PROJECT REPORT

2025

MONITORING POLLUTION IN THE HUALLAGA RIVER, PERU

SAVING RIVERS AND LAKES ORG.

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Photo by Nikolaj Kracht (SR&L).

The Importance of the Huallaga

The Huallaga begins in the high grasslands of Cerro de Pasco and drops through canyons and valleys before joining the Amazon system. It supplies water, food and transport to hundreds of thousands of people, and it supports a rich freshwater fauna that includes diverse fishes and amphibians documented from the basin’s tributaries around Huánuco and Leoncio Prado. Recent surveys in Huallaga tributaries recorded more than thirty fish species in just four small streams, while taxonomic work continues to describe new species from the upper Huallaga, evidence of high but still incompletely known diversity. The basin is also home to unique birdlife. The Huallaga Tanager (Ramphocelus melanogaster) occurs only in this region, while the Pardusco (Nephelornis oneilli) inhabits the cloud forests of Carpish near the upper watershed. The Bosque de Carpish itself is recognized as a hotspot for montane biodiversity, providing refuge for many rare and localized bird species.

At the same time, basin-wide monitoring shows frequent exceedances of water-quality standards. Analyses of 139 monitoring sites in the Huallaga report thermotolerant coliforms and E. coli far above Peruvian limits on a large share of samples, with pH outside the allowed range in about a quarter of measurements and metals such as manganese, iron and aluminum often above national criteria. Agricultural pesticides like chlordane and legacy organochlorines have also been detected above reference values. In the upper watershed, decades of mining around Cerro de Pasco have left children chronically exposed to multiple heavy metals, a pattern confirmed by biomonitoring studies that associate exposure with a range of clinical symptoms. These pressures reach wildlife and people. Amphibian assessments for Peru identify habitat loss and pollution among the principal drivers of declines, a concern in Andean headwaters where contaminants move quickly through streams used by tadpoles and aquatic frogs. Food-chain risks are also visible in the Huallaga system, where research on the Monzón River reports bioaccumulation of cadmium, lead and copper in benthic food fishes, raising questions for consumers who rely on local catches. In Huánuco itself, gastric cancer mortality has ranked among the highest in Peru in recent years, underscoring that river quality is not only an environmental issue but a public-health concern for downstream communities.

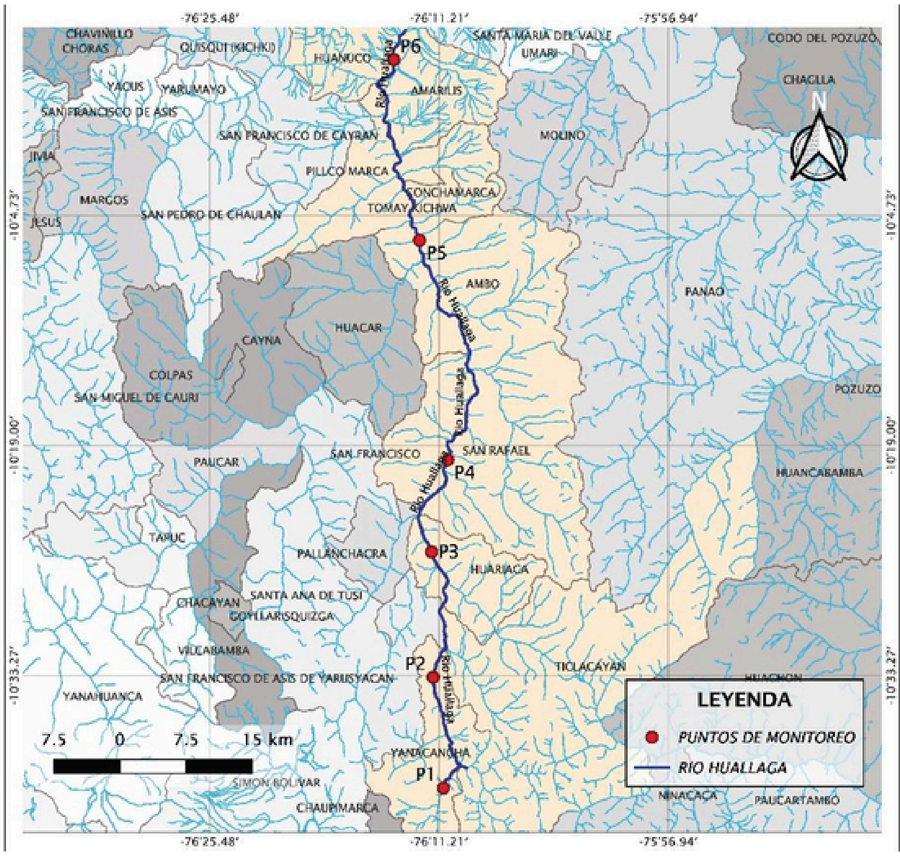
Why We Began Monitoring

Faced with these overlapping pressures on ecosystems and human health, Saving Rivers and Lakes (SR&L) and Asociación Ecológica León de Huánuco (ASOECOLEO Huánuco) decided to begin systematic monitoring of the Huallaga. For SR&L this marks the start of a broader pivot: *moving from general awareness-raising toward information-based activism grounded in field data, mapping, and scientific evidence*. Our goal is to document how rivers are being transformed, not only by pollution but also by the way communities depend on them, and to make this information accessible to both decision-makers and local people. Building an independent evidence base is paramount to strengthening advocacy, supporting communities facing health and livelihood risks, and placing freshwater issues at the center of the public agenda.

With this in mind, we carried out a two-day monitoring mission on the 16th and 17th of August 2025. We began at 7:00 AM on Saturday the 16th at the naciente or birth of the Huallaga in Jarapampa–Ticlacayán (−10.6776, −76.2588), almost 4,000 meters above sea level in the highlands of Cerro de Pasco.

From there, we followed the river downstream, monitoring six points in total:

- **CHICRÍN (−10.5727, −76.1874).**
- **HUARIACA (−10.4276, −76.2030).**
- **SAN RAFAEL (−10.3406, −76.1807).**
- **AYANCOCHA–AMBO (−10.1082, −76.2225).**
- **HUÁNUCO CITY (−9.9214, −76.2356) AT JUST UNDER 1,900 METERS.**



Over the course of 28 hours, we collected water samples and documented conditions to better understand how the river changes along its journey from high mountain springs to farmland and urban areas. Measurements at each point included ***turbidity, electrical conductivity, pH, suspended solids, hardness, and temperature***. These parameters were selected because they provide insight into how pressures from mining, farming, and urban growth influence water quality, with consequences for both ecosystems and human health.

PARAMETERS

Turbidity is a measure of how clear or cloudy the water is. High turbidity often means that the river carries large amounts of sediment, organic matter, or waste. This can reduce oxygen for fish, smother aquatic plants, and signal contamination from upstream activities such as mining tailings, soil erosion, or domestic waste.

Electrical conductivity (EC) reflects the amount of dissolved salts and ions in the water. While all rivers contain natural minerals, unusually high conductivity can point to pollution from mining, fertilizers, or sewage. In the case of the Huallaga, which runs through one of Peru's most intensively mined regions, EC values help detect the presence of dissolved metals that are otherwise invisible to the naked eye.

Acidity (pH) shows whether water is more acidic or alkaline. Healthy rivers generally stay close to neutral, but mining often creates acid drainage that lowers pH. Acidic water makes it easier for heavy metals like lead, arsenic, and cadmium to dissolve, increasing the risk for wildlife and people. In farming and urban stretches, pH shifts can also reveal chemical inputs from detergents, waste, or fertilizers.

Suspended Solids followed the same pattern as turbidity, peaking at Chicrín (333.7 mg/L) and gradually declining downstream. High values reduce light penetration and oxygen, affecting fish and aquatic plants.

Water hardness was highest at Chicrín (0.38%) and lowest at Ayancocha–Ambo (0.24%). Elevated hardness often indicates dissolved calcium, magnesium and other ions, which can be associated with geology but also mining discharges.

Temperatures rose naturally as the river descended from the high Andes (14.3 °C at the source) to the warmer valleys (20.7–20.9 °C at Huánuco and Ambo). This reflects geography rather than pollution.

Field Observations

During the two days of monitoring, we relied on field equipment and direct observations to document the Huallaga at different stages of its journey. Even without laboratory analysis, the conditions at each site revealed how the river is shaped by human activity from its very beginning.

At the ***first point*** near the naciente in ***Jarapampa–Ticlacayán***, the water appeared relatively clean, but we already observed people washing clothes with detergent and chlorine in a small stream that feeds directly into the source. This simple activity highlighted how human use immediately influences the headwaters.

At the ***second point*** near ***Chicrín***, the river runs downstream of major mining areas in Cerro de Pasco, including operations such as Atacocha and El Brocal, which have long been associated with heavy metal contamination in the region. This location was selected specifically to capture conditions after the river passes these mining zones.

Further downstream at ***Chicrín*** and again near ***Ayancocha–Ambo***, we noted clear signs of agricultural influence, with irrigation return flows and drainage channels feeding back into the river. In these stretches we also encountered a surprising number of animal carcasses, including both dogs and cattle, which contribute organic contamination and highlight broader issues of waste disposal and livestock management along the basin.

At ***Huariaca***, domestic wastewater inputs were visible, reflecting how towns along the Huallaga use the river as a sink for sewage and household waste.

Finally, in ***Huánuco city***, the river showed the strongest pressures. Plastic and organic waste were visible along the banks and floating in the current, underscoring the impact of urban growth on water quality.

Data Analysis

During the two days of monitoring, we relied on field equipment and direct observations to document the Huallaga at different stages of its journey. Even without laboratory analysis, the conditions at each site revealed how the river is shaped by human activity from its very beginning.

Monitoring Point	Turbidity (NTU)	Temperature (°C)	Conductivity (mS/m)	Suspended Solids (mg/L)	Hardness (%)	pH
Point 1 Jarapampa–Ticlacayán	5.32	14.3	382.6	192.5	0.235	8.47
Point 2 Chicrín	11.3	14.6	680.0	333.7	0.380	8.10
Point 3 Huariaca	-	17.5	569.0	279.3	0.320	8.14
Point 4 San Rafael	-	16.2	514.7	252.7	0.300	8.46
Point 5 Ayancocha–Ambo	-	20.9	398.1	195.0	0.240	8.55
Point 6 Huánuco	-	20.7	411.2	202.0	0.250	8.63

The monitoring data suggests that the Huallaga River is subject to different kinds of stress along its journey from the high Andes to the city of Huánuco. At the source in ***Jarapampa–Ticlacayán***, values such as turbidity (5.32 NTU), suspended solids (192.5 mg/L), and conductivity (382.6 mS/m) were moderate. These readings indicate that the water is relatively clean compared to downstream points, but not pristine. The observation of detergent and chlorine use at the naciente shows that even at its origin the river is shaped by small-scale human activity.

The most striking change appears at ***Chicrín***. Turbidity doubled (11.3 NTU), suspended solids climbed to 333.7 mg/L, and conductivity rose to 680.0 mS/m, the highest of all six sites. Hardness also peaked at 0.38% while pH dropped to 8.10, the lowest recorded. This profile is typical of mining-affected rivers, and given the proximity of Cerro de Pasco's major mines, it strongly suggests that mining activity is the key driver of water quality deterioration here.

Further downstream, the river begins to show signs of dilution and partial recovery. At ***Huariaca***, conductivity declined to 569.0 mS/m and suspended solids to 279.3 mg/L, although untreated sewage from the settlement added a new form of pollution. At San Rafael, values improved further, with conductivity at 514.7 mS/m, solids at 252.7 mg/L, and pH back to 8.46, closer to the source level. This shows the river's natural capacity to buffer and dilute pollutants, even though the system remains under pressure.

At ***Ayancocha–Ambo***, the water looked clearer, with conductivity at 398.1 mS/m and solids down to 195 mg/L, close to the source values. The pH was more alkaline at 8.55. These results suggest that mining influence is diluted further downstream, but agricultural runoff becomes the dominant pressure in this stretch. Fertilizers and pesticides, however, cannot be detected by the parameters measured, meaning the apparent recovery may conceal hidden chemical risks.

In ***Huánuco city***, urban activity once again altered the water. Conductivity and suspended solids rose slightly (411.2 mS/m and 202 mg/L), and pH climbed to

8.63, the most alkaline value observed. Field observations confirmed inputs of sewage, detergents, plastic waste and organic debris, adding visible evidence of urban stress on the river. While not as extreme as the mining zone, these inputs directly affect public health and ecosystem quality.

Temperature increased steadily along the course of the river, from 14.3 °C at the source to around 20.7–20.9 °C in Ambo and Huánuco. This warming trend is natural due to the drop in altitude, but it reduces oxygen levels in the water and can amplify the effects of pollution.

TRENDS:

- The source is relatively clean but already shows signs of human use.
- Chicrín is the most polluted site, with the highest turbidity, solids, conductivity and hardness, and the lowest pH.
- The river partially recovers through dilution downstream, but pollution levels never return to source conditions.
- Agricultural runoff around Ambo represents a hidden risk not fully captured by field parameters.
- Huánuco city adds urban pressures, with visible waste and slightly elevated conductivity and pH.
- Temperature rises downstream, reducing oxygen availability and increasing ecological stress.

Limitations And Next Steps

The field equipment we used on this mission gave us a first look at the Huallaga's condition. Measuring turbidity, electrical conductivity and pH helped us see changes in clarity, dissolved salts and acidity, but these tests can only go so far. They cannot show if the water contains bacteria such as E. coli or dangerous pollutants such as lead, arsenic, cadmium, mercury or pesticide residues. Electrical conductivity, for example, shows that ions are present but not which ones or in what amounts.

Because of this, the results of our monitoring should be seen as a starting point. They show where the river is under pressure and where closer study is needed, but they do not reveal the full scale of pollution. To truly understand the health of the Huallaga, especially in a region shaped by mining, farming and urban growth, we need laboratory testing that can identify specific contaminants and their effects on ecosystems and people.

That is why **Saving Rivers and Lakes** and **ASOECOLEO Huánuco** will work to secure the funding and partners needed to expand this effort. With regular fieldwork combined with laboratory analysis, we can create a clearer and more reliable picture of the river. This evidence can then guide communities and authorities in their efforts to protect both the Huallaga and the people who depend on it.