

# Hungry Dogs Don't Play – Water quality, culture, and practices in Haiti

*University of Toledo*

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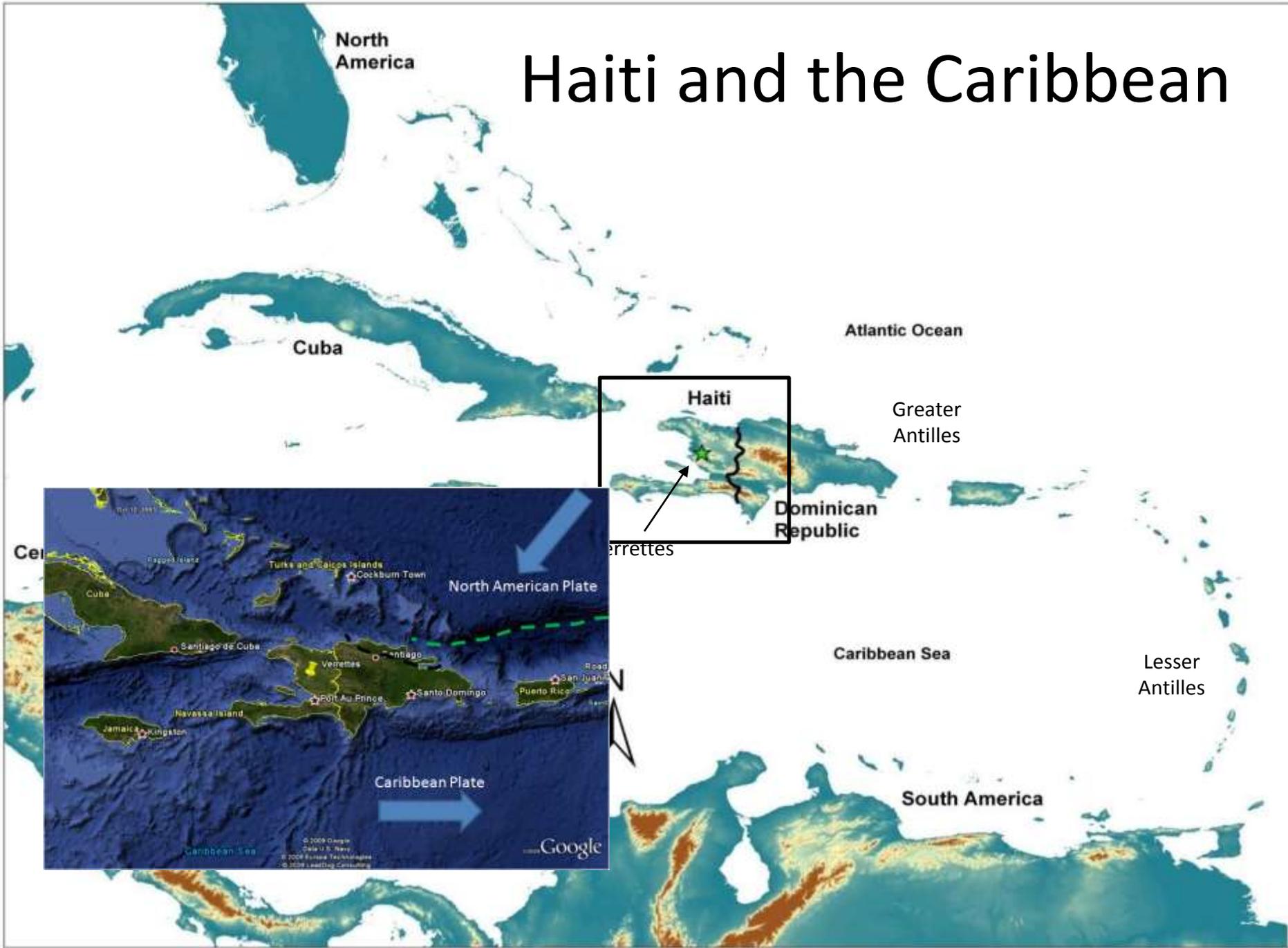


**GRAND VALLEY  
STATE UNIVERSITY**  
GEOLOGY DEPARTMENT

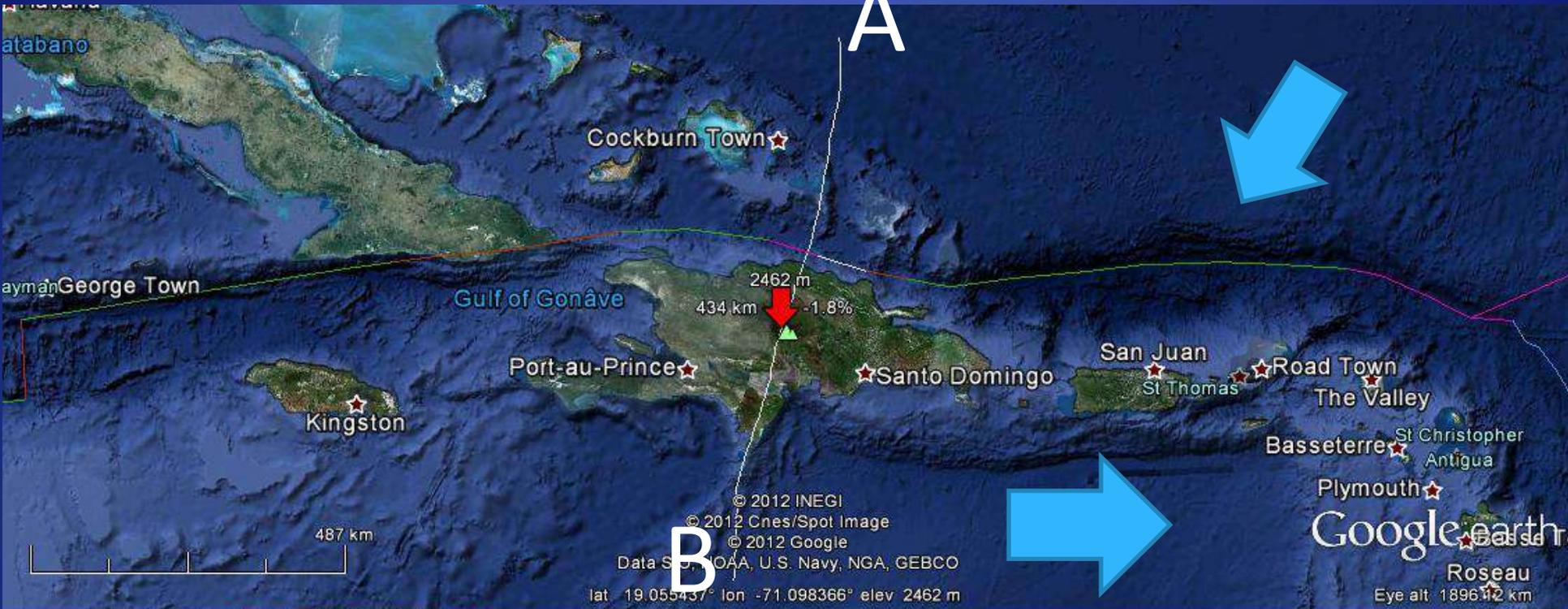
# Talk Road Map

- History of Haiti and Geography
- Socioeconomic and political backdrop for Haiti water issues.
- Geology and Hydrology of Haiti
- My research in Haiti 2007-2011.
- 2012 Interdisciplinary efforts to understand water culture in Haiti.

# Haiti and the Caribbean



# Mountains beyond mountains



Graph: Min. Avg. Max Elevation: -5473, -1923, 2462 m  
Range Totals: Distance: 806 km Elev Gain/Loss: 19061 m, -17593 m Max Slope: 32.6%, -26.3% Avg Slope: 4.4%, -3.6%



A

B

# Socioeconomic and political backdrop

- Largely dysfunctional government and education systems
- Complex (usually negative) relationship with foreign governments
- Ecologically and environmentally “broken”
- Virtually all surface water, and most groundwater, is contaminated with pathogens
- Prone to hurricanes; earthquakes; tsunamis; and other natural disasters

# Dysfunctional and Kleptocratic leaders

## 200 Years of HISTORY





Haiti

Dominican Republic



Ecologically and environmentally "broken"

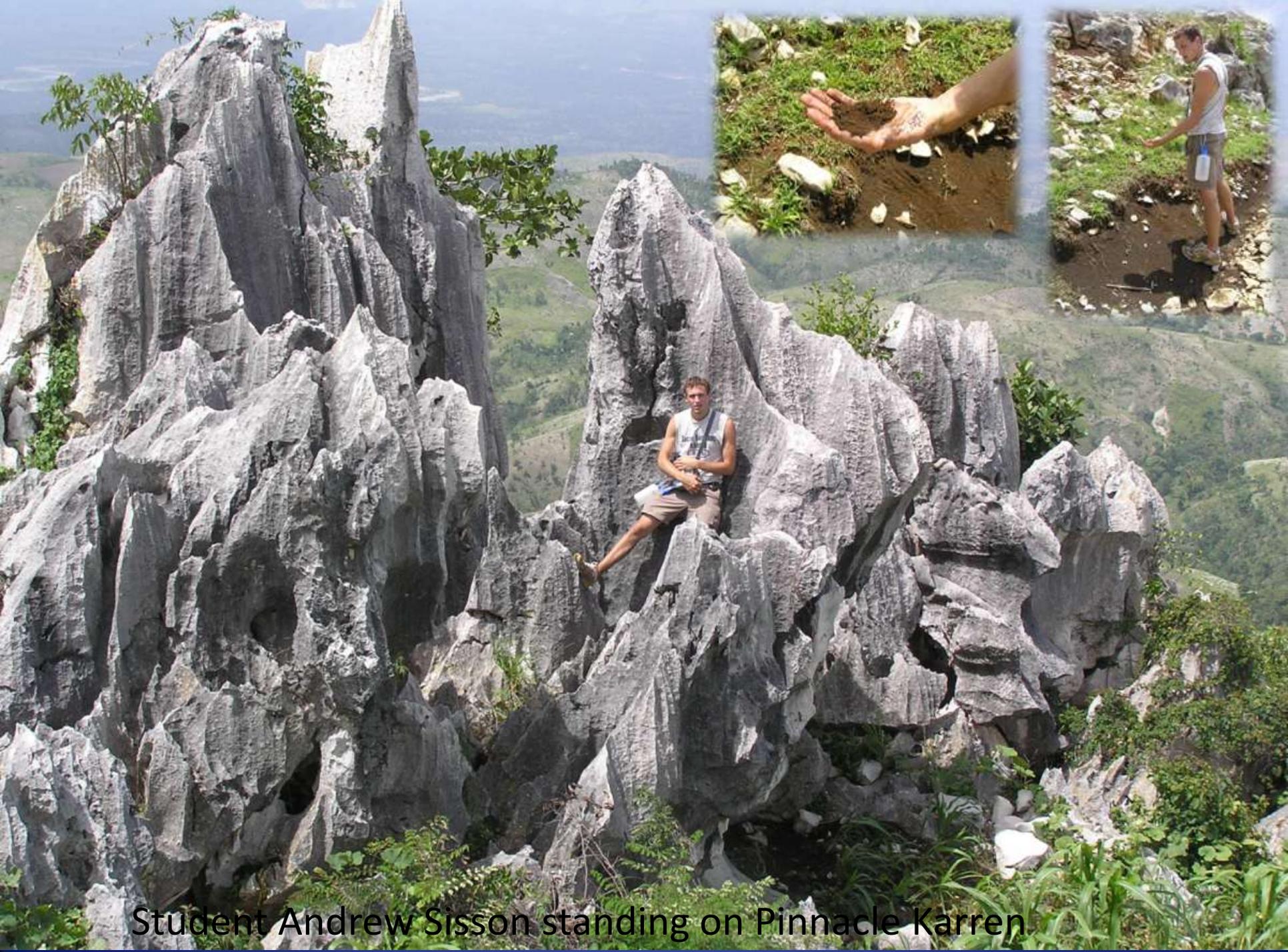
# “Mound” for producing Charcoal





Typical Haitian “stove”

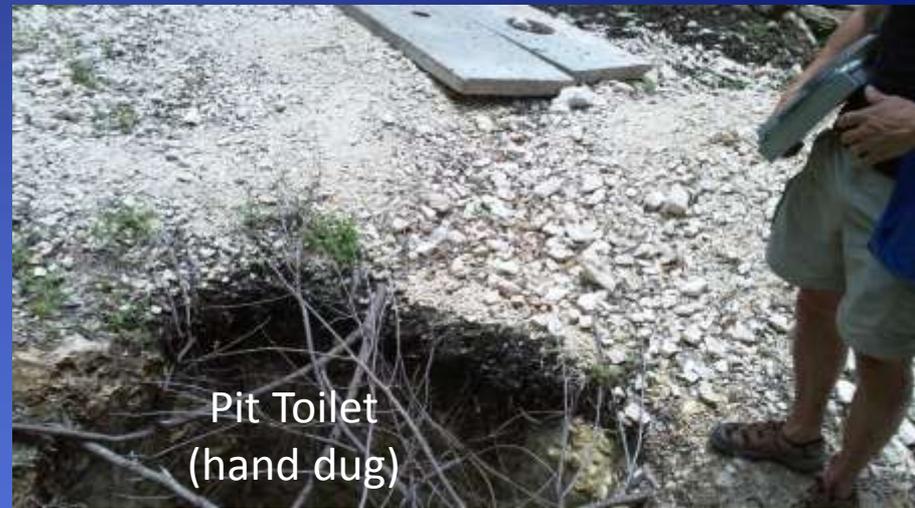
A pile of “money”



Student Andrew Sisson standing on Pinnacle Karren

# Miococene and younger limestone

Very fractured and gently folded



Pit Toilet  
(hand dug)



"The factors that determine an outbreak of cholera, epidemic or pandemic are complex and ecological,"  
Geological

Dr. Stephen Jay, professor of medicine and public health at the Indiana University School of Medicine in reference to the recent Haitian Cholera epidemic



*Washington Times – November 10, 2010*



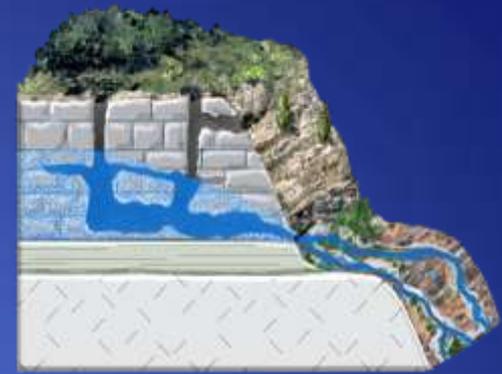
*LA Times – November10, 2010*

Groundwater emerging from a karst aquifer

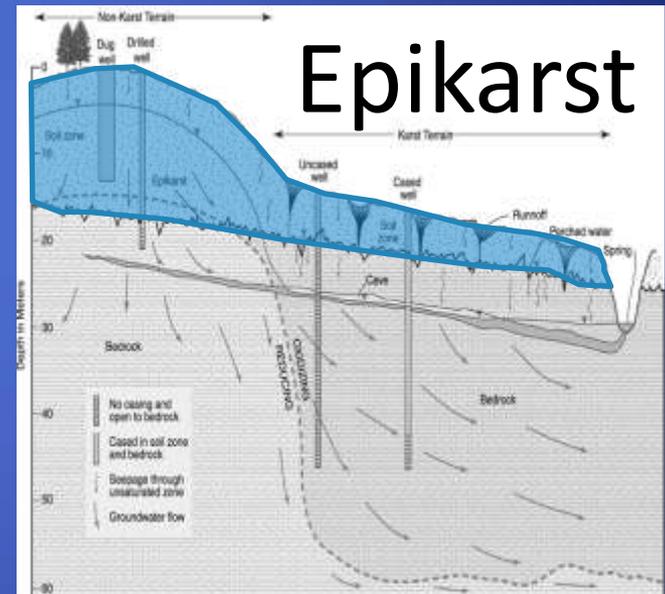


# Limestone, Karst aquifers, and bacteria

- Pathogens can travel long distances (>14km) very quickly (250 m/h) in Karst (Batsch et al. (1970)).
- Epikarst (soil) in most karst settings serves as an important primary filter for pathogens
- Epikarst is missing in many locations in Haiti due to deforestation



Source: Reynolds et al., 2008



Modified from Kelly et al., 2009

# Water Resources of Haiti

- In cities, Haitians use bags and bottles of water.
- Rural Haitians often walk 1-5 miles to get untreated water.
- Springs are contaminated resulting in dysentery and child mortality.
- The World Health Organization (WHO) reported in 2006 that the mortality rate for children under age 5 in Haiti is 15 times higher than in the United States.



Haitian child drinking a “bag” of water



Spring emerging along bedding in a shale unit

# From "Purity Pens" to Interdisciplinary



2007 Trip with NGO



2012 Interdisciplinary Research

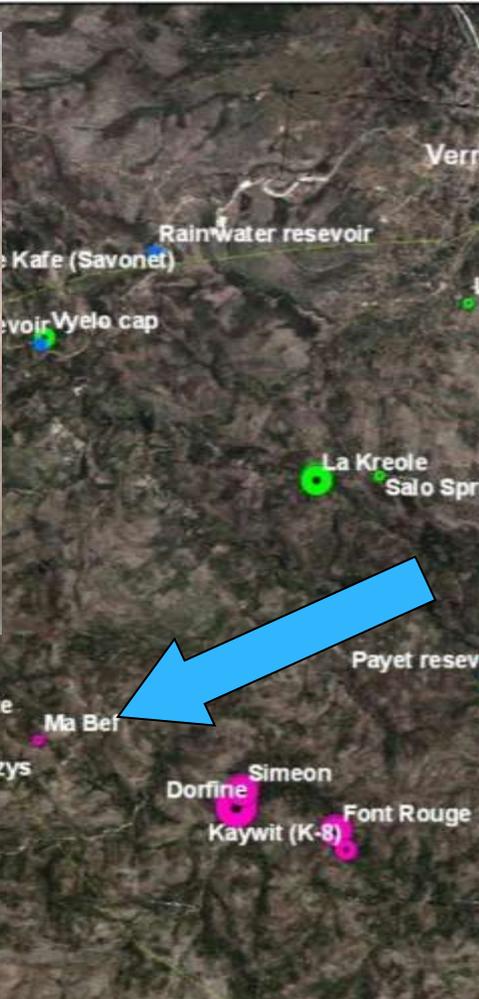


2008 Summer Scholar Research

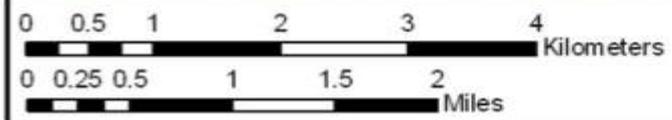


2011 BSF Research

2011 Sabbatical Research



Coliform Coliscan	Coliform HAS	E-coli Coliscan	E-coli HAS
~100	75	>1000	7



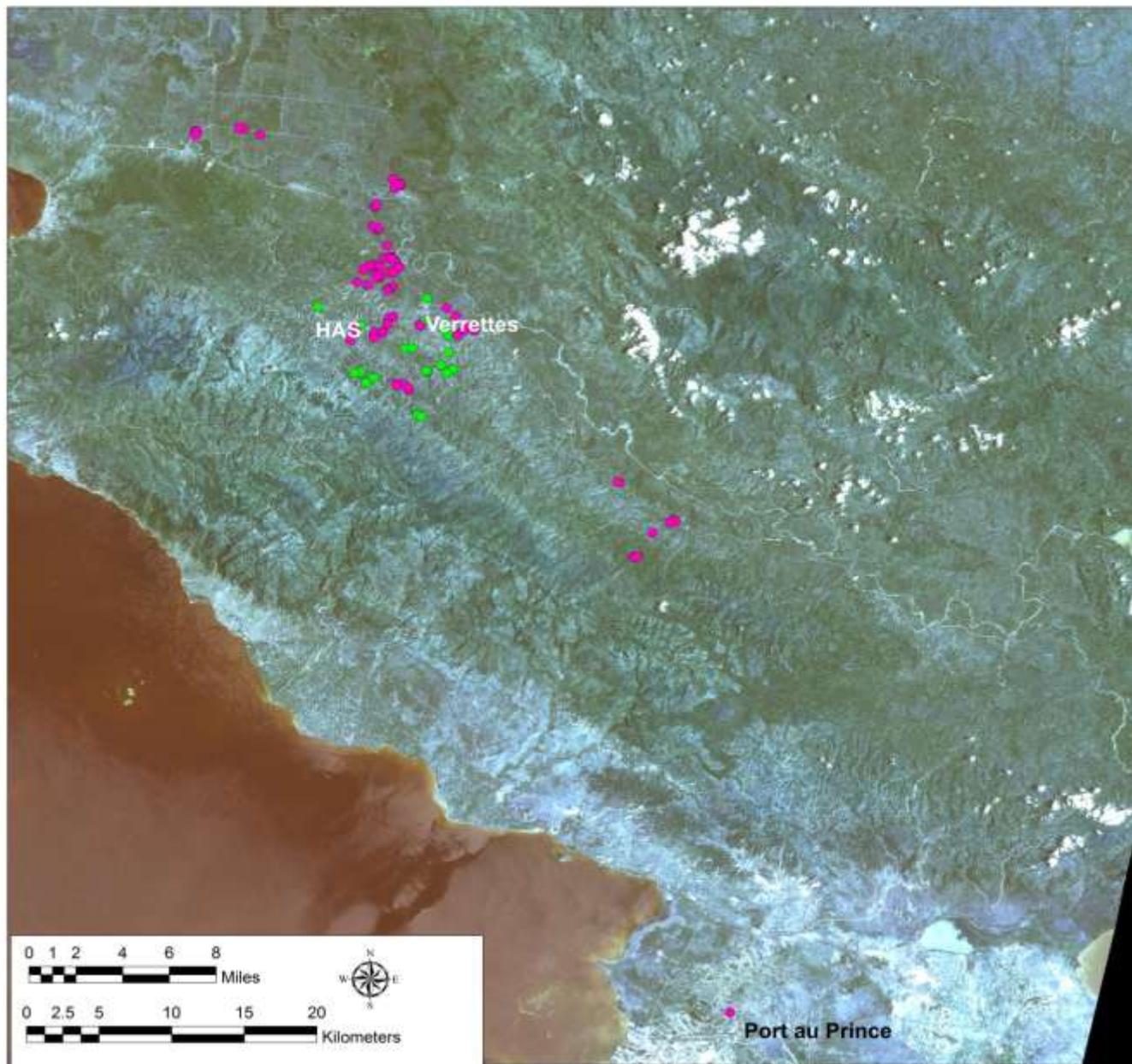
**Verrettes Haiti Spring Project**

Map Prepared by: Andrew Sisson

8/01/08



# Location Map for 2008 & 2011 Samples



# 2011 Sampling

- 180 water samples from water sources and filters
  - Colilert Method using IDEXX quanti-trays
  - 18-hour incubation time at 35C
  - Samples likely to be high were diluted (rivers and streams)
  - Surveys and interviews of biosand filter users





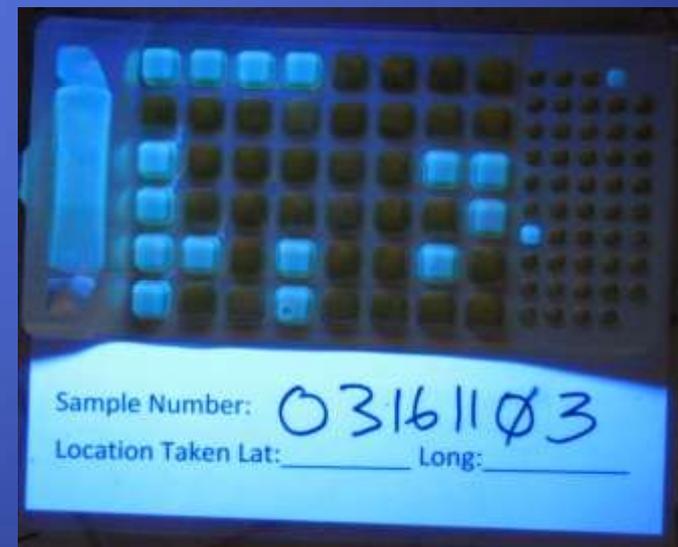
# 2010 BSF Research



# Uncapped Spring



Coliform > 2419.6 cfu/100 ml



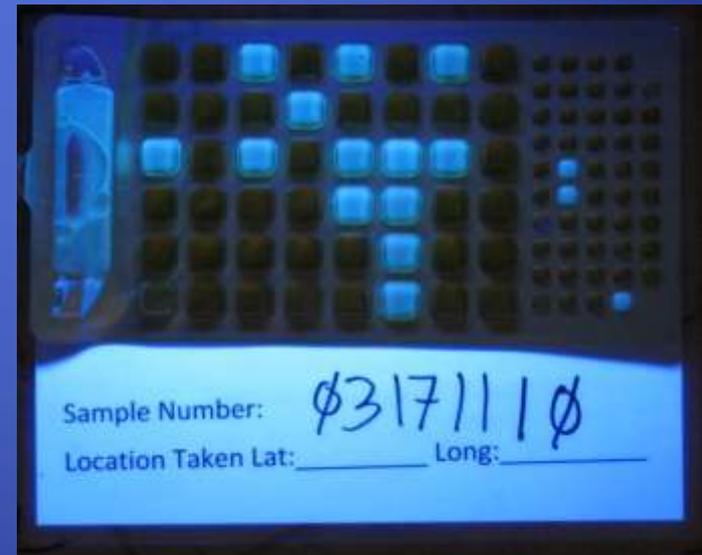
E. Coli = 21.3 cfu/100 ml

Source Type	N =	E Coli (avg)	Coliform (avg)
Spring (capped)	8	43.6	371.5
Spring (uncapped)	13	58.2	1773.3

# Capped Spring



Coliform > 1986.3 cfu/100 ml



E. Coli = 19.7 cfu/100 ml

Source Type	N =	E Coli (avg)	Coliform (avg)
Spring (capped)	8	43.6	371.5
Spring (uncapped)	13	58.2	1773.3

# Hand Dug Well



Coliform > 2419.6 cfu/100 ml



E. Coli = 238.2 cfu/100 ml

Source Type	N =	E Coli (avg)	Coliform (avg)
Hand -Dug Wells	18	393.4	2653.8
Pump Wells	27	0.4	105.9

# Published results

- Wampler and Sisson, 2010 Spring flow, bacterial contamination, and water resources in rural Haiti. Environ. Earth Sci.
- Wampler, Sisson, and Rediske. 2012 An assessment of long term Biosand Filter use and sustainability in Haiti. Journal of Water and Sanitation for Development (in press)
- Several other paper in preparation and close to submittal

# Summary of 2011 Results

Source Type	N =	Total E Coli (avg) cfu/100 ml	Total Coliform (avg) cfu/100 ml
BSF Source Water (Fountain)	2	0.0	74.1
BSF Stored Filtered Water	21	1.0	534.1
BSF Water Filtered Today	31	19.0	368.5
Canal (river water)	1	517.2	2419.6
Chlorine Treatment	1	0.0	0.0
Commercial Well	2	14.5	643.2
Deep Well	7	0.1	6.7
Fountain	30	6.5	454.6
Hand Dug Well	18	383.4	2653.8
Hand Pump Well	27	0.4	105.9
River	8	703.3	5365.5
Sawyer Filter	6	0.0	403.3
Sediment Basin	3	0.3	23.9
Spring (capped)	8	43.6	371.5
Spring (uncapped)	13	58.2	1773.3
Treated Household Water	2	0.0	0.0
Total (avg of all samples)	180	84.8	887.5

A geologist, a microbiologist/chemist, and an anthropologist walked into a bar.....



# 2012 Interdisciplinary Assessment of Water Resources and Water Quality Interventions in Haiti

- Research questions:
  1. How important are sociocultural factors in developing effective programs for sustainable safe water resources in Haiti?
  2. Do data regarding perceptions of water safety correlate with water quality?
  3. Can the combination of water quality and ethnographic data provide actionable strategies for addressing water resource problems in Haiti?

# 2012 Interdisciplinary Research

- Fieldwork accomplished between May 1-May 12 (~ 10 days)
- Collected > 100 samples from water sources and treated water
- Visited 60 homes to conduct interviews
- Conducted 6 focus group interviews

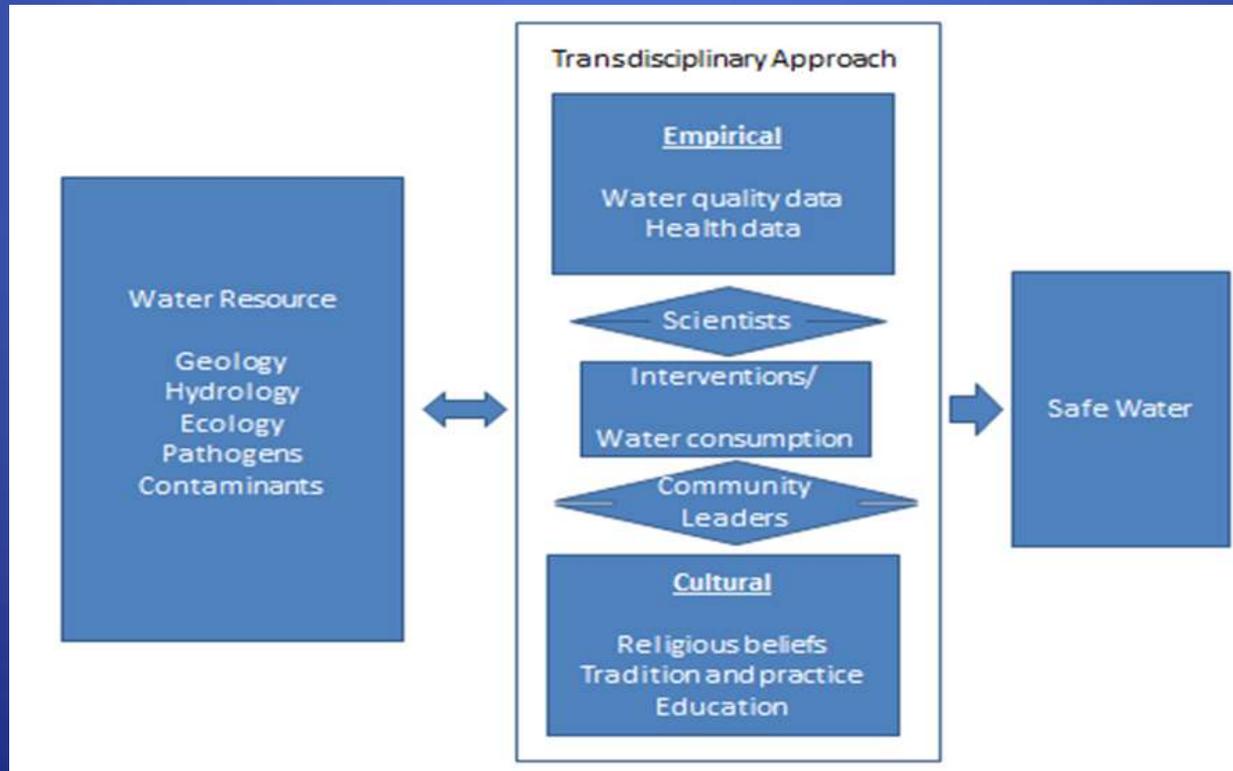


# The Problem

- Sustainable clean water interventions must be culturally appropriate and build local capacity for education and maintenance
- The top down approach analyzing data and publishing a report or installing water filters and leaving is not sustainable and can be more harmful
- Most water quality studies and interventions lack the ethnographic assessment of cultural practices and community resources.

# The Solution

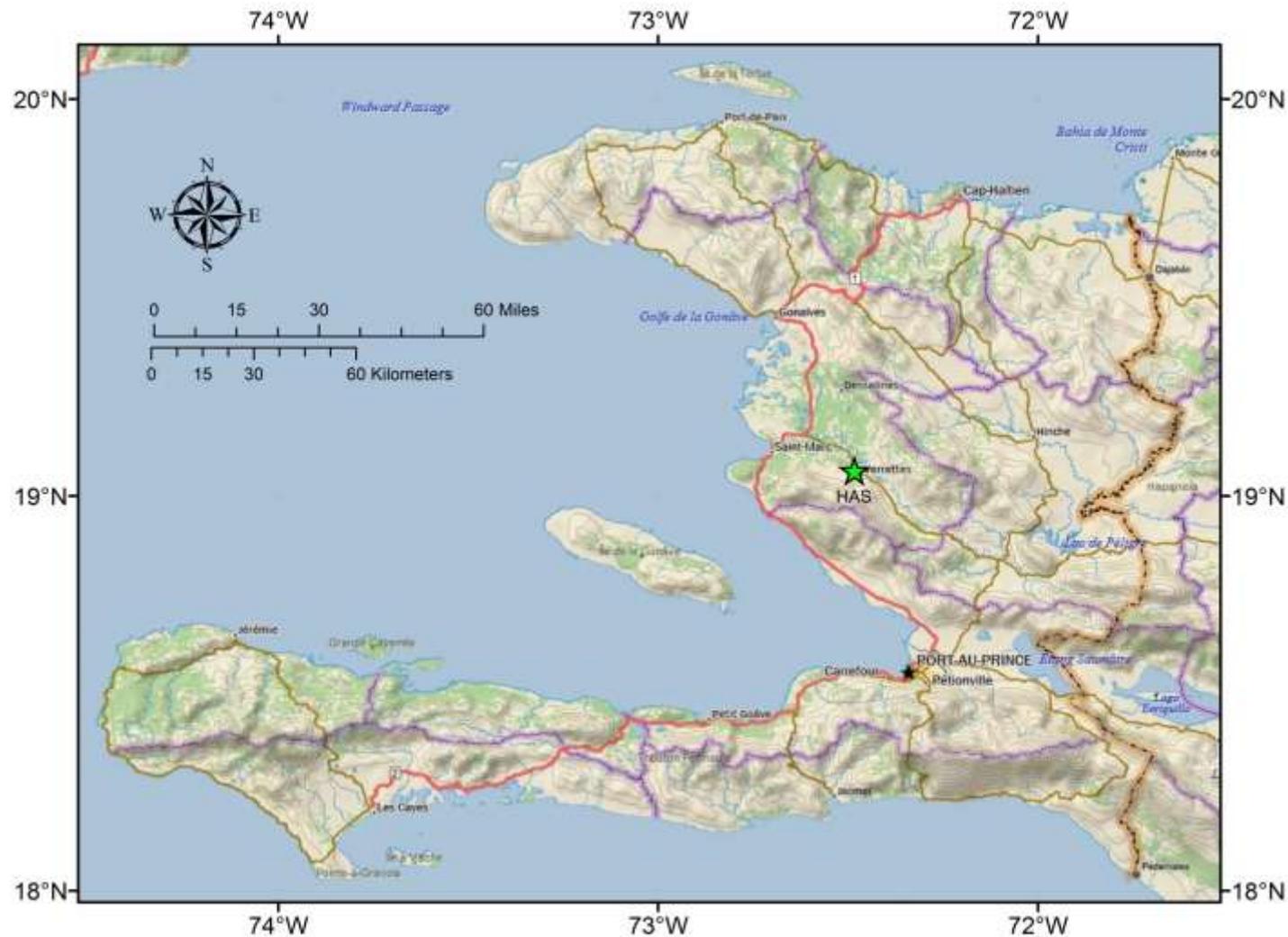
- Design clean water interventions from the bottom up by understanding cultural practices, available water resources, and local capacity.



# Project Components

- Household ethnographic surveys – family history, economics, sanitation practices, cultural practices related to water
- Focus Groups – community perspectives about water and needs
- All interviews videotaped
- Water analyses – *E. coli*, conductance, chlorine residual, turbidity

# Study Area Deschappelles



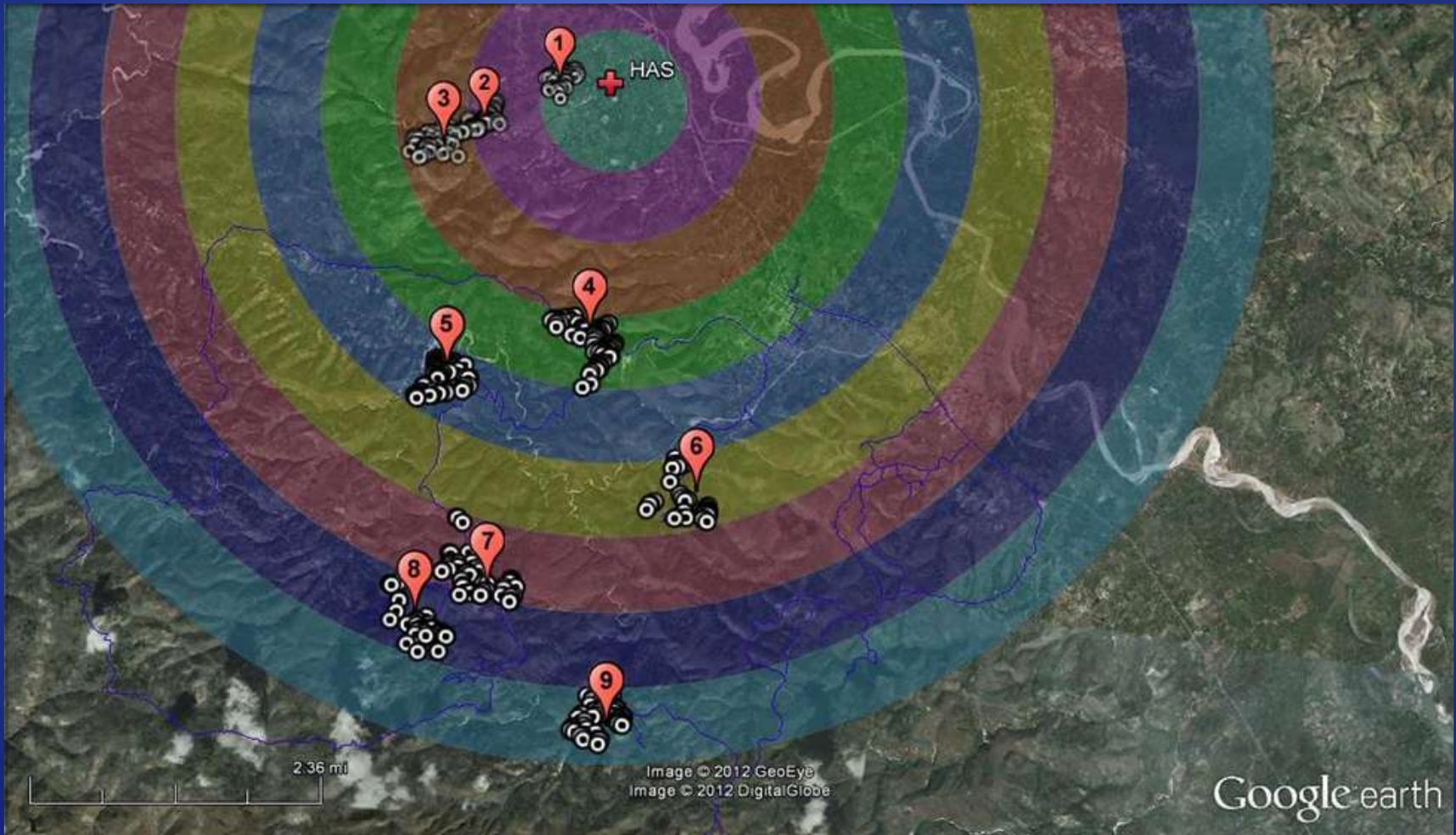
# Artibonite Valley



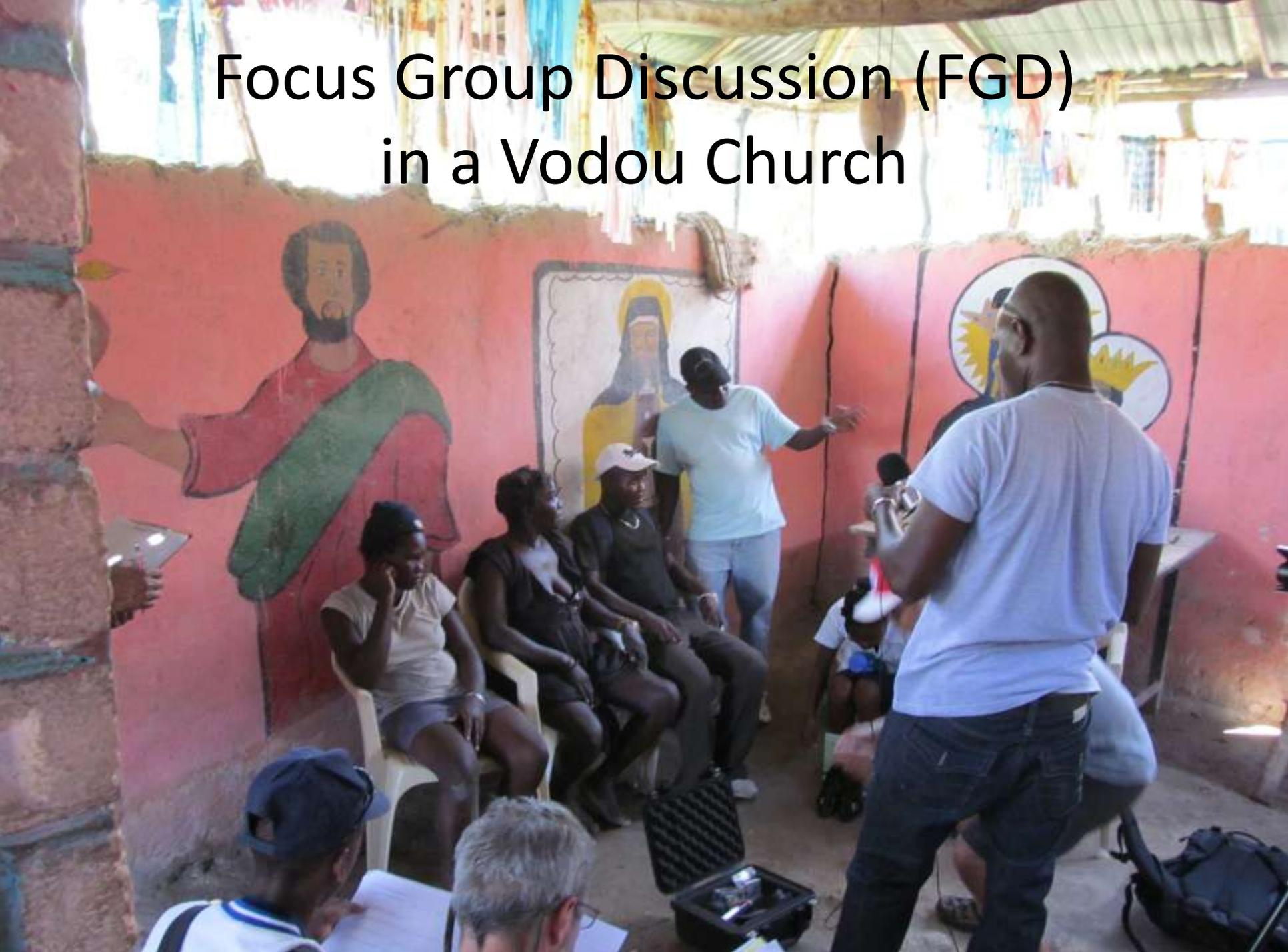
# Deschapelles Area

- Artibonite Valley was the location of the Cholera outbreak
- Regional hospital (HAS) for laboratory and logistical support
- Representative of rural Haiti (65% of population)
- Previous work in the area

# Evaluating the impact of HAS



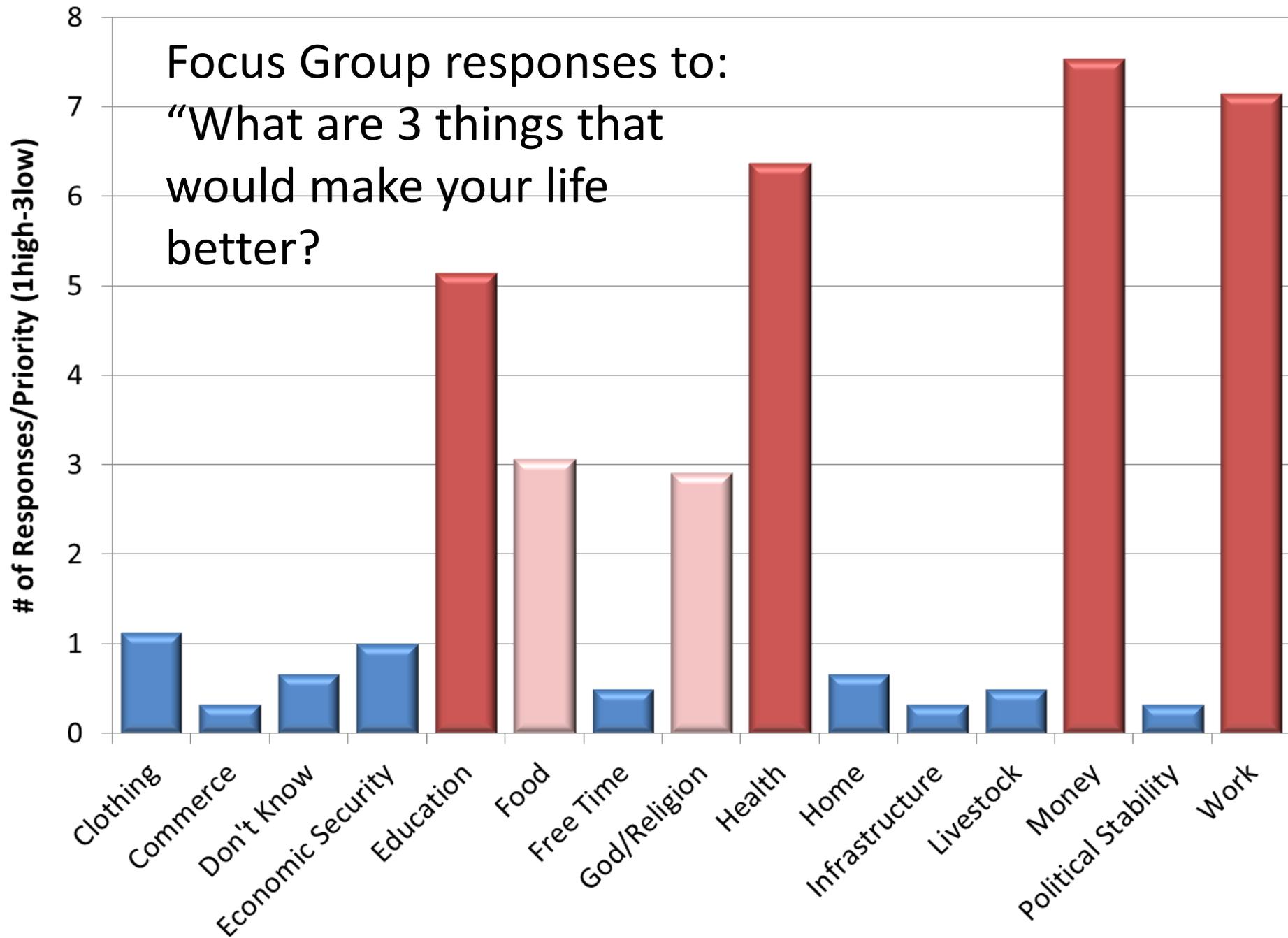
# Focus Group Discussion (FGD) in a Vodou Church



# Interesting Quotes from the Focus Groups

- “people who have income (means) can have safe water, poor people must drink whatever is available”
- “sometimes people are embarrassed about being sick”
- “People would drink clean water if they had the means”
- “Rich people have choices”

Focus Group responses to:  
“What are 3 things that  
would make your life  
better?”



# Individual Interviews





Typical Interview Setup at a home

**Knowledge shapes behavior: Mothers with young children were chlorinating their water**



# Interesting Quotes from Individuals

- “Hungry dogs don’t play”
- “You can tell if someone is rich if they get more than one meal a day”
- “We would use water treatment tablets if we had them”
- “People should stop putting garbage in streams and rivers”

# General Findings

- Most Haitians know that it is microbes that make people sick, but many still retain a belief that some illness has a spiritual component
- Many people use herbal remedies in addition to doctors and “traditional medicine”
- Many people said they were treating their water with chlorine – most were not.
- Most people do not use latrines.
- Many people lack the “means” to properly treat their water to make it safe.

# Results

- All families understood that microbes cause disease and the importance of treating their water
- Only 12% were still treating the water and 90% of this group were women with young children
- 6 BSF units and only 2 were functioning (98% removal)
- 3 Sawyer Filters – all nonfunctional

# Future Plans

- The research team hopes to continue and expand efforts over the next 3 years.
  - Installation and tracking of communities where new water sources and treatments are provided
  - Training of “water workers” to live in communities and provide help and expertise
  - Collaboration with HAS in Deschanelles
  - More accurate data on contamination pathways

# Acknowledgements

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# Questions ?



[www.gvsu.edu/haitiwater](http://www.gvsu.edu/haitiwater)

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