Consilience: The Journal of Sustainable Development
Vol. 7, Iss. 1 (2012), Pp. 130-143

The Mysterious Bloom

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Abstract

Central America's deepest lake, Lake Atitlán, is located in the department of Sololá, just 50 miles from the famous old city of Antigua. Residents depend on the lake for daily life and commerce. Each year, thousands of tourists visit the region to experience the local Mayan culture, learn Spanish, and holiday amidst the picturesque surroundings. Unfortunately, in late 2009 a combination of factors including poor waste treatment, climate change, and inorganic fertilizers caused the lake to be contaminated with mysterious algae that left the local tourism industry devastated and residents scrambling for answers. Localized efforts to cleanup the lake by straining the bacteria out of the water were thwarted by continuous regrowth of the bloom. While the threat of climate change and its heightened impact on impoverished communities increases, government plans to deal with the major contamination issues in the region remain stalled, leading tourists, residents, and businesspeople left to wonder about the murky future of one of Central America's most beautiful natural wonders.

Author's Note

Rachel Boehr is a third-year student of economics in Columbia University's School of General Studies. Having first studied at Syracuse University's School of Drama, she went on to work in non-profit advocacy and political campaigns. Her work in social justice over the last ten years has spanned issues related to health, human rights, and the environment. She has traveled independently in Central America, Europe, and Australasia and has always taken her camera.

Various photos were contributed by Tanya O'Carroll. Tanya recently graduated with an MA in Human Rights Studies from Columbia. She spent 6 weeks volunteering with the Council of Development in San Pedro, Lake Atitlan, December 2009-January 2010.

Keywords: Eutrophication, Guatemala, Water Safety

Photo by Tanya O'Carroll

1. Lake Atitlán

Situated among the extensive coffee plantations and cornfields of the Guatemalan highlands, Lake Atitlán and Sololá, a city which overlooks the lake, serve as the majestic home to 116 species of reptiles and amphibians, 12 of which are endemic to the region, and more than 236 species of birds, including the national bird of Guatemala, the Resplendent Quetzal. At an estimated depth of 324 meters, Atitlán is the deepest lake in Central America.

Despite having suffered systematic violence during the country's bloody thirty-six year civil war ending in 1996, the indigenous culture remains vibrant and strong. Approximately 90% percent of the more than 200,000 people in the area belong to Mayan ethnic subgroups, namely Tz'utujil, Kichee, and Kaqchikel, and their reliance on the lake permeates all facets of daily life. Residents and businesses use the lake for fishing, bathing, drinking water, transport, and tourism.

Each year, thousands of visitors flock to the region to sample fresh coffee and engage in numerous other tourist activities that help sustain the economy. Indigenous reeds, *tul,* grow on the banks of the lake and serve as raw material for baskets and other handicrafts.

Photo by Tanya O'Carroll

Still, "poverty indicators suggest that [Sololá] is one of the poorest departments in the country," where the entire population is considered either poor (74.6% of residents) or extremely poor (25.4%) (MARN 2009). In 2005, Hurricane Stan made matters worse, bringing devastation to the area, claiming 1,400 lives and leaving another 5,000 homeless. One of the hurricane's most lasting effects was the massive runoff it caused from the surrounding hills and towns down into the lake, nearly destroying the nearby waste treatment plant in Panajachel in the process. Repairs to this plant have yet to be made, which has led to further contamination of the lake.

2. Algae Bloom

In October and November 2009, the communities surrounding the majestic Lake Atitlán in Guatemala were devastated by growing bloom known as Lyngbya, a cyanobacteria more commonly known as blue-green algae.

Photo courtesy of NASA

According to a government report, the presence of the bacteria was caused by "the loss of the food chain through the introduction of black bass, the excessive influx of nutrients and waste to the lake and the temperature rise induced by climate change" (MARN 2009). Aerial photos from NASA (above) portray the startling extent of the contamination, which may have been at least partly caused by the increased use of inorganic fertilizers, which were widely distributed over the last 50 years. However, the problem was exacerbated by changing weather patterns and natural disasters like Stan in 2005 and Agatha in 2009, which destroyed infrastructure and expedited the flow of these contaminants into the lake.

One of the biggest concerns of this particular alga was that it fed off nitrogen and phosphorous from the human pollution and agricultural runoff. As the bacteria died, it released toxins which in small amounts could be harmless, but in large amounts could cause liver damage, diarrhea, skin problems and hepatic encephalopathy.

3. Effects on Tourism

Not only were residents placed at a great health risk, their entire livelihoods were undermined. Due to reports of the cyanobacteria, "more than 60% of the reservations for the year-end holidays were cancelled [in Panajachel], the municipality with the largest number of hotels on Lake Atitlán"(Valladares 2011). Tourism in the area – and all related economic activity – effectively slowed to a halt.

4. Community Response

News of the contamination seemed to spread as fast as the bloom itself. In markets, businesses, and homes around the lake, people conversed about the effect of the algae on day-to-day life and cleanup efforts.

Photo by Tanya O'Carroll

Over time, a concerted effort arose. Whenever algae appeared, communities around the lake began manual cleanup efforts. From dawn until dusk, villagers went to the lake with any apparatuses they could find to drain the lake of contamination. In particular, the San Pedro Municipal Council of Development helped coordinate community volunteers and delegations to clean the lake.

Photo by Tanya O'Carroll

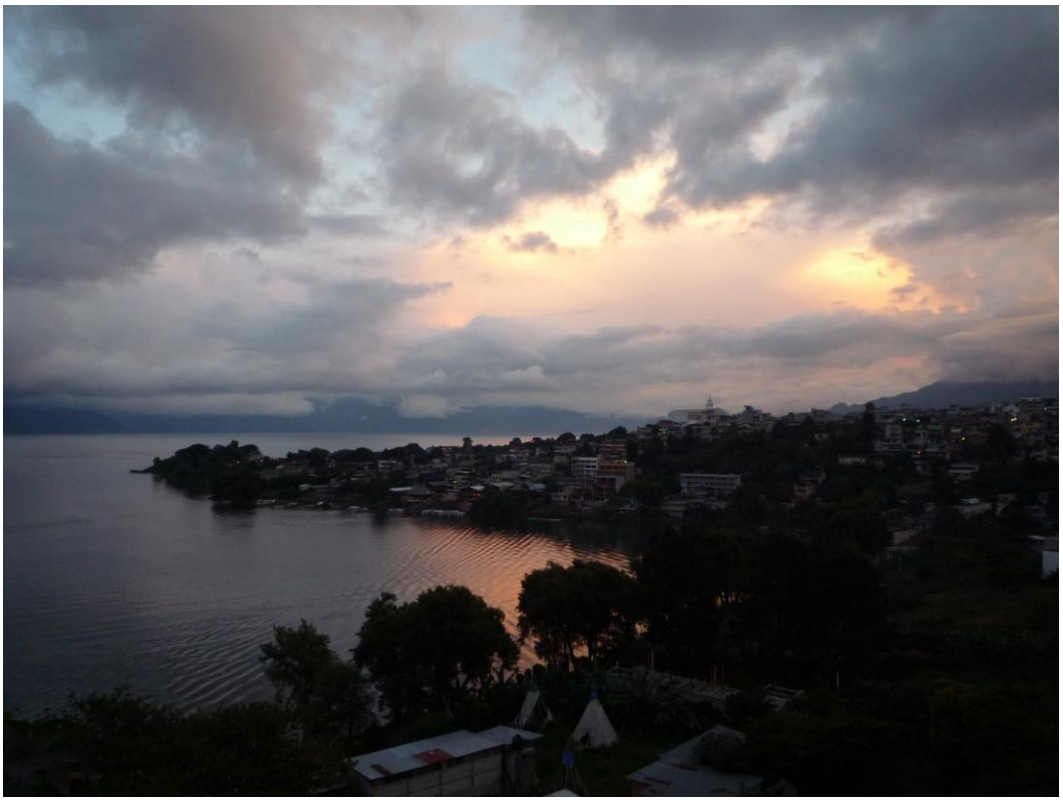
"Algae and seaweed were the declared enemies of the village! The idea was to remove the algae from the lake. People showed up with plastic baskets, screens, bedsheets for sifting and nets to remove the algae. People were plunging into the water and removing algae with their bare hands. They were diving under water and coming back to the surface with piles of seaweed and algae. People were removing rocks covered in algae from the water. There were people in boats, canoes, and on the docs. They were using rakes, sticks, and paddles. Basically, people were trying to remove the algae any way possible! It was a surreal site to see. It went on for the entire day" (Busenius).

- *Local resident, October 26th, 2009 Santa Catarina Palopó, Sololá Guatemala*

Photo by Tanya O'Carroll

Visits from government environmental department brought officials to local businesses to consult about drainage into the lakes. Yet with little funding, frustration and mistrust of the government's promises persisted. Ultimately, it seemed that actions proved futile on the part of the villagers as well. The more local residents cleaned their precious lake, the more the algae grew. And yet, encouraged by community leaders, the resilient and determined citizens worked to protect their lake from the growing problem in the absence of any systemic policy change.

Each morning at dawn, it appeared that local efforts had been successful. The lake appeared clear, reminiscent of the clean and breathtaking natural wonder it was once known as. But throughout the day, the bloom would resurface without fail.



5. Conclusion

Soon after the algae appeared, the government of Guatemala released an action plan detailing the problem and setting out a public education campaign (including broadcasting public information in five languages), which encouraged residents to stay away from the water. In the long term, the government warned people against using chemical detergents and agro-chemicals.

Yet the waters ahead for the people of Lake Atitlán and their precious resource remain clouded with uncertainty. Climate change lurks around the corner, and policymakers acknowledge that poor countries will be hit the hardest. For local advocates, the work only continues to protect their source of tourism and livelihood in the wake of natural disasters, climate change, and changing agricultural practices. While the cyanobacteria Lyngbya is likely to return each year, the extent of the problem hinges on many factors that humans can control. Further, as the field of sustainable development grows, the intersection between cross-cultural education, agriculture, tourism, and resource management continues to be a critical conversation for policymakers, advocates, and researchers.

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