pathways

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welcome.

Welcome to the 2015 Alternative Spring Break literary magazine, Pathways. It is always hard to capture a year's worth of ASB, consisting of 29 trips staffed by nearly 300 committed and passionate U.Va. students, in so few pages. The student papers that follow offer only a small sample of our year's efforts and reflect only a handful of the conversations members of our organization have had throughout the year. These essays speak volumes, however, about the passion and accomplishments of their authors. ASB is committed to refining and promoting our programming in support of such thoughtful service learning projects through need based aid and research grants. From Moab, Utah to Drake Bay, Costa Rica and the U.S. Virgin Islands to Annapolis, MD, ASB participants and site leaders have contributed to our mission of diligent volunteer work in pursuit of service learning for the twenty-third consecutive year.

As we look forward to the coming semesters, it is necessary for me to reflect on the tireless efforts of everyone who has committed their time and energy to making ASB such an amazing organization. From an outstanding cast of Site Leaders, to a phenomenally dedicated and hardworking Executive Board, to the sheer enthusiasm participants from across the University community have expressed for these service trips, ASB is fueled by the passion and commitment of an incredible group of people. I have been humbled and excited by so many members of this organization, and I can honestly say that serving as president of ASB as been the most rewarding experience of my college career. To everyone involved in this publication and in our organization at large, I sincerely thank you for your hard work and dedication. ASB could not be what it is without you.

All my best,
Caroline Trezza
ASB President 2014-2015

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The Remnants of Tragedy: Exploring the Ruins of the Annaberg Plantation on St. John

Alice Burgess

Introduction to Colonization and The Slave Trade in the Virgin Islands

Christopher Columbus, blown off course during his 1493 voyage while searching for a route to India, landed on St. Croix. Continuing onwards to explore Saint Thomas and Saint John, it was Columbus who gave the islands their Spanish saintly names: Santa Cruz, San Tomas, and San Juan.1 He named the islands "The Virgin Islands" after the legendary beauty of Saint Ursula and her 11,000 virgins.[2]

While the islands have most likely been populated ever since the Stone Age, during the age of Columbus, they were home to the "peaceful" Arawaks and the "fierce warriors", the Caribs. While Columbus abandoned these islands fairly quickly, other European explorers followed in his footsteps -- many of whom were Spanish adventurers who tried to convert the native people to Catholicism and enslave them for plantation labor.[1] England and Holland jointly colonized St. Croix in the 1620s, but the colony fell under French control until 1733. It was then purchased by the The Danish West Indian Company, who had been a foreign presence in the territory since the mid 1660's. These Danes had successfully established a settlement on St. Thomas in 1672 and settled on St. John in 1694.[2]

Cinnamon Bay, St. John, All photos by Alice Burgess.

Sadly, following the arrival of different European powers in the early 17th century, the local population was decimated by European diseases against which the natives had no immunity. Forced into harsh labor, it only took a few decades following the colonization of the Caribbean for the native population to plummet.[2] Since the population was reduced on the islands, there was a pressing demand for external labor. To fuel this need, the trans-Atlantic slave trade came to the islands in 1673.

The tobacco crop was already cultivated on the islands, but Europeans brought coffee, cotton, and most importantly, sugar. In 1685, the Danish government signed a treaty that allowed the Brandenburg American Company to establish a slave-trading post on St. Thomas. In the Danish West Indies, slaves labored mainly on sugar plantations. (St. John and St. Croix maintained plantation economies while St. Thomas was the more bustling center of trade.) The islands remained under Danish rule until 1917, when the United States purchased them for $25 million in gold as a WWI strategy. Today, the Virgin Islands are a U.S. territory, and residents are American citizens; however, the local residents continue to take pride in their unique history and thriving culture.[2]

Annaberg Plantation

Our 12-member environmental conservation ASB group worked on maintaining trails in the area surrounding the Annaberg Plantation, which was one of 25 active sugar producing factories on St. John that had been established by 1780. Named after the plantation owner's daughter, the Annaberg Plantation was built on a densely forested hillside which needed clearing and terracing by slaves before the sugar production even began[3].

With respect to the ruins, sixteen slave cabins have been uncovered in the Annaberg area. These cabins were made of woven branches stuck together with lime and mud. The roofs were palm leaves. One of the iconic structures that still stands today is the windmill at Annaberg, which was built between 1810 and 1830 and stands thirty eight feet high. The 518 acres of the Annaberg Plantation were divided into smaller farms upon the emancipation of slaves, but today the Plantation is maintained as a historical ruin site (featuring daily tours and clear signage) that is open to the public and is protected by the Virgin Islands National Park[3].

The Windmill at Annaberg

Preservation Efforts (Friends of the Park)

In 1956, the Rockefeller family gave the National Park Service a generous gift of 5,000 acres of land on St. John. To this day, almost two thirds of St. John is protected by the NPS2. Our group was working for the Friends of the Virgin Islands National Park, a 501(c)(3) non-profit organization dedicated to "the preservation and protection of the natural and cultural resources of the park" and promoting "the responsible enjoyment of this unique national treasure."[5] The volunteer coordinator, a native of Maine named Anna, knew a great deal about the local history, and educated us about not only the slave experience, but also the current economy of St. John, which relies mainly on tourism.

Treatment of the Enslaved

The Caribbean was such a brutal place to be a slave that the average life-span once an individual arrived on the island was eight years. As we worked on the Guard House, the Friends of USVI volunteer coordinator told us that this structure was said to have been built as a "lookout point for dangerous pirates", but that it truly served as a spot for armed guards to stand, ready to shoot any enslaved man, woman, or child who was attempting to swim to their freedom4. The US Virgin Islands and British Virgin Islands are extremely geographically close -- only separated by a few miles of turquoise Caribbean Sea. If slaves made it to one of the British Virgin Islands, they hoped for the chance to live longer under better conditions.

Every slave who arrived from Africa died on the island, and burial spots range from unmarked cemeteries to the "world-class beaches", such as Cinnamon Bay[4]. As for survival conditions, the sun was direct and blazing hot, all personal food had to be cultivated in the moments that slaves were not at work, and all drinking water was collected from rainstorms. Slaves slept in incredibly cramped sleeping quarters (with up to 50 people sleeping in a single hut), and spent most of their days working out in the mountainous terrain or handling boiling hot sugar cane[4].

Making sugar was a long and labor-intensive process. The cane was planted by the slaves, who had to haul water to the plants by hand. After the cane reached its full height, the slaves worked 18-20 hours a day to harvest it. They cut the stalks, loaded them onto donkey-drawn carts, and brought them to the sugar mill[6]. After being initially processed, the cane juice was placed into a large copper kettle, and a fire was lit beneath. Workers ladled the boiling juice from one kettle to the next, evaporating excess water. After the juice reached its maximum con-

centration, it was poured into a box to crystallize. The crystallized brown sugar was put into massive barrels (that held up to 1,600 pounds of sugar)[3].

Early removal from the last heated kettle prevented crystals from forming, and produced molasses that was used to make rum. This was not optimal, as sugar was the cash crop of choice, and slaves that made mistakes on the job were harshly punished[3]. To this day, a holding cell (the dungeon) remains on the lower south side of the estate. Rust stains show where shackles were attached, and remains of graffiti still exist[6].

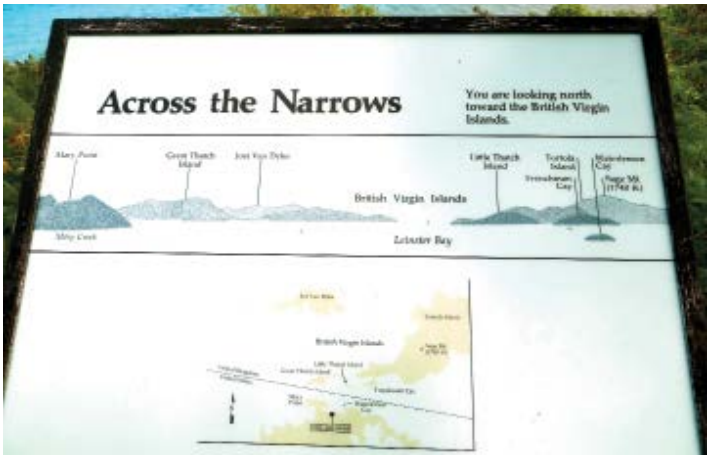
A wall at Annaberg -- coral serves the same purpose as bricks.

A slave's day began at 4:00 a.m. when the overseer sounded a conch shell. After rising and feeding the livestock, slaves would be hard work in the field by 5:00 a.m. At around 8:00 a.m., there would be a short break for the morning meal-- slaves without food would consume raw sugarcane for energy. Work continued until noon, when slaves with families would go home for a lunch with their kin. Afterwards, slaves would work the fields until sunset[6]. During the "dead season", when there were no crops to be tended to in the fields -- between July and November -- the slaves could return home for the evening meal and night work, such as hauling manure and water. However, during crop season, the workday was even longer -- women, children and even sick people had to cut and transport cane to the mills. The field slaves were not given clothes by their masters, and thus had to work six days a week in the unforgivable heat of the tropical sun[6].

On Sundays, slaves tended their garden plots called "provision grounds". Since the St. John estate owners did not have ample resources to buy food for their slaves, slaves produced their own food in plots. While providing for their own food was a great burden for overworked slaves, this system had some hidden benefits: slaves were able to gather and interact out of sight of their masters, pass on cultural traditions, disseminate news, and most importantly, plan their escape and resistance conspiracies[6].

Slaves worked together on their plots, shared their harvest, and had strong bonds with one another. The strongest and healthiest supported the oldest, weakest, and sickest. When slaves were able to produce a surplus of food or crafts, an underground economy often developed, which offered slaves the potential to buy their freedom. In addition, continuing the agriculturally based society structure enabled slaves to survive on St. John after emancipation and the failure of the sugar plantations[6].

An Extension Back to Grounds



Signage for the British Virgin Islands (Looking Out from Annaberg)

While learning about the tragic history of the island was certainly interesting and deeply moving, there is added value in learning and reflecting since the past informs the present. While a majority of humankind recognize slavery and the Trans-Atlantic Slave Trade as wrong, the effects of slavery and racial hierarchies continue to impact our modern lives. On one of our final nights, our group had a discussion about how the history of the island impacted us, not only during the trip, but also thinking back to Grounds.

The group came to a consensus that knowing the turbulent past of St. John changed the way we saw the space[7]. Of course, the Caribbean paradise was wonderful to enjoy, and our late afternoons spent on the white sands and sailing through the aqua waters were magical experiences. That being said, we agreed that with re-

spect to our optimal working conditions under the hot sun -- with ample water and plenty of breaks-- along with our inherent agency as volunteers, we would never be able to grasp what life was like for enslaved people just centuries before. Likewise, as we gazed out over incredible lookouts, we would not have to, nor be able to, see those seascapes as torturous reminders of tantalizing freedom[7]. We also reflected on our interactions with the friendly and welcoming local people -- one of our good friends, Douglas, was a seventh generation St. John resident. Since it was "tourist season", we noted how it was always local Caribbean people serving wealthy white tourists[7]. While we were told that most local people do enjoy the beautiful beaches in the height of summer, and that the economy depends on tourism, the racial disparities were still blatantly clear.

Graffiti in the Holding Cell

The ruined site of the boiling rrom

Slavery in the American South followed a similar timeline to slavery on St. John. Our group had a dialogue about the lawn room selections, what privilege really means, and how these dark historical elements continue to be relevant to our University culture[7]. ASB participants spoke of their frustration: What is a tangible goal for our community to move forward? Why is there a need for change? Does raising awareness of the history of slavery solve any problems, or does it just give people an excuse to take a passive stance on issues of race once they are "aware"? As a member for the Memorial for Enslaved Laborers, I asked people how effective they felt the Annaberg ruin was as a memorial, and what a memorial on Grounds that would honor the men and women who built U.Va. might look like. While there were some disagreements within our group about how to address these pressing issues of memorialization and race within the U.Va. community, the dialogue was valuable for all, and I encourage you to ask your friends about their opinions on the diversity and culture here at U.Va. What would a perfect U.Va. look like? What are things we can individually do to move forward from these dark places in history while acknowledging their pressing significance to our daily existence, even in 2015?

If you are interested in learning more about this ASB trip, slavery on St. John, or especially with getting involved with the Memorial for Enslaved Laborers at U.Va. or the University Guide Service, please do not hesitate to contact me at aeb3sj@virginia.edu.

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Evaluating the Environmental Sustainability of Prescribed Burns in Grand Canyon National Park and Possible Alternatives

Kevin Fry

In 2014, Grand Canyon National Park had approximately 4.76 million visitors (National Park Service). Behind this enormous volume of visitors are teams of people devoted to maintaining the park so that it may continue to be enjoyed by millions more. Just one of these teams is the Grand Canyon National Park Fire Department. Due to the canyon's dry climate, the fire department is often faced with the problem of wildfires. Consequently, a major function of the park's fire department is wildfire prevention, which involves the use of prescribed burns. These burns serve to eliminate possible sources of fire fuels in a controlled manner in order to prevent the outbreak and spread of future wildfires. Although these burns are effective, the process of burning between 2000-5000 acres of forest biomass per year (cite) releases plenty of pollutants into the atmosphere. The social climate is becoming ever more conscious of the state of the environment. Considering this and the environmental toll that prescribed burns take, possible alternatives to prescribed burns ought to be considered and evaluated. In order to identify functional alternatives, the dynamics of prescribed burns will be explored and compared to mechanical removal and the use of herbicides.

The Dynamics of Prescribed Burns

Prescribed burns are multifunctional. While the park's fire department places emphasis on performing prescribed burns in order to lessen and control the outbreak of wildfires, these burns also help seedlings take root and grow in the forest. The park is host to four different forests– piñon-juniper forests, ponderosa pine forests, spruce-fir forests, and mixed conifer forests, which contain a mix of ponderosa pine and spruce-fir. Some of these have adapted to fire and depend on it in order to make room for the next generation of trees to sprout forth, while others have become resistant to burning. This allows the fire department to target which kinds of trees and how many should be included in the prescribed burns. This poses a trade-off, as the park wishes to preserve the state of its forest life in terms of composition and forest density while also providing for the safety of its patrons as well as that of the surrounding communities in the state of Arizona. The EPA estimates that the Grand Canyon's prescribed burns produce roughly

1300 tons of emissions of volatile organic compounds (VOCs), by far the largest source of this type of pollutant in the park. (Sutherland). VOCs, such as benzene, can act as cancer-causing agents or they can have little to no health effects at all. VOCs can also react to atmospheric oxides of nitrogen to form ground level ozone– commonly referred to as "bad ozone" due to its harmful effects on human health and different forms of vegetation (EPA). In one study, the EPA admits that using the current method of prescribed burns, it can only control VOC emissions by controlling what gets burned and the burning conditions. Furthermore, the study confirms that, "it is likely that emissions from prescribed burning will increase as [the park] steps up [its] efforts to return wildlands to a more natural condition" (Sutherland). Instead, the EPA emphasizes that more effort should be put into reducing emissions from automobiles, which ties with prescribed burns as the largest source of park emissions. Keep in mind that this doesn't even consider the amount of particulate matter (both PM10 and PM2.5), carbon dioxide, or carbon monoxide released by these burns, which was estimated in 2000 to be 308,523lbs, 262,476lbs, 3,281,130lbs, and 24,510,000lbs respectively (EA Engineering, Science, and Technology, Inc.). The EPA releases National Ambient Air Quality Standards, as required by the Clean Air Act of 1990. These standards specify acceptable atmospheric quantities of different pollutant species. The park's fire department recognizes there are alternatives to performing these burns, which could greatly reduce the parks emissions. As it turns out, the fire department is under a great deal of budget constraints that make alternatives less financially feasible (Todd). Congress determines the amount of money the park gets, which has been decreasing in recent years. The park of course is comprised of many different subunits, of which the fire department is one. As a result, the fire department has been affected by these budget cuts while still responsible for planning and carrying out prescribed burns and responding to emergency calls.

Alternative #1 Mechanical Removal

Mechanical removal of forest debris such as underbrush and fallen branches or trees is a popular alternative to performing prescribed burns. Its primary benefit is that it dramatically cuts down on the emission of atmospheric pollutants while still reducing the available fire fuels. However, the fire department overlooks this method because it is expensive. Ideally, the removed forest debris would be repurposed for continued use rather than disposal. Ways that wood waste can be repurposed includes using it to create mulch, processing viable waste for use as lumber, or using it for the production of biodiesel (Sonoma County Waste Management Agency). Repurposing harvested forest debris provides an environmentally sustainable option as well as a profitable one – companies purchase the wood waste and sell it to those who can make use of it. While the park's fire department may be faced with budgetary constraints, selling wood waste to companies that specialize in this kind of repurposing may be a way around those constraints. However, in order for this to become a reality, there would need to be nearby pre-existing markets dedicated to repurposing wood waste, and there are few cities in close proximity to the Grand Canyon. Another drawback of this method is the fact that mechanical removal of forest fuels prevents the return of nutrients to the soil via decomposition. If this method were used over a period of time, there would be a significant depletion of nutrients from the soil, which could affect plant life.

Alternative #2 Herbicides

In addition to being a large source of pollution, the smoke from fires, whether it's from wildfires or prescribed burns, affects the visibility of the canyon. This is a large factor when considering visitor satisfaction. Park visitors come from all over to see and hike through the canyon, so a hazy, smoke-filled atmosphere is not an ideal state for the park to be in. The use of herbicides can reduce the need for burns, and as a result less pollution is released into the atmosphere while also maintaining high visibility in the park for sightseeing customers. The problem with herbicides is that they don't reduce the quantity of fire fuels–they only inhibit growth. Thus, in order to be effective, herbicides would need to be coupled with another fire management technique such as burns or mechanical removal. The primary advantage of herbicides is that they are effective in controlling tree populations. While the use of herbicides doesn't decrease the amount of fire fuels, they do help prevent the quantity of fire fuels from growing. This can reduce the need for burns in the long run by controlling forest plant growth. At the same time, the use of herbicides ought to be strictly regulated due to toxicity. This presents a trade-off between atmospheric pollution and soil pollution. The relative pollution contributions of burns and herbicides would need to be investigated in order to evaluate the true usefulness of herbicides as an environmentally safer alternative. Another consideration is the availability and effectiveness of non-toxic herbicides, as these could make the use of herbicides more realistic as an alternative. (Jones & Stokes)

Conclusion

Fire has many roles in a forest, and the park's fire department is faced with the responsibility of balancing those roles while also controlling various tree populations, preventing forest fires, and maintaining the visibility of the canyon to ensure park visitor satisfaction. Although effective, fire is not the most environmentally sustainable method that could be employed, and other methods such as mechanical removal and chemical treatments ought to be considered and further evaluated. Looking forward, more sustainable methods ought to be sought out. While the problem of utilizing a method that totally eliminates environmental pollution may not be currently available or apparent, emissions may still be reduced. They should employ a mixed approach in which prescribed burns are paired with a less environmentally harmful method such as mechanical removal or the use of herbicides.

ALL PHOTOS TAKEN BY KEVIN FRY

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Saving Nature's Jewel: A Look into Restoring the Population of Eastern Oysters in the Chesapeake Bay

Stephanie Hwang

"He was a bold man that first ate an oyster." – Jonathan Swift, Irish Satirist

INTRODUCTION

Imagine you are sitting on a wooden rocking chair on a balcony with a bayside view. In the distance, trees border the shoreline and a small island situated haphazardly in the center of the water. The sky is painted with the richest shades of yellow and pink as the sun slowly drifts towards the horizon. Canadian geese honk as they hunker down for the night. The last rays of sunlight caress your face as a gentle breeze rolls by, and taking a deep breath, you notice the subtle scents of nature. The world smells crisp, new, and full of the promise for life.

Now, imagine the same body of water with a small island carelessly jutting out in the center. In the distance, you still see trees and shrubbery border the water and hear the slow rumble of water as it flows by. You try to listen for birds, but the only noticeable sounds are the occasional leaves rustling in the wind and the call of turkey vultures as they circle overhead. Looking across the bay, the water is oddly murky and green. Upon closer inspection, the green substance seems to be floating on the water, attaching to rocks, and washing up on the shoreline. Where is it coming from, and why is it here? What happened to the geese and the water? Above all, what caused this change?

If you remove a particular species from the waters of the bay, it can cause the entire coastal ecosystem to collapse. What type of animal could possible have such a significant impact on the environment? Oysters.

THE LIFE OF A KEYSTONE SPECIES

The oyster is arguably one of the most unappreciated animals in the animal kingdom. It is neither fuzzy nor warm. It does not even have a face! Yet somehow, this unlikeable creature is one of the most important in its ecosystem. In fact, oysters are considered a keystone species, meaning the size of its population has a disproportionately large effect on the health of its ecosystem.

What exactly makes oysters so important? Firstly, oysters are filter feeders. They remove organic and inorganic particles in the water that could potentially harm other organisms. In fact, adult oysters can filter up to 50 gallons of water each day ("Oyster Fact Sheet"). By removing microscopic algae and other suspended solids and releasing it back into the water in "bundles," other organisms are able to utilize the pseudo-feces for nutrients.

Not only do oysters increase the clarity of the water, but they also provide a sanctuary for other bay organisms. Oysters provide the perfect surface for barnacles, mussels, and anemones to grow because they require a hard foundation in order to attach and grow. Oyster reefs can also offer a sanctuary and nursery for many other organisms in the bay by offering them shelter and protection from predators.

Eastern oysters fill all of these niches in the Chesapeake Bay, which is a 200-mile long estuary located inland of the Atlantic Ocean extending from Norfolk, Virginia to Havre de Grace, Maryland (Chesapeake Bay Program). This body of water formed from freshwater from rivers and streams mixing with salt water from the ocean. Without oysters, many of the organisms found in the bay would not have been able to colonize there. Without oysters, sunlight would not be able to pass through the water to reach bottom-dwelling plants because of the amount of suspended particles obfuscating the water. Without oysters, the coastal ecosystem would collapse. The vital roles oysters play in the bay make it an indicator of the quality and health of the bay.

HISTORY OF THE EASTERN OYSTER IN THE BAY

Centuries ago, oyster reefs were a dominant feature in the Chesapeake Bay. Not only were they a wonder, but they were also a navigational hazard. Records depict massive mounds of oysters lining the bottom of the bay, rising up at times 30 feet, and breaking the surface of the water (Cutlip). In 1608, John Smith described the oysters in the bay as "[laying] as thick as stones" on his voyage of exploration. Almost a century later, Swiss nobleman Francis Louis Michel wrote:

"The abundance of oysters is incredible. There are whole banks of them, so that the ships must avoid them. A sloop, which was to land us at Kings Creek, struck an oyster bed, where we had to wait about two hours for the tide. They surpass those in England by far in size, indeed they are four times as large." (Pelton and Goldsborough)

In the nineteenth century, the invention of the canning machine provided the perfect tipping point because it allowed oysters to be transported large distances without spoiling. This triggered an explosion in the seafood economy and a period of overharvesting in the Chesapeake Bay. In addition, oystermen began practicing lucrative methods of harvesting that harmed the Bay. Dredges, steel devices dragged across the bed of waterways to scoop out objects and mud, ripped out oyster reefs that once thrived and destroyed the bottom of the bay (Pelton and Goldsborough).

After 1920, only about a quarter of the bay's oyster reefs were left in the bay. Oyster harvesting plummeted between 1890 and 1930, but experienced a gradual

Here the ASB trip to the Chesapeake Bay are pictured after making signs in support for conservation efforts.

decline thereafter (Pelton and Goldsborough). Then, a pair of diseases called MSX and Dermo emerged. Though harmless to people, these parasitic diseases attacked and frequently killed oysters. These diseases, favoring brackish water and warmer climates, destroyed oyster reefs in Virginia and Maryland (Willey).

Currently, the oyster population had fallen to as low as one percent of historic levels (NOAA). By comparison, in the past, the oysters in the bay could filter the volume of water equivalent to the entire bay, almost 19 trillion gallons of water, in a single week. Today, with the remaining oysters in the bay, it would take more than a year to accomplish the same feat ("Oyster Fact Sheet"). Harvesting, disease, and pollution devastate the oyster population. However, steps are being made to reverse this trend.

EFFORTS TO RESTORE THE OYSTER POPULATIONS

The Chesapeake Bay Foundation (CBF) was founded in 1967 with the sole intention saving the bay. They serve as a watchdog and strive to find effective solutions to combat issues that face the bay, such as pollution and erosion. Every year, the CBF publishes a report called The State of the Bay, which grades the health of the bay based on their health index. Based on pollution, habitats, and fisheries, the index report generates grades rating the state of the bay on a scale from zero to 100. A score of 100 signifies the bay has returned to the conditions reflected in the 1600s or when the water is clear and the bay is once again teeming with oysters. Since the founding of the CBF, the scores have gradually increased over the years from the low 20s to 32 in 2014, but the state of the bay is still relatively poor. The goal of the CBF is to reach a score of at least 70 on CBF's health index, which means the bay is stable and healthy enough to sustain itself without human interaction or intervention ("State of the Bay").

Because eastern oysters play such a complex and crucial role in the bay ecosystem, the CFB established the Maryland Oyster Restoration Center (ORC) in 2002 to provide a sanctuary for juvenile oysters, or spat, to develop. The ORC collects oyster shells from local restaurants and oyster-shucking factories, allows spat to attach to man-made oyster reefs in an environment without the fear of predators, and disperses these hatchery-produced seed oysters into the bay. They are constantly refining this process to yield a higher number of spat per oyster shell ratio, such as sifting for the shells of adult oyster and discovering the ideal environment for spat to grow. Between 2006 and 2012, the estimated number of spat dispersed into the bay has increased from 6 million to approximately 25.8 million (Willey). Though millions of young oysters are being released into the bay each year, there is still a long way to go before the bay is considered saved.

Taking this into account, the CBF released a report in 2010 called On the Brink: Chesapeake's Native Oysters. It highlights reasons to hope and details the next steps to restore the oyster populations. Main points are as follows:

> Recent research suggest that oysters are becoming more disease-resistant through the process of natural selection

> A boom in Aquaculture is boosting the region's economy, and the government is encouraging underwater farms instead of harvesting wild oysters

> A new oyster sanctuary program in Maryland to provide a safe environment for young oysters, or spat, to grow

> The federal government is proposing a goal to restore self-sustaining oyster populations in approxi-

mately 20 Chesapeake tributaries by the year 2025 (Pelton and Goldsborough)

> Because oysters play such a vital role in the Chesapeake Bay, oyster restoration is the key toward saving the bay.

WAYS TO HELP

During our time in Annapolis, we were able to witness all the hard work devoted to restoring oysters. We spent two days at the ORC helping to prepare the Center for its upcoming busy season, which usually falls between May and October. During this time, the ORC follow a constant cycle of growing spat in oyster setting tanks and planting them in oyster reefs in the Chesapeake Bay. In our time there, we were able to aid in a rain barrel project, sift through donated oyster shells, and repair two oyster shakers, which are devices used to sift shells. The tasks we accomplished would have taken the ORC volunteers multiple days to complete and taken them away from addressing other concerns.

ALL PHOTOS TAKEN BY STEPHANIE HWANG

CBF relies heavily on volunteers to help with oyster restoration. In addition to donating oyster shells for the sanctuary and helping at the ORC, volunteers can also grow oyster gardens. Gardeners are given several thousand seed oysters to grow in a cage for about a year until they are approximately one to two inches long. These oysters are then returned to the ORC to be planted in reefs in the bay (Willey).

Saving the bay is not only CBF's mission, but the responsibility of everyone that lives in its watershed, which covers 64,000-square-miles, covers parts of six states, and home to more than 17 million people (State of the Bay). There are simple ways the average citizen can help save the bay. Some ways are planting trees to prevent erosion, using less water, and reducing the use of fertilizers, pesticides, and herbicides. Because sheer size of the Chesapeake Bay watershed, runoff can easily accumulate in the bay and cause algae blooms at a rate faster than the oysters can filter water. Though there is still a lot of work to be done before the bay is officially saved, hope for the future can be found in the form of an oyster.

Oyster Fast Facts

1. Oysters have the ability to change their sex.
2. Eating four oysters a day gives you a complete daily supply of my of your needed vitimins
3. Oyster farms improve the health of nearby waterways.
4. They protect against soil erosin
5. Only about one in 10,000 oysters contains a pearl

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Do Not Harm: An Inquiry into the Value of Medica Service Trips and Cross-Cultural Interaction

Jeremy Jones

Recently volunteer service trips have come under attack for promoting the notion of "altourism", where well-off individuals go to far off destinations to "help out" for a couple days, enjoy themselves, and then leave, never to return again. Critics say these trips provide no real benefit, rather only letting participants feel they have contributed something and refill their moral karma. They explain that the brief stay of rather unqualified and unskilled foreigners and the attitude these visitors often have is demeaning to the communities they go to work with and actually can be a detriment to the community. This complaint is especially commonly associated with medical service trips, claiming that they detract from the host country's impetus to develop infrastructure and invest in health and human services, instead they become expectant and reliant upon foreign sources. Further, these critics elaborate that the use of students and untrained personnel is insensitive to the patients, often giving the notion that they are second rate individuals, subject to a lower standard of care. Yet, if there are all of these issues with these trips, what are we supposed to do? Sit idly by and do nothing while we have the ability to help?

These critics say the most useful approach if we truly are to help would be to simply make a donation to a reputable, established, and permanent NGO working in this region. While this is well and good, that leaves one significant issue. How do you incite the original investment; why would people care about that particular cause? The very interest of altourists to go see a new culture as they work is the very reason why unattached donating would not work –there is no emotional investment and we as a species are incapable of fully comprehending or empathizing with someone else's situation from afar without a point of reference. Rather, statistics are just numbers on the page. While they may be sad, they may not feel real or potent.

Trip participants pictured creating emergency delivery kits

This is part of human nature, even when supposedly being selfless, we are still self-serving to some degree. Many biologists claim that there is no such thing as true altruism, as even the most selfless act can be associated with personal gain. While we may feel for people suffering financial hardship in far off regions, we're much more likely to do something to help those we know or have a direct relationship as we have a larger personal investment and attachment. We better understand what struggles they go through, and have that critical emotional tie. While researching and subsequently experiencing these trips myself, I have found they have irreplaceable value due to this fact. By taking people to work in the area and engaging in service learning you give them the opportunity to forge this relationship, sparking cross cultural exchange and creating an opportunity for them to change their perspective and attitudes, creating a snowballing effect leading to more productive and systemic change.

This point could not be better emphasized than by how Olive Tree itself was forged. Two of the founding members of Olive Tree who we spoke with (Verna Raynor and Ellyn Stecker) met through their work with a program similar to ASB at Manchester College which was providing services in Nicaragua. They became enraptured with Nicaragua and several years later decided to create their own organization aiming to increase health services in underserved rural areas. This helps to highlight the value of these kinds of trips in terms of increasing exposure and getting involved. It is likely these individuals

may never have established themselves in Nicaragua, and the regions they serve would not be receiving any of their resources had they not attended Manchester's trip. It served as a spark to show them a new culture and help them discover an unknown passion that flourished into a productive NGO. This helps explain how the debate regarding foreign aid turns into a bit of a chicken and the egg phenomena. While the money from a direct donation will likely go much further in terms of real immediate benefit, increasing the number of people making the donations and acquiring human capital seems to be best achieved by conducting such "altouristic" trips. The more experiences like that are created, the more of a snowball effect there is and the more powerful it will become. If these trips are approached properly (e.g. extensive follow up and reflection) they can cause people to become invested in long term change matters they may never have otherwise thought about at all. Even if they don't lead to such action, they make people more aware of the global community and other cultures, making them more tolerant and improving relations in their everyday lives, helping to dispel misconceptions that lead to distrust and animosity between cultures. This point is driven home by a comment made by one of the founders, Verna Raynor, when discussing Olive Tree Nicaragua's services, "[they] are just a drop in the bucket, but if everyone put a drop in it would overflow." Even if altouristic trips may not be the most economically efficient approach, the multiplicative effect of service learning can be profound. Service learning in particular is superior over mere exposure to another community as it forces one to become much more closely integrated, increasing the likelihood of fruitful interaction. The more included travelers feel, the more invested they will be in the community's well-being.

However, while this shows the value of this approach in creating interest by way of the founding of Olive Tree, we have not yet assessed the value of Olive Tree itself. Medical trips in particular receive the complaint that they are not sustainable and undermine the efforts of local practitioners who have fewer resources available to them. This point has a lot of validity and was one of the primary concerns I wanted to investigate in this study. Could Olive Tree be doing harm by removing the criticalness of development in medical infrastructure? Possibly. Definitely if they were only providing these medical services briefly once a year and nothing else. But that isn't how Olive Tree works. Unlike many other organizations they are aware of this innate weakness and seem to be working hard to combat it. For Olive Tree to be most effective they would need to have members staying year round, integrating into the community and working with community members to create attitudinal change in a bottom-up style. However, great as that would be, it simply is not feasible. Most of those involved in Olive Tree are doctors and nurses with jobs and families in the states that preclude them from moving permanently. Furthermore, it is rare that you will find someone willing, as Dr. Stecker told us. While we may have the noblest of intentions and want to do as much as we can, most of us come from a privileged state and for most of us it is hard for us to cope for long periods of time without such luxuries we consider commonplace. I for one was ashamed at how near the end of the trip I pined for water pressure, despite knowing I was in a region where mere access to water is scarce. This attitude was also more than obvious amongst my participants who just a few days before had been overzealous and it became apparent to me how even when organizations know there are more effective approaches, they can be nearly impossible to employ as again, they may require the selfish being to give up its luxuries, something it seems the

The University of Virginia's 2015 trip to Nicaragua

consumerist psyche cannot do.

I was delighted to find Olive Tree realizes this as an innate major weakness and thus has been trying to become progressively more involved in long term community development via investments that can develop even while away, for example by sponsoring several students through medical school (increasing availability of doctors in the region) thereby laying the foundations for greater access to health care. This in particular is vital in the areas served where it can be hard to reach doctors as they are few and far between, making visits cost prohibitive not only due to the price of a visit, but also in terms of time lost from work by going. By helping train people in these areas they are ensuring there is some level of care available year round. Additionally, they work to train local health promoters, thereby increasing dissemination of information. One of the things I found most shocking was the lack of knowledge about medical topics I have known from an early age, which further illustrated to me both the lack of infrastructure in these regions and the overwhelming value health education has in terms of prevention and community wellbeing. Thus, even if the presence of these organizations is reducing pressure on the government to help these areas to some degree, medical service trips seem valuable not only in terms of immediate care, but also in fostering community care in regions that likely would not see much medical attention for a while to come. Furthermore, these organizations themselves often put pressure on governments themselves, partially nullifying this argument.

I became surer of the value of these trips when properly executed while talking to Ellyn about what was available to the people living in these rural areas of Nicaragua. Until recently, cell phones were virtually nonexistent in the Huehuete area. There also was no pharmacy in Huehutete, and even now medications are cost prohibitive. While there is health insurance available, few have access to it. Even government sponsored health insurance through work is difficult to obtain. Prospects of college attendance are near nonexistent for poor families; it costs about $1000 per year for a student to go through school, but most families cannot even approach paying it. For example, the highest earners such as doctors only get about $300 a month and teachers $200. Finally, medical information is very decentralized in terms of dissemination. The government primarily relies on health promoters who are volunteers in the communities that only receive minimal training. Thus, it is hard to find a way to spark change when access to education is so prohibitive. Furthermore, when asked about how people could be so complacent to this state of affairs, Dr. Stecker pointed out how due to the political turbidity in Nicaragua there has been a development of apathy and disenfranchisement that is hard for us as Americans to understand. People in these rural areas often feel they have no agency, no power to create change. I was stunned by the fact that many did not even know their birthday, nor see any reason this date would be important.

This attitude of cultural disenfranchisement makes Olive Tree's work that much more important. They work closely with health promoters to help spread information to these rural communities, allowing them take charge of their own well-being. They provide life-saving information such as explaining how to deliver children safely and sterilely, vital considering that 75% of births occur at home, making tetanus a major killer. Through partnerships with organizations such as Qxion and Blessings Olive Tree is also able to bring in thousands of dollars' worth of medicine, which are given to local doctors after the duration of the delegation's work, increasing their stores for

Extremely close living quarters increase risk of communicable diseases.
Jinotepe, Nicaragua

months to come. They help increase knowledge about water safety and precautions (the leading cause of death for babies is diarrhea) and providing emergency birthing kits. Verna had great experience midwifing in the U.S. and brought additional appalling information about the nonobvious yet damning effects of lack of infrastructure and harm that can be done by these organizations aiming to help if proper care is not taken. Many of the organizations that come down to help provide housing end up unwittingly contributing to rates of incest and rape by building homes with people living in one or two rooms resulting in "children sleeping with parents, siblings sleeping together, children hearing sexual activities, allow[ing] too much early knowledge of intimacy." She pointed out how little unexpected aspects like this can occur as a result of our work, thus we must be very self-critical and aware of the consequences of our action.

This brought a very real element to the debates regarding medical trips. Is it possible we are doing more harm than good? For Olive Tree I believe the answer is clear. Without their work these regions would largely be forgotten and people would remain untreated for conditions that could easily be prevented, yet could unnecessarily take their life. Yet Olive Tree must remain vigilant and self-critical to ensure they are not usurping the endeavors of others or interfering with development efforts. Fortunately in recent years Nicaragua has made major developments. For example any graduate of a public medical school must do two years of social service, vaccinations are given door to door, and Nicaragua is following Costa Rica's lead to capitalize on the natural resources available to them to develop a tourist economy. While this creates another issue for debate, it does promise more financial resources that can be invested in health and human services, for which there is mounting political pressure. Unfortunately, according to Dr. Stecker, the political climate is making it difficult to make a unified front, as there is political pressure for local doctors not to speak out.

Olive Tree made it clear they do not want to be the principal health care provider, but rather supplemental to existing and developing healthcare infrastructure, working to ease the growing pains. They are working to provide immediate benefit via their medical delegations, but also longer term by investing in the community and giving them the resources to take matters into their own hands. This two faceted approach seems to best reconcile competing interests, and the inclusions of participants such as us in these delegations clearly has the vital effect of spreading knowledge and interest in the public health status of Nicaragua, as evidenced by the existence of this paper.

View a report of Olive Tree's most recent delegation here: http://www.olivetreenica.org/reports/reportfinalnica2015.php

First year Michael Knapp sits down outside of a small resturant in Nicaragua

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Moab, Utah Without Water Current Research and Possible Solutions

Marnie Kremer

With nine inches of annual precipitation, an elevation of 4,000 feet, and millions of people coming to visit each year, park rangers in Dead Horse Point State Park must think critically about their daily water usage. The park comes with a magnificent view of the Colorado River Basin, Canyonlands National Park, and an abundance of native vegetation such as Juniper trees, Pinion pines, and single leaf ash. Issues such as water contamination and water usage of invasive species are points of concern the city of Moab must begin to deal with in order to ensure a thriving environment as well as booming economy.

The city of Moab is close enough to use the Glen Canyon Aquifer and La Sal Mountain springs as water sources rather than compete for downstream water in the Colorado River. In particular, in order for Dead Horse Point State park to provide running water to visitors, they must bring in truckloads of water each day. There are no showers in the campgrounds. Visitors at Canyonlands and Arches National Parks will notice most bathrooms have no running water whatsoever.

How does a city with a growing population of 6,000 that doubles or more during spring and summer months provide enough water to visitors and inhabitants? These water sources face the ongoing threat of contamination from septic tanks, residential wells, landfills, and agriculture. The Glen Canyon Aquifer is typically ex-

posed at the surface and is considered unprotected from contamination at those locations (Updated Drinking Water Source Protection Plan).

An abundance of scientific research has begun to focus on invasive species' water use, and how evapotranspiration rates might exceed that of native species. When land is disturbed for any reason such as construction or human disruption, non-native species have the advantage of growing in faster than native species. Revegetation plans must be closely monitored and invasives are likely to keep coming back even after removal.

One of the most common riparian invasives in Moab and surrounding the Colorado River is the tamarisk, a deciduous shrub originating in Eurasia. Tamarisk (saltcedar) grows in dense thickets along shorelines, increases wildfire hazards, and often provides poor habitat for wild animals and birds (Tamarisk FAQ). Tamarisk cannot survive colder winter temperatures, yet this limitation might change due to predicted changes in climate over time (Shafroth et al.).

While tamarisk potentially uses the same amount of water as native species, they can grow over greater areas along the floodplains than native species can. Tamarisk is often removed through mechanical methods (cutting them down), chemical methods, and most recently through biological control. The introduction of the saltcedar leaf beetle, a beetle that consumes the leaves of the tamarisk and overtime weaken and eventually kill the plant, has had controversial responses. Some believe that including a new species to the environment could have unintended effects such as harm to other species like the willow flycatcher (Prettyman). In addition, removal of tamarisk often leads to invasion of the Russian olive thorn trees, another non-native species well suited to the desert environment.

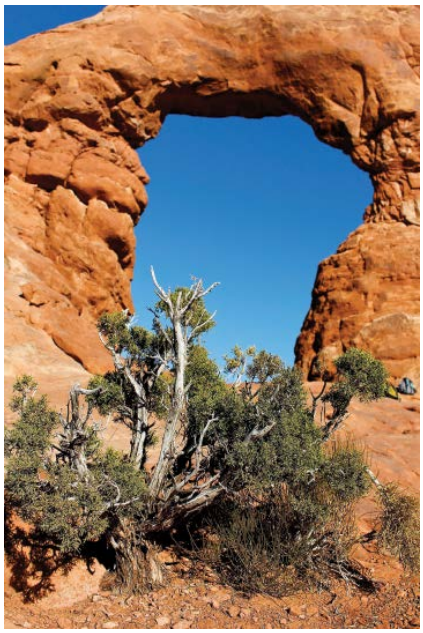
In a report by USGS titled Saltcedar and Russian Olive Control Demonstration Act of 2006, previous research questioned the water benefits of saltcedar removal and believes more advances in evapotranspiration measurement methods are necessary to make any concrete conclusions. The report suggested that future research should focus on small watersheds that often support high vegetation cover relative to stream and groundwater discharge. The removal of non-native vegetation cover along multiple low order streams could have considerable impact on downstream water discharge into higher order streams (Shafroth et al.). An example of a potential research project would be near La Sal tributaries that eventually flow into the Colorado River.

The Quality Assurance

Project Plan for the Spanish Valley Watershed, created in 2014, set goals in which the city of Moab can monitor and mediate water quality and protect streams from excess sun exposure and erosion. Improving water quality will be implemented by working with local organizations, citizens, and Moab Area Watershed Partnership to repair flood plain functionality, improve streambank stability, reduce erosion, and increase stream shading. Decreasing water contamination starts with informing and educating citizens and community members of the effects of non-point source pollution and emphasizing ways they can reduce their impact (Project Proposal Summary). An action believed to reach these goals includes revegetating and monitoring areas where invasive species have been removed but native vegetation has not grown back. The project highlights unintended impacts of invasive species removal without revegetation such as changes in erosion patterns and exposing streams to more sunlight, potentially increasing stream temperature.

It is important to note that tourists visiting Moab and surrounding parks bring in $250 million annually (Project Proposal). Yet, this increase in tourism has cause for concern of contamination of attractive recreation areas. Local parks often address these issues by creating designated trails and providing bathrooms and parking lots to restrict tourist land use.

From spending time in Moab, it was clear that there was much concern for the coming summer months. Very little precipitation seen this winter season most likely means increased droughts and wildfires in areas with vegetation in the coming months. Proactive measures such as the Quality Assurance Project Plan are necessary to ensure there is enough water not only for native vegetation but also seasonal visitors that support the local economy. Preventing contamination is an absolute necessity; there is no other available water source to Moab for miles around.



ALL PHOTOS TAKEN BY RUXANDRA BAGEAC

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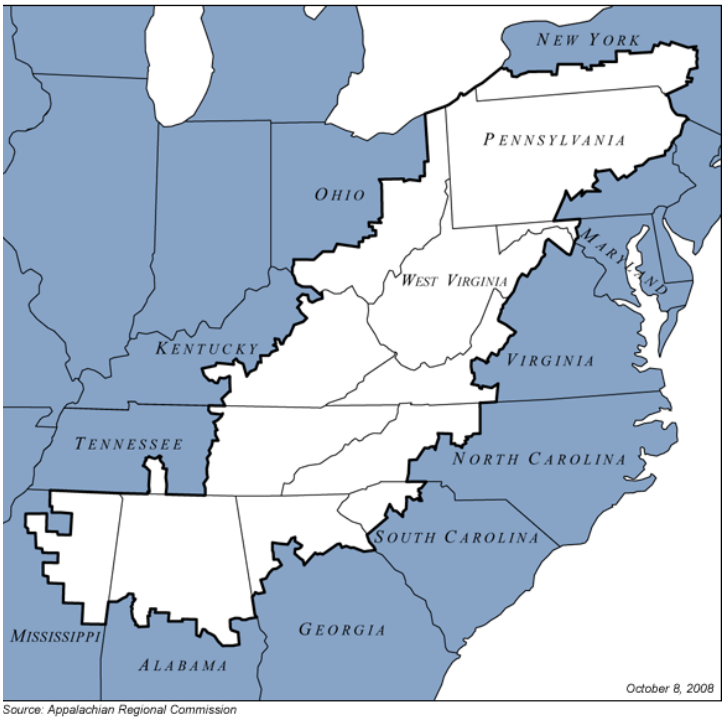
Healthcare in the Appalachia Region

Angela Liu

The United States' health care spending has been rising steadily over the past 40 years, as measured as a percentage of the gross domestic product (GDP). In 1960, health care spending accounted for 5.1% of GDP and by 2002, health care spending accounted for 14.9% of GDP[1]. Equally alarming, health care spending is projected to grow at a faster rate than average annual growth in the GDP, meaning that health care spending as a percentage of the GDP will continue to increase in the next 10 years[2]. These sobering facts are compounded by the changing demographic landscape of our country. Research shows that the elderly spend much more on health care, and that the elderly population is a rising share of the U.S. population[1]. With regards to health care and costs in the United States, our current path is not sustainable, and changes are needed to "promote the general welfare," an established goal that provides the foundation of our country[3]. The Obama administration has introduced a new model for the health care system for our Nation, called the Affordable Care Act. While our country has adopted the overall plan, it remains incompletely implemented in many states, and critical provisions are currently being discussed and decided upon in our court system. The problems surrounding health care still remain, and will continue to remain well into the future, unless we make changes.

Figure 2. A member stands in front of a bathtub that serves as a source for water.



Source: Appalachian Regional Commission

Figure 1. The white area shows the Appalachia area.

Specifically, I'd like to focus on health care disparity as it relates to the Appalachia area. The Appalachia area is an area of the Eastern United States that spans from New York to Mississippi, and is home to approximately 25 million people (see Figure 1). The Appalachia area owns its distinct culture, is rooted in its agricultural ways (while mainly rural, the area spans many big cities), and has historically fallen behind the rest of the Nation in education. The area has also been rooted in poverty, which first came to light in the 1940s[4]. As a culmination of these factors, along with others, the people of the Appalachia have consistently had more healthcare costs, access, and coverage disparities than the rest of the country[5].

My Alternative Spring Break (ASB) trip gave my peers and me an opportunity to live in a cabin in the Shenandoah Mountains that could serve as a model to the life for the Appalachian people. We were living in the Mutton Top Cabin, owned by the Potomac Appalachian Trail Club (PATC). PATC provided housing for us, and in return we cleared trails throughout their property. To get to

Mutton Top, we drove up a road that was unpaved and wound up the side of a mountain. With the weather, both of our cars had troubles making the trip. One of our cars safely remained at the bottom of the mountain, while the other car become stuck in the snow high up in the mountain. While this was simply an inconvenience for our group, it reflects the inaccessibility of places within the Appalachia area. It undermines the importance of the critical capacity behind basic infrastructure that is often overlooked within our society, and especially by University students here at UVa.

During our trip, we were exposed to a life without running water, a basic commodity that we have grown accustomed to. To obtain potable water, we fetched water from a nearby stream in various jugs and cartons, and then stored those water cartons outside our house (see Figure 2). When we needed water, we poured the water through a filter that we had brought with us, and the resulting water was safe to drink, and to use for cooking and brushing our teeth, and other basic needs (see Figure 3). Because there was no running water, we also did not have access to a toilet, and instead, used an outhouse ~40 feet away from our cabin. In addition to our cabin not receiving running water, we also did not we have electricity. The lack of electricity introduced a further learning curve and acclimation period. It meant that when night time fell, we were truly in the dark, and that we had to take care of otherwise menial events, such as washing the dishes and using the outhouse, before the sun set. After the sun went down, such tasks proved extremely difficult, even with the battery powered lanterns and candles we had brought in preparation. In addition, we had company within our cabin in the form of mice. The mice would really come alive at night and scurry around our cabin, eating any food that was not properly stored away. In a sense, they became our not so friendly co-inhabitants, keeping us on our toes at all times. Again, this was something we could imagine, but most of us had never experienced before, simply because we had never been placed in such a situation. The lack of running water, the lack of electricity, and the company of rodents set the scene for living conditions that we had to quickly learn to live with.

All of us had brought supplies to help us throughout our stay: baby wipes, hand sanitizer, tissues, etc. Yet, we recognized that during our trip, we were not as clean as we hoped to be. Because of the large inconvenience of simple, yet important, tasks, such as washing our hands, we often found ourselves ignoring them. While we drank

Figure 3. Two members of the trip work together to filter water so that we can drink it.

the water, we could never quite be sure how safe it was, placing our faith in our filter (which slowly accumulated a layer of grime, thus leading us to "wash" it daily). Our new lifestyle, characterized in part by not being as clean as we were used to, could have led to a few health related issues we had. As participants, we would feel lethargic and dirty, and sometimes suffer from headaches. More than once, one of us became sick, and although we could not pinpoint the source of the illness, we could hypothesize that it was due to the unclean situation. Last year, on this trip to Mutton Top, a majority of the participants became sick, and this was pinpointed to either the unclean environment or a contaminated water or food source. Because we did not have electricity, we did not have stoves or refrigerators, so our food had to be monitored carefully.

From our experience, we collectively realized the importance of health. It is our most basic need, and it is something that must be fulfilled. We lived through the difficulties of maintaining health without our otherwise granted resources. Given that our needs, regarding water and electricity, are usually always met, we had not thought about how essential our needs are, and how much

work and infrastructure has been put in place to grant us those commodities. Living in the Shenandoah Mountains provided us with clear perspective about how difficult it might be to even make health a priority, when the day to day functions of staying alive are on the forefront of peoples' minds. To stay hydrated, we were required to fetch water and to stay warm, we were required to chop wood and scavenge for smaller kindle. All in all, we were still living in luxury, as our food was transported from below the mountain, and our larger wood was delivered right to our doorstep.

In recognizing our experience and the context within which it falls, we now must ask ourselves what can be done to help the people in the Appalachia area, as well as what can be done for the larger health landscape in our country. While these problems will not evaporate on their own, there are steps that can be taken to put us on the right track.

The first of these is to spread awareness. While the Appalachia region falls right in the backyard of the greater Charlottesville area, not many students are aware of their history and their current challenges. While we learn and grow in the comforts of our beautiful University, it is critical that students remain informed and remind each other of what is happening right next door. The people in the Appalachia area suffer from severe healthcare access disparity, and may not have access to basic services that help ensure general health of the individual and the population. It is also important to recognize that while the health care issues experienced by the Appalachian people are extremely serious, these issues are felt across our country, as well.

The second of these is to funnel energy to local issues. Looking outward and internationally is admirable and helpful, but it is important to recognize that there is much work to be done in the domestic sphere. While I am not advocating that we should stop focusing on international work, I do believe that we should not allow the energy we spend on international work to deter us from looking in our backyards. We should also fight the urge to work further away because it is more exciting or foreign. There is a lot to be learned close to home, and many lives to be helped.

Alternative Spring Break gave me the opportunity to explore, and experience, a topic that I have found myself extremely passionate about: the greater health sphere. I gained a perspective that will better allow me to understand the constituents of those that I hope my work will affect. I was fortunate to go through this experience with the greatest group of classmates, who shared with me their thoughts on health, and were interested in discussing our situation and their understanding of health, which shaped my current views (see Figure 4). To combat our disparate health issues, our Nation faces an uphill battle. With that said, small steps go a long way, and I am confident that our emerging student leaders will embrace the change we need.

Figure 4. A photo of the group in front of Mutton Top Cabin.

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Accessing Pura Vida in El Progreso

Sophia Padilla

It was 4 a.m. in the morning when we began our journey to Drake Bay, Costa Rica. We got into a car heading toward the airport and twenty-four hours later, we were waking up before sunrise for the second day in a row to continue the journey. We had already taken two cars, two airplanes, and one bus to get to the hostel that we stayed in for the night. Day two began by boarding a 13-seat bus and driving for over 4 hours to a port where we then took a small motor boat to the coast where we were picked up by two old trucks. Finally after 30 hours of traveling with minimal sleep, we had made it to our destination: a tiny town named El Progreso, situated within Drake Bay, Costa Rica a city named after the explorer Sir Francis Drake. El Progreso is just outside of Agujitas, a popular tourist spot in Drake Bay. What seemed like just part of our adventure is actually a major part of the reason Costa Rica is so prosperous right now. However, our idea of prosperous may be different from that of the local Costa Ricans. Costa Rica thrives on its tourism industry, but as time goes on and business continues to increase, it is important to Costa Ricans to be able to regulate the tourism and maintain a Pura Vida.

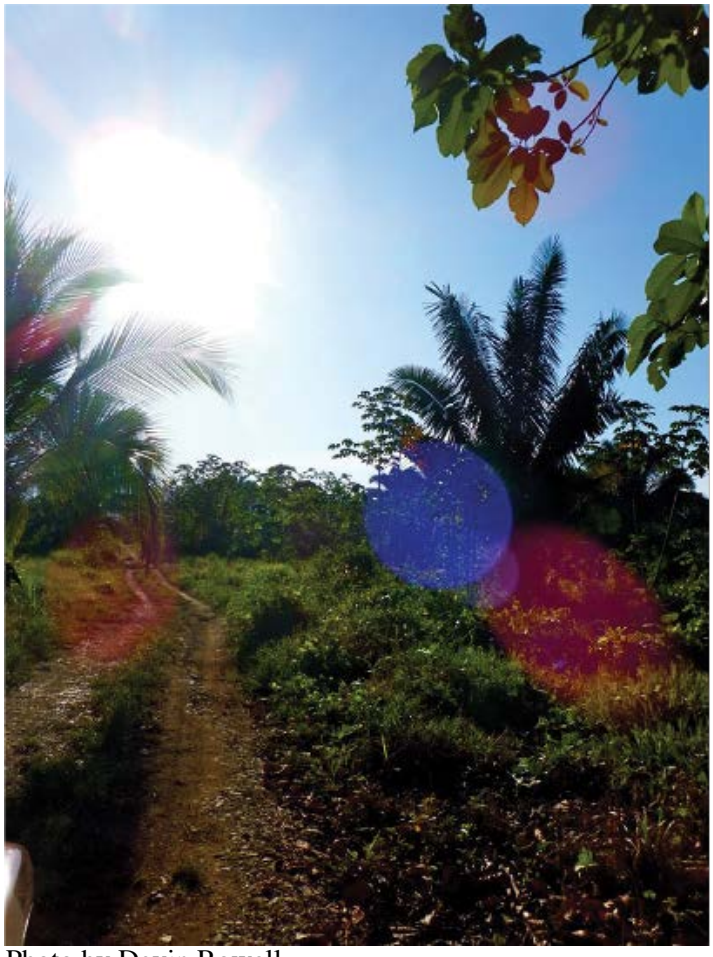

Photo by Devin Rowell

A phrase used to mostly describe the lifestyle, to communicate a general expression of approval, or even to answer the phone sometimes, Pura Vida is a unique way of life that I was fortunate to experience while on my Alternative Spring Break trip. The Costa Ricans live much more simply than I am used to, yet it was easy to understand why they do. Going a week without being able to use my phone, something that is a common punishment to teenagers in America, was the most relaxing thing I've ever done. There were no emails to be checked, no text messages to respond to, and no spending 30 minutes trying to take a perfect selfie. But it is more than just the freeing feeling of being unplugged from technology. The Costa Ricans have a deep, personal connection with their home and a desire to care for it. The majority of the population makes a living through agriculture and the tourism industry (Schäublin). They love sharing their knowledge about the environment and the life within it to foreigners who come to visit. We learned so much from just casual conversation with tour guides who spoke with such genuine enthusiasm for the land and its animals. The general attitude locals have towards the environment is one of admiration. They not only have love for the physical environment, but also a powerful love for their community. When talking with Edu, the owner of the ecotourism lodge that we stayed at, he explained to me how he always tries to support other members of his community by arranging activities for his guests through local tourist businesses like the zip lining tour and snorkeling excursion we did while in Costa Rica. El Progreso is very small so naturally everyone knows each other, and most people have lived there for their entire life (Pomares Pavón). So

far, the Pura Vida lifestyle has been able to coexist with the emergence and continual growth of the tourism industry, but if this hidden gem could be easily accessible by the rest of the world, trouble will follow.

Many of the locals credit the cumbersome journey to maintaining healthy levels of tourists. El Progreso is located on the Osa Peninsula which, according to Alvaro Ugalde, a founder of the Costa Rican national park system, "is one of the most remote and undeveloped parts of Costa Rica, and many places can only be reached by small plane or boat." Because of this underdevelopment, it is extremely difficult to access the area as described by our journey over land, sea, and air. Despite the fact that tourism is currently the biggest industry in Costa Rica, locals largely agree that they do not want further development in the area to make it more accessible to foreigners (Perdro, Pomares Pavón). Our zip lining instructor shared his worries with me about the government's plan to build a new major road that connects Drake Bay with the rest of Central America. The lack of major roads and airports keeps the tourism under control. The El Progreso locals are completely content with traveling on bumpy, dirt and gravel roads, and living off the land and two stores that sell products not locally grown. They understand that overwhelming tourism can bring in unwanted consequences such as prostitution, harm to the environment, and loss of local economic benefits to outside competitor companies. The town, El Progreso, is home to only 150 people, while Agujitas, the heart of Drake Bay holds 300 people (Schäublin). The lodging that is available in this area consists of small individually owned businesses run by locals. The largest of these lodges holds up to 14 people, making our group of 12 students visiting an anomaly (Perdro). Thus in comparison to huge tourist attractions like Cancun, El Progreso is hardly bringing in any tourists at all. Yet the small number of people who choose to make the trek to this secluded area make up a unique group of tourists called eco-tourists. The definition of eco-tourism ranges from simply "a specific form of leisure travel to natural areas" (Hunt), to the encompassing, "environmentally sustainable and economically viable conservation strategy" (Stem) to a "brand of nature-based tourism, which seeks to be low impact and provide tangible benefits for both the environment and host communities" (Honey). This "brand" of tourists has proven to be very beneficial to the small community of El Progreso.

Over the course of one week, we traveled on 5 different airplanes, 3 boats, 3 buses, 2 cars, and 1 truck to get to, from, and around Costa Rica. The difficulty in accessing the area controls the amount of people who can come visit which makes big companies uninterested in developing such a remote area.
Photo credits: Top left: Devin Rowell, Top right: Gabby Levet, Middle Right: Gabby Levet, Bottom Right: Devin Rowell, Bottom Left: Colleen Duda, Bottom Middle: Colleen Duda

The evolution of eco-tourism has been surprisingly successful in Costa Rica due to it's already stable and conscious government. According to the executive director of The International Ecotourism Society and the Center on Ecotourism and Sustainable Development, Martha Honey, "Cost Rica's national parks and biodiversity have been supplemented by other ingredients lacking in many developing countries: its long-standing and well-functioning democracy, its political stability, the abolition of its army in 1948, strong social welfare programs, its respect for human rights, and its (generally) welcoming attitude towards foreigners, particularly the gringo variety. Just as Honey described, the attitude toward the members of my trip and I was always extremely positive. As we joked around in our broken Spanish, the locals joined in and taught us new words and phrases like ¡Qué maje! (an expression similar to pura vida, but used as an interjection when you're happy). Additionally, the crucial foundation of political and social stability is another way Costa Rica, and especially the town of

El Progreso stands out compared to countries that thrive on tourism. However, Costa Rica as a whole is not perfect. Caroline Stem argues:

Ecotourism projects have shown disappointing results in terms of participation…If hotels work towards increasing interaction between tourists and local residents, it will be important to raise awareness amongst travelers about local cultural and social history, so as to minimize negative sociocultural impacts. Ecotourism operators may also wish to organize cultural tours with a few different community groups to ensure a meaningful experience for both the tourists and the community members.

Yet the experience I had was everything that Stem argues isn't fully there. Locals were friendly and excited to share their culture with us just as we were excited to learn about their culture. When talking to a little boy at the local elementary school, he told us his dreams of growing up to own an eco-tourist lodge one day. It could be argued that since we were on an Alternative Spring Break trip as part of a university, our goals were to learn about the culture and environment thereby making us more inclined to engage in those kinds of experiences. However, most people who come to visit El Progreso have the same intentions. They come with respectful attitudes towards the environment and willingness to embrace the lifestyle (Pomares Pavón). They would not travel for hours on end in crowded buses with no air condition to spend a week outside getting eaten alive by bugs and sweating through multiple outfits a day if they did not appreciate the amazing diversity, the untouched environment, the beautiful sunsets, the delicious local cuisine, and the charismatic and loving people of Costa Rica. Honey asks whether Costa Rica can "promote itself as a leading ecotourism/nature tourism destination sprinkled with small-scale rainforest lodges and beach front cabinas, along with dozens of hotel chains and a growing number of megaresorts catering to mass tourism," then concludes with "ecotourism, not mass or conventional tourism, is most in keeping with Costa Rica's geographical size, its extraordinary biodiversity, and its political and social history (Honey). I cannot speak for the entirety of Costa Rica or even all of Drake Bay, but the experience I had in El Progreso was a pleasant surprise. I was afraid that I would go there and find that we were not contributing to the well-being of the community, but the intimate size of the town allowed us to experience a unique lifestyle while supporting local business. Though it took a while to get there, the journey to El Progreso is key in keeping tourism at a sustainable level, and it adds value to the incredible Pura Vida.

Thank you, Edu & Sabrina, Miguel Valladares-Llata, and Esther Poveda Moreno for all of your support

While cleaning up a beach our guides constantly went out of their way to show us turtle eggs while teaching us about the many obstacles these endangered species face. Out of over one hundred eggs that are laid, usually only one will survive to adulthood and return to lay eggs again in the exact same spot. The guides were extremely knowledgeable about the land and loved teaching us about it.
Photo credit: Colleen Duda

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Perspectives on Climate Change: Costa Rica vs. the United States

Devin Rowell

Climate change has evolved since scientists first used the term. Environmentalists are no longer the only ones stressing its importance; there are now public health organizations and governmental agencies involved in its awareness and mitigation (Byrd, 2014). The acceptance and understanding of the complexity of climate change is crucial to enacting effective policies and plans to curb the overarching effects the planet is, and will continue, experiencing. People's lives will be altered in ways that we are only beginning to understand and thus there are discrepancies and differing viewpoints in existence about the topic. The different perspectives of climate change between Costa Rica and the United States are shaped by social, economic, and political factors (Calvo-Alvarado, 2009). These factors must be accounted for and addressed before society can accomplish its goals of adapting to and mitigating climate change with behavioral changes.

Climate change refers to the changes in average weather conditions caused by factors such as biotic processes, solar radiation, plate tectonics, and volcanic eruptions (Kithiia, 2015). Anthropogenic factors have also influenced climate change, often known more popularly as global warming, by the contribution of excess greenhouse gases and other inputs into our atmosphere. Due to climate change, ecosystems have seen temperature and climate changes that have adversely affected their dynamics. Glaciers are melting, ocean temperatures are increasing causing coral bleaching and acidification, and sea levels around the world are rising. Unfortunately, the impacts of climate change are expected to disproportionately fall on the lives of the urban poor (Kithiia, 2015). Small farmers, developing countries, and coastal areas are predicted to be the hardest hit by climate change (Byrd, 2014).

One of the biggest challenges both developed and developing countries face is how to create and implement sustainable plans of action to combat the impacts of climate change. Developing, low-income countries have fewer resources and therefore cannot commit as much to combatting the effects of climate change and likely competition for already scarce resources. Coastal resources are the most at risk due to rising sea levels and

current trends of degradation and over-exploitation (Kithiia, 2015). Costa Rica is one of these less developed countries with many small farms and coastal areas at risk of destruction and even possibly relocation. Costa Rica, however, being less developed than the United States but more advanced than most developing countries, is in a unique situation. Their per capita GDP, energy consumption, and loss of biodiversity are all increasing, yet their rate of deforestation is decreasing (Blasiak, 2011). Numerous studies have been done analyzing possible explanations for their success and the results provide us with hope for the future.

Costa Rica's recipe for success lies in their country's cooperation between policymaking and environmentalists. Their decision makers have acted with strong ethical standards and derived creative, "outside the box" solutions to deforestation and other actions contributing to climate change. For example, they disbanded their standing army in 1948 to invest the money into social and environmental programs for the country (Blasiak, 2011). Not only do Costa Rican policymakers recognize the value of their country's ecosystem, so do all of their citizens. During my time spent in Drake Bay, Costa Rica, it was apparent that individuals had a personal investment in the wildlife around them. The locals were knowledgeable about every plant or animal in sight, they never complained about the lack of air conditioning or other electric luxuries, and most importantly, many of their environmental efforts stemmed from individual initiatives. Signs for recycling and other environmentally conscious memos

appeared in front of houses and small stores all over the town. It was obvious that their lifestyle was one of coexistence with nature and this created a sustainable balance between man and the environment.

The perception of climate change and environmental stewardship in the United States is much different than in Costa Rica. Our differences in lifestyle and upbringing as children contribute a lot to our individual perspectives of climate change (Semenza, 2008). In the United States, the connection between man and nature is much weaker than in Costa Rica. Therefore our sense of social responsibility to take initiative on environmental conservation projects is much weaker than Costa Rica's as well. Various studies have analyzed the awareness of individuals on climate change in the US, including their level of concern, willingness to act, and ability to change their behaviors. Interestingly enough, women and lower-income individuals reported more concern with climate change (Semenza, 2008). Higher-income earners perceive climate change as less of a threat because they believe they have the monetary means to respond. Typically, the higher the level of education an individual has, the younger they are, and more concerned they are with the state of global warming, then the more likely they are to change their behaviors and reduce personal contributions to climate change (Semenza, 2008). The most common activities believed to reduce climate change in America are reducing energy, gas usage, and recycling. Americans tend to live in excess and expect convenience, so if environmentally friendly actions are inconvenient, we are less likely to go out of our way to do something beneficial for nature. So how do we shape the public's opinions of climate change and alter their social behaviors so that we can develop a sustainable coexistence with nature as well?

Even if consumers are interested in curbing global climate change and are willing to take action, there are many remaining impediments. Economic, social, and structural barriers must be eliminated and government policies need to be implemented to advance the access to available alternatives. Individual adaptations, as well as mitigation efforts from industries, the economy, and the government, are essential to achieving the cooperation necessary for reaching our climate change goals. Adaptations involve preventive and preparation measures to respond to potential impacts from climate change (Semenza, 2008). Mitigation efforts by industries, the economy, and the government consist of actions focused on reducing the sources of carbon and augmenting the sinks of green house gases (Semenza, 2008). Adaptation and mitigation actions will benefit not only human systems but also natural systems, however they must happen in a timely manner and behavioral change does not occur quickly. When designing these strategies to combat climate change, the consumer's input is a valuable resource that need not be overlooked.

Voluntary behavioral changes by individuals are contingent on their state of awareness and concern, willingness to act, and ability to actually change. We must determine how to express the need for change to individuals in a manner that is impactful yet understandable and attainable. The first step is establishing a set of shared values and a personal commitment to the environment, which is often undermined by the tragedy of the commons (Kithiia, 2015). The tragedy of the commons is an economic theory established by Garrett Hardin that individuals acting independently and rationally according to their self-interest will behave contrary to the best interest of the whole by abusing a common resource (Hardin, 1968). The tragedy of the commons can be counteracted with education on our tendencies to do the wrong things because often the greatest reason for not changing one's behavior is they do not know how to change (Semenza, 2008).

Handmade sign posted in front of a small store along the main road through town that reads: "Recycle!

Once this education is complete, the creation of standard values and trusting relationships will reinforce the behavioral changes encouraged for environmental conservation.

Costa Rica has found another way to encourage environmentally conscious actions by recognizing the value of the environment on individual and governmental levels. Many of the community members I spoke with during our trip explained that the roads in Drake Bay were dirt and remained unpaved for various reasons. The most surprising of these reasons was that they helped to control the number of tourists that visit the area. By leaving the roads with potholes and even channels of water running across, large international companies are less likely to establish footholds in Drake Bay and monopolize their local industry. The roads also help them keep the balance between humans and the environment because it limits the amount of habitat destruction the development of a new road system would create.

Some roads in Drake Bay consist of small channels of water the cars must pass through.

Costa Rica has also initiated some payments for certain ecosystem services as a tool for poverty reduction and financial incentives to protect the natural resources around them. Ecosystem services refer to the goods and services that humans derive from the environment for their benefit (Costanza, 1997). These goods and services are often ones we are not aware of, such as ecosystem carbon sequestration and water filtration, and because of their interconnectedness they are often difficult to quantify monetarily. Although some argue capturing these services with a dollar sign is against our morals and essentially impossible, it may be necessary for global resource sustainability in the future because without many of these ecosystem services our world's global economy and life itself will come to a halt (Costanza, 1997).

The effects of climate change are no longer simply environmental, but economic and social as well. Because of this shift and differing perspectives, we must create new policies and solutions that approach the problems holistically, transcending all private and public sectors of society. Our economic well-being is closely related with that of our environment's, so education and behavioral changes are crucial to achieving future success. Costa Rica's story of ethical environmental stewardship provides us with hope that there is an achievable balance. Our ideas, like our oceans, must be vast and expansive to conquer the uncharted territory of climate change.

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Accuracy of Research Regarding Herbal Medicines of the Shuar People

Lauren Teague

There is a significant amount of research on traditional medicine use, specifically herbal medicines, of the Amazon Rainforest. Since the Amazon has a plethora of unique plants and many indigenous populations live in or surrounding the jungle, there is much to write about. I think learning about herbal medicine use is fascinating. I was accepted on an Alternative Spring Break trip to Ecuador. We stayed with a small community of Shuar people who lived off the Amazon Rainforest. There is no end to what I could read about herbal medicines in the Amazon, but I thought this trip would be an amazing opportunity to find out for myself what the Shuar people use as medicine.

While I wanted to get most of my information from the people I was interacting with in Pastaza, Ecuador, I did not want to show up completely unprepared. I started out researching a basic history of the practice of medicine in Shuar communities. I learned that in the 1970s, the Shuar people still thought witchcraft was the main source of sickness in their community. Sick people would usually go to the village shaman, a holistic healer who focuses on both physical and spiritual illnesses, to be treated. Missionaries eventually visited the community and built six health posts throughout several Ecuadorian Shuar communities by 2012 (Giovannini, 2015).

Rather than going to the community and asking them to come up with a list of plants that they use, I thought it would be best to come prepared with a list of plants that scholars have claimed the Shuar people use. I would bring this list when I speak with the community and have the people I interact with tell me if they actually use them or not. In order to create this list, I used the most recent and relevant source I could find. I used an article called "Medicinal plants of the achuar (jivaro) of amazonian ecuador: Ethnobotanical survey and comparison with other amazonian pharmacopoeias" from the Journal of Ethnopharmacology. The article lists all the medicinal plants used by the Jivaro peo-

ple, and then it specifies which of those plants are also used by the Shuar people. I used this information to compose a list of plants that the Shuar are expected to use, including the plant species, the local name and Spanish name of the plant, how the plant is prepared, and what the plant is used to treat. I then used a variety of other sources to add pictures of each plant. I thought that if the Shuar people were not familiar with the names of the plant used in the article, they could still recognize a picture. I will not include the pictures in this report for the sake of saving space, but I will include the list of plants I brought with me. All the links to the pictures can be found on the citations page.

During my week in the Amazon, I spent an entire afternoon talking to José, our site contact and the man in charge of our group, about medicines in the community. From our conversation, I learned that sickness is relatively rare in the community. People are very active and they eat healthy, organic foods. When people there do get sick, it is usually only a headache or a cold. Many herbal remedies are common knowledge to the people in the Shuar community, so a lot of the time people treat themselves.

If it is a more severe problem or something they do not know how to treat on their own, they will go see a shaman. The shaman is not chosen and trained. Rather, being a shaman is a calling. José explained that shamans must have a clear mind and have all their energies aligned in order to make objective decisions. Shamans must also consume a certain plant which will help reveal if they are spiritually able to be a shaman. José would not tell me the name of the plant, for it is sacred to the Shuar people.

Not every ailment can be treated with traditional medicines. If a shaman encounters a sickness that they cannot confidently treat, they will recommend that their patient visit a doctor in the closest village. This is the last resort for the Shuar. They do not trust doctors. To the Shuar people, western medicine is not ideal, for the drugs cause as many problems through their side effects as they fix. The Shuar believe that doctors intentionally choose drugs with many side effects to make their patients return for more cures, therefore ensuring that they will continue to have business. The Shuar people think doctors all have their own self-interests in mind when treating patients. Perhaps it is because of this distrust that the Shuar have become so sufficient in herbal medicines. Below is a list of all the plants I came prepared to ask about. In this list I have included additional information that I learned from speaking with José. I also included whether or not the Shuar people use each plant. To clarify, a yes or no only suggests that the community of Shuar that I stayed with use or do not use it. Other Shuar communities might.

1. Species: ***Adenostemma fosbergii***
Local name: Araraats
Use: **Snakebite**
Preparation: Leaves are crushed and mixed with water, used orally
Used by the Shuar: no
Information from José: n/a

2. Species: ***Brugmansia insignis***
Local name: Maikua, Floripondio
Use: **Fractures and sprains**
Preparation: the stem is scraped and squeezed to extract juice, the juice is drunk and applied externally with bandage
Used by the Shuar: yes
Information from José: These plants can produce flowers of three different colors: white, yellow, and pink. The white species is found in José's community.

3. Species: ***Brugmansia insignis***
Local name: Maikua, Floripondio
Use: **Wound Healing**
Preparation: The stem is scraped and squeezed to extract juice and applied externally with bandage. The leaf is roasted, grounded, and then applied on the wound
Used by the Shuar: yes
Information from José: same plant as above, also found as white species

4. Species: ***Brunfelsia grandiflora***
Local name: Chirikiasip
Use: **Rheumatism**
Preparation: Decoction is used orally
Used by the Shuar: yes
Information from José: This plant was planted in their garden, which was approximately ten yards from where my team was sleeping; I also saw it while hiking through the jungle

5. Species: ***Crematosperma cauliflorum R. E. Fr.***
Local name: Mantach, Quinina
Use: **Diarrhea, dysentery, colic, stomach pain**
Preparation: Decoction
Used by the Shuar: no
Information from José: n/a

6. Species: ***Croton lechleri***
Local name: Uruch numi, Sangre de drago
Use: **Wound healing, Leishmaniasis**
Preparation: latex is applied on the lesion
Used by the Shuar: yes
Information from José: n/a

7. Species: ***Carica papaya L.***
Local name: Papaya
Use: **Parasites**
Preparation: seeds are crushed and mixed with water, used orally
Used by the Shuar: yes
Information from José: the Shuar name for this plant is Wopai

8. Species: ***Croton lechleri***
Local name: Uruch numi, Sangre de drago
Use: **Diarrhea, dysentery**
Preparation: raw latex is used orally
Used by the Shuar: yes
Information from José: n/a

9. Species: ***Croton lechleri***
Local name: Uruch numi, Sangre de drago
Use: **Stomach ache**
Preparation: raw or cooked, used orally
Used by the Shuar: yes
Information from José: n/a

10. Species: ***Cymbopogon citratus***
Local name: Hierba luisa
Use: **common cold, fever**
Preparation: decoction is drunk or the water is used to bathe
Used by the Shuar: yes
Information from José: common name is Lemongrass; in the Shuar community it is also commonly used for stomach pains and indigestion

11. Species: ***Cyperus articulates L.***
Local name: Piripiri
Use: **to limit childbirth pain**
Preparation: root chewed with water and then the water is drunk
Used by the Shuar: yes
Information from José: in the Shuar community it is also commonly used as shampoo and to promote health in babies, specifically treating neonatal diarrhea

12. Species: ***Cyperus prolixus Kunth***
Local name: Piripiri
Use: **Diarrhea**
Preparation: Crushed with water or chewed and then used orally
Used by the Shuar: yes
Information from José: same plant as Cyperus articulates L. (while they are different plants, they share the same local name and are used for similar purposes)

13. Species: ***Inga edulis Mart***
Local name: Wampaa, Guava
Use: **diarrhea, dysentery**
Preparation: decoction is used orally mixed with Psidium. guayava
Used by the Shuar: yes
Information from José: n/a

14. Species: ***Jacaranda copaia***
Local name: Kuiniap (Kuiship)
Use: **Leishmaniasis, dermatological**
Preparation: leaves are crushed and applied externally
Used by the Shuar: no
Information from José: n/a

15. Species: ***Musa x paridisiaca***
Local name: Majench, Guineo, Orito
Use: **Diarrhea**
Preparation: latex is used orally
Used by the Shuar: yes
Information from José: in the Shuar community, Majench is eaten to treat diarrhea and mashed on the skin to treat scrapes

16. Species: ***Zingiber officinale Roscoe***
Local name: Ajej. Jengibre
Use: **Diarrhea**
Preparation: decoction or rhizome crushed in water and then used internally
Used by the Shuar: yes
Information from José: drink as tea

17. Species: ***Zingiber officinale Roscoe***
Local name: Ajej, Jengibre
Use: **common cold**
Preparation: decoction or chewed
Used by the Shuar: yes
Information from José: drink as tea

18. Species: ***Zingiber officinale Roscoe***
Local name: Ajej, Jengibre
Use: **cough**
Preparation: decoction or chewed
Used by the Shuar: yes
Information from José: drink as tea

19. Species: ***Zingiber officinale Roscoe***
Local name: Ajej, Jengibre
Use: **blood loss during childbirth, pain during childbirth**
Preparation: decoction, used orally
Used by the Shuar: yes
Information from José: drink as tea

20. Species: ***Zingiber officinale Roscoe***
Local name: Ajej, Jengibre
Use: **snakebite**
Preparation: chewed together with roots of Cyperus sp.
Used by the Shuar: yes
Information from José: Ajej, or ginger root, is also used in preventing pregnancy; when mashed up and added to a small amount of water, it prevents pregnancy for two years while also causing an ir-

It was very interesting to review my plant list with José. I asked him if he recognized any of the plants on my list. I expected that he would, but that one would have to hike into the jungle in order to retrieve them. However, he pointed to a Brunfelsia grandiflora bush on the first page and then pointed to the same bush that was no more than 10 feet away from where we were standing. José then took me on a walk around their garden and pointed out several of the medicinal plants on my list, including Brunfelsia grandiflora, lemongrass, and ginger root. He then showed me how to gather five ingredients necessary to make a tea that would treat indigestion and stomach pain: bark of oyava, young leaves of oyava, ginger, pineapple leaf, and lemongrass. Once we gathered all the ingredients together, he handed me his knife and instructed me to gather all the ingredients a second time, this time by memory only. Once I had collected everything, we put the ingredients together in a pot with water and boiled it for ten minutes. I did not have a stomachache when I drank it so I cannot tell you if it worked or not, but it tasted delicious. Out of the fourteen plants that I came prepared to ask about, José recognized eleven of them. Other Shuar tribes may use the three he did not know. Perhaps those plants do not grow in the region that I stayed in. I would have to say that the research done on herbal medicines among the Shuar people is accurate. However, it is missing a few of the alternative uses that José mentioned. Shuar communities do rely on herbal medicine for the majority of their medical problems. Almost all common ailments can be treated with the plants on this list. My visit to the Amazon confirmed the research I found before I left, and seeing it in person was an invaluable experience.

ALL PHOTOS BY LAUREN GREALY

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The Dangers of Tourism in Paradise

Heather Thompson

Verdant views and welcoming vestibules met us at every turn throughout our week in Puerto Rico. We alternated between dense foliage encompassing bamboo stalks larger than our calves and the gorgeous but urban cityscape. The island was something of a paradox. The combination of natural beauty and modern industry, of commercialism catering to tourists and historic culture, left the true identity of Puerto Rico as something to be uncovered.

Economically, Puerto Rico is going through what might be considered tough times. Referred to by the Economist as the "Greece of the Caribbean' , there are a number of issues which desperately need to be addressed. Because it's a U.S. territory, Puerto Rico uses the national minimum wage, labor is expensive and exports are not competitive. Although investment from U.S. companies has been beneficial in past years, Puerto Rico's reliance on the U.S. government has also become problematic. After 2006, the federal tax exemptions put in place on local taxes expired, and Puerto Rico's economy entered into an ongoing recession. In addition, the Puerto Rico Electric Power Authority (PREPA) is on the verge of bankruptcy as a result of mismanagement and a reliance on fuel oil. This recession and debt crisis has effectively caused a bankruptcy state, complicated by the fact that Puerto Rico is neither an independent nation nor a state, but a U.S. territory. In 2010 per capita GDP was at $16,300, compared to $51,400 for the mainland U.S. Unemployment is at approximately 16%, and has been consistently over 10% for the past decade.

Among many solutions proposed to the economic troubles seen in Puerto Rico is the encouragement of the blooming tourism industry. In 2013, it was estimated that travel and tourism were directly accountable for 2.3% of GDP in the Commonwealth. However some experts are looking to change that, hoping to bring in more revenue and promote growth and jobs from both direct and indirect influences of tourism. The government has created a "Business Star Proposition's tax incentive package" in an attempt to encourage the development of tourism within Puerto Rico. Multiple 'Tourism Development Acts' have been put in place, ranging in emphasis from developing projects in municipalities in need, increasing cruise ship layover in Puerto Rico as well as increasing passenger counts, hotel development, and airline development. There are abundant tax breaks and exemptions for business willing to invest in the island's desirable atmosphere.

The lure of Puerto Rico for tourists is multifaceted. Plane tickets are relatively inexpensive, and being a U.S. territory, visitors from the mainland do not need to possess a passport in order to fly there. Because of its territory status, the dollar is used so currency exchange is unnecessary. Even though Spanish is the primary language, it's not difficult to find people fluent in English as well. In addition to these points of convenience, Puerto Rico possesses incredible natural beauty and impressive biodiversity alongside modern commodities. Among its many attractions are the biolu-

minescent bay at Fajardo, the kioskos at Loquillo Beach, Culebra beach, the Spanish fort El Morro in Old San Juan, and the focus of our ASB trip: El Yunque National Forest.

Of the U.S. national forests, El Yunque is the only tropical one, and offers and entirely different atmosphere than a typical hiking environment. El Yunque is approximately 30,000 acres, and contains about 250 different tree species. This is the same number of tree species as the 192 million acres of all other national forests combine contain. There are 23 species of tree unique to the El Yunque forest, along with 50 native orchid species and over 150 types of ferns. While hiking along the trails, we saw several types of stick insects, watched multiple bird species in the treetops, and heard the near constant trill of the coqui frog. Being able to hike through the rainforest and work on the trails was an incredibly fulfilling experience which I hope many people will have an opportunity to enjoy as tourists. However, with increased tourism also comes increased complications.

A primary concern is making sure that the enjoyment of the park is a safe experience for everyone involved. Although the view from Yokahu tower or Mount Briton is absolutely worth it, the hikes aren't necessarily easy ones. Our guide Aurea Moragon told of a recent unfortunate incident where an older man died of a heart attack just as he reached the observation tower at one of the taller peaks within the park. Family and friends were with him, but he was not able to receive the necessary medical care in time. The hikes can be more physically demanding than one might assume. Our group encountered this first hand when as we were working to clean up the trail which led to La Mina falls we came across an older man struggling forward. He confessed that he had heart, back, and knee problems, but was determined to make it to the falls. Unfortunately, the trail is steep and slippery at some points, and after tripping and falling several times, two of our group members had to assist him back up the trail to his tour bus.

Although many of the trails are well marked with concrete paths or handrails, they still require a respectable amount of physical exertion, and people aren't always prepared for the amount of hiking necessary to get to some of the more scenic locations. We saw a number of tourists in flip-flops and bathing suits surprised at the mud on the trail and the length of the path to their final

destination. The frequent rain throughout the forest only adds to the dangers, making parts of the trail slippery and difficult to gain footing on. The rainy weather also means that the risk of flash floods is high, and many tourists are unaware of the dangers which stem from enjoying the abundant swimming holes once the rain begins. In 2012, 35 year-old Kenah Huggins from New York was killed at La Mina falls, swept down river as the water rapidly rose after a sudden rain.

The additional difficulty with many of these incidents is that if someone were to be seriously injured, maneuvering them out of the park without exacerbating the injury has the potential to be a very difficult task. In many areas of the forest, cell phones are unable to get service. While this does make it easier to fully connect with nature and leave behind the distractions of social media, it also makes it difficult to reach out in the event of an emergency. The dense trees would make it difficult for a helicopter to intervene in the case of a medical emergency where someone needed rapid transport to a hospital. In many cases it would require a long and arduous journey by way of the often steep and slippery trails back out of the

forest, by which time the window for successful treatment may have closed.

In addition to concerns for the safety of park goers are a number of logistical concerns, the first of these being the capacity of the park to handle an influx of tourists. As we journeyed to our volunteer site each day, we would drive on incredibly narrow, windy roads that at times were hard to believe are considered 'two lanes'. Even in the off-season, finding parking was at times very difficult. Vans and busses full of tourists competed with small sedans for the limited number of parking spaces at key site-seeing spots. Aurea told me that already, the park is forced to restrict the number of individuals allowed to enter the forest each day during peak visitation season in the summer simply due to the lack of space. If you want to be let into the park, you have to get there early.

In Aurea's opinion, forest visitation should be regulated all year round as it is during the summer to facilitate smooth operation. However, here again arises the issue of a lack of resources on the part of the El Portal Forest Center. She told me that a few years ago, El Yunque was being considered for a position on a 'Seven Natural Wonders of the World List', which caused visitation to the forest to skyrocket. When this happened, adjustment had to be made to accommodate for the influx in visitors and their increased use of the rest areas and recreation centers in the forest. She said that if growth continues at such a rate, "It's going to be trouble".

Along with the allowance of sufficient space, resources for visitors to the park must also be maintained. Rest areas must be restocked and cleaned, drinking water must be supplied to them appropriately, waste receptacles must be emptied, and general upkeep must be regularly completed. According to Aurea, the Forest Center currently employs only 35 individuals, 7 of which are consistently in the field. Civil Engineer Technician Octavio Jordan told me that the forest is increasingly reliant upon volunteers because the budget is insufficient to hire more workers. The current workforce is nowhere near sufficient to accommodate the increase in visitors to the forest which groups advocating for increased tourism may hope for.

Predictably, with more people would come more waste. Pollution is not presently a huge problem within the El Yunque forest, but given a dramatic increase in tourism it could very easily become one. This is dangerous for multiple reasons. El Yunque is home to a number of rare species, including the Puerto Rican parrot, which would be detrimentally affected by the sound pollution and trash which an influx of tourism brings. But pollution is also influential in a way which the average citizen in Puerto Rico might find even more relevant than the welfare of various bird species: El Yunque actually contains the largest concentration of usable freshwater in the Commonwealth of Puerto Rico, supplying 20% of the population with approximately 50 million gallons each day. Because of this, there is a large focus on maintaining the quality of the water supply within El Yunque. In December of 2013, the Caribbean National Forest Wild and Scenic Rivers Act was signed into law in an attempt to secure both the quality and quantity of the water supply from El Yunque.

In a similar vein, Water Treatment Plant Operator Carlos Rivera gave me further insight into some of the technology and systems behind providing water to the rest areas within El Yunque and its surrounding areas. He said that the water that goes to the recreation areas in the park is

primarily surface water from rivers and three deep wells. A basic bio filter with sediment is used to purify the water before use. Carlos' work in El Yunque includes daily tests of the water quality and ensures that all aspects of the treatment plant are running smoothly and in compliance with the Clean Water Act. According to Carlos, the current water system doesn't have the capacity to provide for a drastically increased number of tourists. "The problem is not the tourism, it's the infrastructure; we haven't planned ahead,".

Many solutions have been proposed and different action plans are being considered in order to address the potential problems of increased tourism and the need to ensure safety and well-being for both the park and its visitors. Among those being considered is the use of trams to reduce congestion on the roads during peak visitation season. The plan is for the tram to run on a path between Yokahu Tower and Mount Britton and into the primary recreation area at no expense to visitors. Plans also include new education programs to encourage visitors not to litter and to only bring things to places like La Mina falls that they intend to take back home in an attempt to protect El Yunque's watersheds.

Additionally, the El Yunque National Forest Management Plan is undergoing a Revision and Developing Alternatives phase which is in its early stages to determine the best policies for the forest looking towards the future with changing technology and public interaction. Under the National Forest Management Act, they are preparing this plan as well as an Environmental Impact Statement to detail the implications of any changes. While at El Portal Forest Center in El Yunque we had the opportunity to sit in on one of the monthly safety meetings in which they discussed the progression of the plan. The goal is to further integrate the community into the forest, finding new ways to garner feedback on new proposals and involve community members in various events. Closing the gap in knowledge of forest management among the locals, particularly youth, is considered of vital importance to the park's future. The hope is that through education and collaboration, community members will feel more accountable to the forest, volunteerism will increase, and a healthy relationship between the forest and the surrounding area's inhabitants will be promoted.

The dichotomy between the economic development of the tourism industry in Puerto Rico and the protection and preservation of El Yunque Forest is a difficult one to rationalize. Changes and sacrifices will have to be made on both sides in order to find a solution. Compromise and collaboration will be necessary in order to preserve the sanctity and beauty of El Yunque forest for generations to come.

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spring trips

Domestic

Annapolis, MD
Asheville, NC
Austin, TX
Biloxi, MS
Congaree, SC
Charleston, SC
Death Valley, CA
Everglades, FL
Fort Pulaski, GA
Grand Canyon, AZ
Hilton Head, SC
Joshua Tree, CA
Jupiter Island, FL
Mammoth Cave, KY
Moab, UT
Nashville, TN
New Orleans, LA
Pensacola, FL
Point Reyes, CA
Portland, OR
San Francisco, CA
San Juan, TX
Shenandoah, VA
Virginia Road Trip
Zion, UT

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International

Nicaragua
Dominican Republic
Drake Bay, Costa Rica
El Yunque, Puerto Rico
Ecuador

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