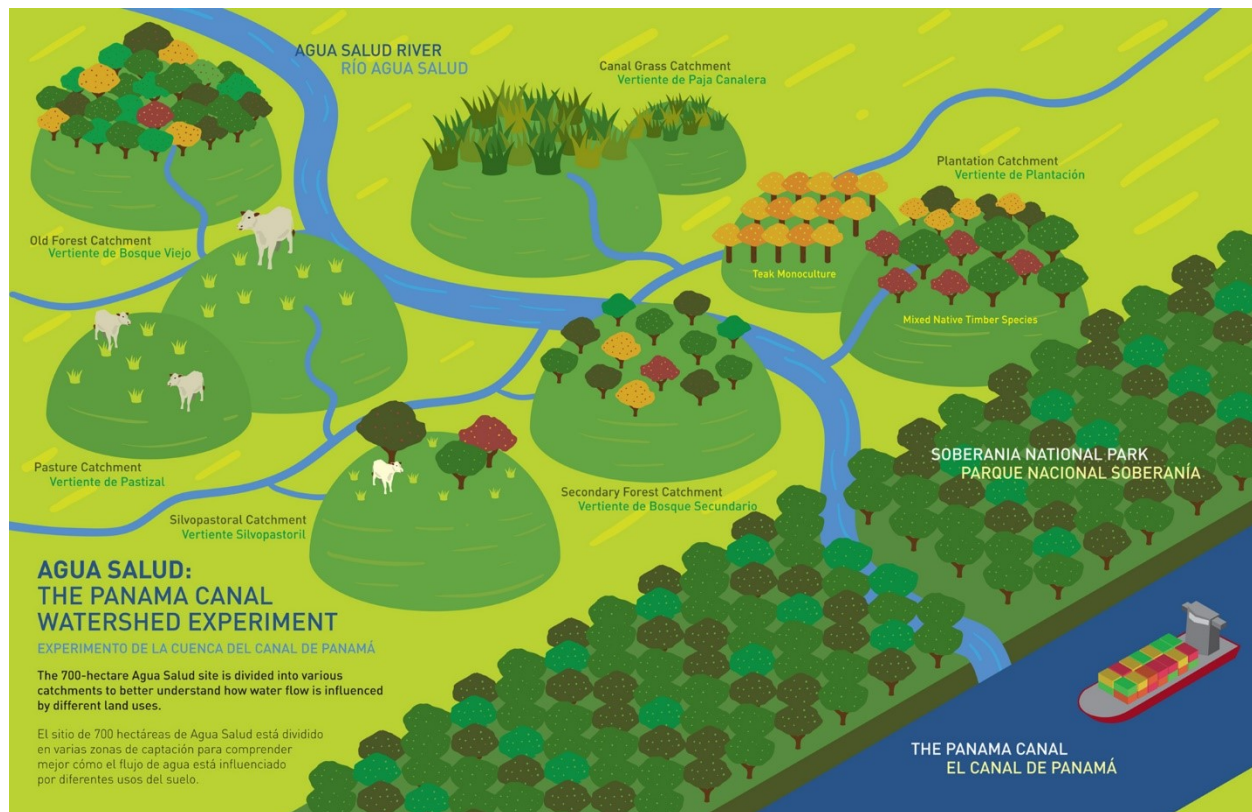


Lloyd's Tercentenary Research Foundation and the Agua Salud – Final report
April 2019



In March 2017 Lloyd's Tercentenary Research Foundation (LTRF) funded a two-year research project led by the Smithsonian Tropical Research Institute's (STRI) Agua Salud team which uses science to advance risk mitigation and land use management strategies in tropical watersheds and landscapes.

Water availability, carbon uptake and biodiversity protection are a few of the “ecosystem services” upon which we all depend to maintain stable and reliable water resources, mitigate climate change and manage other risks. Our ability to rely on these services varies according to how landscapes are managed. Thus, making smart land-use decisions requires an understanding of how hydrology, carbon sequestration and biodiversity change with land use. This is a daunting task, particularly in the tropics, where soil hydrology differs significantly from that in the temperate zone and where there is very little pre-existing, quantifiable data on how land-management practices impact water flow and other services.

Due to the presence of the Panama Canal and STRI, a world class research institution that has been studying tropical forests for over 100 years, Central Panama is an ideal place to test the dual effects of land use and climate change on the ability of tropical forest ecosystems to reduce the risks of water scarcity, dangers of flooding, and to test the forest's ability to capture and store atmospheric carbon dioxide. Because the Panama Canal Watershed provides fresh water

for some two million people in addition to ensuring the passage of some 14,000 ships a year, it is essential that there is enough dry season water for both human use and canal operations and that catastrophic floods are avoided during the wet season.

With support from the Lloyd's Tercentenary Research Foundation, a research team from STRI and Harvard Forest was able to leverage decades of past and on-going research to develop two very different possible futures for the Panama Canal Watershed. The team first used data to develop a model to project land use change based on "Recent Trends," and then overlaid data on forest distribution and carbon density with a locally derived forest growth model to both cut/eliminate and grow forests based on projections. This was then mapped on changes in the forest "sponge effect," which was compared to similar projections based on land-use change rates leading up to the year 2000.

This research and analysis produced a vision of two starkly different futures. If stakeholders and decision makers are able to simply maintain Recent Trends in land use change then the forests of central Panama can accumulate or sequester a significant amount of CO₂. In contrast, if rates of change reverse to what they were prior to 2000, then the same forests will lose 1 and ½ times as much CO₂. The differences in land use change on the forest's ability to store water for the dry season (often referred to as the "sponge effect") and reduce the risk of flooding is similarly striking.

This research has the potential for tremendous impact on stakeholders and decision makers as it brings into clear focus the impacts of choices and their role (and/or culpability) in avoiding or exacerbating environmental disasters. To the extent that leadership use this information to make decisions, the beneficiaries will include the approximately two million people who get their drinking water from the Panama Canal Watershed and anyone who relies on the Panama Canal. The results of this project have highlighted the importance of managing land to favor forest recovery to combat two of the biggest environmental challenges faced today. Ultimately, with future support for research like this, the world will be able to better mitigate risk through improved forest management practices and the ability to use the power of natural resources to combat Climate Change.

You can read more about this project on the [STRI website](#) and see Dr. Jeff Hall's 2018 [TED talk](#) and [interview](#) given at the Global Landscape Forum in Bonn, Germany.

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The [Smithsonian Tropical Research Institute](#) ("STRI") is a bureau of the Smithsonian Institution based in Panama dedicated to understanding biological diversity. STRI is one of the world's leading centers for basic research on the ecology, behavior and evolution of tropical organisms.