ENGINEERS WITHOUT BORDERS USA
Northeastern University Chapter

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PROGRAM UPDATE
HONDURAS

By: Mike Herbert
Honduras Program Director

The Honduras program is currently gearing up for our next trip in May 2018, which will be the program's first implementation trip to Ocotal and Potrerillos. The team has been on two assessment trips for a new water distribution system in the two communities in the Yoro district of Honduras. The most recent trip, in December 2016, sent four students and professional civil engineer Peter Furth to the communities to build upon the data collected on the first assessment trip in August 2015.

In the time since the December trip, our team has been working to design the initial sections of the communities' future system. With the data acquired from our trips along with regular updates about flow rate from the community, we have been able to analyze our design alternatives and settle on an outline for the whole system.

From the water samples gathered on the December trip, we determined that the two new sources proposed by the community are safe for drinking, whereas the existing community source should only be used for agricultural purposes. We plan to enclose the two groundwater springs to feed the system, which will require at least three miles of pipe over a large elevation change to reach the two storage tanks: one smaller tank which will serve the 23 people in Potrerillos, and a larger one on the far side of the Rio Locomapa to serve the 378 people in Ocotal.

During the upcoming trip, we will build the source boxes to enclose the two springs and stake out the final path for the transmission main. We will also survey the area in more detail for further design work. Because the source box is perhaps the most difficult and delicate portion of the entire system, we have a large and dedicated team of members working hard to be sure the designs are water-tight. AutoCAD designs of the brick-and-mortar structure are being developed, and design descriptions and drawings are being made for the excavation work that will precede their construction.

To help us gather data efficiently and be on track for the following implementation trip, we have another team developing profiles of the transmission path based on GPS data taken on the two previous trips. Having an accurate path mapped out will allow us to survey the correct areas in detail for ravines or other obstacles which might require additional design work to cross.

In addition to the continued work with Ocotal and Potrerillos, we also prepared for a short Alumni trip in late October to Los Planes, another Yoro district community with whom our team previously worked. The main goal of this trip was to remedy recurring issues the community was experiencing with a leaking storage tank, but also allowed us to check on a system we built in El Carrizalito. El Carrizalito has historically had several problems with their electronic pump, which is required for the functionality of their system, and we want to be sure they continue to have access to clean drinking water.

The Northeastern University chapter of EWB-USA has been working in the Yoro District of Honduras for over a decade, and we look forward to completing the Ocotal-Potrerillos system, our sixth in the region, over the next few years. This is one of the biggest projects our chapter has ever taken on, and we are excited to work with the communities of Ocotal and Potrerillos to take on the challenge of bringing every community member clean, accessible drinking water.

Alumni Jake Vergara (CHEME '17), Emily Korot (CEE '17), and Brandon Hornak (CEE '17) in Los Planes, Honduras.

PROGRAM UPDATE
PANAMA

By: Patrick Fitzgibbon
Panama Program Director

Over the past year the Panama Program has made progress towards completing a water distribution system in the community of Las Delicias. After conducting two successful assessment trips to Las Delicias, Panama, EWB-USA NEU completed their first implementation trip this August.

The design of the gravity-fed water distribution system was completed with ArcGIS and WaterGEMS, using data collected from the previous two assessment trips. The two assessment trips focused on collecting health and water usage data, water quality and flow data, population data, and elevation data. The information from these trips was then used to start the design of the water distribution system.

One of our main decisions was determining which mechanism is best for the community, several break pressure tanks or a system utilizing pumps. After researching the alternatives we determined that break pressure tanks would suit the needs of the community and be the most sustainable option. The program worked hard through the Spring and Summer semesters to design a system for the community and prepare a clear construction plan set.

Our challenges were designing the system as a gravity fed water system, designing the break pressure tank structures and capacities considering the 50 years projected lifespan of the system, and considering the sustainability of the system. The w-shaped geography of Las Delicias caused the most challenges for the hydraulic design of the system. We had to design different pressure zones, because the changes in elevations would cause pressures that were too high or too low at the residential taps. Additionally, the drawings for the break pressure tanks were particularly challenging because of the level of detail required given that the plans were to be used by a mason. We also faced the challenge of maintaining sustainability and limited material availability. The system will only be built with materials that are readily available in or near the community. So if a system component breaks, the community will be able to purchase a replacement.

Community members in Las Delicias remove a shipment of PVC pipes from the delivery truck.

We split the implementation of the system into two phases, because the technical work should be supervised by an engineer and because the system is being constructed by the community members without heavy machinery.

The August 2017 trip marked the beginning of the first phase of implementation. The team worked with the local Water Board to finalize locations of the first two break pressure tanks and flag the pipe route. Additionally, 13,120 feet of pipe and ancillary materials were delivered and safely stored in the community center.

While on the trip, we made some changes to the original design of the system. We postponed the bridge crossing, as some of the materials were not available and we had new information on the bridge geometry. Based on the new bridge information, we are developing a new method for crossing the river. On the trip, the design of the water distribution system was also simplified as a grouping of homes opted out of the system. These homes are part of another community that received a government grant to build a separate water distribution system. This reduction in homes, particularly these homes due to their location, simplified the distribution system plan and reduced the amount of break pressure tanks needed.

For the first phase implementation, the community agreed to provide all pipeline labor and a local mason was hired to construct the float valve tanks. To promote successful construction and maintenance, we trained the community on how to assemble and care for PVC piping. We left the community with ample materials, tools, and instructions to continue trench digging and laying pipe. The community has shown significant progress to date, completing close to 12,000 linear feet of trench digging and pipe laying.

The design team is currently preparing construction documents for the second phase of implementation, which includes the main river crossing, two smaller river crossings, two break pressure tanks, and an additional portion of distribution system.

The program has maintained contact with the community for updates on the construction progress and to plan a second implementation trip, scheduled for March 2018. The second implementation trip would include completing the last half of the distribution system, and surveying for the transmission main for two new sources. The future plans for the Las Delicias project are to connect two more sources to the system with a new transmission main and source boxes, then re-evaluate the quality of the storage tank. Thus working with the community to holistically meet their drinking water needs.

PROGRAM UPDATE
UGANDA

By: Roisin Floyd O'Sullivan
Uganda Program Director

In April, a team of Uganda Program members traveled to Bbanda, Uganda with a plan to execute many improvements to the Bbanda Distribution System. The team of five student members (Phil Gunderson, Róisín Floyd-O'Sullivan, Sydney Kates, Peter Botticello and Jeff Ling) was led by our Professional Mentor, Tim McGrath. Through the analysis of data provided by the Water Board and the previous travel team, the Uganda Program estimated that the leakage from the water storage tank was approximately 50% of the water pumped into the tank. This posed a serious financial issue to the Water Board, who at the time was still powering the Bbanda Distribution System (BDS) with a diesel generator. Thus, the highest priority of the trip was repairing the water storage tank. Earlier in the year, the Uganda Program learned that the Water Board had connected the BDS to the electric grid! This is great news as it greatly reduces operation costs and allows for better maintenance of the system with the money saved.

Roisin Floyd O'Sullivan (BIOE '19) and Peter Botticello (CEE '21) are accompanied by young community members as the walk to collect water quality samples.

The time preparing for the May 2017 trip was largely spent finding a solution to the water leakage issue. Data from the previous trip showed the major source of leakage was the tank wall around the Distribution Main and the joint between the tank wall and floor. The Uganda Program worked with D.N. Tanks and decided to use a LinkSeal™ around the Distribution Main and to add a cant to the wall-floor joint to reduce the amount of water leaking from the tank.

Upon arrival in Bbanda, the travel team discovered that the Water Board had built a new tap stand in Town Center with the funds saved from the switch to the electric grid. These two improvements exemplified the Water Board's increasing commitment to the maintenance and operation of the BDS.

Inspection of the tank showed extensive seepage of water through the tank walls to the outside of the tank, not just around the Distribution Main and wall-floor joint. After discussion with the Water Board, it was agreed upon that the repair that EWB-USA NEU had prepared for would not be sufficient. Kiyingi Godfrey, the current Chairman of the Water Board, and the Uganda travel team decided to re-line the inside of the tank, in addition to the repairs planned by the Uganda team. By the end of the work, a cant to eliminate the 90° joint at the meeting of the floor and the wall was constructed, the sedimentation outlet was lined with Adeka Water Seal, the LinkSeal™ was installed around the Distribution Main and the entire tank was relined with MoyaProof, a waterproof crystalline cement product.

This full-scale repair took longer than was planned for, so Tim McGrath stayed a few extra days to oversee the tank being refilled. The tank was still retaining water after a 24-hour period. Communication from Bbanda since the April trip has been positive, with reports of no leakage from the tank.

Other tasks completed on the April trip were PMEL surveying, replacing mesh on the Tank Level Indicator to make it more effective at keeping out critters, Water Quality tests, restoration of service to two tap stands (Tap Stands 0 & 4). The cause of the limited flow to Tap Stand 0, closest to the tank, was due to a rusted flow meter. The lack of flow at Tap Stand 4 on Mawa Road was due to insufficient operation of an air release valve. To prevent these issues in the future, students are researching corrosion resistant flow meters and Tim McGrath instructed Kiyingi Godfrey on how to operate the air release valve before he left Bbanda. Another task performed was surveying for the implementation of two new tap stands south of Town Center, one down Kanoni Road and another in a southern neighborhood called Kiraro (Tap Stands 5 & 6 respectively). This Fall, we have been working on the hydraulic model for these two tap stands, evaluating the connection to the electric grid and fine-tuning our PMEL process, among other tasks. We hope to travel twice in 2018 to implement Tap Stands 5 and 6.

Sydney Kates (BIOE '19) and Tim McGrath (Uganda Professional Mentor) modify the Tank Level Indicator to prevent debris from entering into the tank.

MEMBER SPOTLIGHT

Uganda Spotlight: Peter Botticello is a stand-out, dedicated member of the Uganda Program. Peter has just started his second year of Civil Engineering. He joined EWB-USA NEU's Uganda Program as a freshman and was on the Monitoring and Evaluation trip to Bbanda this past April! For him, the best part of the trip was teaching schoolchildren in Bbanda about the water system and the importance of properly washing your hands. One of my favorite moments of the trip was when Peter and Phil joined a soccer game with some of the local children. During the intense game, Peter took an extraordinary tumble and ended up sprawled in the dirt, making his fellow EWB members and the children laugh. Not only is he a good sport, but Peter is hard-working and is always able to keep us laughing. He has already been able to develop leadership skills and hold important roles in the Program as trip treasurer and a current group leader for the Fall semester. He is leading a group of students to design the new tap stands that we plan to implement in Bbanda next year. Thank you for your contributions, Peter! **-By Roisin Floyd O'Sullivan**

Honduras Spotlight: Denzil Leach is a third-year bio engineering major who has been a part of EWB-USA NEU since 2015, and has been vital to the success of the program ever since. Denzil was the primary translator on the December 2016 trip to Ocotal and Potrerillos, and helped our team strengthen its relationship with the communities by working directly with the communities' Water Board and members.

In our current design phase, Denzil and another member, Josephine Rosenthal, are leading a group dedicated to the hydraulic analysis of possible transmission main paths and elevation profiles. The designs from Denzil's group will help us move forward with the rest of our system, since everything from break-pressure tanks to pipe bridges depend on this layout.

Denzil is also hard at work as treasurer of EWB-USA NEU, coordinating the financial challenges that come with having projects in three different countries simultaneously. He helps the project leads assemble accurate budgets and works with the rest of our e-board to update our records and approve any club expenditures, large and small.

Denzil has been and continues to be a critical component of the Honduras program and the chapter as a whole. We thank Denzil for his contributions so far, and are excited to continue to work with him over the next couple of years! **- By Mike Herbert**

Panama Spotlight- For this year's member spotlight, our program would like to highlight Francisco Perignon Machado for his unending help with the project. Francisco first joined Engineers Without Borders in 2016 and traveled with the team to Las Delicias in Spring of 2016 and acted as the translator while on the trip. This was pivotal to the team as Francisco's first language is Spanish; which allows him to accurately and easily transfer knowledge between the parties, and ultimately strengthen the relationship between the team and the community. Francisco is always willing to take on any work he can , always asking people if they need help. During the Spring 2017 semester, he led the break pressure tank design group and led the group to draw preliminary designs and calculate material quantities. With his leadership, the team was able to complete everything necessary for design approval from EWB USA, only possible by many hours spent working on the design and drawings outside of meetings.

Francisco led the effort to translate all documents to Spanish for the Summer 2017 trip, and even offered to do more work for the trip in addition to the translation. Over the past year Francisco has served as the Panama Program's main contact with the community, translating messages, and keeping up with the Water Board through WhatsApp. Francisco traveled as member of the travel team this past August for the first implementation trip, and again played a pivotal role in the trip's success.

Francisco embodies what Engineers Without Borders represents: selflessness, humbleness, generosity, and an unending drive to help. Francisco is often willing to do anything that will help with the project; it does not matter if the task is simply data entry or leading a team. Thank you Francisco for everything you have done for EWB NEU Panama, the project would not be where it is today without your contributions. **–By Patrick Fitzgibbon**

FUNDRAISING

By: Patrick Walsh
Vice President of Development

EWB-USA NEU strives for financial and operational sustainability through active fundraising and financial management throughout the year. We pursue fundraising opportunities in three main ways: corporate donations, grants, and personal donations. To manage the revenue generated, EWB-USA NEU has revamped their bi-weekly financial meetings to get a strong team behind the operations of chapter finances to ensure long term sustainability of our Chapter.

Through the Northeastern Co-op Program, our Chapter has built strong relationships with engineering firms in the Greater Boston Area. Student members deliver corporate presentations detailing EWB-USA's mission and the current status of our projects. Our corporate network continues to grow and we hope to continue expanding this network to spread the mission of our organization and the great work done by our student members.

EWB-USA NEU also applies for grants through the College of Engineering at Northeastern University as well as through EWB-USA. These grants typically support specific trips for each project.

The final source of funding comes from personal donations through our extensive alumni network. Current and former EWB-USA NEU members, their families, and faculty of the College of Engineering at Northeastern, generously support our Chapter's General Fund; which allows us to run on-campus recruiting events, send students to conferences, and support program trips. Without our donors or grant awards, the work we do would not be possible.

To support our fundraising efforts, we have developed strong financial meetings that take place every other week to inform our decision-making when it comes to using money responsibly. The overall goals of these meetings are to internally spread a stronger understanding of EWB-USA NEU's financial situation and work together to financially plan for the future. Whether this means creating a document of best practices or compiling a closeout report for an awarded grant, the work done at these meetings aids the fundraising efforts and allows EWB-USA NEU to confidently run projects in three countries.

Student members at the Northeast Regional Conference at UNH

NORTHEAST REGIONAL CONFERENCE

By: Maria Franko
President

On November 4th, 20 members of EWB-USA NEU ventured north to the University of New Hampshire for an EWB conference. The conference was both an educational event and a networking opportunity.

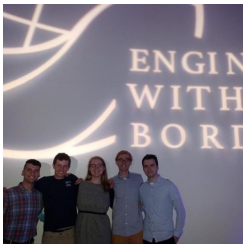
The conference opened with an informational presentation on EWB 2.0; which is EWB-USA's new field driven approach for being more efficient and creating a greater impact in partner communities. The conference goers then split into different groups to run through problem solving simulations. These simulations covered topics like finding new sources of water once one is contaminated and maintaining constant communication with remote villages. During lunch, our members talked with fellow students and with professional members. Some of the professional members we met expressed interest in filling one of our vacant mentor positions. These offers to join our mentor team are necessary to maintain our three programs.

After lunch, students attended a technical session on Drip Chlorination, the India Mark II Hand pump, Solar Electricity Basics, and gps data collection. Our very own Ian Carver ran an abbreviated version of BootCamp with the help of volunteers from EWB-USA NEU. Ian also presented information necessary for other chapters to hold their own BootCamp event.

A presentation by professor James Malley on the code of ethics of EWB-USA concluded the day. Students were reminded of the ethics we must uphold as members of EWB and as future engineers.

NATIONAL CONFERENCE

By: Philip Gunderson
Uganda Design Lead



On a warm Thursday evening in October, five students from the chapter boarded a plane at Logan and made the 3 hour flight to cold, wet Milwaukee. They joined the Uganda Program mentor, Tim McGrath, along with hundreds of other students and professionals attending the two-day long EWB-USA National Conference. This annual event includes presentations from student chapters, professional chapters, and EWB-USA staff exchanging ideas about best practices, lessons learned, new approaches, and organizational updates.

EWB-USA NEU gave two presentations to share some of the lessons we have learned from our successes (and failures). Maria Franko (2017-2018 Chapter President) and Denzil Leach (Treasurer) presented alongside two members from EWB-USA headquarters about running successful fundraising campaigns. They shared on our successes of forming relationships with corporate donors for both financial and technical support. Phil Gunderson (Uganda Design Lead) and Tim McGrath presented on 'Lessons in the Life of a Borehole', sharing important cultural, organizational, and technical lessons from the seven-year life of the rectory borehole in Bbanda.

Key speakers included Kathie Leslie, executive director of EWB-USA, who spoke of the direction that the organization is moving. She introduced EWB 2.0, a new initiative to increase effectiveness of projects and expand the impact that each chapter has on their partner communities. The plan includes prioritizing countries according to their need, and then working to expand projects in those countries. Eventually, they hope to concentrate all projects within 5 target countries, maximizing development in those areas. Two new field offices are scheduled to open in 2018 to help aid chapters in these countries with logistics of travel and monitoring project success.

EWB-USA NEU students attended breakout sessions about a variety of other topics. Valuable lessons shared with the chapter include how to run an effective water quality monitoring program, design of a low-maintenance chlorine disinfection system, and the success of the Community Engineering Corps, EWB-USA's newest program focused on domestic development in the U.S. A highlight for our attendees of the conference was a celebration of Engineers Without Borders' 15 year anniversary. Attendees were hosted in the Milwaukee Museum of Art's elegant Calatrava building, and ate cake while relaxing from a long day of learning and networking.

Upon return to Boston, conference attendees presented to the rest of the chapter about the valuable lessons they learned, as well as the interesting projects and initiatives other chapters have undertaken. There is already much anticipation for next

BOOTCAMP

By: Ian Carver
Vice President of Administration

Since its inception in 2012, EWB-NEU has hosted our fall Bootcamp training activity every year to educate new and existing members on all things EWB. Bootcamp has grown every year, from 20 students the first time around to 80 students that convened on October 21st 2017.

Learning throughout the day was focused on broader lessons in EWB projects. There were two main areas of focus. The first: every member needs to have some basic technical knowledge and skill in order to participate in EWB. The second: what do we need to consider during assessment, design, and implementation to ensure that we build sustainable, ethical projects?

Bootcamp is designed to mimic the different phases of a project throughout its lifetime in the chapter, so it naturally started with a robust assessment activity designed to encourage critical thinking and simulate an assessment trip to their community of Develo in the country of Ping. After collecting data, teams designed an example transmission main, then participated in a simulation of an implementation trip.

Each chapter's program and design leads gave in-depth presentations about the current state of their respective programs. Emily Katzner, a former president, gave an introduction to technical writing to ease the process of writing reports, and Maria Franko, the current president, gave a basic introduction to hydraulics which made the design activity possible. To finish off the day, we were lucky enough to have an EWB-NEU alum, Kevin Rathbun (former Uganda program director) give a presentation on PMEL and its importance during all parts of an EWB project.

One topic that every presenter focused on was why we do what we do -- it's important for us to keep our motivations in mind during all parts of a project. Bootcamp this year was a huge success -- thank you to everyone who attended!

TRAVEL PERSPECTIVE

By: Peter Boticello
Uganda Team Member

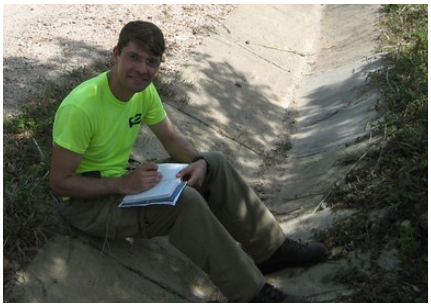
As a freshman in the EWB-Uganda program, I never really strayed out of my comfort zone. I stayed in my small group, working on a small project to connect the water pump in Bbanda village to their newly installed electricity grid. I mostly kept to myself, and while I didn't stray far from my group, I was dedicated and came to almost every meeting the program held.

Though when travel applications for the April 2017 Monitoring and Evaluation Trip opened, I decided to apply, and I could not be happier with my decision. Before college, I never had a chance to truly diversify my experiences in cultures throughout the world. I could learn all about it in school, but it was something entirely different to actually go to Uganda and experience how the people there lived and immerse myself for 3 weeks.

Almost everything is a culture shock. From the hectic buzz of the city of Kampala, with boda-boda's zipping past you, to playing soccer with children from Bbanda, their lifestyle was vastly different than anything I had experienced before. The villagers all knew us from coming for 8+ years to design and build their system, and while it took a few days for them to warm up to the new travel team members, everyone was extremely helpful and friendly. While in-country, we helped to repair the tank that our chapter had previously built for the distribution system. We worked directly with the community laborers and the water board to ensure that the process went smoothly and the tank stopped leaking for good. This specific experience of engineering solutions seems much different than any other project in the U.S, but in general, the process of developing a solution to get a project done and executing it was universal. This approach helped me to understand more about how a project gets done, and all of the different aspects that need to be addressed for a task like this to be completed.

I always knew that I wanted to travel to as many places as possible, but that probably would have been backpacking in Europe or visiting the tourist sights throughout the U.S. if not for my EWB experience. While these are incredible experiences too, there is something truly special about the trip I was able to make with my team, and because of this I will forever cherish the experience I had while traveling with EWB.

Thank you to our fantastic Professional Mentors!



Dan Saulnier- Honduras

Mike Sanders- Panama

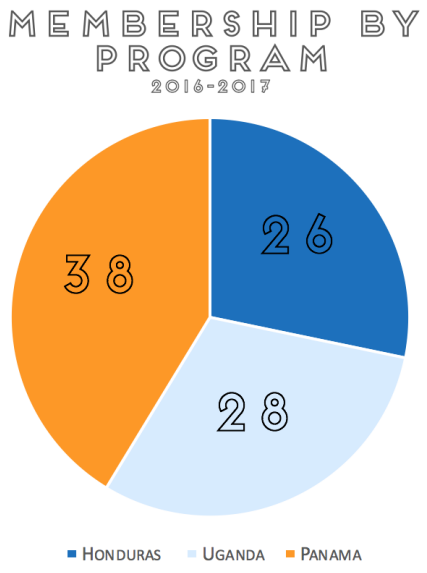
Tim McGrath- Uganda

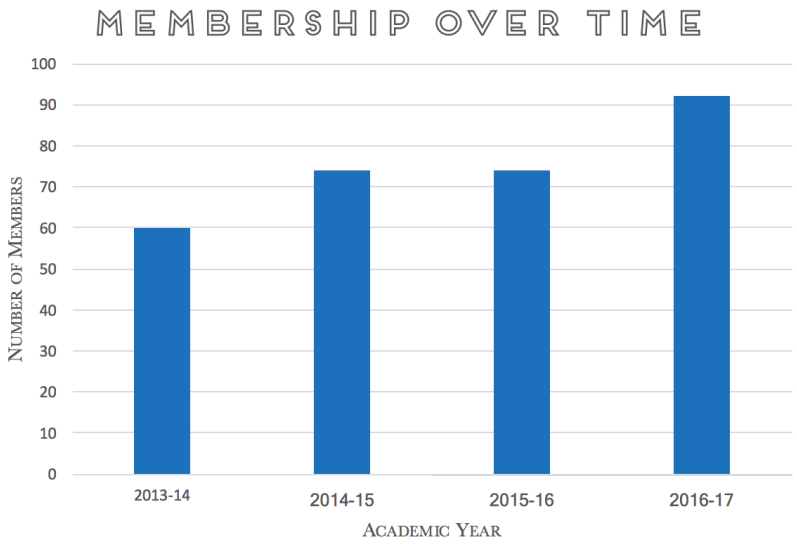
MEMBERSHIP

By: Madeline DuBois
PR and Recruitment Coordinator

The hours that travel teams dedicate to implement and repair projects are unspeakably valuable and EWB would not be possible without that time. However, equally as important but easily overlooked are all the hours of preparation required to make those trips possible and ensure the club is running smoothly here on campus. This behind the scenes work includes recruiting enthusiastic new members to join the chapter every year to continue the projects in the future. How do we find those new members? Some people, usually upperclassmen, hear about EWB through friends. However, most new members are freshmen who find out about EWB at university sponsored club events, such as the involvement fairs during orientations and the annual Fall Fest. EWB also specifically targets engineers during the freshmen night for the College of Engineering in October. These are great opportunities for potential members to check out photos from previous trips on the poster board and to hear firsthand from current members what a powerful experience it is to be able to apply their knowledge to make a significant impact on people's lives. The mission of EWB is what draws people to the table, but it's the enthusiasm of the volunteers and their stories that encourages other students to join. So thank you to these dedicated members who volunteer their time to help with tabling events, EWB would not continue to be so successful without you!

EWB's social media is another great way to reach new members, as well as keep current and past members in the loop. **Check out the EWB-Northeastern University Facebook page and follow @ewb_neu on Instagram and @ewbneu on Twitter to see some awesome photos of past trips and stay updated!**





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