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Colombia, Perú: Bajo Putumayo-Yaguas-Cotuhé

Rapid Biological and Social Inventories

FIELD MUSEUM

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rapid biological and social inventories

INFORME/REPORT NO. 31

Colombia, Perú: Bajo Putumayo-Yaguas-Cotuhé

Christopher C. Jarrett, Michelle E. Thompson, Nigel Pitman, Corine F. Vriesendorp, Diana Alvira Reyes, Ana Alicia Lemos, Farah Carrasco-Rueda, Wayu Matapi Yucuna, Alejandra Salazar Molano, Ana Rosita Sáenz Rodríguez, Freddy Ferreyra, Álvaro del Campo, Madelaide Morales, Alexander Alfonso, Teófilo Torres Tuesta, María Carolina Herrera Vargas, Claus García Ortega, Valentina Cardona Uribe, Nicholas Kotlinski, Debra K. Moskovits, Lesley S. de Souza y/and Douglas F. Stotz

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Fotos e ilustraciones /Photos and illustrations

Carátula/Cover: Una familia transporta la cosecha de su pequeña
chacra/chagra por el río Cotuhé en la Amazonia colombiana. El
conocimiento indígena y el uso tradicional de los recursos naturales
han mantenido en excelente condición los ríos y bosques en toda
la región del Bajo Putumayo-Yaguas-Cotuhé del Perú y Colombia.
Foto de Álvaro del Campo./A family ferries the harvest from their
small garden plot on the Cotuhé River in the Colombian Amazon.
Indigenous knowledge and traditional resource use have kept rivers
and forests well-conserved throughout the Bajo Putumayo-Yaguas-
Cotuhé region of Peru and Colombia. Photo by Álvaro del Campo.

Carátula interior/Inner cover: Con una extensión de 1600 km, el
río Putumayo-Içá de Ecuador, Perú, Colombia y Brasil es uno de
los últimos afluentes importantes del río Amazonas que aún fluye
libremente. En su cuenca más de 15 pueblos indígenas viven en
uno de los paisajes tropicales más diversos y mejor conservados de
la Tierra. Foto de Álvaro del Campo./Stretching for 1600 km across
South America, the Putumayo-Içá River of Ecuador, Peru, Colombia,
and Brazil is one of the last major tributaries of the Amazon to still
flow freely. Home to more than 15 different Indigenous peoples, the
Putumayo-Icá watershed remains one of the most diverse and best-
preserved tropical landscapes on Earth. Photo by Álvaro del Campo.

Láminas a color/Color plates: Figs. 10C, 11D, 11J–K, 11M,
D. Alvira Reyes; Figs. 3J–K, J. Ángel Amaya; Fig. 9K, W. Bonell Rojas;
Figs. 13C–D, H. Carvajal; Figs. 7A–H, 7J–N, 7P–Z, G. Chávez;
Figs. 10B, 10D–H, 10L, 11A–B, 11F, 11H, 11L, M. del Aguila Villacorta;
Figs. 1A, 4A–F, 6R, 8K, 11E, Á. del Campo; Figs. 6A–H, 6J–N, 6S,
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Instituto del Bien Común; Figs. 10K, 11G, 11Q, 13A, C. C. Jarrett;
Figs. 9AA, 10J, 11C, A. A. Lemos; Figs. 6P–Q, 9A–G, 9L–M,
O. L. Montenegro; Figs. 8A–H, 8J, F. Peña Alzate; Figs. 5B, 5K,
M. Ríos Paredes; Fig. 3E, J. Salas; Figs. 12B–G, L. Téllez; Figs. 9N,
9BB, 5A, 5C–H, 5J, L. A. Torres Montenegro; Figs. 3B–D, 3F–H,
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CONDOLENCIAS Y SOLIDARIDAD POR LA TRAGEDIA DEL COVID-19 /
CONDOLENCES AND SOLIDARITY FOR THE COVID-19 TRAGEDY



EN DICIEMBRE DE 2019, el
coronavirus SARS-CoV-2, el cual causa
la enfermedad conocida como COVID-19,
empezó a difundirse por el mundo.
A partir de marzo de 2020, muchos países
implementaron medidas para reducir el
impacto del virus, incluyendo cuarentenas
en el Perú y Colombia. Pese a estas
acciones, la enfermedad llegó a la
Amazonia y a la cuenca del Putumayo.
Trágicamente, muchos han fallecido, entre
ellos grandes líderes, así como abuelos y
abuelas queridos, quienes dejan un vacío
espiritual tremendo.

IN DECEMBER 2019, the coronavirus
SARS-CoV-2, which causes the illness
known as COVID-19, began to spread
around the world. Beginning in March
2020, many countries implemented
measures to reduce the impact of the
virus, including quarantines in Peru
and Colombia. Despite these actions,
the illness spread to Amazonia and to
the Putumayo watershed. Tragically,
many have died, including great leaders
and beloved elders, leaving us with a
tremendous spiritual void.



Benjamín Rodríguez Grández
Ocaína leader

En la cuenca del bajo Putumayo, entre otros, perdimos al líder ocaína Don Benjamín Rodríguez Grández, quien por décadas luchó por el bienestar de las comunidades indígenas ribereñas, y al abuelo ticuna Don Cipriano Ruppi, fundador de la comunidad de Caña Brava en el río Cotuhé en Colombia. La sabiduría de estos líderes, abuelos y abuelas seguirá guiándonos e inspirándonos.

In the lower Putumayo watershed, we lost, among others, the Ocaína leader Benjamín Rodríguez Grández, who for decades fought for the wellbeing of riverine Indigenous communities, and the Ticuna elder Cipriano Ruppi, founder of the community of Caña Brava on the Cotuhé River in Colombia. The wisdom of these leaders and elders will continue to guide and inspire us.

El COVID-19 —un virus altamente contagioso y muchas veces mortal— ha hecho evidente las desigualdades sociales, la carencia de servicios fundamentales para las poblaciones rurales y urbanas más vulnerables, y la desconexión de nuestra sociedad con la naturaleza. Sin embargo, a pesar de las adversidades enfrentadas por el COVID-19, los pueblos indígenas y campesinos han buscado sus propias soluciones a través de conocimientos y prácticas tradicionales, tales como el uso de medicinas tradicionales, el aislamiento voluntario, el cierre de sus territorios y medidas preventivas difundidas y abordadas en sus propias lenguas y estilos. Nuestra esperanza es que de esta crisis surja una comprensión profunda y global, que cuando rompemos nuestra conexión integral con la naturaleza y sus riquezas insuperables, nos hacemos débiles, pobres y vulnerables.

Esperemos que esta tragedia nos lleve —a todos— a redoblar el esfuerzo por cuidar y proteger la selva, los ríos y salvaguardar a la gente que depende de ellos y que nos enseñan cómo reequilibrar nuestra relación con la naturaleza y reducir el riesgo de futuras pandemias. Tratemos de asegurar a largo plazo la conservación de espacios increíbles como el Bajo Putumayo-Yaguas-Cotuhé, defendiendo los derechos de la gente local, y honrando la memoria de los sabios de la cuenca del Putumayo.

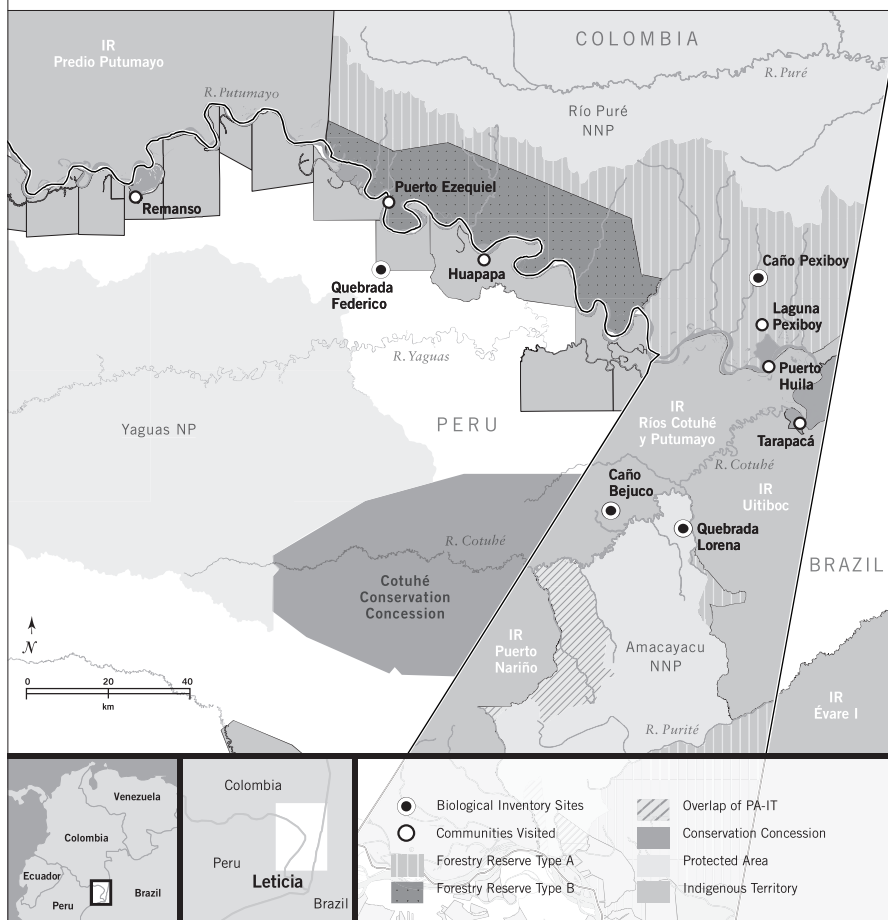
COVID-19—a highly contagious and often mortal virus—has made evident social inequalities, revealed a lack of basic services for the most vulnerable rural and urban populations, and highlighted our society’s disconnect with nature. Yet, despite the adversities faced due to COVID-19, Indigenous and campesino peoples have sought their own solutions through traditional knowledge and practices, such as the use of traditional medicine, voluntary isolation, closing of territories, and sharing information on preventative measures in their own languages and styles. Our hope is that from this crisis emerges a deep, global understanding that when we break our connection with nature and its unsurpassed riches, we make ourselves weak, poor, and vulnerable.

Let us hope that this tragedy leads us all to double down on our commitment to care for and protect the forest and rivers and to safeguard the people who depend on them and who teach us how to rebalance our relationship with nature and reduce the risk of future pandemics. Doing so will ensure the long-term conservation of incredible places like the Bajo Putumayo-Yaguas-Cotuhé, while defending the rights of local people and honoring the memory of the wise elders of the Putumayo watershed.



REPORT AT A GLANCE

Dates of fieldwork: 5–25 November 2019



Region

For much of its serpentine path across the South American continent, from the high Andes of Colombia to its confluence with the Amazon River in Brazil, the Putumayo River forms the border between Colombia and Peru. Where it prepares to leave these countries and enter Brazil, the Putumayo is joined by the Yaguas and Cotuhé rivers—lowland Amazonian watersheds fantastically rich in flora, fauna, and culture. In this extraordinary binational hotspot, biological megadiversity and culture megadiversity are interwoven in a way seen in few other landscapes on the planet.

That forest canopy still covers nearly 100% of this corner of the Amazon is partly due to an extremely low population density (<1 person/km²) and partly due to local people's active management of a mosaic of Indigenous territories, national parks, forestry concessions, conservation concessions, and mestizo (non-Indigenous) settlements. At the same time, this is a remote frontier region in which national governments are largely absent and where cooperation between the Peruvian and Colombian governments has not been sufficient to address shared problems. We carried out a rapid inventory in the Bajo Putumayo-Yaguas-Cotuhé because we see an excellent opportunity to consolidate conservation and sustainable resource use in this binational landscape. Converting this opportunity into action has the potential to guarantee the well-being and high quality of life of local peoples, reduce the impact of illicit activities, maintain connectivity among ecosystems and communities, and safeguard a megadiverse landscape in the heart of the Amazon.

Sites visited

Sites visited by the biological team:

Peru: between the Indigenous communities of the lower Putumayo and Yaguas National Park

Camp Quebrada Federico 6–10 November 2019

Colombia: a forestry concession in the Unidad de Ordenación Forestal de Tarapacá

Camp Caño Pexiboy 11–15 November 2019

Colombia: Ríos Cotuhé y Putumayo Indigenous Territory

Camp Caño Bejuco 16–20 November 2019

Colombia: Amacayacu National Park and the Ríos Cotuhé y Putumayo Indigenous Territory

Camp Quebrada Lorena 21–25 November 2019

Sites visited by the social team:

Peru

Indigenous community of Remanso 7–8 November 2019

REPORT AT A GLANCE		
Sites visited (continued)	Indigenous community of Huapapa	9 November 2019
	<i>Colombia</i>	
	Puerto Ezequiel	10 November 2019
	Tarapacá	14–15 November 2019
	Pexiboy Lagoon and the ASOPROMATA timber harvesting unit	14 November 2019
	Puerto Huila	16–17 November 2019
	Maloca Cabildo Centro Tarapacá Cinceta	19–20 November 2019
<p>On 22–24 November the social team organized a binational workshop in Tarapacá that brought together representatives of Indigenous federations, government agencies, colonist and guild associations, religious organizations, and non-governmental organizations. On 25 November, the biological and social teams presented preliminary results of the rapid inventory in a public event in Tarapacá. On 27–28 November both teams met with other experts in Leticia, Colombia, to analyze the threats, assets, opportunities, and recommendations for conservation, well-being, and quality of life.</p>		
Geological and biological team and inventory focus	Four geologists and 17 biologists from 12 Colombian, Peruvian, and international institutions, supported in the field by >20 local scientists, studied geomorphology, stratigraphy, water, and soils; vegetation and flora; fishes; amphibians and reptiles; birds; large and medium-sized mammals; and bats.	
Social team and inventory focus	A multicultural, interdisciplinary, and international team composed of 4 local Indigenous representatives and >10 biologists and social scientists from 4 government agencies and 6 non-governmental organizations in Colombia, Peru, and elsewhere studied the history and settlement of the region; social and cultural assets; governance, demography, economy, and strategies to manage natural resources; and intercultural relations.	
Main biological results	<p>This is the first study in the Bajo Putumayo-Yaguas-Cotuhé region to synthesize observations on geology, plants, and animals on both sides of the Peru-Colombia border and on both sides of the Putumayo. We found a geologically variable landscape characterized by a small-scale patchwork of relatively fertile soils and very poor soils, and of black-water and white-water rivers and streams, in which the only constants were the diverse flora, the abundant wildlife, and the excellent conservation status of the habitats we studied. In this still-intact biological corridor, the unbroken forest cover and healthy aquatic ecosystems allow birds, terrestrial animals, and fishes to move freely through the region as they have for thousands of years.</p> <p>During the inventory we recorded more than 1,000 species of plants and more than 700 species of vertebrates. We estimate a regional flora of 3,000 plant species and up to 1,554 vertebrate species for the region.</p>	

	<table> <tr> <th></th><th>Species recorded during the inventory</th><th>Species expected for the region</th></tr> <tr> <td>Vascular plants</td><td>> 1,010</td><td>3,000</td></tr> <tr> <td>Fishes</td><td>150</td><td>600</td></tr> <tr> <td>Amphibians</td><td>84</td><td>180</td></tr> <tr> <td>Reptiles</td><td>47</td><td>120</td></tr> <tr> <td>Birds</td><td>346</td><td>500</td></tr> <tr> <td>Large and medium-sized mammals</td><td>49</td><td>56</td></tr> <tr> <td>Bats</td><td>31</td><td>98</td></tr> <tr> <td>Total number of vascular plant and vertebrate species</td><td>> 1,717</td><td>4,554</td></tr> </table>		Species recorded during the inventory	Species expected for the region	Vascular plants	> 1,010	3,000	Fishes	150	600	Amphibians	84	180	Reptiles	47	120	Birds	346	500	Large and medium-sized mammals	49	56	Bats	31	98	Total number of vascular plant and vertebrate species	> 1,717	4,554	
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Total number of vascular plant and vertebrate species	> 1,717	4,554																											
Geology, water, and soils	<p>The region is underlain by poorly consolidated sedimentary rock. Four geological formations surface here: the Pebas Formation, the lower Nauta Formation (also known as Amazonas), modern-day alluvial sediments, and peat. The Pebas Formation is the oldest, at more than 6 million years old, and contributes large quantities of salts and nutrients to the ecosystem. It is composed of blue lodolites (mudstones) with thin layers of fossilized organic matter and mollusk shells deposited millions of years ago in a large paleolake that once covered the northwestern Amazonian basin. The lower Nauta/Amazonas Formation, approximately 2 million years old, is composed of sands and gravels deposited by ancient rivers. Today it occupies the highest points on the landscape, where it forms upland terraces. In contrast to the Pebas Formation, sediments derived from the lower Nauta/Amazonas Formation contain few salts and produce relatively less fertile soils. Although the Pebas and lower Nauta/Amazonas formations are juxtaposed on the higher parts of the landscape, the lower Nauta/Amazonas Formation is more influential in the chemical composition of the rivers and streams.</p> <p>The floodplains of the Yaguas and Cotuhé rivers, and especially that of the Putumayo, are a patchwork of old riverbanks and abandoned meanders that the rivers create as they cut through the ancient red-soiled terraces, leaving behind low-lying areas that are now swamps and peatlands (where the soils are thick accumulations of decaying leaves and organic matter). Between these swampy areas are small patches of floodplain forest (<i>restinga</i>) that cover a limited proportion of the landscape. These alluvial sediments have been deposited over the last million years, and continue to be deposited today. Peat has been accumulating in these floodplains for 12,000 years; some of the peat deposits we visited were 3 m thick.</p> <p>The scattered salt licks on the landscape are strategic conservation objects, in part because they are revered by local communities as sacred places or ancestral hunting sites and in part because large numbers of animals congregate there to drink the salt- and nutrient-rich water. Salt licks are associated with the nutrient-rich Pebas Formation; in salt lick waters we measured salt concentrations 30 times higher than those in upland streams.</p>																												

REPORT AT A GLANCE	
Geology, water, and soils (continued)	Throughout the inventory we measured levels of dissolved salts in streams and rivers to understand how nutrients are distributed in the geological formations and soils in the region. Nutrient concentrations measured in this inventory are among the lowest ever measured in the Amazon and Orinoco basins, with upland and floodplain streams showing values up to 800% lower than the mean values for other Amazonian watersheds. Although the sediments that make up the floodplains of the Yaguas and Cotuhé rivers are relatively poor in nutrients, the Putumayo floodplain receives material eroded from the Andes and thus produces more fertile soils. The low nutrient levels in these soils make it clear that where forest cover is removed, recovery will be extremely slow (as illustrated by the old landing strips in Tarapacá and Amacayacu National Park, abandoned since the 1980s and still not recolonized). Deforestation will also accelerate rates of erosion and soil loss, and the resulting sediment load will pollute waterways, bury floodplains, and interfere with the accumulation of carbon in peatlands. As a result, the entire landscape is very vulnerable to impacts from deforestation and other inappropriate land uses.
Vegetation	<p>We observed three main types of vegetation: upland forests on low-fertility soil terraces, upland forests on more fertile soils in hilly areas, and floodplain forests along rivers and streams. These were not large blocks on the landscape, but rather each a patchwork of distinctive vegetation sub-types, reflecting small-scale patchiness in soil drainage and fertility. Crossing from one side of a river to the other, it was common to find oneself in a different kind of forest.</p> <p>Upland (<i>tierra firme</i>) forests occupy more than 80% of the study area. These are dominated by trees like <i>almendro</i> (<i>Scleronema praecox</i>), <i>farihero</i> (<i>Clathrotropis macrocarpa</i>), <i>cajeto/chimicua</i> (<i>Pseudolmedia laevigata</i>), <i>Brosimum parinarioides</i>, <i>creolino</i> (<i>Monopteryx uauçu</i>), the palm <i>milpesos</i> (<i>Oenocarpus bataua</i>), and many other tree species that are common in western Amazonian forests growing on relatively poor soils. We also observed some blocks of richer-soil upland forest at our campsites that were dominated by tree species that specialize on more fertile soils. At all four campsites, the trees <i>Rinorea racemosa</i> and <i>Ampeloziziphus amazonicus</i> and the palms <i>Attalea insignis</i> and <i>Attalea microcarpa</i> were very common in the understory.</p> <p>In the seasonally flooded floodplain forests we observed patches of palm-dominated forest, with dense populations of palms like <i>corocillo</i> (<i>Bactris riparia</i>), <i>huiririma</i> (<i>Astrocaryum jauari</i>), and <i>asaí</i> (<i>Euterpe precatoria</i>), as well as relatively small patches of swamp forest dominated by the quintessential Amazonian swamp palm <i>Mauritia flexuosa</i>. At the Quebrada Federico campsite we collected in stunted forests (<i>varillales</i>) growing on peat and dominated by the <i>varillal</i>-specialist treelet <i>Tabebuia insignis</i> var. <i>monophylla</i>.</p> <p>Despite evidence of selective logging at all four sites, these tall old-growth forests are still in good condition and contain vast amounts of aboveground carbon. We saw remnant populations of important timber trees like <i>achapo</i> (<i>Cedrelinga cateniformis</i>), <i>ceiba</i> (<i>Ceiba pentandra</i>), tropical cedar (<i>Cedrela odorata</i>), and <i>creolino</i> (<i>Monopteryx</i></p>

	<i>uauçu</i>). The best-conserved forest we visited was in the northern sector of Amacayacu National Park, where some of the largest trees we had ever seen of now-rare timber species are still undisturbed.
Flora	<p>The Putumayo watershed is located in the peak global hotspot for woody plant diversity, and the forests we visited harbor a staggering diversity of plants. The botany team collected 976 specimens with fruits and flowers at the 4 campsites, and recorded 1,010 plant species via collections, field identifications, and photographs. We estimate a regional flora of 3,000 species of herbs, shrubs, trees, lianas, and epiphytes. The team also collected 235 fern specimens representing >100 epiphytic and terrestrial species, most of them typical of the Amazonian lowlands.</p> <p>Notable finds include four species that are potentially new to science, in the genera <i>Calathea</i>, <i>Dilkea</i>, <i>Piper</i>, and <i>Zamia</i>. We also recorded 25 new plant species for Peru or Colombia, including the trees <i>Heterostemon conjugatus</i> (new for Peru), <i>Pagamea duckei</i> (Peru), and <i>Plinia yasuniana</i> (Colombia), the terrestrial orchid <i>Palmorchis yavarensis</i> (Colombia), the filmy fern <i>Trichomanes macilentum</i> (Peru), and the giant cycad <i>Zamia macrochiera</i> (Colombia). Twenty-six plant species we recorded are considered globally threatened or Near Threatened, or threatened at the national level in Peru or Colombia.</p>
Fishes	<p>We collected fishes at 24 stations during the rapid inventory, from streams and creeks that feed the Putumayo and Cotuhé rivers to the main channel of the Cotuhé itself. We sampled both black-water and white-water habitats, most of them small streams in upland forest. Because Amazonian fishes are a poorly collected group and this is a region rarely visited by ichthyologists, our collections help fill a blank spot on the map regarding Colombian freshwater fish communities.</p> <p>We recorded 150 of the 600 fish species estimated to occur in the region. Characiformes was the most abundant and the most diverse order, followed by Siluriformes, Cichliformes, and Gymnotiformes. The most diverse sampling stations were those in the main channel of the Cotuhé River. The most diverse campsite was Caño Bejucó (89 species), followed by Caño Pexiboy (74). Most of the species we recorded were small fishes (5–10 cm) and the most diverse genera were <i>Hemigrammus</i>, <i>Hyphessobrycon</i>, and <i>Knodus</i>. We collected two species that are potentially new to science: one in the genus <i>Imparfinis</i> and the other in <i>Aphyocharacidium</i>. We also recorded four species that were not known previously known to occur in Colombia.</p> <p>The oxbow lakes of the Bajo Putumayo-Yaguas-Cotuhé region are a globally important center for the production of arowana fry (<i>Osteoglossum bicirrhosum</i>), prized in the ornamental fish market. Together with the social team we identified dozens of other fish species that are used for food or as ornamentals (see list below, in the <i>Human communities</i> section). Although the rivers and streams we saw were in good condition</p>

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Fishes (continued) and harbored a great variety of microhabitats capable of sustaining the region's astronomical fish diversity, maintaining healthy fish communities over the long term will require standardizing Peruvian and Colombian fishery regulations (e.g., no-take seasons), as well as developing a binational strategy to avoid overharvests of arowana and the other fish species so important for the people who live here.

Amphibians and reptiles Previous rapid inventories in the Peruvian portion of the Putumayo basin have documented an astonishing herpetological diversity in this part of the Amazon. This inventory provided abundant confirmation of that pattern in what had long been a little-known region for Colombian amphibians and reptiles. We know of just one published study for the region, and it focuses on the amphibians of a site near Leticia.

We recorded 131 species of herpetofauna (84 amphibians and 47 reptiles) and estimate a regional total of 300 species (180 amphibians and 120 reptiles). The species we saw in the field are a typical sample of herpetological communities of flooded and upland forests in Amazonia. We collected an *Anolis* lizard and a *Synapturanus* frog that are potentially new to science, and report the first Colombian records of the frogs *Boana ventrimaculata*, *Osteocephalus subtilis*, *Pristimantis academicus*, and *P. orcus*. Another notable discovery is a single individual of the species *Pristimantis aaptus*, which has only been recorded 3 times in nearly 40 years. Some species are important in the diet of local communities: frogs in the genus *Leptodactylus*, the smooth-fronted caiman (*Paleosuchus trigonatus*), and the yellow-footed tortoise (*Chelonoidis denticulata*). We also recorded two species considered by the IUCN to be globally Vulnerable—the turtles *Chelonoidis denticulata* and *Podocnemis unifilis*—and 28 species of dendrobatid frogs, boas, caimans, and turtles listed on CITES Appendices I and II.

Birds We recorded 346 bird species in the 4 campsites and estimate a regional avifauna of 500 species. The bird community we observed is diverse and typical of upland forests, complemented with species that are more frequent along streams and rivers (most notably, from where we sampled along the Cotuhé River at the Caño Bejuco campsite). We found a guild of birds that specialize in forests on less fertile upland soils, including a new record for Colombia: an undescribed antwren known from Peru (*Herpsilochmus* sp. nov.).

Other notable records that are important for conservation include very healthy populations of commonly hunted birds such as curassows (two species of *Mitu*), guans, trumpeters, and tinamous; and range extensions for a puffbird (*Notharcus ordii*, second record east of the Napo in Peru), a manakin (*Heterocercus aurantiivertex*, second record for Colombia), a flycatcher (*Platyrinchos platyrinchus*), another antwren (*Myrmotherula ambigua*, possibly a tinamou (*Tinamus tao*), and a very poorly known species of antpitta (*Hylopezus macularius*).

All of the sites we visited were in good condition and had a high diversity of birds, despite being managed under different land use categories. The forestry concession we visited may serve as a model for a highly selective logging regime that neither alters forest structure nor permits hunting, and thereby sustains a very diverse bird community. Likewise, the well-conserved avifauna observed in the Ríos Cotuhé y Putumayo Indigenous Territory, where hunting is allowed, suggests that its management may serve as a model for the undesignated lands on the Peruvian side of the border, where we see an excellent opportunity to conserve birds and provide sustainable natural resource use by local communities. The healthy bird community we documented in the northern sector of Amacayacu National Park suggests that the wildlife of that area has largely recovered from a long history of logging and hunting.

Large and medium-sized mammals, and bats We used four methods to study mammal communities: camera traps, direct sightings along the trails at each site, mist-nets to capture bats, and acoustic recorders to record bat vocalizations. In total we recorded 80 mammal species: 45 terrestrial, 4 aquatic, and 31 volant (bats). Based on earlier inventories in the Putumayo basin, the large and medium-sized mammals we recorded account for 88% of the 56 species expected for the region, while the 31 bats account for roughly a third of the 98 expected bat species.

The mammal populations we observed during the rapid inventory are in a good state of conservation. It is remarkable that populations of large mammals, especially ungulates, are still abundant along Pexiboy Creek, where selective logging has been ongoing for the last four years and hunting is prohibited. This suggests that a model of forestry management in which no large clearings are opened and no animals are hunted may be sufficient to maintain healthy populations of large mammals (as well as birds; see above).

Notable records include a high diversity of primates (10 of 11 expected species) and cats (4 of 6). We also observed healthy populations of lowland tapir (*Tapirus terrestris*) and deer (*Mazama americana* and *M. nemorivaga*), as well as an abundance of collared peccary (*Pecari tajacu*) and white-lipped peccary (*Tayassu pecari*). Multiple species are considered threatened at the global level: the Endangered giant river otter (*Pteronura brasiliensis*) and five species classified as Vulnerable (*Lagothrix lagothricha*, *Priodontes maximus*, *Myrmecophaga tridactyla*, *Tayassu pecari*, and *Tapirus terrestris*). We also recorded jaguar (*Panthera onca*), which is globally Near Threatened. Our list includes numerous mammal species considered threatened at the national level, in Peru or Colombia.

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Human communities

History, culture, and settlement patterns

For more than 80 years the Bajo Putumayo-Yaguas-Cotuhé landscape has marked the international border between Peru and Colombia. For hundreds of years before that it was the territory of the Ticuna and Yagua Indigenous peoples. Today, more than 12 different Indigenous groups, as well as *mestizo* settlers (*campesinos* and colonists) and religious communities share this vast territory. The Putumayo River that unites them still bears the echo of the Murui name, *kud+ma* (river of fishes).

This diverse landscape has a long and complex history, both of the original inhabitants and of the *mestizo* and Indigenous groups (Ocaina, Andoque, Ticuna, Murui, Yagua, Inga, Cocama, Bora, and Kichwa) who were forced to relocate here by various disturbances over the last 500 years. Religious missions starting in the 1500s, the quinine boom, the rubber boom of the early 1900s, the war between Peru and Colombia in 1933, and successive waves of extractive fevers—rosewood (*Aniba rosaeodora*), timber species like tropical cedar (*Cedrela odorata*), animal pelts—are some of the historical upheavals that caused drastic changes in the lives of these people and shaped current sociocultural and environmental conditions.

Today, of the approximately 5,000 people who live here (1,400 in Peru and 3,600 in Colombia), 3,700 reside in Indigenous territories, 1,000 in Tarapacá, and the rest in settlements inside the Forestry Reserve. Long experience together and the coexistence of different cultural traditions in this landscape have developed a shared historical memory. In this sense, the territory is held together by intercultural stories, practices, and traditions interwoven into new social and culture dynamics, all of them rooted in the desire to live well in this landscape. This shared historical memory is one legacy of the cooperation and agreements prompted by the determination of present-day residents to conserve natural resources and care for their surroundings, and it is the foundation of their shared identity as residents of the Putumayo River.

Use and management of natural resources (fishes, bushmeat, timber, farm plots, and non-timber forest products)

The impressive abundance of fishes in the lakes, streams, and rivers of the region guarantees a reliable source of food for people on both sides of the border and provides significant income for both domestic and regional economies. During the inventory the biological and social teams identified 21 food fish, including species like arapaima (*Arapaima gigas*), arowana (*Osteoglossum bicirrhosum*), black pacu (*Colossoma macropomum*), red-bellied pacu (*Piaractus brachipomus*), and catfish; and others in smaller tributaries, such as *sábalo* (*Brycon amazonicus* and *Brycon melanopterus*), cheos or lisas (*Leporinus* and *Schizodon*), pacus (*Mylossoma albiscopeum* and *Myleus*), piranhas (*Serrasalmus*), *sardinas* (*Triportheus*), *pez cachorro* (*Acestrorhynchus falcatus*), and sunfish (*Crenicichla*). In addition to the most important ornamental species of the region, arowana (*Osteoglossum bicirrhosum*), we recorded other species with potential as ornamentals, including cory catfish (*Corydoras*) and hatchetfish (*Carngiella*).

In places where there are settlements on both sides of the Peru-Colombia border, communities have signed agreements to regulate shared fishing grounds. Limits to subsistence fishing are set by unwritten agreements based on respect, trust, and solidarity. In the case of commercial fishing, and especially for arowana and arapaima, the agreements are explicit and require that fishermen receive permission from the owners of the lakes where these fish are harvested. On the Peruvian side of the border, formal fisheries management began more than 10 years ago and has resulted in the recovery of economically important fish populations to the benefit of both Peru and Colombia. Seven of the 13 Indigenous communities in Peru have fisheries management plans prepared and implemented by their respective Artesanal Fishing and Processing Associations (APPAs). These associations oversee sustainable harvests of arowana and are models of organization and resource management.

Hunting is another important cultural practice that provides food for communities; it is governed by local agreements for subsistence hunting and, to a lesser degree, hunting for local markets. The species most sought-after by hunters are paca (*Cuniculus paca*), collared peccary (*Pecari tajacu*), white-lipped peccary (*Tayassu pecari*), lowland tapir (*Tapirus terrestris*), curassows (*Mitu* spp.), and Blue-throated Piping Guan (*Pipile cumanensis*).

Logging has long been an important driver of the economy in the lower watersheds of the Yaguas, Cotuhé, and Putumayo rivers. What began as uncontrolled high-grading in the 1970s has been transformed by government strategies to promote legal, selective logging, guided by Management Declarations (DEMAs) in Peru and Long-term Forest Harvest Permits in Colombia. Illegal timber trafficking does still occur on both sides of the border and attempts to control it have not been successful to date. Timber is also harvested for local use, based on mutual consent agreements between loggers and landowners.

Farm plots (*chacras* or *chagras*) do much more than provide subsistence crops; they are also the place where spiritual and cultural practices fundamental for maintaining the social fabric are refreshed on a daily basis. The management and use of these plots is guided by ecological and traditional knowledge, which Indigenous communities share with *mestizo* communities to ensure wise use of the landscape. Farm plots are established in both the uplands and on the floodplains. Along the lower Putumayo, upland plots are mostly on the Colombian side of the river (where the uplands are easier to access), but they are farmed by Peruvian communities under formal and informal agreements founded on family relationships and based on mutual respect, support, friendship, and reciprocity. In a landscape with significant potential for non-timber forest product harvests, the women's association ASMUCOTAR in Tarapacá has taken a lead in commercializing the pulp of fruits like *camu camu* (*Myrciaria dubia*), *arazá* (*Eugenia stipitata*), and *copoazú* (*Theobroma grandifolium*).

REPORT AT A GLANCE	
Human Communities (continued)	<p>Governance</p> <p>During our visit to the region we observed a large number of formal, territorial, and guild-based organizations with varying levels of experience. On the Peruvian side of the border, residents live in Indigenous communities that have organized themselves into two federations: the Federation of Indigenous Communities of the Lower Putumayo (FECOIBAP) and the Organization of Indigenous Communities of the Lower Putumayo and Yaguas Rivers (OCIBPRY). In Colombia, the Indigenous population lives in communities inside Indigenous territories (<i>resguardos indígenas</i>; the Ríos Cotuhé y Putumayo and Uitiboc territories). These are governed by their respective Associations of Traditional Indigenous Authorities (AATIs): the Greater Indigenous Council of Tarapacá (CIMTAR) and the Association of Indigenous Authorities of Tarapacá Amazonas (ASOAINAM), as well as an urban <i>cabildo</i> in Tarapacá. <i>Mestizo</i> settlements are organized under the religious authorities of Puerto Ezequiel. Residents of Tarapacá have organized themselves in a variety of associations and guilds for a variety of purposes.</p> <p>We also observed local agreements between communities and organizations, some at the national scale and some in both countries, which promote harmony and the shared management of natural resources, facilitate the exchange of knowledge and experience, and help coordinate territorial land use zoning, monitoring, and enforcement. Some of these agreements have been officially recognized by government agencies in Peru and Colombia. There are also regular meetings for coordinating and collaborating at a variety of scales (local, regional, and binational), among the various Indigenous organizations and between those organizations and the governments. Some stakeholders in the region have their own instruments and systems for managing their territory, such as life plans, management plans, and environmental plans.</p> <p>There are serious barriers to the binational coordination needed to address threats in the region such as illegal gold mining and drug trafficking, and to preserve cultural traditions, guarantee sustainable resource use, and provide basic government services. Local knowledge, the sense of belonging to the territory, respect for other cultures, and the shared identity of residents of the Putumayo River are fundamental assets for facing these threats and challenges in a frontier region that is, above everything else, a living cultural and ecological corridor.</p>
Current status	<p>The 2.7 million-hectare landscape we studied includes several different land use categories, but an astonishing 88% of it is under some category of conservation or sustainable resource use. This includes 39% that is strictly protected in national parks (Yaguas NP in Peru and Amacayacu and Río Puré NPs in Colombia), 21% that is inside formal Indigenous territories (<i>comunidades nativas</i> in Peru and <i>resguardos indígenas</i> in Colombia), 20% designated as part of Colombia's Forestry Reserve, and 8% in the Cotuhé Conservation Concession in Peru. (An additional 2% is an area of overlap between Amacayacu NP and the Resguardo Indígena Puerto Nariño). The remaining 12% of the landscape, all of it in Peru, does not yet have any formal land use designation.</p>

Principal assets for conservation	<ol style="list-style-type: none"> 01 Forests, rivers, and lakes with an excellent conservation status, constituting an ecological and cultural corridor between parks, Indigenous territories, and forestry concessions 02 Indigenous and <i>mestizo</i> communities of impressive social and cultural diversity, with deep knowledge of the territory and a strong sense of belonging here 03 Megadiverse flora and wildlife, including healthy populations of fishes, birds, and mammals that are a crucial source of food and autonomy for local communities 04 Numerous projects currently managing natural resources in communities, Indigenous territories, protected areas, and forestry concessions 05 National and binational agreements among communities and management plans that regulate natural resource use and monitoring in parks, Indigenous territories, and forestry concessions
Principal threats	<ol style="list-style-type: none"> 01 Limited binational coordination in favor of conservation and the well-being of local residents 02 Widespread illicit activities such as illegal logging, gold mining, and drug trafficking 03 Little to no government presence in the region and inadequate access to government services 04 Conflicting territorial aspirations between local communities and government agencies 05 Lack of incentives promoting legal and sustainable economic activities
Principal recommendations:	<p>Peru</p> <ol style="list-style-type: none"> 01 Implement a land use category focused on conservation and sustainable use for the currently undesignated land in the lower Yaguas watershed, that guarantees its long-term shared use by Indigenous communities of the lower Putumayo, resolves conflicting visions of the landscape, and puts an end to illicit activities in the basin. 02 Press for the implementation of the management plan of the Cotuhé Conservation Concession. 03 Respect the territory of the newly contacted Ticuna population in the Cotuhé watershed. <p>Colombia</p> <ol style="list-style-type: none"> 04 Help zone and organize the Forestry Reserve in a way that reflects current use, respects local peoples' aspirations, and maintains biological and cultural connectivity. 05 Update the integrated life plan of the Ríos Cotuhé y Putumayo Indigenous Reserve with the information from the Environmental Survey and the rapid inventory, and move to implement it.

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Principal Recommendations (continued)	<p>06 Strengthen management and sustainability in the northern and central sectors of Amacayacu National Park.</p> <p>07 Promote dialogue among all the actors in Tarapacá about land use planning, and create management instruments for Tarapacá.</p>
The binational Bajo Putumayo-Yaguas-Cotuhé region	
	08 Carry out joint actions led by Colombian and Peruvian authorities to address the threats of drug trafficking and illegal gold mining, and strengthen the binational strategy to document and mitigate the impacts of mercury pollution in people and wildlife.
The Putumayo-Içá Biological and Cultural Corridor	
	<p>09 Inspire local, regional, national, and international leaders to appreciate the unique opportunity that the Putumayo-Içá watershed offers to protect a living corridor, cultural and biological, through whose immense intact forests flows one of the Amazon's last great undammed rivers.</p> <p>10 Bring together the four countries of the Putumayo-Içá watershed to synchronize national laws that regulate natural resource use and management there, and that guide monitoring and enforcement actions in frontier areas (especially with regard to illicit activities).</p> <p>11 Ensure that every action at the watershed scale respects the assets, knowledge, and on-the-ground realities of the people who live along the Putumayo and Içá, in a way that aligns local, regional, and national aspirations in a grand shared dream of the Putumayo-Içá Corridor.</p>

Why Bajo Putumayo-Cotuhé-Yaguas?

Just a few minutes after liftoff from the landing strip in Tarapacá, Colombia, the town left behind shrinks to a tiny urban island in the sea of Amazonian green. From above you see rivers cutting through the emerald landscape in an ever-changing pattern that records the ebbs and flows of the mighty Putumayo, its tributaries the Yaguas and Cotuhé, and the tiniest creeks that feed them all. Every year these rivers overflow their banks and extend far into the forest, blurring boundaries between aquatic and terrestrial, releasing pulses of nutrients, inviting fish into the forests to disperse fruits, and connecting places that are isolated during the drier months.

To safeguard natural and cultural diversity in this forested wilderness, both Peru and Colombia have established national parks (Yaguas in Peru, Amacayacu and Río Puré in Colombia) and have titled Indigenous lands (*resguardos indígenas* in Colombia, *comunidades nativas* in Peru). The Ticuna Indigenous people have lived in these ancestral territories for millennia, while other Indigenous inhabitants arrived after fleeing the violence during the rubber boom 100 years ago. With few exceptions, the Indigenous residents have land rights. Other colonists—including the families of soldiers who came to fight the Peru-Colombia war during the 1930s and a more recently arrived religious sect known as *Israelitas*—settled mostly along the banks of the Putumayo itself, many with no clear tenure to the land.

Almost all of the more than 5,000 people on this landscape make their living primarily by planting crops, fishing, hunting, logging, and harvesting non-timber forest products. Colombian pesos and Peruvian soles exchange hands, coming and going like the people themselves. When the Peruvian side of the Putumayo floods, gardens are moved to the higher terraces along the Colombian side. When the arowana fishes spawn in lagoons, Peruvian and Colombian fishers shadow their movements, crossing from one country to the other. Colombians cut timber in Peru, Peruvians cut timber in Colombia, and the logs travel along the rivers they share. At the same time, armed mafias and an interconnected web of illegal economies—coca, timber, mining—operate openly, far from the reach of the law, placing extreme pressure on local people, and their livelihoods and well-being.

In this dynamic landscape of streams, rivers, backwaters, and lagoons that connect rather than divide, the long-term integrity of the Bajo Putumayo-Cotuhé-Yaguas region depends on a coordinated strategy among all actors and countries. The strategy must be inclusive and holistic. And it must be grounded in a vision of dignified life for all human inhabitants—Indigenous people, non-Indigenous settlers, *campesinos*, *Israelitas*—in a vibrant landscape of healthy forests, rivers, and streams that sustain, for the long term, some of the richest plant and animal communities on the planet.