Point-of-use Water Purification and Education in Rural Guatemala

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Roadmap

- 2 year volunteer project (2008-2010)
- Health in Action Overview
- Partnering Organizations
- Project Development
- Week Long 2009 Spring Break Trip
- Two Week 2010 Summer Trip
- Lessons Learned
- Goals and Future Projects

- University of Michigan Organization
- Interdisciplinary group of students
- Mission:
  - Develop community health in a sustainable manner
  - Seek to build a network of collaborators
  - Aim to develop our member's cultural awareness, professional skills, and ethics

CasaSito Association

http://www.casasito.org

- Mission

Increase educational opportunities in rural areas

- Vision

Education is the most powerful resource for personal and national development

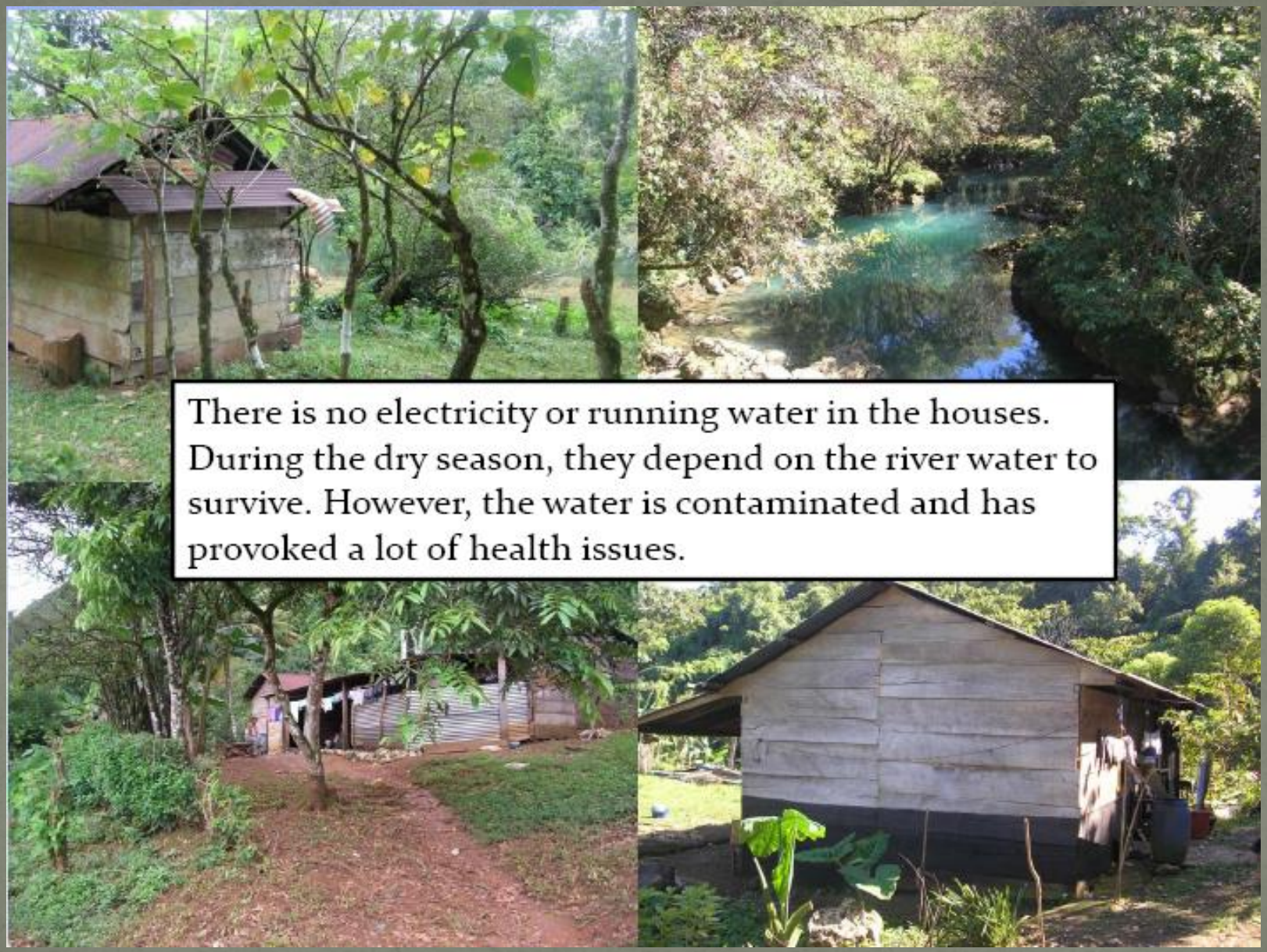
- Location: Antigua

Project Location

- Samox San Lucas,
  Alta Verapaz Region

Samox San Lucas, Alta Verapaz

- Rural village, population of ~600 people
- Native language - Q'eqchi'
- Main income is farming
- Primary school with six grades
- One room secondary classroom



There is no electricity or running water in the houses. During the dry season, they depend on the river water to survive. However, the water is contaminated and has provoked a lot of health issues.

Healthy Schools Program

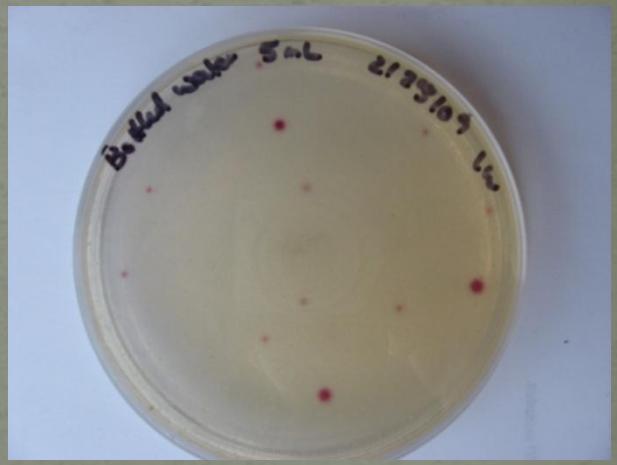
- Executed through Peace Corps
- Goals:
  - Twice each week: teach lessons about health
  - Students brush teeth, wash hands regularly
  - Provide healthy snacks
  - Access to clean drinking water

Trip 1: Project Details

Goal: Establish strong relationship with the community that will foster trust and accountability

Projects:

- Water Treatment and Education
  - Fall 2008
    - Assessed drinking water treatment alternatives
    - Determined appropriate treatment technology
    - Pilot tested technology
  - Week Long Spring Break 2009
    - Implementation
    - Hygiene Education
    - Water Quality Testing



- Community Survey
  - Fall 2008
    - Develop and submitted to CasaSito for review
  - Spring Break 2009
    - Implementation

Assessment of Treatment Alternatives

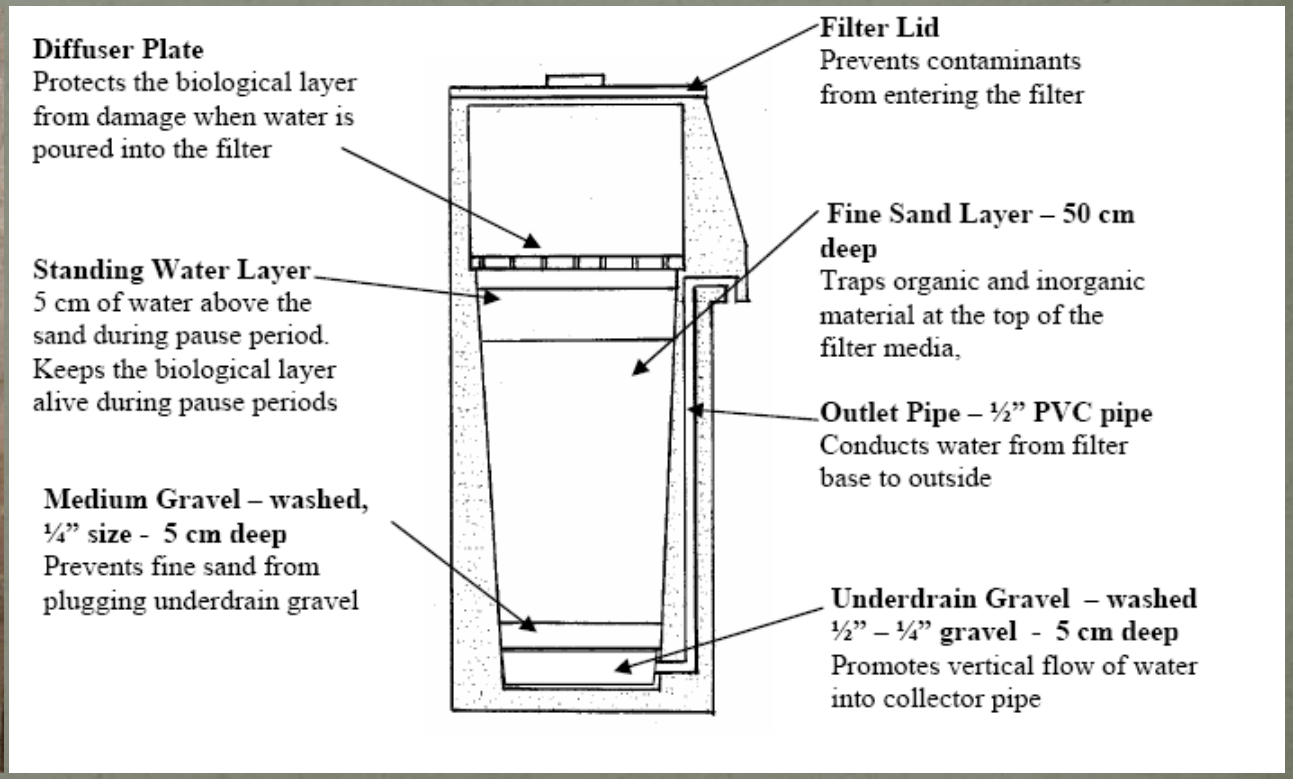
- Point of Use
  - SODIS
  - Biosand Filtration
  - Life Straw
  - Ceramic Filtration
  - Boiling
  - Chlorination

Assessment of Treatment Alternatives

- SODIS

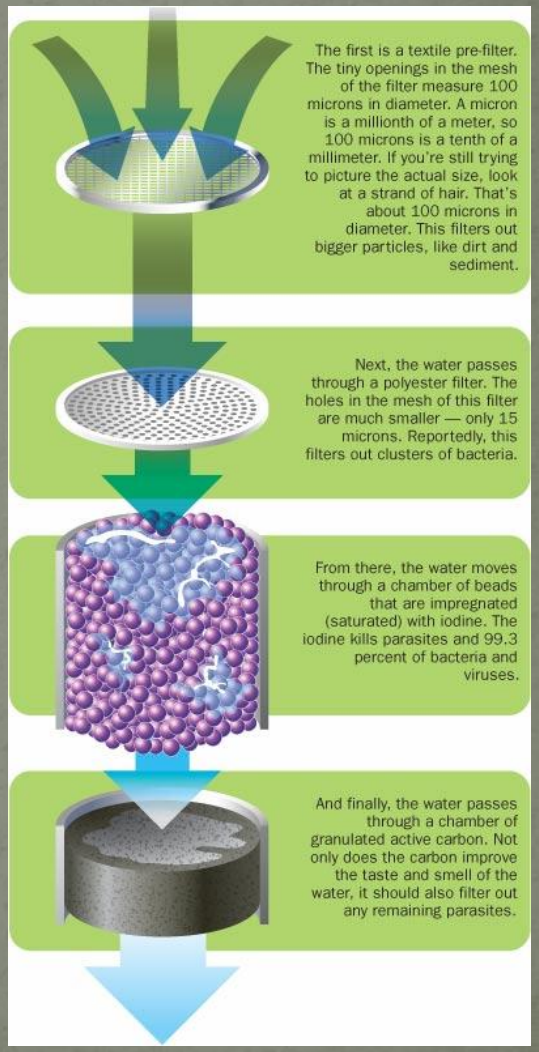
Water Quality Research

- Biosand Filter



Water Quality Research

- Life Straw



Water Quality Research

- Ceramic Filters

Treatment Alternatives Decision Matrix

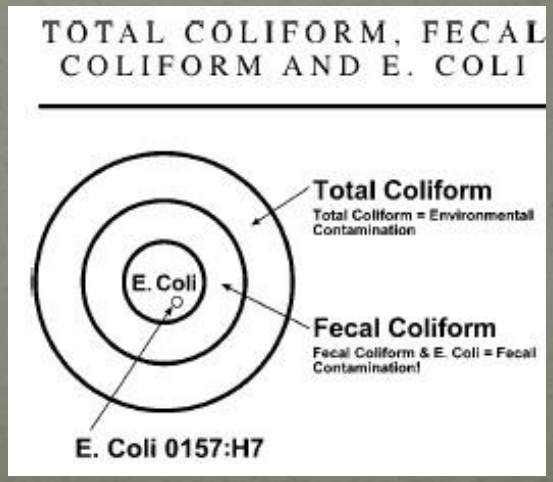
Criteria	SODIS	Biosand Filtration	LifeStraw	Boiling	Chlorine	Ceramic Filtration
Effectiveness (4)	1	4	3	6	5	2
Life Cycle Cost (3)	6	5	1	4	2	3
Availability of Materials (2)	6	5	1	4	3	2
Ease of Use (1)	2	3	6	5	1	4
Totals	36	**44**	23	**49**	33	25

Biosand Filter – Pilot Testing

- Constructed the filter from local materials
  - Plastic instead of concrete
- Maintenance
  - Added 20 L of river water twice a day
- Established removal efficiencies
  - 95% of bacteria

Water Quality Testing of Pilot Filter

- Total coliforms and *E. coli*
- EPA Requirements
  - Drinking Water must < 0 colonies (CFU)/100 mL
  - • Recreational bathing or swimming < 2000 CFU / 100 mL
  - • Boating or secondary contact < 5000 colonies / 100 mL
  - MCLG = 0
  - MCL = 2 positive total coliform samples in 1 month
- Biosand filter finished water quality
  - *E.coli* removed after 5 days
  - 0-2 total coliforms were present following 9 days of operation



2009 Spring Break Trip

- Community Assessment
- Implementation of Biosand Filters
- Water Quality Testing
- Hygiene Education

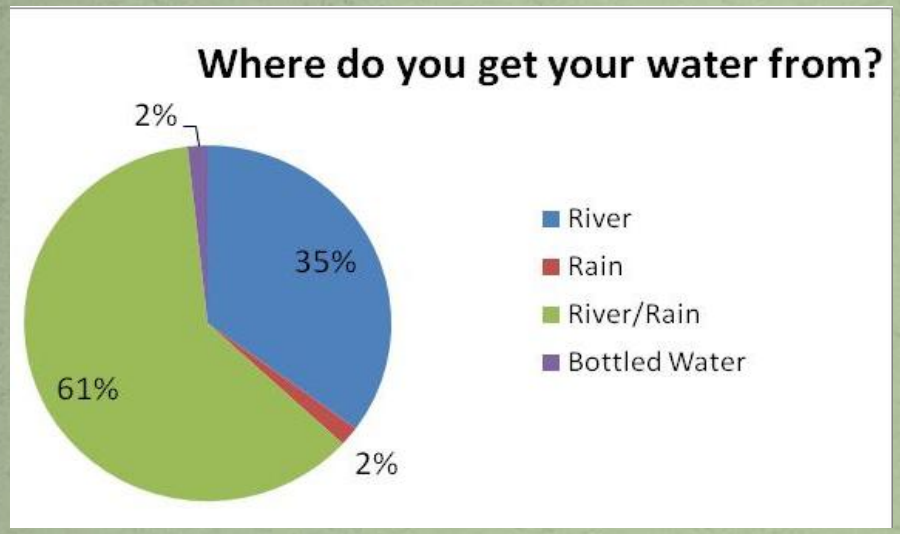
Our Arrival to Guatemala

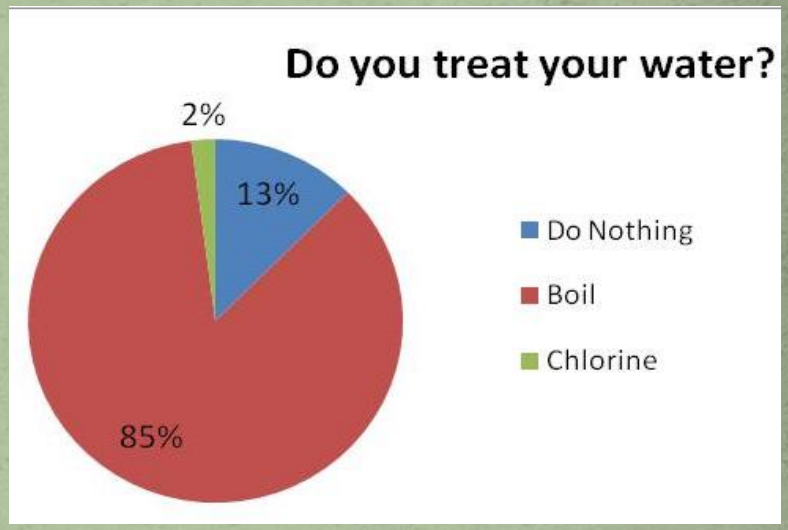
- Two members of CasaSito traveled with HIA
- Gathered biosand filter materials locally
- Purchased materials locally – Coban
  - Each biofilter ~210Q each or $30

Getting to Know the Community

- Organized town meeting at secondary school
- Met with Cocode (elected School Board) and Comite (volunteer governing committee for entire community)
- Project Discussion
  - Community Survey
  - Test Water Quality
  - Filter Construction
  - Hygiene Education

Survey Results





Washing of Sand & Sieving of Gravel

Filter Assembly

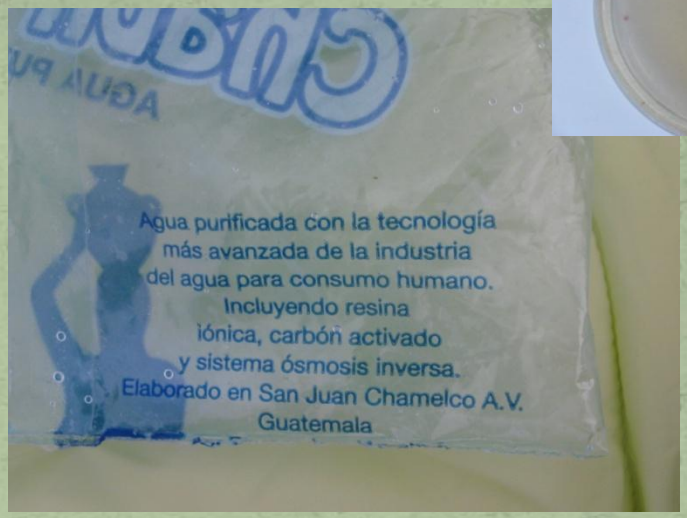
Filter Assembly Cont.

Finished Product

Prepare Filter Education Materials

- List of materials required and location of where they could be bought locally
- Basic procedure for biosand filter construction
- Easy-to-follow diagrams with simple Spanish instructions

Testing Water Quality



	CFU/100 mL			
	Coliforms		E. coli	
Sample	**average**	**stdev**	**average**	**stdev**
River	2937	254	338	34
Church Rainwater Catchment System	483	24	0	0
School Rainwater Catchment System	127	12	1	1
Boiled Water	0	0	0	0
Bottled Water	10	2	0	0

Community Meetings

- Discuss survey and water testing
  - Community surprised by bacteria present in river water
- Education and Importance of boiling water
  - Covering water collected or treated
- Recommended filters for hand washing and tooth brushing or when not boiling water
  - One in each school (secondary & primary)
  - Community members volunteered for maintenance

Hygiene Education

- Importance of hand washing and tooth brushing
- Taught secondary students about water purification
- Built second filter

Evaluation

- HIA was ecstatic with the community involvement and interest with the water project
- Effective survey
- Felt we developed good relationship with the community
- Look for continual community input on future projects

Trip 2 Preparation

- On-going communication with CasaSito and Samox
  - New secondary school
  - Solar panel
- Follow-up on biosand filters
  - Primary school
    - Gasoline contamination (5 months)
  - Secondary school
    - CasaSito – July
    - HiA member – November
    - 100% removal of total coliforms and *E. coli*
    - New secondary school teacher in February
- Determine wastewater treatment system for new secondary school

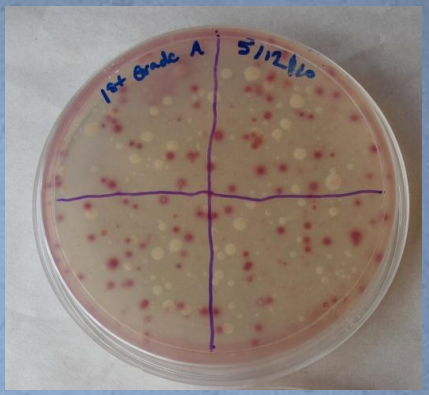
Goals & Projects for 2010 Trip

- Goals:
  - Continue to build relationships with community members
  - Improve water quality and public health
- Activities:
  - Assess biosand filter operation and implementation
  - Assist in new secondary school wastewater treatment system
  - Continue hygiene education to assist Healthy Schools Program
  - Nutrition education

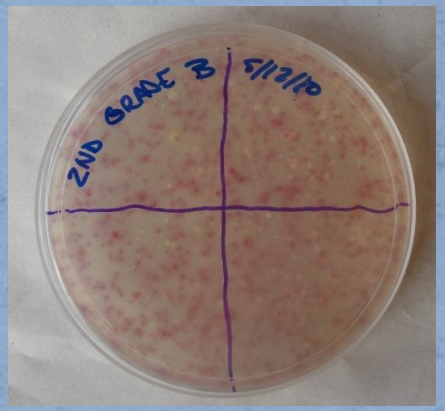
Biosand Filter Demonstration

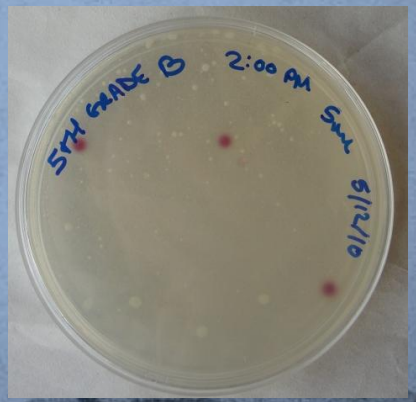
- Educated new secondary teacher on biosand filter use
- Taught him how to use the test kits
- Emphasized importance of health education

Water Quality Assessment



	CFU/100 mL	
Water Source	**Total Coliforms**	***E. coli***
River Water	2500	140
Biosand Filter	0	0
Bottled Water	20	0
Rotary Ceramic Filters		
Preschool	180	0
First Grade	2500	0
Second Grade	8000	0
Third Grade	1800	10
Fourth Grade	60	0
5th Grade	40	0

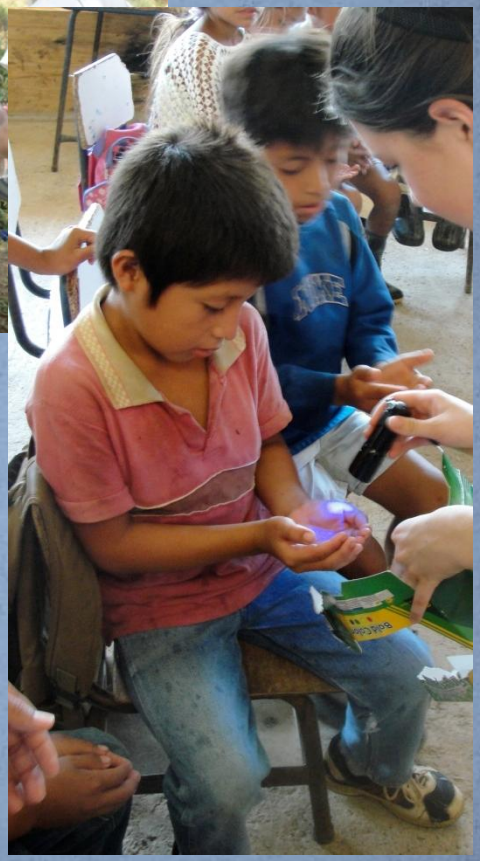




Informing Community on Water Quality

- Results showed importance of follow-up and continued education
- Rotary Ceramic Filters
  - 2 candelas (candles) – 400Q
  - Do not change filters themselves
  - Candles need replacement every 2-3 years
- Difference in maintenance practices
- Teachers like these filters due to cleanliness, and ease of use
- Asked if we would show them how to construct the biosand filters again

Hygiene Education – Hand Washing

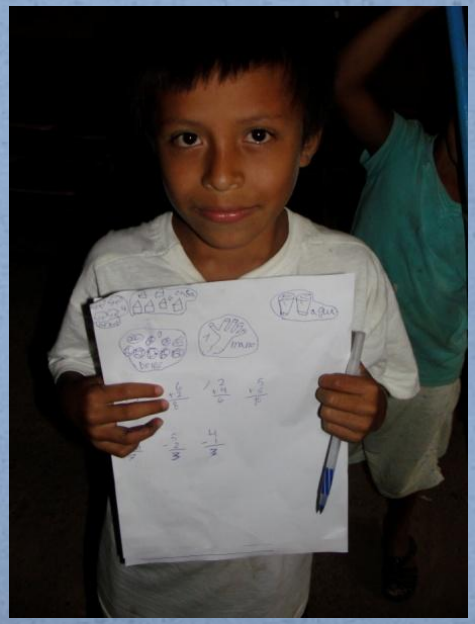


Hygiene Education – Hand Washing

Hygiene Education – Tooth Brushing

Additional Education

- Q'eqchi'/English lessons
- Math



Composting Toilet

- Urine/feces separation
- Land applied after six months

Summary of Trips 1 and 2

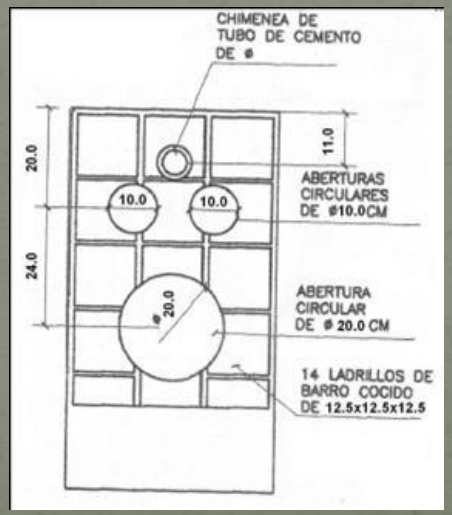
- Secondary school biosand filter operational and treating water effectively
- Great progress in hygiene education
- Composting toilet
- Societal impacts on community
- Community growth and pride in accomplishments

Lessons Learned

- Importance of follow-up
- Need for increased community interaction
- Continued awareness of societal and cultural values
- Uplifting and challenging experiences
- Self reflection - on way of life and the things people often take for granted
- Strong sense of community – look out for each other

Future Projects

- Filtration systems
- Continued water testing
- Continued education on composting toilet
- Clean stoves



Community Dinners

Thank You