

At the Rio Lerma's end a field of hyacinth radiate like the eyes of a peacock's tail. They are thirsty to spill into Lake Chapala's wide expanse where the precious water left unabsorbed by the plants will be pumped over 45 km north to Guadalajara. Here the rainbow-painted houses stand in stark protest against a heavy sky. Up there, rain is bursting down in dissent against the impermeable asphalt. The water begins to rise. It is June. The floods will continue until late September.

Yet between the water from Lake Chapala, Mexico's largest lake, and the roughly 953 mm of rain expected to fall this year there won't be a drop to drink. Or at least it appears that way. Despite large improvements to Guadalajara's water supply system, most of the residents we spoke to do not drink the water. Mexico's second largest city and the more than 5 million people who live in it are experiencing a water crisis. Rapid urbanization and population growth have led to an increased demand for clean drinking water which has surpassed infrastructural advancement. At the same time high rates of cancer, birth defects, and kidney failure in the region have led to concern over pollutants in the water. The chronic kidney disease epidemic is perhaps most evident on the outskirts of Guadalajara, where children as young as 13 have needed kidney transplants. The water in these regions, like in the city center, is supplied from Lake Chapala, wells and rivers. The contaminated water from industrial and agricultural activities that does not flow into rivers like the Rio Santiago, Mexico's most contaminated waterway, eventually sinks into the aquifers that feed the wells. These agricultural and industrial pollutants have perhaps best been studied in Lake Chapala, the main water source for the region.

As demand increases the water levels decline, resulting in a subsequent increase in the concentration of dangerous pollutants. Concern has been raised that the invasive water hyacinth spreading with each rain throughout the lake act as an antagonist in this water crisis, implicating the plants of consuming a large portion of the available water and thus contributing to the high concentration of pollutants. However, in other areas of the world this aquatic plant has been found to be effective at absorbing heavy metals and fertilizers; which led me to wonder, is it possible that hyacinth is in fact protecting the water supply through bioremediation rather than serving as the antagonist in this story?

I have come to Guadalajara to use remote sensing to track bioremediation in the lake by water hyacinth. With satellite imagery and historical data on pollution levels, I hope to better understand what role the hyacinth play in this public health crisis. While travelling around the lake to collect data on presence/absence of hyacinth, it becomes clear that whether or not the hyacinth effect water quality they have drastically changed the landscape and the way of life. Where boats previously could travel and residents made their livelihoods on fishing and tourism, hyacinth now dam the routes. Wild birds that take refuge in these islands of hyacinth take flight as our boat driver, who seems thoroughly confused in our interest in this noxious weed, steers us dead center into the thick of it. I will use the data I collect here to determine the hyacinth

population levels in satellite imagery when I return to Berkeley. For now, I listen to residents who are directly affected and it quickly becomes clear why the hyacinth has become so loathed. Yet while I ponder about hyacinth's role on water quality, the city still has no water to drink.

Part of this problem seems to stem from a lack of independent research on the water quality. The local water company, SIAPA, has long been shrouded by public scandal. Although the surface water is conventionally treated and the well water chlorinated, a distrust in the water supplied by SIAPA flows deep in the community. The health effects due to water issues relate not only to pollution but also to people's diets. Due to a lack of confidence in the water, most people drink bottled water trucked in from communities far away or bottled soda and juice. Thus, the real or perceived lack of access to clean drinking water may in part drive the consumption of sugary drinks which are linked to the leading causes of mortality in Guadalajara- diabetes and cardiovascular disease. A local non-profit, IITAAC, has been working on increasing access to clean drinking water. We have teamed up to conduct a pilot study on the quality and public perceptions of drinking water, focusing on copper which is associated with kidney disease and on bacterial contamination which causes gastrointestinal illnesses.

Yahaira Corona, an undergraduate intern at IITAAC who quickly has become one of my closest friends, accompanies me daily in the field. We knock on a stranger's door. She asks the family of 6 if we can test their water. The mother smiles and opens the door. I am constantly surprised by how friendly the people are here. They welcome us into their homes. They are patient with my broken Spanish and generous with their time. The mother tells us we can try to take samples but sometimes the water pressure is so low no water flows at all. This is not the first time we have heard this. Homes may go weeks without water. To adapt to this intermittent supply most homes have a tinaco and/or a cistern, a rooftop or underground water tank made from either plastic or asbestos and cement. These intermittent supply solutions can themselves introduce dangerous bacteria into the water.

On top of all of these issues, whether or not we find anything dangerous in the water today it will still be considered undrinkable. The intermittent supply, in part caused by the rapid urbanization that has left the city impermeable to replenishing rains and weakened by flooding, has complicated the water crisis. After prolonged periods without water, the homes here receive water contaminated with sediments, colored yellow and brown, smelling of rot or of chlorine so strongly that a grown adult becomes dizzy after a whiff. For some of the homes we visit this is a daily occurrence. And we begin to realize that regardless of what we find here today, in order to improve access to safe, clean and trusted drinking water- to have a real impact on human health- scientists will need to work together with city planners and community members to not only provide clean drinking water but to improve infrastructure and rebuild the public's relationship with water.