ancient Egyptians or the ancient Hindus in India discovered charcoal's miraculous ability to purify water, but it is universally agreed that the technique's inventors were ancient. People all over the world have been making charcoal and using it to filter water for a long, long time.

Charcoal is ridiculously inexpensive, and is abundant in countless locations around the world. It can be made from sustainably harvested woods from fast

growing, coppicing tree species. It can be made from organic waste products such as rice husks, coconut shells, corncobs, nut hulls, and straw. And I've heard bamboo makes especially nice charcoal, particularly for water filtration applications.

The US Environmental Protection Agency and the World Health Organization have identified GAC as the best available technology for the control of many agrochemicals and synthetic organic chemicals in drinking water. But what about your garden variety charcoal – a ubiquitous, inexpensive substance widely available and affordable to most people around the world? What if ordinary charcoal could effectively remove toxic chemical pesticides from drinking water as well as, or at least nearly as well as, the high-grade, industrially produced GAC?

From the livestock track that wove its way through the tropical hardwoods of northern Thailand in January to the dusty fire trail that cut a course through the eucalyptus groves of the Oakland and Berkeley hills on that perfect California June evening, this question burned in my mind. My exercise-induced revelation suggested that if ordinary charcoal can clean pesticides out of drinking water, then the possibility exists for not only our farming community in northern Thailand but indeed people all over the world to protect themselves from these deadly agrichemical poisons and ensure their access to safe drinking water in a sustainable and self-reliant manner.

Aqueous Solutions was created in the hopes of making this possibility a reality. I'll leave it to history to judge whether pursuing such a crazy scheme is foolish fancy or inspired brilliance.

-- Josh Kearns, January 2008

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Please see our website for information about the many ways you can support Aqueous Solutions' research and projects through volunteer work and donations.