Stockholm Environment Institute

The Chiquitania fires: the role of water resources in forest restoration plans

SEI fact sheet
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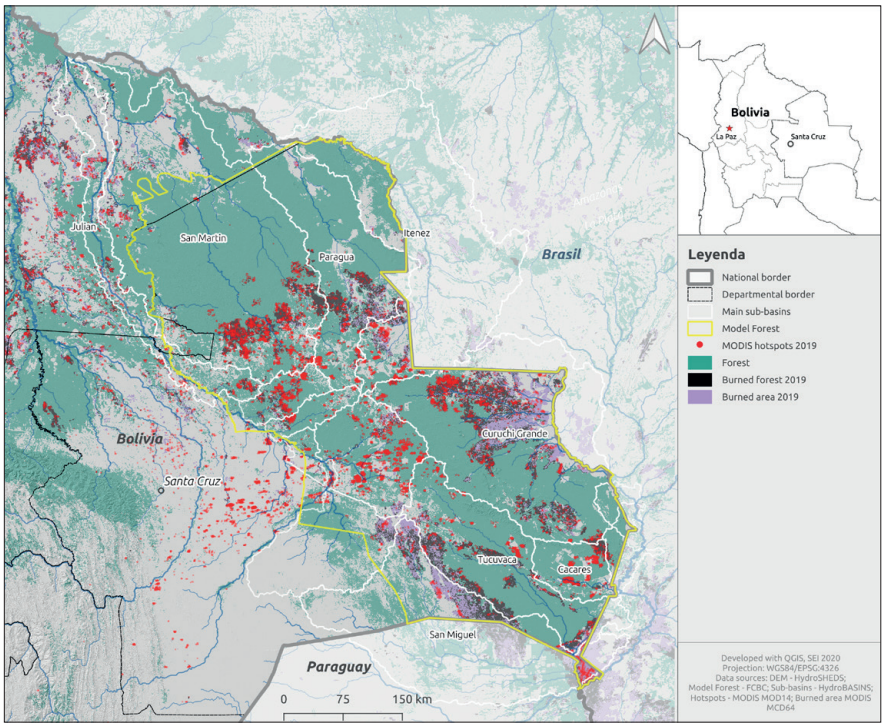
The Chiquitano Forest is the largest of the world's few remaining dry forest ecosystems. Located largely in Bolivia, it sits between South America's two biggest river basins: the Amazon and La Plata.

Fires occur every year in the area, due to regular pasture burning and ongoing agricultural expansion. But in 2019, intentional fires spiraled rapidly out of control, resulting in a catastrophic "megafire", with an intensity that had not been witnessed before. This event was one of the largest forest fires in Bolivian history, with approximately 3.6 million hectares burned, or almost 10% of the Santa Cruz Department.

Fire hotspots and burned areas in the Chiquitano dry forest ecoregion, in 2019.



Such events are problematic – not only in terms of biodiversity loss, but also due to their impact on land cover, water resources and livelihoods. Increased forest fires and deforestation can lead to changes in the water balance, which can affect the availability of water resources in the Chiquitania Region.

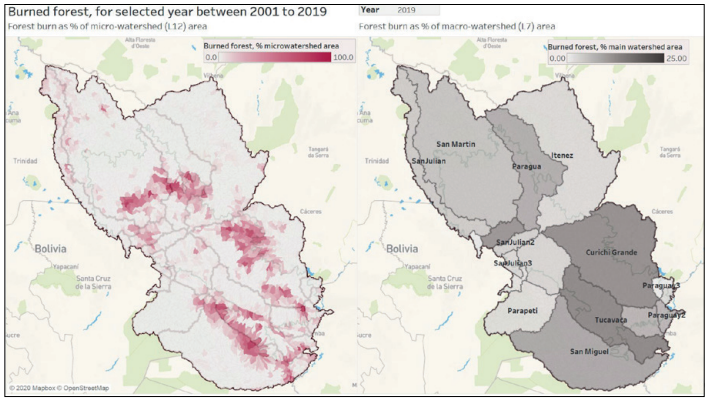
A framework to help policymakers integrate water and forest restoration planning

In response to the 2019 fires, various regional and national agencies in Bolivia launched restoration plans, including the Santa Cruz Department (Plan De Recuperación De Las Zonas Afectadas Por Incendios En El Departamento De Santa Cruz). Most efforts are focused on socio-economic, environmental, cultural and governance actions, but none of them address water resource issues.

Supported by Sida (Swedish International Development Cooperation Agency), SEI launched a pilot program that could inform recovery efforts like the one in the Santa Cruz Department. We worked with essential key actors – such as the regional authorities, the Ministry of Environment and Water (MMAyA), local universities and the Organization for

IMAGE (ABOVE): © LEONARDO MUÑOZ HUANCA / EYEEM / GETTY

Online visualization tool, highlighting burned areas at the micro- and macro-watershed scales in 2019.



the Conservation of the Chiquitano Forest (FCBC) – to propose a framework for evaluating fire impacts and prioritizing restoration efforts at the watershed level. Our aim is to help policymakers consider the watershed as the management unit for land and water resources planning.

For the framework, we combined land use and fire maps from 2001 to 2019 (using remote sensing data) with watershed maps, revealing which watersheds are located in fire-prone zones and where the largest forest cover has been lost. Our prioritization tool in Tableau allowed for the dynamic visualization, over time, of the burned areas and forest cover losses in each watershed. We also included water-related indicators, such as groundwater recharge areas, in order to pinpoint which watersheds are more vulnerable.

This framework lays the foundation for future modelling in SEI's Water Evaluation And Planning (WEAP) tool; the more vulnerable the watershed, for example, the greater the priority for a detailed, regional-level WEAP model that can quantify the impacts of forest cover loss on water resources.

How the fires affected watersheds

The mapping efforts showed how fires are associated with forest cover loss and the advancing of the agricultural frontier. The conversion of forests to cropping areas has been progressing steadily since 2001 and more rapidly since 2016. However, forest fires do not automatically mean that the forest land cover is lost and immediately converted to agriculture.

SEI's visualization tool helps distinguish between fires occurring in watersheds where the forest is still intact, versus fires in watersheds where the forest cover has already been lost. It can identify which watersheds were most affected by the 2019 megafires in terms of burned area, as well as which watersheds suffered the most total burns in the 2001-2019 period. The tool also identifies the areas that have lost the largest amount of their forest cover over the past 20 years. Emphasizing the conservation of intact forest landscapes and protected forest areas might prevent future losses of Chiquitano forest and mitigate the severity of the impacts on water resources.

In terms of groundwater recharge, watersheds in the northern Chiquitania region have the largest recharge potential and number of groundwater wells. These watersheds have not been as impacted by the forest fires so far, but are still worth considering and prioritizing in terms of water resources.

Looking ahead

SEI plans to further develop the prioritization tool with more criteria, such as ecosystems relevance, proximity to protected areas, presence of local communities, and population size. We also plan to use a participatory approach to understand how local stakeholders value the various criteria for prioritization.

SEI aims to develop a regional-scale model that looks at both surface water and groundwater – and integrates data with greater temporal and spatial density – in order to further study the hydrological impacts of forest fires and groundwater resource development in the Chiquitania region.

Learn more about the SEI US Water Program at: www.sei.org/us/water

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