

Sunset over Soufriere Bay and the Marine Management Area

Final Report

Project Title: A coordinated plan for watershed awareness and action in St. Lucia
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Introduction:

The overall goal of this project was to establish a coordinated integrated watershed management program including teacher training, student action and public awareness. The end goal is to reduce erosion and pollution in the watersheds to enhance the overall health of the coral reef ecosystems in St. Lucia.



The nearshore, shallow reef systems of St Lucia are under such stress, not just from warmer ocean temperatures, but even more so from where they are located in proximity to human activities. In some of the protected areas and other shallow reef zones, the green filamentous algae have taken over. In other areas, the sediment has smothered the coral. SCUBA divers say they have to get out to deeper reefs to see any diversity of fish. Yet, when you get away from the villages, the fish scream around you so abundantly it's dazzling. The difference in the reefs which are secluded versus those adjacent to villages is startling. St. Lucia is a beautiful tropical island well known for weddings and honeymoons as well as other tourist visits. The

capital city of Castries has modern conveniences and business offices. However, even in Castries Harbor, raw sewage bubbles up into the bay. That site is surrounded by long strands of white sewage bacteria and green filamentous algae. The situation is even less subtle in the outlying areas of the country where some people routinely utilize chamber pots or open defecation for getting rid of waste. In most villages, the street drains are open and are typically full of whatever wastewater is coming from the homes. Most of the coastal villages are built just above the water table so even if they have septic tanks, they do not function



appropriately. The UN Millenium Development Goal to improve access to appropriate toilet facilities and sewage treatment is not being met in this country. If we can protect the reefs from these land based sources of pollution, they might have a chance of survival!

Project Summary

The following watershed map indicates where the student and community groups are working or have worked over the past two years. While the scientist in all of us wants immediate quantifiable results, for the student projects that has not happened. What has happened has been much very beneficial and maybe even more important in the long term. These students are raising awareness in their communities to such an extent that the adults in the communities are asking for help or are joining forces with the students in the realization that together, they can change what is going on in their waterways. The student work has also leveraged more funding and more groups interested in reducing land based sources of water pollution. In one instance, the volunteer group fell apart only to be reinvigorated by a few water samples taken by a few students...which has led to intense focus on their watershed. Their star is both purple and

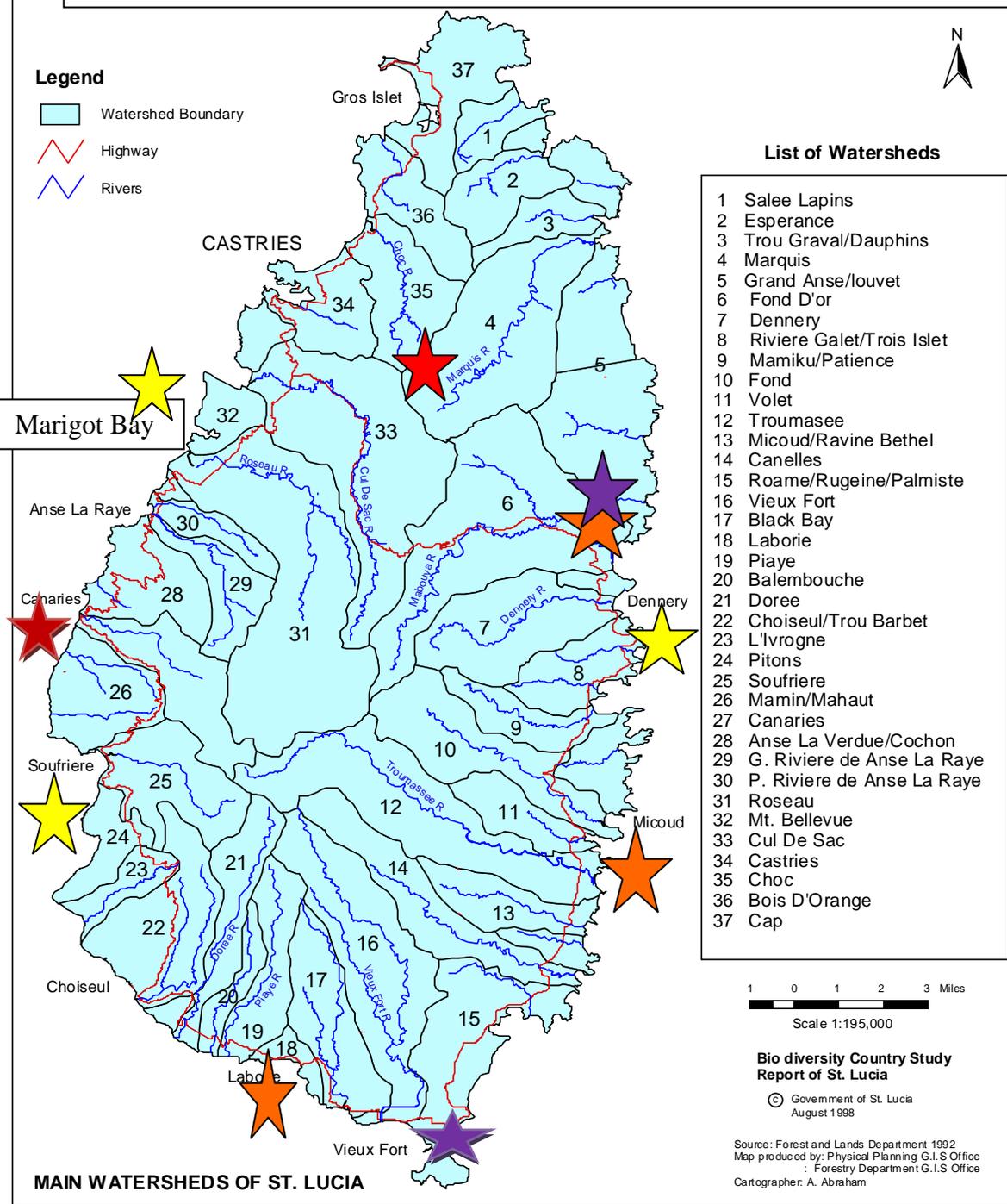


orange, for returning! The sampling which shook up the adults the most was the bacteria sampling done with a new technique called Coliscan Easygel. It is simple to use, requires no incubation, and is approved by the EPA for reliable results. The second map shows the levels of bacteria pollution found in the areas around St Lucia. These results led us to village councils and community development committees in several villages since they were mostly aware that the problems existed, but when the kids were doing the sampling, then they were spurred into action. Two villages now are actively pursuing solutions to their sewage drainage problems and Soufriere is continuing to work on its pig waste issues, thanks to a UN GEF grant. One watershed receives minimally treated drinking water through the water system, so it is imperative for their personal health to solve the human and pig waste problems. Can you quantify these types of results? We have doubled the number of areas where we have kids actively working on land

based sources of pollution. We trained 45 teachers and community leaders and add more each quarter. Our camps have energized around 90 young people to do something about polluted waters. We now have not only government and quasi governmental agencies working with the students, but a private health organization and physicians, tourist resorts, and Carnival Cruise Lines. The Sustainable Development Unit also hired a consultant to determine what needs to be done to improve environmental education in

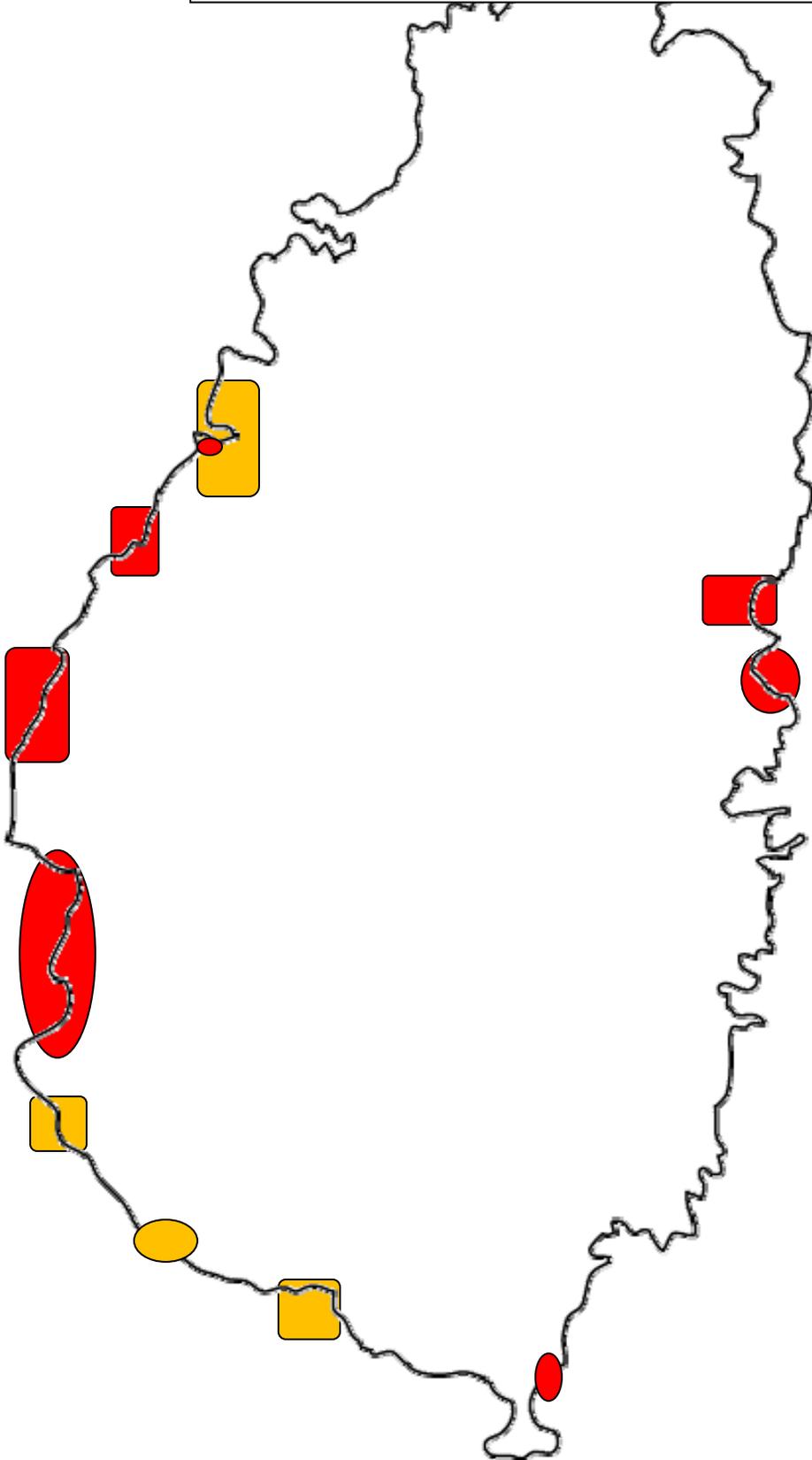
the country and are also developing enforceable water quality standards for recreational waters since they have now signed the Cartagena Protocol. The students are making their voices heard.

Yellow Stars indicate communities that started watershed teams the first year and continue to work together. **Red stars** mean they joined the second year and are really just getting started. **Purple stars** are groups that did some work but lacked follow through. **Orange stars** indicate those interested in joining the work.



MAIN WATERSHEDS OF ST. LUCIA

The **red** color means all of the samples exceeded the standards by at least an order of magnitude (The E. coli or total coliform samples generally exceeded 20,000 cfu's per 100 mL). **Orange** means the standards were exceeded, but less than 10,000 cfu's.



E. coli standards for fresh water are not to exceed 200 colony forming units per 100ml of water.

For salt water, the standards are for total coliforms since E. coli does not survive well in salt water. The salt water standard is 35 cfu's per 100 mL.

Objectives:

Our first objective in this project was to train the trainers. We can reach many more children if more people can understand how to undertake these projects. We have now engaged teachers and community leaders in nine watersheds and have six areas that are actively engaging students in working to restore problems they have found. One school used the training and data collection to prepare their students for the end of year exams the students have to pass as well as for science fair projects (for which they won several awards!) However, they have not, as yet, begun to expand



this into restoration strategies or community awareness. The Ridge to Reef focus for environmental education training was essential to help teachers and community leaders understand that everything that happens in the watershed eventually affects the reef as well. With the assistance of local experts in Agriculture, Forestry, Solid Waste, and Marine Management, the teachers gained a better perspective on the connections within the watershed. We continue to follow up and assist teachers and leaders through visits, meetings with local experts, and continued educational opportunities. Mr. Al Stenstrup, Education Program Coordinator for Project Learning Tree and Dr. Padgett Kelly, Professor of Biology and Board Member of the National Marine Educators Association led the initial training workshop for the teachers.



Additionally, our field trip to the coral reef was supplemented by a discussion led by project officers of the Soufriere Marine Management Area. Project partners from Solid Waste Management, IWCAM, CEHI, Sustainable Development, and Forestry also assisted with the workshop. The most important success arising from the training is that several of the teachers and community members left the training and then came to camp to lead the children. Those teachers who did not come to camp ended up being those who did not engage the children as much during the year.

Our second objective was to expand and strengthen the capacity students to engage in water quality monitoring and conservation within the watershed.

Not only do we have true leaders among the students in water sampling, they also do public outreach and communications and help organize the students at camp. Since the St Lucia Electricity Services is now sponsoring the watershed camp for another 2 years, these students will be counselors next year. They will help teach the new children and explain the history of their work...both mistakes and successes. The students' monitoring is very focused on phosphates, turbidity, and bacteria. One of the groups wondered if perhaps the phosphates were the limiting factor for the algae and that's why they are blooming so readily and





we hope to get experiments going at his school this fall to see if he is correct. The students have made presentations to businesses and sponsors and are becoming the voice for protecting St. Lucia's natural resources. As they said with their chosen motto, "A clean St. Lucia is in our hands." Community Reports follow the objectives. The students have used community meetings, meetings with business people and tourist resorts, as well as numerous press releases to the newspapers to get the word out about their work.

Our third objective was to bring stakeholders together to develop a coordinated message for educators about St. Lucia's watershed and coastal resources and how to protect them. Between our training in environmental education and CEHI's development of standard sampling protocols for community water sampling, we have a basic guide for the groups. In addition, the groups all receive Ridge to Reef

field experiences to supplement the training the teachers have received and we continue to support them in their efforts. The teachers have commented the education about and visits to the variety of precious natural resources found in St Lucia have also instilled a sense of national pride in the students, something which is not strong there. In addition, the Coastal Zone Management department of the Sustainable Development office is now monitoring water quality in important harbors in the effort to determine water quality standards for recreational waters due to being a signatory on the Cartagena Convention. The Sustainable Development Unit has also used EU grant funding to develop a national strategy for environmental education which points toward policy change and governmental coordination of environmental education throughout the agencies. An important note in their research determined that people value the land based environmental resources more highly than they do the ocean, which is not something they see a need to protect. Our work is important toward changing that view.

Our final objective was to develop recommendations for integrated watershed management based on the results of student monitoring.

The biggest impact we have had thus far is the bacterial sampling results which found enormous numbers of *E. coli* and total coliforms in the waters around the island. It shook up the Marigot Bay Business association and they first recoiled and denied it, but then began to listen to the kids.

Canaries, one of our new villages, is ready to actively pursue improvements. We have helped them submit a planning grant for UN GEF funds and the UNDP is actively pursuing this project.

Soufriere is trying to track down the specific points of bacterial

introduction. They are also working on a pig waste pilot project with a biogas digester. It really has an impact on an island dependent on tourism to find out how much bacteria is in their streams running to the sea. It is something that is more easily understood that the wide range of water chemistry parameters that we can test. Turbidity is the

other very important variable that the students can readily see the impact from. In Marigot Bay you can see the sand falling on the dead and dying



corals after a boat goes into the harbor. The students would all recommend first dealing with sewage issues. Marigot students are also recommending sediment traps and mangroves while the Dennery students are working on strategies for changing littering behavior. For integrated watershed management, all of these and perhaps even Purnill's idea for banning phosphate containing detergent should be included.

While we thought the students could make measurable impacts that they could measure in water quality changes, they don't seem to be having that kind of direct impact. Indirectly, however, they are having impacts that are measurably improving water quality. What has happened and is continuing to occur is that the children are making the adults notice what is going on and more and more people are becoming committed to improving the situations. With that, the adults are undertaking improvements that really will cause measurable improvements in the water quality, such as installing wetlands for wastewater treatment and biogas digesters for the pig waste. In Marigot Bay, there is no longer a toilet that flushes directly into the waters of the bay. The owner of another resort, after hearing his resort had the highest E. coli counts, has upgraded his septic system and fixed leaks. The bacteria counts have gone down in Marigot Bay by the end of the summer. Now another resort is working with the students to determine the best places to install sediment retention structures in the ravines leading to the bay. Measurable improvements are beginning to trickle in and will come in larger quantities as our students continue to reach out to diverse and helpful partners to solve the issues they have identified.



We also have seen a renewed interest in environmental education and coordination through our partner, the Sustainable Development and Environment Unit of the Ministry of Economic Affairs. If the recommendations are taken, their unit will become the Ministry of the Environment with a unit dedicated to environmental education and outreach.

Through the work of dedicated volunteers, partners,

and Caribbean SEA staff, we have seen our students bring awareness and begin the cleanup of problems they have discovered. When a business group goes from bullying the students to helping them install sediment traps and sponsoring a snorkeling boat trip, I think the students have made an impact. I will never forget Yasmine telling the white expatriate British business men, "Don't you think it's better for us to solve our problems together rather than involving the government?" She silenced the crowd. Yasmine is in Sir Arthur Lewis Community College now studying business. I think she will be very successful!



Community Reports:

Canaries: More bacteria testing has occurred in Canaries where unsafe levels of E. coli are found in the lower river and the sea. The river is multi use. People are frequently seen bathing themselves, washing clothes, or defecating in the river. The village leaders are very concerned

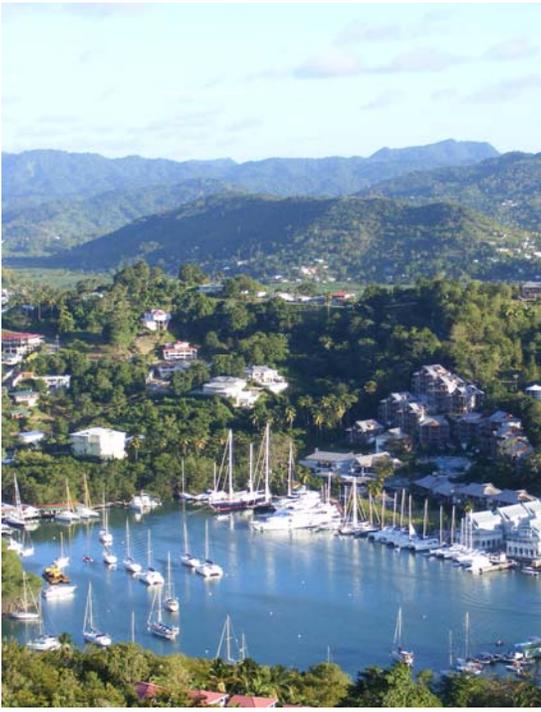


with what they see as a need for behavior change among those residents who refuse to use sanitary facilities or have their toilet water draining into the street drains and into the river. One parent in the community said his boys tend to get sick within 2 weeks of school closing and wondered if it is because they spend hours every day in the river and the sea. The UN Global Environment Facility is working with the village and Caribbean SEA to implement ideas for improving the waste issues. Canaries Bay is part of the Canaries/ Anse La Raye Marine Management area managed by the Soufriere Marine Management Area, but the skin infections people have gotten from swimming in the bay indicate that more protection is necessary.

Marigot: Awareness leads to Action. The Marigot group has focused their restoration on the sediment plumes which are smothering coral in Marigot Bay. They received permission to restore a mangrove habitat at one of the stream outlets to trap sediment and nutrients as well as provide habitat for sea life. The student arranged to have a big mangrove planting along the south side of the bay where the sediment is worst. They had community members involved and had a blast getting muddy and seeing the results of their planting. The next day, someone pulled all the trees up. The students were crushed and have never found out for sure who pulled up the trees.



However, they took that moment and decided that they must be making an impact since someone took the time to pull up their trees, so have begun a communication campaign to bring everyone into the process. It has really reinvigorated them and made them realize what they are doing is incredibly important. They must be very effective since everyone I talk to in the area wants to make their comments on what the kids should do. Originally the Marigot Bay Business Association fought the kids and now have sponsored a snorkeling boat trip for them and are assisting with location of sediment retention structures as well as



placement for new mangroves. One of the students suggested we change our name to the “Bacteria Busting Team”! We have actually written a kids book about what the students in Marigot are trying to accomplish. It is called, “Where the Poo Fish Live” since we frequently see the fish that can gulp air when there is too little dissolved oxygen to gill breathe. Some local students are working on art work for it. The second book in the series is in the works as well and the working title is “Fish Don’t Like Dirt”. The draft of the Poo Fish book is attached.

Soufriere: The Chemistry Club of Soufriere Secondary School is continuing to test the water and are seeing some scary results. The bacteria testing showed over 20,000 cfu’s of E. coli in the river and we also had to watch our step to avoid the piles of human excrement on the beach. Thankfully, the spring where the locals fill their water

jugs was found clean! The reduction of waste in the Soufriere River is a priority since the river flows out into the Marine Management Area which at this time is severely stressed by nutrients, bacteria, and sediment. Unfortunately, a good portion of the waste also comes from the open street drains which run through the town, so the educational message brought into the forefront by the students is very important. The agricultural components of the waste reaching the river is also under discussion and the UN GEF grant they have received funds a biogas digester for one of the pig farmers up the river.



Dennerly: The student solid waste activities have very cleverly been involving the members of the community as well as the kids. Dennerly Village is the poorest village in the country with fishing being the primary occupation, but the decline in fisheries around St. Lucia has hit them hard. Most kids only have tea and bread for their night time meal. Therefore, environmental concerns take a back seat to trying to provide food for the family. The Peace Corps volunteer who is leader of the group designed a scavenger hunt in which the students had to do a good deed for someone who was observed throwing trash on the ground and at the same time exact a promise from them to dispose of trash properly next time. They had a timed contest between the boys and

girls in the village center for how much trash they could collect. They made signs and posters depicting the kinds of trash that were most common. Throughout the year, the residents in the village have been bombarded with the kids’ very visible activities and displays about reducing the trash that goes to the sea. We are eagerly awaiting news from their latest clean up day to see if they have engaged any of the fishermen and other villagers to help and if they see any reduction in trash from their efforts.

Vieux Fort Comprehensive School Campus B. The students used the data they collect for part of their CXE(Common Entrance Exams) required tasks. While they have discovered blackwater flowing from a

beach restaurant through one of the highly touted tourist beaches into the sea, they have not been effective as yet in convincing the owners of the facility to change their practices. Their next step is to present alternatives to the owners and they have already volunteered to help implement the improvements. They also entered their testing in the Science Fair and won several awards. The lead teacher is now eager to get the Environmental Club reactivated to continue their watershed work.



Bacteria Testing Results from May through July, 2008:

The Soufriere Comprehensive Secondary School Chemistry students and Chem Club participated in sampling on Friday 30 May. E-coli results are:

- Site 1 - Mouth of Soufriere River 19,400 cfu/100mL
- Site 2 - Palmiste Ravine into River 40,400 cfu/100mL
- Site 3 - "Spring" in River at Playing Field 0 cfu/100mL (Persons frequent this site to bathe and very often even collect water to drink)
- Site 4 - New Development Ravine into River 15,900 cfu/100mL

All results are for number of colony forming units per 100 milliliters

Marigot Bay

	May 31 (note! We did not count total coliforms, but they were there. This was our initial testing and learning about the test better)	July 8 Lots of rain, not many tourists	July 21 Lots of rain, not many tourists
End of Discovery Dock toward JJ's	1300 E. coli 17,600 total coliforms	50 E. coli 1300 total coliforms	400 E. coli 40,600 total coliforms
Stream beside Chateau Mygo	700 E. coli Total coliforms too numerous to count.	150 E. coli total coliforms were too numerous to count	2300 E. coli Over 50,000 total coliforms (really too numerous too count)
Roped off swimming area at Beach	100 E. coli	700 total coliforms	1365 total coliforms 0 E .coli
Next to beach by Doolittles and guard house	10,000 E. coli	500 E. coli 8400 total coliforms	533 E. coli 7300 total coliforms

Anse La Raye River on north side of town: 1833 total coliforms tntc and teal green colonies over 5000

Canaries

At Pier 833 (over 17,000 total coliforms)

At beach by big rock 700 and total coliforms too numerous to count.

In river 3167 (teal green colonies too numerous to count. Total coliforms too numerous to count)

Choiseul River 7650 (total coliforms too numerous to count)

Balenbouche River 1200

Balenbouche Canal near estate bridge 220 (this is great news!)

Laborie Street Drain 7200 (total coliforms too numerous to count)

Laborie Pier 1000 (total coliforms 7000)

Vieux Fort River 5100 total coliforms tntc

Vieux Fort Drain near airport 7300 (total coliforms tntc)

Dennery street drain and river were too numerous to count (and the kids were swimming!!). with just 1 ml that means it was over 20000

The good news in Dennery is that the beach by the wall where the kids bathe is relatively clean.(less than 500)

