

Title of Project: Update of the water systems at the Pantanal Center for Education and Research

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OVERVIEW

Last summer, in partial completion of the Multidisciplinary Design Minor requirements, the water systems team traveled to the Pantanal of Brazil to build and test the water systems for the Pantanal Center for Education and Research (PCER). The school is located on the Jaguar Ecological Reserve (www.jaguarreserve.com) and scheduled to open in May 2011. Due to the building demands of the trip last summer, the water systems that were installed could not be adequately tested before the team returned to the United States. The team is currently testing a variety of possible upgrades in designs to determine the most efficient system that will be possible to build given the resource constraints of the remote Pantanal. In order to ensure the school provides safe drinking water for the students and staff, the water systems team is requesting funding to return to the Pantanal during the summer of 2011 to test and improve on the designs from last summer, as well as to investigate other potential water systems that would improve quality of life and the community. An itemized budget can be found in Appendix A.

EDUCATIONAL OUTCOME

The goal of our project is to determine the viability of the BSF in the Pantanal. Beyond the viability of the BSF, we wish to determine the factors that make technologies effective within remote regions. Our hope is to improve the health of rural communities through propagating sustainable designs. This experience will be the culmination of past semesters into a project where we will implement, in real life settings, our learned design-build-test practices.

DESIGN

Potable Water

One of the many challenges and constraints our designs were subjected to was minimal access to needed materials for the bio-sand filter (BSF). In order to complete the filter before returning to the U.S. design changes were made [1]. Initial tests done before the *schmutzdecke* was grown indicated that the water had no nutrient contamination, but the water did have potentially harmful bacteria. Since tests were not able to be completed with a mature *schmutzdecke*, the team is currently conducting experiments to determine whether these necessary changes will maintain the efficiency of design [2]. After completing the experiments the team will determine the best design given the material constraints of the site. This will guarantee that the

PCER will have the best filtration capabilities possible. Once the new design is implemented, bacterial tests will be performed to ensure the water is safe for students and staff to drink at PCER.

Wastewater Management

The waste management system built last summer incorporated local practices with our designs to produce a septic system with a leach field [1]. Upon return this summer we will investigate the success of this system by testing nearby bodies of water for bacteria. If the system installed last summer does not remediate the wastewater as desired the team will investigate alternative options, such as constructed wetlands or an anaerobic system.

OUTREACH

BSF Instructions

A goal of the water systems team is to ensure safe drinking water for all members of the community in the Pantanal. Since the team will have neither the time nor the resources to build filters for all members of the community, the team will create a pamphlet to be distributed. The aim of this pamphlet is to provide a universal means of communication on the maintenance of a BSF through the global language of visual diagrams. We will draft this with the intention of distributing it throughout the Pantanal community and to other organizations worldwide doing similar work in bio-sand filters.

In a separate section of the pamphlet we hope to generate a document focused on the building of a BSF within the localized constraints of the Pantanal. This will be written to the average reading level of the adults within the community, with translation being facilitated by Ethan Shirley. In this way, the pamphlet will provide an opportunity for all members of the Pantanal community to build and maintain their own filter.

University of Michigan Community

Another important aspect of our outreach will be with our classmates. Upon returning to the U.S. the team will actively recruit new members to continue the development of the project as part of the Multidisciplinary Design Minor. The team will upload pictures and videos to our blog created last summer to update any interested party on our progress.

LOGISTICS

The PCER site is located on the Jaguar Ecological Reserve property, approximately 200 km from the airport in Cuiabá. The Jaguar Ecological Reserve is located in the state of Mato Grosso, where the economy is 40% agriculture, 40% service, and 19% industry. Cattle ranching, fishing, and ecotourism dominate the area immediately surrounding the reserve.

The water systems team will depart for the Cuiabá Marechal Rondon International Airport (CGB) on May 3rd and return the United States on June 3rd (see Appendix B for a detailed itinerary.) The project directors, Ethan Shirley and Julie Bateman, will be traveling with the water systems team. All travelers will be met at the airport by an employee of the Jaguar Ecological Reserve, which will be arranged by Eduardo Falcão de Arruda, who owns the reserve.

Having spent last summer on site and in the region, the team has developed some Portuguese language skills, as well as personal relationships with the community. This will help the team successfully communicate the needs of the project this summer. It will also help that many of the tour guides at the reserve are bilingual. Finally, Ethan Shirley speaks fluent Portuguese and can act as a translator should any problems arise.

SAFETY

Safety is a major priority for our trip. While on site, if someone should need to be transported to the hospital in case of an emergency, a car will be available at all times. The nearest full hospital is in Poconé, approximately halfway between the PCER site and Cuiabá. The Jaguar Ecological Reserve is a popular destination for tourists and thus has ample first aid resources. The water systems team will heed all recommendations from the Center for Disease Control relating to vaccinations before traveling. Although large numbers of mosquitoes live in the Pantanal, no reports of malaria have been made for over 30 years.

There have been no incidents involving crime or drugs on or near the Jaguar Ecological Reserve. Further, in our activities last year we developed solid relationships with the community surrounding the reserve. This was aided by the University of Michigan GIEU group that participated in homestays with the neighbors of the Jaguar Reserve. All members of the community have been very supportive of the project and offer help whenever possible.

MULTIDISCIPLINARY DESIGN MINOR

All members of the team are declared for the Multidisciplinary Design Minor. Two members will be using this experience as design credits in partial completion of the minor. Although our most senior member has completed all of the requirements for the minor, we see an impetus for him to accompany us on our trip as he is a good mentor with a stronger knowledge of hydrology than the rest of the team, having taken the cornerstone course (CEE 526: Design of hydraulic systems). In the end, we hope that this experience will make us better equipped to meet the design challenges that are pertinent to a large cross section of disciplines, energize more students to get involved in the Multidisciplinary Program, and continue to challenge us to become more holistic conscientious world citizens.

Reference:

[1] VonAchen, Cory and Gregory Ewing. "Multidisciplinary Report Summer 2010," September 23, 2010

[2] VonAchen, Cory and Gregory Ewing. "Biosand Filter Experimental Work Plan," December 22, 2010

APPENDIX A

Table A-1: Itemized budget

Water systems team budget summer 2011				
Transportation	Cost (\$)	# needed	Total Cost (\$)	Source
Airfare (DTW to CGB)	1,410.10	3	4,230.30	expedia.com (3/14/11)
Ground transportation	250.00	3	750.00	Jaguar Reserve
Brazilian Visa	150.00	1	150.00	Brazilian Consulate
Total			5,130.30	
Daily living				
Lodging (1 month discounted)	200.00	3	600.00	Jaguar Reserve
Food (1 month discounted)	150.00	3	450.00	Jaguar Reserve
Total			1,050.00	
Health				
Travel and Medical Insurance	40.00	3	120.00	hthstudent.com
Vaccinations	572.00	1	572.00	uhs.umich.edu
Total			692.00	
Project Materials				
#24 Mesh	8.45	9	76.05	twpinc.com
Wood	20.00	4	80.00	Construmax (Poconé)
Nails	2.00	20	40.00	Construmax (Poconé)
Sand	50.00	5	250.00	Construmax (Poconé)
Gravel	25.00	3	75.00	Construmax (Poconé)
Coliscan EasyGel (Bacteria test)	106.80	1	106.80	www.inspectUSA.com
Total Dissolved Solids Test	17.79	1	17.79	www.inspectUSA.com
Heavy Metal Tests	18.79	1	18.79	www.inspectUSA.com
Total			664.43	
Grand Total			7,536.73	

APPENDIX B

Water Systems Itinerary 5/3-6/3

5/3

Team departs DTW for Cuiabá Marechal Rondon International Airport (CGB). Average travel time is approximately 22 hours with three flights (source: www.kayak.com.)

5/4

Arrive at CGB. Greeted at airport by employee of the Jaguar Ecological Reserve, and arranged by Ethan Shirley (Cell Phone: 55-065-9615-1049.) We will then be driven to PCER. Secure lodging and dinner at PCER.

5/5-5/6

Reacquaint ourselves with the local setting. This will involve interactive tours and discussions pertaining to the sustainability challenges of the area. This will be especially pertinent for team members who are making their first trip. Additionally, we will visit the local peoples of the area to determine the comparative state of their water quality. Food and lodging will be conveniently located at PCER.

5/7-5/9

Conduct a comprehensive analysis of each individual system, and places for improvement. This will include water quality tests of ground and tap water. Make a list of materials to be bought in Poconé for design improvements and maintenance of systems.

5/10

Drive to Poconé for materials. Ethan Shirley and the Jaguar Ecological Reserve will arrange a ride. The drive takes approximately two and a half hours depending on road conditions. We will return the same day. Lunch and dinner will be purchased in Poconé.

5/11-5/27

Build new systems and repair old. As we build there will be breakout sessions with the students at the school for them to learn about how the filters work and how to maintain them.

5/28-/31

Conduct the final efficiency tests on our systems. Continue our education campaign on the maintenance of the filter. There will be a scheduled trip to Poconé within this time frame to print and finalize the diagrams that we will have made. This will also be a day trip and transportation will be supplied by on employees at the Jaguar Ecological Reserve.

6/1-6/2

Depart PCER for Cuiabá. Our friends at the Jaguar Ecological Reserve will supply transportation. We will arrive in Cuiabá early afternoon and use the rest of the day to immerse ourselves in the local culture that the city and the surrounding area have to offer. The next day we will continue our leisurely introduction to Cuiabá with a visit to Chapada dos Guimerães, a nearby national park. Lodging will be in Hotel Velas across from the Cuiabá airport.

Hotel info: Phone number: (0xx)65 3682-3840
Address: Avenida Filinto Müller, 62 - Jd Aeroporto
Várzea Grande - MT, 78110-000, Brazil

6/3

Depart for DTW.

APPENDIX C

Contact Information

Jaguar Ecological Reserve:

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