**Discovering Research Opportunities in Quito, Ecuador**

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In June 2013, I had the opportunity to discover research opportunities related to environmental risks of urbanization outside Quito, Ecuador. Prior to my trip I had reviewed the topography, land cover, and urban boundaries of my study site using Google Earth from the comfort of my office in Berkeley. It is a bit ironic that my first in-person view was from the Quito airport, which has been intertwined with Cerro de las Puntas ever since the city decided to bulldoze a small hill on the edge of the region to construct the new, modern airport. Cerro de las Puntas extends from the valley to the east of Quito outward to the north–south mountain range. The region is spotted with cities in the valley, and dominated by agriculture and grazing lands in the hills. Municipal pamphlets boast of the new airport, which is an important landmark of the evolving city. Yet some within the city’s water resource department are concerned about the environmental impacts it will have on the region. Cerro de las Puntas, in particular, has been selected for environmental protection, while urbanization could to threaten the environmental stability of the area.

The objective of my trip was to work with local government agencies to identifyenvironmental challenges while developing research projects for my graduate research. I traveled with my research partner, an undergraduate student at UC Berkeley in the Forestry Department. We were fortunate to have the sponsorship and support of the Berkeley-based nonprofit International Watershed Partners who put us in direct contact with the Quito water supply and wastewater management agency Empresa Pública Metropolitana de Agua Potable y Saneamiento (EPMAPS) as well as Fondo para la Protección del Agua (FONAG), which serves as the research branch of EPMAPS. In coordination with these agencies, we set out to understand the environmental risks of urbanization in the Cerro de las Puntas region with regards to runoff generation, the primary cause of erosion.

Urban change has occurred quickly in this region, with rural populations moving towards the city for improved economic opportunity or to join other relatives who have already moved. Plots of land that have not been developed have spray-painted signs with the words *“se vende,”* meaning “for sale.” The main cities in the region, Yaruquí, Pifo, and Checa have grown more than 200 percent in the past 20 years. The airport presents additional economic opportunity and growth potential for the region, along with risks of environmental damage.

The problem is not entirely straightforward. Urbanization leads to soil loss, increased runoff and erosion, and reductions in stream water quality. Urbanization and farming are linked in this region: crops and milk produced in rural areas are sold locally in urban areas, which drives demand for produce. It poses the dual environmental threat of degrading the land within the urban extent as well as increasing agricultural strain on the land in the hills, and possibly leading to additional erosion.

These dynamics are pertinent because some researchers consider erosion to be one of the most damaging environmental processes worldwide. Much of the world’s farmland has been degraded to the point of being no longer arable due to loss of the fertile topsoil necessary to sustain plants. While erosion can occur over a short period of time, the regeneration of topsoil takes much longer. The impacts of erosion have been felt particularly strong in Ecuador, where approximately 60 percent of the farmland has been abandoned due to erosion over the past 40 years in the highlands, according to a publication by Ohio State University Professor Douglas Southgate.

Erosion is of particular concern on the steep slopes used for agriculture and grazing to the east of the urban sprawl. Tilling agricultural land loosens the top layer of soil but compacts the layer below. Grazing leads to a terracing of grassy hillslopes and disturbs and compacts the soil. Both these activities increase the likelihood of overland flow and erosion. Furthermore, the water system in Quito has no dams and therefore no surface reservoir water storage. EPMAPS relies on the ability of the watersheds to act as a buffer, taking in water during the rainy season and releasing it slowly throughout the year. The ability of water to infiltrate and be stored in the ground is dependent on the land cover at the soil surface and can be reduced by erosion. Quito, therefore, has an interest in preserving the natural characteristics of the landscape which receives most of its rain in the months from November to May. A reduction in the ability of these mountains to accept, store, and provide water for the city would be detrimental to the city’s water security.

To fully understand the effect of land use practices, we needed to better understand each land cover type and the ability of the soil to absorb rainfall. Different types of land use can affect soil processes in different ways, which affects the amount of overland flow generation. After taking a few days to observe and discuss the watershed with local experts, we began a sampling effort. We selected locations at each of the major types of land cover in the region, including grass yards, agriculture, grazing, and dirt roads. Our sample routine at each location consisted of a set of soil and meteorological samples, as well as observations and record keeping. The most important measurement indicated the rate at which the soil would accept water. Any precipitation over this rate would typically result in overland flow of water, leading to erosion.

Analysis of the land cover, soil properties, and precipitation indicated that runoff is highly sensitive to changes in land cover associated with urbanization. In other words, small changes in the ability of the soil to absorb precipitation can lead to large changes in runoff and thus, erosion.

While the implications of this growth remain unclear, further research will be important. As the plots of land with *se vende* written on them are filled in with new buildings, it will be important to understand and prevent unintended consequences before they occur.